



XP Power



●●● AC-DC Open Frame



●●● AC-DC Enclosed



●●● External



●●● DC-DC



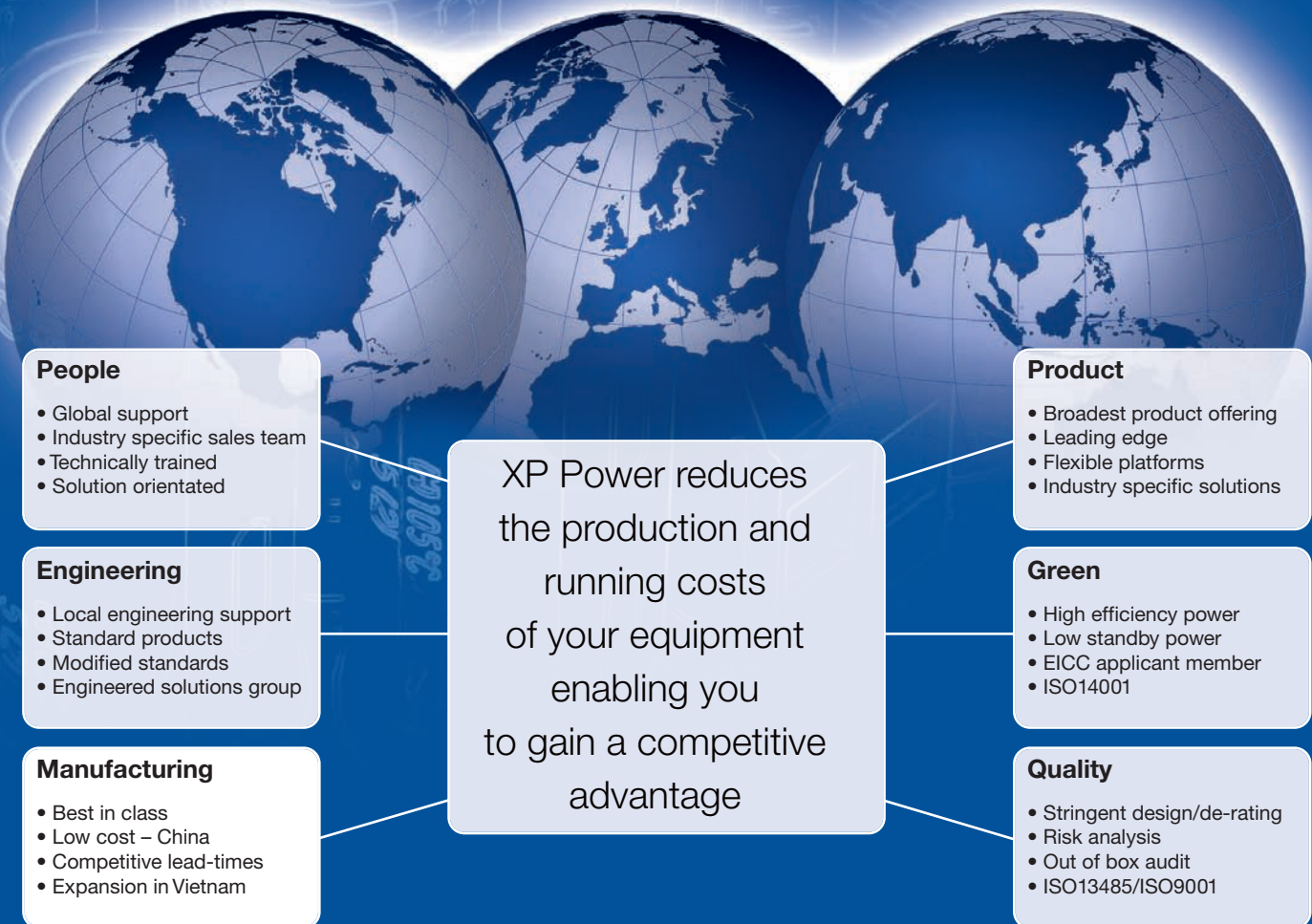
●●● Configurable



●●● DIN Rail

Power Supply Guide 2011/12

Global Power Solutions



We are committed to providing the best technical and commercial solution for your power needs.

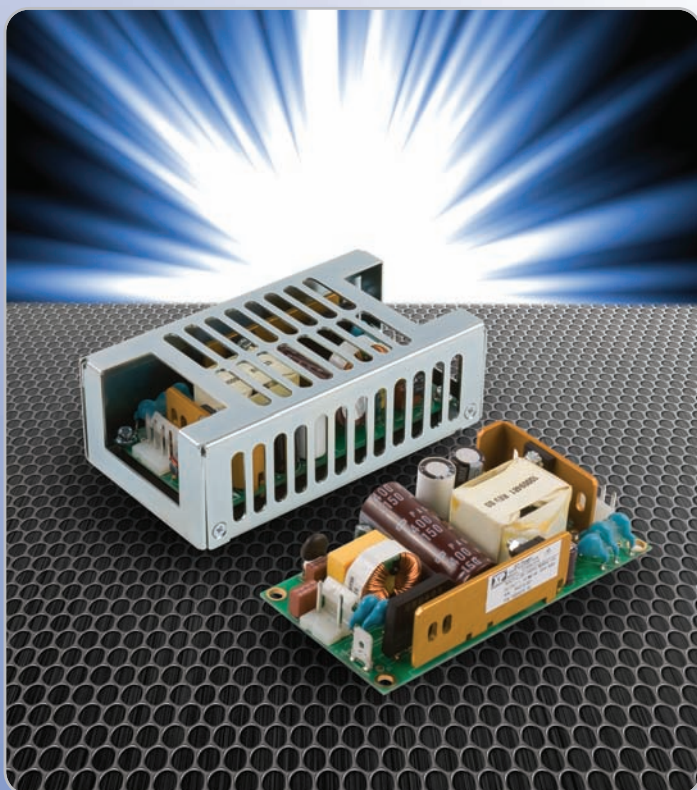
- Exclusive focus on power conversion
- Worldwide sales of \$150 million
- Local engineering and sales support
- London Stock Exchange listed
- ISO9001 certified quality management system

Our mission

To inspire our people to be The Experts in Power delivering genuine value to our customers.



T H E X P E R T S I N P O W E R



New Products



Industry Expertise



Engineered Solutions

Welcome to the latest edition of the XP Power Supply Guide, designed to help you quickly find the best power solution for your application. Pages 8 to 12 list products by type and power range, or if you know the part number, an alphabetical index can be found on the inside back cover.

Contents

New Productspage 2

We have introduced over 60 new product ranges since our last power supply guide and have highlighted some of the many new series here.

Industry Expertisepage 4

Our industry specialists are versed in all the technical requirements and power supply legislation applicable to the industrial, healthcare and technology industries.

Engineered Solutionspage 6

Standard power supplies do not always meet the specific requirements of the target application. XP Power's Engineering Services can provide the solution.

Selector Guidespage 8

Our 'at a glance' guides to choosing the right power solution for your application.

Green Powerpage 13

We aim to develop products that are smaller, produce less waste and have as little environmental impact as possible.

XP Productspage 14

XP product datasheets for our latest products can be found here. These detail full specifications, part number tables and mechanical drawings.

Farnell & Newark Referencepage 284

Looking to purchase from Farnell, element14 or Newark? Use this reference guide to help quickly identify the right part number.



Premier Farnell

XP Power's global agreement with Premier Farnell ensures a high level of service to our customers. Items stocked in the Farnell, Newark & element14 catalogs and websites are highlighted in each series datasheet. In addition, there is a cross reference section on pages 284-296 showing XP Power model numbers against the equivalent Farnell, Newark & element14 stock number.





- ECL Dual & Triple Series
- 15 & 30 Watts dual & triple output
- PCB, chassis mount & encapsulated
- Ultra compact size

Page 14



- ECE Series
- 20 & 40 Watts single output
- Encapsulated, PCB or chassis mount
- Ultra compact size

Page 22



- ECS25/60/65 Series
- 25, 60 & 65 Watts single output
- Compact 2" x 3" & 2" x 4" packages
- IT & medical safety approvals

Page 26/44



- ECP65 & 150 Series
- 65 & 150 Watts 2" x 4"
- Single, dual & triple output
- IT & medical safety approvals

Page 32/58



- VCS Series
- 50, 70 & 100 Watts single output
- Chassis mount industrial supplies
- Low cost

Page 40



- DLG Series
- 50, 75, 100 & 150 Watts single output
- AC input LED driver
- Water proof to IP67

Page 56



- CLC175-M Series
- 175 Watts single output
- Compact 3" x 5" package
- Medical safety approvals

Page 60



- CCB250 Series
- 250 Watts convection-cooled
- Very high efficiency - up to 95%
- IT & medical (BF) safety approvals

Page 70



- EMH Series
- 250 & 350 Watts single output
- Ultra compact 3" x 5" package
- IT & medical (BF) safety approvals

Page 86



- MFA420 Series
- 420 Watts single output
- U-channel, fan cover & hotswap
- 5 V standby & 12 V fan supply outputs

Page 94



- CCH Series
- 400 & 600 Watts baseplate cooled
- -40 °C to +70 °C operation
- Industrial & MIL-STD EMC compliance

Page 108



- MHP/SHP1000 Series
- 1000 Watts (1200 Watts at highline)
- Rugged construction
- IT & medical safety approvals

Page 112/116



- HPU1K5-M Series
- 1500 Watts single output
- Low profile
- IT & medical safety approvals

Page 124



- HCP Series
- 650, 1000, 1500 & 3000 Watts
- Full signals & monitoring
- Programmable o/p voltage & current

Page 138



- VEP Series
- 8 to 36 Watts plugtop
- Energy efficiency level V
- IT & medical safety approvals

Page 156



- AFM Series
- 45 to 120 Watts external
- Energy efficiency level V
- IT & medical safety approvals

Page 160/174



- AHM Series
- 85 to 250 Watts external
- Energy efficiency level V
- IT & medical safety approvals

Page 176



- flexPower X15 Series
- 1500 / 2500 Watts configurable
- SEMI F47 compliant
- IT & medical safety approvals

Page 128



●●● IK Series

- 0.25 Watt single output
- SIP or DIP package
- 1000 VDC (3k VDC optional) isolation

Page 182



●●● SR Series

- 3 pin SIP switching regulator
- Efficiency up to 97%
- Wide input range

Page 183



●●● IQ Series

- 1 Watt single & dual output
- Semi-regulated
- 1000 VDC (3k VDC optional) isolation

Page 189



●●● IP Series

- 3 Watts regulated single & dual output
- 1600 VDC isolation
- Wide 4:1 input range

Page 203



●●● IR Series

- 3 Watts single & dual output
- Semi-regulated
- 1000 VDC (3k VDC optional) isolation

Page 204



●●● JHM10 Series

- 10 Watts single & dual output
- 4000 VAC reinforced insulation
- Meets IEC60601-1, 3rd edition

Page 224



●●● JTF08/10 Series

- 8 & 10 Watts single & dual output
- Compact DIP-24 package
- Wide 4:1 input range

Page 226



●●● JCM15/20 Series

- 15 & 20 Watts single & dual output
- Compact 1" x 1" package
- 2:1 input range

Page 238



●●● JTK20 Series

- 20 Watts single & dual output
- Compact 1" x 1" package
- Wide 4:1 input range

Page 240



●●● JCK30/40 Series

- 30 & 40 Watts single & dual output
- Compact 2" x 1" package
- 2:1 input range

Page 246/250



●●● JTL40 Series

- 40 Watts single & dual output
- Efficiency up to 92%
- Wide 4:1 input range

Page 252



●●● LDU48 Series

- 48 Watts LED driver
- Constant current output
- LED drive current up to 1000 mA

Page 254



●●● MTC35/50 Series

- 35 & 50 Watts
- 10-40 VDC input range
- Designed for vetronic & avionic use

Page 270



●●● QSB350/600 Series

- 350 & 600 Watts
- Baseplate-cooled
- 2:1 input range

Page 274/280

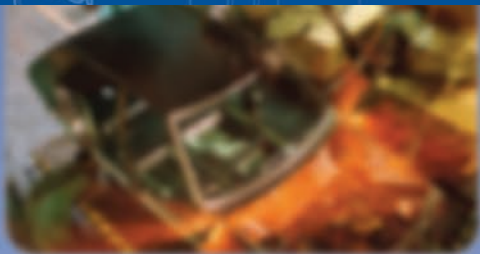


●●● Power Supply Technical Guide

Having trouble keeping up with the latest standards for external power supplies such as the California Energy Commission's (CEC) requirements for efficiency and no-load power consumption; or the implications of the 3rd Edition 60601 on medical safety? Ever wondered why seemingly similar power supplies have significantly different performance and reliability characteristics? The answers to these and many more questions can be found in this, the third edition of XP's Power Supply Technical Guide, the culmination of many, many years experience gained by the XP Power applications team spread over three continents. Whether you're new to designing-in a power supply or DC-DC converter or an 'old hand', this book offers an invaluable resource and all the information you'll need in one easy reference guide.

Visit xppower.com or call your nearest sales office for your free copy.

Industry Expertise



Industrial

Our industrial products are designed to satisfy the legislative and safety requirements that are unique to the industrial sector. XP's product range covers applications in factory automation, automated test equipment, industrial control, test and measurement, instrumentation, hazardous environments and defense. Our team of technical sales specialists is well versed in the individual needs of your specific sector.

Whether your system demands high peak loads for motors, extended temperature range for outdoor applications, field replaceable fans or the need to operate in hazardous environments, you will find a solution from our broad range of industrial power supplies.

In systems requiring more than one output, start up, shutdown and sequencing of outputs is often desirable. Our modular power supplies are fitted with isolated control signals which allow for remote and independent manipulation of the outputs.



Healthcare

XP Power understands the challenges faced by medical device manufacturers due to legislation and market demands. Our products are designed to meet these challenges and provide cost-effective solutions for use in both the hospital and non-hospital environments. Understanding the requirements of our target customers has led to product features that are incorporated for a reason, such as class II approvals for homecare devices, highly efficient convection-cooled designs for low noise patient area devices and defibrillator-proof DC-DC converters for applied part applications.

The mission critical nature of medical devices demands high quality, reliable and safe products. Our goal is to consistently deliver products that meet this criterion. To ensure that we meet this goal XP Power operates under ISO9001 certification and all of our products are designed to rigorous standards as well as undergoing extensive testing. During the design and manufacturing phases we use processes such as DFMEA (Design Failure Mode Effects Analysis) and PFMEA (Process Failure Mode Effects Analysis) to ensure our products are as reliable and safe as possible. In addition, our Kunshan facility has ISO13485 certification for the manufacturing of medical devices.



Technology

An extensive range of product and engineering capabilities allows us to satisfy the often rigorous and fast moving application requirements seen in communications, audio/visual broadcast equipment and semiconductor production equipment. The demand for smaller, more efficient, fully featured power converters with both AC and DC input requirements has driven the development of market leading products. XP Power continue to support emerging standards with our product offering, such as power supplies with digital control suitable for PMBus, and "green" power products employing very low no load power consumption and high efficiency levels compliant with the latest legislation from CEC, EISA and ErP.

For outdoor applications we offer conduction-cooled solutions which operate over a wide temperature range making them suitable for use in sealed enclosures and harsh environments.

In critical applications where the AC supply is not always reliable, XP offers SEMI F47 ratings on our supplies, this means customers are assured a regulated output will be maintained to their system in the event of AC voltage sags.

Free Brochures Available

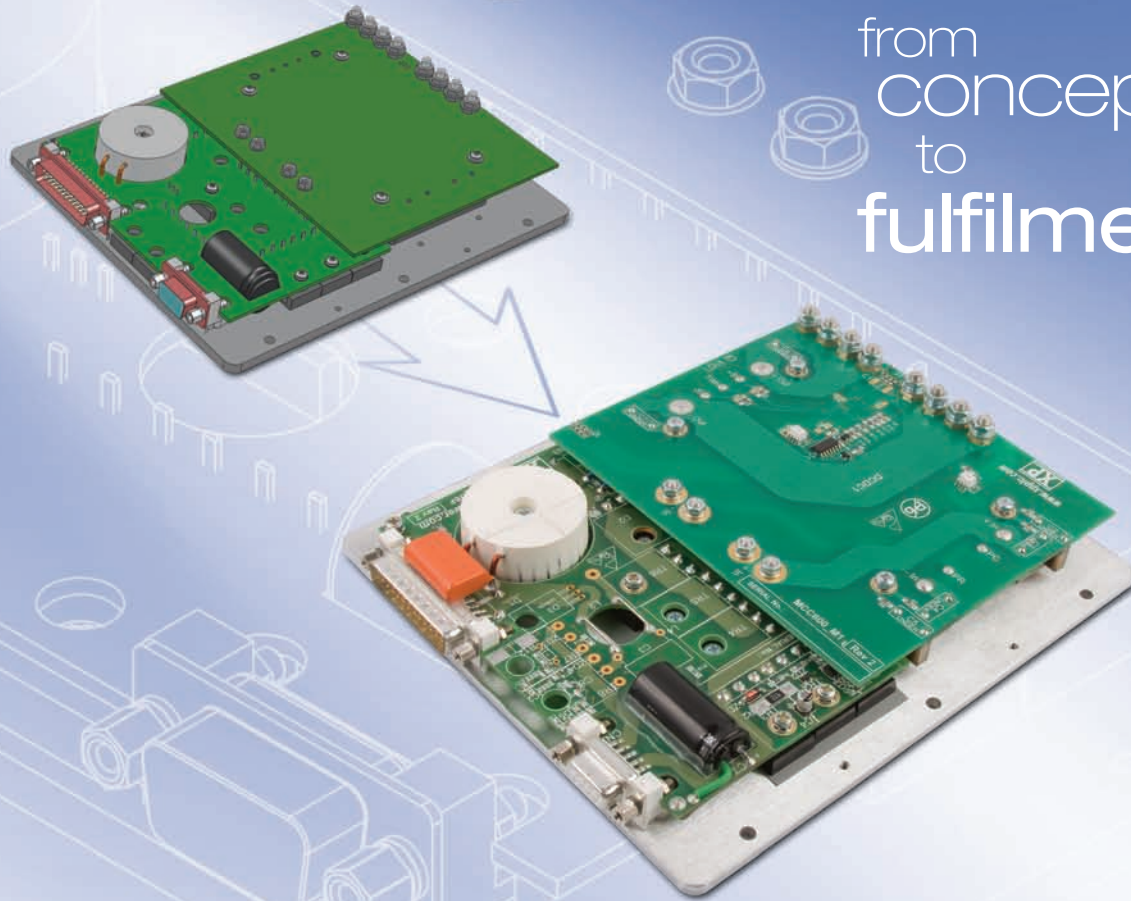
XP Power has published a series of in-depth industry focused literature which look at how XP products can provide power solutions for specific requirements unique to each sector. All literature is available upon request by calling your local sales office or by download. To download a free copy in pdf format, go to:

www.xppower.com



Engineered Solutions

from
concept
to
fulfilment



XP Engineering Services provides solutions where applications cannot be fulfilled from our standard product range or where integrated products are required. We offer the world's strongest standard product range, which provides us with a vast selection of power platforms from which to deliver complex modified standards.

We design and manufacture cost effective application specific solutions that meet your electrical, mechanical, safety, EMC and thermal management requirements, while ensuring a fast time to market.

- Low development cost
- Low risk, proven technology
- World class design
- Short development times
- Worldwide local engineering support
- Low cost manufacturing in Asia
- ISO 9001 certified quality management system

Mechanical Design

- 3D-model, photo-rendering, animation
- Thermal, stress and mass simulation
- Environmentally sealed units

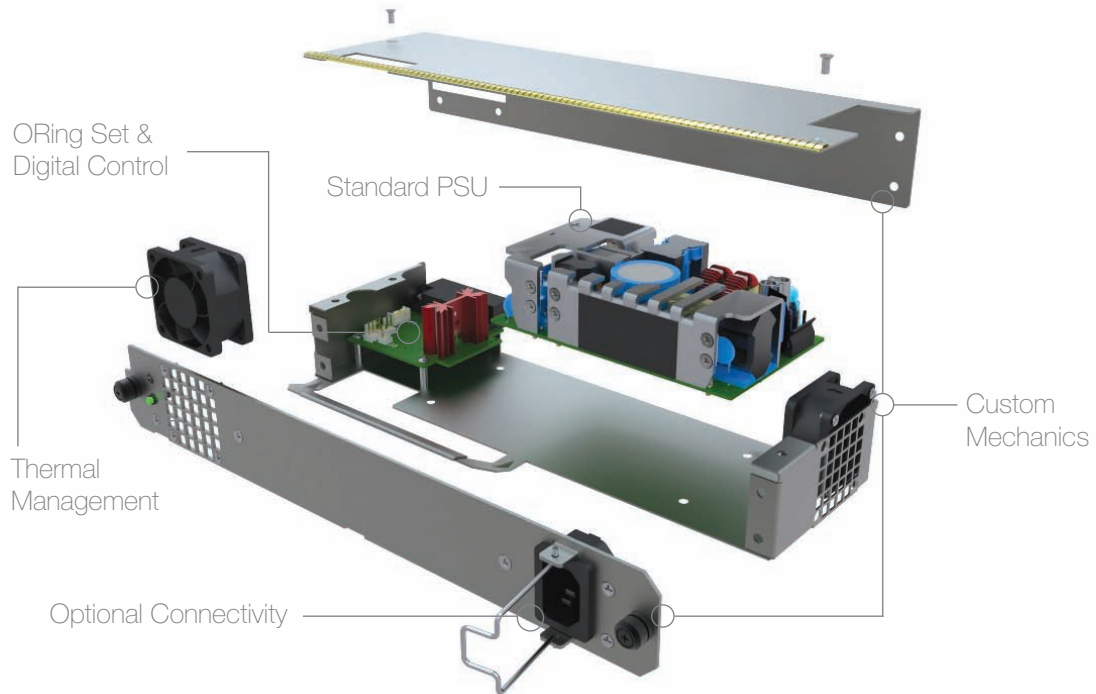
Electrical Design

- Filter design for specific noise and ripple standards
- I²C interface requirements for power supply health and control
- Blind-mate, hot-swap experts
- Embedded micro-processor based design
- Schematic capture / simulation
- Compliance with defense specifications

Quality and Test

- Serial numbered reports attached to each unit shipped
- 100% parametric DVT testing
- In-system troubleshooting
- System specific testing can also be provided
 - Turnkey EMC certification
 - HALT / HASS integrity testing
 - Burn-in

Redundant Hot Swap Power Solution



Printed Circuit Board Design

- Timely electrical assemblies improving customer time-to-market
- Safety specific creepage and clearance
- Design for manufacturability
- PCB modeling & layout

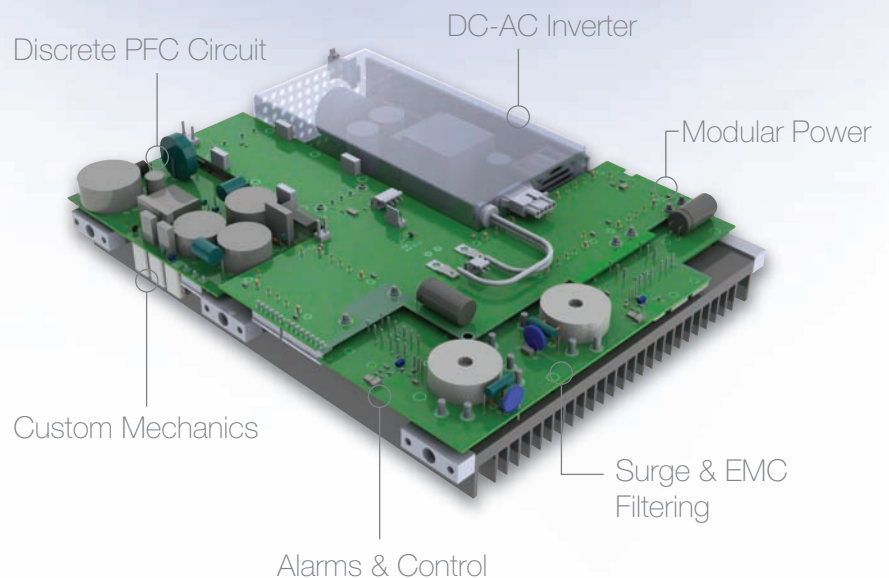
Software Programming

- In-house software / firmware development
- Serial bus interfaces - I²C & RS232 / 422
- Software / firmware functionality
 - Smart battery interface (SMBus)
 - Battery charging
 - Power supply sequencing
 - Power supply alarm and control

Safety & Compliance

- Compliance engineering
- Expert knowledge of UL, TUV, CSA, CE & CB schemes
- NEBS & ETSI compliance
- MIL STD compliance
- IT, Industrial & medical safety standards
- IT, Industrial & medical EMC compliance
- MIL STD & DEF STAN EMC compliance

Secure Satellite Communication Power Supply



AC-DC Selector Guide

5-20 Watts



ECL05

- 5 Watts
- 2" x 1" x 0.9"
- Single Output
- PCB or Chassis Mount
- Class II
- **Page 14**



ECL10

- 10 Watts
- 2" x 1" x 0.9"
- Single Output
- PCB or Chassis Mount
- Class II
- **Page 14**



ECL15

- 15 Watts
- 2.5" x 1.25" x 0.96"
- Single & Multi Outputs
- PCB or Chassis Mount
- Class II
- **Page 14**



ECP20

- 20 Watts
- 2.64" x 1.57" x 0.73"
- Single & Dual Output
- Class II
- PCB Mount
- **Page 20**



ECE20

- 20 Watts
- 2.06" x 1.07" x 0.91"
- Single Output
- PCB Mount
- Ultra Compact Size
- **Page 22**

25-45 Watts



ECL25

- 25 Watts
- 3" x 1.4" x 1"
- Single Output
- Class II
- PCB or Chassis Mount
- **Page 14**



ECS25

- 25 Watts
- 3" x 2" x 0.95"
- Single Output
- <0.3 W Standby Power
- Class I & II
- **Page 26**



ECE40

- 40 Watts
- 3.2" x 1.5" x 1.1"
- Single Output
- PCB or Chassis Mount
- Ultra Compact Size
- **Page 22**



ECM40

- 40 Watts
- 4" x 2" x 1.2"
- Single & Multi Outputs
- Class I & II
- Convection-cooled
- **Page 34**



ECP40

- 40 Watts
- 3" x 2" x 0.9"
- Single & Multi Outputs
- Class I
- Low Profile
- **Page 24**



ECS45

- 45 Watts
- 3" x 2" x 0.95"
- Single Output
- <0.3 W Standby Power
- Class I & II
- **Page 26**

50-70 Watts



VCS50

- 50 Watts
- 4.33" x 3.07" x 1.42"
- Single Output
- Convection-cooled
- Low Cost
- **Page 40**



ECM60

- 60 Watts
- 4" x 2" x 1.2"
- Single & Multi Outputs
- Class I & II
- Convection-cooled
- **Page 34**



ECS60

- 60 Watts
- 3" x 2" x 1.05"
- Single Output
- <0.5 W Standby Power
- Class I & II
- **Page 26**



SDS60

- 60 Watts
- 5" x 3" x 1.32"
- Single & Multi Outputs
- Class I
- Non-Std O/P's Available
- **Page 30**



ECP65

- 65 Watts
- 4" x 2" x 1"
- Single & Multi Outputs
- IT & Medical Approvals
- Peak Load Capacity
- **Page 32**



ECS65

- 65 Watts
- 4" x 2" x 1.54"
- Single Output
- <0.5 W Standby Power
- Low Leakage Current
- **Page 44**



VCS70

- 70 Watts
- 5.12" x 3.88" x 1.57"
- Single Output
- Convection-cooled
- Low Cost
- **Page 40**

80-100 Watts



ECC100

- 100 Watts
- 5" x 4.1" x 1.8"
- Single Output
- Baseplate-cooled
- Remote On/Off
- **Page 48**



ECM100

- 100 Watts
- 4.5" x 2.5" x 1.2"
- Single & Multi Outputs
- Class I & II
- PoE Version
- **Page 34**



ECS100

- 100 Watts
- 4" x 2" x 1.2"
- Single Output
- <0.5 W Standby Power
- Class I & II
- **Page 44**



VCS100

- 100 Watts
- 6.26" x 3.87" x 1.65"
- Single Output
- Convection-cooled
- Low Cost
- **Page 40**

120-140 Watts



SDS120

- 120 Watts
- 5" x 3.2" x 1.54"
- Single & Multi Outputs
- Convection-cooled
- Mechanical Options
- **Page 66**



CLC125

- 125 Watts
- 4" x 2" x 1.2"
- Single Output
- Fan Output
- Low Profile
- **Page 50**



JPS130/M

- 130 Watts
- 5" x 3" x 1.34"
- Single & Multi Outputs
- Fan Output
- Convection Rating
- **Page 52**



ECM140

- 140 Watts
- 5" x 3" x 1.3"
- Single Output
- 120 W Convection
- Signals Options
- **Page 54**

150-175 Watts



ECP150

- 150 Watts
- 4" x 2" x 1.2"
- Single Output
- Fan Supply
- High Efficiency
- **Page 58**



LCL150

- 150 Watts
- 7.55" x 3.74" x 1.97"
- Single Output
- Convection-cooled
- Low Cost
- **Page 104**



SDS150

- 150 Watts
- 5" x 3.2" x 1.62"
- Single Output
- Convection-cooled
- Mechanical Options
- **Page 66**



CLC175

- 175 Watts
- 5" x 3" x 1.3"
- Single Output
- Fan Output
- Signals Options
- **Page 60**



RCL175

- 175 Watts
- 5.5" x 3.7" x 1.38"
- Single & Multi Outputs
- Class I & II
- Mechanical Options
- **Page 62**



= Green Power



= Medical Versions Available

180-250 Watts

SDS180

- 180 Watts
- 5" x 3.21" x 1.54"
- Single Output
- Convection-cooled
- Mechanical Options
- Page 66



CCM250

- 250 Watts
- 6" x 4" x 1.54"
- Single Output
- Convection-cooled
- Efficiency up to 95%
- Page 72



SDR250

- 250 Watts
- 5" x 3.2" x 1.5"
- Single & Dual Outputs
- Fan Cover Options
- Remote On/Off
- Page 74



CCB250

- 250 Watts
- 6" x 3.73" x 5.73"
- Single Output
- Convection-cooled
- Efficiency up to 95%
- Page 70



EMH250

- 250 Watts
- 5" x 3" x 1.43"
- Single Output
- Medical BF Compliant
- 80-275 VAC Operation
- Page 86

300-350 Watts

SDF300

- 300 Watts
- 5" x 3.2" x 1.5"
- Single & Dual Outputs
- Fan Cover Options
- Remote On/Off
- Page 78



LCL300

- 300 Watts
- 8.07" x 4.33" x 1.97"
- Single Output
- Remote On/Off
- Low Cost
- Page 104



SDC320

- 320 Watts
- 6" x 4" x 2.14"
- Single & Dual Outputs
- Status Signals
- Remote On/Off
- Page 82



MFA350

- 350 Watts
- 6.8" x 3.2" x 1.5"
- Single Output
- Fan Cover Options
- DC-DC Versions available
- Page 94



EMH350

- 350 Watts
- 5" x 3" x 1.43"
- Single Output
- Medical BF Compliant
- Analog & PMBus Options
- Page 86

400-600 Watts



FCM400

- 400 Watts
- 6" x 4" x 1.93"
- Single Output
- Low Noise Fan
- 5V Standby
- Page 92



MFA420

- 420 Watts
- 6.8" x 3.2" x 1.5"
- Single Output
- High Power Density
- Active Current Share
- Page 94



LCL500

- 500 Watts
- 9.8" x 5" x 2"
- Single Output
- Remote On/Off
- Low Cost
- Page 104



CCH400/600

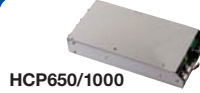
- 400/600 Watts
- 8.43" x 4.02" x 1.69"
- Single Output
- Baseplate-cooled
- -40°C to +70°C Op. Temp.
- Page 108

650-3000 Watts



MHP/SHP650

- 650 Watts
- 8" x 4" x 2.5"
- Single Output
- Rugged Construction
- Fan Cover Options
- Page 116/112



HCP650/1000

- 650/1000 Watts
- Single Output
- Programmable Voltage
- Programmable Current
- Controls and Alarms
- Page 138



SMR800

- 800 Watts
- 9.1" x 4.2" x 2.5"
- Single Output
- SEMI F47 Compliant
- Remote On/Off
- Page 110



MHP/SHP1000

- 1000 Watts
- 9.55" x 5.9" x 2.4"
- Single Output
- Rugged Construction
- Variable Speed Fan
- Page 116/112



GFR1K5

- 1500 Watts
- 12.6" x 4" x 1.6"
- Single Output
- I²C Interface
- Current Share & Signals
- Page 120



HPU1K5

- 1500 Watts
- 12.8" x 4" x 1.7"
- Single Output
- Current Share
- Low Profile
- Page 124



HCP1500/3000

- 1500/3000 Watts
- Single Output
- Programmable Voltage
- Programmable Current
- Controls and Alarms
- Page 138

LED Drivers

DLG50

- 50 Watts
- 7.2" x 1.6" 1.3"
- Single Output
- Up to 88% Efficiency
- IP67
- Page 56



DLG75

- 75 Watts
- 8.3" x 2.6" 1.4"
- Single Output
- Up to 93% Efficiency
- IP67
- Page 56



DLG120

- 120 Watts
- 8.7" x 2.6" 1.4"
- Single Output
- Up to 92% Efficiency
- IP67
- Page 56



DLG150

- 150 Watts
- 8.8" x 2.6" 1.5"
- Single Output
- Up to 94% Efficiency
- IP67
- Page 56

Configurable



LP/LP MD

- 250-450 Watts
- Single & Multi Outputs
- Low Profile 1U
- Semi F47 Compliant
- Isolated Outputs
- Page 98



flexPower

- 400-3000 Watts
- Single & Multi Outputs
- Semi F47 Compliant
- Extra Power at High Line
- Isolated Outputs
- Page 128

DIN Rail



DNR05-60

- 5 - 60 Watts
- Up to 89% Efficiency
- Single Output
- Convection-cooled
- DC Standby Versions
- Page 146



DNR120-480

- 120 - 480 Watts
- Up to 90% Efficiency
- Single Output
- Convection-cooled
- DC Standby Versions
- Page 150



DNR120-960

- 120 - 960 Watts
- Up to 92% Efficiency
- Single Output
- Three Phase Input
- Convection-cooled
- Page 154

DC-DC Selector Guide

0.25-1 Watt	2 Watts	3 Watts	4-5 Watts	6 Watts	8 Watts
IK • ±10% Input • Unregulated • SIP & DIP • Single Output • 1000 V Isolation • Page 182	IH • ±10% Input • Unregulated • SIP & DIP • Dual Output • 1000 V Isolation • Page 196	IS • ±10% Input • Regulated • SIP • Single Output • 1000 V Isolation • Page 205	JCA04 • 2:1 Input • Compact DIP24 • Single & Dual Output • UL & TUV • 1500 V Isolation • Page 216	JCA06 • 2:1 Input • Compact DIP24 • Single & Dual Output • UL & TUV • 1500 V Isolation • Page 216	JCJ08 • 2:1 Input • DIP24 • Single & Dual Output • 1500 V Isolation • Page 220
IA/IB/IE • ±10% Input • Unregulated • SIP & DIP • Single & Dual Output • 1000 V Isolation • Page 184/185/187	IL • ±10% Input • Unregulated • SIP • Single Output • 1000 V Isolation • Page 197	IR • ±10% Output • Semi-regulated • SIP Package • Single & Dual Output • 1000 V Isolation • Page 204	JTC04 • 4:1 Input • DIP24 • Single & Dual Output • 1500 V Isolation • 3500 V Optional • Page 218	JTC06 • 4:1 Input • DIP24 • Single & Dual Output • 1500 V Isolation • 3500 V Optional • Page 218	JTF08 • 4:1 Input • DIP24 • Single & Dual Output • 1600 V Isolation • Remote On/Off • Page 226
IV • ±10% Input • Unregulated • SIP & DIP • Single & Dual Output • 3000 V Isolation • Page 193	JAH02 • ±10 Input • DIP24 • Single & Dual Output • 1000 V Isolation • Up to 6 kV Optional • Page 208	IZ • 2:1 Input • Regulated • SIP • Single & Dual Output • 1600 V Isolation • Page 207	SMD		
IC • ±10% Input • Unregulated • Ultra Slim DIP • Single Output • 1500 V Isolation • Page 186	IU • 2:1 Input • Regulated • SIP & DIP • Single & Dual Output • 1000 V Isolation • Page 202	JCA03 • 2:1 Input • Compact DIP24 • Single & Dual Output • UL & TUV • 1500 V Isolation • Page 210	ISG • ±5% Input • Regulated • Single Output • 1000 V Isolation • Page 191	ISL • 4:1 Input • Regulated • Single & Dual Output • 1500 V Isolation • Page 195	ISQ • ±10% Input • Unregulated • Single Output • 6000 V Isolation • Page 200
IF • ±10% Input • Regulated • SIP & DIP • Single Output • 1000 V Isolation • Page 188	JCA02 • 2:1 Input • Compact DIP24 • Single & Dual Output • UL & TUV • 1500 V Isolation • Page 210	JCB03 • 2:1 Input • DIP24 • Single & Dual Output • 1500 V Isolation • Up to 3 kV Optional • Page 212	ISF • ±10% Input • Unregulated • Single & Dual Output • 1000 V Isolation • 3000 V Optional • Page 190		
IQ • ±10% Input • Semi-regulated • SIP Package • 1000 V Isolation • 3000 V Isolation • Page 189	IM • 4:1 Input • Regulated • SIP • Single & Dual Output • 1500 V Isolation • Page 198	IP/IT • 4:1 Input • Regulated • SIP • Single & Dual Output • 1500 V Isolation • Page 203/206	ISJ • ±10% Input • Unregulated • Ultra Slim Package • Single Output • 1500 V Isolation • Page 192		
IW • 2:1 Input • Regulated • SIP & DIP • Single & Dual Output • 1000 V Isolation • Page 194					
SR • Switching Regulator • Wide Input Range • 3 Pin SIP Package • Up to 97% Efficiency • Short-circuit Protection • Page 183					
IST • ±10% Input • Unregulated • Single Output • 1000 V Isolation • Page 201					
ISP • 2:1 Input • Regulated • Single & Dual Output • 1500 V Isolation • Page 199					

10 Watts

JCJ10

- 2:1 Input
- DIP24
- Single & Dual Output
- 1500 V Isolation
- Page 220



JCH10

- 2:1 Input
- 2" x 1"
- Single & Dual Output
- 1500 V Isolation
- Page 222



JTA10

- 4:1 Input
- 2" x 1"
- Single & Dual Output
- Level 'B' EMI
- UL Approved
- Page 234



JTF10

- 4:1 Input
- DIP24
- Single & Dual Output
- 1600 V Isolation
- Remote On/Off
- Page 226



12 Watts

JCG12

- 2:1 Input
- DIP24
- Single & Dual Output
- 1600 V Isolation
- Remote On/Off
- Page 228



JTF12

- 4:1 Input
- DIP24
- Single & Dual Output
- 1600 V Isolation
- Remote On/Off
- Page 226



15 Watts

JCM15

- 2:1 Input
- 1" x 1"
- Single & Dual Output
- 1600 V Isolation
- Remote On/Off
- Page 238



JTH15

- 4:1 Input
- 2" x 1"
- Single & Dual Output
- 1500 V Isolation
- Page 232



JTA15

- 4:1 Input
- 2" x 1.6"
- Single & Dual Output
- Level 'B' EMI
- UL Approved
- Page 234



JTK15

- 4:1 Input
- 1" x 1"
- Single & Dual Output
- 1600 V Isolation
- Remote On/Off
- Page 240



20 Watts

JCM20

- 2:1 Input
- 1" x 1"
- Single & Dual Output
- 1600 V Isolation
- Remote On/Off
- Page 238



JCK20

- 2:1 Input
- 2" x 1"
- Single & Dual Output
- 1600 V Isolation
- Remote On/Off
- Page 242



JTM20

- 4:1 Input
- 2" x 1"
- Single & Dual Output
- 1600 V Isolation
- Remote On/Off
- Page 244



JTA20

- 4:1 Input
- 2" x 1.6"
- Single & Dual Output
- Level 'B' EMI
- UL Approved
- Page 234



JTK20

- 4:1 Input
- 1" x 1"
- Single & Dual Output
- 1600 V Isolation
- Remote On/Off
- Page 240



30 Watts

JCK30

- 2:1 Input
- 2" x 1"
- Single & Dual Output
- 1600 V Isolation
- Remote On/Off
- Page 246



JTL30

- 4:1 Input
- 2" x 1"
- Single, Dual & Triple
- 1600 V Isolation
- Remote On/Off
- Page 248



40-600 Watts

JCK40

- 2:1 Input
- 2" x 1"
- Single & Dual Output
- 1600 V Isolation
- Remote On/Off
- Page 250



JTL40

- 4:1 Input
- 2" x 2"
- Single & Dual Output
- 1600 V Isolation
- Remote On/Off
- Page 252



ICH

- 50-150 Watts
- 2:1 & 4:1 Input
- Half Brick
- Single Output
- 1500 V Isolation
- Page 258



IFH

- 200 Watts
- 2:1 Input
- Full Brick
- Single Output
- 1500 V Isolation
- Page 258



QSB

- 75-600 Watts
- 2:1 & 4:1 Input
- Quarter, Half & Full Brick
- Single Output
- 1500 V Isolation
- Page 274/280



LED Drivers

8 Watts

LDU08

- LED Driver
- 7-30 VDC Input
- Up to 350 mA Output
- Non Isolated
- Dimming Control
- Page 254



24 Watts

LDU24

- LED Driver
- 7-30 VDC Input
- Up to 1000 mA Output
- Non Isolated
- Dimming Control
- Page 254



48 Watts

LDU48

- LED Driver
- 7-60 VDC Input
- Up to 1000 mA Output
- Non Isolated
- Dimming Control
- Page 254



3 Watts



JHM03

- Wide Input
- DIP24
- Single & Dual Output
- 60601 Approved
- 5000 VAC Isolation
- Page 214



6 Watts



JHM06

- Wide Input
- DIP24
- Single & Dual Output
- 60601 Approved
- 5000 VAC Isolation
- Page 214



10 Watts



JHM10

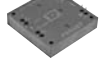
- Wide Input
- DIP24
- Single & Dual Output
- 60601 Approved
- 5000 VAC Isolation
- Page 224



External Selector Guide

8-20 Watts	24-40 Watts	45-60 Watts	70-85 Watts	100-120 Watts	150-250 Watts
   VEP08 • Efficiency Level V • 1.06" x 2.83" x 1.67" • Class II Construction • Changeable Input Plugs • Low Cost • Page 156	   VEP24 • 3.46" x 1.14" x 1.89" • CEC 2008 Compliant • EISA 2007 Compliant • Class II • Changeable Input Plugs • Page 156	   AEB45 • 4.72" x 2.05" x 1.22" • CEC 2008 Compliant • EISA 2007 Compliant • Low Profile • CCC Qualified • Page 170	   AEB70 • Efficiency Level V • 5.20" x 2.28" x 1.2" • CEC 2008 Compliant • EISA 2007 Compliant • CCC Qualified • Page 170	   AEB100 • High Power Density • 5.9" x 2.76" x 1.38" • CEC 2008 Compliant • EISA 2007 Compliant • CCC Qualified • Page 170	   AHM150 • Efficiency Level V • 7.99" x 3.15" x 1.45" • IPX1 Smooth Case • High Efficiency • Page 176
   AEL15 • Efficiency Level V • 3.58" x 1.50" x 1.42" • CEC 2008 Compliant • EISA 2007 Compliant • Low Profile • Page 164	   AEB36 • 4.33" x 1.97" x 0.79" • CEC 2008 Compliant • EISA 2007 Compliant • Low Profile • CCC Qualified • Page 170	   AFM45 • Efficiency Level V • 4.76" x 1.97" x 1.21" • CEC 2008 Compliant • EISA 2007 Compliant • Optional Class II • Page 160	   AEL80 • Efficiency Level V • 5.75" x 1.69" x 2.99" • CEC 2008 Compliant • EISA 2007 Compliant • CCC Qualified • Page 164	   AHM100 • Efficiency Level V • 6.49" x 2.52" x 1.55" • IPX1 Smooth Case • High Efficiency • Optional Class II • Page 176	   AHM180 • Efficiency Level V • 8.06" x 3.15" x 1.61" • IPX1 Smooth Case • High Efficiency • Page 176
   VEP15 • Efficiency Level V • 2.95" x 1.20" x 1.81" • Changeable Input Plugs • CEC 2008 Compliant • EISA 2007 Compliant • Page 156	   VEP36 • Efficiency Level V • 4.02" x 1.42" x 2.4" • Changeable Input Plugs • CEC 2008 Compliant • EISA 2007 Compliant • Page 156	   AEL60 • Efficiency Level V • 4.65" x 1.36" x 2.05" • CEC 2008 Compliant • EISA 2007 Compliant • CCC Qualified • Page 164	   AHM85 • Efficiency Level V • 5.9" x 2.52" x 1.45" • IPX1 Smooth Case • High Efficiency • Optional Class II • Page 176	   AFM120 • Efficiency Level V • 6.79" x 2.79" x 1.4" • Optional IEC320-C6 Inlet • CEC 2008 Compliant • EISA 2007 Compliant • Page 174	   AHM250 • Efficiency Level V • 8.8" x 3.48" x 1.51" • IPX1 Smooth Case • High Efficiency • Page 176
   AEL20 • Efficiency Level V • 3.9" x 1.65" x 1.22" • CEC 2008 Compliant • EISA 2007 Compliant • Optional Class II • Page 164	   AEL40 • Efficiency Level V • 4.65" x 1.36" x 2.05" • CEC 2008 Compliant • EISA 2007 Compliant • Low Profile • Page 164	   AFM60 • Efficiency Level V • 4.91" x 2.44" x 1.33" • CEC 2008 Compliant • EISA 2007 Compliant • Optional Class II • Page 160	 = Green Power  = Medical Versions Available		

Defense Selector Guide

5-30 Watts	35-50 Watts	60-75 Watts	100-150 Watts	200-400 Watts	500-600 Watts
 MTC05 • 15-40 VDC Input • 1.26" x 0.76" x 0.34" • Single & Dual Output • MIL-STD-461E/F • MIL-STD-1275A-D • Page 262	 MTC35 • 15-40 VDC Input • 2" x 1.1" x 0.5" • Single & Dual Output • MIL-STD-461E/F • MIL-STD-1275A-D • Page 270	 MCM60 • Universal AC Input • 5.5" x 2.75" x 1.5" • Single Output • MIL-STD-461 • Convection-cooled • Page 162	 DSF100 • MIL-STD Filter • 1.37" x 1.25" x 0.51" • DEF-STAN 59-41 • MIL-STD 461E/F • MIL-STD 1275A-D • Page 278	 DSF200 • MIL-STD Filter • 2.41" x 1.45" x 0.51" • DEF-STAN 59-41 • MIL-STD 461E/F • MIL-STD 1275A-D • Page 278	 DSF500 • MIL-STD Filter • 2.28" x 2.09" x 0.75" • DEF-STAN 59-41 • MIL-STD 461E/F • MIL-STD 1275A-D • Page 278
 MTC15 • 15-40 VDC Input • 1.57" x 1.02" x 0.38" • Single & Dual Output • MIL-STD-461E/F • MIL-STD-1275A-D • Page 262	 MTF50 • MIL-STD Filter • 10-50 VDC Input • 1.57" x 1.02" x 0.5" • MIL-STD 461E/F • MIL-STD 1275A-D • Page 266	 MTC75 • 10-40 VDC Input • 2.4" x 2.28" x 0.5" • Single & Dual Output • MIL-STD 461E/F • MIL-STD 1275A-D • Page 270	 MTH100 • Hold Up Module • 1.27" x 1.02" x 0.5" • 10-40 VDC Input • User Programmable • 98% Efficiency • Page 268	 MCC400 • 1-4 Configurable O/P's • 7.28" x 6.49" x 1.08" • 400 W Regulated O/P's • MIL-STD-127A/B/C/D • MIL-STD-461E/F • Page 282	 FS0461 • MIL-STD Filter • 2.28" x 2.09" x 0.75" • MIL-STD 461E/F • Page 278
 MTC30 • 10-50 VDC Input • 2.28" x 1.81" x 0.5" • Single & Dual Output • MIL-STD-461E/F • Vetricon & Avionic Use • Page 262	 MTC50 • 10-40 VDC Input • 2.28" x 1.45" x 0.5" • Single Output • MIL-STD 461E/F • MIL-STD 1275A-D • Page 270	 MTC150 • 10-40 VDC Input • 2.4" x 2.28" x 0.5" • Single & Dual Output • MIL-STD 461E/F • MIL-STD 1275A-D • Page 270	 MCC600 • 1-4 Configurable O/P's • 7.28" x 6.49" x 1.08" • 400 W Regulated O/P's • MIL-STD-127A/B/C/D • MIL-STD-461E/F • Page 282		

Protecting the Environment

With the recent withdrawal of the external power supplies category by Energy Star, we are no longer permitted to use the Energy Star logo. We have accelerated the rate of 'green' product introductions in the last two years and have created our own 'green power' logo to highlight these particular products to our customers. This logo will be used for the appropriate products on datasheets and other marketing material.

Below is what we mean by 'green power'. This definition includes the no load power limits and average efficiency limits of our 'green power' products for both our external power supply range and component power supplies.

More and more customers are asking us about efficiency and energy consumption. In summary we are focused on developing products that are smaller, produce less waste, consume less physical material and avoid hazardous substances.

Our goal is to become the leader in our industry on environmental issues.

- Board level Environmental Committee focused on minimizing our environmental impact
- Environmental concerns and legislation drive demand for energy efficient products
- Applicant member of the Electronic Industry Citizenship Coalition (EICC), full membership expected by April 2011
- ISO14001 certified environmental management system



Green Power: A definition

External power supplies meet Energy Efficiency Level V requirements as defined below:

No load power limits	
Rated power	No load consumption
0 W to < 50 W (≤ 51 W)	0.3 W
≥ 50 W to 250 W (> 51 W)	0.5 W

Active mode power limits, O/P < 6 V	
Rated power	*Average efficiency
0 W to 1 W	$\geq 0.497 \times \text{rated power} + 0.067$
> 1 W to ≤ 49 W (≤ 51 W)	$\geq [0.0750 \times \ln(\text{Rated power})] + 0.561$
> 49 W (> 51 W)	≥ 0.86

Active mode power limits, O/P ≥ 6 V	
Rated power	*Average efficiency
0 W to 1 W	$\geq 0.48 \times \text{rated power} + 0.14$
> 1 W to ≤ 49 W (≤ 51 W)	$\geq [0.0626 \times \ln(\text{Rated power})] + 0.622$
> 49 W (> 51 W)	≥ 0.87

Figures in () are ErP limits

In addition, power supplies with an input power of 100 W and above must have minimum power factor of 0.9 at 115 VAC 60 Hz.

Component power supplies meet the following criteria:

No load power limits	
Rated power	No load consumption
0 W to < 250 W	0.5 W
≥ 250 W	No limit

Active mode power limits	
Rated power	*Average efficiency
0 W to 1 W (< 1 W)	0.5 x Rated power
> 1 W to 49 W (≤ 51 W)	$\geq [0.09 \times \ln(\text{Rated power})] + 0.5$
> 49 W (> 51 W)	≥ 0.85

*Average efficiency is measured at 25, 50, 75 & 100% load.



Our printers of this guide are certified by the Forest Stewardship Council®, this means they are ethically minded and the paper is from responsible sources.

5-30 Watts

ECL Series



GREEN•POWER

- Ultra Compact Size
- Single, Dual & Triple Outputs
- Open Frame PCB & Chassis Mount
- Encapsulated PCB & Chassis Mount
- <0.3 W No Load Input Power
- Peak Load Capability
- 3 Year Warranty

Specification

Input

Input Voltage	• 85-264 VAC (120-370 VDC)
Input Frequency	• 47-63 Hz
Input Current	• ECL05: 0.1 A rms, ECL10: 0.2 A rms ECL15: 0.3 A rms, ECL25: 0.4 A rms ECL30: 0.8 A rms at 230 VAC
Inrush Current	• 20 A at 115 VAC, 40 A at 230 VAC, cold start at 25 °C
Earth Leakage Current	• Class II construction no earth
Power Factor	• EN61000-3-2, class A
No Load Input Power	• <0.3 W
Input Protection	• ECL05/10: Internal T1 A/250 VAC fuse ECL15/25/30: Internal T2 A/250 VAC fuse

Output

Output Voltage	• See tables
Output Voltage Trim	• $\pm 5\%$ on output 1 only, on multiple output versions, V2 & V3 will track by same percentage, (not '-E' or '-S' versions)
Initial Set Accuracy	• $\pm 1\%$ for output 1, $\pm 1\%$ for output 2 of UD01 & UD02 versions, $\pm 5\%$ for output 2 & output 3 of other versions
Minimum Load	• Single output versions: none, Multi output versions: UD01 & UD02: 10% V1 & V2 UD03: 10% V1, 20% V2 UT02 & UT03: 10% V1, 20% V2 & V3 to meet regulation specifications
Start Up Delay	• 2 s max
Start Up Rise Time	• 14 ms max
Hold Up Time	• 16 ms typical for single output versions, 12 ms typical for multiple output versions, at full load & 115 VAC
Line Regulation	• $\pm 0.5\%$ max for single output versions and output 1 of multiple output versions, $\pm 0.9\%$ max for output 2 & output 3 of multiple output versions
Load Regulation	• 1% max for single output versions, for multiple output versions (see note 5)
Cross Regulation	• Multi output versions only (see note 5)
Transient Response	• 4% max deviation, recovery to within 1% in 500 μ s for a 25% load change
Ripple & Noise	• Single output versions: 3.3-5 V versions: 50 mV pk-pk, 12-15 V versions: 120 mV pk-pk, 24-48 V versions: 200 mV pk-pk, Multiple output versions: 1% pk-pk on any output, 20 MHz bandwidth
Overvoltage Protection	• 115-135% Vnom, recycle input to reset
Overload Protection	• Single output versions: ECL05/10/15: 120-150%, ECL25: 120-170% Multiple output versions: 140-200%
Short Circuit Protection	• Trip and restart (hiccup mode)
Temperature Coefficient	• 0.05%/°C

General

Efficiency	• See tables
Isolation	• 3000 VAC Input to Output
Switching Frequency	• 70 kHz typical
Power Density	• ECL05: 2.25 W/In ³ (PCB Mount version) ECL10: 5.50 W/In ³ (PCB Mount version) ECL15: 5.30 W/In ³ (PCB Mount version) ECL25: 5.90 W/In ³ (PCB Mount version) ECL30: 7.10 W/In ³ (PCB Mount version)
MTBF	• ECL05/10: >450 kHrs, ECL15/25/30: >400 kHrs, to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Temperature	• -20 °C to +70 °C, derate linearly from 100% at +50 °C to 50% at +70 °C
Cooling	• Convection-cooled
Operating Humidity	• 95% RH, non-condensing
Storage Temperature	• -40 °C to +85 °C
Operating Altitude	• 3000 m
Vibration	• 2 g, 10 Hz to 500 kHz, 10 mins/cycle, 60 mins each cycle

EMC & Safety

Emissions	• EN55022, level B conducted & radiated
Harmonic Currents	• EN61000-3-2, class A
Voltage Flicker	• EN61000-3-3
ESD Immunity	• EN61000-4-2, level 3 Perf Criteria A
Radiated Immunity	• EN61000-4-3, 10 V/m 80% mod Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3, Perf Criteria A
Surge	• EN61000-4-5, installation class 3, Perf Criteria A
Conducted Immunity	• EN61000-4-6, 10 Vrms Perf Criteria A
Magnetic Fields	• EN61000-4-8, 10 A/m, Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% for 10 ms, 60% for 100 ms, 100% for 5000 ms Perf Criteria A, B, B
Safety Approvals	• IEC60950-1, EN60950-1, UL60950-1, CSA22.2 No. 234 per cUL

Models and Ratings

ECL05/10 **XP**

Output Power	Output Voltage	Output Current		Efficiency	Model Number ⁽²⁾
		Nominal	Peak ⁽¹⁾		
4.3 W	3.3 VDC	1.30 A	1.69 A	72%	ECL05US03†^
5.0 W	5.0 VDC	1.00 A	1.30 A	75%	ECL05US05†^
5.0 W	9.0 VDC	0.55 A	0.71 A	78%	ECL05US09†^
5.0 W	12.0 VDC	0.41 A	0.54 A	78%	ECL05US12†^
5.0 W	15.0 VDC	0.33 A	0.44 A	80%	ECL05US15†^
5.0 W	24.0 VDC	0.21 A	0.27 A	82%	ECL05US24†^
5.0 W	48.0 VDC	0.10 A	0.13 A	82%	ECL05US48†^
8.6 W	3.3 VDC	2.60 A	3.38 A	72%	ECL10US03†^
10.0 W	5.0 VDC	2.00 A	2.60 A	75%	ECL10US05†^
10.0 W	9.0 VDC	1.10 A	1.43 A	78%	ECL10US09†^
10.0 W	12.0 VDC	0.83 A	1.08 A	78%	ECL10US12†^
10.0 W	15.0 VDC	0.67 A	0.87 A	80%	ECL10US15†^
10.0 W	24.0 VDC	0.42 A	0.55 A	82%	ECL10US24†^
10.0 W	48.0 VDC	0.21 A	0.27 A	82%	ECL10US48†^

Notes

1. Peak load lasting <30 s with a maximum duty cycle of 10%, average output power not to exceed nominal.

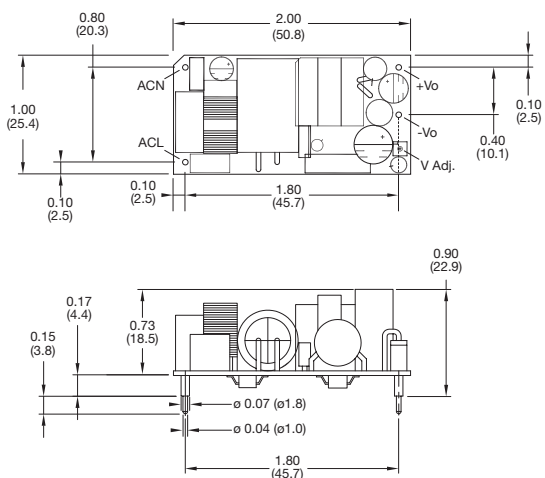
2. Add suffix to model number to define type: add '-P' for PCB mount, add '-T' for chassis mount, add '-E' for encapsulated.

† Available from Farnell & element14. See pages 284-290.

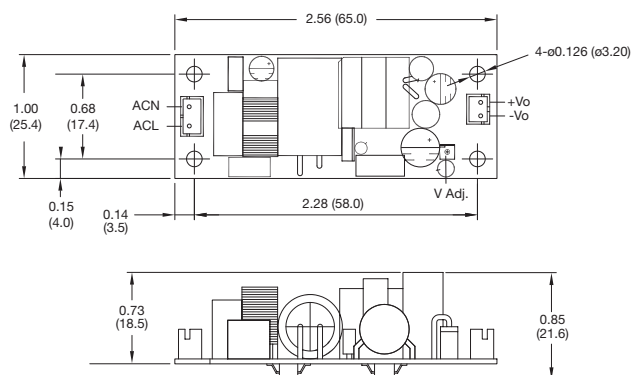
^ Available from Newark. See pages 291-296.

Mechanical Details

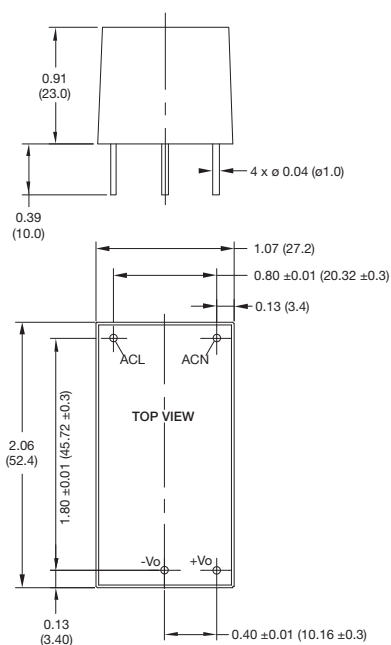
Open Frame - PCB Mount (-P)



Open Frame - Chassis Mount (-T)



Encapsulated (-E)



Notes

1. All dimensions in inches (mm).

2. Weight: ECL05/10 P Version: 0.057 lbs (26 g)
ECL05/10 T Version: 0.057 lbs (26 g)
ECL05/10 E Version: 0.13 lbs (60 g)

3. Tolerances: x.xx = ± 0.02 (x.x = ± 0.5)
x.xxx = ± 0.01 (x.xx = ± 0.25)

Mating Connectors (-T version only)

Input Connector: JST PHR-3

Output Connector: JST PHR-2

Crimps: SPH-002T-P0.5S

Cable harness with 300 mm wire available, order part no. ECL10 LOOM KIT

Models and Ratings

ECL15 XP

Output Power	Output Voltage	Output Current		Efficiency	Model Number ^(2,3)
		Nominal	Peak ⁽¹⁾		
10 W	3.3 VDC	3.00 A	3.90 A	75%	ECL15US03†^
15 W	5.0 VDC	3.00 A	3.90 A	78%	ECL15US05†^
15 W	9.0 VDC	1.67 A	2.17 A	80%	ECL15US09†^
15 W	12.0 VDC	1.25 A	1.62 A	80%	ECL15US12†^
15 W	15.0 VDC	1.00 A	1.30 A	80%	ECL15US15†^
15 W	24.0 VDC	0.63 A	0.82 A	82%	ECL15US24†^
15 W	48.0 VDC	0.32 A	0.41 A	82%	ECL15US48†^

Notes

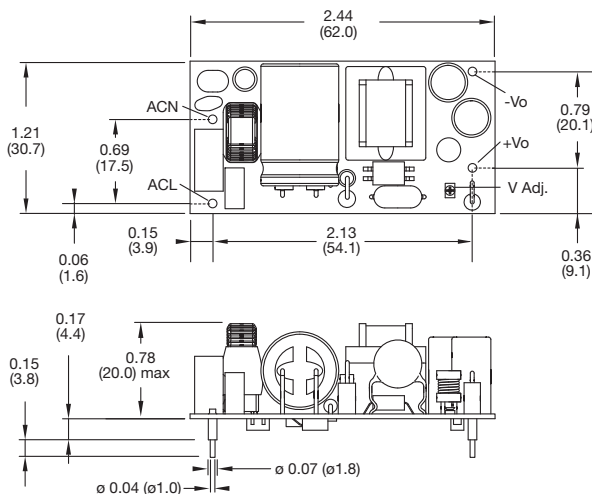
1. Peak load lasting <30 s with a maximum duty cycle of 10%, average output power not to exceed nominal.
2. Add suffix to model number to define type: add '-P' for PCB mount, add '-T' for chassis mount, add '-E' for encapsulated, add '-S' for screw terminals.
3. A screw terminal version (-S) is available with DIN clip attached, add suffix 'D', e.g. ECL15US24-SD, DIN rail mounting kit is available as a separate item, order code ECL15 DIN CLIP.
4. For medically-approved 15 W power supplies contact sales or see www.xppower.com for details of CU15-M series and VCP15 series.

† Available from Farnell & element14. See pages 284-290.

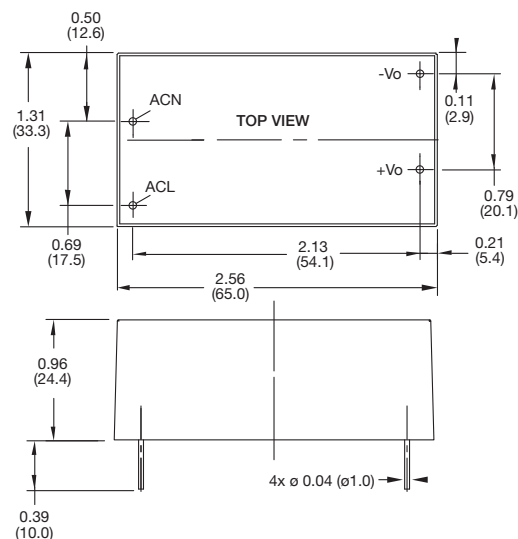
^ Available from Newark. See pages 291-296.

Mechanical Details

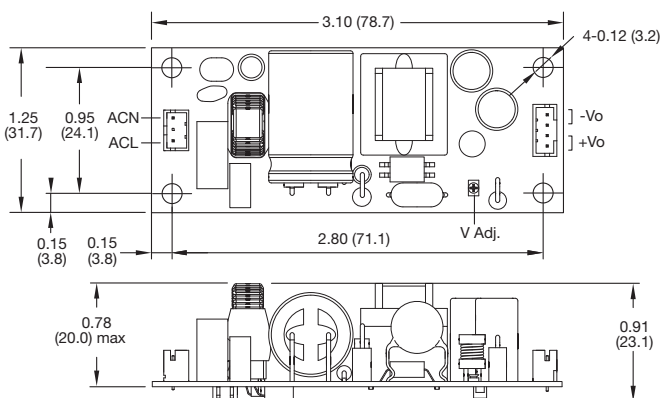
Open Frame - PCB Mount (-P)



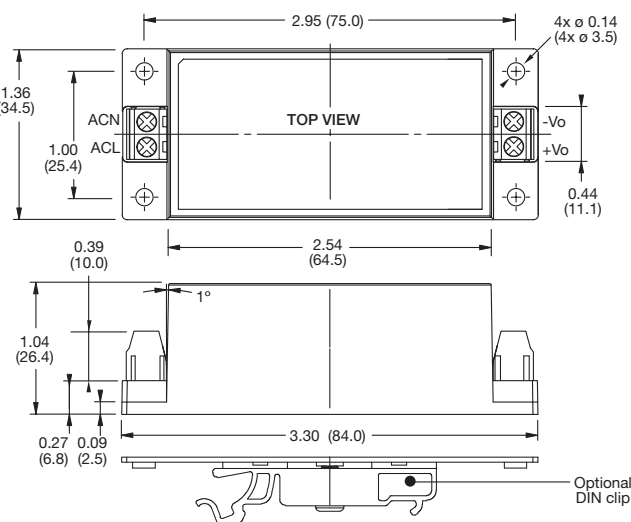
Encapsulated (-E)



Open Frame - Chassis Mount (-T)



Screw Terminal (-S)



Notes

1. All dimensions in inches (mm).
2. Weight: ECL15 P Version: 0.07 lbs (35 g)
T Version: 0.07 lbs (35 g)
E Version: 0.20 lbs (90 g)
S Version: 0.24 lbs (110 g)
3. Tolerances: x.xx = ± 0.02 (x.x = ± 0.5)
x.xxx = ± 0.01 (x.xx = ± 0.25)

Mating Connectors (-T version only)

Input Connector: JST PHR-3
Output Connector: JST PHR-4
Crimps: SPH-002T-P0.5S
Cable harness with 300 mm wire available, order part no. ECL15 LOOM KIT

Models and Ratings

ECL15UD/UT **XP**

Output Power	Output 1		Output 2		Output 3		Model Number ^(3,4)
	Voltage	Current ⁽²⁾	Voltage	Current ⁽²⁾	Voltage	Current ⁽²⁾	
15 W	+12.0 V	0.65 A	-12.0 V	0.650 A			ECL15UD01†^
15 W	+15.0 V	0.50 A	-15.0 V	0.500 A			ECL15UD02†^
15 W	5.0 V ⁽¹⁾	2.00 A	12.0 V ⁽¹⁾	0.625 A			ECL15UD03†
15 W	5.0 V ⁽¹⁾	2.00 A	+12.0 V	0.200 A	-12.0 V	0.20 A	ECL15UT02†^
15 W	5.0 V ⁽¹⁾	2.00 A	+15.0 V	0.150 A	-15.0 V	0.15 A	ECL15UT03†^

Notes

1. Isolated output
2. Peak load of 130% lasting <30 s with a maximum duty cycle of 10%, average output power not to exceed nominal.
3. Add suffix to model number to define type: add '-P' for PCB mount, add '-T' for chassis mount, add '-E' for encapsulated, add '-S' for screw terminals.
4. A screw terminal version (-S) is available with DIN clip attached, add suffix 'D' e.g. ECL15UT02-SD, DIN rail mounting kit is available as a separate item, order code ECL15 DIN CLIP.

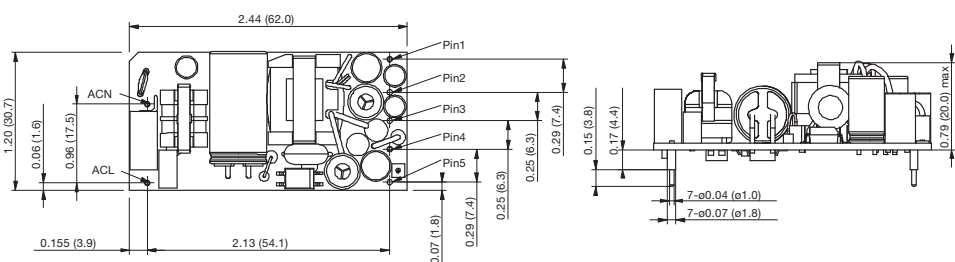
† Available from Farnell & element14. See pages 284-290.

5. UD01/UD02: Load regulation <3%, 10-100% load.
Cross regulation <3%, one output fixed, the other varied from 10-100% load
- UD03: Load regulation <1% V1, <10% V2
Cross regulation <10% V2, V1 varied from 10-100% load
- UT02/UT03: Load regulation <1% V1, <10% V2 & V3
Cross regulation <10% V2 & V3, V2 & V3 at 50% load & V1 varied from 20-100% load

^ Available from Newark. See pages 291-296.

Mechanical Details

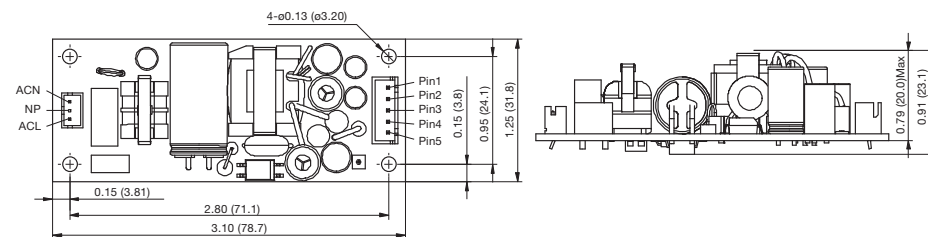
Open Frame - PCB Mount (-P)



Pin	UD01/02	UD03	UT02/03
1	V2	NP	V3
2	NP	V2 RTN	COM
3	COM	V2	V2
4	V1	V1	V1
5	NP	V1 RTN	V1 RTN

NP = No pin.

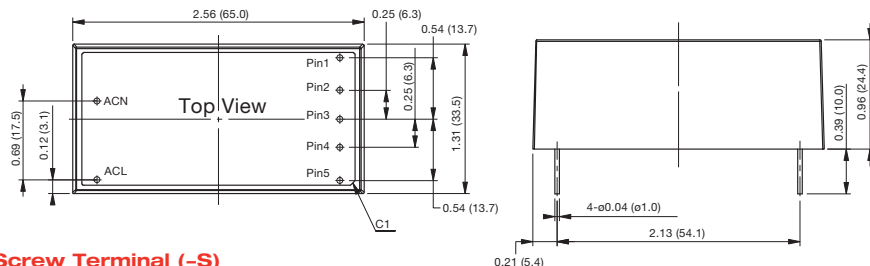
Open Frame - Chassis Mount (-T)



Pin	UD01/02	UD03	UT02/03
1	V2	NC	V3
2	COM	V2 RTN	COM
3	COM	V2	V2
4	COM	V1	V1
5	V1	V1 RTN	V1 RTN

NC = No connection.

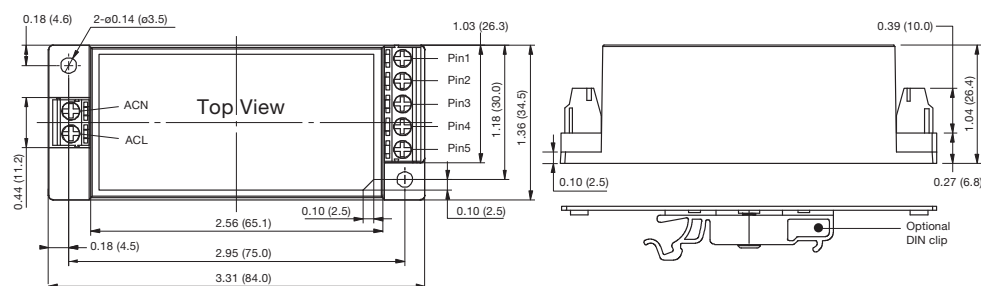
Encapsulated (-E)



Pin	UD01/02	UD03	UT02/03
1	V2	NP	V3
2	NP	V2 RTN	COM
3	COM	V2	V2
4	V1	V1	V1
5	NP	V1 RTN	V1 RTN

NP = No pin.

Screw Terminal (-S)



Pin	UD01/02	UD03	UT02/03
1	V2	NC	V3
2	COM	V2 RTN	COM
3	COM	V2	V2
4	COM	+V1	V1
5	V1	V1 RTN	V1 RTN

NC = No connection.

Notes

1. All dimensions in inches (mm).
2. Tolerances: x.xx = ± 0.02 (x.x = ± 0.5)
x.xxx = ± 0.01 (x.xx = ± 0.25)

3. Weight: ECL15 UD/UT: P Version: 0.09 lbs (40 g)
T Version: 0.09 lbs (40 g)
E Version: 0.21 lbs (95 g)
S Version: 0.26 lbs (120 g)

Mating Connectors (-T version only)

Input Connector: JST PHR-3
Output Connector: JST XHP-5

Models and Ratings

ECL25 **XP**

Output Power	Output Voltage	Output Current		Efficiency	Model Number ^(2,3)
		Nominal	Peak ⁽¹⁾		
20 W	3.3 VDC	6.00 A	7.80 A	75%	ECL25US03†^
25 W	5.0 VDC	5.00 A	6.50 A	78%	ECL25US05†^
25 W	9.0 VDC	2.80 A	3.64 A	80%	ECL25US09†^
25 W	12.0 VDC	2.10 A	2.73 A	80%	ECL25US12†^
25 W	15.0 VDC	1.67 A	2.17 A	80%	ECL25US15†^
25 W	24.0 VDC	1.04 A	1.35 A	82%	ECL25US24†^
25 W	48.0 VDC	0.52 A	0.68 A	82%	ECL25US48†^

Notes

1. Peak load lasting <30 s with a maximum duty cycle of 10%, average output power not to exceed nominal.
2. Add suffix to model number to define type: add '-P' for PCB mount, add '-T' for chassis mount, add '-E' for encapsulated, add '-S' for screw terminals.

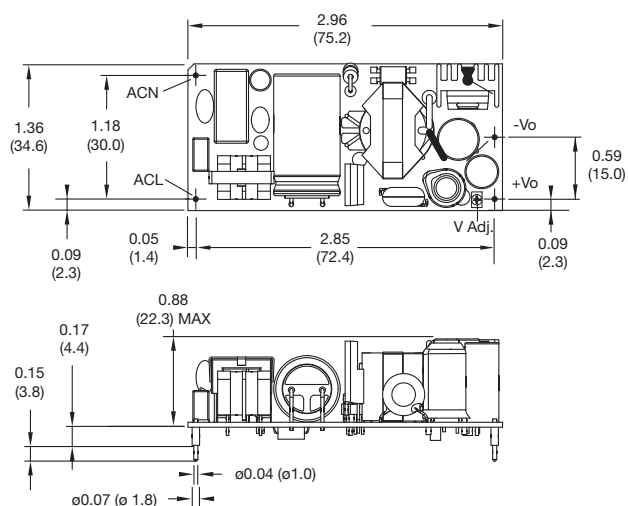
† Available from Farnell & element14. See pages 284-290.

3. A screw terminal version (-S) is available with DIN clip attached, add suffix 'D', e.g. ECL25US24-SD, DIN rail mounting kit is available as a separate item, order code ECL25/30 DIN CLIP.

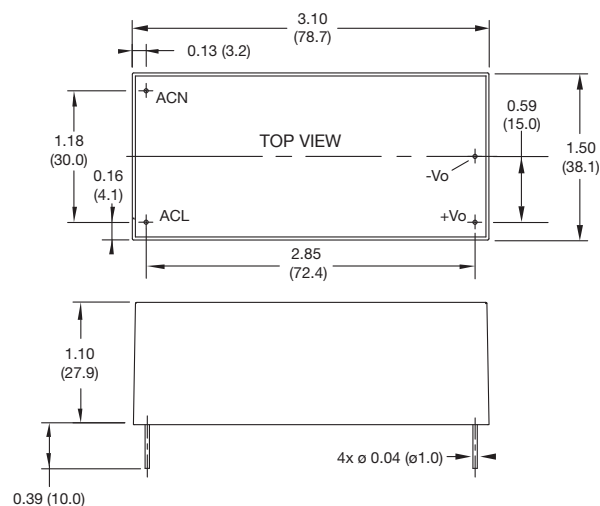
^ Available from Newark. See pages 291-296.

Mechanical Details

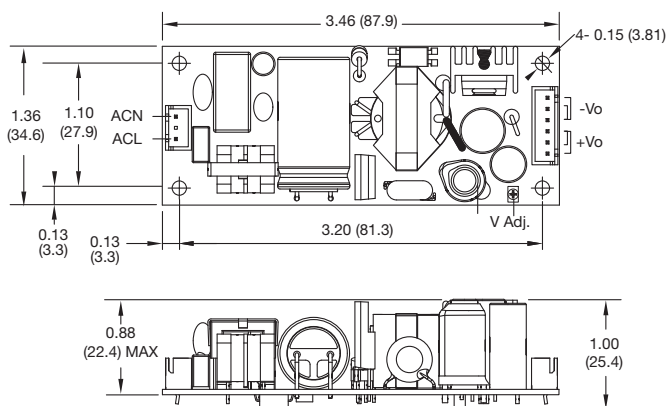
Open Frame - PCB Mount (-P)



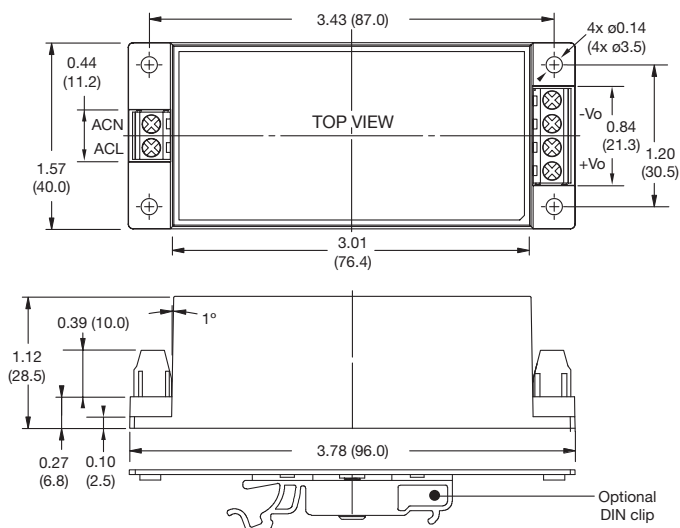
Encapsulated (-E)



Open Frame - Chassis Mount (-T)



Screw Terminal (-S)



Notes

1. All dimensions in inches (mm).
2. Weight: ECL25: P Version: 0.14 lbs (66 g)
T Version: 0.14 lbs (66 g)
E Version: 0.33 lbs (150 g)
S Version: 0.37 lbs (170 g)
3. Tolerances: x.xx = ± 0.02 (x.x = ± 0.5)
x.xxx = ± 0.01 (x.xx = ± 0.25)

Mating Connectors (-T version only)

Input Connector: JST XHP-3
Output Connector: JST XHP-6
Crimps: SXH-002T-P0.6
Cable harness with 300 mm wire available, order part no. ECL25 LOOM KIT

Models and Ratings

ECL30UD/UT **XP**

Output Power	Output 1		Output 2		Output 3		Model Number ^(3,4)
	Voltage	Current ⁽²⁾	Voltage	Current ⁽²⁾	Voltage	Current ⁽²⁾	
30 W	+12.0 V	1.3 A	-12.0 V	1.30 A			ECL30UD01†^
30 W	+15.0 V	1.0 A	-15.0 V	1.00 A			ECL30UD02†^
30 W	5.0 V ⁽¹⁾	3.0 A	12.0 V ⁽¹⁾	1.30 A			ECL30UD03†^
30 W	5.0 V ⁽¹⁾	3.0 A	+12.0 V	0.63 A	-12.0 V	0.63 A	ECL30UT02†^
30 W	5.0 V ⁽¹⁾	3.0 A	+15.0 V	0.50 A	-15.0 V	0.50 A	ECL30UT03†^

Notes

1. Isolated output
2. Peak load of 130% lasting <30 s with a maximum duty cycle of 10%, average output power not to exceed nominal.
3. Add suffix to model number to define type: add '-P' for PCB mount, add '-T' for chassis mount, add '-E' for encapsulated, add '-S' for screw terminals.
4. A screw terminal version (-S) is available with DIN clip attached, add suffix 'D' e.g. ECL30UT02-SD, DIN rail mounting kit is available as a separate item, order code ECL25/30 DIN CLIP.

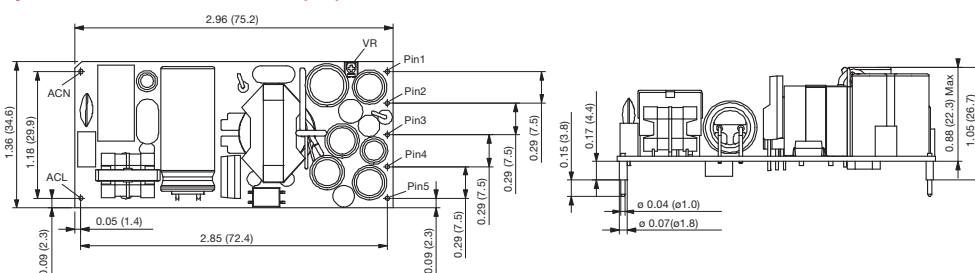
† Available from Farnell & element14. See pages 284-290.

5. UD01/UD02: Load regulation <3%, 10-100% load.
Cross regulation <3%, one output fixed, the other varied from 10-100% load
- UD03: Load regulation <1% V1, <10% V2
Cross regulation <10% V2, V1 varied from 10-100% load
- UT02/UT03: Load regulation <1% V1, <10% V2 & V3
Cross regulation <10% V2 & V3, V2 & V3 at 50% load & V1 varied from 20-100% load

^ Available from Newark. See pages 291-296.

Mechanical Details

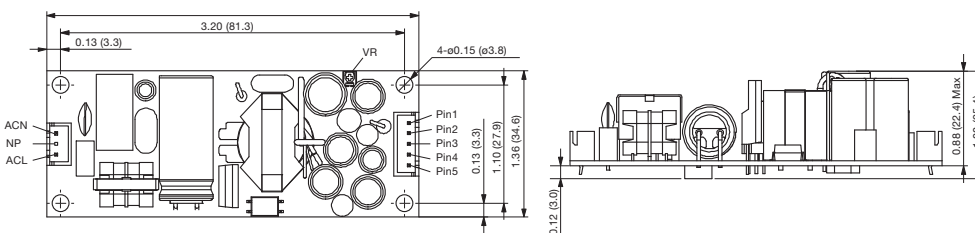
Open Frame - PCB Mount (-P)



Pin	UD01/02	UD03	UT02/03
1	NP	V1 RTN	V1 RTN
2	NP	V1	V1
3	V2	NP	V3
4	COM	V2 RTN	COM
5	V1	V2	V2

NP = No pin.

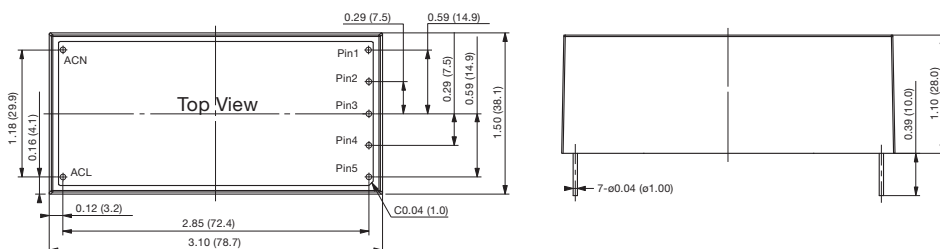
Open Frame - Chassis Mount (-T)



Pin	UD01/02	UD03	UT02/03
1	V2	V1 RTN	V1 RTN
2	COM	V1	V1
3	COM	NC	V3
4	COM	V2 RTN	COM
5	V1	V2	V2

NC = No connection.

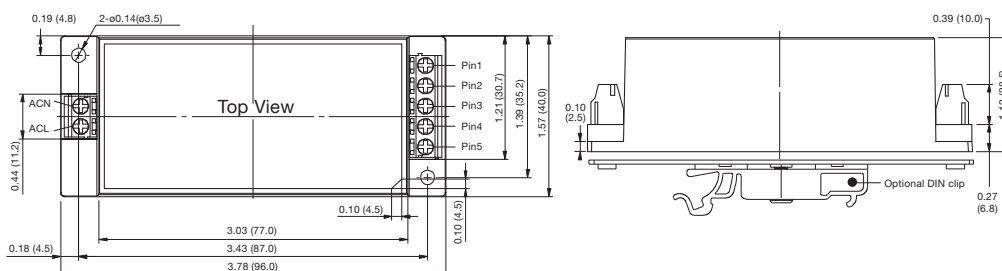
Encapsulated (-E)



Pin	UD01/02	UD03	UT02/03
1	NP	V1 RTN	V1 RTN
2	NP	V1	V1
3	V2	NP	V3
4	COM	V2 RTN	COM
5	V1	V2	V2

NP = No pin.

Screw Terminal (-S)



Pin	UD01/02	UD03	UT02/03
1	V2	V1 RTN	V3
2	COM	V1	COM
3	COM	NC	V2
4	COM	V2 RTN	V1
5	V1	V2	V1 RTN

NC = No connection.

Notes

1. All dimensions in inches (mm).
2. Tolerances: x.xx = ± 0.02 (x.x = ± 0.5)
x.xxx = ± 0.01 (x.xx = ± 0.25)

3. Weight: ECL30 UD/UT: P Version: 0.13 lbs (60 g)
T Version: 0.13 lbs (60 g)
E Version: 0.34 lbs (155 g)
S Version: 0.39 lbs (175 g)

Mating Connectors (-T version only)

Input Connector: JST XHP-3
Output Connector: JST XHP-5

20 Watts

ECP Series



GREEN•POWER

- Low Profile, 0.73"
- Class II Construction
- PCB Mounting
- Single Outputs from 3.3 to 48 V
- Dual Outputs from 12 to 24 V
- <0.3 W No Load Input Power
- 3 Year Warranty

Specification

Input

Input Voltage	• 85-264 VAC (120-370 VDC)
Input Frequency	• 47-63 Hz
Input Current	• 0.5 A max at 115 VAC
Inrush Current	• 40 A max at 230 VAC, cold start 25 °C
Earth Leakage Current	• Class II construction, no earth
Power Factor	• Conforms to EN61000-3-2, Class A
No Load Input Power	• <0.3 W
Input Protection	• T1A / 250 VAC fuse in line

Output

Output Voltage	• See table
Initial Set Accuracy	• $\pm 1\%$ at 60% load
Minimum Load	• 10% on dual output models only
Start Up Delay	• 1.3 s max
Start Up Rise Time	• 15 ms typical
Hold Up Time	• 10 ms min at full load & 115 VAC
Line Regulation	• $\pm 0.5\%$ max
Load Regulation	• $\pm 1.0\%$ max (single output models) • $\pm 2.0\%$ max (dual output models)
Cross Regulation	• Dual output models: 3% on one output when the other is varied from 10%-100% load
Transient Response	• 4% max deviation, recovering to less than 1% within 500 μ s for 50% step load change at 1 A/ μ s
Ripple & Noise	• 3.3 & 5 V versions: 50 mV, 1% for others measured with 20 MHz bandwidth
Overvoltage Protection	• 110-140% of nominal output voltage
Overload Protection	• 150-180% of full load current
Short Circuit Protection	• Trip and restart (hiccup mode)
Peak Load	• See table
Temperature Coefficient	• $\pm 0.02\%/^{\circ}\text{C}$ max

General

Efficiency	• See tables
Isolation	• 3000 VAC Input to Output
Switching Frequency	• 100 kHz typical
Power Density	• 6.80 W/in ³
MTBF	• >400 kHrs to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Temperature	• -10 °C to +70 °C, derate from 100% load at 50 °C to 50% load at 70 °C
Cooling	• Natural convection
Operating Humidity	• 5% to 90% RH, non-condensing
Storage Temperature	• -40 °C to +90 °C
Shock	• 30 g, half sine, 6 axes
Vibration	• 5 to 50 Hz, accelerated 7.35 m/s each x, y, z axes
Altitude	• 3000 m

EMC & Safety

Emissions	• EN55022, level B conducted & radiated
Harmonic Currents	• EN61000-3-2, class A
Voltage Flicker	• EN61000-3-3
ESD Immunity	• EN61000-4-2, ± 4 kV coupling plate discharge, Perf Criteria A
Radiated Immunity	• EN61000-4-3, level 2, Perf Criteria A
EFT / Burst	• EN61000-4-4, level 2 Perf Criteria A
Surge	• EN61000-4-5, installation class 3, Perf Criteria A
Conducted Immunity	• EN61000-4-6, level 2, Perf Criteria A
Magnetic Field	• EN61000-4-8, 1 A/m, Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms, Perf Criteria A, B, B
Safety Approvals	• EN60950-1, cUL60950, IEC60950-1

Models and Ratings

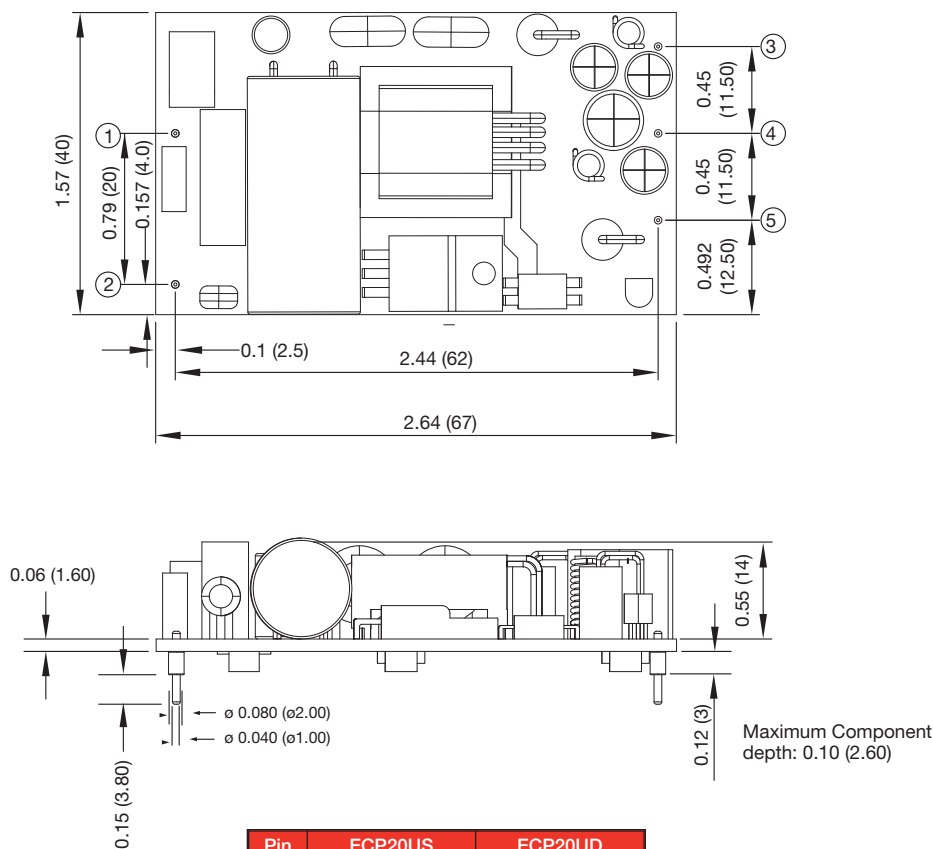
ECP20 **XP**

Output Power	Output 1			Output 2			Efficiency ⁽²⁾	Model Number
	Voltage	Current	Peak ⁽¹⁾	Voltage	Current	Peak ⁽¹⁾		
13.2 W	3.3 VDC	4.0 A	5.20 A				75%	ECP20US03
20 W	5.0 VDC	4.0 A	5.20 A				80%	ECP20US05
20 W	9.0 VDC	2.23 A	2.90 A				82%	ECP20US09
20 W	12.0 VDC	1.67 A	2.17 A				84%	ECP20US12
20 W	15.0 VDC	1.34 A	1.74 A				84%	ECP20US15
20 W	24.0 VDC	0.84 A	1.09 A				85%	ECP20US24
20 W	30.0 VDC	0.67 A	0.87 A				86%	ECP20US30
20 W	48.0 VDC	0.42 A	0.55 A				87%	ECP20US48
20 W	+12.0 VDC	0.84 A	1.09 A	-12.0 VDC	0.84 A	1.09 A	83%	ECP20UD12
20 W	+15.0 VDC	0.67 A	0.87 A	-15.0 VDC	0.67 A	0.87 A	84%	ECP20UD15
20 W	+24.0 VDC	0.42 A	0.55 A	-24.0 VDC	0.42 A	0.55 A	84%	ECP20UD24

Notes

1. Peak load lasting <30 s with a maximum duty cycle of 10%, average output power not to exceed nominal.
 2. Efficiency is measured at 230 VAC Input, 25 °C and full load.

Mechanical Details



Notes

1. All dimensions are in inches (mm).
 2. Weight: 0.105 lbs (45 g)
 3. Tolerance: ±0.02 (±0.05)

20/40 Watts

ECE Series



- Ultra Compact Size
- Single Outputs from 3.3 to 48 V
- Encapsulated
- PCB & Chassis Mount Versions
- <0.3 W No Load Input Power
- Peak Load Capability
- 3 Year Warranty

Specification

Input

Input Voltage	• 85-264 VAC (120-370 VDC) derate load from 100% at 90 VAC to 90% at 85 VAC
Input Frequency	• 47-63 Hz
Input Current	• ECE20: 0.3 A rms at 230 VAC ECE40: 0.5 A rms at 230 VAC
Inrush Current	• 20 A at 115 VAC, 40 A at 230 VAC, cold start at 25 °C
Power Factor	• EN61000-3-2 Class A
Earth Leakage Current	• Class II construction no earth
No Load Input Power	• <0.3 W
Input Protection	• ECE20: Internal T1 A/250 VAC fuse ECE40: Internal T2 A/250 VAC fuse

Output

Output Voltage	• See tables
Initial Set Accuracy	• $\pm 1\%$
Minimum Load	• No minimum load required
Start Up Delay	• 2 s max
Start Up Rise Time	• 16 ms max
Hold Up Time	• 8 ms minimum at full load & 115 VAC
Line Regulation	• $\pm 0.5\%$ max
Load Regulation	• $\pm 1\%$ max, $\pm 2\%$ max for ECE40US03/05-S
Transient Response	• 4% max deviation, recovery to within 1% in 500 μ s for a 25% load change
Ripple & Noise	• 3.3-5 V versions: 60 mV pk-pk, 3.3-5 V 'ECE40-S' versions: 75 mV pk-pk (see note 5), all other models 1% pk-pk max 20 MHz bandwidth
Overvoltage Protection	• 115-140% Vnom, auto recovery
Overload Protection	• 110-180%
Short Circuit Protection	• Trip and restart (hiccup mode)
Temperature Coefficient	• 0.05%/°C

General

Efficiency	• See tables
Isolation	• 3000 VAC Input to Output
Switching Frequency	• 70 kHz typical
Power Density	• ECE20: 9.97 W/in ³ ECE40: 7.58 W/in ³
MTBF	• >450 kHrs to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Temperature	• -25 °C to +70 °C, derate linearly from 100% at +50 °C to 50% at +70 °C
Cooling	• Convection-cooled
Operating Humidity	• 95% RH, non-condensing
Storage Temperature	• -40 °C to +85 °C
Operating Altitude	• 3000 m
Vibration	• 2 g, 10 Hz to 500 kHz, 10 mins/cycle, 60 mins each cycle

EMC & Safety

Emissions	• EN55022, level B conducted & radiated
Harmonic Currents	• EN61000-3-2, EN61000-3-3
ESD Immunity	• EN61000-4-2, level 3 Perf Criteria A
Radiated Immunity	• EN61000-4-3, 10 V/m 80% mod Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3 Perf Criteria A
Surge	• EN61000-4-5, installation Class 3, Perf Criteria A
Conducted Immunity	• EN61000-4-6, 10 Vrms Perf Criteria A
Magnetic Fields	• EN61000-4-8, 10 A/m Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% for 10 ms, 60% for 100 ms, 100% for 5000 ms Perf Criteria A, B, B
Safety Approvals	• EN60950-1, UL60950-1, CSA22.2 No. 234 per cUL

Models and Ratings

ECE20/40 **XP**

Output Power	Output Voltage	Output Current		Efficiency ⁽⁴⁾	Model Number
		Nominal	Peak ⁽¹⁾		
13.5 W	3.3 VDC	4.50 A	5.85 A	73%	ECE20US03†^
20.0 W	5.0 VDC	4.00 A	5.20 A	77%	ECE20US05†^
20.0 W	9.0 VDC	2.22 A	2.89 A	83%	ECE20US09†^
20.0 W	12.0 VDC	1.67 A	2.17 A	82%	ECE20US12†^
20.0 W	15.0 VDC	1.33 A	1.73 A	83%	ECE20US15†^
20.0 W	24.0 VDC	0.83 A	1.08 A	82%	ECE20US24†^
20.0 W	48.0 VDC	0.42 A	0.55 A	86%	ECE20US48†^
35.0 W	3.3 VDC	9.00 A	11.70 A	73%	ECE40US03 ⁽²⁾⁽³⁾ †^
40.0 W	5.0 VDC	8.00 A	10.40 A	77%	ECE40US05 ⁽²⁾⁽³⁾ †^
40.0 W	9.0 VDC	4.44 A	5.77 A	80%	ECE40US09 ⁽²⁾⁽³⁾ †^
40.0 W	12.0 VDC	3.33 A	4.33 A	84%	ECE40US12 ⁽²⁾⁽³⁾ †^
40.0 W	15.0 VDC	2.67 A	3.47 A	84%	ECE40US15 ⁽²⁾⁽³⁾ †^
40.0 W	24.0 VDC	1.67 A	2.17 A	85%	ECE40US24 ⁽²⁾⁽³⁾ †^
40.0 W	48.0 VDC	0.83 A	1.08 A	86%	ECE40US48 ⁽²⁾⁽³⁾ †^

Notes

1. Peak load lasting <30 s with a maximum duty cycle of 10%, average output power not to exceed nominal power.
2. Add suffix -S to model number to denote chassis mount with screw terminal type, e.g. ECE40US12-S. Only available with ECE40 models.
3. A screw terminal versions (-S) is available with DIN Clip attached. Add suffix 'D', e.g. ECE40US24-SD. DIN Rail mounting clip is available as a separate item, order code ECL25/30 DIN CLIP.

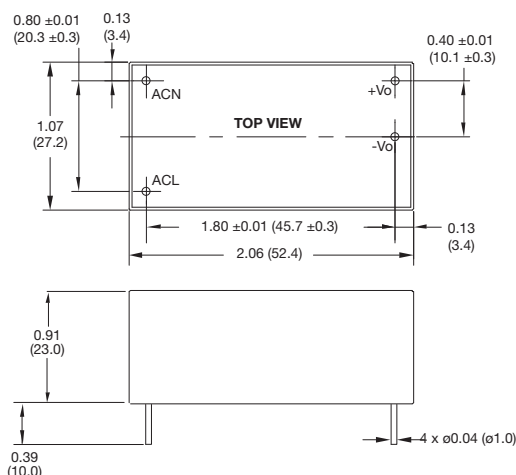
4. Average of efficiencies measured at 25%, 50%, 75% & 100% load with 230 VAC input.
5. 3.3 & 5 V ECE40-S versions meet 75 mV pk-pk with 20 MHz bandwidth and 0.1 μ F capacitor across output terminals.

† Available from Farnell & element14. See pages 284-290.

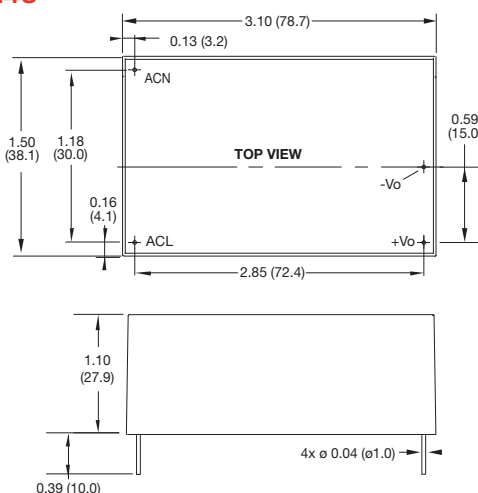
^ Available from Newark. See pages 291-296.

Mechanical Details

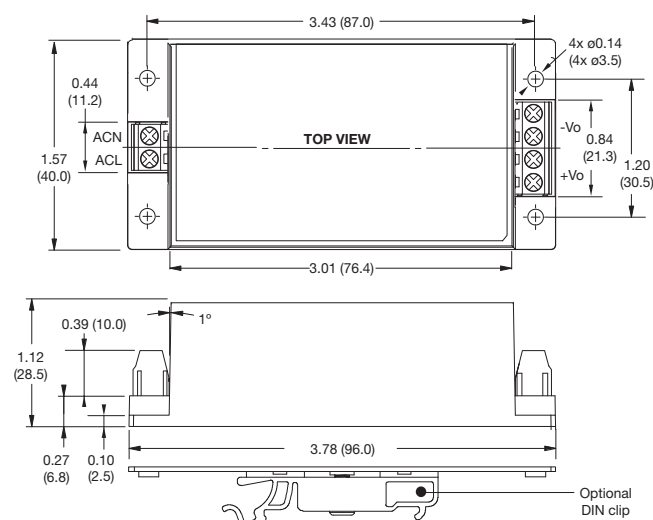
ECE20



ECE40



ECE40 Screw Terminal (-S)



Notes

1. All dimensions in inches (mm).
2. Weight: ECE20: 0.13 lbs (60 g)
ECE40: 0.33 lbs (150 g)
ECE40 Optional Screw Terminal: 0.37 lbs (170 g)
3. Tolerances: x.xx = ± 0.02 (x.x = ± 0.5), x.xxx = ± 0.01 (x.xx = ± 0.25)

40 Watts

ECP Series



GREEN•POWER

- Low Profile Design
- Ultra Compact Size from 3" x 2" x 0.9"
- IT & Medical Approvals
- Single, Dual and Triple Output
- <0.3 W No Load Input Power
- Peak Load Capability
- 3 Year Warranty

Specification

Input

Input Voltage	• 85-264 VAC
Input Frequency	• 47-63 Hz
Input Current	• 0.85 A max at 115 VAC
Inrush Current	• 65 A max at 230 VAC
Power Factor	• EN61000-3-2, Class A
No Load Input Power	• <0.3 W
Earth Leakage Current	• <250 μ A at 264 VAC, 60 Hz
Input Protection	• Internal T2 A/250 V fuse in line and neutral

Output

Output Voltage	• See table
Initial Set Accuracy	• Single output: $\pm 1\%$ at 60% load, Multiple output: $\pm 1\%$ on V1, $\pm 5\%$ on V2 & V3 at 60% load
Minimum Load	• 10% minimum load required on V1 & V2 of multi output versions
Start Up Delay	• 1.3 s max
Start Up Rise Time	• 15 ms typical
Hold Up Time	• 10 ms min at full load at 115 VAC
Line Regulation	• $\pm 0.5\%$ max
Load Regulation	• V1 & V3: $\pm 2\%$, V2: $\pm 4\%$ (see note 3)
Cross Regulation	• V2: 5%, 10-100% load change on V1
Transient Response	• 4% max deviation, recovering to less than 1% within 500 μ s for 50% step load change at 1 A/ μ s
Ripple & Noise	• 1% pk-pk, measured with 20 MHz bandwidth
Overvoltage Protection	• 110-140% of nominal output voltage on V1 only, recycle input to reset
Overload Protection	• Single output: 140-160% of nominal power Multiple output: 120-150% of nominal power on V1 and V2 only
Short Circuit Protection	• Trip and restart (hiccup mode)
Temperature Coefficient	• $\pm 0.02\%/^{\circ}\text{C}$ max

General

Efficiency	• See tables
Isolation	• 4000 VAC Input to Output 1500 VAC Input to Ground 500 VAC Output to Ground
Switching Frequency	• 40-130 kHz variable
MTBF	• >400 kHrs to MIL-HDBK-217F at 25 $^{\circ}\text{C}$, GB

Environmental

Operating Temperature	• -10 $^{\circ}\text{C}$ to +70 $^{\circ}\text{C}$, derate from 100% load at 50 $^{\circ}\text{C}$ to 50% load at 70 $^{\circ}\text{C}$
Cooling	• Natural convection
Operating Humidity	• 5% to 95% RH, non condensing
Storage Temperature	• -40 $^{\circ}\text{C}$ to +85 $^{\circ}\text{C}$
Shock	• 30 g pk, half sine, 6 axes
Vibration	• 2 g rms, 5 Hz to 500 kHz, 3 axes

EMC & Safety

Emissions	• EN55022, level B conducted & radiated
Harmonic Currents	• EN61000-3-2, class A
Voltage Flicker	• EN61000-3-3
ESD Immunity	• EN61000-4-2, ± 4 kV indirect contact, Perf Criteria A
Radiated Immunity	• EN61000-4-3, level 2, Perf Criteria A
EFT / Burst	• EN61000-4-4, level 3 Perf Criteria A
Surge	• EN61000-4-5, installation class 3, Perf Criteria A
Conducted Immunity	• EN61000-4-6, level 3, Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms, Perf Criteria A, B, B
Safety Approvals	• EN60950-1, cUL60950, IEC60950-1, EN60601-1, cUL60601-1, IEC60601-1

Models and Ratings

ECP40 **XP**

Output Power	Output 1			Output 2			Output 3		Efficiency ⁽²⁾	Model Number
	Voltage	Current	Peak ⁽¹⁾	Voltage	Current	Peak ⁽¹⁾	Voltage	Current		
30 W	5.0 VDC	6.00 A	7.80 A						82%	ECP40US05†^
40 W	12.0 VDC	3.34 A	4.34 A						89%	ECP40US12†^
40 W	15.0 VDC	2.67 A	3.47 A						89%	ECP40US15†^
40 W	18.0 VDC	2.22 A	2.89 A						90%	ECP40US18†^
40 W	24.0 VDC	1.67 A	2.17 A						90%	ECP40US24†^
40 W	30.0 VDC	1.34 A	1.74 A						91%	ECP40US30†^
40 W	48.0 VDC	0.84 A	1.09 A						92%	ECP40US48†^
40 W	+5.0 VDC	5.00 A	7.80 A	+12.0 VDC	2.0 A	2.60 A			89%	ECP40UD01†^
40 W	+5.0 VDC	5.00 A	7.80 A	+15.0 VDC	1.5 A	1.95 A			90%	ECP40UD02†^
40 W	+5.0 VDC	5.00 A	7.80 A	+24.0 VDC	1.0 A	1.30 A			90%	ECP40UD03†^
40 W	+5.0 VDC	5.00 A	7.80 A	+12.0 VDC	2.0 A	2.60 A	-12.0 VDC	0.5 A	89%	ECP40UT01†^
40 W	+5.0 VDC	5.00 A	7.80 A	+15.0 VDC	1.5 A	1.95 A	-15.0 VDC	0.5 A	90%	ECP40UT02†^
40 W	+5.0 VDC	5.00 A	7.80 A	+24.0 VDC	1.0 A	1.30 A	+12.0 VDC	0.5 A	90%	ECP40UT03†^
40 W	+5.0 VDC	5.00 A	7.80 A	+24.0 VDC	1.0 A	1.30 A	-12.0 VDC	0.5 A	90%	ECP40UT04†^

Notes

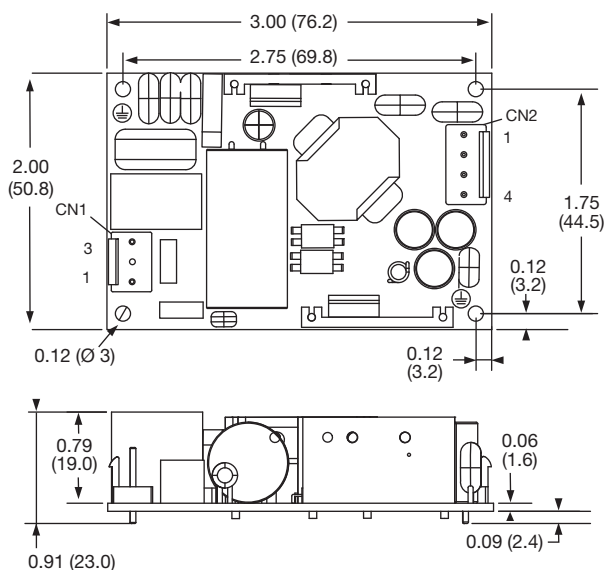
1. Peak load lasting <30 s with a maximum duty cycle of 10%, average output power not to exceed nominal.
 2. Typical efficiency at 230 VAC and full load at 25 °C.
 3. For multiple output units, load regulation is given for load change of 10% to 100% with other outputs set to 60% adjustment load.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296.

Mechanical Details

ECP40USXX



Input Connector CN1	
Pin 1	Neutral
Pin 2	Not Fitted
Pin 3	Line

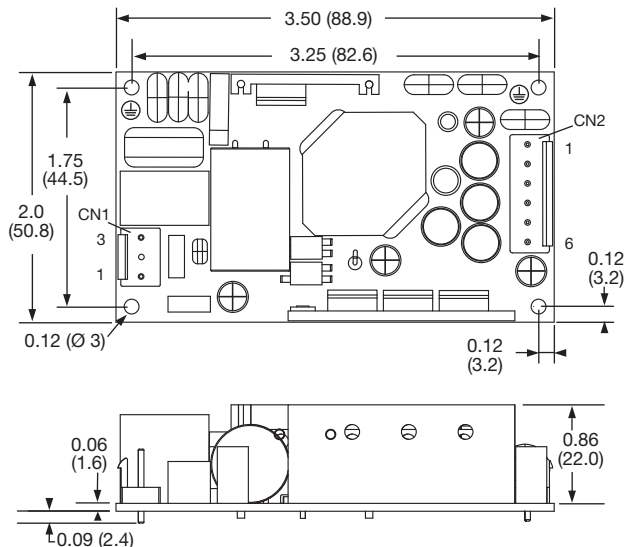
CN1 mates with JST housing VHR-3N and JST Series SVH-21T-P1.1 crimp terminals.

Mounting holes marked with ⊕ must be connected to safety earth

Output Connector CN2	
Pin 1	+ Vout
Pin 2	+ Vout
Pin 3	- Vout
Pin 4	- Vout

CN2 mates with JST housing VHR-4N and JST Series SVH-21T-P1.1 crimp terminals.

ECP40UDXX / ECP40UTXX



Input Connector CN1	
Pin 1	Neutral
Pin 2	Not Fitted
Pin 3	Line

CN1 mates with JST housing VHR-3N and JST Series SVH-21T-P1.1 crimp terminals.

Mounting holes marked with ⊕ must be connected to safety earth

Output Connector CN2	
Pin 1	V2
Pin 2	V1
Pin 3	V1
Pin 4	RTN
Pin 5	RTN
Pin 6	V3

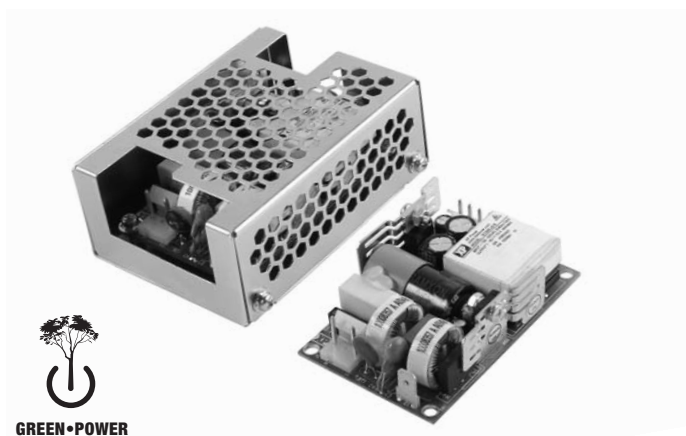
CN2 mates with JST housing VHR-6N and JST Series SVH-21T-P1.1 crimp terminals.

Notes

1. All dimensions are in inches (mm).
 2. Weight: 0.09 lbs (40 g) approx.

25-60 Watts

ECS Series



- IT & Medical Safety Approvals
- Very Small 2" x 3" x 0.95" Package
- <0.3 W No Load Input Power
- 25, 45 & 60 W – Convection Cooled Ratings
- Class I & Class II Installations
- -20 °C to +70 °C Operation
- 3 Year Warranty

Specification

Input

Input Voltage	• 80-264 VAC (120-370 VDC), derate linearly from 100% at 90 VAC to 80% at 80 VAC
Input Frequency	• 47-400 Hz ⁽¹⁾
Input Current	• 25 W: 0.45 A, 45 W: 0.75 A, 60 W: 0.95 A typical at 115 VAC, full load, 25 W: 0.30 A, 45 W: 0.45 A, 60 W: 0.60 A, typical at 230 VAC, full load
Inrush Current	• 40 A max at 230 VAC, cold start 25 °C
Power Factor	• EN61000-3-2, class A
No Load Input Power	• US05, 12 & 24 models: <0.3 W, US48 and all ECS60 models: <0.5 W
Earth Leakage Current	• 260 µA at 264 VAC/60 Hz max, 80/160 µA typical 115/230 VAC
Input Protection	• T3.15 A/250 V internal fuse in line and neutral

Output

Output Voltage	• 5-48 VDC (see tables)
Output Voltage Trim	• ±10%
Initial Set Accuracy	• ±1%
Minimum Load	• No minimum load required
Start Up Delay	• 1 s typical
Start Up Rise Time	• 50 ms
Hold Up Time	• 16 ms min at 115 VAC
Drift	• ±0.2% after 20 min warm up
Line Regulation	• ±0.5% max
Load Regulation	• ±1%
Over/Undershoot	• 5% typical
Transient Response	• 4% max. deviation, recovery to within 1% in 500 µs for a 50-75-50% load change
Ripple & Noise	• 1% pk-pk V1, 20 MHz bandwidth ⁽²⁾
Overvoltage Protection	• 115-140% Vnom, recycle input to reset
Overload Protection	• 110-160%
Short Circuit Protection	• Continuous trip and restart (hiccup mode)
Temperature Coefficient	• 0.05%/°C

Notes

1. Safety approvals cover frequency 47-63 Hz.
2. ECS60US12 1.5% pk-pk, 20 MHz bandwidth under certain line/load conditions.
3. See longform datasheet or contact sales for details.

General

Efficiency	• Up to 90%, model dependant
Isolation	• 4000 VAC Input to Output, 1500 VAC Input to Ground, 500 VDC Output to Ground
Switching Frequency	• 65 KHz typical
Power Density	• Up to 9.5 W/in ³
MTBF	• 25 & 45 W: 1072 kHrs, 60 W: 471 kHrs to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Temperature	• -20 °C to +70 °C derate linearly from +50 °C at 2.5%/°C to 50% load at +70 °C.
Cooling	• Convection, see thermal considerations
Operating Humidity	• 95% RH, non-condensing
Storage Temperature	• -40 °C to +85 °C
Operating Altitude	• 3000 m
Shock	• 30 g pk, half sine, 6 axes
Vibration	• 2 g rms, 5 Hz to 500 kHz, 3 axes

EMC & Safety

Low Voltage PSU EMC Emissions	• EN61204-3, high severity level • All models: EN55011/22 level B conducted, 45 & 60 W: EN55011/22 level A radiated, ECS25 & some ECS60 models: level B radiated ⁽³⁾
Harmonic Currents	• EN61000-3-2, class A
Voltage Flicker	• EN61000-3-3
Radiated Immunity	• EN61000-4-3, level 3 Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3 Perf Criteria A
Surge	• EN61000-4-5, installation class 3 Perf Criteria A
Conducted Immunity	• EN61000-4-6, level 3 Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms, Perf Criteria A, B, B, EN60601-1-2, 30% 500 ms, 60% 100 ms, 100% 10 ms, 100% 5000 ms, Perf Criteria A, A, A, B - 230 VAC. Consult longform datasheet for 115 V operation.
Safety Approvals	• IEC60950-1 CB report, UL60950-1, TUV EN60950-1, IEC60601-1 CB report, UL60601-1, TUV 60601-1
Equipment Protection Class	• Class I and Class II

Models and Ratings

ECS25 XP

Output Power	Output Voltage	Output Current	Model Number ⁽¹⁾
25 W	12.0 VDC	2.08 A	ECS25US12†^
25 W	15.0 VDC	1.67 A	ECS25US15†^
25 W	24.0 VDC	1.04 A	ECS25US24†^
25 W	48.0 VDC	0.52 A	ECS25US48†^

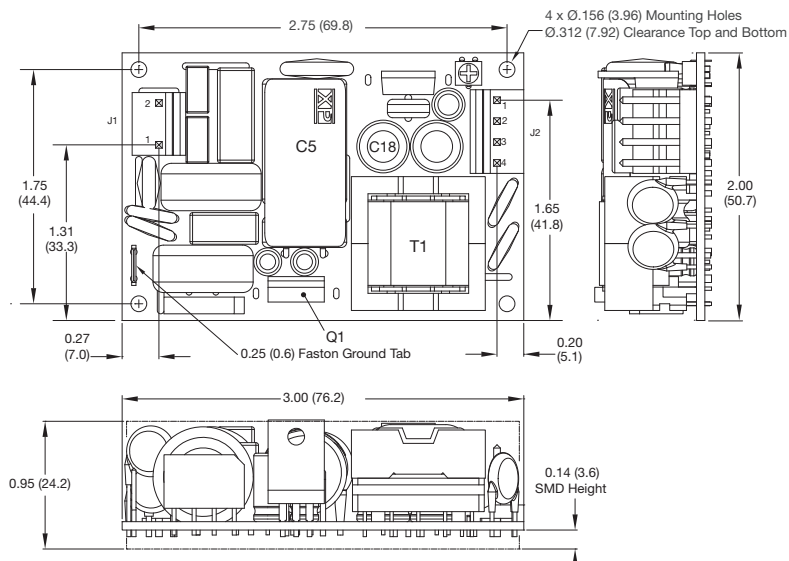
Notes

1. For covered versions, add suffix '-C' to model number or order part number ECS25-60 COVER KIT for standalone cover. Not suitable for use in class II installations, derate output power by 20% with cover.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296.

Mechanical Details



Input Connector J1 Molex PN 09-65-2038	
Pin 1	Line
Pin 2	Neutral
0.25" Faston	Earth

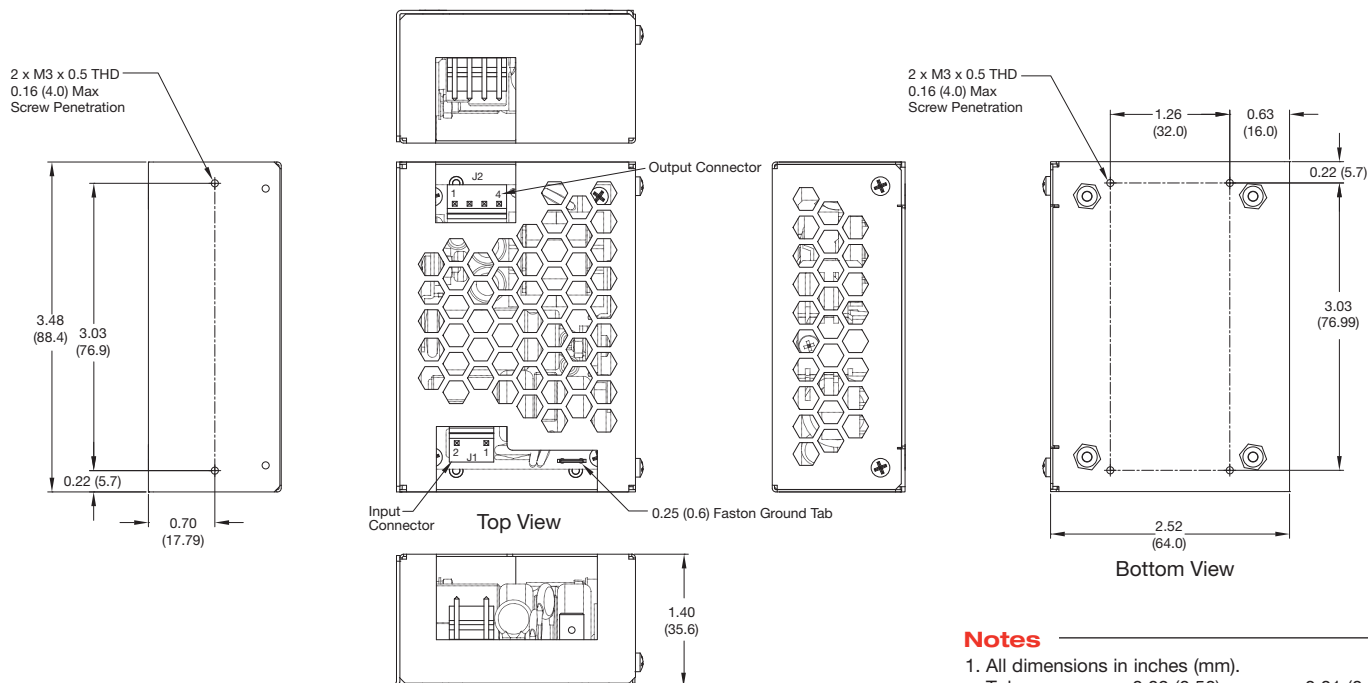
Output Connector J2 Molex PN 09-65-2048	
Pin 1	+V1
Pin 2	+V1
Pin 3	RTN
Pin 4	RTN

J1 mates with Molex Housing PN 09-50-1031, J2 mates with Molex Housing PN 09-50-1041 and both with Molex Series 5194 Crimp Terminals

Notes

- All dimensions in inches (mm).
Tolerance .xx = ±0.02 (0.50); .xxx = ±0.01 (0.25)
- Weight 0.22 lbs (100 g)

Covered version (All ECS25-60 Models)



Notes

- All dimensions in inches (mm).
Tolerance .xx = ±0.02 (0.50); .xxx = ±0.01 (0.25)
- Weight 0.5 lbs (230 g)

Models and Ratings

Output Power	Output Voltage	Output Current	Model Number ⁽¹⁾
30 W	5.0 VDC	6.00 A	ECS45US05†^
45 W	12.0 VDC	3.75 A	ECS45US12†^
45 W	15.0 VDC	3.00 A	ECS45US15†^
45 W	24.0 VDC	1.90 A	ECS45US24†^
45 W	48.0 VDC	0.95 A	ECS45US48†^

Notes

1. For covered versions, add suffix '-C' to model number or order part number ECS25-60 COVER KIT for standalone cover. Not suitable for use in class II installations, derate output power by 20% with cover.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296.

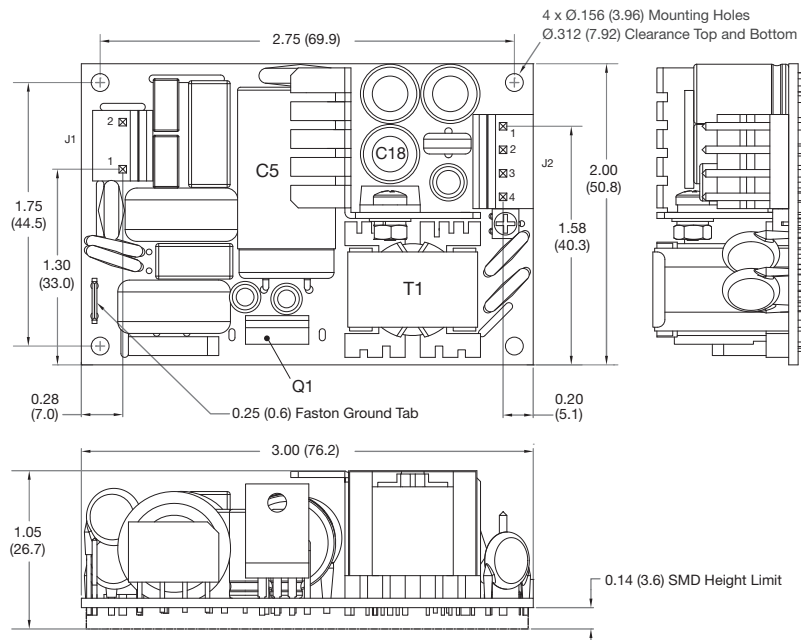
Mechanical Details

5 V version

Input Connector J1 Molex PN 09-65-2038	
Pin 1	Line
Pin 2	Neutral
0.25" Faston	Earth

Output Connector J2 Molex PN 09-65-2048	
Pin 1	+V1
Pin 2	+V1
Pin 3	RTN
Pin 4	RTN

J1 mates with Molex Housing PN 09-50-1031,
J2 mates with Molex Housing PN 09-50-1041 and both with Molex Series 5194 Crimp Terminals

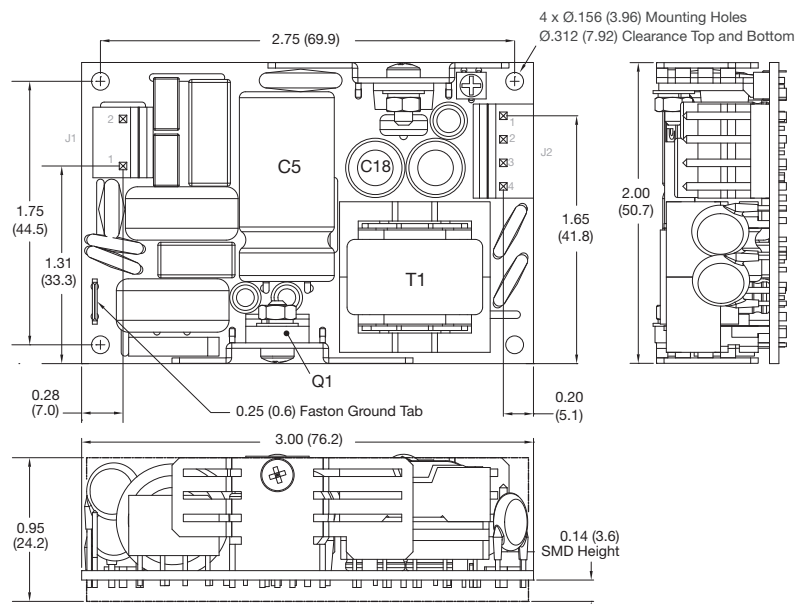


12-48 V version

Input Connector J1 Molex PN 09-65-2038	
Pin 1	Line
Pin 2	Neutral
0.25" Faston	Earth

Output Connector J2 Molex PN 09-65-2048	
Pin 1	+V1
Pin 2	+V1
Pin 3	RTN
Pin 4	RTN

J1 mates with Molex Housing PN 09-50-1031,
J2 mates with Molex Housing PN 09-50-1041 and both with Molex Series 5194 Crimp Terminals



Notes

1. All dimensions in inches (mm).
Tolerance .xx = ±0.02 (0.50); .xxx = ±0.01 (0.25)

2. Weight 0.22 lbs (100 g)

Models and Ratings

ECS60 XP

Output Power	Output Voltage	Output Current	Model Number ⁽¹⁾
40 W	5.0 VDC	8.00 A	ECS60US05 ⁽²⁾
60 W	12.0 VDC	5.00 A	ECS60US12†^
60 W	15.0 VDC	4.00 A	ECS60US15†^
60 W	24.0 VDC	2.50 A	ECS60US24†^
60 W	48.0 VDC	1.25 A	ECS60US48†^

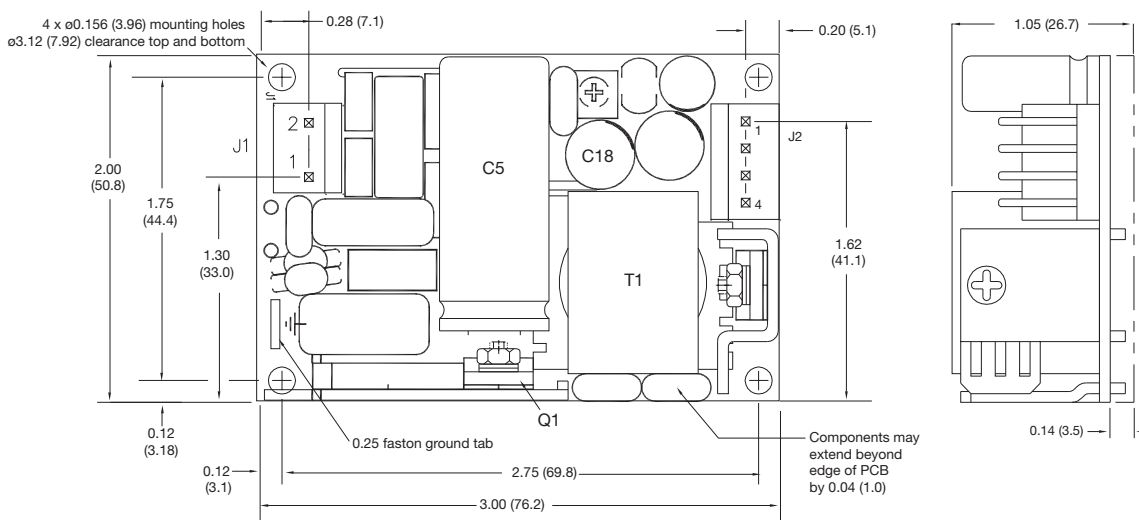
Notes

- For covered versions, add suffix '-C' to model number or order part number ECS25-60 COVER KIT for standalone cover. Not suitable for use in class II installations, derate output power by 20% with cover.
- ECS60US05 available Q3 2011.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296.

Mechanical Details



Input Connector J1 Molex PN 09-65-2038	
Pin 1	Line
Pin 2	Neutral
0.25" Faston	Earth

J1 mates with Molex Housing PN 09-50-1031

Output Connector J2 Molex PN 09-65-2048	
Pin 1	+V1
Pin 2	+V1
Pin 3	RTN
Pin 4	RTN

J2 mates with Molex Housing PN 09-50-1041 and both with Molex Series 5194 Crimp Terminals

Notes

- All dimensions in inches (mm).
Tolerance .xx = ±0.02 (0.50); .xxx = ±0.01 (0.25)

- Weight: 0.22 lbs (100 g)

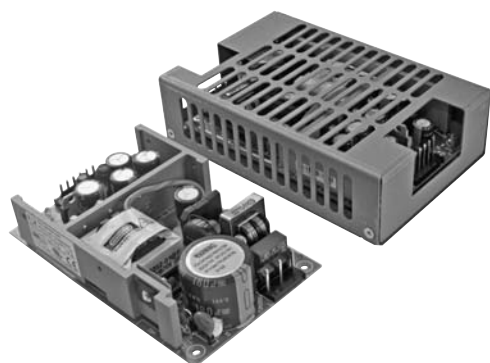
Thermal Considerations (All ECS25-60 Models)

In order to ensure safe and reliable operation of the PSU in the most adverse conditions permitted in the end-use equipment, the temperature of the components listed in the table must not be exceeded. See mechanical drawings for component locations. Temperature should be monitored using K type thermocouples placed on the hottest part of the component (out of any direct air flow).

Temperature Measurements (Ambient ≤50 °C)	
Component	Max Temperature ° C
T1	110 °C
Q1	110 °C
C5	100 °C
C18	100 °C

60 Watts

SDS Series



- Single, Dual, Triple & Quad Outputs
- Output Voltages from 3.3 V to 48 V
- Non-standard Outputs Available
- Industry Standard 3" x 5" Package
- Fits 1U Applications
- Open Frame, U Channel & Covered Versions
- 3 Year Warranty

Specification

Input

Input Voltage	• 90-264 VAC (120-370 VDC)
Input Frequency	• 47-63 Hz
Input Current	• 1.6 A max at 115 VAC 1.0 A max at 230 VAC
Inrush Current	• <15 A at 115 VAC, cold start at 25 °C <30 A at 230 VAC, cold start at 25 °C
Earth Leakage Current	• <0.30 mA at 115 VAC <0.75 mA at 240 VAC
Power Factor	• EN61000-3-2, Class A
Input Protection	• T2 A/250 VAC internal fuse in line

Output

Output Voltage	• See table
Output Voltage Trim	• $\pm 10\%$ on V1 only (see note 4)
Initial Set Accuracy	• Single output models: $\pm 1\%$ Multi-output models: $\pm 5\%$
Minimum Load	• 10% required on V1 & V2 of multi-output models to maintain regulation, unit will start up with no load
Start Up Delay	• 2 s typical
Hold Up Time	• 12 ms min at 110 VAC, 100% load
Line Regulation	• 1% from low line to high line
Load Regulation	• 7% max all models 3% typical, see table 10% with no load on V1, for multi output models
Transient Response	• 4% max deviation, recovery to within 1% in 4 ms for a 50% load change
Ripple & Noise	• 1% pk-pk typical, 20 MHz bandwidth
Overvoltage Protection	• 112-132% of nominal output voltage on V1 only, recycle input to reset
Overload Protection	• 110-150% of nominal power, with auto recovery
Short Circuit Protection	• Trip & restart (hiccup mode), auto recovery
Temperature Coefficient	• $\pm 0.04\%/^{\circ}\text{C}$

General

Efficiency	• 80% typical, 230 VAC full load
Isolation	• 3000 VAC Input to Output 1500 VAC Input to Ground 500 VDC Output to Ground
Switching Frequency	• 60 kHz typical
Power Density	• 3.5 W/In ³
Signals	• Green DC OK LED
MTBF	• 190 kHrs typical to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Temperature	• 0 °C to +70 °C, derate linearly from 100% load at +50 °C to 50% load at +70 °C
Cooling	• Convection-cooled
Operating Humidity	• 5-95% RH, non-condensing
Storage Temperature	• -40 °C to +85 °C

EMC & Safety

Emissions	• EN55022, level B conducted and radiated
Harmonic Currents	• EN61000-3-2, Class A
Voltage Flicker	• EN61000-3-3
ESD Immunity	• EN61000-4-2, level 2 contact, level 3 air, Perf Criteria A
Radiated Immunity	• EN61000-4-3, level 2, Perf Criteria A
EFT/Burst	• EN61000-4-4, level 2, Perf Criteria A
Surge	• EN61000-4-5, installation Class 3, Perf Criteria A
Conducted Immunity	• EN61000-4-6, level 2, Perf Criteria A
Magnetic Field	• EN61000-4-8, 1 A/m, Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms Perf Criteria A, B, B
Safety Approvals	• EN60950-1, UL60950-1, CSA60950-1 per cUL

Models and Ratings

SDS60 XP

Output Power	Output Voltage	Output Current	Factory-Set Voltage Range ⁽¹⁾	Current Range	Total Regulation	Model Number ^(5,6)
50 W	3.3 V	15.1 A	3.0-5.0 VDC	16.6-10.0 A	5%	SDS60US03†^
55 W	5.0 V	11.0 A	5.0-6.0 VDC	11.0-9.1 A	5%	SDS60US05†^
60 W	7.0 V	8.6 A	6.0-8.0 VDC	10.0-7.5 A	4%	SDS60US07
63 W	9.0 V	7.0 A	8.0-11.0 VDC	7.8-5.7 A	3%	SDS60US09†^
63 W	12.0 V	5.2 A	11.0-13.0 VDC	5.7-4.8 A	3%	SDS60US12†^
63 W	15.0 V	4.2 A	13.0-16.0 VDC	4.8-3.9 A	3%	SDS60US15†^
63 W	19.0 V	3.3 A	16.0-21.0 VDC	3.9-3.0 A	3%	SDS60US19†^
63 W	24.0 V	2.6 A	21.0-27.0 VDC	3.0-2.3 A	2%	SDS60US24†^
63 W	30.0 V	2.1 A	27.0-33.0 VDC	2.3-1.9 A	2%	SDS60US30
63 W	36.0 V	1.7 A	33.0-40.0 VDC	1.9-1.5 A	2%	SDS60US36†^
63 W	48.0 V	1.3 A	40.0-50.0 VDC	1.5-1.2 A	2%	SDS60US48†^

Output Power	Output V1 ^(2,3,4)	Output V2 ^(2,3,4)	Output V3 ⁽³⁾	Output V4 ⁽³⁾	Model Number ^(5,6)
63.0 W	+5.0 V/7.0 A	+12.0 V/3.0 A			SDS60UD01†
48.1 W	+3.3 V/7.0 A	+5.0 V/5.0 A			SDS60UD04
63.0 W	+3.3 V/6.0 A	+12.0 V/3.0 A	-12.0 V/0.8 A		SDS60UT00†^
63.0 W	+3.3 V/6.0 A	+12.0 V/3.0 A	-5.0 V/0.8 A		SDS60UT01
63.0 W	+3.3 V/6.0 A	+12.0 V/3.0 A	+5.0 V/0.8 A		SDS60UT02
53.5 W	+3.3 V/5.0 A	+5.0 V/5.0 A	+12.0 V/1.0 A		SDS60UT03†^
53.5 W	+3.3 V/5.0 A	+5.0 V/5.0 A	-12.0 V/1.0 A		SDS60UT04
63.0 W	+5.0 V/6.0 A	+12.0 V/3.0 A	-12.0 V/0.8 A		SDS60UT05†^
63.0 W	+5.0 V/6.0 A	+12.0 V/3.0 A	-5.0 V/0.8 A		SDS60UT06†^
63.0 W	+5.0 V/6.0 A	+15.0 V/3.0 A	-15.0 V/0.8 A		SDS60UT07†^
63.0 W	+5.0 V/6.0 A	+24.0 V/2.0 A	-24.0 V/0.5 A		SDS60UT08†^
63.0 W	+5.0 V/6.0 A	+24.0 V/2.0 A	-12.0 V/0.8 A		SDS60UT09†^
63.0 W	+5.0 V/6.0 A	+24.0 V/2.0 A	+12.0 V/0.8 A		SDS60UT10†^
63.0 W	+3.3 V/6.0 A	+12.0 V/3.0 A	-12.0 V/0.8 A	-5.0 V/0.8 A	SDS60UQ00
63.0 W	+3.3 V/6.0 A	+12.0 V/3.0 A	-12.0 V/0.8 A	+5.0 V/0.8 A	SDS60UQ01†^
63.0 W	+5.0 V/6.0 A	+12.0 V/3.0 A	-12.0 V/0.8 A	-5.0 V/0.8 A	SDS60UQ02†^
63.0 W	+5.0 V/6.0 A	+12.0 V/3.0 A	-12.0 V/0.8 A	+24.0 V/0.8 A	SDS60UQ03†^
63.0 W	+5.0 V/6.0 A	+12.0 V/3.0 A	-12.0 V/0.8 A	-24.0 V/0.8 A	SDS60UQ04
63.0 W	+5.0 V/6.0 A	+15.0 V/3.0 A	-15.0 V/0.8 A	-5.0 V/0.8 A	SDS60UQ05†^
59.3 W	+5.0 V/6.0 A	+24.0 V/1.8 A	-15.0 V/0.1 A	+12.0 V/0.8 A	SDS60UQ06

Notes

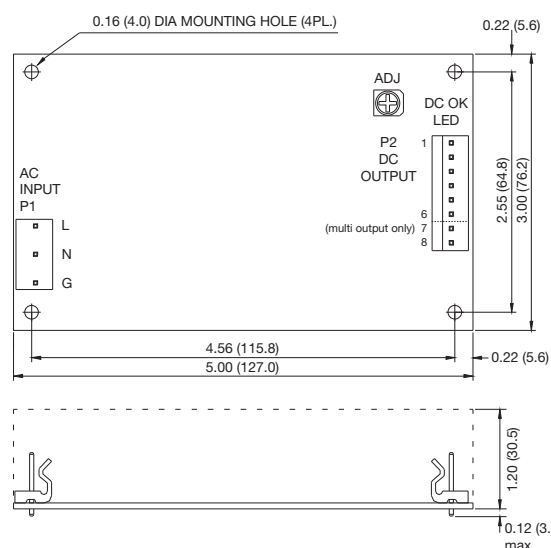
1. If an output voltage within the factory-set voltage range is required, a model number will be allocated at the time of order.
2. 10% minimum load required on V1 & V2 of multi-output units to maintain regulation of $\pm 5\%$. Regulation increases to $\pm 10\%$ with no load.
3. Other output combinations are available - contact sales for more information.

4. On multi-output units V2 tracks V1, if V1 is adjusted by 5%, V2 changes by 5%.
5. For optional U-bracket, add suffix 'B' to model number.
6. For optional 2 pin AC input, contact sales for details.
7. To receive unit with cover fitted, add suffix '-C' to model number.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296.

Mechanical Details



PIN CONNECTIONS				
Pin	Single Output	Dual Output	Triple Output	Quad Output
1	Output 1	Output 2	Output 2	Output 2
2	Output 1	Output 1	Output 1	Output 1
3	Output 1	Output 1	Output 1	Output 1
4	Return	Common	Common	Common
5	Return	Common	Common	Common
6	Return	N/C	Output 3	Output 3
7				Output 4
8				Output 4

Notes

1. All dimensions are in inches (mm)
2. Weight: 0.52 lbs (240 g) approx
3. Tolerance: ± 0.02 (0.5)
4. Input connector mates with Molex housing 09-50-3051 and Molex 2878 series crimp terminal.
5. Output connector mates with Molex housing 09-50-3061 or 9-50-3081 and Molex 2878 series crimp terminal.
6. For optional cover kit order part number SDS60 COVER KIT†^, to receive unit with cover fitted add suffix '-C' to model number. Cover size: 5.46 x 3.55 x 1.55 (140 x 91 x 39.7mm).
7. For mating connectors and cable harness order part numbers:
 - SDS60 CON KIT†^ - Single, dual and triple output models
 - SDS60Q CON KIT†^ - Quad output models
 - SDS60 LOOM KIT†^ - Single output models cable harness
 - SDS60DT LOOM KIT†^ - Dual and triple output models cable harness
 - SDS60Q LOOM KIT†^ - Quad output models cable harness

65 Watts

ECP Series



GREEN-POWER

- Low Profile Design
- Compact Size, 4" x 2"
- IT & Medical Approvals
- Single, Dual and Triple Output
- <0.5 W No Load Input Power
- Peak Load Capability
- 3 Year Warranty

Specification

Input

Input Voltage	• 85-264 VAC, derate from 100% load at 90 VAC to 90% load at 85 VAC
Input Frequency	• 47-63 Hz
Input Current	• 0.85 A max at 115 VAC
Inrush Current	• 100 A max at 230 VAC, cold start at 25 °C
Power Factor	• EN61000-3-2, class A
No Load Input Power	• <0.5 W
Earth Leakage Current	• <250 µA at 264 VAC, 60 Hz
Input Protection	• Internal T2 A/250 V fuse in both line and neutral

Output

Output Voltage	• See table
Output Voltage Trim	• ±10% on V1 only, output 2 on multi output models will track by the same percentage
Minimum Load	• 10% minimum load required on all outputs of multi output models
Start Up Delay	• 1.3 s max
Start Up Rise Time	• 15 ms typical
Hold Up Time	• 16 ms min at full load at 115 VAC
Total Regulation	• Output 1: 2% from 0% load to 100% load Output 2: 5% from 20% load to 100% load Output 3: 5% from 10% load to 100% load
Remote Sense	• Fitted to US05 version, compensates for 0.5 V drop
Transient Response	• 4% max deviation, recovering to less than 1% within 500 µs for 50% step load change at 1 A/µs
Ripple & Noise	• 1% pk-pk (2% for US05 version), measured with 20 MHz bandwidth
Overvoltage Protection	• 115-140% of nominal output voltage on V1 only, recycle input to reset
Overload Protection	• 120-160% of nominal power
Short Circuit Protection	• Trip and restart (hiccup mode)
Temperature Coefficient	• ±0.02%/°C max

General

Efficiency	• 88% typical at 230 VAC and full load
Isolation	• 4000 VAC Input to Output 1500 VAC Input to Ground 500 VDC Output to Ground
Switching Frequency	• 30-130 kHz variable
MTBF	• >400 kHrs to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Temperature	• -20 °C to +70 °C, derate from 100% load at 50 °C to 50% load at 70 °C
Cooling	• Natural convection
Operating Humidity	• 5% to 95% RH, non condensing
Operating Altitude	• 3000 m max
Storage Temperature	• -40 °C to +85 °C
Shock	• 30 g pk, half sine, 6 axes
Vibration	• 2 g rms, 5 Hz to 500 kHz, 3 axes

EMC & Safety

Emissions	• EN55011/22, level B conducted & level A radiated
Harmonic Currents	• EN61000-3-2, class A
Voltage Flicker	• EN61000-3-3
ESD Immunity	• EN61000-4-2, ±4 kV indirect contact, Perf Criteria A
Radiated Immunity	• EN61000-4-3, 3 V/m, Perf Criteria A
EFT / Burst	• EN61000-4-4, level 3 Perf Criteria A
Surge	• EN61000-4-5, installation class 3, Perf Criteria A
Conducted Immunity	• EN61000-4-6, 3 V Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms, Perf Criteria A, B, B EN60601-1-2, 30% 500 ms, 60% 100 ms, 100% 10 ms, 100% 5000 ms, Perf Criteria A, A, A, B
Safety Approvals	• EN60950-1, cUL60950-1, IEC60950-1, EN60601-1, cUL60601-1, IEC60601-1

Models and Ratings

ECP65 **XP**

Output Power	Output 1			Output 2			Output 3		Model Number
	Voltage	Current	Peak ⁽¹⁾	Voltage	Current	Peak ⁽¹⁾	Voltage	Current	
55 W	+5.0 VDC	11.0 A	14.3 A						ECP65US05
65 W	+5.0 VDC	8.0 A	10.4 A	+12.0 VDC	3.0 A	3.90 A			ECP65UD01
65 W	+5.0 VDC	8.0 A	10.4 A	+15.0 VDC	2.0 A	2.60 A			ECP65UD02
65 W	+5.0 VDC	8.0 A	10.4 A	+24.0 VDC	1.5 A	1.95 A			ECP65UD03
65 W	+5.0 VDC	8.0 A	10.4 A	+12.0 VDC	3.0 A	3.90 A	-12.0 V	0.30 A	ECP65UT01
65 W	+5.0 VDC	8.0 A	10.4 A	+15.0 VDC	2.0 A	2.60 A	-15.0 V	0.30 A	ECP65UT02
65 W	+5.0 VDC	8.0 A	10.4 A	+24.0 VDC	1.5 A	1.95 A	+12.0 V	0.30 A	ECP65UT03
65 W	+5.0 VDC	8.0 A	10.4 A	+24.0 VDC	1.5 A	1.95 A	-12.0 V	0.30 A	ECP65UT04

Notes

1. Peak load lasting <30 s with a maximum duty cycle of 10%, average output power not to exceed nominal.

Mechanical Details

CN1 - Input Connector	
Pin 1	Neutral
Pin 2	Not Fitted
Pin 3	Line

Mates with JST housing
VHR-3N and JST Series
SVH-21T-P1.1 crimp terminals

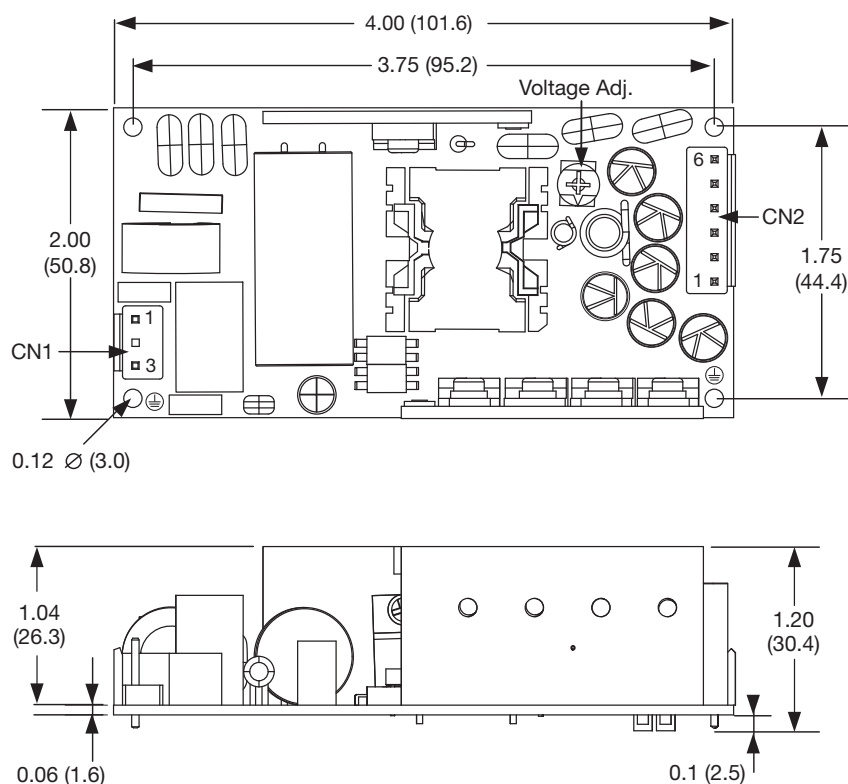
Mounting holes marked with
⊕ must be connected to safety earth

CN2 Output Connector		
	UD/UT	US05
Pin 1	V3	RTN
Pin 2	RTN	RTN
Pin 3	RTN	RTN
Pin 4	V1	+5 V
Pin 5	V1	+5 V
Pin 6	V2	+5 V

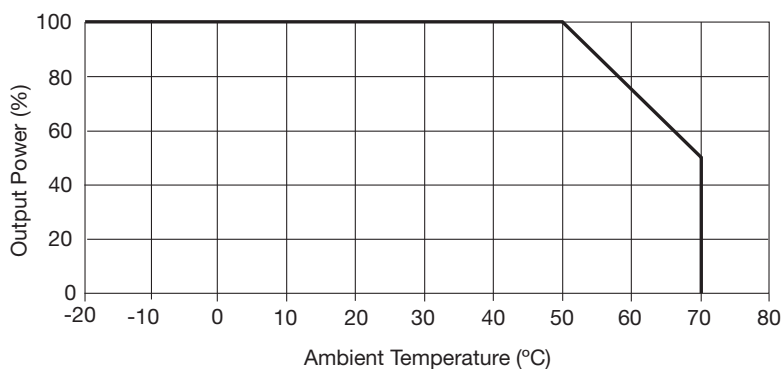
Mates with JST housing
VHR-6N and JST Series
SVH-21T-P1.1 crimp terminals

Notes

1. All dimensions are in inches (mm).
2. Weight: 0.34 lbs (155 g) approx.
3. Tolerance: ±0.02 (±0.5)



Derating Curve



40-100 Watts

ECM Series



- Compact Size
- IT, Medical & SEMI F47 Approvals
- Convection-cooled
- Class I and II Construction
- DC Input Version Available (DCM Series)
- PoE Isolation Version Available (POE Series)
- 3 Year Warranty

Specification

Input

Input Voltage	• 90-264 VAC (120-370 VDC)
Input Frequency	• 47-63 Hz; 440 Hz*
Input Current	• 40 W: 0.4 A max at 230 VAC 60 W: 0.6 A max at 230 VAC 100 W: 0.9 A max at 230 VAC
Inrush Current	• 40 A max at 230 VAC
Earth Leakage Current	• <125 μ A at 115 VAC/60 Hz <210 μ A at 230 VAC/50 Hz
Power Factor	• EN61000-3-2
Input Protection	• Internal T3.15 A, 250 V fuse in line and neutral

Output

Output Voltage	• See tables
Output Voltage Trim	• $\pm 5\%$ on 3.3 V & 5 V versions, $\pm 10\%$ on other single output models and V1 of multi-output models. (See note 1 for ECM40/60 models)
Initial Set Accuracy	• $\pm 1.0\%$ V1, $\pm 5\%$ V2, V3 & V4
Minimum Load	• See tables
Start Up Delay	• 1.5 s max
Start Up Rise Time	• 10 ms max
Hold Up Time	• 16/75 ms min at 115/230 VAC
Line Regulation	• $\pm 0.5\%$
Load Regulation	• $\pm 1\%$ single output models; $\pm 3\%$ V1, $\pm 5\%$ V2 & V3 ECM40/60 multi-output models. $\pm 1\%$ V1 & V2, $\pm 5\%$ V3 & V4 ECM100
Cross Regulation	• 2% on ECM40/60 only
Over/Undershoot	• None at turn on/off
Transient Response	• 4% max. deviation, recovery to within 1% in 500 μ s for a 25% load change
Ripple & Noise	• 1% pk-pk, 20 MHz bandwidth
Overvoltage Protection	• 115-135% Vnom, recycle input to reset
Overload Protection	• 110-150% on primary power limit, auto recovery
Short Circuit Protection	• Trip and restart (hiccup mode)
Temperature Coefficient	• 0.05%/°C
Peak Load	• 120% for 100 ms ECM40/60 (see note 3)

General

Efficiency	• 80-85% depending on model
Isolation	• 4000 VAC Input to Output 1500 VAC Input to Ground 500 VAC Output to Ground
Switching Frequency	• 70 kHz typical
Power Density	• 40 W: 4.2 W/In ³ 60 W: 6.3 W/In ³ 100 W: 7.4 W/In ³
MTBF	• 600 kHrs to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Temperature	• 0 °C to +70 °C. Refer to derating curves for specific operating limitations.
Cooling	• Convection & fan-cooled ratings (see derating curves)
Operating Humidity	• 95% RH, non-condensing
Storage Temperature	• -40 °C to +85 °C
Operating Altitude	• 3000 m
Shock	• 30 g pk, half sine, 6 axes
Vibration	• 2 g rms, 5 Hz to 500 Hz, 3 axes

EMC & Safety

Emissions	• EN60601-1-2, EN61204-3, FCC 20780, EN55022 & EN55011, level B conducted EN55022 Level A radiated
Harmonic Currents	• EN61000-3-2, class A
Voltage Flicker	• EN61000-3-3
ESD Immunity	• EN61000-4-2, level 3 Perf Criteria A
Radiated Immunity	• EN61000-4-3, 10 V/m Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3 Perf Criteria A
Surge	• EN61000-4-5, level 3 Perf Criteria A
Conducted Immunity	• EN61000-4-6, 10 V Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms, Perf Criteria A, B, B EN60601-1, 30% 500 ms, 60% 100 ms, 100% 10 ms, 100% 5000 ms, Perf Criteria A, A (with 50% load), A, B
Safety Approvals	• EN60950-1, UL60950-1, CSA 22.2 601.1, EN60601-1, UL60601-1 ECM40 & ECM60: SEMI F47

Models and Ratings

ECM40 XP

Output Power	Output 1		Output 2		Output 3		Model Number ⁽²⁾
	Voltage	Current Min/Max ⁽³⁾	Voltage	Current Min/Max	Voltage	Current Min/Max	
40 W	5.0 V	0.0 A/8.0 A					ECM40US05†^
	7.0 V	0.0 A/5.7 A					ECM40US07†
	9.0 V	0.0 A/4.4 A					ECM40US09†^
	12.0 V	0.0 A/3.5 A					ECM40US12†^
	15.0 V	0.0 A/2.7 A					ECM40US15†^
	18.0 V	0.0 A/2.2 A					ECM40US18†
	24.0 V	0.0 A/1.7 A					ECM40US24†^
	33.0 V	0.0 A/1.2 A					ECM40US33†
	48.0 V	0.0 A/0.9 A					ECM40US48†^
	+5.0 V	0.5 A/6.0 A	+12.0 V	0.1 A/2.0 A			ECM40UD21†
	+5.0 V	0.5 A/6.0 A	+15.0 V	0.1 A/1.5 A			ECM40UD22
	+5.0 V	0.5 A/6.0 A	+12.0 V	0.1 A/2.0 A	-12.0 V	0.0 A/0.5 A	ECM40UT31†^
	+5.0 V	0.5 A/6.0 A	+24.0 V	0.1 A/1.0 A	-12.0 V	0.0 A/0.5 A	ECM40UT32†
	+5.0 V	0.5 A/6.0 A	+15.0 V	0.1 A/1.5 A	-15.0 V	0.0 A/0.5 A	ECM40UT33†^
	+3.3 V	0.5 A/6.0 A	+5.0 V	0.1 A/1.5 A	+12.0 V	0.0 A/0.5 A	ECM40UT34†^
	+5.0 V	0.5 A/6.0 A	+3.3 V	0.1 A/1.5 A	+12.0 V	0.0 A/0.5 A	ECM40UT35†

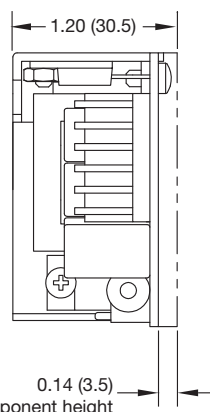
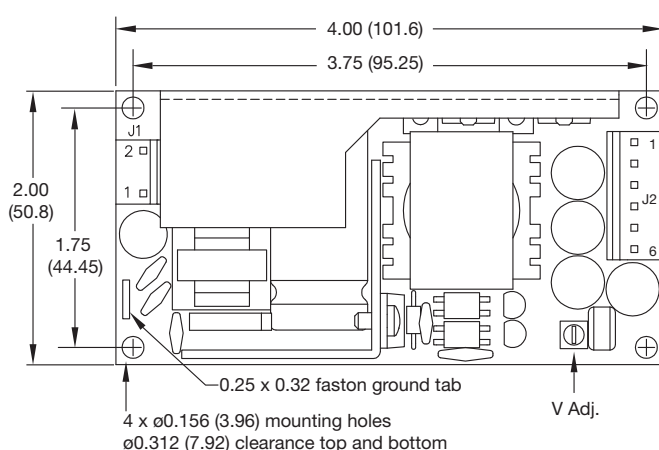
Notes

- V2 will track a change in V1 by the same percentage change in voltage as V1 is trimmed.
- To receive unit with cover fitted, add suffix '-C' to model number. For Class I operation only.
- A 120% peak load can be taken for up to 100 ms with a 25% duty cycle. Average load not to exceed 40 W.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296.

Mechanical Details



Input Connector J1	
Pin 1	Line
Pin 2	Neutral

J1 mates with Molex housing 43061-0003 & Molex series 5194 crimp terminals. Ground tab (0.25 faston) standard.

Output Connector J2		
Pin	Single	Multi
1	V1	+V1
2	V1	+V1
3	RTN	RTN
4	RTN	RTN
5	NC	V3
6	NC	+V2

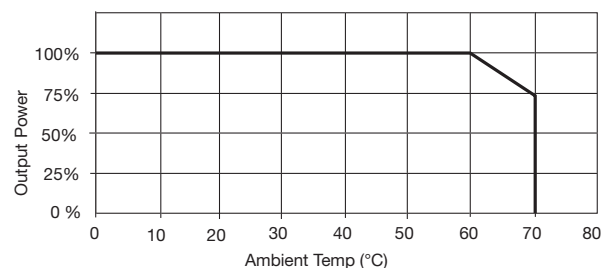
J2 mates with Molex housing 43061-0006 & Molex series 5194 crimp terminals.

Notes

- All dimensions in inches (mm). Tolerance .xx = ±0.02 (0.50); .xxx = ±0.01 (0.25)
- Weight: approx. 0.33 lbs (150 g)
- Cable harnesses with 300 mm wire available.
For single output models, order part number ECM40/60S LOOM†.
For multi-output models, order part number ECM40/60DT LOOM†^.
- Mating connector kit available. Order part number ECM40/60 CONKIT†.
- Covers available. Order part number ECM40/60 COVER†^.
Cover dimensions are 4.49 x 2.52 x 1.52 (114 x 64 x 38.5)

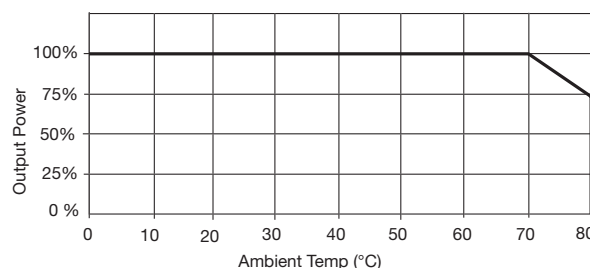
Derating Curves

All ECM40 models convection-cooled



Note: Derate by 10% if cover is fitted

All ECM40 models with 5 CFM



Consult longform datasheet for installation information regarding optimum thermal ratings in convection-cooled applications.

Models and Ratings

Output Power	Output 1		Output 2		Output 3		Model Number ⁽²⁾
	Voltage	Current Min/Max ⁽³⁾	Voltage	Current Min/Max	Voltage	Current Min/Max	
60 W	5.0 V	0.0 A/12.00 A					ECM60US05†^
	7.0 V	0.0 A/8.60 A					ECM60US07
	9.0 V	0.0 A/6.70 A					ECM60US09^
	12.0 V	0.0 A/5.00 A					ECM60US12†^
	15.0 V	0.0 A/4.00 A					ECM60US15†^
	18.0 V	0.0 A/3.30 A					ECM60US18†
	20.0 V	0.0 A/3.00 A					ECM60US20
	24.0 V	0.0 A/2.50 A					ECM60US24†^
	28.0 V	0.0 A/2.14 A					ECM60US28
	33.0 V	0.0 A/1.80 A					ECM60US33
	48.0 V	0.0 A/1.25 A					ECM60US48†^
	+5.0 V	0.5 A/8.00 A	+12.0 V	0.1 A/3.0 A			ECM60UD21^
	+5.0 V	0.5 A/8.00 A	+15.0 V	0.1 A/2.5 A			ECM60UD22
	+5.0 V	0.5 A/8.00 A	+12.0 V	0.1 A/3.0 A	-12.0 V	0.0 A/0.5 A	ECM60UT31†^
	+5.0 V	0.5 A/8.00 A	+24.0 V	0.1 A/1.5 A	-12.0 V	0.0 A/0.5 A	ECM60UT32†
	+5.0 V	0.5 A/8.00 A	+15.0 V	0.1 A/2.5 A	-15.0 V	0.0 A/0.5 A	ECM60UT33†^
	+3.3 V	0.5 A/8.00 A	+5.0 V	0.1 A/1.5 A	+12.0 V	0.0 A/0.5 A	ECM60UT34†^
	+5.0 V	0.5 A/8.00 A	+3.3 V	0.1 A/1.5 A	+12.0 V	0.0 A/0.5 A	ECM60UT35†

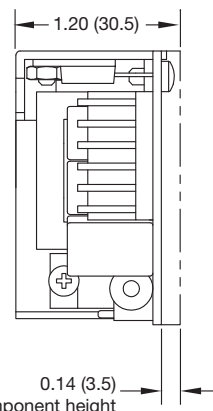
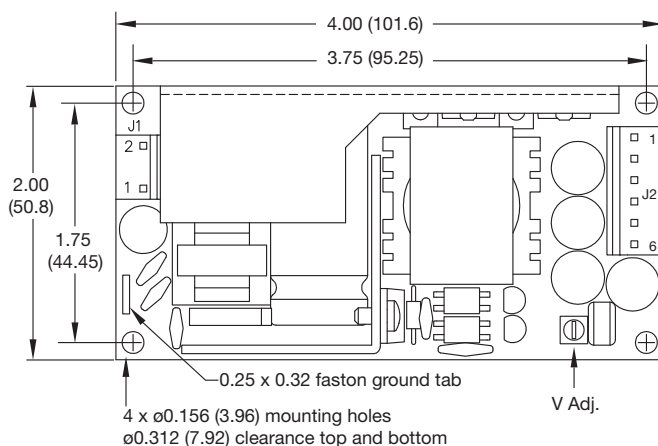
Notes

- V2 will track a change in V1 by the same percentage change in voltage as V1 is trimmed.
- To receive unit with cover fitted, add suffix '-C' to model number. For Class I operation only.
- A 120% peak load can be taken for up to 100 ms with a 25% duty cycle. Average load not to exceed 60 W.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296.

Mechanical Details



Input Connector J1

Pin 1	Line
Pin 2	Neutral

J1 mates with Molex housing 43061-0003 & Molex series 5194 crimp terminals. Ground (0.25 faston) tab standard.

Output Connector J2

Pin	Single	Multi
1	V1	+V1
2	V1	+V1
3	RTN	RTN
4	RTN	RTN
5	NC	V3
6	NC	+V2

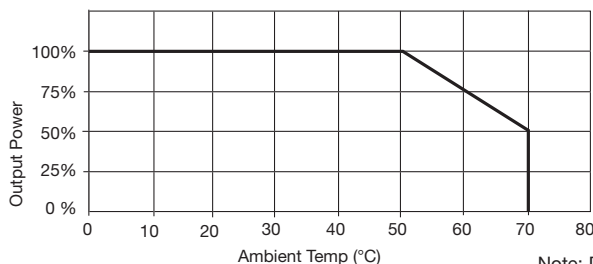
J2 mates with Molex housing 43061-0006 & Molex series 5194 crimp terminals.

Notes

- All dimensions in inches (mm). Tolerance .xx = ±0.02 (0.50); .xxx = ±0.01 (0.25)
- Weight: 0.33 lbs (150 g) approx.
- Cable harnesses with 300 mm wire available.
For single output models, order part number ECM40/60S LOOM†.
For multi-output models, order part number ECM40/60DT LOOM†.
- Mating connector kit available. Order part number ECM40/60 CONKIT†.
- Covers available. Order part number ECM40/60 COVER†. Cover dimensions are 4.49 x 2.52 x 1.52 (114 x 64 x 38.5).
- Selected single output models available in a 3" x 5" footprint for OEM quantities. Contact sales for details.

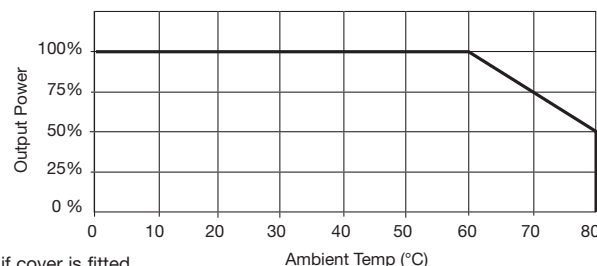
Derating Curves

All ECM60 models convection-cooled



Note: Derate by 10% if cover is fitted

All ECM60 models with 5 CFM



Consult longform datasheet for installation information regarding optimum thermal ratings in convection-cooled applications.

Models and Ratings

ECM100 **XP**

Single Output Models

Output Voltage	Output Current			Model Number ⁽¹⁾
	Minimum	Maximum	with 5 CFM Cooling	
3.3 V	0.0 A	15.0 A	20.0 A	ECM100US03 [†] ^
5.0 V	0.0 A	15.0 A	20.0 A	ECM100US05 [†] ^
7.0 V	0.0 A	11.4 A	14.3 A	ECM100US07
9.0 V	0.0 A	8.8 A	11.1 A	ECM100US09 [†] ^
12.0 V	0.0 A	7.5 A	8.3 A	ECM100US12 [†] ^
15.0 V	0.0 A	6.0 A	6.6 A	ECM100US15 [†] ^
18.0 V	0.0 A	5.0 A	5.5 A	ECM100US18
24.0 V	0.0 A	4.1 A	4.1 A	ECM100US24 [†] ^
28.0 V	0.0 A	3.6 A	3.6 A	ECM100US28
33.0 V	0.0 A	3.0 A	3.0 A	ECM100US33
48.0 V	0.0 A	2.1 A	2.1 A	ECM100US48 [†] ^

Multi Output Models

Output Power		Output 1		Output 2		Output 3		Output 4		Model Number ⁽¹⁾
Convection Cooled	Forced Air 5 CFM	Voltage	Current Min/Max	Voltage	Current Min/Max	Voltage	Current Min/Max	Voltage	Current Min/Max	
80 W	100 W	+5.0 V	0.0 A/12.0 A	+12.0 V	0.0 A/3.0 A					ECM100UD21
80 W	100 W	+5.0 V	0.0 A/12.0 A	+15.0 V	0.0 A/3.0 A					ECM100UD22
75 W	100 W	+5.0 V	0.5 A/10.0 A	+12.0 V	0.0 A/3.0 A	-12.0 V	0.0 A/0.8 A			ECM100UT31 [†] ^
80 W	100 W	+5.0 V	0.5 A/10.0 A	+24.0 V	0.0 A/2.0 A	-12.0 V	0.0 A/0.8 A			ECM100UT32
80 W	100 W	+5.0 V	0.5 A/10.0 A	+15.0 V	0.0 A/3.0 A	-15.0 V	0.0 A/0.8 A			ECM100UT33 [†] ^
65 W	100 W	+3.3 V	0.5 A/10.0 A	+5.0 V	0.0 A/5.0 A	+12.0 V	0.0 A/0.8 A			ECM100UT34 [^]
70 W	100 W	+5.0 V	0.5 A/10.0 A	+3.3 V	0.0 A/5.0 A	+12.0 V	0.0 A/0.8 A			ECM100UT35
80 W	100 W	+5.0 V	0.5 A/10.0 A	+12.0 V	0.0 A/3.0 A	-5.0 V	0.0 A/0.8 A			ECM100UT36
70 W	100 W	+5.0 V	0.5 A/10.0 A	+15.0 V	0.0 A/3.0 A	-5.0 V	0.0 A/0.8 A			ECM100UT37
65 W	100 W	+5.0 V	0.5 A/10.0 A	+3.3 V	0.1 A/5.0 A	+12.0 V	0.0 A/0.8 A	-12.0 V	0.0 A/0.5 A	ECM100UQ41 [†] ^
60 W	100 W	+3.3 V	0.5 A/10.0 A	+5.0 V	0.1 A/5.0 A	+12.0 V	0.0 A/0.8 A	-12.0 V	0.0 A/0.5 A	ECM100UQ42 [†] ^
80 W	100 W	+5.0 V	0.5 A/10.0 A	+24.0 V	0.1 A/2.0 A	+12.0 V	0.0 A/0.8 A	-12.0 V	0.0 A/0.5 A	ECM100UQ43 [†] ^
80 W	100 W	+5.0 V	0.5 A/10.0 A	+24.0 V	0.1 A/2.0 A	+15.0 V	0.0 A/0.8 A	-15.0 V	0.0 A/0.5 A	ECM100UQ44 [†] ^
80 W	100 W	+5.0 V	0.5 A/10.0 A	+12.0 V	0.1 A/3.0 A	-12.0 V	0.0 A/0.8 A	-5.0 V	0.0 A/0.5 A	ECM100UQ45 [^]
80 W	100 W	+5.0 V	0.5 A/10.0 A	+15.0 V	0.1 A/3.0 A	-15.0 V	0.0 A/0.8 A	-5.0 V	0.0 A/0.5 A	ECM100UQ46

Notes

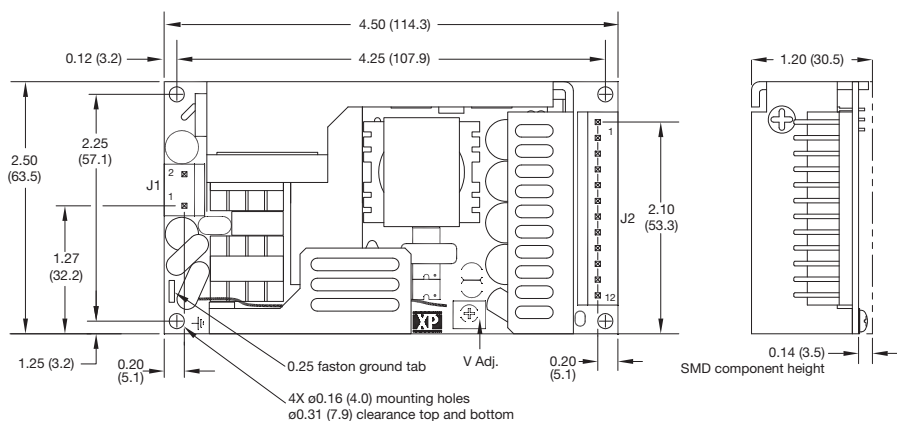
1. To receive unit with cover fitted, add suffix '-C' to model number.

[†] Available from Farnell & element14. See pages 284-290.

2. Output 3 available with opposite polarity for OEM quantities.

[^] Available from Newark. See pages 291-296.

Mechanical Details



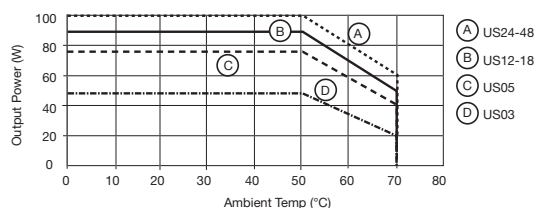
Cover dimensions are 4.98 x 3.01 x 1.54 (126.5 x 76.4 x 39.0)

Notes

1. All dimensions in inches (mm). Tolerance .xx = ± 0.02 (0.50); .xxx = ± 0.01 (0.25)
2. Weight: 0.4 lbs (180 g) approx.
3. Cable harness with 300 mm wire available. For single output models, order part number ECM100S LOOM[†]. For multi-outputs, p/n ECM100DT LOOM[†].

Derating Curves

All ECM100 single output models convection-cooled



Note:

1. Derate by 10% if cover is fitted.
2. For multi output convection-cooled operation above +50 °C derate linearly to 50% at +70 °C.

Input Connector J1	
Pin 1	Line
Pin 2	Neutral

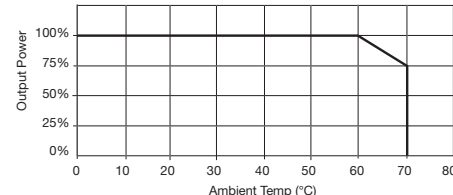
J1 mates with Molex housing 43061-0003 and Molex series 5194 crimp terminals. Ground (0.25 faston) tab standard.

Output Connector J2		
Pin	Single	Multi
1	V1	+V1
2	V1	+V1
3	V1	+V1
4	V1	+V1
5	V1 RTN	RTN
6	V1 RTN	RTN
7	V1 RTN	RTN
8	V1 RTN	RTN
9	NOT USED	+V2
10	NOT USED	+V2
11	NOT USED	+V3
12	NOT USED	-V4

J2 mates with Molex housing 43061-0012 and Molex series 5194 crimp terminals.

4. Mating connector kit available for single output models. Order part number ECM100S CONKIT[†]^.
5. Covers available. Order part number ECM100 COVER[†]^.
6. Available in a 3" x 5" footprint for OEM quantities. Contact sales for details.

All ECM100 models with 5 CFM

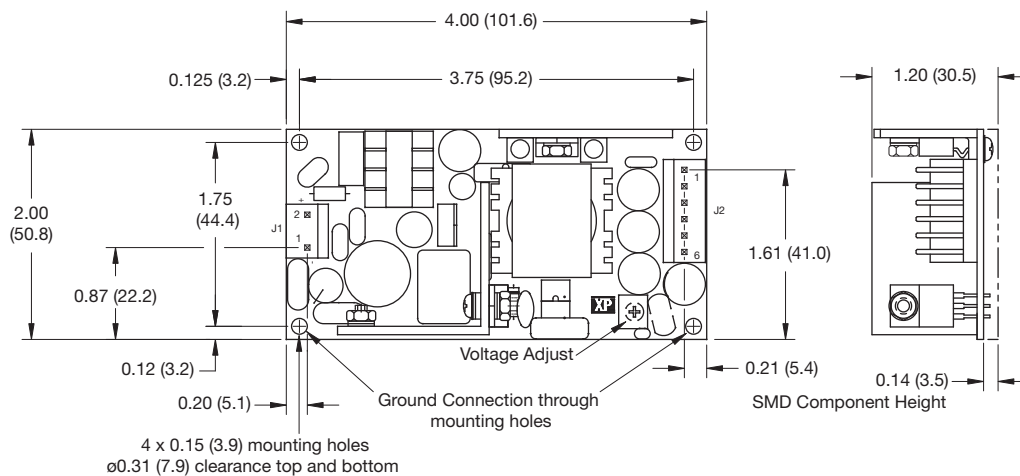


Consult longform datasheet for installation information regarding optimum thermal ratings in convection-cooled applications.

Input Voltage Range ⁽¹⁾	Input Current	UVLO	Output Voltage	Output Current			Model Number
				Min ⁽⁶⁾	Max Convection -cooling	Max - 5CFM forced -cooling	
36-76 VDC (48 VDC Nominal)	1.5 A (2.5 A max)	32 - 35 VDC	12 V	0.25 A	5.00 A	5.00 A	DCM6048S12
	2.2 A (3.5 A max)		12 V	0.40 A	7.50 A	8.30 A	DCM10048S12

Notes

1. Can be configured as -48 VDC input.
2. Input reverse voltage protection is continuous with automatic recovery.
3. Input transients compliant with ETSI EN300 132:2003.
4. For a fitted cover version, add suffix '-C' to model number (power derates by 20% with cover fitted)
5. For full product details contact sales, or visit www.xppower.com
6. 5% minimum load required to meet all specification parameters

Mechanical Details**DCM60****Input Connector J1**

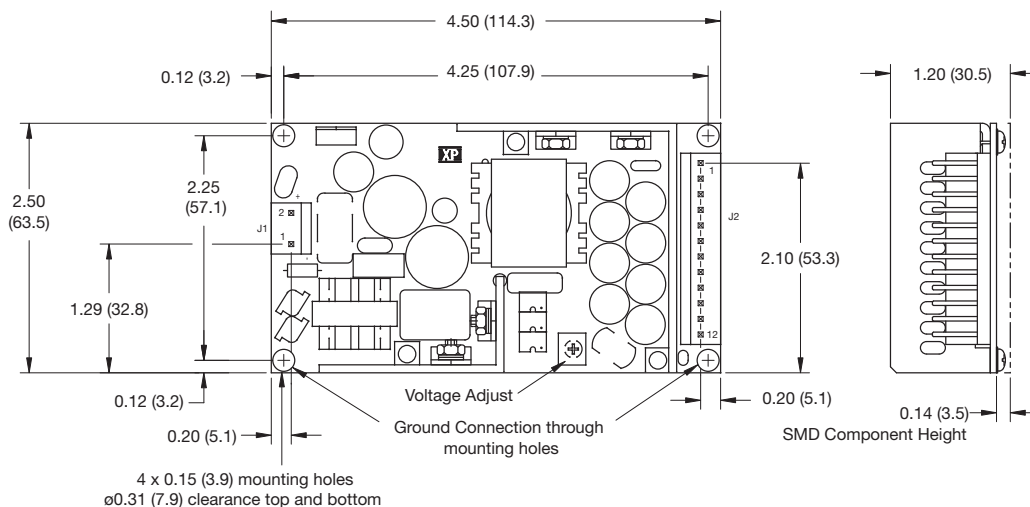
Pin	Signal
Pin 1	-Vin
Pin 2	+Vin

J1 mates with
Molex housing 43061-0003 &
Molex series 5194 crimp terminals

Output Connector J2

Pin	Signal
1	12V
2	12V
3	RTN
4	RTN
5	NC
6	NC

J2 mates with
Molex housing 43061-0006 &
Molex series 5194 crimp terminals

DCM100**Input Connector J1**

Pin	Signal
Pin 1	-Vin
Pin 2	+Vin

J1 mates with
Molex housing 43061-0003 &
Molex series 5194 crimp terminals

Output Connector J2

Pin	Signal
1	12V
2	12V
3	12V
4	12V
5	RTN
6	RTN
7	RTN
8	RTN
9	NC
10	NC
11	NC
12	NC

J2 mates with
Molex housing 43061-0012 &
Molex series 5194 crimp terminals

Notes

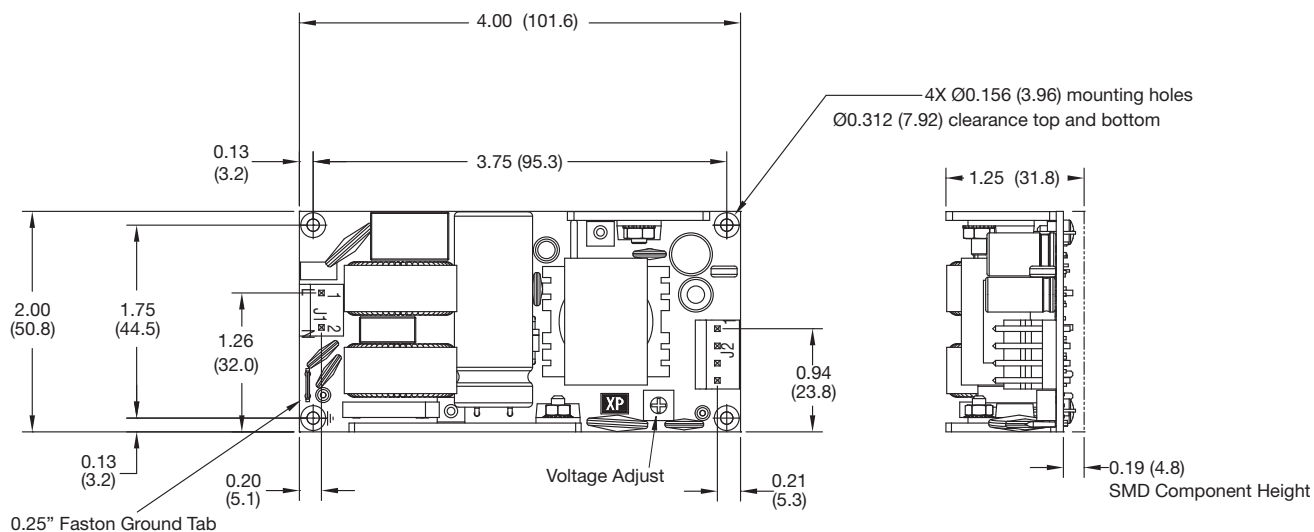
1. All dimensions in inches (mm). Tolerance .xx = ±0.02 (0.50); .xxx = ±0.01 (0.25)
2. Weight: DCM60: 0.3 lbs (136 g) approx. DCM100: 0.4 lbs (181 g) approx.
3. Cover kits available separately, order part number no. ECM40/60 COVER (4.49 x 2.52 x 1.52 (114 x 64 x 38.5)) for DCM60 or part no. ECM100 COVER (4.96 x 3.05 x 1.52 (126 x 77.5 x 38.5)) for DCM100. Output power derates by 20% with cover fitted.

Input Voltage Range	Input Frequency	Input Current		Earth ⁽¹⁾ Leakage Current	Output Power	Output Voltage	Output Current	Model Number
		115 VAC	230 VAC					
90-264 VAC (120-370 VDC)	47-63 Hz	1.8 A max	1.1 A max	<1 mA	100 W	+56 V	1.8 A	POE100US56

Notes

1. Earth leakage current rated at 264 VAC/60 Hz.
 2. Input is protected with internal T3.15 A, 250 V, fuse in line

3. Output to Ground Isolation 1500 VAC POE version.
 4. For full product details contact sales, or visit www.xppower.com

Mechanical Details

Input Connector J1	
Pin 1	Line
Pin 2	Neutral
0.25" Faston	Earth

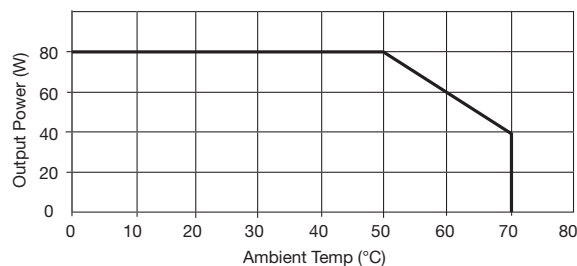
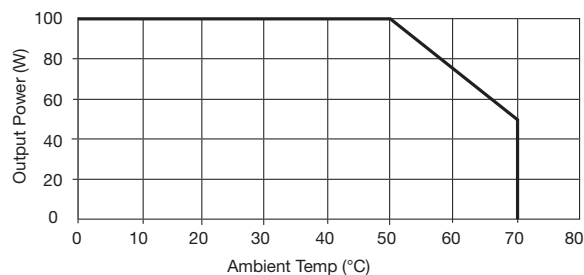
J1 mates with
 Molex housing 09-50-1031 &
 Molex series 5194 crimp terminals

Output Connector J2	
Pin 1	56V
Pin 2	56V
Pin 3	RTN
Pin 4	RTN

J2 mates with
 Molex housing 09-50-1041 &
 Molex series 5194 crimp terminals

Notes

1. All dimensions in inches (mm). Tolerance .xx = ± 0.02 (0.50); .xxx = ± 0.01 (0.25) 2. Weight 0.35 lb (158 g) approx.

Derating Curves**Convection-cooled****Fan-cooled with 10 CFM**

50-100 Watts VCS Series



GREEN-POWER



- Chassis Mount Industrial Supplies
- -25 °C to +70 °C Convection Cooled
- Class B Conducted & Radiated Emissions
- Output Voltages from 5 V to 48 V
- <0.5 W No Load Input Power
- Low Cost
- 2 Year Warranty

Specification

Input

Input Voltage	• 85-264 VAC (127-370 VDC), see derating curve
Input Frequency	• 47-63 Hz
Input Current	• VCS50: 1.1 A, VCS70: 1.4 A, VCS100: 2.0 A typical at 90 VAC
Inrush Current	• 60 A max at 230 VAC, cold start at 25 °C
Power Factor	• EN61000-3-2 Class A
Earth Leakage Current	• 1.0 mA maximum
Input Protection	• 50 & 70 W: T3.15 A/250 V 100 W: T4.0A/250 V, fuse fitted in live line
No Load Input Power	• <0.5 W

Output

Output Voltage	• See model table
Output Adjust	• $\pm 10.0\%$ (5 V & 12 V versions are -5% to +10%)
Initial Set Tolerance	• $\pm 1.0\%$
Minimum Load	• None required
Start Up Delay	• 1 s maximum
Hold Up Time	• 10 ms min at 115 VAC and full load
Line Regulation	• $\pm 0.5\%$, 90 VAC to 264 VAC input
Load Regulation	• 5 V & 12 V versions: $\pm 1\%$, Others: $\pm 0.5\%$ 0% to 100% load
Transient Response	• Less than 4% deviation with a 50% to 75% load change at 1 A/ μ s. Output returns to within 1% in less than 500 μ s
Ripple & Noise	• 1% maximum pk-pk, 20 MHz bandwidth
Overvoltage Protection	• 120-140% of nominal output, recycle input AC to reset
Overload Protection	• 110-150% of nominal, trip and restart
Short Circuit Protection	• Continuous trip and restart
Temperature Coefficient	• $\pm 0.03\%/^{\circ}\text{C}$ after 20 min warm up

General

Efficiency	• See tables
Isolation	• 3000 VAC Input to Output 1500 VAC Input to Ground 500 VAC Output to Ground
Switching Frequency	• 65 kHz typical
MTBF	• >500 kHrs to MIL-STD-217F at 25 °C, GB

Environmental

Operating Temperature	• -25 °C to +70 °C, see derating curve
Cooling	• Convection cooled
Operating Humidity	• 0-95% R.H., non-condensing
Storage Temperature	• -40 °C to +80 °C
Operating Altitude	• 3000 m
Shock	• $\pm 3 \times 30$ g shocks in each plane, 30 g: 11 ms (± 0.5 ms), half sine, compliant to EN60068-2-27 & EN60068-2-47
Vibration	• 10-500 Hz at 2 g sweep and endurance at resonance in all 3 planes. Conforms to EN60068-2-6

EMC & Safety

Emissions	• EN55022 Class B conducted & radiated
Harmonic Currents	• EN61000-3-2 class A
Voltage Flicker	• EN61000-3-3
ESD Immunity	• EN61000-4-2, level 3 Perf Criteria A
Radiated Immunity	• EN61000-4-3, level 3 Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3 Perf Criteria A
Surge	• EN61000-4-5, installation Class 3, Perf Criteria A
Conducted Immunity	• EN61000-4-6, level 3 Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms, Perf Criteria A, B, B
Safety Approvals	• IEC60950-1, CSA C22.2 No.60950-1-03, UL60950-1, TUV EN60950-1

Model and Ratings

VCS50 XP

Output Power	Output Voltage	Output Current	Ripple & Noise ⁽²⁾	Efficiency ⁽¹⁾	Model Number
40 W	5.0 V	8.00 A	50 mV	79%	VCS50US05†^
50 W	12.0 V	4.20 A	120 mV	85%	VCS50US12†^
	15.0 V	3.30 A	150 mV	86%	VCS50US15†^
	24.0 V	2.10 A	240 mV	88%	VCS50US24†^
	48.0 V	1.05 A	480 mV	88%	VCS50US48†^

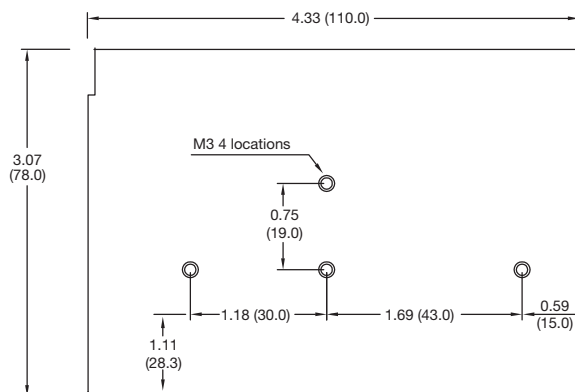
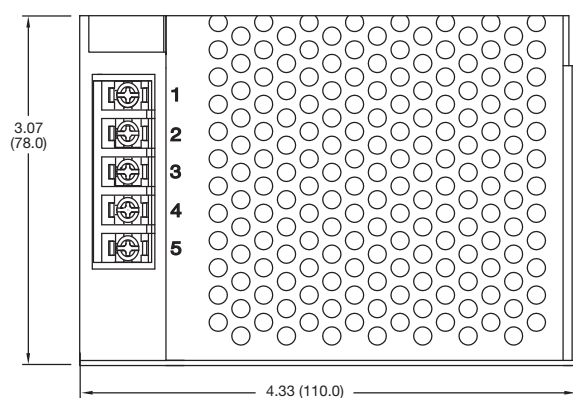
Notes

1. Minimum average of efficiencies measured at 25%, 50%, 75% & 100% load.
2. Ripple & Noise may exceed specified values below -10 °C.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296.

Mechanical Details

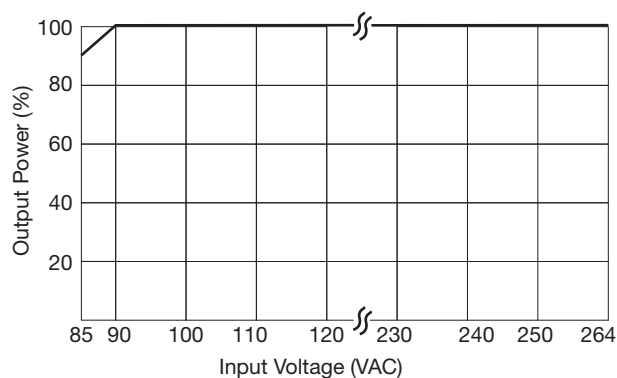
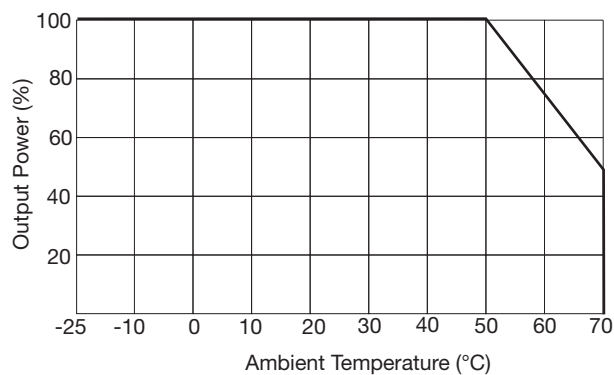


Pin	Function
1	AC Live
2	AC Neutral
3	Ground
4	-Vout
5	+Vout

Notes

1. All dimensions in inches (mm)
2. Weight: 0.55 lbs (250 g) approx
3. Tolerance ± 0.02 (± 0.5)
4. Maximum mounting screw penetration 0.157 (4.0) from outer surface

Derating Curves



Model and Ratings

VCS70 **XP**

Output Power	Output Voltage	Output Current	Ripple & Noise ⁽²⁾	Efficiency ⁽¹⁾	Model Number
50 W	5.0 V	10.0 A	50 mV	80%	VCS70US05†^
70 W	12.0 V	5.83 A	120 mV	87%	VCS70US12†^
	15.0 V	4.67 A	150 mV	87%	VCS70US15†^
	24.0 V	2.92 A	240 mV	87%	VCS70US24†^
	48.0 V	1.46 A	480 mV	87%	VCS70US48†^

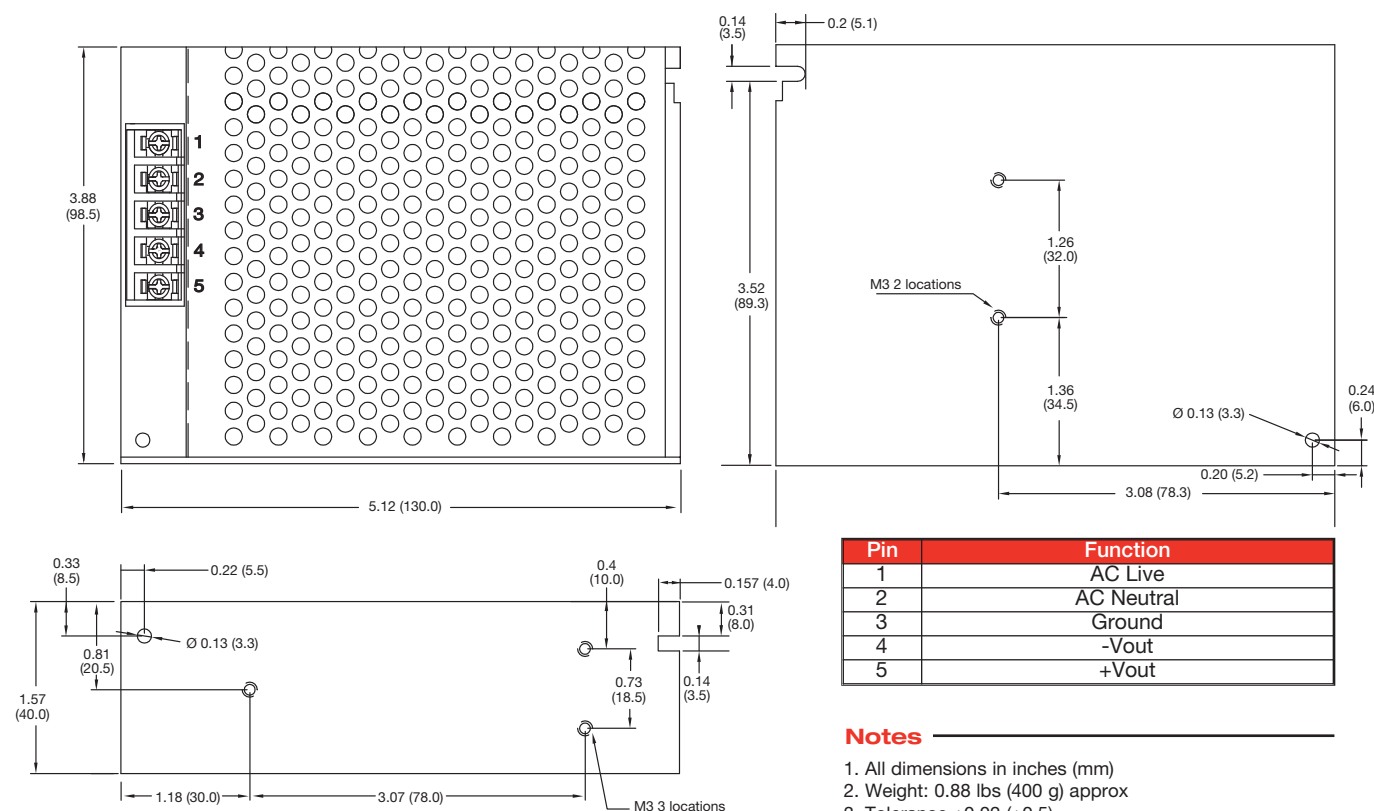
Notes

1. Minimum average of efficiencies measured at 25%, 50%, 75% & 100% load.
2. Ripple & Noise may exceed specified values below -10 °C.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296.

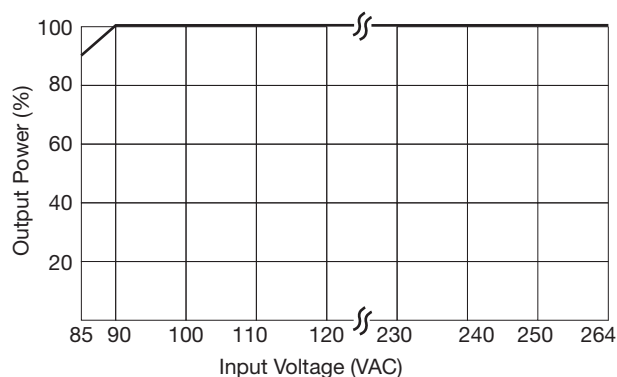
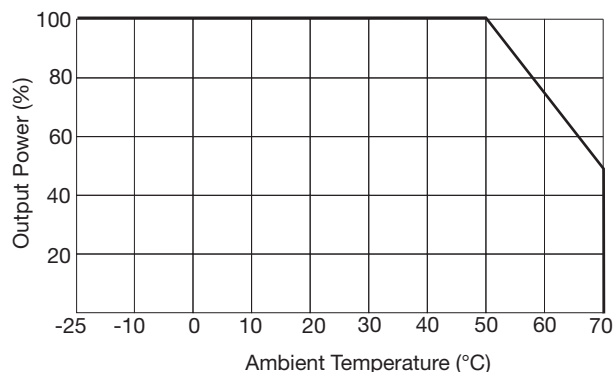
Mechanical Details



Notes

1. All dimensions in inches (mm)
2. Weight: 0.88 lbs (400 g) approx
3. Tolerance ± 0.02 (± 0.5)
4. Maximum mounting screw penetration 0.157 (4.0) from outer surface

Derating Curves



Model and Ratings

VCS100 **XP**

Output Power	Output Voltage	Output Current	Ripple & Noise ⁽²⁾	Efficiency ⁽¹⁾	Model Number
70 W	5.0 V	14.0 A	50 mV	78%	VCS100US05†^
100 W	12.0 V	8.33 A	120 mV	85%	VCS100US12†^
	15.0 V	6.67 A	150 mV	86%	VCS100US15†^
	24.0 V	4.17 A	240 mV	87%	VCS100US24†^
	48.0 V	2.08 A	480 mV	88%	VCS100US48†^

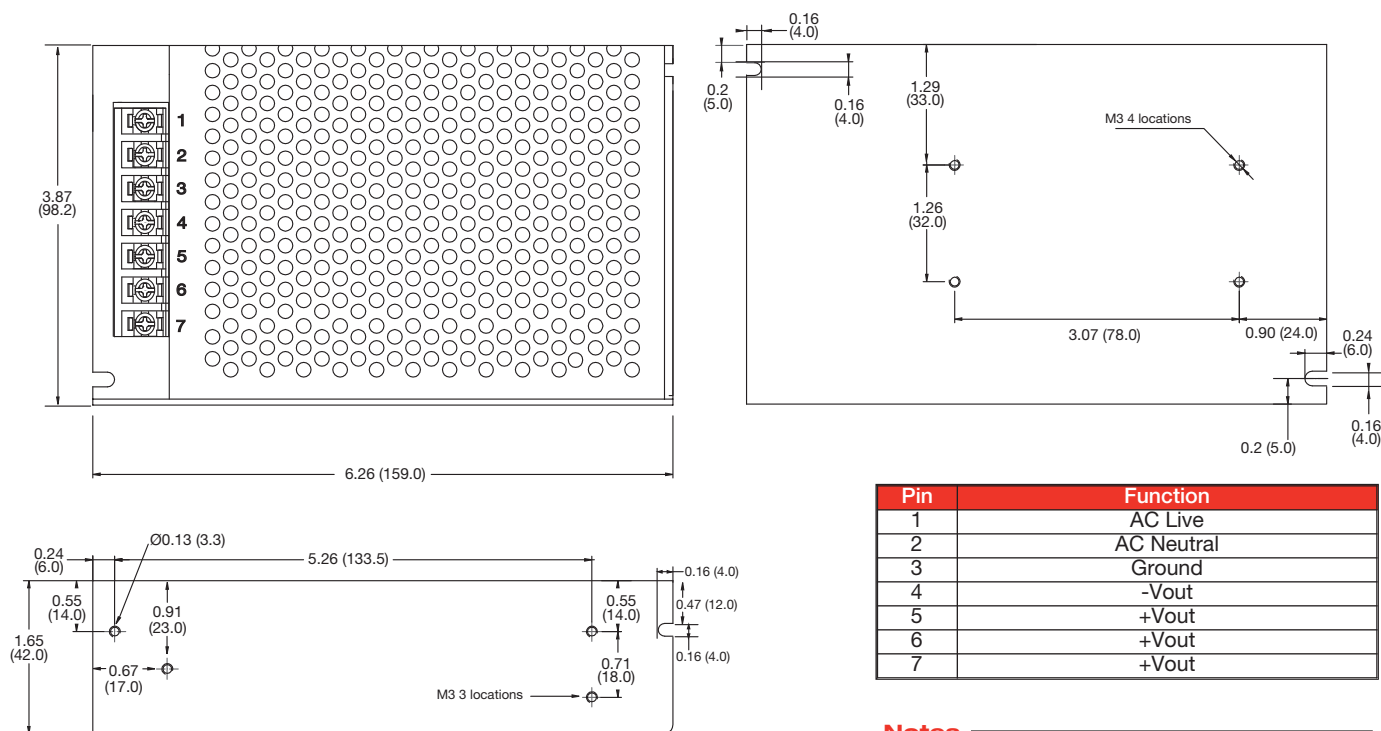
Notes

1. Minimum average of efficiencies measured at 25%, 50%, 75% & 100% load.
 2. Ripple & Noise may exceed specified values below -10 °C.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296.

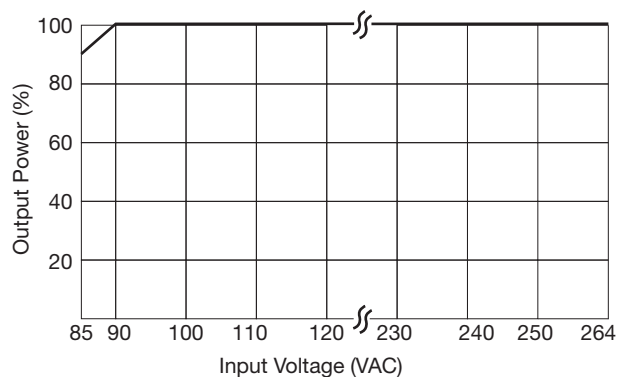
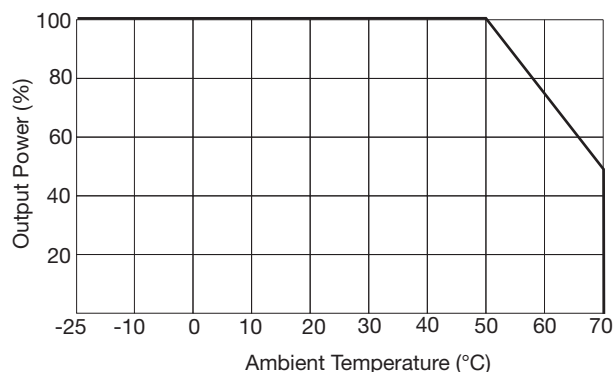
Mechanical Details



Notes

1. All dimensions in inches (mm)
 2. Weight: 1.1 lbs (500 g) approx
 3. Tolerance ± 0.02 (± 0.5)
 4. Maximum mounting screw penetration 0.157 (4.0) from outer surface

Derating Curves





GREEN-POWER



Specification

Input

Input Voltage	• 80-264 VAC (275 VAC ECS65) (120-370 VDC), derate output power <90 VAC, see derating curves
Input Frequency	• 47-400 Hz ⁽¹⁾
Input Current	• 65 W: 1.0/0.6 A typical at 115/230 VAC 100 W: 1.5/0.9 A typical at 115/230 VAC, full load
Inrush Current	• 40 A max at 230 VAC, cold start at 25 °C
Power Factor	• EN61000-3-2, class A
No Load Input Power	• <0.5 W
Earth Leakage Current	• 65 W: 260 µA at 264 VAC/60 Hz max 100 W: 230 µA at 264 VAC/60 Hz max
Input Protection	• Internal T3.15/T5 A/250 V fuse in line and neutral

Output

Output Voltage	• 12-48 VDC (see tables)
Output Voltage Trim	• ±10%
Initial Set Accuracy	• ±1%
Minimum Load	• No minimum load required
Start Up Delay	• 1 s typical
Start Up Rise Time	• 50 ms
Hold Up Time	• 16 ms min at 115 VAC
Drift	• ±0.2% after 20 min warm up
Line Regulation	• ±0.5% max
Load Regulation	• ±1%
Over/Undershoot	• 5% typical
Transient Response	• 4% max. deviation, recovery to within 1% in 500 µs for a 50-75-50% load change
Ripple & Noise	• 1% pk-pk, 20 MHz bandwidth
Overvoltage Protection	• 115-140% Vnom, recycle input to reset
Overload Protection	• 110-160%
Short Circuit Protection	• Continuous trip and restart (hiccup mode)
Temperature Coefficient	• 0.05%/°C

Notes

1. Safety approvals cover frequency 47-63 Hz.

- IT & Medical Safety Approvals
- 65/80 W – Convection-cooled Ratings
- Class I (& Class II Construction – ECS100)
- Industry Standard 2" x 4" Package
- <0.5 W No Load Input Power
- Low Leakage Current
- 3 Year Warranty

General

Efficiency	• Up to 90% model dependent
Isolation	• 4000 VAC Input to Output, 1500 VAC Input to Ground, 500 VDC Output to Ground
Switching Frequency	• 65 KHz typical
Power Density	• 65 W: 7.7 W/in ³ , 100 W: 10 W/in ³
MTBF	• 65 W: 850 kHrs, 100 W: 834 kHrs, to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Temperature	• -20 °C to +70 °C derate linearly from +50 °C at 2.5%/°C to 50% load at +70 °C.
Cooling	• Convection & fan cooled ratings (see tables)
Operating Humidity	• 95% RH, non-condensing
Storage Temperature	• -40 °C to +85 °C
Operating Altitude	• 3000 m
Shock	• 30 g pk, half sine, 6 axes
Vibration	• 2 g rms, 5 Hz to 500 Hz, 3 axes

EMC & Safety

Low Voltage PSU EMC Emissions	• EN61204-3, high severity level • EN55011/22 level B conducted EN55011/22 level A radiated
Harmonic Currents	• EN61000-3-2, class A
Voltage Flicker	• EN61000-3-3
Radiated Immunity	• EN61000-4-3, level 3 Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3 Perf Criteria A
Surge	• EN61000-4-5, installation class 3 Perf Criteria A
Conducted Immunity	• EN61000-4-6, level 3 Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms, Perf Criteria A, B, B, EN60601-1-2, 30% 500 ms, 60% 100 ms, 100% 10 ms, 100% 5000 ms, Perf Criteria A, A, A, B - 230 VAC. Consult longform datasheet for 115 V operation.
Safety Approvals	• IEC60950-1 CB report, CSA 22.2 No. 60950-1, UL60950-1, TUV EN60950-1 IEC60601-1 CB report, CSA 22.2 No. 60601-1, UL60601-1, TUV 60601-1
Equipment Protection Class	• Class I (and Class II - ECS100 models)

Models and Ratings

ECS100 **XP**

Output Power		Output Voltage	Output Current	Model Number ⁽¹⁾
Forced Cooled (10 CFM)	Convection-cooled			
100 W	80 W	12.0 VDC	8.3 A	ECS100US12†^
100 W	80 W	15.0 VDC	6.7 A	ECS100US15†^
100 W	80 W	18.0 VDC	5.5 A	ECS100US18
100 W	80 W	24.0 VDC	4.2 A	ECS100US24†^
100 W	80 W	28.0 VDC	3.6 A	ECS100US28†^
100 W	80 W	48.0 VDC	2.1 A	ECS100US48†^

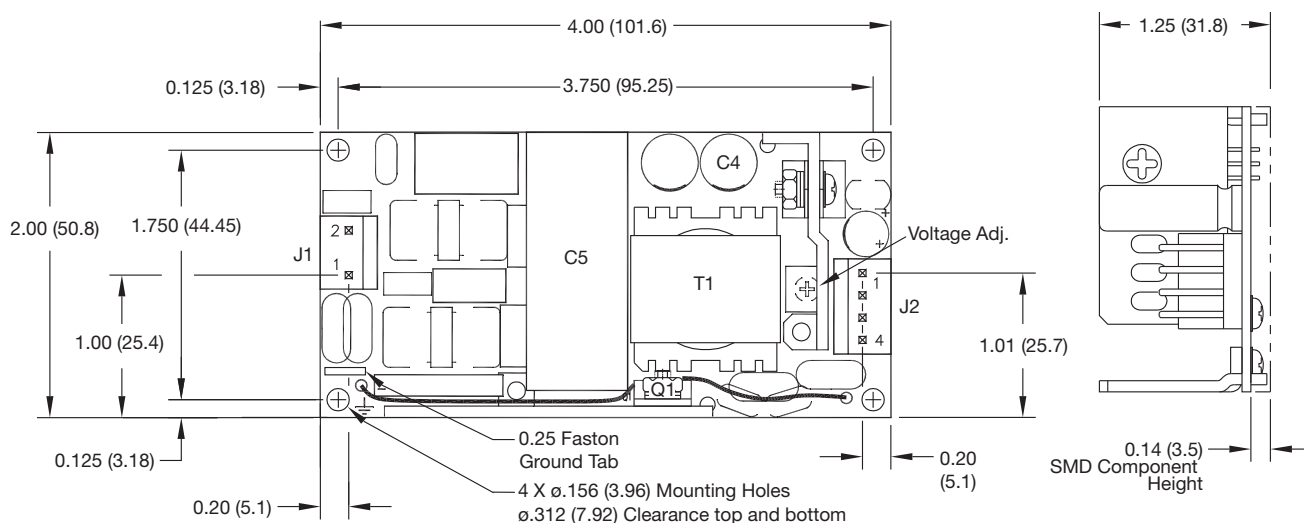
Notes

1. For covered versions, add suffix '-C' to model number or order part no. ECM40/60 COVER KIT for standalone cover. Not suitable for use in class II installations, derate output power by 20% with cover.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296.

Mechanical Details



Input Connector J1 Molex PN 09-65-2038	
Pin 1	Line
Pin 2	Neutral
0.25" Faston	Earth

Output Connector J2 Molex PN 09-65-2048	
Pin 1	+V1
Pin 2	+V1
Pin 3	RTN
Pin 4	RTN

J1 mates with Molex Housing PN 09-50-1031, J2 mates with Molex Housing PN 09-50-1041 and both with Molex Series 5194 Crimp Terminals

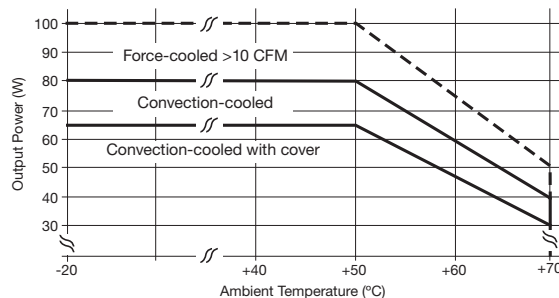
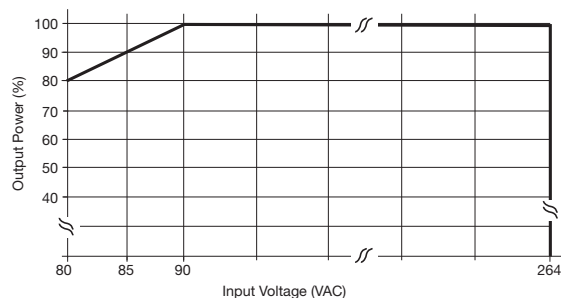
Notes

1. All dimensions in inches (mm).

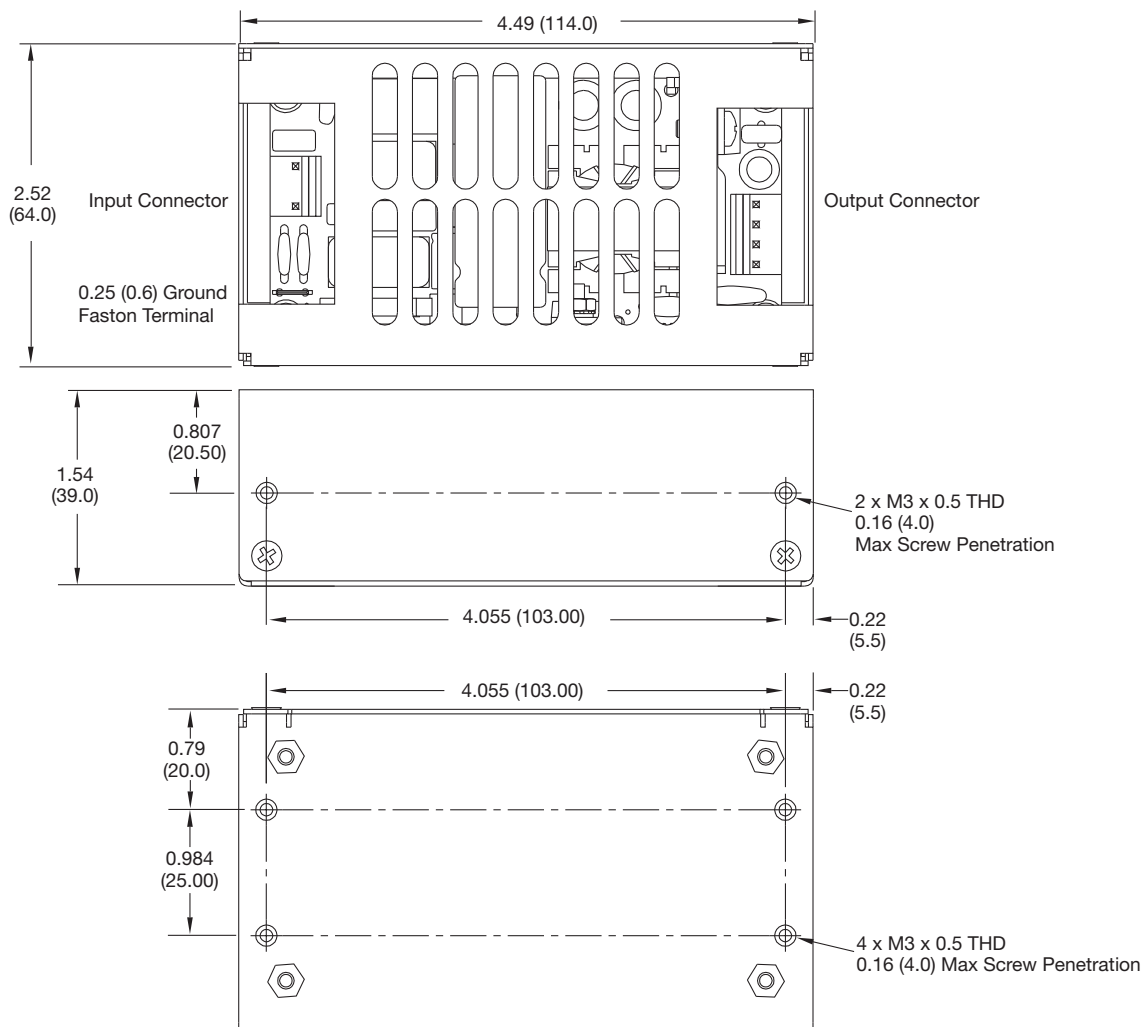
Tolerance .xx = ± 0.02 (0.50); .xxx = ± 0.01 (0.25)

2. Weight: 0.386 lbs (175 g)

Derating Curve - ECS100 Models



Covered Version



Notes

1. All dimensions in inches (mm).

2. Weight: 0.8 lbs (360 g)

Tolerance .xx = ± 0.02 (0.50); .xxx = ± 0.01 (0.25)

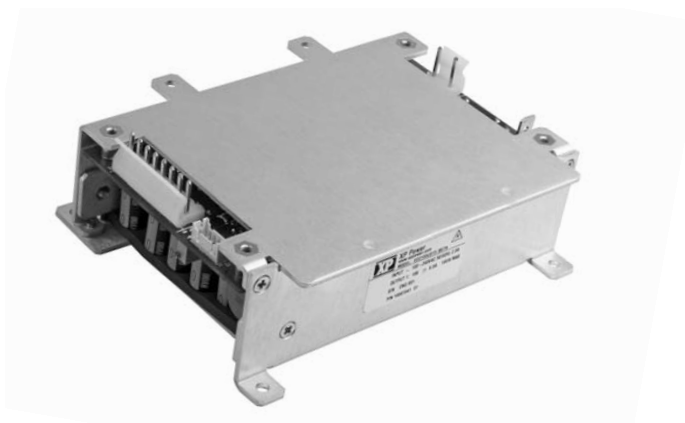
Thermal Considerations - All ECS65 & 100 Models

In order to ensure safe and reliable operation of the PSU in the most adverse conditions permitted in the end-use equipment, the temperature of the components listed in the table below must not be exceeded. See mechanical drawing for component locations. Temperature should be monitored using K type thermocouples placed on the hottest part of the component (out of any direct air flow).

Temperature Measurements (Ambient ≤ 50 °C)	
Component	Max Temperature °C
T1	110 °C
C5	100 °C
C4	100 °C
Q1	110 °C

100 Watts

ECC Series



- -40 °C to +75 °C Operation
- 100 W – Baseplate Cooled
- High Efficiency Resonant Topology
- Remote Sense
- 5V Standby Output
- Remote On/Off & Power OK Signal
- 3 Year Warranty

Specification

Input

Input Voltage	• 85-264 VAC (120-370 VDC), derate output power <90 VAC by 10%
Input Frequency	• 47-400 Hz ⁽¹⁾
Input Current	• 1.5 A typical at 115 VAC, full load 0.9 A typical at 230 VAC, full load
Inrush Current	• 40 A max at 230 VAC, 25 °C cold start
Power Factor	• EN61000-3-2, class A
Earth Leakage Current	• 300 µA at 264 VAC/60 Hz max 110/190 µA 115/230 VAC at 50 Hz and 0.5/1.1 mA 115/230 VAC at 400 Hz typ.
Input Protection	• Internal T5.0 A/250 V fuse in line and neutral

Output

Output Voltage	• 12-48 VDC (see tables)
Output Voltage Trim	• ±5%
Initial Set Accuracy	• ±1% V1, ±3% V2
Minimum Load	• No minimum load required
Start Up Delay	• Typically 1 s ⁽²⁾
Start Up Rise Time	• 50 ms typical
Hold Up Time	• 16 ms min at 115 VAC
Drift	• ±0.2% after 20 min warm up
Line Regulation	• ±0.5% max
Load Regulation	• ±1% V1, ±5% V2 max
Over/Undershoot	• 5% typical
Transient Response	• 4% max. deviation, recovery to within 1% in 500 µs for a 50-75-50% load change
Ripple & Noise	• 1% pk-pk V1, V2 2%, 20 MHz bandwidth
Overvoltage Protection	• 115-140% Vnom, recycle input to reset
Overload Protection	• 110-150% V1 only (see longform datasheet for further details)
Short Circuit Protection	• Continuous trip and restart (hiccup mode)
Temperature Coefficient	• 0.05%/°C
Remote Sense	• Compensates for 0.5 V total voltage drop
Remote On/Off	• Uncommitted isolated optocoupler diode, powered diode inhibits V1

General

Efficiency	• 88% typical
Isolation	• 4000 VAC Input to Output, 1500 VAC Input to Ground, 500 VDC Output to Ground
Switching Frequency	• 70 kHz typical
Signals	• Power OK - open collector, Remote On/Off, 5 V Standby (see longform datasheet for further details)
Power Density	• 3.91 W/in ³
MTBF	• 236 kHrs to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Temperature	• -40 °C to +75 °C ambient. Baseplate must be maintained ≤+85 °C, see longform datasheet for further details
Warm Up Time	• Typically 20 minutes
Cooling	• Baseplate, conduction cooling
Operating Humidity	• 95% RH, non-condensing
Storage Temperature	• -40 °C to +85 °C
Operating Altitude	• 3000 m
Shock	• 30 g pk, half sine, 6 axes
Vibration	• 2 g rms, 5 Hz to 500 kHz, 3 axes

EMC & Safety

Low Voltage PSU EMC Emissions	• EN61204-3, high severity level as below • EN55022 level B conducted EN55022 level A radiated
Harmonic Currents	• EN61000-3-2, class A
Voltage Flicker	• EN61000-3-3
Radiated Immunity	• EN61000-4-3, level 3 Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3 Perf Criteria A
Surge	• EN61000-4-5, installation class 3 Perf Criteria A, installation class 4 Perf Criteria A with optional filter board (-F), see longform datasheet for further details
Conducted Immunity	• EN61000-4-6, level 3 Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms, Perf Criteria A, B, B
Safety Approvals	• IEC60950-1 CB report, CSA 22.2 No. 60950-1, UL60950-1, TUV EN60950-1
Equipment Protection Class	• Class I

Notes

1. Safety approvals cover frequency 47-63 Hz.
2. At low temperature and low line voltage, start up time will increase.

Models and Ratings

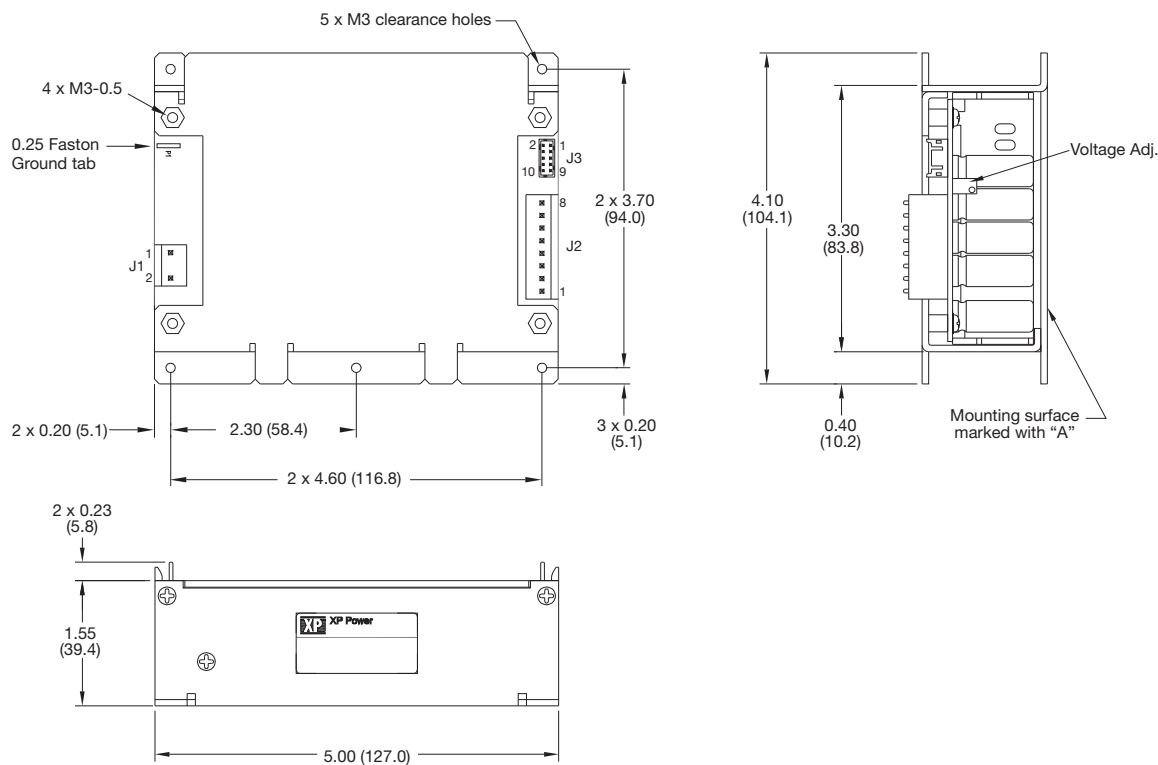
ECC100 XP

Output Power	Output Voltage V1	Output Current V1	Standby Supply V2	Model Number ⁽¹⁾
100 W	12.0 VDC	8.1 A	5.0 V/0.5 A	ECC100US12
100 W	15.0 VDC	6.5 A	5.0 V/0.5 A	ECC100US15
100 W	24.0 VDC	4.1 A	5.0 V/0.5 A	ECC100US24
100 W	28.0 VDC	3.5 A	5.0 V/0.5 A	ECC100US28
100 W	48.0 VDC	2.0 A	5.0 V/0.5 A	ECC100US48

Notes

1. For optional surge filter add suffix '-F' to model number, e.g. ECC100US12-F. See longform datasheet for further details and mechanical drawings.

Mechanical Details



Output Connector J2 Molex PN 09-65-2088	
Pin	Single Output
1	+V1
2	+V1
3	+V1
4	+V1
5	RTN
6	RTN
7	RTN
8	RTN

J2 mates with Molex housing PN 09-50-1081 and both with Molex series 5194 crimp terminals.

Input Connector J1 Molex PN 09-65-2038	
1	Line
2	Neutral

J1 mates with Molex housing PN 09-50-1031.

Signal Connector J3 Molex PN B10B-PHDSS	
1	+5 V Standby
2	Logic GND
3	Logic GND
4	Power OK
5	Inhibit Hi
6	Inhibit Lo
7	+Sense
8	-Sense
9	+Vout
10	-Vout

J3 mates with JST housing PN PHDR-10VS and with JST SPHD-001T-P0.5 crimp terminals.

Notes

1. All dimensions in inches (mm).

2. Tolerance .xx = ± 0.02 (0.50); .xxx = ± 0.01 (0.25)

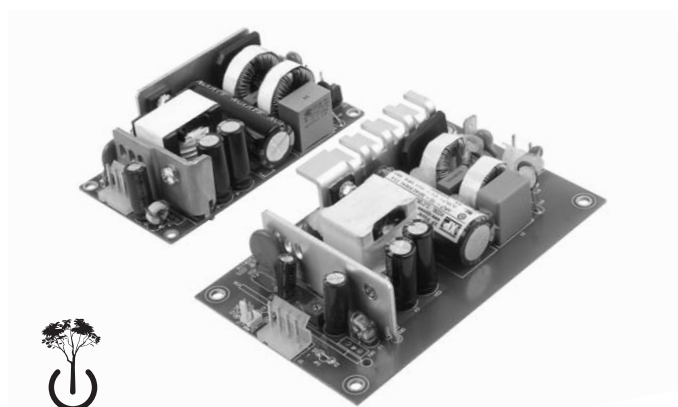
3. Weight 1.2 lbs (550 g)

Thermal Considerations

The baseplate must be maintained below +85 °C and therefore a suitable heatsink must be selected to remove the heat from the power supply. Details of heatsink calculations and other considerations can be found in the longform datasheet.

125 Watts

CLC Series



GREEN•POWER

- 125 W Forced-cooled Rating
- Low Profile 1.25"
- Industry Standard 2" x 4" & 3" x 5" Package Sizes
- 12 V Fan Supply
- Optional ORing Diode
- <0.5 W No Load Input Power
- 3 Year Warranty

Specification

Input

Input Voltage	• 85-264 VAC (120-370 VDC), Derate output power linearly to 90% from 90 VAC to 85 VAC
Input Frequency	• 47-63 Hz
Input Current	• 2.3 A typical at 115 VAC, full load 1.1 A typical at 230 VAC, full load
Inrush Current	• 40 A max at 230 VAC, cold start 25 °C
Power Factor	• EN61000-3-2, class A
No Load Input Power	• <0.5 W
Earth Leakage Current	• 80/160 µA typical 115/230 VAC 50 Hz 300 µA at 264 VAC/60 Hz max.
Input Protection	• Internal T5 A/250 V fuse in line

Output

Output Voltage	• 12-48 VDC (see tables)
Output Voltage Trim	• ±10%
Initial Set Accuracy	• ±1%
Minimum Load	• No minimum load required
Start Up Delay	• 1 s typical
Start Up Rise Time	• 50 ms
Hold Up Time	• 16 ms min at 230 VAC
Drift	• ±0.2% after 20 min warm up
Line Regulation	• ±0.5% max
Load Regulation	• ±1%
Over/Undershoot	• 5% typical
Transient Response	• 4% max. deviation, recovery to within 1% in 500 µs for a 50-75-50% load change
Ripple & Noise	• 1% pk-pk V1, 20 MHz bandwidth
Overvoltage Protection	• 115-140% Vnom, recycle input to reset
Overload Protection	• 110-150%
Short Circuit Protection	• Continuous trip and restart (hiccup mode)
Temperature Coefficient	• 0.05%/°C

General

Efficiency	• 88% typical
Isolation	• 3000 VAC Input to Output, 1500 VAC Input to Ground, 500 VDC Output to Ground
Switching Frequency	• 65 KHz typical
MTBF	• 1,245 KHrs to Telecordia SR-332 at 25 °C, GB

Environmental

Operating Temperature	• 0 °C to +70 °C derate linearly from +50 °C at 2.5%/°C to 50% load at +70 °C.
Cooling	• Forced cooled, 10 CFM
Operating Humidity	• 95% RH, non-condensing
Storage Temperature	• -40 °C to +85 °C
Operating Altitude	• 3000 m
Shock	• 30 g pk, half sine, 6 axes
Vibration	• 2 g rms, 5 Hz to 500 kHz, 3 axes

EMC & Safety

Low Voltage PSU EMC Emissions	• EN61204-3, high severity level as below • EN55022 level B conducted EN55022 level A radiated
Harmonic Currents	• EN61000-3-2, class A
Voltage Flicker	• EN61000-3-3
Radiated Immunity	• EN61000-4-3, level 3 Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3 Perf Criteria A
Surge	• EN61000-4-5, installation class 3 Perf Criteria A
Conducted Immunity	• EN61000-4-6, level 3 Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms, Perf Criteria A, B, B
Safety Approvals	• IEC60950-1 CB report, CSA 22.2 No. 60950-1, UL60950-1, TUV EN60950-1
Equipment Protection Class	• Class I

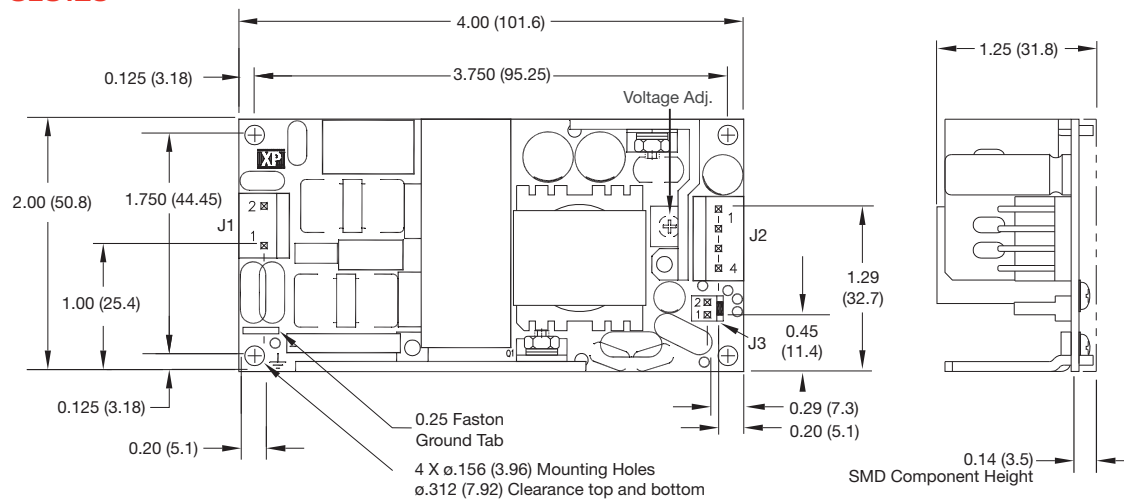
Output Power		Output Voltage V1	Output Current	Fan Supply V2	Model Number
10 CFM	Convection				
125 W	55 W	12.0 VDC	10.4 A	12 V / 0.5 A	CLC125US12†^
125 W	55 W	24.0 VDC	5.2 A	12 V / 0.5 A	CLC125US24†^
125 W	55 W	48.0 VDC	2.6 A	12 V / 0.5 A	CLC125US48†^
125 W	55 W	12.0 VDC	10.4 A	12 V / 0.5 A	CLC125US12D-3x5 ⁽¹⁾
125 W	55 W	24.0 VDC	5.2 A	12 V / 0.5 A	CLC125US24D-3x5 ⁽¹⁾
125 W	55 W	48.0 VDC	2.6 A	12 V / 0.5 A	CLC125US48D-3x5 ⁽¹⁾
125 W	55 W	12.0 VDC	10.4 A	12 V / 0.5 A	CLC125US12D-3x5 ⁽¹⁾
125 W	55 W	24.0 VDC	5.2 A	12 V / 0.5 A	CLC125US24D-3x5 ⁽¹⁾
125 W	55 W	48.0 VDC	2.6 A	12 V / 0.5 A	CLC125US48D-3x5 ⁽¹⁾

Notes

1. The 3 x 5 models share the same specification as the other models except the PCB size is increased to 3" x 5" from 2" x 4". The 'D' models have an integral output ORing diode.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296.

Mechanical Details**CLC125****Input Connector J1**
Molex PN 09-65-2038

Pin 1	Line
Pin 2	Neutral

J1 mates with Molex housing p/n 09-50-1031, and Molex series 5194 crimp terminals

Output Connector J2
Molex PN 09-65-2048

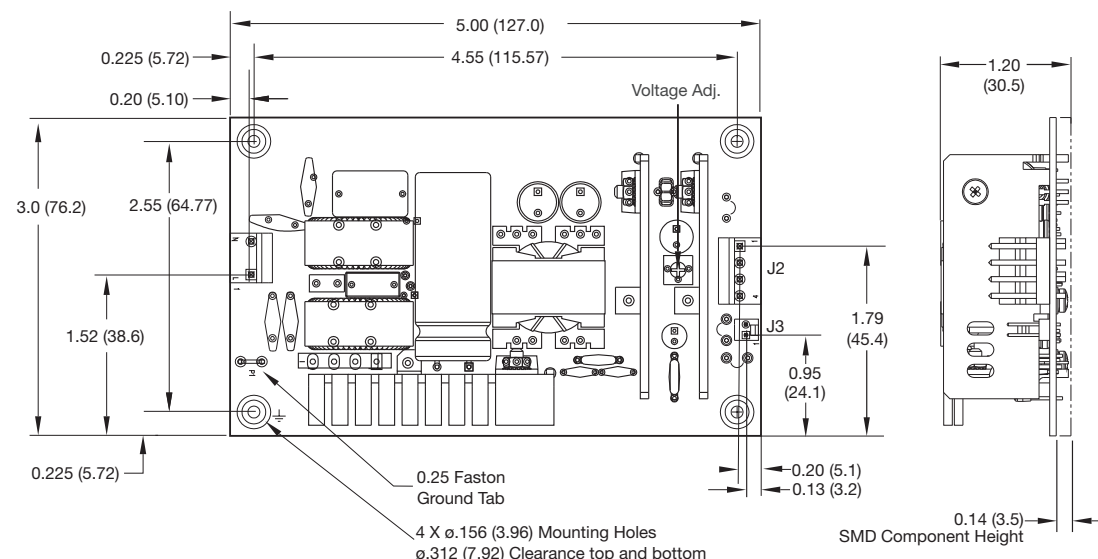
Pin 1	+V1
Pin 2	+V1
Pin 3	RTN
Pin 2	RTN

J2 mates with Molex housing p/n 09-50-1041 and Molex series 5194 crimp terminals

Fan Supply Connector J3
Molex PN 22-04-1021

Pin 1	Fan+
Pin 2	Fan-

J3 mates with Molex housing p/n 22-01-1024 and Molex series 5103 crimp terminals

CLC125 3x5 & CLC125 D 3x5**Input Connector J1**
Molex PN 09-65-2038

Pin 1	Line
Pin 2	Neutral

J1 mates with Molex housing p/n 09-50-1031, and Molex series 5194 crimp terminals

Output Connector J2
Molex PN 09-65-2048

Pin 1	+V1
Pin 2	+V1
Pin 3	RTN
Pin 2	RTN

J2 mates with Molex housing p/n 09-50-1041 and Molex series 5194 crimp terminals

Fan Supply Connector J3
Molex PN 22-04-1021

Pin 1	Fan+
Pin 2	Fan-

J3 mates with Molex housing p/n 22-01-1024 and Molex series 5103 crimp terminals

Notes

1. All dimensions in inches (mm).

2. Weight 0.386 lbs (175 g)

3. Tolerance .xx = ±0.02 (0.50); .xxx = ±0.01 (0.25)

130 Watts

JPS Series



- High Efficiency – up to 90%
- Medical Approval (JPS130-M Versions)
- 3" x 5" Footprint
- 100 W Convection-cooled
- 130 W Forced-cooled
- Single & Multi Outputs
- 3 Year Warranty

Specification

Input

Input Voltage	• 90-264 VAC (130-370 VDC)
Input Frequency	• 47-63 Hz
Input Current	• 2.0/1.0 A max at 115/230 VAC (JPS130) • 2.6/1.3 A max at 115/230 VAC (JPS130-M)
Inrush Current	• 30 A at 115 VAC, 60 A at 230 VAC, cold start at 25 °C
Power Factor	• 0.9 typical
Earth Leakage Current	• 1.5 mA max at 264 VAC/60 Hz (JPS130) • 260 µA max at 275 VAC/63 Hz (JPS130-M)
Input Protection	• JPS130 internal T3.15 A/250 VAC fused line, JPS130-M fused line & neutral

Output

Output Voltage	• See table
Output Voltage Trim	• ±10% on single output models, ±5% on multi output models, auxiliary outputs will track by the same percentage
Initial Set Accuracy	• At 60% rated load ±1% single outputs, ±3% on V1 for multi outputs
Minimum Load	• Single output: no minimum load required • Multi-outputs: (see note 1)
Start Up Rise Time	• <20 ms
Hold Up Time	• 16 ms typical at 115 VAC & rated load (JPS130) • 20 ms typical at 115 VAC & rated load (JPS130-M)
Drift	• <±0.2% after 20 mins warm up
Line Regulation	• ±0.5% Vmin to Vmax
Load Regulation	• ±1%, ±5% for auxiliary outputs, 20%-100% of rated load
Transient Response	• 4% max deviation, recovery to within 1% in 500 µs for a 25% load change
Ripple & Noise	• ±1% max pk-pk (see note 4)
Overvoltage Protection	• 110-140% Vnom on V1 only, recycle input to reset
Overload Protection	• 110-150%, auto recovery
Short Circuit Protection	• Trip & restart (hiccup mode), auto recovery
Temperature Coefficient	• 0.05%/°C
Remote Sense	• Single output models only, compensates for up to 0.5 V drop
Fan Output	• 12 V, 450 mA multi-output models only

General

Efficiency	• Up to 90% nominal line, full load
Isolation	• 3000 VAC Input to Output (JPS130), 4000 VAC Input to Output (JPS130-M), 1500 VAC Input to Ground, 500 VAC Output to Ground
Switching Frequency	• 120 kHz, ±10% for both active PFC & PWM
Power Density	• 6.7 W/In ³
MTBF	• 200 kHrs to MIL-HDBK-217F at 50 °C, GB

Environmental

Operating Temperature	• 0 °C to +70 °C, (see derating curves)
Cooling	• JPS130PS03 83 W convection-cooling, 100 W, with 18 CFM airflow. All others, 100 W with convection cooling, 130 W with 18 CFM airflow
Operating Humidity	• 5-95% RH, non-condensing
Storage Temperature	• -40 °C to +85 °C (JPS130) • -20 °C to +85 °C (JPS130-M)
Operating Altitude	• 3000 m

EMC & Safety

Emissions	• EN55022, Class B conducted • FCC 20780, level B conducted • EN60601-1-2, (JPS130-M)
Harmonic Currents	• EN61000-3-2 Class A
Voltage Flicker	• EN61000-3-3
ESD Immunity	• EN61000-4-2, level 3 contact, level 3 air, Perf Criteria A
Radiated Immunity	• EN61000-4-3, 10 V/m Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3 Perf Criteria A
Surge	• EN61000-4-5, Installation Class 3 Perf Criteria A
Conducted Immunity	• EN61000-4-6, level 2, Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 95% 5000 ms Perf Criteria A, B, B
Safety Approvals	• JPS130: EN60950-1, UL60950-1, CSA C22.2 No. 60950-1, CE Mark LVD. • JPS130-M: UL60601-1, EN60601-1, CSA C22.2 No. 601.1 CE Mark LVD.

Models and Ratings

JPS130 **XP**

Output Power ⁽³⁾	Output Voltage	Output Current		Ripple & Noise Pk-Pk ⁽⁴⁾	Standard Model Number	Medical Model Number
		Convection-cooled	18 CFM			
100 W	3.3 V	25.0 A	30.0 A	50 mV	JPS130PS03 [†]	
	5.0 V	20.0 A	26.0 A	50 mV	JPS130PS05 [†]	JPS130PS05-M [†]
	12.0 V	9.0 A	10.8 A	120 mV	JPS130PS12 [†]	JPS130PS12-M [†]
	15.0 V	7.0 A	8.7 A	120 mV	JPS130PS15 [†]	JPS130PS15-M [†]
	24.0 V	4.5 A	5.4 A	200 mV	JPS130PS24 [†]	JPS130PS24-M [†]
	28.0 V	3.8 A	4.6 A	200 mV		JPS130PS28-M [†]
130 W	48.0 V	2.1 A	2.7 A	200 mV	JPS130PS48 [†]	JPS130PS48-M [†]
	+5.0 V ⁽¹⁾	11.5 A	15.0 A	50 mV	JPS130PT31 [†]	
	+12.0 V ⁽²⁾	3.0 A	5.0 A	100 mV		
	-12.0 V ⁽²⁾	0.5 A	0.5 A	100 mV		
130 W	+3.3 V ⁽¹⁾	10.0 A	15.0 A	50 mV	JPS130PT30 [†]	
	+5.0 V ⁽²⁾	8.0 A	15.0 A	50 mV		
	+12.0 V ⁽²⁾	0.5 A	0.5 A	100 mV		
	+5.0 V ⁽¹⁾	10.0 A	15.0 A	50 mV		JPS130PT31-M [†]
130 W	+12.0 V ⁽²⁾	3.0 A	4.1 A	120 mV		
	-12.0 V ⁽²⁾	0.8 A	1.1 A	120 mV		
	+5.0 V ⁽¹⁾	10.0 A	15.0 A	50 mV		JPS130PT32-M [†]
130 W	+15.0 V ⁽²⁾	2.5 A	4.1 A	150 mV		
	-15.0 V ⁽²⁾	0.8 A	1.1 A	150 mV		
	+5.0 V ⁽¹⁾	2.5 A	4.0 A	50 mV		JPS130PT34-M [†]
130 W	+24.0 V ⁽²⁾	2.8 A	4.0 A	240 mV		
	+12.0 V ⁽²⁾	0.7 A	1.0 A	120 mV		

Notes

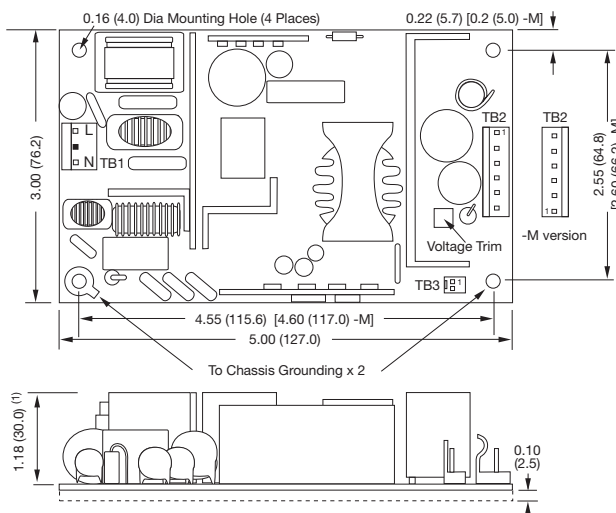
- 20% minimum load required on V1 to maintain stated regulation for auxiliary rails.
- Load regulation of auxiliary rails is defined over the range of 20%-100% of rated load.
- Maximum power with 18 CFM of forced air.
- Ripple and noise measured over 15 MHz bandwidth with a 47 μ F electrolytic capacitor and 0.47 μ F ceramic capacitor.

[†] Available from Farnell & element14. See pages 284-290.

- Covers available, order part number 'JPS130-M COVER'[†] or add suffix '-C' to receive the unit with cover fitted. Overall dimensions 89.5 x 143.0 x 40.0 mm. For industrial units order part number 'JPS130 COVER'[†] or add suffix '-C' to receive the unit with cover fitted. Overall dimensions 90.6 x 142.9 x 39.8 mm. Fixing screws M3, maximum penetration depth 3mm from cover outer surface.
- Connector kits and cable harnesses available. Consult sales for options.

[†] Available from Newark. See pages 291-296.

Mechanical Details



All dimensions are in inches (mm).
Tolerance: 0.02 (0.4) max.
Weight: 0.5 lbs (240 g) approx.

TB3 PIN CONNECTIONS		
Pin	Single	Multi
1	- Sense	0 V
2	+ Sense	+12 V Fan

Notes

- Single output industrial model shown, add extra 0.08" (2.0 mm) to overall height for multi-output models. Dimensions followed by '-M' apply for medical units (note output connector orientation).
- AC input connector (TB1): Molex 5277-02A or equivalent. Mates with 5196-N housings/5194/5225 crimps.
- DC output connector (TB2): Molex 5273 or equivalent, mates with 5195-N housing/5194/5225 crimps and 5239-N housing/5167/5168/2478/2578 crimps. Except JPS130PS03 which has a 6-position terminal screw block: Dinkle part number EHK508V Series accepts 24-12 AWG wire. Terminal screw tightening torque 4 lbs-in (0.45 Nm) maximum.
- TB3: Molex 5045-02A or equivalent. Mates with KK 51191 housings/50802 crimps and KK 5051 housings/2759/5159 crimps. Single output units - TB3 is remote sense. Multi-output units - TB3 is 12 V, 450 mA fan output.

JPS130-M PIN CONNECTIONS

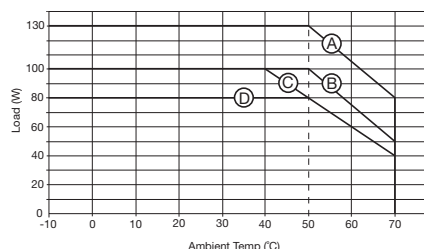
TB2	PS05	PS 12 - 48	PT31	PT32	PT34
1	Return	Return	-12 V	-15 V	+12 V
2	Return	Return	+12 V	+15 V	+24 V
3	Return	Return	Return	Return	Return
4	Return	+V	Return	Return	Return
5	+V	+V	Return	Return	Return
6	+V	+V	Return	Return	Return
7	+V		+5 V	+5 V	+5 V
8	+V		+5 V	+5 V	+5 V
9			+5 V	+5 V	+5 V
Type	*5273-08A	*5273-06A	*5273-09A		

JPS130 PIN CONNECTIONS

TB2	PS05	PS03, 12 - 48	PT31	PT30
1	+V	+V	+5 V	+3.3 V
2	+V	+V	+5 V	+3.3 V
3	+V	+V	+5 V	Return
4	+V	Return	Return	Return
5	Return	Return	Return	Return
6	Return	Return	Return	Return
7	Return		Return	Return
8	Return		+12 V	+5 V
9			-12 V	+5 V
10				+12 V
Type	*5273-08A	*5273-06A	*5273-09A	*5273-10A

* Note: MOLEX connector type

Derating Curves



- Ⓐ JPS130 and '-M' with 18 CFM fan (except JPS130PS03).
- Ⓑ JPS130PS12, PS15, PS24 and PS48 and '-M' with convection cooling. JPS130PS03 with 18 CFM fan.
- Ⓒ JPS130PS05, PT30, PT31, PT32 and PT34 and '-M' with convection cooling.
- Ⓓ JPS130PS03 with convection cooling.

140 Watts

ECM Series



- 120/148 W – Convection/Forced-cooled Ratings
- Class I & Class II Construction
- Remote Sense
- 5 V Standby Option
- Remote On/Off & Power OK Signals Option
- IT, Industrial & Medical Safety Approvals
- 3 Year Warranty

Specification

Input

Input Voltage	• 80-264 VAC (120-370 VDC), derate output power <90 VAC (See derating curve)
Input Frequency	• 47-400 Hz ⁽¹⁾
Input Current	• 2.5 A typical at 115 VAC, full load 1.3 A typical at 230 VAC, full load
Inrush Current	• 40 A max at 230 VAC, cold start at 25 °C
Power Factor	• EN61000-3-2, class A
Earth Leakage Current	• 265 µA max at 264 VAC/60 Hz 0.5/1.1 mA 115/230 VAC at 400 Hz typ.
Input Protection	• Internal T5.0 A/250 V fuse in line and neutral

Output

Output Voltage	• 12-48 VDC (see tables)
Output Voltage Trim	• ±5%, fan output will track by same percentage
Initial Set Accuracy	• ±1% V1, ±5% V2, ±3% V3
Minimum Load	• 0.1 A required on V1 to maintain regulation of V2
Start Up Delay	• 1.5 s max
Start Up Rise Time	• 10 ms max
Hold Up Time	• 16 ms min at 115 VAC
Drift	• ±0.2% after 20 min warm up
Line Regulation	• ±0.5% max
Load Regulation	• ±1% V1, ±5% V2 & V3 max
Over/Undershoot	• 5% typical
Transient Response	• 4% max. deviation, recovery to within 1% in 500 µs for a 50-75-50% load change
Ripple & Noise	• 1% pk-pk V1, others 2%, 20 MHz bandwidth
Overvoltage Protection	• 115-140% Vnom, recycle input to reset
Overload Protection	• 110-150% V1 only
Short Circuit Protection	• Continuous trip and restart (hiccup mode)
Temperature Coefficient	• 0.05%/°C
Remote Sense	• Compensates for 0.5 V total voltage drop
Remote On/Off (Inhibit/Enable Option -A)	• Uncommitted isolated optocoupler diode, powered diode inhibits V1 & V2

General

Efficiency	• 88% typical
Isolation	• 4000 VAC Input to Output, 1500 VAC Input to Ground, 500 VAC Output to Ground
Switching Frequency	• 70 kHz typical
Signals (Option -A)	• Power OK - open collector, Remote On/Off, 5 V Standby
MTBF	• 220 kHrs to MIL-HDBK-217F at 25 °C, GB
Power Density	• 7.2 W/in ³

Environmental

Operating Temperature	• 0 °C to +70 °C derate linearly from +50 °C at 2.5%/°C to 50% load at +70 °C when convection-cooled and from +60 °C at 2.5%/°C to 75% load at +70 °C when forced-cooled. See derating curve.
Cooling	• Convection & fan cooled ratings (see tables)
Operating Humidity	• 95% RH, non-condensing
Storage Temperature	• -40 °C to +85 °C
Operating Altitude	• 3000 m
Shock	• 30 g pk, half sine, 6 axes
Vibration	• 2 g rms, 5 Hz to 500 Hz, 3 axes

EMC & Safety

Low Voltage PSU EMC Emissions	• EN61204-3, high severity level • EN55011/22 level B conducted EN55011/22 level A radiated
Harmonic Currents	• EN61000-3-2, class A
Voltage Flicker	• EN61000-3-3
Radiated Immunity	• EN61000-4-3, level 3 Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3 Perf Criteria A
Surge	• EN61000-4-5, installation class 3 Perf Criteria A
Conducted Immunity	• EN61000-4-6, level 3 Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms, Perf Criteria A, B, B EN60601-1, 30% 500 ms, 60% 100 ms, 100% 10 ms, 100% 5000 ms, Perf Criteria A, A (with 50% load), A, B
Safety Approvals	• See Safety Approvals (see next page)
Equipment Protection Class	• Class I and Class II

Notes

⁽¹⁾ Safety approvals cover frequency range 47-63 Hz.

Models and Ratings – Convection-cooled

ECM140 **XP**

Output Power ⁽¹⁾	Output Voltage V1	Output Current V1	Fan Output V2	Standby Supply V3 ⁽²⁾	Model Number ^(2,3)
120 W	12.0 VDC	10.0 A	12.0 V/0.5 A	5.0 V/0.5 A	ECM140US12†^
120 W	15.0 VDC	8.0 A	12.0 V/0.5 A	5.0 V/0.5 A	ECM140US15†^
120 W	18.0 VDC	6.6 A	12.0 V/0.5 A	5.0 V/0.5 A	ECM140US18†^
120 W	24.0 VDC	5.0 A	12.0 V/0.5 A	5.0 V/0.5 A	ECM140US24†^
120 W	28.0 VDC	4.2 A	12.0 V/0.5 A	5.0 V/0.5 A	ECM140US28
120 W	48.0 VDC	2.5 A	12.0 V/0.5 A	5.0 V/0.5 A	ECM140US48†^

Notes

1. Convection-cooled, output power must not exceed 120 W for combined V1, V2, & V3
2. For 5 V standby (V3), Power OK & Inhibit, add suffix '-A' to model number.

3. For covered versions, add suffix '-C' to model number or order part no. ECM140 COVER KIT†^ for standalone cover (see derating curves). Not suitable for use in class II installations.

Models and Ratings – Forced-cooled

Output Power ⁽¹⁾	Output Voltage V1	Output Current V1	Fan Output V2	Standby Supply V3 ⁽²⁾	Model Number ⁽²⁾
148 W	12.0 VDC	11.7 A	12.0 V/0.5 A	5.0 V/0.5 A	ECM140US12†^
148 W	15.0 VDC	9.3 A	12.0 V/0.5 A	5.0 V/0.5 A	ECM140US15†^
148 W	18.0 VDC	7.7 A	12.0 V/0.5 A	5.0 V/0.5 A	ECM140US18†^
148 W	24.0 VDC	5.8 A	12.0 V/0.5 A	5.0 V/0.5 A	ECM140US24†^
148 W	28.0 VDC	5.0 A	12.0 V/0.5 A	5.0 V/0.5 A	ECM140US28
148 W	48.0 VDC	2.9 A	12.0 V/0.5 A	5.0 V/0.5 A	ECM140US48†^

Notes

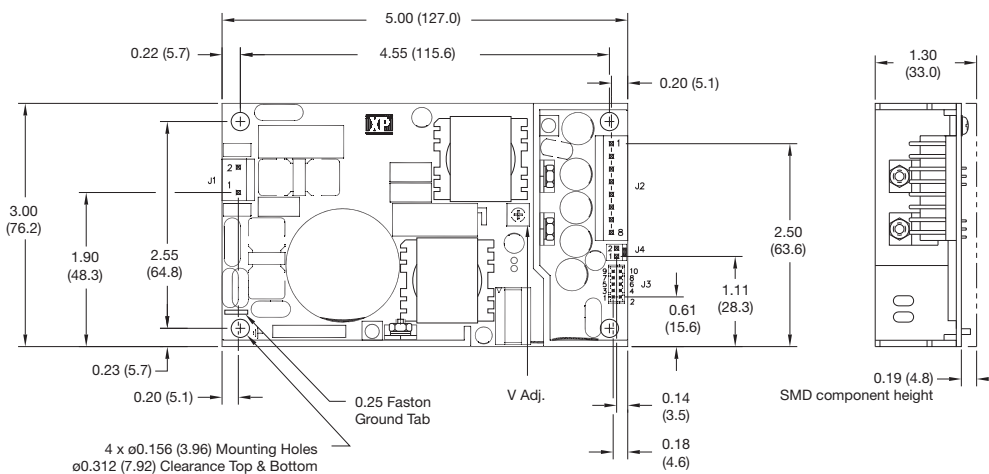
1. 10 CFM airflow achieved with system cooling or with Top Fan assembly.
2. For 5 V standby (V3), Power OK & Inhibit, add suffix '-A' to model number e.g. ECM140US12-A.

3. For cover with Top Fan assembly please refer to longform datasheet for mechanical details.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296.

Mechanical Details



Input Connector J1

Pin 1	Line
Pin 2	Neutral
.25" Faston	Earth

J1 mates with Molex housing 09-50-1031 and Molex series 5194 crimp terminals.

Output Connector J2

Pin 1	+V1
Pin 2	+V1
Pin 3	+V1
Pin 4	+V1
Pin 5	RTN
Pin 6	RTN
Pin 7	RTN
Pin 8	RTN

J2 mates with Molex housing 09-50-1081 and Molex series 5194 crimp terminals.

Signal Connector J3

Pin 1	+5V Standby*	Pin 6	Inhibit LO*
Pin 2	Logic GND*	Pin 7	+Sense
Pin 3	Logic GND*	Pin 8	-Sense
Pin 4	Power OK*	Pin 9	+Vout
Pin 5	Inhibit HI*	Pin 10	-Vout

*Optional

J3 mates with JST housing PHDR-10VS and JST series SPHD-001T-P0.5 crimp terminals.

Fan Connector J4

Pin 1	Fan + (12 V)
Pin 2	Fan -

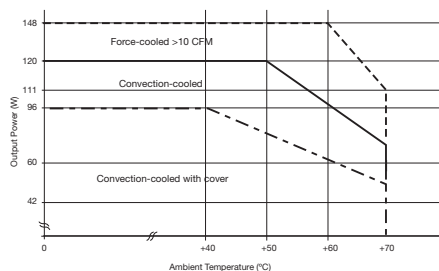
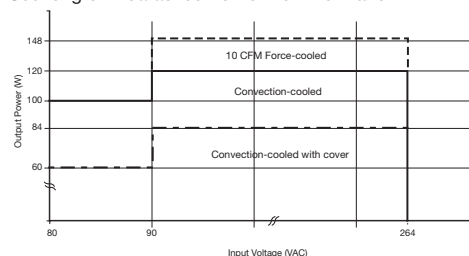
J4 mates with Molex housing 22-01-1024 and Molex series 5103 crimp terminals.

Notes

1. All dimensions in inches (mm). Tolerance .xx = ±0.02 (0.50); .xxx = ±0.01 (0.25)
2. Weight 0.65 lbs (294 g) approx.
3. Vented cover (see derating curves) dimensions are 5.50 x 3.50 x 1.54 (140 x 89 x 39). See longform datasheet for drawing.

Derating Curves

See longform datasheet for further information.



Safety Approvals

IEC60950-1 CB report, CSA 22.2 No. 60950-1, UL60950-1, TUV EN60950-1

IEC60601-1 CB report, CSA 22.2 No. 60601-1, UL60601-1, TUV 60601-1

TUV IEC61010-1

UL1604 Class 1 Division 2 (ECM140US12)

50-150 Watts

DLG Series



- AC Input LED Driver
- Constant Voltage & Current Operation
- High Power Factor
- High Efficiency
- Water Proof to IP67
- 90-305 VAC Input Voltage Range
- 3 Year Warranty

Specification

Input

Input Voltage	• 90-305 VAC, see derating curve
Input Frequency	• 47-63 Hz
Input Current	• 50 W: 1.0 A at 115 VAC, 0.5 A at 230 VAC, 75 W: 1.2 A at 115 VAC, 0.6 A at 230 VAC, 100 W: 1.4 A at 115 VAC, 0.7 A at 230 VAC, 150 W: 2.0 A at 115 VAC, 1.0 A at 230 VAC
Inrush Current	• 65 A at 230 VAC, cold start +25 °C
Power Factor	• >0.94 at 230 VAC, full load
Earth Leakage Current	• DLG50/75: 500 µA max at 230 VAC DLG100/150: 750 µA max at 230 VAC
No Load Input Power	• 0.6 W max at 230 VAC
Input Protection	• DLG50/75 T2.5A/300V fuse fitted in line, DLG100 T3.15A/300V fuse fitted in line, DLG150 T4A/300V fuse fitted in line

Output

Output Voltage	• See table
Minimum Load	• No minimum load required
Start Up Delay	• 1.5 s max at 115 VAC
Hold Up Time	• DLG50/75: No hold up DLG100/150: 16 ms minimum
Line Regulation	• ±0.5%
Load Regulation	• ±1.0% in constant voltage mode, ±5.0% in constant current mode
Turn On Overshoot	• 5% max
Transient Response	• 5% maximum deviation, recovery to within 1% in 10 ms for a 50% load change
Ripple & Noise	• DLG50/75 ⁽¹⁾ DLG100/150: 150 mV pk-pk up to 36 V output, 200 mV for 24 V output, 240 mV for ≥54 V output (see note 2)
Overvoltage Protection	• 110-142%, recycle mains to reset, only on DLG100 & DLG150 versions
Overttemperature Protection	• Unit shuts down, auto recovery
Overload Protection	• 135% typical, auto recovery
Short Circuit Protection	• Trip and restart (hiccup mode)
Temperature Coefficient	• 0.04%/°C

General

Efficiency	• See table
Isolation	• 3750 VAC Input to Output 1880 VAC Input to Ground 500 VAC Output to Ground
Switching Frequency	• DLG50/70: 40-80 kHz DLG100/150: PWM 60-80 kHz, PFC 55-133 kHz
MTBF	• >200 kHrs to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Temperature	• DLG50/70: -40 °C to +60 °C (see derating curve), DLG100/150: -30 °C to +70 °C (see derating curve)
Operating Humidity	• 5-100% RH, non-condensing
Storage Temperature	• -40 °C to +80 °C
Operating Altitude	• 3000 m
Vibration	• 10-500 Hz, 2 g, 10 mins/cycle, 6 cycles in each of 3 axes

EMC & Safety

Emissions	• EN55015, class B conducted and radiated
Harmonic Currents	• EN61000-3-2, class A EN61000-3-2, class C for loads >80%
Voltage Flicker	• EN61000-3-3
ESD Immunity	• EN61000-4-2, 8 kV air and 4 kV contact, Perf Criteria A
Radiated Immunity	• EN61000-4-3, level 2 Perf Criteria A
EFT/Burst	• EN61000-4-4, level 2 Perf Criteria A
Surge	• EN61000-4-5, installation class 3, Perf Criteria A
Conducted Immunity	• EN61000-4-6, level 2 Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms, Perf Criteria A, B, B
Safety Approvals	• EN61347, UL8750, CE Mark DLG100/150: EN60950-1 (pending)

Notes

1. DLG50/70 use a topology which results in increased levels of mains frequency related ripple. Contact technical sales for details.

Models and Ratings

DLG50-150 **XP**

Output Power	Output Voltage	Output Current	Output Voltage Range in Constant Current Mode	Efficiency ⁽¹⁾	Model Number
50 W	12.0 V	4.20 A	8.5-12.0 V	84.0%	DLG50PS12
50 W	24.0 V	2.10 A	19.0-24.0 V	86.0%	DLG50PS24
50 W	36.0 V	1.40 A	26.0-36.0 V	88.0%	DLG50PS36
50 W	48.0 V	1.05 A	35.0-48.0 V	88.0%	DLG50PS48
59 W	12.0 V	4.90 A	8.5-12.0 V	84.0%	DLG75PS12
75 W	24.0 V	3.15 A	19.0-24.0 V	86.0%	DLG75PS24
74 W	30.0 V	2.45 A	22.0-30.0 V	87.0%	DLG75PS30
75 W	36.0 V	2.10 A	26.0-36.0 V	88.0%	DLG75PS36
67 W	48.0 V	1.40 A	35.0-48.0 V	88.0%	DLG75PS48
75 W	54.0 V	1.40 A	37.0-54.0 V	88.0%	DLG75PS54
100 W	12.0 V	8.30 A	9.0-12.0 V	88.0%	DLG100PS12
100 W	15.0 V	6.60 A	10.0-15.0 V	88.0%	DLG100PS15 ⁽³⁾
100 W	24.0 V	4.20 A	14.0-24.0 V	90.0%	DLG100PS24
100 W	30.0 V	3.30 A	22.0-30.0 V	90.0%	DLG100PS30
100 W	36.0 V	2.80 A	26.0-36.0 V	90.0%	DLG100PS36
100 W	48.0 V	2.10 A	34.0-48.0 V	90.5%	DLG100PS48
100 W	57.0 V	1.75 A	43.0-57.0 V	90.5%	DLG100PS57 ⁽³⁾
132 W	12.0 V	11.00 A	9.0-12.0 V	88.0%	DLG150PS12
150 W	15.0 V	10.00 A	11.0-15.0 V	88.0%	DLG150PS15 ⁽³⁾
150 W	24.0 V	6.30 A	14.0-24.0 V	90.0%	DLG150PS24
150 W	30.0 V	5.00 A	22.0-30.0 V	90.0%	DLG150PS30
150 W	36.0 V	4.20 A	26.0-36.0 V	90.0%	DLG150PS36
150 W	48.0 V	3.20 A	33.0-48.0 V	90.0%	DLG150PS48
150 W	54.0 V	2.80 A	38.0-54.0 V	90.0%	DLG150PS54 ⁽³⁾

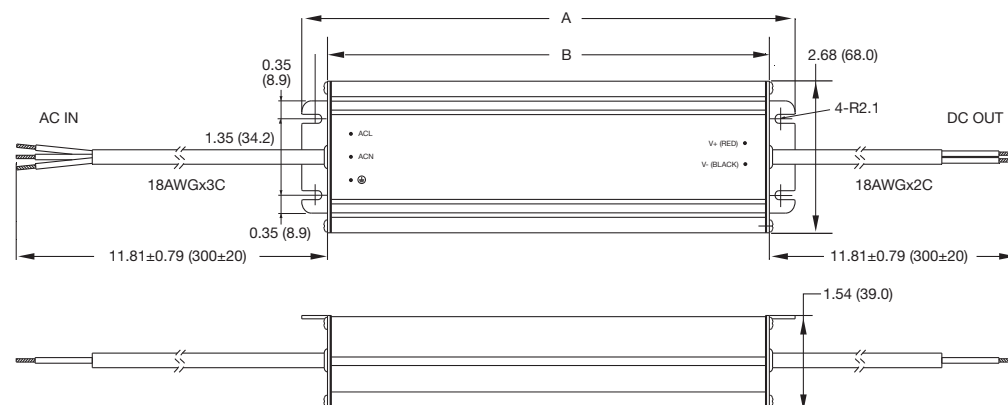
Notes

1. Typical efficiency at full load and 230 VAC input.

2. Measured using 12" twisted pair with 0.1 μ F and 47 μ F capacitors in parallel at 20 MHz bandwidth.

3. Not UL8750 approved.

Mechanical Details



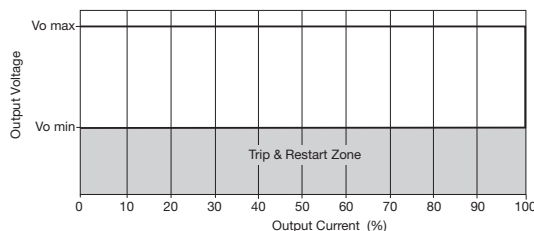
	DLG50/70	DLG100/150
A	6.48 (164.6)	8.74 (222.0)
B	6.03 (153.2)	7.83 (199.0)

Notes

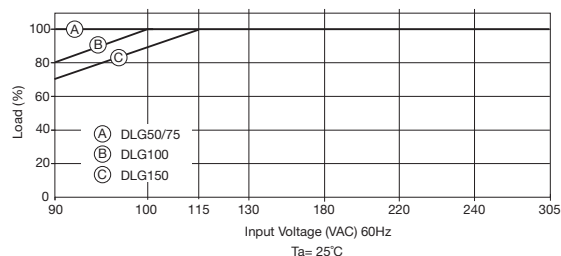
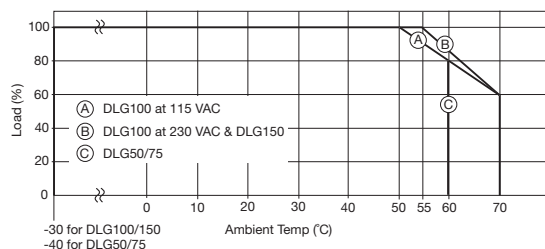
- All dimensions shown in inches (mm).
- Weight: DLG50/75: 1.98 lbs (900 g)
DLG100/150 2.29 lbs (1040 g)
- Tolerance: ±0.02 (0.5)

Application Notes

Constant Voltage / Constant Current Curve



Derating Curve



150 Watts

ECP Series



GREEN-POWER



- 100 W Convection-cooled
- 150 W Forced-cooled
- 2" x 4" Foot Print
- Single Outputs from 12 V to 48 V
- Built-in Fan Supply
- <0.5 W No Load Input Power
- 3 Year Warranty

Specification

Input

Input Voltage	• 90-264 VAC. Derate from 100% load at 100 VAC to 90% load at 90 VAC
Input Frequency	• 47-63 Hz
Input Current	• 2.5 A max at 115 VAC, 1.5 A max at 230 VAC
Inrush Current	• 60 A max at 230 VAC, cold start at 25 °C
Power Factor	• >0.95
Earth Leakage Current	• 230 µA at 260 VAC, 60 Hz
No Load Input Power	• <0.5 W
Input Protection	• Internal T3.15A/250VAC fitted in line and neutral

Output

Output Voltage	• See tables
Output Voltage Trim	• ±10%
Initial Set Accuracy	• ±1% at 50 % load
Minimum Load	• No minimum load requirement
Start Up Delay	• 2 s max
Start Up Rise Time	• 35 ms typical
Hold Up Time	• 16 ms minimum at full load and 115 VAC
Line Regulation	• ±0.5% max
Load Regulation	• ±0.5% max
Transient Response	• 4% maximum deviation, recovering to less than 1% within 500 µs for 25% step load
Ripple & Noise	• 1% max pk-pk, 20 MHz bandwidth, (see note 2)
Overvoltage Protection	• 115% - 140% of nominal voltage on main output. Recycle mains to reset.
Overload Protection	• 110-150%
Short Circuit Protection	• Trip and restart (hiccup)
Temperature Coefficient	• 0.02%/°C
Fan Supply	• 12 V at 500 mA

General

Efficiency	• See table
Isolation	• 4000 VAC Input to Output 1500 VAC Input to Ground 500 VDC Output to Ground
Switching Frequency	• 60 kHz ± 10 kHz
MTBF	• >200 kHrs to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Temperature	• -20 °C to +70 °C derate from 100% load at 50 °C to 50% load at 70 °C
Cooling	• Convection cooled: 100 W Forced cooled: 150 W with 15 CFM
Operating Humidity	• 5% to 90% RH, non condensing
Operating Altitude	• 3000 m
Storage Temperature	• -40 °C to +85 °C
Shock	• IEC68-2-6, 30 g, 11 mins half sine, 3 times in each of 6 axes
Vibration	• IEC68-2-27, 10-55 Hz, 2 g 10 mins / sweep. 60 mins for each of 3 axes

EMC & Safety

Emissions	• EN55022/11, Level B conducted & Level A radiated
Harmonic Currents	• EN61000-3-2 Class A EN61000-3-2 Class C for load >60 W
Voltage Flicker	• EN61000-3-3
ESD Immunity	• EN61000-4-2, ±8 kV air, ±4 kV contact, Perf Criteria A
Radiated Immunity	• EN61000-4-3, 3 V/m, Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3, Perf Criteria A
Surge	• EN61000-4-5, installation class 3, Perf Criteria A
Conducted Immunity	• EN61000-4-6, 3 V, Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60%, 100 ms, 100%, 5000 ms Perf Criteria A, A, B for high line, A, B, B for low line at full load, EN60601-1-2, 30% 500 ms, 60% 100 ms, 100% 10 ms, 100% 5000 ms, Perf Criteria A, A, A, B for high line, A, B, A, B for low line at full load
Safety Approvals	• UL60950-1, IEC60950-1, EN60950-1, UL60601-1, IEC60601-1, EN60601-1

Models and Ratings

ECP150 **XP**

Output Voltage	Output Current		Ripple and Noise pk-pk ⁽²⁾	Fan Output	Efficiency ⁽³⁾	Model Number
	Convection-cooled	Forced-cooled ⁽¹⁾				
12.0 V	8.33 A	12.50 A	120 mV	12 V/0.5 A	91%	ECP150PS12†^
15.0 V	6.67 A	10.00 A	150 mV	12 V/0.5 A	91%	ECP150PS15†^
24.0 V	4.17 A	6.25 A	240 mV	12 V/0.5 A	91%	ECP150PS24†^
28.0 V	3.50 A	5.40 A	280 mV	12 V/0.5 A	92%	ECP150PS28†^
48.0 V	2.08 A	3.10 A	480 mV	12 V/0.5 A	92%	ECP150PS48†^

Notes

1. Requires 15 CFM.

2. Measured with 20 MHz bandwidth and 10 μ F electrolytic capacitor in parallel with 0.1 μ F ceramic capacitor

3. Minimum average efficiencies measured at 25%, 50%, 75% & 100% of 150 W load and 230 VAC input.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296.

Mechanical Details

TB1 - Input Connector	
Pin 1	Neutral
Pin 2	Not Fitted
Pin 3	Line

Mates with JST housing
VHR-3N and JST Series
SVH-21T-P1.1 crimp terminals

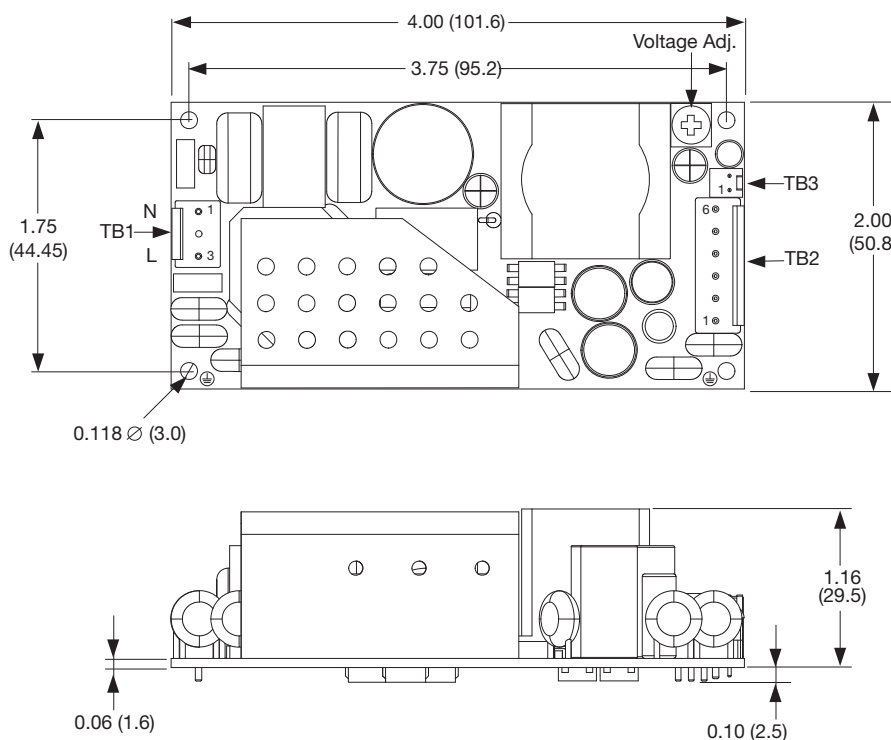
Mounting holes marked with
⊕ must be connected to safety earth

TB2 - Output Connector	
Pin 1	-Vout
Pin 2	-Vout
Pin 3	-Vout
Pin 4	+Vout
Pin 5	+Vout
Pin 6	+Vout

Mates with JST housing
VHR-6N and JST Series
SVH-21T-P1.1 crimp terminals

TB3 - Fan Connector	
Pin 1	Fan -
Pin 2	Fan +

Mates with Molex housing
22-01-1043 and 40445 crimp
terminals

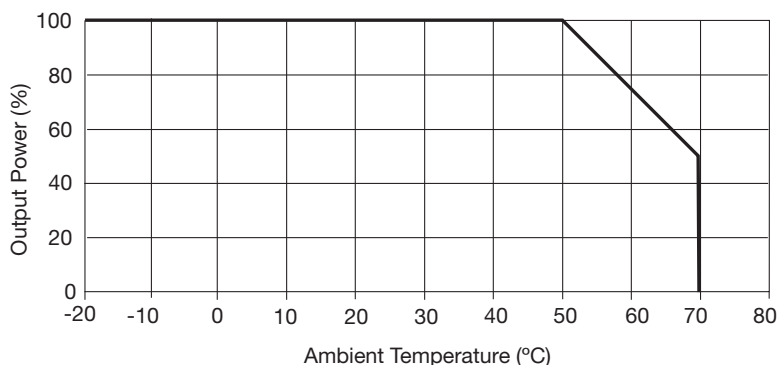


Notes

1. All dimensions shown in inches (mm).
Tolerance: ± 0.02 (0.5)

2. Weight: 0.42 lbs (190 g) approx.

Derating Curve



175 Watts

CLC Series



- High Efficiency Resonant Topology
- Medical Safety Approvals (-M Versions)
- 12 V Fan Output
- Remote Sense
- 5V Standby Option
- Remote On/Off & Power Good Signal Options
- 3 Year Warranty

Specification

Input

Input Voltage	• 85-264 VAC (120-370 VDC), derate output power 10% <90 VAC
Input Frequency	• 47-63 Hz
Input Current	• 3.0 A typical at 115 VAC, full load 1.5 A typical at 230 VAC, full load
Inrush Current	• 40 A max at 230 VAC, cold start at 25 °C
Power Factor	• EN61000-3-2, class A
Earth Leakage Current	• 475 μ A 264 VAC at 60 Hz, 230 μ A maximum at 264 VAC at 60 Hz (-M)
Input Protection	• Internal T5 A 250 V fuse in line Internal T5 A 250 V fuse in line and neutral (-M)

Output

Output Voltage	• 12-48 V (see tables)
Output Voltage Trim	• $\pm 5\%$
Initial Set Accuracy	• $\pm 1\%$ V1, $\pm 5\%$ V2, $\pm 3\%$ V3
Minimum Load	• 0.1 A required on V1 to maintain regulation of V2
Start Up Delay	• 1.5 s typical, see longform datasheet for more details
Start Up Rise Time	• 5 ms typical
Hold Up Time	• 16 ms min at 115 VAC
Drift	• $\pm 0.2\%$ after 20 min warm up
Line Regulation	• $\pm 0.5\%$ max
Load Regulation	• $\pm 1\%$ V1, $\pm 5\%$ V2 & V3 max
Over/Undershoot	• 5% typical
Transient Response	• 4% max. deviation, recovery to within 1% in 500 μ s for a 50-75-50% load change
Ripple & Noise	• 1% pk-pk V1, others 2%, 20 MHz bandwidth
Overvoltage Protection	• 115-140% Vnom, recycle input to reset
Overload Protection	• 110-150% V1 only
Short Circuit Protection	• Continuous trip and restart (hiccup mode)
Temperature Coefficient	• 0.05%/°C
Remote Sense	• Compensates for 0.5 V total voltage drop
Remote On/Off (Inhibit/Enable) (Option -A)	• Uncommitted isolated optocoupler diode, powered diode inhibits V1 & V2

General

Efficiency	• 87% typical
Isolation	• 3000 VAC Input to Output 4000 VAC Input to Output (-M) 1500 VAC Input to Ground 500 VAC Output to Ground
Switching Frequency	• 70 kHz typical
Signals (Option -A)	• Power OK - open collector, Remote On/Off, 5 V Standby
MTBF	• 390 kHrs per MIL-HDBK-217F at 25 °C, GB
Power Density	• 9.0 W/in ³

Environmental

Operating Temperature	• 0 °C to +70 °C derate linearly from +50 °C at 2.5%/°C to 50% load at +70 °C
Cooling	• Forced-cooled >10 CFM
Operating Humidity	• 95% RH, non-condensing
Storage Temperature	• -40 °C to +85 °C
Operating Altitude	• 3000 m
Shock	• 30 g pk, half sine, 6 axes
Vibration	• 2 g rms, 5 Hz to 500 Hz, 3 axes

EMC & Safety

Low Voltage PSU EMC Emissions	• EN61204-3, high severity level • EN55011/22 level B conducted EN55011/22 level A radiated
Harmonic Currents	• EN61000-3-2, class A
Voltage Flicker	• EN61000-3-3
Radiated Immunity	• EN61000-4-3, level 3 Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3 Perf Criteria A
Surge	• EN61000-4-5, installation class 3 Perf Criteria A
Conducted Immunity	• EN61000-4-6, level 3 Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms Perf Criteria A, B, B EN60601-1, 30% 500ms, 60% 100ms, 100% 10ms, 100% 5000ms (-M) Perf Criteria A, A (with 50% load), A, B
Safety Approvals	• IEC60950-1 CB report, CSA 22.2 No. 60950-1, UL60950-1, TUV EN60950-1 IEC60601-1 CB report, UL60601-1, TUV EN60601-1

Output Power ⁽¹⁾	Output Voltage V1	Output Current V1	Fan Output V2	Standby Supply V3 (optional)	Model Number ^(2,3)
175 W	12.0 VDC	13.90 A	12.0 V/0.5 A	5.0 V/0.5 A	CLC175US12†^
175 W	24.0 VDC	6.90 A	12.0 V/0.5 A	5.0 V/0.5 A	CLC175US24†^
175 W	28.0 VDC	6.25 A	12.0 V/0.5 A	5.0 V/0.5 A	CLC175US28
175 W	48.0 VDC	3.50 A	12.0 V/0.5 A	5.0 V/0.5 A	CLC175US48†^

Notes

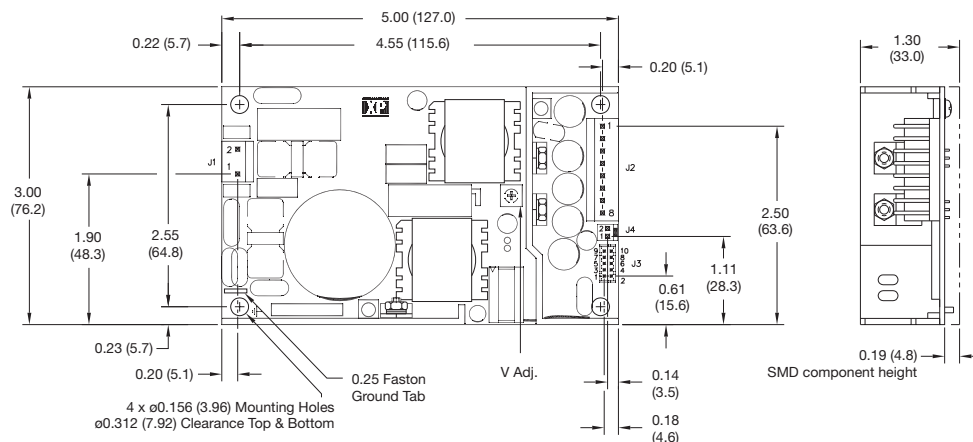
- 10 CFM airflow.
- For medical version add, suffix '-M' to model number.
- For 5 V standby (V3), Power OK & Inhibit, add suffix '-A' to model number.

† Available from Farnell & element14. See pages 284-290.

- For cover with Top Fan assembly add '-TF' to model number e.g. CLC175US12-TF, CLC175US12-ATF, CLC175US12-MTF or CLC175US12-MATF.

^ Available from Newark. See pages 291-296.

Mechanical Details



Input Connector J1	
Pin 1	Line
Pin 2	Neutral
0.25" Faston	Earth

J1 mates with Molex housing 09-50-1031 and Molex series 5194 crimp terminals.

Output Connector J2	
Pin 1	+V1
Pin 2	+V1
Pin 3	+V1
Pin 4	+V1
Pin 5	RTN
Pin 6	RTN
Pin 7	RTN
Pin 8	RTN

J2 mates with Molex housing 09-50-1081 and Molex series 5194 crimp terminals.

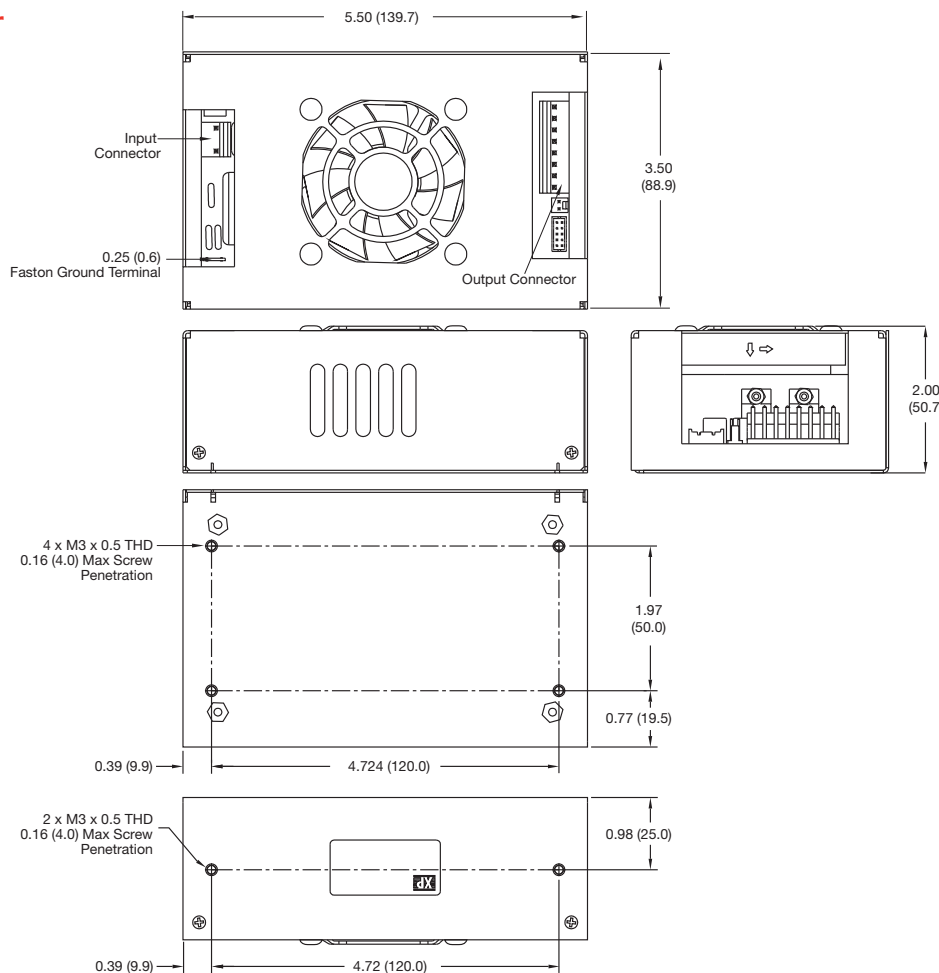
Signal Connector J3	
Pin 1	+5V Standby
Pin 2	Logic GND
Pin 3	Logic GND
Pin 4	Power OK
Pin 5	Inhibit HI
Pin 6	Inhibit LO
Pin 7	+Sense
Pin 8	-Sense
Pin 9	+Vout
Pin 10	-Vout

J3 mates with JST housing PHDR-10VS and JST SPHD-001T-P0.5 crimp terminals.

Fan Connector J4	
Pin 1	Fan +(12V)
Pin 2	Fan -

J4 mates with Molex housing 22-01-1024 and Molex series 5103 crimp terminals.

Fan Cover



Notes

- All dimensions in inches (mm). Tolerance .xx = ±0.02 (0.50); .xxx = ±0.01 (0.25)
- Weight: 0.7 lbs (317 g) approx.
- For thermal derating, please refer to longform datasheet.

175 Watts

RCL Series



- 200 W Peak Rating
- Up to 120 W Convection-cooled
- IT, Industrial and Medical Safety Approvals
- Class I & Class II Installations
- Single, Dual, Triple and Quad Outputs
- Connector & Mechanical Options
- 3 Year Warranty

Specification

Input

Input Voltage	• 85-264 VAC (120-370 VDC) (see note 3)
Input Frequency	• 47-63 Hz; 400 Hz ⁽¹⁾
Input Current	• 2.1 A max at 115 VAC 0.9 A max at 230 VAC
Inrush Current	• 17 A max at 115 VAC, 35 A max at 230 VAC, cold start at +25 °C
Power Factor	• >0.9
Earth Leakage Current	• 120 µA max at 264 VAC / 60 Hz 340 µA max at 115 VAC / 400 Hz
Input Protection	• Internal T3.15 A/250 V in line and neutral

Output

Output Voltage	• See models and ratings table and note 2
Output Voltage Trim	• ±10% output 1, outputs 2-4 track by same percentage
Initial Set Accuracy	• ±1% of nominal at 50% load
Minimum Load	• See models & ratings table
Start Up Delay	• 2 s max
Start Up Rise Time	• 100 ms max
Hold Up Time	• 20 ms min at nominal low line & max power
Drift	• <±0.2% after 20 mins warm up
Line Regulation	• ±0.5% of nominal over full input range
Load Regulation	• PQ42 & 43: V1 & V2 ±3%, V3 & V4 ±5% of nominal, all other models: V1 ±1%, V2, V3 & V4 ±5% of nominal
Transient Response	• 4% max deviation, recovery to within 1% in 500 µs for a 25% load change at 1 A/µs
Ripple & Noise	• 50 mV (Vo ≤ 5 V), 120 mV (Vo = 12, 15 V), 200 mV (Vo = 24, 48 V). Measured pk-pk with a 20 MHz bandwidth
Overvoltage Protection	• 115-140% on V1 only, recycle input to reset
Overtemperature Protection	• Fitted with auto restart
Overload Protection	• 110-125% - Primary side power limiting with auto recovery. Constant current limit for single output models and foldback current limit for multi output models. V3 & V4 PTC resetting fuses
Temperature Coefficient	• 0.02%/°C

Notes

1. Safety approvals cover frequency 47-63 Hz.

General

Efficiency	• 80-90% depending on model
Isolation	• 4000 VAC Input to Output 1500 VAC Input to Ground 1500 VAC Output to Ground open frame (For BF applications, consult sales office) 500 VAC Output to Ground U channel & covered
Switching Frequency	• PFC 75 kHz typical, PWM 60 kHz typical
Signals	• Power fail - open collector output referenced to 0 V sense
Remote Sense	• See application notes
Remote On/Off	• See application notes
MTBF	• 385 kHrs typical to MIL-HDBK-217F at 25 °C, GB
Power Density	• 7.1 W/in ³

Environmental

Operating Temperature	• -10 °C to +50 °C at full power, derate to 50% power at +70 °C
Operating Humidity	• 5-95% RH, non-condensing
Storage Temperature	• -20 °C to +85 °C
Operating Altitude	• 3000 m
Shock	• 30 g peak, half sine, 6 axes
Vibration	• 2 g rms, 5-500 Hz, 3 axes

EMC & Safety

Emissions	• EN55011/22 class B conducted, class A radiated
Harmonic Currents	• EN61000-3-2 class A EN61000-3-2 class C for loads ≥20%
Voltage Flicker	• EN61000-3-3
ESD Immunity	• EN61000-4-2, level 3 Perf Criteria A
Radiated Immunity	• EN61000-4-3, 10 V rms 80% mod, Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3 Perf Criteria A
Surge	• EN61000-4-5, installation class 3 Perf Criteria A
Conducted Immunity	• EN61000-4-6, level 3 Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms, Perf Criteria A, B, B EN60601-1-2, 30% 500 ms, 60% 100 ms, 100% 10 ms, 100% 5000 ms, Perf Criteria A, A, A, B - 230 VAC Contact sales for 115 V operation
Safety Approvals	• EN60601-1, EN60950-1, UL/cUL60950, CSA60601.1, UL60601-1

Models and Ratings

RCL175 **XP**

Total Power			Output 1				Output 2 ^(5,6)				Output 3 ^(5,6)			Output 4 ^(5,6)			Model Number
Max ⁽⁷⁾	Peak ⁽¹⁾	Conv. ^(4,5)	V	Min	Max ^(4,5)	Peak ⁽¹⁾	V	Min	Max	Peak ⁽¹⁾	V	Min	Max	V	Min	Max	
175 W	204 W	120 W	12.0 V	0.0 A	14.5 A	17.0 A											RCL175PS12
175 W	195 W	120 W	15.0 V	0.0 A	11.6 A	13.0 A											RCL175PS15
175 W	200 W	120 W	24.0 V	0.0 A	7.2 A	8.3 A											RCL175PS24
175 W	200 W	120 W	28.0 V	0.0 A	6.2 A	7.1 A											RCL175PS28
175 W	202 W	120 W	48.0 V	0.0 A	3.6 A	4.2 A											RCL175PS48
175 W	200 W	110 W	+5.0 V	1.5 A	15.0 A	-	+12.0 V	0.1 A	8.3 A	10.4 A							RCL175PD22
175 W	200 W	110 W	+5.0 V	1.5 A	15.0 A	-	+12.0 V	0.1 A	6.3 A	8.4 A	F 12 V	0.1 A	2.0 A				RCL175PT31
175 W	200 W	110 W	+5.0 V	1.5 A	15.0 A	-	+15.0 V	0.1 A	4.6 A	6.6 A	F 15 V	0.1 A	2.0 A				RCL175PT32
175 W	200 W	90 W	+5.0 V	1.5 A	15.0 A	-	+3.3 V	0.1 A	15.0 A	-	F 15 V	0.1 A	2.0 A	F 15 V	0.1 A	2.0 A	RCL175PQ43
175 W	200 W	90 W	+5.0 V	1.5 A	15.0 A	-	+12.0 V	0.1 A	5.5 A	7.6 A	F 5 V	0.1 A	2.0 A	F 12 V	0.1 A	2.0 A	RCL175PQ44
175 W	200 W	90 W	+5.0 V	1.5 A	15.0 A	-	+15.0 V	0.1 A	4.0 A	6.0 A	F 5 V	0.1 A	2.0 A	F 15 V	0.1 A	2.0 A	RCL175PQ45
175 W	200 W	90 W	+5.0 V	1.5 A	15.0 A	-	+24.0 V	0.1 A	3.2 A	5.0 A	F 12 V	0.1 A	2.0 A	F 12 V	0.1 A	2.0 A	RCL175PQ46
175 W	200 W	90 W	+5.0 V	1.5 A	15.0 A	-	+24.0 V	0.1 A	3.0 A	5.0 A	F 15 V	0.1 A	2.0 A	F 15 V	0.1 A	2.0 A	RCL175PQ47

Notes

1. Peak rating can be taken for 5 seconds in every minute. Average power not to exceed maximum power.
2. User-accessible fan supply rated at 12 V at 350 mA (not available on fan-cooled units).
3. For operation at 85 VAC output power is derated to 95%.
4. Output 1 10 A max convection-cooled.
5. 20 A max from output 1 and 2 combined convection-cooled.
6. A minimum load of 100 mA is required on output 2, 3 and 4 to maintain the regulation figures.
7. 12 CFM airflow required for maximum power.
8. Outputs 3 & 4 are floating, they can be connected externally for positive or negative output.
9. Connector kits and cable harnesses available. Consult sales for options.

Pin Connectors

INPUT CONNECTOR - P1	
Pin	Function
1	Live
2	N/C
3	Neutral

P1 is a 3-way 0.156" pitch square pin header
Molex housing 09-91-0300 pins 08-50-0106
(24-18 AWG) 08-50-0108 (28-22 AWG)

OUTPUT CONNECTOR - P2	
Pin	Function
1	+Output 1
2	+Output 1
3	+Output 1
4	0 V
5	0 V
6	0 V
7	0 V
8	0 V
9	0 V
10	+Output 2
11	+Output 2
12	+Output 2
13	-Output 3
14	+Output 3
15	-Output 4
16	+Output 4

SIGNALS CONNECTOR - P3	
Pin	Function
1	Remote On/Off
2	+Sense
3	-Sense
4	PF signal
5	0 V fan supply
6	+12 V fan supply

P3 is a 6-way 0.1" pitch square pin header
Molex housing 22-01-2065 pins 08-50-0032
(30-22 AWG)

Application Notes

- Remote Sense** - V1 only, compensates for 0.5 V or 10% whichever is lower.
- Power Fail** - Open collector output referenced to 0 V sense (when using the power fail signal, -Sense must be connected to 0 V).
- Remote On/Off** - Connect pin 1 (P3) to 0 V to disable unit (optional remote enable specify suffix '-E' with the model number).
Applying a logic '0' will also disable the unit.

Options

- For U-channel version, add suffix '-U' to the model number.
- For U-channel version with cover kit, add suffix '-C' to the model number.
- For U-channel version with fan cover kit, add suffix '-F' to the model number.
- For screw terminals (output connector P2 only), add suffix '-S' to the model number.
- For versions with remote enable, add suffix '-E' to the model number.
- For foldback current limit on single output models, contact sales.
- For constant current limit (output 1 & 2) on multi-output models, contact sales.

Connector Information

For all formats, output connector P2 as follows:

Single Output Models:

6-way 0.156" pitch square pin header

Molex housing 09-91-0600

Pins 08-50-0106 (24-18 AWG) 08-50-0108 (28-22 AWG)

Dual Output Models:

12-way 0.156" pitch square pin header

Molex housing 09-91-1200

Pins 08-50-0106 (24-18 AWG) 08-50-0108 (28-22 AWG)

Triple Output Models:

14-way 0.156" pitch square pin header

Molex housing 09-91-1400

Pins 08-50-0106 (24-18 AWG) 08-50-0108 (28-22 AWG)

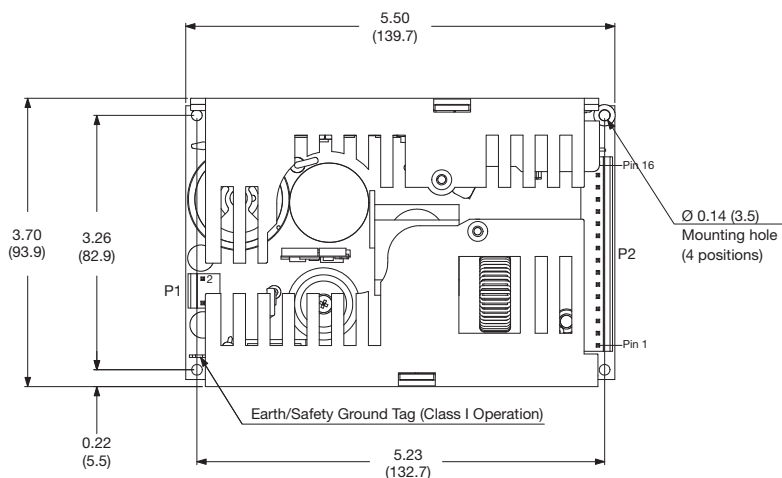
Quad Output Models:

16-way 0.156" pitch square pin header

Molex housing 09-91-1600

Pins 08-50-0106 (24-18 AWG) 08-50-0108 (28-22 AWG)

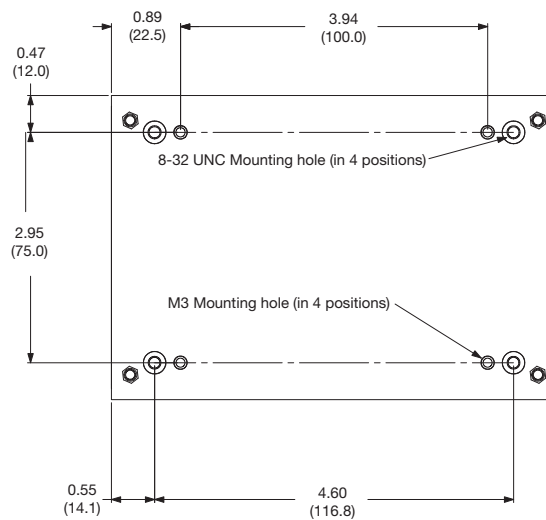
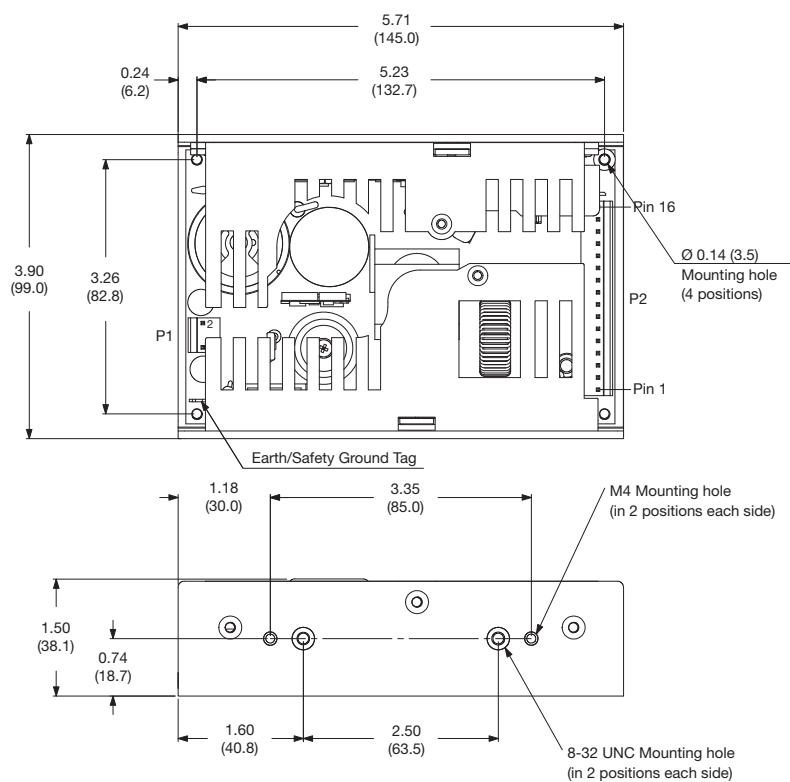
Open Frame



Notes

1. Suitable for class I and class II operation, for class II applications contact sales.
2. All dimensions are in inches (mm)
3. Weight: 1.10 lbs (500 g) approx.
4. Tolerance ± 0.02 (0.5)
5. Overall height: 1.36 (34.6).

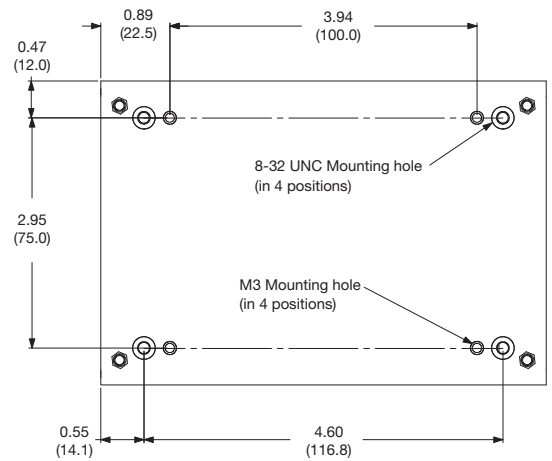
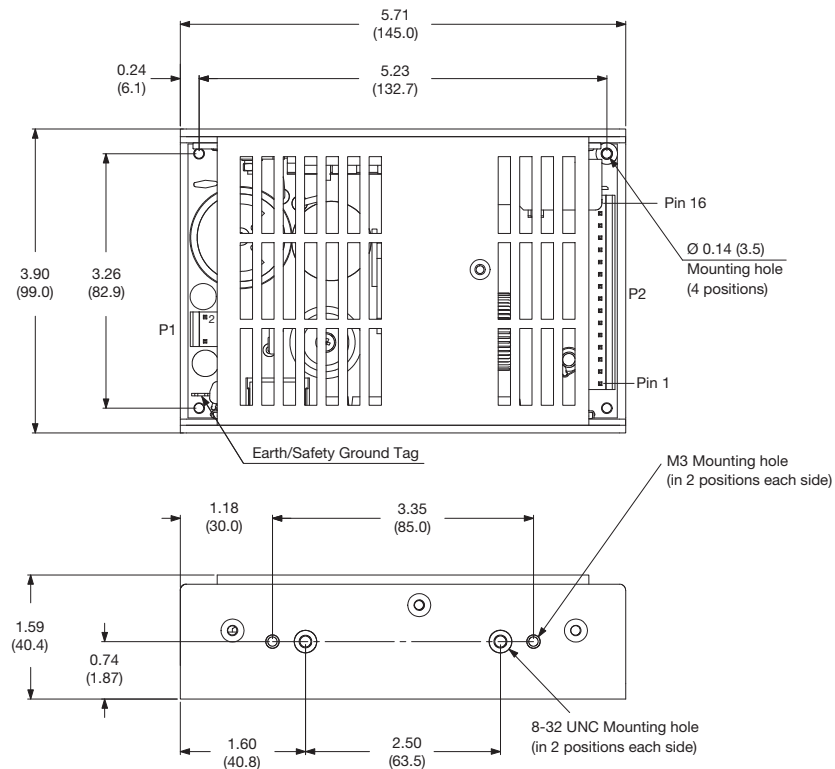
U-channel



Notes

1. Suitable for class I operation only.
2. All dimensions are in inches (mm)
3. Weight: 1.54 lbs (700 g) approx.
4. Tolerance ± 0.02 (0.5)
5. Mounting screws must not penetrate by more than 0.12" (3.0 mm) max

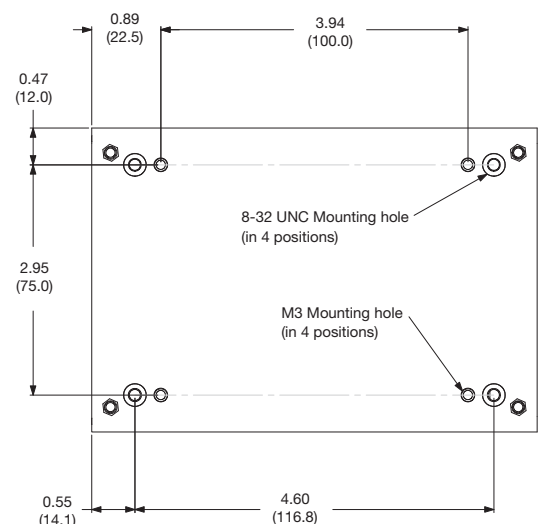
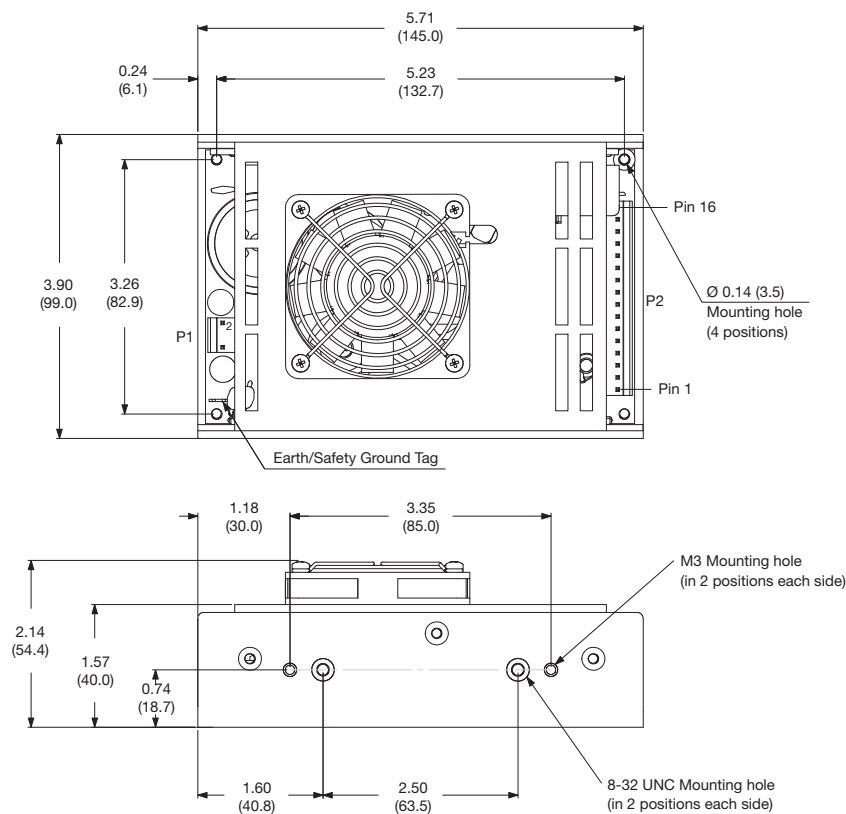
U-channel & Cover



Notes

1. Suitable for class I operation only.
2. All dimensions are in inches (mm)
3. Weight: 1.76 lbs (800 g) approx.
4. Tolerance ± 0.02 (0.5)
5. Mounting screws must not penetrate by more than 0.12" (3.0 mm) max.

U-channel & Fan Cover

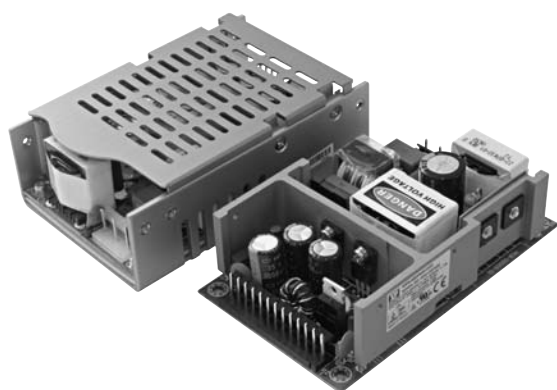


Notes

1. Suitable for class I operation only.
2. All dimensions are in inches (mm)
3. Weight: 1.98 lbs (900 g) approx.
4. Tolerance ± 0.02 (0.5)
5. Mounting screws must not penetrate by more than 0.12" (3.0 mm) max

120-180 Watts

SDS Series



- Convection-cooled
- 3" x 5" Footprint
- Up to 90% Efficiency
- Open Frame, U-Channel & Covered Versions
- Low Temperature Option
- 150 W Medical Version
- 3 Year Warranty

Specification

Input

Input Voltage	• 90-264 VAC (120-370 VDC)
Input Frequency	• 47-63 Hz
Input Current	• 120 W: 1.7 / 1.0 A max at 115 / 230 VAC 150 W: 2.0 / 0.8 A max at 115 / 230 VAC 180 W: 2.7 A max at 90 VAC
Inrush Current	• 120 W: 20 / 51 A max at 115 / 230 VAC 150 W: 54 / 63 A max at 115 / 230 VAC 180 W: 54 / 108 A max at 115 / 230 VAC
Power Factor	• >0.9
Earth Leakage Current	• 120 W: 0.30 / 0.75 mA at 115 / 230 VAC 150 W: 0.40 / 0.75 mA at 115 / 230 VAC 150 W (-M): 0.075 mA at 230 VAC 180 W: 0.75 mA at 230 VAC
Input Protection	• Internal T3.15 A / 250 VAC fuse in line, SDS150-M: line and neutral
No Load Input Power	• 180 W: <0.5 W

Output

Output Voltage	• See table
Output Voltage Trim	• $\pm 5\%$ output 1 only (3.3 V variant $\pm 10\%$) SDS180: not user adjustable
Initial Set Accuracy	• Single output models: $\pm 1\%$ Multi-output models: $\pm 5\%$
Minimum Load	• No minimum load required for single output models. For multi-output models (see table)
Start Up Delay	• 2 s max
Start Up Rise Time	• 2 ms typical
Hold Up Time	• 16 ms minimum at full load and 110 VAC
Line Regulation	• 0.5% typical
Load Regulation	• 3.0% typical
Transient Response	• 4% max deviation, recovery to within 1% in 500 μ s for a 50% load change
Ripple & Noise	• 1% pk-pk typical, 20 MHz bandwidth
Overvoltage Protection	• 112-132% V1 only, recycle input to reset
Overload Protection	• All outputs: 110-150% with auto recovery (primary power limit)
Short Circuit Protection	• Trip & restart (hiccup mode), auto recovery
Temperature Coefficient	• $\pm 0.04\%/^{\circ}\text{C}$

General

Efficiency	• 120 W: 80% typical 150 W and 180 W: 88% typical
Isolation	• 3000 VAC Input to Output, 1500 VAC Input to Ground, 500 VDC Output to Ground, SDS150-M: 5600 VDC Input to Output, 2800 VDC Input to Ground, 500 VDC Output to Ground
Isolation Resistance	• 50 M Ω
Switching Frequency	• 120 W: PFC 100 kHz typical, PWM 67 kHz typical. 150 W: PFC 34 kHz minimum, PWM 55 kHz typical. 180 W: PFC 67 kHz typical, PWM 67 kHz typical
Power Density	• 120 W: 4.87 W/In ³ , 150 W: 6.50 W/In ³ 180 W: 7.47 W/In ³
Signals	• Power Fail Detect = TTL active low, combined AC and DC OK signal (-P versions SDS120 & 150 only) Warning time 16 ms
MTBF	• >130 kHrs to MIL-HDBK-217F at 25 $^{\circ}\text{C}$, GB

Environmental

Operating Temperature	• 0 $^{\circ}\text{C}$ to +70 $^{\circ}\text{C}$ (-20 $^{\circ}\text{C}$ to +70 $^{\circ}\text{C}$, SDS180), derate linearly from 100% load at +50 $^{\circ}\text{C}$ to 50% load at +70 $^{\circ}\text{C}$, for low temperature option add suffix -L: -40 $^{\circ}\text{C}$ to +70 $^{\circ}\text{C}$, SDS120 and SDS150, not available for SDS150-M and SDS180
Cooling	• Convection-cooled
Operating Humidity	• 5-95% RH, non-condensing
Storage Temperature	• -40 $^{\circ}\text{C}$ to +85 $^{\circ}\text{C}$

EMC & Safety

Emissions	• EN55022, level B conducted & radiated. SDS150-M: EN55011 class B conducted & radiated
Harmonic Currents	• EN61000-3-2 class A
Voltage Flicker	• EN61000-3-3
ESD Immunity	• EN61000-4-2, level 2 contact, Perf Criteria A SDS150: level 3 air, Perf criteria A SDS150-M: level 3 contact, Perf Criteria A
Radiated Immunity	• EN61000-4-3, level 2, Perf Criteria A SDS150-M: level 3, Perf Criteria A
EFT/Burst Surge	• EN61000-4-4, level 2, Perf Criteria A • EN61000-4-5, installation class 3, Perf Criteria A
Conducted Immunity	• EN61000-4-6, level 2, Perf Criteria A SDS150-M: level 3, Perf Criteria A
Magnetic Field	• EN61000-4-8, 1 A/m, Perf Criteria A SDS150-M: 3 A/m, Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, >95% 5000 ms Perf Criteria A, B, B
Safety Approvals	• EN60950-1, UL60950-1, CSA60950-1 per cUL. SDS150-M: EN60601-1

Models and Ratings

SDS120 XP

Output Power	Output 1				Output 2				Output 3				Model Number ^(2, 4, 8)
	Vnom	Imin	Imax	Tol. ⁽¹⁾	Vnom	Imin	Imax	Tol. ⁽¹⁾	Vnom	Imin	Imax	Tol. ⁽¹⁾	
72.0 W	3.3 V	0.00 A	22.00 A	5%									SDS120PS03B†^
110.0 W	5.0 V	0.00 A	22.00 A	5%									SDS120PS05B†^
115.0 W	7.0 V	0.00 A	16.42 A	5%									SDS120PS07B
120.0 W	9.0 V	0.00 A	13.33 A	4%									SDS120PS09B
120.0 W	12.0 V	0.00 A	10.00 A	3%									SDS120PS12B†^
120.0 W	15.0 V	0.00 A	8.00 A	3%									SDS120PS15B†^
120.0 W	18.0 V	0.00 A	6.66 A	3%									SDS120PS18B
120.0 W	24.0 V	0.00 A	5.00 A	2%									SDS120PS24B†^
120.0 W	28.0 V	0.00 A	4.28 A	2%									SDS120PS28B†^
120.0 W	36.0 V	0.00 A	3.33 A	2%									SDS120PS36B
120.0 W	48.0 V	0.00 A	2.50 A	2%									SDS120PS48B†^
79.5 W	+3.3 V	1.50 A	15.00 A	5%	+5.0 V	0.40 A	6.0 A	5%					SDS120PD00B
120.0 W	+3.3 V	1.50 A	15.00 A	5%	+12.0 V	0.20 A	6.0 A	5%					SDS120PD01B
120.0 W	+5.0 V	1.50 A	15.00 A	5%	+12.0 V	0.20 A	6.0 A	5%					SDS120PD02B
120.0 W	+5.0 V	1.50 A	15.00 A	5%	+15.0 V	0.20 A	6.0 A	5%					SDS120PD03B
120.0 W	+5.0 V	1.50 A	15.00 A	5%	+24.0 V	0.10 A	3.5 A	5%					SDS120PD04B
120.0 W	+5.0 V	1.50 A	15.00 A	5%	-24.0 V	0.20 A	2.0 A	5%					SDS120PD05B
120.0 W	+28.0 V	0.39 A	3.92 A	5%	+5.0 V	0.20 A	2.0 A	5%					SDS120PD06B
91.5 W	+3.3 V	1.50 A	15.00 A	5%	+5.0 V	0.60 A	6.0 A	5%	+12.0 V	0.00 A	1.0 A	5%	SDS120PT00B†^
91.5 W	+3.3 V	1.50 A	15.00 A	5%	+5.0 V	0.60 A	6.0 A	5%	-12.0 V	0.00 A	1.0 A	5%	SDS120PT01B
120.0 W	+3.3 V	1.50 A	15.00 A	5%	+12.0 V	0.60 A	6.0 A	5%	+5.0 V	0.00 A	0.8 A	5%	SDS120PT02B
120.0 W	+3.3 V	1.50 A	15.00 A	5%	+12.0 V	0.60 A	6.0 A	5%	-5.0 V	0.00 A	0.8 A	5%	SDS120PT03B
120.0 W	+3.3 V	1.50 A	15.00 A	5%	+12.0 V	0.60 A	6.0 A	5%	-12.0 V	0.00 A	0.8 A	5%	SDS120PT04B
120.0 W	+3.3 V	1.50 A	15.00 A	5%	+12.0 V	0.60 A	6.0 A	5%	+12.0 V	0.00 A	0.8 A	5%	SDS120PT05B
120.0 W	+5.0 V	1.50 A	15.00 A	5%	+12.0 V	0.60 A	6.0 A	5%	+5.0 V	0.00 A	0.8 A	5%	SDS120PT06B
120.0 W	+5.0 V	1.50 A	15.00 A	5%	+12.0 V	0.60 A	6.0 A	5%	-5.0 V	0.00 A	0.8 A	5%	SDS120PT07B†^
120.0 W	+5.0 V	1.50 A	15.00 A	5%	+12.0 V	0.60 A	6.0 A	5%	-12.0 V	0.00 A	0.8 A	5%	SDS120PT08B†^
120.0 W	+5.0 V	1.50 A	15.00 A	5%	+12.0 V	0.60 A	6.0 A	5%	+12.0 V	0.00 A	0.8 A	5%	SDS120PT09B
120.0 W	+5.0 V	1.50 A	15.00 A	5%	+15.0 V	0.60 A	6.0 A	5%	-15.0 V	0.00 A	0.8 A	5%	SDS120PT10B†^
120.0 W	+5.0 V	1.50 A	15.00 A	5%	+15.0 V	0.60 A	6.0 A	5%	+15.0 V	0.00 A	0.8 A	5%	SDS120PT11B
120.0 W	+5.0 V	1.50 A	15.00 A	5%	+24.0 V	0.35 A	3.5 A	5%	-24.0 V	0.00 A	0.8 A	5%	SDS120PT12B
120.0 W	+5.0 V	1.50 A	15.00 A	5%	+24.0 V	0.35 A	3.5 A	5%	+24.0 V	0.00 A	0.8 A	5%	SDS120PT13B
120.0 W	+5.0 V	1.50 A	15.00 A	5%	+24.0 V	0.35 A	3.5 A	5%	-12.0 V	0.00 A	0.8 A	5%	SDS120PT14B
120.0 W	+5.0 V	1.50 A	15.00 A	5%	+24.0 V	0.35 A	3.5 A	5%	+12.0 V	0.00 A	0.8 A	5%	SDS120PT15B†
120.0 W	+5.0 V	1.50 A	15.00 A	5%	+10.0 V	0.60 A	6.0 A	5%	-10.0 V	0.00 A	1.0 A	5%	SDS120PT16B
120.0 W	+5.0 V	1.50 A	15.00 A	5%	+10.0 V	0.60 A	6.0 A	5%	+10.0 V	0.00 A	1.0 A	5%	SDS120PT17B

Notes

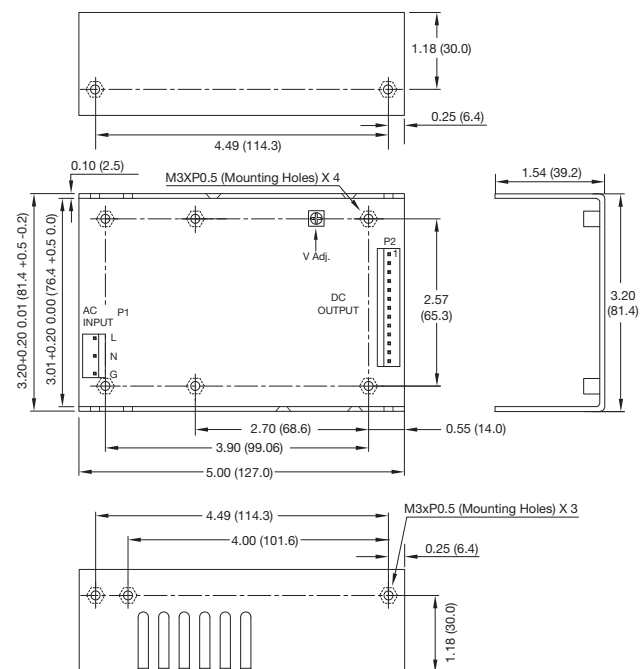
1. Tol. (total regulation) includes line regulation and load regulation.
2. For optional PCB only version, delete suffix 'B' from model number.
Example SDS120PS03.
3. For non-standard voltages contact sales.

† Available from Farnell & element14. See pages 284-290.

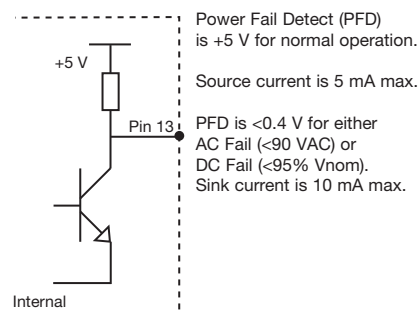
4. For optional low temperature -40 °C operation, add suffix '-L' to model number. Example: SDS120PS12B-L.
5. For optional Power Fail Detect circuit, add suffix '-P' to model number, example: SDS120PS12B-P.

^ Available from Newark. See pages 291-296.

Mechanical Details



PIN CONNECTIONS			
Pin	Single	Dual	Triple
1	V1	V2	V2
2	V1	V2	V2
3	V1	V1	V1
4	V1	V1	V1
5	V1	V1	V1
6	V1	V1	V1
7	Return	Common	Common
8	Return	Common	Common
9	Return	Common	Common
10	Return	N/C	V3
11	Return	Common	Common
12	Return	Common	Common
13	PFD ⁽¹⁾	PFD ⁽¹⁾	PFD ⁽¹⁾



Notes

1. Optional Power Fail Detect signal on '-P' versions only. Standard models pin 13 is N/C.
2. I/P connector P1 mates with Molex housing 09-50-3051 & Molex 2878 series crimp terminal.
3. O/P P2 mates with Molex housing 09-50-3131 & Molex 2878 series crimp terminal.
4. For optional cover kit order part number SDS120 COVER†^, to receive unit with cover fitted add suffix '-C' to model number, e.g. SDS120PS12B-C (overall height is 1.73 (44.0)).
5. For mating connector kit order part number SDS120 CON KIT†.
6. For cable harness order part number SDS120S LOOM†^ for single output models & SDS120M LOOM† for multi-output models.
7. Maximum mounting screw penetration: 0.16 (4.0)
8. All dimensions are in inches (mm).
9. Weight: 0.77-0.99 lbs (350-450 g) approx.
10. For PCB-only version, overall dimensions are max 5.00 x 3.00 x 1.44 (127.0 x 76.2 x 36.6).

Output Power	Output Voltage	Output Current		Total Regulation ⁽¹⁾	Model Number ^(2,4,5,6)
		Minimum	Maximum		
144 W	9 V	0 A	16.00 A	5%	SDS150PS09B†^
150 W	12 V	0 A	12.50 A	5%	SDS150PS12B†^
150 W	15 V	0 A	10.00 A	5%	SDS150PS15B†^
150 W	18 V	0 A	8.33 A	4%	SDS150PS18B†^
150 W	24 V	0 A	6.25 A	3%	SDS150PS24B†^
150 W	30 V	0 A	5.00 A	2%	SDS150PS30B
150 W	36 V	0 A	4.17 A	2%	SDS150PS36B
150 W	48 V	0 A	3.13 A	2%	SDS150PS48B†^

Notes

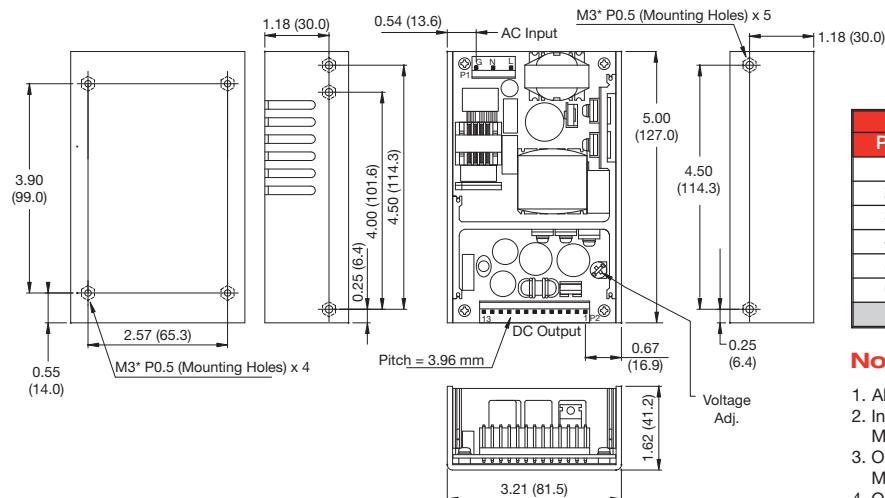
1. Total regulation includes line regulation and load regulation.
2. For optional 2 pin Molex input, add suffix '-D' to model number. Example: SDS150PS12B-D.
3. For non-standard voltages contact sales.
4. For optional low temperature -40 °C operation, add suffix '-L' to model number. Example: SDS150PS12B-L.
5. For optional PCB only version, delete suffix 'B' from model number. Example: SDS150PS48.
6. For optional Power Fail Detect signal (PFD), add suffix '-P' to model number. Example: SDS150PS48B-P.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296.

Mechanical Details

U Channel

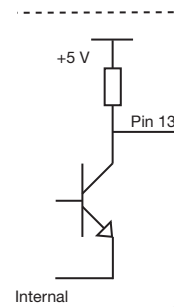
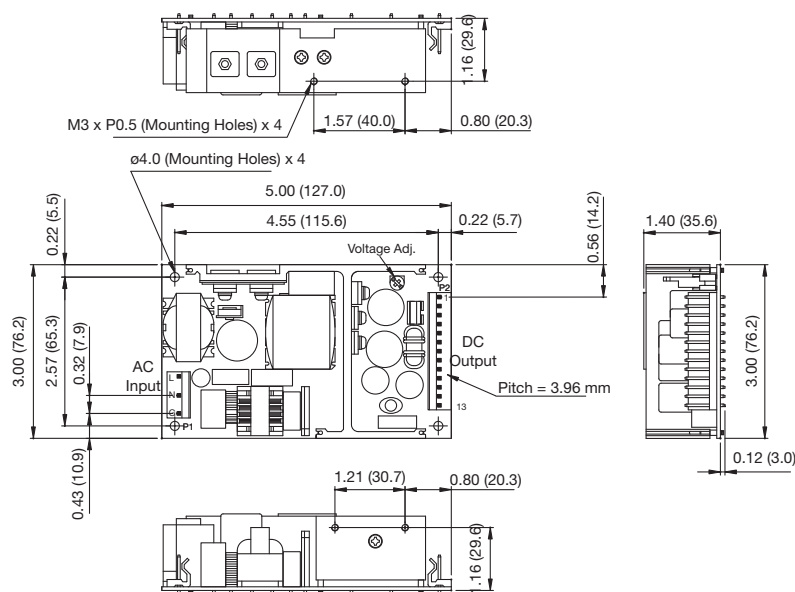


P2 - PIN CONNECTIONS			
Pin	Function	Pin	Function
1	V1	7	Return
2	V1	8	Return
3	V1	9	Return
4	V1	10	Return
5	V1	11	Return
6	V1	12	Return
		13	PFD ⁽⁴⁾

Notes

1. All dimensions in inches (mm), tolerance ± 0.02 (± 0.5).
2. Input connector P1 mates with Molex housing 09-50-3051 and Molex 2478 series crimp terminal.
3. Output connector P2 mates with Molex housing 09-50-3131 and Molex 2478 series crimp terminal.
4. Optional power fail detect signal on '-P' versions only. Standard models pin 13 is not connected.
5. For mating connector kit order part number SDS150 CON KIT.
6. For cable harness order part number SDS150 LOOM.
7. Maximum mounting screw penetration: 0.16 (4.0)
8. For optional cover kit order part number SDS150 COVER
9. Weight: U Channel - 1.27 lbs (580 g) approx.
Open Frame - 0.86 lbs (390 g) approx.

Open Frame



Power Fail Detect (PFD)
is +5 V for normal operation.

Source current is 5 mA max.

PFD is <0.4 V for either
AC Fail (<90 VAC) or
DC Fail ($<95\%$ V_{nom}).
Sink current is 10 mA max.

Models and Ratings

SDS150-M **XP**

Output Power	Output Voltage	Output Current		Total Regulation ⁽³⁾	Model Number ^(4,5)
		Minimum	Maximum		
150 W ⁽¹⁾	12 V	0 A	12.5 A	5%	SDS150PS12B-M†^
150 W ⁽²⁾	24 V	0 A	6.25 A	5%	SDS150PS24B-M†^

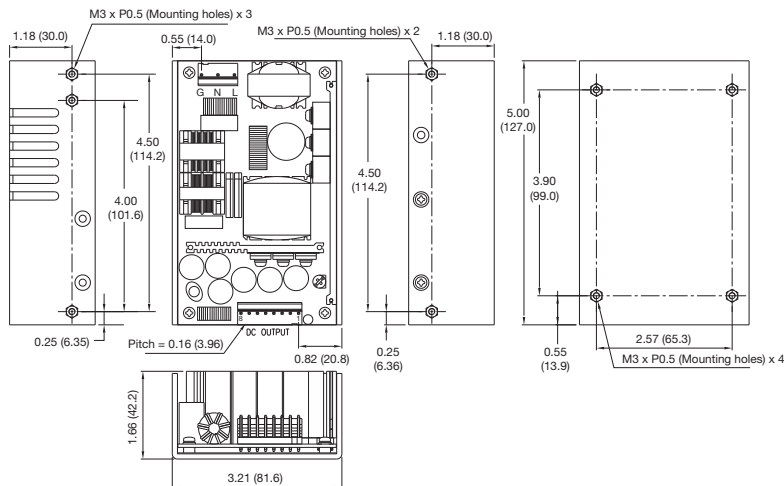
Notes

1. Output power is 150 W at highline input and 130 W at lowline input (90-132 VAC).
2. Output power decrease linearly from 150 W at 100 VAC input to 135 W at 90 VAC input.
3. Total regulation includes line regulation and load regulation.
4. For optional PCB only version delete suffix 'B' from part number.
Example SDS150PS12-M.

5. For optional 2 pin Molex input, add suffix '-D' to model number.
Example SDS150PS12-MD.
6. For non-standard voltages contact sales.

† Available from Farnell & element14. See pages 284-290.
^ Available from Newark. See pages 291-296.

Mechanical Details



P2 - PIN CONNECTIONS			
Pin	Function	Pin	Function
1	V1	5	Return
2	V1	6	Return
3	V1	7	Return
4	V1	8	Return

Notes

1. All dimensions in inches (mm), tolerance ± 0.02 (± 0.5).
2. Weight: 1.27 lbs (580 g)
3. Input connector P1 mates with Molex housing 09-50-3051 and Molex 2478 series crimp terminal.
4. Output connector P2 mates with Molex housing 09-50-3081 and Molex 2478 series crimp terminal.
5. For mating connector kit order part number: SDS150-M CON KIT.
6. For cable harness order part number SDS150-M LOOM.

Models and Ratings

SDS180 **XP**

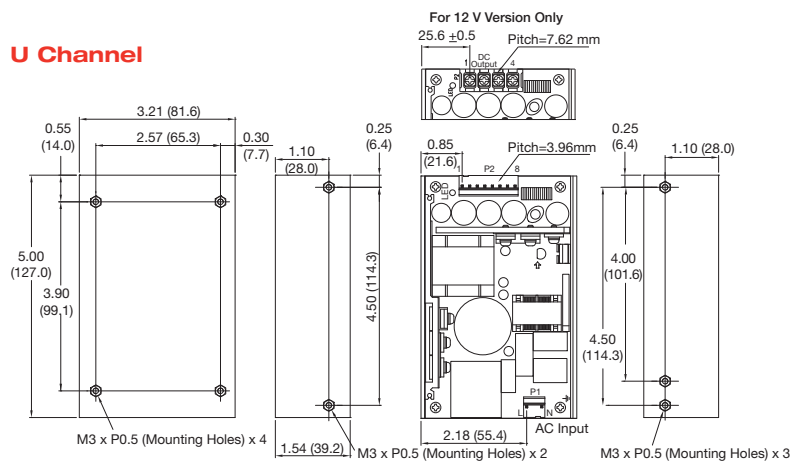
Output Power	Output Voltage	Output Current		Total Regulation ⁽²⁾	Model Number ⁽³⁾
		Minimum	Maximum		
170 W ⁽¹⁾	12 V	0 A	14.16 A	5%	SDS180PS12B†^
180 W	24 V	0 A	7.50 A	3%	SDS180PS24B†^
180 W	48 V	0 A	3.75 A	2%	SDS180PS48B†^

Notes

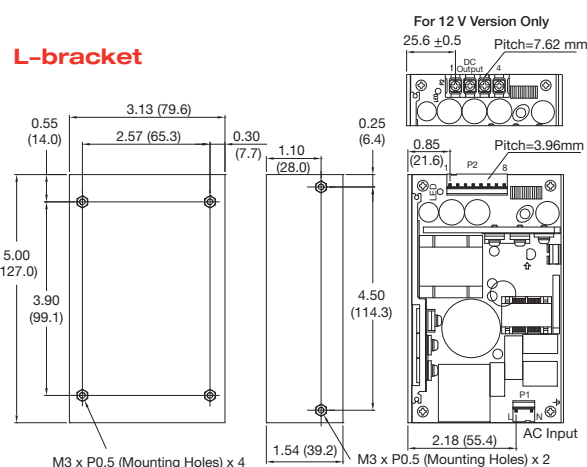
1. Output power is 170 W at highline input and 160 W at low line input, (90-132 VAC).
2. Total regulation includes line regulation and load regulation.
3. For optional L-bracket version, delete suffix 'B' from model number.
Example SDS180PS48.
4. For non-standard voltages contact sales.

Mechanical Details

U Channel



L-bracket



Notes

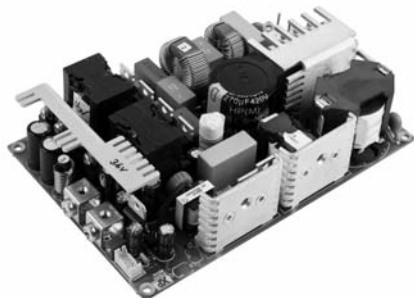
1. All dimensions in inches (mm), tolerance ± 0.02 (± 0.5).
2. Input connector P1 mates with Molex housing 09-50-3031 and Molex 2478 series crimp terminal.
3. Output connector P2 mates with Molex housing 09-50-3061 (or 09-50-3081) and Molex 2478 series crimp terminal for 24/48 V Versions. For 12 V Version, output terminal is screw terminal.
4. For mating connector kit order part number: SDS180 CON KIT.
5. For cable harness order part number SDS180 LOOM.
6. Maximum mounting screw penetration: 0.16 (4.0)
7. Weight: U Channel - 1.14 lbs (520 g)
L-bracket - 1.06 lbs (480 g)

PIN CONNECTIONS 12 V version			
Pin	Function	Pin	Function
1	Return	3	V1
2	Return	4	V1

P2 - PIN CONNECTIONS 24/48 V versions			
Pin	Function	Pin	Function
1	Return	5	V1
2	Return	6	V1
3	Return	7	V1
4	Return	8	V1

250 Watts

CCB250 Series



GREEN•POWER

- 250 W Convection Cooled
- 300 W Peak Rating for 500 ms
- Very High Efficiency up to 95%
- Class B Conducted & Radiated Emissions
- 80 – 275 VAC Operation
- IT & Medical (BF) Safety Approvals
- 3 Year Warranty

Specification

Input

Input Voltage	• 80-275 VAC (See derating curve)
Input Frequency	• 47-63 Hz
Input Current	• 2.4 A typical at 115 VAC, full load 1.2 A typical at 230 VAC, full load
Inrush Current	• 30 A max at 230 VAC, cold start at 25 °C
Power Factor	• >0.9
Earth Leakage Current	• 250 µA max at 264 VAC/60 Hz
Input Protection	• Internal T5.0 A/250 V fuse in line and neutral

Output

Output Voltage	• 12-48 VDC (see tables)
Output Voltage Trim	• ±3% (see Mechanical Details)
Initial Set Accuracy	• ±0.5% V1, ±5% V2
Minimum Load	• No minimum load required
Start Up Delay	• 1 s typical
Start Up Rise Time	• 50 ms typical
Hold Up Time	• 16 ms min at 115 VAC
Drift	• ±0.2% after 20 min warm up
Line Regulation	• ±0.5% max
Load Regulation	• ±1% V1, ±5% V2
Over/Undershoot	• 5% typical
Transient Response	• 4% max. deviation, recovery to within 1% in 500 µs for a 50-75-50% load change
Ripple & Noise	• 1% pk-pk, 20 MHz bandwidth
Overvoltage Protection	• 115-140% Vnom, recycle input to reset (V1 only)
Overload Protection	• 125-165% Inom V1 only
Short Circuit Protection	• Continuous trip and restart (hiccup mode)
Temperature Coefficient	• 0.05%/°C
Remote On/Off (Inhibit/Enable)	• Uncommitted isolated optocoupler diode, powered diode inhibits V1

General

Efficiency	• Up to 95%
Isolation	• 4000 VAC Input to Output, 1500 VAC Input to Ground, 1500 VAC Output to Ground
Switching Frequency	• PFC 30-500 kHz, Boost 25.6 kHz, Main 51.2 kHz
Signals	• Power Fail Inhibit, 5 V Standby
MTBF	• 365 kHrs to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Temperature	• -10 °C to +70 °C derate linearly from +50 °C at 2.5%/°C to 50% load at +70 °C. See derating curve.
Cooling	• Convection cooled
Operating Humidity	• 95% RH, non-condensing
Storage Temperature	• -40 °C to +85 °C
Operating Altitude	• 3000 m
Shock	• 30 g pk, half sine, 6 axes
Vibration	• 2 g rms, 5 Hz to 500 kHz, 3 axes

EMC & Safety

Low Voltage PSU EMC Emissions	• EN61204-3, high severity level • EN55011/22 level B conducted • EN55011/22 level A radiated
Harmonic Currents	• EN61000-3-2, class A
Voltage Flicker	• EN61000-3-3
Radiated Immunity	• EN61000-4-3, level 3 Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3 Perf Criteria A
Surge	• EN61000-4-5, installation class 3 Perf Criteria A
Conducted Immunity	• EN61000-4-6, level 3 Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms, Perf Criteria A, B, B, EN60601-1-2, 30% 500 ms, 60% 100 ms, 100% 10 ms, 100% 5000 ms, Perf Criteria A, A, B - 230 VAC. Consult longform datasheet for 115 V operation.
Safety Approvals	• IEC60950-1 CB report, UL60950-1, TUV EN60950-1, IEC60601-1 CB report, UL60601-1, TUV 60601-1,
Equipment Protection Class	• Class I

Models and Ratings

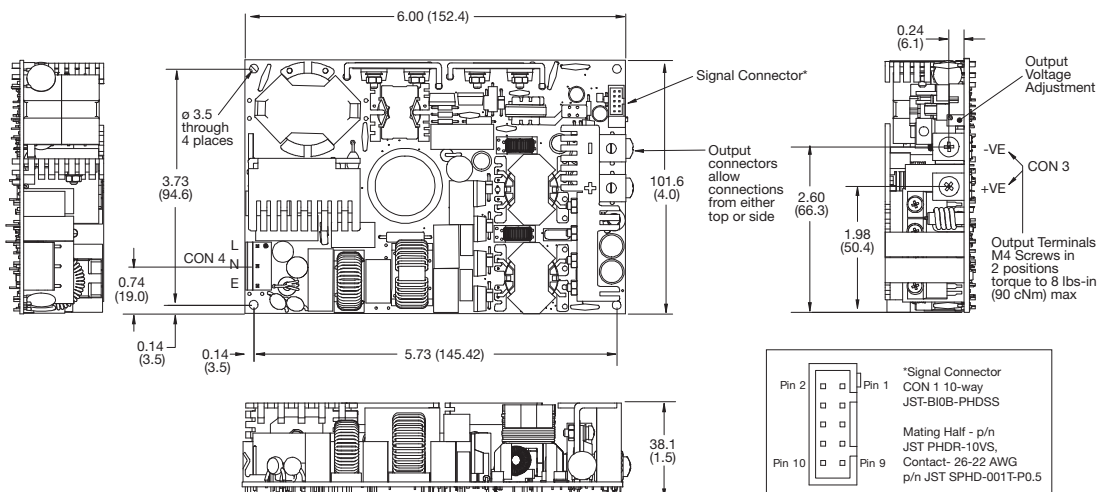
CCB250 **XP**

Output Power		Output Voltage V1	Output Current V1		Standby Supply V2	Model Number
Nominal	Peak ⁽¹⁾		Nominal	Peak ⁽¹⁾		
250 W	300 W	12.0 V	20.8 A	25.00 A	5.0 V/0.5 A	CCB250PS12
250 W	300 W	15.0 V	16.7 A	20.00 A	5.0 V/0.5 A	CCB250PS15
250 W	300 W	24.0 V	10.4 A	12.50 A	5.0 V/0.5 A	CCB250PS24
250 W	300 W	28.0 V	8.9 A	10.70 A	5.0 V/0.5 A	CCB250PS28
250 W	300 W	36.0 V	6.9 A	8.30 A	5.0 V/0.5 A	CCB250PS36
250 W	300 W	48.0 V	5.2 A	6.25 A	5.0 V/0.5 A	CCB250PS48

Notes

1. Peak duration is 500ms max, average power must not exceed 250 W.

Mechanical Details



Signals Connector CON 1	
1	5 V Standby Return
2	5 V Standby
3	5 V Standby Return
4	5 V Standby
5	5 V Standby Return
6	5 V Standby
7	Power Fail (Collector)
8	Power Fail (Emitter)
9	Remote On / Off (Cathode)
10	Remote On / Off (Anode)

Output Connector CON 3	
1	+V1
2	V1 RTN

Input Connector CON 4	
1	Line
2	Neutral
3	Earth

Notes

1. All dimensions in inches (mm).

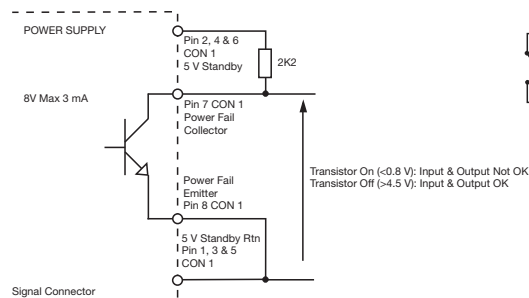
2. Tolerance .xx = ±0.02 (0.50); .xxx = ±0.01 (0.25)

3. Weight 1.7 lb (780 g) approx

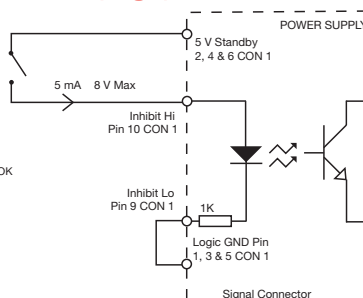
Mates with Molex housing 09-50-1051 and Molex series 5194 crimp terminals.

Signals

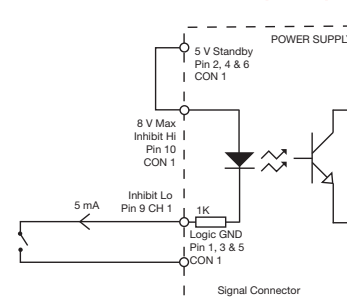
Power Fail



Inhibit (High)

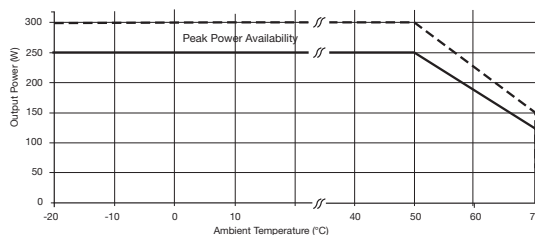
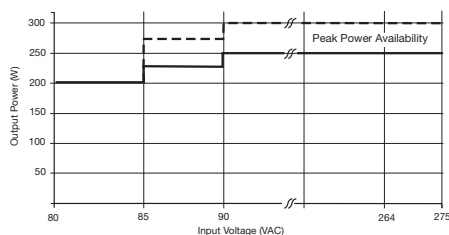


Inhibit (Low)



Signals	Notes & Conditions
Power Fail	Uncommitted opto isolated transistor, normally off when AC is good Provides ≥ 5 ms (typically 20-30 ms) warning of loss of output from AC failure
Remote On/Off (Inhibit/Enable)	Uncommitted isolated optocoupler diode, powered diode inhibits the supply
Standby Supply V2	Isolated 5 V/0.5 A supply, always present when AC supplied.

Input Voltage & Temperature Derating



250 Watts CCM Series



GREEN•POWER

- 250 W Convection Cooled
- 300 W Peak Rating for 500 ms
- Very High Efficiency up to 95%
- Class B Conducted & Radiated Emissions
- 80 – 275 VAC Operation
- IT, Industrial & Medical Safety Approvals
- 3 Year Warranty

Specification

Input

Input Voltage	• 80-275 VAC (See derating curve)
Input Frequency	• 47-63 Hz
Input Current	• 2.4 A typical at 115 VAC, full load 1.2 A typical at 230 VAC, full load
Inrush Current	• 30 A max at 230 VAC, cold start at 25 °C
Power Factor	• >0.9
Earth Leakage Current	• 250 µA max at 264 VAC/60 Hz
Input Protection	• Internal T5.0 A/250 V fuse in line and neutral

Output

Output Voltage	• 12-48 VDC (see tables)
Output Voltage Trim	• ±3% (see Mechanical Details)
Initial Set Accuracy	• ±0.5% V1, ±5% V2
Minimum Load	• No minimum load required
Start Up Delay	• 1 s typical
Start Up Rise Time	• 50 ms typical
Hold Up Time	• 16 ms min at 115 VAC
Drift	• ±0.2% after 20 min warm up
Line Regulation	• ±0.5% max
Load Regulation	• ±1% V1, ±5% V2
Over/Undershoot	• 5% typical
Transient Response	• 4% max. deviation, recovery to within 1% in 500 µs for a 50-75-50% load change
Ripple & Noise	• 1% pk-pk, 20 MHz bandwidth
Overvoltage Protection	• 115-140% Vnom, recycle input to reset (V1 only)
Overload Protection	• 125-165% Inom V1 only
Short Circuit Protection	• Continuous trip and restart (hiccup mode)
Temperature Coefficient	• 0.05%/°C
Remote On/Off (Inhibit/Enable)	• Uncommitted isolated optocoupler diode, powered diode inhibits V1

General

Efficiency	• Up to 95%
Isolation	• 4000 VAC Input to Output, 1500 VAC Input to Ground, 500 VAC Output to Ground
Switching Frequency	• PFC 30-500 kHz, Boost 25.6 kHz, Main 51.2 kHz
Signals	• Power Fail - open collector, transistor off for AC good, ≥5 ms warning of loss of output
MTBF	• 365 kHrs to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Temperature	• -20 °C to +70 °C derate linearly from +50 °C at 2.5%/°C to 50% load at +70 °C. See derating curve and longform datasheet for thermal considerations. (-40 °C consult sales)
Cooling	• Convection cooled
Operating Humidity	• 95% RH, non-condensing
Storage Temperature	• -40 °C to +85 °C
Operating Altitude	• 3000 m
Shock	• 30 g pk, half sine, 6 axes
Vibration	• 2 g rms, 5 Hz to 500 kHz, 3 axes

EMC & Safety

Low Voltage PSU EMC Emissions	• EN61204-3, high severity level • EN55011/22 level B conducted • EN55011/22 level B radiated
Harmonic Currents	• EN61000-3-2, class A, • EN61000-3-2, class C for loads ≥40%
Voltage Flicker	• EN61000-3-3
Radiated Immunity	• EN61000-4-3, level 3 Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3 Perf Criteria A
Surge	• EN61000-4-5, installation class 3 • Perf Criteria A
Conducted Immunity	• EN61000-4-6, level 3 Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms, Perf Criteria A, B, B, • EN60601-1-2, 30% 500 ms, 60% 100 ms, 100% 10 ms, 100% 5000 ms, Perf Criteria A, A, A, B - 230 VAC. Consult longform datasheet for 115 V operation.
Safety Approvals	• See Safety Approvals (see next page)
Equipment Protection Class	• Class I

Models and Ratings

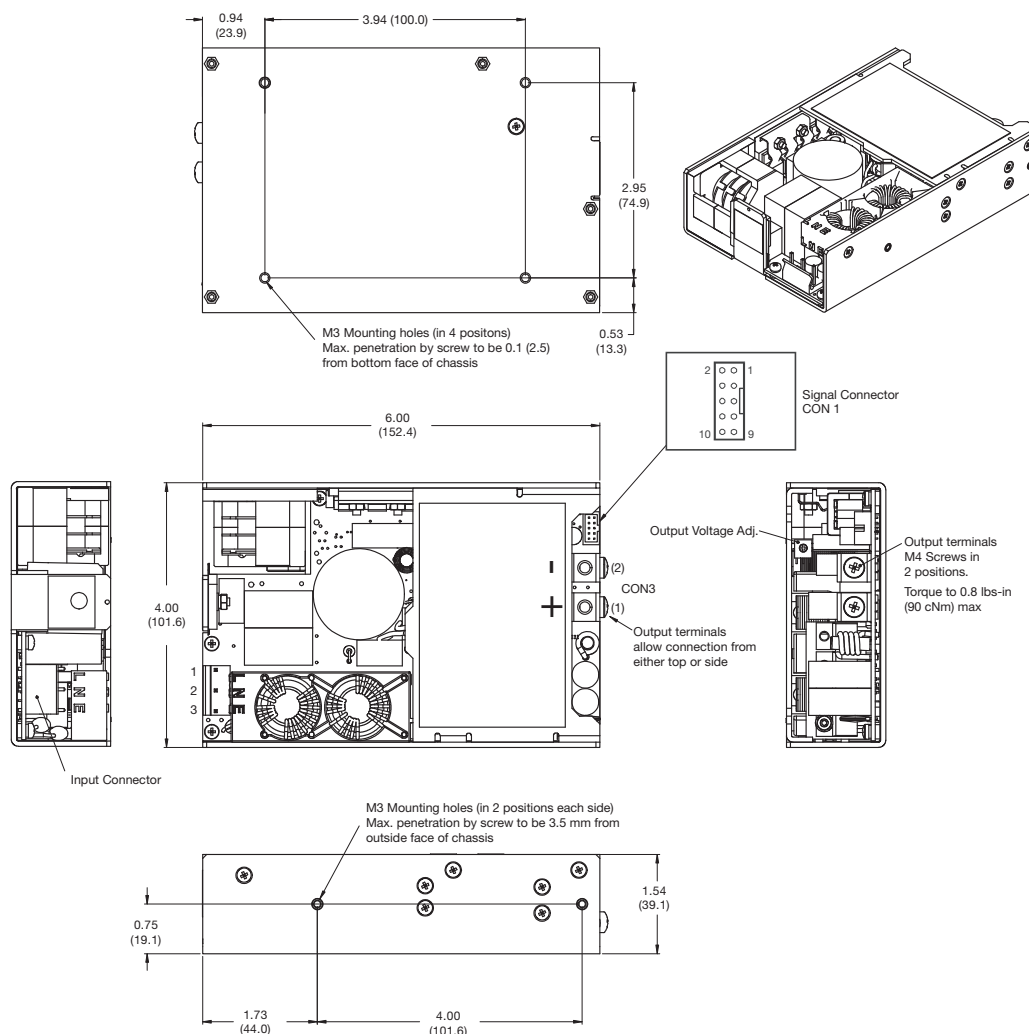
CCM250 **XP**

Output Power		Output Voltage V1	Output Current V1		Standby Supply V2	Model Number
Nominal	Peak ⁽¹⁾		Nominal	Peak ⁽¹⁾		
250 W	300 W	12.0 V	20.8 A	25.00 A	5.0 V/0.5 A	CCM250PS12
250 W	300 W	15.0 V	16.7 A	20.00 A	5.0 V/0.5 A	CCM250PS15
250 W	300 W	24.0 V	10.4 A	12.50 A	5.0 V/0.5 A	CCM250PS24
250 W	300 W	28.0 V	8.9 A	10.70 A	5.0 V/0.5 A	CCM250PS28
250 W	300 W	36.0 V	6.9 A	8.30 A	5.0 V/0.5 A	CCM250PS36
250 W	300 W	48.0 V	5.2 A	6.25 A	5.0 V/0.5 A	CCM250PS48

Notes

1. Peak duration is 500 ms max, average power must not exceed 250 W.

Mechanical Details



Input Connector

Pin 1	Line
Pin 2	Neutral
Pin 3	Earth

Input connector mates with Molex housing 09-50-1051 and Molex series 5194 crimp terminals.

Output Connector CON 3

Pin 1	+V1
Pin 2	V1 RTN

Signals Connector CON 1

Pin 1	5 V Standby Return
Pin 2	5 V Standby
Pin 3	5 V Standby Return
Pin 4	5 V Standby
Pin 5	5 V Standby Return
Pin 6	5 V Standby
Pin 7	Power Fail (Collector)
Pin 8	Power Fail (Emitter)
Pin 9	Remote On / Off (Cathode)
Pin 10	Remote On / Off (Anode)

CON 1 mates with JST housing PHDR-10VS with contact SPHD-001T-P0.5

Notes

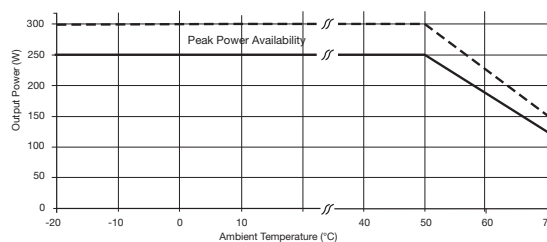
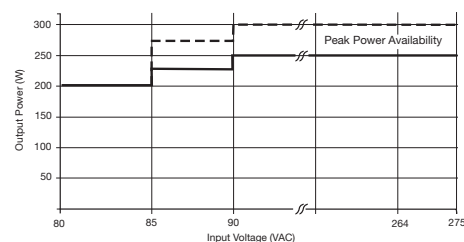
1. At AC switch on the output (V1) may momentarily rise when the unit is disabled using the 5 V standby supply in conjunction with the Remote On/Off function. (See longform datasheet for details)

2. All dimensions in inches (mm).

3. Tolerance .xx = ± 0.02 (0.50); .xxx = ± 0.01 (0.25)

4. Weight 1.7 lb (780 g) approx

Input Voltage & Temperature Derating



Safety Approvals

IEC60950-1 CB report, CSA 22.2 No. 60950-1, UL60950-1, TUV EN60950-1

IEC60601-1 CB report, CSA 22.2 No. 60601-1, UL60601-1, TUV 60601-1,

TUV IEC61010-1

250 Watts

SDR Series



- 3.2" x 5" Footprint
- Fits 1U Applications
- Low Leakage Current Option
- Up to 600 W Peak Power
- Single & Dual Outputs
- Top Fan & Convection-cooled Versions
- 3 Year Warranty

Specification

Input

Input Voltage	• 90-132 VAC/180-264 VAC, auto ranging
Input Frequency	• 47-63 Hz
Input Current	• 6 A at 115 VAC, 3 A at 230 VAC
Inrush Current	• Max 70 A at 230 VAC, 35 A at 115 VAC, cold start at 25 °C
Power Factor	• EN61000-3-2, class A
Earth Leakage Current	• <1.5 mA at 264 VAC, option '-L' 500 μ A leakage current
Input Protection	• Internal T8A/250 V fuse in line

Output

Output Voltage	• See tables
Output Voltage Trim	• $\pm 5\%$ on V1 (V2 of dual output models will track by same % of adjustment)
Initial Set Accuracy	• $\pm 1\%$
Minimum Load	• 1% on single output models, 10% on both outputs for dual models
Start Up Delay	• 1.5 s max at 120 VAC
Start Up Rise Time	• 50 ms typical
Hold Up Time	• 20 ms min at 80% of full load
Line Regulation	• $\pm 0.5\%$
Load Regulation	• $\pm 1\%$ 1-100% load for single outputs $\pm 3\%$ V1, $\pm 7\%$ V2 for dual outputs (except 0312 & 0512 models, $\pm 10\%$ regulation on V2)
Over/Undershoot	• 5% max
Transient Response	• 5% max deviation, recovery to within 1% in 500 μ s for a 50% load change
Ripple & Noise	• 1% pk-pk (see note 3)
Overvoltage Protection	• <130% Vnom on output V1, recycle input to reset
Overtemperature Protection	• Measured internally with auto recovery
Overload Protection	• 110-140%
Short Circuit Protection	• Trip & restart (hiccup mode), auto recovery
Remote On/Off	• Requires a low signal to inhibit output (hiccup mode)
Fan Supply	• 12 VDC, 300 mA, not available on '-F' version with built-in fan

General

Efficiency	• Single output models: 3.3 V & 5 V models 70%, 12 V models 80%, all other models >83% at 230 V & full load. Dual output models: >70% at 230 V & full load
Isolation	• 3000 VAC Input to Output 1500 VAC Input to Ground 100 VDC Output to Ground
Switching Frequency	• 29 kHz typical
Power Density	• 10.4 W/in ³
Signals	• Power Good TTL HIGH within 100-500 ms and LOW ≤ 1 ms before loss of regulation
MTBF	• 150 kHrs typical to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Temperature	• 0 °C to +70 °C, derate at 2.5%/ °C from +50 °C to +70 °C for single output & forced air cooled dual output models. For convection cooled dual output models, (see note 7)
Storage Temperature	• -20 °C to +85 °C
Operating Humidity	• 5-90%, non-condensing
Storage Humidity	• 5-90%, non-condensing
Cooling	• '-F' version has built-in fan, others require 16 CFM to meet forced air ratings
Operating Altitude	• 3000 m
Vibration	• 5-50 Hz, acceleration 7.35 m/s ² on X, Y and Z axis

EMC & Safety

Emissions	• EN55022 level B conducted & radiated
Harmonic Currents	• EN61000-3-2, class A
Voltage Flicker	• EN61000-3-3
ESD Immunity	• EN61000-4-2, level 3 Perf Criteria A
Radiated Immunity	• EN61000-4-3, 3 V/m Perf Criteria A
EFT/Burst	• EN61000-4-4, level 2 Perf Criteria A
Surge	• EN61000-4-5, installation class 3, Perf Criteria A
Conducted Immunity	• EN61000-4-6, 3V Perf Criteria A
Dips & Interruptions	• EN61000-4-11 30% 10 ms, 60% 100 ms, 100% 5000 ms, Perf Criteria A, B, B
Safety Approvals	• UL60950-1, CSA C22.2 No. 950, EN60950-1

Models and Ratings

SDR250 **XP**

Output Voltage	Output Power	Output Current		Ripple & Noise Pk-Pk ⁽³⁾	Model Number ^(1,4,5)
		Nominal	Peak ⁽²⁾		
5 V	200 W	40.00 A	120.00 A	50 mV	SDR250AS05-F ⁽⁶⁾
9 V	225 W	25.00 A	66.67 A	90 mV	SDR250AS09-F ⁽⁶⁾
12 V	250 W	20.83 A	50.00 A	120 mV	SDR250AS12-F
15 V	250 W	16.70 A	40.00 A	150 mV	SDR250AS15-F
18 V	250 W	13.89 A	33.30 A	180 mV	SDR250AS18-F ⁽⁶⁾
24 V	250 W	10.42 A	25.00 A	240 mV	SDR250AS24-F
28 V	250 W	8.93 A	21.43 A	280 mV	SDR250AS28-F ⁽⁶⁾
36 V	250 W	6.94 A	16.67 A	360 mV	SDR250AS36-F
48 V	250 W	5.21 A	12.50 A	480 mV	SDR250AS48-F ⁽⁶⁾
54 V	250 W	4.63 A	11.10 A	540 mV	SDR250AS54-F ⁽⁶⁾
60 V	250 W	4.17 A	10.00 A	600 mV	SDR250AS60-F ⁽⁶⁾

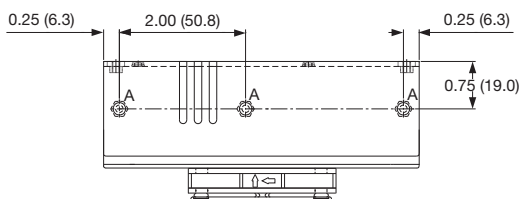
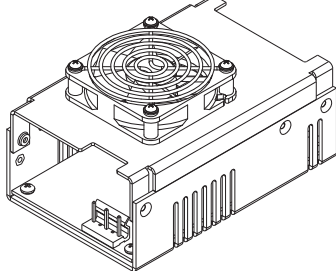
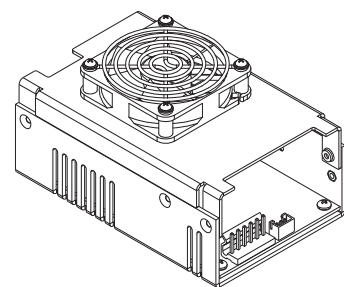
Output Voltage	Output Power	Output Current		Ripple & Noise Pk-Pk ⁽³⁾	Model Number ^(1,4,5)
		Nominal	Peak ⁽²⁾		
V1 : +3.3 V	200 W	24.0 A	28.8 A	50 mV	SDR250AD0312-F ⁽⁶⁾
V2 : +12.0 V		12.0 A	14.4 A	120 mV	
V1 : +3.3 V	200 W	24.0 A	28.8 A	50 mV	SDR250AD0324-F ⁽⁶⁾
V2 : +24.0 V		6.0 A	7.2 A	240 mV	
V1 : +5.0 V	200 W	24.0 A	28.8 A	50 mV	SDR250AD0512-F ⁽⁶⁾
V2 : +12.0 V		12.0 A	14.4 A	120 mV	
V1 : +5.0 V	200 W	24.0 A	28.8 A	50 mV	SDR250AD0524-F ⁽⁶⁾
V2 : +24.0 V		6.0 A	7.2 A	240 mV	
V1 : +5.0 V	200 W	24.0 A	28.8 A	50 mV	SDR250AD0548-F ⁽⁶⁾
V2 : +48.0 V		3.0 A	3.6 A	480 mV	
V1 : +12.0 V	250 W	12.0 A	14.4 A	120 mV	SDR250AD1224-F
V2 : +24.0 V		6.0 A	7.2 A	240 mV	

Notes

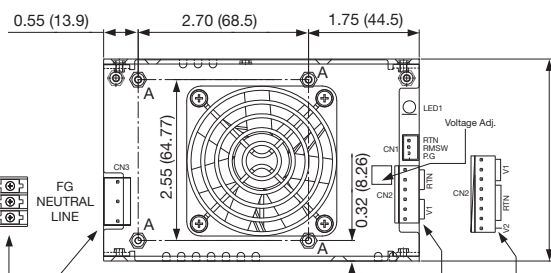
1. Add suffix 'L' to model number for optional 500 μ A leakage current.⁽⁶⁾
2. Peak load can be taken for 500 μ s. Average power not to exceed max power.
3. Ripple & noise is measured using a 0.1 μ F ceramic capacitor in parallel with 22 μ F electrolytic and 20 MHz bandwidth.
4. Add suffix 'D' for optional output terminal block except the 5 V and 9 V output models which are only available with output terminal blocks.⁽⁶⁾
5. Add suffix 'E' for optional input terminal block.⁽⁶⁾
6. Available for OEM quantities, contact Sales.

Mechanical Details

Enclosed with top fan (option -F)



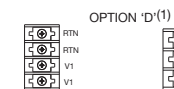
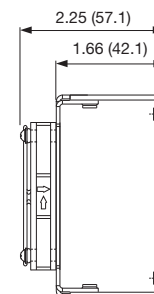
A Mounting hole 7 places, M3 x 0.5 mm.
Max penetration 3.8 mm



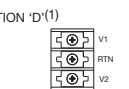
OPTION 'E'
Terminal Block
M3 Screw
3 Pins 0.25 (6.35) Center

Molex Part No. 09-93-0500 or equivalent (5 Pin, 3 Used)

Dual Output Models
Single Output Models
(5 V & 9 V Models Only Available With Screw Terminals)



Single Output Models
Terminal Block
M3 Screw 4 Pins
0.25 (6.3) Center
Max torque for all screw terminals 7.0 lbs-in (0.8 Nm)
(1) Available for OEM quantities, contact Sales.



Notes

1. All dimensions are in inches (mm). Tolerance: ± 0.012 (± 0.3)
2. Weight: 0.95 lbs (430 g)
3. Signal connector CN1 mates with JST XHP-3 or equivalent & crimp terminals SXH-002T-P0.6.
4. Input: Molex No. 09-93-0500, crimp terminals Molex series 6838.
5. Output: Molex No. 09-93-0600 for 12 V to 60 V single output models, 09-93-0800 for dual output models, crimp terminals Molex series 6838.
6. Terminal block for 5 V to 9 V single output models.

Mechanical Details

SDR250 **XP**

Output Voltage	Forced-cooled		Convection-cooled		Peak Current ⁽²⁾	Ripple & Noise Pk-Pk ⁽³⁾	Model Number ^(1,4,5,6)
	Output Power	Output Current	Output Power	Output Current			
5 V	200 W	40.00 A	100 W	20.00 A	120.00 A	50 mV	SDR250AS05 ⁽⁶⁾ ▲
9 V	225 W	25.00 A	121 W	13.50 A	66.67 A	90 mV	SDR250AS09 ⁽⁶⁾
12 V	250 W	20.83 A	135 W	11.23 A	50.00 A	120 mV	SDR250AS12 [†] ▲
15 V	250 W	16.70 A	135 W	9.00 A	40.00 A	150 mV	SDR250AS15 [†] ▲
18 V	250 W	13.89 A	135 W	7.50 A	33.30 A	180 mV	SDR250AS18 ⁽⁶⁾
24 V	250 W	10.42 A	135 W	5.63 A	25.00 A	240 mV	SDR250AS24 [†] ▲
28 V	250 W	8.93 A	135 W	4.82 A	21.43 A	330 mV	SDR250AS28 ⁽⁶⁾
36 V	250 W	6.94 A	135 W	3.75 A	16.67 A	360 mV	SDR250AS36
48 V	250 W	5.21 A	135 W	2.81 A	12.30 A	480 mV	SDR250AS48 ⁽⁶⁾ ▲
54 V	250 W	4.63 A	135 W	2.50 A	11.10 A	540 mV	SDR250AS54 ⁽⁶⁾
60 V	250 W	4.17 A	135 W	2.25 A	10.00 A	600 mV	SDR250AS60 ⁽⁶⁾

Output Voltage	Forced-cooled		Convection-cooled		Peak Current ⁽²⁾	Ripple & Noise Pk-Pk ⁽³⁾	Model Number ^(1,4,5,6,7)
	Output Power	Output Current	Output Power	Output Current			
V1 : +3.3 V	200 W	24.0 A	100 W	12.0 A	28.8 A	50 mV	SDR250AD0312 ⁽⁶⁾
V2 : +12.0 V		12.0 A		7.0 A	14.4 A	120 mV	
V1 : +3.3 V	200 W	24.0 A	100 W	12.0 A	28.8 A	50 mV	SDR250AD0324 ⁽⁶⁾
V2 : +24.0 V		6.0 A		4.0 A	7.2 A	240 mV	
V1 : +5.0 V	200 W	24.0 A	100 W	12.0 A	28.8 A	50 mV	SDR250AD0512 ⁽⁶⁾
V2 : +12.0 V		12.0 A		7.0 A	14.4 A	120 mV	
V1 : +5.0 V	200 W	24.0 A	100 W	12.0 A	28.8 A	50 mV	SDR250AD0524 ⁽⁶⁾
V2 : +24.0 V		6.0 A		4.0 A	7.2 A	240 mV	
V1 : +5.0 V	200 W	24.0 A	100 W	12.0 A	28.8 A	50 mV	SDR250AD0548 ⁽⁶⁾
V2 : +48.0 V		3.0 A		2.0 A	3.6 A	480 mV	
V1 : +12.0 V	250 W	12.0 A	135 W	7.0 A	14.4 A	120 mV	SDR250AD1224
V2 : +24.0 V		6.0 A		4.0 A	7.2 A	240 mV	

Notes

1. Add suffix 'L' to model number for optional 500 μ A leakage current.⁽⁶⁾
2. Peak load can be taken for 500 μ s. Average power not to exceed max power.
3. Ripple & noise is measured using a 0.1 μ F ceramic capacitor in parallel with 22 μ F electrolytic and 20 MHz bandwidth.
4. For optional vented cover add suffix '-C' to model number.
5. Add suffix '-D' for optional output terminal block except the 5 V and 9 V output models which are only available with output terminal blocks.⁽⁶⁾

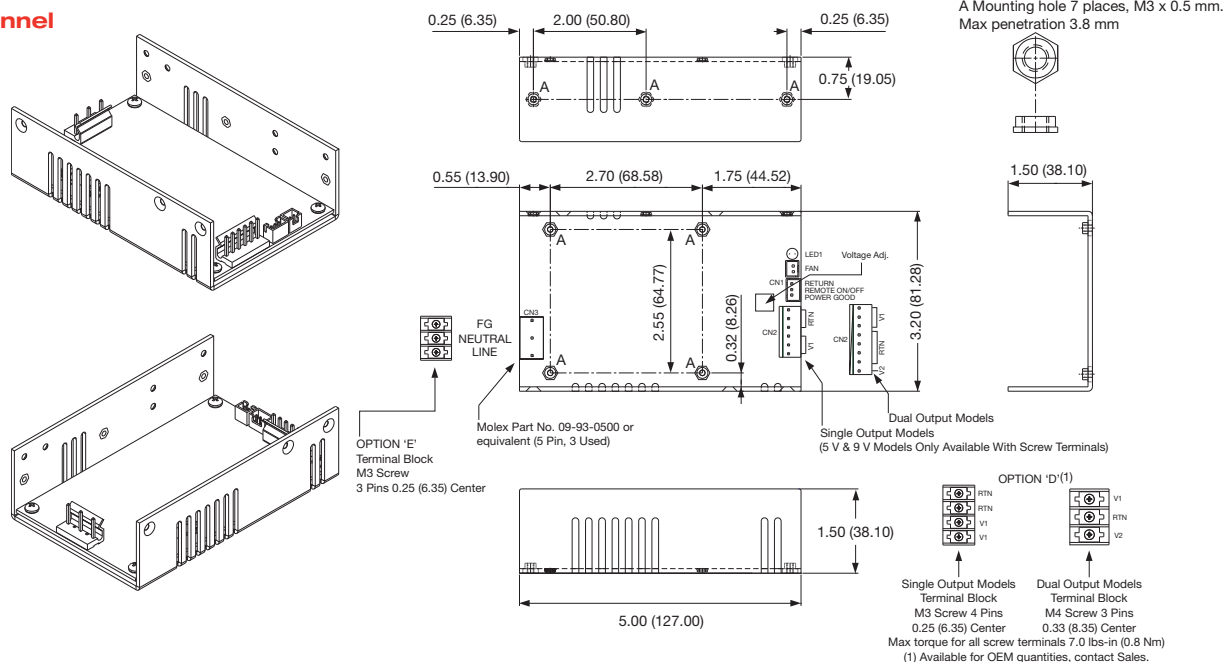
6. Add suffix '-E' for optional input terminal block.⁽⁶⁾
7. Operating temperature - 0 °C to +60 °C, derate at 5%/ °C from 50 °C to 60 °C for convection cooled dual output models.
8. Available for OEM quantities, contact Sales.

† Available from Farnell & element14. See pages 284-290.

▲ Available from Newark. See pages 291-296.

Mechanical Details

U-Channel



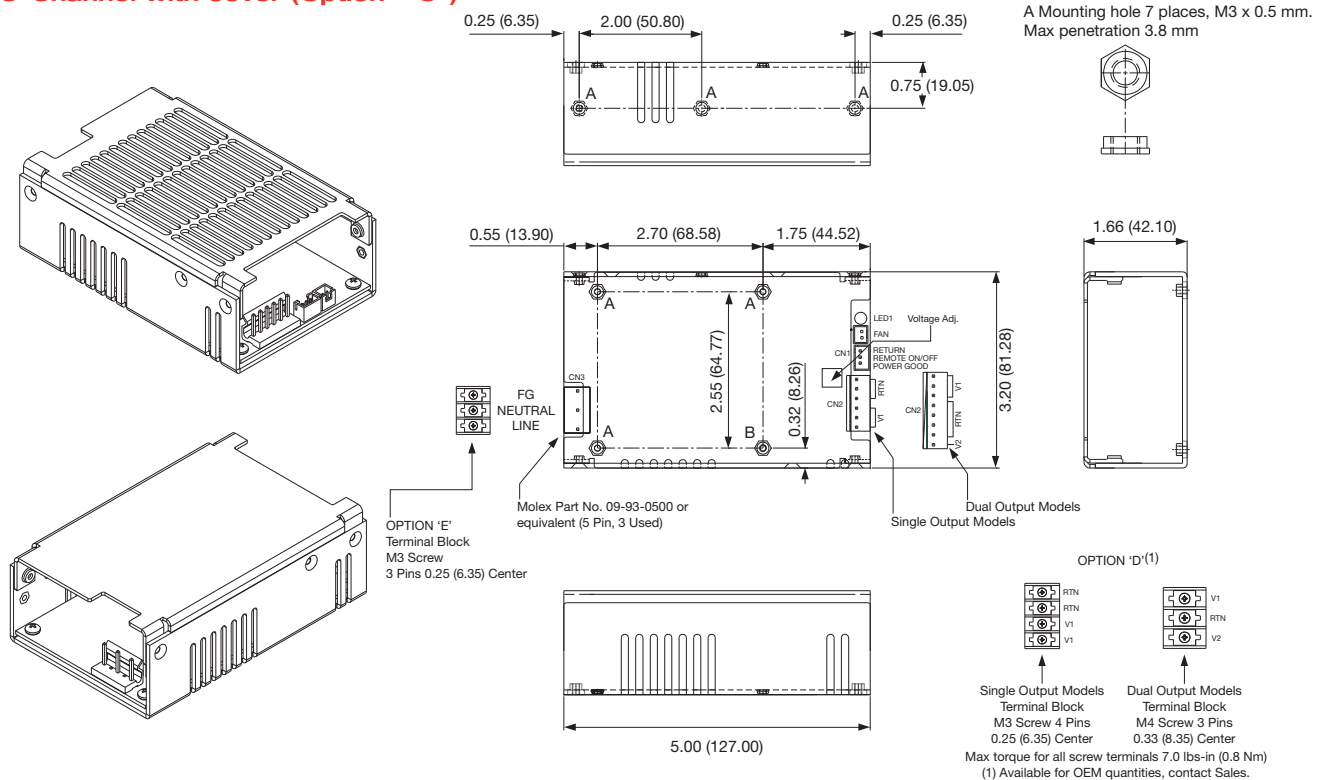
Notes

1. All dimensions are in inches (mm). Tolerance: ± 0.012 (± 0.3)
2. Weight: 0.88 lbs (400 g)
3. Signal connector CN1 mates with JST XHP-3 or equivalent & crimp terminals SXH-002T-P0.6.
4. Fan connector mates with JST XHP-2 or equivalent & crimp terminals.
5. Input: Molex No. 09-93-0500, crimp terminals Molex series 6838.
6. Output: Molex No. 09-93-0600 for 12 V to 60 V single output models, 09-93-0800 for dual output models, crimp terminals Molex series 6838.
7. Terminal block for 5 V to 9 V single output models.

Mechanical Details

SDR250 XP

U-Channel with cover (Option '-C')

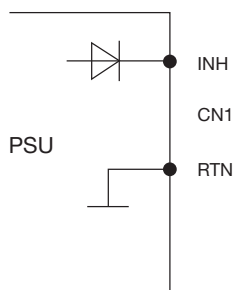


Notes

1. All dimensions are in inches (mm). Tolerance: ± 0.012 (± 0.3)
2. Weight: 0.93 lbs (420 g)
3. Signal connector CN1 mates with JST XHP-3 or equivalent & crimp terminals SXH-002T-P0.6.
4. Fan connector mates with JST XHP-2 or equivalent & crimp terminals.
5. Input: Molex No. 09-93-0500, crimp terminals Molex series 6838.
6. Output: Molex No. 09-93-0600 for 12 V to 60 V single output models, 09-93-0800 for dual output models, crimp terminals Molex series 6838.
7. Terminal block for 5 V to 9 V single output models

Application Notes

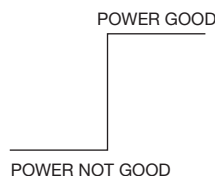
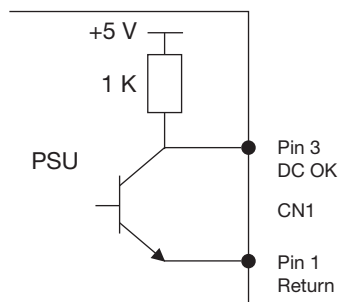
Remote On/Off



Note:

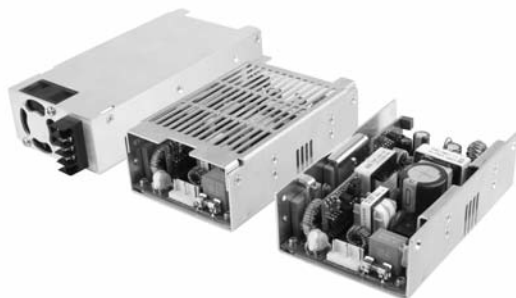
1. Applying < 0.3 V or short between pins 2 and 1 turns the output OFF.
2. Applying > 4.5 V or open circuit between pins 2 and 1 turns output ON.
3. The output will enter hiccup mode. Recommended maximum time is 3 minutes.

Power Good



Sink current = 6 mA
Source current = 1 mA

300 Watts SDF Series



- 3.2" x 5" Footprint
- Fits 1U Applications
- High Efficiency
- Up to 600 W Peak Power
- Single & Dual Outputs
- Output Voltages from 5 V to 54 V
- 3 Year Warranty

Specification

Input

Input Voltage	• 90-264 VAC
Input Frequency	• 47-63 Hz
Input Current	• 5.0 A at 90 VAC, 2 A at 230 VAC
Inrush Current	• Max 70 A at 230 VAC, 35 A at 115 VAC, cold start 25 °C
Power Factor	• >0.9
Earth Leakage Current	• <1 mA at 264 VAC
Input Protection	• F5 A / 350 V internal in line fuse

Output

Output Voltage	• See table
Output Voltage Trim	• $\pm 5\%$ on V1 (V2 of dual output models will track by same % of adjustment)
Initial Set Accuracy	• $\pm 1\%$
Minimum Load	• 1% on single output models, 10% on both outputs of dual output models
Start Up Delay	• 1.5 s max at 120 VAC
Start Up Rise Time	• 100 ms typical
Hold Up Time	• 16 ms min at 80% of full load, 120 VAC
Line Regulation	• $\pm 0.5\%$
Load Regulation	• $\pm 1\%$ 1-100% load for single outputs $\pm 3\%$ V1, $\pm 7\%$ V2 for dual output models (except 0512, $\pm 10\%$ on V2)
Over/Undershoot	• 5% max
Transient Response	• 5% max deviation, recovery to within 1% in 2.5 ms for a 50% load change
Ripple & Noise	• 1% pk-pk (see note 1)
Overvoltage Protection	• 105-130% Vnom on output V1, recycle input to reset
Overtemperature Protection	• Measured internally with auto recovery
Overload Protection	• 110-140%
Short Circuit Protection	• Trip & restart (hiccup mode), auto recovery
Remote On/Off	• Requires a low signal to inhibit output
Fan Supply	• 12 VDC, 300 mA, not available on 'F', 'E' or 'K' versions with built-in fan

General

Efficiency	• Single output models: typically 87% Dual output models: typically 82%
Isolation	• 3000 VAC Input to Output 1500 VAC Input to Ground 250 VDC Output to Ground
Switching Frequency	• 40-66 kHz PFC variable, 55 kHz - 75 kHz PWM fixed
Power Density	• 12.5 W/in ³
Signals	• Power Good goes Hi 100-500 ms after output is in regulation and goes Low at least 1 ms before loss of regulation
MTBF	• 110 kHrs to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Temperature	• 0 °C to +70 °C, derate at 2.5%/ °C from +50 °C to +70 °C
Storage Temperature	• -20 °C to +85 °C
Operating Humidity	• 5-90%, non-condensing
Storage Humidity	• 5-95%, non-condensing
Cooling	• 'F', 'E' & 'K' versions have built-in fan, others require 15 CFM to meet forced air ratings
Operating Altitude	• 3000 m
Vibration	• 5-50 Hz, acceleration 7.35 m/s ² on X, Y and Z axis

EMC & Safety

Emissions	• EN55022 Level B conducted & radiated
Harmonic Currents	• EN61000-3-2 class A EN61000-3-2 class C for loads $\geq 20\%$
Voltage Flicker	• EN61000-4-2, level 3 Perf Criteria A
ESD Immunity	• EN61000-3-3
Radiated Immunity	• EN61000-4-3, 3 V/m Perf Criteria A
EFT/Burst	• EN61000-4-4, level 2 Perf Criteria A
Surge	• EN61000-4-5, installation class 3, Perf Criteria A
Conducted Immunity	• EN61000-4-6, 3V Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms, Perf Criteria A, B, B
Safety Approvals	• UL60950-1, CSA C22.2 No. 950, EN60950-1

Models and Ratings

SDF300 **XP**

Output Voltage	Output Power	Output Current		Model Number ^(3,4,5,6)
		Nominal	Peak ⁽²⁾	
5 V	210 W	42.00 A	120.00 A	SDF300PS05 ⁽⁷⁾
9 V	245 W	27.27 A	66.67 A	SDF300PS09 ⁽⁷⁾
12 V	300 W	25.00 A	50.00 A	SDF300PS12
15 V	300 W	20.00 A	40.00 A	SDF300PS15
18 V	300 W	16.67 A	33.30 A	SDF300PS18 ⁽⁷⁾
24 V	300 W	12.50 A	25.00 A	SDF300PS24
28 V	300 W	10.70 A	21.43 A	SDF300PS28 ⁽⁷⁾
36 V	300 W	8.33 A	16.67 A	SDF300PS36 ⁽⁷⁾
48 V	300 W	6.25 A	12.50 A	SDF300PS48
54 V	300 W	5.56 A	11.10 A	SDF300PS54 ⁽⁷⁾
V1: +5.00 V V2: +12.0 V	240 W	24.00 A 13.33 A	28.80 A 16.00 A	SDF300PD0512 ⁽⁷⁾
V1: +5.00 V V2: +24.0 V	240 W	24.00 A 6.67 A	28.80 A 8.00 A	SDF300PD0524 ⁽⁷⁾
V1: +5.00 V V2: +48.0 V	240 W	24.00 A 3.33 A	28.80 A 4.00 A	SDF300PD0548 ⁽⁷⁾
V1: +12.0 V V2: +24.0 V	240 W	13.33 A 6.67 A	16.00 A 8.00 A	SDF300PD1224 ⁽⁷⁾

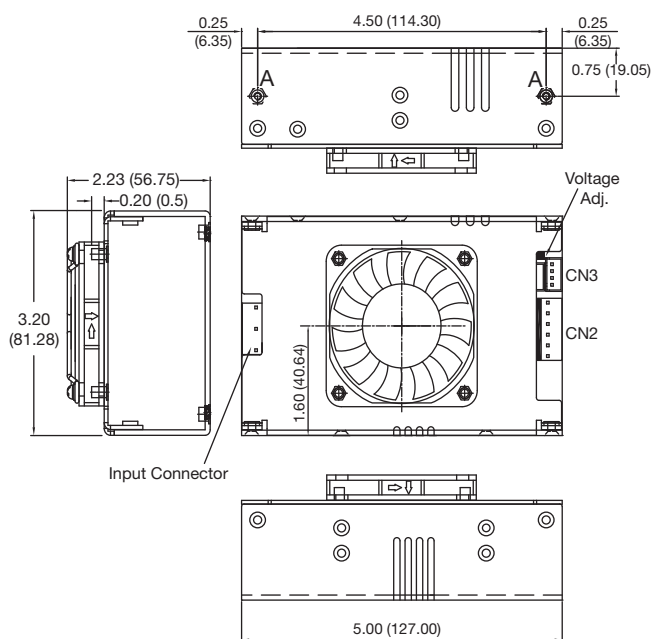
Notes

1. Ripple & noise is measured using a 0.1 μ F ceramic capacitor in parallel with 22 μ F electrolytic and 20 MHz bandwidth
2. Peak load can be taken for 500 μ s. Average power not to exceed max power.
3. Add suffix '-F' for top fan cover option e.g. SDF300PS24-F
Add suffix '-E' for end fan cover with screw terminal option e.g. SDF300PS24-E
Add suffix '-K' for end fan cover with IEC inlet option e.g. SDF300PS24-K
4. Add suffix 'D' for optional output terminal block on single output models except the 5 V, 9 V and 12 V output models which are only available with output terminal blocks eg. SDF300PS24D-F.⁽⁷⁾

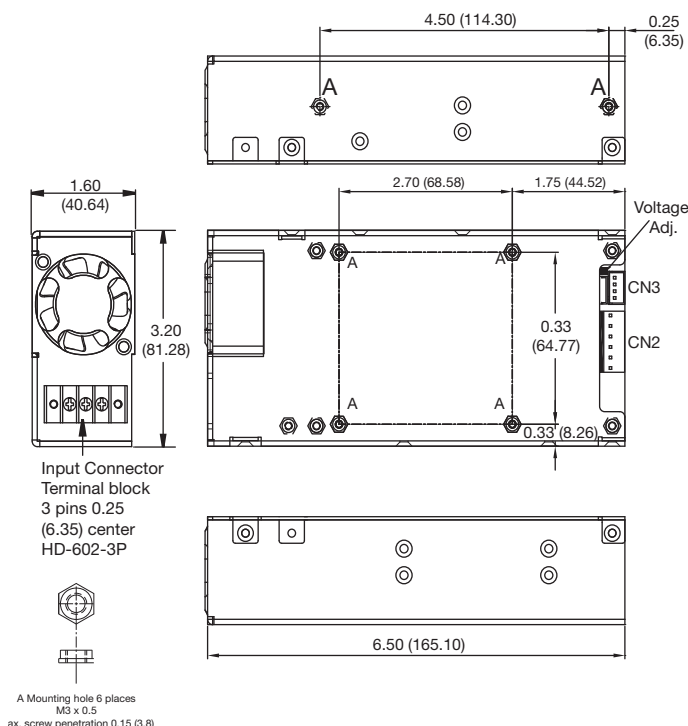
5. Add suffix 'G' for optional input terminal blocks eg. SDF300PS24DG-F, except for enclosed with end fan (option '-E') which has input terminal blocks as standard.⁽⁷⁾
6. Add suffix 'H' for optional molex output terminal on dual output models used in convection applications.⁽⁷⁾
7. Available for OEM quantities, contact Sales.

Mechanical Details

Enclosed with top fan (Option '-F')



Enclosed with end fan (Option '-E')



Notes

1. All dimensions are in inches (mm)
2. Tolerance: ± 0.012 (± 0.3)
3. Weight: Enclosed with top fan (option '-F'): 1.23 lbs (560 g)
Enclosed with end fan (option '-E' & '-K'): 1.32 lbs (600 g)

4. Mounting holes and mating half connectors common to all models.

Models and Ratings

SDF300 **XP**

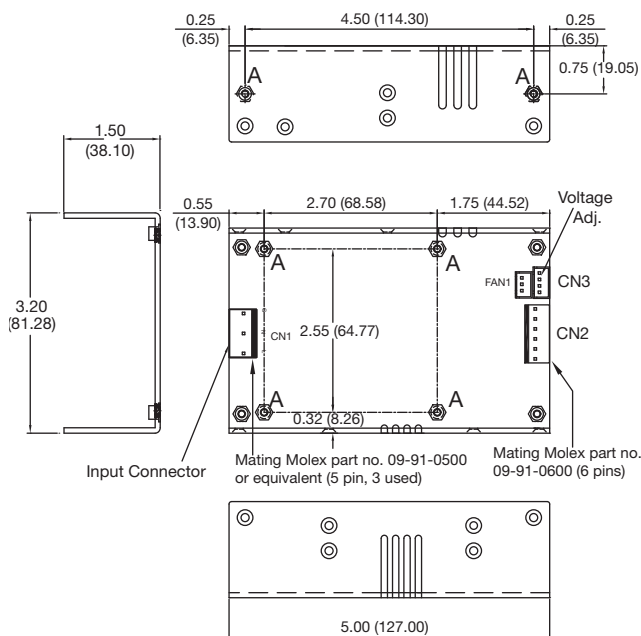
Output Voltage	Output Power		Output Current			Model Number ^(3,4,5,6)
	Forced Cooled	Convection Cooled	Forced Cooled	Convection Cooled	Peak ⁽²⁾	
5 V	210 W	100 W	42.00 A	20.00 A	120.00 A	SDF300PS05 ⁽⁷⁾
9 V	245 W	120 W	27.27 A	13.36 A	66.67 A	SDF300PS09 ⁽⁷⁾
12 V	300 W	150 W	25.00 A	12.50 A	50.00 A	SDF300PS12
15 V	300 W	150 W	20.00 A	10.00 A	40.00 A	SDF300PS15
18 V	300 W	150 W	16.67 A	8.33 A	33.30 A	SDF300PS18 ⁽⁷⁾
24 V	300 W	150 W	12.50 A	6.25 A	25.00 A	SDF300PS24
28 V	300 W	150 W	10.70 A	5.35 A	21.43 A	SDF300PS28 ⁽⁷⁾
36 V	300 W	150 W	8.33 A	4.17 A	16.67 A	SDF300PS36 ⁽⁷⁾
48 V	300 W	150 W	6.25 A	3.12 A	12.50 A	SDF300PS48
54 V	300 W	150 W	5.56 A	2.78 A	11.10 A	SDF300PS54 ⁽⁷⁾
V1: +5.00 V V2: +12.0 V	240 W	120 W	24.00 A 13.33 A	12.00 A 6.67 A	28.80 A 16.00 A	SDF300PD0512 ⁽⁷⁾
V1: +5.00 V V2: +24.0 V	240 W	120 W	24.00 A 6.67 A	12.00 A 3.33 A	28.80 A 8.00 A	SDF300PD0524 ⁽⁷⁾
V1: +5.00 V V2: +48.0 V	240 W	120 W	24.00 A 3.33 A	12.00 A 1.67 A	28.80 A 4.00 A	SDF300PD0548 ⁽⁷⁾
V1: +12.0 V V2: +24.0 V	240 W	120 W	13.33 A 6.67 A	6.67 A 3.33 A	16.00 A 8.00 A	SDF300PD1224 ⁽⁷⁾

Notes

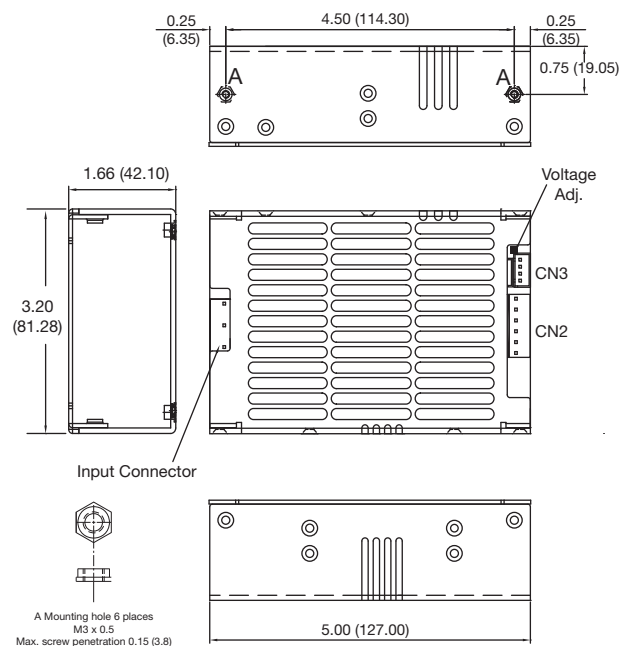
1. Ripple & noise is measured using a 0.1 μ F ceramic capacitor in parallel with 22 μ F electrolytic and 20 MHz bandwidth
2. Peak load can be taken for 500 μ s. Average power not to exceed max power.
3. Add suffix '-C' for vented cover option e.g. SDF300PS24-C
4. Add suffix 'D' for optional output terminal block on single output models except the 5 V, 9 V and 12 V output models which are only available with output terminal blocks eg. SDF300PS24D-F.⁽⁷⁾
5. Add suffix 'G' for optional input terminal blocks eg. SDF300PS24DG-F, except for enclosed with end fan (option '-E') which has input terminal blocks as standard.⁽⁷⁾
6. Add suffix 'H' for optional mox output terminal on dual output models used in convection applications.⁽⁷⁾
7. Available for OEM quantities, contact Sales.

Mechanical Details

U-Channel



U-Channel with cover (Option '-C')



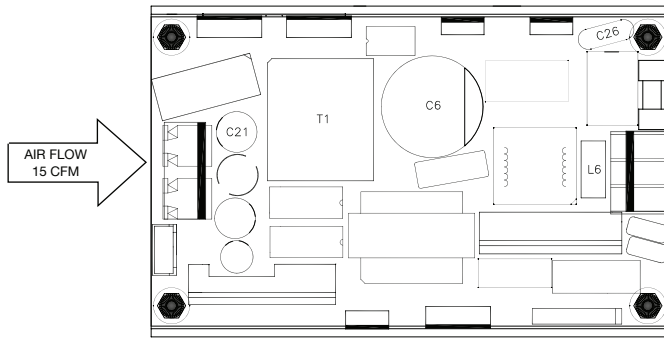
Notes

1. All dimensions are in inches (mm)
2. Tolerance: ± 0.012 (± 0.3)
3. Weight: U-Channel: 1.08 lbs (490 g)
U-Channel with cover (option '-C'): 1.12 lbs (510 g)
4. Mounting holes and mating half connectors common to all models.

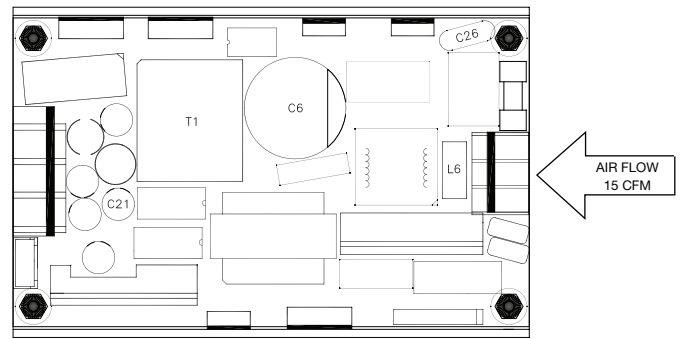
Application Notes

SDF300 XP

Thermal Considerations – U Channel



Single Output Models

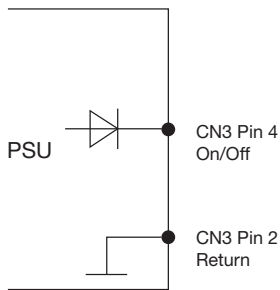


Dual Output Models

In order to ensure safe operation of the PSU in the end-use equipment, the temperature of the components listed in the table (right) must not be exceeded. See drawing above for component locations. The temperature should be monitored using K type thermocouples placed on the hottest part of the component (out of any direct airflow).

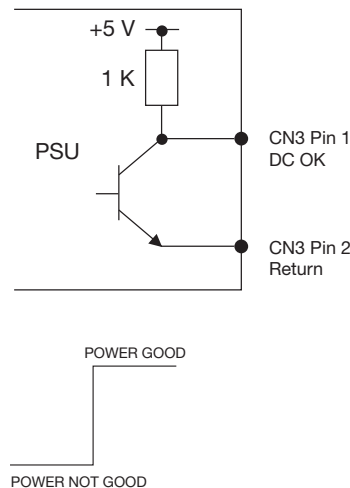
Temperature Measurement	
Component	Max Continuous Temp °C
C26	85
C6	105
C21	105
L6	120
T1 Coil	120

Remote On/Off (INH)



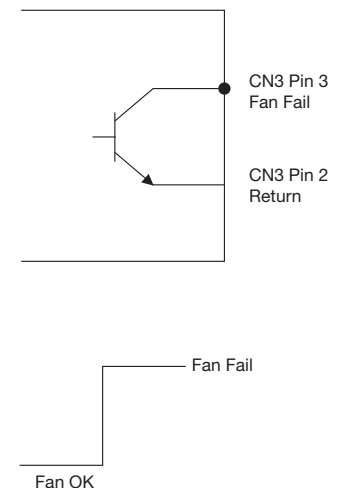
- Note:**
1. Applying <0.3 V or short between pins 2 and 1 turns the output OFF.
 2. Applying >4.5 V or open circuit between pins 2 and 1 turns output ON.
 3. The output will enter at hiccup mode. Recommended maximum time is 3 minutes.

Power Good (PG)



- Note:**
- Sink current = 6 mA, Source current = 1 mA
 Power is good 100-500 ms after output is in regulation.
 Power not good at least 1 ms before loss of regulation.

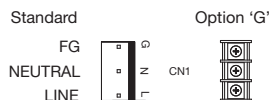
Fan Fail (FF)



- Note:**
1. Open collector signal: 28 V maximum voltage and 5 mA (maximum sink current)

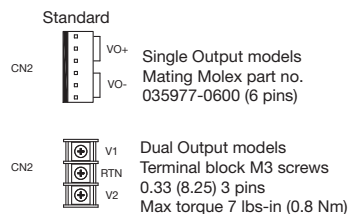
Connectors

INPUT CONNECTORS

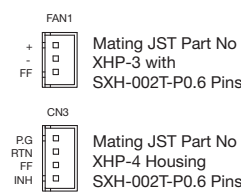


Mating Molex part no. 035977-0500 or equivalent (5 pin, 3 used)
 Terminal block 3 pins 0.25 (6.35) center HD-601-3P

OUTPUT CONNECTORS

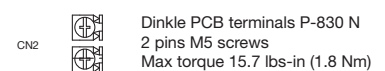


SIGNALS & FAN CONNECTORS



OPTIONAL OUTPUT CONNECTORS⁽¹⁾

Option 'D' (Standard on 5-12 V models)



Option 'H' (only on dual output models in convection-cooled applications)



⁽¹⁾ Available for OEM quantities, contact Sales.

320 Watts

SDC Series



- High Power Density
- Single & Dual Outputs
- Up to 700 W Peak Power
- Fan Fail & Power Good Signals
- Low Leakage Current Option
- Fits 1U Applications
- 3 Year Warranty

Specification

Input

Input Voltage	• 90-132 VAC/180-264 VAC, 'A' version, 90-264 VAC, 'P' version
Input Frequency	• 47-63 Hz
Input Current	• 7 A at 90 VAC, 3 A at 230 VAC, 'A' version 4.5 A at 90 VAC, 2 A at 230 VAC, 'P' version
Inrush Current	• Max 70 A at 230 VAC, 35 A at 115 VAC, cold start
Power Factor	• EN61000-3-2 class A, 'A' version >0.9 'P' versions
Earth Leakage Current	• <1.5 mA at 264 VAC, option '-L' 500 μ A on 'A' input version only
Input Protection	• T8 A/250 V fuse, 'A' version T6 A/250 V fuse, 'P' version

Output

Output Voltage	• See tables
Output Voltage Trim	• $\pm 5\%$ on V1 (V2 of dual output models will track by same % of adjustment)
Initial Set Accuracy	• $\pm 1\%$
Minimum Load	• 1% on single output models, 10% on both output of dual output models in order to maintain ripple & noise and regulation specifications
Start Up Delay	• 1.5 s max at 120 VAC
Start Up Rise Time	• 50 ms typical
Hold Up Time	• 20 ms min at 80% of full load
Line Regulation	• $\pm 0.5\%$
Load Regulation	• $\pm 1\%$ 1-100% load for single outputs, $\pm 3\%$ V1, $\pm 7\%$ V2 for dual outputs (except AD0548 version: $\pm 11\%$ on V2)
Over/Undershoot	• 5% max
Transient Response	• $\pm 5\%$ max deviation, recovery to within 1% in 500 μ s for a 50% load change
Ripple & Noise	• 1% pk-pk (see note 3)
Overvoltage Protection	• <130% on V1 recycle AC input to reset
Overtemperature	• Measured internally auto recovery
Overload Protection	• 110-140%
Short Circuit Protection	• Trip & restart, auto recovery
Fan Supply	• 12 V/300 mA, not available on '-F' & '-E' versions with built-in fans
Remote On / Off	• Fitted to 'P' version only

General

Efficiency	• Single output: 5 V: 70%, 12 V: 80%, All other models: >83% at 230 V & full load, Dual Output: >70% at 230 V & full load
Isolation	• 3000 VAC Input to Output, 1500 VAC Input to Ground, 250 VDC Output to Ground
Switching Frequency	• 23 kHz typical single output models, 25 kHz typical dual output models 'A' versions, 60 kHz PFC, 56 kHz PWM 'P' versions
Power Density	• 8.9 W/In ³
Signals	• Fan Fail & Power Good
MTBF	• >100 kHrs to MIL-HDBK-217F, at 25 °C GB

Environmental

Operating Temperature	• 0 °C to +70 °C, derate at 2.5%/°C from +50 °C to +70 °C when force air cooled. 0 °C to +60 °C, derate at 5%/°C from +50 °C to +60 °C when convection cooled.
Storage Temperature	• -20 °C to +85 °C
Operating Humidity	• 5-90%, non-condensing
Cooling	• '-F' & '-E' versions have built-in fans, 5 V single output model requires 22 CFM to meet forced air ratings, all other models require 18 CFM. 'P' version requires 27 CFM on all models
Operating Altitude	• 3000 m
Vibration	• 5-50 Hz, acceleration 7.35 ms ² on 3 axes

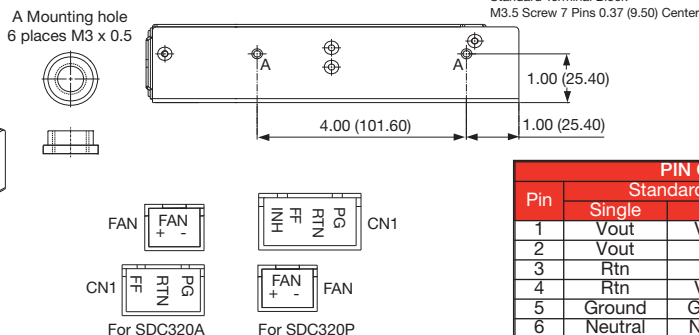
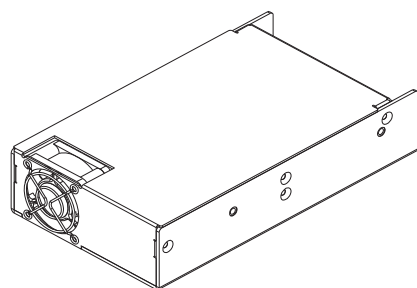
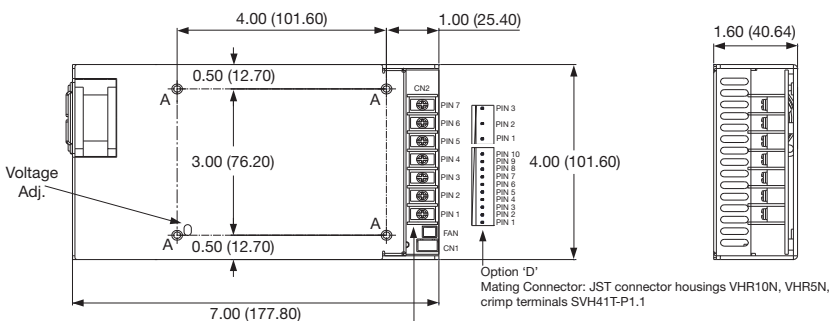
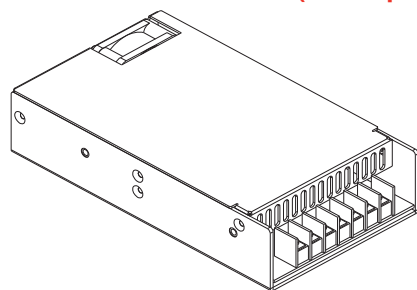
EMC & Safety

Emissions	• EN55022 Level B conducted & radiated
Harmonic Currents	• EN61000-3-2 class A EN61000-3-2 class C for loads $\geq 30\%$ ('P' versions only)
Voltage Flicker	• EN61000-3-3
ESD Immunity	• EN61000-4-2, level 3 Perf Criteria A
Radiated Immunity	• EN61000-4-3, 3 V/m Perf Criteria A
EFT/Burst	• EN61000-4-4, level 2 Perf Criteria A
Surge	• EN61000-4-5, installation class 3 Perf Criteria A
Conducted Immunity	• EN61000-4-6, 3V Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms Perf Criteria A, B, B
Safety Approvals	• UL60950-1, CSA C22.2 No. 60950-1, EN60950-1

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Mechanical Details

Enclosed with End Fan ('-E' Option)



PIN CONNECTIONS				
Pin	Standard		JST (Option D)	
	Single	Dual	Single	Dual
1	Vout	Vout1	Vout	Vout1
2	Vout	Rtn	Vout	Vout1
3	Rtn	Rtn	Vout	Vout1
4	Rtn	Vout2	Vout	Rtn
5	Ground	Ground	Vout	Rtn
6	Neutral	Neutral	Rtn	Rtn
7	Live	Live	Rtn	Rtn
8			Rtn	Rtn
9			Rtn	Vout2
10			Rtn	Vout2

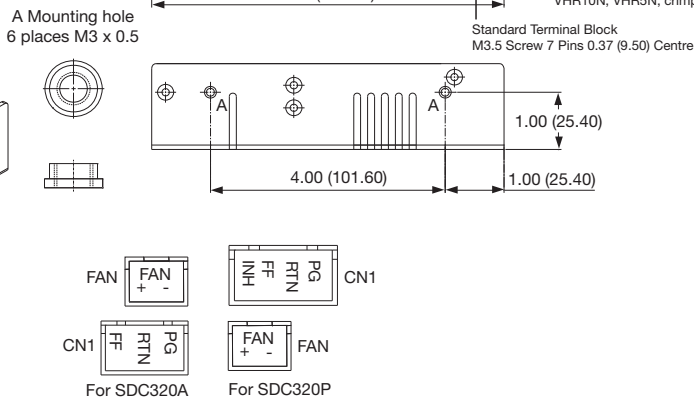
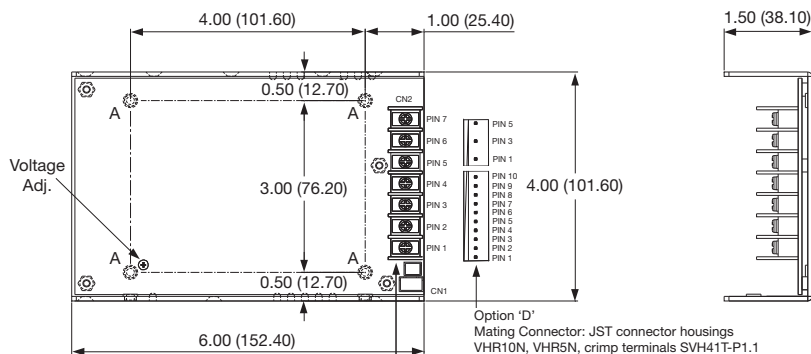
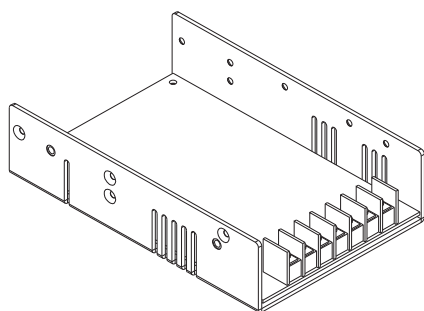
Signal Connector mating part is JST XHP-3 for SDC320A, JST XHP-4 for SDC320P
Crimp terminals SXH-002T-P0.6

All dimensions are in inches (mm)
Weight: 800 g (1.76 lbs)
Tolerance: ± 0.012 in (± 0.3 mm)

Max screw terminal torque: 15.7 lbs-in (1.8 Nm)
Max screw mount hole penetration : 0.16 (4.0)

1		Ground	Ground
3		Neutral	Neutral
5		Live	Live

U-Channel



Signal Connector mating part is JST XHP-3 for SDC320A, JST XHP-4 for SDC320P
Fan Connector mating part is JST XHP-2, Crimp terminals SXH-002T-P0.6

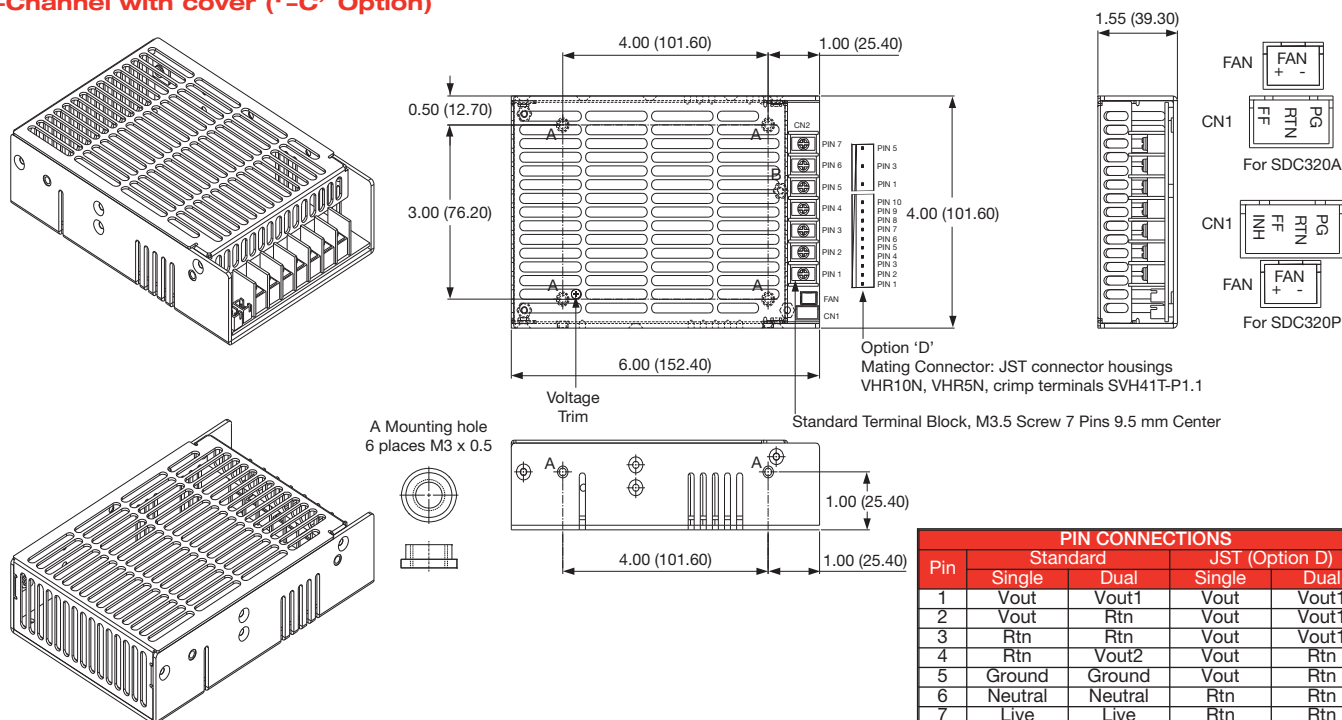
All dimensions are in inches (mm)
Weight: 680 g (1.50 lbs)
Tolerance: ± 0.012 in (± 0.3 mm)

Max screw terminal torque: 15.7 lbs-in (1.8 Nm)
Max screw mount hole penetration : 0.16 (4.0)

Mechanical Details

SDC320 XP

U-Channel with cover ('-C' Option)



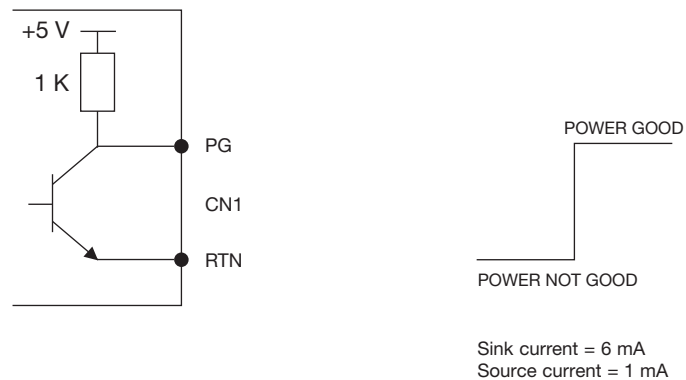
Signal Connector mating part is JST XHP-3 for SDC320A, JST XHP-4 for SDC320P
Fan Connector mating part is JST XHP-2, Crimp terminals SXH-002T-P0.6

All dimensions are in inches (mm)
Weight: 720 g (1.59 lbs)
Tolerance: ± 0.012 in (± 0.3 mm)

Max screw terminal torque: 15.7 lbs-in (1.8 Nm)
Max screw mount hole penetration: 0.16 (4.0)

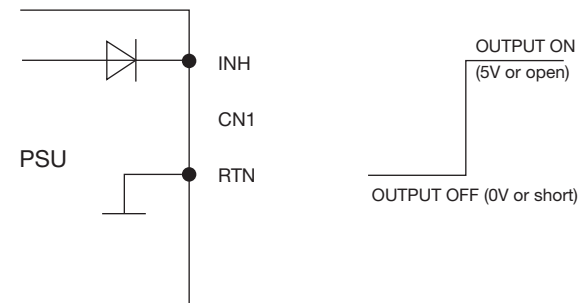
Application Notes

Power Good



Remote On / Off

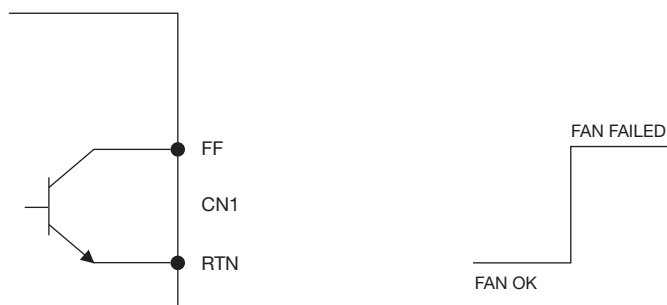
(On SDC320P models only)



Note:

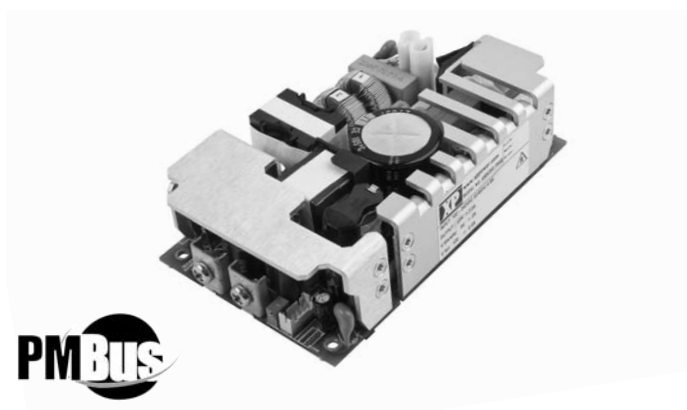
1. Applying < 0.3 V or short between the pins turns the output OFF.
2. Applying > 4.5 V or open circuit between the pins turns output ON.

Fan Fail



Open collector signal can pull up to 5-28 VDC,
limit sink current to 5 mA max

EMH Series



- Industry Standard 3" x 5" x 1.43" Format
- IT & Medical (BF) Approvals
- 80 V – 275 VAC Operation
- Optional ORing Diode (EMH350D Models)
- Analog & PMBus Signals Options (EMH350)
- 5 V Standby (EMH350)
- 3 Year Warranty

Specification

Input

Input Voltage	• 80-275 VAC, derate output power <90 VAC (see derating curve)
Input Frequency	• 47-63 Hz
Input Current	• 2.6 / 3.6 A at 115 VAC typical (250 / 350 W) 1.3 / 1.8 A at 230 VAC typical (250 / 350 W)
Inrush Current	• 60 A max at 264 VAC, cold start 25 °C
Power Factor	• >0.9
Earth Leakage Current	• 250 µA max, 264 VAC, 60 Hz
Patient Leakage Current	• 100 µA max
Input Protection	• 10 AF / 250 V internal fuse in line and neutral

Output

Output Voltage	• 12-48 VDC (see tables)
Output Voltage Trim	• ±10% V1
Initial Set Accuracy	• ±1% V1, ±5% V2
Minimum Load	• No minimum load required
Start Up Delay	• 1 s typical
Start Up Rise Time	• 50 ms
Hold Up Time	• 16 ms typical
Line Regulation	• ±0.5% maximum
Load Regulation	• ±1% V1, ±5% V2
Transient Response	• 4% max. deviation, recovery to within 1% in 500 µs for a 50-75-50% load change
Ripple & Noise	• 1% pk-pk, 20 MHz bandwidth
Overvoltage Protection	• 115-140% Vnom, recycle input to reset
Overtemperature Protection	• Auto reset
Overload Protection	• 110-150%, V1 only
Short Circuit Protection	• Continuous, approximately constant current
Temperature Coefficient	• 0.05% /°C
Remote Sense	• Compensates for up to 0.5 V drop

General

Efficiency	• 87% typical
Isolation	• 4000 VAC input to output, 1500 VAC input to ground, 1500 VAC output to ground
Switching Frequency	• 62-560 / 71 / 50-130 KHz, PFC/Main/Standby Converter
Power Density	• 11.6 / 16.3 W/in ³ (250 W/ 350 W)
Signals (Option EMH350)	• Power fail, Inhibit, 5 V Standby, Current Share, fan speed control and I ² C PMBus Options
MTBF	• 236 kHrs to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Temperature	• 0 °C to +70 °C, derate linearly from +50 °C at 2.5% /°C to 50% load at +70 °C
Cooling	• Forced cooled 12 CFM
Operating Humidity	• 95% RH, non-condensing
Storage Temperature	• -40 °C to +85 °C
Operating Altitude	• 3000 m
Shock	• 30 g pk, half sine, 6 axes
Vibration	• 2 g rms, 10 Hz to 500 kHz, 3 axes

EMC & Safety

Emissions	• EN55011/22 level B conducted EN55011/22 level A radiated
Harmonic Currents	• EN61000-3-2, class A
Voltage Flicker	• EN61000-3-3
Radiated Immunity	• EN61000-4-3, level 3 Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3 Perf Criteria A
Surge	• EN61000-4-5, installation class 3, Perf Criteria A
Conducted Immunity	• EN61000-4-6, level 3, Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms, Perf Criteria A, B, B, EN60601-1-2, 30% 500 ms, 60% 100 ms, 100% 10 ms, 100% 5000 ms, Perf Criteria A, A, A, B - 230 VAC. Consult longform datasheet for 115 V operation.
Safety Approvals	• IEC60950-1 CB report, UL60950-1, TUV, EN60950-1, IEC60601-1 CB report, UL60601-1, TUV60601-1

Models and Ratings

EMH250 **XP**

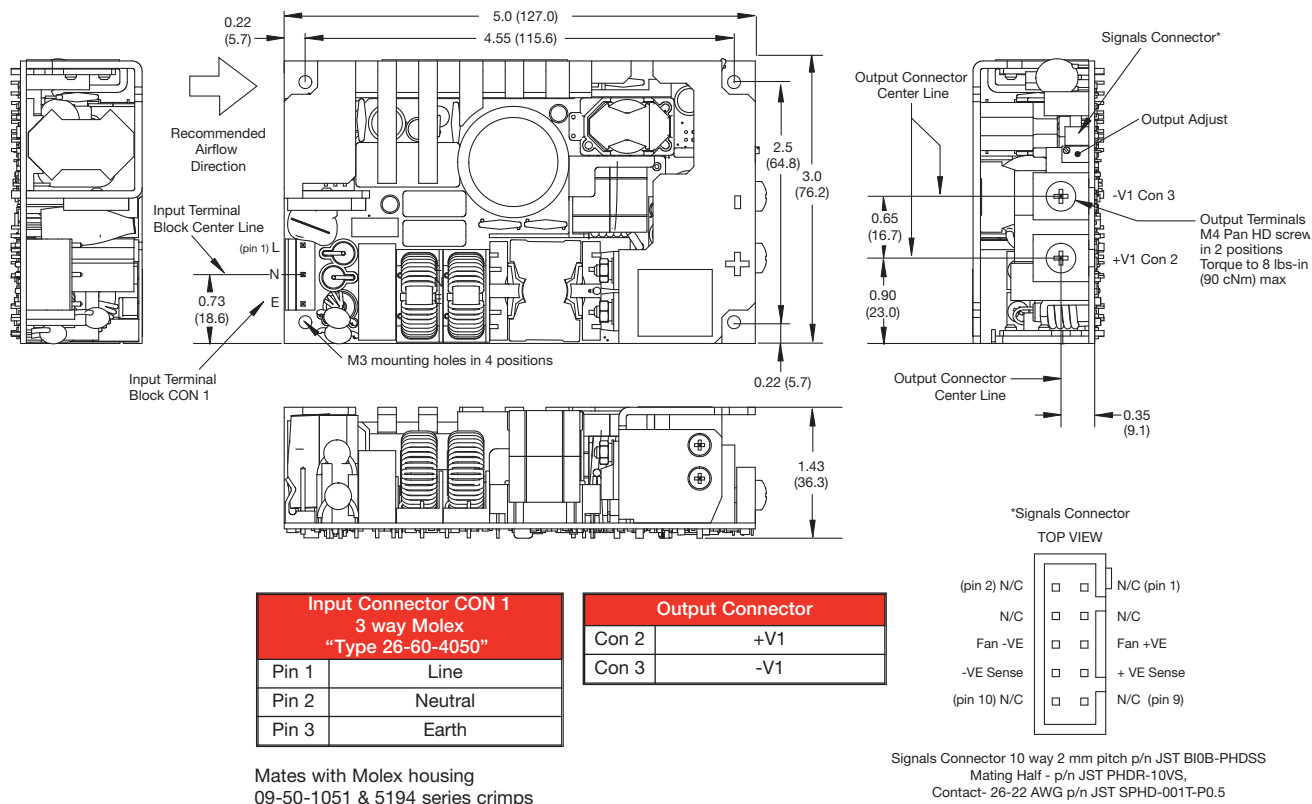
Output Voltage V1	Output Current V1	Fan Supply V3	Output Power	Model Number ⁽¹⁾
12 V	21.0 A	12 V/0.6 A	252 W	EMH250PS12
18 V	14.0 A	12 V/0.6 A	252 W	EMH250PS18
24 V	10.5 A	12 V/0.6 A	252 W	EMH250PS24
48 V	5.2 A	12 V/0.6 A	250 W	EMH250PS48

Notes

1. The EMH250 is available with a top mounted fan cover option. Add suffix '-TF' to model number e.g. EMH250PS12-TF. See mechanical drawing later in this datasheet.

Mechanical Details

EMH250PSXX

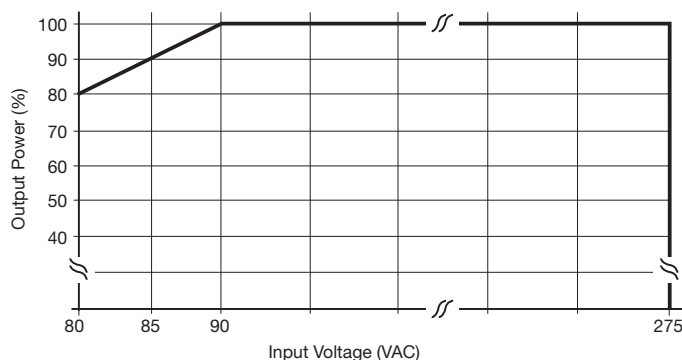


Notes

1. Dimensions shown in inches (mm).
Tolerance: ± 0.02 (± 0.5)

2. Weight: 0.90 lb (410 g).

Derating Curve - All EMH250 & EMH350 Models



Models and Ratings

EMH350 **XP**

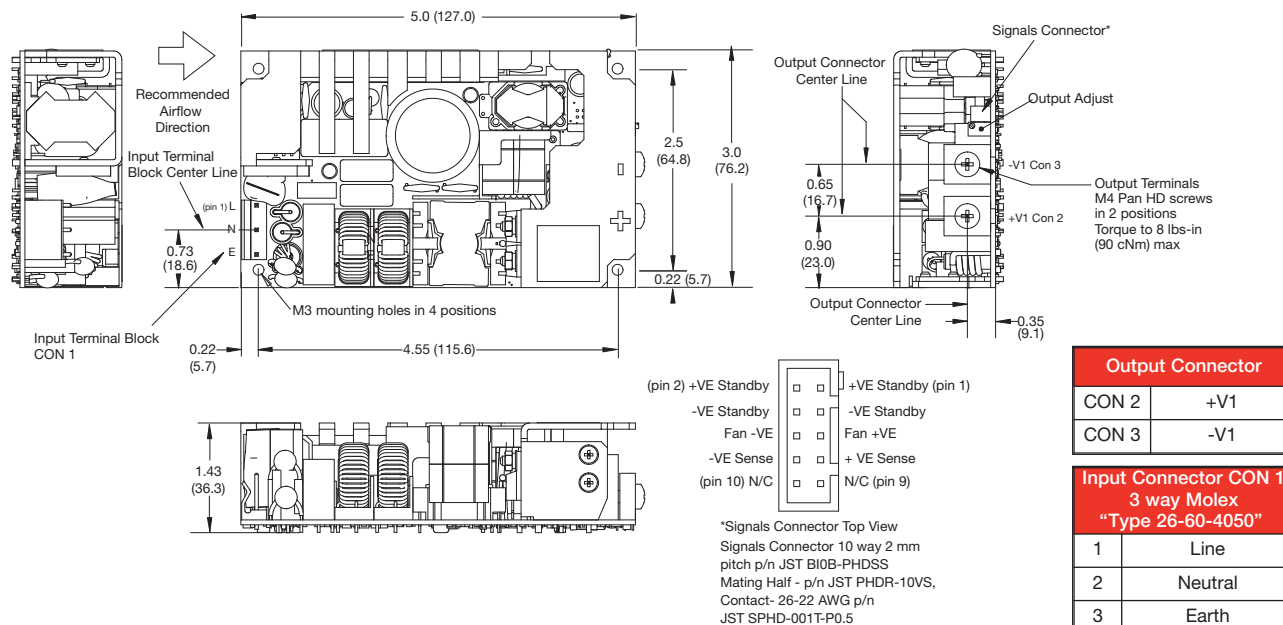
Output Voltage V1	Output Current V1	Standby Supply V2	Fan Supply V3	Output Power	Model Number ⁽¹⁾
12 V	29.2 A	5.0 V / 2.0 A	12 V/0.6 A	354 W	EMH350PS12
18 V	19.5 A	5.0 V / 2.0 A	12 V/0.6 A	354 W	EMH350PS18
24 V	14.6 A	5.0 V / 2.0 A	12 V/0.6 A	355 W	EMH350PS24
48 V	7.3 A	5.0 V / 2.0 A	12 V/0.6 A	354 W	EMH350PS48

Notes

1. The EMH350 is available with various analog, digital signal and cover options. See compatibility table and mechanical drawing later in this datasheet.

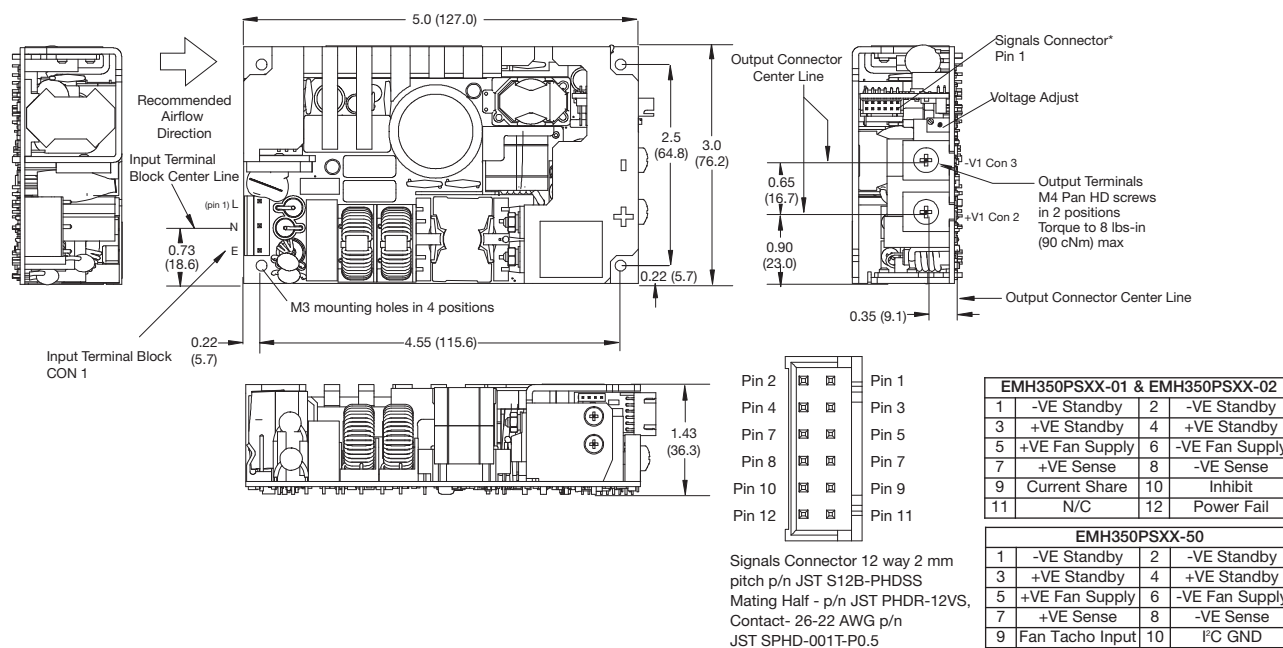
Mechanical Details

EMH350



Mates with Molex housing
09-50-1051 & 5194 series
crimps

EMH350 (Signal Options)



Notes

1. Dimensions shown in inches (mm). Tolerance: ± 0.02 (± 0.5)

2. Weight: 0.9 lb (410 g).

Models and Ratings

EMH350D **XP**

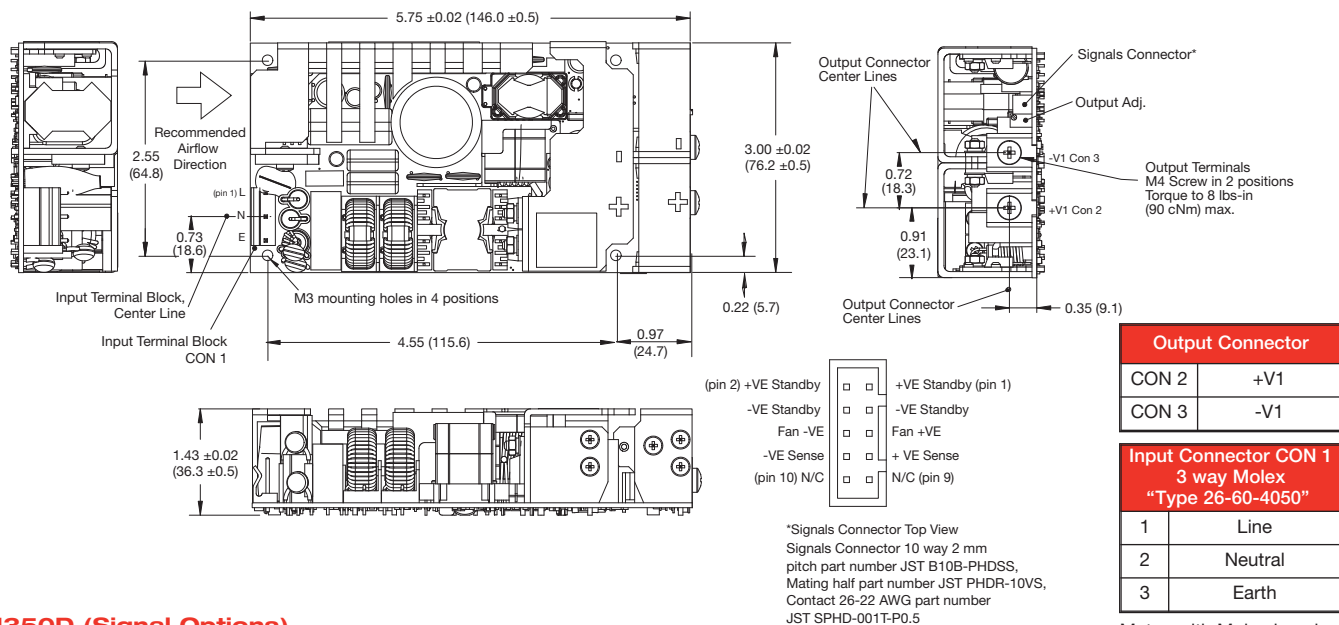
Output Voltage V1	Output Current V1	Standby Supply V2	Fan Supply V3	Output Power	Model Number ⁽¹⁾
12 V	29.2 A	5.0 V / 2.0 A	12 V/0.6 A	354 W	EMH350PS12D
18 V	19.5 A	5.0 V / 2.0 A	12 V/0.6 A	354 W	EMH350PS18D
24 V	14.6 A	5.0 V / 2.0 A	12 V/0.6 A	355 W	EMH350PS24D
48 V	7.3 A	5.0 V / 2.0 A	12 V/0.6 A	354 W	EMH350PS48D

Notes

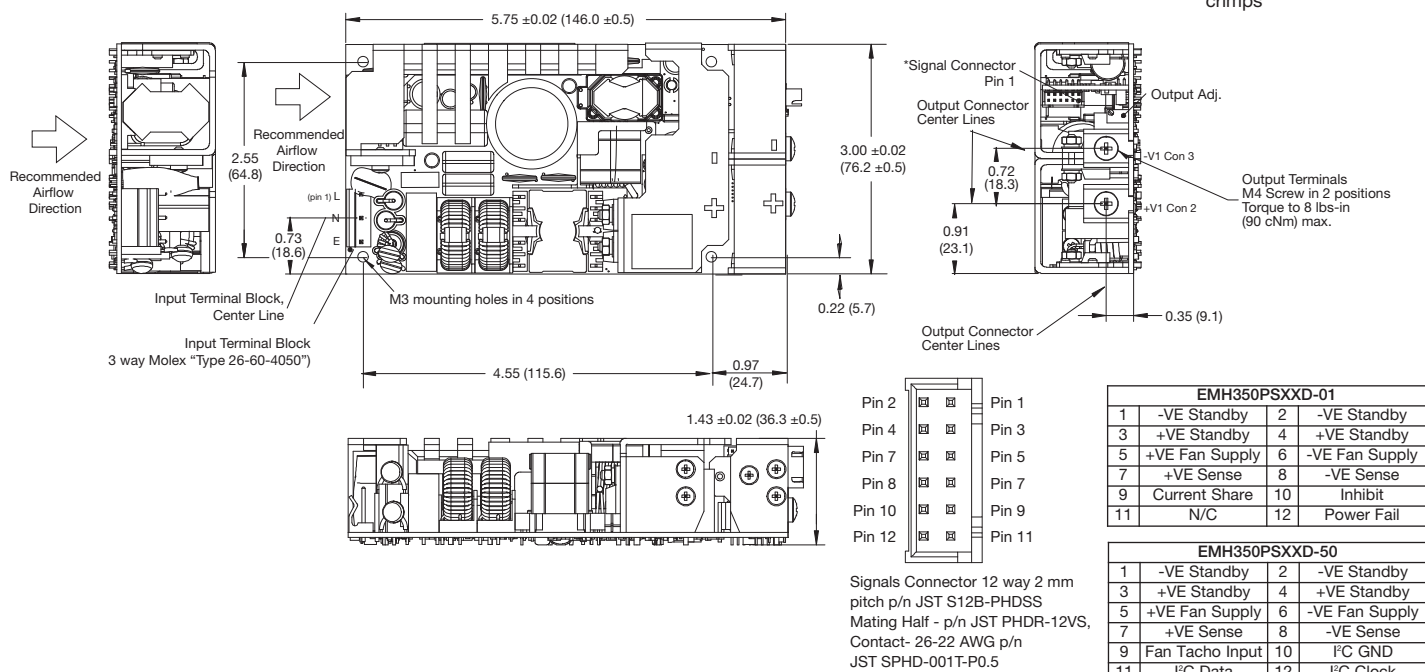
1. The EMH350D models are fitted with an integral ORing diode and are also available with various analog and digital signal options. See compatibility table and mechanical drawing later in this datasheet.

Mechanical Details

EMH350D



EMH350D (Signal Options)



Notes

1. Dimensions shown in inches (mm). Tolerance: ±0.02 (±0.5)

2. Weight: 1.0 lbs (450 g).

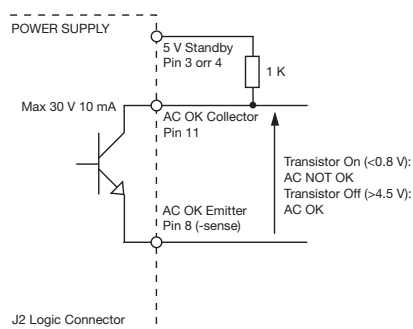
Signals Description & Compatibility

Signal & Cover Options										
Model	Functions								Cover Compatibility	
	Remote Sense	Fan Supply	5 V Standby	AC OK/Power Fail	Inhibit V1 & V Fan	Current Share	Variable Speed Fan Control	PMBus	Standard Top Fan (-TF)	Variable Speed Top Fan (-VF)
EMH250PSXX	✓	✓							✓	
EMH350PSXX	✓	✓	✓						✓	
EMH350PSXX-01	✓	✓	✓	✓	✓	✓			✓	
EMH350PSXX-02	✓	✓	✓	✓	✓	✓	✓			✓
EMH350PSXX-50	✓	✓	✓					✓	✓	
EMH350PSXXD	✓	✓	✓							
EMH350PSXXD-01	✓	✓	✓	✓	✓	✓				
EMH350PSXXD-50	✓	✓	✓					✓		

Characteristic	Notes & Conditions
Signals & Control	
Remote Sense	Compensates for 0.5 V total voltage drop
12 V Fan Supply (V3)	12 V/0.6 A supply, present when AC supplied, inhibit turns fan supply off.
5V Standby (V2)	5 V/2 A supply, always present when AC supplied
AC OK/Power Fail	AC OK is an open collector transistor, referenced to negative sense, providing a minimum of 3 ms warning of loss of output regulation. The transistor is normally off when AC is healthy. See fig 1
Inhibit	The inhibit high pin should be pulled below 0.4 V to switch V1 & V Fan (V3) off. Open circuit or 1-8 V maximum to switch the output on. See fig 2
Current Share	Connecting pin 9 (-01 & -02 models) of like voltage units (3 maximum) will force the current to share between the outputs. Units share current within 10% of each other at full load. See fig 3
Variable Speed Fan Control	When used in conjunction with -VF fan cover, varies the speed of the fan depending on temperature of the unit.
I ² C/PMBus	The I ² C PMBus compatible interface can be used for monitoring the unit output voltage, current, internal temperature, external 3 wire TACHO fan and run time. Adjustment of the output voltage and current limit set point and identification of the unit model number and serial number are also possible. See longform datasheet for full details.

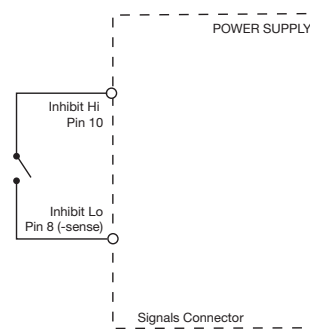
AC OK/Power Fail

Figure 1.



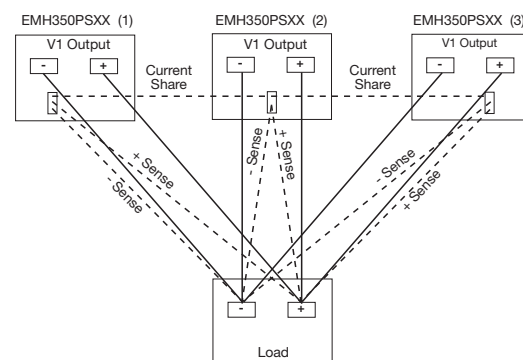
Inhibit

Figure 2.

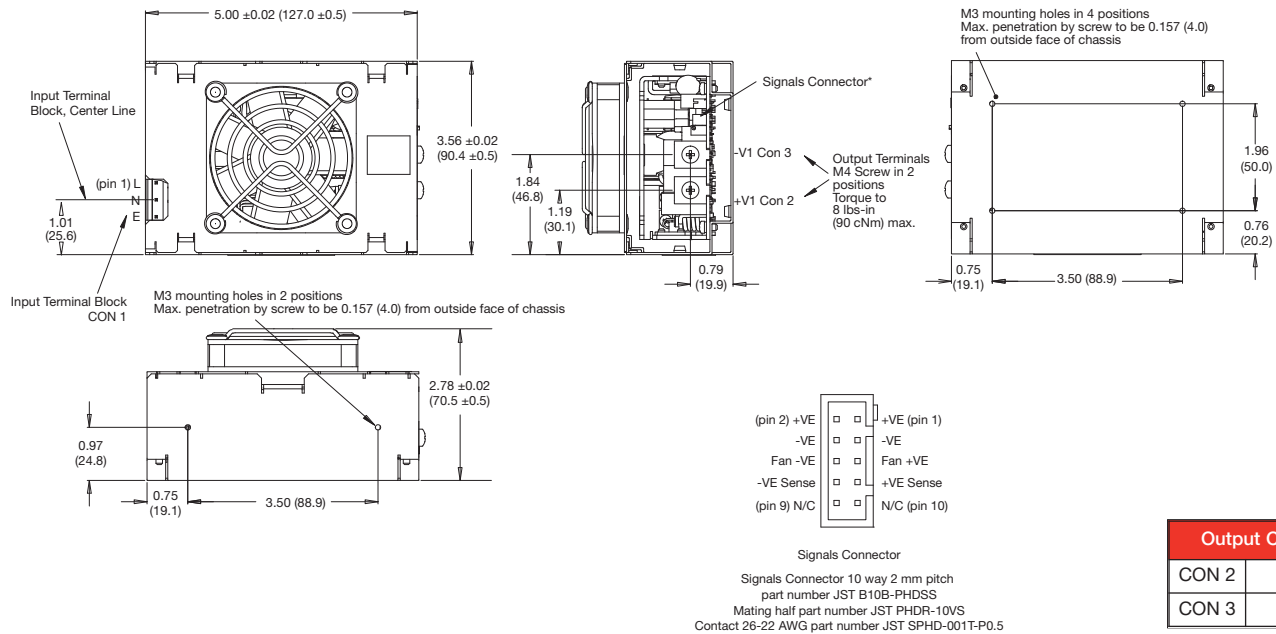


Parallel Load & Current Share

Figure 3.



Top Fan - EMH250-TF & EMH350-TF



Output Connector

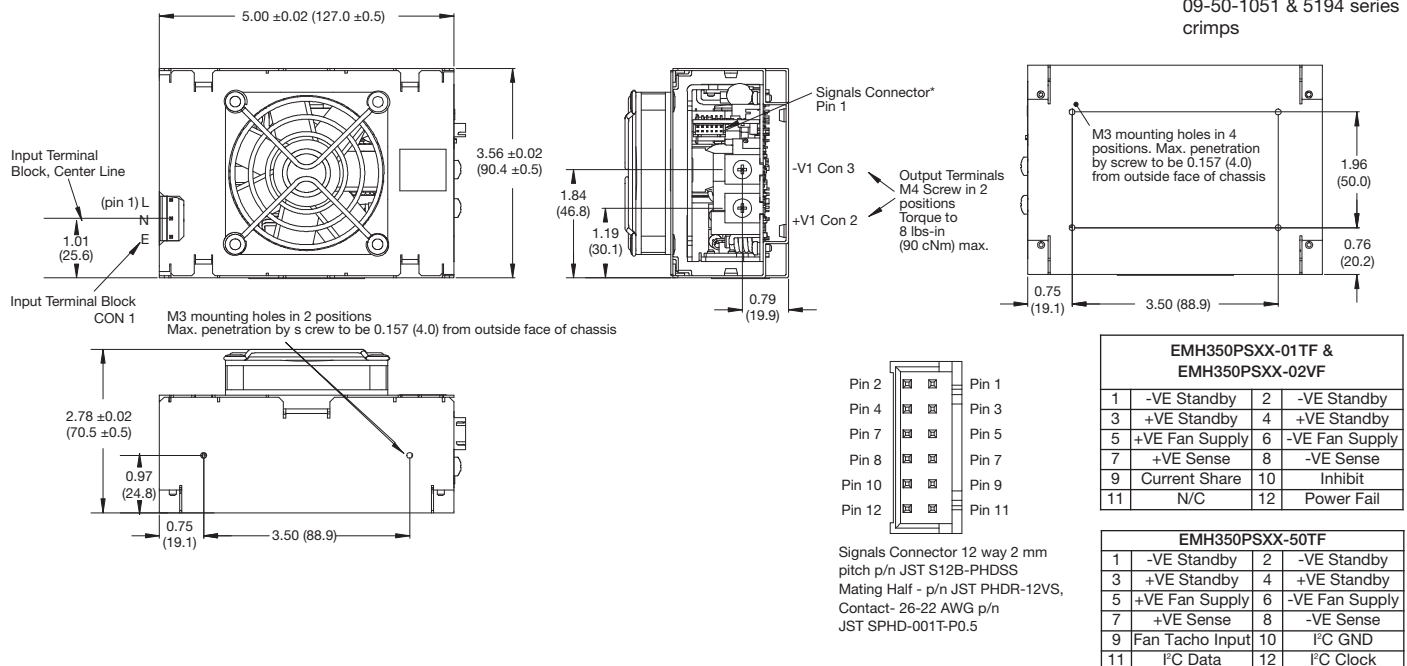
CON 2	+V1
CON 3	-V1

Input Connector CON 1
3 way Molex
"Type 26-60-4050"

1	Line
2	Neutral
3	Earth

Mates with Molex housing
09-50-1051 & 5194 series
crimps

Top Fan with Signals Options - EMH350-01TF, EMH350-50TF & EMH350-02VF

EMH350PSXX-01TF &
EMH350PSXX-02VF

1	-VE Standby	2	-VE Standby
3	+VE Standby	4	+VE Standby
5	+VE Fan Supply	6	-VE Fan Supply
7	+VE Sense	8	-VE Sense
9	Current Share	10	Inhibit
11	N/C	12	Power Fail

EMH350PSXX-50TF

1	-VE Standby	2	-VE Standby
3	+VE Standby	4	+VE Standby
5	+VE Fan Supply	6	-VE Fan Supply
7	+VE Sense	8	-VE Sense
9	Fan Tacho Input	10	I ² C GND
11	I ² C Data	12	I ² C Clock

Notes

1. Dimensions shown in inches (mm). Tolerance: ±0.02 (±0.5)

2. Weight: 1.67 lbs (760 g).

400 Watts

FCM Series



- 400 W Continuous, 600 W Peak
- IT and Medical Approvals
- 80 V – 275 VAC Operation
- Low Noise Fan
- Screw Terminals
- 5 V Standby, AC OK and Remote On/Off
- 3 Year Warranty

Specification

Input

Input Voltage	• 80-275 VAC, derate output power <90 VAC (see derating curve)
Input Frequency	• 47-63 Hz
Input Current	• 4.1 A at 115 VAC typical • 2.1 A at 230 VAC with 400 W load
Inrush Current	• 60 A max at 264 VAC, cold start 25 °C
Power Factor	• >0.9
Earth Leakage Current	• 260 µA max, 264 VAC, 60 Hz
Input Protection	• F10 A / 250 V internal fuse in line and neutral

Output

Output Voltage	• 12-48 VDC (see tables)
Output Voltage Trim	• ±10% V1
Initial Set Accuracy	• ±1% V1, ±5% V2
Minimum Load	• No minimum load required
Start Up Delay	• 1 s typical
Start Up Rise Time	• 50 ms
Hold Up Time	• 20 ms minimum
Line Regulation	• ±0.5% maximum
Load Regulation	• ±1% V1, ±5% V2
Transient Response	• 4% max. deviation, recovery to within 1% in 500 µs for a 50-75-50% load change
Ripple & Noise	• 1% pk-pk, 20 MHz bandwidth
Overvoltage Protection	• 115-140% Vnom, recycle input to reset
Overtemperature Protection	• Auto reset
Overload Protection	• 150-165%, V1 only
Short Circuit Protection	• Continuous, approximately constant current
Temperature Coefficient	• 0.05% / °C
Remote On/Off	• Uncommitted isolated optocoupler diode, powered diode inhibits V1 & Fan

General

Efficiency	• 85% typical
Isolation	• 4000 VAC input to output, 1500 VAC input to ground, 500 VAC output to ground
Switching Frequency	• PFC 70 kHz, main converter 65 kHz typical
Power Density	• 8.6 W/in ³
Signals	• AC OK, remote on/off, 5 V standby
MTBF	• 236 kHrs to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Temperature	• -10 °C to +70 °C, derate linearly from +50 °C at 2.5% / °C to 50% load at +70 °C
Cooling	• Forced cooled with integral fan
Operating Humidity	• 95% RH, non-condensing
Storage Temperature	• -40 °C to +85 °C
Operating Altitude	• 3000 m
Shock	• 30 g pk, half sine, 6 axes
Vibration	• 2 g rms, 5 Hz to 500 kHz, 3 axes

EMC & Safety

Emissions	• EN55011/22 level B conducted • EN55011/22 level A radiated
Harmonic Currents	• EN61000-3-2, class A • EN61000-3-2, class C for loads ≥50%
Voltage Flicker	• EN61000-3-3
Radiated Immunity	• EN61000-4-3, level 3 Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3 Perf Criteria A
Surge	• EN61000-4-5, installation class 3, Perf Criteria A
Conducted Immunity	• EN61000-4-6, level 3, Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms, Perf Criteria A, B, B, • EN60601-1-2, 30% 500 ms, 60% 100 ms, 100% 10 ms, 100% 5000 ms, Perf Criteria A, A, A, B - 230 VAC. Consult longform datasheet for 115 V operation
Safety Approvals	• IEC60950-1 CB report, UL60950-1, TUV, EN60950-1, IEC60601-1 CB report, UL60601-1, TUV60601-1

Models and Ratings

FCM400 **XP**

Output Voltage V1	Output Current V1		Standby Supply V2	Output Power		Model Number
	Continuous	Peak ⁽¹⁾		Continuous	Peak ⁽¹⁾	
12 V	33.3 A	50.0 A	5 V / 0.5 A	400 W	600 W	FCM400PS12†^
15 V	26.6 A	40.0 A	5 V / 0.5 A	400 W	600 W	FCM400PS15†^
24 V	16.6 A	25.0 A	5 V / 0.5 A	400 W	600 W	FCM400PS24†^
28 V	14.2 A	21.4 A	5 V / 0.5 A	400 W	600 W	FCM400PS28†^
36 V	11.1 A	16.7 A	5 V / 0.5 A	400 W	600 W	FCM400PS36†^
48 V	8.3 A	12.5 A	5 V / 0.5 A	400 W	600 W	FCM400PS48†^

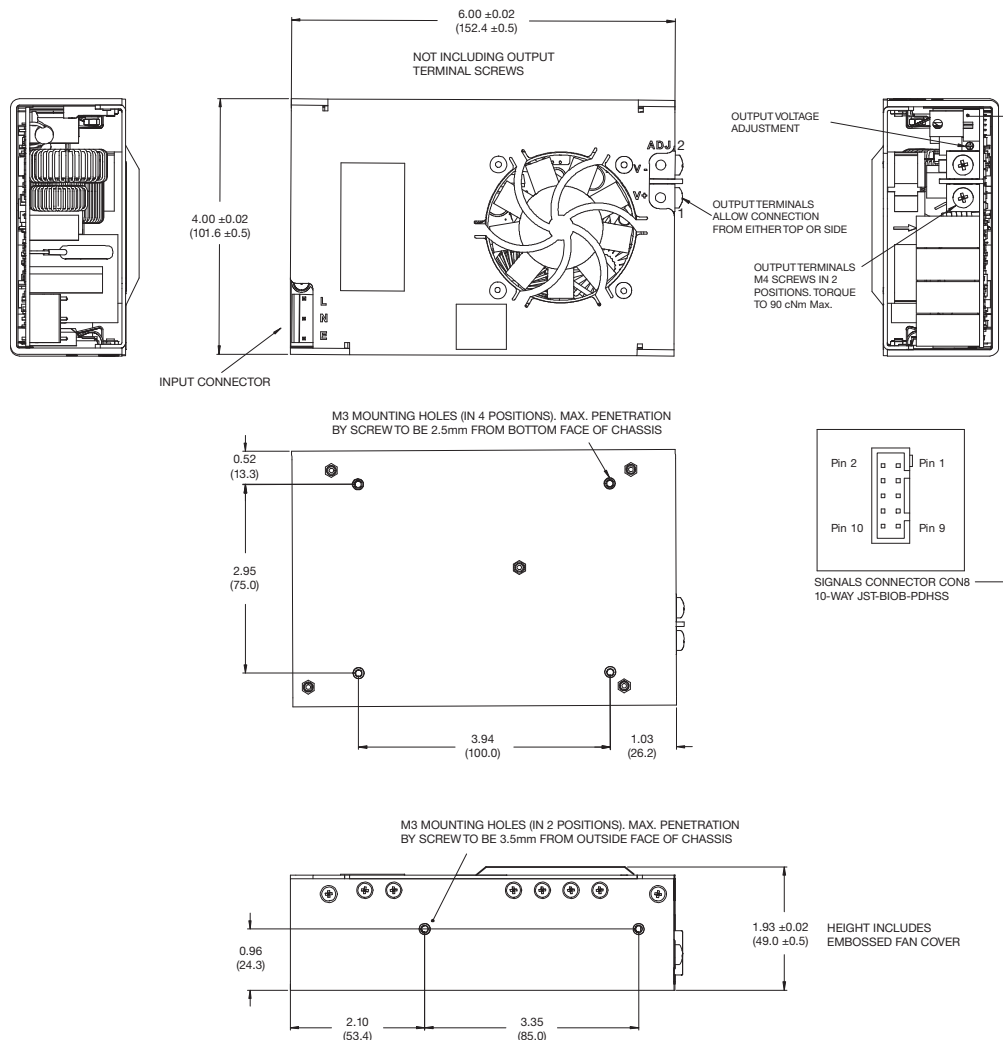
Notes

1. Peak Output Power - The peak duration is 500 ms maximum, average power must not exceed 400 W.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296.

Mechanical Details



Input Connector

Pin 1	Line
Pin 2	Neutral
Pin 3	Earth

J1 mates with Molex housing 09-50-1051 and Molex series 5194 crimp terminals.

Signals Connector

Pin 1	5 V Standby Return
Pin 2	5 V Standby
Pin 3	5 V Standby Return
Pin 4	5 V Standby
Pin 5	5 V Standby Return
Pin 6	5 V Standby
Pin 7	Power Fail (Collector)
Pin 8	Power Fail (Emitter)
Pin 9	Remote On / Off (Cathode)
Pin 10	Remote On / Off (Anode)

Mating plug:
JST p/n PHDR-10VS

Contact:
26-22 AWG JST p/n
SPHD-001T-P0.5

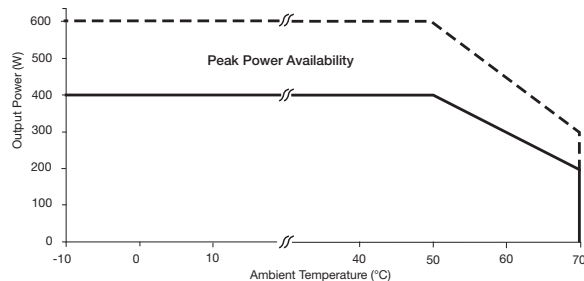
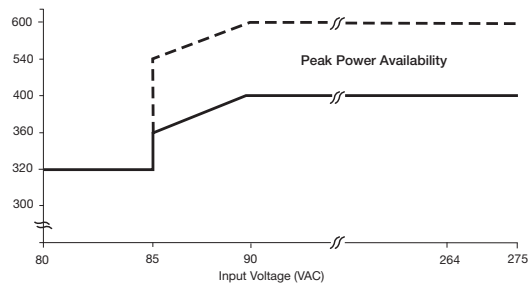
Output Connector

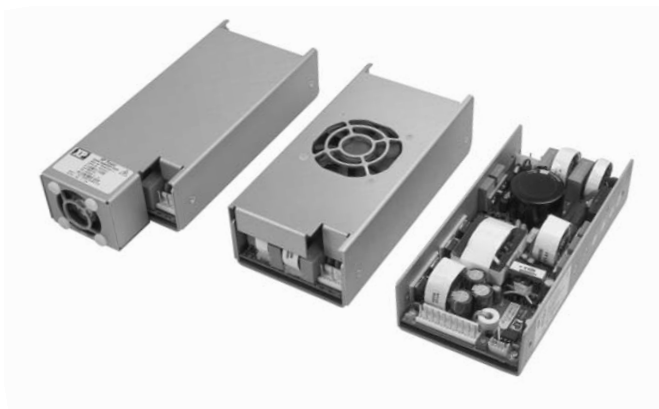
Pin 1	+V1
Pin 2	V1 RTN

Notes

- Dimensions shown in inches (mm). Tolerance: ±0.02 (±0.5)
- Weight: 1.8 lb (800 g).

Input Voltage & Temperature Derating





- U-Channel, Cover Fan & Hotswap Formats
- Power Density up to 12.8 W/in³
- Power Fail, DC OK & Active Current Share
- 5 V Standby & 12 V Fan Supply Outputs
- Screw Terminals Available
- 48 VDC Input Versions Available (DFA350)
- 3 Year Warranty

Specification

Input

Input Voltage	• 85-264 VAC (derate output power 10% below 90 VAC)
Input Frequency	• 47-63 Hz
Input Current	• Typically 3.6 A at 115 VAC & 1.8 A at 230 VAC
Inrush Current	• <60 A max at 230 VAC cold start at 25 °C
Power Factor	• >0.9
Earth Leakage Current	• Typically 1 mA at 230 VAC/50 Hz, 0.5 mA at 115 VAC/60 Hz
Input Protection	• T6.3 A/250 V fuse in line

Output

Output Voltage	• See tables
Output Voltage Trim	• ±10%
Initial Set Accuracy	• V1 ±1%, V2 ±5%, V3 ±3%
Minimum Load	• No minimum load required
Start Up Delay	• 2 s maximum, typically 1 s
Hold Up Time	• 16 ms minimum at 90 VAC full load
Drift	• ±0.2% after 20 min warm-up
Line Regulation	• V1 ±0.5%, V2 ±3.0%, V3 ±0.5%
Load Regulation	• V1 ±1.0%, V2 ±5.0%, V3 ±1.0%, 0-100% load V1 & V3, 10-100% load V2
Over/Undershoot	• <1% maximum
Transient Response	• <4% max deviation, with 50-75-50% load step. Recovery to within 1% <500 µs
Ripple & Noise	• V1 & V3: 1%, V2: 2% pk-pk, 20 MHz bandwidth
Overvoltage Protection	• 115-140% V _{nom} (on V1 only)
Overtemperature Protection	• Thermal sensor under PCB shuts unit down typically >+75 °C, restarts after cooling
Overload Protection	• 110-140%, I _{nom} V1
Short Circuit Protection	• Continuous trip and restart (hiccup mode)
Temperature Coefficient	• 0.05%/°C
Remote Sense	• Compensates for 0.5 V total voltage drop
Remote On/Off	• Short circuit or TTL Low turns PSU off, can also be configured as enable
Current Share	• Up to 3 supplies can be connected in parallel, derate total output current to 90%

General

Efficiency	• Typically 86%
Isolation	• 3000 VAC Input to Output 1500 VAC Input to Ground 100 VDC Output to Ground
Switching Frequency	• PFC 62 kHz typical, Main converter 157 kHz, typical
Power Density	• 11.1 W/in ³ (MFA350), 12.8 W/in ³ (MFA420)
Signals	• Power Fail - open collector, transistor off for AC good, ≥5 ms warning of loss of output. DC OK - open collector, transistor off for DC good
MTBF	• 460 kHrs to MIL-HDBK-217F, notice 2, at +25 °C, GB, typical

Environmental

Operating Temperature	• Forced cooled: -10 °C to +70 °C, derate linearly from +50 °C at 2.5%/°C to +70 °C
Cooling	• >13 CFM forced airflow required for U Channel Versions, '-H', '-TF' & '-EF' versions have integral fan
Operating Humidity	• 5-95% RH
Storage Temperature	• -20 °C to +85 °C
Operating Altitude	• 3000 m
Shock	• 30 g pk, half sine, 6 axes
Vibration	• Single axis 10-500 Hz at 2 g x 10 sweeps

EMC & Safety

Emissions	• EN55022, class B conducted, class A radiated
Harmonic Currents	• EN61000-3-2 class A EN61000-3-2 class C for loads ≥20%
Voltage Flicker	• EN61000-3-3
Radiated Immunity	• EN61000-4-3, level 3 Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3 Perf Criteria A
Surge	• EN61000-4-5, installation class 3 Perf Criteria A
Conducted Immunity	• EN61000-4-6, 10 V rms Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms, Perf Criteria A, B, B
Safety Approvals	• CB Report, IEC60950-1, CSA22.2 No. 60950-1-05, UL60950-1, TUV EN60950-1/A11

Models and Ratings

MFA350/420 XP

Output Voltage V1	Output Current V1	Fan Output V2 ⁽²⁾	Standby Supply V3	Output Power 13 CFM Airflow	Model Number ⁽¹⁾
12 VDC	29.0 A	12 V/1 A	5 V/0.3 A	361 W	MFA350PS12†^
24 VDC	14.5 A	12 V/1 A	5 V/0.3 A	361 W	MFA350PS24†^
48 VDC	7.3 A	12 V/1 A	5 V/0.3 A	364 W	MFA350PS48†^
12 VDC	35.0 A	12 V/1 A	5 V/0.3 A	434 W	MFA420PS12
24 VDC	17.5 A	12 V/1 A	5 V/0.3 A	434 W	MFA420PS24
48 VDC	8.8 A	12 V/1 A	5 V/0.3 A	436 W	MFA420PS48

Notes

1. Units supplied with Molex connections for J1 & J2 as standard. Add suffix '-S' to model number to replace with screw terminals. Add suffix '-TF' for covered version with top fan and suffix '-EF' for covered version with end fan. Example:- MFA420PS12-STF: 12 V unit fitted with screw terminals and top fan.

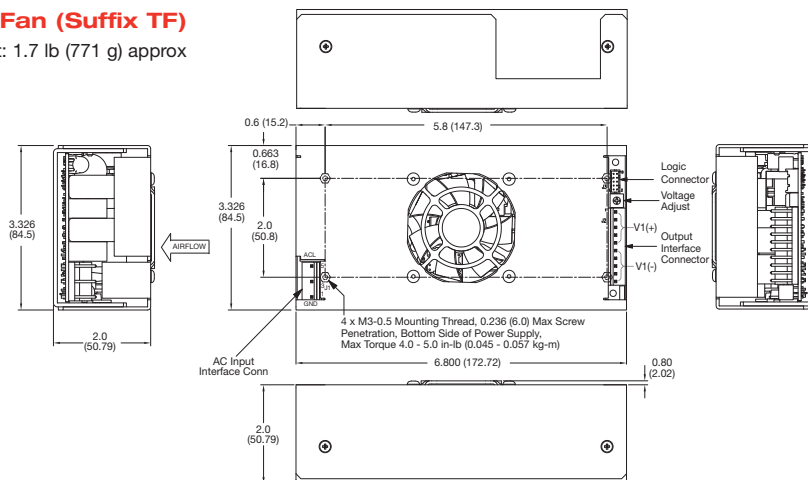
2. Not available for -TF & -EF versions.

† Available from Farnell & element14. See pages 284-290. ^ Available from Newark. See pages 291-296.

Mechanical Details

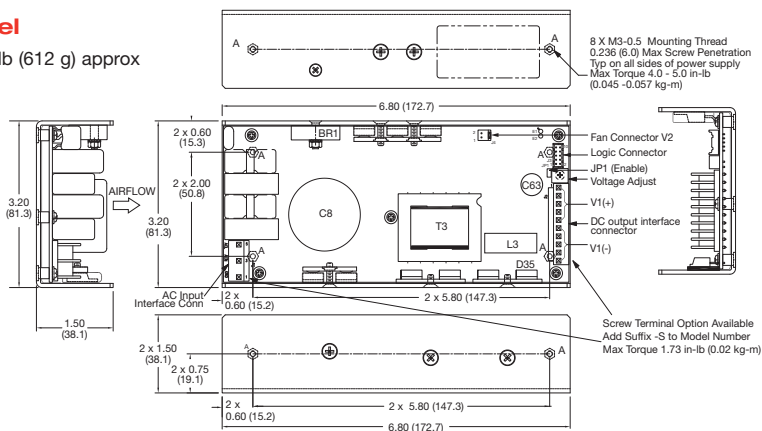
Top Fan (Suffix TF)

Weight: 1.7 lb (771 g) approx



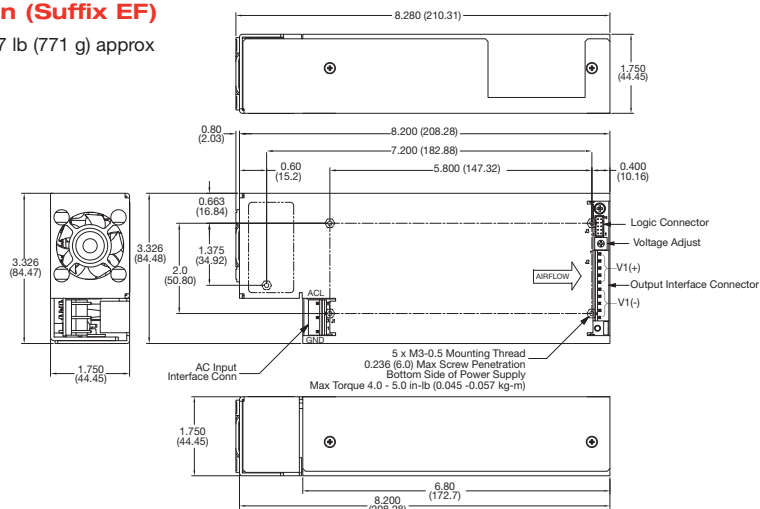
U Channel

Weight: 1.35 lb (612 g) approx



End Fan (Suffix EF)

Weight: 1.7 lb (771 g) approx



PIN CONNECTIONS AC INPUT
J1 Molex 26-60-4050

1	GND
3	Neutral
5	Line

Mating Parts: Molex, Housing 43061-0005
Contact 08-70-1030.

Option '-S' screw terminals

Phoenix Contact: MKDS 1/5-3.81 or similar
accepts 26-16 AWG wire (contacts 2 & 4 removed)
Max Torque 1.73 in-lb (0.02 kg-m)

PIN CONNECTIONS DC OUTPUT
J2 Molex 26-60-4100

PIN	FUNCTION	PIN	FUNCTION
1	+V1	6	-V1
2	+V1	7	-V1
3	+V1	8	-V1
4	+V1	9	-V1
5	+V1	10	-V1

Mating Parts: Molex, Housing 43061-0010
Contact 08-70-1030,

Option '-S' screw terminals

2 x Phoenix Contact: MKDS 1/5-3.81 or similar
accepts 26-16 AWG wire

Max Torque 1.73 in-lb (0.02 kg-m)

PIN CONNECTIONS FAN OUTPUT

1	+V2
2	-V2

Mating Parts: Molex, Housing 22-01-1024
Contact 08-70-0057

PIN CONNECTIONS LOGIC CONNECTOR
J3 JST B10B-PHDSS (LF) (SN)

PIN	FUNCTION	PIN	FUNCTION
1	AC OK	6	+Sense
2	ROF (Inhibit/Enable)	7	-Sense
3	Current Share	8	Not Used
4	DC OK	9	5 V Standby V3
5	Not used	10	5 V Standby Return V3

Mating Parts: JST, Housing PHDR-10VS
Contact SPHD-001T-P0.5

Notes

1. All dimensions in inches (mm).

2. Tolerance: .xx=±0.02 (±0.50); .xxx=±0.01 (±0.25)

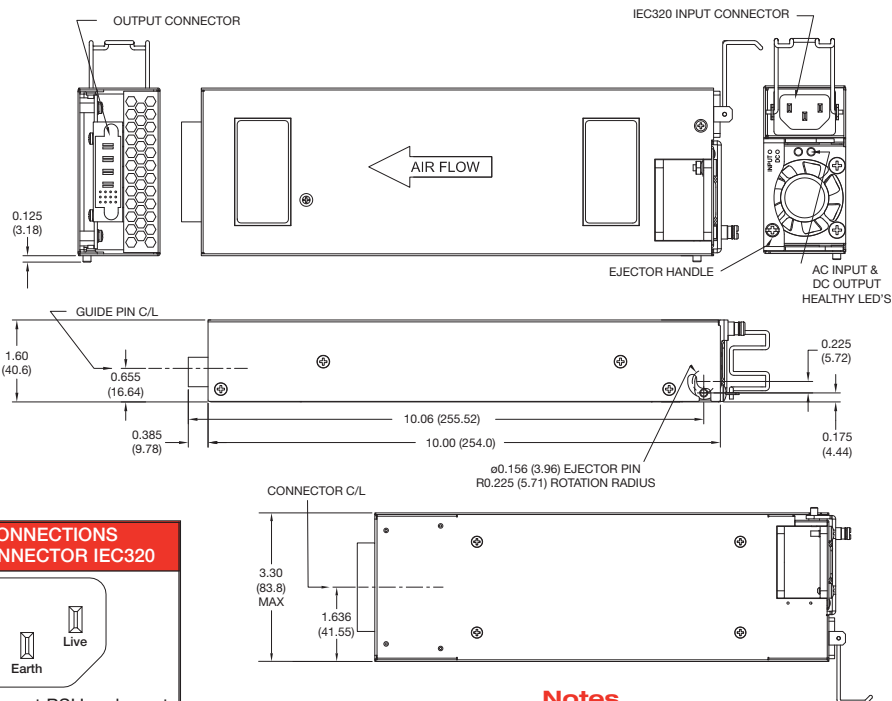
Output Voltage V1	Output Current	Standby Supply V3	Output Power	Model Number
12.0 VDC	29.0 A	5 V/0.3 A	350 W	MFA350PS12-H
24.0 VDC	14.5 A	5 V/0.3 A	350 W	MFA350PS24-H
48.0 VDC	7.3 A	5 V/0.3 A	352 W	MFA350PS48-H
12.0 VDC	35.0 A	5 V/0.3 A	434 W	MFA420PS12-H
24.0 VDC	17.5 A	5 V/0.3 A	434 W	MFA420PS24-H
48.0 VDC	8.8 A	5 V/0.3 A	436 W	MFA420PS48-H

Mechanical Details

-H Hotswap

Pin Connections

PIN CON. OUTPUT CON. FCL 51732-035-LF	
A1	+Sense
A2	Not Used
A3	DC OK
B1	-Sense
B2	Not Used
B3	AC OK
C1	Current Share
C2	Not Used
C3	5 V Standby V3
D1	Not Used
D2	ROF (Inhibit/Enable)
D3	5 V Standby Return V3
P1	-V1
P2	-V1
P3	+V1
P4	+V1



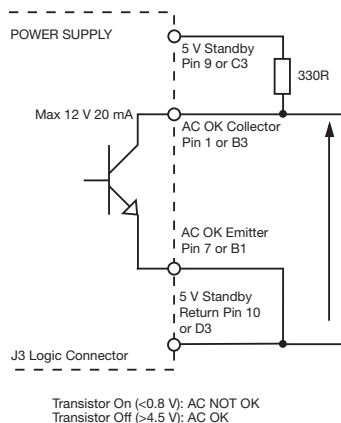
Notes

1. All dimensions in inches (mm).
2. Weight: 2.65 lb (1202 g) approx
3. Tolerance: .xx=±0.02 (±0.50); .xxx=±0.01 (±0.25)

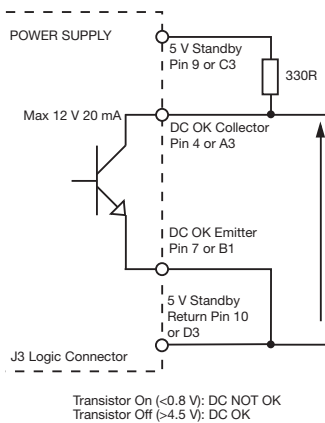
Mating parts: FCI 51762-10401200AA-LF

Signals MFA350, MFA350-H, MFA420 & MFA420-H

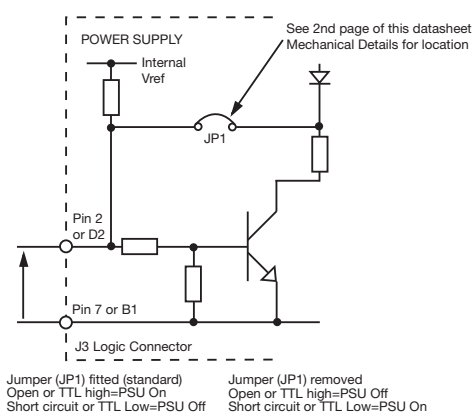
AC OK/Power Fail



DC OK



Remote On/Off (Inhibit/Enable)



Thermal Considerations (U Channel)

In order to ensure safe operation of the PSU in the end-use equipment, the temperature of the components listed in the table below must not be exceeded. See mechanical details for component locations. The temperature should be monitored using K type thermocouples placed on the hottest part of the component (out of any direct air flow). See longform datasheet for further information of service life.

MFA Temperature Measurements (Ambient ≤50 ° C)	
Component	Max Temperature ° C
T3	90 °C
BR1	105 °C
D35	85 °C
L3	90 °C
C8	105 °C
C63	105 °C

DFA Temperature Measurements (Ambient ≤50 ° C)	
Component	Max Temperature ° C
L1	90 °C
Q1	105 °C
HS1	85 °C
C25	75 °C
Q2	105 °C

Models and Ratings

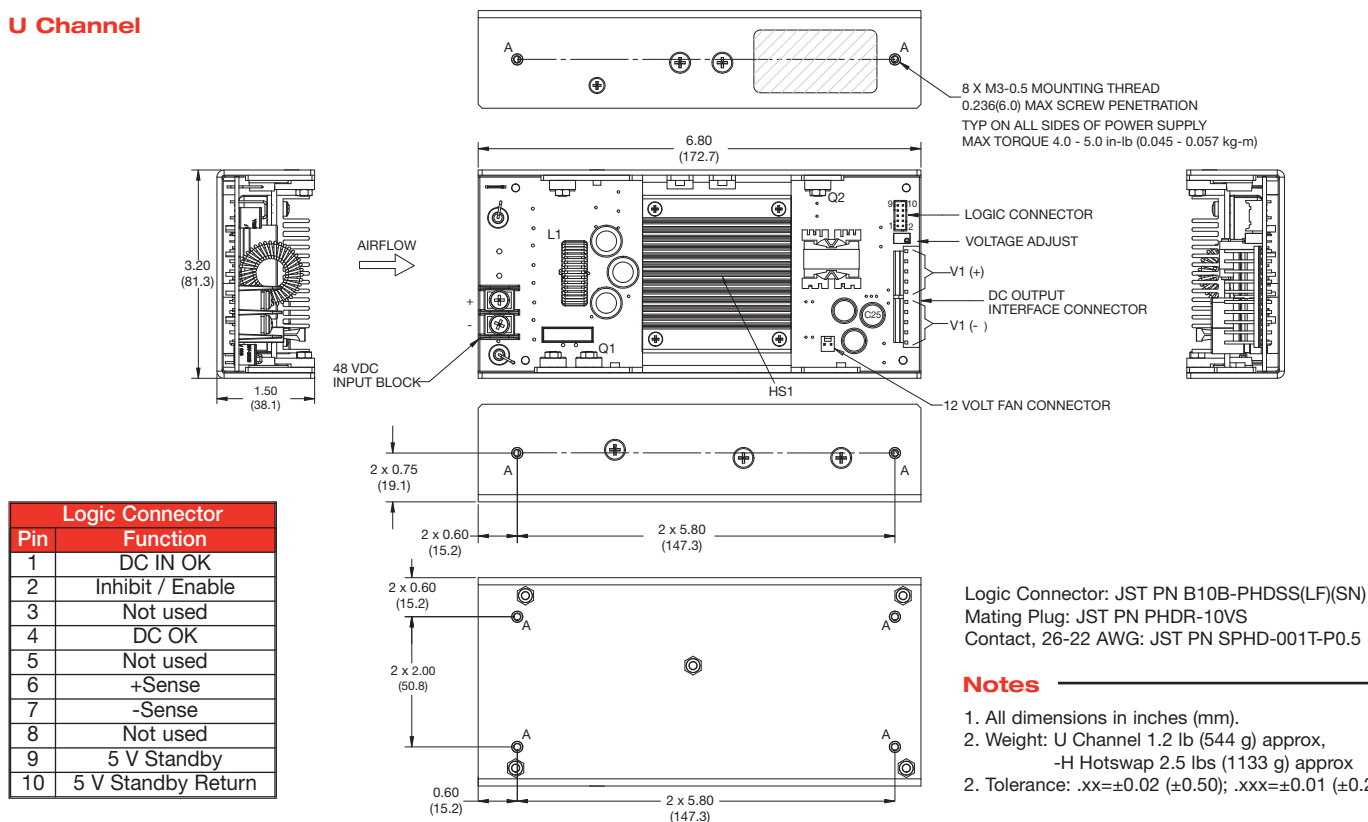
DFA350 **XP**

Input Voltage	Input Current	UVLO	Output Voltage V1	Output Current V1	Fan Output V2	Standby Supply V3	Output Power 20 CFM Airflow	Model Number
48 VDC (36-75 VDC)	9.2 A typical 12.5 A max	32-36 VDC	12.0 VDC	29.0 A	12 V/1 A	5 V/1 A	365 W	DFA35048S12
			24.0 VDC	14.5 A	12 V/1 A	5 V/1 A	365 W	DFA35048S24
			12.0 VDC	29.0 A		5 V/1 A	365 W	DFA35048S12-H
			24.0 VDC	14.5 A		5 V/1 A	365 W	DFA35048S24-H

For all models the input reverse voltage protection is continuous with automatic recovery

Mechanical Details

U Channel



Notes

1. All dimensions in inches (mm).
2. Weight: U Channel 1.2 lb (544 g) approx,
-H Hotswap 2.5 lbs (1133 g) approx
2. Tolerance: .xx=±0.02 (±0.50); .xxx=±0.01 (±0.25)

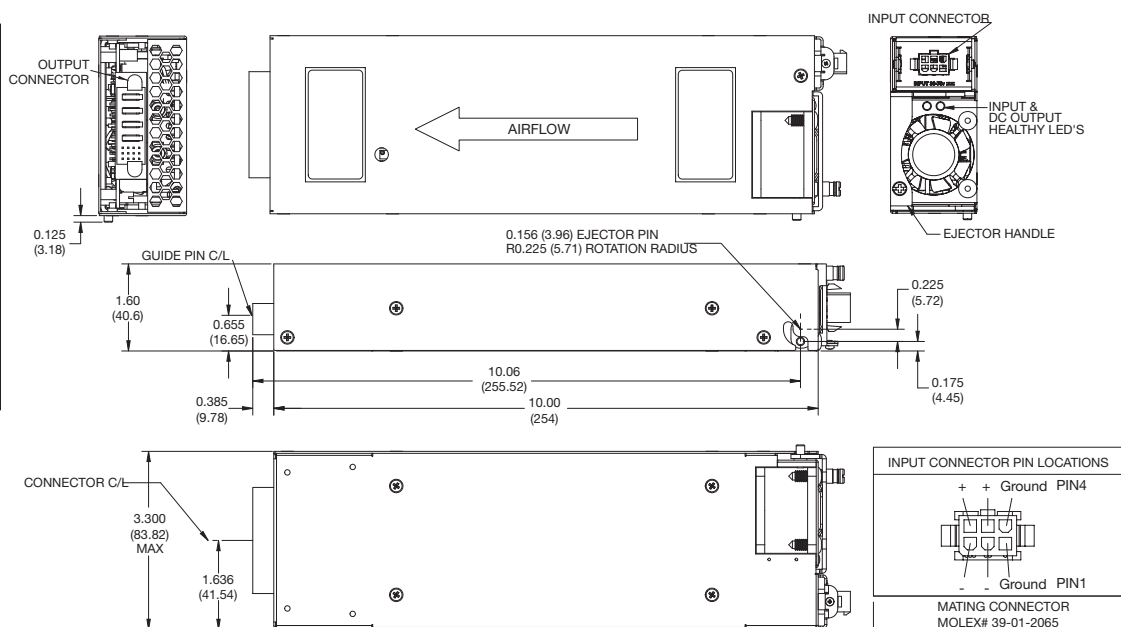
-H Hotswap

PIN CON. OUTPUT CON. FCI 51732-035-LF	
A1	+Sense
A2	Not Used
A3	DC OK
B1	-Sense
B2	Not Used
B3	DC IN OK
C1	Not used
C2	Not Used
C3	5 V Standby V3
D1	Not Used
D2	ROF (Inhibit/Enable)
D3	5 V Standby Return V3
P1	-V1
P2	-V1
P3	+V1
P4	+V1

PIN CONNECTIONS OUTPUT CONNECTOR	
1	D
2	C
3	B
4	A
5	P1
6	P2
7	P3
8	P4

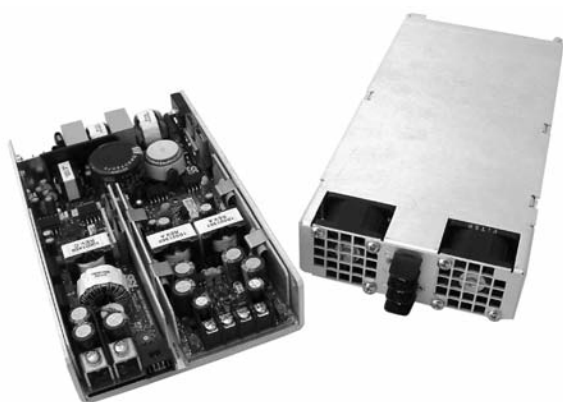
Viewed looking at PSU male part

Mating parts: FCI 51762-10401200AA-LF



250-450 Watts

LP & LP-MD Series



- Configurable for Fast Time to Market
- Industrial/IT & Medical Approvals
- All Outputs Isolated
- Low Profile 1U Applications
- Wide Voltage Adjustment Range
- SEMI F47 Certified
- 3 Year Warranty

Specification

Input

Input Voltage	• 90-264 VAC
Input Frequency	• 47-63 Hz
Inrush Current	• 20 A pk max, cold start 25 °C
Power Factor	• >0.9
Input Protection	• P3/M3: Internal T5 A/250 V fuse in line P4/M4: Internal T6.3 A/250 V fuse in line P5/M5: Internal T10 A/250 V fuse in line. M versions include fuse in neutral

Output

Output Voltage	• See module table
Output Voltage Trim	• $\pm 10\%$ min all modules. See module table for extended adjustment range
Hold Up Time	• 20 ms min
Line Regulation	• Typically 0.1%, maximum 0.3%
Load Regulation	• 1% max for single output modules & V1 of dual & triple output modules 2% max for V2 & V3 of dual & triple output modules A 10% load must be applied to output 1 of the high current dual module (U) & triple module (T) to achieve this figure
Ripple & Noise	• 50 mV or 1% pk-pk, whichever is greater, 20 MHz bandwidth
Overvoltage Protection	• 120-130% Vnom for single output & output 1 of high current dual modules (U) & triple modules (T)
Overload Protection	• <140% of nominal rating
Short Circuit Protection	• Foldback
Temperature Coefficient	• 0.03%/°C
Remote Sense	• Compensates for up to 0.5 V drop on single (S) output modules & output 1 of dual (U) & triple (T) output modules
Current Share	• Single wire parallel current share. See signals & controls page

General

Efficiency	• 75% typical at nominal input
Isolation	• 4000 VAC Input to Output 1500 VAC Input to Ground 500 VAC Output to Ground
Signals & Controls	• AC OK, DC OK, Global & Module Inhibit See signals & controls page
MTBF	• 1,380,538 Hrs demonstrated
Switching Frequency	• 60 kHz typical PFC, 200 kHz typical modules

Environmental

Operating Temperature	• 0 °C to +70 °C, derate linearly from 100% at +50 °C to 50% at +70 °C for fan versions See airflow curves for U-channel versions
Storage Temperature	• -40 °C to +85 °C
Operating Altitude	• 3000 m
Shock	• 30 g, 11 ms (half sine), 3 shocks each axis, 18 shocks total. Compliant with EN60068-2-27
Vibration	• 2 g, 10-500 Hz, 10 sweeps 3 axes Compliant with EN60068-2-27

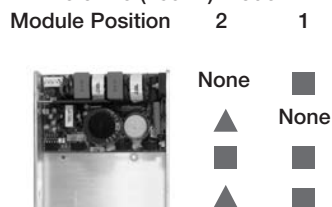
EMC & Safety

Emissions	• LP models P3-P5: EN55022, level B conducted LP-MD models, M3-M5: EN55011, level A conducted with FE(x) cover, M(x) level B conducted with ME(x) cover
Harmonic Currents	• EN61000-3-2, Class A
Voltage Flicker	• EN61000-3-3
ESD Immunity	• EN61000-4-2, level 3 Perf Criteria A
Radiated Immunity	• EN61000-4-3, level 3 Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3 Perf Criteria A
Surge	• EN61000-4-5, installation class 3 Perf Criteria A
Conducted Immunity	• EN61000-4-6, level 3 Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms, Criteria A, B, B
Safety Approvals	• LP models: EN60950, UL60950, CSA22.2 No 950, CE Mark LVD, SEMI F47 compliant (highline only) LP-MD models: EN60601-1, CSA22.2-601, UL60601-1, CE Mark LVD

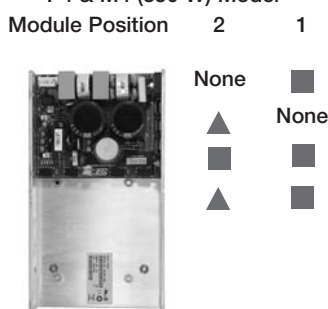
Model Configuration

LP & LP-MD 250-450 **XP**

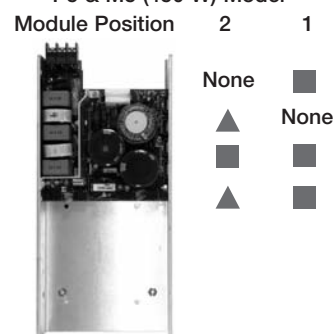
P3 & M3 (250 W) Model



P4 & M4 (350 W) Model



P5 & M5 (450 W) Model



STEP 1

In order to configure a model number for your LP (industrial) or LP-MD (medical) series power supply, first select the appropriate chassis based on your application's continuous, maximum output power requirements. Select 'P' (e.g. P3) for industrial or 'M' (e.g. M3) for medical.

STEP 2

From the ratings below, select the output modules that suit your output voltage and current requirements. Modules can be positioned as denoted by the ■ and ▲ sequence shown above e.g. P3S3T1FE301. P5 and M5 models supplied with fan cover.

STEP 3

Form the model number as shown below, ensuring you have selected a cooling method.

Example

Chassis Power	Module Position 1	Module Position 2	Fan Assembly Style	Parallel Option
P	3	S	T	1
Refer to Step 1	Add Module 1 Refer to Step 2	Add Module 2 Refer to Step 2	Leave blank for U-Channel	Leave blank if not required 2 x S module 1.8 - 15 V 01 2 x S module 24 - 48 V 02

Output Modules Voltage (Adjustment) & Current Ratings

Output 1	Output 2	Output 3	Module Code	Model Size
1.8 V (1.65-1.95 V) @ 50 A			SZ	■
2.5 V (2.25-2.75 V) @ 50 A			S1	■
3.3 V (3.25-3.50 V) @ 50 A			S2	■
5.0 V (4.50-5.50 V) @ 50 A			S3	■
8.0 V (7.20-8.80 V) @ 31 A			SF	■
10.0 V (9.00-11.00 V) @ 25 A			SG	■
12.0 V (11.00-13.00 V) @ 20 A			S4	■
15.0 V (14.00-16.00 V) @ 17 A			S5	■
24.0 V (21.00-26.00 V) @ 10 A			S6	■
28.0 V (25.00-31.00 V) @ 9 A			S7	■
36.0 V (32.00-40.00 V) @ 7 A			S8	■
48.0 V (43.00-53.00 V) @ 5 A			S9	■
3.3 V (3.25-3.50 V) @ 40 A	5.0 V (4.8-16.0 V) @ 4.0 A		U5 ⁽²⁾	■
3.3 V (3.25-3.50 V) @ 40 A	12.0 V (4.8-16.0 V) @ 4.0 A		U6 ⁽²⁾	■
3.3 V (3.25-3.50 V) @ 40 A	15.0 V (4.8-16.0 V) @ 4.0 A		U7 ⁽²⁾	■
3.3 V (3.25-3.50 V) @ 40 A	24.0 V (19.0-28.0 V) @ 2.5 A		U8 ⁽²⁾	■
5.0 V (4.80-5.20 V) @ 40 A	5.0 V (4.8-16.0 V) @ 4.0 A		U1 ⁽²⁾	■
5.0 V (4.80-5.20 V) @ 40 A	12.0 V (4.8-16.0 V) @ 4.0 A		U2 ⁽²⁾	■
5.0 V (4.80-5.20 V) @ 40 A	15.0 V (4.8-16.0 V) @ 4.0 A		U3 ⁽²⁾	■
5.0 V (4.80-5.20 V) @ 40 A	24.0 V (19.0-28.0 V) @ 2.5 A		U4 ⁽²⁾	■
5.0 V (4.80-5.20 V) @ 8 A	12.0 V (11.5-12.5 V) @ 6.0 A		R6 ⁽¹⁾	▲
5.0 V (4.80-5.20 V) @ 8 A	24.0 V (22.0-26.0 V) @ 3.0 A		R4 ⁽¹⁾	▲
12.0 V (11.50-12.50 V) @ 6 A	12.0 V (11.5-12.5 V) @ 6.0 A		R1 ⁽¹⁾	▲
12.0 V (11.50-12.50 V) @ 6 A	24.0 V (22.0-26.0 V) @ 3.0 A		R5 ⁽¹⁾	▲
15.0 V (14.00-16.00 V) @ 5 A	15.0 V (14.0-16.0 V) @ 5.0 A		R2 ⁽¹⁾	▲
3.3 V (3.25-3.50 V) @ 20 A	12.0 V (4.8-16.0 V) @ 4.0 A	12.0 V (4.8-16.0 V) @ 4 A	T3 ⁽²⁾	▲
3.3 V (3.25-3.50 V) @ 20 A	15.0 V (4.8-16.0 V) @ 3.0 A	15.0 V (4.8-16.0 V) @ 3 A	T4 ⁽²⁾	▲
5.0 V (4.80-5.20 V) @ 20 A	12.0 V (4.8-16.0 V) @ 4.0 A	12.0 V (4.8-16.0 V) @ 4 A	T1 ⁽²⁾	▲
5.0 V (4.80-5.20 V) @ 20 A	15.0 V (4.8-16.0 V) @ 3.0 A	15.0 V (4.8-16.0 V) @ 3 A	T2 ⁽²⁾	▲
5.0 V (4.80-5.20 V) @ 20 A	12.0 V (4.8-16.0 V) @ 4.0 A	5.0 V (4.8-16.0 V) @ 4 A	T8 ⁽²⁾	▲
12.0 V (11.50-12.50 V) @ 10 A	12.0 V (4.8-16.0 V) @ 4.0 A	5.0 V (4.8-16.0 V) @ 4 A	T6 ⁽²⁾	▲
12.0 V (11.50-12.50 V) @ 10 A	12.0 V (4.8-16.0 V) @ 4.0 A	15.0 V (4.8-16.0 V) @ 3 A	T10 ⁽²⁾	▲
24.0 V (22.00-26.00 V) @ 4 A	5.0 V (4.8-16.0 V) @ 4.0 A	5.0 V (4.8-16.0 V) @ 4 A	T11 ⁽²⁾	▲
24.0 V (22.00-26.00 V) @ 4 A	15.0 V (4.8-16.0 V) @ 4.0 A	5.0 V (4.8-16.0 V) @ 4 A	T9 ⁽²⁾	▲
24.0 V (22.00-26.00 V) @ 4 A	15.0 V (4.8-16.0 V) @ 3.0 A	15.0 V (4.8-16.0 V) @ 3 A	T7 ⁽²⁾	▲

1. R modules do not have signals or control facilities.

2. Output V2 & V3 of U & T modules can supply up to 5 A in certain applications dependent on other rail loadings. Contact sales for details.

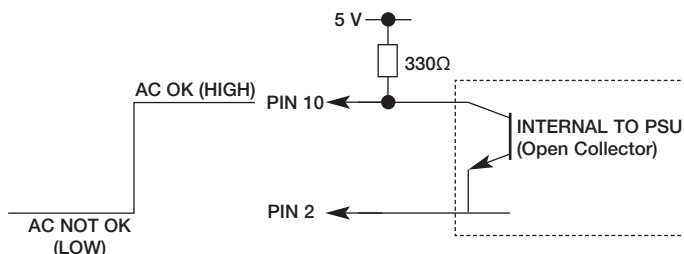
3. Certain model configurations are available from Farnell and Newark.

Signals & Controls

LP & LP-MD 250-450

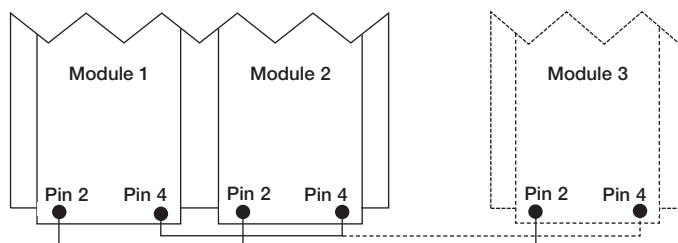
AC OK/Power Fail

When fitted in module position 2 of the chassis, pins 10 and 2 provide a minimum of 5 ms warning of loss of output regulation.



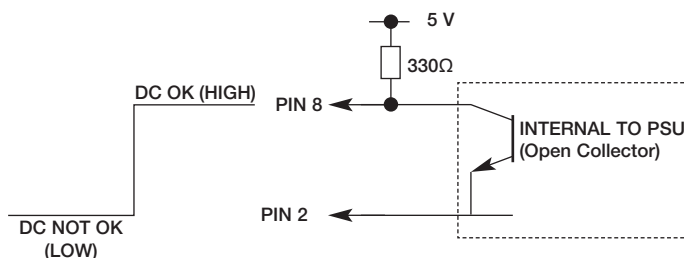
Current Share

Connecting pins 4 & 2 of like part number modules (3 maximum) within the same chassis or separate chassis will force the modules to current share the outputs.



DC OK

Pins 8 and 2 provide notification that the output voltage is within regulation via a logic 1.



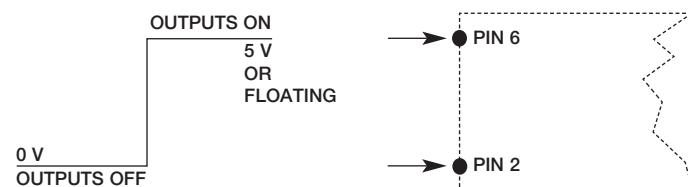
(Reverse logic option available, i.e. high for DC NOT OK).

Global Inhibit

Inhibiting the module fitted in position 2 will inhibit all outputs of other modules (fans remain running if fitted). If individual inhibit is required on the module fitted in chassis position 2 alternative configurations are available. Contact sales for further information.

Module Inhibit

Pins 6 and 2 (return) provide on/off control of the module. Applying a logic '0' between these pins turns the module off.



(Reverse logic option available, i.e. high for outputs off or low for outputs on).

Modules in Parallel

Single output modules with the same part number and V1 of dual and triple output modules can be paralleled to obtain increased output current. These modules can either be fitted in the same chassis or a different chassis with their outputs connected directly together and current share connections made, see *Current Share*.

Modules in Series

Single output modules can be connected in series to obtain alternate output voltages not available from a single module. For example a 10 V (SG module) can be connected in series with a 12 V (S4 module) to obtain an output voltage of 22 V. Maximum output voltage 60 VDC.

Remote Sense

Pins 1 +ve and 2 -ve provide compensation for voltage drops in application wiring up to a maximum of 0.5 V. Remote Sense is not fitted to R modules and V2 & V3 of U and T modules.

Housekeeping

A 5 V standby voltage rated at 1 A is fitted to each chassis. Contact sales for details.

Notes

1. R module does not have these signal facilities.

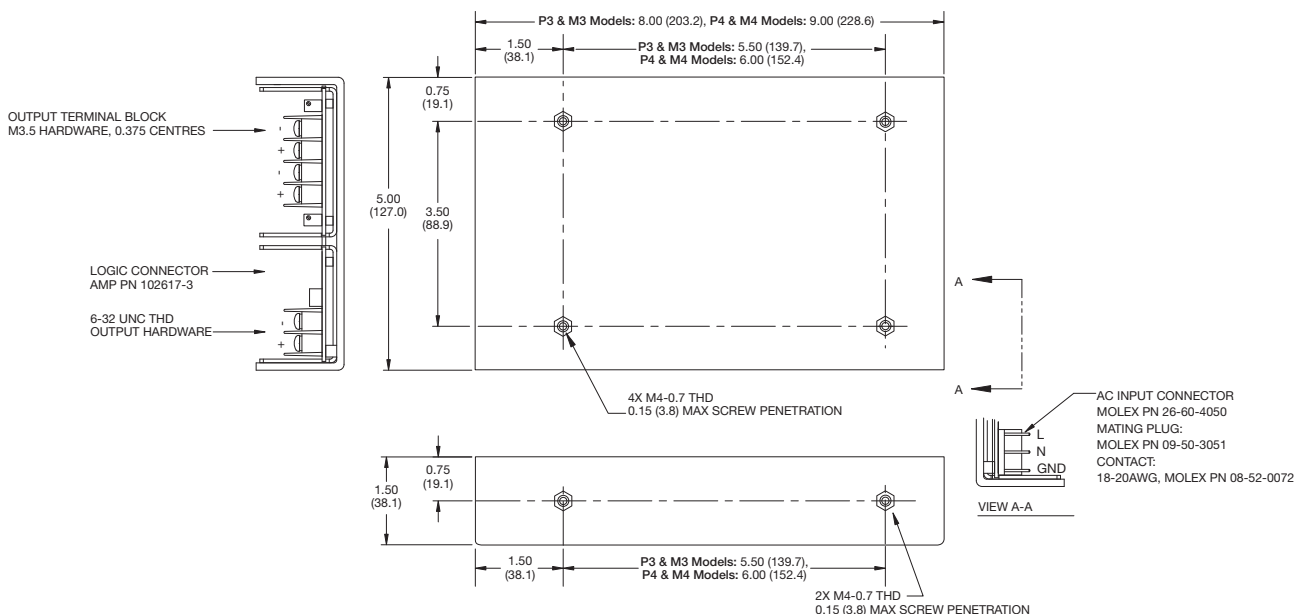
Mechanical Details

LP & LP-MD 250-450 XP

250 Watt P3 & M3 Models and 350 Watt P4 & M4 Models

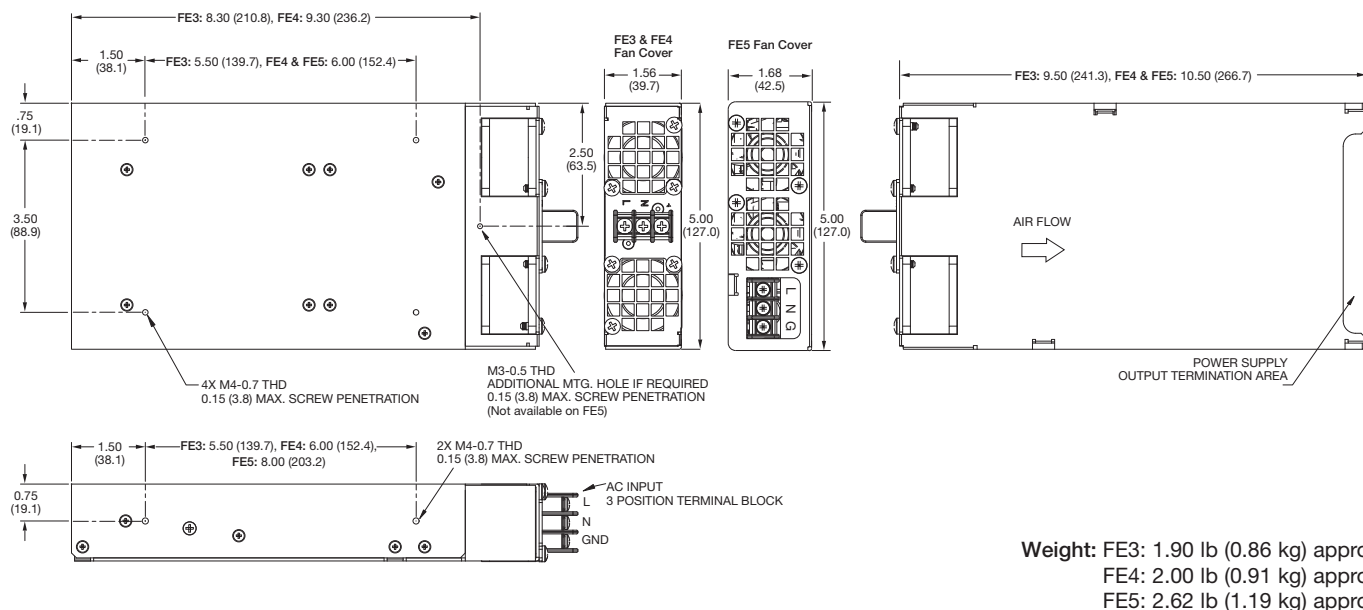
U Channel

See Airflow Curves



Weight: 250 Watt P3 & M3 Model: 1.40 lb (0.64 kg) approx
350 Watt P4 & M4 Model: 1.50 lb (0.68 kg) approx

FE3, FE4 and FE5 Fan Assembly

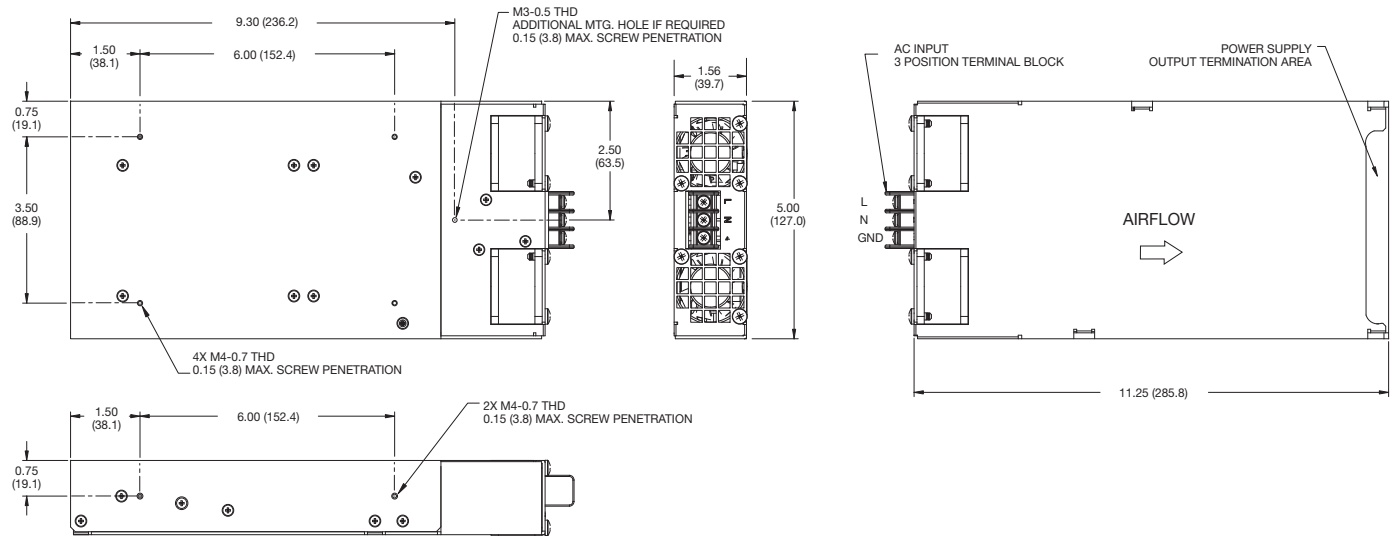


Weight: FE3: 1.90 lb (0.86 kg) approx
FE4: 2.00 lb (0.91 kg) approx
FE5: 2.62 lb (1.19 kg) approx

Notes

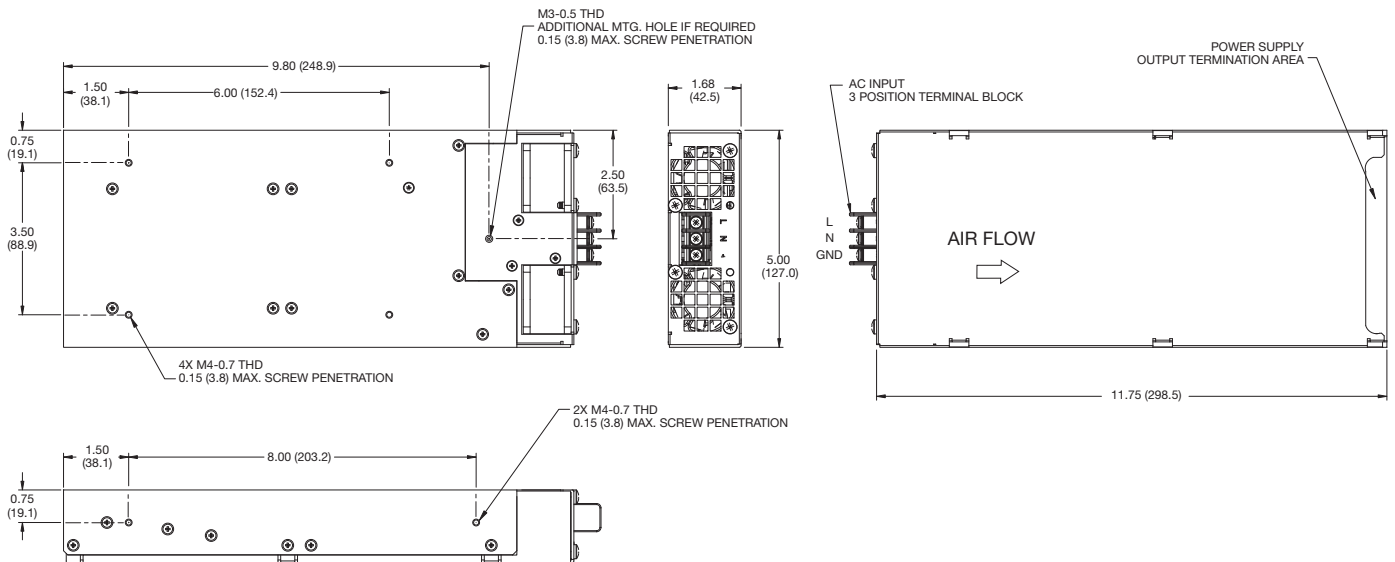
1. Dimensions in inches (mm). Tolerance: X.XX = ± 0.02 (0.50), X.XXX = ± 0.01 (0.25)
2. Supplies are SEMI F47 at highline input (180-264) at 100% rated output power. Certification details available on request.
3. Mating connector kit available. Order part number LP CONN KIT.
4. For mating connectors, use pinouts as detailed in this datasheet. May not match manufacturers mold marks on connector.
5. P5 chassis supplied with fan cover.

350 Watt ME4 Fan Assembly (M Models Only)



Weight: ME4: 2.16 lb (0.98 kg) approx

ME5 Fan Assembly (M Models Only)



Weight: 2.62 lb (1.19 kg) approx

Notes

1. Dimensions in inches (mm). Tolerance: X.XX = ± 0.02 (0.50), X.XXX = ± 0.01 (0.25)
2. Supplies are SEMI F47 at highline input (180-264) at 100% rated output power. Certification details available on request.
3. Mating connector kit available. Order part number LP CONN KIT.
4. For mating connectors, use pinouts as detailed in this datasheet. May not match manufacturers mold marks on connector.
5. M5 chassis supplied with fan cover.

Airflow Curves - U-Channel Models

The curves denote chassis derating. Output modules must be derated by the same proportion.

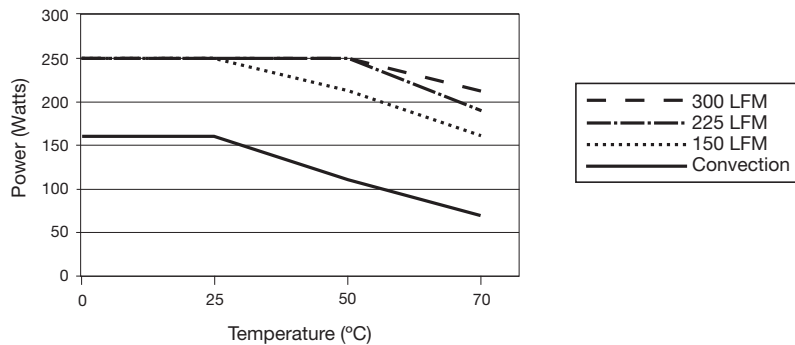
Formula for converting CFM to LFM:

$$\text{LFM} = \frac{\text{CFM} \times 144}{(\text{total cross section of airflow path (Inches}^2\text{)})}$$

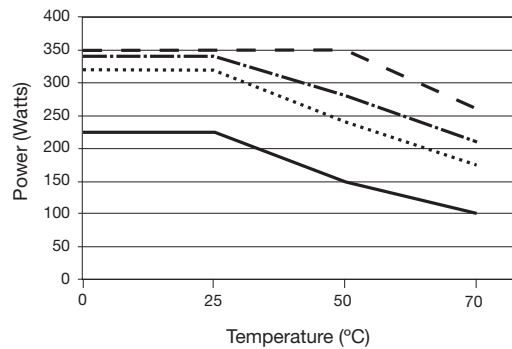
Formula for converting LFM to CFM:

$$\text{CFM} = \frac{\text{LFM} \times (\text{total cross section of airflow path (Inches}^2\text{)})}{144}$$

P3 & M3 Models



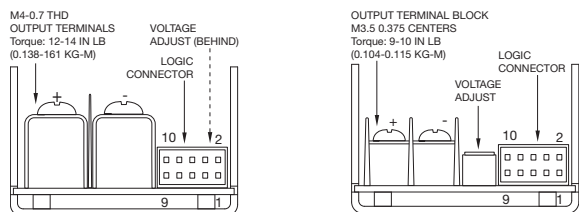
P4 & M4 Models



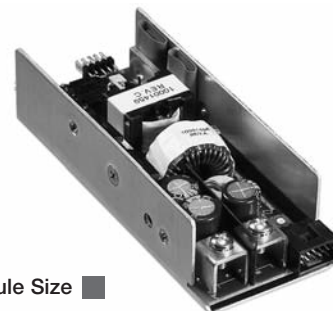
Output Module Connection Details

Single Output (S)

Weight: 0.50 lb (227 g) approx



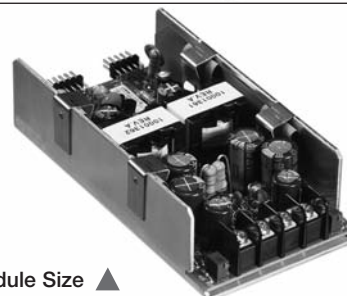
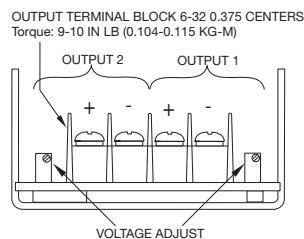
Logic Connector AMP 87631-5	
Pin	Function
1	+sense (V1)
2	-sense (V1)
3	+sense (V1)
4	Current share
5	
6	Inhibit
7	-sense (V1)
8	DC OK
9	
10	Power fail



For mating connectors, use pinouts as detailed in this datasheet. May not match manufacturers mold marks on connector.

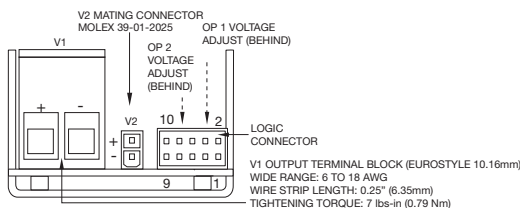
Dual Output (R)

Weight: 0.52 lb (236 g) approx

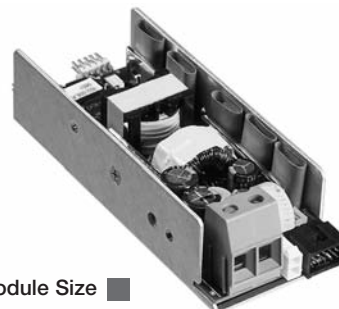


Dual Output (U)

Weight: 0.62 lb (282 g) approx



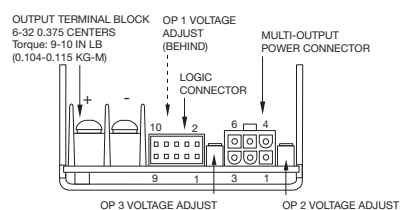
Logic Connector AMP 87631-5	
Pin	Function
1	+sense (V1)
2	-sense (V1)
3	+sense (V1)
4	Current share
5	
6	Inhibit
7	-sense (V1)
8	DC OK
9	
10	Power fail



For mating connectors, use pinouts as detailed in this datasheet. May not match manufacturers mold marks on connector.

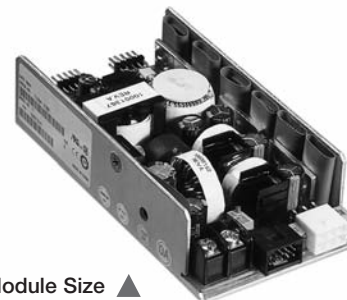
Triple Output (T)

Weight: 0.70 lb (318 g) approx



Output Connector Molex 39-01-2060	
Pin	Function
1	Output RTN V2
2	
3	Output RTN V3
4	Output 2+
5	
6	Output 3+

Logic Connector AMP 87631-5	
Pin	Function
1	+sense (V1)
2	-sense (V1)
3	+sense (V1)
4	Current share
5	
6	Inhibit
7	-sense (V1)
8	DC OK
9	
10	Power fail



For mating connectors, use pinouts as detailed in this datasheet. May not match manufacturers mold marks on connector.

150-500 Watts

LCL Series



- Single Output Industrial Supplies
- High Efficiency
- Low Cost
- 150 W Convection Cooled
- 300 W & 500 W with Internal Fans
- Outputs from 12 V to 48 V
- 3 Year Warranty

Specification

Input

Input Voltage	• 85-264 VAC (127-370 VDC) (see note 1)
Input Frequency	• 47-63 Hz
Input Current	• 2.1 A max for LCL150, 4.5 A max for LCL300, 6.6 A max for LCL500
Inrush Current	• 40 A max for LCL150, 60 A max for LCL300 & 500 cold start at 25 °C, 230 VAC
Power Factor	• >0.9
Earth Leakage Current	• <2 mA at 264 VAC, 60 Hz
Input Protection	• LCL150: T3.15 A/250 V, LCL300: T6.3A/250 V, LCL500: T10A/250 V, internal fuse fitted in line

Output

Output Voltage	• See tables
Output Voltage Trim	• See tables
Initial Set Accuracy	• ± 100 mV at 50% load
Minimum Load	• None required
Start Up Delay	• 2 s max for LCL150, 1.5 s max for LCL300, 0.8 s max for LCL500
Start Up Rise Time	• 50 ms max for LCL150, 35 ms max for LCL300 & LCL500
Hold Up Time	• 10 ms min at 115 VAC and full load
Line Regulation	• $\pm 0.5\%$ max for LCL150, $\pm 0.3\%$ for LCL300 & LCL500
Load Regulation	• $\pm 1\%$ max
Transient Response	• 4% max deviation recovery to within 1% in 500 μ s for a 50% load change
Ripple & Noise	• See tables
Overvoltage Protection	• 115-135%, recycle input to reset
Overtemperature Protection	• Output turns off when OTP triggered, measured internally, auto recovery
Overload Protection	• 110-140% of rated output power. Delayed by 1 s min to allow for peak loads.
Short Circuit Protection	• Trip and restart (hiccup mode), auto recovery
Remote Sense	• Fitted to LCL500 only, compensates for 0.25 V max each line
Remote On/Off	• Fitted on LCL300 & 500 only, On = logic low or open circuit, Off = logic high

General

Efficiency	• 88% typical at full load & 230 VAC
Isolation	• 3000 VAC Input to Output 1500 VAC Input to Ground 500 VAC Output to Ground
Switching Frequency	• 90-110 kHz main converter & 45-190 kHz PFC for LCL150, 80-190 kHz main converter & 62-65 kHz PFC for LCL300 & 500
Power Density	• 2.7 W/in ³ LCL150, 4.4 W/in ³ LCL300, 4.9 W/in ³ LCL500
MTBF	• LCL150: >489 kHrs, LCL300: >235 kHrs, LCL500: >211 kHrs to MIL-HBK-217F at 25 °C, GB

Environmental

Operating Temperature	• -10 °C to +70 °C, derate from 100% load at 50 °C to 50% load at 70 °C
Cooling	• LCL150 convection cooled, LCL300 & LCL500 have internal fans
Operating Humidity	• 5% to 90% non condensing
Storage Temperature	• -40 °C to +85 °C
Operating Altitude	• 3000 m
Vibration	• 10-500 Hz, 2 g, 10 mins per cycle on 3 axes

EMC & Safety

Emissions	• EN55022 level B conducted, level A radiated
Harmonic Currents	• EN61000-3-2 class A LCL150: EN61000-3-2 class C for loads $\geq 40\%$ LCL300 & LCL500: EN61000-3-2 class C for loads $\geq 20\%$
Voltage Flicker	• EN61000-3-3
ESD Immunity	• EN61000-4-2, ± 4 kV contact, ± 8 kV air discharge, Performance Criteria A
Radiated Immunity	• EN61000-4-3, level 2 Perf Criteria A
EFT/Burst	• EN61000-4-4, level 2 Perf Criteria A
Surge	• EN61000-4-5, installation class 3, Perf Criteria A
Conducted Immunity	• EN61000-4-6, level 2 Perf Criteria A
Magnetic Field	• EN61000-4-8, 1 A/m Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms, Perf Criteria A, B, B
Safety Approvals	• EN60950-1, UL60950-1, CSA60950 No 22.2

Model and Ratings

LCL150 **XP**

Output Power ⁽¹⁾	Output Voltage	Trim Range	Output Current	Ripple & Noise ⁽²⁾	Model Number
150 W	12.0 V	11.0-13.0 V	12.5 A	100 mV pk-pk	LCL150PS12†^
	13.5 V	12.5-14.5 V	11.1 A	100 mV pk-pk	LCL150PS13
	15.0 V	14.0-16.0 V	10.0 A	100 mV pk-pk	LCL150PS15†^
	24.0 V	23.0-25.0 V	6.3 A	150 mV pk-pk	LCL150PS24†^
	27.0 V	26.0-28.0 V	5.6 A	150 mV pk-pk	LCL150PS27
	48.0 V	47.0-49.0 V	3.1 A	250 mV pk-pk	LCL150PS48†^

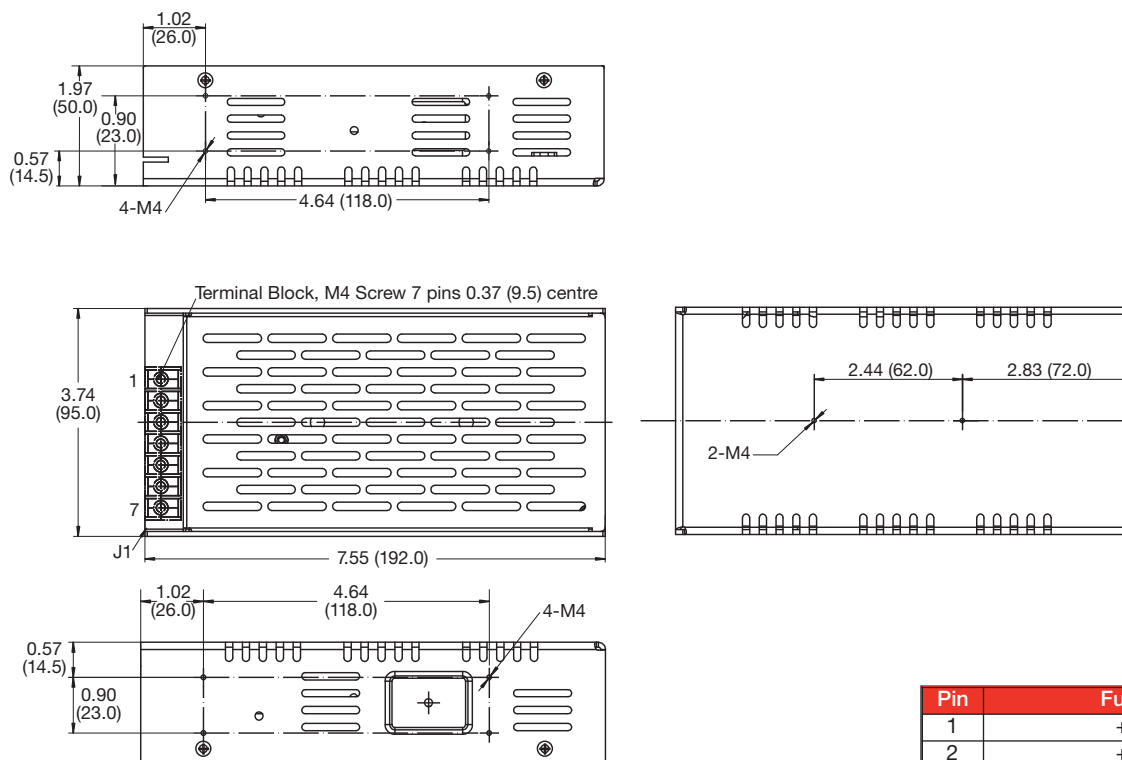
Notes

- Output power derates linearly from 100% at 90 VAC to 90% at 85 VAC.
- Measured with 20 MHz bandwidth.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296

Mechanical Details

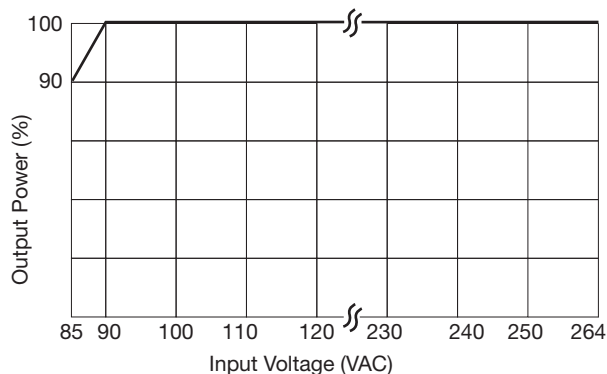
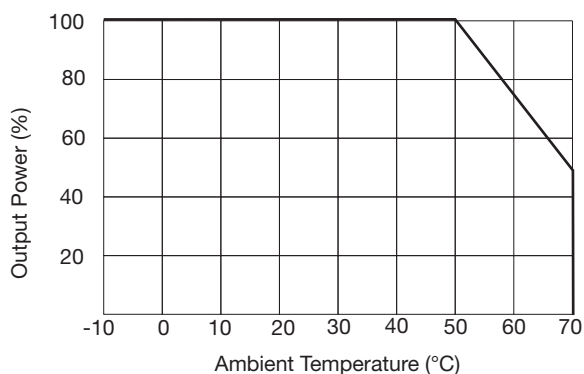


Pin	Function
1	+Vout
2	+Vout
3	-Vout
4	-Vout
5	Ground
6	Neutral
7	Line

Notes

- All dimensions shown in inches (mm).
- Weight: 1.39 lbs (630 g) approx.
- Tolerance is ± 0.05 (± 0.2) maximum.

Derating Curves



Model and Ratings

LCL300 **XP**

Output Power ⁽¹⁾	Output Voltage	Trim Range	Output Current	Ripple & Noise ⁽²⁾	Model Number
300 W	12.0 V	11.0-13.0 V	25.0 A	150 mV pk-pk	LCL300PS12†^
	13.5 V	12.5-14.5 V	22.0 A	150 mV pk-pk	LCL300PS13
	15.0 V	14.0-16.0 V	20.0 A	150 mV pk-pk	LCL300PS15†^
310 W	24.0 V	23.0-25.0 V	13.0 A	150 mV pk-pk	LCL300PS24†^
315 W	27.0 V	26.0-28.0 V	11.7 A	200 mV pk-pk	LCL300PS27
320 W	48.0 V	47.0-49.0 V	6.70 A	240 mV pk-pk	LCL300PS48†^

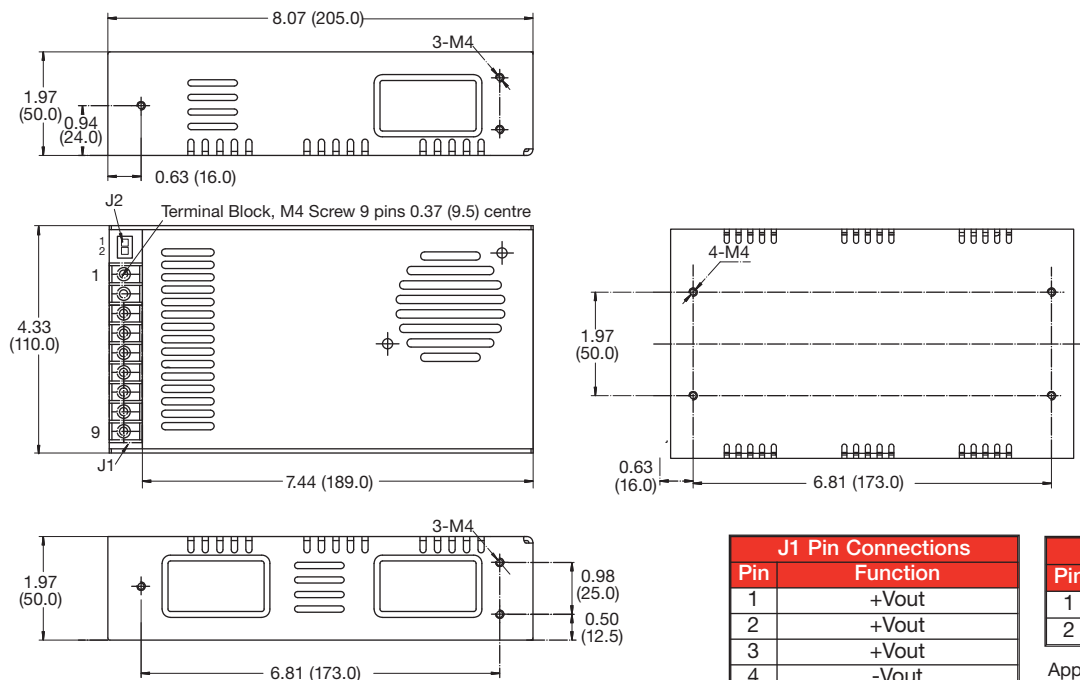
Notes

1. Output power derates linearly from 100% at 90 VAC to 90% at 85 VAC.
 2. Measured with 20 MHz bandwidth.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296

Mechanical Details



J1 Pin Connections	
Pin	Function
1	+Vout
2	+Vout
3	+Vout
4	-Vout
5	-Vout
6	-Vout
7	Ground
8	Neutral
9	Line

J2 Pin Connections	
Pin	Function
1	Remote On/Off -
2	Remote On/Off +

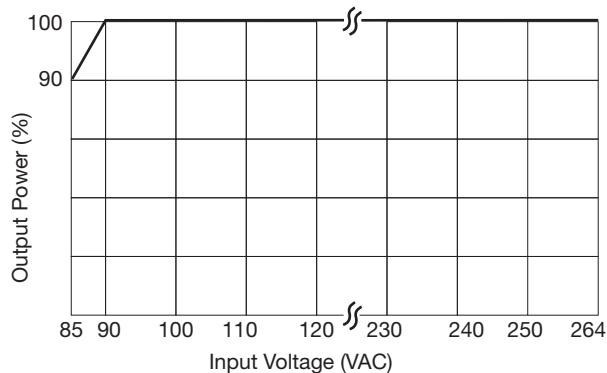
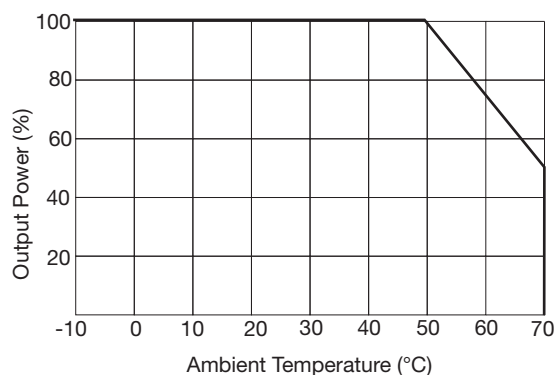
Applying >4.5 V to Pin 2 with respect to Pin 1 turns output off.
 Applying <0.8 V to Pin 2 with respect to Pin 1 or open circuit turns output on.

Mating Connectors (J2):
 Molex KK type 2695 housing
 Molex 2695-2759 contacts

Notes

1. All dimensions shown in inches (mm)
 2. Weight: 1.94 lbs (880 g) approx.
 3. Tolerance is ± 0.05 (± 0.2) maximum.

Derating Curves



Model and Ratings

LCL500 XP

Output Power ⁽¹⁾	Output Voltage	Trim Range	Output Current	Ripple & Noise ⁽²⁾	Model Number
500 W	12.0 V	11.0-13.0 V	42.0 A	120 mV pk-pk	LCL500PS12†^
	13.5 V	12.5-14.5 V	37.0 A	150 mV pk-pk	LCL500PS13
	15.0 V	14.0-16.0 V	34.0 A	150 mV pk-pk	LCL500PS15†^
	24.0 V	23.0-25.0 V	21.0 A	150 mV pk-pk	LCL500PS24†^
	27.0 V	26.0-28.0 V	18.5 A	150 mV pk-pk	LCL500PS27
	48.0 V	47.0-49.0 V	10.5 A	240 mV pk-pk	LCL500PS48†^

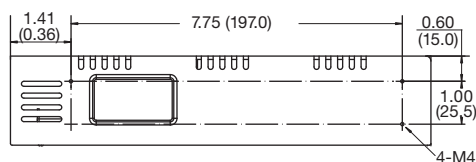
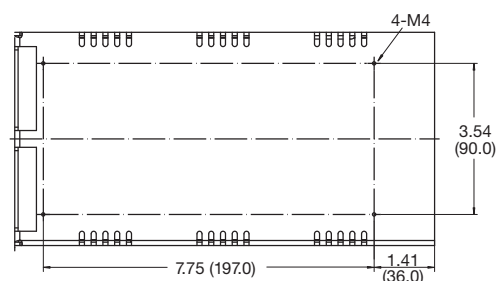
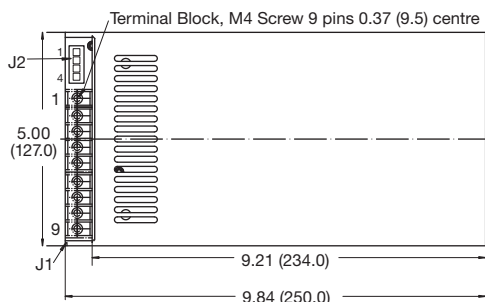
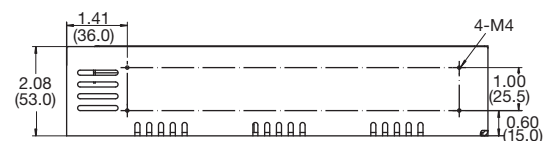
Notes

- Output power derates linearly from 100% at 90 VAC to 90% at 85 VAC.
- Measured with 20 MHz bandwidth.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296

Mechanical Details



J1 Pin Connections	
Pin	Function
1	+Vout
2	+Vout
3	+Vout
4	-Vout
5	-Vout
6	-Vout
7	Ground
8	Neutral
9	Line

J2 Pin Connections	
Pin	Function
1	Remote On/Off -
2	Remote On/Off +
3	Sense -
4	Sense +

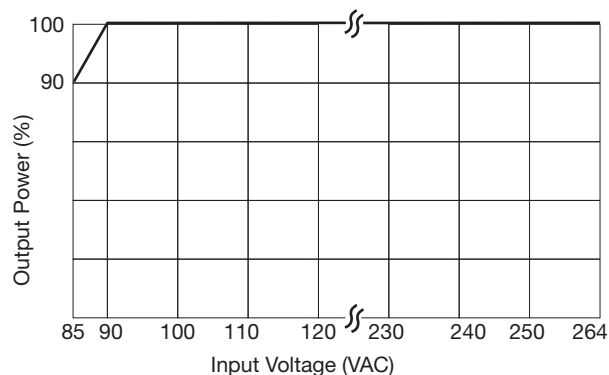
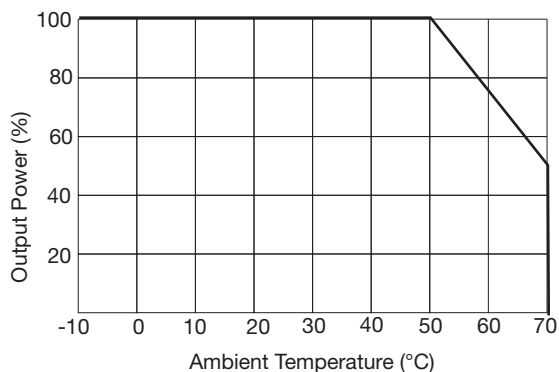
Applying >4.5 V to Pin 2 with respect to Pin 1 turns output off.
Applying <0.8 V to Pin 2 with respect to Pin 1 or open circuit turns output on.

Mating Connectors (J2):
WST P4-I25002 housing
WST I25002BS contacts

Notes

- Dimensions shown in inches (mm).
- Weight: 3.2 lbs (1.45 kg) approx.
- Tolerance is ± 0.05 (± 0.2) maximum.

Derating Curves



400/600 Watts

CCH400-600 Series



- Baseplate Cooled
- -40 °C to +70 °C Operation
- Industrial & MIL-STD461E EMC Compliance
- Power Fail, Inhibit, Overtemp & Current Share
- 5V Standby Output
- Available Q3 2011
- 3 Year Warranty

Specification

Input

Input Voltage	• 90-264 VAC
Input Frequency	• 47-400 Hz ⁽¹⁾
Input Current	• CCH400: 4.1/2.1 A typ. at 115/230 VAC, CCH600: 6.3/3.0 A typ. at 115/230 VAC, full load
Inrush Current	• 60 A max at 230 VAC, 25 °C cold start
Power Factor	• >0.9
Earth Leakage Current	• 0.6/0.9 mA at 115/230 VAC at 60/50 Hz
Input Protection	• Internal F10 A/250 V fuse in line and neutral

Output

Output Voltage	• 12-48 VDC
Output Voltage Trim	• ±5%
Initial Set Accuracy	• ±1% V1, ±3% V2
Minimum Load	• No minimum load required
Start Up Delay	• Typically 1 s
Start Up Rise Time	• 50 ms typical
Hold Up Time	• 16 ms min at 115 VAC
Drift	• ±0.2% after 20 min warm up
Line Regulation	• ±0.5% max
Load Regulation	• ±1% V1, ±5% V2 max
Over/Undershoot	• 5% typical
Transient Response	• 4% max. deviation, recovery to within 1% in 500 µs for a 50-75-50% load change
Ripple & Noise	• 1% pk-pk V1, V2 2%, 20 MHz bandwidth
Overvoltage Protection	• 115-140% Vnom, recycle input to reset
Overload Protection	• 110-150% V1 only
Short Circuit Protection	• Continuous, approximately constant current
Temperature Coefficient	• 0.05%/°C
Remote Sense	• Compensates for 0.5 V total voltage drop
Remote On/Off	• Uncommitted isolated optocoupler diode, powered diode inhibits V1

General

Efficiency	• 86% typical
Isolation	• 3000 VAC Input to Output, 1500 VAC Input to Ground, 500 VDC Output to Ground
Switching Frequency	• 59-420 kHz PFC, 55.5 kHz main and 77-139 kHz standby converter
Signals	• Power Fail, Inhibit, Current Share, Overtemperature Warning and 5 V Standby
MTBF	• 300 kHrs to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Temperature	• -20 °C to +70 °C ambient. Baseplate must be maintained ≤+85 °C. -40 °C start up.
Warm Up Time	• Typically 20 minutes from -40 °C
Cooling	• Baseplate, conduction cooling
Operating Humidity	• 95% RH, non-condensing
Storage Temperature	• -40 °C to +85 °C
Operating Altitude	• 3000 m
Shock	• 30 g pk, half sine, 6 axes & MIL-STD 810F
Vibration	• 2 g rms, 5 Hz to 500 kHz, 3 axes & MIL-STD 810F

EMC & Safety

Low Voltage PSU EMC Emissions	• EN61204-3, high severity level
	• EN55022 level B conducted, level A radiated, MIL-STD 461D-F, CE102
Harmonic Currents	• EN61000-3-2, class A
Voltage Flicker	• EN61000-3-3
Radiated Immunity	• EN61000-4-3, level 3 Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3 Perf Criteria A MIL-STD 461 CS115
Surge	• EN61000-4-5, installation class 3 Perf Criteria A, MIL-STD 461 CS116
Conducted Immunity	• EN61000-4-6, level 3 Perf Criteria A, MIL-STD 461 CS114
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms, Perf Criteria A, B, B
Safety Approvals	• IEC60950-1 CB report, UL60950-1, TUV EN60950-1
Equipment Protection Class	• Class I

Notes

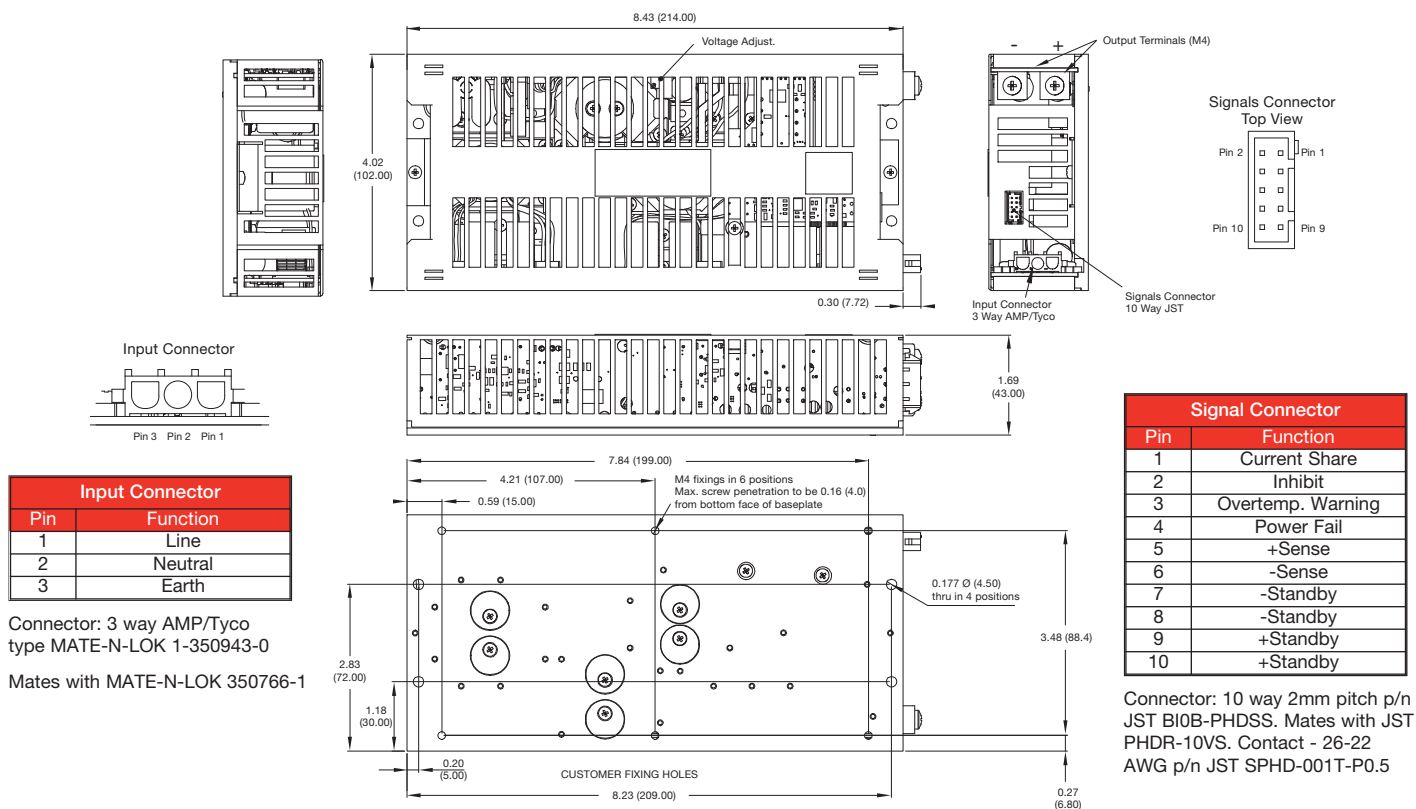
1. Safety approvals cover frequency 47-63 Hz.

Models and Ratings

CCH400/600 **XP**

Output Power	Output Voltage V1	Output Current V1	Standby Supply V2	Model Number
411 W	12.0 VDC	34.0 A	5.0 V/0.5 A	CCH400PS12
411 W	24.0 VDC	17.0 A	5.0 V/0.5 A	CCH400PS24
409 W	28.0 VDC	14.5 A	5.0 V/0.5 A	CCH400PS28
411 W	48.0 VDC	8.5 A	5.0 V/0.5 A	CCH400PS48
603 W	12.0 VDC	50.0 A	5.0 V/0.5 A	CCH600PS12
603 W	24.0 VDC	25.0 A	5.0 V/0.5 A	CCH600PS24
605 W	28.0 VDC	21.5 A	5.0 V/0.5 A	CCH600PS28
603 W	48.0 VDC	12.5 A	5.0 V/0.5 A	CCH600PS48

Mechanical Details

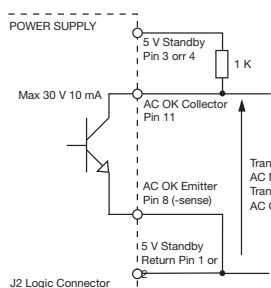


Notes

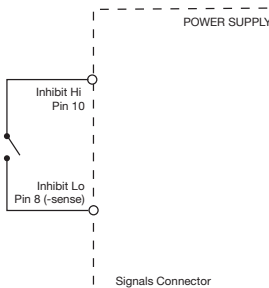
1. All dimensions in inches (mm).
2. Tolerance .xx = ± 0.02 (0.50); .xxx = ± 0.01 (0.25)
3. Weight 3.26 lbs (1.49 kg)

Signals

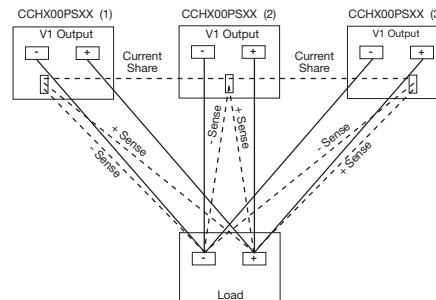
AC OK/Power Fail



Remote On/Off



Parallel Load & Current Share



Thermal Considerations

The baseplate must be maintained below 85 °C and therefore a suitable heatsink must be selected to remove the heat from the power supply. Details of the heatsink calculations and other considerations can be found in the longform datasheet.

800 Watts

SMR Series



- Up to 900 W Peak Output Power
- Single Outputs from 12 V to 48 V
- Compact Size
- Remote On/Off
- SEMI F47 Compliant
- Optional Current Share
- 3 Year Warranty

Specification

Input

Input Voltage	• 90-264 VAC (120-370 VDC)
Input Frequency	• 47-63 Hz
Input Current	• 11 A at 90 VAC, 5 A at 230 VAC
Inrush Current	• 70 A at 230 VAC
Power Factor	• >0.9
Earth Leakage Current	• <2.4 mA max at 264 VAC
Input Protection	• Fitted with a T12 A/250 V fuse

Output

Output Voltage	• See table
Output Voltage Trim	• $\pm 5\%$
Initial Set Accuracy	• $\pm 1\%$
Minimum Load	• 1% (see note 9)
Start Up Delay	• 1.5 s at 230 VAC
Start Up Rise Time	• 40 ms typical
Hold Up Time	• 16 ms min at 120 VAC
Line Regulation	• $\pm 0.5\%$, low line to high line
Load Regulation	• $\pm 1\%$, 1-100% load (see note 8)
Over/Undershoot	• 5% max
Transient Response	• 5% max deviation, 500 μ s recovery to within 1% for a 50% load change
Ripple & Noise	• 1% of nominal output voltage (see note 2)
Overvoltage Protection	• 110-130% recycle input to reset
Overtemperature Protection	• Measured internally with auto recovery
Overload Protection	• 110-140% with auto recovery
Short Circuit Protection	• Trip and restart (Hiccup mode)
Remote Sense	• Compensates for up to 0.5 V line drop (not available with current share)
Remote On/Off	• On = TTL Logic HIGH, or open circuit Off = TTL Logic LOW or short circuit
Current Share	• Optional single wire current share within 10% for up to 4 units (add suffix '-I' to model number) Note that this option includes output blocking diodes. Remote sense is not available with current share.

General

Efficiency	• 80% min (12 V models), 82% min for other models at 230 VAC full load
Isolation	• 3000 VAC Input to Output 1500 VAC Input to Ground 250 VDC Output to Ground
Switching Frequency	• 60 kHz PFC, 25 kHz PWM typical
Power Density	• 8.2 W/In ³
Signals	• Green LED for Power On, Power Good TTL HIGH within 100-500 ms and LOW ≤ 1 ms before loss of regulation
Current Monitor	• 0.5 V to 3 V output denoting 0-100% output current
MTBF	• 150 kHrs min to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Temperature	• 0 °C to +70 °C, derates from 100% load at +50 °C to 50% load at +70 °C
Cooling	• Integral fan
Operating Humidity	• 5-90%, non-condensing
Storage Temperature	• -20 °C to +85 °C
Operating Altitude	• 3000 m
Vibration	• 5-50 Hz, acceleration 7.35 ms ² on X, Y and Z axis

EMC & Safety

Emissions	• FCC Part 15 & EN55022, level B conducted and radiated
Harmonic Currents	• EN61000-3-2 class A EN61000-3-2 class C for loads $\geq 20\%$
Voltage Flicker	• EN61000-3-3
ESD Immunity	• EN61000-4-2, level 3 Perf Criteria A
Radiated Immunity	• EN61000-4-3, 3 V/m Perf Criteria A
EFT/Burst	• EN61000-4-4, level 2 Perf Criteria A
Surge	• EN61000-4-5, installation class 3 Perf Criteria A
Conducted Immunity	• EN61000-4-6, 3V Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms Perf Criteria A, B, B
Safety Approvals	• UL60950, CSA C22.2 No. 950, EN60950-1:2001, CE Mark LVD, SEMI F47 compliant (high line only) at 100% rated power output

Models and Ratings

SMR800 **XP**

Output Power	Output Voltage ⁽²⁾	Output Current		Ripple & Noise ⁽²⁾	Model Number
		Maximum	Peak ⁽¹⁾		
750 W	12 V	62.50 A	75.00 A	120 mV	SMR800PS12 [†] ^
800 W	24 V	33.39 A	37.50 A	240 mV	SMR800PS24 [†] ^
	48 V	16.67 A	18.75 A	480 mV	SMR800PS48 [†] ^

Notes

1. Peak current can be taken for 500 μ s, average power should not exceed the maximum power.
2. Ripple & Noise is measured using 0.1 μ F ceramic and 22 μ F electrolytic capacitor, 20 MHz bandwidth.
3. Load regulation increases to 2% for 0-100% load change.
4. For Top Fan versions replace SMR with SMT. Contact sales for mechanical details.

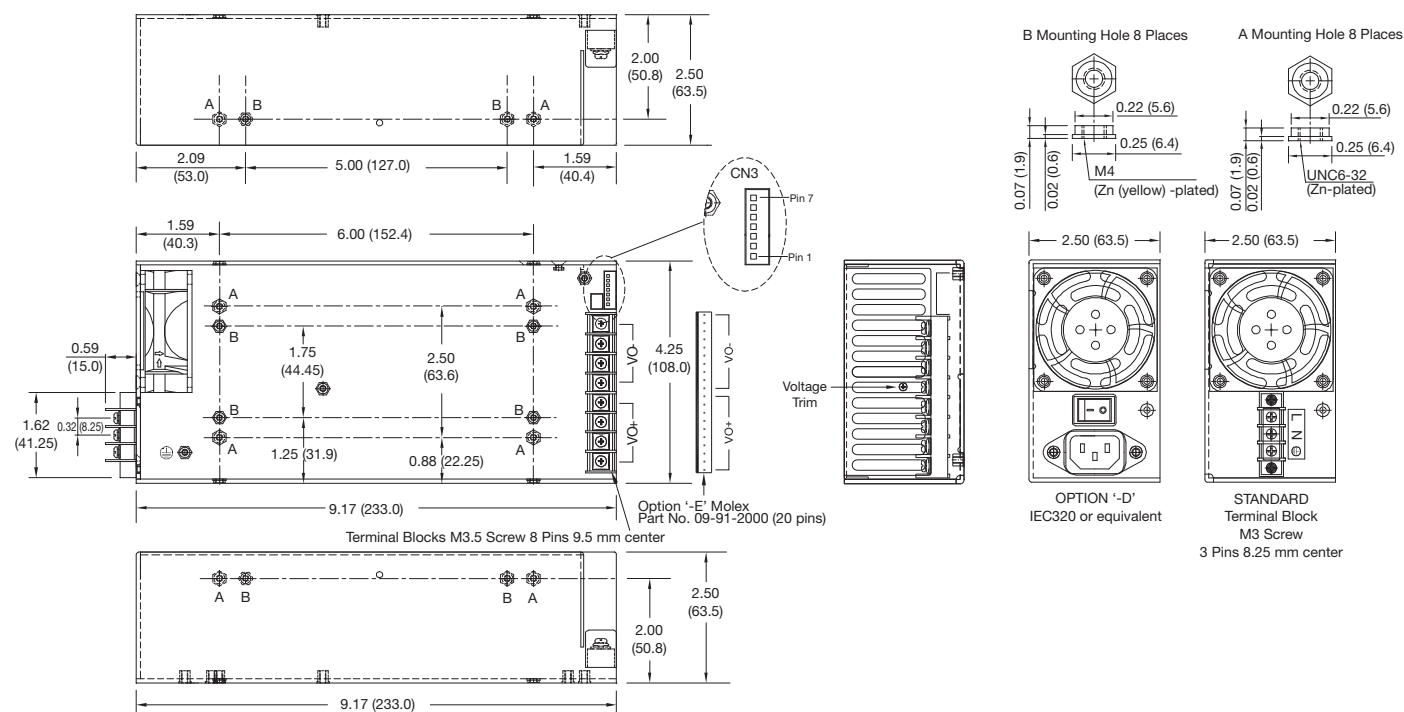
5. For U-channel versions replace SMR with SMS. Contact sales for mechanical details.
6. For output currents >50 A please use remote sense to meet load regulation ratings.
7. Other output voltages available in OEM quantities, please contact sales.
8. Minimum load required to meet ripple and noise specification.

[†] Available from Farnell & element14. See pages 284-290.

[^] Available from Newark. See pages 291-296

Mechanical Details

Covered Version



CN3 (Signals)	
Pin	Function
1	Current monitor
2*	Current share
3	Return
4	Power good
5	Remote On/Off
6*	-Remote sense
7*	+Remote sense

*If optional current share is fitted then remote sense function is excluded.

Options

Option	SMR	SMT	SMS
Current Share + output blocking diodes ⁽¹⁾	-I	-I	-I
Molex Output Connector ⁽¹⁾	-E	-E	-E
Molex Input Connector ⁽¹⁾		-F	-F
Molex Input Molex Output ⁽¹⁾		-G	-G
IEC320 Inlet	-D		
IEC Inlet Molex Outlet ⁽¹⁾	-F		

(1) Available for OEM quantities, contact Sales.

For multiple option codes, place codes in alphabetical order, e.g. SMR800PS12-EI

Notes

1. All dimensions are in inches (mm).
2. Weight: 3.30 lbs (1.5 kg) approx.
3. Tolerance: ± 0.012 (± 0.3)
4. Logic connector CN3 mates with: JST XHP-7 or equivalent & JST SXH-002T-P0.6 crimp terminals.
5. Maximum mounting screw penetration: 0.12 (3.0) on base & 0.25 (6.3) on each side.
6. Maximum screw terminal torque: Output: 15.7 lbs-in (1.8 Nm) Input: 7 lbs-in (0.8 Nm)

650-1200 Watts

MHP Series



- Rugged Construction
- Variable Fan Speed for Noise Reduction
- -20 °C to +70 °C Operation
- AC OK, Remote On/Off and Active Current Share
- 5 V Standby
- Screw Terminals
- 3 Year Warranty

Specification

Input

Input Voltage	• 650 W: 80-264 VAC, derate output power 10% <90 VAC, and 20% <85 VAC, 1000 W: 85-264 VAC, derate output power 10% <90 VAC
Input Frequency	• 47-63 Hz
Input Current	• 650 W: 6.5 A at 115 VAC typical, 3.2 A at 230 VAC full load, 1000 W: 10.9 A at 115 VAC typical, 5.1 A at 230 VAC full load
Inrush Current	• 650 W: 40 A max at 264 VAC 1000 W: 60 A max at 264 VAC
Power Factor	• >0.9
Earth Leakage Current	• 250 µA max at 264 VAC/60 Hz
Input Protection	• 650 W: T16 A/250 V, 1000 W: T20 A/250 V internal fuse in line and neutral

Output

Output Voltage	• 12-48 VDC (see tables)
Output Voltage Trim	• ±10% V1
Initial Set Accuracy	• 650 W: ±1% V1, ±5% V3, 1000 W: ±1% V1, ±5% V2
Minimum Load	• No minimum load required
Start Up Delay	• 500 ms max
Start Up Rise Time	• 50 ms typical
Hold Up Time	• 20 ms minimum
Drift	• ±0.2% after 20 min warm up
Line Regulation	• ±0.5%
Load Regulation	• 650 W: ±1% V1, ±5% V3, 1000 W: ±1% V1, ±5% V2
Transient Response	• 4% max. deviation, recovery to within 1% in 500 µs for a 50-75-50% load change
Ripple & Noise	• 1% pk-pk V1, 20 MHz bandwidth
Overvoltage Protection	• 115-145% Vnom, recycle input to reset
Overload Protection	• 110-140%, V1 only
Overttemperature Protection	• Auto reset
Short Circuit Protection	• Constant current characteristic
Temp. Coefficient	• 0.05% / °C
Remote Sense	• Compensates for 0.5 V total voltage drop
Remote On/Off	• Uncommitted isolated optocoupler diode, powered diode inhibits V1 and fan supply ⁽¹⁾
Current Share	• Single wire current share ⁽¹⁾

General

Efficiency	• 85% typical
Isolation	• 4000 VAC input to output, 1500 VAC input to ground, 500 VDC output to ground
Switching Frequency	• PFC 70 kHz, main converter 200 kHz, standby 130 kHz typical
Power Density	• 650 W: 8.2 W/in ³ , 1000 W: 8.9 W/in ³
Signals	• AC OK, remote on/off, current share ⁽¹⁾
MTBF	• 260 KHrs to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Temperature	• -20 °C to +70 °C, derate linearly from +50 °C at 2.5% / °C to 50% at +70 °C, 1000 W: -40 °C start up
Cooling	• 650 W: Forced cooled, '-TF' & '-EF' models have integral dual voltage level fan, which is load dependant, U Channel requires 5.5 m/s minimum airflow, 1000 W: Forced cooled via integral quad voltage level fan which is load dependant ⁽¹⁾
Operating Humidity	• 95% RH, non-condensing
Storage Temperature	• -40 °C to +85 °C
Operating Altitude	• 3000 m
Shock	• 3 g pk, half sine, 6 axes
Vibration	• 2 g rms, 5 Hz to 500 kHz, 3 axes

EMC & Safety

Emissions	• EN55022/EN55011 class B conducted EN55022/EN55011 class A radiated
Harmonic Currents	• EN61000-3-2 class A, 650 W: class C for loads ≥20% 1000 W: class C for loads ≥10%
Voltage Flicker	• EN61000-3-3
ESD Immunity	• EN61000-4-2, level 3 contact, level 3 air, Perf Criteria A
Radiated Immunity	• EN61000-4-3, level 3 Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3 Perf Criteria A
Surge	• EN61000-4-5, installation class 3, Perf Criteria A
Conducted Immunity	• EN61000-4-6, level 3, Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms, Perf Criteria A, B, B, EN60601-1-2, 30% 500 ms, 60% 100 ms, 100% 10 ms, 100% 5000 ms, Perf Criteria A, A, A, B. Consult longform for 115 VAC operation
Safety Approvals	• IEC60601-1 CB report, CSA 22.2 No.60601-1, UL60601-1, TUV, EN60601-1

⁽¹⁾ See longform datasheet for more information

Models and Ratings

MHP650 **XP**

Output Voltage V1	Output Current V1	Fan Supply V2 ⁽⁴⁾	Standby Supply V3	Output Power ⁽³⁾	Model Number ^(1,2)
12 V	50 A	12 V / 0.5 A	5 V / 0.2 A	607 W	MHP650PS12-EF†^
15 V	40 A	12 V / 0.5 A	5 V / 0.2 A	607 W	MHP650PS15-EF†^
24 V	27 A	12 V / 0.5 A	5 V / 0.2 A	655 W	MHP650PS24-EF†^
28 V	23 A	12 V / 0.5 A	5 V / 0.2 A	655 W	MHP650PS28-EF†^
36 V	18 A	12 V / 0.5 A	5 V / 0.2 A	655 W	MHP650PS36-EF†^
48 V	13.5 A	12 V / 0.5 A	5 V / 0.2 A	655 W	MHP650PS48-EF†^

Notes

1. For top fan version replace '-EF' in model number with '-TF', e.g. MHP650PS12-TF

2. For U Channel version remove suffix.

† Available from Farnell & element14. See pages 284-290.

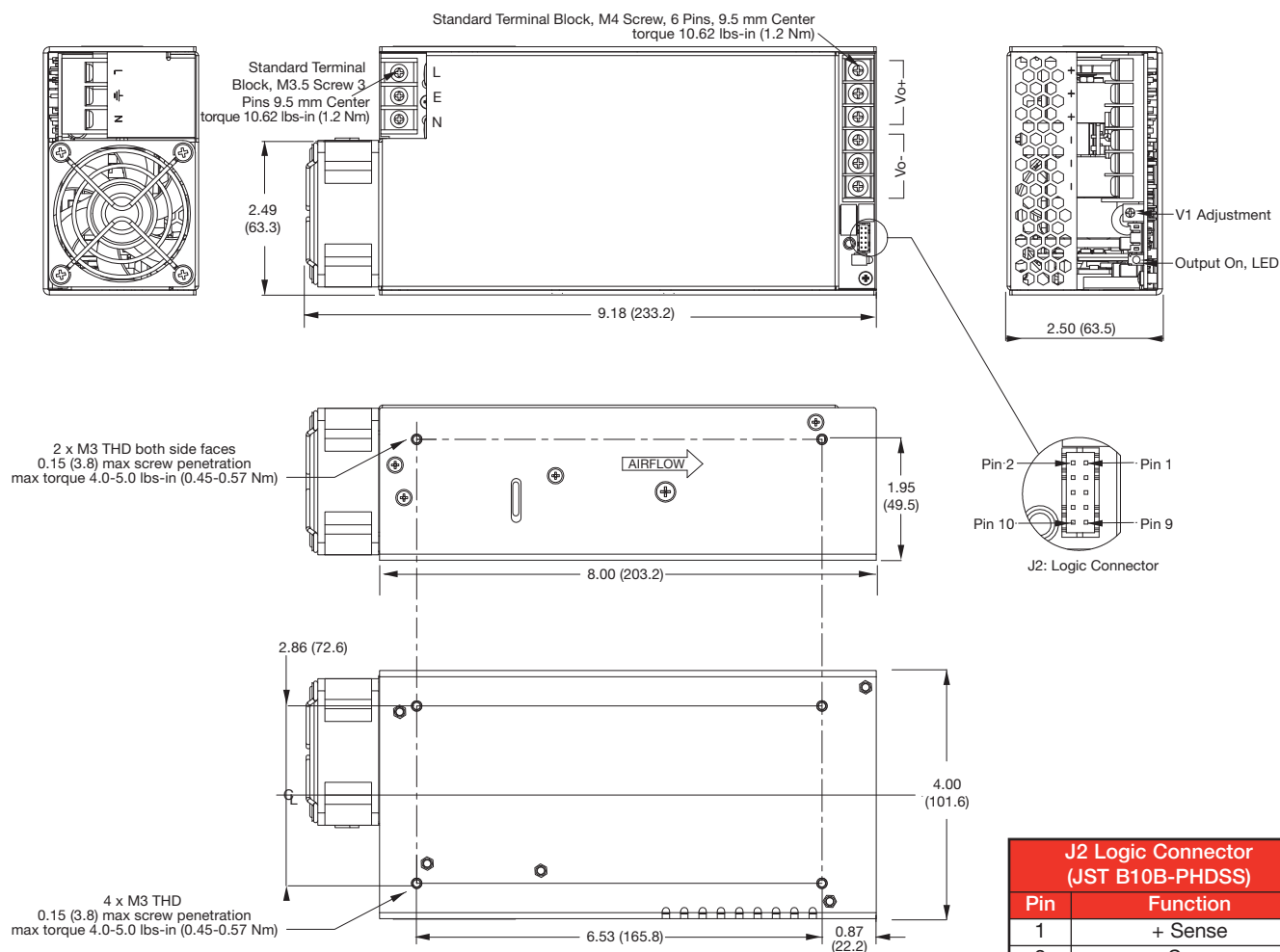
3. U Channel models require a minimum of 5.5 m/s airflow from the system.

4. Not available for '-TF' and '-EF' models as used by integral fan.

^ Available from Newark. See pages 291-296

Mechanical Details

End Fan (See Longform Datasheet for U-Channel Version)



Notes

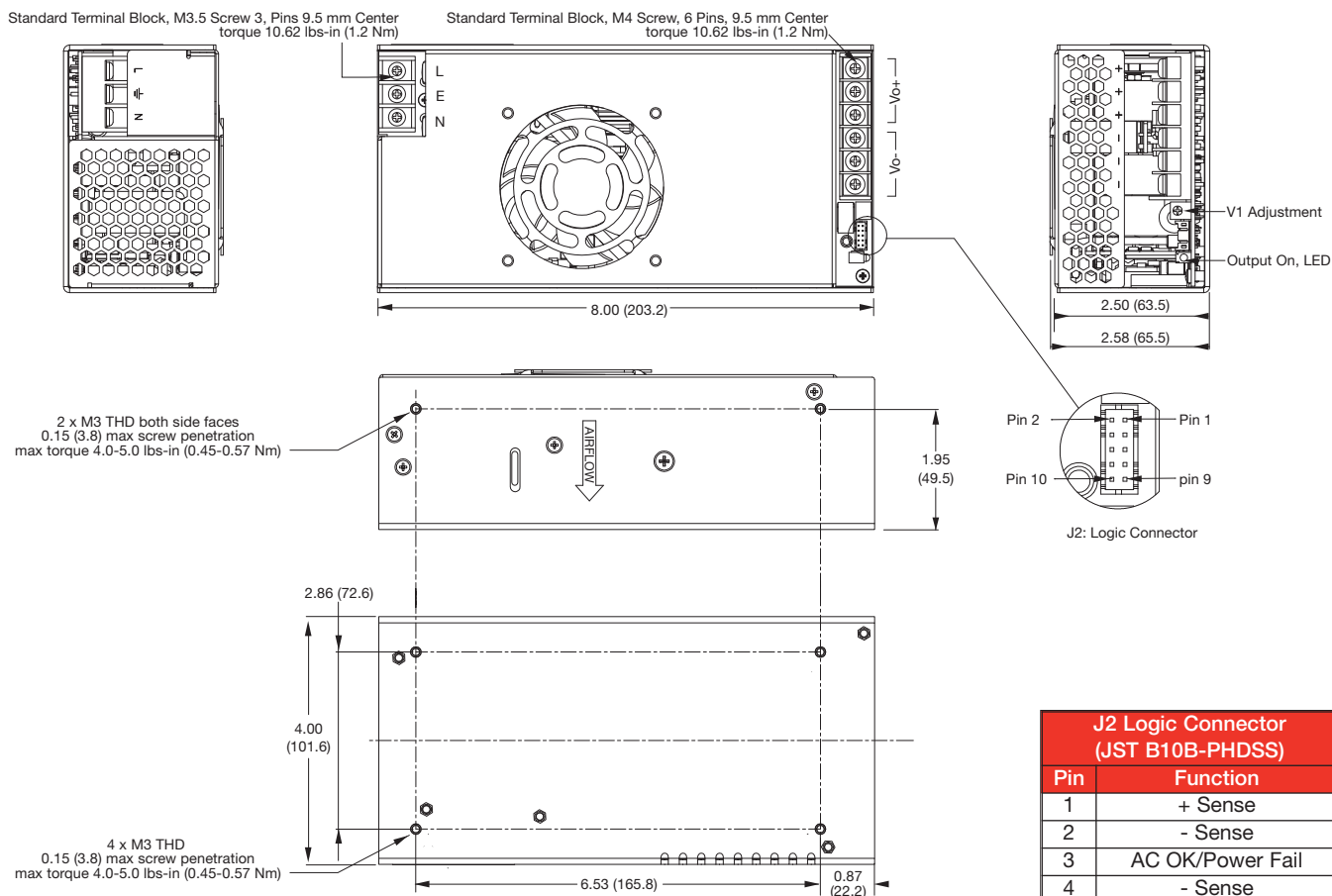
1. Dimensions shown in inches (mm).

2. Weight: 2.8 lb (1.27 kg).

3. J2 Mating plug: JST part no. PHDR-10VS,
contact: 26-22 AWG JST part no. SPHD-001T-P0.5.

Mechanical Details

Top Fan (Suffix -TF)

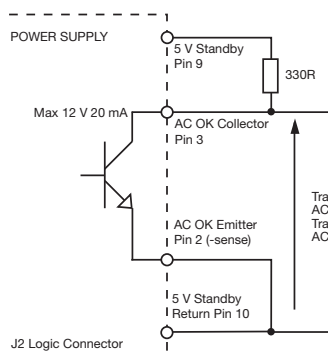


Notes

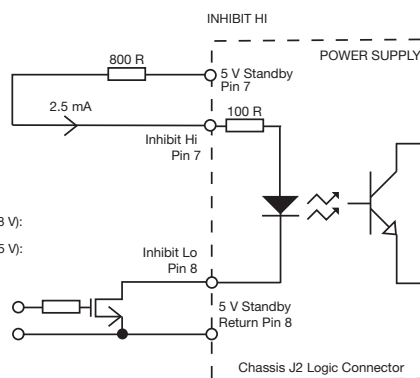
- Dimensions shown in inches (mm).
- Weight: 2.8 lb (1.27 kg).
- J2 Mating plug: JST part no. PHDR-10VS, contact: 26-22 AWG JST part no. SPHD-001T-P0.5.

Signals

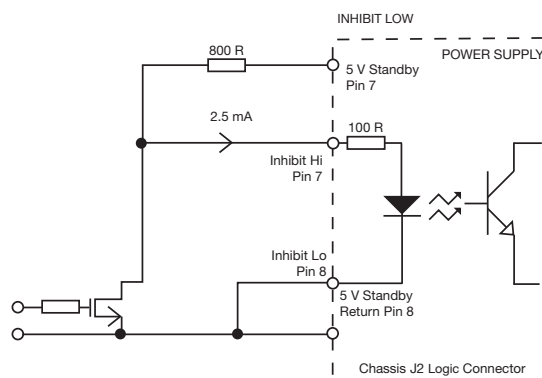
AC OK/Power Fail



Remote On/Off (Inhibit)



Signal High: Power Supply OFF
Low or Floating: Power Supply ON



Signal High: Power Supply ON
Low or Floating: Power Supply OFF

For U Channel and Thermal Considerations please see longform datasheet.

Models and Ratings

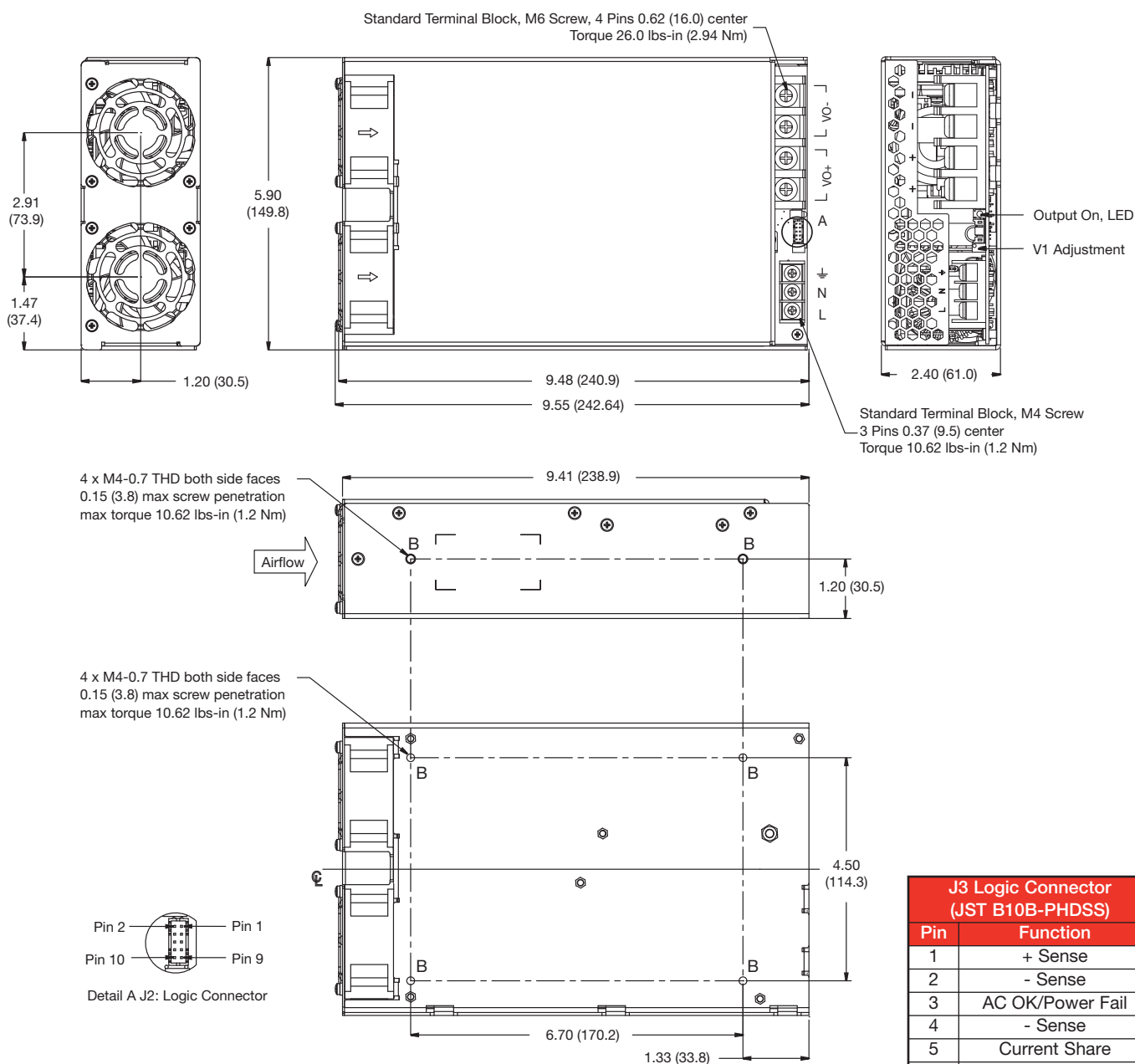
MHP1000 **XP**

Output Voltage V1	Output Current V1		Standby Supply V2	Output Power		Model Number
	<180 VAC	>180 VAC		<180 VAC	>180 VAC	
12 V	83.0 A		5 V / 1.0 A	1000 W		MHP1000PS12†^
15 V	67.0 A		5 V / 1.0 A	1010 W		MHP1000PS15†^
24 V	42.0 A	50.0 A	5 V / 1.0 A	1013 W	1200 W	MHP1000PS24†^
28 V	36.0 A	43.0 A	5 V / 1.0 A	1013 W	1200 W	MHP1000PS28†^
36 V	28.0 A	34.0 A	5 V / 1.0 A	1013 W	1200 W	MHP1000PS36†^
48 V	21.0 A	25.0 A	5 V / 1.0 A	1013 W	1200 W	MHP1000PS48†^

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296

Mechanical Details



Notes

- Dimensions shown in inches (mm).
- Weight: 4.6 lb (2.08 kg)

- J2 Mating plug: JST part no. PHDR-10VS, contact: 26-22 AWG JST part no. SPHD-001T-P0.5.



- Rugged Industrial Construction
- Variable Fan Speed for Noise Reduction
- -20 °C to +70 °C Operation
- AC OK, Remote On/Off and Active Current Share
- 5 V Standby
- Screw Terminals
- 3 Year Warranty

Specification

Input

Input Voltage	• 650 W: 80-264 VAC, derate output power 10% <90 VAC, and 20% <85 VAC • 1000 W: 85-264 VAC, derate output power 10% <90 VAC
Input Frequency	• 47-63 Hz
Input Current	• 650 W: 6.5 A at 115 VAC typical, 3.2 A at 230 VAC full load, • 1000 W: 10.9 A at 115 VAC typical, 5.1 A at 230 VAC full load
Inrush Current	• 650 W: 40 A max at 264 VAC • 1000 W: 60 A max at 264 VAC
Power Factor	• >0.9
Earth Leakage Current	• 0.75 mA max 264 VAC/60 Hz
Input Protection	• 650 W: T16 A/250 V, 1000 W: T20 A/250 V internal fuse in line and neutral

Output

Output Voltage	• 12-48 VDC (see tables)
Output Voltage Trim	• $\pm 10\%$ V1
Initial Set Accuracy	• 650 W: $\pm 1\%$ V1, $\pm 5\%$ V3, • 1000 W: $\pm 1\%$ V1, $\pm 5\%$ V2
Minimum Load	• No minimum load required
Start Up Delay	• 500 ms max
Start Up Rise Time	• 50 ms typical
Hold Up Time	• 20 ms minimum
Drift	• $\pm 0.2\%$ after 20 min warm up
Line Regulation	• $\pm 0.5\%$
Load Regulation	• 650 W: $\pm 1\%$ V1, $\pm 5\%$ V3, • 1000 W: $\pm 1\%$ V1, $\pm 5\%$ V2
Transient Response	• 4% max. deviation, recovery to within 1% in 500 μs for a 50-75-50% load change
Ripple & Noise	• 1% pk-pk V1, 20 MHz bandwidth
Overvoltage Protection	• 115-145% Vnom, recycle input to reset
Overload Protection	• 110-140%, V1 only
Overtemperature Protection	• Auto reset
Short Circuit Protection	• Constant current characteristic
Temp. Coefficient	• 0.05% / °C
Remote Sense	• Compensates for 0.5 V total voltage drop
Remote On/Off	• Uncommitted isolated optocoupler diode, powered diode inhibits V1 and fan supply⁽¹⁾
Current Share	• Single wire current share⁽¹⁾

General

Efficiency	• 85% typical
Isolation	• 3000 VAC input to output, 1500 VAC input to ground, 500 VDC output to ground
Switching Frequency	• PFC 70 kHz, main converter 200 kHz, standby 130 kHz typical
Power Density	• 650 W: 8.2 W/in³, 1000 W: 8.9 W/in³
Signals	• AC OK, remote on/off, current share⁽¹⁾
MTBF	• 260 KHrs to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Temperature	• -20 °C to +70 °C, derate linearly from +50 °C at 2.5% / °C to 50% at +70 °C, 1000 W: -40 °C start up
Cooling	• 650 W: Forced cooled, '-TF' & '-EF' models have integral dual voltage level fan, which is load dependant, U Channel requires 5.5 m/s minimum airflow, • 1000 W: Forced cooled via integral quad voltage level fan which is load dependant⁽¹⁾
Operating Humidity	• 95% RH, non-condensing
Storage Temperature	• -40 °C to +85 °C
Operating Altitude	• 3000 m
Shock	• 3 g pk, half sine, 6 axes
Vibration	• 2 g rms, 5 Hz to 500 kHz, 3 axes

EMC & Safety

Emissions	• EN55022 class B conducted • EN55022 class A radiated
Harmonic Currents	• EN61000-3-2 class A, • 650 W: class C for loads $\geq 20\%$ • 1000 W: class C for loads $\geq 10\%$
Voltage Flicker	• EN61000-3-3
ESD Immunity	• EN61000-4-2, level 3 contact, level 3 air, Perf Criteria A
Radiated Immunity	• EN61000-4-3, level 3 Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3 Perf Criteria A
Surge	• EN61000-4-5, installation class 3, Perf Criteria A
Conducted Immunity	• EN61000-4-6, level 3, Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms, Perf Criteria A, B, B
Safety Approvals	• IEC60950-1 CB report, CSA 22.2 No. 60950-1, UL60950-1, TUV, EN60950-1, SEMI F47

⁽¹⁾ See longform datasheet for more information

Models and Ratings

SHP650 **XP**

Output Voltage V1	Output Current V1	Fan Supply V2 ⁽⁴⁾	Standby Supply V3	Output Power ⁽³⁾	Model Number ^(1,2)
12 V	50.0 A	12 V / 0.5 A	5 V / 0.2 A	607 W	SHP650PS12-EF†^
15 V	40.0 A	12 V / 0.5 A	5 V / 0.2 A	607 W	SHP650PS15-EF†^
24 V	27.0 A	12 V / 0.5 A	5 V / 0.2 A	655 W	SHP650PS24-EF†^
28 V	23.0 A	12 V / 0.5 A	5 V / 0.2 A	655 W	SHP650PS28-EF†^
36 V	18.0 A	12 V / 0.5 A	5 V / 0.2 A	655 W	SHP650PS36-EF†^
48 V	13.5 A	12 V / 0.5 A	5 V / 0.2 A	655 W	SHP650PS48-EF†^

Notes

1. For top fan version replace '-EF' in model number with '-TF', e.g.

SHP650PS12-TF

2. For U Channel version remove suffix.

† Available from Farnell & element14. See pages 284-290.

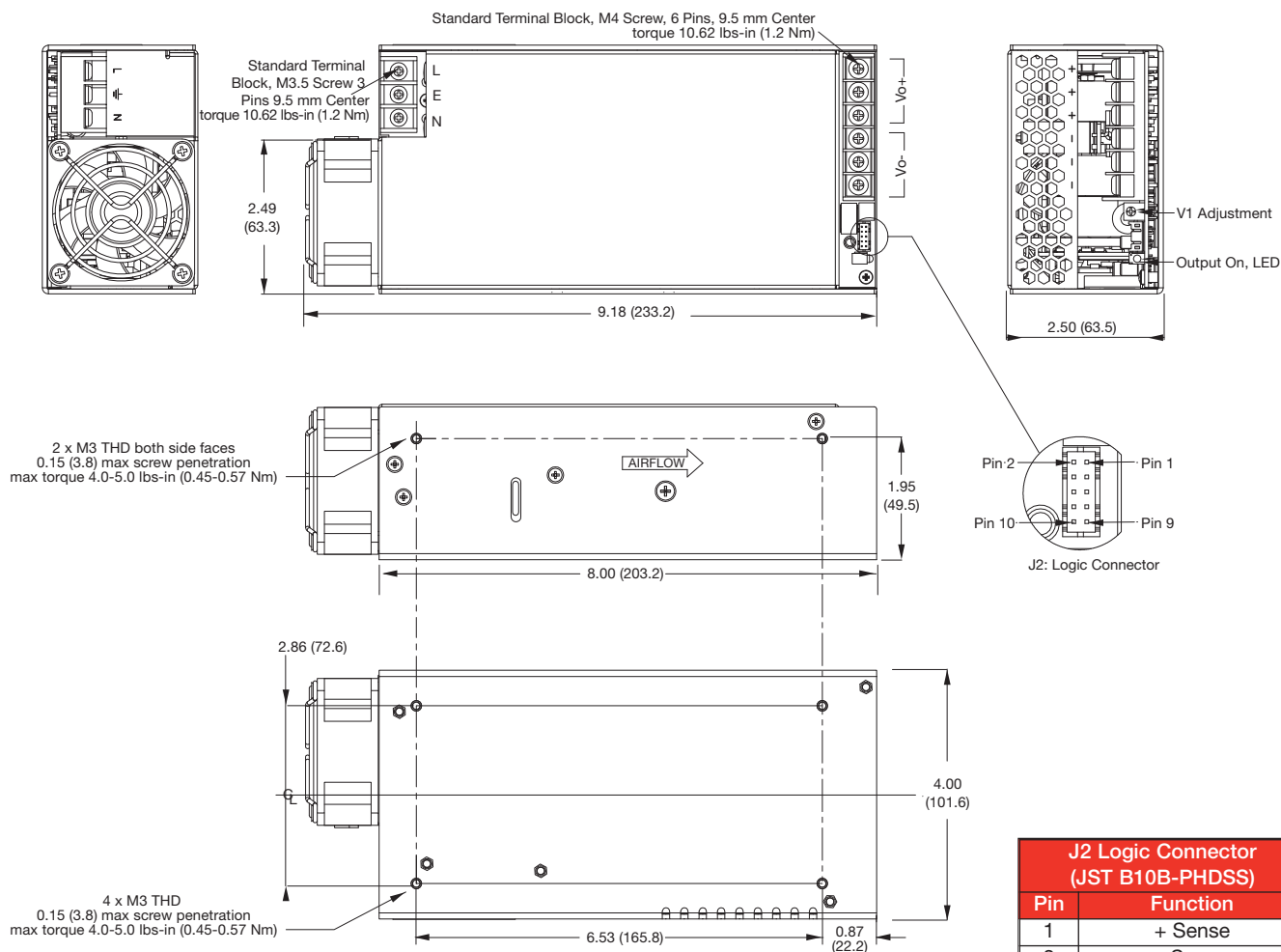
3. U Channel models require a minimum of 5.5 m/s airflow from the system.

4. Not available for '-TF' and '-EF' models as used by integral fan.

^ Available from Newark. See pages 291-296

Mechanical Details

End Fan (See Longform Datasheet for U-Channel Version)



Notes

1. Dimensions shown in inches (mm).

2. Weight: 2.8 lb (1.27 kg).

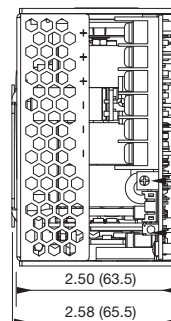
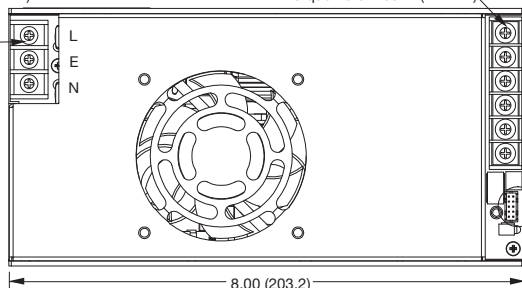
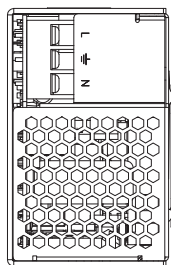
3. J1 Mating Plug: JST part no. PHR-2, contact: JST part no. SPH-002T-P0.5S; J2 Mating Plug: JST part no. PHDR-10VS, contact: 26-22AWG JST part no. SPHD-001T-P0.5

Mechanical Details

Top Fan (Suffix -TF)

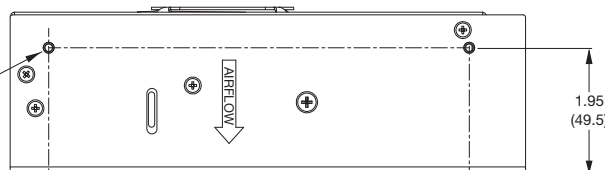
Standard Terminal Block, M3.5 Screw 3, Pins 9.5 mm Center torque 10.62 lbs-in (1.2 Nm)

Standard Terminal Block, M4 Screw, 6 Pins, 9.5 mm Center torque 10.62 lbs-in (1.2 Nm)

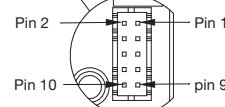
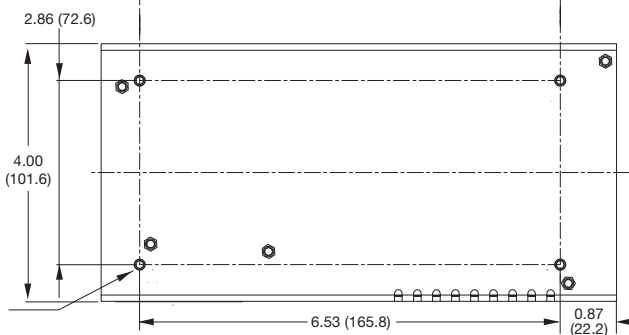


V1 Adjustment
Output On, LED

2 x M3 THD both side faces
0.15 (3.8) max screw penetration
max torque 4.0-5.0 lbs-in (0.45-0.57 Nm)



4 x M3 THD
0.15 (3.8) max screw penetration
max torque 4.0-5.0 lbs-in (0.45-0.57 Nm)



J2: Logic Connector

J2 Logic Connector (JST B10B-PHDS)	
Pin	Function
1	+ Sense
2	- Sense
3	AC OK/Power Fail
4	- Sense
5	Current Share
6	Current Share
7	+ Inhibit
8	- Inhibit
9	+5 V Standby (V3)
10	5 V Standby Return (V3)

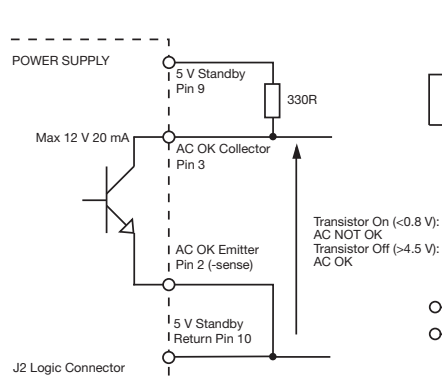
Notes

- Dimensions shown in inches (mm).
- Weight: 2.8 lb (1.27 kg).

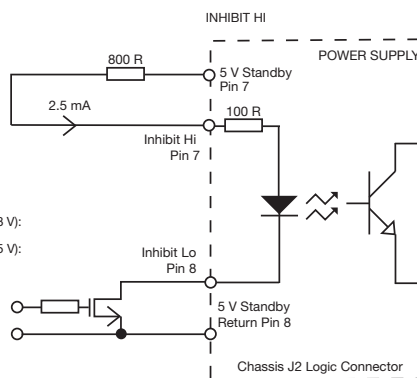
- J2 Mating plug: JST part no. PHDR-10VS, contact: 26-22 AWG JST part no. SPHD-001T-P0.5.

Signals

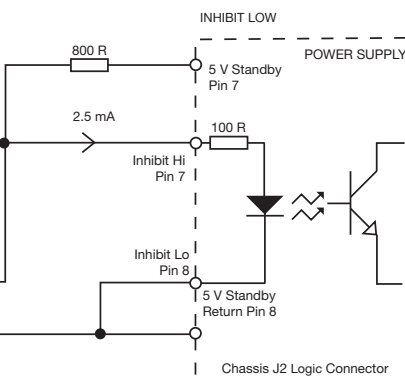
AC OK/Power Fail



Remote On/Off (Inhibit)



Signal High: Power Supply OFF
Low or Floating: Power Supply ON



Signal High: Power Supply ON
Low or Floating: Power Supply OFF

For U Channel and Thermal Considerations please see longform datasheet.

Models and Ratings

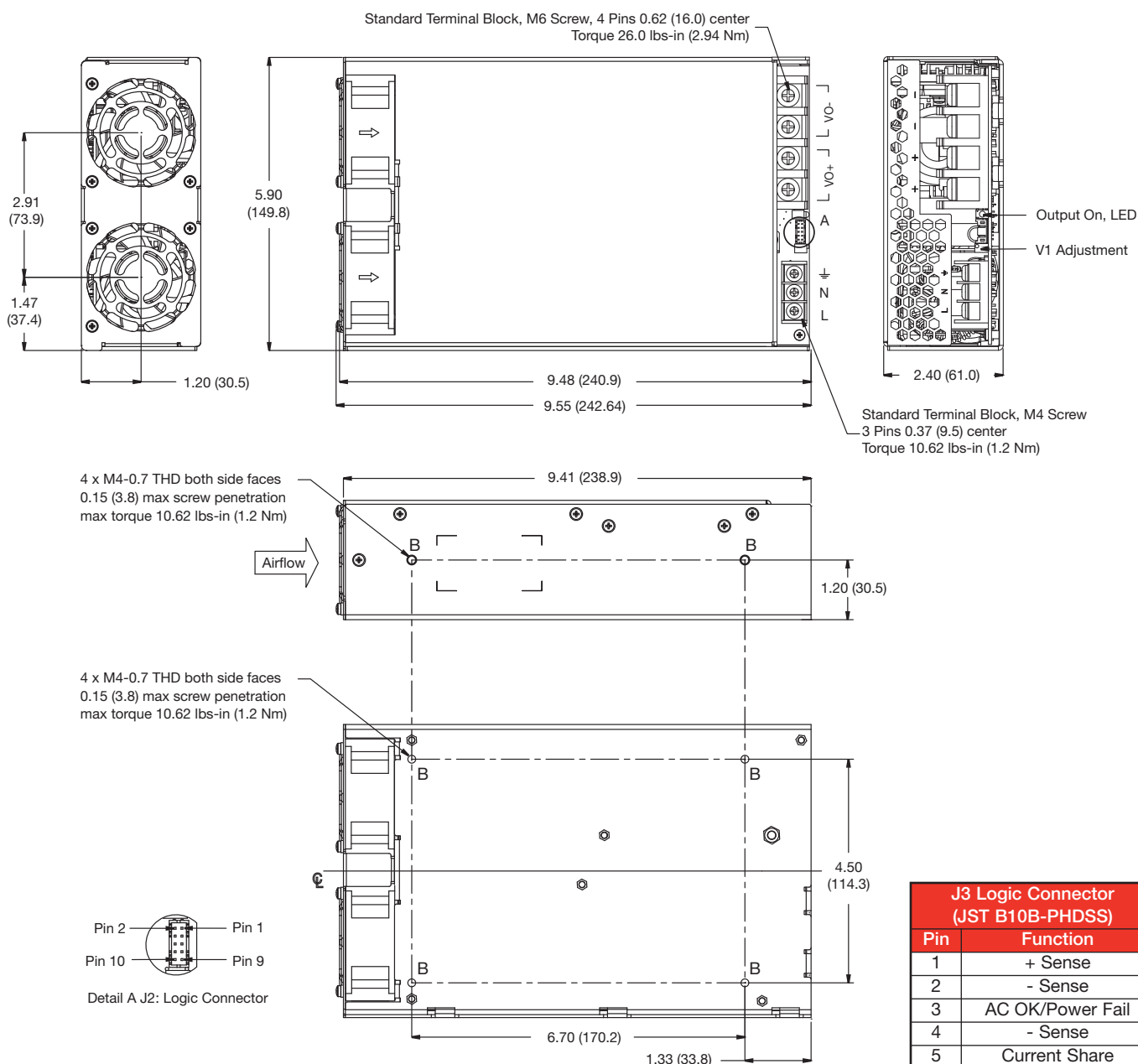
SHP1000 **XP**

Output Voltage V1	Output Current V1		Standby Supply V2	Output Power		Model Number
	<180 VAC	>180 VAC		<180 VAC	>180 VAC	
12 V	83.0 A		5 V / 1.0 A	1000 W		SHP1000PS12†^
15 V	67.0 A		5 V / 1.0 A	1010 W		SHP1000PS15†^
24 V	42.0 A	50.0 A	5 V / 1.0 A	1013 W	1200 W	SHP1000PS24†^
28 V	36.0 A	43.0 A	5 V / 1.0 A	1013 W	1200 W	SHP1000PS28†^
36 V	28.0 A	34.0 A	5 V / 1.0 A	1013 W	1200 W	SHP1000PS36†^
48 V	21.0 A	25.0 A	5 V / 1.0 A	1013 W	1200 W	SHP1000PS48†^

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296

Mechanical Details



Notes

- Dimensions shown in inches (mm).
- Weight: 4.6 lb (2.08 kg)

- J2 Mating Plug: JST part no. PHDR-10VS, contact: 26-22AWG JST part no. SPHD-001T-P0.5

1500 Watts

GFR Series



- 1U Blind-Mate, Hotswap, Redundant
- All Models Share Same Compact Size
- 56 V Power Over Ethernet Compatible Model
- Up to 6 kW in 1U (Rack Available)
- AC OK, DC OK, Inhibit, Enable, 5 V Standby
- Current Share & I²C Interface
- 3 Year Warranty

Specification

Input

Input Voltage	• 85-264 VAC, see derating curve
Input Frequency	• 47-63 Hz
Input Current	• 13 A/6.5 A typical at 115/230 VAC
Inrush Current	• 35 A maximum at 264 VAC
Power Factor	• >0.9
Earth Leakage Current	• 1.5 mA max 264 VAC 60Hz
Input Protection	• Internal T20 A/250 V fuse in line and neutral

Output

Output Voltage	• See model table
Output Voltage Trim	• Via potentiometer, see model table
Initial Set Accuracy	• $\pm 1\%$ of nominal with 50% load
Minimum Load	• No minimum load required
Line Regulation	• $\pm 0.5\%$ maximum
Load Regulation	• V1: $\pm 0.5\%$, V2: $\pm 5\%$
Start Up Delay	• 1 s typical
Over/Undershoot	• 0.5% typical
Transient Response	• 4% deviation, recovery to within 2% in 500 μ s for 50-75-50% load change
Ripple & Noise	• 24-56 V models: 1% max pk-pk 12 V models: 2% max pk-pk V Standby: 3% max pk-pk, 20 MHz bandwidth
Overvoltage Protection	• 115-140% of V1 nominal, recycle input AC to reset
Overtemperature Protection	• Protects the unit against overtemperature. Auto restart
Overcurrent Protection	• 110 - 140% V1, V Standby power limited
Short Circuit Protection	• Continuous, trip and restart (hiccup mode)
Temperature Coefficient	• 0.02%/°C (after 20 minute warm up)
Remote Sense	• Compensates for 0.5V total drop
Current Share	• Share up to 8 units maximum, units share current within 10% of each other at full load.

General

Efficiency	• 90% typical
Isolation	• 3000 VAC Input to Output, 4000 VAC Input to Output (48-56 V) 1500 VAC Input to Ground, 500 VDC Output to Ground 1500 VAC Output to Ground (48-56 V)
Switching Frequency	• 70 kHz PFC typical, 130 kHz main converter typical
Power Density	• 18 W/in ³
Signals	• AC OK, DC OK, Inhibit, Enable, I ² C (see Signals page 3 & 4)
MTBF	• 470 Khrs to TELECORDIA SR-332, 25 °C, GB

Environmental

Operating Temperature	• -20 °C to +70 °C, derate linearly from +50 °C at 2.5 %/°C to 50% load at +70 °C
Cooling	• Internal load dependant variable speed fans
Operating Humidity	• 95% RH, non-condensing
Storage Temperature	• -40 °C to +85 °C
Operating Altitude	• 3000 m
Shock	• ± 3 shocks in each axis (total 18 shocks) 30 g 11 ms (half sine). Compliant with EN60068-2-27.
Vibration	• 2 g 10-500 Hz 10 sweeps. Compliant with EN60068-2-6.

EMC & Safety

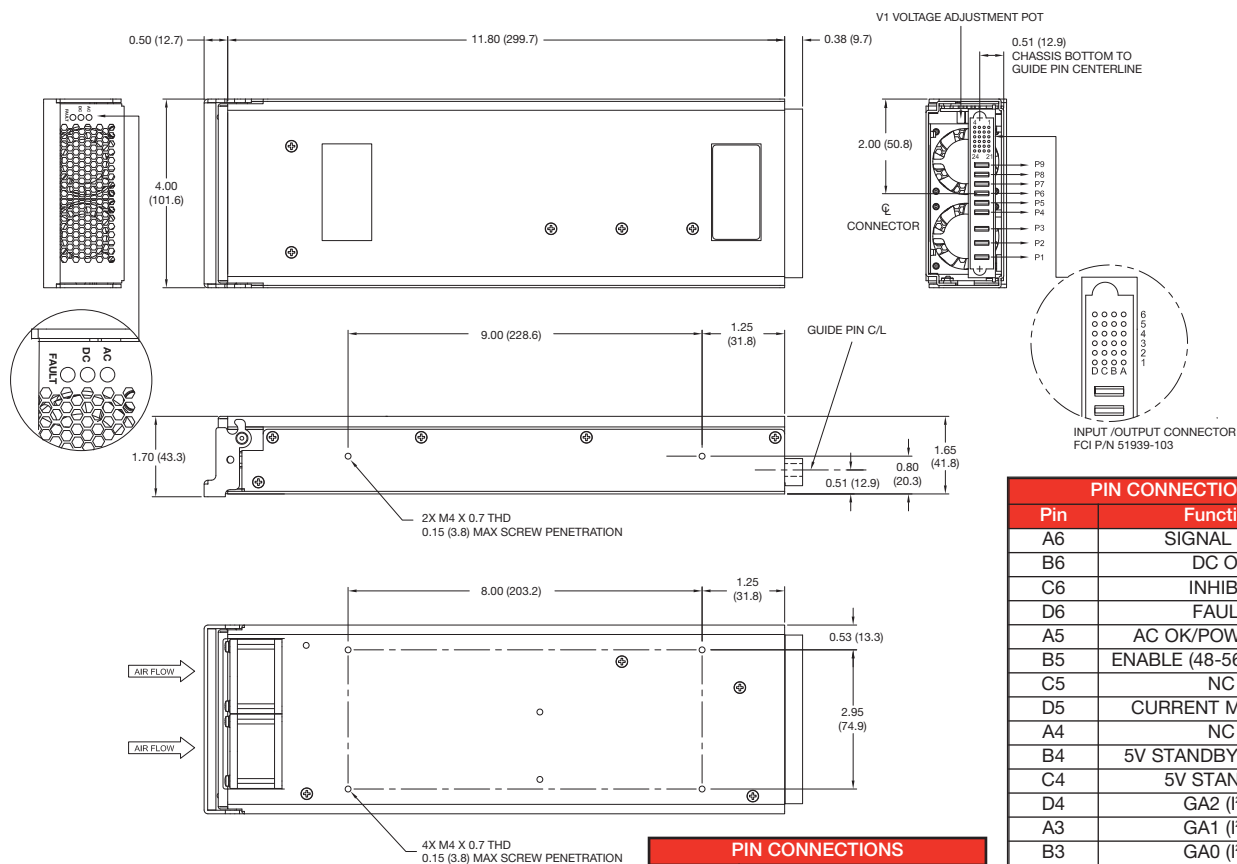
Emissions	• EN55022 class A conducted & radiated ⁽¹⁾
Immunity	• Compliant with EN61204-3:2000 high severity levels
Harmonic Currents	• EN61000-3-2 class A EN61000-3-2 class C for loads >20%
Voltage Flicker	• EN61000-3-3
ESD Immunity	• EN61000-4-2, level 3, Perf Criteria A
Radiated Immunity	• EN61000-4-3, level 3 Perf Criteria A
EFT/Burst	• EN61000-4-4, installation class 3, Perf Criteria A
Surge	• EN61000-4-5, level 3 Perf Criteria A
Conducted Immunity	• EN61000-4-6, level 3, Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms, Perf Criteria A, B, B. Semi F47 Compliant.
Safety Approvals	• IEC60950-1: CB Report, CSA-C22.2 No. 60950-1-05, UL60950-1, TUV EN60950-1.

Notes

1. Contact sales for class B conducted emissions performance.

Output Power	Output Voltage V1	Voltage Adj V1	Output Current V1		Standby Supply V2	Model Number
			90-264 VAC	>180 VAC		
1200 W	12.0 VDC	11-14 V	100 A	100 A	5 V/1 A	GFR1K5PS12
1500 W	24.0 VDC	22-28 V	50 A	63 A	5 V/1 A	GFR1K5PS24
1500 W	48.0 VDC	45-52 V	25 A	31 A	5 V/1 A	GFR1K5PS48
1500 W	56.0 VDC	54-59 V	22 A	27 A	5 V/1 A	GFR1K5PS56

Mechanical Details



PIN CONNECTIONS

Pin	Function
A6	SIGNAL GND
B6	DC OK
C6	INHIBIT
D6	FAULT
A5	AC OK/POWER FAIL
B5	ENABLE (48-56 V models)
C5	NC
D5	CURRENT MONITOR
A4	NC
B4	5V STANDBY RETURN
C4	5V STANDBY
D4	GA2 (I ² C)
A3	GA1 (I ² C)
B3	GA0 (I ² C)
C3	I ² C GND
D3	PMB SDA (DATALINE)
A2	PMB SCL (CLOCK)
B2	PWR ID
C2	V TRIM
D2	ENABLE (12-24 V models)
A1	CURRENT SHARE
B1	NC
C1	- SENSE
D1	+ SENSE

PIN CONNECTIONS

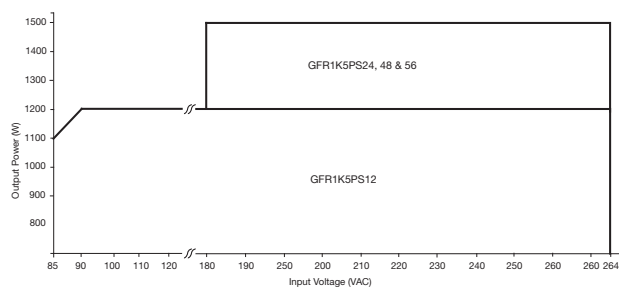
Pin	Function
P1	AC NEUTRAL
P2	AC LINE
P3	CHASSIS GND
P4	-VOUT
P5	-VOUT
P6	-VOUT
P7	+VOUT
P8	+VOUT
P9	+VOUT

Notes

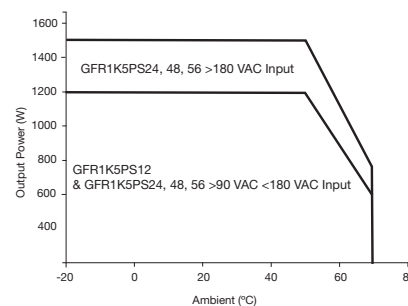
- All dimensions are in inches (mm).
Tolerance X.XX = ±0.02 (0.50); X.XXX = ±0.01 (0.25)
- Weight 5.2 lb (2.35 kg).
- Output connector: BERG/FCI P/N 51939-103LF
Mating connector: BERG/FCI P/N 51866-025LF right-angle PCB receptacle or BERG/FCI P/N 51940-117LF vertical PCB receptacle.

Derating Curves

Input Derating Curve



Thermal Derating Curve

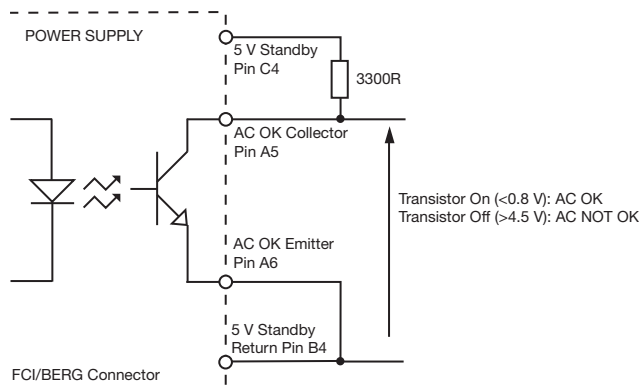


Signals

AC OK/Power Fail

AC OK is an isolated signal providing a minimum of 5 ms warning of loss of output regulation. The signal is fully isolated and the collector and emitter must be connected externally.

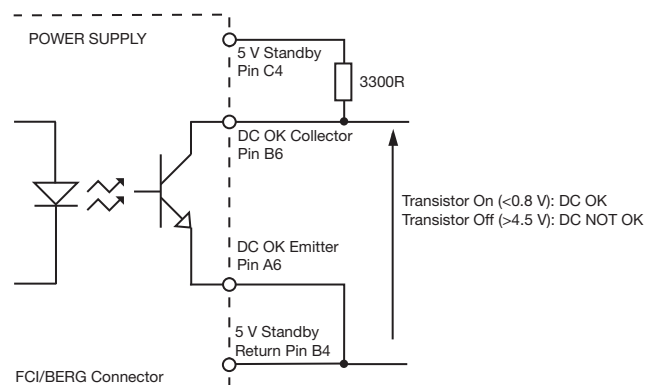
Maximum sink current 2 mA, maximum voltage 20 V.



DC OK

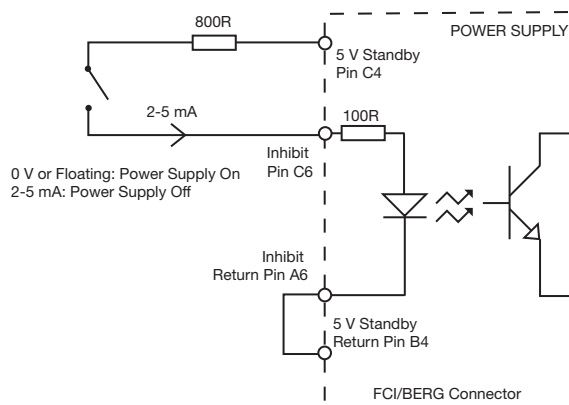
DC OK is an isolated signal providing warning that the output voltage has fallen below 90% of nominal. The signal is fully isolated and the collector and emitter must be connected externally.

Maximum sink current 2 mA, maximum voltage 20 V.



Inhibit

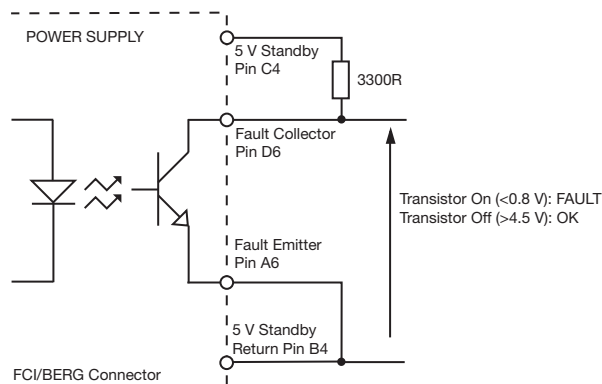
Inhibit is an isolated control signal which can turn the power supply off by supplying 2 to 5 mA into the pin.



Fault

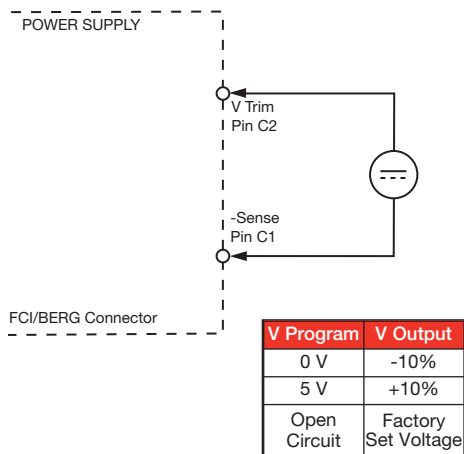
Fault is an isolated signal providing warning of output voltage below 90% of nominal, fan fault or overtemperature. The signal is fully isolated and the collector and emitter must be connected externally.

Maximum sink current 2 mA, maximum voltage 20 V.

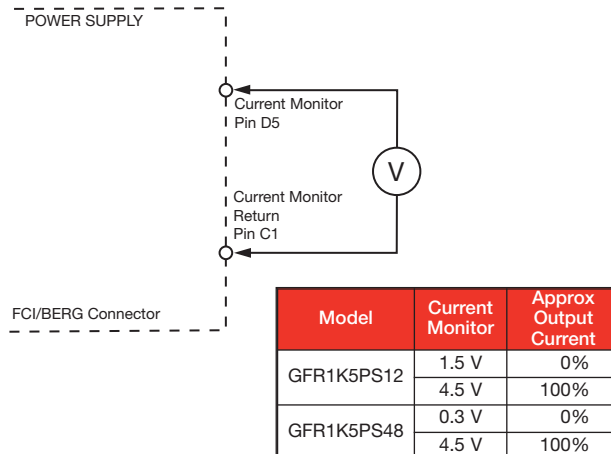


V Program

V Program allows remote voltage adjustment within the range $\pm 10\%$



Current Monitor

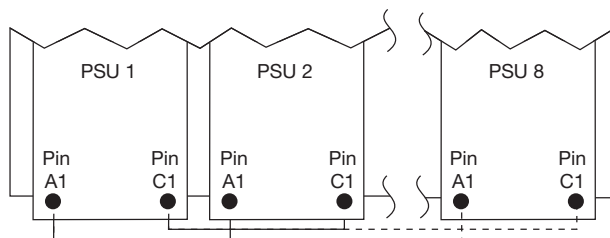


Signals cont.

GFR1K5 XP

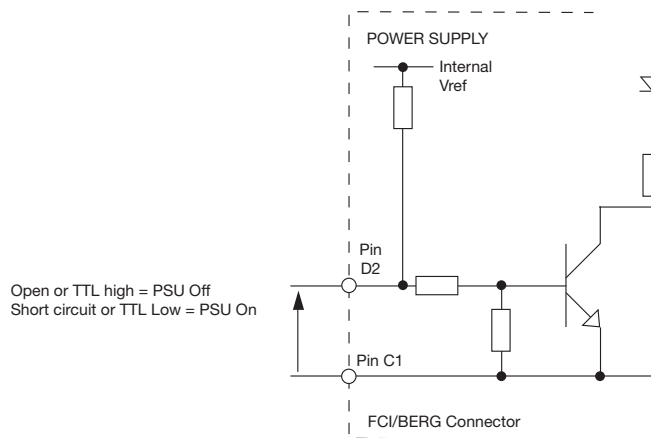
Current Share

Connecting pins A1 and C1 of like voltage units (16 maximum) will force the current to share between the outputs. Units share current within 10% of each other at full load. Derate output to 90% of total combined load.



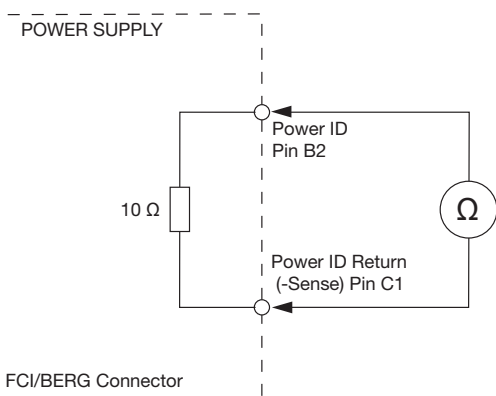
Enable

The enable pin D2 (12-24 V models) or B5 (48-56 V models) is shorter than the other pins and mates last, so that the unit does not power up until the connector is mated correctly connecting pin D2 to -Sense pin C1 thus avoiding connector arcing and premature ageing.



Power ID

The power ID pin B2 can be used to detect the presence of the unit when fitted in a rack.



I²C Interface

The I²C PMBus compatible interface can be used for monitoring the output voltage, current, internal temperature and run time. It can also be utilized to turn the unit on and off, detect faults along with identification of the unit model number and serial number.

A separate handbook detailing the use of this interface including comprehensive application notes is available, please contact sales for details.



GFR1K5 Rack

A standard 1U 19" Rack is also available which has space for 4 GFR's (6 kW) along with I/O connections for power, signals & control. The standard rack is easily customized to suit customer specific requirements.

Consult handbook for full information.



1500 Watts

HPU1K5 Series



- Medical Safety Approvals (-M Versions)
- Variable Fan Speed To Reduce Audible Noise
- -20 °C to +70 °C Operation
- AC OK, DC OK, Inhibit & 5 V Standby Supply
- Fan Fail & Overtemperature Signals
- SEMI F47 Compliant
- 3 Year Warranty

Specification

Input

Input Voltage	• 85-264 VAC, see derating curve
Input Frequency	• 47-63 Hz
Input Current	• 13 A/6.5 A typical at 115/230 VAC
Inrush Current	• 35 A maximum at 264 VAC
Power Factor	• >0.9
Earth Leakage Current	• 1.1 mA max at 264 VAC 60Hz, <300 µA max at 264 VAC 60Hz (-M)
Input Protection	• Internal T20 A/250 VAC fuse in line and neutral

Output

Output Voltage	• See model table
Output Voltage Trim	• Via potentiometer or external voltage, see model tables
Initial Set Accuracy	• ±1% of nominal with 50% load
Minimum Load	• No minimum load required
Line Regulation	• ±0.5% maximum
Load Regulation	• V1: ±0.5%, V2: ±5%
Start Up Delay	• 1 s typical
Over/Undershoot	• 0.5% typical
Transient Response	• 4% deviation, recovery to within 2% in 500 µs for 50-75-50% load change
Ripple & Noise	• 24-48 V models: 1% max pk-pk 12 V models: 2% max pk-pk V Standby: 3% max pk-pk, 20 MHz bandwidth
Overvoltage Protection	• 115-140% of V1 nominal, recycle input AC to reset
Overtemperature Protection	• Protects the unit against overtemperature. Auto restart
Overcurrent Protection	• 110 - 140% V1, V Standby power limited
Short Circuit Protection	• Continuous, trip and restart (hiccup mode)
Temperature Coefficient	• 0.02%/°C (after 20 minute warm up)
Remote Sense	• Compensates for 0.5 V total drop
Current Share	• Share upto 8 units maximum, units share current within 10% of each other at full load.

General

Efficiency	• 90% typical
Isolation	• 4000 VAC Input to Output, 1500 VAC Input to Ground, 500 VDC Output to Ground
Switching Frequency	• 70 kHz (PFC), 130 kHz (main converter) typical
Power Density	• 18 W/in ³
Signals	• AC OK, DC OK, Inhibit, Enable, Fault (see Signals page)
MTBF	• 470 kHrs to Telecordia SR-332 at 25 °C, GB

Environmental

Operating Temperature	• -20 °C to +70 °C, derate linearly from +50 °C at 2.5 %/°C to 50% load at +70 °C
Cooling	• Internal load dependant variable speed fans
Operating Humidity	• 95% RH, non-condensing
Storage Temperature	• -40 °C to +85 °C
Operating Altitude	• 3000 m
Shock	• ±3 shocks in each axis (total 18 shocks) 30 g 11 ms (half sine). Compliant with EN60068-2-27.
Vibration	• 2 g 10-500 Hz 10 sweeps. Compliant with EN60068-2-6.

EMC & Safety

Emissions	• EN55011 level A conducted & radiated, EN55022 level A conducted & radiated
Immunity	• Compliant with EN61204-3:2000 high severity levels
Harmonic Currents	• EN61000-3-2 class A, EN61000-3-2 class C for loads ≥10%
Voltage Flicker	• EN61000-3-3
ESD Immunity	• EN61000-4-2, level 3, Perf Criteria A
Radiated Immunity	• EN61000-4-3, level 3, Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3, Perf Criteria A
Surge	• EN61000-4-5, installation class 3 Perf Criteria A
Conducted Immunity	• EN61000-4-6, level 3, Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms, Perf Criteria A, B, B, EN60601-1-2, 30% 500 ms, 60% 100 ms, 100% 10 ms, 100% 5000 ms, Perf Criteria A, A, A, B - 230 VAC. Consult longform datasheet for 115 V operation.
Safety Approvals	• IEC60950-1 CB Report, CSA-C22.2, No. 60950-1-05, UL60950-1, TUV EN60950-1, SEMI F47 IEC60601-1 CB Report, UL60601-1, TUV EN60601-1 (-M)

Models and Ratings

HPU1K5 **XP**

Output Power ⁽¹⁾	Output Voltage V1	Voltage Adj V1	Output Current V1		Standby Supply V2	Model Number
			<180 VAC	>180 VAC		
1200 W	12.0 VDC	11-14 V	100 A	100 A	5 V/1 A	HPU1K5PS12 [†] ^
1500 W	24.0 VDC	22-28 V	50 A	63 A	5 V/1 A	HPU1K5PS24 [†] ^
1500 W	48.0 VDC	45-52 V	25 A	31 A	5 V/1 A	HPU1K5PS48 [†] ^

Notes

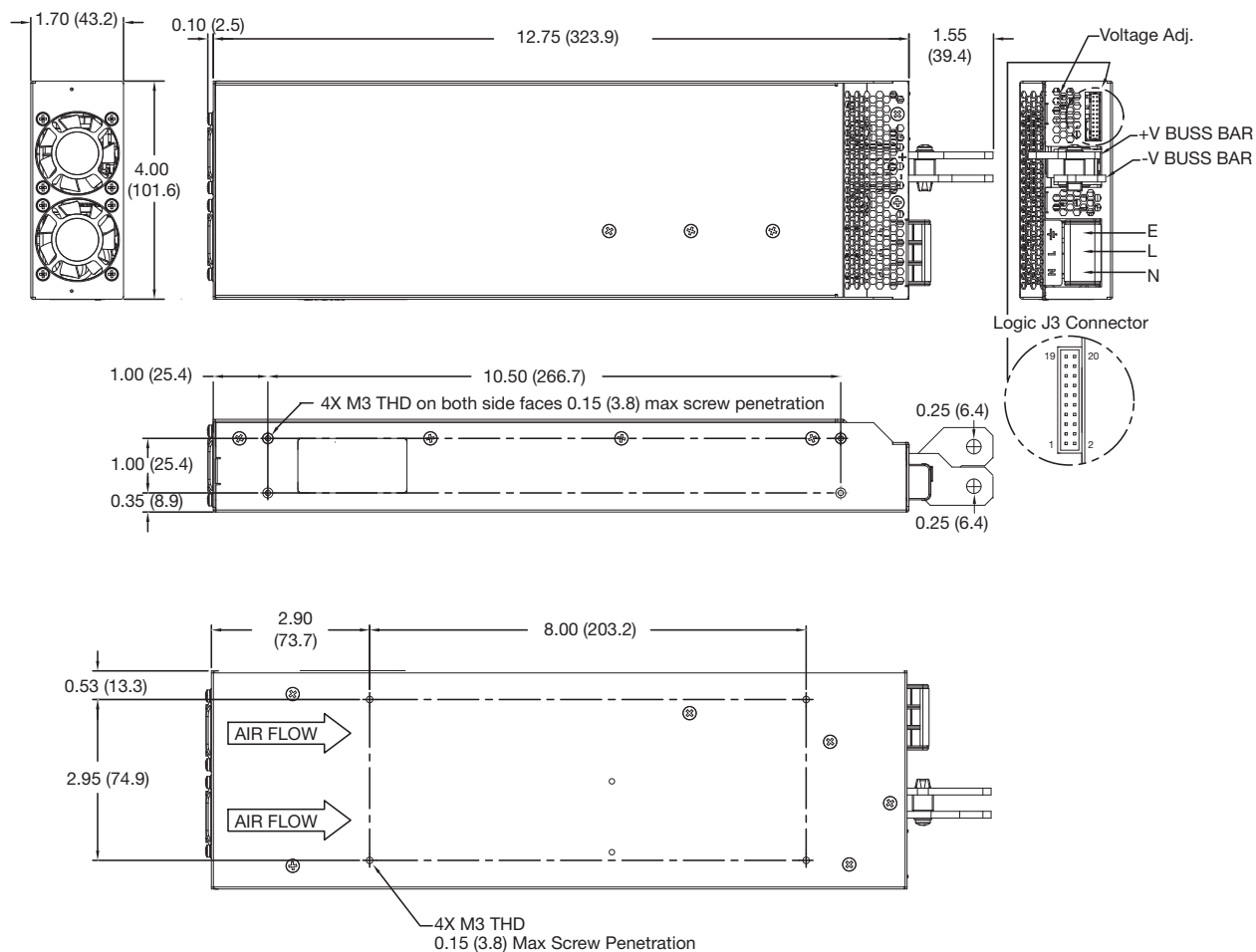
1. See derating curves.

2. For medical version, add suffix '-M' to model number.

[†] Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296.

Mechanical Details



Logic Connector: J3, JST, PN S20B-PHDSS (LF) SN					
Pin	Function	Pin	Function	Pin	Function
1	+ Sense	8	NC	15	DC OK
2	+ Sense	9	Inhibit	16	NC
3	- Sense	10	NC	17	Signal GND
4	- Sense	11	Fault	18	NC
5	Current Share	12	NC	19	5 V Standby Rtn (V2)
6	Current Share	13	AC OK	20	5 V Standby (V2)
7	V Trim	14	NC		

Mates with JST PN PHDR-20VS, Crimp contacts JST PN SPHD-00IT-P0.5

Notes

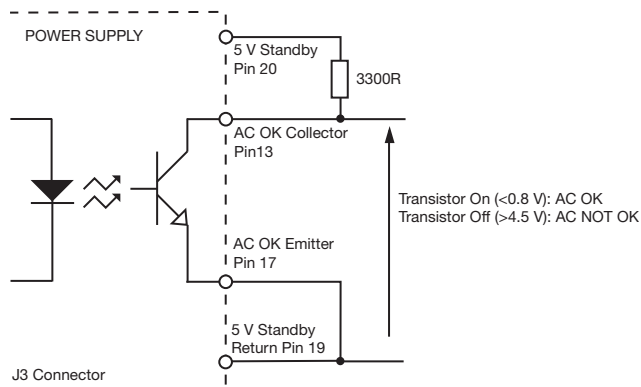
1. All dimensions are in inches (mm).

2. Weight 5.2 lb (2.35 kg)

AC OK/Power Fail

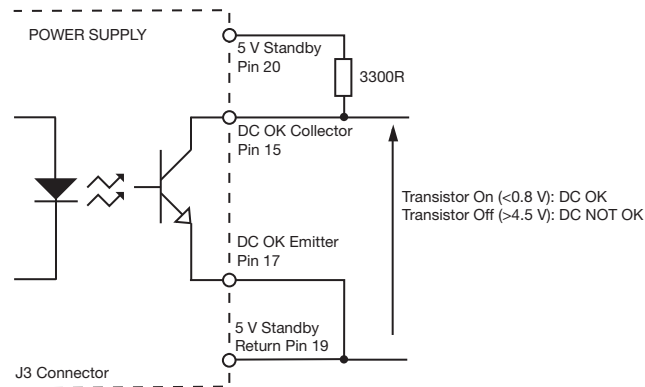
AC OK is an isolated signal providing a minimum of 3 ms warning of loss of output regulation. The signal is fully isolated and the collector and emitter must be connected externally.

Maximum sink current 2 mA, maximum voltage 20 V.

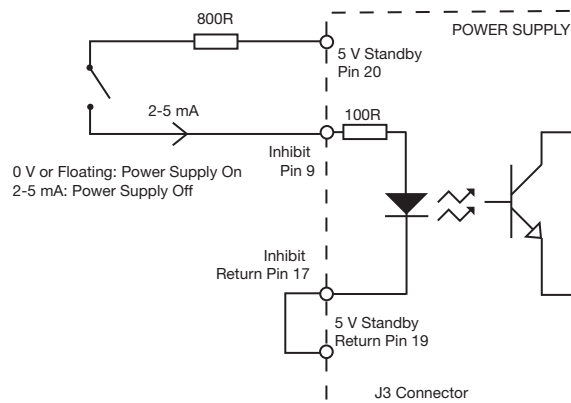
**DC OK**

DC OK is an isolated signal providing warning that the output voltage has fallen below 90% of nominal. The signal is fully isolated and the collector and emitter must be connected externally.

Maximum sink current 2 mA, maximum voltage 20 V.

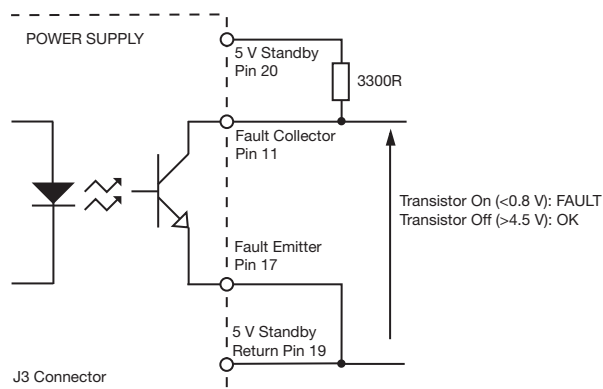
**Inhibit**

Inhibit is an isolated control signal which can turn the power supply and fans off by supplying 2 to 5 mA into the pin.

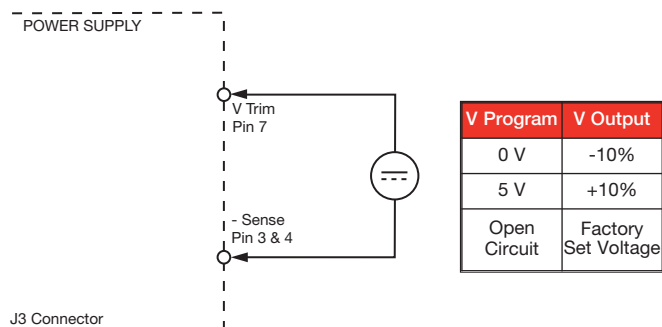
**Fault**

Fault is an isolated signal providing warning of output voltage below 90% of nominal, fan fault or overtemperature. The signal is fully isolated and the collector and emitter must be connected externally.

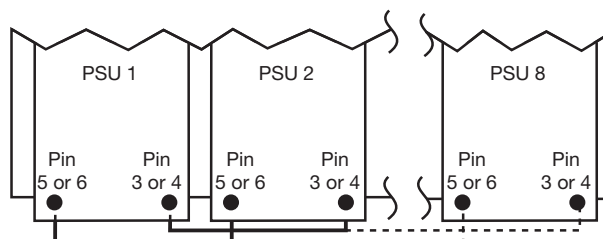
Maximum sink current 2 mA, maximum voltage 20 V.

**V Program**

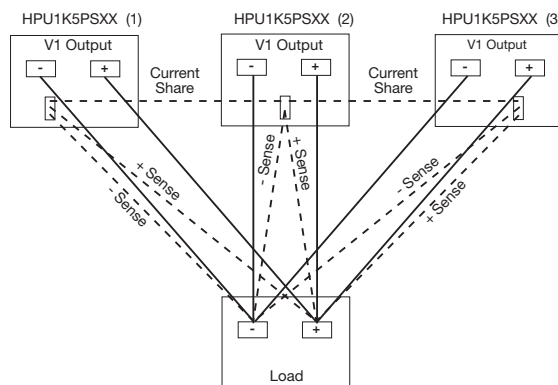
V Program allows remote voltage adjustment within the range $\pm 10\%$

**Current Share**

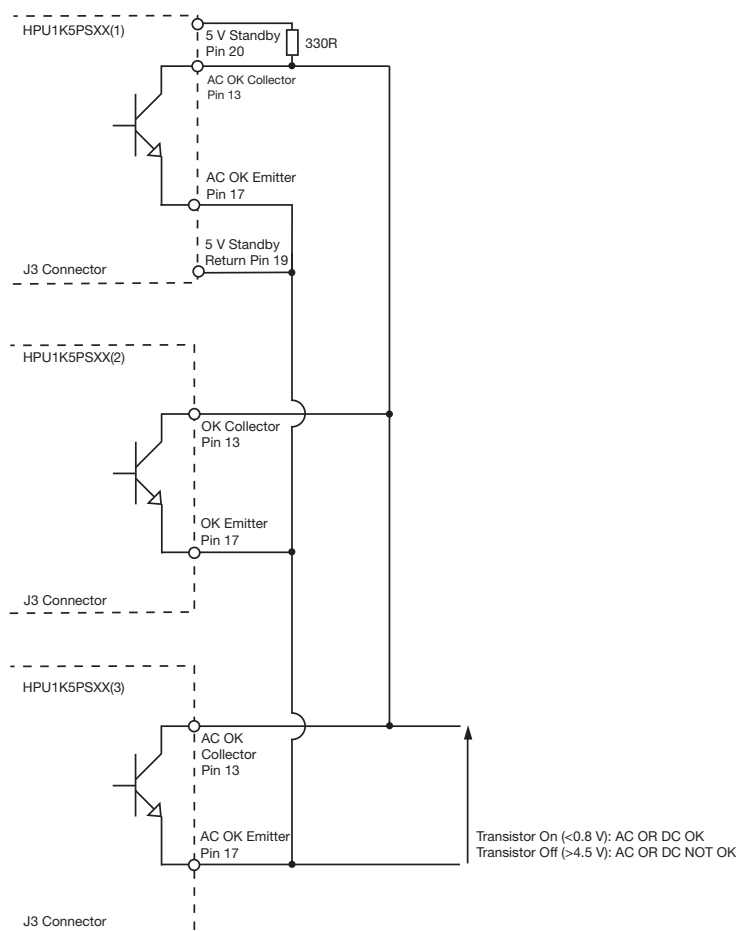
Connecting pins 5 or 6 and 3 or 4 of like voltage units (8 maximum) will force the current to share between the outputs. Units share current within 10% of each other at full load. Derate output to 90% of total combined load.



Parallel Load & Current Share Connections

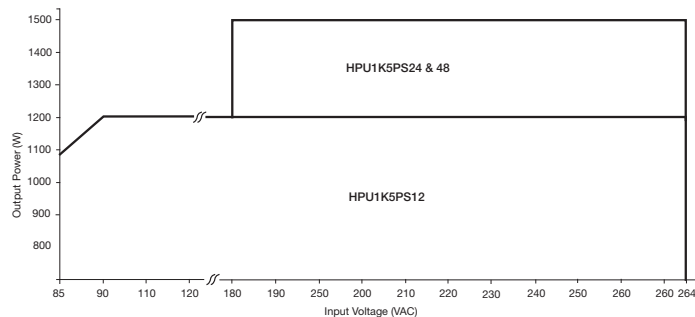


Parallel AC OK Connection (DC OK follows same format)

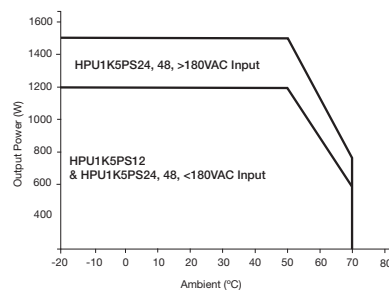


Derating Curves

Input Derating Curve



Thermal Derating Curve



400-2500 Watts fleXPower Series



- Configurable for Fast Time to Market
- SEMI F47 Compliant
- Flexible Series & Parallel Capability
- -20 °C Operation
- Extra Power Available at High Line
- Optional Fan Speed Control
- 3 Year Warranty

Specification

Input

Input Voltage	• 85-264 VAC (120-370 VDC). Full power at 90 VAC, derate by 10% at 85 VAC
Input Frequency	• 47-63 Hz, 400 Hz (all specifications met at 400 Hz, except leakage current)
Input Current ⁽¹⁾	• X4: 5.33 A at 115 VAC, 2.67 A at 230 VAC X5: 6.67 A at 115 VAC, 3.33 A at 230 VAC X7: 9.33 A at 115 VAC, 4.67 A at 230 VAC X9: 12.0 A at 115 VAC, 6.00 A at 230 VAC X10: 13.3 A at 115 VAC, 6.67 A at 230 VAC X15: 20 A at 115 VAC, 10 A at 230 VAC
Inrush Current ⁽¹⁾	• X4, X5, X7: <20 A, X9/X10: <40 A, X15: <60 A, cold start at 25 °C
Power Factor	• 0.99 typical at 115 VAC & 230 VAC full load
Earth Leakage Current ⁽¹⁾	• X models <1.5 mA at 264 VAC, 50 Hz XM models <200 µA at 264 VAC, 50 Hz
Input Protection	• X4-7/XM4-7: T12 A/250 V, X9/XM9: T15 A/250 V, X10/XM10: T20 A/250 V, X15/XM15: T20 A/250 V, internal fuse in line and neutral

Output

Output Power	• See table
Output Voltage	• See table
Output Voltage Trim	• 3.3 V outputs ±6%, others ±10%
Minimum Load	• No min load required for 2 slot or 3 slot single output modules. 2 slot dual outputs require 10% load on V1 to meet specified regulation on V2
Start Up Delay	• 2 s typical
Hold Up Time	• 20 ms at 90 VAC input & full output load
Line Regulation	• <0.1%
Load Regulation	• <1.0%
Ripple & Noise	• 50 mV or 1% pk-pk at 20 MHz bandwidth, whichever is greater
Overvoltage Protection	• 115-130% Vnom
Overtemperature Protection	• 115 °C measured internally, recycle mains to reset
Overload Protection	• 110-140%
Short Circuit Protection	• Continuous trip & restart (hiccup mode)
Temperature Coefficient	• 0.03%/°C
Remote Sense	• Compensates for up to 0.5 V drop
Enable/Inhibit	• See signals page
Current Share	• See signals page
Housekeeping Voltage	• 5 V/1 A from each chassis

General

Efficiency	• Up to 89%
Isolation	• 4000 VAC Input to Output, 1500 VAC Input to Ground, 250 VDC Output to Ground
Switching Frequency	• 60 kHz typ PFC, 200 kHz typ modules
Signals	• See signals page
MTBF	• 225 kHrs typ to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Temperature	• -20 °C to +70 °C. For operation above +50 °C, derate linearly to 50% load at +70 °C. Reverse air option derate from +40 °C to half load at +60 °C
Cooling	• Forced air cooling (via field-replaceable internal fan). Fan speed control optional
Operating Humidity	• 5-95% RH, non-condensing
Storage Temperature	• -40 °C to +85 °C
Operating Altitude	• 3000 m at full specification
Shock	• MIL STD-810 Method 516.4 Procedure 1, 30 g, half sine, 6 axes
Vibration	• MIL STD-810 Method 514.4 Procedure 1, 1 g rms, 5-500 Hz, 3 axes

EMC & Safety

Emissions	• X version: EN55022 (CISPR22) Class B conducted XM version: EN55011 (CISPR 11) Class A conducted
Immunity	• EN60601-1-2, EN61204-3
Harmonic Currents	• EN61000-3-2, Class A
Voltage Flicker	• EN61000-3-3
ESD Immunity	• EN61000-4-2, level 4 Perf Criteria A
Radiated Immunity	• EN61000-4-3, 10 V/m Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3 Perf Criteria A
Surge	• EN61000-4-5, installation class 3, Perf Criteria A
Conducted Immunity	• EN61000-4-6, level 3 Perf Criteria A
Dips and Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms, Perf Criteria A, B, B EN60601-1, 30% 500 ms, 60% 100 ms, 100% 10 ms, 100% 5000 ms, Perf Criteria A, A (with 60% load), A, B
Safety Approvals	• EN60950-1, UL60950-1, CSA22.2 No. 60950-1-03, EN60601-1, UL60601-1, SEMI F47

Note

1. Current specifications double for DD chassis versions.
(Low leakage for EN60601-1-2 available as modified standard, contact sales)

The flexPower range allows for simple configuration of a custom modular power supply with up to twenty outputs. The chassis consists of either ten, twelve or fourteen slots, and modules are either two or three slots wide. Please refer to next page for specific X15 configuration information.

CHASSIS

OUTPUT MODULES 1-5 (1-6: 900 W chassis/ 1-7: 1000 W chassis)

OPTIONS

X	X	X	X	-												-	P	P	S	S	+	+
---	---	---	---	---	--	--	--	--	--	--	--	--	--	--	--	---	---	---	---	---	---	---

Model	Sector	Vinput				Slots
		115 V		230 V		
		Pnom	Ppk*	Pnom	Ppk*	
X4	Industrial	400 W	800 W	600 W	1200 W	10
XM4	Medical	400 W	800 W	600 W	1200 W	10
X5	Industrial	500 W	800 W	700 W	1200 W	10
XM5	Medical	500 W	800 W	700 W	1200 W	10
X7	Industrial	700 W	800 W	900 W	1200 W	10
XM7	Medical	700 W	800 W	900 W	1200 W	10
X9	Industrial	900 W	1100 W	1100 W	1500 W	12
XM9	Medical	900 W	1100 W	1100 W	1500 W	12
X10	Industrial	1000 W	1300 W	1200 W	1600 W	14
XM10	Medical	1000 W	1300 W	1200 W	1600 W	14
X15	Industrial	1500 W	1500 W	2500 W	2500 W	20
XM15	Medical	1500 W	1500 W	2500 W	2500 W	20

Note: Peak power available for 10 seconds with 35% duty cycle.

Step 1

To configure your fleXPower unit, select the required output power and application type. fleXPower chassis are available in five industrial and five medical power formats, detailed above.

Step 2

fileXPower can accommodate up to seven modules, resulting in an extensive range of output combinations. However, as all modules are designed to fit across either two or three-slots in the chassis, configuration is very simple. Select the appropriate modules for your output requirements, ensuring that all modules will fit in the chassis. Insert 3 series modules first, then the lowest voltage for same module width. Follow with 2 series single output, lowest voltage to highest voltage, then 5 series multi-output, ordered alphabetically a-z. Then 1 series, single output modules, lowest voltage to highest voltage.

Step 3

Add any required options. These are grouped into three types; parallel options, series options and other options. The standard signal set for each chassis includes Global Inhibit, Global DC OK and Global AC OK, each having logic 0 operation. Optionally a logic 1 operating version of each is available along with reverse air flow. Also available is a fan speed control card option, which is available separately or combined with previously listed options.

Example

X7 - 700 W industrial chassis, 10 module slots available.
 3C - 3.3 V @ 60.0 A. Three slot width module.
 3L - 15.0 V @ 20.0 A. Three slot width module.
 2C - 3.3 V @ 40.0 A. Two slot width module.
 00 - No parallel option.
 23 - Modules 2 and 3 in series to give 18.3 V @ 20.0 A.
 16 - Fan speed control card.

Single Output - Module Voltage/Current Rating						
Voltage	Current	Ipk	Power	Ppk	Slots	Code
3.3 V	20.0 A	n/a	66 W	n/a	2	1C
3.3 V	40.0 A	n/a	132 W	n/a	2	2C
3.3 V	60.0 A	n/a	198 W	n/a	3	3C
5.0 V	20.0 A	n/a	100 W	n/a	2	1D
5.0 V	40.0 A	n/a	200 W	n/a	2	2D
5.0 V	60.0 A	n/a	300 W	n/a	3	3D
12.0 V	8.50 A	n/a	102 W	n/a	2	1J
12.0 V	17.0 A	n/a	204 W	n/a	2	2J
12.0 V	25.0 A	n/a	300 W	n/a	3	3J
15.0 V	7.00 A	n/a	105 W	n/a	2	1L
15.0 V	14.0 A	n/a	210 W	n/a	2	2L
15.0 V	20.0 A	n/a	300 W	n/a	3	3L
24.0 V	5.00 A	n/a	120 W	n/a	2	1P
24.0 V	10.5 A	n/a	252 W	n/a	2	2P
24.0 V	17.0 A	n/a	408 W	n/a	3	3P
24.0 V	5.00 A	10.0 A	120 W	240 W	2	1R ⁽¹⁾
24.0 V	10.5 A	21.0 A	252 W	504 W	2	2R ⁽¹⁾
24.0 V	17.0 A	34.0 A	408 W	816 W	3	3R ⁽¹⁾
28.0 V	4.50 A	n/a	126 W	n/a	2	1Q
28.0 V	9.00 A	n/a	252 W	n/a	2	2Q
28.0 V	14.0 A	n/a	392 W	n/a	3	3Q
36.0 V	3.50 A	n/a	126 W	n/a	2	1U
36.0 V	7.00 A	n/a	252 W	n/a	2	2U
36.0 V	11.0 A	n/a	396 W	n/a	3	3U
48.0 V	2.50 A	n/a	120 W	n/a	2	1W
48.0 V	5.20 A	n/a	249 W	n/a	2	2W
48.0 V	8.50 A	n/a	408 W	n/a	3	3W
60.0 V	2.00 A	n/a	120 W	n/a	2	1Y
60.0 V	4.20 A	n/a	252 W	n/a	2	2Y
60.0 V	7.00 A	n/a	420 W	n/a	3	3Y

1. Peak power available for 10 seconds with 35% duty cycle, if peak power rating is exceeded output may latch, recycle input to reset.

Dual Output - Module Voltage/Current Rating					
Output 1		Output 2		Slots	Code
Voltage	Current	Voltage	Current		
5.0 V	10.0 A	5.0 V	10.0 A	2	5A
5.0 V	10.0 A	3.3 V	10.0 A	2	5B
12.0 V	10.0 A	12.0 V	8.0 A	2	5D
15.0 V	8.0 A	15.0 V	6.0 A	2	5E
15.0 V	8.0 A	12.0 V	8.0 A	2	5F
12.0 V	10.0 A	5.0 V	10.0 A	2	5G
12.0 V	10.0 A	3.3 V	10.0 A	2	5H
12.0 V	10.0 A	2.0 V	10.0 A	2	5J
15.0 V	10.0 A	5.0 V	10.0 A	2	5K
15.0 V	10.0 A	3.3 V	10.0 A	2	5L
15.0 V	10.0 A	2.0 V	10.0 A	2	5M
24.0 V	6.0 A	5.0 V	10.0 A	2	5N
24.0 V	6.0 A	3.3 V	10.0 A	2	5P
24.0 V	6.0 A	2.0 V	10.0 A	2	5Q

Note: Total power for dual output module must not exceed 175 W max.

Parallel Option Codes	
Code	Description
00	No parallel required
12	Modules 1 & 2
13	Modules 1 to 3
14	Modules 1 to 4
23	Modules 2 & 3
24	Modules 2 to 4
25	Modules 2 to 5
34	Modules 3 & 4
35	Modules 3 to 5
40	Modules 1 & 2, 3 & 4

Series Option Codes	
Code	Description
00	No series required
12	Modules 1 & 2
13	Modules 1 to 3
23	Modules 2 & 3
24	Modules 2 to 4
40	Modules 1 & 2, 3 & 4

Other Option Codes	
Code	Description
01	Reverse Air
02	Global Enable - Logic 1
03	Option 01 & 02
04	Global DC OK - Logic 1
05	Option 01 & 04
06	Option 02 & 04
07	Option 01, 02 & 04
08	Global AC OK - Logic 1
09	Option 01 & 08
10	Option 02 & 08
11	Option 01, 02 & 08
12	Option 04 & 08
13	Option 01, 04 & 08
14	Option 02, 04 & 08
15	Option 01, 02, 04 & 08
16	Fan Speed Control
17	Option 01 & 16
18	Option 02 & 16
19	Option 04 & 16
20	Option 08 & 16
21	Option 01, 02 & 16
22	Option 01, 04 & 16
23	Option 01, 08 & 16
24	Option 02, 04 & 16
25	Option 02, 08 & 16
26	Option 04, 08 & 16
27	Option 01, 02, 04 & 16
28	Option 01, 02, 08 & 16
29	Option 02, 04, 08 & 16
30	Option 01, 02, 04, 08 & 16

Note: Fancard options 16-30 will occupy 2 slots.

X7-3C3L2C-002316



- Configuration for X15 is Chassis - Top Bay - Options / Bottom Bay - Options
- Modules for each bay are configured same as X4, X5, X7, X10.
- Maximum 1250W for each bay, power to be averaged on top and bottom bays.
- Option codes within each bay is the same as X4 to X10.
- 1st and 2nd digits = parallel like voltages, including vertical parallel.
- 3rd and 4th digits = series option designation.
- 5th and 6th digits = other option codes (5th and 6th digits fan card options 16 to 30 is called out for one bay only, either top or bottom).

Vertical Parallel Option Codes	
Code	Description
61	Parallel module 1 to module 1 top and bottom
62	Parallel module 2 to module 2 top and bottom
63	Parallel module 3 to module 3 top and bottom
64	Parallel module 4 to module 4 top and bottom
65	Parallel module 5 to module 5 top and bottom
91	Parallel module 1 to module 1 top and bottom, plus parallel code 12 top bay
92	Parallel module 1 to module 1 top and bottom, plus parallel code 13 top bay
93	Parallel module 1 to module 1 top and bottom, plus parallel code 14 top bay
94	Parallel module 2 to module 2 top and bottom, plus parallel code 23 top bay
95	Parallel module 2 to module 2 top and bottom, plus parallel code 24 top bay
96	Parallel module 2 to module 2 top and bottom, plus parallel code 25 top bay
97	Parallel module 3 to module 3 top and bottom, plus parallel code 34 top bay
98	Parallel module 3 to module 3 top and bottom, plus parallel code 35 top bay

Example 1

X15-3D2D2D5J-910016/3D2D2C-12

X15 - 2500 W industrial chassis, 20 module slots configured as 2 bays of 10 slots each.

3D - 3.3 V @ 60.0 A. Three slot width module.

2D - 5.0 V @ 40.0 A. Two slot width module.

2D - 5.0 V @ 40.0 A. Two slot width module.

5J - 3.3 V @ 40.0 A. Two slot width module.

91 - Vertical parallel module 1 top bay to module 1 bottom bay plus parallel modules 1 and 2 top bay

00 - No series option

16 - Fan speed control card

3D - 5.0 V @ 60.0 A. Three slot width module

2D - 5.0 V @ 40.0 A. Two slot width module

2C - 3.3 V @ 40.0 A. Two slot width module

12 - Parallel modules 1 and 2, bottom bay

Example 2

X15-3D2D5J-610016/3D2D2C-12

X15 - 2500 W industrial chassis, 20 module slots configured as 2 bays of 10 slots each

3D - 5.0 V @ 60.0 A. Three slot width module

2D - 5.0 V @ 40.0 A. Two slot width module

5J - 12.0 V @ 10.0 A 2.0 V @ 10.0 A. Two slot width dual output module

61 - Vertical parallel Module 1 top bay to Module 1, bottom bay

00 - No series option

16 - Fan speed control card

3D - 5.0 V @ 60.0 A. Three slot width module

2D - 5.0 V @ 40.0 A. Two slot width module

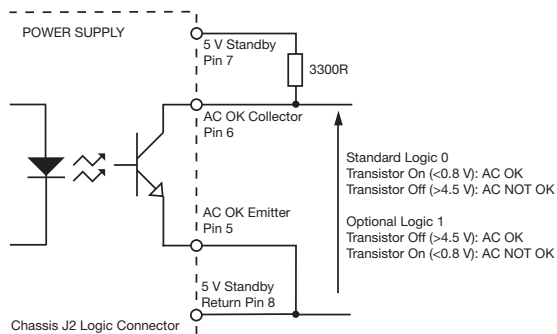
2C - 3.3 V @ 40.0 A. Two slot width module

12 - Parallel modules 1 and 2, bottom bay

Global AC OK/Power Fail

Global AC OK is an isolated transistor of an optocoupler providing a minimum of 5 ms warning of loss of output regulation. The signal is fully isolated and the collector and emitter must be connected externally.

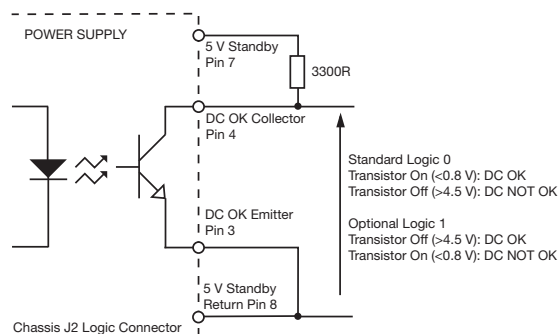
Maximum sink current 2 mA, maximum voltage 20 V.



Global DC OK

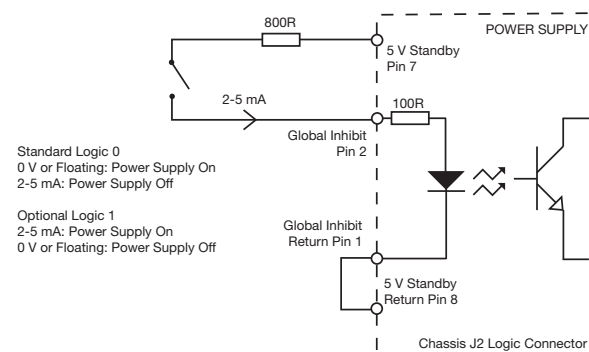
Global DC OK is an isolated transistor of an optocoupler providing warning that the output voltage has fallen below 90% of nominal. The signal is fully isolated and the collector and emitter must be connected externally.

Maximum sink current 2 mA, maximum voltage 20 V.
On Dual output module, DC OK monitors V1 output only.



Global Inhibit

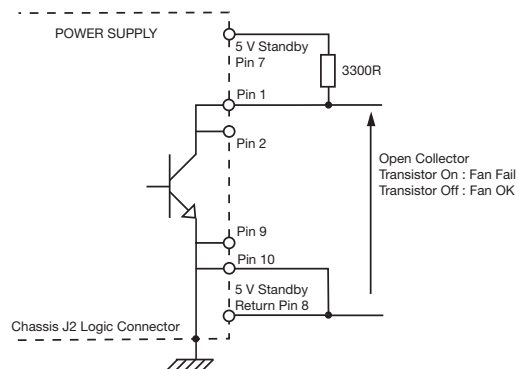
Global Inhibit is an isolated control signal input which turns the power supply off by supplying 2 to 5 mA into the pin. Global Enable option available, see 'Other Option Codes' table.



Fan Fail

When fan speed control fitted (option 16).

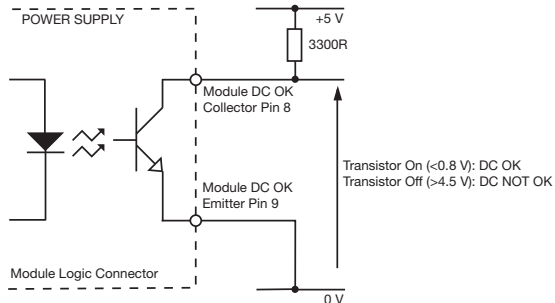
Open collector signal warns of any fan failure.



Module DC OK

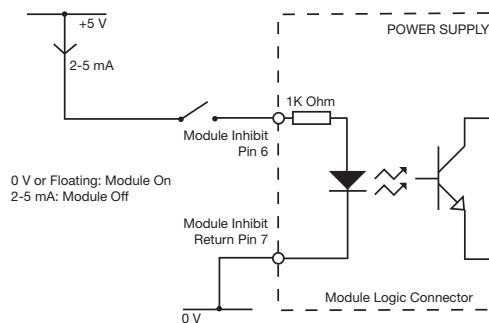
Module DC OK is a nominal "ON" isolated transistor of an optocoupler which provides a warning of the loss of output regulation on the main output of the module.

Maximum sink current 2 mA, maximum voltage 20 V.



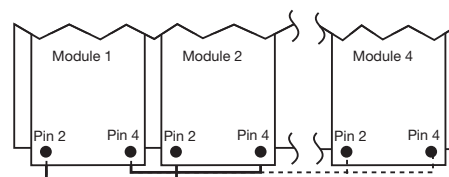
Module Inhibit

Module Inhibit signal is an isolated control signal which turns the module off by supplying 2 to 5 mA into the pin.



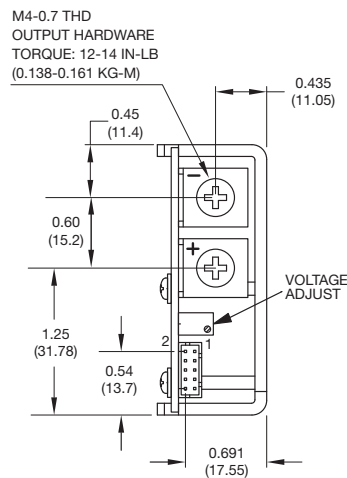
Current Share

Connecting pins 2 and 4 of like voltage modules (4 maximum) within the same chassis or separate chassis will force the current to share between the outputs. Different slot width modules share in proportion to their output current rating.

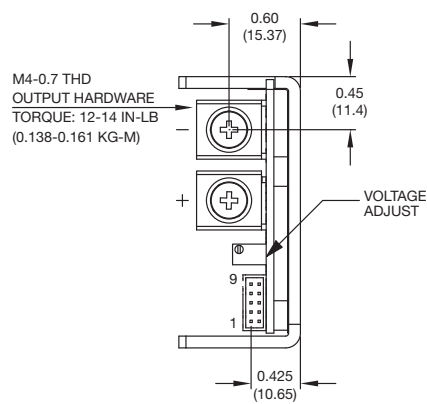


Single Output

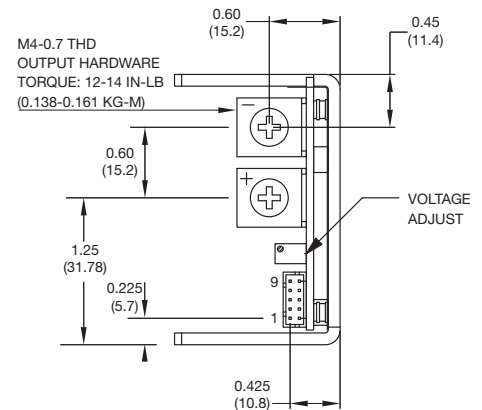
2 Slot Modules



2 Slot Modules (1R / 2R Peak)



3 Slot Modules (3R Peak)



Notes

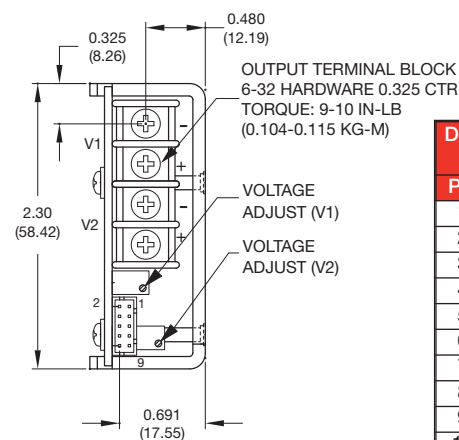
1. All dimensions in inches (mm).
Tolerance: .xx = ± 0.02 (± 0.50); .xxx = ± 0.01 (± 0.25)
2. Weight: 2/2R Slot : 0.48 lb (218 g) approx,
3 Slot : 0.74 lb (335 g) approx.
3. Mating plug: JST part no. PHDR-10VS.
4. Contact: 26-22 AWG JST part no. SPHD-001T-P0.5.
5. Connector kit available order part no. flexPower CONKIT.

Single Output: Module Logic Connector Pinouts

Pin	Function	Pin	Function
1	Sense +	6	Inhibit
2	Sense -	7	Module Inhibit Return
3	V Prog	8	DC OK Collector
4	I Share	9	DC OK Emitter
5	Not used	10	Not used

Dual Output

2 Slot Modules



Dual Output: Module Logic Connector Pinouts

Pin	Function
1	V1 Sense +
2	V1 Sense -
3	Not used
4	Not used
5	V2 Sense +
6	Inhibit
7	Module Inhibit Return
8	DC OK Collector
9	DC OK Emitter
10	V2 Sense -

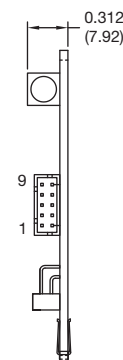
Notes

1. All dimensions in inches (mm).
Tolerance: .xx = ± 0.02 (± 0.50); .xxx = ± 0.01 (± 0.25).
2. Weight: 0.48 lb (218 g) approx.
3. Mating plug: JST part no. PHDR-10VS.
4. Contact: 26-22 AWG JST part no. SPHD-001T-P0.5.
5. Connector kit available order part no. flexPower CONKIT.

Fan Speed Control Module

2 Slot Module

Controls speed of fan(s) depending on output load and thermal environment of the power supply. Also provides warning of any fan failure.



Fan Speed Control Module Connector Pinouts

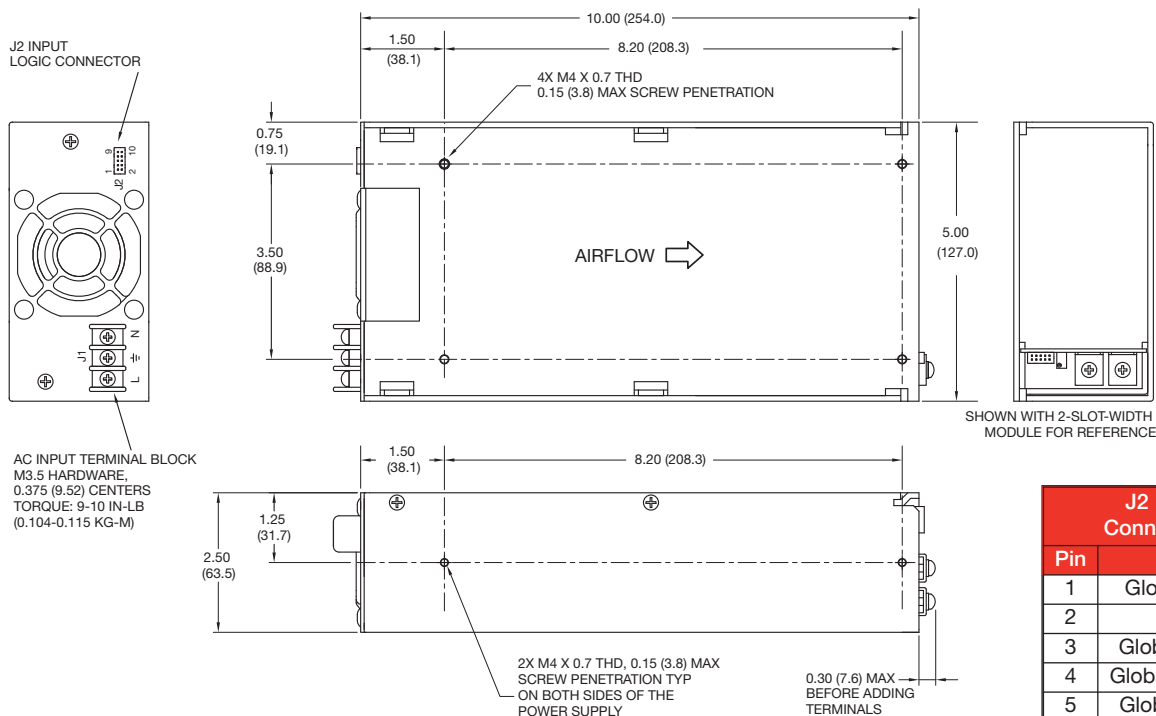
Pin	Function
1	Fan Fail
2	Fan Fail
3	Not Used
4	Not Used
5	Not Used
6	Not Used
7	Not Used
8	Not Used
9	Ground
10	Ground

Notes

1. All dimensions in inches (mm).
Tolerance: .xx = ± 0.02 (± 0.50); .xxx = ± 0.01 (± 0.25).
2. Weight: 0.10 lb (45 g) approx.
3. Mating plug: JST part no. PHDR-10VS.
4. Contact: 26-22 AWG JST part no. SPHD-001T-P0.5.
5. Connector kit available order part no. flexPower CONKIT.

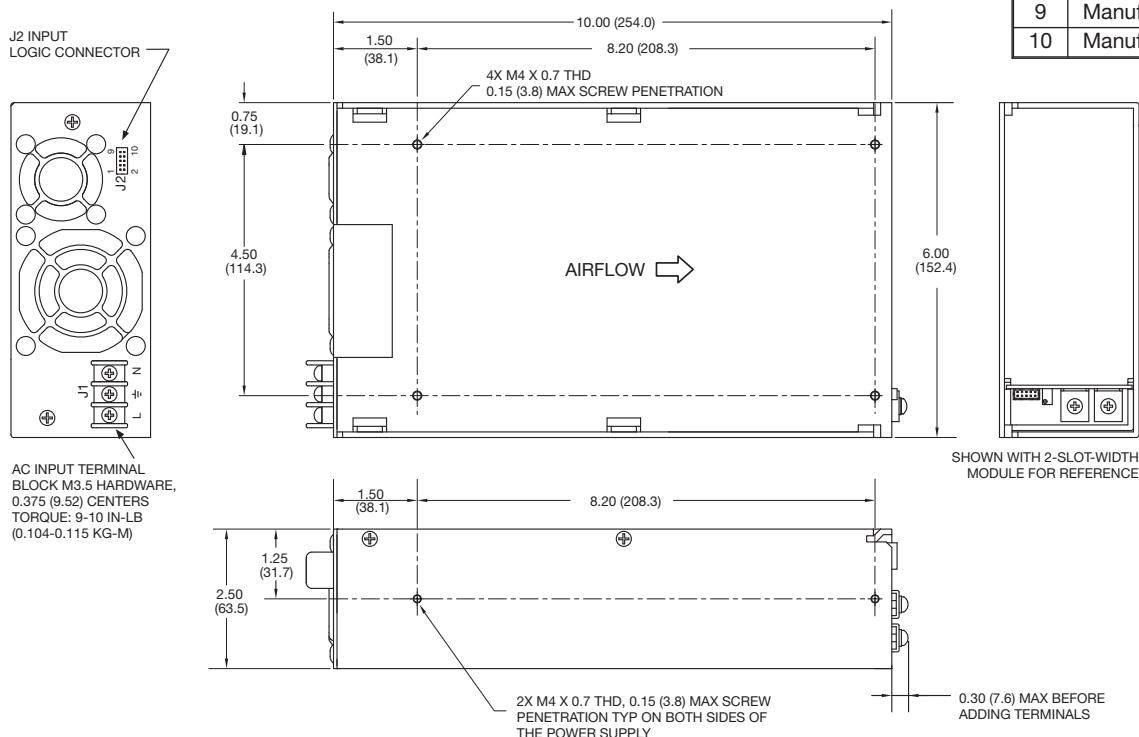
Chassis Mechanical Details

**400 (600)⁽⁴⁾ Watt X4 & XM4 Chassis, 500 (700)⁽⁴⁾ Watt X5 & XM5 Chassis,
700 (900)⁽⁴⁾ Watt X7 & XM7 Chassis**



J2 Input Logic Connector Pinouts	
Pin	Function
1	Global Inhibit Return
2	Global Inhibit
3	Global DC OK Emitter
4	Global DC OK Collector
5	Global AC OK Emitter
6	Global AC OK Collector
7	5V Standby
8	5V Standby Return
9	Manufacturer Use Only
10	Manufacturer Use Only

900 (1100)⁽⁴⁾ Watt X9 & XM9 Chassis

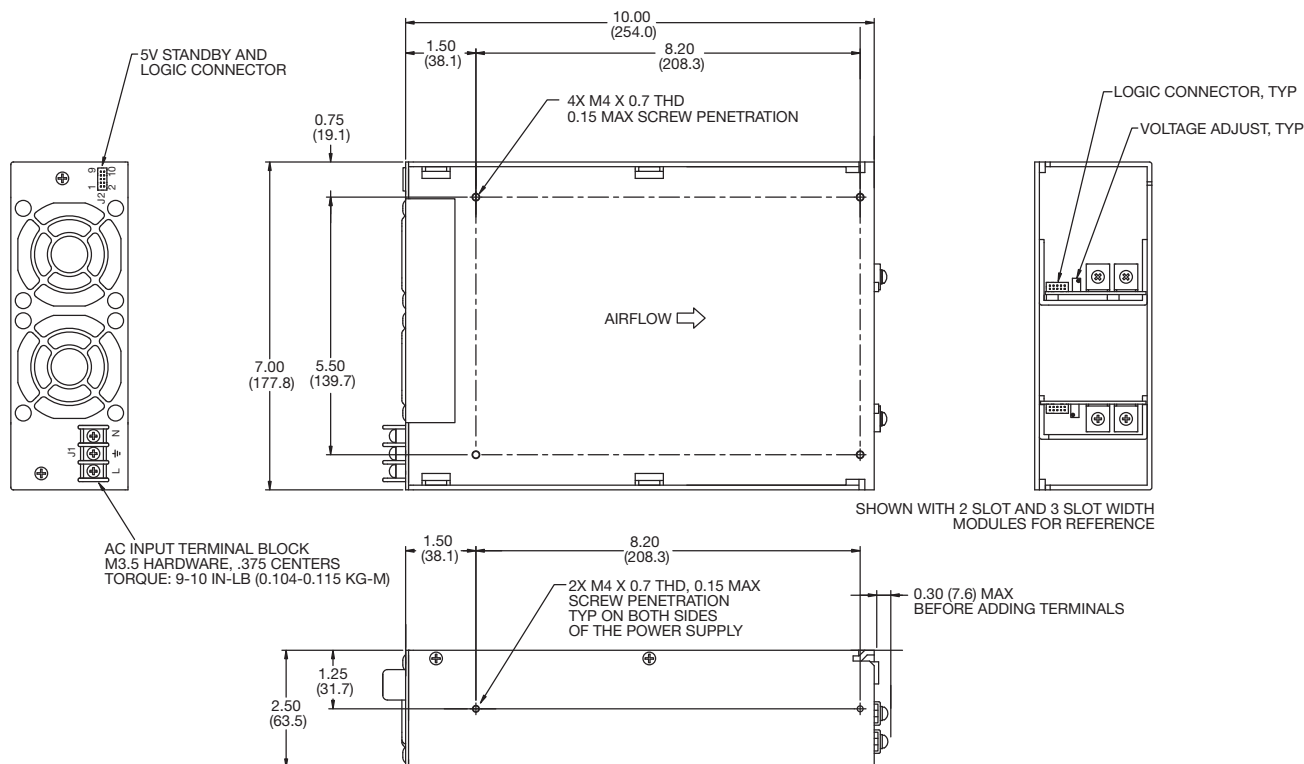


Notes

- All dimensions in inches (mm).
Tolerance X.XX = ±0.02 (0.05), X.XXX = ±0.01 (0.25)
- Mating plug: JST p/n PHDR-10VS.
- Contact: 26-22 AWG JST p/n SPHD-001T-P0.5.
- High line only (180-264 VAC).
- Weights: 400 (600) W X4 & XM4 chassis: 2.75 lbs (1250 g) approx.
500 (700) W X5 & XM5 chassis: 2.75 lbs (1250 g) approx.
700 (900) W X7 & XM7 chassis: 2.75 lbs (1250 g) approx.
900 (110) W X9 & XM9 chassis: 3.3 lbs (1250 g) approx.

Chassis Mechanical Details

1000 (1200) ⁽⁴⁾ Watt X10 & XM10 Chassis



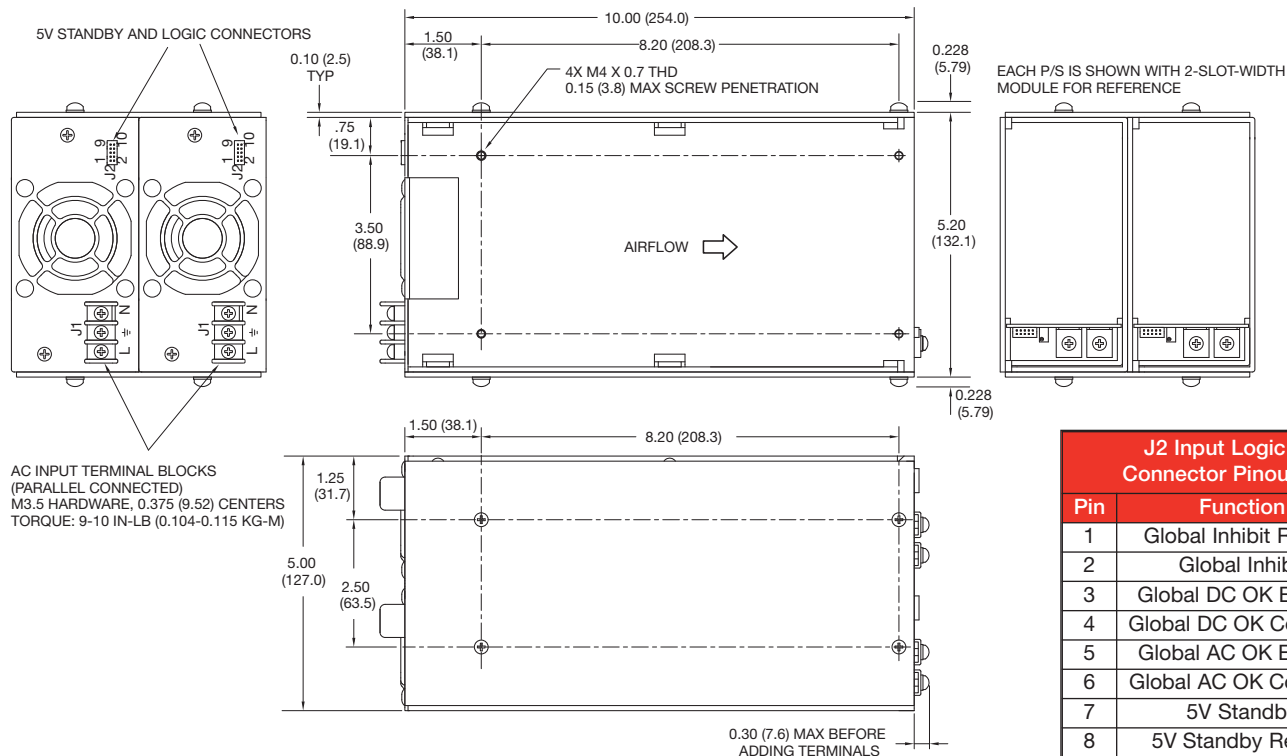
J2 Input Logic Connector Pinouts	
Pin	Function
1	Global Inhibit Return
2	Global Inhibit
3	Global DC OK Emitter
4	Global DC OK Collector
5	Global AC OK Emitter
6	Global AC OK Collector
7	5V Standby
8	5V Standby Return
9	Manufacturer Use Only
10	Manufacturer Use Only

Notes

1. All dimensions in inches (mm). Tolerance X.XX = ±0.02 (0.05), X.XXX = ±0.01 (0.25)
2. Mating plug: JST p/n PHDR-10VS.
3. Contact: 26-22 AWG JST p/n SPHD-001T-P0.5.
4. High line only (180-264 VAC).
5. Weight: 4 lbs (1800 g) approx.

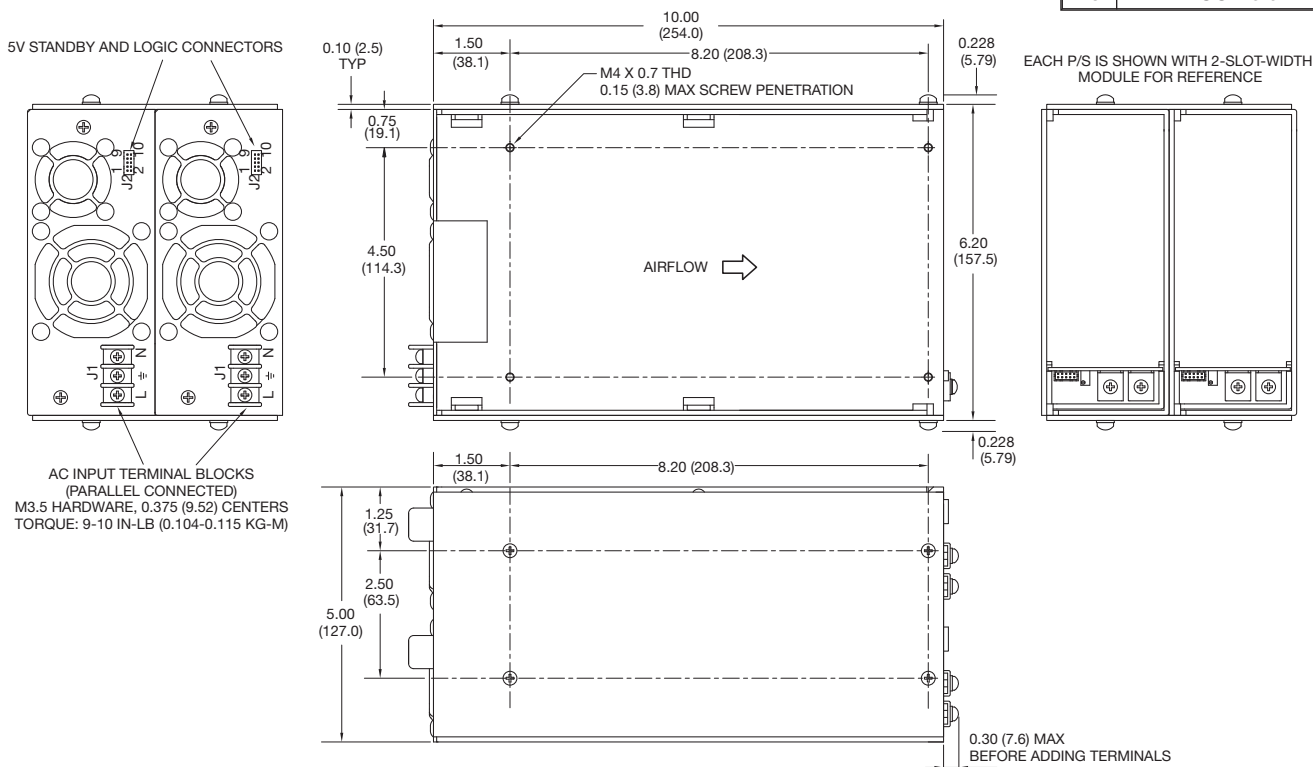
Chassis Mechanical Details

**800 (1200)⁽⁴⁾ Watt X4DD & XM4DD Chassis, 1000 (1400)⁽⁴⁾ Watt X5DD & XM5DD Chassis
1400 (1800)⁽⁴⁾ Watt X7DD & XM7DD Chassis**



J2 Input Logic Connector Pinouts	
Pin	Function
1	Global Inhibit Return
2	Global Inhibit
3	Global DC OK Emitter
4	Global DC OK Collector
5	Global AC OK Emitter
6	Global AC OK Collector
7	5V Standby
8	5V Standby Return
9	Inhibit Sum
10	VCC Return

1800 (2200)⁽⁴⁾ Watt X9DD & XM9DD Chassis



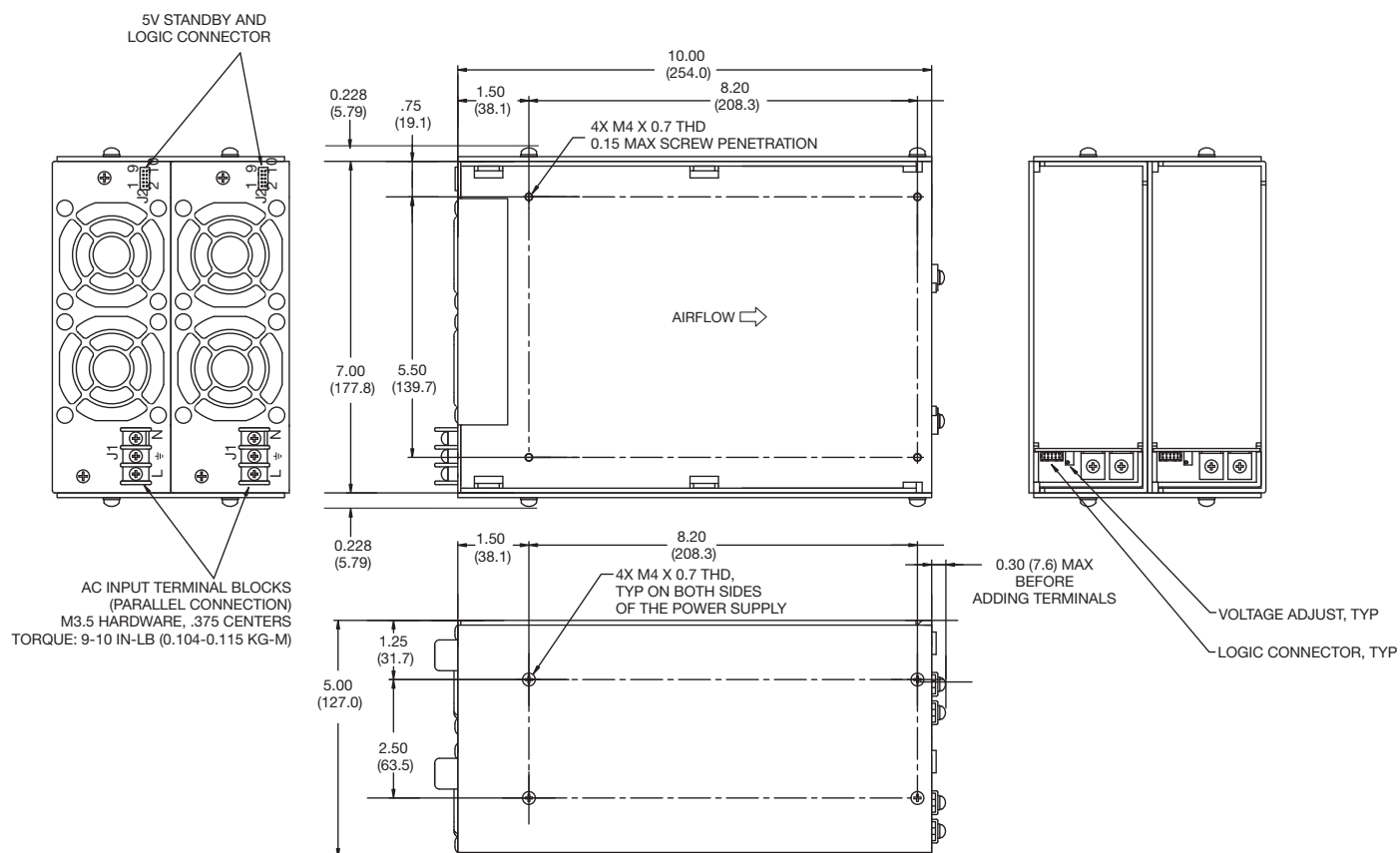
Notes

1. All dimensions in inches (mm).
Tolerance X.XX = ±0.02 (0.05), X.XXX = ±0.01 (0.25)
2. Mating plug: JST p/n PHDR-10VS.
3. Contact: 26-22 AWG JST p/n SPHD-001T-P0.5.
4. High line only (180-264 VAC).

5. Weights: 800 (1200) W X4DD & XM4DD chassis: 5.5 lbs (2500 g) approx.
1000 (1400) W X5DD & XM5DD chassis: 5.5 lbs (2500 g) approx.
1400 (1800) W X7DD & XM7DD chassis: 5.5 lbs (2500 g) approx.
1800 (2200) W X9DD & XM9DD chassis: 6.6 lbs (3000 g) approx.

Chassis Mechanical Details

2000 (2400)⁽⁴⁾ Watt X10DD & XM10DD Chassis



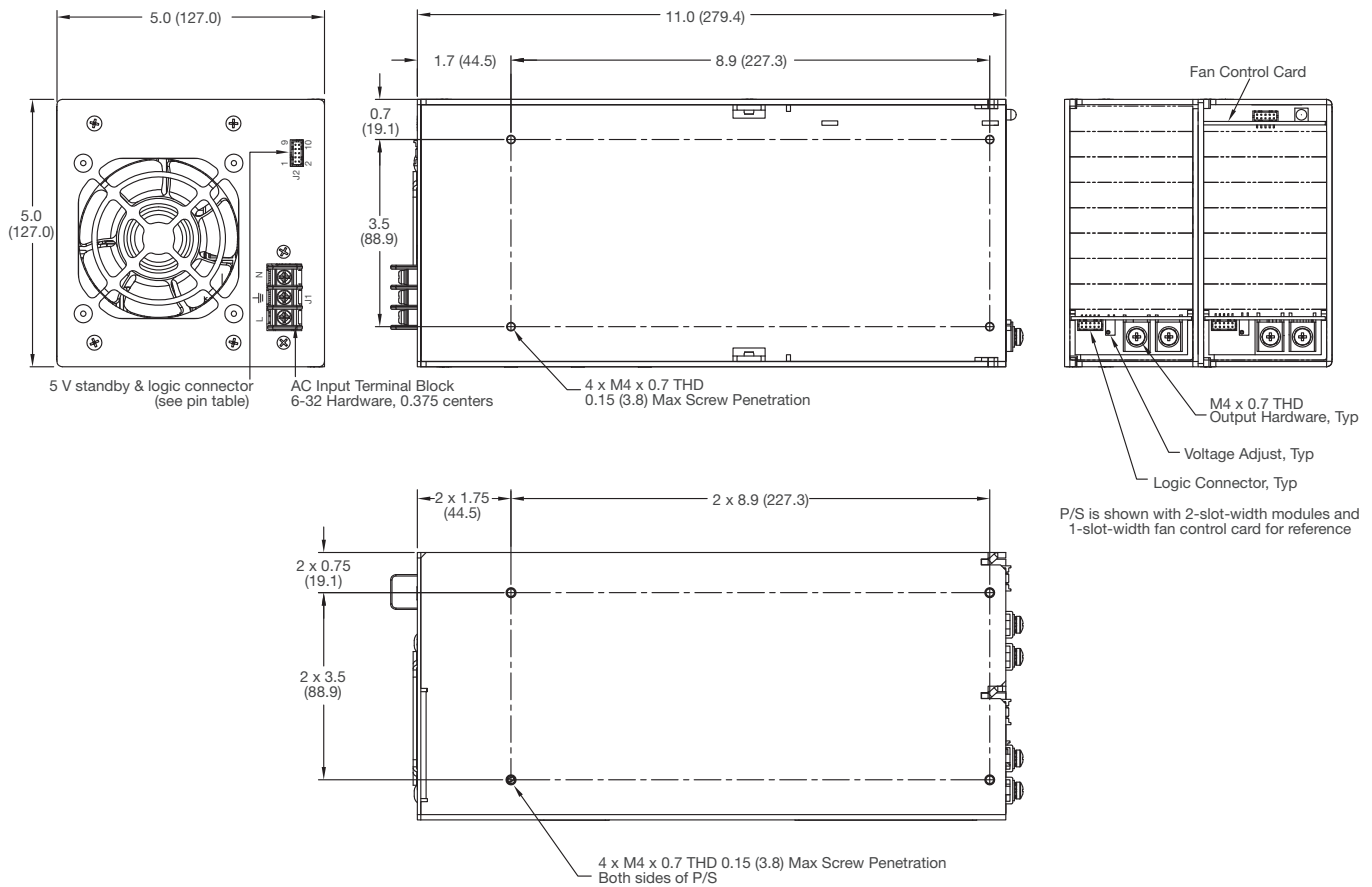
J2 Input Logic Connector Pinouts	
Pin	Function
1	Global Inhibit Return
2	Global Inhibit
3	Global DC OK Emitter
4	Global DC OK Collector
5	Global AC OK Emitter
6	Global AC OK Collector
7	5V Standby
8	5V Standby Return
9	Inhibit Sum
10	VCC Return

Notes

1. All dimensions in inches (mm).
Tolerance X.XX = ±0.02 (0.05), X.XXX = ±0.01 (0.25)
2. Mating plug: JST p/n PHDR-10VS.
3. Contact: 26-22 AWG JST p/n SPHD-001T-P0.5.

4. High line only (180-264 VAC).
5. Weight: 8.0 lbs (3636 g) approx.

Chassis Mechanical Details

1500 (2500)⁽⁴⁾ Watt X15 & XM15 Chassis

J2 Input Logic Connector Pinouts	
Pin	Function
1	Global Inhibit Return
2	Global Inhibit
3	Global DC OK Emitter
4	Global DC OK Collector
5	Global AC OK Emitter
6	Global AC OK Collector
7	5V Standby
8	5V Standby Return
9	Inhibit Sum (Internal Use Only)
10	VCC Return (Internal Use Only)

Notes

- All dimensions in inches (mm).
Tolerance X.XX = ± 0.02 (0.05), X.XXX = ± 0.01 (0.25)
- Mating plug: JST p/n PHDR-10VS.
- Contact: 26-22 AWG JST p/n SPHD-001T-P0.5.

- High line only (180-264 VAC).
- Weight: 8.0 lbs (3636 g) approx.

HCP Series



- High Efficiency up to 91%
- High Power Density
- Programmable Output Voltage (30%–105%)
- Programmable Output Current (40%–105%)
- Parallel Operation
- Fully Featured Signals & Controls
- 3 Year Warranty

Specification

Input

Input Voltage	• 90-264 VAC (127-370 VDC), see derating curves
Input Frequency	• 47-63 Hz
Input Current	• 650 W: 7.5 A/3.5 A typical, 1000 W: 12 A/5 A typical, 1500 W: 18 A/9 A typical, 3000 W: 36 A/18 A typical at 115/230 VAC
Inrush Current	• 650/1000 W: 27 A/54 A typical 1500 W: 30 A/45 A typical 3000 W: 60 A/90 A typical at 115/230 VAC
Power Factor	• 0.99/0.98, typical at 115/230 VAC full load
Earth Leakage Current	• <1.0 mA (3 kW: <2.5 mA) at 240VAC/60 Hz

Output

Output Voltage	• See model table
Output Trim	• $\pm 5.0\%$ by potentiometer
Output Voltage Program	• 30-105% of rated output (see app. notes)
Output Current Program	• 40-105% of rated output (see app. notes)
Initial Set Accuracy	• $\pm 1\%$
Minimum Load	• No minimum load required
Start Up Delay	• 650 W/1000 W: 800 ms max. 1500 W/3000 W: 1 s max.
Start Up Rise Time	• 650 W: 90 ms max. at full load 1000 W: 100 ms max. at full load 1500 W/3000 W: 350 ms max. at full load
Hold Up Time	• 16 ms (3000 W: 20 ms) typ. at 230 VAC and full load
Line Regulation	• $\pm 0.5\%$
Load Regulation	• V1: $\pm 0.5\%$, 5 V standby output: $\pm 3\%$
Transient Response	• <1% for a 25% step load change
Ripple & Noise	• 150 mV pk-pk all voltages (see note 1)
Overvoltage Protection	• Tracks output voltage. 115-135% of set voltage. Recycle AC to reset
Overtemperature Protection	• Auto recovery
Overload Protection	• 105-125% of output power. Constant power to 75% of set output voltage then output shuts down, recycle AC to reset
Short Circuit Protection	• Output latches off, recycle AC to reset
Temp. Coefficient	• $\pm 0.02\%/^{\circ}\text{C}$ (0-50 $^{\circ}\text{C}$)
Remote Sense	• Compensates for 0.5 V max voltage drop. (see app. notes)
Enable	• Output must be enabled (see app. notes)
Current Share	• 5 supplies can share within 5%
Standby Output	• See model table

General

Efficiency	• See model table
Isolation	• 3000 VAC Input to Output, 1500 VAC Input to Ground, 500 VDC Output to Ground
Isolation Resistance	• 100 M Ω /500 VDC
Switching Frequency	• PFC 100 kHz typical, PWM 65 kHz typical
Power Density	• 650 W: 8.2 W/in ³ 1000 W: 11.1 W/in ³ 1500 W/3000 W: 10.8 W/in ³
Signals & Controls	• See app. notes
MTBF	• 650 W: 160 kHrs, 1000 W: 140 kHrs, 1500 W/3000 W: 100 kHrs to MIL-HDBK-217F at 25 $^{\circ}\text{C}$, GB

Environmental

Operating Temperature	• -25 $^{\circ}\text{C}$ to 60 $^{\circ}\text{C}$, see derating curves
Cooling	• Internal fan fitted. Speed increases with load and internal temperature
Operating Humidity	• 20-90% R.H. non-condensing
Storage Temperature	• -40 $^{\circ}\text{C}$ to +85 $^{\circ}\text{C}$
Storage Humidity	• 10-95% R.H.
Vibration	• 10-500 Hz, 5 g 10 min/cycle, 60 min period for each axis. Compliant to IEC68-2-16, IEC 68-2-64

EMC & Safety

Emissions	• EN55022 class B conducted & radiated
Harmonic Currents	• EN61000-3-2 class A, 650 & 1000 W: EN61000-3-2 class C for loads $\geq 10\%$, 1500 W: EN61000-3-2 class C for loads $\geq 40\%$, 3000 W: EN61000-3-2 class C for loads $\geq 30\%$
Voltage Flicker	• EN61000-3-3
ESD Immunity	• EN61000-4-2, ± 4 kV contact, ± 8 kV air discharge, Perf Criteria A
Radiated Immunity	• EN61000-4-3, 3 V/m, Perf Criteria A
EFT/Burst	• EN61000-4-4, level 2, Perf Criteria A
Surge	• EN61000-4-5, installation class 3, Perf Criteria A
Conducted Immunity	• EN61000-4-6, Perf Criteria A
Magnetic Field	• EN61000-4-8, Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, >95% 5000 ms, Perf Criteria A, B, B
Safety Approvals	• UL60950-1, EN60950-1 (all models) CSA C22.2 No. 60950-1 (650 W/1000 W only)

Models and Ratings

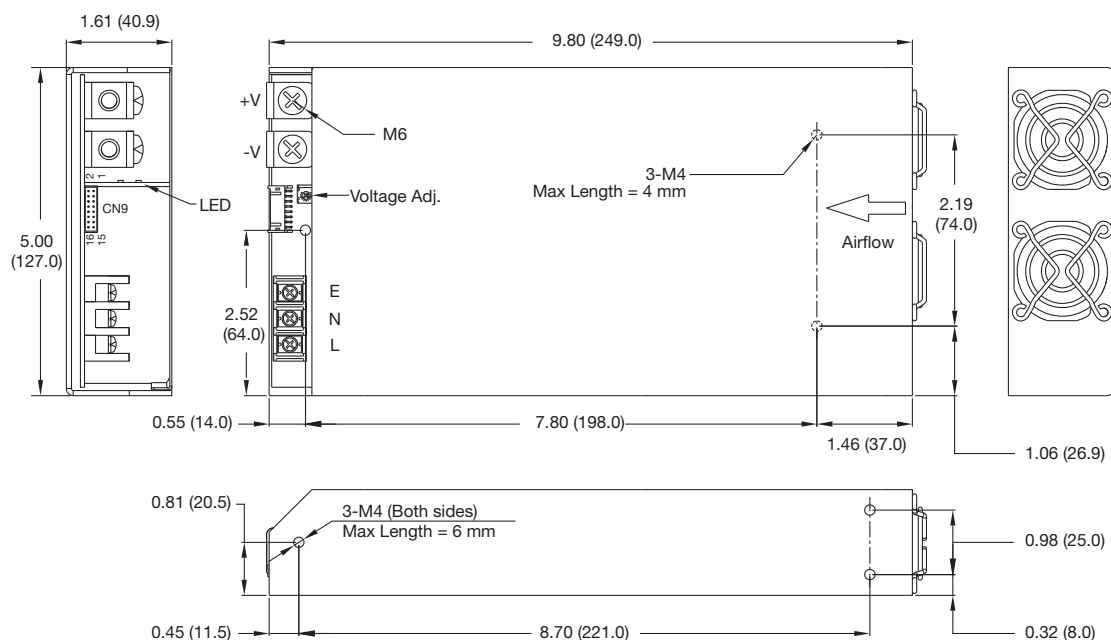
HCP650 **XP**

Output Power	Output Voltage V1	Output Current		Standby Output ⁽³⁾	Efficiency ⁽²⁾	Model Number
		Min	Max			
500 W	5.0 VDC	0.0 A	100.0 A	5 V/0.5 A	83%	HCP650PS05
600 W	12.0 VDC	0.0 A	50.0 A	5 V/0.5 A	88%	HCP650PS12
600 W	15.0 VDC	0.0 A	40.0 A	5 V/0.5 A	88%	HCP650PS15
650 W	24.0 VDC	0.0 A	27.0 A	5 V/0.5 A	90%	HCP650PS24
650 W	27.0 VDC	0.0 A	24.0 A	5 V/0.5 A	90%	HCP650PS27
650 W	48.0 VDC	0.0 A	13.6 A	5 V/0.5 A	91%	HCP650PS48

Notes

1. Ripple & noise is measured with 20 MHz bandwidth and using 12" twisted pair-wire terminated with 0.1 μ F & 47 μ F capacitors in parallel.
2. Measured with 230 VAC input and full load.
3. Present whenever AC is applied.

Mechanical Details



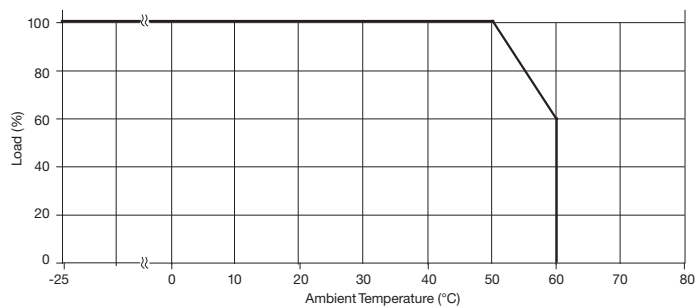
Notes

1. All dimensions are in inches (mm).
2. Weight 3.85 lb (1.75 kg)
3. Signals mating connector: PHDR-16VS housing, SPHD-002T-P05 contacts

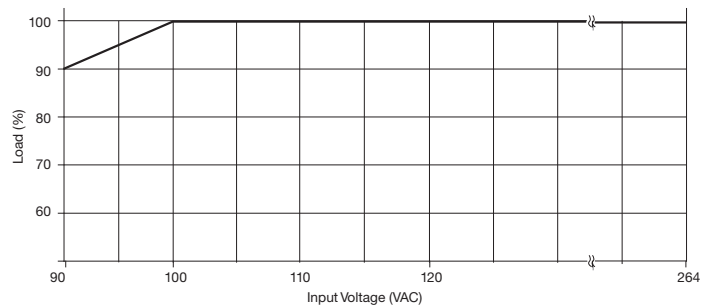
Control Pin Connections					
Pin	Function	Description	Pin	Function	Description
1	VS+	Remote Sense (+)	9	EN-	Enable ON/OFF (-)
2	VO+	Local Sense (+)	10	GND	Signal Ground
3	VS-	Remote Sense (-)	11	PWM	PWM is Switching
4	VO-	Local Sense (-)	12	GND	Signal Ground
5	5 V SB	5 V Standby Output (+)	13	VCI	V Program
6	5 V SB	5 V Standby Output (+)	14	GND	Signal Ground
7	EN+	Enable ON/OFF (+)	15	CS	Current Share
8	GND	Signal Ground	16	ACI	I Program

Derating Curve

Thermal Derating Curve



Input Derating Curve



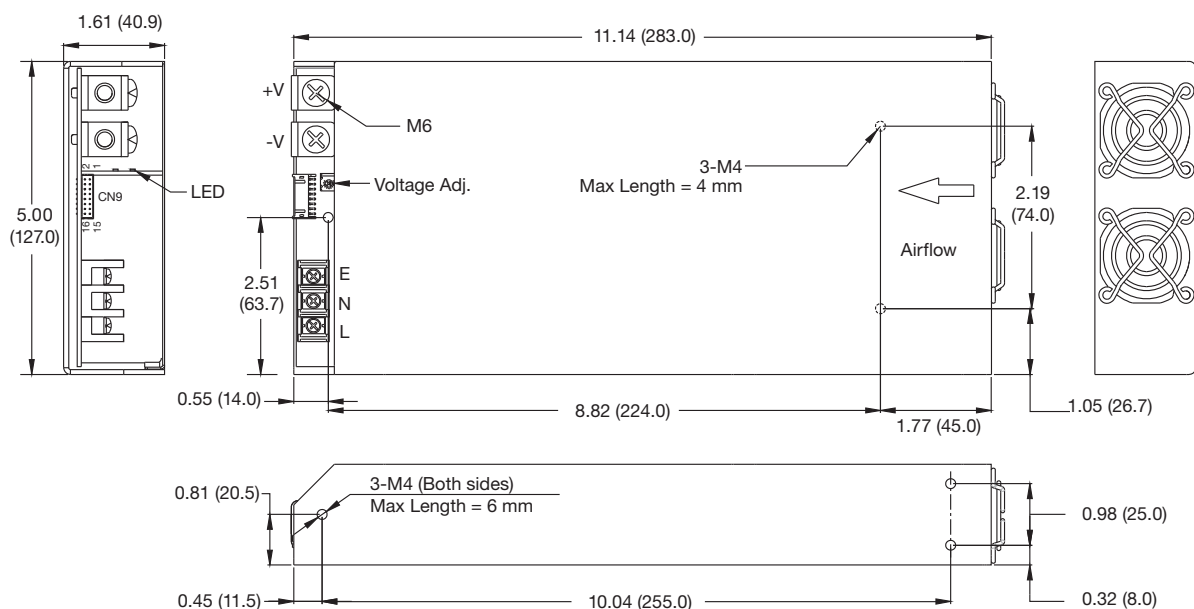
Models and Ratings

Output Power	Output Voltage V1	Output Current		Standby Output ⁽³⁾	Efficiency ⁽²⁾	Model Number
		Min	Max			
750 W	12.0 VDC	0.0 A	62.0 A	5 V/0.5 A	87%	HCP1000PS12
750 W	15.0 VDC	0.0 A	50.0 A	5 V/0.5 A	88%	HCP1000PS15
960 W	24.0 VDC	0.0 A	40.0 A	5 V/0.5 A	89%	HCP1000PS24
1000 W	27.0 VDC	0.0 A	37.0 A	5 V/0.5 A	89%	HCP1000PS27
1000 W	48.0 VDC	0.0 A	21.0 A	5 V/0.5 A	90%	HCP1000PS48

Notes

1. Ripple & noise are measured with 20 MHz bandwidth and using 12" twisted pair-wire terminated with 0.1 μ F & 47 μ F capacitors in parallel.
2. Measured with 230 VAC input and full load.
3. Present whenever AC is applied.

Mechanical Details



Notes

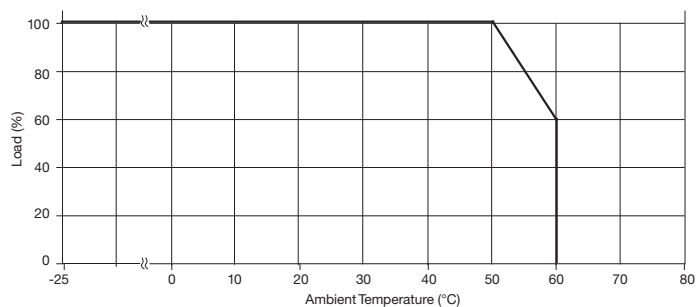
1. All dimensions are in inches (mm).
2. Weight 4.1 lb (1.9 kg)
3. Signals mating connector: PHDR-16VS housing, SPHD-002T-P05 contacts

Control Pin Connections

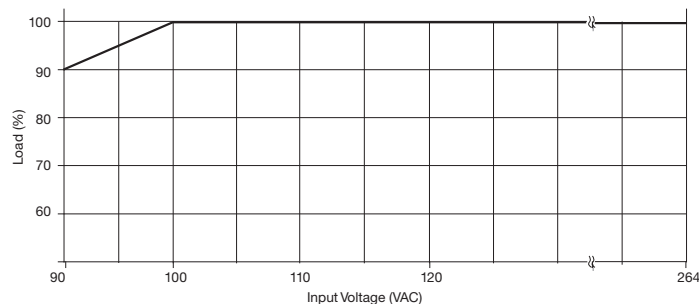
Pin	Function	Description	Pin	Function	Description
1	VS+	Remote Sense (+)	9	EN-	Enable ON/OFF (-)
2	VO+	Local Sense (+)	10	GND	Signal Ground
3	VS-	Remote Sense (-)	11	PWM	PWM is Switching
4	VO-	Local Sense (-)	12	GND	Signal Ground
5	5 V SB	5 V Standby Output (+)	13	VCI	V Program
6	5 V SB	5 V Standby Output (+)	14	GND	Signal Ground
7	EN+	Enable ON/OFF (+)	15	CS	Current Share
8	GND	Signal Ground	16	ACI	I Program

Derating Curve

Thermal Derating Curve



Input Derating Curve



Models and Ratings

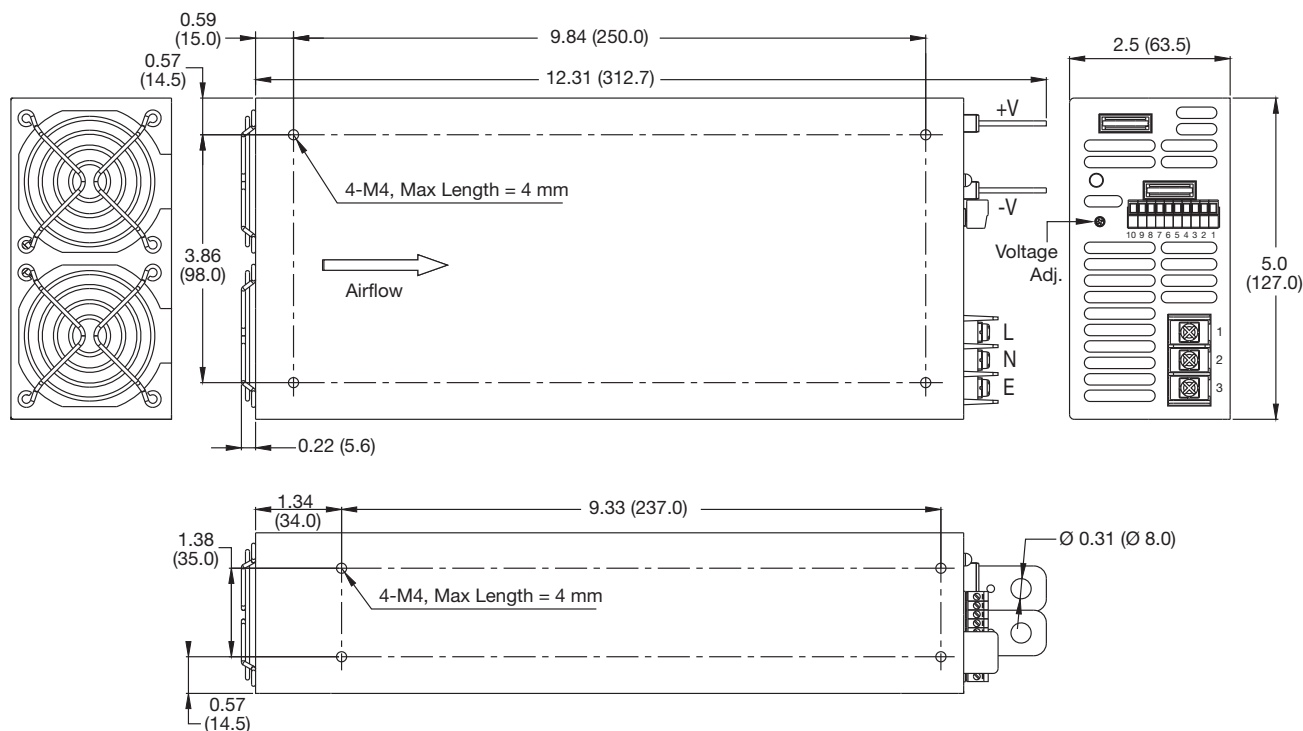
HCP1500 **XP**

Output Power	Output Voltage V1	Output Current		Standby Output ⁽³⁾	Efficiency ⁽²⁾	Model Number
		Min	Max			
1500 W	12.0 VDC	0.0 A	125.0 A	5 V/0.5 A	87%	HCP1500PS12
1500 W	15.0 VDC	0.0 A	100.0 A	5 V/0.5 A	88%	HCP1500PS15
1500 W	24.0 VDC	0.0 A	62.5 A	5 V/0.5 A	89%	HCP1500PS24
1500 W	27.0 VDC	0.0 A	55.5 A	5 V/0.5 A	89%	HCP1500PS27
1500 W	48.0 VDC	0.0 A	31.3 A	5 V/0.5 A	90%	HCP1500PS48

Notes

1. Ripple & noise are measured with 20 MHz bandwidth and using 12" twisted pair-wire terminated with 0.1 μ F & 47 μ F capacitors in parallel.
2. Measured with 230 VAC input and full load.
3. Present whenever AC is applied.

Mechanical Details



Notes

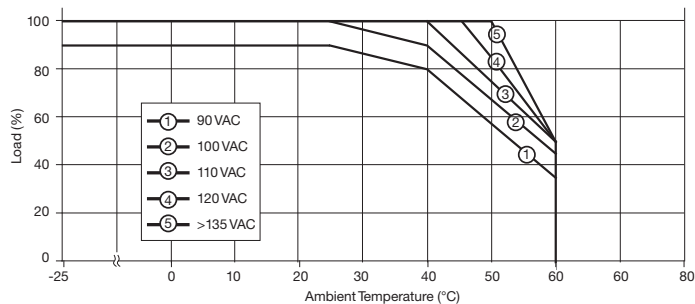
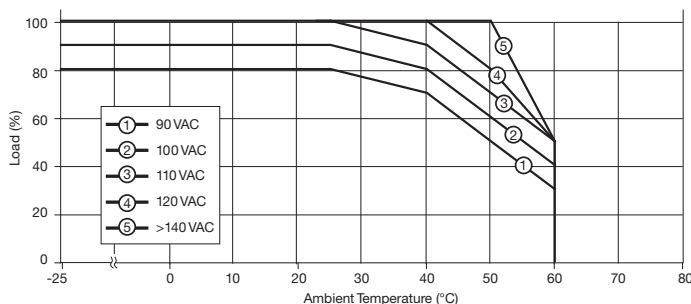
1. All dimensions are in inches (mm).
2. Weight 4.1 lb (1.9 kg)
3. Signals mating connector is Dinkle EC350V-10P or equivalent.
Wire gauge 28-14 AWG.

Control Pin Connections					
Pin	Function	Description	Pin	Function	Description
1	VS+	Remote Sense (+)	6	GND	Signal Ground
2	VS-	Remote Sense (-)	7	PWM	PWM is Switching
3	5 V SB	5 V Standby Output (+)	8	VCI	V Program
4	EN+	Enable (+)	9	ACI	I Program
5	EN-	Enable (-)	10	CS	Current Share

Thermal Derating Curve

For HCP1500PS12/15

For HCP1500PS24/27/48



Models and Ratings

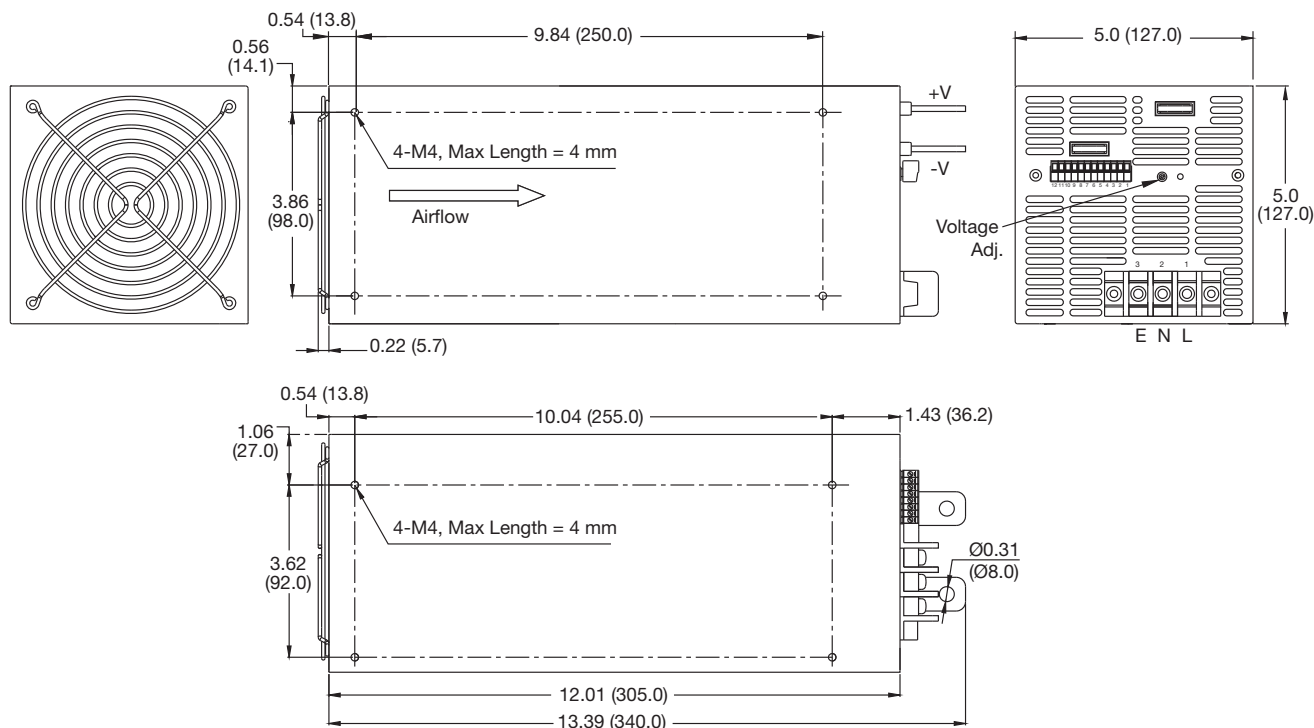
HCP3000 **XP**

Output Power	Output Voltage V1	Output Current		Standby Output ⁽³⁾	Efficiency ⁽²⁾	Model Number
		Min	Max			
3000 W	12.0 VDC	0.0 A	250.0 A	5 V/0.5 A	87%	HCP3000PS12
3000 W	15.0 VDC	0.0 A	200.0 A	5 V/0.5 A	88%	HCP3000PS15
3000 W	24.0 VDC	0.0 A	125.0 A	5 V/0.5 A	89%	HCP3000PS24
3000 W	27.0 VDC	0.0 A	111.1 A	5 V/0.5 A	89%	HCP3000PS27
3000 W	48.0 VDC	0.0 A	62.5 A	5 V/0.5 A	90%	HCP3000PS48

Notes

1. Ripple & noise are measured with 20 MHz bandwidth and using 12" twisted pair-wire terminated with 0.1 μ F & 47 μ F capacitors in parallel.
2. Measured with 230 VAC input and full load.
3. Present whenever AC is applied.

Mechanical Details



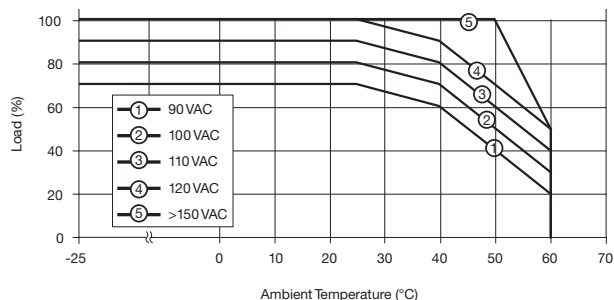
Notes

1. All dimensions are in inches (mm).
2. Weight 4.1 lb (1.9 kg)
3. Signals connector is Dinkle EC350V-12P or equivalent. Wire gauge 28-14 AWG.

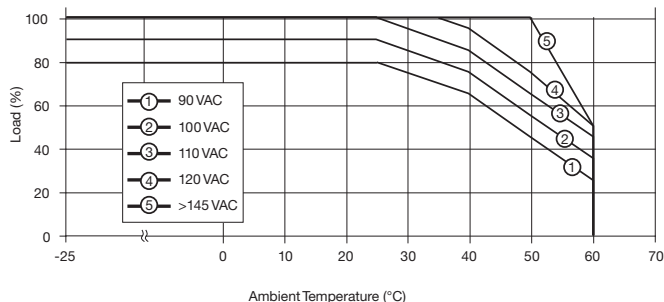
Control Pin Connections					
Pin	Function	Description	Pin	Function	Description
1	VO+	Local Sense (+)	7	EN-	Enable (-)
2	VS+	Remote Sense (+)	8	GND	Signal Ground
3	VS-	Remote Sense (-)	9	PWM	PWM is Switching
4	VO-	Local Sense (-)	10	VCI	V Program
5	5 V SB	5 V Standby Output(+)	11	ACI	I Program
6	EN+	Enable (+)	12	CS	Current Share

Derating Curve

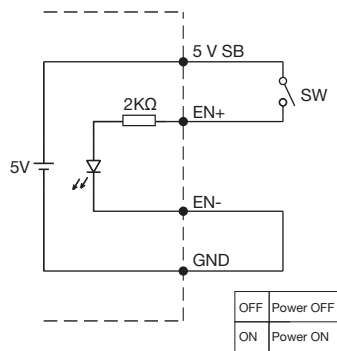
For HCP3000PS12/15



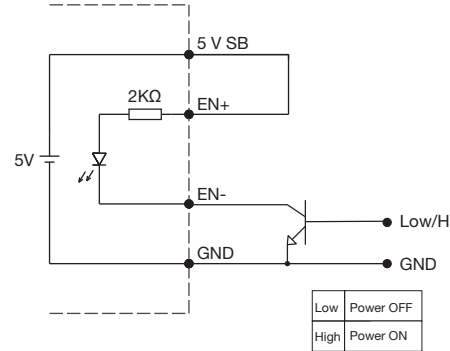
For HCP3000PS24/27/48



Remote Enable (unit supplied enabled)

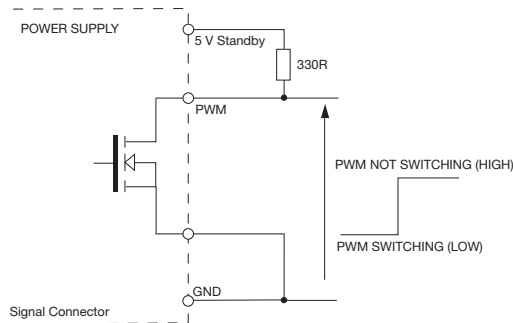


(A) Using internal 5 V standby

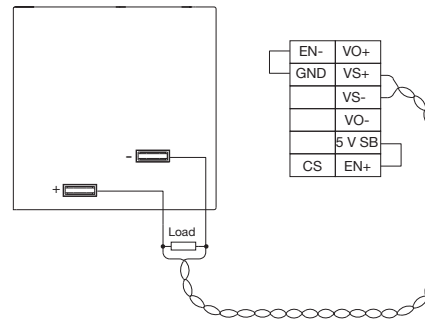


(B) Using external by transistor

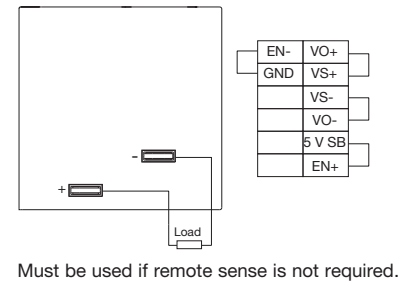
PWM Signal



Remote Sense



Local Sense

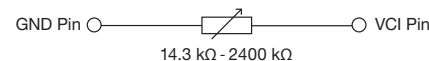
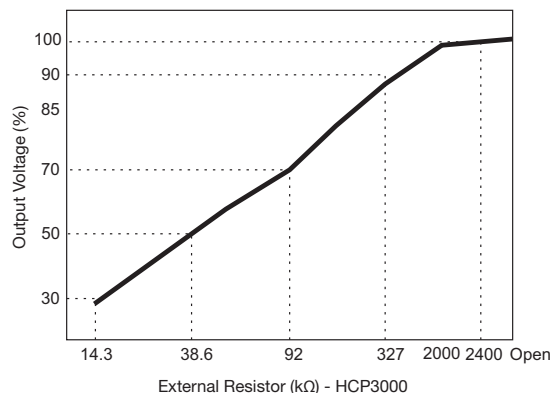
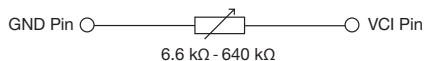
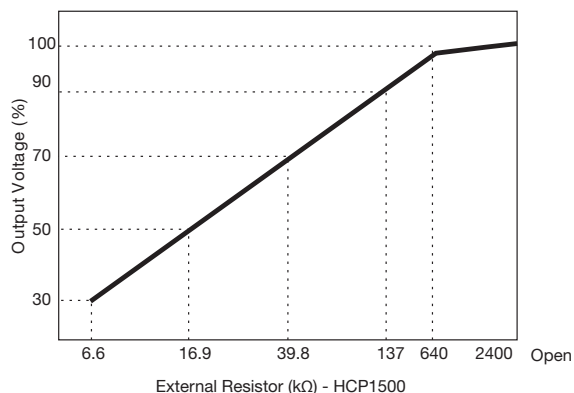
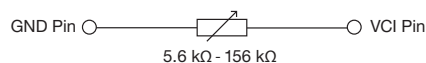
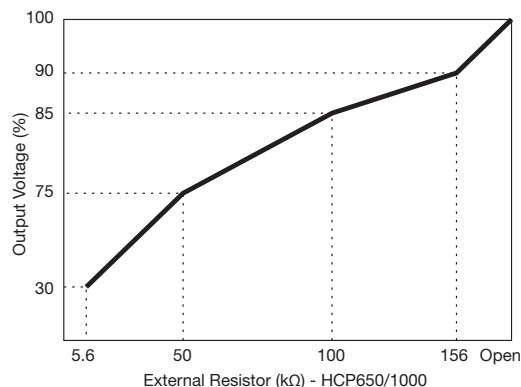
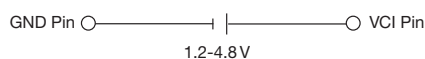
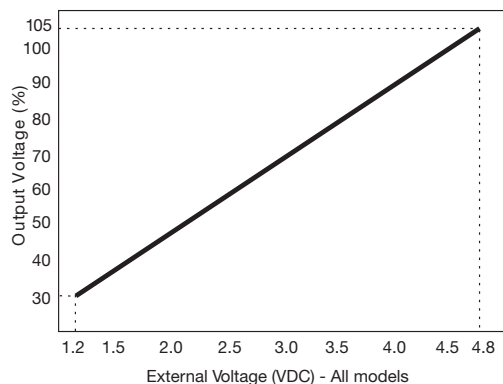


LED Status

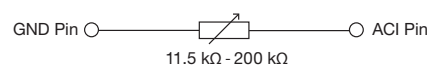
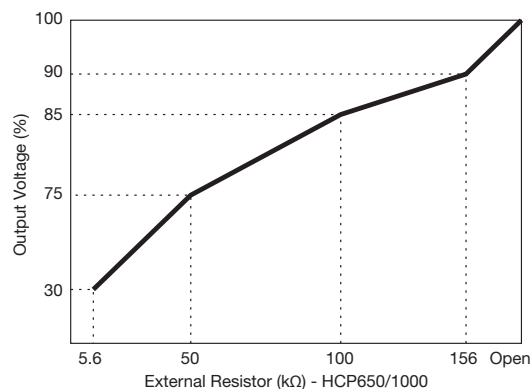
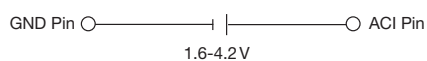
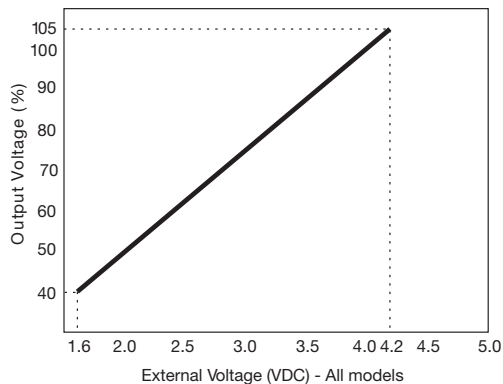
LED Status	Output Status
Solid (Green)	DC Output OK
Slow Blink (Green)	Output Not Enabled
Fast Blink (Red)	Over Voltage
Solid (Red)	Over Loaded
	Short Circuited
	Under Voltage (<70% of output voltage)
Slow Blink (Red)	Over Temperature
Intermittent Blink (Red)	Fan Fail
Short & Long Blink (Red)	5 V Standby Failure

Application Notes

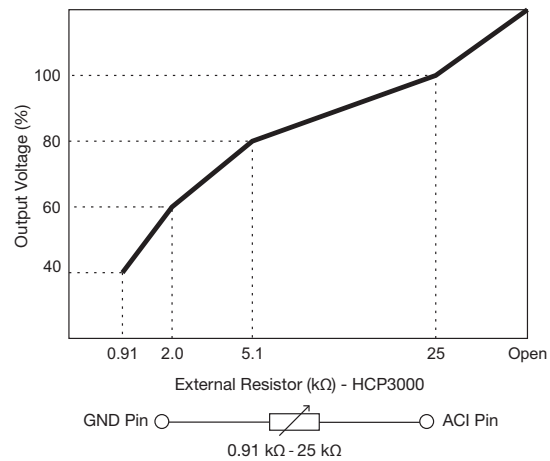
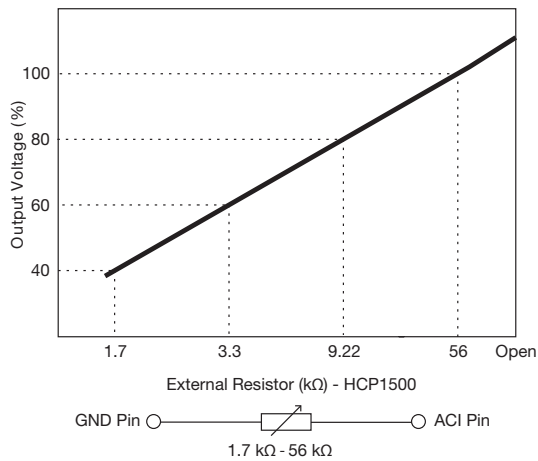
Output Voltage Program



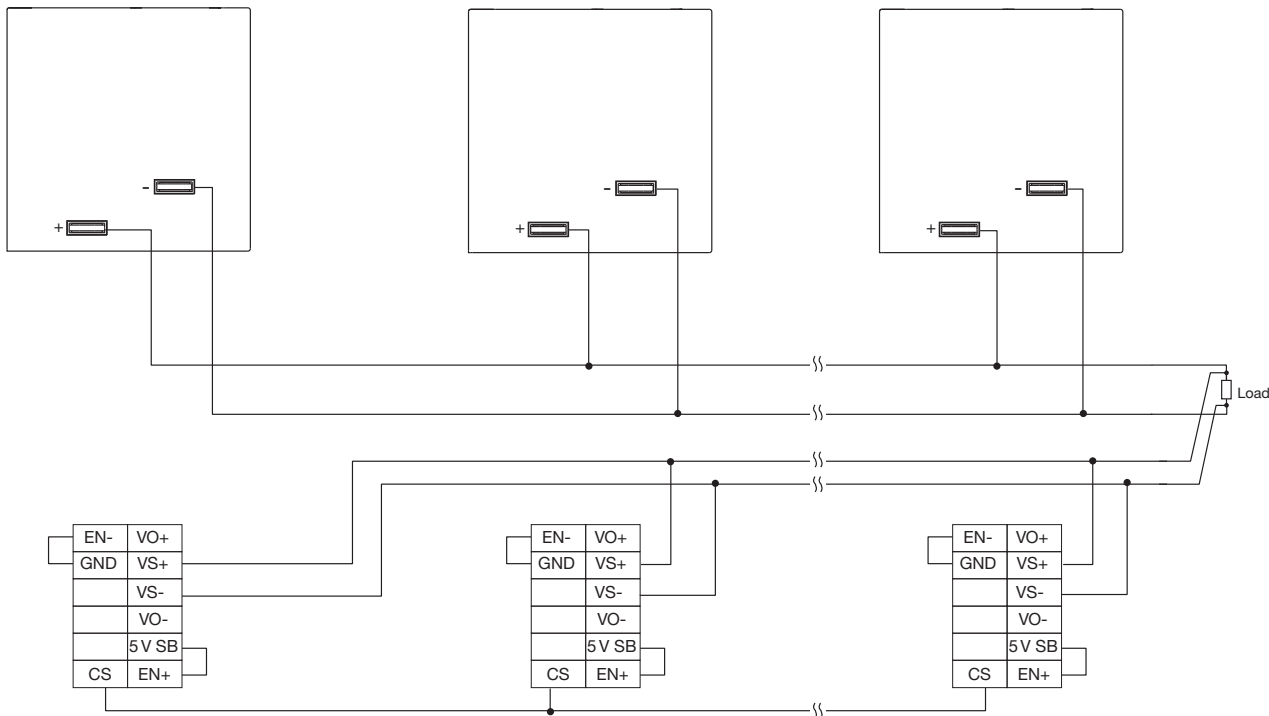
Output Current Program



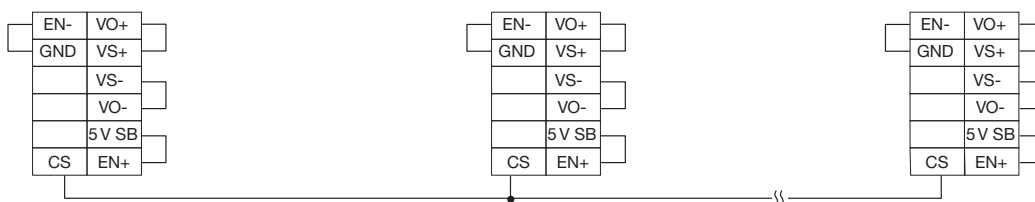
Output Current Program



Current Sharing with Remote Sensing



Current Sharing with Local Sensing



Notes

In parallel operation, it is possible that only one unit will operate if the load is less than 5% of the combined rated output load. It is possible to have more than five units in parallel, contact sales for details.

5-60 Watts

DNR Series



- Rugged Design for Industrial Applications
- Up to 89% Efficiency
- Full Power to +60 °C
- Wide Adjustment Range
- DC OK 24 V Models
- DC Standby Versions
- 3 Year Warranty

Specification

Input

Input Voltage	• 90-264 VAC, 120-375 VDC (DNR05/10/18) 85-264 VAC, 90-375 VDC (DNR30/60)
Input Frequency	• 47-63 Hz
Input Current	• See tables
Inrush Current	• 5-18 W: 10/18 A at 115/230 VAC 30 W: 20/40 A at 115/230 VAC 60 W: 30/60 A at 115/230 VAC
Power Factor	• EN61000-3-2, class A
Earth Leakage Current	• 0.8 mA max
Input Protection	• Internal fuse T2A, 250 VAC fitted in line

Output

Output Voltage	• See tables
Output Voltage Trim	• See tables
Initial Set Accuracy	• $\pm 1\%$
Minimum Load	• No minimum load required
Start Up Delay	• <1 s (may increase at low temperature extremes)
Start Up Rise Time	• <150 ms
Hold Up Time	• 30/130 ms at 115/230 VAC (DNR05) 25/100 ms at 115/230 VAC (DNR10) 20/75 ms at 115/230 VAC (DNR18) 20/30 ms at 115/230 VAC (DNR30) 20/30 ms at 115/230 VAC (DNR60)
Line Regulation	• 5-18 W: $\pm 1.0\%$ max 30-60 W: $\pm 0.5\%$ max
Load Regulation	• 5-18 W: $\pm 2.0\%$ max 30-60 W: $\pm 0.5\%$ max
Parallel Operation	• Redundancy module DPM10 available for load currents up to 10 A (not with standby system), contact sales
Transient Response	• 4% max deviation recovery to within 1% in 2 ms for a 50% load change
Ripple & Noise	• 50 mV pk-pk, 20 MHz bandwidth (may increase at low temperature extremes)
Overvoltage Protection	• Output clamps at 120-145% Vnom, auto recovery
Overload Protection	• 110-145% constant current (DNR05-18) 105-150% power limited (DNR30/60)
Short Circuit Protection	• Power limited, auto recovery
Temperature Coefficient	• $\pm 0.03\%/^{\circ}\text{C}$

General

Efficiency	• See tables
Isolation	• 3000 VAC Input to Output, 1500 VAC Input to Ground, 500 VAC Output to Ground
Switching Frequency	• 132 KHz typical, 55-90 kHz (DNR60)
Signals	• DC ON indicator LED Green: All models DC LOW indicator LED Red: 5-18 W models DC OK: 24 V 30-60 W models DC OK: All standby models
MTBF	• 800 kHrs typical Bellcore, Issue 6 at +40 °C, GB (DNR05/10/18), 530 kHrs typical Bellcore, Issue 6 at +40 °C, GB (DNR30/60)
DIN Rail	• Compatible with TS35/7.5 or TS35/15

Environmental

Operating Temperature	• -20 °C to +70 °C (DNR05/10/18) -40 °C to +70 °C, start up at -35 °C (DNR30/60), all units derate linearly from 60 °C (see derating curves)
Cooling	• Convection-cooled with 25mm free space all sides
Operating Humidity	• 20-95% RH, non-condensing
Storage Temperature	• -25 °C to +85 °C (DNR05/10/18) -40 °C to +85 °C (DNR30/60)
Shock	• 15 g, 11 ms, X, Y & Z axis, 3 shocks/axis in both directions
Vibration	• 2 g, 10 Hz to 500 Hz, along X, Y & Z axis, 60 mins/axis, mounted on rail

EMC & Safety

Emissions	• EN55022, level B conducted & radiated
Harmonic Currents	• EN61000-3-2, class A
Voltage Flicker	• EN61000-3-3
ESD Immunity	• EN61000-4-2, level 4, Perf Criteria A
Radiated Immunity	• EN61000-4-3, level 3, Perf Criteria A
EFT/Burst	• EN61000-4-4, level 4, Perf Criteria A
Surge	• EN61000-4-5, installation class 3, Perf Criteria A
Conducted Immunity	• EN61000-4-6, level 3, Perf Criteria A
Magnetic Field	• EN61000-4-8, level 4 Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms Perf Criteria A, B, B
Safety Approvals	• EN60950-1, UL508 Pollution Degree 2, UL1310 class 2 power recognised, See note 3 & ratings table, UL60950-1 Overvoltage Category II, UL508 Overvoltage Category III, DNR30 & DNR60: SEMI F47 ANSI/ISA 12.12.01. Class 1, Division 2 Groups A,B,C and D

Models and Ratings

DNR05-60 **XP**

Output Voltage	Input Current (typ.)		Output Voltage Trim	Output Current	Efficiency (typ.)	Model Number
	115 VAC	230 VAC				
5 V	0.12 A	0.08 A	4.50-5.75 V	1.000 A	69%	DNR05US05†
12 V	0.12 A	0.08 A	10.80-13.80 V	0.420 A	72%	DNR05US12†
15 V	0.12 A	0.08 A	13.50-17.25 V	0.340 A	72%	DNR05US15 ⁽¹⁾
24 V	0.12 A	0.08 A	21.60-28.80 V	0.210 A	72%	DNR05US24†
5 V	0.20 A	0.13 A	4.50-5.75 V	2.000 A	73%	DNR10US05† [^]
12 V	0.20 A	0.13 A	10.80-13.80 V	0.840 A	75%	DNR10US12† [^]
15 V	0.20 A	0.13 A	13.50-17.25 V	0.670 A	76%	DNR10US15 ⁽¹⁾
24 V	0.20 A	0.13 A	21.60-28.80 V	0.420 A	76%	DNR10US24† [^]
5 V	0.36 A	0.21 A	4.50-5.75 V	3.000 A	75%	DNR18US05† [^]
12 V	0.36 A	0.21 A	10.80-13.80 V	1.500 A	77%	DNR18US12† [^]
15 V	0.36 A	0.21 A	13.50-17.25 V	1.200 A	77%	DNR18US15† [^]
24 V	0.36 A	0.21 A	21.60-28.80 V	0.750 A	77%	DNR18US24† [^]
5 V	0.56 A	0.33 A	5.00-5.50 V	6.000 A	79%	DNR30US05† [^] (1,3,4)
12 V	0.56 A	0.33 A	12.00-14.00 V	2.500 A	84%	DNR30US12† [^] (1,3,4)
24 V	0.56 A	0.33 A	24.00-28.00 V	1.250 A	86%	DNR30US24† [^] (1,3,4)
48 V	0.56 A	0.33 A	48.00-55.00 V	0.625 A	86%	DNR30US48† [^] (1,3,4)
5 V	1.10 A	0.59 A	5.00-5.50 V	10.000 A	79%	DNR60US05† [^] (1,3,4)
12 V	1.10 A	0.59 A	12.00-14.00 V	5.000 A	86%	DNR60US12† [^] (1,3,4)
24 V	1.10 A	0.59 A	24.00-28.00 V	2.500 A	89%	DNR60US24† [^] (1,3,4)
48 V	1.10 A	0.59 A	48.00-55.00 V	1.250 A	89%	DNR60US48† [^] (1,3,4)

Notes

1. Add suffix '-S' for spring clamp connection option.
2. 30-60 W models are suitable for battery-charging applications.

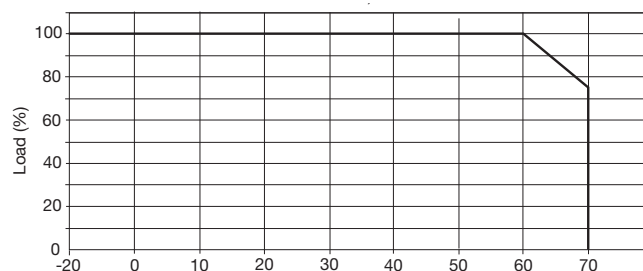
3. Approved to UL1310, but 5 & 12 V not Class 2 Power recognised.
4. SEMI F47 compliant.

† Available from Farnell & element14. See pages 284-290.

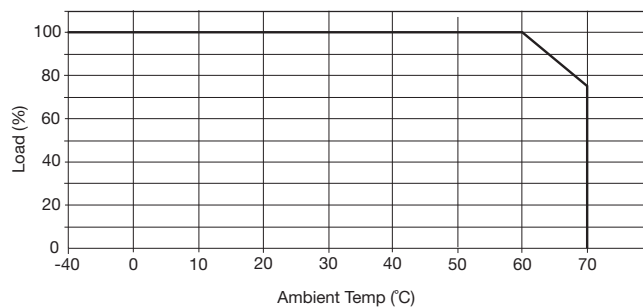
[^] Available from Newark. See pages 291-296.

Derating Curves

DNR05-18 W Models

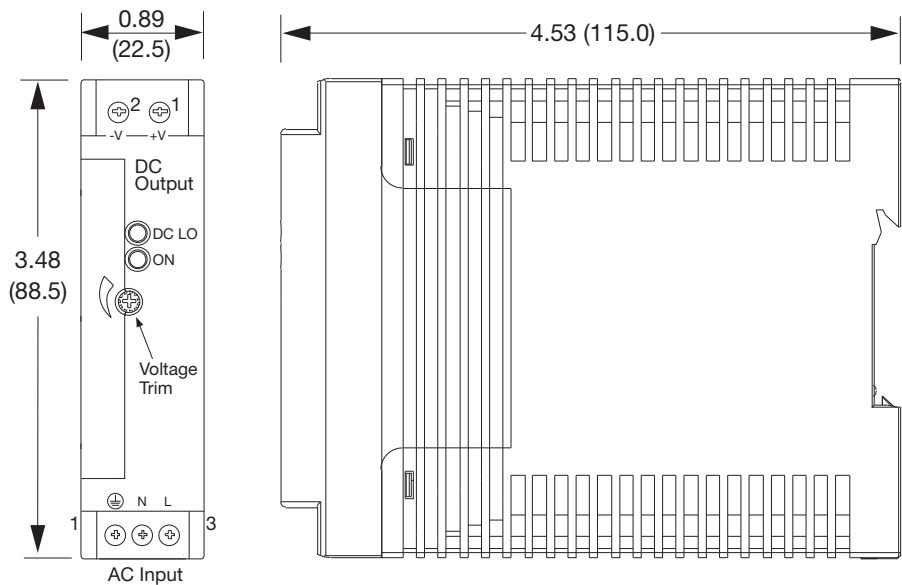


DNR30-60 W Models



Mechanical Details

DNR05/10/18 W Models

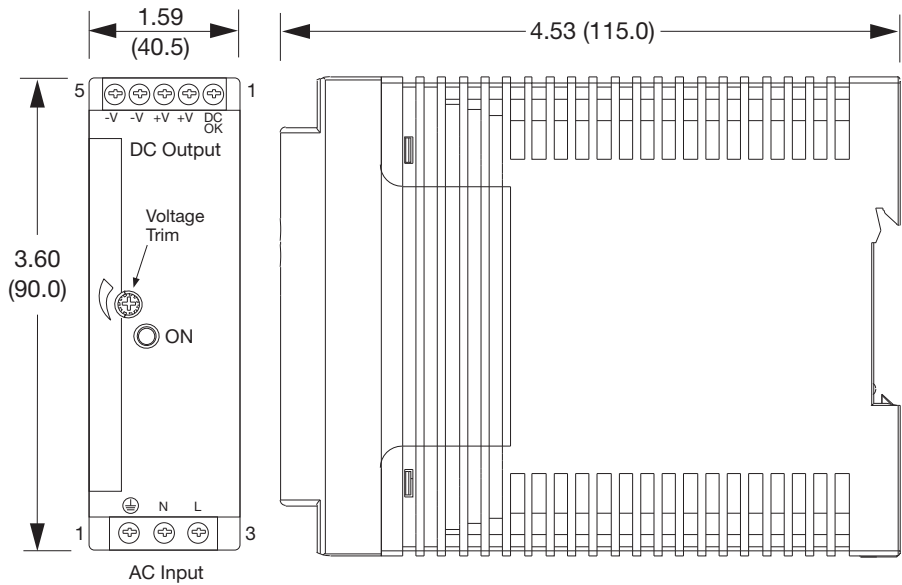


Notes

1. All dimensions in inches (mm).
2. Weight 0.33 lb (150 g) approx.
3. Tolerance: ± 0.02 (0.5) maximum.
4. Connection screw maximum torque: Input: 9 lbs-in (1.0 Nm), Output: 5.5 lbs-in (0.6 Nm)

DNR05, 10, 18 Connections		
Conn	Pin	Designation
AC Input	1	Ground
	2	Neutral
	3	Line
DC Output	1	Positive
	2	Negative

30/60 W Models

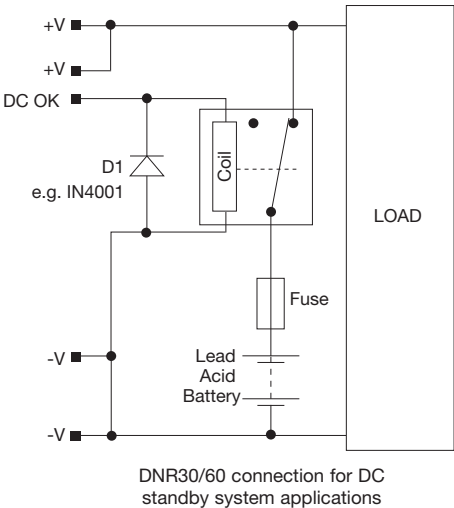
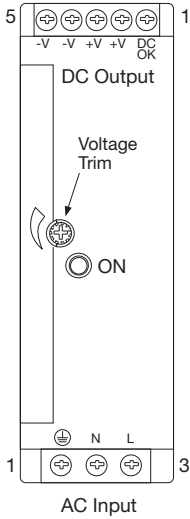


Notes

1. All dimensions in inches (mm).
2. Weight 0.8 lb (350 g) approx.
3. Tolerance: ± 0.02 (0.5) maximum.
4. Connection screw maximum torque: Input: 9 lbs-in (1.0 Nm), Output: 5.5 lbs-in (0.6 Nm)

DNR30/60 Connections		
Conn	Pin	Designation
AC Input	1	Ground
	2	Neutral
	3	Line
DC Output	1	DC OK*
	2	Positive
	3	Positive
	4	Negative
	5	Negative

* 24 V and standby models only.



Maximum current drain from battery by PSU when inactive 22 mA

DNR30/60 Connections		
Conn	Pin	Designation
AC Input	1	Ground
	2	Neutral
	3	Line
DC Output	1	DC OK
	2	Positive
	3	Positive
	4	Negative
	5	Negative

Notes

1. With AC in, unit provides power to the load and to charge the battery. The DC OK signal acts by sensing a voltage on +V and holds the relay closed.
2. With loss of AC in, battery voltage is present on +V. DC OK signal holds the relay closed. Battery supplies power to the load.
3. As the battery discharges, its voltage falls. When this falls below the level shown in the table below the DC OK signal switches off to allow the relay to open to disconnect and protect the battery.

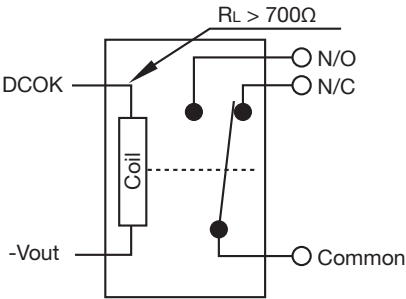
Output Set Voltages For Standby Versions				
Model ⁽¹⁾	Voltage	Current	DC OK Signal Off	Efficiency
DNR30US12#	13.6 V	2.20 A	10.30-11.30 V	84%
DNR30US24#	27.2 V	1.10 A	21.10-22.10 V	86%
DNR30US48#	54.5 V	0.55 A	42.70-43.70 V	86%
DNR60US12# ⁽²⁾	13.6 V	4.40 A	10.30-11.30 V	86%
DNR60US24#	27.2 V	2.20 A	21.10-22.10 V	89%
DNR60US48#	54.5 V	1.10 A	42.70-43.70 V	89%

- Notes**
1. Suffix # indicates standby version.
 2. Not UL1310 approved.

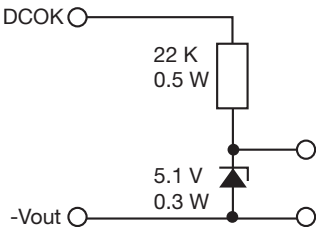
DC OK

30/60 W Models

Output good = 24 V Output not good = 0 V



Example using external relay to create volt-free contact



Example using external components to create TTL signal

Standard on 24 V models, 30-60 W only.

DNR Series



- Up to 90% Efficiency
- Wide Adjustment Range
- Parallel Function
- DC Standby Versions
- Full Power from -40°C to $+60^{\circ}\text{C}$
- Connector Options
- 3 Year Warranty

Specification

Input

Input Voltage	• 90-132/180-264 VAC, auto select, 210-375 VDC (DNR120AS, DNR240PS) • 90-264 VAC, 120-375 VDC (DNR480PS)
Input Frequency	• 47-63 Hz
Input Current	• See tables
Inrush Current	• 24/48 A at 115/230 VAC (DNR120) • 30/60 A at 115/230 VAC (DNR240) • 25/50 A at 115/230 VAC (DNR480)
Power Factor	• 0.7 typical (DNR120, DNR240) • 0.9 typical (DNR480)
Earth Leakage Current	• 0.8 mA max
Input Protection	• T3.15A, 250 VAC (DNR120) • T6.3A, 250 VAC (DNR240) • T10A, 250 VAC (DNR480)

Output

Output Voltage	• See tables
Output Voltage Trim	• See tables
Initial Set Accuracy	• $\pm 1\%$
Minimum Load	• No minimum load required
Start Up Delay	• < 1 s (may increase at low temperature extremes)
Start Up Rise Time	• < 150 ms
Hold Up Time	• 25/30 ms at 115/230 VAC
Line Regulation	• $\pm 0.5\%$ max
Load Regulation	• $\pm 1\%$ ($\pm 5\%$ for units in parallel)
Parallel Operation	• A maximum of 3 units can be paralleled (not with standby system). Total power available is 90% of the rated current of each unit. Minimum load per unit 10%. Redundancy module DPM10 available for load currents up to 10 A, contact sales.
Transient Response	• 4% max deviation recovering to within 1% in 2 ms for a 50% load change
Ripple & Noise	• 50 mV pk-pk (DNR120) • 100 mV pk-pk (DNR240, DNR480) • 20 MHz bandwidth (may increase at low temperature extremes)
Overvoltage Protection	• Output clamps at 125-140% V_{nom}, auto recovery
Overload Protection	• 105-145% constant current, auto recovery
Temp. Coefficient	• $\pm 0.03\%/^{\circ}\text{C}$

General

Efficiency	• See table
Isolation	• 3000 VAC Input to Output • 1500 VAC Input to Ground • 500 VAC Output to Ground
Switching Frequency	• See table
Signals	• DC ON indicator Green LED, • DC LOW indicator Red LED • DC OK: 24 V and standby models
MTBF	• 430 kHrs typical Bellcore, Issue 6 at $+40^{\circ}\text{C}$, GB
DIN Rail	• Compatible with TS35/7.5 or TS35/15

Environmental

Operating Temperature	• -35°C to $+70^{\circ}\text{C}$, derate linearly from $+60^{\circ}\text{C}$ at $2.5\%/^{\circ}\text{C}$, start up at -30°C (DNR120). • -40°C to $+70^{\circ}\text{C}$, derate linearly from $+60^{\circ}\text{C}$ at $2.5\%/^{\circ}\text{C}$, start up at -35°C (DNR240). • -40°C to $+70^{\circ}\text{C}$, derate linearly from $+55^{\circ}\text{C}$ at $2.5\%/^{\circ}\text{C}$, start up at -35°C (DNR480) (see derating curves)
Cooling	• Convection-cooled with 25mm free space all sides
Operating Humidity	• 20-95% RH, non-condensing
Storage Temperature	• -40°C to $+85^{\circ}\text{C}$
Shock	• 15 g, 11 ms, 3 axes, 6 faces, 3 shocks per face
Vibration	• 2 g, 10 Hz to 500 Hz, along X, Y & Z axis, 60 min/axis, mounted on rail

EMC & Safety

Emissions	• EN55022, class B conducted & radiated
Harmonic Currents	• EN61000-3-2, class A
Voltage Flicker	• EN61000-3-3
ESD Immunity	• EN61000-4-2, level 4 Perf Criteria A
Radiated Immunity	• EN61000-4-3, level 3 Perf Criteria A
EFT/Burst	• EN61000-4-4, level 4 Perf Criteria A
Surge	• EN61000-4-5, installation class 3, Perf Criteria A
Conducted Immunity	• EN61000-4-6, level 3 Perf Criteria A
Magnetic Field	• EN61000-4-8, level 4 Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms Perf Criteria A, A, B
Safety Approvals	• EN60950-1 UL508 UL60950-1, cUL60950-1 Pollution Degree 2, CE Mark, UL60950-1 Overvoltage Category II, UL508 Overvoltage Category III, ANSI/ISA 12.12.01. (Class 1, Division 2, Groups A,B,C and D)

Models and Ratings

DNR120-480 **XP**

Output Voltage	Input Current (typ.)		Output Voltage Trim	Output Current	Efficiency (typ.)	Typical Switching Frequency	Model Number
	115 VAC	230 VAC					
12 V	2.20 A	0.83 A	11.4-14.5 V	10.0 A	84%	80 kHz	DNR120AS12-I†^((1,2))
24 V	2.20 A	0.83 A	22.5-28.5 V	5.0 A	86%	80 kHz	DNR120AS24-I†^((1,2))
48 V	2.20 A	0.83 A	45.0-55.0 V	2.5 A	87%	80 kHz	DNR120AS48-I†^((1,2))
24 V	4.00 A	1.55 A	22.5-28.5 V	10.0 A	89%	40 kHz	DNR240PS24-I†^((1,2))
48 V	4.00 A	1.55 A	47.0-56.0 V	5.0 A	90%	40 kHz	DNR240PS48-I†^((1,2))
24 V	4.90 A	2.50 A	22.5-28.5 V	20.0 A	89%	65 kHz	DNR480PS24-I†^((1,2))
48 V	4.90 A	2.50 A	47.0-56.0 V	10.0 A	90%	65 kHz	DNR480PS48-I†^((1,2))

Notes

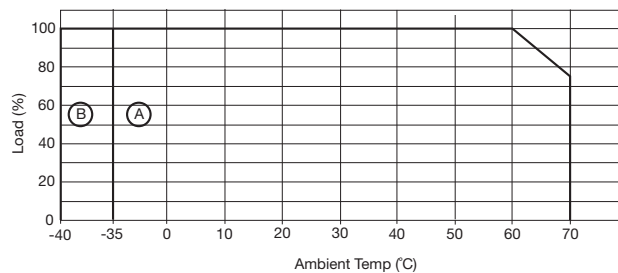
1. Add suffix 'D' for detachable connector option.
2. For DC standby, remove '-I' and add '#' to the end of the model number.

† Available from Farnell & element14. See pages 284-290.

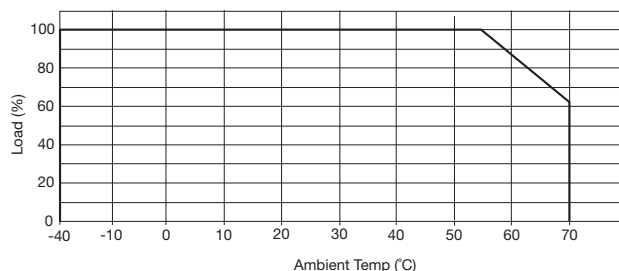
^ Available from Newark. See pages 291-296.

Derating Curves

DNR120 (A) - 240 (B)

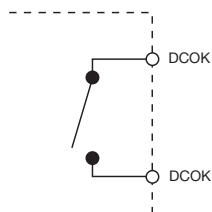


DNR480PS



DC OK

Volt free contact closed when voltage at unit output is within specification. In standby system configured as shown this voltage may be provided by the PSU or battery.

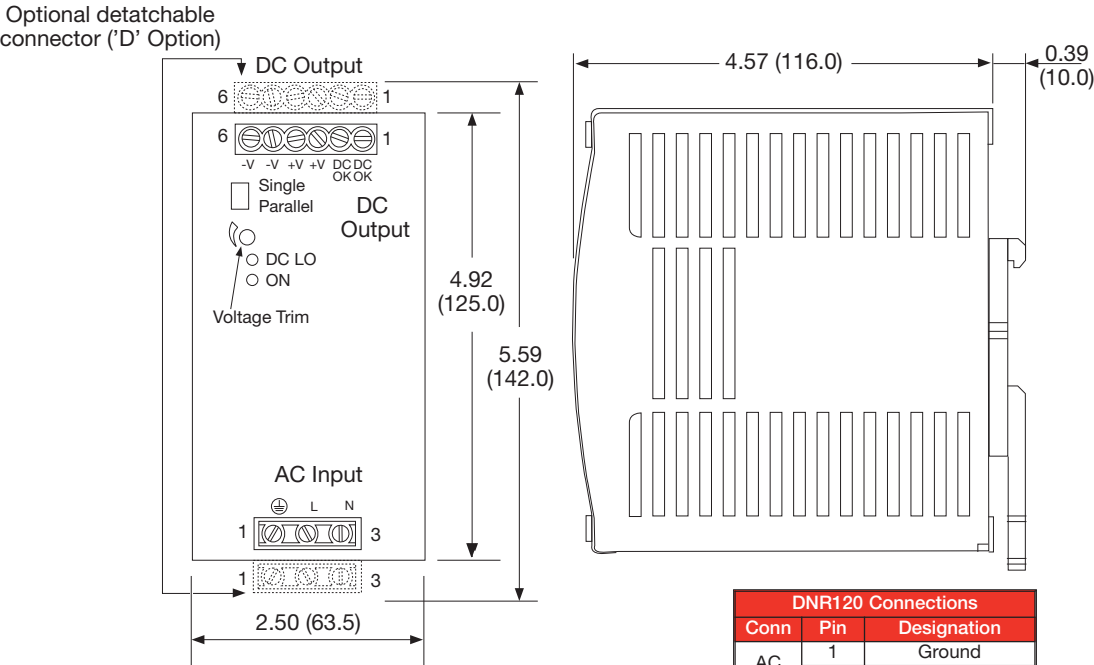


Open = Output fail
Closed = Output good

Contact Rating: 0.3 A at 60 VDC
500 VDC isolation

Mechanical Details

120 W Models



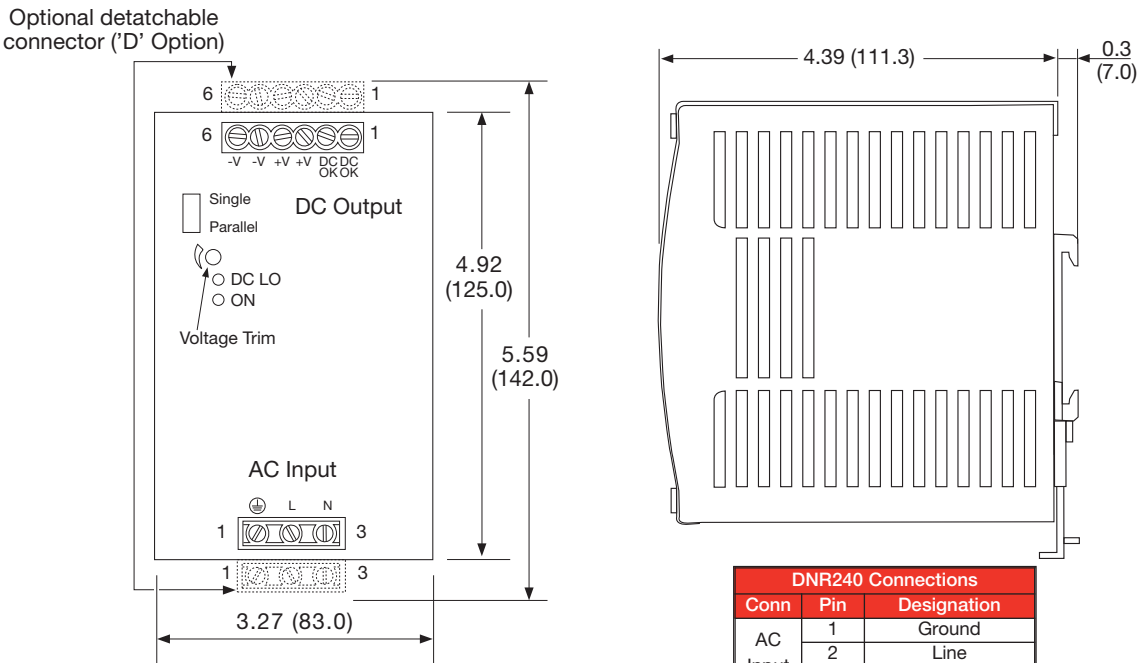
Notes

1. All dimensions in inches (mm).
2. Weight 2.0 lb (920 g) approx.
3. Tolerance: ± 0.02 (0.5) maximum.
4. Screw terminal: 10-24 AWG cable size. Detachable connector version: 14-24AWG cable size.
5. Connection screw maximum torque: Input: 9 lbs-in (1.0 Nm), Output: 5.5 lbs-in (0.6 Nm)

DNR120 Connections		
Conn	Pin	Designation
AC Input	1	Ground
	2	Line
	3	Neutral
DC Output	1	DC OK *
	2	DC OK *
	3	Positive
	4	Positive
	5	Negative
	6	Negative

* 24 V & standby models only.

240 W Models



Notes

1. All dimensions in inches (mm).
2. Weight 3.0 lb (1360 g) approx.
3. Tolerance: ± 0.02 (0.5) maximum.
4. Screw terminal: 10-24 AWG cable size. Detachable connector version: 14-24AWG cable size.
5. Connection screw maximum torque: Input: 9 lbs-in (1.0 Nm), Output: 5.5 lbs-in (0.6 Nm)

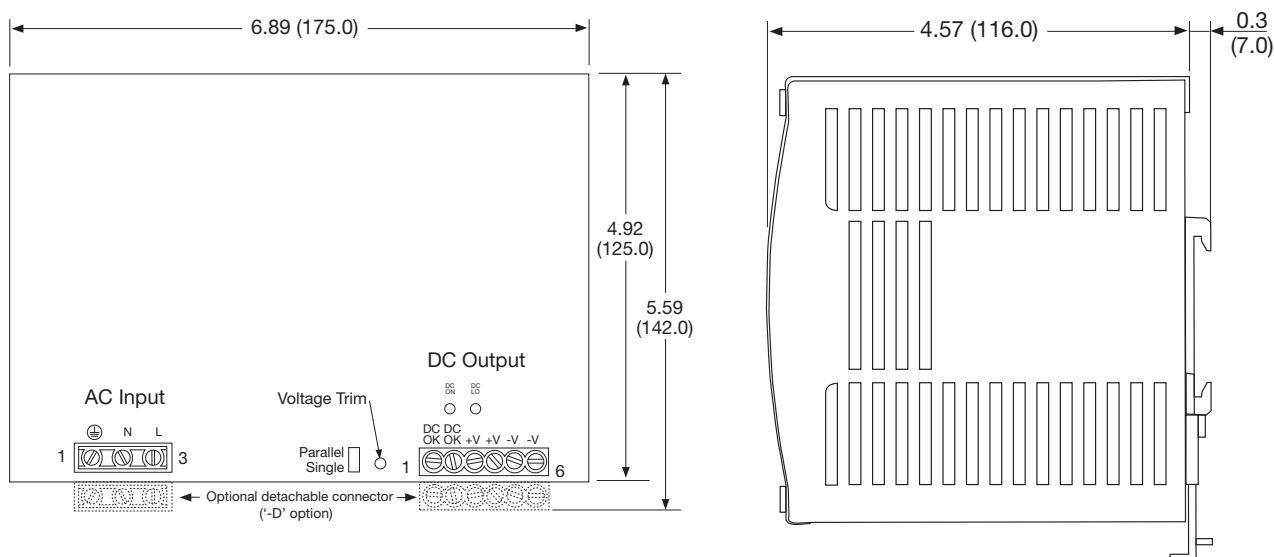
DNR240 Connections		
Conn	Pin	Designation
AC Input	1	Ground
	2	Line
	3	Neutral
DC Output	1	DC OK*
	2	DC OK*
	3	Positive
	4	Positive
	5	Negative
	6	Negative

* 24 V & standby models only.

Mechanical Details

DNR480 **XP**

480 W Models



Notes

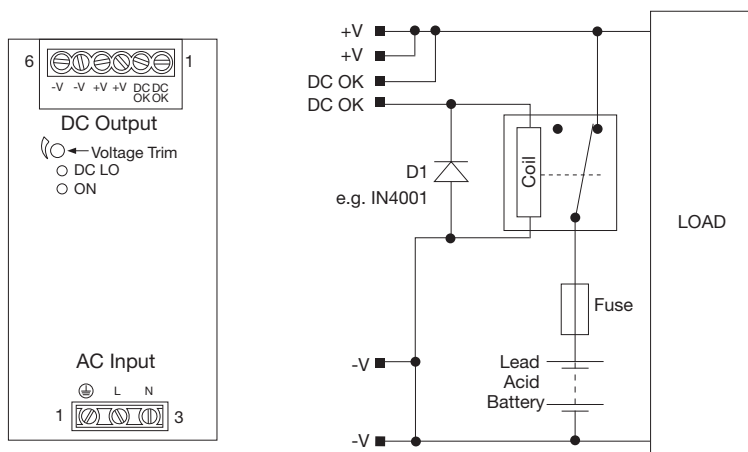
1. All dimensions in inches (mm).
2. Weight 4.2 lb (1920 g) approx.
3. Tolerance: ± 0.02 (0.5) maximum.
4. Screw terminal: 10-24 AWG cable size. Detachable connector version: 14-24 AWG cable size.
5. Connection screw maximum torque: Input: 9 lbs-in (1.0 Nm), Output: 5.5 lbs-in (0.6 Nm)

DNR480PS Connections		
Conn	Pin	Designation
AC Input	1	Ground
	2	Neutral
	3	Line
DC Output	1	DC OK*
	2	DC OK*
	3	Positive
	4	Positive
	5	Negative
	6	Negative

* 24 V and standby models only.

Standby Versions

Maximum current drain from battery by PSU when inactive 22 mA.



Notes

1. Suffix # indicates DC standby version.
2. With AC in, unit provides power to the load and to charge the battery. The DC OK signal acts by sensing a voltage on +V and holds the relay closed.
3. With loss of AC in, battery voltage is present on +V. DC OK signal holds the relay closed. Battery supplies power to the load.
4. As the battery discharges, its voltage falls. When this falls below the level shown in the table the DC OK signal switches off to allow the relay to open to disconnect and protect the battery.

DNR120-480 Connections					
Conn	Pin	Designation	Conn	Pin	Designation
AC Input	1	Ground	DC Output	1	DC OK
	2	Line		2	DC OK
	3	Neutral		3	Positive
				4	Positive
				5	Negative
				6	Negative

Output Set Voltages For Standby Versions				
Model ⁽¹⁾	Voltage	DC OK Signal Off	Current	DC OK Shutoff
DNR120AS12#	13.6 V	10.30-11.30 V	8.8 A	10.8 V $\pm 5\%$
DNR120AS24#	27.2 V	21.10-22.10 V	4.4 A	21.6 V $\pm 5\%$
DNR120AS48#	54.5 V	42.70-43.70 V	2.2 A	43.2 V $\pm 5\%$
DNR240PS24#	27.2 V	21.10-22.10 V	8.8 A	21.6 V $\pm 5\%$
DNR240PS48#	54.5 V	42.70-43.70 V	4.4 A	43.2 V $\pm 5\%$
DNR480PS24#	27.2 V	21.10-22.10 V	17.6 A	21.6 V $\pm 5\%$
DNR480PS48#	54.5 V	42.70-43.70 V	8.8 A	43.2 V $\pm 5\%$

120-960 Watts

DNR120-960TS Series



- Three Phase AC Input
- Up to 93% Efficiency
- Wide Adjustment Range
- Full Power -40 °C to +60 °C
- Rugged Design for Industrial Applications
- Single Phase Input Operation (340-575 VAC)
- 3 Year Warranty

Specification

Input

Input Voltage	• 340-575 VAC 3 phase (single phase operation with 75% of rated output), 480-820 VDC
Input Frequency	• 47-63 Hz
Input Current	• See tables
Inrush Current	• DNR120: 10.0 A, DNR240: 20.0 A, DNR480: 20.0 A, DNR960: 30.0 A, typical at 480 VAC, cold start
Power Factor	• 0.6 typical at 480 VAC input and nominal load, DNR960TS: 0.8 typical at 480 VAC input and nominal load
Earth Leakage Current	• 0.32 mA
Input Protection	• 3 internal fuses, DNR120TS, DNR240TS: T2.0 A, 600 VAC, DNR480TS: T3.15 A, 500 VAC, DNR960TS: T5.0 A, 500 VAC

Output

Output Voltage	• See table
Output Voltage Trim	• See table
Initial Set Accuracy	• $\pm 1\%$
Minimum Load	• No minimum load required
Start Up Delay	• <1 s (may increase at low temperature extremes)
Start Up Rise Time	• <150 ms
Hold Up Time	• 20 ms min at 480 VAC, DNR960TS: 15 ms min at 480 VAC
Line Regulation	• $\pm 1\%$
Load Regulation	• $\pm 1\%$ max ($\pm 5\%$ for units in parallel (not DNR120TS))
Parallel Operation	• 2 units can be connected in parallel (not DNR120TS), total power available is 90% of the rated current of each unit, minimum load per unit 10%, use Ishare connection for DNR960TS. Redundancy module DPM10 available for load currents up to 10 A, contact sales
Transient Response	• 4% max deviation recovering to within 1% in 2 ms for 50% load change
Ripple & Noise	• 100 mV pk-pk 20 MHz bandwidth, DNR960TS: 80 mV pk-pk 20 MHz bandwidth, (may increase at low temperature extremes)
Overvoltage Protection	• 120-145%, auto recovery
Overload Protection	• 110%-140%, constant current, auto recovery
Temperature Coefficient	• $\pm 0.03\%/^{\circ}\text{C}$
Short Circuit Protection	• Continuous trip and restart (hiccup mode) (DNR480TS switchable hiccup mode or power limited)

General

Efficiency	• See table
Isolation	• 3000 VAC Input to Output, 1500 VAC Input to Ground, 500 VAC Output to Ground
Switching Frequency	• DNR120TS: 70 kHz typical, DNR240TS: 25 kHz typical, DNR480TS: 80 kHz typical, DNR960TS: 52 kHz typical
Signals	• DC ON indicator LED Green, DC LOW indicator LED Red DC OK: normally open relay on 24 V models
MTBF	• DNR120TS: 550 kHrs, 240TS: 500 kHrs 480TS: 420 kHrs, 960TS: 380 kHrs to Bellcore Issue 6, at +40 °C, GB
DIN Rail	• Compatible with TS35/7.5 or TS35/15

Environmental

Operating Temperature	• -40 °C to 70 °C (DNR480TS -30 °C), derate linearly from 60 °C at 2.5%/°C (3.5%/°C for DNR960TS), start up at -35 °C (DNR480TS -20 °C) see derating curves
Cooling	• Convection-cooled with 25 mm free space all sides
Operating Humidity	• 20-95% RH, non-condensing
Storage Temperature	• -40 °C to +85 °C
Shock	• 15 g, 11 ms, 3 axis, 6 faces, 3 shocks/face
Vibration	• 2 g, 10 Hz to 500 Hz, along X, Y & Z axis, 60 min/axis, mounted on rail

EMC & Safety

Emissions	• EN55022, Class B conducted & radiated
Harmonic Currents	• EN61000-3-2, Class A
Voltage Flicker	• EN61000-3-3
ESD Immunity	• EN61000-4-2, level 4 Perf Criteria A
Radiated Immunity	• EN61000-4-3, level 3 Perf Criteria A
EFT/Burst	• EN61000-4-4, level 4 Perf Criteria A
Surge	• EN61000-4-5, installation class 4, Perf Criteria A
Conducted Immunity	• EN61000-4-6, level 3 perf criteria A
Magnetic Field	• EN61000-4-8, level 4 perf criteria A
Dips & Interruptions	• EN61000-4-11, 30% 500 ms, 60% 200 ms, >95% 5000 ms Perf Criteria A, A, A
Safety Approvals	• EN60950-1 UL508 UL60950-1 Pollution Degree 2, UL60950-1 Overvoltage Category II, UL508 Overvoltage Category III, ANSI/ISA 12.12.01 Class 1, Division 2, Groups A,B,C and D

Models and Ratings

DNR120-960TS **XP**

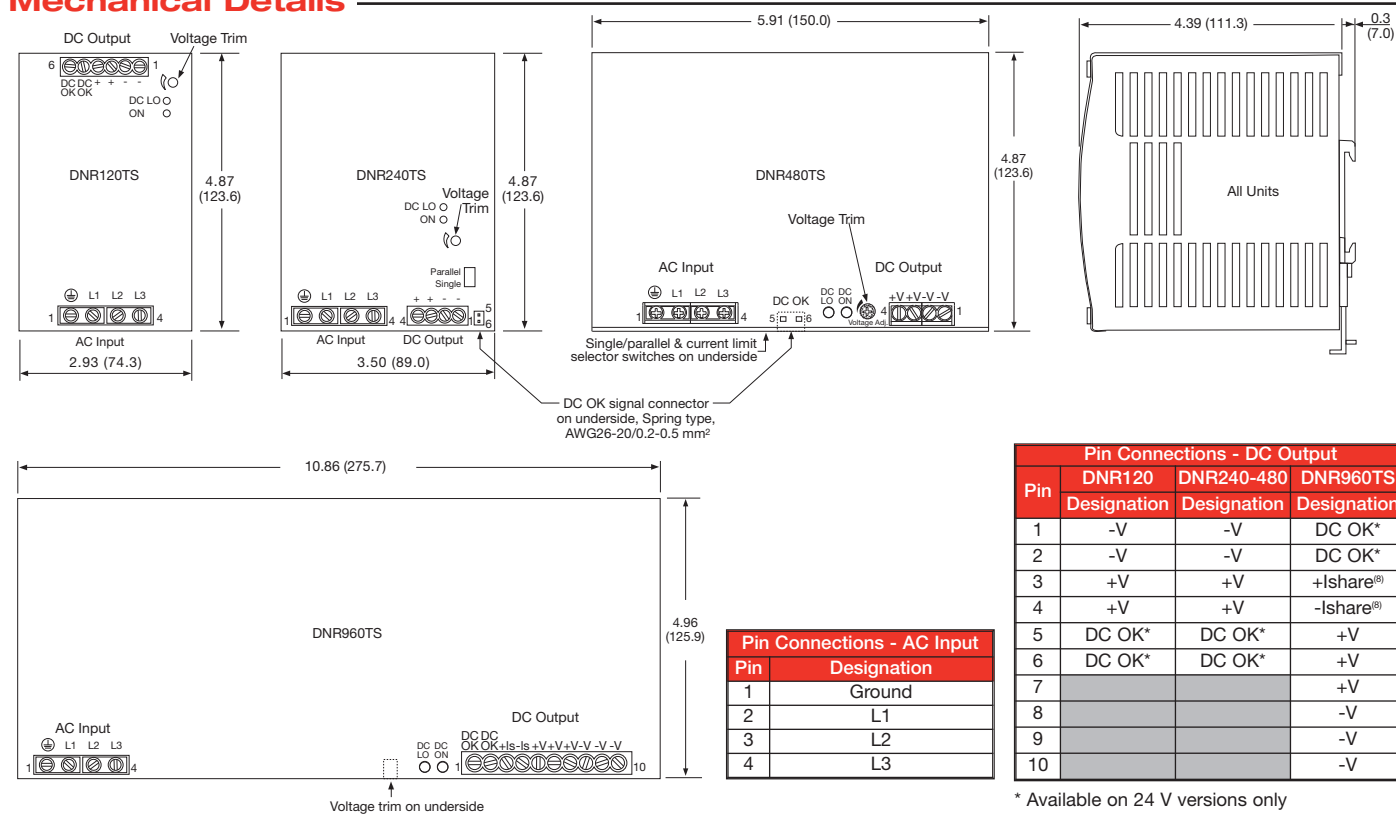
Output Voltage	Input Current (typ.)		Output Voltage Trim	Output Current ⁽¹⁾	Efficiency (typ.)	Model Number
	400 VAC	500 VAC				
12 V	0.36 A	0.30 A	11.4-14.5 V	10.0 A	87%	DNR120TS12†
24 V	0.36 A	0.30 A	22.5-28.5 V	5.0 A	89%	DNR120TS24†
24 V	0.65 A	0.55 A	22.5-28.5 V	10.0 A	90%	DNR240TS24-I†
48 V	0.65 A	0.55 A	47.0-56.0 V	5.0 A	91%	DNR240TS48-I†
24 V	1.10 A	0.93 A	22.5-28.5 V	20.0 A	90%	DNR480TS24-I†
48 V	1.10 A	0.93 A	47.0-56.0 V	10.0 A	91%	DNR480TS48-I†
24 V	1.72 A	1.50 A	22.5-28.5 V	40.0 A	92%	DNR960TS24-I†
48 V	1.72 A	1.50 A	47.0-56.0 V	20.0 A	93%	DNR960TS48-I†

Notes

1. Reduce by 25% for single phase input operation, (340-575 VAC).

† Available from Farnell & element14. See pages 284-290.

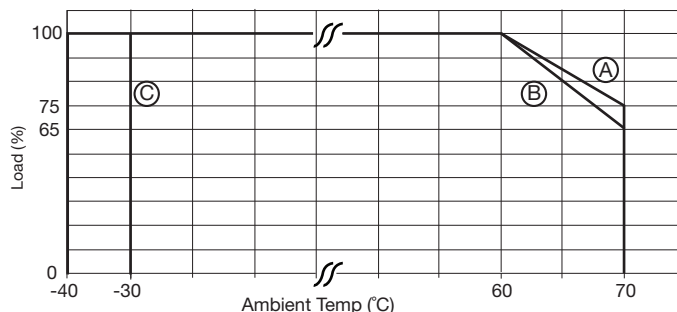
Mechanical Details



Notes

- All dimensions in inches (mm).
- Tolerance: ± 0.02 (0.5) maximum.
- Weight - DNR120TS: 1.76 lb (800 g) approx.
DNR240TS: 2.43 lb (1100 g) approx.
DNR480TS: 4.23 lb (1720 g) approx.
DNR960TS: 7.05 lb (3200 g) approx.
- Screw terminal: 10-24 AWG cable size.
- DC OK Relay rated at 60 VDC at 300 mA.
- Allow 0.98" (25 mm) clearance all round to ensure adequate ventilation.
- Connection screw maximum torque: Input: 9 lbs-in (1.0 Nm), Output: 5.5 lbs-in (0.6 Nm).
- Connecting +Ishare and -Ishare between two power supplies will force the units to current share.

Derating Curves



VEP Series



GREEN-POWER

- Efficiency Efficiency Level V (24 W Level IV)
- CEC2008 & EISA 2007 Compliant
- IT & Medical Approvals
- Interchangeable Input Connectors
- Output Voltages from 5 V to 24 V Available
- Class II Construction
- Low Cost

Specification

Input

Input Voltage	• 90-264 VAC
Input Frequency	• 47-63 Hz
Input Current	• 8 W: 0.3 A max at 90 VAC 15 W: 0.5 A max at 90 VAC 24 W: 0.6 A max at 90 VAC 36 W: 0.9 A max at 90 VAC
Inrush Current	• 50 A max at 230 VAC, cold start at 25 °C
Power Factor	• EN61000-3-2, class A
No Load Input Power	• <0.3 W

Output

Output Voltage	• See tables
Initial Set Accuracy	• $\pm 5\%$ at 50% load
Minimum Load	• No minimum load required
Start Up Delay	• 2 s typical
Start Up Rise Time	• 8 & 15 W: 100 ms typical, 24 & 36 W: 50 ms typical
Hold Up Time	• 5 ms typical at full load and 115 VAC
Line Regulation	• $\pm 0.5\%$ max
Load Regulation	• $\pm 5\%$ max
Transient Response	• 4% max. deviation, recovery to <1% within 500 μ s for a 50% step load change at 0.2 A/ μ s
Ripple & Noise	• See tables
Overvoltage Protection	• See tables
Overload Protection	• 120-280%
Short Circuit Protection	• Trip and restart (hiccup mode)
Temperature Coefficient	• 0.2 %/°C

General

Efficiency	• See tables
Energy Efficiency	• Level V Level IV (24 W versions)
Isolation	• 8 - 24 W: 4000 VAC Input to Output, 36 W: 3000 VAC Input to Output
Switching Frequency	• 8 & 15 W: 132 kHz typical, 24 & 36 W: 65 kHz typical
MTBF	• 8 - 24 W: 250 kHrs, 36 W: 200 kHrs to MIL-HDBK-217F at 25°C, GB

Environmental

Operating Temperature	• 0 °C to +40 °C
Cooling	• Natural convection
Operating Humidity	• 5-95% RH, non-condensing
Storage Temperature	• -20 °C to +60 °C
Shock	• Able to survive 1 m drop onto concrete on each of 6 axes
Vibration	• 10-300 Hz, 1 g 15 mins/sweep. 30 mins for each of 3 axes

EMC & Safety

Emissions	• EN55022, class B conducted & radiated
Harmonic Currents	• EN61000-3-2, class A
Voltage Flicker	• EN61000-3-3
ESD Immunity	• EN61000-4-2, ± 4 kV contact, ± 8 kV air, Perf Criteria A
Radiated Immunity	• EN61000-4-3, 3 V/m, Perf Criteria A
EFT/Burst	• EN61000-4-4, level 2, Perf Criteria A
Surge	• EN61000-4-5, installation class 3, Perf Criteria A
Conducted Immunity	• EN61000-4-6, 3 V, Perf Criteria A
Magnetic Field	• EN61000-4-8, 1 A/m, Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms, Perf Criteria A, B, B
Safety Approvals	• 8 & 15 W: EN60950-1, cUL60950-1, IEC60950-1, EN60601-1, cUL60601-1, IEC60601-1; 24 W: EN60950-1, UL60950-1, IEC60950-1, CSA60950-01-03, EN60601-1, UL60601-1, IEC60601-1, CSA C22.2 No601.1, China Compulsory Certification (CCC) Qualified; 36 W: IEC60950-1, EN60950-1, UL60950-1

Models and Ratings

VEP08/15 **XP**

Output Power	Output Voltage ⁽²⁾	Output Current	Ripple & Noise ⁽¹⁾	Overvoltage Trip ⁽⁵⁾	Efficiency ⁽⁴⁾	Model Number ⁽³⁾
8.0 W	5.0 V	1.60 A	150 mV	10.0 V	74%	VEP08US05†^
8.0 W	9.0 V	0.88 A	200 mV	18.0 V	77%	VEP08US09†^
8.0 W	12.0 V	0.66 A	200 mV	20.0 V	77%	VEP08US12†^
8.0 W	15.0 V	0.53 A	200 mV	25.0 V	78%	VEP08US15
10.0 W	5.0 V	2.00 A	50 mV	9.0 V	75%	VEP15US05†^
12.6 W	9.0 V	1.40 A	100 mV	15.0 V	80%	VEP15US09†^
15.0 W	12.0 V	1.25 A	100 mV	20.0 V	82%	VEP15US12†^
15.0 W	15.0 V	0.90 A	150 mV	25.0 V	84%	VEP15US15
15.0 W	24.0 V	0.63 A	200 mV	35.0 V	83%	VEP15US24†^

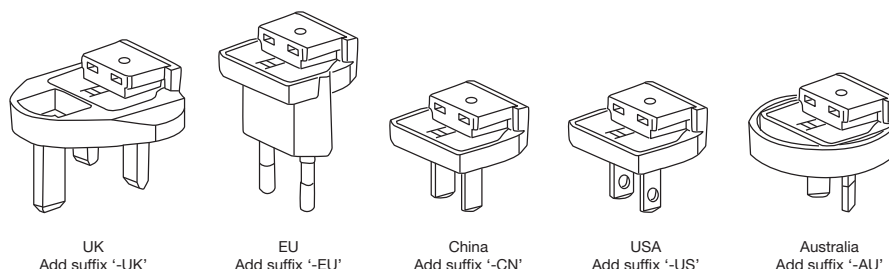
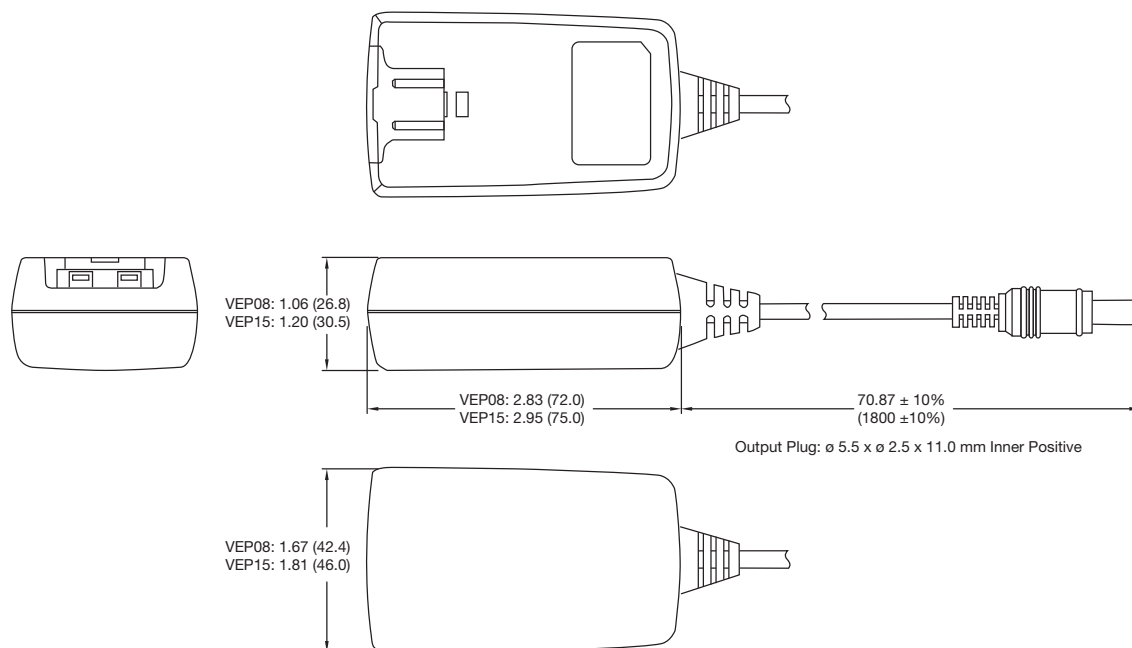
Notes

1. Measured at end of DC output lead using 20 MHz bandwidth and 0.1 μ F ceramic capacitor in parallel with 10 μ F electrolytic capacitor placed at connector terminals.
2. VEP08 models: Other voltages between 3.0 V and 18.0 V are available on request, consult sales for details.
VEP15 models: Other voltages between 3.0 V and 24.0 V are available on request, consult sales for details.
3. A suffix denoting the type of mains plug required must be added to the part number. See below.
4. Efficiency given is the average of efficiencies measured with output loads of 25%, 50%, 75% and 100%.
5. VEP08 models: Typical trip point, VEP15 models: Maximum trip point.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296

Mechanical Details



Notes

1. All dimensions in inches (mm). Tolerance is ± 0.04 (± 1) maximum, except output cable length.
2. Weight: VEP08 - 0.18 lbs (80 g) approx., VEP15 - 0.26 lbs (120 g) approx.
3. Case material is PC Class 94 V-0
4. Output Lead: UL2468 18-24 AWG
5. Mains plugs can be ordered separately. Part numbers are: VEP PLUG UK†^, VEP PLUG EU†^, VEP PLUG CN†^, VEP PLUG US†^ or VEP PLUG AU†^

Models and Ratings

Output Power	Output Voltage ⁽³⁾	Output Current	Ripple & Noise ⁽¹⁾	Overvoltage Trip ⁽⁵⁾	Efficiency ⁽⁴⁾	Model Number ⁽²⁾
12.5 W	5.0 V	2.5 A	100 mV	10.0 V	73%	VEP24US05†^
19.8 W	9.0 V	2.2 A	100 mV	18.0 V	77%	VEP24US09†^
24.0 W	12.0 V	2.0 A	100 mV	20.0 V	78%	VEP24US12†^
24.0 W	15.0 V	1.6 A	100 mV	25.0 V	78%	VEP24US15
24.0 W	24.0 V	1.0 A	100 mV	35.0 V	78%	VEP24US24†^

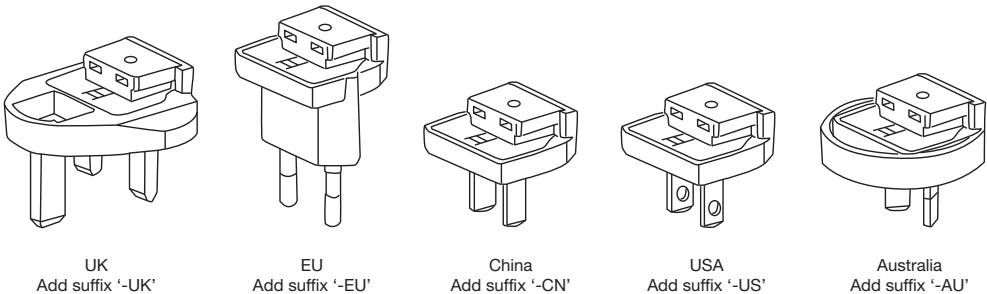
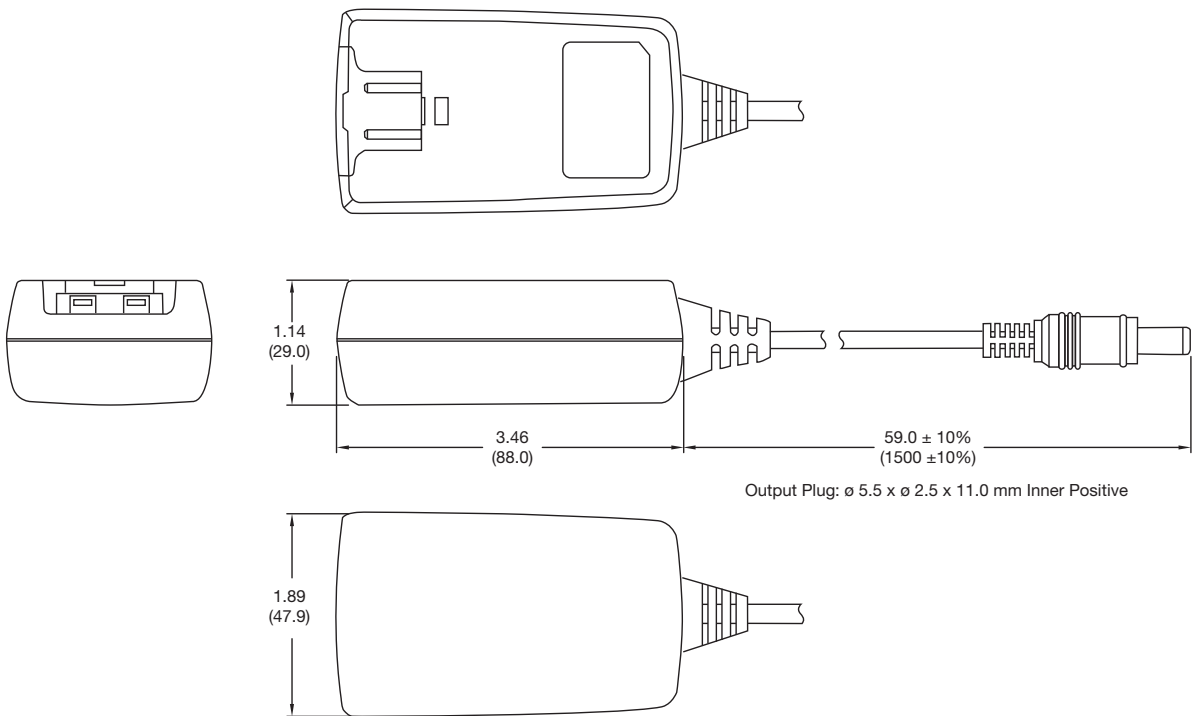
Notes

1. Measured at end of DC output lead using 20 MHz bandwidth and 0.1 µF ceramic capacitor in parallel with 10 µF electrolytic capacitor placed at connector terminals.
2. A suffix denoting the type of mains plug required must be added to the part number. See below.
3. Other voltages between 3.0 V and 24.0 V are available on request, consult sales for details.
4. Efficiency given is the average of efficiencies measured with output loads of 25%, 50%, 75% and 100%.
5. Typical trip point.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296

Mechanical Details



Notes

1. All dimensions in inches (mm). Tolerance is ±0.04 (±1) maximum, except output cable length
2. Weight: 0.35 lbs (160 g) Approx
3. Case material is PC Class 94 V-0
4. Output Lead: UL2468 18-24 AWG
5. Mains plugs can be ordered separately. Part numbers are: VEP PLUG UK†^, VEP PLUG EU†^, VEP PLUG CN^, VEP PLUG US†^ or VEP PLUG AU^

Models and Ratings

VEP36 XP

Output Power	Output Voltage ⁽³⁾	Output Current	Ripple & Noise ⁽¹⁾	Overvoltage Trip ⁽⁴⁾	Efficiency ⁽³⁾	Model Number ⁽²⁾
27 W	9.0 V	3.0 A	200 mV	25.0 V	82%	VEP36US09†^
36 W	12.0 V	3.0 A	200 mV	28.0 V	84%	VEP36US12†^
36 W	15.0 V	2.4 A	200 mV	28.0 V	84%	VEP36US15†^
36 W	24.0 V	1.5 A	200 mV	42.0 V	84%	VEP36US24†^

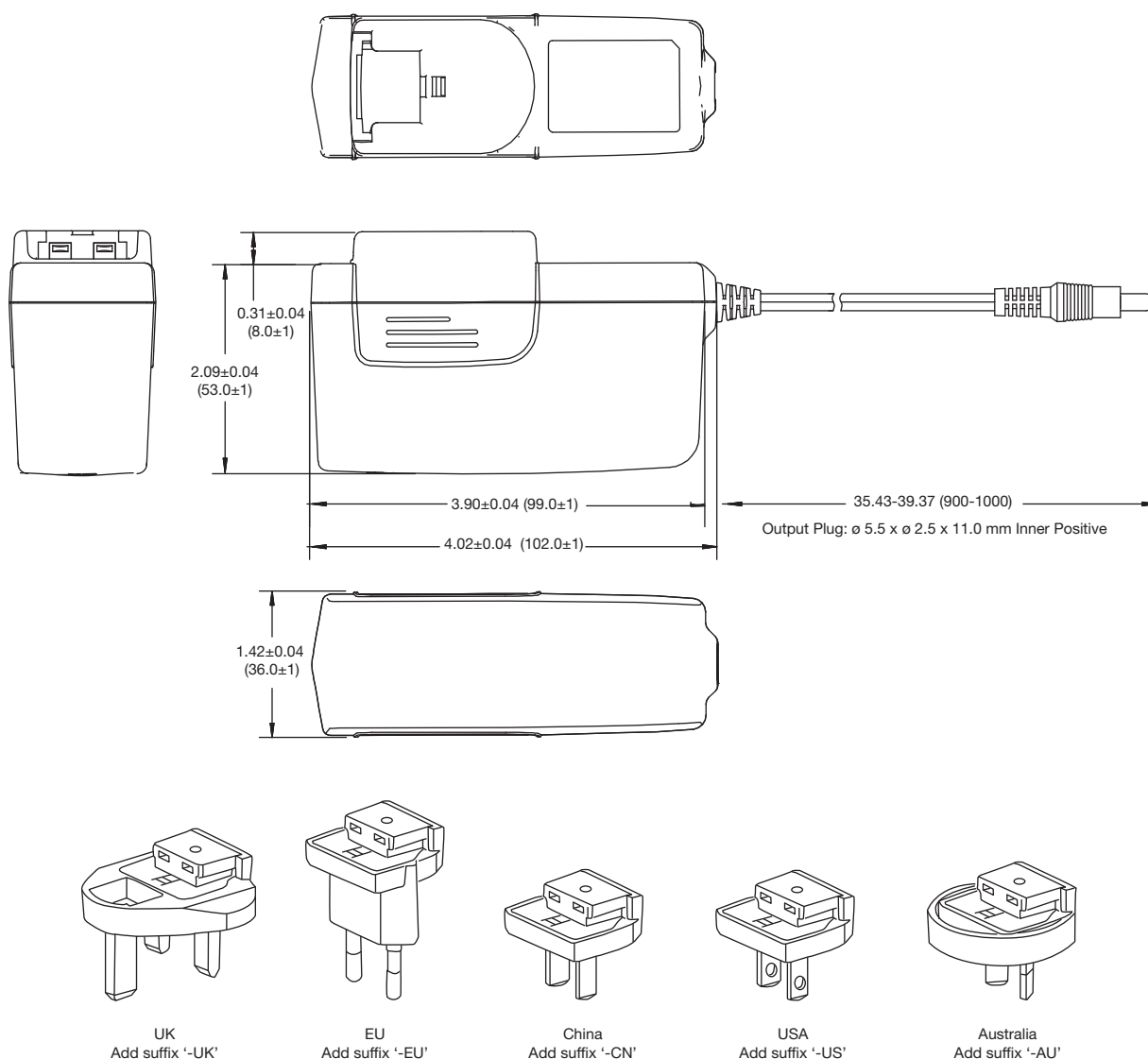
Notes

1. Measured at end of DC output lead using 20 MHz bandwidth and 0.1 μ F ceramic capacitor in parallel with 10 μ F electrolytic capacitor placed at connector terminals.
 2. A suffix denoting the type of mains plug required must be added to the part number. See below.
 3. Efficiency given is the average of efficiencies measured with output loads of 25%, 50%, 75% and 100%.
 4. Typical trip point.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296

Mechanical Details



Notes

1. All dimensions in inches (mm). Tolerance is ± 0.04 (± 1) maximum, except output cable length
 2. Weight: 0.57 lbs (260 g) Approx
 3. Case material is PC Class 94 V-0
 4. Output Lead: UL2468 18-24 AWG
 5. Mains plugs can be ordered separately. Part numbers are: VEP PLUG UK†^, VEP PLUG EU†^, VEP PLUG CN†^, VEP PLUG US†^ or VEP PLUG AU†^

48/60 Watts

AFM Series



- Energy Efficiency Level V
- CEC2008 & EISA2007 Compliant
- IT & Medical Approvals
- Optional Class II Versions
- 0 °C to +70 °C Operating Temperature
- Optional IEC320-C6 Inlet
- 3 Year Warranty

Specification

Input

Input Voltage	• 90-264 VAC
Input Frequency	• 47-63 Hz
Input Current	• AFM45: 1.2 A rms, AFM60: 1.5 A rms at 115 VAC
Power Factor	• EN61000-3-2, class A
Earth Leakage Current	• 150 μ A max at 264 VAC/60 Hz
No Load Input Power	• AFM45: <0.3 W, AFM60: <0.5 W

Output

Output Voltage	• See table
Output Voltage Trim	• Not user-adjustable
Initial Set Accuracy	• $\pm 2\%$
Minimum Load	• No minimum load required
Start Up Delay	• 3 s max at 115 VAC
Hold Up Time	• 8 ms minimum at 115 VAC
Line Regulation	• $\pm 1.0\%$ maximum
Load Regulation	• See table
Transient Response	• 4% max. deviation, recovery to within 1% in 500 μ s for a 25% load change
Ripple & Noise	• 1% max pk-pk (see note 1)
Overvoltage Protection	• 110-170% Vnom, recycle input to reset
Overload Protection	• 110-170%, auto recovery
Short Circuit Protection	• Trip and restart (hiccup mode)
Temperature Coefficient	• 0.04%/°C

General

Efficiency	• >88% typical (see note 6)
Energy Efficiency	• Level V
Isolation	• 4000 VAC Input to Output 1500 VAC Input to Ground Output 0 V is electrically connected to Input Ground
Switching Frequency	• 65-100 kHz variable
Power Density	• AFM45: 4.2 W/In ³ , AFM60: 3.76 W/In ³
MTBF	• >250 kHrs to MIL-HDBK-217F at 25 °C, GB, full load

Environmental

Operating Temperature	• 0 °C to +70 °C, derate from 100% power at +40 °C to 60% power at +70 °C
Operating Humidity	• 10-95% RH, non-condensing
Storage Temperature	• -40 °C to +80 °C
Operating Altitude	• 3000 m
Shock	• 30 g, 10 ms on 3 axes
Vibration	• 5-100 Hz, 2.31 m/s ² , 20 mins, 3 axes

EMC & Safety

Emissions	• EN55011/22/FCC Class B conducted, EN55011/22/FCC Class B radiated
Harmonic Currents	• EN61000-3-2, Class A
Voltage Flicker	• EN61000-3-3
ESD Immunity	• EN61000-4-2, 4 kV contact and 8 kV air discharge
Radiated Immunity	• EN61000-4-3, 3 V/m Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3 Perf Criteria A, (see note 7)
Surge	• EN61000-4-5, installation class 3 Perf Criteria A
Conducted Immunity	• EN61000-4-6, 3 Vrms Perf Criteria A
Magnetic Field	• EN61000-4-8, 3 A/m, Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% for 10 ms, 60% 100 ms, 100% 5000 ms, Perf Criteria A, B, B EN60601-1-2, 30% 500 ms, 60% 100 ms, 100% 10 ms, 100% 5000 ms, Perf A, A, B (see note 8)
Safety Approvals	• EN60950-1, UL60950-1, IEC60950-1 EN60601-1, UL60601-1, IEC60601-1

Models and Ratings

AFM45/60 XP

Output Power	Output Voltage ⁽⁹⁾	Output Current	Total Regulation ⁽²⁾	Model Number ^(3,4)
48 W	12 V	4.00 A	5%	AFM45US12†^
48 W	15 V	3.20 A	5%	AFM45US15†^
48 W	18 V	2.67 A	5%	AFM45US18†^
48 W	24 V	2.00 A	5%	AFM45US24†^
60 W	12 V	5.00 A	5%	AFM60US12†^
60 W	15 V	4.00 A	5%	AFM60US15†^
60 W	18 V	3.74 A	5%	AFM60US18†^
60 W	24 V	2.50 A	5%	AFM60US24†^

Notes

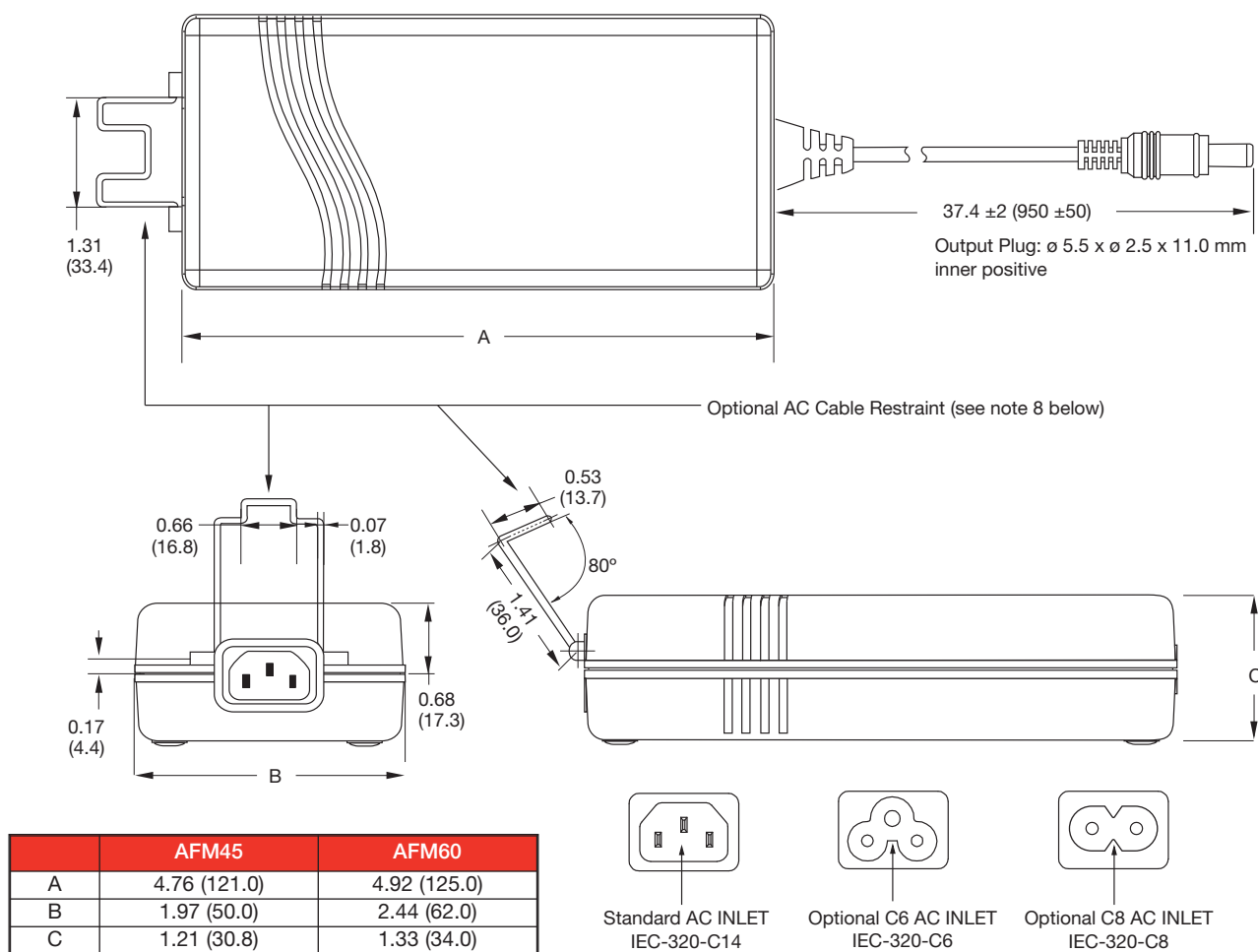
1. Ripple and noise measured at 20 MHz bandwidth with a 10 μ F tantalum and 0.1 μ F ceramic cap connected at the measurement point.
2. Total regulation includes initial set accuracy, line and load regulation.
3. For optional Class II versions with a polarised IEC320-C8 inlet, add suffix 'C2' to the model number, e.g. AFM60US24C2.
4. For alternative IEC320-C6 inlet, add suffix 'C6' to the model number eg. AFM60US24C6.

5. Other output voltages are available, contact sales for details.
6. Minimum average of efficiencies measured at 25%, 50%, 75% & 100% load.
7. A minimum load of 1% is required to meet performance criteria A.
8. Performance criteria given for high line input.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296.

Mechanical Details



Notes

1. All dimensions shown in inches (mm). Tolerance is 0.02 (0.5) maximum, except output cable length.
2. Weight: AFM45: 0.56 lbs (256 g), AFM60: 0.78 lbs (360 g) approx.
3. Case material is PC Class 94 V-0.
4. Output Lead: UL1185, 16 AWG
5. For European mains lead order part EU-MAINS-IEC for C14 versions, EU-MAINS-5 for C6 versions or EU-MAINS-8 for C8 versions.
6. For UK mains lead order part UK-MAINS-IEC for C14 versions, UK-MAINS-5 for C6 versions or UK-MAINS-8 for C8 versions.
7. For US mains lead order part US-MAINS-IEC for C14 versions, US-MAINS-5 for C6 versions or US-MAINS-8 for C8 versions.
8. For optional AC Cable Restraint on the standard input version add suffix 'A' to the model number e.g. AFM60US24A. AC Mains Lead must be Interpower Corporation, part number 70006020300. Option AC Cable Restraint is not available on IEC320-C6 inlet or Class II versions.

60 Watts

MCM Series



- Compact Size – High Power Density
- Rugged Design for Defense Applications
- Universal Input
- Wide Operating Temperature
- MIL-STD-461E
- Convection-cooled
- 3 Year Warranty

Specification

Input

Input Voltage	• 90-264 VAC (120-370 VDC)
Input Frequency	• 47-63 Hz
Input Current	• 0.4 A max at 230 VAC
Inrush Current	• 40 A max at 230 VAC, cold start 25 °C
Power Factor	• EN61000-3-2, class A
Input Protection	• Internal T3.15 A/250 V fuse in line and neutral
Earth Leakage Current	• 2 mA max at 230 VAC, 60 Hz

Output

Output Voltage	• See table
Initial Set Accuracy	• $\pm 1.0\%$, set at 60% load
Minimum Load	• No minimum load required
Start Up Delay	• 2 s max
Start Up Rise Time	• 50 ms
Hold Up Time	• 16/75 ms minimum at 115/230 VAC
Line Regulation	• $\pm 0.5\%$
Load Regulation	• 3%
Over/Undershoot	• None at turn on/off
Transient Response	• 4% max. deviation, recovery to within 1% in 500 μ s for a 25% load change
Ripple & Noise	• 1% pk-pk, 20 MHz bandwidth with 1 μ F capacitor connected across measurement points
Overvoltage Protection	• 115-135% Vnom, recycle input to reset
Overload Protection	• 110-150%, on primary power limit, auto recovery
Short Circuit Protection	• Trip and restart (hiccup mode)
Temperature Coefficient	• 0.05%/°C
Peak Load	• 120% for 100 ms (see note 2)

General

Efficiency	• Up to 83% at nominal line, 100% load
Isolation	• 4000 VAC Input to Output 1500 VAC Input to Ground 500 VAC Output to Ground
Switching Frequency	• 70 kHz typical
Power Density	• 2.6 W/In ³
MTBF	• 250 kHrs to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Temperature	• -40 °C to +70 °C, derate linearly from 100% load at +50 °C to 50% load at +70 °C. Start up at -30 °C.
Cooling	• Convection-cooled
Operating Humidity	• 95% RH, non-condensing
Storage Temperature	• -40 °C to + 85 °C
Operating Altitude	• 3000 m
Shock	• 30 g pk, half sine, 6 axes
Vibration	• 2 g rms, 5 Hz to 500 Hz, 3 axes

EMC & Safety

Emissions	• MIL-STD-461E, CE102, RE102 EN60601-1-2, EN61204-3, FCC 20780, EN55022, level B conducted EN55022 Level A radiated
Military Immunity	• MIL-STD-461E Fixed Wing External (2 MHz to 18 GHz) and Helicopters, CS101, 114, 115, 116 & RS103
Harmonic Currents	• EN61000-3-2, class A
Voltage Flicker	• EN61000-3-3
ESD Immunity	• EN61000-4-2, level 3 Perf Criteria A
Radiated Immunity	• EN61000-4-3, 10 V/m Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3 Perf Criteria A
Surge	• EN61000-4-5, installation class 3, Perf Criteria A
Conducted Immunity	• EN61000-4-6, 10 V Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms, Perf Criteria A, B, B
Safety	• Compliant to EN60950-1, UL60950-1, CSA 22.2 601.1, EN60601-1, UL60601-1

Models and Ratings

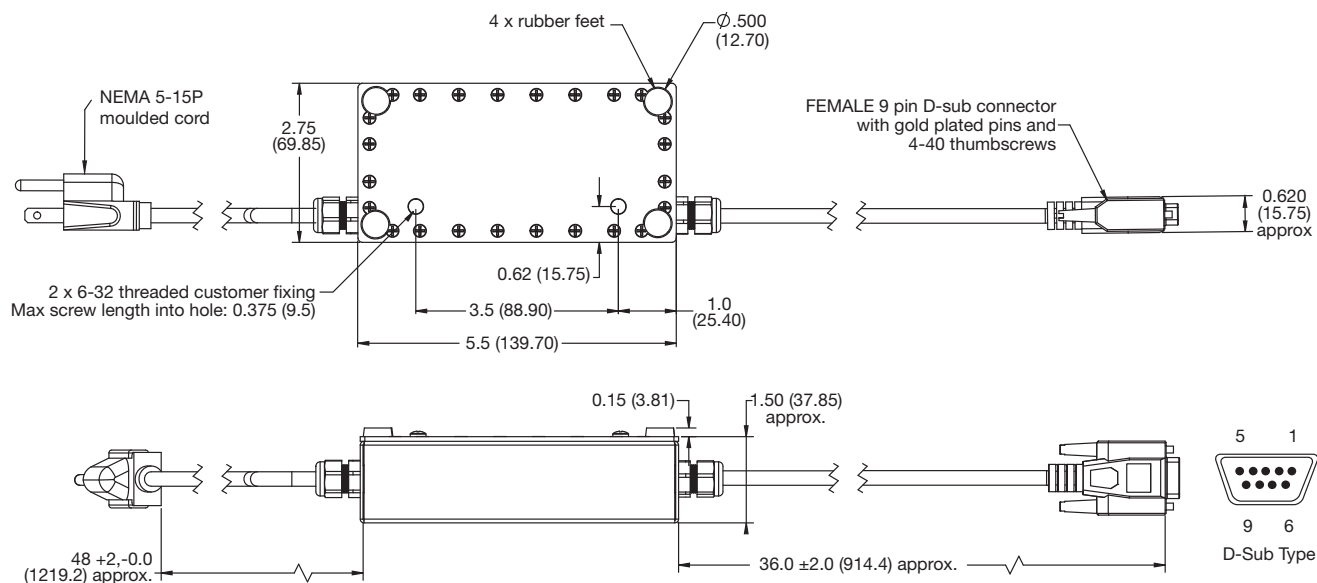
MCM60 **XP**

Input Voltage	Output Voltage	Output Current	Efficiency (typ.)	Model Number ^(2,3)
90-264 V	12 VDC	5.0 A	80%	MCM60US12-D9
	15 VDC	4.0 A	80%	MCM60US15-D9
	18 VDC	3.3 A	81%	MCM60US18-D9
	24 VDC	2.5 A	83%	MCM60US24-D9
	28 VDC	2.1 A	83%	MCM60US28-D9

Notes

- For other output voltages 12 V to 48 V, consult sales.
- A 120% peak load can be taken for up to 100 ms with a 25% duty cycle. Average load not to exceed 60 W.
- Mechanical drawing shows the '-D9' 9 Pin Output D-Sub connector. For other connectors, contact sales.
- US AC mains lead is standard. For other mains leads, contact sales.

Mechanical Details

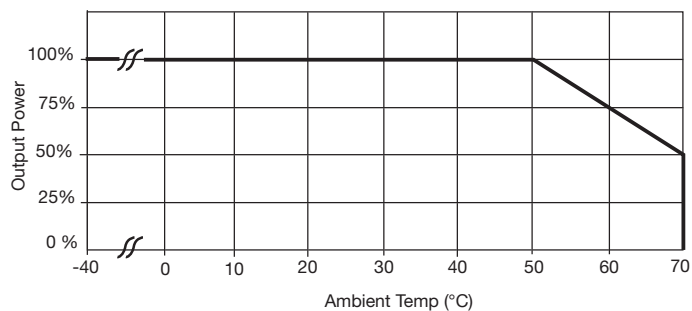


Output Pin Connections			
Pin	D-Sub Type	Pin	D-Sub Type
1	Earth	6	N/C
2	N/C	7	N/C
3	N/C	8	Return
4	+Output	9	Return
5	+Output		

Notes

- All dimensions are in inches (mm).
- Tolerance X.XX = +/-0.02 (0.50); X.XXX = +/-0.015 (0.38) except input/output cables.
- Weight: 2.5 lbs (1.13 kg)
- Finish: Black epoxy paint.

Derating Curve



15–80 Watts

AEL Series



GREEN•POWER

- Energy Efficiency Level V
- CEC 2008 and EISA 2007 Compliant
- Limited Power Source Approval
- China Compulsory Certification (CCC) Qualified
- +70 °C Operating Temperature
- Compact Dimensions
- 3 Year Warranty

Specification

Input

Input Voltage	• 90-264 VAC
Input Frequency	• 47-63 Hz
Input Current	• AEL15/20: 0.4 A max at 115 VAC AEL40: 1.0 A max at 115 VAC AEL60: 1.6 A max at 115 VAC AEL80: 1.1 A max at 115 VAC
Inrush Current	• AEL15/20: 15/30 A max for 115/230 VAC, AEL40: 25/50 A max for 115/230 VAC, AEL60: 35/70 A max for 115/230 VAC, AEL80: 45/92 A max for 115/230 VAC, cold start at 25 °C
Earth Leakage Current	• 0.75 mA at 240 VAC
Power Factor	• EN61000-3-2, Class A
Input Protection	• Internal fuse in line, AEL15/20: T1 A, 250 V AEL40: T2 A, 250 V AEL60/80: T3.15 A, 250 V
No Load Input Power	• 0.5 W maximum, model dependent

Output

Output Voltage	• See tables
Minimum Load	• No minimum load required
Hold Up Time	• AEL15: 5 ms min, AEL20/40: 12 ms min, AEL60/80: 16 ms min, at full load 110 VAC
Start Up Delay	• AEL20/40: 0.5 s, AEL15/60/80: 2.0 s max at full load 100 VAC
Transient Response	• 2% max deviation, recovery to within 1% of nominal in 500 μ s for 50% load change
Line Regulation	• See tables
Load Regulation	• See tables
Ripple & Noise	• 1% pk-pk, 20 MHz bandwidth
Overvoltage Protection	• 112-132% (AEL40/60/80 only)
Overload Protection	• 110-150% (AEL20/40/60/80 only)
Short Circuit Protection	• Trip & restart (hiccup mode), auto recovery
Temperature Coefficient	• $\pm 0.04\%/^{\circ}\text{C}$

General

Efficiency	• See tables
Energy Efficiency	• Model dependent, see tables
Isolation	• 3000 VAC Input to Output 1500 VAC Input to Ground* 500 VDC Output to Ground* *Not C8 version
Switching Frequency	• 63 kHz typical
MTBF	• >100 kHrs to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Temperature	• -20 °C to +70 °C, derate linearly from 100% power at +40 °C to 50% power at +70 °C
Storage Temperature	• -40 °C to +85 °C
Cooling	• Convection cooled
Operating Humidity	• 5-95% RH, non-condensing
Operating Altitude	• 3000 m
Shock	• 10 g, 10 ms on 3 axes

EMC & Safety

Emissions	• EN55022 level B conducted & radiated
Harmonic Current	• EN61000-3-2 class A
Voltage Flicker	• EN61000-3-3
ESD Immunity	• EN61000-4-2, level 3, Perf criteria A
Radiated Immunity	• EN61000-4-3, 3 V/m, Perf criteria A
EFT/Burst	• EN61000-4-4, level 2, Perf criteria A
Surge	• EN61000-4-5, installation class 3, Perf criteria A
Conducted Immunity	• EN61000-4-6, level 2, Perf criteria A
Magnetic Field	• EN61000-4-8, 1 A/m, Perf criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms Perf Criteria A, B, B
Safety Approvals	• EN60950-1: UL/cUL60950-1, Approved as Limited Power Source (AEL15-60 only), China Compulsory Certification (CCC) qualified.

Models and Ratings

AEL15 XP

Output Power	Output Voltage ⁽³⁾	Output Current	Total Regulation ⁽²⁾	Efficiency ⁽⁵⁾	Model Number ⁽¹⁾
8 W	3.3 VDC	2.50 A	7%	68%	AEL15US03 ⁽⁴⁾ †^
12 W	5.0 VDC	2.40 A	7%	78%	AEL15US05†^
15 W	8.0 VDC	1.87 A	5%	79%	AEL15US08†^
	9.0 VDC	1.66 A	5%	79%	AEL15US09†^
	12.0 VDC	1.25 A	5%	80%	AEL15US12†^
	15.0 VDC	1.00 A	5%	81%	AEL15US15†^
	18.0 VDC	0.83 A	5%	82%	AEL15US18†^
	24.0 VDC	0.62 A	5%	78%	AEL15US24 ⁽⁴⁾ †^
	30.0 VDC	0.50 A	5%	77%	AEL15US30 ⁽⁴⁾ †^
	36.0 VDC	0.42 A	3%	75%	AEL15US36 ⁽⁴⁾ †^
	48.0 VDC	0.31 A	3%	81%	AEL15US48†^

Notes

1. Standard input connector is IEC320-C14 Inlet. For optional IEC320-C6 Inlet, add suffix "C6" to model number e.g. AEL15US12C6.

2. Total regulation includes line regulation and load regulation.

3. Other output voltages available, contact sales for details.

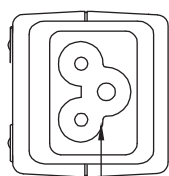
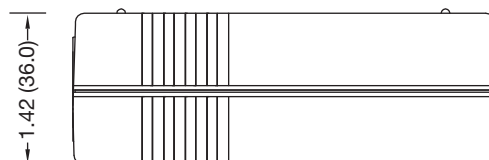
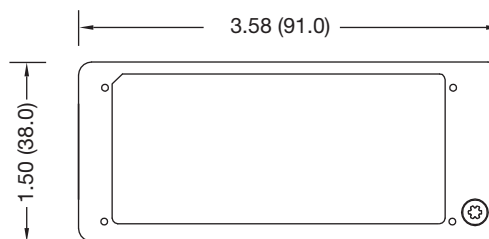
4. Energy Efficiency Level IV.

5. Minimum average of efficiencies measured at 25%, 50%, 75% & 100% load.

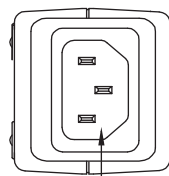
† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296.

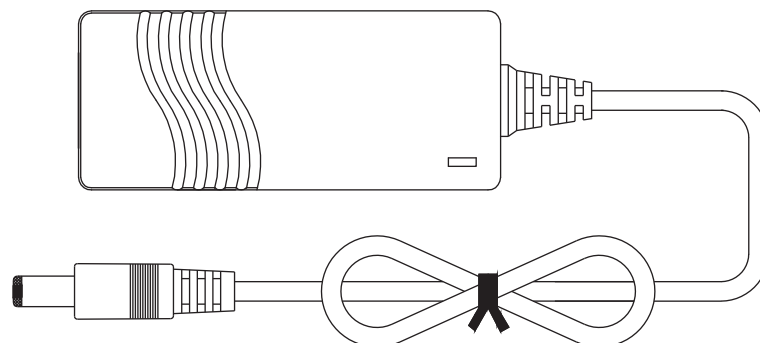
Mechanical Details



AC INPUT
IEC-320-C6 INLET



AC INPUT
IEC-320-C14 INLET



Notes

1. All dimensions are shown in inches (mm). Tolerance ± 0.04 (± 1.0) max.

2. Output connector: is 0.22 (5.5) outer diameter barrel, 0.10 (2.5) inner diameter barrel with centre positive (+) and outer shell negative (-). Length is 0.433 (11.0).

3. Output cable length is 48" (1220mm) approx.

4. Weight: 0.36 lbs (165 g)

5. For European mains lead order part: EU-MAINS-IEC or EU-MAINS-5 for C6 version.

6. For UK mains lead order part: UK-MAINS-IEC or UK-MAINS-5 for C6 version.

7. For US mains lead order part: US-MAINS-IEC or US-MAINS-5 for C6 version.

8. Mains lead length is 78" (2000 mm) approx

Models and Ratings

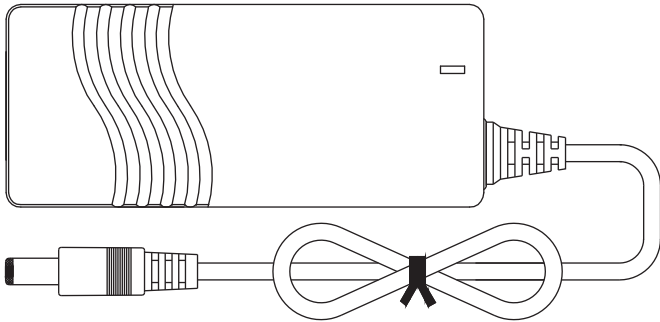
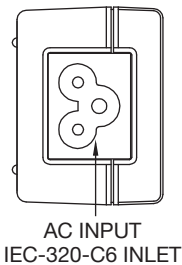
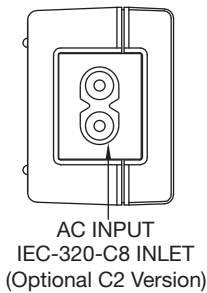
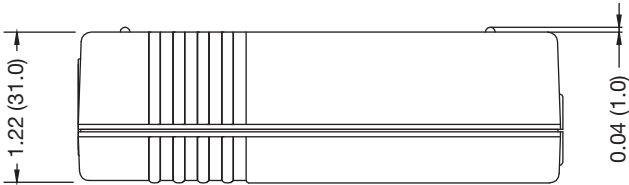
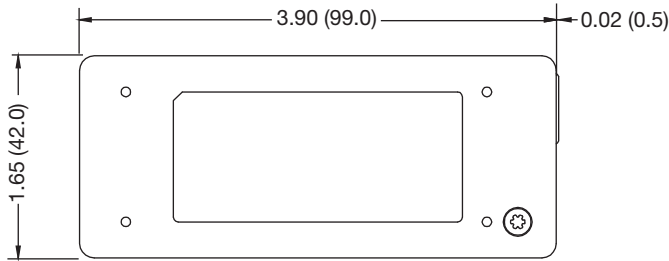
Output Power	Output Voltage ⁽³⁾	Output Current	Total Regulation ⁽²⁾	Efficiency ⁽⁴⁾	Model Number ⁽¹⁾
15 W	5 VDC	3.00 A	5%	79%	AEL20US05^
20 W	12 VDC	1.67 A	4%	86%	AEL20US12^
	15 VDC	1.33 A	4%	85%	AEL20US15^
	24 VDC	0.83 A	3%	87%	AEL20US24^
	30 VDC	0.67 A	3%	86%	AEL20US30^
	48 VDC	0.42 A	3%	87%	AEL20US48^

Notes

1. For optional class II version on AEL20 models only, add suffix 'C2' to model number e.g. AEL20US12C2.
2. Total regulation includes line regulation and load regulation.
3. Other output voltages available, contact sales for details.
4. Minimum average of efficiencies measured at 25%, 50%, 75% & 100% load.

^ Available from Newark. See pages 291-296.

Mechanical Details



Notes

1. All dimensions are shown in inches (mm). Tolerance ± 0.04 (± 1.0) max.
2. Output connector: 0.22 (5.5) outer diameter barrel, 0.10 (2.5) inner diameter barrel with centre positive (+) and outer shell negative (-). Length is 0.433 (11.0).
3. Output cable length is 48" (1220mm) approx.
4. Weight: 0.37 lbs (170 g)
5. For European mains lead order part: EU-MAINS-C5 for AEL20, EU-MAINS-8 for AEL20 Class II.
6. For UK mains lead order part: UK-MAINS-5 for AEL20, UK-MAINS-8 for AEL20 Class II.
7. For US mains lead order part: US-MAINS-5 for AEL20, US-MAINS-8 for AEL20 Class II.
8. Mains lead length is 78" (2000 mm) approx

Models and Ratings

AEL40 XP

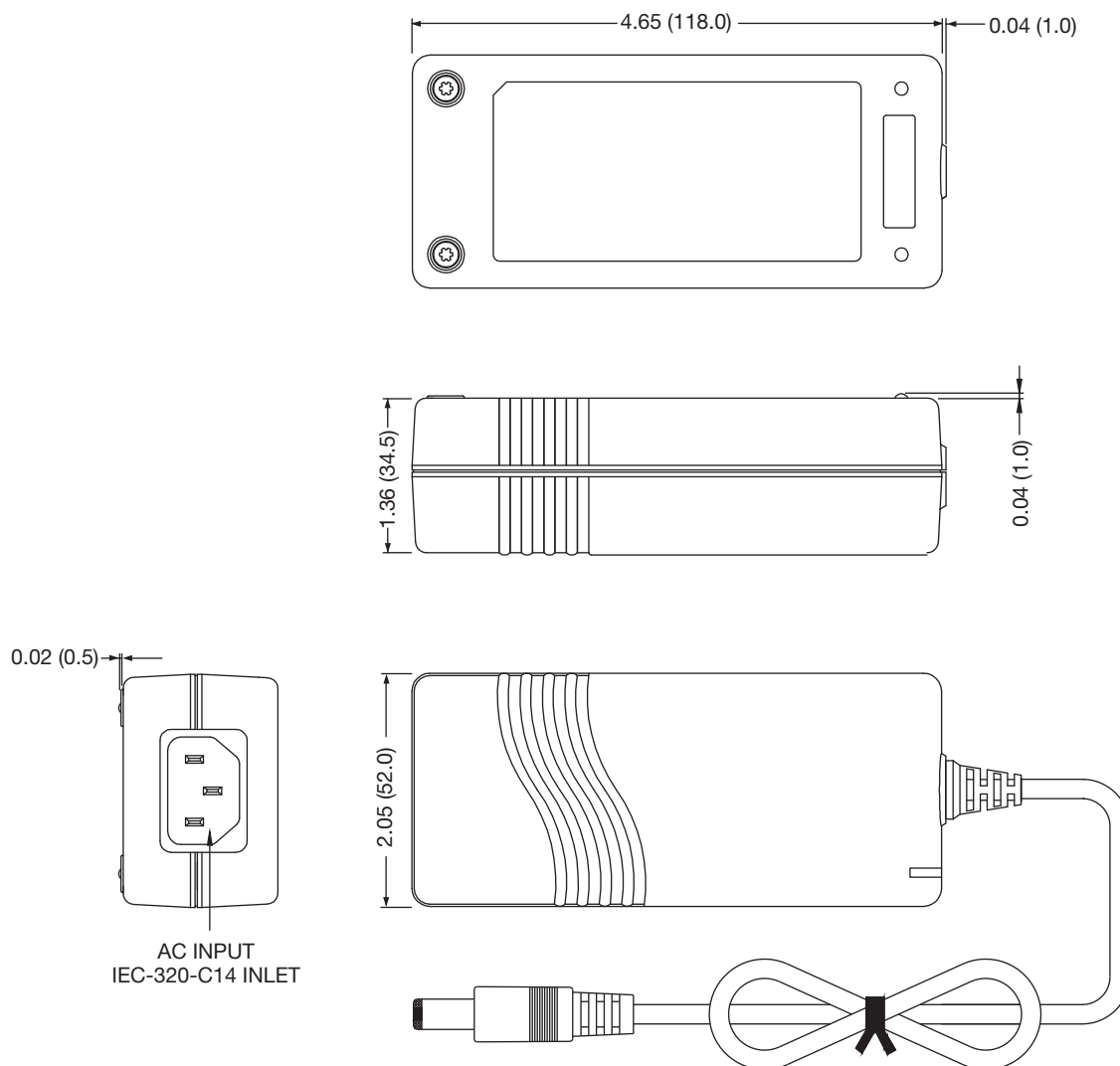
Output Power	Output Voltage ⁽²⁾	Output Current	Total Regulation ⁽¹⁾	Efficiency ⁽⁴⁾	Model Number
25 W	5 VDC	5.00 A	7%	79%	AEL40US05 ⁽³⁾ ^
35 W	8 VDC	4.37 A	5%	82%	AEL40US08 ⁽³⁾
	9 VDC	3.88 A	5%	83%	AEL40US09 ⁽³⁾ ^
40 W	12 VDC	3.33 A	5%	87%	AEL40US12^
	15 VDC	2.67 A	5%	87%	AEL40US15
	18 VDC	2.22 A	5%	86%	AEL40US18^
	24 VDC	1.67 A	3%	86%	AEL40US24^
	36 VDC	1.11 A	3%	89%	AEL40US36^
	48 VDC	0.83 A	3%	91%	AEL40US48^

Notes

1. Total regulation includes line regulation and load regulation.
2. Other output voltages available, contact sales for details.
3. Energy Efficiency Level IV
4. Minimum average of efficiencies measured at 25%, 50%, 75% & 100% load.

^ Available from Newark. See pages 291-296.

Mechanical Details



Notes

1. All dimensions are shown in inches (mm). Tolerance ± 0.04 (± 1.0) max.
2. Output connector: 0.22 (5.5) outer diameter barrel, 0.10 (2.5) inner diameter barrel with centre positive (+) and outer shell negative (-). Length is 0.433 (11.0).
3. Output cable length is 48" (1220mm) approx.
4. Weight: 0.64 lbs (275 g).
5. For European mains lead order part: EU-MAINS-IEC.
6. For UK mains lead order part: UK-MAINS-IEC.
7. For US mains lead order part: US-MAINS-IEC.
8. Mains lead length is 78" (2000 mm) approx

Models and Ratings

AEL60

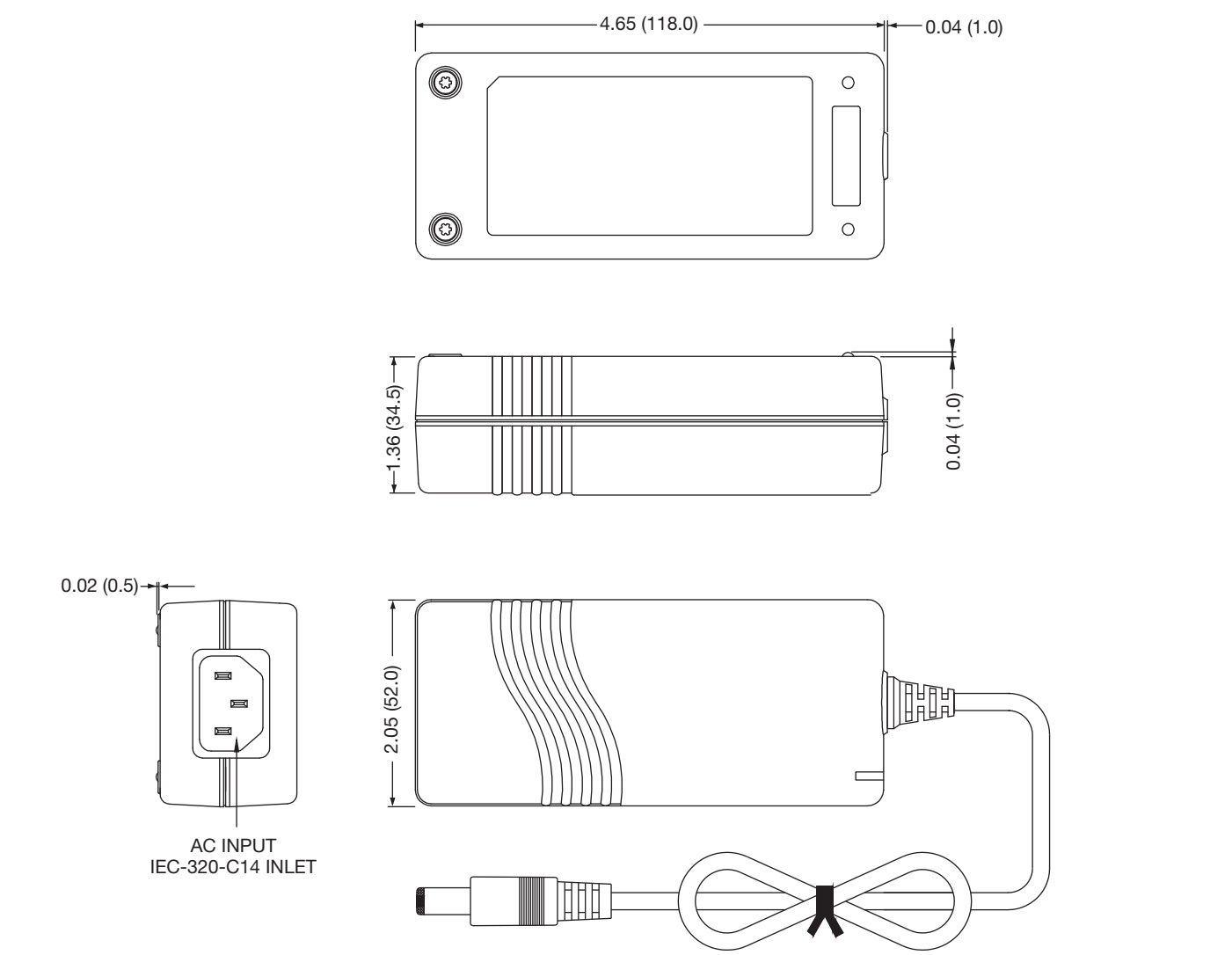
XP

Max Output Power	Output Voltage ⁽²⁾	Output Current	Total Regulation ⁽¹⁾	Efficiency ⁽³⁾	Model Number
57 W	12 VDC	4.75 A	5%	87%	AEL60US12
63 W	15 VDC	4.20 A	5%	88%	AEL60US15
	18 VDC	3.50 A	5%	88%	AEL60US18
	24 VDC	2.63 A	5%	88%	AEL60US24
	30 VDC	2.15 A	5%	90%	AEL60US30
	36 VDC	1.75 A	3%	90%	AEL60US36
	48 VDC	1.31 A	3%	90%	AEL60US48

- Notes
1. Total regulation includes line regulation and load regulation.
2. Other output voltages available, contact sales for details.

3. Minimum average of efficiencies measured at 25%, 50%, 75% & 100% load.

Mechanical Details



- Notes
1. All dimensions are shown in inches (mm). Tolerance ± 0.04 (± 1.0) max.
2. Output connector: 0.22 (5.5) outer diameter barrel, 0.10 (2.5) inner diameter barrel with centre positive (+) and outer shell negative (-). Length is 0.433 (11.0).
3. Output cable length is 48" (1220mm) approx.
4. Weight: 0.79 lbs (340 g).
5. For European mains lead order part: EU-MAINS-IEC.
6. For UK mains lead order part: UK-MAINS-IEC.
7. For US mains lead order part: US-MAINS-IEC.
8. Mains lead length is 78" (2000 mm) approx

Models and Ratings

AEL80 **XP**

Max Output Power	Output Voltage ⁽²⁾	Output Current	Total Regulation ⁽¹⁾	Efficiency ⁽⁴⁾	Model Number
80 W	12 VDC	6.66 A	5%	85%	AEL80US12 ⁽³⁾ †^
	15 VDC	5.38 A	5%	87%	AEL80US15 ⁽³⁾ †^
	18 VDC	4.44 A	5%	88%	AEL80US18†^
	24 VDC	3.33 A	5%	87%	AEL80US24†^
	30 VDC	2.66 A	5%	87%	AEL80US30†^
	36 VDC	2.22 A	5%	88%	AEL80US36†^
	48 VDC	1.66 A	5%	88%	AEL80US48†^

Notes

1. Total regulation includes line regulation and load regulation.
 2. Other output voltages available, contact sales for details.

3. Energy Efficiency Level IV.

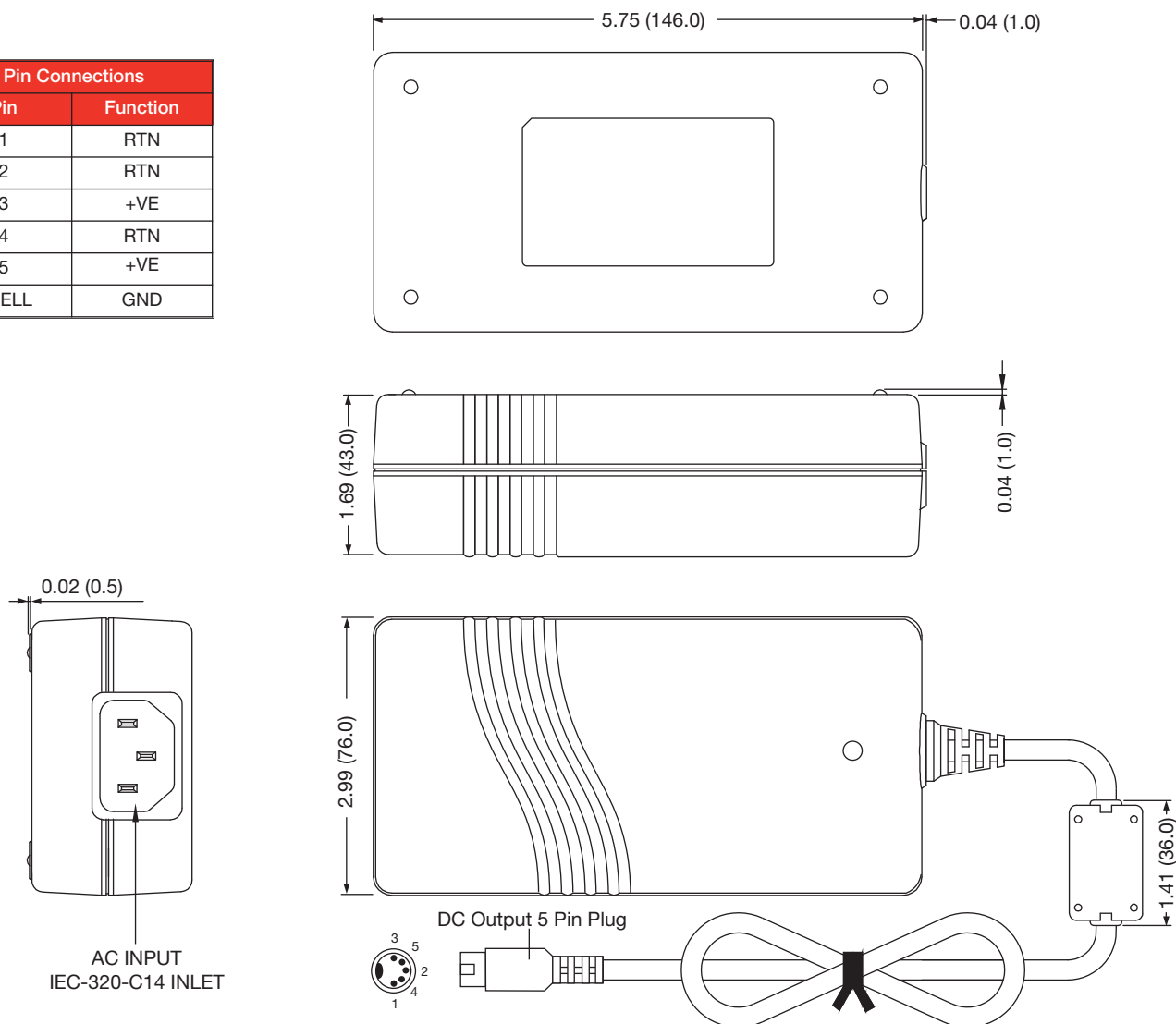
4. Minimum average of efficiencies measured at 25%, 50%, 75% & 100% load.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296.

Mechanical Details

Pin Connections	
Pin	Function
1	RTN
2	RTN
3	+VE
4	RTN
5	+VE
SHELL	GND



Notes

1. All dimensions are shown in inches (mm). Tolerance ± 0.04 (± 1.0) max.
 2. Output connector: 5 pin 180° DIN
 3. Output cable length: 48" (1220mm) approx.
 4. Weight: 1.5 lbs (700 g)
 5. For European mains lead order part: EU-MAINS-IEC.
 6. For UK mains lead order part: UK-MAINS-IEC.
 7. For US mains lead order part: US-MAINS-IEC.
 8. Mains lead length is 78" (2000 mm) approx

36–100 Watts

AEB Series



- CEC2008 & EISA2007 Compliant
- Low Profile
- Single Outputs from 5 V to 48 V
- High Power Density
- Universal Input
- China Compulsory Certification (CCC) Qualified
- 3 Year Warranty

Specification

Input

Input Voltage	• 90-264 VAC
Input Frequency	• 47-63 Hz
Input Current	• AEB36: 1.00 A max AEB45: 1.20 A max AEB70: 1.50 A max AEB100: 1.85 A max
Inrush Current	• AEB36: 60 A max at 240 VAC AEB45: 70 A max at 240 VAC AEB70: 80 A max at 240 VAC AEB100: 120 A max at 240 VAC
Power Factor	• EN61000-3-2, class A
Earth Leakage Current	• <3.5 mA (AEB45/70/100)
Input Protection	• Fitted with an internal fuse AEB36 T1A/250 VAC, AEB45/70/100 T2A/250 VAC
No Load Input Power	• <0.5 W

Output

Output Voltage	• See tables
Initial Set Accuracy	• $\pm 2\%$, set at 60% load
Minimum Load	• No minimum load required
Start Up Delay	• 3 s max
Start Up Rise Time	• 20 ms
Hold Up Time	• AEB36/45/70: 8 ms at 115 VAC AEB100: 20 ms at 115 VAC
Drift	• $\pm 0.05\%$
Line Regulation	• $\pm 1\%$
Load Regulation	• See tables
Ripple & Noise	• 1% pk-pk max, 20 MHz bandwidth, (see note 2)
Transient Response	• 5% max deviation, recovery to within 1% in 500 μ s for a 25% load change
Overvoltage Protection	• Typical 125% max, latching
Overload Protection	• Trip & restart mode (hiccup mode)
Short Circuit Protection	• Continuous
Temperature Coefficient	• $\pm 0.04\%/^{\circ}\text{C}$

General

Efficiency	• See tables
Energy Efficiency	• AEB70: Level V All other models: Level IV
Isolation	• AEB36: 3000 VAC Input to Output AEB45/70/100: 3000 VAC Input to Output, 1500 VAC Input to Ground. Negative output is connected to ground. For optional 500 VAC output to ground isolation add suffix '-F' to model number
Switching Frequency	• AEB36: 60 kHz typical, AEB45: 100 kHz typical, AEB70: 65 kHz typical, AEB100: 80 kHz typical PFC converter 45 kHz typical main converter
Power Density	• AEB36: 5.34 W/in ³ , AEB45: 3.81 W/in ³ , AEB70: 4.92 W/in ³ , AEB100: 4.45 W/in ³
MTBF	• AEB36: >360 kHrs, AEB45: >300 kHrs, AEB70: >200 kHrs, AEB100: >150 kHrs to MIL-HDBK-217F at 25 $^{\circ}\text{C}$, GB

Environmental

Operating Temperature	• AEB36/45/70: 0 $^{\circ}\text{C}$ to +60 $^{\circ}\text{C}$ derate linearly from 100% load at +40 $^{\circ}\text{C}$ to 60%, load at +60 $^{\circ}\text{C}$, AEB100: 0 $^{\circ}\text{C}$ to +60 $^{\circ}\text{C}$ derate linearly from 100% load at +40 $^{\circ}\text{C}$ to 50% load at +60 $^{\circ}\text{C}$
Storage Temperature	• -20 $^{\circ}\text{C}$ to +85 $^{\circ}\text{C}$
Operating Humidity	• 93% RH, non-condensing

EMC & Safety

Emissions	• EN55022, Level B conducted & radiated
Harmonic Currents	• EN61000-3-2 Class A
Voltage Flicker	• EN61000-3-3
ESD Immunity	• EN61000-4-2 Level 2 (contact) Perf Criteria A EN61000-4-2 Level 3 (air) Perf Criteria A
Radiated Immunity	• EN61000-4-3, 3 V/m Perf Criteria A
EFT/Burst	• EN61000-4-4, level 2 Perf Criteria A
Surge	• EN61000-4-5, installation class 3, Perf Criteria B
Conducted Immunity	• EN61000-4-6, Level 2 Perf Criteria A
Magnetic Field	• EN61000-4-8, 3 A/m Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms Perf Criteria A, B, B
Safety Approvals	• EN60950-1:2006+A11, UL/cUL60950-1, China Compulsory Certification (CCC) qualified (AEB36/70 only)

Models and Ratings

AEB36-100 

AEB36

Output Power	Output Voltage	Output Current	Load Regulation ⁽¹⁾	Efficiency ⁽³⁾	Model Number
20 W	5.0 V	4.00 A	±6%	73%	AEB36US05†^
27 W	9.0 V	3.00 A	±5%	77%	AEB36US09†^
30 W	12.0 V	2.50 A	±5%	78%	AEB36US12†^
32 W	13.5 V	2.40 A	±5%	80%	AEB36US13†^
36 W	15.0 V	2.40 A	±3%	80%	AEB36US15†^
36 W	18.0 V	2.00 A	±2%	81%	AEB36US18†^
36 W	24.0 V	1.50 A	±2%	81%	AEB36US24†^
36 W	48.0 V	0.75 A	±2%	83%	AEB36US48†^

Notes

1. Load regulation is measured from 60% to full load and from 60% to 20% load (60% ±40% full load).
2. Measured at the output connector with a 0.1 µF ceramic capacitor and a 10 µF electrolytic capacitor.
3. Minimum average of efficiencies measured at 25%, 50%, 75% & 100% load.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296.

AEB45

Output Power	Output Voltage	Output Current	Load Regulation ⁽¹⁾	Efficiency ⁽⁴⁾	Model Number ⁽³⁾
45 W	12.0 V	3.75 A	±3%	84%	AEB45US12^
45 W	15.0 V	3.00 A	±3%	85%	AEB45US15^
45 W	18.0 V	2.50 A	±2%	85%	AEB45US18^
45 W	19.0 V	2.37 A	±2%	85%	AEB45US19^
45 W	24.0 V	1.88 A	±2%	86%	AEB45US24^
48 W	48.0 V	1.00 A	±2%	87%	AEB45US48^

Notes

1. Load regulation is measured from 60% to full load and from 60% to 20% load (60% ±40% full load).
2. Measured at the output connector with a 0.1 µF ceramic capacitor and a 10 µF electrolytic capacitor.
3. For optional 500 VAC output to ground isolation add suffix '-F' to model number.
4. Minimum average of efficiencies measured at 25%, 50%, 75% & 100% load.

^ Available from Newark. See pages 291-296.

AEB70

Output Power	Output Voltage	Output Current	Load Regulation ⁽¹⁾	Efficiency ⁽⁵⁾	Model Number ⁽³⁾
66 W	12.0 V	5.50 A	±5%	82%	AEB70US12†^
69 W	15.0 V	4.60 A	±3%	84%	AEB70US15†^
70 W	18.0 V	3.90 A	±2%	84%	AEB70US18†^
72 W	19.0 V	3.70 A	±2%	84%	AEB70US19†^
72 W	24.0 V	3.00 A	±2%	85%	AEB70US24†^
72 W	48.0 V	1.50 A	±2%	87%	AEB70US48†^

Notes

1. Load regulation is measured from 60% to full load and from 60% to 20% load (60% ±40% full load).
2. Measured at the output connector with a 0.1 µF ceramic capacitor and a 10 µF electrolytic capacitor.
3. For optional 500 VAC output to ground isolation add suffix '-F' to model number.
4. Energy efficiency level V.
5. Minimum average of efficiencies measured at 25%, 50%, 75% & 100% load.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296.

AEB100

Output Power	Output Voltage	Output Current	Load Regulation ⁽¹⁾	Efficiency ⁽⁴⁾	Model Number ⁽³⁾
100 W	12.0 V	8.34 A	±4%	85%	AEB100PS12^
100 W	12.5 V	8.00 A	±4%	85%	AEB100PS125^
100 W	15.0 V	6.67 A	±4%	85%	AEB100PS15^
100 W	24.0 V	4.17 A	±2%	85%	AEB100PS24^
100 W	48.0 V	2.08 A	±2%	85%	AEB100PS48^

Notes

1. Load regulation is measured from 60% to full load and from 60% to 20% load (60% ±40% full load).
2. Measured at the output connector with a 0.1 µF ceramic capacitor and a 10 µF electrolytic capacitor.
3. For optional 500 VAC output to ground isolation add suffix '-F' to model number.
4. Minimum average of efficiencies measured at 25%, 50%, 75% & 100% load.

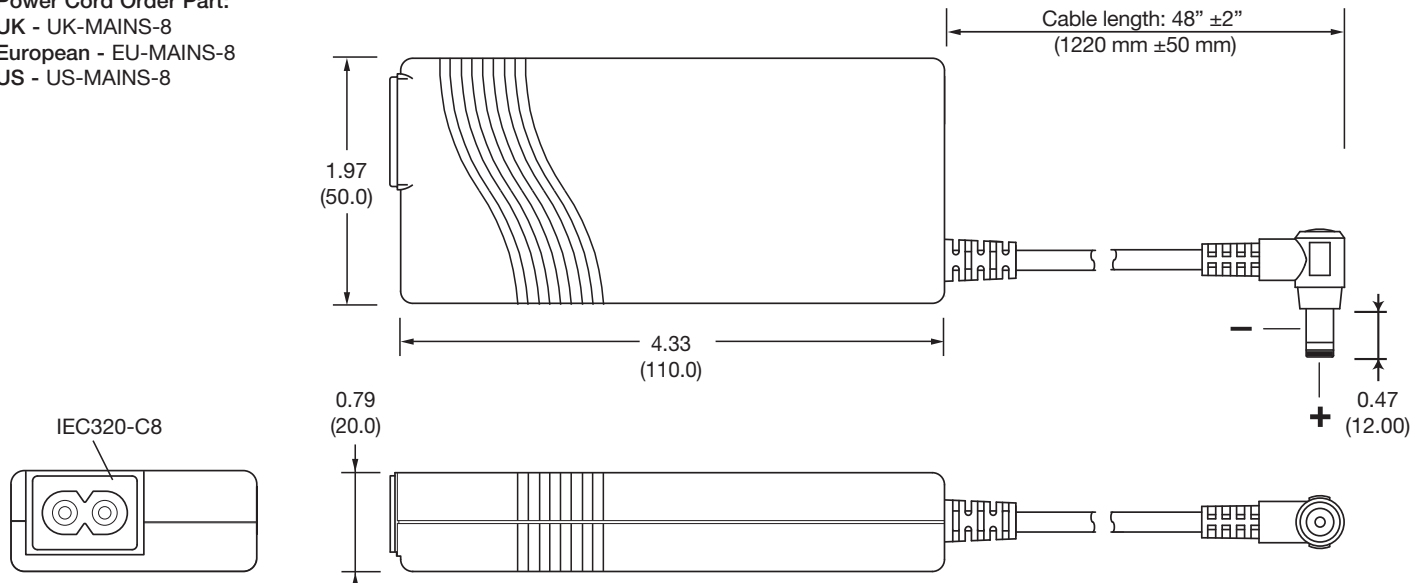
^ Available from Newark. See pages 291-296.

Mechanical Details

AEB36/45 **XP**

AEB36

Power Cord Order Part:
 UK - UK-MAINS-8
 European - EU-MAINS-8
 US - US-MAINS-8

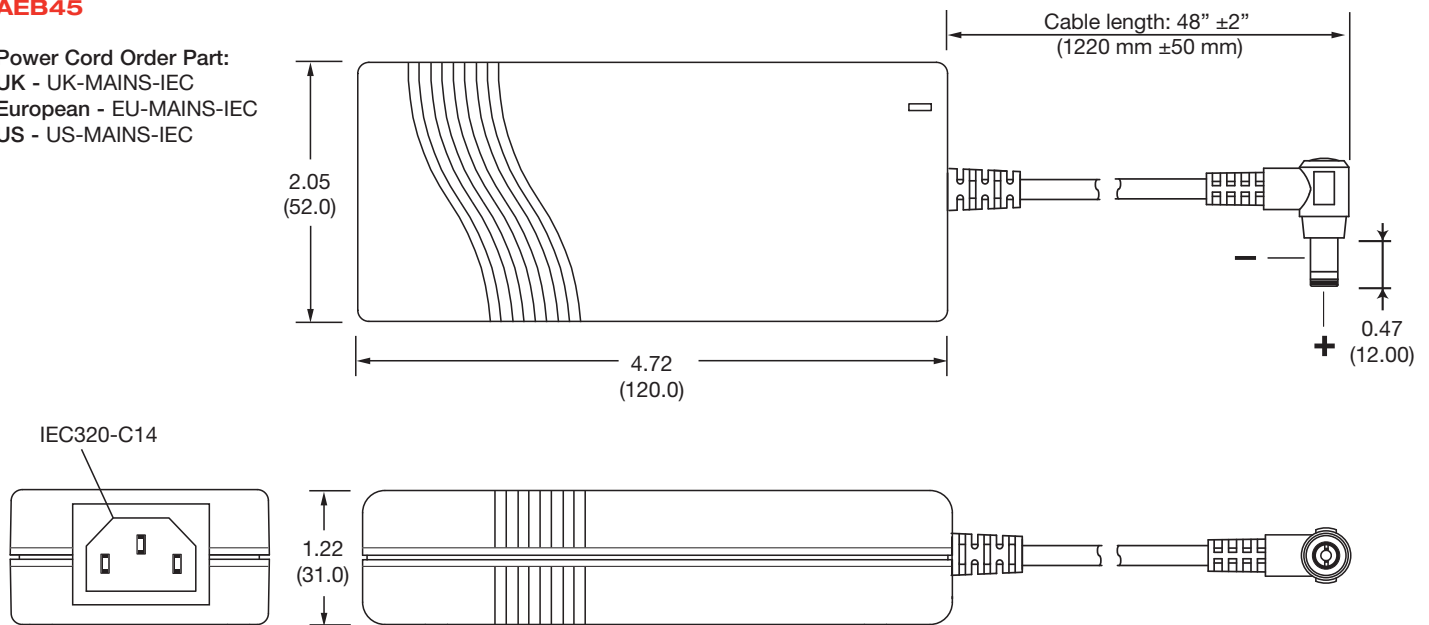


Notes

1. All dimensions shown in inches (mm).
2. Weight: 0.42 lbs (190 g) approx.
3. Tolerance is ± 0.02 (± 0.5) maximum, except output cable length.
4. Output connector is 5.5 mm dia. outer barrel, inner dia. is 2.5 mm with a center + and outer shell - polarity.
5. Optional output connectors available, contact sales for details.
6. Length of mains lead: 76 inches (1930 mm) approx

AEB45

Power Cord Order Part:
 UK - UK-MAINS-IEC
 European - EU-MAINS-IEC
 US - US-MAINS-IEC



Notes

1. All dimensions shown in inches (mm).
2. Weight: 0.62 lbs (280 g) approx.
3. Tolerance is ± 0.02 (± 0.5) maximum, except output cable length.
4. Output connector is 5.5 mm dia. outer barrel, inner dia. is 2.5 mm with a center + and outer shell - polarity.
5. Optional output connectors available, contact sales for details.
6. Length of mains lead: 76 inches (1930 mm) approx

Mechanical Details

AEB70/100 XP

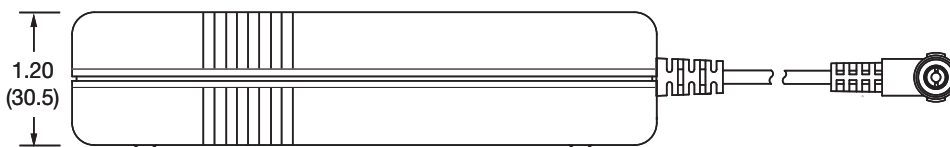
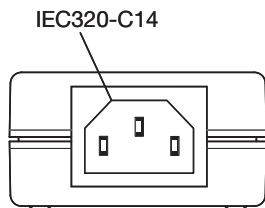
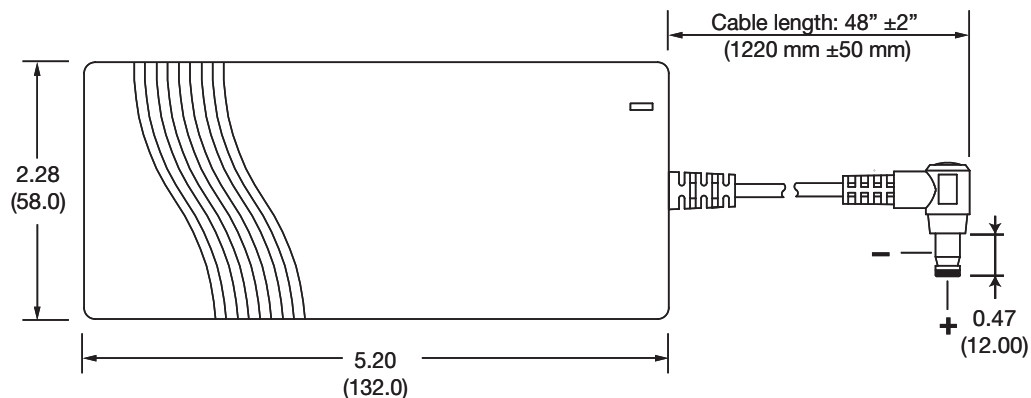
AEB70

Power Cord Order Part:

UK - UK-MAINS-IEC

European - EU-MAINS-IEC

US - US-MAINS-IEC



Notes

1. All dimensions shown in inches (mm).
2. Weight: 0.76 lbs (345 g) approx.
3. Tolerance is ± 0.02 (± 0.5) maximum, except output cable length.
4. Output connector is 5.5 mm dia. outer barrel, inner dia. is 2.5 mm with a center + and outer shell - polarity.
5. Optional output connectors available, contact sales for details.
6. Length of mains lead: 76 inches (1930 mm) approx

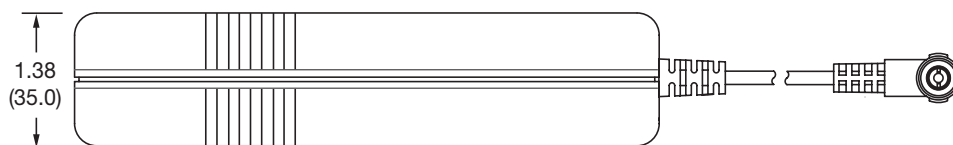
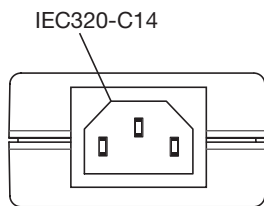
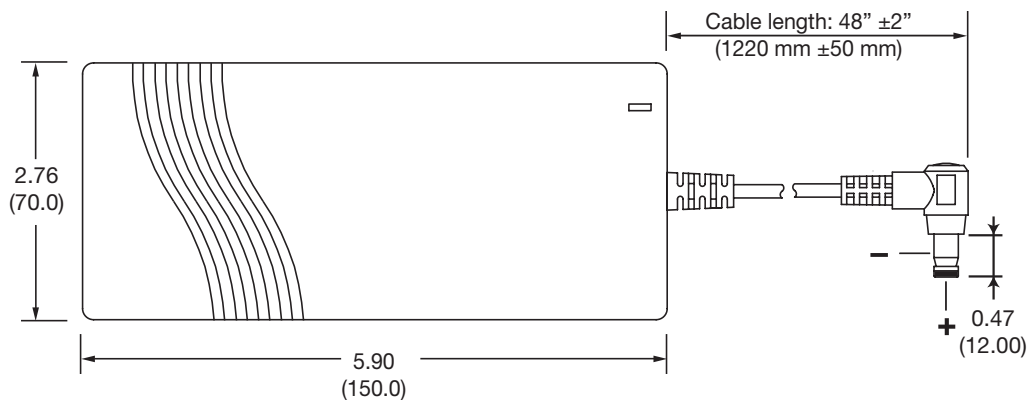
AEB100

Power Cord Order Part:

UK - UK-MAINS-IEC

European - EU-MAINS-IEC

US - US-MAINS-IEC



Notes

1. All dimensions shown in inches (mm).
2. Weight: 1.36 lbs (600 g) approx.
3. Tolerance is ± 0.02 (± 0.5) maximum, except output cable length.
4. Output connector is 5.5 mm dia. outer barrel, inner dia. is 2.5 mm with a center + and outer shell - polarity.
5. Optional output connectors available, contact sales for details.
6. Length of mains lead: 76 inches (1930 mm) approx

120 Watts

AFM Series



GREEN-POWER



- Energy Efficiency Level V
- CEC2008 & EISA2007 Compliant
- IT & Medical Approvals
- High Efficiency
- 0 °C to +70 °C Operating Temperature
- Optional IEC320-C6 Inlet
- 3 Year Warranty

Specification

Input

Input Voltage	• 90-264 VAC
Input Frequency	• 47-63 Hz
Input Current	• 2.0 A rms at 115 VAC, 1.0 A rms at 230 VAC
Inrush Current	• 40 A at 115 VAC, 60 A at 230 VAC, cold start +25 °C
Power Factor	• >0.9
Earth Leakage Current	• 250 µA max at 264 VAC
No Load Input Power	• <0.5 W

Output

Output Voltage	• See table
Output Voltage Trim	• Not user-adjustable
Initial Set Accuracy	• ±2%
Minimum Load	• No minimum load required
Start Up Delay	• 3 s max at 115 VAC
Hold Up Time	• 8 ms minimum at 115 VAC
Line Regulation	• ±1.0% maximum
Load Regulation	• See table
Transient Response	• 4% max. deviation, recovery to within 1% in 500 µs for a 25% load change
Ripple & Noise	• 1% max pk-pk (see note 1)
Overvoltage Protection	• 110-140% Vnom, recycle input to reset
Overtemperature Protection	• Unit shuts down, recycle input to reset
Overload Protection	• 110-150%, auto recovery
Short Circuit Protection	• Output shuts down, recycle input to reset
Temperature Coefficient	• 0.04%/°C

General

Efficiency	• >87%
Energy Efficiency	• Level V
Isolation	• 4000 VAC Input to Output 1500 VAC Input to Ground Output 0 V is electrically connected to Input Ground
Switching Frequency	• 65 kHz - 100 kHz variable
Power Density	• 4.5 W/In ³
MTBF	• >100 kHrs per MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Temperature	• 0 °C to +70 °C, derate from 100% power at +40 °C to 60% power at +70 °C
Operating Humidity	• 10-95% RH, non-condensing
Storage Temperature	• -40 °C to +80 °C
Operating Altitude	• 3000 m
Shock	• 30 g, 10 ms on 3 axes
Vibration	• 5-100 Hz, 2.31 m/s ² , 20 mins, 3 axes

EMC & Safety

Emissions	• EN55011/22/FCC/Class B conducted EN55011/22/FCC/Class B radiated
Harmonic Currents	• EN61000-3-2, Class A
Voltage Flicker	• EN61000-3-3
ESD Immunity	• EN61000-4-2, 4 kV contact and 8 kV air discharge
Radiated Immunity	• EN61000-4-3, 3 V/m Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3 Perf Criteria A
Surge	• EN61000-4-5, installation Class 3 Perf Criteria A
Conducted Immunity	• EN61000-4-6, 3 Vrms Perf Criteria A
Magnetic Field	• EN61000-4-3, 3 A/m, Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms, Perf Criteria A, B, B EN60601-1-2, 30% 500 ms, 60% 100 ms, 100% 10 ms, 100% 5000 ms, Perf A, A, A, B
Safety Approvals	• EN60950-1, UL60950-1, IEC60950-1 EN60601-1, UL60601-1, IEC60601-1

Models and Ratings

AFM120 **XP**

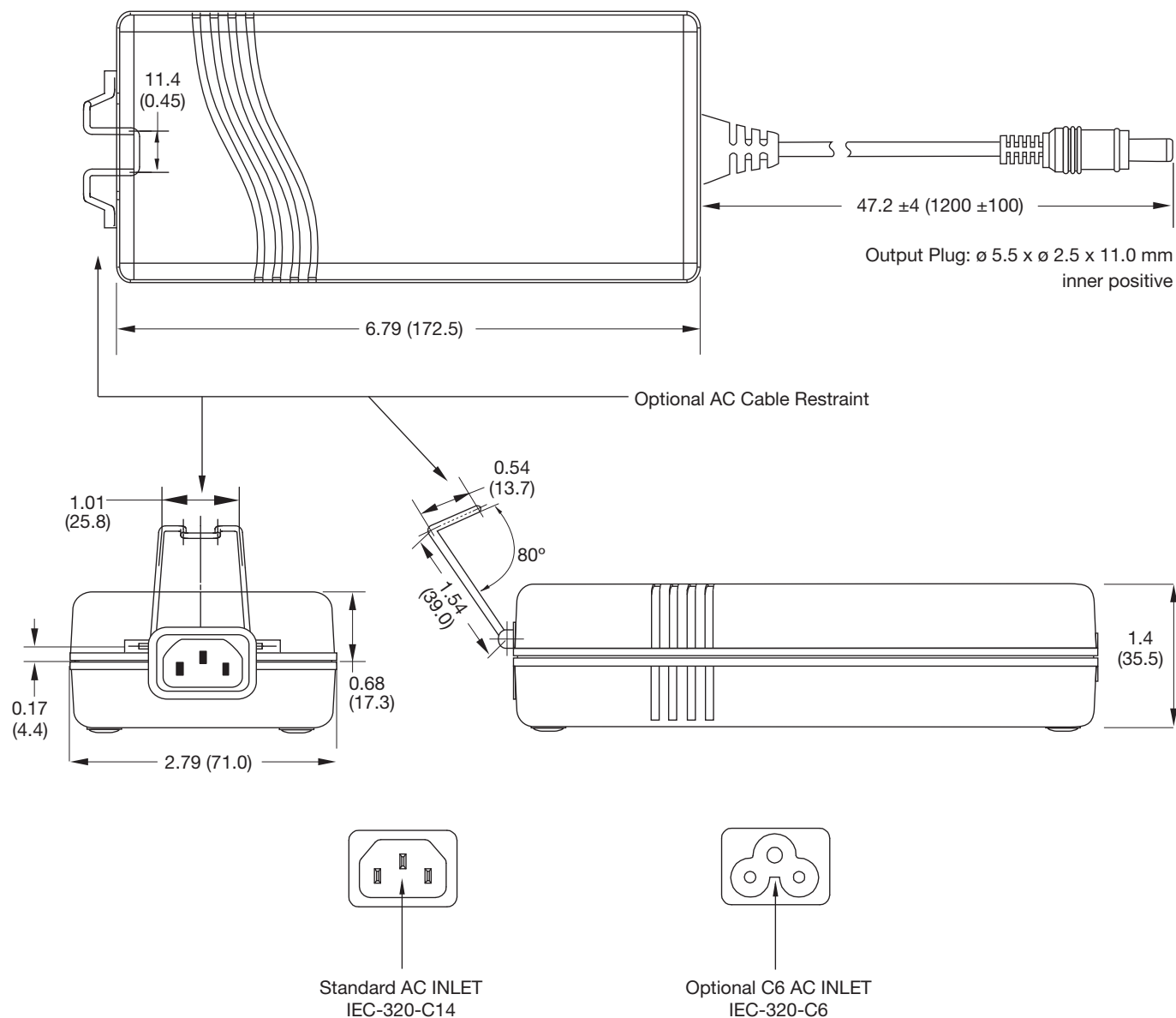
Output Power	Output Voltage ⁽⁴⁾	Output Current	Total Regulation ⁽²⁾	Model Number ^(3,5)
100 W	12.0 V	8.30 A	5%	AFM120PS12
100 W	15.0 V	6.66 A	5%	AFM120PS15
100 W	18.0 V	5.55 A	5%	AFM120PS18
120 W	24.0 V	5.00 A	5%	AFM120PS24
120 W	48.0 V	2.50 A	5%	AFM120PS48

Notes

1. Ripple and noise measured at 20 MHz bandwidth with a 10 μ F tantalum and 0.1 μ F ceramic cap connected at the measurement point.
2. Total regulation includes initial set accuracy, line and load regulation.
3. For alternative IEC320-C6 inlet, add suffix C6 to model number eg. AFM120PS24C6.
4. Other output voltages are available, contact sales for details.

5. For optional AC cable restraint on the standard input version, add suffix 'A' to the model number e.g. AFM120PS24A. AC mains lead must be Interpower Corporation, part number 70006020300. Optional AC cable restraint is not available on IEC320-C6 inlet.
6. Minimum average of efficiencies measured at 25%, 50%, 75% & 100% load.

Mechanical Details



Notes

1. Dimensions shown in inches (mm). Tolerance is 0.02 (0.5) maximum, except output cable length.
2. Weight: 1.57 lb (680 g) approx.

3. Case material is PC Class 94 V-0.
4. Output Lead: UL1185, 14 AWG

AHM Series



GREEN•POWER

- IT & Medical Approvals
- Energy Efficiency Level V, CEC2008 & EISA 2007
- <0.5 W No Load Input Power
- Class I (and Class II Models 85 W & 100 W)
- Very High Efficiency
- IPX1 Environmental Rating
- 3 Year Warranty

Specification

Input

Input Voltage	• 90-264 VAC (250 W models - see derating curve)
Input Frequency	• 47-63 Hz
Input Current	• 85 W: 0.8 A at 115 VAC, 0.4 A 100 W: 1.0 A at 115 VAC, 0.5 A 150 W: 1.5 A at 115 VAC, 0.75 A 180 W: 1.7 A at 115 VAC, 0.9 A 250 W: 2.3 A at 115 VAC, 0.9 A at 230 VAC
Inrush Current	• 70 A typical, 120 A max at 230 VAC, cold start at 25 °C
Power Factor	• >0.9 at 115 VAC, 60 Hz at 250 VAC
Earth Leakage Current	• 85 W: 70 µA typical, 180 µA max 100 W: 70 µA typical, 180 µA max 150 W: 80 µA typical, 200 µA max 180 W: 80 µA typical, 200 µA max 250 W: 80 µA typical, 200 µA max at 264 VAC/60 Hz
Input Protection	• 85 W: Internal T2.5 A/250 V 100 W: Internal T2.5 A/250 V 150 W: Internal T4.0 A/250 V 180 W: Internal T4.0 A/250 V 250 W: Internal T6.3 A/250 V fuse in line and neutral
No Load Input Power	• <0.5 W

Output

Output Voltage	• See tables
Output Voltage Trim	• Not user-adjustable
Minimum Load	• No minimum load required
Start Up Delay	• 100-300 ms typical, model dependant ⁽¹⁾
Hold Up Time	• 20 ms typical
Line Regulation	• ±1.5% maximum
Load Regulation	• ±3.0% maximum
Transient Response	• 5% max. deviation, recovery to within 1% in 500 µs for a 25% load change
Ripple & Noise	• Typically less than 1%, 1.5% max pk-pk ⁽²⁾
Overvoltage Protection	• 125% typical, Recycle input to reset
Overtemperature Protection	• Unit shuts down, auto recovery
Overload Protection	• 115-175%, auto recovery
Short Circuit Protection	• Trip and restart (hiccup mode)
Temperature Coefficient	• 0.05 %/°C

General

Efficiency	• 92% typical
Energy Efficiency	• Level V
Isolation	• 4000 VAC Input to Output 1500 VAC Input to Ground (Class I only) 500 VAC Output to Ground (Class I only)
Switching Frequency	• 45-200 KHz variable
Power Density	• 4.4-5.7 W/in ³
MTBF	• 153 kHrs typical to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Temperature	• 0 °C to +60 °C, derate linearly from 100% power at +40 °C to 60% power at +60 °C
Cooling	• Convection-cooled
Operating Humidity	• 5-95% RH, non-condensing
Storage Temperature	• -40 °C to +85 °C
Operating Altitude	• 3000 m
Shock	• 3 x 30 g/11 ms shocks in both +ve & -ve directions along the 3 orthogonal axis, total 18 shocks.
Vibration	• Three axis 5-500 Hz at 2 g x 10 sweeps

EMC & Safety

Emissions	• EN55011/22, class B conducted EN55011/22, class B radiated
Harmonic Currents	• EN61000-3-2, class A
Voltage Flicker	• EN61000-3-3
ESD Immunity	• EN61000-4-2, level 3, Perf Criteria A
Radiated Immunity	• EN61000-4-3, level 3, Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3, Perf Criteria A
Surge	• EN61000-4-5, installation class 3, Perf Criteria A
Conducted Immunity	• EN61000-4-6, level 3, Perf Criteria A
Magnetic Field	• EN61000-4-8, level 3, Perf Criteria A
Dips & Interruptions	• EN61000-4-11, EN60601-1-2
Safety Approvals	• EN60601-1, UL60601-1, CSA22.2 No. 601-1 per cUL, EN60950, UL60950

Notes

1. See longform datasheet for further information.
2. Measured at the end of the output cable with 10 µF electrolytic and 0.1 µF ceramic capacitor.

Models and Ratings

AHM85 XP

Output Power	Output Voltage	Output Current	Model Number ⁽¹⁾
85 W	12.0 VDC	7.08 A	AHM85PS12†^
85 W	15.0 VDC	5.67 A	AHM85PS15†^
85 W	19.0 VDC	4.47 A	AHM85PS19†^
85 W	24.0 VDC	3.54 A	AHM85PS24†^
85 W	12.0 VDC	7.08 A	AHM85PS12C2
85 W	15.0 VDC	5.67 A	AHM85PS15C2
85 W	19.0 VDC	4.47 A	AHM85PS19C2
85 W	24.0 VDC	3.54 A	AHM85PS24C2

Notes

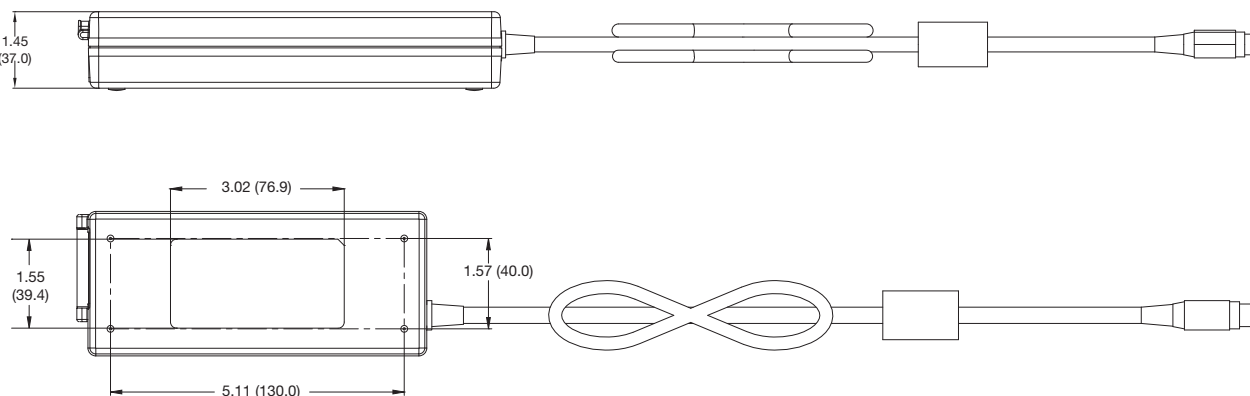
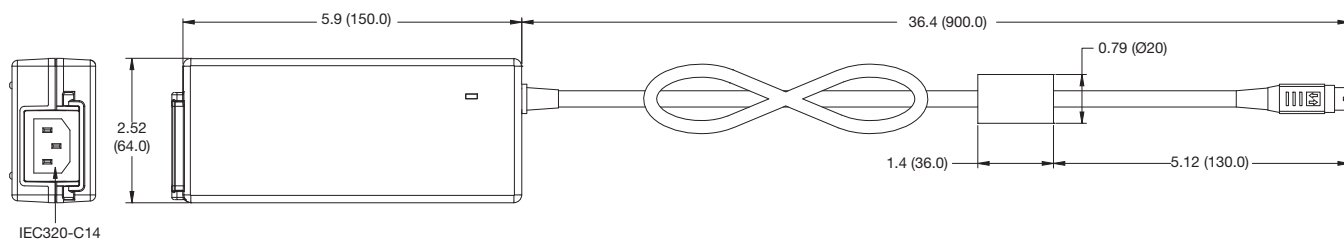
1. Models with suffix 'C2' have a Class II equipment protection classification.
 2. For IEC320-C8 input connector with Class II models, add suffix '-8' to the model number, e.g. AHM85PS24C2-8.

† Available from Farnell & element14. See pages 284-290.

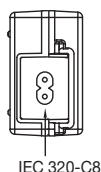
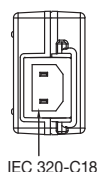
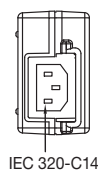
3. For optional input connector retention clip, add suffix '-A' to the model number e.g. AHM85PS24C2-A.

^ Available from Newark. See pages 291-296.

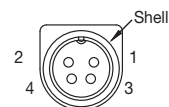
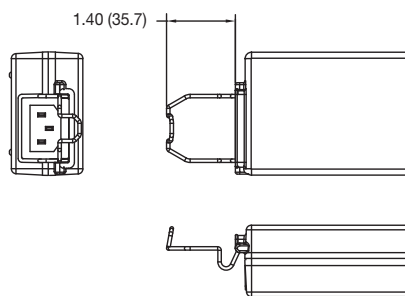
Mechanical Details



Standard (Class I) C2 Models (Class II) C2-8 Models (Class II)



Optional Input Connector Retention (-A)



Output Connector equivalent to KPPX-4P (Non Locking)

Pin 1	Output +
Pin 2	Output +
Pin 3	Return
Pin 4	Return
Outer Shell	GND
Outer Shell C2 Models	Floating

Notes

1. Tolerance is 0.02 (0.5) maximum, except output cable length.
 2. Weight 0.9 lbs (400 g).

3. Dimensions shown in inches (mm).

Models and Ratings

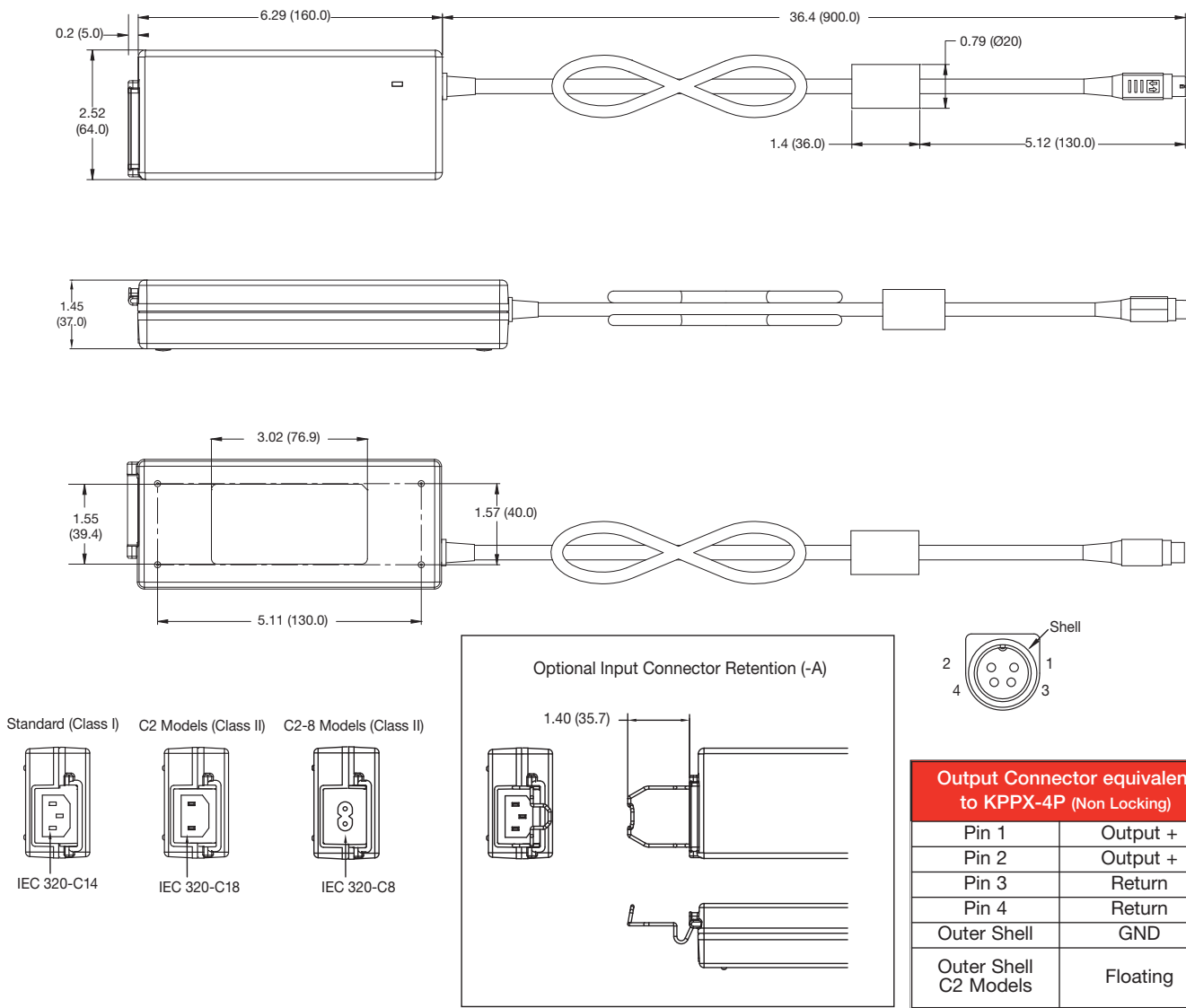
Output Power	Output Voltage	Output Current	Model Number ⁽¹⁾
100 W	12.0 VDC	8.33 A	AHM100PS12†^
100 W	15.0 VDC	6.67 A	AHM100PS15†^
100 W	19.0 VDC	5.26 A	AHM100PS19†^
100 W	24.0 VDC	4.16 A	AHM100PS24†^
100 W	48.0 VDC	2.08 A	AHM100PS48†^
100 W	12.0 VDC	8.33 A	AHM100PS12C2
100 W	15.0 VDC	6.67 A	AHM100PS15C2
100 W	19.0 VDC	5.26 A	AHM100PS19C2
100 W	24.0 VDC	4.16 A	AHM100PS24C2
100 W	48.0 VDC	2.08 A	AHM100PS48C2

Notes

- Models with suffix 'C2' have a class II equipment protection classification.
- For IEC320-C8 input connector with class II models, add suffix '-8' to the model number, e.g. AHM100PS24C2-8.
- For optional input connector retention clip, add suffix '-A' to the model number e.g. AHM100PS24C2-A.

† Available from Farnell & element14. See pages 284-290. ^ Available from Newark. See pages 291-296.

Mechanical Details



Notes

- Tolerance is 0.02 (0.5) maximum, except output cable length.
- Weight 1.1 lbs (500 g).
- Dimensions shown in inches (mm).

Models and Ratings

AHM150 XP

Output Power	Output Voltage	Output Current	Model Number ⁽¹⁾
150 W	12.0 VDC	12.50 A	AHM150PS12†^
150 W	15.0 VDC	10.00 A	AHM150PS15†^
150 W	19.0 VDC	7.89 A	AHM150PS19†^
150 W	24.0 VDC	6.25 A	AHM150PS24†^
150 W	48.0 VDC	3.13 A	AHM150PS48†^

Notes

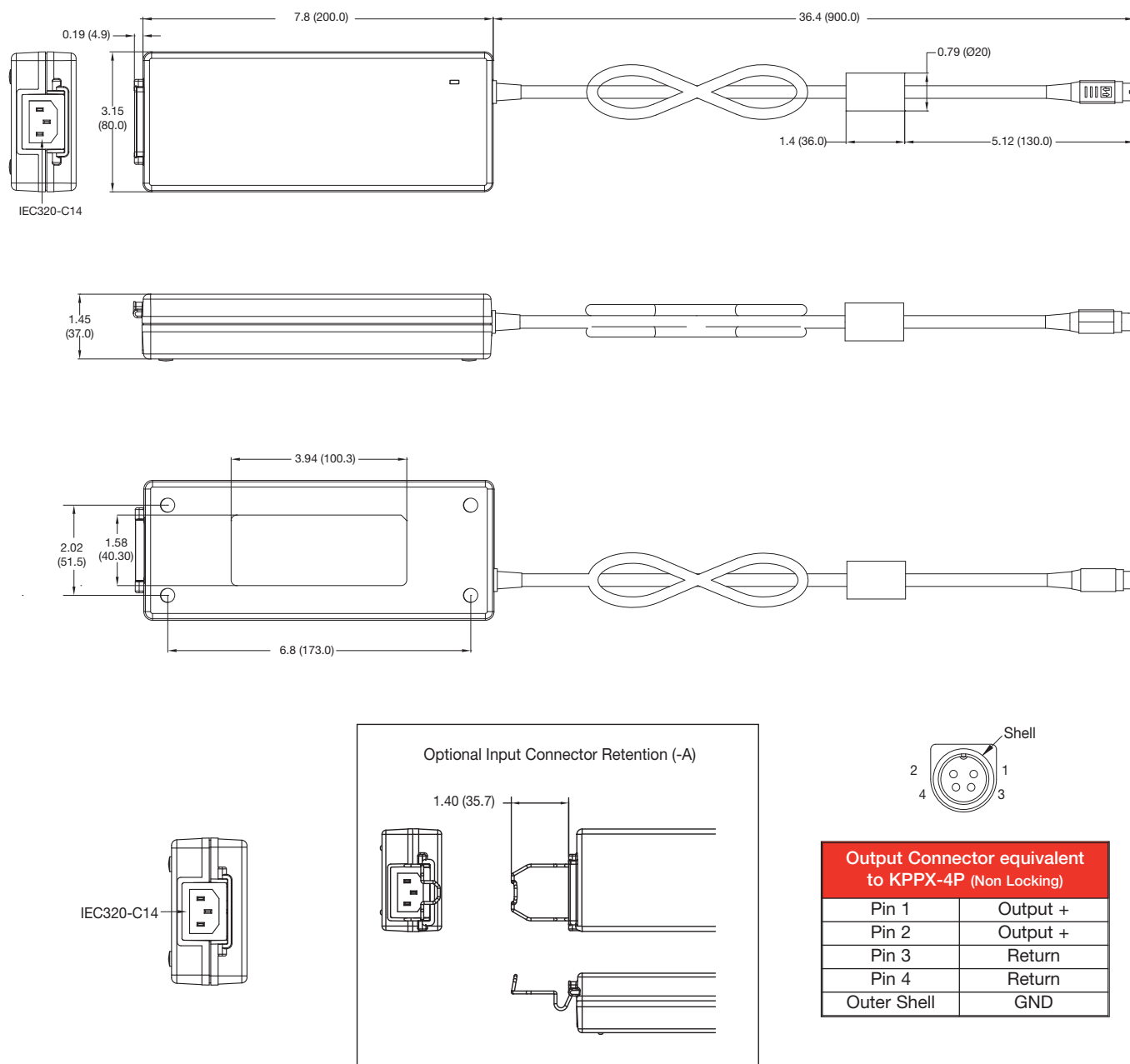
1. For optional input connector retention clip, add suffix '-A' to the model number e.g. AHM150PS24-A.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296.

Mechanical Details

Dimensions shown in inches (mm).

**Notes**

1. Tolerance is 0.02 (0.5) maximum, except output cable length.

2. Weight 1.3 lbs (600 g).

Models and Ratings

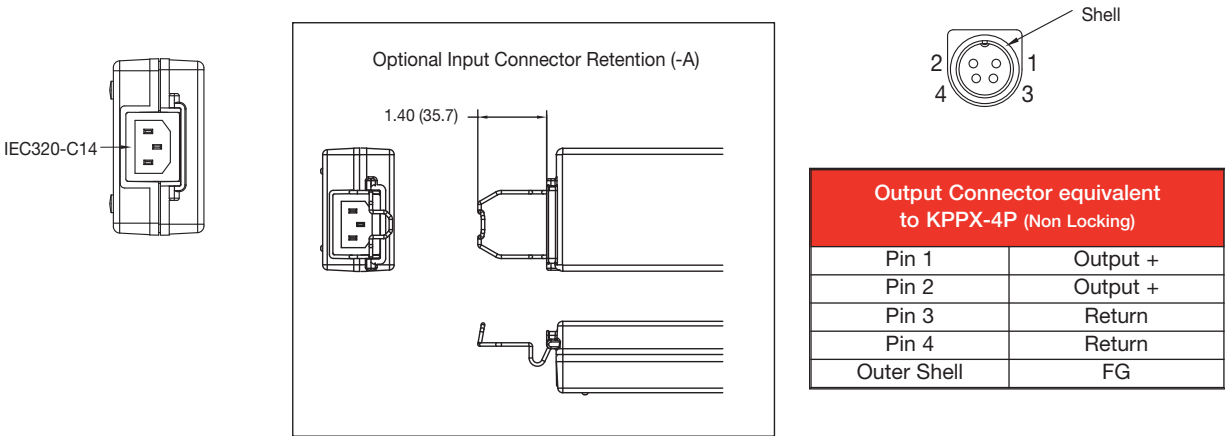
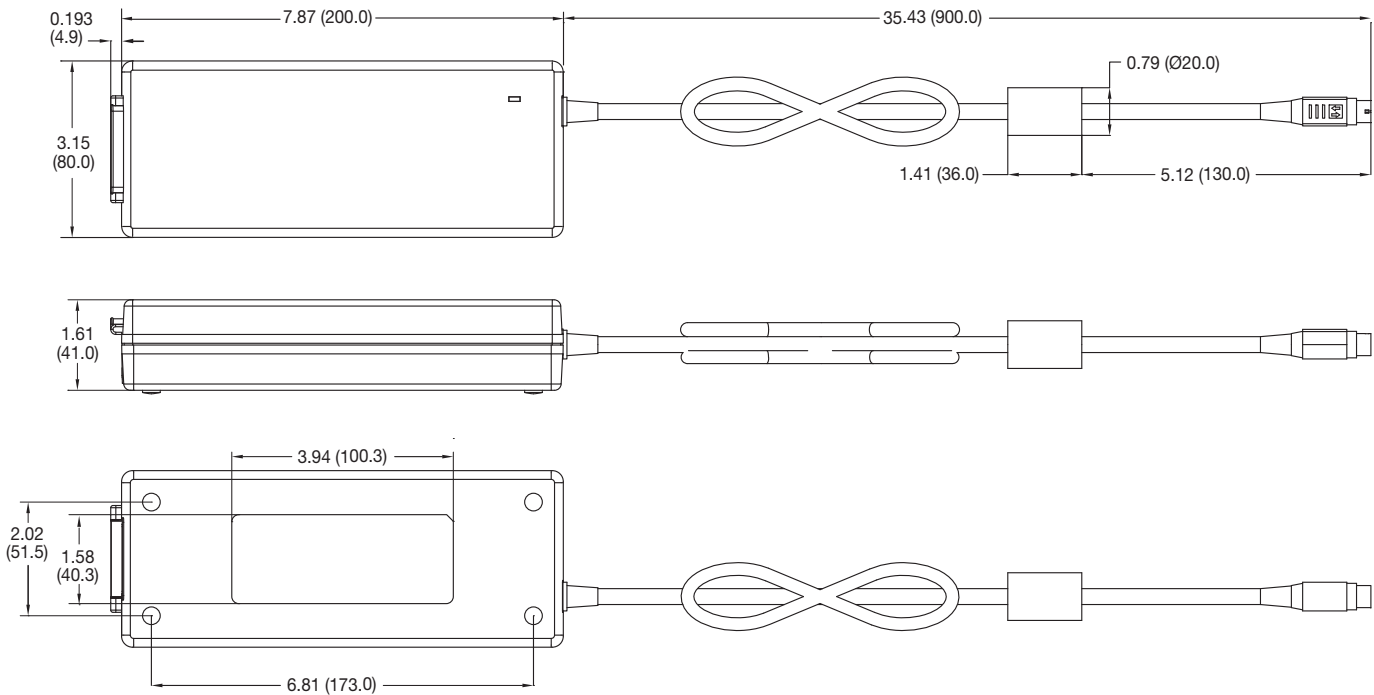
Output Power	Output Voltage	Output Current	Model Number
165 W	12.0 VDC	13.50 A	AHM180PS12†^
180 W	15.0 VDC	12.00 A	AHM180PS15†^
180 W	19.0 VDC	9.47 A	AHM180PS19†^
180 W	24.0 VDC	7.50 A	AHM180PS24†^
180 W	48.0 VDC	3.75 A	AHM180PS48†^

Notes

1. For optional input connector retention clip, add suffix '-A' to the model number e.g. AHM180PS24-A.
- † Available from Farnell & element14. See pages 284-290.
- ^ Available from Newark. See pages 291-296.

Mechanical Details

Dimensions shown in inches (mm).



Notes

1. Dimensions shown in inches (mm). Tolerance is 0.02 (0.5) maximum, except output cable length.
2. Weight 1.4 lbs (620 g)

Models and Ratings

AHM250 **XP**

Output Power	Output Voltage	Output Current	Model Number
210 W	12.0 VDC	17.50 A	AHM250PS12†^
220 W	15.0 VDC	14.66 A	AHM250PS15†^
240 W	19.0 VDC	12.63 A	AHM250PS19†^
250 W	24.0 VDC	10.41 A	AHM250PS24†^
250 W	48.0 VDC	5.21 A	AHM250PS48†^

Notes

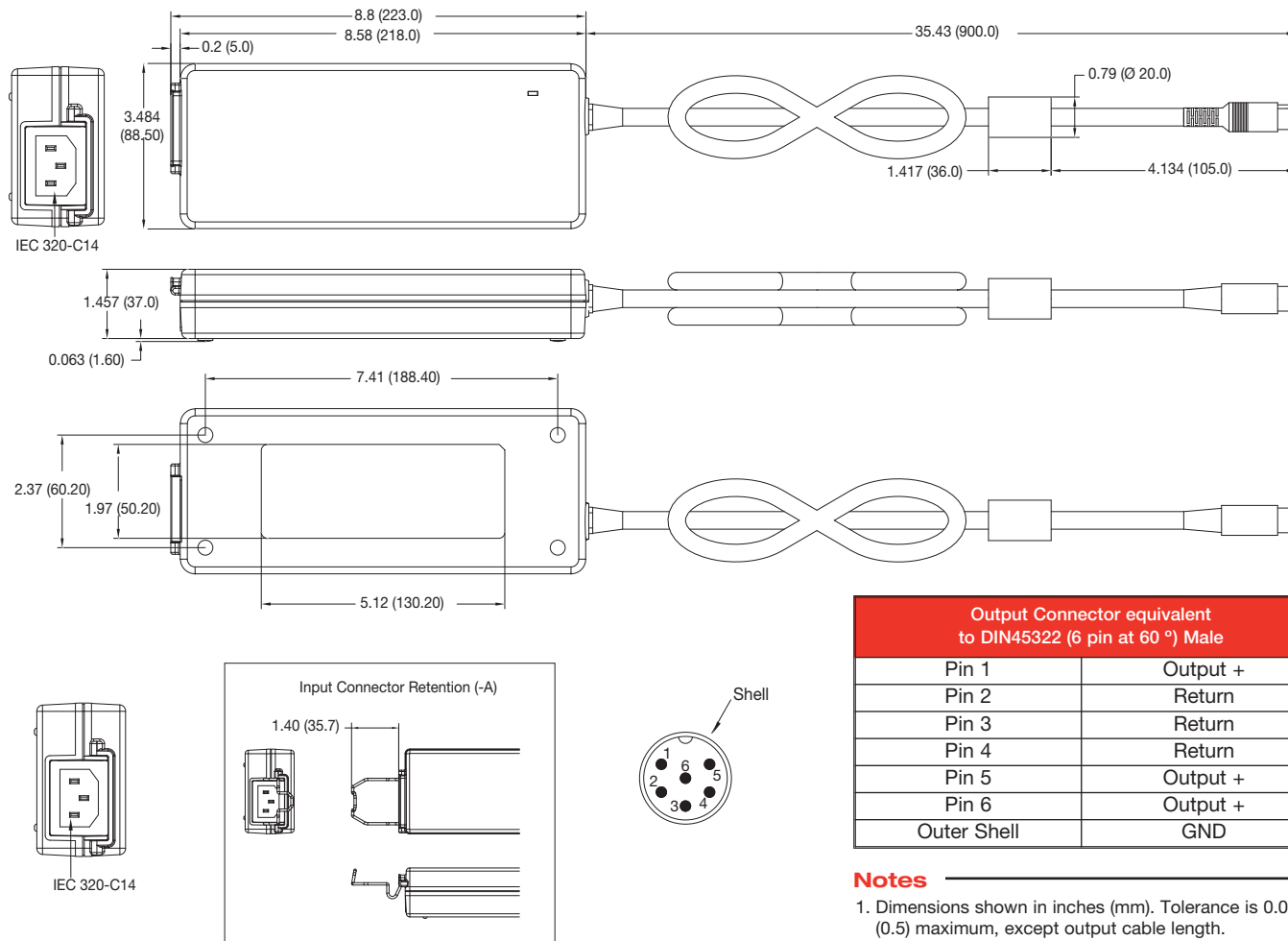
1. For optional input connector retention clip, add suffix '-A' to the model number e.g. AHM250PS24-A.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296.

Mechanical Details

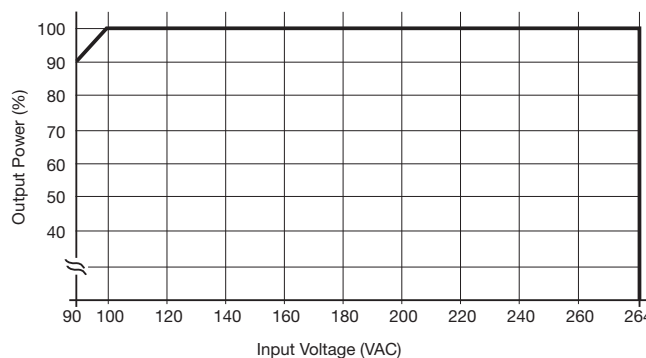
Dimensions shown in inches (mm).



Notes

- Dimensions shown in inches (mm). Tolerance is 0.02 (0.5) maximum, except output cable length.
- Weight 2.2 lbs (1000 g).

Derating Curve - AHM250 only



0.25 Watt

IK Series



- Single Output
- SIP or DIP Package
- 1000 VDC Isolation
- Optional 3000 VDC Isolation
- Small Package Sizes
- -40 °C to +85 °C Operation
- 3 Year Warranty

Specification

Input

- Input Voltage Range • Nominal $\pm 10\%$
- Input Reflected Ripple Current • 20 mA pk-pk through 12 μ H inductor 5Hz to 20 MHz
- Input Reverse Voltage Protection • None

Output

- Output Voltage • See table
- Minimum Load • None⁽⁴⁾
- Line Regulation • 1.2%/1% ΔV_{in}
- Load Regulation • 10% 20-100% load change (3.3 V models $\pm 20\%$)
- Setpoint Accuracy • $\pm 3\%$
- Ripple & Noise • 100 mV pk-pk max, 20 MHz bandwidth
- Temperature Coefficient • 0.02%/°C
- Maximum Capacitive Load • 100 μ F

General

- Efficiency • See table
- Isolation Voltage • 1000 VDC minimum⁽²⁾
- Isolation Resistance • $10^9 \Omega$
- Isolation Capacitance • 60 pF typical
- Switching Frequency • Variable, 80 KHz typical
- MTBF • >1.1 Mhrs to MIL-HDBK-217F at 25 °C, GB

Environmental

- Operating Temperature • -40 °C to +85 °C
- Storage Temperature • -40 °C to +125 °C
- Case Temperature • 100 °C max
- Cooling • Convection-cooled

Notes

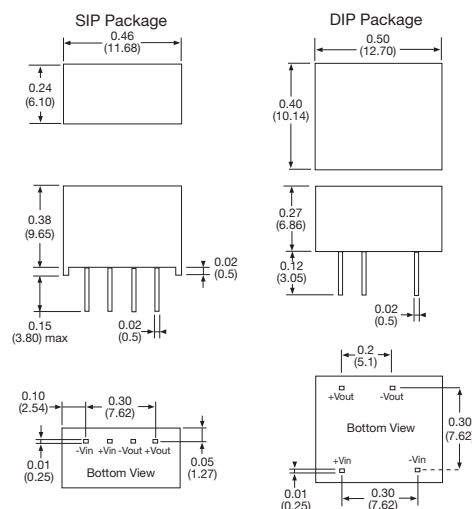
- For DIP package, replace 'S' in model number with 'D'.
- Add suffix '-H' to model number for 3000 VDC isolation.
- 48 V input not available with DIP package.
- Operation at no load will not damage unit but it may not meet all specifications.
- All dimensions in inches (mm).
- Pin pitch tolerance: ± 0.014 (± 0.35)
- Case tolerance: ± 0.02 (± 0.5)
- Weight: SIP 0.003 lbs (1.4 g), DIP 0.004 lbs (1.8 g)

Input Voltage	No Load Input Current	Output Voltage	Output Current	Efficiency	Model Number ^(1,2)
5 VDC	20 mA	3.3 V	75.70 mA	66%	IK0503SA [†] [^]
	20 mA	5.0 V	50.00 mA	66%	IK0505SA [†] [^]
	20 mA	7.2 V	34.72 mA	66%	IK0507SA
	20 mA	9.0 V	27.77 mA	68%	IK0509SA
	20 mA	12.0 V	20.83 mA	68%	IK0512SA [†] [^]
	20 mA	15.0 V	16.67 mA	68%	IK0515SA [†] [^]
	20 mA	18.0 V	13.88 mA	68%	IK0518SA
	20 mA	24.0 V	10.41 mA	70%	IK0524SA [†] [^]
12 VDC	15 mA	3.3 V	75.70 mA	65%	IK1203SA [†] [^]
	15 mA	5.0 V	50.00 mA	65%	IK1205SA [†] [^]
	15 mA	7.2 V	34.72 mA	68%	IK1207SA
	15 mA	9.0 V	27.77 mA	64%	IK1209SA
	15 mA	12.0 V	20.83 mA	62%	IK1212SA [†] [^]
	15 mA	15.0 V	16.67 mA	67%	IK1215SA [†] [^]
	15 mA	18.0 V	13.88 mA	67%	IK1218SA
	15 mA	24.0 V	10.41 mA	54%	IK1224SA [†] [^]
24 VDC	8 mA	3.3 V	75.70 mA	60%	IK2403SA
	8 mA	5.0 V	50.00 mA	62%	IK2405SA
	8 mA	7.2 V	34.72 mA	61%	IK2407SA
	8 mA	9.0 V	27.77 mA	62%	IK2409SA
	8 mA	12.0 V	20.83 mA	56%	IK2412SA
	8 mA	15.0 V	16.67 mA	56%	IK2415SA
	8 mA	18.0 V	13.88 mA	55%	IK2418SA
	8 mA	24.0 V	10.41 mA	59%	IK2424SA
48 VDC ⁽³⁾	5 mA	3.3 V	75.70 mA	55%	IK4803SA
	5 mA	5.0 V	50.00 mA	57%	IK4805SA
	5 mA	7.2 V	34.72 mA	57%	IK4807SA
	5 mA	9.0 V	27.77 mA	57%	IK4809SA
	5 mA	12.0 V	20.83 mA	53%	IK4812SA
	5 mA	15.0 V	16.67 mA	53%	IK4815SA
	5 mA	18.0 V	13.88 mA	53%	IK4818SA
	5 mA	24.0 V	10.41 mA	50%	IK4824SA

[†] Available from Farnell & element14. See pages 284-290.

[^] Available from Newark. See pages 291-296.

Mechanical Details



0.5–1 Amps SR Series



- 3 Pin SIP 3T Switching Regulator
- Wide Input Range
- Continuous Short-circuit Protection
- Pin Compatible with LM78MXX
- Efficiency up to 97%
- -40 °C to +85 °C Operating Temperature
- 3 Year Warranty

Specification

Input

- Input Voltage Range • See table
- Input Current • See table
- Input Reflected Ripple • SR05: 35 mA pk-pk, SR10: 40 mA pk-pk, through 12 μ H inductor, 5 Hz to 20 MHz
- Input Filter • External capacitor (see application notes)

Output

- Output Voltage • See table
- Minimum Load • No minimum load required
- Line Regulation • $\pm 0.5\%$ max
- Load Regulation • $\pm 0.6\%$ from 10% to 100% load
- Setpoint Accuracy • $\pm 2\%$
- Turn-on Time • See note 6
- Ripple & Noise • 60 mV pk-pk with 10% minimum load, 20 MHz bandwidth
- Maximum Capacitive Load • 220 μ F
- Short Circuit Protection • Indefinite (automatic recovery)
- Temperature Coefficient • 0.02%/°C

General

- Efficiency • See table
- Isolation Voltage • Non-isolated
- Switching Frequency • 330 kHz typical
- Package Style • 3 pin SIP
- MTBF • >4.5 Mhrs to MIL-HDBK-217F at 25 °C, GB

Environmental

- Operating Temperature • SR05: -40 °C to +85 °C, SR10: -40 °C to +60 °C,
- Operating Humidity • 95% RH
- Case Temperature • +100 °C max
- Storage Temperature • -40 °C to +125 °C
- Cooling • Convection-cooled

Notes

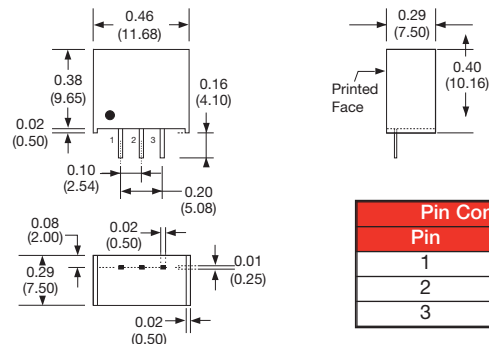
1. All dimensions in inches (mm)
2. Weight: 0.004 lbs (1.8 g)
3. Pin pitch tolerance: ± 0.014 (± 0.35)
4. Case tolerance: ± 0.02 (± 0.5)
5. Efficiency range given for maximum V_{in} to minimum V_{in}
6. For maximum reliability, ensure turn on time is >1 ms by placing a 47 μ F capacitor between +Vin and GND

Input Voltage	No Load Input Current	Output Voltage	Output Current	Efficiency [†]	Model Number
4.75-34 VDC	10 mA	1.5 V	500 mA	64-79%	SR05S1V5 ^{†^}
4.75-34 VDC	10 mA	1.8 V	500 mA	66-82%	SR05S1V8 ^{†^}
4.75-34 VDC	10 mA	2.5 V	500 mA	72-87%	SR05S2V5 ^{†^}
4.75-34 VDC	10 mA	3.3 V	500 mA	77-91%	SR05S3V3 ^{†^}
6.50-34 VDC	10 mA	5.0 V	500 mA	83-94%	SR05S05 ^{†^}
8.00-34 VDC	10 mA	6.5 V	500 mA	85-95%	SR05S6V5 ^{†^}
9.00-34 VDC	10 mA	7.2 V	500 mA	86-95%	SR05S7V2 ^{†^}
11.00-34 VDC	10 mA	9.0 V	500 mA	88-96%	SR05S09 ^{†^}
15.00-34 VDC	10 mA	12.0 V	500 mA	91-96%	SR05S12 ^{†^}
18.00-34 VDC	10 mA	15.0 V	500 mA	92-97%	SR05S15 ^{†^}
4.75-18 VDC	15 mA	1.5 V	1000 mA	71-78%	SR10S1V5 ^{†^}
4.75-18 VDC	15 mA	1.8 V	1000 mA	75-82%	SR10S1V8 ^{†^}
4.75-18 VDC	15 mA	2.5 V	1000 mA	80-87%	SR10S2V5 ^{†^}
4.75-18 VDC	15 mA	3.3 V	1000 mA	83-90%	SR10S3V3 ^{†^}
6.50-18 VDC	15 mA	5.0 V	1000 mA	88-93%	SR10S05 ^{†^}

[†] Available from Farnell & element14. See pages 284-290.

[^] Available from Newark. See pages 291-296.

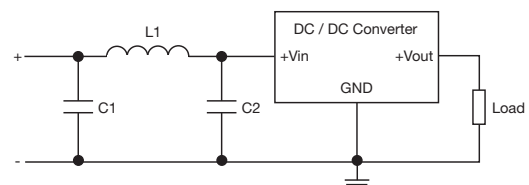
Mechanical Details



Pin Connections	
Pin	Function
1	+Vin
2	GND
3	+Vout

Application Notes

Input Filter to meet Class B Conducted Emissions



C1	L1	C2
470 μ F, 35 V	6.4 μ H	470 μ F, 35 V

1 Watt IA Series



- Dual Output
- SIP or DIP Package
- Industry Standard Pinout
- 1000 VDC Isolation
- -40 °C to +85 °C Operation
- MTBF >1.1 Mhrs
- 3 Year Warranty

Specification

Input

- | | |
|----------------------------------|--|
| Input Voltage Range | • Nominal $\pm 10\%$ ⁽⁵⁾ |
| Input Reflected Ripple Current | • 20 mA pk-pk (through 12 μ H inductor 5 Hz to 20 MHz) |
| Input Reverse Voltage Protection | • None |

Output

- | | |
|-------------------------|--|
| Output Voltage | • See table |
| Minimum Load | • None ⁽⁶⁾ |
| Line Regulation | • 1.2%/1% Δ Vin |
| Load Regulation | • 10% 20-100% load change (3.3 V models $\pm 20\%$) |
| Setpoint Accuracy | • $\pm 3\%$ |
| Ripple & Noise | • 75 mV pk-pk max, 20 MHz bandwidth |
| Temperature Coefficient | • 0.02%/°C |
| Maximum Capacitive Load | • $\pm 100 \mu$ F |

General

- | | |
|-----------------------|--|
| Efficiency | • See table |
| Isolation Voltage | • 1000 VDC minimum |
| Isolation Resistance | • $10^9 \Omega$ |
| Isolation Capacitance | • 60 pF typical |
| Switching Frequency | • Variable, 80 KHz typical |
| MTBF | • >1.12 Mhrs to MIL-HDBK-217F at 25 °C, GB |

Environmental

- | | |
|-----------------------|---------------------|
| Operating Temperature | • -40 °C to +85 °C |
| Storage Temperature | • -40 °C to +125 °C |
| Case Temperature | • 100 °C max |
| Cooling | • Convection-cooled |

Notes

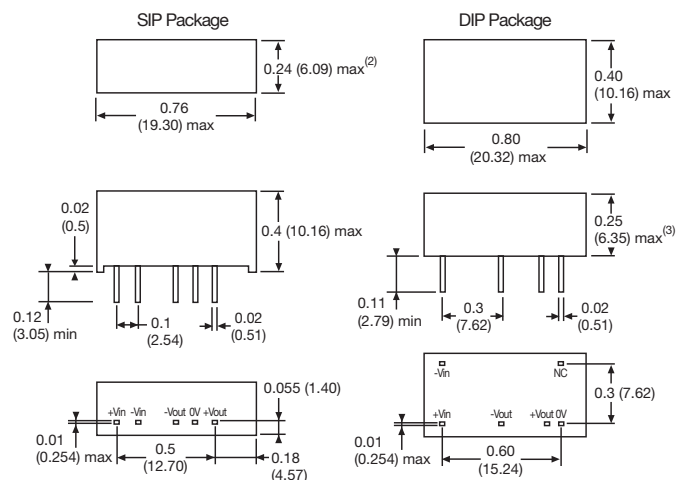
1. Replace 'S' in model number with 'D' for DIP package.
2. SIP 48 Vin models, dimension is 0.28 (7.20) max.
3. DIP 48 Vin models, dimension is 0.27 (6.88) max.
4. Outputs power-trade.
5. For 48 V models a 10 μ F capacitor is required between +Vin and -Vin pins.
6. Operation at no load will not damage unit but it may not meet all specifications.
7. All dimensions in inches (mm).
8. Pin pitch tolerance: ± 0.014 (± 0.35)
9. Case tolerance ± 0.02 (± 0.5)
10. Weight: SIP 0.006 lbs (2.6 g), DIP 0.005 lbs (2.3 g)

Input Voltage	Output Voltage	Output Current ⁽⁴⁾	Efficiency	Model Number ⁽¹⁾
3.3 VDC	± 5.0 V	± 100 mA	66%	IA0305S
5 VDC	± 3.3 V	± 151 mA	65%	IA0503S [^]
	± 5.0 V	± 100 mA	74%	IA0505S ^{†^}
	± 9.0 V	± 55 mA	78%	IA0509S ^{†^}
	± 12.0 V	± 42 mA	78%	IA0512S ^{†^}
	± 15.0 V	± 33 mA	80%	IA0515S ^{†^}
	± 24.0 V	± 21 mA	80%	IA0524S [^]
12 VDC	± 3.3 V	± 151 mA	66%	IA1203S [^]
	± 5.0 V	± 100 mA	75%	IA1205S ^{†^}
	± 9.0 V	± 55 mA	76%	IA1209S ^{†^}
	± 12.0 V	± 42 mA	78%	IA1212S ^{†^}
	± 15.0 V	± 33 mA	80%	IA1215S ^{†^}
	± 24.0 V	± 21 mA	76%	IA1224S [^]
24 VDC	± 3.3 V	± 151 mA	68%	IA2403S [^]
	± 5.0 V	± 100 mA	74%	IA2405S ^{†^}
	± 9.0 V	± 55 mA	76%	IA2409S [^]
	± 12.0 V	± 42 mA	78%	IA2412S ^{†^}
	± 15.0 V	± 33 mA	78%	IA2415S ^{†^}
	± 24.0 V	± 21 mA	78%	IA2424S [^]
48 VDC ⁽⁵⁾	± 3.3 V	± 151 mA	60%	IA4803S
	± 5.0 V	± 100 mA	70%	IA4805S [†]
	± 9.0 V	± 55 mA	72%	IA4809S
	± 12.0 V	± 42 mA	74%	IA4812S [†]
	± 15.0 V	± 33 mA	74%	IA4815S
	± 24.0 V	± 21 mA	70%	IA4824S

[†] Available from Farnell & element14. See pages 284-290.

[^] Available from Newark. See pages 291-296.

Mechanical Details



1 Watt

IB Series



- Single Output
- SIP or DIP Package
- Industry Standard Pinout
- 1000 VDC Isolation
- -40 °C to +85 °C Operation
- MTBF >1.1 MHrs
- 3 Year Warranty

Specification

Input

- Input Voltage Range • Nominal $\pm 10\%$ ⁽⁴⁾
- Input Reflected Ripple Current • 20 mA pk-pk through 12 μ H inductor, 5 Hz to 20 MHz
- Input Reverse Voltage Protection • None

Output

- Output Voltage • See table
- Minimum Load • None⁽⁵⁾
- Line Regulation • 1.2%/1% Δ Vin
- Load Regulation • 10% for a 20-100% load change⁽⁹⁾ (3.3 V models $\pm 20\%$)
- Setpoint Accuracy • $\pm 3\%$
- Ripple & Noise • 75 mV pk-pk max, 20 MHz bandwidth
- Temperature Coefficient • 0.02%/°C
- Maximum Capacitive Load • 220 μ F

General

- Efficiency • See table
- Isolation Voltage • 1000 VDC minimum
- Isolation Resistance • $10^9 \Omega$
- Isolation Capacitance • 60 pF typical
- Switching Frequency • 40-160 KHz variable
- MTBF • >1.1 MHrs to MIL-HDBK-217F at 25 °C, GB

Environmental

- Operating Temperature • -40 °C to +85 °C
- Storage Temperature • -40 °C to +125 °C
- Case Temperature • 100 °C max
- Cooling • Convection-cooled

Notes

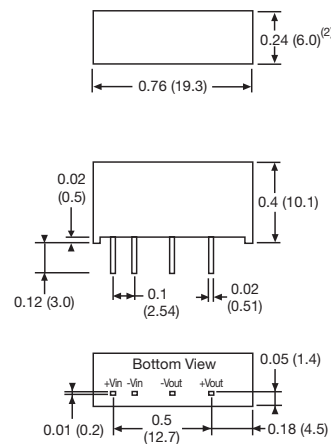
1. Replace 'S' in model number with 'D' for DIP package.
2. SIP 48 Vin models, dimension is 0.28 (7.20) max.
3. DIP 48 Vin models, dimension is 0.27 (6.88) max.
4. For 48 V models a 10 μ F capacitor is required between +Vin and -Vin pins.
5. Operation at no load will not damage unit but it may not meet all specifications.
6. All dimensions in inches (mm).
7. Pin pitch tolerance: ± 0.014 (± 0.35)
8. Case tolerance: ± 0.02 (± 0.5)
9. Weight: SIP 0.006 lbs (2.6 g), DIP 0.005 lbs (2.3 g)

Input Voltage ⁽⁴⁾	Output Voltage	Output Current	Efficiency	Model Number ⁽¹⁾
5 VDC	3.3 V	303 mA	75%	IB0503S
	5.0 V	200 mA	78%	IB0505S†
	9.0 V	111 mA	75%	IB0509S
	12.0 V	84 mA	76%	IB0512S
	15.0 V	66 mA	76%	IB0515S
	24.0 V	42 mA	72%	IB0524S
12 VDC	3.3 V	303 mA	74%	IB1203S
	5.0 V	200 mA	74%	IB1205S
	9.0 V	111 mA	75%	IB1209S
	12.0 V	84 mA	77%	IB1212S
	15.0 V	66 mA	78%	IB1215S
	24.0 V	42 mA	75%	IB1224S
24 VDC	3.3 V	303 mA	75%	IB2403S
	5.0 V	200 mA	77%	IB2405S
	9.0 V	111 mA	75%	IB2409S
	12.0 V	84 mA	78%	IB2412S
	15.0 V	66 mA	78%	IB2415S
	24.0 V	42 mA	78%	IB2424S
48 VDC	3.3 V	303 mA	72%	IB4803S
	5.0 V	200 mA	72%	IB4805S
	9.0 V	111 mA	74%	IB4809S
	12.0 V	84 mA	74%	IB4812S
	15.0 V	66 mA	75%	IB4815S
	24.0 V	42 mA	70%	IB4824S

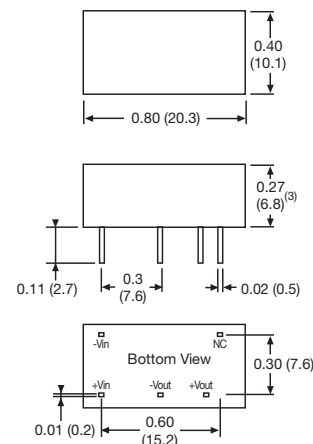
† Available from Farnell & element14. See pages 284-290.

Mechanical Details

SIP Package

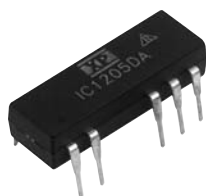


DIP Package



1 Watt

IC Series



- Single Output
- Ultra Slim DIP Package
- Industry Standard Pinout
- 1500 VDC Isolation Standard
- MTBF >3.5 MHrs
- -40 °C to +85 °C Operation
- 3 Year Warranty

Specification

Input

- Input Voltage Range • Nominal $\pm 10\%$
- Input Reverse Voltage Protection • None

Output

- Output Voltage • See table
- Minimum Load • 10%
- Line Regulation • 1.2%/1% ΔV_{in}
- Load Regulation • 10% to 100% load change,
5 Vout: 12.8% typ, 15% max,
12 Vout: 6.8% typ, 15% max,
15 Vout: 6.8% typ, 15% max
- Setpoint Accuracy • 100-110% of nominal at 10% load
- Ripple & Noise • 75 mV pk-pk 20 MHz bandwidth
- Temperature Coefficient • 0.03%/°C
- Short Circuit Protection • Continuous, auto recovery

General

- Efficiency • See table
- Isolation Voltage • 1500 VDC minimum, 3000 VDC optional⁽¹⁾, tested for 1 minute
- Isolation Resistance • $10^9 \Omega$
- Isolation Capacitance • 25 pF typical
- Switching Frequency • 100 kHz typical at nominal input, full load
- MTBF • >3.5 MHrs to MIL-HDBK-217F at 25 °C, GB

Environmental

- Operating Temperature • -40 °C to +85 °C
- Storage Temperature • -55 °C to +125 °C
- Case Temperature • 105 °C max
- Cooling • Convection-cooled
- Lead Temperature • 250 °C, 0.06 in (1.5 mm) from case, 10 s

Input Voltage	Output Voltage	Output Current	Efficiency (typ)	Model Number
5 VDC	5.0 V	200 mA	74%	IC0505DA [†] [^]
	12.0 V	83 mA	77%	IC0512DA [†] [^]
	15.0 V	67 mA	76%	IC0515DA [†] [^]
12 VDC	5.0 V	200 mA	73%	IC1205DA [†] [^]

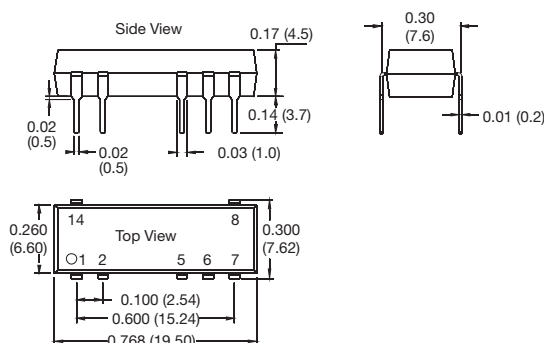
Notes

1. IC0505DA available with 3000 VDC isolation, add suffix 'H' to part number.

[†] Available from Farnell & element14. See pages 284-290.

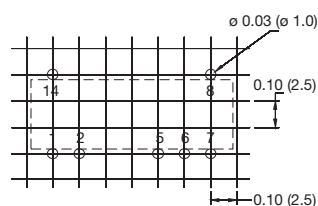
[^] Available from Newark. See pages 291-296.

Mechanical Details



Recommended footprint

Top view grid: 0.1 x 0.1 in (2.54 x 2.54 mm)



Pin	Function
1	Vin
2	GND
5	0 V
6	+Vout
7	N.C.
8	N.C.
14	N.C.

N.C. Not connected

Notes

1. All dimensions in inches (mm)

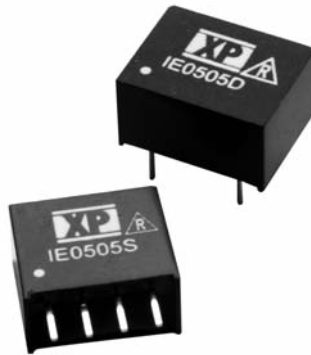
2. Tolerance: ± 0.010 (± 0.25)

3. Weight: 0.003 lbs (1.4 g)

4. Pin tolerance: ± 0.004 (± 0.10 mm)

1 Watt

IE Series



- Single Output
- SIP or DIP Package
- 1000 VDC Isolation
- Optional 3000 VDC Isolation
- Small Package Sizes
- -40 °C to +85 °C Operation
- 3 Year Warranty

Specification

Input

- Input Voltage Range • Nominal $\pm 10\%$
- Input Reflected Ripple Current • 20 mA pk-pk through 12 μ H inductor 5Hz to 20 MHz
- Input Reverse Voltage Protection • None

Output

- Output Voltage • See table
- Minimum Load • None⁽⁵⁾
- Line Regulation • 1.2%/1% ΔV_{in}
- Load Regulation • 10% for a 20-100% load change⁽⁵⁾ (3.3 V models $\pm 20\%$)
- Setpoint Accuracy • $\pm 3\%$
- Ripple & Noise • 100 mV pk-pk max, 20 MHz bandwidth
- Temperature Coefficient • 0.02%/°C
- Maximum Capacitive Load • 220 μ F

General

- Efficiency • See table
- Isolation Voltage • 1000 VDC minimum (3000 VDC -H option)
- Isolation Resistance • $10^9 \Omega$
- Isolation Capacitance • 60 pF typical
- Switching Frequency • 40-150 KHz variable
- MTBF • >1.1 Mhrs to MIL-HDBK-217F at 25 °C, GB

Environmental

- Operating Temperature • -40 °C to +85 °C
- Storage Temperature • -40 °C to +125 °C
- Case Temperature • 100 °C max
- Cooling • Convection-cooled

Notes

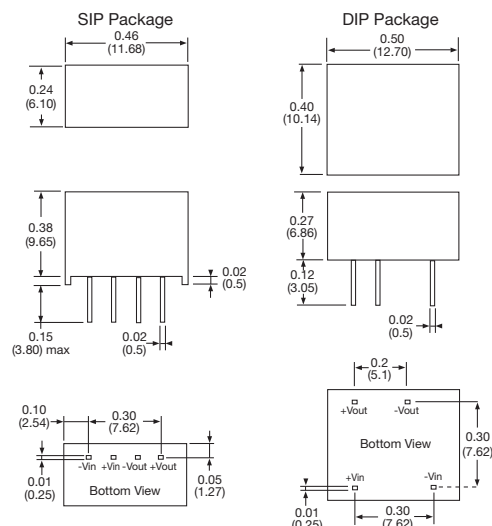
- For DIP package, replace 'S' in model number with 'D'.
- Add suffix '-H' to model number for 3000 VDC isolation.
- For 48 VDC in, specify model number as IE48XXS (not available in DIP package).
- 48 VDC input models dimension is 0.29 (7.5).
- Operation at no load will not damage unit but it may not meet all specifications.
- All dimensions in inches (mm).
- Pin pitch tolerance: ± 0.014 (± 0.35)
- Case tolerance: ± 0.02 (± 0.5)
- Weight: SIP 0.003 lbs (1.4 g), DIP 0.004 lbs (1.8 g)

Input Voltage ⁽³⁾	No Load Input Current	Output Voltage	Output Current	Efficiency	Model Number ^(1,2)
3.3 VDC	25 mA	3.3 V	300 mA	71%	IE0303S†
	25 mA	5.0 V	200 mA	75%	IE0305S†
	30 mA	9.0 V	111 mA	74%	IE0309S†
	45 mA	12.0 V	84 mA	74%	IE0312S†
	40 mA	15.0 V	66 mA	77%	IE0315S†
	40 mA	24.0 V	42 mA	77%	IE0324S†
5 VDC	25 mA	3.3 V	300 mA	72%	IE0503S†^
	25 mA	5.0 V	200 mA	75%	IE0505S†^
	25 mA	9.0 V	111 mA	77%	IE0509S†^
	25 mA	12.0 V	84 mA	78%	IE0512S†^
	25 mA	15.0 V	66 mA	78%	IE0515S†^
	25 mA	24.0 V	42 mA	80%	IE0524S†^
12 VDC	16 mA	3.3 V	300 mA	72%	IE1203S†^
	16 mA	5.0 V	200 mA	75%	IE1205S†^
	16 mA	9.0 V	111 mA	77%	IE1209S†^
	16 mA	12.0 V	84 mA	80%	IE1212S†^
	16 mA	15.0 V	66 mA	78%	IE1215S†^
	16 mA	24.0 V	42 mA	78%	IE1224S†^
24 VDC	10 mA	3.3 V	300 mA	72%	IE2403S†^
	10 mA	5.0 V	200 mA	75%	IE2405S†^
	10 mA	9.0 V	111 mA	77%	IE2409S†^
	10 mA	12.0 V	84 mA	80%	IE2412S†^
	10 mA	15.0 V	66 mA	78%	IE2415S†^
	10 mA	24.0 V	42 mA	80%	IE2424S†^

† Available from Farnell & element14. See pages 284-290.

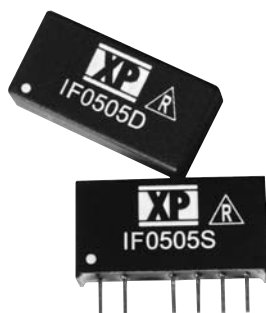
^ Available from Newark. See pages 291-296.

Mechanical Details



1 Watt

IF Series



- Regulated Single Output
- SIP or DIP Package
- Low Ripple & Noise
- 1000 VDC Isolation
- Optional 3000 VDC Isolation
- MTBF 4.2 Mhrs
- 3 Year Warranty

Specification

Input

- | | |
|----------------------------------|---|
| Input Voltage Range | • Nominal $\pm 10\%$ |
| Input Reflected Ripple Current | • 20 mA pk-pk through 12 μ H inductor, 5 Hz to 20 MHz |
| Input Reverse Voltage Protection | • None |

Output

- | | |
|-------------------------|--|
| Output Voltage | • See table |
| Minimum Load | • None ⁽³⁾ |
| Line Regulation | • $\pm 0.5\%$ max |
| Load Regulation | • $\pm 0.5\%$ max for a 10-100% load change ⁽³⁾ ($\pm 1.0\%$ for 3.3 V output) |
| Setpoint Accuracy | • $\pm 2\%$ max |
| Ripple & Noise | • 50 mV pk-pk max, 20 MHz bandwidth |
| Temperature Coefficient | • $0.02\%/^{\circ}\text{C}$ |
| Maximum Capacitive Load | • 220 μ F |

General

- | | |
|-----------------------|---|
| Efficiency | • See table |
| Isolation Voltage | • 1000 VDC standard, 3000 VDC option ⁽²⁾ |
| Isolation Resistance | • 1000 M Ω min |
| Isolation Capacitance | • 60 pF typical |
| Switching Frequency | • 36-150 kHz variable |
| MTBF | • 4.2 Mhrs to MIL-HDBK-217F at 25 $^{\circ}\text{C}$, GB |

Environmental

- | | |
|-----------------------|--|
| Operating Temperature | • -40°C to $+85^{\circ}\text{C}$ (no derating) |
| Storage Temperature | • -40°C to $+125^{\circ}\text{C}$ |
| Case Temperature | • $+100^{\circ}\text{C}$ max |
| Cooling | • Convection-cooled |

Notes

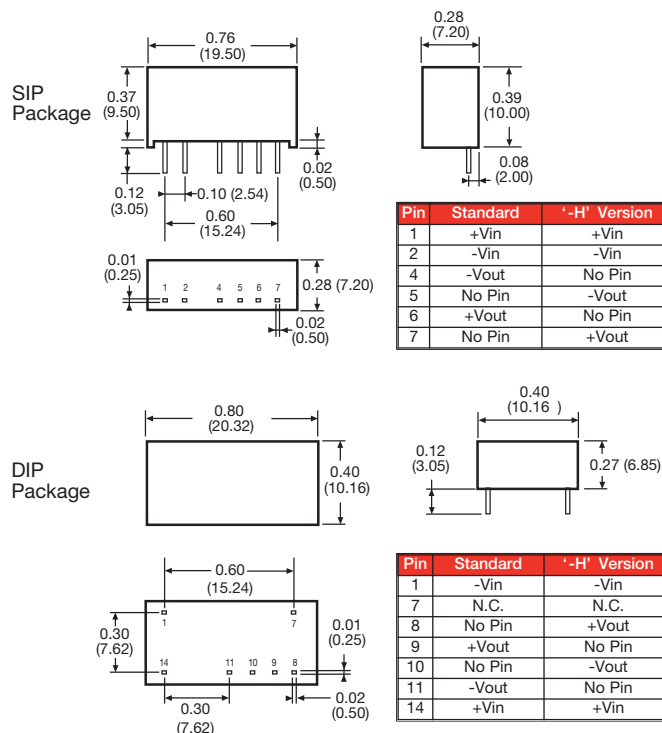
- For DIP package, replace suffix 'S' with suffix 'D'.
- For 3000 VDC isolation, add suffix '-H'.
- Operation at no load will not damage unit but it may not meet all specifications.
- All dimensions in inches (mm).
- Pin pitch tolerance: ± 0.014 (± 0.35)
- Case tolerance: ± 0.02 (± 0.5)
- Weight: 0.005 lbs (2.4 g)

Input Voltage	Output Voltage	Output Current	Efficiency	Model Number ^{†,‡}
5 V	3.3 V	333 mA	57%	IF0503S ^{†^}
	5.0 V	200 mA	65%	IF0505S ^{†^}
	9.0 V	111 mA	65%	IF0509S ^{†^}
	12.0 V	84 mA	68%	IF0512S ^{†^}
	15.0 V	67 mA	68%	IF0515S ^{†^}
12 V	3.3 V	333 mA	57%	IF1203S ^{†^}
	5.0 V	200 mA	63%	IF1205S ^{†^}
	9.0 V	111 mA	66%	IF1209S ^{†^}
	12.0 V	84 mA	68%	IF1212S ^{†^}
	15.0 V	67 mA	66%	IF1215S ^{†^}
24 V	3.3 V	333 mA	60%	IF2403S ^{†^}
	5.0 V	200 mA	65%	IF2405S ^{†^}
	9.0 V	111 mA	68%	IF2409S ^{†^}
	12.0 V	84 mA	68%	IF2412S ^{†^}
	15.0 V	67 mA	68%	IF2415S ^{†^}

[†] Available from Farnell & element14. See pages 284-290.

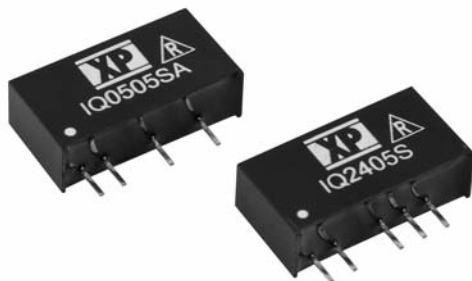
[^] Available from Newark. See pages 291-296.

Mechanical Details



1 Watt

IQ Series



- Single & Dual Output
- SIP Package
- 1000 VDC Isolation
- Optional 3000 VDC Isolation
- -40 °C to +85 °C Operation
- Semi-regulated
- 3 Year Warranty

Specification

Input

- Input Voltage Range • Nominal $\pm 10\%$
- Input Reflected • 5 & 12 V: 20 mA, 15 V: 30 mA
- Ripple Current • 24 V: 40 mA, 48 V: 50 mA pk-pk, 5 Hz to 20 MHz
- Input Reverse Voltage Protection • None

Output

- Output Voltage • See table
- Minimum Load • None⁽¹⁾
- Line Regulation • 1.2%/1% ΔV_{in}
- Load Regulation • See table
- Setpoint Accuracy • $\pm 3\%$
- Ripple & Noise • 50 mV pk-pk max, 20 MHz bandwidth
- Temperature Coefficient • 0.02%/°C
- Maximum Capacitive Load • See table

General

- Efficiency • See table
- Isolation Voltage • 1000 VDC minimum, 3000 VDC option⁽²⁾
- Isolation Resistance • $10^9 \Omega$
- Isolation Capacitance • 60 pF typical
- Switching Frequency • Variable, 55 kHz - 85 kHz
- MTBF • >1.1 Mhrs to MIL-HDBK-217F at 25 °C, GB

Environmental

- Operating Temperature • -40 °C to +85 °C
- Storage Temperature • -40 °C to +125 °C
- Case Temperature • 100 °C max
- Cooling • Convection-cooled

Notes

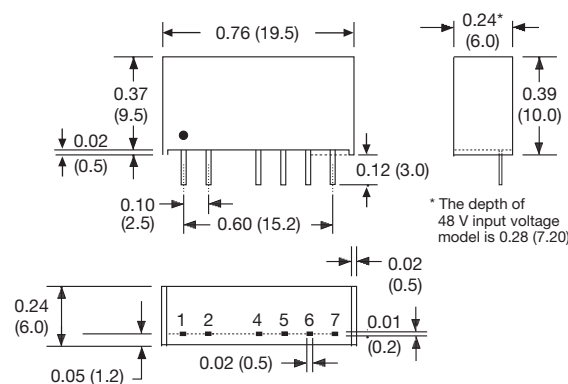
1. Operation at no load will not damage unit but it may not meet all specifications.
2. For optional 3000 VDC isolation, add suffix '-H' to the model number.
3. For dual output delete suffix 'A' and split output current equally between rails.
4. All dimensions in inches (mm).
5. Pin pitch tolerance: ± 0.014 (± 0.35)
6. Case tolerance: ± 0.02 (± 0.5)
7. Weight: 0.06 lbs (2.8 g)

Input Voltage	Output Voltage	Output Current	No Load Input Current	Max Capacitive Load	Efficiency	Load Reg.	Model [®] Number
5 VDC	5.0 V	200 mA	20 mA	200 μ F	83%	6.0%	IQ0505SA†^
	9.0 V	111 mA	20 mA	200 μ F	86%	5.5%	IQ0509SA†^
	12.0 V	83 mA	20 mA	100 μ F	87%	5.5%	IQ0512SA†^
	15.0 V	67 mA	20 mA	100 μ F	87%	5.0%	IQ0515SA†^
12 VDC	5.0 V	200 mA	15 mA	200 μ F	84%	4.0%	IQ1205SA†^
	9.0 V	111 mA	15 mA	200 μ F	86%	3.5%	IQ1209SA†^
	12.0 V	83 mA	15 mA	100 μ F	88%	3.5%	IQ1212SA†^
	15.0 V	67 mA	15 mA	100 μ F	88%	3.0%	IQ1215SA†^
15 VDC	5.0 V	200 mA	10 mA	200 μ F	84%	4.0%	IQ1505SA†^
	9.0 V	111 mA	10 mA	200 μ F	86%	3.5%	IQ1509SA†^
	12.0 V	83 mA	10 mA	100 μ F	87%	3.5%	IQ1512SA†^
	15.0 V	67 mA	10 mA	100 μ F	89%	3.0%	IQ1515SA†^
24 VDC	5.0 V	200 mA	7 mA	200 μ F	81%	4.0%	IQ2405SA†^
	9.0 V	111 mA	7 mA	200 μ F	84%	3.5%	IQ2409SA†^
	12.0 V	83 mA	7 mA	100 μ F	85%	3.5%	IQ2412SA†^
	15.0 V	67 mA	7 mA	100 μ F	86%	2.5%	IQ2415SA†^
48 VDC	5.0 V	200 mA	5 mA	200 μ F	78%	4.0%	IQ4805SA†^
	9.0 V	111 mA	5 mA	200 μ F	80%	3.5%	IQ4809SA†^
	12.0 V	83 mA	5 mA	100 μ F	81%	3.0%	IQ4812SA†^
	15.0 V	67 mA	5 mA	100 μ F	81%	3.0%	IQ4815SA†^

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296.

Mechanical Details



Pin Connections				
Pin	Single	Dual	Single-H	Dual-H
1	+Vin	+Vin	+Vin	+Vin
2	-Vin	-Vin	-Vin	-Vin
4	-Vout	-Vout	N.P	N.P
5	N.P	Common	-Vout	-Vout
6	+Vout	+Vout	N.P	Common
7	N.P	N.P	+Vout	+Vout

1 Watt

ISF Series



- Single & Dual Output
- SMD Package
- Industry Standard Pinouts
- 1000 VDC Isolation, 3000 VDC Optional
- MTBF >3.5 Mhrs
- -40 °C to +85 °C Operation
- 3 Year Warranty

Specification

Input

- Input Voltage Range • Nominal $\pm 10\%$
 Input Reverse Voltage Protection • None

Output

- Output Voltage • See table
 Minimum Load • $10\%^{(6)}$
 Line Regulation • $1.2\%/1\% \Delta V_{in}$
 Load Regulation • 7.5% max for a 10-100% load change
 Setpoint Accuracy • 100-110% of nominal at 10% load
 Ripple & Noise • Single output: 100 mV pk-pk,
 Dual output: 75 mV pk-pk,
 20 MHz bandwidth

Temperature Coefficient • $0.03\%/^{\circ}\text{C}$

General

- Efficiency • See table
 Isolation Voltage • 1000 VDC standard, 3000 VDC optional
 Isolation Resistance • $10^9 \Omega$
 Switching Frequency • 5/12 V input: 100 kHz, 24 V input: 500 kHz
 typical at nominal input, full load
 MTBF • >3.5 Mhrs to MIL-HDBK-217F at 25 °C, GB

Environmental

- Operating Temperature • -40 °C to +85 °C, full load
 Storage Temperature • -55 °C to +125 °C
 Case Temperature • 105 °C max
 Cooling • Convection-cooled
 Lead Temperature • 260 °C, 0.06 in (1.5 mm) from case, 10 s

Connections

No. O/P	Isolation	Pinout	Package	+Vin	-Vin	-Vout	0 V	+Vout	N/C
1	1 kV	Standard	B1	2	1	N/A	4	5	3,6,7,8
1	1 kV	Optional '-X'	B2	2	1	N/A	4	5	8
1	3 kV	Optional '-H'	C1	2	1	N/A	5	8	3,6,7,10,11,12
2	1 kV	Standard	A1	2	1	5	4	7	3,6,8,9,10
2	1 kV	Optional '-X'	A2	2	1	5	4	7	10
2	3 kV	Optional '-H'	C1	2	1	6	5	8	3,7,10,11,12

Notes

1. All dimensions in inches (mm)
2. Tolerance: ± 0.010 (± 0.25)
3. Weight: 0.004 lbs (1.7 g)
4. Pin tolerance: ± 0.004 (± 0.10 mm)

Input Voltage	Output Voltage	Output Current	Efficiency (typ)	Model Number ^(4,5)
3.3 VDC	3.3 V	300 mA	73%	ISF0303A ^{(2)†^}
	5.0 V	200 mA	74%	ISF0305A ^{(2)†^}
5 VDC	3.3 V	300 mA	72%	ISF0503A ^{(2)†^}
	5.0 V	200 mA	77%	ISF0505A ^{(1,2,3)†^}
	9.0 V	110 mA	76%	ISF0509A ^{(1,2,3)†^}
	12.0 V	84 mA	79%	ISF0512A ^{(1,2,3)†^}
	15.0 V	67 mA	78%	ISF0515A ^{(1,2,3)†^}
12 VDC	5.0 V	200 mA	69%	ISF1205A ^{(1,2,3)†^}
	9.0 V	110 mA	73%	ISF1209A ^{(1,2,3)†^}
	12.0 V	84 mA	73%	ISF1212A ^{(1,2,3)†^}
	15.0 V	67 mA	74%	ISF1215A ^{(1,2,3)†^}
24 VDC	3.3 V	300 mA	69%	ISF2403A ^{†^}
	5.0 V	200 mA	70%	ISF2405A ^{(1)†^}
	9.0 V	110 mA	72%	ISF2409A ^{(1)†^}
	12.0 V	84 mA	75%	ISF2412A ^{(1)†^}
	15.0 V	67 mA	76%	ISF2415A ^{(1)†^}
	24.0 V	42 mA	77%	ISF2424A ^{†^}

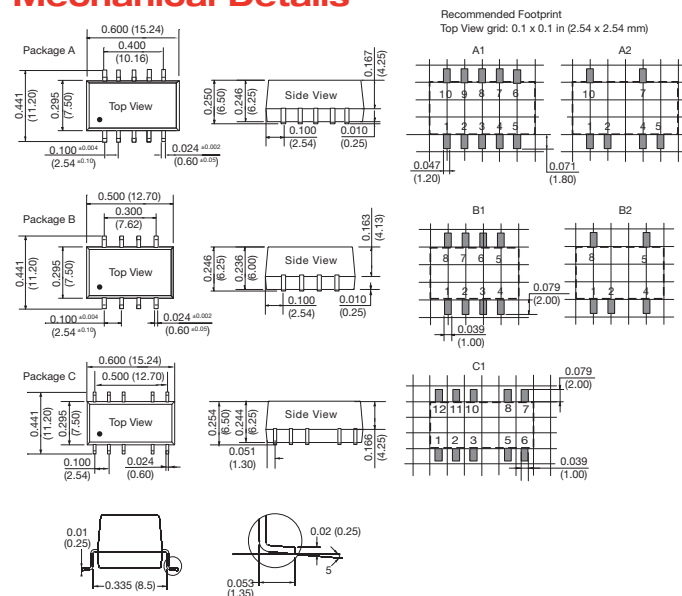
Notes

1. For dual output models, delete suffix 'A' at the end of the part number and split current equally between two outputs.
2. For single output 3000 VDC isolation, add '-H' to the end of the part number.
3. For dual output 3000 VDC isolation, replace 'A' with '-H' in the part number.
4. For package type see connections table.
5. Single & dual output 1 kV models can have optional pinout, add suffix '-X' to part number
6. Operation at no load will not damage device but may not meet all specifications.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296.

Mechanical Details



ISG Series



- Regulated Single Output
- SMD Package
- Industry Standard Pinout
- 1000 VDC Isolation
- Short Circuit Protection
- MTBF >3.5 Mhrs
- 3 Year Warranty

Specification

Input

- Input Voltage Range • Nominal $\pm 5\%$
 Input Reverse Voltage Protection • None

Output

- Output Voltage • See table
 Minimum Load • 10%⁽²⁾
 Line Regulation • $\pm 0.25\%$
 Load Regulation • $\pm 1\%$, 10-100% load change
 Setpoint Accuracy • $\pm 3\%$ at 100% load
 Ripple & Noise • 100 mV pk-pk 20 MHz bandwidth
 Temperature Coefficient • 0.03%/°C
 Short Circuit Protection • Continuous

General

- Efficiency • See table
 Isolation Voltage • 1000 VDC
 Isolation Resistance • $10^9 \Omega$
 Switching Frequency • 100 kHz typical at nominal input, full load
 MTBF • >3.5 Mhrs to MIL-HDBK-217F at 25 °C, GB

Environmental

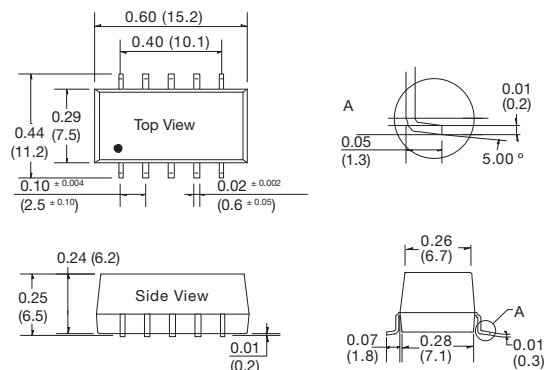
- Operating Temperature • -40 °C to +85 °C, derate from 100% load at 70 °C to 60% load at 85 °C
 Storage Temperature • -55 °C to +125 °C
 Case Temperature • 100 °C max
 Cooling • Convection-cooled
 Lead Temperature • 260 °C, 0.06 in (1.5 mm) from case, 10 s

Input Voltage	Output Voltage	Output Current	Efficiency (typical)	Model Number ⁽¹⁾
5 VDC	5 V	150 mA	68%	ISG0505A†^
	12 V	83 mA	69%	ISG0512A†^
	15 V	67 mA	69%	ISG0515A†^
12 VDC	5 V	150 mA	68%	ISG1205A†^
	12 V	83 mA	69%	ISG1212A†^
	15 V	67 mA	70%	ISG1215A†^

† Available from Farnell & element14. See pages 284-290.

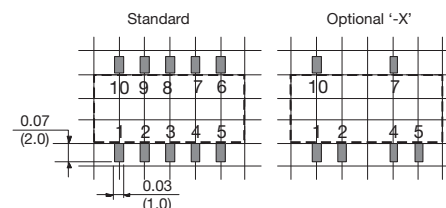
^ Available from Newark. See pages 291-296.

Mechanical Details



Recommended footprint

Top view grid: 0.1 x 0.1 in (2.54 x 2.54 mm)



Pin	Standard	'-X' Version
1	GND	GND
2	V _{in}	V _{in}
4	0 V	0 V
7	+V _o	+V _o
3, 6, 8, 9	N.C.	No Pin
5, 10	N.C.	N.C.

N.C. Not connected

Notes

- For optional '-X' pin configuration, add suffix '-X' to part number.
- Operation at no load will not damage device but may not meet all specifications.
- All dimensions in inches (mm)
- Tolerance: ± 0.010 (± 0.25)
- Weight: 0.003 lbs (1.7 g)
- Pin tolerance: ± 0.004 (± 0.10 mm)

1 Watt

ISJ Series



- Single Output
- Ultra Slim SMD Package
- Industry Standard Pinout
- 1500 VDC Isolation
- MTBF >3.5 MHrs
- -40 °C to +85 °C Operation
- 3 Year Warranty

Specification

Input

- Input Voltage Range • Nominal $\pm 10\%$
- Input Reverse Voltage Protection • None

Output

- Output Voltage • See table
- Minimum Load • 10%
- Line Regulation • 1.2%/1% ΔV_{in}
- Load Regulation • 7.5% max for 10-100% load change
- Setpoint Accuracy • 100-110% of nominal at 10% load
- Ripple & Noise • 75 mV pk-pk 20 MHz bandwidth
- Temperature Coefficient • 0.03%/°C
- Short Circuit Protection • Continuous

General

- Efficiency • See table
- Isolation Voltage • 1500 VDC minimum⁽¹⁾
- Isolation Resistance • $10^9 \Omega$
- Isolation Capacitance • 25 pF typical
- Switching Frequency • 100 kHz typical at nominal input, full load
- MTBF • >3.5 MHrs to MIL-HDBK-217F at 25 °C, GB

Environmental

- Operating Temperature • -40 °C to +85 °C
- Storage Temperature • -55 °C to +125 °C
- Case Temperature • 105 °C max
- Cooling • Convection-cooled
- Lead Temperature • 250 °C, 0.06 in (1.5 mm) from case, 10 s

Input Voltage	Output Voltage	Output Current	Efficiency (typ)	Model Number
5 VDC	5.0 V	200 mA	74%	ISJ0505A [†] ^
	12.0 V	83 mA	77%	ISJ0512A [†] ^
	15.0 V	67 mA	76%	ISJ0515A [†] ^
12 VDC	5.0 V	200 mA	73%	ISJ1205A [†] ^

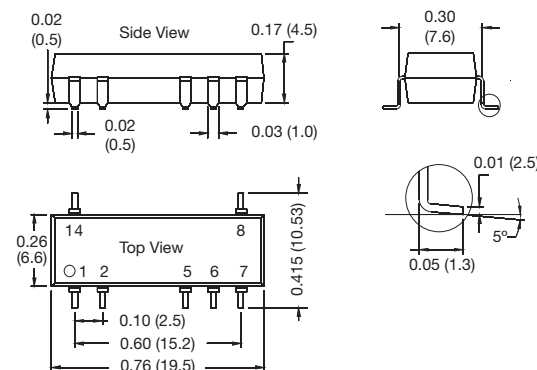
Notes

1. ISJ0505A available with 3000 VDC isolation, add suffix '-H' to part number.

[†] Available from Farnell & element14. See pages 284-290.

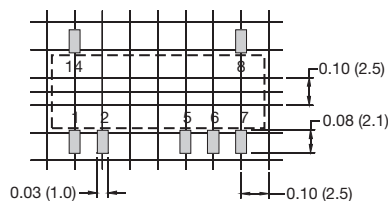
[^] Available from Newark. See pages 291-296.

Mechanical Details



Recommended footprint

Top view grid: 0.1 x 0.1 in (2.54 x 2.54 mm)



Pin	Function
1	Vin
2	GND
5	0 V.
6	+Vout
7	N.C.
8	N.C.
14	N.C.

N.C. Not connected

Notes

1. All dimensions in inches (mm)

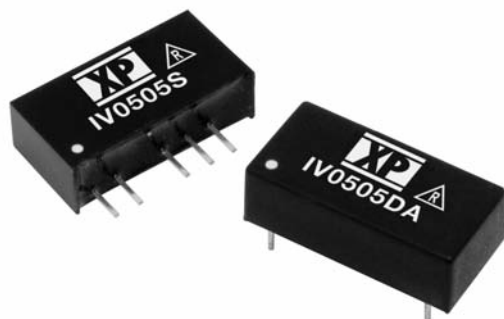
2. Tolerance: ± 0.010 (± 0.25)

4. Pin tolerance: ± 0.004 (± 0.10 mm)

3. Weight: 0.003 lbs (1.4 g)

1 Watt

IV Series



- Single & Dual Output
- SIP or DIP Package
- 3000 VDC Isolation
- Optional 4000 & 6000 VDC Isolation
- -40 °C to +85 °C Operation
- MTBF >1.1 Mhrs
- 3 Year Warranty

Specification

Input

- Input Voltage Range • Nominal $\pm 10\%$ ⁽³⁾
- Input Reflected • 20 mA pk-pk through 12 μ H, 5 Hz to 20 MHz
- Ripple Current
- Input Reverse Voltage Protection • None
- Input Filter • Capacitor

Output

- Output Voltage • See table
- Minimum Load • None⁽⁴⁾
- Line Regulation • 1.2%/1% Δ Vin
- Load Regulation • $\pm 10\%$ 20-100% load change (3.3 V models $\pm 20\%$)
- Setpoint Accuracy • $\pm 3\%$
- Ripple & Noise • 75 mV pk-pk max, 20 MHz bandwidth
- Temperature Coefficient • 0.02%/°C
- Maximum Capacitive Load • Dual: $\pm 100 \mu$ F, Single: 220 μ F

General

- Efficiency • See table
- Isolation Voltage • 3000 VDC⁽⁶⁾
- Isolation Resistance • $10^9 \Omega$
- Isolation Capacitance • 60 pF typical
- Switching Frequency • Variable, 80 KHz typical
- MTBF • >1.1 Mhrs to MIL-HDBK-217F at 25 °C, GB

Environmental

- Operating Temperature • -40 °C to +85 °C
- Storage Temperature • -40 °C to +125 °C
- Case Temperature • 100 °C max
- Cooling • Convection-cooled

Notes

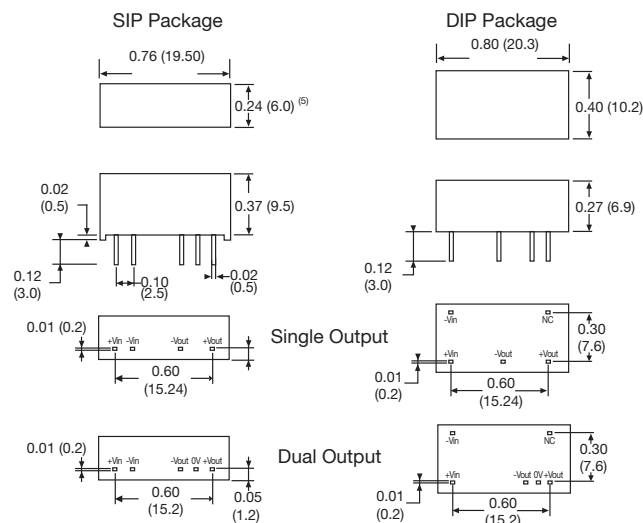
1. For dual output, delete suffix 'A', and split current equally between rails.
2. For DIP package, replace 'S' in part number with 'D'.
3. For 48 V nominal input, a 4.7-47 μ F capacitor is required across the input.
4. Operation at no load will not damage unit but it may not meet all specifications.
5. 48 V model dimension is 0.28 (7.20).
6. For 4000 VDC Isolation, add suffix '-H4'. For 6000 VDC Isolation, add suffix '-H6'.
7. All dimensions in inches (mm).
8. Pin pitch tolerance: ± 0.014 (± 0.35)
9. Case tolerance: ± 0.02 (± 0.5)
10. Weight: SIP 0.006 lbs (2.6 g), DIP 0.005 lbs (2.3 g)

Input Voltage ⁽³⁾	No Load Input Current	Output Voltage	Output Current	Efficiency	Model Number ^(1,2)
5 VDC	30 mA	3.3 V	300 mA	75%	IV0503SA [^]
	30 mA	5.0 V	200 mA	78%	IV0505SA ^{†^}
	30 mA	9.0 V	112 mA	75%	IV0509SA [^]
	30 mA	12.0 V	84 mA	76%	IV0512SA ^{†^}
	30 mA	15.0 V	66 mA	76%	IV0515SA ^{†^}
12 VDC	30 mA	24.0 V	42 mA	72%	IV0524SA ^{†^}
	20 mA	3.3 V	300 mA	74%	IV1203SA [^]
	20 mA	5.0 V	200 mA	74%	IV1205SA ^{†^}
	20 mA	9.0 V	112 mA	75%	IV1209SA [^]
	20 mA	12.0 V	84 mA	77%	IV1212SA ^{†^}
24 VDC	20 mA	15.0 V	66 mA	78%	IV1215SA ^{†^}
	20 mA	24.0 V	42 mA	75%	IV1224SA ^{†^}
	10 mA	3.3 V	300 mA	75%	IV2403SA [^]
	10 mA	5.0 V	200 mA	77%	IV2405SA [^]
	10 mA	9.0 V	112 mA	75%	IV2409SA [^]
48 VDC	10 mA	12.0 V	84 mA	78%	IV2412SA [^]
	10 mA	15.0 V	66 mA	78%	IV2415SA [^]
	10 mA	24.0 V	42 mA	78%	IV2424SA [^]
	6 mA	3.3 V	300 mA	72%	IV4803SA
	6 mA	5.0 V	200 mA	72%	IV4805SA
48 VDC	6 mA	9.0 V	112 mA	74%	IV4809SA
	6 mA	12.0 V	84 mA	75%	IV4812SA
	6 mA	15.0 V	66 mA	75%	IV4815SA
	6 mA	24.0 V	42 mA	70%	IV4824SA

[†] Available from Farnell & element14. See pages 284-290.

[^] Available from Newark. See pages 291-296.

Mechanical Details



1 Watt IW Series



- Regulated Single & Dual Output
- Wide 2:1 Input Range
- SIP or DIP Package
- 1000 VDC Isolation (Optional 3000 VDC)
- Continuous Short Circuit Protection
- Optional Metal Case
- 3 Year Warranty

Specification

Input

- | | |
|----------------------------------|---|
| Input Voltage Range | • See table |
| Input Reflected Ripple Current | • 35 mA pk-pk through 12 μ H inductor, 5 Hz to 20 MHz |
| Input Reverse Voltage Protection | • None |
| Input Filter | • Capacitor |
| Input Surge | • 5 V models: 12 VDC for 100 ms
12 V models: 24 VDC for 100 ms
24 V models: 40 VDC for 100 ms
48 V models: 80 VDC for 100 ms |

Output

- | | |
|--------------------------|--|
| Output Voltage | • See table |
| Minimum Load | • None ⁽⁶⁾ |
| Line Regulation | • $\pm 0.5\%$ max |
| Load Regulation | • $\pm 1.0\%$ max from 25-100% load ⁽⁷⁾ |
| Setpoint Accuracy | • $\pm 2\%$ max |
| Ripple & Noise | • 80 mV pk-pk max, 20 MHz bandwidth ⁽⁶⁾ |
| Short Circuit Protection | • Continuous with auto recovery (foldback) |
| Cross Regulation | • $\pm 5\%$ on dual output models |
| Remote On/Off | • Optional on SIP package model ⁽⁴⁾ |
| Temperature Coefficient | • $0.02\%/^{\circ}\text{C}$ |

General

- | | |
|-----------------------|---|
| Efficiency | • See table |
| Isolation Voltage | • 1000 VDC (optional 3000 VDC) |
| Isolation Resistance | • $10^9\Omega$ |
| Isolation Capacitance | • 60 pF |
| Switching Frequency | • 100-650 kHz |
| MTBF | • >1.66 Mhrs to MIL-HDBK-217F at 25 $^{\circ}\text{C}$, GB |

Environmental

- | | |
|-----------------------|---|
| Operating Temperature | • -40 $^{\circ}\text{C}$ to +100 $^{\circ}\text{C}$, derate from 100% load at 85 $^{\circ}\text{C}$ to 0% load at 100 $^{\circ}\text{C}$ |
| Storage Temperature | • -40 $^{\circ}\text{C}$ to +125 $^{\circ}\text{C}$ |
| Case Temperature | • 100 $^{\circ}\text{C}$ max |
| Cooling | • Convection cooled |

Notes

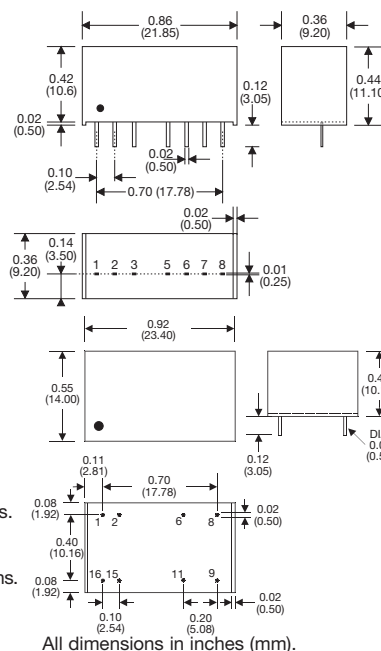
- For dual inline package replace 'S' in model number with 'D'.
- For optional 3 kV isolation add suffix '-H' to the model number.
- For dual output delete suffix 'A' & split output current equally between rails.
- For optional Remote On/Off on SIP models, add suffix '-R' to model number. Applying 5 V via 1 k Ω current limiting resistor and diode turns output off.
- For optional metal case, add suffix '-M' to model number, contact sales for details.
- Output capacitor of 100 μF required to meet quoted ripple & noise.
- Minimum load of 25% required to meet quoted specifications.
- Operation at no load will not damage the converter but it may not meet all specifications.
- Pin pitch tolerance: ± 0.014 (± 0.35), Case tolerance: ± 0.02 (± 0.5)
- Weight: SIP 0.009 lbs (4.0 g), DIP 0.013 lbs (6.0 g)
- Metal case weight: SIP 0.014 lbs (6.5 g), DIP 0.017 lbs (8.0 g)

Input Voltage	No Load Input Current	Output Voltage ⁽⁸⁾	Output Current	Max. Capacitive Load	Efficiency	Model Number ⁽¹⁻⁵⁾
4.5-9.0 V	15 mA	3.3 V	303 mA	3300 μF	67%	IW0503SA [†]
	15 mA	5.0 V	200 mA	3300 μF	67%	IW0505SA [†]
	40 mA	9.0 V	111 mA	470 μF	70%	IW0509SA [†]
	55 mA	12.0 V	83 mA	470 μF	70%	IW0512SA [†]
	55 mA	15.0 V	67 mA	470 μF	70%	IW0515SA [†]
	70 mA	24.0 V	42 mA	220 μF	68%	IW0524SA [†]
9.0-18.0 V	15 mA	3.3 V	303 mA	3300 μF	70%	IW1203SA [†]
	15 mA	5.0 V	200 mA	3300 μF	72%	IW1205SA [†]
	15 mA	9.0 V	111 mA	470 μF	77%	IW1209SA [†]
	15 mA	12.0 V	83 mA	470 μF	77%	IW1212SA [†]
	15 mA	15.0 V	67 mA	470 μF	77%	IW1215SA [†]
	15 mA	24.0 V	42 mA	220 μF	73%	IW1224SA [†]
18.0-36.0 V	8 mA	3.3 V	303 mA	3300 μF	70%	IW2403SA [†]
	8 mA	5.0 V	200 mA	3300 μF	72%	IW2405SA [†]
	8 mA	9.0 V	111 mA	470 μF	75%	IW2409SA [†]
	8 mA	12.0 V	83 mA	470 μF	75%	IW2412SA [†]
	8 mA	15.0 V	67 mA	470 μF	75%	IW2415SA [†]
	8 mA	24.0 V	42 mA	220 μF	75%	IW2424SA [†]
36.0-72.0 V	6 mA	3.3 V	303 mA	3300 μF	66%	IW4803SA
	6 mA	5.0 V	200 mA	3300 μF	68%	IW4805SA
	6 mA	9.0 V	111 mA	470 μF	70%	IW4809SA
	6 mA	12.0 V	83 mA	470 μF	70%	IW4812SA
	6 mA	15.0 V	67 mA	470 μF	70%	IW4815SA
	6 mA	24.0 V	42 mA	220 μF	68%	IW4824SA

[†] Available from Farnell & element14. See pages 284-290.

[^] Available from Newark. See pages 291-296.

Mechanical Details



PIN CONNECTIONS		
Pin	Single	Dual
1	-V Input	-V Input
2	+V Input	+V Input
3	Opt. ROF*	Opt. ROF**
5	N.P. / N.C.	N.C.
6	+V Output	+V Output
7	-V Output	-V Output
8	NC	Common

*When optional ROF is present pin 5 is No Connection. When not present pin 3 & 5 are No Pin.

**When optional ROF is present pin 5 is No Connection. When not present pin 3 & 5 are No Connection.

PIN CONNECTIONS		
Pin	Single	Dual
1	-V Input	-V Input
2	-V Input	-V Input
6	NC	Common
8	NC	-V Output
9	+V Output	+V Output
11	-V Output	Common
15	+V Input	+V Input
16	+V Input	+V Input

1.5 Watts

ISL Series



- Single & Dual Regulated Outputs
- 4:1 Input Range
- SMD Package
- Industry Standard Pinout
- 1500 VDC Isolation
- Short Circuit Protection
- 3 Year Warranty

Specification

Input

- Input Voltage Range** • 24 V (9-36 VDC)
48 V (18-72 VDC)
- Input Reverse Voltage Protection** • None
- Input Surge** • 24 V: 40 VDC for 100 ms
48 V: 80 VDC for 100 ms

Output

- Output Voltage** • See table
- Minimum Load** • 10%⁽¹⁾
- Line Regulation** • $\pm 0.2\%$ typical
- Load Regulation** • $\pm 0.5\%$ typical
- Setpoint Accuracy** • $\pm 1\%/\pm 3\%$ typical, positive/negative output
- Ripple & Noise** • 100 mV pk-pk 20 MHz bandwidth
- Temperature Coefficient** • 0.03%/°C
- Short Circuit Protection** • Continuous, automatic recovery

General

- Efficiency** • See table
- Isolation Voltage** • 1500 VDC
- Isolation Resistance** • $10^9 \Omega$
- Isolation Capacitance** • 1000 pF typical
- Switching Frequency** • 550 kHz typical at nominal input, full load
- MTBF** • >1 Mhrs to MIL-HDBK-217F at 25 °C, GB

Environmental

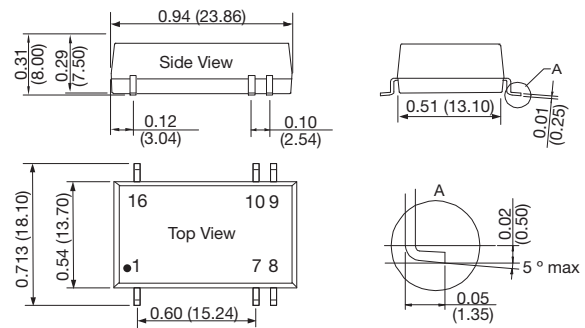
- Operating Temperature** • -40 °C to +85 °C, derate from 100% load at 70 °C to 0% load at 100 °C
- Storage Temperature** • -55 °C to +125 °C
- Case Temperature** • 100 °C max
- Cooling** • Convection-cooled
- Lead Temperature** • 240 °C, 0.06 in (1.5 mm) from case, 10 s

Notes

1. Operation at no load will not damage unit but it may not meet all specifications.

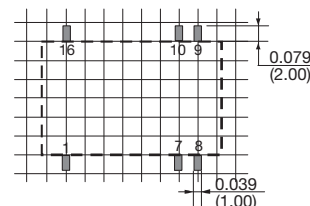
Input Voltage	Output Voltage	Output Current	Efficiency (typ)	Model Number
24 VDC	3.3 V	455 mA	72%	ISL2403A
	5.0 V	300 mA	76%	ISL2405A
	9.0 V	167 mA	78%	ISL2409A
	12.0 V	125 mA	79%	ISL2412A
	15.0 V	100 mA	80%	ISL2415A
	± 5.0 V	± 150 mA	74%	ISL2405
	± 12.0 V	± 63 mA	78%	ISL2412
48 VDC	± 15.0 V	± 50 mA	80%	ISL2415
	3.3 V	455 mA	72%	ISL4803A
	5.0 V	300 mA	76%	ISL4805A
	9.0 V	167 mA	78%	ISL4809A
	12.0 V	125 mA	79%	ISL4812A
	15.0 V	100 mA	80%	ISL4815A
	± 5.0 V	± 150 mA	74%	ISL4805
	± 12.0 V	± 63 mA	78%	ISL4812
	± 15.0 V	± 50 mA	80%	ISL4815

Mechanical Details



Recommended footprint

Top view grid: 0.1 x 0.1 in (2.54 x 2.54 mm)



Pin	Single	Dual
1	-Vin	-Vin
7	N.C.	N.C.
8	N.C.	0 V
9	+Vo	+Vo
10	0 V	-Vo
16	Vin	Vin

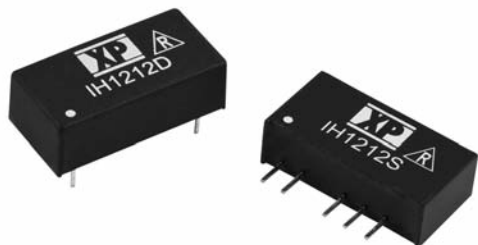
N.C. Not connected

Notes

1. All dimensions in inches (mm)
2. Tolerance: ± 0.010 (± 0.25)
3. Weight: 0.011 lbs (5.2 g)
4. Pin tolerance: ± 0.004 (± 0.10 mm)

2 Watts

IH Series



- Dual Output
- SIP or DIP Package
- 1000 VDC Isolation
- Optional 3000–6000 VDC Isolation
- MTBF >1.1 Mhrs
- -40 °C to +85 °C Operation
- 3 Year Warranty

Specification

Input

- | | |
|----------------------------------|--|
| Input Voltage Range | • Nominal $\pm 10\%$ |
| Input Reflected Ripple Current | • 20 mA pk-pk through 12 μ H inductor, 5Hz to 20 MHz |
| Input Reverse Voltage Protection | • None |
| Input Filter | • Capacitor |

Output

- | | |
|-------------------------|---|
| Output Voltage | • See table |
| Minimum Load | • None ⁽⁴⁾ |
| Line Regulation | • 1.2%/1% ΔV_{in} |
| Load Regulation | • $\pm 10\%$ 20-100% load change (3.3 V models $\pm 20\%$) |
| Setpoint Accuracy | • $\pm 3\%$ |
| Ripple & Noise | • 75 mV pk-pk max, 20 MHz bandwidth |
| Temperature Coefficient | • 0.02%/°C |
| Maximum Capacitive Load | • $\pm 220 \mu$ F |
| Cross Regulation | • 3.3 V and 5 V: $\pm 8\%$, all others: $\pm 5\%$ ⁽⁵⁾ |

General

- | | |
|-----------------------|---|
| Efficiency | • See table |
| Isolation Voltage | • 1000 VDC ⁽²⁾ |
| Isolation Resistance | • $10^9 \Omega$ |
| Isolation Capacitance | • 60 pF typical |
| MTBF | • >1.1 Mhrs to MIL-HDBK-217F at 25 °C, GB |

Environmental

- | | |
|-----------------------|---------------------|
| Operating Temperature | • -40 °C to +85 °C |
| Storage Temperature | • -40 °C to +125 °C |
| Case Temperature | • 100 °C max |
| Cooling | • Convection-cooled |

Notes

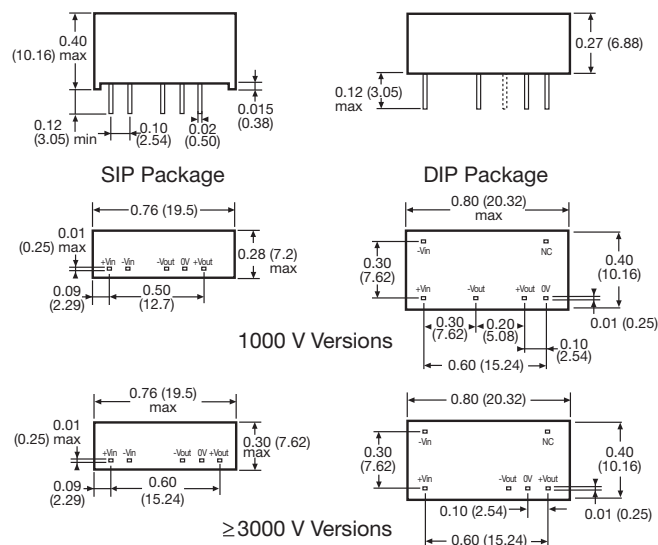
- For DIP package, replace 'S' with 'D' in model number.
- Add suffix '-H' to model number for 3000 VDC isolation. For higher VDC isolation, add suffix '-Hx' to model number where x=4 for 4000 VDC isolation, x=5 for 5200 VDC isolation and x=6 for 6000 VDC isolation.
- Outputs will power-trade.
- Operation at no load will not damage unit but it may not meet all specifications.
- When one output is set to 100% load and the other varies between 25%-100% load.
- All dimensions in inches (mm).
- Pin pitch tolerance: ± 0.014 (± 0.35)
- Case tolerance: ± 0.02 (± 0.5)
- Weight: SIP 0.004 lbs (2.2 g), DIP 0.005 lbs (2.4 g)

Input Voltage	No Load Input Current	Output Voltage	Output Current ⁽⁶⁾	Efficiency	Model Number ^(1,2)
5 VDC	30 mA	± 3.3 V	± 200 mA	65%	IH0503S [†] ^
	30 mA	± 5.0 V	± 200 mA	72%	IH0505S [†] ^
	30 mA	± 9.0 V	± 111 mA	77%	IH0509S [†] ^
	30 mA	± 12.0 V	± 84 mA	78%	IH0512S [†] ^
	30 mA	± 15.0 V	± 66 mA	80%	IH0515S [†] ^
	30 mA	± 24.0 V	± 42 mA	80%	IH0524S [†] ^
12 VDC	20 mA	± 3.3 V	± 200 mA	67%	IH1203S [†] ^
	20 mA	± 5.0 V	± 200 mA	75%	IH1205S [†] ^
	20 mA	± 9.0 V	± 111 mA	77%	IH1209S [†] ^
	20 mA	± 12.0 V	± 84 mA	82%	IH1212S [†] ^
	20 mA	± 15.0 V	± 66 mA	82%	IH1215S [†] ^
	20 mA	± 24.0 V	± 42 mA	82%	IH1224S [†] ^
24 VDC	10 mA	± 3.3 V	± 200 mA	68%	IH2403S [†] ^
	10 mA	± 5.0 V	± 200 mA	75%	IH2405S [†] ^
	10 mA	± 9.0 V	± 111 mA	80%	IH2409S [†] ^
	10 mA	± 12.0 V	± 84 mA	82%	IH2412S [†] ^
	10 mA	± 15.0 V	± 66 mA	82%	IH2415S [†] ^
	10 mA	± 24.0 V	± 42 mA	82%	IH2424S [†] ^
48 VDC	6 mA	± 3.3 V	± 200 mA	60%	IH4803S
	6 mA	± 5.0 V	± 200 mA	73%	IH4805S
	6 mA	± 9.0 V	± 111 mA	77%	IH4809S
	6 mA	± 12.0 V	± 84 mA	80%	IH4812S
	6 mA	± 15.0 V	± 66 mA	80%	IH4815S
	6 mA	± 24.0 V	± 42 mA	80%	IH4824S

[†] Available from Farnell & element14. See pages 284-290.

[^] Available from Newark. See pages 291-296.

Mechanical Details



2 Watts

IL Series



- Single Output
- SIP Package
- 1000 VDC Isolation
- Optional 3000 VDC Isolation
- MTBF >1.2 MHrs
- -40 °C to +85 °C Operation
- 3 Year Warranty

Specification

Input

- Input Voltage Range • Nominal $\pm 10\%$
- Input Reflected Ripple Current • 20 mA pk-pk through 12 μ H inductor, 5 Hz to 20 MHz
- Input Reverse Voltage Protection • None
- Input Filter • Capacitor

Output

- Output Voltage Range • See table
- Minimum Load • None⁽²⁾
- Line Regulation • 1.2%/1% Δ Vin
- Load Regulation • $\pm 10\%$, 20-100% load change (3.3 V models: $\pm 20\%$)
- Setpoint Accuracy • $\pm 3\%$
- Ripple & Noise • 150 mV pk-pk max, 20 MHz bandwidth
- Temperature Coefficient • 0.02%/°C
- Maximum Capacitive Load • 470 μ F

General

- Efficiency • See table
- Isolation Voltage • 1000 VDC minimum (3000 VDC -H option)
- Isolation Resistance • $10^9 \Omega$
- Isolation Capacitance • 60 pF typical
- Switching Frequency • Variable, 70 KHz typical
- MTBF • >1.21 MHrs to MIL-HDBK-217F at 25 °C, GB

Environmental

- Operating Temperature • -40 °C to +85 °C
- Storage Temperature • -40 °C to +125 °C
- Case Temperature • 100 °C max
- Cooling • Convection-cooled

Notes

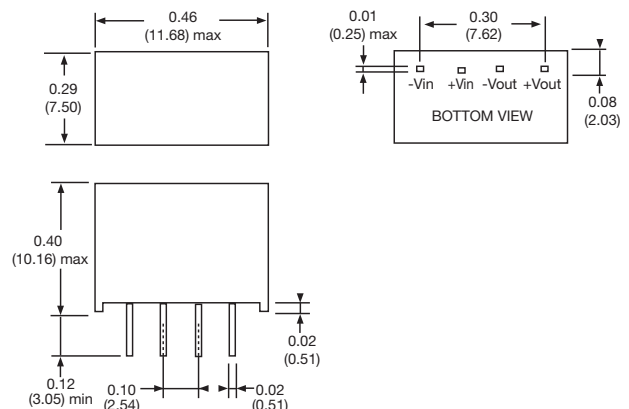
1. Add suffix 'H' to model for 3000 VDC isolation.
2. Operation at no load will not damage unit but it may not meet all specifications.
3. All dimensions in inches (mm).
4. Pin pitch tolerance: ± 0.014 (± 0.35), Case tolerance: ± 0.02 (± 0.5)
5. Weight: 0.004 lbs (1.8 g)

Input Voltage	No Load Input Current	Output Voltage	Output Current	Efficiency	Model Number ⁽¹⁾
5 VDC	35 mA	3.3 V	400 mA	71%	IL0503S [^]
	35 mA	5.0 V	400 mA	77%	IL0505S ^{†^}
	35 mA	9.0 V	222 mA	80%	IL0509S ^{†^}
	35 mA	12.0 V	168 mA	82%	IL0512S ^{†^}
	35 mA	15.0 V	132 mA	82%	IL0515S ^{†^}
	35 mA	24.0 V	84 mA	82%	IL0524S [^]
12 VDC	20 mA	3.3 V	400 mA	72%	IL1203S [^]
	20 mA	5.0 V	400 mA	78%	IL1205S ^{†^}
	20 mA	9.0 V	222 mA	82%	IL1209S ^{†^}
	20 mA	12.0 V	168 mA	84%	IL1212S ^{†^}
	20 mA	15.0 V	132 mA	84%	IL1215S ^{†^}
24 VDC	25 mA	24.0 V	84 mA	82%	IL1224S [^]
	10 mA	3.3 V	400 mA	74%	IL2403S ^{†^}
	10 mA	5.0 V	400 mA	80%	IL2405S ^{†^}
	10 mA	9.0 V	222 mA	84%	IL2409S [^]
	10 mA	12.0 V	168 mA	84%	IL2412S [^]
48 VDC	10 mA	15.0 V	132 mA	84%	IL2415S [^]
	10 mA	24.0 V	84 mA	84%	IL2424S [^]
	7 mA	3.3 V	400 mA	72%	IL4803S
	7 mA	5.0 V	400 mA	78%	IL4805S
	7 mA	9.0 V	222 mA	82%	IL4809S
	7 mA	12.0 V	168 mA	80%	IL4812S
	7 mA	15.0 V	132 mA	82%	IL4815S
	7 mA	24.0 V	84 mA	82%	IL4824S

[†] Available from Farnell & element14. See pages 284-290.

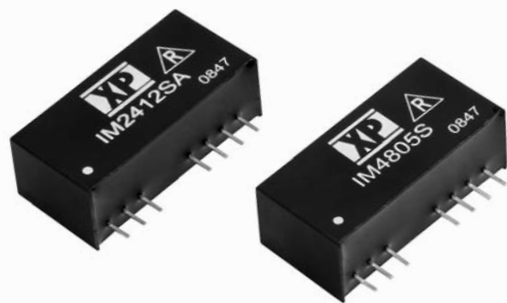
[^] Available from Newark. See pages 291-296.

Mechanical Details



2 Watts

IM Series



- Regulated Single & Dual Output
- Wide 4:1 Input Range
- SIP Package
- 1500 VDC Isolation
- Remote On/Off
- Continuous Short Circuit Protection
- 3 Year Warranty

Specification

Input

- Input Voltage Range • See table
- Input Reflected Ripple Current • 20 mA pk-pk through 12 μ H inductor and 47 μ F capacitor, 5 Hz to 20 MHz
- Input Filter • Capacitor
- Input Surge • 24 V models: 50 VDC for 100 ms
48 V models: 100 VDC for 100 ms

Output

- Output Voltage • See table
- Minimum Load • None⁽¹⁾
- Line Regulation • $\pm 0.5\%$ max
- Load Regulation • $\pm 0.5\%$ max from 10-100% load⁽¹⁾
- Setpoint Accuracy • $\pm 1\%$ max
- Ripple & Noise • 50 mV pk-pk max, 20 MHz bandwidth
- Short Circuit Protection • Continuous with auto recovery (foldback)
- Cross Regulation • $\pm 5\%$ on dual output models⁽²⁾
- Remote On/Off • Applying 2.7 to 15 VDC to pin 3 will turn output off
- Temperature Coefficient • 0.02%/C

General

- Efficiency • See table
- Isolation Voltage • 1500 VDC
- Isolation Resistance • $10^9 \Omega$
- Isolation Capacitance • 500 pF max
- Switching Frequency • 250 kHz typical
- MTBF • >1.2 Mhrs to MIL-HDBK-217F at 25 °C, GB

Environmental

- Operating Temperature • -40 °C to +100 °C, derate from 100% load at 75 °C to 0% load at 100 °C
- Storage Temperature • -40 °C to +125 °C
- Case Temperature • 100 °C max
- Cooling • Convection-cooled

Notes

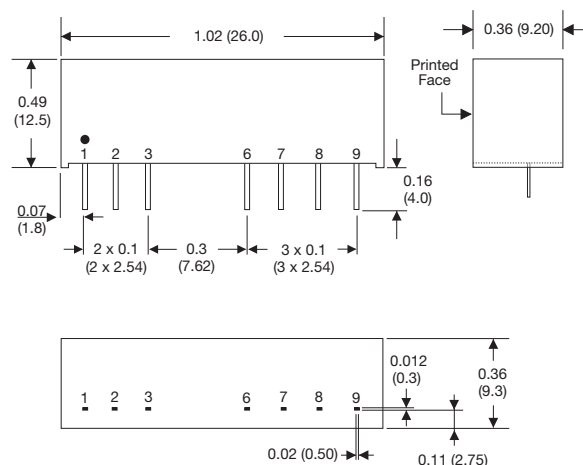
1. Operation at no load will not damage the converter but may not meet all specifications.
2. When one output is set to 100% load and the other varies between 25%-100% load.
3. Input current measured at nominal input voltage
4. Pin pitch tolerance: ± 0.014 (± 0.35)
5. Case tolerance: ± 0.02 (± 0.5)
6. Weight: 0.014 lbs (6.5 g)

Input Voltage	Output Voltage	Output Current	No Load Input Current ⁽³⁾	Max Capacitive Load	Efficiency	Model Number
9.0-36.0 V	3.3 V	500 mA	10 mA	2200 μ F	75%	IM2403SA [†] ^
	5.0 V	400 mA	10 mA	1000 μ F	81%	IM2405SA [†] ^
	12.0 V	165 mA	10 mA	165 μ F	84%	IM2412SA [†] ^
	15.0 V	135 mA	10 mA	100 μ F	85%	IM2415SA [†] ^
	± 5.0 V	± 200 mA	10 mA	± 470 μ F	81%	IM2405S [†] ^
	± 12.0 V	± 85 mA	10 mA	± 100 μ F	83%	IM2412S [†] ^
	± 15.0 V	± 65 mA	10 mA	± 47 μ F	82%	IM2415S [†] ^
18.0-75.0 V	3.3 V	500 mA	5 mA	2200 μ F	75%	IM4803SA [†] ^
	5.0 V	400 mA	5 mA	1000 μ F	80%	IM4805SA [†] ^
	12.0 V	165 mA	5 mA	165 μ F	84%	IM4812SA [†] ^
	15.0 V	135 mA	5 mA	100 μ F	84%	IM4815SA [†] ^
	± 5.0 V	± 200 mA	5 mA	± 470 μ F	80%	IM4805S [†] ^
	± 12.0 V	± 85 mA	5 mA	± 100 μ F	81%	IM4812S [†] ^
	± 15.0 V	± 65 mA	5 mA	± 47 μ F	84%	IM4815S [†] ^

[†] Available from Farnell & element14. See pages 284-290.

[^] Available from Newark. See pages 291-296.

Mechanical Details



PIN CONNECTIONS					
Pin	Single	Dual	Pin	Single	Dual
1	-V Input	-V Input	7	N.C.	Common
2	+V Input	+V Input	8	N.C.	N.C.
3	Remote On/Off	Remote On/Off	9	-V Output	-V Output
6	+V Output	+V Output			

2 Watts ISP Series



- Single & Dual Regulated Outputs
- 2:1 Input Range
- SMD Package
- Industry Standard Pinout
- 1500 VDC Isolation
- -40 °C to +85 °C Operation
- 3 Year Warranty

Specification

Input

- Input Voltage Range
 - 12 V (9-18 VDC)
 - 24 V (18-36 VDC)
- Input Reverse Voltage Protection
 - None
- Input Surge
 - 12 V: 22 VDC for 100 ms
 - 24 V: 40 VDC for 100 ms

Output

- Output Voltage
 - See table
- Minimum Load
 - 10%⁽¹⁾
- Line Regulation
 - ±0.5%
- Load Regulation
 - ±1%, balanced load on dual outputs
- Setpoint Accuracy
 - ±3%/±5%, positive/negative output
- Ripple & Noise
 - 150 mV pk-pk 20 MHz bandwidth
- Temperature Coefficient
 - 0.03%/°C
- Short Circuit Protection
 - Continuous, automatic recovery

General

- Efficiency
 - See table
- Isolation Voltage
 - 1500 VDC
- Isolation Resistance
 - 10⁹ Ω
- Isolation Capacitance
 - 85 pF typical
- Switching Frequency
 - 300 kHz typical at nominal input, full load
- MTBF
 - >1 Mhrs to MIL-HDBK-217F at 25 °C, GB

Environmental

- Operating Temperature
 - -40 °C to +70 °C, derate linearly to 0% load at +100 °C
- Storage Temperature
 - -55 °C to +125 °C
- Case Temperature
 - 100 °C max
- Cooling
 - Convection-cooled
- Lead Temperature
 - 240 °C, 0.06 in (1.5 mm) from case, 10 s

Notes

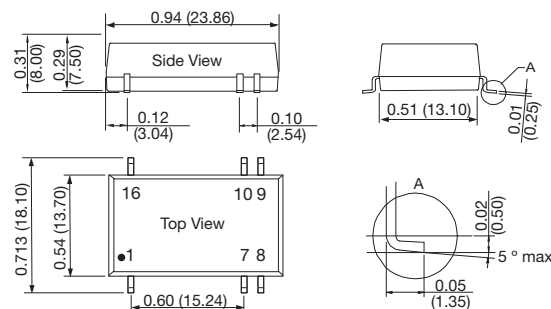
1. Operation at no load will not damage unit but it may not meet all specifications.

Input Voltage	Output Voltage	Output Current	Efficiency (typ)	Model Number
12 VDC	3.3 V	500 mA	70%	ISP1203A†^
	5.0 V	400 mA	74%	ISP1205A†^
	9.0 V	222 mA	76%	ISP1209A†^
	12.0 V	167 mA	78%	ISP1212A†^
	15.0 V	133 mA	79%	ISP1215A†^
	±5.0 V	±200 mA	74%	ISP1205†^
	±12.0 V	±83 mA	78%	ISP1212†^
24 VDC	±15.0 V	±67 mA	80%	ISP1215†^
	3.3 V	500 mA	72%	ISP2403A†^
	5.0 V	400 mA	76%	ISP2405A†^
	9.0 V	222 mA	78%	ISP2409A†^
	12.0 V	167 mA	80%	ISP2412A†^
	15.0 V	133 mA	80%	ISP2415A†^
	±5.0 V	±200 mA	74%	ISP2405†^
	±12.0 V	±83 mA	78%	ISP2412†^
	±15.0 V	±67 mA	80%	ISP2415†^

† Available from Farnell & element14. See pages 284-290.

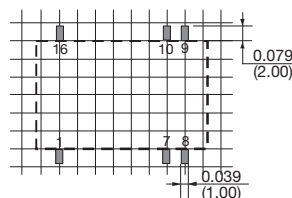
^ Available from Newark. See pages 291-296.

Mechanical Details



Recommended footprint

Top view grid: 0.1 x 0.1 in (2.54 x 2.54 mm)



Pin	Single	Dual
1	-Vin	-Vin
7	N.C.	N.C.
8	N.C.	0 V
9	+Vo	+Vo
10	0 V	-Vo
16	Vin	Vin

N.C. Not connected

Notes

1. All dimensions in inches (mm)

2. Tolerance: ±0.010 (±0.25)

3. Pin tolerance: ±0.004 (±0.10 mm)

4. Weight: 0.011 lbs (5.2 g)

2 Watts

ISQ Series



- Single Output
- SMD Package
- Industry Standard Pinout
- 6000 VDC Isolation
- -40 °C to +85 °C Operation
- MTBF >3.5 MHrs
- 3 Year Warranty

Specification

Input

- Input Voltage Range • Nominal $\pm 10\%$
- Input Reverse Voltage Protection • None

Output

- Output Voltage • See table
- Minimum Load • $10\%^{(1)}$
- Line Regulation • $1.2\%/1\% \Delta V_{in}$
- Load Regulation • 7.5% max for a 10-100% load change
- Setpoint Accuracy • 100-110% of nominal at 10% load
- Ripple & Noise • 200 mV pk-pk 20 MHz bandwidth
- Temperature Coefficient • $0.03\%/^{\circ}\text{C}$
- Short Circuit Protection • Continuous, automatic recovery

General

- Efficiency • See table
- Isolation Voltage • 6000 VDC
- Isolation Resistance • $10^9 \Omega$
- Isolation Capacitance • 10 pF typical
- Switching Frequency • 50 kHz at nominal input, full load
- MTBF • >3.5 MHrs to MIL-HDBK-217F at 25 °C, GB

Environmental

- Operating Temperature • -40 °C to +85 °C
- Storage Temperature • -55 °C to +125 °C
- Case Temperature • 105 °C max
- Cooling • Convection-cooled
- Lead Temperature • 260 °C, 0.06 in (1.5 mm) from case, 10 s

Notes

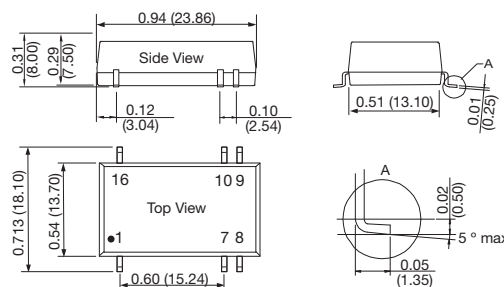
1. Operation at no load will not damage device but may not meet all specifications.

Input Voltage	Output Voltage	Output Current	Efficiency (typ)	Model Number
5 VDC	5.0 V	400 mA	76%	ISQ0505A†^
	12.0 V	167 mA	79%	ISQ0512A†^
	15.0 V	133 mA	78%	ISQ0515A†^
12 VDC	5.0 V	400 mA	76%	ISQ1205A†^
	12.0 V	167 mA	80%	ISQ1212A†^
	15.0 V	133 mA	79%	ISQ1215A†^
24 VDC	5.0 V	400 mA	77%	ISQ2405A†^
	12.0 V	167 mA	80%	ISQ2412A†^
	15.0 V	133 mA	78%	ISQ2415A†^

† Available from Farnell & element14. See pages 284-290.

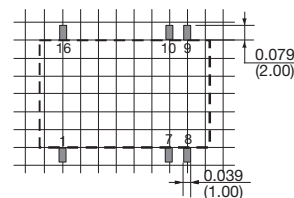
^ Available from Newark. See pages 291-296.

Mechanical Details



Recommended footprint

Top view grid: 0.1 x 0.1 in (2.54 x 2.54 mm)



Pin	Function
1	-Vin
7	N.C.
8	N.C.
9	+Vo
10	-Vo
16	+Vin

N.C. Not connected

Notes

1. All dimensions in inches (mm)
2. Tolerance: ± 0.010 (± 0.25)

3. Weight: 0.008 lbs (3.8 g)
4. Pin tolerance: ± 0.004 (± 0.10 mm)

2 Watts

IST Series



- Single Output
- SMD Package
- Industry Standard Pinout
- 1000 VDC Isolation
- MTBF >3.5 MHrs
- -40 °C to +85 °C Operation
- 3 Year Warranty

Specification

Input

- Input Voltage Range • Nominal $\pm 10\%$
- Input Reverse Voltage Protection • None

Output

- Output Voltage • See table
- Minimum Load • $10\%^{(2)}$
- Line Regulation • $1.2\%/1\% \Delta V_{in}$
- Load Regulation • 7.5% max for a 10-100% load change
- Setpoint Accuracy • 100-110% of nominal at 10% load
- Ripple & Noise • 200 mV pk-pk 20 MHz bandwidth
- Temperature Coefficient • $0.03\%/^{\circ}\text{C}$

General

- Efficiency • See table
- Isolation Voltage • 1000 VDC
- Isolation Resistance • $10^9 \Omega$
- Switching Frequency • 500 kHz typical at nominal input, full load
- MTBF • >3.5 MHrs to MIL-HDBK-217F at 25 °C, GB

Environmental

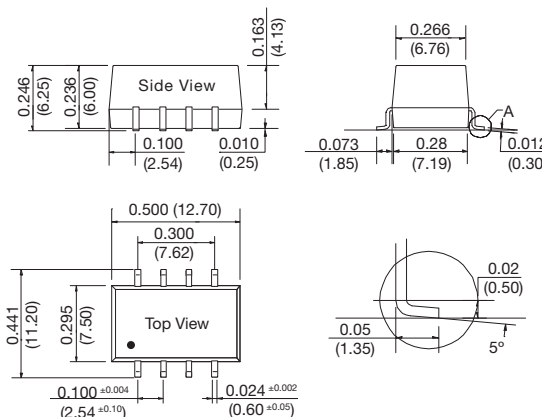
- Operating Temperature • -40 °C to +85 °C
- Storage Temperature • -55 °C to +125 °C
- Case Temperature • 105 °C max
- Cooling • Convection-cooled
- Lead Temperature • 260 °C, 0.06 in (1.5 mm) from case, 10 s

Input Voltage	Output Voltage	Output Current	Efficiency (typ)	Model Number ⁽¹⁾
5 VDC	5.0 V	400 mA	78%	IST0505A [†] ^
	12.0 V	167 mA	79%	IST0512A [†] ^
	15.0 V	133 mA	79%	IST0515A [†] ^
12 VDC	5.0 V	400 mA	78%	IST1205A [†] ^
	12.0 V	167 mA	80%	IST1212A [†] ^
	15.0 V	133 mA	81%	IST1215A [†] ^
24 VDC	5.0 V	400 mA	78%	IST2405A [†] ^
	12.0 V	167 mA	80%	IST2412A [†] ^
	15.0 V	133 mA	81%	IST2415A [†] ^

Notes

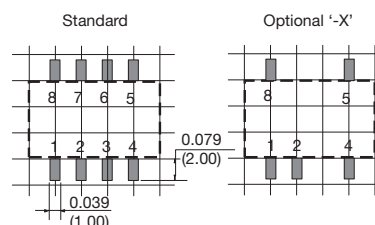
1. For alternative pin out, add suffix '-X' to end of part number eg. IST2415A-X.
 2. Operation at no load will not damage device but may not meet all specifications.
- [†] Available from Farnell & element14. See pages 284-290.
[^] Available from Newark. See pages 291-296.

Mechanical Details



Recommended footprint

Top view grid: 0.1 x 0.1 in (2.54 x 2.54 mm)



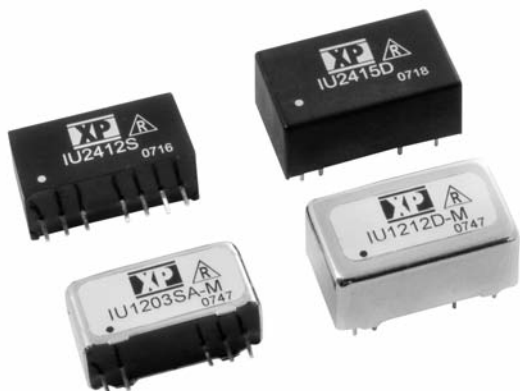
Pin	Standard	'-X' Version
1	-Vin	-Vin
2	+Vin	+Vin
4	0 V	0 V
5	+Vo	+Vo
3,6,7	N.C.	No Pin
8	N.C.	N.C.

N.C. Not connected

Notes

1. All dimensions in inches (mm)
2. Tolerance: ± 0.010 (± 0.25)
3. Weight: 0.004 lbs (1.7 g)
4. Pin tolerance: ± 0.004 (± 0.10 mm)

2 Watts IU Series



- Regulated Single & Dual Output
- Wide 2:1 Input Range
- SIP or DIP Package
- 1000 VDC Isolation (Optional 3000 VDC)
- Optional Metal Case
- Continuous Short Circuit Protection
- 3 Year Warranty

Specification

Input

- Input Voltage Range • See table
- Input Reflected Ripple Current • 35 mA pk-pk through 12 μ H inductor, 5-20 MHz
- Input Filter • Capacitor

Output

- Output Voltage • See table
- Minimum Load • None⁽⁶⁾
- Line Regulation • $\pm 0.5\%$
- Load Regulation • $\pm 1\%$ for a 25-100% load change⁽⁷⁾
- Setpoint Accuracy • $\pm 2\%$
- Cross Regulation • $\pm 5\%$ on dual output models
- Ripple & Noise • 80 mV pk-pk max, 20 MHz bandwidth⁽⁸⁾
- Short Circuit Protection • Continuous with auto recovery (foldback)
- Max Capacitive Load • See table
- Remote On/Off • Optional on SIP package model⁽⁴⁾
- Temperature Coefficient • 0.02%/C

General

- Efficiency • See table
- Isolation Voltage • 1000 VDC, Optional 3000 VDC⁽²⁾
- Isolation Resistance • $10^9 \Omega$
- Isolation Capacitance • 60 pF
- Switching Frequency • 100-650 kHz
- MTBF • >1.61 Mhrs to MIL-HDBK-217F, at 25 °C, GB

Environmental

- Operating Temperature • -40 °C to +85 °C
- Storage Temperature • -40 °C to +125 °C
- Case Temperature • +100 °C max
- Cooling • Convection cooled

Notes

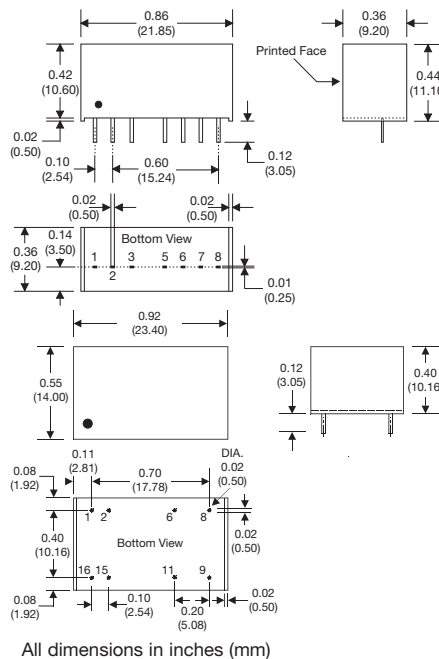
- For dual inline package replace 'S' in model number with 'D'.
- For optional 3 kV isolation add suffix '-H' to the model number.
- For dual output delete suffix 'A' & split output current equally between rails.
- For optional Remote On/Off on SIP models, add suffix '-R' to model number. Applying 5 V via 1 k Ω current limiting resistor and diode turns output off.
- For optional metal case, add suffix '-M' to model number.
- Output capacitor of 100 μ F required to meet quoted ripple & noise.
- Minimum load of 25% required to meet load regulation & ripple & noise specifications.
- Operation at no load will not damage device but may not meet all specifications.
- Pin pitch tolerance: ± 0.014 (± 0.35), Case tolerance: ± 0.02 (± 0.5)
- Weight: SIP 0.009 lbs (4.0 g), DIP 0.013 lbs (6.0 g), Metal case weight: SIP 0.014 lbs (6.5 g), DIP 0.017 lbs (8.0 g), consult sales for drawing

Input Voltage	No Load Input Current	Output Voltage ⁽³⁾	Output Current	Max. Capacitive Load	Efficiency	Model Number (1-5)
4.5-9.0 V	15 mA	3.3 V	500 mA	3300 μ F	67%	IU0503SA†^
	15 mA	5.0 V	400 mA	3300 μ F	70%	IU0505SA†^
	30 mA	9.0 V	222 mA	470 μ F	72%	IU0509SA†^
	30 mA	12.0 V	167 mA	470 μ F	72%	IU0512SA†^
	30 mA	15.0 V	133 mA	470 μ F	73%	IU0515SA†^
	60 mA	24.0 V	83 mA	220 μ F	75%	IU0524SA†^
9.0-18.0 V	15 mA	3.3 V	500 mA	3300 μ F	67%	IU1203SA†^
	15 mA	5.0 V	400 mA	3300 μ F	77%	IU1205SA†^
	15 mA	9.0 V	222 mA	470 μ F	78%	IU1209SA†^
	15 mA	12.0 V	167 mA	470 μ F	80%	IU1212SA†^
	15 mA	15.0 V	133 mA	470 μ F	78%	IU1215SA†^
	15 mA	24.0 V	83 mA	220 μ F	80%	IU1224SA†^
18.0-36.0 V	8 mA	3.3 V	500 mA	3300 μ F	70%	IU2403SA†^
	8 mA	5.0 V	400 mA	3300 μ F	77%	IU2405SA†^
	8 mA	9.0 V	222 mA	470 μ F	80%	IU2409SA†^
	8 mA	12.0 V	167 mA	470 μ F	80%	IU2412SA†^
	8 mA	15.0 V	133 mA	470 μ F	80%	IU2415SA†^
	8 mA	24.0 V	83 mA	220 μ F	80%	IU2424SA†^
36.0-72.0 V	6 mA	3.3 V	500 mA	3300 μ F	71%	IU4803SA†^
	6 mA	5.0 V	400 mA	3300 μ F	74%	IU4805SA†^
	6 mA	9.0 V	222 mA	470 μ F	78%	IU4809SA†^
	6 mA	12.0 V	167 mA	470 μ F	78%	IU4812SA†^
	6 mA	15.0 V	133 mA	470 μ F	78%	IU4815SA†^
	6 mA	24.0 V	83 mA	220 μ F	80%	IU4824SA†^

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296.

Mechanical Details



PIN CONNECTIONS		
Pin	Single	Dual
1	-V Input	-V Input
2	+V Input	+V Input
3	Opt. ROF*	Opt. ROF**
5	N.P. / N.C.	N.C.
6	+V Output	+V Output
7	-V Output	-V Output
8	NC	Common

* When optional ROF is present pin 5 is No Connection. When not present pin 3 & 5 are No Pin.

** When optional ROF is present pin 5 is No Connection. When not present pin 3 & 5 are No Connection.

PIN CONNECTIONS		
Pin	Single	Dual
1	-V Input	-V Input
2	-V Input	-V Input
6	NC	Common
8	NC	-V Output
9	+V Output	+V Output
11	-V Output	Common
15	+V Input	+V Input
16	+V Input	+V Input

3 Watts

IP Series



- Regulated Single & Dual Output
- Wide 4:1 Input Range
- SIP Package
- 1600 VDC Isolation
- -40 °C to 85 °C Operation
- Remote On/Off
- 3 Year Warranty

Specification

Input

- Input Voltage Range • See table
- Input Reflected Ripple Current • 20 mA pk-pk through 12 μ H inductor and 47 μ F capacitor, 5 Hz to 20 MHz
- Input Filter • Capacitor
- Input Surge • 12 V models: 25 VDC for 100 ms
24 V models: 50 VDC for 100 ms
48 V models: 100 VDC for 100 ms

Output

- Output Voltage • See table
- Minimum Load • None⁽¹⁾
- Line Regulation • $\pm 0.2\%$ max
- Load Regulation • $\pm 1.0\%$ max for a 10-100% load change⁽¹⁾
- Setpoint Accuracy • $\pm 1\%$ max
- Ripple & Noise • 30 mV pk-pk max, 20 MHz bandwidth
- Temperature Coefficient • 0.02%/°C
- Short Circuit Protection • Continuous with auto recovery (foldback)
- Cross Regulation • $\pm 5\%$ on dual output models⁽²⁾
- Remote On/Off • Apply 2 to 4 mA to pin 3 to turn off output

General

- Efficiency • See table
- Isolation Voltage • 1600 VDC
- Isolation Resistance • 10⁹ Ω
- Isolation Capacitance • 200 pF
- Switching Frequency • 100-600 kHz variable
- MTBF • >1.7 Mhrs to MIL-HDBK-217F at 25 °C, GB

Environmental

- Operating Temperature • -40 °C to +85 °C, derate from 100% load at 70 °C to 30% load at 85 °C
- Storage Temperature • -40 °C to +125 °C
- Case Temperature • 100 °C max
- Cooling • Convection cooled

Notes

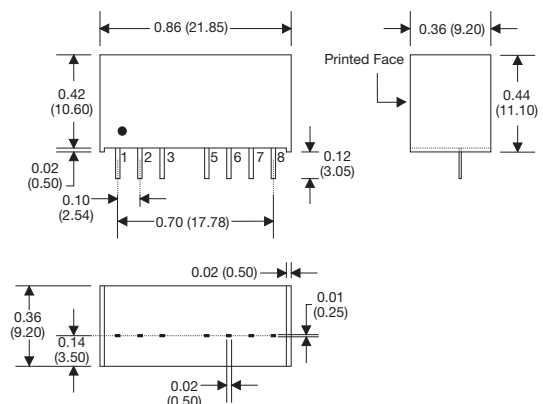
1. Operation at no load will not damage the converter but may not meet all specifications.
2. When one output is set to 100% load and the other varies between 25%-100% load.
3. Pin pitch tolerance ± 0.014 (± 0.35)
4. Case tolerance ± 0.02 (0.5)
5. Weight: 0.014 lbs (6.5 g)
6. All dimensions in inches (mm)

Input Voltage	Output Voltage	Output Current	No Load Input Current	Max Capacitive Load	Efficiency	Model Number
4.5-18.0 V	3.3 V	700 mA	40 mA	1760 μ F	72%	IP1203SA [†] [^]
	5.0 V	600 mA	40 mA	1000 μ F	77%	IP1205SA [†] [^]
	12.0 V	250 mA	40 mA	170 μ F	81%	IP1212SA [†] [^]
	15.0 V	200 mA	40 mA	110 μ F	81%	IP1215SA [†] [^]
	± 5.0 V	± 300 mA	40 mA	± 470 μ F	77%	IP1205S [†] [^]
	± 12.0 V	± 125 mA	40 mA	± 100 μ F	80%	IP1212S [†] [^]
	± 15.0 V	± 100 mA	40 mA	± 47 μ F	80%	IP1215S [†] [^]
9.0-36.0 V	3.3 V	700 mA	25 mA	1760 μ F	75%	IP2403SA [†] [^]
	5.0 V	600 mA	25 mA	1000 μ F	79%	IP2405SA [†] [^]
	12.0 V	250 mA	25 mA	170 μ F	82%	IP2412SA [†] [^]
	15.0 V	200 mA	25 mA	110 μ F	82%	IP2415SA [†] [^]
	± 5.0 V	± 300 mA	25 mA	± 470 μ F	79%	IP2405S [†] [^]
	± 12.0 V	± 125 mA	25 mA	± 100 μ F	79%	IP2412S [†] [^]
	± 15.0 V	± 100 mA	25 mA	± 47 μ F	80%	IP2415S [†] [^]
18.0-75.0 V	3.3 V	700 mA	15 mA	1760 μ F	74%	IP4803SA [†] [^]
	5.0 V	600 mA	15 mA	1000 μ F	78%	IP4805SA [†] [^]
	12.0 V	250 mA	15 mA	170 μ F	80%	IP4812SA [†] [^]
	15.0 V	200 mA	15 mA	110 μ F	81%	IP4815SA [†] [^]
	± 5.0 V	± 300 mA	15 mA	± 470 μ F	79%	IP4805S [†] [^]
	± 12.0 V	± 125 mA	15 mA	± 100 μ F	79%	IP4812S [†] [^]
	± 15.0 V	± 100 mA	15 mA	± 47 μ F	79%	IP4815S [†] [^]

[†] Available from Farnell & element14. See pages 284-290.

[^] Available from Newark. See pages 291-296.

Mechanical Details



PIN CONNECTIONS					
Pin	Single	Dual	Pin	Single	Dual
1	-V Input	-V Input	5	N.C.	N.C.
2	+V Input	+V Input	6	+V Output	+V Output
3	Remote On/Off	Remote On/Off	7	-V Output	Common
4	No Pin	No Pin	8	N.C.	-V Output

3 Watts

IR Series



- Single & Dual Output
- SIP Package
- 1000 VDC Isolation
- Optional 3000 VDC Isolation
- -40 °C to +85 °C Operation
- Semi-regulated
- 3 Year Warranty

Specification

Input

- Input Voltage Range • Nominal $\pm 10\%$
- Input Reflected Ripple Current • 20 mA pk-pk, 5 Hz to 20 MHz
- Input Reverse Voltage Protection • None

Output

- Output Voltage • See table
- Minimum Load • None⁽¹⁾
- Line Regulation • 1.2%/1% ΔV_{in}
- Load Regulation • See table
- Setpoint Accuracy • +2%, -4%
- Ripple & Noise • 50 mV pk-pk max, 20 MHz bandwidth⁽²⁾
- Temperature Coefficient • 0.02%/°C
- Maximum Capacitive Load • See table

General

- Efficiency • See table
- Isolation Voltage • 1000 VDC minimum, 3000 VDC option⁽³⁾
- Isolation Resistance • $10^9 \Omega$
- Isolation Capacitance • 60 pF typical
- Switching Frequency • Variable, 60 kHz - 85 kHz
- MTBF • >1.1 Mhrs to MIL-HDBK-217F at 25 °C, GB

Environmental

- Operating Temperature • -40 °C to +85 °C
- Storage Temperature • -40 °C to +125 °C
- Case Temperature • 100 °C max
- Cooling • Convection-cooled

Notes

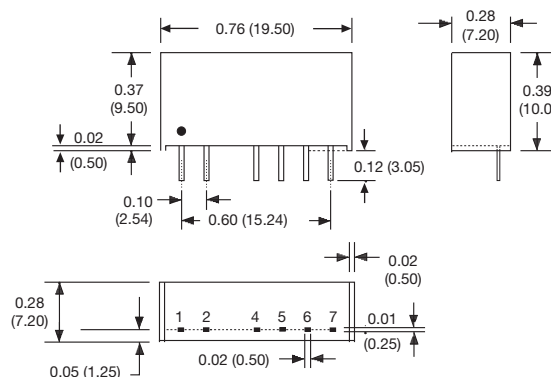
- Operation at no load will not damage unit but it may not meet all specifications.
- Output capacitor of 1 μF required to meet quoted ripple and noise.
- For optional 3 kV isolation, add suffix '-H' to the model number.
- All dimensions in inches (mm).
- Pin pitch tolerance: ± 0.014 (± 0.35)
- Case tolerance: ± 0.02 (± 0.5)
- Weight: 0.006 lbs (2.8 g)

Input Voltage	No Load Input Current	Output Voltage	Output Current	Max Capacitive Load	Efficiency	Load Reg.	Model Number
5 VDC	80 mA	5.0 V	600 mA	220 μF	79%	8.0%	IR0505SA†^
	70 mA	9.0 V	333 mA	220 μF	84%	7.0%	IR0509SA†^
	70 mA	12.0 V	250 mA	100 μF	84%	6.0%	IR0512SA†^
	80 mA	15.0 V	200 mA	100 μF	84%	6.0%	IR0515SA†^
	80 mA	± 5.0 V	± 300 mA	± 100 μF	82%	7.0%	IR0505S†^
	70 mA	± 9.0 V	± 167 mA	± 100 μF	85%	6.0%	IR0509S†^
	70 mA	± 12.0 V	± 125 mA	± 47 μF	85%	6.0%	IR0512S†^
	70 mA	± 15.0 V	± 100 mA	± 47 μF	86%	5.0%	IR0515S†^
12 VDC	25 mA	5.0 V	600 mA	220 μF	84%	6.0%	IR1205SA†^
	25 mA	9.0 V	333 mA	220 μF	87%	4.0%	IR1209SA†^
	25 mA	12.0 V	250 mA	100 μF	88%	4.0%	IR1212SA†^
	20 mA	15.0 V	200 mA	100 μF	90%	3.0%	IR1215SA†^
	25 mA	± 5.0 V	± 300 mA	± 100 μF	85%	5.0%	IR1205S†^
	25 mA	± 9.0 V	± 167 mA	± 100 μF	88%	4.0%	IR1209S†^
	25 mA	± 12.0 V	± 125 mA	± 47 μF	89%	3.0%	IR1212S†^
	20 mA	± 15.0 V	± 100 mA	± 47 μF	90%	3.0%	IR1215S†^

† Available from Farnell & element14. See pages 284-290.

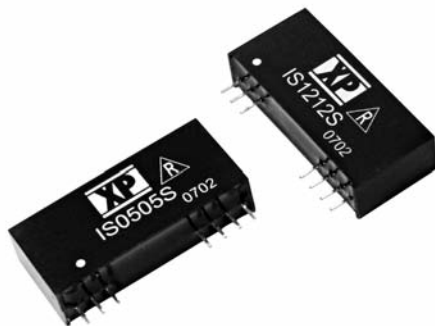
^ Available from Newark. See pages 291-296.

Mechanical Details



3 Watts

IS Series



- Regulated Single Output
- SIP Package
- 1000 VDC Isolation
- Optional 3000 VDC Isolation
- Continuous Short Circuit Protection
- MTBF >1.1 Mhrs
- 3 Year Warranty

Specification

Input

- Input Voltage Range • Nominal $\pm 10\%$
- Input Reflected Ripple Current • 20 mA pk-pk through 12 μ H inductor, 5 Hz to 20 MHz
- Input Filter • Capacitor

Output

- Output Voltage • See table
- Minimum Load • None⁽²⁾
- Line Regulation • $\pm 0.5\%$ max
- Load Regulation • $\pm 0.5\%$ max (0% to full load)
 $\pm 1.5\%$ for 3.3 V versions
- Setpoint Accuracy • $\pm 2\%$ max
- Ripple & Noise • 75 mV pk-pk max, 20 MHz bandwidth
- Temperature Coefficient • $\pm 0.02\%/^{\circ}\text{C}$
- Short Circuit Protection • Continuous with auto recovery (foldback)
- Maximum Capacitive Load • 470 μ F

Input Voltage	No Load Input Current	Output Voltage	Output Current	Efficiency	Model Number ⁽¹⁾
5 V	100 mA	3.3 V	600 mA	53%	IS0503SA
	100 mA	5.0 V	600 mA	62%	IS0505SA
	100 mA	9.0 V	333 mA	67%	IS0509SA
	100 mA	12.0 V	250 mA	70%	IS0512SA
	100 mA	15.0 V	200 mA	68%	IS0515SA
	120 mA	24.0 V	125 mA	64%	IS0524SA
12 V	60 mA	3.3 V	600 mA	55%	IS1203SA
	60 mA	5.0 V	600 mA	60%	IS1205SA
	60 mA	9.0 V	333 mA	67%	IS1209SA
	60 mA	12.0 V	250 mA	69%	IS1212SA-1
	60 mA	15.0 V	200 mA	70%	IS1215SA
	60 mA	24.0 V	125 mA	68%	IS1224SA
24 V	30 mA	3.3 V	600 mA	54%	IS2403SA
	30 mA	5.0 V	600 mA	61%	IS2405SA
	30 mA	9.0 V	333 mA	65%	IS2409SA
	30 mA	12.0 V	250 mA	70%	IS2412SA
	30 mA	15.0 V	200 mA	71%	IS2415SA
	30 mA	24.0 V	125 mA	71%	IS2424SA

General

- Efficiency • See table
- Isolation Voltage • 1000 VDC, optional 3000 VDC⁽¹⁾
- Isolation Resistance • $10^9 \Omega$
- Isolation Capacitance • 60 pF
- Switching Frequency • 50 kHz typical
- MTBF • >1.1 Mhrs to MIL-HDBK- 217F at 25 $^{\circ}\text{C}$, GB

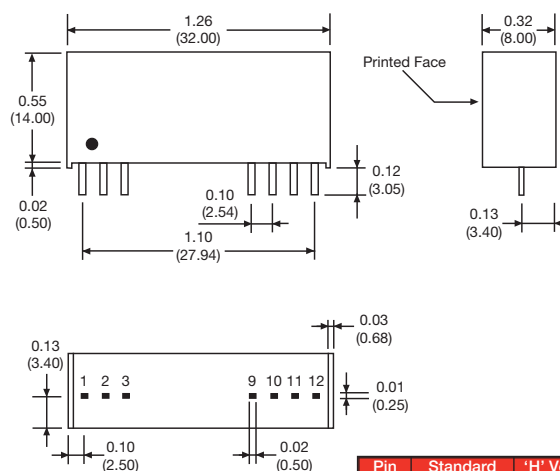
Environmental

- Operating Temperature • -25 $^{\circ}\text{C}$ to +70 $^{\circ}\text{C}$
- Storage Temperature • -40 $^{\circ}\text{C}$ to +125 $^{\circ}\text{C}$
- Case Temperature • +100 $^{\circ}\text{C}$ max
- Cooling • Convection-cooled
- Derating • Derate from 100% load at +70 $^{\circ}\text{C}$ to 50% load at +85 $^{\circ}\text{C}$

Notes

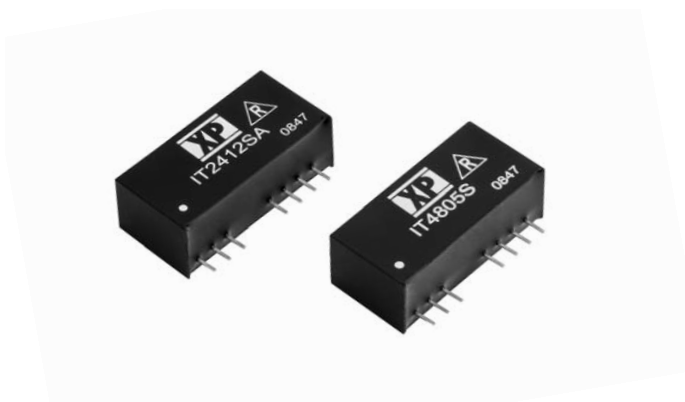
1. Add suffix '-H' to model number for 3000 VDC isolation.
2. Operation at no load will not damage device but it may not meet all specifications
3. All dimensions in inches (mm).
4. Pin pitch tolerance: ± 0.014 (± 0.35)
5. Case tolerance: ± 0.02 (± 0.5)
6. Weight: 0.02 lbs (7.2 g)

Mechanical Details



Pin	Standard	'H' Versions
1	+Vin	+Vin
2	N.C.	-Vin
3	N.C.	N.C.
9	N.C.	N.C.
10	-Vout	-Vout
11	+Vout	+Vout
12	-Vin	N.C.

3 Watts IT Series



- Regulated Single & Dual Output
- Wide 4:1 Input Range
- SIP Package
- 1500 VDC Isolation
- -40 °C to 100 °C Operation
- Remote On/Off
- 3 Year Warranty

Specification

Input

- Input Voltage Range • See table
- Input Reflected Ripple Current • 20 mA pk-pk through 12 μ H inductor and 47 μ F capacitor, 5 Hz to 20 MHz
- Input Filter • Capacitor
- Input Surge • 24 V models: 50 VDC for 100 ms
48 V models: 100 VDC for 100 ms

Output

- Output Voltage • See table
- Minimum Load • None⁽¹⁾
- Line Regulation • $\pm 0.5\%$ max
- Load Regulation • $\pm 0.5\%$ max from 10-100% load⁽¹⁾
- Setpoint Accuracy • $\pm 1\%$ max
- Ripple & Noise • 50 mV pk-pk max, 20 MHz bandwidth
- Temperature Coefficient • 0.02%/°C
- Short Circuit Protection • Continuous with auto recovery (hiccup)
- Cross Regulation • $\pm 5\%$ on dual output models⁽²⁾
- Remote On/Off • Apply 2.7 to 15 VDC to pin 3 to turn output off

General

- Efficiency • See table
- Isolation Voltage • 1500 VDC
- Isolation Resistance • $10^9 \Omega$
- Isolation Capacitance • 500 pF, max
- Switching Frequency • 250 kHz typical
- MTBF • >1.2 Mhrs to MIL-HDBK-217F at 25 °C, GB

Environmental

- Operating Temperature • -40 °C to +100 °C, derate from 100% load at 75 °C to 0% load at 100 °C
- Storage Temperature • -40 °C to +125 °C
- Case Temperature • 100 °C max
- Cooling • Convection cooled

Notes

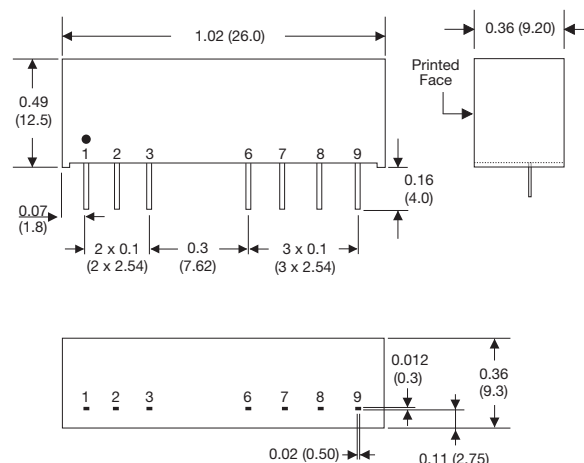
1. Operation at no load will not damage the converter but may not meet all specifications.
2. When one output is set to 100% load and the other varies between 25%-100% load.
3. Pin pitch tolerance ± 0.014 (± 0.35)
4. Case tolerance ± 0.02 (0.5)
5. Weight: 0.014 lbs (6.5 g)
6. All dimensions in inches (mm)

Input Voltage	Output Voltage	Output Current	No Load Input Current	Max Capacitive Load	Efficiency	Model Number
9.0-36.0 V	3.3 V	700 mA	10 mA	2200 μ F	77%	IT2403SA [†] ^
	5.0 V	600 mA	10 mA	1000 μ F	82%	IT2405SA [†] ^
	12.0 V	250 mA	10 mA	165 μ F	84%	IT2412SA [†] ^
	15.0 V	200 mA	10 mA	100 μ F	85%	IT2415SA [†] ^
	± 5.0 V	± 300 mA	10 mA	± 470 μ F	81%	IT2405S [†] ^
	± 12.0 V	± 125 mA	10 mA	± 100 μ F	84%	IT2412S [†] ^
18.0-75.0 V	± 15.0 V	± 100 mA	10 mA	± 47 μ F	84%	IT2415S [†] ^
	3.3 V	700 mA	5 mA	2200 μ F	75%	IT4803SA [†] ^
	5.0 V	600 mA	8 mA	1000 μ F	81%	IT4805SA [†] ^
	12.0 V	250 mA	5 mA	165 μ F	84%	IT4812SA [†] ^
	15.0 V	200 mA	5 mA	100 μ F	84%	IT4815SA [†] ^
	± 5.0 V	± 300 mA	5 mA	± 470 μ F	81%	IT4805S [†] ^
	± 12.0 V	± 125 mA	5 mA	± 100 μ F	84%	IT4812S [†] ^
	± 15.0 V	± 100 mA	5 mA	± 47 μ F	83%	IT4815S [†] ^

[†] Available from Farnell & element14. See pages 284-290.

[^] Available from Newark. See pages 291-296.

Mechanical Details



PIN CONNECTIONS					
Pin	Single	Dual	Pin	Single	Dual
1	-V Input	-V Input	7	N.C.	Common
2	+V Input	+V Input	8	N.C.	N.C.
3	Remote On/Off	Remote On/Off	9	-V Output	-V Output
6	+V Output	+V Output			

3 Watts

IZ Series



- Regulated Single & Dual Output
- Wide 2:1 Input Range
- SIP Package
- 1600 VDC Isolation
- Continuous Short Circuit Protection
- Remote On/Off
- 3 Year Warranty

Specification

Input

- Input Voltage Range • See table
- Input Reflected Ripple Current • 35 mA pk-pk through 12 μ H inductor and 47 μ F capacitor, 5 Hz to 20 MHz
- Input Filter • Capacitor

Output

- Output Voltage • See table
- Minimum Load • None⁽⁴⁾
- Line Regulation • $\pm 0.5\%$ max
- Load Regulation • $\pm 1.0\%$ max for a 25-100% load change
- Setpoint Accuracy • $\pm 1\%$ max
- Ripple & Noise • 75 mV pk-pk max, 20 MHz bandwidth
- Short Circuit Protection • Continuous with auto recovery (foldback)
- Cross Regulation • $\pm 5\%$ on dual output models⁽⁵⁾
- Remote On/Off • Apply 3-6 mA to pin 3 to turn off output
- Temperature Coefficient • 0.02%/C

General

- Efficiency • See table
- Isolation Voltage • 1600 VDC
- Isolation Resistance • $10^9 \Omega$
- Isolation Capacitance • 680 pF
- Switching Frequency • 100-650 kHz
- MTBF • >1.34 Mhrs to MIL-HDBK-217F at 25 °C, GB

Environmental

- Operating Temperature • -40 °C to +100 °C, derate from 100% load at +70 °C to 0% load at +100 °C
- Storage Temperature • -40 °C to +125 °C
- Case Temperature • +100 °C max
- Cooling • Convection cooled

Notes

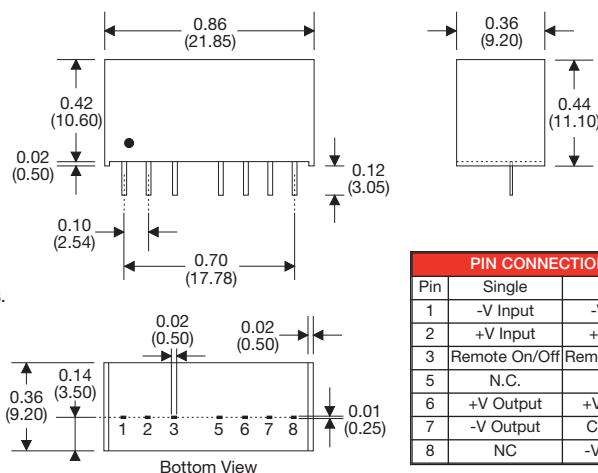
1. Measured at nominal input voltage.
2. For optional metal case, add suffix '-M' to model number.
3. Minimum load of 25% required to meet load regulation & ripple & noise specifications.
4. Operation at no load will not damage the part but it may not meet all specifications.
5. When one output is set to 100% load and the other varies between 25-100% load.
6. Pin pitch tolerance: ± 0.014 (± 0.35)
7. Case tolerance: ± 0.02 (± 0.5)
8. Weight: SIP 0.009 lbs (3.9 g), DIP 0.013 lbs (5.9 g)
9. All dimensions in inches (mm)

Input Voltage	No Load ⁽¹⁾ Input Current	Output Voltage	Output Current	Efficiency	Max Capacitive Load	Model Number ⁽²⁾
4.5-9.0 V	65 mA	3.3 V	700 mA	74%	2200 μ F	IZ0503SA [†] [^]
	70 mA	5.0 V	600 mA	76%	1000 μ F	IZ0505SA [†] [^]
	75 mA	12.0 V	250 mA	82%	470 μ F	IZ0512SA [†] [^]
	75 mA	15.0 V	200 mA	82%	220 μ F	IZ0515SA [†] [^]
	90 mA	± 5.0 V	± 300 mA	77%	± 470 μ F	IZ0505S [†] [^]
	90 mA	± 12.0 V	± 125 mA	81%	± 220 μ F	IZ0512S [†] [^]
9.0-18.0 V	90 mA	± 15.0 V	± 100 mA	82%	± 100 μ F	IZ0515S [†] [^]
	25 mA	3.3 V	700 mA	76%	2200 μ F	IZ1203SA [†] [^]
	35 mA	5.0 V	600 mA	81%	1000 μ F	IZ1205SA [†] [^]
	35 mA	12.0 V	250 mA	84%	470 μ F	IZ1212SA [†] [^]
	35 mA	15.0 V	200 mA	84%	220 μ F	IZ1215SA [†] [^]
	45 mA	± 5.0 V	± 300 mA	80%	± 470 μ F	IZ1205S [†] [^]
18.0-36.0 V	45 mA	± 12.0 V	± 125 mA	83%	± 220 μ F	IZ1212S [†] [^]
	45 mA	± 15.0 V	± 100 mA	82%	± 100 μ F	IZ1215S [†] [^]
	15 mA	3.3 V	700 mA	74%	2200 μ F	IZ2403SA [†] [^]
	15 mA	5.0 V	600 mA	79%	1000 μ F	IZ2405SA [†] [^]
	20 mA	12.0 V	250 mA	82%	470 μ F	IZ2412SA [†] [^]
	20 mA	15.0 V	200 mA	84%	220 μ F	IZ2415SA [†] [^]
36.0-72.0 V	20 mA	± 5.0 V	± 300 mA	80%	± 470 μ F	IZ2405S [†] [^]
	20 mA	± 12.0 V	± 125 mA	83%	± 220 μ F	IZ2412S [†] [^]
	20 mA	± 15.0 V	± 100 mA	83%	± 100 μ F	IZ2415S [†] [^]
	10 mA	3.3 V	700 mA	75%	2200 μ F	IZ4803SA [†] [^]
	10 mA	5.0 V	600 mA	78%	1000 μ F	IZ4805SA [†] [^]
	15 mA	12.0 V	250 mA	81%	470 μ F	IZ4812SA [†] [^]
	15 mA	15.0 V	200 mA	81%	220 μ F	IZ4815SA [†] [^]
	35 mA	± 5.0 V	± 300 mA	78%	± 470 μ F	IZ4805S [†] [^]
	20 mA	± 12.0 V	± 125 mA	80%	± 220 μ F	IZ4812S [†] [^]
	20 mA	± 15.0 V	± 100 mA	81%	± 100 μ F	IZ4815S [†] [^]

[†] Available from Farnell & element14. See pages 284-290.

[^] Available from Newark. See pages 291-296.

Mechanical Details



PIN CONNECTIONS		
Pin	Single	Dual
1	-V Input	-V Input
2	+V Input	+V Input
3	Remote On/Off	Remote On/Off
5	N.C.	N.C.
6	+V Output	+V Output
7	-V Output	Common
8	NC	-V Output

2 Watts

JAH Series



- Low Cost
- DIP-24 Package
- Operating Temperature -40 °C to +100 °C
- Single & Dual Outputs
- Optional Metal Case
- Optional Isolation to 6000 VDC
- 3 Year Warranty

Specification

Input

Input Voltage Range	• Nominal $\pm 10\%$
Input Current	• See table
Input Filter	• Pi network
Input Reverse Voltage Protection	• None
Undervoltage Lockout	• None
Input Reflected Ripple	• 35 mA pk-pk through 12 μ H inductor, 5 Hz to 20 MHz
Input Surge	• 5 V models 7 VDC for 100 ms 12 V models 15 VDC for 100 ms 24 V models 28 VDC for 100 ms

Output

Output Voltage	• See table
Minimum Load	• No minimum load required
Initial Set Accuracy	• $\pm 2\%$ max
Start Up Delay	• 20 ms typical
Start Up Rise Time	• 20 ms typical
Line Regulation	• $\pm 0.5\%$ max
Load Regulation	• $\pm 0.5\%$ max single & dual models ($\pm 1.0\%$ max for 3V3 versions) (see note 6)
Cross Regulation	• $\pm 5\%$ on dual output models (see note 4)
Transient Response	• $\pm 3\%$ max deviation ($\pm 5\%$ for 3V3 output), recovery to within 1% in 2 ms for a 50% load change
Ripple & Noise	• 75 mV pk-pk measured with 20 MHz bandwidth
Short Circuit Protection	• Output shuts down with auto recovery
Maximum Capacitive Load	• See tables
Temperature Coefficient	• $\pm 0.02/^{\circ}\text{C}$ max

General

Efficiency	• See tables
Isolation	• 1000 VDC input to output, for optional high isolation versions up to 6000 VDC input to output (see note 1) 1000 VDC input to case 1000 VDC output to case
Isolation Resistance	• $10^9 \Omega$
Switching Frequency	• 40 kHz typical singles, 300 kHz typical duals
Power Density	• 5.21 W/in ³
MTBF	• >3 Mhrs to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Temperature	• -40 °C to +100 °C, derate from 100% load at +85 °C to no load at +100 °C
Case Temperature	• +100 °C max
Storage Temperature	• -40 °C to +125 °C
Humidity	• Up to 90%, non-condensing
Cooling	• Natural convection

EMC & Safety

Emissions	• EN55022 class A, conducted & radiated with external components (see Application Notes)
ESD Immunity	• EN61000-4-2, level 3, Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3, Perf Criteria A (see note 5)
Surge	• EN61000-4-5, installation class 2, Perf Criteria A (see note 5)
Conducted Immunity	• EN61000-4-6, 10 Vrms, Perf Criteria A
Magnetic Fields	• EN61000-4-8, 1 A/m, Perf Criteria A

Models and Ratings

JAH02 XP

Input Voltage	Output Voltage	Output Current	Input Current ⁽²⁾		Maximum Capacitive Load	Efficiency	Model Number ^(1,3)
			No Load	Full Load			
5 V	3.3 V	500 mA	75 mA	622 mA	330 μ F	53%	JAH0205S3V3†^
	5.0 V	400 mA	75 mA	615 mA	330 μ F	65%	JAH0205S05†^
	9.0 V	222 mA	75 mA	597 mA	330 μ F	67%	JAH0205S09†^
	12.0 V	166 mA	75 mA	571 mA	330 μ F	70%	JAH0205S12†^
	15.0 V	133 mA	75 mA	588 mA	330 μ F	68%	JAH0205S15†^
	24.0 V	83 mA	75 mA	615 mA	330 μ F	65%	JAH0205S24†^
	±3.3 V	±300 mA	30 mA	638 mA	±1000 μ F	62%	JAH0205D03†^
	±5.0 V	±200 mA	30 mA	588 mA	±1000 μ F	68%	JAH0205D05†^
	±9.0 V	±111 mA	40 mA	571 mA	±470 μ F	70%	JAH0205D09†^
	±12.0 V	±83 mA	40 mA	571 mA	±470 μ F	70%	JAH0205D12†^
12 V	3.3 V	500 mA	70 mA	245 mA	330 μ F	56%	JAH0212S3V3†^
	5.0 V	400 mA	70 mA	260 mA	330 μ F	64%	JAH0212S05†^
	9.0 V	222 mA	70 mA	245 mA	330 μ F	68%	JAH0212S09†^
	12.0 V	166 mA	70 mA	238 mA	330 μ F	70%	JAH0212S12†^
	15.0 V	133 mA	70 mA	252 mA	330 μ F	66%	JAH0212S15†^
	24.0 V	83 mA	70 mA	256 mA	330 μ F	65%	JAH0212S24†^
	±3.3 V	±300 mA	20 mA	250 mA	±1000 μ F	66%	JAH0212D03†^
	±5.0 V	±200 mA	20 mA	228 mA	±1000 μ F	73%	JAH0212D05†^
	±9.0 V	±111 mA	20 mA	222 mA	±470 μ F	75%	JAH0212D09†^
	±12.0 V	±83 mA	20 mA	213 mA	±470 μ F	78%	JAH0212D12†^
24 V	3.3 V	500 mA	25 mA	120 mA	330 μ F	57%	JAH0224S3V3†^
	5.0 V	400 mA	25 mA	132 mA	330 μ F	63%	JAH0224S05†^
	9.0 V	222 mA	25 mA	132 mA	330 μ F	63%	JAH0224S09†^
	12.0 V	166 mA	25 mA	122 mA	330 μ F	68%	JAH0224S12†^
	15.0 V	133 mA	25 mA	122 mA	330 μ F	68%	JAH0224S15†^
	24.0 V	83 mA	25 mA	122 mA	330 μ F	68%	JAH0224S24†^
	±3.3 V	±300 mA	15 mA	121 mA	±1000 μ F	68%	JAH0224D03†^
	±5.0 V	±200 mA	15 mA	114 mA	±1000 μ F	73%	JAH0224D05†^
	±9.0 V	±111 mA	15 mA	111 mA	±470 μ F	75%	JAH0224D09†^
	±12.0 V	±83 mA	15 mA	104 mA	±470 μ F	80%	JAH0224D12†^

Notes

- For optional 3000 VDC isolation add suffix '-H' to model number.
For optional 4000 VDC isolation add suffix '-H4' to model number.
For optional 5000 VDC isolation add suffix '-H5' to model number.
For optional 6000 VDC isolation add suffix '-H6' to model number.
- Input current measured at nominal input voltage.
- For optional metal case add suffix '-M'. Metal case is only an option up to 3000 VDC isolation versions eg. JAH0212S15-HM.

- Cross regulation is $\pm 5\%$ when one output is at 100% and the other is varied between 25% and 100%.
- A 220 μ F/250 V capacitor across the input is required in order to meet EN61000-4-4 and EN61000-4-5.
- Dual output regulation is specified with a balanced load.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296.

Mechanical Details

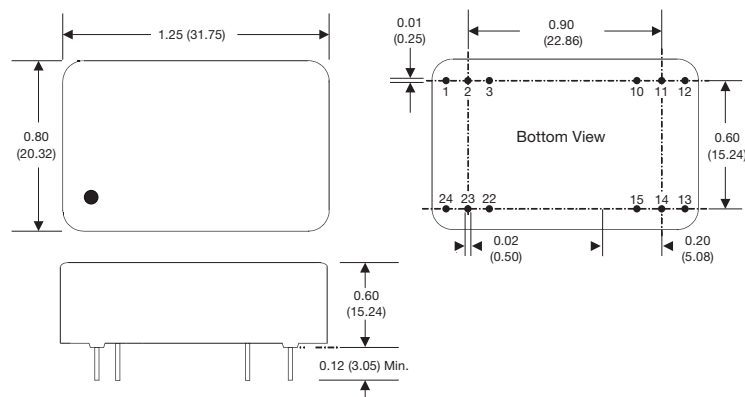
PIN CONNECTIONS				
Pin	Single	Dual	Single -H	Dual -H
1	+Vin	+Vin	+Vin	+Vin
2	N.C.	-Vin	+Vin	+Vin
3	N.C.	Common	N.P	N.P
10	-Vout	Common	N.P	Common
11	+Vout	+Vout	N.P	Common
12	-Vin	-Vin	-Vout	N.P
13	-Vin	-Vin	+Vout	-Vout
14	+Vout	+Vout	N.P	N.P
15	-Vout	Common	N.P	+Vout
22	N.C.	Common	N.P	N.P
23	N.C.	-Vout	-Vin	-Vin
24	+Vin	+Vin	-Vin	-Vin

N.P : No Pin

N.C : No Connection

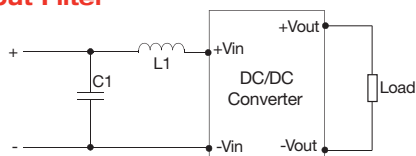
Notes

- All dimensions are in inches (mm)
- Weight: Plastic Case: 0.028 lbs (12.5 g),
Metal Case: 0.033 lbs (15.0 g)
- Pin diameter: 0.02 $\pm$ 0.002 (0.5 $\pm$ 0.05)
- Pin pitch tolerance: $\pm$ 0.014 ($\pm$ 0.35)
- Case tolerance: $\pm$ 0.02 ($\pm$ 0.5)



Application Notes

Input Filter



Single Output Models		Dual Output Models	
C1	L1	C1	L1
220 μ F/100 V	12 μ H	220 μ F/100 V	22 μ H

2/3 Watts

JCA Series



- Compact 1.0" x 0.8" Metal Package
- Industry Standard Pin Out
- 2:1 Input Range
- Single & Dual Outputs
- Operating Temperature -40 °C to +100 °C
- UL & TUV Approved
- 3 Year Warranty

Specification

Input

Input Voltage Range	• 5 V (4.5-9.0 VDC) • 12 V (9-18 VDC) • 24 V (18-36 VDC) • 48 V (36-75 VDC)
Input Current	• See table
Input Filter	• Pi network
Undervoltage Lockout	• Turn On at >90-95% of rated input • Turn Off at <80% of rated input
Input Reflected Ripple Current	• 80 mA, 5 V input models, 30 mA all others • 12 μH inductor, 5 Hz to 20 MHz
Input Surge	• 5 V models 10 V for 1 s max, • 12 V models 25 V for 1 s max, • 24 V models 50 V for 1 s max, • 48 V models 100 V for 1 s max

Output

Output Voltage	• See table
Initial Set Accuracy	• $\pm 1\%$ max
Start Up Delay	• 30 ms max
Start Up Rise Time	• 3.5 ms typical
Minimum Load	• No minimum load required
Line Regulation	• $\pm 0.3\%$
Load Regulation	• $\pm 1\%$
Cross Regulation	• $\pm 5\%$ on dual output models
Transient Response	• 4% max deviation, recovery to within 1% in <500 μs for a 25% load change at 1 A/μs
Ripple & Noise	• 50 mV pk-pk, 20 MHz bandwidth
Overcurrent Protection	• 150% typical, trip and restart (hiccup mode)
Short Circuit Protection	• Continuous with auto recovery
Overvoltage Protection	• 150% typical, Recycle input to reset
Temperature Coefficient	• $\pm 0.05\%/^{\circ}\text{C}$

General

Efficiency	• See table
Isolation	• 1500 VDC Input to Output, basic insulation • 500 VDC Input to Case • 500 VDC Output to Case
Switching Frequency	• 300 kHz typical
Power Density	• JCA02: 6.25 W/in³, JCA03: 9.38 W/in³
MTBF	• >2 Mhrs to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Temperature	• -40 °C to +100 °C output power derates from 100% load at +75 °C linearly to 0% load at +100 °C
Case Temperature	• +100 °C max
Storage Temperature	• -55 °C to +125 °C
Cooling	• Convection cooled
Operating Humidity	• Up to 95% RH, non-condensing

EMC & Safety

Emissions	• EN55022, level A conducted (level B with external components, see application note), level B radiated
ESD Immunity	• EN61000-4-2, level 2 Perf Criteria A
Radiated Immunity	• EN61000-4-3, 3 V/m Perf Criteria A
Conducted Immunity	• EN61000-4-6, 3 V rms Perf Criteria A
Magnetic Fields	• EN61000-4-8, 10 A/m, Perf Criteria A
Safety Approvals	• EN60950-1, UL60950-1, CSA C22.2 No. 60950-1-03, CE Mark LVD

Models and Ratings

JCA02/03 XP

Input Voltage ⁽¹⁾	Output Voltage	Output Current	Input Current ⁽²⁾		Efficiency	Model Number
			No Load	Full Load		
4.5-9.0 VDC	3.3 VDC	0.600 A	28 mA	560 mA	69%	JCA0205S03†^
	5.0 VDC	0.400 A	10 mA	535 mA	73%	JCA0205S05†^
	12.0 VDC	0.170 A	15 mA	526 mA	74%	JCA0205S12†^
	15.0 VDC	0.140 A	26 mA	559 mA	74%	JCA0205S15†^
	±5.0 VDC	±0.200 A	15 mA	502 mA	74%	JCA0205D01†^
	±12.0 VDC	±0.085 A	19 mA	537 mA	73%	JCA0205D02†^
	±15.0 VDC	±0.070 A	25 mA	560 mA	70%	JCA0205D03†^
9-18 VDC	3.3 VDC	0.600 A	8 mA	225 mA	72%	JCA0212S03†^
	5.0 VDC	0.400 A	5 mA	224 mA	74%	JCA0212S05†^
	12.0 VDC	0.170 A	5 mA	223 mA	74%	JCA0212S12†^
	15.0 VDC	0.140 A	7 mA	227 mA	74%	JCA0212S15†^
	±5.0 VDC	±0.200 A	10 mA	219 mA	74%	JCA0212D01†^
	±12.0 VDC	±0.085 A	9 mA	223 mA	74%	JCA0212D02†^
	±15.0 VDC	±0.070 A	11 mA	232 mA	73%	JCA0212D03†^
18-36 VDC	3.3 VDC	0.600 A	3 mA	112 mA	73%	JCA0224S03†^
	5.0 VDC	0.400 A	3 mA	107 mA	75%	JCA0224S05†^
	12.0 VDC	0.170 A	4 mA	109 mA	75%	JCA0224S12†^
	15.0 VDC	0.140 A	4 mA	111 mA	75%	JCA0224S15†^
	±5.0 VDC	±0.200 A	3 mA	107 mA	76%	JCA0224D01†^
	±12.0 VDC	±0.085 A	5 mA	108 mA	76%	JCA0224D02†^
	±15.0 VDC	±0.070 A	6 mA	115 mA	73%	JCA0224D03†^
36-75 VDC	3.3 VDC	0.600 A	3 mA	62 mA	71%	JCA0248S03†^
	5.0 VDC	0.400 A	5 mA	58 mA	70%	JCA0248S05†^
	12.0 VDC	0.170 A	3 mA	58 mA	70%	JCA0248S12†^
	15.0 VDC	0.140 A	3 mA	59 mA	72%	JCA0248S15†^
	±5.0 VDC	±0.200 A	2 mA	56 mA	73%	JCA0248D01†^
	±12.0 VDC	±0.085 A	3 mA	57 mA	73%	JCA0248D02†^
	±15.0 VDC	±0.070 A	3 mA	60 mA	70%	JCA0248D03†^

Input Voltage ⁽¹⁾	Output Voltage	Output Current	Input Current ⁽²⁾		Efficiency	Model Number
			No Load	Full Load		
4.5-9.0 VDC	3.3 VDC	0.910 A	28 mA	873 mA	68%	JCA0305S03†^
	5.0 VDC	0.600 A	10 mA	835 mA	74%	JCA0305S05†^
	12.0 VDC	0.260 A	15 mA	805 mA	75%	JCA0305S12†^
	15.0 VDC	0.200 A	26 mA	804 mA	74%	JCA0305S15†^
	±5.0 VDC	±0.300 A	15 mA	778 mA	74%	JCA0305D01†^
	±12.0 VDC	±0.130 A	19 mA	793 mA	74%	JCA0305D02†^
	±15.0 VDC	±0.100 A	25 mA	820 mA	73%	JCA0305D03†^
9-18 VDC	3.3 VDC	0.910 A	8 mA	333 mA	74%	JCA0312S03†^
	5.0 VDC	0.600 A	5 mA	324 mA	75%	JCA0312S05†^
	12.0 VDC	0.260 A	5 mA	315 mA	78%	JCA0312S12†^
	15.0 VDC	0.200 A	7 mA	322 mA	77%	JCA0312S15†^
	±5.0 VDC	±0.300 A	10 mA	325 mA	75%	JCA0312D01†^
	±12.0 VDC	±0.130 A	9 mA	313 mA	75%	JCA0312D02†^
	±15.0 VDC	±0.100 A	11 mA	322 mA	73%	JCA0312D03†^
18-36 VDC	3.3 VDC	0.910 A	3 mA	165 mA	74%	JCA0324S03†^
	5.0 VDC	0.600 A	3 mA	157 mA	77%	JCA0324S05†^
	12.0 VDC	0.260 A	4 mA	154 mA	77%	JCA0324S12†^
	15.0 VDC	0.200 A	4 mA	157 mA	77%	JCA0324S15†^
	±5.0 VDC	±0.300 A	3 mA	156 mA	77%	JCA0324D01†^
	±12.0 VDC	±0.130 A	5 mA	154 mA	77%	JCA0324D02†^
	±15.0 VDC	±0.100 A	6 mA	160 mA	75%	JCA0324D03†^
36-75 VDC	3.3 VDC	0.910 A	3 mA	82 mA	73%	JCA0348S03†^
	5.0 VDC	0.600 A	5 mA	82 mA	74%	JCA0348S05†^
	12.0 VDC	0.260 A	6 mA	79 mA	75%	JCA0348S12†^
	15.0 VDC	0.200 A	6 mA	81 mA	75%	JCA0348S15†^
	±5.0 VDC	±0.300 A	2 mA	79 mA	76%	JCA0348D01†^
	±12.0 VDC	±0.130 A	3 mA	78 mA	76%	JCA0348D02†^
	±15.0 VDC	±0.100 A	3 mA	82 mA	74%	JCA0348D03†^

Notes

1. Nominal input voltage 5, 12, 24 or 48 VDC.

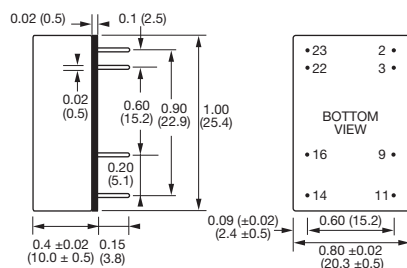
2. Input current is at nominal input voltage.

3. Efficiency is measured at nominal input and full load at 25 °C.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296.

Mechanical Details and Application Note

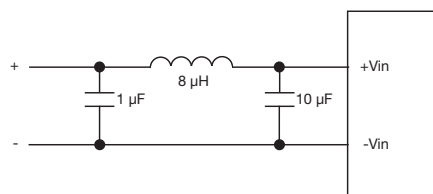


PIN CONNECTIONS		
Pin	Single Output	Dual Output
2	-Vin	-Vin
3	-Vin	-Vin
9	No pin	Common
11	N/C	-Vout
14	+Vout	+Vout
16	-Vout	Common
22	+Vin	+Vin
23	+Vin	+Vin

- All dimensions in inches (mm)
- Weight: 0.03 lbs (12 g)
- Pin diameter tolerance: ±0.00079 (±0.02)
- Pin pitch tolerance: ±0.01 (±0.25)
- Case tolerance: ±0.02 (±0.5)

Input Filter

To meet level B conducted emissions.



JCB Series



- 2:1 Input Range
- Operating Temperature -40°C to $+100^{\circ}\text{C}$
- Single & Dual Outputs
- 1500 VDC Isolation
- Optional Isolation to 3000 VDC
- Optional Metal Case
- 3 Year Warranty

Specification

Input

Input Voltage Range	• 5 V (4.5-9 VDC) • 12 V (9-18 VDC) • 24 V (18-36 VDC) • 48 V (36-72 VDC)
Input Current	• See table
Input Filter	• Pi network
Input Reflected Ripple	• 35 mA pk-pk through 12 μH inductor
Input Surge	• 5 V models 15 VDC for 100 ms • 12 V models 24 VDC for 100 ms • 24 V models 40 VDC for 100 ms • 48 V models 80 VDC for 100 ms
Undervoltage Lockout	• None
Reverse Voltage Protection	• None

Output

Output Voltage	• See table
Minimum Load	• Minimum load required (see note 1)
Initial Set Accuracy	• $\pm 1\%$ max
Line Regulation	• $\pm 0.5\%$ max
Load Regulation	• $\pm 0.5\%$ max
Cross Regulation	• $\pm 5\%$ on dual output models (see note 2)
Transient Response	• $< 3\%$ deviation, recovery to within 1% in 2 ms for a 50% load change
Ripple & Noise	• 60 mV pk-pk max, 20 MHz bandwidth
Short Circuit Protection	• Continuous, with auto recovery
Overvoltage Protection	• None
Overcurrent Protection	• None
Maximum Capacitive Load	• See tables
Temperature Coefficient	• $\pm 0.02/^{\circ}\text{C}$ max

General

Efficiency	• See tables
Isolation Voltage	• 1500 VDC Input to Output • For optional high isolation version 3000 VDC (see note 3) • 1500 VDC Input to Case • 1500 VDC Output to Case
Switching Frequency	• 100-400 kHz variable
Isolation Resistance	• $10^9 \Omega$
Power Density	• 7.5 W/in³
MTBF	• > 2 Mhrs to MIL-HDBK-217F at 25°C, GB

Environmental

Operating Temperature	• -40°C to $+100^{\circ}\text{C}$, derate from 100% load at $+85^{\circ}\text{C}$ to no load at $+100^{\circ}\text{C}$
Case Temperature	• $+100^{\circ}\text{C}$ max
Storage Temperature	• -40°C to $+125^{\circ}\text{C}$
Humidity	• Up to 95% RH, non-condensing
Cooling	• Natural convection

EMC & Safety

Emissions	• EN55022 Class A conducted & radiated, with external components, see application note
ESD Immunity	• EN61000-4-2, level 3, Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3, Perf Criteria A (see note 7)
Surge	• EN61000-4-5, installation class 3, Perf Criteria A (see note 7)
Conducted Immunity	• EN61000-4-6, 10 V rms, Perf Criteria A
Magnetic Fields	• EN61000-4-8, 1 A/m, Perf Criteria A

Models and Ratings

Input Voltage	Output Voltage	Output Current	Input Current ⁽⁶⁾		Maximum Capacitive Load	Efficiency	Model Number ^(3,4,5)
			No Load	Full Load			
4.5-9 V	5.0 V	600 mA	40 mA	857 mA	2200 µF	70%	JCB0305S05†^
	9.0 V	333 mA	40 mA	833 mA	470 µF	72%	JCB0305S09†^
	12.0 V	250 mA	40 mA	810 mA	470 µF	74%	JCB0305S12†^
	15.0 V	200 mA	40 mA	810 mA	470 µF	74%	JCB0305S15†^
	24.0 V	125 mA	40 mA	857 mA	220 µF	70%	JCB0305S24†^
	±5.0 V	±300 mA	40 mA	869 mA	±1000 µF	69%	JCB0305D05†^
	±9.0 V	±167 mA	40 mA	857 mA	±220 µF	70%	JCB0305D09†^
	±12.0 V	±125 mA	40 mA	833 mA	±220 µF	72%	JCB0305D12†^
	±15.0 V	±100 mA	40 mA	810 mA	±220 µF	74%	JCB0305D15†^
9-18 V	5.0 V	600 mA	20 mA	328 mA	2200 µF	76%	JCB0312S05†^
	9.0 V	333 mA	20 mA	324 mA	470 µF	77%	JCB0312S09†^
	12.0 V	250 mA	20 mA	316 mA	470 µF	79%	JCB0312S12†^
	15.0 V	200 mA	20 mA	316 mA	470 µF	79%	JCB0312S15†^
	24.0 V	125 mA	20 mA	316 mA	220 µF	79%	JCB0312S24†^
	±5.0 V	±300 mA	20 mA	324 mA	±1000 µF	77%	JCB0312D05†^
	±9.0 V	±167 mA	20 mA	320 mA	±220 µF	78%	JCB0312D09†^
	±12.0 V	±125 mA	20 mA	320 mA	±220 µF	78%	JCB0312D12†^
	±15.0 V	±100 mA	20 mA	320 mA	±220 µF	78%	JCB0312D15†^
18-36 V	5.0 V	600 mA	12 mA	156 mA	2200 µF	80%	JCB0324S05†^
	9.0 V	333 mA	12 mA	156 mA	470 µF	80%	JCB0324S09†^
	12.0 V	250 mA	12 mA	152 mA	470 µF	82%	JCB0324S12†^
	15.0 V	200 mA	12 mA	152 mA	470 µF	82%	JCB0324S15†^
	24.0 V	125 mA	12 mA	156 mA	220 µF	80%	JCB0324S24†^
	±5.0 V	±300 mA	12 mA	160 mA	±1000 µF	78%	JCB0324D05†^
	±9.0 V	±167 mA	12 mA	158 mA	±220 µF	79%	JCB0324D09†^
	±12.0 V	±125 mA	12 mA	156 mA	±220 µF	80%	JCB0324D12†^
	±15.0 V	±100 mA	12 mA	156 mA	±220 µF	80%	JCB0324D15†^
36-72 V	5.0 V	600 mA	8 mA	81 mA	2200 µF	77%	JCB0348S05†^
	9.0 V	333 mA	8 mA	80 mA	470 µF	78%	JCB0348S09†^
	12.0 V	250 mA	8 mA	78 mA	470 µF	80%	JCB0348S12†^
	15.0 V	200 mA	8 mA	78 mA	470 µF	80%	JCB0348S15†^
	24.0 V	125 mA	8 mA	78 mA	220 µF	80%	JCB0348S24†^
	±5.0 V	±300 mA	8 mA	80 mA	±1000 µF	78%	JCB0348D05†^
	±9.0 V	±167 mA	8 mA	79 mA	±220 µF	79%	JCB0348D09†^
	±12.0 V	±125 mA	8 mA	78 mA	±220 µF	80%	JCB0348D12†^
	±15.0 V	±100 mA	8 mA	78 mA	±220 µF	80%	JCB0348D15†^
	5.0 V	600 mA	8 mA	78 mA	±100 µF	80%	JCB0348D24†^
	9.0 V	333 mA	8 mA	78 mA	±100 µF	80%	JCB0348D24†^
	12.0 V	250 mA	8 mA	78 mA	±100 µF	80%	JCB0348D24†^
	15.0 V	200 mA	8 mA	78 mA	±100 µF	80%	JCB0348D24†^
	24.0 V	125 mA	8 mA	78 mA	±100 µF	80%	JCB0348D24†^
	±5.0 V	±300 mA	8 mA	78 mA	±100 µF	80%	JCB0348D24†^
	±9.0 V	±167 mA	8 mA	78 mA	±100 µF	80%	JCB0348D24†^
	±12.0 V	±125 mA	8 mA	78 mA	±100 µF	80%	JCB0348D24†^
	±15.0 V	±100 mA	8 mA	78 mA	±100 µF	80%	JCB0348D24†^

Notes

1. Minimum load required to meet noise and ripple and initial set accuracy specifications. Below 25% load, noise and ripple increases to 200 mV pk-pk typical and load regulation to ±1% max.
2. Cross regulation is ±5% when one output is at 100% the other is varied between 25% and 100%.
3. For optional 3000 VDC isolation, add suffix '-H' to end of part number.

† Available from Farnell & element14. See pages 284-290.

4. For optional metal case version, add suffix '-M' to end of part number, eg. JCB0324S12-HM

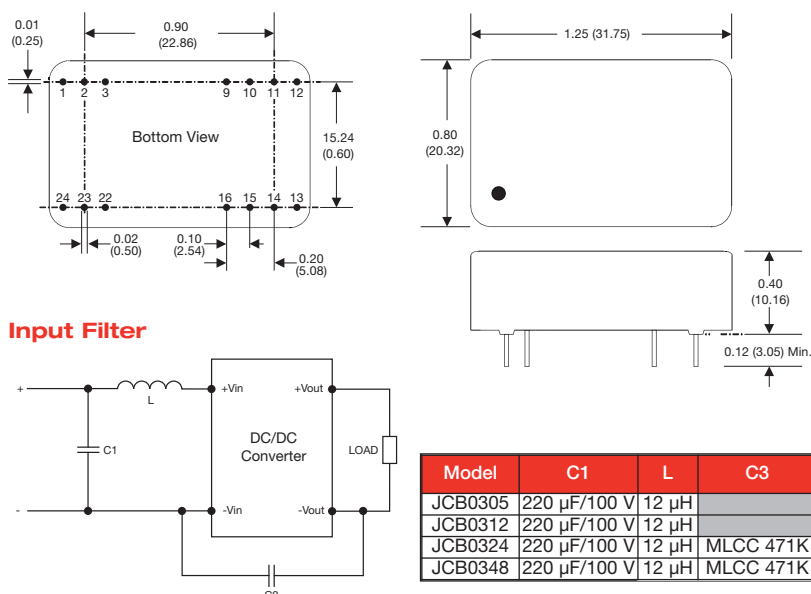
5. For alternative pin out, add suffix '-Z' to end of part number, eg. JCB0324S12-HMZ

6. Input current measured at nominal input voltage

7. A 220 µF/100 V capacitor across the input is required in order to meet EN61000-4-4 & EN61000-4-5.

^ Available from Newark. See pages 291-296

Mechanical Details and Application Notes



PIN CONNECTIONS						
Pin	Single	Dual	Single-H	Dual-H	Single-Z, or -HZ	Dual-Z, or -HZ
1	+Vin	+Vin	N.P.	N.P.	N.P.	N.P.
2	N.C.	-Vout	-Vin	-Vin	-Vin	-Vin
3	N.C.	Common	-Vin	-Vin	-Vin	-Vin
9	N.P.	N.P.	N.P.	Common	N.P.	Common
10	-Vout	Common	N.P.	N.P.	N.P.	N.P.
11	+Vout	+Vout	N.C.	-Vout	N.C.	-Vout
12	-Vin	-Vin	N.P.	N.P.	N.P.	N.P.
13	-Vin	-Vin	N.P.	N.P.	N.P.	N.P.
14	+Vout	+Vout	+Vout	+Vout	+Vout	+Vout
15	-Vout	Common	N.P.	N.P.	N.P.	N.P.
16	N.P.	N.P.	-Vout	Common	-Vout	Common
22	N.C.	Common	+Vin	+Vin	+Vin	+Vout
23	N.C.	-Vout	+Vin	+Vin	+Vin	+Vout
24	+Vin	+Vin	N.P.	N.P.	N.P.	N.P.

N.C. - No Connection

N.P. - No Pin

Notes

1. All dimensions are in inches (mm)
2. Weight: 0.04 lbs (20 g) approx.
3. Pin diameter: 0.02±0.002 (0.5±0.05)
4. Pin pitch tolerance: ±0.014 (±0.35)
5. Case tolerance: ±0.02 (±0.5)

3/6 Watts

JHM Series



- International Medical Approvals
- 3000 VAC Reinforced Insulation
- 60 °C Operation Without Derating
- 2 μ A Patient Leakage Current
- DIP-24 Package
- EN55011 Level A With No External Components
- 3 Year Warranty

Specification

Input

Input Voltage Range	• 12 V (10-17 VDC) • 24 V (20-30 VDC)
Input Current	• See table
Inrush Current	• 25 A max at 30 V
Input Filter	• Pi network
Patient Leakage Current	• 2 μA max
Undervoltage Lockout	• 12 V model, on at <9 V, off >8.5 V • 24 V model on at <18.8 V, off >16 V
Input Surge	• 12 V models 25 V for 3 s • 24 V model 50 V for 3 s

Output

Output Voltage	• See table
Output Voltage Trim	• $\pm 10\%$
Minimum Load	• No minimum load required
Initial Set Accuracy	• $\pm 1\%$ max
Start Up Delay	• 5 ms typical
Start Up Rise Time	• 2 ms typical
Line Regulation	• $\pm 0.3\%$ max
Load Regulation	• $\pm 2\%$ max 0% to 10% load, • $\pm 1\%$ max 10% to 100% load
Cross Regulation	• $\pm 4\%$ max on dual with one output set to 50% load and the other varied from 0% to 100% load
Transient Response	• 4% max deviation, recovery to within 1% in <500 μs for a 50% load change at 0.25 A/μs rate
Ripple & Noise	• 1% pk-pk max 20 MHz bandwidth
Overload Protection	• 120% - 200%
Overvoltage Protection	• 120% - 140%
Temperature Coefficient	• $\pm 0.03/^{\circ}\text{C}$ max
Short Circuit Protection	• Trip and restart (hiccup mode), auto recovery

General

Efficiency	• See tables
Isolation	• 5000 VAC for 10 ms (acc. to IEC60664-1), 3000 VAC reinforced isolation for 1 min.
Input to Output Capacitance	• 20 pF max
Switching Frequency	• JHM03: 180 kHz to 1.2 MHz variable • JHM06: 200 kHz to 1.6 MHz variable
Power Density	• JHM03: 7.5 W/in³, JHM06: 17.0 W/in³
MTBF	• >1 Mhrs typical to MIL-STD-217F at 25 $^{\circ}\text{C}$, GB

Environmental

Operating Temperature	• -20 $^{\circ}\text{C}$ to +100 $^{\circ}\text{C}$, derate from 100% load at +60 $^{\circ}\text{C}$ to no load at 100 $^{\circ}\text{C}$
Case Temperature	• +100 $^{\circ}\text{C}$ max
Storage Temperature	• -40 $^{\circ}\text{C}$ to +100 $^{\circ}\text{C}$
Operating Humidity	• 5-90%, non-condensing
Cooling	• Natural convection

EMC & Safety

Emissions	• EN55011 & EN55022 level A conducted & radiated with no external components
Immunity	• IEC60601-1-2, EN61204-3
ESD Immunity	• EN61000-4-2, level 2, Perf Criteria A
Radiated Immunity	• EN61000-4-3, 10 V/m Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3 Perf Criteria A
Surge	• EN61000-4-5, level 1 Perf Criteria A
Conducted Immunity	• EN61000-4-6, 10 Vm, Perf Criteria A
Magnetic Field	• EN61000-4-8, 3 A/m Perf Criteria A
Safety Approvals	• UL60601-1 1st Edition, CSA-22.2 No.601.1-M90, 2005 IEC60601-1 2nd Edition

Models and Ratings

JHM03/06 **XP**

Input Voltage	Output Voltage	Output Current	Input Current		Maximum Capacitive Load	Efficiency ⁽³⁾	Model Number
			No Load ⁽¹⁾	Full Load ⁽²⁾			
10-17 V	5.0 V	600 mA	52 mA	380 mA	720 μ F	75%	JHM0312S05†^
	12.0 V	250 mA	64 mA	370 mA	300 μ F	77%	JHM0312S12†^
	15.0 V	200 mA	64 mA	370 mA	240 μ F	78%	JHM0312S15†^
	± 12.0 V	± 125 mA	66 mA	400 mA	± 140 μ F	80%	JHM0312D12†^
	± 15.0 V	± 100 mA	85 mA	400 mA	± 120 μ F	80%	JHM0312D15†^
20-30 V	5.0 V	600 mA	47 mA	210 mA	720 μ F	74%	JHM0324S05†^
	12.0 V	250 mA	42 mA	200 mA	300 μ F	77%	JHM0324S12†^
	15.0 V	200 mA	29 mA	190 mA	240 μ F	81%	JHM0324S15†^
	± 12.0 V	± 125 mA	40 mA	200 mA	± 140 μ F	80%	JHM0324D12†^
	± 15.0 V	± 100 mA	50 mA	190 mA	± 120 μ F	80%	JHM0324D15†^
10-17 V	5.0 V	1200 mA	72 mA	790 mA	1200 μ F	78%	JHM0612S05†^
	12.0 V	500 mA	86 mA	750 mA	500 μ F	80%	JHM0612S12†^
	15.0 V	400 mA	85 mA	740 mA	400 μ F	83%	JHM0612S15†^
	± 12.0 V	± 250 mA	60 mA	730 mA	± 250 μ F	83%	JHM0612D12†^
	± 15.0 V	± 200 mA	80 mA	730 mA	± 200 μ F	84%	JHM0612D15†^
20-30 V	5.0 V	1200 mA	44 mA	380 mA	1200 μ F	78%	JHM0624S05†^
	12.0 V	500 mA	39 mA	360 mA	500 μ F	83%	JHM0624S12†^
	15.0 V	400 mA	27 mA	350 mA	400 μ F	85%	JHM0624S15†^
	± 12.0 V	± 250 mA	37 mA	360 mA	± 250 μ F	83%	JHM0624D12†^
	± 15.0 V	± 200 mA	39 mA	360 mA	± 200 μ F	83%	JHM0624D15†^

Notes

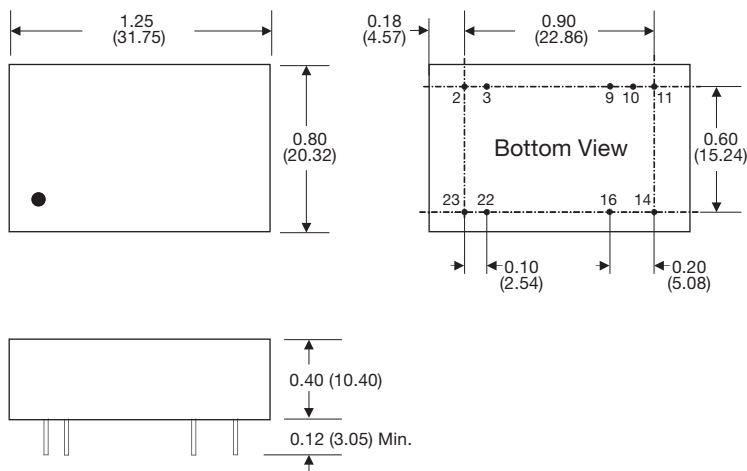
1. Input current measured at nominal input voltage.
 2. Input current measured at lowest input voltage.

3. Typical values.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296.

Mechanical Details



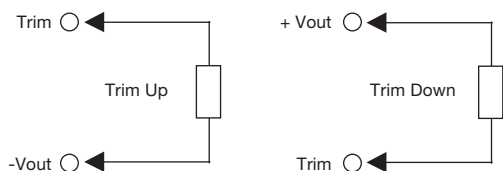
Pin Connections		
Pin	Single	Dual
2	-Vin	-Vin
3	-Vin	-Vin
9	No Pin	Common
10	Trim	Trim
11	No Pin	-Vout
14	+Vout	+Vout
16	-Vout	Common
22	+Vin	+Vin
23	+Vin	+Vin

Notes

1. All dimensions are in inches (mm)
 2. Weight: 0.04 lbs (20 g) approx.
 3. Pin diameter: 0.02 $\pm$ 0.002 (0.5 $\pm$ 0.05)
 4. Pin pitch tolerance: $\pm$ 0.014 ($\pm$ 0.35)
 5. Case tolerance: $\pm$ 0.02 ($\pm$ 0.5)

Application Notes

External Output Trim



For 5 V output:
 Trim +10%, R = 3.4 k Ω typical
 Trim -10%, R = 1 k Ω typical

For 12 V output:
 Trim +10%, R = 5.9 k Ω typical
 Trim -10%, R = 11.3 k Ω typical

For 15 V output:
 Trim +10%, R = 8.3 k Ω typical
 Trim -10%, R = 10 k Ω typical

For ± 12 V output:
 Trim +10%, R = 12.8 k Ω typical
 Trim -10%, R = 9.5 k Ω typical

For ± 15 V output:
 Trim +10%, R = 18 k Ω typical
 Trim -10%, R = 14.8 k Ω typical

4/6 Watts

JCA Series



- Compact 1.0" x 0.8" Metal Package
- Industry Standard Pin Out
- 2:1 Input Range
- Single & Dual Outputs
- Operating Temperature -40 °C to +100 °C
- UL & TUV Approved
- 3 Year Warranty

Specification

Input

Input Voltage Range	• 5 V (4.5-9.0 VDC), 12 V (9-18 VDC) 24 V (18-36 VDC), 48 V (36-75 VDC)
Input Current	• See table
Input Filter	• Pi network
Undervoltage Lockout	• Turn On at >90-95% of rated input Turn Off at <80% of rated input
Input Surge	• 5 V models 10 V for 1 s max, 12 V models 25 V for 1 s max, 24 V models 50 V for 1 s max, 48 V models 100 V for 1 s max
Input Reflected Ripple	• 80 mA for 5 V models 30 mA for all other models

Output

Output Voltage	• See table
Initial Set Accuracy	• $\pm 1\%$ max
Start Up Delay	• 200 ms max
Start Up Rise Time	• 3.5 ms typical
Minimum Load	• No minimum load required
Line Regulation	• $\pm 0.3\%$
Load Regulation	• $\pm 1\%$
Cross Regulation	• $\pm 5\%$ on dual output models
Transient Response	• 4% max deviation, recovery to within 1% in <500 μ s for a 25% load change at 1 A/ μ s
Ripple & Noise	• 50 mV pk-pk, 20 MHz bandwidth
Overcurrent Protection	• 150% typical, trip & restart (hiccup mode)
Short Circuit Protection	• Continuous with auto recovery
Overvoltage Protection	• 150% typical, Recycle input to reset
Temperature Coefficient	• $\pm 0.05\%/^{\circ}\text{C}$

General

Efficiency	• See table
Isolation	• 1500 VDC Input to Output, basic insulation 500 VDC Input to Case 500 VDC Output to Case
Switching Frequency	• 300 kHz typical
Power Density	• JCA04: 12.5 W/in ³ , JCA06: 18.8 W/in ³
MTBF	• 1.0 Mhrs to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Temperature	• -40 °C to +100 °C output power derates from 100% load at +75 °C linearly to 0% load at +100 °C
Case Temperature	• +100 °C max
Storage Temperature	• -55 °C to +125 °C
Cooling	• Convection cooled
Operating Humidity	• Up to 95% RH, non-condensing

EMC & Safety

Emissions	• EN55022, level A conducted & radiated (level B with external components, see application note)
ESD Immunity	• EN61000-4-2, level 2 Perf Criteria A
Radiated Immunity	• EN61000-4-3 3 V/m Perf Criteria A
Conducted Immunity	• EN61000-4-6 3 V rms Perf Criteria A
Magnetic Fields	• EN61000-4-8, 10 A/m, Perf Criteria A
Safety Approvals	• EN60950-1, UL60950-1, CSA C22.2 No. 60950-1-03, CE Mark LVD

Input Voltage ⁽¹⁾	Output Voltage	Output Current	Input Current ⁽³⁾		Efficiency	Model Number
			No Load	Full Load		
4.5-9.0 VDC	3.3 VDC	1.22 A	44 mA	1000 mA	80%	JCA0405S03† [†]
	5.0 VDC	0.80 A	66 mA	955 mA	83%	JCA0405S05† [†]
	12.0 VDC	0.34 A	9 mA	975 mA	84%	JCA0405S12† [†]
	15.0 VDC	0.28 A	10 mA	985 mA	85%	JCA0405S15† [†]
	±5.0 VDC	±0.40 A	12 mA	982 mA	81%	JCA0405D01† [†]
	±12.0 VDC	±0.17 A	34 mA	973 mA	83%	JCA0405D02† [†]
9-18 VDC	3.3 VDC	1.22 A	38 mA	403 mA	83%	JCA0412S03† [†]
	5.0 VDC	0.80 A	46 mA	396 mA	82%	JCA0412S05† [†]
	12.0 VDC	0.34 A	18 mA	404 mA	82%	JCA0412S12† [†]
	15.0 VDC	0.28 A	22 mA	416 mA	84%	JCA0412S15† [†]
	±5.0 VDC	±0.40 A	15 mA	409 mA	82%	JCA0412D01† [†]
	±12.0 VDC	±0.17 A	21 mA	407 mA	83%	JCA0412D02† [†]
18-36 VDC	3.3 VDC	1.22 A	21 mA	204 mA	82%	JCA0424S03† [†]
	5.0 VDC	0.80 A	34 mA	205 mA	80%	JCA0424S05† [†]
	12.0 VDC	0.34 A	13 mA	205 mA	82%	JCA0424S12† [†]
	15.0 VDC	0.28 A	13 mA	211 mA	83%	JCA0424S15† [†]
	±5.0 VDC	±0.40 A	11 mA	207 mA	81%	JCA0424D01† [†]
	±12.0 VDC	±0.17 A	16 mA	209 mA	83%	JCA0424D02† [†]
36-75 VDC	3.3 VDC	1.22 A	13 mA	104 mA	82%	JCA0448S03† [†]
	5.0 VDC	0.80 A	14 mA	104 mA	80%	JCA0448S05† [†]
	12.0 VDC	0.34 A	6 mA	103 mA	80%	JCA0448S12† [†]
	15.0 VDC	0.28 A	7 mA	108 mA	81%	JCA0448S15† [†]
	±5.0 VDC	±0.40 A	7 mA	108 mA	80%	JCA0448D01† [†]
	±12.0 VDC	±0.17 A	8 mA	107 mA	82%	JCA0448D02† [†]
	±15.0 VDC	±0.14 A	10 mA	109 mA	82%	JCA0448D03† [†]

Input Voltage ⁽¹⁾	Output Voltage	Output Current	Input Current ⁽³⁾		Efficiency	Model Number
			No Load	Full Load		
4.5-9.0 VDC	3.3 VDC	1.52 A	44 mA	1286 mA	82%	JCA0605S03† [†]
	5.0 VDC	1.00 A	66 mA	1208 mA	84%	JCA0605S05† [†]
	12.0 VDC	0.50 A	9 mA	1451 mA	84%	JCA0605S12† [†]
	15.0 VDC	0.40 A	10 mA	1419 mA	84%	JCA0605S15† [†]
	±5.0 VDC	±0.50 A	12 mA	1239 mA	81%	JCA0605D01† [†]
	±12.0 VDC	±0.25 A	34 mA	1431 mA	83%	JCA0605D02† [†]
9-18 VDC	3.3 VDC	1.52 A	38 mA	505 mA	82%	JCA0612S03† [†]
	5.0 VDC	1.00 A	46 mA	492 mA	82%	JCA0612S05† [†]
	12.0 VDC	0.50 A	18 mA	591 mA	84%	JCA0612S12† [†]
	15.0 VDC	0.40 A	22 mA	589 mA	85%	JCA0612S15† [†]
	±5.0 VDC	±0.50 A	15 mA	513 mA	82%	JCA0612D01† [†]
	±12.0 VDC	±0.25 A	21 mA	591 mA	84%	JCA0612D02† [†]
18-36 VDC	3.3 VDC	1.52 A	21 mA	255 mA	82%	JCA0624S03† [†]
	5.0 VDC	1.00 A	34 mA	252 mA	82%	JCA0624S05† [†]
	12.0 VDC	0.50 A	13 mA	297 mA	84%	JCA0624S12† [†]
	15.0 VDC	0.40 A	13 mA	297 mA	84%	JCA0624S15† [†]
	±5.0 VDC	±0.50 A	11 mA	257 mA	81%	JCA0624D01† [†]
	±12.0 VDC	±0.25 A	16 mA	299 mA	84%	JCA0624D02† [†]
36-75 VDC	3.3 VDC	1.52 A	13 mA	130 mA	82%	JCA0648S03† [†]
	5.0 VDC	1.00 A	14 mA	128 mA	81%	JCA0648S05† [†]
	12.0 VDC	0.50 A	6 mA	149 mA	84%	JCA0648S12† [†]
	15.0 VDC	0.40 A	7 mA	149 mA	84%	JCA0648S15† [†]
	±5.0 VDC	±0.50 A	7 mA	131 mA	80%	JCA0648D01† [†]
	±12.0 VDC	±0.25 A	8 mA	150 mA	83%	JCA0648D02† [†]
	±15.0 VDC	±0.20 A	10 mA	150 mA	83%	JCA0648D03† [†]

Notes

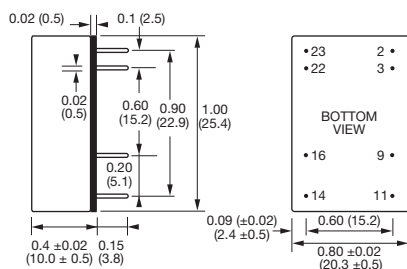
1. Nominal input voltage 5, 12, 24 or 48 VDC.
2. Input current is at nominal input voltage.

3. Efficiency is measured at nominal input and full load at 25 °C.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296.

Mechanical Details and Application Note

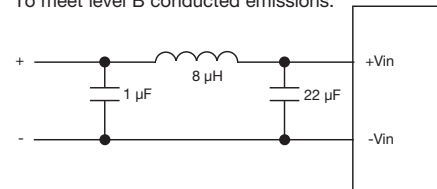


PIN CONNECTIONS		
Pin	Single Output	Dual Output
2	-Vin	-Vin
3	-Vin	-Vin
9	No pin	Common
11	N/C	-Vout
14	+Vout	+Vout
16	-Vout	Common
22	+Vin	+Vin
23	+Vin	+Vin

1. All dimensions are in inches (mm)
2. Weight: 0.03 lbs (12 g)
3. Pin diameter tolerance: ±0.00079 (±0.02)
4. Pin pitch tolerance: ±0.01 (±0.25)
5. Case tolerance: ±0.02 (±0.5)

Input Filter

To meet level B conducted emissions.



4/6 Watts JTC Series



- 4:1 Input Range
- DIP-24 Metal Package
- Operating Temperature -40°C to $+100^{\circ}\text{C}$
- Single & Dual Outputs
- Continuous Short Circuit Protection
- 1500 VDC Isolation, 3500 VDC Option
- 3 Year Warranty

Specification

Input

Input Voltage Range	• 24 V (9-36 VDC) • 48 V (18-72 VDC)
Input Current	• See table
Input Filter	• Pi network
Input Reflected Ripple	• 35 mA pk-pk through 12 μH inductor
Input Surge	• 24 V models 40 VDC for 100 ms • 48 V models 80 VDC for 100 ms
Undervoltage Lockout	• None
Input Reverse Voltage Protection	• None

Output

Output Voltage	• See table
Output Voltage Balance	• $\pm 1\%$ max, dual output models
Minimum Load	• No minimum load required
Initial Set Accuracy	• $\pm 1\%$ max
Start Up Delay	• < 800 ms
Start Up Rise Time	• < 10 ms
Line Regulation	• $\pm 0.5\%$ max
Load Regulation	• $\pm 0.5\%$ max, $\pm 1.5\%$ max for 3.3 V and ± 3.3 V models
Cross Regulation	• $\pm 5\%$ on dual output models (see note 4)
Transient Response	• $< 1.5\%$ max deviation, recovery to within 1% in 200 μs for a 50% load change
Ripple & Noise	• 60 mV pk-pk for 3.3 V to 15 V models, 100 mV pk-pk for 18 V models, 150 mV pk-pk for 24 V models, 20 MHz bandwidth
Short Circuit Protection	• Trip & restart (Hiccup mode), auto recovery
Maximum Capacitive Load	• See tables
Temperature Coefficient	• $\pm 0.02/^{\circ}\text{C}$ max

General

Efficiency	• See tables
Isolation Voltage	• 1500 VDC Input to Output, for optional high isolation version 3500 VDC input to output add suffix '-H' to model number • 1000 VDC Input to Case • 1000 VDC Output to Case
Isolation Resistance	• $10^9 \Omega$
Switching Frequency	• 266 kHz typical
Power Density	• JTC04: 10 W/in³, JTC06: 15 W/in³
MTBF	• > 1.0 Mhrs to MIL-HDBK-217F at 25°C, GB

Environmental

Operating Temperature	• -40°C to $+100^{\circ}\text{C}$, derate from 100% load at $+85^{\circ}\text{C}$ to no load at $+100^{\circ}\text{C}$
Case Temperature	• $+100^{\circ}\text{C}$ max
Storage Temperature	• -40°C to $+125^{\circ}\text{C}$
Humidity	• Up to 95%, non-condensing
Cooling	• Natural convection

EMC

Emissions	• EN55022 class A conducted with external components - see application note
ESD Immunity	• EN61000-4-2, 8 kV air discharge Perf Criteria A, 4 kV contact discharge Perf Criteria A
EFT/Burst	• EN61000-4-4, level 1, Perf Criteria A
Conducted Immunity	• EN61000-4-6, 3 Vrms, Perf Criteria A
Magnetic Fields	• EN61000-4-8, 1 A/m, Perf Criteria A

Models and Ratings

JTC04/06 XP

Input Voltage	Output Voltage	Output Current	Input Current ⁽²⁾		Maximum Capacitive Load ⁽³⁾	Efficiency	Model Number ⁽¹⁾
			No Load	Full Load			
9-36 V	3.3 V	1200 mA	12 mA	220 mA	1000 μ F	75%	JTC0424S3V3†^A
	5.0 V	800 mA	15 mA	211 mA	1000 μ F	79%	JTC0424S05†^A
	9.0 V	445 mA	12 mA	201 mA	220 μ F	83%	JTC0424S09
	12.0 V	333 mA	15 mA	203 mA	100 μ F	82%	JTC0424S12†^A
	15.0 V	267 mA	15 mA	203 mA	220 μ F	82%	JTC0424S15†^A
	18.0 V	223 mA	15 mA	203 mA	10 μ F	82%	JTC0424S18
	24.0 V	167 mA	18 mA	203 mA	220 μ F	82%	JTC0424S24
	±3.3 V	±606 mA	12 mA	222 mA	±470 μ F	75%	JTC0424D03†^A
	±5.0 V	±400 mA	15 mA	211 mA	±100 μ F	79%	JTC0424D05†^A
	±9.0 V	±222 mA	18 mA	208 mA	±47 μ F	80%	JTC0424D09
	±12.0 V	±167 mA	15 mA	203 mA	±47 μ F	82%	JTC0424D12†^A
	±15.0 V	±134 mA	20 mA	208 mA	±10 μ F	80%	JTC0424D15†^A
18-72 V	3.3 V	1200 mA	10 mA	110 mA	1000 μ F	76%	JTC0448S3V3†^A
	5.0 V	800 mA	8 mA	106 mA	470 μ F	79%	JTC0448S05†^A
	9.0 V	445 mA	10 mA	100 mA	330 μ F	83%	JTC0448S09
	12.0 V	333 mA	12 mA	104 mA	1000 μ F	80%	JTC0448S12†^A
	15.0 V	267 mA	10 mA	99 mA	47 μ F	84%	JTC0448S15†^A
	18.0 V	223 mA	10 mA	99 mA	10 μ F	84%	JTC0448S18
	24.0 V	167 mA	15 mA	102 mA	22 μ F	82%	JTC0448S24
	±3.3 V	±606 mA	10 mA	107 mA	±680 μ F	78%	JTC0448D03†^A
	±5.0 V	±400 mA	15 mA	106 mA	±330 μ F	79%	JTC0448D05†^A
	±9.0 V	±222 mA	15 mA	104 mA	±47 μ F	80%	JTC0448D09
	±12.0 V	±167 mA	12 mA	102 mA	±100 μ F	82%	JTC0448D12†^A
	±15.0 V	±134 mA	15 mA	104 mA	±100 μ F	80%	JTC0448D15†^A
	±24.0 V	±84 mA	15 mA	104 mA	±10 μ F	80%	JTC0448D24

Input Voltage	Output Voltage	Output Current	Input Current ⁽²⁾		Maximum Capacitive Load ⁽³⁾	Efficiency	Model Number ⁽¹⁾
			No Load	Full Load			
9-36 V	3.3 V	1400 mA	12 mA	253 mA	1000 μ F	76%	JTC0624S3V3†^A
	5.0 V	1200 mA	10 mA	312 mA	1000 μ F	80%	JTC0624S05†^A
	9.0 V	667 mA	12 mA	301 mA	220 μ F	83%	JTC0624S09
	12.0 V	500 mA	15 mA	301 mA	1000 μ F	83%	JTC0624S12†^A
	15.0 V	400 mA	18 mA	301 mA	470 μ F	83%	JTC0624S15†^A
	18.0 V	334 mA	15 mA	301 mA	47 μ F	83%	JTC0624S18
	24.0 V	250 mA	18 mA	305 mA	47 μ F	82%	JTC0624S24
	±3.3 V	±909 mA	12 mA	338 mA	±470 μ F	74%	JTC0624D03†^A
	±5.0 V	±600 mA	10 mA	312 mA	±680 μ F	80%	JTC0624D05†^A
	±9.0 V	±333 mA	18 mA	309 mA	±100 μ F	81%	JTC0624D09
	±12.0 V	±250 mA	20 mA	301 mA	±330 μ F	83%	JTC0624D12†^A
	±15.0 V	±200 mA	22 mA	305 mA	±100 μ F	82%	JTC0624D15†^A
18-72 V	3.3 V	1400 mA	15 mA	126 mA	1000 μ F	76%	JTC0648S3V3†^A
	5.0 V	1200 mA	8 mA	156 mA	1000 μ F	80%	JTC0648S05†^A
	9.0 V	667 mA	10 mA	153 mA	220 μ F	82%	JTC0648S09
	12.0 V	500 mA	10 mA	151 mA	1000 μ F	83%	JTC0648S12†^A
	15.0 V	400 mA	10 mA	149 mA	100 μ F	84%	JTC0648S15†^A
	18.0 V	334 mA	10 mA	151 mA	10 μ F	83%	JTC0648S18
	24.0 V	250 mA	12 mA	151 mA	22 μ F	83%	JTC0648S24
	±3.3 V	±909 mA	10 mA	162 mA	±330 μ F	77%	JTC0648D03†^A
	±5.0 V	±600 mA	10 mA	158 mA	±470 μ F	79%	JTC0648D05†^A
	±9.0 V	±333 mA	15 mA	154 mA	±100 μ F	81%	JTC0648D09
	±12.0 V	±250 mA	10 mA	152 mA	±100 μ F	82%	JTC0648D12†^A
	±15.0 V	±200 mA	15 mA	149 mA	±47 μ F	84%	JTC0648D15†^A
	±24.0 V	±125 mA	15 mA	154 mA	±22 μ F	81%	JTC0648D24

Notes

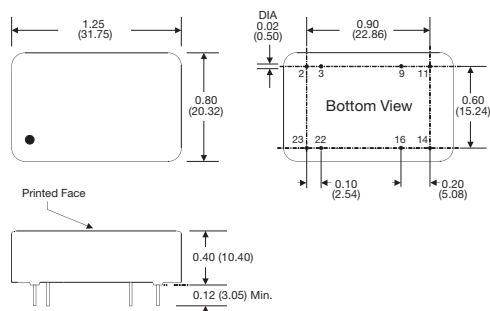
- For optional 3500 VDC isolation add suffix '-H' to model number.
- Input current measured at nominal input voltage.
- Maximum capacitive load is per output.

† Available from Farnell & element14. See pages 284-290.

- Cross regulation for duals is ±5% when one output is at 100% and the other is varied between 25% and 100%.

^ Available from Newark. See pages 291-296.

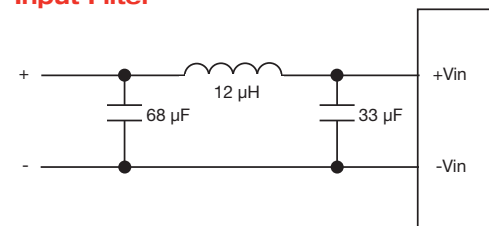
Mechanical Details and Application Note



Pin	Single	Dual
2	-Vin	-Vin
3	-Vin	-Vin
9	No Pin	Common
11	N.C.	-Vout
14	+Vout	+Vout
16	-Vout	Common
22	+Vin	+Vin
23	+Vin	+Vin

- All dimensions are in inches (mm)
- Weight: 0.04 lbs (17 g) approx.
- Pin diameter: 0.02 ±0.002 (0.5 ±0.005)
- Pin pitch tolerance: ±0.014 (±0.35)
- Case tolerance: ±0.02 (±0.5)

Input Filter



8/10 Watts

JCJ Series



- 2:1 Input Range
- DIP-24 Metal Package
- Operating Temperature -40°C to $+100^{\circ}\text{C}$
- Single & Dual Outputs
- Continuous Short Circuit Protection
- 1500 VDC Isolation
- 3 Year Warranty

Specification

Input

Input Voltage Range	• 12 V (9-18 VDC) • 24 V (18-36 VDC) • 48 V (36-75 VDC)
Input Current	• See table
Input Filter	• Pi network
Input Reflected Ripple Current	• JCJ08: 35 mA, JCJ10: 20 mA pk-pk through 12 μH inductor
Input Surge	• 12 V models 24/25 VDC for 100 ms • 24 V models 40/50 VDC for 100 ms • 48 V models 100 VDC for 100 ms
Undervoltage Lockout	• None
Reverse Voltage Protection	• None

Output

Output Voltage	• See table
Output Voltage Balance	• $\pm 1\%$ max, dual output models
Minimum Load	• No minimum load required
Initial Set Accuracy	• $\pm 1\%$ max
Line Regulation	• $\pm 0.5\%$ max
Load Regulation	• $\pm 0.7\%$ for 2.5-3.3 V models, $\pm 0.5\%$ for all other models (see note 2)
Cross Regulation	• $\pm 5\%$ on dual output models (see note 3)
Transient Response	• $< 3\%$ max deviation, recovery to within 1% in 200 μs for a 25% load change
Ripple & Noise	• 75 mV pk-pk, 20 MHz bandwidth, (see note 4)
Overvoltage Protection	• JCJ10: 3.3 V models: 3.9 V typ., 5 V models: 6.2 V typ., 12 V models: 15.0 V typ., 15 V models: 18.0 V typ., ± 12 V models: ± 15.0 V typ., ± 15 V models: ± 18.0 V typ. JCJ08: No OVP
Overload Protection	• $> 150\%$ of full load
Short Circuit Protection	• Trip & restart (hiccup) with auto recovery
Maximum Capacitive Load	• See tables
Temperature Coefficient	• $\pm 0.02/^{\circ}\text{C}$ max

General

Efficiency	• See tables
Isolation	• 1500 VDC Input to Output • 1000 VDC Input to Case • 1000 VDC Output to Case
Isolation Capacitance	• 1200 pF max
Switching Frequency	• 330 kHz typical
Power Density	• JCJ10: 25 W/in³ • JCJ08: 20 W/in³
MTBF	• > 900 KHrs to MIL-HDBK-217F at 25°C, GB

Environmental

Operating Temperature	• -40°C to $+100^{\circ}\text{C}$, derate from 100% load at $+60^{\circ}\text{C}$ to no load at $+100^{\circ}\text{C}$
Case Temperature	• $+100^{\circ}\text{C}$ max
Storage Temperature	• -40°C to $+125^{\circ}\text{C}$
Humidity	• Up to 95% RH, non-condensing
Cooling	• Natural convection

EMC

Emissions	• EN55022 Class A conducted & radiated with external components, see application note
ESD Immunity	• EN61000-4-2, 8 kV air discharge, 4 kV contact discharge • JCJ10: 6 kV contact discharge, Perf Criteria A
EFT/Burst	• EN61000-4-4, level 1 • JCJ10: level 3, Perf Criteria A, (see note 5)
Surge	• JCJ08: EN61000-4-5, installation class 2, Perf Criteria A, (see note 5) • JCJ10: installation class 3, Perf Criteria A, (see note 5)
Conducted Immunity	• EN61000-4-6, 3 Vrms • JCJ10: 10 Vrms, Perf Criteria A
Magnetic Field	• EN61000-4-8, 1 A/m Perf Criteria A

Input Voltage	Output Voltage	Output Current	Input Current ⁽¹⁾		Maximum Capacitive Load	Efficiency	Model Number
			No Load	Full Load			
9-18 V	3.3 V	2.000 A	20 mA	0.69 A	3300 μ F	80%	JCJ0812S3V3†^
	5.0 V	1.500 A	20 mA	0.76 A	2200 μ F	82%	JCJ0812S05†^
	12.0 V	0.665 A	20 mA	0.78 A	470 μ F	85%	JCJ0812S12†^
	15.0 V	0.535 A	20 mA	0.80 A	220 μ F	83%	JCJ0812S15†^
	± 5.0 V	± 0.800 A	20 mA	0.81 A	± 1000 μ F	82%	JCJ0812D05†^
	± 12.0 V	± 0.335 A	20 mA	0.79 A	± 220 μ F	84%	JCJ0812D12†^
18-36 V	3.3 V	2.000 A	15 mA	0.34 A	3300 μ F	80%	JCJ0824S3V3†^
	5.0 V	1.500 A	15 mA	0.38 A	2200 μ F	82%	JCJ0824S05†^
	12.0 V	0.665 A	15 mA	0.39 A	470 μ F	85%	JCJ0824S12†^
	15.0 V	0.535 A	15 mA	0.40 A	220 μ F	84%	JCJ0824S15†^
	± 5.0 V	± 0.800 A	15 mA	0.41 A	± 1000 μ F	82%	JCJ0824D05†^
	± 12.0 V	± 0.335 A	15 mA	0.40 A	± 220 μ F	83%	JCJ0824D12†^
36-75 V	3.3 V	2.000 A	15 mA	0.17 A	3300 μ F	80%	JCJ0848S3V3†^
	5.0 V	1.500 A	15 mA	0.19 A	2200 μ F	82%	JCJ0848S05†^
	12.0 V	0.665 A	15 mA	0.20 A	470 μ F	84%	JCJ0848S12†^
	15.0 V	0.535 A	15 mA	0.20 A	220 μ F	84%	JCJ0848S15†^
	± 5.0 V	± 0.800 A	15 mA	0.20 A	± 1000 μ F	82%	JCJ0848D05†^
	± 12.0 V	± 0.335 A	15 mA	0.20 A	± 220 μ F	85%	JCJ0848D12†^
9-18 V	2.5 V	3.000 A	10 mA	0.79 A	2200 μ F	81%	JCJ1012S2V5†^
	3.3 V	3.000 A	10 mA	1.01 A	2200 μ F	84%	JCJ1012S3V3†^
	5.0 V	2.000 A	10 mA	0.99 A	2200 μ F	86%	JCJ1012S05†^
	12.0 V	0.833 A	10 mA	0.98 A	820 μ F	87%	JCJ1012S12†^
	15.0 V	0.667 A	10 mA	0.96 A	470 μ F	89%	JCJ1012S15†^
	± 12.0 V	± 0.416 A	10 mA	0.98 A	± 220 μ F	87%	JCJ1012D12†^
18-36 V	2.5 V	3.000 A	10 mA	0.38 A	2200 μ F	84%	JCJ1024S2V5†^
	3.3 V	3.000 A	10 mA	0.50 A	2200 μ F	85%	JCJ1024S3V3†^
	5.0 V	2.000 A	10 mA	0.48 A	2200 μ F	89%	JCJ1024S05†^
	12.0 V	0.833 A	10 mA	0.49 A	820 μ F	88%	JCJ1024S12†^
	15.0 V	0.667 A	10 mA	0.49 A	470 μ F	88%	JCJ1024S15†^
	± 12.0 V	± 0.416 A	10 mA	0.49 A	± 220 μ F	88%	JCJ1024D12†^
36-75 V	2.5 V	3.000 A	10 mA	0.19 A	2200 μ F	84%	JCJ1048S2V5†^
	3.3 V	3.000 A	10 mA	0.25 A	2200 μ F	85%	JCJ1048S3V3†^
	5.0 V	2.000 A	10 mA	0.24 A	2200 μ F	88%	JCJ1048S05†^
	12.0 V	0.833 A	10 mA	0.25 A	820 μ F	87%	JCJ1048S12†^
	15.0 V	0.667 A	10 mA	0.24 A	470 μ F	88%	JCJ1048S15†^
	± 12.0 V	± 0.416 A	10 mA	0.25 A	± 220 μ F	87%	JCJ1048D12†^
9-18 V	2.5 V	3.000 A	10 mA	0.19 A	2200 μ F	84%	JCJ1048D15†^
	3.3 V	3.000 A	10 mA	0.25 A	2200 μ F	85%	JCJ1048D12†^
	5.0 V	2.000 A	10 mA	0.24 A	2200 μ F	88%	JCJ1048D15†^
	12.0 V	0.833 A	10 mA	0.25 A	820 μ F	87%	JCJ1048D12†^
	15.0 V	0.667 A	10 mA	0.24 A	470 μ F	88%	JCJ1048D15†^
	± 12.0 V	± 0.416 A	10 mA	0.25 A	± 220 μ F	87%	JCJ1048D12†^

Notes

1. Input current measured at nominal input voltage.
2. From 10% to 100% load.
3. When one output is set at 100% load and the other varied between 25% and 100% load

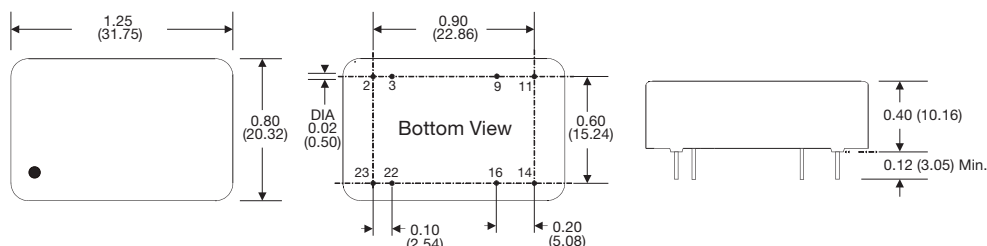
† Available from Farnell & element14. See pages 284-290.

4. Measured with 20 MHz bandwidth and 1 μ F ceramic capacitor across output rails.

5. A 220 μ F/100 V capacitor across the input is required to meet EN61000-4-4 and EN61000-4-5

^ Available from Newark. See pages 291-296.

Mechanical Details and Application Note



Pin Connections					
Pin	Single	Dual	Pin	Single	Dual
2	-Vin	-Vin	14	+Vout	+Vout
3	-Vin	-Vin	16	-Vout	Common
9	No Pin	Common	22	+Vin	+Vin
11	N.C.	-Vout	23	+Vin	+Vin

Notes

1. All dimensions are in inches (mm)
2. Weight: 0.04 lbs (17 g) approx.
3. Pin pitch tolerance: 0.02 $\pm$ 0.002 (0.5 $\pm$ 0.05)
4. Case tolerance: $\pm$ 0.02 ($\pm$ 0.5)
5. Package: 24 in DIL nickel-coated copper.

10 Watts

JCH Series



- 2:1 Input Range
- Industry Standard Package
- 1500 VDC Isolation
- Continuous Short Circuit Protection
- -40 °C to +100 °C Operating Temperature
- Single & Dual Outputs
- 3 Year Warranty

Specification

Input

Input Voltage Range	• 12 V (9-18 VDC) • 24 V (18-36 VDC) • 48 V (36-72 VDC)
Input Current	• See table
Input Reflected Ripple Current	• 35 mA rms through 12 μH inductor
Input Filter	• Pi network
Input Surge	• 12 V models 25 VDC for 100 ms • 24 V models 50 VDC for 100 ms • 48 V models 100 VDC for 100 ms

Output

Output Voltage	• See table
Voltage Balance	• $\pm 1\%$ ($\pm 2\%$ for dual output 3.3 V models)
Minimum Load	• No minimum load required
Line Regulation	• $\pm 0.5\%$
Load Regulation	• $\pm 0.5\%$ single outputs, $\pm 1.0\%$ dual outputs
Setpoint Accuracy	• $\pm 1.0\%$
Ripple & Noise	• 100 mV pk-pk for 3.3 V to 15 V models, 150 mV pk-pk for 24 V models, 20 MHz bandwidth
Transient Response	• 3% max deviation, recovery to within 1% in 250 μs for a 25% load change
Temperature Coefficient	• 0.02%/°C
Overload Protection	• 140% of full load
Short Circuit Protection	• Trip & restart (hiccup mode) with auto recovery
Maximum Capacitive Load	• See table
Start Up Delay	• <20 ms

General

Efficiency	• See table
Isolation Voltage	• 1500 VDC Input to Output • 1000 VDC Input to Case • 1000 VDC Output to Case
Isolation Capacitance	• 500 pF typical input to output
Isolation Resistance	• $10^9 \Omega$
Switching Frequency	• 200 kHz typical
Power Density	• 12.5 W/in³
MTBF	• >1.1 Mhrs to MIL-STD-217F at 25 °C, GB

Environmental

Operating Temperature	• -40 °C to +100 °C, derate from 100% load at +85 °C to 0% load at +100 °C
Case Temperature	• +100 °C max
Storage Temperature	• -40 °C to +125 °C
Cooling	• Convection-cooled
Operating Humidity	• Up to 95% RH, non-condensing

EMC

Emissions	• EN55022 Class A conducted & radiated with external components, see application note
ESD Immunity	• EN61000-4-2, 8 kV air discharge Perf Criteria A
Radiated Immunity	• EN61000-4-3, 3 V/m, Perf Criteria A

Models and Ratings

JCH10 **XP**

Input Voltage	Output Voltage	Output Current	Input Current ⁽¹⁾		Efficiency	Maximum Capacitive Load	Model Number
			No Load	Full Load			
9-18 VDC	3.3 V	2000 mA	30 mA	705 mA	78%	2200 μ F	JCH1012S3V3 [†] ^
	5.0 V	2000 mA	30 mA	1016 mA	82%	2200 μ F	JCH1012S05 [†] ^
	12.0 V	833 mA	30 mA	992 mA	84%	680 μ F	JCH1012S12 [†] ^
	15.0 V	666 mA	30 mA	992 mA	84%	470 μ F	JCH1012S15 [†] ^
	24.0 V	416 mA	30 mA	980 mA	85%	330 μ F	JCH1012S24
	± 3.3 V	± 1000 mA	30 mA	1068 mA	78%	± 1000 μ F	JCH1012D03 [†] ^
	± 5.0 V	± 1000 mA	30 mA	1016 mA	82%	± 1000 μ F	JCH1012D05 [†] ^
	± 12.0 V	± 416 mA	30 mA	992 mA	84%	± 470 μ F	JCH1012D12 [†] ^
	± 15.0 V	± 333 mA	30 mA	980 mA	85%	± 330 μ F	JCH1012D15 [†] ^
18-36 VDC	3.3 V	2000 mA	25 mA	352 mA	78%	2200 μ F	JCH1024S3V3 [†] ^
	5.0 V	2000 mA	25 mA	508 mA	82%	2200 μ F	JCH1024S05 [†] ^
	12.0 V	833 mA	25 mA	496 mA	84%	680 μ F	JCH1024S12 [†] ^
	15.0 V	666 mA	25 mA	490 mA	85%	470 μ F	JCH1024S15 [†] ^
	24.0 V	416 mA	25 mA	484 mA	86%	330 μ F	JCH1024S24
	± 3.3 V	± 1000 mA	25 mA	352 mA	78%	± 1000 μ F	JCH1024D03 [†] ^
	± 5.0 V	± 1000 mA	25 mA	508 mA	82%	± 1000 μ F	JCH1024D05 [†] ^
	± 12.0 V	± 416 mA	25 mA	496 mA	84%	± 470 μ F	JCH1024D12 [†] ^
	± 15.0 V	± 333 mA	25 mA	496 mA	84%	± 330 μ F	JCH1024D15 [†] ^
36-72 VDC	3.3 V	2000 mA	20 mA	176 mA	78%	2200 μ F	JCH1048S3V3 [†] ^
	5.0 V	2000 mA	20 mA	251 mA	83%	2200 μ F	JCH1048S05 [†] ^
	12.0 V	833 mA	20 mA	248 mA	84%	680 μ F	JCH1048S12 [†] ^
	15.0 V	666 mA	20 mA	248 mA	84%	470 μ F	JCH1048S15 [†] ^
	24.0 V	416 mA	20 mA	245 mA	86%	330 μ F	JCH1048S24
	± 3.3 V	± 1000 mA	20 mA	176 mA	78%	± 1000 μ F	JCH1048D03 [†] ^
	± 5.0 V	± 1000 mA	20 mA	254 mA	82%	± 1000 μ F	JCH1048D05 [†] ^
	± 12.0 V	± 416 mA	20 mA	245 mA	85%	± 470 μ F	JCH1048D12 [†] ^
	± 15.0 V	± 333 mA	20 mA	245 mA	85%	± 330 μ F	JCH1048D15 [†] ^
	± 24.0 V	± 208 mA	20 mA	242 mA	86%	± 220 μ F	JCH1048D24

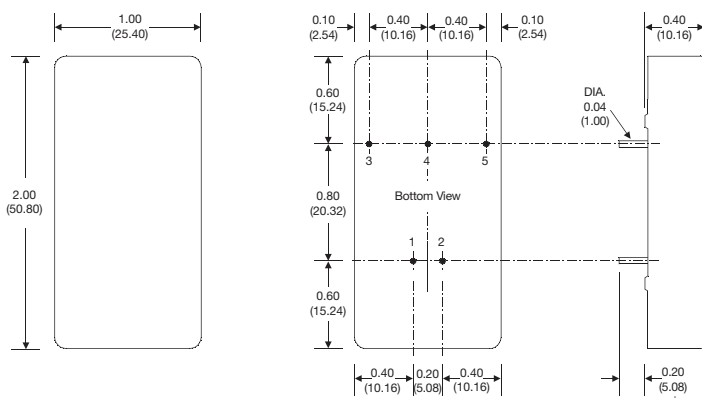
Notes

1. Measured at nominal input voltage.

[†] Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296.

Mechanical Details



PIN CONNECTIONS

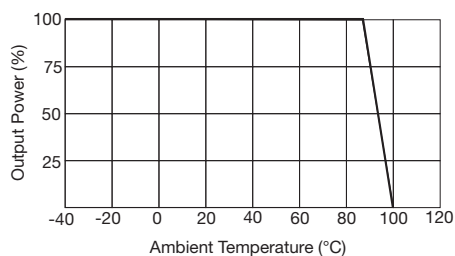
Pin	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
3	+Vout	+Vout
4	No Pin	Com
5	-Vout	-Vout

Notes

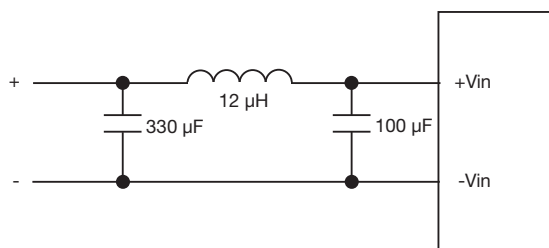
1. All dimensions are in inches (mm)
2. Weight: 0.07 lbs (30 g)
3. Pin diameter tolerance: ± 0.002 (± 0.05)
4. Pin pitch tolerance: ± 0.014 (± 0.35)
5. Case tolerance: ± 0.02 (± 0.50)

Application Notes

Derating Curve



Input Filter



10 Watts

JHM10 Series



- International Medical Approvals
- 4000 VAC Reinforced Insulation
- Meets IEC60601-1, 3rd Edition
- 2 μ A Patient Leakage Current
- DIP-24 Package
- EN55011 Level A With No External Components
- 3 Year Warranty

Specification

Input

Input Voltage Range	• 5 V (4.5-9 VDC) • 12 V (9-18 VDC) • 24 V (18-36 VDC)
Input Current	• See table
Inrush Current	• 20 A max at 36 V
Input Filter	• Pi network
Patient Leakage Current	• 2 μA max
Undervoltage Lockout	• 5 V models, on at >4.4 V, off <4.2 V • 12 V models, on at >8.8 V, off <8.3 V • 24 V models, on at >17.5 V, off <17.0 V
Input Surge	• 5 V models 15 V for 3 s • 12 V models 25 V for 3 s • 24 V models 50 V for 3 s

Output

Output Voltage	• See table
Output Voltage Trim	• $\pm 10\%$
Minimum Load	• No minimum load required
Initial Set Accuracy	• $\pm 1\%$ max on V1, $\pm 2\%$ max on V2
Start Up Delay	• 5 ms typical
Start Up Rise Time	• 2 ms typical
Line Regulation	• $\pm 0.3\%$ max
Load Regulation	• $\pm 2\%$ max 0% to 10% load, $\pm 1\%$ max 10% to 100% load
Cross Regulation	• $\pm 4\%$ max on dual with one output set to 50% load and the other varied from 10% to 100% load (D05 is 20% to 100%)
Transient Response	• 4% max deviation, recovery to within 1% in <500 μs for a 50% load change at 0.25 A/μs rate
Ripple & Noise	• 1% pk-pk max at 20 MHz bandwidth
Overload Protection	• 120% - 200%, trip and restart
Overvoltage Protection	• 115% - 140%
Temperature Coefficient	• $\pm 0.03/^{\circ}\text{C}$ max
Short Circuit Protection	• Trip and Restart (hiccup mode), auto recovery

General

Efficiency	• See tables
Isolation	• 4000 VAC for 1 min. double/reinforced with a working voltage of 250 VAC. Meets 2 x MOPP per 3rd edition of IEC60601-1 5000 VAC for 10 ms in accordance with IEC60664-1
Input to Output Capacitance	• 20 pF max
Switching Frequency	• 80 kHz to 1.2 MHz variable
Power Density	• 20.0 W/in³
MTBF	• >1 Mhrs typical to MIL-STD-217F at 25 $^{\circ}\text{C}$, GB

Environmental

Operating Temperature	• -40 $^{\circ}\text{C}$ to +80 $^{\circ}\text{C}$, see derating curve
Case Temperature	• +100 $^{\circ}\text{C}$ max
Storage Temperature	• -40 $^{\circ}\text{C}$ to +100 $^{\circ}\text{C}$
Operating Humidity	• 5-90%, non-condensing
Cooling	• Natural convection

EMC & Safety

Emissions	• EN55011 & EN55022 level A conducted & radiated with no external components
Immunity	• IEC60601-1-2, EN61204-3
ESD Immunity	• EN61000-4-2, level 2, Perf Criteria A
Radiated Immunity	• EN61000-4-3, 10 V/m Perf Criteria A
EFT/Burst	• EN61000-4-4, level 2 Perf Criteria A
Surge	• EN61000-4-5, level 1 Perf Criteria A
Conducted Immunity	• EN61000-4-6, 10 Vm, Perf Criteria A
Magnetic Field	• EN61000-4-8, 3 A/m Perf Criteria A
Safety Approvals	• UL60601-1 1st Edition, CSA-22.2 No.601.1-M90, 2005 IEC60601-1 3rd Edition

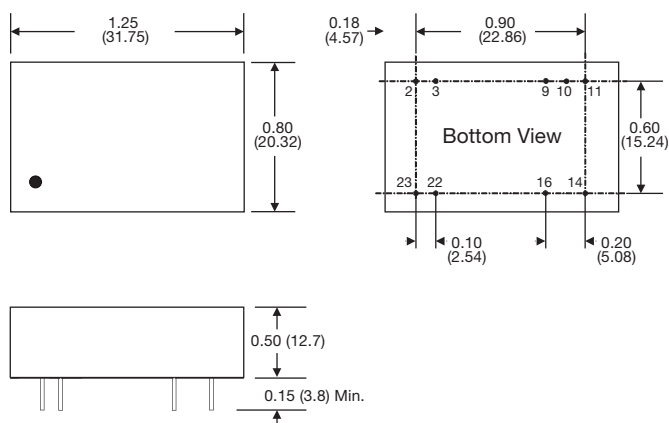
Input Voltage	Output Voltage	Output Current	Input Current		Maximum Capacitive Load	Efficiency ⁽³⁾	Model Number
			No Load ⁽¹⁾	Full Load ⁽²⁾			
4.5-9 V	5.0 V	2000 mA	100 mA	2690 mA	2200 μ F	83.5%	JHM1005S05
	12.0 V	833 mA	115 mA	2640 mA	1000 μ F	85.0%	JHM1005S12
	15.0 V	666 mA	115 mA	2640 mA	680 μ F	85.0%	JHM1005S15
	± 5.0 V	± 1000 mA	130 mA	2760 mA	± 1000 μ F	81.5%	JHM1005D05
	± 12.0 V	± 420 mA	115 mA	2695 mA	± 470 μ F	84.0%	JHM1005D12
9-18 V	5.0 V	2000 mA	50 mA	1310 mA	2200 μ F	86.0%	JHM1012S05
	12.0 V	833 mA	50 mA	1280 mA	1000 μ F	88.0%	JHM1012S12
	15.0 V	666 mA	50 mA	1265 mA	680 μ F	89.0%	JHM1012S15
	± 5.0 V	± 1000 mA	50 mA	1345 mA	± 1000 μ F	84.0%	JHM1012D05
	± 12.0 V	± 420 mA	50 mA	1290 mA	± 470 μ F	88.0%	JHM1012D12
18-36 V	5.0 V	2000 mA	25 mA	645 mA	2200 μ F	87.0%	JHM1024S05
	12.0 V	833 mA	20 mA	630 mA	1000 μ F	89.0%	JHM1024S12
	15.0 V	666 mA	20 mA	630 mA	680 μ F	89.0%	JHM1024S15
	± 5.0 V	± 1000 mA	20 mA	660 mA	± 1000 μ F	85.0%	JHM1024D05
	± 12.0 V	± 420 mA	25 mA	640 mA	± 470 μ F	88.0%	JHM1024D12
	± 15.0 V	± 333 mA	25 mA	635 mA	± 470 μ F	88.0%	JHM1024D15

Notes

1. Input current measured at nominal input voltage.
2. Input current measured at lowest input voltage.

3. Typical values.

Mechanical Details



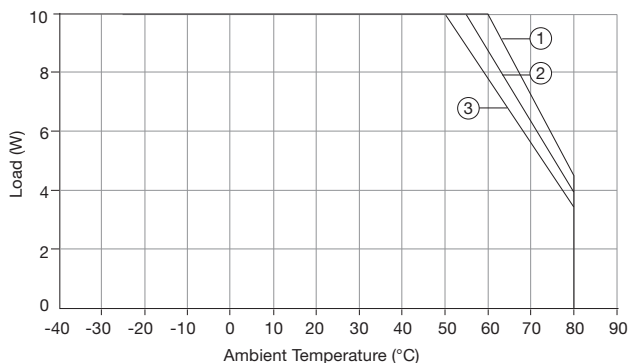
Pin Connections		
Pin	Single	Dual
2	-Vin	-Vin
3	-Vin	-Vin
9	No Pin	Common
10	Trim	Trim
11	No Pin	-Vout
14	+Vout	+Vout
16	-Vout	Common
22	+Vin	+Vin
23	+Vin	+Vin

Notes

1. All dimensions are in inches (mm)
2. Weight: 0.04 lbs (20 g) approx.
3. Pin diameter: 0.02 $\pm$ 0.002 (0.5 $\pm$ 0.05)
4. Pin pitch tolerance: $\pm$ 0.01 ($\pm$ 0.25)
5. Case tolerance: $\pm$ 0.02 ($\pm$ 0.5)

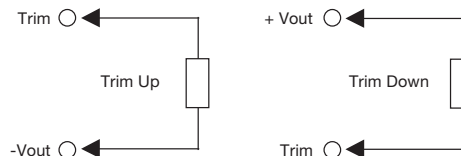
Application Notes

Derating Curve



- ① JHM1012/24 S05, S12, S15, D12, D15
- ② JHM1012/24 D05, JHM1005S05, S12, S15, D12, D15
- ③ JHM1005D05

External Output Trim



For 5 V output:
Trim +10%, R = 3.4 k Ω typical
Trim -10%, R = 1 k Ω typical

For 12 V output:
Trim +10%, R = 5.9 k Ω typical
Trim -10%, R = 11.3 k Ω typical

For 15 V output:
Trim +10%, R = 8.3 k Ω typical
Trim -10%, R = 10 k Ω typical

For ± 5 V output:
Trim +10%, R = 12.0 k Ω typical
Trim -10%, R = 8.0 k Ω typical

For ± 12 V output:
Trim +10%, R = 12.8 k Ω typical
Trim -10%, R = 9.5 k Ω typical

For ± 15 V output:
Trim +10%, R = 18 k Ω typical
Trim -10%, R = 14.8 k Ω typical



- High Power Density
- Wide 4:1 Input Range
- Operating Temperature -40 °C to +105 °C
- Single & Dual Outputs
- Standard Remote On/Off
- 1600 VDC Isolation
- 3 Year Warranty

Specification

Input

Input Voltage Range	• 24 V (9-36 VDC) • 48 V (18-75 VDC)
Input Current	• See table
Input Filter	• Pi network
Input Reflected Ripple Current	• 20 mA pk-pk through 12 μH inductor and 47 μF capacitor, 5 Hz to 20 MHz
Input Surge	• 24 V models: 50 VDC for 100 ms (1 second for 12 W versions) • 48 V models: 100 VDC for 100 ms (1 second for 12 W versions)

Output

Output Voltage	• See table
Minimum Load	• No minimum load required
Initial Set Accuracy	• $\pm 1.2\%$ max
Start Up Delay	• 20 ms typical
Line Regulation	• $\pm 0.2\%$ max
Load Regulation	• $\pm 0.5\%$ max single, $\pm 1.0\%$ max dual
Cross Regulation	• $\pm 5\%$ on dual output models (see note 2)
Transient Response	• $< 3\%$ max deviation, recovery to within 1% in 250 μs for a 25% load change
Ripple & Noise	• 75 mV pk-pk, 20 MHz bandwidth for 8 W versions, • 85 mV pk-pk, 20 MHz bandwidth for 10 W and 12 W versions (see note 3)
Overload Protection	• 150% of full load typical for 8 W versions, 170% of full load typical for 10 W and 12 W versions
Overvoltage Protection	• 3.3 V models: 3.9 V typical • 5 V models: 6.2 V typical • 12 V models: 15 V typical • 15 V models: 18 V typical • ± 5 V models: ± 6.2 V typical • ± 12 V models: ± 15 V typical • ± 15 V models: ± 18 V typical
Short Circuit Protection	• Trip & restart (hiccup) with auto recovery
Maximum Capacitive Load	• See table
Temperature Coefficient	• $\pm 0.02/^{\circ}\text{C}$ max
Remote On/Off	• On > 3.0 VDC or open circuit • Off < 1.2 VDC or short circuit pins 1, 2 & 3

General

Efficiency	• See tables
Isolation	• 1600 VDC Input to Output • 1600 VDC Input to Case • 1600 VDC Output to Case
Isolation Capacitance	• 1500 pF max
Switching Frequency	• 270 kHz typical
Power Density	• JTF08: 20 W/in³, JTF10: 25 W/in³, JTF12: 30 W/in³
MTBF	• > 1 Mhrs to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Temperature	• -40 °C to +105 °C, derate from 100% load at +60 °C to no load at +105 °C for 10 W and 12 W versions and from 100% load at 70 °C to no load at 105 °C for 8 W version
Case Temperature	• +105 °C max
Storage Temperature	• -40 °C to +125 °C
Humidity	• Up to 90%, non-condensing
Cooling	• Natural convection

EMC

Emissions	• EN55022 class A conducted with external components - see application note
ESD Immunity	• EN61000-4-2, level 3, Perf Criteria B
Radiated Immunity	• EN61000-4-3, 10 V/m Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3 Perf Criteria B*
Surge	• EN61000-4-5, level 2 Perf Criteria B*
Conducted Immunity	• EN61000-4-6, 10 Vrms Perf Criteria A*
Magnetic Field	• EN61000-4-8, 1 A/m Perf Criteria A

*External input capacitor required, 330 μ F/100 V.

Input Voltage	Output Voltage	Output Current	Input Current ⁽¹⁾		Max. Capacitive Load	Efficiency	Model Number
			No Load	Full Load			
9-36 V	3.3 V	2.0 A	10 mA	335 mA	1330 μ F	83%	JTF0824S3V3†^
	5.0 V	1.5 A	10 mA	365 mA	1330 μ F	86%	JTF0824S05†^
	12.0 V	0.665 A	15 mA	385 mA	288 μ F	87%	JTF0824S12†^
	15.0 V	0.535 A	15 mA	385 mA	200 μ F	87%	JTF0824S15†^
	± 5.0 V	± 0.8 A	10 mA	400 mA	± 900 μ F	84%	JTF0824D05†^
	± 12.0 V	± 0.335 A	15 mA	390 mA	± 133 μ F	86%	JTF0824D12†^
18-75 V	3.3 V	2.0 A	10 mA	170 mA	1330 μ F	82%	JTF0848S3V3†^
	5.0 V	1.5 A	10 mA	185 mA	1330 μ F	86%	JTF0848S05†^
	12.0 V	0.665 A	10 mA	195 mA	288 μ F	87%	JTF0848S12†^
	15.0 V	0.535 A	10 mA	195 mA	200 μ F	87%	JTF0848S15†^
	± 5.0 V	± 0.8 A	10 mA	200 mA	± 900 μ F	84%	JTF0848D05†^
	± 12.0 V	± 0.335 A	10 mA	195 mA	± 133 μ F	87%	JTF0848D12†^
9-36 V	3.3 V	2.7 A	15 mA	440 mA	1330 μ F	85%	JTF1024S3V3†^
	5.0 V	2.0 A	15 mA	475 mA	1330 μ F	87%	JTF1024S05†^
	12.0 V	0.833 A	15 mA	475 mA	288 μ F	88%	JTF1024S12†^
	15.0 V	0.667 A	15 mA	480 mA	200 μ F	88%	JTF1024S15†^
	± 5.0 V	± 1.0 A	15 mA	495 mA	± 900 μ F	85%	JTF1024D05†^
	± 12.0 V	± 0.417 A	15 mA	480 mA	± 133 μ F	87%	JTF1024D12†^
18-75 V	3.3 V	2.7 A	15 mA	480 mA	± 90 μ F	87%	JTF1024D15†^
	5.0 V	2.0 A	15 mA	225 mA	1330 μ F	84%	JTF1048S3V3†^
	12.0 V	0.833 A	15 mA	240 mA	1330 μ F	87%	JTF1048S05†^
	15.0 V	0.667 A	15 mA	240 mA	288 μ F	87%	JTF1048S12†^
	± 5.0 V	± 1.0 A	15 mA	250 mA	± 900 μ F	85%	JTF1048D05†^
	± 12.0 V	± 0.417 A	15 mA	245 mA	± 133 μ F	88%	JTF1048D12†^
9-36 V	3.3 V	3.5 A	15 mA	573 mA	2000 μ F	87%	JTF1224S3V3†^
	5.0 V	2.4 A	15 mA	581 mA	2000 μ F	89%	JTF1224S05†^
	12.0 V	1.0 A	15 mA	574 mA	430 μ F	90%	JTF1224S12†^
	15.0 V	0.8 A	15 mA	574 mA	300 μ F	90%	JTF1224S15†^
	± 5.0 V	± 1.2 A	15 mA	595 mA	± 1250 μ F	87%	JTF1224D05†^
	± 12.0 V	± 0.5 A	15 mA	574 mA	± 200 μ F	90%	JTF1224D12†^
18-75 V	3.3 V	3.5 A	15 mA	574 mA	± 120 μ F	90%	JTF1224D15†^
	5.0 V	2.4 A	15 mA	286 mA	2000 μ F	87%	JTF1248S3V3†^
	12.0 V	1.0 A	15 mA	290 mA	2000 μ F	89%	JTF1248S05†^
	15.0 V	0.8 A	15 mA	287 mA	430 μ F	90%	JTF1248S12†^
	± 5.0 V	± 1.2 A	15 mA	287 mA	300 μ F	90%	JTF1248S15†^
	± 12.0 V	± 0.5 A	15 mA	297 mA	± 1250 μ F	87%	JTF1248D05†^
18-75 V	± 12.0 V	± 0.5 A	15 mA	287 mA	± 200 μ F	90%	JTF1248D12†^
	± 15.0 V	± 0.4 A	15 mA	287 mA	± 120 μ F	90%	JTF1248D15†^

Notes

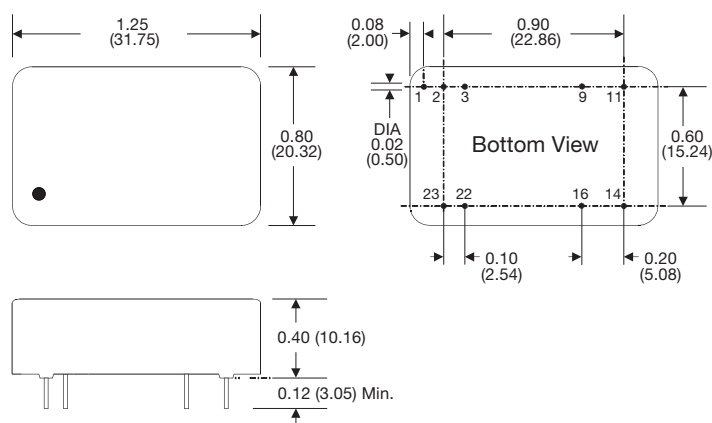
1. Input current measured at nominal 24 V and 48 V input.

2. When one output is set to 100% load, and the other varies between 25% and 100% load.

† Available from Farnell & element14. See pages 284-290.

3. Measured with 1 μ F ceramic capacitor across output rails.

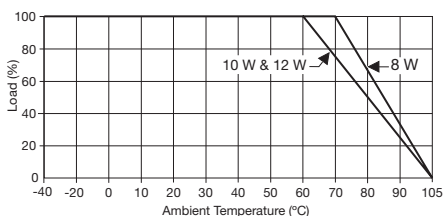
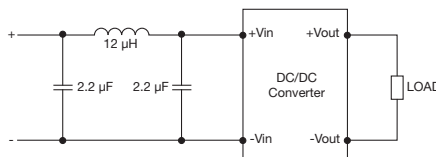
^ Available from Newark. See pages 291-296

Mechanical Details

Pin Connections		
Pin	Single	Dual
1	Remote On/Off	Remote On/Off
2	-Vin	-Vin
3	-Vin	-Vin
9	No Pin	Common
11	Not Connected	-Vout
14	+Vout	+Vout
16	-Vout	Common
22	+Vin	+Vin
23	+Vin	+Vin

Notes

- All dimensions are in inches (mm)
- Weight: 0.04 lbs (18 g)
- Pin diameter: 0.02 $\pm$ 0.002 (0.5 $\pm$ 0.05)
- Pin pitch tolerance: $\pm$ 0.014 ($\pm$ 0.35)
- Case tolerance: $\pm$ 0.02 ($\pm$ 0.5)
- Package: 24 pin DIL nickel-coated copper.

Application Notes**Derating Curve****Input Filter****Remote On/Off**

Standard ROF logic is positive
 Output On >3.0 VDC or open circuit
 Output Off <1.2 VDC or short circuit pins 1, 2 & 3

12 Watts

JCG Series



- High Power Density
- 2:1 Input Range
- Operating Temperature -40°C to $+100^{\circ}\text{C}$
- Single & Dual Outputs
- Remote On/Off
- 1600 VDC Isolation
- 3 Year Warranty

Specification

Input

Input Voltage Range	• 12 V (9-18 VDC) • 24 V (18-36 VDC) • 48 V (36-75 VDC)
Input Current	• See table
Input Filter	• Pi network
Input Reflected Ripple Current	• 20 mA pk-pk through 12 μH inductor
Input Surge	• 12 V models 36 VDC for 1000 ms • 24 V models 50 VDC for 1000 ms • 48 V models 100 VDC for 1000 ms
Undervoltage Lockout	• None
Input Reverse Voltage Protection	• None

Output

Output Voltage	• See table
Minimum Load	• No minimum load required
Initial Set Accuracy	• $\pm 1.2\%$ max
Start Up Delay	• 20 ms max
Line Regulation	• $\pm 0.5\%$ max
Load Regulation	• $\pm 0.5\%$ max single, $\pm 1.0\%$ max dual
Cross Regulation	• $\pm 5\%$ on dual output models (see note 2)
Transient Response	• $< 3\%$ deviation, recovery to within 1% in 250 μs for a 25% load change
Ripple & Noise	• 85 mV pk-pk, 20 MHz bandwidth, (see note 3)
Overload Protection	• $> 150\%$ of full load
Overvoltage Protection	• 2.5/3.3 V models: 3.9 V typical • 5 V models: 6.2 V typical • 12 V models: 15.0 V typical • 15 V models: 18.0 V typical • ± 12 V models: ± 15.0 V typical • ± 15 V models: ± 18.0 V typical
Short Circuit Protection	• Trip & restart (hiccup) with auto recovery
Maximum Capacitive Load	• See table
Temperature Coefficient	• $\pm 0.02/^{\circ}\text{C}$ max
Remote On/Off	• ON > 3.0 VDC or open circuit • OFF < 1.2 VDC or short circuit pin 1, 2 & 3

General

Efficiency	• See tables
Isolation Voltage	• 1600 VDC Input to Output • 1600 VDC Input to Case • 1600 VDC Output to Case
Switching Frequency	• 330 kHz typical
Power Density	• 30 W/in³
MTBF	• > 1.0 Mhrs to MIL-HDBK-217F at 25°C, GB

Environmental

Operating Temperature	• -40°C to $+100^{\circ}\text{C}$, derate from 100% load at $+60^{\circ}\text{C}$ to no load at $+100^{\circ}\text{C}$
Case Temperature	• $+100^{\circ}\text{C}$ max
Storage Temperature	• -40°C to $+125^{\circ}\text{C}$
Humidity	• Up to 95%, non-condensing
Cooling	• Natural convection

EMC

Emissions	• EN55022 Class A conducted and radiated with external components - see application note
ESD Immunity	• EN61000-4-2, level 3, Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3, Perf Criteria A*
Surge	• EN61000-4-5, installation class 3, Perf Criteria A*
Conducted Immunity	• EN61000-4-6, 10 Vrms, Perf Criteria A
Magnetic Field	• EN61000-4-8, 1 A/m, Perf Criteria A

* A 330 μF , 100 V capacitor is required across input terminals to meet performance criteria A.

Models and Ratings

JCG12 XP

Input Voltage	Output Voltage	Output Current	Input Current ⁽¹⁾		Maximum Capacitive Load	Efficiency	Model Number
			No Load	Full Load			
9-18 V	2.5 V	3.5 A	15 mA	0.89 A	2000 μ F	85%	JCG1212S2V5† [^]
	3.3 V	3.5 A	15 mA	1.15 A	2000 μ F	87%	JCG1212S3V3† [^]
	5.0 V	2.4 A	15 mA	1.16 A	2000 μ F	89%	JCG1212S05† [^]
	12.0 V	1.0 A	15 mA	1.15 A	430 μ F	90%	JCG1212S12† [^]
	15.0 V	0.8 A	15 mA	1.15 A	300 μ F	90%	JCG1212S15† [^]
	± 12.0 V	± 0.5 A	15 mA	1.15 A	± 200 μ F	90%	JCG1212D12† [^]
18-36 V	2.5 V	3.5 A	15 mA	0.45 A	2000 μ F	85%	JCG1224S2V5† [^]
	3.3 V	3.5 A	15 mA	0.57 A	2000 μ F	87%	JCG1224S3V3† [^]
	5.0 V	2.4 A	15 mA	0.58 A	2000 μ F	89%	JCG1224S05† [^]
	12.0 V	1.0 A	15 mA	0.58 A	430 μ F	90%	JCG1224S12† [^]
	15.0 V	0.8 A	15 mA	0.58 A	300 μ F	90%	JCG1224S15† [^]
	± 12.0 V	± 0.5 A	15 mA	0.58 A	± 200 μ F	90%	JCG1224D12† [^]
36-75 V	2.5 V	3.5 A	15 mA	0.23 A	2000 μ F	84%	JCG1248S2V5† [^]
	3.3 V	3.5 A	15 mA	0.28 A	2000 μ F	88%	JCG1248S3V3† [^]
	5.0 V	2.4 A	15 mA	0.29 A	2000 μ F	89%	JCG1248S05† [^]
	12.0 V	1.0 A	15 mA	0.29 A	430 μ F	88%	JCG1248S12† [^]
	15.0 V	0.8 A	15 mA	0.29 A	300 μ F	89%	JCG1248S15† [^]
	± 12.0 V	± 0.5 A	15 mA	0.29 A	± 200 μ F	88%	JCG1248D12† [^]
	± 15.0 V	± 0.4 A	15 mA	0.29 A	± 120 μ F	89%	JCG1248D15† [^]

Notes

1. Input current measured at nominal input voltage.

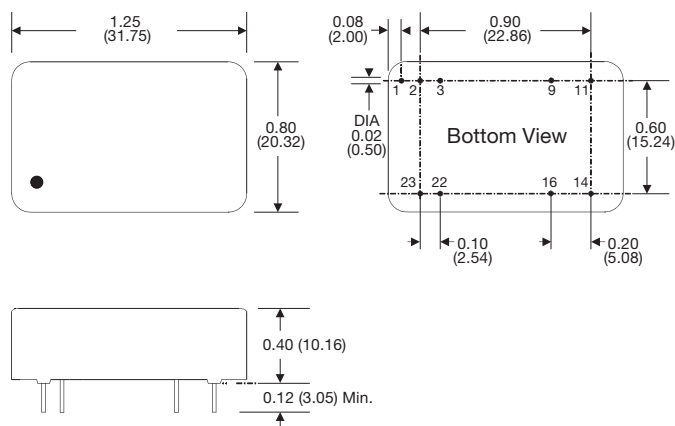
2. When one output is set to 100% load and the other varies between 25% & 100% load.

3. Measured with 1 μ F ceramic capacitor across output rails.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296.

Mechanical Details



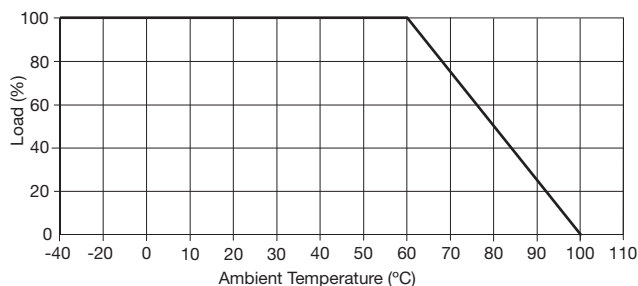
Pin Connections		
Pin	Single	Dual
1	Remote On/Off	Remote On/Off
2	-Vin	-Vin
3	-Vin	-Vin
9	No Pin	Common
11	Not Connected	-Vout
14	+Vout	+Vout
16	-Vout	Common
22	+Vin	+Vin
23	+Vin	+Vin

Notes

- All dimensions are in inches (mm)
- Weight: 0.04 lbs (18 g) approx
- Pin diameter: 0.02 $\pm$ 0.002 (0.5 $\pm$ 0.05)
- Pin pitch tolerance: $\pm$ 0.014 ($\pm$ 0.35)
- Package: 24 pin DIL nickel-coated copper

Application Notes

Derating Curve



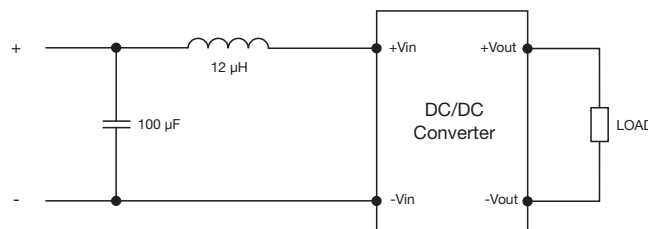
Remote On/Off

Standard ROF logic is positive

Output On >3.0 VDC or open circuit

Output Off <1.2 VDC or short circuit pins 1, 2 & 3

Input Filter



15 Watts

JCK Series



- 2:1 Input Range
- Industry Standard Package
- 1500 VDC Isolation
- Continuous Short Circuit Protection
- High Efficiency - up to 89%
- -40 °C to +100 °C Operating Temperature
- 3 Year Warranty

Specification

Input

Input Voltage Range	• 12 V (9-18 VDC) • 24 V (18-36 VDC) • 48 V (36-75 VDC)
Input Current	• See table
Input Reflected Ripple Current	• 20 mA rms through 12 μH inductor, 5 Hz to 20 MHz
Under Voltage Lockout	• 12 V models On 8.6 V, Off 7.9 V typical • 24 V models On 17.8 V, Off 16 V typical • 48 V models On 33.5 V, Off 30.5 V typical
Input Surge	• 12 V models 30 VDC for 100 ms • 24 V models 50 VDC for 100 ms • 48 V models 100 VDC for 100 ms

Output

Output Voltage	• See table
Minimum Load	• No minimum load required
Line Regulation	• $\pm 0.5\%$ max
Load Regulation	• $\pm 0.5\%$ max for single and dual outputs except $\pm 0.8\%$ for D03 versions
Cross Regulation	• $\pm 5\%$ max on dual output models (see note 2)
Setpoint Accuracy	• $\pm 1.0\%$ max
Start Up Delay	• <20 ms
Start Up Rise Time	• <5 ms
Ripple & Noise	• 75 mV pk-pk max (see note 3)
Transient Response	• $\pm 3\%$ max deviation, recovery to within 1% in 250 μs for a 25% load change
Temperature Coefficient	• 0.02%/°C
Overload Protection	• >140% of full load at nominal input
Short Circuit Protection	• Trip & restart (hiccup mode) with auto recovery
Maximum Capacitive Load	• See table

General

Efficiency	• See table
Isolation Voltage	• 1600 VDC Input to Output, optional 3500 V (see note 4) • 1600 VDC Input to Case • 1600 VDC Output to Case
Isolation Capacitance	• 1200 pF typical
Isolation Resistance	• $10^9 \Omega$ min
Switching Frequency	• 300 kHz typical
Power Density	• 18.75 W/in³
MTBF	• >1.1 Mhrs to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Temperature	• -40 °C to +100 °C, derate from 100% load at +70 °C to 0% load at +100 °C
Case Temperature	• +100 °C max
Storage Temperature	• -40 °C to +125 °C
Cooling	• Convection-cooled
Operating Humidity	• Up to 95% RH, non-condensing

EMC

Emissions	• EN55022, Class A conducted & radiated with external components, see application note
ESD Immunity	• EN61000-4-2, 8 kV air, 6 kV contact, Perf Criteria A
Radiated Immunity	• EN61000-4-3 10 V/m, Perf Criteria A
EFT/Burst	• EN61000-4-4 level 3, Perf Criteria B*
Surge	• EN61000-4-5 level 2, Perf Criteria B*
Conducted Immunity	• EN61000-4-6 10 V/rms, Perf Criteria A
Magnetic Field	• EN61000-4-8 1 A/m, Perf Criteria A

*External input capacitor required 220 μ F/100 V.

Models and Ratings

JCK15 XP

Input Voltage	Output Voltage	Output Current	Input Current ⁽¹⁾		Maximum Capacitive Load	Efficiency	Model Number ⁽⁴⁾
			No Load	Full Load			
9-18 VDC	3.3 V	3.00 A	30 mA	1.03 A	3300 μ F	82%	JCK1512S3V3 [†] ^
	5.0 V	3.00 A	30 mA	1.52 A	3300 μ F	84%	JCK1512S05 [†] ^
	12.0 V	1.250 A	30 mA	1.45 A	1000 μ F	88%	JCK1512S12 [†] ^
	15.0 V	1.000 A	30 mA	1.44 A	680 μ F	89%	JCK1512S15 [†] ^
	± 3.3 V	± 1.500 A	30 mA	1.03 A	± 1000 μ F	82%	JCK1512D03 [†] ^
	± 5.0 V	± 1.500 A	30 mA	1.50 A	± 1000 μ F	85%	JCK1512D05 [†] ^
	± 12.0 V	± 0.625 A	30 mA	1.45 A	± 470 μ F	88%	JCK1512D12 [†] ^
18-36 VDC	3.3 V	3.000 A	25 mA	0.52 A	3300 μ F	82%	JCK1524S3V3 [†] ^
	5.0 V	3.000 A	25 mA	0.75 A	3300 μ F	85%	JCK1524S05 [†] ^
	12.0 V	1.250 A	25 mA	0.72 A	1000 μ F	89%	JCK1524S12 [†] ^
	15.0 V	1.000 A	25 mA	0.72 A	680 μ F	89%	JCK1524S15 [†] ^
	± 3.3 V	± 1.500 A	25 mA	0.52 A	± 1000 μ F	82%	JCK1524D03 [†] ^
	± 5.0 V	± 1.500 A	25 mA	0.75 A	± 1000 μ F	85%	JCK1524D05 [†] ^
	± 12.0 V	± 0.625 A	25 mA	0.72 A	± 470 μ F	88%	JCK1524D12 [†] ^
36-75 VDC	3.3 V	3.000 A	20 mA	0.26 A	3300 μ F	82%	JCK1548S3V3 [†] ^
	5.0 V	3.000 A	20 mA	0.38 A	3300 μ F	85%	JCK1548S05 [†] ^
	12.0 V	1.250 A	20 mA	0.36 A	1000 μ F	89%	JCK1548S12 [†] ^
	15.0 V	1.000 A	20 mA	0.36 A	680 μ F	89%	JCK1548S15 [†] ^
	± 3.3 V	± 1.500 A	20 mA	0.26 A	± 1000 μ F	82%	JCK1548D03 [†] ^
	± 5.0 V	± 1.500 A	20 mA	0.38 A	± 1000 μ F	85%	JCK1548D05 [†] ^
	± 12.0 V	± 0.625 A	20 mA	0.36 A	± 470 μ F	88%	JCK1548D12 [†] ^
	± 15.0 V	± 0.500 A	20 mA	0.36 A	± 330 μ F	88%	JCK1548D15 [†] ^

Notes

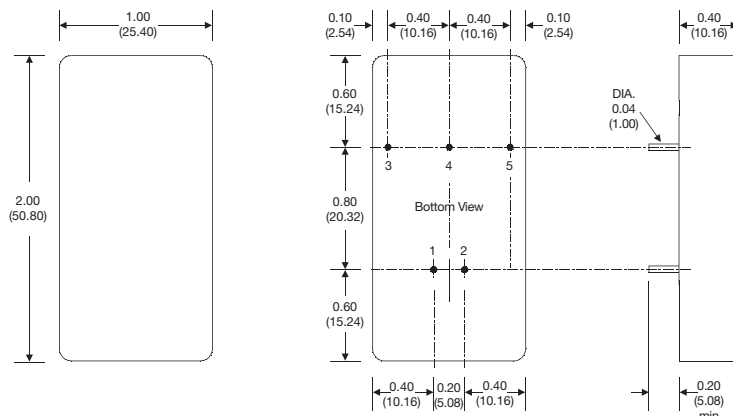
1. Measured at nominal input voltage.
2. When one output is set at 100% load and other varied between 25% and 100% load.

[†] Available from Farnell & element14. See pages 284-290.

3. Measured with 20 MHz bandwidth and 1 μ F ceramic capacitor across output rails.
4. For optional 3.5 kV isolation version, add suffix -H to part number eg. JCK1524S12-H.

^ Available from Newark. See pages 291-296

Mechanical Details



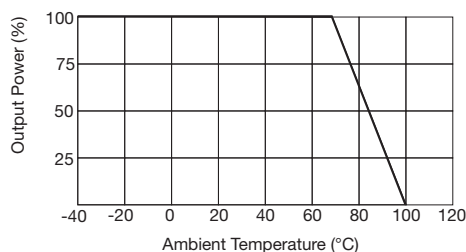
PIN CONNECTIONS		
Pin	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
3	+Vout	+Vout
4	No Pin	Com
5	-Vout	-Vout

Notes

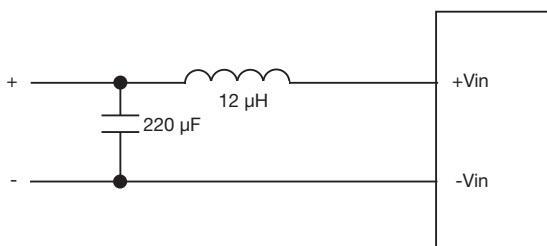
1. All dimensions are in inches (mm).
2. Weight: 0.07 lbs (30 g)
3. Pin diameter: 0.04 ± 0.002 (1.0 ± 0.05)
4. Pin pitch tolerance: ± 0.014 (± 0.35)
5. Case tolerance: ± 0.02 (± 0.5)

Application Notes

Derating Curve



Input Filter



15 Watts

JTH Series



- 4:1 Input Range
- 1500 VDC Isolation
- Efficiency up to 86%
- -40 °C to +100 °C Operating Temperature
- Optional Remote On/Off
- Single & Dual Outputs
- 3 Year Warranty

Specification

Input

Input Voltage Range	• 24 V (9-36 VDC) • 48 V (18-72 VDC)
Input Current	• See table
Input Filter	• Pi network
Input Reflected Ripple Current	• 35 mA rms through 12 μH inductor
Input Surge	• 24 V models 40 VDC for 100 ms • 48 V models 80 VDC for 100 ms
Undervoltage Lockout	• 24 V models ON 8.6 V, OFF 8 VDC typical • 48 V models ON 16.0 V, OFF 14 V typical

Output

Output Voltage	• See table
Minimum Load	• No minimum load required
Line Regulation	• $\pm 0.5\%$
Load Regulation	• $\pm 0.5\%$ 10-100% load, • $\pm 1.0\%$ 10% load
Cross Regulation	• $\pm 5\%$ on dual output models (see note 3)
Setpoint Accuracy	• $\pm 1\%$
Start Up Delay	• <10 ms
Start Up Rise Time	• <20 ms
Ripple & Noise	• 75 mV pk-pk 20 MHz bandwidth
Transient Response	• 3% max deviation, recovery to within 1% in 200 μs for 25% load change
Temperature Coefficient	• 0.02%/°C
Overvoltage Protection	• None
Overcurrent Protection	• 140% typical of full load at nominal input
Short Circuit Protection	• Trip & restart (hiccup mode), auto recovery
Remote On/Off	• Optional (see application note)
Maximum Capacitive Load	• See table

General

Efficiency	• See table
Isolation	• 1500 VDC Input to Output • 1000 VDC Input to Case • 1000 VDC Output to Case
Isolation Resistance	• $10^9 \Omega$
Isolation Capacitance	• 1200 pF typical
Switching Frequency	• 300 kHz typical
Power Density	• 18.75 W/in³
MTBF	• >1.21 Mhrs to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Temperature	• -40 °C to +100 °C, derate from 100% load at +60 °C to 0% load at +100 °C
Case Temperature	• 100 °C max
Cooling	• Convection-cooled
Operating Humidity	• Up to 95% RH, non-condensing
Storage Temperature	• -40 °C to +125 °C

EMC

Emissions	• EN55022 class A conducted & radiated with external components, see application note
ESD Immunity	• EN61000-4-2, 8 kV air discharge Perf Criteria A, 4 kV contact discharge Perf Criteria A
EFT/Burst Surge	• EN61000-4-4, level 1 Perf Criteria A • EN61000-4-5, installation class 1, Perf Criteria A
Conducted Immunity Magnetic Field	• EN61000-4-6, 3 Vrms Perf Criteria A • EN61000-4-8, 1 A/m Perf Criteria A

Models and Ratings

JTH15 XP

Input Voltage Range	Output Voltage	Output Current	Input Current ⁽¹⁾		Efficiency	Max. Capacitive Load	Model Number ⁽²⁾
			No Load	Full Load			
9-36 VDC	3.3 V	3000 mA	25 mA	515 mA	80%	3300 μ F	JTH1524S3V3 [†] [^]
	5.0 V	3000 mA	25 mA	753 mA	83%	3300 μ F	JTH1524S05 [†] [^]
	12.0 V	1250 mA	25 mA	735 mA	85%	680 μ F	JTH1524S12 [†] [^]
	15.0 V	1000 mA	25 mA	726 mA	86%	470 μ F	JTH1524S15 [†] [^]
	± 5.0 V	± 1500 mA	25 mA	753 mA	83%	± 2200 μ F	JTH1524D05 [†] [^]
	± 12.0 V	± 625 mA	25 mA	735 mA	85%	± 470 μ F	JTH1524D12 [†] [^]
	± 15.0 V	± 500 mA	25 mA	726 mA	86%	± 330 μ F	JTH1524D15 [†] [^]
18-72 VDC	3.3 V	3000 mA	20 mA	257 mA	80%	3300 μ F	JTH1548S3V3 [†] [^]
	5.0 V	3000 mA	20 mA	376 mA	83%	3300 μ F	JTH1548S05 [†] [^]
	12.0 V	1250 mA	20 mA	367 mA	85%	680 μ F	JTH1548S12 [†] [^]
	15.0 V	1000 mA	20 mA	363 mA	86%	470 μ F	JTH1548S15 [†] [^]
	± 5.0 V	± 1500 mA	20 mA	376 mA	83%	± 2200 μ F	JTH1548D05 [†] [^]
	± 12.0 V	± 625 mA	20 mA	367 mA	85%	± 470 μ F	JTH1548D12 [†] [^]
	± 15.0 V	± 500 mA	20 mA	363 mA	86%	± 330 μ F	JTH1548D15 [†] [^]

Notes

1. Measured at nominal input voltage.

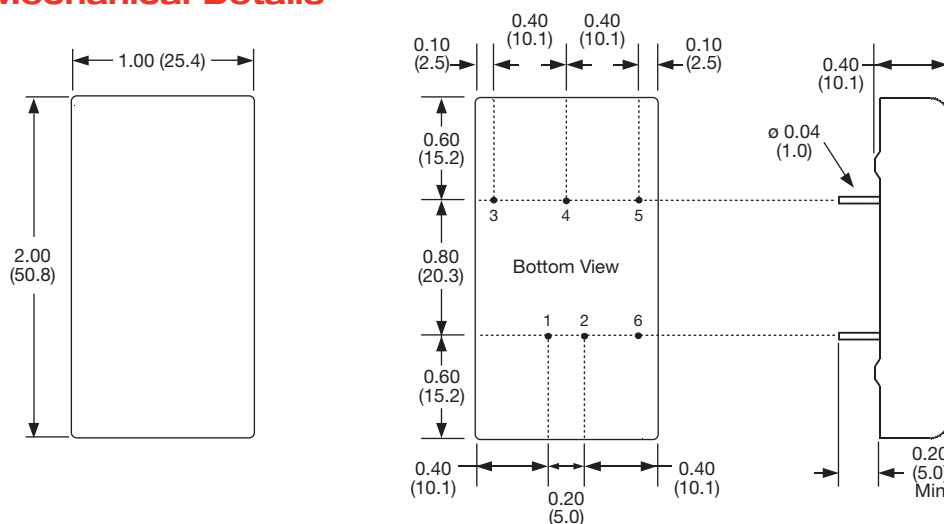
2. For optional Remote On/Off, add suffix '-R' to model number.

3. Cross regulations is $\pm 5\%$ when one output is at 100% and the other is varied between 25% and 100%.

[†] Available from Farnell & element14. See pages 284-290.

[^] Available from Newark. See pages 291-296.

Mechanical Details



PIN CONNECTIONS		
Pin	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
3	+Vout	+Vout
4	No pin	Common
5	-Vout	-Vout
6*	ROF*	ROF*

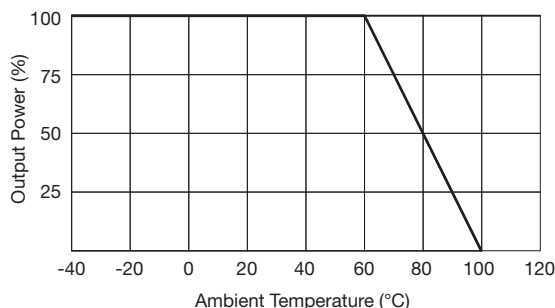
* Pin 6 only present with optional Remote On/Off

Notes

- All dimensions are in inches (mm).
- Weight: 0.07 lbs (30 g)
- Pin diameter: 0.04 ± 0.002 (1.0 ± 0.05)
- Pin pitch tolerance: ± 0.014 (± 0.35)
- Case tolerance: ± 0.02 (± 0.5)

Application Notes

Derating Curve



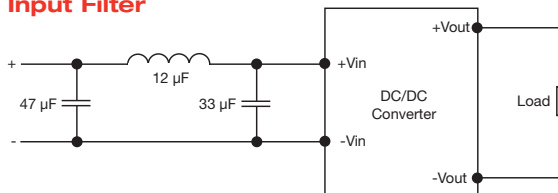
Optional Remote On/Off

On = +2.5 to +5.5 VDC on pin 6 WRT pin 2 or open circuit

Off = -0.7 to +0.8 VDC on pin 6 WRT pin 2 or short circuit pin 2 & 6

Input current is typically 2.5 mA when output is remotely switched off.

Input Filter



JTA Series



- 4:1 Input Range
- -40 °C to +100 °C Operating Temperature
- Single & Dual Outputs
- Overvoltage & Overcurrent Protection
- UL Safety Approvals
- Remote On/Off
- 3 Year Warranty

Specification

Input

Input Voltage Range	• 24 V (9-36 VDC) • 48 V (18-75 VDC)
Input Current	• JTA10: 1.65 A max at 9 VDC input • JTA15: 2.20 A max at 9 VDC input • JTA20: 2.90 A max at 9 VDC input
Input Filter	• Pi Network
Input Surge	• 24 V models: 50 VDC for 100ms • 48 V models: 100 VDC for 100 ms
Input Reflected Ripple Current	• 24 V models, with a 100 μF capacitor: JTA10: 20mA pk-pk, JTA15: 35mA pk-pk JTA20: 60mA pk-pk, 48 V models, with a 22 μF capacitor: JTA10: 30 mA pk-pk, JTA15: 20 mA pk-pk JTA20: 30 mA pk-pk
Input Reverse Voltage Protection	• None

Output

Output Voltage	• See table
Output Voltage Trim	• $\pm 10\%$ (15 & 20 W models only)
Voltage Balance	• $\pm 1\%$ max dual models, 100% load
Minimum Load	• No minimum load required for single output models, 10% required for dual output models
Line Regulation	• $\pm 1\%$ max
Load Regulation	• Single output models: $\pm 1\%$ max • Dual output models: $\pm 2\%$ max for a 10-100% load change
Setpoint Accuracy	• $\pm 2\%$
Ripple & Noise	• Single output models: 50 mV pk-pk • Dual output models: 75 mV pk-pk typical at 20 MHz bandwidth
Transient Response	• 4% max deviation, recovery to within 1% in <500 μs for a 25% load change
Temperature Coefficient	• 0.02%/°C
Overvoltage Protection	• See table
Overcurrent Protection	• 120-190% • JTA10: Constant current, auto recovery • JTA15/20: Trip & restart (hiccup mode)
Short Circuit Protection	• Continuous with auto recovery
Remote On/Off	• On = Logic High or Open • Off = Logic Low or <1.8 V (15 & 20 W models only)
Maximum Capacitive Load	• Single outputs: 1000 μF, Dual outputs: 650 μF

General

Efficiency	• See table
Isolation Voltage	• 1500 VDC Input to Output
Isolation Resistance	• $10^9 \Omega$
Switching Frequency	• 300 kHz typical
Power Density	• JTA10: 11.4 W/in³ • JTA15: 10.4 W/in³ • JTA20: 13.9 W/in³
MTBF	• 1.0 MHrs to MIL-HDBK-217F at 25°C, GB

Environmental

Operating Temperature	• -40 °C to +100 °C, derate from 100% load at 70 °C (60 °C for JTA20) to no load at 100 °C
Case Temperature	• +100 °C max
Cooling	• Convection-cooled
Operating Humidity	• 5-95% RH, non-condensing
Storage Temperature	• -55 °C to +105 °C

EMC & Safety

Emissions	• EN55022, level A conducted (below -25 °C) • level B conducted (-25 °C to +100 °C) (see note 1) • EN55022, level A radiated
ESD Immunity	• EN61000-4-2, level 2 • Perf Criteria A
Radiated Immunity	• EN61000-4-3 3 Vrms, Perf Criteria A
Conducted Immunity	• EN61000-4-6 3 V/m, Perf Criteria A
Safety Approvals	• UL60950-1

Models and Ratings

JTA10 **XP**

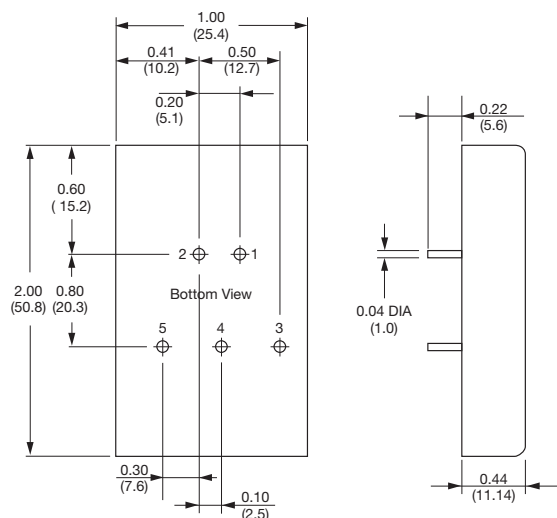
Input Voltage	Maximum Power	Overvoltage Protection	Output V1		Output V2		Efficiency ⁽²⁾	Model Number
			Voltage	Current	Voltage	Current		
9-36 VDC	6.6 W	3.9 V	3.3 V	2.00 A			77%	JTA1024S3V3
	10.0 W	6.8 V	5.0 V	2.00 A			79%	JTA1024S05 [^]
	10.0 W	15.0 V	12.0 V	0.83 A			81%	JTA1024S12
	10.0 W	18.0 V	15.0 V	0.67 A			81%	JTA1024S15
	10.0 W	6.8 V	+5.0 V	1.00 A	-5.0 V	1.00 A	80%	JTA1024D01
	10.0 W	15.0 V	+12.0 V	0.42 A	-12.0 V	0.42 A	80%	JTA1024D02 [^]
18-75 VDC	10.0 W	18.0 V	+15.0 V	0.33 A	-15.0 V	0.33 A	80%	JTA1024D03
	6.6 W	3.9 V	3.3 V	2.00 A			78%	JTA1048S3V3
	10.0 W	6.8 V	5.0 V	2.00 A			80%	JTA1048S05
	10.0 W	15.0 V	12.0 V	0.83 A			82%	JTA1048S12
	10.0 W	18.0 V	15.0 V	0.67 A			82%	JTA1048S15
	10.0 W	6.8 V	+5.0 V	1.00 A	-5.0 V	1.00 A	81%	JTA1048D01
	10.0 W	15.0 V	+12.0 V	0.42 A	-12.0 V	0.42 A	83%	JTA1048D02
	10.0 W	18.0 V	+15.0 V	0.33 A	-15.0 V	0.33 A	83%	JTA1048D03

Notes

1. For EN55022 Level B performance below -25 °C, a 100 μ F (24 VDC input), 22 μ F (48 VDC input) electrolytic capacitor is required across the input of the converter.
 2. Efficiency is measured at nominal input, full load and 25 °C

[^] Available from Newark. See pages 291-296

Mechanical Details



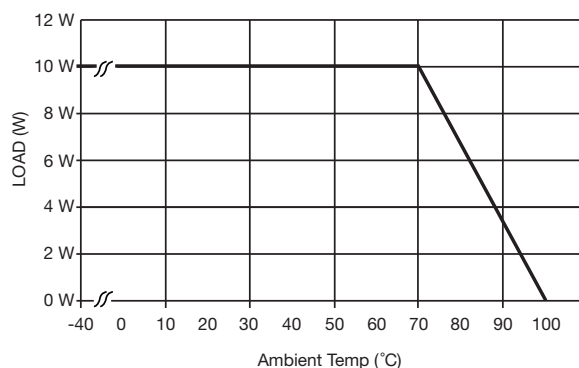
PIN CONNECTIONS		
Pin	Single Output	Dual Output
1	+Input	+Input
2	-Input	-Input
3	+Output	+Output
4	No pin	Common
5	-Output	-Output

Notes

1. All dimensions are in inches (mm)
 2. Weight: 0.06 lb (28 g) approx.
 3. Pin diameter tolerance: ± 0.002 (± 0.052)
 4. Pin pitch tolerance: ± 0.01 (± 0.25)
 5. Case tolerance: ± 0.04 (± 1.0)
 6. Packaging Style: Copper case with non-conducting base

Application Notes

Derating Curve



Models and Ratings

JTA15 **XP**

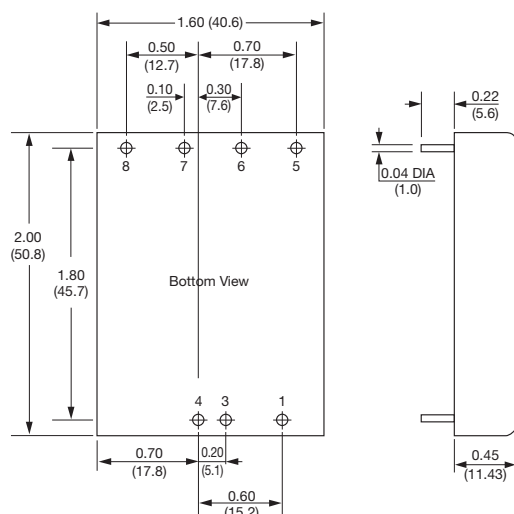
Input Voltage	Maximum Power	Overvoltage Protection	Output V1		Output V2		Efficiency ⁽²⁾	Model Number
			Voltage	Current	Voltage	Current		
9-36 VDC	10 W	3.9 V	3.3 V	3.000 A			76%	JTA1524S3V3
	15 W	6.8 V	5.0 V	3.000 A			80%	JTA1524S05 [^]
	15 W	15.0 V	12.0 V	1.250 A			82%	JTA1524S12
	15 W	18.0 V	15.0 V	1.000 A			82%	JTA1524S15
	15 W	6.8 V	+5.0 V	1.500 A	-5.0 V	1.500 A	80%	JTA1524D01
	15 W	15.0 V	+12.0 V	0.625 A	-12.0 V	0.625 A	82%	JTA1524D02
18-75 VDC	15 W	18.0 V	+15.0 V	0.500 A	-15.0 V	0.500 A	82%	JTA1524D03
	10 W	3.9 V	3.3 V	3.000 A			76%	JTA1548S3V3
	15 W	6.8 V	5.0 V	3.000 A			80%	JTA1548S05
	15 W	15.0 V	12.0 V	1.250 A			82%	JTA1548S12
	15 W	18.0 V	15.0 V	1.000 A			82%	JTA1548S15
	15 W	6.8 V	+5.0 V	1.500 A	-5.0 V	1.500 A	80%	JTA1548D01
	15 W	15.0 V	+12.0 V	0.625 A	-12.0 V	0.625 A	82%	JTA1548D02
	15 W	18.0 V	+15.0 V	0.500 A	-15.0 V	0.500 A	82%	JTA1548D03

Notes

- For EN55022 Level B performance below -25 °C, a 220 µF (24 VDC input), 47 µF (48 VDC input) electrolytic capacitor is required across the input of the converter.
- Efficiency is measured at nominal input, full load and 25 °C

[^] Available from Newark. See pages 291-296

Mechanical Details



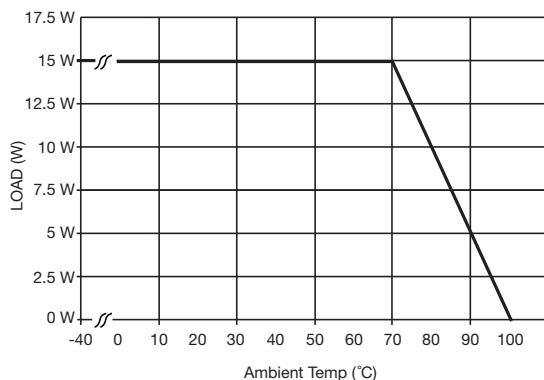
PIN CONNECTIONS		
Pin	Single Output	Dual Output
1	On/Off control	On/Off control
3	-Vin	-Vin
4	+Vin	+Vin
5	Trim	Trim
6	-Vout	-Vout
7	+Vout	Common
8	No pin	+Vout

Notes

- All dimensions are in inches (mm)
- Weight: 0.11 lb (50 g) approx.
- Pin diameter tolerance: ±0.001 (±0.025)
- Pin pitch tolerance: ±0.01 (±0.25)
- Case tolerance: ±0.04 (±1.0)
- Packaging Style: Copper case with non-conducting base

Application Notes

Derating Curve



Output Trim

OUTPUT TRIM		
Output Voltage	R Trim Down (kΩ)	R Trim Up (kΩ)
3.3 V	$(6.180 - (12.10 \times \Delta V_o)) / \Delta V_o$	$(3.484 - (7.511 \times \Delta V_o)) / \Delta V_o$
5.0 V	$(5.788 - (10.57 \times \Delta V_o)) / \Delta V_o$	$(5.788 - (8.250 \times \Delta V_o)) / \Delta V_o$
12.0 V	$(86.496 - (60.10 \times \Delta V_o)) / \Delta V_o$	$(19.763 - (14.366 \times \Delta V_o)) / \Delta V_o$
15.0 V	$(150.000 - (87.00 \times \Delta V_o)) / \Delta V_o$	$(25.585 - (14.516 \times \Delta V_o)) / \Delta V_o$
±5.0 V	$(68.296 - (48.10 \times \Delta V_o)) / \Delta V_o$	$(20.657 - (19.500 \times \Delta V_o)) / \Delta V_o$
±12.0 V	$(430.000 - (120.00 \times \Delta V_o)) / \Delta V_o$	$(42.141 - (13.793 \times \Delta V_o)) / \Delta V_o$
±15.0 V	$(743.000 - (177.00 \times \Delta V_o)) / \Delta V_o$	$(56.644 - (17.647 \times \Delta V_o)) / \Delta V_o$

Note:

- ΔVo is the change in the trimmed output voltage from the nominal output voltage.

Example: JTA1524S05 trimmed to 5.3 V.

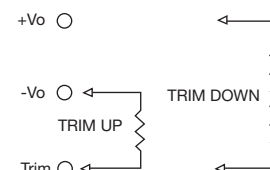
For dual output models, Vo should be multiplied by 2.

$$\Delta V_o = 5.0 - 5.3 = 0.3 \text{ VDC}$$

$$\text{The equation is } (5.788 - (8.25 \times \Delta V_o)) / \Delta V_o$$

$$\text{The value of resistor} = (5.788 - (8.25 \times 0.3)) / 0.3 = 11.04 \text{ K}\Omega$$

Connect the resistor between TRIM pin and -Vo pin.



Models and Ratings

JTA20 XP

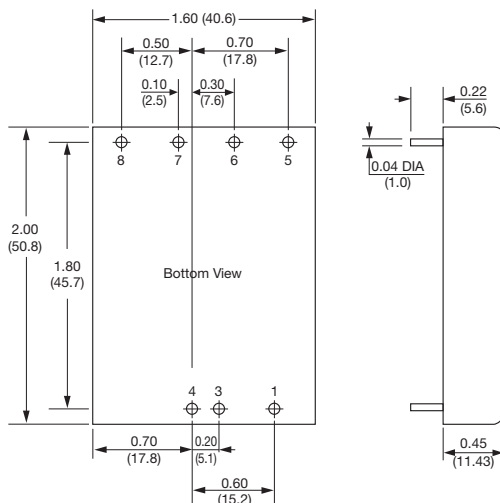
Input Voltage	Maximum Power	Overvoltage Protection	Output V1		Output V2		Efficiency ⁽²⁾	Model Number
			Voltage	Current	Voltage	Current		
9-36 VDC	13.2 W	3.9 V	3.3 V	4.00 A			78%	JTA2024S3V3
	20.0 W	6.8 V	5.0 V	4.00 A			81%	JTA2024S05
	20.0 W	15.0 V	12.0 V	1.67 A			83%	JTA2024S12
	20.0 W	18.0 V	15.0 V	1.33 A			83%	JTA2024S15
	20.0 W	6.8 V	+5.0 V	2.00 A	-5.0 V	2.00 A	83%	JTA2024D01
	20.0 W	15.0 V	+12.0 V	0.83 A	-12.0 V	0.83 A	83%	JTA2024D02 [^]
18-75 VDC	20.0 W	18.0 V	+15.0 V	0.67 A	-15.0 V	0.67 A	83%	JTA2024D03
	13.2 W	3.9 V	3.3 V	4.00 A			78%	JTA2048S3V3
	20.0 W	6.8 V	5.0 V	4.00 A			82%	JTA2048S05
	20.0 W	15.0 V	12.0 V	1.67 A			84%	JTA2048S12 [^]
	20.0 W	18.0 V	15.0 V	1.33 A			84%	JTA2048S15
	20.0 W	6.8 V	+5.0 V	2.00 A	-5.0 V	2.00 A	84%	JTA2048D01
	20.0 W	15.0 V	+12.0 V	0.83 A	-12.0 V	0.83 A	84%	JTA2048D02 [^]
	20.0 W	18.0 V	+15.0 V	0.67 A	-15.0 V	0.67 A	84%	JTA2048D03

Notes

- For EN55022 Level B performance below -25 °C, a 220 µF (24 VDC input), 47 µF (48 VDC input) electrolytic capacitor is required across the input of the converter.
- Efficiency is measured at nominal input, full load and 25 °C

[^] Available from Newark. See pages 291-296

Mechanical Details



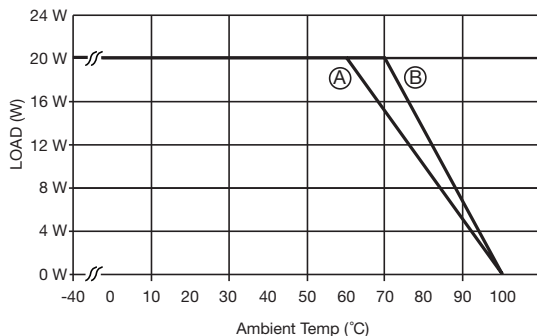
PIN CONNECTIONS		
Pin	Single Output	Dual Output
1	On/Off control	On/Off control
3	-Vin	-Vin
4	+Vin	+Vin
5	Trim	Trim
6	-Vout	-Vout
7	+Vout	Common
8	No pin	+Vout

Notes

- All dimensions are in inches (mm)
- Weight: 0.11 lb (50 g) approx.
- Pin diameter tolerance: ± 0.001 (± 0.025)
- Pin pitch tolerance: ± 0.01 (± 0.25)
- Case tolerance: ± 0.04 (± 1.0)
- Packaging Style: Copper case with non-conducting base

Application Notes

Derating Curve



Output Trim

OUTPUT TRIM		
Output voltage	R Trim Down (kΩ)	R Trim Up (kΩ)
3.3 V	$(6.180 - (12.10 \times \Delta V_o)) / \Delta V_o$	$(3.484 - (7.511 \times \Delta V_o)) / \Delta V_o$
5.0 V	$(5.788 - (10.57 \times \Delta V_o)) / \Delta V_o$	$(5.788 - (8.250 \times \Delta V_o)) / \Delta V_o$
12.0 V	$(86.496 - (60.10 \times \Delta V_o)) / \Delta V_o$	$(19.763 - (14.366 \times \Delta V_o)) / \Delta V_o$
15.0 V	$(150.000 - (87.00 \times \Delta V_o)) / \Delta V_o$	$(25.585 - (14.516 \times \Delta V_o)) / \Delta V_o$
± 5.0 V	$(68.296 - (48.10 \times \Delta V_o)) / \Delta V_o$	$(20.657 - (19.500 \times \Delta V_o)) / \Delta V_o$
± 12.0 V	$(430.000 - (120.00 \times \Delta V_o)) / \Delta V_o$	$(42.141 - (13.793 \times \Delta V_o)) / \Delta V_o$
± 15.0 V	$(743.000 - (177.00 \times \Delta V_o)) / \Delta V_o$	$(56.644 - (17.647 \times \Delta V_o)) / \Delta V_o$

Note:

- ΔV_o is the change in the trimmed output voltage from the nominal output voltage.

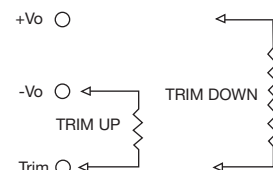
Example: JTA2024S05 trimmed to 5.3 V. For dual output models, V_o should be multiplied by 2.

$$\Delta V_o = 5.0 - 5.3 = 0.3 \text{ VDC}$$

$$\text{The equation is } (5.788 - (8.25 \times \Delta V_o)) / \Delta V_o$$

$$\text{The value of resistor} = (5.788 - (8.25 \times 0.3)) / 0.3 = 11.04 \text{ K}\Omega$$

Connect the resistor between TRIM pin and -Vo pin.



15/20 Watts

JCM Series



- Very High Power Density
- 2:1 Input Range
- Operating Temperature -40°C to $+105^{\circ}\text{C}$
- Single & Dual Outputs
- 1600 VDC Isolation
- High Efficiency – up to 89%
- 3 Year Warranty

Specification

Input

Input Voltage Range	• 12 V (9-18 VDC) • 24 V (18-36 VDC) • 48 V (36-75 VDC)
Input Current	• See table
Input Filter	• Pi network
Input Reflected Ripple Current	• JCM15: 20 mA pk-pk, JCM20: 30 mA pk-pk through 12 μH inductor and 47 μF capacitor, 5 Hz to 20 MHz
Input Surge	• 12 V models: 36 VDC for 100 ms • 24 V models: 50 VDC for 100 ms • 48 V models: 100 VDC for 100 ms

Output

Output Voltage	• See table
Output Trim	• $\pm 10\%$ max on single output
Minimum Load	• No minimum load required
Initial Set Accuracy	• $\pm 1\%$ max
Start Up Delay	• 20 ms typical
Line Regulation	• JCM15: $\pm 0.2\%$ max, JCM20: $\pm 0.5\%$
Load Regulation	• $\pm 0.5\%$ max single, $\pm 1.0\%$ max dual
Cross Regulation	• $\pm 5\%$ on dual output models (see note 2)
Transient Response	• $< 3\%$ max deviation, recovery to within 1% in 250 μs for a 25% load change
Ripple & Noise	• 100 mV pk-pk, 20 MHz bandwidth, (see note 3)
Overvoltage Protection	• 3.3 V models: 3.9 V typical • 5 V models: 6.2 V typical • 12 V models: 15 V typical • 15 V models: 18 V typical • ± 5 V models: ± 6.2 V typical • ± 12 V models: ± 15 V typical • ± 15 V models: ± 18 V typical
Overload Protection	• 150% of full load typical
Short Circuit Protection	• Trip & restart (hiccup) with auto recovery
Maximum Capacitive Load	• See table
Temperature Coefficient	• $\pm 0.02/^{\circ}\text{C}$ max
Remote On/Off	• On > 3.0 VDC or open circuit • Off < 1.2 VDC or short circuit pins 2 & 3

General

Efficiency	• See table
Isolation	• 1600 VDC Input to Output • 1600 VDC Input to Case • 1600 VDC Output to Case
Isolation Capacitance	• JCM15: 1200 pF max, JCM20: 1000 pF max
Switching Frequency	• JCM15: 375 kHz typical, JCM20: 330 kHz typical
Power Density	• JCM15: 38.4 W/in³, JCM20: 51.3 W/in³
MTBF	• > 560 kHrs to MIL-STD-217F at 25°C, GB

Environmental

Operating Temperature	• -40°C to $+105^{\circ}\text{C}$, derate from 100% load at $+65^{\circ}\text{C}$ to no load at $+105^{\circ}\text{C}$
Case Temperature	• $+105^{\circ}\text{C}$ max
Storage Temperature	• -40°C to $+125^{\circ}\text{C}$
Humidity	• Up to 90%, non-condensing
Cooling	• Natural convection

EMC

Emissions	• EN55022 class A conducted & radiated with external components, see application note
ESD Immunity	• EN61000-4-2, 6 kV contact discharge, 8 kV air discharge, Perf Criteria A
Radiated Immunity	• EN61000-4-3, 10 V/m, Perf Criteria A
EFT/Burst	• EN61000-4-4, level 2, Perf Criteria A*
Surge	• EN61000-4-5, level 2, Perf Criteria A
Conducted Immunity	• EN61000-4-6, 10 Vrms, Perf Criteria A
Magnetic Field	• EN61000-4-8, 1 A/m, Perf Criteria A

*External input capacitor required, 220 $\mu\text{F}/100$ V.

Models and Ratings

JCM15/20 **XP**

Input Voltage	Output Voltage	Output Current	Input Current ⁽¹⁾		Maximum Capacitive Load	Efficiency	Model Number
			No Load	Full Load			
9-18 V	3.3 V	4.000 A	20 mA	1310 mA	1000 μ F	85%	JCM1512S3V3 [†] ^
	5.0 V	3.000 A	20 mA	1471 mA	1000 μ F	86%	JCM1512S05 [†] ^
	12.0 V	1.300 A	20 mA	1494 mA	330 μ F	88%	JCM1512S12 [†] ^
	15.0 V	1.000 A	20 mA	1420 mA	220 μ F	89%	JCM1512S15 [†] ^
	± 5.0 V	± 1.500 A	20 mA	1488 mA	± 470 μ F	85%	JCM1512D05 [†] ^
	± 12.0 V	± 0.625 A	20 mA	1420 mA	± 220 μ F	89%	JCM1512D12 [†] ^
18-36 V	± 15.0 V	± 0.500 A	20 mA	1437 mA	± 100 μ F	89%	JCM1512D15 [†] ^
	3.3 V	4.000 A	15 mA	647 mA	1000 μ F	86%	JCM1524S3V3 [†] ^
	5.0 V	3.000 A	15 mA	727 mA	1000 μ F	87%	JCM1524S05 [†] ^
	12.0 V	1.300 A	15 mA	747 mA	330 μ F	88%	JCM1524S12 [†] ^
	15.0 V	1.000 A	15 mA	710 mA	220 μ F	89%	JCM1524S15 [†] ^
	± 5.0 V	± 1.500 A	15 mA	744 mA	± 470 μ F	85%	JCM1524D05 [†] ^
36-75 V	± 12.0 V	± 0.625 A	15 mA	718 mA	± 220 μ F	88%	JCM1524D12 [†] ^
	± 15.0 V	± 0.500 A	15 mA	710 mA	± 100 μ F	89%	JCM1524D15 [†] ^
	3.3 V	4.000 A	10 mA	327 mA	1000 μ F	85%	JCM1548S3V3 [†] ^
	5.0 V	3.000 A	10 mA	368 mA	1000 μ F	86%	JCM1548S05 [†] ^
	12.0 V	1.300 A	10 mA	374 mA	330 μ F	88%	JCM1548S12 [†] ^
	15.0 V	1.000 A	10 mA	359 mA	220 μ F	88%	JCM1548S15 [†] ^
9-18 V	± 5.0 V	± 1.500 A	10 mA	377 mA	± 470 μ F	84%	JCM1548D05 [†] ^
	± 12.0 V	± 0.625 A	10 mA	363 mA	± 220 μ F	87%	JCM1548D12 [†] ^
	± 15.0 V	± 0.500 A	10 mA	359 mA	± 100 μ F	88%	JCM1548D15 [†] ^
	3.3 V	4.500 A	60 mA	1439 mA	7000 μ F	86%	JCM2012S3V3 [†] ^
	5.0 V	4.000 A	60 mA	1852 mA	5000 μ F	90%	JCM2012S05 [†] ^
	12.0 V	1.670 A	30 mA	1873 mA	850 μ F	89%	JCM2012S12 [†] ^
18-36 V	15.0 V	1.330 A	30 mA	1873 mA	700 μ F	89%	JCM2012S15 [†] ^
	± 12.0 V	± 0.833 A	30 mA	1873 mA	± 470 μ F	89%	JCM2012D12 [†] ^
	± 15.0 V	± 0.667 A	30 mA	1873 mA	± 330 μ F	89%	JCM2012D15 [†] ^
	3.3 V	4.500 A	35 mA	720 mA	7000 μ F	86%	JCM2024S3V3 [†] ^
	5.0 V	4.000 A	35 mA	936 mA	5000 μ F	89%	JCM2024S05 [†] ^
	12.0 V	1.670 A	25 mA	936 mA	850 μ F	89%	JCM2024S12 [†] ^
36-75 V	15.0 V	1.330 A	25 mA	936 mA	700 μ F	89%	JCM2024S15 [†] ^
	± 12.0 V	± 0.833 A	30 mA	936 mA	± 470 μ F	89%	JCM2024D12 [†] ^
	± 15.0 V	± 0.667 A	30 mA	936 mA	± 330 μ F	89%	JCM2024D15 [†] ^
	3.3 V	4.500 A	25 mA	360 mA	7000 μ F	86%	JCM2048S3V3 [†] ^
	5.0 V	4.000 A	25 mA	468 mA	5000 μ F	89%	JCM2048S05 [†] ^
	12.0 V	1.670 A	15 mA	468 mA	850 μ F	89%	JCM2048S12 [†] ^
36-75 V	15.0 V	1.330 A	15 mA	468 mA	700 μ F	90%	JCM2048S15 [†] ^
	± 12.0 V	± 0.833 A	20 mA	468 mA	± 470 μ F	89%	JCM2048D12 [†] ^
	± 15.0 V	± 0.667 A	20 mA	468 mA	± 330 μ F	89%	JCM2048D15 [†] ^

Notes

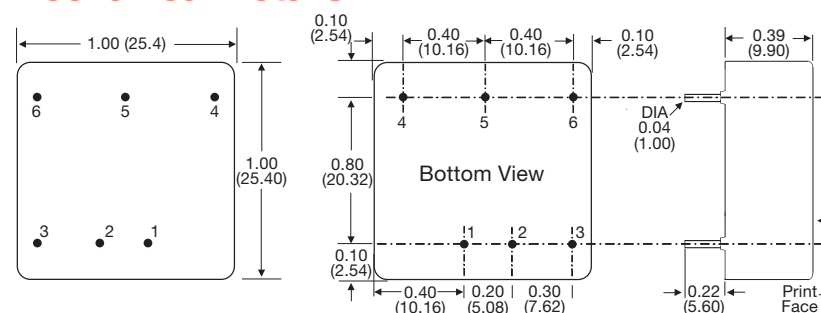
1. Input current specified at nominal input.
2. Cross regulation for duals is $\pm 5\%$ when one output is at 100% and the other is varied between 25% and 100%.

3. Measured with 1 μ F ceramic capacitor in parallel with a 10 μ F electrolytic across output rails.

[†] Available from Farnell & element14. See pages 284-290.

[^] Available from Newark. See pages 291-296

Mechanical Details



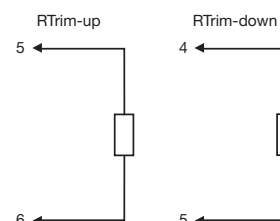
Pin Connections					
Pin	Single	Dual	Pin	Single	Dual
1	+Vin	+Vin	4	+Vout	+Vout
2	-Vin	-Vin	5	Trim	Com
3	Remote On/Off	Remote On/Off	6	-Vout	-Vout

Notes

1. All dimensions are in inches (mm).
2. Weight: 0.04 lbs (20 g) approx.
3. Pin diameter: 0.004 $\pm$ 0.002 (1.0 $\pm$ 0.05)
4. Pin pitch tolerance: $\pm$ 0.014 ($\pm$ 0.35)
5. Case tolerance: $\pm$ 0.02 ($\pm$ 0.5)

Application Notes

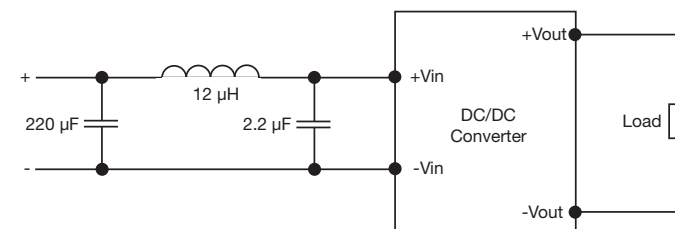
Output Trim



Trim Resistor Values		
Model Number	Trim up 10%	Trim down 10%
JCM-S3V3	8 k Ω	12 k Ω
JCM-S05	10 k Ω	5 k Ω
JCM-S12	20 k Ω	7 k Ω
JCM-S15	20 k Ω	6 k Ω

Approximate values.

Input Filter



Output can be externally trimmed by using the method above.
(Single output models only). For variable trimming, use 100 k Ω potentiometer

JTK Series



- Very High Power Density
- Wide 4:1 Input Range
- Operating Temperature -40°C to $+100^{\circ}\text{C}$
- Single & Dual Outputs
- 1600 VDC Isolation
- High Efficiency – up to 89%
- 3 Year Warranty

Specification

Input

Input Voltage Range	• 24 V (9-36 VDC) • 48 V (18-75 VDC)
Input Current	• See table
Input Filter	• Pi network
Input Reflected Ripple Current	• JTK15: 20 mA pk-pk • JTK20: 30 mA pk-pk through 12 μH inductor and 47 μF capacitor, 5 Hz to 20 MHz
Input Surge	• 24 V models: 50 VDC for 100 ms • 48 V models: 100 VDC for 100 ms

Output

Output Voltage	• See table
Output Trim	• $\pm 10\%$ max on single output
Minimum Load	• No minimum load required
Initial Set Accuracy	• $\pm 1\%$ max
Start Up Delay	• 20 ms typical
Line Regulation	• JTK15: $\pm 0.2\%$ max, JTK20: $\pm 0.5\%$ max
Load Regulation	• $\pm 0.5\%$ max single, $\pm 1.0\%$ max dual
Cross Regulation	• $\pm 5\%$ on dual output models, (see note 2)
Transient Response	• $< 3\%$ max deviation, recovery to within 1% in 250 μs for a 25% load change
Ripple & Noise	• 100 mV pk-pk, 20 MHz bandwidth, (see note 3)
Overload Protection	• JTK15: 170% of full load typical, JTK20: 150% of full load typical
Overvoltage Protection	• 3.3 V models: 3.9 V typical • 5 V models: 6.2 V typical • 12 V models: 15 V typical • 15 V models: 18 V typical • ± 5 V models: ± 6.2 V typical • ± 12 V models: ± 15 V typical • ± 15 V models: ± 18 V typical
Short Circuit Protection	• Trip & restart (hiccup) with auto recovery
Maximum Capacitive Load	• See table
Temperature Coefficient	• $\pm 0.02/^{\circ}\text{C}$ max
Remote On/Off	• On > 3.0 VDC or open circuit • Off < 1.2 VDC or short circuit pins 2 & 3

General

Efficiency	• See table
Isolation	• 1600 VDC Input to Output • 1600 VDC Input to Case • 1600 VDC Output to Case
Isolation Capacitance	• JTK15: 1200 pF max • JTK20: 1000 pF max
Switching Frequency	• JTK15: 375 kHz typical • JTK20: 330 kHz typical
Power Density	• JTK15: 38.4 W/in³, JTK20: 51.3 W/in³
MTBF	• > 560 Khrs to MIL-STD-217F at 25°C, GB

Environmental

Operating Temperature	• -40°C to $+100^{\circ}\text{C}$, JTK15: derate from 100% load at $+65^{\circ}\text{C}$ to no load at $+100^{\circ}\text{C}$, JTK20: derate from 100% load at $+55^{\circ}\text{C}$ to no load at $+100^{\circ}\text{C}$
Case Temperature	• $+105^{\circ}\text{C}$ max
Storage Temperature	• -40°C to $+125^{\circ}\text{C}$
Humidity	• Up to 90%, non-condensing
Cooling	• Natural convection

EMC

Emissions	• EN55022, Level A conducted & radiated with external components - see applications note
ESD Immunity	• EN61000-4-2, Level 2 Perf Criteria A
Radiated Immunity	• EN61000-4-3, 3 V/m Perf Criteria A
EFT/Burst	• EN61000-4-4, Level 3 Perf Criteria A*
Conducted Immunity	• EN61000-4-6, 3 V rms Perf Criteria A
Magnetic Fields	• EN61000-4-8, 1 A/m Perf Criteria A

*External input capacitor required 220 μF / 100 V.

Models and Ratings

JTK15/20 **XP**

Input Voltage	Output Voltage	Output Current	Input Current ⁽¹⁾		Maximum Capacitive Load	Efficiency	Model Number
			No Load	Full Load			
9-36 V	3.3 V	4.000 A	15 mA	647 mA	1000 μ F	86%	JTK1524S3V3†^
	5.0 V	3.000 A	15 mA	727 mA	1000 μ F	87%	JTK1524S05†^
	12.0 V	1.300 A	15 mA	747 mA	330 μ F	88%	JTK1524S12†^
	15.0 V	1.000 A	15 mA	710 mA	220 μ F	89%	JTK1524S15†^
	± 5.0 V	± 1.500 A	15 mA	744 mA	± 470 μ F	85%	JTK1524D05†^
	± 12.0 V	± 0.625 A	15 mA	720 mA	± 220 μ F	88%	JTK1524D12†^
18-75 V	± 15.0 V	± 0.500 A	15 mA	710 mA	± 100 μ F	89%	JTK1524D15†^
	3.3 V	4.000 A	10 mA	331 mA	1000 μ F	84%	JTK1548S3V3†^
	5.0 V	3.000 A	10 mA	368 mA	1000 μ F	86%	JTK1548S05†^
	12.0 V	1.300 A	10 mA	378 mA	330 μ F	87%	JTK1548S12†^
	15.0 V	1.000 A	10 mA	360 mA	220 μ F	88%	JTK1548S15†^
	± 5.0 V	± 1.500 A	10 mA	377 mA	± 470 μ F	84%	JTK1548D05†^
9-36 V	± 12.0 V	± 0.625 A	10 mA	363 mA	± 220 μ F	87%	JTK1548D12†^
	± 15.0 V	± 0.500 A	10 mA	360 mA	± 100 μ F	88%	JTK1548D15†^
	3.3 V	4.500 A	50 mA	720 mA	10000 μ F	86%	JTK2024S3V3†^
	5.0 V	4.000 A	50 mA	936 mA	5000 μ F	89%	JTK2024S05†^
	12.0 V	1.670 A	22 mA	936 mA	850 μ F	89%	JTK2024S12†^
	15.0 V	1.330 A	22 mA	936 mA	700 μ F	89%	JTK2024S15†^
18-75 V	± 12.0 V	± 0.833 A	25 mA	936 mA	± 470 μ F	89%	JTK2024D12†^
	± 15.0 V	± 0.667 A	25 mA	936 mA	± 330 μ F	89%	JTK2024D15†^
	3.3 V	4.500 A	30 mA	309 mA	10000 μ F	86%	JTK2048S3V3†^
	5.0 V	4.000 A	30 mA	468 mA	5000 μ F	89%	JTK2048S05†^
	12.0 V	1.670 A	15 mA	468 mA	850 μ F	89%	JTK2048S12†^
	15.0 V	1.330 A	15 mA	468 mA	700 μ F	90%	JTK2048S15†^
18-75 V	± 12.0 V	± 0.833 A	15 mA	468 mA	± 470 μ F	89%	JTK2048D12†^
	± 15.0 V	± 0.667 A	15 mA	468 mA	± 330 μ F	89%	JTK2048D15†^

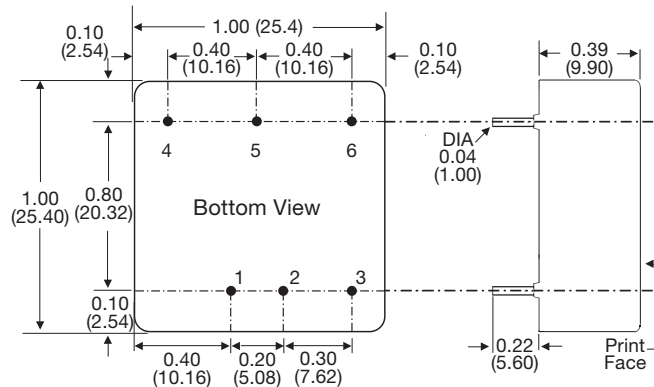
Notes

1. Input current measured at nominal 24 V and 48 V input.
2. When one output is set to 100% load, and the other varies between 25% and 100% load.
3. Measured with 1 μ F ceramic capacitor and 10 μ F tantalum capacitor across output rails.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296

Mechanical Details



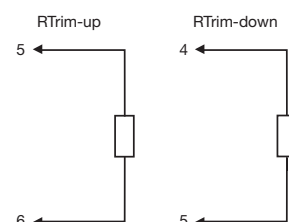
Pin	Pin Connections	
	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
3	Remote On/Off	Remote On/Off
4	+Vout	+Vout
5	Trim	Com
6	-Vout	-Vout

Notes

1. All dimensions are in inches (mm)
2. Weight: 0.04 lbs (20 g) approx.
3. Pin diameter: 0.04 $\pm$ 0.002 (1.0 $\pm$ 0.05)
4. Pin pitch tolerance: $\pm$ 0.014 ($\pm$ 0.35)
5. Case tolerance: $\pm$ 0.02 ($\pm$ 0.5)

Application Notes

Output Trim

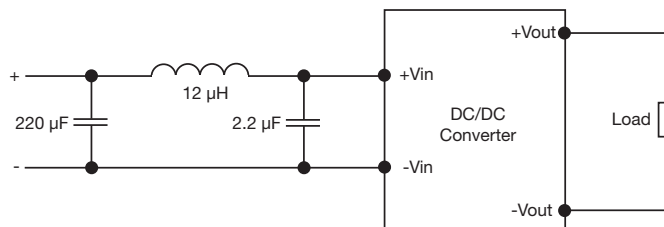


Trim Resistor Values		
Model Number	Trim up 10%	Trim down 10%
JTK - S3V3	8 k	12 k
JTK - S05	10 k	5 k
JTK - S12	20 k	7 k
JTK - S15	20 k	6 k

Approximate values.

Output can be externally trimmed by using this method.
(Single output models only). For variable trimming, use 100 k Ω potentiometer.
Contact sales for details.

Input Filter



20 Watts

JCK Series



- 2:1 Input Range
- -40 °C to +100 °C Operating Temperature
- Single & Dual Outputs
- Remote On/Off
- High Efficiency – up to 93%
- 1600 VDC Isolation
- 3 Year Warranty

Specification

Input

Input Voltage Range	• 12 V (9-18 VDC) • 24 V (18-36 VDC) • 48 V (36-75 VDC)
Input Current	• See table
Undervoltage Lockout	• 12 V models: ON 8.6 V, OFF 7.9 V typical • 24 V models: ON 17.8 V, OFF 16 V typical • 48 V models: ON 33.5 V, OFF 30.5 V typical
Input Surge	• 12 V models 36 VDC for 100 ms • 24 V models 50 VDC for 100 ms • 48 V models 100 VDC for 100 ms

Output

Output Voltage	• See table
Output Voltage Trim	• $\pm 10\%$ max on single outputs
Minimum Load	• No minimum load required
Line Regulation	• $\pm 0.5\%$ max
Load Regulation	• Single output models: $\pm 0.5\%$ max • Dual output models: $\pm 1\%$ max balanced outputs
Cross Regulation	• $\pm 5\%$ for dual outputs (see note 2)
Setpoint Accuracy	• $\pm 1\%$ max
Start Up Delay	• <20 ms
Start Up Rise Time	• <5 ms
Ripple & Noise	• 75 mV pk-pk (see note 3)
Transient Response	• $\pm 3\%$ max deviation, recovery to within 1% in 250 μs for a 25% load change
Temperature Coefficient	• 0.02%/°C
Overvoltage Protection	• 3.3 V models: 3.9 V typical • 5 V models: 6.2 V typical • 12 V models: 15 V typical • 15 V models: 18 V typical • ± 12 V models: ± 15 V typical • ± 15 V models: ± 18 V typical
Overload Protection	• >140% of full load at nominal input
Short Circuit Protection	• Trip & restart (hiccup mode), auto recovery
Remote On/Off	• On = Logic High (>3.0 V) or Open • Off = Logic Low (<1.2 V) or short pin 2 to pin 6
Capacitive Load	• See table

General

Efficiency	• See table
Isolation	• 1600 VDC Input to Output • 1600 VDC Input to Case • 1600 VDC Output to Case
Isolation Capacitance	• 1200 pF typical
Isolation Resistance	• $10^9 \Omega$ min
Switching Frequency	• 330 kHz typical
Power Density	• 25 W/in³
MTBF	• >680 kHrs minimum to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Temperature	• -40 °C to +100 °C, derate from 100% load at +70 °C to 0% load at +100 °C
Case Temperature	• +100 °C max
Cooling	• Convection-cooled
Operating Humidity	• Up to 95% RH, non-condensing
Storage Temperature	• -40 °C to +125 °C

EMC

Emissions	• EN55022, Class A conducted & radiated with external components, see application note
ESD Immunity	• EN61000-4-2, 8 kV air, 6 kV contact, Perf Criteria A
Radiated Immunity	• EN61000-4-3 10 V/m, Perf Criteria A
EFT/Burst	• EN61000-4-4 level 3, Perf Criteria B*
Surge	• EN61000-4-5 level 2, Perf Criteria B*
Conducted Immunity	• EN61000-4-6 10 V/rms, Perf Criteria A
Magnetic Field	• EN61000-4-8 1 A/m, Perf Criteria A

*External input capacitor required 220 μ F/100 V.

Models and Ratings

JCK20 **XP**

Input Voltage	Output Voltage	Output Current	Input Current ⁽¹⁾		Maximum Capacitive Load	Efficiency	Model Number
			No Load	Full Load			
9-18 VDC	3.3 VDC	5.500 A	60 mA	1.74 A	10,000 μ F	90%	JCK2012S3V3 [†] [^]
	5.0 VDC	4.000 A	60 mA	1.87 A	6,800 μ F	92%	JCK2012S05 [†] [^]
	12.0 VDC	1.670 A	30 mA	1.92 A	1,000 μ F	90%	JCK2012S12 [†] [^]
	15.0 VDC	1.330 A	30 mA	1.92 A	680 μ F	90%	JCK2012S15 [†] [^]
	± 12.0 VDC	± 0.835 A	30 mA	1.94 A	± 470 μ F	89%	JCK2012D12 [†] [^]
18-36 VDC	3.3 VDC	5.500 A	35 mA	0.86 A	10,000 μ F	91%	JCK2024S3V3 [†] [^]
	5.0 VDC	4.000 A	35 mA	0.93 A	6,800 μ F	93%	JCK2024S05 [†] [^]
	12.0 VDC	1.670 A	25 mA	0.95 A	1,000 μ F	91%	JCK2024S12 [†] [^]
	15.0 VDC	1.330 A	25 mA	0.95 A	680 μ F	91%	JCK2024S15 [†] [^]
	± 12.0 VDC	± 0.835 A	30 mA	0.96 A	± 470 μ F	90%	JCK2024D12 [†] [^]
36-75 VDC	3.3 VDC	5.500 A	25 mA	0.43 A	10,000 μ F	91%	JCK2048S3V3 [†] [^]
	5.0 VDC	4.000 A	25 mA	0.46 A	6,800 μ F	93%	JCK2048S05 [†] [^]
	12.0 VDC	1.670 A	15 mA	0.47 A	1,000 μ F	91%	JCK2048S12 [†] [^]
	15.0 VDC	1.330 A	15 mA	0.47 A	680 μ F	91%	JCK2048S15 [†] [^]
	± 12.0 VDC	± 0.835 A	20 mA	0.48 A	± 470 μ F	90%	JCK2048D12 [†] [^]
	± 15.0 VDC	± 0.665 A	20 mA	0.48 A	± 330 μ F	89%	JCK2048D15 [†] [^]

Notes

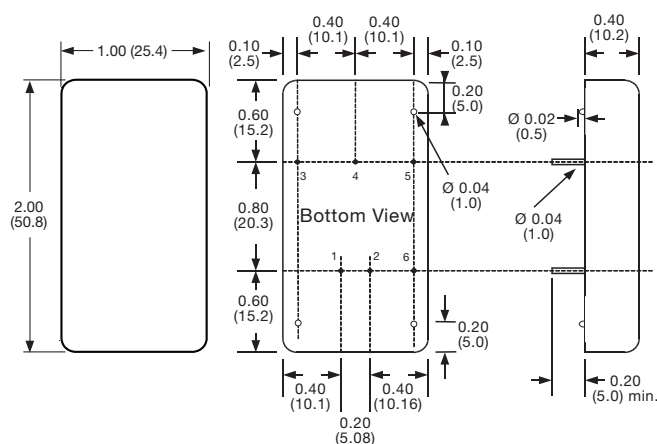
1. Input current specified at nominal 12, 24 V or 48 V input.
2. Cross regulation is $\pm 5\%$ when one output is at 100% and the other is varied between 25% and 100%.

3. Measured with 20 MHz bandwidth and 1 μ F ceramic capacitor across output rails.

[†] Available from Farnell & element14. See pages 284-290.

[^] Available from Newark. See pages 291-296

Mechanical Details



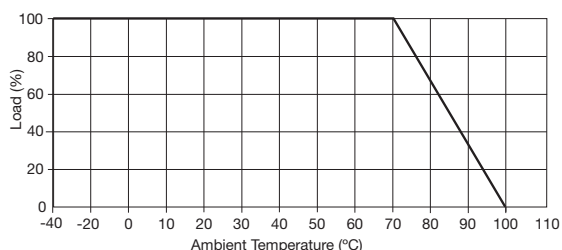
PIN CONNECTIONS		
Pin	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
3	+Vout	+Vout
4	Trim	Com
5	-Vout	-Vout
6	Remote On/Off	Remote On/Off

Notes

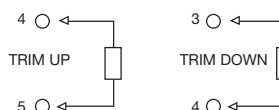
1. All dimensions are in inches (mm).
2. Weight: 0.07 lbs (30 g)
3. Pin diameter: 0.04 ± 0.002 (1.0 ± 0.05)
4. Pin pitch tolerance: ± 0.014 (± 0.35)
5. Case tolerance: ± 0.02 (± 0.5)

Application Notes

Derating Curve

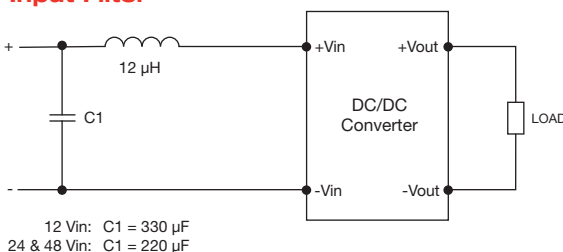


External Output Trim



- For 3.3 V output:
Trim +10%, R = 10 k typical
Trim - 10%, R = 15 k typical
- For 5 V output:
Trim +10%, R = 10 k typical
Trim - 10%, R = 5 k typical
- For 12 V output:
Trim +10%, R = 22 k typical
Trim - 10%, R = 5 k typical
- For 15 V output:
Trim +10%, R = 20 k typical
Trim - 10%, R = 5 k typical

Input Filter



Remote On/Off Control

- Output On >3.0 VDC or open circuit
Output Off <1.2 VDC or short circuit pins 2 & 6

20 Watts

JTM Series



- Wide 4:1 Input Range
- Single & Dual Outputs
- -40 °C to +105 °C Operating Temperature
- Overvoltage & Overcurrent Protection
- Remote On/Off
- 1600 VDC Isolation
- 3 Year Warranty

Specification

Input

Input Voltage Range	• 24 V (9-36 VDC) • 48 V (18-75 VDC)
Input Current	• See table
Undervoltage Lockout	• 24 V models: ON 8.6 V, OFF 7.9 V typical • 48 V models: ON 17.8 V, OFF 16 V typical
Input Surge	• 24 V models 50 VDC for 100 ms • 48 V models 100 VDC for 100 ms

Output

Output Voltage	• See table
Output Voltage Trim	• $\pm 10\%$, single outputs
Minimum Load	• No minimum load required
Line Regulation	• $\pm 0.5\%$ max
Load Regulation	• Single output models: $\pm 0.5\%$ max • Dual output models: $\pm 1\%$ max balanced outputs
Cross Regulation	• $\pm 5\%$ for dual outputs (see note 2)
Setpoint Accuracy	• $\pm 1\%$
Start Up Time	• 20 ms typical
Ripple & Noise	• 75 mV pk-pk at 20 MHz bandwidth, (see note 3)
Transient Response	• 3% max deviation, recovery to within 1% in $<250 \mu\text{s}$ for a 25% load change
Temperature Coefficient	• 0.02%/°C
Overvoltage Protection	• 3.3 V models: 3.9 V typical • 5 V models: 6.2 V typical • 12 V models: 15 V typical • 15 V models: 18 V typical • ± 5 V models: ± 6.2 V typical • ± 12 V models: ± 15 V typical • ± 15 V models: ± 18 V typical
Overload Protection	• $>120\%$ of full load typical
Short Circuit Protection	• Trip & restart (hiccup mode), auto recovery
Remote On/Off	• On = Logic High (3.0-12.0 V) or Open • Off = Logic Low (<1.2 V) or short pin 2 to 6 (see note 4)

General

Efficiency	• See table
Isolation	• 1600 VDC Input to Output • 1600 VDC Input to Case • 1600 VDC Output to Case
Switching Frequency	• 330 kHz typical
Power Density	• 25 W/in³
MTBF	• 560 kHrs min to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Temperature	• -40 °C to +105 °C, see derating curve
Case Temperature	• +105 °C max
Cooling	• Convection-cooled
Operating Humidity	• 5-95% RH, non-condensing
Storage Temperature	• -40 °C to +125 °C

EMC & Safety

Emissions	• EN55022, class A conducted & radiated with external components - see application notes
ESD Immunity	• EN61000-4-2, level 3 Perf Criteria A
Radiated Immunity	• EN61000-4-3 10 V/m, Perf Criteria A
EFT/Burst	• EN61000-4-4 level 3, Perf Criteria B*
Surge	• EN61000-4-5 level 2, Perf Criteria B*
Conducted Immunity	• EN61000-4-6 10 V/rms, Perf Criteria A
Magnetic Field	• EN61000-4-8 1 A/m, Perf Criteria A
Safety Approvals	• EN60950-1, IEC60950-1

*External input capacitor required 220 μF /100 V

Models and Ratings

JTM20 XP

Input Voltage	Output Voltage	Output Current	Input Current ⁽¹⁾		Maximum Capacitive Load	Efficiency	Model Number
			No Load	Full Load			
9-36 VDC	3.3 VDC	5.500 A	50 mA	879 mA	10,000 μ F	89%	JTM2024S3V3 [†] ^
	5.0 VDC	4.000 A	50 mA	957 mA	6,800 μ F	91%	JTM2024S05 [†] ^
	12.0 VDC	1.670 A	22 mA	980 mA	1,000 μ F	89%	JTM2024S12 [†] ^
	15.0 VDC	1.330 A	22 mA	968 mA	680 μ F	89%	JTM2024S15 [†] ^
	± 5.0 VDC	± 2.000 A	65 mA	969 mA	$\pm 2,200$ μ F	89%	JTM2024D05 [†] ^
	± 12.0 VDC	± 0.835 A	25 mA	980 mA	± 470 μ F	88%	JTM2024D12 [†] ^
	± 15.0 VDC	± 0.665 A	25 mA	980 mA	± 330 μ F	89%	JTM2024D15 [†] ^
18-75 VDC	3.3 VDC	5.500 A	30 mA	440 mA	10,000 μ F	89%	JTM2048S3V3 [†] ^
	5.0 VDC	4.000 A	30 mA	473 mA	6,800 μ F	91%	JTM2048S05 [†] ^
	12.0 VDC	1.670 A	15 mA	484 mA	1,000 μ F	89%	JTM2048S12 [†] ^
	15.0 VDC	1.330 A	15 mA	484 mA	680 μ F	89%	JTM2048S15 [†] ^
	± 5.0 VDC	± 2.000 A	40 mA	484 mA	$\pm 2,200$ μ F	89%	JTM2048D05 [†] ^
	± 12.0 VDC	± 0.835 A	15 mA	490 mA	± 470 μ F	88%	JTM2048D12 [†] ^
	± 15.0 VDC	± 0.665 A	15 mA	490 mA	± 330 μ F	89%	JTM2048D15 [†] ^

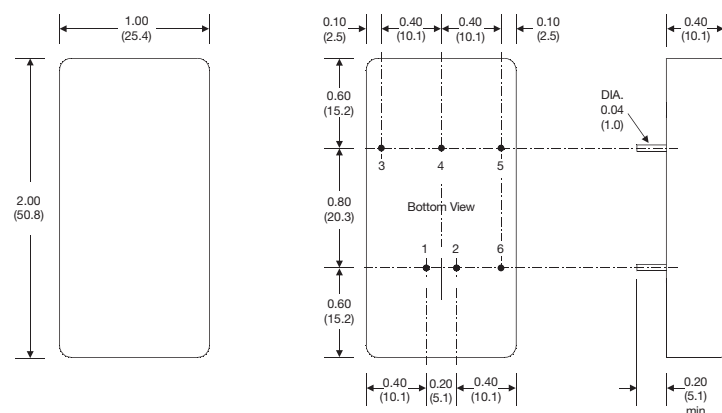
Notes

1. Input current specified at nominal 24 V or 48 V input.
2. Cross regulation is $\pm 5\%$ when one output is at 100% and the other is varied between 25% and 100%.
3. Measured with 1 μ F ceramic capacitor across output rails.
4. Non-standard versions can have Remote On/Off function and pin removed. Contact sales for details.

[†] Available from Farnell & element14. See pages 284-290.

[^] Available from Newark. See pages 291-296.

Mechanical Details



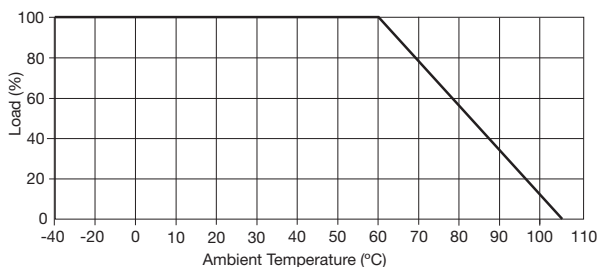
Pin	Pin Connections	
	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
3	+Vout	+Vout
4	Trim	Com
5	-Vout	-Vout
6	Remote On/Off	Remote On/Off

Notes

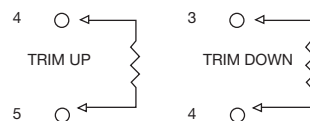
1. All dimensions are in inches (mm).
2. Weight: 0.07 lbs (30 g)
3. Pin diameter: 0.04 $\pm$ 0.002 (1.0 $\pm$ 0.05)
4. Pin pitch tolerance: ± 0.014 (± 0.35)
5. Case tolerance: ± 0.02 (± 0.5)

Application Notes

Derating Curve



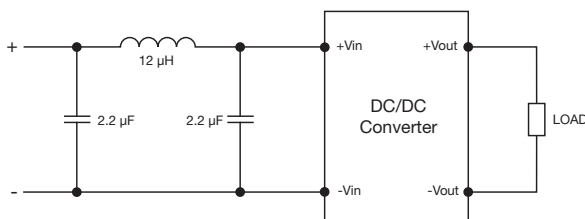
External Output Trim



Output can be externally trimmed using this method.

Contact sales for details.

Input Filter



Remote On/Off Control

Standard ROF logic is positive.

Output On 3.0-12.0 VDC or open circuit

Output Off <1.2 VDC or short circuit pins 2 & 6

30 Watts

JCK Series



- 2:1 Input Range
- Operating Temperature -40°C to $+105^{\circ}\text{C}$
- Single and Dual Outputs
- High Efficiency – Up to 92%
- Remote On/Off
- 1600 VDC Isolation
- 3 Year Warranty

Specification

Input

Input Voltage Range	• 12 V (9-18 VDC), 24 V (18-36 VDC), 48 V (36-75 VDC)
Input Current	• See table
Undervoltage Lockout	• 12 V models: ON 8.6 V, OFF 7.9 V typical • 24 V models: ON 17.8 V, OFF 16 V typical • 48 V models: ON 33.5 V, OFF 30.5 V typical
Input Reflected Ripple Current	• 20 mA pk-pk through 12 μH inductor
Input Surge	• 12 V models 25 VDC for 100 ms • 24 V models 50 VDC for 100 ms • 48 V models 100 VDC for 100 ms
Input Filter	• Pi network

Output

Output Voltage	• See table
Output Voltage Trim	• $\pm 10\%$ on single outputs models only
Start Up Delay	• 30 ms max
Minimum Load	• No minimum load required
Line Regulation	• $\pm 0.5\%$ max
Load Regulation	• Single output models: $\pm 0.5\%$ max • Dual output models: $\pm 1\%$ max balanced outputs
Cross Regulation	• $\pm 5\%$ (see note 2)
Setpoint Accuracy	• $\pm 1\%$
Ripple & Noise	• 100 mV pk-pk, 20 MHz bandwidth (see note 3)
Transient Response	• 3% max deviation, recovery to within 1% in $<250 \mu\text{s}$ for a 25% load change
Temperature Coefficient	• $0.02\%/^{\circ}\text{C}$
Overvoltage Protection	• 3.3 V models: 3.9 V typical • 5 V models: 6.2 V typical • 12 V models: 15 V typical • 15 V models: 18 V typical • ± 5 V models: ± 6.2 V typical • ± 12 V models: ± 15 V typical • ± 15 V models: ± 18 V typical
Overload Protection	• $>150\%$ of full load
Short Circuit Protection	• Trip & restart (Hiccup mode), auto recovery
Remote On/Off	• See application notes
Maximum Capacitive Load	• See table

General

Efficiency	• See table
Isolation	• 1600 VDC Input to Output • 1600 VDC Input to Case • 1600 VDC Output to Case
Isolation Capacitance	• 1500 pF typical
Switching Frequency	• 330 kHz typical
Power Density	• 37.5 W/in^3
MTBF	• 430 kHrs min to MIL-HDBK-217F at 25°C, GB

Environmental

Operating Temperature	• -40°C to 105°C, derate from 100% load at 50°C to no load at 105°C
Case Temperature	• $+105^{\circ}\text{C}$ max
Cooling	• Convection-cooled
Operating Humidity	• 5-95% RH, non-condensing
Storage Temperature	• -40°C to $+125^{\circ}\text{C}$

EMC

Emissions	• EN55022 level A conducted & radiated with external components, see application notes
ESD Immunity	• EN61000-4-2, level 3, Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3, Perf Criteria A⁽⁴⁾
Surge	• EN61000-4-5, installation class 3, Perf Criteria A⁽⁴⁾
Conducted Immunity	• EN61000-4-6, 10 Vrms, Perf Criteria A
Magnetic Field	• EN61000-4-8, 1 A/m, Perf Criteria A

Models and Ratings

JCK30 XP

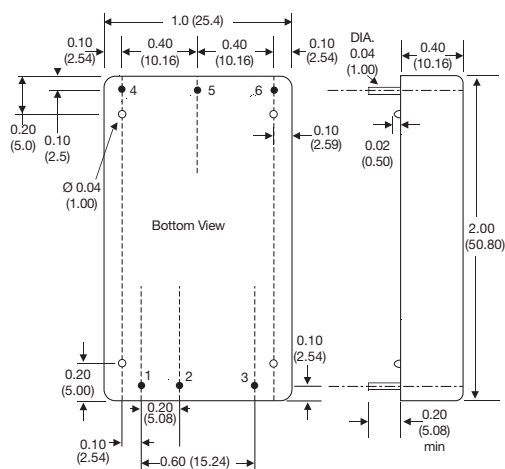
Input Voltage	Output Voltage	Output Current	Input Current ⁽¹⁾		Maximum Capacitive Load	Efficiency	Model Number
			No Load	Full Load			
9-18 VDC	3.3 V	8.00 A	80 mA	2426 mA	20000 μ F	89%	JCK3012S3V3 [†] ^
	5.0 V	6.00 A	180 mA	2874 mA	14000 μ F	91%	JCK3012S05 [†] ^
	5.1 V	6.00 A	160 mA	2874 mA	14000 μ F	92%	JCK3012S5V1
	12.0 V	2.50 A	30 mA	2809 mA	2000 μ F	91%	JCK3012S12 [†] ^
	15.0 V	2.00 A	30 mA	2809 mA	2000 μ F	92%	JCK3012S15 [†] ^
	± 5.0 V	± 3.00 A	180 mA	2874 mA	± 3000 μ F	89%	JCK3012D05 [†] ^
	± 12.0 V	± 1.25 A	50 mA	2874 mA	± 1250 μ F	90%	JCK3012D12 [†] ^
	± 15.0 V	± 1.00 A	50 mA	2874 mA	± 1000 μ F	91%	JCK3012D15 [†] ^
18-36 VDC	3.3 V	8.00 A	70 mA	1185 mA	20000 μ F	91%	JCK3024S3V3 [†] ^
	5.0 V	6.00 A	100 mA	1420 mA	14000 μ F	92%	JCK3024S05 [†] ^
	5.1 V	6.00 A	100 mA	1448 mA	14000 μ F	92%	JCK3024S5V1
	12.0 V	2.50 A	20 mA	1436 mA	2000 μ F	92%	JCK3024S12 [†] ^
	15.0 V	2.00 A	40 mA	1420 mA	2000 μ F	92%	JCK3024S15 [†] ^
	± 5.0 V	± 3.00 A	100 mA	1437 mA	± 3000 μ F	90%	JCK3024D05 [†] ^
	± 12.0 V	± 1.25 A	40 mA	1453 mA	± 1250 μ F	91%	JCK3024D12 [†] ^
	± 15.0 V	± 1.00 A	50 mA	1437 mA	± 1000 μ F	91%	JCK3024D15 [†] ^
36-75 VDC	3.3 V	8.00 A	50 mA	593 mA	20000 μ F	90%	JCK3048S3V3 [†] ^
	5.0 V	6.00 A	70 mA	702 mA	14000 μ F	91%	JCK3048S05 [†] ^
	5.1 V	6.00 A	70 mA	724 mA	14000 μ F	91%	JCK3048S5V1
	12.0 V	2.50 A	30 mA	718 mA	2000 μ F	91%	JCK3048S12 [†] ^
	15.0 V	2.00 A	30 mA	710 mA	2000 μ F	91%	JCK3048S15 [†] ^
	± 5.0 V	± 3.00 A	70 mA	710 mA	± 3000 μ F	90%	JCK3048D05 [†] ^
	± 12.0 V	± 1.25 A	50 mA	718 mA	± 1250 μ F	90%	JCK3048D12 [†] ^
	± 15.0 V	± 1.00 A	40 mA	718 mA	± 1000 μ F	90%	JCK3048D15 [†] ^

Notes

1. Input current specified at nominal input.

2. Cross regulation for duals is $\pm 5\%$ when one output is at 100% and the other is varied between 25% and 100%.[†] Available from Farnell & element14. See pages 284-290.3. Measured with 1 μ F ceramic capacitor across output rails.4. A 220 μ F/250 V capacitor across the input is required in order to meet EN61000-4-4 and EN61000-4-5.[^] Available from Newark. See pages 291-296

Mechanical Details



PIN CONNECTIONS		
Pin	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
3	Remote On/Off	Remote On/Off
4	+Vout	+Vout
5	-Vout	Com
6	Trim	-Vout

Notes

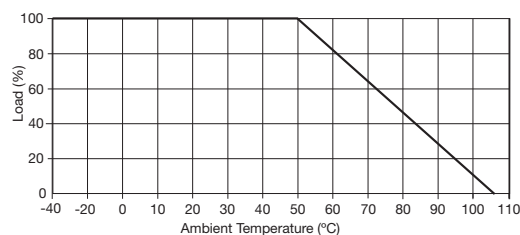
1. All dimensions are in inches (mm).

2. Weight: 0.07 lbs (31 g) approx

3. Pin diameter: 0.04 ± 0.002 (1.0 ± 0.05)4. Pin pitch tolerance: ± 0.014 (± 0.35)5. Case tolerance: ± 0.02 (± 0.5)

Application Notes

Derating Curve

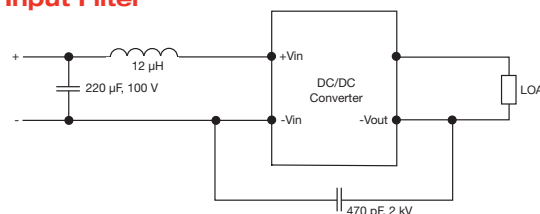


Remote On/Off Control

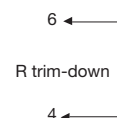
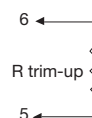
Output On >3.0 VDC or open circuit

Output Off <1.2 VDC or short circuit pins 2 & 3

Input Filter



External Output Trim



Output can be externally trimmed using this method.

Contact sales for details.

30 Watts

JTL Series



- 4:1 Input Range
- High Power Density
- Single, Dual and Triple Outputs
- High Efficiency - Up to 91%
- Remote On/Off
- 1600 VDC Isolation
- 3 Year Warranty

Specification

Input

Input Voltage Range	• 24 V (9-36 VDC), 48 V (18-75 VDC)
Input Current	• See table
Input Reflected Ripple	• 20 mA pk-pk through 12 μ H inductor
Input Filter	• Pi network
Undervoltage Lockout	• 24 V models: ON 8.6 V, OFF 7.9 V typical 48 V models: ON 17.8 V, OFF 16 V typical
Input Surge	• 24 V models 50 VDC for 100 ms 48 V models 100 VDC for 100 ms

Output

Output Voltage	• See table
Output Voltage Trim	• $\pm 10\%$ on single outputs models only
Minimum Load	• No minimum load required for single and dual output models, 10% required on all outputs for triple output models
Line Regulation	• $\pm 0.2\%$ max for single and dual output models, $\pm 1.0\%$ main, $\pm 5\%$ auxiliary for triple output models
Load Regulation	• Single output models: $\pm 0.5\%$ max Dual output models: $\pm 1\%$ max balanced outputs Triple output models: $\pm 1\%$ max main, $\pm 5\%$ auxiliaries
Cross Regulation	• $\pm 5\%$ for dual and triples output (see note 2)
Setpoint Accuracy	• $\pm 1\%$ ($\pm 5\%$ for triple auxiliaries)
Start Up Time	• 30 ms typical
Ripple & Noise	• 100 mV or 1% pk-pk, whichever is greater single & dual output models, 50/75 mV pk-pk main/auxiliary outputs of triple output models, 20 MHz bandwidth (see note 3)
Transient Response	• 3% max deviation, recovery to within 1% in $<250 \mu$ s for a 25% load change
Temp. Coefficient	• $0.02\%/^{\circ}\text{C}$
Overvoltage Protection	• 3.3 V models: 3.9 V typical 5 V models: 6.2 V typical 12 V models: 15 V typical 15 V models: 18 V typical ± 5 V models: ± 6.2 V typical ± 12 V models: ± 15 V typical ± 15 V models: ± 18 V typical
Overload Protection	• $>150\%$ of full load
Short Circuit Protection	• Trip & restart (hiccup mode), auto recovery
Overtemperature Protection	• 115°C typical
Remote On/Off	• On = Logic High (>3.0) or Open Off = Logic Low (<1.2 V) or short pin 2 to 3
Maximum Capacitive Load	• See table

General

Efficiency	• See table
Isolation Voltage	• 1600 VDC Input to Output 1600 VDC Input to Case 1600 VDC Output to Case
Switching Frequency	• 330 kHz typical
Power Density	• 37.5 W/in^3
MTBF	• 320 kHrs min to MIL-HDBK-217F at 25°C , GB

Environmental

Operating Temperature	• -40°C to $+75^{\circ}\text{C}$, see derating curve
Case Temperature	• $+105^{\circ}\text{C}$ max
Cooling	• Convection-cooled
Operating Humidity	• 5-95% RH, non-condensing
Storage Temperature	• -40°C to $+125^{\circ}\text{C}$

EMC

Emissions	• EN55022, class A conducted & radiated with external components, see application note
ESD Immunity	• EN61000-4-2, level 3, Perf Criteria A
Radiated Immunity	• EN61000-4-3 10 V/m Perf Criteria A*
EFT/Burst	• EN61000-4-4 level 3, Perf Criteria A*
Surge	• EN61000-4-5 installation class 2, Perf Criteria A
Conducted Immunity	• EN61000-4-6 10 V/rms, Perf Criteria A
Magnetic Field	• EN61000-4-8 1 A/m, Perf Criteria A

*External input capacitor required 220 $\mu\text{F}/250 \text{ V}$

Models and Ratings

Input Voltage	Output Voltage	Output Current	Input Current ⁽¹⁾		Maximum Capacitive Load	Efficiency	Model Number
			No Load	Full Load			
9-36 VDC	3.3 V	7.50 A	60 mA	1185 mA	20000 µF	89%	JTL3024S3V3†^
	5.0 V	6.00 A	100 mA	1420 mA	14000 µF	91%	JTL3024S05†^
	12.0 V	2.50 A	30 mA	1436 mA	2000 µF	90%	JTL3024S12†^
	15.0 V	2.00 A	30 mA	1420 mA	2000 µF	91%	JTL3024S15†^
	±5.0 V	±3.00 A	120 mA	1437 mA	±3000 µF	90%	JTL3024D05†^
	±12.0 V	±1.25 A	30 mA	1453 mA	±1300 µF	89%	JTL3024D12†^
	±15.0 V	±1.00 A	40 mA	1437 mA	±1300 µF	89%	JTL3024D15†^
	+3.3 V, ±12.0 V	5.00 A, ±0.42 A	80 mA	1287 mA	15000, ±220 µF	89%	JTL3024T0312†^
	+3.3 V, ±15.0 V	5.00 A, ±0.33 A	90 mA	1279 mA	15000, ±220 µF	89%	JTL3024T0315†^
	+5.0 V, ±12.0 V	4.00 A, ±0.42 A	100 mA	1440 mA	8000, ±220 µF	89%	JTL3024T0512†^
18-75 VDC	3.3 V	7.50 A	50 mA	593 mA	20000 µF	89%	JTL3048S3V3†^
	5.0 V	6.00 A	60 mA	702 mA	14000 µF	91%	JTL3048S05†^
	12.0 V	2.50 A	30 mA	718 mA	2000 µF	90%	JTL3048S12†^
	15.0 V	2.00 A	30 mA	710 mA	2000 µF	90%	JTL3048S15†^
	±5.0 V	±3.00 A	70 mA	710 mA	±3000 µF	91%	JTL3048D05†^
	±12.0 V	±1.25 A	30 mA	718 mA	±1300 µF	90%	JTL3048D12†^
	±15.0 V	±1.00 A	40 mA	718 mA	±1300 µF	90%	JTL3048D15†^
	+3.3 V, ±12.0 V	5.00 A, ±0.42 A	50 mA	663 mA	15000, ±220 µF	89%	JTL3048T0312†^
	+3.3 V, ±15.0 V	5.00 A, ±0.33 A	50 mA	640 mA	15000, ±220 µF	89%	JTL3048T0315†^
	+5.0 V, ±12.0 V	4.00 A, ±0.42 A	60 mA	712 mA	8000, ±220 µF	91%	JTL3048T0512†^
	+5.0 V, ±15.0 V	4.00 A, ±0.33 A	50 mA	707 mA	8000, ±220 µF	90%	JTL3048T0515†^

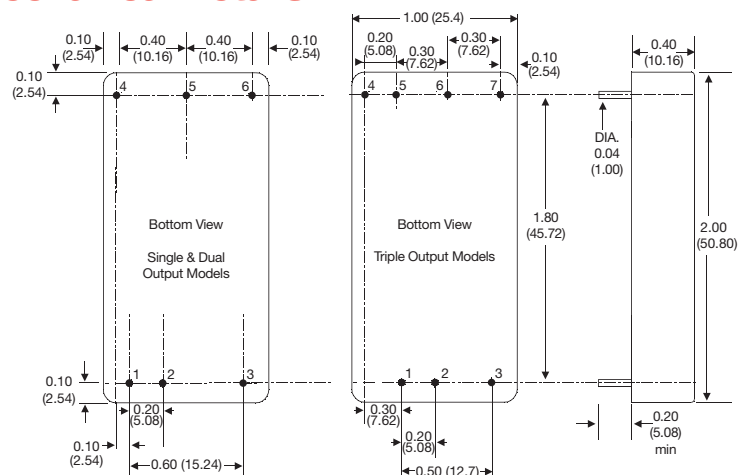
Notes

1. Input current specified at nominal 24 V or 48 V input.
2. Cross regulation for duals is ±5% when one output is at 100% and the other is varied between 25% and 100%. Cross regulation for triples is ±5% when main output and one auxiliary is at 25% and the other is varied between 25% and 100%.
3. Measured with 1 µF ceramic capacitor across output rails.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296

Mechanical Details



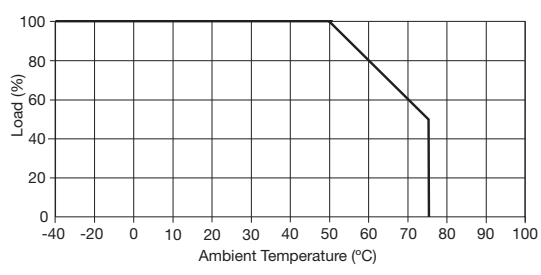
PIN CONNECTIONS			
Pin	Single	Dual	Triple
1	+Vin	+Vin	+Vin
2	-Vin	-Vin	-Vin
3	Remote On/Off	Remote On/Off	Remote On/Off
4	+Vout	+Vout	+Vout 2
5	-Vout	Com	-Vout 3
6	Trim	-Vout	Com
7			+Vout 1

Notes

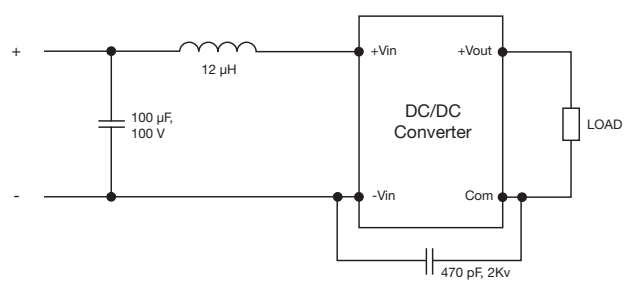
1. All dimensions are in inches (mm).
2. Weight: 0.07 lbs (30 g) approx
3. Pin diameter: 0.04 ±0.002 (1.0 ±0.05)
4. Pin pitch tolerance: ±0.014 (±0.35)
5. Case tolerance: ±0.02 (±0.5)

Application Notes

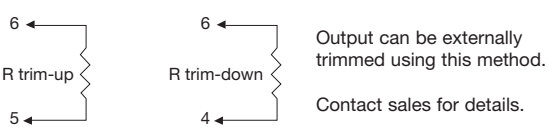
Derating Curve



Input Filter



External Output Trim



40 Watts

JCK Series



- 2:1 Input Range
- Very High Power Density
- Single and Dual Outputs
- High Efficiency – Up to 92%
- Remote On/Off
- 1600 VDC Isolation
- 3 Year Warranty

Specification

Input

Input Voltage Range	• 12 V (9-18 VDC), 24 V (18-36 VDC), 48 V (36-75 VDC)
Input Current	• See table
Input Reflected Ripple Current	• 20 mA pk-pk through 12 μH inductor, 5 Hz to 20 MHz
Undervoltage Lockout	• 12 V models: ON 8.6 V, OFF 7.9 V typical • 24 V models: ON 17.8 V, OFF 16 V typical • 48 V models: ON 33.5 V, OFF 30.5 V typical
Input Surge	• 12 V models 25 VDC for 1000 ms • 24 V models 50 VDC for 1000 ms • 48 V models 100 VDC for 1000 ms

Output

Output Voltage	• See table
Output Voltage Trim	• $\pm 10\%$ on single outputs models only, contact sales for details
Minimum Load	• No minimum load required
Line Regulation	• $\pm 0.5\%$ max
Load Regulation	• Single output models: $\pm 0.5\%$ max • Dual output models: $\pm 1\%$ max balanced outputs
Cross Regulation	• $\pm 5\%$ (see note 2)
Setpoint Accuracy	• $\pm 1\%$
Start Up Time	• 30 ms typical
Ripple & Noise	• 100 mV for 3V3 +5 V models, 150 mV for other models (see note 3)
Transient Response	• 3% max deviation, recovery to within 1% in $<250 \mu$s for a 25% load change
Temperature Coefficient	• $0.02\%/^{\circ}\text{C}$
Overvoltage Protection	• 3.3 V models: 3.9 V typical • 5 V models: 6.2 V typical • 12 V models: 15 V typical • 15 V models: 18 V typical • ± 12 V models: ± 15 V typical • ± 15 V models: ± 18 V typical
Overload Protection	• 115-130% of output current
Short Circuit Protection	• Trip & restart (Hiccup mode), auto recovery
Remote On/Off	• On = Logic High (>3.0) or Open • Off = Logic Low (<1.2 V) or short pin 2 to 3

General

Efficiency	• See table
Isolation	• 1600 VDC Input to Output • 1600 VDC Input to Case • 1600 VDC Output to Case
Isolation Capacitance	• 1000 pF typical
Switching Frequency	• 270 kHz typical
Power Density	• 50 W/in³
MTBF	• 330 kHrs min to MIL-HDBK-217F at 25 $^{\circ}\text{C}$, GB

Environmental

Operating Temperature	• -40°C to $+70^{\circ}\text{C}$, derate from 100% load at 55 $^{\circ}\text{C}$ to 60% load at 70 $^{\circ}\text{C}$
Case Temperature	• $+105^{\circ}\text{C}$ max
Cooling	• Convection-cooled
Operating Humidity	• 5-95% RH, non-condensing
Storage Temperature	• -40°C to $+125^{\circ}\text{C}$

EMC

Emissions	• EN55022 class B conducted & radiated with external components, see application note
ESD Immunity	• EN61000-4-2, 4 kV contact discharge, Perf Criteria B
Radiated Immunity	• EN61000-4-3, 3 V/m, Perf Criteria A
EFT/Burst	• EN61000-4-4, level 1, Perf Criteria A*
Surge	• EN61000-4-5, level 1, Perf Criteria A
Conducted Immunity	• EN61000-4-6, 3 Vrms, Perf Criteria A
Magnetic Field	• EN61000-4-8, 1 A/m, Perf Criteria A

*External input capacitor required, 220 μ F/100 V.

Models and Ratings

JCK40 **XP**

Input Voltage	Output Voltage	Output Current	Input Current ⁽¹⁾		Maximum Capacitive Load	Efficiency	Model Number
			No Load	Full Load			
9-18 VDC	3.3 V	8.00 A	100 mA	2444 mA	21000 μ F	90%	JCK4012S3V3 [†] ^
	5.0 V	8.00 A	150 mA	3663 mA	13000 μ F	91%	JCK4012S05 [†] ^
	12.0 V	3.33 A	40 mA	3663 mA	2000 μ F	91%	JCK4012S12 [†] ^
	15.0 V	2.67 A	50 mA	3663 mA	1500 μ F	91%	JCK4012S15 [†] ^
	± 12.0 V	± 1.67 A	30 mA	3663 mA	± 1200 μ F	91%	JCK4012D12 [†] ^
18-36 VDC	3.3 V	8.00 A	60 mA	1208 mA	21000 μ F	91%	JCK4024S3V3 [†] ^
	5.0 V	8.00 A	80 mA	1811 mA	13000 μ F	92%	JCK4024S05 [†] ^
	12.0 V	3.33 A	30 mA	1831 mA	2000 μ F	91%	JCK4024S12 [†] ^
	15.0 V	2.67 A	40 mA	1811 mA	1500 μ F	92%	JCK4024S15 [†] ^
	± 12.0 V	± 1.67 A	50 mA	1831 mA	± 1200 μ F	91%	JCK4024D12 [†] ^
36-75 VDC	3.3 V	8.00 A	40 mA	604 mA	21000 μ F	91%	JCK4048S3V3 [†] ^
	5.0 V	8.00 A	60 mA	905 mA	13000 μ F	92%	JCK4048S05 [†] ^
	12.0 V	3.33 A	20 mA	915 mA	2000 μ F	91%	JCK4048S12 [†] ^
	15.0 V	2.67 A	20 mA	905 mA	1500 μ F	92%	JCK4048S15 [†] ^
	± 12.0 V	± 1.67 A	30 mA	906 mA	± 1200 μ F	92%	JCK4048D12 [†] ^
	± 15.0 V	± 1.33 A	40 mA	906 mA	± 750 μ F	92%	JCK4048D15 [†] ^

Notes

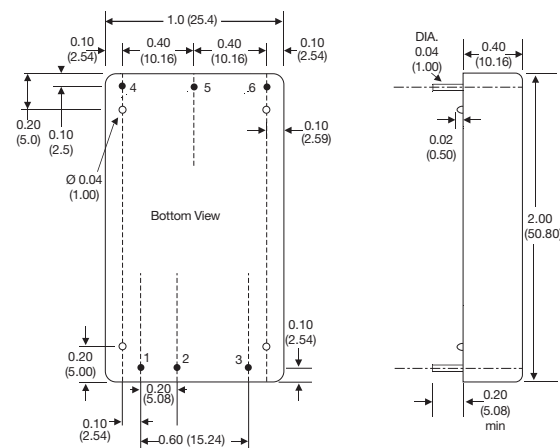
1. Input current specified at nominal input.
2. Cross regulation for duals is $\pm 5\%$ when one output is at 100% and the other is varied between 25% and 100%.

[†] Available from Farnell & element14. See pages 284-290.

3. Measured with 1 μ F ceramic capacitor in parallel with a 10 μ F electrolytic across output rails.

[^] Available from Newark. See pages 291-296.

Mechanical Details



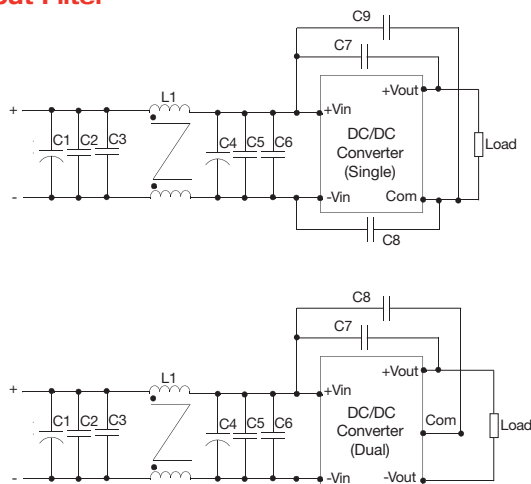
PIN CONNECTIONS		
Pin	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
3	Remote On/Off	Remote On/Off
4	+Vout	+Vout
5	Com	Com
6	Trim	-Vout

Notes

1. All dimensions are in inches (mm).
2. Weight: 0.07 lbs (30 g) approx
3. Pin diameter: 0.04 ± 0.002 (1.0 ± 0.05)
4. Pin pitch tolerance: ± 0.014 (± 0.35)
5. Case tolerance: ± 0.02 (± 0.5)

Application Notes

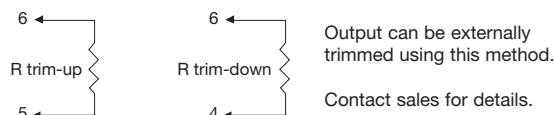
Input Filter



JCK40 Single	C1	L1	C2/C3/C5/C6	C4
12 V	220 μ F, 100 V	Common Mode Choke 68 μ H	6.8 μ F, 50 V	330 μ F, 100 V
24 V			4.7 μ F, 50 V	220 μ F, 100 V
48 V			1.5 μ F, 1000 V	220 μ F, 100 V
JCK40 Dual	C1	L1	C2/C3/C5/C6	C4
12 V	220 μ F, 100 V	Common Mode Choke 68 μ H	6.8 μ F, 50 V	330 μ F, 100 V
24 V			4.7 μ F, 50 V	220 μ F, 100 V
48 V			1.5 μ F, 1000 V	220 μ F, 100 V

JCK40 Single	C7	C8	C9
12 V	1000 pF, 2 kV	1000 pF, 2 kV	1000 pF, 2 kV
24 V			
48 V			
JCK40 Dual	C7	C8	
12 V	1000 pF, 2 kV	1000 pF, 2 kV	
24 V	1000 pF, 2 kV	1000 pF, 2 kV	
48 V	1000 pF, 2 kV	1000 pF, 2 kV	

External Output Trim



40 Watts

JTL Series



- 4:1 Input Range
- High Power Density
- Single and Dual Outputs
- High Efficiency – Up to 92%
- Remote On/Off
- 1600 VDC Isolation
- 3 Year Warranty

Specification

Input

Input Voltage Range	• 24 V (9-36 VDC), 48 V (18-75 VDC)
Input Current	• See table
Input Reflected Ripple Current	• 20 mA pk-pk through 12 μ H inductor
Input Reverse Voltage Protection	• None
Undervoltage Lockout	• 24 V models: ON 8.6 V, OFF 7.9 V typical 48 V models: ON 17.8 V, OFF 16 V typical
Input Filter	• Pi network
Input Surge	• 24 V models 50 VDC for 100 ms 48 V models 100 VDC for 100 ms

Output

Output Voltage	• See table
Output Voltage Trim	• $\pm 10\%$
Minimum Load	• No minimum load required
Line Regulation	• $\pm 0.5\%$ max
Load Regulation	• Single output models: $\pm 0.5\%$ max Dual output models: $\pm 1\%$ max balanced outputs
Cross Regulation	• $\pm 5\%$ for dual outputs (see note 2)
Setpoint Accuracy	• $\pm 1\%$
Start Up Time	• 25 ms typical
Ripple & Noise	• 50 mV pk-pk max for 3.3 V & 5 V models, 75 mV pk-pk max for other single output models, 150 mV pk-pk max for dual output models, 20 MHz bandwidth, (see note 3)
Transient Response	• 3% max deviation, recovery to within 1% in $<250 \mu$ s for a 25% load change
Temperature Coefficient	• 0.02%/°C
Overvoltage Protection	• 3.3 V models: 3.9 V typical 5 V models: 6.2 V typical 12 V models: 15 V typical 15 V models: 18 V typical ± 12 V models: ± 15 V typical ± 15 V models: ± 18 V typical
Overload Protection	• $>130\%$ of full load
Short Circuit Protection	• Trip & restart (Hiccup mode), auto recovery
Remote On/Off	• On = Logic High (>3.0) or Open Off = Logic Low (<1.2 V) or short pin 2 to 3
Max Capacitive Load	• See table

General

Efficiency	• See table
Isolation	• 1600 VDC Input to Output 1600 VDC Input to Case 1600 VDC Output to Case
Isolation Capacitance	• 2500 pF max
Switching Frequency	• 270 kHz, typical
Power Density	• 25 W/in ³
MTBF	• 150 kHrs min to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Temperature	• -40 °C to +85 °C, see derating curve
Case Temperature	• +105 °C max
Cooling	• Convection-cooled
Operating Humidity	• 5-95% RH, non-condensing
Storage Temperature	• -40 °C to +125 °C

EMC & Safety

Emissions	• EN55022, class A conducted and radiated with external components
ESD Immunity	• EN61000-4-2, level 3, Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3, Perf Criteria A (see note 4)
Surge	• EN61000-4-5, installation class 2, Perf Criteria A (see note 4)
Conducted Immunity	• EN61000-4-6, 3 Vrms, Perf Criteria A
Magnetic Fields	• EN61000-4-8, 1 A/m, Perf Criteria A

Models and Ratings

Input Voltage	Output Voltage	Output Current	Input Current ⁽¹⁾		Maximum Capacitive Load	Efficiency	Model Number
			No Load	Full Load			
9-36 VDC	3.3 V	10.00 A	80 mA	1600 mA	25000 μ F	89%	JTL4024S3V3†^
	5.0 V	8.00 A	100 mA	1900 mA	13000 μ F	91%	JTL4024S05†^
	12.0 V	3.35 A	50 mA	1930 mA	2300 μ F	90%	JTL4024S12†^
	15.0 V	2.65 A	50 mA	1910 mA	1500 μ F	90%	JTL4024S15†^
	$\pm$ 12.0 V	$\pm$ 1.65 A	60 mA	1920 mA	$\pm$ 1200 μ F	89%	JTL4024D12†^
	$\pm$ 15.0 V	$\pm$ 1.35 A	60 mA	1960 mA	$\pm$ 750 μ F	89%	JTL4024D15†^
18-75 VDC	3.3 V	10.00 A	60 mA	800 mA	25000 μ F	89%	JTL4048S3V3†^
	5.0 V	8.00 A	60 mA	940 mA	13000 μ F	92%	JTL4048S05†^
	12.0 V	3.35 A	30 mA	970 mA	2300 μ F	90%	JTL4048S12†^
	15.0 V	2.65 A	30 mA	940 mA	1500 μ F	91%	JTL4048S15†^
	$\pm$ 12.0 V	$\pm$ 1.65 A	30 mA	950 mA	$\pm$ 1200 μ F	90%	JTL4048D12†^
	$\pm$ 15.0 V	$\pm$ 1.35 A	30 mA	970 mA	$\pm$ 750 μ F	90%	JTL4048D15†^

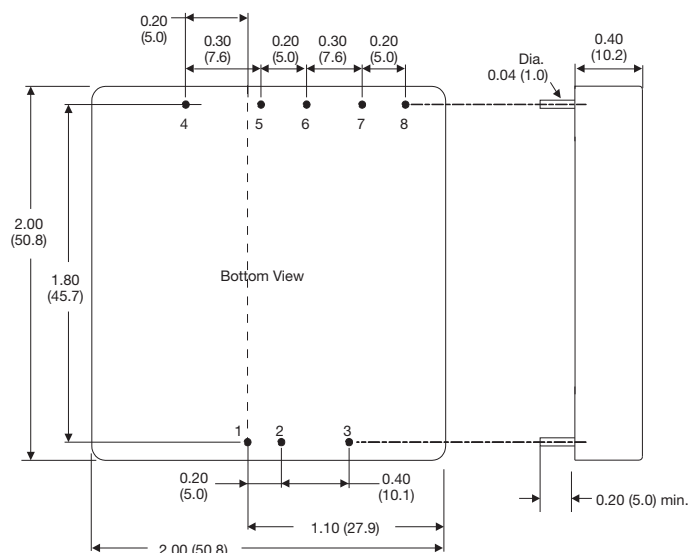
Notes

1. Input current specified at nominal 24 V or 48 V input.
2. Cross regulation for duals is $\pm$ 5% when one output is at 100% and the other is varied between 25% and 100%.
3. Measured with 1 μ F ceramic capacitor across output rails.
4. A 220 μ F/250 V capacitor across the input is required in order to meet EN61000-4-4 and EN61000-4-5.
5. Efficiency is measured at full load and nominal input at 25 °C.

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296.

Mechanical Details



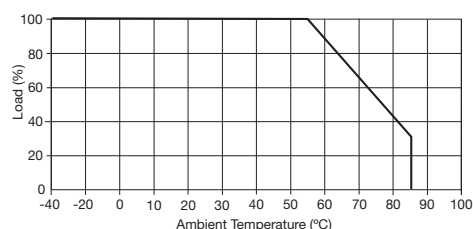
PIN CONNECTIONS		
Pin	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
3	Remote On/Off	Remote On/Off
4	-Sense	+Vout
5	+Sense	Com
6	+Vout	Com
7	-Vout	-Vout
8	Trim	Trim

Notes

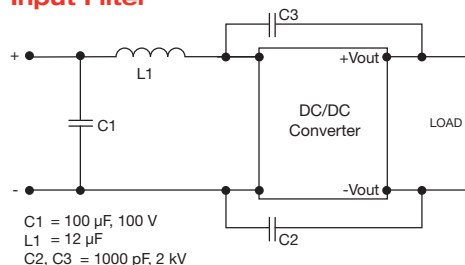
1. All dimensions are in inches (mm).
2. Weight: 0.07 lbs (30 g) approx
3. Pin diameter: 0.04 $\pm$ 0.002 (1.0 $\pm$ 0.05)
4. Pin pitch tolerance: $\pm$ 0.014 ($\pm$ 0.35)
5. Case tolerance: $\pm$ 0.02 ($\pm$ 0.5)

Application Notes

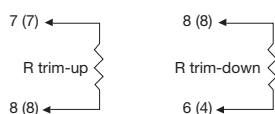
Derating Curve



Input Filter



External Output Trim



Output can be externally trimmed using this method.
() for dual output trim.

Contact sales for details.

LED Driver

LDU Series



- Constant Current Output
- LED Drive Current up to 1000 mA
- LED Strings from 2 V to 57 V
- PWM & Analog Dimming Control
- High Efficiency – up to 95%
- Open or Short Circuit LED Protection
- 3 Year Warranty

Specification

Input

Input Voltage	• LDU08 & 24: 7-30 VDC • LDU48: 7-60 VDC
Input Filter	• Capacitor
Input Surge	• LDU08 & 24: 40 VDC for 0.5 s • LDU48: 65 VDC for 0.5 s

Output

Output Voltage	• See tables (V_{in} must be at least 2 V greater than V_{out})
Output Current	• See tables
Output Current Trim	• 25-100%
Output Current Accuracy	• LDU08: $\pm 6.0\%$ max • LDU24: $\pm 8.0\%$ max • LDU48: $\pm 8.0\%$ max
Ripple & Noise	• LDU08: 200 mV pk-pk max • LDU24: 250 mV pk-pk max (except 1000 mA units: 300 mV pk-pk max) • LDU48: See tables measured with 20 MHz bandwidth
Short Circuit Protection	• Current is limited to the rated output
Temperature Coefficient	• LDU08: $\pm 0.03\%/^{\circ}\text{C}$ max • LDU24: $\pm 0.08\%/^{\circ}\text{C}$ max • LDU48: $\pm 0.03\%/^{\circ}\text{C}$ max
Remote On/Off	• On = 0.3-1.25 V or open circuit • Off = ≤ 0.15 V (applied to control pin) • LDU08 & 24: Quiescent input current is 25 μA max, • LDU48: Quiescent input current is 100 μA max
Remote On/Off Signal Current	• 1 mA max

Dimming

PWM	
Output Current Range	• 25% to 100%
Operating Frequency	• 1 kHz max
On Time	• 200 ns min
Off Time	• 200 ns min
Amplitude	• 1.25 V max
DC Voltage Control	
Output Current Range	• 25% to 100%
Control Input	• 0.3 to 1.25 V max
Variable Resistor	
Output Current Range	• 25% to 100%

General

Efficiency	• See tables
Switching Frequency	• LDU08: 40-380 kHz variable • LDU24: 50-330 kHz variable • LDU48: 20-500 kHz variable
MTBF	• LDU08: >1.6 Mhrs • LDU24: >1.6 Mhrs • LDU48: >950 Khrs to MIL-HDBK-217F at 25 $^{\circ}\text{C}$, GB

Environmental

Operating Temperature	• LDU08: -40 $^{\circ}\text{C}$ to +85 $^{\circ}\text{C}$, • LDU24: -40 $^{\circ}\text{C}$ to +85 $^{\circ}\text{C}$, • LDU24 1000 mA unit: -40 $^{\circ}\text{C}$ to +70 $^{\circ}\text{C}$, • LDU48: See derating curves
Case Temperature	• LDU08 & 24: +100 $^{\circ}\text{C}$ max • LDU48: +110 $^{\circ}\text{C}$ max
Storage Temperature	• -40 $^{\circ}\text{C}$ to +125 $^{\circ}\text{C}$
Humidity	• Up to 95%, non-condensing
Thermal Impedance	• 35-50 $^{\circ}\text{C}/\text{W}$ model dependant
Ingress Protection Rating	• IP67 (wired versions)

EMC

Emissions	• EN55022 class B conducted & radiated with external components - see application notes
ESD Immunity	• EN61000-4-2, level 2 Perf Criteria A
Radiated Immunity	• EN61000-4-3, level 2 Perf Criteria A
EFT/Burst	• EN61000-4-4, level 2 Perf Criteria A
Surge	• EN61000-4-5, level 2 Perf Criteria A
Conducted Immunity	• EN61000-4-6, level 2 Perf Criteria A

Models and Ratings

LDU08/24 **XP**

With Dimming Control

Output Power	Input Voltage Range	Output Voltage	Output Current	Efficiency	Model Number
8.0 W	7 - 30 V	2 - 28 V	300 mA	95%	LDU0830S300†^
8.0 W	7 - 30 V	2 - 28 V	350 mA	95%	LDU0830S350†^
14.0 W	7 - 30 V	2 - 28 V	500 mA	95%	LDU2430S500†^
17.0 W	7 - 30 V	2 - 28 V	600 mA	95%	LDU2430S600†^
20.0 W	7 - 30 V	2 - 28 V	700 mA	95%	LDU2430S700†^
24.0 W	7 - 30 V	2 - 28 V	1000 mA	95%	LDU2430S1000†^

Wired Versions (No Dimming Control)

Output Power	Input Voltage Range	Output Voltage	Output Current	Efficiency	Model Number
8.0 W	7 - 30 V	2 - 28 V	350 mA	95%	LDU0830S350-W
14.0 W	7 - 30 V	2 - 28 V	500 mA	95%	LDU2430S500-W
20.0 W	7 - 30 V	2 - 28 V	700 mA	95%	LDU2430S700-W
24.0 W	7 - 30 V	2 - 28 V	1000 mA	95%	LDU2430S1000-W

Wired Version with Dimming Control

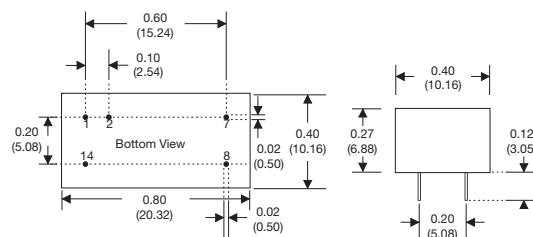
Output Power	Input Voltage Range	Output Voltage	Output Current	Efficiency	Model Number
8.0 W	7 - 30 V	2 - 28 V	350 mA	95%	LDU0830S350-WD
14.0 W	7 - 30 V	2 - 28 V	500 mA	95%	LDU2430S500-WD
20.0 W	7 - 30 V	2 - 28 V	700 mA	95%	LDU2430S700-WD
24.0 W	7 - 30 V	2 - 28 V	1000 mA	95%	LDU2430S1000-WD

† Available from Farnell & element14. See pages 284-290.

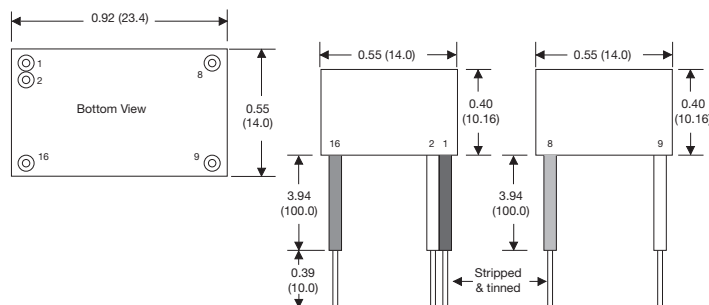
^ Available from Newark. See pages 291-296.

Mechanical Details

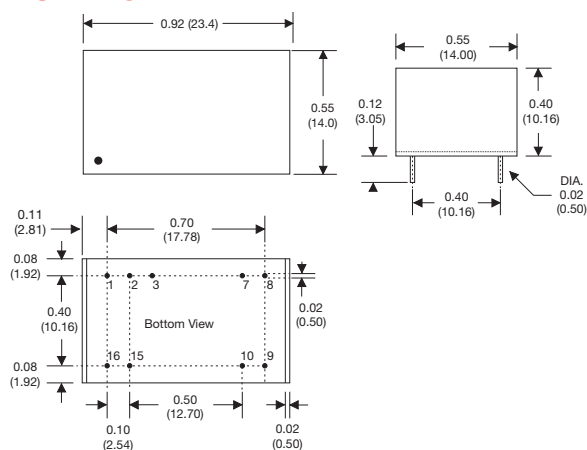
LDU08: 14 Pin DIL



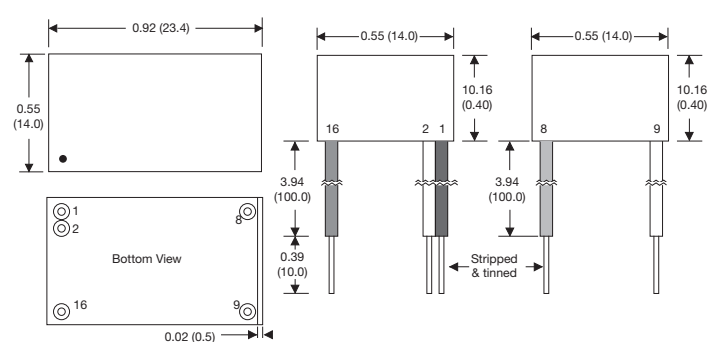
LDU08 - Wired Versions



LDU24- 16 Pin DIL



LDU24 - Wired Versions



Notes

- All dimensions are in inches (mm)
- Weight: LDU08 - 0.006 lbs (2.6 g) approx.
LDU08 (wired version) - 0.02 lbs (11.1 g) approx.
LDU24 - 0.014 lbs (6.2 g) approx.
LDU24 (wired version) - 0.02 lbs (11.1 g) approx.
- Pin diameter: 0.02±0.002 (0.5±0.05)
- Pin pitch tolerance: ±0.014 (±0.35)
- Case tolerance: ±0.02 (±0.5)

LDU Connections						Function
LDU08	LDU08-W	LDU08-WD	LDU24	LDU24-W	LDU24-WD	
1	1 (Black)	1 (Black)	1 & 2	1 (Black)	1 (Black)	-Vin: -DC supply
2	No Wire	2 (White)	3	No Wire	2 (White)	Control
7	8 (Blue)	8 (Blue)	7 & 8	8 (Blue)	8 (Blue)	-Vout: LED cathode connection
8	9 (Yellow)	9 (Yellow)	9 & 10	9 (Yellow)	9 (Yellow)	+Vout: LED anode connection
14	16 (Red)	16 (Red)	15 & 16	16 (Red)	16 (Red)	+Vin: +DC supply

Note: LDU08: Do not connect Pin 1 (-Vin) to Pin 7 (-Vout).

LDU24: Do not connect Pins 1 & 2 (-Vin) to Pins 7 & 8 (-Vout).

Models and Ratings

With Dimming Control

LDU48 **XP**

Output Power	Input Voltage Range	Output Voltage	Output Current	Ripple & Noise (pk-pk)	Efficiency	Model Number
9.0 W	7 - 60 V	2 - 57 V	150 mA	150 mV	97%	LDU4860S150
14.0 W	7 - 60 V	2 - 57 V	250 mA	200 mV	97%	LDU4860S250
17.0 W	7 - 60 V	2 - 57 V	300 mA	250 mV	97%	LDU4860S300
20.0 W	7 - 60 V	2 - 57 V	350 mA	300 mV	97%	LDU4860S350
29.0 W	7 - 60 V	2 - 57 V	500 mA	400 mV	97%	LDU4860S500
34.0 W	7 - 60 V	2 - 57 V	600 mA	450 mV	97%	LDU4860S600
40.0 W	7 - 60 V	2 - 57 V	700 mA	500 mV	97%	LDU4860S700
48.0 W	7 - 60 V	2 - 48 V	1000 mA	800 mV	97%	LDU4860S1000

Wired Versions (No Dimming Control)

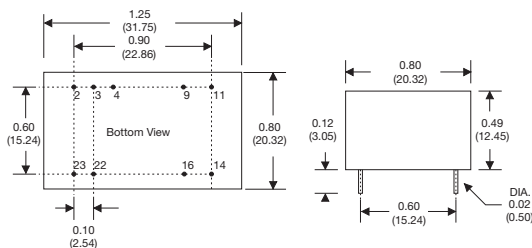
Output Power	Input Voltage Range	Output Voltage	Output Current	Ripple & Noise (pk-pk)	Efficiency	Model Number
9.0 W	7 - 60 V	2 - 57 V	150 mA	150 mV	97%	LDU4860S150-W
14.0 W	7 - 60 V	2 - 57 V	250 mA	200 mV	97%	LDU4860S250-W
17.0 W	7 - 60 V	2 - 57 V	300 mA	250 mV	97%	LDU4860S300-W
20.0 W	7 - 60 V	2 - 57 V	350 mA	300 mV	97%	LDU4860S350-W
29.0 W	7 - 60 V	2 - 57 V	500 mA	400 mV	97%	LDU4860S500-W
34.0 W	7 - 60 V	2 - 57 V	600 mA	450 mV	97%	LDU4860S600-W
40.0 W	7 - 60 V	2 - 57 V	700 mA	500 mV	97%	LDU4860S700-W
48.0 W	7 - 60 V	2 - 48 V	1000 mA	800 mV	97%	LDU4860S1000-W

Wired Version with Dimming Control

Output Power	Input Voltage Range	Output Voltage	Output Current	Ripple & Noise (pk-pk)	Efficiency	Model Number
9.0 W	7 - 60 V	2 - 57 V	150 mA	150 mV	97%	LDU4860S150-WD
14.0 W	7 - 60 V	2 - 57 V	250 mA	200 mV	97%	LDU4860S250-WD
17.0 W	7 - 60 V	2 - 57 V	300 mA	250 mV	97%	LDU4860S300-WD
20.0 W	7 - 60 V	2 - 57 V	350 mA	300 mV	97%	LDU4860S350-WD
29.0 W	7 - 60 V	2 - 57 V	500 mA	400 mV	97%	LDU4860S500-WD
34.0 W	7 - 60 V	2 - 57 V	600 mA	450 mV	97%	LDU4860S600-WD
40.0 W	7 - 60 V	2 - 57 V	700 mA	500 mV	97%	LDU4860S700-WD
48.0 W	7 - 60 V	2 - 48 V	1000 mA	800 mV	97%	LDU4860S1000-WD

Mechanical Details

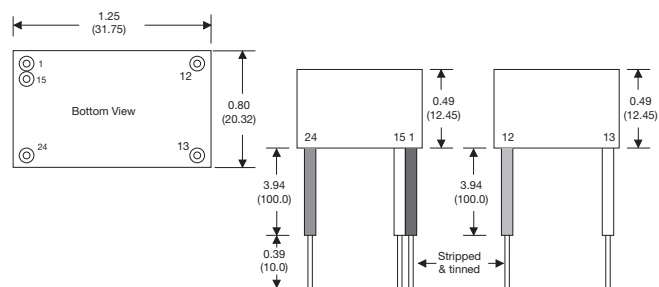
LDU48 - 24 Pin DIL



LDU48 Connections			
LDU48	LDU48-W	LDU48-WD	Function
2 & 3	1 (Black)	1 (Black)	-Vin: -DC supply
4	No Wire	15 (White)	Control
9 & 11	12 (Blue)	12 (Blue)	-Vout: LED cathode connection
14 & 16	13 (Yellow)	13 (Yellow)	+Vout: LED anode connection
22 & 23	24 (Red)	24 (Red)	+Vin: +DC supply

Note: Do not connect pins 1 & 2 (-Vin) to pins 9 & 11 (-Vout)

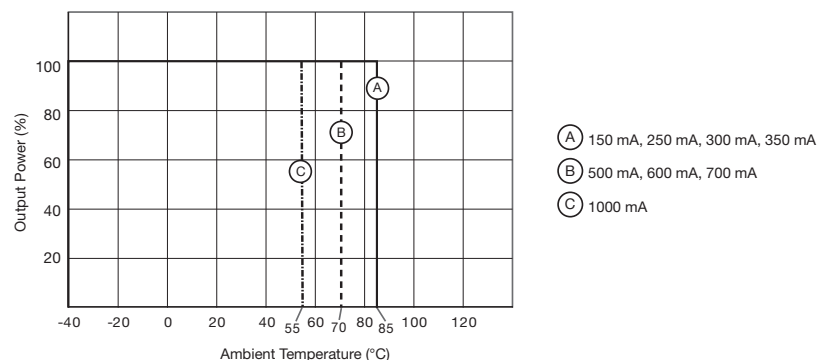
LDU48 - Wired Versions



Notes

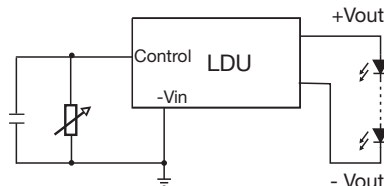
- All dimensions are in inches (mm)
- Weight: LDU48 - 0.04 lbs (17.7 g) approx.
LDU48 (wired version) - 0.04 lbs (18.0 g) approx.
- Pin diameter: 0.02±0.002 (0.5±0.05)
- Pin pitch tolerance: ±0.014 (±0.35)
- Case tolerance: ±0.02 (±0.5)

Derating Curve



Output Current Adjustment by Variable Resistor

By connecting a variable resistor between control and GND, simple dimming can be achieved. Capacitor is optional for HF noise rejection. Recommended value is 0.22 μF .



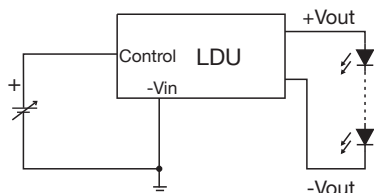
The output current can be determined using the equation:

$$I_{out} = \frac{I_{out} \times R}{(R + 200 \text{ k})}$$

Where the value of R is between 0 and 2 M Ω , the maximum adjustment range of output current is 25% to 90% (For Vin-Vout, LDU08 & 24: <20 VDC, LDU48: <30 VDC)

Output Current Adjustment by DC Voltage

Control Voltage Range: 0.3 V to 1.25 VDC



The output current is given by:

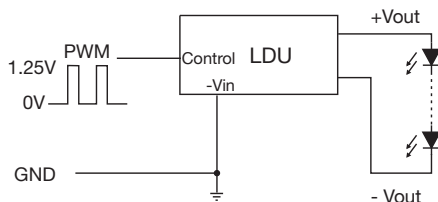
$$I_{out \text{ nom}} = \frac{I_{out} \times \text{Control}}{1.25}$$

Output Current Adjustment by PWM

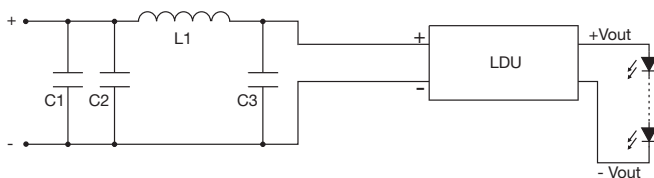
Directly driving control input

A Pulse Width Modulated (PWM) signal with duty cycle DPWM can be applied to the control pin, as shown:

$$I_{out \text{ nom}} = I_{out} \times D_{pwm} \quad (D_{pwm} = \text{PWM duty cycle})$$



Input Filter to meet Class B Conducted Emissions



	LDU08	LDU24	LDU48
C1	10 μF	10 μF	4.7 μF
C2	Not Fitted	Not Fitted	4.7 μF
C3	47 μF	47 μF	Not Fitted
L1	68 μF	68 μF	47 μF

50-200 Watts

ICH/IFH Series



- 2:1 & 4:1 Input Ranges
- Efficiency up to 90%
- Single Output
- -40 °C to +100 °C Operating Temperature
- Continuous Short Circuit Protection
- Five-sided Metal Case
- 3 Year Warranty

Specification

Input

Input Voltage Range	• See tables
Input Current (no load)	• See tables
Input Reverse Voltage Protection	• None
Input Filter	• Pi network
Undervoltage Lockout	• 2:1 Input Models: 12 Vin, power up 8.8 V, down 8.0 V 24 Vin, power up 17.0 V, down 16.0 V 48 Vin, power up 34.0 V, down 32.5 V • 4:1 Input Models: 24 Vin, power up 8.8 V, down 8.0 V 48 Vin, power up 17.0 V, down 16.0 V

Output

Output Voltage Trim	• $\pm 10\%$
Initial Set Accuracy	• $\pm 1\%$ max (ICH100: $\pm 1.5\%$)
Line Regulation	• $\pm 0.2\%$ max measured from high line to low line
Load Regulation	• $\pm 0.2\%$ max measured from 0-100% load
Transient Response	• 5% max deviation, recovery to within 1% in 500 μ s, 25% step load change
Ripple & Noise	• 2.5, 3.3 & 5 V models: 100 mV pk-pk • 12 & 15 V models: 150 mV pk-pk • 24, 28 & 48 V models: 1% max pk-pk • ICH50/75 - 2.5 V, 3.3 V, 5 V models: 75 mV • 12 V, 15 V models: 100 mV • 20 MHz bandwidth (see note 3)
Overvoltage Protection	• 115-140%
Short Circuit Protection	• ICH50/75/100W/IFH200-: Trip & restart (hiccup mode) with auto recovery • ICH50W/75W/100/150 & IFH200: Current limit, auto recovery
Temperature Coefficient	• $\pm 0.03\%/^{\circ}\text{C}$
Current Limit	• IFH200: 110-150% nominal output, all other models: 110-160% nominal output
Remote On/Off	• See note 1 & 2
Thermal Shutdown	• ICH50/50W/75/75W/100/150: Thermal shutdown when case temperature reaches 100 °C, auto recovery when case temperature < +60 °C • ICH100W/IFH200: Thermal shutdown when case temperature reaches 105 °C, auto recovery when case temperature < +90 °C

General

Efficiency	• See tables
Isolation Voltage	• 1500 VDC Input to Output • 1500 VDC Input to Case • 1500 VDC Output to Case
Isolation Resistance	• 10 ⁷ Ω min
Switching Frequency	• ICH50/75 12-24V models: 400 kHz typical • ICH50/75 48 V models: 300 kHz typical • ICH50W/75W: 300 kHz typical • ICH100/ICH150: 500 kHz typical • ICH100W: 250 kHz typical • IFH200: 350 kHz typical
Power Density	• ICH50: 18.3 W/in³ • ICH75: 27.4 W/in³ • ICH100: 36.6 W/in³ • ICH150: 54.8 W/in³ • IFH200: 34.8 W/in³
MTBF	• ≥ 790 kHrs to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Case Temperature	• -40 °C to +100 °C, see derating curve
Storage Temperature	• ICH50/75: -55 °C to +105 °C • ICH100/150 & IFH200: -40 °C to +105 °C
Shock	• 30 g pk, half sine wave for 18 ms, 3 pulses per face, all 6 faces tested on all 3 axes
Vibration	• 5-500 Hz at 3 g, 10 mins per axis

EMC & Safety

Emissions	• EN55022, level A conducted
ESD Immunity	• EN61000-4-2, level 2 Perf Criteria A
EFT/Burst	• EN61000-4-4, level 1, Perf Criteria A
Surge	• EN61000-4-5, installation class 1, Perf Criteria A
Conducted Immunity	• EN61000-4-6, 3 V rms Perf Criteria A
Magnetic Field	• EN61000-4-8, 1 A/m, Perf Criteria A
Safety Approvals	• UL60950-1 (ICH100W not UL approved)

Models and Ratings

ICH/IFH Series

Input Voltage	Output Voltage	Output Current	Input Current ⁽⁴⁾		Efficiency	Model Number ^(2,5)
			No Load	Full Load		
9-18 VDC (24 V nominal)	2.5 V	10.00 A	50 mA	2740 mA	76%	ICH5012S2V5
	3.3 V	10.00 A	50 mA	3525 mA	78%	ICH5012S3V3
	5.0 V	10.00 A	50 mA	5145 mA	81%	ICH5012S05
	12.0 V	4.16 A	50 mA	4950 mA	84%	ICH5012S12
	15.0 V	3.33 A	50 mA	4950 mA	84%	ICH5012S15
	24.0 V	2.08 A	50 mA	4950 mA	84%	ICH5012S24
18-36 VDC (24 V nominal)	2.5 V	10.00 A	50 mA	1353 mA	77%	ICH5024S2V5
	3.3 V	10.00 A	50 mA	1740 mA	79%	ICH5024S3V3
	5.0 V	10.00 A	50 mA	2540 mA	82%	ICH5024S05
	12.0 V	4.16 A	50 mA	2450 mA	85%	ICH5024S12
	15.0 V	3.33 A	50 mA	2450 mA	85%	ICH5024S15
	24.0 V	2.08 A	50 mA	2419 mA	86%	ICH5024S24
36-75 VDC (48 V nominal)	2.5 V	10.00 A	50 mA	676 mA	77%	ICH5048S2V5
	3.3 V	10.00 A	50 mA	870 mA	79%	ICH5048S3V3
	5.0 V	10.00 A	50 mA	1250 mA	83%	ICH5048S05
	12.0 V	4.16 A	50 mA	1220 mA	85%	ICH5048S12
	15.0 V	3.33 A	50 mA	1220 mA	85%	ICH5048S15
	24.0 V	2.08 A	50 mA	1209 mA	86%	ICH5048S24

Input Voltage	Output Voltage	Output Current	Input Current ⁽⁴⁾		Efficiency	Model Number ⁽²⁾
			No Load	Full Load		
9-36 VDC (24 V nominal)	3.3 V	10.00 A	50 mA	1785 mA	77%	ICH5024WS3V3
	5.0 V	10.00 A	50 mA	2570 mA	81%	ICH5024WS05†^
	12.0 V	4.16 A	50 mA	2510 mA	83%	ICH5024WS12
	15.0 V	3.33 A	50 mA	2510 mA	83%	ICH5024WS15
	24.0 V	2.08 A	50 mA	2510 mA	83%	ICH5024WS24†^
18-36 VDC (48 V nominal)	3.3 V	10.00 A	50 mA	880 mA	78%	ICH5048WS3V3
	5.0 V	10.00 A	50 mA	1270 mA	82%	ICH5048WS05
	12.0 V	4.16 A	50 mA	1240 mA	84%	ICH5048WS12
	15.0 V	3.33 A	50 mA	1240 mA	84%	ICH5048WS15
	24.0 V	2.08 A	50 mA	1240 mA	84%	ICH5048WS24

Input Voltage	Output Voltage	Output Current	Input Current ⁽⁴⁾		Efficiency	Model Number ^(2,5)
			No Load	Full Load		
9-18 VDC (24 V nominal)	2.5 V	15.00 A	50 mA	4110 mA	76%	ICH7512S2V5
	3.3 V	15.00 A	50 mA	5290 mA	78%	ICH7512S3V3
	5.0 V	15.00 A	50 mA	7715 mA	81%	ICH7512S05
	12.0 V	6.25 A	50 mA	7440 mA	84%	ICH7512S12
	15.0 V	5.00 A	50 mA	7440 mA	84%	ICH7512S15
	24.0 V	3.13 A	50 mA	7440 mA	84%	ICH7512S24
18-36 VDC (24 V nominal)	2.5 V	15.00 A	50 mA	2029 mA	77%	ICH7524S2V5
	3.3 V	15.00 A	50 mA	2610 mA	79%	ICH7524S3V3
	5.0 V	15.00 A	50 mA	3810 mA	82%	ICH7524S05†^
	12.0 V	6.25 A	50 mA	3675 mA	85%	ICH7524S12
	15.0 V	5.00 A	50 mA	3675 mA	85%	ICH7524S15
	24.0 V	3.13 A	50 mA	3640 mA	86%	ICH7524S24
36-75 VDC (48 V nominal)	2.5 V	15.00 A	50 mA	1015 mA	77%	ICH7548S2V5
	3.3 V	15.00 A	50 mA	1305 mA	79%	ICH7548S3V3
	5.0 V	15.00 A	50 mA	1883 mA	83%	ICH7548S05
	12.0 V	6.25 A	50 mA	1838 mA	85%	ICH7548S12
	15.0 V	5.00 A	50 mA	1838 mA	85%	ICH7548S15
	24.0 V	3.13 A	50 mA	1820 mA	86%	ICH7548S24

Input Voltage	Output Voltage	Output Current	Input Current ⁽⁴⁾		Efficiency	Model Number ⁽²⁾
			No Load	Full Load		
9-18 VDC (24 V nominal)	3.3 V	15.00 A	50 mA	2611 mA	79%	ICH7524WS3V3
	5.0 V	15.00 A	50 mA	3811 mA	82%	ICH7524WS05
	12.0 V	6.25 A	50 mA	3765 mA	83%	ICH7524WS12
	15.0 V	5.00 A	50 mA	3720 mA	84%	ICH7524WS15
	24.0 V	3.12 A	50 mA	3720 mA	84%	ICH7524WS24
18-36 VDC (24 V nominal)	3.3 V	15.00 A	50 mA	1289 mA	80%	ICH7548WS3V3
	5.0 V	15.00 A	50 mA	1883 mA	83%	ICH7548WS05
	12.0 V	6.25 A	50 mA	1860 mA	84%	ICH7548WS12
	15.0 V	5.00 A	50 mA	1838 mA	85%	ICH7548WS15
	24.0 V	3.12 A	50 mA	1835 mA	85%	ICH7548WS24

† Available from Farnell & element14. See pages 284-290.

^ Available from Newark. See pages 291-296.

Models & Ratings

ICH/IFH Series **XP**

Input Voltage	Output Voltage	Output Current	Input Current ⁽⁴⁾		Efficiency	Model Number ⁽²⁾
			No Load	Full Load		
18-36 VDC (24 V nominal)	2.5 V	20.00 A	50 mA	2705 mA	77%	ICH10024S2V5
	3.3 V	20.00 A	50 mA	3480 mA	79%	ICH10024S3V3
	5.0 V	20.00 A	50 mA	5020 mA	83%	ICH10024S05
	12.0 V	8.30 A	50 mA	4880 mA	85%	ICH10024S12†^
	15.0 V	6.70 A	50 mA	4925 mA	85%	ICH10024S15
	24.0 V	4.17 A	50 mA	4905 mA	85%	ICH10024S24
36-75 VDC (48 V nominal)	2.5 V	20.00 A	50 mA	1335 mA	78%	ICH10048S2V5
	3.3 V	20.00 A	50 mA	1720 mA	80%	ICH10048S3V3
	5.0 V	20.00 A	50 mA	2480 mA	84%	ICH10048S05
	12.0 V	8.30 A	50 mA	2442 mA	85%	ICH10048S12
	15.0 V	6.70 A	50 mA	2463 mA	85%	ICH10048S15
	24.0 V	4.17 A	50 mA	2463 mA	85%	ICH10048S24

Input Voltage	Output Voltage	Output Current	Input Current ⁽⁴⁾		Efficiency	Model Number ⁽²⁾
			No Load	Full Load		
9-36 VDC (24 V nominal)	3.3 V	20.00 A	35 mA	3374 mA	81%	ICH10024WS3V3
	5.0 V	20.00 A	35 mA	4990 mA	83%	ICH10024WS05
	12.0 V	8.30 A	35 mA	4902 mA	85%	ICH10024WS12
	15.0 V	6.70 A	35 mA	4817 mA	86%	ICH10024WS15
	24.0 V	4.17 A	35 mA	4849 mA	86%	ICH10024WS24
18-75 VDC (48 V nominal)	3.3 V	20.00 A	30 mA	1708 mA	80%	ICH10048WS3V3
	5.0 V	20.00 A	30 mA	2422 mA	86%	ICH10048WS05
	12.0 V	8.30 A	30 mA	2408 mA	86%	ICH10048WS12
	15.0 V	6.70 A	30 mA	2381 mA	87%	ICH10048WS15
	24.0 V	4.17 A	30 mA	2367 mA	88%	ICH10048WS24

Input Voltage	Output Voltage	Output Current	Input Current ⁽⁴⁾		Efficiency	Model Number ⁽²⁾
			No Load	Full Load		
36-75 VDC (48 V nominal)	2.5 V	30.00 A	25 mA	2.10 A	74%	ICH15048S2V5
	3.3 V	30.00 A	25 mA	2.60 A	79%	ICH15048S3V3
	5.0 V	30.00 A	25 mA	3.70 A	83%	ICH15048S05
	12.0 V	12.50 A	25 mA	3.60 A	85%	ICH15048S12
	15.0 V	10.00 A	25 mA	3.60 A	85%	ICH15048S15
	24.0 V	6.25 A	25 mA	3.60 A	85%	ICH15048S24

Input Voltage	Output Voltage	Output Current	Input Current ⁽⁴⁾		Efficiency	Model Number ⁽²⁾
			No Load	Full Load		
36-75 VDC (48 V nominal)	2.5 V	40.00 A	25 mA	2.8 A	74%	IFH20048S2V5
	3.3 V	40.00 A	25 mA	3.5 A	79%	IFH20048S3V3
	5.0 V	40.00 A	25 mA	5.0 A	83%	IFH20048S05
	12.0 V	17.00 A	25 mA	5.0 A	85%	IFH20048S12
	15.0 V	13.30 A	25 mA	5.0 A	85%	IFH20048S15
	24.0 V	8.33 A	25 mA	5.0 A	85%	IFH20048S24
	28.0 V	7.14 A	25 mA	4.7 A	89%	IFH20048S28
	48.0 V	4.20 A	25 mA	4.7 A	90%	IFH20048S48

Notes

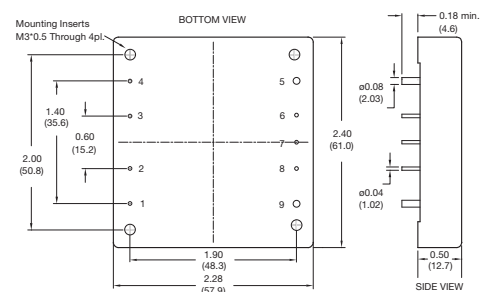
- Logic compatibility: Module On = Open circuit (or >3.5 VDC for ICH100 W models). Module Off = <0.8 VDC (<1.8 VDC for ICH100 W models).
- Add suffix 'N' to the model number to receive the unit with negative logic Remote On/Off.
- Ripple & noise is measured with a 10 μ F tantalum capacitor and 0.1 μ F ceramic capacitor across output.
- Input current specified at 24 V for 18-36 & 9-36 VDC and 48 V for 36-75 & 18-75 VDC models.
- For dual output models available, contact sales.

† Available from Farnell. See pages 284-290.

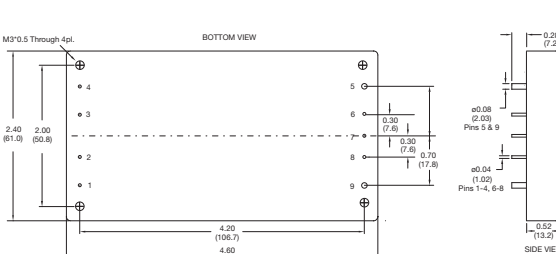
^ Available from Newark. See pages 291-296.

Mechanical Details

ICH50 to ICH150



IFH200



PIN CONNECTIONS	
Pin	Function
1	+Vin
2	On/Off
3	Case*
4	-Vin
5	-Vout
6	-Sense
7	Trim
8	+Sense
9	+Vout

* IFH200: N.C.

Notes

- All dimensions are in inches (mm)
- Weight: ICH50: 0.194 lbs (88 g)
ICH50W: 0.207 lbs (94 g)
ICH75: 0.202 lbs (92 g)
ICH75W: 0.207 lbs (94 g)
ICH100: 0.209 lbs (95 g)
ICH150: 0.220 lbs (100 g)
IFH200: 0.425 lbs (193 g)
- Case tolerance: ± 0.02 (± 0.50)
- Pin diameter tolerance: ICH series ± 0.002 (± 0.05), ± 0.004 (± 0.1),
IFH series ± 0.006 (± 0.15)
- Case Material: ICH50/75/100/150 - Aluminium
IFH200 - Aluminium baseplate with plastic case
- Pin pitch tolerance: ± 0.01 (± 0.25)

Derating Curves

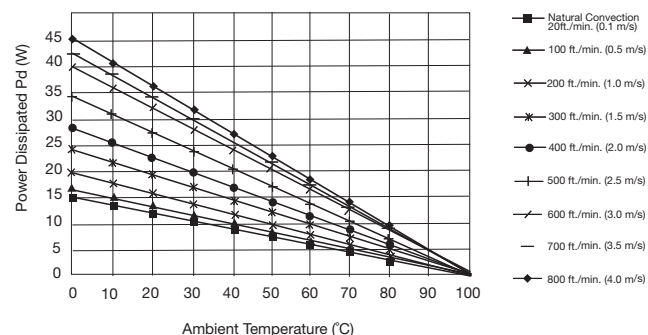
ICH/IFH Series **XP**

THERMAL RESISTANCE vs AIR FLOW		
Air Flow Rate	ICH Typical Rca	IFH Typical Rca
Natural Convection 20 ft./min (0.1 m/s)	7.12 °C/W	3.82 °C/W
100 ft./min (0.5 m/s)	6.21 °C/W	3.23 °C/W
200 ft./min (1.0 m/s)	5.17 °C/W	2.71 °C/W
300 ft./min (1.5 m/s)	4.29 °C/W	2.28 °C/W
400 ft./min (2.0 m/s)	3.64 °C/W	1.92 °C/W
500 ft./min (2.5 m/s)	2.96 °C/W	1.68 °C/W
600 ft./min (3.0 m/s)	2.53 °C/W	1.50 °C/W
700 ft./min (3.5 m/s)	2.37 °C/W	1.35 °C/W
800 ft./min (4.0 m/s)	2.19 °C/W	1.23 °C/W

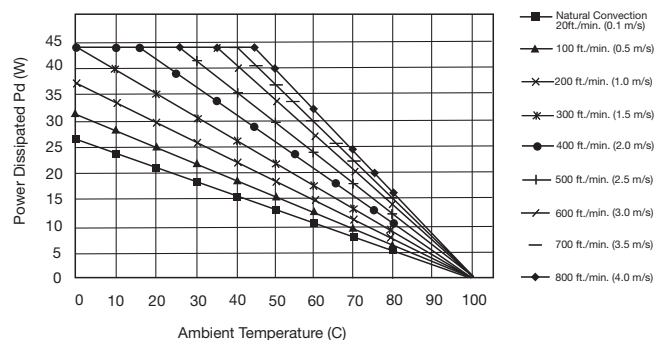
Temperature Rise = $P_d \times R_{ca}$, Where P_d = $P_{in} - P_{out}$ or $P_{out} (1-\eta) / \eta$, Where η = efficiency

Maximum Power Dissipation vs Ambient Temperature and Air Flow (without Heatsink)

ICH50-150S

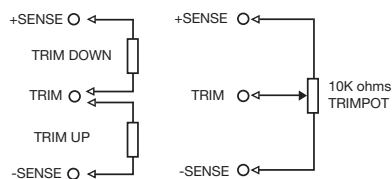


IFH200S



Application Notes

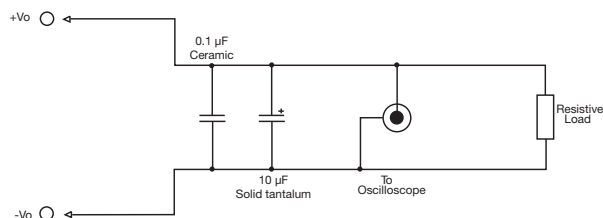
External Output Trimming



LOGIC TABLE		
Logic State (Pin 2)	Positive Logic	Negative Logic (-N)
Logic Low Switch Closed	Module Off	Module On
Logic High Switch Open	Module On	Module Off

Output may be trimmed by $\pm 10\%$ ($\pm 5\%$ for dual output models) with a fixed resistor or an external trimpot as shown.
Contact sales for details.

Output Noise



Output noise is measured with a 10 μ F tantalum capacitor and 0.1 μ F ceramic capacitor across output.
Oscilloscope limited to 20 MHz bandwidth

5-35 Watts

MTC Series



- 10-50 VDC Input Range
- Designed for Vetricon & Avionic Use
- Single & Dual Output Versions
- -55 °C Operation Available
- MIL-STD 461 and DEF-STAN 59-411
- MIL-STD 1275 and DEF-STAN 61-5
- 3 Year Warranty

Specification

Input

Input Voltage Range	• 15.5-40.0 VDC
Transient Input Range	• 10 VDC for 10 s 50 VDC for 1 s
Turn On	• <15.5 VDC
Turn Off	• <10 VDC
Input Reverse Voltage Protection	• None
Max Input Current	• See table

Output

Output Voltage	• See table
Output Voltage Trim	• See table (not available for dual outputs)
Minimum Load	• No minimum load required
Line Regulation	• $\pm 1\%$ Vout nominal (15.5-40.0 Vin)
Load Regulation	• $\pm 1\%$ Vout nominal
Cross Regulation	• $\pm 3\%$ with 150 mA min load (Dual output only) see longform datasheet for more information
Output Set Tolerance	• ± 100 mV or $\pm 2\%$ whichever is greater
Ripple & Noise	• ≤ 5 Vout: 75 mV pk-pk max, >5 Vout: 1% pk-pk, at max load & 20 MHz bandwidth
Overvoltage Protection	• 110-120% Vout max (15 W & 30 W versions only)
Overcurrent Protection	• 105-150% at nominal input voltage
Short Circuit Protection	• Trip and restart
Overtemperature Protection	• 102 °C to 107 °C, 2 °C to 5 °C hysteresis
Remote Sense	• 0.5 V (Single output only)
Load Step Output Transient	• $< \pm 3\%$ of Vout nom (25-75% load)
Load Step Recovery	• 500 μ s within 1% of nominal value
Line Step Output Transient	• $< \pm 3\%$ of nominal Vout (15.5-40.0 Vin)
Line Step Recovery	• 500 μ s within 1% of nominal value
Start Up Time	• <100 ms
Maximum Capacitive Load	• 300 μ F x Iout max startup within 100 ms

General

Efficiency	• See tables and performance curves
Isolation	• 1500 VDC Input to Output, 1000 VDC Input to Case, 500 VDC Output to Case
Switching Frequency	• Fixed 450 kHz typical
Frequency Synchronization	• 400-500 kHz
Inhibit	• Off = TTL Low or short circuit On = TTL High or open circuit
Power Density	• MTC05: 15.3 W/in ³ , MTC15: 24.4 W/in ³ , MTC30: 14.5 W/in ³
MTBF	• MTC05: 1.7 Mhrs, MTC15: 890 khrs MTC30: 740 khrs, to MIL-HDBK-217F at +40 °C, GF

Environmental

Case Temperature	• -40 °C to +100 °C, -55 °C to +100 °C extended range '-LT'
Storage Temperature	• -50 °C to + 125 °C
Cooling	• Conduction cooling through baseplate
Operating Humidity	• 88% Relative Humidity 240 hrs MIL-STD-810D Method 507.2
Operating Altitude	• Tested to 70000 ft (21336 m)
Shock	• 100 g MIL-STD-810D Method 516.3
Vibration	• 5 to 500 Hz MIL-STD-810D Method 514.3
Bump	• 2000 Bumps in each axis 40 g MIL-STD-810D Method 516.3
Salt Atmosphere	• 48 hrs MIL-STD-810E Method 509.3

Environmental Screening & Low Temperature

All standard products are stress-screened and electrically tested over the operating temperature range. See notes for option details.

EMC

Conducted Emissions	• EN55022 conducted level B* MIL-STD 461E/F CE102* DEF STAN 59-411 DCE01/DCE02*
Immunity	• MIL-STD-704 A*, MIL-STD-704 B-F MIL-STD-1275A/B/C/D*
Conducted Susceptibility	• MIL-STD-461E/F CS101 CS114, CS115, CS116* DEF-STAN 61-5 part 6 issue 5*

* MTF50 Filter Module required to meet these standards

Models and Ratings

MTC05 XP

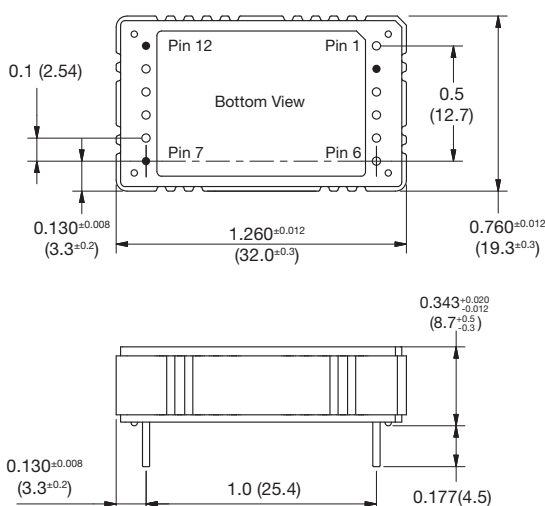
Output Power	Output Voltage			Output Current	Input Current ⁽⁵⁾		Efficiency	Model Number ^(3,4)
	Nominal	Min ⁽¹⁾	Max ⁽¹⁾		No Load	Full Load		
4 W	3.3 VDC	3.3 VDC	4.0 VDC	1.21 A	0.03 A	0.18 A	80%	MTC0528S3V3 [^]
4 W	5.0 VDC	4.0 VDC	6.0 VDC ⁽²⁾	0.80 A	0.02 A	0.19 A	77%	MTC0528S05 [^]
5 W	12.0 VDC	9.0 VDC	13.8 VDC	0.42 A	0.02 A	0.23 A	78%	MTC0528S12 [^]
5 W	15.0 VDC	11.0 VDC	17.0 VDC	0.33 A	0.01 A	0.23 A	77%	MTC0528S15 [^]
5 W	28.0 VDC	20.0 VDC	30.0 VDC	0.18 A	0.02 A	0.22 A	78%	MTC0528S28 [^]

Notes

1. Indicates maximum and minimum voltage adjustment (maximum includes Remote Sense adjustment).
2. The full trim range is not available when the input is <15.5 V.
3. For additional ESS screening, add the suffix '-ESS' to the part number e.g. MTC0528S05-ESS.
4. For -55 °C extended operating range option, add suffix '-LT' to the part number e.g. MTC0528S05-LT.
5. Vin = 28 VDC.

[^] Available from Newark. See pages 291-296.

Mechanical Details



MTC05 Connections	
Pin	Function
1	Case
2	No Pin
3	-Vin
4	+Vin
5	Synchronization
6	Inhibit
7	No Pin
8	Adjust
9	+Sense
10	+Vout
11	-Vout
12	No Pin

Notes.

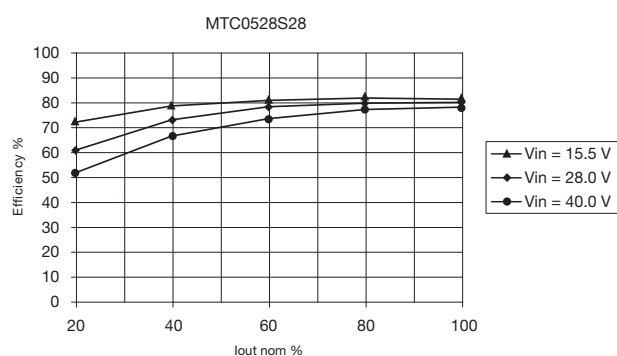
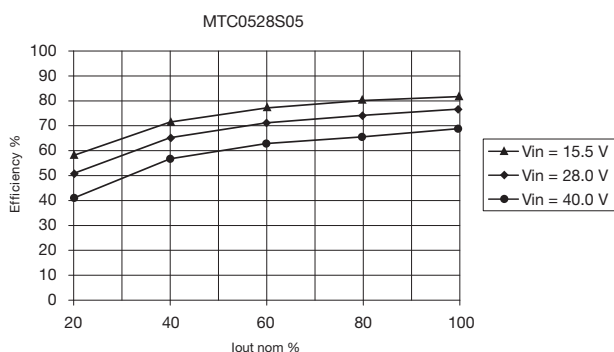
1. Dimensions are in inches (mm)
2. Tolerance: ±0.02 inches (±0.5 mm) except where indicated.
3. Weight: 0.02 lb (10 g)
4. Materials & Finish:
 - Pin - Diameter: 0.032 (0.8)
Material: Cu Zn30 2.5 µm Ni
Finish: 0.2-0.5 µm AU (HV 170-200)
 - Case - Material: Aluminium (Al Mg Si 0.5)
Finish: Chromated
 - Nameplate - Non-conductive plastic

Accessories

For more information contact sales office or visit www.xppower.com.

- For thermal pad, order model number MTC05 PAD.
- For spacers, order model number MTC05 1 mm SPACER or MTC05 4 mm SPACER.

Efficiency Curves



Models and Ratings

MTC15 **XP**

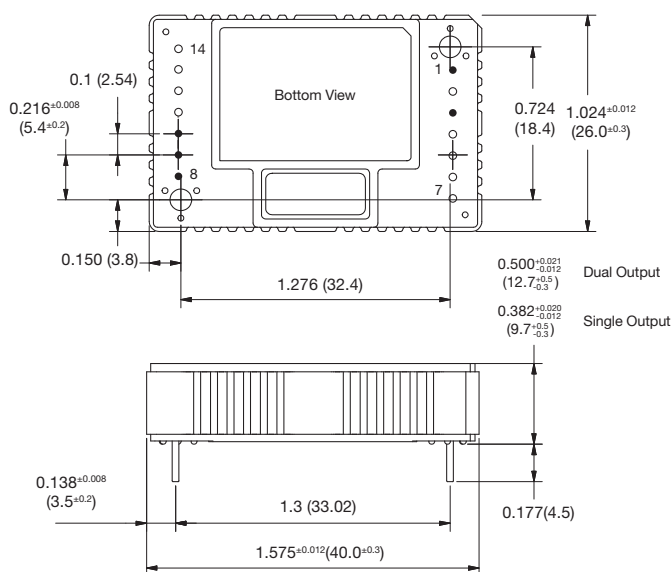
Output Power	Output Voltage			Output Current	Input Current ⁽⁴⁾		Efficiency	Model Number ^(2,3)
	Nominal	Min ⁽¹⁾	Max ⁽¹⁾		No Load	Full Load		
10 W	3.3 VDC	3.3 VDC	4.0 VDC	3.03 A	0.04 A	0.46 A	77%	MTC1528S3V3 [^]
12 W	5.0 VDC	4.0 VDC	6.0 VDC	2.40 A	0.05 A	0.53 A	81%	MTC1528S05 [^]
15 W	12.0 VDC	9.0 VDC	13.8 VDC	1.25 A	0.04 A	0.67 A	80%	MTC1528S12 [^]
15 W	15.0 VDC	11.0 VDC	17.0 VDC	1.00 A	0.05 A	0.67 A	80%	MTC1528S15 [^]
15 W	28.0 VDC	20.0 VDC	30.0 VDC	0.54 A	0.03 A	0.69 A	78%	MTC1528S28 [^]
15 W ⁽⁵⁾	±12 VDC			±1.0 A ⁽⁵⁾	0.03 A	0.68 A	80%	MTC1528D12 [^]
15 W ⁽⁵⁾	±15 VDC			±0.8 A ⁽⁵⁾	0.03 A	0.68 A	80%	MTC1528D15 [^]

Notes

1. Indicates maximum and minimum voltage adjustment (maximum includes Remote Sense adjustment).
2. For additional ESS screening, add the suffix '-ESS' to the part number e.g. MTC1528S05-ESS.
3. For -55 °C extended operating range option, add suffix '-LT' to the part number e.g. MTC1528S05-LT.
4. Typical with $V_{in} = 28$ VDC.
5. Max power 15 W must not be exceeded.

[^] Available from Newark. See pages 291-296.

Mechanical Details



MTC15 Connections		
Pin	Single Output	Dual Output
1	No Pin	No Pin
2	Case	Case
3	No Pin	No Pin
4	- Vin	- Vin
5	Synchronization	Synchronization
6	+ Vin	+ Vin
7	Inhibit	Inhibit
8	No Pin	No Pin
9	No Pin	No Pin
10	No Pin	-Vout
11	+ Sense	No Pin
12	- Vout	COM
13	Adjust	No Pin
14	+ Vout	+ Vout

Notes

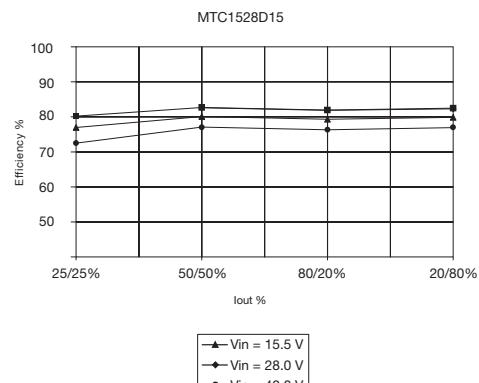
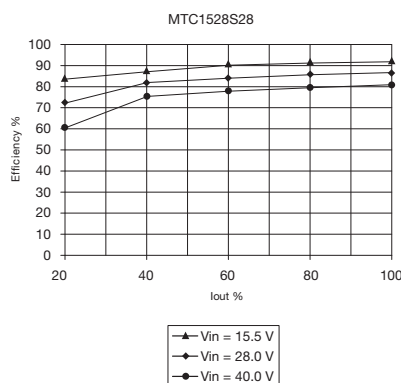
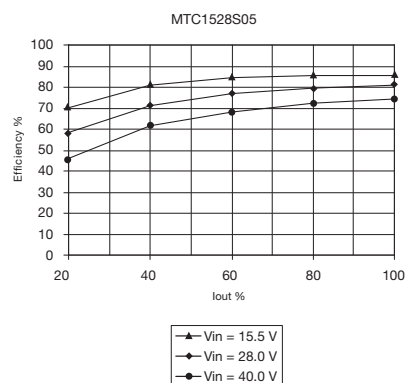
1. Dimensions are in inches (mm)
2. Tolerance: ±0.02 inches (±0.5 mm) except where indicated.
3. Weight: 0.04 lb (20 g)
4. Materials & Finish:
 - Pin - Diameter: 0.032 (0.8)
 - Material: Cu Zn30 2.5 µm Ni
 - Finish: 0.2-0.5 µm AU (HV 170-200)
 - Mounting Hole - Diameter: 0.102 (2.6)
 - Case - Material: Aluminium (Al Mg Si 0.5)
 - Finish: Chromated
 - Nameplate - Non-conductive plastic

Accessories

For more information contact sales office or visit www.xppower.com.

- For thermal pad, order model number MTC15 PAD.
- For spacers, order model number MTC15 3 mm SPACER.

Efficiency Curves



Models and Ratings

MTC30 **XP**

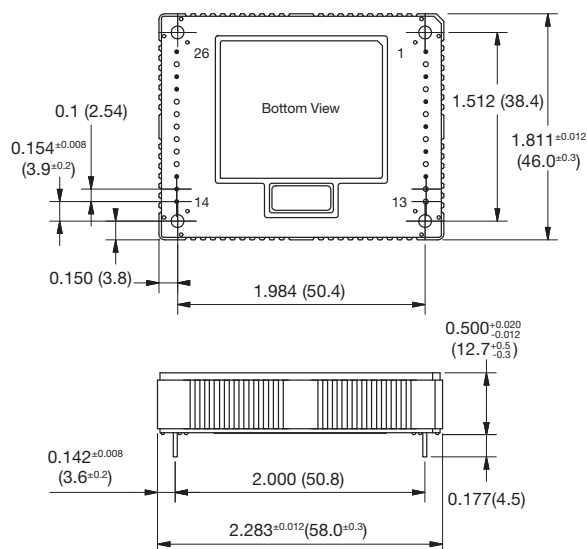
Output Power	Output Voltage			Output Current	Input Current ⁽⁶⁾		Efficiency	Model Number ^(3,4)
	Nominal	Min ⁽¹⁾	Max ⁽¹⁾		No Load	Full Load		
20 W	3.3 VDC	3.3 VDC	4.0 VDC	6.06 A	0.06 A	0.89 A	80%	MTC3028S3V3 [^]
25 W	5.0 VDC	4.0 VDC	6.0 VDC	5.00 A	0.09 A	1.08 A	83%	MTC3028S05 [^]
32 W	12.0 VDC	9.0 VDC	13.8 VDC ⁽²⁾	2.70 A	0.05 A	1.41 A	81%	MTC3028S12 [^]
35 W	15.0 VDC	11.0 VDC	17.0 VDC ⁽²⁾	2.33 A	0.06 A	1.54 A	81%	MTC3028S15 [^]
35 W	28.0 VDC	20.0 VDC	30.0 VDC	1.25 A	0.07 A	1.51 A	83%	MTC3028S28 [^]
30 W ⁽⁶⁾	±12 VDC			±2.0 A ⁽⁶⁾	0.04 A	1.33 A	81%	MTC3028D12 [^]
30 W ⁽⁶⁾	±15 VDC			±1.6 A ⁽⁶⁾	0.04 A	1.33 A	80%	MTC3028D15 [^]

Notes

1. Indicates maximum and minimum voltage adjustment (Maximum includes Remote Sense adjustment).
2. The full trim range is not available when the input is <15.5 V.
3. For additional ESS screening, add the suffix '-ESS' to the part number e.g. MTC3028S05-ESS.
4. For -55 °C extended operating range option, add suffix '-LT' to the part number e.g. MTC3028S05-LT.
5. Typical with $V_{in} = 28$ VDC.
6. Max power 30 W must not be exceeded.

[^] Available from Newark. See pages 291-296.

Mechanical Details



MTC30 Connections		
Pin	Single Output	Dual Output
1	No Pin	No Pin
2	Case	Case
3	No Pin	No Pin
4	- Vin	- Vin
5	No Pin	No Pin
6	+ Vin	+ Vin
7	No Pin	No Pin
8	Synchronization	Synchronization
9	No Pin	No Pin
10	Inhibit	Inhibit
11	No Pin	No Pin
12	Thermal Warning (TW)	Thermal Warning (TW)
13	Signal GND (SGND)	No Pin
14	No Pin	No Pin
15	No Pin	No Pin
16	No Pin	No Pin
17	Adjust	No Pin
18	+ Sense	No Pin
19	+ Vout	+ Vout
20	+ Vout	+ Vout
21	- Vout	COM
22	- Vout	COM
23	No Pin	- Vout
24	No Pin	- Vout
25	- Sense	No Pin
26	No Pin	No Pin

Notes

1. Dimensions are in inches (mm)
2. Tolerance: ±0.02 inches (±0.5 mm) except where indicated.
3. Weight: 0.15 lb (70 g)
4. Materials & Finish:

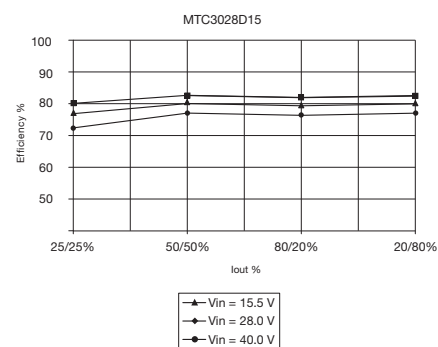
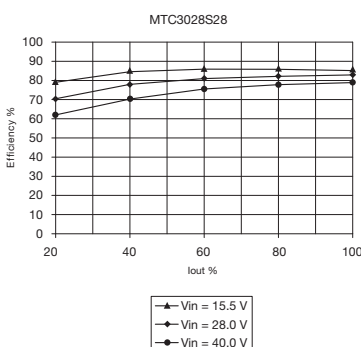
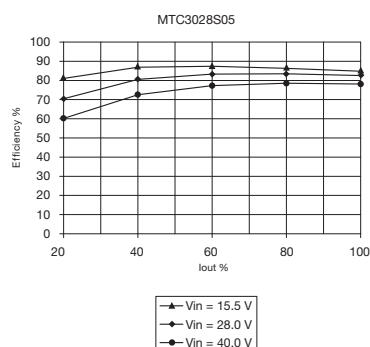
Pin -	Diameter: 0.032 (0.8)
	Material: Cu Zn30 2.5 µm Ni
	Finish: 0.2-0.5 µm AU (HV 170-200)
Mounting Hole -	Diameter: 0.102 (2.6)
Case -	Material: Aluminium (Al Mg Si 0.5)
	Finish: Chromated
Nameplate -	Non-conductive plastic

Accessories

For more information contact sales office or visit www.xppower.com.

- For thermal pad, order model number MTC30 PAD.

Efficiency Curves



Filter Module

MTF50



- Wide Input Voltage Range 10–50 VDC
- Active Surge Protection
- Max Output Power 50 W
- Wide Temperature Range –55 °C to 100 °C
- MIL–STD–461E and DEF–STAN 59–411
- MIL–STD–1275 and DEF–STAN 61–5
- 3 Year Warranty

Specification

Input

- | | |
|---------------------|---|
| Input Voltage Range | • 15.5–40 VDC |
| Input Transient | <ul style="list-style-type: none"> • 10–50 V for 10 s • 600 V for 10 μs 50 Ω source resistance per MIL–STD–704A, 100 V for 50 ms 0.5 Ω source resistance per MIL–STD–1275A, $\pm$250 V for 100 μs as per MIL–STD–1275A |

Output

- | | |
|----------------|---|
| Output Voltage | • Clamped <50 VDC |
| Output Power | • 50 W maximum |
| Inhibit | <ul style="list-style-type: none"> • Off = TTL Low or short circuit • On = TTL High or open circuit |

General

- | | |
|-----------------------------|---|
| Efficiency | • 97% typical |
| Resistance | <ul style="list-style-type: none"> • 0.25 Ω input to output • <0.1 Ω case to case pin at 10A |
| Inhibited Power Dissipation | • 0.1 W |
| Inrush Current | • 25 A at 28 Vin |
| Fusing | • External fusing required |
| MTBF | • 846 kHrs to MIL–HDBK–217F at +40 °C, GF |

Environmental

- | | |
|-----------------------|---|
| Operating Temperature | <ul style="list-style-type: none"> • –40 °C to +85 °C ambient • –40 °C to +100 °C case • Extended Temperature Range: (option –LT) –55 °C to +85 °C ambient • –55 °C to +100 °C case |
| Storage Temperature | • –55 °C to +125 °C |
| Operating Altitude | • Tested to 70000 ft (21336 m) |
| Operating Humidity | <ul style="list-style-type: none"> • 88% relative humidity • 240h MIL–STD–810D Method 507.2 |
| Shock | • 100 g MIL–STD–810D Method 516.3 |
| Vibration | • 5 to 500 Hz MIL–STD–810D Method 514.3 |
| Bump | <ul style="list-style-type: none"> • 2000 Bumps in each axis • 40 g MIL–STD–810D Method 516.3 |
| Salt Atmosphere | • 48 hours MIL–STD–810E Method 509.1 |

EMC

- | | |
|--------------------------|--|
| Conducted Emissions | <ul style="list-style-type: none"> • EN55022 conducted level B. • MIL–STD–461E/F, CE101 & CE102 • DEF–STAN 59–411 DCE01/DCE02 |
| Immunity | <ul style="list-style-type: none"> • MIL–STD–704E, MIL–STD 704A & MIL–STD–1275A/B/C/D • DEF–STAN 61–5 part 6 issue 5 |
| Conducted Susceptibility | <ul style="list-style-type: none"> • MIL–STD–461E/F, CS101, CS114, CS115 & CS116 |

EMC standards are met when used in conjunction with the MTC series of DC/DC converters

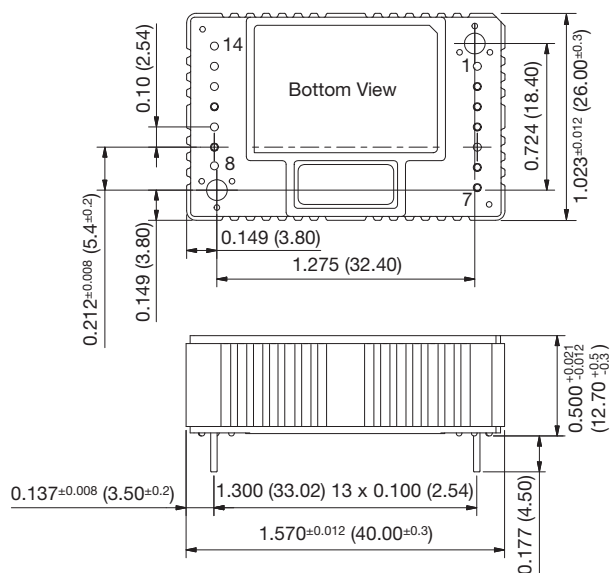
Models & Ratings

Output Voltage	Input Voltage	Efficiency	Model Number
50 VDC max	15.5-40 VDC	97%	MTF50

Notes

1. Add suffix '-LT' to the part number for extended temperature range version (-55 °C).
2. Add suffix '-ESS' to the part number for extended environmental stress screening.

Mechanical Details



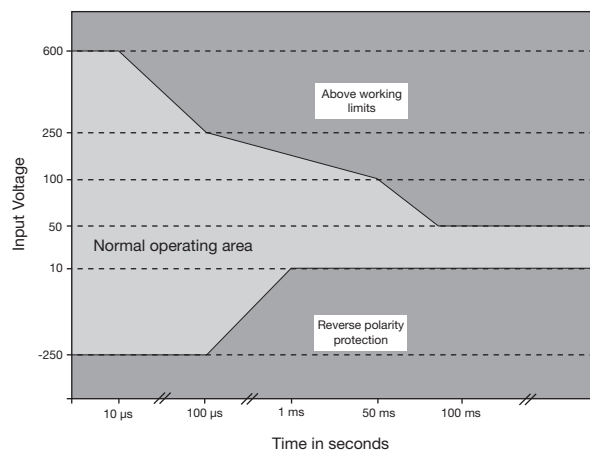
Pin	Function
1	No Pin
2	Case
3	Y-cap
4	-Vin
5	No Pin
6	+Vin
7	INH
8	No Pin
9	+Vout
10	No Pin
11	-Vout
12	No Pin
13	No Pin
14	No Pin

Notes

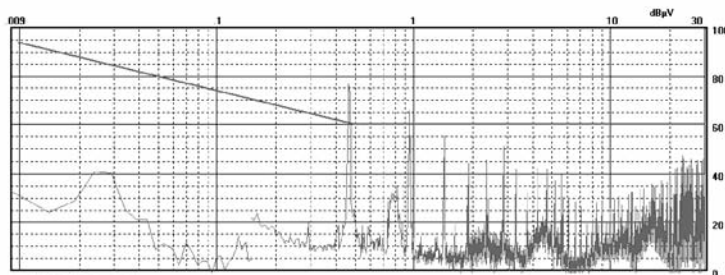
1. Dimensions are in inches (mm)
2. Tolerance: ±0.02 (±0.5) except where indicated
3. Weight: 0.06 lbs (25 g)
4. Materials & Finish:
 - Pin - Diameter: 0.032 (0.8)
 - Material: Cu Zn30 2.5 µm Ni
 - Finish: 0.2-0.5 µm AU (HV 170-200)
 - Mounting Hole - Diameter: 0.102 (2.6)
 - Case - Material: Aluminium (Al Mg Si 0.5)
 - Finish: Chromated
 - Nameplate - Non-conductive plastic

Application Notes

Safe Operating Area

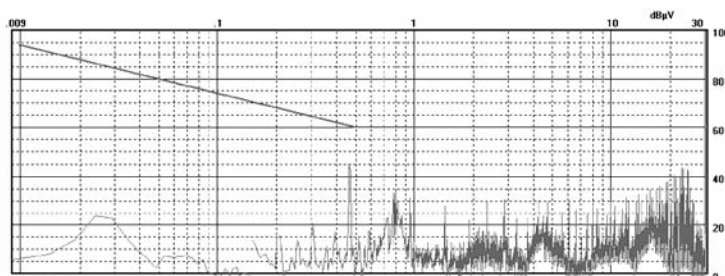
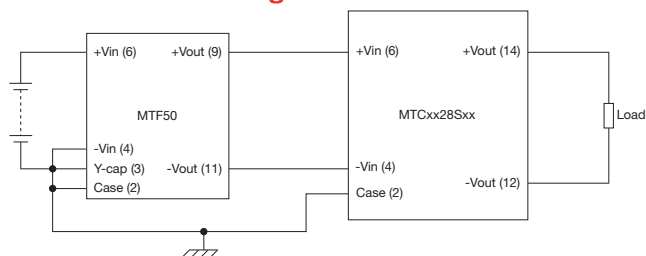


Conducted Emissions



MTC0528S12 without MTF50 filter

EMC Connection Diagram



MTC0528S12 with MTF50 filter

Hold Up Module

MTH100 Series



- Designed for Extended Hold Up Applications
- 80% Less Hold Up Capacitance Required
- Reduces System Size and Weight
- 10 A Output Current
- Wide Input Range
- User Programmable
- 3 Year Warranty

Specification

Input

Input Voltage	• 10-40 VDC (50 VDC for 1 s)
Input Current	• 10.05 A max at full load
Additional Input Charging Current	• 1.5 A typical at 10 V input, during hold up capacitor charging, 2.5 A max
No Load Current	• <50 mA
Power Fail Voltage Threshold (DCFP)	• V_{fail} set by resistor R1, see application notes
Input Reverse Voltage Protection	• Required, see application notes

Output

Output Current	• 10 A max
Output Power	• 100 W max
Voltage Drop	• <130 mV at 10 A max
Output Voltage	• See table
Changeover Capacitor (C2)	• 150 μ F min - 470 μ F max ($\pm 20\%$), see application notes
Hold Up Time	• See application notes

Charger Output

Hold Up Capacitor (C1)	• 1000 μ F min, see application notes
Hold Up Capacitor Charge Time	• See application notes
Set Accuracy	• $\pm 2\%$
Charge Output Voltage (Vcap)	• 35 V -0/+4% CVP pin not connected 45 V -0/+4% CVP pin connected to ground
Overvoltage Protection	• 49 V ± 1 V
Overload Protection	• No damage for overload or short circuit. If output voltage <30 V after 10 s the charger will shut down and re-start after a further 10 s
Overtemperature Protection	• 102-107 °C with 5 °C typical hysteresis
Charge/Discharge Detect Signal (CDD)	• Open collector output, 100 V, 100 mA max Low at 90% Vcap, High at 30% Vcap Tolerance: $\pm 3\%$
Power Fail Detect (DCFD)	• Open collector output, 100 V, 100 mA max Low: $V_{in} >$ fail voltage threshold High: $V_{in} <$ fail voltage threshold Tolerance: $\pm 3\%$

General

Efficiency	• 98% typical
Series Resistance	• 0.013 Ω
Isolation	• 1000 VDC Input to Case 1000 VDC Output to Case
Charger Switching Frequency	• 400 kHz typical
MTBF	• 1.7 Mhrs to MIL-HDBK-217F at 40 °C, GF

Environmental

Operating Temperature	• -40 °C to +100 °C case Extended Temperature Range: (option -LT) -55 °C start up
Storage Temperature	• -50 °C to +125 °C
Operating Altitude	• Tested to 70000 ft (21336 m)
Shock	• 100 g MIL-STD-810D Method 516.3
Vibration	• 10 to 2000 Hz MIL-STD-810D Method 514.3
Bump	• 2000 Bumps in each axis 40 g MIL-STD-810D Method 516.3
Salt Atmosphere	• 48 hours MIL-STD-810E Method 509.1

EMC

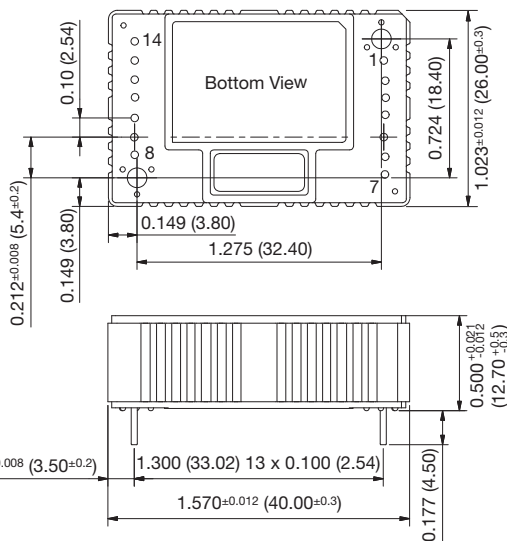
Conducted Emissions	• EN55022 Conducted Level B. MIL-STD-461E/F, CE101 & CE102
Immunity	• MIL-STD-1275A/B/C/D
Conducted Susceptibility	• MIL-STD-461E/F, CS101, CS114, CS115 & CS116

EMC standards are met when used in conjunction with the MTF or DSF filter modules or other external components, consult longform datasheet.

MTH100

Output Voltage	Input Voltage	Efficiency	Model Number
$V_{in} - (I_{out} \times 0.013)^{(1)}$	10 - 40 VDC	98 %	MTH100
$V_{cap} - 0.8 V^{(2)}$			

1. During normal operation.
2. During hold-up time.
3. For -55 °C extended operating range add suffix 'LT' to the part number



Pin	Function	Pin	Function
1	Not fitted	8	Not fitted
2	Case	9	+Vout
3	Not fitted	10	+Vout
4	-Vin	11	Hold-up capacitor voltage, Vcap
5	Input DC fail programming (DCFP)	12	Charge voltage programming (CVP)
6	+Vin	13	Input DC fail detect (DCFD)
7	+Vin	14	Charge/discharge detect (CDD)

1. Dimensions are in inches (mm)
2. Tolerance: ± 0.02 (± 0.5) unless otherwise stated
3. Weight: 0.06 lb (25 g)
4. Materials & Finish:
 - Pin - Diameter: 0.032 (0.8), Material: Cu Zn30 2.5 μ m Ni
Finish: 0.2-0.5 μ m AU (HV 170-200)
 - Mounting Hole - Diameter: 0.102 (2.6)
 - Case - Material: Aluminium (Al Mg Si 0.5), Finish: Chromated
 - Nameplate - Non-conductive plastic

Maximum charge time at Vin = 10 V			
C1 (μF)	Vcap (V)	Time (s)	
		Typical	Max
10,000	45	1.2	1.5
10,000	35	0.8	1.0
30,000	45	3.4	4.0
30,000	35	2.0	2.4
50,000	45	5.5	6.0
50,000	35	3.2	3.8

$$R1 = \left(\frac{40.67}{V_{fail} - 9.785} - 3.92 \right) \times 10^3$$

$$C1 = \left(\frac{2 \times P_{out} \times t_{hold-up}}{V_{cap}^2 - V_{min}^2} \right) \times 1.1$$

$$C2 = \frac{P_{out} \times 400 \times 10^{-6}}{V_{fail}^2 - V_{min}^2}$$

R1: Resistor setting the input voltage fail threshold (DCFP)

V_{fail} : Required fail voltage

C1: Hold up capacitor (minimum value including tolerance)

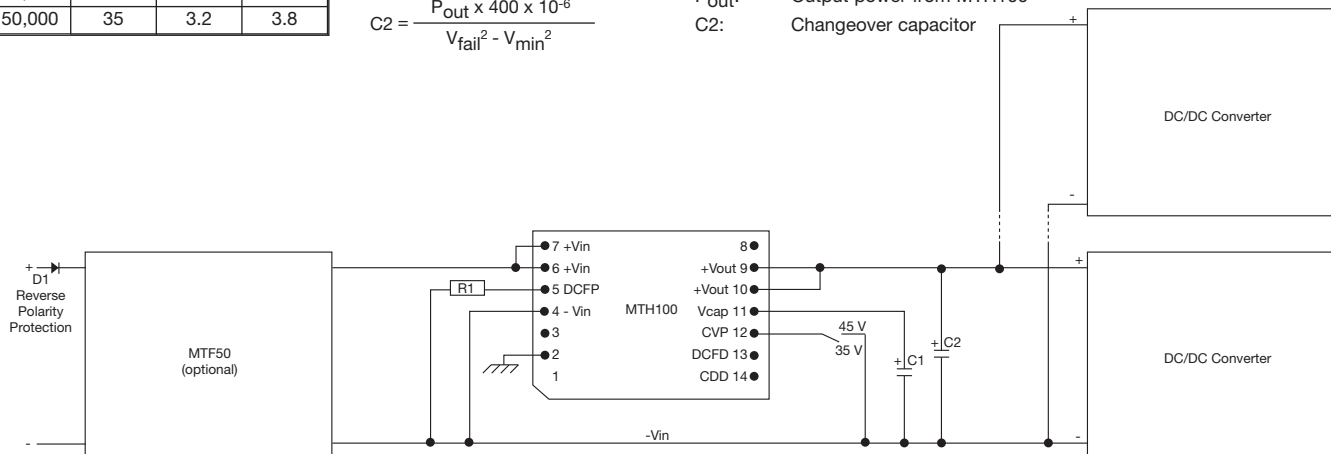
 $t_{\text{hold up}}$: Hold up time required

V_{can} : C1 charge voltage

V_{min}: Minimum DC/DC input voltage (≥10 VDC)

P_{out} : Output power from MTH100

C2: Changeover capacitor



1. C1 has a minimum value of 1000 μF , this enables an open circuit or missing component to be detected. There is no maximum limit other than extended charge time.
2. MTH100 charges the Hold-up capacitor C1 to 45 V max when charge voltage programming (CVP) pin is connected or 35 V when not connected.
3. Input DC fail programming (DCFP) sets the power fail voltage threshold using resistor R1. See formula for the value required.
4. Input DC fail detect (DCFD) is an open collector circuit which changes state when the input voltage fails below the set threshold.
5. Charge/discharge detect (CDD) is an open collector circuit which goes low when C1 is charged to 90% of V_{cap} or high when C1 discharges down to 30% of V_{cap} .
6. See longform datasheet for detailed application information.

MTC Series



- 10-40 VDC Input Range
- Designed for Vetric & Avionic Use
- Magnetic Feedback Technology
- -55 °C to +100 °C Operation
- MIL-STD 461 and DEF-STAN 59-411
- MIL-STD 1275 and DEF-STAN 61-5
- 3 Year Warranty

Specification

Input

Input Voltage Range	• 10.0-40.0 VDC
Transient Input Range	• 50 VDC for 100 ms
Inrush Current	• <40 A at 28 VDC
Turn On	• >9.5 VDC
Turn Off	• <9.0 VDC
Input Reverse Voltage Protection	• None
Input Current	• See table

Output

Output Voltage	• See table
Output Voltage Trim	• -20%, +10% ($\pm 10\%$ for 3.3 V version), see note 2
Minimum Load	• No minimum load required on single output models, 5% load required on each output of dual output models
Line Regulation	• $\pm 1\%$ Vout nominal
Load Regulation	• Single Output: $\pm 1\%$ Vout nominal, Dual Output: $\pm 2\%$
Output Set Tolerance	• $\pm 1.5\%$ max
Ripple & Noise	• ≤ 5 Vout: 50 mV pk-pk max, >5 Vout: 100 mV pk-pk, at max load and 20 MHz bandwidth
Overvoltage Protection	• 120-140% Vout max
Overcurrent Protection	• 110-140% at nominal Iout, constant power down to 40-50% of nominal output voltage
Short Circuit Protection	• Continuous trip and restart (hiccup mode) until the short is removed
Maximum Capacitive Load	• 300 μ F x Iout max for startup within 100 ms
Thermal Warning	• Active when internal temp is >105 °C
Remote Sense	• Compensates for 0.5 V total voltage drop
Cross Regulation	• $\pm 4\%$ on dual outputs (see note 3)
Transient Response	• $\pm 4\%$ max deviation recovery to within 1% in 500 μ s for a 50% load change at 0.1 A/ μ s
Start Up Time	• <100 ms
Start Up Rise Time	• <20 ms
Current Share	• Parallel up to 4 modules, single output versions only (MTC75 & 150 only)
Temperature Coefficient	• 0.03%/°C
Remote On/Off	• On: ≥ 3.5 V or open circuit, Off: ≤ 1.8 V

General

Efficiency	• See table
Isolation	• 1500 VDC Input to Output 1000 VDC Input to Case 1000 VDC Output to Case
Isolation Capacitance	• 2500 pF
Switching Frequency	• Fixed, 400 kHz typical (MTC35 & 50) 450 kHz typical (MTC75 & 150)
Frequency Synchronization	• 400-500 kHz (MTC35 & 50) 450-550 kHz (MTC75 & 150)
Power Density	• MTC35: 31.8 W/in ³ , MTC50: 30.2 W/in ³ , MTC75: 27.4 W/in ³ , MTC150: 54.8 W/in ³
MTBF	• >1 Mhrs to MIL-HDBK-217F at 25 °C, GF

Environmental

Case Temperature	• -40 °C to +100 °C (start up at -55 °C)
Storage Temperature	• -60 °C to +125 °C
Cooling	• Conduction cooling through baseplate
Operating Humidity	• 95% Relative Humidity 240 hrs MIL-STD-810F Method 507.4
Operating Altitude	• Tested to 70000 ft (21336 m)
Shock	• 75 g MIL-STD-810F Method 516.5
Vibration	• 15 to 2000 Hz MIL-STD-810F Method 514.5, table 514.5-VIII
Bump	• 2000 Bumps in each axis 40 g MIL-STD-810F Method 516.5
Salt Atmosphere	• 48 hrs MIL-STD-810F Method 509.4

EMC

Conducted Emissions	• EN55022 Conducted Level B* MIL-STD 461F: CE102* DEF STAN 59-411 DCE01/DCE02*
Immunity	• MIL-STD-704 B-F, MIL-STD-1275A/B/C/D*
Conducted Susceptibility	• MIL-STD-461F CS101, CS114, CS115, CS116* DEF-STAN 61-5 part 6 issue 5*

* When used in conjunction with standard EMI filter and surge protection modules, DSF and FSO series. Consult longform datasheet.

Models and Ratings

MTC35/50 **XP**

Output Power	Output Voltage	Output Current	Input Current ⁽¹⁾		Efficiency ⁽¹⁾	Model Number
			No Load	Full Load		
35 W	3.3 VDC	10.00 A	100 mA	1.49 A	84%	MTC3528S3V3
35 W	5.0 VDC	7.00 A	100 mA	1.45 A	86%	MTC3528S05
35 W	12.0 VDC	2.90 A	100 mA	1.41 A	88%	MTC3528S12
35 W	15.0 VDC	2.30 A	100 mA	1.40 A	88%	MTC3528S15
35 W	28.0 VDC	1.30 A	100 mA	1.48 A	88%	MTC3528S28
50 W	3.3 VDC	15.00 A	100 mA	2.18 A	82%	MTC5028S3V3
50 W	5.0 VDC	10.00 A	60 mA	2.15 A	83%	MTC5028S05
50 W	12.0 VDC	4.20 A	70 mA	2.13 A	84%	MTC5028S12
50 W	15.0 VDC	3.33 A	70 mA	2.13 A	84%	MTC5028S15
50 W	28.0 VDC	1.80 A	120 mA	2.15 A	83%	MTC5028S28

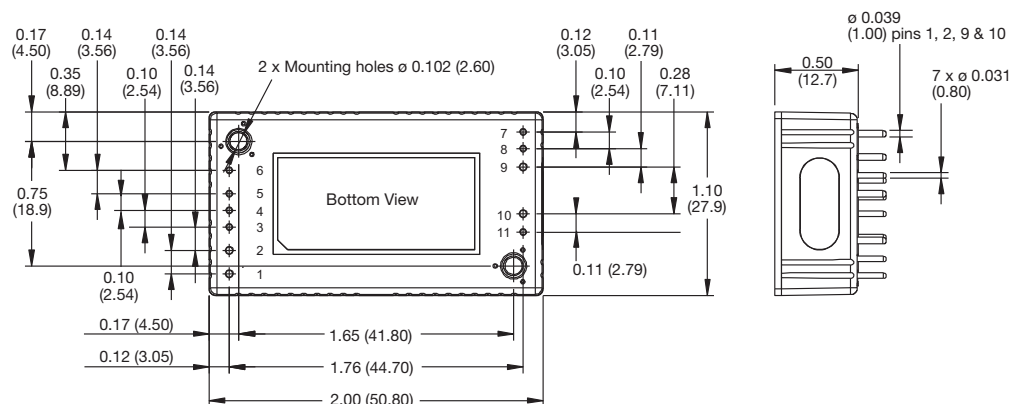
Notes

1. Typical and measured at 28 V input

2. Total of voltage trim and remote sense is +10% max.

Mechanical Details

MTC35



Notes

- Dimensions are in inches (mm)
- Tolerance: ± 0.02 inches (± 0.5 mm)
- Weight: 0.07 lb (35 g) approx

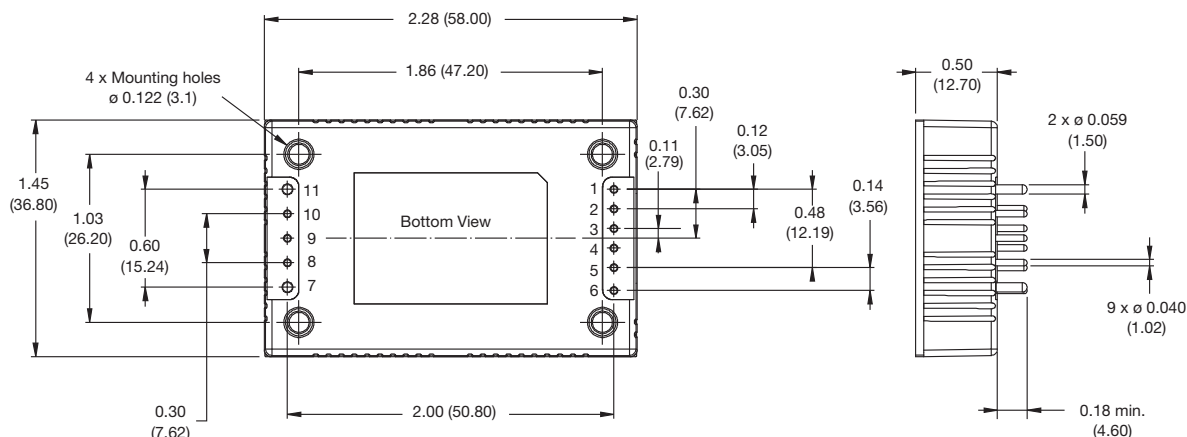
4. Materials & Finish:

Pin - Material: Copper
Finish: Nickel plated 2.5 μ m Ni and gold plated 0.3 μ m Au.

Mounting Hole Diameter - 0.10 (2.7) clearance hole
Baseplate - Material: Aluminium
Case - Material: Non-conductive plastic

Pin Connections			
Pin	Single Output	Pin	Single Output
1	+Vin	7	Trim
2	-Vin	8	-Sense
3	Thermal Warning (TW)	9	-Vout
4	Synchronization	10	+Vout
5	Inhibit (Inh.)	11	+Sense
6	Case		

MTC50



Notes

- Dimensions are in inches (mm)
- Tolerance: ± 0.02 inches (± 0.5 mm)
- Weight: 0.14 lb (62 g) approx

4. Materials & Finish:

Pin - Material: Copper
Finish: Nickel plated 2.5 μ m Ni and gold plated 0.3 μ m Au.

Mounting Hole Diameter - 0.126 (3.2) clearance hole

Baseplate - Material: Aluminium
Case - Material: Non-conductive plastic

Pin Connections			
Pin	Single Output	Pin	Single Output
1	+Vin	7	-Vout
2	Remote On/Off	8	-Sense
3	Synchronization	9	Trim
4	Thermal Warning (TW)	10	+Sense
5	-Vin	11	+Vout
6	Case		

Models and Ratings

MTC75/150 **XP**

Output Power	Output Voltage	Output Current	Input Current ⁽¹⁾		Efficiency ⁽¹⁾	Model Number
			No Load	Full Load		
66 W	3.3 VDC	20.00 A	120 mA	2.87 A	82%	MTC7528S3V3
75 W	5.0 VDC	15.00 A	130 mA	3.19 A	84%	MTC7528S05
75 W	12.0 VDC	6.25 A	60 mA	3.19 A	84%	MTC7528S12
75 W	15.0 VDC	5.00 A	40 mA	3.19 A	84%	MTC7528S15
75 W	28.0 VDC	2.70 A	75 mA	3.23 A	83%	MTC7528S28
75 W	±12.0 VDC	±3.13 A ⁽⁴⁾	220 mA	3.23 A	83%	MTC7528D12 ⁽³⁾
75 W	±15.0 VDC	±2.50 A ⁽⁴⁾	230 mA	3.27 A	82%	MTC7528D15 ⁽³⁾
132 W	3.3 VDC	40.00 A	120 mA	5.82 A	81%	MTC15028S3V3
150 W	5.0 VDC	30.00 A	147 mA	6.38 A	84%	MTC15028S05
150 W	12.0 VDC	12.50 A	70 mA	6.38 A	84%	MTC15028S12
150 W	15.0 VDC	10.00 A	75 mA	6.30 A	86%	MTC15028S15
150 W	28.0 VDC	5.35 A	170 mA	6.30 A	86%	MTC15028S28
150 W	±12.0 VDC	±6.25 A ⁽⁴⁾	250 mA	6.38 A	84%	MTC15028D12 ⁽³⁾
150 W	±15.0 VDC	±5.00 A ⁽⁴⁾	275 mA	6.31 A	85%	MTC15028D15 ⁽³⁾

Notes

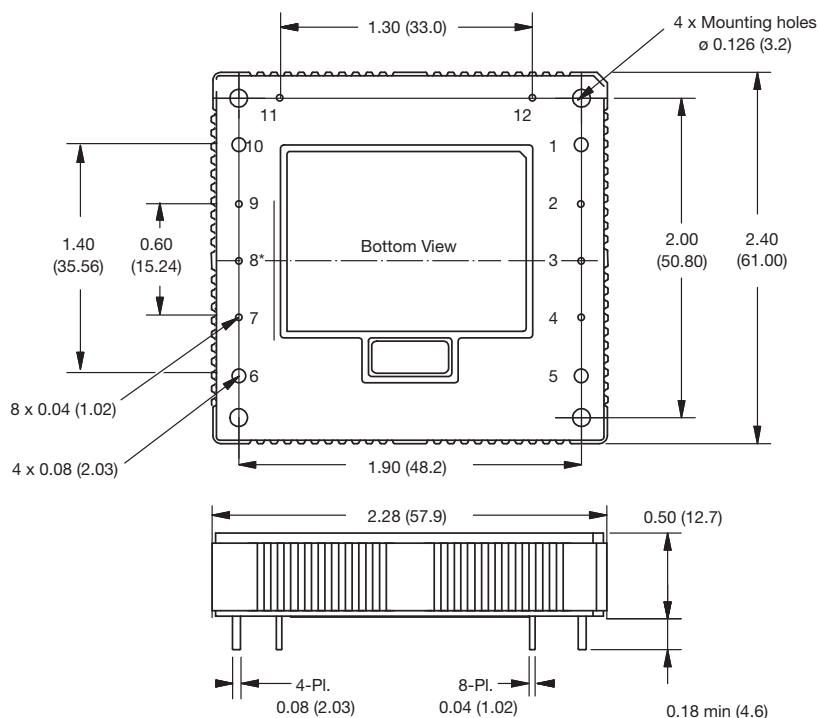
1. Typical and measured at 28 V input

2. Total of voltage trim and remote sense is +10% max.

3. Minimum load of 5% required on one output for ±4% regulation on the other.

4. Each output can deliver 70% of the combined current when other output delivers between 5% and 30%.

Mechanical Details



Notes

1. Dimensions are in inches (mm)

2. Tolerance: ±0.02 inches (±0.5 mm)

3. Weight: 0.28 lb (128 g) approx

4. Materials & Finish:

Pin -	Material: Copper
	Finish: Nickel plated 2.5 µm Ni and gold plated 0.3 µm Au.
Mounting Hole Diameter -	0.126 (3.2) clearance hole
Baseplate -	Material: Aluminium
Case -	Material: Non-conductive plastic

*On dual output versions, Pin 8 is 0.08 (2.03)

Pin Connections		
Pin	Single Output	Dual Output
1	+Vin	+Vin
2	Remote On/Off	Remote On/Off
3	Thermal Warning (TW)	Thermal Warning (TW)
4	Case	Case
5	-Vin	-Vin
6	-Vout	-Vout
7	-Sense	Trim
8*	Trim	Common
9	+Sense	No Pin
10	+Vout	+Vout
11	Share	No Pin
12	Synchronization	Synchronization

Remote On/Off

This is an active low signal referenced to -Vin. If >3.5V (or open circuit) is applied, the output is on. If <1.8V (or short circuit) is applied, the output is off. If module inhibit is not required, leave the pin floating.

Thermal Warning (Tw)

This is an open collector signal with emitter connected to -Vin. Transistor is off under normal conditions and is turned on when trip threshold is exceeded (typically 105 °C).

Thermal Shutdown

The output of the module can be optionally turned off under a high temperature condition by connecting the Thermal Warning (TW) pin directly to the Remote On/Off pin. Auto resetting.

Synchronization

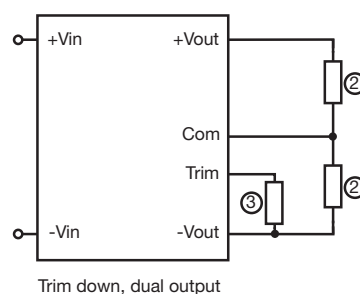
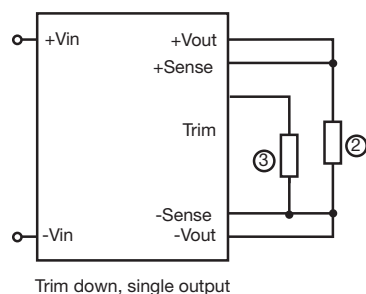
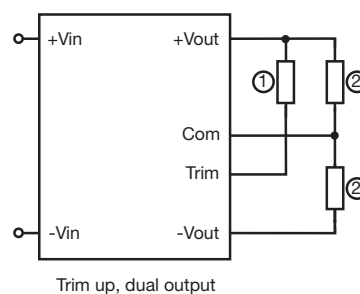
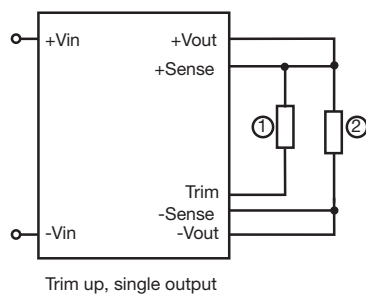
The internal switching frequency can be synchronized to an external source within the range 450 to 550 kHz (MTC75 & 150) or 400 to 500 kHz (MTC35 & 50). If two modules or more are synchronized, they will run at the highest frequency. Connect synchronization pins directly together.

Share

Up to four modules can be forced to share by connecting the share pins directly together, derate maximum output to 90% of total power. (MTC75 & 150 W only)

Output Trim

In order to trim the output voltage of the singles up or down, connect the trim resistor either between the trim pin and +sense for trimming-up or between trim pin and -sense for trimming-down. In order to trim the output voltage of the duals up or down, connect the trim resistor either between the trim pin and +Vout for trimming up or between trim pin and -Vout for trimming down. The trimming output voltage range is ±10% on 3V3 output voltage and -20% to +10% rated output voltage on others. See diagram & table below.



① = R Trim-up ② = R-Load ③ = R Trim-down

$$\text{Trim up resistor} = R \text{ trim-up} = \left[\frac{A}{1 - \frac{V_{\text{nom}}}{V_{\text{required}}}} - C \right] \text{ k } \Omega$$

$$\text{Trim down resistor} = R \text{ trim-down} = \left[\frac{B}{\frac{V_{\text{nom}}}{V_{\text{required}}} - 1} - C \right] \text{ k } \Omega$$

MTC35 & 50					
	S3V3	S05	S12	S15	S28
A	9.826	15	43.814	56.056	81.993
B	6	5	5.1	5.1	3.825
C	5.1	5.1	5.1	5.1	9.1

MTC75 & 150							
	S3V3	S05	S12	S15	S28	D12	D15
A	9.826	15	21.907	28.028	54.622	46.446	58.524
B	6	5	2.55	2.55	2.55	2.55	2.55
C	5.1	5.1	5.1	5.1	9.1	9.1	9.1

QSB Series



- Wide Input Range
- Industry Standard Packages
- -40 °C to +100 °C Operating Temperature
- High Power Density
- Base Plate Cooled
- Remote On/Off & Remote Sense
- 3 Year Warranty

Specification

Input

Input Voltage Range	• See tables
Input Current	• See tables
Input Reverse Voltage Protection	• None
Input Filter	• Pi network
Undervoltage Lockout	• QSB75-150: 24 Vin - turn on 8.8 V, turn off 8.0 V for 9-36 V, QSB200: 24 Vin - turn on 9.6 V, turn off 8.8 V, QSB75-200: 48 Vin - turn on 17.0 V, turn off 16.0 V, QSB350: 24 Vin - turn on 17.0 V, turn off 16.0 V, QSB350: 48 Vin - turn on 35.0 V, turn off 33.0 V
Input Surge	• 24 Vin: 50 VDC for 100 ms 48 Vin: 100 VDC for 100 ms

Output

Output Voltage Trim	• $\pm 10\%$, see application notes
Initial Set Accuracy	• $\pm 1.5\%$ max
Line Regulation	• $\pm 0.2\%$ max measured from high line to low line
Load Regulation	• $\pm 0.2\%$ max measured from 0-100% load
Transient Response	• 5% max deviation, recovery to within 1% in 500 μ s, 25% step load change
Ripple & Noise	• 3.3 & 5 V models: 100 mV pk-pk 12 & 15 V models: 150 mV pk-pk 24 V & 28 V models: 280 mV max pk-pk 20 MHz bandwidth (see note 1)
Overvoltage Protection	• 115-140%
Short Circuit Protection	• Continuous
Thermal Shutdown	• Case temperature > 105 °C
Temperature Coefficient	• $\pm 0.03\%/^{\circ}\text{C}$
Current Limit	• 110-140% nominal output for 75 & 150 W 110-160% nominal output for 100 W 110-150% nominal output for 200 W 105-140% nominal output for 350 W
Remote On/Off	• See notes 2 & 3
Remote Sense	• Compensates up to 10% of Vout nominal, total of output trim and remote sense

General

Efficiency	• See tables
Isolation Voltage	• 1500 VDC Input to Output 1500 VDC Input to Case 1500 VDC Output to Case
Isolation Resistance	• $10^7 \Omega$
Isolation Capacitance	• QSB75-200: 100 pF typical, QSB350: 1000 pF typical
Switching Frequency	• QSB75: 300 kHz typical QSB100, 150 & 200: 250 kHz typical QSB350 (3V3 & 5 V): 300 kHz typical QSB350 (12, 24 & 28 V): 330 kHz typical
Power Density	• QSB75: 45.4 W/in ³ , QSB100: 60.5 W/in ³ , QSB150: 57.2 W/in ³ , QSB200: 70.3 W/in ³ , QSB350: 123.0 W/in ³
MTBF	• QSB75 & 100: 730 kHrs QSB150 & 200: 1 MHrs QSB350: 658 kHrs typical to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Base Plate Temperature	• -40 °C to +100 °C, see derating curves
Storage Temperature	• -55 °C to +105 °C
Operating Humidity	• Up to 90% non-condensing
Cooling	• Base plate cooled, see derating curves

EMC & Safety

Emissions	• EN55022, level A conducted with external components, see longform datasheet for further details
ESD Immunity	• EN61000-4-2, level 2, Perf Criteria B
Radiated Immunity	• EN61000-4-3, 3 V/m, Perf Criteria A
EFT/Burst	• EN61000-4-4, level 1, Perf Criteria A
Surge	• EN61000-4-5, level 1, Perf Criteria A
Conducted Immunity	• EN61000-4-6, 3 V rms Perf Criteria A
Safety Approvals	• QSB150 & QSB200: UL60950-1

Models and Ratings

QSB75/100 **XP**

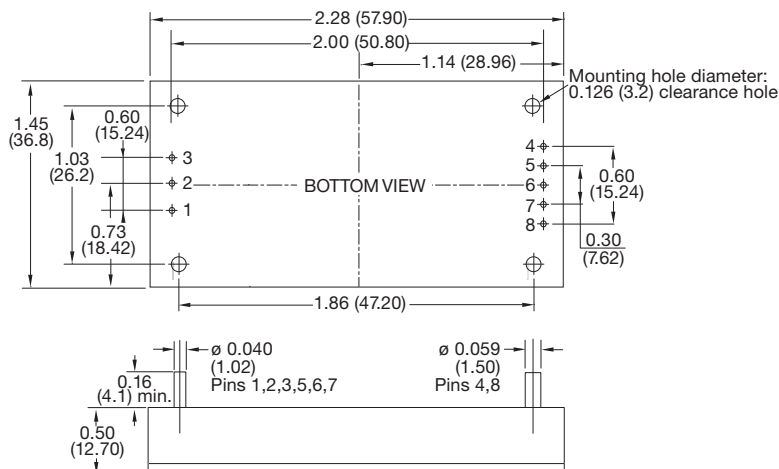
Input Voltage	Output Voltage	Output Current	Input Current ⁽⁴⁾		Efficiency	Model Number ⁽³⁾
			No Load	Full Load		
9-36 VDC (24 V nominal)	3.3 V	12.00 A	50 mA	2.04 A	81%	QSB7524S3V3
	5.0 V	12.00 A	50 mA	2.98 A	84%	QSB7524S05
	12.0 V	6.25 A	50 mA	3.64 A	86%	QSB7524S12
	15.0 V	5.00 A	50 mA	3.64 A	86%	QSB7524S15
	24.0 V	3.12 A	50 mA	3.63 A	86%	QSB7524S24
18-75 VDC (48 V nominal)	3.3 V	12.00 A	30 mA	1.10 A	82%	QSB7548S3V3
	5.0 V	12.00 A	30 mA	1.47 A	85%	QSB7548S05
	12.0 V	6.25 A	30 mA	1.82 A	86%	QSB7548S12
	15.0 V	5.00 A	30 mA	1.80 A	87%	QSB7548S15
	24.0 V	3.12 A	30 mA	1.80 A	87%	QSB7548S24
9-36 VDC (24 V nominal)	3.3 V	20.00 A	60 mA	3.37 A	81.5%	QSB10024S3V3
	5.0 V	20.00 A	60 mA	4.99 A	83.5%	QSB10024S05
	12.0 V	8.30 A	30 mA	4.88 A	85.0%	QSB10024S12
	15.0 V	6.70 A	30 mA	4.84 A	86.5%	QSB10024S15
	24.0 V	4.17 A	30 mA	4.85 A	86.0%	QSB10024S24
18-75 VDC (48 V nominal)	3.3 V	20.00 A	60 mA	1.71 A	80.5%	QSB10048S3V3
	5.0 V	20.00 A	60 mA	2.42 A	86.0%	QSB10048S05
	12.0 V	8.30 A	30 mA	2.40 A	86.5%	QSB10048S12
	15.0 V	6.70 A	30 mA	2.39 A	87.5%	QSB10048S15
	24.0 V	4.17 A	30 mA	2.37 A	88.0%	QSB10048S24

Notes

1. Ripple & noise is measured with a 10 μ F tantalum capacitor and 0.1 μ F ceramic capacitor across output.
2. Logic compatibility: Ref to -ve input. Module On = open circuit. Module Off = <0.8 VDC.

3. Add suffix 'N' to the model number to receive the unit with negative logic Remote On/Off.
4. Input current specified at 24 V for 9-36 VDC and 48 V for 18-75 VDC models.

Mechanical Details



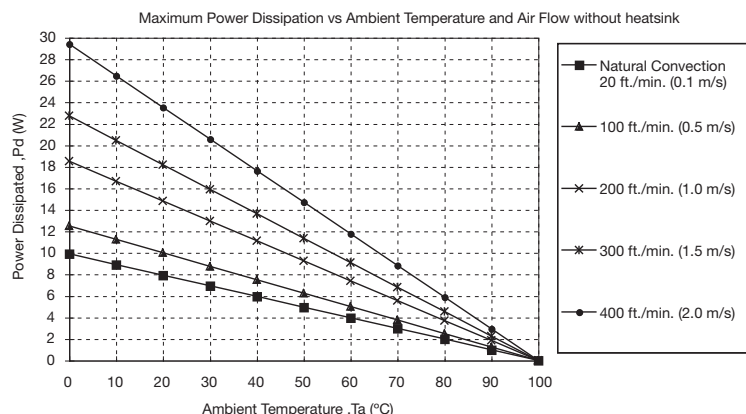
PIN CONNECTIONS	
Pin	Function
1	+Vin
2	Remote On/Off
3	-Vin
4	-Vout
5	-Sense
6	Trim
7	+Sense
8	+Vout

Notes

1. Dimensions are in inches (mm)
2. Tolerances: X.XX = ± 0.02 (X.X = ± 0.5)
X.XXX = ± 0.01 (X.XX = ± 0.25)
3. Weight: 0.22 lbs (100 g) approx

Thermal Resistance Information

Derating Curve



Air Flow Rate	Typical R_{ca}
Natural Convection 20 ft. / min (0.1 ms)	10.1 $^{\circ}$ C/W
100 ft./min (0.5 ms)	8.0 $^{\circ}$ C/W
200 ft./min (1.0 ms)	5.4 $^{\circ}$ C/W
300 ft./min (1.5 ms)	4.4 $^{\circ}$ C/W
400 ft./min (2.0 ms)	3.4 $^{\circ}$ C/W

R_{ca} = Thermal resistance case to ambient

Models & Ratings

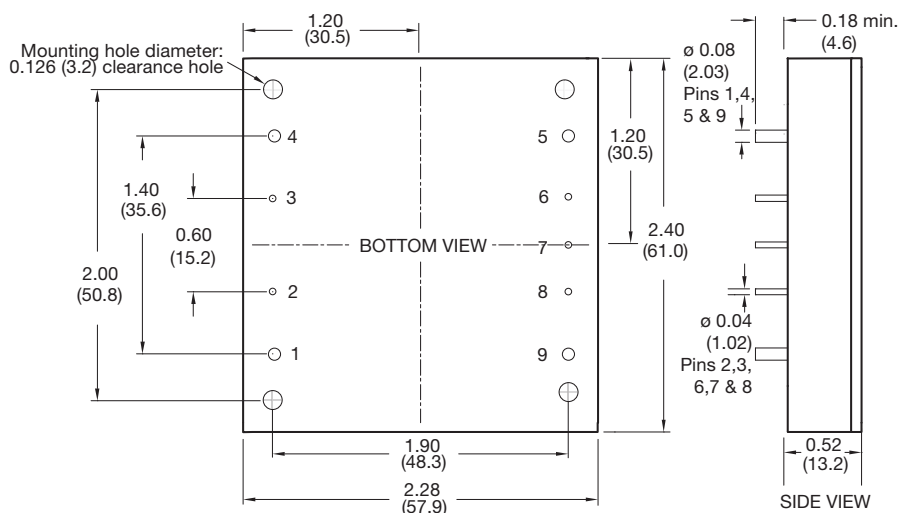
QSB150-350 **XP**

Input Voltage	Output Voltage	Output Current	Input Current ⁽⁴⁾		Efficiency	Model Number ⁽³⁾
			No Load	Full Load		
9-36 VDC (24 V nominal)	3.3 V	30.00 A	200 mA	4.75 A	87.0%	QSB15024S3V3
	5.0 V	30.00 A	200 mA	7.19 A	87.0%	QSB15024S05
	12.0 V	12.50 A	100 mA	7.10 A	88.0%	QSB15024S12
	15.0 V	10.00 A	100 mA	7.19 A	87.0%	QSB15024S15
	24.0 V	6.50 A	100 mA	7.34 A	88.0%	QSB15024S24
18-75 VDC (48 V nominal)	3.3 V	30.00 A	100 mA	2.34 A	88.0%	QSB15048S3V3
	5.0 V	30.00 A	100 mA	3.47 A	90.0%	QSB15048S05
	12.0 V	12.50 A	50 mA	3.44 A	91.0%	QSB15048S12
	15.0 V	10.00 A	50 mA	3.47 A	90.0%	QSB15048S15
	24.0 V	6.50 A	50 mA	3.61 A	90.0%	QSB15048S24
10-36 VDC (24 V nominal)	3.3 V	50.00 A	150 mA	7.90 A	87.0%	QSB20024S3V3
	5.0 V	40.00 A	150 mA	9.58 A	87.0%	QSB20024S05
	12.0 V	16.70 A	100 mA	9.71 A	86.0%	QSB20024S12
	15.0 V	13.30 A	100 mA	9.67 A	86.0%	QSB20024S15
	24.0 V	8.30 A	100 mA	9.54 A	87.0%	QSB20024S24
18-75 VDC (48 V nominal)	3.3 V	40.00 A	80 mA	3.13 A	88.0%	QSB20048S3V3
	5.0 V	40.00 A	80 mA	4.69 A	89.0%	QSB20048S05
	12.0 V	16.70 A	60 mA	4.74 A	88.0%	QSB20048S12
	15.0 V	13.30 A	60 mA	4.72 A	88.0%	QSB20048S15
	24.0 V	8.30 A	60 mA	7.72 A	88.0%	QSB20048S24
18-36 VDC (24 V nominal)	3.3 V	70.0 A	130 mA	10.94 A	88.0 %	QSB35024S3V3
	5.0 V	70.0 A	250 mA	16.29 A	89.5 %	QSB35024S05
	12.0 V	29.2 A	220 mA	15.96 A	91.5%	QSB35024S12
	24.0 V	14.6 A	40 mA	16.22 A	90.0%	QSB35024S24
	28.0 V	12.5 A	50 mA	16.03 A	91.0%	QSB35024S28
36-75 VDC (48 V nominal)	3.3 V	70.0 A	80 mA	5.41 A	89.0%	QSB35048S3V3
	5.0 V	70.0 A	120 mA	8.01 A	91.0%	QSB35048S05
	12.0 V	29.2 A	100 mA	7.89 A	92.5%	QSB35048S12
	24.0 V	14.6 A	40 mA	7.98 A	91.5%	QSB35048S24
	28.0 V	12.5 A	30 mA	7.88 S	92.5%	QSB35048S28

Notes

1. Ripple & noise is measured with a 10 μ F tantalum capacitor and 0.1 μ F ceramic capacitor across output.
2. Logic compatibility: Ref to -ve input. Module On = open circuit. Module Off = <0.8 VDC.
3. Add suffix 'N' to the model number to receive the unit with negative logic Remote On/Off.
4. Input current specified at 24 V for 10-36 VDC models and 48 V for 18-75 VDC models.

Mechanical Details

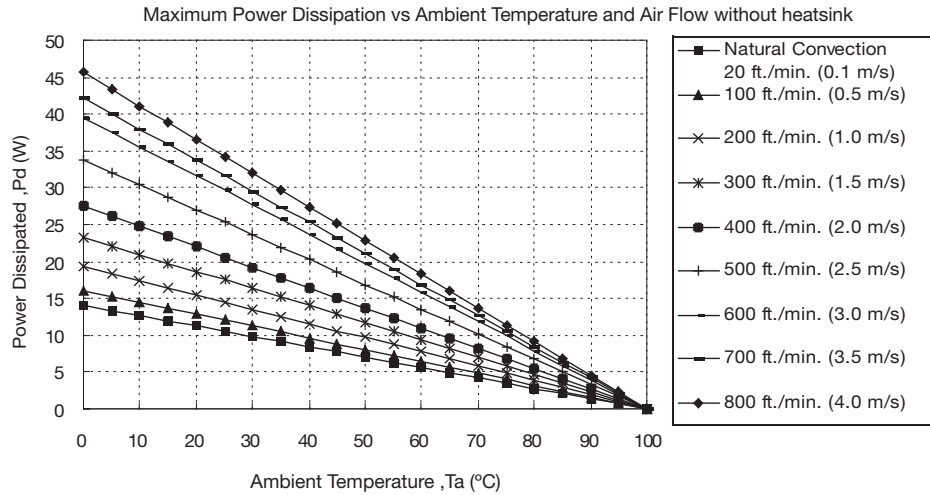


PIN CONNECTIONS	
Pin	Function
1	+Vin
2	Remote On/Off
3	Case
4	-Vin
5	-Vout
6	-Sense
7	Trim
8	+Sense
9	+Vout

Notes

1. Dimensions are in inches (mm)
2. Tolerances: X.XX = ± 0.02 (X.X = ± 0.5)
X.XXX = ± 0.01 (X.XX = ± 0.25)
3. Weight: 0.25 lbs (114 g) approx

Derating Curve



Air Flow Rate	Typical R _{ca}
Natural Convection 20 ft. / min (0.1 ms)	7.12 °C/W
100 ft./min (0.5 ms)	6.21 °C/W
200 ft./min (1.0 ms)	5.17 °C/W
300 ft./min (1.5 ms)	4.29 °C/W
400 ft./min (2.0 ms)	3.64 °C/W
500 ft./min (2.5 ms)	2.96 °C/W
600 ft./min (3.0 ms)	2.53 °C/W
700 ft./min (3.5 ms)	2.37 °C/W
800 ft./min (4.0 ms)	2.19 °C/W

R_{ca} = Thermal resistance case to ambient

Application Notes

Output Voltage Trim - QSB75, QSB100 & QSB150 Series

Voltage trim up

Connect trim resistor R_{trim} between Trim pin and -Sense pin.

$$R_{\text{trim up}} = \left(\frac{R1 \left(V_r - V_f \left(\frac{R2}{R2 + R3} \right) \right)}{V_{\text{des}} - V_{\text{nom}}} \right) - \frac{R2 \times R3}{R2 + R3} \text{ (k}\Omega\text{)}$$

Voltage trim down

Connect trim resistor R_{trim} between Trim pin and +Sense pin

$$R_{\text{trim down}} = \frac{R1 \times (V_{\text{des}} - V_r)}{V_{\text{nom}} - V_{\text{des}}} - R2 \text{ (k}\Omega\text{)}$$

Where: R trim up/down is the external resistor in kΩ. V_{nom} is the nominal output voltage. V_{des} is the desired output voltage. R1, R2, R3 and V_r are internal to the unit and are defined in the table below.

Output Voltage (V)	R1 (kΩ)	R2 (kΩ)	R3 (kΩ)	V _r (V)	V _f (V)
3.3 V	3.00	12.0	4.3	1.24	0.46
5.0 V	2.32	3.3	0.0	2.5	0.0
12.0 V	9.10	51.0	5.1	2.5	0.46
15.0 V	12.0	56.0	8.25	2.5	0.46
24.0 V	20.0	100.0	7.5	2.5	0.46

Output Voltage Trim - QSB200 & QSB350 Series

Voltage trim down - Connect trim resistor R_{trim} between Trim pin and -Sense pin

$$R_{\text{trim down}} = \left(\frac{511}{\Delta\%} - 10.22 \right) \text{ k}\Omega$$

Where:

$$\Delta\% = \left(\frac{V_{\text{nom}} - V_{\text{des}}}{V_{\text{nom}}} \right) \times 100$$

Voltage trim up - Voltage trim up, Connect trim resistor R_{trim} between Trim pin and +Sense pin.

$$R_{\text{trim up}} = \left(\frac{5.11 V_{\text{nom}} (100 + \Delta\%)}{1.225 \times \Delta\%} - \frac{511}{\Delta\%} - 10.22 \right) \text{ k}\Omega$$

Where:

$$\Delta\% = \left(\frac{V_{\text{des}} - V_{\text{nom}}}{V_{\text{nom}}} \right) \times 100$$

Filter & Surge Protection

DSF/FSO Series



- Up to 28 A Output Current
- Up to 500 W Output Power
- Active Surge Protection
- MIL-STD 461 and DEF-STAN 59-411
- MIL-STD 1275 and DEF-STAN 61-5
- MIL-STD 810
- 3 Year Warranty

Specification

Input

Input Voltage Range	• See Models & Ratings table
Input Transient	• ± 250 V for 50 μ s 15 mJ, 100 V for 50 ms 0.5 Ω per MIL-STD-1275A/B/C/D
Input Reverse Voltage Protection	• Continuous
Fuse Protection	• None

Output

Output Voltage	• Tracks input voltage & clamps <36 VDC
Output Power	• See Models & Ratings table
Output Module Inhibit (INH)	• Open collector transistor rated 70 VDC with 5 mA sink current referenced to -Vin/-Vout. When the output current is: >4 A: DSF100, >7.77 A: DSF200LV >28 A: DSF500 then the INH pin is pulled logic low. This can be used to inhibit downstream DC-DC converters and reduce the load on the filter. When the output current is lower than above the INH pin is logic high.
Overtemperature Protection	• Shuts down output by pulling disable pin low when baseplate >100 °C. Typical hysteresis 5 °C auto recovery (not fitted to '-H' models)

General

Efficiency	• See Table
Isolation Voltage	• 500 VDC Input & Output to Case
Series Resistance	• 0.07 Ω DSF100, 0.26 Ω DSF200LV, 0.018 Ω DSF500, 0.013 Ω FSO461
Disabled Input Current	• 25 mA
Disable (DIS)	• On = Logic high or open circuit Off = Logic low or short circuit
No Load Current	• 75 mA
Package Style	• Photo-etched nickel-silver case with RoHS compliant conductive chromate finish & aluminium cooling baseplate
MTBF	• DSF100: 2496 kHrs, DSF200LV: 2218 kHrs, DSF500: 573 kHrs, FSO461: 8737 kHrs, to MIL-HDBK-217F at 40 °C, GB

Environmental

Operating Temperature	• -40 °C to +100 °C baseplate
Storage Temperature	• -55 °C to +100 °C
Salt Atmosphere	• MIL-STD-810F method 509.4
Humidity	• MIL-STD-810F 507.4
Altitude	• MIL-STD-810F 500.4
Shock	• MIL-STD-810F 516.5 function test for ground equipment 40 g in 3 axes
Vibration	• MIL-STD-810F method 514.5C-17. Minimum integrity test for military equipment (1 Hr/axis, 3 axes). Vibration 5-33 Hz, 0.5 mm displacement

EMC & Safety

Safety Approvals	• CE marked LVD
Immunity	• MIL-STD-1275A-D, MIL-STD-461E/F (CS101, CS114, CS115 & CS116) MIL-STD-704A, DEF-STAN 61-5 part 6 issue 5
EMC Performance	• DSF100 & DSF200LV: MIL-STD 461E/F CE102 & DEF STAN 59-411 DCE01/DCE02 is achieved with external components. DSF500: Compliance to MIL-STD 461E/F CE102 & DEF STAN 59-411 DCE01/DCE02 is achieved when used in conjunction with FSO461. See longform datasheet for more information.

Models & Ratings

DSF/FSO **XP**

Output Power	Input Voltage	Output		Typical Efficiency	Model Number ⁽⁴⁾
		Voltage	Max Current		
100 W	10-33 VDC	<36 VDC	3.7 A	98%	DSF100
30 - 54 W	10-18 VDC	<36 VDC	3.0 A	92%	DSF200 LV [^]
126 - 230 W	18-33 VDC	<36 VDC	7.0 A	93%	
280 - 500 W	10-33 VDC	<36 VDC	28.0 A ⁽¹⁾	98%	DSF500 ⁽³⁾ [^]
500 W	0-100 VDC	$V_{in} - I_{in} \times 0.013$	28.0 A	99%	FSO461 ⁽²⁾

Notes

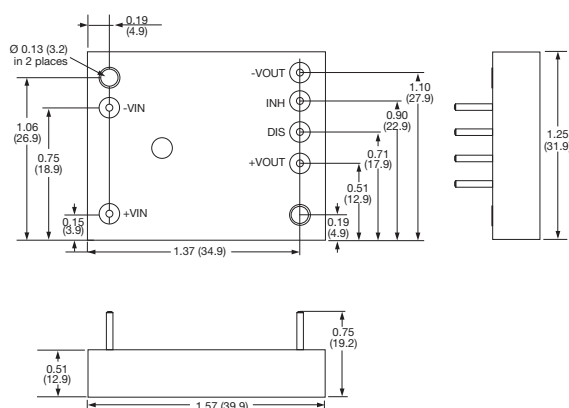
1. For input voltages above 18 V, maximum load is 500 W.
2. FSO461 has filter circuitry only. To be used with DSF500 for conducted immunity compliance.
3. DSF500 has surge protection only. To meet stated EMC performance it must be used with FSO461.

4. For models without overtemperature protection, add suffix '-H' e.g. DSF500-H. Contact sales for further information.

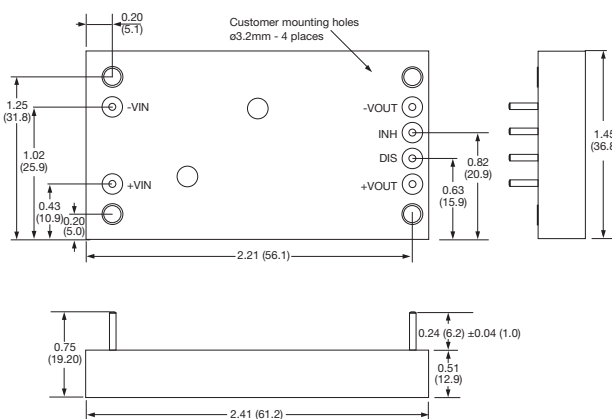
[^] Available from Newark. See pages 291-296.

Mechanical Details

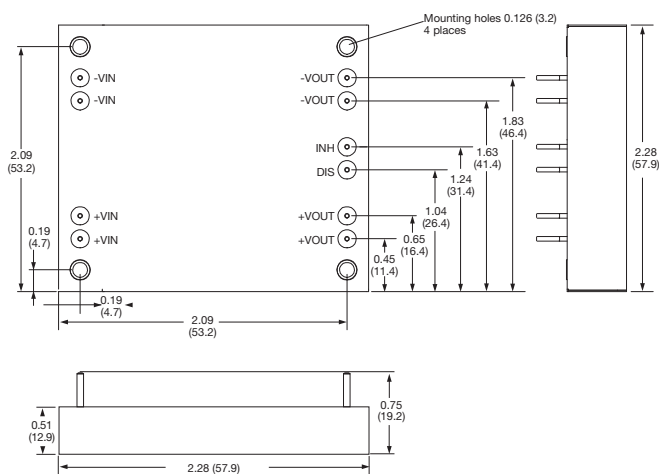
DSF100 - Surge protection and filter



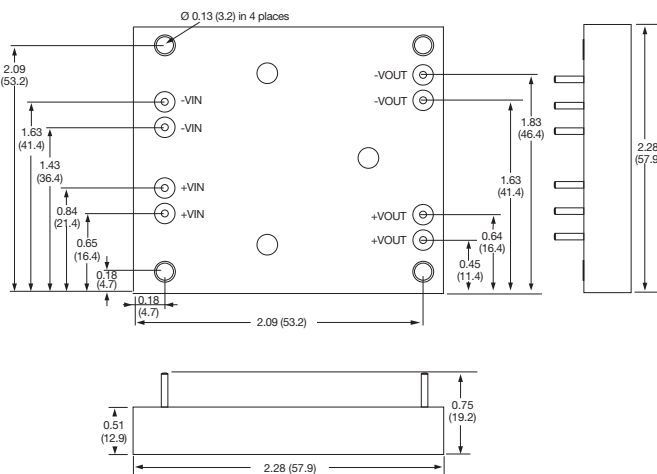
DSF200LV - Surge protection and filter



DSF500 - Surge protection



FSO461 - Filter



Notes

1. All dimensions in inches (mm).
2. Weights: DSF100: 0.11 lbs (50 g)
DSF200LV: 0.18 lbs (80 g)
DSF500: 0.36 lbs (160 g)
FSO461: 0.36 lbs (160 g)
3. Tolerance ±0.008 (±0.2)
4. Pin diameter 0.04 (1.0)

600 Watts

QSB Series



- Up to 92% Efficiency
- Industry Standard Full Brick Package
- -40 °C to +100 °C Operating Temperature
- High Power Density
- Baseplate-cooled
- Remote On/Off & Remote Sense
- 3 Year Warranty

Specification

Input

Input Voltage Range	• 24 V (18-36 V), 48 V (36-75 V)
Input Current	• See table
Idle Current	• 50 mA
Input Reverse Voltage Protection	• None
Input Filter	• Pi network
Undervoltage Lockout	• 24 Vin: turn on 17.0 V, turn off 16.0 V 48 Vin: turn on 35.0 V, turn off 33.0 V

Output

Output Voltage Trim	• -60%, +110%, see application notes
Initial Set Accuracy	• $\pm 1.5\%$ max
Line Regulation	• $\pm 0.2\%$ max measured from high line to low line
Load Regulation	• $\pm 0.5\%$ max measured from 0-100% load
Transient Response	• 5% max deviation, recovery to within 1% in 500 μ s, 25% step load change
Ripple & Noise	• 12 V models: 120 mV pk-pk 28 V models: 280 mV max pk-pk 32 V models: 320 mV max pk-pk 20 MHz bandwidth (see note 1)
Overvoltage Protection	• 115-140%
Short Circuit Protection	• Continuous
Current Limit	• 110-150% nominal output
Thermal Shutdown	• Case temperature > 110 °C typical
Temperature Coefficient	• $\pm 0.03\%/^{\circ}\text{C}$
Remote On/Off	• Referenced to -ve input, Module on = open circuit, Module off ≤ 0.8 VDC
Remote Sense	• Compensates up to 10% of Vout nominal, total of output trim and remote sense
Current Share	• Parallel up to 4 modules using the PC pin

General

Efficiency	• See tables
Isolation Voltage	• 1500 VDC Input to Output 1500 VDC Input to Case 1500 VDC Output to Case
Isolation Resistance	• $10^7 \Omega$
Isolation Capacitance	• 4000 pF typical
Switching Frequency	• 24 Vin: 250 kHz typical 48 Vin: 300 kHz typical
DC OK Signal	• DC OK TTL low, not OK TTL high, connect IOC pin to Aux pin through a resistor (see note 3)
Power Density	• 108.7 W/in ³
MTBF	• 381 kHrs typical to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Base Plate Temperature	• -40 °C to +100 °C, see derating curve
Storage Temperature	• -55 °C to +105 °C
Operating Humidity	• Up to 90% non-condensing
Cooling	• Baseplate-cooled, see derating curve

EMC & Safety

Emissions	• EN55022, level A conducted, with external components. Contact sales for details.
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Models & Ratings

QSB600 **XP**

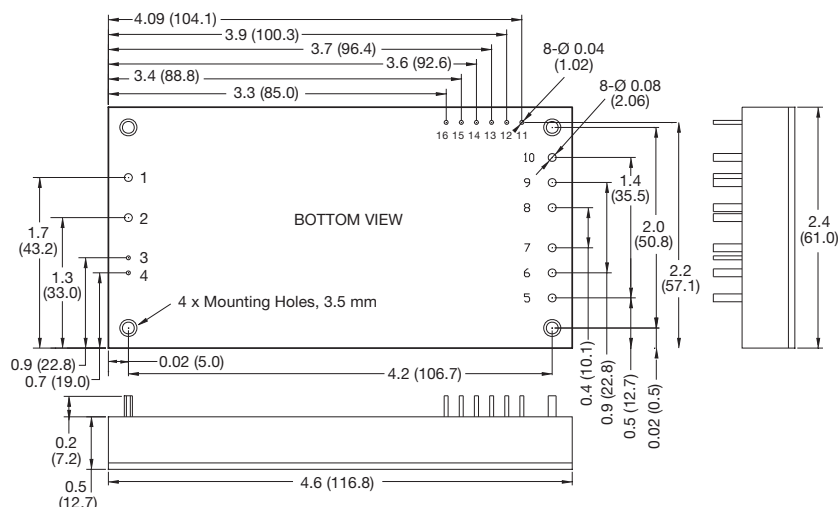
Input Voltage	Output Voltage	Output Current	Input Current		Efficiency	Model Number ²
			No Load	Full Load		
18-36 V	12.0 V	50.0 A	150 mA	28.09 A	89.0%	QSB60024S12
	28.0 V	21.5 A	150 mA	27.87 A	90.0%	QSB60024S28
	32.0 V	19.0 A	150 mA	27.84 A	91.0%	QSB60024S32
36-75 V	12.0 V	50.0 A	90 mA	13.89 A	90.0%	QSB60048S12
	28.0 V	25.0 A	105 mA	16.03 A	91.0%	QSB60048S28
	32.0 V	19.0 A	90 mA	13.77 A	92.0%	QSB60048S32

Notes

1. Output Ripple and Noise measured with 10 μ F tantalum and 1 μ F ceramic capacitor across output.
2. Add suffix 'N' to the model number to receive the unit with negative logic Remote On/Off.

3. The auxiliary supply output is within 7-13 V with max of 20 mA (auxiliary pin 16). Ground reference is -Sense.

Mechanical Details



PIN CONNECTIONS	
Pin	Function
1	-Vin
2	+Vin
3	-On/Off
4	+On/Off
5-7	+Vout
8-10	-Vout
11	-Sense
12	+Sense
13	Trim
14	PC
15	IOC
16	Aux

Notes

1. All dimensions are in inches (mm)
2. Weight: 0.57 lbs (260 g) approx
3. Tolerances: X.XX = ± 0.02 (X.X = ± 0.5)
X.XXX = ± 0.01 (X.XX = ± 0.25)

Output Voltage Adjustment - QSB600

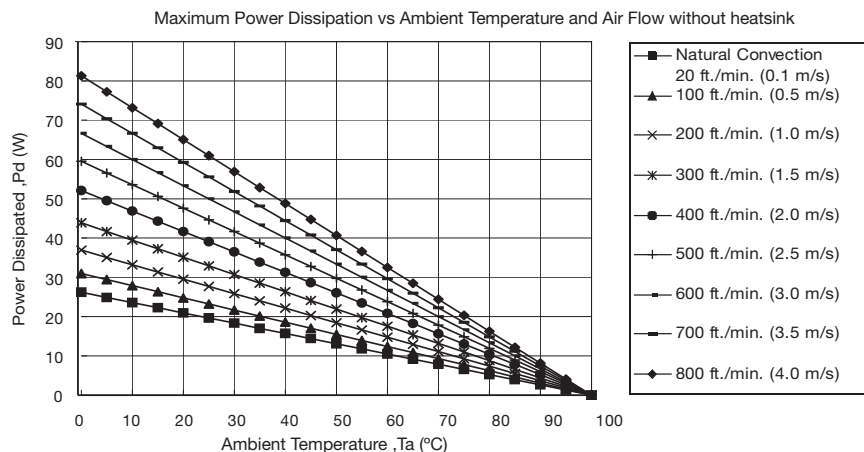
The trim pin permits the user to adjust the output voltage up or down according to the trim range specification (60% to 100% of nominal output). This is accomplished by connecting an external resistor between the +Vout and +Sense pin for trim up and between the trim and -Sense pin for trim down. The trim pin should be left open if trimming is not being used. The trim resistor can be determined by the following equations:

$$V_f = \frac{V_t}{V_t + V_o}$$

$$V_f = \frac{1.24 \times \left(\frac{R_t \times 33}{R_t + 33} \right)}{7.68 + \frac{R_t \times 33}{R_t + 33}} \quad \begin{array}{l} R_t: K\Omega \\ V_o: \text{Nominal Output Voltage} \\ V_t: \text{Trimmed Output Voltage} \end{array}$$

Thermal Resistance Information

Derating Curve



Air Flow Rate	Typical R _{ca}
Natural Convection	
20 ft./min (0.1 ms)	3.82 °C/W
100 ft./min (0.5 ms)	3.23 °C/W
200 ft./min (1.0 ms)	2.71 °C/W
300 ft./min (1.5 ms)	2.28 °C/W
400 ft./min (2.0 ms)	1.92 °C/W
500 ft./min (2.5 ms)	1.68 °C/W
600 ft./min (3.0 ms)	1.50 °C/W
700 ft./min (3.5 ms)	1.35 °C/W
800 ft./min (4.0 ms)	1.23 °C/W

R_{ca} = Thermal resistance from case to ambient

400/600 Watts

MCC Series



- Baseplate-cooled
- Up to 4 Regulated Outputs
- Optional 200 W Conditioned Output
- MIL-STD 1275 and DEF-STAN 61-5
- MIL-STD 461 and DEF-STAN 59-411
- Rugged Construction to MIL-STD 810F
- 3 Year Warranty

Specification

Input

Input Voltage Range	• 18.5-34 VDC steady state
Input Current	• 27 A at 18.5 V max
Inrush Current	• <60 A
Input Reverse Voltage Protection	• Continuous
Input Transient	• MIL-STD-1275A/B/C/D
Undervoltage Lockout	• $V_{in} < 18$ VDC

Output

Output Voltage	• O/P 1-4: regulated outputs 2-48 VDC
Output Voltage Adjustment	• O/P 1-4: 10-110% factory set A minimum load of 10% is required for outputs below 90% of nominal voltage
Optional Aux. Output Rail Voltage	• $V_{in} - 2$ VDC ⁽¹⁾
Optional Aux. Output Power	• 200 W for MCC600 (9 A max)
Maximum Aux. Output	• V_{out} clamped <36 VDC
Minimum Load	• No minimum load (output ripple increased at $P_{out} < 10\%$ P_{out} max)
Line Regulation	• 1% max
Load Regulation	• 1% max
Cross Regulation	• Outputs 1-4 individually regulated, no cross regulation
Output Set Tolerance	• ± 100 mV
External Hold Up	• External connection for additional hold up capacitance, see longform datasheet
Ripple & Noise	• 50 mV or 1% pk-pk, whichever is the greater, 20 MHz bandwidth
Low Noise (Option 'Q')	• Outputs 1 & 2: 25 mV reduction Outputs 3 & 4: 45 mV reduction
Temperature Coefficient	• $\pm 0.05\%/^{\circ}\text{C}$
Overvoltage Protection	• 110-120% of nominal output, recycle input to restart
Overcurrent Protection	• 110-120% of nominal output, auto recovery
Short Circuit Protection	• Continuous, with auto restart
Overtemperature Protection	• $> +90^{\circ}\text{C}$ baseplate temperature, auto restart
Remote Sense	• Outputs 1 & 2, Compensate for 0.5 V total voltage drop

General

Efficiency	• 75% typical
Isolation Voltage	• 500 VDC Input to Output, 500 VDC Output to Chassis, 500 VDC Input to Chassis
Material and Finish	• Aluminium baseplate and safety cover
Input Inhibit	• Global enable and disable function, short to negative input to inhibit
Output Inhibit	• Each regulated output has independent inhibit, TTL high to inhibit
Inhibited Input Current	• <5 mA when input inhibit function is used
DC OK Signal	• Optional on output voltages ≥ 5 VDC Isolated opto-coupler transistor output
MTBF	• 517 kHrs to MIL-HDBK-217F at 40°C , GB

Environmental

Operating Temperature	• -40°C to $+70^{\circ}\text{C}$ ambient with baseplate temperature within -40°C to $+90^{\circ}\text{C}$
Extended Temperature	• -55°C to $+90^{\circ}\text{C}$ baseplate temperature, (see note 4)
Cooling	• Baseplate-cooled. It is recommended that a thermal pad or compound is fitted between the MCC baseplate and any heatsink
Operating Humidity	• 20-95% non-condensing
Storage Temperature	• -55°C to $+90^{\circ}\text{C}$
Storage Humidity	• 20-95% non-condensing
Shock	• 40 g MIL-STD-810F, method 516.5-1
Vibration	• MIL-STD-810F, method 514.5C-17 minimum integrity test for military equipment

EMC

Emissions	• EN55022 Level B conducted MIL-STD-461E/F army ground use CE101 & CE102 DEF-STAN 59-411, DCE01/DCE02
Conducted Immunity	• MIL-STD-1275A/B/C/D, MIL-STD-461E/F CS101, CS114, CS115, CS116 DEF-STAN 61-5 part 6 issue 5

⁽¹⁾ $V_{in} - 2$ VDC minimum 36 VDC (clamped) maximum

Model Number & Ratings

MCC400/600 **XP**

			1	2	3	4							
MCC			4	Q	2J	2J	2J	2J	E	X	X	X	X
Chassis Designations, Power & Sizes													
Code	Power	Slots											
MCC4	400 W	4											
MCC6	400 W + 200 W Aux	4											
MCC400/600: Single (S), Dual (D), Triple (T) or Quad (Q) (4 slots max where all slots must be filled)													
			Modules Output Voltage / Current Rating										
			V	I	W	Slots	Code						
			3.3	22.7 A	75 W	1	2C						
			3.3	45.4 A	150 W	2	3C						
			3.3	80.0 A	264 W	4	4C ⁽²⁾						
			5	20.0 A	100 W	1	2D						
			5	40.0 A	200 W	2	3D						
			5	80.0 A	400 W	4	4D ⁽²⁾						
			12	8.3 A	100 W	1	2J						
			12	16.6 A	200 W	2	3J						
			12	33.3 A	400 W	4	4J ⁽²⁾						
			15	6.6 A	100 W	1	2L						
			15	13.3 A	200 W	2	3L						
			15	26.7 A	400 W	4	4L ⁽²⁾						
			24	4.1 A	100 W	1	2P						
			24	8.3 A	200 W	2	3P						
			24	16.7 A	400 W	4	4P ⁽²⁾						
			28	3.5 A	100 W	1	2Q						
			28	7.1 A	200 W	2	3Q						
			28	14.3 A	400 W	4	4Q ⁽²⁾						
			36	2.78 A	100 W	1	2T						
			36	5.56 A	200 W	2	3T						
			36	11.11 A	400 W	4	4T						
			48	2.1 A	100 W	1	2W						
			48	4.1 A	200 W	2	3W						
			48	8.3 A	400 W	4	4W ⁽²⁾						
			D - DC OK, leave blank if not required Q - Low noise output L - Passive filtering only ⁽⁴⁾ P - Conformal coating										
			S - Standard E - Screening option ⁽⁵⁾ A - Auxiliary Turn Off ⁽⁵⁾										
			Notes										
			1. Modules 1 to 4 available for MCC400/600 e.g. MCC4Q2D2J2L2PED.										
			2. 4 series output modules to be used with single MCC400/600 models only.										
			3. DC-DC output modules are stress-screened for -55 °C to +90 °C operation.										
			4. Low cost option with passive EMI filtering only. No auxiliary output, EMI to EN55022 level B only										
			5. Global inhibit will also turn off the auxiliary output - Option A.										

MCC400/600:
Single (S), Dual (D), Triple (T) or Quad (Q)
(4 slots max where all slots must be filled)

D - DC OK, leave blank if not required
Q - Low noise output
L - Passive filtering only⁽⁴⁾
P - Conformal coating

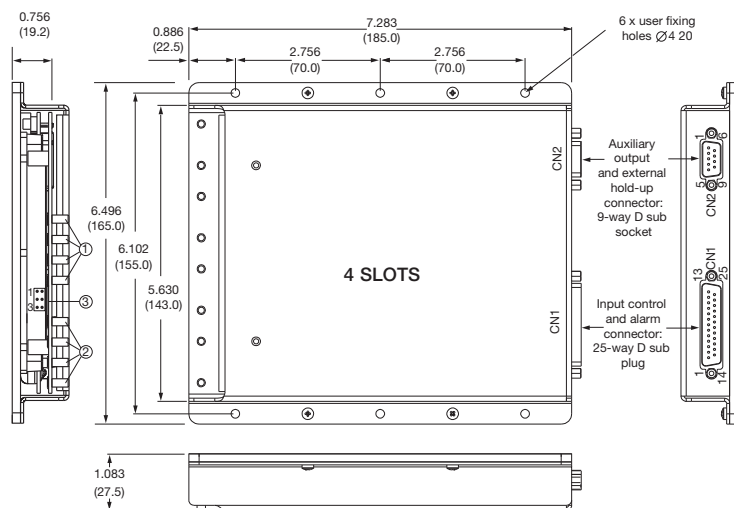
S - Standard
E - Screening option⁽⁵⁾
A - Auxiliary Turn Off⁽⁵⁾

Notes

- Modules 1 to 4 available for MCC400/600 e.g. MCC4Q2D2J2L2PED.
- 4 series output modules to be used with single MCC400/600 models only.
- DC-DC output modules are stress-screened for -55 °C to +90 °C operation.
- Low cost option with passive EMI filtering only. No auxiliary output, EMI to EN55022 level B only.
- Global inhibit will also turn off the auxiliary output - Option A.

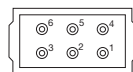
Mechanical Details

MCC400-600



① ② = M4 output studs polarity marked on PCB silk screen. Output polarity varies for multiple outputs.

③ Signal Connector



Harwin 2mm Datamate Connector.
Horizontal male latched, p/n: M80-8680642
Mates with p/n: M80-8890605

MCC400-600: Signals Connector			
Pin	Function	Pin	Function
1	Disable	4	DC OK RTN
2	+sense	5	Disable RTN
3	-sense	6	DC OK

MCC400-600: CN1 25-Pin Input Connector			
Pin	Function	Pin	Function
1	DC OK	14	DC OK RTN
2	Global Inhibit	15	Global Inhibit RTN
3	N/C	16	Negative Input
4	Negative Input	17	Negative Input
5	Negative Input	18	Negative Input
6	Negative Input	19	Negative Input
7	Negative Input	20	Negative Input
8	Negative Input	21	Positive Input
9	Positive Input	22	Positive Input
10	Positive Input	23	Positive Input
11	Positive Input	24	Positive Input
12	Positive Input	25	Positive Input
13	Positive Input		

MCC400-600: CN2 9-Pin Aux Output Connector			
Pin	Function	Pin	Function
1	External Holdup Positive	6	External Holdup Negative
2	External Holdup Positive	7	External Holdup Negative
3	N/C	8	Aux Output Negative
4	Aux Output Positive	9	Aux Output Negative
5	Aux Output Positive		

Notes

- All dimensions are in inches (mm).
- Weight: MCC400/600: 2.31 lb (1.05kg) max.
- Tolerance: ±0.008 in (±0.2 mm).
- Max Torque: M4 studs 17.7 lbs-in (2.0 Nm)
- For mating signal connector kit order part number MCC 6SIG CON KIT

XP Power - Farnell & element14 Cross Reference

XP Power Model	Farnell & e14 Code	XP Power Model	Farnell & e14 Code	XP Power Model	Farnell & e14 Code	XP Power Model	Farnell & e14 Code
ACS40/60 COVER.....	1110687	AEH45UM25.....	1550960	AHM85PS19.....	1821429	DLA150PS24-V.....	1738388
ACS40-60 LOOM.....	1110689	AEH45UM28.....	1550961	AHM85PS24.....	1821431	DLA150PS3150-A.....	1738385
ACS40US03.....	1109805	AEH45UM31.....	1550963	AML120PS12.....	1005742	DLA150PS48-V.....	1738389
ACS40US05.....	1109806	AEH45UM32.....	1550964	AML120PS15.....	1005743	DLA150PS5950-A.....	1738386
ACS40US09.....	1109808	AEH45UM33.....	1550965	AML120PS18.....	1550976	DLA150PS700-A.....	1738383
ACS40US12.....	1109809	AEH45US12.....	1550955	AML120PS19.....	1005744	DLA50PS12-V.....	1738369
ACS40US15.....	1109810	AEH45US24.....	1550956	AML120PS24.....	1005745	DLA50PS2100-A.....	1738368
ACS40US24.....	1109811	AEH45US36.....	1550957	AML120PS36.....	1005746	DLA50PS24-V.....	1738370
ACS40US48.....	1109812	AEH45US48.....	1550958	AML120PS48.....	1005747	DLA50PS350-A.....	1738365
ACS60US03.....	1109813	AEH80UM23.....	1550968	AMM120PS12.....	1625693	DLA50PS700-A.....	1738366
ACS60US09.....	1109814	AEH80UM31.....	1550969	AMM120PS15.....	1625694	DLA75PS12-V.....	1738374
ACS60US12.....	1109815	AEH80US24.....	1550970	AMM120PS18.....	1625695	DLA75PS2100-A.....	1738373
ACS60US12.....	1109816	AEH80US48.....	1550971	AMM120PS19.....	1625696	DLA75PS24-V.....	1738375
ACS60US24.....	1109817	AEL15US03.....	1633333	AMM120PS20.....	1625697	DLA75PS350-A.....	1738371
ACS60US48.....	1109818	AEL15US05.....	1633334	AMM120PS24.....	1625698	DLA75PS48-V.....	1738376
AEB36US05.....	1634808	AEL15US08.....	1633335	AMM120PS30.....	1625699	DLA75PS700-A.....	1738372
AEB36US09.....	1634809	AEL15US09.....	1633336	AMM120PS36.....	1625700	DNR05US05.....	1858046
AEB36US12.....	1634810	AEL15US12.....	1633337	AMM120PS48.....	1625701	DNR05US12.....	1858047
AEB36US13.....	1634812	AEL15US15.....	1633339	AMM150PS12.....	1625702	DNR05US24.....	1858048
AEB36US15.....	1634813	AEL15US18.....	1633341	AMM150PS15.....	1625703	DNR10US05.....	1858049
AEB36US18.....	1634814	AEL15US24.....	1633342	AMM150PS19.....	1625704	DNR10US12.....	1858050
AEB36US24.....	1634815	AEL15US30.....	1633343	AMM150PS24.....	1625705	DNR10US24.....	1550977
AEB36US48.....	1634816	AEL15US36.....	1633344	AMM150PS27.....	1625707	DNR120AS12-I.....	1372699
AEB70US12.....	1634817	AEL15US48.....	1633345	AMM150PS48.....	1625708	DNR120AS24-I.....	1372700
AEB70US15.....	1634818	AEL80US12.....	1633346	CLC125US12.....	1860851	DNR120AS48-I.....	1372702
AEB70US18.....	1634819	AEL80US15.....	1633347	CLC125US24.....	1860852	DNR120PS12.....	1209253
AEB70US19.....	1634820	AEL80US18.....	1633348	CLC125US48.....	1860853	DNR120PS24.....	1209254
AEB70US24.....	1634821	AEL80US24.....	1633349	CLC175US12.....	1634802	DNR120PS48.....	1209256
AEB70US48.....	1634822	AEL80US30.....	1633350	CLC175US12-M.....	1821508	DNR120TS12.....	1673355
AED36US05.....	1550924	AEL80US36.....	1633352	CLC175US12-MTF.....	1821511	DNR120TS24.....	1673356
AED36US09.....	1550926	AEL80US48.....	1633353	CLC175US12-TF.....	1821514	DNR18US05.....	1372689
AED36US12.....	9602941	AEM60US05.....	1738302	CLC175US24.....	1634804	DNR18US12.....	1372690
AED36US15.....	9602950	AEM60US12.....	1738303	CLC175US24-M.....	1821509	DNR18US15.....	1372691
AED36US18.....	9602968	AEM60US15.....	1738304	CLC175US24-MTF.....	1821512	DNR18US24.....	1372692
AED36US24.....	9602976	AEM60US18.....	1738305	CLC175US24-TF.....	1821515	DNR240PS24-I.....	1209257
AED36US48.....	1550927	AEM60US19.....	1738307	CLC175US48.....	1634805	DNR240PS24-ID.....	1550978
AED45US05.....	1550928	AEM60US24.....	1738308	CLC175US48-M.....	1821510	DNR240PS48-I.....	1209258
AED45US12.....	1550929	AEM60US36.....	1738309	CLC175US48-MTF.....	1821513	DNR240TS24-I.....	1673357
AED45US15.....	9602917	AEM60US48.....	1738310	CLC175US48-TF.....	1821516	DNR240TS48-I.....	1673358
AED45US18.....	9602925	AEP10US12.....	1550972	CU10-00.....	1005639	DNR30US05.....	1372693
AED45US24.....	9602933	AEP25US05-EU.....	1550973	CU10-09.....	1005641	DNR30US12.....	1372694
AED45US48.....	1550930	AEP25US12-EU.....	1550975	CU10-10.....	1005640	DNR30US24.....	1372696
AED70US12.....	1550931	AFM45US12.....	1860842	CU10-12.....	1005642	DNR30US48.....	1372697
AED70US15.....	1550932	AFM45US15.....	1860843	CU10-13.....	1005643	DNR480PS24-I.....	1372703
AED70US18.....	1550933	AFM45US18.....	1860844	CU10-14.....	1005644	DNR480PS48-I.....	1372704
AED70US19.....	1550934	AFM45US24.....	1860845	CU15-00.....	1005645	DNR480TS24-I.....	1372705
AED70US24.....	1550935	AFM60US12.....	1860846	CU15-00-M.....	1005653	DNR480TS48-I.....	1372706
AED70US48.....	1550936	AFM60US15.....	1860848	CU15-09.....	1005647	DNR60US05.....	1372698
AEF100PS12.....	1765294	AFM60US18.....	1860849	CU15-09-M.....	1005655	DNR60US12.....	1209250
AEF100PS19.....	1765295	AFM60US24.....	1860850	CU15-10.....	1005646	DNR60US24.....	1209251
AEF100PS24.....	1765296	AHM100PS12.....	1821432	CU15-10-M.....	1005654	DNR60US48.....	1209252
AEF100PS48.....	1765297	AHM100PS15.....	1821433	CU15-12.....	1005648	DNR960TS24-I.....	1634806
AEF120PS12.....	1765298	AHM100PS19.....	1821434	CU15-12-M.....	1005656	DNR960TS48-I.....	1634807
AEF120PS19.....	1765299	AHM100PS24.....	1821435	CU15-13.....	1005651	ECE20US03.....	1860854
AEF120PS24.....	1765300	AHM100PS48.....	1821436	CU15-13-M.....	1005657	ECE20US05.....	1860855
AEF120PS48.....	1765301	AHM150PS12.....	1821437	CU15-14.....	1005652	ECE20US09.....	1860856
AEF150PS12.....	1765302	AHM150PS15.....	1821438	CU15-14-M.....	1005658	ECE20US12.....	1860857
AEF150PS19.....	1765303	AHM150PS19.....	1821439	CU20 COVER.....	1005667	ECE20US15.....	1860858
AEF150PS24.....	1765304	AHM150PS24.....	1821440	CU20 LOOM KIT.....	1005666	ECE20US24.....	1860861
AEF150PS36.....	1765305	AHM150PS48.....	1821442	CU20-00.....	1005659	ECE20US48.....	1860862
AEF150PS48.....	1765306	AHM180PS12.....	1821443	CU20-09.....	1005661	ECE40US03.....	1860863
AEH130PS05.....	1550938	AHM180PS15.....	1821444	CU20-10.....	1005660	ECE40US03-S.....	1860864
AEH130PS12.....	1550939	AHM180PS19.....	1821445	CU20-12.....	1005663	ECE40US03-SD.....	1860865
AEH130PS24.....	1550940	AHM180PS24.....	1821446	CU20-13.....	1005664	ECE40US05.....	1860866
AEH130PS28.....	1550941	AHM180PS48.....	1821447	CU20-14.....	1005665	ECE40US05-S.....	1860867
AEH130PS48.....	1550942	AHM250PS12.....	1821448	CU20-60 CONNECTOR KIT.....	1005668	ECE40US05-SD.....	1860868
AEH15US03.....	1550943	AHM250PS15.....	1821449	DLA120PS2100-A.....	1738378	ECE40US09.....	1860869
AEH15US05.....	1550944	AHM250PS19.....	1821450	DLA120PS3150-A.....	1738381	ECE40US09-S.....	1860870
AEH15US12.....	1550945	AHM250PS24.....	1821451	DLA120PS4900-A.....	1738382	ECE40US09-SD.....	1860871
AEH15US15.....	1550946	AHM250PS48.....	1821452	DLA120PS700-A.....	1738377	ECE40US12.....	1860873
AEH15US24.....	1550947	AHM85PS12.....	1821426	DLA150PS12-V.....	1738387	ECE40US12-S.....	1860874
AEH45UM23.....	1550959	AHM85PS15.....	1821427	DLA150PS2100-A.....	1738384	ECE40US12-SD.....	1860875

XP Power - Farnell & element14 Cross Reference

XP Power Model	Farnell & e14 Code	XP Power Model	Farnell & e14 Code	XP Power Model	Farnell & e14 Code	XP Power Model	Farnell & e14 Code
ECE40US15	1860876	ECL15US09-E	1435366	ECL30UT02-T	1860924	ECP40US24	1738169
ECE40US15-S	1860877	ECL15US09-P	1337081	ECL30UT03-E	1860925	ECP40US30	1738170
ECE40US15-SD	1860878	ECL15US09-S	1738152	ECL30UT03-P	1860927	ECP40US48	1738171
ECE40US24	1860879	ECL15US09-T	1337089	ECL30UT03-S	1860928	ECP40UT01	1765317
ECE40US24-S	1860880	ECL15US12-E	1435367	ECL30UT03-T	1860929	ECP40UT02	1765318
ECE40US24-SD	1860881	ECL15US12-P	1337082	ECM100S CON KIT	1005738	ECP40UT03	1765319
ECE40US48	1860882	ECL15US12-S	1738153	ECM100 COVER	1005737	ECP40UT04	1765320
ECE40US48-S	1860883	ECL15US12-T	1337090	ECM100DT LOOM	1005740	ECS100US12	1738297
ECE40US48-SD	1860885	ECL15US15-E	1435368	ECM100S LOOM	1005739	ECS100US15	1738298
ECL05US03-E	1765283	ECL15US15-P	1337083	ECM100UQ41	1289216	ECS100US24	1738299
ECL05US03-P	1765266	ECL15US15-S	1738154	ECM100UQ42	1289217	ECS100US28	1738300
ECL05US03-T	1765274	ECL15US15-T	1337091	ECM100UQ43	1289218	ECS100US48	1738301
ECL05US05-E	1765284	ECL15US24-E	1435369	ECM100UQ44	1289219	ECS25/60 COVER KIT	1821523
ECL05US05-P	1765268	ECL15US24-P	1337084	ECM100US03	1005729	ECS25US12	1821517
ECL05US05-T	1765275	ECL15US24-S	1738155	ECM100US05	1005731	ECS25US15	1821518
ECL05US09-E	1765285	ECL15US24-T	1337092	ECM100US09	1005732	ECS25US24	1821521
ECL05US09-P	1765269	ECL15US48-E	1435370	ECM100US12	1005733	ECS25US48	1821522
ECL05US09-T	1765276	ECL15US48-P	1337085	ECM100US15	1005734	ECS45US05	1821524
ECL05US12-E	1765286	ECL15US48-S	1738156	ECM100US24	1005735	ECS45US12	1821525
ECL05US12-P	1765270	ECL15US48-T	1337093	ECM100US48	1005736	ECS45US15	1821526
ECL05US12-T	1765277	ECL15UT02-E	1860899	ECM100UT31	1289213	ECS45US24	1821527
ECL05US15-E	1765287	ECL15UT02-P	1860900	ECM100UT33	1289215	ECS45US48	1821528
ECL05US15-P	1765271	ECL15UT02-S	1860901	ECM140 COVER KIT	1692787	ECS60US12	1860930
ECL05US15-T	1765278	ECL15UT02-T	1860903	ECM140US12	1624685	ECS60US15	1860931
ECL05US24-E	1765288	ECL15UT03-E	1860904	ECM140US15	1624686	ECS60US24	1860932
ECL05US24-P	1765272	ECL15UT03-P	1860905	ECM140US18	1624687	ECS60US48	1860933
ECL05US24-T	1765281	ECL15UT03-S	1860906	ECM140US24	1624688	ECS65US12	1821421
ECL05US48-E	1765289	ECL15UT03-T	1860907	ECM140US48	1624689	ECS65US15	1821422
ECL05US48-P	1765273	ECL25/30 DIN CLIP	1821553	ECM40/60 CON KIT	1176955	ECS65US24	1821423
ECL05US48-T	1765282	ECL25US03-E	1580479	ECM40/60 COVER	1176953	ECS65US28	1821424
ECL10US03-E	1435355	ECL25US03-P	1580464	ECM40/60DT LOOM	1177009	ECS65US48	1821425
ECL10US03-P	1289130	ECL25US03-S	1738157	ECM40/60S LOOM	1176954	EMA212PS12	1289126
ECL10US03-T	1289138	ECL25US03-T	1580471	ECM40UD21	1550983	EMA212PS24	1289127
ECL10US05-E	1435356	ECL25US05-E	1580480	ECM40US05	1176956	EMA212PS48	1289128
ECL10US05-P	1289131	ECL25US05-P	1580465	ECM40US07	1550979	FCM400PS12	1821414
ECL10US05-T	1289139	ECL25US05-S	1738158	ECM40US09	1550980	FCM400PS15	1821415
ECL10US09-E	1435357	ECL25US05-T	1580472	ECM40US12	1176957	FCM400PS24	1821417
ECL10US09-P	1289132	ECL25US09-E	1580481	ECM40US15	1176958	FCM400PS28	1821418
ECL10US09-T	1289140	ECL25US09-P	1580466	ECM40US18	1550981	FCM400PS36	1821419
ECL10US12-E	1435359	ECL25US09-S	1738159	ECM40US24	1176959	FCM400PS48	1821420
ECL10US12-P	1289133	ECL25US09-T	1580473	ECM40US33	1550982	HPU1K5PS12	1765290
ECL10US12-T	1289141	ECL25US12-E	1580482	ECM40US48	1176960	HPU1K5PS24	1765291
ECL10US15-E	1435361	ECL25US12-P	1580467	ECM40UT31	1176970	HPU1K5PS48	1765293
ECL10US15-P	1289134	ECL25US12-S	1738160	ECM40UT32	1176971	IA0505D	8727465
ECL10US15-T	1289142	ECL25US12-T	1580475	ECM40UT33	1176974	IA0505S	8727473
ECL10US24-E	1435362	ECL25US15-E	1580483	ECM40UT34	1176975	IA0509S	8727481
ECL10US24-P	1289136	ECL25US15-P	1580468	ECM40UT35	1176976	IA0512D	8727490
ECL10US24-T	1289143	ECL25US15-S	1738162	ECM60US05	1176962	IA0512S	8727503
ECL10US48-E	1435363	ECL25US15-T	1580476	ECM60US12	1176963	IA0515D	8727511
ECL10US48-P	1289137	ECL25US24-E	1580484	ECM60US12-C	1550984	IA0515S	8727520
ECL10US48-T	1289144	ECL25US24-P	1580469	ECM60US15	1176964	IA1205D	8727538
ECL15 DIN CLIP	1821552	ECL25US24-S	1738163	ECM60US18	1550985	IA1205S	8727546
ECL15UD01-E	1860886	ECL25US24-T	1580477	ECM60US24	1176965	IA1209S	8727554
ECL15UD01-P	1860887	ECL25US48-E	1580485	ECM60US24-C	1487783	IA1212D	8727562
ECL15UD01-S	1860888	ECL25US48-P	1580470	ECM60US48	1176966	IA1212S	8727570
ECL15UD01-T	1860889	ECL25US48-S	1738164	ECM60UT31	1176969	IA1215D	8727589
ECL15UD02-E	1860890	ECL25US48-T	1580478	ECM60UT32	1176977	IA1215S	8727597
ECL15UD02-P	1860891	ECL30UD01-E	1860908	ECM60UT33	1176978	IA2405D	8727600
ECL15UD02-S	1860892	ECL30UD01-P	1860909	ECM60UT34	1176979	IA2405S	8727619
ECL15UD02-T	1860893	ECL30UD01-S	1860910	ECM60UT35	1176980	IA2412D	8727627
ECL15UD03-E	1860894	ECL30UD01-T	1860911	ECP150PS12	1821473	IA2412S	8727635
ECL15UD03-P	1860895	ECL30UD02-E	1860912	ECP150PS15	1821474	IA2415D	8727643
ECL15UD03-S	1860897	ECL30UD02-P	1860913	ECP150PS24	1821475	IA2415S	8727651
ECL15UD03-T	1860898	ECL30UD02-S	1860915	ECP150PS28	1821476	IA4805S	8727660
ECL15US03-E	1435364	ECL30UD02-T	1860916	ECP150PS48	1821478	IA4812S	8727678
ECL15US03-P	1337079	ECL30UD03-E	1860917	ECP40UD01	1765314	IB0505S	1550987
ECL15US03-S	1738149	ECL30UD03-P	1860918	ECP40UD02	1765315	IC0505DA	1860934
ECL15US03-T	1337086	ECL30UD03-S	1860919	ECP40UD03	1765316	IC0512DA	1860935
ECL15US05-E	1435365	ECL30UD03-T	1860920	ECP40US05	1738165	IC0515DA	1860936
ECL15US05-P	1337080	ECL30UT02-E	1860921	ECP40US12	1738166	IC1205DA	1860937
ECL15US05-S	1738151	ECL30UT02-P	1860922	ECP40US15	1738167	ICH10024S12	1550991
ECL15US05-T	1337088	ECL30UT02-S	1860923	ECP40US18	1738168	ICH5024WS05	1550988



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XP Power Model	Farnell & e14 Code	XP Power Model	Farnell & e14 Code	XP Power Model	Farnell & e14 Code	XP Power Model	Farnell & e14 Code
ICH5024WS24.....	1550989	IH1203S-H.....	1436148	IP2412SA.....	1859161	ISF0509A.....	1776114
ICH7524S05.....	1550990	IH1205D.....	8727937	IP2415S.....	1859164	ISF0512.....	1776119
IE0303S-H.....	1436114	IH1205S.....	8727945	IP2415SA.....	1859162	ISF0512A.....	1776115
IE0305S-H.....	1436115	IH1205S-H.....	1436149	IP4803SA.....	1859165	ISF0515.....	1776120
IE0309S-H.....	1436116	IH1209D.....	8727953	IP4805S.....	1859169	ISF0515A.....	1776116
IE0312S-H.....	1436117	IH1209S.....	8727961	IP4805SA.....	1859166	ISF1205.....	1776126
IE0315S-H.....	1436118	IH1209S-H.....	1436150	IP4812S.....	1861112	ISF1205A.....	1776121
IE0324S-H.....	1436121	IH1212D.....	8727970	IP4812SA.....	1859167	ISF1209.....	1776127
IE0503S-H.....	1436122	IH1212S.....	8727988	IP4815S.....	1859170	ISF1209A.....	1776122
IE0505D.....	8727686	IH1212S-H.....	1436151	IP4815SA.....	1859168	ISF1212.....	1776128
IE0505S.....	8727694	IH1215D.....	8727996	IQ0505S.....	1860939	ISF1212A.....	1776123
IE0505S-H.....	1436123	IH1215S.....	8728003	IQ0505SA.....	1860941	ISF1215.....	1776129
IE0509S-H.....	1436124	IH1215S-H.....	1436152	IQ0509S.....	1860942	ISF1215A.....	1776124
IE0512D.....	8727708	IH1224S-H.....	1436153	IQ0509SA.....	1860943	ISF2403A.....	1776130
IE0512S.....	8727716	IH2403S-H.....	1436154	IQ0512S.....	1860944	ISF2405.....	1776136
IE0512S-H.....	1436125	IH2405D.....	8728011	IQ0512SA.....	1860945	ISF2405A.....	1776131
IE0515D.....	8727724	IH2405S.....	8728020	IQ0515S.....	1860946	ISF2409.....	1776138
IE0515S.....	8727732	IH2405S-H.....	1436155	IQ0515SA.....	1860947	ISF2409A.....	1776132
IE0515S-H.....	1436126	IH2409D.....	8728038	IQ1205S.....	1860948	ISF2412.....	1776139
IE0524S-H.....	1436127	IH2409S.....	8728046	IQ1205SA.....	1860949	ISF2412A.....	1776133
IE1203S-H.....	1436128	IH2409S-H.....	1436157	IQ1209S.....	1860950	ISF2415.....	1776140
IE1205D.....	8727740	IH2412D.....	8728054	IQ1209SA.....	1860952	ISF2415A.....	1776134
IE1205S.....	8727759	IH2412S.....	8728062	IQ1212S.....	1860953	ISF2424A.....	1776135
IE1205S-H.....	1436129	IH2412S-H.....	1436158	IQ1212SA.....	1860954	ISG0505A.....	1738332
IE1209S-H.....	1436130	IH2415D.....	8728070	IQ1215S.....	1860955	ISG0512A.....	1738333
IE1212D.....	8727767	IH2415S.....	8728089	IQ1215SA.....	1860956	ISG0515A.....	1738334
IE1212S.....	8727775	IH2415S-H.....	1436159	IQ1505S.....	1860957	ISG1205A.....	1738335
IE1212S-H.....	1436131	IH2424S-H.....	1436160	IQ1505SA.....	1860958	ISG1212A.....	1738336
IE1215S.....	8727783	IK0503SA.....	1859045	IQ1509S.....	1860959	ISG1215A.....	1738337
IE1215S-H.....	1436133	IK0505SA.....	1859046	IQ1509SA.....	1860960	ISJ0505A.....	1861002
IE1224S-H.....	1436134	IK0512SA.....	1859047	IQ1512S.....	1860961	ISJ0512A.....	1861003
IE2403S-H.....	1436135	IK0515SA.....	1859048	IQ1512SA.....	1860962	ISJ0515A.....	1861004
IE2405D.....	8727791	IK0524SA.....	1859049	IQ1515S.....	1860964	ISJ1205A.....	1861005
IE2405S.....	8727805	IK1203SA.....	1859050	IQ1515SA.....	1860965	ISP1203A.....	1738338
IE2405S-H.....	1436136	IK1205SA.....	1859051	IQ2405S.....	1860966	ISP1205.....	1738344
IE2409S-H.....	1436137	IK1212SA.....	1859052	IQ2405SA.....	1860967	ISP1205A.....	1738339
IE2412D.....	8727813	IK1215SA.....	1859053	IQ2409S.....	1860968	ISP1209A.....	1738340
IE2412S.....	8727821	IK1224SA.....	1859054	IQ2409SA.....	1860969	ISP1212.....	1738345
IE2412S-H.....	1436138	IL0505S.....	8728097	IQ2412S.....	1860970	ISP1212A.....	1738341
IE2415D.....	8727830	IL0509S.....	8728100	IQ2412SA.....	1860971	ISP1215.....	1738346
IE2415S.....	8727848	IL0512S.....	8728119	IQ2415S.....	1860972	ISP1215A.....	1738342
IE2415S-H.....	1436139	IL0515S.....	8728127	IQ2415SA.....	1860973	ISP2403A.....	1738347
IE2424S-H.....	1436140	IL1205S.....	8728135	IQ4805S.....	1860974	ISP2405.....	1738352
IF0503S.....	1435372	IL1209S.....	8728143	IQ4805SA.....	1860976	ISP2405A.....	1738348
IF0505S.....	1435373	IL1212S.....	8728151	IQ4809S.....	1860977	ISP2409A.....	1738349
IF0509S.....	1435374	IL1215S.....	8728160	IQ4809SA.....	1860978	ISP2412.....	1738353
IF0512S.....	1435375	IL2405S.....	1550992	IQ4812S.....	1860979	ISP2412A.....	1738350
IF0515S.....	1435376	IM2403SA.....	1738172	IQ4812SA.....	1860980	ISP2415.....	1738354
IF1203S.....	1435377	IM2405S.....	1738177	IQ4815S.....	1860981	ISP2415A.....	1738351
IF1205S.....	1435378	IM2405SA.....	1738174	IQ4815SA.....	1860982	ISQ0505A.....	1861006
IF1209S.....	1435379	IM2412S.....	1738178	IR0505S.....	1860983	ISQ0512A.....	1861007
IF1212S.....	1435380	IM2412SA.....	1738175	IR0505SA.....	1860984	ISQ0515A.....	1861008
IF1215S.....	1435381	IM2415S.....	1738179	IR0509S.....	1860985	ISQ1205A.....	1861009
IF2403S.....	1435382	IM2415SA.....	1738176	IR0509SA.....	1860986	ISQ1212A.....	1861010
IF2405S.....	1435384	IM4803SA.....	1738180	IR0512S.....	1860988	ISQ1215A.....	1861011
IF2409S.....	1435385	IM4805S.....	1738184	IR0512SA.....	1860989	ISQ2405A.....	1861012
IF2412S.....	1435386	IM4805SA.....	1738181	IR0515S.....	1860990	ISQ2412A.....	1861014
IF2415S.....	1435387	IM4812S.....	1738186	IR0515SA.....	1860991	ISQ2415A.....	1861015
IH0503S-H.....	1436141	IM4812SA.....	1738182	IR1205S.....	1860992	IST0505A.....	1738356
IH0505D.....	8727856	IM4815S.....	1738187	IR1205SA.....	1860993	IST0512A.....	1738357
IH0505S.....	8727864	IM4815SA.....	1738183	IR1209S.....	1860994	IST0515A.....	1738358
IH0505S-H.....	1436142	IP1203SA.....	1859151	IR1209SA.....	1860995	IST1205A.....	1738359
IH0509D.....	8727872	IP1205S.....	1859155	IR1212S.....	1860996	IST1212A.....	1738360
IH0509S.....	8727880	IP1205SA.....	1859152	IR1212SA.....	1860997	IST1215A.....	1738361
IH0509S-H.....	1436143	IP1212S.....	1861110	IR1215S.....	1860998	IST2405A.....	1738362
IH0512D.....	8727899	IP1212SA.....	1859153	IR1215SA.....	1861000	IST2412A.....	1738363
IH0512S.....	8727902	IP1215S.....	1859156	ISF0303A.....	1776109	IST2415A.....	1738364
IH0512S-H.....	1436145	IP1215SA.....	1859154	ISF0305A.....	1776110	IT2403SA.....	1738188
IH0515D.....	8727910	IP2403SA.....	1859157	ISF0503A.....	1776111	IT2405S.....	1738192
IH0515S.....	8727929	IP2405S.....	1859163	ISF0505.....	1776117	IT2405SA.....	1738189
IH0515S-H.....	1436146	IP2405SA.....	1859159	ISF0505A.....	1776112	IT2412S.....	1738193
IH0524S-H.....	1436147	IP2412S.....	1861111	ISF0509.....	1776118	IT2412SA.....	1738190

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IT2415S	1738194	IZ1205SA	1637823	JCA0224S03	1289162	JCA0605S12	1337127
IT2415SA	1738191	IZ1212S	1637828	JCA0224S05	1289163	JCA0605S15	1337128
IT4803SA	1738195	IZ1212SA	1637825	JCA0224S12	1289164	JCA0612D01	1337138
IT4805S	1738200	IZ1215S	1637829	JCA0224S15	1289165	JCA0612D02	1337139
IT4805SA	1738196	IZ1215SA	1637826	JCA0248D01	1289174	JCA0612D03	1337140
IT4812S	1738201	IZ2403SA	1637830	JCA0248D02	1289175	JCA0612S03	1337134
IT4812SA	1738198	IZ2405S	1637834	JCA0248D03	1289176	JCA0612S05	1337135
IT4815S	1738202	IZ2405SA	1637831	JCA0248S03	1289169	JCA0612S12	1337136
IT4815SA	1738199	IZ2412S	1637835	JCA0248S05	1289170	JCA0612S15	1337137
IU0503SA	1435408	IZ2412SA	1637832	JCA0248S12	1289171	JCA0624D01	1337146
IU0505SA	1435409	IZ2415S	1637837	JCA0248S15	1289173	JCA0624D02	1337147
IU0509SA	1435410	IZ2415SA	1637833	JCA0305D01	1289181	JCA0624D03	1337148
IU0512SA	1435411	IZ4803SA	1637838	JCA0305D02	1289182	JCA0624S03	1337141
IU0515SA	1435412	IZ4805S	1637842	JCA0305D03	1289183	JCA0624S05	1337143
IU0524SA	1435414	IZ4805SA	1637839	JCA0305S03	1289177	JCA0624S12	1337144
IU1203SA	1435415	IZ4812S	1637843	JCA0305S05	1289178	JCA0624S15	1337145
IU1205SA	1435416	IZ4812SA	1637840	JCA0305S12	1289179	JCA0648D01	1337153
IU1209SA	1435417	IZ4815S	1637844	JCA0305S15	1289180	JCA0648D02	1337155
IU1212SA	1435418	IZ4815SA	1637841	JCA0312D01	1289189	JCA0648D03	1337156
IU1215SA	1435419	JAH0205D03	1859062	JCA0312D02	1289190	JCA0648S03	1337149
IU1224SA	1435420	JAH0205D05	1859063	JCA0312D03	1289191	JCA0648S05	1337150
IU2403SA	1435421	JAH0205D09	1859064	JCA0312S03	1289185	JCA0648S12	1337151
IU2405SA	1435422	JAH0205D12	1859065	JCA0312S05	1289186	JCA0648S15	1337152
IU2409SA	1435423	JAH0205D15	1859066	JCA0312S12	1289187	JCB0305D05	1859100
IU2412SA	1435424	JAH0205D24	1859068	JCA0312S15	1289188	JCB0305D09	1859101
IU2415SA	1435426	JAH0205S05	1859057	JCA0324D01	1289197	JCB0305D12	1859102
IU2424SA	1435427	JAH0205S09	1859058	JCA0324D02	1289198	JCB0305D15	1859103
IU4803SA	1435428	JAH0205S12	1859059	JCA0324D03	1289199	JCB0305D24	1859104
IU4805SA	1435429	JAH0205S15	1859060	JCA0324S03	1289192	JCB0305S05	1859096
IU4809SA	1435430	JAH0205S24	1859061	JCA0324S05	1289193	JCB0305S09	1859097
IU4812SA	1435431	JAH0205S3V3	1859056	JCA0324S12	1289194	JCB0305S12	1859098
IU4815SA	1435432	JAH0212D03	1859075	JCA0324S15	1289195	JCB0305S15	1861106
IU4824SA	1435433	JAH0212D05	1859076	JCA0348D01	1289205	JCB0305S24	1859099
IV0505S	8728178	JAH0212D09	1859077	JCA0348D02	1289206	JCB0312D05	1859111
IV0505SA	8728186	JAH0212D12	1859078	JCA0348D03	1289207	JCB0312D09	1859112
IV0512S	8728194	JAH0212D15	1859081	JCA0348S03	1289200	JCB0312D12	1859113
IV0512SA	8728208	JAH0212D24	1859082	JCA0348S05	1289201	JCB0312D15	1859114
IV0515S	8728216	JAH0212S05	1859070	JCA0348S12	1289203	JCB0312D24	1859115
IV0515SA	8728224	JAH0212S09	1859071	JCA0348S15	1289204	JCB0312S05	1859105
IV1205S	8728232	JAH0212S12	1859072	JCA0405D01	1337098	JCB0312S09	1859106
IV1205SA	8728240	JAH0212S15	1859073	JCA0405D02	1337100	JCB0312S12	1859107
IV1212S	8728259	JAH0212S24	1859074	JCA0405D03	1337101	JCB0312S15	1861107
IV1212SA	8728267	JAH0212S3V3	1859069	JCA0405S03	1337094	JCB0312S24	1859108
IV1215S	8728275	JAH0224D03	1859089	JCA0405S05	1337095	JCB0324D05	1859120
IV1215SA	8728283	JAH0224D05	1859090	JCA0405S12	1337096	JCB0324D09	1859121
IW0503SA	1435388	JAH0224D09	1859091	JCA0405S15	1337097	JCB0324D12	1859123
IW0505SA	1435389	JAH0224D12	1859093	JCA0412D01	1337107	JCB0324D15	1859124
IW0509SA	1435390	JAH0224D15	1859094	JCA0412D02	1337108	JCB0324D24	1859125
IW0512SA	1435391	JAH0224D24	1859095	JCA0412D03	1337109	JCB0324S05	1859116
IW0515SA	1435392	JAH0224S05	1859084	JCA0412S03	1337102	JCB0324S09	1859117
IW0524SA	1435393	JAH0224S09	1859085	JCA0412S05	1337103	JCB0324S12	1859118
IW1203SA	1435394	JAH0224S12	1859086	JCA0412S12	1337104	JCB0324S15	1861108
IW1205SA	1435396	JAH0224S15	1859087	JCA0412S15	1337106	JCB0324S24	1859119
IW1209SA	1435397	JAH0224S24	1859088	JCA0424D01	1337114	JCB0348D05	1859130
IW1212SA	1435398	JAH0224S3V3	1859083	JCA0424D02	1337115	JCB0348D09	1859131
IW1215SA	1435399	JCA0205D01	1289150	JCA0424D03	1337116	JCB0348D12	1859132
IW1224SA	1435400	JCA0205D02	1289151	JCA0424S03	1337110	JCB0348D15	1859133
IW2403SA	1435402	JCA0205D03	1289152	JCA0424S05	1337111	JCB0348D24	1859135
IW2405SA	1435403	JCA0205S03	1289145	JCA0424S12	1337112	JCB0348S05	1859126
IW2409SA	1435404	JCA0205S05	1289146	JCA0424S15	1337113	JCB0348S09	1859127
IW2412SA	1435405	JCA0205S12	1289148	JCA0448D01	1337122	JCB0348S12	1859128
IW2415SA	1435406	JCA0205S15	1289149	JCA0448D02	1337123	JCB0348S15	1861109
IW2424SA	1435407	JCA0212D01	1289157	JCA0448D03	1337124	JCB0348S24	1859129
IZ0503SA	1637815	JCA0212D02	1289158	JCA0448S03	1337118	JCG1212D12	1637898
IZ0505S	1637819	JCA0212D03	1289161	JCA0448S05	1337119	JCG1212D15	1637899
IZ0505SA	1637816	JCA0212S03	1289153	JCA0448S12	1337120	JCG1212S05	1637894
IZ0512S	1637820	JCA0212S05	1289154	JCA0448S15	1337121	JCG1212S12	1637895
IZ0512SA	1637817	JCA0212S12	1289155	JCA0605D01	1337131	JCG1212S15	1637896
IZ0515S	1637821	JCA0212S15	1289156	JCA0605D02	1337132	JCG1212S2V5	1637892
IZ0515SA	1637818	JCA0224D01	1289166	JCA0605D03	1337133	JCG1212S3V3	1637893
IZ1203SA	1637822	JCA0224D02	1289167	JCA0605S03	1337125	JCG1224D12	1637906
IZ1205S	1637827	JCA0224D03	1289168	JCA0605S05	1337126	JCG1224D15	1637907



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JCG1224S05.....	1637902	JCJ1048D15.....	1637891	JCK4012S12.....	1861019	JCP4012D12.....	1435533
JCG1224S12.....	1637904	JCJ1048S05.....	1637887	JCK4012S15.....	1861020	JCP4012D15.....	1435534
JCG1224S15.....	1637905	JCJ1048S12.....	1637888	JCK4012S3V3.....	1861021	JCP4012S05.....	1435529
JCG1224S2V5.....	1637900	JCJ1048S15.....	1637889	JCK4024D12.....	1861022	JCP4012S12.....	1435531
JCG1224S3V3.....	1637901	JCJ1048S2V5.....	1637884	JCK4024D15.....	1861023	JCP4012S15.....	1435532
JCG1248D12.....	1637913	JCJ1048S3V3.....	1637886	JCK4024S05.....	1861024	JCP4012S3V3.....	1435527
JCG1248D15.....	1637914	JCK1512D03.....	1738223	JCK4024S12.....	1861026	JCP4012T0312.....	1435535
JCG1248S05.....	1637910	JCK1512D05.....	1738224	JCK4024S15.....	1861027	JCP4012T0315.....	1435536
JCG1248S12.....	1637911	JCK1512D12.....	1738225	JCK4024S3V3.....	1861028	JCP4012T0512.....	1435537
JCG1248S15.....	1637912	JCK1512D15.....	1738226	JCK4048D12.....	1861029	JCP4012T0515.....	1435538
JCG1248S2V5.....	1637908	JCK1512S05.....	1738220	JCK4048D15.....	1861030	JCP4024D12.....	1435544
JCG1248S3V3.....	1637909	JCK1512S12.....	1738221	JCK4048S05.....	1861031	JCP4024D15.....	1435545
JCH1012D03.....	1435506	JCK1512S15.....	1738222	JCK4048S12.....	1861032	JCP4024S05.....	1435540
JCH1012D05.....	1435507	JCK1512S3V3.....	1738219	JCK4048S15.....	1861033	JCP4024S12.....	1435542
JCH1012D12.....	1435508	JCK1524D03.....	1738232	JCK4048S3V3.....	1861034	JCP4024S15.....	1435543
JCH1012D15.....	1435509	JCK1524D05.....	1738233	JCL3012D12.....	1637957	JCP4024S3V3.....	1435539
JCH1012S05.....	1435502	JCK1524D12.....	1738234	JCL3012D15.....	1637958	JCP4024T0312.....	1435546
JCH1012S12.....	1435503	JCK1524D15.....	1738235	JCL3012S05.....	1637954	JCP4024T0315.....	1435547
JCH1012S15.....	1435505	JCK1524S05.....	1738229	JCL3012S12.....	1637955	JCP4024T0512.....	1435548
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JCH1024D03.....	1435514	JCK1524S15.....	1738231	JCL3012S3V3.....	1637953	JCP4048D12.....	1435555
JCH1024D05.....	1435515	JCK1524S3V3.....	1738228	JCL3024D12.....	1637963	JCP4048D15.....	1435556
JCH1024D12.....	1435517	JCK1548D03.....	1738242	JCL3024D15.....	1637965	JCP4048S05.....	1435551
JCH1024D15.....	1435518	JCK1548D05.....	1738243	JCL3024S05.....	1637960	JCP4048S12.....	1435552
JCH1024S05.....	1435511	JCK1548D12.....	1738244	JCL3024S12.....	1637961	JCP4048S15.....	1435554
JCH1024S12.....	1435512	JCK1548D15.....	1738245	JCL3024S15.....	1637962	JCP4048S3V3.....	1435550
JCH1024S15.....	1435513	JCK1548S05.....	1738237	JCL3024S3V3.....	1637959	JCP4048T0312.....	1435557
JCH1024S3V3.....	1435510	JCK1548S12.....	1738238	JCL3048D12.....	1637970	JCP4048T0315.....	1435558
JCH1048D03.....	1435523	JCK1548S15.....	1738241	JCL3048D15.....	1637971	JCP4048T0512.....	1435559
JCH1048D05.....	1435524	JCK1548S3V3.....	1738236	JCL3048S05.....	1637967	JCP4048T0515.....	1435560
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JCJ0824S15.....	1637857	JCK3012D05.....	1821395	JCM1548D12.....	1821550	JHM0624S12.....	1673378
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JCJ0848S05.....	1637863	JCK3012S15.....	1821394	JCM1548S3V3.....	1821545	JPM120PS12.....	1109841
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JCJ0848S15.....	1637865	JCK3024D05.....	1821403	JCM2012D15.....	1861036	JPM120PS15.....	1109843
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JCJ1012D15.....	1637876	JCK3024S05.....	1821400	JCM2012S15.....	1861040	JPM120PS48.....	1109847
JCJ1012S05.....	1637871	JCK3024S12.....	1821401	JCM2012S3V3.....	1861041	JPM160PS03.....	1109848
JCJ1012S12.....	1637872	JCK3024S15.....	1821402	JCM2024D12.....	1861042	JPM160PS05.....	1109849
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JCJ1024D12.....	1637882	JCK3048D15.....	1821413	JCM2024S15.....	1861046	JPM160PS15.....	1109853
JCJ1024D15.....	1637883	JCK3048S05.....	1821408	JCM2024S3V3.....	1861047	JPM160PS24.....	1109854
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JCJ1024S12.....	1637880	JCK3048S15.....	1821410	JCM2048D15.....	1861051	JPM160PS48.....	1109857
JCJ1024S15.....	1637881	JCK3048S3V3.....	1821407	JCM2048S05.....	1861052	JPM80PS03.....	1109827
JCJ1024S2V5.....	1637877	JCK4012D12.....	1861016	JCM2048S12.....	1861053	JPM80PS05.....	1109829
JCJ1024S3V3.....	1637878	JCK4012D15.....	1861017	JCM2048S15.....	1861054	JPM80PS07.....	1109830
JCJ1048D12.....	1637890	JCK4012S05.....	1861018	JCM2048S3V3.....	1861055	JPM80PS12.....	1109831

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XP Power Model	Farnell & e14 Code	XP Power Model	Farnell & e14 Code	XP Power Model	Farnell & e14 Code	XP Power Model	Farnell & e14 Code
JPM80PS13	1109833	JTB0548S12	1435495	JTF1248D15	1637935	JTL4024S3V3	1821378
JPM80PS15	1109834	JTB0548S15	1435496	JTF1248S05	1637925	JTL4048D12	1821389
JPM80PS24	1109835	JTB0548S3V3	1435493	JTF1248S12	1637931	JTL4048D15	1821390
JPM80PS27	1109836	JTC0424D03	1435455	JTF1248S15	1637932	JTL4048S05	1821385
JPM80PS48	1109837	JTC0424D05	1435456	JTF1248S3V3	1637924	JTL4048S12	1821387
JPS130 COVER	1110693	JTC0424D12	1435457	JTH1524D05	1372711	JTL4048S15	1821388
JPS130-M COVER	1005638	JTC0424D15	1435458	JTH1524D12	1372712	JTL4048S3V3	1821384
JPS130PS CON KIT	1110691	JTC0424S05	1435452	JTH1524D15	1372714	JTM2024D05	1637942
JPS130PS05	1109858	JTC0424S12	1435453	JTH1524S05	1372708	JTM2024D12	1637943
JPS130PS05-M	1337226	JTC0424S15	1435454	JTH1524S12	1372709	JTM2024D15	1637944
JPS130PS12	1109859	JTC0424S3V3	1435451	JTH1524S15	1372710	JTM2024S05	1637937
JPS130PS12-M	1337227	JTC0448D03	1435464	JTH1524S3V3	1372707	JTM2024S12	1637938
JPS130PS15	1109860	JTC0448D05	1435465	JTH1548D05	1372719	JTM2024S15	1637941
JPS130PS15-M	1337228	JTC0448D12	1435466	JTH1548D12	1372720	JTM2024S3V3	1637936
JPS130PS24	1109861	JTC0448D15	1435467	JTH1548D15	1372721	JTM2048D05	1637949
JPS130PS24-M	1337229	JTC0448S05	1435460	JTH1548S05	1372716	JTM2048D12	1637950
JPS130PS28-M	1337230	JTC0448S12	1435461	JTH1548S12	1372717	JTM2048D15	1637951
JPS130PS48	1109862	JTC0448S15	1435463	JTH1548S15	1372718	JTM2048S05	1637946
JPS130PS48-M	1337231	JTC0448S3V3	1435459	JTH1548S3V3	1372715	JTM2048S12	1637947
JPS130PS-M CON KIT	1019932	JTC0624D03	1435472	JTK1524D05	1738208	JTM2048S15	1637948
JPS130PT CON KIT	1110692	JTC0624D05	1435473	JTK1524D12	1738209	JTM2048S3V3	1637945
JPS130PT30	1109863	JTC0624D12	1435475	JTK1524D15	1738210	LCL150PS12	1738311
JPS130PT31	1109864	JTC0624D15	1435476	JTK1524S05	1738205	LCL150PS15	1738312
JPS130PT31-M	1337232	JTC0624S05	1435469	JTK1524S12	1738206	LCL150PS24	1738313
JPS130PT32-M	1337234	JTC0624S12	1435470	JTK1524S15	1738207	LCL150PS48	1738314
JPS130PT34-M	1337235	JTC0624S15	1435471	JTK1524S3V3	1738204	LCL300PS12	1738315
JPS130PT CON KIT	1019933	JTC0624S3V3	1435468	JTK1548D05	1738216	LCL300PS15	1738316
JPS250 F/CVR	1176946	JTC0648D03	1435481	JTK1548D12	1738217	LCL300PS24	1738317
JPS250 F/CVR 24	1176952	JTC0648D05	1435482	JTK1548D15	1738218	LCL300PS48	1738319
JPS250 F/CVR 5	1176949	JTC0648D12	1435483	JTK1548S05	1738212	LCL500PS12	1738321
JPS250PQ41	1177005	JTC0648D15	1435484	JTK1548S12	1738213	LCL500PS15	1738322
JPS250PQ46	1177004	JTC0648S05	1435478	JTK1548S15	1738214	LCL500PS24	1738323
JPS250PQ47	1177006	JTC0648S12	1435479	JTK1548S3V3	1738211	LCL500PS48	1738324
JPS250PQ48	1177007	JTC0648S15	1435480	JTK2024D12	1861071	LDU0830S300	1738291
JPS250PS05C	1176935	JTC0648S3V3	1435477	JTK2024D15	1861072	LDU0830S350	1738292
JPS250PS12C	1176937	JTF0824D05	1859140	JTK2024S05	1861073	LDU2430S1000	1738296
JPS250PS15C	1176938	JTF0824D12	1859141	JTK2024S12	1861075	LDU2430S500	1738293
JPS250PS24C	1176939	JTF0824D15	1859142	JTK2024S15	1861076	LDU2430S600	1738294
JPS250PS48C	1176940	JTF0824S05	1859137	JTK2024S3V3	1861077	LDU2430S700	1738295
JPS350 F/CVR	1176947	JTF0824S12	1859138	JTK2048D12	1861078	MFA350PS12	1289122
JPS350 F/CVR 5	1176951	JTF0824S15	1859139	JTK2048D15	1861079	MFA350PS12-SEF	1676497
JPS350PQ48	1550993	JTF0824S3V3	1859136	JTK2048S05	1861080	MFA350PS12-STF	1676494
JPS350PS05C	1176941	JTF0848D05	1859148	JTK2048S12	1861081	MFA350PS24	1289124
JPS350PS12C	1176942	JTF0848D12	1859149	JTK2048S15	1861082	MFA350PS24-SEF	1676498
JPS350PS15C	1176943	JTF0848D15	1859150	JTK2048S3V3	1861083	MFA350PS24-STF	1676495
JPS350PS24C	1176944	JTF0848S05	1859144	JTL3024D05	1738270	MFA350PS48	1289125
JPS350PS48C	1176945	JTF0848S12	1859145	JTL3024D12	1738271	MFA350PS48-SEF	1676499
JTB0324D05	1435439	JTF0848S15	1859147	JTL3024D15	1738272	MFA350PS48-STF	1676496
JTB0324D12	1435440	JTF0848S3V3	1859143	JTL3024S05	1738267	MHP1000PS12	1821479
JTB0324D15	1435441	JTF1024D05	1861056	JTL3024S12	1738268	MHP1000PS15	1821480
JTB0324S05	1435435	JTF1024D12	1861057	JTL3024S15	1738269	MHP1000PS24	1821481
JTB0324S12	1435436	JTF1024D15	1861058	JTL3024S3V3	1738266	MHP1000PS28	1821482
JTB0324S15	1435438	JTF1024S05	1861059	JTL3024T0312	1738273	MHP1000PS36	1821483
JTB0324S3V3	1435434	JTF1024S12	1861060	JTL3024T0315	1738274	MHP1000PS48	1821484
JTB0348D05	1435446	JTF1024S15	1861061	JTL3024T0512	1738275	MHP650PS12-EF	1821501
JTB0348D12	1435447	JTF1024S3V3	1861063	JTL3024T0515	1738277	MHP650PS15-EF	1821502
JTB0348D15	1435448	JTF1048D05	1861064	JTL3048D05	1738282	MHP650PS24-EF	1821503
JTB0348S05	1435443	JTF1048D12	1861065	JTL3048D12	1738283	MHP650PS28-EF	1821504
JTB0348S12	1435444	JTF1048D15	1861066	JTL3048D15	1738284	MHP650PS36-EF	1821505
JTB0348S15	1435445	JTF1048S05	1861067	JTL3048S05	1738279	MHP650PS48-EF	1821506
JTB0348S3V3	1435442	JTF1048S12	1861068	JTL3048S12	1738280	PBM200PQ02-C	1289229
JTB0524D05	1435490	JTF1048S15	1861069	JTL3048S15	1738281	PBM200PQ05-C	1289230
JTB0524D12	1435491	JTF1048S3V3	1861070	JTL3048S3V3	1738278	PBM200PQ06-C	1289231
JTB0524D15	1435492	JTF1224D05	1637921	JTL3048T0312	1738285	PBM200PS05-C	1289221
JTB0524S05	1435487	JTF1224D12	1637922	JTL3048T0315	1738286	PBM200PS12-C	1289222
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JTB0524S15	1435489	JTF1224S05	1637917	JTL3048T0515	1738289	PBM200PS24-C	1289224
JTB0524S3V3	1435485	JTF1224S12	1637919	JTL4024D12	1821382	PBM200PS3V3-C	1289220
JTB0548D05	1435497	JTF1224S15	1637920	JTL4024D15	1821383	PBM200PS48-C	1289225
JTB0548D12	1435499	JTF1224S3V3	1637916	JTL4024S05	1821379	PBM200PT02-C	1289227
JTB0548D15	1435500	JTF1248D05	1637933	JTL4024S12	1821380	PBM200PT03-C	1289228
JTB0548S05	1435494	JTF1248D12	1637934	JTL4024S15	1821381	PBM200PT04-C	1550994



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XP Power Model	Farnell & e14 Code	XP Power Model	Farnell & e14 Code	XP Power Model	Farnell & e14 Code	XP Power Model	Farnell & e14 Code
PBM25 COVER	1110694	PCM80PT04	1176995	SDS60UT07-C	1551006	VCS70US15	1821464
PBM25D/T CONNECTOR KIT	1110696	PCM80PT05	1176996	SDS60UT08	1551007	VCS70US24	1821466
PBM25S CONNECTOR KIT	1110695	PCM80PT07	1550995	SDS60UT09	1551008	VCS70US48	1821467
PBM25UD01	1109872	PDM30US05	1625685	SDS60UT10	1109925	VCT40US05	1716958
PBM25UD02	1109873	PDM30US09	1625686	SHP1000PS12	1821485	VCT60US12	1716959
PBM25US05	1109865	PDM30US12	1625687	SHP1000PS15	1821486	VCT60US15	1716960
PBM25US12	1109866	PDM30US15	1625689	SHP1000PS24	1821487	VCT60US24	1716961
PBM25US15	1109867	PDM30US18	1625691	SHP1000PS28	1821488	VEH60US12	1673382
PBM25US24	1109869	PDM30US24	1625692	SHP1000PS36	1821491	VEH60US15	1673383
PBM25US28	1109871	PDM60US15	1550996	SHP1000PS48	1821492	VEH60US24	1673384
PBM25UT01	1109874	PDM60US18	1550997	SHP650PS12-EF	1738325	VEH90PS12	1821454
PBM25UT02	1109875	SDC320AS12	1436104	SHP650PS15-EF	1738326	VEH90PS19	1821455
PBM25UT03	1109876	SDC320AS24	1436106	SHP650PS24-EF	1738327	VEH90PS24	1821456
PBM300PQ01-C	1289118	SDC320AS48	1436108	SHP650PS28-EF	1738328	VEP PLUG EU	1716986
PBM300PQ02-C	1289119	SDR FAN COVER	1436102	SHP650PS36-EF	1738329	VEP PLUG UK	1716984
PBM300PQ03-C	1289120	SDR250AS12	1436098	SHP650PS48-EF	1738330	VEP PLUG US	1716985
PBM300PQ07-C	1289121	SDR250AS15	1436099	SMC500PS12-C	1005718	VEP08US05	1716971
PBM300PS03-C	1289112	SDR250AS24	1436100	SMC500PS24-C	1005720	VEP08US09	1716972
PBM300PS05-C	1289113	SDS120 CON KIT	1110707	SMC500PS48-C	1005721	VEP08US12	1716973
PBM300PS12-C	1289114	SDS120 COVER	1109955	SMC600PS12-C	1005724	VEP15US05	1716974
PBM300PS15-C	1289115	SDS120M LOOM	1110709	SMC600PS24-C	1005726	VEP15US09	1716975
PBM300PS24-C	1289116	SDS120PS03B	1109943	SMC600PS48-C	1005727	VEP15US12	1716976
PBM300PS48-C	1289117	SDS120PS05B	1109944	SMM400PS12-C	1289107	VEP15US24	1716977
PBM65 CONNECTOR KIT	1110699	SDS120PS12B	1109945	SMM400PS24-C	1289109	VEP24US05	1716978
PBM65 COVER	1110697	SDS120PS15B	1109946	SMM400PS48-C	1289110	VEP24US09	1716981
PBM65 LOOM	1110698	SDS120PS24B	1109948	SMQ300PS12-C	1109934	VEP24US12	1716982
PBM65US05	1109877	SDS120PS28B	1550999	SMQ300PS15-C	1109936	VEP24US24	1716983
PBM65US12	1109878	SDS120PS48B	1109949	SMQ300PS24-C	1109937	VEP36US09	1861101
PBM65US15	1109880	SDS120PS48B-C	1551001	SMQ400PS12-C	1109939	VEP36US12	1861102
PBM65US18	1109882	SDS120PT00B	1109950	SMQ400PS15-C	1109940	VEP36US15	1861103
PBM65US24	1109883	SDS120PT07B	1109951	SMQ400PS24-C	1109941	VEP36US24	1861105
PBM65US28	1109885	SDS120PT08B	1109952	SMR800PS12	1436109	VFT150PS05	1821497
PCM120PS12	1337236	SDS120PT10B	1109953	SMR800PS24	1436111	VFT150PS12	1821498
PCM120PS15	1337237	SDS120PT15B	1109954	SMR800PS48	1436113	VFT150PS24	1821499
PCM120PS18	1337238	SDS120S LOOM	1110708	SR05S05	1861084	VFT150PS48	1821500
PCM120PS24	1337240	SDS150PS09B	1337157	SR05S09	1861085	VFT80US05	1821493
PCM120PS48	1337241	SDS150PS12B	1337158	SR05S12	1861087	VFT80US12	1821494
PCM50UD02	1109899	SDS150PS12B-M	1765307	SR05S15	1861088	VFT80US15	1821495
PCM50UD07	1109901	SDS150PS15B	1337159	SR05S1V5	1861089	VFT80US24	1821496
PCM50UD08	1109902	SDS150PS18B	1337160	SR05S1V8	1861090	WA201	1551020
PCM50US05	1109888	SDS150PS24B	1337161	SR05S2V5	1861091	WC206	1551022
PCM50US07	1109889	SDS150PS24B-M	1765308	SR05S3V3	1861092	WD201	1551023
PCM50US09	1109890	SDS150PS48B	1337162	SR05S6V5	1861093	WD202	1551025
PCM50US12	1109891	SDS180PS12B	1765311	SR05S7V2	1861094	WE300	1551026
PCM50US15	1109892	SDS180PS24B	1765312	SR10S05	1861095	WF202	1551027
PCM50US18	1109894	SDS180PS48B	1765313	SR10S1V5	1861096	WF203	1551028
PCM50US24	1109895	SDS60 CON KIT	1110700	SR10S1V8	1861097	WF205	1551029
PCM50US28	1109896	SDS60 COVER KIT	1110705	SR10S2V5	1861099	WF206	1551030
PCM50US2V5	1109886	SDS60DT LOOM KIT	1110703	SR10S3V3	1861100	WT205A	1551031
PCM50US36	1109897	SDS60Q CON KIT	1110701	THF120LS24	1551018	WT301	1551032
PCM50US3V3	1109887	SDS60Q LOOM KIT	1110704	THF240PS24	1551019	WU201	1551033
PCM50US48	1109898	SDS60 LOOM KIT	1110702	THF45US24	1551017		
PCM50UT01	1109903	SDS60UD01	1551005	VCP05US05	1716962		
PCM50UT02	1109904	SDS60UQ01	1109926	VCP05US12	1716963		
PCM50UT03	1109905	SDS60UQ02	1109927	VCP15US05	1716964		
PCM50UT04	1109906	SDS60UQ03	1109928	VCP15US12	1716965		
PCM50UT05	1109907	SDS60UQ05	1109929	VCP15US24	1716966		
PCM50UT06	1109908	SDS60US03	1109910	VCP24US05	1716968		
PCM50UT07	1109909	SDS60US05	1109912	VCP24US12	1716969		
PCM80PS05	1176982	SDS60US09	1109914	VCP24US24	1716970		
PCM80PS07	1176983	SDS60US12	1109915	VCS100US05	1821468		
PCM80PS09	1176984	SDS60US15	1109916	VCS100US12	1821469		
PCM80PS12	1176986	SDS60US19	1551002	VCS100US15	1821470		
PCM80PS13V5	1176987	SDS60US24	1109917	VCS100US24	1821471		
PCM80PS15	1176988	SDS60US24B	1551003	VCS100US48	1821472		
PCM80PS18	1176989	SDS60US36	1551004	VCS50US05	1821457		
PCM80PS24	1176990	SDS60US48	1109918	VCS50US12	1821458		
PCM80PS27	1176991	SDS60UT00	1109919	VCS50US15	1821459		
PCM80PS3V3	1176981	SDS60UT03	1109920	VCS50US24	1821460		
PCM80PS48	1176992	SDS60UT05	1109921	VCS50US48	1821461		
PCM80PT01	1176993	SDS60UT06	1109922	VCS70US05	1821462		
PCM80PT03	1176994	SDS60UT07	1109924	VCS70US12	1821463		

We are continually adding products to the Farnell & element14 catalogs and websites, please visit www.farnell.com & www.element14.com for the latest product availability.

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XP Power Model	Newark Code	XP Power Model	Newark Code	XP Power Model	Newark Code	XP Power Model	Newark Code	XP Power Model	Newark Code
ACS40/60 COVER	04R8189	AEL15US12	12P6960	AML120PS19	70K8503	DLA150PS700-A	52R2648	ECE40US12-S	24T5142
ACS40US03	04R8190	AEL15US15	12P6961	AML120PS24	04R8283	DLA50PS12-V	52R2649	ECE40US12-SD	24T5143
ACS40US05	04R8191	AEL15US18	12P6962	AML120PS36	04R8284	DLA50PS2100-A	52R2650	ECE40US15	24T5144
ACS40US09	04R8192	AEL15US24	12P6963	AML120PS48	04R8285	DLA50PS24-V	52R2651	ECE40US15-S	24T5145
ACS40US12	04R8193	AEL15US30	12P6964	AML180PS18	63R9850	DLA50PS350-A	52R2652	ECE40US15-SD	24T5146
ACS40US15	04R8194	AEL15US36	12P6965	AML180PS19	63R9851	DLA50PS700-A	52R2653	ECE40US24	24T5147
ACS40US24	86K9386	AEL15US48	12P6966	AML180PS24	11R6699	DLA75PS12-V	52R2654	ECE40US24-S	24T5148
ACS40US48	04R8195	AEL20US05	77M9134	AML180PS48	51R1456	DLA75PS2100-A	52R2655	ECE40US24-SD	24T5149
ACS60US03	04R8196	AEL20US12	77M9135	AMM120PS12	88M3065	DLA75PS24-V	52R2656	ECE40US48	24T5150
ACS60US05	04R8197	AEL20US15	77M9136	AMM120PS15	12P6974	DLA75PS350-A	52R2657	ECE40US48-S	24T5151
ACS60US09	04R8198	AEL20US24	77M9137	AMM120PS18	12P6975	DLA75PS48-V	52R2658	ECE40US48-SD	24T5152
ACS60US12	44P2266	AEL20US30	77M9138	AMM120PS19	12P6976	DLA75PS700-A	52R2659	ECL05US03-E	52R2670
ACS60US15	27M3852	AEL20US48	77M9139	AMM120PS20	12P6977	DNR10US05	19P1915	ECL05US03-P	52R2671
ACS60US24	04R8199	AEL40US05	77M9140	AMM120PS24	12P6978	DNR10US05-S	32R8022	ECL05US03-T	52R2672
ACS60US48	04R8200	AEL40US09	77M9141	AMM120PS30	12P6979	DNR10US12	19P1916	ECL05US05-E	52R2673
AEB100PS12	11R6440	AEL40US12	77M9142	AMM120PS36	12P6980	DNR10US12-S	32R8023	ECL05US05-P	52R2674
AEB100PS125	11R6441	AEL40US18	77M9143	AMM120PS48	12P6981	DNR10US15	19P1917	ECL05US05-T	52R2675
AEB100PS15	11R6442	AEL40US24	77M9144	AMM150PS12	12P6982	DNR10US15-S	32R8024	ECL05US09-E	52R2676
AEB100PS24	11R6443	AEL40US36	77M9145	AMM150PS15	12P6983	DNR10US24	66M8131	ECL05US09-P	52R2677
AEB100PS48	11R6444	AEL40US48	77M9146	AMM150PS19	12P6984	DNR10US24-S	32R8025	ECL05US09-T	52R2678
AEB36US05	12P6941	AEL80US12	12P6967	AMM150PS24	12P6985	DNR120AS12-I	19P1918	ECL05US12-E	52R2679
AEB36US09	12P6942	AEL80US15	12P6968	AMM150PS27	12P6986	DNR120AS24-I	53M7441	ECL05US12-P	52R2680
AEB36US12	12P6943	AEL80US18	12P6969	AMM150PS48	12P6987	DNR120AS48-I	19P1919	ECL05US12-T	52R2681
AEB36US13	12P6944	AEL80US24	12P6970	CLC125US12	67R9643	DNR18US05	19P1920	ECL05US15-E	52R2682
AEB36US15	12P6945	AEL80US30	12P6971	CLC125US24	67R9644	DNR18US05-S	34P2668	ECL05US15-P	52R2683
AEB36US18	12P6946	AEL80US36	12P6972	CLC125US48	67R9645	DNR18US12	19P1921	ECL05US15-T	52R2684
AEB36US24	12P6948	AEL80US48	12P6973	CLC175US12	04R8364	DNR18US12-S	32R8026	ECL05US24-E	52R2685
AEB36US48	12P6949	AEM60US05	52R2706	CLC175US12-M	79R9144	DNR18US15	19P1922	ECL05US24-P	52R2686
AEB45US12	12P6950	AEM60US12	52R2707	CLC175US12-MTF	79R9145	DNR18US15-S	32R8027	ECL05US24-T	52R2687
AEB45US15	12P6951	AEM60US15	52R2708	CLC175US12-TF	79R9146	DNR18US24	88M3106	ECL05US48-E	52R2688
AEB45US18	12P6952	AEM60US18	52R2709	CLC175US24	04R8365	DNR18US24-S	56P3006	ECL05US48-P	52R2689
AEB45US19	12P6953	AEM60US19	52R2710	CLC175US24-M	79R9147	DNR240PS24-I	19P1923	ECL05US48-T	52R2690
AEB45US24	12P6954	AEM60US24	52R2711	CLC175US24-MTF	79R9148	DNR240PS48-I	19P1924	ECL10US03-E	89M0081
AEB45US48	12P6955	AEM60US36	52R2712	CLC175US24-TF	79R9149	DNR30US05	19P1925	ECL10US03-P	32M6275
AEB70US12	77M9128	AEM60US48	52R2713	CLC175US48	04R8366	DNR30US05-S	32R8028	ECL10US03-T	32M6276
AEB70US15	77M9129	AFM45US12	24T5117	CLC175US48-M	79R9150	DNR30US12	88M3108	ECL10US05-E	89M0082
AEB70US18	77M9130	AFM45US15	24T5118	CLC175US48-MTF	79R9151	DNR30US12-S	32R8029	ECL10US05-P	32M6277
AEB70US19	77M9131	AFM45US18	24T5119	CLC175US48-TF	79R9152	DNR30US24	19P1926	ECL10US05-T	32M6278
AEB70US24	77M9132	AFM45US24	24T5120	CU10-00	72K7908	DNR30US24-S	32R8030	ECL10US09-E	89M0083
AEB70US48	77M9133	AFM60US12	24T5121	CU10-10	72K7909	DNR30US48	19P1927	ECL10US09-P	32M6279
AED100US12	72K7807	AFM60US15	24T5122	CU10-12	72K7910	DNR30US48-S	32R8031	ECL10US09-T	32M6280
AED100US15	72K7808	AFM60US18	24T5123	CU10-13	72K7911	DNR480PS24-I	19P1928	ECL10US12-E	89M0084
AED100US18	73K6072	AFM60US24	24T5124	CU10-14	72K7912	DNR480PS48-I	19P1929	ECL10US12-P	32M6281
AED100US19	72K7809	AHM100PS12	67R9445	CU15-00	72K7913	DNR60US05	19P1930	ECL10US12-T	32M6282
AED100US24	73K0919	AHM100PS15	67R9446	CU15-00-M	85K4791	DNR60US05-S	32R8032	ECL10US15-E	89M0085
AED100US48	72K7810	AHM100PS19	67R9447	CU15-09-M	85K4794	DNR60US12	19P1931	ECL10US15-P	32M6283
AED45US18	55R2426	AHM100PS24	67R9448	CU15-10	72K7914	DNR60US12-S	32R8033	ECL10US15-T	32M6284
AED70US12	71J0077	AHM100PS48	67R9449	CU15-10-M	85K4796	DNR60US24	19P1932	ECL10US24-E	89M0086
AED70US15	71J0078	AHM150PS12	67R9450	CU15-12	72K7915	DNR60US24-S	32R8034	ECL10US24-P	32M6285
AED70US18	72K7811	AHM150PS15	67R9451	CU15-12-M	85K4798	DNR60US48	19P1933	ECL10US24-T	32M6286
AED70US19	72K7812	AHM150PS19	67R9452	CU15-13	72K7916	DNR60US48-S	32R8035	ECL10US48-E	89M0087
AED70US24	71J0081	AHM150PS24	67R9453	CU15-13-M	85K4800	DSF200LV	64M6391	ECL10US48-P	32M6287
AED70US48	71J0082	AHM150PS48	67R9454	CU15-14	72K7917	DSF500	07R8386	ECL10US48-T	32M6288
AEF100PS12	52R2714	AHM180PS12	67R9455	CU15-14-M	85K4802	ECE20US03	24T5125	ECL15 DIN CLIP	79R9153
AEF100PS19	52R2715	AHM180PS15	67R9456	CU20 COVER	04R8375	ECE20US05	24T5126	ECL15UD01-E	24T5153
AEF100PS24	52R2716	AHM180PS19	67R9457	CU20-00	72K7918	ECE20US09	24T5127	ECL15UD01-P	24T5154
AEF100PS48	52R2717	AHM180PS24	67R9458	CU20-10	72K7919	ECE20US12	24T5128	ECL15UD01-S	24T5155
AEF120PS12	52R2718	AHM180PS48	67R9459	CU20-12	71J0095	ECE20US15	24T5129	ECL15UD01-T	24T5156
AEF120PS19	52R2719	AHM250PS12	67R9460	CU20-13	72K7920	ECE20US24	24T5130	ECL15UD02-E	24T5157
AEF120PS24	52R2720	AHM250PS15	67R9461	CU20-14	79K6122	ECE20US48	24T5131	ECL15UD02-P	24T5158
AEF120PS48	52R2721	AHM250PS19	67R9462	DLA120PS2100-A	52R2638	ECE40US03	24T5132	ECL15UD02-S	24T5159
AEF150PS12	52R2722	AHM250PS24	67R9463	DLA120PS3150-A	52R2639	ECE40US03-S	24T5133	ECL15UD02-T	24T5160
AEF150PS19	52R2723	AHM250PS48	67R9464	DLA120PS4900-A	52R2640	ECE40US03-SD	24T5134	ECL15UD03-E	24T5161
AEF150PS24	52R2724	AHM85PS12	67R9465	DLA120PS700-A	52R2641	ECE40US05	24T5135	ECL15UD03-P	24T5162
AEF150PS36	52R2725	AHM85PS15	67R9466	DLA150PS12-V	52R2642	ECE40US05-S	24T5136	ECL15UD03-S	24T5163
AEF150PS48	52R2726	AHM85PS19	67R9467	DLA150PS2100-A	52R2643	ECE40US05-SD	24T5137	ECL15UD03-T	24T5164
AEL15US03	12P6956	AHM85PS24	67R9468	DLA150PS24-V	52R2644	ECE40US09	24T5138	ECL15US03-E	89M0088
AEL15US05	12P6957	AML120PS12	06M3719	DLA150PS3150-A	52R2645	ECE40US09-S	24T5139	ECL15US03-P	32M6289
AEL15US08	12P6958	AML120PS15	04R8281	DLA150PS48-V	52R2646	ECE40US09-SD	24T5140	ECL15US03-S	52R2691
AEL15US09	12P6959	AML120PS18	04R8282	DLA150PS5950-A	52R2647	ECE40US12	24T5141	ECL15US03-T	32M6290



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XP Power Model	Newark Code	XP Power Model	Newark Code	XP Power Model	Newark Code	XP Power Model	Newark Code	XP Power Model	Newark Code
ECL15US05-E	89M0089	ECL30UD03-P	24T5182	ECP40UT01	52R2737	IA1224S	88M0702	IF0509S	04R8559
ECL15US05-P	32M6291	ECL30UD03-S	24T5183	ECP40UT02	52R2738	IA2403S	88M0703	IF0512S	04R8560
ECL15US05-S	52R2692	ECL30UD03-T	24T5184	ECP40UT03	52R2739	IA2405D	04R8537	IF0515S	04R8561
ECL15US05-T	32M6292	ECL30UT02-E	24T5185	ECP40UT04	52R2740	IA2405S	88M0704	IF1203S	04R8562
ECL15US09-E	89M0090	ECL30UT02-P	24T5186	ECS100US12	33R2421	IA2409S	88M0705	IF1205S	04R8563
ECL15US09-P	32M6293	ECL30UT02-S	24T5187	ECS100US15	33R2422	IA2412D	04R8538	IF1209S	04R8564
ECL15US09-S	52R2693	ECL30UT02-T	24T5188	ECS100US24	33R2423	IA2412S	88M0706	IF1212S	04R8565
ECL15US09-T	32M6294	ECL30UT03-E	24T5189	ECS100US28	33R2424	IA2415D	04R8539	IF1215S	04R8566
ECL15US12-E	89M0091	ECL30UT03-P	24T5190	ECS100US48	33R2425	IA2415S	88M0707	IF2403S	04R8567
ECL15US12-P	32M6295	ECL30UT03-S	24T5191	ECS25-60 COVER KIT	67R9469	IA2424S	88M0708	IF2405S	04R8568
ECL15US12-S	52R2694	ECL30UT03-T	24T5192	ECS25US12	67R9470	IC0505DA	24T5197	IF2409S	04R8569
ECL15US12-T	32M6296	ECM100S CON KIT	55R3037	ECS25US15	67R9471	IC0512DA	24T5198	IF2412S	04R8570
ECL15US15-E	89M0092	ECM100 COVER	32M6303	ECS25US24	67R9472	IC0515DA	24T5199	IF2415S	04R8571
ECL15US15-P	32M6297	ECM100UQ41	04R8439	ECS25US48	67R9473	IC1205DA	24T5200	IH0503S	88M0745
ECL15US15-S	52R2695	ECM100UQ42	85K4804	ECS45US05	67R9474	ICH10024S12	04R8540	IH0503SH	04R8572
ECL15US15-T	32M6298	ECM100UQ43	85K4806	ECS45US12	67R9475	ICH5024WS05	04R8541	IH0505D	14M8369
ECL15US24-E	89M0093	ECM100UQ44	04R8440	ECS45US15	67R9476	ICH5024WS24	39M3541	IH0505S	88M0746
ECL15US24-P	32M6299	ECM100UQ45	85K4808	ECS45US24	67R9477	ICH7524S05	04R8542	IH0505SH	04R8573
ECL15US24-S	52R2696	ECM100US03	85K4810	ECS45US48	67R9478	IE0303SH	04R8543	IH0509D	04R8574
ECL15US24-T	32M6300	ECM100US05	85K4812	ECS60US12	24T5193	IE0305SH	04R8544	IH0509S	88M0747
ECL15US48-E	89M0094	ECM100US09	04R8441	ECS60US15	24T5194	IE0309SH	04R8545	IH0509SH	04R8575
ECL15US48-P	32M6301	ECM100US12	85K4814	ECS60US24	24T5195	IE0312SH	04R8546	IH0512D	04R8576
ECL15US48-S	52R2697	ECM100US15	67K7667	ECS60US48	24T5196	IE0315SH	04R8547	IH0512S	88M0748
ECL15US48-T	32M6302	ECM100US24	85K4816	ECS65US12	67R9479	IE0324SH	04R8548	IH0512SH	04R8577
ECL15UT02-E	24T5165	ECM100US48	85K4818	ECS65US15	67R9480	IE0503S	88M0709	IH0515D	04R8578
ECL15UT02-P	24T5166	ECM100UT31	85K4820	ECS65US24	67R9481	IE0503SH	88M0710	IH0515S	88M0749
ECL15UT02-S	24T5167	ECM100UT33	85K4822	ECS65US28	67R9482	IE0505D	04R8549	IH0515SH	04R8579
ECL15UT02-T	24T5168	ECM100UT34	85K4824	ECS65US48	67R9483	IE0505S	88M0711	IH0524S	88M0750
ECL15UT03-E	24T5169	ECM140 COVER KIT	04R8442	EMA212PS12	85K4826	IE0505SH	88M0712	IH0524SH	04R8580
ECL15UT03-P	24T5170	ECM140US12	04R8443	EMA212PS24	32M6305	IE0509S	88M0713	IH1203S	88M0751
ECL15UT03-S	24T5171	ECM140US15	04R8444	EMA212PS48	85K4828	IE0509SH	88M0714	IH1203SH	04R8581
ECL15UT03-T	24T5172	ECM140US18	04R8445	FCM400PS12	67R9646	IE0512D	04R8550	IH1205D	04R8582
ECL25/30 DIN CLIP	79R9154	ECM140US24	04R8446	FCM400PS15	67R9647	IE0512S	88M0715	IH1205S	88M0752
ECL25US03-E	04R8432	ECM140US48	04R8447	FCM400PS24	67R9648	IE0512SH	88M0716	IH1205SH	04R8583
ECL25US03-P	95M8911	ECM40/60 COVER	32M6304	FCM400PS28	67R9649	IE0515D	04R8551	IH1209D	04R8584
ECL25US03-S	52R2698	ECM40/60DT LOOM	55R3038	FCM400PS36	67R9650	IE0515S	88M0717	IH1209S	88M0753
ECL25US03-T	95M8912	ECM40US05	72K8442	FCM400PS48	67R9651	IE0515SH	88M0718	IH1209SH	04R8585
ECL25US05-E	04R8433	ECM40US09	72K8443	FXB3A5A5A7	57R5372	IE0524S	88M0719	IH1212D	04R8586
ECL25US05-P	95M8913	ECM40US12	72K8444	FXB3B4A4A6	57R5373	IE0524SH	88M0720	IH1212S	88M0754
ECL25US05-S	52R2699	ECM40US15	72K8445	FXB3B5A5A6	57R5374	IE1203S	88M0721	IH1212SH	04R8587
ECL25US05-T	95M8914	ECM40US24	71J0110	FXB5B5A3	57R5375	IE1203SH	88M0722	IH1215D	04R8588
ECL25US09-E	04R8434	ECM40US48	72K8446	FXC2C3	57R5376	IE1205D	04R8552	IH1215S	88M0755
ECL25US09-P	95M8915	ECM40UT31	72K8447	FXC3A5A5A7	57R5377	IE1205S	88M0723	IH1215SH	04R8589
ECL25US09-S	52R2700	ECM40UT33	72K8448	FXC3C3	57R5378	IE1205SH	88M0724	IH1224S	88M0756
ECL25US09-T	95M8916	ECM40UT34	72K8449	FXC6C6	57R5379	IE1209S	88M0725	IH1224SH	04R8590
ECL25US12-E	04R8435	ECM60UD21	99K1367	FXD1C3B4	57R5380	IE1209SH	88M0726	IH2403S	88M0757
ECL25US12-P	95M8917	ECM60US05	72K8450	FXD3B3B4B4	57R5381	IE1212D	04R8553	IH2403SH	04R8591
ECL25US12-S	52R2701	ECM60US09	72K8451	FXD3B3B5B5	57R5382	IE1212S	88M0727	IH2405D	04R8592
ECL25US12-T	95M8918	ECM60US12	72K8452	FXE1C3A6	57R5383	IE1212SH	88M0728	IH2405S	88M0758
ECL25US15-E	04R8436	ECM60US15	71J0120	FXE3C3B4	57R5384	IE1215S	88M0729	IH2405SH	04R8593
ECL25US15-P	95M8919	ECM60US24	73K2386	HPU1K5PS12	41R3837	IE1215SH	88M0730	IH2409D	04R8594
ECL25US15-S	52R2702	ECM60US48	72K8453	HPU1K5PS24	52R2918	IE1224S	88M0731	IH2409S	88M0759
ECL25US15-T	95M8920	ECM60UT31	72K8454	HPU1K5PS48	52R2919	IE1224SH	88M0732	IH2409SH	04R8595
ECL25US24-E	04R8437	ECM60UT33	72K8455	IA0503S	88M0691	IE2403S	88M0733	IH2412D	04R8596
ECL25US24-P	95M8921	ECM60UT34	72K8456	IA0505D	04R8531	IE2403SH	88M0734	IH2412S	88M0760
ECL25US24-S	52R2703	ECP150PS12	68R2070	IA0505S	88M0692	IE2405D	04R8554	IH2412SH	04R8597
ECL25US24-T	95M8922	ECP150PS15	68R2071	IA0509S	88M0693	IE2405S	88M0735	IH2415D	04R8598
ECL25US48-E	04R8438	ECP150PS24	68R2072	IA0512D	04R8532	IE2405SH	88M0736	IH2415S	88M0761
ECL25US48-P	95M8923	ECP150PS28	68R2073	IA0512S	88M0694	IE2409S	88M0737	IH2415SH	04R8599
ECL25US48-S	52R2704	ECP150PS48	68R2074	IA0515D	04R8533	IE2409SH	88M0738	IH2424S	88M0762
ECL25US48-T	95M8924	ECP40UD01	52R2727	IA0515S	88M0695	IE2412D	04R8555	IH2424SH	04R8600
ECL30UD01-E	24T5173	ECP40UD02	52R2728	IA0524S	88M0696	IE2412S	88M0739	IK0503SA	99R4231
ECL30UD01-P	24T5174	ECP40UD03	52R2729	IA1203S	88M0697	IE2412SH	88M0740	IK0505SA	99R4232
ECL30UD01-S	24T5175	ECP40US05	52R2730	IA1205D	04R8534	IE2415D	04R8556	IK0512SA	99R4233
ECL30UD01-T	24T5176	ECP40US12	52R2731	IA1205S	88M0698	IE2415S	88M0741	IK0515SA	99R4234
ECL30UD02-E	24T5177	ECP40US15	52R2732	IA1209S	88M0699	IE2415SH	88M0742	IK0524SA	99R4235
ECL30UD02-P	24T5178	ECP40US18	52R2733	IA1212D	04R8535	IE2424S	88M0743	IK1203SA	99R4236
ECL30UD02-S	24T5179	ECP40US24	52R2734	IA1212S	88M0700	IE2424SH	88M0744	IK1205SA	99R4237
ECL30UD02-T	24T5180	ECP40US30	52R2735	IA1215D	04R8536	IF0503S	04R8557	IK1212SA	99R4238
ECL30UD03-E	24T5181	ECP40US48	52R2736	IA1215S	88M0701	IF0505S	04R8558	IK1215SA	99R4239



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IK1224SA	99R4240	IQ1505S	24T5217	ISG0515A	52R2785	IU2409SA	88M0795	IZ2415S	04R8644
IL0503S	88M0763	IQ1505SA	24T5218	ISG1205A	52R2786	IU2412SA	88M0796	IZ2415SA	04R8645
IL0505S	88M0764	IQ1509S	24T5219	ISG1212A	52R2787	IU2415SA	88M0797	IZ4803SA	04R8646
IL0509S	88M0765	IQ1509SA	24T5220	ISG1215A	52R2788	IU2424SA	88M0798	IZ4805S	04R8647
IL0512S	88M0766	IQ1512S	24T5221	ISJ0505A	24T5257	IU4803SA	88M0799	IZ4805SA	04R8648
IL0515S	88M0767	IQ1512SA	24T5222	ISJ0512A	24T5258	IU4805SA	88M0800	IZ4812S	46P9875
IL0524S	88M0768	IQ1515S	24T5223	ISJ0515A	24T5259	IU4809SA	88M0801	IZ4812SA	04R8649
IL1203S	88M0769	IQ1515SA	24T5224	ISJ1205A	24T5260	IU4812SA	88M0802	IZ4815S	04R8650
IL1205S	88M0770	IQ2405S	24T5225	ISP1203A	52R2789	IU4815SA	88M0803	IZ4815SA	04R8651
IL1209S	88M0771	IQ2405SA	24T5226	ISP1205	52R2790	IU4824SA	88M0804	JAH0205D03	99R4259
IL1212S	88M0772	IQ2409S	24T5227	ISP1205A	52R2791	IV0503SA	88M0805	JAH0205D05	99R4260
IL1215S	88M0773	IQ2409SA	24T5228	ISP1209A	52R2792	IV0505S	04R8601	JAH0205D09	99R4261
IL1224S	88M0774	IQ2412S	24T5229	ISP1212	52R2793	IV0505SA	88M0806	JAH0205D12	99R4262
IL2403S	88M0775	IQ2412SA	24T5230	ISP1212A	52R2794	IV0509SA	88M0807	JAH0205D15	99R4263
IL2405S	88M0776	IQ2415S	24T5231	ISP1215	52R2795	IV0512S	04R8602	JAH0205D24	99R4264
IL2409S	88M0777	IQ2415SA	24T5232	ISP1215A	52R2796	IV0512SA	88M0808	JAH0205S05	99R4265
IL2412S	88M0778	IQ4805S	24T5233	ISP2403A	52R2797	IV0515S	04R8603	JAH0205S09	99R4266
IL2415S	88M0779	IQ4805SA	24T5234	ISP2405	52R2798	IV0515SA	96K4994	JAH0205S12	99R4267
IL2424S	88M0780	IQ4809S	24T5235	ISP2405A	52R2799	IV0524SA	88M0809	JAH0205S15	99R4268
IM2403SA	52R2741	IQ4809SA	24T5236	ISP2409A	52R2800	IV1203SA	88M0810	JAH0205S24	99R4269
IM2405S	52R2742	IQ4812S	24T5237	ISP2412	52R2801	IV1205S	04R8604	JAH0205S3V3	99R4270
IM2405SA	52R2743	IQ4812SA	24T5238	ISP2412A	52R2802	IV1205SA	88M0811	JAH0212D03	99R4271
IM2412S	52R2744	IQ4815S	24T5239	ISP2415	52R2803	IV1209SA	88M0812	JAH0212D05	99R4272
IM2412SA	52R2745	IQ4815SA	24T5240	ISP2415A	52R2804	IV1212S	04R8605	JAH0212D09	99R4273
IM2415S	52R2746	IR0505S	24T5241	ISQ0505A	24T5261	IV1212SA	88M0813	JAH0212D12	99R4274
IM2415SA	52R2747	IR0505SA	24T5242	ISQ0512A	24T5262	IV1215S	04R8606	JAH0212D15	99R4275
IM4803SA	52R2748	IR0509S	24T5243	ISQ0515A	24T5263	IV1215SA	88M0814	JAH0212D24	99R4276
IM4805S	52R2749	IR0509SA	24T5244	ISQ1205A	64R8647	IV1224SA	88M0815	JAH0212S05	99R4277
IM4805SA	52R2750	IR0512S	24T5245	ISQ1212A	24T5264	IV2405SA	88M0817	JAH0212S09	99R4278
IM4812S	52R2751	IR0512SA	24T5246	ISQ1215A	24T5265	IV2409SA	88M0818	JAH0212S12	99R4279
IM4812SA	52R2752	IR0515S	24T5247	ISQ2405A	24T5266	IV2412SA	88M0819	JAH0212S15	99R4280
IM4815S	52R2753	IR0515SA	24T5248	ISQ2412A	24T5267	IV2415SA	14M7872	JAH0212S24	99R4281
IM4815SA	52R2754	IR1205S	24T5249	ISQ2415A	24T5268	IV2424SA	88M0820	JAH0212S3V3	99R4282
IP1203SA	99R4241	IR1205SA	24T5250	IST0505A	52R2805	IW0503SA	04R8607	JAH0224D03	99R4283
IP1205S	99R4242	IR1209S	24T5251	IST0512A	52R2806	IW0505SA	04R8608	JAH0224D05	99R4284
IP1205SA	99R4243	IR1209SA	24T5252	IST0515A	52R2807	IW0509SA	04R8609	JAH0224D09	99R4285
IP1212S	24T5847	IR1212S	24T5253	IST1205A	52R2808	IW0512SA	04R8610	JAH0224D12	99R4286
IP1212SA	99R4244	IR1212SA	24T5254	IST1212A	52R2809	IW0515SA	04R8611	JAH0224D15	99R4287
IP1215S	99R4245	IR1215S	24T5255	IST1215A	52R2810	IW0524SA	04R8612	JAH0224D24	99R4288
IP1215SA	99R4246	IR1215SA	24T5256	IST2405A	52R2811	IW1203SA	04R8613	JAH0224S05	63R1564
IP2403SA	99R4247	ISF0303A	52R2755	IST2412A	52R2812	IW1205SA	04R8614	JAH0224S09	99R4289
IP2405S	99R4248	ISF0305A	52R2756	IST2415A	52R2813	IW1209SA	04R8615	JAH0224S12	99R4290
IP2405SA	99R4249	ISF0503A	52R2757	IT2403SA	52R2814	IW1212SA	04R8616	JAH0224S15	99R4291
IP2412S	24T5848	ISF0505	52R2758	IT2405S	52R2815	IW1215SA	04R8617	JAH0224S24	99R4292
IP2412SA	99R4250	ISF0505A	52R2759	IT2405SA	52R2816	IW1224SA	04R8618	JAH0224S3V3	99R4293
IP2415S	99R4251	ISF0509	52R2760	IT2412S	52R2817	IW2403SA	04R8619	JCA0205D01	32M6306
IP2415SA	99R4252	ISF0509A	52R2761	IT2412SA	52R2818	IW2405SA	04R8620	JCA0205D02	32M6307
IP4803SA	99R4253	ISF0512	52R2762	IT2415S	52R2819	IW2409SA	04R8621	JCA0205D03	32M6308
IP4805S	99R4254	ISF0512A	52R2763	IT2415SA	52R2820	IW2412SA	04R8622	JCA0205S03	32M6309
IP4805SA	99R4255	ISF0515	52R2764	IT4803SA	52R2821	IW2415SA	04R8623	JCA0205S05	32M6310
IP4812S	24T5849	ISF0515A	52R2765	IT4805S	52R2822	IW2424SA	04R8624	JCA0205S12	32M6311
IP4812SA	99R4256	ISF1205	52R2766	IT4805SA	52R2823	IZ0503SA	04R8625	JCA0205S15	32M6312
IP4815S	99R4257	ISF1205A	52R2767	IT4812S	52R2824	IZ0505S	04R8626	JCA0212D01	32M6313
IP4815SA	99R4258	ISF1209	52R2768	IT4812SA	52R2825	IZ0505SA	04R8627	JCA0212D02	32M6314
IQ0505S	24T5201	ISF1209A	52R2769	IT4815S	52R2826	IZ0512S	04R8628	JCA0212D03	32M6315
IQ0505SA	24T5202	ISF1212	52R2770	IT4815SA	52R2827	IZ0512SA	04R8629	JCA0212S03	32M6316
IQ0509S	24T5203	ISF1212A	52R2771	IU0503SA	88M0781	IZ0515S	04R8630	JCA0212S05	32M6317
IQ0509SA	24T5204	ISF1215	52R2772	IU0505SA	88M0782	IZ0515SA	04R8631	JCA0212S12	32M6318
IQ0512S	24T5205	ISF1215A	52R2773	IU0509SA	88M0783	IZ1203SA	04R8632	JCA0212S15	32M6319
IQ0512SA	24T5206	ISF2403A	52R2774	IU0512SA	88M0784	IZ1205S	04R8633	JCA0224D01	32M6320
IQ0515S	24T5207	ISF2405	52R2775	IU0515SA	88M0785	IZ1205SA	04R8634	JCA0224D02	32M6321
IQ0515SA	24T5208	ISF2405A	52R2776	IU0524SA	88M0786	IZ1212S	04R8635	JCA0224D03	32M6322
IQ1205S	24T5209	ISF2409	52R2777	IU1203SA	88M0787	IZ1212SA	04R8636	JCA0224S03	32M6323
IQ1205SA	24T5210	ISF2409A	52R2778	IU1205SA	88M0788	IZ1215S	04R8637	JCA0224S05	32M6324
IQ1209S	24T5211	ISF2412	52R2779	IU1209SA	88M0789	IZ1215SA	04R8638	JCA0224S12	32M6325
IQ1209SA	24T5212	ISF2412A	52R2780	IU1212SA	88M0790	IZ2403SA	04R8639	JCA0224S15	32M6326
IQ1212S	24T5213	ISF2415A	52R2781	IU1215SA	88M0791	IZ2405S	04R8640	JCA0248D01	32M6327
IQ1212SA	24T5214	ISF2424A	52R2782	IU1224SA	88M0792	IZ2405SA	04R8641	JCA0248D02	32M6328
IQ1215S	24T5215	ISG0505A	52R2783	IU2403SA	88M0793	IZ2412S	04R8642	JCA0248D03	32M6329
IQ1215SA	24T5216	ISG0512A	52R2784	IU2405SA	88M0794	IZ2412SA	04R8643	JCA0248S03	32M6330



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JCA0248S05.....	32M6331	JCA0612S05.....	32M6401	JCG1212S2V5.....	04R8657	JCJ1024S05.....	04R8724	JCK3048D15.....	79R9172
JCA0248S12.....	32M6332	JCA0612S12.....	32M6402	JCG1212S3V3.....	04R8658	JCJ1024S12.....	04R8725	JCK3048S05.....	79R9173
JCA0248S15.....	32M6333	JCA0612S15.....	32M6403	JCG1224D12.....	04R8659	JCJ1024S15.....	04R8726	JCK3048S12.....	79R9174
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JCA0305D02.....	32M6335	JCA0624D02.....	32M6405	JCG1224S05.....	04R8661	JCJ1024S3V3.....	04R8728	JCK3048S3V3.....	79R9176
JCA0305D03.....	32M6336	JCA0624D03.....	32M6406	JCG1224S12.....	04R8662	JCJ1048D12.....	04R8729	JCK4012D12.....	24T5269
JCA0305S03.....	32M6337	JCA0624S03.....	32M6407	JCG1224S15.....	04R8663	JCJ1048D15.....	04R8730	JCK4012D15.....	24T5270
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JCA0412S15.....	32M6375	JCB0324S12.....	99R4320	JCJ0812S12.....	04R8698	JCK2024S05.....	52R2869	JCM1512S05.....	79R9180
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JCA0424D02.....	32M6377	JCB0324S24.....	99R4321	JCJ0812S3V3.....	04R8700	JCK2024S15.....	52R2871	JCM1512S15.....	79R9182
JCA0424D03.....	32M6378	JCB0348D05.....	99R4322	JCJ0824D05.....	04R8701	JCK2024S3V3.....	52R2872	JCM1512S3V3.....	79R9183
JCA0424S03.....	32M6379	JCB0348D09.....	99R4323	JCJ0824D12.....	04R8702	JCK2048D12.....	52R2873	JCM1524D05.....	79R9184
JCA0424S05.....	32M6380	JCB0348D12.....	99R4324	JCJ0824D15.....	04R8703	JCK2048D15.....	52R2874	JCM1524D12.....	79R9185
JCA0424S12.....	32M6381	JCB0348D15.....	99R4325	JCJ0824S05.....	04R8704	JCK2048S05.....	52R2875	JCM1524D15.....	79R9186
JCA0424S15.....	32M6382	JCB0348D24.....	99R4326	JCJ0824S12.....	04R8705	JCK2048S12.....	52R2876	JCM1524S05.....	79R9187
JCA0448D01.....	32M6383	JCB0348S05.....	99R4327	JCJ0824S15.....	04R8706	JCK2048S15.....	52R2877	JCM1524S12.....	79R9188
JCA0448D02.....	32M6384	JCB0348S09.....	99R4328	JCJ0824S3V3.....	04R8707	JCK2048S3V3.....	41R3844	JCM1524S15.....	79R9189
JCA0448D03.....	32M6385	JCB0348S12.....	99R4329	JCJ0848D05.....	04R8708	JCK3012D05.....	79R9155	JCM1524S3V3.....	79R9190
JCA0448S03.....	32M6386	JCB0348S15.....	24T5853	JCJ0848D12.....	04R8709	JCK3012D12.....	79R9156	JCM1548D05.....	79R9191
JCA0448S05.....	32M6387	JCB0348S24.....	99R4330	JCJ0848D15.....	04R8710	JCK3012D15.....	79R9157	JCM1548D12.....	79R9192
JCA0448S12.....	32M6388	JCF1024S05.....	32M9263	JCJ0848S05.....	04R8711	JCK3012S05.....	79R9158	JCM1548D15.....	79R9193
JCA0448S15.....	32M6389	JCF1024S12.....	32M9264	JCJ0848S12.....	04R8712	JCK3012S12.....	79R9159	JCM1548S05.....	79R9194
JCA0605D01.....	32M6390	JCF1024S2V5.....	32M9265	JCJ0848S15.....	04R8713	JCK3012S15.....	79R9160	JCM1548S12.....	79R9195
JCA0605D02.....	32M6391	JCF1024S3V3.....	32M9266	JCJ0848S3V3.....	04R8714	JCK3012S3V3.....	79R9161	JCM1548S15.....	79R9196
JCA0605D03.....	32M6392	JCF1048S05.....	32M9267	JCJ1012D12.....	04R8715	JCK3024D05.....	79R9163	JCM1548S3V3.....	79R9197
JCA0605S03.....	32M6393	JCF1048S12.....	32M9268	JCJ1012D15.....	04R8716	JCK3024D12.....	79R9164	JCM2012D12.....	24T5287
JCA0605S05.....	32M6394	JCF1048S2V5.....	32M9269	JCJ1012S05.....	04R8717	JCK3024D15.....	79R9165	JCM2012D15.....	24T5288
JCA0605S12.....	32M6395	JCF1048S3V3.....	32M9270	JCJ1012S12.....	04R8718	JCK3024S05.....	79R9166	JCM2012S05.....	24T5289
JCA0605S15.....	32M6396	JCG1212D12.....	04R8652	JCJ1012S15.....	04R8719	JCK3024S12.....	79R9167	JCM2012S12.....	24T5290
JCA0612D01.....	32M6397	JCG1212D15.....	04R8653	JCJ1012S2V5.....	04R8720	JCK3024S15.....	79R9168	JCM2012S15.....	24T5291
JCA0612D02.....	32M6398	JCG1212S05.....	04R8654	JCJ1012S3V3.....	04R8721	JCK3024S3V3.....	79R9169	JCM2012S3V3.....	24T5292
JCA0612D03.....	32M6399	JCG1212S12.....	04R8655	JCJ1024D12.....	04R8722	JCK3048D05.....	79R9170	JCM2024D12.....	24T5293
JCA0612S03.....	32M6400	JCG1212S15.....	04R8656	JCJ1024D15.....	04R8723	JCK3048D12.....	79R9171	JCM2024D15.....	24T5294



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JCM2024S05	24T5295	JPM160PS05	04R8813	JTB0348S05	04R8840	JTF1024S3V3	24T5311	JTL3024T0315	52R2889
JCM2024S12	24T5296	JPM160PS07	04R8814	JTB0348S12	04R8841	JTF1048D05	24T5312	JTL3024T0512	52R2890
JCM2024S15	24T5297	JPM160PS12	04R8815	JTB0348S15	04R8842	JTF1048D12	24T5313	JTL3024T0515	52R2891
JCM2024S3V3	24T5298	JPM160PS13	04R8816	JTB0348S3V3	04R8843	JTF1048D15	24T5314	JTL3048D05	52R2892
JCM2048D12	24T5299	JPM160PS15	04R8817	JTB0524D05	04R8844	JTF1048S05	24T5315	JTL3048D12	52R2893
JCM2048D15	24T5300	JPM160PS24	04R8818	JTB0524D12	04R8845	JTF1048S12	24T5316	JTL3048D15	52R2894
JCM2048S05	24T5301	JPM160PS27	04R8819	JTB0524D15	04R8846	JTF1048S15	24T5317	JTL3048S05	52R2895
JCM2048S12	24T5302	JPM160PS48	04R8820	JTB0524S05	04R8847	JTF1048S3V3	24T5318	JTL3048S12	52R2896
JCM2048S15	24T5303	JPM80PS03	04R8821	JTB0524S12	04R8848	JTF1224D05	04R8889	JTL3048S15	52R2897
JCM2048S3V3	24T5304	JPM80PS05	04R8822	JTB0524S15	04R8849	JTF1224D12	04R8890	JTL3048S3V3	52R2898
JCP4012D12	04R8754	JPM80PS07	04R8823	JTB0524S3V3	04R8850	JTF1224D15	04R8891	JTL3048T0312	52R2899
JCP4012D15	04R8755	JPM80PS12	04R8824	JTB0548D05	04R8851	JTF1224S05	04R8892	JTL3048T0315	52R2900
JCP4012S05	04R8756	JPM80PS13	04R8825	JTB0548D12	04R8852	JTF1224S12	04R8893	JTL3048T0512	52R2901
JCP4012S12	04R8757	JPM80PS15	04R8826	JTB0548D15	04R8853	JTF1224S15	04R8894	JTL3048T0515	52R2902
JCP4012S15	04R8758	JPM80PS24	04R8827	JTB0548S05	04R8854	JTF1224S3V3	04R8895	JTL4024D12	79R9198
JCP4012S3V3	04R8759	JPM80PS27	04R8828	JTB0548S12	04R8855	JTF1248D05	04R8896	JTL4024D15	79R9199
JCP4012T0312	04R8760	JPM80PS48	04R8829	JTB0548S15	04R8856	JTF1248D12	04R8897	JTL4024S05	79R9200
JCP4012T0315	04R8761	JPS130 COVER	32M6418	JTB0548S3V3	04R8857	JTF1248D15	04R8898	JTL4024S12	79R9201
JCP4012T0512	04R8762	JPS130-M COVER	32M6419	JTC0424D03	04R8858	JTF1248S05	04R8899	JTL4024S15	79R9202
JCP4012T0515	04R8763	JPS130PS03	72K8672	JTC0424D05	04R8859	JTF1248S12	04R8900	JTL4024S3V3	79R9203
JCP4024D12	04R8764	JPS130PS05	72K8673	JTC0424D12	04R8860	JTF1248S15	04R8901	JTL4048D12	79R9204
JCP4024D15	04R8765	JPS130PS05-M	51M8826	JTC0424D15	04R8861	JTF1248S3V3	04R8902	JTL4048D15	79R9205
JCP4024S05	04R8766	JPS130PS12	72K8674	JTC0424S05	04R8862	JTH1524D05	32M9271	JTL4048S05	79R9206
JCP4024S12	04R8767	JPS130PS12-M	51M8827	JTC0424S12	04R8863	JTH1524D12	32M9272	JTL4048S12	79R9207
JCP4024S15	50M0696	JPS130PS15	72K8675	JTC0424S15	04R8864	JTH1524D15	32M9273	JTL4048S15	79R9208
JCP4024S3V3	04R8768	JPS130PS15-M	71J0100	JTC0424S3V3	04R8865	JTH1524S05	32M9274	JTL4048S3V3	79R9209
JCP4024T0312	04R8769	JPS130PS24	72K8676	JTC0448D03	04R8866	JTH1524S12	32M9275	JTM2024D05	04R8909
JCP4024T0315	04R8770	JPS130PS24-M	51M8828	JTC0448D05	04R8867	JTH1524S15	32M9276	JTM2024D12	04R8910
JCP4024T0512	04R8771	JPS130PS28-M	51M8829	JTC0448D12	04R8868	JTH1524S3V3	32M9277	JTM2024D15	04R8911
JCP4024T0515	04R8772	JPS130PS48	72K8677	JTC0448D15	04R8869	JTH1548D05	32M9278	JTM2024S05	04R8912
JCP4048D12	04R8773	JPS130PS48-M	51M8830	JTC0448S05	04R8870	JTH1548D12	32M9279	JTM2024S12	04R8913
JCP4048D15	04R8774	JPS130PT30	72K8678	JTC0448S12	04R8871	JTH1548D15	32M9280	JTM2024S15	04R8914
JCP4048S05	04R8775	JPS130PT31	72K8679	JTC0448S15	04R8872	JTH1548S05	32M9281	JTM2024S3V3	04R8915
JCP4048S12	04R8776	JPS130PT31-M	51M8831	JTC0448S3V3	04R8873	JTH1548S12	32M9282	JTM2048D05	04R8916
JCP4048S15	04R8777	JPS130PT32-M	71J0105	JTC0624D03	04R8874	JTH1548S15	32M9283	JTM2048D12	04R8917
JCP4048S3V3	04R8778	JPS250F/CVR	32M6420	JTC0624D05	04R8875	JTH1548S3V3	32M9284	JTM2048D15	04R8918
JCP4048T0312	04R8779	JPS250F/CVR24	32M6421	JTC0624D12	04R8876	JTK1524D05	32R7661	JTM2048S05	04R8919
JCP4048T0315	04R8780	JPS250F/CVR5	32M6422	JTC0624D15	04R8877	JTK1524D12	52R2828	JTM2048S12	04R8920
JCP4048T0512	04R8781	JPS250PQ41	72K8680	JTC0624S05	04R8878	JTK1524D15	32R7662	JTM2048S15	04R8921
JCP4048T0515	04R8782	JPS250PQ46	72K8681	JTC0624S12	04R8879	JTK1524S05	52R2829	JTM2048S3V3	04R8922
JHM0312D12	04R8783	JPS250PQ47	72K8682	JTC0624S15	04R8880	JTK1524S12	52R2830	LCL150PS12	52R2906
JHM0312D15	04R8784	JPS250PQ48	72K8683	JTC0624S3V3	04R8881	JTK1524S15	32R7663	LCL150PS15	52R2907
JHM0312S05	04R8785	JPS250PS05	72K8684	JTC0648D03	04R8882	JTK1524S3V3	52R2831	LCL150PS24	52R2908
JHM0312S12	04R8786	JPS250PS12	71J0141	JTC0648D05	04R8883	JTK1548D05	52R2832	LCL150PS48	52R2909
JHM0312S15	04R8787	JPS250PS15	71J0142	JTC0648D12	04R8884	JTK1548D12	52R2833	LCL300PS12	52R2910
JHM0324D12	04R8788	JPS250PS24	72K8685	JTC0648D15	04R8885	JTK1548D15	52R2834	LCL300PS15	52R2911
JHM0324D15	04R8789	JPS250PS48	72K8686	JTC0648S05	46P9872	JTK1548S05	32R7664	LCL300PS24	52R2912
JHM0324S05	04R8790	JPS350F/CVR	32M6423	JTC0648S12	04R8886	JTK1548S12	52R2835	LCL300PS48	52R2913
JHM0324S12	04R8791	JPS350F/CVR5V	32M6424	JTC0648S15	04R8887	JTK1548S15	52R2836	LCL500PS12	52R2914
JHM0324S15	04R8792	JPS350PS05	73K2435	JTC0648S3V3	04R8888	JTK1548S3V3	52R2837	LCL500PS15	52R2915
JHM0612D12	04R8793	JPS350PS12	72K8687	JTF0824D05	99R4331	JTK2024D12	24T5319	LCL500PS24	52R2916
JHM0612D15	04R8794	JPS350PS15	72K8688	JTF0824D12	99R4332	JTK2024D15	24T5320	LCL500PS48	52R2917
JHM0612S05	04R8795	JPS350PS24	72K8689	JTF0824D15	99R4333	JTK2024S05	24T5321	LDU0830S300	52R2661
JHM0612S12	04R8796	JPS350PS48	72K8690	JTF0824S05	99R4335	JTK2024S12	24T5322	LDU0830S350	52R2662
JHM0612S15	04R8797	JTA1024D02	88M2449	JTF0824S12	99R4336	JTK2024S15	24T5323	LDU2430S1000	52R2663
JHM0624D12	04R8798	JTA1024S05	04M4302	JTF0824S15	99R4337	JTK2024S3V3	24T5324	LDU2430S500	52R2664
JHM0624D15	04R8799	JTA1524S05	51M4240	JTF0824S3V3	99R4338	JTK2048D12	24T5325	LDU2430S600	52R2665
JHM0624S05	04R8800	JTA2024D02	67P3705	JTF0848D05	99R4339	JTK2048D15	24T5326	LDU2430S700	52R2666
JHM0624S12	04R8801	JTA2048D02	57K9993	JTF0848D12	99R4340	JTK2048S05	24T5327	M5S4S4FE5-01	72K8959
JHM0624S15	04R8802	JTA2048S12	02M8866	JTF0848D15	99R4341	JTK2048S12	24T5328	M5S5S5FE5-01	72K8960
JPM120PS03	04R8803	JTB0324D05	04R8830	JTF0848S05	99R4342	JTK2048S15	24T5329	M5S6S6FE5-02	72K8961
JPM120PS05	04R8804	JTB0324D12	04R8831	JTF0848S12	99R4343	JTK2048S3V3	24T5330	M5S9S9FE5-02	72K8962
JPM120PS07	04R8805	JTB0324D15	04R8832	JTF0848S15	99R4344	JTL3024D05	52R2881	MCM60US12-D9	71P8403
JPM120PS12	04R8806	JTB0324S05	04R8833	JTF0848S3V3	99R4345	JTL3024D12	52R2882	MFA350PS12	85K4830
JPM120PS13	04R8807	JTB0324S12	04R8834	JTF1024D05	24T5305	JTL3024D15	52R2883	MFA350PS12-SEF	04R9395
JPM120PS15	04R8808	JTB0324S15	04R8835	JTF1024D12	24T5306	JTL3024S05	52R2884	MFA350PS12-STF	04R9396
JPM120PS24	04R8809	JTB0324S3V3	04R8836	JTF1024D15	24T5307	JTL3024S12	52R2885	MFA350PS24	85K4832
JPM120PS27	04R8810	JTB0324SD05	04R8837	JTF1024S05	24T5308	JTL3024S15	52R2886	MFA350PS24-SEF	04R9397
JPM120PS48	04R8811	JTB0348D12	04R8838	JTF1024S12	24T5309	JTL3024S3V3	52R2887	MFA350PS24-STF	04R9398
JPM160PS03	04R8812	JTB0348D15	04R8839	JTF1024S15	24T5310	JTL3024T0312	52R2888	MFA350PS48	85K4834



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MFA350PS48-SEF.....	04R9399	PBM200PQ02-C.....	04R9500	PCM80PS18.....	72K9061	SDS60UT07.....	04R9621	VCP05US05.....	04R9669
MFA350PS48-STF.....	04R9400	PBM200PQ05-C.....	04R9501	PCM80PS24.....	72K9062	SDS60UT08.....	04R9622	VCP05US12.....	04R9670
MHP1000PS12.....	67R9484	PBM200PQ06-C.....	04R9502	PCM80PS27.....	78K8922	SDS60UT09.....	04R9623	VCP15US05.....	04R9671
MHP1000PS15.....	67R9485	PBM200PS05-C.....	04R9504	PCM80PS48.....	72K9063	SDS60UT10.....	04R9624	VCP15US12.....	04R9672
MHP1000PS24.....	67R9486	PBM200PS12-C.....	04R9505	PCM80PT01.....	04R9551	SHP1000PS12.....	67R9496	VCP15US24.....	04R9673
MHP1000PS28.....	67R9487	PBM200PS15-C.....	04R9506	PCM80PT03.....	04R9552	SHP1000PS15.....	67R9497	VCP24US05.....	04R9674
MHP1000PS36.....	67R9488	PBM200PS24-C.....	04R9507	PCM80PT04.....	72K9064	SHP1000PS24.....	67R9498	VCP24US12.....	04R9675
MHP1000PS48.....	67R9489	PBM200PS3V3-C.....	04R9503	PCM80PT05.....	71J0182	SHP1000PS28.....	67R9499	VCP24US24.....	04R9676
MHP650PS12-EF.....	67R9490	PBM200PS48-C.....	04R9508	PCM80PT07.....	04R9553	SHP1000PS36.....	67R9500	VCS100US05.....	68R4458
MHP650PS15-EF.....	67R9491	PBM200PT02-C.....	04R9509	PDM30US05.....	53M4619	SHP1000PS48.....	67R9501	VCS100US12.....	68R4459
MHP650PS24-EF.....	67R9492	PBM200PT03-C.....	04R9510	PDM30US09.....	12P6988	SHP650PS12-EF.....	52R2920	VCS100US15.....	68R4460
MHP650PS28-EF.....	67R9493	PBM200PT04-C.....	04R9511	PDM30US12.....	12P6989	SHP650PS15-EF.....	52R2921	VCS100US24.....	68R4461
MHP650PS36-EF.....	67R9494	PBM25 COVER.....	04R9512	PDM30US15.....	12P6990	SHP650PS24-EF.....	52R2922	VCS100US48.....	68R4462
MHP650PS48-EF.....	67R9495	PBM25UD01.....	04R9513	PDM30US18.....	12P6991	SHP650PS28-EF.....	52R2923	VCS50US05.....	68R2923
MTC0528S05.....	73P9521	PBM25UD02.....	04R9514	PDM30US24.....	12P6992	SHP650PS36-EF.....	52R2924	VCS50US12.....	68R2924
MTC0528S12.....	42M3513	PBM25US05.....	04R9515	SDC320AS05-E.....	96M0814	SHP650PS48-EF.....	52R2925	VCS50US15.....	68R2925
MTC0528S15.....	07R8736	PBM25US12.....	04R9516	SDC320AS12-E.....	96M0815	SMC500PS03-C.....	04R9627	VCS50US24.....	68R2926
MTC0528S28.....	66M8359	PBM25US15.....	04R9517	SDC320AS15-E.....	96M0816	SMC500PS05-C.....	72K9403	VCS50US48.....	68R2927
MTC0528S3V3.....	07R8737	PBM25US24.....	04R9518	SDC320AS24-E.....	96M0817	SMC500PS12-C.....	72K9404	VCS70US05.....	68R2928
MTC1528D12.....	07R8738	PBM25US28.....	04R9519	SDC320AS48-E.....	96M0818	SMC500PS15-C.....	72K9405	VCS70US12.....	68R2929
MTC1528D15.....	07R8739	PBM25UT01.....	04R9520	SDR FAN COVER.....	96M0819	SMC500PS24-C.....	72K9406	VCS70US15.....	68R2930
MTC1528S05.....	40P3833	PBM25UT02.....	04R9521	SDR250AS05.....	96M0820	SMC500PS27-C.....	04R9628	VCS70US24.....	68R2931
MTC1528S12.....	40P3830	PBM25UT03.....	04R9522	SDR250AS12.....	96M0821	SMC500PS48-C.....	72K9407	VCS70US48.....	68R2932
MTC1528S15.....	42M3516	PBM300PQ01-C.....	04R9523	SDR250AS15.....	96M0822	SMC600PS03-C.....	04R9629	VCT40US05.....	04R9677
MTC1528S28.....	11R0493	PBM300PQ02-C.....	04R9524	SDR250AS24.....	96M0823	SMC600PS05-C.....	04R9630	VCT60US12.....	04R9678
MTC1528S3V3.....	40P3827	PBM300PQ03-C.....	04R9525	SDR250AS48.....	96M0824	SMC600PS05-Cl.....	72K9408	VCT60US15.....	04R9679
MTC3028D12.....	07R8740	PBM300PQ07-C.....	04R9526	SDS120 COVER.....	04R9594	SMC600PS12-C.....	04R9631	VCT60US24.....	04R9680
MTC3028D15.....	07R8741	PBM300PS03-C.....	04R9527	SDS120PS03B.....	04R9595	SMC600PS12-Cl.....	72K9409	VEH60US12.....	04R9681
MTC3028S05.....	42M3514	PBM300PS05-C.....	04R9528	SDS120PS05B.....	04R9596	SMC600PS15-C.....	04R9632	VEH60US15.....	04R9682
MTC3028S12.....	42M9876	PBM300PS12-C.....	04R9529	SDS120PS12B.....	04R9597	SMC600PS15-Cl.....	72K9410	VEH60US24.....	04R9683
MTC3028S15.....	50M0700	PBM300PS15-C.....	04R9530	SDS120PS15B.....	04R9598	SMC600PS24-C.....	66M7879	VEH90PS12.....	67R9652
MTC3028S28.....	66M8355	PBM300PS24-C.....	04R9531	SDS120PS24B.....	04R9599	SMC600PS24-Cl.....	72K9411	VEH90PS19.....	67R9653
MTC3028S3V3.....	42M3515	PBM300PS48-C.....	04R9532	SDS120PS28B.....	04R9600	SMC600PS48-C.....	04R9633	VEH90PS24.....	67R9654
MTF50.....	43M0033	PBM65 COVER.....	04R9533	SDS120PS48B.....	04R9601	SMC600PS48-Cl.....	72K9412	VEP PLUG AU.....	24R2777
MTF50-ESS.....	07R8742	PBM65US05.....	04R9534	SDS120PT00B.....	04R9602	SMM400PS03-C.....	04R9634	VEP PLUG CN.....	24R2778
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