February 2012

New Products Catalog

High Performance Analog ICs

LTC5585 Wideband I/Q Demodulator with IIP2 and DC Offset Control

LTC4415 Dual 4A Ideal Diodes with Adjustable Current Limit

LTC2862/3/4/5 ±60V Fault Protected 3V to 5.5V RS485/RS422 Transceivers

LTM8047 3.1V_{IN} to 32V_{IN} Isolated µModule DC/DC Converter

LTC3103 1.8µA Quiescent Current, 15V, 300mA Synchronous Step-Down DC/DC Converter

LTC6945 Ultralow Noise and Spurious 0.35GHz to 6GHz Integer-N Synthesizer

LINEAR TECHNOLOGY

Contents

Switching Regulators—Controllers

Timing

LTC3260

Low Noise Dual Supply Inverting Charge Pump

FEATURES

- **4.5V to 32V V_{IN} Range**
- **Inverting Charge Pump Generates $-V_{IN}$**
- **Low Noise Negative LDO Post Regulator**
- **Low Noise Independent Positive LDO Regulator**
- **90µA Quiescent Current in Burst Mode® Operation with Both LDO Regulators On**
- **Charge Pump Output Current Up to 100mA**
- **LDO Dropout = 300mV at 50mA**
- **50kHz to 500kHz Programmable Oscillator Frequency**
- Stable with Ceramic Capacitors
- Short-Circuit/Thermal Protection
- Low Profile 3mm × 4mm 14-Pin DFN and Thermally Enhanced 16-Pin MSOP Packages

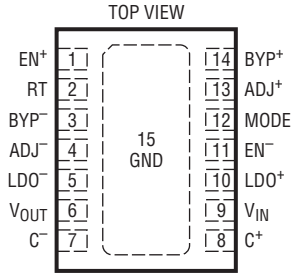
APPLICATIONS

- Low Noise Bipolar/Inverting Supplies
- Industrial/Instrumentation Low Noise Bias Generators
- Portable Medical Equipment
- Portable Instruments

DESCRIPTION

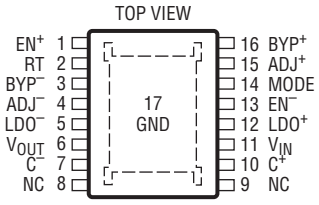
The LTC®3260 is a low noise dual polarity output power supply that includes an inverting charge pump with both positive and negative LDO regulators. The charge pump operates over a wide 4.5V to 32V input range and can deliver up to 100mA of output current. Each LDO regulator can provide up to 50mA of output current. The negative LDO post regulator is powered from the charge pump output. The LDO output voltages can be adjusted using external resistor dividers.

The charge pump operates in either low quiescent current Burst Mode operation or low noise constant frequency mode. In Burst Mode operation the charge pump V_{OUT} regulates to $-0.95 \bullet V_{IN}$, and the LTC3260 draws only 90µA of quiescent current with both LDO regulators on. In constant frequency mode the charge pump produces an output equal to $-V_{IN}$ and operates at a fixed 500kHz or to a programmed value between 50kHz to 500kHz using an external resistor. The LTC3260 is available in low profile (0.75mm) 3mm x 4mm 14-pin DFN and thermally enhanced 16-pin MSOP packages.



DE PACKAGE
14-LEAD (4mm × 3mm) PLASTIC DFN

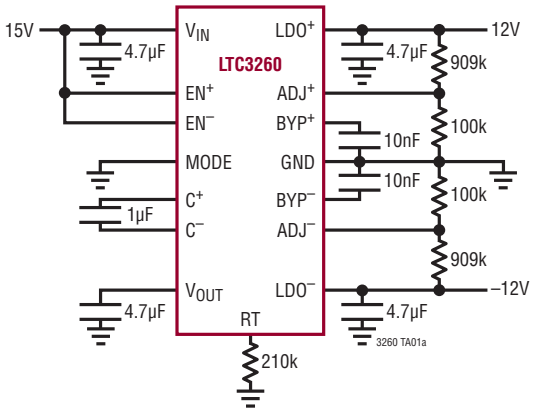
LTC3260EDE
LTC3260IDE



MSE PACKAGE
16-LEAD PLASTIC MSOP

LTC3260EMSE
LTC3260IMSE
LTC3260HMSE
LTC3260MPMSE

±12V Outputs from a Single 15V Input



LTC2152-12/LTC2151-12/LTC2150-12
Single 12-Bit 250Msps/210Msps/170Msps ADCs

FEATURES

- 68.5dB SNR
- 90dB SFDR
- Low Power: 347mW/333mW/306mW Total
- Single 1.8V Supply
- DDR LVDS Outputs
- Easy-to-Drive 1.5V_{P-P} Input Range
- 1.25GHz Full Power Bandwidth S/H
- Optional Clock Duty Cycle Stabilizer
- Low Power Sleep and Nap Modes
- Serial SPI Port for Configuration
- Pin-Compatible 14-Bit Versions
- 40-Lead (6mm × 6mm) QFN Package

APPLICATIONS

- Communications
- Cellular Base Stations
- Software Defined Radios
- Medical Imaging
- High Definition Video
- Testing and Measurement Instruments

DESCRIPTION

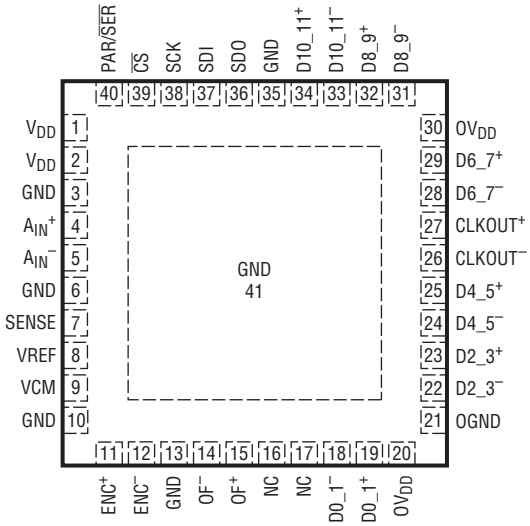
The LTC®2152-12/LTC2151-12/LTC2150-12 are a family of 250Msps/210Msps/170Msps 12-bit A/D converters designed for digitizing high frequency, wide dynamic range signals. They are perfect for demanding communications applications with AC performance that includes 68.5dB SNR and 90dB spurious free dynamic range (SFDR). The 1.25GHz input bandwidth allows the ADC to undersample high input frequencies with good performance. The latency is only five clock cycles.

DC specs include ±0.26LSB INL (typ), ±0.16LSB DNL (typ) and no missing codes over temperature. The transition noise is 0.54LSB_{RMS}.

The digital outputs are double-data rate (DDR) LVDS.

The ENC+ and ENC– inputs can be driven differentially with a sine wave, PECL, LVDS, TTL, or CMOS inputs. An optional clock duty cycle stabilizer allows high performance at full speed for a wide range of clock duty cycles.

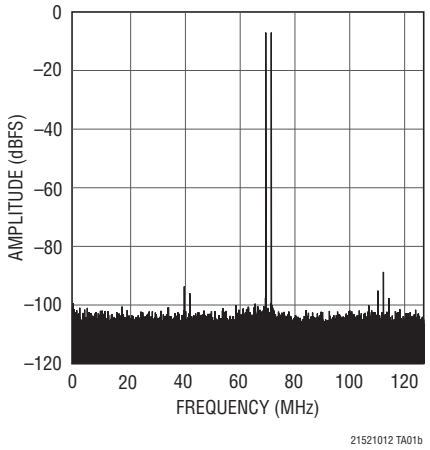
TOP VIEW

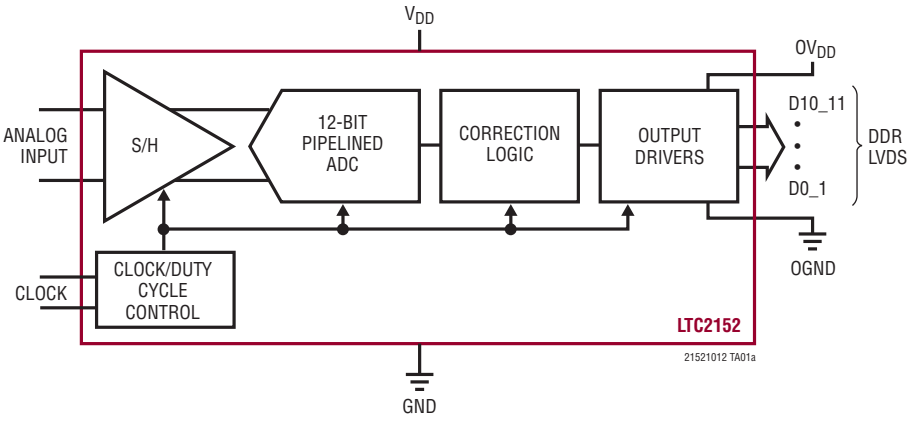


UJ PACKAGE
40-LEAD (6mm × 6mm) PLASTIC QFN

LTC2152CUJ-12
LTC2152IUJ-12
LTC2151CUJ-12
LTC2151IUJ-12
LTC2150CUJ-12
LTC2150IUJ-12

LTC2152-12: 32K Point 2-Tone FFT, f_{IN} = 71MHz and 69MHz, 250Msps





LTC5585

Wideband I/Q Demodulator with IIP2 and DC Offset Control

FEATURES

- **700MHz to 3GHz Operating Frequency**
- **High IIP3: 28.7dBm at 700MHz, 25.7dBm at 1.95GHz**
- **High IIP2: 70dBm at 700MHz, 60dBm at 1.95GHz**
- **User Adjustable IIP2 Up to 80dBm**
- **User Adjustable DC Offset Null**
- **High Input P1dB: 16dBm at 1950MHz**
- **I/Q Bandwidth of 530MHz or Higher**
- **Image Rejection: 43dB at 1950MHz**
- Noise Figure: 13.5dB at 700MHz
  12.7dB at 1.95GHz
- Conversion Gain: 2.0dB at 700MHz
  2.4dB at 1.95GHz
- Single-Ended RF with On-Chip Transformer
- Shutdown Mode
- Operating Temperature Range (T_C): –40°C to 105°C
- 24-Lead 4mm × 4mm QFN Package

APPLICATIONS

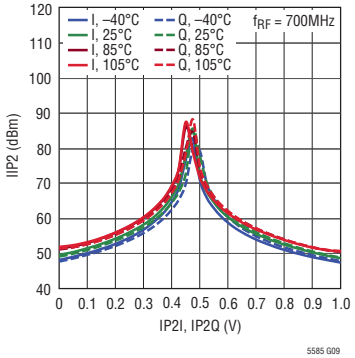
- LTE/W-CDMA/TD-SCDMA Base Station Receivers
- Wideband DPD Receivers
- Point-To-Point Broadband Radios
- High Linearity Direct Conversion I/Q Receivers
- Image Rejection Receivers

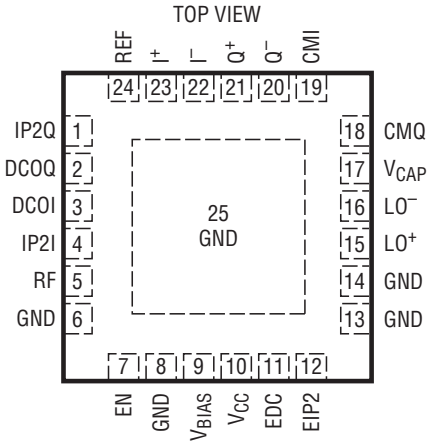
DESCRIPTION

The LTC®5585 is a direct conversion quadrature demodulator optimized for high linearity receiver applications in the 700MHz to 3GHz frequency range. It is also usable in the 400MHz to 700MHz and 3GHz to 4GHz ranges with reduced performance. It is suitable for communications receivers where an RF signal is directly converted into I and Q baseband signals with bandwidth of 530MHz or higher. The LTC5585 incorporates balanced I and Q mixers, LO buffer amplifiers and a precision, high frequency quadrature phase shifter. The integrated on-chip broadband transformer provides a single-ended interface at the RF input with simple off-chip L-C matching. In addition, the LTC5585 provides four analog control voltage interface pins for IIP2 and DC offset correction, greatly simplifying system calibration.

The high linearity of the LTC5585 provides excellent spur-free dynamic range for the receiver. This direct conversion demodulator can eliminate the need for intermediate frequency (IF) signal processing, as well as the corresponding requirements for image filtering and IF filtering. These I/Q outputs can interface directly to channel-select filters (LPFs) or to baseband amplifiers.

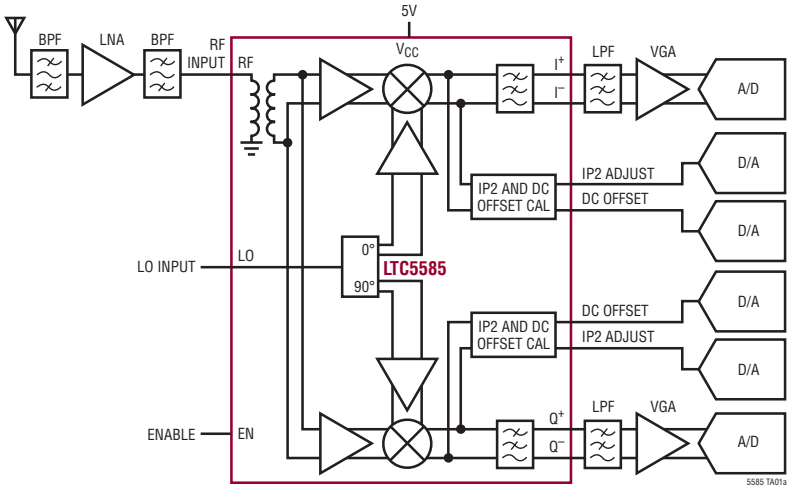
IIP2 vs IP2I, IP2Q Trim Voltage





UF PACKAGE
24-LEAD (4mm x 4mm) PLASTIC QFN
LTC5585IUF

Direct Conversion Receiver with IIP2 and DC Offset Calibration



LTC4232
5A Integrated Hot Swap Controller

FEATURES

- **Small Footprint**
- **33mΩ MOSFET with R_{SENSE}**
- **Wide Operating Voltage Range: 2.9V to 15V**
- **Adjustable, 10% Accurate Current Limit**
- Current and Temperature Monitor Outputs
- Overtemperature Protection
- Adjustable Current Limit Timer Before Fault
- Power Good and Fault Outputs
- Adjustable Inrush Current Control
- 2% Accurate Undervoltage and Overvoltage Protection
- Available in 16-Lead 5mm × 3mm DFN Package

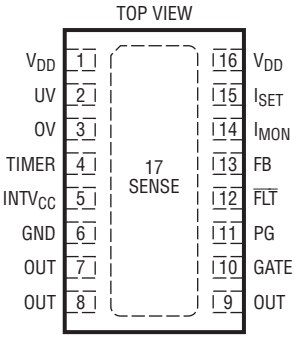
APPLICATIONS

- RAID Systems
- Server I/O Cards
- Industrial

DESCRIPTION

The LTC®4232 is an integrated solution for Hot Swap™ applications that allows a board to be safely inserted and removed from a live backplane. The part integrates a Hot Swap controller, power MOSFET and current sense resistor in a single package for small form factor applications.

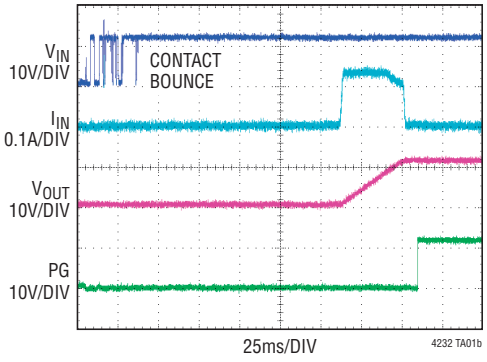
The LTC4232 provides separate inrush current control and a 10% accurate 5A current limit with foldback current limiting. The current limit threshold can be adjusted dynamically using an external pin. Additional features include a current monitor output that amplifies the sense resistor voltage for ground referenced current sensing and a MOSFET temperature monitor output. Thermal limit, overvoltage, undervoltage and power good monitoring are also provided.



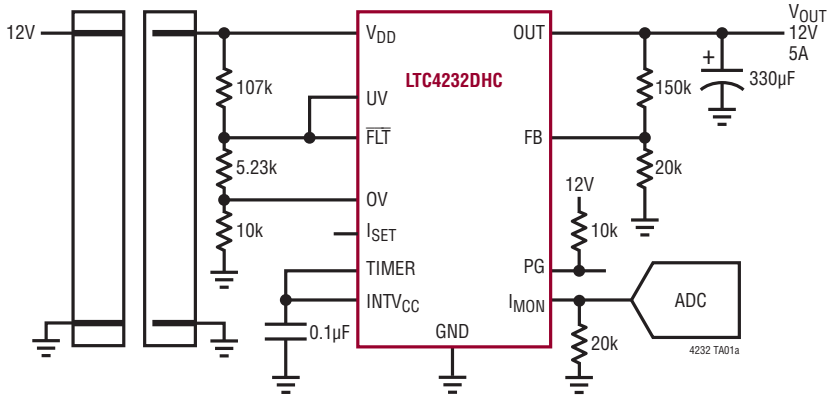
DHC PACKAGE
16-LEAD (5mm × 3mm) PLASTIC DFN

LTC4232CDHC
LTC4232IDHC

Power-Up Waveforms



12V, 5A Card Resident Application



LTC4363

High Voltage Surge Stopper with Current Limit

FEATURES

- **Withstands Surges Over 80V with V_{CC} Clamp**
- **Wide Operating Voltage Range: 4V to 80V**
- **Adjustable Output Clamp Voltage**
- **Fast Overcurrent Limit: Less Than 5µs**
- **Reverse Input Protection to –60V**
- Adjustable UV/OV Comparator Thresholds
- Low 7µA Shutdown Current
- Shutdown Pin Withstands –60V to 100V
- Adjustable Fault Timer
- Controls N-Channel MOSFET
- Less Than 1% Retry Duty Cycle During Faults, LT4363-2
- Available in 12-Pin (4mm × 3mm) DFN, 12-Pin MSOP or 16-Pin SO Packages

APPLICATIONS

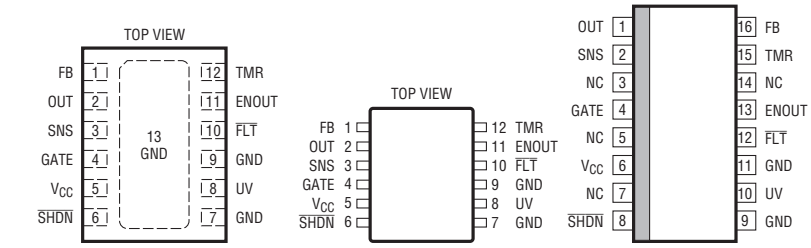
- Automotive/Avionic Surge Protection
- Hot Swap™/Live Insertion
- High Side Switch for Battery Powered Systems
- Intrinsic Safety Applications

DESCRIPTION

The LT®4363 surge stopper protects loads from high voltage transients. It regulates the output during an overvoltage event, such as load dump in vehicles, by controlling the gate of an external N-channel MOSFET. The output is limited to a safe value allowing the loads to continue functioning. The LT4363 also monitors the voltage drop between the SNS and OUT pins to protect against overcurrent faults. An internal amplifier limits the voltage across the current sense resistor to 50mV. In either fault condition, a timer is started inversely proportional to MOSFET stress. Before the timer expires, the $\overline{FLT}$ pin pulls low to warn of an impending power-down. If the condition persists, the MOSFET is turned off. The LT4363-1 remains off until reset whereas the LT4363-2 restarts after a cooldown period.

Two precision comparators can monitor the input supply for overvoltage (OV) and undervoltage (UV) conditions. When the potential is below the UV threshold, the external MOSFET is kept off. If the input supply voltage is above the OV threshold, the MOSFET is not allowed to turn back on. Back-to-back MOSFETs can be used in lieu of a Schottky diode for reverse input protection, reducing voltage drop and power loss. A shutdown pin reduces the quiescent current to less than 7µA during shutdown.

LT4363-1

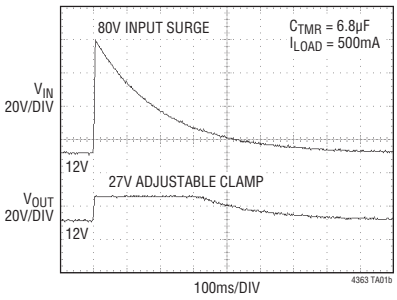


DE PACKAGE
12-LEAD (4mm × 3mm) PLASTIC DFN
LT4363CDE-1 LT4363IDE-1

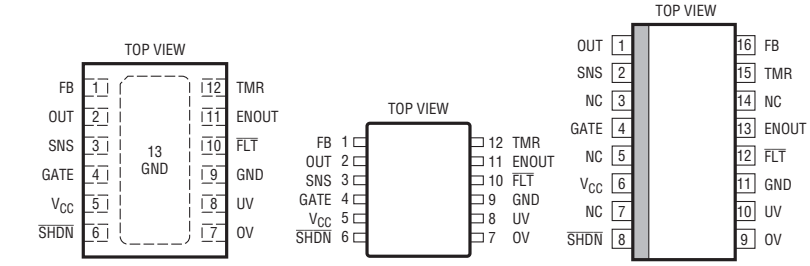
MS PACKAGE
12-LEAD PLASTIC MSOP
LT4363CMS-1 LT4363IMS-1

S PACKAGE
16-LEAD PLASTIC SO
LT4363CS-1 LT4363IS-1

Overvoltage Protector Regulates Output at 27V During Transient



LT4363-2

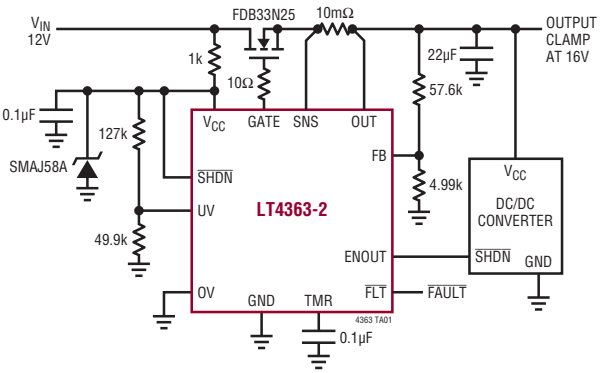


DE PACKAGE
12-LEAD (4mm × 3mm) PLASTIC DFN
LT4363CDE-2 LT4363IDE-2

MS PACKAGE
12-LEAD PLASTIC MSOP
LT4363CMS-2 LT4363IMS-2

S PACKAGE
16-LEAD PLASTIC SO
LT4363CS-2 LT4363IS-2

4A, 12V Overvoltage Output Regulator with 150V Surge Protection



LTC4366-1/LTC4366-2
High Voltage Surge Stopper

FEATURES

- **Rugged Floating Topology**
- **Wide Operating Voltage Range: 9V to >500V**
- Adjustable Output Clamp Voltage
- Controls N-Channel MOSFET
- Adjustable Protection Timer
- Internal 9 Second Cooldown Timer
- Shutdown I_Q < 20µA
- Available in 8-Lead TSOT and 8-Lead 3mm × 2mm DFN Packages

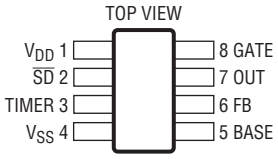
APPLICATIONS

- Industrial, Automotive and Avionics Surge Protection
- High Voltage DC Distribution

DESCRIPTION

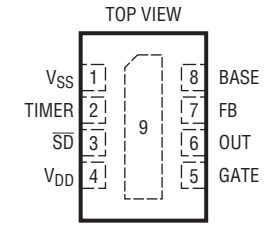
The LTC®4366 surge stopper protects loads from high voltage transients. By controlling the gate of an external N-channel MOSFET, the LTC4366 regulates the output during an overvoltage transient. The load may remain operational while the overvoltage is dropped across the MOSFET. Placing a resistor in the return line isolates the LTC4366 and allows it to float up with the supply; therefore, the upper limit on the output voltage depends only on the availability of high valued resistors and MOSFET ratings.

An adjustable overvoltage timer prevents MOSFET damage during the surge while an additional 9 second timer provides for MOSFET cool down. A shutdown pin reduces the quiescent current to less than 20µA during shutdown. After a fault the LTC4366-1 latches off while the LTC4366-2 will auto-retry.



TS8 PACKAGE
8-LEAD PLASTIC TSOT-23

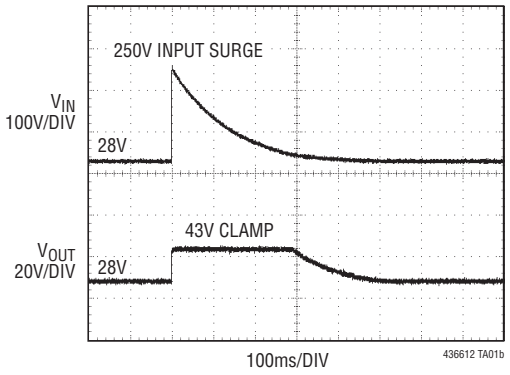
LTC4366CTS8-1 **LTC4366CTS8-2**
LTC4366ITS8-1 **LTC4366ITS8-2**
LTC4366HTS8-1 **LTC4366HTS8-2**



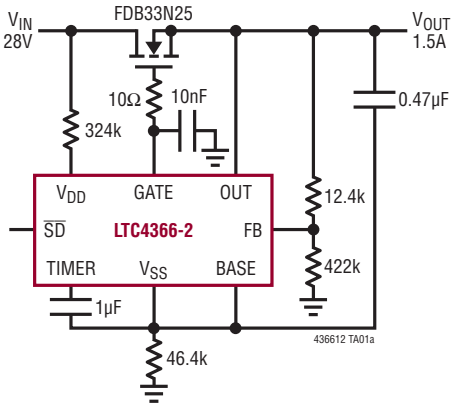
DDB PACKAGE
8-LEAD PLASTIC (3mm × 2mm) PLASTIC DFN

LTC4366CDDB-1 **LTC4366CDDB-2**
LTC4366IDDB-1 **LTC4366IDDB-2**
LTC4366HDDB-1 **LTC4366HDDB-2**

Overvoltage Protector Regulates Output at 43V During Transient



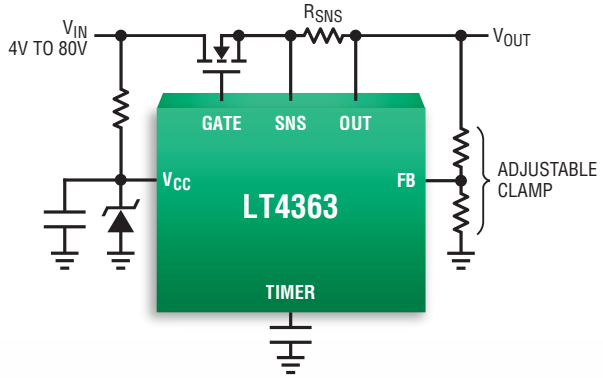
Overvoltage Protected 1.5A, 28V Supply

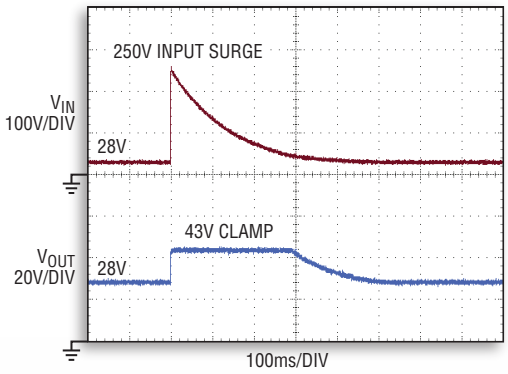


Surge Stoppers

LT4363 High Voltage Surge Stopper with Current Limit

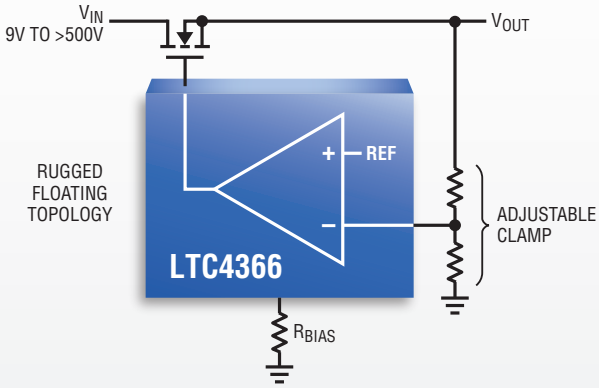
In harsh industrial, automotive and avionic environments, systems must continue operating reliably through severe overvoltage events. The LT®4363 builds on the first-generation LT4356 by extending overvoltage protection capabilities beyond 100V, without sacrificing overcurrent protection. Additional features include OV/UV monitoring, fast overcurrent limit and extended cooldown period.

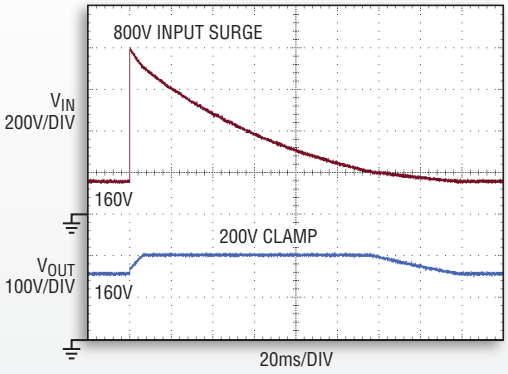




LTC4366 Floating Surge Stopper

The LTC®4366's adjustable floating topology is capable of extremely high voltages; the operational upper voltage is limited only by MOSFET ratings. During high voltage transient events, the LTC4366 clamps the output to a user-defined voltage, while the fault timer ensures safe shutdown of the MOSFET if the fault persists.

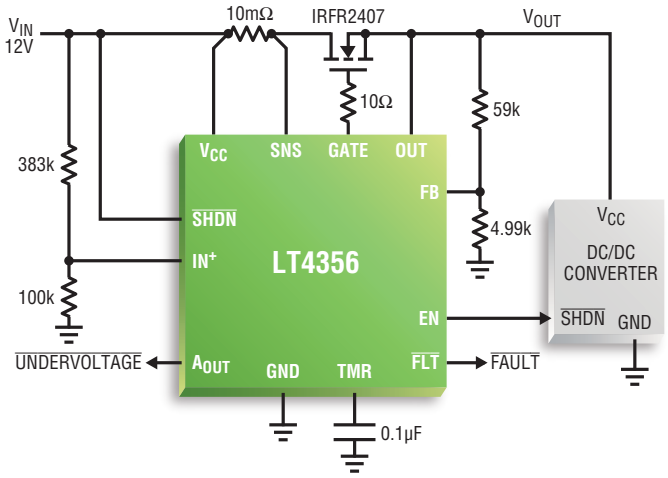


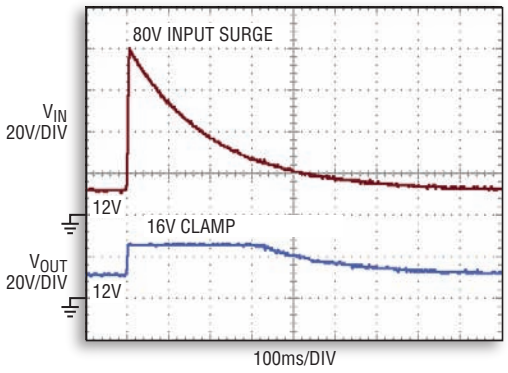


Part Number	Operating Range	V_{IN} Max	Reverse Protection	Overcurrent Protection	Comments	Package Options
LT4356	4V to 80V	100V	–60V	Yes, <100V	Surge Stopper with Auxiliary Amplifier	4mm × 3mm DFN, MSOP-10, SO-16
LT4363	4V to 80V	100V	–60V	Yes, >100V	High Voltage Surge Stopper with Current Limit	4mm × 3mm DFN, MSOP-12, SO-16
LTC4365	2.5V to 34V	60V	–40V		UV, OV and Reverse Supply Protection Controller	3mm × 2mm DFN, TSOT-8
LTC4366	9V to >500V	Unlimited	Yes		Floating Surge Stopper	3mm × 2mm DFN, TSOT-8

LINEAR TECHNOLOGY

LT4356 Surge Stopper Regulates Overvoltage and Overcurrent Surges



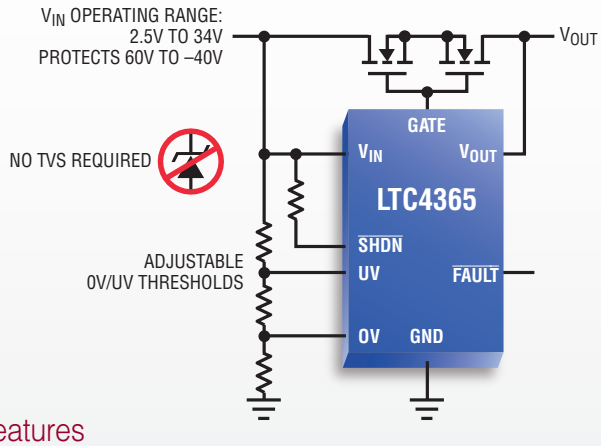


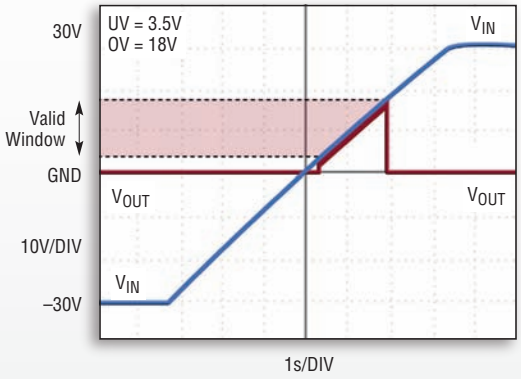
Features

- Wide Operating Range: 4V to 80V
- Adjustable Output Clamp Voltage
- Reverse Input Protection to –60V
- Adjustable Fault Timer
- Overcurrent Protection
- Inrush Limiting
- Auxiliary Amplifier
- –55°C to 125°C Operation

	LT4356-1	LT4356-2	LT4356-3
Shutdown Current	7µA	60µA	7µA
Aux. Amp in Shutdown	OFF	ON	OFF
Fault Retry	Retry	Retry	Latchoff
Temperature Grades	C, I, H, MP	C, I, H, MP	C, I, H
Packages	4mm × 3mm DFN-12 MSOP-10 SO-16	4mm × 3mm DFN-12 SO-16	4mm × 3mm DFN-12 MSOP-10 SO-16

LTC4365 UV, OV and Reverse Supply Protection Controller





Features

- Low Operating Current: 125µA
- Low Shutdown Current: 10µA
- Blocks 50Hz and 60Hz AC Power
- –40°C to 125°C Operation
- 8-Lead, 3mm × 2mm DFN and TSOT-23 Packages

LTC4415

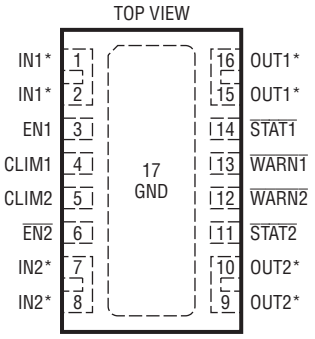
Dual 4A Ideal Diodes with Adjustable Current Limit

FEATURES

- **Dual 50mΩ Monolithic Ideal Diodes**
- **1.7V to 5.5V Operating Range**
- **Up to 4A Adjustable Current Limit for Each Diode**
- **Low Reverse Leakage Current (1µA Max)**
- **15mV Forward Drop in Regulation**
- **Smooth Switchover in Diode ORing**
- Load Current Monitor
- Precision Enable Thresholds to Set Switchover
- Soft-Start to Limit Inrush Current on Start-Up
- Status Pins to Indicate Forward Diode Conduction
- Current and Thermal Limit with Warning
- Thermally Enhanced 16-Lead MSOP and DFN (3mm × 5mm) Packages

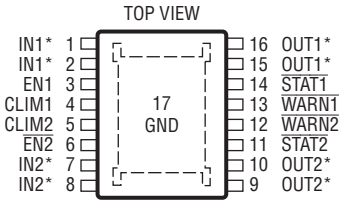
APPLICATIONS

- High Current PowerPath™ Switch
- Battery and Wall Adapter Diode ORing
- Backup Battery Diode ORing
- Logic Controlled High Current Power Switch
- Supercapacitor ORing
- Multiple Battery Sharing



DHC PACKAGE
VARITION A
16-LEAD (5mm × 3mm) PLASTIC DFN

LTC4415EDHC
LTC4415IDHC



MSE PACKAGE
16-LEAD PLASTIC MSOP

LTC4415EMSE
LTC4415IMSE

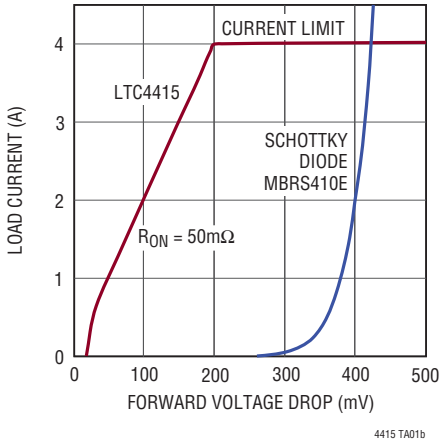
DESCRIPTION

The LTC®4415 contains two monolithic PowerPath ideal diodes, each capable of supplying up to 4A with typical forward conduction resistance of 50mΩ. The diode voltage drops are regulated to 15mV during forward conduction at low currents, extending the power supply operating range and ensuring no oscillations during supply switchover. Less than 1µA of reverse current flows from OUT to IN making this device well suited for power supply ORing applications.

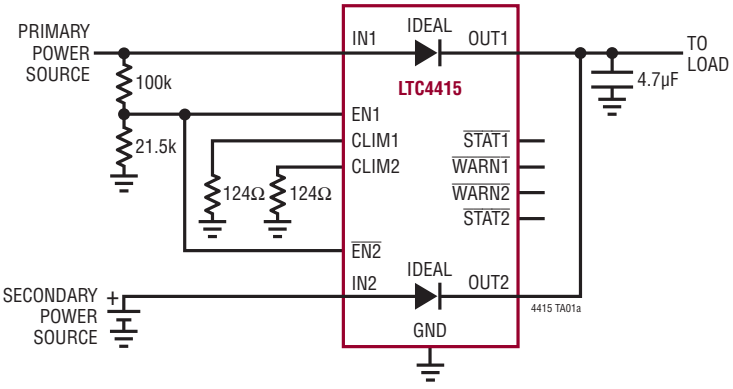
The two ideal diodes are independently enabled and prioritized using inputs EN1 and $\overline{EN2}$. The output current limits can be adjusted independently from 0.5A to 4A using resistors on the CLIM pins. Furthermore, the ideal diode currents can be monitored via CLIM pin voltages.

Open-drain status pins indicate when the ideal diodes are forward conducting. When the die temperature approaches thermal shutdown, or if the output load exceeds the current limit threshold, the corresponding warning pins are pulled low.

Forward Characteristics of LTC4415 vs MBRS410E Schottky



Prioritized Power Supply ORing



LTC2862/LTC2863/LTC2864/LTC2865

±60V Fault Protected 3V to 5.5V RS485/RS422 Transceivers

FEATURES

- **Protected from Overvoltage Line Faults to ±60V**
- **3V to 5.5V Supply Voltage**
- **20Mbps or Low EMI 250kbps Data Rate**
- **±15kV ESD Interface Pins, ±8kV All Other Pins**
- **Extended Common Mode Range: ±25V**
- Guaranteed Failsafe Receiver Operation
- High Input Impedance Supports 256 Nodes
- 1.65V to 5.5V Logic Supply Pin (V_L) for Flexible Digital Interface (LTC2865)
- H-Grade Option Available (–40°C to 125°C)
- Fully Balanced Differential Receiver Thresholds for Low Duty Cycle Distortion
- Current Limited Drivers and Thermal Shutdown
- Pin Compatible with LT1785 and LT1791
- Available in DFN and Leaded Packages

APPLICATIONS

- Supervisory Control and Data Acquisition (SCADA)
- Industrial Control and Instrumentation Networks
- Automotive and Transportation Electronics
- Building Automation, Security Systems and HVAC
- Medical Equipment
- Lighting and Sound System Control

DESCRIPTION

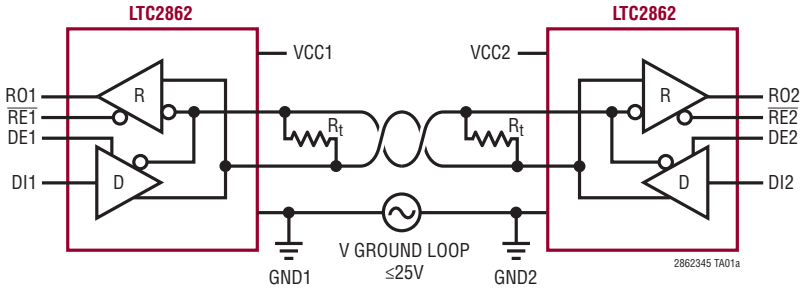
The LTC®2862/LTC2863/LTC2864/LTC2865 are low power, 20Mbps or 250kbps RS485/RS422 transceivers operating on 3V to 5.5V supplies that feature ±60V overvoltage fault protection on the data transmission lines during all modes of operation, including power-down. Low EMI slew rate limited data transmission is available in a logic-selectable 250kbps mode in the LTC2865 and in 250kbps versions of the LTC2862-LTC2864. Enhanced ESD protection allows these parts to withstand ±15kV HBM on the transceiver interface pins without latchup or damage.

Extended ±25V input common mode range and full failsafe operation improve data communication reliability in electrically noisy environments and in the presence of large ground loop voltages.

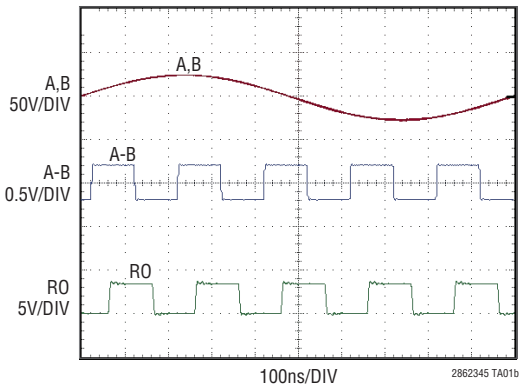
Product Selection Guide

PART NUMBER	DUPLEX	ENABLES	MAX DATA RATE (bps)	V_L PIN	PACKAGES
LTC2862-1	HALF	YES	20M	NO	SO-8, DFN-8
LTC2862-2	HALF	YES	250k	NO	SO-8, DFN-8
LTC2863-1	FULL	NO	20M	NO	SO-8, DFN-8
LTC2863-2	FULL	NO	250k	NO	SO-8, DFN-8
LTC2864-1	FULL	YES	20M	NO	SO-14, DFN-10
LTC2864-2	FULL	YES	250k	NO	SO-14, DFN-10
LTC2865	FULL	YES	20M/250k	YES	MS-12, DFN-12

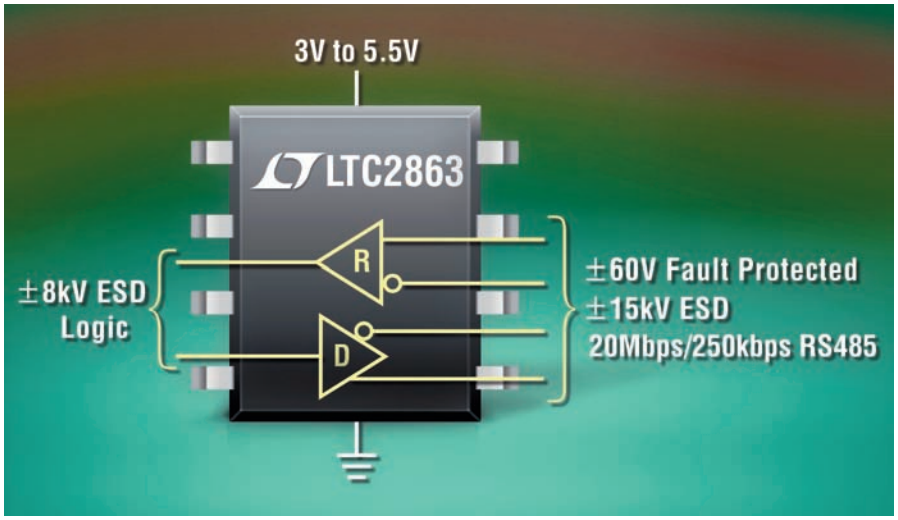
RS485 Link With Large Ground Loop Voltage



LTC2865 Receiving 10Mbps ±200mV Differential Signal with 1MHz ±25V Common Mode Sweep



Ultra Rugged ±60V RS485 Transceivers



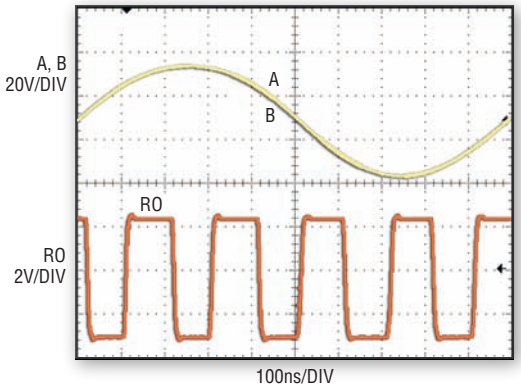
Run Full RS485 Levels at Up to 20Mbps with 3.3V or 5V Operation

The LTC®2862–LTC2865 is a family of exceptionally rugged, high voltage tolerant RS485/RS422 transceivers that help eliminate field failures without the need of costly external protection devices. ±60V overvoltage fault protection on the data transmission lines protects bus pins during operation and power shutdown, while an extended ±25V input common mode range and full failsafe operation improve data communications reliability in electrically noisy environments and in the presence of ground loop voltages. Enhanced ESD protection allows these devices to withstand ±15kV (HBM and IEC-1000-4-2 air discharge) on the transceiver pins without latchup or damage; all other pins are protected to ±8kV HBM.

Features

- Protected from Overvoltage Line Faults to ±60V
- 3V to 5.5V Supply Voltage
- 20Mbps or Low EMI 250kbps Data Rate
- ±15kV ESD Interface Pins, ±8kV All Other Pins
- Extended Common Mode Range: ±25V
- Guaranteed Failsafe Receiver Operation
- Supports up to 256 Nodes
- Separate 1.65V to 5.5V Logic Supply Pin (LTC2865)
- Temperature Range: –40°C to 125°C

LTC2865 Receiving 10Mbps ±200mV Signal with 1MHz ±25V Common Mode Sweep



Part Number	Max Data Rate	Duplex	SHDN	Comments	Package
LTC2862-1/-2	20Mbps/250kbps	Half	Yes	Pin-Compatible with LT®1785A	SO-8, 3 x 3 DFN-8
LTC2863-1/-2	20Mbps/250kbps	Full	No		SO-8, 3 x 3 DFN-8
LTC2864-1/-2	20Mbps/250kbps	Full	Yes	Pin-Compatible with LT1791A	SO-14, 3 x 3 DFN-10
LTC2865	20Mbps/250kbps	Full	Yes	Logic Supply Pin, SLO Pin	MSOP-12, 4 x 3 DFN-12

LINEAR TECHNOLOGY

Linear Technology RS485/RS422 Transceivers

Part Number	Supply (V)	Max Data Rate (Bits/s)	# Dr	# Rec	Duplex	SHDN	ESD (kV)	Failsafe	Comments	Temp Grade	Package
2500V_{RMS} Isolation											
LTM®2881-3/-5	3.3/5	20M	1	1	Full	Yes	±15	Type 2	No External Components Required, Isolated 1W DC/DC Converter, Switchable, 120Ω Termination, UL File #E151738	C, I, H, MP	15 × 11.25 × 2.8 LGA, 15 × 11.25 × 3.4 BGA
LTC1535	5	250k	1	1	Full	No	±8	Type 2	UL File #E151738	C, I	SO(W)-28
±60V Fault Protection											
LTC2862-1/-2	3 to 5.5	20M/250k	1	1	Half	Yes	±15	Type 2	Pin-Compatible with LT1785A	C, I, H	SO-8, 3 × 3 DFN-8
LTC2863-1/-2	3 to 5.5	20M/250k	1	1	Full	No	±15	Type 2		C, I, H	SO-8, 3 × 3 DFN-8
LTC2864-1/-2	3 to 5.5	20M/250k	1	1	Full	Yes	±15	Type 2	Pin-Compatible with LT1791A	C, I, H	SO-14, 3 × 3 DFN-10
LTC2865	3 to 5.5	20M/250k	1	1	Full	Yes	±15	Type 2	Logic Supply Pin, SLO Pin	C, I, H	MSOP-12, 4 × 3 DFN-12
LT1785A	5	250k	1	1	Half	Yes	±15	Type 2	Pin-Compatible with LTC485	C, I, H	SO-8, DIP-8
LT1791A	5	250k	1	1	Full	Yes	±15	Type 2	Pin-Compatible with LTC491	C, I, H	SO-14, DIP-14
Integrated Switchable 120Ω Termination											
LTC2854	3.3	20M	1	1	Half	Yes	±25	Type 2	±25kV ESD	C, I, H	3 × 3 DFN-10
LTC2859	5	20M/250k	1	1	Half	Yes	±15	Type 2	Driver Slew Rate Control	C, I	3 × 3 DFN-10
LTC2855	3.3	20M	1	1	Full	Yes	±15	Type 2		C, I, H	4 × 3 DFN-12, SSOP-16
LTC2861	5	20M/250k	1	1	Full	Yes	±15	Type 2	Driver Slew Rate Control	C, I	4 × 3 DFN-12, SSOP-16
3.3V Supply Operation											
LTC2850	3.3	20M	1	1	Half	Yes	±15	Type 2		C, I, H	SO-8, MSOP-8, 3 × 3 DFN-8
LTC2851	3.3	20M	1	1	Full	No	±15	Type 2		C, I, H	SO-8, MSOP-8, 3 × 3 DFN-8
LTC2852	3.3	20M	1	1	Full	Yes	±15	Type 2	DE and RE Pins	C, I, H	SO-14, MSOP-10, 3 × 3 DFN-10
LTC1480	3.3	2.5M	1	1	Half	Yes	±3.5	Type 1		C, I	SO-8, DIP- 8
Low Power											
LTC2856-1/-2	5	20M/250k	1	1	Half	Yes	±15	Type 2	Hot Swap™ Capable	C, I, H	MSOP-8, 3 × 3 DFN-8
LTC2857-1/-2	5	20M/250k	1	1	Full	No	±15	Type 2	Hot Swap Capable	C, I, H	MSOP-8, 3 × 3 DFN-8
LTC2858-1/-2	5	20M/250k	1	1	Full	Yes	±15	Type 2	Hot Swap Capable	C, I, H	MSOP-10, 3 × 3 DFN-10
LTC1690	5	5M	1	1	Full	No	±15	Type 2		C, I	MSOP-8, SO-8, DIP-8
LTC1481	5	2.5M	1	1	Half	Yes	±10	Type 1		C, I	SO-8, DIP-8
LTC1482	5	4M	1	1	Half	Yes	±15	Type 2	Carrier Detect	C, I	MSOP-8, SO-8, DIP-8
LTC1483	5	150k	1	1	Half	Yes	±10	Type 1	Low EMI	C, I	SO-8, DIP-8
LTC1484	5	4M	1	1	Half	Yes	±15	Type 2		C, I	MSOP-8, SO-8, DIP-8
LTC1485	5	10M	1	1	Half	No	±10	Type 1		C, I	SO-8, DIP-8
LTC1487	5	250k	1	1	Half	Yes	±10	Type 1	Low EMI	C	SO-8, DIP-8
LTC485	5	2.5M	1	1	Half	No	±4	Type 1		C, I, M	SO-8, DIP-8, CERDIP-8
LTC490	5	2.5M	1	1	Full	No	±10	Type 1		C, I	SO-8, DIP-8
LTC491	5	2.5M	1	1	Full	No	±10	Type 1	DE and RE Pins	C, I	SO-14, DIP-14
High Speed											
LTC1685	5	52M	1	1	Half	No	±4	Type 2		C, I	SO-8
LTC1686	5	52M	1	1	Full	No	±4	Type 1		C, I	SO-8
LTC1687	5	52M	1	1	Full	No	±4	Type 1	DE and RE Pins	C, I	SO-14
Quad Drivers and Receivers											
LTC1688/89	5	100M	4	0		No	±4		Hot Swap Capable, 1/2 DE Pins	C, I	SO-16
LTC486/87	5	10M	4	0		No	±4	Type 1	Low Power, 1/2 DE Pins	C, I	SO(W)-16, DIP-16
LTC1518/19	5	52M	0	4		No	±4	Type 2		C, I	SO-16
LTC488/89	5	10M	0	4		No	±10	Type 1	Low Power, 1/2 DE Pins	C, I	SO(W)-16, DIP-16
LVDS Compatible											
LTC1520	5	50M	0	4		No	±4		High Speed, LVDS-Compatible	C	SO-16

Type 1 = Open

Type 2 = Idle, Open, Short

LTM8047

3.1V_{IN} to 32V_{IN} Isolated μModule DC/DC Converter

FEATURES

- **Complete Switch Mode Power Supply**
- **725VDC Isolation**
- **Wide Input Voltage Range: 3.1V to 32V**
- **Up to 440mA Output Current (V_{OUT} = 2.5V)**
- **2.5V to 12V Output Voltage**
- Current Mode Control
- Programmable Soft-Start
- User Configurable Undervoltage Lockout
- (e1) RoHS Compliant Package
- Low Profile (11.25mm × 9mm × 4.92mm) Surface Mount BGA Package

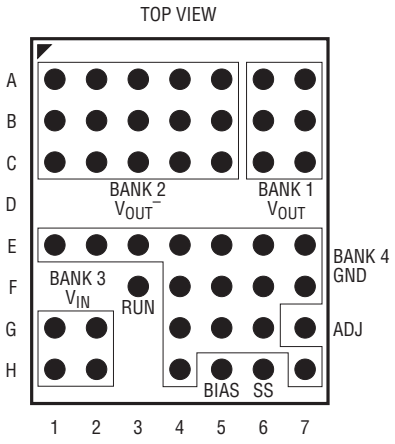
APPLICATIONS

- Industrial Sensors
- Industrial Switches
- Ground Loop Mitigation

DESCRIPTION

The LTM®8047 is an isolated flyback μModule® DC/DC converter. The LTM8047 has an isolation rating of 725VDC. For a similar product with LDO post regulator, see the LTM8048. Included in the package are the switching controller, power switches, transformer, and all support components. Operating over an input voltage range of 3.1V to 32V, the LTM8047 supports an output voltage range of 2.5V to 12V, set by a single resistor. Only output, input, and bypass capacitors are needed to finish the design. Other components may be used to control the soft-start control and biasing.

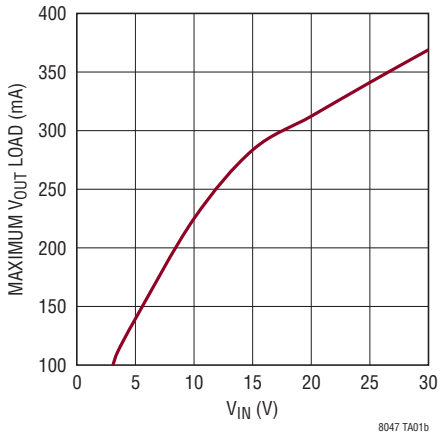
The LTM8047 is packaged in a thermally enhanced, compact (11.25mm × 9mm × 4.92mm) over-molded ball grid array (BGA) package suitable for automated assembly by standard surface mount equipment. The LTM8047 is RoHS compliant.



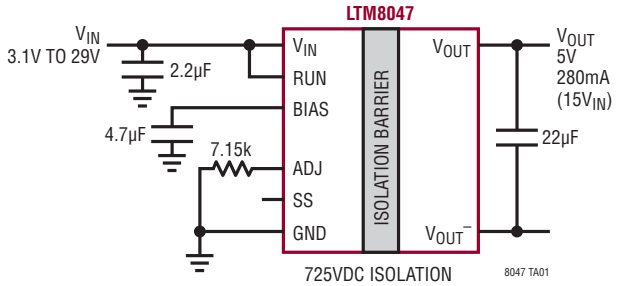
BGA PACKAGE
45-LEAD (11.25mm × 9mm × 4.92mm)

LTM8047EY
LTM8047IY
LTM8047MPY

Maximum Load vs V_{IN}



725V DC Isolated Low Noise μModule Regulator



LTM8048

3.1V_{IN} to 32V_{IN} Isolated μModule DC/DC Converter with LDO Post Regulator

FEATURES

- **Complete Switch Mode Power Supply**
- **725VDC Isolation**
- **Wide Input Voltage Range: 3.1V to 32V**
- **V_{OUT1} Output:**
  Up to 440mA (V_{OUT1} = 2.5V, 24V_{IN})
  2.5V to 13V Output Range
- **V_{OUT2} Low Noise Linear Post Regulator:**
  Up to 300mA
  1.2V to 12V Output Range
- Current Mode Control
- Programmable Soft-Start
- User Configurable Undervoltage Lockout
- (e1) RoHS Compliant Package
- Low Profile (11.25mm × 9mm × 4.92mm) Surface Mount BGA Package

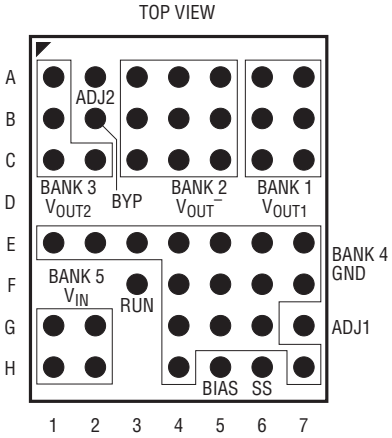
APPLICATIONS

- Industrial Sensors
- Industrial Switches
- Ground Loop Mitigation

DESCRIPTION

The LTM®8048 is an isolated flyback μModule® DC/DC converter with LDO post regulator. The LTM8048 has an isolation rating of 725VDC. Included in the package are the switching controller, power switches, transformer, and all support components. Operating over an input voltage range of 3.1V to 32V, the LTM8048 supports an output voltage range of 2.5V to 13V, set by a single resistor. There is also a linear post regulator whose output voltage is adjustable from 1.2V to 12V as set by a single resistor. Only output, input, and bypass capacitors are needed to finish the design. Other components may be used to control the soft-start control and biasing.

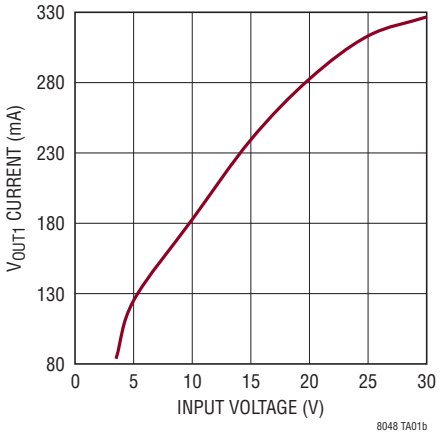
The LTM8048 is packaged in a thermally enhanced, compact (11.25mm × 9mm × 4.92mm) over-molded ball grid array (BGA) package suitable for automated assembly by standard surface mount equipment. The LTM8048 is RoHS compliant.



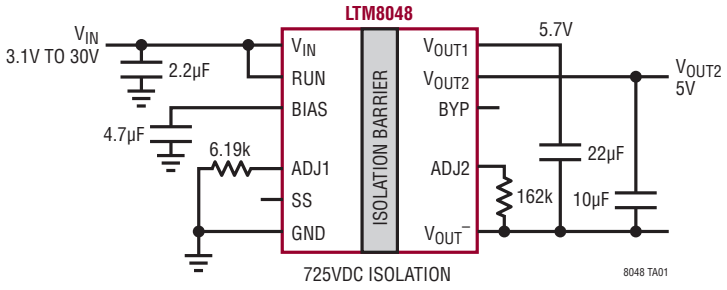
BGA PACKAGE
45-LEAD (11.25mm × 9mm × 4.92mm)

LTM8048EY
LTM8048IY
LTM8048MPY

Total Output Current vs V_{IN}



725V DC Isolated Low Noise μModule Regulator



LTM8052

36V_{IN}, 5A, 2-Quadrant CVCC Step-Down μModule Regulator

FEATURES

- **Complete Step-Down Switch Mode Power Supply**
- **CVCC: Constant-Voltage Constant-Current**
- **2-Quadrant: Sources and Sinks Output Current**
- **Adjustable Output Current**
- **Wide Input Voltage Range: 6V to 36V**
- **1.2V to 24V Output Voltage**
- Forced Continuous Operation
- Selectable Switching Frequency: 100kHz to 1MHz
- (e4) RoHS Compliant Package with Gold Pad Finish
- Programmable Soft-Start
- Tiny, Low Profile (11.25mm × 15mm × 2.82mm) Surface Mount LGA Package

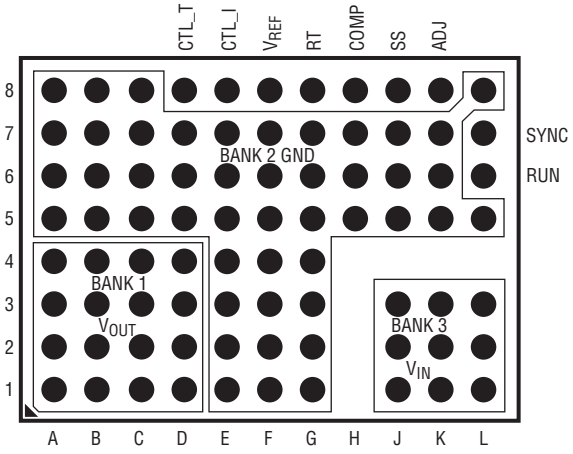
APPLICATIONS

- Constant-Frequency Voltage Regulation Even at No Load
- Peltier Driver
- Battery Tester
- Battery/Supercap Charging and Cell Balancing
- Motor Drive Power Regulator
- High Power LED Drive

DESCRIPTION

The LTM®8052 is a 36V_{IN}, 5A, 2-quadrant constant-voltage, constant-current (CVCC) step-down μModule® regulator. Included in the package are the switching controller, power switches, inductor and support components. Operating over an input voltage range of 6V to 36V, the LTM8052 supports an output voltage range of 1.2V to 24V. 2-quadrant operation allows the LTM8052 to sink or source current to maintain voltage regulation, while the CVCC characteristic provides precise positive and negative current limits. The output current limit can be set by a control voltage, a single resistor or a thermistor. Only resistors to set the frequency and output voltage, and the bulk input and output filter capacitors, are needed to finish the design.

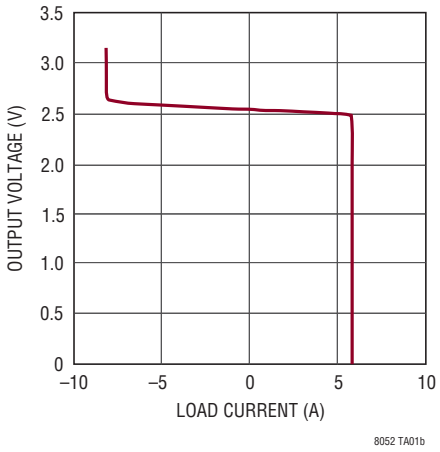
The low profile package (2.82mm) enables utilization of unused space on the bottom of PC boards for high density point-of-load regulation. The LTM8052 is packaged in a thermally enhanced, compact (11.25mm × 15mm) RoHS compliant, over-molded land grid array (LGA) package suitable for automated assembly by standard surface mount equipment.



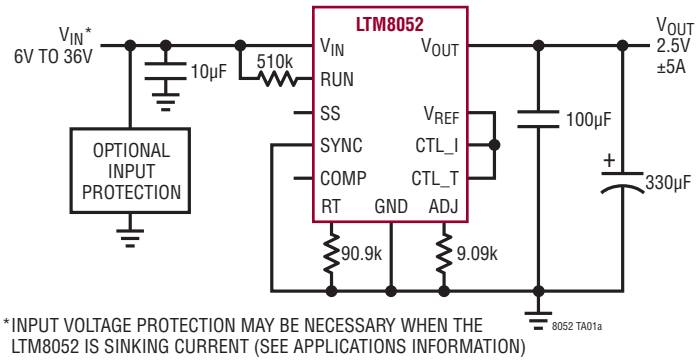
LGA PACKAGE
81-LEAD (15mm × 11.25mm × 2.82mm)

LTM8052EV
LTM8052IV

Output Voltage vs Output Current



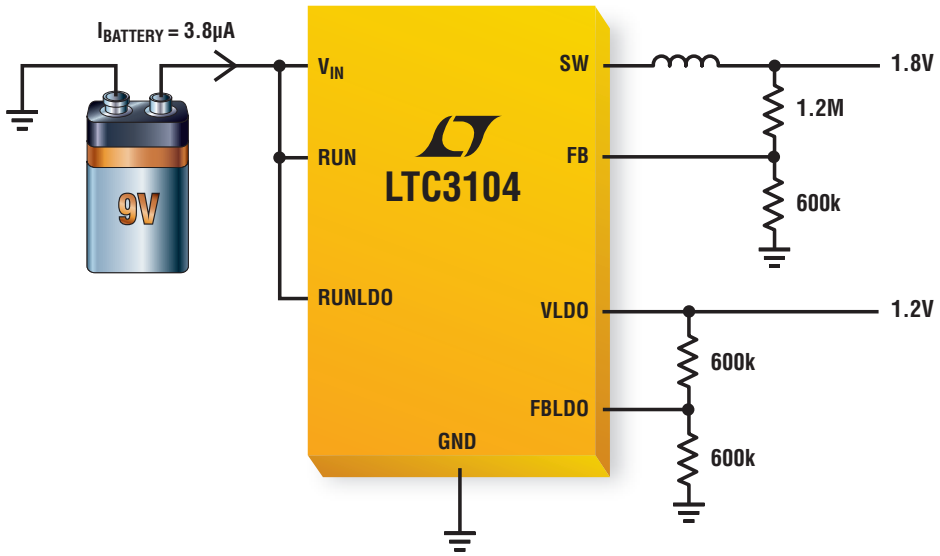
±5A, 2.5V (2-Quadrant) μModule Voltage Regulator



*INPUT VOLTAGE PROTECTION MAY BE NECESSARY WHEN THE LTM8052 IS SINKING CURRENT (SEE APPLICATIONS INFORMATION)

*Protected by U.S. Patents, including 7199560, 7321203 and others pending.

Change Batteries in 2018



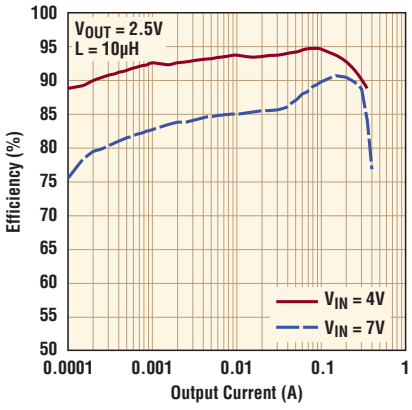
When You Can't Afford to Turn it Off

Enabling long battery life in an "always-on" system means drawing very little active standby current. Fortunately, our LTC®3104 does just that: its buck regulator can deliver 300mA with up to 95% efficiency with a no load quiescent current of just 1.8µA when in Burst Mode® operation. Its 10mA low noise LDO adds just 1.0µA of quiescent current and can be powered from the buck output. The LTC3104's wide 2.5V to 15V input voltage range accommodates a variety of input sources, making it ideal for remote sensor networks, portable instruments and a wide range of battery-powered devices.

Features

- V_{IN} Range: 2.5V to 15V
- V_{OUT} Range: 0.6V to 13.8V
- 300mA Buck I_Q = 1.8µA
- 1.2MHz Constant Frequency, Current Mode Architecture
- 10mA LDO I_Q = 1.0µA
- LDO Dropout = 150mV
- 3mm x 4mm DFN14, MSE16 Packages
- LTC3103 for 300mA Buck Only in 3mm x 3mm DFN, MSE10

LTC3104 Efficiency Curve
(Automatic Burst Mode Operation)



Info & Free Samples

www.linear.com/product/LTC3104

1-800-4-LINEAR

LTC3104 Video Product Brief

LINEAR TECHNOLOGY

LTC3104

2.6µA Quiescent Current, 15V, 300mA Synchronous Step-Down DC/DC Converter and 10mA LDO

FEATURES

- **Ultralow Quiescent Current: 2.6µA**
- **Synchronous Rectification Efficiency Up to 95%**
- **Wide V_{IN} Range: 2.5V to 15V**
- **Wide V_{OUT} Range: 0.6V to 13.8V**
- **300mA Output Current**
- **User-Selectable Automatic Burst Mode® or Forced Continuous Operation**
- Accurate and Programmable RUN Pin Threshold
- 1.2MHz Fixed Frequency PWM
- Internal Compensation
- Power Good Status Output for V_{OUT}
- 10mA Adjustable LDO
- Available in Thermally Enhanced 3mm × 4mm × 0.75mm, 14-Pin DFN and 16-Pin MSOP Packages

APPLICATIONS

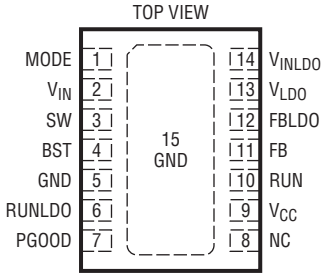
- Remote Sensor Networks
- Distributed Power Systems
- Multicell Battery or Supercap Regulator
- Energy Harvesters
- Portable Instruments
- Low Power Wireless Systems

DESCRIPTION

The LTC®3104 is a high efficiency, monolithic synchronous step-down converter using a current mode architecture capable of supplying 300mA of output current. The LTC3104 includes an integrated, adjustable 10mA LDO to power noise sensitive functions.

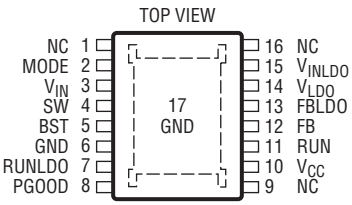
The LTC3104 offers two operational modes: automatic Burst Mode operation and forced continuous mode allowing the user to optimize output voltage ripple, noise and light load efficiency. With Burst Mode operation enabled, the typical DC input supply current at no load drops to 2.6µA, maximizing the efficiency for light loads. Selection of forced continuous mode provides very low noise constant frequency, 1.2MHz operation.

Additionally, the LTC3104 includes an accurate RUN comparator, thermal overload protection, a power good output and an integrated soft-start feature to guarantee that the power system start-up is well controlled.



DE PACKAGE
14-LEAD (4mm × 3mm) PLASTIC DFN

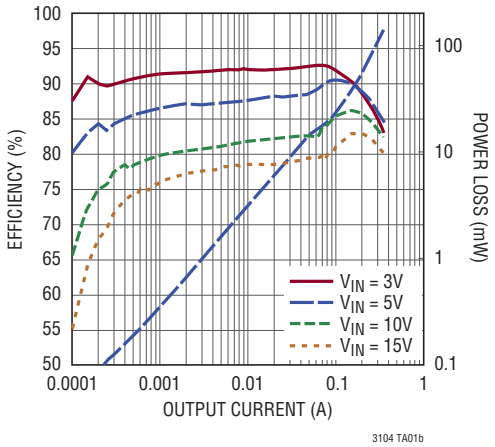
LTC3104EDE
LTC3104IDE

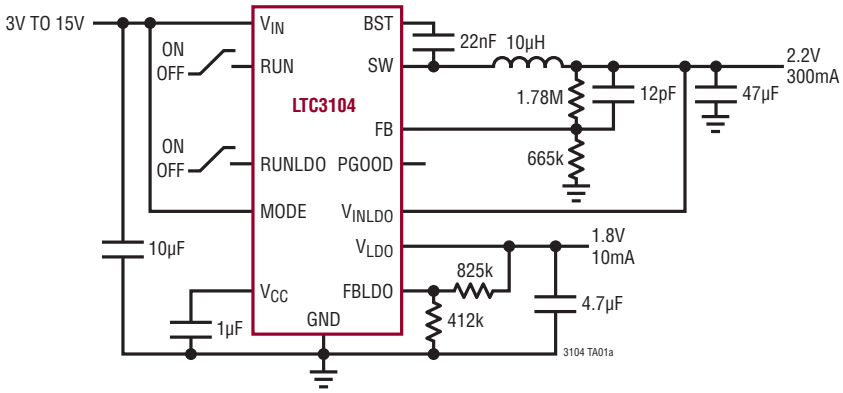


MSE PACKAGE
16-LEAD PLASTIC MSOP

LTC3104EMSE
LTC3104IMSE

Efficiency vs Output Current





LTC3103

1.8µA Quiescent Current, 15V, 300mA Synchronous Step-Down DC/DC Converter

FEATURES

- **Ultralow Quiescent Current: 1.8µA**
- **Synchronous Rectification: Efficiency Up to 95%**
- **Wide V_{IN} Range: 2.5V to 15V**
- **Wide V_{OUT} Range: 0.6V to 13.8V**
- **300mA Output Current**
- **User-Selectable Automatic Burst Mode® or Forced Continuous Operation**
- Accurate and Programmable RUN Pin Threshold
- 1.2MHz Fixed Frequency PWM
- Internal Compensation
- Power Good Status Output for V_{OUT}
- Available in Thermally Enhanced 3mm × 3mm × 0.75mm, 10-Pin DFN and 10-Pin MSOP Packages

APPLICATIONS

- Remote Sensor Networks
- Distributed Power Systems
- Multicell Battery or Supercap Regulator
- Energy Harvesting
- Portable Instruments
- Low Power Wireless Systems

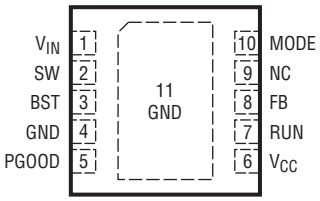
DESCRIPTION

The LTC®3103 is a high efficiency, monolithic synchronous step-down converter using a current mode architecture capable of supplying 300mA of output current.

The LTC3103 offers two operational modes: automatic Burst Mode operation and forced continuous mode allowing the user the ability to optimize output voltage ripple, noise and light load efficiency. With Burst Mode operation enabled, the typical DC input supply current at no load drops to 1.8µA maximizing the efficiency for light loads. Selection of forced continuous mode provides very low noise constant frequency, 1.2MHz operation.

Additionally, the LTC3103 includes an accurate RUN comparator, thermal overload protection, a power good output and an integrated soft-start feature to guarantee that the power system start-up is well controlled.

TOP VIEW



DD PACKAGE
10-LEAD (3mm × 3mm) PLASTIC DFN

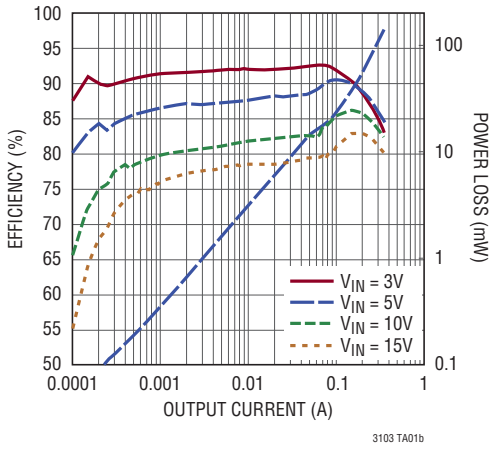
LTC3103EDD
LTC3103IDD

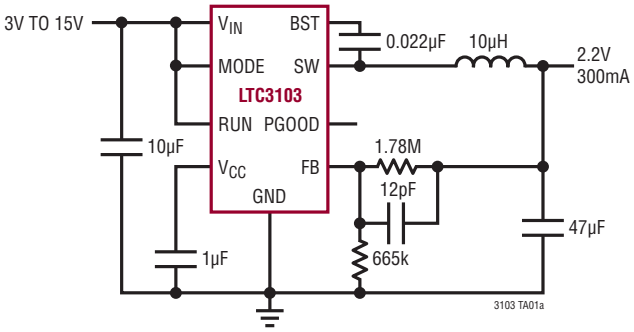
TOP VIEW

MSE PACKAGE
10-LEAD PLASTIC MSOP

LTC3103EMSE
LTC3103IMSE

Efficiency vs Output Current





LTC3600

15V, 1.5A Synchronous Rail-to-Rail Single Resistor Step-Down Regulator

FEATURES

- **Single Resistor Programmable V_{OUT}**
- **±1% I_{SET} Accuracy**
- **High Efficiency: Up to 96%**
- 1.5A Output Current
- Integrated Power N-Channel MOSFETs (200mΩ Top and 100mΩ Bottom)
- Adjustable Frequency: 200kHz to 4MHz
- Wide V_{OUT} Range 0V to V_{IN} – 0.5V
- 4V to 15V V_{IN} Range
- Current Mode Operation for Excellent Line and Load Transient Response
- <1µA Supply Current in Shutdown
- Available in Thermally Enhanced 12-Pin (3mm × 3mm) DFN and MSOP Packages

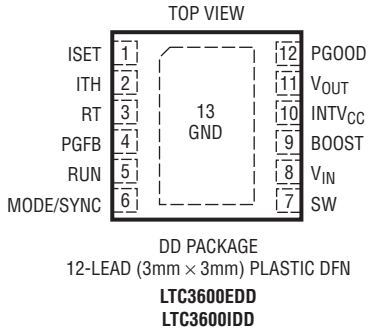
APPLICATIONS

- Point-of-Load Power Supplies
- Portable Instruments
- Distributed Power Systems
- Battery-Powered Equipment
- Voltage Tracking Supplies

DESCRIPTION

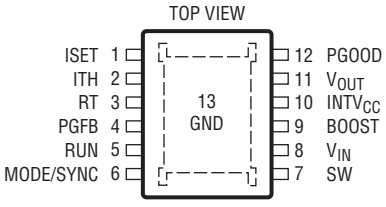
The LTC®3600 is a high efficiency, monolithic synchronous buck regulator whose output is programmed with just one external resistor. The accurate internally generated 50µA current source on the ISET pin allows the use of a single external resistor to program an output voltage that ranges from 0V to 0.5V below V_{IN}. The V_{OUT} voltage feeds directly back to the error amplifier in unity gain fashion and equals the ISET voltage. The operating supply voltage range is 4V to 15V, making it suitable for dual lithium-ion battery and 5V or 12V input point-of-load power supply applications.

The operating frequency is synchronizable to an external clock or programmable from 200kHz to 4MHz with an external resistor. The high frequency allows the use of small surface mount inductors. The unique constant on-time architecture is ideal for operating at high frequency in high step-down ratio applications that also demand fast load transient response.



DD PACKAGE
12-LEAD (3mm × 3mm) PLASTIC DFN

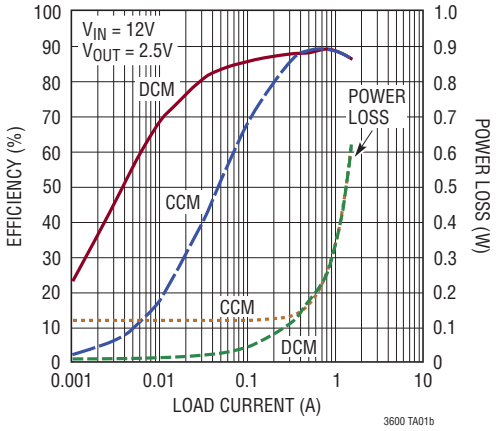
LTC3600EDD
LTC3600IDD



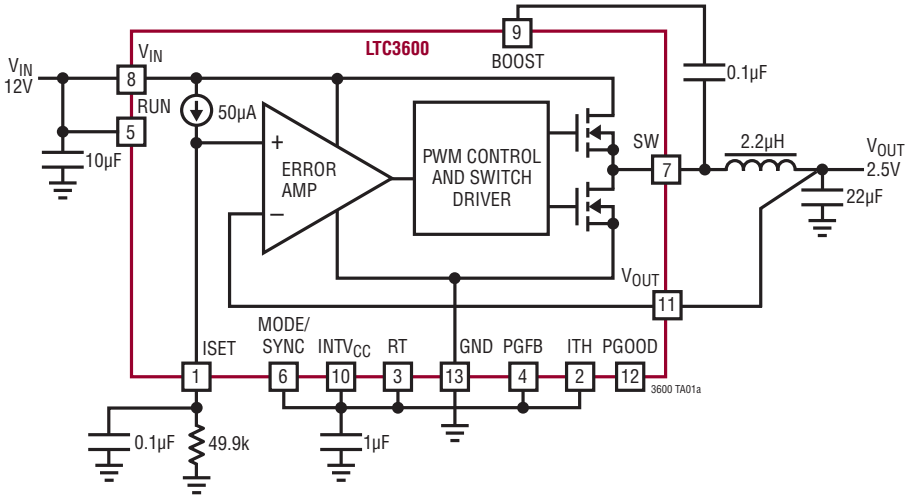
MSE PACKAGE
12-LEAD PLASTIC MSOP

LTC3600EMSE
LTC3600IMSE

Efficiency and Power Loss vs Output Current



High Efficiency, 1MHz, 1.5A Step-Down Converter



LTC3613

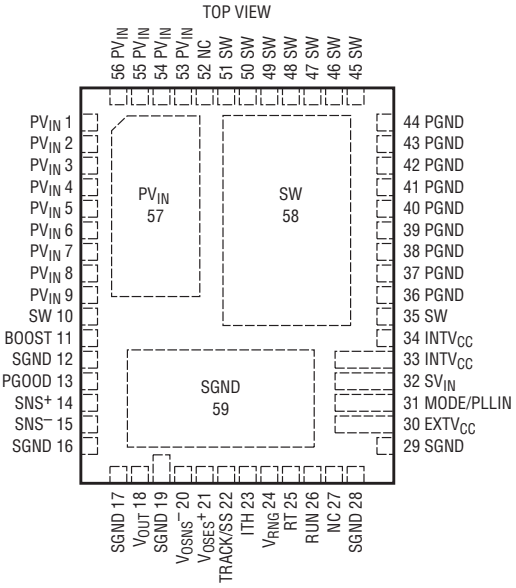
24V, 15A Monolithic Step-Down Regulator with Differential Output Sensing

FEATURES

- **Wide V_{IN} Range: 4.5V to 24V; V_{OUT} Range: 0.6V to 5.5V at up to 15A**
- **0.67% Output Voltage Accuracy**
- **Controlled On-Time Valley Current Mode Architecture, Excellent Current Sharing Capability**
- **Frequency Programmable from 200kHz to 1MHz and Synchronizable to External Clock**
- **R_{SENSE} or Inductor DCR Current Sensing With Accurate Current Limit**
- Fast Transient Response
- Differential Output Voltage Sensing Allowing 500mV Common Mode Remote Ground
- $t_{ON(MIN)}$ = 65ns; $t_{OFF(MIN)}$ = 105ns
- Overvoltage Protection and Current Limit Foldback
- Power Good Output Voltage Monitor
- Voltage Tracking Start-Up
- External V_{CC} Input for Bypassing Internal LDO
- Micropower Shutdown: I_Q = 15µA
- 7mm × 9mm 56-Pin QFN Package

APPLICATIONS

- Distributed Power System
- Point-of-Load Converters
- Servers



WKH PACKAGE
56-LEAD (7mm × 9mm) MULTIPAD QFN

LTC3613EWKH
LTC3613IWKH

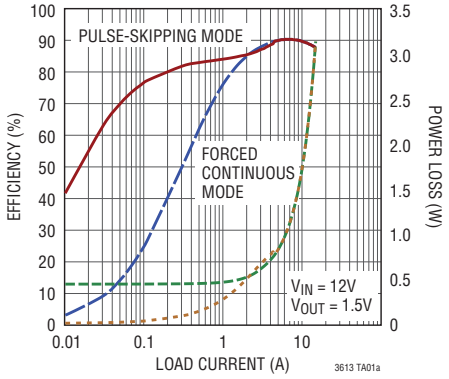
DESCRIPTION

The LTC®3613 is a monolithic synchronous step-down switching regulator capable of regulating outputs from 0.6V to 5.5V with up to 15A output current. The controlled on-time constant frequency valley current mode architecture allows for both fast transient response and constant frequency switching in steady-state operation, independent of V_{IN}, V_{OUT} and load. This also provides excellent current sharing capability.

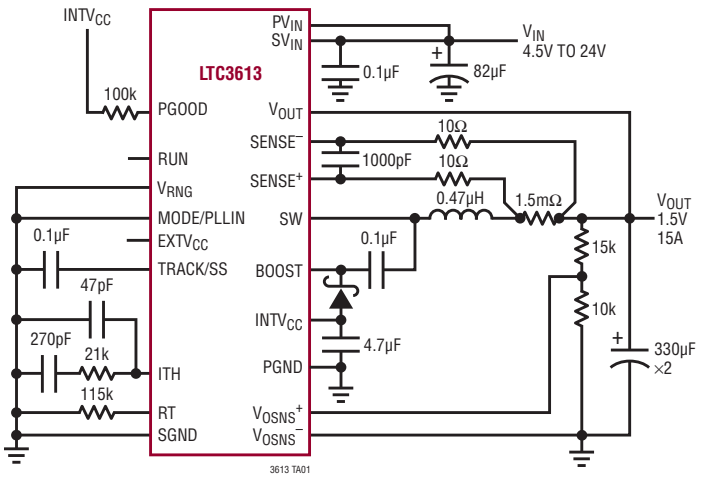
Differential output voltage sensing along with a precision internal reference combine to offer ±0.67% output regulation, even if the output ground reference deviates from local ground by 500mV. The switching frequency can be programmed from 200kHz to 1MHz with an external resistor. The switching frequency is also phase synchronizable to an external clock in applications where switching noise/EMI reduction is crucial.

Very low t_{ON} and t_{OFF} times allow for near 0% and near 100% duty cycles, respectively. Voltage tracking soft start-up is provided for tracking and sequencing applications. Safety features include output overvoltage protection, programmable current limit with foldback, and power good monitoring.

Efficiency and Power Loss vs Load Current



High Efficiency High Power Step-Down Converter



LT3641

Dual Monolithic Buck Regulator with Power-On Reset and Watchdog Timer with –40°C to 150°C Operating Range

FEATURES

- **High Voltage Buck Regulator:**
  4V to 42V Operating Range
  1.3A Output Current
- **Input Transient Protection to 55V**
- **Low Voltage Synchronous Buck Regulator:**
  2.5V to 5.5V Input Voltage Range
  1.1A Output Current
- **Synchronizable, Adjustable 350kHz to 2.5MHz Switching Frequency**
- **Programmable Power-On Reset Timer**
- **Programmable Window Mode Watchdog Timer**
- Typical Quiescent Current: 290µA
- Short-Circuit Robust
- Programmable Soft-Start
- Low Shutdown Current: I_Q < 1µA
- Thermal Shutdown
- Available in Thermally Enhanced 28-Lead (4mm × 5mm) QFN and 28-Lead TSSOP Packages

APPLICATIONS

- Industrial Power Supplies
- Automotive Electronic Control Units

DESCRIPTION

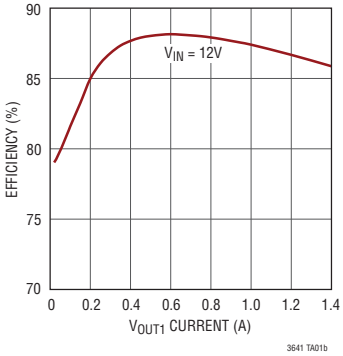
The LT®3641 is a dual channel, current mode monolithic buck switching regulator with a power-on reset and a watchdog timer. Both regulators are synchronized to a single oscillator with an adjustable frequency (350kHz to 2.5MHz). At light loads, both regulators operate in low ripple Burst Mode® operation to maintain high efficiency and low output ripple.

The high voltage channel is a nonsynchronous buck with an internal 2.4A top switch that operates from an input of 4V to 42V and input transient protection to 55V. The low voltage channel operates from an input of 2.5V to 5.5V. Internal synchronous power switches provide high efficiency without the need of external Schottky diode. Both channels have cycle-by-cycle current limit, providing protection against shorted outputs.

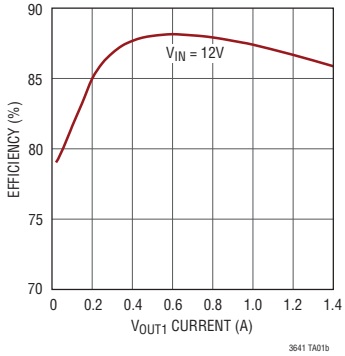
The power-on reset and watchdog timeout periods are both adjustable using external capacitors. The window mode watchdog timer flags when the µP pulses group too close together or too far apart.

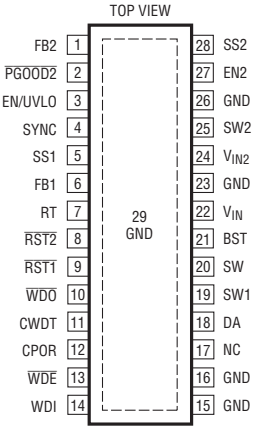
The LT3641 is available in a 28-pin 4mm × 5mm QFN package and 28-pin TSSOP package. Both packages have an exposed pad for low thermal resistance.

HV Channel Efficiency, 2MHz, V_{OUT1} = 5V



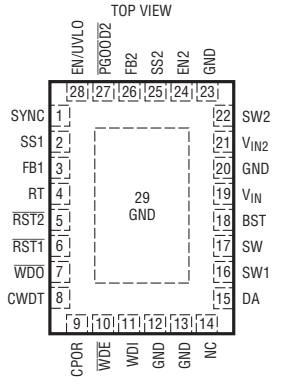
LV Channel Efficiency, 2MHz, V_{OUT2} = 3.3V





FE PACKAGE
28-LEAD PLASTIC TSSOP

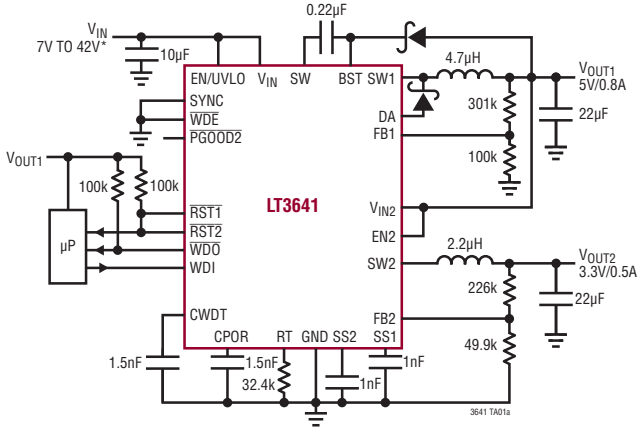
LT3641EFE
LT3641IFE
LT3641HFE



UFD PACKAGE
28-LEAD (4mm × 5mm) PLASTIC DFN

LT3641EUFD
LT3641IUFD

2MHz 5V/0.8A and 3.3V/0.5A Step Down Regulators



* FOR INPUT VOLTAGES ABOVE 42V RESTRICTIONS APPLY

LT3692A

Monolithic Dual Tracking 3.5A Step-Down Switching Regulator with –40°C to 150°C Operating Range

FEATURES

- **Wide Input Range:**
  - **– Operation from 3V to 36V**
  - **– OVLO Protects Circuit Through 60V Transients**
- **Independent Supply, Shutdown, Soft-Start, UVLO, Programmable Current Limit and Programmable Power Good for Each 3.5A Regulator**
- **Die Temperature Monitor**
- **Adjustable/Synchronizable Fixed Frequency Operation from 250kHz to 2.25MHz with Synchronized Clock Output**
- **Independent Synchronized Switching Frequencies Optimize Component Size**
- **Antiphase Switching**
- **Outputs Can Be Paralleled**
- Flexible Output Voltage Tracking
- Low Dropout: 95% Maximum Duty Cycle
- 5mm × 5mm QFN Package
- FMEA Compliant 38-Pin Exposed Pad TSSOP Package

APPLICATIONS

- Automotive Supplies
- Distributed Supply Regulation

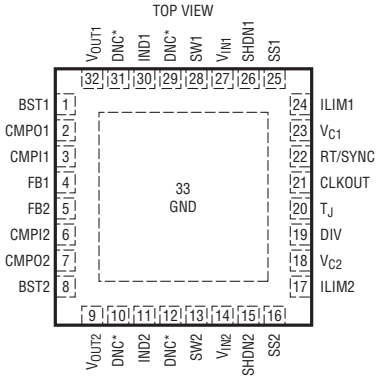
DESCRIPTION

The LT®3692A is a dual current mode PWM step-down DC/DC converter with two internal 3.8A switches. Independent input voltage, shutdown, feedback, soft-start, UVLO current limit and comparator pins for each channel simplify complex power supply tracking and sequencing requirements.

To optimize efficiency and component size, both converters have a programmable maximum current limit and are synchronized to either a common external clock input, or a resistor settable fixed 250kHz to 2.25MHz internal oscillator. A frequency divider is provided for channel 1 to further optimize component size. At all frequencies, a 180° phase relationship between channels is maintained, reducing voltage ripple and component size. A clock output is available for synchronizing multiple regulators.

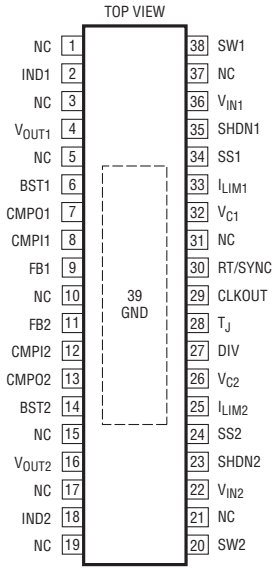
Minimum input to output voltage ratios are improved by allowing the switch to stay on through multiple clock cycles only switching off when the boost capacitor needs recharging. Independent channel operation can be programmed using the SHDN pin. Disabling both converters reduces the total quiescent current to <10µA.

The LT3692A is an improved version of the LT3692 with reduced minimum on-time.



UH PACKAGE
32-LEAD (5mm × 5mm) PLASTIC QFN

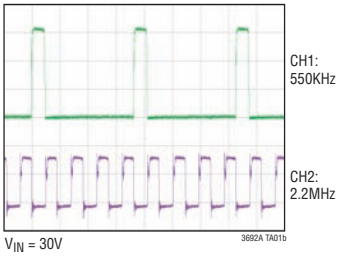
LT3692AEUH
LT3692AIUH
LT3692AHUH

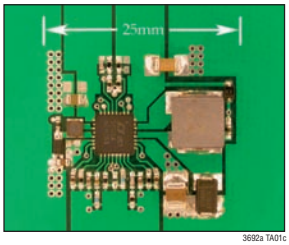


FE PACKAGE
38-LEAD PLASTIC TSSOP

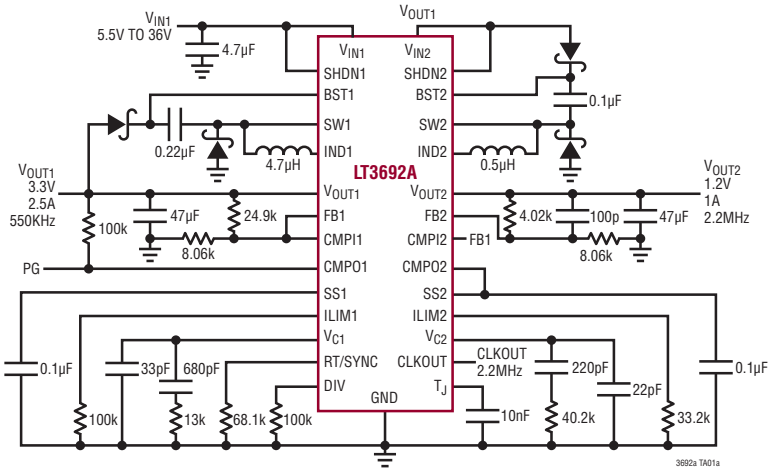
LT3692AEFE
LT3692AIFE
LT3692AHFE

Independent Synchronized Switching Frequencies Extend Full Frequency Input Range





3.3V and 1.2V 2-Stage Dual Step-Down Multi-Frequency Converter



LT3798

Isolated No Opto-Coupler Flyback Controller with Active PFC

FEATURES

- **Isolated PFC Flyback with Minimum Number of External Components**
- **V_{IN} and V_{OUT} Limited Only by External Components**
- **Active Power Factor Correction**
- **Low Harmonic Distortion**
- **No Opto-Coupler Required**
- **Constant-Current and Constant-Voltage Regulation**
- Accurate Regulated Voltage and Current (±5% Typical)
- Energy Star Compliant (<0.5W No Load Operation)
- Thermally Enhanced 16-lead MSOP Package

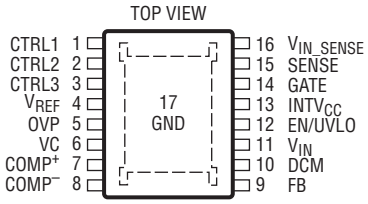
APPLICATIONS

- Offline 5W to 100W+ Applications
- High DC V_{IN} Isolated Applications
- Offline Bus Converter (12V, 24V or 48V Outputs)

DESCRIPTION

The LT®3798 is a constant voltage/constant current isolated flyback controller that combines active power factor correction (PFC) with no opto-coupler required for output voltage feedback into a single-stage converter. A LT3798 based design can achieve a power factor of greater than 0.97 by actively modulating the input current, allowing compliance with most Harmonic Current Emission requirements.

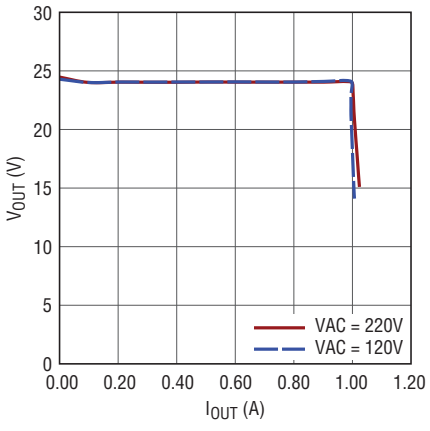
The LT3798 is well suited for a wide variety of off-line applications. The input range can be scaled up or down, depending mainly on the choice of external components. Efficiencies higher than 86% can be achieved with output power levels up to 100 watts. In addition, the LT3798 can easily be designed into high DC input applications.



MSE PACKAGE
16-LEAD PLASTIC MSOP

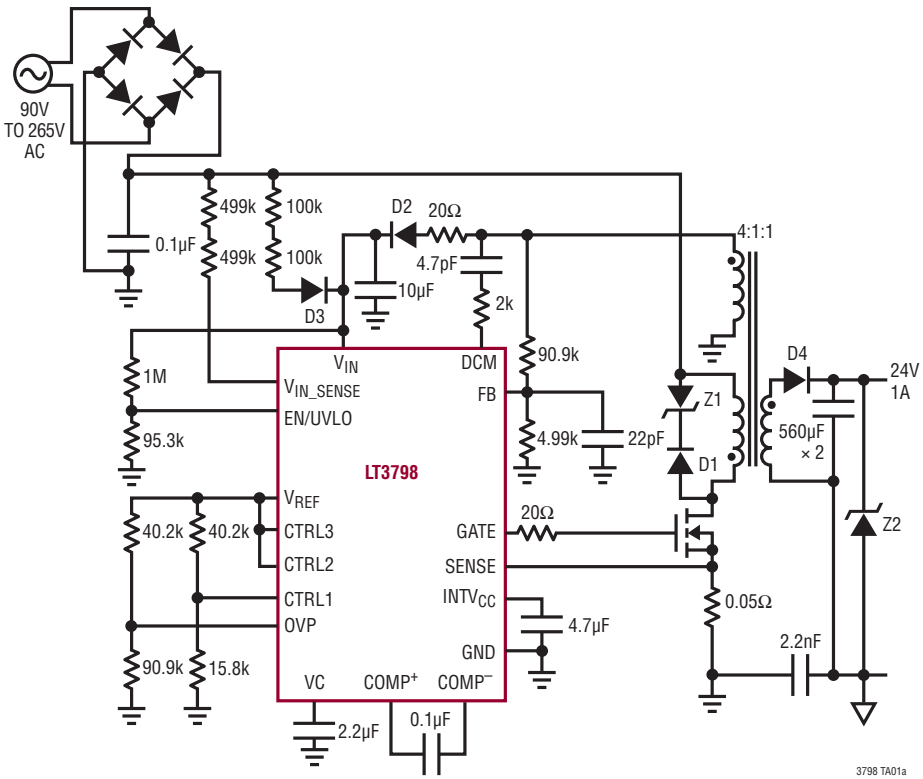
LT3798EMSE
LT3798IMSE
LT3798HMSE

V_{OUT} vs I_{OUT}



3798 TA01b

Universal Input 24W PFC Bus Converter



3798 TA01a

LTC3839

Fast, Accurate, 2-Phase, Single-Output Step-Down DC/DC Controller with Differential Output Sensing

FEATURES

- **Wide V_{IN} Range: 4.5V to 38V, V_{OUT}: 0.6V to 5.5V**
- **±0.67% Output Voltage Accuracy Over Temperature, Differential Output Voltage Sensing, Allowing Up to ±500mV Line Loss at Remote Ground**
- **Controlled On-Time, Valley Current Mode Control**
- **Fast Load Transient Response**
- **Detect Transient (DTR) Reduces V_{OUT} Overshoot**
- **Frequency Programmable from 200kHz to 2MHz, Synchronizable to External Clock**
- **$t_{ON(MIN)}$ = 30ns, $t_{OFF(MIN)}$ = 90ns**
- Up to 12-Phase Operation
- R_{SENSE} or Inductor DCR Current Sensing
- Overvoltage Protection and Current Limit Foldback
- Power Good Output Voltage Monitor
- Output Voltage Tracking and Adjustable Soft Start-Up
- Thermally Enhanced 32-Pin (5mm × 5mm) QFN Package

APPLICATIONS

- Distributed Power Systems
- Point-of-Load Converters
- Computing Systems
- Data Communication Systems

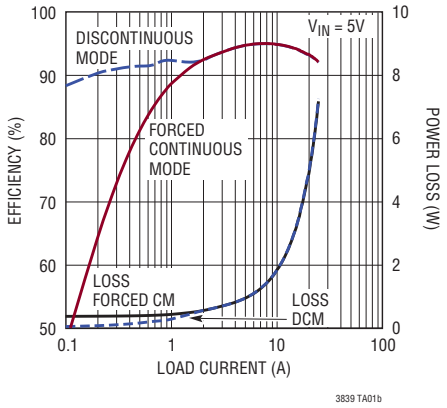
DESCRIPTION

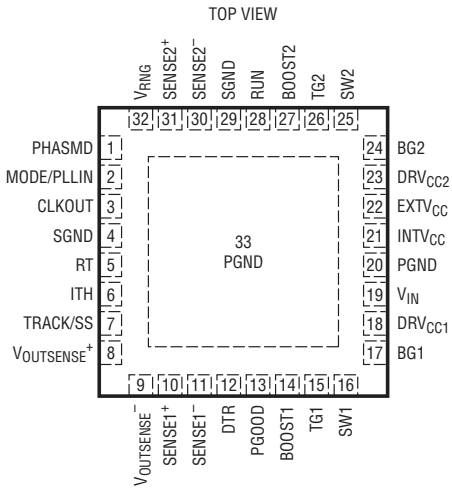
The LTC®3839 is a 2-phase, single-output PolyPhase® synchronous step-down switching regulator controller that drives all N-channel power MOSFETs. The controlled on-time, valley current mode control architecture allows for fast transient response and constant frequency switching in steady-state operation, independent of V_{IN}, V_{OUT} and load current. Its load-release transient detection feature significantly reduces overshoot at low output voltages.

Differential output voltage sensing, along with a precision internal reference, offers an accurate ±0.67% output regulation, even if the remote output ground deviates from local ground by ±500mV.

The switching frequency can be programmed from 200kHz to 2MHz with an external resistor and can be synchronized to an external clock. Very low t_{ON} and t_{OFF} times allow for near 0% and near 100% duty cycles, respectively. Voltage tracking soft start-up and multiple safety features are provided.

Efficiency/Power Loss

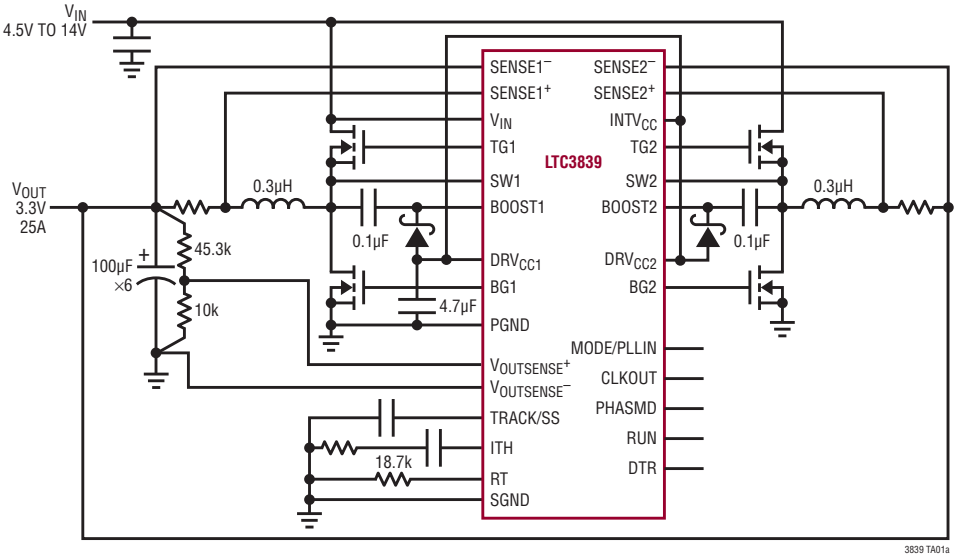




UH PACKAGE
32-LEAD (5mm × 5mm) PLASTIC QFN

LTC3839EUH
LTC3839IUH

3.3V/25A Output, 2MHz Step-Down Converter



LTC3861

Dual, Multiphase Step-Down Voltage Mode DC/DC Controller with Accurate Current Sharing

FEATURES

- **Operates with Power Blocks, DrMOS or External Gate Drivers and MOSFETs**
- **Constant-Frequency Voltage Mode Control with Accurate Current Sharing**
- **±0.75% 0.6V Voltage Reference**
- **Dual Differential Output Voltage Sense Amplifiers**
- **Multiphase Capability—Up to 12-Phase Operation**
- **Programmable Current Limit**
- **Safely Powers a Prebiased Load**
- **Programmable or PLL-Synchronizable Switching Frequency Up to 2.25MHz**
- **Lossless Current Sensing Using Inductor DCR or Precision Current Sensing with Sense Resistor**
- V_{CC} Range: 3V to 5.5V
- V_{IN} Range: 3V to 24V
- Power Good Output Voltage Monitor
- Output Voltage Tracking Capability
- Programmable Soft-Start
- Available in a 36-Pin 5mm × 6mm QFN Package

APPLICATIONS

- High Current Distributed Power Systems
- DSP, FPGA and ASIC Supplies
- Datacom and Telecom Systems
- Industrial Power Supplies

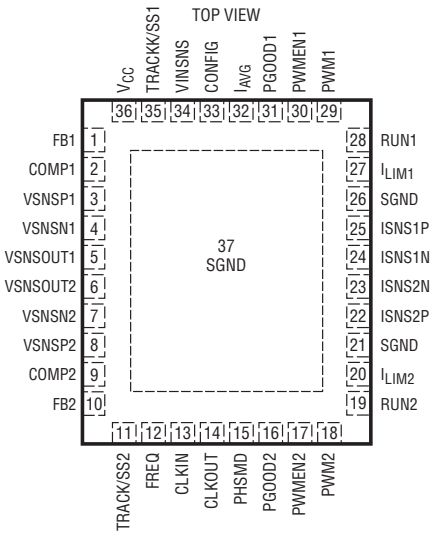
DESCRIPTION

The LTC®3861 is a dual PolyPhase® synchronous step-down switching regulator controller for high current distributed power systems, digital signal processors, and other telecom and industrial DC/DC power supplies. It uses a constant-frequency voltage mode architecture combined with very low offset, high bandwidth error amplifiers and a remote output sense differential amplifier per channel for excellent transient response and output regulation.

The controller incorporates lossless inductor DCR current sensing to maintain current balance between phases and to provide overcurrent protection. The chip operates from a V_{CC} supply between 3V and 5.5V and is designed for step-down conversion from V_{IN} between 3V and 24V to output voltages between 0.6V and V_{CC} – 0.5V.

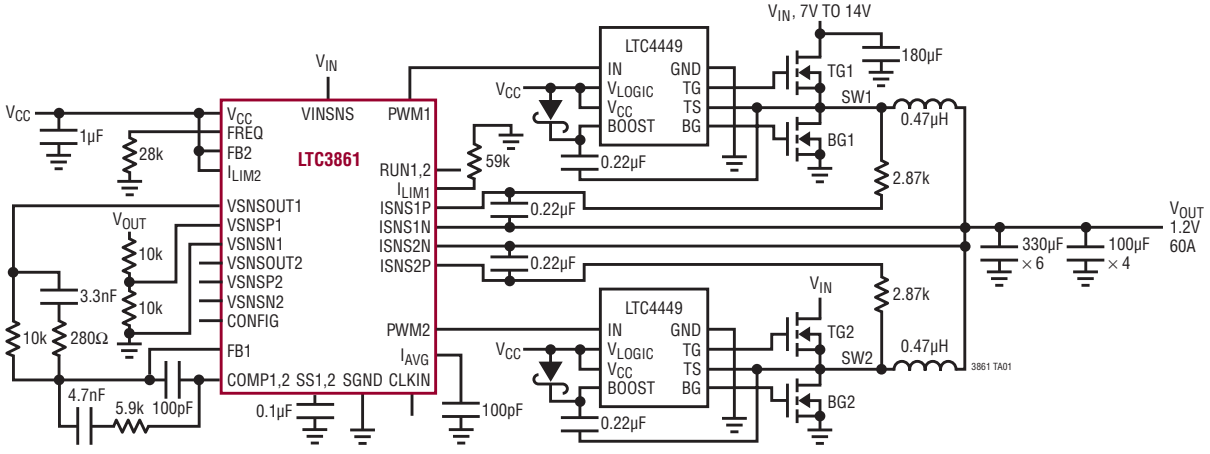
The TRACK/SS pins provide programmable soft-start or tracking functions. Inductor current reversal is disabled during soft-start to safely power prebiased loads. The constant operating frequency can be synchronized to an external clock or linearly programmed from 250kHz to 2.25MHz. Up to six LTC3861 controllers can operate in parallel for 1-, 2-, 3-, 4-, 6- or 12-phase operation.

The LTC3861 is available in a 36-pin 5mm × 6mm QFN package.



UHE PACKAGE
36-LEAD (5mm × 6mm) PLASTIC QFN

LTC3861EUHE
LTC3861IUHE



LTC3866

Current Mode Synchronous Controller for Sub Milliohm DCR Sensing

FEATURES

- **Sub Milliohm DCR Current Sensing: 0.17mΩ**
- **High Efficiency: Up to 95%**
- **Selectable Current Sensing Limit**
- **Programmable DCR Temperature Compensation**
- **Die Overtemperature Thermal Shutdown**
- **± 0.75% 0.6V Output Voltage Accuracy**
- **Programmable Fixed Frequency 250kHz to 770kHz**
- **High Speed Differential Remote Sense Amplifier**
- Wide Input Voltage Range: 4.75V to 38V
- Output Voltage Range: 0.6V to 3.5V
- Adjustable Soft-Start or Output Voltage Tracking
- Foldback Output Current Limit
- Short-Circuit Soft Recovery
- Output Overvoltage Protection
- 24-Lead (4mm × 4mm) QFN and 24-Lead FE Packages

APPLICATIONS

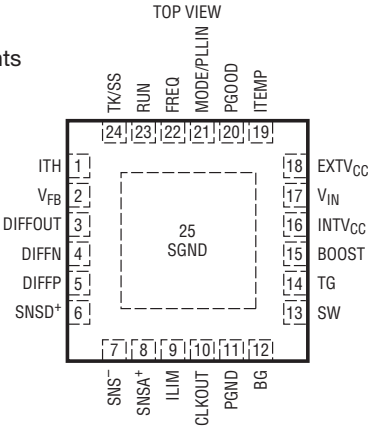
- Computer Systems
- Telecom Systems
- Industrial and Medical Instruments
- DC Power Distribution Systems

DESCRIPTION

The LTC®3866 is a single phase current mode synchronous step-down switching regulator controller that drives all N-channel power MOSFET switches. It employs a unique architecture which enhances the signal-to-noise ratio of the current sense signal, allowing the use of a very low DC resistance power inductor to maximize the efficiency in high current applications. This feature also reduces the switching jitter commonly found in low DCR applications. The LTC3866 also includes a high speed remote sense differential amplifier, a programmable current sense limit that can be selected to 10mV, 15mV, 20mV, 25mV or 30mV, and DCR temperature compensation to limit the maximum output current precisely over temperature.

The LTC3866 also features a precise 0.6V reference with a guaranteed limit of ±0.75% that provides an accurate output voltage from 0.6V to 3.5V. A 4.75V to 38V input voltage range allows it to support a wide variety of bus voltages and various types of batteries.

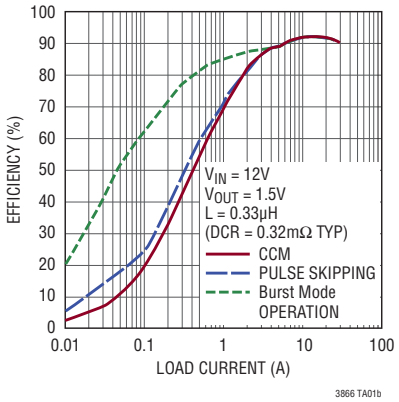
The LTC3866 is offered in a low profile 24-lead 4mm × 4mm QFN and 24-lead exposed pad FE packages.

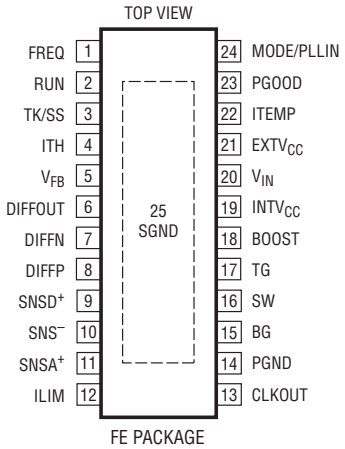


UF PACKAGE
24-LEAD (4mm × 4mm) PLASTIC QFN

LTC3866EUF
LTC3866IUF

Efficiency vs Load Current and Mode

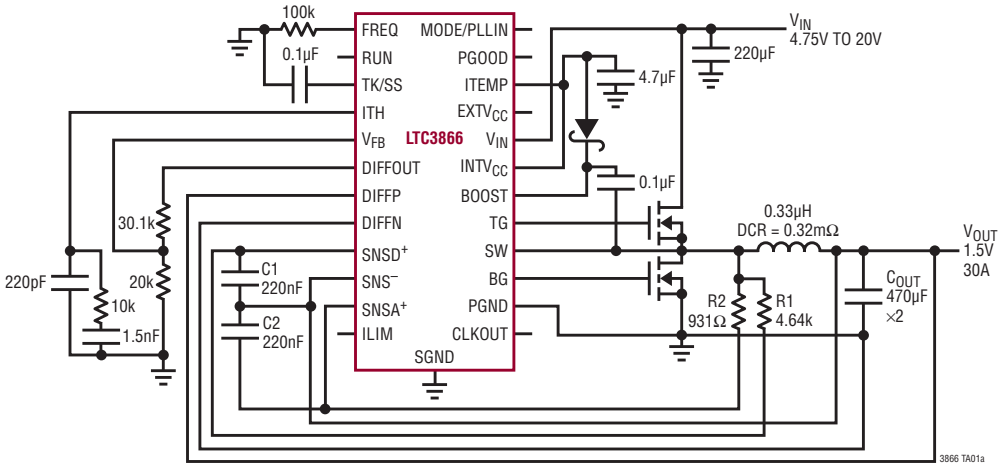




FE PACKAGE
24-LEAD PLASTIC TSSOP

LTC3866EFE
LTC3866IFE

High Efficiency, 1.5V/30A Step-Down Converter with Very Low DCR Sensing



LTC3876

Dual DC/DC Controller for DDR Power with Differential VDDQ Sensing and ±50mA VTT Reference

FEATURES

- **Complete DDR Power Solution with VTT Reference**
- **Wide V_{IN} Range: 4.5V to 38V, VDDQ: 1V to 2.5V**
- **±0.67% VDDQ Output Voltage Accuracy**
- **VDDQ and VTT Termination Controllers**
- **±1.2% ±50mA Linear VTTR Reference Output**
- **Controlled On-Time, Valley Current Mode Control**
- **Frequency Programmable from 200kHz to 2MHz Synchronizable to External Clock**
- **$t_{ON(MIN)}$ = 30ns, $t_{OFF(MIN)}$ = 90ns**
- R_{SENSE} or Inductor DCR Current Sensing
- Power Good Output Voltage Monitor
- Overvoltage Protection and Current Limit Foldback
- Thermally Enhanced 38-Pin (5mm × 7mm) QFN and TSSOP Packages

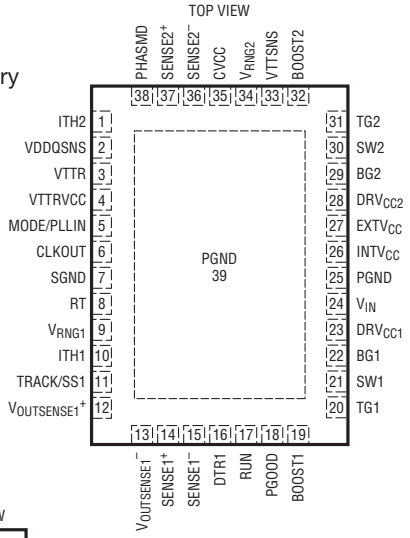
APPLICATIONS

- Motherboard Memory
- Servers

DESCRIPTION

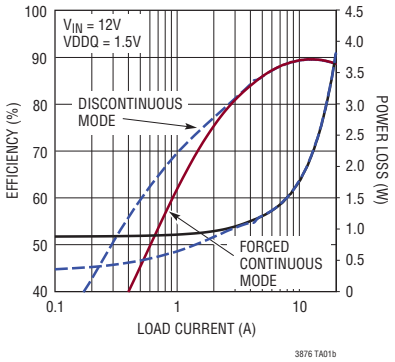
The LTC®3876 is a complete DDR power solution, compatible with DDR1, DDR2, DDR3 and future DDRX lower voltage standards. The LTC3876 includes VDDQ and VTT DC/DC controllers and a precision linear VTT reference. A differential output sense amplifier and precision internal reference combine to offer an accurate VDDQ supply. The VTT controller tracks the precision VTTR linear reference with less than 20mV total DC error. The precision VTTR reference maintains 1.2% regulation accuracy tracking one-half VDDQ over temperature for a ±50mA reference load.

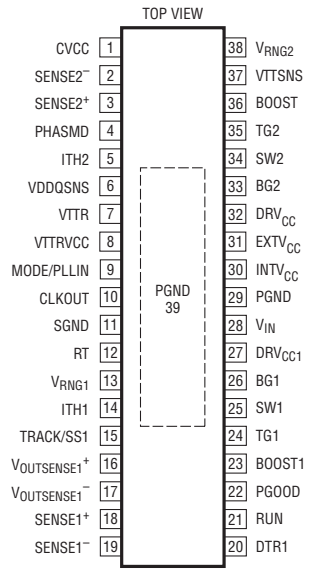
The LTC3876 allows operation from 4.5V to 38V maximum at the input. The VDDQ output can range from 1.0V to 2.5V, with a corresponding VTT and VTTR output range of 0.5V to 1.25V. Voltage tracking soft-start, PGOOD and fault protection features are provided.



UFE PACKAGE
38-LEAD (5mm × 7mm) PLASTIC QFN
LTC3876EUHF
LTC3876IUHF

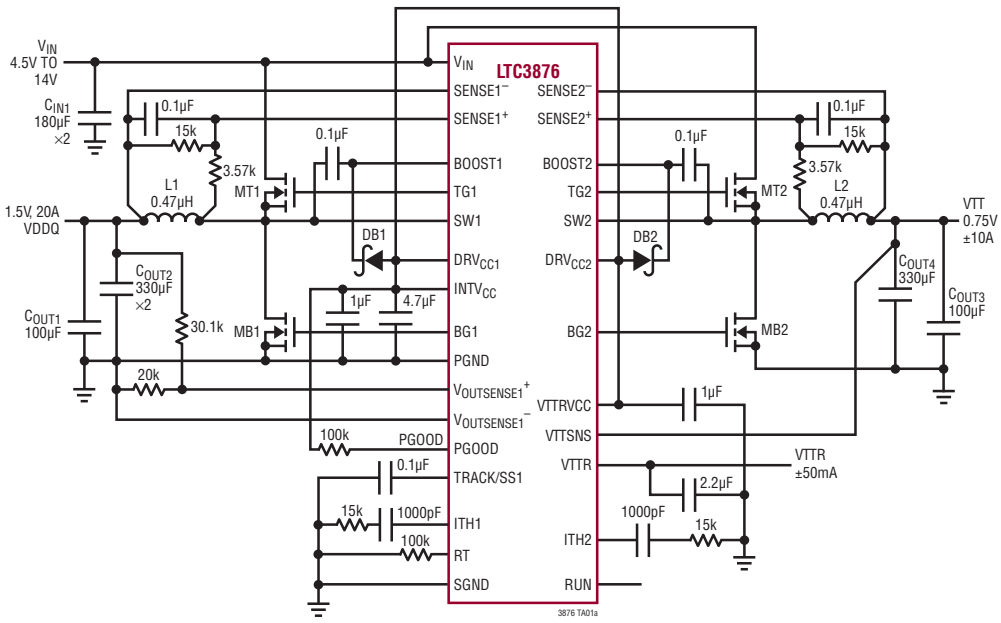
Efficiency/Power Loss VDDR Channel 1



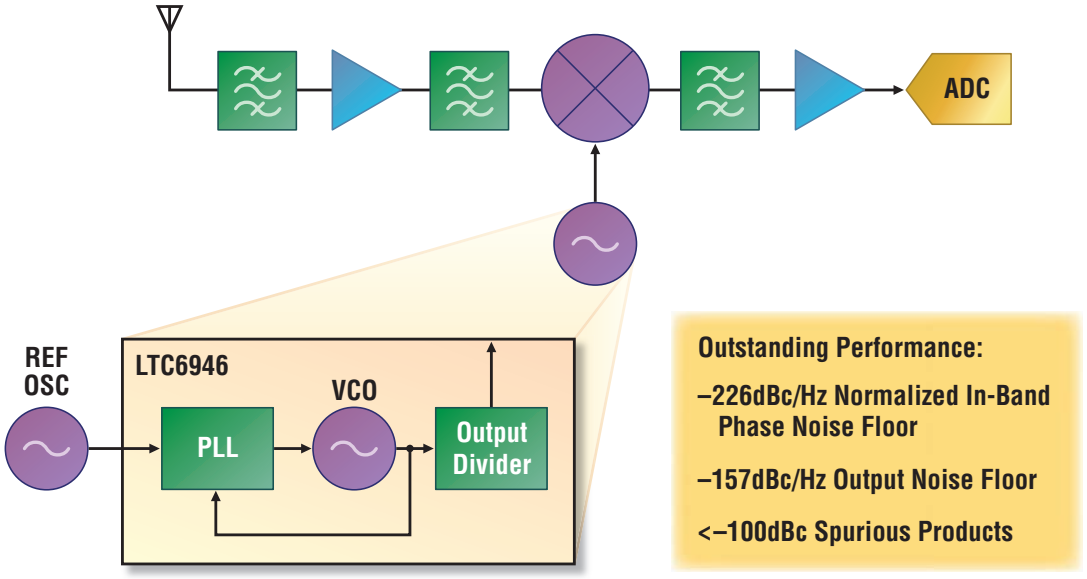


FE PACKAGE
38-LEAD PLASTIC TSSOP
LTC3876EFE
LTC3876IFE

DDR3 1.5V VDDQ/20A 0.75VTT/±10A 4.5V to 14V Input



The New Low in Frequency Synthesis



Outstanding Performance:

–226dBc/Hz Normalized In-Band Phase Noise Floor

–157dBc/Hz Output Noise Floor

<–100dBc Spurious Products

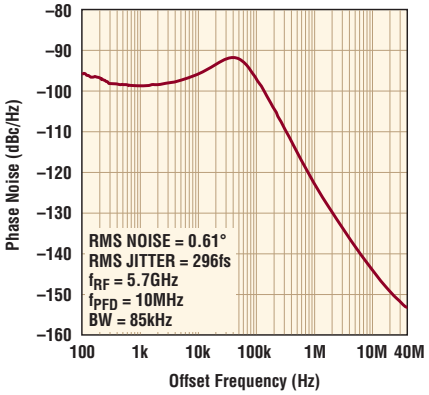
Low Noise and Spurious Levels, 375MHz to 6GHz Frequency Synthesizers

Our new ultralow noise, integer-N frequency synthesizers provide best-in-class phase noise and spurious performance. The LTC®6945 is a low noise, low 1/f corner PLL core for use with an external VCO while the LTC6946 is a complete frequency synthesizer including a low phase noise VCO. The free, easy-to-use PLLWizard™ CAD tool quickly and accurately simulates synthesizer performance to ensure an optimal design. So, creating low noise designs without performance compromises is done without losing sleep.

Features

- Low –226dBc/Hz Normalized In-Band Phase Noise Floor
- Industry's Lowest In-Band 1/f Noise Corner
- Spurious Levels <–100dBc
- High Current 11mA Output Charge Pump Minimizes Loop Compensation Thermal Noise
- Programmable Output Divider for Wide Operating Frequency Range

Closed-Loop Phase Noise



Info & Free Samples

www.linear.com/product/LTC6946

1-800-4-LINEAR

Get the PLLWizard

www.linear.com/PLL

LINEAR TECHNOLOGY

LTC6945

Ultralow Noise and Spurious 0.35GHz to 6GHz Integer-N Synthesizer

FEATURES

- **Low Noise Integer-N PLL**
- **350MHz to 6GHz VCO Input Range**
- **–226dBc/Hz Normalized In-Band Phase Noise Floor**
- **–274dBc/Hz Normalized In-Band 1/f Noise**
- **–157dBc/Hz Wideband Output Phase Noise Floor**
- **Excellent Spurious Performance**
- **Output Divider (1 to 6, 50% Duty Cycle)**
- **Low Noise Reference Buffer**
- **Output Buffer Muting**
- Charge Pump Supply from 3.15V to 5.25V
- Charge Pump Current from 250µA to 11.2mA
- Configurable Status Output
- SPI Compatible Serial Port Control
- PLLWizard™ Software Design Tool Support

APPLICATIONS

- Wireless Base Stations (LTE, WiMAX, W-CDMA, PCS)
- Broadband Wireless Access
- Microwave Data Links
- Military and Secure Radio
- Test and Measurement

DESCRIPTION

The LTC®6945 is a high performance, low noise, 6GHz phase-locked loop (PLL), including a reference divider, phase-frequency detector (PFD) with phase-lock indicator, charge pump, integer feedback divider and VCO output divider.

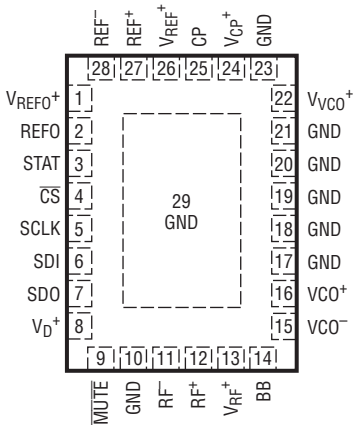
The part features a buffered, programmable VCO output divider with a range of 1 through 6. The differential, low noise output buffer has user-programmable output power ranging from –6dBm to 3dBm, and may be muted through either a digital input pin or software.

The low noise reference buffer outputs a typical 0dBm square wave directly into a 50Ω impedance from 10MHz to 250MHz, or may be disabled through software.

The ultralow noise charge pump contains selectable high and low voltage clamps useful for VCO monitoring, and also may be set to provide a V⁺/2 bias.

All device settings are controlled through a SPI-compatible serial port.

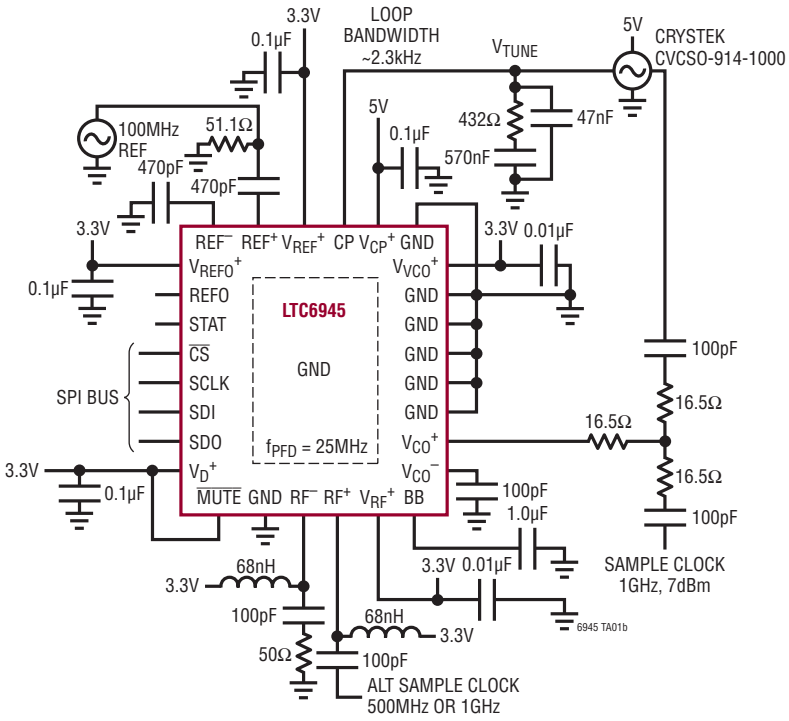
TOP VIEW



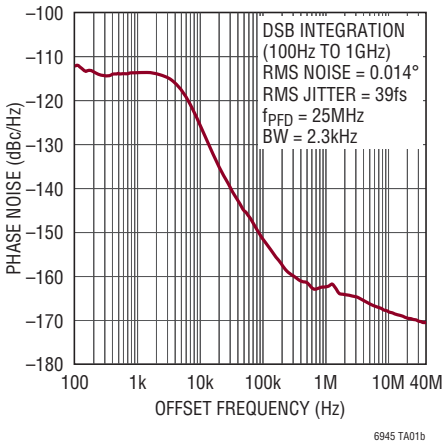
UFD PACKAGE
28-LEAD (4mm × 5mm) PLASTIC QFN

LTC6945IUFD

LTC6945 Data Converter Sample Clock



1GHz Sample Clock Phase Noise



LTC6990

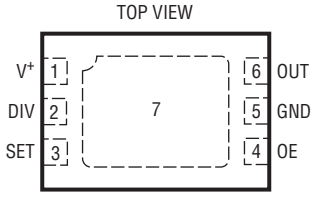
TimerBlox: Voltage Controlled Silicon Oscillator with –55°C to 125°C Operating Range

FEATURES

- **Fixed-Frequency or Voltage-Controlled Operation**
  - **Fixed: Single Resistor Programs Frequency with <1.5% Max Error**
  - **VCO: Two Resistors Set VCO Center Frequency and Tuning Range**
- **Frequency Range: 488Hz to 2MHz**
- 2.25V to 5.5V Single Supply Operation
- 72µA Supply Current at 100kHz
- 500µs Start-Up Time
- VCO Bandwidth >300kHz at 1MHz
- CMOS Logic Output Sources/Sinks 20mA
- 50% Duty Cycle Square Wave Output
- Output Enable (Selectable Low or Hi-Z When Disabled)
- **–55°C to 125°C Operating Temperature Range**
- Available in Low Profile (1mm) SOT-23 (ThinSOT™) and 2mm × 3mm DFN Package

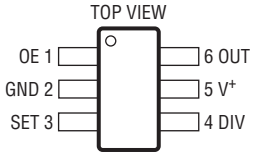
APPLICATIONS

- Low Cost Precision Programmable Oscillator
- Voltage-Controlled Oscillator
- High Vibration, High Acceleration Environments
- Replacement for Fixed Crystal and Ceramic Oscillators
- Portable and Battery-Powered Equipment



DCB PACKAGE
6-LEAD (2mm × 3mm) PLASTIC DFN

LTC6990CDCB
LTC6990IDCB
LTC6990HDCB



S6 PACKAGE
6-LEAD PLASTIC TSOT-23

LTC6990CS6
LTC6990IS6
LTC6990HS6
LTC6990MPS6

DESCRIPTION

The LTC®6990 is a precision silicon oscillator with a programmable frequency range of 488Hz to 2MHz. It can be used as a fixed-frequency or voltage-controlled oscillator (VCO). The LTC6990 is part of the TimerBlox® family of versatile silicon timing devices.

A single resistor, R_{SET}, programs the LTC6990's internal master oscillator frequency. The output frequency is determined by this master oscillator and an internal frequency divider, N_{DIV}, programmable to eight settings from 1 to 128.

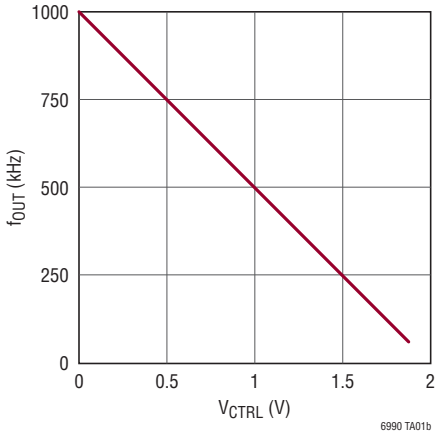
$$f_{OUT} = \frac{1MHz}{N_{DIV}} \bullet \frac{50k\Omega}{R_{SET}}, N_{DIV} = 1, 2, 4 \ldots 128$$

Optionally, a second resistor at the SET input provides linear voltage control of the output frequency and can be used for frequency modulation. A narrow or wide VCO tuning range can be configured by the appropriate selection of the two resistors.

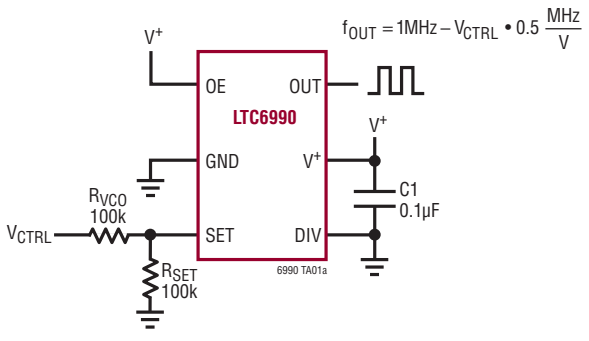
The LTC6990 includes an enable function that is synchronized with the master oscillator to ensure clean, glitch-free output pulses. The disabled output can be canfigured to be high impedance or forced low.

For easy configuration of the LTC6990, download the TimerBlox Designer tool at www.linear.com/timerblox.

VCO Transfer Function



Voltage Controlled Oscillator with 16:1 Frequency Range



LTC6991

TimerBlox: Resettable, Low Frequency Oscillator with –55°C to 125°C Operating Range

FEATURES

- **Period Range: 1ms to 9.5 Hours**
- Configured with 1 to 3 Resistors
- <1.5% Maximum Frequency Error
- Output Reset Function
- 2.25V to 5.5V Single Supply Operation
- 55µA to 80µA Supply Current (2ms to 9.5hr Clock Period)
- 500µs Start-Up Time
- CMOS Output Driver Sources/Sinks 20mA
- **–55°C to 125°C Operating Temperature Range**
- Available in Low Profile (1mm) SOT-23 (ThinSOT™) and 2mm × 3mm DFN Packages

APPLICATIONS

- "Heartbeat" Timers
- Watchdog Timers
- Intervalometers
- Periodic "Wake-Up" Call
- High Vibration, High Acceleration Environments
- Portable and Battery-Powered Equipment

DESCRIPTION

The LTC®6991 is a silicon oscillator with a programmable period range of 1.024ms to 9.54 hours (29.1µHz to 977Hz), specifically intended for long duration timing events. The LTC6991 is part of the TimerBlox® family of versatile silicon timing devices.

A single resistor, R_{SET}, programs the LTC6991's internal master oscillator frequency. The output clock period is determined by this master oscillator and an internal frequency divider, N_{DIV}, programmable to eight settings from 1 to 2^{21}.

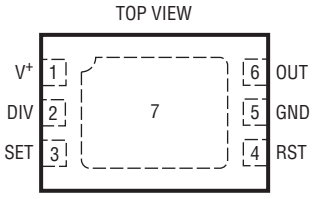
$$t_{OUT} = \frac{N_{DIV} \bullet R_{SET}}{50k\Omega} \bullet 1.024ms,\ N_{DIV} = 1,8,64,...,2^{21}$$

In normal operation, the LTC6991 oscillates with a 50% duty cycle. A reset function is provided to truncate the pulse (reducing the duty cycle). The reset pin can also be used to prevent the output from oscillating.

The RST and OUT pins can be configured for active-low or active-high operation using a polarity function.

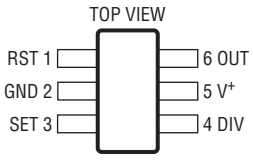
POL BIT	RST PIN	OUTPUT STATE
0	0	Oscillating
0	1	0 (reset)
1	0	1 (reset)
1	1	Oscillating

For easy configuration of the LTC6991, download the TimerBlox Designer tool at www.linear.com/timerblox.



DCB PACKAGE
6-LEAD (2mm × 3mm) PLASTIC DFN

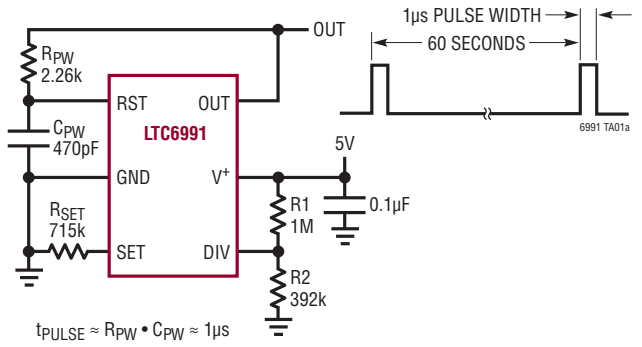
LTC6991CDCB
LTC6991IDCB
LTC6991HDCB



S6 PACKAGE
6-LEAD PLASTIC TSOT-23

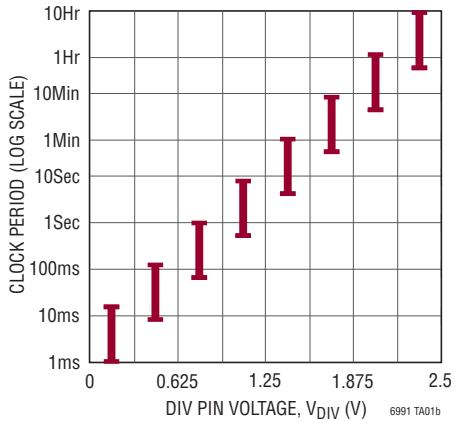
LTC6991CS6
LTC6991IS6
LTC6991HS6
LTC6991MPS6

Low Frequency Pulse Generator



$t_{PULSE} \approx R_{PW} \bullet C_{PW} \approx 1\mu s$

Clock Period Range over Eight Divider Settings



LTC6992-1/LTC6992-2/LTC6992-3/LTC6992-4

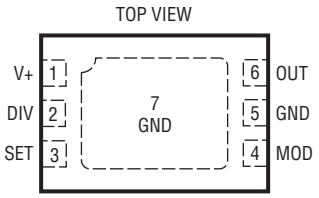
TimerBlox: Voltage-Controlled Pulse Width Modulator (PWM) with –55°C to 125°C Operating Range

FEATURES

- **Pulse Width Modulation (PWM) Controlled by Simple 0V to 1V Analog Input**
- **Four Available Options Define Duty Cycle Limits**
  - **Minimum Duty Cycle at 0% or 5%**
  - **Maximum Duty Cycle at 95% or 100%**
- **Frequency Range: 3.81Hz to 1MHz**
- Configured with 1 to 3 Resistors
- <1.7% Maximum Frequency Error
- PWM Duty Cycle Error <3.7% Maximum
- Frequency Modulation (VCO) Capability
- 2.25V to 5.5V Single Supply Operation
- 115µA Supply Current at 100kHz
- 500µs Start-Up Time
- CMOS Output Driver Sources/Sinks 20mA
- **–55°C to 125°C Operating Temperature Range**
- Available in Low Profile (1mm) SOT-23 (ThinSOT™) and 2mm × 3mm DFN

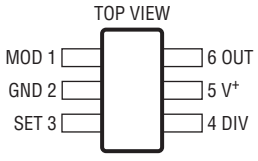
APPLICATIONS

- PWM Servo Loops
- Heater Control
- LED Dimming Control
- High Vibration, High Acceleration Environments
- Portable and Battery-Powered Equipment



DCB PACKAGE
6-LEAD (2mm × 3mm) PLASTIC DFN

LTC6992CDCB-1	**LTC6992IDCB-2**	**LTC6992HDCB-3**
LTC6992IDCB-1	**LTC6992HDCB-2**	**LTC6992CDCB-4**
LTC6992HDCB-1	**LTC6992CDCB-3**	**LTC6992IDCB-4**
LTC6992CDCB-2	**LTC6992IDCB-3**	**LTC6992HDCB-4**



S6 PACKAGE
6-LEAD PLASTIC TSOT-23

LTC6992CS6-1	**LTC6992HS6-2**	**LTC6992IS6-4**
LTC6992IS6-1	**LTC6992CS6-3**	**LTC6992HS6-4**
LTC6992HS6-1	**LTC6992IS6-3**	**LTC6992MPS6-1**
LTC6992CS6-2	**LTC6992HS6-3**	**LTC6992MPS6-2**
LTC6992IS6-2	**LTC6992CS6-4**	**LTC6992MPS6-3**
		LTC6992MPS6-4

DESCRIPTION

The LTC®6992 is a silicon oscillator with an easy-to-use analog voltage-controlled pulse width modulation (PWM) capability. The LTC6992 is part of the TimerBlox® family of versatile silicon timing devices.

A single resistor, R_{SET}, programs the LTC6992's internal master oscillator frequency. The output frequency is determined by this master oscillator and an internal frequency divider, N_{DIV}, programmable to eight settings from 1 to 16384.

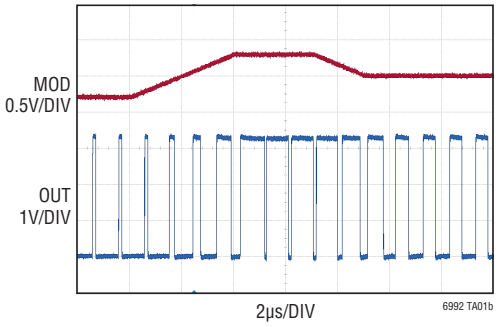
$$f_{OUT} = \frac{1MHz}{N_{DIV}} \bullet \frac{50k\Omega}{R_{SET}}, N_{DIV} = 1,4,16 \ldots 16384$$

Applying a voltage between 0V and 1V on the MOD pin sets the duty cycle.

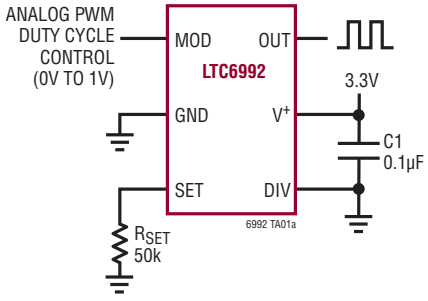
The four versions differ in their minimum/maximum duty cycle. Note that a minimum duty cycle limit of 0% or maximum duty cycle limit of 100% allows oscillations to stop at the extreme duty cycle settings.

DEVICE NAME	PWM DUTY CYCLE RANGE
LTC6992-1	0% to 100%
LTC6992-2	5% to 95%
LTC6992-3	0% to 95%
LTC6992-4	5% to 100%

For easy configuration of the LTC6992, download the TimerBlox Designer tool at www.linear.com/timerblox.



1MHz Pulse Width Modulator



LTC6993-1/LTC6993-2/LTC6993-3/LTC6993-4

TimerBlox: Monostable Pulse Generator (One Shot) with –55°C to 125°C Operating Range

FEATURES

- **Pulse Width Range: 1µs to 33.6 Seconds**
- Configured with 1 to 3 Resistors
- Pulse Width Max Error:
  - <2.3% for Pulse Width > 512µs
  - <3.4% for Pulse Width of 8µs to 512µs
  - <4.9% for Pulse Width of 1µs to 8µs
- Four LTC6993 Options Available:
  - Rising-Edge or Falling-Edge Trigger
  - Retriggerable or Non-Retriggerable
- Configurable for Positive or Negative Output Pulse
- Fast Recovery Time
- 2.25V to 5.5V Single Supply Operation
- 70µA Supply Current at 10µs Pulse Width
- 500µs Start-Up Time
- CMOS Output Driver Sources/Sinks 20mA
- **–55°C to 125°C Operating Temperature Range**
- Available in Low Profile (1mm) SOT-23 (ThinSOT™) and 2mm × 3mm DFN

APPLICATIONS

- Watchdog Timer
- Frequency Discriminators
- Missing Pulse Detection
- Envelope Detection
- High Vibration, High Acceleration Environments
- Portable and Battery-Powered Equipment

DESCRIPTION

The LTC®6993 is a monostable multivibrator (also known as a "one-shot" pulse generator) with a programmable pulse width of 1µs to 33.6 seconds. The LTC6993 is part of the TimerBlox® family of versatile silicon timing devices.

A single resistor, R_{SET}, programs an internal master oscillator frequency, setting the LTC6993's time base. The output pulse width is determined by this master oscillator and an internal clock divider, N_{DIV}, programmable to eight settings from 1 to 2^{21}.

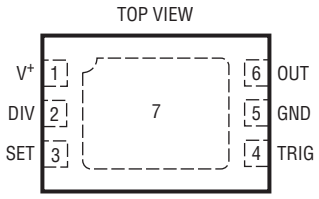
$$t_{OUT} = \frac{N_{DIV} \bullet R_{SET}}{50k\Omega} \bullet 1\mu s,\ N_{DIV} = 1, 8, 64, ..., 2^{21}$$

The output pulse is initiated by a transition on the trigger input (TRIG). Each part can be configured to generate positive or negative output pulses. The LTC6993 is available in four versions to provide different trigger signal polarity and retrigger capability.

DEVICE	INPUT POLARITY	RETRIGGER
LTC6993-1	Rising-Edge	No
LTC6993-2	Rising-Edge	Yes
LTC6993-3	Falling-Edge	No
LTC6993-4	Falling-Edge	Yes

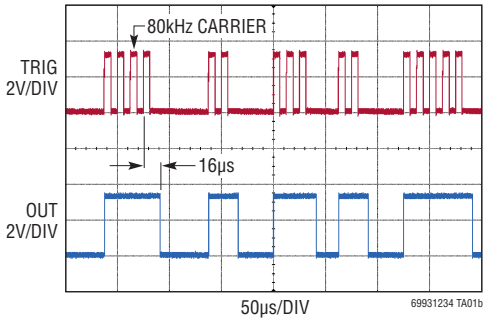
The LTC6993 also offers the ability to dynamically adjust the width of the output pulse via a separate control voltage.

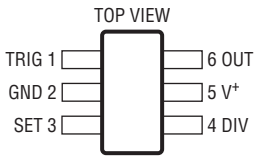
For easy configuration of the LTC6993, download the TimerBlox Designer tool at www.linear.com/timerblox.



DCB PACKAGE
6-LEAD (2mm × 3mm) PLASTIC DFN

LTC6993CDCB-1 LTC6993IDCB-2 LTC6993HDCB-3
LTC6993IDCB-1 LTC6993HDCB-2 LTC6993CDCB-4
LTC6993HDCB-1 LTC6993CDCB-3 LTC6993IDCB-4
LTC6993CDCB-2 LTC6993IDCB-3 LTC6993HDCB-4

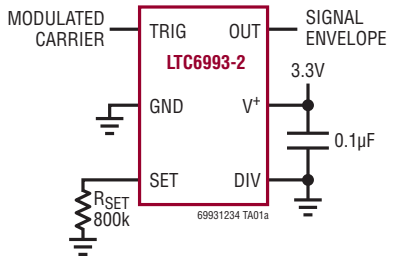




S6 PACKAGE
6-LEAD PLASTIC TSOT-23

LTC6993CS6-1 LTC6993HS6-2 LTC6993IS6-4
LTC6993IS6-1 LTC6993CS6-3 LTC6993HS6-4
LTC6993HS6-1 LTC6993IS6-3 LTC6993MPS6-1
LTC6993CS6-2 LTC6993HS6-3 LTC6993MPS6-2
LTC6993IS6-2 LTC6993CS6-4 LTC6993MPS6-3
LTC6993MPS6-4

Envelope Detector



LTC6994-1/LTC6994-2

TimerBlox: Delay Block/Debouncer with –55°C to 125°C Operating Range

FEATURES

- **Delay Range: 1µs to 33.6 Seconds**
- Configured with 1 to 3 Resistors
- Delay Max Error:
  - <2.3% for Delay > 512µs
  - <3.4% for Delay of 8µs to 512µs
  - <5.1% for Delay of 1µs to 8µs
- Delay One or Both Rising/Falling Edges
- 2.25V to 5.5V Single Supply Operation
- 70µA Supply Current at 10µs Delay
- 500µs Start-Up Time
- CMOS Output Driver Sources/Sinks 20mA
- **–55°C to 125°C Operating Temperature Range**
- Available in Low Profile (1mm) SOT-23 (ThinSOT™) and 2mm × 3mm DFN

APPLICATIONS

- Noise Discriminators/Pulse Qualifiers
- Delay Matching
- Switch Debouncing
- High Vibration, High Acceleration Environments
- Portable and Battery-Powered Equipment

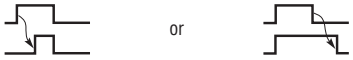
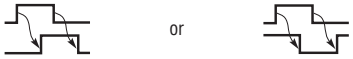
DESCRIPTION

The LTC®6994 is a programmable delay block with a range of 1µs to 33.6 seconds. The LTC6994 is part of the TimerBlox® family of versatile silicon timing devices.

A single resistor, R_{SET}, programs an internal master oscillator frequency, setting the LTC6994's time base. The input-to-output delay is determined by this master oscillator and an internal clock divider, N_{DIV}, programmable to eight settings from 1 to 2^{21}:

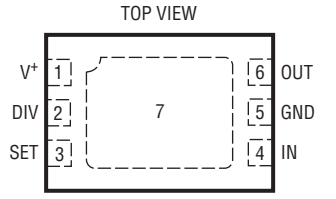
$$t_{DELAY} = \frac{N_{DIV} \bullet R_{SET}}{50k\Omega} \bullet 1\mu s,\ N_{DIV} = 1, 8, 64, ..., 2^{21}$$

The output (OUT) follows the input (IN) after delaying the rising and/or falling transitions. The LTC6994-1 will delay the rising or falling edge. The LTC6994-2 will delay both transitions, and adds the option to invert the output.

DEVICE	DELAY FUNCTION
LTC6994-1	
LTC6994-2	

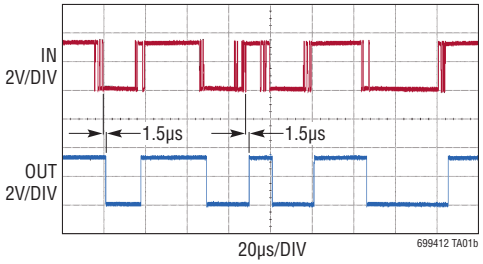
The LTC6994 also offers the ability to dynamically adjust the delay time via a separate control voltage.

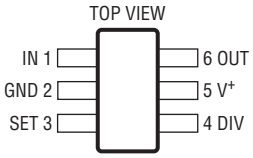
For easy configuration of the LTC6994, download the TimerBlox Designer tool at www.linear.com/timerblox.



DCB PACKAGE
6-LEAD PLASTIC (3mm × 2mm) PLASTIC DFN

LTC6994CDCB-1 **LTC6994CDCB-2**
LTC6994IDCB-1 **LTC6994IDCB-2**
LTC6994HDCB-1 **LTC6994HDCB-2**

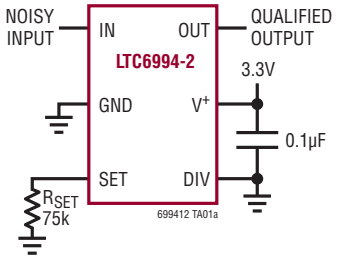




TS8 PACKAGE
8-LEAD PLASTIC TSOT-23

LTC6994CS6-1 **LTC6994CS6-2**
LTC6994IS6-1 **LTC6994IS6-2**
LTC6994HS6-1 **LTC6994HS6-2**
LTC6994MPS6-1 **LTC6994MPS6-2**

Noise Discriminator



Sales Offices

NORTH AMERICA

NORTHERN CALIFORNIA / NEVADA

Bay Area
720 Sycamore Dr.
Milpitas, CA 95035
Tel: (408) 428-2050
Fax: (408) 432-6331

Sacramento / Nevada
2260 Douglas Blvd., Ste. 280
Roseville, CA 95661
Tel: (916) 787-5210
Fax: (916) 787-0110

PACIFIC NORTHWEST

Denver
7007 Winchester Cir., Ste. 130
Boulder, CO 80301
Tel: (303) 926-0002
Fax: (303) 530-1477

Portland
5005 SW Meadows Rd., Ste. 410
Lake Oswego, OR 97035
Tel: (503) 520-9930
Fax: (503) 520-9929

Salt Lake City
Tel: (801) 731-8008

Seattle
2018 156th Ave. NE, Ste. 100
Bellevue, WA 98007
Tel: (425) 748-5010
Fax: (425) 748-5009

SOUTHWEST AREA

Los Angeles
21243 Ventura Blvd., Ste. 238
Woodland Hills, CA 91364
Tel: (818) 703-0835
Fax: (818) 703-0517

Orange County
7595 Irvine Center Dr., Ste. 120
Irvine, CA 92618
Tel: (949) 453-4650
Fax: (949) 453-4765

Phoenix
2085 E. Technology Cir., Ste. 101
Tempe, AZ 85284
Tel: (480) 777-1600
Fax: (480) 838-1104

San Diego
5090 Shoreham Place, Ste. 110
San Diego, CA 92122
Tel: (858) 638-7131
Fax: (858) 638-7231

CENTRAL AREA

Chicago
2040 E. Algonquin Rd., Ste. 512
Schaumburg, IL 60173
Tel: (847) 925-0860
Fax: (847) 925-0878

Cleveland
7550 Lucerne Dr., Ste. 106
Middleburg Heights, OH 44130
Tel: (440) 239-0817
Fax: (440) 239-1466

Columbus
Tel: (614) 488-4466

Detroit
39111 West Six Mile Road
Livonia, MI 48152
Tel: (734) 779-1657
Fax: (734) 779-1658

Indiana
Tel: (847) 925-0860

Iowa
Tel: (847) 925-0860

Kansas
Tel: (913) 829-8844

Minneapolis
7805 Telegraph Rd., Ste. 225
Bloomington, MN 55438
Tel: (952) 903-0605

Wisconsin
Tel: (262) 697-5001

NORTHEAST AREA

Boston
15 Research Place
North Chelmsford, MA 01863
Tel: (978) 656-4750
Fax: (978) 656-4760

Connecticut
Tel: (860) 228-4104

Philadelphia
3220 Tillman Dr., Ste. 120
Bensalem, PA 19020
Tel: (215) 638-9667
Fax: (215) 638-9764

SOUTHEAST AREA

Atlanta
Tel: (770) 888-8137

Austin
8500 N. Mopac, Ste. 603
Austin, TX 78759
Tel: (512) 795-8000
Fax: (512) 795-0491

Dallas
2301 W. Plano Pkwy., Ste. 109
Plano, TX 75075
Tel: (972) 733-3071
Fax: (972) 380-5138

Fort Lauderdale
Tel: (954) 473-1212

Houston
1080 W. Sam Houston Pkwy.,
Ste. 225
Houston, TX 77043
Tel: (713) 463-5001
Fax: (713) 463-5009

Huntsville
Tel: (256) 881-9850

Orlando
Tel: (407) 688-7616

Raleigh
15100 Weston Pkwy., Ste. 202
Cary, NC 27513
Tel: (919) 677-0066
Fax: (919) 678-0041

Tampa
Tel: (813) 634-9434

CANADA

Calgary, AB
Tel: (403) 455-3577

Montreal, QC
Tel: (450) 689-2660

Ottawa, ON
Tel: (440) 239-0817

Toronto, ON
Tel: (440) 239-0817

Vancouver, BC
Tel: (604) 729-1204

ASIA

AUSTRALIA / NEW ZEALAND

Linear Technology Corporation
133 Alexander Street
Crows Nest NSW 2065
Australia
Tel: +61 (0)2 9432 7803
Fax: +61 (0)2 9439 2738

CHINA

Linear Technology Corp. Ltd.
Unit 1503-04, Metroplaza Tower 2
223 Hing Fong Road
Kwai Fong, N.T., Hong Kong
Tel: +852 2428-0303
Fax: +852 2348-0885

Linear Technology Corp. Ltd.
Room 2701, City Gateway
No. 398 Cao Xi North Road
Shanghai, China 200030
Tel: +86 (21) 6375-9478
Fax: +86 (21) 5465-5918

Linear Technology Corp. Ltd.
Room 816, 8/F
China Electronics Plaza B
No. 3 Dan Ling Rd., Hai Dian District
Beijing, China 100080
Tel: +86 (10) 6801-1080
Fax: +86 (10) 6805-4030

Linear Technology Corp. Ltd.
Room 2604, 26/F
Excellence Times Square Building
4068 YiTian Road, Futian District
Shenzhen, China 518048
Tel: +86 755-2360-4866
Fax: +86 755-2360-4966

Linear Technology Corp. Ltd.
Room 1805, Tower A
Optics Valley International Plaza
No. 889 Luoyu Rd., Wuchang District
Wuhan, China 430074
Tel: +86 027-8665 9231
Fax: +86 027-8665 9241

Linear Technology Corp. Ltd.
Unit 08, 11/F
Jinjiang International Office Building
No. 1 Linjiang West Rd., Chengdu City
Sichuan Province, China 610041
Tel: +86 028-8555 9725
Fax: +86 028-8542 6859

Linear Technology Corp. Ltd.
Room 10905, Tower B, City Gateway
No. 1 Jinye Road
High-Tech Develop Industry Zone
Xian, Shaanxi Province, China 710065
Tel: +86 029-6851 8978 / 6851 8979
Fax: +86 029-6851 8976

INDIA

Linear Technology Semiconductor India Pvt. Ltd.
602, 6th Floor, Prestige Meridian-1
No. 29, MG Road, Bangalore 560001
India
Tel: +91 80 4012-4610
Fax: +91 80 4012-4612

JAPAN

Linear Technology KK
8F Shuwa Kioicho Park Bldg.
3-6 Kioicho Chiyoda-ku
Tokyo, 102-0094, Japan
Tel: +81 (3) 5226-7291
Fax: +81 (3) 5226-0268

Linear Technology KK
6F Kearny Place Honmachi Bldg.
1-6-13 Awaza, Nishi-ku
Osaka-shi, 550-0011, Japan
Tel: +81 (6) 6533-5880
Fax: +81 (6) 6543-2588

Linear Technology KK
7F, Sakuradori Ohtsu KT Bldg.
3-20-22 Marunouchi, Naka-ku
Nagoya-shi, 460-0002, Japan
Tel: +81 (52) 955-0056
Fax: +81 (52) 955-0058

KOREA

Linear Technology Korea Co., Ltd.
Yundang Building, #1002
Samsung-Dong 144-23
Kangnam-Ku, Seoul 135-090,
Korea
Tel: +82 (2) 792-1617
Fax: +82 (2) 792-1619

SINGAPORE

Linear Technology Pte. Ltd.
507 Yishun Industrial Park A
Singapore 768734
Tel: +65 6753-2692
Fax: +65 6752-0108

TAIWAN

Linear Technology Corporation
8F-1, 77, Nanking E. Rd., Sec. 3
Taipei, Taiwan
Tel: +886 (2) 2505-2622
Fax: +886 (2) 2516-0702

EUROPE

FINLAND

Linear Technology AB
Teknobulevardi 3-5
P.O. Box 35
FIN-01531 Vantaa
Finland
Tel: +358 (0)46 712 2171
Fax: +358 (0)46 712 2175

FRANCE

Linear Technology S.A.R.L.
Parc Tertiaire Silic
2 Rue de la Couture, BP10217
94518 Rungis Cedex
France
Tel: +33 (1) 56 70 19 90
Fax: +33 (1) 56 70 19 94

GERMANY

Linear Technology GmbH
Osterfeldstrasse 84, Haus C
D-85737 Ismaning
Germany
Tel: +49 (89) 962455-0
Fax: +49 (89) 963147

Linear Technology GmbH
Haselburger Damm 4
D-59387 Ascheberg
Germany
Tel: +49 (2593) 9516-0
Fax: +49 (2593) 951679

Linear Technology GmbH
Jesinger Strasse 65
D-73230 Kirchheim/Teck
Germany
Tel: +49 (0)7021 80770
Fax: +49 (0)7021 807720

ITALY

Linear Technology Italy Srl
Orione 3, C.D. Colleoni
Via Colleoni, 17
I-20041 Agrate Brianza (MI)
Italy
Tel: +39 039 596 5080
Fax: +39 039 596 5090

SWEDEN

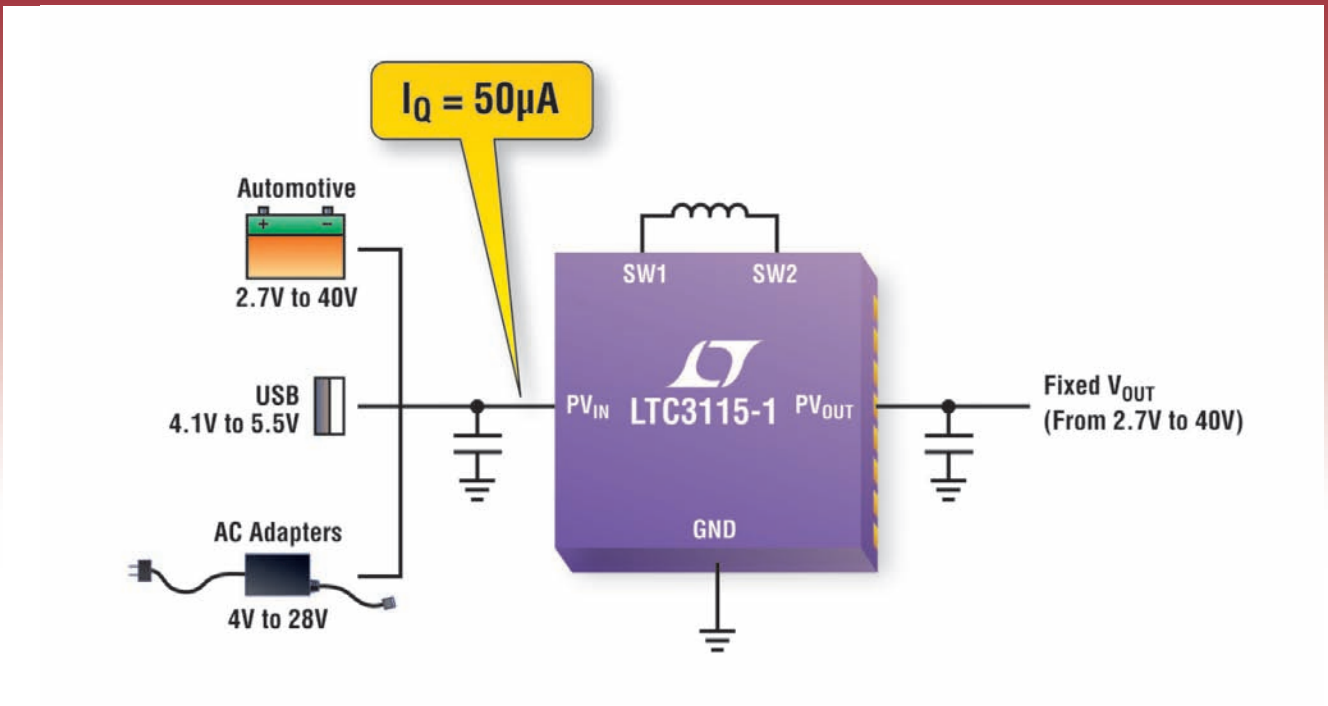
Linear Technology AB
Electrum 204
Isafjordsgatan 22
SE-164 40 Kista
Sweden
Tel: +46 (8) 623 16 00
Fax: +46 (8) 623 16 50

UNITED KINGDOM

Linear Technology (UK) Ltd.
3 The Listons, Liston Road
Marlow, Buckinghamshire
SL7 1FD
United Kingdom
Tel: +44 (1628) 477066
Fax: +44 (1628) 478153

Linear Technology Corporation
1630 McCarthy Blvd., Milpitas, CA 95035-7417
1-800-4-LINEAR • 408-432-1900 • 408-434-0507 (Fax)
www.linear.com

2.7V to 40V, 2A, Sync Buck-Boost



Simple Solutions to Your Power Conversion Challenges

The LTC®3115-1 is just one of our growing family of buck-boost converters, greatly simplifying designs where a fixed output voltage is required even when the input can be above, below or equal to it. Applications with multiple input sources typically face this challenge, necessitating a wide input range for this type of converter. The LTC3115-1's 2.7V to 40V input range easily manages these voltage levels and its 50µA quiescent current at no load is ideal for "always-on" systems. The LTC3115-1 provides true output disconnect between the load and the input source in shutdown, and its low transition noise minimizes interference with audio or RF circuitry.

Selected Buck-Boost Converters

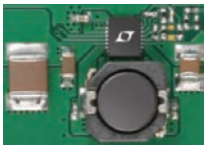
Part Number	V_{IN} Range (V)	V_{OUT} Range (V)	I_{OUT} (Buck Mode)	Comments
LTC3536	1.8 to 5.5	1.8 to 5.5	1A	Up to 2MHz switching & I_Q = 28µA
LTC3113	1.8 to 5.5	1.8 to 5.5	3A	New low noise architecture
LTC3112	2.7 to 15	2.5 to 14	2.5A	Up to 1.5MHz switching & I_Q = 50µA
LTC3115-1	2.7 to 40	2.7 to 40	2A	Up to 2MHz switching & I_Q = 50µA
LTC3785	2.7 to 10	2.7 to 10	10A*	True output disconnect during shutdown
LTC3789	4 to 38	0.8 to 36	20A*	5.5V LDO & PowerGood monitor
LTM®4605	4.5 to 20	0.8 to 16	10A	DC/DC µModule® regulator with external inductor
LTM4607	4.5 to 36	0.8 to 24		
LTM4609	4.5 to 36	0.8 to 34		

*Depends on external MOSFETs.

Info & Free Samples

www.linear.com/products/buckboostfamily

1-800-4-LINEAR



LINEAR TECHNOLOGY