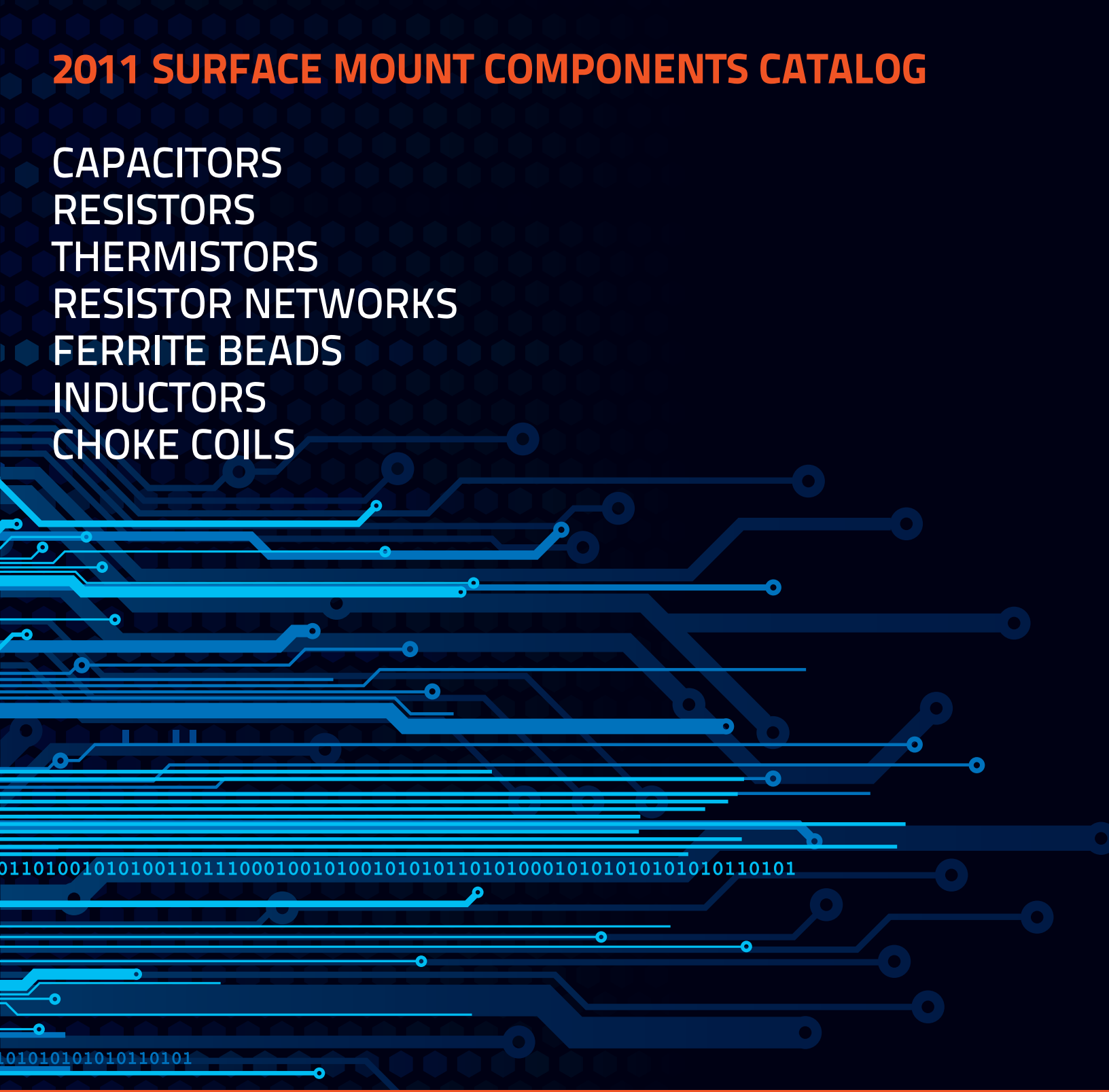
2011 SURFACE MOUNT COMPONENTS CATALOG

CAPACITORS
RESISTORS
THERMISTORS
RESISTOR NETWORKS
FERRITE BEADS
INDUCTORS
CHOKE COILS



Same Day Shipping ▪ Engineering Kits ▪ Value-Added Services ▪ Complete Line of SMT Components

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25th

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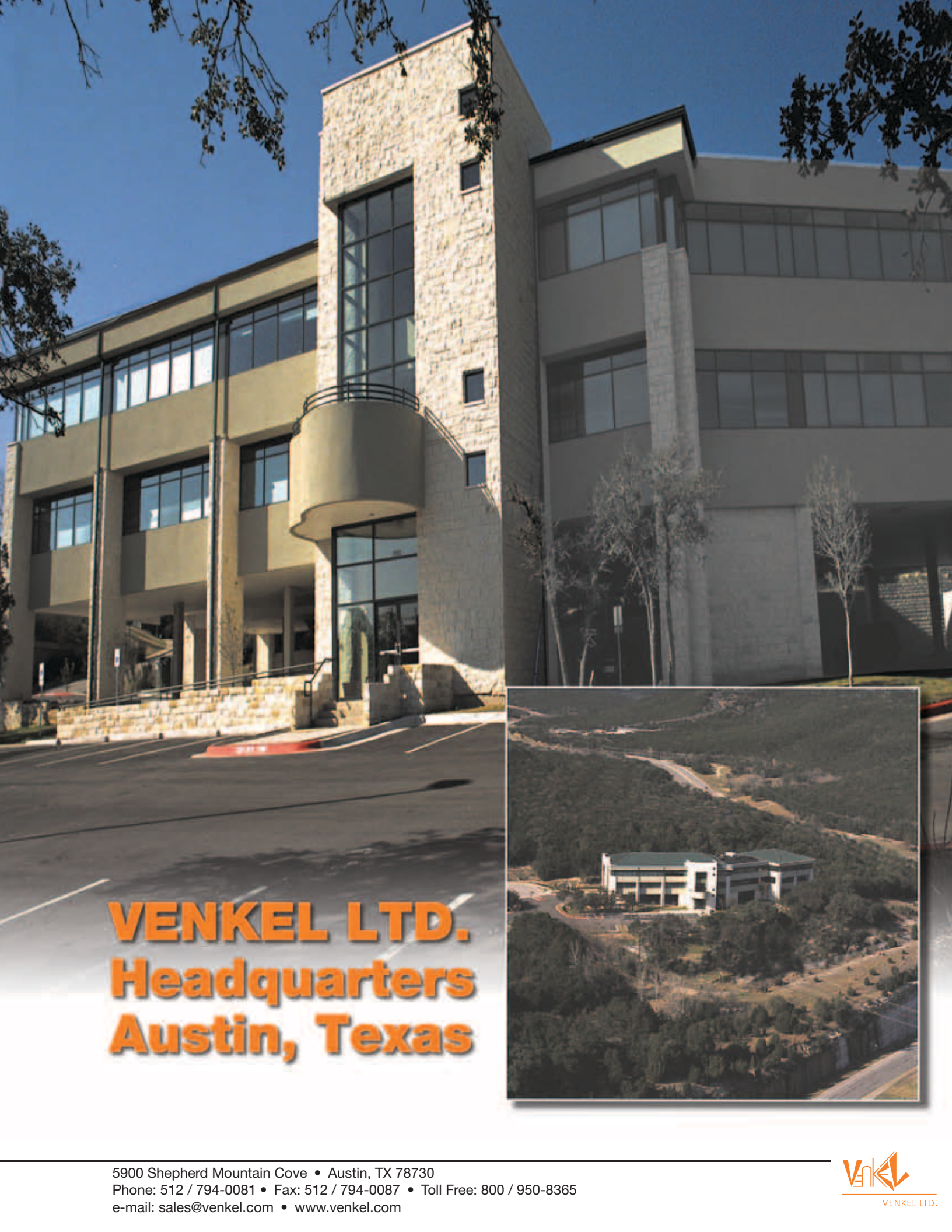

VENKEL LTD.
Headquarters
Austin, Texas

5900 Shepherd Mountain Cove • Austin, TX 78730
Phone: 512 / 794-0081 • Fax: 512 / 794-0087 • Toll Free: 800 / 950-8365
e-mail: sales@venkel.com • www.venkel.com

VENKEL LTD.

2011 marks the 25th year that Venkel has supplied OEMs, Contract Manufacturers, Distributors and Engineering Firms with Surface Mount Passive Components.

In that time we've progressed from a product-only supplier with a product line consisting primarily of Capacitors and Resistors to a full line-up that also includes Inductors, Ferrite Beads, Thermistors and Choke Coils. This enabled us to effectively serve a broader base of customers operating in a wide range of markets. We also established ourselves as a stronger partner to our customers by offering an array of Value Added Services designed to help them more effectively manage the Supply Chain. We've seen the booming nineties, high times for our industry, as well as the challenging times that marked the first few years of the new century.

The reason we're still around after 25 years?
Our **loyal customers** and **dedicated employees**.

Predictable answer yes, true nonetheless. Our perseverence and success has been made possible by these two groups who have placed their trust in Venkel. To you, we say THANK YOU! With your help, we look forward to another 25.

Please join us in celebrating this milestone and in recognizing those who brought us here.

With appreciation,

Anil R. Venkatrao
President

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e-mail: sales@venkel.com • www.venkel.com

VENKEL LTD.

RoHS Certificate of Compliance

Resistive Products

Venkel Ltd. hereby declares and certifies that all resistive components manufactured are RoHS 5/6 compliant with RoHS Recast (RoHS2) according to the definitions and restrictions given by the Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE).

Restricted substances referred to in Article 4(1) and maximum concentration values tolerated by weight in homogenous materials:

1. **Lead (Pb) 0.1%****
2. **Mercury (Hg) 0.1%**
3. **Cadmium (Cd) 0.01%**
4. **Hexavalent Chromium (Cr^{6+}) 0.1%**
5. **Polybrominated Biphenyls (PBB) 0.1%**
6. **Polybrominated Diphenyl Ethers (PBDE) 0.1%**

These include all product categories as follows:

PHCR (Precision High Value)
CRN (Chip Resistor Arrays)
TRCR (Trimmable)
CR (Chip Resistors)
LCR (Low Value Chip Resistors)
ULCR (Ultra Low Value Chip Resistors)
TFCR (Rectangular Thin Film)
UPTF (Ultra Precision Thin Film)
HMCR (High Value)
NTC (Chip Thermistors)
THR (Resistor Networks)

All the products listed above are made in accordance to the Article 4(1) which states that:

“Member States shall ensure that EEE placed on the market including cables and spare parts for its repair, its reuse, updating of its functionalities or upgrading of its capacity, does not contain the substances listed in Annex II.”

**Our components listed above do not contain any of the substances listed in Annex II for the exception of lead which is allowed by exemption 7(c)-I which states:

Electrical and electronic components containing lead in a glass or ceramic other than dielectric ceramic in capacitors, e.g. piezolectronic devices, or in a glass or ceramic matrix compound

Prepared by:

Nelson Johnson

Nelson Johnson
VENKEL LTD.

Venkel RoHS doc. 031005-3
Effective date of this document: 07/21/2011

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Phone: 512 / 794-0081 • Fax: 512 / 794-0087 • Toll Free: 800 / 950-8365
e-mail: sales@venkel.com • www.venkel.com

VENKEL LTD.

RoHS Certificate of Compliance

Non-Resistive Products

Venkel Ltd. hereby declares and certifies that all non-resistive components manufactured are RoHS 6/6 compliant with RoHS Recast (RoHS2) according to the definitions and restrictions given by the Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE).

Restricted substances referred to in Article 4(1) and maximum concentration values tolerated by weight in homogenous materials:

1. **Lead (Pb) 0.1%**
2. **Mercury (Hg) 0.1%**
3. **Cadmium (Cd) 0.01%**
4. **Hexavalent Chromium (Cr^{6+}) 0.1%**
5. **Polybrominated Biphenyls (PBB) 0.1%**
6. **Polybrominated Diphenyl Ethers (PBDE) 0.1%**

These include all product categories as follows:

C (Ceramic Chip Capacitors)
HVC (High Voltage Ceramic)
LIC (Low Inductance Capacitors)
HQN (High-Q NP0)
TCM (Tantalum - Standard)
TCR (Tantalum - Low ESR)
MLF (Multilayer Chip Inductors)
LMCI (Low Value Multilayer Chip Inductors)
NL (Wire Wound Chip Inductors)
MRFI (Miniature RF Chip Inductors)
CMCC (Common Mode Choke Coils)
FBS (Ferrite Beads Single-Layer)
FBM (Ferrite Beads Multi-Layer)
FBC (Ferrite Bead High Current)

All the products listed above are made in accordance to the Article 4(1) which states that:

“Member States shall ensure that EEE placed on the market including cables and spare parts for its repair, its reuse, updating of its functionalities or upgrading of its capacity, does not contain the substances listed in Annex II.”

Our components listed above do not contain any of the substances listed in Annex II.

Prepared by:

Nelson Johnson
VENKEL LTD.

Venkel RoHS doc. 031005-3
Effective date of this document: 07/21/2011

SMT Components

CAPACITORS
RESISTORS
THERMISTORS
INDUCTORS
CHOKE COILS
FERRITE BEADS

Venkel offers the customer the ability to go DIRECT without losing the flexibility of distribution.

VENKEL SERVICE SOLUTIONS

- **Broken Reels** (Small quantities)
- **Engineering Kits**
- **Extensive Inventory**
- **Kitting**
- **Liberal Sampling Policy**
- **Bar-coding**
- **Bonded Inventory**
- **EDI**
- **Consigned Inventory/Auto Replenishment System**

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Contents

All components in this catalog are RoHS compliant per the EU directives and definitions.

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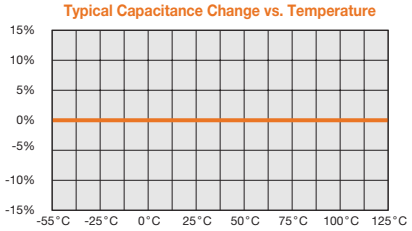
Ceramic Chip Capacitors

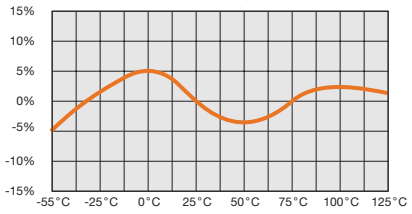
Multilayer chip capacitors have a low residual inductance, an excellent frequency response and minimal stray capacitance since there are no leads. These characteristics enable design to be very close to the theoretical values of the capacitors.

NP0/C0G: SPECIFICATIONS:



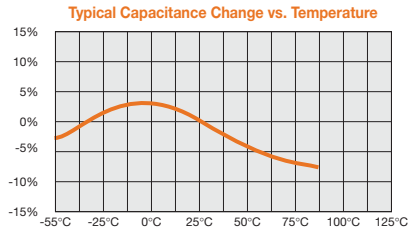
OPERATING TEMPERATURE RANGE:	-55°C to +125°C
TEMPERATURE COEFFICIENT:	0 ±30PPM/°C
TEMPERATURE VOLTAGE COEFFICIENT:	0 ±30PPM/°C
DISSIPATION FACTOR:	0.1% MAX.
INSULATION RESISTANCE:	>1000 ohms F or 100 G ohms, whichever is less at 25°C, VDCW. (The IR at 125°C is 10% of the value at 25°C)
AGEING:	None
WITHSTANDING VOLTAGE:	>2.5 times VDCW
TEST PARAMETERS:	1MHz ± 100KHz at 1.0 ± 0.2 Vrms ≤ 100 pF, 25°C 1KHz ± 100Hz at 1.0 ± 0.2 Vrms > 100 pF, 25°C
CAPACITANCE TOLERANCE:	B,C,D,F,G,J,K

X7R: SPECIFICATIONS:



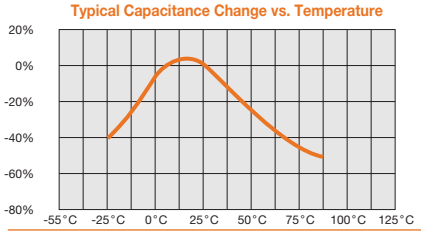
OPERATING TEMPERATURE RANGE:	-55°C to +125°C
TEMPERATURE COEFFICIENT:	0 ±15%Δ°C MAX.
TEMPERATURE VOLTAGE COEFFICIENT:	X7R not applicable
DISSIPATION FACTOR:	For 50 volts and 100 volts: 2.5% MAX.; For 25 Volts 3.5 %(0201, 0402, 0603, sizes If 7% Max, for Values ≥ 0.33uF) for 16 Volts: 3.5% Max (except 0402 ≥ 0.33uF & 0603 ≥ 0.15uF DF is 5% Max) For 10 Volts: 5% Max For 6.3 Volts: 10% Max For Values ≥ 10uF For all voltage offerings, the DF is 10% Max
INSULATION RESISTANCE:	>1000 ohms F or 100 G ohms, whichever is less at 25°C, VDCW. (The IR at 125°C is 10% of the value at 25°C)
AGEING:	2.5% per decade hour, typical
WITHSTANDING VOLTAGE:	>2.5 times VDCW
TEST PARAMETERS:*	1KHz ± 100Hz at 1.0 ± 0.2 Vrms > 100 pF, 25°C
CAPACITANCE TOLERANCE:	J,K,M

X5R: SPECIFICATIONS:



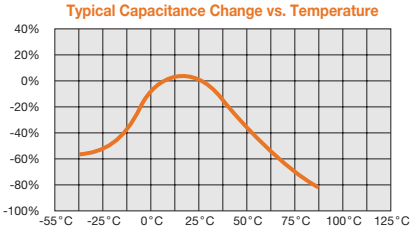
OPERATING TEMPERATURE RANGE:	-55°C to +85°C
TEMPERATURE COEFFICIENT:	0 ±15%Δ°C MAX.
TEMPERATURE VOLTAGE COEFFICIENT:	X5R not applicable
DISSIPATION FACTOR:	For 50 Volts and 100 Volts 2.5% Max For 25 Volts: 3.5% Max (0201, 0402, 0603, ≥ 0.33uF DF is 7% Max) For 16 Volts: 3.5% Max (except 0402 ≥ 0.33uF & 0603 ≥ 0.15uF DF is 5% Max) For 10 Volts 5.0% Max; For 4.0 Volts and 6.3Volts: 10% Max For values ≥ 10uF the D.F. is 10% Max.
INSULATION RESISTANCE:	>1000 ohms F or 100 G ohms, whichever is less at 25°C, VDCW. (10,000 ohms at 125°C)
AGEING:	2.5% per decade hour, typical
WITHSTANDING VOLTAGE:	>2.5 times VDCW
TEST PARAMETERS:*	1KHZ ± 100Hz at 1.0 ± 0.2 Vrms > 100 pF, 25°C
CAPACITANCE TOLERANCE:	K,M

Z5U: SPECIFICATIONS:



OPERATING TEMPERATURE RANGE:	+10°C to +85°C
TEMPERATURE COEFFICIENT:	+22% - 56%Δ°C MAX.
DISSIPATION FACTOR:	4.0% MAX.
INSULATION RESISTANCE:	>100 ohms F or 10 G ohms, whichever is less at 25°C, VDCW.
AGEING:	5% per decade hour, typical
WITHSTANDING VOLTAGE:	>2.5 times VDCW
TEST PARAMETERS:	1KHz ± 100Hz at 0.5 ± 0.1 Vrms, 25°C
CAPACITANCE TOLERANCE:	M,Z

Y5V: SPECIFICATIONS:

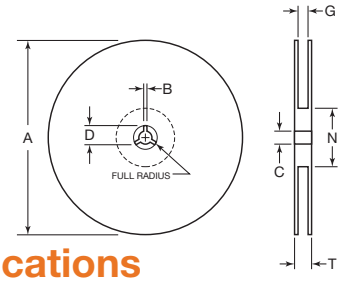


OPERATING TEMPERATURE RANGE:	-30°C to +85°C
TEMPERATURE COEFFICIENT:	+22% - 82%Δ°C MAX.
DISSIPATION FACTOR:	For 25 volts and 50 volts: 5% MAX.; For 16 volts: 7% MAX.; For 10 volts: 9% MAX.; For 6.3 volts: 11% MAX. For higher Cap values > 10µF, the D.F. is 20% MAX.
INSULATION RESISTANCE:	>100 ohms F or 10 G ohms, whichever is less at 25°C, VDCW.
AGEING:	7% per decade hour, typical
WITHSTANDING VOLTAGE:	>2.5 times VDCW
TEST PARAMETERS:*	1KHz ± 100Hz at 1.0 ± 0.2 Vrms, 25°C
CAPACITANCE TOLERANCE:	M,Z

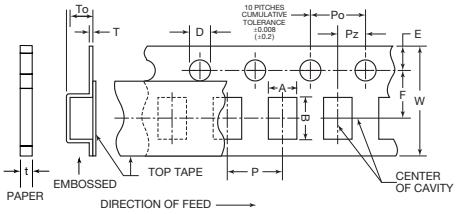
* Test parameters for High Value Caps - X7R, X5R and Y5V:
1KHz ± 100Hz at 1.0 ± 0.2 Vrms < 10uF (10 V min.)
1KHz ± 100Hz at 0.5 ± 0.1 Vrms < 10uF (6.3V max.)
120Hz ± 24Hz at 0.5 ± 0.1 Vrms ≥ 10uF

All components in this section are RoHS compliant per the EU directives and definitions.

All tape and reel specifications must be adhered to per EIA-481-1-A as noted and stated in the Chip Resistor section on page 68.



Taping Specifications



Reel Dimensions

Unit: mm (inch)

TAPE	B min	C	A (7")	A (13")	D min	N min	G	T max
8mm	0.3 (.012)	13 ± .05 (.512 ± .02)	178 ± 2.0 (7 ± .079)	330 ± 2.0 (13 ± .08)	20.2 (.795)	50 (1.97)	10 ± 1.5 (.394 ± .059)	14.9 (.587)
12mm	0.3 (.012)	13 ± .05 (.512 ± .02)	178 ± 2.0 (7 ± .079)	330 ± 2.0 (13 ± .08)	20.2 (.795)	50 (1.97)	10 ± 1.5 (.394 ± .059)	14.9 (.587)

7 in. Reel Quantities**

SIZE	01005	0201*	0402*	0603	0805	1206	1210	1812	2221
TAPE SIZE	8mm	8mm	8mm	8mm	8mm	8mm	8mm	12mm	12mm
MIN QTY PER REEL	20,000†	15,000	5000	3000	2000	2000	1000	1000	1000
MAX QTY PER REEL	20,000†	15,000	10,000	4000	5000	5000	5000	3000	1000

** Quantity dependent on Chip Thickness
* 0201 and 0402 Pitch ("P") is .079" ± .004" (2.0 ± 0.1mm)
† Smaller quantities may be available. Please contact your sales person.

Paper Tape Carrier Dimensions (8mm)

Unit: mm (inch)

SIZE	A	B	W	F	E	Po	Pz	D	t	P
01005	0.25 ± 0.05 (0.010 ± .002)	0.45 ± 0.05 (0.018 ± .002)	8.0 ± 0.2 (.315 ± .008)	3.5 ± 0.1 (.138 ± .004)	1.75 ± 0.1 (.069 ± .004)	4.0 ± 0.1 (.157 ± .004)	2.0 ± 0.05 (.039 ± .002)	1.5 + 0.1 - 0.0 (.064 + .004 - .000)	1.15 MAX (.045 MAX)	2.0 ± 0.05 (.079 ± .002)
0201	0.37 ± 0.05 (0.014 ± .002)	0.67 ± 0.05 (0.026 ± .002)	8.0 ± 0.2 (.315 ± .008)	3.5 ± 0.1 (.138 ± .004)	1.75 ± 0.1 (.069 ± .004)	4.0 ± 0.1 (.157 ± .004)	2.0 ± 0.05 (.039 ± .002)	1.5 + 0.1 - 0.0 (.064 + .004 - .000)	1.15 MAX (.045 MAX)	2.0 ± 0.05 (.079 ± .002)
0402	0.65 ± 0.1 (.026 ± .004)	1.10 ± 0.2 (.043 ± .008)	8.0 ± 0.2 (.315 ± .008)	3.5 ± 0.1 (.138 ± .004)	1.75 ± 0.1 (.069 ± .004)	4.0 ± 0.1 (.157 ± .004)	2.0 ± 0.05 (.039 ± .002)	1.5 + 0.1 - 0.0 (.064 + .004 - .000)	1.15 MAX (.045 MAX)	2.0 ± 0.05 (.079 ± .002)
0603	1.10 ± 0.2 (.043 ± .008)	1.90 ± 0.2 (.075 ± .008)	8.0 ± 0.2 (.315 ± .008)	3.5 ± 0.1 (.138 ± .004)	1.75 ± 0.1 (.069 ± .004)	4.0 ± 0.1 (.157 ± .004)	2.0 ± 0.05 (.079 ± .002)	1.5 + 0.1 - 0.0 (.064 + .004 - .000)	1.15 MAX (.045 MAX)	4.0 ± 0.1 (.157 ± .004)
0805	1.16 ± 0.2 (.046 ± .008)	2.4 ± 0.2 (.095 ± .008)	8.0 ± 0.2 (.315 ± .008)	3.5 ± 0.1 (.138 ± .004)	1.75 ± 0.1 (.069 ± .004)	4.0 ± 0.1 (.157 ± .004)	2.0 ± 0.05 (.079 ± .002)	1.5 + 0.1 - 0.0 (.064 + .004 - .000)	1.15 MAX (.045 MAX)	4.0 ± 0.1 (.157 ± .004)
1206	2.0 ± 0.2 (.079 ± .008)	3.6 ± 0.2 (.142 ± .008)	8.0 ± 0.2 (.315 ± .008)	3.5 ± 0.1 (.138 ± .004)	1.75 ± 0.1 (.069 ± .004)	4.0 ± 0.1 (.157 ± .004)	2.0 ± 0.05 (.079 ± .002)	1.5 + 0.1 - 0.0 (.064 + .004 - .000)	1.15 MAX (.045 MAX)	4.0 ± 0.1 (.157 ± .004)

Embossed Carrier Dimensions (8mm & 12mm)

SIZE	A	B	W	F	E	Po	Pz	D	To	T	P
0805	1.48 ± 0.2 (.058 ± .008)	2.3 ± 0.2 (.091 ± .008)	8.0 ± 0.2 (.315 ± .008)	3.5 ± .0.1 (.138 ± .004)	1.75 ± 0.1 (.069 ± .004)	4.0 ± 0.1 (.157 ± .004)	2.0 ± 0.05 (.079 ± .002)	1.5 + 0.1 - 0.0 (.06 + .004 - .000)	2.5 MAX (.098 MAX)	0.6 MAX (.024 MAX)	4.0 ± 0.1 (.157 ± .004)
1206	2.0 ± 0.2 (.079 ± .008)	3.6 ± 0.2 (.142 ± .008)	8.0 ± 0.2 (.315 ± .008)	3.5 ± .0.1 (.138 ± .004)	1.75 ± 0.1 (.069 ± .004)	4.0 ± 0.1 (.157 ± .004)	2.0 ± 0.05 (.079 ± .002)	1.5 + 0.1 - 0.0 (.06 + .004 - .000)	2.5 MAX (.098 MAX)	0.6 MAX (.024 MAX)	4.0 ± 0.1 (.157 ± .004)
1210	2.9 ± 0.2 (.114 ± .008)	3.6 ± 0.2 (.142 ± .008)	8.0 ± 0.2 (.315 ± .008)	3.5 ± .0.1 (.138 ± .004)	1.75 ± 0.1 (.069 ± .004)	4.0 ± 0.1 (.157 ± .004)	2.0 ± 0.05 (.079 ± .002)	1.5 + 0.1 - 0.0 (.06 + .004 - .000)	2.5 MAX (.098 MAX)	0.6 MAX (.024 MAX)	4.0 ± 0.1 (.157 ± .004)
1812	3.6 ± 0.2 (.142 ± .008)	4.9 ± 0.2 (.193 ± .008)	12.0 ± 0.3 (.472 ± .012)	5.6 ± .0.1 (.221 ± .004)	1.75 ± 0.1 (.069 ± .004)	4.0 ± 0.1 (.157 ± .004)	2.0 ± 0.05 (.079 ± .002)	1.5 + 0.1 - 0.0 (.06 + .004 - .000)	3.8 MAX (.150 MAX)	0.6 MAX (.024 MAX)	8.0 ± 0.1 (.315 ± .004)

How To Order

C0805 Series — See Chart

C0G Temperature Characteristic

500 — Rated Voltage
1st two digits are significant followed by number of zeroes.
4R0 = 4.0 VDCW
6R3 = 6.3 VDCW
100 = 10 VDCW
160 = 16 VDCW
250 = 25 VDCW
500 = 50 VDCW
630 = 63 VDCW
101 = 100 VDCW
201 = 200 VDCW
251 = 250 VDCW

101 Capacitance (pico - Farads)
1st two digits are significant, followed by number of zeroes.
101 = 100 pF
R denotes decimal
6R8 = 6.8 pF

J Tolerance Code:
*B = ± 0.1 pF
*C = ± 0.25 pF
*D = ± 0.5 pF
F = ± 1%
G = ± 2%
J = ± 5%
K = ± 10%
M = ± 20%
N = ± 30%
Z = +80 - 20%
P = +100 - 0%
* For capacitance values below 10 pF only. 10 pF also avail. in C & D Tol.

N Termination
N = Nickel Barrier, Tinned Termination Composition is 100% matte Tin (Sn)
‡ P = Palladium Silver
‡ G = Gold over Nickel
Pb: 90% Tin (Sn)/10% Lead (Pb) Termination

Standard termination finish for this product is 100% matte Tin (Sn). If a 100% Tin designation is required, replace the N with Sn.

‡ Pd/Ag & Gold terminations have limited values available. Please consult your salesperson.

□ Marking**
6 = EIA "J" Code
"Leave blank if No Marking"

P — Packaging
D = Paper Tape (10" Reel)
E = Embossed Tape (7" Reel)
P = Paper Tape (7" Reel)
R = Paper Tape (13" Reel)
U = Embossed Tape (13" Reel)

***** Optional Identifier

** 0201,0402 and 0603 size capacitors cannot be marked

† See pages 19 - 20 for our standard High Voltage Ceramic Chip Capacitors.

— * OPTIONAL IDENTIFIER
Min./Max. thickness
— designates minimum thickness
* designates maximum thickness

The following letters define thickness as signified below:

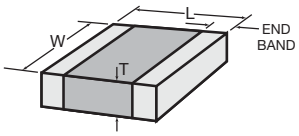
CODE:	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	6
DIMENSION:	.015	.020	.026	.030	.035	.040	.045	.050	.055	.060	.065	.070	.075	.080	.085	.090	.095	.100	.105	.110	.023

Please Note: Venkel offers Engineering Kits for this product. See page 124 for details.

NOTE: See the Web site for soldering information. 0603 size and smaller are not recommended for wave soldering.

Ceramic Chip Capacitors

NP0/C0G Dielectric



Values that are typically available.

25V Available in 25V only.

(All measurements in inches)																				
Size		**01005** (± 0.0008)		**0201** (± 0.002)		**0402** (± 0.004)		**0504** (± 0.008)		**0603** (± 0.006)		**0805** (± 0.008)			**1206** (± 0.008)		**1210** (±0.008)		**1812** (±0.012)	
L		.016		.024		.040		.053		.063		.080			.126		.126		.177	
W		.008		.012		.020		.040		.032		.050			.063		.098		.126	
*T (max)**		.008		.012		.025		.040		.033		.055			.070		.075		.085	
Min E/B		.002		.002		.004		.005		.008		.020 ± .010			.020 ± .010		.020 ± .010		.024 ± .015	
VDCW (MAX)		16V		25V	50V	25V	50V	50V	100V	50V	100V	25V	50V	100V	50V	100V	50V	100V	50V	100V
CAP. CODE	CAP. VALUE																			
0R1	0.1pF	■		■	■	■	■			■	■	■	■	■						
0R2	0.2pF	■		■	■	■	■			■	■	■	■	■						
0R3	0.3pF	■		■	■	■	■			■	■	■	■	■						
0R4	0.4pF	■		■	■	■	■			■	■	■	■	■						
0R5	0.5pF	■		■	■	■	■	■	■	■	■	■	■	■	■	■				
1R0	1.0pF	■		■	■	■	■	■	■	■	■	■	■	■	■	■				
1R2	1.2	■		■	■	■	■	■	■	■	■	■	■	■	■	■				
1R5	1.5	■		■	■	■	■	■	■	■	■	■	■	■	■	■				
1R8	1.8	■		■	■	■	■	■	■	■	■	■	■	■	■	■				
2R2	2.2	■	2.0	■	2.0	■	■	■	■	■	■	■	■	■	■	■				
2R7	2.7	■		■	■	■	■	■	■	■	■	■	■	■	■	■				
3R3	3.3	■	3.0	■	3.0	■	■	■	■	■	■	■	■	■	■	■				
3R9	3.9	■		■	■	■	■	■	■	■	■	■	■	■	■	■				
4R7	4.7	■	4.0	■	4.0	■	■	■	■	■	■	■	■	■	■	■				
5R0	5.0	■	5.0	■	5.0	■	■	■	■	■	■	■	■	■	■	■				
5R6	5.6	■	6.0	■	6.0	■	■	■	■	■	■	■	■	■	■	■				
6R8	6.8	■	7.0	■	7.0	■	■	■	■	■	■	■	■	■	■	■				
8R2	8.2	■	8.0 9.0	■	8.0 9.0	■	■	■	■	■	■	■	■	■	■	■				
100	10pF	■		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
120	12	■		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
150	15	■		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
180	18			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
220	22			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
270	27			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
330	33			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
390	39			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
470	47			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
560	56			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
680	68			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
820	82			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
101	100pF			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
121	120					■	■	■	■	■	■	■	■	■	■	■	■	■		
151	150					■	■	■	■	■	■	■	■	■	■	■	■	■		
181	180					■	■	■	■	■	■	■	■	■	■	■	■	■		
221	220					■	■	■	■	■	■	■	■	■	■	■	■	■	■	
271	270					■	■	■	■	■	■	■	■	■	■	■	■	■	■	
331	330					■	■	■		■	■	■	■	■	■	■	■	■	■	
391	390					■	■	■		■	■	■	■	■	■	■	■	■	■	
471	470					■	■	■		■	■	■	■	■	■	■	■	■	■	
561	560					■	■	■		■	■	■	■	■	■	■	■	■	■	
681	680					■	■	■		■	■	■	■	■	■	■	■	■	■	
821	820					■	■	■		■		■	■	■	■	■	■	■	■	
102	1000pF					■	■	■		■	■	■	■	■	■	■	■	■	■	■
122	1200									■		■	■	■	■	■	■	■	■	■
152	1500									■	■	■	■	■	■	■	■	■	■	■
182	1800									■		■	■	■	■	■	■	■	■	■
222	2200									■		■	■	■	■	■	■	■	■	■
272	2700									■		■	■		■	■	■	■	■	■
332	3300									■		■	■		■	■	■	■	■	■

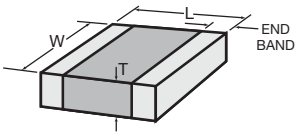
* Values shown to the left are available for 01005 size

* Values shown to the left are also available for 0201 size

Note: * For additional values that may be available, please consult your salesperson.

Ceramic Chip Capacitors

NP0/C0G Dielectric



Values that are typically available.

25V Available in 25V only.

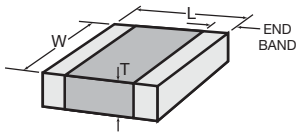
(All measurements in inches)																				
Size			**0201** (± 0.002)		**0402** (± 0.004)		**0504** (± 0.008)		**0603** (± 0.006)		**0805** (± 0.008)			**1206** (± 0.008)		**1210** (±0.008)		**1812** (±0.012)		**2220 / 2221** (±0.016)	
L			.024		.040		.053		.063		.080			.126		.126		.177		.225 / .225	
W			.012		.020		.040		.032		.050			.063		.098		.126		.200 / .210	
*T (max)**			.012		.025		.040		.033		.055			.070		.075		.085		.108 /.108	
Min E/B			.002		.004		.005		.008		.020 ± .010			.020 ± .010		.020 ± .010		.024 ± .015		.025 ± .015	
VDCW (MAX)			25V		25V	50V	50V	100V	25V	50V	25V	50V	100V	50V	100V	50V	100V	50V	100V	50V	100V
CAP. CODE	CAP. VALUE																				
392	3900								■	■	■	■		■	■	■	■	■	■		
472	4700										■	■		■	■	■	■	■	■	■	■
562	5600										■	■		■		■		■	■	■	■
682	6800										■	■		■	■	■		■	■	■	■
822	8200										■	■		■		■		■	■	■	■
103	.01µF										■	■		■	■	■		■	■	■	■
123	.012										■	■		■				■		■	■
153	.015											■		■				■		■	■
183	.018													■				■		■	■
223	.022										■	■		■				■		■	■
273	.027													■				■		■	■
333	.033													■						■	■
393	.039																			■	■
473	.047													■				■		■	■
563	.056													■						■	
683	.068													■				■		■	
823	.082													■							
104	.100µF													25V				■			
124	.120																				
154	.150																				
184	.180																				
224	.220																	■			
274	.270																				
334	.330																				
394	.390																				
474	.470																				
564	.560																				
684	.680																				
824	.820																				
105	1.00µF																				
125	1.20																				
155	1.50																				
185	1.80																				
225	2.20																				
335	3.30																				
395	3.90																				
475	4.70																				
685	6.80																				
106	10.0µF																				
156	15.0µF																				
226	22.0µF																				
476	47.0µF																				
107	100.0µF																				

Note:

Due to demand and raw material fluctuations in the market, changes and availability of individual values may occur. Minimum order quantities may apply.

Ceramic Chip Capacitors

X7R Dielectric



Values that are typically available.

X5R — Available in X5R only. See X5R chart on page 13, for all values 1µF and above

(All measurements in inches)																							
Size	**01005** (± 0.0008)		**0201** (± 0.002)				**0402** (± 0.004)				**0504** (± 0.008)			**0603** (± 0.006)					**0805** (± 0.008)				
L	.016		.024				.040				.053			.063					.080				
W	.008		.012				.020				.040			.032					.050				
*T (max)**	.008		.012				.025				.040			.038					.058				
Min E/B	.002		.002				.004				.005			.008					.020 ± .010				
VDCW (MAX)	6.3V	10V	6.3V	10V	16V	25V	10V	16V	25V	50V	25V	50V	100V	10V	16V	25V	50V	100V	25V	50V	100V		

CAP. CODE	CAP. VALUE	6.3V	10V	6.3V	10V	16V	25V	10V	16V	25V	50V	25V	50V	100V	10V	16V	25V	50V	100V	25V	50V	100V
101	100pF	■	■		■	■	■				■	■	■	■		■	■	■	■	■	■	■
121	120				■	■	■					■	■	■		■	■	■	■	■	■	■
151	150				■	■	■					■	■	■		■	■	■	■	■	■	■
181	180				■	■	■					■	■	■		■	■	■	■	■	■	■
221	220	■	■		■	■	■				■	■	■	■		■	■	■	■	■	■	■
271	270				■	■	■				■	■	■	■		■	■	■	■	■	■	■
331	330	■	■		■	■	■				■	■	■	■		■	■	■	■	■	■	■
391	390				■	■	■				■	■	■	■		■	■	■	■	■	■	■
471	470	■	■		■	■	■			■	■	■	■	■		■	■	■	■	■	■	■
561	560				■	■	■			■	■	■	■	■		■	■	■	■	■	■	■
681	680	■			■	■	■			■	■	■	■	■		■	■	■	■	■	■	■
821	820				■	■	■			■	■	■	■	■		■	■	■	■	■	■	■
102	1000pF	X5R		■	■	■	■			■	■	■	■	■		■	■	■	■	■	■	■
122	1200					■				■	■	■	■	■		■	■	■	■	■	■	■
152	1500	X5R		■	■	■	■			■	■	■	■	■		■	■	■	■	■	■	■
182	1800									■	■	■	■	■		■	■	■	■	■	■	■
222	2200	X5R		■	■	■	■			■	■	■	■	■		■	■	■	■	■	■	■
272	2700									■	■	■	■	■		■	■	■	■	■	■	■
332	3300	X5R		■	■	■				■	■	■	■	■		■	■	■	■	■	■	■
392	3900									■	■	■	■	■		■	■	■	■	■	■	■
472	4700	X5R		■	■	■				■	■	■	■	■		■	■	■	■	■	■	■
562	5600								■	■	■	■	■	■		■	■	■	■	■	■	■
682	6800	X5R		■	■				■	■	■	■	■	■		■	■	■	■	■	■	■
822	8200								■	■	■	■	■	■		■	■	■	■	■	■	■
103	.01µF	X5R		■	■				■	■	■	■	■	■	■	■	■	■	■	■	■	■
123	.012								■	■		■	■		■	■	■	■		■	■	■
153	.015			X5R					■	■		■	■		■	■	■	■		■	■	■
183	.018								■	■		■			■	■	■	■		■	■	■
223	.022			X5R					■	■		■			■	■	■	■	■	■	■	■
273	.027							■	■	■					■	■	■	■		■	■	■
333	.033			X5R				■	■						■	■	■	■		■	■	■

* For values above 1uF, thickness may be greater than specified above.
T(max): 0603 – 0.040"
0805 – 0.060"

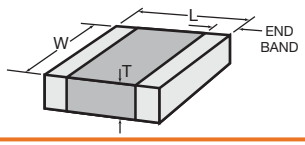
Note:

Due to demand and raw material fluctuations in the market, changes and availability of individual values may occur. Minimum order quantities may apply.

All components manufactured with the X7R dielectric are also available as an X5R dielectric.

Ceramic Chip Capacitors

X7R Dielectric



Values that are typically available.

X5R — Available in X5R only. See X5R chart on page 13, for all values 1µF and above

(All measurements in inches)																						
Size		**0201** (± 0.002)			**0402** (± 0.004)					**0603** (± 0.006)						**0805** (± 0.008)					
L		.024			.040					.063						.080					
W		.012			.020					.032						.050					
*T (max)**		.012			.025					.038						.058					
Min E/B		.002			.004					.008						.020 ± .010					
VDCW (MAX)		4V	6.3V	10V	4V	6.3V	10V	16V	25V	6.3V	10V	16V	25V	50V	100V	6.3V	10V	16V	25V	50V	100V
CAP. CODE	CAP. VALUE																				
393	.039		X5R																		
473	.047		X5R																		
563	.056																				
683	.068																				
823	.082																				
104	.100µF		X5R						X5R												
124	.120																				
154	.150					X5R	X5R														
184	.180																				
224	.220	X5R				X5R	X5R														
274	.270																				
334	.330					X5R															
394	.390																				
474	.470					X5R	X5R						X5R								
564	.560																				
684	.680									X5R	X5R										
824	.820																				
105	1.00µF	X5R	X5R			X5R	X5R	X5R					X5R								
125	1.20																				
155	1.50																				
185	1.80																				
225	2.20				X5R	X5R						X5R									
335	3.30																X5R	X5R			
475	4.70									X5R	X5R								X5R		
685	6.80																				
106	10.0µF				X5R					X5R	X5R							X5R			
156	15.0µF																				
226	22.0µF																				
476	47.0µF																				
107	100.0µF																				

* For values above 1uF, thickness may be greater than specified above.
T(max): 0603 – 0.040"
0805 – 0.060"

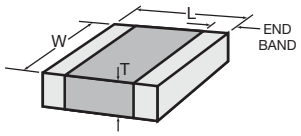
Note:

Due to demand and raw material fluctuations in the market, changes and availability of individual values may occur. Minimum order quantities may apply.

All components manufactured with the X7R dielectric are also available as an X5R dielectric.

Ceramic Chip Capacitors

X7R Dielectric



Values that are typically available.

X5R — Available in X5R only. See X5R chart on page 13, for all values 1µF and above

(All measurements in inches)																					
Size		**1206** (± 0.008)					**1210** (±0.008)					**1812** (±0.012)						**2220 / 2221** (±0.016)			
L		.126					.126					.177						.225 / .225			
W		.063					.098					.126						.200 / .210			
*T (max)**		.070					.075					.085						.108 /.108			
Min E/B		.020 ± .010					.020 ± .010					.024 ± .015						.025 ± .015			
VDCW (MAX)		10V	16V	25V	50V	100V	10V	16V	25V	50V	100V	6.3V	10V	16V	25V	50V	100V	16V	25V	50V	100V
CAP. CODE	CAP. VALUE																				
102	1000pF			■	■	■			■	■	■										
122	1200			■	■	■			■	■	■										
152	1500			■	■	■			■	■	■										
182	1800			■	■	■			■	■	■										
222	2200			■	■	■			■	■	■										
272	2700			■	■	■			■	■	■										
332	3300			■	■	■			■	■	■										
392	3900			■	■	■			■	■	■										
472	4700			■	■	■			■	■	■										
562	5600			■	■	■			■	■	■										
682	6800			■	■	■			■	■	■					■	■				
822	8200			■	■	■			■	■	■					■	■				
103	.01µF			■	■	■			■	■	■			■	■	■	■				
123	.012			■	■	■			■	■	■			■	■	■	■				
153	.015			■	■	■			■	■	■			■	■	■	■				
183	.018			■	■	■			■	■	■			■	■	■	■				
223	.022			■	■	■			■	■	■			■	■	■	■		■	■	■
273	.027			■	■	■			■	■	■			■	■	■	■		■	■	■
333	.033			■	■	■			■	■	■			■	■	■	■		■	■	■
393	.039			■	■	■			■	■	■			■	■	■	■		■	■	■
473	.047			■	■	■			■	■	■			■	■	■	■		■	■	■
563	.056			■	■	■			■	■	■			■	■	■	■		■	■	■
683	.068			■	■	■			■	■	■			■	■	■	■		■	■	■
823	.082			■	■	■			■	■	■			■	■	■	■		■	■	■
104	.100µF		■	■	■	■	■	■	■	■	■			■	■	■	■		■	■	■
124	.120		■	■	■		■	■	■	■	■			■	■	■	■		■	■	■
154	.150		■	■	■		■	■	■	■	■			■	■	■	■		■	■	■
184	.180		■	■	■		■	■	■	■	■			■	■	■	■		■	■	■
224	.220		■	■	■	■	■	■	■	■	■			■	■	■	■		■	■	■
274	.270		■	■	■		■	■	■	■	■			■	■	■	■		■	■	■
334	.330		■	■	■		■	■	■	■	■			■	■	■	■		■	■	■

* For values above 1uF, thickness may be greater than specified above.
T(max): 1206 – 0.075" 1812 – 0.130"
1210 – 0.125" 2220 – 0.135"

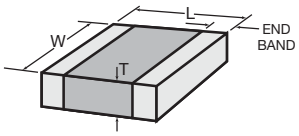
Note:

Due to demand and raw material fluctuations in the market, changes and availability of individual values may occur. Minimum order quantities may apply.

All components manufactured with the X7R dielectric are also available as an X5R dielectric.

Ceramic Chip Capacitors

X7R Dielectric



Values that are typically available.

X5R — Available in X5R only. See X5R chart on page 13, for all values 1µF and above

(All measurements in inches)																							
Size		**1206** (± 0.008)						**1210** (±0.008)						**1812** (±0.012)						**2220 / 2221** (±0.016)			
L		.126						.126						.177						.225 / .225			
W		.063						.098						.126						.200 / .210			
*T (max)**		.070						.075						.095						.108 /.108			
Min E/B		.020 ± .010						.020 ± .010						.024 ± .015						.025 ± .015			
VDCW (MAX)		6.3V	10V	16V	25V	50V	100V	6.3V	10V	16V	25V	50V	100V	6.3V	10V	16V	25V	50V	100V	16V	25V	50V	100V
CAP. CODE	CAP. VALUE																						
394	.390			■	■	■		■	■	■	■	■				■	■	■	■		■	■	■
474	.470			■	■	■		■	■	■	■	■	■			■	■	■	■		■	■	■
564	.560			■	■	■		■	■	■	■	■				■	■	■	■		■	■	■
684	.680			■	■			■	■	■	■	■	■			■	■	■	■		■	■	■
824	.820			■	■			■	■	■	■					■	■	■			■	■	■
105	1.00µF	■	■	■	■	■	■	■	■	■	■	■	■			■	■	■	■		■	■	■
125	1.20															■	■	■			■	■	■
155	1.50	■	■	■	■	■		■	■	■	■										■		
185	1.80																						
225	2.20	■	■	■	■	■		■	■	■	■	■	■			■	■	■	■				
335	3.30	■	■	■	■			■	■	■	■	■											
475	4.70	■	■	■	■			■	■	■	■	■				■	■					■	■
685	6.80																						
106	10.0µF	■	■	■	■			■	■	■	■				■	■	X5R					X5R	
156	15.0µF																				X5R		
226	22.0µF	■	■					■	■	■	X5R				■	X5R	X5R			■			
476	47.0µF							■	■					X5R	X5R								
107	100.0µF																						

* For values above 1uF, thickness may be greater than specified above.
T(max): 1206 – 0.072" 1812 – 0.130"
1210 – 0.125" 2220 – 0.135"

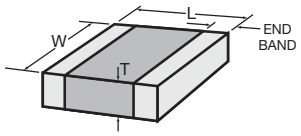
Note:

Due to demand and raw material fluctuations in the market, changes and availability of individual values may occur. Minimum order quantities may apply.

All components manufactured with the X7R dielectric are also available as an X5R dielectric.

Ceramic Chip Capacitors

X5R Dielectric (1µF and above)



Values that are typically available.

For values less than 1µF, see X7R chart on pages 9–12.

(All measurements in inches)																											
Size		**0201** (± 0.002)		**0402** (± 0.004)				**0603** (± 0.006)					**0805** (± 0.008)				**1206** (± 0.008)				**1210** (±0.016)				**1812** (±0.016)		
L		.024		.040				.063					.080				.126				.126				.177		
W		.012		.020				.032					.050				.063				.098				.126		
T (max)		.012		.025				.040					.060				.072				.125				.130		
Min E/B		.002		.004				.008					.020 ± .010				.020 ± .010				.020 ± .010				.024 ± .015		
VDCW (MAX)		4V	6.3V	4V	6.3V	10V	16V	4V	6.3V	10V	16V	25V	6.3V	10V	16V	25V	6.3V	10V	16V	25V	6.3V	10V	16V	25V	6.3V	10V	16V
CAP. CODE	CAP. VALUE																										
105	1.00µF	■	■		■	■	■		■	■	■	■	■	■	■	■	■	■	■	■							
125	1.20																										
155	1.50																										
185	1.80																										
225	2.20			■	■				■	■	■		■	■	■	■	■	■	■	■							
335	3.30												■	■	■		■	■	■	■			■	■			

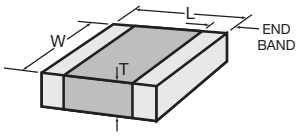
Note:

Due to demand and raw material fluctuations in the market, changes and availability of individual values may occur. Minimum order quantities may apply.

All components manufactured with the X7R dielectric are also available as an X5R dielectric.

Ceramic Chip Capacitors

X5R Dielectric (1µF and above)



Values that are typically available.

For values less than 1µF, see X7R chart on pages 9–12.

(All measurements in inches)			0402 (± 0.004)		0603 (± 0.006)			0805 (± 0.008)					1206 (± 0.008)				1210 (±0.016)				1812 (±0.016)				2220 / 2221 (±0.016)			
Size																												
L			.040		.063			.080					.126				.126				.177				.225 / .225			
W			.020		.032			.050					.063				.098				.126				.200 / .210			
T (max)			.025		.040			.060					.072				.125				.130				.135			
Min E/B			.004		.008			.020 ± .010					.020 ± .010				.020 ± .010				.024 ± .015				.025 ± .015			
VDCW (MAX)			4V	6.3V	4V	6.3V	10V	4V	6.3V	10V	16V	25V	6.3V	10V	16V	25V	6.3V	10V	16V	25V	6.3V	10V	16V	25V	6.3V	10V	25V	50V
CAP. CODE	395	CAP. VALUE	3.90																									
	475		4.70		■		■	■		■	■	■	■	■	■	■	■	■	■	■	■		■	■	■				
	685		6.80																									
	106		10.0µF	■		■	■	■		■	■	■		■	■	■	■	■	■	■	■		■	■	■			■	■
	156		15.0µF																								■	
	226		22.0µF			■	■			■				■	■	■		■	■	■	■	■	■	■	■				
	476		47.0µF						■	■				■				■	■	■		■	■			■	■		
	107		100.0µF											■				■				■				■			
	157		150.0uF															■											
	227		220.0uF															■											

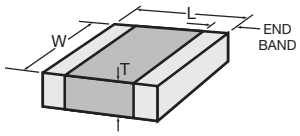
Note:

Due to demand and raw material fluctuations in the market, changes and availability of individual values may occur. Minimum order quantities may apply.

All components manufactured with the X7R dielectric are also available as an X5R dielectric.

Ceramic Chip Capacitors

Z5U Dielectric



Values that are typically available.

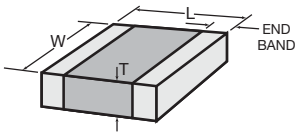
(All measurements in inches)														
Size	**0504** (± 0.008)		**0603** (± 0.006)		**0805** (± 0.008)		**1206** (± 0.008)		**1210** (±0.016)		**1812** (±0.016)		**2220 / 2221** (±0.016)	
L	.050		.063		.080		.126		.126		.177		.225 / .225	
W	.040		.032		.050		.063		.098		.126		.200 / .210	
*T (max)**	.040		.038		.058		.070		.075		.085		.108 /.108	
Min E/B	.005		.008		.020 ± .010		.020 ± .010		.020 ± .010		.024 ± .015		.025 ± .015	
VDCW (MAX)	25V	50V	25V	50V	25V	50V	25V	50V	25V	50V	25V	50V	25V	50V
CAP. CODE	CAP. VALUE													
102	1000pF	■	■											
122	1200	■	■											
152	1500	■	■											
182	1800	■	■											
222	2200	■	■											
272	2700	■	■											
332	3300	■	■											
392	3900	■	■											
472	4700	■	■			■								
562	5600	■	■			■	■							
682	6800	■	■			■	■							
822	8200	■	■			■	■							
103	.01µF	■	■	■	■	■	■	■	■	■	■			
123	.012	■	■	■	■	■	■	■	■	■	■			
153	.015	■	■	■	■	■	■	■	■	■	■			
183	.018	■	■	■	■	■	■	■	■	■	■			
223	.022	■	■	■	■	■	■	■	■	■	■			
273	.027	■	■	■	■	■	■	■	■	■	■			
333	.033	■	■	■	■	■	■	■	■	■	■			
393	.039	■	■	■	■	■	■	■	■	■	■			
473	.047	■	■	■	■	■	■	■	■	■	■			
563	.056	■		■	■	■	■	■	■	■	■			
683	.068	■		■	■	■	■	■	■	■	■			
823	.082	■		■	■	■	■	■	■	■	■			
104	.100µF	■		■	■	■	■	■	■	■	■	■	■	
124	.120			■		■	■	■	■	■	■	■	■	
154	.150			■		■	■	■	■	■	■	■	■	■
184	.180			■		■	■	■	■	■	■	■	■	■
224	.220			■		■	■	■	■	■	■	■	■	■
274	.270					■	■	■	■	■	■	■	■	■
334	.330			■		■	■	■	■	■	■	■	■	■

Note:

Due to demand and raw material fluctuations in the market, changes and availability of individual values may occur. Minimum order quantities may apply.

Ceramic Chip Capacitors

Z5U Dielectric



Values that are typically available.

(All measurements in inches)														
Size	**0504** (± 0.008)		**0603** (± 0.006)		**0805** (± 0.008)		**1206** (± 0.008)		**1210** (±0.016)		**1812** (±0.016)		**2220 / 2221** (±0.016)	
L	.050		.063		.080		.126		.126		.177		.225 / .225	
W	.040		.032		.050		.063		.098		.126		.200 / .210	
*T (max)**	.040		.038		.058		.070		.075		.085		.108 /.108	
Min E/B	.005		.008		.020 ± .010		.020 ± .010		.020 ± .010		.024 ± .015		.025 ± .015	
VDCW (MAX)	25V	50V	25V	50V	25V	50V	25V	50V	25V	50V	25V	50V	25V	50V
CAP. CODE / CAP. VALUE														
394	.390														
474	.470														
564	.560														
684	.680														
824	.820														
105	1.00µF														
125	1.20														
155	1.50														
185	1.80														
225	2.20														
335	3.30														
395	3.90														
475	4.70														
685	6.80														
106	10.0µF														
156	15.0µF														
226	22.0µF														
476	47.0µF														
107	100.0µF														

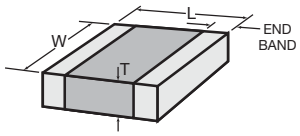
Note:

Due to demand and raw material fluctuations in the market, changes and availability of individual values may occur. Minimum order quantities may apply.

* For values above 1uF, thickness may be greater than specified above. Please see X5R specifications.

Ceramic Chip Capacitors

Y5V Dielectric



Values that are typically available.

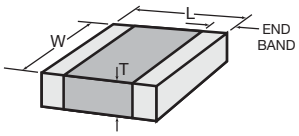
(All measurements in inches)																												
Size	**0201** (± 0.002)	**0402** (± 0.004)					**0603** (± 0.006)					**0805** (± 0.008)					**1206** (± 0.008)				**1210** (±0.016)				**1812** (±0.016)		
L	.024	.040					.063					.080					.126				.126				.177		
W	.012	.020					.032					.050					.063				.098				.126		
*T (max)**	.012	.025					.038					.058					.070				.075				.085		
Min E/B	.002	.004					.008					.020 ± .010					.020 ± .010				.020 ± .010				.024 ± .015		
VDCW (MAX)	10V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	10V	16V	25V	50V	6.3V	10V	16V	25V	6.3V	10V	25V
CAP. CODE	CAP. VALUE																											
102	1000pF	■				■	■																					
122	1200					■	■																					
152	1500					■	■																					
182	1800					■	■																					
222	2200	■				■	■																					
272	2700					■	■																					
332	3300	■				■	■																					
392	3900					■	■																					
472	4700	■				■	■																					
562	5600					■	■																					
682	6800	■				■	■																					
822	8200					■	■																					
103	.01µF	■			■	■	■			■	■	■																
123	.012				■	■				■	■	■																
153	.015				■	■				■	■	■																
183	.018				■	■				■	■	■																
223	.022				■	■				■	■	■																
273	.027				■	■				■	■	■																
333	.033				■	■				■	■	■																
393	.039				■	■				■	■	■				■												
473	.047				■	■				■	■	■				■												
563	.056				■	■				■	■	■				■												
683	.068				■	■				■	■	■				■												
823	.082				■	■				■	■	■				■												
104	.100µF		■	■	■	■		■	■	■	■	■			■	■	■			■	■							
124	.120							■	■	■	■				■	■	■			■	■							
154	.150							■	■	■	■				■	■	■			■	■							
184	.180							■	■	■	■				■	■	■			■	■							
224	.220		■	■	■			■	■	■	■	■			■	■	■			■	■							
274	.270									■	■				■	■	■			■	■							
334	.330		■	■						■	■				■	■	■			■	■			■	■			

Note:

Due to demand and raw material fluctuations in the market, changes and availability of individual values may occur. Minimum order quantities may apply.

Ceramic Chip Capacitors

Y5V Dielectric



Values that are typically available.

(All measurements in inches)		0201 (± 0.002)	0402 (± 0.004)			0603 (± 0.006)					0805 (± 0.008)					1206 (± 0.008)				1210 (±0.016)					1812 (±0.016)		
L		.024	.040			.063					.080					.126				.126					.177		
W		.012	.020			.032					.050					.063				.098					.126		
*T (max)**		.012	.025			.038					.058					.070				.075					.085		
Min E/B		.002	.004			.008					.020 ± .010					.020 ± .010				.020 ± .010					.024 ± .015		
VDCW (MAX)		10V	6.3V	10V	16V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	25V
CAP. CODE	CAP. VALUE																										
394	.390												■	■	■			■	■			■	■				
474	.470		■	■		■	■	■	■				■	■	■			■	■			■	■				
564	.560												■					■				■	■				
684	.680												■				■	■				■	■				
824	.820												■				■	■				■	■				
105	1.00µF		■			■	■	■	■		■	■	■	■	■	■	■	■				■	■			■	■
125	1.20																									■	■
155	1.50																■	■				■	■			■	■
185	1.80																									■	■
225	2.20					■	■	■			■	■	■	■		■	■	■				■	■			■	■
335	3.30										■	■					■	■				■	■			■	■
395	3.90																■					■	■			■	■
475	4.70					■	■				■	■	■	■		■	■	■				■	■			■	■
685	6.80																■					■	■				
106	10.0µF										■	■	■			■	■	■				■	■	■		■	■
156	15.0µF																										
226	22.0µF															■					■	■				■	■
476	47.0µF																			■	■					■	■
107	100.0µF																			■						■	

Note:

Due to demand and raw material fluctuations in the market, changes and availability of individual values may occur. Minimum order quantities may apply.

* For values above 1uF, thickness may be greater than specified above. Please see X5R specifications.

All components in this section are RoHS compliant per the EU directives and definitions.

High Voltage

NP0/C0G:

Class I dielectric; ultra stable electrical characteristics over time, voltage, frequency and temperature changes. Low dielectric loss.

SPECIFICATIONS:

OPERATING TEMPERATURE RANGE:	-55°C to +125°C
TEMPERATURE COEFFICIENT:	0 ± 30PPM/°C
TEMPERATURE VOLTAGE COEFFICIENT:	0 ± 30PPM/°C
DISSIPATION FACTOR:	0.1% MAX.
INSULATION RESISTANCE:	>1000 ohms F or 100 G ohms, whichever is less at 25°C, VDCW. (The IR at 125°C is 10% of the value at 25°C)
WITHSTANDING VOLTAGE:	See below
TEST PARAMETERS:	1MHZ ± 50KHZ at 1.0 ± 0.2 Vrms ≤ 100 pF, 25°C 1KHZ ± 50HZ at 1.0 ± 0.2 Vrms > 100 pF, 25°C
CAPACITANCE TOLERANCE:	*F, *G, J, K *NP0/C0G only

X7R:

Stable Class II dielectric.

SPECIFICATIONS:

OPERATING TEMPERATURE RANGE:	-55°C to +125°C
TEMPERATURE COEFFICIENT:	0 ± 15%Δ°C MAX.
TEMPERATURE VOLTAGE COEFFICIENT:	X7R not applicable
DISSIPATION FACTOR:	2.5% MAX.
IINSULATION RESISTANCE:	>1000 ohms F or 100 G ohms, whichever is less at 25°C, VDCW. (The IR at 125°C is 10% of the value at 25°C)
WITHSTANDING VOLTAGE:	See below
TEST PARAMETERS:	1KHz ± 50Hz at 1.0 ± 0.2 Vrms, 25°C
CAPACITANCE TOLERANCE:	J, K, M

How To Order

C1206
Series
See Chart

C0G
Temperature Characteristic

501 —
Rated Voltage
1st two digits are significant, followed by number of zeros
201 = 200V
251 = 250V
501 = 500V
*601 = 600V
*631 = 630V
102 = 1000V
202 = 2000V
302 = 3000V
402 = 4000V
502 = 5000V

101
Capacitance (pico - Farads)
1st two digits are significant followed by number of zeroes.
101 = 100 pF
R denotes decimal
6R8 = 6.8 pF

J
Tolerance Code:
*F = ± 1%
*G = ± 2%
J = ± 5%
K = ± 10%
M = ± 20%
*NP0/C0G only

N
Termination
P = Palladium Silver
N = Nickel barrier, Tinned Termination
Standard termination finish for this product is 100% matte Tin (Sn)

☐
Marking
6 = EIA "J" Code
"Leave blank if No Marking"

E
Packaging
E = Embossed Tape

* 600V and 630V capacitors are available for any 500V capacitor ranges.

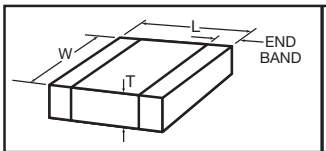
Dielectric Strength is equal to 1.5 times rated voltage (WVDC) for 500 volt capacitors and 1.2 times (WVDC) for 1,000 through 5,000 volt capacitors. Circuit applications in excess of 1,000 volts may require a surface coating to prevent external arcing.

All components in this section are RoHS compliant per the EU directives and definitions.

5900 Shepherd Mountain Cove • Austin, TX 78730
Phone: 512 / 794-0081 • Fax: 512 / 794-0087 • Toll Free: 800 / 950-8365
e-mail: sales@venkel.com • www.venkel.com

VENKEL LTD.

Ceramic Chip Capacitors



VOLTAGE AND CAPACITANCE RANGE

CAPACITOR CASE SIZE	in.	mm	RATED WVDC	10 pF – 100 pF – 1000 pF – .01 µF – .1 µF
0805 SIZE			250V	102 – 273
* L	.080	2.03	500V	821 – 123
* W	.050	1.27	1,000V	471 – 272
T(Max)	.065	1.65		
Max E/B	.020	.508		
1206 SIZE			250V	332 – 104
* L	.125	3.18	500V	102 – 473
* W	.062	1.58	1,000V	681 – 562
T(Max)	.080	2.03	2,000V	151 – 102
Max E/B	.020	.508		
1210 SIZE			250V	472 – 474
* L	.125	3.18	500V	222 – 563
* W	.095	2.41	1,000V	102 – 153
T(Max)	.085	2.16	2,000V	221 – 152
Max E/B	.020	.508		
1808 SIZE			250V	562 – 124
* L	.180	4.57	500V	332 – 683
* W	.080	2.03	1,000V	152 – 183
T(Max)	.095	2.41	2,000V	221 – 332
Max E/B	.020	.508	3,000V	121 – 102
			4,000V	470 – 471 – 102
1812 SIZE			250V	682 – 224
* L	.177	4.49	500V	472 – 124
* W	.125	3.18	1,000V	222 – 473
T(Max)	.118	3.00	2,000V	471 – 103
Max E/B	.020	.508	3,000V	221 – 222
			4,000V	101 – 681
1825 SIZE			500V	103 – 224
* L	.180	4.57	1,000V	562 – 104
* W	.250	6.35	2,000V	102 – 682
T(Max)	.128	3.25	3,000V	471 – 472
Max E/B	.020	.508	4,000V	271 – 821
			5,000V	101 – 391
2225 SIZE			500V	333 – 394
* L	.225	5.72	1,000V	822 – 104
* W	.250	6.35	2,000V	122 – 273
T(Max)	.145	3.68	3,000V	102 – 392
Max E/B	.020	.508	4,000V	471 – 152
			5,000V	181 – 681

* Tolerance: ± 0.010"

NOTE: (1) Standard ranges begin at 10pF. Please consult your sales representative if values below 10pF are required.
(2) Thickness may exceed the T(Max) specification if capacitance and rated voltage are near the end of the range. Please advise your sales representative if thickness is a concern.

NPO or X7R
X7R only
X7R non-RoHS compliant

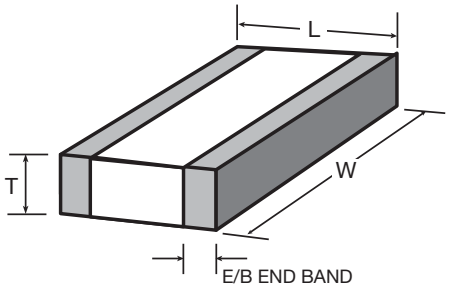
5900 Shepherd Mountain Cove • Austin, TX 78730
Phone: 512 / 794-0081 • Fax: 512 / 794-0087 • Toll Free: 800 / 950-8365
e-mail: sales@venkel.com • www.venkel.com

Low Inductance Chip Capacitors

Features

- Multilayer Chip Capacitor with very low inductance
- Monolithic structure for high reliability
- Excellent for by-pass filter applications

Dimensions



Unit: inch (mm)

Series	L	W	E/B (Max)	T (Max)
LIC0204	0.020 ± 0.002 (0.50 ± 0.05)	0.040 ± 0.0021 (1.00 ± 0.05)	0.006 (0.15)	0.016 ± 0.002 (0.40 ± 0.05)
LIC0306	0.032 ± 0.006 (0.80 ± 0.15)	0.063 ± 0.006 (1.60 ± 0.15)	0.0088 (0.22)	0.04 (0.86)
LIC0508	0.048 ± 0.010 (1.20 ± 0.25)	0.080 ± 0.010 (2.00 ± 0.25)	0.016 (0.40)	0.024 (0.61)
LIC0612	0.063 ± 0.010 (1.60 ± 0.25)	0.126 ± 0.010 (3.20 ± 0.25)	0.016 (0.40)	0.038 (0.97)

X7R: SPECIFICATIONS:

OPERATING TEMP. RANGE:	X7R = –55°C to +125°C
TEMPERATURE COEFFICIENT:	0 ±15% Δ°C max.
VOLTAGE RATINGS:	10, 16, 25, 50 VDC
DISSIPATION FACTOR:	10V = 5.0% max., 16V = 3.5% max. 25V = 3.0% max., 50V = 2.5% max.
INSULATION RESISTANCE: (@ +25°C, RVDC)	100,000 MΩ min., or 1,000 MΩ per µF min. or 100 GΩ, whichever is less
TEST PARAMETERS:	1KHz ± 50Hz at 1.0 ± 0.2 Vrms, 25°C
CAPACITANCE TOLERANCES:	K = ±10%; M = ±20%

X7S: SPECIFICATIONS:

OPERATING TEMP. RANGE:	X7S = –55°C to +125°C
TEMPERATURE COEFFICIENT:	0 ±22% Δ°C max.
VOLTAGE RATINGS:	4 VDC
DISSIPATION FACTOR:	0.1 (10%) max. when measured at the frequency and voltage specified
INSULATION RESISTANCE: (@ +25°C, RVDC)	> 50 ohms F or 5 Gig ohms, whichever is less
TEST PARAMETERS:	1KHz ± 50Hz at 1.0 ± 0.2 Vrms, 25°C
CAPACITANCE TOLERANCES:	K = ±10%; M = ±20%

X6S: SPECIFICATIONS:

OPERATING TEMP. RANGE:	X6S = –55°C to +105°C
TEMPERATURE COEFFICIENT:	0 ±22% Δ°C max.
VOLTAGE RATINGS:	6.3 VDC
DISSIPATION FACTOR:	6.3V = 12% max.
INSULATION RESISTANCE: (@ +25°C, RVDC)	100,000 MΩ min., or 1,000 MΩ per µF min. or 100 GΩ, whichever is less
TEST PARAMETERS:	1KHz ± 50Hz at 1.0 ± 0.2 Vrms, 25°C
CAPACITANCE TOLERANCES:	K = ±10%; M = ±20%

X5R: SPECIFICATIONS:

OPERATING TEMP. RANGE:	X5R = -55°C TO +85°C
TEMPERATURE COEFFICIENT:	0 ±15%Δ°C MAX.
VOLTAGE RATINGS:	4, 6.3, 10, 16, 25, 50, 100 VDC
DISSIPATION FACTOR:	4V & 6.3V = 10% max., 10V = 5.0% max. 16V = 3.5% max., 25V = 3.0% max. 50V & 100V = 2.5% max.. For values > 10˚F and voltages ≤ 10V, the D.F. IS 10% max.
INSULATION RESISTANCE: (@ +25°C, VDCW.)	>1000 ohms F or 100 Gig ohms, whichever is less (10,000 ohms at 125°C)
TEST PARAMETERS:*	1KHz ± 100Hz at 1.0 ± 0.2 VRMS > 100 PF, 25°C
CAPACITANCE TOLERANCE:	K = ±10%; M = ±20%

Typical Inductance

SERIES	Measured Inductance (nH)
LIC0204	0.275
LIC0306	0.325

SERIES	Measured Inductance (nH)
LIC0508	0.400
LIC0612	0.450

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Voltage and Capacitance Range

X7R, X6S, X7S, X5R

■ X7R ■ X6S ■ X7S ■ X5R

Case Size	Voltage	222 (2200pF)	472 (4700pF)	103 (.01 µF)	123 (.012uF)	153 (.015uF)	183 (.018uF)	223 (.022uF)	273 (.027uF)	333 (.033uF)	393 (.039uF)	473 (.047uF)	563 (.056uF)	683 (.068uF)	823 (.082uF)	104 (.1µF)	224 (.22uF)	474 (.47uF)	105 (1uF)	225 (2.2uF)	475 (4.7uF)	106 (10uF)
0204	6.3V																					
0306	4V																					
	6.3V																					
	10V																					
	16V																					
	25V																					
	50V																					
0508	4V																					
	6.3V																					
	10V																					
	16V																					
	25V																					
	50V																					
0612	6.3V																					
	10V																					
	16V																					
	25V																					
	50V																					

How To Order

LIC — Series

0508 — Size

X7R, X6S, X7S, X5R — Temperature Characteristic

250 — Rated Voltage
4R0 = 4V
6R3 = 6.3V
100 = 10V
160 = 16V
250 = 25V
500 = 50V

–

104 — Capacitance (pico - Farads)
1st two digits are significant followed by number of zeroes.
104 = 0.1 µF

K — Tolerance Code:
K = ± 10%
M = ± 20%

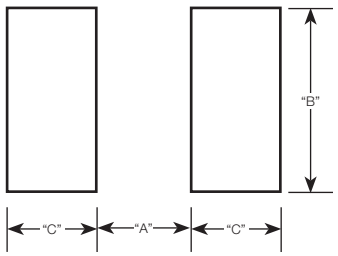
N — Termination
N = Nickel barrier, Tinned Termination Composition is 100% matte Tin (Sn)
Standard termination finish for this product is 100% matte Tin (Sn)

P — Packaging
E = Embossed Tape
P = Paper Tape
(7" reels – 4,000/RL)

Recommended Land Pattern

Unit: inch (mm)

Series	A	B	C
LIC0204	0.006 – 0.008 (0.15 – 0.20	0.028 – 0.04 (0.7 – 1.0)	0.008 – 0.012 (0.20 – 0.30)
LIC0306	0.012 (0.31)	0.060 (1.52)	0.036 (0.90)
LIC0508	0.020 (0.51)	0.080 (2.03)	0.036 (0.90)
LIC0612	0.030 (0.76)	0.120 (3.05)	0.036 (0.90)



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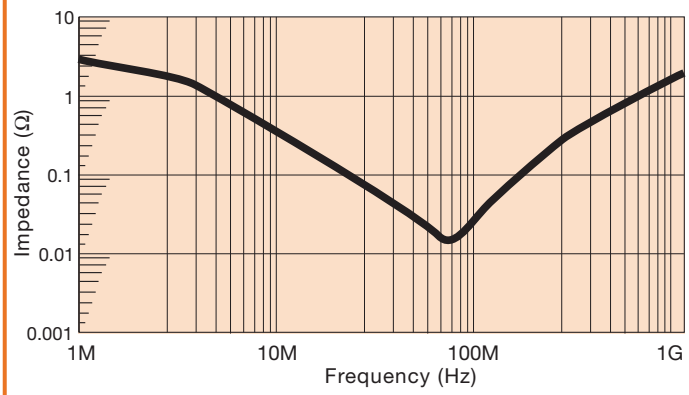
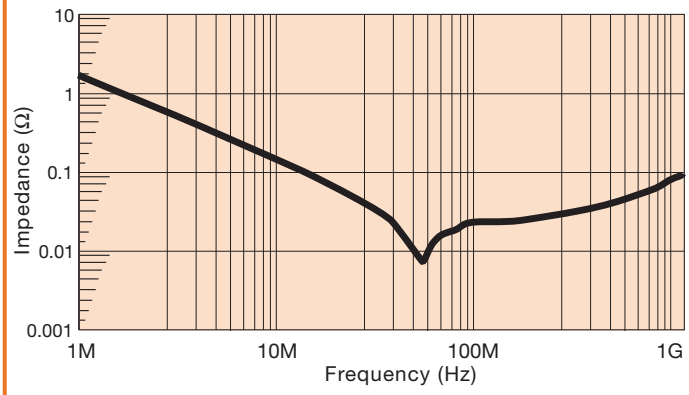
Low Inductance Chip Capacitors

Typical Impedance Characteristics

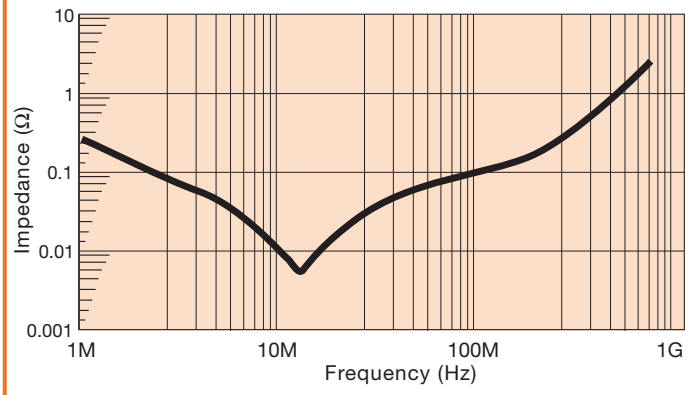
LIC0204X6S6R3-104MNP



LIC0306X7R100-104KNP



LIC0306X7S4R0-105MNP



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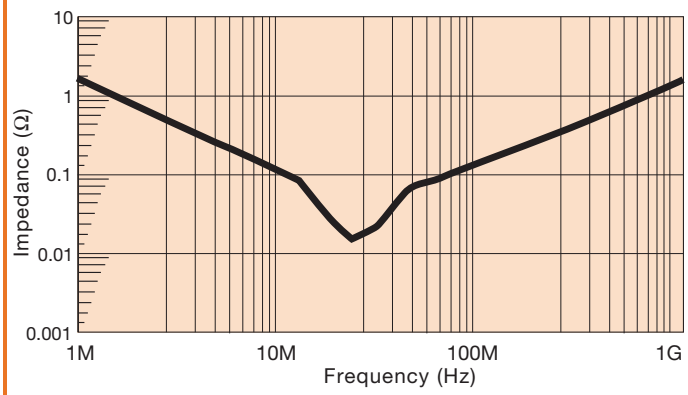
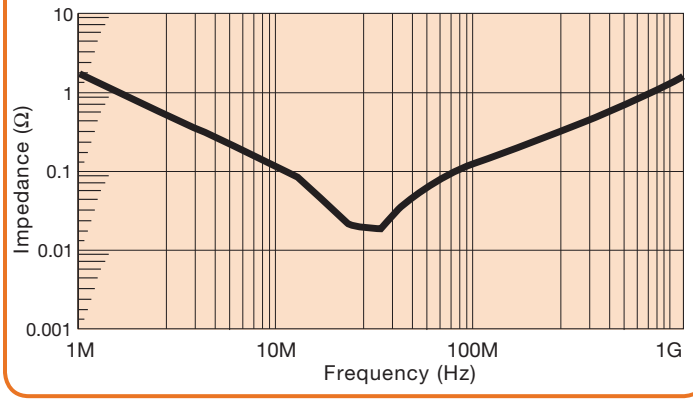
Typical Impedance Characteristics

LIC0508X7R250-104KNP



LIC0612X7R250-104KNP



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High - Q NP0 Chip Capacitors

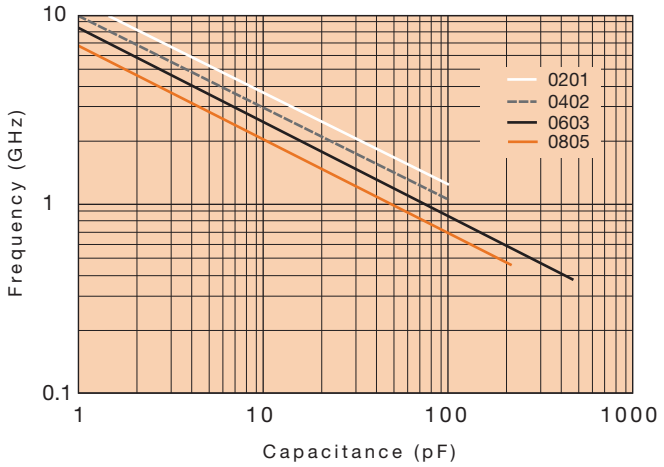
Features

- Capacitance available from 0.1 pF to 220 pF.
- Available in 0201, 0402, 0603 and 0805 sizes.
- Nickel Barrier / Tinned Termination.

Characteristics

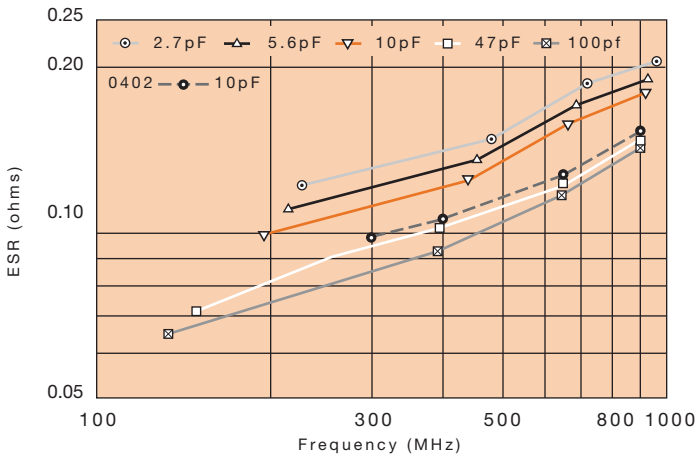
Temperature Coefficient:	0% ± 30PPM/°C, -55°C to 125°C
Dissipation Factor:	.0002 (0.02%) max, 25°C
0201 Quality Factor:	Q > 1,000 @ 1MHz, Typical 10,000
Quality Factor:	Q > 5,000 @ 1MHz
Ageing:	None
Insulation Resistance:	1,000 GΩ @ 25°C, 50 mA max 125°C IR is 10% of 25°C, 50 mA max
Dielectric Strength:	2.5 x WVDC Min., 25°C, 50 mA max
Test Parameters:	1MHz ± 50kHz, 1.0 ± 0.2 VRMS, 25°C

Typical Series Resonant Frequency



RF Performance Characteristics

0201, 0402, 0603 & 0805 Maximum ESR



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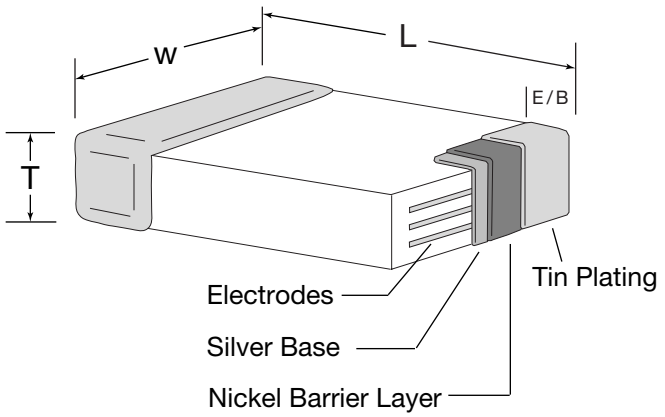
Voltage and Capacitance Range

CASE SIZE	Voltage	0.1pF	0.2pF	0.3pF	0.4pF	0.5pF	0.6pF	0.7pF	0.8pF	0.9pF	1.0pF	1.2pF	1.5pF	1.8pF	2.2pF	2.7pF	3.3pF	3.9pF	4.7pF	5.6pF	6.8pF	8.2pF	9.1pF	10pF	12pF	15pF	18pF	20pF	22pF	27pF	33pF	39pF	47pF	56pF	68pF	82pF	100pF	120pF	150pF	180pF	220pF	270pF	330pF	390pF
0201	25V		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■														
0402	25V	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■													
	50V	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■													
0603	50V		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■							
	100V		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■							
	200V		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■							
	250V		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■							
0805	100V					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
	200V					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
	250V					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				

Above selection indicates standard product offering. Contact your sales representative for C/V requirements which may not be shown.

Mechanical Characteristics



PHYSICAL DIMENSIONS	0201*	0402	0603	0805
LENGTH ± .010" (Millimeters)	.024 (0.6)	.040 (1.02±0.1)	.060 (1.52)	.080 (2.03)
WIDTH ± .010" (Millimeters)	.012 (0.3)	.020 (0.51±0.1)	.030 (0.76)	.050 (1.27)
THICKNESS MAX (Millimeters)	.012 (0.3)	.020 (0.51±0.1)	.035 (0.90)	.050 (1.27)
ENDBAND MAX (Millimeters)	.006 (0.15)	.010 (0.25)	.015 (0.38)	.020 (.508)

* 0201 dimensions are ± .001

How To Order

C0805
Series
See Chart

HQN
Dielectric
Code
High - Q NP0

201 —
Rated Voltage
250 = 25V
500 = 50V
101 = 100V
151 = 150V
201 = 200V
251 = 250V

101
Capacitance
(pico - Farads)
1st 2 digits
are significant
followed by number
of zeroes.

J
Tolerance
Code:
**A = ± 0.05 pF
*B = ± 0.1 pF
*C = ± 0.25 pF
*D = ± 0.5 pF
F = ± 1%
G = + 2%
J = ± 5%
K = ± 10%
*For capacitance values below 10 pF only
**For capacitance values of 2.2 pF and less

N
Termination
N = Nickel barrier,
Tinned Termination
G = Gold over
Nickel
Standard termination finish for this product is 100% matte Tin (Sn)

□
Marking
6 = EIA "J" Code
"Leave blank if
No Marking"

E
Packaging
E = Embossed Tape
P = Paper Tape

* 0402 size cannot be marked.

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Tantalum Chip Capacitors

TCM series

Standard Tantalum Chip Capacitors.

TCM Series Molded Chip Tantalum Capacitors are designed for use in thick film hybrid circuits and for direct mounting on printed circuit boards.

Fully-molded construction has good resistance to mechanical stress and moisture.

Specifications

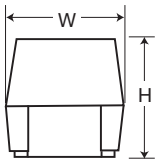
Operating Temperature Range		-55°C – +125°C
Maximum Operating Temperature at Rated Voltage		+85°C
Leakage Current		0.01CV or 0.5μA max.
Dissipation Factor at 20°C and 120 Hz		Cap. ≤ 1.0μF less than 4% Cap. ≥ 1.5μF less than 6%
Humidity Test	**Test Condition**	Temp.: 60°C, humidity: 90 – 95% RH, duration: 500 hrs
	Capacitance Change	Within 5% of the value before test
	Leakage Current	Not to exceed the value specified above
	Dissipation Factor	Not to exceed 125 % of the value specified above
High Temp. Load Test	**Test Condition**	Temp.: 85°C at rated voltage duration: 1,000 hrs
	Capacitance Change	Within 10% of the value before test
	Leakage Current	Not to exceed 125 % of the value specified above
	Dissipation Factor	Not to exceed 125 % of the value specified above
	Solderability	260°C 10 sec. (Dip or Reflow) Within 5% of recorded value before test.
Reliability		Failure rate: Less than 1%/1,000 hours (60% CL)

Standard Ratings and Case Codes

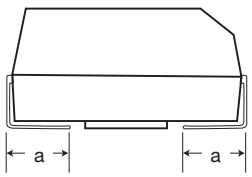
W.V. Cap. (μF) ▼	4	6.3	10	16	20	25	35	50
0.1							A	A
0.15							A	A,B
0.22							A	B
0.33						A	A	B
0.47						A	A,B	B,C
0.68					A	A	A,B	B,C
1				A	A	A,B	A,B	B,C
1.5			A	A	A	A,B	B,C	C,D
2.2		A	A,B	A	A,B	B,C	B,C	C,D
3.3	A	A	A	A,B	A,B	B,C	B,C	D
4.7	A	A	A,B	A,B,C	A,B,C	A,B,C	C,D	D
6.8	A	A,B	A,B	A,B,C	A,B,C	B,C	C,D	D,E
10	A,B	A,B	A,B,C	A,B,C	A,B,C	B,C,D	C,D	D,E
15	A,B	A,B,C	A,B,C	A,B,C	C,D	B,C,D	D,E	E
22	A,B,C	A,B,C	A,B,C	B,C,D	B,C,D	C,D	D,E	
33	A,B,C	A,B,C	A,B,C,D	C,D	C,D	C,D,E	E	
47	A,B,C	A,B,C,D	B,C,D	C,D	C,D	D,E	E	
68	B,C,D	A,B,C,D	B,C,D	C,D	D,E	D,E		
100	A,B,C,D	B,C,D	C,D	D,E	E	E		
150	B,C,D	C,D	C,D,E	D,E	E			
220	B	C,D,E	D,E	E				
330	C,D	D,E	D,E					
470	D,E	D,E	E					
680	D,E							
1000	E							

Dimensions

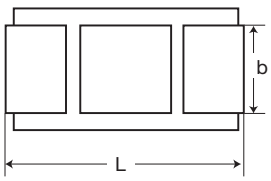
END VIEW



SIDE VIEW



BOTTOM VIEW



Unit: mm (inch)

Case Code	L	W	H	a	b
A	3.2 ± 0.2 (0.126 ± 0.008)	1.6 ± 0.2 (0.063 ± 0.008)	1.6 ± 0.2 (0.063 ± 0.008)	0.8 ± 0.3 (0.031 ± 0.012)	1.2 ± 0.2 (0.047 ± 0.008)
B	3.5 ± 0.2 (0.138 ± 0.008)	2.8 ± 0.2 (0.110 ± 0.008)	1.9 ± 0.2 (0.075 ± 0.008)	0.8 ± 0.3 (0.031 ± 0.012)	2.2 ± 0.2 (0.087 ± 0.008)
C	6.0 ± 0.3 (0.236 ± 0.012)	3.2 ± 0.3 (0.126 ± 0.012)	2.5 ± 0.3 (0.098 ± 0.012)	1.3 ± 0.3 (0.051 ± 0.012)	2.2 ± 0.2 (0.087 ± 0.008)
D	7.3 ± 0.3 (0.287 ± 0.012)	4.3 ± 0.3 (0.169 ± 0.012)	2.8 ± 0.3 (0.110 ± 0.012)	1.3 ± 0.3 (0.051 ± 0.012)	2.4 ± 0.2 (0.094 ± 0.008)
E	7.3 ± 0.3 (0.287 ± 0.012)	4.3 ± 0.3 (0.169 ± 0.012)	4.0 ± 0.3 (0.157 ± 0.012)	1.3 ± 0.3 (0.051 ± 0.012)	2.4 ± 0.2 (0.094 ± 0.008)

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TCM SERIES DATA TABLE
Standard Part Numbers & Data

Cap. µF	Case Code	Catalogue P/N	Max. DCL @ +25°C (µA)	Max. DF @ +25°C 120 Hz (%)	Max. ESR 100 kHz (Ω)
		4.0V DC			
3.3	A	TA004TCM335 K or M AR	0.5	6	8
4.7	A	TA004TCM475 K or M AR	0.5	6	8
6.8	A	TA004TCM685 K or M AR	0.5	6	6
10	A	TA004TCM106 K or M AR	0.5	6	6
10	B	TA004TCM106 K or M BR	0.5	6	3.5
15	A	TA004TCM156 K or M AR	0.6	6	4
15	B	TA004TCM156 K or M BR	0.6	6	3.5
22	A	TA004TCM226 K or M AR	0.9	6	4
22	B	TA004TCM226 K or M BR	0.9	6	3.5
22	C	TA004TCM226 K or M CR	0.9	6	1.8
33	A	TA004TCM336 K or M AR	1.3	6	4
33	B	TA004TCM336 K or M BR	1.3	6	3.5
33	C	TA004TCM336 K or M CR	1.3	6	1.8
47	A	TA004TCM476 K or M AR	1.9	12	2.5
47	B	TA004TCM476 K or M BR	1.9	6	3
47	C	TA004TCM476 K or M CR	1.9	6	1.8
68	B	TA004TCM686 K or M BR	2.7	6	3.5
68	C	TA004TCM686 K or M CR	2.7	6	1.6
68	D	TA004TCM686 K or M DR	2.7	6	0.8
100	A	TA004TCM107 K or M AR	4	30	4
100	B	TA004TCM107 K or M BR	4	8	0.9
100	C	TA004TCM107 K or M CR	4	8	1.2
100	D	TA004TCM107 K or M DR	4	8	0.8
150	B	TA004TCM157 K or M BR	6	12	2
150	C	TA004TCM157 K or M CR	6	8	1.2
150	D	TA004TCM157 K or M DR	6	8	0.8
220	B	TA004TCM227 K or M BR	8.8	18	0.5
330	C	TA004TCM337 K or M CR	13.2	10	0.9
330	D	TA004TCM337 K or M DR	13.2	8	0.7
470	D	TA004TCM477 K or M DR	18.8	8	0.8
470	E	TA004TCM477 K or M ER	18.8	8	0.5
680	D	TA004TCM687 K or M DR	27.2	12	0.5
680	E	TA004TCM687 K or M ER	27.2	12	0.5
1000	E	TA004TCM108 K or M ER	40	12	0.5

Tantalum Chip Capacitors

TCM SERIES DATA TABLE
Standard Part Numbers & Data

Cap. µF	Case Code	Catalogue P/N	Max. DCL @ +25°C (µA)	Max. DF @ +25°C 120 Hz (%)	Max. ESR 100 kHz (Ω)
		6.3V DC			
2.2	A	TA006TCM225 K or M AR	0.5	6	8
3.3	A	TA006TCM335 K or M AR	0.5	6	8
4.7	A	TA006TCM475 K or M AR	0.5	6	6
6.8	A	TA006TCM685 K or M AR	0.5	6	6
6.8	B	TA006TCM685 K or M BR	0.5	6	3.5
10	A	TA006TCM106 K or M AR	0.6	6	4
10	B	TA006TCM106 K or M BR	0.6	6	3.5
15	A	TA006TCM156 K or M AR	0.9	6	3.5
15	B	TA006TCM156 K or M BR	0.9	6	3.5
15	C	TA006TCM156 K or M CR	0.9	6	1.8
22	A	TA006TCM226 K or M AR	1.4	6	4
22	B	TA006TCM226 K or M BR	1.4	6	3.5
22	C	TA006TCM226 K or M CR	1.4	6	1.8
33	A	TA006TCM336 K or M AR	2	12	2.5
33	B	TA006TCM336 K or M BR	2	6	3
33	C	TA006TCM336 K or M CR	2	6	1.8
47	A	TA006TCM476 K or M AR	3	12	3.5
47	B	TA006TCM476 K or M BR	2.9	6	2
47	C	TA006TCM476 K or M CR	2.9	6	1.6
47	D	TA006TCM476 K or M DR	2.9	6	0.8
68	A	TA006TCM686 K or M AR	5	30	4
68	B	TA006TCM686 K or M BR	4.1	8	0.9
68	C	TA006TCM686 K or M CR	4.1	6	1.2
68	D	TA006TCM686 K or M DR	4.1	6	0.8
100	B	TA006TCM107 K or M BR	6.3	15	3
100	C	TA006TCM107 K or M CR	6	8	0.9
100	D	TA006TCM107 K or M DR	6	8	0.8
150	C	TA006TCM157 K or M CR	9	8	1.2
150	D	TA006TCM157 K or M DR	9	8	0.7
220	C	TA006TCM227 K or M CR	13.2	10	1.2
220	D	TA006TCM227 K or M DR	13.2	8	0.7
220	E	TA006TCM227 K or M ER	13.2	8	0.7
330	D	TA006TCM337 K or M DR	19.8	8	0.4
330	E	TA006TCM337 K or M ER	19.8	8	0.4
470	D	TA006TCM477 K or M DR	28.2	12	0.4
470	E	TA006TCM477 K or M ER	28.2	10	0.4

Note: All 6.3V Tantalums have P/N callouts as "006" but are rated at 6.3V.

5900 Shepherd Mountain Cove • Austin, TX 78730
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e-mail: sales@venkel.com • www.venkel.com

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TCM SERIES DATA TABLE
Standard Part Numbers & Data

Cap. µF	Case Code	Catalogue P/N	Max. DCL @ +25°C (µA)	Max. DF @ +25°C 120 Hz (%)	Max. ESR 100 kHz (Ω)
		10V DC			
1.5	A	TA010TCM155 K or M AR	0.5	6	8
2.2	A	TA010TCM225 K or M AR	0.5	6	8
2.2	B	TA010TCM225 K or M BR	0.5	5	3.5
3.3	A	TA010TCM335 K or M AR	0.5	6	6
4.7	A	TA010TCM475 K or M AR	0.5	6	5
4.7	B	TA010TCM475 K or M BR	0.5	6	3.5
6.8	A	TA010TCM685 K or M AR	0.7	6	4
6.8	B	TA010TCM685 K or M BR	0.7	6	3.5
10	A	TA010TCM106 K or M AR	1	6	4
10	B	TA010TCM106 K or M BR	1	6	3.5
10	C	TA010TCM106 K or M CR	1	6	1.8
15	A	TA010TCM156 K or M AR	1.5	8	6
15	B	TA010TCM156 K or M BR	1.5	6	2.8
15	C	TA010TCM156 K or M CR	1.5	6	1.8
22	A	TA010TCM226 K or M AR	2.2	10	6
22	B	TA010TCM226 K or M BR	2.2	6	2.4
22	C	TA010TCM226 K or M CR	2.2	6	1.8
33	A	TA010TCM336 K or M AR	3.3	15	6
33	B	TA010TCM336 K or M BR	3.3	6	1.8
33	C	TA010TCM336 K or M CR	3.3	6	1.6
33	D	TA010TCM336 K or M DR	3.3	6	0.8
47	B	TA010TCM476 K or M BR	4.7	8	1
47	C	TA010TCM476 K or M CR	4.7	6	1.2
47	D	TA010TCM476 K or M DR	4.7	6	0.8
68	B	TA010TCM686 K or M BR	6.8	10	3
68	C	TA010TCM686 K or M CR	6.8	6	1.2
68	D	TA010TCM686 K or M DR	6.8	6	0.8
100	C	TA010TCM107 K or M CR	10	8	1.2
100	D	TA010TCM107 K or M DR	10	8	0.7
150	C	TA010TCM157 K or M CR	15	10	0.9
150	D	TA010TCM157 K or M DR	15	8	0.7
150	E	TA010TCM157 K or M ER	15	8	0.7
220	D	TA010TCM227 K or M DR	22	8	0.5
220	E	TA010TCM227 K or M ER	22	8	0.5
330	D	TA010TCM337 K or M DR	33	10	0.5
330	E	TA010TCM337 K or M ER	33	10	0.5
470	E	TA010TCM477 K or M ER	47	10	0.2

Tantalum Chip Capacitors

TCM SERIES DATA TABLE
Standard Part Numbers & Data

Cap. µF	Case Code	Catalogue P/N	Max. DCL @ +25°C (µA)	Max. DF @ +25°C 120 Hz (%)	Max. ESR 100 kHz (Ω)
		16V DC			
1	A	TA016TCM105 K or M AR	0.5	4	10
1.5	A	TA016TCM155 K or M AR	0.5	6	8
2.2	A	TA016TCM225 K or M AR	0.5	6	6
3.3	A	TA016TCM335 K or M AR	0.5	6	5
3.3	B	TA016TCM335 K or M BR	0.5	6	3.5
4.7	A	TA016TCM475 K or M AR	0.8	6	4
4.7	B	TA016TCM475 K or M BR	0.8	6	3.5
4.7	C	TA016TCM475 K or M CR	0.8	6	2.4
6.8	A	TA016TCM685 K or M AR	1.1	6	3.5
6.8	B	TA016TCM685 K or M BR	1.1	6	2.5
6.8	C	TA016TCM685 K or M CR	1.1	6	1.9
10	A	TA016TCM106 K or M AR	1.6	8	7
10	B	TA016TCM106 K or M BR	1.6	6	2.8
10	C	TA016TCM106 K or M CR	1.6	6	1.8
15	A	TA016TCM156 K or M AR	2.4	8	3.5
15	B	TA016TCM156 K or M BR	2.4	6	2.5
15	C	TA016TCM156 K or M CR	2.5	6	1.8
22	B	TA016TCM226 K or M BR	3.6	6	2.2
22	C	TA016TCM226 K or M CR	3.6	6	1.6
22	D	TA016TCM226 K or M DR	3.6	6	0.8
33	C	TA016TCM336 K or M CR	5.3	6	1.2
33	D	TA016TCM336 K or M DR	5.3	6	0.8
47	C	TA016TCM476 K or M CR	7.5	6	1.2
47	D	TA016TCM476 K or M DR	7.5	6	0.8
68	C	TA016TCM686 K or M CR	10.9	12	1.2
68	D	TA016TCM686 K or M DR	10.9	6	0.7
100	D	TA016TCM107 K or M DR	16	8	0.7
100	E	TA016TCM107 K or M ER	16	8	0.7
150	D	TA016TCM157 K or M DR	24	12	0.7
150	E	TA016TCM157 K or M ER	24	8	0.5
220	E	TA016TCM227 K or M ER	35.2	10	0.5

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TCM SERIES DATA TABLE
Standard Part Numbers & Data

Cap. µF	Case Code	Catalogue P/N	Max. DCL @ +25°C (µA)	Max. DF @ +25°C 120 Hz (%)	Max. ESR 100 kHz (Ω)
		20V DC			
0.68	A	TA020TCM684 K or M AR	0.5	4	12
1	A	TA020TCM105 K or M AR	0.5	4	9
1.5	A	TA020TCM155 K or M AR	0.5	6	6.5
2.2	A	TA020TCM225 K or M AR	0.5	6	7
2.2	B	TA020TCM225 K or M BR	0.5	6	3.5
3.3	A	TA020TCM335 K or M AR	0.7	6	4.5
3.3	B	TA020TCM335 K or M BR	0.7	6	3
4.7	A	TA020TCM475 K or M AR	1	6	4
4.7	B	TA020TCM475 K or M BR	1	6	3
4.7	C	TA020TCM475 K or M CR	1	6	2.4
6.8	A	TA020TCM685 K or M AR	1.4	8	6
6.8	B	TA020TCM685 K or M BR	1.4	6	2.5
6.8	C	TA020TCM685 K or M CR	1.4	6	1.9
10	A	TA020TCM106 K or M AR	2	10	5
10	B	TA020TCM106 K or M BR	2	6	2.1
10	C	TA020TCM106 K or M CR	2	6	1.8
15	C	TA020TCM156 K or M CR	3	6	1.7
15	D	TA020TCM156 K or M DR	3	6	1
22	B	TA020TCM226 K or M BR	4.4	8	4
22	C	TA020TCM226 K or M CR	4.4	6	1.2
22	D	TA020TCM226 K or M DR	4.4	6	0.8
33	C	TA020TCM336 K or M CR	6.6	6	1.2
33	D	TA020TCM336 K or M DR	6.6	6	0.8
47	D	TA020TCM476 K or M DR	9.4	6	0.7
68	D	TA020TCM686 K or M DR	13.6	8	0.7
68	E	TA020TCM686 K or M ER	13.6	6	0.7
100	E	TA020TCM107 K or M ER	20	8	0.5
150	E	TA020TCM157 K or M ER	30	10	0.5

Tantalum Chip Capacitors

TCM SERIES DATA TABLE
Standard Part Numbers & Data

Cap. µF	Case Code	Catalogue P/N	Max. DCL @ +25°C (µA)	Max. DF @ +25°C 120 Hz (%)	Max. ESR 100 kHz (Ω)
		25V DC			
0.33	A	TA025TCM334 K or M AR	0.5	4	15
0.47	A	TA025TCM474 K or M AR	0.5	4	14
0.68	A	TA025TCM684 K or M AR	0.5	4	10
1	A	TA025TCM105 K or M AR	0.5	4	8
1	B	TA025TCM105 K or M BR	0.5	4	5
1.5	A	TA025TCM155 K or M AR	0.5	6	7.5
1.5	B	TA025TCM155 K or M BR	0.5	6	5
2.2	B	TA025TCM225 K or M BR	0.6	6	4.5
2.2	C	TA025TCM225 K or M CR	0.6	6	3.5
3.3	B	TA025TCM335 K or M BR	0.9	6	3.5
3.3	C	TA025TCM335 K or M CR	0.9	6	2.5
4.7	A	TA025TCM475 K or M AR	1.2	8	6
4.7	B	TA025TCM475 K or M BR	1.2	6	1.5
4.7	C	TA025TCM475 K or M CR	1.2	6	2.4
6.8	B	TA025TCM685 K or M BR	1.7	8	2.8
6.8	C	TA025TCM685 K or M CR	1.7	6	1.9
10	B	TA025TCM106 K or M BR	2.5	8	3
10	C	TA025TCM106 K or M CR	2.5	6	1.5
10	D	TA025TCM106 K or M DR	2.5	6	1
15	B	TA025TCM156 K or M BR	3.8	8	4
15	C	TA025TCM156 K or M CR	3.8	6	1.5
15	D	TA025TCM156 K or M DR	3.8	6	1
22	C	TA025TCM226 K or M CR	5.5	6	1.4
22	D	TA025TCM226 K or M DR	5.5	6	0.8
33	C	TA025TCM336 K or M CR	8.3	10	1.2
33	D	TA025TCM336 K or M DR	8.3	6	0.7
33	E	TA025TCM336 K or M ER	8.3	6	0.7
47	D	TA025TCM476 K or M DR	11.8	10	0.7
47	E	TA025TCM476 K or M ER	11.8	6	0.7
68	D	TA025TCM686 K or M DR	17	10	0.7
68	E	TA025TCM686 K or M ER	17	8	0.7
100	E	TA025TCM107 K or M ER	25	8	0.3

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e-mail: sales@venkel.com • www.venkel.com

VENKEL LTD.

TCM SERIES DATA TABLE
Standard Part Numbers & Data

Cap. µF	Case Code	Catalogue P/N	Max. DCL @ +25°C (µA)	Max. DF @ +25°C 120 Hz (%)	Max. ESR 100 kHz (Ω)
		35V DC			
0.1	A	TA035TCM104 K or M AR	0.5	4	20
0.15	A	TA035TCM154 K or M AR	0.5	4	19
0.22	A	TA035TCM224 K or M AR	0.5	4	18
0.33	A	TA035TCM334 K or M AR	0.5	4	15
0.47	A	TA035TCM474 K or M AR	0.5	4	12
0.47	B	TA035TCM474 K or M BR	0.5	4	8
0.68	A	TA035TCM684 K or M AR	0.5	4	8
0.68	B	TA035TCM684 K or M BR	0.5	4	6.5
1	A	TA035TCM105 K or M AR	0.5	4	7.5
1	B	TA035TCM105 K or M BR	0.5	4	5
1.5	B	TA035TCM155 K or M BR	0.5	6	5
1.5	C	TA035TCM155 K or M CR	0.5	6	4.5
2.2	B	TA035TCM225 K or M BR	0.8	6	4
2.2	C	TA035TCM225 K or M CR	0.8	6	3.5
3.3	B	TA035TCM335 K or M BR	1.2	6	3.5
3.3	C	TA035TCM335 K or M CR	1.2	6	2.5
4.7	C	TA035TCM475 K or M CR	1.7	6	2.2
4.7	D	TA035TCM475 K or M DR	1.7	6	1.5
6.8	C	TA035TCM685 K or M CR	2.4	6	1.8
6.8	D	TA035TCM685 K or M DR	2.4	6	1.3
10	C	TA035TCM106 K or M CR	3.5	6	1.6
10	D	TA035TCM106 K or M DR	3.5	6	1
15	D	TA035TCM156 K or M DR	5.3	6	0.8
15	E	TA035TCM156 K or M ER	5.3	6	0.9
22	D	TA035TCM226 K or M DR	7.7	6	0.7
22	E	TA035TCM226 K or M ER	7.7	6	0.7
33	E	TA035TCM336 K or M ER	11.6	6	0.6
47	E	TA035TCM476 K or M ER	16.5	8	0.6

Tantalum Chip Capacitors

TCM SERIES DATA TABLE
Standard Part Numbers & Data

Cap. µF	Case Code	Catalogue P/N	Max. DCL @ +25°C (µA)	Max. DF @ +25°C 120 Hz (%)	Max. ESR 100 kHz (Ω)
		50V DC			
0.1	A	TA050TCM104 K or M AR	0.5	4	20
0.15	A	TA050TCM154 K or M AR	0.5	4	15
0.15	B	TA050TCM154 K or M BR	0.5	4	16
0.22	B	TA050TCM224 K or M BR	0.5	4	14
0.33	B	TA050TCM334 K or M BR	0.5	4	10
0.47	B	TA050TCM474 K or M BR	0.5	4	9
0.47	C	TA050TCM474 K or M CR	0.5	4	8
0.68	B	TA050TCM684 K or M BR	0.5	4	8
0.68	C	TA050TCM684 K or M CR	0.5	4	7
1	B	TA050TCM105 K or M BR	0.5	6	6
1	C	TA050TCM105 K or M CR	0.5	4	5.5
1.5	C	TA050TCM155 K or M CR	0.8	6	4.5
1.5	D	TA050TCM155 K or M DR	0.8	6	3.5
2.2	C	TA050TCM225 K or M CR	1.1	6	3
2.2	D	TA050TCM225 K or M DR	1.1	6	2.5
3.3	D	TA050TCM335 K or M DR	1.7	6	2
4.7	D	TA050TCM475 K or M DR	2.4	6	1.4
6.8	D	TA050TCM685 K or M DR	3.4	6	1
6.8	E	TA050TCM685 K or M ER	3.5	6	1
10	D	TA050TCM106 K or M DR	5	6	0.8
10	E	TA050TCM106 K or M ER	5	6	0.7
15	E	TA050TCM156 K or M ER	7.5	8	0.7
22	E	TA050TCM226 K or M ER	11	10	0.6

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VENKEL LTD.

Tantalum Chip Capacitors

TCR series

Low ESR & High Ripple Current

Low ESR & High Ripple Current. High Resistance against Rush current.
Lower failure even at low impedance Circuits. Failure Rate: 0.5% or less/1000 hrs.
Capacitance up to 1000µF in E case.

Specifications

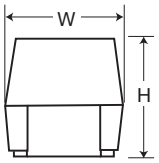
Operating Temperature Range	-55°~+125°C
Maximum Operating Temperature at Rated Voltage	+85°C
Capacitance Tolerance	±20% (M), ±10% (K) at 120Hz
Dissipation Factor (Tan)	As per the following table
ESR & Maximum Ripple Current	As per the following table
DC Leakage Current	As per the following table
Resistance to Rush Current	Rated Voltage applied, 5A/ON • OFF 10,000 cycle
Solderability	260°C 10 Sec. (Dip or Reflow) Within 5% of recorded value before test.
Humidity Test	60°C, 90 – 95%RH 5000 hrs.
High Temp Load Test	85°C, Rated Voltage Applied for 2,000 hrs. or 125°C, Derated Voltage Applied for 2,000 hrs.
Failure Rate	0.5% or less/1,000 hrs after solder (60% CL)
Conformity	JIS-C-5143 Performance HB, EIA-535BAAC etc.

Standard Ratings and Case Codes

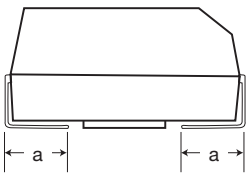
W.V. ► / Cap. (µF) ▼	4	6.3	10	16	20	25	35	50
0.47						A	B	
0.68								
1					A		A,B	C
1.5								
2.2				A		C	B,C	D
3.3				A		C	B,C	D
4.7			A,B	A,B		C	B,C	D,E
6.8			A,B	C		B	D,E	D
10			B		B,C	C	D,E	E
15			B,C	A,B	C,D	D,E	D,E	E
22			C	C	D	C,D,E	D,E	
33			B	C,D	D	D,E	E	
47		B,C	B,D	C,D	D,E	D,E	E	
68		D	B,C,D,E	D	D,E	D,E		
100	B	B,C,D	D,E	D,E	E			
150	B,C	C,D,E	D,E	D,E				
220	D	C,D,E	D,E	E				
330	C,D	D,E	D,E					
470	D,E	D,E	E					
680	E							
1000								

Dimensions

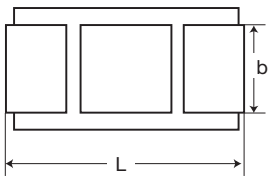
END VIEW



SIDE VIEW



BOTTOM VIEW



Unit: mm (inch)

Case Code	L	W	H	a	b
A	3.2 ± 0.2 (0.126 ± 0.008)	1.6 ± 0.2 (0.063 ± 0.008)	1.6 ± 0.2 (0.063 ± 0.008)	0.8 ± 0.3 (0.031 ± 0.012)	1.2 ± 0.2 (0.047 ± 0.008)
B	3.5 ± 0.2 (0.138 ± 0.008)	2.8 ± 0.2 (0.110 ± 0.008)	1.9 ± 0.2 (0.075 ± 0.008)	0.8 ± 0.3 (0.031 ± 0.012)	2.2 ± 0.2 (0.087 ± 0.008)
C	6.0 ± 0.3 (0.236 ± 0.012)	3.2 ± 0.3 (0.126 ± 0.012)	2.5 ± 0.3 (0.098 ± 0.012)	1.3 ± 0.3 (0.051 ± 0.012)	2.2 ± 0.2 (0.087 ± 0.008)
D	7.3 ± 0.3 (0.287 ± 0.012)	4.3 ± 0.3 (0.169 ± 0.012)	2.8 ± 0.3 (0.110 ± 0.012)	1.3 ± 0.3 (0.051 ± 0.012)	2.4 ± 0.2 (0.094 ± 0.008)
E	7.3 ± 0.3 (0.287 ± 0.012)	4.3 ± 0.3 (0.169 ± 0.012)	4.0 ± 0.3 (0.157 ± 0.012)	1.3 ± 0.3 (0.051 ± 0.012)	2.4 ± 0.2 (0.094 ± 0.008)

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Tantalum Chip Capacitors

TCR SERIES DATA TABLE (Low ESR)
Standard Part Numbers & Data

Cap. µF	Case Code	Catalogue P/N	Max. DCL @ +25°C (µA)	Max. DF @ +25°C 120 Hz (%)	Max. ESR 100 kHz (Ω)	Max. Ripple Current (mA@25°C)
4.0V DC						
100	B	TA4R0TCR107 K or M BR	4	8	0.5	412
150	B	TA4R0TCR157 K or M BR	6	12	0.9	307
150	C	TA4R0TCR157 K or M CR	6	8	0.25	663
220	D	TA4R0TCR227 K or M DR	8	8	0.1	1225
330	C	TA4R0TCR337 K or M CR	13.2	12	0.7	396
330	D	TA4R0TCR337 K or M DR	13.2	8	0.05	1826
470	D	TA4R0TCR477 K or M DR	18.8	12	0.1	1225
470	E	TA4R0TCR477 K or M ER	18.8	8	0.1	1285
1000	E	TA4R0TCR108 K or M ER	40	12	0.07	1535
6.3V DC						
47	B	TA6R3TCR476 K or M BR	3	6	0.45	435
47	C	TA6R3TCR476 K or M CR	2.9	6	0.25	663
68	D	TA6R3TCR686 K or M DR	3.3	4	0.18	926
100	B	TA6R3TCR107 K or M BR	6.3	15	0.7	348
100	C	TA6R3TCR107 K or M CR	6	8	0.15	856
100	D	TA6R3TCR107 K or M DR	6	8	0.15	1000
150	C	TA6R3TCR157 K or M CR	9	8	0.2	742
150	D	TA6R3TCR157 K or M DR	9	6	0.13	1095
150	E	TA6R3TCR157 K or M ER	7.2	6	0.1	1285
220	C	TA6R3TCR227 K or M CR	13.9	10	0.23	700
220	D	TA6R3TCR227 K or M DR	13.9	8	0.1	1225
220	E	TA6R3TCR227 K or M ER	13.2	8	0.1	1285
330	D	TA6R3TCR337 K or M DR	20.8	8	0.1	1225
330	E	TA6R3TCR337 K or M ER	19.8	8	0.1	1285
470	D	TA6R3TCR477 K or M DR	29.6	12	0.13	1095
470	E	TA6R3TCR477 K or M ER	28.2	10	0.07	1593

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TCR SERIES DATA TABLE (Low ESR)
Standard Part Numbers & Data

Cap. µF	Case Code	Catalogue P/N	Max. DCL @ +25°C (µA)	Max. DF @ +25°C 120 Hz (%)	Max. ESR 100 kHz (Ω)	Max. Ripple Current (mA@25°C)
10V DC						
4.7	A	TA010TCR475 K or M AR	0.5	6	1.3	240
4.7	B	TA010TCR475 K or M BR	0.5	15	1.3	256
6.8	A	TA010TCR685 K or M AR	1	6	1.8	204
6.8	B	TA010TCR685 K or M BR	1	6	0.9	307
10	B	TA010TCR106 K or M BR	1	6	0.75	337
15	B	TA010TCR156 K or M BR	1.5	6	0.5	412
15	C	TA010TCR156 K or M CR	1.5	6	0.48	481
22	C	TA010TCR226 K or M CR	2.2	6	0.35	565
33	B	TA010TCR336 K or M BR	3.3	6	0.45	435
47	B	TA010TCR476 K or M BR	4.7	6	0.5	412
47	D	TA010TCR476 K or M DR	3.8	4	0.2	866
68	B	TA010TCR686 K or M BR	6.8	10	0.9	307
68	C	TA010TCR686 K or M CR	6.8	6	0.23	700
68	D	TA010TCR686 K or M DR	6.8	6	0.15	1000
68	E	TA010TCR686 K or M ER	5.4	4	0.15	1049
100	D	TA010TCR107 K or M DR	10	8	0.1	1220
100	E	TA010TCR107 K or M ER	8	6	0.1	1285
150	D	TA010TCR157 K or M DR	15	8	0.1	1225
150	E	TA010TCR157 K or M ER	15	8	0.1	1285
220	D	TA010TCR227 K or M DR	22	8	0.13	1095
220	E	TA010TCR227 K or M ER	22	8	0.1	1285
330	D	TA010TCR337 K or M DR	33	10	0.15	1000
330	E	TA010TCR337 K or M ER	33	10	0.1	1284
470	E	TA010TCR477 K or M ER	47	10	0.2	908
16V DC						
2.2	A	TA016TCR225 K or M AR	0.5	6	4	150
3.3	A	TA016TCR335 K or M AR	0.5	6	3	158
4.7	A	TA016TCR475 K or M AR	0.8	6	2	194
4.7	B	TA016TCR475 K or M BR	0.8	6	0.7	348
6.8	C	TA016TCR685 K or M CR	1.1	6	0.75	383
15	A	TA016TCR156 K or M AR	2.4	8	2.5	173
15	B	TA016TCR156 K or M BR	2.4	6	0.8	326
22	C	TA016TCR226K or M CR	3.6	6	.35	490
33	C	TA016TCR336 K or M CR	5.3	6	0.28	632
33	D	TA016TCR336 K or M DR	4.2	4	0.23	816
47	C	TA016TCR476 K or M CR	7.5	6	0.35	561
47	D	TA016TCR476 K or M DR	7.5	6	0.15	1000
68	D	TA016TCR686 K or M DR	10.9	6	0.15	1000
100	D	TA016TCR107 K or M DR	16	8	0.13	1095

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Tantalum Chip Capacitors

TCR SERIES DATA TABLE (Low ESR)
Standard Part Numbers & Data

Cap. µF	Case Code	Catalogue P/N	Max. DCL @ +25°C (µA)	Max. DF @ +25°C 120 Hz (%)	Max. ESR 100 kHz (Ω)	Max. Ripple Current (mA@25°C)
16V DC (continued)						
100	E	TA016TCR107 K or M ER	16	8	0.1	1285
150	D	TA016TCR157 K or M DR	24	8	0.15	1000
150	E	TA016TCR157 K or M ER	24	8	0.1	1285
220	E	TA016TCR227 K or M ER	35.2	8	0.1	1284
20V DC						
1	A	TA020TCR105 K or M AR	0.2	4	3	158
10	B	TA020TCR106 K or M BR	2	6	1	292
10	C	TA020TCR106 K or M CR	2	6	0.48	481
15	C	TA020TCR156 K or M CR	3	6	0.38	542
15	D	TA020TCR156 K or M DR	2.4	4	0.28	738
22	D	TA020TCR226 K or M DR	3.5	4	0.23	816
33	D	TA020TCR336 K or M DR	6.6	6	0.2	866
47	D	TA020TCR476 K or M DR	9.4	6	0.18	926
47	E	TA020TCR476 K or M ER	7.5	4	0.15	1049
68	D	TA020TCR686 K or M DR	13.6	8	0.15	1000
68	E	TA020TCR686 K or M ER	13.6	6	0.15	1049
100	E	TA020TCR107 K or M ER	20	8	0.15	1049
25V DC						
0.47	A	TA025TCR474 K or M AR	0.5	4	4.5	129
2.2	C	TA025TCR225 K or M CR	0.6	6	1.3	291
3.3	C	TA025TCR335 K or M CR	0.9	6	0.75	383
4.7	C	TA025TCR475 K or M CR	1.2	6	0.58	437
6.8	B	TA025TCR685 K or M BR	1.7	6	1.5	238
10	C	TA025TCR106 K or M CR	2.5	6	0.45	494
15	D	TA025TCR156 K or M DR	3.8	6	0.28	738
15	E	TA025TCR156 K or M ER	3	4	0.2	908
22	C	TA025TCR226 K or M CR	5.5	6	0.9	350
22	D	TA025TCR226 K or M DR	5.5	6	0.2	866
22	E	TA025TCR226 K or M ER	4.4	4	0.23	856
33	D	TA025TCR336 K or M DR	8.3	6	0.3	707
33	E	TA025TCR336 K or M ER	8.3	4	0.2	908
47	D	TA025TCR476 K or M DR	11.8	10	0.25	775
47	E	TA025TCR476 K or M ER	11.8	6	0.2	908
68	D	TA025TCR686 K or M DR	17	10	0.2	866
68	E	TA025TCR686 K or M ER	17	8	0.2	908

All components in this section are RoHS compliant per the EU directives and definitions.

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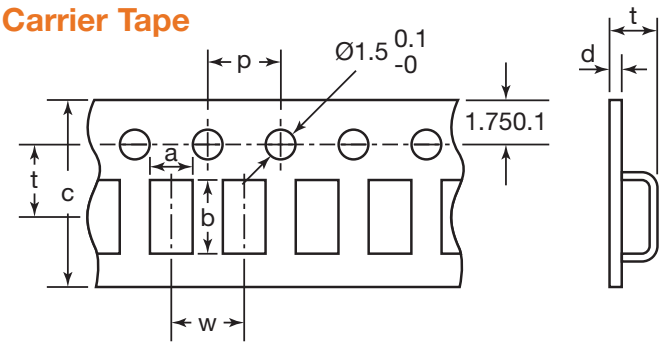
TCR SERIES DATA TABLE (Low ESR)
Standard Part Numbers & Data

Cap. µF	Case Code	Catalogue P/N	Max. DCL @ +25°C (µA)	Max. DF @ +25°C 120 Hz (%)	Max. ESR 100 kHz (Ω)	Max. Ripple Current (mA@25°C)
35V DC						
0.47	B	TA035TCR474 K or M BR	0.5	4	2.2	197
1	A	TA035TCR105 K or M AR	0.4	4	3	158
1	B	TA035TCR105 K or M BR	0.5	4	1.7	224
2.2	B	TA035TCR225 K or M BR	0.8	6	1.5	238
2.2	C	TA035TCR225 K or M CR	0.8	6	0.75	383
3.3	B	TA035TCR335 K or M BR	1.2	6	0.9	307
3.3	C	TA035TCR335 K or M CR	1.2	6	0.6	428
4.7	B	TA035TCR475 K or M BR	1.6	6	0.9	292
4.7	C	TA035TCR475 K or M CR	1.7	6	0.6	428
6.8	D	TA035TCR685 K or M DR	2.4	6	0.4	612
6.8	E	TA035TCR685 K or M ER	1.9	4	0.3	742
10	D	TA035TCR106 K or M DR	3.5	6	0.3	707
10	E	TA035TCR106 K or M ER	2.8	4	0.25	812
15	D	TA035TCR156 K or M DR	5.3	6	0.3	707
15	E	TA035TCR156 K or M ER	5.3	6	0.23	856
22	D	TA035TCR226 K or M DR	7.7	6	0.3	707
22	E	TA035TCR226 K or M ER	7.7	6	0.28	775
33	E	TA035TCR336 K or M ER	11.6	6	0.2	1000
47	E	TA035TCR476 K or M ER	16.5	8	0.3	742
50V DC						
1	C	TA050TCR105 K or M CR	0.5	4	1.3	291
2.2	D	TA050TCR225 K or M DR	1.1	6	0.6	500
3.3	D	TA050TCR335 K or M DR	1.7	6	0.7	463
4.7	D	TA050TCR475 K or M DR	2.4	6	0.3	707
4.7	E	TA050TCR475 K or M ER	1.9	4	0.3	742
6.8	D	TA050TCR685 K or M DR	3.4	8	0.3	700
10	E	TA050TCR106 K or M ER	5	6	0.3	741
15	E	TA050TCR156 K or M ER	7.5	8	0.3	742

Taping Specifications

Carrier Tape



Carrier Tape Dimensions

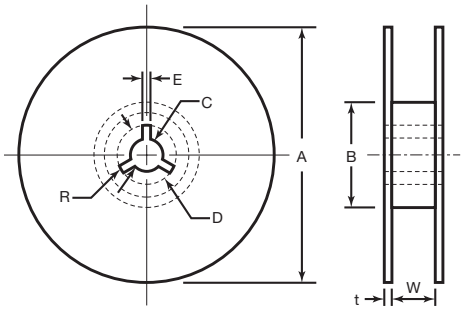
(Unit: mm)

CASE	a ± 0.1	b ± 0.1	c ± 0.2	t ± 0.1	p ± 0.1	w ± 0.1	d
A	1.9	3.9	8.0	2.0	4.0	4.0	0.2
B	3.1	3.9	8.0	2.3	4.0	4.0	0.2
C	3.9	6.3	12.0	2.7	4.0	8.0	0.3
D	4.6	7.7	12.0	3.3	4.0	8.0	0.3
E	4.6	7.7	12.0	4.2	4.0	8.0	0.3

Quantity per reel

Case Size	Reel Size	
	7"	13"
A	2,000 pcs	10,000 pcs
B	2,000 pcs	7,500 pcs
C, D, E	500 pcs	2,500 pcs
E	400 pcs	2,000 pcs

Reel



Reel Dimensions

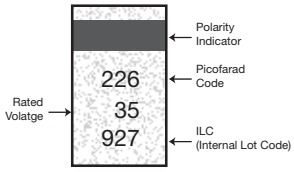
Case Size	A +0 -3.0	B -0	C ± 0.2	D ± 0.8	E ± 0.5	W ± 0.3	t ± 0.5	R
A, B,	180	60	13.0	21.0	2.0	9.0	2.0	1.0
C, D, E	330	60	13.0	21.0	2.0	13.0	2.0	1.0

How To Order

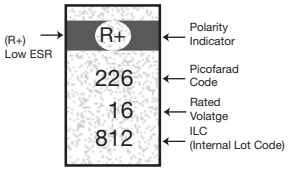
TA	035	TCM	105	M	B	R	-13
Tantalum	Rated Voltage 4.0V-004 (TCM Series) 4.0V-4R0 (TCR Series) 6.3V–006 (TCM Series) 6.3V–6R3 (TCR Series) 35V–035	Series TCM TCR	Capacitance in picofarads First two figures are significant. Third is the number of zeros to follow. 1.0 µF - 105, 22 µF - 226, 100 µF - 107	Capacitance Tolerance ±20%: M ±10%: K	Case Code A, B, C, D, E	Packaging Tape	For 13 inch reels add -13, leave blank for standard 7 inch reels

Marking*

(1) A, B, C, D, E Case
(For TCM Series)



(2) A, B, C, D, E Case
(For TCR Series)



Standard termination finish for this product is 100% matte Tin (Sn)

* All 6.3V rated Tantalums will typically be marked as 6 or 6V.

All components in this section are RoHS compliant per the EU directives and definitions.

Please Note: Venkel offers Engineering Kits for this product. See page 121 for details.

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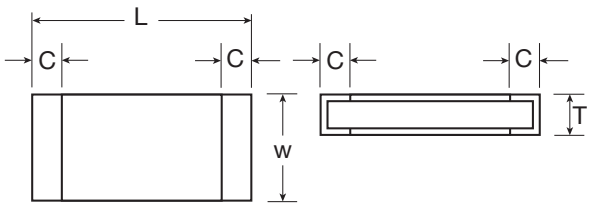
Chip Resistors – CR, LCR and ULCR

Features

- Flat Chip Resistors for surface mount applications
- LCR and ULCR for current sensing applications

Dimensions

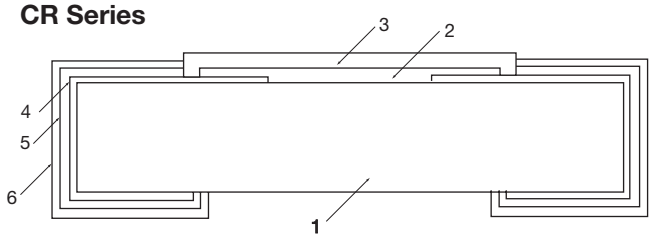


	01005	0201	0402	0603	0805	1206	1210	2010	2512*
L (Length) Inches (mm)	0.016 ± .0008 (0.4 ± 0.02)	0.024 ± .002 (0.6 ± 0.05)	0.040 ± .002 (1.0 ± 0.05)	0.063 ± .004 (1.6 ± 0.1)	0.079 ± .006 (2.0 ± 0.15)	0.126 ± .006 (3.2 ± 0.15)	0.126 ± .006 (3.2 ± 0.15)	0.197 ± .006 (5.0 ± 0.15)	0.248 ± .006 (6.3 ± 0.15)
W (Width) Inches (mm)	0.008 ± .0008 (0.2 ± 0.02)	0.012 ± .001 (0.3 ± 0.02)	0.020 ± .001 (0.5 ± 0.02)	0.031 ± .004 (0.8 ± 0.1)	0.050 ± .006 (1.25 ± 0.15)	0.063 ± .006 (1.6 ± 0.15)	0.098 ± .006 (2.50 ± 0.15)	0.098 ± .006 (2.50 ± 0.15)	0.126 ± .006 (3.2 ± 0.15)
T (Thickness) Inches (mm)	0.005 ± .0008 (0.13 ± 0.02)	0.010 ± .002 (0.25 ± 0.05)	0.014 ± .002 (0.35 ± .05)	0.018 ± .004 (0.45 ± 0.1)	0.018 ± .006 (0.45 ± 0.15)	0.022 ± .006 (0.56 ± 0.15)	0.022 ± .006 (0.56 ± 0.15)	0.022 ± .006 (0.56 ± 0.15)	0.022 ± .006 (0.56 ± 0.15)
C (End Band) Inches (mm)	0.003 ± .001 (0.08 ± 0.03)	0.006 ± .002 (0.15 ± 0.05)	0.008 ± .004 (0.2 ± 0.1)	0.012 ± .006 (0.30 ± 0.15)	0.014 ± .006 (0.35 ± 0.15)	0.020 ± .008 (0.50 ± 0.20)	0.020 ± .008 (0.50 ± 0.20)	0.024 ± .008 (0.60 ± 0.20)	0.024 ± .008 (0.60 ± 0.20)

* ULCR. See page 46

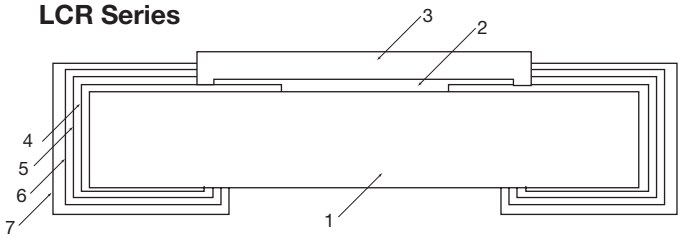
Structure

CR Series



	Description	
1	Substrate	Alumina
2	Resistive element	Ruthenium Oxide (RuO_2)
3	Protective coating	Boro-Silicate Glass
4	Inner termination	Silver Palladium (Ag-Pd)
5	Inner Plating	Nickel (Ni)
6	Outer Plating	Solder Plating, 100% matte Tin (Sn)

LCR Series



	Description	
1	Substrate	Alumina
2	Resistive element	Silver Palladium (Ag-Pd)
3	Protective coating	Boro-Silicate Glass
4	Inner termination	Silver Palladium (Ag-Pd)
5	1st Plating	Copper (Cu)
6	2nd Plating	Nickel (Ni)
7	3rd Plating	Solder Plating, 100% matte Tin (Sn)

All components in this section are RoHS compliant per the EU directives and definitions.

For standard resistance values, please see "EIA Standard Resistance Values" on page 66.

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CR – Standard Chip Resistors
Specifications

Series	Power Rating at 70°C	Max. Working Voltage	* Maximum Overload Voltage	Zero (ohm) Current Rating	Resistance Range
CR01005-32W	0.03W	$\sqrt{PR}$ or 15V whichever is less	50V	0.5A	Zero, 10Ω - 1Meg Ω
CR0201-20W	0.050W	$\sqrt{PR}$ or 25V whichever is less	50V	0.5A	Zero, 1Ω - 10 Meg Ω E-12 (1.2 Meg Ω - 10 Meg Ω)
CR0402-16W	0.063W	$\sqrt{PR}$ or 50V whichever is less	100V	1A	Zero, 1Ω - 10 Meg Ω
CR0603-16W	0.063W	$\sqrt{PR}$ or 50V whichever is less	100V	1A	Zero, 1Ω - 22 Meg Ω
CR0603-10W	0.10W	$\sqrt{PR}$ or 50V whichever is less	100V	1A	Zero, 1Ω - 22 Meg Ω
CR0805-10W	0.10W	$\sqrt{PR}$ or 150V whichever is less	300V	2A	Zero, 1Ω - 22 Meg Ω
CR0805-8W	0.125W	$\sqrt{PR}$ or 150V whichever is less	300V	2A	Zero, 1Ω - 22 Meg Ω
CR1206-8W	0.125W	$\sqrt{PR}$ or 200V whichever is less	400V	2A	Zero, 1Ω - 22 Meg Ω
CR1206-4W	0.25W	$\sqrt{PR}$ or 200V whichever is less	400V	2A	Zero, 1Ω - 22Meg Ω
CR1210-4W	0.25W	$\sqrt{PR}$ or 200V whichever is less	400V	2.5A	Zero, 1Ω - 10 Meg Ω
CR1210-2W	0.50W	$\sqrt{PR}$ or 200V whichever is less	400V	2.5A	Zero, 1Ω - 10 Meg Ω
CR2010-2W	0.50W	$\sqrt{PR}$ or 200V whichever is less	400V	3.5A	Zero, 1Ω - 10 Meg Ω
CR2010-1W	1.00W	$\sqrt{PR}$ or 200V whichever is less	400V	3.5A	Zero, 1Ω - 10 Meg Ω
CR2512-1W	1.00W	$\sqrt{PR}$ or 200V whichever is less	500V	4A	Zero, 1Ω - 10 Meg Ω
CR2512-2W	2.00W	$\sqrt{PR}$ or 200V whichever is less	500V	4A	Zero, 1Ω - 10 Meg Ω

* Overload Voltage=2.5*√(P*R) or Max. overload voltage listed above, whichever is lower.
G and J Tol.: ±200 (1Ω - 10 Meg Ω); F and D Tol.: ±100 (10Ω - 1 Meg Ω); ±200 (1Ω - 9.76Ω) & (1.02 Meg Ω - 9.76 Meg Ω); D, F, G & J Tol.: ±350 (10 Meg Ω and over)
T.C.R. is ±350 for values outside referenced range. 0201 case size: ±200 for F and J Tol (10Ω - 1 Meg Ω). 01005 case size: ±250 for (10Ω - 1 Meg Ω); +600 - -200 for (4.7-9.1Ω). TCR is ±350 for values outside referenced range.

Operating Temp. Range is -55°C to +155°C • DC Resistance Value of zero ohm is 50m ohms max.
01005 and 0201 sizes: Range is -55°C to +125°C.

Chip Resistors

LCR – Low Value Chip Resistors

Specifications

Series	Power Rating At 70°C (W)	Rated Current Range (A)	Resistance Range (mΩ)	Specific Resistance Range (SRR) (mΩ)	Tolerance Available	Temperature Coefficient of Resistance (PPM) (10^{-6}/°C)	Dielectric Withstanding Voltage (DWV) (V)	Operating Temperature Range (°C)
LCR0402	0.125	0.36 – 1.58	50 – 976	50 – 100	F, G, J	±300	100	–55 ~ +125
				102 – 500		±200		
				511 – 976		±100		
LCR0603	0.125	0.36 – 2.5	20 – 976	20 – 50	F, G, J	±450	100	–55 ~ +125
				51 – 100		±300		
				102 – 500		±200		
				511 – 976		±100		
LCR0805	0.25	0.50 – 3.53	20 – 976	20 – 50	F, G, J	±450	500	–55 ~ +125
				51 – 100		±300		
				102 – 500		±200		
				511 – 976		±100		
LCR1206	0.50	0.71 – 7.07	10 – 976	10 – 20	F, G, J	±450	500	–55 ~ +125
				21 – 50		±300		
				51 – 500		±200		
				511 – 976		±100		
LCR1210	0.66	0.85 – 3.63	50 – 900	50 – 470	F, G, J	±200	500	–55 ~ +125
				500 – 900	F, G, J	±100		
LCR2010	1.00	0.87 – 8.66	10 – 976	10 – 20	F, G, J	±450	500	–55 ~ +125
				21 – 50		±300		
				51 – 500		±200		
				511 – 976		±100		
LCR2512	2.00	1.01 – 10.0	10 – 976	10 – 20	F, G, J	±450	500	–55 ~ +125
				21 – 50		±300		
				51 – 500		±200		
				511 – 976		±100		

Note: Other nominal resistance values may also be available, please contact VENKEL LTD. for further information.

Standard resistance values and corresponding codes:

Resistance	P/N Code	Resistance	P/N Code	Resistance	P/N Code	Resistance	P/N Code	Resistance	P/N Code	Resistance	P/N Code	Resistance	P/N Code
10m ohm	R010	27m ohm	R027	50m ohm	R050	80m ohm	R080	160m ohm	R160	330m ohm	R330	600m ohm	R600
12m ohm	R012	30m ohm	R030	56m ohm	R056	90m ohm	R090	180m ohm	R180	360m ohm	R360	650m ohm	R650
15m ohm	R015	33m ohm	R033	60m ohm	R060	100m ohm	R100	200m ohm	R200	400m ohm	R400	680m ohm	R680
18m ohm	R018	35m ohm	R035	65m ohm	R065	110m ohm	R110	220m ohm	R220	430m ohm	R430	700m ohm	R700
20m ohm	R020	40m ohm	R040	68m ohm	R068	120m ohm	R120	250m ohm	R250	470m ohm	R470	750m ohm	R750
22m ohm	R022	43m ohm	R043	70m ohm	R070	130m ohm	R130	270m ohm	R270	500m ohm	R500	800m ohm	R800
25m ohm	R025	47m ohm	R047	75m ohm	R075	150m ohm	R150	300m ohm	R300	560m ohm	R560	900m ohm	R900

Marking for LCR:

The resistance code shall be marked on the resistor as follows (this code is the same for 1% and 5% tolerances):

0402 size: no markings
0603 size: 3-digit markings using “R” and 2 digits. When “R” can not be used then 3 digits and underlined. (see below)
0805 – 2512 size: 4-digit markings using “R” and 3 digits. “Rxxx.” R010 = 10m ohm, R120 = 120m ohm.

Examples of 3-digit markings:
R01 = 10m ohm 022 = 22m ohm 068 = 68m ohm R08 = 80m ohm R10 = 100m ohm

All components in this section are RoHS compliant per the EU directives and definitions.

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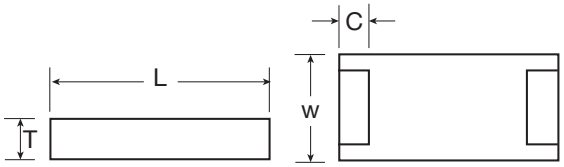
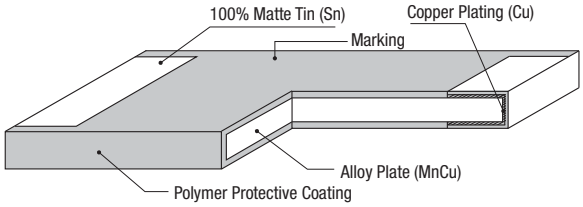
ULCR – Ultra Low Value Chip Resistors

Dimensions





Specifications

Unit: (mm)

Size	Resistance (mΩ)	Power Rating At 70°C (W)	Tolerance Available	Temperature Coefficient of Resistance (PPM) (10^{-6}/°C)	Maximum Rated Current (A)	Dimensions			
						L	W	T	C
2512	0.50	1	J	±50	44.7	6.35 ±0.25	3.18 ±0.25	1.40 ±0.20	1.30 ±0.30
2512	0.75	1	F, J	±50	36.5	6.35 ±0.25	3.18 ±0.25	1.00 ±0.20	1.30 ±0.30
2512	1.00	1	F, J	±50	31.6	6.35 ±0.25	3.18 ±0.25	0.80 ±0.20	1.30 ±0.30
2512	1.50	1	F, J	±50	25.8	6.35 ±0.25	3.18 ±0.25	0.65 ±0.20	1.30 ±0.30
2512	2.00	1	F, J	±50	22.4	6.35 ±0.25	3.18 ±0.25	0.50 ±0.20	1.30 ±0.30
2512	2.50	1	F, J	±100	20.0	6.35 ±0.25	3.18 ±0.25	1.00 ±0.20	1.30 ±0.30
2512	3.00	1	F, J	±100	18.3	6.35 ±0.25	3.18 ±0.25	0.70 ±0.20	1.30 ±0.30
2512	3.50	1	F, J	±100	16.9	6.35 ±0.25	3.18 ±0.25	0.71 ±0.20	1.30 ±0.30
2512	4.00	1	F, J	±100	15.8	6.35 ±0.25	3.18 ±0.25	0.60 ±0.20	1.30 ±0.30
2512	4.50	1	F, J	±100	14.9	6.35 ±0.25	3.18 ±0.25	0.58 ±0.20	1.30 ±0.30
2512	5.00	1	F, J	±100	14.1	6.35 ±0.25	3.18 ±0.25	0.50 ±0.20	1.30 ±0.30
2512	5.50	1	F, J	±100	13.4	6.35 ±0.25	3.18 ±0.25	0.47 ±0.20	1.30 ±0.30
2512	6.00	1	F, J	±100	12.9	6.35 ±0.25	3.18 ±0.25	0.50 ±0.20	1.30 ±0.30
2512	6.50	1	F, J	±100	12.4	6.35 ±0.25	3.18 ±0.25	0.47 ±0.20	1.30 ±0.30
2512	7.00	1	F, J	±100	12.0	6.35 ±0.25	3.18 ±0.25	0.45 ±0.20	1.30 ±0.30

Note: Operating temperature range is -55°C to +170°C

Standard resistance values and corresponding codes:

Resistance (mΩ)	P/N Code	Marking Code	Resistance (mΩ)	P/N Code	Marking Code
0.50	M500	M50	4.00	4M00	R004
0.75	M750	M75	4.50	4M50	4M5
1.00	1M00	R001	5.00	5M00	R005
1.50	1M50	1M5	5.50	5M50	5M5
2.00	2M00	R002	6.00	6M00	R006
2.50	2M50	2M5	6.50	6M50	6M5
3.00	3M00	R003	7.00	7M00	R007
3.50	3M50	3M5			

Note: Other nominal resistance values may also be available, please contact VENKEL LTD. for further information.

All components in this section are RoHS compliant per the EU directives and definitions.

Characteristics

Item	Test Basis: JIS-C-5202	Specification Requirements	Typical
Short-time Overload	2.5 x rated voltage DC for 5 sec.	±1% +0.5Ω, no arc evidence	within ±0.4%
Load Life	70°C, rated voltage for 1.5 hrs. on/0.5 hr. for 1000 hrs	<1 Meg ±3% +0.1Ω, > 1 Meg ±5%	—
Dielectric Withstanding Voltage	500V for 1 minute	No insulation breakdown	above 900-950V
Resistance to Soldering Heat	270°C for 10 seconds	±1% +0.05Ω, no mechanical damage	—
Temperature Cycling	EIA STD. 575, Para. 3.5 -55 ~ +125° C, 5 cycles.	± 1.0%	—
Solderability	230°C, 3 seconds, flux applied	95% minimum coverage	more than 97-98%
Curing Heat Resistance	+150°C for 10 minutes	±1% +0.05Ω	within ±0.3%
Dry Heat Resistance	-125°C for 1,000 hours	±3% +0.1Ω, no mechanical damage	within ±0.5%
Pull Terminal Strength	500G load for 30 seconds	±1% +0.05Ω, no mechanical damage	within ±0.2%
PCB Terminal Strength	1/45mm bend for 10 seconds	±1% +0.05Ω, no mechanical damage	within ±0.2%
Moisture Resistance, Thermal Shock	-55°C to +125°C, 5 cycles	±1% +0.05Ω, no mechanical damage	within ±0.2%
Moisture Load Life	40°C, 95% R.H., 1.5 hr. on, 0.5 hr. off, 1,000 hours	<1 Meg ±3% +0.1Ω, > 1 Meg ±5%	—
Insulation Resistance	500V, 1 minute	1,000 Meg minimum	more than 10 Meg
Voltage Coefficient	Rated voltage and 1/10 times rated voltage	+0/-100ppm/v: above 1K ±	within - 90ppm/V
Low Temperature Exposure	-55°C for 1,000 hours	±3% +0.1Ω, no mechanical damage	within ±0.5%

T.C.R. Temperature Coefficient of Resistance (PPM/°C) (For CR Series only)	0402 – 2512 case sizes: G & J Tol.: ±200 (1Ω – 10 Meg Ω); F & D Tol.: ±100 (10Ω – 1 Meg Ω); ±200 (1Ω – 9.76Ω) & (1.02 Meg Ω – 9.76 Meg Ω) D, F, G & J Tol.: ±350 (10 Meg Ω and over) TCR is ±350 for values outside referenced range

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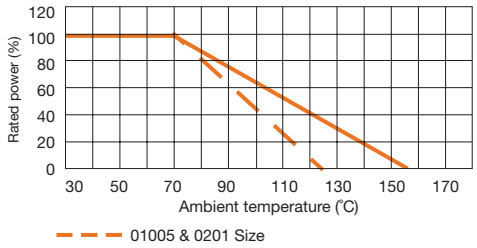
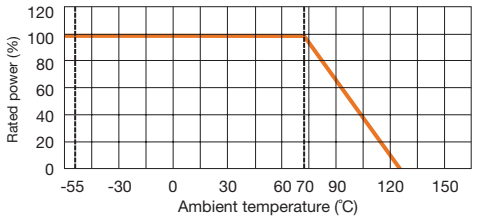
Derating Curves

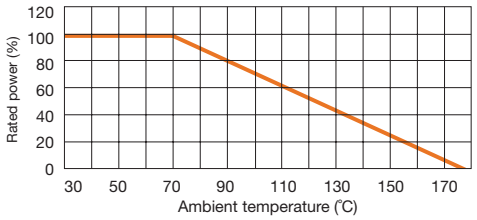
DERATING CURVE (CR Only)



DERATING CURVE (LCR only)



DERATING CURVE (ULCR Only)



How To Order

CR1206-8W — 103 J □ T — 13
LCR0805
ULCR2512

SERIES

3 DIGIT (G & J TOL.)	e.g. 2R2=2.2Ω 103=10KΩ
4 DIGIT (D & F TOL.)	e.g. 10R2=10.2Ω 1002=10kΩ
Jumper	3 zeros
LCR, ULCR 4 DIGIT (F, G & J TOL.)	e.g. 3M00=3mΩ R022=22mΩ R033=33mΩ R120=120mΩ

TOLERANCE AT 25°C
D: ± 0.5%*
F: ± 1%
G: ± 2%
J: ± 5%
(No Tolerance specified for the Zero Ohm)
* All 0.5% resistors come in ±50 ppm/°C.

Leave blank for standard termination.
Standard Chip Resistor Termination finish is 100% matte Tin (Sn).
P: For Palladium Silver Termination (PdAg) (CR Series only)

PACKAGING
T: TAPE

Add only if 13" Reel required

0603 — 1% Chip Resistors may not be marked. (For CR Series)
Please consult your salesperson if marking is required. *(See the data sheet on Marking Codes)*

- *E-24 Standard Resistance values that are available in 1%, may be marked with the standard 3-digit code identifier or an alpha numeric code. For the alpha numeric marking see page 67 for details.*
- *NOTE: 01005, 0201 and 0402 Resistors cannot be marked.*
- *NOTE: See page 66 for Standard Resistance Values*
- *NOTE: Other nominal resistance values may also be available, please contact your sales representative for further information.*

Please Note: Venkel offers Engineering Kits for this product. See page 123 for details.

All components in this section are RoHS compliant per the EU directives and definitions.

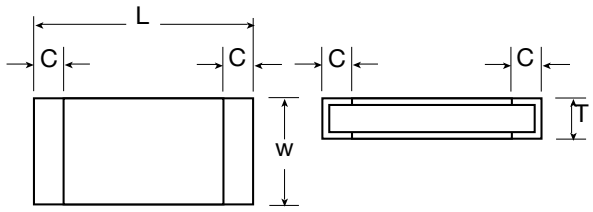
For standard resistance values, please see "EIA Standard Resistance Values" on page 66.

High Voltage Chip Resistors - HVCR

Features

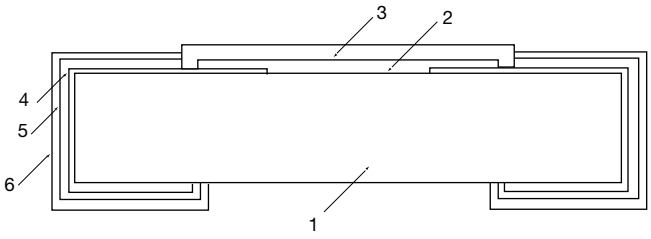
- High Voltage Chip Resistors
- Flat Chip Resistors for surface mount applications

Dimensions



	0402	0603	0805	1206	2010	2512
L (Length) Inches (mm)	0.040 ± .002 (1.0 ± 0.05)	0.063 ± .004 (1.6 ± 0.1)	0.079 ± .006 (2.0 ± 0.15)	0.126 ± .006 (3.2 ± 0.15)	0.197 ± .006 (5.0 ± 0.15)	0.248 ± .006 (6.3 ± 0.15)
W (Width) Inches (mm)	0.020 ± .001 (0.5 ± 0.02)	0.031 ± .004 (0.8 ± 0.1)	0.050 ± .006 (1.25 ± 0.15)	0.063 ± .006 (1.6 ± 0.15)	0.098 ± .006 (2.50 ± 0.15)	0.126 ± .006 (3.2 ± 0.15)
T (Thickness) Inches (mm)	0.014 ± .002 (0.35 ± .05)	0.018 ± .004 (0.45 ± 0.1)	0.018 ± .006 (0.45 ± 0.15)	0.022 ± .006 (0.56 ± 0.15)	0.022 ± .006 (0.56 ± 0.15)	0.022 ± .006 (0.56 ± 0.15)
C (End Band) Inches (mm)	0.008 ± .004 (0.2 ± 0.1)	0.012 ± .006 (0.30 ± 0.15)	0.014 ± .006 (0.35 ± 0.15)	0.020 ± .008 (0.50 ± 0.20)	0.024 ± .008 (0.60 ± 0.20)	0.024 ± .008 (0.60 ± 0.20)

Structure



	Description	
1	Substrate	Alumina
2	Resistive element	Ruthenium Oxide (RuO_2)
3	Protective coating	Boro-Silicate Glass
4	Inner termination	Silver Palladium (Ag-Pd)
5	Inner Plating	Nickel (Ni)
6	Outer Plating	Solder Plating, 100% matte Tin (Sn)

All components in this section are RoHS compliant per the EU directives and definitions.

For standard resistance values, please see “EIA Standard Resistance Values” on page 66.

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Specifications

Series	Power Rating at 70°C	Max. Working Voltage	Max. Overload Voltage	T.C.R. Temperature Coefficient of Resistance (PPM/°C)	Resistance Range
HVCR0402-16W	0.063W	*E = $\sqrt{PR}$ or 100V whichever is less	200V	10Ω – 1 Meg Ω: ±100 1.02MegΩ – 10 Meg Ω: ±200	10Ω - 10 Meg Ω
HVCR0603-10W	0.10W	*E = $\sqrt{PR}$ or 100V whichever is less	200V	10Ω – 1 Meg Ω: ±100 1.02 Meg Ω – 10 Meg Ω: ±200	10Ω - 10 Meg Ω
HVCR0805-8W	0.125W	*E = $\sqrt{PR}$ or 300V whichever is less	600V	10Ω – 1 Meg Ω: ±100 1.02 Meg Ω – 10 Meg Ω: ±200	10Ω - 10 Meg Ω
HVCR1206-4W	0.25W	*E = $\sqrt{PR}$ or 500V whichever is less	1000V	10Ω – 1 Meg Ω: ±100 1.02 Meg Ω – 10 Meg Ω: ±200	10Ω - 10 Meg Ω
HVCR2010-2W	0.50W	*E = $\sqrt{PR}$ or 500V whichever is less	1000V	10Ω – 1 Meg Ω: ±100 1.02 Meg Ω – 10 Meg Ω: ±200	10Ω - 10 Meg Ω
HVCR2512-1W	1.00W	*E = $\sqrt{PR}$ or 500V whichever is less	1000V	10Ω – 1 Meg Ω: ±100 1.02 Meg Ω – 10 Meg Ω: ±200	10Ω - 10 Meg Ω

Operating Temp. Range is -55°C to +155°C • DC Resistance Value of zero ohm is 50m ohms max.

*E = $\sqrt{PR}$ where E = Rated Voltage (V); P = Rated Power (P) and R = Nominal Resistance (Ω).

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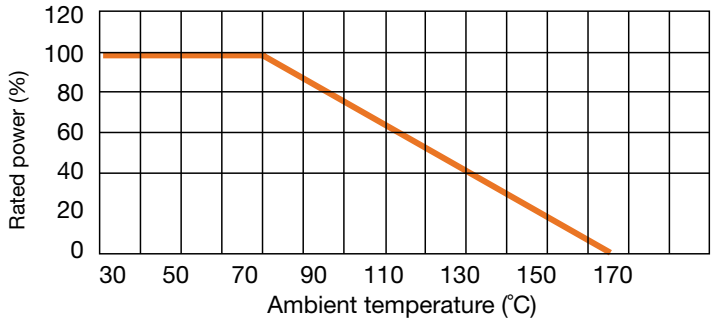
High Voltage Chip Resistors - HVCR

Derating Curve



How To Order

HVCR1206-4W — 103 J T

SERIES

3 DIGIT (J TOL.)	e.g. 2R2=2.2Ω 103=10KΩ
4 DIGIT (F TOL.)	e.g. 10R2=10.2Ω 1002=10kΩ
Jumper	3 zeros

TOLERANCE AT 25°C
F: ± 1%
J: ± 5% (No Tolerance specified for the Zero Ohm)

PACKAGING
T: TAPE

Standard Chip Resistor Termination finish is 100% matte Tin (Sn).

0603 — 1% Chip Resistors may not be marked. (For HVCR Series)

Please consult your salesperson if marking is required. (See the data sheet on Marking Codes) • E-24 Standard Resistance values that are available in 1%, may be marked with the standard 3-digit code identifier or an alpha numeric code. For the alpha numeric marking see page 67 for details.

• NOTE: See page 66 for Standard Resistance Values
• NOTE: Other nominal resistance values may also be available, please contact your sales representative for further information.

All components in this section are RoHS compliant per the EU directives and definitions.

For standard resistance values, please see “EIA Standard Resistance Values” on page 66.

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Characteristics

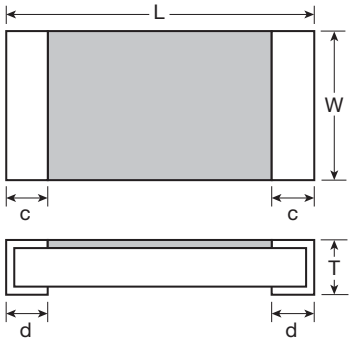
Item	Test Basis: JIS-C-5202	Specification Requirements	Typical
Short-time Overload	2.5 x rated voltage DC for 5 sec.	±1% +0.5Ω, no arc evidence	within ±0.4%
Load Life	70°C, rated voltage for 1.5 hrs. on/0.5 hr. off for 1000 hrs.	<1 Meg ±2% +0.1Ω; > 1 Meg ±3%	—
Resistance to Soldering Heat	260°C for 10 seconds	±1% +0.05Ω, no mechanical damage	—
Temperature Cycling	–55 ~ +125° C, 5 cycles.	± 1.0%	—
Solderability	230°C, 3 seconds, flux applied	95% minimum coverage	more than 97-98%
Dry Heat Resistance	+125°C for 1,000 hours	±3% +0.1Ω, no mechanical damage	within ±0.5%
Pull Terminal Strength	500G load for 30 seconds	±1% +0.05Ω, no mechanical damage	within ±0.2%
PCB Terminal Strength	1/45mm bend for 10 seconds	±1% +0.05Ω, no mechanical damage	within ±0.2%
Moisture Resistance, Thermal Shock	-55°C to +125°C, 5 cycles	±1% +0.05Ω, no mechanical damage	within ±0.2%
Moisture Load Life	40°C, 95% R.H., 1.5 hr. on, 0.5 hr. off, 1,000 hours	<1 Meg ±2% +0.1Ω; > 1 Meg ±3%	—
Insulation Resistance	Max. Overload Voltage for 1 minute	≥ 10 G	more than 10 Meg
Voltage Proof	1.5 times Rated Voltage for 1 minute	No breakdown or flashover	—
Low Temperature Exposure	-55°C for 1,000 hours	±3% +0.1Ω, no mechanical damage	within ±0.5%

Thick Film Chip Resistors — Anti-Sulfuration

Features

- High stability Thick Film Chip Resistor
- Special (patented) termination prevents sulfuration in a sulfur containing environment
- TCR ±100ppm

Specifications



Unit: inches (mm)

	CRS0201	CRS0402	CRS0603	CRS0805	CRS1206	CRS1210
L	0.024 ± .002 (0.6 ± 0.05)	0.040 ± .002 (1.0 ± 0.05)	0.063 ± .008 (1.6 ± 0.2)	0.079 ± .008 (2.0 ± 0.2)	0.126 ± .008 (3.2 ± 0.2)	0.126 ± .008 (3.2 ± 0.2)
W	0.012 ± .001 (0.3 ± 0.02)	0.020 ± .002 (0.5 ± 0.05)	0.031 ± .008 (0.8 ± 0.2)	0.050 ± .008 (1.25 ± 0.02)	0.063 ± .008 (1.6 ± 0.2)	0.098 ± .006 (2.50 ± 0.15)
T	0.010 ± .002 (0.25 ± 0.05)	0.014 ± .002 (0.35 ± 0.05)	0.014 ± .004 (0.45 ± 0.10)	0.018 ± .006 (0.45 ± 0.15)	0.022 ± .006 (0.57 ± 0.15)	0.022 ± .006 (0.56 ± 0.15)
c	0.006 ± .002 (0.15 ± 0.05)	0.008 ± .004 (0.2 ± 0.01)	0.010 ± .006 (0.25 ± 0.15)	0.016 ± .008 (0.4 ± 0.2)	0.018 ± .008 (0.45 ± 0.2)	0.018 ± .008 (0.45 ± 0.2)
d	0.006 ± .002 (0.15 ± 0.05)	0.008 ± .004 (0.2 ± 0.01)	0.010 ± .006 (0.25 ± 0.15)	0.012 ± .008 (0.3 ± 0.2)	0.012 ± .008 (0.3 ± 0.2)	0.012 ± .008 (0.3 ± 0.2)

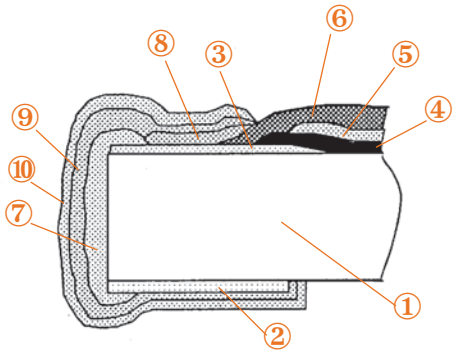
Rating

Series	Rated Power at 70°C	Maximum Working Voltage	*Maximum Overload Voltage	Operating Temperature Range	Resistance Range
CRS0201-20W	0.05W	$\sqrt{PR}$ or 25V whichever is less	50V	-55°C ~ 150°C	10Ω ~ 1MΩ
CRS0402-16W	0.063W	$\sqrt{PR}$ or 50V whichever is less	100V	-55°C ~ 150°C	1Ω ~ 1MΩ
CRS0603-16W	0.063W	$\sqrt{PR}$ or 75V whichever is less	150V	-55°C ~ 150°C	1Ω ~ 1MΩ
CRS0805-10W	0.10W	$\sqrt{PR}$ or 150V whichever is less	200V	-55°C ~ 150°C	1Ω ~ 1MΩ
CRS1206-8W	0.125W	$\sqrt{PR}$ or 175V whichever is less	300V	-55°C ~ 150°C	1Ω ~ 1MΩ
CRS1210-4W	0.25W	$\sqrt{PR}$ or 200V whichever is less	400V	-55°C ~ 150°C	1Ω ~ 1MΩ

NOTE: * Overload Voltage=2.5*√(P*R) or Max. overload voltage listed above, whichever is lower.
Markings on Thick Film Chip Resistors may have an internal lot identification code or the E-24 (5%) or E-96 (1%) marking code. If value identification is required, please consult your sales person for availability.
Values available in the E-24 Series that are crossover values (same value for 1% and 5%) will typically be marked with a 3-digit E-24 Series marking code.

Structure

No.	Description	
①	Ceramic Substrate	96% Alumina
② & ③	Inner Electrode	Silver Palladium (Ag-Pd)
④	Resistive Element	Ruthenium Oxide (RuO_2)
⑤ & ⑥	Protective Coating	Boro-Silicate Glass
⑦	Side termination	Silver (Ag)
⑧	Resin Coating	Special (patented) anti-sulfuration coating Silver (Ag)
⑨	Middle Layer	Nickel (Ni)
⑩	Outer Layer	Tin (Sn) (100% Sn for Lead free)



How To Order

CRS1206-8W — 103 J T — 13

SERIES

3 DIGIT (J TOL.)	e.g.2R2=2.2Ω 103=10KΩ
4 DIGIT (F TOL.)	e.g.10R2=10.2Ω 1002=10kΩ
Jumper	3 zero's

TOLERANCE AT 25°C
F: ± 1%
J: ± 5%
(No Tolerence specified for the Zero Ohm)

PACKAGING
B:BULK
T:TAPE

Add only if 13" Reel required

0603 — 1% Chip Resistors may not be marked. (For CRS Series)
Please consult your salesperson if marking is required.
(See the data sheet on Marking Codes)
**E-24 Standard Resistance values that are available in 1%, may be marked with a 3-digit code identifier.*
** NOTE: 0201 and 0402 Resistors cannot be marked.*

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Anti-Sulfuration Test Data

Test Conditions:

Chip resistors are mounted on the test board with the power "ON" and kept in the atmosphere of 50˚C, Relative Humidity of 95% and present in the atmosphere is H_2S – 3PPM.

10 pieces each of regular chip resistors and anti-sulfuration chip resistors were tested.

Hours >>	1,000	2,000	3,000	4,000	4,500	5,000	5,500	6,000	6,500	7,000	8,000	8,500	9,000
Regular chip resistors	O	O	O	O	X1	X2	X1	X1	X3	X1	X1	–	–
Anti-sulfuration chip resistors	O	O	O	O	O	O	O	O	O	O	O	O	O
O = No failure. X1 = 1 failure. X2 = 2 failures. X3 = 3 failures.													

Test Results:

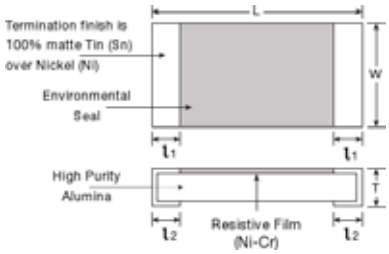
Regular chip resistors start failing (open) from 4,500 hours and by 8,500 hours, all have failed (opened). Anti-sulfuration chip resistors have no failures up to 9,000 hours and beyond.

Rectangular Thin Film Chip Resistors

Features

These Thin Film Chip Resistors are designed for high precision, stability and reliability. Available in 0201 thru 2512 sizes, having a TCR of either ± 25PPM/°C, ± 50PPM/°C or ±100PPM/°C. Suitable for flow and reflow soldering.

Dimensions



Unit: inches (mm)

	L	W	T	l1	l2
TFCR0201	0.024 ± 0.002 (0.6 ± 0.05)	0.012 ± 0.001 (0.3 ± 0.02)	0.010 ± 0.002 (0.25 ± 0.05)	0.006 ± 0.002 (0.15 ± 0.05)	0.006 ± 0.002 (0.15 ± 0.05)
TFCR0402	0.040 ± 0.002 (1.0 ± 0.05)	0.020 ± 0.002 (0.5 ± 0.05)	0.014 ± 0.002 (0.35 ± 0.05)	0.008 ± 0.004 (0.2 ± 0.01)	0.008 ± 0.004 (0.2 ± 0.01)
TFCR0603	0.063 ± 0.008 (1.6 ± 0.2)	0.031 ± 0.008 (0.8 ± 0.2)	0.014 ± 0.004 (0.45 ± 0.10)	0.010 ± 0.006 (0.25 ± 0.15)	0.010 ± 0.006 (0.25 ± 0.15)
TFCR0805	0.079 ± 0.008 (2.0 ± 0.2)	0.050 ± 0.008 (1.25 ± 0.20)	0.018 ± 0.006 (0.45 ± 0.15)	0.016 ± 0.008 (0.4 ± 0.2)	0.012 ± 0.008 (0.3 ± 0.2)
TFCR1206	0.126 ± 0.008 (3.2 ± 0.2)	0.063 ± 0.008 (1.6 ± 0.2)	0.022 ± 0.006 (0.57 ± 0.15)	0.018 ± 0.008 (0.45 ± 0.2)	0.012 ± 0.008 (0.3 ± 0.2)
TFCR1210	0.126 ± 0.008 (3.2 ± 0.2)	0.098 ± 0.006 (2.50 ± 0.15)	0.022 ± 0.006 (0.56 ± 0.15)	0.018 ± 0.008 (0.45 ± 0.2)	0.012 ± 0.008 (0.3 ± 0.2)
TFCR2010	0.197 ± 0.008 (5.0 ± 0.20)	0.098 ± 0.006 (2.50 ± 0.15)	0.217 ± 0.004 (0.55 ± 0.10)	0.236 ± 0.012 (0.60 ± 0.30)	0.02 ± 0.010 (0.50 ± 0.25)
TFCR2512	0.248 ± 0.008 (6.30 ± 0.20)	0.122 ± 0.006 (3.10 ± 0.15)	0.217 ± 0.004 (0.55 ± 0.10)	0.236 ± 0.012 (0.60 ± 0.30)	0.02 ± 0.010 (0.50 ± 0.25)

Specifications

Series	Rated Power at 70°C	Maximum Working Voltage	*Maximum Overload Voltage	Operating Temperature Range	Resistance Range
TFCR0201-20W	0.05W	$\sqrt{PR}$ or 15V whichever is less	30V	-55°C ~ 150°C	50Ω ~ 33KΩ
TFCR0402-16W	0.063W	$\sqrt{PR}$ or 25V whichever is less	75V	-55°C ~ 150°C	10Ω ~ 255KΩ
TFCR0603-16W	0.063W	$\sqrt{PR}$ or 75V whichever is less	150V	-55°C ~ 150°C	4.7Ω ~ 1 Meg Ω
TFCR0603-10W	0.10W	$\sqrt{PR}$ or 75V whichever is less	150V	-55°C ~ 150°C	4.7Ω ~ 1 Meg Ω
TFCR0805-10W	0.10W	$\sqrt{PR}$ or 100V whichever is less	200V	-55°C ~ 150°C	4.7Ω ~ 2 Meg Ω
TFCR0805-8W	0.125W	$\sqrt{PR}$ or 100V whichever is less	200V	-55°C ~ 150°C	4.7Ω ~ 2 Meg Ω
TFCR1206-8W	0.125W	$\sqrt{PR}$ or 150V whichever is less	300V	-55°C ~ 150°C	4.7Ω ~ 2.5 Meg Ω
TFCR1206-4W	0.25W	$\sqrt{PR}$ or 150V whichever is less	300V	-55°C ~ 150°C	4.7Ω ~ 2.5 Meg Ω
TFCR1210-4W	0.25W	$\sqrt{PR}$ or 150V whichever is less	300V	-55°C ~ 150°C	4.7Ω ~ 1 Meg Ω
TFCR1210-2W	0.5W	$\sqrt{PR}$ or 150V whichever is less	300V	-55°C ~ 150°C	4.7Ω ~ 1 Meg Ω
TFCR2010-2W	0.5W	$\sqrt{PR}$ or 150V whichever is less	300V	-55°C ~ 150°C	4.7Ω ~ 1 Meg Ω
TFCR2512-2W	0.5W	$\sqrt{PR}$ or 150V whichever is less	300V	-55°C ~ 150°C	4.7Ω ~ 1 Meg Ω

NOTE: * Overload Voltage=2.5*√(P*R) or Max. overload voltage listed above, whichever is lower.
Markings on Thin Film Chip Resistors may have an internal lot identification code or the E-24 (5%) or E-96 (1%) marking code. If value identification is required, please consult your sales representative for availability. Values available in the E-24 Series that are crossover values (same value for 1% and 5%) will typically be marked with a 3-digit E-24 Series marking code.
* For 0201 case size: TCR is 50ppm for values above 5K Ω

How To Order

TFCR1206-8W – E – XXXX B T

- TFCR1206-8W — Series
- E — TCR: E: ±25PPM/°C; C: ±50PPM/°C; K: ±100PPM/°C
- XXXX — Resistance Value
- B — Resistance Tolerance: B: ±0.1%; C: ±0.25%; D: ±0.50%; F: ±1%
- T — Packaging: T: Tape

Standard termination finish for this product is 100% matte Tin (Sn)

All components in this section are RoHS compliant per the EU directives and definitions.

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Characteristics

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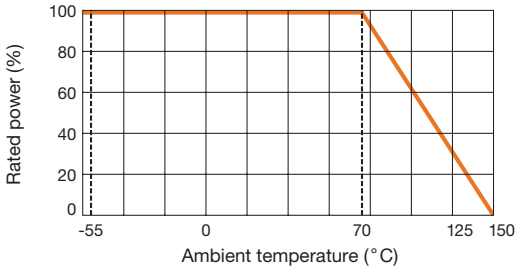
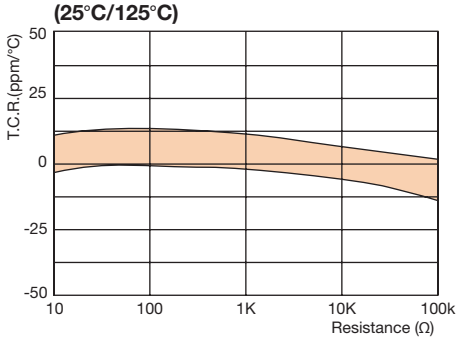


Description	Requirements	Test method JIS C 5202
Resistance Value	Within specified tolerance	
Temperature Coefficient of Resistance (T.C.R.)	E: Within ± 25PPM/°C C: Within ± 50PPM/°C K: Within ± 100PPM/°C	Measuring temperature +25/ + 125°C
Short-time Overload	Within ± (0.5% +0.05Ω) No major visible damage	2.5 times rated voltage 5 seconds
Insulation Resistance	At least 1,000 Meg Ω	100V 1 minute
Withstanding Voltage	Within ± (0.5% +0.05Ω) no flashover, scorching or insulation breakdown	1/10: AC 150V 1 minute 1/8: AC 300V 1 minute
Terminal Strength	Within ± (0.5% +0.05Ω) No mechanical damage	Install a sample on the board and bend the board 3/45mm for 10 seconds
Solder Heat Resistance	Within ± (0.5% +0.05Ω) No major visible damage	Dip into 260°C solder bath for 10 seconds
Solderability	At least 95% of the dipping surface must be covered by new solder	235°C 2 seconds
Temperature Cycle	Within ± (0.5% +0.05Ω) No major visible damage Markings Legible	Cycle between -55°C and + 150°C for 5 cycles
Load Life in Moisture	Within ± (0.5% +0.05Ω) No major visible damage Markings Legible	Rated voltage 1.5 hours "ON" 0.5 hours "OFF" 40°C, 95% RH 1,000 hours
Load Life	Within ± (0.5% +0.05Ω) No major visible damage Markings Legible	Rated voltage 1.5 hours "ON" 0.5 hours "OFF" 70°C 1,000 hours

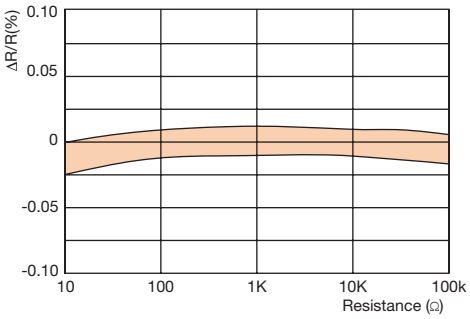
* NOTE: These specifications are typical and are based on standard operating conditions.

Examples of Typical Characteristics

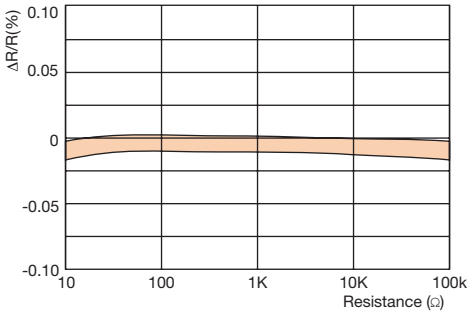
Temperature Coefficient of Resistance (25°C/125°C)



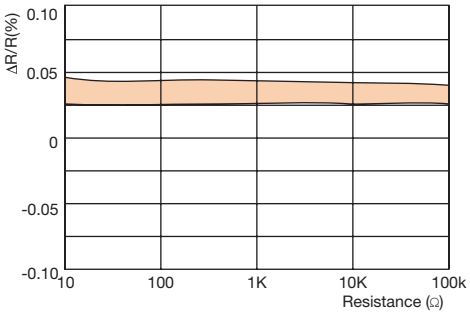
Short-time Overload



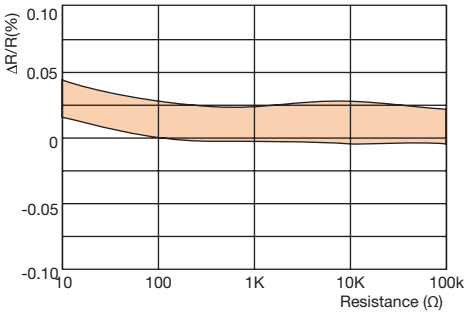
Solder Heat Resistance (260°C, 10 seconds)



Temperature Cycle (-55°C/125°C, 5 cycles)



Load Life in Moisture 40°C, 90-95% RH, RCWV 1,000 hours



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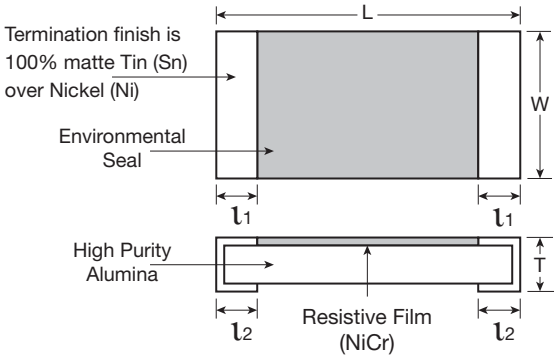
Ultra Precision Thin Film Chip Resistors

Features

- Minimized Aging
- TCR as low as ± 5PPM/°C and Tolerance as low as ± 0.01%
- Good high frequency characteristics
- Suitable for flow and reflow soldering

Dimensions

Unit: inches (mm)



	UPTF0402	UPTF0603	UPTF0805	UPTF1206	UPTF1210
L	0.040 ± .002 (1.0 ± 0.05)	0.063 ± .008 (1.6 ± 0.2)	0.079 ± .008 (2.0 ± 0.2)	0.126 ± .008 (3.2 ± 0.2)	0.124 ± .008 (3.1 ± 0.2)
W	0.020 ± .002 (0.5 ± 0.05)	0.031 ± .008 (0.8 ± 0.2)	0.050 ± .008 (1.25± 0.02)	0.063 ± .008 (1.6 ± 0.2)	0.095 ± .008 (2.4 ± 0.2)
T	0.014 ± .002 (0.35 ± 0.05)	0.018 ± .004 (0.45 ± 0.10)	0.020 ± .006 (0.50 ± 0.15)	0.022 ± .006 (0.55 ± 0.15)	0.022 ± .006 (0.55 ± 0.15)
l1	0.008 ± .004 (0.2 ± 0.01)	0.010 ± .006 (0.25 ± 0.15)	0.016 ± .008 (0.4 ± 0.2)	0.018 ± .008 (0.45 ± 0.2)	0.016 ± .01 (0.40 ± 0.25)
l2	0.008 ± .004 (0.2 ± 0.01)	0.010 ± .006 (0.25 ± 0.15)	0.012 ± .008 (0.3 ± 0.2)	0.012 ± .008 (0.3 ± 0.2)	0.022 ± .012 (0.55 ± 0.3)

Specifications

Tolerance	Series	UPTF0402	UPTF0603	UPTF0805	UPTF1206	UPTF1210
	Power Rating at 70°C (W)	0.063	0.063	0.10	0.125	0.20
	Max. Working Voltage	$\sqrt{PR}$ or 25V whichever is less	$\sqrt{PR}$ or 50V whichever is less	$\sqrt{PR}$ or 100V whichever is less	$\sqrt{PR}$ or 150V whichever is less	$\sqrt{PR}$ or 150V whichever is less
	*Max. Overload Voltage	50V	100V	200V	300V	300V
	TCR	Resistance Range	Resistance Range	Resistance Range	Resistance Range	Resistance Range
0.01% (U)	±5ppm (P)	49.9Ω – 3KΩ	25Ω – 15KΩ	25Ω – 30KΩ	25Ω – 50KΩ	25Ω – 50KΩ
	±10ppm (N)	50Ω – 12KΩ	25Ω – 100KΩ	25Ω – 200KΩ	25Ω – 500KΩ	25Ω – 500KΩ
	±25ppm (E)	50Ω – 12KΩ	25Ω – 100KΩ	25Ω – 200KΩ	25Ω – 500KΩ	25Ω – 500KΩ
0.05% (A)	±5ppm (P)	49.9Ω – 3KΩ	25Ω – 15KΩ	25Ω – 30KΩ	25Ω – 50KΩ	25Ω – 50KΩ
	±10ppm (N)	50Ω – 12KΩ	25Ω – 100KΩ	4.7Ω – 500KΩ	4.7Ω – 1MΩ	25Ω – 500KΩ
	±25ppm (E)	50Ω – 12KΩ	4.7Ω – 150KΩ	4.7Ω – 1MΩ	4.7Ω – 1MΩ	25Ω – 500KΩ
0.10% (B)	±5ppm (P)	49.9Ω – 3KΩ	25Ω – 15KΩ	25Ω – 30KΩ	25Ω – 50KΩ	25Ω – 50KΩ
	±10ppm (N)	50Ω – 12KΩ	4.7Ω – 332KΩ	4.7Ω – 500KΩ	4.7Ω – 1MΩ	4.7Ω – 1MΩ
0.25% (C)	±5ppm (P)	50Ω – 2KΩ	50Ω – 8KΩ	50Ω – 16KΩ	50Ω – 30KΩ	25Ω – 50KΩ
	±10ppm (N)	50Ω – 12KΩ	4.7Ω – 332KΩ	4.7Ω – 500KΩ	4.7Ω – 1MΩ	4.7Ω – 1MΩ
0.50% (D)	±5ppm (P)	50Ω – 2KΩ	50Ω – 8KΩ	50Ω – 16KΩ	50Ω – 30KΩ	25Ω – 50KΩ
	±10ppm (N)	50Ω – 12KΩ	4.7Ω – 332KΩ	4.7Ω – 500KΩ	4.7Ω – 1MΩ	4.7Ω – 1MΩ

Operating Temperature Range (°C) –55 ~ +150.

* Overload Voltage=2.5*√(P*R) or Max. overload voltage listed above, whichever is lower.

Please consult your salesperson for values available outside these ranges and for non-standard values.

Any values and corresponding ranges available in 5ppm or 10ppm are also available in 25ppm.

All components in this section are RoHS compliant per the EU directives and definitions.

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Characteristics

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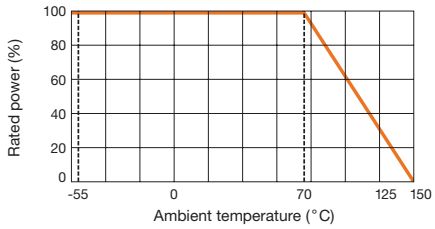

Description	Requirements	Test method JIS C 5202
Short-time Overload	Within ± (0.1% +0.05Ω) No major visible damage	2.5 times rated voltage 5 seconds
Insulation Resistance	At least 1,000 Meg Ω	100V 1 minute
Withstanding Voltage	Within ± (0.5% +0.05Ω) no flashover, scorching or insulation breakdown	1/10: AC 150V 1 minute 1/8: AC 300V 1 minute
Terminal Strength	Within ± (0.5% +0.05Ω) No mechanical damage	Install a sample on the board and bend the board 3/45mm for 10 seconds
Solder Heat Resistance	Within ± (0.05% +0.05Ω) No major visible damage	Dip into 260°C solder bath for 10 seconds
Solderability	At least 95% of the dipping surface must be covered by new solder	235°C 2 seconds
Temperature Cycle	Within ± (0.1% +0.05Ω) No major visible damage Markings Legible	Cycle between -55°C and + 150°C for 5 cycles
Load Life in Moisture	Within ± (0.25% +0.05Ω) No major visible damage Markings Legible	Rated voltage 1.5 hours "ON" 0.5 hours "OFF" 40°C, 95% RH 1,000 hours
Load Life	Within ± (0.25% +0.05Ω) No major visible damage Markings Legible	Rated voltage 1.5 hours "ON" 0.5 hours "OFF" 70°C 1,000 hours

NOTE: These specifications are typical and are based on standard operating conditions.

How To Order

UPTF0805-10W — P — XXXX A □ T

- **UPTF0805-10W** — Series
- **P** — TCR
  - P: ±5PPM/°C
  - N: ±10PPM/°C
  - E: ±25PPM/°C
- **XXXX** — Resistance Value
- **A** — Resistance Tolerance
  - U: ±0.01%
  - A: ±0.05%
  - B: ±0.1%
  - C: ±0.25%
  - D: ±0.5%
  - F: ±1%
- **□** — Leave blank for standard termination. Standard termination finish for this product is 100% matte Tin (Sn). Add Pb above for Lead Termination.
- **T** — Packaging
  - T: Tape

Part Marking Description

Series	E24 Values	E96 Values
UPTF0603	Standard 3 Digit Marking	Alpha code system (Alpha numeric code - see pg. 67)
UPTF0805	Standard 3 Digit Marking	Standard 4 Digit Marking
UPTF1206	Standard 3 Digit Marking	Standard 4 Digit Marking
UPTF1210	Standard 3 Digit Marking	Standard 4 Digit Marking

Examples:	
3 Digit (alpha numeric)	30C = 20KΩ
Standard 3 Digit	103 = 10KΩ
Standard 4 Digit	2491 = 2.49KΩ

- If the component is a crossover value (both available in E-24 and E-96) then the 3 digit E-24 series marking will typically be used.
- 0402 size resistors are not marked.

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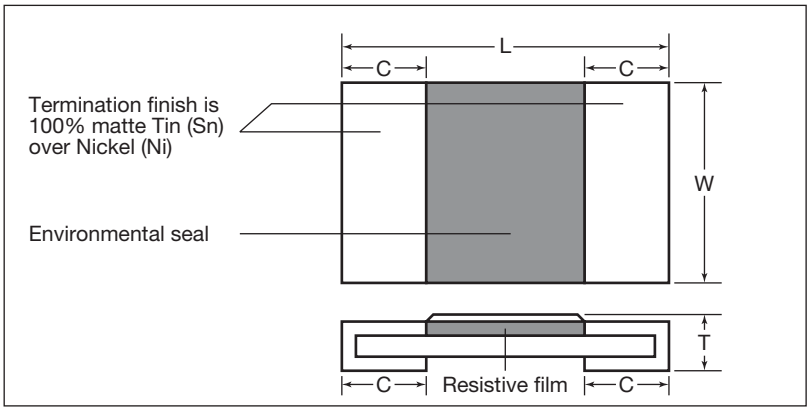
High Value Chip Resistors

Features

HMCR Chip Resistors are small in size but offer extremely high resistance - up to 100 Giga Ohms. Available in standard 0402, 0603, 0805, 1206 and 2512 sizes. Suitable for pick and place equipment.

Specifications

ELECTRODE TYPE W: WRAP AROUND



Series	Rated Power (W)	Max. Working Voltage DC (V)	Max. Overload Voltage DC(V)	Range of Resistance Values (Ω)	Dimensions (mm)			
					L	W	T	C
HMCR0402-16W	0.063	25	50	12 Meg ~ 100 Meg	1.0 ± 0.05	0.5 ± 0.05	0.35 ± 0.05	0.2 ± 0.1
HMCR0603-16W	0.063	50	100	24 Meg ~ 100 Gig	1.6 ± 0.1	0.8 ± 0.1	0.4 ± 0.1	0.2 ± 0.1
HMCR0805-10W	0.10	75	150	24 Meg ~ 100 Gig	2.0 ± 0.2	1.25 ± 0.2	0.4 ± 0.1	0.4 ± 0.2
HMCR1206-8W	0.125	150	300	24 Meg ~ 100 Gig	3.2 ± 0.2	1.6 ± 0.2	0.5 ± 0.1	0.5 ± 0.3
HMCR2512-1W	1.00	300	500	12 Meg ~ 100 Gig	6.4 ± 0.2	3.2 ± 0.2	0.5 ± 0.1	0.5 ± 0.3

All components in this section are RoHS compliant per the EU directives and definitions.

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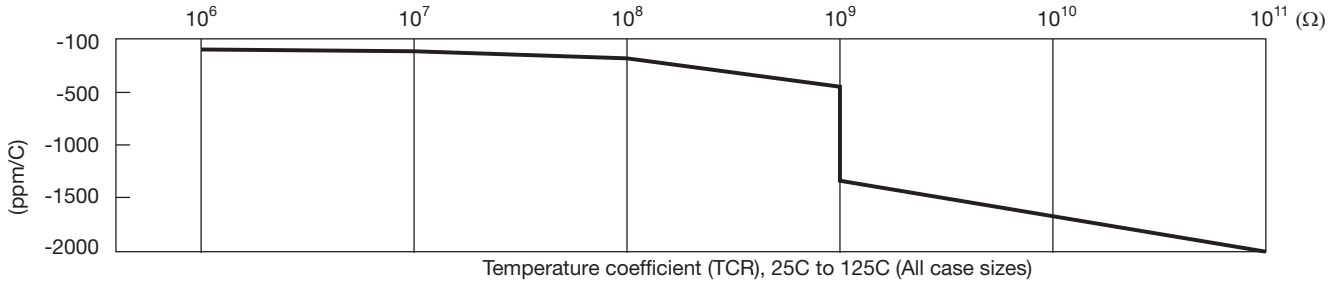
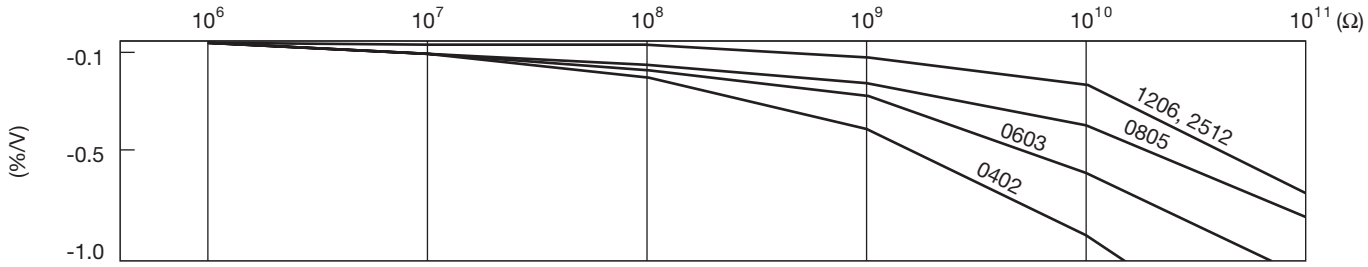
Characteristics

Item	Characteristics	Test method
Long-term Stability	±0.5%	At normal temperature and humidity for 1,000 hr.
High Temperature Loading	±1%	DC15V, 1.5 hr ON, 0.5 hr OFF, 1,000 hr 70°C
Resistance of Soldering Heat	±1%	Dip into 260°C solder bath for 10 seconds
Short-time Overload	±2%	Test for 5 sec using maximum overload voltage
Operating Temperature Range	-55~+125°C	



Temperature coefficient (TCR), 25C to 125C (All case sizes)



Voltage coefficient (VCR), 5V - 15V

How To Order

HMCR1206-8W — XXX(X) J T

SERIES

RESISTANCE VALUE
the first two digits represent significant figures. The last specifies the number of zeros to follow. (eg. 108 - 1 Gig ohms)
(E-24 and E-96 series see page 66)

TOLERANCE AT 25°C
F: ±1% (≤100MΩ)*
J: ±5%
K: ±10%
M: ±20%
N: ±30%
* Available in 0603, 0805 & 1206, up to 100 Meg ohms.

PACKAGING
T:TAPE

Standard termination finish for this product is 100% matte Tin (Sn)

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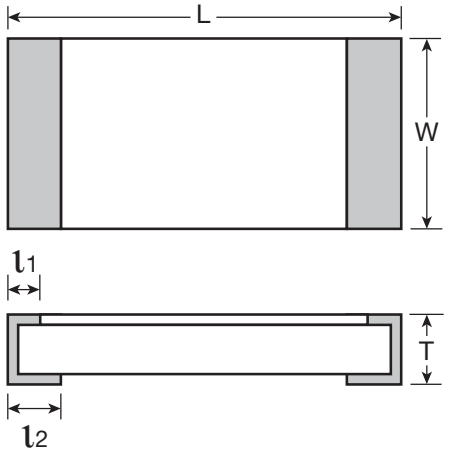
Precision – High Value Chip Resistors

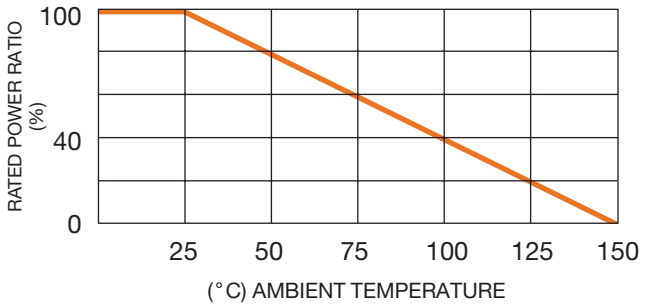
Features

Precision high value chip resistors offer extremely high resistance — up to 1 Giga Ohm, with low TCR. They exhibit excellent long term stability and can be used in high voltage applications.

Specifications



DERATING CURVE



Series	TCR	Maximum Temperature Coefficient (PPM)	Range of Resistance Values (MΩ) Min.	Range of Resistance Values (MΩ) Max.	Rated Power (W)	Maximum Working Voltage DC (KV)	Voltage Coefficient (PPM/V)	Dimensions (mm) L	Dimensions (mm) W	Dimensions (mm) T	Dimensions (mm) l1	Dimensions (mm) l2	Available Resistance Tolerance (%)
PHCR 2512	E	± 25	0.5	30	0.5	1.5	< 20	6.4 ±0.2	3.2 ±0.2	0.5 ±0.1	0.5 ±0.3	0.5 ±0.3	For values ≤100MΩ B±0.1 C±0.25 D±0.5 F±1 G±2 J±5 K±10
	C	± 50	0.5	30									
	K	± 100	0.5	1000									
PHCR 5020	E	± 25	1	30	1.0	2.5	< 5	12.8 ±0.2	5.0 ±0.2	0.8 ±0.1	1.0 ±0.1	2.0 ±0.2	
	C	± 50	1	30									
	K	± 100	1	1000									
PHCR 7020	K	± 100	1	1000	1.5	3.5	< 2	18.0 ±0.2	5.0 ±0.2	0.8 ±0.1	1.0 ±0.1	2.0 ±0.2	For values ≤1GΩ F±1 G±2 J±5 K±10
PHCR 10020	K	± 100	1	1000	2.0	5.0	< 1	25.5 ±0.2	5.0 ±0.2	0.8 ±0.1	1.0 ±0.1	2.0 ±0.2	

*Consult your sales representative for the resistors with resistance values which are outside the range specified above and with resistance tolerance between 0.1% and 0.25%.

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Characteristics

Item	Characteristics	Test Method
Operating Temperature Range	-55°C ~ + 150°C	
Temperature Coefficient	±25, ±50, ±100PPM/°C	Measured at 25°C and 125°C
Long-term Stability	± 0.1%	At normal temperature and humidity for 10,000 hr.
Moisture Resistance	± 0.1%	40°C 90 ~ 95% R.H. 1000 hr.
Heat Cycle	± 0.1%	-55°C ~ + 150°C 5 cycles
Resistance to Soldering Heat	± 0.1%	260°C ± 5°C 10 sec.

How To Order

PHCR2512 — XXX (X) F C T

SERIES

RESISTANCE VALUE
E-24 Values (3 digits): The first two digits represent significant figures.
The last specifies the number of zeros to follow. (eg. 507 — 500Meg Ω)

E-96 Values (4 digits): The first three digits represent significant figures.
The last specifies the number of zeros to follow. (eg. 4754 — 4.75Meg Ω)

TOLERANCE AT 25°C
B: ± 0.1%
C: ± 0.25%
D: ± 0.5%
F: ± 1%
G: ± 2%
J: ± 5%
K: ± 10%

TCR
E: ± 25PPM/°C
C: ± 50PPM/°C
K: ± 100PPM/°C

PACKAGING
B: BULK
T: TAPE

Standard termination finish for this product is 100% matte Tin (Sn)

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Chip Resistor Arrays

Features

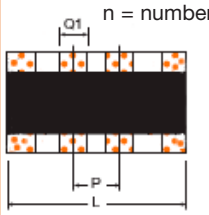
Chip resistor arrays have been designed to fit in wherever greater density is required. Available in banks of 2, 4 or 8 resistors in one package. Suitable for flow and reflow soldering.

Dimensions

Unit: mm

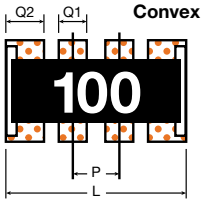
Series	L	W	T	P (Ref.)	Q1	Q2	C	Terminal T
CRN06	1.4 ± 0.1	0.6 ± 0.1	0.35 ± 0.1	0.4 ± 0.1	0.2 ± 0.1	-	0.15 ± 0.05	N/A
CRN10	0.5 X n ± 0.05	1.0 ± 0.05	0.35 ± 0.05	0.5 ± 0.15	0.3 ± 0.1	0.4 ± 0.1	0.25 ± 0.05	Convex/Concave
CRN16	0.8 X n ± 0.1	1.6 ± 0.1	0.5 ± 0.1	0.8 ± 0.2	0.5 ± 0.15	0.6 ± 0.15	0.25 ± 0.15	Convex/Concave
CRN 31-8	6.4 ± 0.2	3.1 ± 0.2	0.6 ± 0.1	1.27 ± 0.2	1.0 ± 0.2	NA	0.6 ± 0.2	Concave
CRN 32-4	5.08 ± 0.2	3.1 ± 0.2	0.55 ± 0.1	1.27 ± 0.2	0.8 ± 0.2	1.1 ± 0.15	0.3 ± 0.2	Convex/Concave
CRN 34-8	6.4 ± 0.2	3.1 ± 0.2	0.6 ± 0.1	1.27 ± 0.2	1.0 ± 0.2	NA	0.6 ± 0.2	Concave
CRN 35-8	3.2 ± 0.2	1.6 ± 0.2	0.6 ± 0.1	0.64 ± 0.25	0.34 ± 0.15	0.49 ± 0.15	0.2+0.2-0.1	Convex

n = number of resistive elements.

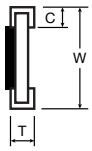


CRN06 (only)

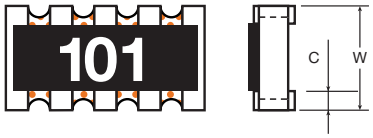
Note: Drawings shown to the right are for CRN10, CRN16 and CRN 32-4 only.



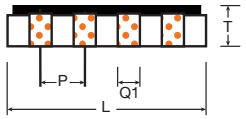
Convex Terminal



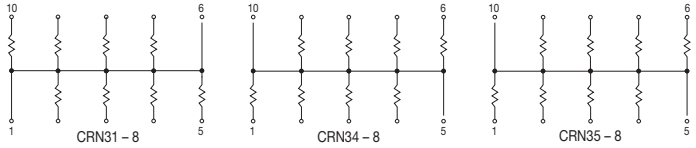
Concave Terminal



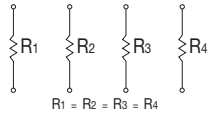
Side View (Concave)



Bussed Arrays: All resistance values are the same



Isolated Arrays: CRN 06, 10, 16 & 32



Rating

Series	Rated Power at 70°C	Maximum Working Voltage	Maximum Overload Voltage	TCR	* Resistance Range	Tolerance	Operating Temperature Range	Quantity per Reel
CRN06-4	0.03W	12.5V	25V	±200ppm/°C	0,1Ω ~ 10MΩ	J	-55°C ~ 125°C	10,000
*CRN10	0.063W	25V	50V	±200PPM/°C	0,10Ω ~ 1MΩ	F	-55°C ~ 150°C	10,000
					0,1Ω ~ 10MΩ	J		
**CRN16	0.063W	50V	100V	±200PPM/°C	0,10Ω ~ 1MΩ	F	-55°C ~ 150°C	5,000
					0,1Ω ~ 10MΩ	J		
CRN31-8	0.063W	100V	200V	±200PPM/°C	22Ω ~ 470K	F, J	-55°C ~ 150°C	4,000
CRN32-4	0.125W	200V	400V	±200PPM/°C	0,10Ω ~ 1MΩ	F, J	-55°C ~ 150°C	4,000
CRN34-8	0.063W	100V	200V	±200PPM/°C	22Ω ~ 470K	F, J	-55°C ~ 150°C	4,000
CRN35-8	0.031W	25V	50V	±250PPM/°C	10Ω ~ 100K	F, J	-55°C ~ 150°C	5,000

* Only available with 2 or 4 resistors. Concave in 4 element only.

** CRN16 Series with 2 or 8 resistors is available in 5% tolerance only.
CRN16 Series with 8 resistors is available in Convex style termination only.

Minimum order quantities may apply.
NOTE: Values under 10Ω may be available. Please consult your sales representative for availability.

How To Order

CRN16 – 4 – XXX(X) J □ □ T

- **CRN16** — Series
- **4** — Number of Elements (2, 4 or 8)
- **XXX(X)** — Resistance Value Code (can be 3-digit or 4-digit marking. See page 48)
- **J** — Resistance Tolerance
  - F: ±1% (4-digit marking)
  - J: ±5% (3-digit marking)
  - Leave blank for zero ohm jumper (CRN16-4-000T)
- **□** — Convex termination is standard and requires no designation. C – add the letter "C" for Concave termination
- **□** — Standard termination finish for this product is 100% matte Tin (Sn). If a 100% Tin designation is required, add Sn.
- **T** — Packaging T: Tape

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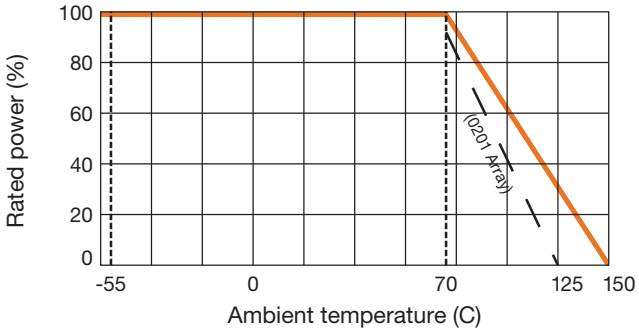
DERATING CURVE



The resistors shall have a power rating based on continuous full-load operation at an ambient temperature of 70°C. For operation at ambient temperature in excess of 70°C, the load shall be derated in accordance with figure of Derating Curve.

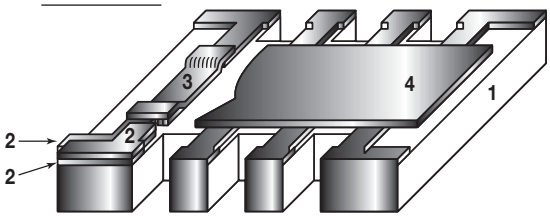
Characteristics

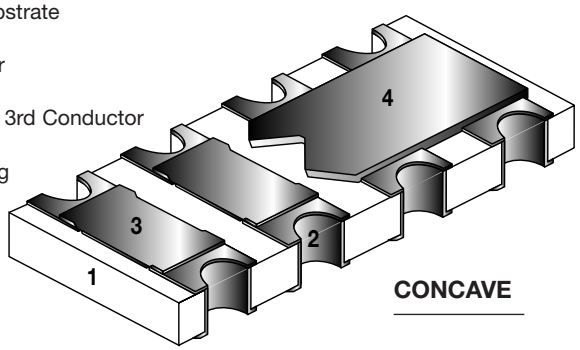
Description	Requirements	Test method JIS C 5202
Resistance Value	Within specified tolerance	
Resistance Temperature Coefficient	See Rating table	Measuring temperature +25°C/ -55°C/ +20°C/ +125°C
Short time Overload	Within ± (1% +0.05Ω) No major visible damage	2.5 times rated voltage 5 seconds
Insulation Resistance	At least 1,000 MΩ	CRN10: 50Vdc, CRN16/35: 100Vdc 1 minute CRN31/32: 500Vdc 1 minute
Terminal Strength	Within ± (1% +0.05Ω) No mechanical damage to the resistor body	Install a sample on the board and bend the board 3/45mm for 10 seconds
Resistance to Vibration	Within ± (1% +0.05Ω) No mechanical damage to the resistor body	10Hz → 55Hz → 10Hz 3 directions (X, Y, Z) 2 hours each Amplitude 1.5mm
Solder Heat Resistance	Within ± (1% +0.05Ω) No major visible damage	Dip into 260°C solder bath for 10 seconds
Solderability	At least 95% of the terminal surface must be covered by new solder	After dipping into flux, dip into 235°C solder bath for 2 seconds
Temperature Cycle	Within ± (1% +0.05Ω) No major visible damage	Cycle between -55°C and +150°C for 5 cycles
Load Life in Moisture	Within ± (3% +0.1Ω) No major visible damage	Rated voltage 1.5 hours "ON" 0.5 hours "OFF" 40°C, 95% RH 1,000 hours
Load Life	Within ± (3% +0.1Ω) No major visible damage	Rated voltage 1.5 hours "ON" 0.5 hours "OFF" 70°C 1,000 hours

Construction

1 – High Purity Alumina Substrate
2 – Termination
1) Ag/Pd 1st Conductor
2) Ni 2nd Conductor
3) 100% matte Tin (Sn) 3rd Conductor
3 – RuO_2 Resistor Material
4 – Glass Protective Coating

CONVEX





CONCAVE

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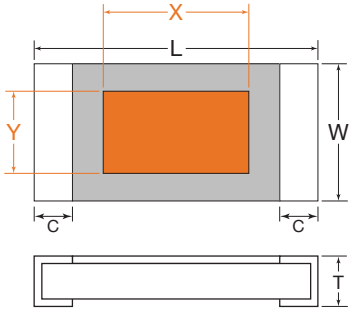
Trimmable Chip Resistors

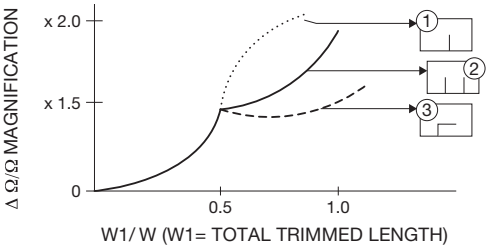
Features

Trimmable Chip Resistors are used when final adjustment of circuits is required. The resistance film and glass passivation have been specifically designed to enhance YAG laser trimming.

Dimensions



X,Y: TRIMMING AREA



Unit: mm (inch)

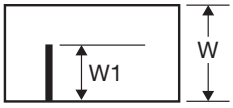
Size	L	W	T	C
0402	1.00 ± 0.05 (0.040 ± 0.002)	0.5 ± 0.02 (0.020 ± 0.001)	0.35 ± .05 (0.014 ± 0.002)	0.17 ± 0.1 (0.007 ± 0.004)
0603	1.6 ± 0.1 (0.063 ± 0.004)	0.8 ± 0.1 (0.031 ± 0.004)	0.45 ± 0.1 (0.018 ± 0.004)	0.30 ± 0.15 (0.012 ± 0.015)
0805	2.00 ± 0.15 (0.079 ± 0.006)	1.25 ± 0.15 (0.049 ± 0.006)	0.50 ± 0.15 (0.020 ± 0.006)	0.40 ± 0.25 (0.016 ± 0.008)
1206	3.20 ± 0.15 (0.126 ± 0.006)	1.60 ± 0.15 (0.063 ± 0.006)	0.60 ± 0.15 (0.024 ± 0.006)	0.45 ± 0.25 (0.018 ± 0.010)
1210	3.2 ± 0.2 (0.126 ± 0.008)	2.6 ± 0.2 (0.102 ± 0.008)	0.50 ± 0.3 (0.024 ± 0.004)	0.5 ± 0.3 (0.020 ± 0.012)
2010	5.0 ± 0.2 (0.197 ± 0.008)	2.50 ± 0.20 (0.098 ± 0.008)	0.6 ± 0.1 (0.024 ± 0.004)	0.5 ± 0.3 (0.020 ± 0.012)
2512	6.3 ± 0.2 (0.248 ± 0.008)	3.1 ± 0.2 (0.122 ± 0.008)	0.60 ± 0.15 (0.024 ± 0.004)	0.5 ± 0.3 (0.020 ± 0.012)

① **SINGLE CUT** ② **DOUBLE CUT** ③ **L CUT**

Trimming by laser increases the initial resistance. Amount of R is dependent on the laser cut configuration as demonstrated.

W1 must not exceed 1/2 of W to ensure power rating of the unit.

ABILITY TO REACH 2X ORIGINAL R



Characteristics

Series	Power Rating @ 70°C	TCR (ppm / °C) Max.	Resistance Range	Resistance Tolerance	Working Voltage	Overload Voltage (5 sec. max.)	Operating Temp. Range
TRCR0402	62.5 mW	±200	47Ω ~ 47KΩ 10Ω ~ 4.7MΩ	M: (±20%) N: 0 to -30%	50 V	100 V	-55 ~ +125°C
TRCR0603	62.5 mW						
TRCR0805	125 mW (100 mW)	±200 (std. range) +500 ~ –200 (1Ω ~ 9.1Ω)	1Ω ~ 4.7MΩ		150 V	200 V	-55 ~ +150°C
TRCR1206	250 mW (125 mW)				200 V	400 V	
TRCR1210	330 mW (250 mW)						
TRCR2010	750 mW (500 mW)						
TRCR2512	1000 mW						

How To Order

TRCR0805 — **XXX** **M** **T**

- TRCR0805 — Series
- XXX — Resistance Value
- M — Resistance Tolerance M: ±20% N: 0 to -30%
- T — Packaging T: Tape

Standard termination finish for this product is 100% matte Tin (Sn)

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EIA Standard Resistance Values

(5%)			(1%)		
E6	E12	E24	E48	E96	E192
100	100	100	100	100	100
					101
				102	102
					104
			105	105	105
					106
				107	107
					109
		110	110	110	110
					111
				113	113
					114
			115	115	115
					117
				118	118
					120
	120	120	121	121	121
					123
				124	124
					126
			127	127	127
					129
		130		130	130
					132
			133	133	133
					135
				137	137
					138
			140	140	140
					142
				143	143
					145
			147	147	147
					149
150	150	150		150	150
					152
			154	154	154
					156
				158	158
		160			160
			162	162	162
					164
				165	165
					167
			169	169	169
					172
				174	174
					176
			178	178	178
	180	180			180
				182	182
					184
			187	187	187
					189
				191	191
					193
			196	196	196
					198
		200		200	200
					203
			205	205	205
					208
				210	210
					213
			215	215	215
					218
220	220	220			
				221	221
					223

(5%)			(1%)		
E6	E12	E24	E48	E96	E192
			226	226	226
					229
				232	232
					234
			237	237	237
		240			240
				243	
					244
					246
			249	249	249
					252
				255	255
					258
			261	261	261
					264
				267	267
					271
	270	270			
			274	274	274
					277
				280	280
					284
			287	287	287
					291
				294	294
					298
		300			
			301	301	301
					305
				309	309
					312
			316	316	316
					320
				324	324
					328
330	330	330			
			332	332	332
					336
				340	340
					344
			348	348	348
					352
				357	357
		360			
					361
			365	365	365
					370
				374	374
					379
			383	383	383
					388
	390	390			
				392	392
					397
			402	402	402
					407
				412	412
					417
			422	422	422
					427
		430			
				432	432
					437
			442	442	442
					448
				453	453
					458
			464	464	464
470	470	470			470

(5%)			(1%)		
E6	E12	E24	E48	E96	E192
				475	475
					481
			487	487	487
					493
				499	499
					505
		510			
			511	511	511
					517
				523	523
					530
			536	536	536
					542
				549	549
					556
	560	560			
			562	562	562
					569
				576	576
					583
			590	590	590
					597
				604	604
					612
			619	619	619
		620			
					626
				634	634
					642
			649	649	649
					657
				665	665
					673
680	680	680			
			681	681	681
					690
				698	698
					706
			715	715	715
					723
				732	732
					741
		750	750	750	750
					759
				768	768
					777
			787	787	787
					796
				806	806
					816
	820	820			
			825	825	825
					835
				845	845
					856
			866	866	866
					876
				887	887
					898
			909	909	909
		910			
					920
				931	931
					942
			953	953	953
					965
				976	976
					988

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Marking Code for Chip Resistors

0603, 1% Chip Resistors and Rectangular Thin Film Chip Resistors

As the chart shows, a Two-Digit Number Code is assigned to each standard Resistance Value per E96 guidelines. (Decade Value Listing)

This is followed by an Alpha Code System which is a multiplier for the value table. Each letter from "A" — "Y" representing a specific multiplier.

STANDARD RESISTANCE VALUES FOR THE 10 TO 100 DECADE
(also usable in decade multiples or sub-multiples)

RESISTANCE TOLERANCE (+%)

E96		E96		E96		E96		E96		E96	
1%	#	1%	#	1%	#	1%	#	1%	#	1%	#
10.0	01	14.7	17	21.5	33	31.6	49	46.4	65	68.1	81
10.2	02	15.0	18	22.1	34	32.4	50	47.5	66	69.8	82
10.5	03	15.4	19	22.6	35	33.2	51	48.7	67	71.5	83
10.7	04	15.8	20	23.2	36	34.0	52	49.9	68	73.2	84
11.0	05	16.2	21	23.7	37	34.8	53	51.1	69	75.0	85
11.3	06	16.5	22	24.3	38	35.7	54	52.3	70	76.8	86
11.5	07	16.9	23	24.9	39	36.5	55	53.6	71	78.7	87
11.8	08	17.4	24	25.5	40	37.4	56	54.9	72	80.6	88
12.1	09	17.8	25	26.1	41	38.3	57	56.2	73	82.5	89
12.4	10	18.2	26	26.7	42	39.2	58	57.6	74	84.5	90
12.7	11	18.7	27	27.4	43	40.2	59	59.0	75	86.6	91
13.0	12	19.1	28	28.0	44	41.2	60	60.4	76	88.7	92
13.3	13	19.6	29	28.7	45	42.2	61	61.9	77	90.9	93
13.7	14	20.0	30	29.4	46	43.2	62	63.4	78	93.1	94
14.0	15	20.5	31	30.1	47	44.2	63	64.9	79	95.3	95
14.3	16	21.0	32	30.9	48	45.3	64	66.5	80	97.6	96

LETTER MULTIPLIER CROSS REFERENCE

A – 10
* H or B – 100
C – 1,000
D – 10,000
E – 100,000
F – 1,000,000
X – 1
* R or Y – 0.1
Z – 0.01

(Letter multipliers may also come in lower case.)

By combining a specific two digit number and a letter code you have a series of Numeric/Alpha digits that give you the complete E96 Resistance Value Codes for part marking.
* The "B" and "Y" codes are being phased out due to their confusion with the numbers "8" and "4" respectively.

#0603, ±1% Chip Marking	**EXAMPLE: Explanation**	**VALUE**
01B or H	01 means 10.0 and B or (H) = 100	10.0 x 100 = 1K Ohm
25C	25 means 17.8 and C = 1,000	17.8 x 1,000 = 17.8K Ohm
93D	93 means 90.9 and D = 10,000	90.9 x 10,000 = 909K Ohm

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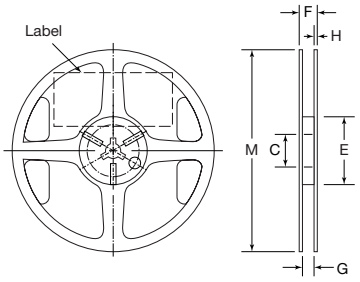
Taping Specifications

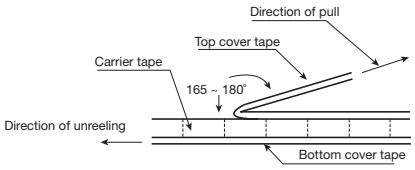


Reel Dimensions

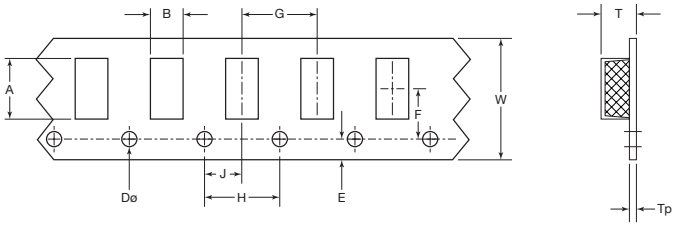
Unit: mm (inch)

	C	E	F	G	H	M
mm	13.0 ± 0.2	6.0 ± .5	11.4 ± 1.0	9.0 ± .3	1.5 ± .3	180 ± 2.0
inch	(.51 ± .008)	(2.36 ± .02)	(.45 ± .04)	(.35 ± .012)	(.06 ± .012)	(7.09 ± .08)

Minimum of 30 empty pockets at the beginning of reel,
65 minimum empty pockets at the end.



All tape and reel peel back force and direction of tape peel back angle should follow EIA481-1-A. Peel back force should be between 0.1N – 1.3N and peel back angle of 165° – 180°.



Chip Resistors

All dimensions in mm.

Tape	Size	A	B	W	E	F	T	Tp	G	H	J	Dø
Paper	01005	0.45 ± 0.03	0.25 ± 0.03	8.0 ± 0.2	1.75 ± 0.1	3.5 ± 0.05	—	0.40 ± 0.1	2.0 ± 0.05	4.0 ± 0.1	2.0 ± 0.05	1.5 + 0.1-0
	0201	0.7 ± 0.08	0.4 ± 0.08	8.0 ± 0.2	1.75 ± 0.1	3.5 ± 0.05	—	0.40 ± 0.1	2.0 ± 0.05	4.0 ± 0.1	2.0 ± 0.05	1.5 + 0.1-0
	0402	1.15 ± 0.1	0.65 ± 0.1	8.0 ± 0.2	1.75 ± 0.1	3.5 ± 0.05	—	0.45 ± 0.1	2.0 ± 0.05	4.0 ± 0.1	2.0 ± 0.05	1.5 + 0.1-0
	0603	1.9 ± 0.1	1.1 ± 0.1	8.0 ± 0.2	1.75 ± 0.1	3.5 ± 0.05	—	0.60 ± 0.1	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.5 + 0.1-0
	0805	2.4 ± 0.1	1.65 ± 0.1	8.0 ± 0.2	1.75 ± 0.1	3.5 ± 0.05	—	0.75 ± 0.1	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.5 + 0.1-0
	1206	3.5 ± 0.1	1.9 ± 0.1	8.0 ± 0.2	1.75 ± 0.1	3.5 ± 0.05	—	0.75 ± 0.1	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.5 + 0.1-0
	1210	3.5 ± 0.1	2.8 ± 0.1	8.0 ± 0.2	1.75 ± 0.1	3.5 ± 0.05	—	0.75 ± 0.1	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.5 + 0.1-0
Plastic	2010	5.4 ± 0.2	2.9 ± 0.2	12.0 ± 0.1	1.75 ± 0.1	5.5 ± 0.5	0.85 ± 0.1	0.2 ± 0.1	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.5 + 0.1-0
	2512	6.9 ± 0.2	3.6 ± 0.2	12.0 ± 0.1	1.75 ± 0.1	5.5 ± 0.5	0.85 ± 0.1	0.2 ± 0.1	8.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.5 + 0.1-0

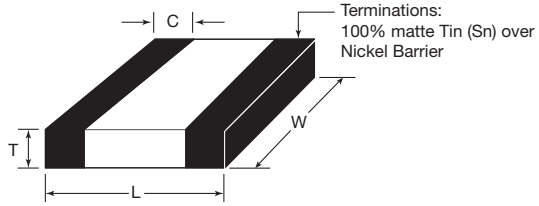
Chip Array

Tape	Series	A	B	W	E	F	T	Tp	G	H	J	Dø
Paper	CRN10-2	1.17 ± 0.1	1.17 ± 0.1	8.0 ± 0.3	1.75 ± 0.1	3.5 ± 0.05	1.0 MAX.	0.45 ± 0.1	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.5 + 0.1-0
	CRN10-4	2.3 ± 0.2	1.3 ± 0.2	8.0 ± 0.2	1.75 ± 0.1	3.5 ± 0.05	1.0 MAX.	0.45 ± 0.1	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.5 + 0.1-0
	CRN16-2	1.9 ± 0.1	1.9 ± 0.1	8.0 ± 0.2	1.75 ± 0.1	3.5 ± 0.05	1.0 MAX.	0.6 ± 0.05	4.0 ± 0.01	—	2.0 ± 0.05	1.5 + 0.1-0
	CRN16-4	3.5 ± 0.1	1.9 ± 0.1	8.0 ± 0.2	1.75 ± 0.1	3.5 ± 0.05	1.0 MAX.	0.75 ± 0.1	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.5 + 0.1-0
Plastic	CRN35-8	3.5 ± 0.2	2.0 ± 0.2	8.0 ± 0.2	1.75 ± 0.1	3.5 ± 0.05	1.0 MAX.	0.75 ± 0.1	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.5 + 0.1-0
	CRN32-4	5.45 ± 0.1	3.6 ± 0.1	12.0 ± 0.3	1.75 ± 0.1	5.5 ± 0.05	1.0 MAX.	0.3 ± 0.1	4.0 ± 0.1	8.0 ± 0.1	2.0 ± 0.05	1.5 + 0.1-0
	CRN31-8	6.9 ± 0.1	3.5 ± 0.1	12.0 ± 0.3	1.75 ± 0.1	5.5 ± 0.05	1.0 MAX.	0.75 ± 0.1	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.5 + 0.1-0
	CRN34-8	6.9 ± 0.1	3.5 ± 0.1	12.0 ± 0.3	1.75 ± 0.1	5.5 ± 0.05	1.0 MAX.	0.75 ± 0.1	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.5 + 0.1-0

NTC Chip Thermistors

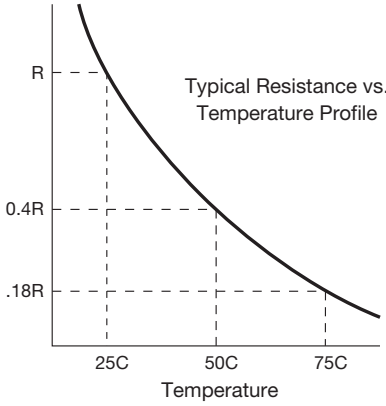
Features

- Negative temperature coefficient
- Flat response to temperature variations make them ideally suited for temperature sensors and compensators
- Standard EIA 0201, 0402, 0603 and 0805 sizes



Unit: mm (inch)

Series	Size	L	W	T max.	C
NTC0402	0402	1.0 ± 0.15 (0.040 ± .006)	0.5 ± 0.05 (0.020 ± .002)	0.55 (0.022)	0.15 min. (0.006)
NTC0603	0603	1.6 ± 0.15 (0.063 ± .006)	0.80 ± 0.15 (0.031 ± .006)	0.95 (0.040)	0.30 ± .15 (0.012 ± 0.006)
NTC0805	0805	2.0 ± 0.20 (0.079 ± .008)	1.25 ± 0.20 (0.050 ± .008)	1.25 (0.050)	0.40 ± .2 (0.016 ± 0.008)



Characteristics

Series	NTC0402	NTC0603	NTC0805
EIA Size	0402	0603	0805
Resistance Range (+25°C)*	40 Ω ~ 2 MEG Ω	22 Ω ~200K Ω	40 Ω ~ 200K Ω
Resistance Tolerance (+25°C)*	(K) ±10% STD. (J) ±5% OPT.	(K) ±10% STD. (J) ±5% OPT.	(K) ±10% STD. (J) ±5% OPT.
Operating Temp. Range	-40°C ~ +125°C	-40°C ~ +125°C	-40°C ~ +125°C
Storage Temp. Range	-40°C ~ +125°C	-40°C ~ +125°C	-40°C ~ +125°C
Maximum Power Rating**	30mW	150mW	400mW
Dissipation Constant	1.5mW/ °C	1.7mW/ °C	2.0mW/ °C
Beta Value Range (+25°C~+50°C)	2800 ~ 4950	2150 ~ 4250	2750 ~ 4250
Beta Value Tolerance	(J) ±5%, (H) ±3%	(J) ±5%, (H) ±3%	(J) ±5%, (H) ±3%

*See Standard Products Table. **Test Method per JIS-C2571.

How To Order

NTC 0805 3H J 103 K T

- **NTC 0805** — Series
- **3H** — Beta Value Code (See 2 digit codes on Standard Products Table)
- **J** — Beta Value Tolerance: J = 5%, H = 3%
- **103** — Resistance Value Code (see 3 digit codes on Standard Products Table)
- **K** — Resistance Tolerance: K = 10%, J = 5%
- **T** — Packaging, Tape and Reel

Standard termination finish for this product is 100% matte Tin (Sn)

All components in this section are RoHS compliant per the EU directives and definitions.

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NTC CHIP THERMISTORS - Standard Products Table

		Series: NTC0402			Series: NTC0603			Series: NTC0805		
Resistance (+25°C)		Beta**		TC*	Beta**		TC*	Beta**		TC*
Value (OHM)	Code	Value	Code	%°C	Value	Code	%°C	Value	Code	%°C
22	220	n/a	n/a	n/a	2750	2S	-3.07	n/a	n/a	n/a
30	300	n/a	n/a	n/a	2150	2D	-2.40	n/a	n/a	n/a
33	330	n/a	n/a	n/a	2750	2S	-3.07	n/a	n/a	n/a
40	400	2800	2T	-3.13	2750	2S	-3.07	2800	2T	-3.13
50	500	n/a	n/a	n/a	2800	2T	-3.13	n/a	n/a	n/a
68	680	2800	2T	-3.13	2800	2T	-3.13	n/a	n/a	n/a
100	101	2800	2T	-3.13	2750	2S	-3.07	2750	2S	-3.07
150	151	2800	2T	-3.13	n/a	n/a	n/a	n/a	n/a	n/a
220	221	n/a	n/a	n/a	2900	2V	-3.24	2900	2V	-3.24
470	471	n/a	n/a	n/a	3200	3E	-3.58	3250	3F	-3.63
500	501	n/a	n/a	n/a	3200	3E	-3.58	3250	3F	-3.63
680	681	n/a	n/a	n/a	3250	3F	-3.63	3250	3F	-3.63
1K	102	3200	3E	-3.58	3250	3F	-3.63	3250	3E	-3.58
1.5K	152	3200	3E	-3.58	n/a	n/a	n/a	n/a	n/a	n/a
2.0K	202	4100	4C	-4.58	n/a	n/a	n/a	3500	3K	-3.91
2.0K	202	n/a	n/a	n/a	4100	4C	-4.58	4100	4C	-4.58
3.0K	302	4100	4C	-4.58	4100	4C	-4.58	4100	4C	-4.58
3.3K	332	4100	4C	-4.58	4100	4C	-4.58	4100	4C	-4.58
4.7K	472	n/a	n/a	n/a	3550	3L	-3.94	3550	3L	-3.94
5K	502	n/a	n/a	n/a	3550	3L	-3.94	3550	3L	-3.94
10K	103	3800	3T	-4.27	4100	4C	-4.58	3370	3H	-3.77
10K	103	n/a	n/a	n/a	3370	3H	-3.77	3750	3S	-4.19
10K	103	n/a	n/a	n/a	3750	3S	-4.19	3924	3V	-4.38
15K	153	3800	3T	-4.27	3800	3T	-4.27	4000	4A	-4.42
20K	203	3800	3T	-4.27	3800	3T	-4.27	4000	4A	-4.42
22K	223	3900	3V	-4.36	3800	3T	-4.27	4000	4A	-4.42
30K	303	4000	4A	-4.42	4000	4A	-4.42	4000	4A	-4.42
33K	333	4000	4A	-4.42	4000	4A	-4.42	4000	4A	-4.42
47K	473	4000	4A	-4.42	4000	4A	-4.42	4150	4D	-4.64
50K	503	n/a	n/a	n/a	4000	4A	-4.42	4000	4A	-4.42
68K	683	4000	4A	-4.42	4000	4A	-4.42	4150	4D	-4.64
100K	104	4250	4F	-4.78	3700	3R	-4.13	4100	4C	-4.58
100K	104	n/a	n/a	n/a	4150	4D	-4.64	4250	4F	-4.78
150K	154	4250	4F	-4.78	4250	4F	-4.78	4250	4F	-4.78
200K	204	4250	4F	-4.78	4250	4F	-4.78	4250	4F	-4.78
2MEG	205	4950	4W	-5.53	n/a	n/a	n/a	n/a	n/a	n/a

*TC is Temperature Coefficient at +25°C expressed in Percent Resistance Value Change per degree Celsius
**Beta Value is specified (+/-3%) for +25°C ~ +50°C Temperature Range

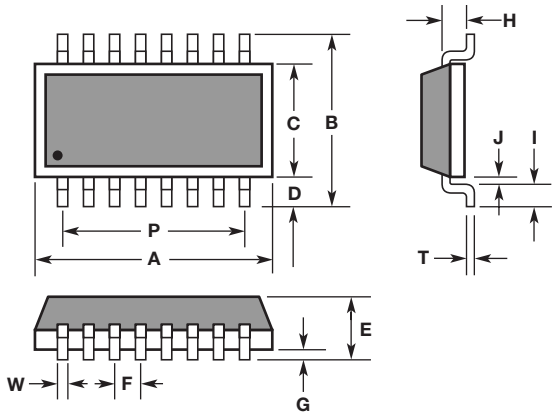
Surface Mount Resistor Networks

"THR-MG" is a MINI FLAT Surface Mount Resistor Network having high quality thick film resistors sealed in a molded package.

Features

- Surface Mount Applications
- Maximum seated height of 1.70 mm (0.070")
- Short terminal pitch (lead spacing) of 1.27 mm (0.050")
- Compatible with all Surface Mounting Equipment

Dimensions



Unit: mm

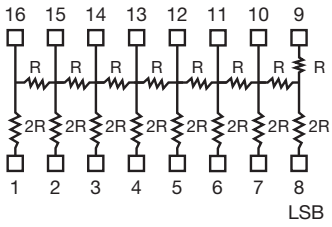
A	B	C	D	E	F	G	H	I	J	P	T	W
11.0	7.7	5.7	1.0	1.7	1.27	0.1	0.75	0.3	0.5	8.89	0.18	0.4
± 0.2	± 0.2	max.	±0.1	±0.2	±0.2	±0.05	max.	min.	max.	±0.1	±0.02	±0.05

SCHEMATICS

L

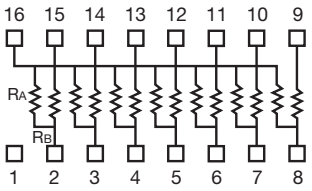
(Ladder Circuit)

- 4~8 Bits (DC 20V max)
- FSA ±1/2 LSB



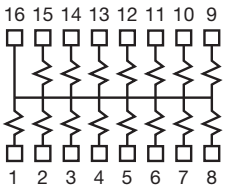
D

(Voltage Divider)



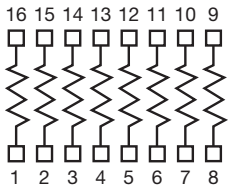
P

(Parallel Circuit)



I

(Isolated Circuit)



Rating

Requirements	MGI	MGP
Number of Terminals	16 Pin	
Rated Environmental Temp.	70°C	
Element Rated Power	160mW	80mW
Overall Rated Power	1.28W	1.2W
Max. Operating Voltage	50V	
Operating Temp. Range	–55°C ~ +125°C	
Temperature Coefficient of Resistance	+100PPM/°C	+200PPM/°C
Resistance Value Tolerance	±2% (G) ±5% (J) ±10% (K)	
Resistance Value Range	33 ohms ~ 2.2M ohms	

All components in this section are RoHS compliant per the EU directives and definitions.

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Characteristics

Test method EIAJ-RC-2680;MIL-R-8340IC

Requirements	Characteristics
Short-time Overload	±(0.5% ±0.05 Ω)
Temperature Cycling	±(0.5% ±0.05 Ω)
Resistance to Soldering Heat	±(0.5% ±0.05 Ω)
Dielectric with Standing V	±(0.5% ±0.05 Ω)
Insulation Resistance	Over 10^4M
Terminal Strength (Pull)	±(0.5% ±0.05 Ω)
Terminal Strength (Bend)	±(0.5% ±0.05 Ω)
Moisture Resistance Load Life	±(1% ±0.05 Ω)
Load Life	±(2% ±0.05 Ω)

How To Order

THR-MG — Series
MG Mini-Flat

I — Schematics
I 8 isolated resistors
P 15 resistors with pin one common
L Ladder Network
D Voltage Divider

16 — 16 Pin

Standard termination finish for this product is 100% matte Tin (Sn).

—

103 — Resistance Value
First two digits are significant figures. The third digit specifies multiplier.

J — Tolerance
G 2%
J 5%
K 10%

Please consult your sales representative for further specific requirements such as: Resistance values; tolerances; ratio matching; and circuit construction.

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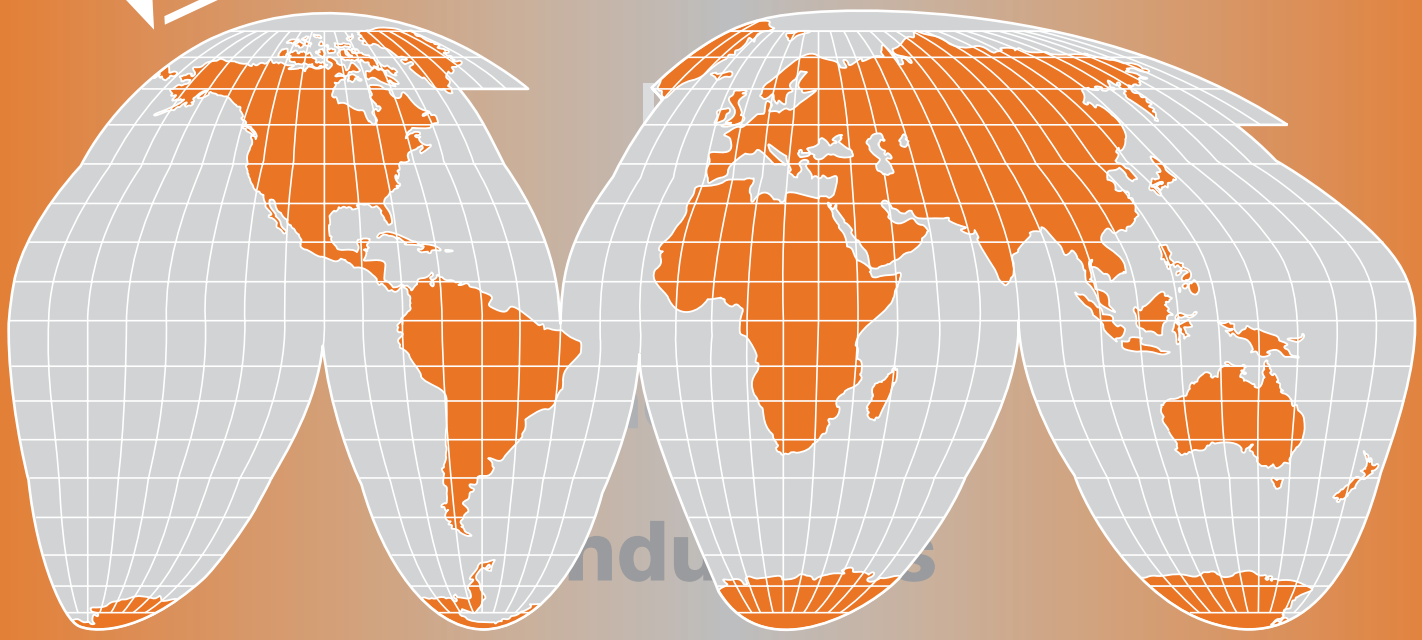

Inductors

Inductors
Inductors
Inductors
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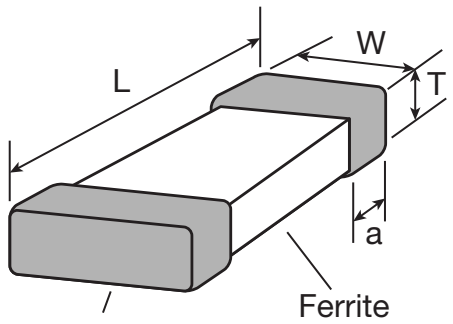
Multilayer Chip Inductors

Features

- No crosstalk between inductors due to magnetic shield Perfect for high density installation
- Unified automatic chip mounting shape with no directionality
- Excellent solderability and high resistance for either flow or reflow soldering
- Monolithic structure for high reliability

Dimensions



Termination finish is 100% matte Tin (Sn) over Nickel (Ni)

Unit: mm (inch)

SERIES	L	W	T	a
MLF 1608 (0603)	1.6 ± 0.15 (0.064 ± .006)	0.8 ± 0.15 (0.032 ± .006)	0.8 ± 0.15 (0.032 ± .006) 1.2 ± 0.2 (0.048 ± .008)	0.3 ± 0.2 (0.012 ± .008)
MLF 2012 (0805)	2.0 ± 0.2 (0.080 ± .008)	1.25 ± 0.2 (0.050 ± .008)	0.85 ± 0.2 (0.034 ± .008) 1.25 ± 0.2 (0.050 ± .008)	0.5 ± 0.3 (0.020 ± .012)

Operating Temperature Range	-40 to +85° C
Storage Temperature Range	-10 to +40° C

How To Order

MLF1608 – **47N** **M** **T**

- **MLF1608** – Series
- **47N** – Inductance Value
  - 47N: 47nH (0.047μH)
  - R12: 0.12μH
  - 1R0: 1μH
- **M** – Tolerance
  - K: ± 10%
  - M: ± 20%
- **T** – Packaging
  - T: Tape

NOTE: All MLF series have Ferrite core.

Standard termination finish for this product is 100% matte Tin (Sn)

Please Note: Venkel offers Engineering Kits for this product. See page 123 for details.

All components in this section are RoHS compliant per the EU directives and definitions.

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MLF1608 SERIES (0603) - Electrical Characteristics

Inductance (µH)	Inductance Tolerance	Q		Test frequency L, Q	Self-resonant frequency (MHz)		DC resistance (Ω)		Rated current (mA) max.	Thickness T (mm)	Part No.*
		min.	nominal	(MHz)	min.	nominal	max.	nominal			
0.047	± 20%	10	20	50	260	350	0.3	0.2	50	0.8	MLF1608-47NM T
0.068	± 20%	10	20	50	250	325	0.3	0.2	50	0.8	MLF1608-68NM T
0.082	± 20%	10	20	50	245	310	0.3	0.2	50	0.8	MLF1608-82NM T
0.1	± 20%, ± 10%	15	25	25	240	295	0.5	0.3	50	0.8	MLF1608-R10□T
0.12	± 20%, ± 10%	15	25	25	205	280	0.5	0.3	50	0.8	MLF1608-R12□T
0.15	± 20%, ± 10%	15	25	25	180	260	0.6	0.4	50	0.8	MLF1608-R15□T
0.18	± 20%, ± 10%	15	25	25	165	245	0.6	0.4	50	0.8	MLF1608-R18□T
0.22	± 20%, ± 10%	15	25	25	150	230	0.8	0.45	50	0.8	MLF1608-R22□T
0.27	± 20%, ± 10%	15	25	25	136	210	0.8	0.5	50	0.8	MLF1608-R27□T
0.33	± 20%, ± 10%	15	25	25	125	200	0.85	0.55	35	0.8	MLF1608-R33□T
0.39	± 20%, ± 10%	15	25	25	110	185	1	0.65	35	0.8	MLF1608-R39□T
0.47	± 20%, ± 10%	15	25	25	105	170	1.35	0.7	35	0.8	MLF1608-R47□T
0.56	± 20%, ± 10%	15	25	25	95	155	1.55	0.75	35	0.8	MLF1608-R56□T
0.68	± 20%, ± 10%	15	25	25	90	140	1.7	0.8	35	0.8	MLF1608-R68□T
0.82	± 20%, ± 10%	15	25	25	85	125	2.1	0.85	35	0.8	MLF1608-R82□T
1	± 20%, ± 10%	35	50	10	75	105	0.6	0.35	25	0.8	MLF1608-1R0□T
1.2	± 20%, ± 10%	35	50	10	65	100	0.8	0.45	25	0.8	MLF1608-1R2□T
1.5	± 20%, ± 10%	35	50	10	60	90	0.8	0.5	25	0.8	MLF1608-1R5□T
1.8	± 20%, ± 10%	35	50	10	55	80	0.95	0.55	25	0.8	MLF1608-1R8□T
2.2	± 20%, ± 10%	35	50	10	50	75	1.15	0.65	15	0.8	MLF1608-2R2□T
2.7	± 20%, ± 10%	35	50	10	45	65	1.35	0.75	15	0.8	MLF1608-2R7□T
3.3	± 20%, ± 10%	35	50	10	40	60	1.55	0.85	15	0.8	MLF1608-3R3□T
3.9	± 20%, ± 10%	35	50	10	35	50	1.7	0.9	15	0.8	MLF1608-3R9□T
4.7	± 20%, ± 10%	35	50	10	33	47	2.1	1	15	0.8	MLF1608-4R7□T
5.6	± 20%, ± 10%	35	55	4	22	45	1.55	0.8	5	0.8	MLF1608-5R6□T
6.8	± 20%, ± 10%	35	55	4	20	40	1.7	0.9	5	0.8	MLF1608-6R8□T
8.2	± 20%, ± 10%	35	55	4	18	38	2.1	1	5	0.8	MLF1608-8R2□T
10	± 20%, ± 10%	30	50	2	17	37	1.85	0.9	3	0.8	MLF1608-100□T

***NOTE** — Part No. can be written as MLF0603.

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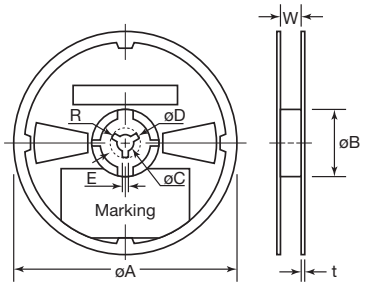
MLF2012 SERIES (0805) - Electrical Characteristics

Inductance (µH)	Inductance tolerance	Q		Test frequency L, Q (MHz)	Self-resonant frequency (MHz)		DC resistance (Ω)		Rated current (mA) max.	Thickness T (mm)	Part No.*
		min.	nominal		min.	nominal	max.	nominal			
0.047	± 20%	15	25	50	320	400	0.2	0.11	300	0.85	MLF2012-47NM T
0.068	± 20%	15	25	50	280	350	0.2	0.11	300	0.85	MLF2012-68NM T
0.082	± 20%	15	25	50	255	320	0.2	0.11	300	0.85	MLF2012-82NM T
0.1	± 20%, ± 10%	20	30	25	235	300	0.3	0.16	250	0.85	MLF2012-R10□T
0.12	± 20%, ± 10%	20	30	25	220	280	0.3	0.16	250	0.85	MLF2012-R12□T
0.15	± 20%, ± 10%	20	30	25	200	250	0.4	0.21	250	0.85	MLF2012-R15□T
0.18	± 20%, ± 10%	20	30	25	185	230	0.4	0.21	250	0.85	MLF2012-R18□T
0.22	± 20%, ± 10%	20	30	25	170	220	0.5	0.26	250	0.85	MLF2012-R22□T
0.27	± 20%, ± 10%	20	30	25	150	200	0.5	0.26	250	0.85	MLF2012-R27□T
0.33	± 20%, ± 10%	20	30	25	145	180	0.55	0.31	250	0.85	MLF2012-R33□T
0.39	± 20%, ± 10%	25	35	25	135	170	0.65	0.36	200	0.85	MLF2012-R39□T
0.47	± 20%, ± 10%	25	35	25	125	160	0.65	0.36	200	1.25	MLF2012-R47□T
0.56	± 20%, ± 10%	25	35	25	115	150	0.75	0.41	150	1.25	MLF2012-R56□T
0.68	± 20%, ± 10%	25	35	25	105	135	0.8	0.46	150	1.25	MLF2012-R68□T
0.82	± 20%, ± 10%	25	35	25	100	125	1	0.56	150	1.25	MLF2012-R82□T
1	± 20%, ± 10%	45	55	10	75	105	0.4	0.21	50	0.85	MLF2012-1R0□T
1.2	± 20%, ± 10%	45	55	10	65	95	0.5	0.26	50	0.85	MLF2012-1R2□T
1.5	± 20%, ± 10%	45	55	10	60	85	0.5	0.26	50	0.85	MLF2012-1R5□T
1.8	± 20%, ± 10%	45	55	10	55	78	0.6	0.31	50	0.85	MLF2012-1R8□T
2.2	± 20%, ± 10%	45	60	10	50	70	0.65	0.36	30	0.85	MLF2012-2R2□T
2.7	± 20%, ± 10%	45	60	10	45	64	0.75	0.41	30	1.25	MLF2012-2R7□T
3.3	± 20%, ± 10%	45	60	10	41	58	0.8	0.46	30	1.25	MLF2012-3R3□T
3.9	± 20%, ± 10%	45	60	10	38	53	0.9	0.51	30	1.25	MLF2012-3R9□T
4.7	± 20%, ± 10%	45	60	10	35	48	1	0.56	30	1.25	MLF2012-4R7□T
5.6	± 20%, ± 10%	50	60	4	32	44	0.9	0.51	15	1.25	MLF2012-5R6□T
6.8	± 20%, ± 10%	50	60	4	29	40	1	0.56	15	1.25	MLF2012-6R8□T
8.2	± 20%, ± 10%	50	60	4	26	36	1.1	0.61	15	1.25	MLF2012-8R2□T
10	± 20%, ± 10%	50	60	2	24	33	1.15	0.66	15	1.25	MLF2012-100□T
12	± 20%, ± 10%	50	60	2	22	30	1.25	0.71	15	1.25	MLF2012-120□T
15	± 20%, ± 10%	30	40	1	19	27	0.8	0.46	5	1.25	MLF2012-150□T
18	± 20%, ± 10%	30	40	1	18	25	0.9	0.51	5	1.25	MLF2012-180□T

***NOTE** — Part No. can be written as MLF0805.

Multilayer Chip Inductors

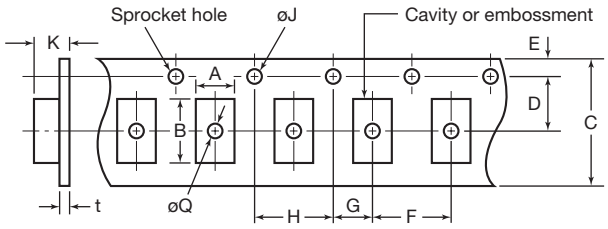
Reel Dimensions

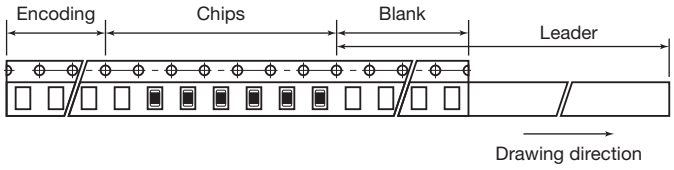


Dimensions (unit = mm)

Series	Product's Thickness (mm)	Quantities (pieces)	Reel Dimensions (mm)				
		Taping (/reel)	øA	øB	øC	W	t
MLF 1608	0.8 ± .0.15	4000 (4mm pitch)	178 ± 2	60 ± 2	13 ± 0.5	10 ± 1.5	2.5 ± 0.2
	1.2 ± 0.2	2000 (4mm pitch)					
MLF 2012	0.85 ± 0.2	4000 (4mm pitch)	178 ± 2	60 ± 2	13 ± 0.5	10 ± 1.5	2.5 ± 0.2
	1.25 ± 0.2	2000 (4mm pitch)					

Taping Dimensions





Tape Dimensions (unit = mm)

Series	Tape Dimensions (mm)												Tape Material	Taping Dimensions (mm)		
	A	B	C	D	E	F	G	H	øJ	K	t	øQ		Leader	Blank	Ending
MLF 1608	1.1	1.9	8	3.5	1.75	4	2	4	1.5	1.1 max. / 2 max.	0.3		Paper	150	150	40

All components in this section are RoHS compliant per the EU directives and definitions.

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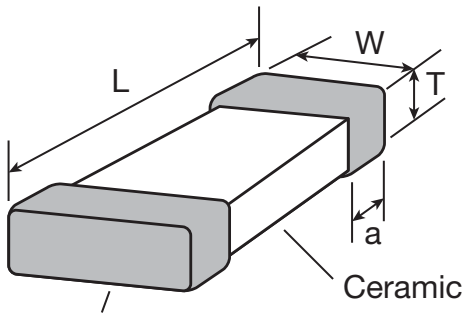
Low Value Multilayer Chip Inductors

Features

- Low inductance — down to 1.0 nH
- Suitable for high frequency applications
- Monolithic structure
- Excellent solderability for either flow or reflow soldering

Dimensions



Termination finish is 100% matte Tin (Sn) over Nickel (Ni)

Unit: mm (inch)

SERIES	L	W	T	a
LMCI 0201 (0201)	0.60 ± 0.03 (0.024 ± .0012)	0.30 ± 0.03 (0.012 ± .0012)	0.3 ± 0.03 (0.012 ± .0012)	0.15 ± 0.05 (0.006 ± .002)
LMCI 1005 (0402)	1.0 ± 0.05 (0.040 ± .002)	0.5 ± 0.05 (0.020 ± .001)	0.5 ± 0.05 (0.014 ± .002)	0.25 ± 0.1 (0.007 ± .004)
LMCI 1608 (0603)	1.6 ± 0.15 (0.064 ± .006)	0.8 ± 0.15 (0.032 ± .006)	0.8 ± 0.15 (0.032 ± .006)	0.3 ± 0.2 (0.012 ± .008)

Operating Temperature Range	-40 to +85° C -55~ +125° C (1005 only)
Temperature Coefficient of Inductance (TCL)	±250 PPM
Storage Temperature Range	-10 to +40° C

How To Order

LMCI 1608 — **3N9** **K** **T**

- **LMCI 1608** — Series
- **3N9** — Inductance Value
  3N9: 3.9nH
  10N: 10nH
  R10: 100nH
- **K** — Tolerance
  J: ± 5%
  K: ± 10%
  M: ± 20%
  S: ± 0.3nH
- **T** — Packaging
  T: Tape

NOTE: All LMCI series have Ceramic core.

Standard termination finish for this product is 100% matte Tin (Sn)

Please Note: Venkel offers Engineering Kits for this product. See page 121 for details.

All components in this section are RoHS compliant per the EU directives and definitions.

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LMCI 0201 SERIES (0.6 x 0.3mm) - Electrical Characteristics

Part Number	Inductance (at 100MHz)		Q min. (MHz)		S.R.F. (MHz) min.	RDC (Ω) max.	IDC (mA) max.	Q'ty/Reel (pcs)
	L (nH)	Tolerance	100	800				
LMCI0201-1N0S T	1.0	S	4	15	20,000	0.12	300	15,000
LMCI0201-1N2S T	1.2	S	4	15	20,000	0.12	300	15,000
LMCI0201-1N5S T	1.5	S	4	15	20,000	0.13	300	15,000
LMCI0201-1N8S T	1.8	S	4	15	20,000	0.14	300	15,000
LMCI0201-2N2S T	2.2	S	4	15	20,000	0.18	300	15,000
LMCI0201-2N7S T	2.7	S	4	14	20,000	0.19	300	15,000
LMCI0201-3N3 □T	3.3	S, K	4	14	20,000	0.24	200	15,000
LMCI0201-3N9 □T	3.9	S, K	4	14	18,000	0.28	190	15,000
LMCI0201-4N7 □T	4.7	S, K	4	14	9,600	0.35	180	15,000
LMCI0201-5N6 □T	5.6	S, K	4	14	9,000	0.40	170	15,000
LMCI0201-6N8 □T	6.8	J, K	4	14	8,000	0.45	160	15,000
LMCI0201-8N2 □T	8.2	J, K	4	14	7,000	0.55	150	15,000
LMCI0201-10N □T	10.0	J, K	4	14	6,700	0.65	150	15,000
LMCI0201-12N □T	12.0	J, K	4	14	6,400	0.75	120	15,000
LMCI0201-15N □T	15.0	J, K	4	14	6,000	0.95	110	15,000
LMCI0201-18N □T	18.0	J, K	4	13	5,300	1.20	100	15,000
LMCI0201-22N □T	22.0	J, K	4	13	5,000	1.80	100	15,000
LMCI0201-27N □T	27.0	J, K	4	12	3,600	2.00	90	15,000
LMCI0201-33N □T	33.0	J, K	4	12	3,000	2.30	85	15,000

NOTE

- L, Q; HP4291A at 100MHz (Test fixture: HP16193A)
- S.R.F: Self-resonance Frequency; HP8753C (Test fixture: HP16193A)
- RDC: DC Resistance; VP-2811A
- IDC: Allowable Current
- □ Inductance Tolerance (S = ±0.3nH, J = ±5%, K = ± 10%, M = ± 20%)

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LMCI 1005 SERIES (0402) - Electrical Characteristics

Part Number	Inductance (at 100MHz)		Q min. (MHz)		S.R.F. (MHz) min.	RDC (Ω) max.	IDC (mA) max.	Q'ty/Reel (pcs)
	L (nH)	Tolerance	100	800 *500				
LMCI1005-1N0S T	1.0	S	8	20	8,000	0.12	300	10,000
LMCI1005-1N2S T	1.2	S	8	20	8,000	0.12	300	10,000
LMCI1005-1N5S T	1.5	S	8	22	6,000	0.13	300	10,000
LMCI1005-1N8S T	1.8	S	8	22	6,000	0.14	300	10,000
LMCI1005-2N2S T	2.2	S	8	22	6,000	0.16	300	10,000
LMCI1005-2N7S T	2.7	S	8	22	5,800	0.17	300	10,000
LMCI1005-3N3K T	3.3	K	8	22	5,800	0.19	300	10,000
LMCI1005-3N9K T	3.9	K	8	22	4,000	0.22	300	10,000
LMCI1005-4N7K T	4.7	K	8	22	4,000	0.24	300	10,000
LMCI1005-5N6K T	5.6	K	8	22	3,900	0.28	300	10,000
LMCI1005-6N8 □T	6.8	J, K	8	21	3,900	0.34	250	10,000
LMCI1005-8N2 □T	8.2	J, K	8	21	3,500	0.38	250	10,000
LMCI1005-10N □T	10.0	J, K	8	21	3,200	0.45	250	10,000
LMCI1005-12N □T	12.0	J, K	8	20	2,700	0.55	250	10,000
LMCI1005-15N □T	15.0	J, K	8	20	2,300	0.60	250	10,000
LMCI1005-18N □T	18.0	J, K	8	20	2,000	0.70	200	10,000
LMCI1005-22N □T	22.0	J, K	8	20	1,800	0.80	200	10,000
LMCI1005-27N □T	27.0	J, K	8	17	1,500	0.90	200	10,000
LMCI1005-33N □T	33.0	J, K	8	17	1,200	1.0	200	10,000
LMCI1005-39N □T	39.0	J, K	8	16	1,100	1.20	150	10,000
LMCI1005-47N □T	47.0	J, K	8	15	1,000	1.30	150	10,000
LMCI1005-56N □T	56.0	J, K	8	—	700	1.40	150	10,000
LMCI1005-68N □T	68.0	J, K	8	—	700	1.40	150	10,000
LMCI1005-82N □T	82.0	J, K	8	—	600	1.60	100	10,000
LMCI1005-R10 □T	100.0	J, K	8	—	600	1.60	100	10,000

NOTE

- L, Q; HP4291A at 100MHz (Test fixture: HP16193A)
- S.R.F: Self-resonance Frequency; HP8753C (Test fixture: HP16193A)
- RDC: DC Resistance; VP-2811A
- IDC: Allowable Current
- □ Inductance Tolerance (S = ±0.3nH, J = ±5%, K = ± 10%, M = ± 20%)

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Low Value Multilayer Chip Inductors

LMCI 1608 SERIES (0603) - Electrical Characteristics

Part Number	Inductance (at 100MHz)		Q min. (MHz)		S.R.F. (MHz) min.	RDC (Ω) max.	IDC (mA) max.	Q'ty/Reel (pcs)
	L (nH)	Tolerance	100	800 *500/**50				
LMCI1608-1N2S T	1.2	S	8	40	8,000	0.10	300	4,000
LMCI1608-1N5S T	1.5	S	8	36	6,000	0.10	300	4,000
LMCI1608-1N8S T	1.8	S	8	38	6,000	0.10	300	4,000
LMCI1608-2N2S T	2.2	S	8	28	6,000	0.12	300	4,000
LMCI1608-2N7S T	2.7	S	10	28	6,000	0.12	300	4,000
LMCI1608-3N3 □T	3.3	S, K	10	26	5,900	0.14	300	4,000
LMCI1608-3N9 □T	3.9	S, K	10	28	5,600	0.16	300	4,000
LMCI1608-4N7 □T	4.7	S, K	10	28	4,200	0.18	300	4,000
LMCI1608-5N6 □T	5.6	S, K	10	28	4,000	0.20	300	4,000
LMCI1608-6N8 □T	6.8	J, K	10	26	3,800	0.24	300	4,000
LMCI1608-8N2 □T	8.2	J, K	10	26	3,500	0.26	300	4,000
LMCI1608-10N □T	10.0	J, K	12	32	2,800	0.28	300	4,000
LMCI1608-12N □T	12.0	J, K	12	32	2,500	0.32	300	4,000
LMCI1608-15N □T	15.0	J, K	12	32	2,200	0.34	300	4,000
LMCI1608-18N □T	18.0	J, K	12	32	2,000	0.36	300	4,000
LMCI1608-22N □T	22.0	J, K	12	34	1,600	0.42	300	4,000
LMCI1608-27N □T	27.0	J, K	12	34	1,400	0.46	300	4,000
LMCI1608-33N □T	33.0	J, K	12	28	1,200	0.58	300	4,000
LMCI1608-39N □T	39.0	J, K	12	24	1,100	0.64	300	4,000
LMCI1608-47N □T	47.0	J, K	12	24	900	0.80	300	4,000
LMCI1608-56N □T	56.0	J, K	12	24	900	0.86	300	4,000
LMCI1608-68N □T	68.0	J, K	12	*24	700	0.86	300	4,000
LMCI1608-82N □T	82.0	J, K	12	*22	600	0.95	300	4,000
LMCI1608-R10 □T	100.0	J, K	12	*20	600	1.00	300	4,000
LMCI1608-R12 □T	120.0	J, K	8	–	500	1.20	300	4,000
LMCI1608-R15 □T	150.0	J, K	8	–	500	1.20	300	4,000
LMCI1608-R18 □T	180.0	J, K	8	–	400	1.30	300	4,000
LMCI1608-R22 □T	220.0	J, K	8	–	400	1.50	300	4,000
LMCI1608-R27 □T	270.0	J, K	8	–	400	1.50	300	4,000

***NOTE**

- L, Q; HP4191A at 100MHz (Test fixture: HP16092A)
- S.R.F: Self-resonance Frequency; HP8753C (Test fixture: HP16091A)
- RDC: DC Resistance; VP-2811A
- IDC: Allowable Current
- □ Inductance Tolerance (S = ±0.3nH, J = ±5%, K = ± 10%, M = ± 20%)

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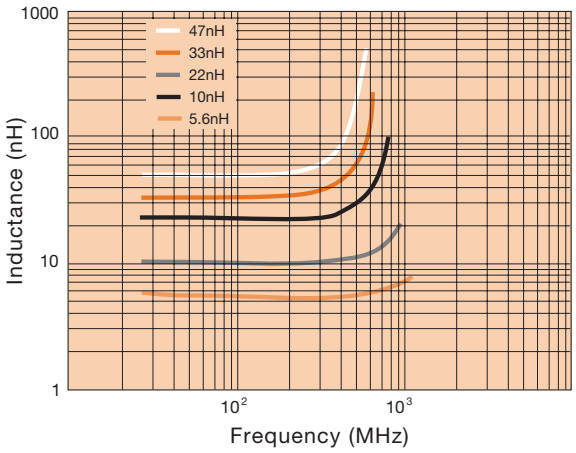
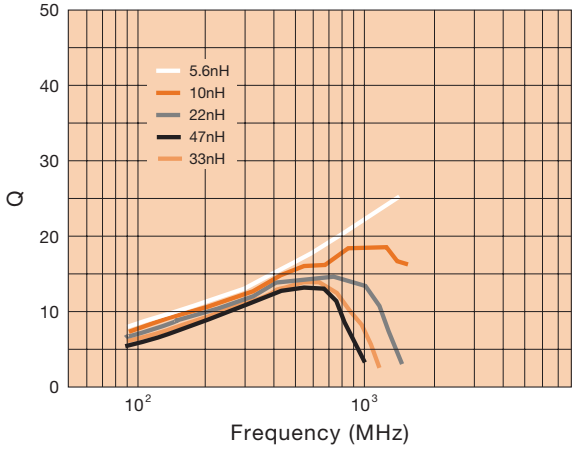
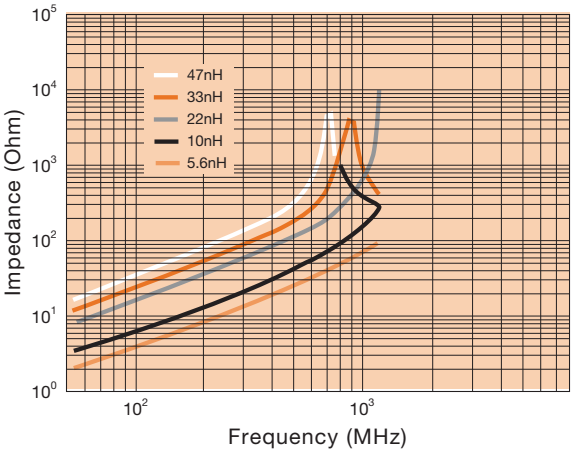
Low Value Multilayer Chip Inductors

1005







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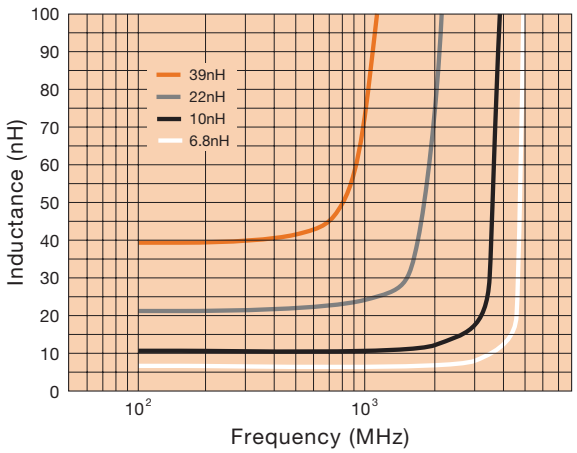

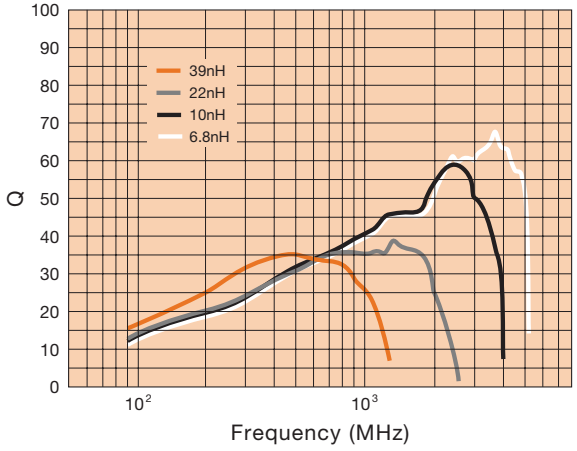

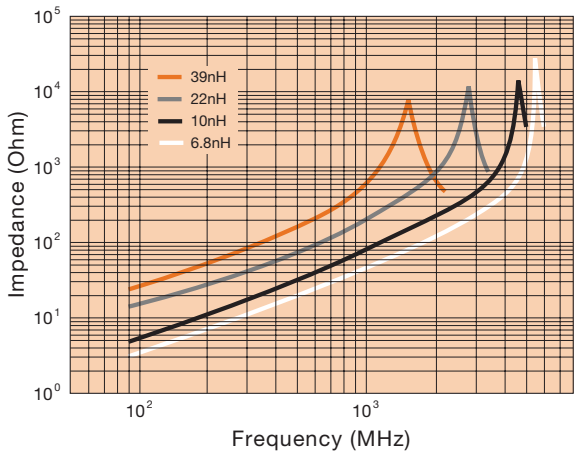

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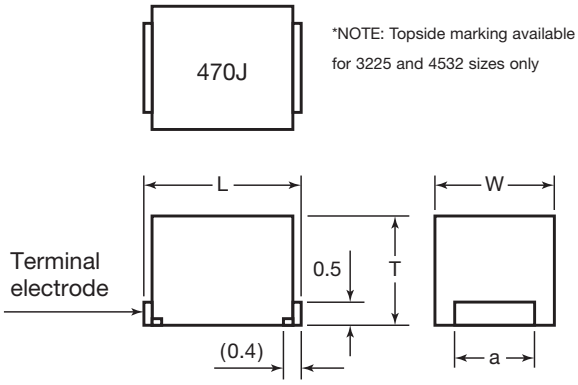
Wire Wound Chip Inductors

Features

- Moulded, heat resistant, resin package
- Unified automatic chip mounting shape with no directionality
- Excellent solderability for either flow or reflow soldering



Dimensions

Dimensions (unit = mm)

SERIES	L	W	T	a
NL252018 (1008)	2.5 ± 0.2 (0.100 ± .008)	2.0 ± 0.2 (0.08 ± .008)	1.8 ± 0.2 (0.072 ± .008)	1.4 ± 0.1 (0.056 ± .004)
NL322522 (1210)	3.2 ± 0.2 (0.128 ± .008)	2.5 ± 0.2 (0.100 ± .008)	2.2 ± 0.2 (0.088 ± .008)	1.9 ± 0.1 (0.076 ± .004)
NL453232 (1812)	4.5 ± 0.3 (0.180 ± .012)	3.2 ± 0.2 (0.128 ± .008)	3.2 ± 0.2 (0.128 ± .008)	2.6 ± 0.1 (0.104 ± .004)

Characteristics

Storage Temperature Range	-40 to 100° C
Operating Temperature Range* (including Self-Temperature Rise)	-20 to 100° C
Temperature Rise (against Ambient Temperature)	20° C max.
Ambient Temperature	80° C max.
Terminal Tensile Strength	0.5kg min.
Current Rating	Value obtained when current flows and the temperature has risen to 20° C or when DC current flows and the initial value of inductance has fallen by 10%, whichever is smaller.
Resistance to Soldering Heat	260° C, 10 seconds
Resistance to Solvent	Conforms to MIL-STD-202E
* Should be used at a stabilized operating temperature Note: Storage temperature range for taping product: 0 to 60° C	

How To Order

NL252018 – 1R0 J T

- **NL252018** – Series
- **1R0** – Inductance Value
  - 047: .047µH
  - R12: 0.12µH
  - 1R0: 1µH
  - 820: 82µH
- **J** – Tolerance
  - J: ± 5%
  - K: ± 10%
  - M: ± 20%
- **T** – Packaging
  - T: Tape

NOTE: All NL series have Ferrite core.

Standard termination finish for this product is 100% matte Tin (Sn). Topside marking available for 3225 and 4532 sizes only.

All components in this section are RoHS compliant per the EU directives and definitions.

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NL252018 SERIES (1008) - Electrical Characteristics

Inductance (µH)	Inductance Tolerance	Q min.	Test Frequency L, Q (MHz)	Self-resonant Frequency (MHz) min.	DC Resistance (Ω) max.	Rated Current (mA) max.	Part No.*
0.01	J, K, M	15	100	2150	0.26	530	NL252018-010□T
0.012	J, K, M	15	100	2050	0.27	500	NL252018-012□T
0.015	J, K, M	15	100	2000	0.29	480	NL252018-015□T
0.018	J, K, M	15	100	1850	0.31	450	NL252018-018□T
0.022	J, K, M	15	100	1650	0.37	420	NL252018-022□T
0.027	J, K, M	15	100	1550	0.4	410	NL252018-027□T
0.033	J, K, M	20	100	1450	0.42	400	NL252018-033□T
0.039	J, K, M	20	100	1350	0.45	380	NL252018-039□T
0.047	J, K, M	20	100	1200	0.5	360	NL252018-047□T
0.056	J, K, M	20	100	1100	0.6	340	NL252018-056□T
0.068	J, K, M	20	100	1050	0.65	320	NL252018-068□T
0.082	J, K, M	20	100	900	0.75	300	NL252018-082□T
0.1	J, K, M	20	100	800	0.8	280	NL252018-R10□T
0.12	J, K, M	30	25.2	700	0.3	550	NL252018-R12□T
0.15	J, K, M	30	25.2	550	0.35	500	NL252018-R15□T
0.18	J, K, M	30	25.2	500	0.4	460	NL252018-R18□T
0.22	J, K, M	30	25.2	450	0.5	430	NL252018-R22□T
0.27	J, K, M	30	25.2	425	0.55	420	NL252018-R27□T
0.33	J, K, M	30	25.2	400	0.6	400	NL252018-R33□T
0.39	J, K, M	30	25.2	375	0.65	375	NL252018-R39□T
0.47	J, K, M	30	25.2	350	0.68	350	NL252018-R47□T
0.56	J, K, M	30	25.2	325	0.75	325	NL252018-R56□T
0.68	J, K, M	30	25.2	300	0.85	300	NL252018-R68□T
0.82	J, K, M	30	25.2	260	1	260	NL252018-R82□T
1	J, K, M	30	7.96	245	1.1	245	NL252018-1R0□T
1.2	J, K, M	30	7.96	230	1.2	230	NL252018-1R2□T
1.5	J, K, M	30	7.96	182	1.3	220	NL252018-1R5□T
1.8	J, K, M	30	7.96	135	1.45	210	NL252018-1R8□T
2.2	J, K, M	30	7.96	105	1.55	200	NL252018-2R2□T
2.7	J, K, M	30	7.96	70	1.7	195	NL252018-2R7□T
3.3	J, K, M	30	7.96	55	1.9	185	NL252018-3R3□T
3.9	J, K, M	30	7.96	48	2.1	180	NL252018-3R9□T
4.7	J, K, M	30	7.96	43	2.3	175	NL252018-4R7□T
5.6	J, K, M	25	7.96	41	2.5	170	NL252018-5R6□T
6.8	J, K, M	25	7.96	39	2.7	165	NL252018-6R8□T
8.2	J, K, M	25	7.96	36	3.05	160	NL252018-8R2□T
10	J, K, M	25	2.52	33	3.5	155	NL252018-100□T
12	J, K, M	25	2.52	30	3.8	150	NL252018-120□T
15	J, K, M	25	2.52	26	4.4	140	NL252018-150□T
18	J, K, M	25	2.52	24	4.8	130	NL252018-180□T
22	J, K, M	25	2.52	22	5.5	125	NL252018-220□T
27	J, K, M	25	2.52	21	6.3	115	NL252018-270□T
33	J, K, M	25	2.52	20	7.1	110	NL252018-330□T
39	J, K, M	20	2.52	18	9.5	90	NL252018-390□T
47	J, K, M	20	2.52	17	11.1	80	NL252018-470□T
56	J, K, M	25	2.52	26	12.1	75	NL252018-560□T
68	J, K, M	25	2.52	26	16.6	70	NL252018-680□T
82	J, K, M	25	2.52	26	19.0	65	NL252018-820□T
100	J, K, M	25	2.52	26	21.0	60	NL252018-101□T

***NOTE** — Part No. can be written as NL1008. These components do not have topside markings.

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Wire Wound Chip Inductors

NL322522 SERIES (1210) - Electrical Characteristics

Inductance (µH)	Inductance tolerance	Q min.	Test frequency L, Q (MHz)	Self-resonant frequency (MHz) min.	DC resistance (Ω) max.	Rated current (mA) max.	Part No.*
0.01	J, K, M	15	100	2500	0.13	450	NL322522-010□T
0.012	J, K, M	17	100	2300	0.14	450	NL322522-012□T
0.015	J, K, M	19	100	2100	0.16	450	NL322522-015□T
0.018	J, K, M	21	100	1900	0.18	450	NL322522-018□T
0.022	J, K, M	23	100	1700	0.2	450	NL322522-022□T
0.027	J, K, M	23	100	1500	0.22	450	NL322522-027□T
0.033	J, K, M	25	100	1400	0.24	450	NL322522-033□T
0.039	J, K, M	25	100	1300	0.27	450	NL322522-039□T
0.047	J, K, M	26	100	1200	0.3	450	NL322522-047□T
0.056	J, K, M	26	100	1100	0.33	450	NL322522-056□T
0.068	J, K, M	27	100	1000	0.36	450	NL322522-068□T
0.082	J, K, M	27	100	900	0.4	450	NL322522-082□T
0.1	J, K, M	28	100	700	0.44	450	NL322522-R10□T
0.12	J, K, M	30	25.2	500	0.22	450	NL322522-R12□T
0.15	J, K, M	30	25.2	450	0.25	450	NL322522-R15□T
0.18	J, K, M	30	25.2	400	0.28	450	NL322522-R18□T
0.22	J, K, M	30	25.2	350	0.32	450	NL322522-R22□T
0.27	J, K, M	30	25.2	320	0.36	450	NL322522-R27□T
0.33	J, K, M	30	25.2	300	0.4	450	NL322522-R33□T
0.39	J, K, M	30	25.2	250	0.45	450	NL322522-R39□T
0.47	J, K, M	30	25.2	220	0.5	450	NL322522-R47□T
0.56	J, K, M	30	25.2	180	0.55	450	NL322522-R56□T
0.68	J, K, M	30	25.2	160	0.6	450	NL322522-R68□T
0.82	J, K, M	30	25.2	140	0.65	450	NL322522-R82□T
1	J, K, M	30	7.96	120	0.7	400	NL322522-1R0□T
1.2	J, K, M	30	7.96	100	0.75	390	NL322522-1R2□T
1.5	J, K, M	30	7.96	85	0.85	370	NL322522-1R5□T
1.8	J, K, M	30	7.96	80	0.9	350	NL322522-1R8□T
2.2	J, K, M	30	7.96	75	1	320	NL322522-2R2□T
2.7	J, K, M	30	7.96	70	1.1	290	NL322522-2R7□T
3.3	J, K, M	30	7.96	60	1.2	260	NL322522-3R3□T
3.9	J, K, M	30	7.96	55	1.3	250	NL322522-3R9□T
4.7	J, K, M	30	7.96	50	1.5	220	NL322522-4R7□T
5.6	J, K, M	30	7.96	45	1.6	200	NL322522-5R6□T
6.8	J, K, M	30	7.96	40	1.8	180	NL322522-6R8□T
8.2	J, K, M	30	7.96	35	2	170	NL322522-8R2□T
10	J, K, M	30	2.52	30	2.1	150	NL322522-100□T
12	J, K, M	30	2.52	20	2.5	140	NL322522-120□T
15	J, K, M	30	2.52	20	2.8	130	NL322522-150□T
18	J, K, M	30	2.52	20	3.3	120	NL322522-180□T
22	J, K, M	30	2.52	20	3.7	110	NL322522-220□T
27	J, K, M	30	2.52	20	5	80	NL322522-270□T
33	J, K, M	30	2.52	17	5.6	70	NL322522-330□T
39	J, K, M	30	2.52	16	6.4	65	NL322522-390□T
47	J, K, M	30	2.52	15	7	60	NL322522-470□T
56	J, K, M	30	2.52	13	8	55	NL322522-560□T
68	J, K, M	30	2.52	12	9	50	NL322522-680□T
82	J, K, M	30	2.52	11	10	45	NL322522-820□T
100	J, K, M	20	0.796	10	10	40	NL322522-101□T
120	J, K, M	20	0.796	10	11	70	NL322522-121□T
150	J, K, M	20	0.796	8	15	65	NL322522-151□T
180	J, K, M	20	0.796	7	17	60	NL322522-181□T
220	J, K, M	20	0.796	7	21	50	NL322522-221□T
270	J, K, M	20	0.796	6	28	45	NL322522-271□T
330	J, K, M	20	0.796	5	34	40	NL322522-331□T
390	J, K, M	20	0.796	5	42	35	NL322522-391□T
470	J, K, M	20	0.796	4	40	25	NL322522-471□T

***NOTE** — Part No. can be written as NL1210. These components have topside markings.

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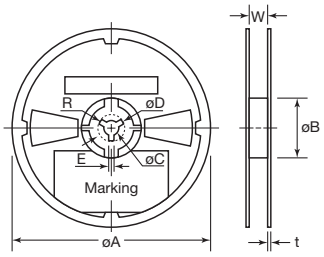
NL453232 SERIES (1812) - Electrical Characteristics

Inductance (µH)	Inductance Tolerance	Q min.	Test Frequency L. Q (MHz)	Self-resonant Frequency (MHz) min.	DC Resistance (Ω) max.	Rated Current (mA) max.	Part No.*
270	J, K, M	40	0.796	4	12	92	NL453232-271□T
330	J, K, M	40	0.796	3.5	14	85	NL453232-331□T
390	J, K, M	40	0.796	3	16	80	NL453232-391□T
470	J, K, M	40	0.796	3	26	62	NL453232-471□T
560	J, K, M	30	0.796	3	30	50	NL453232-561□T
680	J, K, M	30	0.796	3	30	50	NL453232-681□T
820	J, K, M	30	0.796	2.5	35	30	NL453232-821□T
1000	J, K, M	30	0.252	2.5	40	30	NL453232-102□T

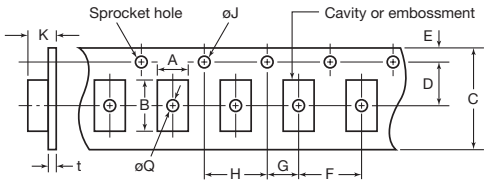
***NOTE** — Part No. can be written as NL1812. These components have topside markings.

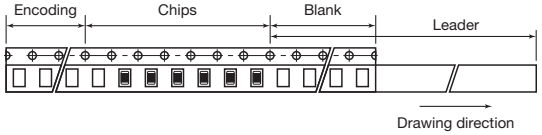
Reel Dimensions



Series	Product's Thickness (mm)	Quantities (pieces)	Reel Dimensions (mm)				
		Taping (/reel)	øA	øB	øC	W	t
NL252018	1.8 ± 0.2	2000	178 ± 2	50 min.	13 ± 0.5	10 ± 1.5	2 ± 0.5
NL322522	2.2 ± 0.2	2000					
NL453232	3.2 ± 0.2	500	178 ± 2	50 min.	13 ± 0.5	14 ± 1.5	2 ± 0.5

Taping Dimensions





Tape Dimensions (unit = mm)

Series	Tape Dimensions (mm)												Tape Material	Taping Dimensions (mm)		
	A	B	C	D	E	F	G	H	øJ	K	t	øQ		Leader	Blank	Ending
NL252018	2.3	2.8	8	3.5	1.75	4	2	4	1.5	2.3	0.3	1.5	Plastic	160 to 200	80 to 100	40 to 60
NL322522	2.9	3.6	8	3.5	1.75	4	2	4	1.5	2.5.	0.3	1.5				
NL453232	3.6	4.9	12	5.5	1.75	8	2	4	1.5	3.8	0.3	1.5				

All components in this section are RoHS compliant per the EU directives and definitions.

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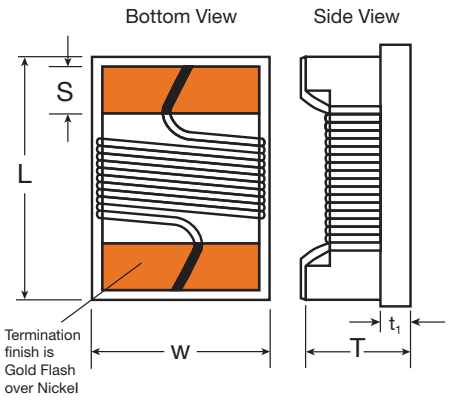
Miniature RF Chip Inductors

Features

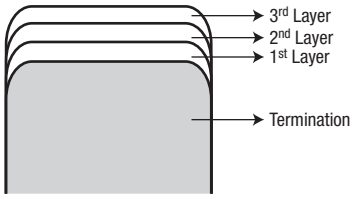
- High Q values
- High SRF
- Wide inductance range, 1nH to 47µH
- Excellent solderability and resistance to soldering heat suitable for flow or reflow soldering
- High reliability and high speed surface mount assembly

Dimensions



Unit: inch (mm)

SERIES	L	W	T	S	(t_1)	QTY/REEL
MRFI 0402 (1005)	0.039 ± .004 (1.0 ± 0.10)	0.022 ± .004 (0.55 ± 0.10)	0.020 ± .006 (0.5 ± 0.15)	0.008 ± 0.004 (0.20 ± 0.1)	0.20	10,000
MRFI 0603 (1608)	0.063 ± 0.008 (1.6 ± 0.2)	0.041 ± 0.008 (1.05 ± 0.2)	0.041± 0.008 (1.05 ± 0.2)	0.014 ± 0.004 (0.35 ± 0.1)	0.50	3,000
MRFI 0805 (2012)	0.080 ± 0.008 (2.0 ± 0.2)	0.050 ± 0.008 (1.25 ± 0.2)	0.048 ± 0.008 (1.2 ± 0.2)	0.016 ± 0.004 (0.4 ± 0.1)	0.60	2,000
MRFI 1008 (2520)	0.098 ± 0.008 (2.6 ± 0.2)	0.080 ± 0.008 (2.1 ± 0.2)	0.063 ± 0.008 (1.6 ± 0.2)	0.020 ± 0.004 (0.5 ± 0.1)	0.70	2,000
MRFI 1210 (3225)	0.126 ± .008 (3.2 ± 0.2)	0.102 ± .008 (2.6 ± 0.2)	0.087 ± 0.008 (2.2 ± 0.2)	0.020 ± 0.004 (0.5 ± 0.1)	1.10	2,000



	Ceramic Type	Ferrite Type
a) 1st Layer	Mo/Mn or Pd/Ag	Pd/Ag
b) 2nd Layer	Ni	Ni
c) 3rd Layer	Au	Sn

How To Order

MRFI0603 – 4N7 S T

- **MRFI0603** – Series
- **4N7** – Inductance Value
  - 4N7: 4.7nH
  - 47N: 47nH
  - R47: 470nH
  - 4R7: 4.7µH
  - 470: 47µH
- **S** – Tolerance
  - B: ± 0.2nH
  - S: ± 0.3nH
  - G: ± 2%
  - J: ± 5%
  - K: ± 10%
  - M: ± 20%
- **T** – Packaging
  - T: Tape

Termination finish is Gold Flash over Nickel

NOTE: Core composition is either Ceramic or Ferrite depending on size and value. See note on the bottom of each data sheet.

Please Note: Venkel offers Engineering Kits for this product. See page 123 for details.

All components in this section are RoHS compliant per the EU directives and definitions.

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MRFI 0402 SERIES (1005) - Electrical Characteristics

Part Number	Inductance (nH)	Tolerance	Q		S.R.F. Min. (MHz)	RDC Max (Ω)	IDC Max (mA)	Color Coding**
			Min.	Typical @ 900MHz				
MRFI 0402 – 1N0 ☐ T	1.0 @ 250 MHz	B, S	13	26	6,000	0.045	1360	N/A
MRFI 0402 – 1N9 ☐ T	1.9 @ 250 MHz	B, S	16	29	6,000	0.070	1040	N/A
MRFI 0402 – 2N0 ☐ T	2.0 @ 250 MHz	B, S	16	30	6,000	0.070	1040	N/A
MRFI 0402 – 2N2 ☐ T	2.2 @ 250 MHz	B, S	18	32	6,000	0.070	960	N/A
MRFI 0402 – 2N4 ☐ T	2.4 @ 250 MHz	B, S	16	35	6,000	0.068	790	N/A
MRFI 0402 – 2N7 ☐ T	2.7 @ 250 MHz	B, S	16	31	6,000	0.120	640	N/A
MRFI 0402 – 3N3 ☐ T	3.3 @ 250 MHz	K, J, B	20	41	6,000	0.066	840	N/A
MRFI 0402 – 3N6 ☐ T	3.6 @ 250 MHz	K, J, B	20	43	6,000	0.066	840	N/A
MRFI 0402 – 3N9 ☐ T	3.9 @ 250 MHz	K, J, B	20	41	5,800	0.066	840	N/A
MRFI 0402 – 4N3 ☐ T	4.3 @ 250 MHz	K, J, B	18	45	6,000	0.091	700	N/A
MRFI 0402 – 4N7 ☐ T	4.7 @ 250 MHz	K, J, B	15	45	4,775	0.130	640	N/A
MRFI 0402 – 5N1 ☐ T	5.1 @ 250 MHz	K, J, B	23	49	5,800	0.083	800	N/A
MRFI 0402 – 5N6 ☐ T	5.6 @ 250 MHz	K, J, B	23	46	5,800	0.083	760	N/A
MRFI 0402 – 6N2 ☐ T	6.2 @ 250 MHz	K, J, B	23	49	5,800	0.083	760	N/A
MRFI 0402 – 6N8 ☐ T	6.8 @ 250 MHz	K, J, B	20	50	4,800	0.083	680	N/A
MRFI 0402 – 7N5 ☐ T	7.5 @ 250 MHz	K, J, B	25	50	5,800	0.104	680	N/A
MRFI 0402 – 8N2 ☐ T	8.2 @ 250 MHz	K, J, B	25	49	4,400	0.104	680	N/A
MRFI 0402 – 8N7 ☐ T	8.7 @ 250 MHz	K, J, B	18	50	4,100	0.200	480	N/A
MRFI 0402 – 9N0 ☐ T	9.0 @ 250 MHz	K, J, B	25	49	4,160	0.104	680	N/A
MRFI 0402 – 9N5 ☐ T	9.5 @ 250 MHz	K, J, B	18	45	4,000	0.200	680	N/A
MRFI 0402 – 10N ☐ T	10 @ 250 MHz	K, J, G	23	47	3,900	0.195	480	N/A
MRFI 0402 – 11N ☐ T	11 @ 250 MHz	K, J, G	26	56	3,680	0.120	640	N/A
MRFI 0402 – 12N ☐ T	12 @ 250 MHz	K, J, G	26	51	3,600	0.120	640	N/A
MRFI 0402 – 13N ☐ T	13 @ 250 MHz	K, J, G	24	54	3,450	0.210	560	N/A
MRFI 0402 – 15N ☐ T	15 @ 250 MHz	K, J, G	26	54	3,280	0.172	560	N/A
MRFI 0402 – 16N ☐ T	16 @ 250 MHz	K, J, G	24	54	3,100	0.220	560	N/A
MRFI 0402 – 18N ☐ T	18 @ 250 MHz	K, J, G	25	52	3,100	0.230	420	N/A
MRFI 0402 – 19N ☐ T	19 @ 250 MHz	K, J, G	26	50	3,040	0.202	480	N/A
MRFI 0402 – 20N ☐ T	20 @ 250 MHz	K, J, G	25	51	3,000	0.250	420	N/A
MRFI 0402 – 22N ☐ T	22 @ 250 MHz	K, J, G	25	52	2,800	0.300	400	N/A
MRFI 0402 – 23N ☐ T	23 @ 250 MHz	K, J, G	26	53	2,720	0.214	400	N/A
MRFI 0402 – 24N ☐ T	24 @ 250 MHz	K, J, G	25	51	2,700	0.300	400	N/A
MRFI 0402 – 27N ☐ T	27 @ 250 MHz	K, J, G	26	48	2,480	0.298	400	N/A
MRFI 0402 – 30N ☐ T	30 @ 250 MHz	K, J, G	25	46	2,350	0.300	400	N/A
MRFI 0402 – 33N ☐ T	33 @ 250 MHz	K, J, G	24	48	2,350	0.350	400	N/A
MRFI 0402 – 36N ☐ T	36 @ 250 MHz	K, J, G	26	48	2,320	0.403	320	N/A
MRFI 0402 – 39N ☐ T	39 @ 250 MHz	K, J, G	25	45	2.100	0.550	320	N/A
MRFI 0402 – 40N ☐ T	40 @ 250 MHz	K, J, G	26	48	2,240	0.438	320	N/A
MRFI 0402 – 43N ☐ T	43 @ 250 MHz	K, J, G	25	46	2,030	0.810	100	N/A
MRFI 0402 – 47N ☐ T	47 @ 200 MHz	K, J, G	26	46	2,100	0.830	150	N/A
MRFI 0402 – 51N ☐ T	51 @ 200 MHz	K, J	25	40	1,750	0.820	100	N/A
MRFI 0402 – 56N ☐ T	56 @ 200 MHz	K, J	22	42	1,760	0.970	100	N/A
MRFI 0402 – 68N ☐ T	68 @ 200 MHz	K, J	22	36	1,620	1.120	100	N/A
MRFI 0402 – 82N ☐ T	82 @ 150 MHz	K, J	20	33	1,500	1.250	100	N/A
MRFI 0402 – R10 ☐ T	100 @ 150 MHz	K, J	20	30	1,300	2.520	100	N/A

NOTE: All 0402's have Ceramic core.

Note: * For values not listed, please consult your salesperson.

NOTE

- Inductance: HP-4287A RF LCR meter with HP-16193 fixture
- Q: HP-4287A RF LCR meter with HP-16193 fixture
- S.R.F (Self-resonance Frequency) ENA E5071B network analyzer
- RDC (DC Resistance): HP-4338B millohmeter
- IDC (Allowable Current)
- ☐ (Inductance Tolerance) (B = ±0.2nH, S = ±0.3nH, G = ±2% J = ±5%, K = ±10%, M = ±20%)
- ** Color code or marking is not applicable for this series

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Miniature RF Chip Inductors

MRFI 0603 SERIES (1608) - Electrical Characteristics

Part Number	Inductance (nH)	Tolerance	Q		S.R.F. Min. (MHz)	RDC Max (Ω)	IDC Max (mA)
			Min.	Typical @ 900MHz			
MRFI 0603 – 1N6 ☐ T	1.6 @ 250 MHz	B, S	24	40	12,500	0.030	700
MRFI 0603 – 1N8 ☐ T	1.8 @ 250 MHz	B, S	16	35	12,500	0.045	700
MRFI 0603 – 2N0 ☐ T	2.0 @ 250 MHz	B, S	16	31	6,900	0.080	700
MRFI 0603 – 3N9 ☐ T	3.9 @ 250 MHz	B, S	22	51	6,900	0.080	700
MRFI 0603 – 4N3 ☐ T	4.3 @ 250 MHz	B, S	22	45	5,900	0.080	700
MRFI 0603 – 4N7 ☐ T	4.7 @ 250 MHz	B, S	20	47	5,800	0.130	700
MRFI 0603 – 5N1 ☐ T	5.1 @ 250 MHz	K, J	20	47	5,700	0.140	700
MRFI 0603 – 5N6 ☐ T	5.6 @ 250 MHz	K, J	16	40	5,500	0.150	700
MRFI 0603 – 6N8 ☐ T	6.8 @ 250 MHz	K, J, B	30	63	5,800	0.110	700
MRFI 0603 – 7N5 ☐ T	7.5 @ 250 MHz	K, J, B	28	64	4,800	0.106	700
MRFI 0603 – 8N2 ☐ T	8.2 @ 250 MHz	K, J, B	30	72	4,600	0.100	700
MRFI 0603 – 8N7 ☐ T	8.7 @ 250 MHz	K, J, B	28	66	4,600	0.109	700
MRFI 0603 – 9N1 ☐ T	9.1 @ 250 MHz	K, J	28	60	4,000	0.135	700
MRFI 0603 – 10N ☐ T	10 @ 250 MHz	K, J, G	30	66	3,800	0.130	700
MRFI 0603 – 12N ☐ T	12 @ 250 MHz	K, J, G	35	72	4,000	0.130	700
MRFI 0603 – 15N ☐ T	15 @ 250 MHz	K, J, G	35	68	4,000	0.170	700
MRFI 0603 – 18N ☐ T	18 @ 250 MHz	K, J, G	38	77	3,100	0.170	700
MRFI 0603 – 20N ☐ T	20 @ 250 MHz	K, J	38	72	3,000	0.220	700
MRFI 0603 – 22N ☐ T	22 @ 250 MHz	K, J, G	38	70	3,000	0.220	700
MRFI 0603 – 24N ☐ T	24 @ 250 MHz	K, J	37	75	2,650	0.135	700
MRFI 0603 – 27N ☐ T	27 @ 250 MHz	K, J, G	40	75	2,800	0.220	600
MRFI 0603 – 30N ☐ T	30 @ 250 MHz	K, J	45	57	2,300	0.220	600
MRFI 0603 – 33N ☐ T	33 @ 250 MHz	K, J, G	43	78	2,300	0.220	600
MRFI 0603 – 36N ☐ T	36 @ 250 MHz	K, J	43	70	2,200	0.250	600
MRFI 0603 – 39N ☐ T	39 @ 250 MHz	K, J, G	43	66	2,200	0.250	600
MRFI 0603 – 43N ☐ T	43 @ 250 MHz	K, J	38	62	2,000	0.280	600
MRFI 0603 – 47N ☐ T	47 @ 200 MHz	K, J, G	40	65	2,000	0.280	600
MRFI 0603 – 51N ☐ T	51 @ 200 MHz	K, J	40	66	1,900	0.310	600
MRFI 0603 – 56N ☐ T	56 @ 200 MHz	K, J, G	40	66	1,900	0.310	600
MRFI 0603 – 62N ☐ T	62 @ 200 MHz	K, J	40	60	1,700	0.340	600
MRFI 0603 – 68N ☐ T	68 @ 200 MHz	K, J, G	40	57	1,700	0.340	600
MRFI 0603 – 72N ☐ T	72 @ 150 MHz	K, J, G	35	60	1,700	0.490	400
MRFI 0603 – 82N ☐ T	82 @ 150 MHz	K, J, G	35	58	1,700	0.540	400
MRFI 0603 – R10 ☐ T	100 @ 150 MHz	K, J, G	35	51	1,400	0.630	400
MRFI 0603 – R12 ☐ T	120 @ 150 MHz	K, J, G	35	45	1,300	0.650	300
MRFI 0603 – R13 ☐ T	130 @ 150 MHz	K, J	35	40	1,000	0.920	280
MRFI 0603 – R15 ☐ T	150 @ 150 MHz	K, J, G	35	33	1,000	0.920	280
MRFI 0603 – R18 ☐ T	180 @ 100MHz	K, J, G	30	26	1,000	1.250	240
MRFI 0603 – R20 ☐ T	200 @ 100 MHz	K, J	30	23	1,000	1.250	240
MRFI 0603 – R21 ☐ T	210 @ 100 MHz	K, J	27	23	1,000	1.700	200
MRFI 0603 – R22 ☐ T	220 @ 100 MHz	K, J	30	23	1,000	1.700	200
MRFI 0603 – R24 ☐ T	240 @ 100 MHz	K, J	30	15	1,000	1.700	200
MRFI 0603 – R27 ☐ T	270 @ 100 MHz	K, J	30	10	1,000	1.800	170
MRFI 0603 – R33 ☐ T	330 @ 100 MHz	K, J	25	–	450	2.000	150
MRFI 0603 – R39 ☐ T	390 @ 100 MHz	K, J	20	–	350	2.000	170

NOTE: All 0603's have Ceramic core.

Note: * For values not listed, please consult your salesperson.

NOTE

- Inductance: HP-4287A RF LCR meter with HP-16193 fixture
- Q: HP-4287A RF LCR meter with HP-16193 fixture
- S.R.F (Self-resonance Frequency) ENA E5071B network analyzer
- RDC (DC Resistance): HP-4338B millohmeter
- IDC (Allowable Current)
- ☐ (Inductance Tolerance) (B = ±0.2nH, S = ±0.3nH, G = ±2% J = ±5%, K = ±10%, M = ±20%)

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MRFI 0805 SERIES (2012) - Electrical Characteristics

Part Number	Inductance (nH)	Tolerance	Q Min.	S.R.F. Min. (MHz)	RDC Max (Ω)	IDC Max (mA)	Color Coding**
MRFI 0805 – 2N2 □T	2.2 @ 250 MHz	B, S	50 @ 1000 MHz	6,000	0.06	800	Gray
MRFI 0805 – 2N7 □T	2.7 @ 250 MHz	B, S	35 @ 1000 MHz	6,000	0.08	800	Brown
MRFI 0805 – 3N3 □T	3.3 @ 250 MHz	B, S	60 @ 1000 MHz	6,000	0.08	800	Black
MRFI 0805 – 3N9 □T	3.9 @ 250 MHz	B, S	60 @ 1000 MHz	6,000	0.06	600	Red
MRFI 0805 – 4N7 □T	4.7 @ 250 MHz	B, S	60 @ 1000 MHz	5,800	0.06	600	Yellow
MRFI 0805 – 5N1 □T	5.1 @ 250 MHz	K, J, B	60 @ 1000 MHz	5,800	0.08	600	Blue
MRFI 0805 – 5N6 □T	5.6 @ 250 MHz	K, J, B	60 @ 1000 MHz	5,800	0.08	600	Orange
MRFI 0805 – 6N8 □T	6.8 @ 250 MHz	K, J, B	60 @ 1000 MHz	5,500	0.06	600	Brown
MRFI 0805 – 8N2 □T	8.2 @ 250 MHz	K, J, B	60 @ 1000 MHz	5,500	0.06	600	Red
MRFI 0805 – 10N □T	10 @ 250 MHz	K, J, G	60 @ 500 MHz	4,800	0.08	600	Blue
MRFI 0805 – 12N □T	12 @ 250 MHz	K, J, G	60 @ 500 MHz	4,100	0.08	600	Orange
MRFI 0805 – 15N □T	15 @ 250 MHz	K, J, G	60 @ 500 MHz	3,600	0.08	600	Yellow
MRFI 0805 – 18N □T	18 @ 250 MHz	K, J, G	60 @ 500 MHz	3,400	0.08	600	Green
MRFI 0805 – 22N □T	22 @ 250 MHz	K, J, G	60 @ 500 MHz	3,300	0.10	600	Blue
MRFI 0805 – 27N □T	27 @ 250 MHz	K, J, G	60 @ 500 MHz	2,600	0.12	600	Violet
MRFI 0805 – 33N □T	33 @ 250 MHz	K, J, G	60 @ 500 MHz	2,400	0.15	500	Gray
MRFI 0805 – 39N □T	39 @ 250 MHz	K, J, G	60 @ 500 MHz	2,100	0.18	500	White
MRFI 0805 – 47N □T	47 @ 200 MHz	K, J, G	60 @ 500 MHz	1,700	0.15	500	Black
MRFI 0805 – 56N □T	56 @ 200 MHz	K, J, G	60 @ 500 MHz	1,600	0.25	500	Brown
MRFI 0805 – 68N □T	68 @ 200 MHz	K, J, G	60 @ 500 MHz	1,450	0.27	500	Red
MRFI 0805 – 82N □T	82 @ 150 MHz	K, J, G	60 @ 500 MHz	1,350	0.32	500	Orange
MRFI 0805 – R10 □T	100 @ 150 MHz	K, J, G	60 @ 500 MHz	1,200	0.43	500	Yellow
MRFI 0805 – R12 □T	120 @ 150 MHz	K, J, G	50 @ 250 MHz	1,100	0.48	500	Green
MRFI 0805 – R15 □T	150 @ 100 MHz	K, J, G	50 @ 250 MHz	950	0.56	400	Blue
MRFI 0805 – R18 □T	180 @ 100 MHz	K, J, G	50 @ 250 MHz	900	0.78	400	Violet
MRFI 0805 – R22 □T	220 @ 100 MHz	K, J, G	50 @ 250 MHz	860	1.00	400	Gray
MRFI 0805 – R27 □T	270 @ 100 MHz	K, J, G	45 @ 250 MHz	850	1.46	350	White
MRFI 0805 – R33 □T	330 @ 100 MHz	K, J, G	45 @ 250 MHz	800	1.65	300	Black
MRFI 0805 – R39 □T	390 @ 100 MHz	K, J, G	45 @ 250 MHz	780	2.20	210	Brown
*MRFI 0805 – R47 □T	470 @ 25 MHz	K, J	45 @ 100 MHz	375	0.95	500	Red
*MRFI 0805 – R56 □T	560 @ 25 MHz	K, J	45 @ 100 MHz	340	1.10	450	Green
*MRFI 0805 – R68 □T	680 @ 25 MHz	K, J	35 @ 100 MHz	188	1.20	400	Orange
*MRFI 0805 – R82 □T	820 @ 25 MHz	K, J	35 @ 100 MHz	215	1.50	300	Gray
*MRFI 0805 – 1R0 □T	1000 @ 25 MHz	K, J	35 @ 50 MHz	200	2.13	180	Yellow
*MRFI 0805 – 1R2 □T	1200 @ 7.96 MHz	K, J	15 @ 7.96 MHz	200	2.38	150	Brown
*MRFI 0805 – 1R5 □T	1500 @ 7.96 MHz	K, J	15 @ 7.96 MHz	200	2.90	130	Green
*MRFI 0805 – 1R8 □T	1800 @ 7.96 MHz	K, J	15 @ 7.96 MHz	120	3.00	120	Blue
*MRFI 0805 – 2R2 □T	2200 @ 7.96 MHz	K, J	15 @ 7.96 MHz	110	3.10	110	Brown
*MRFI 0805 – 2R7 □T	2700 @ 7.96 MHz	K, J	15 @ 7.96 MHz	100	3.50	100	Violet
*MRFI 0805 – 3R3 □T	3300 @ 7.96 MHz	K, J	15 @ 7.96 MHz	70	2.30	210	Gray
*MRFI 0805 – 3R9 □T	3900 @ 7.96 MHz	K, J	15 @ 7.96 MHz	60	2.50	200	White
*MRFI 0805 – 4R7 □T	4700 @ 7.96 MHz	K, J	15 @ 7.96 MHz	50	2.80	180	Black
*MRFI 0805 – 5R6 □T	5600 @ 7.96 MHz	K, J	15 @ 7.96 MHz	45	3.00	160	Red
*MRFI 0805 – 6R8 □T	6800 @ 7.96 MHz	K, J	15 @ 7.96 MHz	45	3.20	130	Brown
*MRFI 0805 – 8R2 □T	8200 @ 7.96 MHz	K, J	15 @ 7.96 MHz	40	3.50	120	Red
*MRFI 0805 – 100 □T	10000 @ 2.52 MHz	K, J	15 @ 2.52 MHz	40	5.00	80	Orange

NOTE: All values, 390nH and lower have a Ceramic core with Gold plating.
* All values higher than 390nH have a Ferrite core with Lead Free solder plating.

Note: * For values not listed, please consult your salesperson.

NOTE

- L, Q; HP-4287A at 100MHz (Test fixture: HP-16193)
- S.R.F: Self-resonance Frequency; ENA E5071B network analyzer
- RDC: DC Resistance; HP-4338B
- IDC: Allowable Current
- □ Inductance Tolerance (B = ±0.2nH, S = ±0.3nH, G = ±2% J = ±5%, K = ±10%, M = ±20%)
- ** A color dot is put on these components for internal lot identification purposes

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Miniature RF Chip Inductors

MRFI 1008 SERIES (2520) - Electrical Characteristics

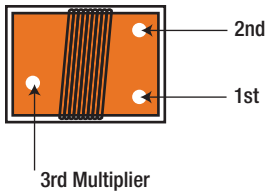
Part Number	Inductance (nH)	Tolerance	Q Min.	S.R.F. Min. (MHz)	RDC Max (Ω)	IDC Max (mA)	Color Coding		
							1st	2nd	3rd
MRFI 1008 – 3N3 □T	3.3 @ 100 MHz	B, S	50 @ 1000 MHz	6,000	0.06	1000	Black	Orange	Orange
MRFI 1008 – 6N8 □T	6.8 @ 100 MHz	K, J, B	50 @ 1000 MHz	5,500	0.06	1000	Black	Blue	Gray
MRFI 1008 – 8N2 □T	8.2 @ 100 MHz	K, J, B	50 @ 1000 MHz	5,500	0.06	1000	Black	Gray	Red
MRFI 1008 – 10N □T	10 @ 100 MHz	K, J, G	50 @ 1000 MHz	4,300	0.08	1000	Brown	Black	Black
MRFI 1008 – 12N □T	12 @ 100 MHz	K, J, G	60 @ 500 MHz	3,600	0.08	1000	Brown	Red	Black
MRFI 1008 – 15N □T	15 @ 100 MHz	K, J, G	60 @ 500 MHz	2,700	0.08	1000	Brown	Green	Black
MRFI 1008 – 18N □T	18 @ 100 MHz	K, J, G	60 @ 350 MHz	2,700	0.10	1000	Brown	Gray	Black
MRFI 1008 – 22N □T	22 @ 100 MHz	K, J, G	60 @ 350 MHz	2,500	0.10	1000	Red	Red	Black
MRFI 1008 – 27N □T	27 @ 100 MHz	K, J, G	60 @ 350 MHz	1,800	0.10	1000	Red	Violet	Black
MRFI 1008 – 33N □T	33 @ 100 MHz	K, J, G	60 @ 350 MHz	1,700	0.10	1000	Orange	Orange	Black
MRFI 1008 – 39N □T	39 @ 100 MHz	K, J, G	60 @ 350 MHz	1,500	0.10	1000	Orange	White	Black
MRFI 1008 – 47N □T	47 @ 100 MHz	K, J, G	60 @ 350 MHz	1,500	0.10	1000	Yellow	Violet	Black
MRFI 1008 – 56N □T	56 @ 100 MHz	K, J, G	60 @ 350 MHz	1,350	0.12	1000	Green	Blue	Black
MRFI 1008 – 68N □T	68 @ 100 MHz	K, J, G	60 @ 350 MHz	1,300	0.15	1000	Blue	Gray	Black
MRFI 1008 – 82N □T	82 @ 100 MHz	K, J, G	60 @ 350 MHz	1,100	0.18	1000	Gray	Red	Black
MRFI 1008 – R10 □T	100 @ 100 MHz	K, J, G	60 @ 350 MHz	1,100	0.18	1000	Brown	Black	Brown
MRFI 1008 – R12 □T	120 @ 25 MHz	K, J, G	45 @ 100 MHz	950	0.20	800	Brown	Red	Brown
MRFI 1008 – R15 □T	150 @ 25 MHz	K, J, G	45 @ 100 MHz	880	0.22	800	Brown	Green	Brown
MRFI 1008 – R18 □T	180 @ 25 MHz	K, J, G	45 @ 100 MHz	800	0.33	800	Brown	Gray	Brown
MRFI 1008 – R22 □T	220 @ 25 MHz	K, J, G	45 @ 100 MHz	730	0.45	800	Red	Red	Brown
MRFI 1008 – R27 □T	270 @ 25 MHz	K, J, G	45 @ 100 MHz	650	0.75	600	Red	Violet	Brown
MRFI 1008 – R33 □T	330 @ 25 MHz	K, J, G	45 @ 100 MHz	570	0.90	500	Orange	Orange	Brown
MRFI 1008 – R39 □T	390 @ 25 MHz	K, J, G	45 @ 100 MHz	530	1.06	470	Orange	White	Brown
MRFI 1008 – R47 □T	470 @ 25 MHz	K, J, G	45 @ 100 MHz	480	1.17	420	Yellow	Violet	Brown
MRFI 1008 – R56 □T	560 @ 25 MHz	K, J, G	45 @ 100 MHz	430	1.50	310	Green	Blue	Brown
MRFI 1008 – R68 □T	680 @ 25 MHz	K, J, G	45 @ 100 MHz	380	2.06	230	Blue	Gray	Brown
MRFI 1008 – R75 □T	750 @ 25 MHz	K, J, G	45 @ 100 MHz	360	2.20	200	Violet	Green	Brown
MRFI 1008 – R82 □T	820 @ 25 MHz	K, J, G	45 @ 100 MHz	350	2.30	180	Gray	Red	Brown
MRFI 1008 – R91 □T	910 @ 25 MHz	K, J, G	45 @ 100 MHz	330	3.18	150	White	Brown	Brown
MRFI 1008 – 1R0 □T	1000 @ 25 MHz	K, J, G	35 @ 50 MHz	310	3.30	120	Brown	Black	Red

NOTE: All values 1000nH (1.0 uH) and lower have a Ceramic core with Gold plating.

Note: * For values not listed, please consult your salesperson.

NOTE

- Inductance: HP-4287A RF LCR meter with HP-16193 fixture
- Q: HP-4287A RF LCR meter with HP-16193 fixture
- S.R.F (Self-resonance Frequency) ENA E5071B network analyzer
- RDC (DC Resistance): HP-4338B millohmeter
- IDC (Allowable Current)
- □ (Inductance Tolerance) (B = ±0.2nH, S = ±0.3nH, G = ±2% J = ±5%, K = ±10%, M = ±20%)



These parts are marked with 3 color dots. The table above shows the significance of each color.
Dots 1 and 2 indicate the inductance in nanoHenries.
Dot 3 indicates the number of zeros to be added.

Examples:

Gray Red Black = 82nH
Brown Red Brown = 120 nH
Yellow Violet Red = 4700nH

Values below 10nH

On these parts, the third dot is not a multiplier. Refer to the table above for specific inductance values.

MRFI 1008 Series

Black Gray Red = 8.2nH

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MRFI 1008 SERIES (2520) - Electrical Characteristics

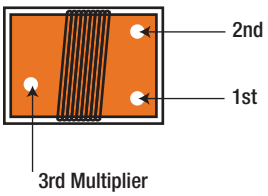
Part Number	Inductance (nH)	Tolerance	Q Min.	S.R.F. Min. (MHz)	RDC Max (Ω)	IDC Max (mA)	Color Coding		
							1st	2nd	3rd
*MRFI 1008 – 1R2 □T	1200 @ 7.96 MHz	K, J	20 @ 7.96 MHz	280	1.30	230	Brown	Red	Red
*MRFI 1008 – 1R5 □T	1500 @ 7.96 MHz	K, J	20 @ 7.96 MHz	250	1.65	220	Brown	Green	Red
*MRFI 1008 – 1R8 □T	1800 @ 7.96 MHz	K, J	20 @ 7.96 MHz	200	2.20	210	Brown	Gray	Red
*MRFI 1008 – 2R2 □T	2200 @ 7.96 MHz	K, J	20 @ 7.96 MHz	160	2.35	200	Red	Red	Red
*MRFI 1008 – 2R7 □T	2700 @ 7.96 MHz	K, J	20 @ 7.96 MHz	130	2.60	195	Red	Violet	Red
*MRFI 1008 – 3R3 □T	3300 @ 7.96 MHz	K, J	20 @ 7.96 MHz	80	2.85	185	Orange	Orange	Red
*MRFI 1008 – 3R9 □T	3900 @ 7.96 MHz	K, J	20 @ 7.96 MHz	50	4.00	180	Orange	White	Red
*MRFI 1008 – 4R7 □T	4700 @ 7.96 MHz	K, J	20 @ 7.96 MHz	45	4.30	175	Yellow	Violet	Red
*MRFI 1008 – 5R6 □T	5600 @ 7.96 MHz	K, J	20 @ 7.96 MHz	42	2.60	170	Green	Blue	Red
*MRFI 1008 – 6R8 □T	6800 @ 7.96 MHz	K, J	20 @ 7.96 MHz	39	2.80	165	Blue	Gray	Red
*MRFI 1008 – 8R2 □T	8200 @ 7.96 MHz	K, J	20 @ 7.96 MHz	36	3.05	160	Gray	Red	Red
*MRFI 1008 – 100 □T	10000 @ 2.52 MHz	K, J	15 @ 2.52 MHz	33	3.50	150	Brown	Black	Orange
*MRFI 1008 – 120 □T	12000 @ 2.52 MHz	K, J	15 @ 2.52 MHz	30	3.60	140	Brown	Red	Orange
*MRFI 1008 – 150 □T	15000 @ 2.52 MHz	K, J	15 @ 2.52 MHz	26	4.00	130	Brown	Green	Orange
*MRFI 1008 – 180 □T	18000 @ 2.52 MHz	K, J	15 @ 2.52 MHz	24	4.50	120	Brown	Gray	Orange
*MRFI 1008 – 220 □T	22000 @ 2.52 MHz	K, J	15 @ 2.52 MHz	22	4.80	110	Red	Red	Orange
*MRFI 1008 – 270 □T	27000 @ 2.52 MHz	K, J	15 @ 2.52 MHz	21	5.30	95	Red	Violet	Orange
*MRFI 1008 – 330 □T	33000 @ 2.52 MHz	K, J	15 @ 2.52 MHz	20	6.10	85	Orange	Orange	Orange
*MRFI 1008 – 390 □T	39000 @ 2.52 MHz	K, J	15 @ 2.52 MHz	18	8.30	60	Orange	White	Orange
*MRFI 1008 – 470 □T	47000 @ 2.52 MHz	K, J	15 @ 2.52 MHz	17	12.60	45	Yellow	Violet	Orange

Note: * For values not listed, please consult your salesperson.

NOTE: * All values higher than 1000nH (1.0 uH) have a Ferrite core with Lead Free solder plating.

NOTE

- Inductance: HP-4287A RF LCR meter with HP-16193 fixture
- Q: HP-4287A RF LCR meter with HP-16193 fixture
- S.R.F (Self-resonance Frequency) ENA E5071B network analyzer
- RDC (DC Resistance): HP-4338B millohmeter
- IDC (Allowable Current)
- □ (Inductance Tolerance) (B = ±0.2nH, S = ±0.3nH, G = ±2% J = ±5%, K = ±10%, M = ±20%)



These parts are marked with 3 color dots. The table above shows the significance of each color.
Dots 1 and 2 indicate the inductance in nanoHenries.
Dot 3 indicates the number of zeros to be added.

Examples:

Gray Red Black = 82nH
Brown Red Brown = 120 nH
Yellow Violet Red = 4700nH

Color Code Scheme (nH)

Color Code	Significant Digit Associated with Color	Color Code	Significant Digit Associated with Color
Black	0	Green	5
Brown	1	Blue	6
Red	2	Violet	7
Orange	3	Gray	8
Yellow	4	White	9

NOTE: For values below 10nH, the color code scheme does not apply. Refer to the data sheet for actual values.

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Miniature RF Chip Inductors

MRFI 1210 SERIES (3225) - Electrical Characteristics

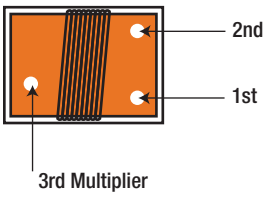
Part Number	Inductance (nH)	Tolerance	Q Min.	S.R.F. Min. (MHz)	RDC Max (Ω)	IDC Max (mA)	Color Coding		
							1st	2nd	3rd
MRFI 1210 – 4N7 □T	4.7 @ 100 MHz	B, S	50 @ 1000 MHz	6,000	0.06	1000	Black	Yellow	Violet
MRFI 1210 – 5N6 □T	5.6 @ 100 MHz	K, J, B	50 @ 1000 MHz	5,500	0.06	1000	Black	Green	Blue
MRFI 1210 – 10N □T	10 @ 100 MHz	K, J, G	60 @ 500 MHz	4,000	0.06	1000	Brown	Black	Black
MRFI 1210 – 12N □T	12 @ 100 MHz	K, J, G	60 @ 500 MHz	3,400	0.06	1000	Brown	Red	Black
MRFI 1210 – 15N □T	15 @ 100 MHz	K, J, G	60 @ 500 MHz	3,200	0.06	1000	Brown	Green	Black
MRFI 1210 – 18N □T	18 @ 100 MHz	K, J, G	60 @ 300 MHz	2,800	0.06	1000	Brown	Gray	Black
MRFI 1210 – 22N □T	22 @ 100 MHz	K, J, G	60 @ 300 MHz	2,100	0.08	1000	Red	Red	Black
MRFI 1210 – 27N □T	27 @ 100 MHz	K, J, G	60 @ 300 MHz	1,900	0.08	1000	Red	Violet	Black
MRFI 1210 – 33N □T	33 @ 100 MHz	K, J, G	60 @ 300 MHz	1,700	0.08	1000	Orange	Orange	Black
MRFI 1210 – 39N □T	39 @ 100 MHz	K, J, G	60 @ 300 MHz	1.700	0.08	1000	Orange	White	Black
MRFI 1210 – 47N □T	47 @ 100 MHz	K, J, G	60 @ 300 MHz	1,400	0.08	1000	Yellow	Violet	Black
MRFI 1210 – 56N □T	56 @ 100 MHz	K, J, G	60 @ 300 MHz	1,100	0.10	1000	Green	Blue	Black
MRFI 1210 – 68N □T	68 @ 100 MHz	K, J, G	60 @ 300 MHz	1,000	0.10	1000	Blue	Gray	Black
MRFI 1210 – 82N □T	82 @ 100 MHz	K, J, G	60 @ 300 MHz	1,000	0.10	1000	Gray	Red	Black
MRFI 1210 – R10 □T	100 @ 100 MHz	K, J, G	60 @ 300 MHz	900	0.10	1000	Brown	Black	Brown
MRFI 1210 – R12 □T	120 @ 50 MHz	K, J, G	60 @ 300 MHz	900	0.12	800	Brown	Red	Brown
MRFI 1210 – R15 □T	150 @ 50 MHz	K, J, G	60 @ 300 MHz	800	0.18	800	Brown	Green	Brown
MRFI 1210 – R18 □T	180 @ 50 MHz	K, J, G	60 @ 300 MHz	760	0.21	800	Brown	Gray	Brown
MRFI 1210 – R22 □T	220 @ 50 MHz	K, J, G	60 @ 300 MHz	660	0.27	800	Red	Red	Brown
MRFI 1210 – R27 □T	270 @ 50 MHz	K, J, G	50 @ 300 MHz	600	0.33	700	Red	Violet	Brown
MRFI 1210 – R33 □T	330 @ 50 MHz	K, J, G	50 @ 100 MHz	550	0.37	650	Orange	Orange	Brown
MRFI 1210 – R39 □T	390 @ 50 MHz	K, J, G	50 @ 100 MHz	500	0.63	600	Orange	White	Brown
MRFI 1210 – R47 □T	470 @ 50 MHz	K, J, G	50 @ 100 MHz	450	0.69	550	Yellow	Violet	Brown
MRFI 1210 – R56 □T	560 @ 50 MHz	K, J, G	50 @ 100 MHz	400	0.90	450	Green	Blue	Brown
MRFI 1210 – R68 □T	680 @ 25 MHz	K, J, G	50 @ 100 MHz	380	1.05	400	Blue	Gray	Brown
MRFI 1210 – R82 □T	820 @ 25 MHz	K, J, G	50 @ 100 MHz	350	1.45	350	Gray	Red	Brown
MRFI 1210 – 1R0 □T	1000 @ 25 MHz	K, J, G	45 @ 100 MHz	300	1.90	280	Brown	Black	Red
MRFI 1210 – 1R2 □T	1200 @ 7.96 MHz	K, J	45 @ 50 MHz	300	2.20	250	Brown	Red	Red
MRFI 1210 – 1R5 □T	1500 @ 7.96 MHz	K. J	45 @ 50 MHz	250	2.43	220	Brown	Green	Red
MRFI 1210 – 1R8 □T	1800 @ 7.96 MHz	K, J	45 @ 50MHz	200	3.36	180	Brown	Gray	Red
MRFI 1210 – 2R2 □T	2200 @ 7.96 MHz	K, J	40 @ 50 MHz	200	3.50	150	Red	Red	Red

NOTE: All values 2200nH (2.2 uH) and lower have a Ceramic core with Gold plating.

Note: * For values not listed, please consult your salesperson.

NOTE

- Inductance: HP-4287A RF LCR meter with HP-16193 fixture
- Q: HP-4287A RF LCR meter with HP-16193 fixture
- S.R.F (Self-resonance Frequency) ENA E5071B network analyzer
- RDC (DC Resistance): HP-4338B millohmeter
- IDC (Allowable Current)
- □ (Inductance Tolerance) (B = ±0.2nH, S = ±0.3nH, G = ±2% J = ±5%, K = ±10%, M = ±20%)



These parts are marked with 3 color dots. The table above shows the significance of each color.
Dots 1 and 2 indicate the inductance in nanoHenries.
Dot 3 indicates the number of zeros to be added.

Examples:

Gray Red Black = 82nH

Brown Red Brown = 120 nH

Yellow Violet Red = 4700nH

Values below 10nH

On these parts, the third dot is not a multiplier. Refer to the table above for specific inductance values.

MRFI 1210 Series

Black Gray Red = 8.2nH

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MRFI 1210 SERIES (3225) - Electrical Characteristics

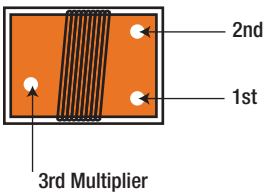
Part Number	Inductance (nH)	Tolerance	Q Min.	S.R.F. Min. (MHz)	RDC Max (Ω)	IDC Max (mA)	Color Coding		
							1st	2nd	3rd
*MRFI 1210 – 1R2 □T	1200 @ 7.96 MHz	K, J	30 @ 7.96 MHz	100	0.70	390	Brown	Red	Red
*MRFI 1210 – 1R5 □T	1500 @ 7.96 MHz	K, J	30 @ 7.96 MHz	85	0.75	370	Brown	Green	Red
*MRFI 1210 – 1R8 □T	1800 @ 7.96 MHz	K, J	30 @ 7.96 MHz	80	0.80	350	Brown	Gray	Red
*MRFI 1210 – 2R2 □T	2200 @ 7.96 MHz	K, J	30 @ 7.96 MHz	75	0.90	320	Red	Red	Red
*MRFI 1210 – 2R7 □T	2700 @ 7.96 MHz	K, J	30 @ 7.96 MHz	70	1.10	290	Red	Violet	Red
*MRFI 1210 – 3R3 □T	3300 @ 7.96 MHz	K, J	30 @ 7.96 MHz	60	1.40	260	Orange	Orange	Red
*MRFI 1210 – 3R9 □T	3900 @ 7.96 MHz	K, J	30 @ 7.96 MHz	55	1.70	250	Orange	White	Red
*MRFI 1210 – 4R7 □T	4700 @ 7.96 MHz	K, J	30 @ 7.96 MHz	50	2.30	220	Yellow	Violet	Red
*MRFI 1210 – 5R6 □T	5600 @ 7.96 MHz	K, J	20 @ 7.96 MHz	47	1.60	200	Green	Blue	Red
*MRFI 1210 – 6R8 □T	6800 @ 7.96 MHz	K, J	20 @ 7.96 MHz	43	2.20	180	Blue	Gray	Red
*MRFI 1210 – 8R2 □T	8200 @ 7.96 MHz	K, J	20 @ 7.96 MHz	40	2.40	170	Gray	Red	Red
*MRFI 1210 – 100 □T	10000 @ 2.52 MHz	K, J	15 @ 2.52 MHz	36	3.28	150	Brown	Black	Orange
*MRFI 1210 – 120 □T	12000 @ 2.52 MHz	K, J	15 @ 2.52 MHz	33	3.40	140	Brown	Red	Orange
*MRFI 1210 – 150 □T	15000 @ 2.52 MHz	K, J	15 @ 2.52 MHz	30	3.90	125	Brown	Green	Orange
*MRFI 1210 – 180 □T	18000 @ 2.52 MHz	K, J	15 @ 2.52 MHz	27	4.20	110	Brown	Gray	Orange
*MRFI 1210 – 220 □T	22000 @ 2.52 MHz	K, J	15 @ 2.52 MHz	25	6.00	90	Red	Red	Orange
*MRFI 1210 – 270 □T	27000 @ 2.52 MHz	K, J	15 @ 2.52 MHz	20	6.80	80	Red	Violet	Orange
*MRFI 1210 – 330 □T	33000 @ 2.52 MHz	K, J	15 @ 2.52 MHz	17	7.50	70	Orange	Orange	Orange
*MRFI 1210 – 390 □T	39000 @ 2.52 MHz	K, J	15 @ 2.52 MHz	16	8.00	65	Orange	White	Orange
*MRFI 1210 – 470 □T	47000 @ 2.52 MHz	K, J	15 @ 2.52 MHz	15	8.50	60	Yellow	Violet	Orange

Note: * For values not listed, please consult your salesperson.

NOTE: * All values on this page 1200nH (1.2 uH) and higher have a Ferrite core with Lead Free solder plating.

NOTE

- Inductance: HP-4287A RF LCR meter with HP-16193 fixture
- Q: HP-4287A RF LCR meter with HP-16193 fixture
- S.R.F (Self-resonance Frequency) ENA E5071B network analyzer
- RDC (DC Resistance): HP-4338B millohmeter
- IDC (Allowable Current)
- □ (Inductance Tolerance) (B = ±0.2nH, S = ±0.3nH, G = ±2% J = ±5%, K = ±10%, M = ±20%)



These parts are marked with 3 color dots. The table above shows the significance of each color.
Dots 1 and 2 indicate the inductance in nanoHenries.
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Examples:

Gray Red Black = 82nH
Brown Red Brown = 120 nH
Yellow Violet Red = 4700nH

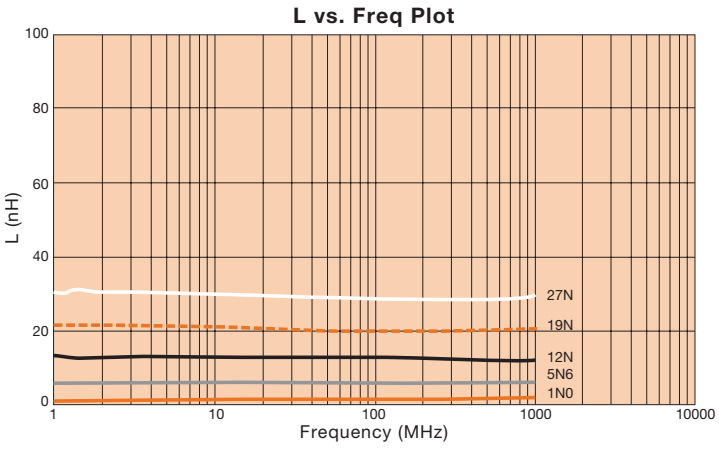
Color Code Scheme (nH)

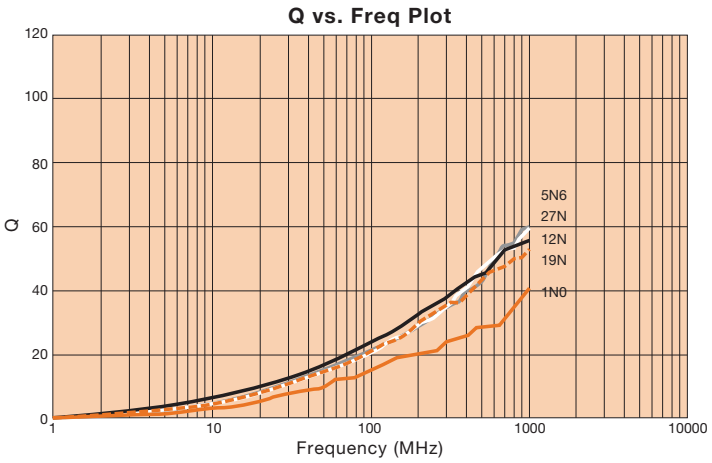
Color Code	Significant Digit Associated with Color	Color Code	Significant Digit Associated with Color
Black	0	Green	5
Brown	1	Blue	6
Red	2	Violet	7
Orange	3	Gray	8
Yellow	4	White	9

NOTE: For values below 10nH, the color code scheme does not apply. Refer to the data sheet for actual values.

Miniature RF Chip Inductors

0402 (1005)





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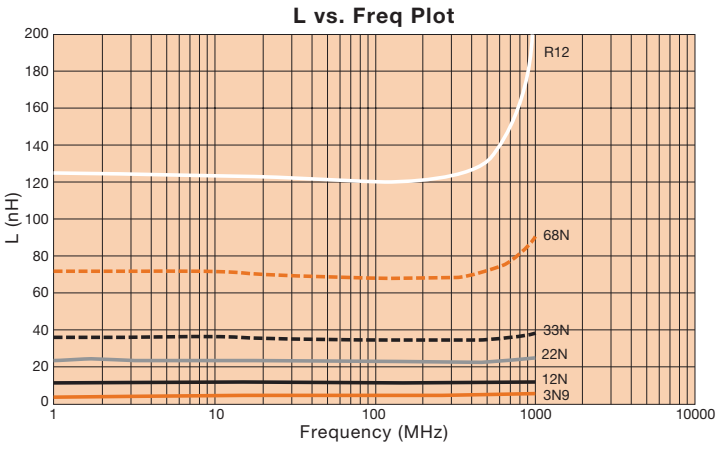

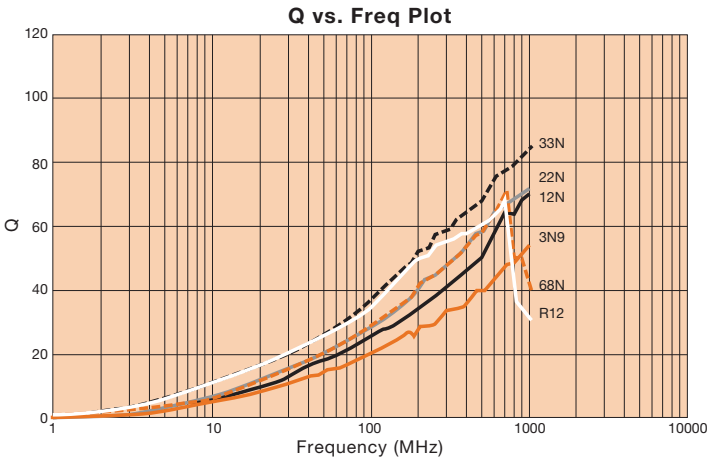

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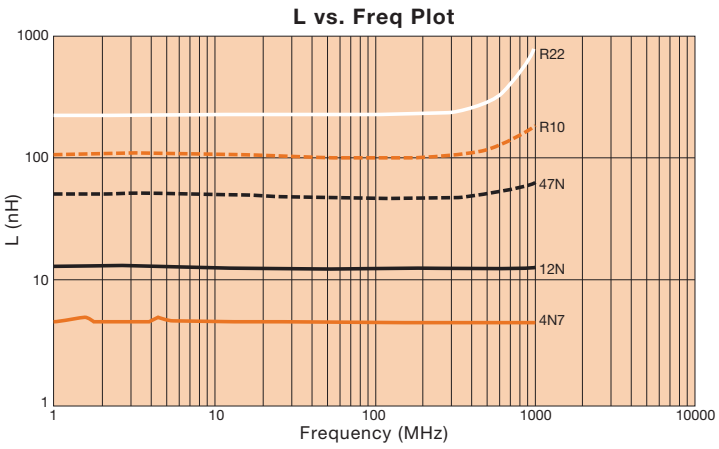

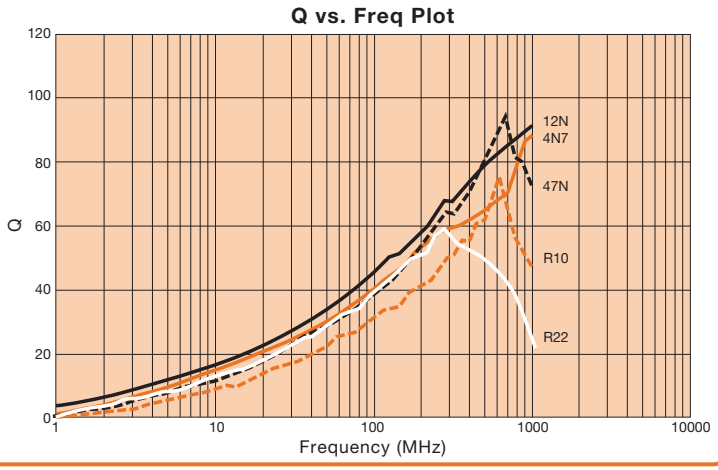

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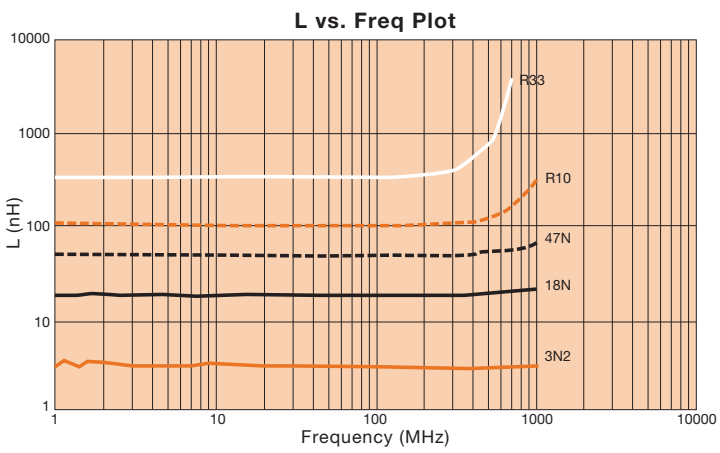
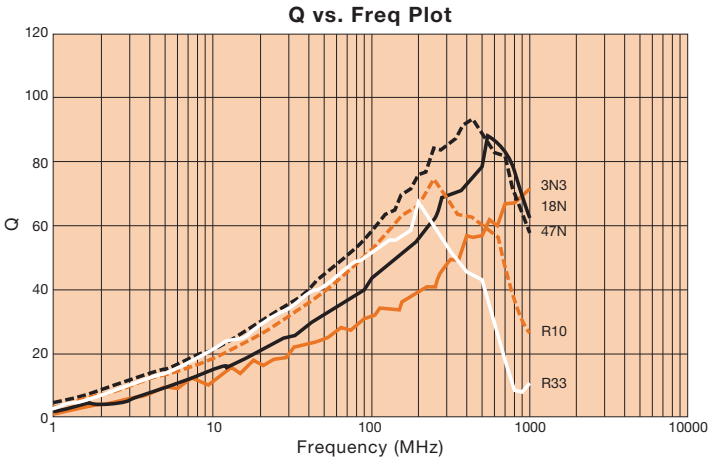
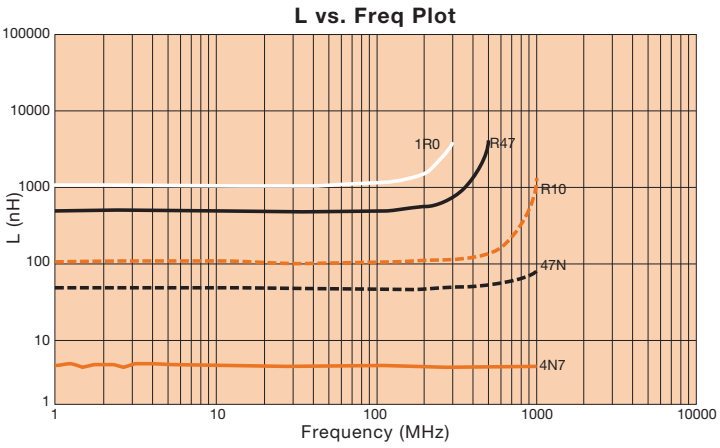
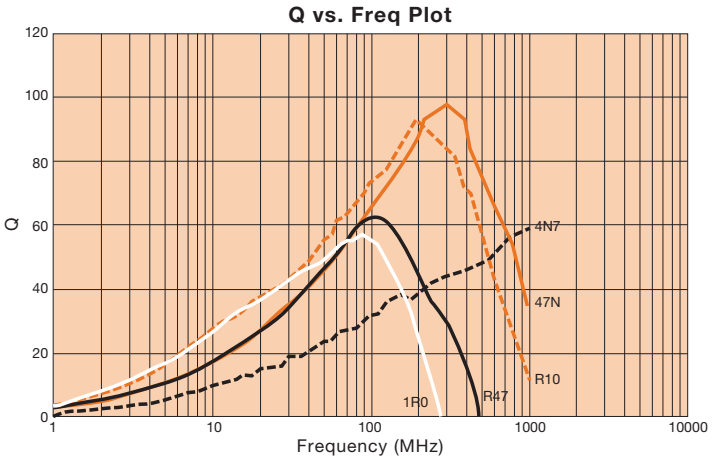
1008 (2520)





1210 (3225)





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Miniature RF Chip Inductors

General Characteristics

Operating Temperature Range

Operating Temperature Range is the range of ambient temperature at which the inductor can be operated continuously at rated current.

Temp. Range:

Ceramic material	-40°C to + 125°C
Ferrite material	-40°C to + 85°C

Characteristics

Standards Atmospheric Conditions

Unless otherwise specified, the standard range of atmospheric conditions for making measurements and tests are as follows:

Ambient Temperature:	25°C (20°C) ± 2°C
Relative Humidity:	60% to 70%
Air Pressure:	86 Kpa to 106 Kpa

Item	Condition	Specification
Inductance and Tolerance	Measuring frequency: As shown in Product Table Measuring temperature: 25°C	Within specified tolerance
Quality Factor	Measuring frequency: As shown in Product Table Measuring temperature: 25°C	Within specified tolerance
Insulation Resistance	Measured at 100 VDC between inductor terminal and enclosure.	1000 mega ohms minimum
Dielectric Withstanding Voltage	Measured at 500 VAC between terminal and enclosure for a maximum of 1 minute.	No damage occurs when the test voltage is applied.
Temperature Coefficient of Inductance (TCL)	Over -40°C to +85°C at frequency specified in Product Table.	+25 to 500 PPM/°C $TCL = \frac{L1 - L2}{L1\ (T1-T2)} \times 10^6$ (PPM/°C)
Component Adhesion (PUSH TEST)	The component should be reflow soldered onto a P.C. Board (230°C 20 seconds) using a dynameter force gauge apply force to any side of the component.	The component must withstand a minimum force of 1 Kg for Pt/Ag termination and 2 Kg for Mo/Mn termination without any failure of the termination to component attachment.
Thermal Shock Test	Each cycle should consist of 30 minutes at -40°C followed by 30 minutes at +85°C with a 20 second maximum transition time between temperature extremes. Test duration is 10 cycles.	*Change In Inductance:* No more than 5% *Change in Q:* No more than 10%
Solderability	Dip pads in flux and dip in solder pot (63Sn/37Pb) at 230°C ±5°C for 5 seconds.	A minimum of 80% of the metalized area being covered with solder.
Resistance to Soldering Heat	Dip the components into flux and dip into solder pot containing 63Sn/37Pb at 260°C ±5°C for 5 seconds ± 1 second.	*Change In Inductance:* No more than 5% *Change In Q:* No more than 10%
Vibration (Random)	Inductors should be randomly vibrated per NAVMAT P9492 profile. Sample should be subjected to 10-2,000 Hz: 0.04 G/Hz for a minimum of 15 minutes per axis for each of three axes.	*Change In Inductance:* No more than 5% *Change In Q:* No more than 10%
Moisture Resistance	Inductors should be stored in the chamber at 45°C at 90 - 95% R.H. for 240 hours, and then the inductors are to be tested after 2 hours at room temperature.	*Change In Inductance:* No more than 5% *Change In Q:* No more than 10%
Cold Temperature Storage	Inductors should be stored at a temperature of -40°C for ±2 hours. Then it should be subjected to standard atmospheric conditions for 1 hour. After that, measurement should be made.	*Change In Inductance:* No more than 5% *Change In Q:* No more than 10%.
High Temperature Storage	Inductors should be stored at a temperature of 125°C ± 2°C for 48 ± 2 hours. Then it should be subjected to standard atmospheric conditions for1 hour. After that, measurement should be made.	*Change In Inductance:* No more than 5% *Change In Q:* No more than 10%.
High Temperature with Load	Inductors should be stored in the chamber at 85°C for 1000 hours with rated current applied. Inductors should be tested at the beginning test for 500 hours, 1000 hours, and then Inductors are to be tested after 2 hours at room temperature.	*Change In Inductance:* No more than 5% *Change In Q:* No more than 10%.

All components in this section are RoHS compliant per the EU directives and definitions.

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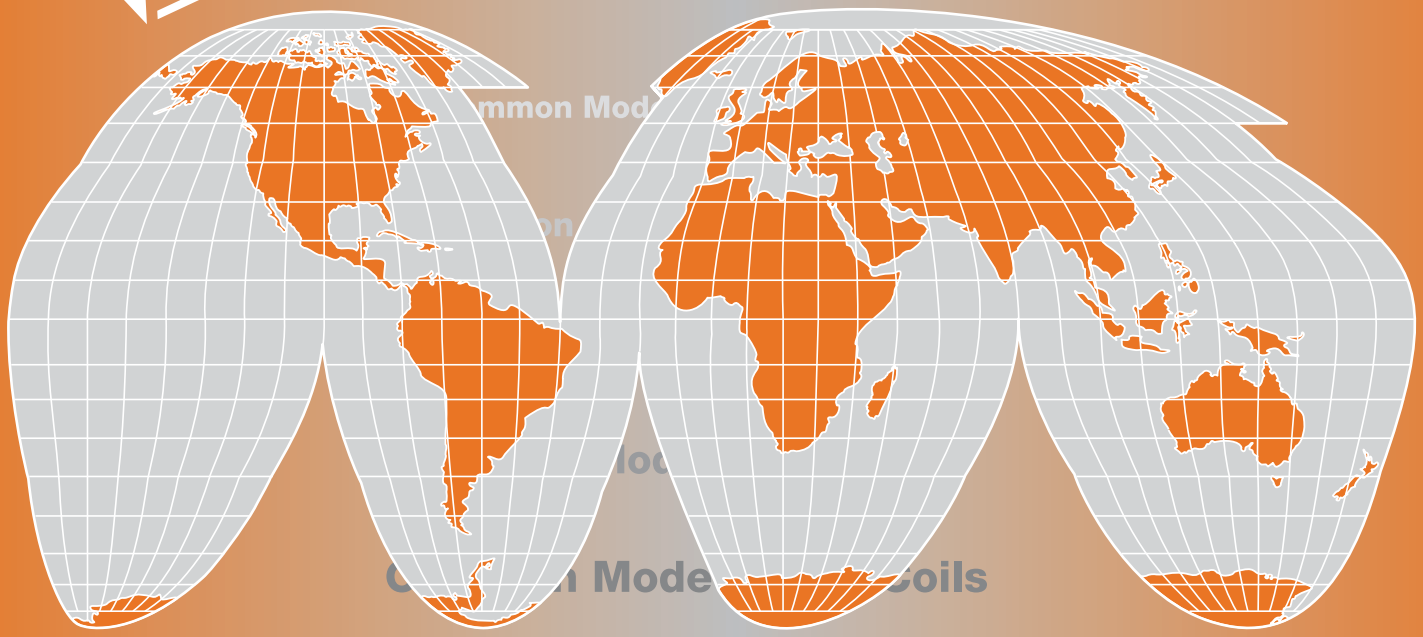

Common Mode Choke Coils

Common Mode Choke Coils

Common Mode Choke Coils

Common Mode Choke Coils

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Common Mode Choke Coils

CMCC Series

This series is used in all applications where a wire wound common mode choke is required in a chip type form.

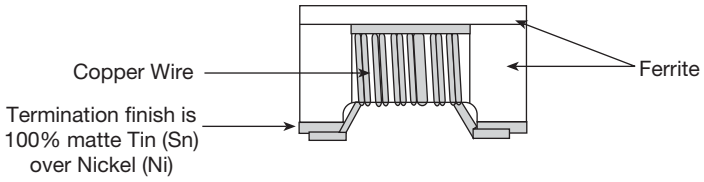
Application

- The CMCC Series are widely used in notebook, PC, USB, and HUB applications. The wire wound features provide advanced low DC resistance and higher current tolerance, while giving very stable performance characteristics.

Features

- Operating temperature –40˚C to +85˚C
- Excellent solderability and resistance to soldering heat
- Suitable for flow and reflow soldering
- High reliability and standard EIA size for easy placement
- Direct cross to Murata Global P/N DLW31and DLW21 Series or previous Series PLW3216, and PLW2012

Material Structure



Unit: inch (mm)

Size	L	W	t
0805	0.079 (2.00)	0.047 (1.20)	0.047 (1.20)
1206	0.126 (3.20)	0.063 (1.60)	0.075 (1.90)

How To Order

CMCC	1206	900	N	T
Common Mode Choke Coil3.	Chip Size	Typical Impedance at 100MHz 900 = 90Ω 261 = 260Ω 102 = 1000Ω	Tolerance N = ±30%	Tape and Reel 2,000 pcs./reel

Standard termination finish for this product is 100% matte Tin (Sn)

All components in this section are RoHS compliant per the EU directives and definitions.

Standard Termination is 100% matte Tin (Sn)
Pb: For 90% Tin (Sn)/10% Lead (PB) Termination add Pb above.

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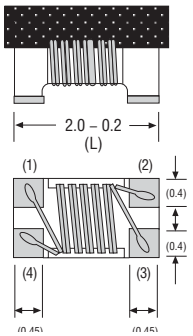
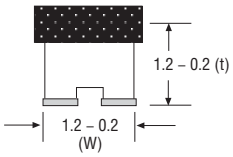
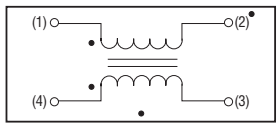
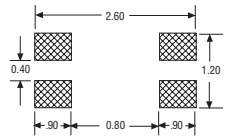
CMCC 0805 (2012) Standard Series







EQUIVALENT CIRCUIT



RECOMMENDED LAND PATTERN

Remark: : Electrode

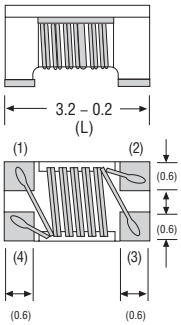
( ) : Reference Value

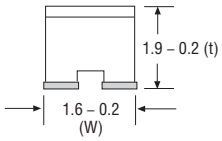
Unit : mm

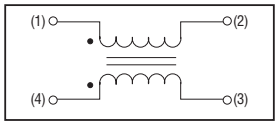
SPECIFICATION

Part Number	Impedance[1] at 100 MHz (Ω)	Rated Voltage V (DC)	Withstanding Voltage V (DC)	Rated[2] Current max (mA)	DC Resistance max (Ω)	Insulation Resistance min (MΩ)
CMCC0805670NT	67	50	125	400	0.25	10
CMCC0805900NT	90	50	125	330	0.35	10
CMCC0805121NT	120	50	125	370	0.30	10
CMCC0805181NT	180	50	125	330	0.35	10
CMCC0805261NT	260	50	125	300	0.40	10
CMCC0805371NT	370	50	125	280	0.45	10

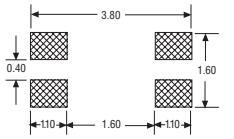
CMCC 1206 (3216) Standard Series







EQUIVALENT CIRCUIT



RECOMMENDED LAND PATTERN

Remark: : Electrode

( ) : Reference Value

Unit : mm

SPECIFICATION

Part Number	Impedance[1] at 100 MHz (Ω)	Rated Voltage V (DC)	Withstanding Voltage V (DC)	Rated[2] Current max (mA)	DC Resistance max (Ω)	Insulation Resistance min (MΩ)
CMCC1206900NT	90	50	125	370	0.3	10
CMCC1206161NT	160	50	125	340	0.4	10
CMCC1206261NT	260	50	125	310	0.5	10
CMCC1206601NT	600	50	125	260	0.8	10
CMCC1206102NT	1000	50	125	230	1.0	10
CMCC1206222NT	2200	50	125	200	1.2	10

1. Impedance is measured on a HP4287A
2. For 15°C rise.

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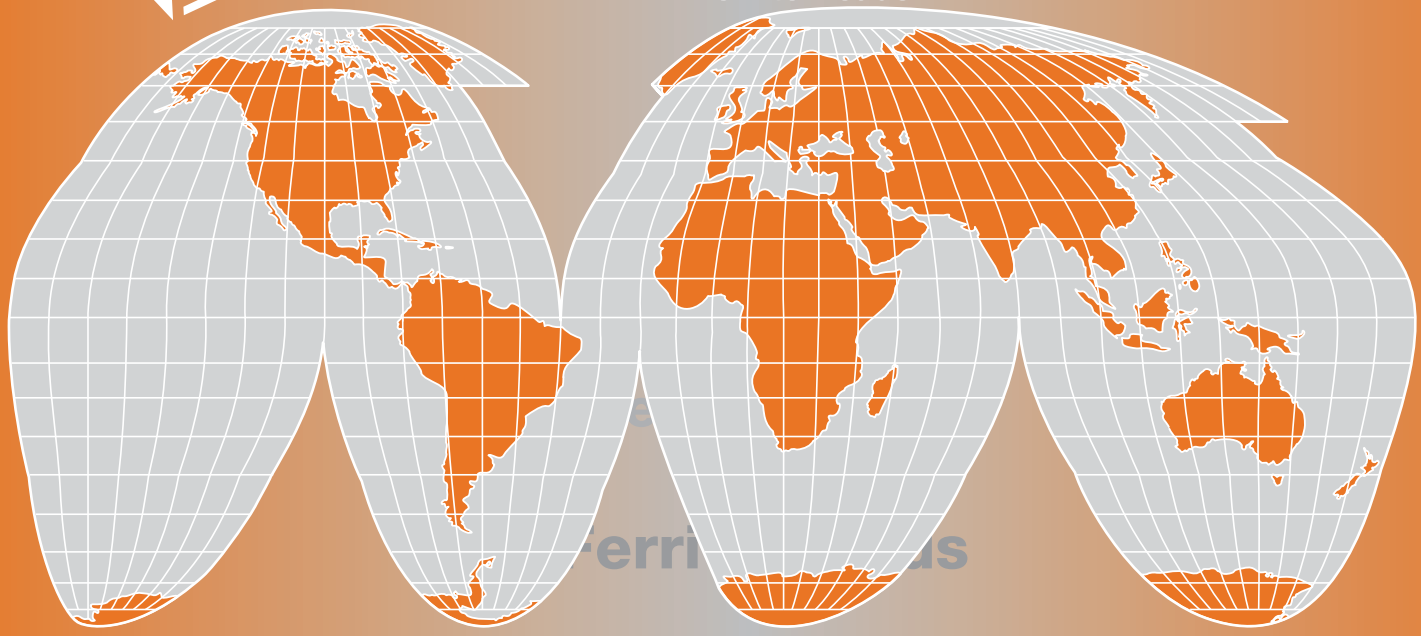

Ferrite Beads

Ferrite Beads

Ferrite Beads

Ferrite Beads

Ferrite Beads

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Ferrite Beads

For EMI Suppression

The FBS and FBM Series are used for EMI suppression. These inductors suppress electro-magnetic wave noise by increased impedence, especially by increased resistance at noise frequency.

FBS Series: The FBS Series is composed of a single layer internal electrode that is for low impedance and low DC resistance.

FBM Series: The FBM Series displays high impedance because it is composed of multi-layered internal electrodes and has excellent attenuation characteristics for wide band frequencies.

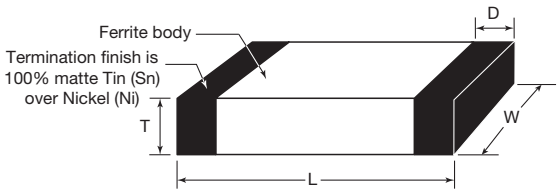
Features

- Smallest beads possible for surface mounting and high impedance
- Perfect shape for automatic mounting with no directionality
- Excellent solderability and high heat resistance for either flow or reflow soldering
- Monolithic inorganic material construction for high reliability
- Closed magnetic circuit configuration avoids crosstalk and is suitable for high density PCBs

Application

- High frequency EMI prevention in computers, printers, VCRs, TVs and portable telephones.

Dimensions



Unit: mm (inch)

Size	L	W	T	D
0402	1.0 ± 0.05 (0.040 ± 0.002)	0.5 ± 0.05 (0.020 ± 0.002	0.5 ± 0.05 (0.020 ± 0.002	0.25 ± 0.1 (0.010 ± 0.004)
0603	1.6 ± 0.15 (0.063 ± 0.006)	0.8 ± 0.15 (0.031 ± 0.006)	0.8 ± 0.15 (0.031 ± 0.006)	0.3 ± 0.2 (0.012 ± 0.008)
0805	2.0 ± 0.2 (0.079 ± 0.008)	1.25 ± 0.2 (0.050 ± 0.008)	0.9 ± 0.2 (0.036 ± 0.008)	0.5 ± 0.3 (0.020 ± 0.012)
1206	3.2 ± 0.2 (0.126 ± 0.008)	1.6 ± 0.2 (0.063 ± 0.008)	1.1 ± 0.2 (0.043 ± 0.008)	0.5 ± 0.3 (0.020 ± 0.012
1210	3.2 ± 0.2 (0.126 ± 0.008)	2.5 ± 0.2 (0.098 ± 0.008)	1.3 ± 0.2 (0.051 ± 0.008)	0.5 ± 0.3 (0.020 ± 0.012
1806	4.5 ± 0.2 (0.177 ± 0.008)	1.6 ± 0.2 (0.063 ± 0.008)	1.6 ± 0.2 (0.063 ± 0.008)	0.5 ± 0.3 (0.020 ± 0.02)
1812	4.5 ± 0.2 (0.177 ± 0.008)	3.2 ± 0.2 (0.126 ± 0.008)	1.5 ± 0.2 (0.060 ± 0.008)	0.5 ± 0.3 (0.020 ± 0.012

Operating Temperature Range	-55 to +125° C
Storage Temperature Range	-10 to +40° C

How To Order

FBM0805 — **121** — **E**

- FBM0805: Series
- 121: Impedance Values
- E: Packaging (E: Embossed Tape, P: Paper Tape)

Standard termination finish for this product is 100% matte Tin (Sn)

All components in this section are RoHS compliant per the EU directives and definitions.

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Standard Part Numbers & Data

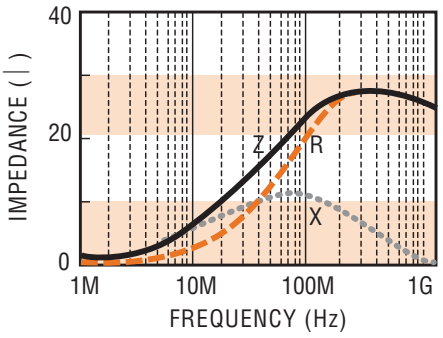
FBS SERIES DATA TABLE

Series Part Number	Thickness (mm)	Impedance (Ω) ± 25% (at 100MHz)	DC resistance (Ω) max.	Rated current (mA) max.
FBS 0603-260 □	0.8 ± 0.15	26	0.08	1000
FBS 0603-330 □	0.8 ± 0.15	33	0.08	1000
FBS 0805-110 □	0.9 ± 0.2	11	0.05	2000
FBS 0805-260 □	0.9 ± 0.2	26	0.05	2000
FBS 0805-330 □	0.9 ± 0.2	33	0.05	1000
FBS 0805-470 □	0.9 ± 0.2	47	0.05	1000
FBS 1206-260 □	1.1 ± 0.2	26	0.05	2000
FBS 1206-310 □	1.1 ± 0.2	31	0.05	2000
FBS 1206-500 □	1.1 ± 0.2	50	0.05	2000
FBS 1206-700 □	1.1 ± 0.2	70	0.05	2000
FBS 1210-310 □	1.3 ± 0.2	31	0.025	2500
FBS 1210-600 □	1.3 ± 0.2	60	0.025	1500
FBS 1806-800 □	1.6 ± 0.2	80	0.03	600
FBS 1806-151 □	1.6 ± 0.2	150	0.05	300
FBS 1812-131 □	1.5 ± 0.2	130	0.04	600
FBS 1812-151 □	1.5 ± 0.2	150	0.04	600

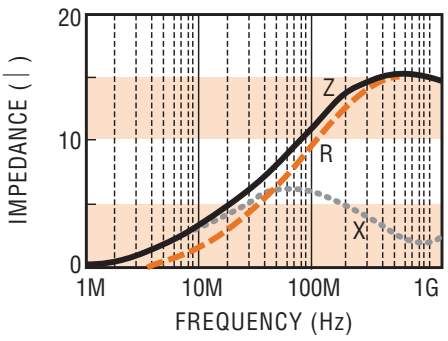
Venkel Ltd. may also be able to provide custom products to meet specific customer needs. Please consult your sales representative.

FBS SERIES

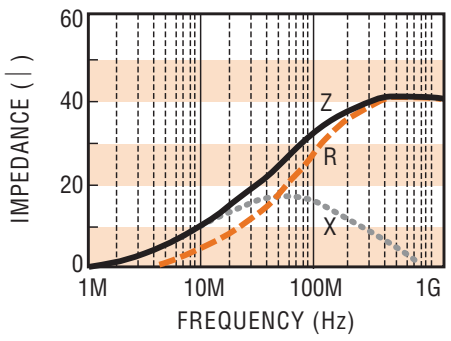
FBS0603-260□



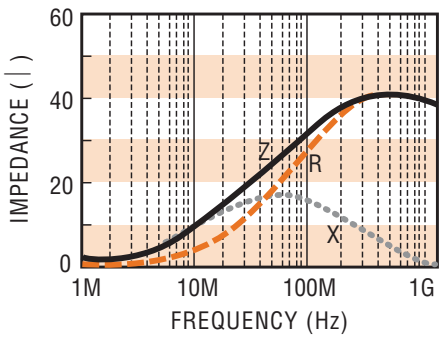
FBS0805-110□



FBS0805-330□



FBS0603-330□



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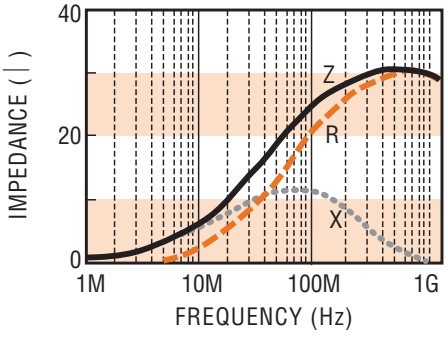
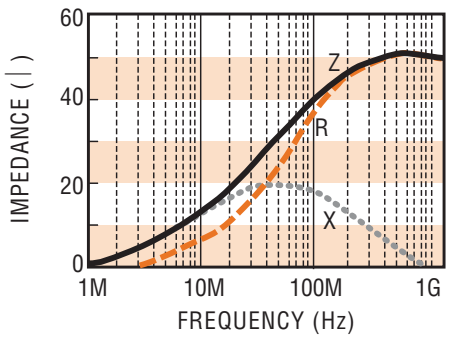


FBS0805-470□



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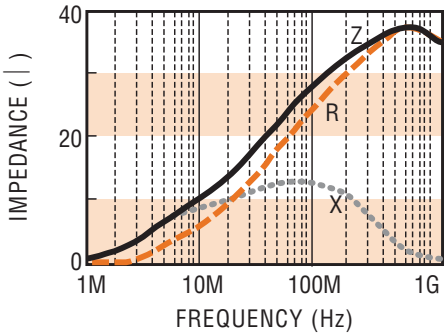
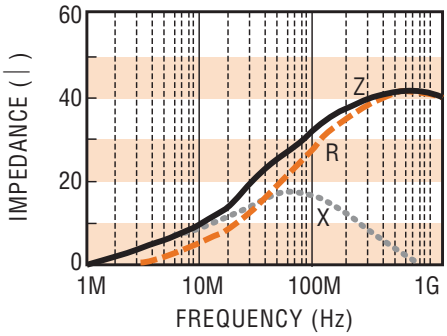
FBS SERIES

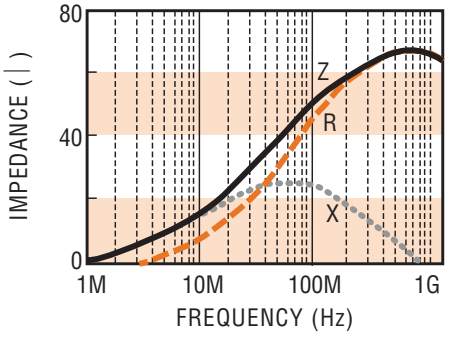
FBS1206-260□



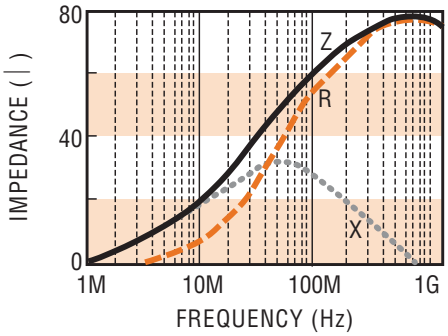
FBS1206-310□



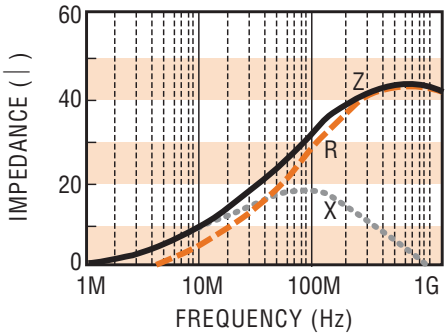
FBS1206-500□



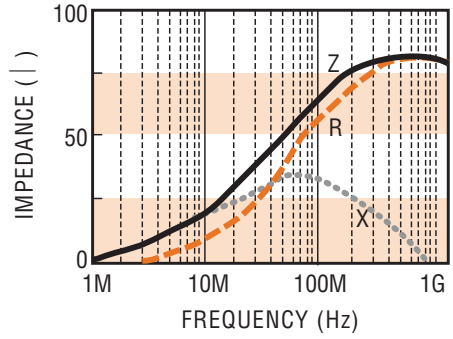
FBS1206-700□



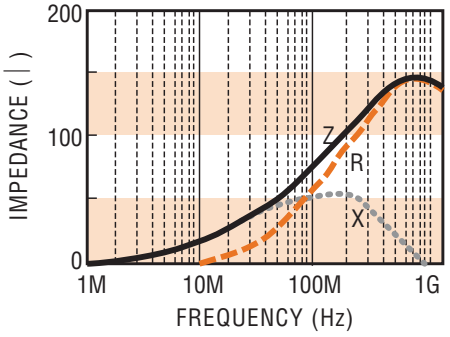
FBS1210-310□



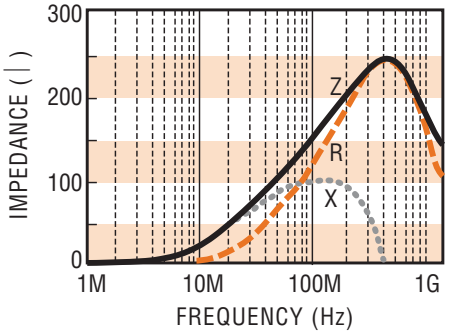
FBS1210-600□



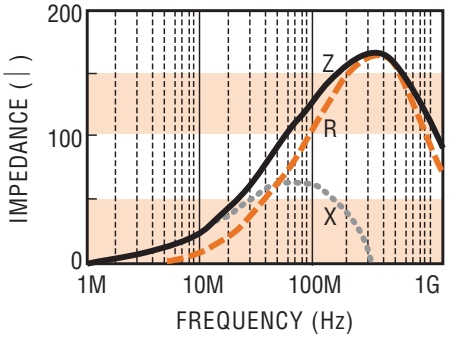
FBS1806-800□



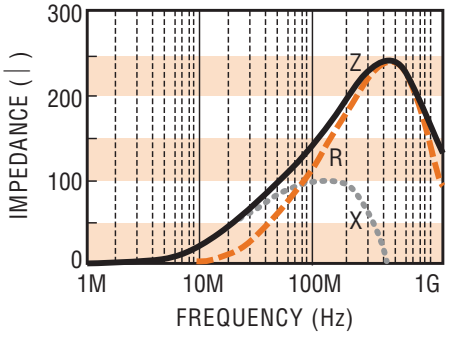
FBS1806-151□



FBS1812-131□



FBS1812-151□



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Ferrite Beads

Standard Part Numbers & Data

FBM 0402 SERIES DATA TABLE

Series Part Number	Thickness (mm)	Impedance (Ω) ± 25% (at 100MHz)	DC resistance (Ω) max.	Rated current (mA) max.
FBM 0402-100 □	0.5 ± 0.05	10	0.05	500
FBM 0402-300 □	0.5 ± 0.05	30	0.15	300
FBM 0402-600 □	0.5 ± 0.05	60	0.20	200
FBM 0402-800 □	0.5 ± 0.05	80	0.30	200
FBM 0402-121 □	0.5 ± 0.05	120	0.30	200
FBM 0402-241 □	0.5 ± 0.05	240	0.50	150
FBM 0402-301 □	0.5 ± 0.05	300	0.60	100
FBM 0402-471 □	0.5 ± 0.05	470	0.70	100
FBM 0402-601 □	0.5 ± 0.05	600	0.70	100
FBM 0402-102 □	0.5 ± 0.05	1000	0.90	100
FBM 0402-152 □	0.5 ± 0.05	1500	1.00	100

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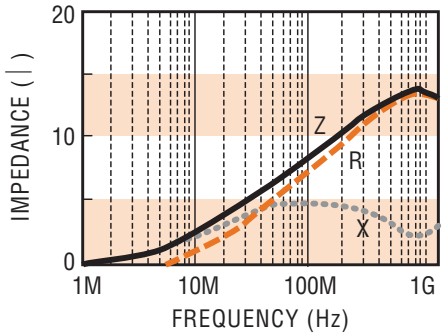
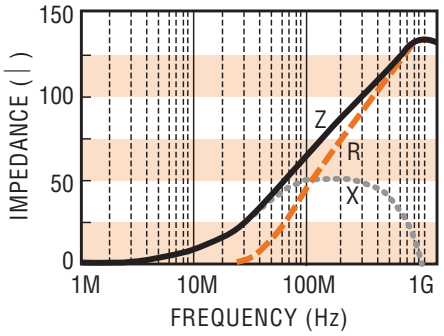
FBM 0402 SERIES

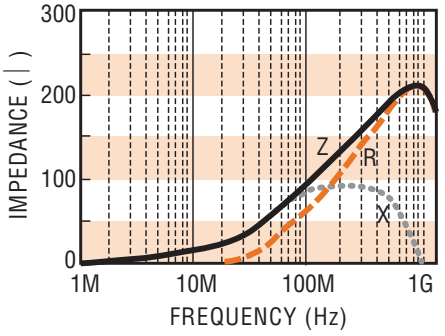
FBM0402-100□



FBM0402-600□



FBM0402-121□



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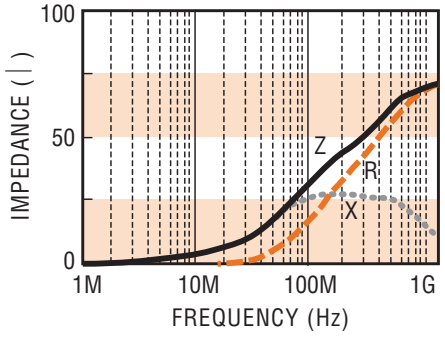
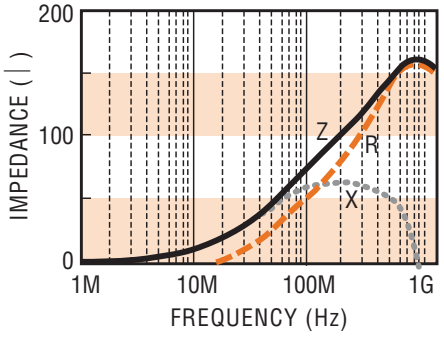
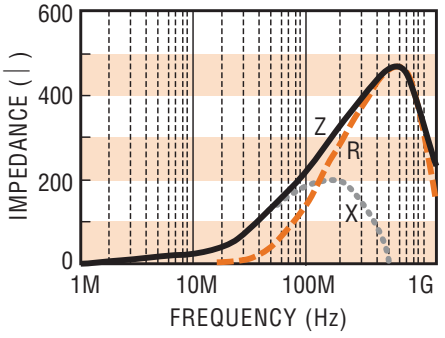


FBM0402-800□



FBM0402-241□



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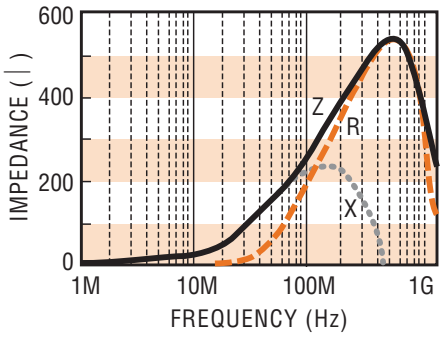
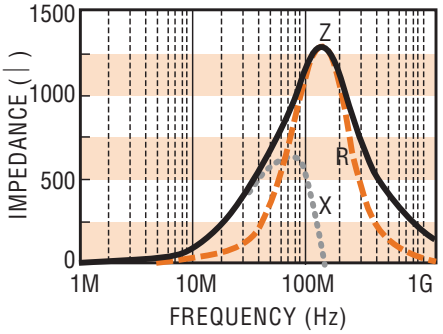
FBM 0402 SERIES

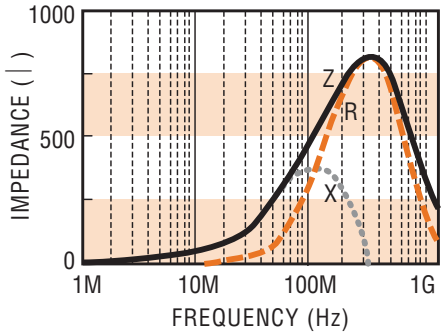
FBM0402-301□



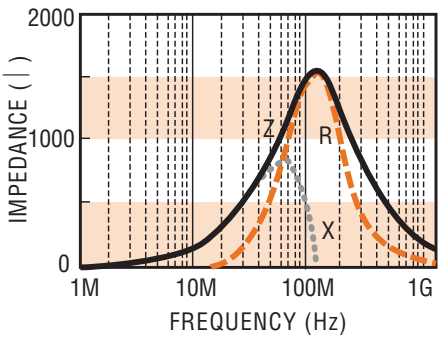
FBM0402-102□



FBM0402-471□



FBM0402-152□



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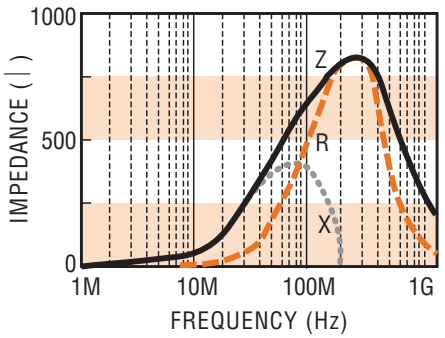

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Ferrite Beads

Standard Part Numbers & Data

FBM 0603 / 0805 / 1206 SERIES DATA TABLE

Series Part Number	Thickness (mm)	Impedance (Ω) ± 25% (at 100MHz)	DC resistance (Ω) max.	Rated current (mA) max.
FBM 0603-400 ☐	0.5 ± 0.05	40	0.12	600
FBM 0603-600 ☐	0.8 ± 0.15	60	0.12	600
FBM 0603-800 ☐	0.8 ± 0.15	80	0.15	550
FBM 0603-121 ☐	0.8 ± 0.15	120	0.20	500
FBM 0603-241 ☐	0.8 ± 0.15	240	0.30	400
FBM 0603-471 ☐	0.8 ± 0.15	470	0.35	300
FBM 0603-601 ☐	0.8 ± 0.15	600	0.45	300
FBM 0603-102 ☐	0.8 ± 0.15	1000	0.60	250
FBM 0603-152 ☐	0.8 ± 0.15	1500	0.80	200
FBM 0603-202 ☐	0.8 ± 0.15	2000 (at 70 MHz)	0.95	200
FBM 0805-600 ☐	0.9 ± 0.2	60	0.08	900
FBM 0805-800 ☐	0.9 ± 0.2	80	0.08	900
FBM 0805-101 ☐	0.9 ± 0.2	100	0.10	600
FBM 0805-121 ☐	0.9 ± 0.2	120	0.15	600
FBM 0805-151 ☐	0.9 ± 0.2	150	0.15	500
FBM 0805-241 ☐	0.9 ± 0.2	240	0.20	400
FBM 0805-301 ☐	0.9 ± 0.2	300	0.25	400
FBM 0805-471 ☐	0.9 ± 0.2	470	0.25	400
FBM 0805-601 ☐	0.9 ± 0.2	600	0.25	400
FBM 0805-102 ☐	0.9 ± 0.2	1000	0.40	350
FBM 0805-152 ☐	0.9 ± 0.2	1500 (at 70 MHz)	0.55	300
FBM 0805-202 ☐	0.9 ± 0.2	2000 (at 70 MHz)	0.70	300
FBM 1206-151 ☐	1.1 ± 0.2	150	0.20	500
FBM 1206-221 ☐	1.1 ± 0.2	220	0.25	400
FBM 1206-301 ☐	1.1 ± 0.2	300	0.30	400
FBM 1206-601 ☐	1.1 ± 0.2	600	0.35	400
FBM 1206-801 ☐	1.1 ± 0.2	800	0.40	400
FBM 1206-102 ☐	1.1 ± 0.2	1000	0.45	400
FBM 1206-152 ☐	1.1 ± 0.2	1500 (at 70 MHz)	0.55	300

Venkel Ltd. may also be able to provide custom products to meet specific customer needs.
Please consult your sales representative.

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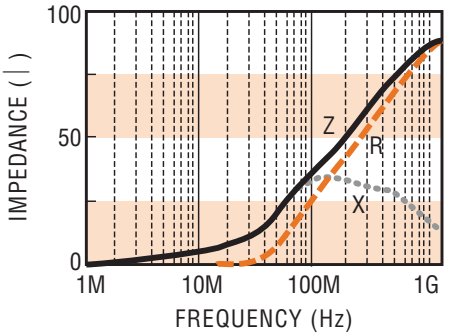
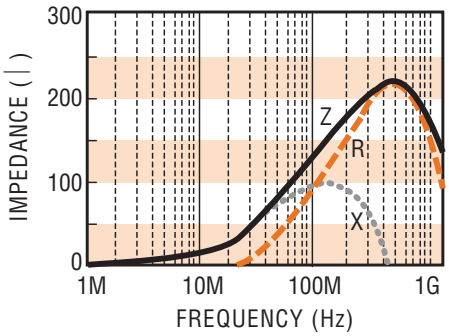
FBM 0603 SERIES

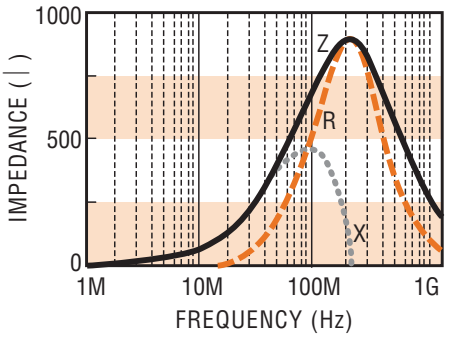
FBM0603-400□



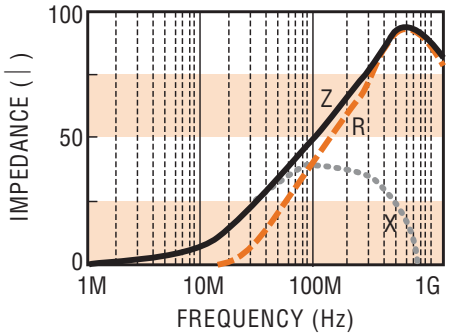
FBM0603-121□



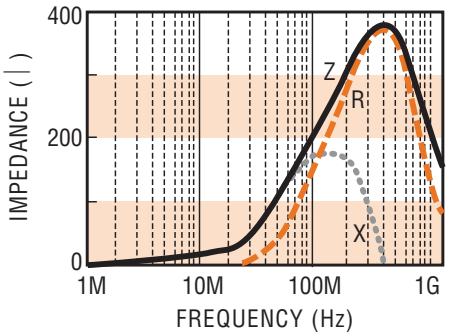
FBM0603-601□



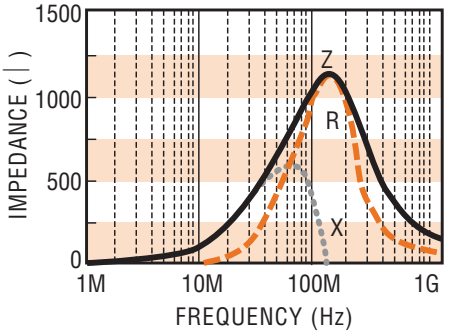
FBM0603-600□



FBM0603-241□



FBM0603-102□



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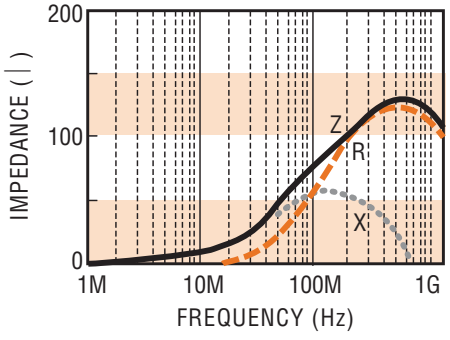
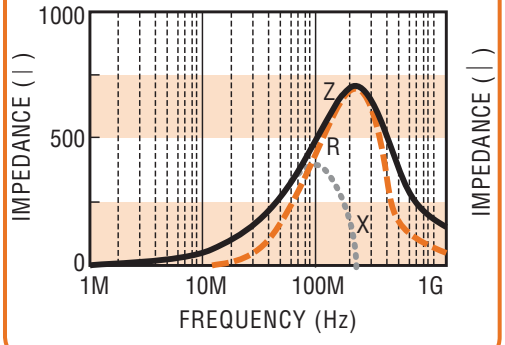
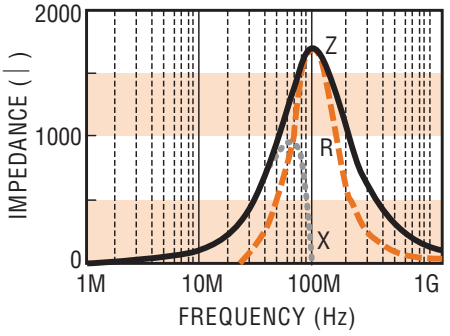


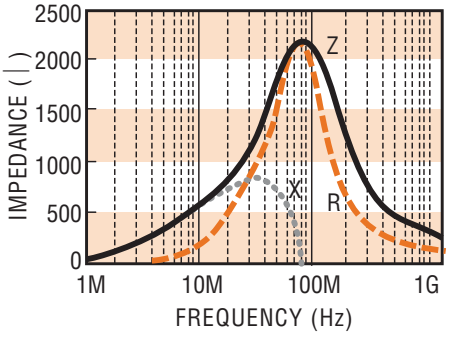
FBM0603-471□



FBM0603-152□



FBM0603-202□



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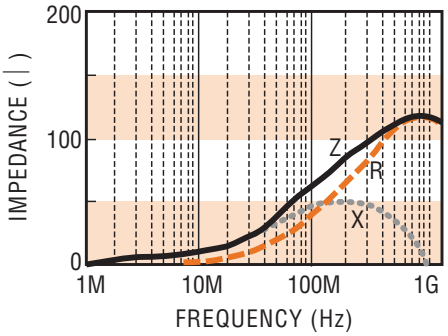
Ferrite Beads

FBM 0805 SERIES

FBM0805-600□



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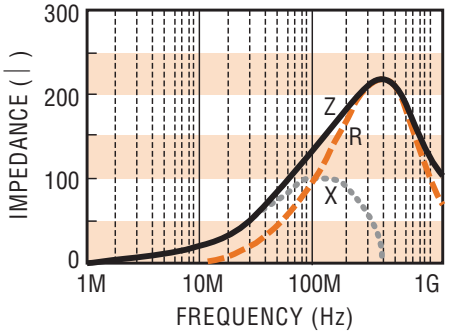
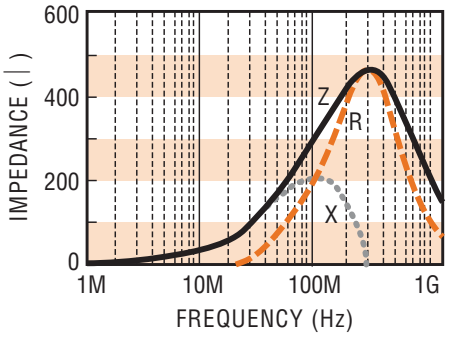
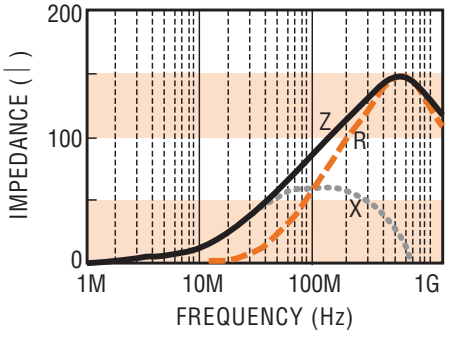


FBM0805-301□



FBM0805-800□



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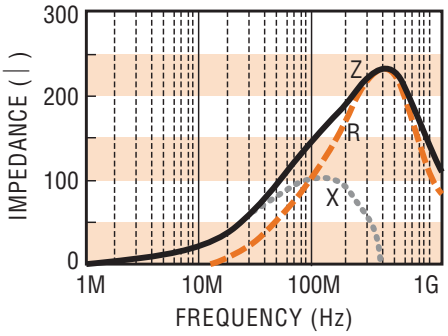

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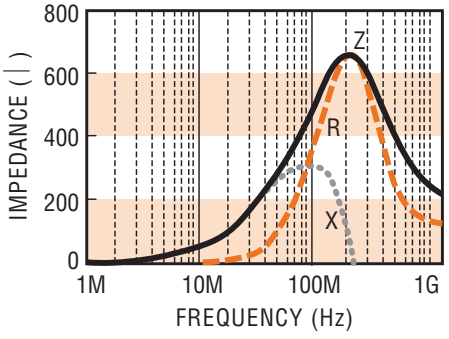

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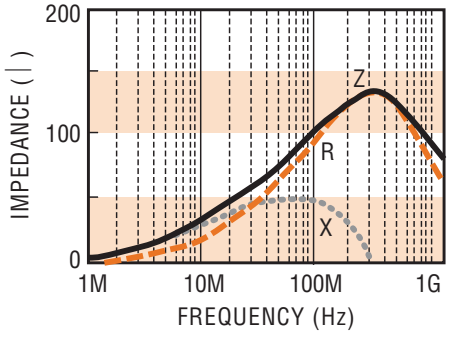
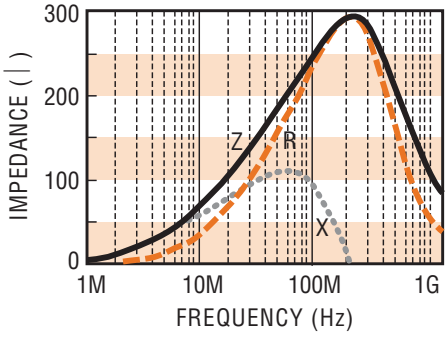
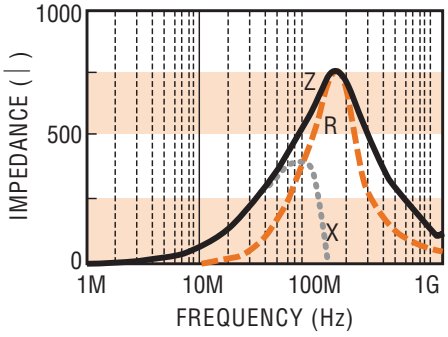


FBM0805-241□



FBM0805-601□



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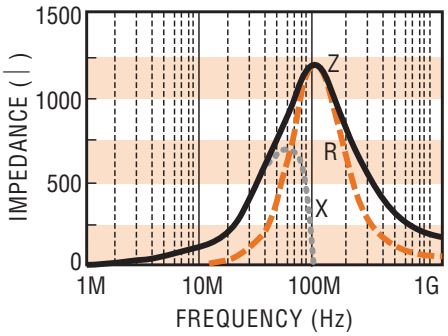
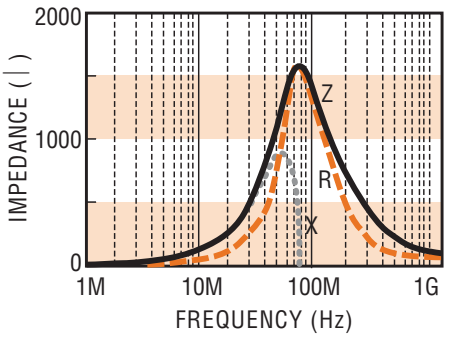
FBM 0805 SERIES

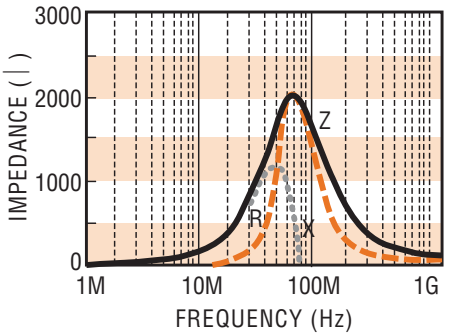
FBM0805-102□



FBM0805-152□

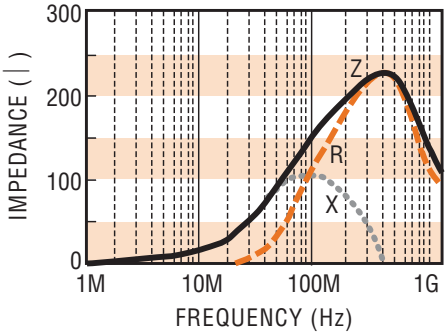


FBM0805-202□

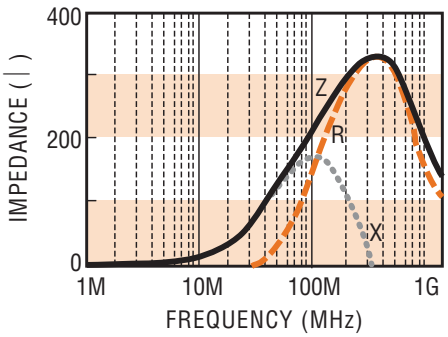


FBM 1206 SERIES

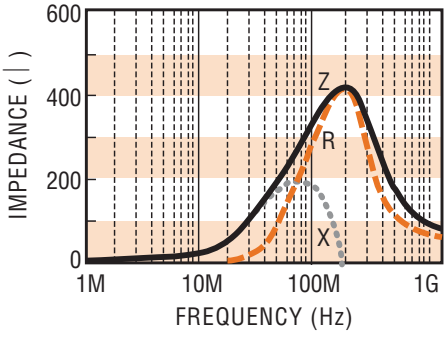
FBM1206-151□



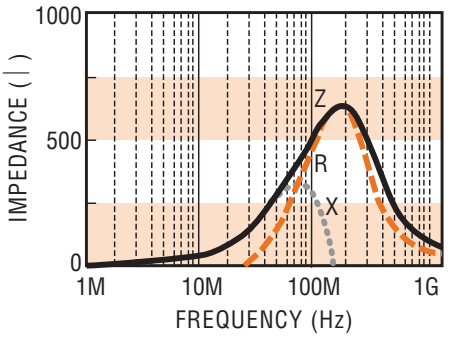
FBM1206-221□



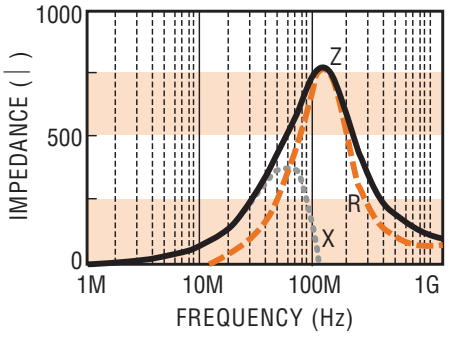
FBM1206-301□



FBM1206-601□



FBM1206-801□



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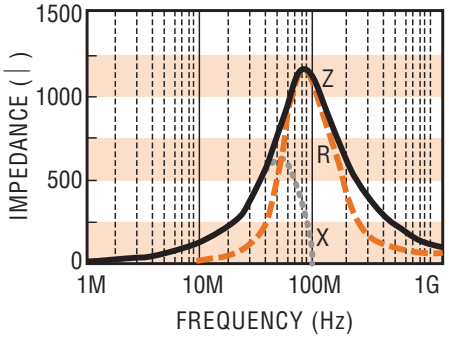
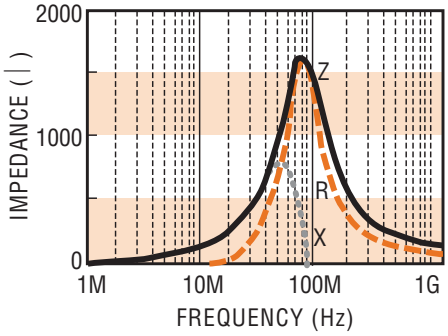


FBM1206-152□



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High Current Ferrite Beads

This series is used for EMI suppression and can match power lines to a maximum of 3A or 3000mA.

These beads exhibit high current capabilities due to their low DC resistance.

FBC-L Series: This series provides lower impedance at 10MHz.

FBC-H Series: This series provides higher impedance values at 10MHz due to different material permeability.

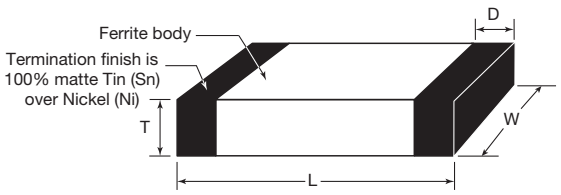
Features

- Smallest beads possible for high current and high impedance
- Perfect shape for automatic mounting with no directionality
- Excellent solderability and high heat resistance for either flow or reflow soldering
- Monolithic inorganic material construction for high reliability

Application

- EMI and Noise Suppression in power lines.

Dimensions



Unit: mm (inch)

Size	L	W	t	d
0402	1.0 ± 0.05 (0.040 ± 0.002)	0.5 ± 0.05 (0.020 ± 0.002	0.5 ± 0.05 (0.020 ± 0.002	0.25 ± 0.1 (0.010 ± 0.004)
0603	1.6 ± 0.15 (0.063 ± 0.006)	0.8 ± 0.15 (0.031 ± 0.006)	0.8 ± 0.15 (0.031 ± 0.006)	0.3 ± 0.2 (0.012 ± 0.008)
0805	2.0 ± 0.2 (0.079 ± 0.008)	1.25 ± 0.2 (0.050 ± 0.008)	0.9 ± 0.2 (0.036 ± 0.008)	0.5 ± 0.3 (0.020 ± 0.012)
1206	3.2 ± 0.2 (0.126 ± 0.008)	1.6 ± 0.2 (0.063 ± 0.008)	1.1 ± 0.2 (0.043 ± 0.008)	0.5 ± 0.3 (0.020 ± 0.012
1806	4.5 ± 0.2 (0.177 ± 0.008)	1.6 ± 0.2 (0.063 ± 0.008)	1.6 ± 0.2 (0.063 ± 0.008)	0.5 ± 0.3 (0.020 ± 0.02)
1812	4.5 ± 0.2 (0.177 ± 0.008)	3.2 ± 0.2 (0.126 ± 0.008)	1.5 ± 0.2 (0.060 ± 0.008)	0.5 ± 0.3 (0.020 ± 0.012

How To Order

FBC1206	—	121	H	E
Series		Impedance Values Standard termination finish for this product is 100% matte Tin (Sn)	L: Low Impedance at 10MHz H: High Impedance at 10MHz.	Packaging E: Embossed Tape P: Paper Tape

All components in this section are RoHS compliant per the EU directives and definitions.

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VENKEL LTD.

Standard Part Numbers & Data

FBC 'L' SERIES DATA TABLE

Series Part Number	Thickness (mm)	Impedance (Ω) ± 25% (at 100MHz)	DC resistance (Ω) max.	Rated current (mA) max.
FBC 0402-600L □	0.80 ± 0.15	60	0.1	1000
FBC 0603-600L □	0.80 ± 0.15	60	0.1	1000
FBC 0603-121L □	0.80 ± 0.15	120	0.15	750
FBC 0603-221L □	0.80 ± 0.15	220	0.15	750
FBC 0805-600L □	0.90 ± 0.2	60	0.03	3000
FBC 0805-121L □	0.90 ± 0.2	120	0.05	2500
FBC 0805-221L □	0.90 ± 0.2	220	0.05	2000
FBC 0805-301L □	0.90 ± 0.2	300	0.07	2000
FBC 0805-471L □	0.90 ± 0.2	470	0.07	2000
FBC 0805-601L □	0.90 ± 0.2	600	0.10	1000
FBC 1206-300L □	1.1 ± 0.2	30	0.02	3000
FBC 1206-500L □	1.1 ± 0.2	50	0.02	3000
FBC 1206-121L □	1.1 ± 0.2	120	0.03	3000
FBC 1206-241L □	1.1 ± 0.2	240	0.05	2500
FBC 1206-301L □	1.1 ± 0.2	300	0.05	2500
FBC 1206-471L □	1.1 ± 0.2	470	0.05	2500
FBC 1206-601L □	1.1 ± 0.2	600	0.05	2500
FBC 1806-400L □	1.6 ± 0.2	40	0.02	3000
FBC 1806-800L □	1.6 ± 0.2	80	0.02	3000
FBC 1806-121L □	1.6 ± 0.2	120	0.03	3000
FBC 1806-221L □	1.6 ± 0.2	220	0.04	2500
FBC 1806-301L □	1.6 ± 0.2	300	0.04	2500
FBC 1806-471L □	1.6 ± 0.2	470	0.04	2500
FBC 1806-601L □	1.6 ± 0.2	600	0.04	2500
FBC 1812-300L □	1.5 ± 0.2	30	0.02	3000
FBC 1812-121L □	1.5 ± 0.2	120	0.03	3000
FBC 1812-471L □	1.5 ± 0.2	470	0.04	3000

Venkel Ltd. may also be able to provide custom products to meet specific customer needs.
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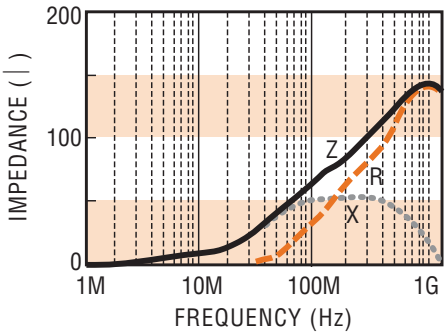
High Current Ferrite Beads

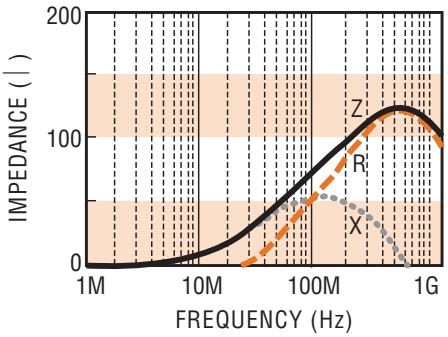
FBC 0402 'L' SERIES

FBC0402-600L□

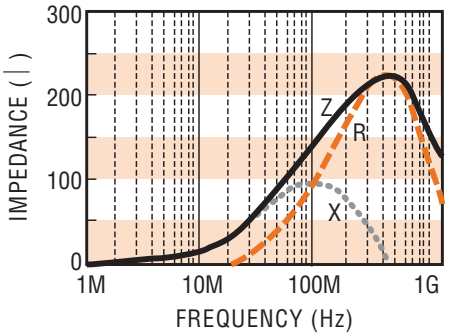


FBC 0603 'L' SERIES

FBC0603-600L□



FBC0603-121L□



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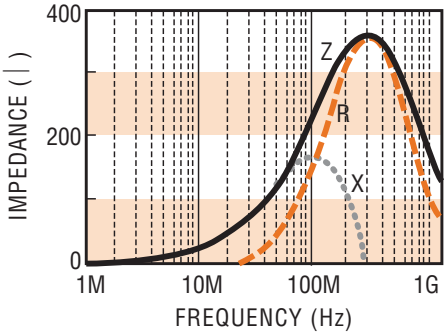

FBC 0805 'L' SERIES

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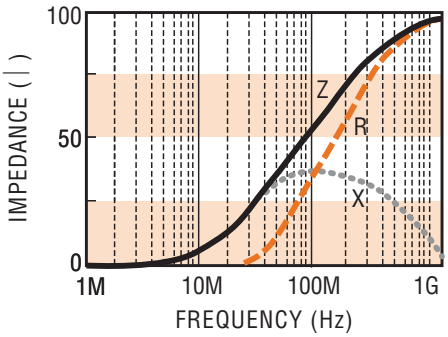

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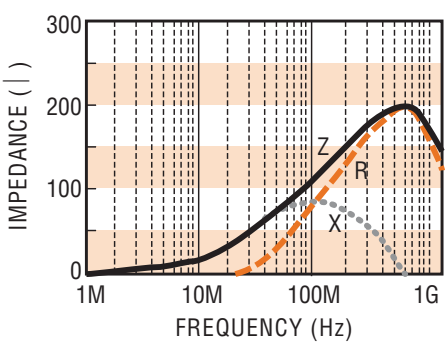

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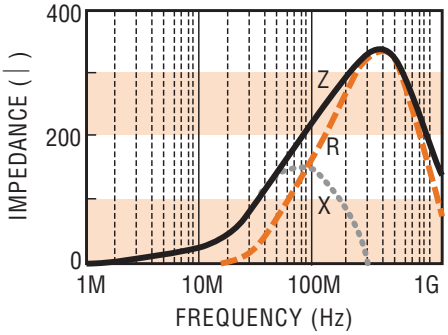

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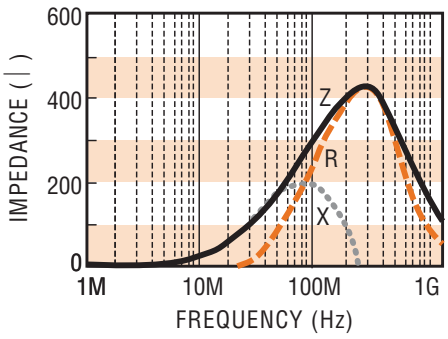
FBC 0805 'L' SERIES

FBC0805-301L□



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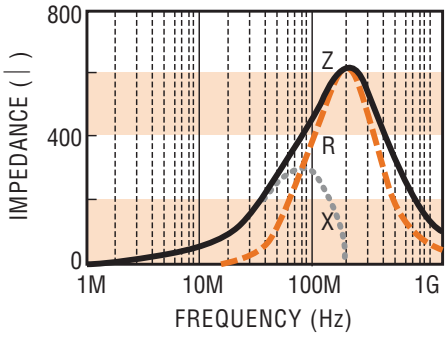

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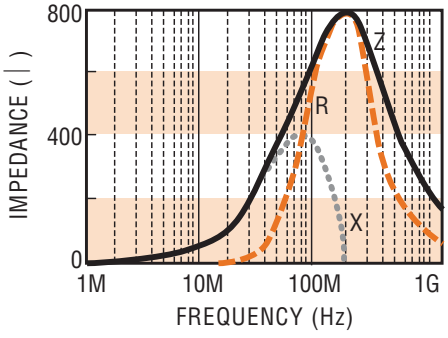
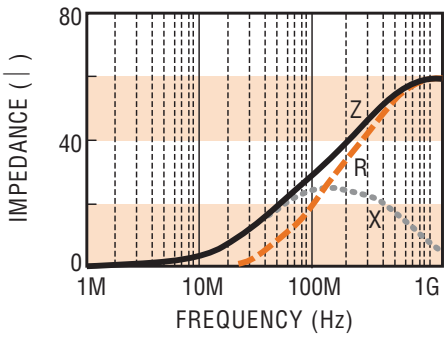
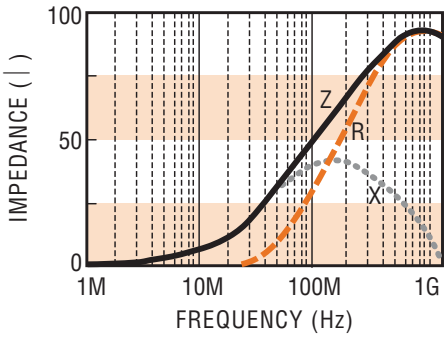


FBC 1206 'L' SERIES

FBC1206-300L□



FBC1206-500L□



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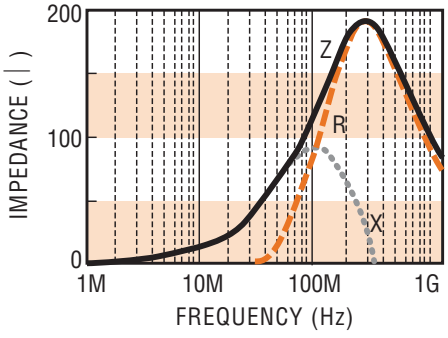
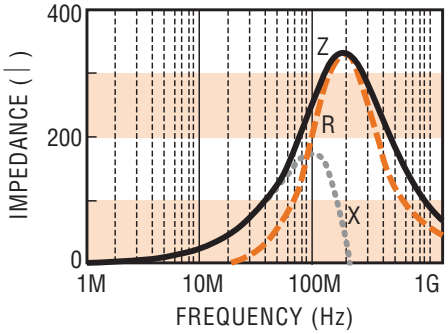


FBC1206-241L□



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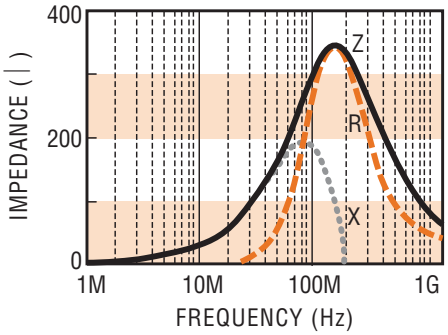
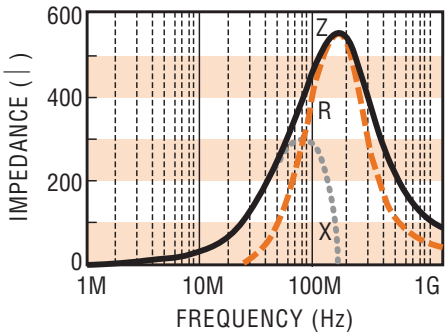
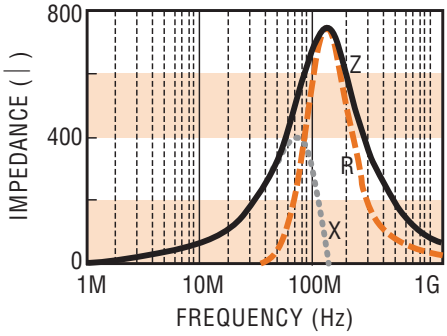


FBC1206-471L□



FBC1206-601L□



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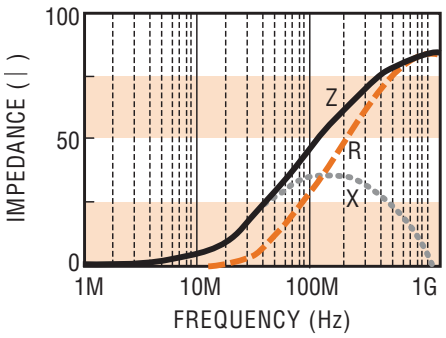
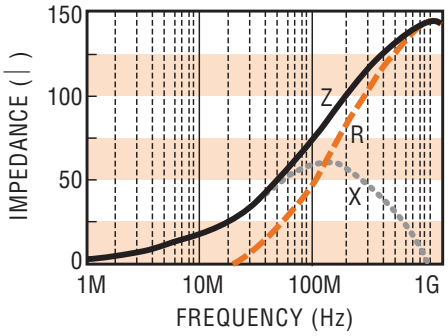
FBC 1806 'L' SERIES

FBC1806-400L□



FBC1806-800L□



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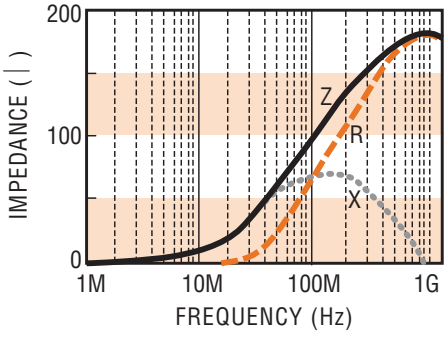

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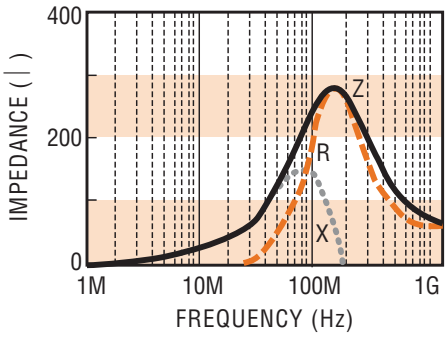

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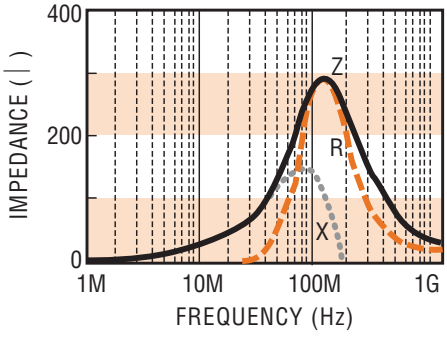

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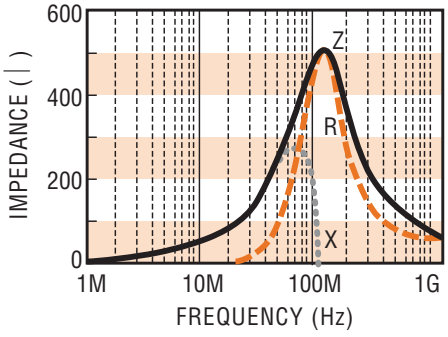

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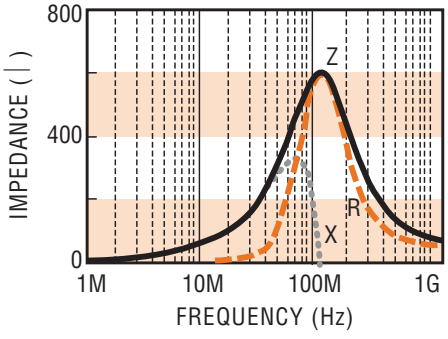
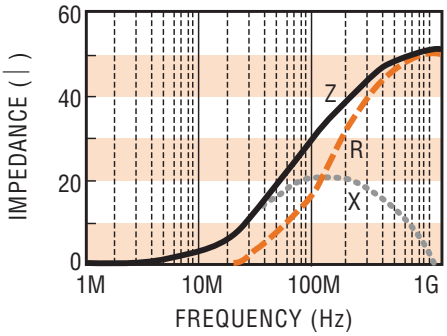


FBC 1812 'L' SERIES

FBC1812-300L□



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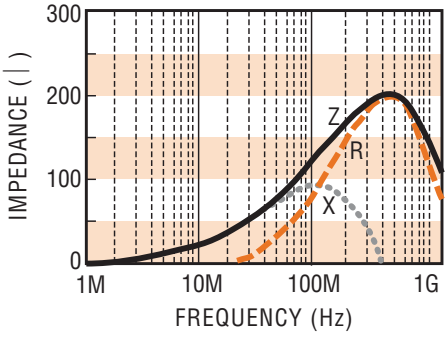

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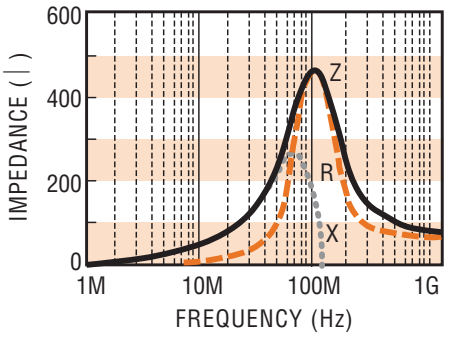
FBC 1812 ‘L’ SERIES

FBC1812-471L□



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High Current Ferrite Beads

Standard Part Numbers & Data

FBC 'H' SERIES DATA TABLE

Series Part Number	Thickness (mm)	Impedance (Ω) ± 25% (at 100MHz)	DC resistance (Ω) max.	Rated current (mA) max.
FBC 0402-300H □	0.80 ± 0.15	30	0.05	1000
FBC 0603-300H □	0.80 ± 0.15	30	0.10	1000
FBC 0603-600H □	0.80 ± 0.15	60	0.10	1000
FBC 0603-121H □	0.80 ± 0.15	120	0.15	750
FBC 0603-221H □	0.80 ± 0.15	220	0.15	750
FBC 0805-110H □	0.90 ± 0.2	11	0.05	3000
FBC 0805-300H □	0.90 ± 0.2	30	0.05	3000
FBC 0805-600H □	0.90 ± 0.2	60	0.05	2500
FBC 0805-121H □	0.90 ± 0.2	120	0.05	2500
FBC 0805-221H □	0.90 ± 0.2	220	0.05	2000
FBC 1206-300H □	1.1 ± 0.2	30	0.03	3000
FBC 1206-500H □	1.1 ± 0.2	50	0.05	3000
FBC 1206-121H □	1.1 ± 0.2	120	0.05	2500
FBC 1206-221H □	1.1 ± 0.2	220	0.05	2000
FBC 1206-301H □	1.1 ± 0.2	300	0.05	2000
FBC 1206-471H □	1.1 ± 0.2	470	0.07	2000
FBC 1806-600H □	1.6 ± 0.2	60	0.02	3000
FBC 1806-800H □	1.6 ± 0.2	80	0.03	3000
FBC 1806-121H □	1.6 ± 0.2	120	0.05	2500
FBC 1806-221H □	1.6 ± 0.2	220	0.05	2000
FBC 1806-301H □	1.6 ± 0.2	300	0.05	2000
FBC 1806-471H □	1.6 ± 0.2	470	0.05	2000
FBC 1806-601H □	1.6 ± 0.2	600	0.07	1500
FBC 1812-300H □	1.5 ± 0.2	30	0.03	3000
FBC 1812-700H □	1.5 ± 0.2	70	0.03	3000
FBC 1812-121H □	1.5 ± 0.2	120	0.03	3000
FBC 1812-221H □	1.5 ± 0.2	220	0.05	2000
FBC 1812-301H □	1.5 ± 0.2	300	0.04	3000
FBC 1812-471H □	1.5 ± 0.2	470	0.03	2000

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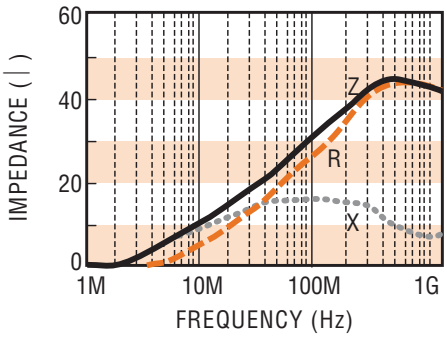
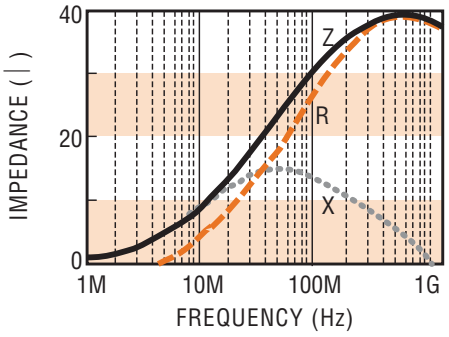
FBC 0402 'H' SERIES

FBC0402-300H□



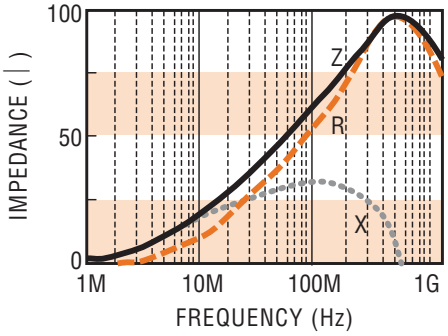
FBC 0603 'H' SERIES

FBC0603-300H□

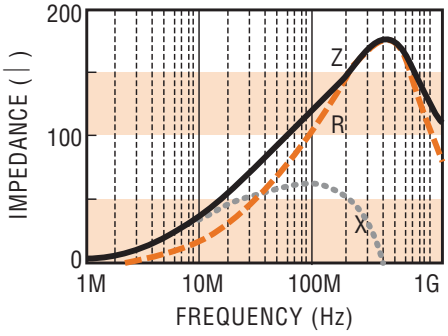


FBC 0603 'H' SERIES

FBC0603-600H□



FBC0603-121H□



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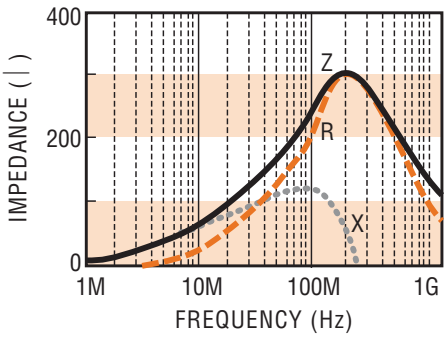
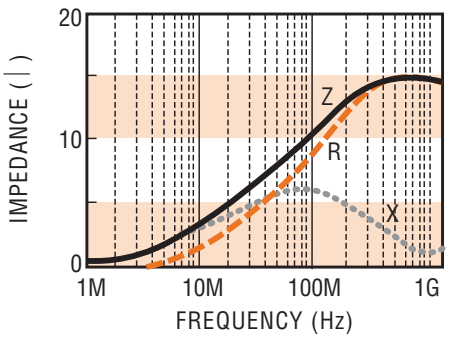
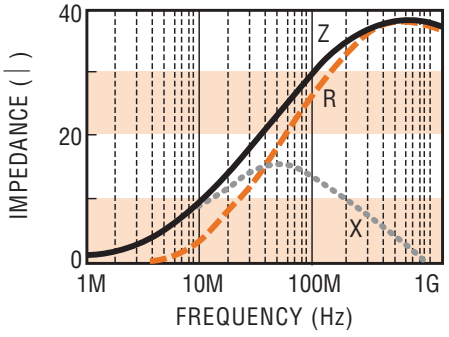


FBC 0805 'H' SERIES

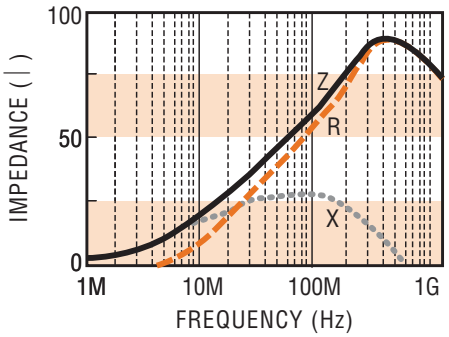
FBC0805-110H□



FBC0805-300H□



FBC0805-600H□



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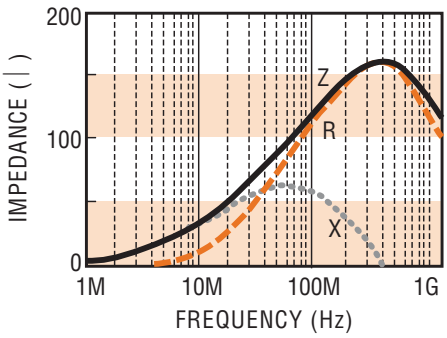
High Current Ferrite Beads

FBC 0805 'H' SERIES

FBC0805-121H□



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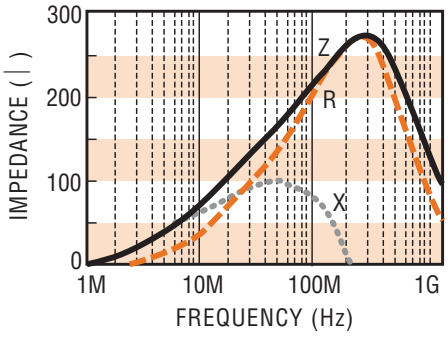
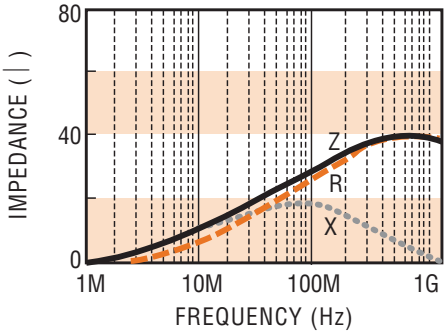
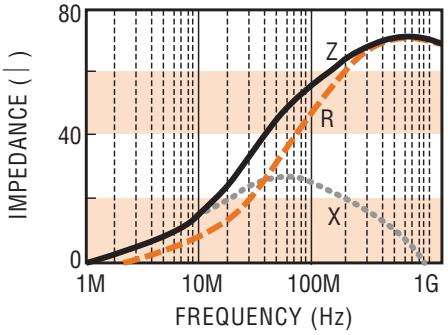


FBC 1206 'H' SERIES

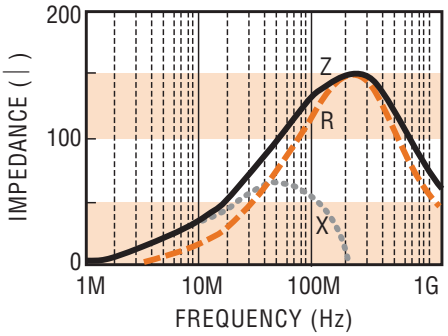
FBC1206-300H□



FBC1206-500H□



FBC1206-121H□



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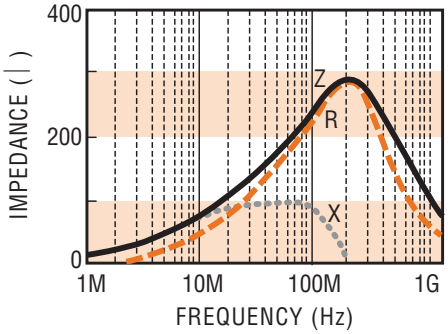
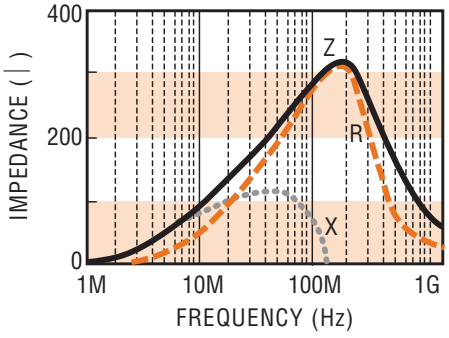
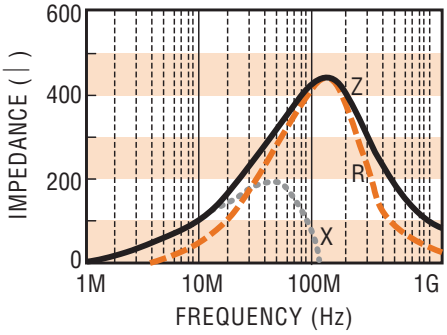


FBC1206-301H□



FBC1206-471H□



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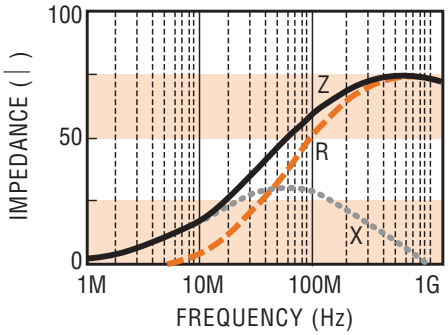
FBC 1806 'H' SERIES

FBC1806-600H□



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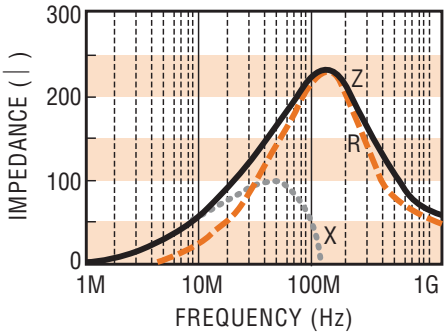

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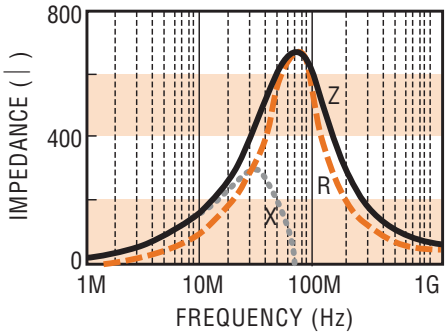

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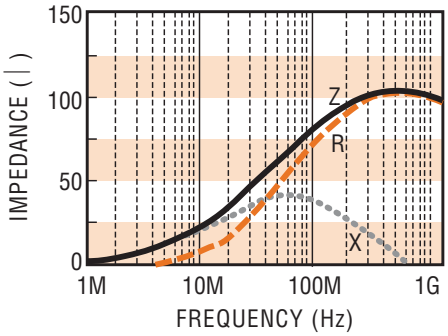

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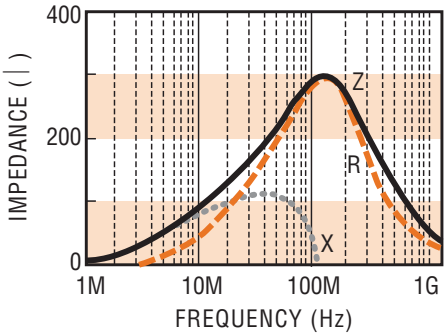

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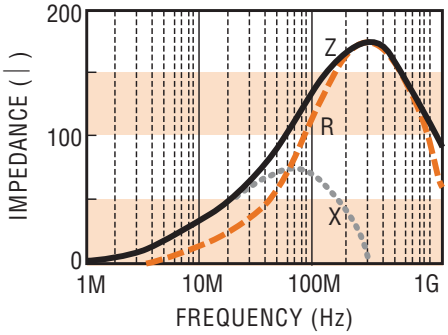

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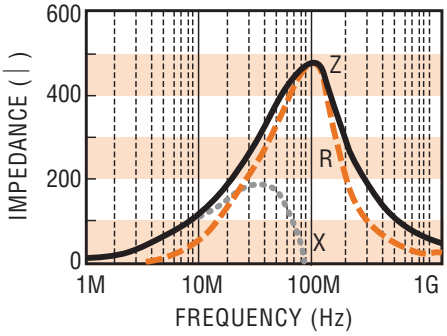

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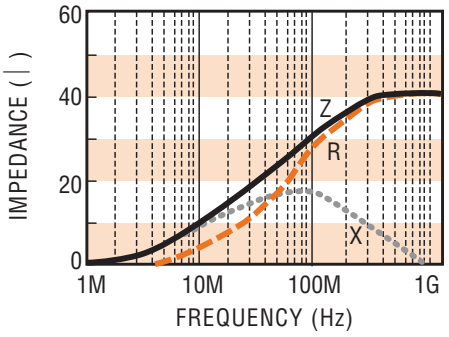
High Current Ferrite Beads

FBC 1812 'H' SERIES

FBC1812-300H□



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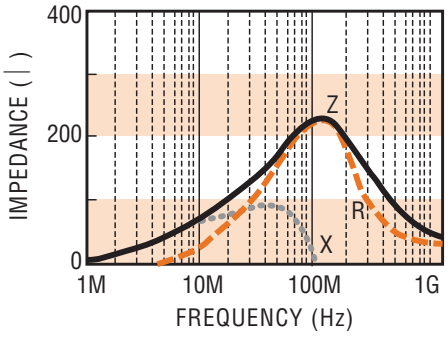

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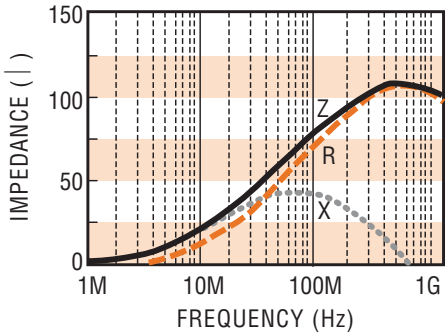

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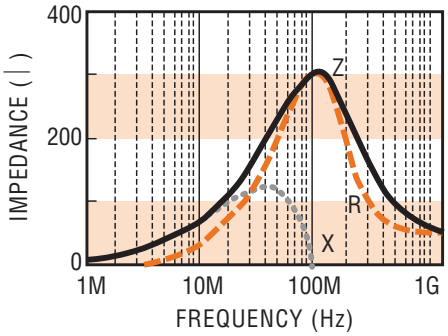

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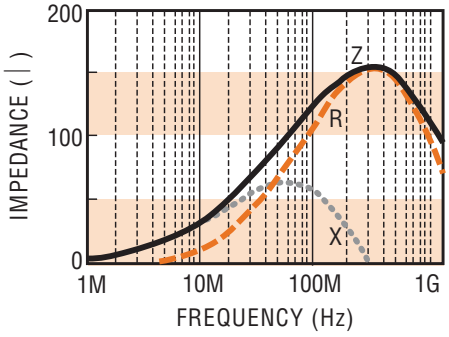

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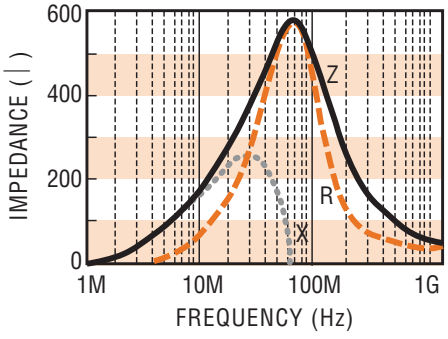

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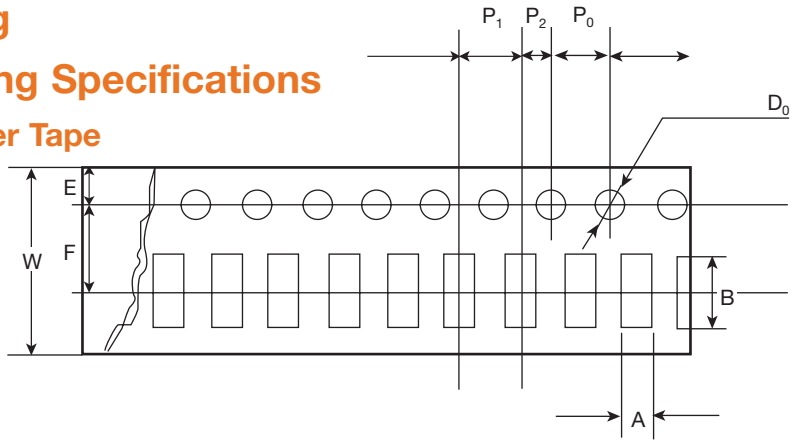
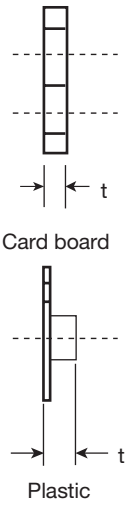
Packaging

Taping Specifications

Carrier Tape



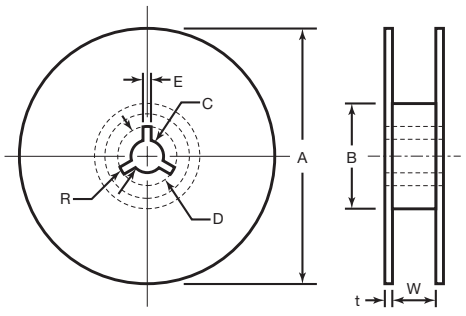


Type	0402	0603	0805	1206	1210	1806	1812
Tape	Paper	Paper	Embossed	Embossed	Embossed	Embossed	Embossed
W	8.0 ± 0.2	8.0 ± 0.2	8.0 ± 0.2	8.0 ± 0.2	8.0 ± 0.2	12.0 ± 0.2	12.0 ± 0.2
F	3.5 ± 0.05	3.5 ± 0.05	3.5 ± 0.05	3.5 ± 0.05	3.5 ± 0.05	5.5 ± 0.05	5.5 ± 0.05
E	1.75 ± 0.1	1.75 ± 0.1	1.75 ± 0.1	1.75 ± 0.1	1.75 ± 0.1	1.75 ± 0.1	1.75 ± 0.1
P_1	2.0 ± 0.05	4.0 ± 0.1	4.0 ± 0.2	4.0 ± 0.2	4.0 ± 0.1	8.0 ± 0.1	8.0 ± 0.1
P_2	1.0 ± 0.05	2.0 ± 0.05	2.0 ± 0.05	2.0 ± 0.05	2.0 ± 0.05	2.0 ± 0.05	2.0 ± 0.05
P_0	4.0 ± 0.1	4.0 ± 0.1	4.0 ± 0.1	4.0 ± 0.1	4.0 ± 0.1	4.0 ± 0.1	4.0 ± 0.1
D_0	Ø 1.55 ± 0.1	Ø 1.55 ± 0.1	Ø 1.55 ± 0.1	Ø 1.55 ± 0.1	Ø 1.55 ± 0.1	Ø 1.55 ± 0.1	Ø 1.55 ± 0.1
A	0.65 ± 0.1	1.0 ± 0.2	8.45 ± 0.1	1.90 ± 0.1	2.90 ± 0.1	4.9 ± 0.2	4.85 ± 0.1
B	1.15 ± 0.1	1.8 ± 0.2	2.3 ± 0.1	3.5 ± 0.1	3.6 ± 0.1	1.9 ± 0.2	3.5 ± 0.1
t	0.8 max.	1.0 ± 0.1	1.15 ± 0.1	1.137 ± 0.1	1.55 ± 0.1	1.78 ± 0.2	1.75 ± 0.1
EA/Reel	**10,000**	**4,000**	**4,000**	**3,000**	**2,500**	**2,000**	**1,000**

Unit: mm (inch)

Tape	8mm	12mm
A	178 ± 2	178 ± 2
B	50 ± 1	50 ± 1
C	13.0 ± 0.5	13.0 ± 0.5
D	21.0 ± 0.8	21.0 ± 0.8
E	2.0 ± 0.5	2.0 ± 0.5
W	10.0 ± 1.0	14.0 ± 1.0
t	1.2 ± 0.5	2.0 ± 0.5
R	1.0	1.0

Reel



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Surface Mount Engineering Kits

Chip Resistors

Series	Size	Power Rating	Tolerance	Resistance Range	Values/Kit
CR0201-20W	0201	0.050W	1%	10 ohm - 1M ohm	Consult Salesperson
CR0201-20W	0201	0.050W	5%	10 ohm - 1M ohm	Consult Salesperson
CR0402-16W	0402	0.063W	1%	10 ohm - 1M ohm	340
CR0402-16W	0402	0.063W	5%	0 ohm - 1.5M ohm	142
CR0603-16W	0603	0.063W	1%	10 ohm - 1M ohm	480
CR0603-16W	0603	0.063W	5%	0 ohm - 3.3M ohm	150
CR0805-10W	0805	0.100W	1%	10 ohm - 1M ohm	480
CR0805-10W	0805	0.100W	5%	0 ohm - 10M ohm	170
CR1206-8W	1206	0.125W	1%	10 ohm - 1M ohm	480
CR1206-8W	1206	0.125W	5%	0 ohm - 10M ohm	170
CR1210-4W	1210	0.250W	5%	0 ohm - 3.3M ohm	50

How To Order

CR0805-10W — **KIT** — **J** — **25**

- CR0805-10W: SERIES
- J: TOLERANCE (F= ±1% or J= ±5%)
- 25: QTY/VALUE (25, 50 or 100 pcs)

Standard termination finish for this product is 100% matte Tin (Sn)

THIN FILM CHIP RESISTOR KITS:

TFCR 0402-16W: 10Ω to 205KΩ — 150 VALUES
TFCR 0603-10W: 10Ω to 1MegΩ — 175 VALUES
TFCR 0805-8W: 10Ω to 1MegΩ — 175 VALUES

How To Order

TFCR 0805 — **KIT** — **EB** — **25**

- TFCR 0805: SERIES
- EB: TCR: 25ppm; Tol. 0.1%
- 25: QTY/VALUE (25 pcs)

Standard termination finish for this product is 100% matte Tin (Sn)

Thin Film Kits are only available with a Tolerance of 0.1% and a TCR of 25ppm.

Chip Inductors

MULTILAYER CHIP INDUCTOR KITS:

MLF1608: 68nH to 10µH — 16 VALUES
MLF2012: 68nH to 18µH — 16 VALUES

How To Order

MLF2012 — **KIT** — **10**

- MLF2012: SERIES
- 10: QTY/VALUE (10, 25, 50 or 100 pcs)

Standard termination finish for this product is 100% matte Tin (Sn)

LMCI 0201: 1.0nH to 33nH — 12 VALUES
LMCI 1608: 1.5nH to 100nH — 18 VALUES
LMCI 1005: 1.0nH to 100nH — 18 VALUES
LMCI 2012: 1.8nH to 390nH — 22 VALUES

How To Order

LMCI 2012 — **KIT** — **10**

- LMCI 2012: SERIES
- 10: QTY/VALUE (10, 25, 50 or 100 pcs)

Standard termination finish for this product is 100% matte Tin (Sn)

RF INDUCTOR KITS:

MRFI 0402: 1.0nH to 47 nH — 16 VALUES
MRFI 0603: 2.0nH to 180nH — 18 VALUES
MRFI 0805: 3.9nH to 1000nH — 20 VALUES
MRFI 1008: 6.8nH to 6800nH — 22 VALUES
MRFI 1210: 5.6nH to 8200nH — 22 VALUES

How To Order

MRFI 0805 — **KIT** — **10**

- MRFI 0805: SERIES
- 10: QTY/VALUE (10, 25, 50 or 100 pcs)

Standard termination finish for this product is Gold Flash over Nickel

Please Note: Values in all these Engineering Kits are based on available local stock and customer needs.
If a specific value is needed, please consult your sales representative for availability and more information.

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Ceramic Chip Capacitors

Size	TC	Tolerance	Range	Values/Kit
0201	C0G	±.25pF, 5%	0.5 pF – 100 pF	36
	X7R	10%	100 pF – 0.01µF	
	Y5V	+80/-20%	2200pF – 0.01µF	
0402	HQN	±0.05pF, ±0.1pF, ±0.25pF, ±5%	0.1pF – 10pF	27
	C0G	±.25pF, 5%	1 pF – 220 pF	54
	X7R	10%	220 pF – 0.1µF	
	Y5V	+80/-20%	0.015µF – 0.1µF	
0603	HQN	±0.05pF, ±0.1pF, ±0.25pF, ±5%	0.2pF – 22pF	24
	C0G	±.25pF, 5%	0.5 pF – 680 pF	62
	X7R	10%	390 pF – 0.33µF	
	Y5V	+80/-20%	0.047µF – 1.0µF	
0805	C0G	±.25pF, 5%	0.5 pF – 1500 pF	62
	X7R	10%	820 pF – 2.2µF	
	Y5V	+80/-20%	0.1µF – 4.7µF	
1206	C0G	±.25pF, 5%	1.0 pF – 3300 pF	62
	X7R	10%	1000 pF – 10.0µF	
	Y5V	+80/-20%	0.1µF – 10.0µF	

How To Order

Standard termination finish for this product is 100% matte Tin (Sn)

C0805 — **CAP KIT** — **25**

SERIES — QTY/VALUE (25, 50 or 100 pcs)

C0402/C0603 — **HQN KIT** — **10**

SERIES — QTY/VALUE (10 or 25 pcs)

Ferrite Beads

FERRITE BEAD KITS: How To Order

Standard termination finish for this product is 100% matte Tin (Sn)

FBM & FBC-L — **KIT** — **10**

SERIES — QTY/VALUE (10, 25, 50 or 100 pcs)

Hi-Cap Kit (Tantalum Replacement MLCC Kit)

High Value Ceramic Chip Capacitor Kit

Part Number	Size	Rated Voltage (VDCW)	Cap. Value (µF)	Tolerance (%)
C0402X5R6R3-105KNE	0402	6.3	1	±10
C0402X5R6R3-475MNE	0402	6.3	4.7	±20
C0402X5R4R0-106MNP	0402	4	10	±20
C0603X5R250-105KNE	0603	25	1	±10
C0603X7R160-105KNE	0603	16	1	±10
C0603X5R160-225KNE	0603	16	2.2	±10
C0603X7R100-225KNP	0603	10	2.2	±10
C0603X5R100-475KNE	0603	10	4.7	±10
C0603X5R6R3-106MNE	0603	6.3	10	±20
C0603X5R6R3-226MNE	0603	6.3	22	±20
C0805X7R250-105KNE	0805	25	1	±10
C0805X7R100-225KNE	0805	10	2.2	±10
C0805X7R160-225KNE	0805	16	2.2	±10
C0805X5R100-475KNE	0805	10	4.7	±10
C0805X5R100-106KNE	0805	10	10	±10
C0805X7R100-106KNE	0805	10	10	±10
C0805X5R6R3-226MNE	0805	6.3	22	±20
C0805X5R6R3-476MNE	0805	6.3	47	±20
C1206X7R250-105KNE	1206	25	1	±10
C1206X7R500-105KNE	1206	50	1	±10
C1206X5R100-475KNE	1206	10	4.7	±10
C1206X7R100-106KNE	1206	10	10	±10
C1206X5R6R3-226KNE	1206	6.3	22	±10
C1206X5R100-226MNE	1206	10	47	±20
C1206X5R6R3-476MNE	1206	6.3	47	±20
C1206X5R6R3-107MNE	1206	6.3	100	±20
C1210X7R160-106KNE	1210	16	10	±10
C1210X5R160-106KNE	1210	16	10	±10
C1210X5R160-226KNE	1210	16	22	±10
C1210X5R250-226KNE	1210	25	22	±10
C1210X5R6R3-476MNE	1210	6.3	47	±20
C1210X5R6R3-107MNE	1210	6.3	100	±20
C1812X5R160-226KNE	1812	16	22	±10

How To Order

HI — CAP KIT — 25

Standard termination finish for this product is 100% matte Tin (Sn)

QTY/VALUE
(25, 50 or 100 pcs)

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High Value C0G Ceramic Chip Capacitor Kit

Part Number	Size	Rated Voltage (VDCW)	Cap. Value	Tolerance (%)
C0402C0G500-331JNE	0402	50	330 pF	±5
C0402C0G500-471JNE	0402	50	470 pF	±5
C0402C0G500-561JNE	0402	50	560 pF	±5
C0402C0G500-681JNE	0402	50	680 pF	±5
C0402C0G500-821JNE	0402	50	820 pF	±5
C0402C0G500-102JNE	0402	50	1000 pF	±5
C0603C0G500-152JNE	0603	50	1500 pF	±5
C0603C0G500-182JNE	0603	50	1800 pF	±5
C0603C0G500-222JNE	0603	50	2200 pF	±5
C0603C0G500-272JNE	0603	50	2700 pF	±5
C0805C0G500-392JNE	0805	50	3900 pF	±5
C0805C0G500-472JNE	0805	50	4700 pF	±5
C0805C0G500-562JNE	0805	50	5600 pF	±5
C0805C0G500-822JNE	0805	50	8200 pF	±5
C0805C0G500-103JNE	0805	50	.01 µF	±5
C0805C0G500-223JNE	0805	50	.022 µF	±5
C1206C0G500-183JNE	1206	50	.018 µF	±5
C1206C0G500-223JNE	1206	50	.022 µF	±5
C1206C0G500-273JNE	1206	50	.027 µF	±5
C1206C0G500-333JNE	1206	50	.033 µF	±5
C1206C0G500-473JNE	1206	50	.047 µF	±5
C1206C0G500-563JNE	1206	50	.056 µF	±5
C1206C0G500-683JNE	1206	50	.068 µF	±5
C1206C0G500-823JNE	1206	50	.082 µF	±5
C1206C0G250-104JNE	1206	25	.100 µF	±5

How To Order

HI — CAPC0G KIT — 25

Standard termination finish for this product is 100% matte Tin (Sn)

QTY/VALUE (25, 50 or 100 pcs)

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High Voltage Ceramic Chip Capacitor Kit

200V	Capacitance Value
C0805C0G201-151KNE	150pF
C0805C0G201-221JNE	220pF
C0805X7R201-221KNE	220pF
C0805X7R201-471KNE	470pF
C0805X7R201-681KNE	680pF
C0805X7R201-102KNE	1000pF
C0805X7R201-222KNE	2200pF
C1206X7R201-473KNE	0.047uF
C1210X7R201-333KNE	0.033uF
250V	**Capacitance Value**
C0805X7R251-102KNE	1000pF
C1206X7R251-102KNE	1000pF
C1206X7R251-104KNE	0.1uF
500V	**Capacitance Value**
C1206C0G501-101JNE	100pF
C1206C0G501-221JNE	220pF
C1206C0G501-391JNE	390pF
C1206C0G501-471JNE	470pF
C1206C0G501-561JNE	560pF
C1206C0G501-681JNE	680pF
C1206X7R501-681KNE	680pF
C1206X7R501-102KNE	1000pF
C1206X7R501-152KNE	1500pF
C1206X7R501-332KNE	3300pF
C1206X7R501-472KNE	4700pF
C1206X7R501-103KNE	0.01uF
C1206X7R501-223KNE	0.022uF
1000V	**Capacitance Value**
C1206C0G102-101JNE	100pF
C1206X7R102-102KNE	1000pF
2000V	**Capacitance Value**
C1206X7R202-102KNE	1000pF
C1808X7R202-102KNE	1000pF
3000V	**Capacitance Value**
C1808X7R302-102KNE	1000pF

How To Order

HVC — CAP KIT — 10

Standard termination finish for this product is 100% matte Tin (Sn)

QTY/VALUE
(10 or 25 pcs)

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Multilayer Chip Inductors
MLF Series

Low Value Multilayer Chip Inductors
LMCI Series

Wire Wound Chip Inductors
NL Series

Miniature RF Chip Inductors
MRFI Series

CHIP RESISTORS

Chip Resistors
CR Series

Low Value Chip Resistors
LCR Series

Ultra Low Value Chip Resistors
ULCR Series

High Voltage Chip Resistors
HVCR Series

Thick Film Chip Resistors: Anti-Sulfuration
CRS Series

Rectangular Thin Film Chip Resistors
TFCR Series

Ultra Precision Thin Film Chip Resistors
UPTF Series

High Value Chip Resistors
HMCR Series

Precision High Value Chip Resistors
PHCR Series

Chip Resistor Arrays
CRN Series

Trimmable Chip Resistors
TRCR Series

CHIP THERMISTORS

NTC Chip Thermistors
NTC Series

RESISTOR NETWORKS

Surface Mount Resistor Networks
THR Series

CHOKE COILS

Common Mode Choke Coils
CMCC Series

FERRITE BEADS

Ferrite Beads: Single-Layer
FBS Series

Ferrite Beads: Multi-Layer
FBM Series

Ferrite Beads: High Current
FBC Series

VENKEL LTD.

VENKEL LTD.
5900 SHEPHERD MOUNTAIN COVE
AUSTIN, TX 78730
www.venkel.com
sales@venkel.com

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