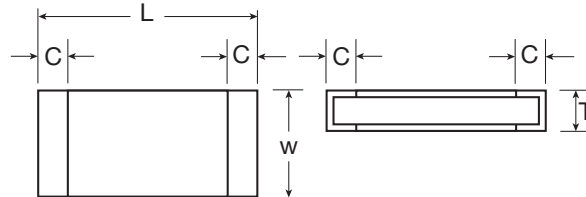


Chip Resistors – CR, LCR and ULCR

Features

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

Dimensions

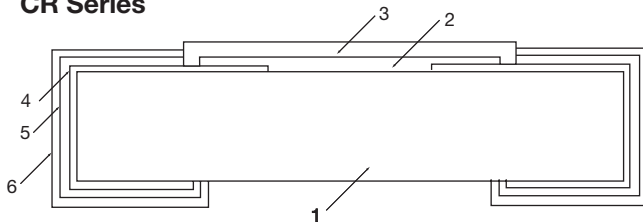


| | 01005 | 0201 | 0402 | 0603 | 0805 | 1206 | 1210 | 2010 | 2512* |
|----------------------------------|--------------------------------|-------------------------------|------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| 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 43

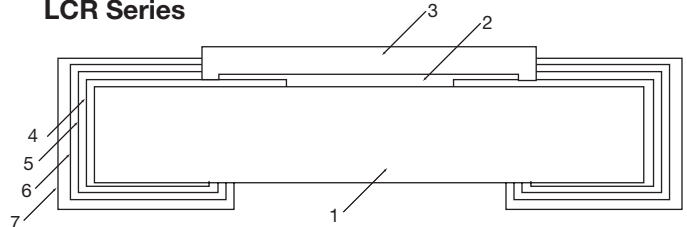
Structure

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 59.

CR – Standard Chip Resistors

Specifications

| Series | Power Rating at 70°C | Max. Working Voltage | Zero (ohm) Current Rating | Resistance Range |
|-------------|----------------------|---------------------------------------|---------------------------|---|
| CR01005-30W | 0.03W | \sqrt{PR} or 15V whichever is less | 0.5A | Zero, 10 Ω - 1Meg Ω Only available in 5% tolerance |
| CR0201-20W | 0.050W | \sqrt{PR} or 25V whichever is less | 0.5A | Zero, 1 Ω - 10Meg Ω E-12 (1.2Meg Ω - 10Meg Ω) |
| CR0402-16W | 0.063W | \sqrt{PR} or 50V whichever is less | 1A | Zero, 1 Ω - 10Meg Ω |
| CR0603-16W | 0.063W | \sqrt{PR} or 50V whichever is less | 1A | Zero, 1 Ω - 22Meg Ω |
| CR0603-10W | 0.10W | \sqrt{PR} or 50V whichever is less | 1A | Zero, 1 Ω - 22Meg Ω |
| CR0805-10W | 0.10W | \sqrt{PR} or 150V whichever is less | 2A | Zero, 1 Ω - 22Meg Ω |
| CR0805-8W | 0.125W | \sqrt{PR} or 150V whichever is less | 2A | Zero, 1 Ω - 22Meg Ω |
| CR1206-8W | 0.125W | \sqrt{PR} or 200V whichever is less | 2A | Zero, 1 Ω - 22Meg Ω |
| CR1206-4W | 0.25W | \sqrt{PR} or 200V whichever is less | 2A | Zero, 1 Ω - 22Meg Ω |
| CR1210-4W | 0.25W | \sqrt{PR} or 200V whichever is less | 4A | Zero, 1 Ω - 10Meg Ω |
| CR1210-2W | 0.50W | \sqrt{PR} or 200V whichever is less | 4A | Zero, 1 Ω - 10Meg Ω |
| CR2010-2W | 0.50W | \sqrt{PR} or 200V whichever is less | 5A | Zero, 1 Ω - 10Meg Ω |
| CR2010-1W | 1.00W | \sqrt{PR} or 200V whichever is less | 5A | Zero, 1 Ω - 10Meg Ω |
| CR2512-1W | 1.00W | \sqrt{PR} or 200V whichever is less | 5A | Zero, 1 Ω - 10Meg Ω |
| CR2512-2W | 2.00W | \sqrt{PR} or 200V whichever is less | 5A | Zero, 1 Ω - 10Meg Ω |

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

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 | 0.37 – 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 | 0.75 | 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.

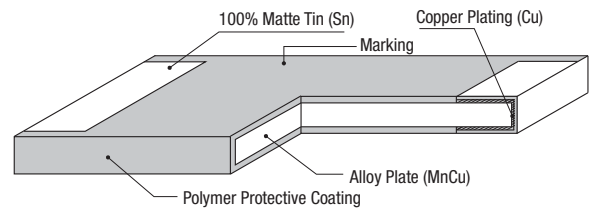
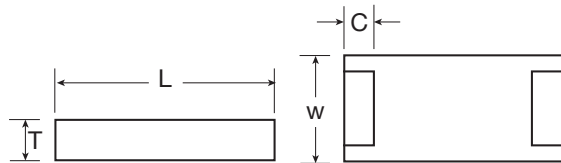
5900 Shepherd Mountain Cove • Austin, TX 78730
 Phone: 512 / 794-0081 • Fax: 512 / 794-0087 • Toll Free: 800 / 950-8365
 e-mail: sales@venkel.com • www.venkel.com



VENKEL LTD.

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 | 2 | J | ±50 | 44.7 | 6.35 ±0.25 | 3.18 ±0.25 | 1.40 ±0.20 | 1.30 ±0.30 |
| 2512 | 0.75 | 2 | F, J | ±50 | 36.5 | 6.35 ±0.25 | 3.18 ±0.25 | 1.00 ±0.20 | 1.30 ±0.30 |
| 2512 | 1.00 | 2 | F, J | ±50 | 31.6 | 6.35 ±0.25 | 3.18 ±0.25 | 0.80 ±0.20 | 1.30 ±0.30 |
| 2512 | 1.50 | 2 | F, J | ±50 | 25.8 | 6.35 ±0.25 | 3.18 ±0.25 | 0.65 ±0.20 | 1.30 ±0.30 |
| 2512 | 2.00 | 2 | F, J | ±50 | 22.4 | 6.35 ±0.25 | 3.18 ±0.25 | 0.50 ±0.20 | 1.30 ±0.30 |
| 2512 | 2.50 | 2 | F, J | ±100 | 20.0 | 6.35 ±0.25 | 3.18 ±0.25 | 1.00 ±0.20 | 1.30 ±0.30 |
| 2512 | 3.00 | 2 | F, J | ±100 | 18.3 | 6.35 ±0.25 | 3.18 ±0.25 | 0.70 ±0.20 | 1.30 ±0.30 |
| 2512 | 3.50 | 2 | F, J | ±100 | 16.9 | 6.35 ±0.25 | 3.18 ±0.25 | 0.71 ±0.20 | 1.30 ±0.30 |
| 2512 | 4.00 | 2 | F, J | ±100 | 15.8 | 6.35 ±0.25 | 3.18 ±0.25 | 0.60 ±0.20 | 1.30 ±0.30 |
| 2512 | 4.50 | 2 | F, J | ±100 | 14.9 | 6.35 ±0.25 | 3.18 ±0.25 | 0.58 ±0.20 | 1.30 ±0.30 |
| 2512 | 5.00 | 2 | F, J | ±100 | 14.1 | 6.35 ±0.25 | 3.18 ±0.25 | 0.50 ±0.20 | 1.30 ±0.30 |
| 2512 | 5.50 | 2 | F, J | ±100 | 13.4 | 6.35 ±0.25 | 3.18 ±0.25 | 0.47 ±0.20 | 1.30 ±0.30 |
| 2512 | 6.00 | 2 | F, J | ±100 | 12.9 | 6.35 ±0.25 | 3.18 ±0.25 | 0.50 ±0.20 | 1.30 ±0.30 |
| 2512 | 6.50 | 2 | F, J | ±100 | 12.4 | 6.35 ±0.25 | 3.18 ±0.25 | 0.47 ±0.20 | 1.30 ±0.30 |
| 2512 | 7.00 | 2 | F, J | ±100 | 12.0 | 6.35 ±0.25 | 3.18 ±0.25 | 0.45 ±0.20 | 1.30 ±0.30 |

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

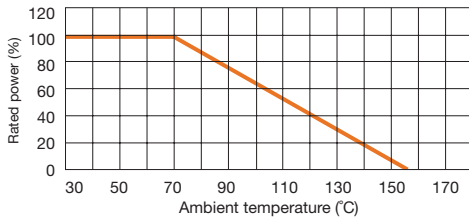
| Item | Test Basis: JIS-C-5202 | Specification Requirements | Typical |
|---|--|----------------------------------|-------------------|
| Short-time Overload | 2.5 x rated voltage DC for 5 sec. | ±1% +0.5Ω, no arc evidence | within ±0.4% |
| Load Life | 70°C, rated voltage for 1.5 hrs. on/0.5 hr. for 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)

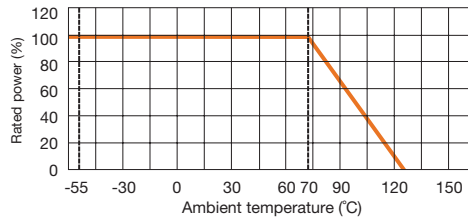
0402 – 2512 case sizes: G & J Tol.: ± 200 (1Ω – 10 Meg. Ω);
 F & D Tol.: ± 100 (1Ω – 10 Meg. Ω);
 D, F, G & J Tol.: ±350 (over 10 Meg. Ω)
 0201 case size: ± 200 for F and J Tol. (10Ω – 1 Meg. Ω);
 TCR is ±350 for values outside referenced range
 01005 case size: + 600 ~ -200 for (4.7Ω – 9.1Ω); ± 250 for (10Ω – 1 Meg. Ω)

Derating Curves

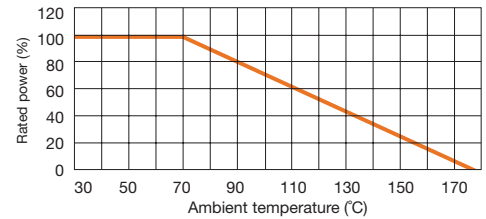
DERATING CURVE (CR Only)



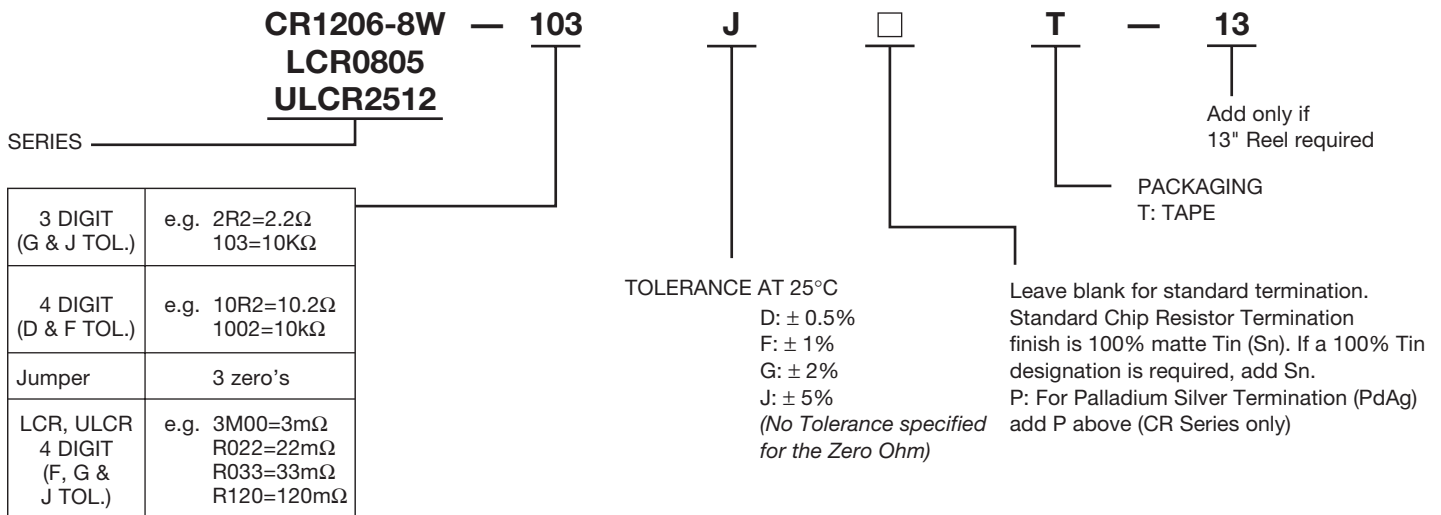
DERATING CURVE (LCR only)



DERATING CURVE (ULCR Only)



How To Order



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 60 for details.

* NOTE: 01005, 0201 and 0402 Resistors cannot be marked.

* NOTE: See page 59 for Standard Resistance Values

Note: Other nominal resistance values may also be available, please contact your sales representative for further information.

See page 59 for Standard Resistance Values.

Please Note: Venkel offers Engineering Kits for this product. See page 117 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 59.