



## CR-Series Thick Film Chip Resistor Product Specifications

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### ■ Thick Film Chip Resistor — CR Series



#### ■ Application

- Entertainment: Stereo, TV tuners, Tape recorder
- Appliance: Air conditioner, Refrigerator
- Computer & relative products: Main board, PDA
- Communication equipment: Cell phone, Fax machine
- Power equipment: Power supply, Illumination equipment
- Measuring instrument: Electric meter, Navigation equipment

#### ■ Features

- Small size and light weight
- Reduction of assembly costs and matching with placement machines
- Reliability, high quality and fast delivery

### ■ Parts Number Explanation

Example:

| CR                | 0603   | J   | 10R0  | P   | 05   | Z   |
|-------------------|--|---|---|---|--|---|
| Product Type      | Size (Inch)  | Resistor Tolerance  | Resistor Value  | Package   | Quantity   | Optional  |
| CR:<br>Thick Film | 0201<br>0402<br>0603<br>0805<br>1206<br>1210<br>1812<br>2010<br>2512 | B : $\pm 0.1\%$<br>D : $\pm 0.5\%$<br>F : $\pm 1\%$<br>G : $\pm 2\%$<br>J : $\pm 5\%$ | 10mR=R010<br>100mR=R100<br>1R=1R00<br>10R=10R0<br>100R=100R<br>1K=1K00<br>1M=1M00 | P : Paper Taping<br>(0603~1210)<br>Q : Paper Taping<br>(0201、0402)<br>E : Embossed Taping | 01 : 1000PCS<br>02 : 2000PCS<br>04 : 4000PCS<br>05 : 5000PCS<br>10 : 10000PCS<br>20 : 20000PCS<br>40 : 40000PCS<br>50 : 50000PCS | Z : Default code<br>(Resistor Paste).<br><br>S : TCR $\pm 100$ ppm.<br><br>R : Metal Paste. |



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### ■ Standard Electrical Specifications

| Type   | Item | Rated Power at 70℃ | Max Working Voltage | Max Overload Voltage | T.C.R. (PPM/℃) | Resistance Range |                |                |                  |
|--------|------|--------------------|---------------------|----------------------|----------------|------------------|----------------|----------------|------------------|
|        |      |                    |                     |                      |                | B(±0.1%)         | D(±0.5%)       | F(±1%)         | G(±2%)<br>J(±5%) |
| CR0201 |      | 0.05 W             | 25V                 | 50V                  | -200/+400      | -                | -              | 1Ω ≤ R < 10Ω   |                  |
|        |      |                    |                     |                      | ±200           | -                | -              | 10Ω ≤ R ≤ 10MΩ |                  |
| CR0402 |      | 0.063 W            | 50V                 | 100V                 | ±400           | -                | 1Ω ≤ R < 10Ω   |                |                  |
|        |      |                    |                     |                      | ±100           | 10Ω ≤ R ≤ 1MΩ    | 10Ω ≤ R ≤ 10MΩ |                |                  |
| CR0603 |      | 0.1 W              | 75V                 | 150V                 | ±400           | -                | 1Ω ≤ R < 10Ω   |                |                  |
|        |      |                    |                     |                      | ±100           | 10Ω ≤ R ≤ 1MΩ    | 10Ω ≤ R ≤ 10MΩ |                |                  |
| CR0805 |      | 0.125 W            | 150V                | 300V                 | ±400           | -                | 1Ω ≤ R < 10Ω   |                |                  |
|        |      |                    |                     |                      | ±100           | 10Ω ≤ R ≤ 1MΩ    | 10Ω ≤ R ≤ 10MΩ |                |                  |
| CR1206 |      | 0.25 W             | 200V                | 400V                 | ±400           | -                | 1Ω ≤ R < 10Ω   |                |                  |
|        |      |                    |                     |                      | ±100           | 10Ω ≤ R ≤ 1MΩ    | 10Ω ≤ R ≤ 10MΩ |                |                  |
| CR1210 |      | 0.5 W              | 200V                | 400V                 | ±400           | -                | 1Ω ≤ R < 10Ω   |                |                  |
|        |      |                    |                     |                      | ±100           | 10Ω ≤ R ≤ 1MΩ    | 10Ω ≤ R ≤ 10MΩ |                |                  |
| CR1812 |      | 0.75 W             | 200V                | 400V                 | ±400           | -                | 1Ω ≤ R < 10Ω   |                |                  |
|        |      |                    |                     |                      | ±100           | 10Ω ≤ R ≤ 1MΩ    | 10Ω ≤ R ≤ 10MΩ |                |                  |
| CR2010 |      | 0.75 W             | 200V                | 400V                 | ±400           | -                | 1Ω ≤ R < 10Ω   |                |                  |
|        |      |                    |                     |                      | ±100           | 10Ω ≤ R ≤ 1MΩ    | 10Ω ≤ R ≤ 10MΩ |                |                  |
| CR2512 |      | 1 W                | 200V                | 400V                 | ±400           | -                | 1Ω ≤ R < 10Ω   |                |                  |
|        |      |                    |                     |                      | ±100           | 10Ω ≤ R ≤ 1MΩ    | 10Ω ≤ R ≤ 10MΩ |                |                  |

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range : -55℃ ~ +155℃
- Type CR0603/0805/1206/1210/1812/2010/2512 1Ω ≤ R ≤ 10Ω optional code 「S」 is TCR: ±100 PPM/℃

| Type  | 0201     | 0402 | 0603 | 0805 | 1206 | 1210 | 1812 | 2010 | 2512 |
|---|----------|------|------|------|------|------|------|------|------|
| Jumper Resistance Value                         | 50mΩ Max |      |      |      |      |      |      |      |      |
| Jumper Rated Current                            | 0.5A     | 1A   |      |      | 2A   |      |      |      |      |
| Max. Over Load Current<br><1 second and 1 times | 1A       | 3A   |      |      | 10A  |      |      |      |      |



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### ● Low Ohm Chip Resistor ■ Standard Electrical Specifications

| Item<br>Type | Rated Power<br>at 70°C | Rated Voltage<br>Range | Max Overload<br>Voltage | T.C.R.<br>(PPM/°C) | Resistance Range<br>(mΩ) |
|--------------|------------------------|------------------------|-------------------------|--------------------|--------------------------|
|              |                        |                        |                         |                    | F(±1%)、J±(5%)            |
| CR0402       | 0.063 W                | 0.12~0.25V             | 0.624 V                 | ±1000              | 220 ≤ R ≤ 450            |
|              |                        |                        |                         | ±800               | 450 < R < 1000           |
| CR0603       | 0.1 W                  | 0.09~0.31V             | 0.775 V                 | ±1000              | 75 ≤ R < 100             |
|              |                        |                        |                         | ±800               | 100 ≤ R ≤ 330            |
|              |                        |                        |                         | ±600               | 330 < R < 1000           |
| CR0805       | 0.125 W                | 0.04~0.35V             | 0.875 V                 | ±1800              | 10 ≤ R < 50              |
|              |                        |                        |                         | ±800               | 50 ≤ R < 100             |
|              |                        |                        |                         | ±600               | 100 ≤ R < 1000           |
| CR1206       | 0.25 W                 | 0.05~0.5V              | 1.25 V                  | ±1800              | 10 ≤ R < 50              |
|              |                        |                        |                         | ±800               | 50 ≤ R < 100             |
|              |                        |                        |                         | ±600               | 100 ≤ R < 1000           |
| CR1210       | 0.5 W                  | 0.07~0.7V              | 1.75 V                  | ±1800              | 10 ≤ R < 50              |
|              |                        |                        |                         | ±800               | 50 ≤ R < 100             |
|              |                        |                        |                         | ±600               | 100 ≤ R < 1000           |
| CR1812       | 0.75 W                 | 0.08~0.8V              | 2.15 V                  | ±1800              | 10 ≤ R < 50              |
|              |                        |                        |                         | ±800               | 50 ≤ R < 100             |
|              |                        |                        |                         | ±600               | 100 ≤ R < 1000           |
| CR2010       | 0.75 W                 | 0.08~0.8V              | 2.15 V                  | ±1800              | 10 ≤ R < 50              |
|              |                        |                        |                         | ±800               | 50 ≤ R < 100             |
|              |                        |                        |                         | ±600               | 100 ≤ R < 1000           |
| CR2512       | 1 W                    | 0.1~0.99V              | 2.475V                  | ±1800              | 10 ≤ R < 50              |
|              |                        |                        |                         | ±800               | 50 ≤ R < 100             |
|              |                        |                        |                         | ±600               | 100 ≤ R < 1000           |

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range : -55°C ~ +155°C.
- Type CR1206/1210/1812/2010/2512 100 mΩ ≤ R < 1000mΩ optional code 「R」 is Metal Paste.  
TCR ±200 PPM/°C (100mΩ ≤ R ≤ 200 mΩ), TCR ±100 PPM/°C (200mΩ < R < 1000 mΩ)
- Type CR1206 10 mΩ ≤ R < 100mΩ optional code 「R」 is Metal Paste.  
TCR ±1800 PPM/°C (10mΩ ≤ R < 20 mΩ), TCR ±1200 PPM/°C (20mΩ ≤ R < 50 mΩ), TCR ±300 PPM/°C (50mΩ ≤ R < 100 mΩ)
- Type CR2512 10 mΩ ≤ R < 100mΩ optional code 「R」 is Metal Paste.  
TCR ±1800 PPM/°C (10mΩ ≤ R < 20 mΩ), TCR ±800 PPM/°C (20mΩ ≤ R < 50 mΩ), TCR ±200 PPM/°C (50mΩ ≤ R < 100 mΩ)



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## ● High Ohm Chip Resistor

### ■ Standard Electrical Specifications

| Type   | Item | Rated Power<br>at 70 °C | Max Working<br>Voltage | Max Overload<br>Voltage | T.C.R.<br>(PPM/°C) | Resistance Range      |                       |
|--------|------|-------------------------|------------------------|-------------------------|--------------------|-----------------------|-----------------------|
|        |      |                         |                        |                         |                    | F(±1%)                | J(±5%)                |
| CR0402 |      | 0.063 W                 | 50V                    | 100V                    | ±200               | 10.1 MΩ<br>~<br>30 MΩ | 10.1 MΩ<br>~<br>30 MΩ |
| CR0603 |      | 0.1 W                   | 75V                    | 150V                    |                    |                       |                       |
| CR0805 |      | 0.125 W                 | 150V                   | 300V                    |                    |                       |                       |
| CR1206 |      | 0.25 W                  | 200V                   | 400V                    |                    |                       |                       |
| CR1210 |      | 0.5 W                   |                        |                         |                    |                       |                       |
| CR2010 |      | 0.75 W                  |                        |                         |                    |                       |                       |
| CR2512 |      | 1 W                     |                        |                         |                    |                       |                       |

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range : -55°C ~ +155°C.

### ■ Type Dimension



CR0201 / CR0402 / CR0603 / CR0805 / CR1206  
CR1210 / CR1812 / CR2010 / CR2512

| TYPE   | L           | W           | H           | l <sub>1</sub> | l <sub>2</sub> |
|--------|-------------|-------------|-------------|----------------|----------------|
| CR0201 | 0.60 ± 0.03 | 0.30 ± 0.03 | 0.23 ± 0.05 | 0.15 ± 0.05    | 0.15 ± 0.05    |
| CR0402 | 1.00 ± 0.10 | 0.50 ± 0.05 | 0.30 ± 0.05 | 0.15 ± 0.10    | 0.20 ± 0.10    |
| CR0603 | 1.60 ± 0.20 | 0.80 ± 0.15 | 0.40 ± 0.10 | 0.30 ± 0.20    | 0.30 ± 0.10    |
| CR0805 | 2.00 ± 0.20 | 1.25 ± 0.15 | 0.50 ± 0.15 | 0.30 ± 0.15    | 0.40 ± 0.15    |
| CR1206 | 3.05 ± 0.10 | 1.60 ± 0.20 | 0.55 ± 0.15 | 0.40 ± 0.20    | 0.50 ± 0.20    |
| CR1210 | 3.05 ± 0.10 | 2.50 ± 0.20 | 0.55 ± 0.15 | 0.50 ± 0.20    | 0.50 ± 0.20    |
| CR1812 | 4.50 ± 0.10 | 3.10 ± 0.20 | 0.55 ± 0.05 | 0.55 ± 0.20    | 0.70 ± 0.20    |
| CR2010 | 5.00 ± 0.20 | 2.50 ± 0.20 | 0.55 ± 0.10 | 0.60 ± 0.20    | 0.60 ± 0.20    |
| CR1218 | 3.10 ± 0.10 | 4.60 ± 0.10 | 0.55 ± 0.05 | 0.40 ± 0.20    | 0.50 ± 0.20    |
| CR2512 | 6.30 ± 0.20 | 3.20 ± 0.20 | 0.55 ± 0.10 | 0.60 ± 0.20    | 0.60 ± 0.20    |



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## ● General Information

### ■ Recommend Land Pattern Design



### ■ Dimension

Unit:mm

| Item \ Type | 0201 | 0402 | 0603 | 0805 | 1206 | 1210 | 1812 | 2010 | 2512 |
|-------------|------|------|------|------|------|------|------|------|------|
| A           | 0.25 | 0.60 | 0.80 | 1.30 | 2.20 | 2.00 | 3.11 | 3.80 | 4.90 |
| B           | 1.10 | 1.60 | 2.40 | 2.90 | 4.20 | 4.40 | 5.91 | 6.60 | 8.10 |
| C           | 0.32 | 0.70 | 1.00 | 1.40 | 1.70 | 2.70 | 3.00 | 2.70 | 3.40 |

## ■ Performance Characteristics

### ■ Power Derating Curve



Power rating or current rating is in the case based on continuous full-load at ambient temperature of 70°C. For operation at ambient temperature in excess of 70°C, the load should be derated in accordance with figure of derating Curve.

### ■ Voltage Rating or Current Rating

Resistance Range:  $\geq 1 \Omega$

Rated Voltage: The resistor shall have a DC continuous working voltage or a RMS AC continuous working voltage at commercial-line frequency and wave form corresponding to the power rating, as determined formula as following:

$$E(RCWV) = \sqrt{P \times R}$$

E=Rated voltage(V)  
P=Power rating(W)  
R=Nominal resistance( $\Omega$ )



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### ● Reliability Test and Requirement

| Test Item                                     | Test Method                               | Procedure  | Requirements  |
|---|---|--|---|
| Temperature Coefficient of Resistance (T.C.R) | JIS-C-5201-1 4.8<br>IEC-60115-1 4.8       | At 25 / -55°C and 25°C / +155°C, 25°C is the reference temperature   | As Spec   |
| Short Time Overload                           | JIS-C-5201-1 4.13<br>IEC-60115-1 4.13     | 2.5 times RCWV or Max. Overload voltage whichever is less for 5 seconds.<br>Jumper : Over Load Current for 5 seconds<br>0201=1A , 0402/0603/0805=2.5A<br>1206/1210/1812/2010/2512=5A | 1% and below : $\pm(1.0\%+0.05\Omega)$<br>2%、5% : $\pm(2.0\%+0.10\Omega)$<br>Jumper : Max 0.05Ω after test.                                       |
| Leaching                                      | JIS-C-5201-1 4.18<br>IEC-60068-2-58 8.2.1 | 260±5°C for 30 seconds.  | Individual leaching area $\leq 5\%$<br>Total leaching area $\leq 10\%$  |
| Resistance to Soldering Heat                  | JIS-C-5201-1 4.18<br>IEC-60115-1 4.18     | 260±5°C for 10 seconds.  | 1% and below : $\pm(0.5\%+0.05\Omega)$<br>2%、5% : $\pm(1.0\%+0.05\Omega)$   |
| Rapid Change of Temperature                   | JIS-C-5201-1 4.19<br>IEC-60115-1 4.19     | -55°C to +155°C, 5 cycles  | 1% and below : $\pm(0.5\%+0.05\Omega)$<br>2%、5% : $\pm(1.0\%+0.10\Omega)$   |
| Resistance to Solvent                         | JIS-C-5201-1 4.29                         | The tested resistor be immersed into isopropyl alcohol of 20~25°C for 60 secs.<br>Then the resistor is left in the room for 48 hrs.  | 1% and below : $\pm(0.5\%+0.05\Omega)$<br>2%、5% : $\pm(0.5\%+0.05\Omega)$<br>Jumper : Max 0.05Ω after test.                                       |
| Damp Heat with Load                           | JIS-C-5201-1 4.24<br>IEC-60115-1 4.24     | 40±2°C, 90~95% R.H. RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF" .  | 1% and below : $\pm(1.0\%+0.05\Omega)$<br>2%、5% : $\pm(2.0\%+0.05\Omega)$<br>Value <1Ω : $\pm(2.0\%+0.05\Omega)$<br>Jumper : Max 0.1Ω after test. |
| Load Life (Endurance)                         | JIS-C-5201-1 4.25<br>IEC-60115-1 4.25.1   | 70±2°C, RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF" .  | 1% and below : $\pm(1.0\%+0.05\Omega)$<br>2%、5% : $\pm(3.0\%+0.10\Omega)$<br>Value <1Ω : $\pm(3.0\%+0.10\Omega)$<br>Jumper : Max 0.1Ω after test. |
| Insulation Resistance                         | JIS-C-5201-1 4.6<br>IEC-60115-1 4.6       | Apply 100VDC for 1 minute.   | $\geq 10G\Omega$  |
| Bending Strength                              | JIS-C-5201-1 4.33<br>IEC-60115-1 4.33     | Bending once for 5 seconds<br>D : 0402、0603、0805=5mm<br>1206、1210、1812=3mm<br>2010、2512=2mm  | 1% and below : $\pm(1.0\%+0.05\Omega)$<br>2%、5% : $\pm(1.0\%+0.05\Omega)$   |



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## ■ Recommended Customer Soldering Parameters

### ■ Wave solder Temperature condition



### ■ Solder reflow Temperature condition



### ■ Solder reflow Temperature condition

■ Rework temperature (hot air equipment) : 350°C, 3~5seconds

### ■ Recommended reflow methods

IR, vapor phase oven, hot air oven

If reflow temperatures exceed the recommended profile, devices may not meet the performance requirements.



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### ■ Appendix For SMD Chip Resistor

#### ● Packaging Information



#### ■ Dimension

Unit:mm

| TYPE                | SIZE | SIZE   | A       | ØB       | ØC     | ØD      | W        | ØM      |
|---------------------|------|--|---------|----------|--------|---------|----------|---------|
| 0201/0402           | 7"   | 10K/Reel (0201 & 0402)<br>15K/Reel (0201 only) | 2.0±0.5 | 13.5±1.0 | 21±1.0 | 60±1.0  | 11.5±2.0 | 178±2.0 |
| 0402                | 13"  | 40K/50K Reel                                   | 2.0±0.5 | 13.5±1.0 | 21±1.0 | 100±1.0 | 11.5±2.0 | 330±2.0 |
| 0603/0805/1206/1210 | 7"   | 5K/Reel  | 2.0±0.5 | 13.5±1.0 | 21±1.0 | 60±1.0  | 11.5±2.0 | 178±2.0 |
| 0603/0805/1206      | 10"  | 10K/Reel                                       | 2.0±0.5 | 13.5±1.0 | 21±1.0 | 100±1.0 | 11.5±2.0 | 254±2.0 |
|                     | 13"  | 20K/Reel                                       | 2.0±0.5 | 13.5±1.0 | 21±1.0 | 100±1.0 | 11.5±2.0 | 330±2.0 |
| 2010/2512/1812      | 7"   | 4K/Reel  | 2.0±0.5 | 13.5±1.0 | 21±1.0 | 60±1.0  | 16.0±2.0 | 178±2.0 |





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## ■ Tapping Specification



## ■ Dimension

Unit:mm

| Packaging  | Type | A        | B        | W       | E        | F        | G       | H        | T        | $\phi D$            | P       |
|------------|------|----------|----------|---------|----------|----------|---------|----------|----------|---------------------|---------|
| Paper Type | 0201 | 0.45±0.1 | 0.75±0.1 | 8.0±0.2 | 1.75±0.1 | 3.5±0.05 | 4.0±0.1 | 2.0±0.05 | 0.35±0.1 | 1.50<br>+0.10<br>-0 | 2.0±0.1 |
|            | 0402 | 0.70±0.1 | 1.20±0.1 | 8.0±0.2 | 1.75±0.1 | 3.5±0.05 | 4.0±0.1 | 2.0±0.05 | 0.45±0.1 |                     |         |
|            | 0603 | 1.05±0.2 | 1.80±0.2 | 8.0±0.2 | 1.75±0.1 | 3.5±0.05 | 4.0±0.1 | 2.0±0.05 | 0.60±0.1 |                     |         |
|            | 0805 | 1.55±0.2 | 2.30±0.2 | 8.0±0.2 | 1.75±0.1 | 3.5±0.05 | 4.0±0.1 | 2.0±0.05 | 0.75±0.1 |                     |         |
|            | 1206 | 1.90±0.2 | 3.50±0.2 | 8.0±0.2 | 1.75±0.1 | 3.5±0.05 | 4.0±0.1 | 2.0±0.05 | 0.75±0.1 |                     |         |
|            | 1210 | 2.85±0.2 | 3.50±0.2 | 8.0±0.2 | 1.75±0.1 | 3.5±0.05 | 4.0±0.1 | 2.0±0.05 | 0.75±0.1 |                     | 4.0±0.1 |



## ■ Dimension

Unit: mm

| Packaging     | Type | A         | B         | W       | E         | F        | G        | H        | T         | $\phi D$            | $\psi D1$ | T1        | P       |
|---------------|------|-----------|-----------|---------|-----------|----------|----------|----------|-----------|---------------------|-----------|-----------|---------|
| Embossed Type | 2010 | 2.80±0.20 | 5.60±0.20 | 12±0.10 | 1.75±0.10 | 5.5±0.05 | 4.0±0.10 | 2.0±0.05 | 0.23±0.10 | 1.50<br>+0.10<br>-0 | 1.50±0.10 | 0.85±0.15 | 4.0±0.1 |
|               | 2512 | 3.40±0.20 | 6.70±0.20 | 12±0.10 | 1.75±0.10 | 5.5±0.05 | 4.0±0.10 | 2.0±0.05 | 0.23±0.10 |                     | 1.50±0.10 | 0.85±0.15 |         |
|               | 1812 | 3.30±0.20 | 4.60±0.20 | 12±0.10 | 1.75±0.10 | 5.5±0.05 | 4.0±0.10 | 2.0±0.05 | 0.23±0.10 |                     | 1.50±0.10 | 0.85±0.15 |         |



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## ■ Packing Material Data/Storage Data

### ■ Front & Back Lead Dimension



### ■ Top Adhesive Peel Off Strength : 10~70g



### ■ Package

| Inner Box Size |            |
|----------------|------------|
| Reel           | Size H(mm) |
| 1              | 13         |
| 2              | 24         |
| 3              | 36         |
| 5              | 60         |
| 10             | 113        |



| External Box Size |             |            |             |
|-------------------|-------------|------------|-------------|
| Contain (Kpcs)    | Length (mm) | Width (mm) | Height (mm) |
| 25K               | 180         | 180        | 60          |
| 50K               | 180         | 180        | 110         |
| 150K              | 430         | 200        | 200         |
| 300K              | 400         | 400        | 200         |



### ■ Storage Data :

Storage time at the environment temp:  $25\pm 5^{\circ}\text{C}$  & humidity:  $60\pm 20\%$  is valid for one year from the date of delivery.

### ■ Product Testing Method:

Our products are tested with our company's tapping & testing equipments by using four-foot probe to touch at the back of both electrodes. Supposed different testing points or methods are requested, please advise beforehand and customized-made production is available.



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## ■ Marking

### ■ General Resistance Codes



0402: no marking



0603: 3 digits code



0805~2512: 3 digits code(5%)



0805~2512: 4 digits code  
(1% and below)

### ■ No marking on 0402 and 0201 type

### ■ 3 digits code for 0603 type

#### ● Standard E96 Values and 0603 Resistance Codes

|         |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| R-Value | 100 | 102 | 105 | 107 | 110 | 113 | 115 | 118 | 121 | 124 | 127 | 130 | 133 | 137 | 140 | 143 | 147 | 150 | 154 | 158 | 162 | 165 | 169 | 174 |
| Code    | 01  | 02  | 03  | 04  | 05  | 06  | 07  | 08  | 09  | 10  | 11  | 12  | 13  | 14  | 15  | 16  | 17  | 18  | 19  | 20  | 21  | 22  | 23  | 24  |
| R-Value | 178 | 182 | 187 | 191 | 196 | 200 | 205 | 210 | 215 | 221 | 226 | 232 | 237 | 243 | 249 | 255 | 261 | 267 | 274 | 280 | 287 | 294 | 301 | 309 |
| Code    | 25  | 26  | 27  | 28  | 29  | 30  | 31  | 32  | 33  | 34  | 35  | 36  | 37  | 38  | 39  | 40  | 41  | 42  | 43  | 44  | 45  | 46  | 47  | 48  |
| R-Value | 316 | 324 | 332 | 340 | 348 | 357 | 365 | 374 | 383 | 392 | 402 | 412 | 422 | 432 | 442 | 453 | 464 | 475 | 487 | 499 | 511 | 523 | 536 | 549 |
| Code    | 49  | 50  | 51  | 52  | 53  | 54  | 55  | 56  | 57  | 58  | 59  | 60  | 61  | 62  | 63  | 64  | 65  | 66  | 67  | 68  | 69  | 70  | 71  | 72  |
| R-Value | 562 | 576 | 590 | 604 | 619 | 634 | 649 | 665 | 681 | 698 | 715 | 732 | 750 | 768 | 787 | 806 | 825 | 845 | 866 | 887 | 909 | 931 | 953 | 976 |
| Code    | 73  | 74  | 75  | 76  | 77  | 78  | 79  | 80  | 81  | 82  | 83  | 84  | 85  | 86  | 87  | 88  | 89  | 90  | 91  | 92  | 93  | 94  | 95  | 96  |

#### ● E96 Multiplier Code

|            |                 |                 |                 |                 |                 |                 |                 |                 |                  |                  |                  |
|------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|------------------|------------------|
| Code       | A               | B               | C               | D               | E               | F               | G               | H               | X                | Y                | Z                |
| Multiplier | 10 <sup>0</sup> | 10 <sup>1</sup> | 10 <sup>2</sup> | 10 <sup>3</sup> | 10 <sup>4</sup> | 10 <sup>5</sup> | 10 <sup>6</sup> | 10 <sup>7</sup> | 10 <sup>-1</sup> | 10 <sup>-2</sup> | 10 <sup>-3</sup> |

1. 0603 3 digits coding formula for E96 values as following:

CODING FORMULA



EX.: 7.5Ω=85Y ; 11Ω=05X ; 130Ω=12A ; 2KΩ= 30B ; 10KΩ=01C ; 150KΩ=18D

|     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| E24 | 10 | 11 | 12 | 13 | 15 | 16 | 18 | 20 | 22 | 24 | 27 | 30 | 33 | 36 | 39 | 43 | 47 | 51 | 56 | 62 | 68 | 75 | 82 | 91 |
|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|

### ■ 0603 ~2512 3 digits for E24 values (±5%)

Examples:

|               |      |     |      |       |      |       |
|---------------|------|-----|------|-------|------|-------|
| Resistance    | 4.7Ω | 33Ω | 470Ω | 5.6KΩ | 62KΩ | 680KΩ |
| 3 digits code | 4R7  | 330 | 471  | 562   | 623  | 684   |

("R"= decimal point)

### ■ 4 digits code for 0805 ~ 2512 type

First 3 digits are the significant figures, the 4th digit is the multiplier. "R"= decimal point.

Examples:

|               |      |      |       |      |       |      |       |      |
|---------------|------|------|-------|------|-------|------|-------|------|
| Resistance    | 5.6Ω | 10Ω  | 22.6Ω | 100Ω | 1.1KΩ | 10KΩ | 332KΩ | 1MΩ  |
| 4 digits code | 5R60 | 10R0 | 22R6  | 1000 | 1101  | 1002 | 3323  | 1004 |



# CR-Series Thick Film Chip Resistor Product Specifications

|               |               |
|---------------|---------------|
| Document No.  | S-10-12-01-10 |
| Revision Date | 2020/05/04    |
| Page No.      | 12/12         |

## ■ mΩ Resistance Codes



0402: no marking



0603: 3 digits



0805~2512: 4 digits

### ■ 0402 : No marking

### ■ 0603 : 3 digit marking

1. For E-24 values:

| Resistance value | Code       | Example     |
|------------------|------------|-------------|
| 10mΩ ~ 99mΩ      | <b>0XX</b> | 068 = 68mΩ  |
| 100mΩ ~ 990mΩ    | <b>RXX</b> | R68 = 680mΩ |

|      |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| E-24 | 10 | 11 | 12 | 13 | 15 | 16 | 18 | 20 | 22 | 24 | 27 | 30 | 33 | 36 | 39 | 43 | 47 | 51 | 56 | 62 | 68 | 75 | 82 | 91 |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|

2. For E-96 values: excluding values 10/11/13/15/20/75 of E-24 series.

#### ● Standard E-96 Values and 0603 Resistance Codes

|         |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| R-Value | 100 | 102 | 105 | 107 | 110 | 113 | 115 | 118 | 121 | 124 | 127 | 130 | 133 | 137 | 140 | 143 | 147 | 150 | 154 | 158 | 162 | 165 | 169 | 174 |
| Code    | 01  | 02  | 03  | 04  | 05  | 06  | 07  | 08  | 09  | 10  | 11  | 12  | 13  | 14  | 15  | 16  | 17  | 18  | 19  | 20  | 21  | 22  | 23  | 24  |
| R-Value | 178 | 182 | 187 | 191 | 196 | 200 | 205 | 210 | 215 | 221 | 226 | 232 | 237 | 243 | 249 | 255 | 261 | 267 | 274 | 280 | 287 | 294 | 301 | 309 |
| Code    | 25  | 26  | 27  | 28  | 29  | 30  | 31  | 32  | 33  | 34  | 35  | 36  | 37  | 38  | 39  | 40  | 41  | 42  | 43  | 44  | 45  | 46  | 47  | 48  |
| R-Value | 316 | 324 | 332 | 340 | 348 | 357 | 365 | 374 | 383 | 392 | 402 | 412 | 422 | 432 | 442 | 453 | 464 | 475 | 487 | 499 | 511 | 523 | 536 | 549 |
| Code    | 49  | 50  | 51  | 52  | 53  | 54  | 55  | 56  | 57  | 58  | 59  | 60  | 61  | 62  | 63  | 64  | 65  | 66  | 67  | 68  | 69  | 70  | 71  | 72  |
| R-Value | 562 | 576 | 590 | 604 | 619 | 634 | 649 | 665 | 681 | 698 | 715 | 732 | 750 | 768 | 787 | 806 | 825 | 845 | 866 | 887 | 909 | 931 | 953 | 976 |
| Code    | 73  | 74  | 75  | 76  | 77  | 78  | 79  | 80  | 81  | 82  | 83  | 84  | 85  | 86  | 87  | 88  | 89  | 90  | 91  | 92  | 93  | 94  | 95  | 96  |

#### ● E-96 Multiplier Code

| Code       | A               | B               | C               | D               | E               | F               | G               | H               | X                | Y                | Z                |
|------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|------------------|------------------|
| Multiplier | 10 <sup>0</sup> | 10 <sup>1</sup> | 10 <sup>2</sup> | 10 <sup>3</sup> | 10 <sup>4</sup> | 10 <sup>5</sup> | 10 <sup>6</sup> | 10 <sup>7</sup> | 10 <sup>-1</sup> | 10 <sup>-2</sup> | 10 <sup>-3</sup> |

#### ● 0603 3 digits coding formula for E-96 values as following:

CODING FORMULA



Example:  $499 \text{ m}\Omega = 499 \times 10^{-3} \Omega = \mathbf{68Z}$

68      Z

### ■ 0805~2512 : 4 digit marking

1. For E-24 values:

| Resistance value | Code        | Example      |
|------------------|-------------|--------------|
| 10mΩ ~ 990mΩ     | <b>RXXX</b> | R680 = 680mΩ |

■ Note: jumper zero ohm resistor marking code is one 「0」 (except type below 0402).

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