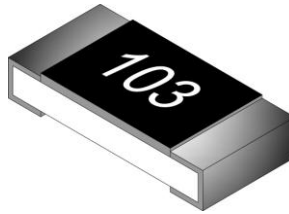


## Thick Film Chip Resistor — CR Series



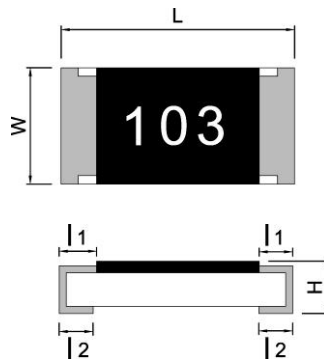
### Application

- Consumer electrical
- Home Appliance: Air conditioner, Refrigerator
- Computer & relative products: Main board
- Communication equipment: Cell phone, Fax machine
- Power equipment: Power supply, Illumination equipment
- Measuring instrument: Electric meter, Navigation equipment

### Features

- Small size and light weight
- Reliability, high quality

### Type Dimension



### Dimension

Unit: mm

| TYPE   | L               | W               | H               | $l_1$           | $l_2$           |
|--------|-----------------|-----------------|-----------------|-----------------|-----------------|
| CR0201 | $0.60 \pm 0.03$ | $0.30 \pm 0.03$ | $0.23 \pm 0.05$ | $0.15 \pm 0.05$ | $0.15 \pm 0.05$ |
| CR0402 | $1.00 \pm 0.10$ | $0.50 \pm 0.05$ | $0.30 \pm 0.05$ | $0.15 \pm 0.10$ | $0.20 \pm 0.10$ |
| CR0603 | $1.60 \pm 0.20$ | $0.80 \pm 0.15$ | $0.40 \pm 0.10$ | $0.30 \pm 0.20$ | $0.30 \pm 0.10$ |
| CR0805 | $2.00 \pm 0.20$ | $1.25 \pm 0.15$ | $0.50 \pm 0.15$ | $0.30 \pm 0.15$ | $0.40 \pm 0.15$ |
| CR1206 | $3.05 \pm 0.10$ | $1.60 \pm 0.20$ | $0.55 \pm 0.15$ | $0.40 \pm 0.20$ | $0.50 \pm 0.20$ |
| CR1210 | $3.05 \pm 0.10$ | $2.50 \pm 0.20$ | $0.55 \pm 0.15$ | $0.50 \pm 0.20$ | $0.50 \pm 0.20$ |
| CR1812 | $4.50 \pm 0.10$ | $3.10 \pm 0.20$ | $0.55 \pm 0.05$ | $0.55 \pm 0.20$ | $0.70 \pm 0.20$ |
| CR2010 | $5.00 \pm 0.20$ | $2.50 \pm 0.20$ | $0.55 \pm 0.10$ | $0.60 \pm 0.20$ | $0.60 \pm 0.20$ |
| CR2512 | $6.30 \pm 0.20$ | $3.20 \pm 0.20$ | $0.55 \pm 0.10$ | $0.60 \pm 0.20$ | $0.60 \pm 0.20$ |

## ■ Standard Electrical Specifications

| Item<br>Type | Rated Power<br>at 70℃ | Max Working<br>Voltage | Max Overload<br>Voltage | T.C.R.<br>(PPM/℃) | Resistance Range     |                  |            |            |            |
|--------------|-----------------------|------------------------|-------------------------|-------------------|----------------------|------------------|------------|------------|------------|
|              |                       |                        |                         |                   | B(±0.1%)<br>D(±0.5%) | F(±1%)<br>G(±2%) | J(±5%)     |            |            |
| CR0201       | 0.05 W                | 25V                    | 50V                     | -200/+400         | -                    | 1Ω~9.9Ω          |            |            |            |
|              |                       |                        |                         | ±200              | -                    | 10Ω~10MΩ         |            |            |            |
| CR0402       | 0.063 W               | 50V                    | 100V                    | ±400              | -                    | 1Ω~9.9Ω          |            |            |            |
|              |                       |                        |                         | ±300              | -                    | 10Ω~990Ω         |            |            |            |
|              |                       |                        |                         | ±200              | 10Ω~1MΩ              | 1KΩ~10MΩ         |            |            |            |
| CR0603       | 0.1 W                 | 75V                    | 150V                    | ±400              | -                    | 1Ω~9.9Ω          |            |            |            |
|              |                       |                        |                         | ±200              | -                    | -                | 10Ω~10MΩ   |            |            |
|              |                       |                        |                         | ±100              | 10Ω~1MΩ              | 10Ω~10MΩ         | -          |            |            |
| CR0805       | 0.125 W               | 150V                   | 300V                    | ±400              | -                    | 1Ω~9.9Ω          |            |            |            |
|              |                       |                        |                         | ±200              | -                    | -                | 10Ω~10MΩ   |            |            |
|              |                       |                        |                         | ±100              | 10Ω~1MΩ              | 10Ω~10MΩ         | -          |            |            |
| CR1206       | 0.25 W                | 200V                   | 400V                    | ±300              | -                    | 1Ω~10Ω           |            |            |            |
|              |                       |                        |                         | ±200              | -                    | -                | 10.2Ω~10MΩ |            |            |
|              |                       |                        |                         | ±100              | 10.2Ω~1MΩ            | 10.2Ω~10MΩ       | -          |            |            |
| CR1210       | 0.5 W                 |                        |                         | ±300              | -                    | 1Ω~10Ω           | 1Ω~10Ω     |            |            |
|              |                       |                        |                         | ±200              | -                    | -                | 10.2Ω~10MΩ |            |            |
|              |                       |                        |                         | ±100              | 10.2Ω~1MΩ            | 10.2Ω~10MΩ       | -          |            |            |
| CR1812       | 0.75 W                |                        |                         | ±300              | -                    | 1Ω~10Ω           |            |            |            |
|              |                       |                        |                         | ±200              | -                    | -                | 10.2Ω~10MΩ |            |            |
|              |                       |                        |                         | ±100              | 10.2Ω~1MΩ            | 10.2Ω~10MΩ       | -          |            |            |
| CR2010       | 0.75 W                |                        |                         | ±300              | -                    | 1Ω~10Ω           |            |            |            |
|              |                       |                        |                         | ±200              | -                    | -                | 10.2Ω~10MΩ |            |            |
|              |                       |                        |                         | ±100              | 10.2Ω~1MΩ            | 10.2Ω~10MΩ       | -          |            |            |
| CR2512       | 1 W                   |                        |                         |                   |                      | ±300             | -          | 1Ω~10Ω     |            |
|              |                       |                        |                         |                   |                      | ±200             | -          | -          | 10.2Ω~10MΩ |
|              |                       |                        |                         |                   |                      | ±100             | 10.2Ω~1MΩ  | 10.2Ω~10MΩ | -          |

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range : -55°C ~ +155°C.
- Type CR1210/1812/2010/2512 : 1Ω~10Ω (Alloy Film)
- Type CR1210/1812/2010/2512 : >10Ω (Thick Film)

| Type                    | 0201     | 0402 | 0603 | 0805 | 1206 | 1210 | 1812 | 2010 | 2512 |
|-------------------------|----------|------|------|------|------|------|------|------|------|
| Jumper Resistance Value | 50mΩ Max |      |      |      |      |      |      |      |      |
| Jumper Rated Current    | 0.5A     | 1A   |      |      | 2A   |      |      |      |      |

## ● Low Ohm Chip Resistor

### ■ Standard Electrical Specifications

| Item<br>Type | Rated Power<br>at 70℃ | Rated Voltage<br>Range | Max Overload<br>Voltage | T.C.R.<br>(PPM/℃) | Resistance Range<br>(mΩ) |
|--------------|-----------------------|------------------------|-------------------------|-------------------|--------------------------|
|              |                       |                        |                         |                   | F(±1%)、J(±5%)            |
| CR0402       | 0.063 W               | 0.17~0.25V             | 0.624 V                 | ±800              | 470~990                  |
| CR0603       | 0.1 W                 | 0.1~0.31V              | 0.775 V                 | ±800              | 100~330                  |
|              |                       |                        |                         | ±600              | 331~990                  |
| CR0805       | 0.125 W               | 0.04~0.35V             | 0.875 V                 | ±1800             | 10~50                    |
|              |                       |                        |                         | ±800              | 51~100                   |
|              |                       |                        |                         | ±600              | 101~990                  |
| CR1206       | 0.25 W                | 0.05~0.5V              | 1.25 V                  | ±1800             | 10~50                    |
|              |                       |                        |                         | ±800              | 51~100                   |
|              |                       |                        |                         | ±600              | 101~990                  |
| CR1210       | 0.5 W                 | 0.07~0.7V              | 1.75 V                  | ±1800             | 10~50                    |
|              |                       |                        |                         | ±800              | 51~100                   |
|              |                       |                        |                         | ±600              | 101~990                  |
| CR1812       | 0.75 W                | 0.08~0.8V              | 2.15 V                  | ±1800             | 10~50                    |
|              |                       |                        |                         | ±800              | 51~100                   |
|              |                       |                        |                         | ±600              | 101~990                  |
| CR2010       | 0.75 W                | 0.08~0.8V              | 2.15 V                  | ±1800             | 10~50                    |
|              |                       |                        |                         | ±800              | 51~100                   |
|              |                       |                        |                         | ±600              | 101~990                  |
| CR2512       | 1 W                   | 0.1~0.99V              | 2.475V                  | ±1800             | 10~50                    |
|              |                       |                        |                         | ±800              | 51~100                   |
|              |                       |                        |                         | ±600              | 101~990                  |

● For non-standard parts, please contact our sales dept.

● Operating Temperature Range : -55℃ ~ +155℃.

## ● High Ohm Chip Resistor

### ■ Standard Electrical Specifications

| Item<br>Type | Rated Power<br>at 70℃ | Max Working<br>Voltage | Max Overload<br>Voltage | T.C.R.<br>(PPM/℃) | Resistance Range |         |
|--------------|-----------------------|------------------------|-------------------------|-------------------|------------------|---------|
|              |                       |                        |                         |                   | F(±1%)           | J(±5%)  |
| CR0402       | 0.063 W               | 50V                    | 100V                    | ±200              | 10.1 MΩ          | 10.1 MΩ |
| CR0603       | 0.1 W                 | 75V                    | 150V                    |                   |                  |         |
| CR0805       | 0.125 W               | 150V                   | 300V                    |                   |                  |         |
| CR1206       | 0.25 W                | 200V                   | 400V                    |                   | ~                | ~       |
| CR1210       | 0.5 W                 |                        |                         |                   | 54 MΩ            | 100 MΩ  |
| CR2010       | 0.75 W                |                        |                         |                   |                  |         |
| CR2512       | 1 W                   |                        |                         |                   |                  |         |

● For non-standard parts, please contact our sales dept.

● Operating Temperature Range : -55℃ ~ +155℃.

## ● Trimmable Chip Resistor – TCR series

### ■ Standard Electrical Specifications

| Item<br>Type | Rated Power<br>at 70℃ | Max Working<br>Voltage | Max Overload<br>Voltage | T.C.R.<br>(PPM/℃) | Resistance<br>Tolerance | Resistance<br>Range |
|--------------|-----------------------|------------------------|-------------------------|-------------------|-------------------------|---------------------|
| TCR0402      | 0.063 W               | 50V                    | 100V                    | ±200              | ±15%<br>±20%<br>±30%    | 10Ω~1MΩ             |
| TCR0603      | 0.1 W                 | 75V                    | 150V                    |                   |                         |                     |
| TCR0805      | 0.125 W               | 150V                   | 300V                    |                   |                         |                     |
| TCR1206      | 0.25 W                | 200V                   | 400V                    |                   |                         |                     |
| TCR1210      | 0.5 W                 |                        |                         |                   |                         |                     |
| TCR1812      | 0.75 W                |                        |                         |                   |                         |                     |
| TCR2010      | 0.75 W                |                        |                         |                   |                         |                     |
| TCR1218      | 1 W                   |                        |                         |                   |                         |                     |
| TCR2512      | 1 W                   |                        |                         |                   |                         |                     |

● For non-standard parts, please contact our sales dept.

● Operating Temperature Range : -55℃ ~ +155℃.

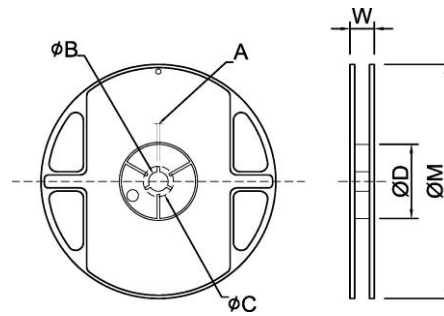
### ■ Parts Number Explanation

#### ■ Example:

| CR           | 0603                                                                 | J                                                                                                       | 10R                | P                                                                | 05                                                                              |          |
|--------------|----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|--------------------|------------------------------------------------------------------|---------------------------------------------------------------------------------|----------|
| Product Type | Size(Inch)                                                           | Resistor<br>Tolerance                                                                                   | Resistors<br>Value | Package                                                          | Quantity                                                                        | Optional |
| CR<br>TCR    | 0201<br>0402<br>0603<br>0805<br>1206<br>1210<br>1812<br>2010<br>2512 | B : ±0.1%<br>D : ±0.5%<br>F : ±1%<br>G : ±2%<br>J : ±5%<br>K : ±10%<br>L : ±15%<br>M : ±20%<br>N : ±30% |                    | P、Q : Paper Taping<br>E : Embossed Taping<br>D : Packed in a Bag | 04 : 4000PCS<br>05 : 5000PCS<br>10 : 10000PCS<br>40 : 40000PCS<br>50 : 50000PCS |          |

## Appendix For SMD Chip Resistor

### Packaging Information

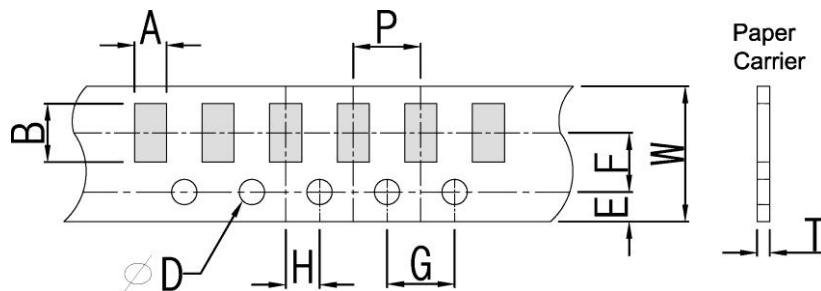


### Dimension

Unit: mm

| TYPE                | SIZE |              | A       | ϕB       | ϕC     | ϕD      | W        | ϕM      |
|---------------------|------|--------------|---------|----------|--------|---------|----------|---------|
| 0201/0402           | 7"   | 10K/Reel     | 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 |

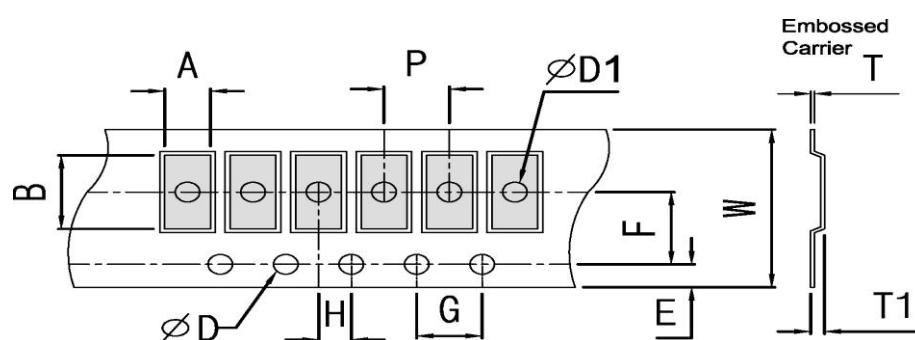
### Tapping Specification



### Dimension

Unit: mm

| Packaging  | Type | A        | B        | W       | E        | F        | G       | H        | T        | ϕD                                  | 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 <sup>+0.10</sup> <sub>-0</sub> | 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 |                                     | 4.0±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 |                                     |         |



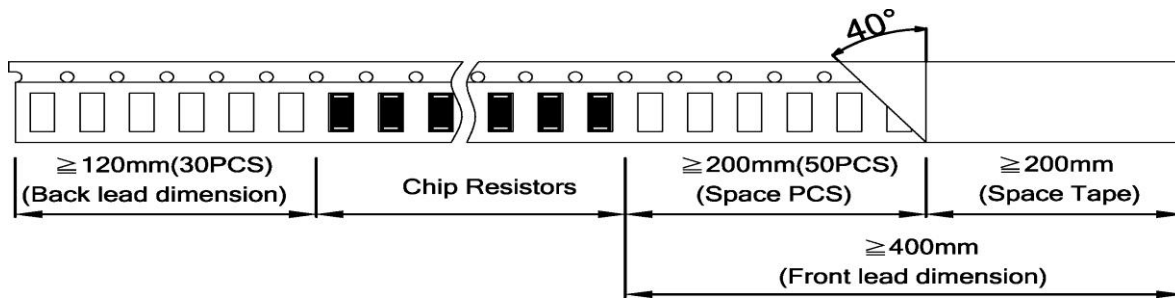
## Dimension

Unit: mm

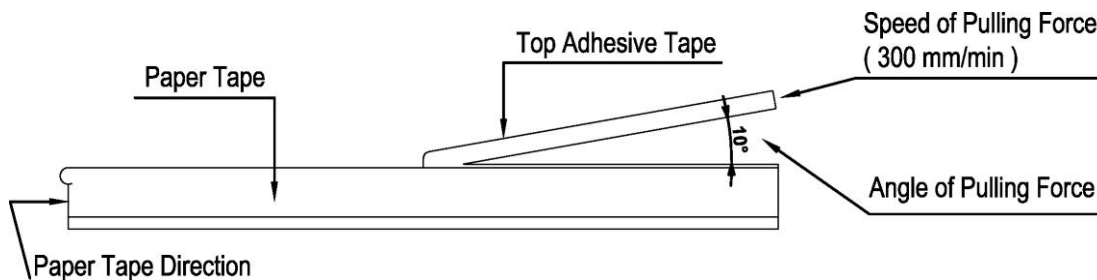
| Packaging     | Type | A              | B              | W            | E              | F              | G             | H              | T              | $\phi D$            | $\phi D1$      | T1              | P             |
|---------------|------|----------------|----------------|--------------|----------------|----------------|---------------|----------------|----------------|---------------------|----------------|-----------------|---------------|
| Embossed Type | 2010 | $2.80 \pm 0.2$ | $5.60 \pm 0.2$ | $12 \pm 0.1$ | $1.75 \pm 0.1$ | $5.5 \pm 0.05$ | $4.0 \pm 0.1$ | $2.0 \pm 0.05$ | $0.23 \pm 0.1$ | $1.50^{+0.10}_{-0}$ | $1.50 \pm 0.1$ | $0.85 \pm 0.15$ | $4.0 \pm 0.1$ |
|               | 2512 | $3.40 \pm 0.2$ | $6.70 \pm 0.2$ | $12 \pm 0.1$ | $1.75 \pm 0.1$ | $5.5 \pm 0.05$ | $4.0 \pm 0.1$ | $2.0 \pm 0.05$ | $0.23 \pm 0.1$ |                     | $1.50 \pm 0.1$ | $0.85 \pm 0.15$ |               |
|               | 1812 | $3.30 \pm 0.2$ | $4.60 \pm 0.2$ | $12 \pm 0.1$ | $1.75 \pm 0.1$ | $5.5 \pm 0.05$ | $4.0 \pm 0.1$ | $2.0 \pm 0.05$ | $0.23 \pm 0.1$ |                     | $1.50 \pm 0.1$ | $0.85 \pm 0.15$ |               |

## Packing Material Data / Storage Data

### Front & Back Lead Dimension

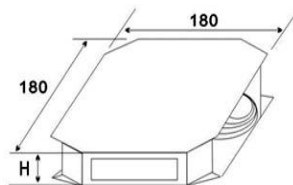


### Top Adhesive Peel Off Strength : 10~70g

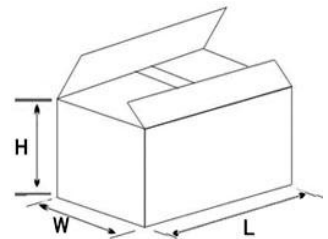


### Package

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



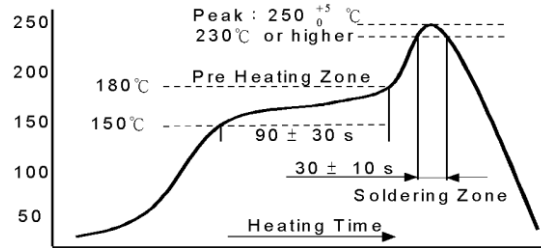
| External Box Size |             |            |             |
|-------------------|-------------|------------|-------------|
| Contain (Kpcs)    | Length (mm) | Width (mm) | Height (mm) |
| 25K               | 180         | 180        | 60          |
| 50K               | 180         | 180        |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



### Storage Data :

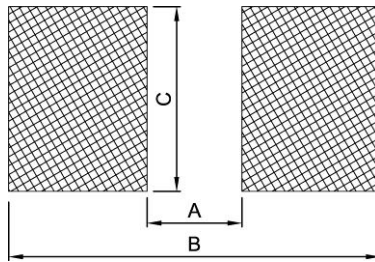
Storage time at the environment temp:  $25\pm 5^\circ\text{C}$  & humidity:  $60\pm 20\%$  is valid for one year from the date of delivery.

## ● Reliability Test and Requirement

| Test Item                                     | Test Method              | Procedure                                                                                                                                                                                                                                                                                                                              | Requirements                                                                                                          |
|-----------------------------------------------|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| Temperature Coefficient of Resistance (T.C.R) | JIS C 5201-1 clause 4.8  | -55℃ or +155℃, 25℃ is the reference temperature                                                                                                                                                                                                                                                                                        | Refer to Ratings                                                                                                      |
| Short Time Overload                           | JIS C 5201-1 clause 4.13 | General : 2.5 times RCWV or Max. Overload voltage whichever is less for 5 seconds.                                                                                                                                                                                                                                                     | $\pm 1 : \pm(1.0\%+0.05\Omega)$<br>$\pm 5 : \pm(2.0\%+0.1\Omega)$<br>Value $<1\Omega : \pm(2.0\%+0.1\Omega)$          |
| IR Reflow                                     | Sony SS-00254            |  <p>Peak : <math>250 \pm 5^\circ\text{C}</math><br/> <math>230^\circ\text{C}</math> or higher<br/>           180℃ --- Pre Heating Zone<br/>           150℃ --- 90 ± 30 s<br/>           30 ± 10 s --- Soldering Zone<br/>           Heating Time</p> | $\pm 1 : \pm(1.0\%+0.05\Omega)$<br>$\pm 5 : \pm(1.0\%+0.05\Omega)$                                                    |
| Leaching                                      | Sony SS-00254-9          | 260±5℃ for 30 seconds.                                                                                                                                                                                                                                                                                                                 | >95% Coverage                                                                                                         |
| Soldering Heat                                | JIS C 5201-1 clause 4.18 | 260±5℃ for 10 seconds.                                                                                                                                                                                                                                                                                                                 | $\pm 1 : \pm(0.5\%+0.05\Omega)$<br>$\pm 5 : \pm(1.0\%+0.05\Omega)$<br>Value $<1\Omega : \pm(1.0\%+0.05\Omega)$        |
| Temperature Cycling                           | JIS C 5201-1 clause 4.19 | -55℃ to +155℃, 5 cycles                                                                                                                                                                                                                                                                                                                | 0.1%、0.5%、1% : $\pm(0.5\%+0.05\Omega)$<br>2%、5% : $\pm(1.0\%+0.10\Omega)$<br>Value $<1\Omega : \pm(1.0\%+0.10\Omega)$ |
| Electric Iron                                 | Sony SS-00254-5          | Preheating temperature : 350±10℃<br>Electric iron preheating time : 3+1/-0 sec                                                                                                                                                                                                                                                         | $\pm 1 : \pm(1.0\%+0.05\Omega)$<br>$\pm 5 : \pm(1.0\%+0.05\Omega)$<br>Value $<1\Omega : \pm(1.0\%+0.05\Omega)$        |
| Resistance to Solvent                         | JIS C 5201-1 clause 4.29 | The tested resistor be immersed into isopropyl alcohol of 20~25℃ for 60 secs.<br>Then the resistor is left in the room for 48 hrs.                                                                                                                                                                                                     | $\pm 1 : \pm(0.5\%+0.05\Omega)$<br>$\pm 5 : \pm(0.5\%+0.05\Omega)$<br>Value $<1\Omega : \pm(1.0\%+0.05\Omega)$        |
| Load Life in Humidity                         | JIS C 5201-1 clause 4.24 | 40±2℃, 90~95% R.H. RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF" .                                                                                                                                                                                                                    | 0.1%、0.5%、1% : $\pm(1.0\%+0.05\Omega)$<br>2%、5% : $\pm(2.0\%+0.05\Omega)$<br>Value $<1\Omega : \pm(2.0\%+0.05\Omega)$ |
| Load Life (Endurance)                         | JIS C 5201-1 clause 4.25 | 70±2℃, RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF" .                                                                                                                                                                                                                                | 0.1%、0.5%、1% : $\pm(1.0\%+0.05\Omega)$<br>2%、5% : $\pm(3.0\%+0.10\Omega)$<br>Value $<1\Omega : \pm(3.0\%+0.10\Omega)$ |
| Insulation Resistance                         | JIS C 5201-1 clause 4.6  | 100V for 1 minute.                                                                                                                                                                                                                                                                                                                     | $\geq 10G\Omega$                                                                                                      |
| Terminal Bending Strength                     | JIS C 5201-1 clause 4.33 | Bending once for 5 seconds<br>D : 0402、0603、0805=5mm<br>1206、1210、1812=3mm<br>2010、2512=2mm                                                                                                                                                                                                                                            | $\pm 1 : \pm(1.0\%+0.05\Omega)$<br>$\pm 5 : \pm(1.0\%+0.05\Omega)$                                                    |

## General Information

### Recommend Land Pattern Design



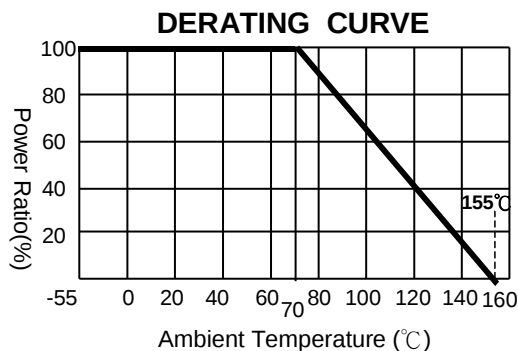
### Dimension

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 | 1.45 | 1.80 | 2.70 | 3.30 | 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( $\Omega$ )

## ■ Operation and Storage Temperature

|                       | MIN  | MAX |
|-----------------------|------|-----|
| Operation temperature | -55℃ | 70℃ |
| Storage temperature   | 20℃  | 30℃ |
| Storage humidity      | 40%  | 80% |

## ■ Product Testing Method:

Our products are tested with our company's tapping & testing equipments by using four-feet 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.

## ■ Marking

### ■ 0603 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> |

### CODING FORMULA

XX      X  
 ↑      ↙  
 Resistance Code      Multiplier Code

$$\text{Example: } 10.2\text{K}\Omega = \underline{102} \times \underline{10^2}\Omega = 02\text{C}$$

$$33.2\Omega = \underline{332} \times \underline{10^{-1}}\Omega = 51\text{X}$$

### ■ 0603 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  |

## Standard Resistance Values in a Decade

Marking code:

- 1%: marking code, please refer to E96 and E24 data form as below  
Ex: 120K, The marking code is 1203 in E24  
121K, The marking code is 1213 in E96
- 5%: marking code, please refer to E24 data form as below  
Ex: 120K, The marking code is 124 in E24
- Note: 0201/0402 series resistor has no marking code.
- Type: 0603 1% marking code, please refer to E-96 multiplier code.

| E192 | E96 | E48 | E192 | E96 | E48 | E192 | E96 | E48 | E192 | E96 | E48 | E192 | E96 | E48 |    |
|------|-----|-----|------|-----|-----|------|-----|-----|------|-----|-----|------|-----|-----|----|
| 100  | 100 | 100 | 169  | 169 | 169 | 287  | 287 | 287 | 487  | 487 | 487 | 825  | 825 | 825 |    |
| 101  |     |     | 172  |     |     | 291  |     |     | 493  |     |     | 835  |     |     |    |
| 102  | 102 |     | 174  | 174 |     | 294  | 294 |     | 499  | 499 |     | 845  | 845 |     |    |
| 104  |     |     | 176  |     |     | 298  |     |     | 505  |     |     | 856  |     |     |    |
| 105  | 105 | 105 | 178  | 178 | 178 | 301  | 301 | 301 | 511  | 511 | 511 | 866  | 866 | 866 |    |
| 106  |     |     | 180  |     |     | 305  |     |     | 517  |     |     | 876  |     |     |    |
| 107  | 107 |     | 182  | 182 |     | 309  | 309 |     | 523  | 523 |     | 887  | 887 |     |    |
| 109  |     |     | 184  |     |     | 312  |     |     | 530  |     |     | 898  |     |     |    |
| 110  | 110 | 110 | 187  | 187 | 187 | 316  | 316 | 316 | 536  | 536 | 536 | 909  | 909 | 909 |    |
| 111  |     |     | 189  |     |     | 320  |     |     | 542  |     |     | 920  |     |     |    |
| 113  | 113 |     | 191  | 191 |     | 324  | 324 |     | 549  | 549 |     | 931  | 931 |     |    |
| 114  |     |     | 193  |     |     | 328  |     |     | 556  |     |     | 942  |     |     |    |
| 115  | 115 | 115 | 196  | 196 | 196 | 332  | 332 | 332 | 562  | 562 | 562 | 953  | 953 | 953 |    |
| 117  |     |     | 198  |     |     | 336  |     |     | 569  |     |     | 965  |     |     |    |
| 118  | 118 |     | 200  | 200 |     | 340  | 340 |     | 576  | 576 |     | 976  | 976 |     |    |
| 120  |     |     | 203  |     |     | 344  |     |     | 583  |     |     | 988  |     |     |    |
| 121  | 121 | 121 | 205  | 205 | 205 | 348  | 348 | 348 | 590  | 590 | 590 |      |     |     |    |
| 123  |     |     | 208  |     |     | 352  |     |     | 597  |     |     |      |     |     |    |
| 124  | 124 |     | 210  | 210 |     | 357  | 357 |     | 604  | 604 |     | E24  | E12 | E6  | E3 |
| 126  |     |     | 213  |     |     | 361  |     |     | 612  |     |     | 10   | 10  | 10  | 10 |
| 127  | 127 | 127 | 215  | 215 | 215 | 365  | 365 | 365 | 619  | 619 | 619 | 11   |     |     |    |
| 129  |     |     | 218  |     |     | 370  |     |     | 626  |     |     | 12   | 12  |     |    |
| 130  | 130 |     | 221  | 221 |     | 374  | 374 |     | 634  | 634 |     | 13   |     |     |    |
| 132  |     |     | 223  |     |     | 379  |     |     | 642  |     |     | 15   | 15  | 15  |    |
| 133  | 133 | 133 | 226  | 226 | 226 | 383  | 383 | 383 | 649  | 649 | 649 | 16   |     |     |    |
| 135  |     |     | 229  |     |     | 388  |     |     | 657  |     |     | 18   | 18  |     |    |
| 137  | 137 |     | 232  | 232 |     | 392  | 392 |     | 665  | 665 |     | 20   |     |     |    |
| 138  |     |     | 234  |     |     | 397  |     |     | 673  |     |     | 22   | 22  | 22  | 22 |
| 140  | 140 | 140 | 237  | 237 | 237 | 402  | 402 | 402 | 681  | 681 | 681 | 24   |     |     |    |
| 142  |     |     | 240  |     |     | 407  |     |     | 690  |     |     | 27   | 27  |     |    |
| 143  | 143 |     | 243  | 243 |     | 412  | 412 |     | 698  | 698 |     | 30   |     |     |    |
| 145  |     |     | 246  |     |     | 417  |     |     | 706  |     |     | 33   | 33  | 33  |    |
| 147  | 147 | 147 | 249  | 249 | 249 | 422  | 422 | 422 | 715  | 715 | 715 | 36   |     |     |    |
| 149  |     |     | 252  |     |     | 427  |     |     | 723  |     |     | 39   | 39  |     |    |
| 150  | 150 |     | 255  | 255 |     | 432  | 432 |     | 732  | 732 |     | 43   |     |     |    |
| 152  |     |     | 258  |     |     | 437  |     |     | 741  |     |     | 47   | 47  | 47  | 47 |
| 154  | 154 | 154 | 261  | 261 | 261 | 442  | 442 | 442 | 750  | 750 | 750 | 51   |     |     |    |
| 156  |     |     | 264  |     |     | 448  |     |     | 759  |     |     | 56   | 56  |     |    |
| 158  | 158 |     | 267  | 267 |     | 453  | 453 |     | 768  | 768 |     | 62   |     |     |    |
| 160  |     |     | 271  |     |     | 459  |     |     | 777  |     |     | 68   | 68  | 68  |    |
| 162  | 162 | 162 | 274  | 274 | 274 | 464  | 464 | 464 | 787  | 787 | 787 | 75   |     |     |    |
| 164  |     |     | 277  |     |     | 470  |     |     | 796  |     |     | 82   | 82  |     |    |
| 165  | 165 |     | 280  | 280 |     | 475  | 475 |     | 806  | 806 |     | 91   |     |     |    |
| 167  |     |     | 284  |     |     | 481  |     |     | 816  |     |     |      |     |     |    |

According to IEC publication 63

## ■ mΩ Resistance Codes

| Resistance | Code | 0603 Code | Resistance | Code | 0603 Code | Resistance | Code | 0603 Code | Resistance | Code | 0603 Code | Resistance | Code | 0603 Code |
|------------|------|-----------|------------|------|-----------|------------|------|-----------|------------|------|-----------|------------|------|-----------|
| 10mΩ       | R010 | 010       | 65mΩ       | R065 | 065       | 0.12Ω      | R120 | R12       | 0.27Ω      | R270 | R27       | 0.56Ω      | R560 | R56       |
| 15mΩ       | R015 | 015       | 68mΩ       | R068 | 068       | 0.13Ω      | R130 | R13       | 0.30Ω      | R300 | R30       | 0.60Ω      | R600 | R60       |
| 20mΩ       | R020 | 020       | 70mΩ       | R070 | 070       | 0.15Ω      | R150 | R15       | 0.33Ω      | R330 | R33       | 0.65Ω      | R650 | R65       |
| 30mΩ       | R030 | 030       | 75mΩ       | R075 | 075       | 0.16Ω      | R160 | R16       | 0.36Ω      | R360 | R36       | 0.68Ω      | R680 | R68       |
| 40mΩ       | R040 | 040       | 80mΩ       | R080 | 080       | 0.18Ω      | R180 | R18       | 0.40Ω      | R400 | R40       | 0.70Ω      | R700 | R70       |
| 50mΩ       | R050 | 050       | 90mΩ       | R090 | 090       | 0.20Ω      | R200 | R20       | 0.43Ω      | R430 | R43       | 0.75Ω      | R750 | R75       |
| 56mΩ       | R056 | 056       | 0.10Ω      | R100 | R10       | 0.22Ω      | R220 | R22       | 0.47Ω      | R470 | R47       | 0.80Ω      | R800 | R80       |
| 60mΩ       | R060 | 060       | 0.11Ω      | R110 | R11       | 0.25Ω      | R250 | R25       | 0.50Ω      | R500 | R50       | 0.90Ω      | R900 | R90       |

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