

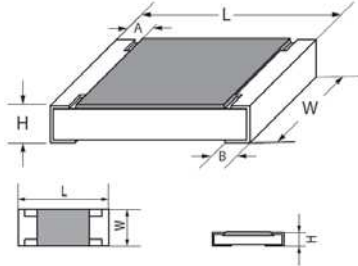


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# Thick Film Chip Resistors –Data Sheet

## 1. Dimension



| Type  | Dimension(mm) |                  |           |           |           |
|-------|---------------|------------------|-----------|-----------|-----------|
|       | L             | W                | H         | A         | B         |
| 01005 | 0.40±0.02     | 0.20±0.02        | 0.13±0.02 | 0.10±0.05 | 0.10±0.03 |
| 0201  | 0.60±0.03     | 0.30±0.03        | 0.23±0.03 | 0.10±0.05 | 0.15±0.05 |
| 0402  | 1.00±0.10     | 0.50±0.05        | 0.35±0.05 | 0.20±0.10 | 0.25±0.10 |
| 0603  | 1.60±0.10     | 0.80±0.10        | 0.45±0.10 | 0.30±0.20 | 0.30±0.20 |
| 0805  | 2.00±0.15     | 1.25+0.15/-0.10  | 0.55±0.10 | 0.40±0.20 | 0.40±0.20 |
| 1206  | 3.10±0.15     | 1.55 +0.15/-0.10 | 0.55±0.10 | 0.45±0.20 | 0.45±0.20 |
| 1210  | 3.10±0.10     | 2.60±0.20        | 0.55±0.10 | 0.50±0.25 | 0.50±0.20 |
| 1812  | 4.50±0.20     | 3.20±0.20        | 0.55±0.20 | 0.50±0.20 | 0.50±0.20 |
| 2010  | 5.00±0.10     | 2.50±0.20        | 0.55±0.10 | 0.60±0.25 | 0.50±0.20 |
| 2512  | 6.35±0.10     | 3.20±0.20        | 0.55±0.10 | 0.60±0.25 | 0.50±0.20 |

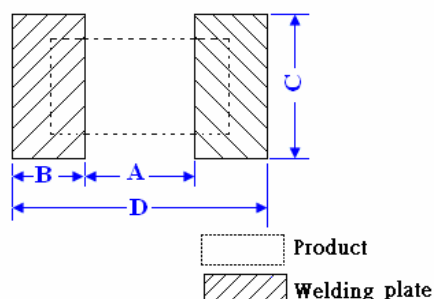
## 2. Resistance Range

| Type  | Power Rating<br>at 70℃ | Resistance Range |              |              |              |
|-------|------------------------|------------------|--------------|--------------|--------------|
|       |                        | 0.5%             | 1.0%         | 2.0%         | 5.0%         |
| 01005 | 1/32W                  | ---              | 10Ω-10MΩ     | 10Ω-10MΩ     | 1Ω -10MΩ     |
| 0201  | 1/20W                  | ---              | 1Ω-10MΩ      | 1Ω-10MΩ      | 1Ω-10MΩ      |
| 0402  | 1/16W                  | 1Ω-10MΩ          | 1Ω-10MΩ      | 1Ω-10MΩ      | 1Ω-10MΩ      |
| 0603  | 1/10W                  | 1Ω-10MΩ          | 0.01Ω-10MΩ   | 0.01Ω-10MΩ   | 0.01Ω-10MΩ   |
| 0805  | 1/8W                   | 1Ω-10MΩ          | 0.1Ω≤R<10MΩ  | 0.1Ω≤R<10MΩ  | 0.1Ω≤R<10MΩ  |
|       | 1/4W                   | ---              | 0.01Ω≤R<0.1Ω | 0.01Ω≤R<0.1Ω | 0.01Ω≤R<0.1Ω |
| 1206  | 1/4W                   | 1Ω-10MΩ          | 0.1Ω≤R<10MΩ  | 0.1Ω≤R<10MΩ  | 0.1Ω≤R<10MΩ  |
|       | 1/3W                   | ---              | 0.01Ω≤R<0.1Ω | 0.01Ω≤R<0.1Ω | 0.01Ω≤R<0.1Ω |
| 1210  | 1/2W                   | 1Ω-10MΩ          | 0.01Ω-10MΩ   | 0.01Ω-10MΩ   | 0.01Ω-10MΩ   |
| 1812  | 3/4W                   | 1Ω-10MΩ          | 0.01Ω-10MΩ   | 0.01Ω-10MΩ   | 0.01Ω-10MΩ   |
| 2010  | 3/4W                   | 1Ω-10MΩ          | 0.01Ω-10MΩ   | 0.01Ω-10MΩ   | 0.01Ω-10MΩ   |
| 2512  | 1W                     | 1Ω-10MΩ          | 0.01Ω-10MΩ   | 0.01Ω-10MΩ   | 0.01Ω-10MΩ   |

## 3. Ratings

| Type  | Max. Working Voltage | Max. Overload Voltage | Dielectric withstanding Voltage | Resistance Value of Jumper | Rated Current of Jumper | Max. Overload Current of Jumper | Operating Temperature |
|-------|----------------------|-----------------------|---------------------------------|----------------------------|-------------------------|---------------------------------|-----------------------|
| 01005 | 15V                  | 30V                   | --                              | <50mΩ                      | 0.5A                    | 1A                              | -55℃~125℃             |
| 0201  | 25V                  | 50V                   | --                              | <50mΩ                      | 0.5A                    | 1A                              | -55℃~155℃             |
| 0402  | 50V                  | 100V                  | 100V                            | <50mΩ                      | 1A                      | 2A                              | -55℃~155℃             |
| 0603  | 75V                  | 150V                  | 300V                            | <50mΩ                      | 1A                      | 2A                              | -55℃~155℃             |
| 0805  | 150V                 | 300V                  | 500V                            | <50mΩ                      | 2A                      | 5A                              | -55℃~155℃             |
| 1206  | 200V                 | 400V                  | 500V                            | <50mΩ                      | 2A                      | 10A                             | -55℃~155℃             |
| 1210  | 200V                 | 500V                  | 500V                            | <50mΩ                      | 2A                      | 10A                             | -55℃~155℃             |
| 1812  | 200V                 | 500V                  | 500V                            | <50mΩ                      | 2A                      | 10A                             | -55℃~155℃             |
| 2010  | 200V                 | 500V                  | 500V                            | <50mΩ                      | 2A                      | 10A                             | -55℃~155℃             |
| 2512  | 200V                 | 500V                  | 500V                            | <50mΩ                      | 2A                      | 10A                             | -55℃~155℃             |

## 4. Recommend the size of welding plate

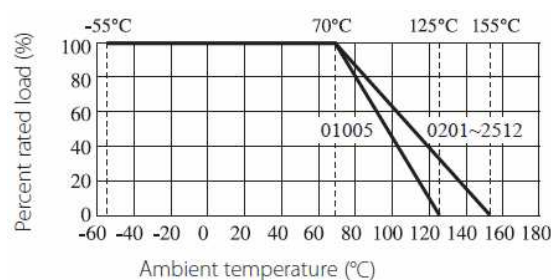


| Type  | Dimension(mm) |           |          |           |
|-------|---------------|-----------|----------|-----------|
|       | A             | B         | C        | D         |
| 01005 | 0.14±0.03     | 0.2±0.03  | 0.2±0.03 | 0.54±0.03 |
| 0201  | 0.25±0.05     | 0.35±0.05 | 0.4±0.05 | 1.0±0.05  |
| 0402  | 0.50±0.05     | 0.45±0.05 | 0.5±0.05 | 1.4±0.05  |
| 0603  | 0.9±0.05      | 0.65±0.05 | 0.8±0.05 | 2.1±0.05  |
| 0805  | 1.0±0.1       | 1.0±0.1   | 1.3±0.1  | 3.0±0.1   |
| 1206  | 2.0±0.1       | 1.1±0.1   | 1.6±0.1  | 4.2±0.1   |
| 1210  | 2.0±0.1       | 1.1±0.1   | 2.6±0.1  | 4.2±0.1   |
| 1812  | 3.2±0.1       | 1.4±0.1   | 3.3±0.1  | 5.8±0.1   |
| 2010  | 3.6±0.1       | 1.3±0.1   | 2.6±0.1  | 6.2±0.1   |
| 2512  | 5.0±0.1       | 1.6±0.1   | 3.3±0.1  | 8.2±0.1   |

## 5. Derating Curve

Resistors shall have a power rating based on continuous load operation at an ambient temperature from -55℃ to 70℃. For temperature in excess of 70℃, the load shall be derated as shown in figure 1

Figure 1



Voltage rating:

Resistors shall have a rated direct-current (DC) continuous working

Voltage or an approximate sine-wave root-mean-square (RMS) alternating-current (AC) continuous working voltage at commercial-line frequency and waveform corresponding to the power rating, as determined from the following formula:

$$RCWV = \sqrt{P \times R}$$

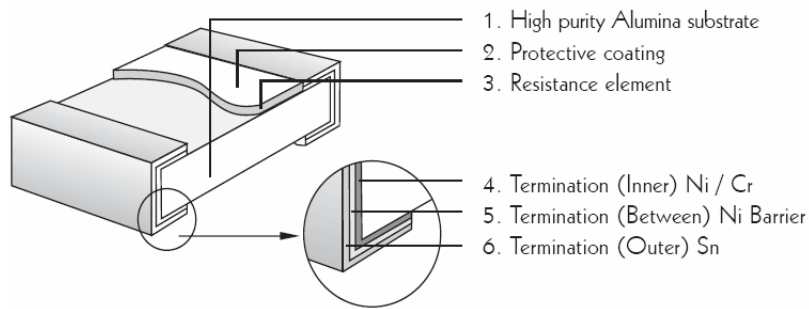
Where: RCWV commercial-line frequency and waveform (Volt.)

P = power rating (WATT.) R = nominal resistance (OHM)

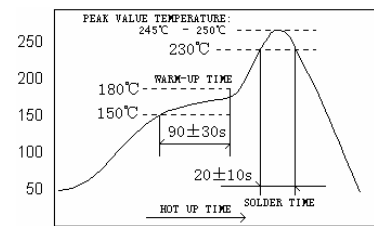
In no case shall the rated DC or RMS AC continuous working voltage be greater than the applicable maximum value.

The overload voltage is 2.5 times RCWV or Max. Overload voltage whichever is less

## 6. Structure



## 7. Performance Specification

| Characteristic                    | Limits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Test Method<br>(GB/T 5729&JIS-C-5201&IEC60115-1)                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ◎ Temperature Coefficient         | 01005:<br>$1\Omega \leq R < 10\Omega$ : -200~+600PPM/°C<br>$10\Omega \leq R < 100\Omega$ : ±300PPM/°C<br>$100\Omega \leq R \leq 10M\Omega$ : ±200PPM/°C<br>0201:<br>$1\Omega \leq R \leq 10\Omega$ : -100~ + 350PPM/°C<br>$> 10\Omega$ : ±200PPM/°C<br>0402:<br>$1\Omega \leq R \leq 10\Omega$ : ±200PPM/°C<br>$> 10\Omega$ : ±100PPM/°C<br>0603:<br>$0.01\Omega \leq R \leq 0.03\Omega$ : ±1500 PPM/°C<br>$0.03\Omega < R \leq 0.05\Omega$ : ±1000 PPM/°C<br>$0.05\Omega < R < 1\Omega$ : ±800PPM/°C<br>$1\Omega \leq R \leq 10\Omega$ : ±200PPM/°C<br>$> 10\Omega$ : ±100PPM/°C<br>0805,1206,1210,2010,1812,2512:<br>$0.01\Omega \leq R \leq 0.015\Omega$ : ±1500PPM/°C<br>$0.015\Omega < R \leq 0.03\Omega$ : ±1000PPM/°C<br>$0.03\Omega < R < 1\Omega$ : ±800PPM/°C<br>$1\Omega \leq R \leq 10\Omega$ : ±200PPM/°C<br>$> 10\Omega$ : ±100PPM/°C | 4.8 Natural resistance changes per temp. Degree centigrade<br>$\frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \text{ (PPM/°C)}$ R <sub>1</sub> : Resistance Value at room temperature (t <sub>1</sub> ) ;<br>R <sub>2</sub> : Resistance at test temperature<br>(Upper limit temperature or Lower limit temperature)<br>t <sub>1</sub> : +25°C or specified room temperature<br>t <sub>2</sub> : Upper limit temperature or Lower limit temperature test temperature |
| ◎ *Short-time overload            | ±0.5%, ±1%: ±(1.0%+0.05Ω)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 4.13 Permanent resistance change after the application of a potential of 2.5 times RCWV or Max. Overload Voltage whichever less for 5 seconds..<br><br>Apply max Overload current for 0Ω                                                                                                                                                                                                                                                                           |
|                                   | ±2%, ±5%: ±(2.0%+0.05Ω)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                   | 01005: ±(2.0%+0.05Ω)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                   | * <50mΩ                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| * Dielectric withstanding voltage | No evidence of flashover mechanical damage, arcing or insulation breaks down.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 4.7 Resistors shall be clamped in the trough of a 90°C metallic v-block and shall be tested at ac potential respectively specified in the given list of each product type for 60-70 seconds.                                                                                                                                                                                                                                                                       |
| ◎ *Solderability                  | Coverage must be over 95%.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Wave solder: Test temperature of solder: 245°C±3°C dipping time in solder: 2-3 seconds.                                                                                                                                                                                                                                                                                                                                                                            |
|                                   | Go up tin rate bigger than half of end pole                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Reflow:                                                                                                                                                                                                                                                                                                                                                                        |

## Thick Film Chip Resistors –Data Sheet

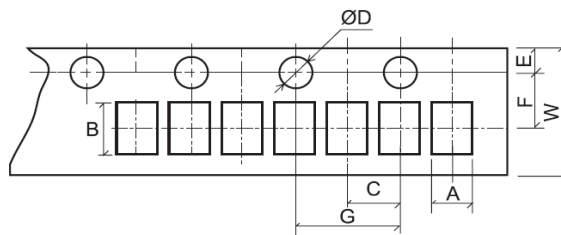
|                               |                                                   |                                                                                                                                                                                              |
|-------------------------------|---------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ◎ Rapid change of temperature | $\pm 0.5\%, \pm 1\%$ : $\pm (0.5\% + 0.05\Omega)$ | 4.19 30 min at -55 °C and 30 min at 155°C; 100 cycles.                                                                                                                                       |
|                               | $\pm 2\%, \pm 5\%$ : $\pm (1.0\% + 0.05\Omega)$   |                                                                                                                                                                                              |
|                               | 01005: $\pm (1.0\% + 0.05\Omega)$                 |                                                                                                                                                                                              |
| ◎ Soldering heat              | $\pm (1.0\% + 0.05\Omega)$                        | 4.18 Dip the resistor into a solder bath having a temperature of $260^\circ\text{C} \pm 5^\circ\text{C}$ and hold it for $10 \pm 1$ seconds.                                                 |
| Terminal bending              | $\pm (1.0\% + 0.05\Omega)$                        | 4.33 Twist of test board:<br>Y/X = 3/90 mm for 60Seconds                                                                                                                                     |
| * Insulation resistance       | $\geq 1,000 \text{ M}\Omega$                      | 4.6 The measuring voltage shall be ,measured with a direct voltage of $(100 \pm 15)\text{V}$ or a voltage equal to the dielectric withstanding voltage., and apply for 1min.                 |
| ◎ Humidity ( steady state )   | $\pm 0.5\%, \pm 1\%$ : $\pm (0.5\% + 0.05\Omega)$ | 4.24 Temporary resistance change after 240 hours exposure in a humidity test chamber controlled at $40 \pm 2^\circ\text{C}$ and 90-95% relative humidity,                                    |
|                               | $\pm 2\%, \pm 5\%$ : $\pm (3.0\% + 0.05\Omega)$   |                                                                                                                                                                                              |
|                               | 01005(-55°C~125°C):<br>$\pm (2.0\% + 0.05\Omega)$ |                                                                                                                                                                                              |
| ◎ *Load life in humidity      | $\pm 0.5\%, \pm 1\%$ : $\pm (1.0\% + 0.05\Omega)$ | 7.9 Resistance change after 1,000 hours (1.5 hours “ON”, 0.5 hour “OFF”) at RCWV in a humidity chamber controlled at $40^\circ\text{C} \pm 2^\circ\text{C}$ and 90 to 95% relative humidity. |
|                               | $\pm 2\%, \pm 5\%$ : $\pm (3.0\% + 0.05\Omega)$   |                                                                                                                                                                                              |
|                               | 01005: $\pm (3.0\% + 0.05\Omega)$                 |                                                                                                                                                                                              |
|                               | * <50mΩ                                           |                                                                                                                                                                                              |
| ◎ *Load life                  | $\pm 0.5\%, \pm 1\%$ : $\pm (1.0\% + 0.05\Omega)$ | 4.25.1 Permanent resistance change after 1,000 hours operating at RCWV with duty cycle 1.5 hours “ON”, 0.5 hour “OFF” at $70^\circ\text{C} \pm 2^\circ\text{C}$ ambient.                     |
|                               | $\pm 2\%, \pm 5\%$ : $\pm (3.0\% + 0.05\Omega)$   |                                                                                                                                                                                              |
|                               | 01005: $\pm (3.0\% + 0.05\Omega)$                 |                                                                                                                                                                                              |
|                               | * <50MΩ                                           |                                                                                                                                                                                              |
| ◎ *Low Temperature Storage    | $\pm 0.5\%, \pm 1\%$ : $\pm (1.0\% + 0.05\Omega)$ | 4.23.4 Lower limit temperature , for 2H.                                                                                                                                                     |
|                               | $\pm 2\%, \pm 5\%$ : $\pm (3.0\% + 0.05\Omega)$   |                                                                                                                                                                                              |
|                               | * <50mΩ                                           |                                                                                                                                                                                              |
| ◎ *High Temperature Exposure  | $\pm 0.5\%, \pm 1\%$ : $\pm (1.0\% + 0.05\Omega)$ | 4.23.2 Upper limit temperature , for 16H.                                                                                                                                                    |
|                               | $\pm 2\%, \pm 5\%$ : $\pm (3.0\% + 0.05\Omega)$   |                                                                                                                                                                                              |
|                               | 01005: $\pm (1.0\% + 0.05\Omega)$                 |                                                                                                                                                                                              |
|                               | * <50mΩ                                           |                                                                                                                                                                                              |
| ◎ *Leaching                   | No visible damage                                 | J-STD-002 Test D<br>Samples completely immersed for 30 sec in solder bath at $260^\circ\text{C}$ .                                                                                           |

The resistors of 0Ω only can do the characteristic noted of \*

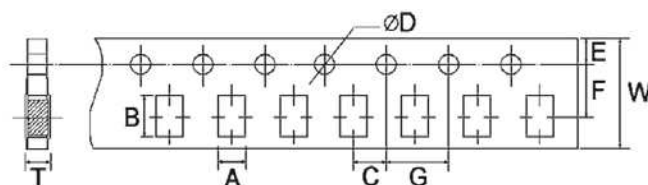
The resistors of 01005 & 0201 only can do the characteristic noted of ◎

### 8. Packing of Surface Mount Resistors

#### 8.1 Dimension of Paper Taping :(Unit: mm)

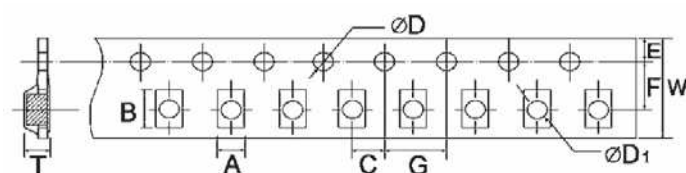


| Type  | A               | B               | C<br>$\pm 0.05$ | $\begin{matrix} +0.1 \\ \Phi D \\ -0 \end{matrix}$ | E<br>$\pm 0.1$ | F<br>$\pm 0.05$ | G<br>$\pm 0.1$ | W<br>$\pm 0.2$ | T               |
|-------|-----------------|-----------------|-----------------|----------------------------------------------------|----------------|-----------------|----------------|----------------|-----------------|
| 01005 | $0.24 \pm 0.05$ | $0.45 \pm 0.05$ | 2.00            | 1.50                                               | 1.75           | 3.50            | 4.00           | 8.00           | $0.40 \pm 0.1$  |
| 0201  | $0.40 \pm 0.05$ | $0.70 \pm 0.05$ | 2.00            | 1.50                                               | 1.75           | 3.50            | 4.00           | 8.00           | $0.42 \pm 0.1$  |
| 0402  | $0.65 \pm 0.10$ | $1.20 \pm 0.10$ | 2.00            | 1.50                                               | 1.75           | 3.50            | 4.00           | 8.00           | $0.42 \pm 0.05$ |



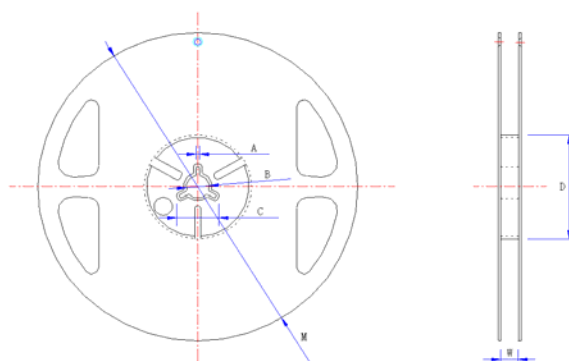
| Type | A<br>±0.2 | B<br>±0.2 | C<br>±0.05 | +0.1<br>ØD<br>-0 | E<br>±0.1 | F<br>±0.05 | G<br>±0.1 | W<br>±0.2 | T<br>±0.1 |
|------|-----------|-----------|------------|------------------|-----------|------------|-----------|-----------|-----------|
| 0603 | 1.10      | 1.90      | 2.00       | 1.50             | 1.75      | 3.50       | 4.00      | 8.00      | 0.67      |
| 0805 | 1.65      | 2.40      | 2.00       | 1.50             | 1.75      | 3.50       | 4.00      | 8.00      | 0.81      |
| 1206 | 2.00      | 3.60      | 2.00       | 1.50             | 1.75      | 3.50       | 4.00      | 8.00      | 0.81      |
| 1210 | 2.80      | 3.50      | 2.00       | 1.50             | 1.75      | 3.50       | 4.00      | 8.00      | 0.75      |

## 8.2 Dimension of Embossed Taping: (Unit: mm)



| Type | A<br>±0.2 | B<br>±0.2 | C<br>±0.05 | +0.1<br>ØD<br>-0 | +0.25<br>ØD1<br>-0 | E<br>±0.1 | F<br>±0.05 | G<br>±0.1 | W<br>±0.2 | T<br>±0.1 |
|------|-----------|-----------|------------|------------------|--------------------|-----------|------------|-----------|-----------|-----------|
| 2010 | 2.90      | 5.60      | 2.00       | 1.50             | 1.50               | 1.75      | 5.50       | 4.00      | 12.00     | 1.00      |
| 1812 | 3.50      | 4.80      | 2.00       | 1.50             | 1.50               | 1.75      | 5.50       | 4.00      | 12.00     | 1.00      |
| 2512 | 3.50      | 6.70      | 2.00       | 1.50             | 1.50               | 1.75      | 5.50       | 4.00      | 12.00     | 1.00      |

## 8.3 Dimension of Reel : (Unit: mm)



| Type  | Taping   | Qty/Reel  | A<br>±0.5 | B<br>±0.5 | C<br>±0.5 | D<br>±1 | M<br>±2 | W<br>±1 |
|-------|----------|-----------|-----------|-----------|-----------|---------|---------|---------|
| 01005 | Paper    | 20,000pcs | 2.0       | 13.0      | 21.0      | 60.0    | 178.0   | 10.0    |
| 0201  | Paper    | 15,000pcs | 2.0       | 13.0      | 21.0      | 60.0    | 178.0   | 10.0    |
| 0402  | Paper    | 10,000pcs | 2.0       | 13.0      | 21.0      | 60.0    | 178.0   | 10.0    |
| 0603  | Paper    | 5,000pcs  | 2.0       | 13.0      | 21.0      | 60.0    | 178.0   | 10.0    |
| 0805  | Paper    | 5,000pcs  | 2.0       | 13.0      | 21.0      | 60.0    | 178.0   | 10.0    |
| 1206  | Paper    | 5,000pcs  | 2.0       | 13.0      | 21.0      | 60.0    | 178.0   | 10.0    |
| 1210  | Paper    | 5,000pcs  | 2.0       | 13.0      | 21.0      | 60.0    | 178.0   | 10.0    |
| 2010  | Embossed | 4,000pcs  | 2.0       | 13.0      | 21.0      | 60.0    | 178.0   | 13.8    |
| 1812  | Embossed | 4,000pcs  | 2.0       | 13.0      | 21.0      | 60.0    | 178.0   | 13.8    |
| 2512  | Embossed | 4,000pcs  | 2.0       | 13.0      | 21.0      | 60.0    | 178.0   | 13.8    |