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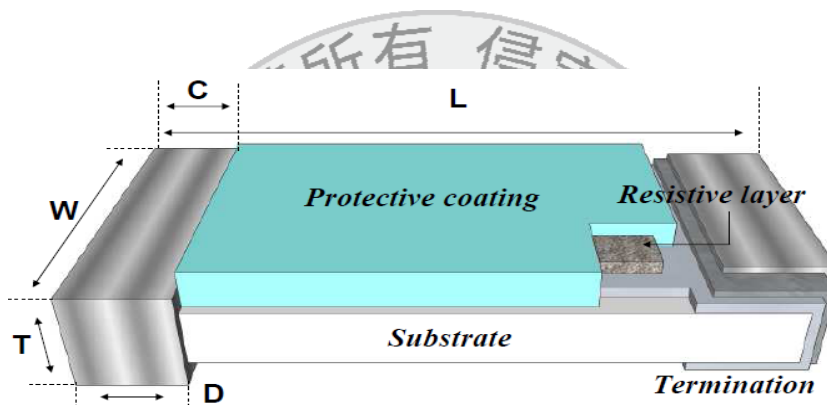
## 1. Features

- Small size and light weight.
- Suitable for lead free soldering.
- Compatible with wave and reflow soldering.
- RoHS compliant & Halogen free.
- Lead content below 100ppm.

## 2. Applications

- Mobile phone.
- Digital meter, Consumer electronics, M/B.
- Portable electronics devices.

## 3. Dimension and Construction

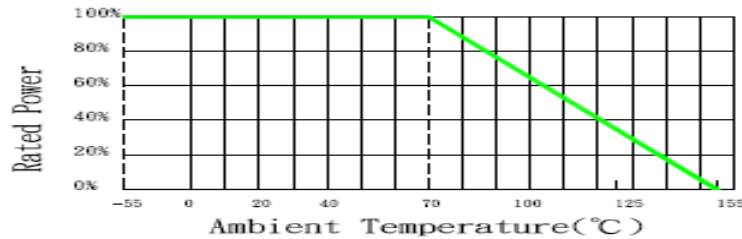


| Type  | L         | W         | C         | D         | T         |
|-------|-----------|-----------|-----------|-----------|-----------|
| FCF02 | 1.00±0.05 | 0.50±0.05 | 0.20±0.10 | 0.25±0.10 | 0.35±0.05 |
| FCF03 | 1.60±0.10 | 0.80±0.10 | 0.30±0.20 | 0.30±0.20 | 0.45±0.10 |
| FCF05 | 2.00±0.10 | 1.25±0.10 | 0.40±0.20 | 0.40±0.20 | 0.50±0.10 |
| FCF06 | 3.10±0.10 | 1.60±0.10 | 0.50±0.20 | 0.50±0.25 | 0.55±0.10 |
| FCF12 | 3.10±0.10 | 2.60±0.15 | 0.50±0.25 | 0.50±0.25 | 0.55±0.10 |
| FCF20 | 5.00±0.20 | 2.50±0.20 | 0.65±0.25 | 0.60±0.25 | 0.55±0.10 |
| FCF25 | 6.40±0.20 | 3.20±0.20 | 0.65±0.25 | 0.90±0.25 | 0.60±0.10 |
| FCF18 | 3.05±0.15 | 4.60±0.20 | 0.45±0.25 | 0.50±0.25 | 0.55±0.10 |

Unit : mm

#### 4. Power Derating Curve

Operating Temperature Range: -55 to +155 deg.C



#### 5. Rating

| Type  | Size | Power Rating at 70°C | Max. RCWV | Max. Overload Voltage | Resistance Tolerance | Temperature Coefficient (ppm/°C) | Resistance Range |        | Standard Resistance Values |
|-------|------|----------------------|-----------|-----------------------|----------------------|----------------------------------|------------------|--------|----------------------------|
|       |      |                      |           |                       |                      |                                  | Min.             | Max.   |                            |
| FCF02 | 0402 | 1/16W                | 50V       | 100V                  | ±1%(F)               | -300/+500                        | 1 Ω              | 10 Ω   | E24<br>E96                 |
|       |      |                      |           |                       |                      | ±100                             | 10.2 Ω           | 976 KΩ |                            |
|       |      |                      |           |                       |                      | ±300                             | 1 MΩ             | 10 MΩ  |                            |
|       |      |                      |           |                       | ±5%(J)               | -300/+500                        | 1 Ω              | 10 Ω   | E24<br>Jumper              |
|       |      |                      |           |                       |                      | ±200                             | 11 Ω             | 910 KΩ |                            |
|       |      |                      |           |                       |                      | ±300                             | 1 MΩ             | 10 MΩ  |                            |
| FCF03 | 0603 | 1/10W                | 50V       | 100V                  | ±1%(F)               | -300/+500                        | 1 Ω              | 10 Ω   | E24<br>E96                 |
|       |      |                      |           |                       |                      | ±100                             | 10.2 Ω           | 976 KΩ |                            |
|       |      |                      |           |                       |                      | ±200                             | 1 MΩ             | 10 MΩ  |                            |
|       |      |                      |           |                       | ±5%(J)               | -300/+500                        | 1 Ω              | 10 Ω   | E24<br>Jumper              |
|       |      |                      |           |                       |                      | ±200                             | 11 Ω             | 910 KΩ |                            |
|       |      |                      |           |                       |                      | ±200                             | 1 MΩ             | 10 MΩ  |                            |
| FCF05 | 0805 | 1/8W                 | 150V      | 300V                  | ±1%(F)               | -300/+500                        | 1 Ω              | 10 Ω   | E24<br>E96                 |
|       |      |                      |           |                       |                      | ±100                             | 10.2 Ω           | 976 KΩ |                            |
|       |      |                      |           |                       |                      | ±200                             | 1 MΩ             | 10 MΩ  |                            |
|       |      |                      |           |                       | ±5%(J)               | -300/+500                        | 1 Ω              | 10 Ω   | E24<br>Jumper              |
|       |      |                      |           |                       |                      | ±200                             | 11 Ω             | 910 KΩ |                            |
|       |      |                      |           |                       |                      | ±200                             | 1 MΩ             | 10 MΩ  |                            |

# FCF Green series.

## RoHS Exemption Free (Pb ≤ 100ppm)

### Thick-film Lead Free Chip Resistors

| Type  | Size | Power Rating at 70°C | Max. RCWV | Max. Overload Voltage | Resistance Tolerance | Temperature Coefficient (ppm/°C) | Resistance Range |        | Standard Resistance Values |
|-------|------|----------------------|-----------|-----------------------|----------------------|----------------------------------|------------------|--------|----------------------------|
|       |      |                      |           |                       |                      |                                  | Min.             | Max.   |                            |
| FCF06 | 1206 | 1/4W                 | 200V      | 400V                  | ±1%(F)               | -300/+500                        | 1 Ω              | 10 Ω   | E24<br>E96                 |
|       |      |                      |           |                       |                      | ±100                             | 10.2 Ω           | 976 KΩ |                            |
|       |      |                      |           |                       |                      | ±200                             | 1 MΩ             | 10 MΩ  |                            |
|       |      |                      |           |                       | ±5%(J)               | -300/+500                        | 1 Ω              | 10 Ω   | E24<br>Jumper              |
|       |      |                      |           |                       |                      | ±200                             | 11 Ω             | 910 KΩ |                            |
|       |      |                      |           |                       |                      | ±200                             | 1 MΩ             | 10 MΩ  |                            |
| FCF12 | 1210 | 1/3W                 | 200V      | 400V                  | ±1%(F)               | -300/+500                        | 1 Ω              | 10 Ω   | E24<br>E96                 |
|       |      |                      |           |                       |                      | ±100                             | 10.2 Ω           | 976 KΩ |                            |
|       |      |                      |           |                       |                      | ±200                             | 1 MΩ             | 10 MΩ  |                            |
|       |      |                      |           |                       | ±5%(J)               | -300/+500                        | 1 Ω              | 10 Ω   | E24<br>Jumper              |
|       |      |                      |           |                       |                      | ±200                             | 11 Ω             | 910 KΩ |                            |
|       |      |                      |           |                       |                      | ±200                             | 1 MΩ             | 10 MΩ  |                            |
| FCF20 | 2010 | 1/2W                 | 200V      | 400V                  | ±1%(F)               | ±100                             | 1 Ω              | 10 Ω   | E24<br>E96                 |
|       |      |                      |           |                       |                      | ±200                             | 10.2 Ω           | 10 MΩ  |                            |
|       |      |                      |           |                       | ±5%(J)               | ±100                             | 1 Ω              | 10 Ω   | E24<br>Jumper              |
|       |      |                      |           |                       |                      | ±200                             | 11 Ω             | 10 MΩ  |                            |
| FCF25 | 2512 | 1W                   | 250V      | 500V                  | ±1%(F)               | ±100                             | 1 Ω              | 10 Ω   | E24<br>E96                 |
|       |      |                      |           |                       |                      | ±200                             | 10.2 Ω           | 10 MΩ  |                            |
|       |      |                      |           |                       | ±5%(J)               | ±100                             | 1 Ω              | 10 Ω   | E24<br>Jumper              |
|       |      |                      |           |                       |                      | ±200                             | 11 Ω             | 10 MΩ  |                            |
| FCF18 | 1218 | 1W                   | 200V      | 400V                  | ±1%(F)               | ±100                             | 1 Ω              | 10 Ω   | E24<br>E96                 |
|       |      |                      |           |                       |                      | ±200                             | 10.2 Ω           | 10 MΩ  |                            |
|       |      |                      |           |                       | ±5%(J)               | ±100                             | 1 Ω              | 10 Ω   | E24<br>Jumper              |
|       |      |                      |           |                       |                      | ±200                             | 11 Ω             | 10 MΩ  |                            |

Note :  $RCWV = (P \times R)^{1/2}$  or Max. RCWV listed above, whichever is lower.

RCWV : Working Voltage (V) , P : Rated Power (W) , R : Resistance Value (Ω)

Jumper : Max. 50mΩ.

## 6.Part Number

| Type       | Size            | Tolerance     | Packing  | Watt                        | R Value   | TCR                         | Control Code                |
|------------|-----------------|---------------|--|-----------------------------|---|-----------------------------|-----------------------------|
| <b>FCF</b> | <b>02</b> :0402 | <b>F</b> :±1% | <b>Paper Tape :</b><br><b>0402.</b><br><b>V</b> : 10Kpcs<br><b>0603.0805.</b><br><b>1206.1210.</b><br><b>T</b> : 5Kpcs<br><b>V</b> : 10Kpcs<br><b>W</b> : 20Kpcs<br><b>Plastic Tape :</b><br><b>2010.2512</b><br><b>P</b> : 4Kpcs<br><b>1218</b><br><b>Q</b> : 3Kpcs | ∅:<br>As<br>Rating<br>Info. | <b>XXXX</b><br><b>XXX</b><br><b>1%:</b><br>4 digits<br><b>5%:</b><br>3 digits | ∅:<br>As<br>Rating<br>Info. | <b>G</b> :<br>Green series. |
|            | <b>03</b> :0603 | <b>J</b> :±5% |  |                             |   |                             |                             |
|            | <b>05</b> :0805 |               |  |                             |   |                             |                             |
|            | <b>06</b> :1206 |               |  |                             |   |                             |                             |
|            | <b>20</b> :2010 |               |  |                             |   |                             |                             |
|            | <b>25</b> :2512 |               |  |                             |   |                             |                             |
|            | <b>18</b> :1218 |               |  |                             |   |                             |                             |

Example :

### FCF05FT-1001-G

→0805 size, tolerance 1%, paper tape, 1/8W, 1 KΩ, Green series.

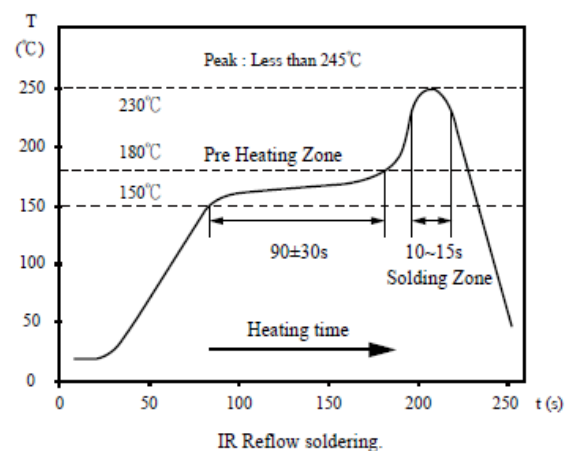
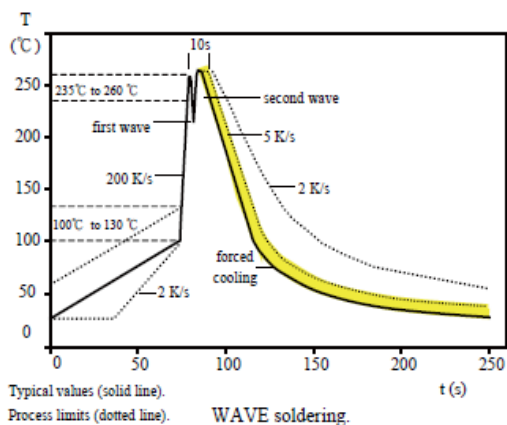
### FCF03JT-203\_-G

→0603 size, tolerance 5%, paper tape, 1/10W, 20 KΩ, Green series.

## 7.Marking/Soldering

※ All sizes are no marking.

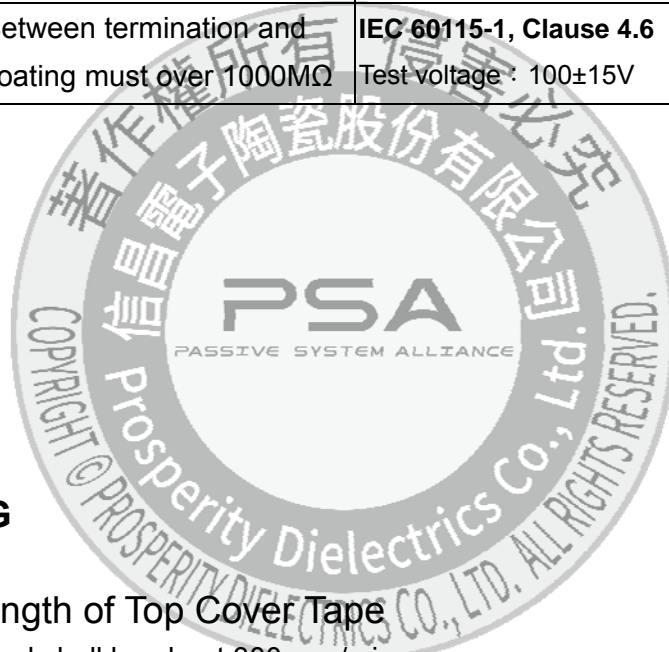
### Soldering Reference :



## 8. Reliability Performance

| Test Item                        | Specification  | Test Method  |
|----------------------------------|--|--|
| <b>DC Resistance</b>             | F:±1%<br>J:±5%   | IEC 60115-1 / JIS C 5201-1 , <b>Clause 4.5</b> Measure the resistance Value.   |
| <b>Resistance to Solder Heat</b> | 2010/2512/1218 :<br>$\Delta R \leq \pm(1\% + 0.05\Omega)$<br>Other size :<br>F: $\Delta R \leq \pm(0.5\% + 0.1\Omega)$<br>J: $\Delta R \leq \pm(1\% + 0.1\Omega)$                          | <b>IEC 60115-1, Clause 4.18</b><br>Solder dipping @ 260°C±5°C for 10sec.±1sec.   |
| <b>Solder Ability</b>            | Over 95% of termination must be covered with solder.   | <b>IEC 60115-1, Clause 4.17</b><br>After immersing flux, dip in the 235±5°C molten SAC solder bath for 2±0.5 sec.  |
| <b>Board Flex</b>                | 2010/2512/1218 :<br>$\Delta R \leq \pm(1\% + 0.05\Omega)$<br>Other size :<br>F: $\Delta R \leq \pm(0.5\% + 0.1\Omega)$<br>J: $\Delta R \leq \pm(1\% + 0.1\Omega)$<br>No mechanical damage. | <b>IEC 60115-1, Clause 4.33</b><br>Resistance change after bended on the 90mm PCB, 10sec.<br>2512/2010/1218:2mm, 0402:5mm, else 3mm.                               |
| <b>Short Time Overload</b>       | 2010/2512/1218 :<br>$\Delta R \leq \pm(2\% + 0.1\Omega)$<br>Other size :<br>F: $\Delta R \leq \pm(1\% + 0.1\Omega)$<br>J: $\Delta R \leq \pm(2\% + 0.1\Omega)$                             | <b>IEC 60115-1, Clause 4.13</b><br>2.5 × Rated voltage for 5 seconds.  |
| <b>Temperature Cycle</b>         | 2010/2512/1218 :<br>$\Delta R \leq \pm(1\% + 0.05\Omega)$<br>Other size :<br>F: $\Delta R \leq \pm(0.5\% + 0.1\Omega)$<br>J: $\Delta R \leq \pm(1\% + 0.1\Omega)$                          | <b>IEC 60115-1, Clause 4.19</b><br>Repeat 5 cycles as follow.<br>-55°C (30min)→25°C (2~3min)→155°C (30min)<br>→25°C (2~3min)                                       |
| <b>Load Life Humidity</b>        | 2010/2512/1218 :<br>$\Delta R \leq \pm(3\% + 0.1\Omega)$<br>Other size :<br>F: $\Delta R \leq \pm(1\% + 0.1\Omega)$<br>J: $\Delta R \leq \pm(2\% + 0.1\Omega)$                             | <b>IEC 60115-1, Clause 4.24</b><br>40±2°C with relative humidity<br>90% ~ 95% D.C. rated voltage for<br>1.5 hours ON 30 minutes OFF.<br>Cycle repeated 1000 hours. |

| Test Item  | Specification  | Test Method  |
|--|--|--|
| <b>Temperature Coefficient of Resistance (TCR)</b> | Within the spec.   | <b>IEC 60115-1, Clause 4.8</b><br><br>$T_1 \quad T_2$<br>Test temperature : 25°C ~ -55°C<br>25°C ~ +155°C<br><br>$TCR(ppm/^{\circ}C) = (R_2 - R_1) / R_1 \times 1 / (T_2 - T_1) \times 10^6$ |
| <b>Load Life</b>                                   | 2010/2512/1218 :<br>$\Delta R \leq \pm(3\% + 0.1\Omega)$<br>Other size :<br>F: $\Delta R \leq \pm(1\% + 0.1\Omega)$<br>J: $\Delta R \leq \pm(2\% + 0.1\Omega)$ | <b>IEC 60115-1, Clause 4.25</b><br><br>Rated voltage for 1.5 hours for followed by a pause 0.5 hour at 70±2°C.<br><br>Cycle repeated 1000 hours.   |
| <b>Insulation Resistance</b>                       | Between termination and coating must over 1000MΩ   | <b>IEC 60115-1, Clause 4.6</b><br>Test voltage : 100±15V   |

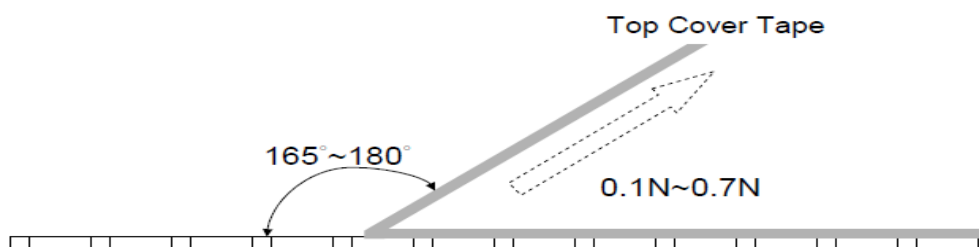


## 9. PACKAGING

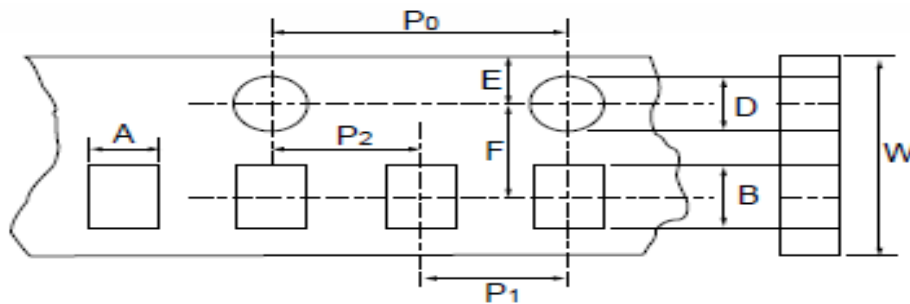
### 9.1 Peel Strength of Top Cover Tape

The peel speed shall be about 300 mm/min

The peel force of top cover tape shall between 0.1 to 0.7N



## 9.2 Tape Packaging Dimensions



• Accumulated dimensional tolerance  $40 \pm 0.2mm$

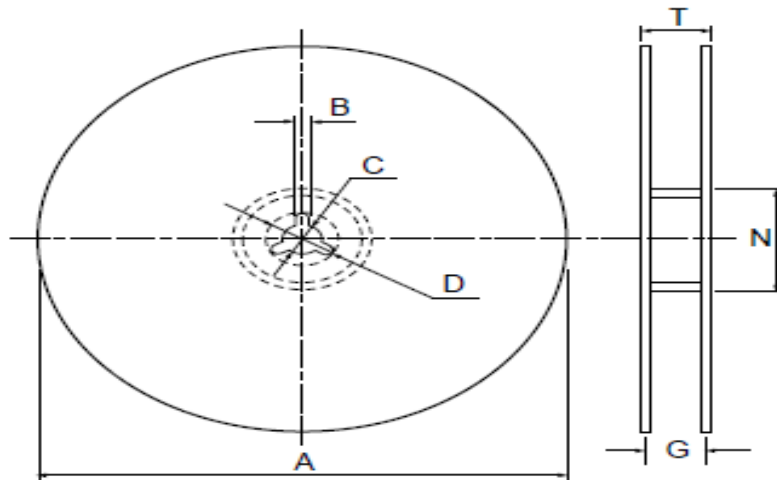
| Size | A               | B               | W                | F               | E               | P1              | P2              | P0              | D                  |
|------|-----------------|-----------------|------------------|-----------------|-----------------|-----------------|-----------------|-----------------|--------------------|
| 0402 | $0.70 \pm 0.10$ | $1.20 \pm 0.10$ | $8.00 \pm 0.30$  | $3.50 \pm 0.20$ | $1.75 \pm 0.10$ | $2.00 \pm 0.10$ | $2.00 \pm 0.05$ | $4.00 \pm 0.10$ | $1.50 + 0.10 / -0$ |
| 0603 | $1.10 \pm 0.20$ | $1.90 \pm 0.20$ | $8.00 \pm 0.30$  | $3.50 \pm 0.20$ | $1.75 \pm 0.10$ | $4.00 \pm 0.10$ | $2.00 \pm 0.05$ | $4.00 \pm 0.10$ | $1.50 + 0.10 / -0$ |
| 0805 | $1.65 \pm 0.20$ | $2.40 \pm 0.20$ | $8.00 \pm 0.30$  | $3.50 \pm 0.20$ | $1.75 \pm 0.10$ | $4.00 \pm 0.10$ | $2.00 \pm 0.05$ | $4.00 \pm 0.10$ | $1.50 + 0.10 / -0$ |
| 1206 | $2.00 \pm 0.20$ | $3.60 \pm 0.20$ | $8.00 \pm 0.30$  | $3.50 \pm 0.20$ | $1.75 \pm 0.10$ | $4.00 \pm 0.10$ | $2.00 \pm 0.05$ | $4.00 \pm 0.10$ | $1.50 + 0.10 / -0$ |
| 1210 | $3.00 \pm 0.20$ | $3.60 \pm 0.20$ | $8.00 \pm 0.30$  | $3.50 \pm 0.20$ | $1.75 \pm 0.10$ | $4.00 \pm 0.10$ | $2.00 \pm 0.05$ | $4.00 \pm 0.10$ | $1.50 + 0.10 / -0$ |
| 2010 | $2.80 \pm 0.20$ | $5.50 \pm 0.20$ | $12.00 \pm 0.30$ | $5.50 \pm 0.10$ | $1.75 \pm 0.10$ | $4.00 \pm 0.10$ | $2.00 \pm 0.05$ | $4.00 \pm 0.10$ | $1.50 + 0.10 / -0$ |
| 2512 | $3.50 \pm 0.20$ | $6.90 \pm 0.20$ | $12.00 \pm 0.30$ | $5.50 \pm 0.10$ | $1.75 \pm 0.10$ | $4.00 \pm 0.10$ | $2.00 \pm 0.05$ | $4.00 \pm 0.10$ | $1.50 + 0.10 / -0$ |
| 1218 | $3.55 \pm 0.30$ | $4.90 \pm 0.20$ | $12.00 \pm 0.30$ | $5.50 \pm 0.10$ | $1.75 \pm 0.10$ | $8.00 \pm 0.10$ | $2.00 \pm 0.05$ | $4.00 \pm 0.10$ | $1.50 + 0.10 / -0$ |

unit:mm

unit : mm



### 9.3 Reel Dimensions



unit:mm

| Size | Packaging Q'ty | A         | N         | C        | D        | B       | G        | T        |
|------|----------------|-----------|-----------|----------|----------|---------|----------|----------|
| 0402 | 10kpcs/Reel    | 254.0±2.0 | 100.0±1.0 | 13.5±0.5 | 20(Min.) | 2.0±0.5 | 10.0±1.5 | 14.9max. |
|      | 20kpcs/Reel    | 330.0±2.0 | 100.0±1.0 | 13.5±0.5 | 20(Min.) | 2.0±0.5 | 10.0±1.5 | 14.9max. |
| 0603 | 5kpcs/Reel     | 178.0±2.0 | 60.0±0.5  | 13.0±0.5 | 20(Min.) | 2.0±0.5 | 10.0±1.5 | 14.9max. |
| 0805 | 10kpcs/Reel    | 254.0±2.0 | 100.0±1.0 | 13.5±0.5 | 20(Min.) | 2.0±0.5 | 10.0±1.5 | 14.9max. |
| 1206 |                | 330.0±2.0 | 100.0±1.0 | 13.5±0.5 | 20(Min.) | 2.0±0.5 | 10.0±1.5 | 14.9max. |
| 1210 | 20kpcs/Reel    | 330.0±2.0 | 100.0±1.0 | 13.5±0.5 | 20(Min.) | 2.0±0.5 | 10.0±1.5 | 14.9max. |
| 2010 | 4kpcs/Reel     | 178.0±2.0 | 60.0±0.5  | 13.0±0.5 | 20(Min.) | 2.0±0.5 | 13.8±1.5 | 16.7max. |
| 2512 |                | 178.0±2.0 | 60.0±0.5  | 13.0±0.5 | 20(Min.) | 2.0±0.5 | 13.8±1.5 | 16.7max. |
| 1218 | 3kpcs/Reel     | 178.0±2.0 | 60.0±0.5  | 13.0±0.5 | 20(Min.) | 2.0±0.5 | 13.8±1.5 | 16.7max. |

## 10. Storage & Handling

... Products are recommended to be used up within one year as ensured shelf life.

Check solder ability in case shelf life extension is needed.

... To store products with following condition:

Temperature: 5 to 40°C ; Humidity: 20 to 70% relative humidity.

※ All product specification and data are subject to change without notice.