

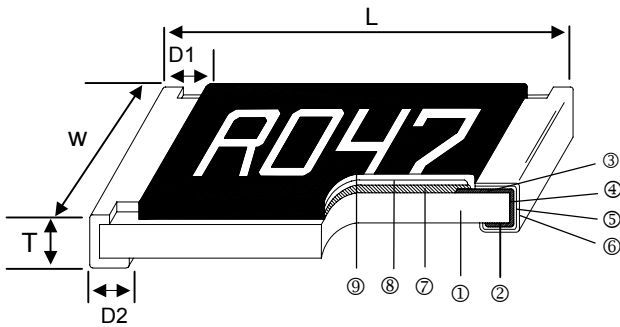
|      |            |
|------|------------|
| 系列号  | HoCS       |
| 修订日期 | 2020-03-06 |
| 版本号  | Ho-A0      |



## Features

- 3 Watts power rating in 1 Watt size, 1225 package
- Low TCR of  $\pm 100$  PPM/ $^{\circ}$ C
- Resistance values from 1m to 1 ohm
- High purity alumina substrate for high power dissipation
- Long side terminations with higher power rating
- RoHS Compliance

## Construction



## Applications

- Power Management Applications
- Switching Power Supply
- Over Current Protection in Audio Applications
- Voltage Regulation Module (VRM)
- DC-DC Converter, Battery Pack, Charger, Adaptor
- Automotive Engine Control
- Disk Driver

|                     |                      |                      |
|---------------------|----------------------|----------------------|
| ① Alumina Substrate | ④ Edge Electrode     | ⑦ Resistor Layer     |
| ② Bottom Electrode  | ⑤ Barrier Layer      | ⑧ Primary Overcoat   |
| ③ Top Electrode     | ⑥ External Electrode | ⑨ Secondary Overcoat |

## Dimensions

| Type    | Size (Inch)                  | L (mm)          | W (mm)          | T (mm)          | D1 (mm)         | D2 (mm)         | Weight (g) (1000pcs) |
|---------|------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|----------------------|
| CS      | 0201                         | 0.60 $\pm$ 0.03 | 0.30 $\pm$ 0.03 | 0.23 $\pm$ 0.05 | 0.12 $\pm$ 0.05 | 0.15 $\pm$ 0.05 | 0.18                 |
| CS      | 0402                         | 1.00 $\pm$ 0.05 | 0.50 $\pm$ 0.05 | 0.32 $\pm$ 0.10 | 0.25 $\pm$ 0.10 | 0.20 $\pm$ 0.10 | 0.7                  |
| CS      | 0603                         | 1.60 $\pm$ 0.10 | 0.80 $\pm$ 0.10 | 0.45 $\pm$ 0.10 | 0.30 $\pm$ 0.20 | 0.30 $\pm$ 0.20 | 1.99                 |
| CS      | 0805                         | 2.00 $\pm$ 0.10 | 1.25 $\pm$ 0.10 | 0.55 $\pm$ 0.10 | 0.30 $\pm$ 0.20 | 0.40 $\pm$ 0.25 | 5.3                  |
| CS      | 1206                         | 3.10 $\pm$ 0.10 | 1.55 $\pm$ 0.10 | 0.55 $\pm$ 0.10 | 0.50 $\pm$ 0.30 | 0.40 $\pm$ 0.25 | 8.82                 |
| CS      | 1210                         | 3.10 $\pm$ 0.10 | 2.60 $\pm$ 0.15 | 0.55 $\pm$ 0.10 | 0.50 $\pm$ 0.30 | 0.50 $\pm$ 0.25 | 15.5                 |
| CS      | 2010                         | 5.00 $\pm$ 0.10 | 2.50 $\pm$ 0.15 | 0.60 $\pm$ 0.15 | 0.60 $\pm$ 0.30 | 0.50 $\pm$ 0.25 | 27.03                |
| CS      | 2512                         | 6.35 $\pm$ 0.10 | 3.10 $\pm$ 0.15 | 0.60 $\pm$ 0.10 | 0.60 $\pm$ 0.30 | 0.55 $\pm$ 0.25 | 43.08                |
| CS (2W) | 2512 (10 - 99m $\Omega$ )    | 6.35 $\pm$ 0.20 | 3.15 $\pm$ 0.15 | 0.74 $\pm$ 0.10 | 0.60 $\pm$ 0.30 | 0.55 $\pm$ 0.25 | 53.08                |
| CS (2W) | 2512 (100 - 1000m $\Omega$ ) | 6.35 $\pm$ 0.20 | 3.15 $\pm$ 0.15 | 0.74 $\pm$ 0.10 | 0.60 $\pm$ 0.30 | 2.10 $\pm$ 0.10 | 53.08                |
| CS      | 1225                         | 3.10 $\pm$ 0.15 | 6.30 $\pm$ 0.15 | 0.90 $\pm$ 0.15 | 0.60 $\pm$ 0.30 | 0.80 $\pm$ 0.25 | 64.88                |
| CS      | 3720                         | 2.00 $\pm$ 0.20 | 3.75 $\pm$ 0.20 | 0.60 $\pm$ 0.10 | 0.40 $\pm$ 0.20 | 0.40 $\pm$ 0.20 | 19.96                |
| CS      | 7520                         | 2.00 $\pm$ 0.20 | 7.50 $\pm$ 0.30 | 0.60 $\pm$ 0.10 | 0.40 $\pm$ 0.20 | 0.40 $\pm$ 0.20 | 35.71                |
| CS      | 0612                         | 1.55 $\pm$ 0.10 | 3.10 $\pm$ 0.15 | 0.55 $\pm$ 0.10 | 0.30 $\pm$ 0.15 | 0.45 $\pm$ 0.15 | 10.19                |



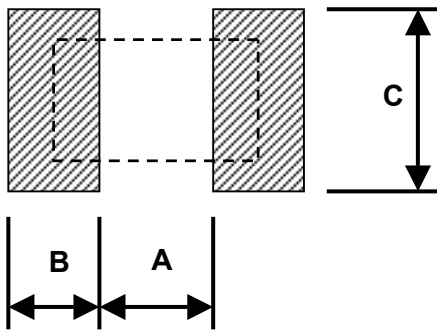
地址：深圳市龙华新区观澜大布头路南通邦高新产业园 A 栋 8 楼

|      |            |
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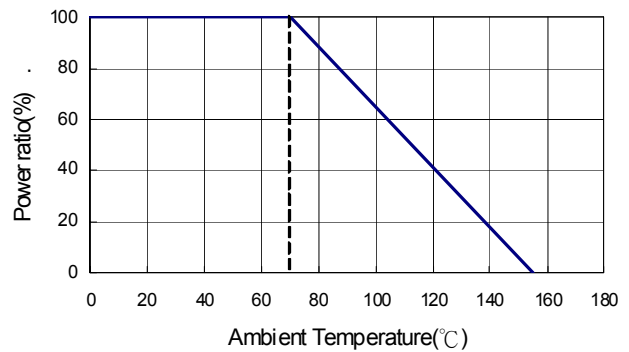
## Part Numbering

| CS           | 0603   | 1/4W   | R100                                  | 1%                         | ±100  |
|--------------|--|--|---------------------------------------|----------------------------|---|
| Product Type | Dimensions (L×W)   | Power Rating   | Resistance                            | Resistance Tolerance       | TCR (PPM/°C)  |
|              | 0201<br>0402<br>0603<br>0805<br>1206<br>1210<br>2010<br>2512<br>1225<br>3720<br>7520<br>0612 | 2W<br>1.5W<br>1W<br>3/4W<br>1/2W<br>1/4W<br>1/5W<br>1/8W | R010: 0.01Ω<br>R100: 0.1Ω<br>1R00: 1Ω | ±0.5%<br>±1%<br>±2%<br>±5% | ±100<br>±200<br>±300<br>±400<br>±600<br>±150<br>±1000 |

## Recommend Land Pattern



## Derating Curve



Pad Layout (Except For CS12: Ultra High Power Rating Series)

| Type   | A (mm) | B (mm) | C (mm)   |
|--------|--------|--------|----------|
| CS0201 | 0.25   | 0.30   | 0.40±0.2 |
| CS0402 | 0.50   | 0.50   | 0.60±0.2 |
| CS0603 | 0.80   | 1.00   | 0.90±0.2 |
| CS0805 | 1.00   | 1.00   | 1.35±0.2 |
| CS1206 | 2.00   | 1.15   | 1.70±0.2 |
| CS1210 | 2.00   | 1.15   | 2.50±0.2 |
| CS2110 | 3.60   | 1.40   | 2.50±0.2 |
| CS2512 | 4.90   | 1.60   | 3.20±0.2 |
| CS1225 | 1.20   | 2.00   | 7.00±0.2 |
| CS3720 | 1.00   | 1.80   | 3.90±0.2 |
| CS7520 | 1.00   | 1.80   | 7.60±0.2 |
| CS0612 | 0.60   | 1.00   | 3.20±0.2 |

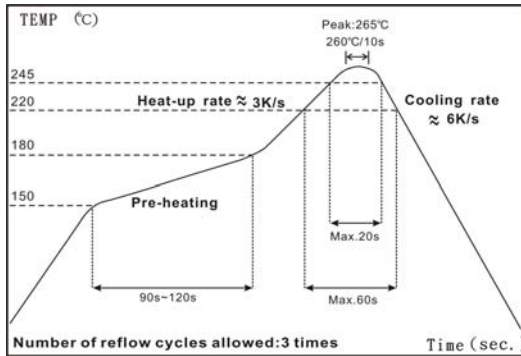
## Marking for 0603

| Type       | Code   |
|------------|--------|
| 1R0        | 1.000Ω |
| R10        | 0.100Ω |
| R01        | 0.010Ω |
| <u>102</u> | 0.102Ω |
| <u>024</u> | 0.024Ω |

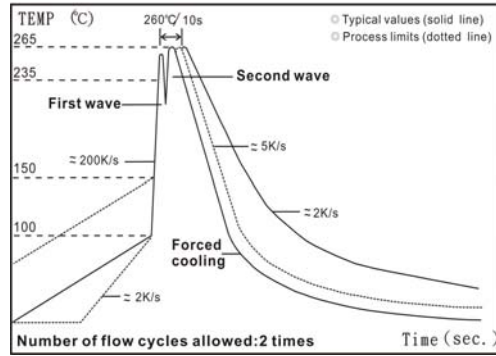
Pad Layout ( For CS12: Ultra High Power Rating Series)

| Type   | Resistance Range | A (mm) | B (mm) | C (mm)  |
|--------|------------------|--------|--------|---------|
| CS2512 | 10~99 mΩ         | 4.9    | 1.6    | 3.2±0.2 |
| CS2512 | 100~1000mΩ       | 1.0    | 3.55   | 3.2±0.2 |

## ■ Soldering Condition



IR Reflow Soldering



Wave Soldering (Flow Soldering)

- (1) Time of IR reflow soldering at maximum temperature point 260°C : 10s
- (2) Time of wave soldering at maximum temperature point 260°C : 10s
- (3) Time of soldering iron at maximum temperature point 410°C : 5s

## ■ Standard Electrical Specifications

| Type    | Item | Power Rating at 70°C | Operating Temp. Range | Max. Operating Current | Resistance Range (mΩ) |           |            |                       | TCR (PPM/°C)                 |
|---------|------|----------------------|-----------------------|------------------------|-----------------------|-----------|------------|-----------------------|------------------------------|
|         |      |                      |                       |                        | ±0.5%                 | ±1%       | ±2%        | ±5%                   |                              |
| CS0201  |      | 1/20W                | -55 ~ +155°C          | 0.70A                  | 100 - 147             | 150 - 500 | 510 - 1000 | ±1000<br>±600<br>±300 |                              |
| CS0402  |      | 1/16W                |                       | 1.11A                  | 50 - 100              | 102 - 500 | 510 - 1000 | ±400<br>±300<br>±200  |                              |
| CS0603  |      | 1/10W                |                       | 2.23A                  | 20 - 50               | 51 - 100  | 102 - 500  | 510 - 1000            | ±600<br>±400<br>±300<br>±200 |
| CS0805  |      | 1/8W                 |                       | 2.50A                  | 20 - 50               | 51 - 100  | 102 - 196  | 200 - 1000            | ±600<br>±400<br>±300<br>±200 |
| CS1206  |      | 1/4W                 |                       | 5.00A                  | 10 - 20               | 21 - 50   | 51 - 91    | 100 - 1000            | ±600                         |
| CS1210  |      | 1/2W                 |                       | 7.07A                  | 10 - 20               | 21 - 50   |            |                       | ±400                         |
| CS2010  |      | 3/4W                 |                       | 8.66A                  | 10 - 20               | 21 - 50   |            |                       | ±300                         |
| CS12512 |      | 1W                   |                       | 10.0A                  | 10 - 20               | 21 - 50   |            |                       | ±200                         |
| CS1225  |      | 3W                   |                       | 31.6A                  | 3 - 5                 | 6 - 20    | 21 - 30    | 33 - 8000             | ±300<br>±200<br>±150<br>±100 |
| CS3720  |      | 1W                   |                       | 10.0A                  | 10 - 18               | 20 - 500  |            |                       | ±300<br>±150                 |
| CS7520  |      | 2W                   |                       | 44.7A                  | —                     | 1 - 4     |            |                       | ±300                         |
| CS0612  |      | 1W                   |                       | 10.0A                  | 10 - 27               | 30 - 91   | 100 - 499  | 500 - 1000            | ±600<br>±300<br>±200<br>±100 |

### High Power & Ultra High Power Rating Electrical Specifications

| Type \ Item | Power Rating at 70°C | Operating Temp. Range | Max. Operating Current | Resistance Range (mΩ) |           |            |                      | TCR (PPM/°C)                 |
|-------------|----------------------|-----------------------|------------------------|-----------------------|-----------|------------|----------------------|------------------------------|
|             |                      |                       |                        | ±0.5%                 | ±1%       | ±2%        | ±5%                  |                              |
| CS0402      | 1/8W                 | -55 ~ +155°C          | 1.56A                  | 51 - 100              | 102 - 500 | 510 - 1000 | ±400<br>±300<br>±200 |                              |
| CS0603      | 1/8W                 |                       | 1.98A                  |                       |           |            |                      |                              |
| CS0805      | 1/5W                 |                       | 2.21A                  |                       |           |            |                      |                              |
| CS1206      | 1/4W                 |                       | 7.07A                  | 10 - 20               | 21 - 50   | 51 - 91    |                      | ±600<br>±400<br>±300<br>±200 |
| CS1210      | 3/4W                 |                       | 8.66A                  |                       |           |            |                      |                              |
| CS2010      | 1W                   |                       | 10.0A                  |                       |           |            |                      |                              |
| CS2512      | 1.5W                 |                       | 12.2A                  |                       |           |            |                      |                              |
| CS2512      | *2W                  |                       | 14.1A                  |                       |           |            |                      |                              |

\*: Ultra High Power

### Low TCR Electrical Specifications

| Type \ Item | Power Rating at 70°C | Operating Temp. Range | Max. Operating Current | Resistance Range (mΩ) |     |     |     | TCR (PPM/°C) |
|-------------|----------------------|-----------------------|------------------------|-----------------------|-----|-----|-----|--------------|
|             |                      |                       |                        | ±0.5%                 | ±1% | ±2% | ±5% |              |
| CS0805      | 1/8W                 | -55 ~ +155°C          | 1.11A                  | 100 - 1000            |     |     |     | ±100         |
| CS1206      | 1/4W                 |                       | 1.58A                  | 100 - 1000            |     |     |     | ±100         |
| CS1210      | 1/2W                 |                       | 2.58A                  | 75 - 1000             |     |     |     | ±100         |
| CS2010      | 3/4W                 |                       | 3.87A                  | 50 - 1000             |     |     |     | ±100         |
| CS2512      | 1W                   |                       | 7.07A                  | 20 - 1000             |     |     |     | ±100         |
| CS2512      | *2W                  |                       | 6.32A                  | 50 - 1000             |     |     |     | ±100         |
| CS3720      | 1W                   |                       | 3.16A                  | 100 - 500             |     |     |     | ±100         |
| CS7520      | 2W                   |                       | 6.32A                  | 50 - 350              |     |     |     | ±100         |

Operating Current= $\sqrt{P/R}$

## Environmental Characteristics

| Item   | Requirement  | Test Method  |
|--|--|--|
| Temperature Coefficient of Resistance (T.C.R.) | As Spec.   | <b>JIS-C-5201-1 4.8</b><br><b>IEC-60115-1 4.8</b><br>-55°C~+125°C, 25°C is the reference temperature                             |
| Short Time Overload                            | ±(0.5%+0.05Ω)  | <b>JIS C 5201-1 4.13</b><br><b>IEC 60115-1 4.13</b><br>RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds        |
|  | ±(1.0%+0.05Ω)<br>For High power rating                     |  |
| Insulation Resistance                          | ≥ 10G  | <b>JIS-C-5201-1 4.6</b><br><b>IEC-60115-1 4.6</b><br>Max. Overload Voltage for 1 minute  |
| Endurance                                      | ±(1.0%+0.05Ω)  | <b>JIS-C-5201-1 4.25</b><br><b>IEC-60115-1 4.25.1</b><br>70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"            |
| Damp Heat with Load                            | ±(0.5%+0.05Ω)  | <b>JIS-C-5201-1 4.24</b><br><b>IEC-60115-1 4.24</b><br>40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF" |
| Dry Heat                                       | ±(0.5%+0.05Ω)  | <b>JIS-C-5201-1 4.23</b><br><b>IEC-60115-1 4.23.2</b><br>at +155°C for 1000 hrs  |
| Bending Strength                               | ±(1.0%+0.05Ω)  | <b>JIS-C-5201-1 4.33</b><br><b>IEC-60115-1 4.33</b><br>Bending once for 5 seconds with 3mm 2010, 2512 sizes: 2mm                 |
| Solderability                                  | 95% min. coverage  | <b>JIS-C-5201-1 4.17</b><br><b>IEC-60115-1 4.17</b><br>245±5°C for 3 seconds   |
| Resistance to Soldering Heat                   | ±(0.5%+0.05Ω)  | <b>JIS-C-5201-1 4.18</b><br><b>IEC-60115-1 4.18</b><br>260±5°C for 10 seconds  |
| Voltage Proof                                  | No breakdown or flashover                                  | <b>JIS-C-5201-1 4.7</b><br><b>IEC-60115-1 4.7</b><br>1.42 times Max. Operating Voltage for 1 minute                              |
| Leaching                                       | Individual leaching area ≤ 5%<br>Total leaching area ≤ 10% | <b>JIS-C-5201-1 4.18</b><br><b>IEC-60068-2-58 8.2.1</b><br>260±5°C for 30 seconds  |
| Rapid Change of Temperature                    | ±(0.5%+0.05Ω)  | <b>JIS-C-5201-1 4.19</b><br><b>IEC-60115-1 4.19</b><br>-55°C to +155°C, 5 cycles   |

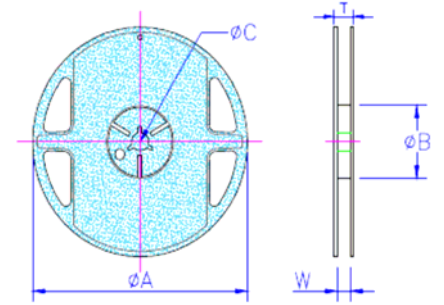
RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$  or Max. Operating Voltage whichever is lower.

Storage Temperature: 15~28°C; Humidity < 80%RH

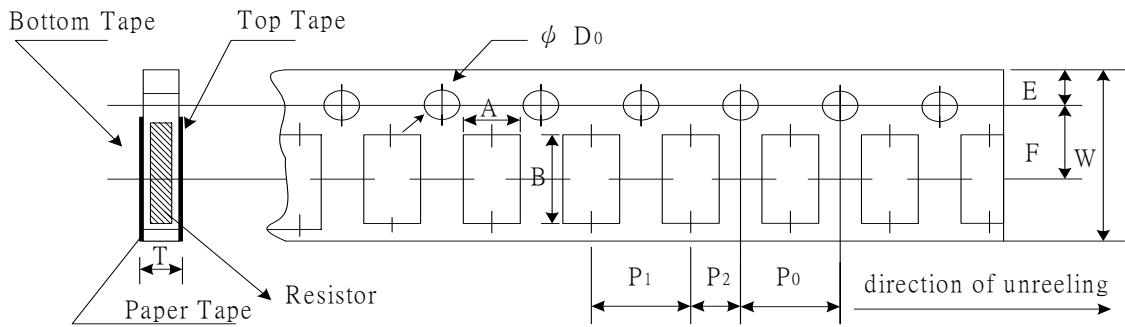
## ■Packaging

### Packaging Quantity & Reel Specifications

| Type        | ΦA (mm)   | ΦB (mm)  | ΦC (mm)  | W (mm)   | T (mm)   | Paper Tape (EA) | Embossed Plastic Tape (EA) |
|-------------|-----------|----------|----------|----------|----------|-----------------|----------------------------|
| CS0201      | 178.0±1.0 | 60.0+1.0 | 13.5±0.7 | 9.5±0.1  | 11.5±1.0 | 10,000          |                            |
| CS0402      | 178.0±1.0 | 60.0+1.0 | 13.5±0.7 | 9.5±0.1  | 11.5±1.0 | 10,000          | -                          |
| CS0603      | 178.0±1.0 | 60.0+1.0 | 13.5±0.7 | 9.5±0.1  | 11.5±1.0 | 5,000           | -                          |
| CS0805      | 178.0±1.0 | 60.0+1.0 | 13.5±0.7 | 9.5±0.1  | 11.5±1.0 | 5,000           | -                          |
| CS1206      | 178.0±1.0 | 60.0+1.0 | 13.5±0.7 | 9.5±0.1  | 11.5±1.0 | 5,000           | -                          |
| CS1210      | 178.0±1.0 | 60.0+1.0 | 13.5±0.7 | 9.5±0.1  | 11.5±1.0 | 5,000           |                            |
| CS2010      | 178.0±1.0 | 60.0+1.0 | 13.5±0.7 | 13.5±1.0 | 15.5±1.0 | -               | 4,000                      |
| CS2512      | 178.0±1.0 | 60.0+1.0 | 13.5±0.7 | 13.5±1.0 | 15.5±1.0 | -               | 4,000                      |
| CS2512 (2W) | 178.0±1.0 | 60.0+1.0 | 13.5±0.7 | 13.5±1.0 | 15.5±1.0 | -               | 2,000                      |
| CS1225      | 178.0±1.0 | 60.0+1.0 | 13.5±0.7 | 13.5±1.0 | 15.5±1.0 | -               | 2,000                      |
| CS3720      | 178.0±1.0 | 60.0+1.0 | 13.5±0.7 | 13.5±1.0 | 15.5±1.0 | -               | 2,000                      |
| CS7520      | 178.0±1.0 | 60.0+1.0 | 13.5±0.7 | 17.5±1.0 | 19.5±1.0 | -               | 2,000                      |
| CS0612      | 178.0±1.0 | 60.0+1.0 | 13.5±0.7 | 9.5±0.1  | 11.5±1.0 | 5,000           | -                          |

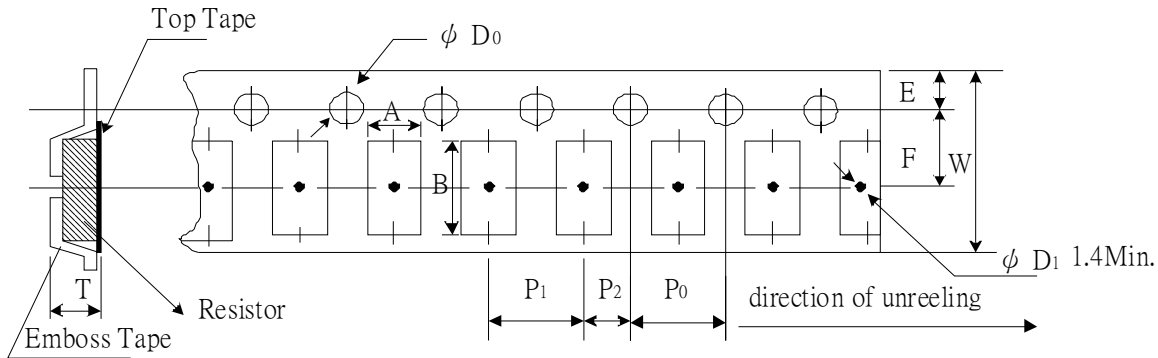


### Paper Tape Specifications



| Type   | A (mm)    | B (mm)    | W (mm)   | E (mm)    | F (mm)    | P0 (mm)   | P1 (mm)   | P2 (mm)   | ΦD <sub>0</sub> (mm) | T (mm)    |
|--------|-----------|-----------|----------|-----------|-----------|-----------|-----------|-----------|----------------------|-----------|
| CS0201 | 0.38±0.05 | 0.68±0.05 | 8.0±0.20 | 1.75±0.10 | 3.50±0.05 | 4.00±0.10 | 2.00±0.05 | 2.00±0.05 | 1.50+0.1,-0          | 0.42±0.20 |
| CS0402 | 0.65±0.10 | 1.15±0.10 | 8.0±0.20 | 1.75±0.10 | 3.50±0.05 | 4.00±0.10 | 2.00±0.05 | 2.00±0.05 | 1.50+0.1,-0          | 0.45±0.10 |
| CS0603 | 1.10±0.10 | 1.90±0.10 | 8.0±0.20 | 1.75±0.10 | 3.50±0.05 | 4.00±0.10 | 4.00±0.05 | 2.00±0.05 | 1.50+0.1,-0          | 0.70±0.10 |
| CS0805 | 1.60±0.10 | 2.40±0.20 | 8.0±0.20 | 1.75±0.10 | 3.50±0.05 | 4.00±0.10 | 4.00±0.05 | 2.00±0.05 | 1.50+0.1,-0          | 0.85±0.10 |
| CS1206 | 1.90±0.10 | 3.50±0.20 | 8.0±0.20 | 1.75±0.10 | 3.50±0.05 | 4.00±0.10 | 4.00±0.05 | 2.00±0.05 | 1.50+0.1,-0          | 0.85±0.10 |
| CS1210 | 2.90±0.10 | 3.50±0.20 | 8.0±0.20 | 1.75±0.10 | 3.50±0.05 | 4.00±0.10 | 4.00±0.05 | 2.00±0.05 | 1.50+0.1,-0          | 0.85±0.10 |
| CS0612 | 1.90±0.10 | 3.50±0.20 | 8.0±0.20 | 1.75±0.10 | 3.50±0.05 | 4.00±0.10 | 4.00±0.05 | 2.00±0.05 | 1.50+0.1,-0          | 0.85±0.10 |

Emboss Plastic Tape Specifications



| Type        | A (mm)    | B (mm)    | W (mm)    | E (mm)    | F (mm)   | P <sub>0</sub> (mm) | P <sub>1</sub> (mm) | P <sub>2</sub> (mm) | ΦD <sub>0</sub> (mm) | T (mm)     |
|-------------|-----------|-----------|-----------|-----------|----------|---------------------|---------------------|---------------------|----------------------|------------|
| CS2010      | 2.80±0.10 | 5.50±0.10 | 12.0±0.30 | 1.75±0.10 | 5.5±0.05 | 4.00±0.05           | 4.00±0.10           | 2.00±0.05           | 1.50+0.10            | 1.00±0.20  |
| CS2512      | 3.50±0.10 | 6.70±0.10 | 12.0±0.30 | 1.75±0.10 | 5.5±0.05 | 4.00±0.05           | 4.00±0.10           | 2.00±0.05           | 1.50+0.10            | 1.00±0.20  |
| CS2512 (2W) | 3.38±0.10 | 6.68±0.10 | 12.0±0.30 | 1.75±0.10 | 5.5±0.10 | 4.00±0.10           | 4.00±0.10           | 2.00±0.05           | 1.55+0.05            | 1.45±0.20  |
| CS1225      | 3.38±0.10 | 6.68±0.10 | 12.0±0.30 | 1.75±0.10 | 5.5±0.10 | 4.00±0.10           | 4.00±0.10           | 2.00±0.05           | 1.55+0.05            | 1.45±0.20  |
| CS3720      | 2.50±0.20 | 4.45±0.20 | 12.0±0.30 | 1.75±0.10 | 5.5±0.05 | 4.00 ±0.05          | 4.00±0.10           | 2.00±0.05           | 1.50+0.10            | 1.20 ±0.20 |
| CS7520      | 2.50±0.20 | 8.30±0.20 | 16.0±0.30 | 1.75±0.10 | 7.8±0.05 | 4.00±0.05           | 4.00±0.10           | 2.00±0.05           | 1.50+0.10            | 1.20 ±0.20 |