



LEAN GIMN ENTERPRISE CO., LTD.

Data Sheet

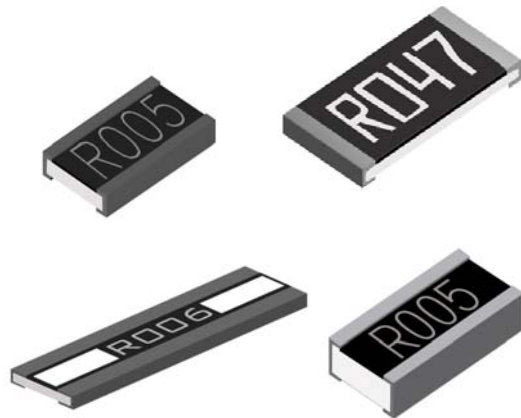
Customer :

Product Type : Current Sensing Chip Resistor -CS

Part No. : CS series

Issued Date : 02-Sep-08

Document No CS Series REV.B5



| Produced by (QC) | Checked by (QC) | Approved by (QC) | Prepared by (Sales) | Accepted by (Customer) |
|---------------------|--------------------|---------------------|------------------------|---------------------------|
| 02-Sep-08 | 02-Sep-08 | 02-Sep-08 | 02-Sep-08 | |
| Chun | Ann | Judy | | |



Current Sensing Chip Resistor (CS Series)

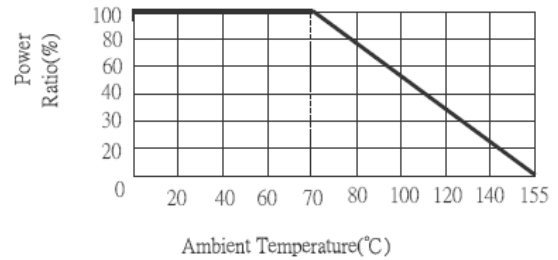
1. Scope

This specification applies to all sizes of rectangular-type fixed chip resistors with metal paste as material.

2. Features

- 3 Watts power rating in 1Watt size, 1225 package
- Low TCR of ± 100 PPM/ $^{\circ}$ C
- Resistance values from 1 m to 1000 m ohm
- High purity alumina substrate for high power dissipation
- Long side terminations with higher power rating

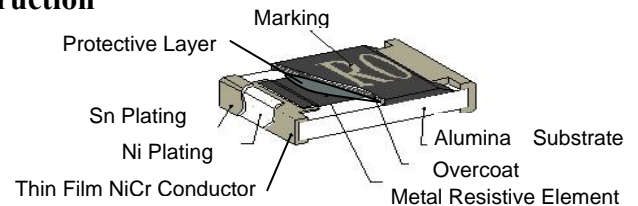
Derating Curve



3. Application

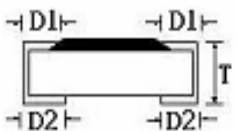
- Power Management Applications
- Switching Power Supply
- Over Current Protection in Audio Application
- Voltage Regulation Module (VRM)
- DC-DC Converter, Battery Pack, Charger, Adaptor
- Automotive Engine Control
- Disk Driver
- Portable Devices (PDA, Cell phone)

4-1. Construction



4. Dimensions

0201 / 0402 / 0603 / 0805 / 1206 / 2512



1225/3720/7520

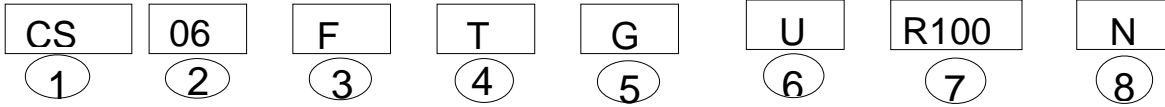


Unit : mm

| Codes | L | W | T | D1 | D2 |
|-------|-----------------|-----------------|-----------------|-----------------|-----------------|
| CS01 | 0.58 \pm 0.05 | 0.29 \pm 0.05 | 0.23 \pm 0.05 | 0.12 \pm 0.05 | 0.15 \pm 0.05 |
| CS02 | 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 |
| CS03 | 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 |
| CS05 | 2.00 \pm 0.15 | 1.25 \pm 0.15 | 0.55 \pm 0.10 | 0.30 \pm 0.20 | 0.40 \pm 0.25 |
| CS06 | 3.05 \pm 0.15 | 1.55 \pm 0.15 | 0.55 \pm 0.10 | 0.50 \pm 0.30 | 0.40 \pm 0.25 |
| CS13 | 3.00 \pm 0.15 | 2.50 \pm 0.15 | 0.55 \pm 0.10 | 0.50 \pm 0.30 | 0.50 \pm 0.25 |
| CS10 | 5.00 \pm 0.20 | 2.45 \pm 0.15 | 0.60 \pm 0.15 | 0.60 \pm 0.30 | 0.50 \pm 0.25 |
| CS12 | 6.35 \pm 0.20 | 3.15 \pm 0.15 | 0.60 \pm 0.10 | 0.60 \pm 0.30 | 0.55 \pm 0.25 |
| CS25 | 3.10 \pm 0.15 | 6.30 \pm 0.15 | 0.90 \pm 0.15 | 0.60 \pm 0.30 | 0.55 \pm 0.25 |
| CS37 | 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 |
| CS75 | 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 |



5. Product Identification



(1) Product Type

| Product Type | |
|--------------|-------------------------------|
| CS | Current Sensing Chip Resistor |

(2) Dimensions(LxW)

| Codes | Dimensions (LxW) | EIA |
|-------|------------------|------|
| CS01 | 0.58x0.29mm | 0201 |
| CS02 | 1.00x0.50mm | 0402 |
| CS03 | 1.60x0.80mm | 0603 |
| CS05 | 2.00x1.25mm | 0805 |
| CS06 | 3.10x1.55mm | 1206 |
| CS13 | 3.00x2.50 mm | 1210 |
| CS10 | 5.00x2.50mm | 2010 |
| CS12 | 6.30x3.10mm | 2512 |
| CS25 | 3.10x6.30mm | 1225 |
| CS37 | 3.75x2.00mm | 3720 |
| CS75 | 7.50x2.00mm | 7520 |

(3) Resistance Tolerance

| Codes | Resistance Tolerance |
|-------|----------------------|
| F | ±1% |
| G | ±2% |
| H | ±3% |
| J | ±5% |

(4) Packaging

| Codes | Type |
|-------|-------------|
| T | Taping Reel |
| B | Bulk |

(5) TCR

| Codes | Type |
|-------|--------------|
| E | ±100 PPM/°C |
| K | ±150 PPM/°C |
| F | ±200 PPM/°C |
| G | ±300 PPM/°C |
| H | ±400 PPM/°C |
| I | ±500 PPM/°C |
| J | ±600 PPM/°C |
| R | ±1000 PPM/°C |

(6) Power Rating

| Codes | Type |
|-------|----------|
| | Standard |
| A | 1.5W |
| T | 1W |
| Q | 3/4W |
| U | 1/2W |
| V | 1/4W |

(7) Resistance

| Codes | Type |
|-------|--------|
| R010 | 0.010Ω |
| R100 | 0.100Ω |
| 1R00 | 1.000Ω |

(8) Special

| Codes | Type |
|-------|------------|
| | Standard |
| N | No Marking |

★ Standard Power Rating Without Code

5-2 Resistance codes example

5-2-1 Remark : 0603 3digit marking for Example :

| Resistance | 1Ω | 0.1Ω | 0.15Ω | 0.01Ω | 0.101Ω | 0.035Ω |
|------------|-----|------|-------|-------|------------|------------|
| Codes | 1R0 | R10 | R15 | R01 | <u>101</u> | <u>035</u> |

5-2-2 Remark : 0805~2512 4digit marking for Example :

| Resistance | 1Ω | 0.1Ω | 0.05Ω | 0.015Ω | 0.01Ω |
|------------|------|------|-------|--------|-------|
| Codes | 1R00 | R100 | R050 | R015 | R010 |



6. Specifications

Standard Electrical Specifications

| Type \ Item | Power Rating at 70°C | Operating Temp. Range | Resistance Tolerance | Resistance Range | TCR (PPM/°C) | |
|-------------|----------------------|-----------------------|----------------------|--|--------------------------------------|--------------|
| CS01(0201) | 1/20W | -55 ~ +155°C | ±1%,±2%,±5% | 50mΩ~149mΩ 150mΩ~500mΩ 501mΩ~1000mΩ | ±1000 ±600 ±300 | |
| CS02 (0402) | 1/16W | | | 50mΩ~100mΩ 101mΩ~500mΩ 501mΩ~1000mΩ | ±400 ±300 ±200 | |
| CS03 (0603) | 1/10W | | | 20mΩ~50mΩ 51mΩ~100mΩ 101 mΩ~500mΩ 501mΩ~1000mΩ | ±600 ±400 ±300 ±200 | |
| CS05 (0805) | 1/8W | | | 20mΩ~50mΩ 51mΩ~100mΩ 101mΩ~500mΩ 501mΩ~1000mΩ | ±600 ±400 ±300 ±200 | |
| CS06 (1206) | 1/4W | | | 10mΩ~20mΩ 21mΩ~50mΩ 51mΩ~500mΩ 501mΩ~1000mΩ | ±600 ±400 ±300 ±200 | |
| CS13(1210) | 1/2W | | | | | |
| CS10 (2010) | 3/4W | | | | | |
| CS12 (2512) | 1W | | | | | |
| CS25 (1225) | 3W | | | 3mΩ~5mΩ 6mΩ~20mΩ 21mΩ~30mΩ 31mΩ~250mΩ 251mΩ~8Ω | ±300 ±200 ±150 ±100 ±200 | |
| CS37 (3720) | 1W | | | 10mΩ~19mΩ 20mΩ~500mΩ | ±300 ±150 | |
| CS75 (7520) | 2W | | | ±2%,±5% | 1mΩ~4mΩ | ±300 |
| | | | | ±1%,±2%,±5% | 5mΩ~10mΩ 11mΩ~350mΩ | ±200 ±150 |

High Power Rating Electrical Specifications

| Type \ Item | Power Rating at 70°C | Operating Temp. Range | Resistance Tolerance | Resistance Range |
|--------------|----------------------|-----------------------|----------------------|------------------|
| CS05□T□V□□□□ | 1/4W | -55 ~ +155°C | ±1%,±2%,±5% | 100mΩ~1000mΩ |
| CS06□T□U□□□□ | 1/2W | | | 100mΩ~1000mΩ |
| CS13□T□Q□□□□ | 3/4W | | | 100mΩ~1000mΩ |
| CS10□T□T□□□□ | 1W | | | 100mΩ~1000mΩ |
| CS12□T□A□□□□ | 1.5W | | | 100mΩ~1000mΩ |



Low TCR Electrical Specifications

| Type \ Item | Power Rating at 70°C | Operating Temp. Range | Resistance Tolerance | Resistance Range | TCR (PPM/°C) |
|-------------|----------------------|-----------------------|----------------------|------------------|--------------|
| CS06□TE□□□□ | 1/4W | -55 ~ +155°C | ±1% ±2% ±5% | 100mΩ~1000mΩ | ±100 |
| CS13□TE□□□□ | 1/2W | | | 100mΩ~1000mΩ | ±100 |
| CS10□TE□□□□ | 3/4W | | | 100mΩ~1000mΩ | ±100 |
| CS12□TE□□□□ | 1W | | | 100mΩ~1000mΩ | ±100 |
| CS37□TE□□□□ | 1 W | | | 100mΩ~500mΩ | ±100 |
| CS75□TE□□□□ | 2W | | | 50mΩ~350mΩ | ±100 |

Operating Current $I=\sqrt{P/R}$, Operating Voltage $V=\sqrt{P*R}$

*We are capable to manufacture the optional spec based on customer's requirement.

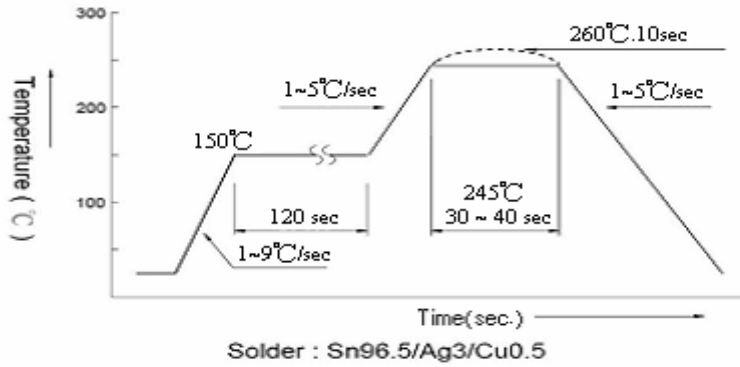
7. Electrical Characteristics

| Item | Specification | Test Method |
|---|-----------------------------|---|
| 1 Temperature Coefficient of Resistance | As Spec | MIL-STD-202F Method 304 +25/-55/+25/+125/+25°C |
| 2 Short Time Overload | ±0.5% | JIS-C-5202-5.5 RCWV*2.5 or Max Overloading Voltage 5 seconds |
| | ΔR±1% for high power rating | |
| 3 Dielectric Withstand Voltage | by Type | MIL-STD-202F Method 301 Apply Max Overload Voltage for 1 minute |
| 4 Insulation Resistance | >1000MΩ | MIL-STD-202F Method 302 Apply 100VDC for 1minute |
| 5 Thermal Shock | ±0.5% | MIL-STD-202F Method 107G -55°C ~ 150°C, 100cycles |
| 6 Load Life | ±1% | MIL-STD-202F Method 108A RCWV, 70°C, 1.5 hours on, 0.5 hours off Total 1000~1048 hours |
| 7 Humidity (Steady State) | ±0.5% | MIL-STD-202F Method 103B 40°C , 90~95%RH , RCWV 1.5 hours ON , 0.5 hours OFF , total 1000 ~ 1048 hours |
| 8 Resistance to Dry Heat | ±0.5% | JIS-C-5202-7.2 96hours @ +155°C without load |
| 9 Low Temperature Operation | ±0.5% | JIS-C-5202-7.1 1hour, -65°C followed by 45 minutes of RCWV |
| 10 Bending Strength | AS SPEC. | JIS-C-5202-6.1.4 Bending Amplitude 3mm for 10 seconds |
| 11 Solderability | 95%min coverage | MIL-STD-202F Method 208H 245°C±5°C 3±0.5 (sec) |
| 12 Resistance to Soldering Heat | ±0.5% | MIL-STD-202F Method 210E 260±5°C, 10±1 seconds |

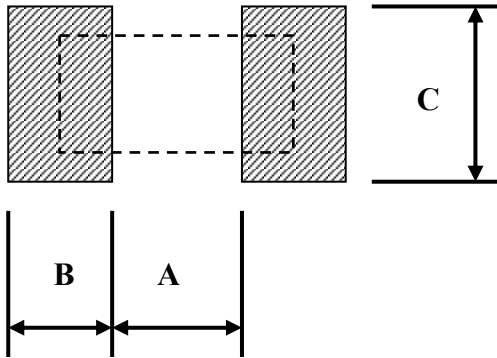
* Storage Temperature : $25\pm 3^{\circ}\text{C}$; Humidity $< 80\% \text{RH}$

8. Reflow

Soldering profile (Lead-free)



9.Recommend Land Pattern

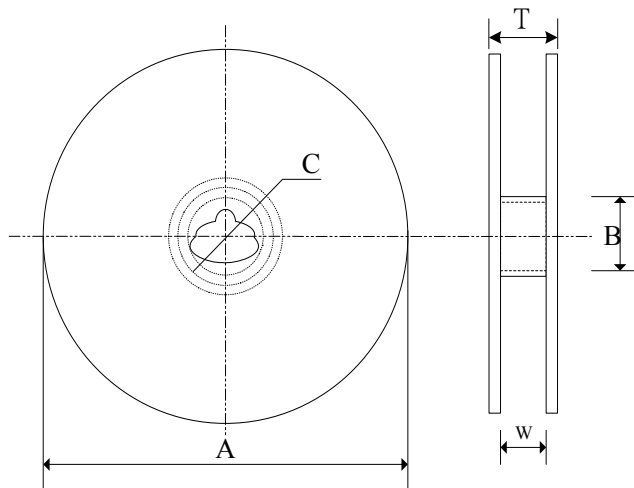


Unit : mm

| Codes | A | B | C |
|-------|------|------|---------------|
| CS01 | 0.25 | 0.30 | 0.40 ± 0.2 |
| CS02 | 0.50 | 0.50 | 0.60 ± 0.2 |
| CS03 | 0.80 | 1.00 | 0.90 ± 0.2 |
| CS05 | 1.00 | 1.00 | 1.35 ± 0.2 |
| CS06 | 2.00 | 1.15 | 1.70 ± 0.2 |
| CS13 | 2.00 | 1.15 | 2.5 ± 0.2 |
| CS10 | 3.60 | 1.40 | 2.50 ± 0.2 |
| CS12 | 4.90 | 1.60 | 3.10 ± 0.2 |
| CS25 | 2.00 | 2.00 | 6.40 ± 0.2 |
| CS37 | 1.00 | 1.80 | 3.90 ± 0.2 |
| CS75 | 1.00 | 1.80 | 7.60 ± 0.2 |

10. Packaging

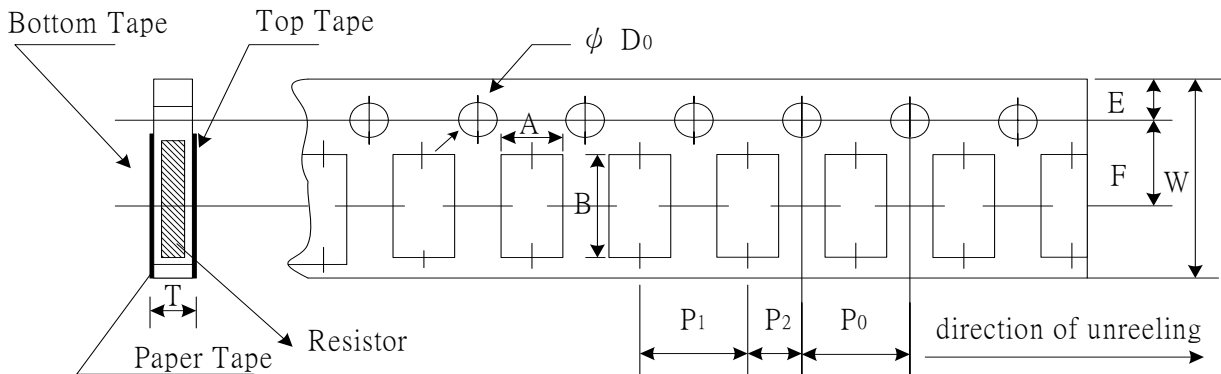
10-1-1 Packaging Quantity & Reel Specifications



Unit :mm

| Packaging Codes | ϕA | ΦB | ϕC | W | T | Paper Tape (EA) | Emboss Plastic Tape (EA) |
|-----------------|-----------|----------|----------|----------|----------|-----------------|--------------------------|
| CS01 | 178.0±1.0 | 60.0+1.0 | 13.5±0.7 | 9.5±0.1 | 11.5±1.0 | 10,000 | |
| CS02 | 178.0±1.0 | 60.0+1.0 | 13.5±0.7 | 9.5±0.1 | 11.5±1.0 | 10,000 | - |
| CS03 | 178.0±1.0 | 60.0+1.0 | 13.5±0.7 | 9.5±0.1 | 11.5±1.0 | 5,000 | - |
| CS05 | 178.0±1.0 | 60.0+1.0 | 13.5±0.7 | 9.5±0.1 | 11.5±1.0 | 5,000 | - |
| CS06 | 178.0±1.0 | 60.0+1.0 | 13.5±0.7 | 9.5±0.1 | 11.5±1.0 | 5,000 | - |
| CS13 | 178.0±1.0 | 60.0+1.0 | 13.5±0.7 | 9.5±0.1 | 11.5±1.0 | 5,000 | |
| CS10 | 178.0±1.0 | 60.0+1.0 | 13.5±0.7 | 13.5±1.0 | 15.5±1.0 | - | 4,000 |
| CS12 | 178.0±1.0 | 60.0+1.0 | 13.5±0.7 | 13.5±1.0 | 15.5±1.0 | - | 4,000 |
| CS25 | 178.0±1.0 | 60.0+1.0 | 13.5±0.7 | 13.5±1.0 | 15.5±1.0 | - | 2,000 |
| CS37 | 178.0±1.0 | 60.0+1.0 | 13.5±0.7 | 13.5±1.0 | 15.5±1.0 | - | 2,000 |
| CS75 | 178.0±1.0 | 60.0+1.0 | 13.5±0.7 | 17.5±1.0 | 19.5±1.0 | - | 2,000 |

10-1-2 Paper Tape Specifications



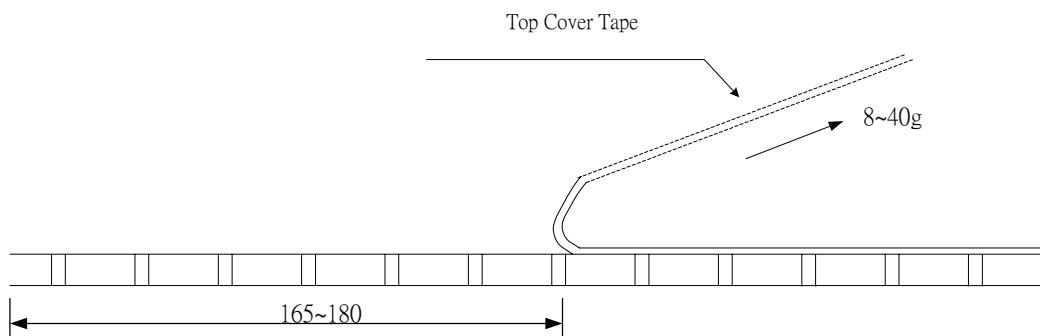
Unit: mm

| Codes | A | B | W | E | F | P0 | P1 | P2 | ϕD_0 | T |
|-------|-----------|-----------|-----------|-----------|----------|-----------|-----------|-----------|------------|------------|
| CS01 | 0.40±0.05 | 0.70±0.05 | 8.00±0.10 | 1.75±0.05 | 3.5±0.05 | 4.00±0.10 | 2.00±0.05 | 2.00±0.05 | 1.55±0.05 | 0.265±0.05 |
| CS02 | 0.70±0.05 | 1.16±0.05 | 8.00±0.10 | 1.75±0.05 | 3.5±0.05 | 4.00±0.10 | 2.00±0.05 | 2.00±0.05 | 1.55±0.05 | 0.40±0.03 |
| CS03 | 1.10±0.05 | 1.90±0.05 | 8.00±0.10 | 1.75±0.05 | 3.5±0.05 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.55±0.05 | 0.60±0.03 |
| CS05 | 1.60±0.05 | 2.37±0.05 | 8.00±0.10 | 1.75±0.05 | 3.5±0.05 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.55±0.05 | 0.75±0.05 |
| CS06 | 2.00±0.05 | 3.55±0.05 | 8.00±0.10 | 1.75±0.05 | 3.5±0.05 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.55±0.05 | 0.75±0.05 |
| CS13 | 2.75±0.05 | 3.4±0.05 | 8.00±0.10 | 1.75±0.05 | 3.5±0.05 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.55±0.05 | 0.75±0.05 |

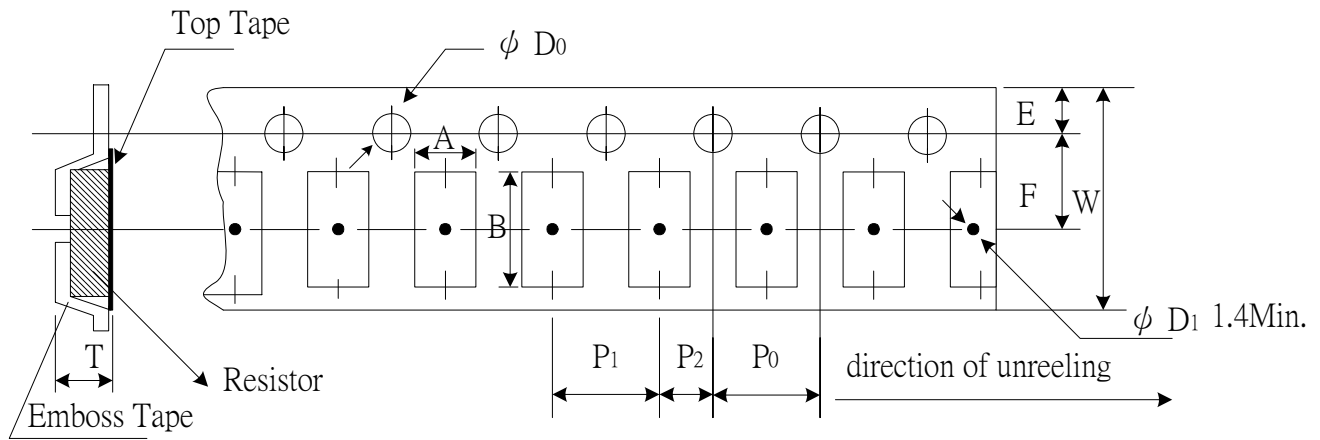
Peel force of top cover tape

The peel speed shall be about 300mm/min±5%

The peel force of top cover tape shall be between 8 and 40g



10-1-3 Emboss Plastic Tape Specifications



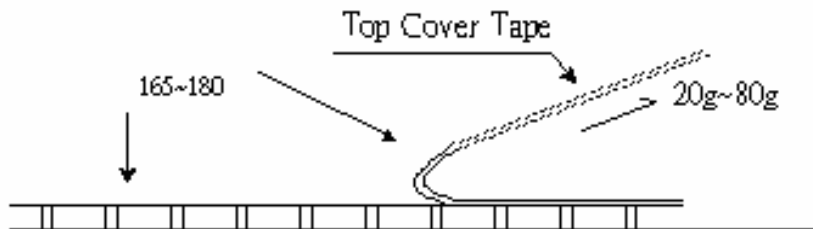
Unit: mm

| Codes | A | B | W | E | F | P ₀ | P ₁ | P ₂ | φ D ₀ | T |
|-------|-----------|-----------|-----------|-----------|----------|----------------|----------------|----------------|------------------|-----------|
| CS10 | 2.85±0.10 | 5.45±0.10 | 12.0±0.10 | 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 |
| CS12 | 3.40±0.10 | 6.65±0.10 | 12.0±0.10 | 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 |
| CS25 | 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 |

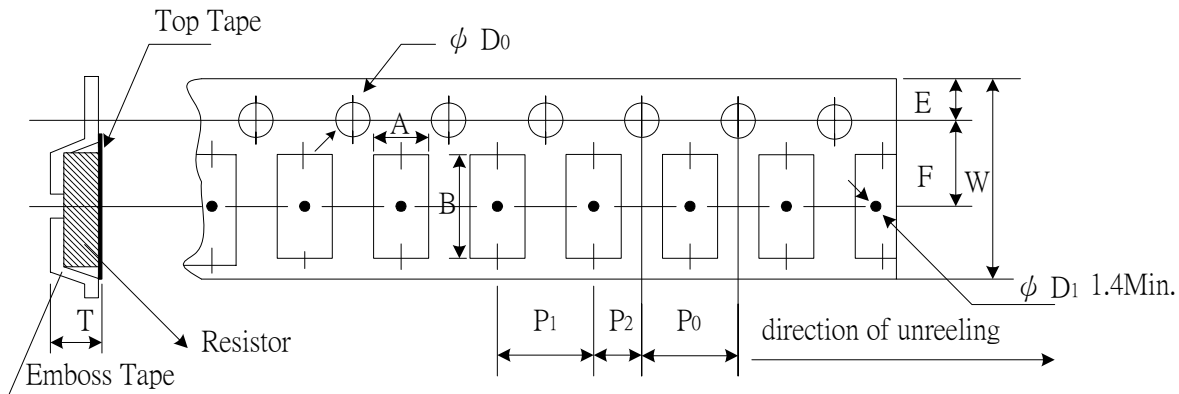
Peel force of top cover tape

The peel speed shall be about 300mm/min±5%

The peel force of top cover tape shall be between 20g and 80g



10-1-4 Emboss Plastic Tape Specifications



Unit: mm

| Codes | A | B | W | E | F | P ₀ | P ₁ | P ₂ | ϕD_0 | T |
|-------|-----------|-----------|-----------|-----------|----------|----------------|----------------|----------------|------------|------------|
| CS37 | 2.50±0.20 | 4.45±0.20 | 12.0±0.30 | 1.75±0.01 | 5.5±0.05 | 4.00 ±0.05 | 4.00±0.10 | 2.00±0.05 | 1.50+0.10 | 1.50 ±0.10 |
| CS75 | 2.50±0.20 | 8.30±0.20 | 16.0±0.30 | 1.75±0.01 | 7.8±0.05 | 4.00±0.05 | 4.00±0.10 | 2.00±0.05 | 1.50+0.10 | 1.50 ±0.10 |

Peel force of top cover tape

The peel speed shall be about 300mm/min±5%

The peel force of top cover tape shall be between 20g and 80g

