



# Current Sensing Resistors

## Thin Film Current Sensing Chip Resistors - TCS Series / 薄膜电流感测贴片电阻

### ► Features

- Thin Film Process
- Very Tight Tolerance from  $\pm 0.5\% \sim \pm 1\%$
- Extremely Low TCR from  $\pm 50 \sim \pm 200 \text{ PPM}/^\circ\text{C}$
- Resistance Values from 50m to 999m ohms
- High Purity Alumina Substrate for High Power Dissipation
- Products with Pb-free Terminations Meet RoHS Requirements

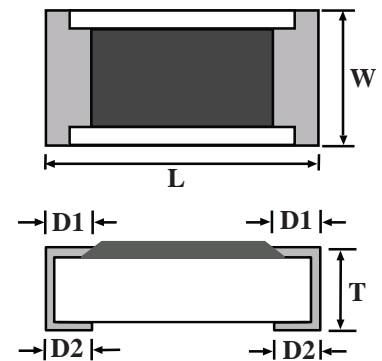
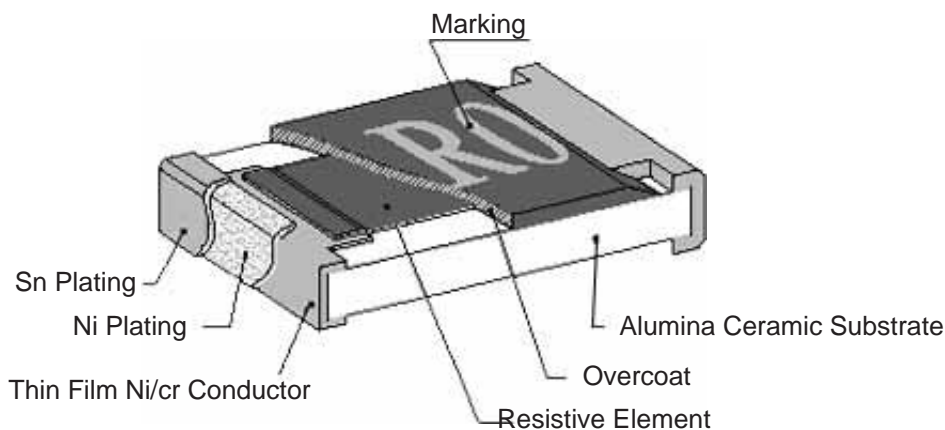
### ► Applications

- 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)



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### ► Chip Current Sensing Resistor Construction



### ► Dimensions (Unit: mm)

Type	L	W	T	D1	D2
TCS02	1.00±0.05	0.50±0.05	0.32±0.10	0.25±0.10	0.20±0.10
TCS03	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20
TCS05	2.00±0.15	1.25±0.15	0.55±0.10	0.30±0.20	0.40±0.25
TCS06	3.05±0.15	1.55±0.15	0.55±0.10	0.50±0.30	0.40±0.25
TCS10	5.00±0.20	2.45±0.15	0.60±0.15	0.60±0.30	0.50±0.25
TCS12	6.35±0.20	3.15±0.15	0.60±0.10	0.60±0.30	0.55±0.25



# Current Sensing Resistors

## ► Standard Electrical Specifications - Current Sensing Chip Resistors

Type	Power Rating at 70°C	Operating Temp. Range	Resistance Tolerance	Resistance Range	TCR (PPM/°C)
TCS02 (0402)	1/16W	-55 ~ +155°C	±0.5% ±1.0%	500mΩ~999mΩ	±100 ±50
TCS03 (0603)	1/10W		±0.5% ±1.0%	200mΩ~300mΩ 301mΩ~999mΩ	±100 ±50
TCS05 (0805)	1/8W		±1.0%	50mΩ~100mΩ	±200 ±100 ±50
TCS06 (1206)	1/4W		±0.5% ±1.0%	101mΩ~300mΩ 301mΩ~999mΩ	
TCS10 (2010)	3/4W		±0.5% ±1.0%	50mΩ~100mΩ 101mΩ~300mΩ 301mΩ~999mΩ	
TCS12 (2512)	1W				

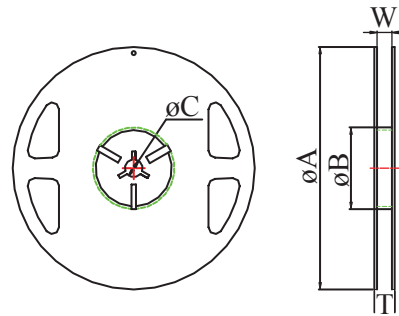
Note:Token has the ability to manufacture following options based on customer's requirement.

## ► High Power Rating Electrical Specifications

Type	Power Rating at 70°C	Operating Temp. Range	Resistance Tolerance	Resistance Range	TCR (PPM/°C)
TCS12 (2512)	3W	-55 ~ +155°C	±1.0%	100mΩ~1Ω	±100

## ► Chip Current Sensing Resistor Marking for 0603

Marking	Value
1R0	1.000Ω
R10	0.100Ω
R01	0.010Ω
<u>101</u>	0.101Ω
<u>035</u>	0.035Ω



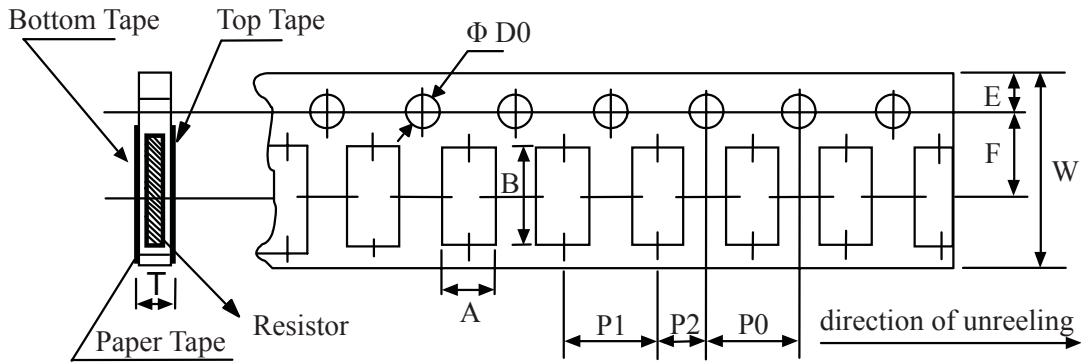
## ► Packaging Quantity & Reel Specifications (Unit: mm)

Type	ΦA	ΦB	ΦC	W	T	Paper Tape	Emboss Plastic Tape
TCS02	178±1	60.0+0.5	13.0±0.20	9.00±0.50	12.0±0.15	10,000	-
TCS03	178±1	60.0+0.5	13.0±0.20	9.00±0.50	12.0±0.15	5,000	-
TCS05	178±1	60.0+0.5	13.0±0.20	9.00±0.50	12.0±0.15	5,000	-
TCS06	178±1	60.0+0.5	13.0±0.20	9.00±0.50	12.0±0.15	5,000	-
TCS10	178±1	60.2±0.5	13.0±0.50	13.2±1.50	16.0±0.20	-	4,000
TCS12	178±1	60.2±0.5	13.0±0.50	13.2±1.50	16.0±0.20	-	4,000



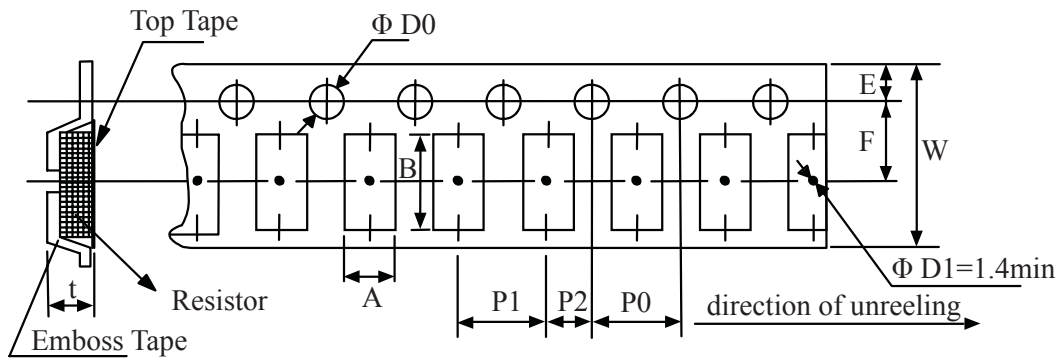
# Current Sensing Resistors

## ► TCS Resistors - Paper Tape Specifications (Unit: mm)



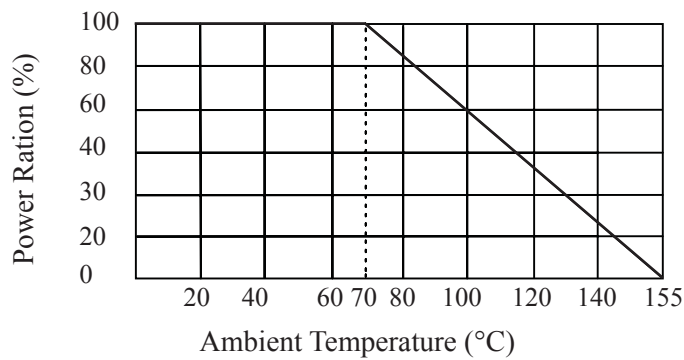
Type	A	B	W	E	F	P0	P1	P2	ΦD0	T
TCS02	0.70±0.05	1.16±0.05	8.00±0.10	1.75±0.05	3.50±0.05	4.00±0.10	2.00±0.10	2.00±0.05	1.55±0.05	0.40±0.03
TCS03	1.10±0.05	1.90±0.05	8.00±0.10	1.75±0.05	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.60±0.03
TCS05	1.60±0.05	2.37±0.05	8.00±0.10	1.75±0.05	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.75±0.05
TCS06	2.00±0.05	3.55±0.05	8.00±0.10	1.75±0.05	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.75±0.05

## ► TCS Resistors - Emboss Plastic Tape Specifications (Unit: mm)



Type	A	B	W	E	F	P0	P1	P2	ΦD0	T
TCS10	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
TCS12	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

## ► Derating Curve





# Current Sensing Resistors

## ► Environmental Characteristics - Chip Current Sensing Resistor

Item	Specification	Test Method
Temperature Coefficient of Resistance	As Spec	MIL-STD-202F Method 304 +25/-55/+25/+125/+25°C
Short Time Overload	±0.5%	JIS-C-5202-5.5 RCWV*2.5 or Max Overloading Voltage 5seconds
Dielectric Withstand Voltage	by Type	MIL-STD-202F Method 301 Apply Max Overload Voltage for 1 minute
Insulation Resistance	>1000MΩ	MIL-STD-202F Method 302 Apply 100VDC for 1minute
Thermal Shock	±0.5%	MIL-STD-202F Method 107G -55°C~150°C, 100cycles
Load Life	±1%	MIL-STD-202F Method 108A RCWV, 70°C, 1.5 hours on , 0.5 hours off , Total 1000~1048 hours
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
Resistance to dry heat	±0.5%	JIS-C-5202-7.2 96hours @ +155°C without load
Low Temperature Operation	±0.5%	JIS-C-5202-7.1 1hour, -65°C followed by 45minutes of RCWV
Bending Strength	As Spec	JIS-C-5202-6.1.4 Bending Amplitude 3mm for 10seconds
Solderability	95%min coverage	MIL-STD-202F Method 208H 245°C±5°C, 2±0.5 (sec)
Resistance to Soldering Heat	±0.5%	MIL-STD-202F Method 210E 260±5°C, 10±1 second

Note: Storage Temperature: 25±3°C; Humidity: <80%RH





# Current Sensing Resistors

## ► How to Order

TCS	12	J	T	F	S	R010	N
①	②	③	④	⑤	⑥	⑦	⑧

### ① Product Type

### ② Dimensions (L×W)

Code	Dimensions (L×W)	
02	1.00×0.50mm	0402
03	1.60×0.80mm	0603
05	2.00×1.25mm	0805
06	3.10×1.55mm	1206
10	5.00×2.50mm	2010
12	6.30×3.10mm	2512

### ③ Resistance Tolerance

Code	Resistance Tolerance
J	±5%
F	±1%
D	±0.5%

### ④ Packaging

Code	Packaging
T	Taping Reel
P	Bulk

### ⑤ TCR

Code	TCR
D	±50PPM/°C
E	±100PPM/°C
F	±200PPM/°C

### ⑥ Power Rating

Code	Power Rating
R	3W
S	2W
A	1.5W
T	1W
Q	3/4W
U	1/2W
V	1/4W
W	1/8W
X	1/10W
Y	1/16W
Z	1/32W

### ⑦ Resistance

Code	Resistance
R010	0.010Ω
R100	0.100Ω
1R00	1.000Ω
R100	0.100Ω

### ⑧ Marking

Code	Standard Marking
N	No Marking