

Thin Film Current Sense Chip Resistors

TCS Surface Mount Resistors Make Sense of Current

▶ Preview

The trend towards smaller handheld and portable electronics equipment has also increased the need for ultra small current sensing resistors. Devices from the Token Electronics' TCS series use a thin film construction that enables them to achieve precision resistance tolerances, low noise and long-term stability.

The Token TCS Series precision resistors are nichrome thin film chip resistors with a temperature coefficient of resistance of just $\pm 50\text{PPM}/^\circ\text{C}$ and tolerances of $\pm 0.5\%$.

They offer excellent stability at high frequencies and are suitable for operating high voltages with more options in the smaller form sizes of 0402, 0603, 0402, 0805, 1206, 2010, and 2512.

The full range of values is from $50\text{m}\Omega$ to 1Ω . This low ohmic devices are particularly suited to car engine management units to act as current sensing shunt resistors.

The TCS series is fully RoHS compliant and is supplied in tape and reel packaging ready for use with automated assembly processes.

Contact us with your specific needs.

▶ Features

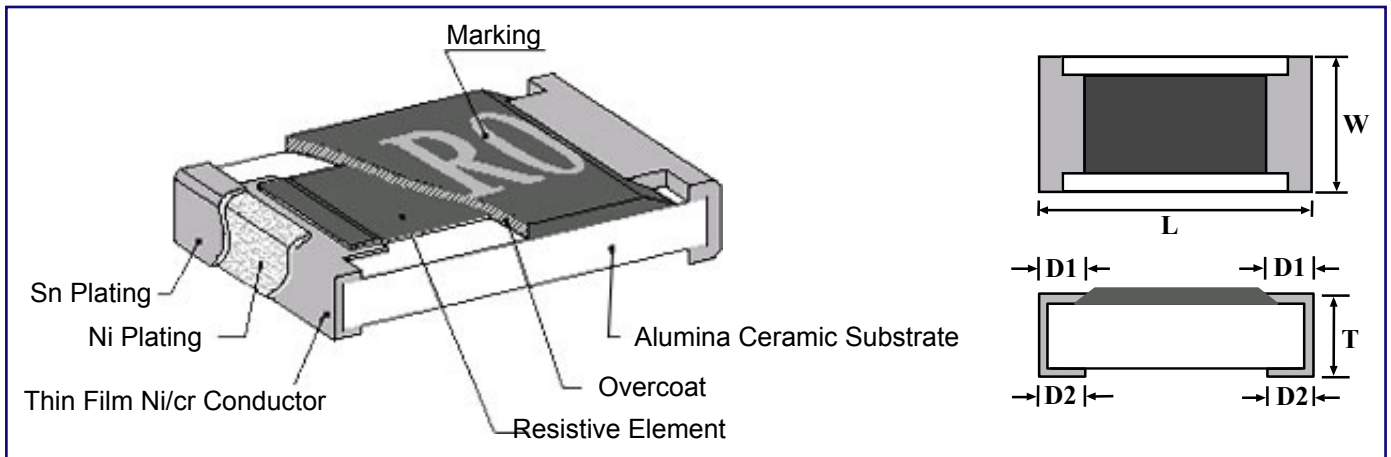
- Thin Film Process.
- Resistance Values from $50\text{m}\Omega$ to 1Ω .
- Very Tight Tolerance from $\pm 1\%$ to $\pm 0.5\%$.
- RoHS Requirements with Pb-free Terminations.
- Extremely Low TCR from $\pm 200\text{PPM}/^\circ\text{C}$ to $\pm 50\text{PPM}/^\circ\text{C}$.
- High Purity Alumina Substrate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



▶ Applications

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

► 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

► Standard Electrical Specifications

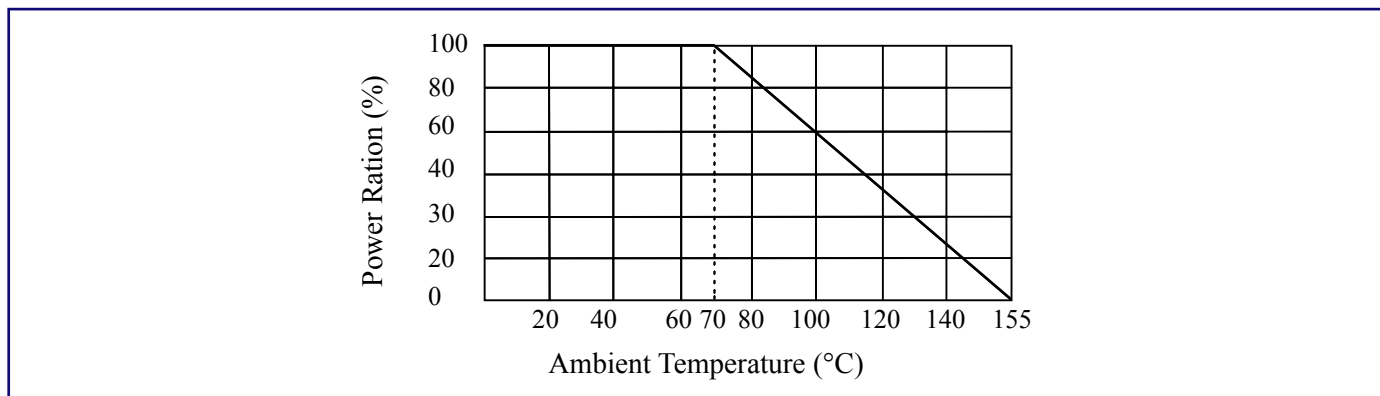
Type	Power Rating at 70°C	Operating Temp. Range	Resistance Tolerance	Resistance Range	TCR (PPM/°C)
TCS02 (0402)	1/16W	-55 ~ +155°C	±0.5% ±1.0%	500mΩ~999mΩ	±100 ±50
TCS03 (0603)	1/10W		±0.5% ±1.0%	200mΩ~300mΩ 301mΩ~999mΩ	±100 ±50
TCS05 (0805)	1/8W		±1.0%	50mΩ~100mΩ	±200 ±100
TCS06 (1206)	1/4W		±0.5% ±1.0%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

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

▶ Power Derating Curve



▶ Environmental Characteristics

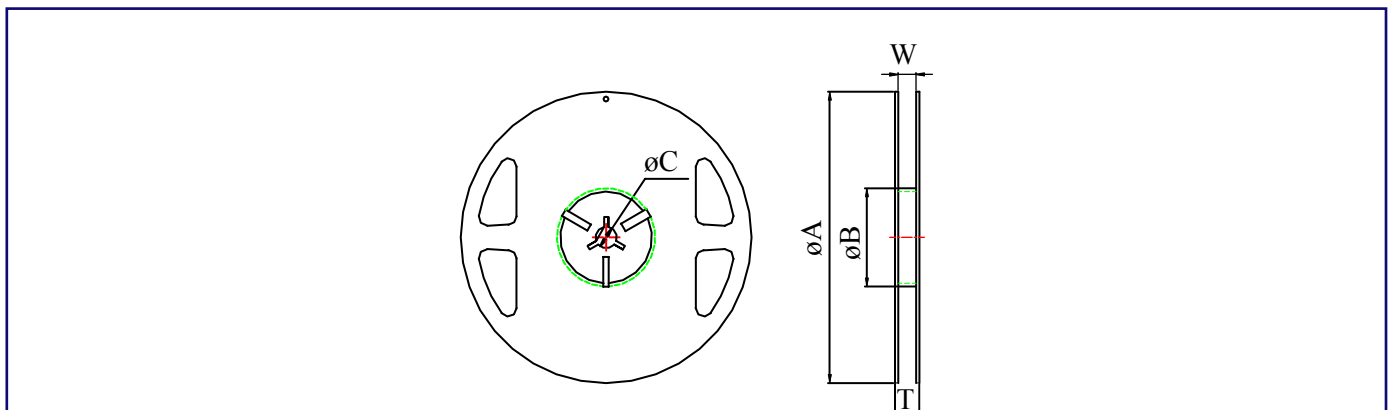
Item	Specification	Test Method
Temperature Coefficient of Resistance	As Spec	MIL-STD-202F Method 304 +25/-55/+25/+125/+25°C
Short Time Overload	±0.5%	JIS-C-5202-5.5 RCWV*2.5 or Max Overloading Voltage 5seconds
Dielectric Withstand Voltage	by Type	MIL-STD-202F Method 301 Apply Max Overload Voltage for 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

▶ Marking for 0603

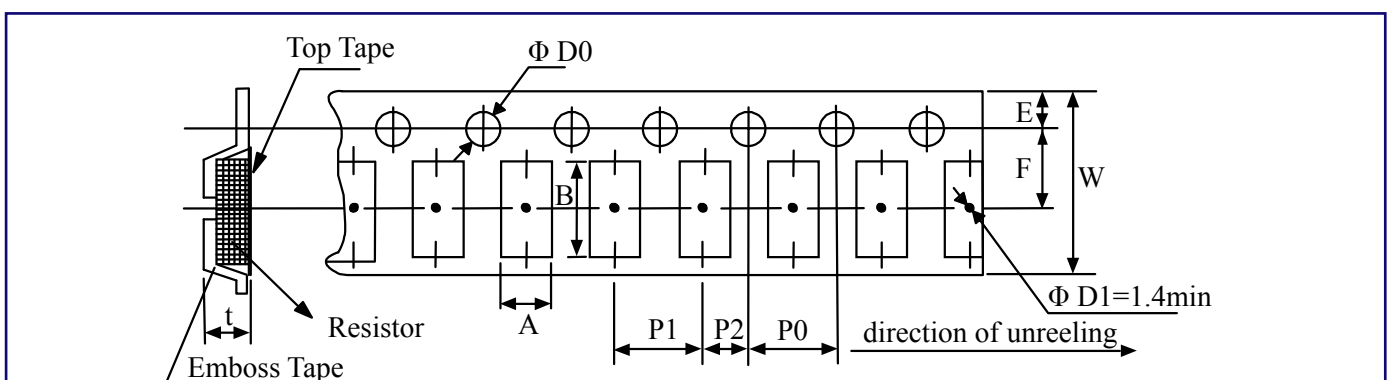
Marking	Value
1R0	1.000Ω
R10	0.100Ω
R01	0.010Ω
<u>101</u>	0.101Ω
<u>035</u>	0.035Ω

▶ Packaging Quantity & Reel Specifications



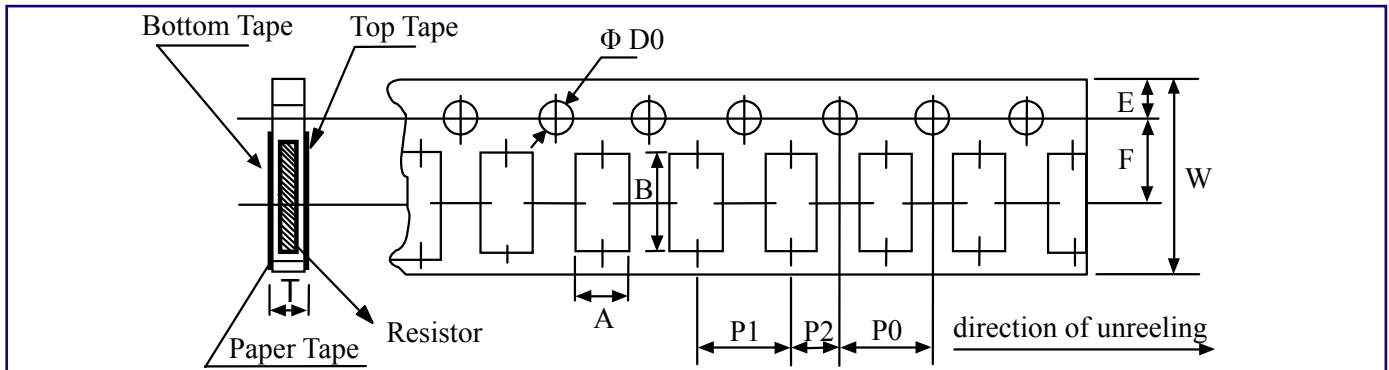
Type	ΦA	ΦB	ΦC	W	T	Paper Tape	Emboss Plastic Tape
TCS02	178±1	60.0±0.5	13.0±0.20	9.00±0.50	12.0±0.15	10,000	-
TCS03	178±1	60.0±0.5	13.0±0.20	9.00±0.50	12.0±0.15	5,000	-
TCS05	178±1	60.0±0.5	13.0±0.20	9.00±0.50	12.0±0.15	5,000	-
TCS06	178±1	60.0±0.5	13.0±0.20	9.00±0.50	12.0±0.15	5,000	-
TCS10	178±1	60.2±0.5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

▶ Emboss Plastic Tape Specifications



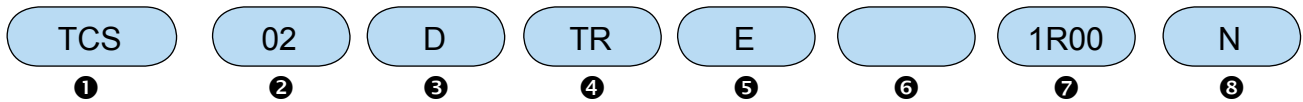
Type	A	B	W	E	F	P0	P1	P2	ΦD0	T
TCS10	2.85±0.10	5.45±0.10	12.0±0.10	1.75±0.10	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50±0.10	1.00±0.20
TCS12	3.40±0.10	6.65±0.10	12.0±0.10	1.75±0.10	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50±0.10	1.00±0.20

Paper Tape Specifications



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

How to Order



1 Part Number

2 Dimensions (L×W)

Code	Dimensions (L×W)	
01	0.58×0.29mm	0201
02	1.00×0.50mm	0402
03	1.60×0.80mm	0603
05	2.00×1.25mm	0805
06	3.10×1.55mm	1206
13	3.00×2.50mm	1210
10	5.00×2.50mm	2010
12	6.30×3.10mm	2512
25	3.10×6.30mm	1225
37	3.75×2.00mm	3720
75	7.50×2.00mm	7520

3 Resistance Tolerance

Code	Resistance Tolerance
J	±5%
g	±2%
F	±1%

4 Packaging

Code	Packaging
TR	Taping Reel
P	Bulk

5 TCR

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

6 Power Rating

Code	Power Rating
S	2W
A	1.5W
T	1W
Q	3/4W
U	1/2W
V	1/4W
W	1/8W

7 Resistance

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

8 Marking

Code	Standard Marking
	Standard
N	No Marking

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