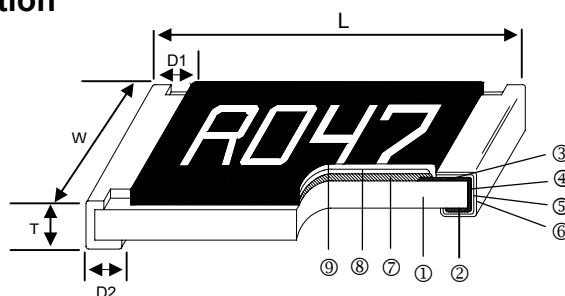


## Thin Film Current Sensing Chip Resistor – TCS Series

### Construction



① Alumina Substrate	④ Edge Electrode (NiCr)	⑦ Resistor Layer (NiCr)
② Bottom Electrode (Ag)	⑤ Barrier Layer (Ni)	⑧ Overcoat (Epoxy)
③ Top Electrode (Ag-Pd)	⑥ External Electrode (Sn)	⑨ Marking

### Features

- Thin film process
- High power rating up to 3 Watts in 2512 size
- Tight tolerance down to  $\pm 0.5\%$
- Extremely low TCR down to  $\pm 50$  PPM/ $^{\circ}\text{C}$
- Resistance values from 50m to 1ohm
- High purity alumina substrate for high power dissipation

### 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

### Dimensions

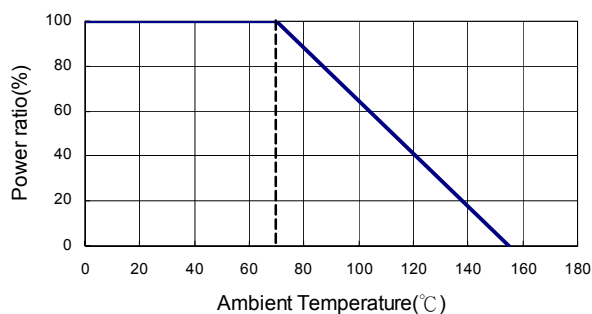
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
TCS02	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	0.56
TCS03	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	3.1
TCS05	0805	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	5.6
TCS06	1206	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	12.3
TCS10	2010	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	26.7
TCS12	2512	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	49.6

### Part Numbering

TCS	12	F	T	E		R010	N
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/ $^{\circ}\text{C}$ )	Power Rating	Resistance	Marking
	02: 0402 03: 0603 05: 0805 06: 1206 10: 2010 12: 2512	D: $\pm 0.5\%$ F: $\pm 1\%$	T: Taping Reel B: Bulk	D: $\pm 50$ E: $\pm 100$ F: $\pm 200$	: Standard R: 3W	R010: 0.01 $\Omega$ R100: 0.1 $\Omega$ 1R00: 1 $\Omega$	: Standard N: No Marking

### Derating Curve



## Standard Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Resistance Range (mΩ)		TCR (PPM/°C)
			±0.5%	±1%	
TCS02 (0402)	1/16W	-55~+155°C	500 - 1000		±100 ±50
TCS03 (0603)	1/10W	-55~+155°C	200 - 300 301 - 1000		±100 ±50
TCS05 (0805)	1/8W		200 - 300 301 - 1000		±100 ±50
TCS06 (1206)	1/4W	-55~+155°C	—	50 - 100	±200 ±100 ±50
			101 - 300 301 - 1000		
TCS10 (2010)	3/4W	-55~+155°C	50 - 100 101 - 300 301 - 1000		±200 ±100 ±50
TCS12 (2512)	1W	-55~+155°C	50 - 100 101 - 300 301 - 1000		±200 ±100 ±50

## High Power Rating Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Resistance Range (mΩ)		TCR (PPM/°C)
			±1%		
TCS12 (2512)	3W	-55~+155°C	100 - 1000		±100

Operating Voltage= $\sqrt{P \cdot R}$

Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

## Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	+25/-55/+25/+125/+25°C
Short Time Overload	±1%	RCWV*2.5 or Max. overload voltage for 5 seconds
Insulation Resistance	>1000MΩ	Apply 100V <sub>DC</sub> for 1 minute
Endurance	±1%	70±2°C, Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	±0.5%	40±2°C, 90~95% R.H. Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Bending Strength	As Spec.	Bending amplitude 3mm for 10 seconds
Solderability	95% min. coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	±0.5%	260±5°C for 10 seconds
Dielectric Withstand Voltage	By Type	Apply Max. Overload Voltage for 1 minute
Thermal Shock	±0.5%	-55°C ~150°C, 100 cycles
Low Temperature Operation	±0.5%	1 hour, -65°C followed by 45 minutes of RCWV

■ Reference Standards: MIL-STD-202, JIS-C 5201-1

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

## ■ Marking for 0603

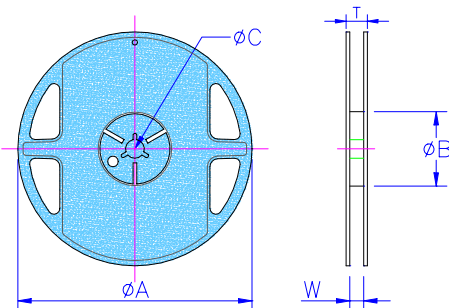
Codes	Type
1R0	1.000Ω
R10	0.100Ω
R01	0.010Ω
<u>101</u>	0.101Ω
<u>035</u>	0.035Ω

## ■ Packaging

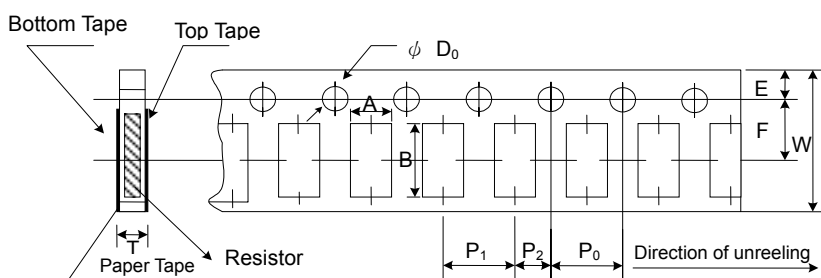
### Packaging Quantity & Reel Specifications

Unit: mm

Type	ΦA	ΦB	ΦC	W	T	Paper Tape (EA)	Embossed Plastic Tape (EA)
TCS02	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 1.0	11.5 ± 1.0	10,000	-
TCS03	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 1.0	11.5 ± 1.0	5,000	-
TCS05	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 1.0	11.5 ± 1.0	5,000	-
TCS06	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 1.0	11.5 ± 1.0	5,000	-
TCS10	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	13.5 ± 1.0	15.5 ± 1.0	-	4,000
TCS12	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	13.5 ± 1.0	15.5 ± 1.0	-	4,000



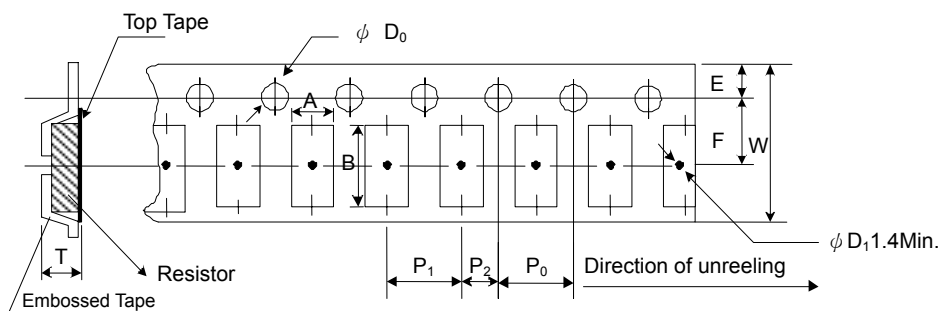
### Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	ΦD <sub>0</sub>	T
TCS02	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
TCS03	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
TCS05	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
TCS06	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

### Embossed Plastic Tape Specifications



Unit: mm

Type	A	B	W	E	F	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	ΦD <sub>0</sub>	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