Data Sheet

Customer：	
Product：	Thin Film Current Sensing Chip Resistor –TCS Series
Size：	0402/0603/0805/1206/2010/2512
Issued Date：	1-Jul-24
Edition :	REV.B8

RoHS Compliant

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1-Jul-24	1-Jul-24	1-Jul-24	1-Jul-24	
Chun	***Ben Chang***	***Ben Chang***		

Thin Film Current Sensing Chip Resistor
(TCS Series)



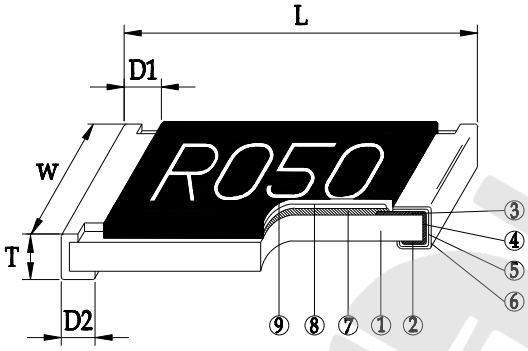
■Features

- Thin film process
- High power rating up to 3 Watts in 2512 size
- Tight tolerance down to ±0.5%
- Extremely low TCR down to ±50 PPM/°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
- Disk Driver
- Portable Devices (PDA, Cell Phone)

■Construction



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

■Dimensions

Unit: mm

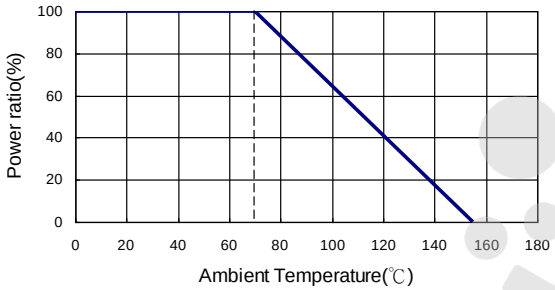
Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
TCS02	0402	1.00±0.05	0.50±0.05	0.32±0.10	0.25±0.10	0.20±0.10	0.56
TCS03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	3.1
TCS05	0805	2.00±0.15	1.25±0.15	0.55±0.10	0.30±0.20	0.40±0.25	5.6
TCS06	1206	3.05±0.15	1.55±0.15	0.55±0.10	0.50±0.30	0.40±0.25	12.3
TCS10	2010	5.00±0.20	2.45±0.15	0.60±0.15	0.60±0.30	0.50±0.25	26.7
TCS12	2512	6.35±0.20	3.15±0.15	0.60±0.10	0.60±0.30	0.55±0.25	49.6
TCS12(3W)	2512	6.35±0.20	3.15±0.15	0.75±0.10	0.60±0.30	0.55±0.25	49.6

■Part Numbering

TCS	12	F	T	E		R050	
Product Type	Dimensions (L×W)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking
	02: 0402 03: 0603 05: 0805 06: 1206 10: 2010 12: 2512	D: ±0.5% F: ±1%	T: Taping Reel B: Bulk	D: ±50 E: ±100 F: ±200	: Standard* (See Remark) R: 3W	R050: 0.05Ω R100: 0.1Ω 1R00: 1Ω	: Standard N: No Marking

*Remark: Standard part no need for power rating code.

■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)
			±0.5%	±1%	
TCS12 (2512)	3W	-55~+155°C	100 - 1000		±100

Operating Voltage=$\sqrt{}$(P*R)

Overload Voltage=2.5*$\sqrt{}$(P*R)

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

■Environmental Characteristics

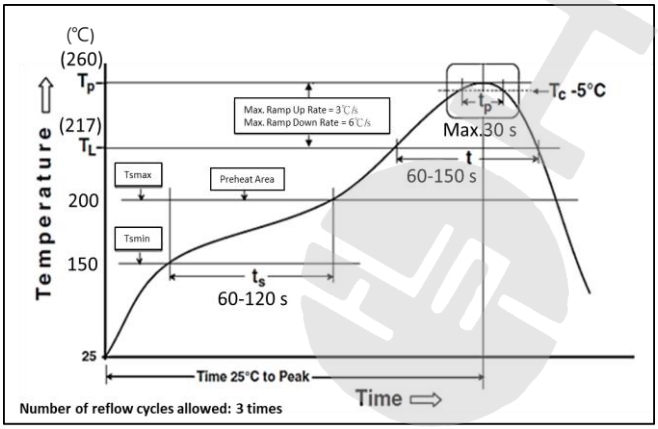
Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	**MIL-STD-202 Method 304** +25/-55/+25/+125/+25°C
Short Time Overload	±1%	**JIS-C-5201-1 4.13** RCWV*2.5 or Max. overload voltage whichever is lower for 5seconds
Insulation Resistance	>1000MΩ	**MIL-STD-202 Method 302** Apply 100V_{DC} for 1 minute
Endurance	±1%	**MIL-STD-202 Method 108A** 70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	±0.5%	**MIL-STD-202 Method 103B** 40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Bending Strength	As Spec.	**JIS-C-5201-1 4.33** Bending amplitude 3mm for 10 seconds
Solderability	95% min. coverage	**MIL-STD-202 Method 208H** 245±5°C for 3 seconds
Resistance to Soldering Heat	±0.5%	**MIL-STD-202 Method 210E** 260±5°C for 10 seconds
Dielectric Withstand Voltage	By Type	**MIL-STD-202 Method 301** Apply Max. Overload Voltage for I minute
Thermal Shock	±0.5%	**MIL-STD-202 Method 107G** -55°C ~150°C, 100 cycles
Low Temperature Operation	±0.5%	**JIS-C-5201-1 4.36** 1 hour, -65°C followed by 45 minutes of RCWV

RCWV(Rated continuous working voltage)= √(P*R) or Max. Operating voltage whichever is lower

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

■ **Shelf Life: 2 years from production date.**

■Soldering Condition(IPC/JEDEC J-STD-020)



■Marking

0603 3digit marking **Example：**

Resistance	1Ω	0.1Ω	0.15Ω	0.01Ω	0.101Ω	0.035Ω
Codes	1R0	R10	R15	R01	101	035

0805~2512 4digit marking **Example：**

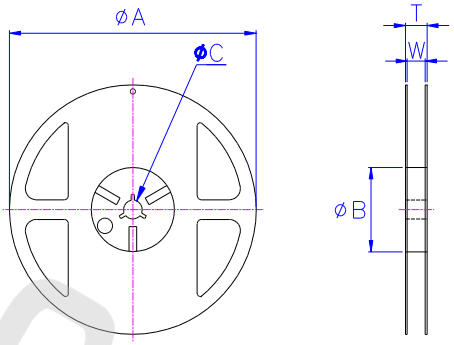
Resistance	1Ω	0.1Ω	0.05Ω	0.015Ω	0.01Ω
Codes	1R00	R100	R050	R015	R010

■Packaging

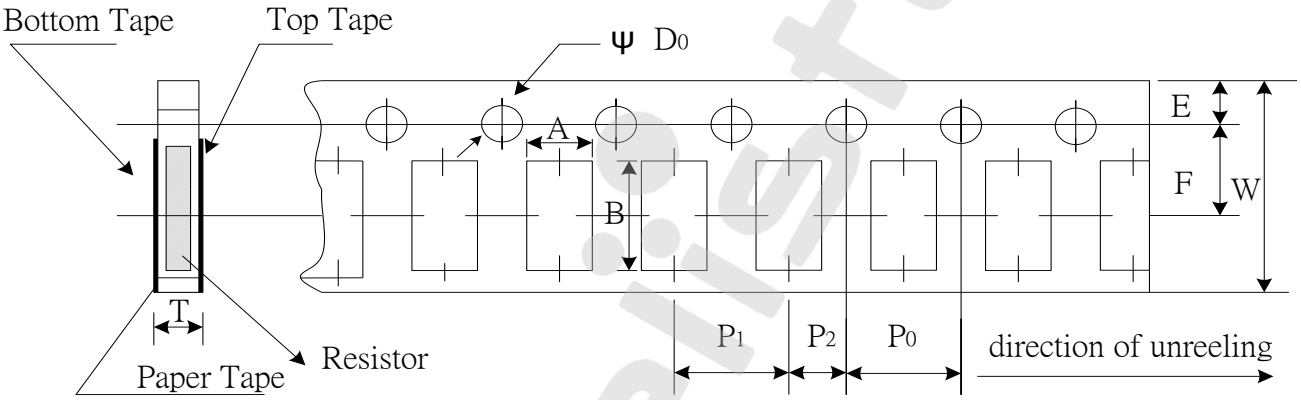
Packaging Quantity & Reel Specifications

Unit :mm

Type	nA	nB	nC	W	T	Paper Tape (EA)	Emboss 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±1.00	15.5±1.0	-	4,000
TCS12	178.0±1.0	60.0+1.0	13.5±0.7	13.5±1.00	15.5±1.0	-	4,000



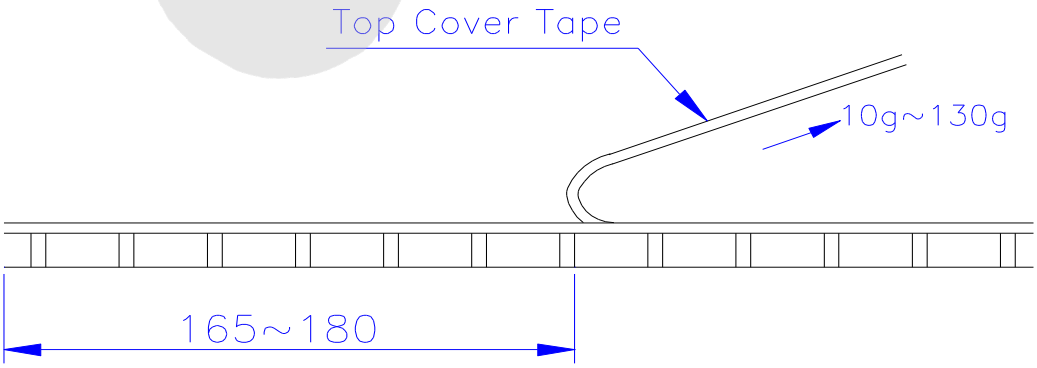
Paper Tape Specifications



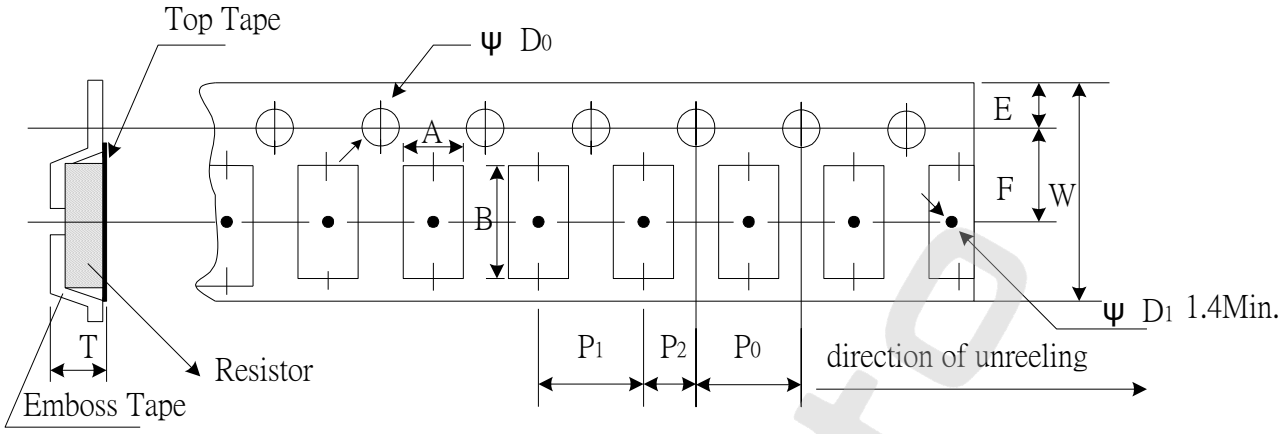
Unit: mm

Type	A	B	W	E	F	P0	P1	P2	ψD0	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

■ 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 10 to 100g



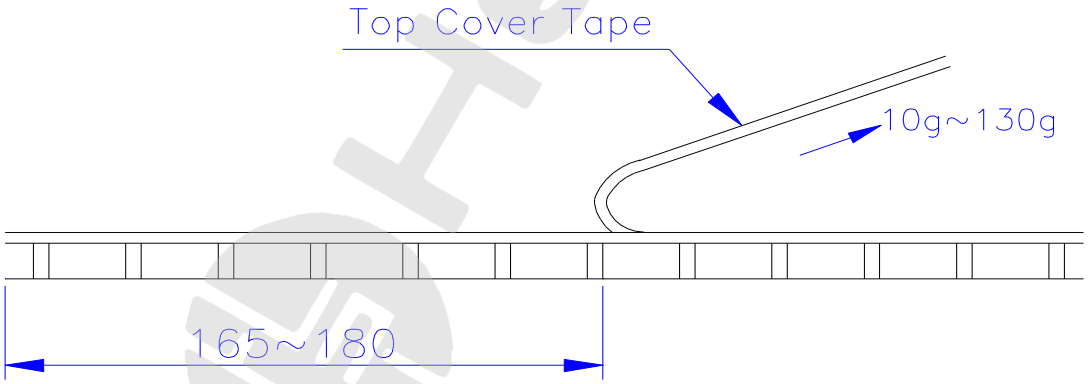
Emboss Plastic Tape Specifications



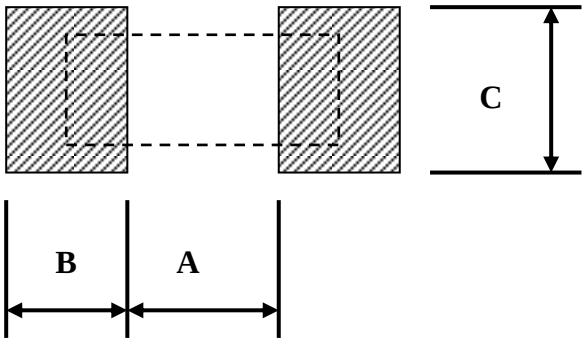
Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	ψD_0	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

- 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 10 to 130g



■Recommend Land Pattern



Unit : mm

Type	A	B	C
TCS02	0.50	0.50	0.60±0.2
TCS03	0.80	1.00	0.90±0.2
TCS05	1.00	1.00	1.35±0.2
TCS06	2.00	1.15	1.70±0.2
TCS10	3.60	1.40	2.50±0.2
TCS12	4.90	1.60	3.10±0.2

REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version B2	May 08,2015	-	- Correct the element of Top Electrode.
Version B3	July 10,2015	-	- Add 0.5% tolerance for High Power Rating Electrical Specifications
Version B4	Mar 02, 2016	-	- Modify Storage Temperature. - Remove Material Description.
Version B5	Nov 10, 2017	-	- Correct the reference standard in Environmental Characteristics.
Version B6	Aug 24, 2020	-	- Add dimensions specification for TCS12(3W) product.
Version B7	Jan 28, 2022	-	- Modify IR reflow profile to comply IPC/JEDEC J-STD-020. - Add shelf life description.