

APPROVAL SHEET

Product Name : Anti-Sulfur Chip Resistor

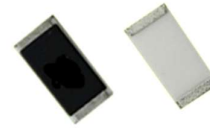
Part No. : TCS Series

Description : Size 0402~2512

Anti-Sulfur Chip Resistor—TCS Series

Applications

- Industrial Equipment
- Electronic devices
- Navigation systems
- DC-DC power supplies



Features

- All case sizes are available from 0402 to 2512
- AEC-Q200 compliant
- Sulfur-resistant

Part Number Explanation

TCS	0603	J	1R00	T	S
Product	Size (Inch)	Tolerance	Resistance	Packaging	Functional
Anti-Sulfur Chip Resistor	0402 0603 0805 1206 1210 2010 2512	F= $\pm 1\%$ J= $\pm 5\%$	1 Ω =1R00 10 Ω =10R0 1K Ω =1001 1M Ω =1004	T= Tape & Reel	M= Meet AEC-Q200 S= Standard

■ Standard Electrical Specifications

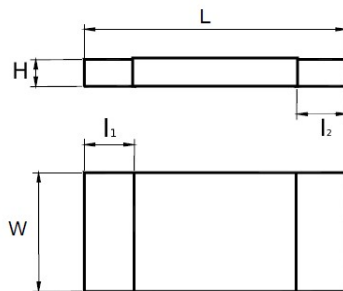
Type	Power Rating at 70°C	Max. RCWV	Max Overload Voltage	Resistance Tolerance (%)	Temperature Coefficient (TCR; ppm/°C)	Resistance Range
TCS0402	0.1 W	50V	100V	±1、±5	±200	1M<R≤10MΩ
					±100	10Ω<R≤1MΩ
					-200~+400	0Ω , 1Ω≤R≤10Ω
TCS0603	0.1 W	75V	150V	±1、±5	±200	1M<R≤10MΩ
					±100	10Ω<R≤1MΩ
					-200~+400	0Ω , 1Ω≤R≤10Ω
TCS0805	0.25 W	150V	300V	±1、±5	±200	1M<R≤10MΩ
					±100	10Ω<R≤1MΩ
					-200~+400	0Ω , 1Ω≤R≤10Ω
TCS1206	0.25 W	200V	400V	±1、±5	±200	1M<R≤10MΩ
					±100	10Ω<R≤1MΩ
					-200~+400	0Ω , 1Ω≤R≤10Ω
TCS1210	0.5 W	200V	400V	±1、±5	±200	1M<R≤10MΩ
					±100	10Ω<R≤1MΩ
					-200~+400	0Ω , 1Ω≤R≤10Ω
TCS2010	0.75 W	200V	400V	±1、±5	±200	1M<R≤10MΩ
					±100	10Ω<R≤1MΩ
					±200	0Ω , 1Ω≤R≤10Ω
TCS2512	1 W	250V	500V	±1、±5	±200	1M<R≤10MΩ
					±100	10Ω<R≤1MΩ
					±200	0Ω , 1Ω≤R≤10Ω

- Functional code: S
- Beyond the above specification also can meet the special requirements. For detail questions, please contact us freely.

Size	0402	0603	0805	1206	1210	2010	2512
Resistance	0R (50mΩ Max)						
Max Rated Current	1A		2A		3A		

- Note : RCWV=(P×R)^{1/2} or Max. RCWV listed above, whichever is lower.
- RCWV : Working Voltage (V) , P : Rated Power (W) , R : Resistance Value (Ω)

■ Dimension

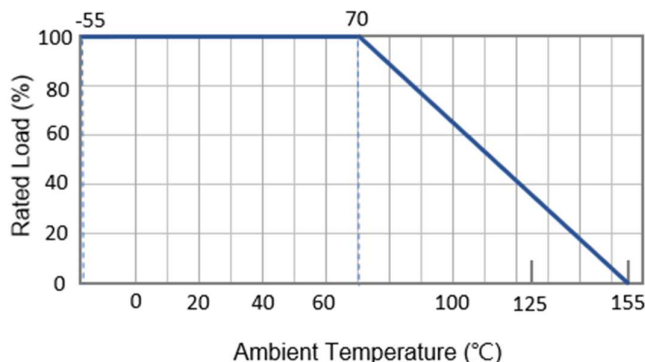


Unit: mm

Type	L	W	l ₁	l ₂	H
TCS0402	1.00±0.05	0.50±0.05	0.20±0.10	0.25±0.10	0.35±0.05
TCS0603	1.60±0.10	0.80±0.10	0.30±0.20	0.30±0.20	0.45±0.10
TCS0805	2.00±0.10	1.25±0.10	0.40±0.20	0.40±0.20	0.50±0.10
TCS1206	3.10±0.10	1.60±0.10	0.50±0.25	0.50±0.25	0.55±0.10
TCS1210	3.10±0.10	2.60±0.10	0.50±0.25	0.50±0.25	0.55±0.10
TCS2010	5.00±0.20	2.50±0.20	0.60±0.25	0.60±0.25	0.60±0.10
TCS2512	6.30±0.20	3.10±0.20	0.60±0.25	0.90±0.25	0.60±0.15

Derating Curve

Operating Temperature Range: -55 to +155°C



Voltage Rating or Current Rating

The direct or alternating voltage for the rated power can be calculated from the following formula but must not exceed the maximum voltage.

$$V = \sqrt{P \times R}$$

E=Rated voltage(V)
P=Power rating(W)
R=Nominal resistance(Ω)

Recommended Customer Soldering Parameters

Recommended IR Reflow Soldering Conditions

Preliminary heating: 150°C~180°C, 120s max

Soldering: 220°C, 60s max

Peak temperature: 245°C, 15s max

Recommended WAVE Soldering Conditions

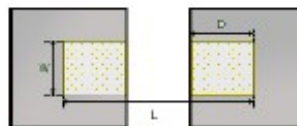
Reservoir Temperature: 260°C, 10s max

Number of times: two times max

Recommend Land Pattern Design

Type	W	D	L
TCS0402	0.60	0.50	1.50
TCS0603	0.90	1.00	3.00
TCS0805	1.30	1.15	3.50
TCS1206	1.80	1.30	4.70
TCS1210	3.00	1.30	4.70
TCS2010	3.00	1.50	6.80
TCS2512	3.70	1.60	7.60

Unit : mm

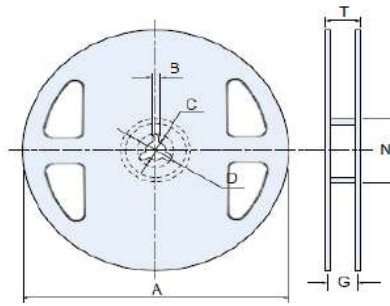


Reliability Test and Requirement

Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25 / -55°C and 25°C /+155°C, 25°C is the reference temperature	As Spec
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	2.5 times RCWV or Max. Overload voltage whichever is less for 5 seconds.	J : $\Delta R \leq \pm(1\% + 0.1\Omega)$ F : $\Delta R \leq \pm(0.5\% + 0.05\Omega)$
Resistance to Soldering Heat	AEC-Q200 7.15	Solder dipping @ 270°C±5°C for 10sec.±1sec..	J : $\Delta R \leq \pm(1\% + 0.1\Omega)$ F : $\Delta R \leq \pm(0.5\% + 0.05\Omega)$ No mechanical damage.
Insulation Resistance	JIS-C-5201-1 4.6 IEC-60115-1 4.6	Apply the maximum overload voltage (DC) for 1minute	$\Delta R \geq 10G\Omega$
Temperature Cycling	AEC-Q200 7.4	1000 Cycles (-55°C to +125°C) Measurement at 24±4 hours after test conclusion.	J : $\Delta R \leq \pm(1\% + 0.1\Omega)$ F : $\Delta R \leq \pm(0.5\% + 0.05\Omega)$ No mechanical damage.
Biased Humidity	AEC-Q200 7.7	1,000 hours; 85°C / 85% RH, 10% of operating power. Measurement at 24±2 hours after test conclusion.	J : $\Delta R \leq \pm(3\% + 0.1\Omega)$ F : $\Delta R \leq \pm(1\% + 0.05\Omega)$
High Temperature Exposure (Storage)	AEC-Q200 7.3	1000 hrs. @ T=125°C. Unpowered. Measurement at 24±2 hours after test conclusion.	J : $\Delta R \leq \pm(3\% + 0.1\Omega)$ F : $\Delta R \leq \pm(1\% + 0.05\Omega)$
Operational Life	AEC-Q200 7.8	Test 1000hr @ TA=125°C at specified rated power. Measurement at 24±2 hours after test conclusion.	J : $\Delta R \leq \pm(3\% + 0.1\Omega)$ F : $\Delta R \leq \pm(1\% + 0.05\Omega)$
External Visual	AEC-Q200 7.9	Inspect device construction, marking and workmanship.	No visual damage and refer Ridee marking code
Mechanical Shock	AEC-Q200 7.13	Test Peak value:100g's,Wave:Hail-sine, Duration:6ms,Velocity:12.3ft/sec.	Within product specification tolerance and no visible damage.

Vibration	AEC-Q200 7.14	5 g's for 20 min., 12 cycles each of 3 orientations. Note: Test from 10-2000 Hz	No mechanical damage
Solderability	AEC-Q200 7.18	a) Baking 155°C 4H, dipping 235°C 5s b) Steam 1H, dipping 215°C 5s c) Steam 1H, dipping 260°C 7s	Over 95% of termination must be covered with solder.
Terminal Strength	AEC-Q200 7.22	Force 1 Kg for 60 seconds.	No mechanical damage
Bending Strength	AEC-Q200 7.21	Bending 2mm 2512.2010.1210.1206, 3mm 0805.0603.0402.	J : $\Delta R \leq \pm(1\% + 0.1\Omega)$ F : $\Delta R \leq \pm(0.5\% + 0.05\Omega)$ No mechanical damage.
Moisture Resistance	AEC-Q200 7.6	Test 65°C/80~100%RH/10Cycles. Measurement at 24±2 hours after test conclusion. (t=24hrs/cycle).	J : $\Delta R \leq \pm(1\% + 0.1\Omega)$ F : $\Delta R \leq \pm(0.5\% + 0.05\Omega)$
Physical Dimension	AEC-Q200 7.10	Verify physical dimensions to the applicable device detail specification.	Within the spec.
Thermal Shock	AEC-Q200 7.16	-55 to 155°C/ dwell time 15min/ Max transfer time 20sec/ 300cycles.	J : $\Delta R \leq \pm(1\% + 0.1\Omega)$ F : $\Delta R \leq \pm(0.5\% + 0.05\Omega)$
ESD	AEC-Q200-002	Test contact min. 0.5 KV.	$\Delta R \leq \pm(1\% + 0.1\Omega)$ No mechanical damage.
Damp Heat	JIS-C-5201-1 4.24 IEC-60115-1 4.24	Maintain the temperature of the resistor at 40±2°C and 90~95% R.H. with the rated voltage applied. Cycle ON for 1.5 hours and OFF for 0.5 hour for 1000+48/-0 hours.	J : $\Delta R \leq \pm(3\% + 0.1\Omega)$ F : $\Delta R \leq \pm(1\% + 0.05\Omega)$
Load Life	JIS-C-5201-1 4.25 IEC-60115-1 4.25.	Permanent resistance change after 1000+48/-0 hours(1.5 hours ON , 0.5 hour OFF) at RCWV or Max.Keep the resistor at 70±2°C ambient"	J : $\Delta R \leq \pm(3\% + 0.1\Omega)$ F : $\Delta R \leq \pm(1\% + 0.05\Omega)$
Sulfuration Test	ASTM B-809 EIA-977	105±2°C, 750hrs	$\Delta R \leq \pm 2\%$ No mechanical damage.

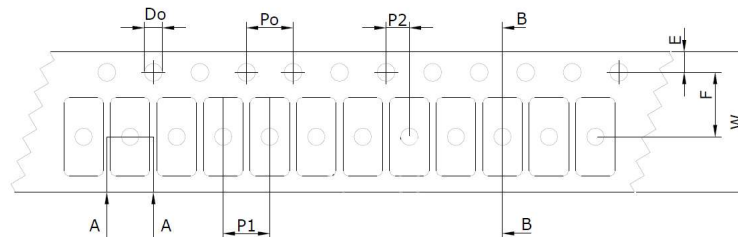
■ Packaging Information



Unit:mm

Size	Packaging Q'ty	A	N	C	D	B	G	T
0402	10Kpcs/Reel	178±2.0	60.0±0.5	13.0±0.5	20min	2.0±0.5	10.0±1.5	14.9 max
0603 0805 1206 1210	5kpcs/Reel	178.0±2.0	60.0±0.5	13.0±0.5	20(Min.)	2.0±0.5	10.0±1.5	14.9max.
2010 2512	4kpcs/Reel	178.0±2.0	60.0±0.5	13.0±0.5	20(Min.)	2.0±0.5	13.8±1.5	16.7max.

■ Tapping Specification



Unit:mm

Size	A	B	W	F	E	P1	P2	Po	Do
0402	0.70±0.10	1.20±0.10	8.00±0.30	3.50±0.05	1.75±0.10	2.00±0.10	2.00±0.05	4.00±0.10	1.50+0.10/-0
0603	1.10±0.20	1.90±0.20	8.00±0.30	3.50±0.05	1.75±0.10	4.00±0.10	2.00±0.05	4.00±0.10	1.50+0.10/-0
0805	1.65±0.20	2.40±0.20	8.00±0.30	3.50±0.05	1.75±0.10	4.00±0.10	2.00±0.05	4.00±0.10	1.50+0.10/-0
1206	2.00±0.20	3.60±0.20	8.00±0.30	3.50±0.05	1.75±0.10	4.00±0.10	2.00±0.05	4.00±0.10	1.50+0.10/-0
1210	3.00±0.20	3.60±0.20	8.00±0.30	3.50±0.05	1.75±0.10	4.00±0.10	2.00±0.05	4.00±0.10	1.50+0.10/-0
2010	2.80±0.20	5.50±0.20	12.00±0.30	5.50±0.05	1.75±0.10	4.00±0.10	2.00±0.05	4.00±0.10	1.50+0.10/-0
2512	3.50±0.20	6.70±0.20	12.00±0.30	5.50±0.05	1.75±0.10	4.00±0.10	2.00±0.05	4.00±0.10	1.50+0.10/-0

■ Marking

E24 $\pm 5\%$: 3 Digits marking to identify the resistance value

0603/0805/1206/2010/2512

Resistance	300 Ω
3 digits code	301

E24/E96 $\pm 1\%$: 4 Digits marking to identify the resistance value

0805/1206/2010/2512

Resistance	15.4K Ω
4 digits code	1542

E24 $\pm 1\%$: 3 Digits marking to identify the resistance value

0603

Resistance	2.2K Ω
3 digits code	222

E96 $\pm 1\%$: 3 Digits marking to identify the resistance value

0603

No marking of 0402 product.