

Type TCR Series

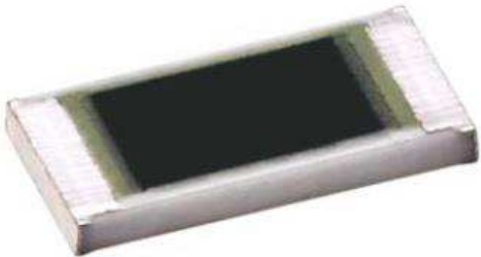
Key Features

Suitable for
laser fine tune

Small size and
light weight

Highly reliable
multilayer
electrode
construction

Compatible
with all
soldering
process



This Ruthenium based trimmable thick film chip resistor, suitable for laser fine tuning is ideal for use in circuits where a variable resistor might otherwise be used.

Applications

Tuner

Mobile Phone

Camcorder

Portable
Audio

Photo Sensor

Portable
Measuring
Equipment

Characteristics – Electrical

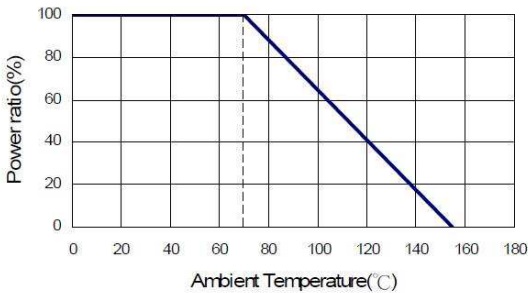
Size	Power Rating @70°C	Max. Operating Voltage	Max. Overload Voltage	Tolerance	Resistance Range	TCR (ppm/°C)
0402	0.0625W	50V	100V	+0 ~ -10 +0 ~ -20 +0 ~ -30	1Ω ~ 10MΩ	±200
0603	0.1W	50V	100V		1Ω ~ 9.76 10Ω ~ 1MΩ 1M02 ~ 10MΩ	±200 ±100 ±200
0805	0.125W	150V	300V			
1206	0.25W	200V	400V			
1210	0.3W	200V	400V			
2010	0.75W	200V	400V			
2512	1W	250V	500V			

Operating Temperature range -55 ~ +155°C

Operating Voltage= $V(P \cdot R)$ or Max. operating voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot V(P \cdot R)$ or Max. overload voltage listed above, whichever is lower.

Derating



Environmental Characteristics

Item	Requirement	Test Methods
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	JIS-C-5201-1 4.8 IEC-60115-1 4.8 -55°C~+125°C, 25°C is the reference temperature
Short Time Overload	$\pm(1.0\%+0.05\Omega)$	JIS-C-5201-1 4.13 IEC-60115-1 4.13 RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	$\geq 10G$	JIS-C-5201-1 4.6 IEC-60115-1 4.6 Max. Overload Voltage for 1 minute
Endurance	$\pm(2.0\%+0.10\Omega)$	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1 70 $\pm$ 2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Damp Heat with Load	$\pm(2.0\%+0.10\Omega)$	JIS-C-5201-1 4.24 IEC-60115-1 4.24 40 $\pm$ 2°C, 90~95% R.H. RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Dry Heat	$\pm(1.0\%+0.05\Omega)$	JIS-C-5201-1 4.23 IEC-60115-1 4.23.2 at +125/+155°C for 1000 hrs
Bending Strength	(1.0%+0.05 Ω)	JIS-C-5201-1 4.33 IEC-60115-1 4.33 Bending once for 60 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage	JIS-C-5201-1 4.17 IEC-60115-1 4.17 245 $\pm$ 5°C for 3 seconds
Resistance to Soldering Heat	$\pm(0.5\%+0.05\Omega)$	JIS-C-5201-1 4.18 IEC-60115-1 4.18 260 $\pm$ 5°C for 10 seconds
Voltage Proof	No breakdown or flashover	JIS-C-5201-1 4.7 IEC-60115-1 4.7 1.42 times Max. Operating Voltage for 1 minute

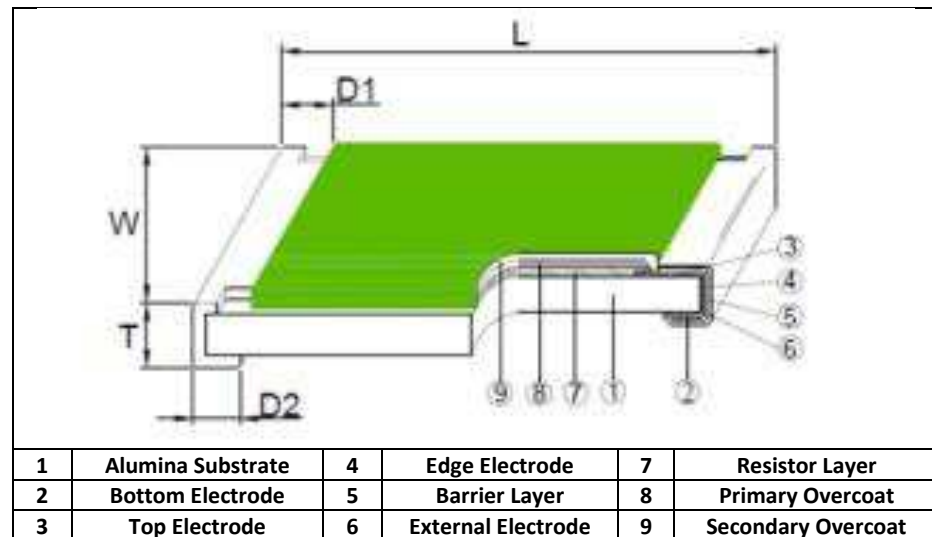
Environmental Characteristics (cont.)

Item	Requirement	Test Methods
Leaching	Individual leaching area $\leq 5\%$ Total leaching area $\leq 10\%$	JIS-C-5201-1 4.18 IEC-60068-2-58 8.2.1 260 $\pm$ 5°C for 30 seconds
Rapid Change of Temperature	$\pm(0.5\%+0.05\Omega)$	JIS-C-5201-1 4.19 IEC-60115-1 4.19 -55°C to +125/+155°C, 5 cycles

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

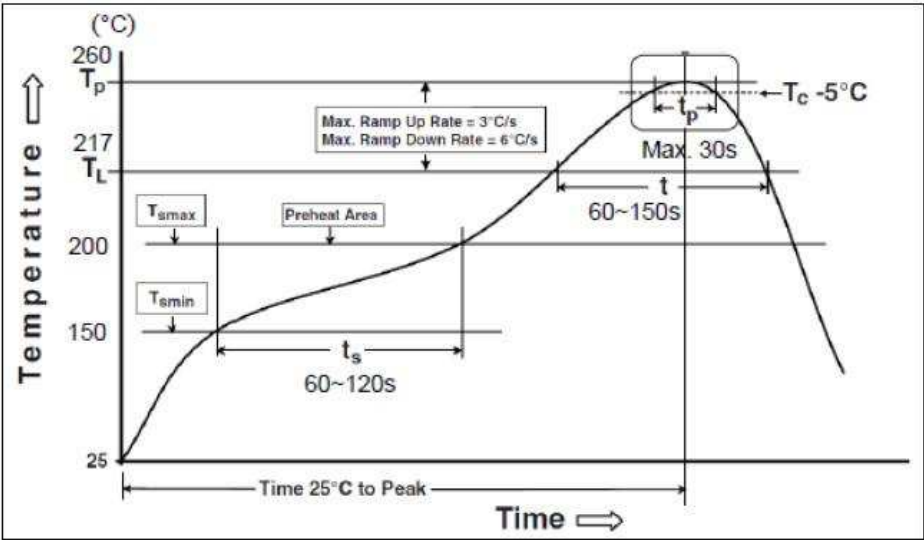
Storage Temperature: 15~28°C; Humidity < 80%RH

Construction and Dimensions



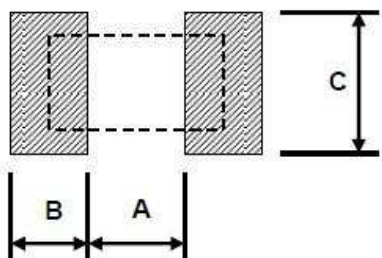
Size	L (mm)	W (mm)	T (mm)	D1 (mm)	D2 (mm)	Weight (g) (1000pcs)
0402	1.00 $\pm$ 0.05	0.50 $\pm$ 0.05	0.35 $\pm$ 0.05	0.20 $\pm$ 0.10	0.20 $\pm$ 0.10	0.62
0603	1.60 $\pm$ 0.10	0.80 $\pm$ 0.10	0.45 $\pm$ 0.10	0.30 $\pm$ 0.20	0.30 $\pm$ 0.20	2.0
0805	2.00 $\pm$ 0.10	1.25 $\pm$ 0.10	0.50 $\pm$ 0.10	0.35 $\pm$ 0.20	0.40 $\pm$ 0.20	4.3
1206	3.10 $\pm$ 0.10	1.55 $\pm$ 0.10	0.55 $\pm$ 0.10	0.50 $\pm$ 0.25	0.50 $\pm$ 0.20	8.9
1210	3.10 $\pm$ 0.10	2.60 $\pm$ 0.15	0.55 $\pm$ 0.10	0.50 $\pm$ 0.25	0.50 $\pm$ 0.20	15.95
2010	5.00 $\pm$ 0.10	2.50 $\pm$ 0.15	0.55 $\pm$ 0.10	0.60 $\pm$ 0.25	0.50 $\pm$ 0.20	24.0
2512	6.35 $\pm$ 0.10	3.10 $\pm$ 0.15	0.55 $\pm$ 0.10	0.60 $\pm$ 0.25	0.50 $\pm$ 0.20	39.4

Soldering Condition (Ref. IPC/JEDEC J-STD-020 & J-STD-002)



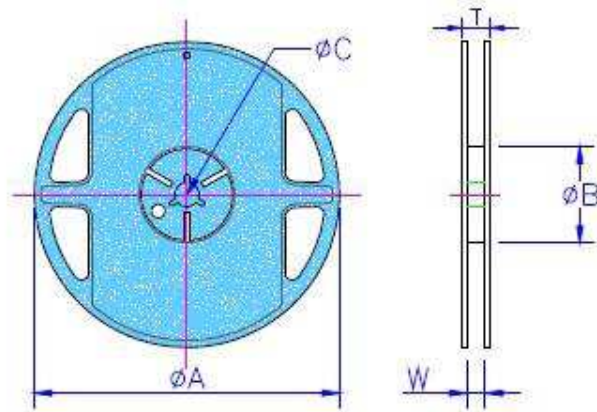
Reflow Profiles	
Profile Feature	Pb-Free Assembly
Preheat	
Min. Temperature (T _{smin})	150°C
Max Temperature (T _{smax})	200°C
Preheating time (t _s) from (T _{smin} to T _{smax})	60 – 120 seconds
Ramp-up rate (T _L to T _p)	3°C/second max.
Liquidous temperature (T _L)	217°C
Time (t _L) maintained above T _L	60 – 150 seconds
Min. Peak temperature (T _p min)	235°C
Max. Peak temperature (T _p max)	260°C
Time (t _p) within 5 °C of the specified classification temperature (T _c)	30 seconds max.
Ramp-down rate (T _p to T _L)	6°C/second max.
Time 25 °C to peak temperature	8 minutes max.

Recommended Land Pattern

	Size	A (mm)	B (mm)	C (mm)
	0402	0.50	0.45	0.60
	0603	0.90	0.60	0.90
	0805	1.20	0.70	1.30
	1206	2.00	0.90	1.60
	1210	2.00	0.90	2.80
	2010	3.80	0.90	2.80
	2512	4.90	1.60	3.50

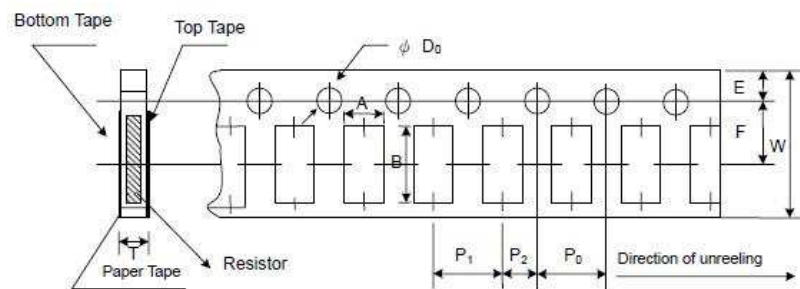
Packaging

Reel Specification



Size	Tape Type	Qty Reel	Tape Width	Reel Nom.	ØA (mm)	ØB (mm)	ØC (mm)	W (mm)	T (mm)
0402	Paper	10K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
0603	Paper	5K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
0805	Paper	5K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
1206	Paper	5K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
1210	Paper	5K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
2010	Emboss	4K	12mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	13.0±0.5	15.5±0.5
2512	Plastic	4K	12mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	13.0±0.5	15.5±0.5

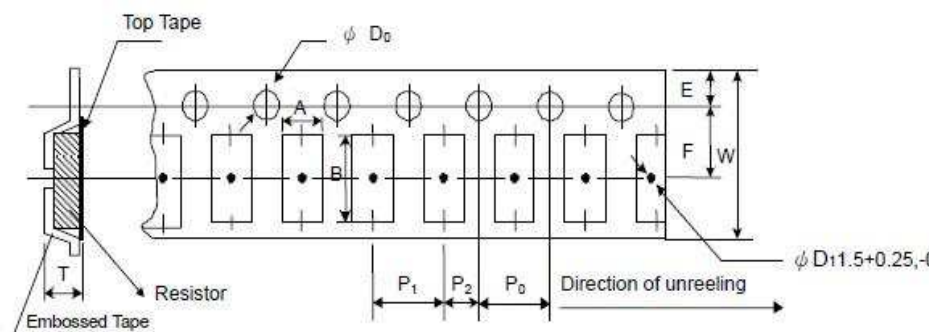
Paper Tape Specification.



Dimensions (mm)

Size	A ±0.10	B	W ±0.20	E ±0.10	F ±0.05	P ₀ ±0.10	P ₁ ±0.05	P ₂ ±0.05	ØD ₀ +0.1/-0	T ±0.10
0402	0.65	1.15±0.10	8.0	1.75	3.50	4.00	2.00	2.00	1.50	0.45
0603	1.10	1.90±0.10	8.0	1.75	3.50	4.00	4.00	2.00	1.50	0.70
0805	1.60	2.40±0.20	8.0	1.75	3.50	4.00	4.00	2.00	1.50	0.85
1206	1.90	3.50±0.20	8.0	1.75	3.50	4.00	4.00	2.00	1.50	0.85
1210	2.90	3.50±0.20	8.0	1.75	3.50	4.00	4.00	2.00	1.50	0.85

Embossed Plastic Tape Specification



Dimensions (mm)

Size	A	B	W	E	F	P ₀	P ₁	P ₂	ØD ₀	T
2010	±0.10	±0.10	±0.30	±0.10	±0.05	±0.10	±0.10	±0.05	+0.1/-0	±0
2512	2.8	5.5	12.0	1.75	5.5	4.00	4.00	2.00	1.50	1.2
2512	3.5	6.7	12.0	1.75	5.5	4.00	4.00	2.00	1.50	1.2

How To Order

TCR	0805	N	1K5
Common Part	Size	Resistance Tolerance	Resistance
TCR	0402 0603 0805 1206 1210 2010 2512	N: 0 ~ -10% P: 0 ~ -20% Q: 0 ~ -30%	1R2: 1.2Ω 100R: 100Ω 3K3: 3.3KΩ 100K: 100KΩ 1M5: 1.5MΩ 10M: 10MΩ

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