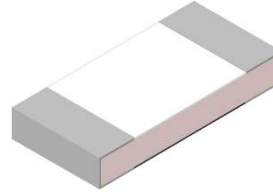
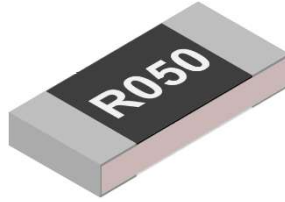
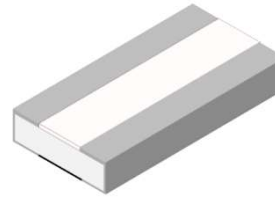


## Low-Resistance Metal Film Chip Resistor — TRL Series

Standard Type



Wide Terminal Type



Top view

Bottom view

### Applications

- Consumer electronics
- Computer & relative products
- Communication devices
- Measuring instrument
- Industrial / Power supply
- Battery management system

### Features

- Low Resistance / TCR / Inductance( $\leq 5nH$ )
- Excellent long-term stability
- High precision current sensing
- High power capability
- Halogen free and lead free
- RoHS compliant
- AEC-Q200 compliant

### Parts Number Explanation

#### Example:

TRL	1206	05	F	R560	P	05	Z
Product Type	Size (Inch)	Rated Power	Tolerance	Resistance	Package	Quantity (PCS)	Optional
TRL Series Low-Resistance Metal Film Chip Resistors	0201 0402 0603 0805 1206 1210 2010 2512 0508 0612 1020 1225	Y5 : 0.05W Y6 : 0.063W 01 : 0.10W X1 : 0.125W 02 : 0.20W X2 : 0.25W 04 : 0.4W 05 : 0.5W 07 : 0.75W 10 : 1.0W 15 : 1.5W 20 : 2.0W 30 : 3.0W	C : $\pm 0.25\%$ D : $\pm 0.5\%$ F : $\pm 1\%$ G : $\pm 2\%$ J : $\pm 5\%$	Ex. R056=0.056 $\Omega$ R560=0.56 $\Omega$ 1R00= 1 $\Omega$	P : Paper Taping (0603~1210)  Q : Paper Taping (0201 - 0402)  E : Embossed Taping	04 : 4000 05 : 5000 10 : 10000	



# TRL Series Low-Resistance Metal Film Chip Resistor Product Specifications

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## Standard Electrical Specifications

### Standard Type:

Type	Rated Power at 70°C	Max. Rated Current	Max. Overload Current	T.C.R. (ppm/°C)	Resistance Range	
					C(0.25%)	D(0.5%), F(1.0%), G(2.0%), J(5.0%)
TRL0201	1/20W	1.00A	2.50A			
	1/10W	1.41A	3.16A			
	1/5 W	2.00A	4.47A			
TRL0402	1/16W	1.12A	2.80A	±100	-	50 mΩ ≤ R < 100 mΩ
	1/8W	1.58A	3.54A	-----		-----
	1/4W	2.24A	5.00A	±50		100 mΩ ≤ R ≤ 10 Ω
TRL0603	1/10W	1.41A	3.54A			
	1/5W	2.00A	4.47A			
	2/5W	2.83A	6.32A			
TRL0805	1/8W	1.79A	4.48A	±150	-	39 mΩ ≤ R < 50 mΩ
	1/4W	2.53A	5.66A	±100		50 mΩ ≤ R < 100 mΩ
	1/2W	3.58A	8.00A	±50		100 mΩ ≤ R ≤ 10 Ω
TRL1206	1/4W	2.53A	6.33A	±150	-	39 mΩ ≤ R < 50 mΩ
	1/2W	3.58A	8.00A	-----		-----
	3/4W	4.39A	9.81A	±100		50 mΩ ≤ R < 100 mΩ
TRL1210	1/2W	3.58A	8.95A	±50	470 mΩ ≤ R ≤ 10 Ω	100 mΩ ≤ R ≤ 10 Ω
	1W	5.06A	11.32A			
TRL2010	3/4W	2.74A	6.85A			
	1.5W	3.87A	8.66A			
TRL2512	1W	3.16A	7.91A	±50	470 mΩ ≤ R ≤ 10 Ω	100 mΩ ≤ R ≤ 10 Ω
	2W	4.47A	10.00A			
	3W	5.48A	12.25A			



# TRL Series Low-Resistance Metal Film Chip Resistor Product Specifications

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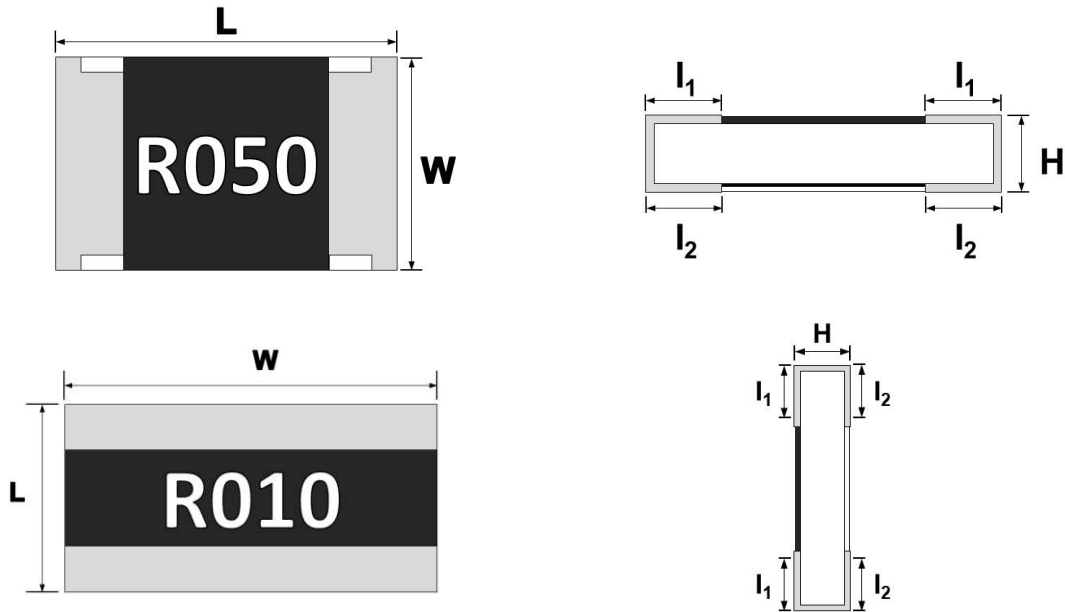
Type	Rated Power at 70°C	Max. Rated Current	Max. Overload Current	T.C.R. (ppm/°C)	Resistance Range
					F(1.0%), G(2.0%), J(5.0%)
TRL1206	1/4W	5.00A	12.50A	±200	10 mΩ ≤ R < 39 mΩ
	1/2W	7.07A	15.81A		

## ■ Wide Terminal Type:

Type	Rated Power at 70°C	Max. Rated Current	Max. Overload Current	T.C.R. (ppm/°C)	Resistance Range			
					D (0.5%)	F (1.0%)	G (2.0%)	J (5.0%)
TRL0508	1W	10.00A	22.36A	±150	-	10mΩ ≤ R < 20mΩ		
				±100	100mΩ ≤ R ≤ 2Ω	20mΩ ≤ R ≤ 2Ω		
TRL0612	1W	10.00A	22.36A	±150	-	10mΩ ≤ R < 20mΩ		
				±100	100mΩ ≤ R ≤ 2Ω	20mΩ ≤ R ≤ 2Ω		
TRL1020	2W	14.14A	31.62A	±150	-	10mΩ ≤ R < 20mΩ		
				±100	100mΩ ≤ R ≤ 2Ω	20mΩ ≤ R ≤ 2Ω		
TRL1225	3W	17.32A	38.73A	±150	-	10mΩ ≤ R < 20mΩ		
				±100	100mΩ ≤ R ≤ 2Ω	20mΩ ≤ R ≤ 2Ω		

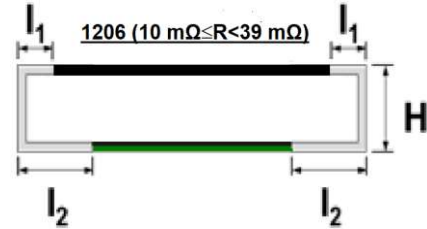
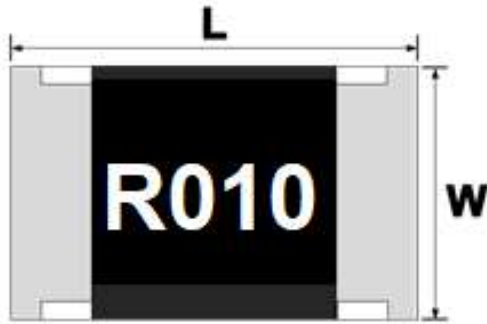
- For non-standard parts, please contact our sales dept.
- Operating Temperature Range : -55°C ~ +155°C.

■ **Type Dimensions**



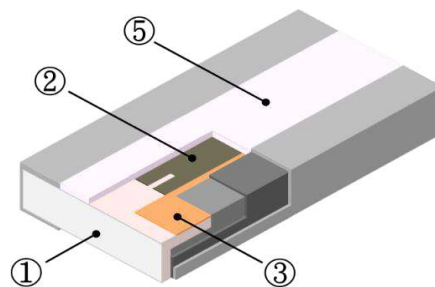
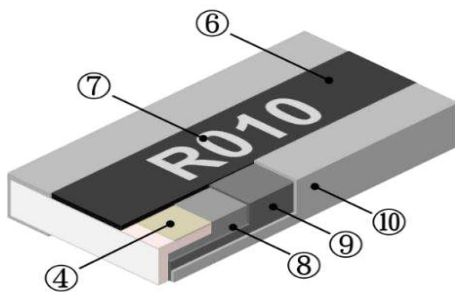
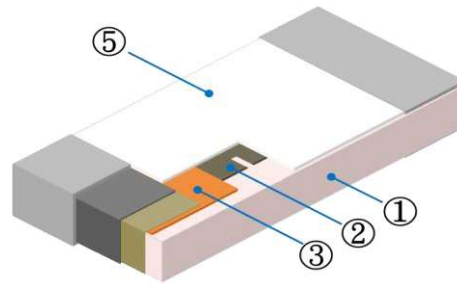
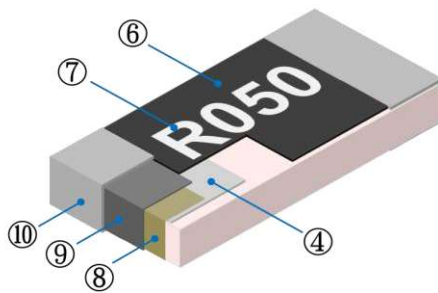
Unit : mm

TYPE	L	W	H	l <sub>1</sub>	l <sub>2</sub>
TRL0201	0.60±0.03	0.30±0.03	0.26±0.05	0.15±0.05	0.15±0.05
TRL0402	1.00±0.10	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10
TRL0603	1.60±0.10	0.80±0.10	0.45±0.10	0.25±0.15	0.30±0.15
TRL0805	2.00±0.10	1.25±0.10	0.55±0.10	0.35±0.20	0.40±0.20
TRL1206	3.10±0.10	1.60±0.10	0.55±0.10	0.40±0.20	0.45±0.20
TRL1210	3.10±0.10	2.50±0.15	0.55±0.10	0.50±0.20	0.50±0.20
TRL2010	5.00±0.20	2.50±0.15	0.55±0.10	0.60±0.25	0.60±0.25
TRL2512	6.30±0.20	3.20±0.20	0.55±0.10	0.65±0.25	0.65±0.25
TRL2512(3W)	6.30±0.20	3.20±0.20	0.70±0.15	0.65±0.25	0.65±0.25
TRL0508	1.25±0.10	2.00±0.10	0.55±0.15	0.25±0.15	0.35±0.15
TRL0612	1.60±0.15	3.20±0.20	0.55±0.15	0.30±0.20	0.50±0.20
TRL1020	2.50±0.15	5.00±0.15	0.55±0.15	0.40±0.20	0.50±0.20
TRL1225	3.20±0.20	6.30±0.20	0.55±0.15	0.60±0.25	0.80±0.25



TYPE	L	W	H	l <sub>1</sub>	l <sub>2</sub>
TRL1206 (10 mΩ ≤ R < 39 mΩ)	3.30±0.20	1.70±0.20	0.65±0.2	0.20±0.15	0.68±0.20

## Construction



①	Alumina Substrate	⑥	Top Protective Overcoat
②	Resistive Layer	⑦	Marking
③	Bottom Inner Electrode (Cu)	⑧	Side Inner Electrode
④	Top Inner Electrode	⑨	Barrier Layer (Ni)
⑤	Bottom Protective Overcoat White(≥ 39mR) Green(<39mR)	⑩	Solder coating (Sn)



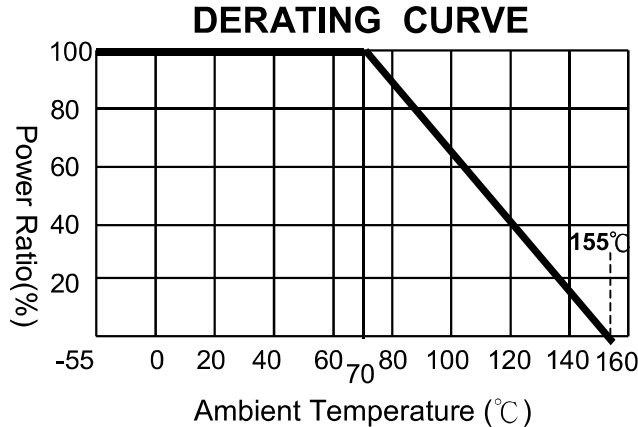
## ■ Performance Characteristics

### ■ Power Derating Curve

The Operating Temperature Range: -55°C ~+155°C.

Power rating or current rating is in the case based on continuous full-load at ambient temperature of 70°C.

For operation at ambient temperature in excess of 70°C, the load should be derated in accordance with figure of derating Curve.



### ■ Rated Current

Resistance Range: <1Ω

Rated Current: The resistor shall have a DC continuous working current or a AC (rms) continuous working current at commercial-line frequency and wave form corresponding to the power rating, as determined formula as following:

$$I = \sqrt{P/R}$$

I = Rated current (A)

P= Rated Power (W)

R= Resistance(Ω)

### ■ Rated Voltage

Resistance Range: ≥1Ω

Rated Voltage: The resistor shall have a DC continuous working voltage or a RMS AC continuous working voltage at commercial-line frequency and wave form corresponding to the power rating, as determined formula as following:

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

V = Rated voltage (V)

P = Rated power (W)

R = Nominal resistance (Ω)



# TRL Series Low-Resistance Metal Film Chip Resistor Product Specifications

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## Reliability Tests and Requirements

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°C /+125°C, 25°C is the reference temperature	Refer to Standard Electrical Specifications
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	Standard power : 6.25 times rated power whichever is less for 5 seconds. High power (2X/4X) and wide terminal type : 5 times rated power whichever is less for 5 seconds.	±(1.0%+0.001Ω)
Insulation Resistance	JIS-C-5201-1 4.6 IEC-60115-1 4.6	Apply 100VDC for 1 minute.	≥10GΩ
Dielectric Withstanding Voltage	JIS-C5201-1 4.7	0805 / 0508 and above applied 500VAC for 1 minute. 0201 / 0402 / 0603 applied 300VAC for 1 minute.	No short or burned on the appearance.
Core Body Strength	JIS-C5201-1 4.15	Central part pressurizing force : 10N , 10 seconds	No broken
Solderability	JIS-C-5201-1 4.17 IEC-60115-1 4.17	245±5°C for 3 seconds.	>95% Coverage No Visual damage
Resistance to Soldering Heat	JIS-C-5201-1 4.18 IEC-60115-1 4.18	260±5°C for 10 seconds.	±(1.0%+0.001Ω) No Visual damage
Leaching	JIS-C-5201-1 4.18 IEC-60068-2-58 8.2.1	260±5°C for 30 seconds.	>95% Coverage No Visual damage
Rapid Change of Temperature	JIS-C-5201-1 4.19 IEC-60115-1 4.19	-55°C to +155°C, 300 cycles	±(1.0%+0.001Ω) No Visual damage
Damp Heat with Load	JIS-C-5201-1 4.24 IEC-60115-1 4.24	40±2°C, 90~95% R.H. RCWW or Max. working current whichever is less for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"	±(1.0%+0.001Ω)
Biased Humidity	MIL-STD-202 Method 103	1,000 hours; 85°C / 85% RH, 10% of operating power. Measurement at 24±4 hours after test conclusion.	±(0.5%+0.05Ω)
Load Life (Endurance)	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1	70±2°C, Rated power, or Max. working current whichever is less for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF" .	±(1.0%+0.001Ω)
High Temperature Exposure	JIS-C5201-1 4.25 IEC 60068-2-2	At 155±5°C for 1000 hours.	±(1.0%+0.001Ω)
Resistance to Solvent	JIS-C-5201-1 4.29	The tested resistor be immersed into isopropyl alcohol of 20~25°C for 60 secs. Then the resistor is left in the room for 48 hrs.	±(1.0%+0.001Ω) No Visual damage
Terminal Strength	JIS-C5201-1 4.32 AEC Q200-006	Pressurizing force for 10 seconds 0201 / 0402 / 0603 : 8N ; 0805 / 0508 and above : 17.7N	No broken
Bending Strength	JIS-C-5201-1 4.33 IEC-60115-1 4.33	Bending once for 5 seconds D : 0201 / 0402 / 0603 / 0805 = 5mm 1206 / 1210 / 0508 / 0612 = 3mm 2010 / 2512 / 1020 / 1225 = 2mm	±(1.0%+0.001Ω) No Visual damage

- Temperature Coefficient of Resistance test to - 55 °C is available on request





# TRL Series Low-Resistance Metal Film Chip Resistor Product Specifications

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## TRL0805 ~ TRL2512 : 4 digit marking

First 3 digits are the significant figures, the 4th digit is the multiplier. "R"= decimal point.

Examples:

Resistance value	Code	Example
50mΩ ~ 99mΩ (only for 0805, 1206, 1210)	<b>R0XX</b>	R068 = 68mΩ
100mΩ ~ 990mΩ	<b>RXXX</b>	R680 = 680mΩ
1Ω ~ 9.9Ω	<b>XXXX</b>	6R80 = 6.8Ω
10Ω	<b>10R0</b>	10R0 = 10Ω

## TRL0612 ~ TRL1225 : 4 digit marking

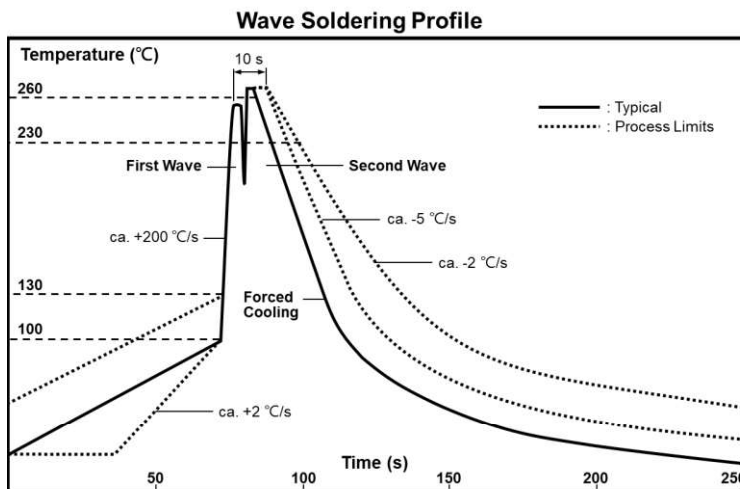
First 3 digits are the significant figures, the 4th digit is the multiplier. "R"= decimal point.

Examples:

Resistance value	Code	Example
10 mΩ ~ 99 mΩ	<b>R0XX</b>	R010 = 10 mΩ
100 mΩ ~ 500 mΩ	<b>RXXX</b>	R100 = 100 mΩ

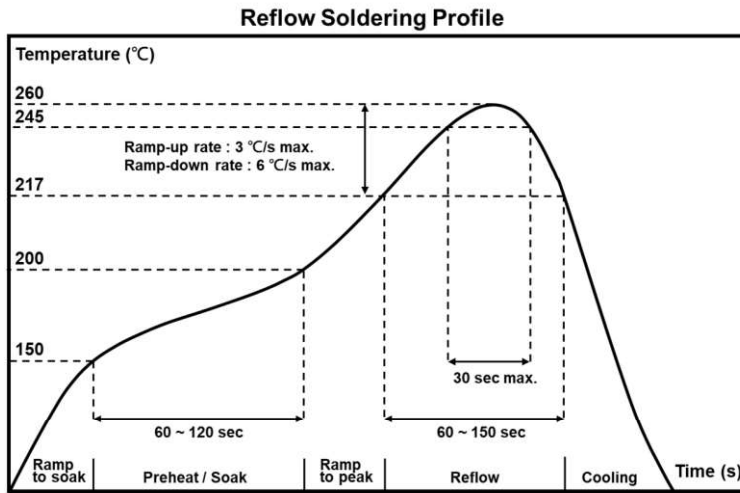
## Recommended Customer Soldering Parameters

### Wave solder Temperature condition





■ **Solder reflow Temperature condition**



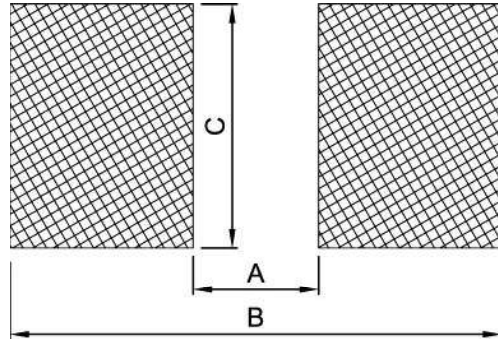
■ **Rework temperature ( hot air equipment ) : 350°C, 3~5seconds**

■ **Recommended reflow methods**

IR, vapor phase oven, hot air oven

If reflow temperatures exceed the recommended profile, devices may not meet the performance requirements.

## ■ Recommend Land Pattern Design



Unit: mm

TYPE	A	B	C
TRL0201	0.25	0.85	0.35
TRL0402	0.50	1.60	0.70
TRL0603	0.80	2.40	1.00
TRL0805	1.30	2.90	1.45
TRL1206	2.20	4.20	1.80
TRL1206 ( $10\text{ m}\Omega \leq R < 39\text{ m}\Omega$ )	1.20	4.80	1.84
TRL1210	2.00	4.40	2.70
TRL2010	3.80	6.60	2.70
TRL2512	4.90	8.10	3.40
TRL0508	0.40	1.80	2.00
TRL0612	0.50	2.60	3.20
TRL1020	1.00	4.05	5.50
TRL1225	1.20	5.20	7.00

## ■ Plating Thickness

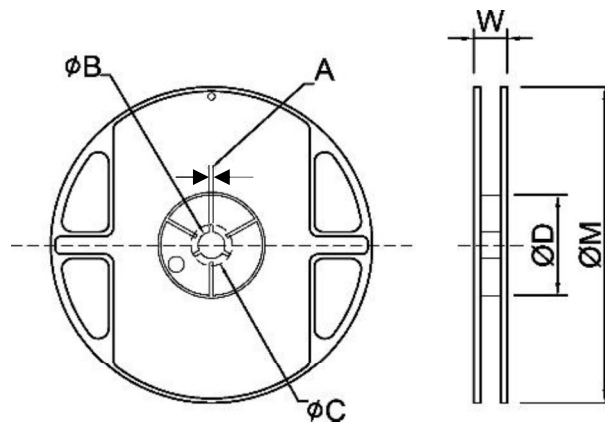
Ni:  $\geq 3\ \mu\text{m}$

Sn(Tin):  $\geq 3\ \mu\text{m}$

## ■ Appendix For SMD Chip Resistor

### ■ Packaging Information

#### ■ Reel Dimensions



Unit: mm

TYPE	SIZE	A	φB	φC	φD	W	φM
TRL0201	7" 10K/Reel	2.0±0.5	13.5±1.0	21±1.0	60±1.0	11.5±2.0	178±2.0
TRL0402	7" 10K/Reel	2.0±0.5	13.5±1.0	21±1.0	60±1.0	11.5±2.0	178±2.0
TRL0603	7" 5K/Reel	2.0±0.5	13.5±1.0	21±1.0	60±1.0	11.5±2.0	178±2.0
TRL0805	7" 5K/Reel	2.0±0.5	13.5±1.0	21±1.0	60±1.0	11.5±2.0	178±2.0
TRL1206	7" 5K/Reel	2.0±0.5	13.5±1.0	21±1.0	60±1.0	11.5±2.0	178±2.0
TRL1210	7" 5K/Reel	2.0±0.5	13.5±1.0	21±1.0	60±1.0	11.5±2.0	178±2.0
TRL2010	7" 4K/Reel	2.0±0.5	13.5±1.0	21±1.0	60±1.0	16.0±2.0	178±2.0
TRL2512	7" 4K/Reel	2.0±0.5	13.5±1.0	21±1.0	60±1.0	16.0±2.0	178±2.0
TRL0508	7" 5K/Reel	2.0±0.5	13.5±1.0	21±1.0	60±1.0	11.5±2.0	178±2.0
TRL0612	7" 5K/Reel	2.0±0.5	13.5±1.0	21±1.0	60±1.0	11.5±2.0	178±2.0
TRL1020	7" 4K/Reel	2.0±0.5	13.5±1.0	21±1.0	60±1.0	16.0±2.0	178±2.0
TRL1225	7" 4K/Reel	2.0±0.5	13.5±1.0	21±1.0	60±1.0	16.0±2.0	178±2.0

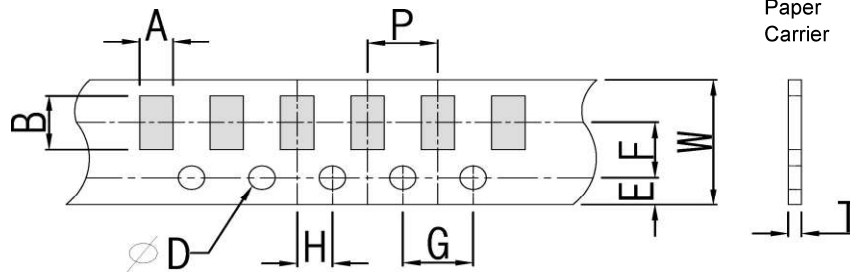


**TRL Series Low-Resistance Metal Film Chip Resistor Product Specifications**

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■ **Packaging Information**

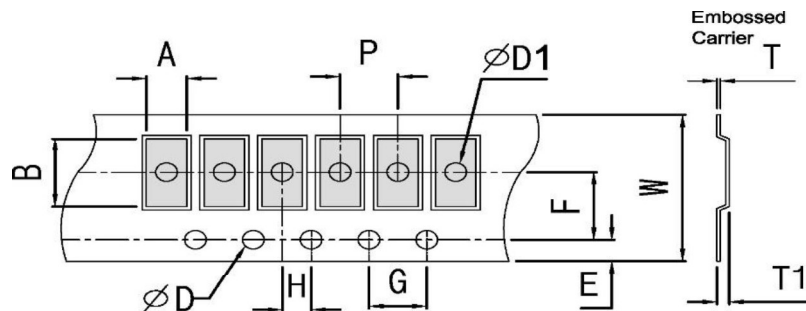
■ **Tapping Specifications**



Unit: mm

Packaging	Type	A	B	W	E	F	G	H	T	ΦD	P
Paper Type	0201	0.45±0.1	0.75±0.1	8.0±0.2	1.75±0.1	3.5±0.05	4.0±0.1	2.0±0.05	0.35±0.1	1.50 <sup>+0.1</sup> <sub>0</sub>	2.0±0.1
	0402	0.7±0.1	1.20±0.1	8.0±0.2	1.75±0.1	3.5±0.05	4.0±0.1	2.0±0.05	0.45±0.1		2.0±0.1
	0603	1.05±0.2	1.80±0.2	8.0±0.2	1.75±0.1	3.5±0.05	4.0±0.1	2.0±0.05	0.60±0.1		4.0±0.1
	0805	1.55±0.2	2.30±0.2	8.0±0.2	1.75±0.1	3.5±0.05	4.0±0.1	2.0±0.05	0.75±0.1		4.0±0.1
	1206	1.90±0.2	3.05±0.2	8.0±0.2	1.75±0.1	3.5±0.05	4.0±0.1	2.0±0.05	0.75±0.1		4.0±0.1
	1210	2.85±0.2	3.05±0.2	8.0±0.2	1.75±0.1	3.5±0.05	4.0±0.1	2.0±0.05	0.75±0.1		4.0±0.1
	0508	1.50±0.15	2.25±0.15	8.0±0.2	1.75±0.1	3.5±0.05	4.0±0.1	2.0±0.05	0.75±0.1		4.0±0.1
	0612	2.85±0.2	3.05±0.2	8.0±0.2	1.75±0.1	3.5±0.05	4.0±0.1	2.0±0.05	0.75±0.1		4.0±0.1

■ **Embossed Dimensions**

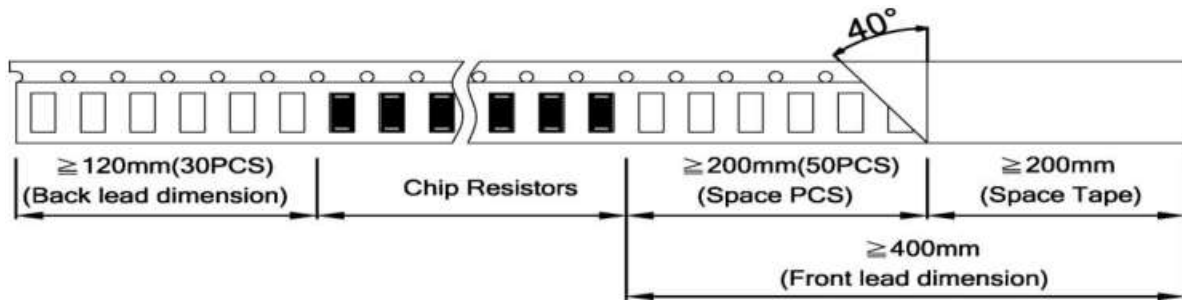


Unit: mm

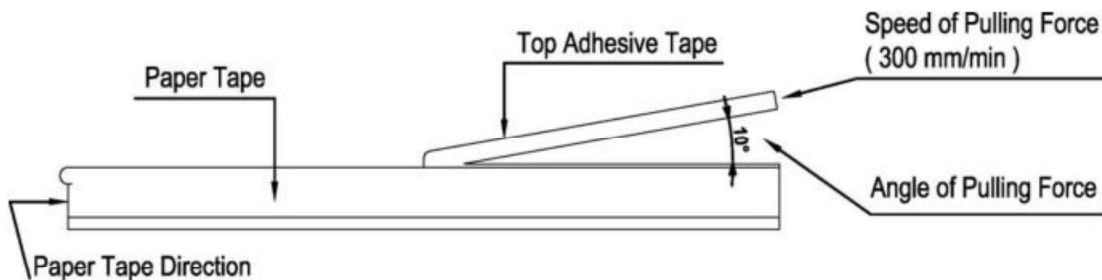
Packaging	Type	A	B	W	E	F	G	H	T	ΦD	ΦD1	T1	P
Embossed Type	2010	2.80±0.2	5.60±0.2	12±0.1	1.75±0.1	5.5±0.05	4.0±0.1	2.0±0.05	0.23±0.1	1.50 <sup>+0.1</sup> <sub>0</sub>	1.50±0.1	0.85±0.15	4.0±0.1
	2512	3.40±0.2	6.70±0.2	12±0.1	1.75±0.1	5.5±0.05	4.0±0.1	2.0±0.05	0.23±0.1		1.50±0.1	0.85±0.15	4.0±0.1
	1020	2.80±0.2	5.60±0.2	12±0.1	1.75±0.1	5.5±0.05	4.0±0.1	2.0±0.05	0.23±0.1		1.50±0.1	0.85±0.15	4.0±0.1
	1225	3.40±0.2	6.70±0.2	12±0.1	1.75±0.1	5.5±0.05	4.0±0.1	2.0±0.05	0.23±0.1		1.50±0.1	0.85±0.15	4.0±0.1

■ Packing Material Data / Storage Data

■ Front & Back Lead Dimensions



■ Top Adhesive Peel Off Strength : 10~70g



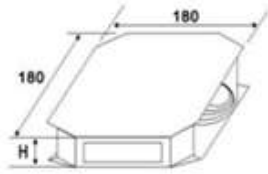


# TRL Series Low-Resistance Metal Film Chip Resistor Product Specifications

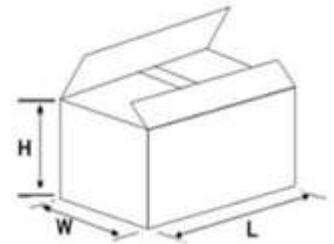
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## Package

Inner Box Size	
Reel	Size H(mm)
1	13
2	24
3	36
5	60
10	113



External Box Size			
Contain (Kpcs)	Length (mm)	Width (mm)	Height (mm)
25K	180	180	60
50K	180	180	110
150K	430	200	200
300K	400	400	200



## Storage Data :

Storage time at the environment temp:  $25\pm 5^{\circ}\text{C}$  & humidity:  $60\pm 20\%$  is valid for one year from the date of delivery.