

## SMD - Resistors

Product: Current Sensing Chip Resistor – SMDL Series

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Size: 0201/0402/0603/0805/1206/1010/2010/2512/1225/3720/7520

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official distributor of



RoHS Compliant

## SMD - Resistors

### Current Sensing Chip Resistor (SMDL Series)

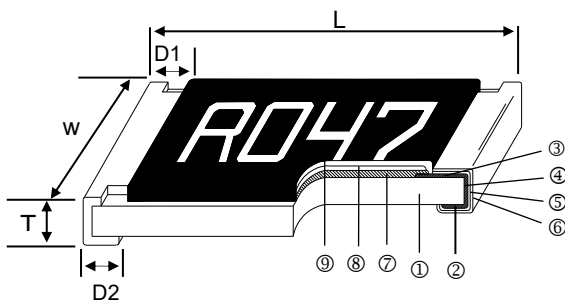
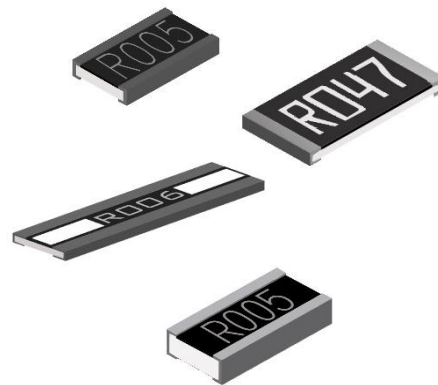
#### ► 1. Features

- 3 Watts power rating in 1 Watt size, 1225 package
- Low TCR of  $\pm 100$  PPM/°C
- Resistance values from 1m to 1 ohm
- High purity alumina substrate for high power dissipation
- Long side terminations with higher power rating
- RoHS Compliance

#### ► 2. 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

#### ► 3. 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

## SMD - Resistors

### 4. Dimensions

Unit: mm

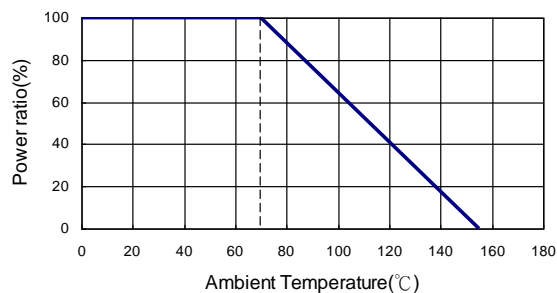
Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
SMDL0201	0201	0.58±0.05	0.29±0.05	0.23±0.05	0.12±0.05	0.15±0.05	0.18
SMDL0402	0402	1.00±0.05	0.50±0.05	0.32±0.10	0.25±0.10	0.20±0.10	0.7
SMDL0603	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	1.99
SMDL0805	0805	2.00±0.15	1.25±0.15	0.55±0.10	0.30±0.20	0.40±0.25	5.3
SMDL1206	1206	3.05±0.15	1.55±0.15	0.55±0.10	0.50±0.30	0.40±0.25	8.82
SMDL1206 (1W)	1206 102 - 1000mΩ	3.15±0.15	1.60±0.15	0.65±0.10	0.80±0.30	0.80±0.25	12.15
SMDL1210	1210	3.00±0.15	2.50±0.15	0.55±0.10	0.50±0.30	0.50±0.25	15.5
SMDL2010	2010	5.00±0.20	2.45±0.15	0.60±0.15	0.60±0.30	0.50±0.25	27.03
SMDL2512	2512	6.35±0.20	3.15±0.15	0.60±0.10	0.60±0.30	0.55±0.25	43.08
SMDL2512 (2W)	2512 10 - 99mΩ	6.35±0.20	3.15±0.15	0.74±0.10	0.60±0.30	0.55±0.25	43.08
SMDL2512 (2W)	2512 100 - 1000mΩ	6.35±0.20	3.15±0.15	0.74±0.10	0.60±0.30	2.70±0.10	43.08
SMDL1225	1225	3.10±0.15	6.30±0.15	0.90±0.15	0.60±0.30	0.55±0.25	53.8
SMDL3720	3720	2.00±0.20	3.75±0.20	0.60±0.10	0.40±0.20	0.40±0.20	19.96
SMDL7520	7520	2.00±0.20	7.50±0.30	0.60±0.10	0.40±0.20	0.40±0.20	35.71
SMDL0612	0612	1.55±0.10	3.10±0.15	0.55±0.10	0.30±0.15	0.45±0.15	10.91

### 5. Part Numbering

Product Type	Dimensions (LxW)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking
SMDL	1206	F	T	G	U	R100	N
	0201 0402 0603 0805 1206 1210 2010 2512 1225 3720 7520 0612	F: ±1% G: ±2% J: ±5%	T: Taping Reel B: Bulk	E: ±100 F: ±200 G: ±300 H: ±400 J: ±600 K: ±150 R: ±1000	: Standard A: 1.5W Q: 3/4W S: 2W T: 1W U: 1/2W V: 1/4W W: 1/8W	R010: 0.01Ω R100: 0.1Ω 1R00: 1Ω	: Standard N: No Marking

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### ► 6. Derating Curve



### ► 7.1 Standard Electrical Specifications

Type	Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Current	Resistance Range (mΩ)			TCR (PPM/°C)
					±1%	±2%	±5%	
SMDL 0201		1/20W	-55 ~ +155°C	0.70A	100 - 147 150 - 500 510 - 1000		±1000 ±600 ±300	
SMDL 0402		1/16W		1.11A	50 - 100 102 - 500 510 - 1000		±400 ±300 ±200	
SMDL 0603		1/10W		2.23A	20 - 50 51 - 100 102 - 300 301 - 1000		±600 ±400 ±300 ±200	
SMDL 0805		1/8W		2.5A	20 - 50 51 - 100 102 - 196 200 - 1000		±600 ±400 ±300 ±200	
SMDL 1206		1/4W		5.00A	10 - 20		±600	
SMDL 1210		1/2W		7.07A	21 - 50		±400	
SMDL 2010		3/4W		8.66A	51 - 91		±300	
SMDL 2512		1W		10.0A	100 - 1000		±200	
SMDL 1225		3W		31.6A	3 - 5 6 - 20 21 - 30 33 - 8000		±300 ±200 ±150 ±100	
SMDL 3720		1W		10.0A	10 - 18 20 - 500		±300 ±150	
SMDL 7520		2W		44.7A	-	1 - 4	±300	
						5 - 10 11 - 350	±200 ±150	
SMDL 0612		1W		10.0A	10 - 27 30 - 91 100 - 499 501 - 1000		±600 ±300 ±200 ±100	

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### ▶ 7.2 High Power Rating Electrical Specifications

Type	Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Current	Resistance Range (mΩ)			TCR (PPM/°C)
					±1%	±2%	±5%	
SMDL0402		1/8W	-55 ~ +155°C	1.56A	51 - 100 101 - 500 501 - 1000		±400 ±300 ±200	
SMDL 0603	1/8W 1/5W			1.98A				
SMDL 0805	1/4W			2.21A				
SMDL 1206	1/2W			7.07A	10 - 20 21 - 50 51 - 91 100 - 1000		±600 ±400 ±300 ±200	
SMDL 1210	3/4W			8.66A				
SMDL 2010	1W			10.0A				
SMDL 2512	1.5W			12.2A				
SMDL 2512	2W*			14.1A				
SMDL 1206	1W*			3.13A	102 - 1000		±100	

\*: Ultra High Power

SMDL 1206 1W: double side printed resistor element without marking.

### ▶ 7.3 Low TCR Electrical Specifications

Type	Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Current	Resistance Range (mΩ)			TCR (PPM/°C)
					±1%	±2%	±5%	
SMDL 0805		1/8W	-55 ~ +155°C	1.11A	100 - 1000 100 - 1000 100 - 1000 100 - 1000 20 - 1000 50 - 1000 100 - 500 50 - 350		±100	
SMDL 1206	1/4W			1.58A				
SMDL 1210	1/2W			2.58A				
SMDL 2010	3/4W			3.87A				
SMDL 2512	1W			7.07A				
SMDL 2512	*2W			6.32A				
SMDL 3720	1W			3.16A				
SMDL 7520	2W			6.32A				

Operating Voltage= $\sqrt{P \cdot R}$  ; Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$  ; Operating Current= $\sqrt{P/R}$

Electronic sensor + resistor is capable of manufacturing the optional spec based on customer's requirement.

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### 8. Marking

No marking for 0201/0402

1%, 5% for 0805/1206/1210/2010/2512/1225/3720/7520/0612: 4 digits marking

Example:

Resistance	100Ω	2.2KΩ	10KΩ	49.9KΩ	100KΩ
Marking	1000	2201	1002	4992	1003

5% for 0603: 3 digits marking in E24

Example: 101=100Ω 102=1KΩ (1<sup>st</sup> and 2<sup>nd</sup> are E24 code and 3<sup>rd</sup> code is multiplier)

E24 code	10	11	12	13	15	16	18	20	22	24	27	30	33	36	39	43	47	51	56	62	68	75	82	91
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1% for 0603: 3 digits marking in E96



3 digits marking for Example: 14C=13K7Ω 13C=13K3Ω

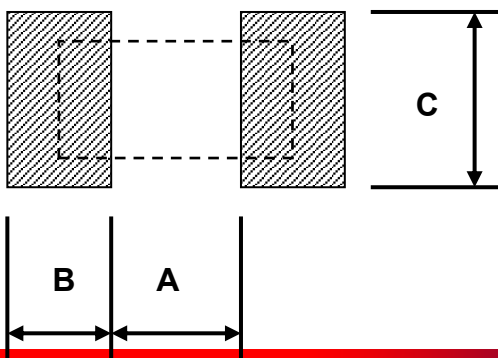
68B=4K99Ω 68X=49.9Ω

### 9. Recommend Land Pattern

Pad Layout (Except For SMDL 2512:High Power Rating Series)

Unit : mm

Type	A	B	C
SMDL 0201	0.25	0.30	0.40±0.2
SMDL 0402	0.50	0.50	0.60±0.2
SMDL 0603	0.80	1.00	0.90±0.2
SMDL 0805	1.00	1.00	1.35±0.2
SMDL 1206	2.00	1.15	1.70±0.2
SMDL 1206 (1W)	0.90	1.70	1.70±0.2
SMDL 1210	2.00	1.15	2.5±0.2
SMDL 2010	3.60	1.40	2.50±0.2
SMDL 2512	4.90	1.60	3.10±0.2
SMDL 1225	1.20	2.00	7.00±0.2
SMDL 3720	1.00	1.80	3.90±0.2
SMDL 7520	1.00	1.80	7.60±0.2
SMDL 0612	0.60	1.00	3.20±0.2



## SMD - Resistors

mm

Pad Layout ( For SMDL2512:High Power Rating Series)

Unit :

Type	Resistance	A	B	C
SMDL 2512	10~99 mΩ	4.9	1.6	3.1±0.2
SMDL 2512	100~1000mΩ	1.0	3.55	3.1±0.2

## SMD - Resistors

### ▶ 10. Environmental Characteristics

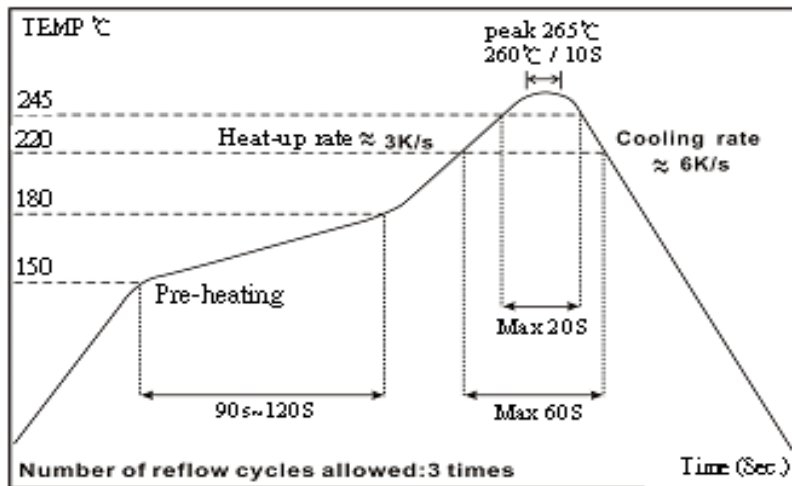
Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	<b>JIS-C-5201-1 4.8</b> <b>IEC-60115-1 4.8</b> At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	$\pm(0.5\%+0.05\Omega)$	<b>JIS-C-5201-1 4.13</b> <b>IEC-60115-1 4.13</b> RCWV*2.5 or max. overload voltage whichever is lower for 5 seconds, 2 seconds for high power series <b>JIS-C-5201-1 4.6</b> <b>IEC-60115-1 4.6</b> Max. overload voltage for 1 minute
	$\pm(1\%+0.05\Omega)$ for high power rating	
Insulation Resistance	>10GΩ	<b>JIS-C-5201-1 4.25</b> <b>IEC-60115-1 4.25.1</b> 70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Endurance	$\pm(1\%+0.05\Omega)$	<b>JIS-C-5201-1 4.24</b> <b>IEC-60115-1 4.24</b> 40±2°C, 90~95% R.H. RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	$\pm(0.5\%+0.05\Omega)$	<b>MIL-STD-202F Method 103B</b> 40±2°C, 90~95% R.H. Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
	CS06 1W: $\pm(1\%+0.05\Omega)$	
Dry Heat	$\pm(0.5\%+0.05\Omega)$	<b>JIS-C-5201-1 4.23</b> <b>IEC-60115-1 2.23.2</b> at +155°C for 1000 hrs
	CS06 1W: $\pm(1\%+0.05\Omega)$	
Bending Strength	$\pm(1\%+0.05\Omega)$	<b>JIS-C-5201-1 4.33</b> <b>IEC-60115-1 4.33</b> Bending once for 5 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage	<b>JIS-C-5201-1 4.17</b> <b>IEC-60115-1 4.17</b> 245±5°C for 3 seconds
Resistance to Soldering Heat	$\pm(0.5\%+0.05\Omega)$	<b>JIS-C-5201-1 4.18</b> <b>IEC-60115-1 4.18</b> 260±5°C for 10 seconds
	CS06 1W: $\pm(1\%+0.05\Omega)$	
Voltage Proof	No breakdown or flashover	<b>JIS-C-5201-1 4.7</b> <b>IEC-60115-1 4.7</b> 1.42 times RCWV (RMS) for 1 minute
Leaching	Individual leaching area ≤ 5% Total leaching area ≤ 10%	<b>JIS-C-5201-1 4.18</b> <b>IEC-60068-2-58 8.2.1</b> 260±5°C for 30 seconds
Rapid Change of Temperature	$\pm(0.5\%+0.05\Omega)$	<b>JIS-C-5201-1 4.18</b> <b>IEC-60115-1 4.18</b> -55°C to +125/+155°C, 5 cycles
	CS06 1W: $\pm(1\%+0.05\Omega)$	

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



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### ► 11. Reflow

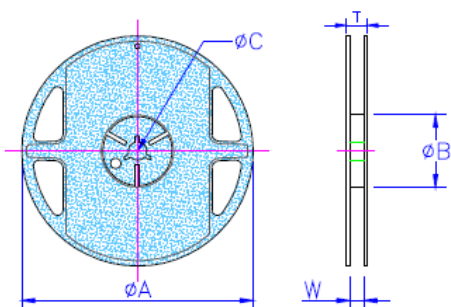


### ► 12. Packaging

Packaging Quantity & Reel Specifications

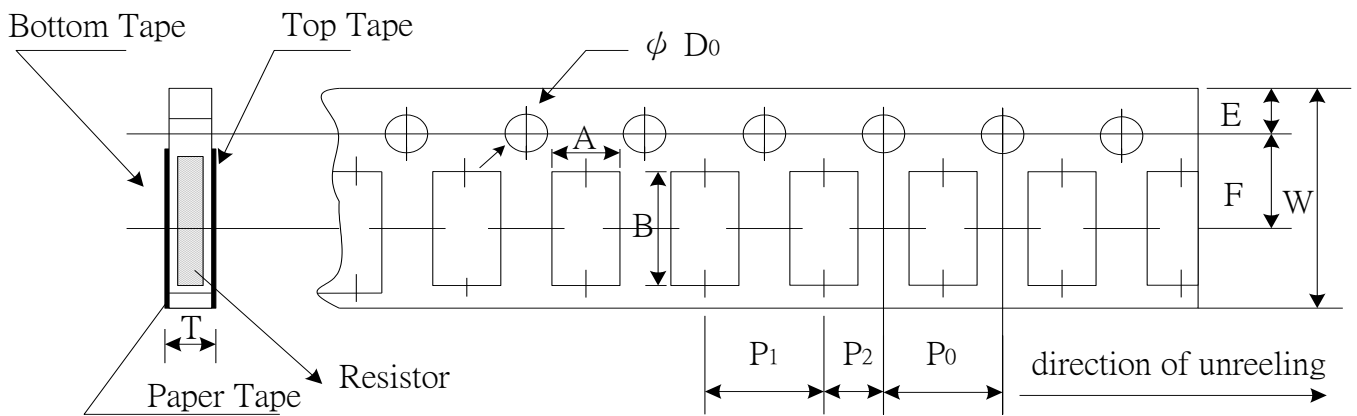
Unit :mm

Type	$\psi A$	$\Phi B$	$\psi C$	W	T	Paper Tape (EA)	Emboss Plastic Tape (EA)
SMDL0201	178.0±1.0	60.0+1.0	13.5±0.7	9.5±0.1	11.5±1.0	10,000	
SMDL0402	178.0±1.0	60.0+1.0	13.5±0.7	9.5±0.1	11.5±1.0	10,000	-
SMDL0603	178.0±1.0	60.0+1.0	13.5±0.7	9.5±0.1	11.5±1.0	5,000	-
SMDL0805	178.0±1.0	60.0+1.0	13.5±0.7	9.5±0.1	11.5±1.0	5,000	-
SMDL1206	178.0±1.0	60.0+1.0	13.5±0.7	9.5±0.1	11.5±1.0	5,000	-
SMDL1210	178.0±1.0	60.0+1.0	13.5±0.7	9.5±0.1	11.5±1.0	5,000	
SMDL2010	178.0±1.0	60.0+1.0	13.5±0.7	13.5±1.0	15.5±1.0	-	4,000
SMDL2512	178.0±1.0	60.0+1.0	13.5±0.7	13.5±1.0	15.5±1.0	-	4,000
SMDL1225	178.0±1.0	60.0+1.0	13.5±0.7	13.5±1.0	15.5±1.0	-	2,000
SMDL3720	178.0±1.0	60.0+1.0	13.5±0.7	13.5±1.0	15.5±1.0	-	2,000
SMDL7520	178.0±1.0	60.0+1.0	13.5±0.7	17.5±1.0	19.5±1.0	-	2,000



Paper Tape Specifications

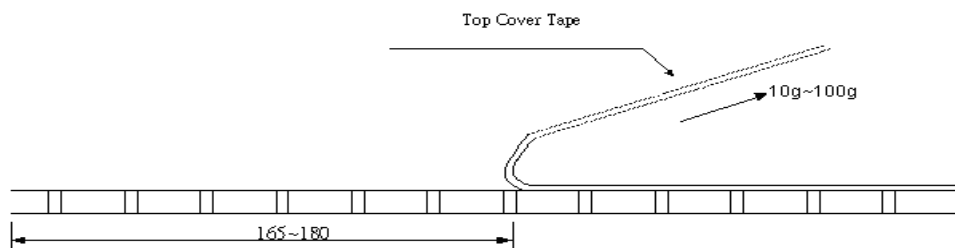
## SMD - Resistors



Unit: mm

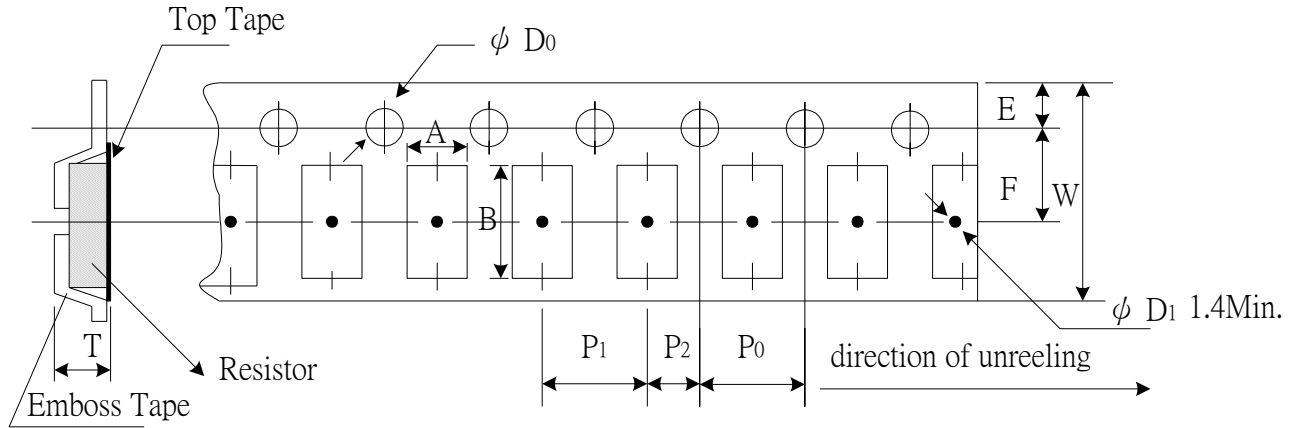
Type	A	B	W	E	F	P0	P1	P2	$\psi D0$	T
SMDL0201	0.40±0.05	0.70±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.55±0.03	0.42±0.02
SMDL0402	0.70±0.05	1.16±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.55±0.05	0.40±0.03
SMDL0603	1.10±0.05	1.90±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.60±0.03
SMDL0805	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
SMDL1206	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
SMDL1210	2.75±0.05	3.4±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 10g and 100g



Emboss Plastic Tape Specifications

## SMD - Resistors



Unit: mm

Type	A	B	W	E	F	$P_0$	$P_1$	$P_2$	$\psi D_0$	T
SMDL2010	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
SMDL2512	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
SMDL2512 (2W)	3.38±0.10	6.68±0.10	12.0±0.30	1.75±0.10	5.5±0.10	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	1.45±0.20
SMDL1225	3.38±0.10	6.68±0.10	12.0±0.30	1.75±0.10	5.5±0.10	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	1.45±0.20
SMDL3720	2.50±0.20	4.45±0.20	12.0±0.30	1.75±0.01	5.5±0.05	4.00 ±0.05	4.00±0.10	2.00±0.05	1.50±0.10	1.50 ±0.10
SMDL7520	2.50±0.20	8.30±0.20	16.0±0.30	1.75±0.01	7.8±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50±0.10	1.50 ±0.10

- 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 10g and 130g

