



### General

- Chip size from 0402 to 2512
- Resistance value from 1Ω to 10MΩ
- Compatible with Pb & Halogen free
- RoHS compliant

### Application

- Converters
- Printer equipment
- Consumer
- Server board
- Telecom

### Electrical Specifications

Type	Power Rating at 70°C	Resistance Range	TCR (ppm/°C)	Resistance tolerance	Operation Temp. Range
0402	1/16W	$1\Omega \leq R < 10\Omega$	$\pm 200$ or $\pm 400$	$\pm 1\%$ (F)、 $\pm 2\%$ (G) $\pm 5\%$ (J)、 $\pm 10\%$ (K)	-55°C~+155°C
		$10\Omega \leq R \leq 1M\Omega$	$\pm 100$ or $\pm 200$	$\pm 0.5\%$ (D)、 $\pm 1\%$ (F)、 $\pm 2\%$ (G) $\pm 5\%$ (J)、 $\pm 10\%$ (K)	
		$1M\Omega < R \leq 10M\Omega$	$\pm 100$ or $\pm 400$	$\pm 1\%$ (F)、 $\pm 2\%$ (G) $\pm 5\%$ (J)、 $\pm 10\%$ (K)	
0603	1/16W、1/10W	$1\Omega \leq R < 10\Omega$	$\pm 200$ or $\pm 250$	$\pm 0.5\%$ (D)、 $\pm 1\%$ (F)、 $\pm 2\%$ (G) $\pm 5\%$ (J)、 $\pm 10\%$ (K)	
		$10\Omega \leq R \leq 1M\Omega$	$\pm 100$	$\pm 0.1\%$ (B)、 $\pm 0.25\%$ (C)、 $\pm 0.5\%$ (D)、 $\pm 1\%$ (F)、 $\pm 2\%$ (G) $\pm 5\%$ (J)、 $\pm 10\%$ (K)	
		$1M\Omega < R \leq 10M\Omega$	$\pm 100$ or $\pm 250$	$\pm 0.25\%$ (C)、 $\pm 0.5\%$ (D)、 $\pm 1\%$ (F)、 $\pm 2\%$ (G) $\pm 5\%$ (J)、 $\pm 10\%$ (K)	

Type	Power Rating at 70°C	Resistance Range	TCR (ppm/°C)	Resistance tolerance	Operation Temp. Range
0805	1/10W、1/8W	1Ω≤R<10Ω	1Ω≤R<10Ω: ±200 or±250 10Ω≤R≤1MΩ: ±100 1MΩ<R≤10MΩ: ±100 or±250	1Ω≤R<10Ω: ±0.5%(D)、±1%(F)、 ±2%(G) ±5%(J)、±10%(K) 10Ω≤R≤1MΩ: ±0.1%(B)、±0.25%(C)、 ±0.5%(D)、±1%(F)、 ±2%(G) ±5%(J)、±10%(K) 1MΩ<R≤10MΩ: ±0.25%(C)、±0.5%(D)、 ±1%(F)、±2%(G) ±5%(J)、±10%(K)	-55°C~+155°C
		10Ω≤R≤1MΩ			
		1MΩ<R≤10MΩ			
1206	1/8W、1/4W	1Ω≤R<10Ω			
		10Ω≤R≤1MΩ			
		1MΩ<R≤10MΩ			
1210	1/4W、1/3W	1Ω≤R<10Ω			
		10Ω≤R≤1MΩ			
		1MΩ<R≤10MΩ			
2010	1/2W、3/4W	1Ω≤R<10Ω			
		10Ω≤R≤1MΩ			
		1MΩ<R≤10MΩ			
2512	1W	1Ω≤R<10Ω			
		10Ω≤R≤1MΩ			
		1MΩ<R≤10MΩ			

## Part Number Information

SKC    25    R    C    F    1R00    I  
**【1】**    **【2】**    **【3】**    **【4】**    **【5】**    **【6】**    **【7】**

**【1】** Series Name: SART Thick Film Type

**【2】** Chip size: 25: 2512 20:2010 13:1210 12:1206 08:0805 06:0603 04:0402

**【3】** Material Code: R:RuO<sub>2</sub>

**【4】** Power Code: 1:1W A:1/2W C:3/4W D:1/4W F:1/8W G:1/10W H:1/16W L:1/20W

**【5】** Resistance Tolerance: D:±0.5% F:±1.0% J:±5.0%

**【6】** Resistance Code: 1R00 = 1Ω 10R0 = 10Ω 1K00=1000Ω 1W00=1MΩ 22W0=22MΩ 0000=0Ω

**【7】** Packaging Code: T:Tape& Reel B: Bulk Pack

## Dimensions



Type	L (mm)	W (mm)	T (mm)	E (mm)	e (mm)
0402	1.00±0.05	0.50±0.05	0.30±0.05	0.20±0.10	0.25±0.10
0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20
0805	2.00±0.10	1.25±0.15	0.50±0.10	0.30±0.20	0.40±0.20
1206	3.20±0.20	1.60±0.15	0.55±0.10	0.50±0.20	0.50±0.20
1210	3.20±0.20	2.50±0.20	0.55±0.10	0.50±0.20	0.50±0.20
2010	5.00±0.20	2.50±0.20	0.55±0.10	0.60±0.20	0.60±0.20
2512	6.30±0.20	3.20±0.20	0.55±0.10	0.60±0.20	0.60±0.20

## Markings

### IEC E-24、E-96 Series Resistance Cross-reference List

• E-24 series(x10<sup>n</sup> Ω)

(unit: 0.001 Ω、0.01 Ω、0.1 Ω、1 Ω、10 Ω、100 Ω、1k Ω、10k Ω、100k Ω、1M Ω、10M Ω、100M Ω、1000M Ω)

Table One:

1.0	1.5	2.2	3.3	4.7	6.8
1.1	1.6	2.4	3.6	5.1	7.5
1.2	1.8	2.7	3.9	5.6	8.2
1.3	2.0	3.0	4.3	6.2	9.1

• E-96 series(x10<sup>n</sup> Ω)

(unit: 0.001 Ω、0.01 Ω、0.1 Ω、1 Ω、10 Ω、100 Ω、1k Ω、10k Ω、100k Ω、1M Ω、10M Ω、100M Ω、1000M Ω)

Table Two:

1.00	1.33	1.78	2.37	3.16	4.22	5.62	7.50
1.02	1.37	1.82	2.43	3.24	4.32	5.76	7.68
1.05	1.40	1.87	2.49	3.32	4.42	5.90	7.87
1.07	1.43	1.91	2.55	3.40	4.53	6.04	8.06
1.10	1.47	1.96	2.61	3.48	4.64	6.19	8.25
1.13	1.50	2.00	2.67	3.57	4.75	6.34	8.45
1.15	1.54	2.05	2.74	3.65	4.87	6.49	8.66
1.18	1.58	2.10	2.80	3.74	4.99	6.65	8.87
1.21	1.62	2.15	2.87	3.83	5.11	6.81	9.09
1.24	1.65	2.21	2.94	3.92	5.23	6.98	9.31
1.27	1.69	2.26	3.01	4.02	5.36	7.15	9.53
1.30	1.74	2.32	3.09	4.12	5.49	7.32	9.76

- E-96 series(0603) 《multiplied Cross-reference List》 and 《Resistance Cross-reference List》

Table Three:

Code	A	B	C	D	E	F	G	H	X	Y	Z
Multiplied	10 <sup>0</sup>	10 <sup>1</sup>	10 <sup>2</sup>	10 <sup>3</sup>	10 <sup>4</sup>	10 <sup>5</sup>	10 <sup>6</sup>	10 <sup>7</sup>	10 <sup>-1</sup>	10 <sup>-2</sup>	10 <sup>-3</sup>

Table Four:

Value	Code	Value	Code	Value	Code	Value	Code	Value	Code	Value
100	17	147	33	215	49	316	65	464	81	681
102	18	150	34	221	50	324	66	475	82	698
105	19	154	35	226	51	332	67	487	83	715
107	20	158	36	232	52	340	68	499	84	732
110	21	162	37	237	53	348	69	511	85	750
113	22	165	38	243	54	357	70	523	86	768
115	23	169	39	249	55	365	71	536	87	787
118	24	174	40	255	56	374	72	549	88	806
121	25	178	41	261	57	383	73	562	89	825
124	26	182	42	267	58	392	74	576	90	845
127	27	187	43	274	59	402	75	590	91	866
130	28	191	44	280	60	412	76	604	92	887
133	29	196	45	287	61	422	77	619	93	909
137	30	200	46	294	62	432	78	634	94	931
140	31	205	47	301	63	442	79	649	95	953
143	32	210	48	309	64	453	80	665	96	976

•Description for Resistance Value Code and Marking of Thick Film Chip Resistor

- E-24 series( $\geq 0603$ 、 $\geq \pm 5\%$ ) : Express resistance value on the glass side with three digits, the first two digits should be significant and the third one denote number of zeros.

For Example:



- E-24 series (0603、 $\leq \pm 1\%$ ) : Three digits with one short bar under marking letter.

For Example:



- E-96 series & E-24 series( $\geq 0805$ 、 $\leq \pm 1\%$ ) :

Express the resistance value with four digits, the first three digits are significant figures and the fourth denotes the number of zeros.

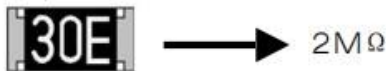
For Example:



- E-96 series (0603、 $\leq \pm 1\%$ ) :

Express the resistance value with three code, the first two digit code denote the resistance of E-96 series, and the third code of letter denote the multiplier (see the table three and four).

For Example:



- The decimal point should be expressed by " R " .

For Example:



- For the chip resistor ( $\leq 0402$ ) ,there is no mark on the glass side.

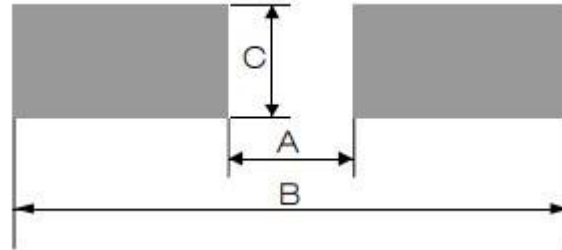
For Example:



- For the resistance which don't belong to IEC serial, use the resistance of IEC serial which is most close to the required resistance of non-IEC serial for replacement.

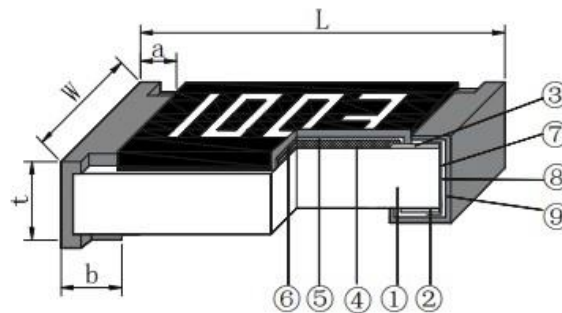
- To get agreement by both party if there special requirement for the marking.

## Recommended Land Patterns



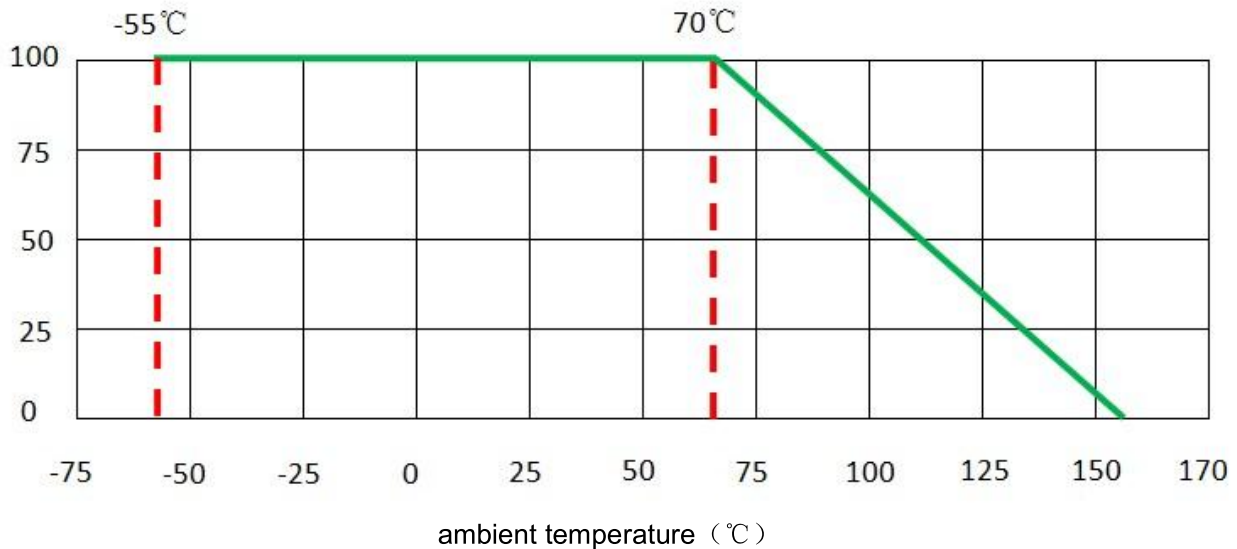
Type	A (mm)	B (mm)	C (mm)
0402	0.45	1.45	0.60
0603	0.80	2.50	0.95
0805	1.05	3.25	1.40
1206	1.90	4.50	1.75
2010	3.50	6.50	2.70
2512	4.80	7.80	3.40

## Materials



No.	Materials	No.	Materials
1	Ceramic	6	Marking
2	Bottom Electrode	7	Edge Electrode
3	Top Electrode	8	Barrier Layer
4	Resistive layer	9	External Electrode
5	Protective coating	/	

## Power Derating Curve

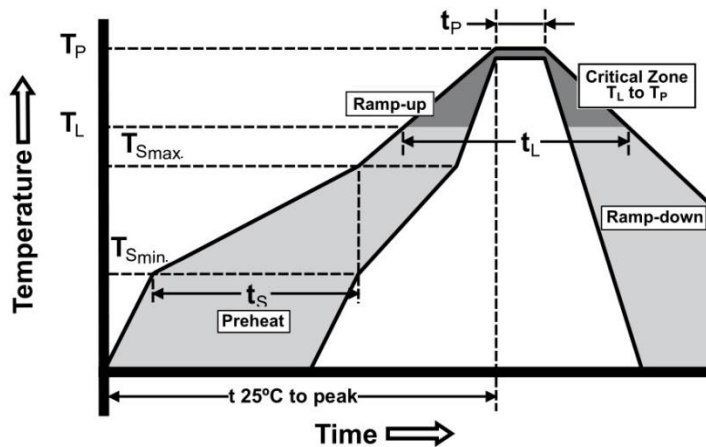


Note : For resistors operated in ambient over 70°C, rated load (rated power) shall be derated accordance With the above figure.

## Recommended Solder Curve

### 1. Infrared Reflow

- Temperature: 240°C~260°C
- Time: 10sec Max.
- Recommend Reflow profile:



Profile Feature	Pb-Free Assembly
Average Ramp-up Rate (Tsmax to Tp)	3°C/sec Max.
Preheat Temperature Min.(Tsmin) Temperature Max.(Tsmax) Time(Tsmin to Tsmax)(ts)	150°C 200°C 60sec~120sec
Peak Temperature(Tp)	240°C~260°C
Time(tp) within 5°C of actual Peak Temperature(Tp)	10sec Max.
Melting tin time(tL)	60sec ~150sec
Ramp-down Rate	6°C/sec Max.
Time 25°C to peak Temperature	8 min Max.

### 2. Wave soldering

- Reservoir Temperature:250°C~260°C
- Time in Reservoir:10sec Max.

### 3. Hand Soldering

- Temperature: 350°C
- Time: 3sec Max.

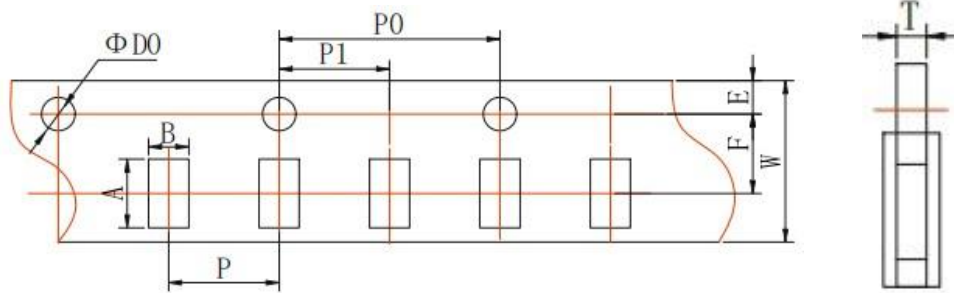
## Product Characteristics

Item	Test condition / Methods	Performance	Standard
Short Time Overload	2.5 times the rated power for 5 sec	±0.1%、±0.25%、±0.5%、±1%:  ΔR ≤1.0%R+0.05Ω ±2%、±5%、±10%:  ΔR ≤2.0%R+0.05Ω	IEC60115-1 4.13
Temperature Coefficient of Resistance (T.C.R.)	TCR=(R-R <sub>0</sub> )/R <sub>0</sub> (T <sub>2</sub> -T <sub>1</sub> )X 10 <sup>6</sup> T <sub>1</sub> T <sub>2</sub> Test temperature: +25℃~+125℃	Refer to SART Spec	IEC60115-1 4.8
Thermal Shock	-55℃(30min)/+125℃ (30min), 300 cycles	±0.1%、±0.25%、±0.5%、±1%:  ΔR ≤0.5%R+0.05Ω ±2%、±5%、±10%:  ΔR ≤1.0%R+0.05Ω	IEC60115-1 4.19
Resistance to Soldering Heat	270℃±5℃, 10sec ±1.0sec	ΔR ≤1.0%R+0.05Ω	IEC60115-1 4.18
Solderability	245℃±5℃, 3sec ±0.3sec	95% coverage Min.	IEC60115-1 4.17
Load Life	1000 hours at rated power, 70℃±2℃, 1.5hours "ON", 0.5hours "OFF"	±0.1%、±0.25%、±0.5%、±1%:  ΔR ≤1.0%R+0.05Ω ±2%、±5%、±10%:  ΔR ≤2.0%R+0.05Ω	IEC60115-1 4.25.1
Bias Humidity	40℃±2℃, 93% ±3% RH, 1000 hours at rated power, 1.5 hours "ON", 0.5 hours "OFF"	±0.1%、±0.25%、±0.5%、±1%:  ΔR ≤1.0%R+0.05Ω ±2%、±5%、±10%:  ΔR ≤2.0%R+0.05Ω	IEC60115-1 4.24
Bending test	Bending width 5mm(0402、0603、0805), Bending width 4mm (1206、1210) .Bending width 2mm (2010、2512) ; Duration:60S±5S	ΔR ≤1.0%R+0.05Ω	IEC60115-1 4.33
High temperature Exposure	0402、0603、0805、1206、1210、2010、2512: 155℃±2℃ for 1000 hours	±0.1%、±0.25%、±0.5%、±1%:  ΔR ≤1.0%R+0.05Ω ±2%、±5%、±10%:  ΔR ≤2.0%R+0.05Ω	IEC60115-1 4.25.3
Operation at Low temperature	-55℃±5℃, 1h without load rated voltage or limiting element voltage whichever is lower for 45min, 15min without load.	±0.1%、±0.25%、±0.5%、±1%:  ΔR ≤1.0%R+0.05Ω ±2%、±5%、±10%:  ΔR ≤2.0%R+0.05Ω	IEC60115-1 4.36
Insulation resistance	Apply DC 100V ±15V between substrate and terminations for 1min, then check insulation resistance.	1000MΩ Min	IEC60115-1 4.6

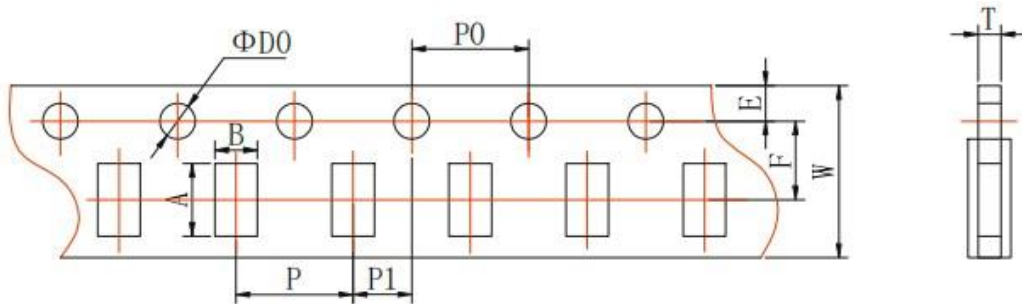


## Packaging

### 1. Tape Packaging Dimensions

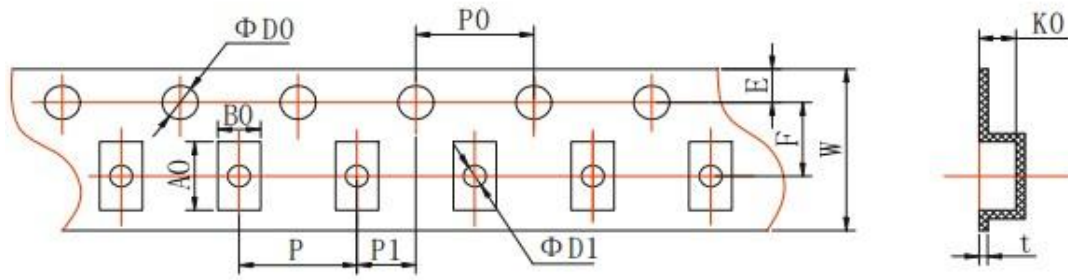


Type	A (mm)	B (mm)	W (mm)	F (mm)	E (mm)
0402	1.20±0.10	0.70±0.10	8.00±0.20	3.50±0.05	1.75±0.10
Type	P (mm)	P0 (mm)	P1 (mm)	∅D0 (mm)	T (mm)
0402	2.00±0.05	4.00±0.10	2.00±0.05	1.50±0.10	0.42±0.05



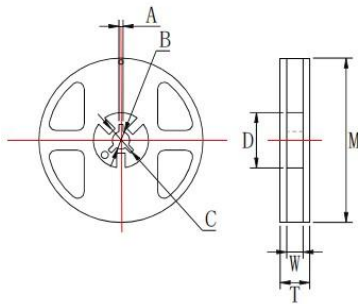
Type	A (mm)	B (mm)	W (mm)	F (mm)	E (mm)
0603	1.85±0.10	1.10±0.10	8.00±0.20	3.50±0.05	1.75±0.10
0805	2.35±0.10	1.65±0.10	8.00±0.20	3.50±0.05	1.75±0.10
1206	3.50±0.20	1.90±0.20	8.00±0.20	3.50±0.05	1.75±0.10
1210	3.50±0.20	2.80±0.20	8.00±0.20	3.50±0.05	1.75±0.10
Type	P (mm)	P0 (mm)	P1 (mm)	∅D0 (mm)	T (mm)
0603	4.00±0.10	4.00±0.10	2.00±0.05	1.50±0.10	0.60±0.10
0805	4.00±0.10	4.00±0.10	2.00±0.05	1.50±0.10	0.75±0.10
1206	4.00±0.10	4.00±0.10	2.00±0.05	1.50±0.10	0.75±0.10
1210	4.00±0.10	4.00±0.10	2.00±0.05	1.50±0.10	0.75±0.10

2. Embossed Tape Dimensions



Type	A0 (mm)	B0 (mm)	W (mm)	F (mm)	E (mm)	t (mm)
2010	5.50±0.15	2.82±0.15	12.00±0.10	5.50±0.10	1.75±0.10	0.25±0.05
2512	6.78±0.15	3.45±0.15	12.00±0.10	5.50±0.10	1.75±0.10	0.25±0.05
Type	P (mm)	P0 (mm)	P1 (mm)	∅D0 (mm)	∅D1 (mm)	K0 (mm)
2010	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.10/-0	1.50±0.10	0.84±0.10
2512	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.10/-0	1.50±0.10	0.81±0.10

3. Reel Dimensions

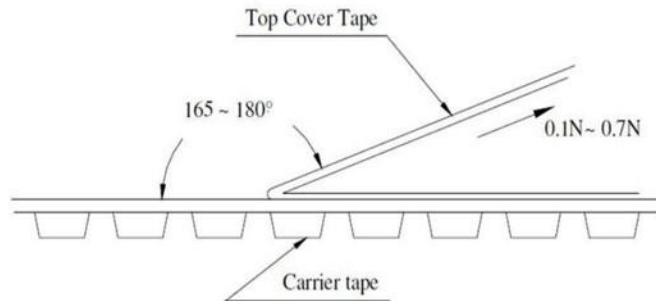


Type	M (mm)	W (mm)	T (mm)	A (mm)	B (mm)	C (mm)	D (mm)
0402 0603 0805 1206 1210	178.00±2.00	9.50±1.00	12.50±1.50	2.00±0.50	13.00±0.50	21.00±0.50	58.00±2.00
2010 2512	178.00±2.00	13.00±0.50	15.50±1.50	2.00±0.50	13.00±0.50	21.00±0.50	57.00±2.00

4.Quantity of Package

Type	Quantities
0402	10K/Reel
0603/0805/1206/1210	5K/Reel
2010/2512	4K/Reel

5.Peeling Test



**Storage**

- Storage time at the environment temp: 5°C~30°C&humidity:30%RH~75%RH is valid for one year from date of delivery.
- Sealed plastic bags with desiccant shall be used to reduce the oxidation of the termination and shall only be opened prior to use.
- The products shall not be stored in areas where harmful gases containing sulfur or chlorine are present.