

## General



- Ideal for all types of current sensing, voltage division and Pulse applications including switching and linear power supplies, instruments , power amplifiers
- Compatible with Reflow and Wave soldering processes
- Lead-free, Halogen-free and RoHS-compliant

## Application

- Switching model power supply.
- Battery pack.
- Notebook, personal computer.
- Test Instrument.
- Power Amplifier.

## Ordering Information

Type	Resistance Range (mΩ)	TCR (PPM/°C)	Power Rating at 70°C	Resistance tolerance	Maximum Working Voltage(V)	Operating Temperature Range	Standard Resistance Values
0402	510≤R<1000	±200	0402: 1/16W 0603: 1/8W 0805: 1/4W 1206: 1/2W 1210: 1/2W 2010: 1W 2512: 1W	±1%(F)	(P×R) <sup>1/2</sup>	-55℃ ~+155℃	E24/E96
0603	100	±800					
	101≤R<300	±500					
	300≤R<1000	±200					
0805 1206	100	±800					
	101≤R < 300	±300					
	300≤R < 500	±200					
	500≤R < 1000	±100					
1210	100≤R < 200	±200					
2010	200≤R < 500	±100					
2512	500≤R < 1000	±75					
2512	10≤R < 20	±1500	2512: 2W				
	20≤R < 100	±800					
	100≤R < 1000	±500					

Remark : Special tolerance and range of resistance are upon requested .

## Catalog Symbol

SK      08      G      D      F      R047      I  
**【1】**      **【2】**      **【3】**      **【4】**      **【5】**      **【6】**      **【7】**

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

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

**【3】 Material Code: G:Ag Alloy**

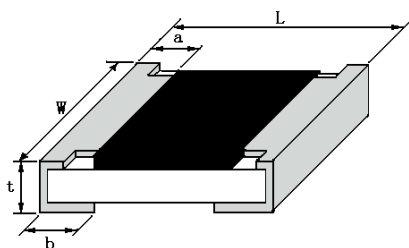
**【4】 Power Code: H:1/16W   F:1/8W   D:1/4W   A:1/2W   1:1W   2:2W**

**【5】 Resistance Tolerance: F:±1%**

**【6】 Resistance Code: R047=47mΩ;**

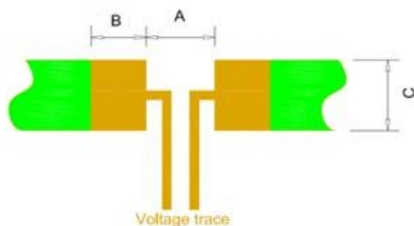
**【7】 Packaging Code: T: Tape& Reel    B: Bulk Pack**

## Dimensions



Type	L(mm)	W(mm)	t(mm)	a(mm)	b(mm)
0402	1.00±0.10	0.50±0.10	0.30±0.10	0.20±0.10	0.25±0.10
0603	1.60±0.15	0.80±0.15	0.40±0.10	0.30±0.20	0.30±0.20
0805	2.00±0.20	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	6.40±0.20	3.20±0.20	0.55±0.10	0.60±0.20	0.60±0.20

## Recommended Land Patterns

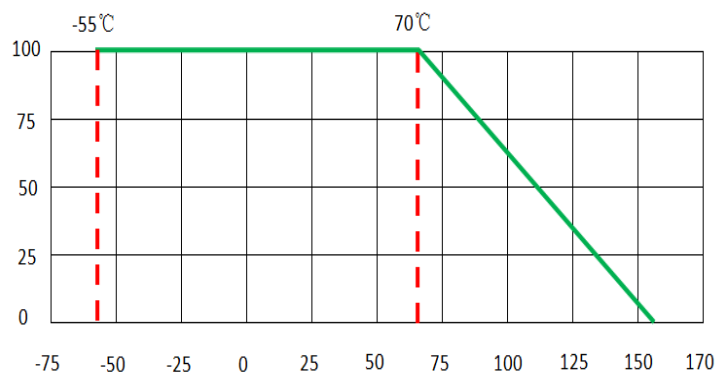


Type	A(mm)	B(mm)	C(mm)
0402	0.45	1.45	0.60
0603	0.80	2.50	0.95
0805	1.05	3.25	1.40
1206	1.90	4.50	1.75
1210	2.00	4.60	2.70
2010	3.50	6.50	2.70
2512	4.80	7.80	3.40

## Materials

Components	Material
Substrate	Ceramic
Terminations	Ni-Cr/ Ni/Sn
Element	Silver or Silver Alloy

## Power Derating Curve



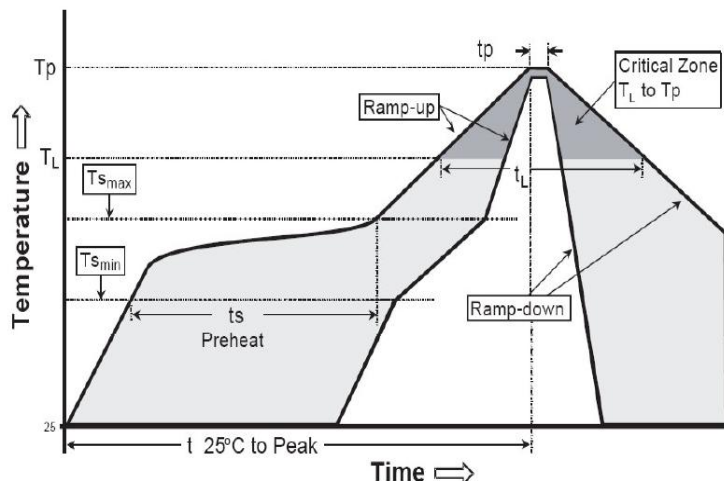
## Recommended Solder Curve

### 1. Infrared Reflow

Temperature: 260°C

Time: 5sec Max.

Recommend Reflow profile:



### 2. Wave soldering

Reservoir Temperature : 260°C

Time in Reservoir : 10sec Max.

Profile Feature	Pb-Free Assembly
Average Ramp-Up Rate(Ts <sub>max</sub> to Tp)	3°C/s Max.
Preheat Temperature Min(Ts <sub>min</sub> )	150°C
Temperature Max(Ts <sub>max</sub> )	180°C
Time(Ts <sub>min</sub> to Ts <sub>max</sub> )	60sec~120sec
Peak Temperature(Tp)	260°C
Time within 5°C of actual Peak Temperature(Tp)	5sec
Low Temperature (TL)	230°C
Melting tin time(t <sub>L</sub> )	20sec~50sec
Ramp-Down Rate	6°C/s Max.
Time 25°C to Peak Temperature	8 minutes Max.

### 3. Hand Soldering

Temperature : 350°C

Time : 5sec Max.

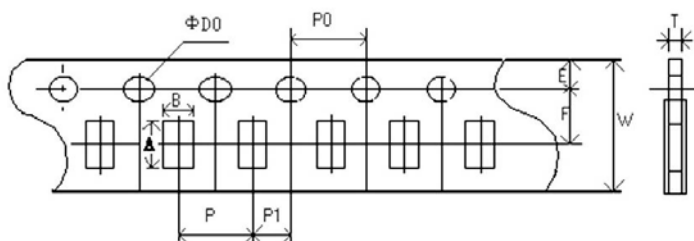
## Reliability Test

Item	Test condition / Methods	Performance	Standard
Temperature Coefficient of Resistance(TCR)	$TCR = (R - R_0) / R_0 (T_2 - T_1) \times 10^6$ Test temperature: T1 T2 25℃ ~ 125℃	Refer to SART Spec	IEC60115-1 4.8
Short Time Overload	2.5X rated voltage for 5 sec	No mechanical damage 2512:2W $ \Delta R  \leq \pm (2.0\%R + 0.05\Omega)$ Other $ \Delta R  \leq \pm (1.0\%R + 0.05\Omega)$	IEC60115-1 4.13
Thermal Shock	For 2512:2W -55℃(15Min.)/+155℃ (15Min.), 300 cycles Others: -55℃(15Min.)/+155℃ (15Min.), 5 cycles	No mechanical damage $ \Delta R  \leq \pm (1.0\%R + 0.05\Omega)$	IEC60115-1 4.19
Solderability	245℃±5℃, 3sec±0.3sec	95% Coverage Min.	IEC60115-1 4.17
Load Life	1000 hours at rated power, 70℃, 1.5hours “ON”, 0.5hour “OFF”	No mechanical damage $ \Delta R  \leq \pm (2.0\%R + 0.05\Omega)$ 2512:2W $ \Delta R  \leq \pm (1.0\%R + 0.05\Omega)$	IEC60115-1 4.25
Steady State Humidity	40℃±2℃, 90%~95% RH, 1,000 hours, 1.5 hours On, 0.5 hours Off	No mechanical damage $ \Delta R  \leq \pm (3.0\%R + 0.05\Omega)$	IEC60115-1 4.24
Resistance to Soldering Heat	260℃±5℃, 10sec±0.5sec	No mechanical damage $ \Delta R  \leq \pm (1.0\%R + 0.05\Omega)$	IEC60115-1 4.18
Insulation Resistance	100V±15V DC	1000MΩ Min.	IEC60115-1 4.6
Bending test	Bending Distance: 0402、0603、0805: 5mm 1206、1210: 4mm 2010、2512: 2mm Duration: 60sec±5sec	No mechanical damage $ \Delta R  \leq \pm (1.0\%R + 0.05\Omega)$	IEC60115-1 4.33
Endurance at upper category temperature	155℃±2℃, 1000h	No mechanical damage $ \Delta R  \leq \pm (1.0\%R + 0.05\Omega)$	IEC60115-1 4.25.1
Operation at low temperature	-55℃±5℃, 1h without load, rated voltage or limiting element voltage whichever is lower for 45 min, 15min without load.	No mechanical damage $ \Delta R  \leq \pm (1.0\%R + 0.05\Omega)$	IEC60115-1 4.25.3

Voltage proof	Apply max. overload voltage of AC RMS at a rate of approximately 100V/s between substrate and terminations for 60s±5s.	No breakdown or flashover	IEC60115-1 4.7
Component solvent resistance	Iso-propyl alcohol (IPA) 23℃±5℃, 10h.	No mechanical damage $ \Delta R  \leq (1.0\%R + 0.05\Omega)$	IEC60115-1 4.29
Shear test	Applying force: 0603: 5N; 0805: 9N; 1206, 1210: 25N; 2010, 2512: 45N. Duration: 10s ±1s.	No mechanical damage	IEC60115-1 4.32

## Packaging

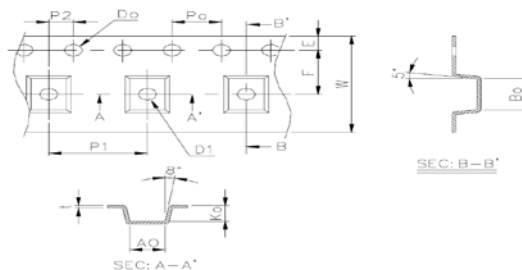
### 1. Paper Tape Dimensions



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
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)	ΦD0(mm)	T(mm)
0402	2.00±0.05	4.00±0.10	2.00±0.05	1.50±0.10	0.42±0.05
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

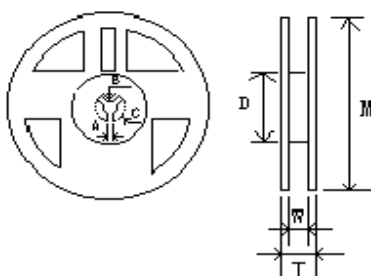
### 2. Embossed Tape Dimensions



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)	ΦD0(mm)	ΦD1(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

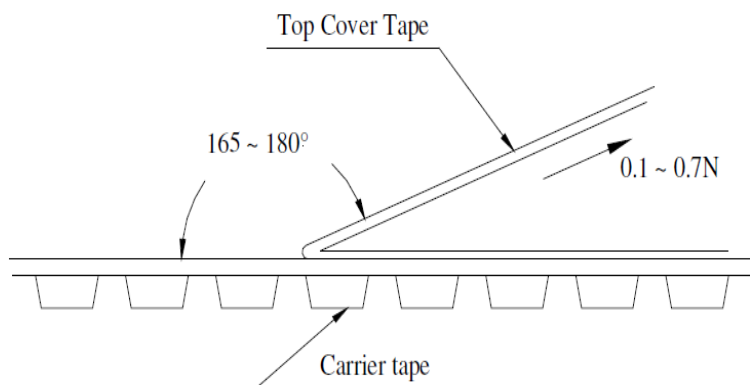


Type	M(mm)	W(mm)	T(mm)	A(mm)	B(mm)	C(mm)	D(mm)
0402	178.00±2.00	9.50±1.00	12.50±1.50	2.00±0.50	13.00±0.50	21.00±0.50	58.00±2.00
0603							
0805							
1206							
1210	178.00±2.00	13.00±0.50	15.50±1.50	2.00±0.50	13.00±0.50	21.00±0.50	57.00±2.00
2010							
2512							

### Number of Package

Packaging style	Tape and Reel						
Type	0402	0603	0805	1206	1210	2010	2512
Quantity (PCS)	10000	5000				4000	

## Peeling Test



## Storage

- The ambient temperature shall be between 5°C~30°C.
- The relative humidity recommended for storage is between 30%~60%.
- 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.
- The products are suggested to be used within six months when received, and the storage condition mentioned above should be followed.