SA Series

Anti-Surge High Accuracy Thick Film Chip Resistors

Version. I

FEATURE

- Superior anti-surge voltage performance
- Superior high-power performance
- High accuracy and stability
- RoHS and Halogen-free compliance
- Compatible with reflow and wave soldering
- MSL class: MSL 1
- Applications:
  - Computer, notebook, workstation, tablet, and peripherals
  - Monitors
  - Power supply
  - Security monitoring
  - etc.

MANUFACTURER PART NO.

For example: SA1206F100KT5G00-SA1206 ±1% 100KΩ T/R-5000

Series	Size	Tol.	Nominal Resistance Value	PKG	SPQ	Feature	TCR
2 codes	4 codes	1 code	2~5 codes	1 code	1 code	1 code	2 codes
SA	1206	F	100K	T	5	G	00
Anti-Surge High Accuracy Thick Film Chip Resistors	0402 0603 0805 1206 1210 2010 2512	F=±1% J=±5%	0R1[①]=0.1Ω 1R=1Ω 4R7=4.7Ω 4K7[②]=4.7KΩ 100K=100KΩ 4M7[③]=4.7MΩ	T=T/R[④]	4=4K 5=5K A=10K	G=Std. S=P.C.[⑤]	00=Refer to item RELIABILITY.

Note:

① R=Radix, 10^0, Ω ② K=Kilo, 10^3, KΩ ③ M=Mega, 10^6, MΩ

④ T/R=Taping in Reel packing type ⑤ P.C.=Personal and Customized.

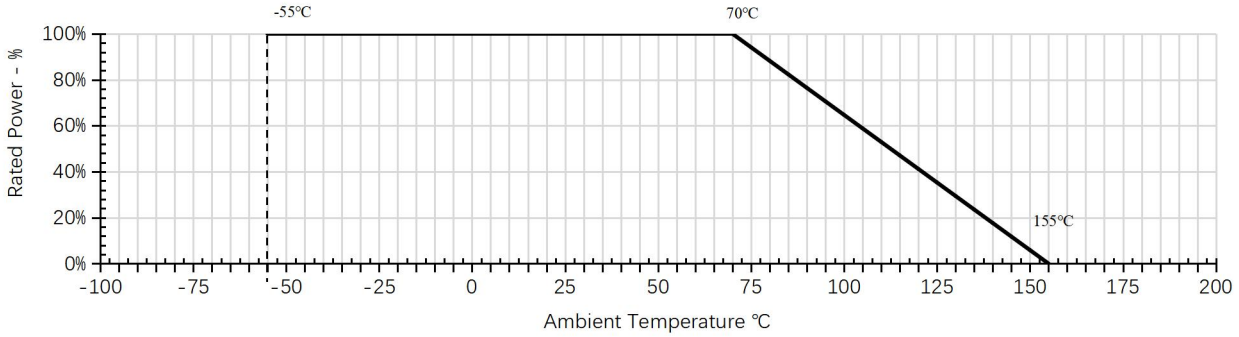
CHARACTERISTIC

Type	Rated Power	MWV[①]	MOV[②]	DWV[③]	Tolerance	Value Range
SA0402	1/8W	50V	100V	100V	±1% / ±5%	1Ω-10MΩ
SA0603	1/4W	75V	150V	300V	±1% / ±5%	1Ω-10MΩ
SA0805	1/3W	150V	300V	500V	±1% / ±5%	1Ω-10MΩ
SA1206	1/2W	200V	400V	500V	±1% / ±5%	0.1Ω-10MΩ
SA1210	3/4W	200V	500V	500V	±1% / ±5%	0.1Ω-10MΩ
SA2010	1.25W	400V	800V	500V	±1% / ±5%	1Ω-10MΩ
SA2512	2W	500V	1000V	500V	±1% / ±5%	0.1Ω-10MΩ

Note: ① MWV=Max. Working Voltage ② MOV=Max. Overload Voltage ③ DWV=Dielectric Withstanding Voltage

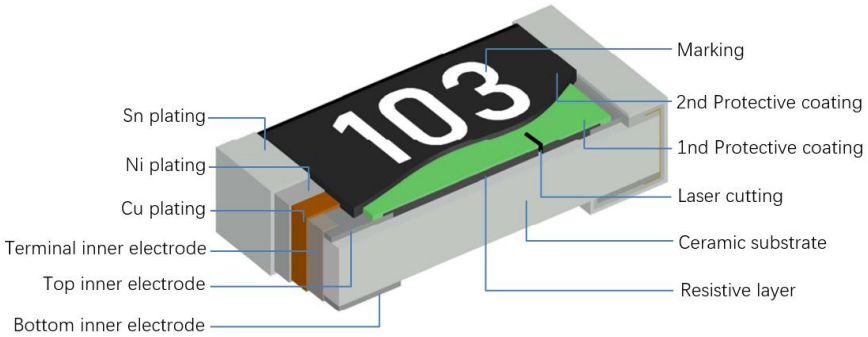
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POWER DERATING CURVE



Note: Operating Temperature Range: -55℃~+155℃

STRUCTURE GRAPH



Note: Cu Plating = Partial size or resistance range

RATED VOLTAGE

Resistors should have a Rated Voltage DC or AC corresponding to Rated Power which can be calculated by formula as below.

The Rated Voltage of certain resistance value should be the calculated result or Max. Working Voltage of product series whichever less.

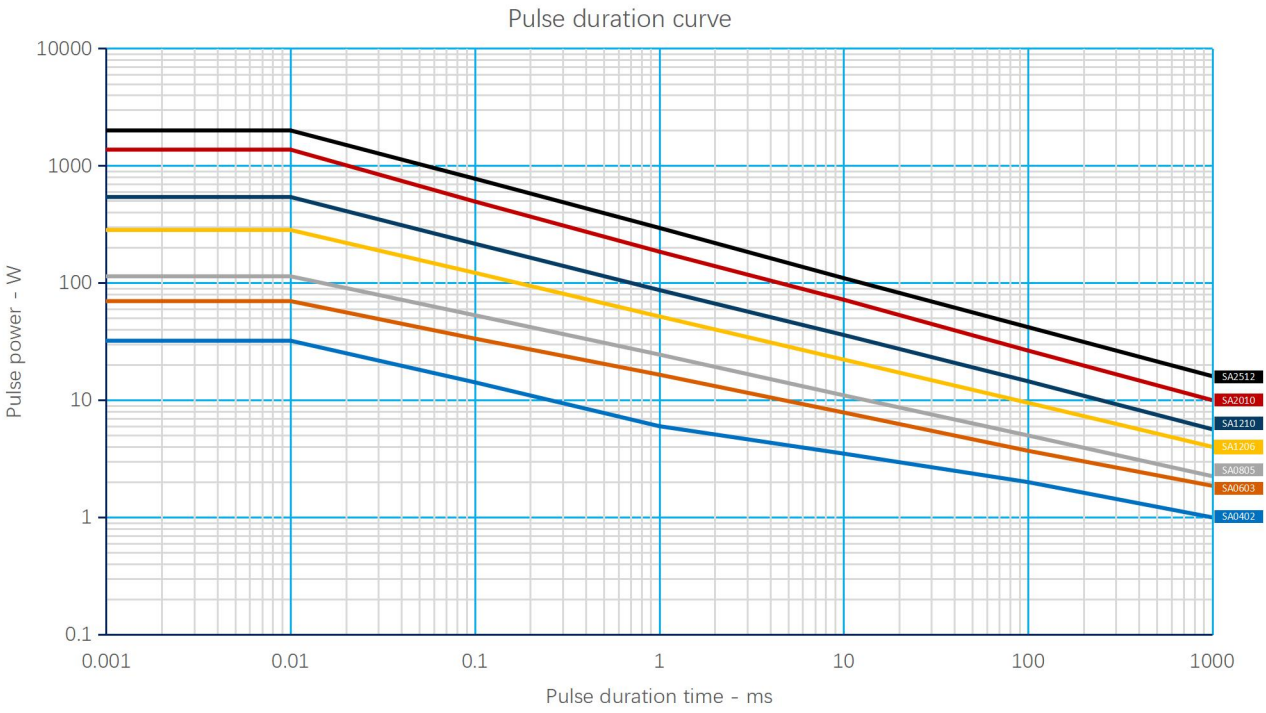
Formula:

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

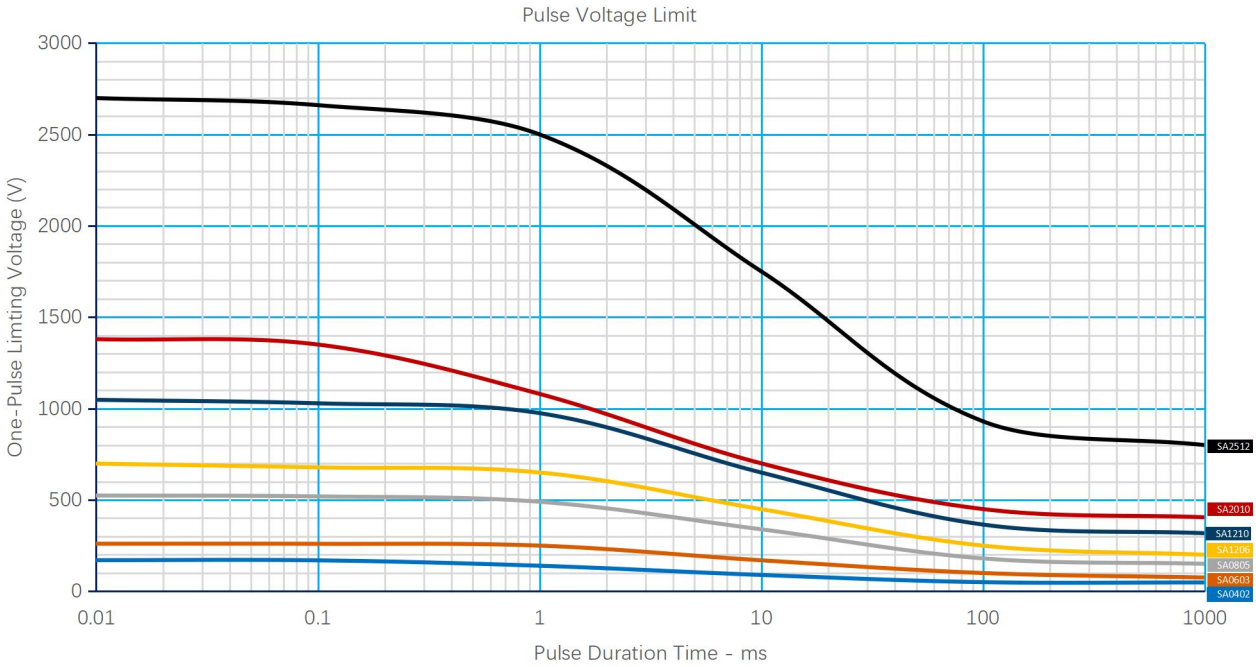
E=Rated voltage(V)
P=Rated power(W)
R=Nominal resistance(Ω)

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PULSE POWER CURVE



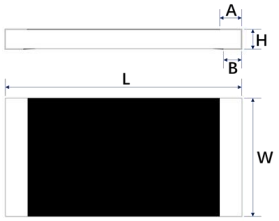
PULSE VOLTAGE CURVE



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DIMENSIONS

Unit: mm

Figure	Type	L	W	H	A	B
	0402	1.00±0.10	0.50±0.05	0.35±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±0.15	1.25±0.15	0.55±0.10	0.40±0.20	0.40±0.20
	1206	3.10±0.15	1.55±0.15	0.55±0.10	0.45±0.20	0.45±0.20
	1210	3.10±0.10	2.60±0.20	0.55±0.10	0.50±0.25	0.50±0.20
	2010	5.00±0.10	2.50±0.20	0.55±0.10	0.50±0.25	0.50±0.20
	2512	6.35±0.10	3.20±0.20	0.55±0.10	0.60±0.25	0.50±0.20

RELIABILITY

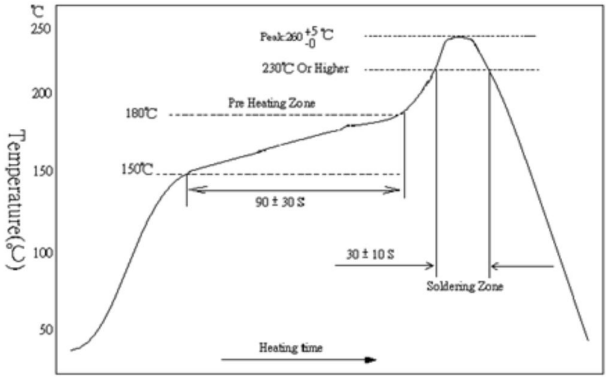
Item	Test Method	Acceptable criterion
Temperature Coefficient of Resistance (T.C.R.)	TCR(PPM/℃)=$\frac{(R_2-R_1)}{R_1\times(T_2-T_1)}\times10^6$ R_1=Value in room temperature R_2=Value in test temperature -55℃ or +125℃ T_1=Room temperature T_2=Test temperature -55℃ or +125℃ Reference: IEC 60115-1 6.2	0.1Ω≤ R < 1Ω: ±400PPM/℃ 1Ω≤ R≤10Ω: ±200PPM/℃ 10Ω < R≤10M: ±100PPM/℃
Insulation Resistance	Using the parallel clamp method: 100±15V_{DC} voltage is applied between the electrode and the substrate within 60 seconds. Test the insulation resistance between the terminal and the back of the part. Reference: IEC 60115-1 12.1.3.5	⩾ 10^9Ω
Dielectric Withstanding Voltage	Apply an alternating current between the electrode and substrate, with the effective value of the maximum overload voltage referring to the DWV characteristics and maintain the pressure for 60 ± 5 seconds. Reference: IEC 60115-1 12.2.4	Test to confirm if the presence of current or arc breakdown by ⩾10uA
Short Time Overload	Apply 2.5 times of rated voltage or maximum overload voltage (whichever is the smallest) for 5 seconds. Reference: IEC 60115-1 8.1.4.2	1% series: △R/R=±(1.0%+0.05Ω) 5% series: △R/R=±(2.0%+0.05Ω)
Intermittent Overload	Put it in the thermostat, apply 2.5 times of rated voltage, 1 second ON, 25 seconds OFF, 10000^{+400}_{-0} cycles, take it out and stand for 60 minutes, then measure the change rate of resistance value. Reference: IEC 60115-1 8.4.4	△R/R=±(5.0%+0.05Ω)
Resistance to Solvent	Immerse in isopropanol solvent at room temperature (23±5℃) for 5min, wipe 10 times with a hard toothbrush, repeat 3 times, take out and blow dry for examination Reference: IEC 60115-1 11.3.2 method1	No obvious damage, peeling, swelling phenomenon
Solderability	Pretreatment: dry heat 155℃, 4H, after taking out, stand at room temperature for 2 hours. Test method B1: Dip the resistance in a tin furnace at 245±5℃ for 5 seconds, then take it out and observe the solder area under a microscope. Method D: 260±5℃, T=30+5/-0s. Reference: J-STD-002 & IEC 60115-1 11.1.4.3	1. Solder coverage over 95% 2. No more than 5% of the partially exposed substrate, non-wetted plating, or ceramic substrate part.
Resistance to Soldering Heat	Reflow test, time above 217 °C is 60s-150s, time above 250 ± 5°C is 30±5s. Reference: IEC 60115-1 11.2.4.3& MIL-STD-202 Method 210	△R/R=±(1.0%+0.05Ω)
Thermal Shock	High and low temperature test is carried out according to the upper and lower limits of the application temperature of the parts, the residence time of the upper and lower limits of the temperature is 30min, and the temperature conversion time is less than 30s, lasting 500 cycles. Reference: IEC 60115-1 10.1.4	△R/R=±(1.0%+0.05Ω)

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Item	Test Method	Acceptable criterion
Solder Joint Endurance Test	The SMD resistance was welded to the test board and bent with the standard pressure block. After standing for 60 sec. under the corresponding deformation condition, the change rate of resistance value of the part was tested. Size: 0402, 0603, 0805 | 1206, 1210 | 2010, 2512 Depth: 5mm | 3mm | 2mm Reference: IEC 60115-1 9.8.4	△R/R=±(1.0%+0.05Ω)
Resistance to Dry Heat	Put it in an oven at 155±5℃ for 1000^{+48}_{-0}hrs., take it out and let it stand for more than 1hr., then measure the change rate of resistance value. Reference: IEC 60115-1 7.3	1% series: △R/R=±(1.0%+0.05Ω) 5% series: △R/R=±(3.0%+0.05Ω)
Loading Life in Moisture	Place it in a constant temperature and humidity box with 40±2℃ and 90~96%RH and apply the voltage (IEC 60115-1 10.4 Table 22) for 1000 hrs. Take it out and stand for 30 minutes before applying rated voltage for 1 minute, and then measure the change rate. Reference: IEC 60115-1 10.4	1% series: △R/R=±(1.0%+0.05Ω) 5% series: △R/R=±(3.0%+0.05Ω)
Load Life	Put in an oven at 70±2℃, apply rated voltage, 90 min ON, 30 min OFF, 1000 hrs., take out and stand for more than 60 min, then measure the resistance change rate. Reference: IEC 60115-1 7.1	1% series: △R/R=±(1.0%+0.05Ω) 5% series: △R/R=±(3.0%+0.05Ω)
Low temperature load test	-55℃, unpowered, 1 hr.: Rated voltage/current for 45 minutes, then unpowered within 15 minutes, return to room temperature, take out and stand for 24 hours, then measure the change rate of resistance value. Reference: IEC 60115-1 10.2.4	1% series: △R/R=±(1.0%+0.05Ω) 5% series: △R/R=±(2.0%+0.05Ω)
Shear force test	Weld the part to the PCB. Apply the corresponding test stress from the side of the part with the test terminal for 10s. Check the appearance of the welded end of the part under the stress condition. Size: 0402 | 0603, 0805, 1206, 1210, 2010, 2512 Test force: 10N | 18N Reference: IEC 60115-1 9.7	Without visible damage.
Impulse testing	Test pulse curve and type, pulse time, voltage / current according to specification standards	△R/R=±(3.0%+0.05Ω)

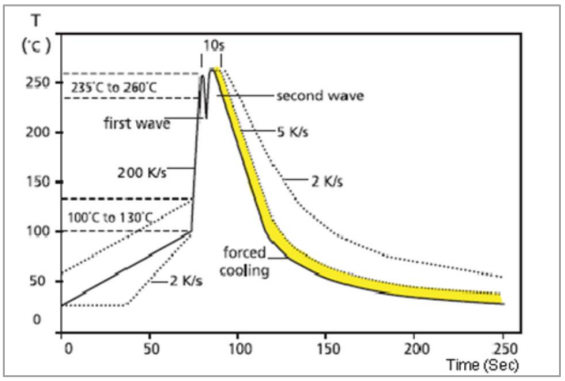
SOLDERING

Lead Free IR Reflow Soldering Profile



- Top temperature should be under 260 +5/-0 ℃ ,10Sec.
- Reference: J-STD-020D

Lead Free Double-Wave Soldering Profile

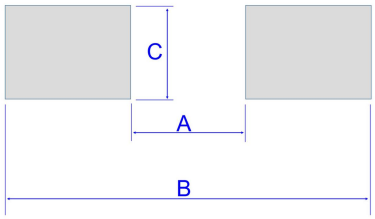


- Suitable for 0603 above size products
- 350±10℃ within 3 Sec. if soldering iron.

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SOLDERING PAD

Unit: mm

Figure	Type	A	B	C
	0402	0.5	1.5	0.6
	0603	0.8	2.1	0.9
	0805	1.2	3.0	1.3
	1206	2.2	4.2	1.6
	1210	2.2	4.2	2.8
	2010	3.5	6.1	2.8
	2512	3.8	8.0	3.5

WORKING ENVIRONMENT

If user intends to use products in special environments or states (including but not limited to the following), it is necessary to approve special characteristics and reliability for the following or other application environments.

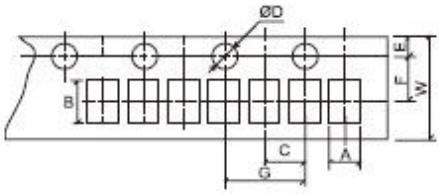
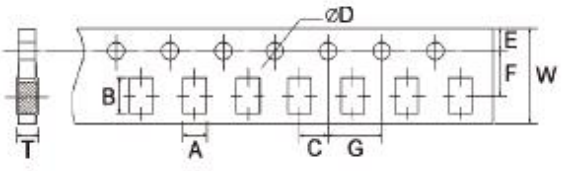
A. High temperature.
B. Near the sea, or corrosive gas, such as Cl_2, H_2S, NH_3, SO_2 and NO_2, etc.
C. Unverified liquids, such as water, oil, chemical or organic solvent.
D. Unverified resin or paint to cover products.
E. Products should be washed with water soluble cleaner even if non cleaning flux.

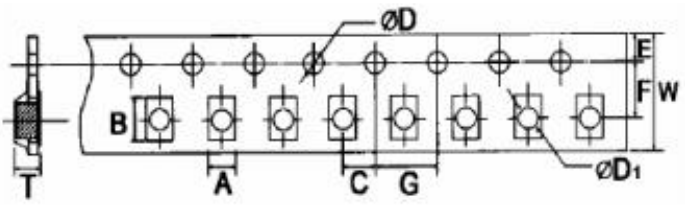
STORAGE / CARRY CONDITIONS

A. Temperature: 25±5℃
B. Humidity: 60±15%RH
C. Storage life: 2 years. FIFO
D. Please hold box correct orientation when storing and carrying. It is strictly prohibited to fall or squeeze the box, otherwise the product electrode or body may be damaged.

TAPING SPECIFICATIONS

A. Taping drawing

Carrier Taping A	Carrier Taping B
	

Embossed Taping


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B. Taping Dimensions

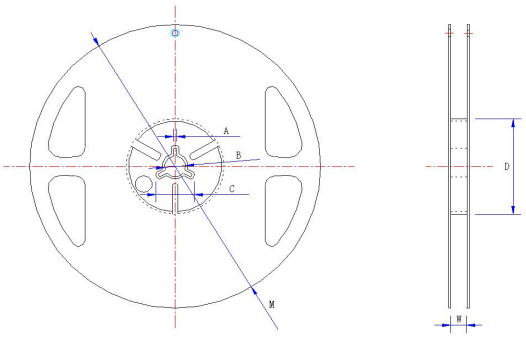
Unit: mm

Type or Size		A±0.2	B±0.2	C±0.05	$\varnothing D^{+0.1}_{-0}$	E±0.1	F±0.05	G±0.1	W±0.2	T±0.1
Carrier Taping A	0402	0.67±0.1	1.17±0.1	2.0	1.5	1.75	3.5	4.0	8.0	0.47
	0603	1.10	1.90	2.0	1.5	1.75	3.5	4.0	8.0	0.67
Carrier Taping B	0603	1.10	1.90	2.0	1.5	1.75	3.5	4.0	8.0	0.67
	0805	1.65	2.40	2.0	1.5	1.75	3.5	4.0	8.0	0.81
	1206	1.90	3.45	2.0	1.5	1.75	3.5	4.0	8.0	0.81
	1210	2.85	3.50	2.0	1.5	1.75	3.5	4.0	8.0	0.81

Type or Size		A±0.2	B±0.2	C±0.05	$\varnothing D^{+0.1}_{-0}$	$\varnothing D^{+0.25}_{-0}$	E±0.1	F±0.05	G±0.1	W±0.2	T±0.1
Embossed Taping	2010	2.90	5.60	2.00	1.50	1.50	1.75	5.50	4.00	12.00	1.00
	2512	3.50	6.70	2.00	1.50	1.50	1.75	5.50	4.00	12.00	1.00

REEL SPECIFICATION

A. Reel drawing



B. Reel dimension

Unit: mm

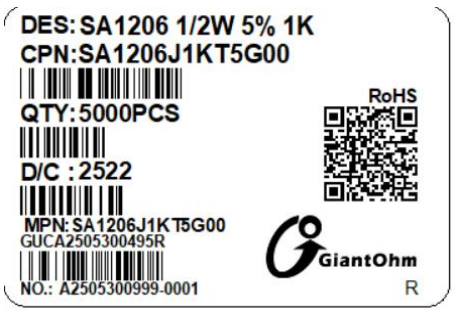
Type	SPQ PCS/Rl.	A±0.5	B±0.5	C±0.5	D±1	M±2	W±1
0402	10,000	2.0	13.0	21.0	60.0	178.0	10.0
0603	5,000	2.0	13.0	21.0	60.0	178.0	10.0
0805	5,000	2.0	13.0	21.0	60.0	178.0	10.0
1206	5,000	2.0	13.0	21.0	60.0	178.0	10.0
1210	5,000	2.0	13.0	21.0	60.0	178.0	10.0
2010	4,000	2.0	13.0	21.0	60.0	178.0	13.8
2512	4,000	2.0	13.0	21.0	60.0	178.0	13.8

C. Label Specification

A. Produce Label



B. Customer Label (Common)



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PACKING BOX

A. Packing Type

Taping in reel / Bulk in plastic bag.

B. Inner box

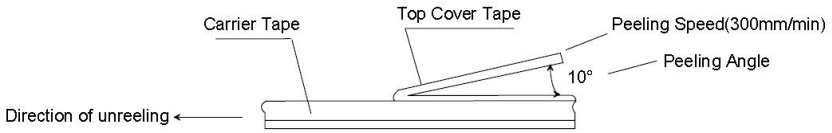
The inner box has several capacities hold 1 reel, 2 reels, 3 reels, 4 reels, 5 reels and 10 reels.

C. Out box

The out box has two capacities hold 6- or 8-pieces inner box.

NOTE OF COVER TAPE PEEL OFF

A. Figure of cover tape peel off.



B. Please keep peeling speed under 300mm per minute.

C. Please keep the angle between cover tape and direction of unreeling narrower than 10 degree.

D. There is limit of adhesive force between cover tape and carrier tape or embossed tape shown as following table.

Size of chip resistors	0402	0603 and above
Adhesive force limit	10~40gf	10~70gf

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VERSION HISTORY

Version	Date	Change Item(s)	Description
A	2022/06/05	-	First version
B	2022/11/10	Reliability	Update test items, method, and acceptable criterion.
C	2023/07/21	Reliability	Update test items, method, and acceptable criterion.
D	2024/01/24	Full	Add Packing Specifications. Add Dielectric Withstanding Voltage.
E	2024/06/08	Full	Add Moisture sensitivity level description.
F	2025/04/08	Legal Disclaimer Taping Dimensions	Revise the entire text Updated the size of the 0603 paper tape
G	2025/04/25	Feature	RoHS
H	2025/07/08	Label Specification	Correction of reference label template
I	2026/01/05	Dimensions	Correction 2010 A Value

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