AS Series

Automotive Grade Anti-Sulfur Anti-Surge Thick Film Chip Resistors

Version. D

FEATURE

- 100% Rated Power at working temperature +125℃.
- AEC-Q200 qualified.
- Superior Anti-Surge Voltage performance.
- Superior Anti-Sulfur performance.
- RoHS complaint.
- High reliability and stability.
- Meet application requirements for high temperature and high humidity with 85℃ and 85%RH.
- MSL class：MSL 1
- Applications:
  - Automotive electronics
  - Medical devices
  - Industrial control system
  - etc.

MANUFACTURER PART NO.

For example: AS1206J100KT5G00-AS1206 ±5% 100KΩ T/R-5000

Series	Size	Tol.	Value	PKG	SPQ	Feature	TCR
2 codes	4 codes	1 code	2~5 codes	1 code	1 code	1 code	2 codes
AS	1206	J	100K	T	5	G	00
Automotive Grade Anti-Sulfur Anti-Surge Thick Film Chip Resistors	0201 0402 0603 0805 1206 1210 2010 2512	F=1% J=5%	0R=Jumper(<50mΩ) 1R[①]=1Ω 4R7=4.7Ω 4K7[②]=4.7KΩ 100K=100KΩ 4M7[③]=4.7MΩ	T=T/R[④]	4=4K 5=5K A=10K B=15K	G=Std. S=P.C.[⑤]	00=Refer to table as below.

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 Package type ⑤ P.C.: Personal and Customized.

CHARACTERISTIC

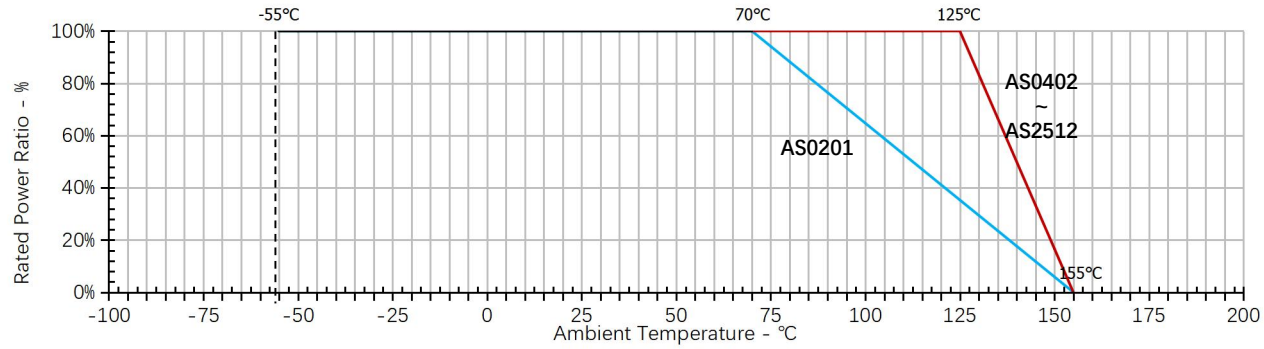
Type	Rated Power	MWV[①]	MOV[②]	Tolerance	Value Range	Jumper(0Ω)		
						Rated Current	MOC[③]	Range
AS0201	1/20W	25V	50V	±1%, ±5%	1Ω≤R≤10MΩ	0.5A	1A	50mΩ Max.
AS0402	1/16W	50V	100V	±1%, ±5%	1Ω≤R≤10MΩ	1A	2A	50mΩ Max.
AS0603	1/10W	75V	150V	±1%, ±5%	1Ω≤R≤10MΩ	1A	2A	50mΩ Max.
AS0805	1/8W	150V	300V	±1%, ±5%	1Ω≤R≤10MΩ	2A	5A	50mΩ Max.
AS1206	1/4W	200V	400V	±1%, ±5%	1Ω≤R≤10MΩ	2A	10A	50mΩ Max.
AS1210	1/3W	200V	500V	±1%, ±5%	1Ω≤R≤10MΩ	2A	10A	50mΩ Max.
AS2010	3/4W	200V	500V	±1%, ±5%	1Ω≤R≤10MΩ	2A	10A	50mΩ Max.
AS2512	1W	200V	500V	±1%, ±5%	1Ω≤R≤10MΩ	2A	10A	50mΩ Max.

Note: ① MWV=Max. Working Voltage ② MOV: Max. Overload Voltage

③ MOC: Max. Overload Current

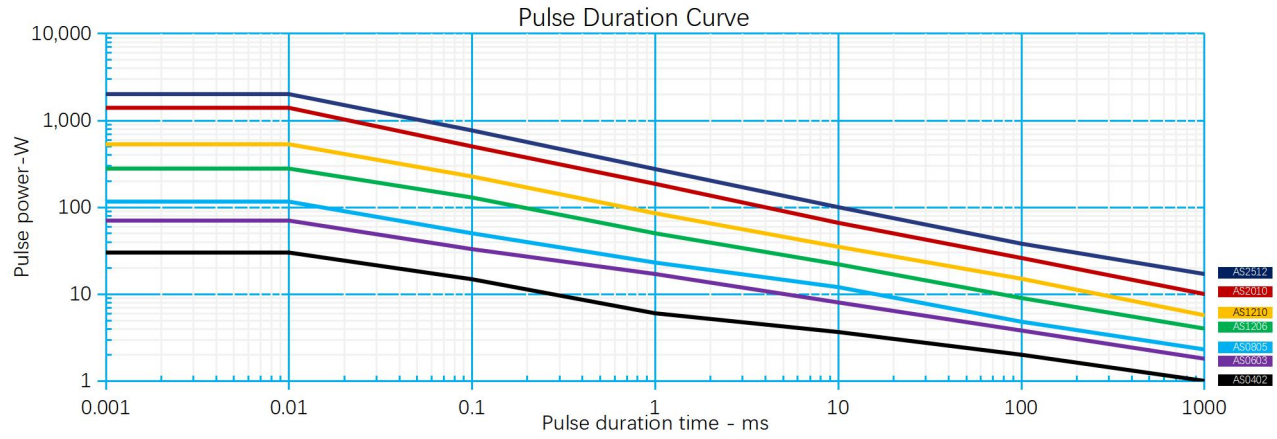
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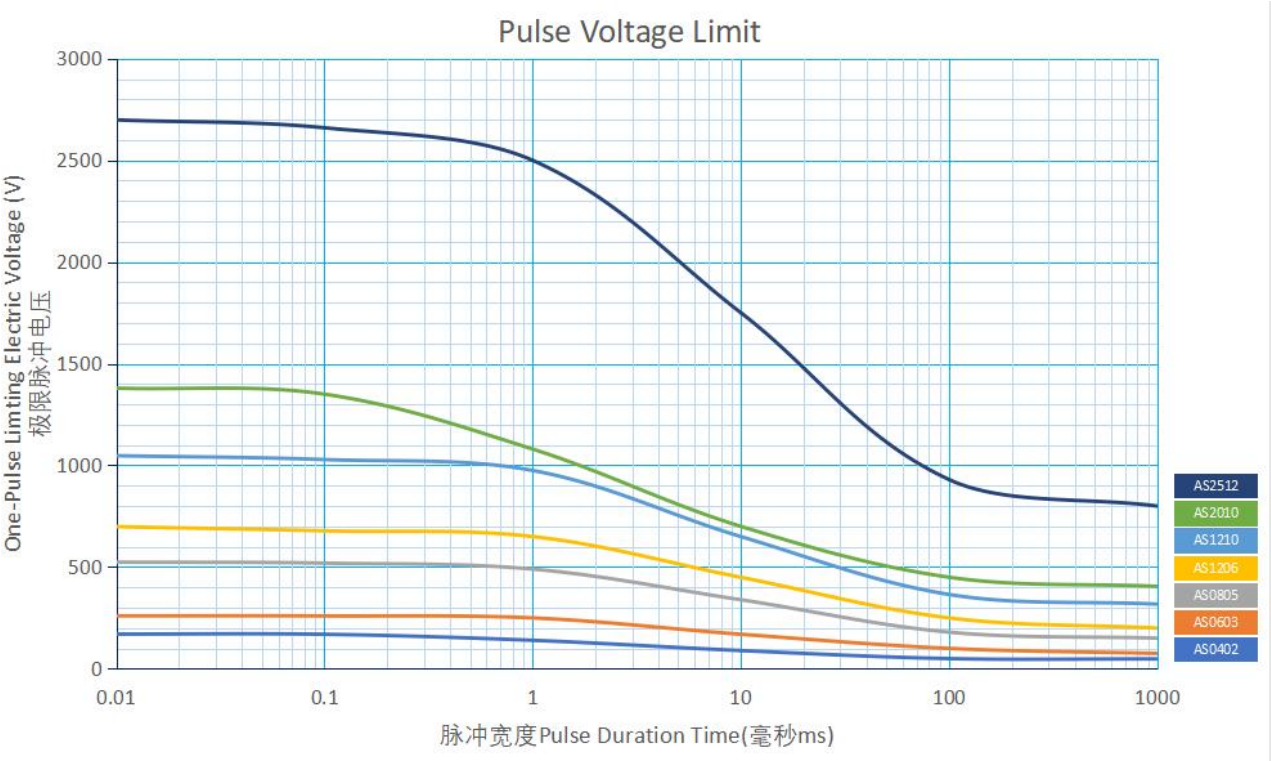
POWER DERATING CURVE



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

PULSE DURATION CURVE





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RATED VOLTAGE

Resistors should have a Rated Voltage DC or AC (RMS) 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.

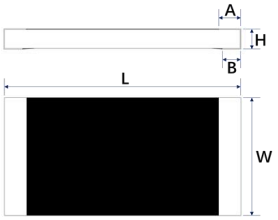
Formula:

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

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

DIMENSIONS

Unit: mm

Figure	Type	L	W	H	A	B
	AS0201	0.60±0.03	0.30±0.03	0.23±0.03	0.12±0.05	0.15±0.05
	AS0402	1.00±0.10	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10
	AS0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20
	AS0805	2.00±0.15	1.25±0.15	0.55±0.10	0.40±0.20	0.40±0.20
	AS1206	3.10±0.15	1.55±0.15	0.55±0.10	0.45±0.20	0.45±0.20
	AS1210	3.10±0.10	2.60±0.20	0.55±0.10	0.50±0.25	0.50±0.20
	AS2010	5.00±0.10	2.50±0.20	0.55±0.10	0.60±0.25	0.50±0.20
	AS2512	6.35±0.10	3.20±0.20	0.55±0.10	0.60±0.25	0.50±0.20

RELIABILITY

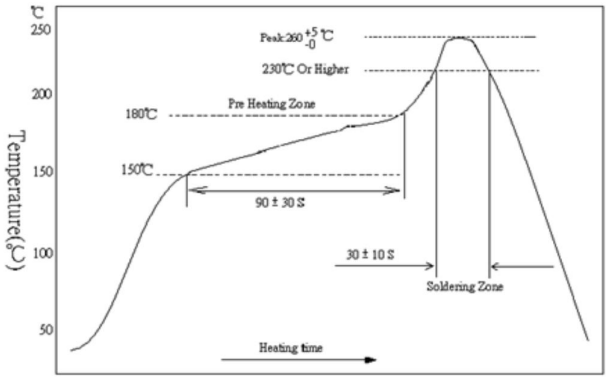
Item	Test Method	Acceptable Criterion
High Temperature Exposure	+155℃, 1000 hrs., unpowered, measure the resistance change rate after test.. **Reference: AEC-Q200 Test 3, MIL-STD-202 Method 108**	±1% Series: △R/R=±(1.0%+0.05Ω) ±5% Series: △R/R=±(2.0%+0.05Ω) Jumper: ＜50mΩ
Temperature Cycling	-55~+155℃, soak time 30min, Transition Time :1minute, 1000 cycles . **Reference: AEC-Q200 Test 4, JESD22 Method JA-104**	△R/R=±(2.0%+0.05Ω) Jumper: ＜50mΩ
Biased Humidity	85℃, 85%, 10% rated power, 1000H, after the test and stand 24H to measure the change rate of resistance value for components with specified operating voltages higher or equal to500V, 10% of operating voltage. **Reference: AEC-Q200 TEST 7, MIL-STD-202 Method 103**	±1% Series: △R/R=±(2.0%+0.05Ω) ±5% Series: △R/R=±(3.0%+0.05Ω) Jumper: ＜100mΩ
High Temperature Operating Life	maximum specified operating temperature at 100% rated power without derating, 1000H, 90 min ON,30 min OFF **Reference: AEC-Q200 Test 8, MIL-STD -202 Method 108**	±1% Series: △R/R=±(2.0%+0.05Ω) ±5% Series: △R/R= ±(3.0%+0.05Ω) Jumper: ＜100mΩ
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: AEC-Q200 Test 12, MIL-STD-202 Method 215**	No visible damage
Resistance to Soldering Heat	Reflow test, time above 217 °C is 60s-150s, time above 250 ± 5°C is 30±5s. **Reference: AEC-Q200 TEST 15, MIL-STD-202 Method 210**	△R/R=±(1.0%+0.05Ω) Jumper: ＜50mΩ
ESD	Human body mode, two discharges, positive and negative polarity once each Size: 0201 | 0402, 0603 | 0805 and above Test Voltage: 500V | 1000V | 2000V **Reference: AEC-Q200 Test 17, AEC-Q200-002**	△R/R=±(2.0%+0.05Ω) Jumper: ＜50mΩ

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Item	Test Method	Acceptable Criterion
Solderability	Pretreatment: dry heat 155℃, 4 hrs. or PCT aging for 4 hrs. (equivalent), after take out, stand at room temperature for 2 hrs. Test method: 1. Dip the resistance in a tin furnace at 245±3℃ for 3 seconds, then take it out and observe the solder area under a microscope; 2. Reflow soldering test, Peak Temperature: 235℃, T=40± 5 seconds. **Reference: AEC-Q200 Test 18, J-STD-002 & IEC 60115-1 11.1.4.3**	Soldering coverage over 95% At the edge of terminal, the object underneath (e.g., white ceramic) shall not expose.
Electrical Characterization	$\mathrm{TCR(PPM/℃)} = \frac{(R_2 - R_1)}{R1 \times (T_2 - T_1)} \times 10^6$ R_1: Resistance value tested at room temperature (Ω) R_2: Resistance value tested at-55℃ or +125℃ T_1: Temperature at room temperature (℃) T_2: Temperature at-55℃ or +125℃ **Reference: AEC-Q200 Test 19,IEC 60115-1 6.2**	1Ω≤R≤10Ω: 0201:-100~+350 PPM/°C 0402~2512: ±200 PPM/°C 10Ω<R≤10MΩ: 0201: ±200 PPM/°C 0402~2512: ±100 PPM/°C
Board Flex	The SMD resistance was welded to the test board and bent with the standard pressure block. After standing for 60s under the corresponding deformation condition, the change rate of resistance value of the part was tested. Size | 0402, 0603, 0805 | 0201, 1206, 1210 | 2010, 2512 Depth | 5mm | 3mm | 2mm **Reference: AEC-Q200 TEST 21, AEC-Q200-005**	△R/R=±(1.0%+0.05Ω) Jumper: <50mΩ
Terminal Strength	Apply 1.8Kgf. external force (0402,1 Kgf.) on the side of the part to test the solder joint adhesion of the part **Reference: AEC Q200-005**	No mechanical damage or peel-off of side end
Short Time Overload	Apply 2.5 times 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) Jumper: <50mΩ
Mechanical shock	Half sine wave, acceleration 100g's, each three times in X, Y and Z directions, pulse width 6ms. **Reference: AEC-Q200 Test 13, MIL-STD -202 Method 213**	△R/R=±(1.0%+0.05Ω) Jumper: <50mΩ
Vibration	Frequency: 10Hz~2000Hz, acceleration: 5g's, X, Y, Z three directions, 12 cycles in each direction, a total of 36 cycles, a single cycle test for 20min. **Reference: AEC-Q200 Test 14, MIL-STD -202 Method 204**	△R/R=±(1.0%+0.05Ω) Jumper: <50mΩ
Flammability	Protective layer flammability report or component needle flame test report **Reference: AEC-Q200 Test 20, UL-94, IEC 60695-11-5**	Do not burn and cotton below do not ignite
Flame retardancy	$9V_{DC}$ to $32V_{DC}$ (clamp current 500A) in each increment $1V_{DC}$ for 1 hr. **Reference: AEC-Q200 Test 24, AEC-Q200-001**	1. Nonflammable 2. Do not explode 3. The temperature cannot be higher than 350℃ for 10 sec
Sulfide test	Put the test sample resistor in sulfur vapor, at a temperature of 105±2℃ for 750hrs **Reference: ASTM-B-809-95&EIA977**	△R/R=±(4.0%+0.05Ω) Jumper: <100mΩ

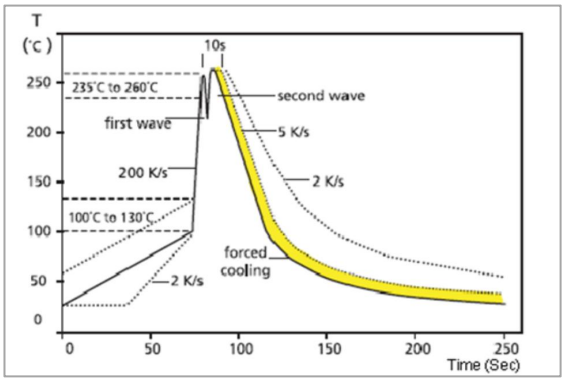
SOLDERING

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

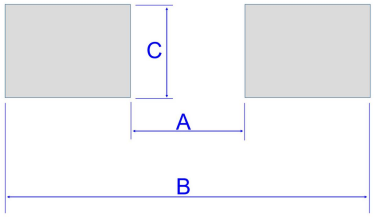


- Suitable for 0603 above size products
- 350±10℃ within 3 Sec. if soldering iron.

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SOLDERING PAD

Unit: mm

Figure	Type	A	B	C
	AS0201	0.3	1.0	0.4
	AS0402	0.5	1.5	0.6
	AS0603	0.8	2.1	0.9
	AS0805	1.2	3.0	1.3
	AS1206	2.2	4.2	1.6
	AS1210	2.2	4.2	2.8
	AS2010	3.5	6.1	2.8
	AS2512	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.

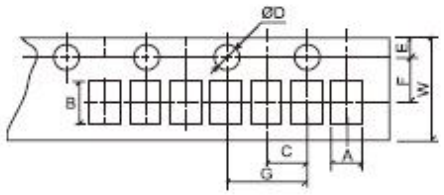
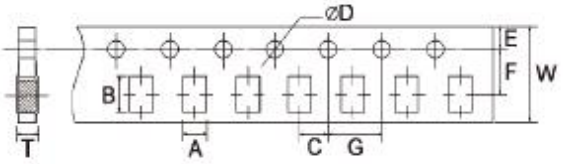
A. High temperature.
B. Near the sea, or corrosive gas, such as Cl_2, H_2S, NH_3, SO_2 and NO_2, etc.
C. Unverified liquids, such as water, oil, chemical or organic solvent.
D. Unverified resin or paint to cover products.
E. Products should be washed with water soluble cleaner even if non cleaning flux.

STORAGE / CARRY CONDITIONS

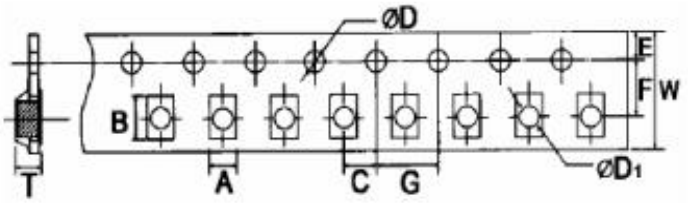
A. Temperature: 25±5℃
B. Humidity: 60±15%RH
C. Storage life:
   - 0201 size: 1 year;
   - 0402 above size: 2 years.
   - FIFO
D. Please hold box correct orientation when storing and carrying. It is strictly prohibited to fall or squeeze the box, otherwise the product electrode or body may be damaged.

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TAPING SPECIFICATIONS Taping drawing

Carrier Taping A	Carrier Taping B
	

Embossed Taping



B. Taping Dimensions unit: mm

Type or Size		A±0.2	B±0.2	C±0.05	$\text{ØD}^{+0.1}_{-0}$	E±0.1	F±0.05	G±0.1	W±0.2	T±0.1
Carrier Taping A	0201	0.40±0.05	0.70±0.05	2.0	1.5	1.75	3.5	4.0	8.0	0.47
	0402	0.67±0.1	1.17±0.1	2.0	1.5	1.75	3.5	4.0	8.0	0.47
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

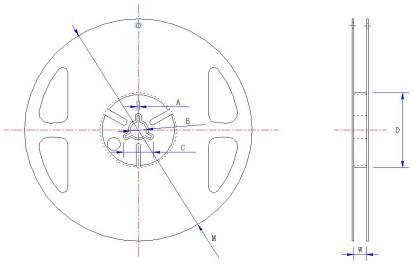
Type or Size		A±0.2	B±0.2	C±0.05	$\text{ØD}^{+0.1}_{-0}$	$\text{ØD}^{+0.25}_{-0}$	E±0.1	F±0.05	G±0.1	W±0.2	T±0.1
Embossed Taping	2010	2.90	5.60	2.00	1.50	1.50	1.75	5.50	4.00	12.00	1.00
	2512	3.50	6.70	2.00	1.50	1.50	1.75	5.50	4.00	12.00	1.00

STANDARD PACKING

Series	0201	0402	0603	0805	1206	1210	2010	2512
SPQ, PCS/Reel	15,000	10,000	5,000	5,000	5,000	5,000	4,000	4,000
Taping material	Carrier	Carrier	Carrier	Carrier	Carrier	Carrier	Embossed	Embossed

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

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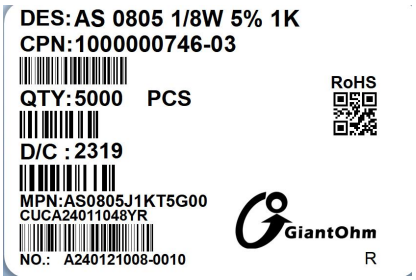
0201	15,000	2.0	13.0	21.0	60.0	178.0	10.0
0402	10,000	2.0	13.0	21.0	60.0	178.0	10.0
0603	5,000	2.0	13.0	21.0	60.0	178.0	10.0
0805	5,000	2.0	13.0	21.0	60.0	178.0	10.0
1206	5,000	2.0	13.0	21.0	60.0	178.0	10.0
1210	5,000	2.0	13.0	21.0	60.0	178.0	10.0
2010	4,000	2.0	13.0	21.0	60.0	178.0	13.8
2512	4,000	2.0	13.0	21.0	60.0	178.0	13.8

LABEL SPECIFICATION

A. Produce Label



B. Customer Label



PACKING BOX

A. Packing Type

Taping in reel / Bulk in plastic bag.

B. Inner box

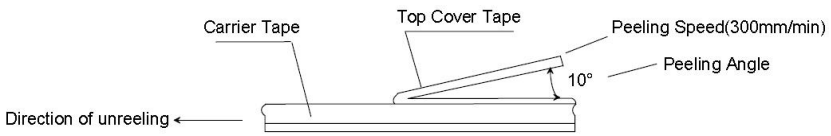
The inner box has several capacities hold 1 reel, 2 reels, 3 reels, 4 reels, 5 reels and 10 reels.

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	0201	0402	0603 and above
Adhesive force limit	6~30gf	10~40gf	10~70gf

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VERSION HISTORY

Version	Date	Change Item(s)	Description
A	2022/03/18	-	First version
B	2022/11/02	Reliabilities	Updated test items, method and acceptable criterion.
C	2024/02/01	Full	Add Packing Specifications and update according to AEC-Q200 version E.
D	2024/07/16	Full	Add Jumper Description in MPN . Updated Jumper test acceptable criterion. Add Moisture sensitivity level description. Add Pulse Voltage Limit

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