FEATURE

- Higher max. working voltage than general purpose series products.
- AEC-Q200 qualified.
- High reliability and stability
- RoHS and Halogen-free compliance
- Superior anti-sulfur performance.
- Meet high requirements for high temperature and high humidity with 85℃ and 85%RH.
- Compatible with reflow and wave soldering.
- MSL class: MSL 1
- Applications:
  - Adapters
  - Back-light circuit
  - Camera
  - Automotive electronics
  - Industrial Equipment
  - etc.

MANUFACTURER PART NO.

For example: AV1206F1MT5G00-AV1206 ±1% 1MΩ T/R-5000

Series	Size	Tolerance	Nominal Resistance Value	PKG	SPQ	Feature	TCR
2 codes	4 codes	1 code	2~5 codes	1 code	1 code	1 code	2 codes
AV	1206	F	1M	T	5	G	00
Automotive Grade High Voltage Thick Film Chip Resistors	0603 0805 1206 1210 2010 2512	D=±0.5% F=±1% J=±5%	10K=10KΩ 36K①=36KΩ 49K9=49.9KΩ 4M7②=4.7MΩ	T=T/R③	4=4K 5=5K A=10K	G=Std. S=P.C.④	00=Refer to table RELIABILITY.

Note: ① K=Kilo, 10^3, KΩ ②M=Mega, 10^6, MΩ
③ T/R=Taping in Reel package type ④P.C.=Personal and Customized.

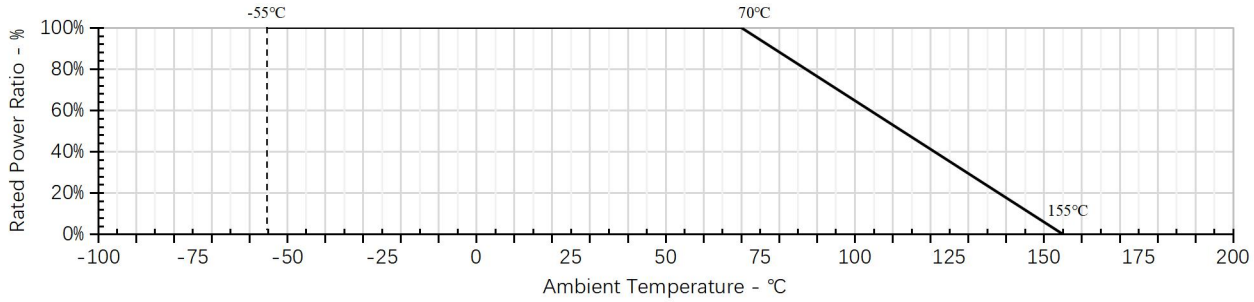
CHARACTERISTICS

Type	Rated Power	MWV①	MOV②	Tolerance	Value Range	Operating Temp.
AV0603	1/10W	350V	500V	±0.5%, ±1%, ±5%	10KΩ≤R≤10MΩ	-55~+155℃
AV0805	1/8W	400V	800V	±0.5%, ±1%, ±5%	10KΩ≤R≤10MΩ	
AV1206	1/4W	500V	1000V	±0.5%, ±1%, ±5%	10KΩ≤R≤10MΩ	
AV1210	1/2W	800V	1500V	±0.5%, ±1%, ±5%	10KΩ≤R≤10MΩ	
AV2010	3/4W	2000V	3000V	±1%, ±5%	10KΩ≤R≤10MΩ	
				±0.5%	10KΩ≤R≤1MΩ	
AV2512	1W	3000V	4000V	±1%, ±5%	10KΩ≤R≤10MΩ	
				±0.5%	10KΩ≤R≤1MΩ	

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

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POWER DERATING CURVE



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

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.

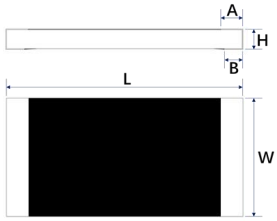
Formula:

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

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

DIMENSIONS

Unit: mm

Figure	Type	L	W	H	A	B
	AV0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20
	AV0805	2.00±0.15	1.25±0.15	0.55±0.10	0.40±0.20	0.40±0.20
	AV1206	3.10±0.15	1.55±0.15	0.55±0.10	0.45±0.20	0.45±0.20
	AV1210	3.10±0.10	2.60±0.20	0.55±0.10	0.50±0.25	0.50±0.20
	AV2010	5.00±0.10	2.50±0.20	0.55±0.10	0.60±0.25	0.50±0.20
	AV2512	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℃, 1000hrs., unpowered, measure the resistance change rate after test. **Reference: AEC-Q200 Test 3, MIL-STD 202 Method 108**	0.5%, 1% Series: △R/R=±(1.0%+0.05Ω) 5% Series: △R/R=±(2.0%+0.05Ω)
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)
Humidity Bias	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**	0.5%, 1% Series: △R/R=±(2.0%+0.05Ω) 5% Series: △R/R=±(3.0%+0.05Ω)

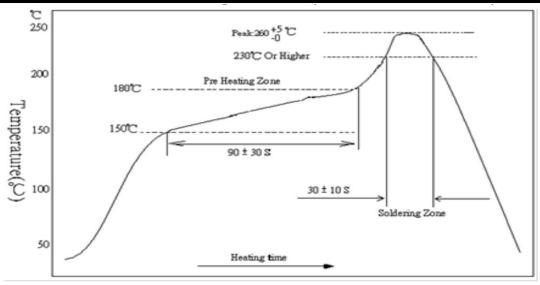
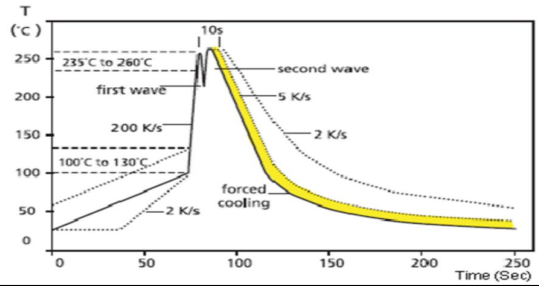
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Item	Test Method	Acceptable Criterion
High Temperature Operational Life	maximum specified operating temperature at 100% rated power without derating, 1000H, 90 min ON,30 min OFF **Reference: AEC-Q200 Test 8, MIL-STD -202 Method 108**	0.5%, 1% Series: △R/R=±(2.0%+0.05Ω) 5% Series: △R/R= ±(3.0%+0.05Ω)
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)
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
ESD	Human body mode, two discharges, positive and negative polarity once each Size: 0603 / 0805 and above Test Voltage: 1000V / 2000V **Reference: AEC-Q200 Test 17, AEC-Q200-002**	△R/R=±(2.0%+0.05Ω)
Solderability	Pretreatment: dry heat 155℃, 4 hrs. after taking out, stand at room temperature for 2 hrs. 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; Test method D: 260±5℃, T=30+5/-0s. **Reference: AEC-Q200 Test 18, J-STD-002 & IEC 60115-1 11.1.4.3**	Soldering coverage must be 95% minimum. At the edge of terminal, the object underneath (e.g., white ceramic) shall not expose
Electrical Characterization	$\mathrm{TCR(PPM/℃)} = \frac{(R_2 - R_1)}{R_1 \times (T_2 - T_1)} \times 10^6$ 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**	±100PPM/°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: 0603, 0805 / 1206, 1210 / 2010, 2512 Depth: 5mm / 3mm / 2mm **Reference: AEC-Q200 TEST 21, AEC-Q200-005**	△R/R=±(1.0%+0.05Ω)
Terminal Strength	Apply 1.8Kgf. external force 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**	0.5%, 1% Series: △R/R=±(1.0%+0.05Ω) 5% Series: △R/R=±(2.0%+0.05Ω)
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)
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)
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	9VDC to 32VDC (clamp current 500A) in each increment 1VDC 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 seconds
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)

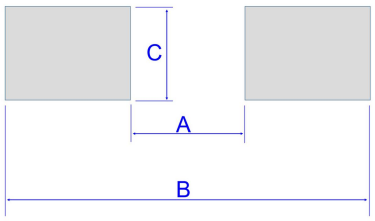
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SOLDERING

Recommendation only. Please adjust it according to the actual application

Lead-free IR Reflow Soldering Profile	Lead-free Double-Wave Soldering Profile
	
Note: ・ The Max. Temp. is 260^{+5}_{0}℃ within 10 sec ・ Reference: J-STD-020D	Note: ・ Suit for ⩾ 0603 size ・ Manual soldering in 350±10℃ within 3 sec.

SOLDERING PAD

Figure	Type	A	B	C
	AV0603	0.8	2.1	0.9
	AV0805	1.2	3.0	1.3
	AV1206	2.2	4.2	1.6
	AV1210	2.2	4.2	2.8
	AV2010	3.5	6.1	2.8
	AV2512	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

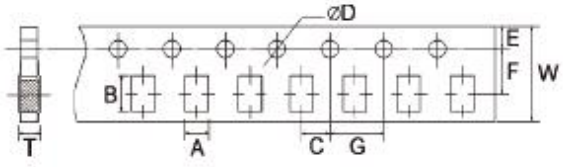
A. Temperature: 25±5℃
B. Humidity: 60±15%RH
C. Storage life: 2 years. FIFO
D. Please hold box correct orientation when storing and carrying. It is strictly prohibited to fall or squeeze the box, otherwise the product electrode or package may be damaged.

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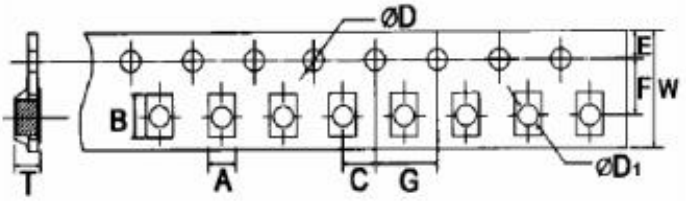
TAPING SPECIFICATIONS

A.Taping drawing

Carrier Taping A



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	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

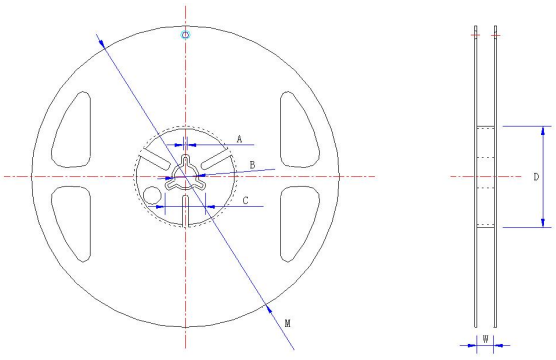
STANDARD PACKING

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

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REEL SPECIFICATION

A. .Reel drawing

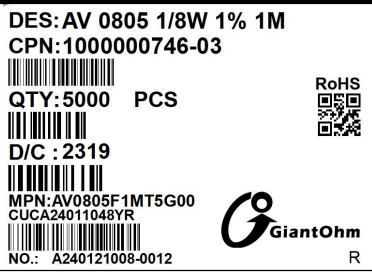


B. Reel dimension

Unit: mm

Type	SPQ PCS/RI.	A±0.5	B±0.5	C±0.5	D±1	M±2	W±1
0603	10,000	2.0	13.0	21.0	60.0	178.0	10.0
	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

Produce Label	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.

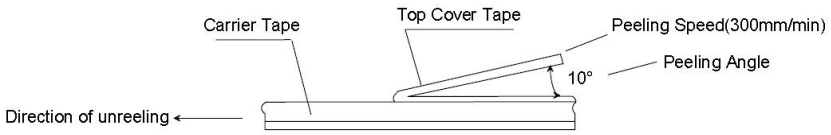
C. Out box

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

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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	0603 and above
Adhesive force limit	10~70gf

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   - Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each user application by the user's technical experts for the application, with the user assuming full responsibility.
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   - Continued use of the products by the user after the Terms update shall constitute deemed acceptance of the new Terms.

6. **Effectiveness:**

   This disclaimer does not exclude liability for personal injury caused by intentional misconduct or gross negligence, or other liabilities prohibited from exclusion by law.

VERSION HISTORY

Version	Date	Change Item(s)	Description
A	2022/06/22	-	First version
B	2022/11/03	Reliabilities	Updated test and requirements
C	2022/11/26	Reliabilities, Characteristics	Add tolerance ±0.5%.
D	2023/09/10	Reliabilities	Update according to AEC-Q200 version E
E	2024/02/01	Full	Add Packing Specifications.
F	2024/07/16	Full	Updated test acceptable criterion. Add Moisture sensitivity level description.
G	2025/05/24	Full	Update RoHS,Revise the entire text,Update Format.
H	2026/10/19	Characteristics	Update the resistance range.Add the SPQ for 0603.

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