AG Series

Automotive Grade General Purpose Thick Film Chip Resistors

Version.I

鼎声微电 GiantOhm

FEATURE

- AEC-Q200 Compliant
- High stability and reliability
- RoHS and Halogen-free compliance
- MSL class: MSL 1
- Applications:
  - Automotive electronics, such as multimedia entertainment, vehicle navigation, audio control unit, Electric door and window, electric seat control unit, reversing radar
  - Automotive lighting and control unit
  - Consumer electronics
  - etc.

MANUFACTURER PART NO.

For example: AG1206J100KT5G00-AG1206 ±5% 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
AG	1206	J	100K	T	5	G	00
Automotive Grade General Purpose Thick Film Chip Resistors	0201 0402 0603 0805 1206 1210 1812 2010 2512	D=±0.5% F=±1% J=±5%	0R=Jumper(＜50mΩ) 1R①=1Ω 4R7=4.7Ω 4K7②=4.7KΩ 100K=100KΩ 4M7③=4.7MΩ	T=T/R④	4=4K 5=5K A=10K B=15K	G=Std. S=P.C.⑤ D=1/10W	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 packing type ⑤ P.C.=Personal and Customized.

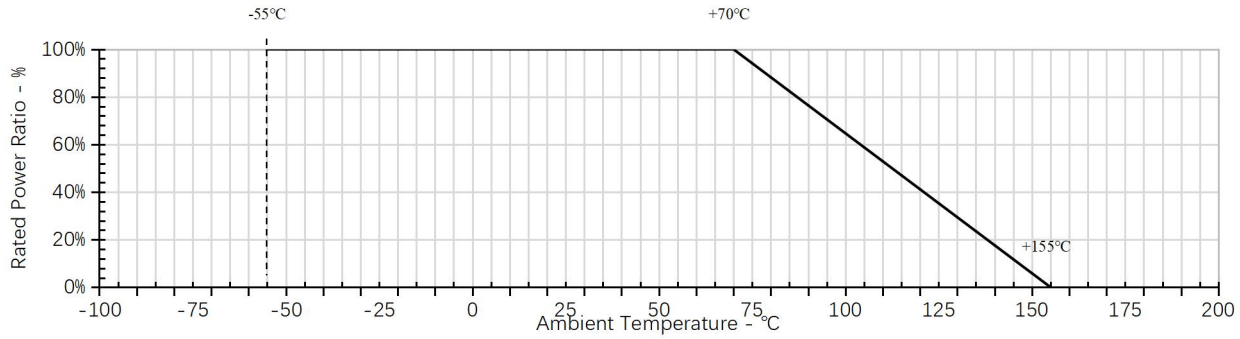
CHARACTERISTICS

Type	Rated Power	MWV①	MOV②	Tolerance	Value Range	Jumper(0Ω)		
						Rated Current	MOC③	Range
AG0201	1/20W	25V	50V	±0.5%, ±1%, ±5%	1Ω≤R≤10MΩ	0.5A	1A	50mΩ Max.
AG0402	1/16W 1/10W	50V	100V	±0.5%, ±1%, ±5%	1Ω≤R≤10MΩ	1A	2A	50mΩ Max.
AG0603	1/10W	75V	150V	±0.5%, ±1%, ±5%	1Ω≤R≤10MΩ	1A	2A	50mΩ Max.
AG0805	1/8W	150V	300V	±0.5%, ±1%, ±5%	1Ω≤R≤10MΩ	2A	5A	50mΩ Max.
AG1206	1/4W	200V	400V	±0.5%, ±1%, ±5%	1Ω≤R≤10MΩ	2A	10A	50mΩ Max.
AG1210	1/2W	200V	500V	±0.5%	10Ω≤R≤10MΩ	2A	10A	50mΩ Max.
				±1%, ±5%	1Ω≤R≤10MΩ			
AG1812	3/4W	200V	500V	±1%, ±5%	1Ω≤R≤10MΩ	2A	10A	50mΩ Max.
AG2010	3/4W	200V	500V	±0.5%	10Ω≤R≤10MΩ	2A	10A	50mΩ Max.
				±1%, ±5%	1Ω≤R≤10MΩ			
AG2512	1W	200V	500V	±0.5%	10Ω≤R≤10MΩ	2A	10A	50mΩ Max.
				±1%, ±5%	1Ω≤R≤10MΩ			

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℃

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.

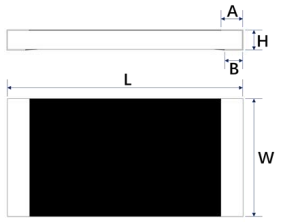
Formula:

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

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

DIMENSIONS

Unit: mm

Figure	Type	L	W	H	A	B
	AG0201	0.60±0.03	0.30±0.03	0.23±0.03	0.12±0.05	0.15±0.05
	AG0402	1.00±0.10	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10
	AG0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20
	AG0805	2.00±0.15	1.25±0.15	0.55±0.10	0.40±0.20	0.40±0.20
	AG1206	3.10±0.10	1.55±0.15	0.55±0.10	0.45±0.20	0.45±0.20
	AG1210	3.10±0.10	2.60±0.20	0.55±0.10	0.50±0.25	0.50±0.20
	AG1812	4.50±0.10	3.20±0.20	0.55±0.10	0.50±0.25	0.50±0.25
	AG2010	5.00±0.10	2.50±0.20	0.55±0.10	0.60±0.25	0.50±0.20
	AG2512	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) 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
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) 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	±0.5%, ±1% Series: △R/R=±(2.0%+0.05Ω) ±5% Series: △R/R= ±(3.0%+0.05Ω) Jumper: < 100mΩ

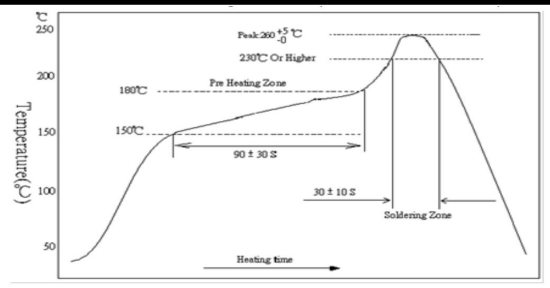
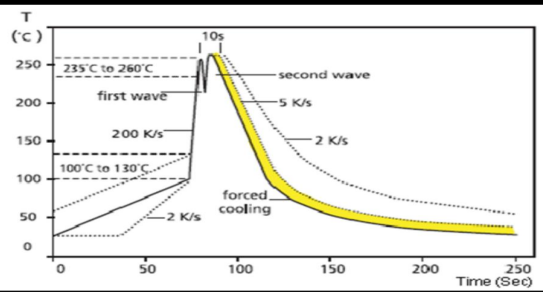
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Item	Conditions	Acceptable Criterion
Resistance to Solvent	Immerse in isopropanol solvent at room temperature (23±5℃) for 5min, wipe 10 times with a hard toothbrush, repeat 3 times, take out and blow dry for examination Reference: AEC-Q200 Test 12, 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
Solderability	Pretreatment: dry heat 155℃, 4H, after take 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; 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 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 | 1812, 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	±0.5%, ±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 seconds
Sulfide test	Sulfur (saturated vapor) 500 hours, 60± 2°C, unpowered Reference: ASTM-B-809-95	△R/R=±(1.0%+0.05Ω) Jumper: ＜100mΩ

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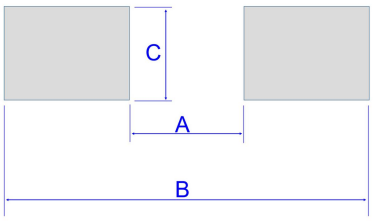
SOLDERING

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

Unit: mm

Figure	Type	A	B	C
	AG0201	0.3	1.0	0.4
	AG0402	0.5	1.5	0.6
	AG0603	0.8	2.1	0.9
	AG0805	1.2	3.0	1.3
	AG1206	2.2	4.2	1.6
	AG1210	2.2	4.2	2.8
	AG1812	3.1	5.9	3.0
	AG2010	3.5	6.1	2.8
	AG2512	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. Hot 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.

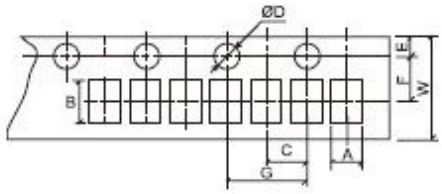
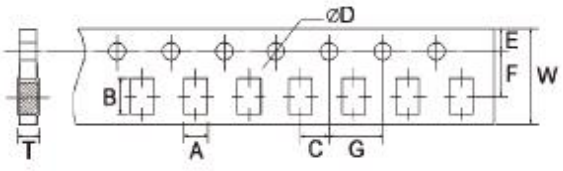
STORAGE / CARRY CONDITIONS

A. Temperature: 25±5℃
B. Humidity: 60±15%RH
C. Storage life:
   - 0201 size: 1 year.
   - 0402 and 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.

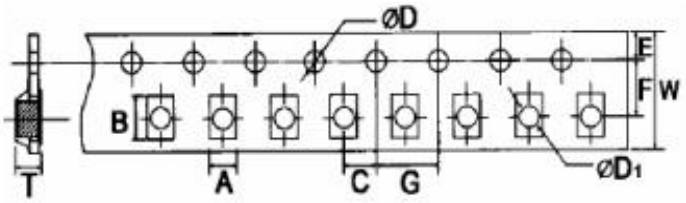
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TAPING SPECIFICATIONS

A. Taping drawing

Carrier Taping A	Carrier Taping B
	

Embossed Taping



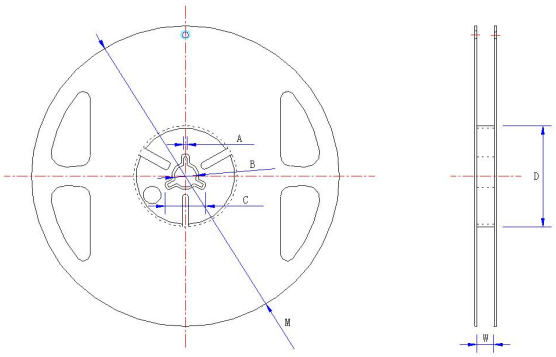
B. Taping Dimensions Unit: mm

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
	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	$\text{ØD}^{+0.1}_{-0}$	$\text{ØD}^{+0.25}_{-0}$	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
	1812	3.50	4.80	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



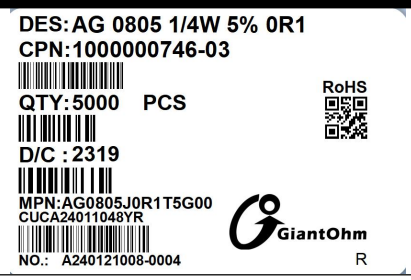
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B. Reel dimension

Unit: mm

Type	SPQ PCS/Rl.	A±0.5	B±0.5	C±0.5	D±1	M±2	W±1
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
	15,000	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
	10,000	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
1812	4,000	2.0	13.0	21.0	60.0	178.0	13.8
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

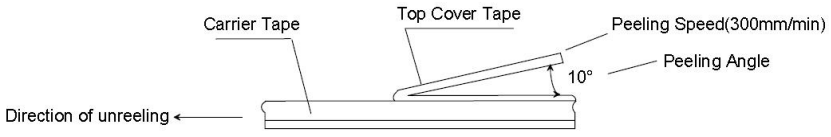
The inner box has several capacities hold 1 reel, 2 reels, 3 reels, 4 reels, 5 reels and 10 reels.

C. Out box

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

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	0105, 0201	0402	0603 and above
Adhesive force limit	6~30gf	10~40gf	10~70gf

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6. **Effectiveness:**

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VERSION HISTORY

Version	Date	Change Item(s)	Description
A	2022/05/25	-	First version
B	2022/10/31	Reliabilities	Updated test and requirements
C	2023/09/05	All items	Add product types and update according to AEC-Q200 version E.
D	2024/02/01	Full	Add Packing Specifications and update according to AEC-Q200 version E.
E	2024/05/15	Full	Add product Tolerance “±0.1%”. Add Jumper Description in MPN Add Jumper test acceptable criterion. Add Moisture sensitivity level description.
F	2024/07/26	Full	Revise Jumper test acceptable criterion.
G	2025/02/11	Characteristics&MPN	0402 add power：1/10W
H	2025/05/10	Full	Update RoHS,Revise the entire text,Update Format
I	2025/08/20	Full	Update RoHS,Revise the entire text,Update Format Removal of ± 0.1% product accuracy,Update “Legal Disclaimer” Increase the reel parameters of:0402 15Kpcs and 0603 10Kpcs

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