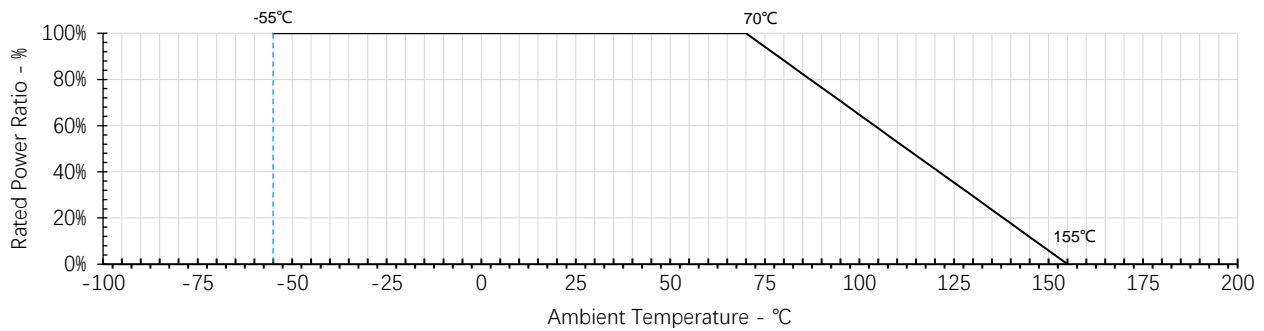


POWER DERATING CURVE



Note: Operating Temperature Range: -55°C~+155°C

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:

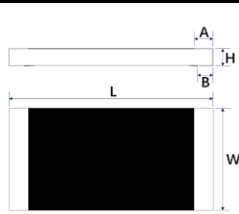
$$E = \sqrt{P \times R}$$

E=Rated voltage(V)

P=Rated power(W)

R=Nominal resistance(Ω)

DIMENSIONS

Figure	Type	L	W	H	Unit: mm	
					A	B
	AP0402	1.00±0.10	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10
	AP0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20
	AP0805	2.00±0.15	1.25±0.15	0.55±0.10	0.40±0.20	0.40±0.20
	AP1206	3.10±0.15	1.55±0.15	0.55±0.10	0.45±0.20	0.45±0.20
	AP1210	3.10±0.10	2.60±0.20	0.55±0.10	0.50±0.25	0.50±0.20
	AP2010	5.00±0.10	2.50±0.20	0.55±0.10	0.60±0.25	0.50±0.20
	AP2512	6.35±0.10	3.20±0.20	0.55±0.10	0.60±0.25	0.50±0.20

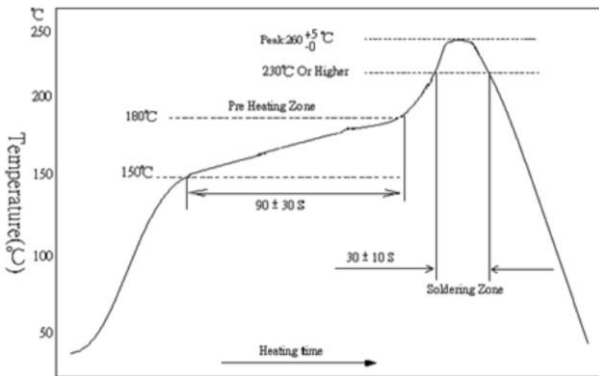
RELIABILITY

Item	Test method	Acceptable Criterion
High Temperature Exposure	+155°C, 1000hrs., unpowered, measure the resistance change rate after test. Reference: AEC-Q200 Test 3, MIL-STD-202 Method 108	1% Series: ΔR/R= ±1.0% 5% Series: ΔR/R= ±2.0%
Temperature Cycling	-55~+125°C, slope 10~20°C/min, dwell time 15min, 1000 cycles Reference: AEC-Q200 Test 4, JESD22 Method JA-104	ΔR/R=±2.0%
Biased Humidity	85°C, 85%RH, load 10% rated power, 1000hrs., take it out and stabilized 24 hrs. then measure the change rate of resistance value Reference: AEC-Q200 TEST 7, MIL-STD-202 Method 103	1% Series: ΔR/R=±2.0% 5% Series: ΔR/R=±3.0%
Operational Life	125°C, rated voltage (calculated according to derating curve), 1000 hrs., with cycle 90 min ON, 30 min OFF Reference: AEC-Q200 Test 8, MIL-STD -202 Method 108	1% Series: ΔR/R=±2.0% 5% Series: ΔR/R=±3.0%

Item	Test method	Acceptable Criterion						
Resistance to Solvent	Immerse in isopropanol solvent at room temperature (23±5°C) 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	Soak in a tin furnace at 260±5°C for 10±1 seconds, take out and stand for more than 60 minutes, then measure the change rate of resistance value. Reference: AEC-Q200 TEST 15, MIL-STD-202 Method 210	ΔR/R=±1.0%						
ESD	Human body mode, two discharges, positive and negative polarity once each	ΔR/R=±2.0%						
	<table border="1"> <tr> <td>Size</td> <td>0402, 0603</td> <td>0805 and above</td> </tr> <tr> <td>Test Voltage</td> <td>1000V</td> <td>2000V</td> </tr> </table>		Size	0402, 0603	0805 and above	Test Voltage	1000V	2000V
Size	0402, 0603	0805 and above						
Test Voltage	1000V	2000V						
Reference: AEC-Q200 Test 17, AEC-Q200-002								
Solderability	Pretreatment: dry heat 155°C, 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°C for 3 seconds, then take it out and observe the solder area under a microscope; 2. Reflow soldering test, Peak Temperature: 235°C, 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	$TCR(PPM/°C) = \frac{(R_2 - R_1)}{R_1 \times (T_2 - T_1)} \times 10^6$ <p> R_1: Resistance value tested at room temperature (Ω) R_2: Resistance value tested at -55°C or +125°C T_1: Temperature at room temperature (°C) T_2: Temperature at -55°C or +125°C Reference: AEC-Q200 Test 19, IEC 60115-1 6.2 </p>	1Ω ≤ R ≤ 10Ω: ±200PPM/°C > 10Ω: ±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.	ΔR/R=±1.0%						
<table border="1"> <tr> <td>Size</td> <td>0402, 0603, 0805</td> <td>1206, 1210</td> <td>2010, 2512</td> </tr> <tr> <td>Depth</td> <td>5mm</td> <td>3mm</td> <td>2mm</td> </tr> </table>	Size		0402, 0603, 0805	1206, 1210	2010, 2512	Depth	5mm	3mm
Size	0402, 0603, 0805	1206, 1210	2010, 2512					
Depth	5mm	3mm	2mm					
Reference: AEC-Q200 TEST 21, AEC-Q200-005								
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: ΔR/R=±1.0% 5% Series: ΔR/R=±2.0%						
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	ΔR/R=±1.0%						
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	ΔR/R=±1.0%						
Flammability	V-0 Reference: AEC-Q200 Test 20, UL-94	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°C for 10 seconds						
FOS	Put the test sample resistor in sulfur vapor, at a temperature of 105±2°C for 750hrs Reference: ASTM-B-809-95&EIA977	ΔR/R=±4.0%						

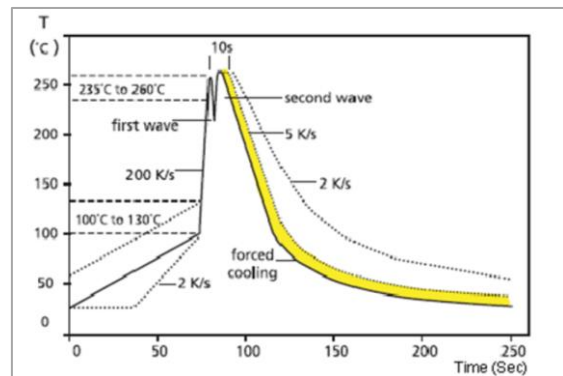
SOLDERING

Lead Free IR Reflow Soldering Profile



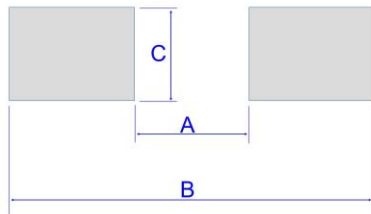
- Top temperature should be under 260 +5/-0 °C ,10Sec.
- Reference: J-STD-020D

Lead Free Double-Wave Soldering Profile



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

SOLDERING PAD



Unit: mm

Type	A	B	C
AP0402	0.5	1.5	0.6
AP0603	0.8	2.1	0.9
AP0805	1.2	3.0	1.3
AP1206	2.2	4.2	1.6
AP1210	2.2	4.2	2.8
AP2010	3.5	6.1	2.8
AP2512	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.

- High temperature.
- Near the sea, or corrosive gas, such as Cl₂, H₂S, NH₃, SO₂ and NO₂, etc.
- Unverified liquids, such as water, oil, chemical or organic solvent.
- Unverified resin or paint to cover products.
- Products should be washed with water soluble cleaner even if non cleaning flux.

STORAGE / CARRY CONDITIONS

- Temperature: 25±5°C
- Humidity: 60±15%RH
- Storage life: 2 years. FIFO
- 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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