1 Scope:

1.1 This specification is applicable to lead free and halogen free of RoHS directive for AHH series super high power Low-Resistance thick film chip resistors.

1.2 This product is for automotive electronic application.

1.3 AEC-Q200 qualified, grade 0.

2 Explanation Of Part Number:

(EX)

AHH 0603 T R050 J

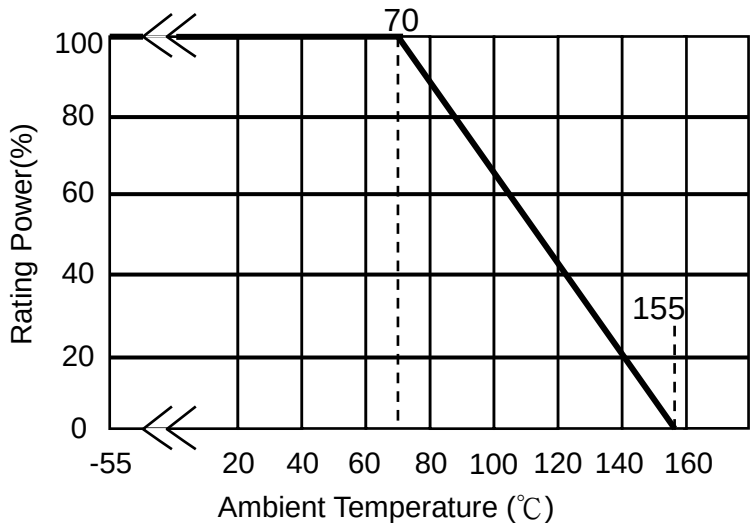
Type	Size	Packaging	Nominal Resistance		Resistance Tolerance
AHH Series Super High Power Low-Resistance Thick Film Chip Resistors	0603 0805 1206	T:Taping Type	4-digits	EX. 0.05Ω=R050	F=± 1% J=± 5%

3 General Specifications:

Type	Rated Power at 70℃	Max. Rated Current	Max. Overload Current	T.C.R (ppm / ℃)	Resistance Range F(±1%)、J(±5%) E-24、E-96
AHH (0603)	1/3W	4.08A	10.2A	±250	20mΩ≦R＜39mΩ
				±150	39mΩ≦R≦100mΩ
AHH (0805)	1/2W	7.07A	17.6A	±300	10mΩ≤R＜15mΩ
				±200	15mΩ≤R≤100mΩ
				±150	100mΩ＜R≤200mΩ
AHH (1206)	1W	9.53A	23.83A	±350	10mΩ≦R＜20mΩ
				±200	20mΩ≦R≦100mΩ
Operating Temperature Range				-55℃ ~ +155℃	

3.1 Power Derating Curve:

Temperature Range: -55℃~+155℃
If the ambient temperature exceeds 70 degrees centigrade to 155 degrees centigrade, the power can be modified by the curve as below



3.2 Voltage Rating or Current Rating:

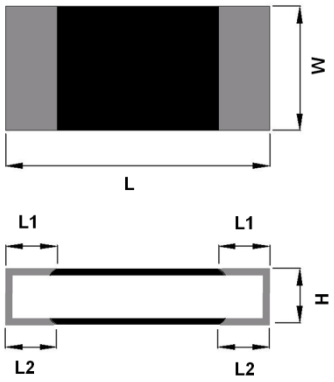
Rated Current: DC current or AC current (rms.) based on the rated power.
The current can be calculated by the following formula. If the calculated value exceeds the Max. current specified in the Table 3.2, the Max. current rating is set as the current rating.

$$I = \sqrt{P/R}$$

I= Rated current (A)
P= Power rating (W)
R= Nominal resistance(Ω)

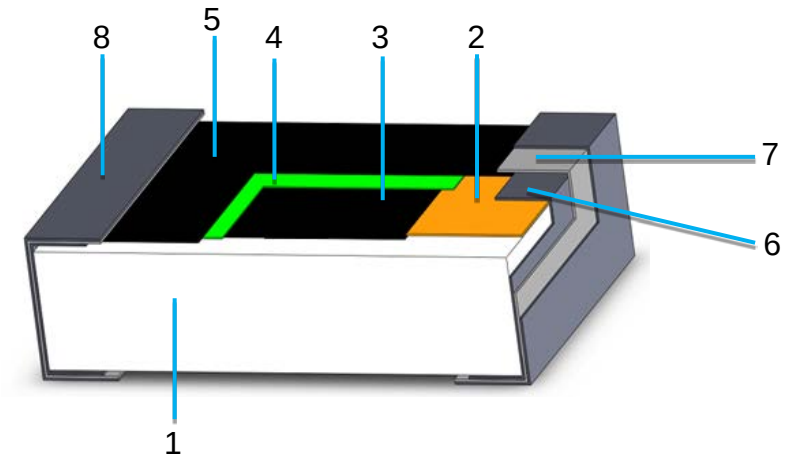
4 Dimensions:

Unit:mm



Type \ Dimension / Size Code	L	W	H	L1	L2
AHH 0603	1.60±0.10	0.80±0.10	0.50±0.15	0.30±0.15	0.30±0.15
AHH 0805	2.10±0.20	1.40±0.20	0.65±0.20	0.75±0.20	0.75±0.20
AHH 1206	3.20±0.20	1.70±0.20	0.65±0.20	0.75±0.20	0.75±0.20

5 Structure Graph:(the top side is the same with the bottom side)



1	Ceramic substrate	6	Terminal inner electrode
2	Inner electrode	7	Ni plating
3	Resistive layer	8	Sn plating
4	1st Protective coating	9	-
5	2nd Protective coating	10	-

6 Reliability Test:

Item	Conditions	Specifications Resistors
High Temperature Exposure (Storage)	Put the specimens in the chamber with temperature of 155±3℃ for 1000 hours. Then take them out to stabilize in room temperature for 24±4hr or more, and measure of its resistance variance rate. Experiment evidence: AEC-Q200	△R%=±2.0%
Temperature Cycling	Put the specimens in the High & low temperature test chamber with temperature varies from -55℃to 125℃ for 15 minutes and total 1000 cycles. Then take them out to stabilize in room temperature for 24±4hr or more, and measure of its resistance variance rate. Experiment evidence: AEC-Q200	△R%=±2.0%
Short Time Overload	Applied 2.5 times rated current for 5 seconds and release the load for about 30 minutes, then measure its resistance variance rate. (Rated current refers to item 3. general specifications) Refer to JIS-C5201-1 4.13	△R%=±2.0%
Biased Humidity	Solder the specimens on the test PCB and put them into the constant temperature humidity chamber with 85±2℃ and 85±5%RH. Then apply the test voltage that calculates based on the 10% of rated power for 1000hrs. Then take them out to stabilize in room temperature for 24±4hr or more, and measure of its resistance variance rate. Experiment evidence: AEC-Q200	△R%=±3.0%
Operational Life	Solder the specimens on the test PCB and Put them in the chamber with temperature of 125±3℃and load the current for 1000 hours. Then take them out to stabilize in room temperature for 24±4hr or more, and measure of its resistance variance rate. Note: The input current shall refer to the power de-rating curve (referring to page 2,No.3.2) Experiment evidence: AEC-Q200	△R%=±3.0%
Board Flex (Bending Test)	Solder the specimens on the test PCB and put the PCBA onto the Bending Tester. Add force at the central part of PCB, and the duration of the applied forces shall be 60 (+ 5) Sec. Measure of its resistance variance rate in load. Bending depth D:0603=5mm 0805=5mm 1206=3mm Experiment evidence: AEC-Q200	△R%=±2.0% No mechanical damage, peel-off of side end or chip crack.

Item	Conditions	Specifications Resistors
Resistance to Soldering Heat	The specimens are fully immersed into the Pb-free solder pot, then take them out to stabilize for 1 hour or more and measure of its resistance variance rate. Temp of solder pot：260±5℃ Soldering duration：10±1sec. Experiment evidence AEC-Q200	△R%=±3.0%
ESD	Put the specimens on the test fixture and two (2)discharges (2KVDC) shall be applied to each PUT, one (1) with a positive polarity and one (1) with a negative polarity. Afterwards, the specimens stabilize for 30min or more and measure of its resistance variance rate. The test is performed with direct contact and regular discharge mode. The resistor and capacitor used on the spearhead is 2000Ω and 150pF respectively. Experiment evidence AEC-Q200	△R%=±3.0%
Solderability	**Test method:** **Test item 1 (solder pot test): Method B** Precondition: The specimens are subjected to 155℃ dry bake for 4hrs±15min. The specimens are immersed into the flux first, then fully immersed into the solder pot, at a temperature of 235± 5℃ for 5+0/-0.5 sec. Then rinse with water and observe the soldering coverage under the microscope. **Test item 2 (Leaching test): Method D** The specimens are immersed into the flux first, then fully immersed into the solder pot, at a temperature of 260±5℃ for 30+0/-0.5 sec. Then rinse with water and observe the soldering coverage under the microscope. Experiment evidence AEC-Q200	1.Soldering coverage over 95% 2.At the edge of terminal, the object underneath (e.g. white ceramic) shall not expose.
Electrical Characterization	$TCR(ppm/℃)=\frac{(R2-R1)}{R1(T2-T1)}\times 10^6$ R1: Resistance at room temperature (Ω) R2: Resistance at +25℃or +125℃(Ω) T1: Room temperature (℃) T2: Temperature +25℃or +125℃ Experiment evidence: AEC-Q200	Refer to item 3. General specifications

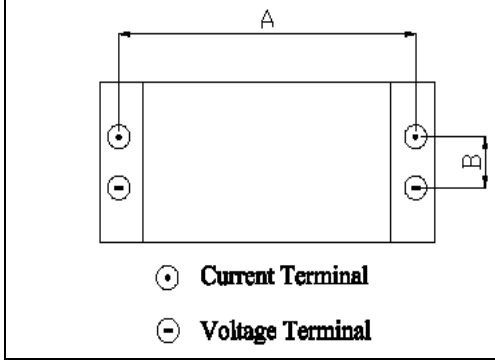
7 No Marking

8 Plating Thickness:

8.1 Ni:≧2μm
8.2 Sn(Tin):≧3μm
8.3 Sn(Tin):Matte Sn

9 Measurement Point:

Measure from bottom electrodes



Unit : mm

TYPE \ DIM	A	B
AHH0603	1.35±0.05	0.35±0.05
AHH0805	1.80±0.05	0.35±0.05
AHH1206	2.90±0.05	0.35±0.05

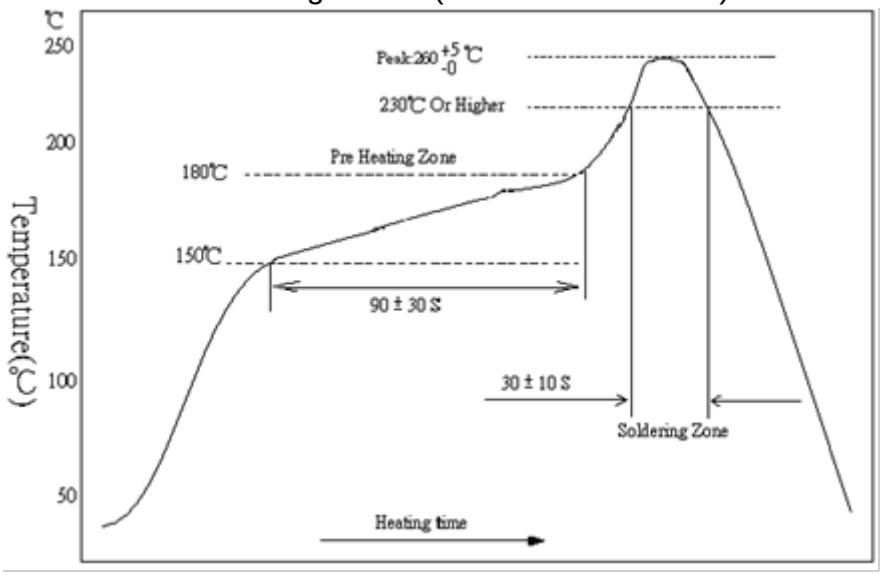
10 Rule of package empty quantity:

10.1Empty quantity for each reels not allowed to exceed 0.1% of the whole quantity, and continuous 2pcs (included) empty are also allowed.

11 Technical application notes: (This is for recommendation, please customer perform adjustment according to actual application)

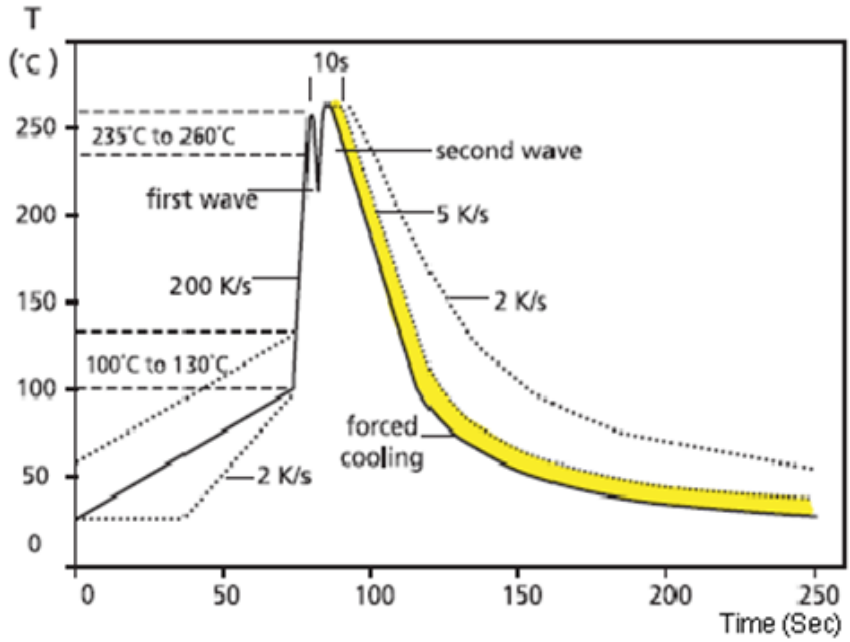
11.1Recommend Soldering Method:

11.1.1Lead Free IR Reflow Soldering Profile (MEET J-STD-020D)



Remark: The peak temperature of soldering heat is 260 +5/-0 ℃ for 10 seconds

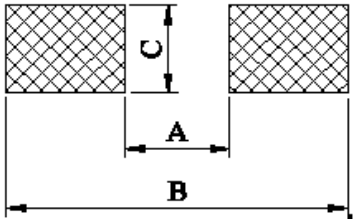
11.1.2Lead Free Double-Wave Soldering Profile.



11.1.3Soldering Iron: temperature 350℃±10℃ , dwell time shall be less than 3 sec.

11.2Recommend Land Pattern Design (For Reflow Soldering)

When a component is soldered, the resistance after soldering changes slightly depending on the size of the soldering area and the amount of soldering. When designing a circuit, it is necessary to consider the effect of a decrease or increase in its resistance.



Unit:mm

TYPE \ DIM	A	B	C
AHH0603	0.8	2.1	0.9
AHH0805	1.2	3.0	1.3
AHH1206	2.2	4.2	1.6

11.3Automobile Electronic Application:

This specification is for automobile electronic use. RALEC will take no responsibility if any damage, cost or loss occurs when the product has been used in any special circumstances.

(a) Information、entertainment、navigation、audio control units.
(b) Comfortable door, window, seat control unit.
(c) Internal lighting control unit.

11.4Environment Precautions:

If consumer intends to use our company product in special environment or condition (including but not limited to those mentioned below), then will need to make individual recognition of product features and reliability accordingly.

(a) Used in high temperature and humidity environment
(b) Exposed to sea breeze or other corrosive gas, such as Cl2、H2S、NH3、SO2 and NO2.
(c) Used in non-verified liquids including water, oil, chemical and organic solvents.
(d) Using non-verified resin or other coating material to seal or coat our Company product.
(e) After soldering, it is necessary to use water-soluble detergents to clean residual solder fluxes, even though no-clean fluxes are recommended.

11.5Momentary Overload Precautions:

The product might be out of function when momentary overloaded. Please make sure to avoid momentary overloading while using and preserving。

11.6Operation and Processing Precautions:

(a) Avoid damage to the edge of resistor and protective layer caused by mechanical stress.

(b) Handle with care when printing circuit board (PCB) is divided or fixed on support body, because bending of printing circuit board (PCB) mounting will make mechanical stress for resistors.

(c) Make sure the power rating is under the limit when using the resistor. When power rating is over the limit, the resister will be overloaded. There might be machinery damage due to the climbing temperature

(d) If the resister will be exposed under massive impact load (shock wave) in a short period of time, the working environment must be set up well before use.

(e) Please make evaluation and confirmation when the product is well used in your company and have a through consideration of its fail-safe design to ensure the system safety.

12 Storage and transportation requirement:

12.1The temperature condition must be controlled at 25±5℃, the R.H. must be controlled at 60±15%. The stock can maintain quality level in two years.

12.2Please avoid the mentioned harsh environment below when storing to ensure product performance and its' weldability. Places exposed to sea breeze or other corrosive gas, such as Cl2、H2S、NH3、SO2 and NO2.

12.3When the product is moved and stored, please ensure the correct orientation of the box. Do not drop or squeeze the box. Otherwise, the electrode or the body of the product may be damaged.

13 The carton packaged for electronic-information products is made by the symbol as follows: (For China)

	
Marking for control of pollution cause by electronic-information products	Marking for package recovery

14 Attachments:

14.1Document Revise Record (QA-QR-027)

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