



Lead-Free Current Sensing Resistors
RLS Series
(Halogen-Free)
AEC-Q 200-Ver D qualified

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1. Scope :

This specification applied to the products of Lead-Free current sensing resistor of metal foil for Lead-Free RLS series manufactured by TA-I TECHNOLOGY CO.,LTD.

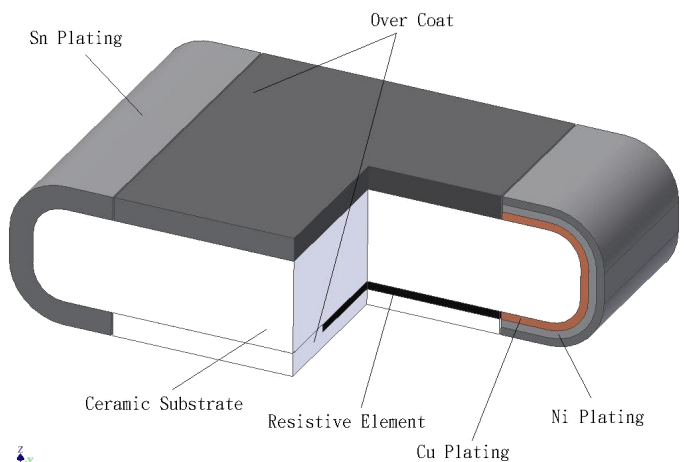
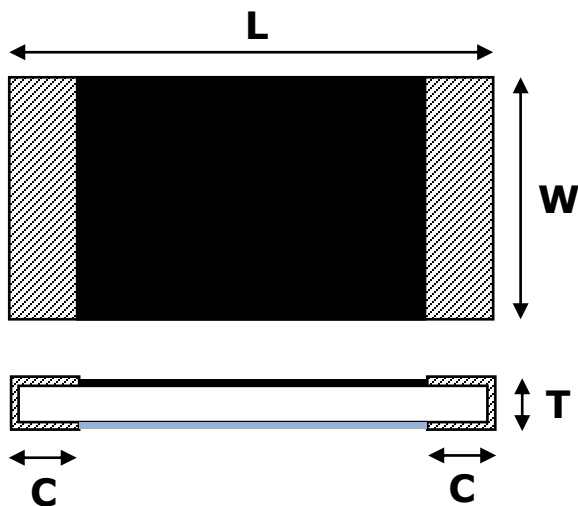
2. Type Designation :



Series No.	Tolerance	Packaging	Power	Resistance
04→0402	F = ± 1% G = ± 2% J = ± 5%	T=Paper	K = 1/5 W A = 1/4 W P=1/16W	R010=10mΩ R020=20mΩ R0Z10 =Jumper Max Resistance 10mΩ

3. Dimension :

3.1 Marking : For 0402: No Marking.



Series	L	W	C	T
RLS04	1.10±0.10	0.55±0.10	0.30±0.10	0.45±0.10

UNIT: mm



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4. Features:

Series	Size	Power (W)	Tolerance	Resistance Value	Operation Temperature Range	TCR
RLS04	0402	1/16	5%	Max. resistance 10 mΩ Max. Current 3A	-55°C~+125°C	±100ppm/°C
		1/4	±1% ±2% ±5%	10 -20mΩ		

5. Reliability Tests:

Test Items	Reference standard	Condition of Test	Test Limits
Temperature Coefficient of Resistance	IEC60115-1 4.8	+25 ~ 125°C	Refer item 4
Short Time Overload	IEC60115-1 4.13	5 X rated power for 5s	< ±1%
High Temperature Exposure (Storage)	AEC-Q200-REV D-Test 3 MIL-STD-202 Method 108	1000 hrs. @ T=125°C. Unpowered. Measurement at 24±2 hours after test conclusion.	< ±1%
Temperature Cycling	AEC-Q200-REV D-Test 4 JESD22 Method JA-104	1000 Cycles (-55°Cto+125°C) Measurement at 24±4 hours after test conclusion. 30min maximum dwell time at each temperature extreme. 1 min. maximum transition time.	< ±1%
Moisture Resistance	AEC-Q200-REV D-Test 6 MIL-STD-202 Method 106	T=24 hours / Cycle , 10 Cycles Notes: Steps 7a& 7b not required. Unpowered	< ±1%
Biased Humidity	AEC-Q200-REV D-Test 7 MIL-STD-202 Method 103	1000 hours 85°C/85%RH. Note: Specified conditions: 10% of operating power (not exceeding max working voltage). Measurement at 24±2 hours after test conclusion.	< ±1%
Operational Life	AEC-Q200-REV D-Test 8 MIL-STD-202 Method 108	1000 hours TA=125°C at 35% rated power. Measurement at 24±4 hours after test conclusion.	< ±2%
External Visual	AEC-Q200-REV D-Test 9 MIL-STD-883 Method 2009	Electrical test not required. Inspect device construction, marking and workmanship.	
Physical Dimension	AEC-Q200-REV D-Test 10 JESD22 Method JB-100	Verify physical dimensions to the applicable device detail specification. Note: User(s) and Suppliers spec. Electrical test not required.	



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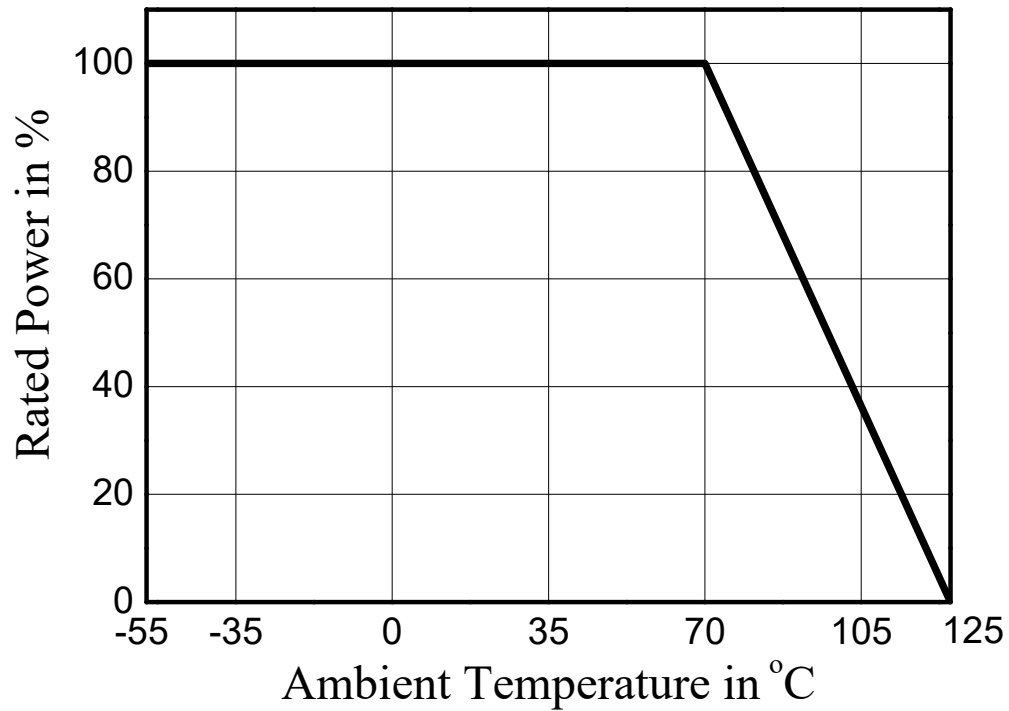
Resistance to Solvents	AEC-Q200-REV D-Test 12 MIL-STD-202 Method 215	a:Isopropyl Alcohol : Mineral Spirits= 1 : 3 b:Terpene Defluxer (Bioact EC-7R) c:Deionized water : Propylene Glycol Monomethyl Ether : monoethanolamine =42 : 1 : 1	Marking and protective Layer can not be detached
Mechanical Shock	AEC-Q200-REV D-Test 13 MIL-STD-202 Method 213	Wave Form : Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration(D) is 6(ms)	< ±1.0%
Vibration	AEC-Q200-REV D-Test 14 MIL-STD-202 Method 204	5 g's for 20 min., 12 cycles each of 3 orientations. Note: Test from 10-2000 Hz.	< ±1.0%
Resistance to Soldering Heat	AEC-Q200-REV D-Test 15 MIL-STD-202 Method 210	Condition B : Immerse the specimens in and eutectic solder at 260±5°C for 10±1S .	< ±0.5%
Thermal Shock	AEC-Q200-REV D-Test 16 MIL-STD-202 Method 107	-55°C/+155°C. Note: Number of cycles required-300, Maximum transfer time-20 seconds, Dwell time-15 minutes. Air-Air.	< ±1.0%
ESD	AEC-Q200-REV D-Test 17 AEC-Q200-002 or ISO/DIS 10605	verify the voltage setting at 500V	< ±1.0%
Solderability	AEC-Q200-REV D-Test 18 J-STD-002	Method B, aging 4 hours at 155 °C dry heat Lead-free solder bath at 235±3 °C Dipping time: 3±0.5 seconds	> 95% area covered with tin
Flammability	AEC-Q200-REV D-Test 20 UL-94	V-0 are acceptable. Electrical test not required.	V-0
Board Flex (Bending)	AEC-Q200-REV D-Test 21 AEC-Q200-005	The duration of the applied forces shall be 60 (+ 5) Sec 2mm deflection.	< ±1.0%
Terminal Strength (SMD)	AEC-Q200-REV D-Test 22 AEC-Q200-006	Force of 1.0 kg for 60 seconds Remarks : 0201-NA	< ±1.0%



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5.1 Derating Curve



5.2 Rated Current & Voltage

The rated Current and Voltage are calculated by the following formula:

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

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

I: Rated Current(I)

V: Rated Voltage(V)

P: Rated Power(W)

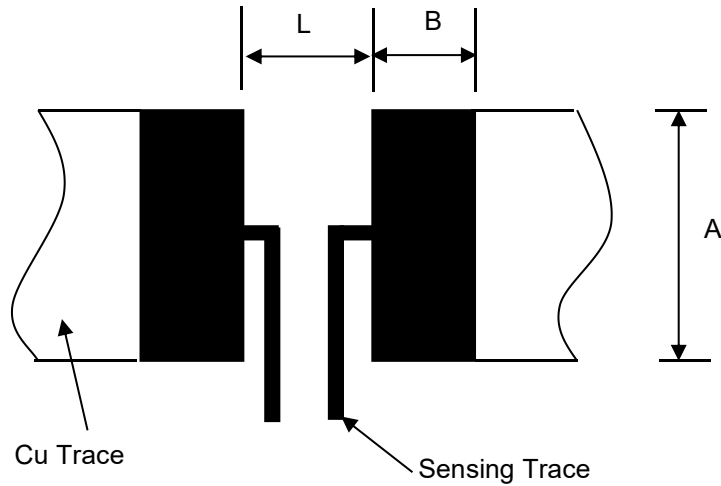
R: Resistance Value(Ω)



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6. Recommended Solder Pad Dimension



Unit: mm

Series	Resistance (mΩ)	A	L	B
RLS04	10~20	0.7	0.45	0.375

Note:

- *1The copper foil minimum thickness of PCB needs 3 oz
- *2.PCB Dimension Tolerance is +/-0.1mm.
- *3.The Resistance will change slightly after soldered, it is depend on PCB PAD size deign and it's necessary to consider the effect of the resistance increase or decrease.



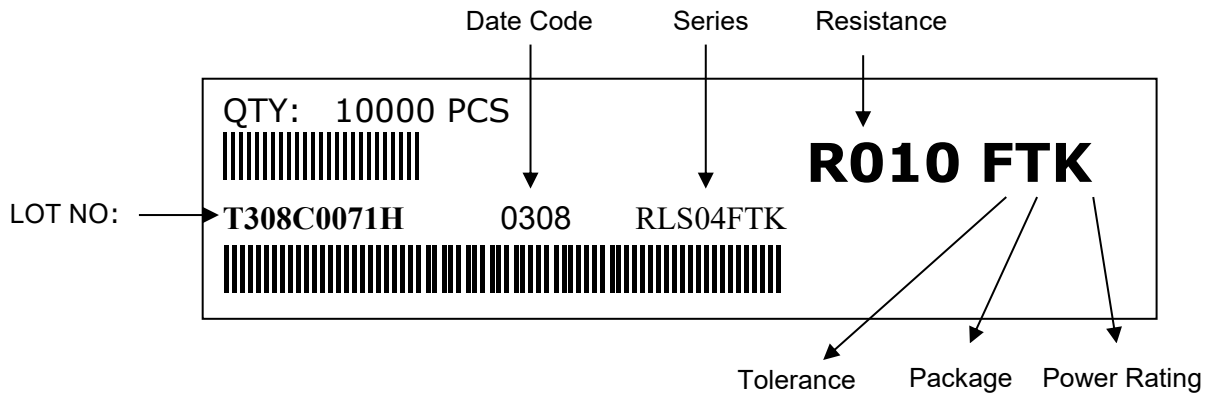
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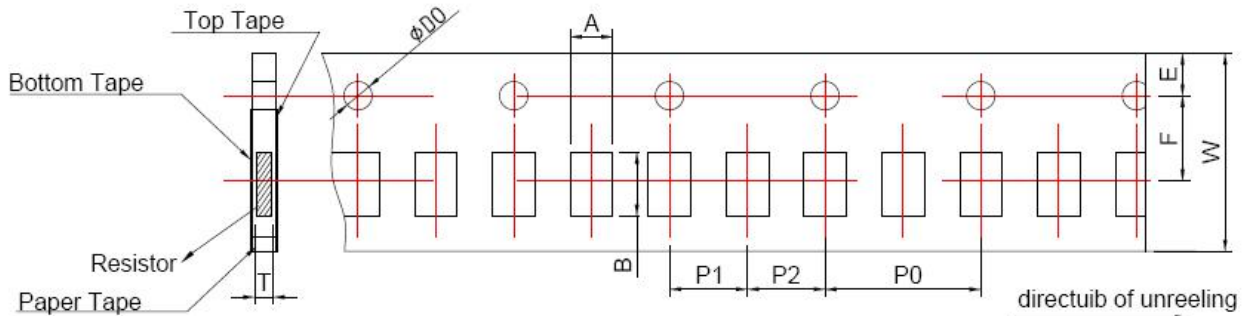
7. Number of Package:

Series	RLS04
Pieces/Package	10000

8. Label:



9. Packaging



Tape packaging dimension

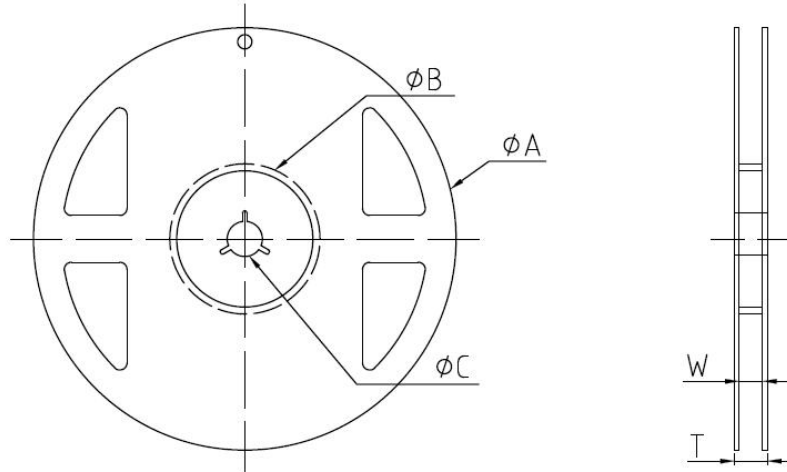
Packing	Type	A	B	W	F	E	P1	P2	P0	D0	T
Paper Tape	RLS04	0.75	1.30	8.00	3.50	1.75	2.00	2.00	4.00	1.55	0.65
Tolerance		±0.05	±0.05	±0.20	±0.05	±0.10	±0.10	±0.10	±0.10	±0.10	±0.10



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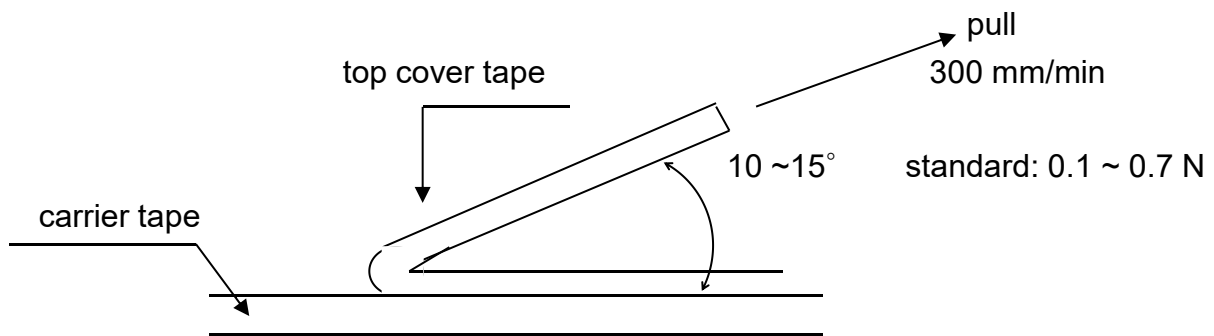
10. Reel Specification



Series	ϕA	ϕB	ϕC	W	T
RLS04	178 \pm 2.0	60 \pm 1.0	13.0 \pm 1.0	9.0 \pm 1.0	11.4 \pm 1.0

11. Peeling Strength of Top Cover Tape

Test Condition: 0.1 to 0.7 N at a peel-off speed of 300 mm / min.



12. Storage Conditions:

Temperature: 5°C ~ 35°C, Humidity: 40% ~ 75%

13. Shelf Life:

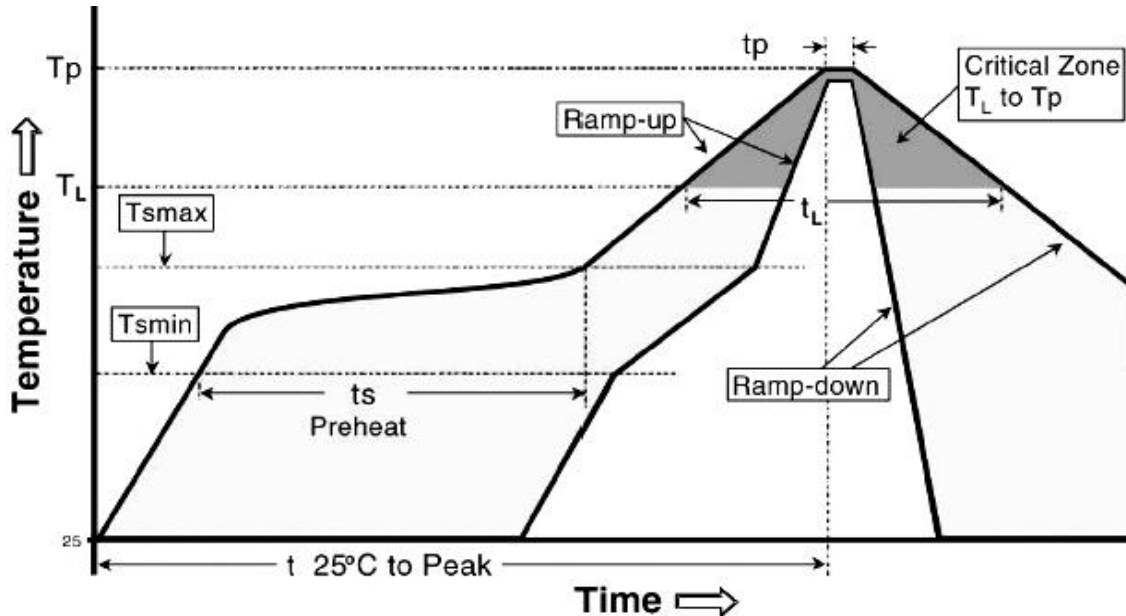
2 years from manufacturing date.



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14. Recommend IR – Reflow profile : (solder : Sn96.5 / Ag3 / Cu0.5)



Alloyed Re-flow times : 3 times

Remark : To avoid discoloration phenomena of chip on terminal electrodes, please use N2 Re-flow furnace .

Iron Solder: 350±10°C , 3+1/-0 sec, 1 time

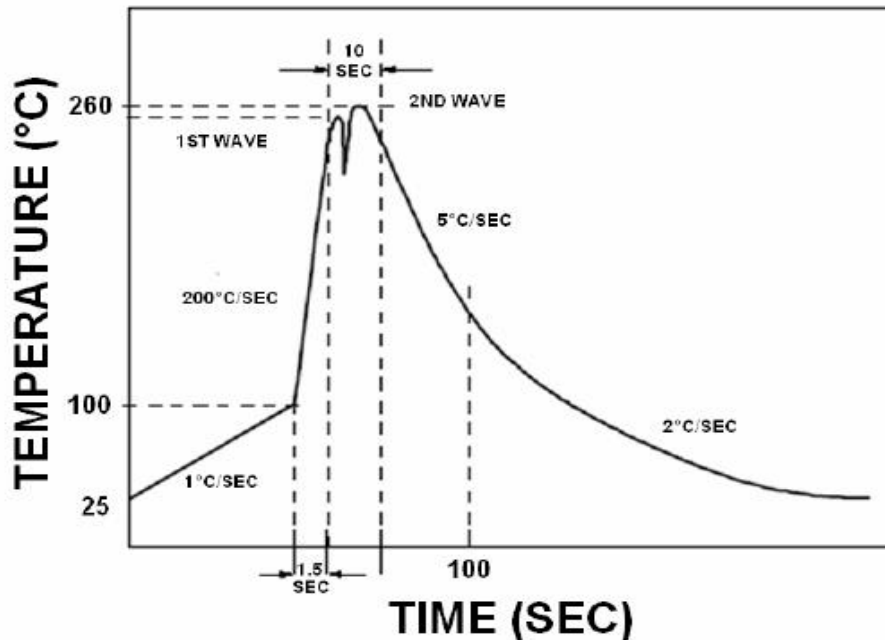
Profile Feature	Lead (Pb)-Free Assembly
Average ramp-up rate (T _{smax} to T _p)	3°C / second max.
Preheat - Temperature Min (T _{smin}) - Temperature Max (T _{smax}) - Time (T _{smin} to T _{smax}) (ts)	150°C 200°C 60 -150 seconds
Time maintained above : - Temperature (T _L) - Time (T _L)	217°C 60-120 seconds
Peak Temperature (T _p)	260°C
Time within $\begin{matrix} +0 \\ -5 \end{matrix}$ °C of actual Peak Temperature (t _p) ²	10 seconds
Ramp-down Rate	6°C/second max.
Time 25°C to Peak Temperature	8mimutes max.



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15. Recommend Wave-Solder profile : (solder : Sn96.5 / Ag3 / Cu0.5)



16. ECN

Engineering Change Notice: The customer will be informed with ECN if there is significant modification on the characteristics and materials described in Approval Sheet.

17. Manufacturing Country & City :

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