



Lead-Free Current Sensing Resistors
RLSL Series
(Halogen-Free)
AEC-Q 200-Ver E 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 RLSL series manufactured by TA-I TECHNOLOGY CO.,LTD.

2. Type Designation

RLSL05	F	T	S	R010
Series No.	Tolerance	Packaging	Power	Resistance
05→0508 06→0612	F = ± 1% G = ± 2% J = ± 5%	T=Paper	A = 0.25 W S = 0.5 W C = 1 W D=1.5W	R0025=2.5mΩ R005=5 mΩ R010=10 mΩ

3. Features

Series	Size	Power (W)	Resistance Value	Operation Temperature Range	TCR	Tolerance
RLSL05	0508	1.0	$1 \leq R < 5\text{m}\Omega$	$-55^{\circ}\text{C} \sim +155^{\circ}\text{C}$	$\pm 75\text{ppm}/^{\circ}\text{C}$	$\pm 1\%$ $\pm 2\%$ $\pm 5\%$
			$5 \leq R \leq 10\text{m}\Omega$		$\pm 50\text{ppm}/^{\circ}\text{C}$	
RLSL06	0612	1.5	$1 \leq R < 5\text{m}\Omega$		$\pm 75\text{ppm}/^{\circ}\text{C}$	
			$5 \leq R \leq 30\text{m}\Omega$		$\pm 50\text{ppm}/^{\circ}\text{C}$	

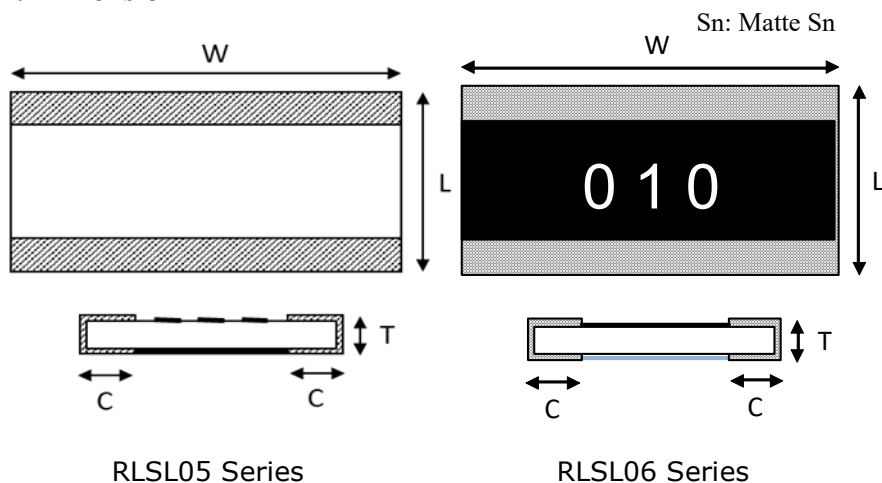
Note : The specifications and characteristics of this product are not suitable for series and parallel use.



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4. Dimension



3.1 Marking

Resistance value is expressed by 3-4 digits.

05 series no marking

E.G.:

0025=0.0025Ω=2.5mΩ

005 = 0.005Ω = 5mΩ

010 = 0.010Ω = 10mΩ

Series		L	W	C	T
RLSL05	$1 \leq R < 5\text{m}\Omega$	1.25 ± 0.20	2.00 ± 0.20	0.40 ± 0.20	0.70 ± 0.20
	$5 \leq R \leq 10\text{m}\Omega$				0.50 ± 0.20
RLSL06	$1 \leq R < 5\text{m}\Omega$	1.60 ± 0.20	3.20 ± 0.20	0.40 ± 0.20	0.70 ± 0.20
	$5 \leq R \leq 30\text{m}\Omega$				0.50 ± 0.20

UNIT: mm

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 3
Short Time Overload	IEC60115-1 4.13	5 X rated power for 5s	< ±1%
High Temperature Exposure (Storage)	AEC-Q200-REV E-Test 3 MIL-STD-202 Method 108	1000 hrs. @ T=155°C. Unpowered. Measurement at 24±2 hours after test conclusion.	< ±1%
Temperature Cycling	AEC-Q200-REV E-Test 4 JESD22 Method JA-104	1000 Cycles (-55°C to +155°C) Measurement at 24±4 hours after test conclusion. 30min maximum dwell time at each temperature extreme. 1 min. maximum transition time.	< ±1%
Biased Humidity	AEC-Q200-REV E-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%



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Operational Life	AEC-Q200-REV E-Test 8 MIL-STD-202 Method 108	1000 hours TA=70°C at 100% rated power. 90min ON and 30 min OFF. Measurement at 24±4 hours after test conclusion.	< ±1%
External Visual	AEC-Q200-REV E-Test 9 MIL-STD-883 Method 2009	Electrical test not required. Inspect device construction, marking and workmanship.	
Physical Dimension	AEC-Q200-REV E-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.	
Resistance to Solvents	AEC-Q200-REV E-Test 12 MIL-STD-202 Method 215	a:Isopropyl Alcohol : Mineral Spirits= 1 : 3 b:Terpene Defluxer c:Deionized water : Propylene Glycol Monomethyl Ether : monoethanolamine = 42 : 1 : 1	Marking and protective layer cannot be detached
Mechanical Shock	AEC-Q200-REV E-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 E-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 E-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%
ESD	AEC-Q200-REV E-Test 17 AEC-Q200-002 or ISO/DIS 10605	verify the voltage setting at 500V	< ±1.0%
Solderability	AEC-Q200-REV E-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 E-Test 20 UL-94	V-0 or V-1 are acceptable. Electrical test not required.	V-0
Board Flex (Bending)	AEC-Q200-REV E-Test 21 AEC-Q200-005	The duration of the applied forces shall be 60 (+ 5) Sec 3mm deflection	< ±1.0%
Terminal Strength (SMD)	AEC-Q200-REV E-Test 22 AEC-Q200-006	Force of 1.8kg for 60 seconds Remarks: 0201-NA	< ±1.0%
Low Temperature Storage	EC60115-1 4.23.4 JIS C 5201-1 4.23.4	-55°C, 1000hrs	<±1%



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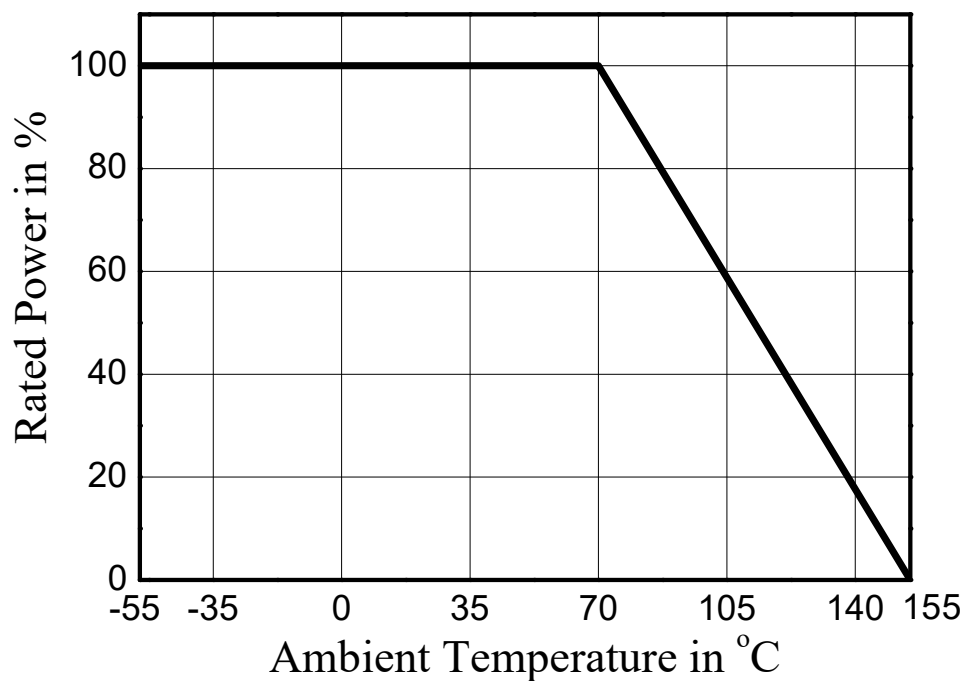
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5.1 Derating Curve



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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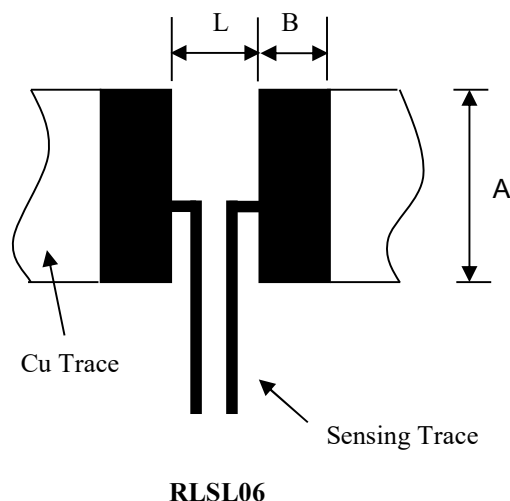
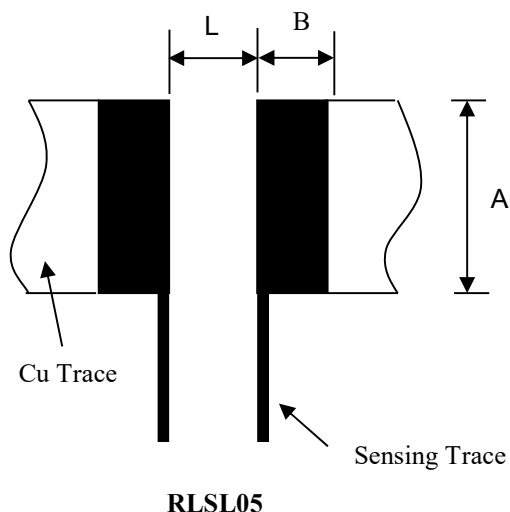
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6. Recommended Solder Pad Dimension



Unit: mm

Series	Resistance (mΩ)	A	L	B
RLSL05	$1 \leq R \leq 10$	2.4	0.45	0.875
RLSL06	$1 \leq R \leq 30$	3.8	0.85	0.625

Note:

- *1. The 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 depends on PCB PAD size design and it's necessary to consider the effect of the resistance increase or decrease.



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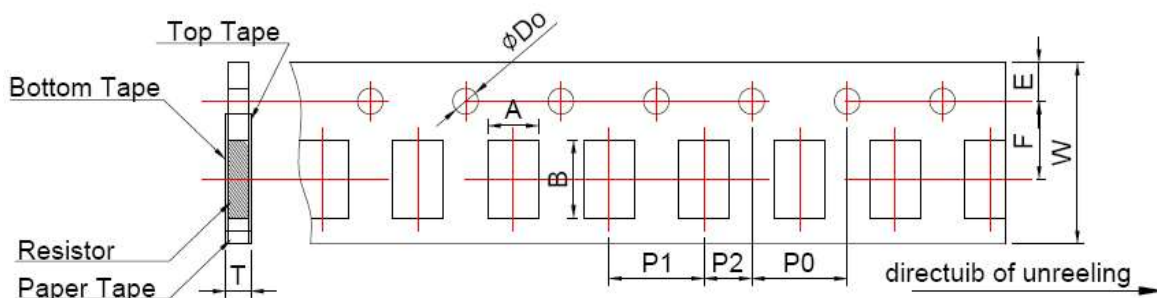
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7. Number of Package

Series	RLSL05	RLSL06
Pieces/Package	4000	4000

8. Packaging



Paper Tape packaging dimension

Unit: mm

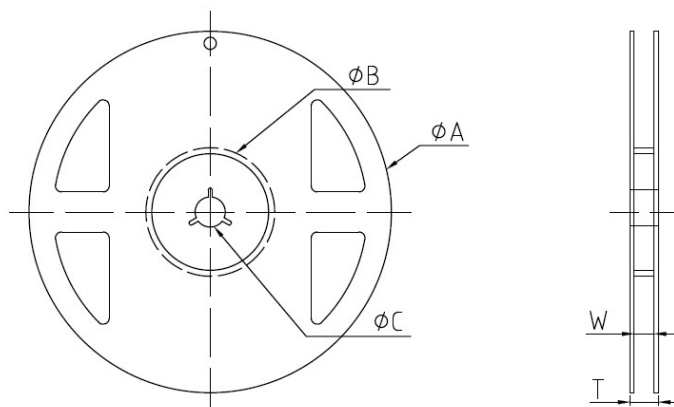
Type	Resistance Range	A	B	W	F	E	P1	P2	P0	D0	T
RLSL05	$1 \leq R < 5\text{m}\Omega$	1.60	2.40	8.00	3.50	1.75	4.00	2.00	4.00	1.55	1.05
	$5 \leq R \leq 10\text{m}\Omega$	1.60	2.40	8.00	3.50	1.75	4.00	2.00	4.00	1.55	0.85
RLSL06	$1 \leq R \leq 30\text{m}\Omega$	2.00	3.60	8.00	3.50	1.75	4.00	2.00	4.00	1.55	1.05
Tolerance		± 0.15	± 0.20	± 0.20	± 0.05	± 0.10	± 0.10	± 0.10	± 0.10	± 0.10	± 0.10



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9. Reel Specification

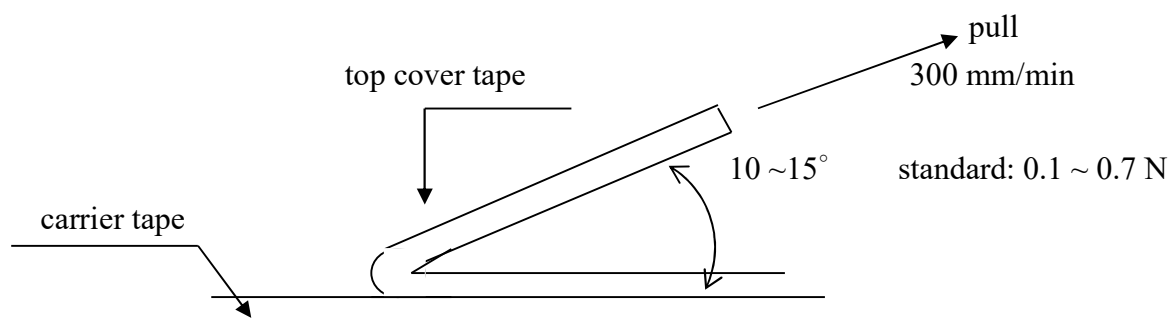


Series	ϕA	ϕB	ϕC	W	T
RLSL05	178 ± 2.0	60 ± 1.0	13.0 ± 1.0	9.0 ± 1.0	11.4 ± 1.0
RLSL06					

Unit: mm

10. Peeling Strength of Top Cover Tape

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



11. Storage Conditions:

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

MSL level 1

12. Shelf Life:

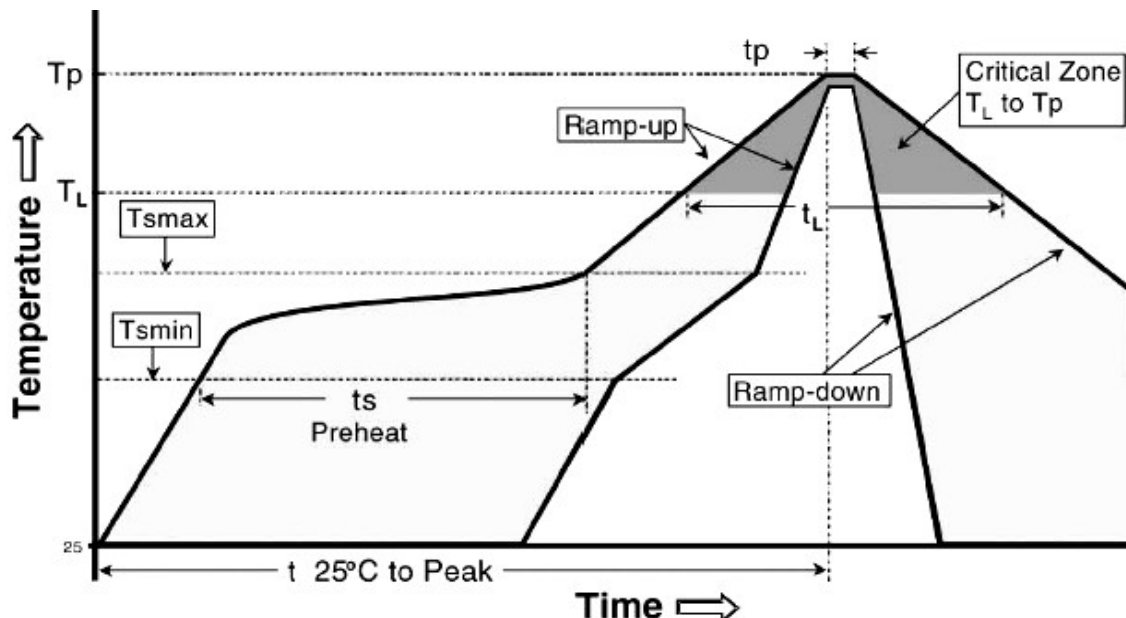
2 years from manufacturing date.



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



Allowed 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

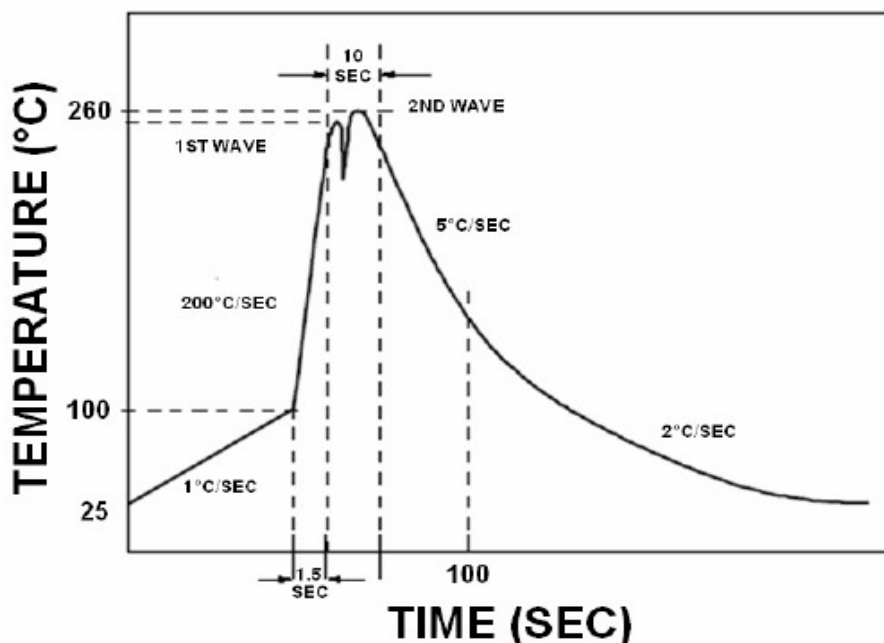
Profile Feature	Lead (Pb)-Free Assembly
Average ramp-up rate (T _{smax} to T _p)	3°C / second max.
Preheat - Temperature Min (T _{smin}) - Temperature Max (T _{smax}) - Time (T _{smin} to T _{smax}) (ts)	150°C 200°C 60 -120 seconds
Time maintained above: - Temperature (T _L) - Time (T _L)	217°C 60-150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



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



15. 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.

16. Manufacturing Country & City

TA-I TECHNOLOGY CO., LTD. (Taiwan- Tao Yuan)

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(4) TAI OHM ELECTRONICS (M) SDN. BHD. (Malaysia – Penang)

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