



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

Document No

TRLF-060S009D

Issued date

2022/11/03

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1. Scope

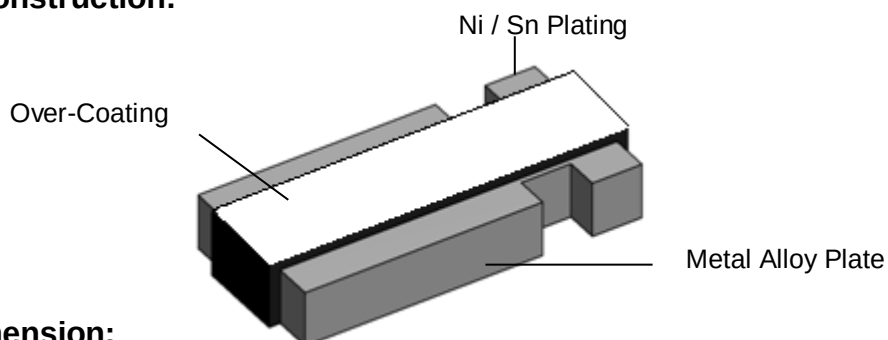
This specification applied to the products of Lead-Free current sensing resistor of metal strip for Lead-Free RLF series manufactured by TA-I TECHNOLOGY CO.,LTD.

2. Type Designation

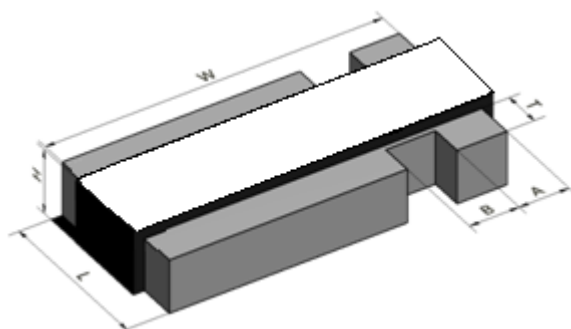
<u>RLF</u>	<u>06</u>	<u>E</u>	<u>E</u>	<u>C</u>	<u>(M)</u>	<u>R001</u>
Item	Series No	Resistance tolerance	Packaging	Power Rating	Metal	Resistance
	06:0612	F:±1% G:±2% J:±5%	E:Embossed Tape	S=1/2W C=1 W	M=MnCu	e.g: R001=1mΩ R50M=0.5mΩ

3. Construction and Dimension

3.1 Construction:



3.2 Dimension:



Unit: mm

Style	L	W	H	T	A	B	Material
RLF06	1.65±0.2	3.05±0.25	0.65±0.2	0.4±0.25	0.51±0.13	0.51±0.13	Strip : Alloy Over Coating : molding Compound UL-94V-O grade

Note* Patent Pending



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4. Features

Type	RLF
Power Rating	1/2 W&1W
Resistance Value	0.5mΩ ~5mΩ
Operation Temperature Range	-55℃ ~+170℃
Temperature Coefficient of Resistance	± 200ppm/°C (0.5mΩ ≤ R < 3mΩ)
	± 150ppm/°C (3 mΩ ≤ R ≤ 5mΩ)
Tolerance	±1% , ±2% , ±5%
Insulation Resistance	Over 100MΩ
Maximum Working Voltage(V)	(P*R) ^{1/2}

5. Reliability Tests

Test Items	Reference	Condition of Test	Test Limits
Temperature Coefficient of Resistance	IEC60115-1 4.8	+25 ~ 125℃	Refer 4.0
High Temperature Exposure(Storage)	AEC-Q200-REV D-Test 3 MIL-STD-202 Method 108	T=125℃ ,1000hrs,Measurement at 24hrs after test conclusion.	< ±1.0%
Temperature Cycling	AEC-Q200-REV D-Test 4 JESD22 Method JA-104	1000Cycle (-55℃ to 125℃),Measurement at 24hrs after test conclusion.	< ±1.0%
Short time overload	IEC60115-1 4.13	5 X rated power for 5s	< ±0.5%
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	10% Rated power at 85℃ ,RH:85% ,1000Hrs, Measurement at 24hrs after test conclusion.	< ±1.0%
Operation life	AEC-Q200-REV D-Test 8 MIL-STD-202 Method 108	1000 hours TA=125℃ at 45% 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
Resistance to Soldering Heat	AEC-Q200-REV D-Test 15 MIL-STD-202 Method 210	T=260+/-5°C solder,10+/-1 sec dwell	< ±0.5%
Mechanical Shock	AEC-Q200-REV D-Test 13 MIL-STD-202 Method 213	100g's , Normal duration is 6ms , half sine shock pulse	< ±0.5%
Resistance to vibration	AEC-Q200-REV D-Test 14 MIL-STD-202 Method 204	5g's for 20min.12cycles, 10-2000Hz	<±0.5%
Board Flex	AEC-Q200-REV D-Test 21 AEC-Q200-005	Min 2mm deflection ,60sec.	< ±0.5%
Flammability	AEC-Q200-REV D-Test 20 UL-94	V-0 or V-1are acceptable, Electrical test not required	V-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
Terminal Strength(SMD)	AEC-Q200-REV D-Test 22 AEC-Q200-006	Force of 1.8kg for 60 seconds Remarks : 0201-NA	< ±1.0%



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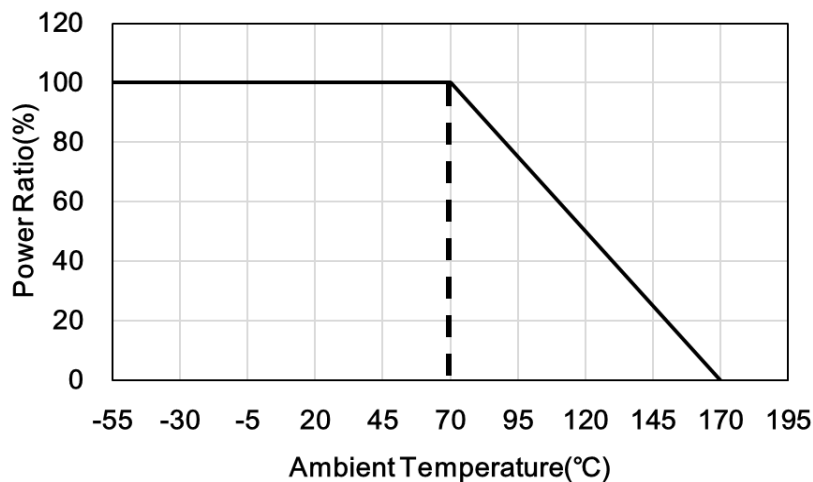
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5.1 Derating Curve



5.2 Rated Current

The rated current is calculated by the following formula:

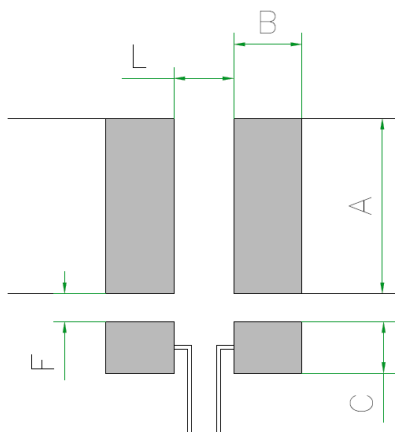
$$I = \sqrt{P \div R}$$

I: Rated Current (A)

P: Rated Power (W)

R: Resistance Value(Ω)

6. Recommended Solder Pad Dimension



Copper foil minimum thickness of PCB: 3oz

Resistance Range (Ω)	A	B	C	L	F
0.0005-0.005	2.3±0.1	1.0±0.1	0.8±0.1	0.7±0.1	0.4±0.1

Unit: mm



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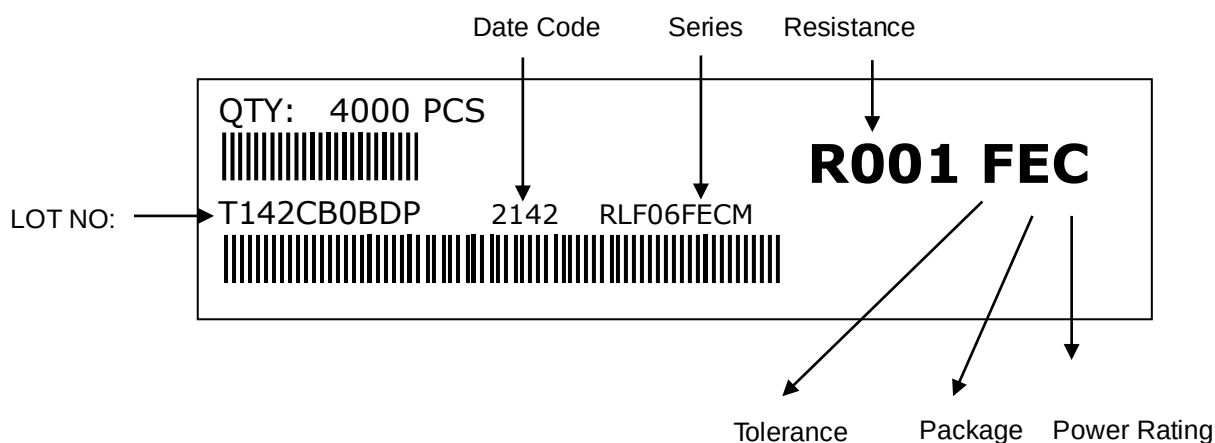
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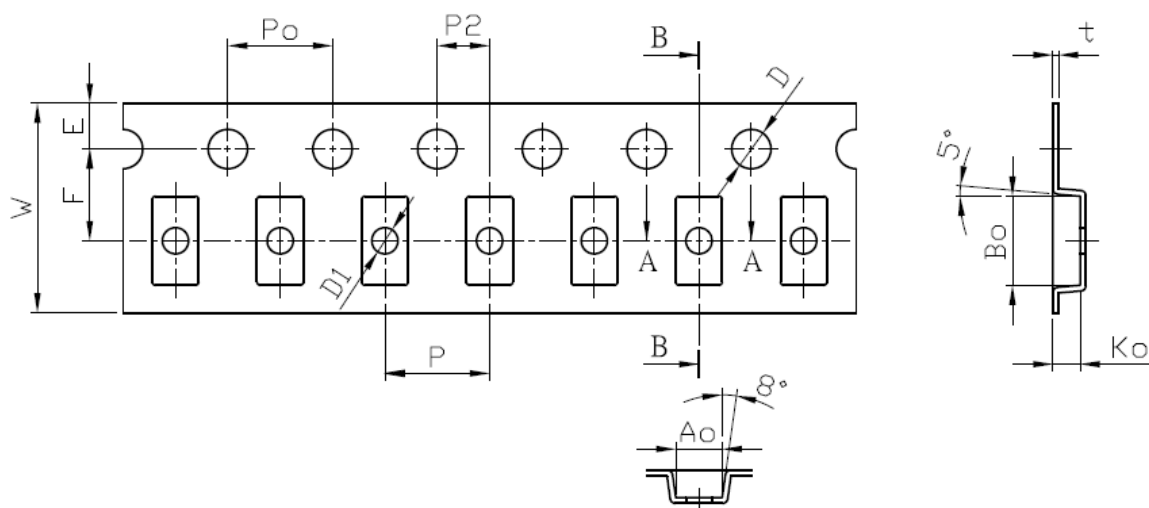
7. Number of Package:

4000 Pieces / package

8. Label:



9. Taping



Type	Packing	W	P	E	F	P2	D	D1	P0	10P0	A0	B0	K0	t
RLF06	Emboss	8.00	4.00	1.75	3.50	2.00	1.50	1.00	4.00	40.00	1.77	3.40	1.04	0.22
	Tolerance	±0.10	±0.10	±0.10	±0.05	±0.05	+0.10 -0.00	±0.10	±0.10	±0.20	±0.10	±0.10	±0.10	±0.05

Unit: mm



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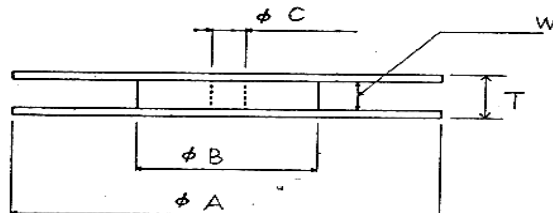
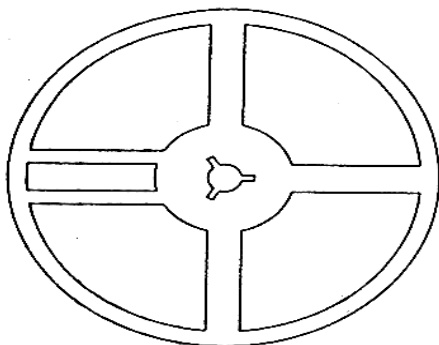
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10. Reel Specification

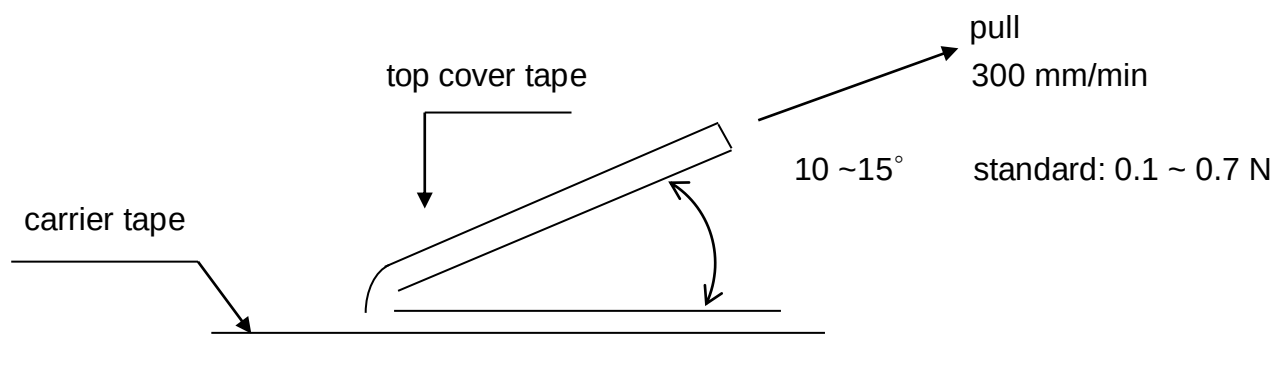


Series	ϕA	ϕB	ϕC	W	T
RLF06	178 $\pm$ 2.0	60.0 $\pm$ 1.0	13.0 $\pm$ 1.0	9.0 $\pm$ 1.0	11.5 $\pm$ 1.0

Unit: mm

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%

MSL level 1

13. Shelf Life:

2 years from manufacturing date.



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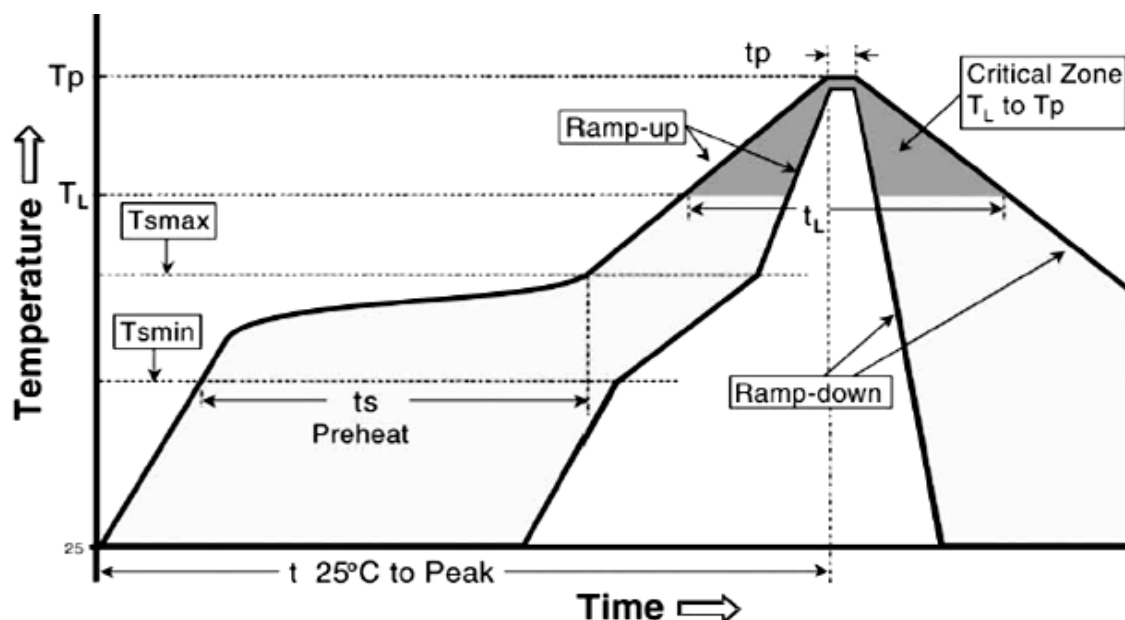
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14. Recommend IR – Reflow profile : (solder: Sn96.5 / Ag3 / Cu0.5)



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 (Tsmax to Tp)	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 (Tp)	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	8mimutes max.



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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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