1. Scope

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

2. Type Designation

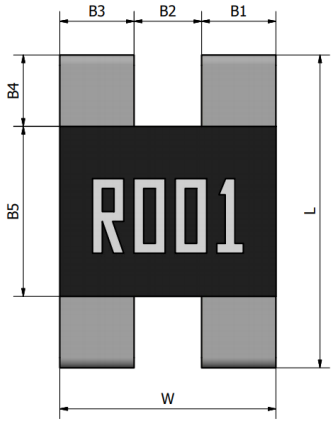
RLF12	F	E	E	R001
Series No.	**Tolerance**	**Packaging**	**Power**	**Resistance**
12：1225 (F=4-Wire)	F= ±1% G= ±2% J= ±5%	E= Embossed	C=1W E= 2W	e.g. R001=1mΩ

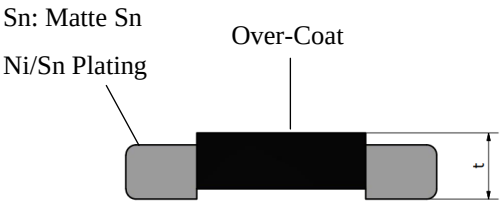
3. Features

Type	RLF 12
Size	1225
Power Rating	2W
Resistance Value	1mΩ~3mΩ
Operation Temperature Range	-55℃~+170℃
TCR	±100ppm/℃
Tolerance	±1%、±2%、±5%
Insulation Resistance	Over 100MΩ
Maximum Working Voltage(V)	$(P*R)^{1/2}$

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

4. Construction and Dimension





Metal Alloy Construction

Series	L	W	t	B1	B2	B3	B4	B5
RLF12	6.40 ±0.20	3.20 ±0.20	0.70 ±0.20	0.95 ±0.20	1.25 ±0.20	0.95 ±0.20	2.2 ±0.20	2.1 ±0.20

UNIT: mm

Marking

The marking pattern is as follows.

Resistance value is expressed by 4 digits.

E.G.:

R001 = 0.001Ω = 1mΩ

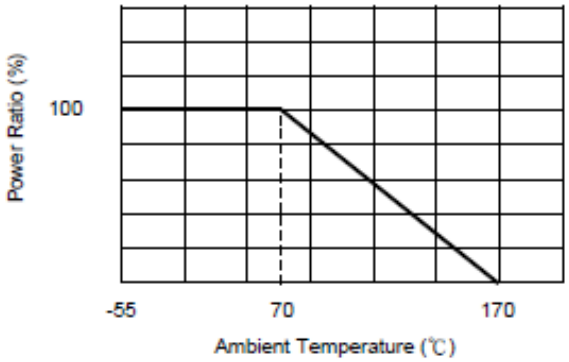
R002 = 0.002Ω = 2mΩ

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 E-Test 3 MIL-STD202 Method 108	T=170℃,1000hrs, Measurement at 24hrs after test conclusion.	< ±(1%+0.0005Ω)
Temperature Cycling	AEC-Q200-REV E-Test 4 JESD22 Method JA-104	1000Cycle (-55℃ to 155℃), Measurement at 24hrs after test conclusion.	< ±(1%+0.0005Ω)
Short time overload	IEC60115-1 4.13	2.5 X rated power for 5s.	< ±(1%+0.0005Ω)
Biased Humidity	AEC-Q200-REV E-Test 7 MIL-STD-202 Method 103	10% Rated power at 85℃, RH:85% ,1000Hrs, Measurement at 24hrs after test conclusion.	< ±(1%+0.0005Ω)
Operation life	AEC-Q200-REV E-Test 8 MIL-STD-202 Method 108	1000 hours TA=70℃ at 100% rated power. 90min ON and 30 min OFF. Measurement at 24±4 hours after test conclusion.	< ±(2%+0.0005Ω)
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
Resistance to Soldering Heat	AEC-Q200-REV E-Test 15 MIL-STD-202 Method 210	T=260+/-5℃ solder,10+/-1 sec dwell.	< ±(0.5%+0.0005Ω)
Mechanical Shock	AEC-Q200-REV E-Test 13 MIL-STD-202 Method 213	100g's, Normal duration is 6ms, half sine shock pulse.	< ±(0.5%+0.0005Ω)
Resistance to vibration	AEC-Q200-REV E-Test 14 MIL-STD-202 Method 204	5g's for 20min.12cycles, 10-2000Hz.	<±(0.5%+0.0005Ω)
Board Flex	AEC-Q200-REV E-Test 21 AEC-Q200-005	Min 2mm deflection ,60sec.	<±(0.5%+0.0005Ω)
Flammability	AEC-Q200-REV E-Test 20 UL-94	V-0 or V-1are acceptable, Electrical test not required.	V-0
ESD	AEC-Q200-REV E-Test 17 AEC-Q200-002 or ISO/DIS 10605	verify the voltage setting at 500V.	< ±(1%+0.0005Ω)
Solderability	AEC-Q200-REV E-Test 18 J-STD-002	aging 4 hours at 155 ℃ dry heat Lead-free solder bath at 235±3 ℃ Dipping time: 3±0.5 seconds.	> 95% area covered with tin

Terminal Strength (SMD)	AEC-Q200-REV E-Test 22 AEC-Q200-006	Force of 1.8kg for 60 seconds. Remarks: 0201-NA	< ±(2%+0.0005Ω)
Low Temperature Storage	EC60115-1 4.23.4 JIS C 5201-1 4.23.4	-55℃, 1000hrs	<±(1%+0.0005Ω)

5.1 Derating Curve



5.2 Rated Current

The rated current is calculated by the following formula:

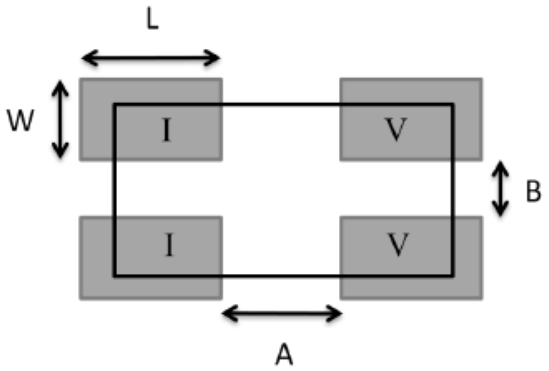
$$I = \sqrt{P \div R}$$

I: Rated Current (A)

P: Rated Power (W)

R: Resistance Value (Ω)

6. Recommended Solder Pad Dimension



Series	Resistance (mΩ)	A	B	L	W
RLF12	1~3	2.3±0.1	1.4±0.1	2.6±0.1	1.5±0.1

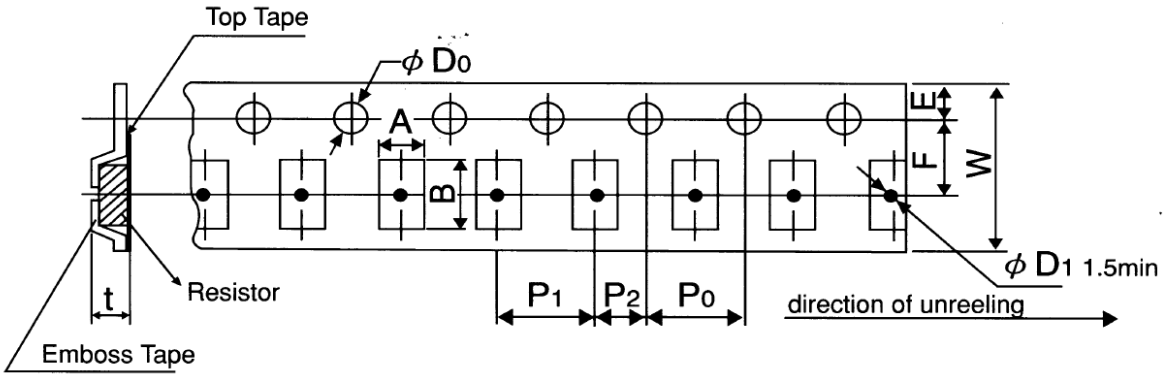
Note: *The copper foil minimum thickness of PCB needs 3 oz

Unit: mm

7. Number of Package

Series	RLF12
Pieces	4000

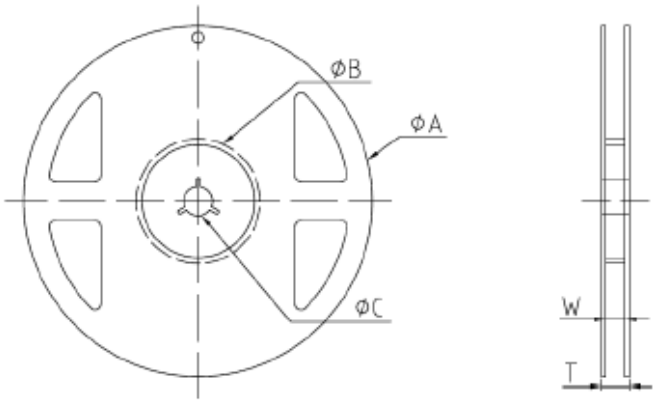
8. Packaging



Packing	Type	A	B	W	F	E	P1	P2	P0	ψD0	t
Emboss	RLF12	3.60	6.90	12.0	5.50	1.75	4.00	2.00	4.00	1.5	1.2
Tolerance		±0.20	±0.20	±0.20	±0.05	±0.10	±0.10	±0.10	±0.10	±0.10	±0.15

Unit: mm

9. Reel Specification

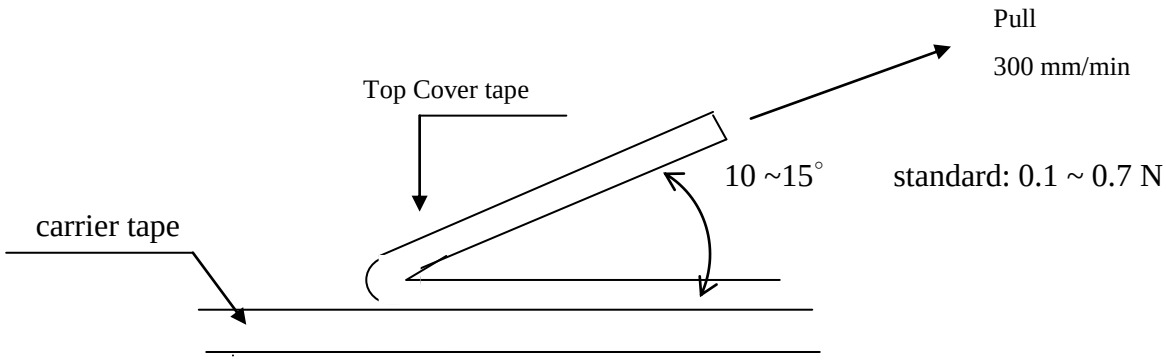


Series	ϕ A	ϕ B	ϕ C	W	T
RLF12	178.0 ±2.0	60.0 ±1.0	13.0 ±1.0	13.0 ±1.0	15.5±1.0

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

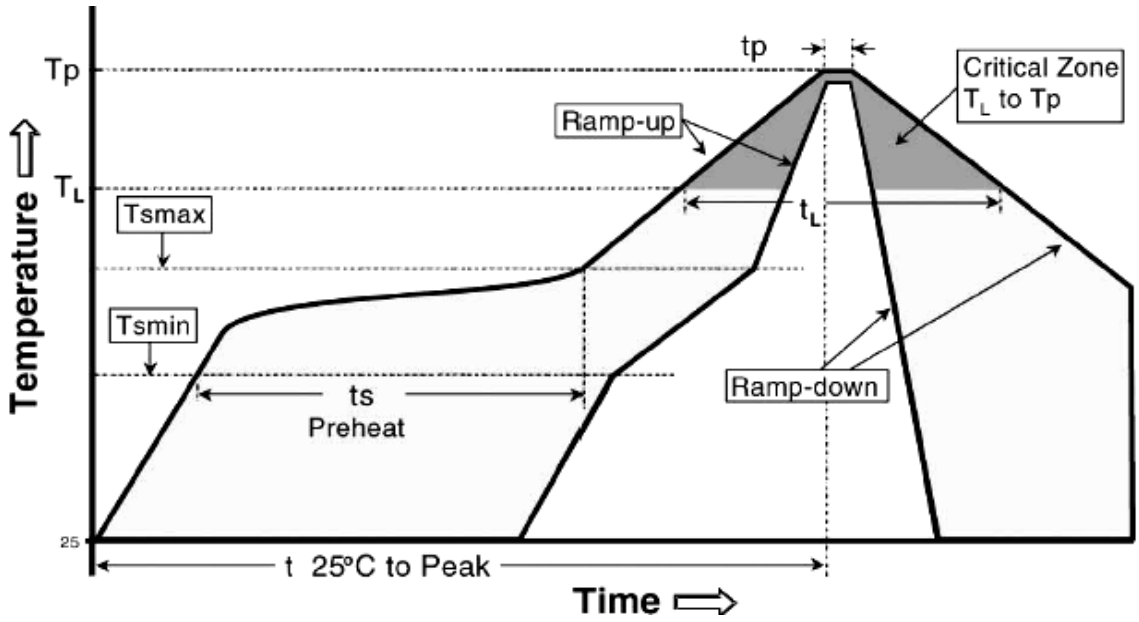
Temperature: 5℃~35℃, Humidity:40%~75%

MSL level 1

12. Shelf Life

2 years from manufacturing date.

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℃, 3+1/-0 sec, 1 time

Profile Feature	Lead (Pb)-Free Assembly
Average ramp-up rate (Tsmax to Tp)	3℃ / second max.
Preheat - Temperature Min (Ts_{min}) - Temperature Max (Ts_{max}) - Time (Ts_{min} to Ts_{max}) (ts)	 150℃ 200℃ 60 -120 seconds
Time maintained above: - Temperature (T_L) - Time (T_L)	 217℃ 60-150 seconds
Peak Temperature (Tp)	260℃
Time within $^{+0}_{-5}$ ℃ of actual Peak Temperature $(tp)^2$	10 seconds
Ramp-down Rate	6℃/second max.
Time 25℃ to Peak Temperature	8mimutes max.

14. 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.

15. Manufacturing Country & City

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Tel : (+86) 769-8339-4790～3 Fax : (+86) 769-8339-4794

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