



Lead-Free Current Sensing Resistors
RLS 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 RLS series manufactured by TA-I TECHNOLOGY CO.,LTD.

2. Type Designation

RLS06	F	T	C	R005
Series No. 04 : 0402 06 : 0603 10 : 0805 12 : 1206 25 : 2512	Tolerance F= ±1% G= ±2% J= ±5%	Packaging T= Paper E= Embossed	Power P= 1/16W K= 1/5W A= 1/4W T= 1/3W S= 1/2W I= 3/4W C= 1.0W E= 2.0W	Resistance R005=5mΩ R0065=6.5mΩ R010= 10mΩ *For 0402 R0Z10=Jumper Max resistance 10mΩ

3. Features

Series	Size	Power (W)	Resistance Value	Operation Temperature Range	TCR	Tolerance
RLS04	0402	0.0625	Max. resistance 10mΩ Max. Current 3A	-55°C~+125°C	±100ppm/°C	5%
		0.25	5mΩ ≤ R ≤ 50mΩ			±1% ±2% ±5%
RLS06	0603	0.50	3mΩ ≤ R ≤ 200mΩ	-55°C~+155°C	±50ppm/°C	±1% ±2% ±5%
RLS10	0805	0.75	5mΩ ≤ R ≤ 100mΩ			
		0.50	100mΩ < R ≤ 200mΩ			
RLS12	1206	1.0	3mΩ ≤ R ≤ 200mΩ			
RLS25	2512	2.0	5mΩ ≤ R ≤ 10mΩ			

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



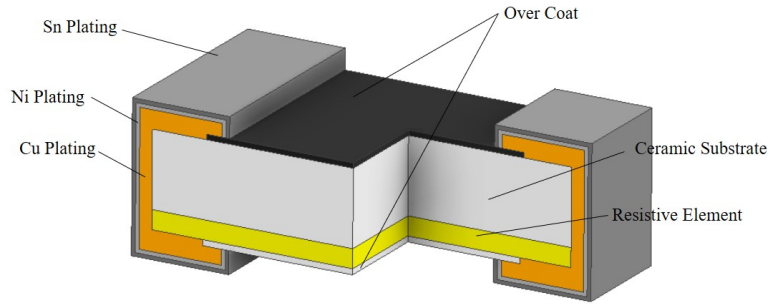
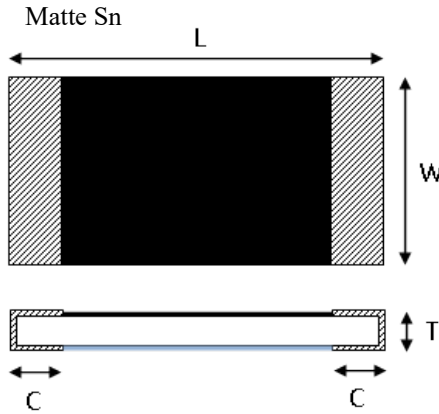
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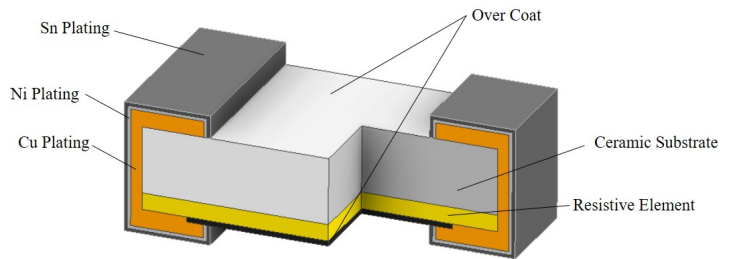
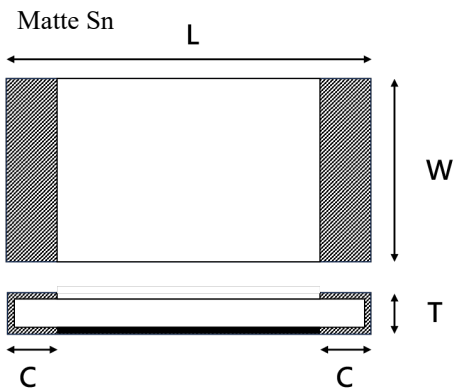
4. Construction and Dimension

4.1 RLS04 & RLS06

Marking: For 0402 & 0603 No Marking



RLS04 \geq 10mohm and RLS06



RLS04 < 10mohm

Series	Resistance	L	W	C	T
RLS04	Jumper	1.10±0.10	0.55±0.10	0.30±0.10	0.45±0.10
	$5\text{m}\Omega \leq R \leq 50\text{m}\Omega$	1.10±0.10	0.55±0.10	0.30±0.10	0.45±0.10
RLS06	$5\text{m}\Omega \leq R \leq 200\text{m}\Omega$	1.60±0.20	0.80±0.20	0.40±0.20	0.60±0.20
	$3\text{m}\Omega \leq R \leq 4\text{m}\Omega$	1.60±0.20	0.80±0.20	0.60±0.20	0.60±0.20

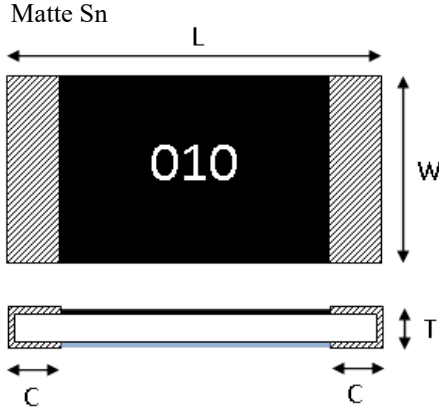
UNIT: mm



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4.2 RLS10 to RLS25



Marking

For 0805 to 2512:

Resistance value is expressed by 3-4 digits.

E.G.:

005 = 0.005Ω = 5mΩ

010 = 0.010Ω = 10mΩ

6.5 = 0.0065Ω = 6.5mΩ

R100=0.1Ω=100mΩ

R150=0.15Ω=150mΩ

Series	Resistance	L	W	C	T
RLS10	$5\text{m}\Omega \leq R \leq 200\text{m}\Omega$	2.00±0.20	1.25±0.20	0.40±0.30	0.70±0.20
RLS12	$3\text{m}\Omega \leq R \leq 200\text{m}\Omega$	3.20±0.20	1.60±0.20	0.50±0.30	0.70±0.20
RLS25	$5\text{m}\Omega \leq R \leq 10\text{m}\Omega$	6.40±0.20	3.20±0.20	0.90±0.20	0.70±0.20

UNIT: mm

5. Reliability Tests

Test Items	Reference	Condition of Test	Test Limits
Temperature Coefficient of Resistance	IEC60115-1 4.8	+25 ~ 125°C	Refer 3.0
High Temperature Exposure (Storage)	AEC-Q200-REV E-Test 3 MIL-STD202 Method 108	RLS04 T=125°C, 1000hrs, Measurement at 24hrs after test conclusion. RLS06~RLS25 T=155°C, 1000hrs, Measurement at 24hrs after test conclusion.	< ±(1%+0.0005Ω)
Temperature Cycling	AEC-Q200-REV E-Test 4 JESD22 Method JA-104	RLS04 1000Cycle (-55°C to 125°C), Measurement at 24hrs after test conclusion. RLS06~RLS25 1000Cycle (-55°C to 155°C), Measurement at 24hrs after test conclusion.	< ±(1%+0.0005Ω)
Short time overload	IEC60115-1 4.13	5 X rated power for 5s.	< ±(1%+0.0005Ω)



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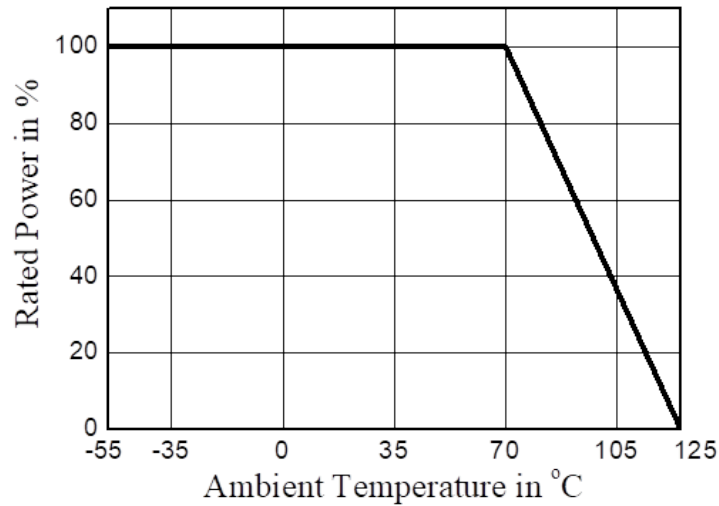
Biased Humidity	AEC-Q200-REV E-Test 7 MIL-STD-202 Method 103	1000 hours 85°C/85%RH. Note: Specified conditions: 10% of operating power (not exceeding max working voltage). Measurement at 24±2 hours after test conclusion.	< ±(1%+0.0005Ω)
Operation life	AEC-Q200-REV E-Test 8 MIL-STD-202 Method 108	1000 hours TA=70°C at 100% rated power. 90min ON and 30 min OFF. Measurement at 24±4 hours after test conclusion.	< ±(1%+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 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°C solder, 10+/-1 sec dwell.	< ±(0.5%+0.0005Ω)
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%+0.0005Ω)
Resistance to 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%+0.0005Ω)
Board Flex	AEC-Q200-REV E-Test 21 AEC-Q200-005	The duration of the applied forces shall be 60 (+ 5) Sec 3mm deflection (RLS04~ RLS 12) 2mm deflection (RLS 25)	<±(1%+0.0005Ω)
Flammability	AEC-Q200-REV E-Test 20 UL-94	V-0 are 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 °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 E-Test 22 AEC-Q200-006	RLS04 Force of 1.0 kg for 60 seconds Remarks: 0201-NA RLS06~RLS25 Force of 1.8kg for 60 seconds Remarks: 0201-NA	< ±(1%+0.0005Ω)
Low Temperature Storage	AEC60115-1 4.23.4 JIS C 5201-1 4.23.4	-55°C, 1000hrs	<±(1%+0.0005Ω)



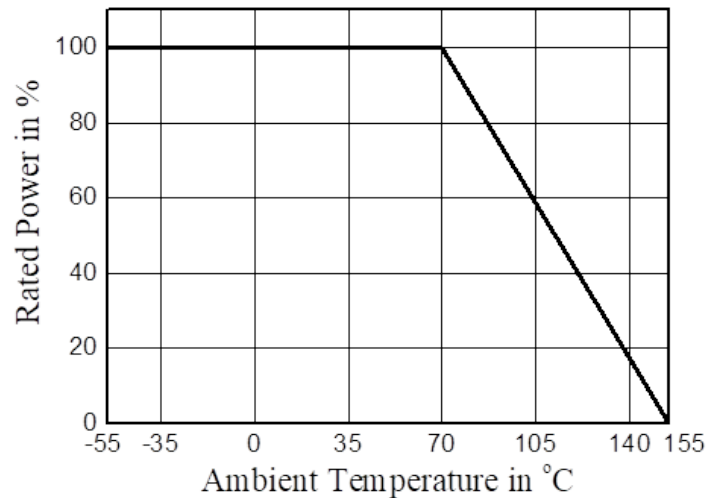
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5.1 Derating Curve
5.1.1 RLS04



5.1.2 RLS06 to RLS25



5.2 Rated Current

The rated current is calculated by the following formula:

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

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

I: Rated Current (A)

V: Rated Voltage (V)

P: Rated Power (W)

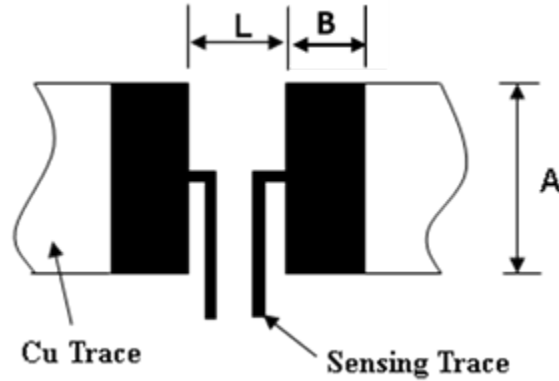
R: Resistance Value (Ω)



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6. Recommended Solder Pad Dimension



Series	Resistance (mΩ)	A	L	B
RLS04	$5 \leq R \leq 50$	0.7	0.45	0.375
RLS06	$3 \leq R \leq 200$	1.0	0.6	1.1
RLS10	$5 \leq R \leq 200$	1.4	1.2	1.0
RLS12	$3 \leq R \leq 35$	1.8	1.6	1.55
	$36 \leq R \leq 200$	1.8	2.2	1.35
RLS25	$5 \leq R \leq 10$	4.0	4.1	2.1

Unit: mm

*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 is depended on PCB PAD size design and its necessary to consider the effect of the resistance increase or decrease.

7. Number of Package

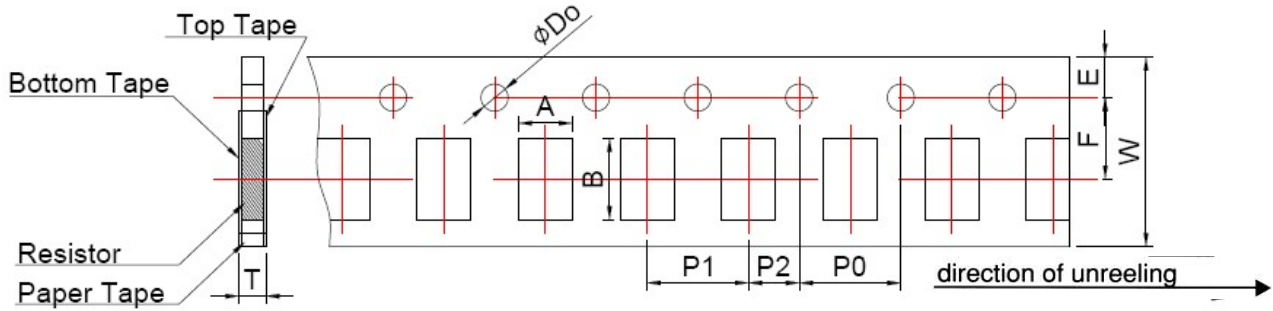
Series	RLS04	RLS06	RLS10	RLS12	RLS25
Pieces/Package	10000	5000	4000	4000	4000



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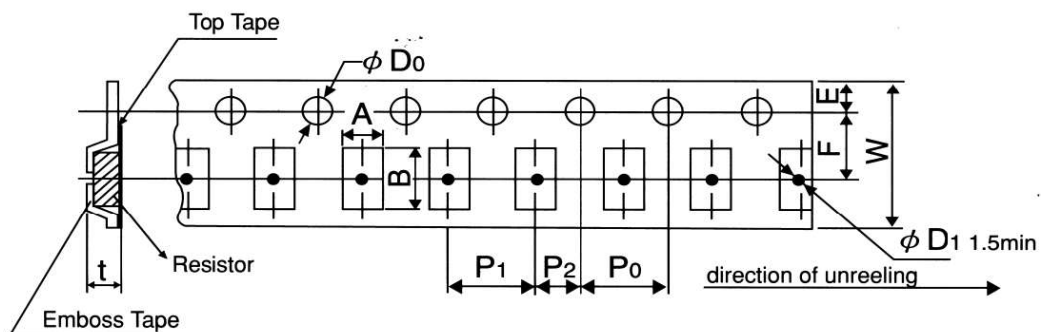
8. Packaging



Tape packaging dimension

Packing	Type	A	B	W	F	E	P1	P2	P0	$\phi D0$	T
Paper	RLS04	0.75 ± 0.05	1.30 ± 0.05	8.00 ± 0.20	3.50 ± 0.05	1.75 ± 0.10	2.00 ± 0.10	2.00 ± 0.10	4.00 ± 0.10	1.55 ± 0.10	0.65 ± 0.10
	RLS06	1.10 ± 0.15	1.90 ± 0.20	8.00 ± 0.20	3.50 ± 0.05	1.75 ± 0.10	4.00 ± 0.10	2.00 ± 0.10	4.00 ± 0.10	1.55 ± 0.10	0.85 ± 0.10
	RLS10	1.60 ± 0.15	2.40 ± 0.20	8.00 ± 0.20	3.50 ± 0.05	1.75 ± 0.10	4.00 ± 0.10	2.00 ± 0.10	4.00 ± 0.10	1.55 ± 0.10	1.05 ± 0.10
	RLS12	2.00 ± 0.15	3.60 ± 0.20	8.00 ± 0.20	3.50 ± 0.05	1.75 ± 0.10	4.00 ± 0.10	2.00 ± 0.10	4.00 ± 0.10	1.55 ± 0.10	1.05 ± 0.10

Unit: mm



Tape packaging dimension

Packing	Type	A	B	W	F	E	P1	P2	P0	$\phi D0$	t
Embossed	RLS25	3.60 ± 0.15	6.90 ± 0.20	12.0 ± 0.20	5.50 ± 0.05	1.75 ± 0.10	4.00 ± 0.10	2.00 ± 0.10	4.00 ± 0.10	1.55 ± 0.10	0.85 ± 0.10

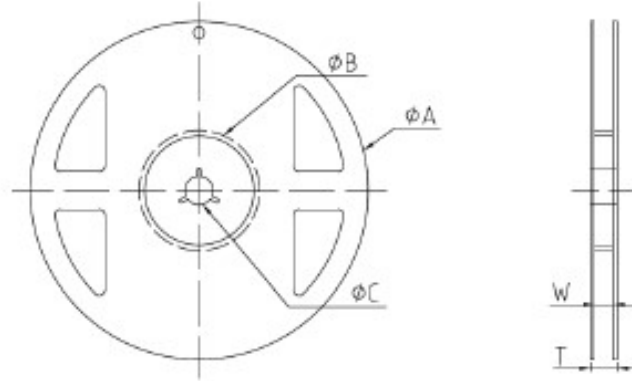
Unit: mm



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9. Reel Specification

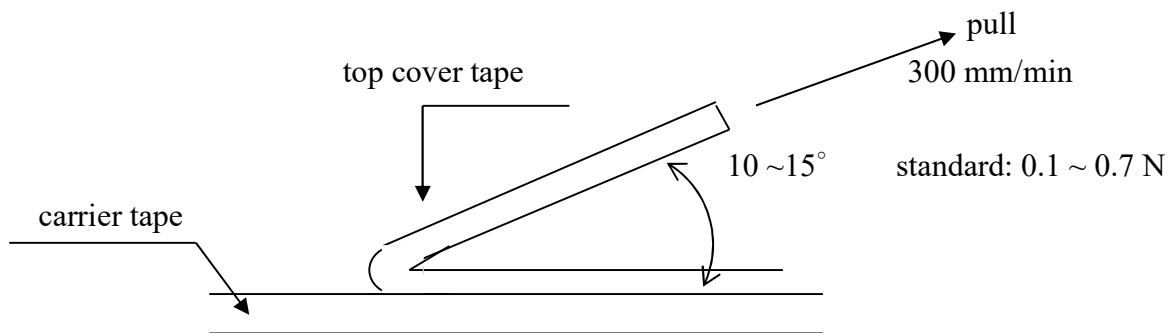


Series	ϕA	ϕB	ϕC	W	T
RLS04	178 ±2.0	60 ±1.0	13.0±1.0	9.0±1.0	11.4±1.0
RLS06 RLS10 RLS12	180 ±2.0	60 ±1.0	13.0±1.0	9.0±1.0	11.4±1.0
RLS25	180 ±2.0	60 ±1.0	13.0±1.0	13.0±1.0	15.4±1.0

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°C~35°C, Humidity:40%~75%
 Moisture Sensitivity Level: Level 1

12. Shelf Life

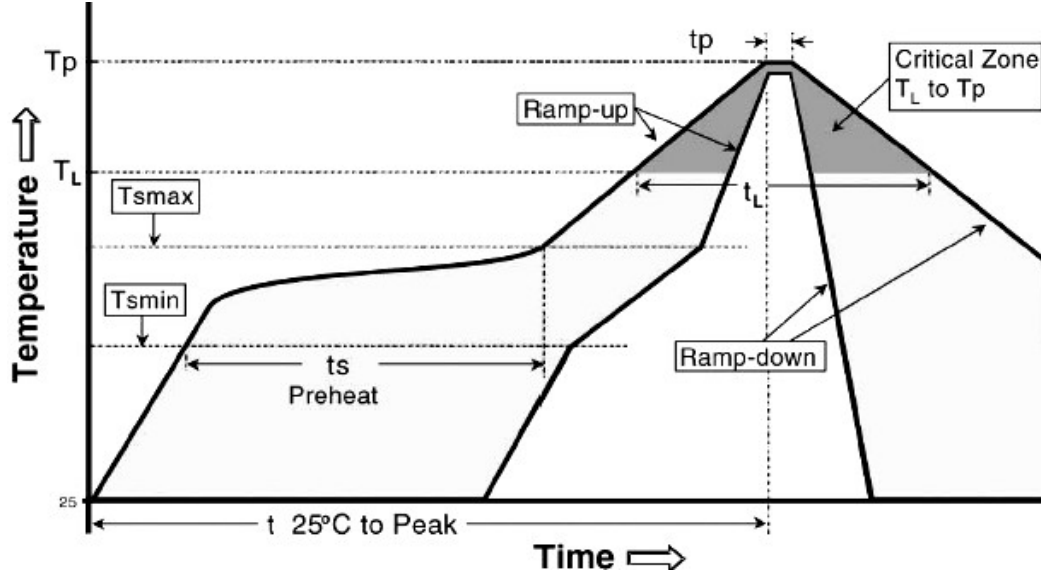
2 years from manufacturing date.



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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

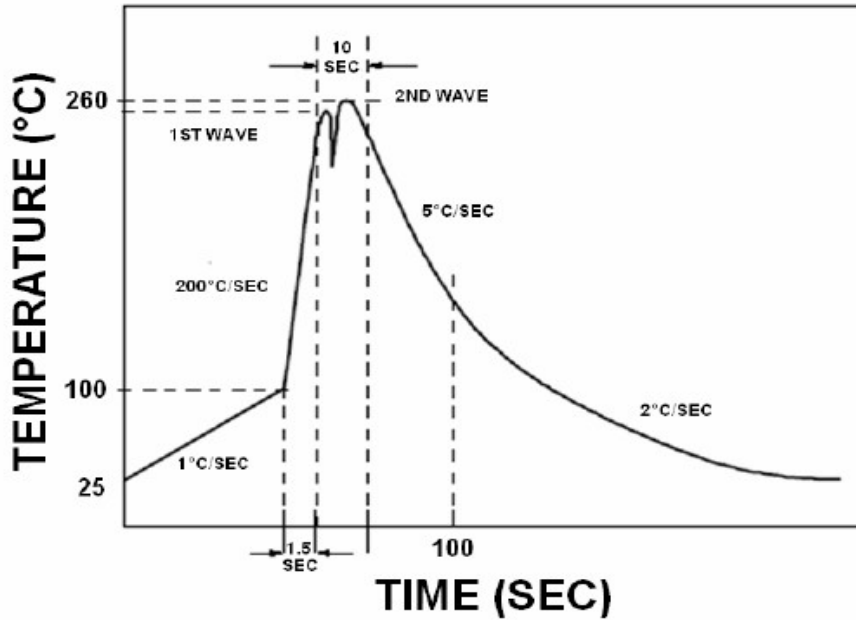
Profile Feature	Lead (Pb)-Free Assembly
Average ramp-up rate (T _{smax} to T _p)	3°C / second max.
Preheat - Temperature Min (T _{smin}) - Temperature Max (T _{smax}) - Time (T _{smin} to T _{smax}) (t _s)	150°C 200°C 60 -120 seconds
Time maintained above: - Temperature (T _L) - Time (T _L)	217°C 60-150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