



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

Document No	TRLS-XXOS002B
Issued date	2021/12/21
page	1/10

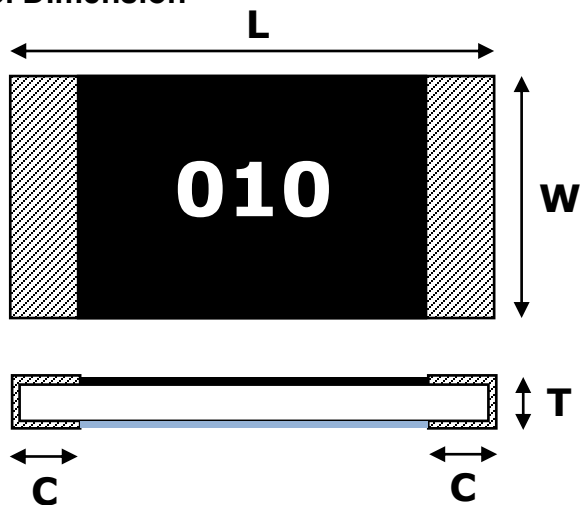
1. Scope :

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 :

RLS12	F	T	C	R010
Series No.	Tolerance	Packaging	Power	Resistance
06→0603 10→0805 12→1206 25→2512	F = $\pm 1\%$ G = $\pm 2\%$ J = $\pm 5\%$	T=Paper E=Embossed	A = 0.25W S = 0.5 W I = 0.75W C = 1 W E = 2W	R005=5 mΩ R0065=6.5 mΩ R010=10mΩ

3. Dimension :



3.1 Marking

For 0805 to 2512:

Resistance value is expressed by 3 digits.

E.G.:

005 = $0.005\Omega = 5\text{ m}\Omega$

010 = $0.010\Omega = 10\text{m}\Omega$

6.5 = $0.0065\Omega = 6.5\text{ m}\Omega$

For 0603: No Marking.

Series	L	W	C	T
RLS06	1.60±0.20	0.80±0.20	0.40±0.20	0.60±0.20
RLS10	2.00±0.20	1.25±0.20	0.40±0.30	0.70±0.20
RLS12	3.20±0.20	1.60±0.20	0.50±0.30	0.70±0.20
RLS25	6.40±0.20	3.20±0.20	0.90±0.20	0.70±0.20



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Document No	TRLS-XXOS002B
Issued date	2021/12/21
page	2/10

4. Features:

Series	Size	Power (W)	Resistance Value	Operation Temperature Range	TCR	Tolerance
RLS06	0603	0.50	5 ~ 20 mΩ	-55°C ~ +155°C	±50ppm/°C	±1% ±2% ±5%
RLS10	0805	0.75	5 ~ 30 mΩ			
RLS12	1206	1.0	5 ~ 40 mΩ			
RLS25	2512	2.0	5 ~ 10 mΩ			

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°C to +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.	



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Document No	TRLS-XXOS002B
Issued date	2021/12/21
page	3/10

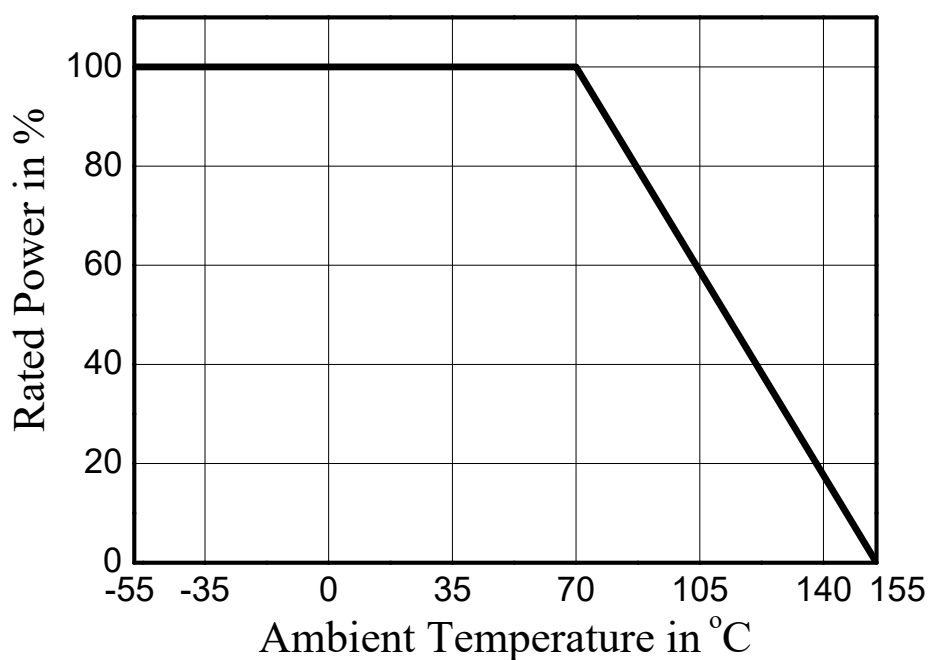
Physical Dimension	AEC-Q200-REV D-Test 10 JESD22 Method JB-100	Verify physical dimensions to the applicable device detail specification. Note: User(s) and Suppliers spec. Electrical test not required.	
Resistance to Solvents	AEC-Q200-REV D-Test 12 MIL-STD-202 Method 215	a:Isopropyl Alcohol : Mineral 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 pluse. 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 3mm deflection(RLS06~ RLS 12) 2mm deflection(RLS 25)	< ±1.0%
Terminal Strength (SMD)	AEC-Q200-REV D-Test 22 AEC-Q200-006	Force of 1.8kg for 60 seconds Remarks : 0201-NA	< ±1.0%



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

Document No	TRLS-XXOS002B
Issued date	2021/12/21
page	4/10

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 (A)

V: Rated Voltage (V)

P: Rated Power (W)

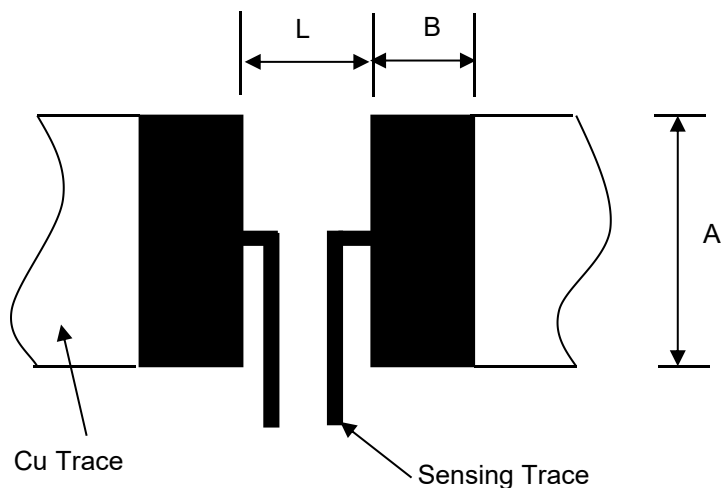
R: Resistance Value (Ω)



Lead-Free Current Sensing Resistors
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AEC-Q 200-Ver D qualified

Document No	TRLS-XXOS002B
Issued date	2021/12/21
page	5/10

6. Recommended Solder Pad Dimension



Unit: mm

Series	Resistance (mΩ)	A	L	B
RLS06	$5 \leq R \leq 20$	1.0	0.6	1.1
RLS10	$5 \leq R \leq 30$	1.4	1.2	1.0
RLS12	$5 \leq R \leq 30$	1.8	1.6	1.55
	$R = 40$	1.8	2.2	1.35
RLS25	$5 \leq R \leq 10$	4.0	4.1	2.1

*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 depend on PCB PAD size deign and it's necessary to consider the effect of the resistance increase or decrease.



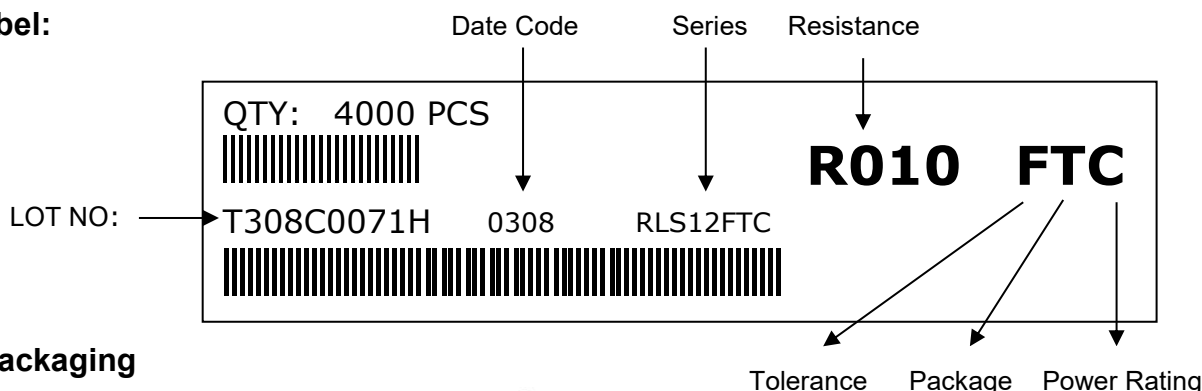
Lead-Free Current Sensing Resistors **RLS Series** **(Halogen-Free)** **AEC-Q 200-Ver D qualified**

Document No	TRLS-XXOS002B
Issued date	2021/12/21
page	6/10

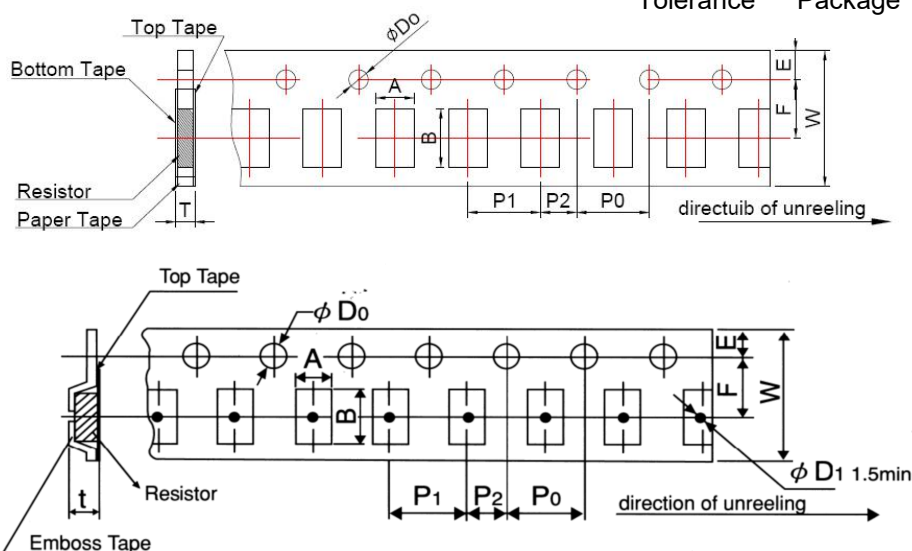
7. Number of Package:

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

8. Label:



9. Packaging



Tape packaging dimension

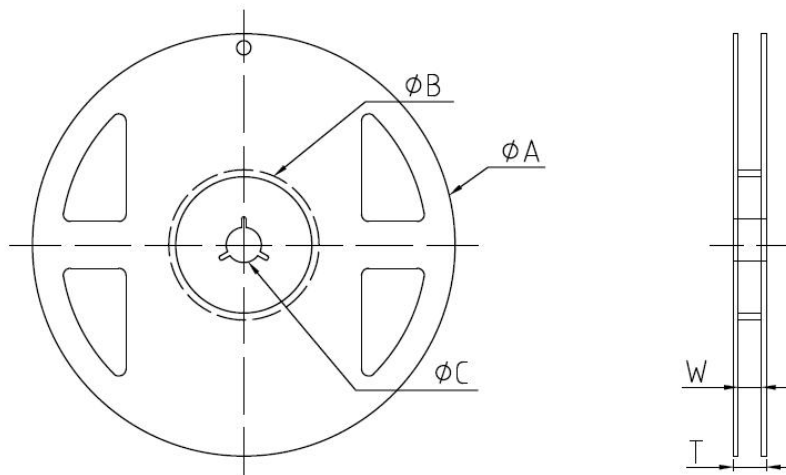
Packing	Type	A	B	W	F	E	P1	P2	P0	D0	T
Paper	RLS06	1.10	1.90	8.00	3.50	1.75	4.00	2.00	4.00	1.55	0.85
	RLS10	1.60	2.40	8.00	3.50	1.75	4.00	2.00	4.00	1.55	1.05
	RLS12	2.00	3.60	8.00	3.50	1.75	4.00	2.00	4.00	1.55	1.05
Embossed	RLS25	3.60	6.90	12.0	5.50	1.75	4.00	2.00	4.00	1.55	0.85
Tolerance		±0.15	±0.20	±0.20	±0.05	±0.10	±0.10	±0.10	±0.10	±0.10	±0.10



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Document No	TRLS-XXOS002B
Issued date	2021/12/21
page	7/10

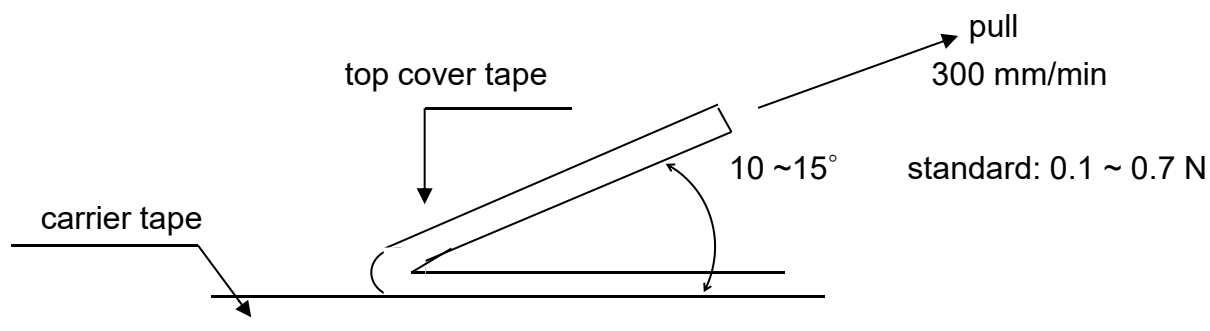
10. Reel Specification



Series	ϕA	ϕB	ϕC	W	T
RLS06 RLS10 RLS12	180 $\pm$ 2.0	60 $\pm$ 1.0	13.0 $\pm$ 1.0	9.0 $\pm$ 1.0	11.4 $\pm$ 1.0
RLS25	180 $\pm$ 2.0	60 $\pm$ 1.0	13.0 $\pm$ 1.0	13.0 $\pm$ 1.0	15.4 $\pm$ 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:

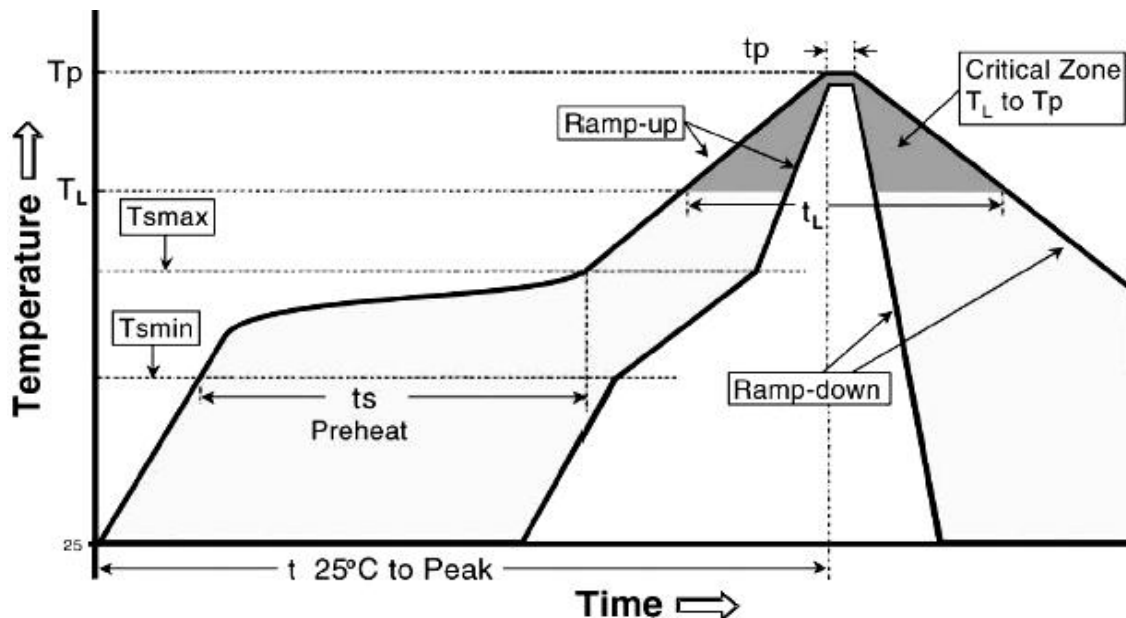
2 years from manufacturing date.



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Document No	TRLS-XXOS002B
Issued date	2021/12/21
page	8/10

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℃ , 3+1/-0 sec, 1 time

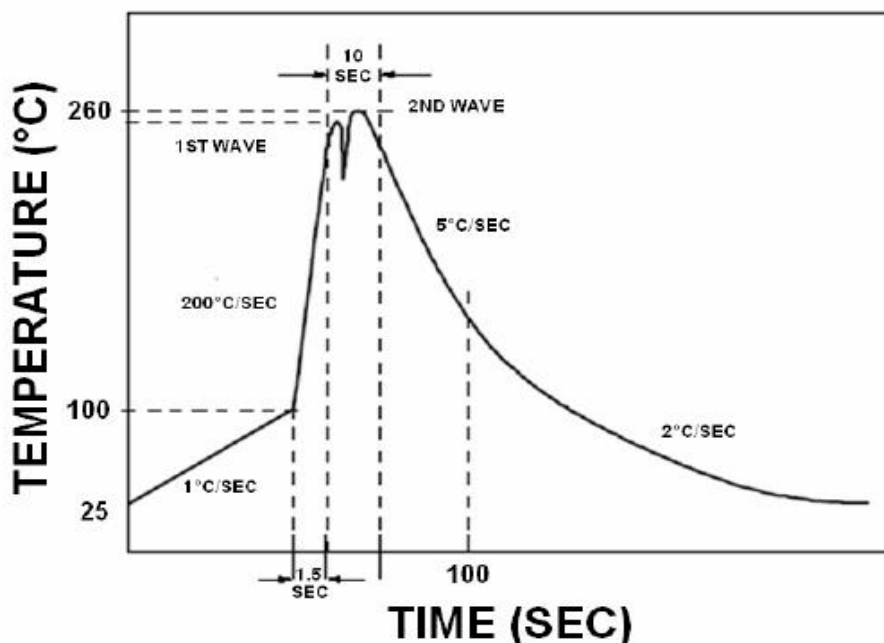
Profile Feature	Lead (Pb)-Free Assembly
Average ramp-up rate (T _{smax} to T _p)	3℃ / second max.
Preheat - Temperature Min (T _{smin}) - Temperature Max (T _{smax}) - Time (T _{smin} to T _{smax}) (ts)	150℃ 200℃ 60 -150 seconds
Time maintained above : - Temperature (T _L) - Time (T _L)	217℃ 60-120 seconds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



Lead-Free Current Sensing Resistors
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AEC-Q 200-Ver D qualified

Document No	TRLS-XXOS002B
Issued date	2021/12/21
page	9/10

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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(3) FORTUNE TASK RESISTOR FACTORY (China – Dongguan)

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