



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

Document No	TRLM-100S005H
Issued date	2022/09/08
page	1/8

**1. Scope :**

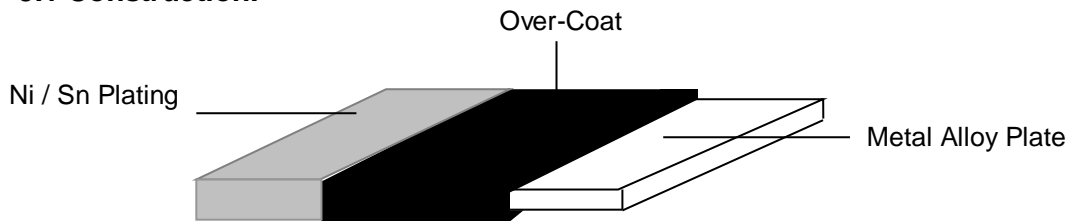
This specification applied to the products of Lead-Free current sensing resistor of metal foil for Lead-Free RLM series manufactured by TA-I TECHNOLOGY CO.,LTD.

**2. Type Designation :**

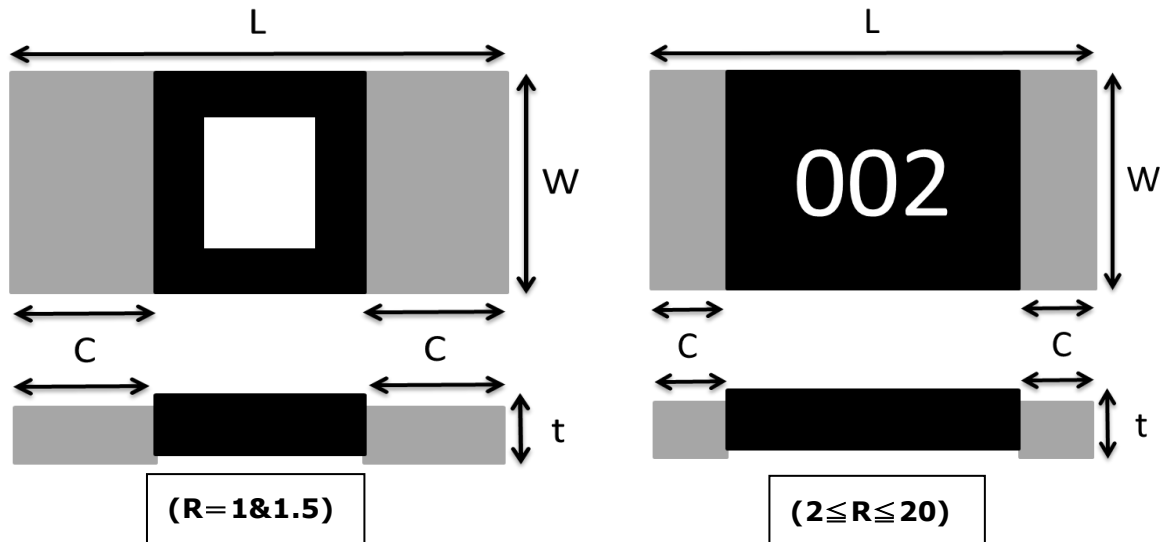
<u>RLM</u> Item	<u>10</u> Series No.	<u>F</u> Resistance tolerance	<u>I</u> Packaging	<u>S</u> Power Rating	<u>M</u> Metal	<u>R003</u> Resistance
10:0805(2012)		F:±1% G:±2% J:±5%	T: Paper	B=1/8W A=1/4W S=1/2W	M=MnCu	e.g : R003=3mΩ R020=20mΩ

**3. Construction and Dimension :**

**3.1 Construction:**



**3.2 Dimension:**



unit: mm

Style	L	W	C	t	Material
RLM10	2.0±0.1	1.25±0.1	0.65±0.2 (1 ≤ R < 2)	0.6 ±0.20	Strip : Alloy Over Coating : molding Compound UL-94V-0 grade
			0.4±0.2 (2 ≤ R ≤ 25)		



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Document No	TRLM-100S005H
Issued date	2022/09/08
page	2/8

#### 4. Features:

Type	RLM10
Power Rating	1/8W 、 1/4W 、 1/2W
Resistance Value	1~25 mΩ
Operation Temperature Range	-55℃ ~+170℃
Temperature Coefficient of Resistance	±50ppm/℃
Tolerance	±1% 、 ±2% 、 ±5%
Insulation Resistance	Over 100MΩ
Maximum Working Voltage(V)	(P*R) <sup>1/2</sup>

#### 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=170℃ ,1000hrs,Measurement at 24hrs after test conclusion.	< ±1%
Temperature Cycling	AEC-Q200-REV D-Test 4 JESD22 Method JA-104	1000Cycle (-55℃ to 125℃),Measurement at 24hrs after test conclusion.	< ±0.5%
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.	< ±0.5%
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.	< ±1%
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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Document No	TRLM-100S005H
Issued date	2022/09/08
page	3/8

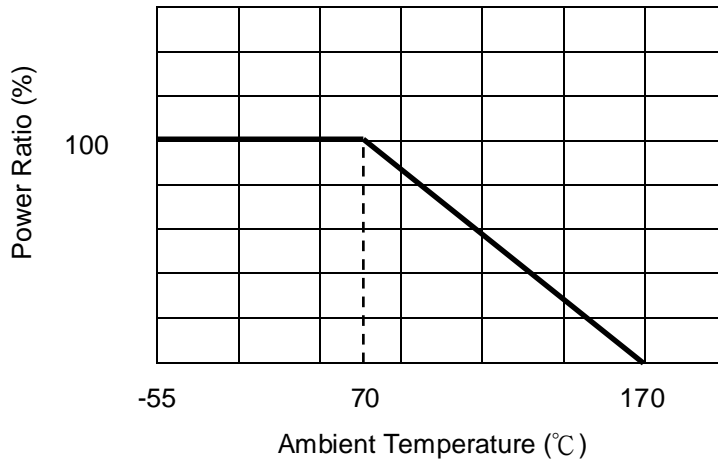
Resistance to Solvents	AEC-Q200-REV D-Test 12 MIL-STD-202 Method 215	a:Isopropyl Alcohol : Mineral Spirits= 1 : 3 b:Terpene Defluxer (Bioact EC-7R) c:Deionized water : Propylene Glycol Monomethyl Ether : monoethanolamine = 42 : 1 : 1	Marking and protective layer can not be detached
Resistance to Soldering 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
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
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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Document No	TRLM-100S005H
Issued date	2022/09/08
page	4/8

### 5.1 Derating Curve



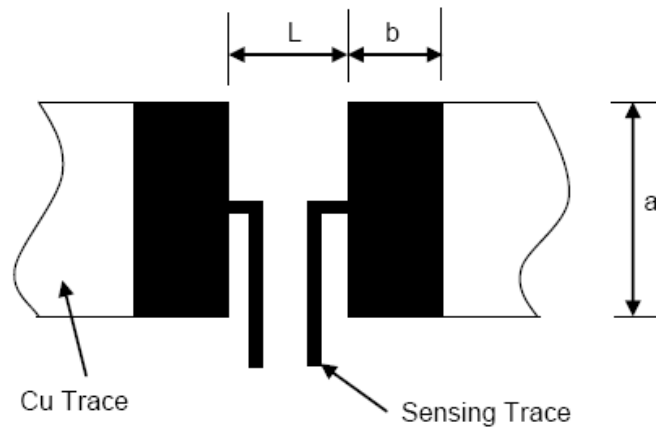
### 5.2 Rated Current

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



Resistance Range (mΩ)	a	b	L
1 ≤ R < 2	1.4	1.15	0.7
2 ≤ R ≤ 25	1.4	1.15	1.2

Unit: mm



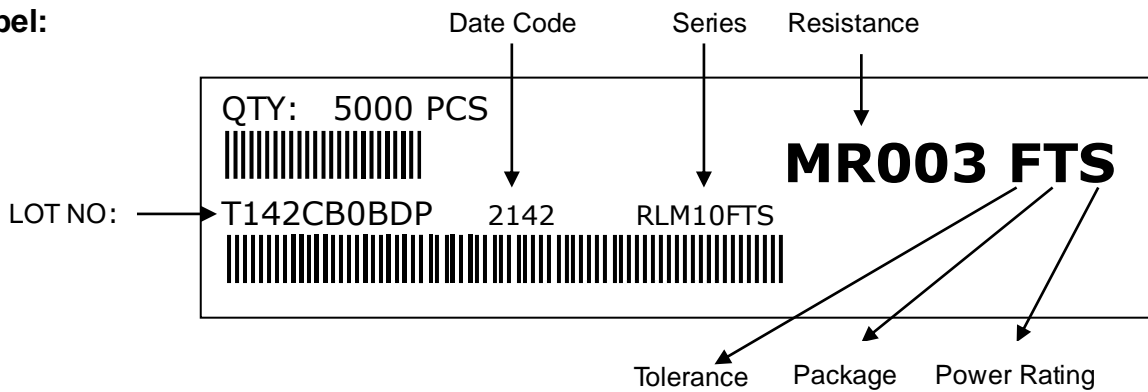
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Document No	TRLM-100S005H
Issued date	2022/09/08
page	5/8

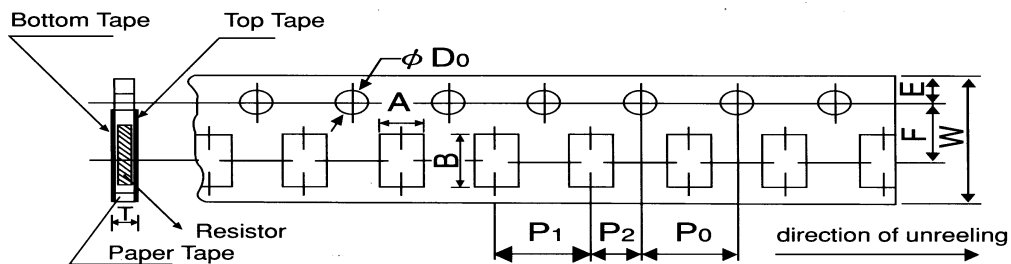
**7. Number of Package:**

5000 Pieces / package

**8. Label:**



**9. Taping**



Packing	Type	A	B	W	F	E	$P_1$	$P_2$	$P_0$	$D_0$	T
Paper Tape	RLM10	1.6±0.15	2.4±0.2	8.0±0.2	3.5±0.05	1.75±0.1	4.0±0.1	2.0±0.1	4.0±0.1	+0.1 $\Phi$ 1.5 -0	0.84±0.1

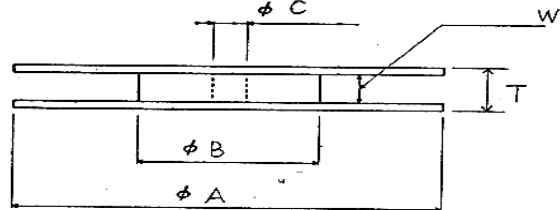
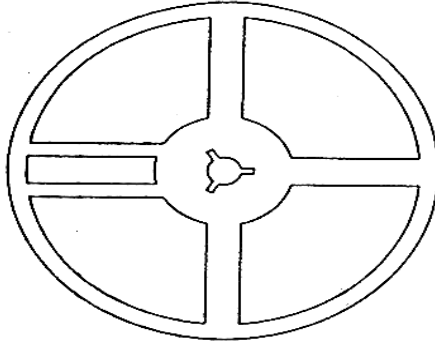
Unit:mm



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Document No	TRLM-100S005H
Issued date	2022/09/08
page	6/8

### 10. Reel Specification

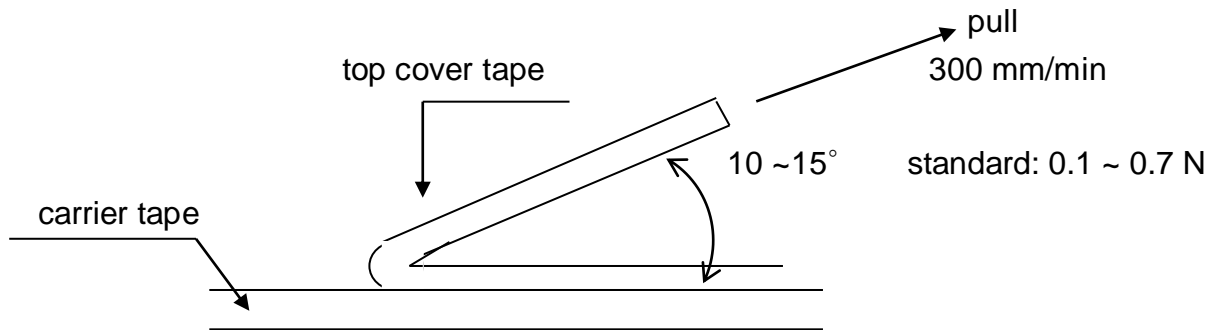


Series	$\phi A$	$\phi B$	$\phi C$	W	T
RLM 10	178.0 ±2.0	60.0 ±1.0	13.0 ±1.0	9.0 ±1.0	11.4 ±1.0

Unit: mm

### 11. Peeling Strength of Top Cover Tape

Peel – off force of paper and blister tape is in accordance with “JIS ” that is , 0.1 to 0.7 N at a peel-off speed of 300 mm / minute.



### 12. Storage Conditions:

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

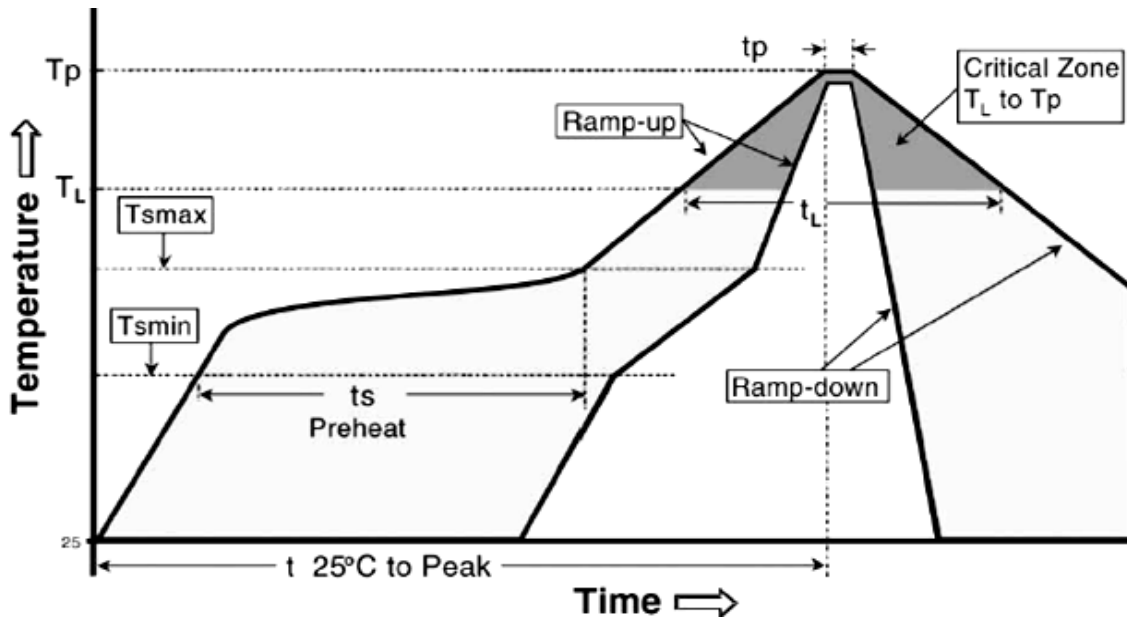
MSL level 1

### 13. Shelf Life:

2 years from manufacturing date.



**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 (T <sub>smax</sub> to T <sub>p</sub> )	3°C / second max.
Preheat - Temperature Min (T <sub>smin</sub> ) - Temperature Max (T <sub>smax</sub> ) - Time (T <sub>smin</sub> to T <sub>smax</sub> ) (t <sub>s</sub> )	150°C 200°C 60 -120 seconds
Time maintained above : - Temperature (T <sub>L</sub> ) - Time (T <sub>L</sub> )	217°C 60-150 seconds
Peak Temperature (T <sub>p</sub> )	260°C
Time within $\begin{matrix} +0 \\ -5 \end{matrix}$ °C of actual Peak Temperature (t <sub>p</sub> ) <sup>2</sup>	10 seconds
Ramp-down Rate	6°C/second max.
Time 25°C to Peak Temperature	8mimutes max.



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Issued date	2022/09/08
page	8/8

### 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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#### Associated companies :

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

Tel : 604- 3900480 Fax : 604-3901481

(4) P.T.TAI ELECTRONICS Indonesia ( Indonesia – Jakarta )

Tel : 62-21-89830123 Fax : 62-21-89830703