Towards Excellence in *Quality, Service & Innovation*

ASJ

DATA SHEET

Metal Alloy Low-Resistance Resistor

LRP Series

±1%, TCR ±50

SIZE: 2512

RoHS-Compliant

Product Specification –20 May, 2024 v1

1. SCOPE

1.1. This specification is applicable to Lead-free, Halogen-free of RoHS Directive for metal alloy low-resistance resistor.

1.2. The product is for general purpose.

2. PART NUMBERING SYSTEM

Part Numbering is made in accordance with the following system:

LRP	63	-	R100	-	F	E
Type	**Size (Inch)**		**Nominal Resistance**		**Tolerance**	**Packaging**
Metal Alloy Low-Resistance Resistor	63 (2512)		Resistance (4~6 Digit) EX: R001 = 1mΩ R010 = 10mΩ		F=±1.0%	E=4,000 pcs

3. RATING

3.1. Rated Power

3.1.1 Resistor Rated Power

Type	Rating Power	Rating Current	Overload Current
LRP63	2W	$Ir=\sqrt{P/R}$	$Io=\sqrt{5\,P/R}$

3.1.2 Power Derating Curve: Operating Temperature Range： - 55 ~+170 ℃

For resistors operated in ambient temperatures 70°C, power rating shall be derated in accordance with the curve below:

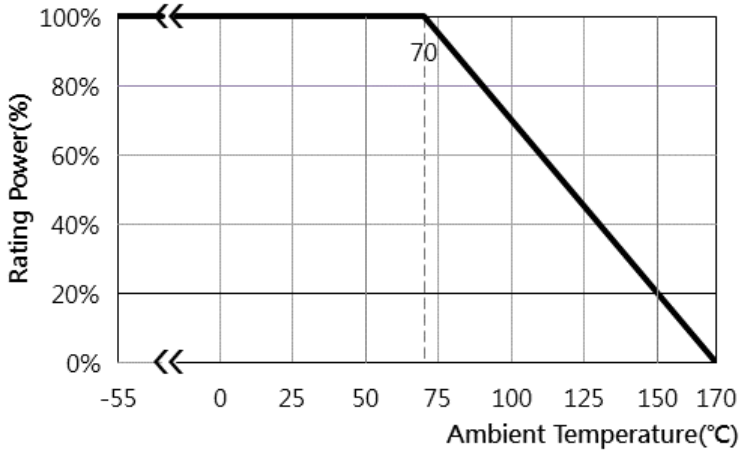


Fig.1 Power Derating Characteristics

3.2 Standard Atmospheric Condition

Unless otherwise specified, the standard range of atmospheric conditions for making measurements and tests is as follows:

Ambient Temperature = +5°C to +35°C

Relative Humidity = < 85% RH

Air Pressure = 86 to 106kPa

If there may be any doubt about the results, measurement shall be made within the following limits :

Ambient Temperature = 20± 2°C

Relative Humidity = 60 to 70% RH

Air Pressure = 86 to 106kPa

3.3 Operating Temperature Range -55°C to +170°C,

3.4 Storage Temperature Range -5°C to +40°C / < 85% RH

3.5 Flammability Rating Tested in accordance to UL-94, V-0

3.6 Moisture Sensitivity Level Rating: Level 1

3.7 Product Assurance
ASJ resistor shall warranty 24 months from manufacturing date with control conditions.

3.8 ASJ resistors are RoHS-compliant in accordance to RoHS Directive.

3.9 Resistance, Resistance Tolerance and Temperature Coefficient of Resistance

Type	# of Terminals	Rating Power	Rating Current	Overload Current	T.C.R. (ppm/°C)	Resistance Range (mΩ) F (±1%);	Operating Temperature Range
LRP63	2	2W	Ir=$\sqrt{P/R}$	Io=$\sqrt{5P/R}$	≦±50	1mΩ	-55~170°C
					≦±50	2mΩ	
					≦±50	3mΩ	
					≦±50	4mΩ	
					≦±50	5mΩ	
					≦±50	10mΩ	
					≦±50	15mΩ	
					≦±50	20mΩ	
					≦±50	30mΩ	

Ir = Rating Current (A) P = Rating Power (W)
Io = Overload Current (A) R = Resistance (Ω)

3.10 Rating Current

The following equation may be used to determine the DC (Direct Current) or AC (Alternative Current) currents (RMS, root mean square value) of normal rated power. However, if the result value exceeds the highest current of regulated standards, the highest normal rated power is to be used.

Remark:

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

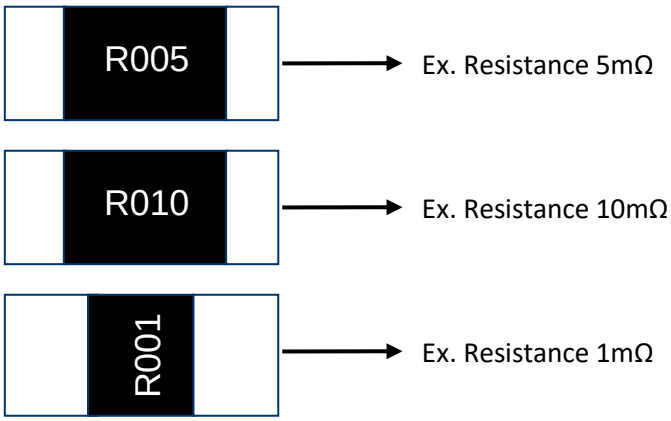
I=Rating Current (A)
P= Rating Power (W)
R=Resistance (Ω)

4. MARKING FORMAT

4.1 Product resistance is indicated by using two marking notation styles:
"**R**" designates the decimal location in ohms, e.g.

- For 5mΩ the product marking is R005;
- For 10mΩ the product marking is R010;

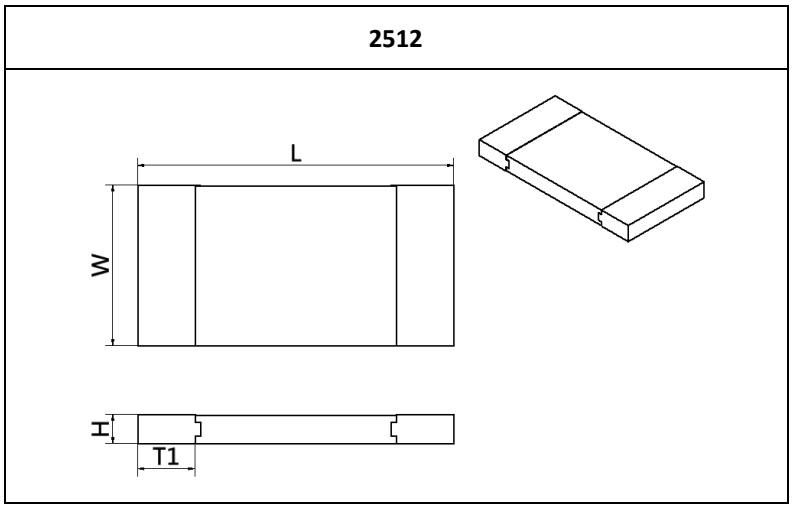
4.2 2512 Series (4-digits marking)



4.3 Marking Style

Marking / Type	R	1	2	3	4	5	0
2512							

5. DIMENSION



Type	Power Rating (Watts)	Resistance Range (mΩ)	Dimensions - in inches (millimeters)			
			L	W	H	T1
2512	2.0	1	0.248±0.008 (6.30±0.2)	0.126±0.008 (3.20±0.2)	0.026±0.008 (0.65±0.2)	0.079±0.008 (2.00±0.2)
		2			0.024±0.008 (0.60±0.2)	
		3				
		4	0.248±0.010 (6.30±0.254)	0.123±0.010 (3.13±0.254)	0.0197±0.010 (0.50±0.254)	0.048±0.010 (1.22±0.254)
		5				
		10				
		15				
		20				
		30				

5.1 Material of Alloy

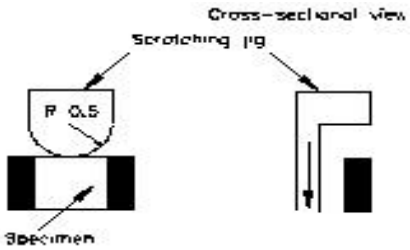
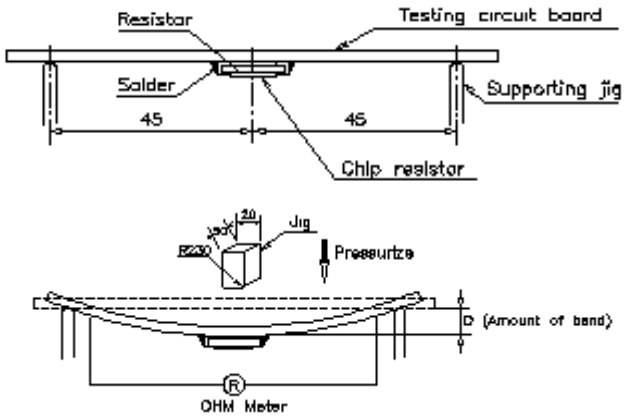
Type	Watts	Material	Resistance
2512	2.0	Manganese copper alloy	1mΩ/2mΩ/3mΩ/4mΩ/5mΩ
		Iron chromium aluminum alloy	10mΩ/15mΩ/20mΩ/30mΩ

6. RELIABILITY PERFORMANCE

6.1 Electrical Performance

<table>
<tr><th>Test Item</th><th>Conditions of Test</th><th>Test Limits</th></tr>
<tr><td>Temperature Coefficient of Resistance (TCR)</td><td>• $TCR(ppm/℃)=\frac{(R2-R1)}{R1(T2-T1)}\times10^6$
• R1: resistance of room temperature
• R2: resistance of 150 °C
• T1: Room temperature
• T2: Temperature at 150 °C
• Refer to JIS C 5201-1 4.8</td><td>Refer to Paragraph 3. general specifications</td></tr>
<tr><td>Short Time Overload</td><td>Applied Overload for 5 seconds and release the load for about 30 minutes, then measure its resistance variance rate. (Overload condition refer to below):
<table>
<tr><th>Type</th><th>Power (W)</th><th># of rated power</th></tr>
<tr><td>2512</td><td>2.0</td><td>5times</td></tr>
</table>
Refer to JIS C 5201-1 4.13</td><td>≦±0.5%</td></tr>
<tr><td>Insulation Resistance</td><td>Put the resistor in the fixture, add 100 VDC in + ,- terminal for 60secs then measured the insulation resistance between electrodes and insulating enclosure or between electrodes and base material.
Refer to JIS-C5201-1 4.6</td><td>≧$10^9\Omega$</td></tr>
<tr><td>Dielectric Withstanding Voltage</td><td>Applied 500VAC for 1 minute, and Limit surge current 50 mA (max.)
Refer to JIS-C5201-1 4.7</td><td>No short or burned on the appearance.</td></tr>
</table>

6.2 Mechanical /Constructional Performance

Test Item	Conditions of Test	Test Limits
Resistance to Solder Heat	The tested resistor be immersed 25 mm/sec into molten solder of 260±5℃ for 10±1secs. Then the resistor is left in the room for 1 hour, and measured its resistance variance rate. Refer to JIS-C5201-1 4.18	≦±0.5% No evidence of mechanical damage
Solderability	Add flux into tested resistors, immersion into solder bath in temperature 245±5℃ for 3±1sec. Refer to JIS-C5201-1 4.17	Solder coverage over 95%
Core Body Strength	Applied R0.5 test probe at its central part then pushing 5N force on the sample for 10 sec. Refer to JIS-C5201-1 4.15	≦±0.5%
Joint Strength of Solder	Preconditioning Put tested resistor in the apparatus of PCT, at a temperature of 105℃, humidity of 100% RH, and pressure of 1.22×105 Pa for a duration of 4 hours. Then after left the specimen in a temperature for 2 hours or more. Test method: ◎Test item 1 (Adhesion): A static load using a R0.5 scratch tool shall be applied on the core of the component and in the direction of the arrow and held for 10 seconds and under load measured its resistance variance rate. Load:17.7N  Refer to JIS-C5201-1 4.32	Test item 1: 1. ≦±0.5% 2. No evidence of mechanical damage. No terminal peeling off. Test item 2: 1. ≦±0.5% 2. No evidence of mechanical damage. No terminal peeling off and core body cracked.
	◎Test item 2 (Bending Strength): Solder tested resistor on to PC board add force in the middle down, and under load measured its resistance variance rate. D:2mm  Refer to JIS-C5201-1 4.33	

Test Item	Conditions of Test	Test Limits
Resistance to solvent	The tested resistor be immersed into isopropyl alcohol of 20~25℃ for 60secs, then the resistor is left in the room for 48 hrs. Refer to JIS-C5201-1 4.29	≦±0.5% No evidence of mechanical damage
Vibration	The resistor shall be mounted by its terminal leads to the supporting terminals on the solid table. The entire frequency range :from 10 Hz to 55 Hz and return to 10 Hz, shall be transferred in 1 min. Amplitude : 1.5mm This motion shall be applied for a period of 4 hours in each 3 mutually perpendicular directions (a total of 12hrs) Refer to JIS-C5201-1 4.22	≦±0.5% No evidence of mechanical damage

6.3 Environmental Performance

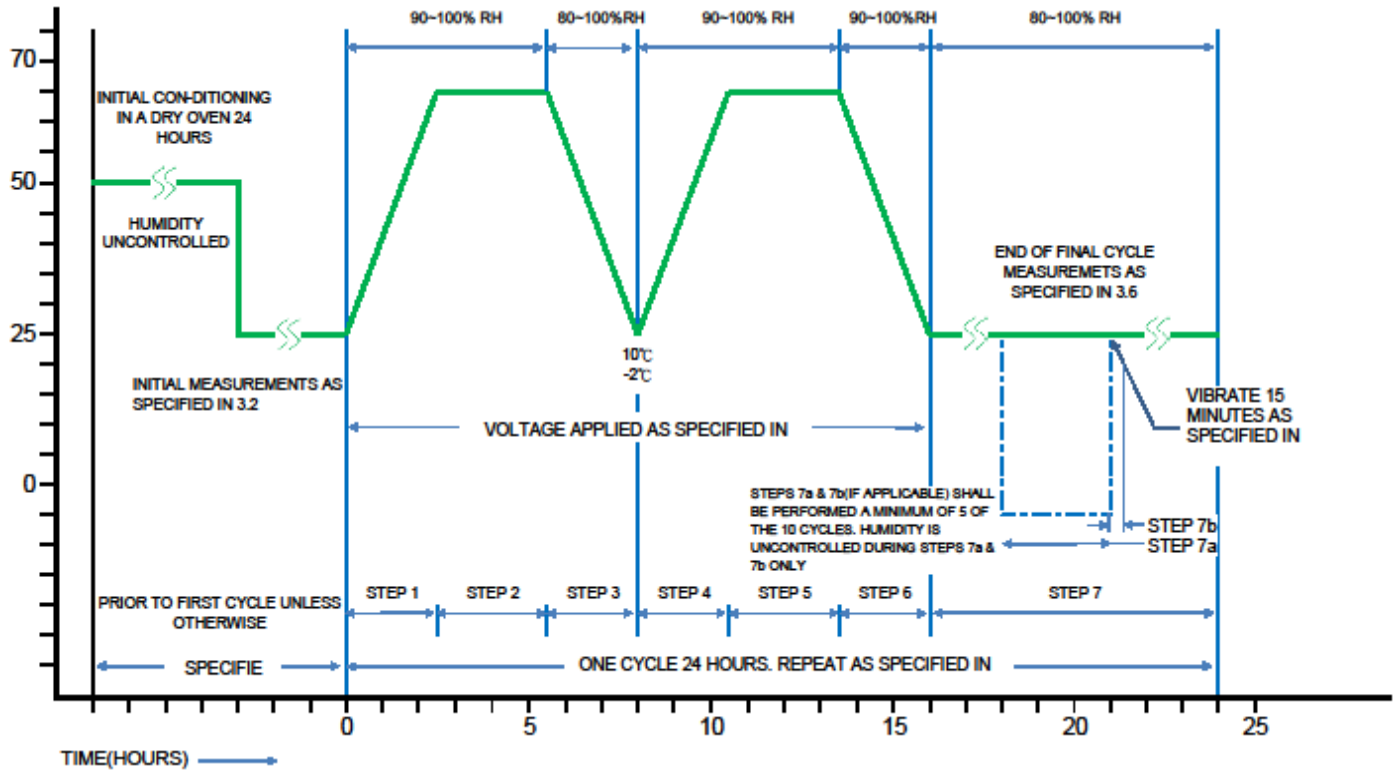
Test Item	Conditions of Test	Test Limits
Low Temperature Exposure (Storage)	Put the tested resistor in chamber under temperature -55±2℃ for 1,000 hours. Then leaving the tested resistor in room temperature for 60 minutes, and measure its resistance variance rate. Refer to JIS-C5201-1 4.23.4	≦±0.5% No evidence of mechanical damage
High Temperature Exposure (Storage)	Put tested resistor in chamber under temperature 170±5℃ for 1,000 hours. Then leaving the tested resistor in room temperature for 60 minutes , and measure its resistance variance rate. Refer to JIS-C5201-1 4.23.2	≦±1.0% No evidence of mechanical damage
Temperature Cycling (Rapid Temperature Change)	Put the tested resistor in the chamber under the temperature cycling which shown in the following table shall be repeated 1000 times consecutively. Then leaving the tested resistor in the room temperature for 60 minutes, and measure its resistance variance rate. Refer to JESD22-A104	≦±1.0 No evidence of mechanical damage
Moisture Resistance (Climatic Sequence)	Put the tested resistor in chamber and subject to 10 cycles of damp heat and without power. Each one of which consists of the steps 1 to 7 (Figure 1). Then leaving the tested resistor in room temperature for 24 hr, and measure its resistance variance rate. Refer to MIL-STD 202 Method 106	≦±0.5% No evidence of mechanical damage
Bias Humidity	Put the tested resistor in chamber under 85±5℃and 85± 5%RH with 10% bias and load the rated Power for 90 minutes on, 30 minutes off, total 1,000 hours. Then leaving the tested resistor in room temperature for 60 minutes, and measure its resistance variance rate. Refer to MIL-STD 202 Method 103	≦±0.5% No evidence of mechanical damage

	Testing Condition
Lowest Temperature	-55 +0/-10℃
Highest Temperature	150 +10/-0℃
Dwell time	30min maximum

<table>
<tr><th>Test Item</th><th>Conditions of Test</th><th>Test Limits</th></tr>
<tr><td>Whisker Test</td><td>◎Test item (Thermal Shock test):
<table><tr><td colspan="2">Testing Condition</td></tr><tr><td>Minimum storage temperature</td><td>-55+0/-10℃</td></tr><tr><td>Maximum storage temperature</td><td>85+10/-0℃</td></tr><tr><td>Temperature-retaining time</td><td>10 min.</td></tr><tr><td>Number of temperature cycles</td><td>1,500</td></tr></table>◎Inspection:
Inspect for whisker formation on specimens that underwent the acceleration test specified in subclause 4.2, with a magnifier (stereo microscope) of about 40 or higher magnification. If judgment is hard in this method, use a scanning electron microscope (SEM) of about 1,000 or higher magnification.
By JESD Standard NO.22A121 class 2.</td><td>Max. 50μm</td></tr>
</table>

6.4 Operational Life Endurance

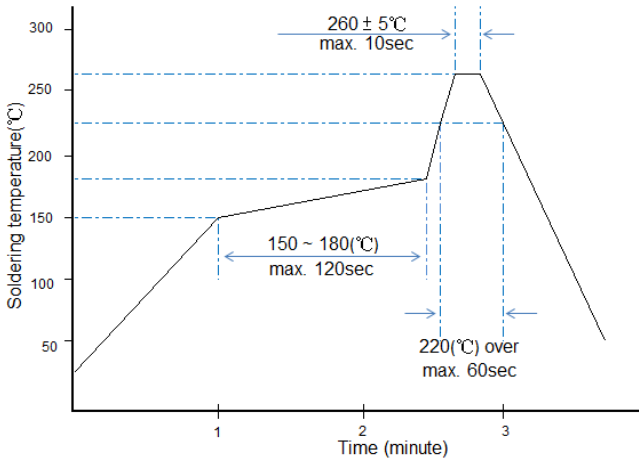
Test Item	Conditions of Test	Test Limits
Load Life	Put the tested resistor in chamber under temperature 70± 2℃ and load the rated current for 90 minutes on 30 minutes off, total 1000 hours. Then leaving the tested resistor in room temperature for 60 minutes, and measure its resistance variance rate. Refer to JIS-C5201-1 4.25	≦±1.0% No evidence of mechanical damage


90~100% RH
80~100%RH
90~100% RH
90~100%RH
80~100% RH
70
50
25
0
INITIAL CON-DITIONING IN A DRY OVEN 24 HOURS
HUMIDITY UNCONTROLLED
END OF FINAL CYCLE MEASUREMETS AS SPECIFIED IN 3.6
10℃
-2℃
INITIAL MEASUREMENTS AS SPECIFIED IN 3.2
VOLTAGE APPLIED AS SPECIFIED IN
VIBRATE 15 MINUTES AS SPECIFIED IN
STEPS 7a & 7b(IF APPLICABLE) SHALL BE PERFORMED A MINIMUM OF 5 OF THE 10 CYCLES. HUMIDITY IS UNCONTROLLED DURING STEPS 7a & 7b ONLY
STEP 7b
STEP 7a
PRIOR TO FIRST CYCLE UNLESS OTHERWISE
STEP 1
STEP 2
STEP 3
STEP 4
STEP 5
STEP 6
STEP 7
SPECIFIE
ONE CYCLE 24 HOURS. REPEAT AS SPECIFIED IN
0
5
10
15
20
25
TIME(HOURS)

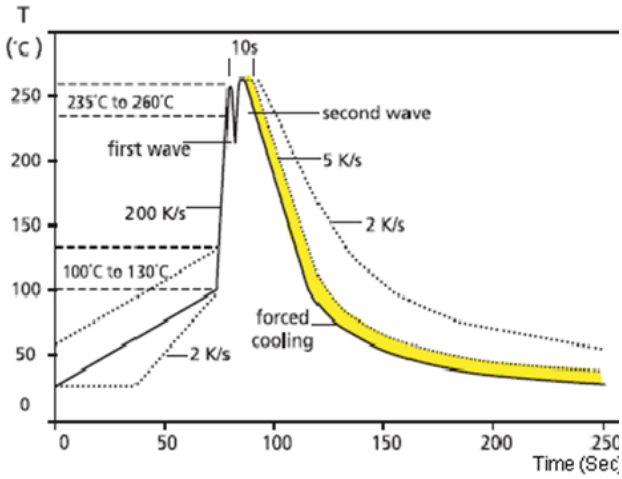
6.5 Soldering Profile

Technical Notes: This is for recommendation, customer please perform adjustment according to actual application.

6.5.1 Surface-mount components are tested for solderability at temperature of 245˚C for 3 seconds. Typical examples of soldering processes that provide reliable joint without any damage are giving as below:



Recommended IR Reflow Soldering profile
MEET J-STD-020D



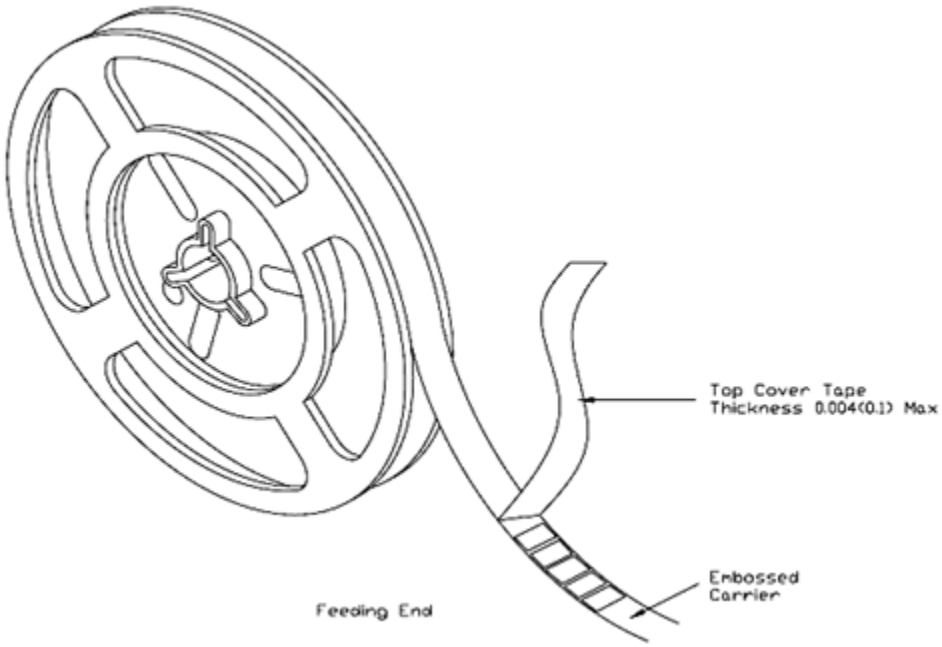
Recommended Wave Soldering Profile
Typical values (solid line)
Process limits (dotted line)

6.5.2 Soldering Iron: Temperature 350℃±10℃, dwell time shall be less than 3 sec.

7. TAPING

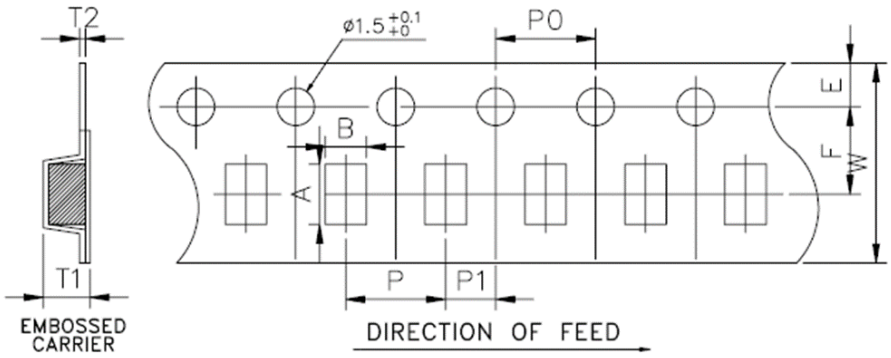
7.1 Structure of Taping

Embossed Plastic Carrier



7.2 Tape dimension

7.2.1 Tape Dimension of Plastic Embossed Carrier System



Dimension of Embossed Plastic Carrier System

Unit: mm

DIM / Item	A	B	W	E	F	T1	T2	P	P0	10*P0	P1
LRP63	6.75±0.10	3.50±0.10	12.0±0.15	1.75±0.10	5.5±0.10	1.30±0.10	0.20±0.05	4.0±0.10	4.0±0.10	40.0±0.20	2.0±0.10

7.3 Packaging

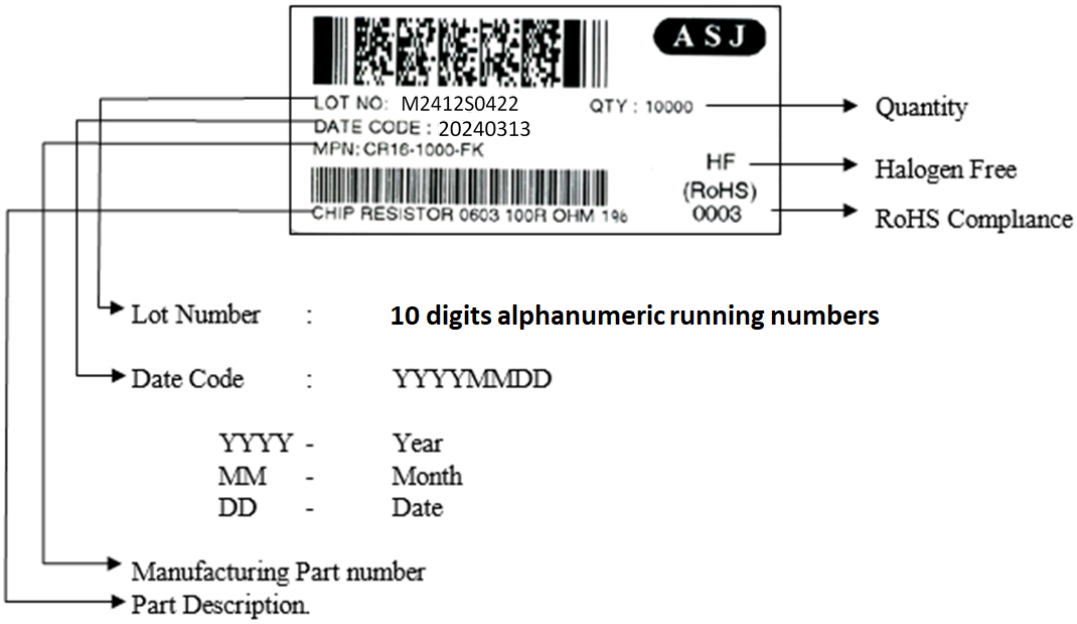
7.3.1 Taping

Quantity - Tape and Reels

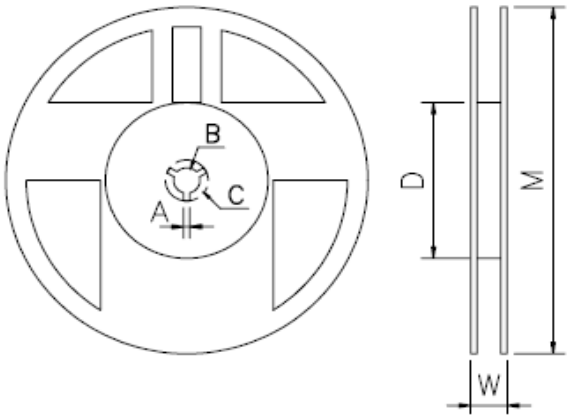
Type	Tape Width	Packaging Quantity(pcs/reel)
		Emboss Plastic Type
		4 mm Pitch
CLS63	12 mm	4,000 pcs

7.3.2 Identification

Production label that indicates the 10 digits lot number, product type, resistance value and tolerance shall be pasted on the surface of each reel.



7.3.3 Reel Dimension

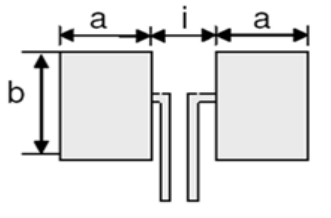


Unit: mm

Reel Type / Tape	W	M	A	B	C	D
7” reel for 12 mm tape	13.8 ± 0.5	178 ± 2.0	2.0 ± 0.5	13.5 ± 0.5	21.0 ± 0.5	80.0 ± 1.0

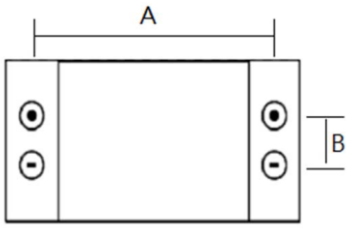
8. RECOMMENDED LAND PATTERN

When a component is soldered, the resistance after soldering changes slightly depending on the size of the soldering area and the amount of soldering. When designing a circuit, it is necessary to consider the effect of a decrease or increase in its resistance.

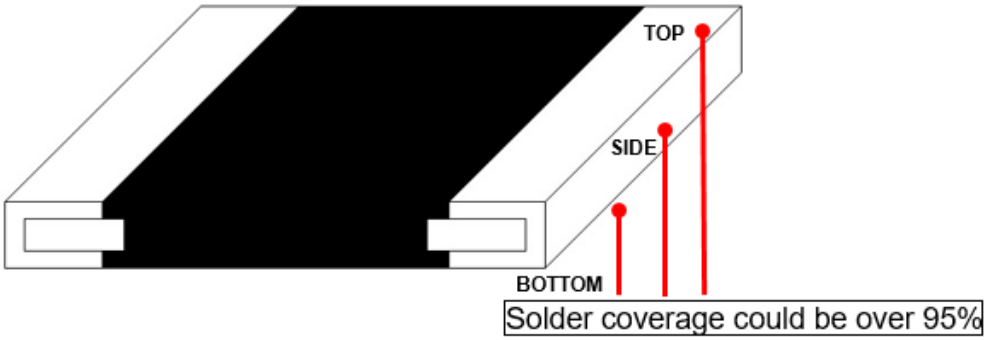


Type	Maximum Power Rating (Watts)	Resistance Range (mΩ)	Dimensions - in millimeters		
			a	b	i
LRP63	2.0	1	2.75	3.60	1.50
		2			
		3			
		4	2.25		2.50
		5			
		10			
		15			
		20			
		30			

9. MEASUREMENT POINT

Bottom Side	Type	A	B
	LRP63	5.35±0.25	1.80±0.25
	Unit：mm		

9.1. Product warranted solder area



10. REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version 1	20.05.2024		Initial Release