Towards Excellence in *Quality, Service & Innovation*

ASJ

DATA SHEET

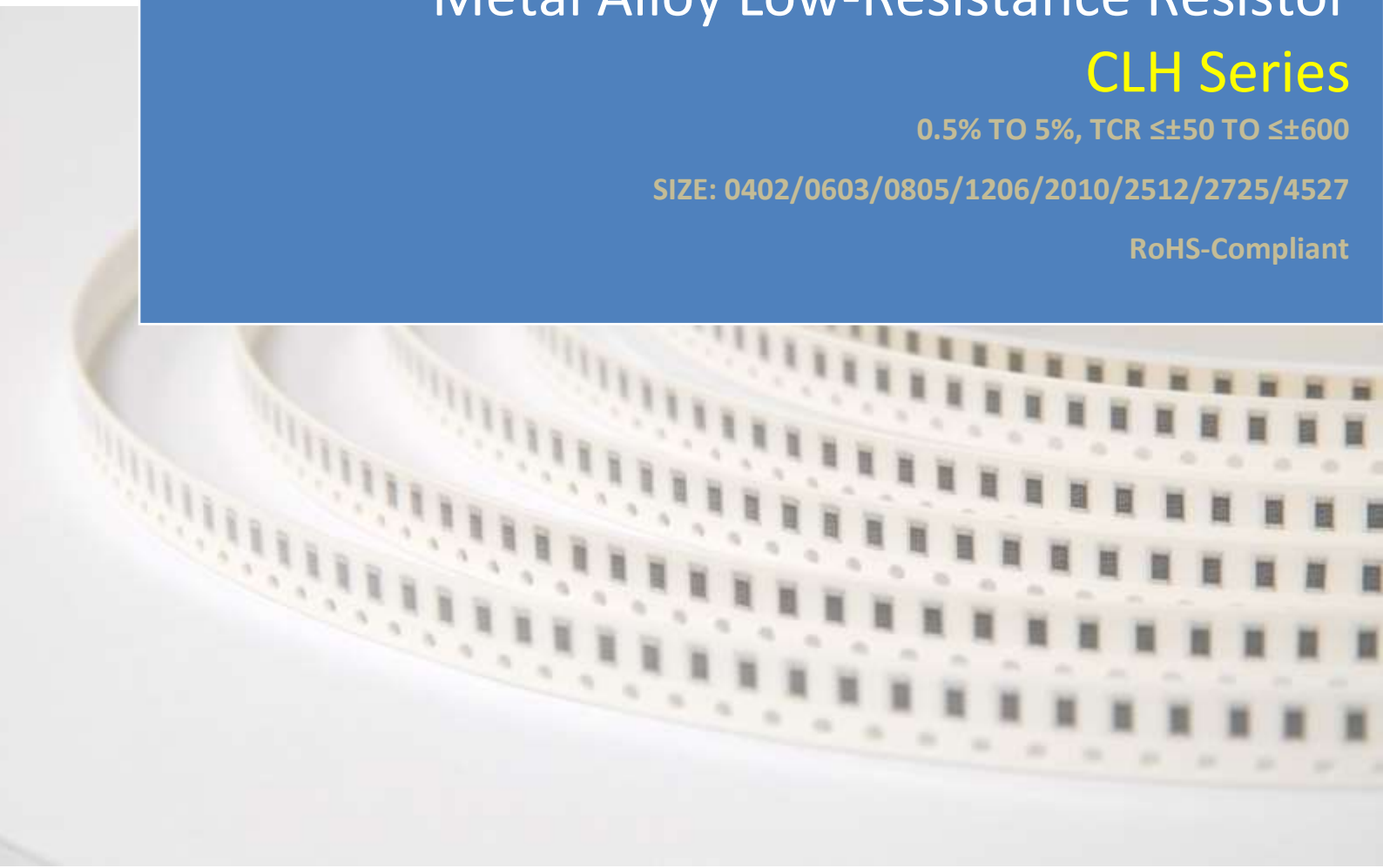
Metal Alloy Low-Resistance Resistor

CLH Series

0.5% TO 5%, TCR ≤±50 TO ≤±600

SIZE: 0402/0603/0805/1206/2010/2512/2725/4527

RoHS-Compliant



Product Specification – Mar. 01, 2024 V7

1. SCOPE

1.1. This specification is applicable to Lead-free and Halogen-free for CLH series low-inductance metal alloy low-resistance resistor.

1.2. The product belongs to the universal series.

2. PART NUMBERING SYSTEM

Part Numbering is made in accordance with the following system:

CLH	63	2	B	-	R003		-	F	E
Type	Size(Inch)	Type of Terminal	Power Rating		Nominal Resistance			Tolerance	Packaging
Low-Inductance Metal Alloy Low-Resistance Resistor	10(0402) 16(0603) 21(0805) 32(1206) 50(2010) 63(2512) 27(2725) 45(4527)	2 : 2 Terminal T : Wrap around	H=0.2W F=0.33W A=0.5W 1=1.0W B=1.5W 2=2.0W 3=3.0W 4=4.0W		Resistor	Resistance (4~6 Digit) Example: R003 = 3mΩ R0015 = 1.5mΩ R0005 = 0.50mΩ R00075 = 0.75mΩ R100 = 100mΩ		D=±0.5% F=±1.0% G=±2.0% J=±5.0%	T=500 pcs Q=1,000 pcs P=2,000 pcs E=4,000 pcs L=5,000 pcs K=10,000 pcs

3. RATING

3.1. Rated Power

3.1.1 Resistor Rated Power

Type	Type of Terminal	Max. Rating Power	(Ir) Rating Current	(Io) Overload Current
CLH10 (0402)	2	1/5W	$Ir=\sqrt{P/R}$	$Io=\sqrt{NP/R}$
CLH16 (0603)	2	1/3W		
CLH21 (0805)	2	1/2W		
		3/4W		
CLH32 (1206)	2	1/2W		
		1W		
CLH21 (0805)	T	1/2W		
		3/4W		
CLH32 (1206)	T	1/2W		
		1W		
CLH50 (2010)	2	1W		
		1.5W		
		2.0W		
CLH63 (2512)	2	1W		
		1.5W		
		2.0W		
		3.0W		
CLH27 (2725)	2	1.5W		
		2.0W		
		3.0W		
CLH45 (4527)	2	5.0W		

Ir= Rating Current(A) R= Resistance(Ω)

Io= Overload Current(A) N= CLH50/CLH63/CLH27/CLH45：5

P= Rating Power(W) Others：4

3.1.2 Power Derating Curve:

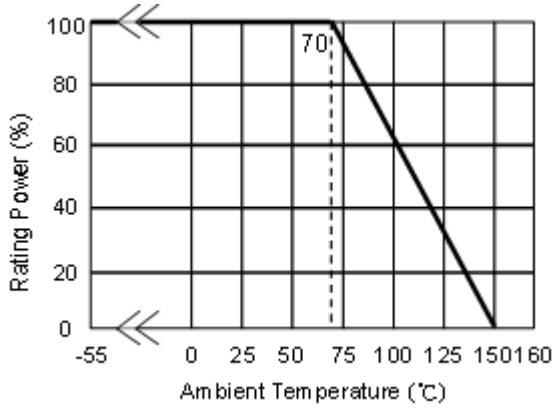
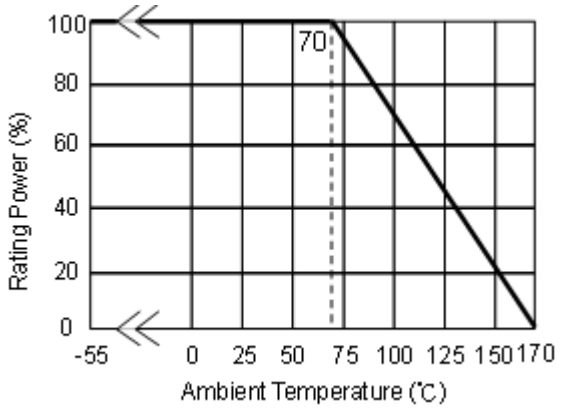
Type	0402/0603/0805/1206	2010/2512/2725/4527
Operating Temperature Range	－55℃ ~ ＋150℃	－55℃ ~ ＋170℃
Explain	For resistors operated in ambient temperatures above 70℃, power rating shall be derated in accordance with figure below.	For resistors operated in ambient temperatures above 70℃, power rating shall be derated in accordance with figure below.
Figure		

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 2010, 2512, 2725, 4527: -55°C to +170°C,
(0402, 0603, 0805, 1206: : -55°C to +150°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 condition.

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

3.9 Resistance, Resistance Tolerance and Temperature Coefficient of Resistance

Type	Type of Terminal	Max. Rating Power	(Ir) Rating Current	(Io) Overload Current	T.C.R. (ppm/°C)	Inductance	Resistance Range (mΩ)		Operating Temperature Range
							D (±0.5%)	F (±1%) G (±2%) J (±5%)	
CLH10 (0402)	2	1/5W	$Ir=\sqrt{P/R}$	$Io=\sqrt{NP/R}$	≦±600	< 5nH	--	1.5、2	-55~+150°C
					≦±200		--	3	
					≦±125		--	4、5	
					≦±50		--	10	
CLH16 (0603)	2	1/3W			≦±450		--	1≦R＜4	
					≦±50		--	4≦R≦24	
CLH21 (0805)	2	1/2W			≦±100		--	1≦R＜3	
					≦±75		--	3≦R＜5	
					≦±50		5≦R≦19	5≦R≦19	
		3/4W			≦±100		--	1≦R＜3	
					≦±75		--	3≦R＜5	
					≦±50		5≦R≦10	5≦R≦10	
CLH32 (1206)	2	1/2W			≦±400		--	1≦R＜2	
					≦±75		--	2≦R＜4	
					≦±50		4≦R≦21	4≦R≦21	
		1W			≦±400		--	1≦R＜2	
					≦±75		--	2≦R＜4	
					≦±50		4≦R≦10	4≦R≦10	
CLH21 (0805	T	1/2W			≦±100		--	1.5≦R＜3	
					≦±75		--	3≦R＜5	
					≦±50		5≦R≦19	5≦R≦19	
		3/4W			≦±100		--	1.5≦R＜3	
					≦±75		--	3≦R＜5	
					≦±50		5≦R≦10	5≦R≦10	
CLH32 (1206)	T	1/2W			≦±400		--	1≦R＜2	
					≦±75		--	2≦R＜4	
					≦±50		4≦R≦21	4≦R≦21	
		1W			≦±400		--	1≦R＜2	
					≦±75		--	2≦R＜4	
					≦±50		4≦R≦10	4≦R≦10	
CLH50 (2010)	2	1W			≦±50		--	5~90	-55~+170°C
		1.5W						5~60	
		2.0W						5~10	
CLH63 (2512)	2	1W			≦±50		3~50	3~100	
		1.5W					3~50	3~100	
		2.0W					3~50	3~70	
		3.0W					3~10	3~10	

Type	Type of	Max.	(Ir)	(Io)	T.C.R.	Inductance	Resistance Range (mΩ)	Operating

	Terminal	Rating Power	Rating Current	Overload Current	(ppm/°C)		D (±0.5%)	F (±1%) G (±2%) J (±5%)	Temperature Range
CLH27 (2725)	2	4.0W	$Ir=\sqrt{P/R}$	$Io=\sqrt{NP/R}$	≦±100	< 5nH	--	0.2	-55~+170°C
					≦±50		--	0.25~3	
		5.0W			≦±100		--	0.2	
					≦±50		--	0.25~3	
CLH45 (4527)	2	5.0W			≦±50		--	5~50	
						< 10nH	--	51~100	

4. MARKING FORMAT

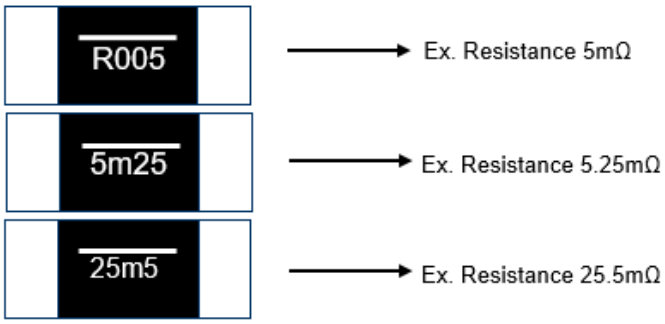
4.1 Marking styles by Laser (For CLH21 / CLH32)

CLH21	CLH32
	

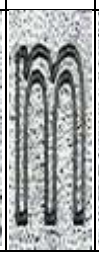
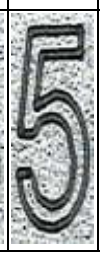
4.2 CLH32, CLH50, CLH63, CLH45 series:
Product resistance is indicated by using two marking notation style:

a. "R" designates the decimal location in ohm, e.g.
- For 1mΩ the product marking is R001
- For 25mΩ the product marking is R025
- For 100mΩ the product marking is R100

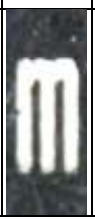
b. "m" designates the decimal location in milliohms, e.g.
- For 0.25mΩ the product marking is 0m25
- For 0.5mΩ the product marking is 0m50
- For 5.5mΩ the product marking is 5m50
- For 25.5mΩ the product marking is 25m5



4.3 Marking Styles by Laser (For CLH32)

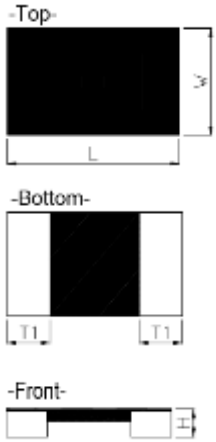
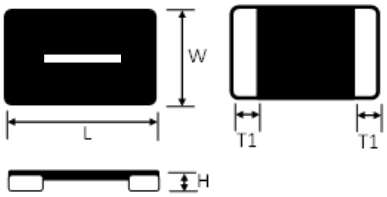
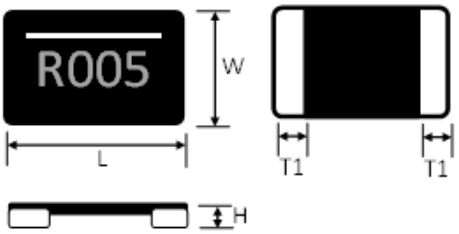
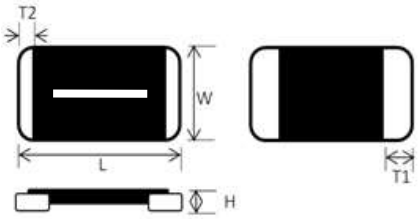
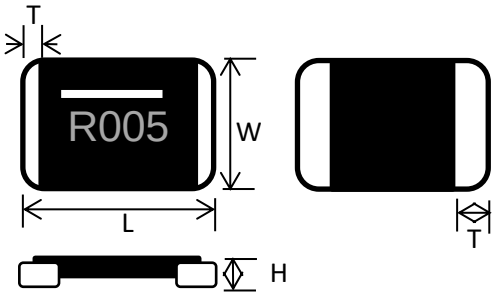
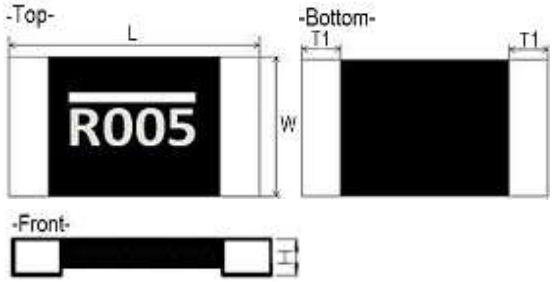
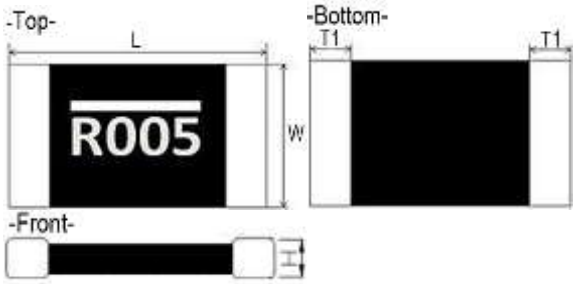
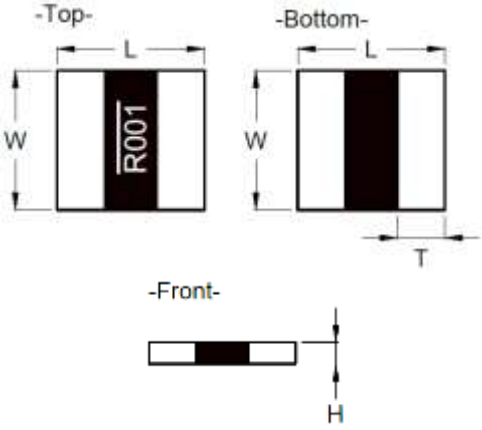
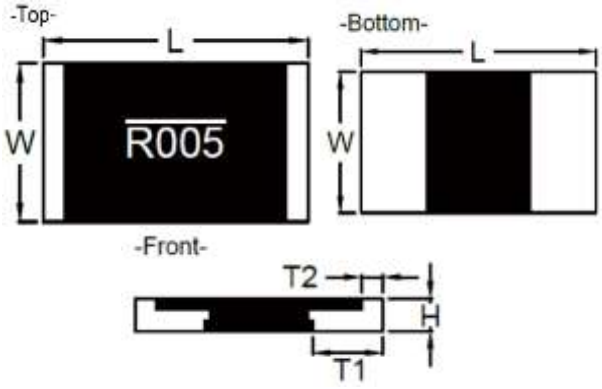
Marking / Type	R	m	1	2	3	4	5	6	7	8	9	0
CLH32 (1206)												

4.4 Marking Style(for CLH50/CLH63)

Marking / Type	R	m	1	2	3	4	5	6	7	8	9	0
CLH50/CLH63 (2010/2512)												

4.5 CLH10, CLH16 No Marking

5. DIMENSION

CLH10/CLH16	CLH21	CLH32
		
	CLH21-T	**CLH32-T**
		
CLH50		**CLH63**
		
CLH27		**CLH45**
		

Type	Type of	Power	Resistance	Dimensions - in inches (millimeters)

	Terminal	Rating (Watts)	Range (mΩ)	L	W	H	T1	T2
CLH10 (0402)	2	1/5W	1.5、2、3 4、5、10	0.039±0.004 (1.00±0.100)	0.020±0.004 (0.50±0.100)	0.014±0.004 (0.35±0.10)	0.010±0.004 (0.25±0.100)	---
CLH16 (0603)	2	1/3W	1~24	0.063±0.008 (1.60±0.20)	0.031±0.008 (0.80±0.20)	0.014±0.004 (0.35±0.10)	0.012±0.006 (0.30±0.15)	---
CLH21 (0805)	2	1/2W	1	0.08±0.008 (2.0320±0.20)	0.05±0.008 (1.270±0.20)	0.014±0.004 (0.50±0.10)	0.023±0.006 (0.60±0.15)	---
			1.5、2、2.5	0.08±0.008 (2.0320±0.20)	0.05±0.008 (1.270±0.20)	0.014±0.004 (0.35±0.10)	0.02±0.006 (0.50±0.15)	
			3~19				0.014±0.008 (0.35±0.20)	
		3/4W	1	0.08±0.008 (2.0320±0.20)	0.05±0.008 (1.270±0.20)	0.014±0.004 (0.50±0.10)	0.023±0.006 (0.60±0.15)	
			1.5、2、2.5	0.08±0.008 (2.0320±0.20)	0.05±0.008 (1.270±0.20)	0.014±0.004 (0.35±0.10)	0.02±0.006 (0.50±0.15)	
			3~10				0.014±0.008 (0.35±0.20)	
CLH32 (1206)	2	1/2W	1≦R＜3	0.126±0.008 (3.20±0.20)	0.063±0.008 (1.60±0.20)	0.016±0.008 (0.40±0.20)	0.035±0.008 (0.90±0.20)	---
			3≦R＜4				0.028±0.008 (0.70±0.20)	
			4≦R≦21				0.014±0.008 (0.35±0.20)	
		1.00W	1≦R＜3	0.126±0.008 (3.20±0.20)	0.063±0.008 (1.60±0.20)	0.016±0.008 (0.40±0.20)	0.035±0.008 (0.90±0.20)	
			3≦R＜4				0.028±0.008 (0.70±0.20)	
			4≦R≦10				0.014±0.008 (0.35±0.20)	
CLH21 (0805)	T	1/2W	1.5、2、2.5	0.08±0.008 (2.0320±0.20)	0.05±0.008 (1.270±0.20)	0.014±0.004 (0.35±0.10)	0.02±0.006 (0.50±0.15)	0.010±0.008 (0.25±0.20)
			3~19				0.014±0.008 (0.35±0.20)	
		3/4W	1.5、2、2.5	0.08±0.008 (2.0320±0.20)	0.05±0.008 (1.270±0.20)	0.014±0.004 (0.35±0.10)	0.02±0.006 (0.50±0.15)	
			3~10				0.014±0.008 (0.35±0.20)	
CLH32 (1206)	T	1/2W	1≦R＜3	0.126±0.008 (3.20±0.20)	0.063±0.008 (1.60±0.20)	0.016±0.008 (0.40±0.20)	0.035±0.008 (0.90±0.20)	0.010±0.008 (0.25±0.20)
			3≦R＜4				0.028±0.008 (0.70±0.20)	
			4≦R≦21				0.014±0.008 (0.35±0.20)	
		1.00W	1≦R＜3	0.126±0.008 (3.20±0.20)	0.063±0.008 (1.60±0.20)	0.016±0.008 (0.40±0.20)	0.035±0.008 (0.90±0.20)	
			3≦R＜4				0.028±0.008 (0.70±0.20)	
			4≦R≦10				0.014±0.008 (0.35±0.20)	
CLH50 (2010)	2	1W	5~90	0.200±0.010 (5.080±0.254)	0.100±0.010 (2.540±0.254)	0.031±0.010 (0.787±0.254	0.031±0.010 (0.787±0.254)	-
		1.5W	5~60					
		2.0	5~10					
CLH63 (2512)	2	1W	3~70	0.246±0.010 (6.248±0.254)	0.126±0.010 (3.202±0.254)	0.0254±0.010 (0.645±0.254)	0.044±0.010 (1.118±0.254)	0.044±0.010 (1.118±0.254)
			71~100				0.034±0.010 (0.868±0.254)	0.034±0.010 (0.868±0.254)
CLH63 (2512)	2	1.5W	3~70	0.246±0.010 (6.248±0.254)	0.126±0.010 (3.202±0.254)	0.0254±0.010 (0.645±0.254)	0.044±0.010 (1.118±0.254)	0.044±0.010 (1.118±0.254)

Type	Type of Terminal	Power Rating (Watts)	Resistance Range (mΩ)	Dimensions - in inches (millimeters)				
				L	W	H	T1	T2
			71~100				0.034±0.010 (0.868±0.254)	0.034±0.010 (0.868±0.254)
		2.00W	3~70				0.044±0.010 (1.118±0.254)	0.044±0.010 (1.118±0.254)
		3.00W	3~10					
CLH27 (2725)	2	4.00W 5.00W	0.2~0.3	0.268±0.010 (6.807±0.254)	0.254±0.010 (6.452±0.254)	0.039±0.010 (0.991±0.254)	0.085±0.010 (2.159±0.254)	---
			0.35				0.075±0.010 (1.900±0.254)	
			0.40~0.45				0.051±0.010 (1.300±0.254)	
			0.5				0.085±0.010 (2.159±0.254)	
			0.6				0.071±0.010 (1.803±0.254)	
			0.75				0.065±0.010 (1.651±0.254)	
			1~1.5				0.051±0.010 (1.300±0.254)	
			2			0.035±0.010 (0.889±0.254)	0.085±0.010 (2.159±0.254)	
			3				0.065±0.010 (1.651±0.254)	
CLH45 (4527)	2	5.00W	5	0.450±0.010 (11.430±0.254)	0.270±0.010 (6.850±0.254)	0.059±0.010 (1.500±0.254)	0.127±0.010 (3.215±0.254)	0.038±0.010 (0.965±0.254)
			5.1~100				0.071±0.010 (1.815±0.254)	

5.1 Material of Alloy

Type	Material	Resistance
CLH10	Manganese-Copper Alloy	1.5mΩ / 2mΩ~5mΩ /10mΩ
CLH16	Manganese-Copper Alloy	1mΩ- 24mΩ
CLH21	Manganese-Copper Alloy	1mΩ- 19mΩ
CLH32	Manganese-Copper Alloy	1mΩ- 21mΩ
CLH50	Manganese-Copper Alloy	5mΩ ~10mΩ
	Nickel-Chromium- Aluminum Alloy	11mΩ~90mΩ
CLH63	Manganese-Copper Alloy	3mΩ- 5mΩ
	Nickel-Chromium- Aluminum Alloy	6mΩ- 100mΩ
CLH27	Manganese-Copper Alloy	0.2mΩ~1.5mΩ
	Nickel-Chromium- Aluminum Alloy	2mΩ~3mΩ
CLH45	Nickel-Chromium- Aluminum Alloy	5mΩ~100mΩ

5.2 Plating Thickness

Ni：≧ 2 μm

Sn (Tin)：≧ 3 μm

Sn (Tin)：Matte Sn

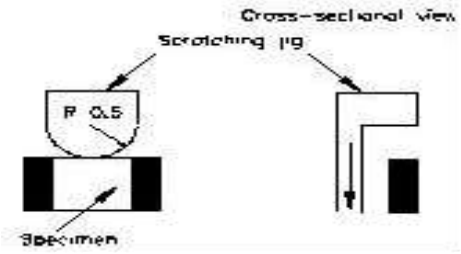
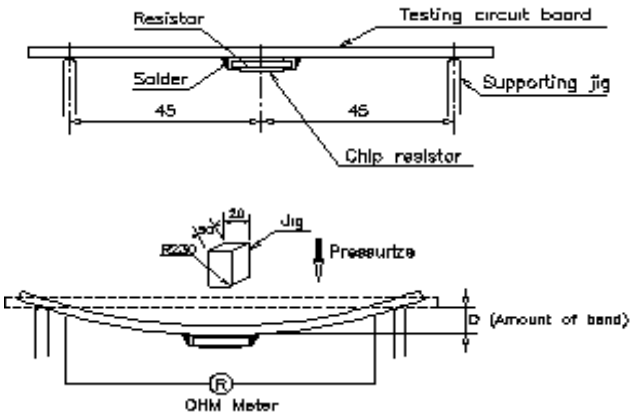
6. RELIABILITY PERFORMANCE

6.1 Electrical Performance Test

<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>Refer to JIS C 5201-1 4.8
$TCR(ppm/^{\circ}C) = \frac{(R2-R1)}{R1(T2-T1)} x10^6$
● R1: resistance of room temperature
● R2: resistance of 150 °C
● T1: Room temperature
● T2: Temperature at 150 °C</td><td>Refer to Paragraph 3.10</td></tr>
<tr><td>Short Time Overload</td><td>Refer to JIS C 5201-1 4.13
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>CLH10</td><td>0.2</td><td>4 times</td></tr>
<tr><td>CLH16</td><td>0.33</td><td>4 times</td></tr>
<tr><td>CLH21</td><td>0.5</td><td>4 times</td></tr>
<tr><td>CLH32</td><td>0.5、1</td><td>4 times</td></tr>
<tr><td>CLH50</td><td>1.0、1.5、2.0</td><td>5 times</td></tr>
<tr><td>CLH63</td><td>1.0、1.5、2.0、3.0</td><td>5 times</td></tr>
<tr><td>CLH27</td><td>4.0、5.0</td><td>5 times</td></tr>
<tr><td>CLH45</td><td>5</td><td>5 times</td></tr>
</table></td><td>CLH10、21、32、50、27：≦±0.5%
CLH63、CLH45：≦±2%</td></tr>
<tr><td>Insulation Resistance</td><td>Refer to JIS-C5201-1 4.6
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.</td><td>≧$10^8\Omega$</td></tr>
<tr><td>Dielectric Withstanding Voltage</td><td>Refer to JIS-C5201-1 4.7
Applied 300VAC for 1 minute, and Limit surge current 50 mA (max.)</td><td>No short or burned on the appearance.</td></tr>
</table>

6.2 Mechanical Performance

Test Item	Conditions of Test	Test Limits

Test Item	Conditions of Test	Test Limits
Joint Strength of Solder	Test method: ◎Test item 1 (Adhesion): A static load using a R0.1 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 20N load measured its resistance variance rate.  Refer to JIS-C5201-1 4.32 ◎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. 2512, 1206, 0805,D=3mm, 0603 D=5mm  Refer to JIS-C5201-1 4.33	Test item 1: (1).Variance rate on resistance： ±1.0% (2).No evidence of mechanical damage. No terminal peeling off. Test item 2: (1).Variance rate on resistance： ±1.0% (2).No evidence of mechanical damage. No terminal peeling off and core body cracked.
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±0.5secs. Refer to JIS-C5201-1 4.17	Solder coverage over 95%
Core Body Strength (1206 & above applies)	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% 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

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

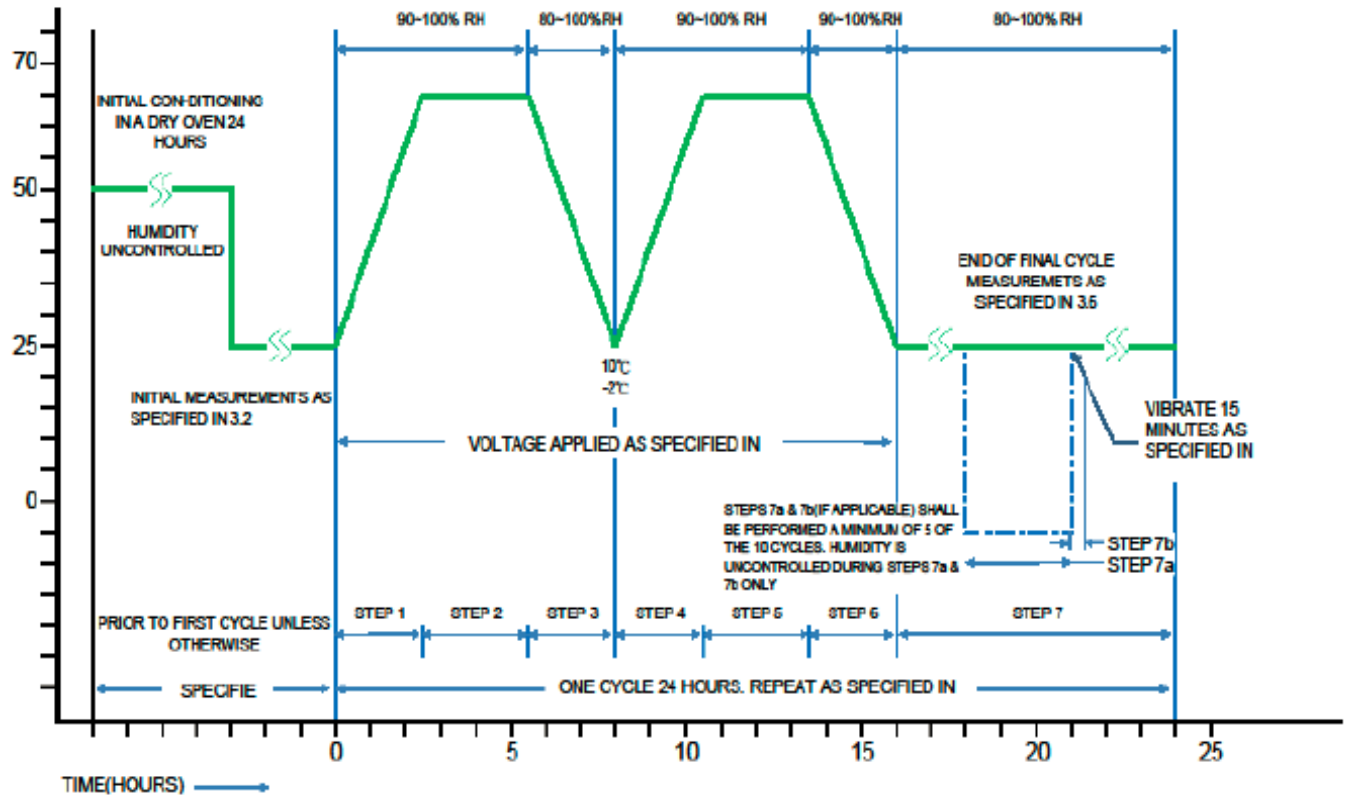
6.3 Environmental Test

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 CLH63:170±5℃(Others:150±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 300 times consecutively. Then leaving the tested resistor in the room temperature for 60 minutes, and measure its resistance variance rate. Testing Condition Lowest Temperature: -55 +0/-10℃ Highest Temperature: 150 +10/-0℃ Refer to JIS-C5201-1 4.19	CLH10, CLH16, CLH21, CLH32：≦±1.0% CLH50, 63, 27, 45：≦±0.5% 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	CLH10、16：≦±1.0% CLH21、32、50、63、27、45：≦±0.5% No evidence of mechanical damage

<table>
<tr>
<td>Whisker Test</td>
<td>◎Test item (Thermal Shock test):
<table>
<tr><th colspan="2">Testing Condition</th></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 subciause 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	***Refer to JIS-C5201-1 4.25*** Put the tested resistor in chamber under temperature 70± 2℃ and load the rated voltage 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.	CLH10, 16, 21 ,32, 50, 27：≦±1.0% CLH63, 45：≦±2.0%
		No evidence of mechanical damage

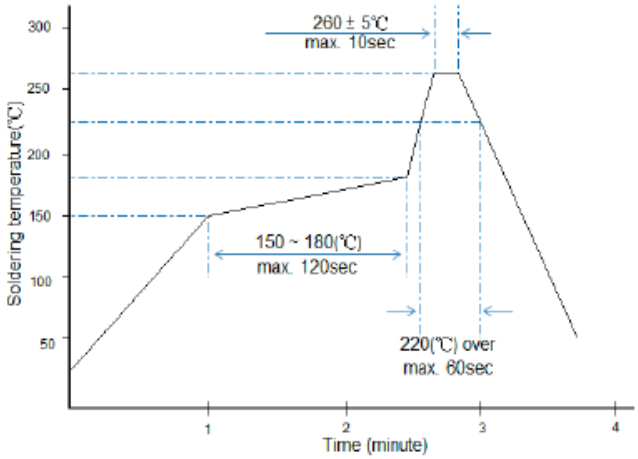


6.5 Recommended Soldering Method

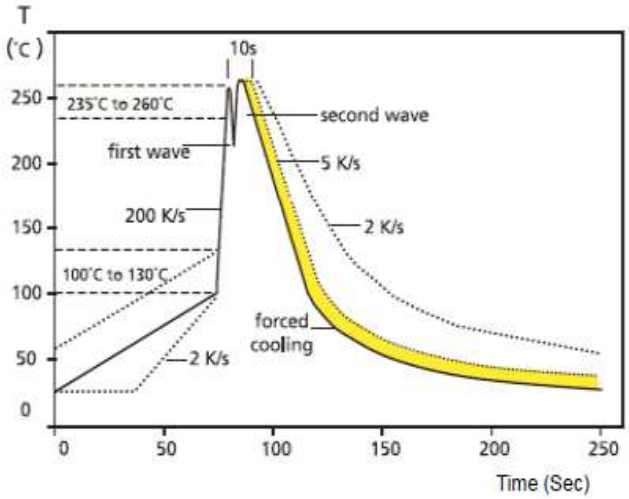
Technical Notes: This is for recommendation, customer please perform adjustment according to actual application.

6.5.1 This product is applicable to IR-Reflow process only. (Infrared Reflow)

Typical examples of soldering process that provides reliable joints without any damage are Given in below:



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



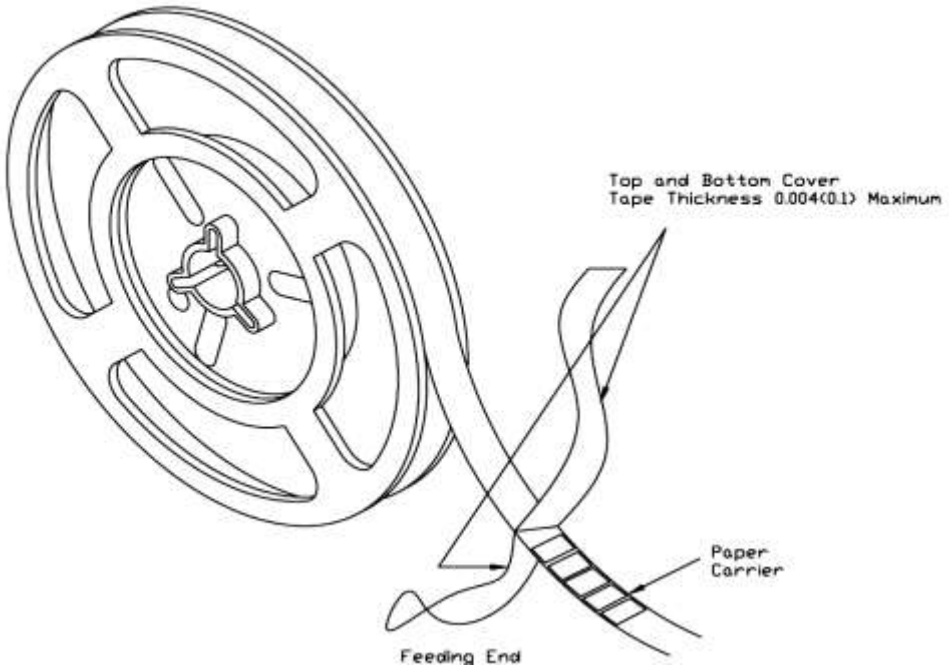
Recommended Wave Soldering Profile
Typical values (solid line)
Process limits (dotted line)

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

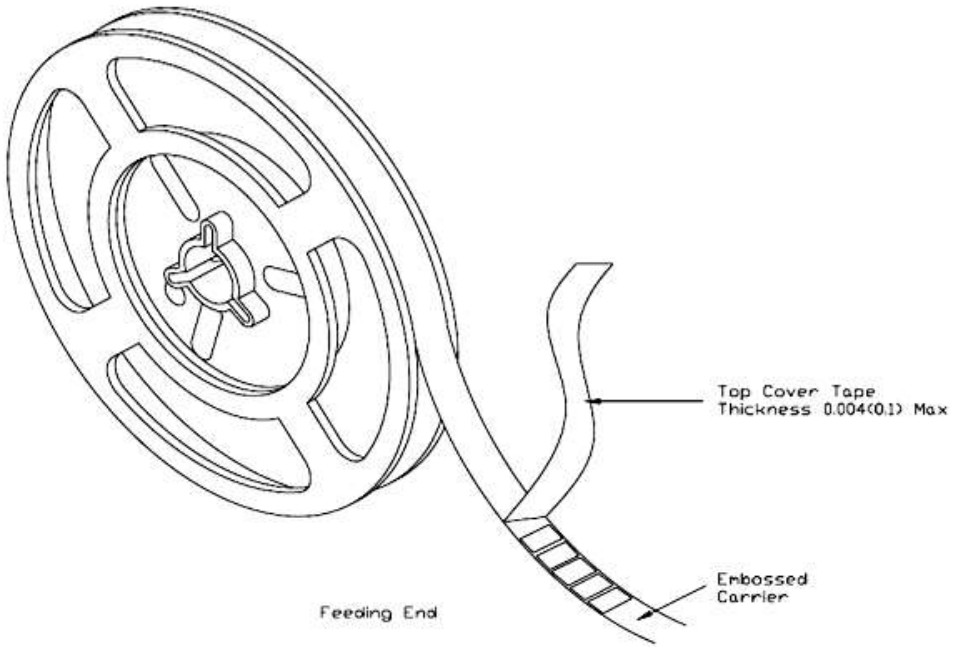
7. TAPING

7.1 Structure of Taping

Paper Carrier

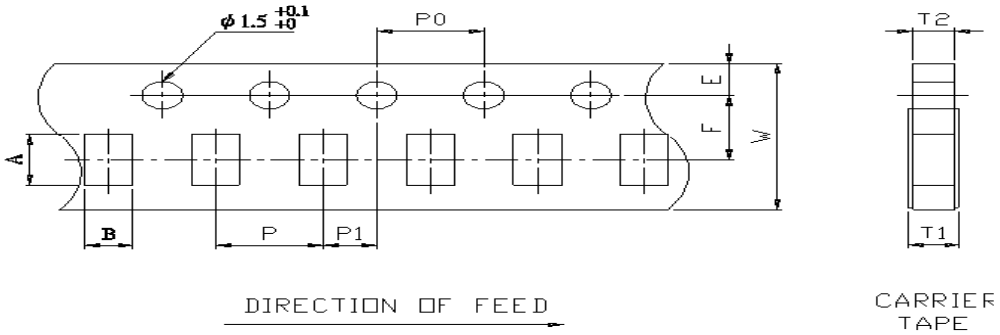


Embossed Plastic Carrier

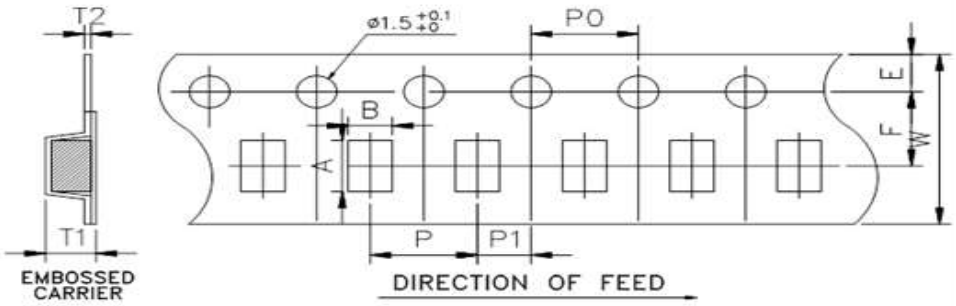


7.2 Tape dimension

7.2.1 Carrier Tape Dimension



7.2.2 Embossed Tape Dimension



Unit : mm

Item \ DIM		A	B	W	E	F	T1	T2	P	P0	10*P0	P1
CLH10	R0015~ R010	1.15±0.05	0.65±0.05	8.0±0.20	1.75±0.10	3.5±0.05	0.40+0.2/-0	0.40±0.05	2.0±0.10	4.0±0.05	40.0±0.20	2.0±0.05
CLH16	R001~ R024	1.80±0.10	1.00±0.10	8.0±0.20	1.75±0.10	3.5±0.05	0.40+0.2/-0	0.40±0.05	4.0±0.10	4.0±0.10	40.0±0.20	2.0±0.05
CLH21	R001	2.30±0.10	1.55±0.10	8.0±0.20	1.75±0.10	3.5±0.05	0.60+0.2/-0	0.60±0.05	4.0±0.10	4.0±0.10	40.0±0.20	2.0±0.05
	R0015~ R019	2.30±0.10	1.55±0.10	8.0±0.20	1.75±0.10	3.5±0.05	0.40+0.2/-0	0.40±0.05	4.0±0.10	4.0±0.10	40.0±0.20	2.0±0.05
CLH32	R001~ R021	3.50±0.20	1.90±0.20	8.0±0.20	1.75±0.10	3.5±0.05	0.60+0.2/-0	0.60±0.05	4.0±0.10	4.0±0.10	40.0±0.20	2.0±0.05
CLH50	5~90	5.45±0.10	2.90±0.10	12.0±0.15	1.75±0.10	5.5±0.10	1.33±0.10	0.23±0.05	4.0±0.10	4.0±0.10	40.0±0.20	2.0±0.10
CLH63	R003~ R100	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
CLH27	R0002~ R003	7.15±0.10	6.75±0.10	12.0±0.15	1.75±0.10	5.5±0.10	1.95±0.10	0.25±0.05	8.0±0.10	4.0±0.10	40.0±0.20	2.0±0.10
CLH45	R005~ R100	11.80±0.10	7.20±0.10	24.0±0.15	1.75±0.10	11.5±0.10	2.00±0.10	0.30±0.10	12.0±0.10	4.0±0.10	40.0±0.20	2.0±0.10

7.3 Packaging

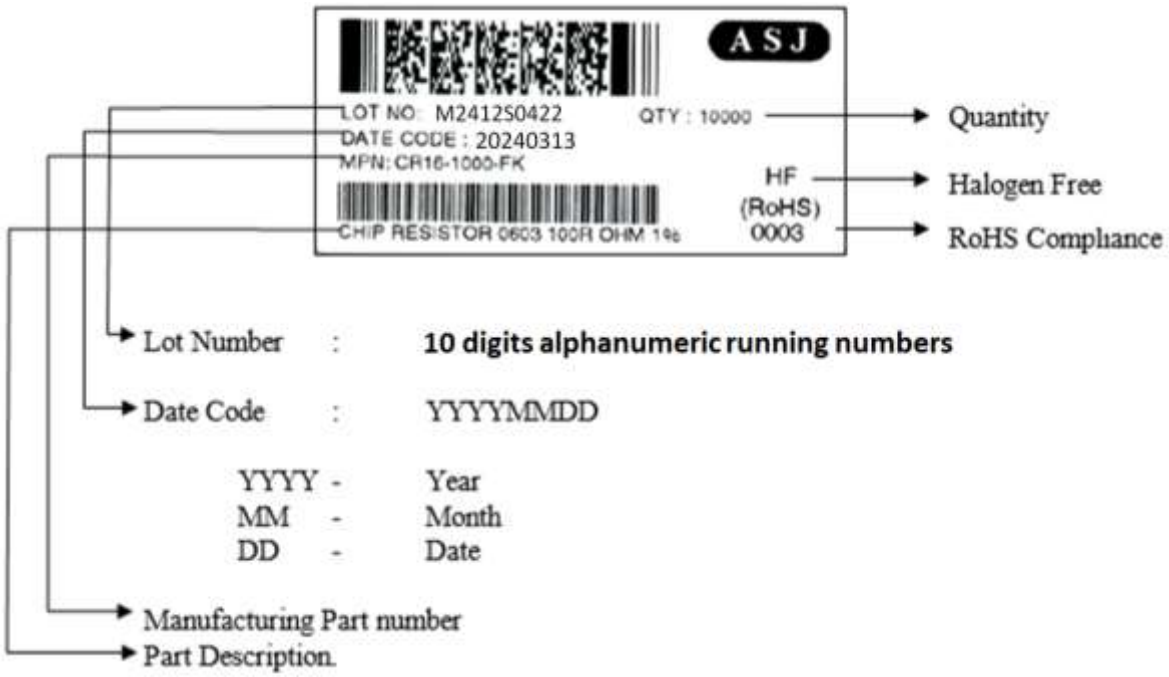
7.3.1 Taping

Quantity - Tape and Reels

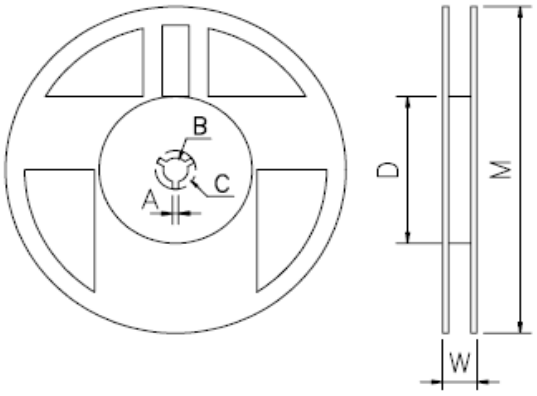
Type	Tape width	Max. Packaging Quantity (pcs/reel)				
		Carrier Tape		Embossed Plastic Type		
		2mm pitch	4mm pitch	4mm pitch	8mm pitch	12mm pitch
0402	8mm	10,000pcs	--	--	--	--
0603	8mm	--	5,000pcs	--	--	--
0805	8mm	--	5,000pcs	--	--	--
1206	8mm	--	5,000pcs	--	--	--
2010	12mm	--	--	2,000pcs	--	--
2512	12mm	--	--	--	4,000pcs	--
2725	12mm	--	--	--	1,000pcs	--
4527	24mm	--	--	--	--	500pcs

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

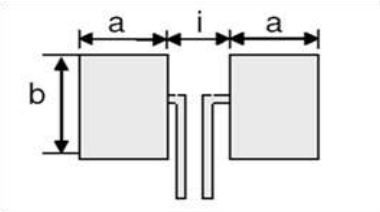


Unit: mm

Item	Reel Type / Tape	W	M	A	B	C	D
CLH10	7” reel for 8 mm tape	9.0±0.5	178±2.0	2.0±0.5	13.5±0.5	21.0±0.5	60.0±1.0
CLH16	7” reel for 8 mm tape	9.0±0.5	178±2.0	2.0±0.5	13.5±0.5	21.0±0.5	60.0±1.0
CLH21 CLH32	7” reel for 8 mm tape	9.0±0.5	178±2.0	2.0±0.5	13.5±0.5	21.0±0.5	60.0±1.0
CLH50 CLH63	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	60.0±1.0
CLH27	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
CLH45	7” reel for 24 mm tape	25.0 ± 1.0	178 ± 2.0	2.0 ± 0.5	13.2 ± 0.5	17.7 ± 0.5	60.0 ± 1.0

8. RECOMMENDED LAND PATTERN

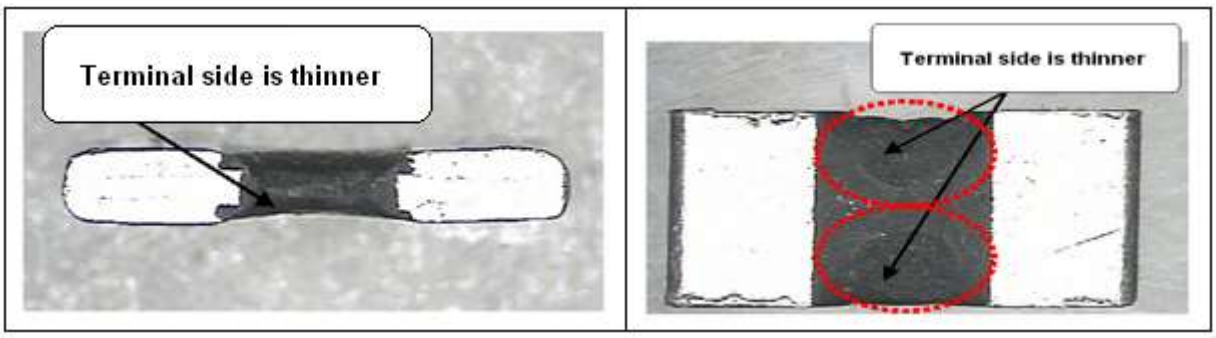
When a component is soldered, the resistance after soldering changes slightly depending on the size of the soldering area and the amount of soldering. When designing a circuit, it is necessary to consider the effect of a decrease or increase in its resistance.



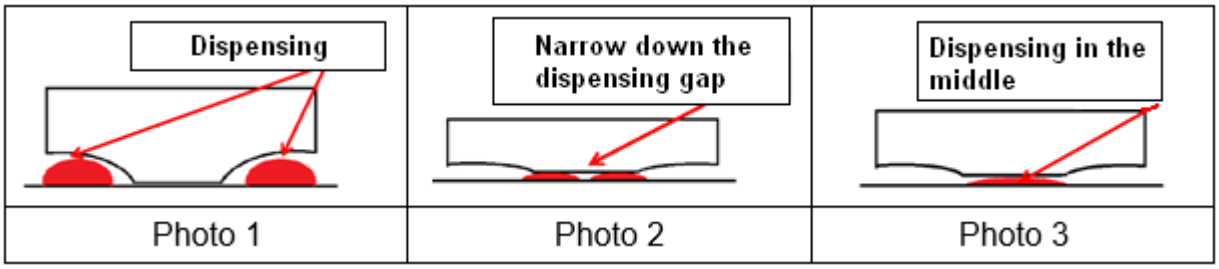
Type	Power Rating (Watts)	Resistance Range (mΩ)	Dimensions - in millimeters		
			a	b	i
CLH10	0.2	1.5、2	0.65	0.50	0.50
		3≦R≦4			
		5			
		10			
CLH16	0.33	1 ~ 24	1.00	1.27	0.50
CLH21	0.5	1~19	1.45	1.78	0.66
CLH32	0.5 1	1≦R＜3	1.65	2.18	0.60
		3≦R＜4	1.65	2.18	0.90
		4≦R≦21	1.65	2.18	1.00
CLH50	1	5~90	2.29	2.92	2.41
	1.5	5~60			
	2	5~10			
CLH63	1&1.5	3~100	2.11	3.68	3.18
	2	3 ~ 70			
	3	3 ~ 10			
CLH27	4& 5	0.20 ~ 3.0	3.18	6.86	1.32
CLH45	5	5	5.80	8.74	3.51
		5.1~100	4.15		6.81

8.1 Recommended Dispensing Method (for CLH63)

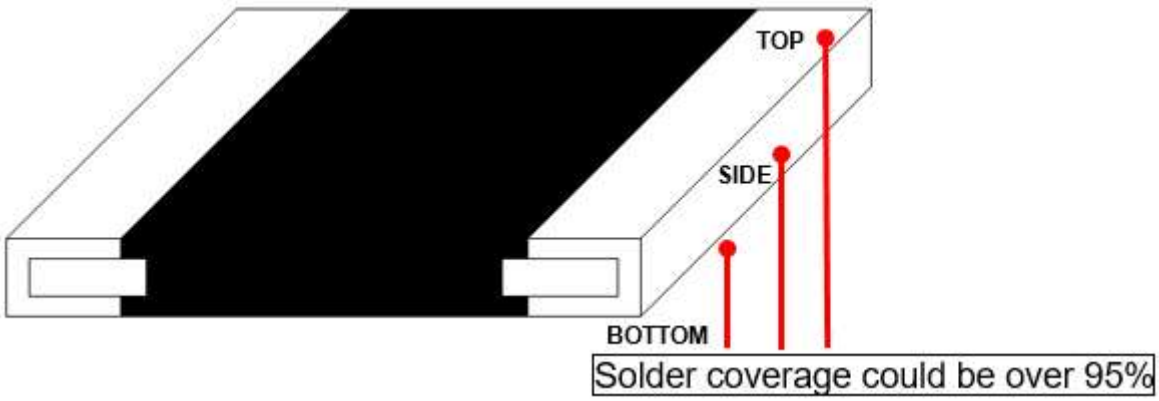
8.1.1 The structure of ASJ metal alloy resistor that both side of main body would be thinner due to process factor (as the photo below).



8.1.2 When customer performs wave solder process shall take note on the dispensing gap. If the gap between two dispensing is over, the red-glue will not adhesive the resistor body and be dropped out (Photo 1). Therefore, we suggest customer to narrow down the dispenser gap (Photo 2), or dispenser on the body center (Photo 3).



8.1.3 Product Warranted solder area



9. REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version.1	07.01.2019		Initial Release
Version.2	07.10.2020		Revise clause 3.1.1 Resistor rated power Revise clause 3.4 Storage temp. range Revise clause 3.9 Revise clause 3.10 TCR table Revise clause 6.2, add test item Joint Strength of solder and Core body strength Revise clause 6.3, add test item whisker test Add clause 6.5.2 soldering iron temp. Revise clause 7.3.3 Reel dimension
Version.3	05.04.2021		Revise clause 3.10 TCR table Revise clause 5 Dimension
Version.4	19.01.2022		Add product CLH50 Revise clause 2 Part Numbering System Revise clause 3.1.1 Resistor rated power Revise clause 3.1.2 Power Derating Curve Revise clause 3.10 TCR table Revise clause 5 dimension Revise clause 5.1 Material of alloy Revise clause 6 Reliability performance Revise clause 7.2 tape dimension Revise clause 7.3.1.1 tape and reel qty Revise clause 7.3.3 Reel dimension Revise clause 8 Land pattern
Version.5	07.03.2023		Add product CLH45, CLH21 t type, CLH32 T type Revise clause 2 Part Numbering System Revise clause 3.1.1 Resistor rated power Revise clause 3.3 Operating temperature range Revise clause 3.8 Resistor assurance Revise clause 3.10 TCR table Revise clause 4.2 Marking series Revise clause 5 dimension Revise clause 5.1 material of alloy Revise clause 6.1 item short time overload Revise clause 6.3 item temperature cycling, bias humidity Revise clause 6.4 item load life Revise clause 7.2 Tape dimension Revise clause 7.3.1.1 Tape and reel Revise clause 7.3.3 Reel dimension Revise clause 8 Recommended land pattern
Version 6	09.05.2023		Add product CLH27 Revise the resistance values of 5mΩ, 10mΩ, and 90mΩ set to 5~90 mΩ
Version 7	01.03.2024		Revise clause 3.1.1 table. Revise clause 3.9 table. Revise clause 5 Dimension table. Revise clause 5.1 Material of Alloy table. Revise clause 7.3.1 Taping table. Revise clause 7.3.1 Identification. Revise clause 8 Recommended Land Pattern table.