

ASJ

DATA SHEET

Low Inductance Metal Alloy Low Resistance
Resistor

CLH 4 Terminal Series

$\pm 0.1\%$ TO $\pm 5.0\%$, TCR $\leq \pm 50$ TO $\leq \pm 100$

SIZE: 3637/0612



LOW INDUCTANCE METAL ALLOY LOW RESISTANCE RESISTOR

CLH 4 Terminal Series

DS-ENG-088

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1. SCOPE

- 1.1 This specification is applicable to Lead-free and Halogen-free of RoHS Directive for CLH 4 terminals 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	36	2	-	R020	-	F	Q	-	4
Type	Size(Inch)	Power Rating		Nominal Resistance		Tolerance	Packaging		# of terminal
Low-Inductance Metal Alloy Low-Resistance Resistor	36 (3637) 06 (0612)	1 = 1.0 W 2 = 2.0 W 3 = 3.0 W		Resistance (4~6 Digits) Resistor EX: R0003 = 0.3mΩ R001 = 1mΩ		B = ±0.1% D = ±0.5% F = ±1.0% G = ±2.0% J = ±5.0%	Q = 1,000 pcs L = 5,000 pcs		4:4 terminals

3. RATING

3.1 Rated Power

3.1.1 Resistor Rated Power

TYPE	# Of Terminals	Max.Rating Power	Max.Rating Current	Max.Overload Current
CLH36	4	2 W	$I_r = \sqrt{P/R}$ I _r : Rating Current (A) P : Rating Power (W) R : R value(Ω)	$I_o = \sqrt{5P/R}$ I _o : Overload Current (A) P : Rating Power (W) R : R value(Ω)
		3 W		
CLH06		1 W	$I_r = \sqrt{P/R}$ I _r : Rating Current (A) P : Rating Power (W) R : R value(Ω)	$I_o = \sqrt{4P/R}$ I _o : Overload Current (A) P : Rating Power (W) R : R value(Ω)



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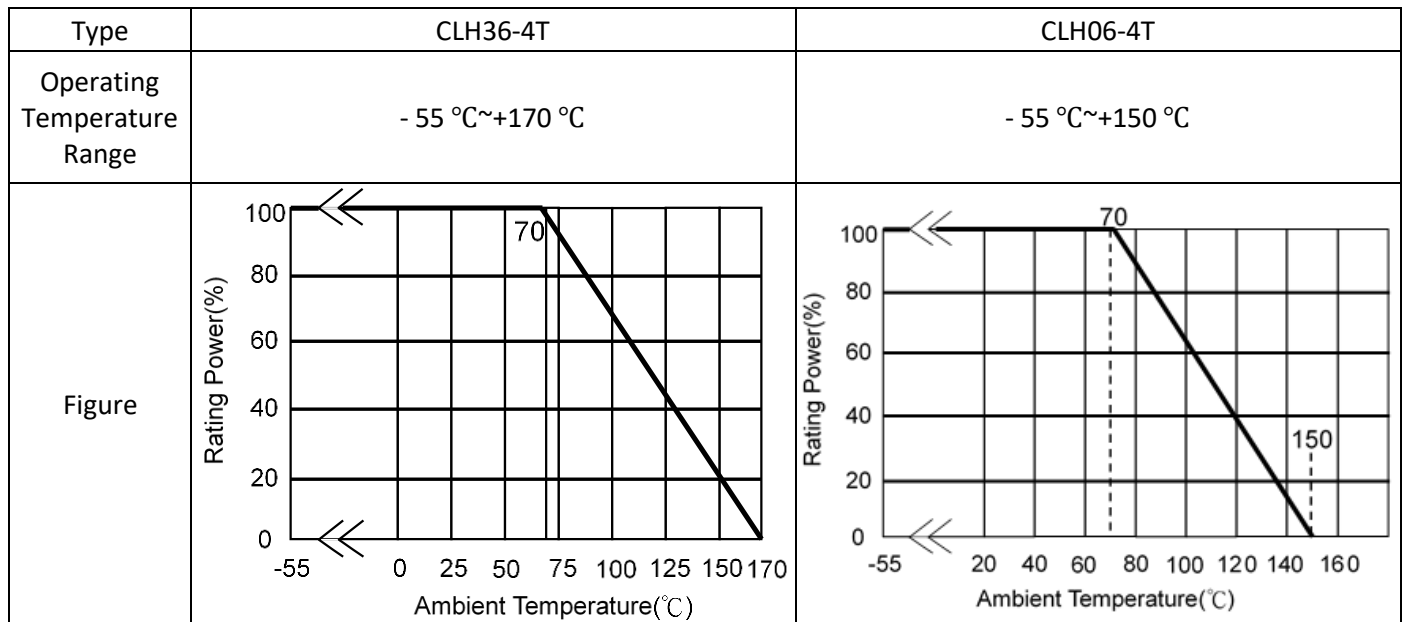
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3.2 Power Derating Curve.

Temperature Range: - 55°C ~ + 170°C

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



3.3 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 kPa 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 kPa to 106kPa

3.4 Operating Temperature Range -55°C to +170°C

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

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

3.7 Moisture Sensitivity Level Rating: Level 1



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- 3.8 Product Assurance
ASJ resistor shall warranty 24 months from manufacturing date with control conditions.
- 3.9 ASJ resistors are RoHS-compliant in accordance to RoHS Directive.
- 3.10 Resistance, Resistance Tolerance and Temperature Coefficient of Resistance.

Type	# of Terminals	Max. Rating Power	Max. Rating Current	Max. Overload Current	T.C.R. (ppm/°C)	Resistance Range (mΩ)	Tolerance	Operating Temperature Range
CLH36	4	2 W	$I_r = \sqrt{P/R}$ I _r : Rating Current (A) P : Rating Power (W) R : R value(Ω)	$I_o = \sqrt{5P/R}$ I _o : Overload Current (A) P : Rating Power (W) R : R value(Ω)	$\leq \pm 50$	2.5 ~ 20	B (±0.1%) D (±0.5%) F (±1.0%)	-55~170°C
		3 W			$\leq \pm 50$	2.5 ~ 10		
CLH06	4	1 W	$I_r = \sqrt{P/R}$ I _r : Rating Current (A) P : Rating Power (W) R : R value(Ω)	$I_o = \sqrt{4P/R}$ I _o : Overload Current (A) P : Rating Power (W) R : R value(Ω)	$\leq \pm 75$	$1 \leq R \leq 4$	F (±1.0%) G (±2.0%) J (±5.0%)	-55~150°C
					$\leq \pm 100$	5		

- 3.11 Current Rating:
The following equation may be used to determine the DC (Direct Current) or AC (Alternating 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)

- 3.12 All product, product specifications and data are subject to change without notice to improve reliability, function or design or otherwise.

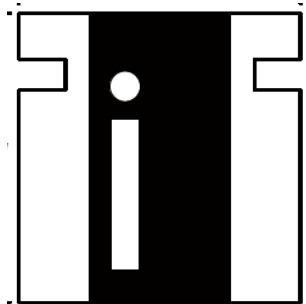
4 MARKING FORMAT



Product Specification

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- 4.1 LRH3637-4 Terminals (Dot / Bar marking)
Recognize Top/Bottom side and A/B terminal.



- 4.2 LRH0612-4 Terminals Product resistance is indicated by using two marking notation styles:

- a. "R" designates the decimal location in ohms, e.g.
- For 1mΩ the product marking is R001;
 - For 5mΩ the product marking is R005;
- 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 1.5mΩ the product marking is 1m50;



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4.3 Marking Style

Type \ Marking	R	M	1	2	3	4	5	6	7	8	9	0
CLH06	R	m	1	2	3	4	5	6	7	8	9	0

Example - Marking → R001 = 1mΩ

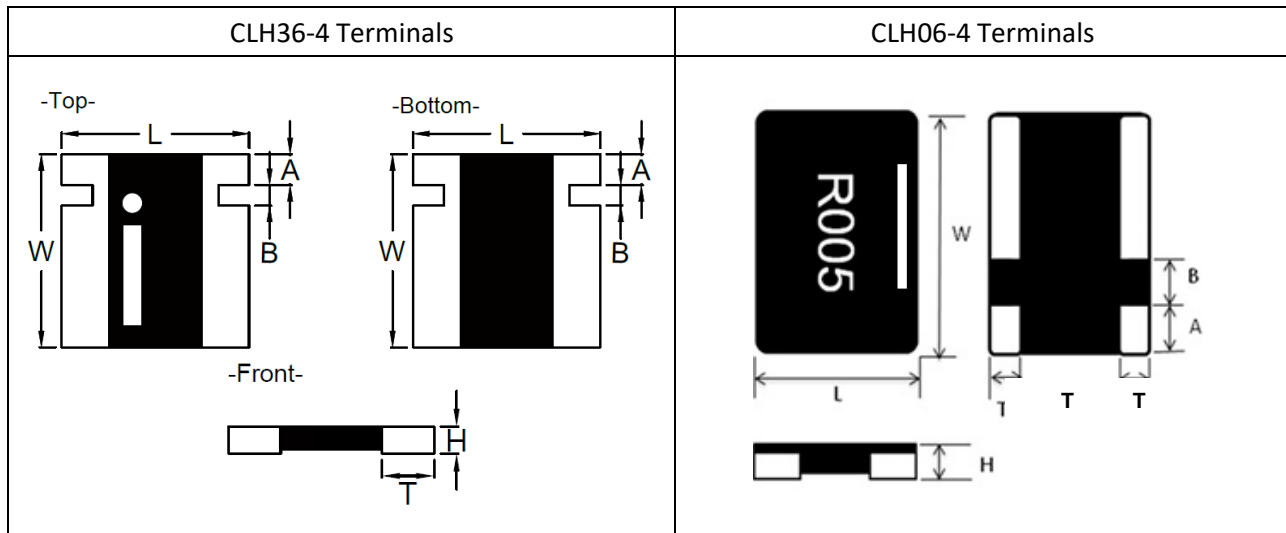


4.4 Plating Thickness :

- 4.4.1 Ni : $\geq 2\mu\text{m}$
- 4.4.2 Sn (Tin) : $\geq 3\mu\text{m}$
- 4.4.3 Sn (Tin) : Matte Sn

5. DIMENSION AND MATERIAL

5.1 Dimension



Type	# of Terminals	Maximum Power Rating (Watts)	Resistance Range (mΩ)	Dimensions - in inches (millimeters)					
				L	W	A	B	T	H
CLH36	4	2	2.5~20	0.360±0.010 (9.14±0.254)	0.370±0.010 (9.40±0.254)	0.059±0.010 (1.50±0.254)	0.039±0.010 (1.00±0.254)	0.091±0.010 (2.31±0.254)	0.047±0.010 (1.20±0.254)
		3	2.5~10						
CLH06	4	1	1-4	0.063±0.008 (1.60±0.20)	0.126±0.008 (3.20±0.20)	0.020±0.006 (0.50±0.15)	0.020±0.006 (0.50±0.15)	0.016±0.006 (0.40±0.15)	0.014±0.004 (0.35±0.10)
			5						

5.2 Material of Alloy

Type	# of Terminals	Watts	Material	Resistance
CLH36	4	2.0	Nickel-Chromium-Aluminum Alloy	2.5mΩ ~ 20mΩ
		3.0	Nickel-Chromium Aluminum Alloy	2.5mΩ ~ 10mΩ
CLH06	4	1.0	Copper-Manganese Alloy	1mΩ≤R≤4mΩ
			Nickel-Chromium-Aluminum Alloy	5mΩ

6. RELIABILITY PERFORMANCE

6.1 Electrical Performance

Test Item	Conditions of Test	Test Limits												
Temperature Coefficient of Resistance (TCR)	$TCR(ppm/^{\circ}C) = \frac{(R2 - R1)}{R1(t2 - T1)} \times 10^6$ <ul style="list-style-type: none"> 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 	Refer to Paragraph 3.10 general specifications												
Short Time Overload	Applied Overload for 5 seconds and release the load for about 30 minutes, then measure its resistance variance rate. (Overload condition refer to below):	CLH36 : $\leq \pm 0.5\%$ CLH06 : $\leq \pm 1.0\%$												
	<table border="1"> <thead> <tr> <th>Type</th> <th># of Terminals</th> <th>Power (W)</th> <th># of rated power</th> </tr> </thead> <tbody> <tr> <td rowspan="2">CLH36</td> <td rowspan="2">4</td> <td>2.0</td> <td rowspan="2">5 times</td> </tr> <tr> <td>3.0</td> </tr> <tr> <td>CLH06</td> <td>4</td> <td>1.0</td> <td>4 times</td> </tr> </tbody> </table> <p>Refer to JIS C 5201-1 4.13</p>	Type	# of Terminals	Power (W)	# of rated power	CLH36	4	2.0	5 times	3.0	CLH06	4	1.0	4 times
Type	# of Terminals	Power (W)	# of rated power											
CLH36	4	2.0	5 times											
		3.0												
CLH06	4	1.0	4 times											
Insulation Resistance	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	CLH36 $\geq 10^9 \Omega$ CLH06 $\geq 10^8 \Omega$												
Dielectric Withstanding Voltage	Applied 500VAC for 1 minute, and Limit surge current 50 mA (max.) Refer to JIS-C5201-1 4.7	No short or burned on the appearance.												

6.2 Mechanical / Constructional Performance

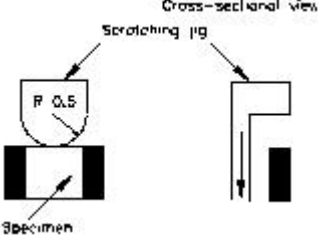
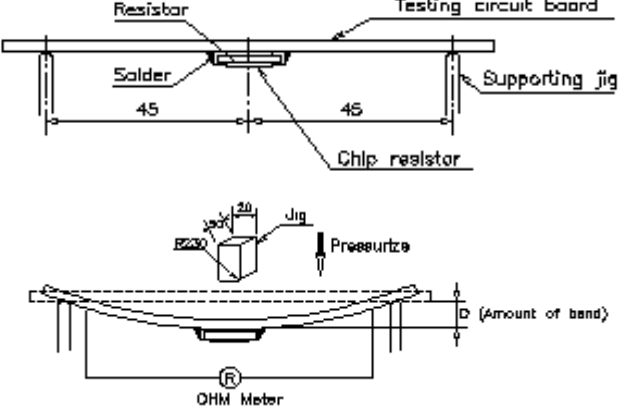
Test Item	Conditions of Test	Test Limits
Resistance to Solder Heat	The tested resistor be immersed 25 mm/sec into molten solder of 260±5°C for 10±1secs. Then the resistor is left in the room for 1 hour, and measured its resistance variance rate. Refer to JIS-C5201-1 4.18	$\leq \pm 0.5\%$
		No evidence of mechanical damage
Solderability	Add flux into tested resistors, immersion into solder bath in temperature 245±5°C for 3±0.5secs. Refer to JIS-C5201-1 4.17	Solder coverage over 95%
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	$\leq \pm 0.5\%$
		No evidence of mechanical damage
Resistance to solvent	The tested resistor immersed into isopropyl alcohol of 20~25°C for 60secs, then the resistor is left in the room for 48 hrs. Refer to JIS-C5201-1 4.29	$\leq \pm 0.5\%$
		No evidence of mechanical damage

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Test Item	Conditions of Test	Test Limits
<p>Joint Strength of Solder</p>	<p>Preconditioning Put tested resistor in the apparatus of PCT, at a temperature of 105°C, humidity of 100% RH, and pressure of 1.22×10^5 Pa for a duration of 4 hours. Then after left the specimen in a temperature for 2 hours or more. Test method:</p> <p>©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</p>  <p>Refer to JIS-C5201-1 4.32</p>	<p>Test item 1: (1). $\leq \pm 0.5\%$ (2). No evidence of mechanical damage. No terminal peeling off.</p> <p>Test item 2: (1). $\leq \pm 0.5\%$ (2). No evidence of mechanical damage. No terminal peeling off and core body cracked.</p>
	<p>©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</p>  <p>Refer to JIS-C5201-1 4.33</p>	

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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°C 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°C 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	CLH36 : ≤ ±0.5%										
		CLH06 : ≤ ±1.0%										
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 1,000 times consecutively. Then leaving the tested resistor in the room temperature for 60 minutes, and measure its resistance variance rate. <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Testing Condition</th> </tr> </thead> <tbody> <tr> <td>Lowest Temperature</td> <td>-55 +0/-10°C</td> </tr> <tr> <td>Highest Temperature</td> <td>150 +10/-0°C</td> </tr> </tbody> </table> Refer to JIS-C5201-1 4.19	Testing Condition		Lowest Temperature	-55 +0/-10°C	Highest Temperature	150 +10/-0°C	CLH36 : ≤ ±0.5%				
		Testing Condition										
Lowest Temperature	-55 +0/-10°C											
Highest Temperature	150 +10/-0°C											
		CLH06 : ≤ ±1.0%										
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°C and 85± 5%RH with 10% bias and load the rated current 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	CLH36 : ≤ ±0.5%										
		CLH06 : ≤ ±1.0%										
Whisker Test	©Test item (Thermal Shock test): <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Testing Condition</th> </tr> </thead> <tbody> <tr> <td>Minimum storage temperature</td> <td>-55+0/-10°C</td> </tr> <tr> <td>Maximum storage temperature</td> <td>85+10/-0°C</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> </tbody> </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.	Testing Condition		Minimum storage temperature	-55+0/-10°C	Maximum storage temperature	85+10/-0°C	Temperature-retaining time	10 min.	Number of temperature cycles	1,500	Max. 50µm
		Testing Condition										
Minimum storage temperature	-55+0/-10°C											
Maximum storage temperature	85+10/-0°C											
Temperature-retaining time	10 min.											
Number of temperature cycles	1,500											



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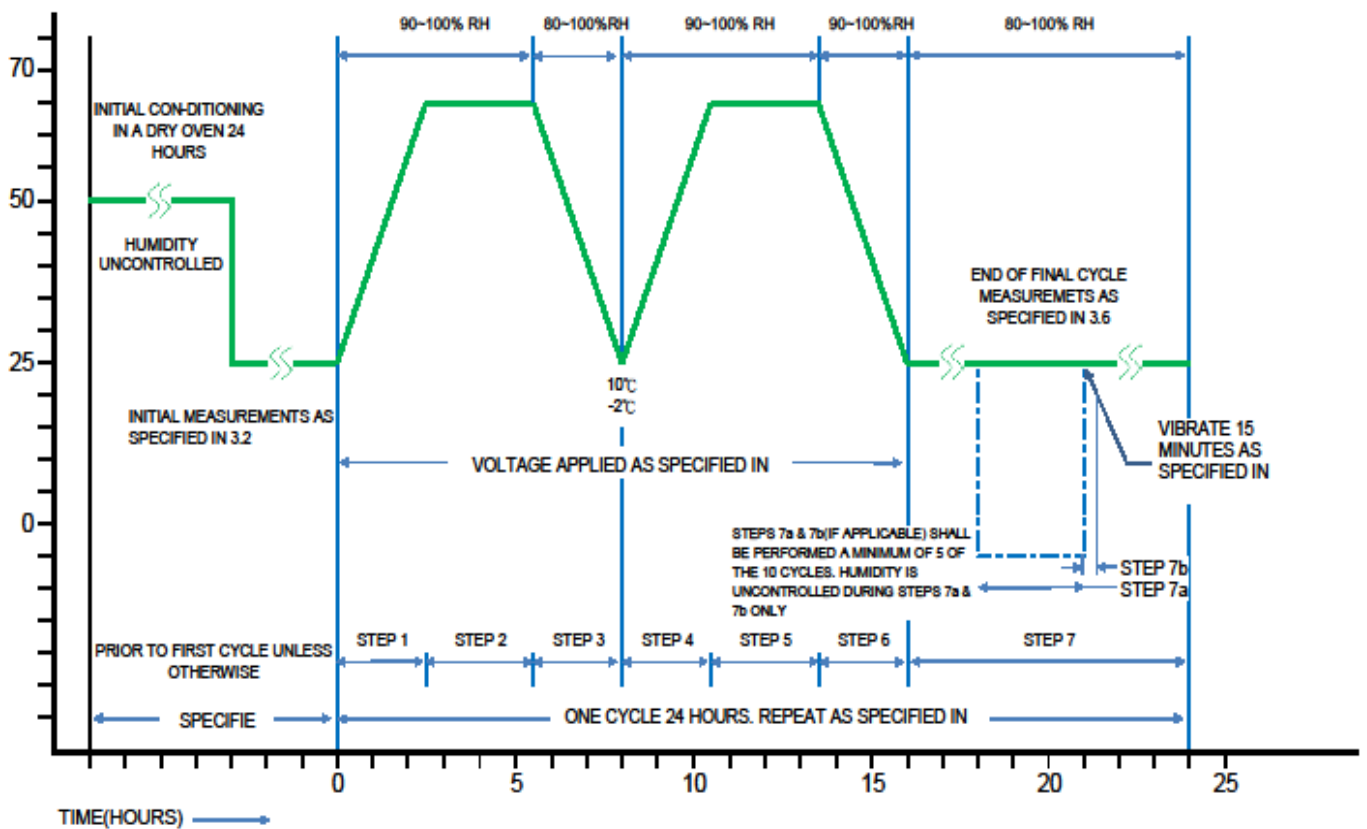
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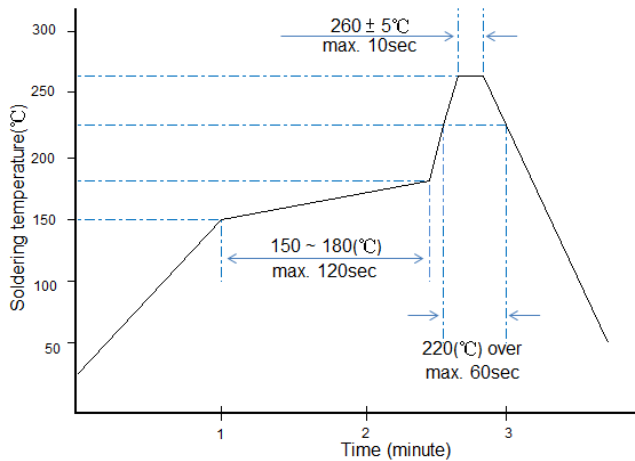
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6.4 Operational Life Endurance

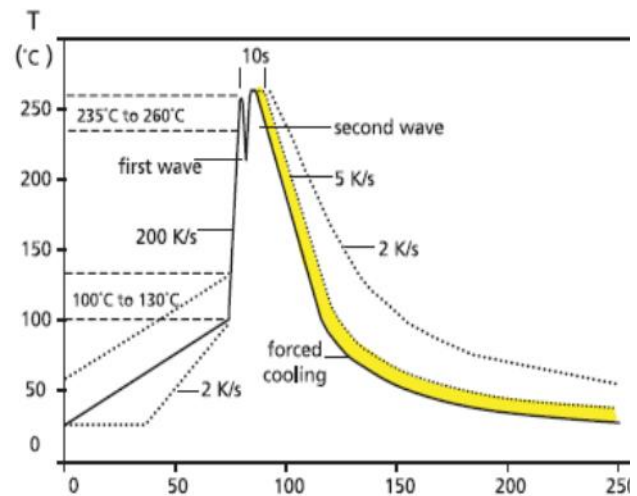
Test Item	Conditions of Test	Test Limits
Load Life	Put the tested resistor in chamber under temperature $70 \pm 2^\circ\text{C}$ and load the rated current for 90 minutes on 30 minutes off, total 1000 hours. Then leaving the tested resistor in room temperature for 60 minutes, and measure its resistance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



6.5 Technical application note: (This is for recommendation, customer please perform adjustment according to the actual application)



Recommended IR Reflow Soldering Profile



Recommended double-wave Soldering Profile

Typical values (solid line)

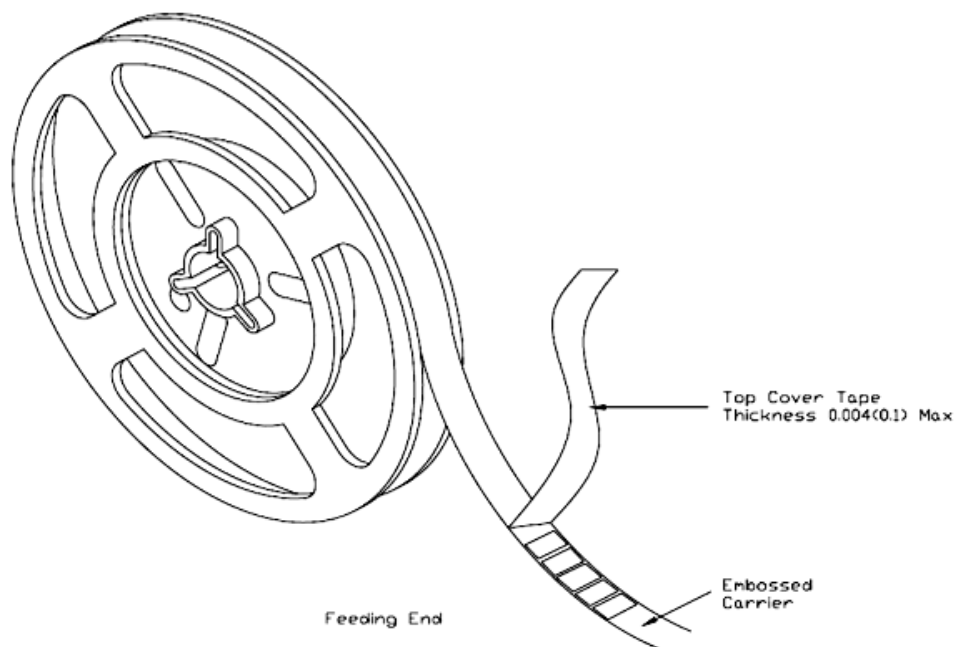
Process limits (dotted line)

- 6.5.1 Soldering Iron: Temperature 350°C±10°C, dwell time shall be less than 3 sec.
- 6.5.2 Surface-mount components are tested for solderability at a temperature of 245 °C for 3 seconds.

7. TAPING

7.1 Structure of Taping

Embossed Plastic Carrier



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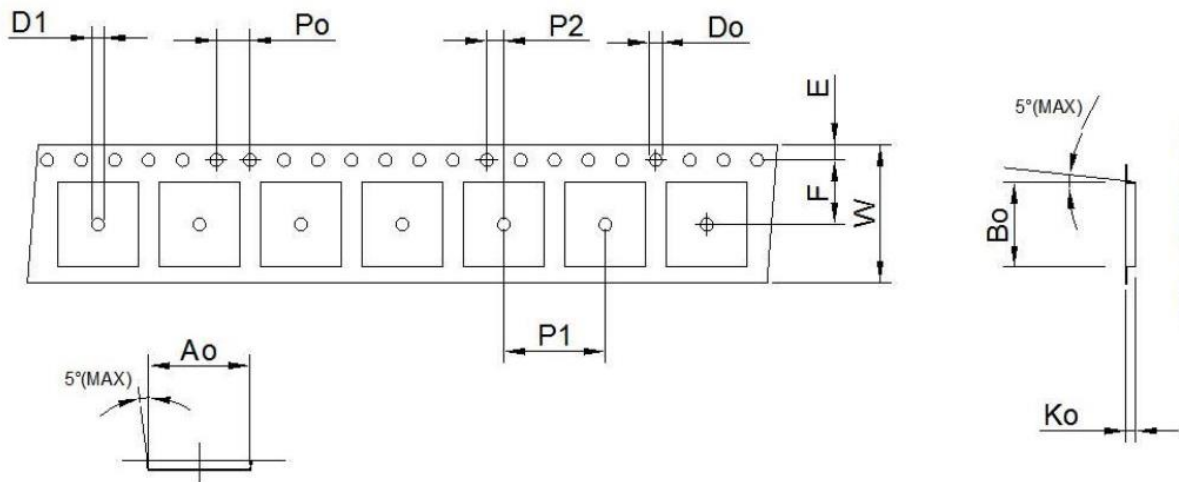
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7.2 Tape Dimension

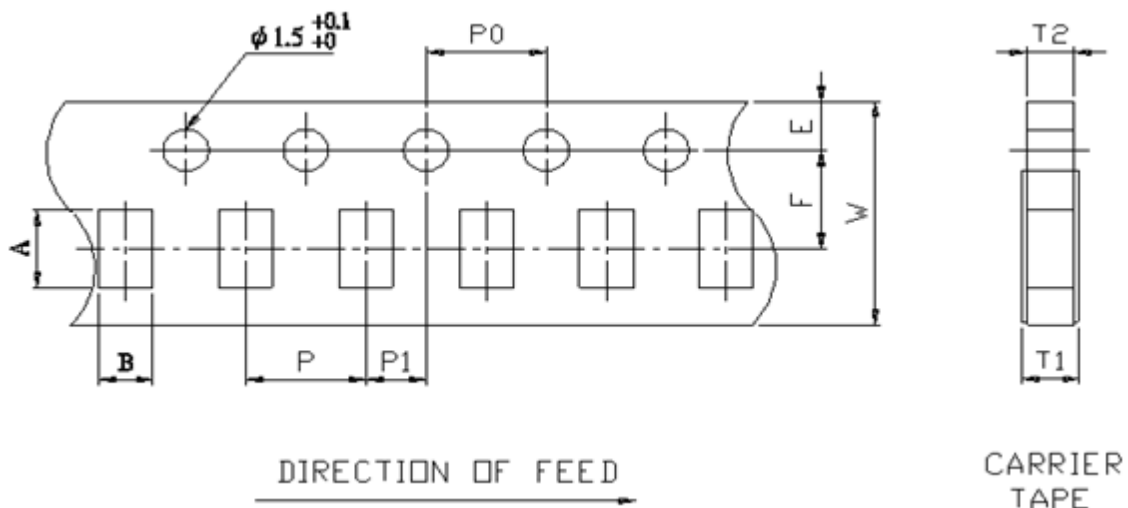
7.2.1 Embossed Tape Dimension (CLH36-4T):



Unit: mm

DIM	Ao	Bo	W	E	F	Ko	Po	P1	P2	Do	D1
CLH36	9.6±0.1	9.9±0.1	16.0±0.2	1.75±0.1	7.5±0.1	1.5 Max	4.0±0.1	12.0±0.1	2.0±0.1	1.5±0.1	1.5 Max

7.2.2 Carrier Tape Dimension (CLH06-4):



CARRIER TAPE

Unit: mm

DIM	A	B	W	E	F	T1	T2	P	P0	10*P0	P1
CLH06	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



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7.3 Packaging

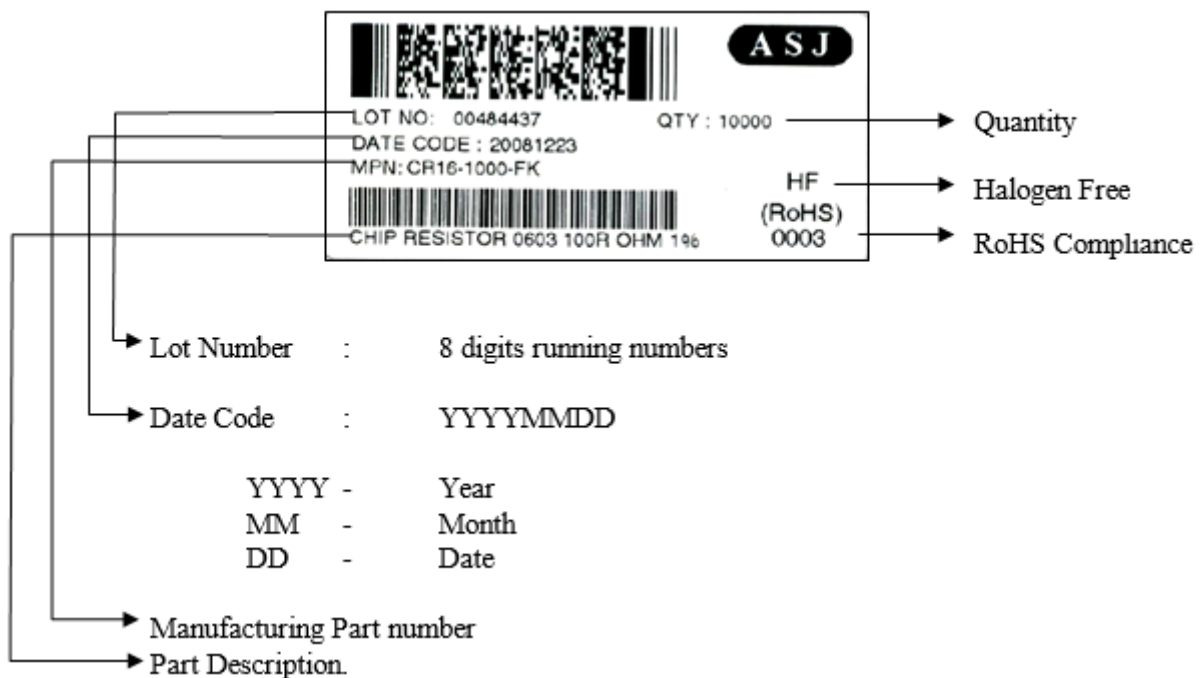
7.3.1 Taping

7.3.1.1 Quantity – Tape and Reels

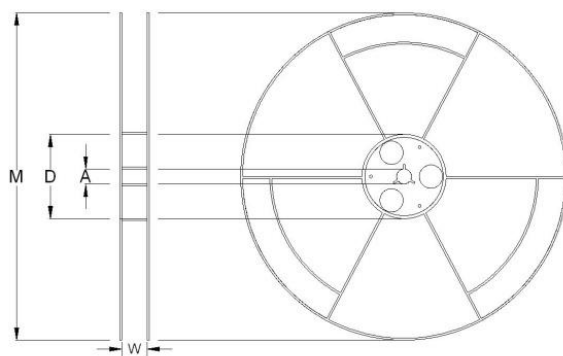
Type	# of Terminals	Tape width	Max. Packaging Quantity (pcs/reel)	
			Embossed Plastic Type	Carrier Tape
			4 mm pitch	4 mm pitch
CLH36	4	16 mm	1000 pcs	--
CLH06	4	8 mm	--	5,000 pcs

7.3.2 Identification

Production label that indicates the 8 digits lot number, product type, resistance value and tolerance shall be pasted on the surface of each reel.

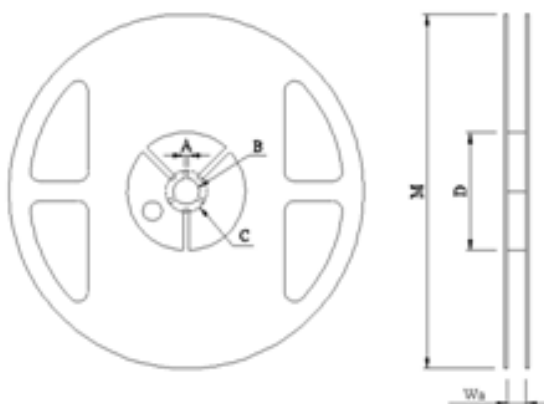


7.3.3 Reel Dimensions



Unit: mm

Type	Reel Type / Tape	W	M	A	D
CLH36	7" reel for 16 mm tape	17.4 ± 1.0	178 ± 2.0	13.2 ± 0.5	60.0 ± 1.0

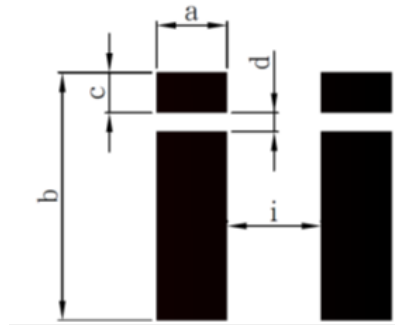


Unit: mm

Type	Reel Type / Tape	W	M	A	B	C	D
CLH06	7" reel for 8 mm tape	12.00 ± 0.5	178 ± 1.0	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	# of Terminals	Maximum Power Rating (Watts)	Resistance Range (mΩ)	Dimensions - in millimeters				
				a	b	c	d	i
CLH36	4	2.0	2.5 ~ 20	2.95	9.90	1.68	0.60	4.50
		3.0	2.5 ~ 10					
CLH06		1.0	1~5	1.00	3.50	0.80	0.40	0.70

9. MEASUREMENT POINT

Bottom electrode		Unit : mm	
	DIM	A	B
	Type		
	CLH36-4T		5.10 ±0.10
CLH06-4T		1.78±0.05	1.20±0.05

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10. REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version.1	01.06.2022		Initial Release
Version 2	03.07.2023		Added CLH06-4T type specification Revise clause 3.1.1 Resistor Rated Power Revise clause 3.2 Power Derating Curve Revise clause 3.8 Product Assurance Revise clause 3.10 table Add clause 4 Marking Format Revise clause 5 Dimension and Material Revise clause 6 Reliability Performance Revise clause 7 Taping Revise clause 8 Recommended Land Pattern Revise clause 9 Measurement Point



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