

ASJ

# DATA SHEET

## Wide Terminal Metal Alloy Low-Resistance Resistor

### CLS Series

0.5% TO 5%, TCR  $\pm 50$

SIZE: 1020/1225

RoHS-Compliant

# WIDE TERMINAL METAL ALLOY LOW-RESISTANCE RESISTOR

CLS Series

DS-ENG-085

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## 1. SCOPE

- 1.1. This specification is applicable to Lead-free and Halogen-free of RoHS Directive for CLS Series Wide Terminal Metal Alloy Low-Resistance Resistor.
- 1.2. Ideal for current detection under high current circuit.
- 1.3. The product is for general electronic purpose.

## 2. PART NUMBERING SYSTEM

Part Numbering is made in accordance with the following system:

CLS	50W	2	-	R003	-	F	L	-
Type	Size (mm/inch)	Power Rating	Nominal Resistance			Resistance Tolerance	Packaging	Number of Terminal
Metal Alloy Low Resistance Resistors	50W(1020) 63W(1225)	2=2W 3=3W	Resistors	Resistance (4-6 Digit) R0005 = 0.50mΩ R002 = 2mΩ R003 = 3mΩ		D=±0.5% F=±1.0% J=±5.0%	E=4,000 pcs	2: 2 terminals 4: 4 terminals  (Leave blank if 2 terminal)

## 3. RATING

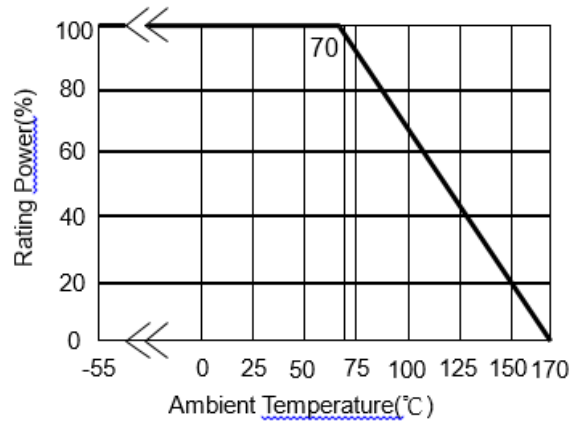
### 3.1. Rated Power

#### 3.1.1 Resistor Rated Power

Type	# of Terminals	Rating Power	Rating Current	Overload Current
CLS50W	2	2W	$I_r = \sqrt{P/R}$ I <sub>r</sub> : Rating Current (A)	$I_o = \sqrt{5P/R}$ I <sub>o</sub> : Overload Current (A)
		3W		
CLS63W	2	2W	P : Rating Power (W) R : R value(Ω)	P : Rating Power (W) R : R value(Ω)
		3W		



- 3.2 Power Derating Curve: Operating Temperature Range: - 55 ~+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 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

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

### 3.5 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

### 3.8 Product Assurance

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

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## 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)	Operating Temperature Range
						D(±0.5%) F(±1%) J(±5%)	
CLS50W	2	2W	$I_r = \sqrt{P/R}$	$I_o = \sqrt{5P/R}$	0.3mΩ~0.5mΩ : $\leq \pm 75$ 1mΩ~3mΩ : $\leq \pm 50$	0.3~3	-55~170°C
		3W			0.3mΩ~0.5mΩ : $\leq \pm 75$ 1mΩ~3mΩ : $\leq \pm 50$	0.3~3	
CLS63W	2	2W			0.5mΩ : $\leq \pm 125$ 1mΩ~15mΩ : $\leq \pm 50$	0.5~15	
		3W			0.5mΩ : $\leq \pm 125$ 1mΩ~5mΩ : $\leq \pm 50$	0.5~5	

## 4. MARKING FORMAT

(All the products marking are 4 digits)

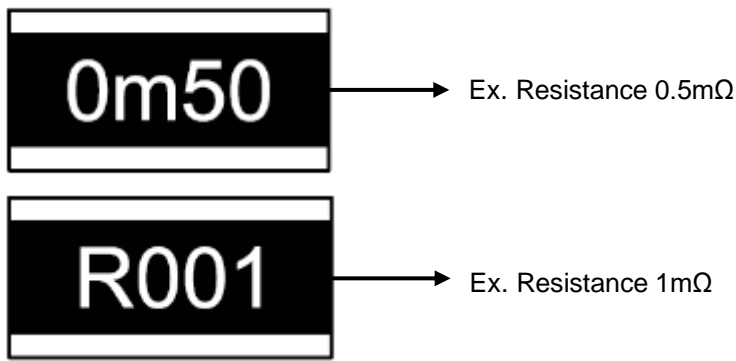


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4.2.1 Product resistance is indicated by using two marking notation styles:

- a. "R" designates the decimal location in ohms, e.g.
  - For 5mΩ the product marking is R005;
  - 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 5.5mΩ the product marking is 5m50;
  - For 25.5mΩ the product marking is 25m5.



4.2.2 Marking Style :

Type \ Marking	R	m	1	2	3	4	5	6	7	8	9	0
1020 1225	R	m	1	2	3	4	5	6	7	8	9	0

**5. DIMENSION**

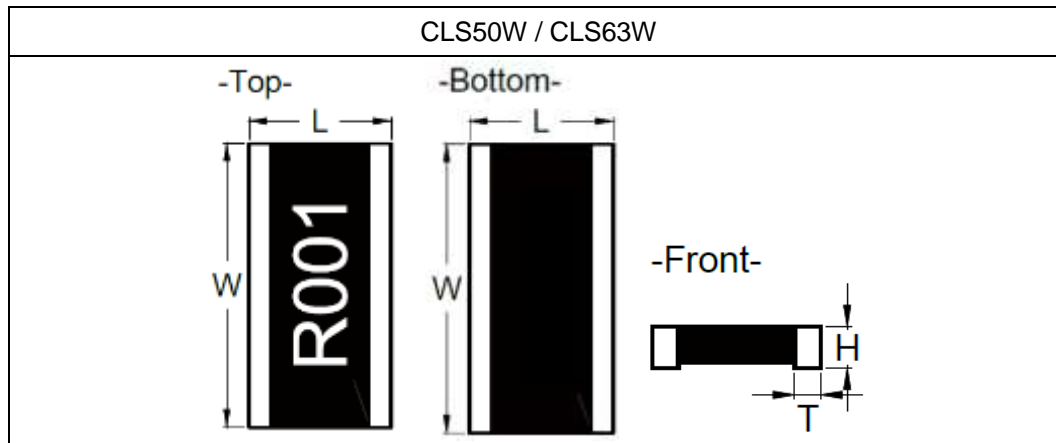


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Type	# of Terminals	Maximum Power Rating (Watts)	Resistance Range (mΩ)	Dimensions - in inches (millimeters)			
				L	W	T	H
CLS50W	2	2 & 3	0.3~3	0.100±0.010 (2.54±0.254)	0.200±0.010 (5.08±0.254)	0.022±0.008 (0.558±0.203)	0.032±0.005 (0.82±0.127)
CLS63W	2	2 & 3	0.5~15	0.126±0.010 (3.20±0.254)	0.250±0.010 (6.35±0.254)	0.020±0.010 (0.51±0.254)	0.040±0.010 (1.02±0.254)

## 5.1 Material of Alloy

Type	# of Terminals	Watts	Material	Resistance
CLS50W	2	2.0	Copper-Manganese Alloy	0.3mΩ ~ 0.5mΩ
		3.0	Iron-Chromium Aluminum Alloy	1mΩ~3mΩ
CLS63W	2	2.0	Copper-Manganese Alloy	0.5mΩ ~ 1.0mΩ
			Iron-Chromium Aluminum Alloy	1.5mΩ ~ 15mΩ
		3.0	Copper-Manganese Alloy	0.5mΩ ~ 1.0mΩ
			Iron-Chromium Aluminum Alloy	1.5mΩ ~ 5mΩ

## 5.2 Plating Thickness

Ni :  $\geq 2 \mu\text{m}$

Sn (Tin) :  $\geq 3 \mu\text{m}$

Sn (Tin) : Matte Sn

## 5. RELIABILITY PERFORMANCE

### 5.1 Electrical Performance Test



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Test Item	Conditions of Test	Test Limits												
Temperature Coefficient of Resistance (TCR)	<ul style="list-style-type: none"> <li>• <math>TCR(ppm/^{\circ}C) = \frac{(R2-R1)}{R1(T2-T1)} \times 10^6</math></li> <li>• R1: resistance of room temperature</li> <li>• R2: resistance of 150 °C</li> <li>• T1: Room temperature</li> <li>• T2: Temperature at 150 °C</li> </ul> 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):	$\leq \pm 0.5\%$												
	<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">CLS50W</td> <td rowspan="2">2</td> <td>2.0</td> <td rowspan="4">5 times</td> </tr> <tr> <td>3.0</td> </tr> <tr> <td rowspan="2">CLS63W</td> <td rowspan="2">2</td> <td>2.0</td> </tr> <tr> <td>3.0</td> </tr> </tbody> </table> Refer to JIS C 5201-1 4.13	Type	# of Terminals	Power (W)	# of rated power	CLS50W	2	2.0	5 times	3.0	CLS63W	2	2.0	3.0
Type	# of Terminals	Power (W)	# of rated power											
CLS50W	2	2.0	5 times											
		3.0												
CLS63W	2	2.0												
		3.0												

## 5.2 Mechanical Performance Test

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

## 5.3 Environmental Performance



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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	≤±0.5%						
		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 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: 20px;"> <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	≤±0.5%
		Testing Condition						
Lowest Temperature	-55 +0/-10°C							
Highest Temperature	150 +10/-0°C							
		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°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 JIS-C5201-1 4.24	≤±0.5%						
		No evidence of mechanical damage						

## 5.4 Operational life Endurance

Test Item	Conditions of Test	Test Limits
Load Life	Put the tested resistor in chamber under temperature 70± 2°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	≤±1.0%
		No evidence of mechanical damage



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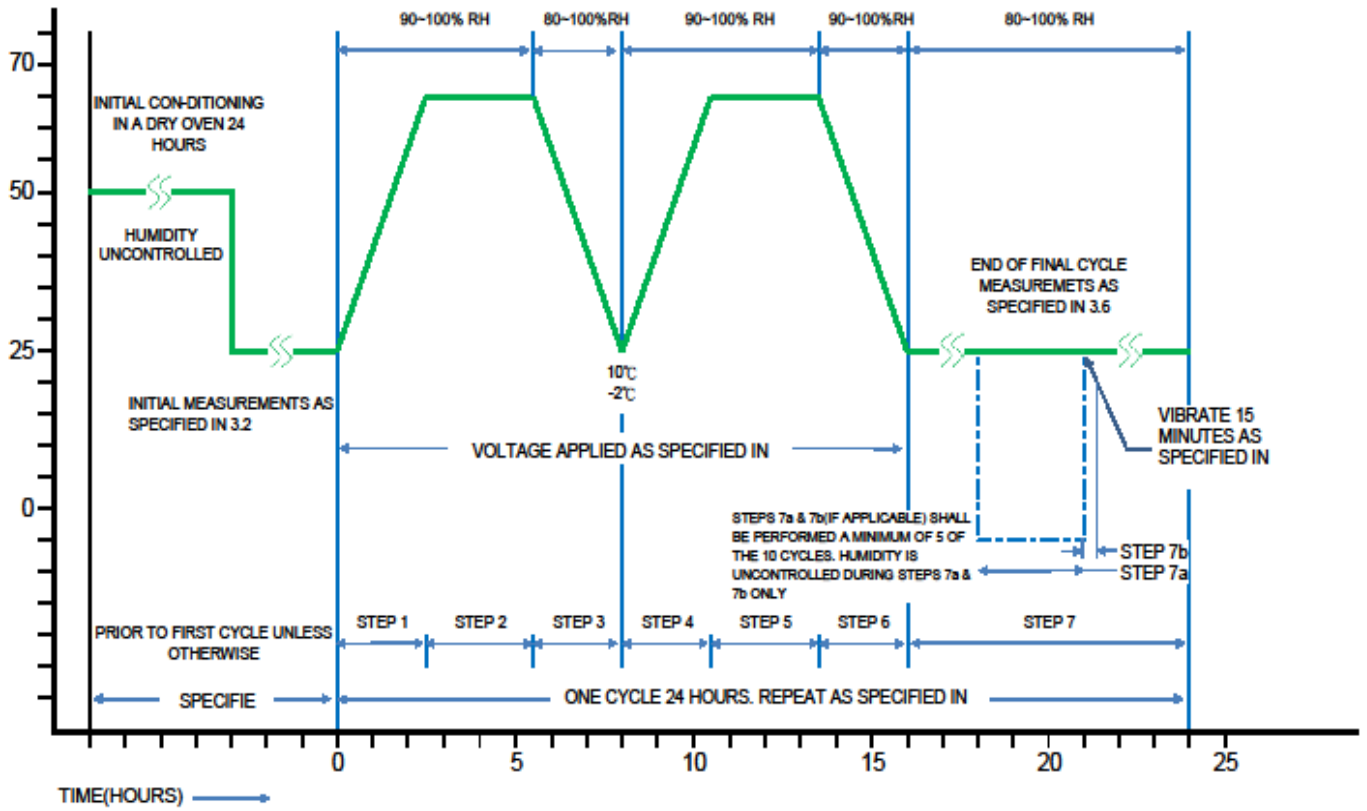


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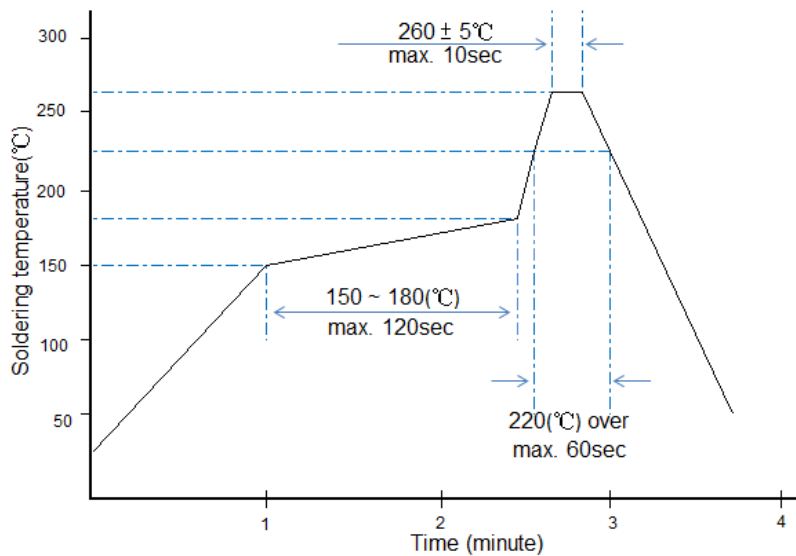
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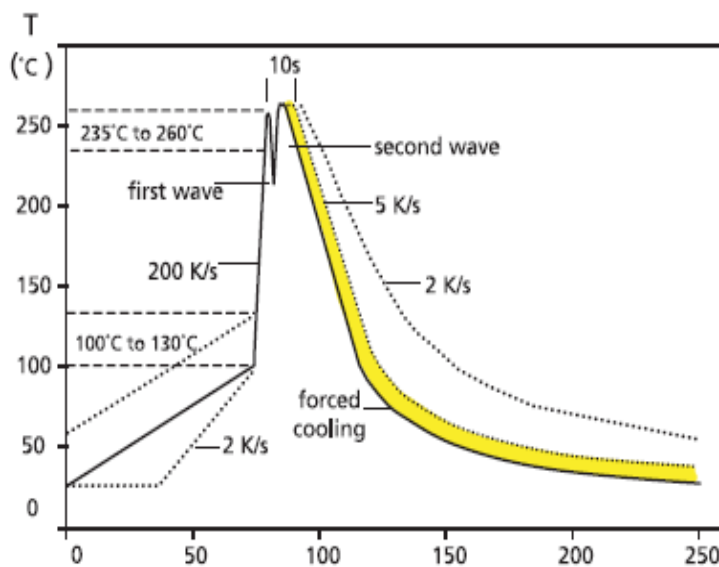
5.5 Recommended Soldering Method

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

6.1.1 Typical example of soldering process that provide reliable joints without any damage are given in below.



Recommended IR Reflow Soldering Profile (MEET J-STD-020)



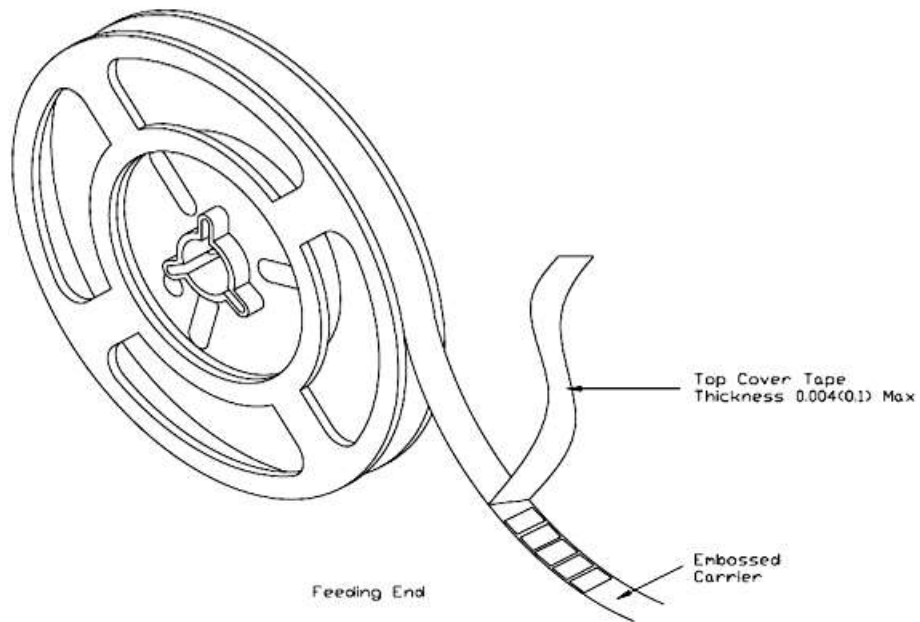
Recommended Double-Wave Soldering Profile  
 Typical value (solid line)  
 Process limits (dotted line)

6.1.2 Soldering Iron: Temperature 350°C±10°C , dwell time shall be less than 3 sec.

## 7. TAPING

### 7.1 Structure of Taping

Embossed Plastic Carrier



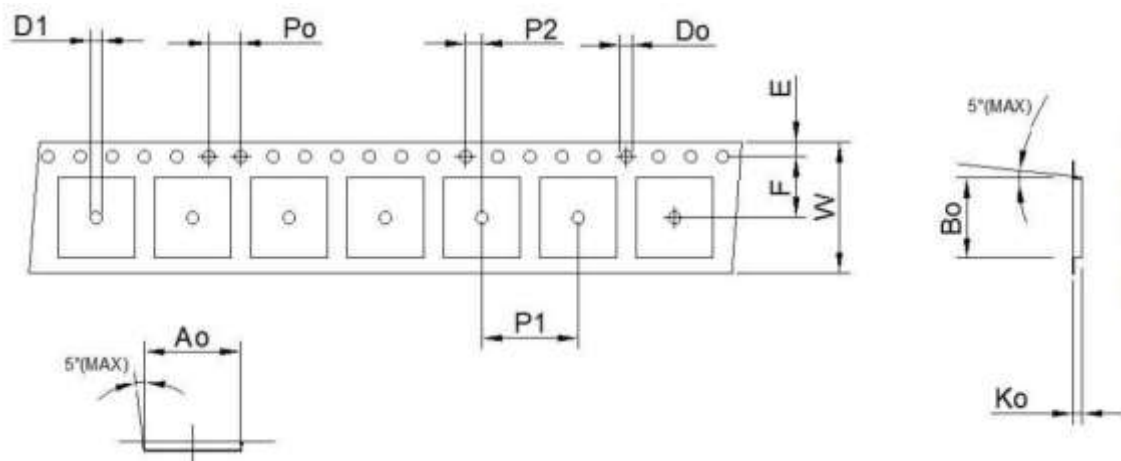
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## 7.2 Tape Dimension



Unit: mm

Type-Terminals	DIM										
	Ao	Bo	W	E	F	Ko	Po	P1	P2	Do	D1
CLS50W	2.9±0.1	5.45±0.1	12.0±0.2	1.75±0.1	5.5±0.1	1.33±0.1	4.0±0.1	4.0±0.1	2.0±0.1	1.5±0.1	---
CLS63W	3.5±0.1	6.75±0.1	12.0±0.1	1.75±0.1	5.5±0.1	1.3±0.1	4.0±0.1	4.0±0.1	2.0±0.1	1.5±0.1	---

## 7.3 Packaging

### 7.3.1 Taping

#### Quantity – Tape and Reels

Type	# of Terminals	Tape width	Max. Packaging Quantity (pcs/reel)
			Embossed Plastic Type
			4mm pitch
CLS50W	2	12mm	2000/4000pcs
CLS63W	2	12mm	4000pcs

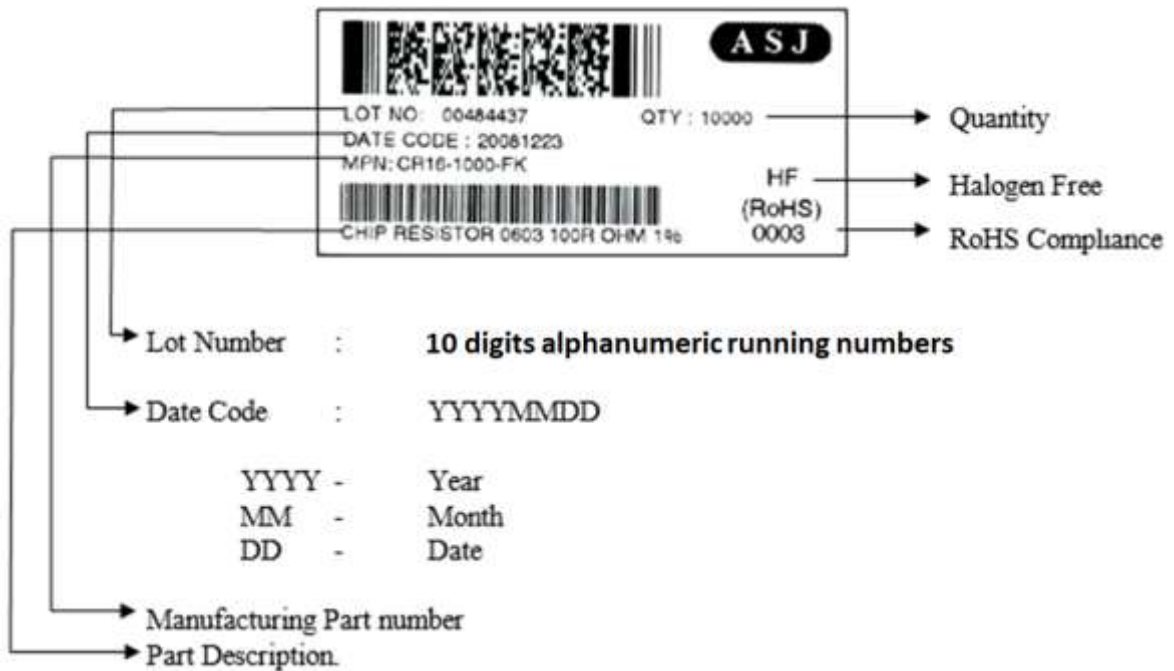


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### 7.3.2 Identification

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



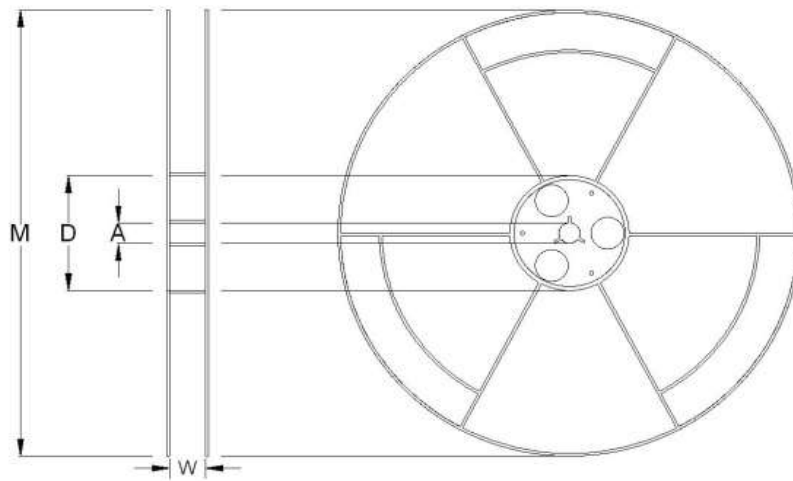
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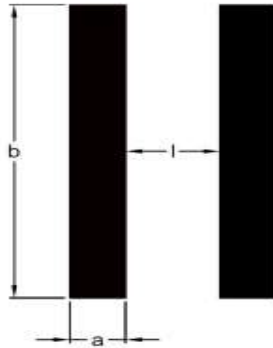
## 7.3.3 Reel Dimension



Reel Type / Tape	W	M	A	D
7" reel for 12 mm tape	$13.8 \pm 0.5$	$178 \pm 2.0$	$13.5 \pm 0.5$	$80.0 \pm 1.0$

## 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	i
CLS50W	2	2&3	0.3~3.0	1.25	5.65	1.00
CLS63W	2	2	0.5~15	1.00	7.00	1.70
		3	0.5~5			

## 9. MEASUREMENT POINT

Bottom electrode	Unit : mm		
	DIM	A	B
	Type		
	CLS50W		1.97±0.10
CLS63W		2.7±0.10	3.2±0.10

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## 10. REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version.1	03.11.2020		Initial Release
Version 2	12.06.2023		Revise clause 3.8 Product Assurance Revise Resistance Range for CLS63W Type 2W and 3W to 0.5~10mΩ and 0.5~5mΩ Revise clause 3.9 table Revise clause 4 Dimension table Revise clause 4.1 Material of Alloy Revise clause 8 Recommended Land Pattern
Version 3	15.12.2023		Revise clause 3.1.1 Resistor Rated Power. Revise clause 3.9 table. Revise clause 5 Dimension. Revise clause 5.1 Material of Alloy. Revise clause 7.3.2 Identification. Revise clause 8 Recommended Land Pattern.



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