Towards Excellence in *Quality, Service & Innovation*

A S J

DATA SHEET

Metal Alloy Low-Resistance Resistor

CLS-4 Terminal Series

0.5% TO 1%, TCR ±50 to ±75

SIZE: 2512/3637

RoHs Compliant

Product Specification – 03 November, 2020 V.5

1. SCOPE

1.1. This specification is applicable to lead free and halogen free of RoHS for CLS 4 terminals 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	36	3	-	R001		-	F	Q	-	4
Type	Size(Inch)	Power Rting		Nominal Resistance			Tolerance	Packaging		# of terminal
Metal Alloy Low-Resistance Resistor	36(3637) 63W(1225) 63(2512)	2=2.0W 3=3.0W		Resistor	Resistance (4~6 Digits) EX: R0003 = 0.3mΩ R001 = 1mΩ R003 = 3mΩ R010 = 10mΩ		D=±0.5% F=±1.0%	Q=1,000 pcs P=2,000 pcs E=4,000 pcs		4:4 terminals

3. RATING

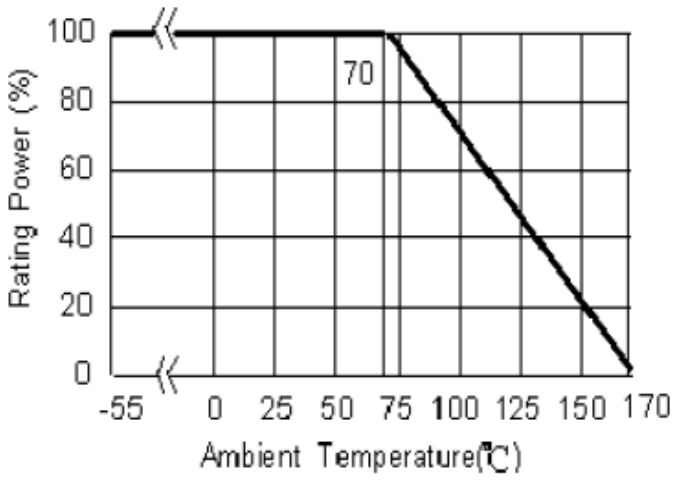
3.1. Rated Power

3.1.1 Resistor Rated Power

Type	# of Terminals	Max. Rating Power	Max. Rating Current	Max. Overload Current
CLS36	4	3W	100.00A	233.61A
CLS63	4	2W	24.62A	55.05A
		3W	30.15A	67.42A
CLS63W	4	2W	31.62A	70.71A
	4	3W	38.73A	83.60A

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:



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

3.8 ASJ resistor shall warranty 24 months from the date of shipment.

3.9 ASJ resistors are RoHS compliance 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)		Operating Temperature Range
						D(±0.5%)	F(±1%)	
CLS36	4	3W	100.00A	233.61A	0.3mΩ~1mΩ: ≦±75 2mΩ~5mΩ: ≦±50	0.3~5	0.3~5	-55~170°C
CLS63		2W	24.62A	55.05A	3.3mΩ: 6.2mΩ: ≦±50 12mΩ:	3.3 6.2 12	3.3 6.2 12	
		3W	30.15A	67.42A	3.3mΩ: 6.2mΩ: ≦±50 12mΩ:	3.3 6.2 12	3.3 6.2 12	
CLS63W		2W	31.62A	70.71A	2mΩ: ≦±50	2	2	
		3W	38.73A	86.60A	2mΩ: ≦±50	2	2	

3.11 Rating Current

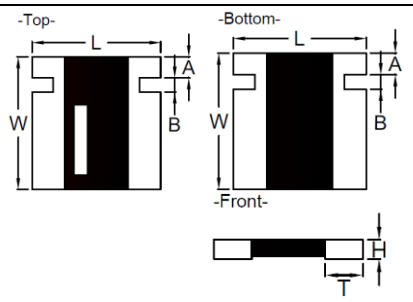
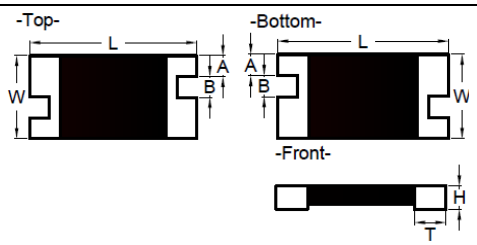
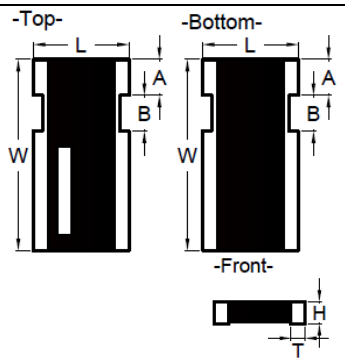
The following equation may be used to determine the DC (Direct Current) or AC (Alternative Current) currents (RMS, root mean square value) of normal rated power. However, if the result value exceeds the highest current of regulated standards, the highest normal rated power is to be used.

Remark:

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

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

4. Dimension

CLS36-4T	CLS63-4T	CLS63W-4T
		

Type	# of Terminals	Maximum Power Rating (Watts)	Resistance Range (mΩ)	Dimensions - in inches (millimeters)					
				L	W	A	B	T	H
CLS36	4	3	0.3~5	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)
CLS63		2	3.3	0.246±0.010 (6.248±0.254)	0.126±0.010 (3.202±0.254)	0.031±0.010 (0.80±0.254)	0.031±0.010 (0.80±0.254)	0.083±0.010 (2.10±0.254)	0.0346±0.010 (0.880±0.254)
			6.2					0.047±0.010 (1.20±0.254)	
			12						
		3	3.3					0.074±0.010 (1.88±0.254)	
			6.2					0.047±0.010 (1.20±0.254)	
			12						
CLS63W		2 & 3	2	0.126±0.010 (3.20±0.254)	0.250±0.010 (6.35±0.254)	0.048±0.005 (1.21±0.127)	0.048±0.005 (1.21±0.127)	0.020±0.010 (0.51±0.254)	0.040±0.010 (1.02±0.254)

4.1 Material of Alloy

Type	# of Terminals	Watts	Material	Resistance
CLS36	4	3.0	Copper-Manganese Alloy	0.3mΩ ~ 1.mΩ
			Iron-Chromium Aluminum Alloy	2mΩ ~ 5mΩ
CLS63		2.0	Copper-Manganese Alloy	< 3.5mR
			Iron-Chromium Aluminum Alloy	≧3.5mR
		3.0	Copper-Manganese Alloy	≦3.5mR
			Iron-Chromium Aluminum Alloy	≧3.5mR
CLS63W		2.0	Iron-Chromium Aluminum Alloy	2mΩ
		3.0		

5. Reliability Performance

5.1 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># of Terminals</th><th>Power (W)</th><th># of rated power</th></tr>
<tr><td>CLS36</td><td rowspan="5">4</td><td>3.0</td><td rowspan="5">5 times</td></tr>
<tr><td rowspan="2">CLS63</td><td>2.0</td></tr>
<tr><td>3.0</td></tr>
<tr><td rowspan="2">CLS40</td><td>2.0</td></tr>
<tr><td>3.0</td></tr>
</table></td><td>CLS36-4 ≦±0.5%
CLS63-4 ≦±1.0%
CLS63W0-4 ≦±0.5%</td></tr>
</table>

5.2 Mechanical Performance

<table>
<tr><th>Test Item</th><th>Conditions of Test</th><th>Test Limits</th></tr>
<tr><td>Resistance to Solder Heat</td><td>Refer to JIS-C5201-1 4.18
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.</td><td>≦±0.5%
No evidence of mechanical damage</td></tr>
<tr><td>Solderability</td><td>Refer to JIS-C5201-1 4.17
Add flux into tested resistors, immersion into solder bath in temperature 245±5℃ for 3±0.5secs.</td><td>Solder coverage over 95%</td></tr>
<tr><td>Vibration</td><td>Refer to JIS-C5201-1 4.22
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)</td><td>≦±0.5%
No evidence of mechanical damage</td></tr>
</table>

5.3 Environmental Test

Test Item	Conditions of Test	Test Limits
Low Temperature Exposure (Storage)	***Refer to JIS-C5201-1 4.23.4*** 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.	≦±0.5% No evidence of mechanical damage
High Temperature Exposure (Storage)	***Refer to JIS-C5201-1 4.23.2*** 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.	≦±0.5% No evidence of mechanical damage
Temperature Cycling (Rapid Temperature Change)	***Refer to JIS-C5201-1 4.19*** 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. Testing Condition: Lowest Temperature -55 +0/-10℃; Highest Temperature 150 +10/-0℃	≦±0.5% No evidence of mechanical damage
Moisture Resistance (Climatic Sequence)	***Refer to MIL-STD 202 Method 106*** 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.	≦±0.5% No evidence of mechanical damage
Bias Humidity	***Refer to JIS-C5201-1 4.24*** Put the tested resistor in chamber under 85± 5℃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.	≦±0.5% No evidence of mechanical damage

5.4 Operational Life Endurance

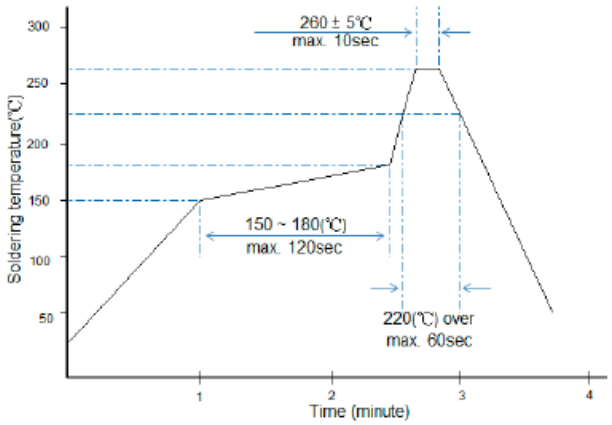
Test Item	Conditions of Test	Test Limits
Load Life	***Refer to JIS-C5201-1 4.25*** Put the tested resistor in chamber under temperature 70± 2℃ and load the rated current for 90 minutes on 30 minutes off, total 1000 hours. Then leaving the tested resistor in room temperature for 60 minutes, and measure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

6 Technical Notes: (This is for recommendation, customer are please to perform adjustment according to actual application)

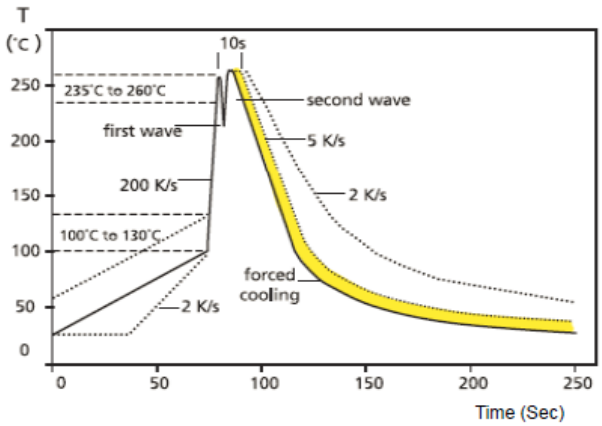
Recommend Soldering method

6.0.1 Typical examples of soldering processes that provides reliable joints without any damage are given in below:

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



Recommended IR Reflow Soldering profile

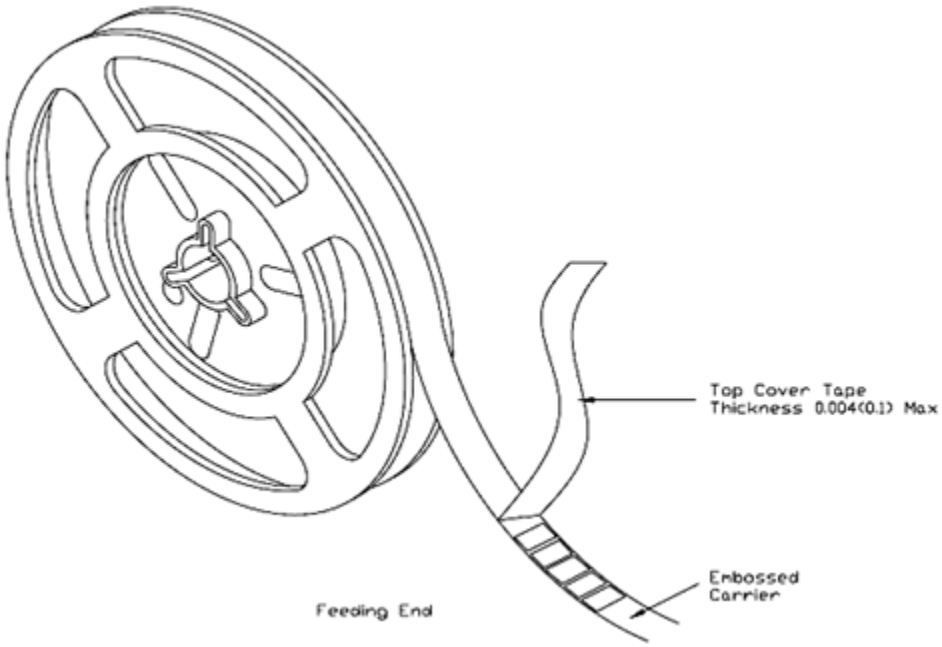


Recommended Wave Soldering Profile
Typical values (solid line)
Process limits (dotted line)

7. TAPING

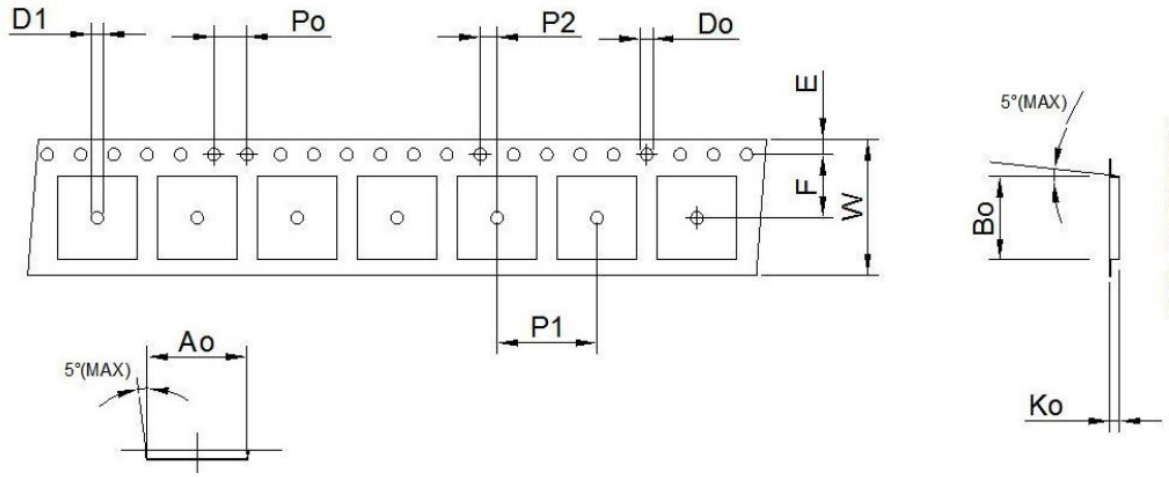
7.1 Structure of Taping

Embossed Plastic Carrier



7.2 Tape dimension.

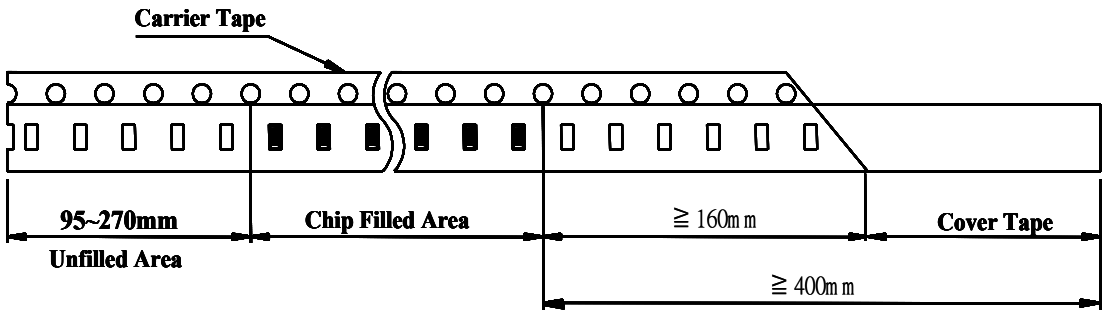
7.2.1 Tape Dimension of Plastic Embossed Carrier System



Unit: mm

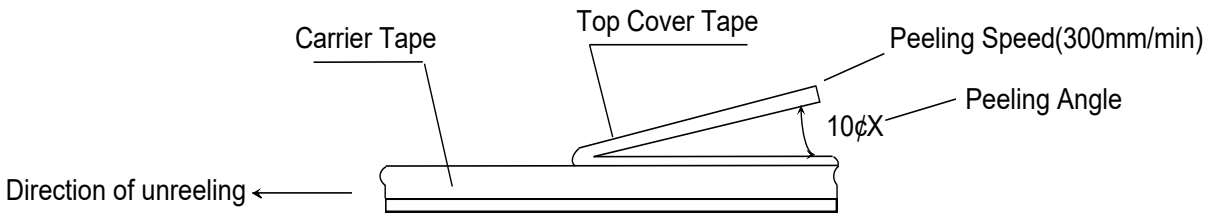
DIM / Type-Terminals	Ao	Bo	W	E	F	Ko	Po	P1	P2	Do	D1
CLS36-4	9.6±0.1	9.9±0.1	16.0±0.2	1.75±0.1	7.5±0.1	1.5 Max	4.0±0.1	12.0±0.1	2.0±0.1	1.5±0.1	1.5 Max
CLS63-4	3.5±0.1	6.75±0.1	12.0±0.1	1.75±0.1	5.5±0.1	1.3±0.1	4.0±0.1	4.0±0.1	2.0±0.1	1.5±0.1	---
CLS63W-4	3.5±0.1	6.75±0.1	12.0±0.1	1.75±0.1	5.5±0.1	1.3±0.1	4.0±0.1	4.0±0.1	2.0±0.1	1.5±0.1	---

7.2.2 Lead Dimension



7.2.3 Cover tape peel off strength:

Specification value: 0.3～1.0N(30~100gf)



7.3 Packaging

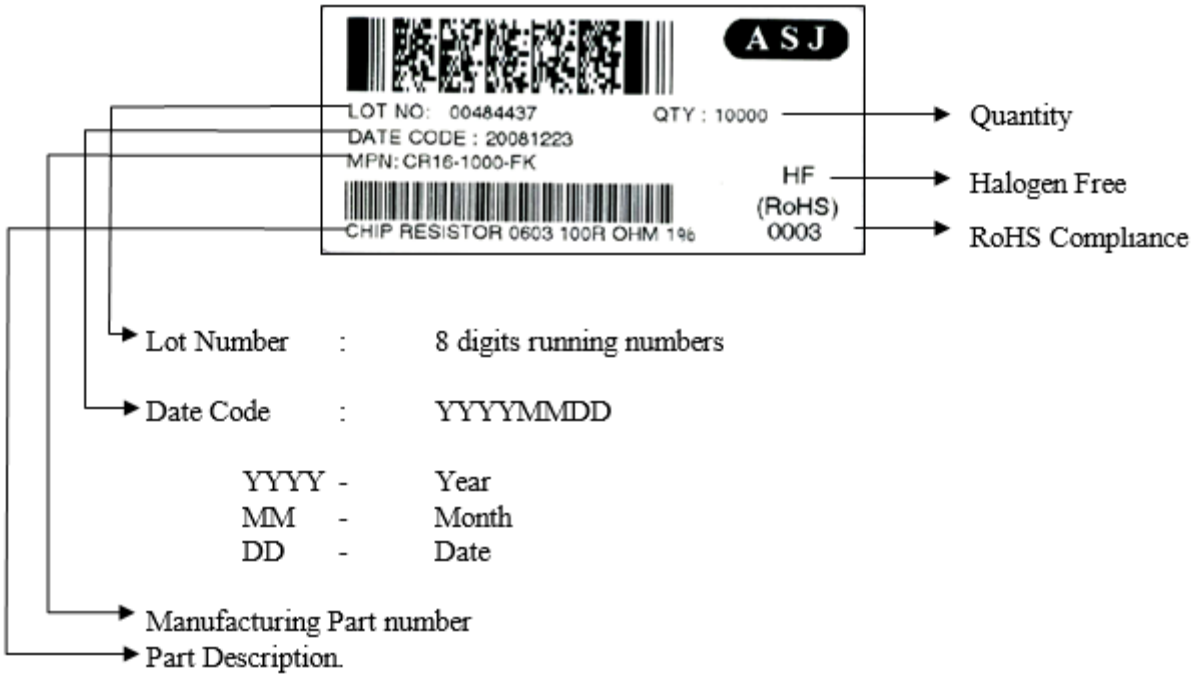
7.3.1 Taping

7.3.1.1 Quantity - Tape and Reels

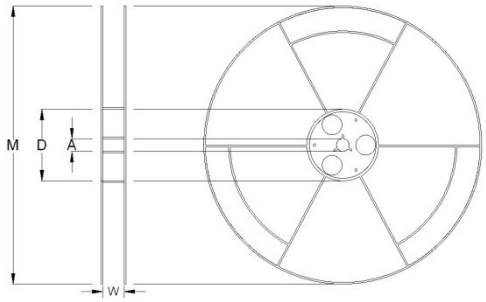
Type	# of Terminals	Tape width	Max. Packaging Quantity (pcs/reel)	
			Embossed Plastic Type	
			4mm pitch	8mm pitch
CLS36	4	16mm	1000	-----
CLS63(0.3mΩ)		12mm	-----	2000
CLS63			4000	-----
CLS63W		12mm	4000	-----

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.



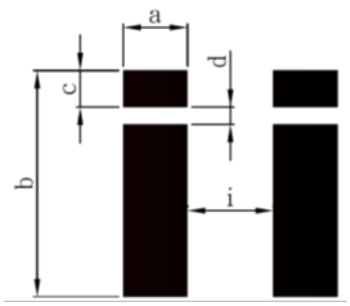
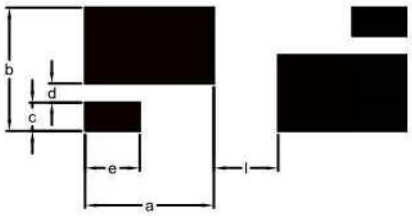
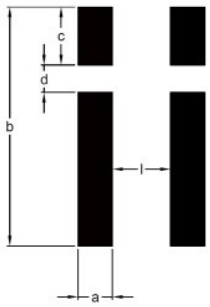
7.3.3 Reel Dimension



Reel Type / Tape	W	M	A	D
7" reel for 16 mm tape	17.4 ± 1.0	178 ± 2.0	13.2 ± 0.5	60.0 ± 1.0
7" reel for 12 mm tape	13.8 ± 0.5	178 ± 2.0	13.5 ± 0.5	80.0 ± 1.0

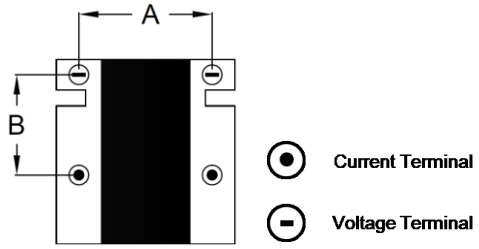
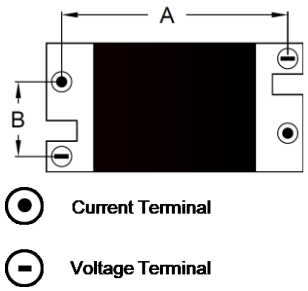
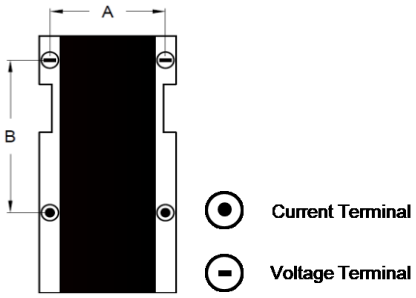
8. RECOMMEND LAND PATTERN

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.

CLS36-4	CLS63-4	CLS63W0-4
		

Type	# of Terminals	Maximum Power Rating (Watts)	Resistance Range (mΩ)	Dimensions - in millimeters					
				a	b	c	d	e	i
CLS36	4	3	0.3	2.95	9.90	1.68	0.60	---	4.50
CLS63		2 & 3	3.3	2.60	3.68	1.14	0.53	1.39	2.17
			6.2	2.10					3.17
			12.0						
CLS63W		2 & 3	2.0	1.00	7.00	1.70	0.80	---	1.70

8.1 Measurement Point:

Bottom electrode			**Unit：mm**
	DIM / **Type-Terminals**	**A**	**B**
	CLS36	6.82±0.10	5.10 ±0.10
	CLS63	5.548±0.10	2.001±0.10
	CLS63W	2.7±0.10	3.8±0.10

9. REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version.1	17.01.2019		Initial Release
Version.2	19.02.2019		Add in CLS63W 4 terminal product to datasheet
Version.3	30.10.2019		Revise front page CLS to CLS-4 Terminal series Add in CLS40 4 terminal product to datasheet Revise clause 2 part numbering system Revise clause 3.9 Revise clause 3.10 TCR table Revise clause 4 dimension Revise clause 4.1 Material of alloy Revise clause 5.1 Short time overload test Revise clause 7.2.1 Tape dimension table Revise clause 7.3.1.1 Tape and reel quantity Revise clause 8 Land pattern and dimension table
Version.4	07.10.2020		Revise clause 3.4 Storage temp. range Revise clause 3.10 TCR table Add clause 8.1 Measurement point
Version.5	03.11.2020		Revise clause 4 dimension Revise clause 4.1 Material of alloy