Towards Excellence in *Quality, Service & Innovation*

ASJ

DATA SHEET

Metal Alloy Low-Resistance Resistor

CLS Series

0.5% To 5%, TCR ±25 To ±175

SIZE: 1206/2010/2512/2725/2728/4527/4527S

RoHS-Compliant

Product Specification –07 Dec, 2023 V17

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:

CLS	63	1	-	R100	-	F	E
Type	Size(Inch)	Power Rting		Nominal Resistance		Tolerance	Packaging
Metal Alloy Low-Resistance Resistor	32(1206) 40(1210) 50(2010) 63(2512) 27(2725) 28(2728) 45(4527) 45S(4527S)	A=0.5W 1=1.0W B=1.5W 2=2.0W 3=3.0W D=3.5W 4=4.0W 5=5.0W		Resistor	Resistance (4~6 Digit) EX: R001 = 1mΩ R010 = 10mΩ R100 = 100mΩ R00025 = 0.25mΩ	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

3. RATING

3.1. Rated Power

3.1.1 Resistor Rated Power

Type	Max. Rating Power	Max. Rating Current	Max. Overload Current
CLS32	0.5W	$Ir=\sqrt{P/R}$	$Io=\sqrt{5P/R}$
	1W		
	1.5W		
	2W		
CLS40	1.5W		
CLS50	1W		
	1.5w		
	2W		
CLS63	1W		
	1.5W		
	2W		
	3W		
CLS27	4W		
	5W		
CLS28	3W		
	3.5W		
	4W		
CLS45S (without heat sink)	2W		
	3W		
	5W		
CLS45	5W		

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:

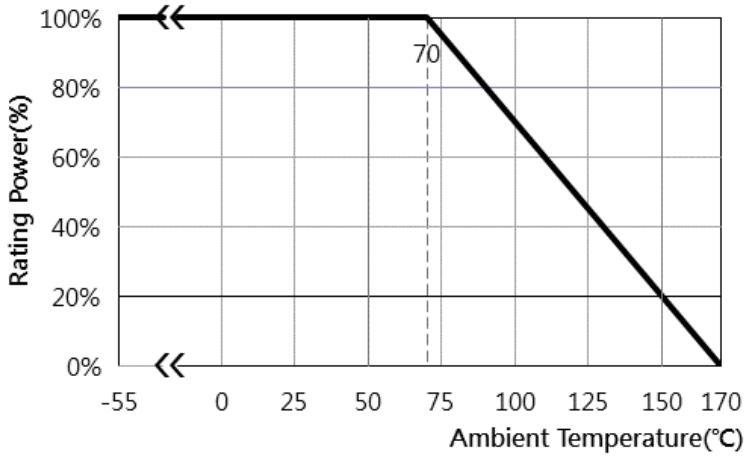


Fig.1 Power Derating Characteristics

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)		Operating Temperature Range
						D (±0.5%)	F (±1%) G (±2%) J (±5%)	
1206	2	0.5W	$Ir=\sqrt{P/R}$	$Io=\sqrt{5P/R}$	0.5~0.6 mΩ: ≦±175 1~1.5 mΩ: ≦±75 2~4 mΩ: ≦±75 5~15 mΩ: ≦±75 15.1~50 mΩ: ≦±50	5 ~ 50	0.5 ~ 50	-55~170°C
		1W			0.5~0.6 mΩ: ≦±175 1~1.5 mΩ: ≦±75 2~4 mΩ: ≦±75 5~15 mΩ: ≦±75 15.1~50 mΩ: ≦±50	5 ~ 50	0.5 ~ 50	
		1.5W			0.5~0.6 mΩ: ≦±175 1~1.5 mΩ: ≦±75 2~4 mΩ: ≦±75 5 mΩ: ≦±75	5	0.5 ~ 5	
		2W			0.5~0.6 mΩ: ≦±175 1~1.5 mΩ: ≦±75 2~4 mΩ: ≦±75 5 mΩ: ≦±75	5	0.5 ~ 5	
1210		1.5W			2~10 mΩ: ≦±75	2 ~10	2 ~ 10	
2010		1W			0.5~0.9 mΩ: ≦±100 1~1.9 mΩ: ≦±75 2~6.9 mΩ: ≦±50 7~100 mΩ: ≦±25	7 ~ 49	0.5~100	
		1.5W			0.5~0.9 mΩ: ≦±100 1~1.9 mΩ: ≦±75 2~6.9 mΩ: ≦±50 7~40 mΩ: ≦±25	7 ~ 40	0.5~40	
		2W			0.5~0.9 mΩ: ≦±100 1~1.9 mΩ: ≦±75 2~6.9 mΩ: ≦±50 7~12 mΩ: ≦±25	7 ~ 12	0.5~12	
2512	2	1W			0.3 mΩ: ≦±150 0.5~0.7 mΩ: ≦±75 0.75 mΩ: ≦±75 0.8~1 mΩ: ≦±75 1.1~3 mΩ: ≦±50 3.1~100 mΩ: ≦±25 101~300 mΩ: ≦±50 301~500 mΩ: ≦±50	1 ~ 50	0.3 ~ 500	
		1.5W			0.3 mΩ: ≦±150 0.5~0.7 mΩ: ≦±75 0.75 mΩ: ≦±75 0.8~1 mΩ: ≦±75 1.1~3 mΩ: ≦±50 3.1~100 mΩ: ≦±25 101~220 mΩ: ≦±50	1 ~ 50	0.3 ~ 220	

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%) G (±2%) J (±5%)	
2512	2	2W	$Ir=\sqrt{P/R}$	$Io=\sqrt{5P/R}$	0.3 mΩ: ≦±150 0.5~0.7 mΩ: ≦±75 0.75 mΩ: ≦±75 0.8~1 mΩ: ≦±75 1.1~3 mΩ: ≦±50 3.1~75 mΩ: ≦±25 80~100 mΩ: ≦±25 101~150 mΩ: ≦±50 151~299 mΩ: ≦±75 300~500 mΩ: ≦±50	1 ~ 50	0.3 ~ 500	
		3W			0.3 mΩ: ≦±150 0.5~0.7 mΩ: ≦±75 0.75 mΩ: ≦±75 0.8~1 mΩ: ≦±75 1.1~2.5 mΩ: ≦±50 2.6~10 mΩ: ≦±25 50~150 mΩ: ≦±50	1 ~ 10	0.3 ~ 10 50 ~ 150	
2725		4W			0.20 mΩ: ≦±100 0.25~3 mΩ: ≦±50	--	0.20 ~ 3	
		5W			0.20 mΩ: ≦±100 0.25~0.5 mΩ: ≦±50	--	0.20 ~ 0.5	
2728		3W			4~200 mΩ: ≦±25	4 ~ 19	4 ~ 200	
		3.5W			4~100 mΩ: ≦±25	4 ~ 19	4 ~ 100	
		4W			4~80 mΩ: ≦±25	4 ~ 19	4 ~ 80	
4527S (without heat sink)		2W			0.5 mΩ: ≦±75 0.6~1 mΩ: ≦±75 1.1~3 mΩ: ≦±50 4~5 mΩ: ≦±50 5.1~200 mΩ: ≦±50	7 ~ 100	0.5 ~ 200	
		3W			0.5 mΩ: ≦±75 0.6~1 mΩ: ≦±75 1.1~3 mΩ: ≦±50 4~5 mΩ: ≦±50 5.1~27 mΩ: ≦±50	7 ~ 27	0.5 ~ 27	
		5W			0.5 mΩ: ≦±75 0.6~1 mΩ: ≦±75 1.1~3 mΩ: ≦±50 4~5 mΩ: ≦±50 5.1~7.5 mΩ: ≦±50	7 ~ 7.5	0.5~7.5	
4527		5W			0.5 mΩ: ≦±75 0.6~1 mΩ: ≦±75 1.1~3 mΩ: ≦±50 4~5 mΩ: ≦±50 5.1~200 mΩ: ≦±50	7 ~ 120	0.5 ~ 200	

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 FOMAT

4.1 Product resistance is indicated by using two marking notation style:

a. "R" designates the decimal location in ohm, 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 Numeric Numbering

4.2.1 CLS32 Series: (4 digits marking)

4.2.1.1 Above 1.0mΩ & 0.3mΩ

→ Ex. Resistance 10mΩ (for all CLS32 products)

4.2.2 0.5~0.6 mΩ:(Square marking)
Recognize Top/Bottom side

4.2.2.1 CLS40 series: (4 digits marking)

→ Ex. Resistance 7mΩ

4.2.3 CLS50 Series: (4 digits marking)

→ Ex. Resistance 0.5mΩ (when resistance below than 1mΩ)

→ Ex. Resistance 2mΩ (when resistance below or equal than 3mΩ)

Ex. Resistance 5mΩ (when resistance greater than 3mΩ)

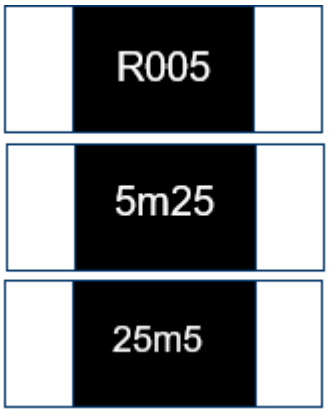
4.2.4 CLS63 Series: (3 digits marking / 4 digits marking)

4.2.4.1 ≦4.0mΩ (3-digits marking)

Ex. Resistance 0.5mΩ

Ex. Resistance 4mΩ

4.2.4.2 ＞4.0mΩ (4-digits marking)



Ex. Resistance 5mΩ

Ex. Resistance 5.25mΩ

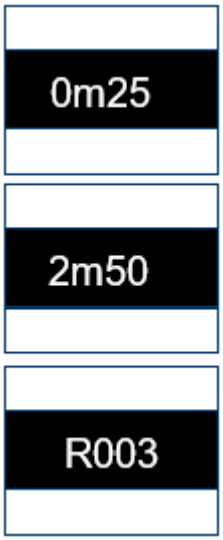
Ex. Resistance 25.5mΩ

4.2.5 CLS63 Series 2 Watts, 80 ~ 100 mΩ (4-digits marking)

Ex. Resistance 80mΩ

Ex. Resistance 100mΩ

4.2.6 CLS27 Series: (4-digits marking)

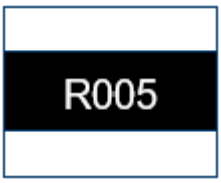


Ex. Resistance 0.25mΩ (or 0.25mΩ only)

Ex. Resistance 2.5mΩ (for 1.5mΩ and 2.5mΩ only)

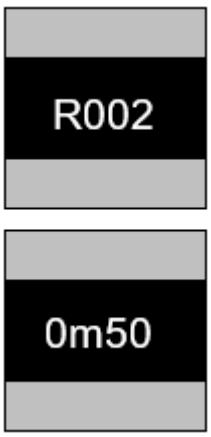
Ex. Resistance 3mΩ (for 1m、2m and 3mΩ only)

4.2.7 CLS28 Series: (4 digits marking)



Ex. Resistance 5mΩ (for all CLS28 products)

4.2.8 CLS45 Series: (4 digits marking)



Ex: Resistance 2mΩ.

Ex: Resistance 0.5mΩ.

4.2.8 CLS45S Series: (4 digits marking)

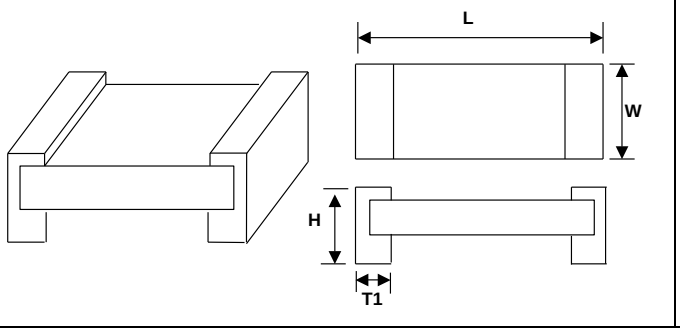
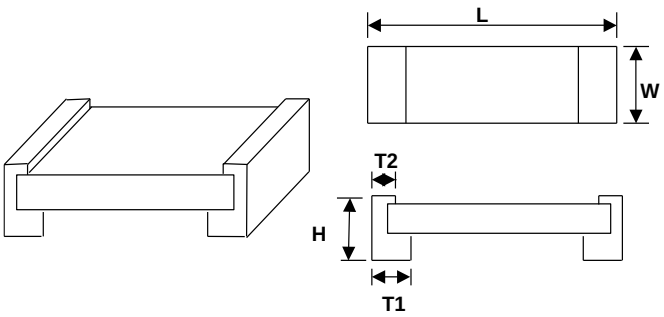
→ Ex: Resistance 2mΩ.

→ Ex: Resistance 0.5mΩ.

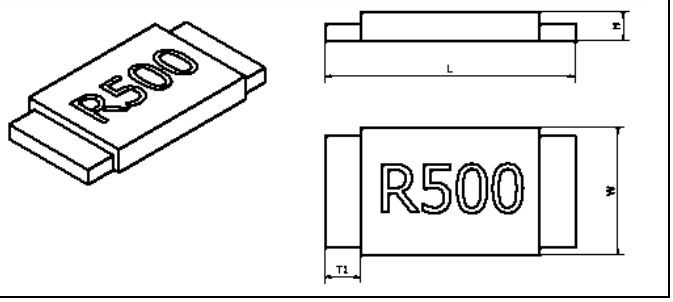
4.3 Marking Style

Marking / Type	R	m	1	2	3	4	5	6	7	8	9	0
CLS32 CLS40 CLS50 CLS63 CLS27 CLS28 CLS45 CLS45S												

5. DIMENSION

CLS32 / CLS40 / CLS50 / CLS63 / CLS27 / CLS28	CLS45 / CLS45S
	

CLS63 (2W) 101mR~500mR
CLS63 (3W) 50mR~150mR



Type	Power Rating (Watts)	Resistance Range (mΩ)	Dimensions - in inches (millimeters)				
			L	W	H	T1	T2
CLS32	0.5 1	0.5 ~ 0.6	0.126±0.010 (3.200±0.254)	0.063±0.010 (1.600±0.254)	0.039±0.010 (1.000±0.254)	0.029±0.010 (0.725±0.254)	
		1 ~ 1.5			0.025±0.010 (0.645±0.254)	0.020±0.010 (0.508±0.254)	
		2 ~ 4			0.022±0.010 (0.545±0.254)		
		5				0.024±0.010 (0.600±0.254)	
		6 ~ 50				0.020±0.010 (0.508±0.254)	
	1.5 2	0.5 ~ 0.6			0.039±0.010 (1.000±0.254)	0.029±0.010 (0.725±0.254)	
		1.0 ~ 1.5			0.025±0.010 (0.645±0.254)	0.020±0.010 (0.508±0.254)	
		2. ~ 4			0.022±0.010 (0.545±0.254)		
		5				0.024±0.010 (0.600±0.254)	
CLS40	1.5	2 ~ 10	0.126±0.010 (3.20±0.254)	0.100±0.010 (2.54±0.254)	0.035±0.010 (0.88±0.254)	0.024±0.010 (0.60±0.254)	
CLS50	1 1.5 2	0.5 ~ 0.9	0.200±0.010 (5.080±0.254)	0.100±0.010 (2.540±0.254)	0.031±0.010 (0.787±0.254)	0.057±0.010 (1.440±0.254)	
		1 ~ 3				0.051±0.010 (1.295±0.254)	

Type	Power Rating (Watts)	Resistance Range (mΩ)	Dimensions - in inches (millimeters)				
			L	W	H	T1	T2
		3.1 ~ 4			0.025±0.010 (0.645±0.254)	0.031±0.010 (0.787±0.254)	
		4.1 ~100					
CLS63	1	0.3	0.246±0.010 (6.248±0.254)	0.126±0.010 (3.202±0.254)	0.040±0.010 (1.000±0.254)	0.079±0.010 (2.02±0.254)	
		0.5 ~ 0.7			0.031±0.010 (0.787±0.254)	0.079±0.010 (2.02±0.254)	
		0.75				0.054±0.010 (1.374±0.254)	
		0.8 ~ 3				0.074±0.010 (1.880±0.254)	
		3.1 ~ 4				0.074±0.010 (1.880±0.254)	
		4.1 ~79			0.025±0.010 (0.645±0.254)	0.044±0.010 (1.118±0.254)	
		80~ 200				0.034±0.010 (0.868±0.254)	
		201 - 300			0.0236±0.010 (0.600±0.254)	0.034±0.010 (0.868±0.254)	
		301 ~ 500			0.0283±0.010 (0.720±0.254)		
	1.5	0.3	0.246±0.010 (6.248±0.254)	0.126±0.010 (3.202±0.254)	0.040±0.010 (1.000±0.254)	0.079±0.010 (2.02±0.254)	
		0.5 ~ 0.7			0.031±0.010 (0.787±0.254)	0.079±0.010 (2.02±0.254)	
		0.75				0.054±0.010 (1.374±0.254)	
		0.8 ~ 3				0.074±0.010 (1.880±0.254)	
		3.1 ~ 4				0.074±0.010 (1.880±0.254)	
		4.1 ~ 79			0.025±0.010 (0.645±0.254)	0.044±0.010 (1.118±0.254)	
		80 ~ 200				0.034±0.010 (0.868±0.254)	
		201 ~ 220			0.0236±0.010 (0.600±0.254)	0.034±0.010 (0.868±0.254)	
	2	0.3			0.040±0.010 (1.000±0.254)	0.079±0.010 (2.02±0.254)	
		0.5 ~ 0.7			0.031±0.010 (0.787±0.254)	0.079±0.010 (2.02±0.254)	
		0.75				0.054±0.010 (1.374±0.254)	
		0.8 ~ 3				0.074±0.010 (1.880±0.254)	
		3.1 ~ 4				0.074±0.010 (1.880±0.254)	
		4.1 ~ 75			0.025±0.010 (0.645±0.254)	0.044±0.010 (1.118±0.254)	
		80 ~ 100				0.024±0.010 (0.624±0.254)	
		101 ~ 500			0.0283±0.010 (0.720±0.254)	0.034±0.010 (0.868±0.254)	
	3	0.3			0.040±0.010 (1.000±0.254)	0.079±0.010 (2.02±0.254)	
		0.5			0.031±0.010 (0.787±0.254)	0.079±0.010 (2.02±0.254)	

Type	Power Rating (Watts)	Resistance Range (mΩ)	Dimensions - in inches (millimeters)				
			L	W	H	T1	T2
		0.6 ~ 0.7				0.074±0.010 (1.880±0.254)	
		0.75				0.054±0.010 (1.374±0.254)	
		0.8 ~ 2.9				0.044±0.010 (1.118±0.254)	
		3 ~ 3.5				0.074±0.010 (1.880±0.254)	
		3.6 ~ 4				0.066±0.010 (1.676±0.254)	
CLS63	3	4.1~10	0.246±0.010 (6.248±0.254)	0.126±0.010 (3.202±0.254)	0.025±0.010 (0.645±0.254)	0.044±0.010 (1.118±0.254)	
		50~150			0.0283±0.010 (0.720±0.254)	0.034±0.010 (0.868±0.254)	
CLS27	4	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 (1.90±0.254)	
		0.4 ~ 0.45				0.051±0.010 (1.30±0.254)	
		0.5				0.085±0.010 (2.159±0.254)	
		0.6				0.071±0.010 (1.803±0.254)	
		0.75				0.059±0.010 (1.504±0.254)	
		1	0.268±0.010 (6.807±0.254)	0.254±0.010 (6.452±0.254)	0.043±0.010 (1.092±0.254)	0.085±0.010 (2.159±0.254)	
		1.5			0.039±0.010 (0.991±0.254)		
		2			0.035±0.010 (0.889±0.254)	0.071±0.010 (1.803±0.254)	
		2.25 ~ 2.5				0.065±0.010 (1.651±0.254)	
		3				0.051±0.010 (1.30±0.254)	
	5	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 (1.90±0.254)	
		0.4 ~ 0.45				0.051±0.010 (1.30±0.254)	
		0.5				0.085±0.010 (2.159±0.254)	
CLS28	3	4 ~ 200	0.264±0.010 (6.706±0.254)	0.283±0.010 (7.188±0.254)	0.039±0.010 (0.991±0.254)	0.045±0.010 (1.143±0.254)	
	3.5	4 ~ 100					
	4	4 ~ 80					

Type	Power Rating (Watts)	Resistance Range (mΩ)	Dimensions - in inches (millimeters)				
			L	W	H	T1	T2
CLS45S (without heat sink)	2	0.5	0.450±0.010 (11.430±0.254)	0.270±0.010 (6.850±0.254)	0.055±0.010 (1.400±0.254)	0.136±0.010 (3.465±0.254)	0.038±0.010 (0.965±0.254)
		0.6 ~ 3				0.127±0.010 (3.215±0.254)	
		4 ~ 5					
		5.1 ~ 200				0.071±0.010 (1.815±0.254)	
	3	0.5				0.136±0.010 (3.465±0.254)	
		0.6 ~ 3				0.127±0.010 (3.215±0.254)	
		4 ~ 5					
		5.1 ~ 27				0.071±0.010 (1.815±0.254)	
	5	0.5				0.136±0.010 (3.465±0.254)	
		0.6 ~ 3				0.127±0.010 (3.215±0.254)	
		4 ~ 5					
		5.1 ~ 7.5				0.071±0.010 (1.815±0.254)	
CLS45	5	0.5	0.450±0.010 (11.430±0.254)	0.270±0.010 (6.850±0.254)	0.059±0.010 (1.500±0.254)	0.136±0.010 (3.465±0.254)	0.038±0.010 (0.965±0.254)
		0.6 ~ 3				0.127±0.010 (3.215±0.254)	
		4 ~ 5				0.127±0.010 (3.215±0.254)	
		5.1 ~ 200				0.071±0.010 (1.815±0.254)	

5.1 Material of Alloy

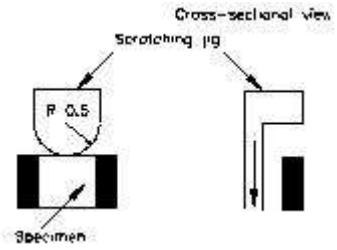
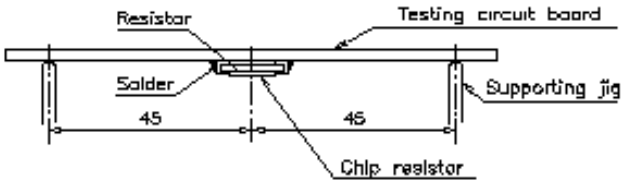
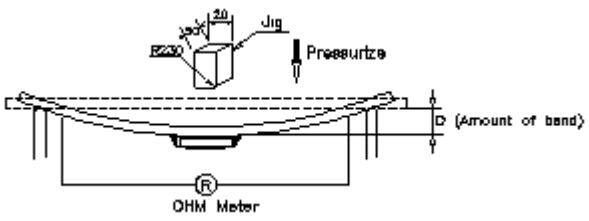
Type	Watts	Material	Resistance(R)
CLS32	0.5 1.0 1.5 2.0	Copper-Manganese Alloy	≦4.0mΩ
		Iron-Chromium Aluminium Alloy	＞4.0mΩ
CLS40	1.5	Copper-Manganese Alloy	≦2.0mΩ
		Iron-Chromium Aluminium Alloy	＞2.0mΩ
CLS50	1.0 1.5 2.0	Copper-Manganese Alloy	≦4.0mΩ
		Iron-Chromium Aluminium Alloy	＞4.0mΩ
CLS63	1.0	Copper-Manganese Alloy	＜3.5mΩ
		Iron-Chromium Aluminium Alloy	3.5 mΩ≦R≦500mΩ
	1.5	Copper-Manganese Alloy	＜3.5mΩ
		Iron-Chromium Aluminium Alloy	3.5 mΩ≦R≦220mΩ
	2.0	Copper-Manganese Alloy	＜3.5mΩ
		Iron-Chromium Aluminium Alloy	3.5 mΩ≦R≦100mΩ
		Nickel-Copper Alloy	101 mΩ≦R≦150mΩ
		Nickel-Chromium Aluminium Alloy	151 mΩ≦R≦299mΩ
		Iron-Chromium Aluminium Alloy	300 mΩ≦R≦500mΩ
	3.0	Copper-Manganese Alloy	≦2.5mΩ
		Iron-Chromium Aluminium Alloy	3mΩ≦R≦10mΩ
		Nickel-Copper Alloy	50mΩ≦R≦150mΩ
CLS27	4.0 5.0	Copper-Manganese Alloy	≦0.5mΩ
		Iron-Chromium Aluminium Alloy	＞0.5mΩ
CLS28	3.0 3.5 4.0	Iron-Chromium Aluminium Alloy	All
CLS45	2.0 3.0 5.0	Copper-Manganese Alloy	≦3.0mΩ
		Iron-Chromium Aluminium Alloy	≧4.0mΩ

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 rowspan="2">Short Time Overload</td><td rowspan="2">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 rowspan="4">CLS32</td><td>0.5</td><td rowspan="4">5 times</td></tr>
<tr><td>1.0</td></tr>
<tr><td>1.5</td></tr>
<tr><td>2.0</td></tr>
<tr><td>CLS40</td><td>1.5</td><td>5 times</td></tr>
<tr><td rowspan="3">CLS50</td><td>1.0</td><td rowspan="3">5 times</td></tr>
<tr><td>1.5</td></tr>
<tr><td>2.0</td></tr>
<tr><td rowspan="4">CLS63</td><td>1.0</td><td rowspan="4">5 times</td></tr>
<tr><td>1.5</td></tr>
<tr><td>2.0</td></tr>
<tr><td>3.0</td></tr>
<tr><td rowspan="2">CLS27</td><td>4.0</td><td>5 times</td></tr>
<tr><td>5.0</td><td>5 times</td></tr>
<tr><td rowspan="3">CLS28</td><td>3.0</td><td rowspan="7">5 times</td></tr>
<tr><td>3.5</td></tr>
<tr><td>4.0</td></tr>
<tr><td rowspan="3">CLS45S</td><td>2.0</td></tr>
<tr><td>3.0</td></tr>
<tr><td>5.0</td></tr>
<tr><td>CLS45</td><td>5.0</td></tr>
</table></td><td>≦±0.5%
≦±2.0% (CLS45 & CLS45S series)</td></tr>
<tr><td></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>≧$10^9\Omega$</td></tr>
<tr><td>Dielectric Withstanding Voltage</td><td>Refer to JIS-C5201-1 4.7
Applied 500VAC 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
Resistance to Solder Heat	***Refer to JIS-C5201-1 4.18*** 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.	≦±0.5% No evidence of mechanical damage
Solderability	***Refer to JIS-C5201-1 4.17*** Add flux into tested resistors, immersion into solder bath in temperature 245±5°C for 3±0.5secs.	Solder coverage over 95%
Core Body Strength	***Refer to JIS-C5201-1 4.15*** Applied R0.5 test probe at its central part then pushing 5N force on the sample for 10 sec.	≦±0.5% No evidence of mechanical damage
Joint Strength of Solder	***Refer to JIS-C5201-1 4.32*** 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: ◎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  	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.
	Refer to JIS-C5201-1 4.33 ◎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  	
	 	

Test Item	Conditions of Test	Test Limits
Resistance to solvent	***Refer to JIS-C5201-1 4.29*** The tested resistor be immersed into isopropyl alcohol of 20~25℃ for 60secs, then the resistor is left in the room for 48 hrs.	≦±0.5% No evidence of mechanical damage
Vibration	***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)	≦±0.5% No evidence of mechanical damage

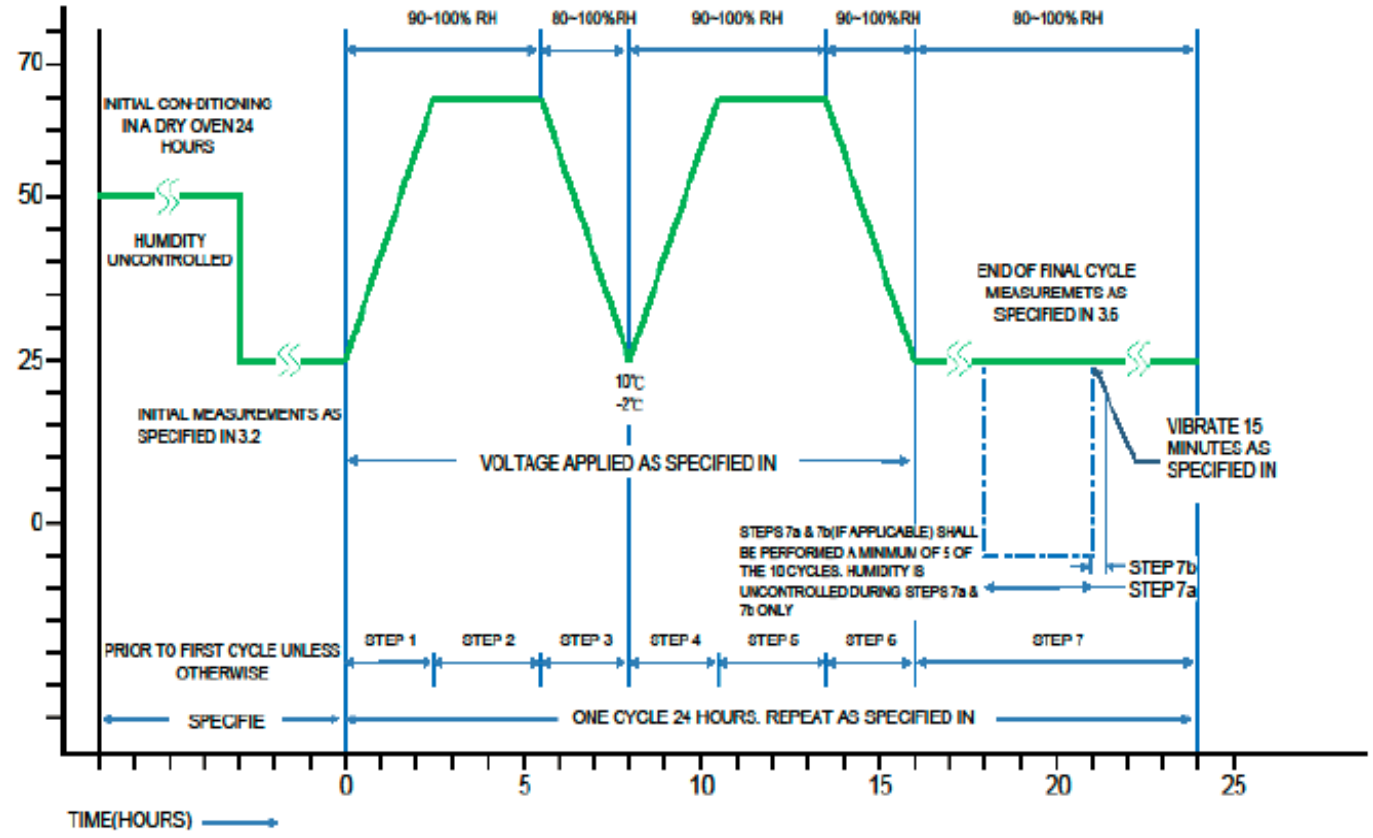
6.3 Environmental Test

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% ≦±1% for 2512(1W) 301~500MΩ ≦±1% for 2512(2W) 101~500mΩ ≦±1% for 2512(3W) 50~150mΩ 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.	≦±1.0% No evidence of mechanical damage
Temperature Cycling (Rapid Temperature Change)	***Refer to JESD22-A104*** 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℃ Dwell time: 30min maximum	≦±0.5% ≦±1% for 2512(1W) 301~500MΩ ≦±1% for 2512(2W) 101~500mΩ ≦±1% for 2512(3W) 50~150mΩ 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% ≦±1% for 2512(1W) 301~500MΩ ≦±1% for 2512(2W) 101~500mΩ ≦±1% for 2512(3W) 50~150mΩ No evidence of mechanical damage

<table>
<tr><th>Test Item</th><th>Conditions of Test</th><th>Test Limits</th></tr>
<tr><td>Bias Humidity</td><td>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.</td><td>≦±0.5%
≦±1% for 2512(1W) 301~500MΩ
≦±1% for 2512(2W) 101~500mΩ
≦±1% for 2512(3W) 50~150mΩ
No evidence of mechanical damage</td></tr>
<tr><td>Whisker Test</td><td>By JESD Standard NO.22A121 class 2.
◎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 sub-clause 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.</td><td>Max. 50μm</td></tr>
</table>

6.4 Operational Life Endurance

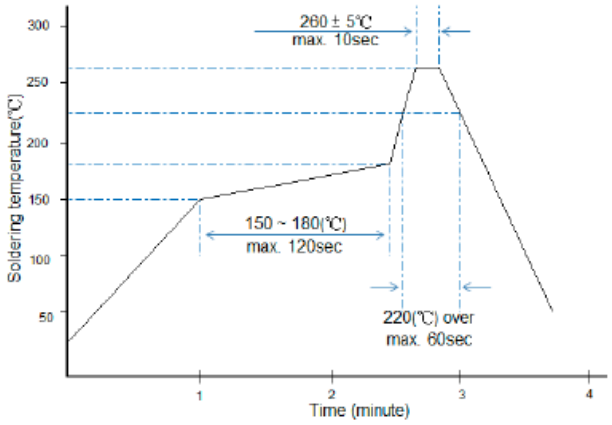
<table>
<tr><th>Test Item</th><th>Conditions of Test</th><th>Test Limits</th></tr>
<tr><td>Load Life</td><td>Refer to JIS-C5201-1 4.25
Put the tested resistor in chamber under temperature 70± 2℃ and load the rated current for 90 minutes on 30 minutes off, total 1000 hours. Then leaving the tested resistor in room temperature for 60 minutes, and measure its resistance variance rate.</td><td>≦±1.0%
≦±2.0% (CLS45 & CLS45S Sseries)
No evidence of mechanical damage</td></tr>
</table>


90~100% RH
80~100%RH
90~100% RH
90~100%RH
80~100% RH
70
50
25
0
INITIAL CONDITIONING IN A DRY OVEN 24 HOURS
HUMIDITY UNCONTROLLED
END OF FINAL CYCLE MEASUREMETS AS SPECIFIED IN 3.5
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 MINIMUN 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)

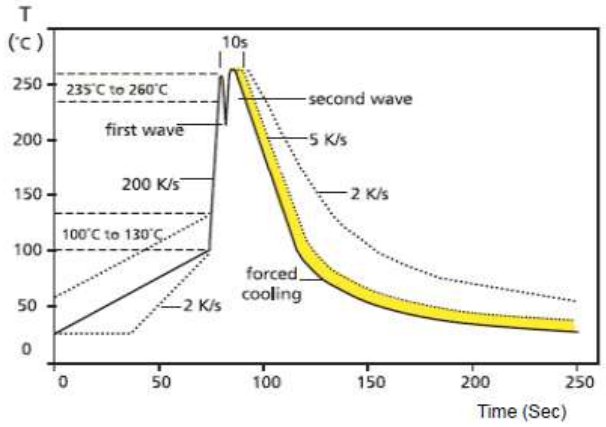
6.5 Soldering Profile

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



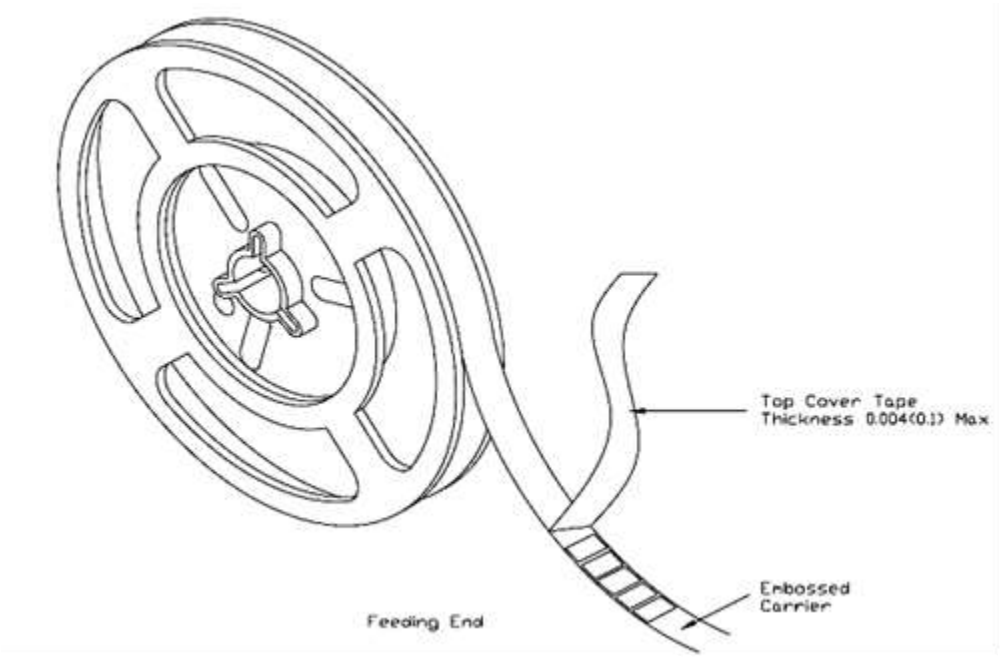
Recommended Wave Soldering Profile
Typical values (solid line)
Process limits (dotted line)

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

7. TAPING

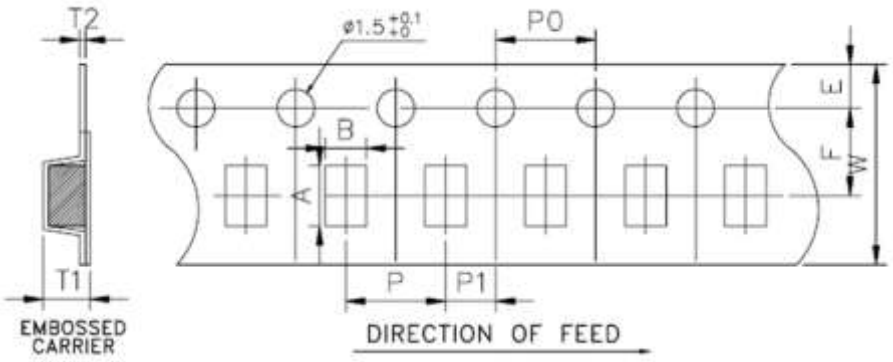
7.1 Structure of Taping

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
CLS32 (0.5~0.6mΩ)	3.50±0.10	1.90±0.10	8.0±0.15	1.75±0.10	3.5±0.10	1.27±0.10	0.23±01.0	4.0±0.10	4.0±0.10	40.0±0.20	2.0±0.10
CLS32 (≥1.0mΩ)	3.48±0.10	1.83±0.10	8.0±0.15	1.75±0.10	3.5±0.10	1.10±0.10	0.20±0.05	4.0±0.10	4.0±0.10	40.0±0.20	2.0±0.10
CLS40	3.5±0.1	3.0±0.1	8.0±0.2	1.75±0.1	3.5±0.1	1.10±0.1	0.22±0.05	4.0±0.1	4.0±0.1	40.0±0.2	2.0±0.1
CLS50	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
CLS63 (0.3mΩ)	6.74±0.10	3.50±0.10	12.0±0.15	1.75±0.10	5.5±0.10	1.60±0.10	0.24±0.05	8.0±0.10	4.0±0.10	40.0±0.20	2.0±0.10
CLS63	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
CLS27	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
CLS28	7.15±0.10	7.70±0.10	12.0±0.15	1.75±0.10	5.5±0.10	1.45±0.10	0.25±0.05	12.0±0.10	4.0±0.10	40.0±0.20	2.0±0.10
CLS45	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
CLS45S	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

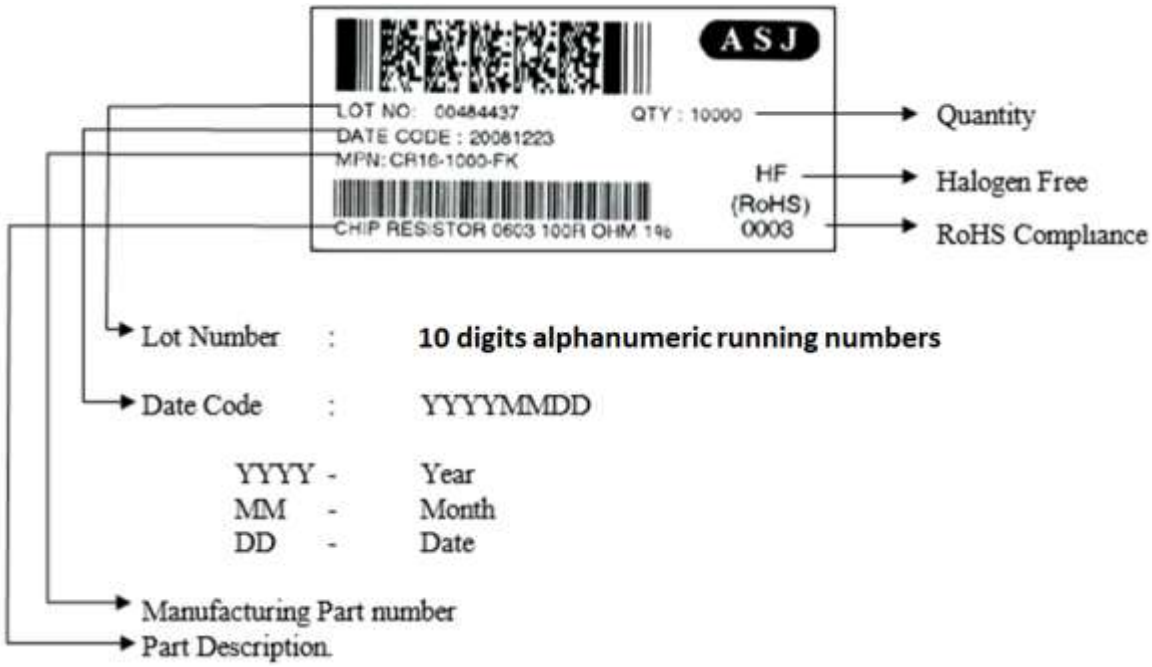
7.3.1 Taping

7.3.1.1 Quantity - Tape and Reels

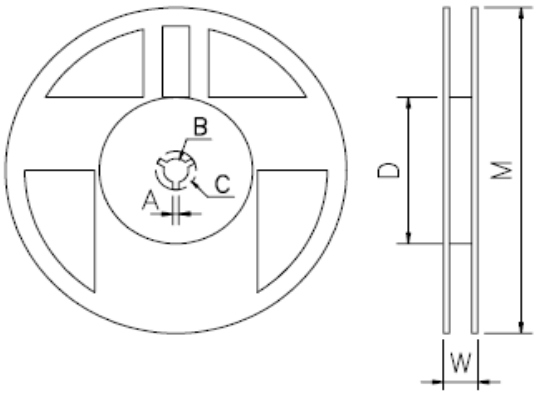
Type	Tape Width	Packaging Quantity(pcs/reel)		
		Emboss Plastic Type		
		4 mm Pitch	8 mm Pitch	12 mm Pitch
CLS32(0.5~0.6mΩ)	8 mm	2,000 pcs	---	---
CLS32(≥1.0mΩ)		4,000 pcs		
CLS40	8mm	4,000 pcs	---	---
CLS50	12 mm	2,000/4,000 pcs	---	---
CLS63(0.3mΩ)		---	1,000 pcs	---
CLS63		4,000 pcs	---	---
CLS27		---	1,000 pcs	---
CLS28		---	---	1,000 pcs
CLS45 CLS45S	24 mm	---	---	500 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

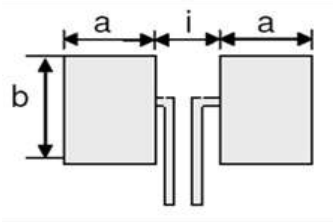


Unit: mm

Reel Type / Tape	W	M	A	B	C	D
7" reel for 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
7" reel for 12 mm tape	13.8 ± 0.5					80.0 ± 1.0
7" reel for 24 mm tape	25.0 ± 1.0			13.2 ± 0.5	17.7 ± 0.5	60.0 ± 1.0

8. RECOMMENDED LAND PATTERN

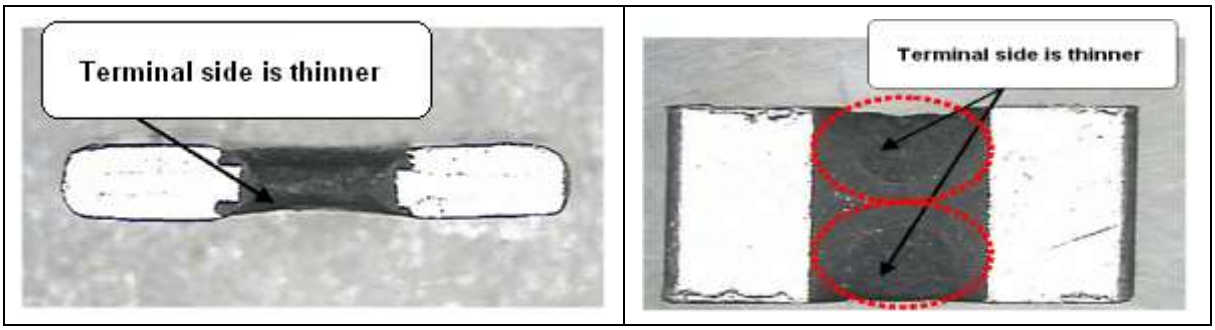
When a component is soldered, the resistance after soldering changes slightly depending on the size of the soldering area and the amount of soldering. When designing a circuit, it is necessary to consider the effect of a decrease or increase in its resistance.



Type	Maximum Power Rating (Watts)	Resistance Range (mΩ)	Dimensions - in millimeters		
			a	b	i
CLS32	0.5 & 1 & 1.5 & 2	0.5 ~ 0.6	1.65	2.18	0.90
		1 ~ 50	1.60		1.00
CLS40	1.5	2 ~ 10	1.25	2.92	1.70
CLS50	1 & 1.5 & 2	0.5 ~ 3	2.89	2.92	1.22
		3.1 ~ 100	2.29		2.41
CLS63	1	0.3 ~ 0.7	3.05	3.68	1.27
		0.8 ~ 4			
		0.75	2.19		3.00
		4.1 ~ 300	2.11		3.18
		301 ~ 500	2.11		3.18
	1.5	0.3 ~ 0.7	3.05		1.27
		0.8 ~ 4			
		0.75	2.19		3.00
		4.1 ~ 220	2.11		3.18
	2	0.3 ~ 0.7	3.05		1.27
		0.8 ~ 4			
		0.75	2.19		3.00
		4.1 ~ 75	2.11		3.18
		80 ~ 500	2.11		3.18
	3	0.3 ~ 0.5	3.05		1.27
		0.6 ~ 2.9	2.19		3.00
		4.1 ~ 10			
		3 ~ 4	2.79		1.80
		50~150	2.11		3.18
CLS27	4 & 5	0.2 ~ 3	3.18	6.86	1.32
CLS28	3	4 ~ 200	2.75	7.82	3.51
	3.5	4 ~ 100			
	4	4 ~ 80			
CLS45S	2	0.5 ~ 5	5.80	8.74	3.51
		5.1 ~ 200	4.15		6.81
	3	0.5 ~ 5	5.80		3.51
		5.1 ~ 27	4.15		6.81
	5	0.5 ~ 5	5.80		3.51
		5.1 ~ 7.5	4.15		6.81
CLS45	5	0.5 ~ 5	5.80	8.74	3.51
		5.1 ~ 200	4.15		6.81

8.1 Recommended Dispensing Method

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 (as photo 1). Therefore, we suggest customer to narrow down the dispenser gap (as photo 2), or dispenser on the body center (as photo 3)

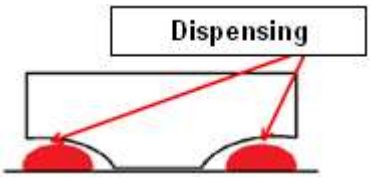
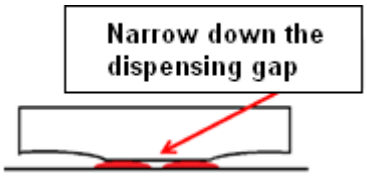
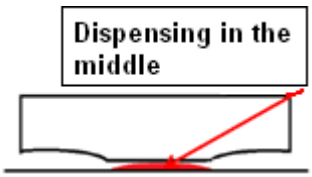
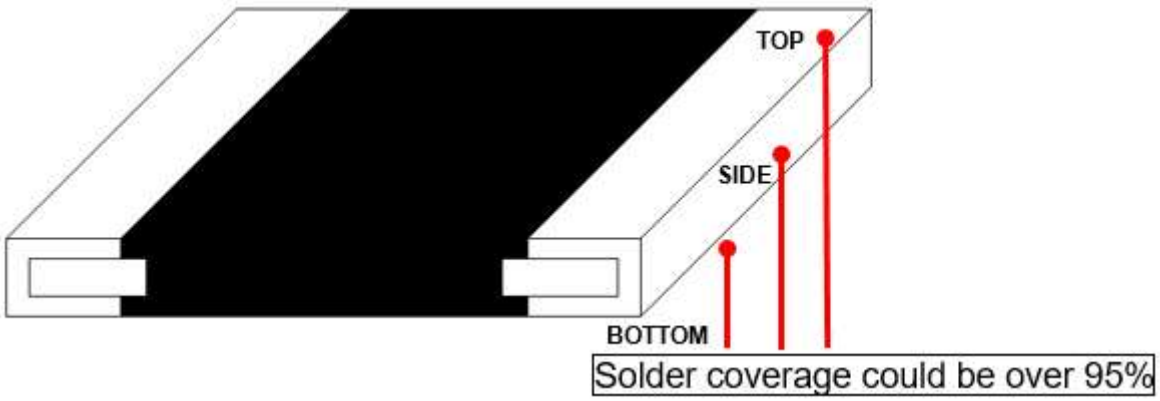
		

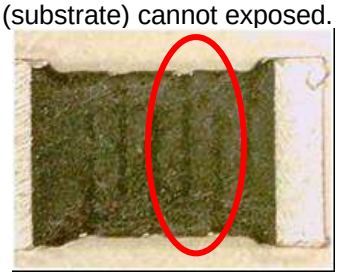
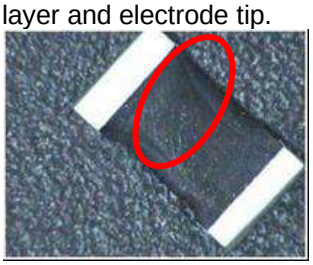
Photo 1	Photo 2	Photo 3

8.1.3 Product Warranted solder area



8.1.4 Appearance

The metal alloy need more punch for product, appearance of the product are listed below :

Illustration of qualified protective layer	Illustration of abnormal protective layer
a. Punch mark is allowed but raw material (substrate) cannot exposed.  b. Without cracks are found on the protective layer when looking at product under naked eyes at a distance of 30 cm.  c. Dent is allowed at the joining point of protective layer and electrode tip.  d. Bulging appearance (bulging degree should not exceed height of electrode tip) is allowed at the joining point of protective layer and electrode tip. 	a. Substance is not to have any fractures that would expose itself. 

9. REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version.1	13.02.2015		Initial Release
Version.2	23.07.2015		TCR spec update
Version.3	06.09.2016		Update clause 2, Part Numbering System Update clause 3.1.1, Resistor Rated Power Table Update clause 3.1.2, Power Derating Curve Update clause 3.10, Resistance, Resistance Tolerance & TCR table Update clause 4.1, Numeric Numbering table Update clause 5, Dimension table Update clause 6.1, Elactrical Performance test Update clause 6.2, Mechanical Performance test Update clause 6.3, Environmental test Update clause 6.4, Operation Life Endurance test Update clause 7.2.1, Tape dimension Table Update clause 7.3.1.1, Tape and reels table Update clause 8, Land Pattern table
Version.4	14.10.2016		Typo error in clause 2
Version.5	08.08.2017		Update clause 3.1.1 Resistor Rated Power Update clause 3.10 Resistance, Resistance Tolerance and Temperature Coefficient of Resistance Update clause 5 Dimension
Version.6	05.12.2017	Refer to ECN: G2017E045	Change marking of CLS63 4mΩ and below from 4 digit to 3 digit
Version.7	03.01.2019		Datasheet Update
Version.8	15.01.2019		Update clause 3.10 table Update clause 5 table Update clause 7.2.1 table Update clause 7.3.1.1 table Update clause 8 table
Version.9	05.03.2019		Update clause 2 Part Numbering System Update clause 3.1.1 table Update clause 3.10 table Update clause 5 dimension
Version.10	04.09.2019		Revise clause 3.9 Revise clause 5 dimension
Version.11	19.11.2019		Revise clause 3.10 TCR table Revise clause 5 dimension Add clause 6.5.2 Iron temperature Revise clause 8 dimension Add clause 8.1.4 Appearance
Version.12	24.09.2020		Add product CLS40 Revise clause 2 Part Numbering System Revise clause 3.5 Revise clause 3.10 TCR table Add clause 4.2.2.1 CLS40 marking Revise clause 4.3 Marking Style Revise clause 5 Dimension table Revise clause 5.1 Material of alloy table Revise clause 6.1 item Short time overload Revise clause 7.2.1 Tape dimension table Revise clause 7.3.1.1 tape and reel qty table Revise clause 8 Land Pattern dimension table

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version.13	07.03.2023		Revise clause 3.7 Product Assurance. Revise clause 3.9 table, Resistance Range.
Version 14	16.05.2023		Add CLS63 1W 301~500mΩ, 2W 80~100mΩ and 2W 300~500mΩ related specifications and Resistance Range 1~6mΩ for resistance tolerance ±0.5%. Revise clause 3.9 Resistance, Resistance Tolerance and Temperature Coefficient of Resistance Revise clause 5 Dimension Revise clause 6.3 Environmental Test Revise clause 8 Recommended Land Pattern Add clause 4.2.5 CLS63 Series 2 Watts, 80 ~ 100 mΩ (4-digits marking)
Version 15	07.07.2023		Revise clause 4.2.4.2 ＞4.0mΩ (4-digits marking) Revise clause 5 Dimension CLS63 (2W) 300mR~500mR schematic diagram Revise clause 5 table, CLS63 1W, 1.5W resistance range
Version 16	14.08.2023		Revise clause 3.1.1 Resistor Rated Power table Revise clause 3.9 table Revise clause 8 Recommended Land Pattern table
Version 17	07.12.2023		Revise clause 3.9 table. Revise clause 5 Dimension drawing and table. Revise clause 5.1 Material of Alloy table. Revise clause 7.3.2 Identification. Revise clause 8 Recommended Land Pattern table. Revise clause 8.1.4 Appearance.

DATA SHEET

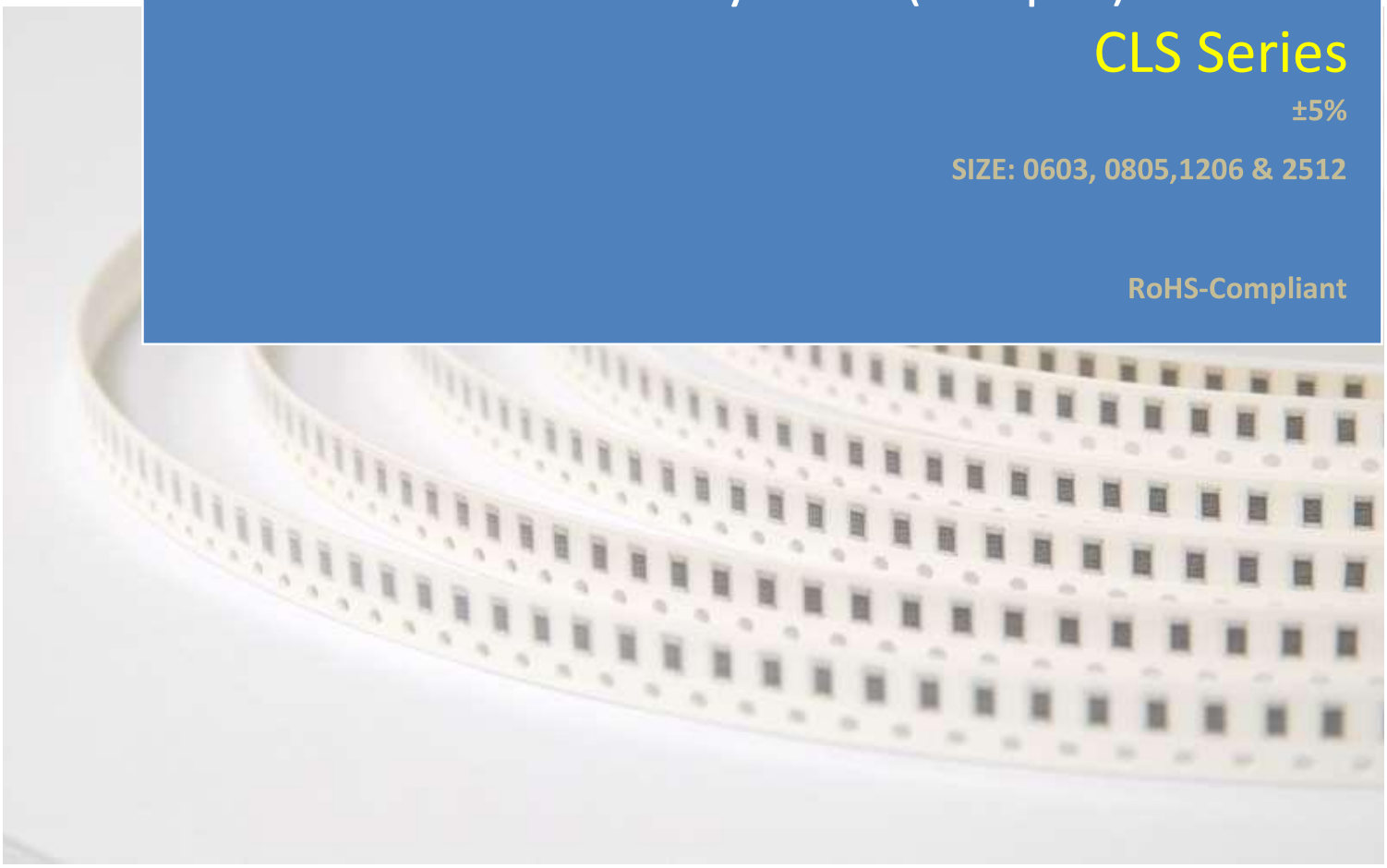
Metal Alloy 0mΩ (Jumper) Resistor

CLS Series

±5%

SIZE: 0603, 0805,1206 & 2512

RoHS-Compliant



1. SCOPE

1.1. This specification is applicable to Lead-free and Halogen-free for zero milli-ohm resistor (Jumper) series metal alloy product only.

1.2. The product is for general purpose.

2. PART NUMBERING SYSTEM

Part Numbering is made in accordance with the following system:

CLS	21	X	-	RXXX	-	J	L
Type	Size (Inch / mm)	Power Rating		Nominal Resistance		Resistance Tolerance	Packaging
Metal Alloy Low-Resistance Resistors	16(0603) 21(0805) 32(1206) 63(2512)	G = 0.25W A = 0.5W 1 = 1W 2 = 2W 3 = 3W		R000 = Below 0.2mΩ		J = ±5%	E = 4,000 pcs L = 5,000 pcs

3. RATING

3.1. Rated Power

3.1.1 Resistor Rated Power

Type	Number of Terminals	Rated Power at 70°C	Max Loading Current	Resistance (mΩ)
CLS16	2	$\frac{1}{4}$W	28.9A	<0.30
CLS21	2	$\frac{1}{2}$W	50.0 A	< 0.20
CLS32	2	$\frac{1}{2}$W	50.0 A	< 0.20
		1 W	70.7 A	< 0.20
CLS63	2	2 W	100.0 A	< 0.20
CLS63	2	3 W	122.5 A	< 0.20

3.2 Power Derating Curve

Operating Temperature Range: - 55 ~+150 ℃

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

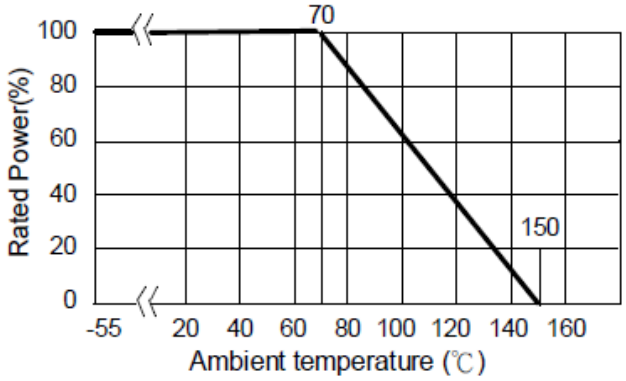


Fig.1 Power Derating Characteristics

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 +150°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.

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

3.10 Resistance, Resistance Tolerance and Temperature Coefficient of Resistance

Type	Number of Terminals	Rated Power at 70℃	Max Loading Current	Resistance (mΩ)	Operating Temperature Range
CLS16	2	$\frac{1}{4}$W	28.9A	<0.30	-55~+150°C
CLS21	2	$\frac{1}{2}$W	50.0 A	< 0.20	-55~+150°C
CLS32	2	$\frac{1}{2}$W	50.0 A	< 0.20	-55~+150°C
		1 W	70.7 A	< 0.20	-55~+150°C
CLS63	2	2 W	100.0 A	< 0.20	-55~+150°C
CLS63	2	3 W	122.5 A	< 0.20	-55~+150°C

3.11 Rated Current

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.

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

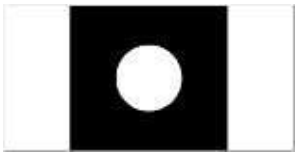
I=Rating Current(A)
P= Rating Power(W)
R=Resistance(Ω)

4. MARKING ON PRODUCT

The nominal resistance shall be marked on the surface of each resistor

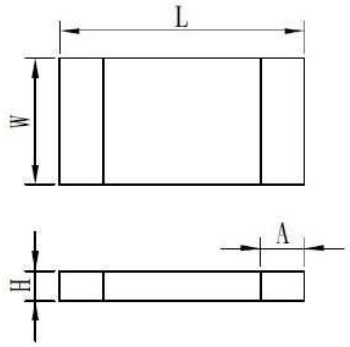
4.1 Numeric Numbering(All the products marking are 1 digit):-

4.1.1 Marking for 0805/0603 – 0mΩ



4.1.2 Marking for 1206 / 2512 - 0mΩ

5. DIMENSION



TYPE	Rated Power	Resistance Range(mΩ)	Dimensions(mm)			
			L	W	H	A
CLS16	$\frac{1}{4}$W	＜0.3	1.60±0.1	0.80±0.1	0.35±0.15	0.30±0.15
CLS21	$\frac{1}{2}$W	＜0.2	2.03±0.2	1.27±0.2	0.35±0.15	0.40±0.15
CLS32	$\frac{1}{2}$W 1 W	＜0.2	3.20±0.2	1.60±0.2	0.50±0.2	0.70±0.2
CLS63	2 W	＜0.2	6.35±0.2	3.05±0.2	0.60±0.2	1.40±0.2
CLS63	3 W	＜0.2	6.35±0.2	3.05±0.2	0.60±0.2	1.40±0.2

5.1 Plating Thickness
Ni ≥ 2 μm
Sn (Tin) ≥ 3 μm
Sn (Tin) : Matte Sn

6. RELIABILITY PERFORMANCE, CHARACTERISTICS AND TEST CONDITIONS

6.1 Electrical Performance Test

<table>
<tr><th>Test Item</th><th>Conditions of Test</th><th>Test Limits</th></tr>
<tr><td rowspan="2">Short Time Overload</td><td rowspan="2">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>CLS16</td><td>1/4</td><td rowspan="5">4 times</td></tr>
<tr><td>CLS21</td><td>1/2</td></tr>
<tr><td>CLS32</td><td>1/2
1.0</td></tr>
<tr><td>CLS63</td><td>2.0</td></tr>
<tr><td>CLS63</td><td>3.0</td></tr>
</table></td><td>CLS16 :≦0.3 mΩ
Others :≦0.2 mΩ</td></tr>
<tr><td>No evidence of mechanical damage</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>≧10^9Ω</td></tr>
<tr><td>Dielectric Withstanding Voltage</td><td>Refer to JIS-C5201-1 4.7
Applied 500VAC 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

<table>
<tr><th>Test Item</th><th>Conditions of Test</th><th>Test Limits</th></tr>
<tr><td rowspan="2">Resistance to Solder Heat</td><td rowspan="2">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>CLS16 :≦0.3 mΩ
Others:≦0.2 mΩ</td></tr>
<tr><td>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 rowspan="2">Vibration</td><td rowspan="2">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>CLS16:≦0.3 mΩ
Others:≦0.2 mΩ</td></tr>
<tr><td>No evidence of mechanical damage</td></tr>
<tr><td rowspan="2">Resistance to solvent</td><td rowspan="2">Refer to JIS-C5201-1 4.29
The tested resistor be immersed into isopropyl alcohol of 20~25℃ for 60secs, then the resistor is left in the room for 48 hrs.</td><td>CLS16:≦0.3 mΩ
Others:≦0.2 mΩ</td></tr>
<tr><td>No evidence of mechanical damage</td></tr>
</table>

6.3 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.	CLS16:≦0.3 mΩ Others:≦0.2 mΩ No evidence of mechanical damage
High Temperature Exposure (Storage)	***Refer to JIS-C5201-1 4.23.2*** Put tested resistor in chamber under temperature 150±5℃ for 1,000 hours. Then leaving the tested resistor in room temperature for 60 minutes, and measure its resistance variance rate.	CLS16:≦0.3 mΩ Others:≦0.2 mΩ 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} ℃	CLS16:≦0.3 mΩ Others:≦0.2 mΩ 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.	CLS16:≦0.3 mΩ Others:≦0.2 mΩ 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 voltage 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.	CLS16:≦0.3 mΩ Others:≦0.2 mΩ No evidence of mechanical damage

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 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. Refer to JIS-C5201-1 4.25	CLS16:≦0.3 mΩ Others:≦0.2 mΩ No evidence of mechanical damage

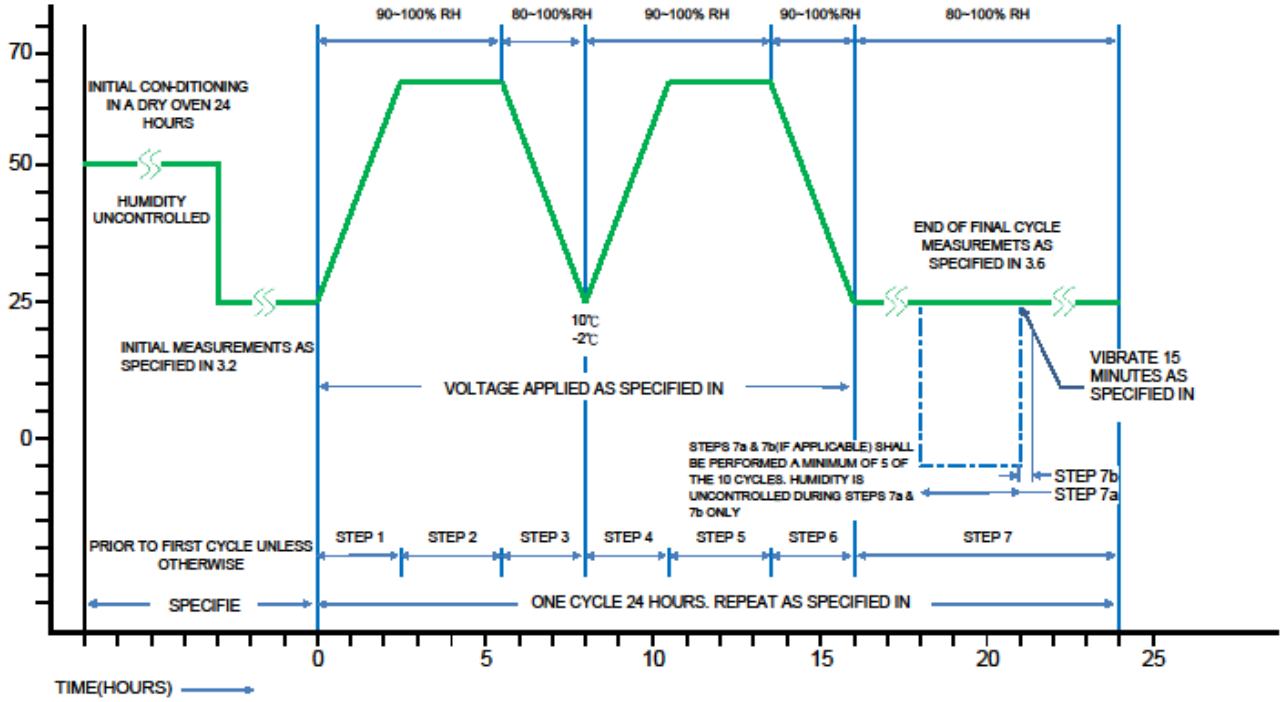
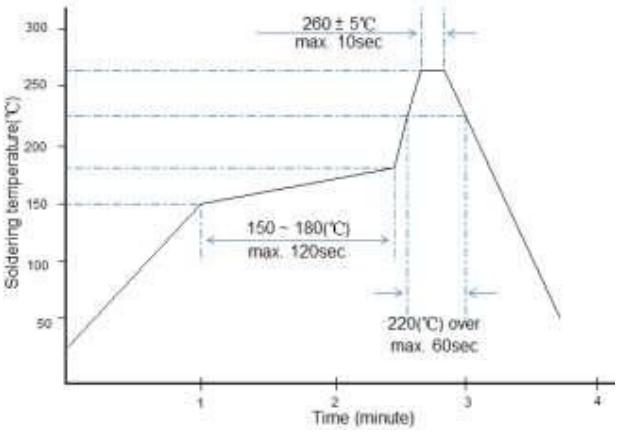

90~100% RH
80~100%RH
90~100% RH
90~100%RH
80~100% RH
70
50
25
0
INITIAL CON-DITIONING IN A DRY OVEN 24 HOURS
HUMIDITY UNCONTROLLED
END OF FINAL CYCLE MEASUREMETS AS SPECIFIED IN 3.6
10℃
-2℃
INITIAL MEASUREMENTS AS SPECIFIED IN 3.2
VOLTAGE APPLIED AS SPECIFIED IN
VIBRATE 15 MINUTES AS SPECIFIED IN
STEPS 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)

Figure 1

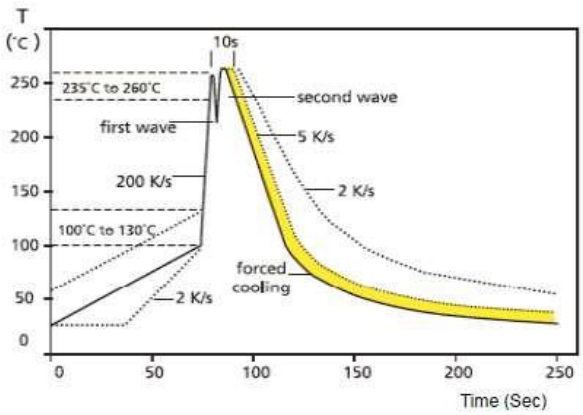
6.4 Recommended Soldering Method

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

6.4.1 Surface mount components are tested for solderability at a temperature of 245˚C For 3 seconds, Typical examples of soldering processes that provide reliable joints without any damage are given below:



Recommended IR Reflow Soldering Profile
MEET J-STD-020

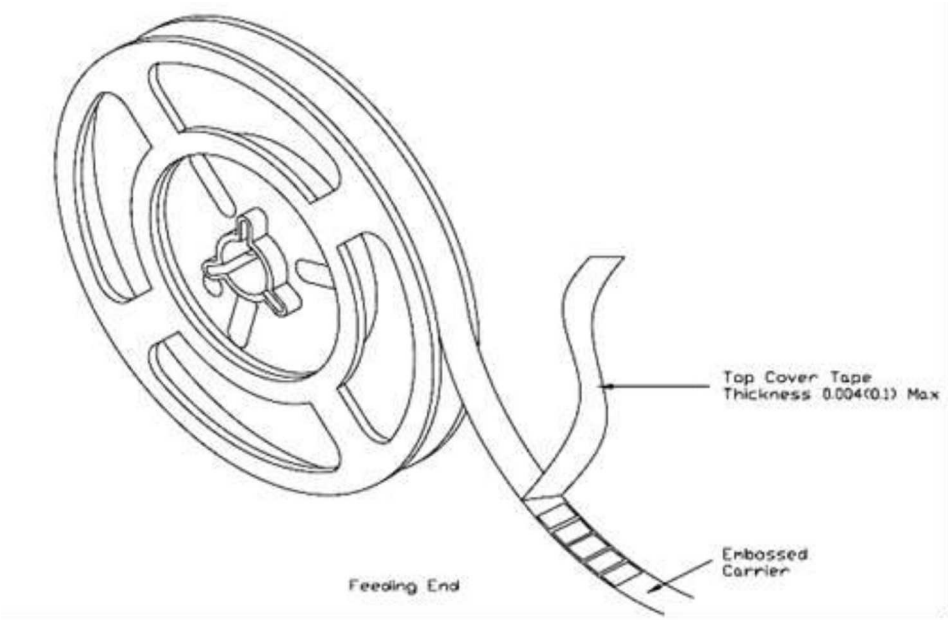


Recommended double-wave Soldering Profile
Typical Values (solid line)
Process limits (dotted line)

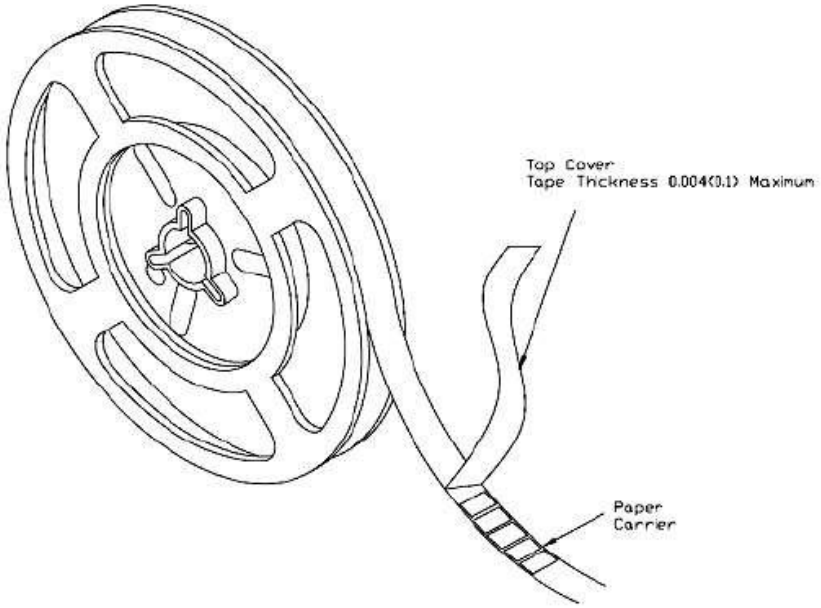
7. TAPING

7.1 Structure of Taping

Embossed Plastic Carrier

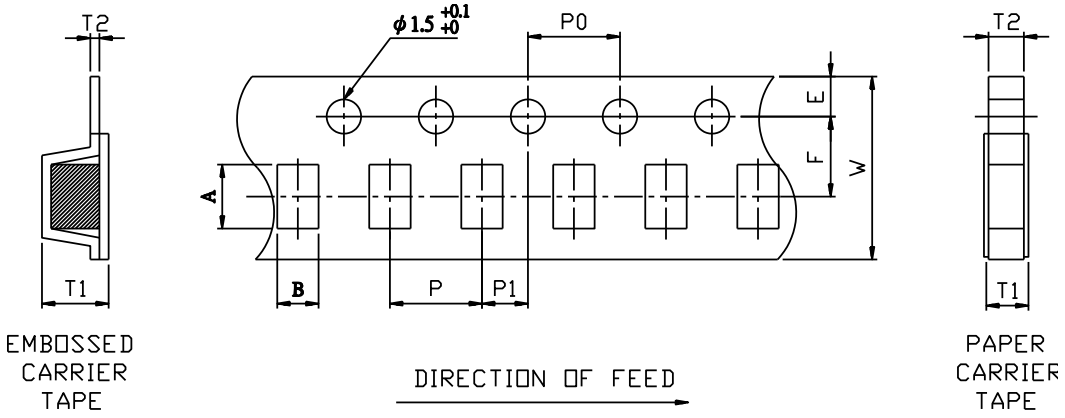


Paper Carrier



7.2 Tape Dimension

7.2.1 Tape Dimension



Unit: mm

DIM / Item	A	B	W	E	F	T1	T2	P	P0	10*P0	P1
CLS16	1.75±0.05	1.05±0.05	8.0±0.10	1.75±0.05	3.5±0.05	$0.42^{+0.2}_{-0}$	0.42±0.10	4.0±0.10	4.0±0.10	40.0±0.10	2.0±0.05
CLS21	2.30±0.10	1.55±0.10	8.0±0.20	1.75±0.10	3.5±0.05	$0.42^{+0.2}_{-0}$	0.42±0.10	4.0±0.10	4.0±0.10	40.0±0.20	2.0±0.05
CLS32	3.50±0.20	1.90±0.20	8.0±0.20	1.75±0.10	3.5±0.05	$0.75^{+0.2}_{-0}$	0.75±0.10	4.0±0.10	4.0±0.10	40.0±0.20	2.0±0.05
CLS63	6.70±0.20	3.40±0.20	12.0±0.20	1.75±0.10	5.5±0.05	1.10±0.15	0.23±0.05	4.0±0.10	4.0±0.10	40.0±0.20	2.0±0.10

7.3 Packaging

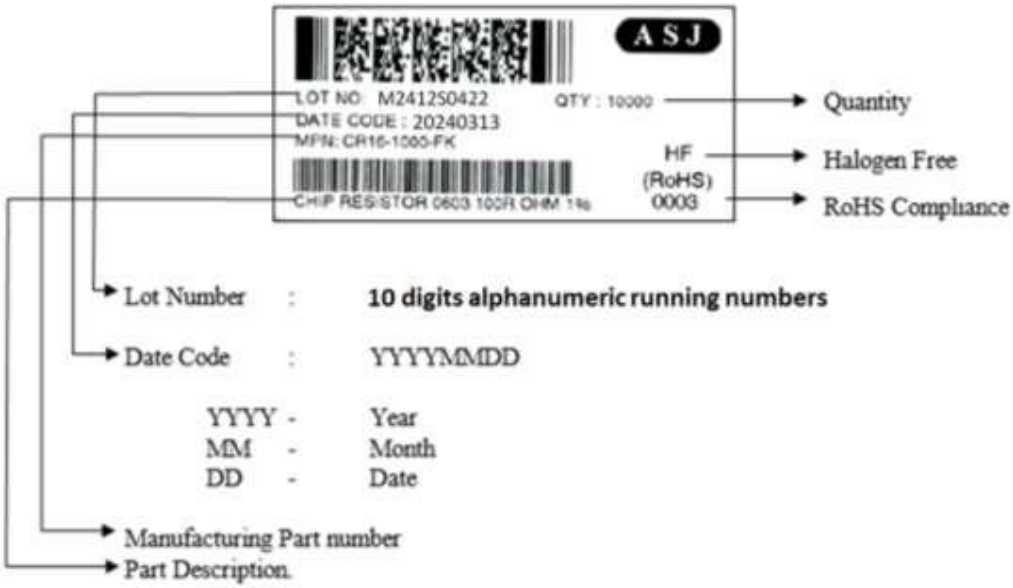
7.3.1 Taping

Quantity – Tape and Reels

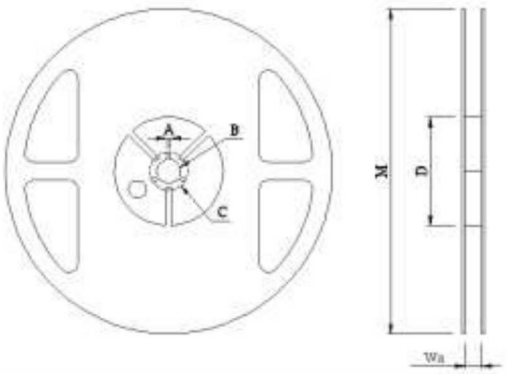
Type	Tape Width	Packaging Quantity(pcs/reel)
		4 mm Pitch
CLS16	8 mm	5000 pcs
CLS21		5000 pcs
CLS32		4000 pcs
CLS63	12 mm	4000 pcs

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.



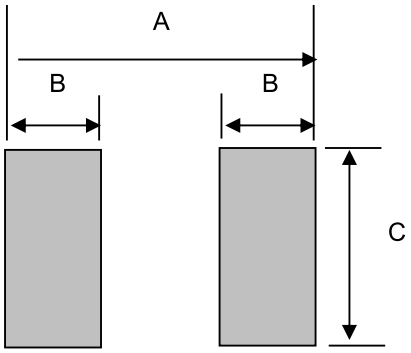
7.3.3 Reel Dimensions



Unit: mm

Reel Type / Tape	Wa	M	A	B	C	D
7" reel for 8mm tape	12.0± 0.5	178 ± 1.0	2.0 ± 0.5	13.2 ± 0.5	17.7 ± 0.5	60.0 ± 0.5
7" reel for 12mm tape	16.2± 0.5	178 ± 1.0	2.5 ± 0.5	13.5 ± 0.5	17.7 ± 0.5	60.0 ± 0.5
7" reel for 24mm tape	24.0^{+2}_{-0}	178 ± 1.0	2.0 ± 0.5	13.2 ± 0.5	17.7 ± 0.5	60.0 ± 1.0

8. RECOMMENDED LAND PATTERN



Type	Dimensions (mm)		
	A	B	C
CLS16	2.60	0.90	0.90
CLS21	3.40	1.30	1.30
CLS32	4.00	1.50	1.80
CLS63	7.60	2.60	3.80

9. REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version.1	13.02.2015		Initial Release
Version.2	14.07.2015		Update Max. Rating Power, Max. Overload Current and Part Ordering Number
Version.3	07.09.2016		Update information as below : 2. Part Numbering System 3.1 Power derating characteristic 5. Dimension 6.1 Electrical Performance Test 6.3. Environmental Test 6.4.1 Recommended Soldering Profile 7.2 Tape Dimension 7.3.1 Tape and Reels 8 Land Pattern Dimension Typo error in clause 2
Version.4	14.10.2016		Update Clause 4, Marking on Product Update Clause 5, Dimension information
Version.5	19.01.2017		Update clause 6.4.1, soldering profile Update clause 7.3.3 reel dimension
Version.6	26.04.2017	Refer to ECO : 01/2017	Delete clause 4.1.2 1206 marking information, add 1206 marking information together with 2512 Typo error in clause 5
Version.7	09.08.2018		Replace AEC-Q200 to general purpose in clause 1.2 Add in CLS16 to clause 2 Add in CLS16 to clause 3.11 Add in CLS16 to clause 3.10 Add in CLS16 Marking on product in clause 4.1.1 Add in CLS16 dimension to clause 5 Add in CLS16 specification to clause 6.1, 6.2 and 6.3 Add in CLS16 tape dimension to clause 7.2.1 Add in CLS16 Packaging to clause 7.3.1.1 Add in CLS16 Land Pattern into clause 8
Version.8	03.01.2019		Remove AEC-Q200 from clause 1.2 Update datasheet
Version.9	04.09.2019		Revise clause 3.9
Version.10	24.09.2020		Revise clause 3.5 Revise clause 7.3.1.1 qty tape and reel table
Version.11	19.04.2022		Revise clause 5 dimension Add 6.3.1 Operational Life Endurance Add 6.3.2 Plating thickness
Version 12	19.04.2024		Revise clause 3.8 Product Assurance Revise clause 7.3.2 Identification

ASJ

DATA SHEET

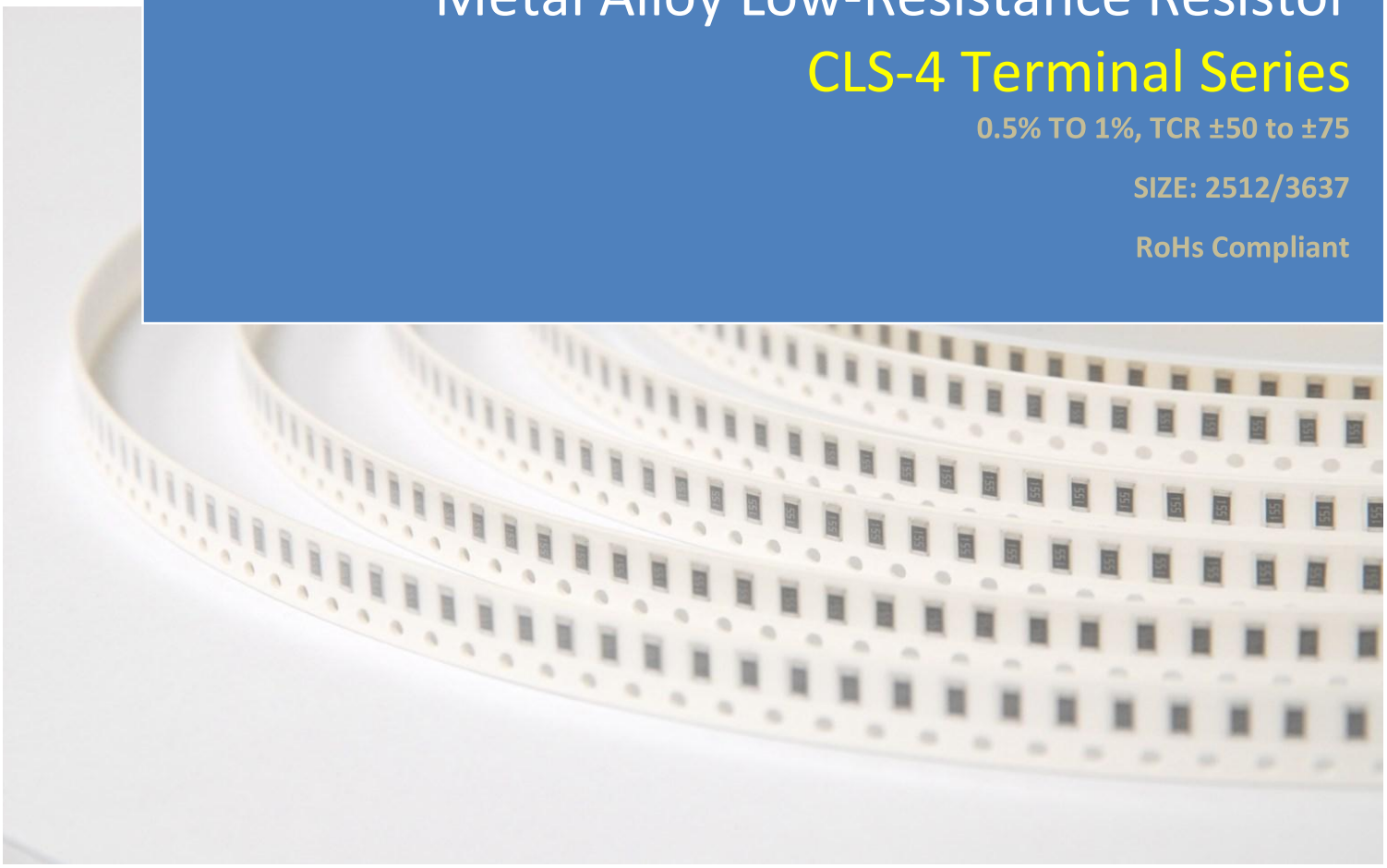
Metal Alloy Low-Resistance Resistor

CLS-4 Terminal Series

0.5% TO 1%, TCR ±50 to ±75

SIZE: 2512/3637

RoHs Compliant



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

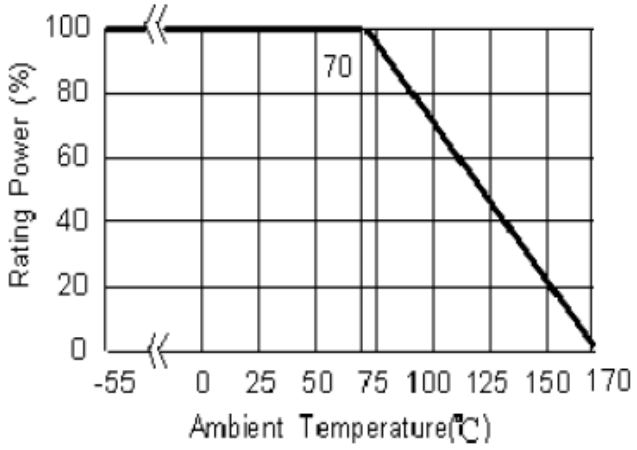
3.1. Rated Power

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

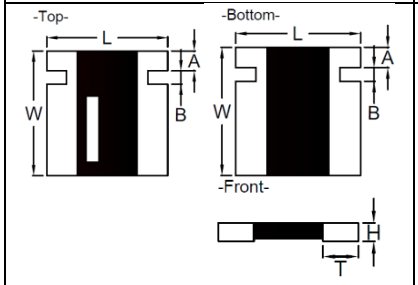
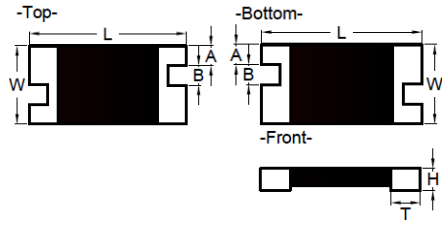
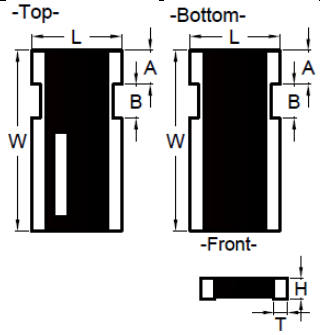
The following equation may be used to determine the DC (Direct Current) or AC (Alternative Current) currents (RMS, root mean square value) of normal rated power. However, if the result value exceeds the highest current of regulated standards, the highest normal rated power is to be used.

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 rowspan="2">Resistance to Solder Heat</td><td rowspan="2">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%</td></tr>
<tr><td>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 rowspan="2">Vibration</td><td rowspan="2">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%</td></tr>
<tr><td>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

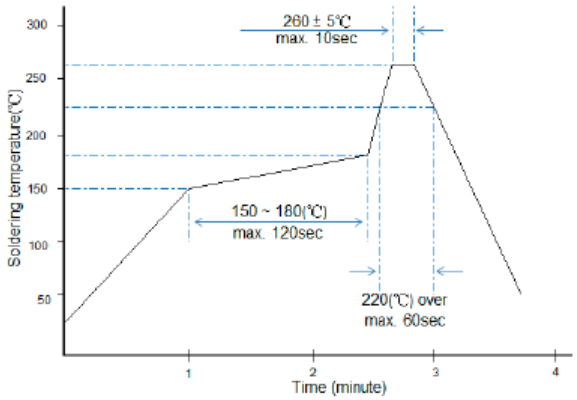
Test Item	Conditions of Test	Test Limits
Load Life	***Refer to JIS-C5201-1 4.25*** Put the tested resistor in chamber under temperature 70± 2℃ and load the rated current for 90 minutes on 30 minutes off, total 1000 hours. Then leaving the tested resistor in room temperature for 60 minutes, and measure 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)

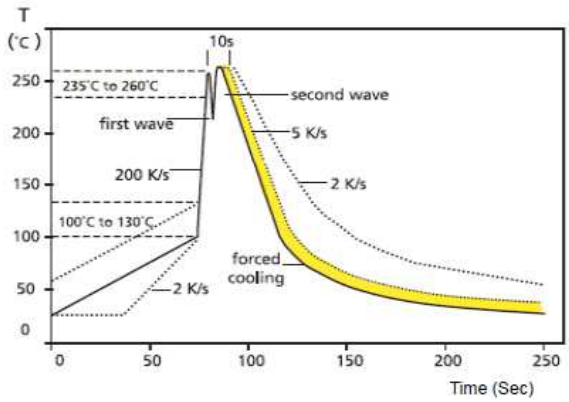
Recommend Soldering method

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°C±10°C , dwell time shall be less than 3 sec.



Recommended IR Reflow Soldering profile

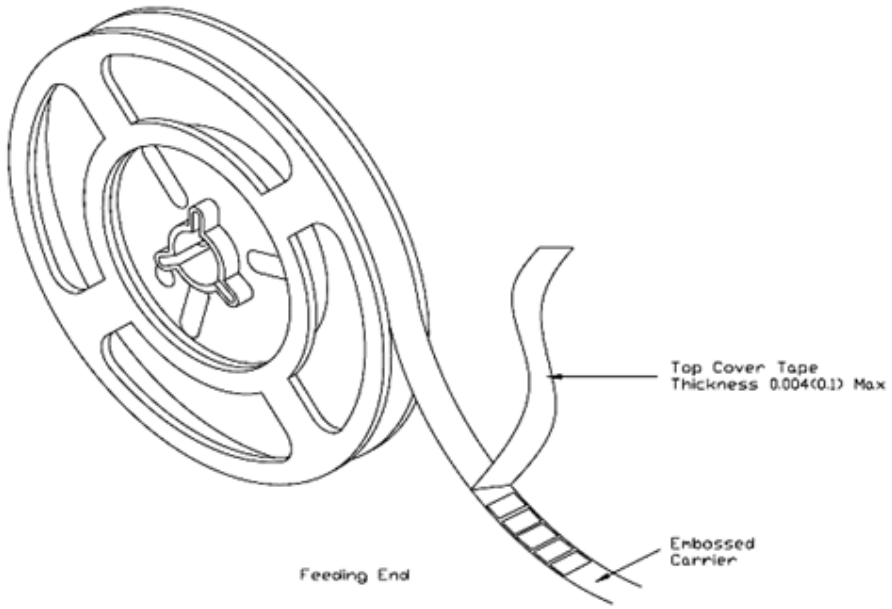


Recommended Wave Soldering Profile
Typical values (solid line)
Process limits (dotted line)

7. TAPING

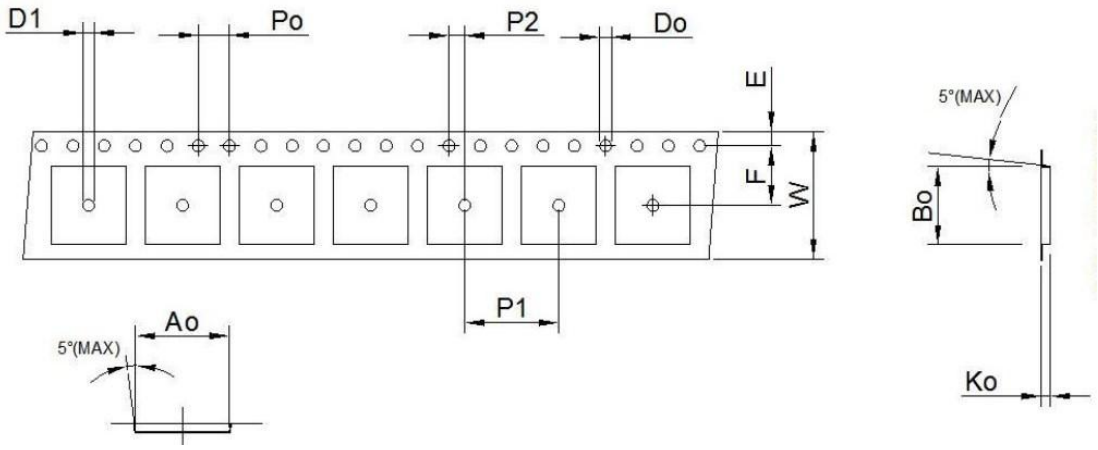
7.1 Structure of Taping

Embossed Plastic Carrier



7.2 Tape dimension.

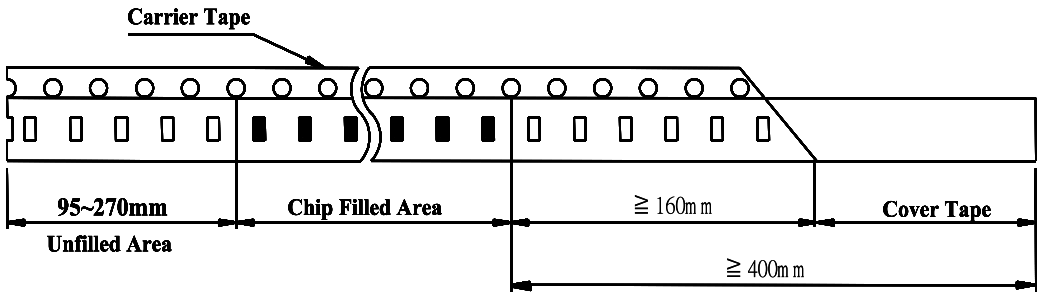
7.2.1 Tape Dimension of Plastic Embossed Carrier System



Unit: mm

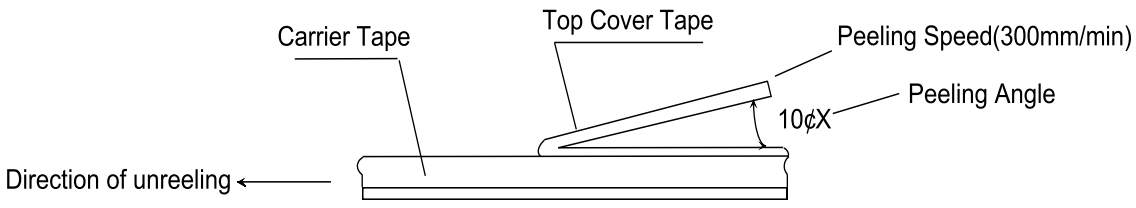
DIM / Type-Terminals	Ao	Bo	W	E	F	Ko	Po	P1	P2	Do	D1
CLS36-4	9.6±0.1	9.9±0.1	16.0±0.2	1.75±0.1	7.5±0.1	1.5 Max	4.0±0.1	12.0±0.1	2.0±0.1	1.5±0.1	1.5 Max
CLS63-4	3.5±0.1	6.75±0.1	12.0±0.1	1.75±0.1	5.5±0.1	1.3±0.1	4.0±0.1	4.0±0.1	2.0±0.1	1.5±0.1	---
CLS63W-4	3.5±0.1	6.75±0.1	12.0±0.1	1.75±0.1	5.5±0.1	1.3±0.1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

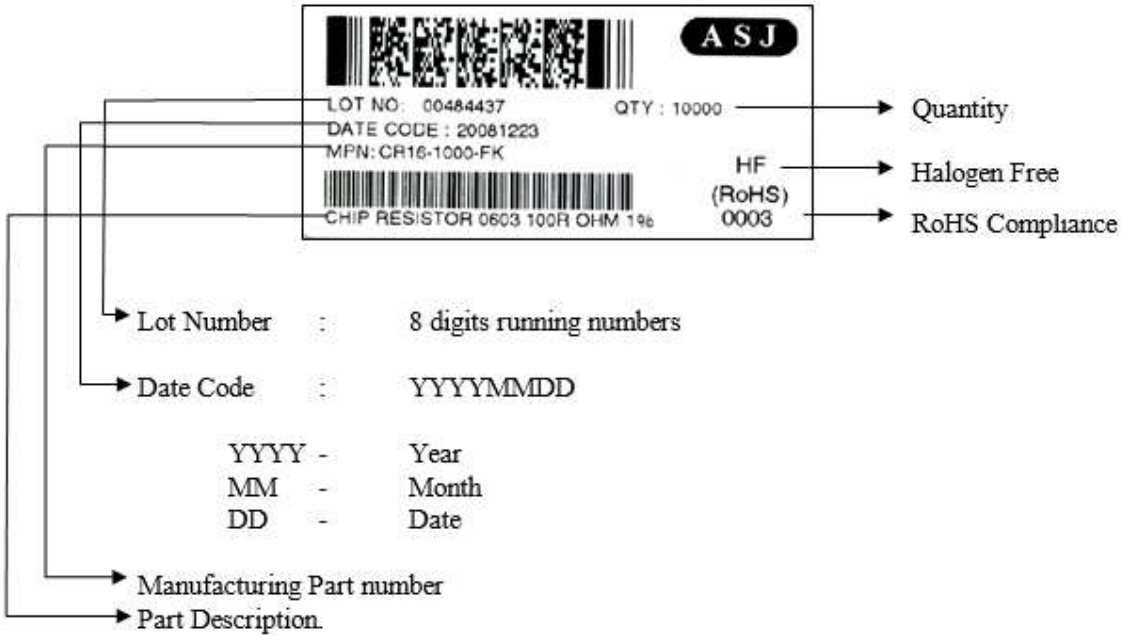
7.3.1 Taping

7.3.1.1 Quantity - Tape and Reels

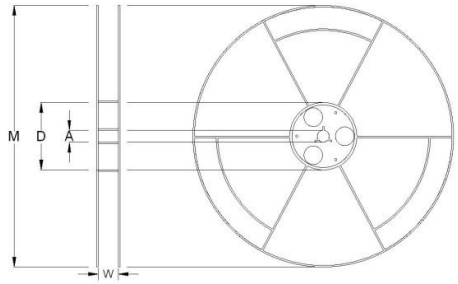
Type	# of Terminals	Tape width	Max. Packaging Quantity (pcs/reel)	
			Embossed Plastic Type	
			4mm pitch	8mm pitch
CLS36	4	16mm	1000	-----
CLS63(0.3mΩ)		12mm	-----	2000
CLS63			4000	-----
CLS63W		12mm	4000	-----

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.



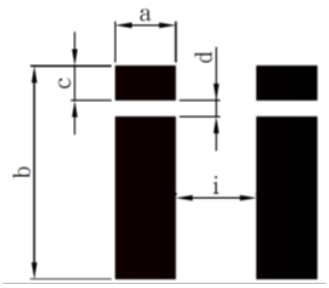
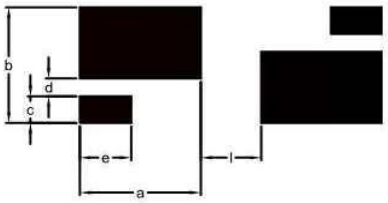
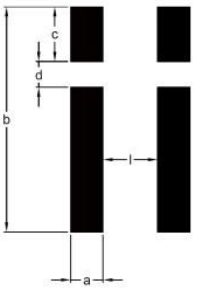
7.3.3 Reel Dimension



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

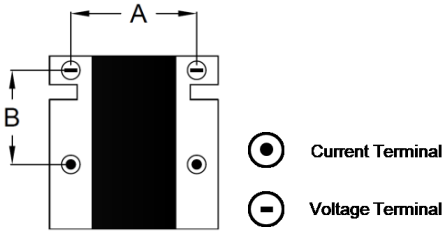
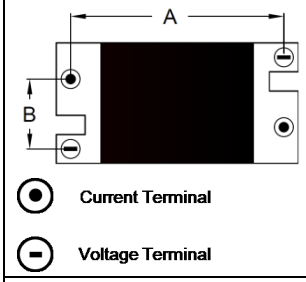
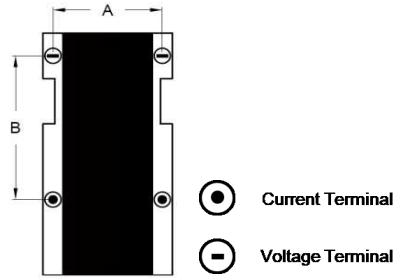
8. RECOMMEND LAND PATTERN

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