

ASJ

# DATA SHEET

## Metal Alloy Low-Resistance Shunt Resistor

### LS Series

1.0% To 5%, TCR  $\pm 50$  To  $\pm 200$

Size : 2512/3921/5931

RoHS-Compliant



# METAL ALLOY LOW-RESISTANCE SHUNT RESISTOR

LS Series

DS-ENG-105

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## 1. SCOPE

- 1.1 This specification is applicable to Lead-free and Halogen-free of RoHS directive for LS series metal alloy low-resistance shunt resistor.

## 2. PART NUMBERING SYSTEM

Part Numbering is made in accordance with the following system:

LS	63	2	-	R001	-	F	P
Type	Size (Inch)	Power Rating		Nominal Resistance		Tolerance	Packaging
Metal Alloy Low-Resistance Shunt Resistor	63 (2512) 52 (3921) 75 (5931)	2 = 2.0W 3 = 3.0W 4 = 4.0W N = 4.5W 5 = 5.0W 6 = 6.0W 7 = 7.0W 9 = 9.0W K = 10.0W		Resistance (4 ~ 6 Digit) E.g.: R001 = 1mΩ R0002 = 0.2mΩ		F = ±1.0% J = ±5.0%	P = 2000 pcs E = 4000 pcs

## 3. RATING

### 3.1 Rated Power

#### 3.1.1 Resistor Rated Power

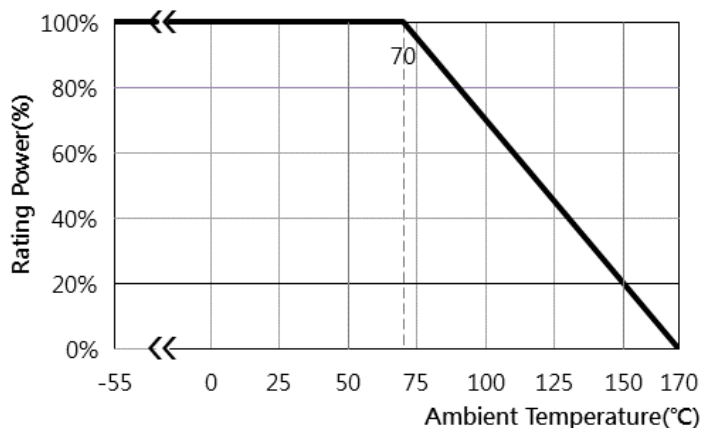
Type	Max. Rating Power	Max. Rating Current	Max. Overload Current
LS63	5W	$I_r = \sqrt{P/R}$ I <sub>r</sub> : Rating Current (A) P : Rating Power (W) R : R value (Ω)	$I_o = \sqrt{5P/R}$ I <sub>o</sub> : Overload Current (A) P : Rating Power (W) R : R value(Ω)
	4W		
	3W		
LS52	9W		
	7W		
	5W		
	4W		
	3W		
LS75	2W		
	10W		
	9W		
	7W		
	6W		
	5W		
	4W		



### 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 condition.

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

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## 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	
						F (±1%);J (±5%)		
LS63	2	5W	$I_r = \sqrt{P/R}$	$I_o = \sqrt{5P/R}$	±200	0.3~1.0	- 55 ~+170 °C	
		4W			±200	0.3~1.0		
		3W			±150	2.0		
					±200	0.3~1.0		
LS52		9W			±175	0.2		
					±150	0.3		
					7W	±175		0.2
						±150		0.3
		5W			±100	0.4~0.8		
					±175	0.2		
					±150	0.3		
					±100	0.4~1.0		
LS52	2	4W	±50	1.5~2.0	- 55 ~+170 °C			
			±175	0.2				
			±150	0.3				
			±100	0.4~1.0				
		3W	±50	1.5~3.0				
			±175	0.2				
			±150	0.3				
		2W	±100	0.4~1.0				
			±50	1.5~5.0				
			±175	0.2				
±150	0.3							
LS75	2	10W	±100	0.4~1.0	- 55 ~+170 °C			
			±50	1.5~5.0				
		9W	±100	0.2				
			±100	0.2~0.3				
		7W	±100	0.2~0.4				
			±75	0.5~0.8				
		6W	±50	1.0~1.5				
			±100	0.2~0.3				
±75	0.5~0.8							
±50	1.0~1.5							
5W	±100	0.2~0.3						
	±100	0.2~0.3						



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Type	# of Terminals	Max. Rating Power	Max. Rating Current	Max. Overload Current	T.C.R. (ppm/°C)	Resistance Range (mΩ)	Operating Temperature Range
						F (±1%);J (±5%)	
		4W			±75	0.5~0.8	
					±50	1.0~3.0	
					±100	0.2~0.3	
					±75	0.5~0.8	
					±50	1.0~3.0	

\* Notes: Non-standard values may be available for high volume requirements.

Type	Standard Values (mΩ)
LS63	0.3、0.35、0.4、0.5、0.7、0.75、1.0、2.0、3.0、4.0
LS52	0.2、0.3、0.4、0.5、0.7、0.8、1.0、1.5、2.0、3.0、4.0、5.0
LS75	0.2、0.3、0.4、0.5、0.7、0.75、0.8、1.0、1.5、2.0、3.0

### 3.11 Rated 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.

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

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

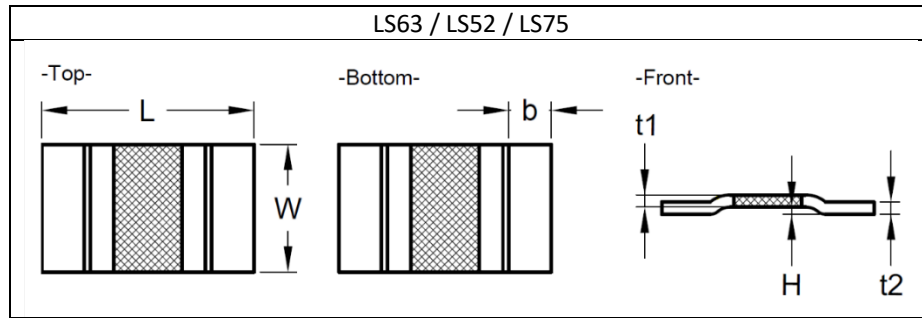
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## 4. DIMENSION



Type	Resistance Range (mΩ)	Dimensions - in inches (millimeters)				
		L	W	H	b	T
LS63	0.3	0.252±0.008 (6.40±0.20)	0.126±0.01 (3.20±0.25)	0.020±0.004 (0.50±0.10)	0.047±0.008 (1.20±0.20)	0.037±0.004 (0.95±0.10)
	0.35					0.031±0.004 (0.80±0.10)
	0.4					0.035±0.004 (0.88±0.10)
	0.5					0.033±0.004 (0.85±0.10)
	0.7					0.024±0.004 (0.60±0.10)
	0.75					0.022±0.004 (0.56±0.10)
	1.0					0.017±0.004 (0.42±0.10)
	2.0					0.026±0.004 (0.67±0.10)
	3.0					0.018±0.004 (0.45±0.10)
	4.0					0.013±0.004 (0.32±0.10)
LS52	0.2	0.394±0.008 (10.00±0.20)	0.205±0.01 (5.20±0.25)	0.0197±0.004 (0.50±0.10)	0.079±0.008 (2.00±0.20)	0.067±0.004 (1.70±0.10)
	0.3					0.050±0.004 (1.28±0.10)
	0.4					0.039±0.004 (1.00±0.10)
	0.5					0.031±0.004 (0.80±0.10)
	0.7					0.022±0.004 (0.55±0.10)
	0.8					0.019±0.004 (0.48±0.10)
	1					0.016±0.004 (0.40±0.10)
	1.5					0.037±0.004 (0.94±0.10)
	2					0.024±0.004 (0.62±0.10)
	3					0.017±0.004 (0.42±0.10)
4	0.014±0.004 (0.35±0.10)					



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Type	Resistance Range (mΩ)	Dimensions - in inches (millimeters)				
		L	W	H	b	T
	5					0.011±0.004 (0.28±0.10)
LS75	0.2	0.590±0.008 (15.00±0.20)	0.303±0.012 (7.70±0.30)	0.020±0.006 (0.50±0.15)	0.165±0.024 (4.20±0.60)	0.059±0.004 (1.50±0.10)
	0.3					0.038±0.004 (0.96±0.10)
	0.4					0.028±0.004 (0.72±0.10)
	0.5					0.023±0.004 (0.58±0.10)
	0.7					0.017±0.004 (0.42±0.10)
	0.75					0.015±0.004 (0.39±0.10)
	0.8					0.014±0.004 (0.36±0.10)
	1					0.037±0.004 (0.94±0.10)
	1.5					0.024±0.004 (0.62±0.10)
	2					0.019±0.004 (0.48±0.10)
	3					0.012±0.004 (0.31±0.10)

## 4.1 Material of Alloy

Type	Material	Resistance
LS63	Copper-Manganese Alloy	0.3mΩ 、 0.35mΩ 、 0.4mΩ 、 0.5mΩ 、 0.7mΩ 、 0.75mΩ 、 1.0mΩ
	Iron-Chromium Aluminum Alloy	2.0mΩ 、 3.0mΩ 、 4.0mΩ
LS52	Copper-Manganese Alloy	0.2mΩ 、 0.3mΩ 、 0.4mΩ 、 0.5mΩ 、 0.7mΩ 、 0.8mΩ 、 1.0mΩ
	Iron-Chromium Aluminum Alloy	1.5mΩ 、 2.0mΩ 、 3.0mΩ 、 4.0mΩ 、 5.0mΩ
LS75	Copper-Manganese Alloy	0.2mΩ 、 0.3mΩ 、 0.4mΩ 、 0.5mΩ 、 0.7mΩ 、 0.75mΩ 、 0.8mΩ
	Iron-Chromium Aluminum Alloy	1.0mΩ 、 1.5mΩ 、 2.0mΩ 、 3.0mΩ



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## 5. RELIABILITY PERFORMANCE

### 5.1 Electrical Performance

Test Item	Conditions of Test	Test Limits						
Electrical Characterization (TCR)	$TCR(ppm/^{\circ}C) = \frac{(R2-R1)}{R1(T2-T1)} \times 10^6$ <ul style="list-style-type: none"> <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> <p>Refer to JIS-C 5201-1 4.8</p>	Refer to Paragraph 3. general specifications						
Short Time Overload	<p>Applied Overload for 5 seconds and release the load for about 30 minutes, then measure its resistance variance rate. (Overload condition refer to below):</p> <table border="1"> <thead> <tr> <th>Type</th> <th># of rated power</th> </tr> </thead> <tbody> <tr> <td>LS63</td> <td rowspan="3">5 times</td> </tr> <tr> <td>LS52</td> </tr> <tr> <td>LS75</td> </tr> </tbody> </table> <p>Refer to JIS-C 5201-1 4.13</p>	Type	# of rated power	LS63	5 times	LS52	LS75	ΔR±1.0%
Type	# of rated power							
LS63	5 times							
LS52								
LS75								

### 5.2 Mechanical / Constructional Performance

Test Item	Conditions of Test	Test Limits
Resistance to Solder Heat	<p>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.</p> <p>Refer to JIS-C 5201-1 4.18</p>	ΔR±1.0%
Solderability	<p>Add flux into tested resistors, immersion into solder bath in temperature 245±5°C for 3±0.5secs.</p> <p>Refer to JIS-C 5201-1 4.17</p>	Solder coverage over 95%

### 5.3 Environmental Performance

Test Item	Conditions of Test	Test Limits
High Temperature Exposure	<p>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.</p> <p>Refer to JIS-C 5201-1 4.23.2</p>	ΔR±1.0%
Low Temperature Exposure (Storage)	<p>Put the tested resistor in chamber under temperature -55±2°C for 1,000 hours. Load the rated voltage for 45 minutes on, 15 minutes off. Then leaving the tested resistor in room temperature for 60 minutes, and measure its resistance variance rate.</p> <p>Refer to JIS-C 5201-1 4.23.4</p>	ΔR±1.0%





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Test Item	Conditions of Test	Test Limits						
Temperature Cycling	<p>Put the tested resistor in the chamber under the temperature cycling which shown in the following table shall be repeated 500 times consecutively. Then leaving the tested resistor in the room temperature for 60 minutes, and measure its resistance variance rate.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th>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> <p>Refer to JESD22-A104</p>		Testing Condition	Lowest Temperature	-55 +0/-10°C	Highest Temperature	150 +10/-0°C	$\Delta R \pm 1.0\%$
	Testing Condition							
Lowest Temperature	-55 +0/-10°C							
Highest Temperature	150 +10/-0°C							
Bias Humidity	<p>Put the tested resistor in chamber under <math>85 \pm 5^\circ\text{C}</math> and <math>85 \pm 5\% \text{RH}</math> with 10% bias and load the rated power for 90 minutes on, 30 minutes off, total 1,000 hours. Then leaving the tested resistor in room temperature for 60 minutes, and measure its resistance variance rate.</p> <p>Refer to MIL-STD-202 Method 103</p>	$\Delta R \pm 1.0\%$						

## 5.4 Operational Life Endurance

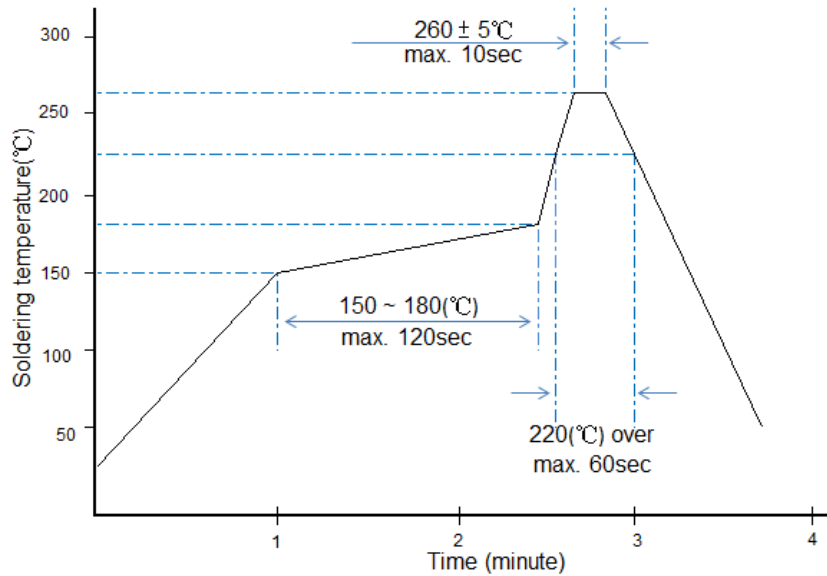
Test Item	Conditions of Test	Test Limits
Operational Life	<p>Put the tested resistor in chamber under temperature <math>70 \pm 2^\circ\text{C}</math> and load the rated current for 90 minutes on 30 minutes off, total 1000 hours. Then leaving the tested resistor in room temperature for 60 minutes, and measure its resistance variance rate.</p> <p>Refer to JIS-C5201-1 4.25</p>	$\Delta R \pm 1.0\%$



## 5.5 Recommended Soldering Method

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

- This product is applicable to IR-reflow process only.(Infrared Reflow)
- Typical examples of soldering process that provides reliable joints without any damage are given in below:

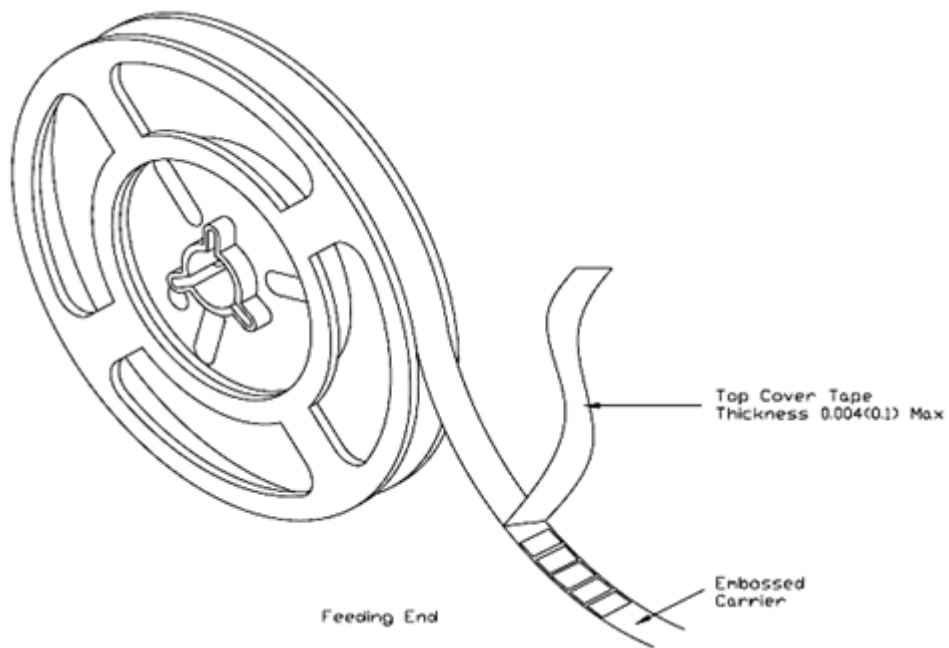


Recommended IR Reflow Soldering Profile  
MEET J-STD-020

## 6. TAPING

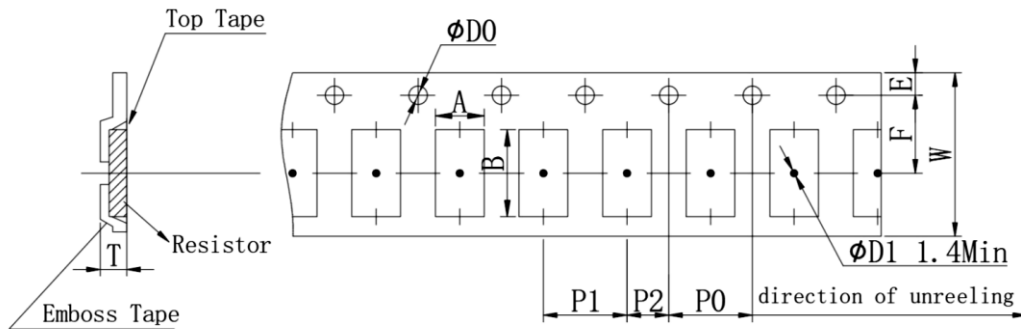
### 6.1 Structure of Taping

Embossed Plastic Carrier



## 6.2 Tape dimension

### 6.2.1 Tape Dimension of Plastic Embossed Carrier System



Dimension of Embossed Plastic Carrier System

Unit : mm

Item	DIM	mΩ	A	B	W	E	F	T	P1	P0	10*P0	P2
LS63	All		6.8±0.1	3.5±0.1	16.0±0.2	1.75±0.1	7.5±0.1	1.8±0.1	8.0±0.1	4.0±0.1	40.0±0.2	2.0±0.1
LS52	All		11.2±0.2	5.7±0.2	24.0±0.2	1.75±0.1	11.5±0.1	2.5±0.1	12.0±0.1	4.0±0.1	40.0±0.2	2.0±0.1
LS75	All		15.5±0.2	8.2±0.2	32.0±0.2	1.75±0.1	14.25±0.1	2.5±0.1	12.0±0.1	4.0±0.1	40.0±0.2	2.0±0.1

## 6.3 Packaging

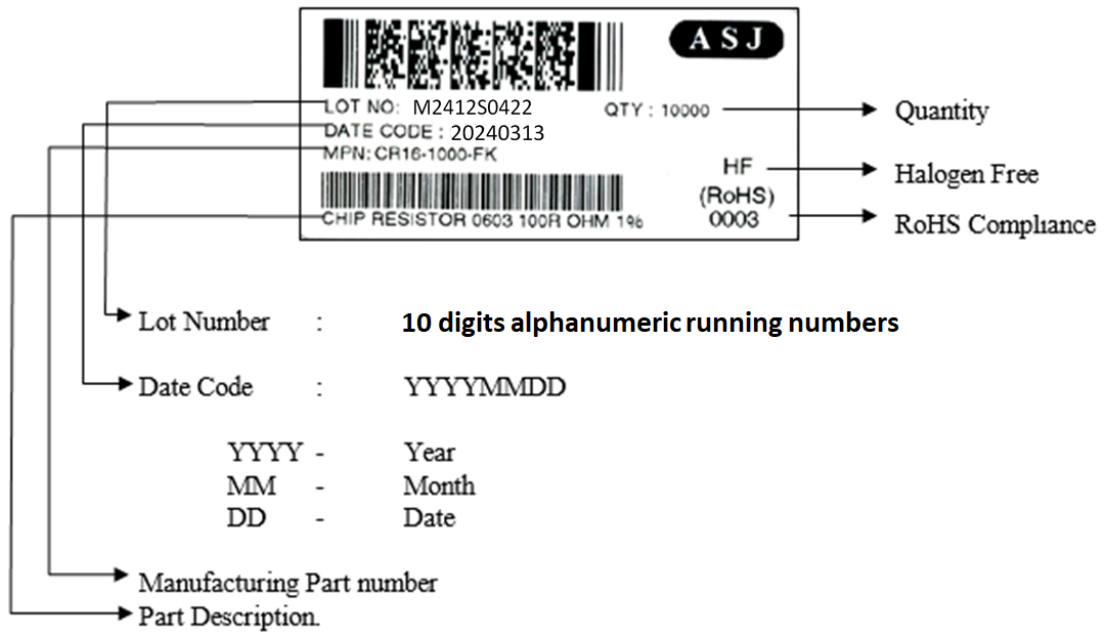
### 6.3.1 Taping

#### Quantity - Tape and Reels

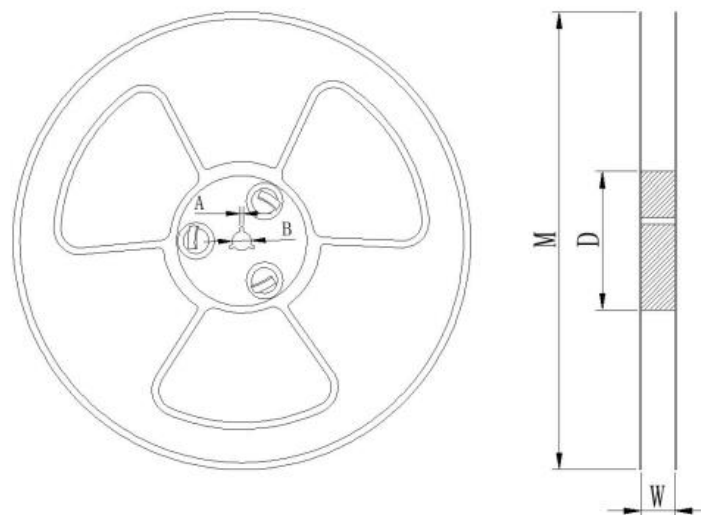
Type	Tape width	Max. Packaging Quantity (pcs/reel)	
		Embossed Plastic Type	
		8mm pitch	12mm pitch
LS63	16mm	4000	---
LS52	24mm	---	2000
LS75	32mm	---	2000

## 6.4 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.



## 6.5 Reel Dimension

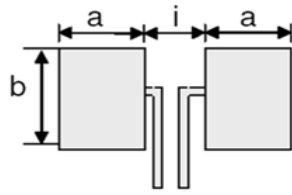


Unit: mm

Reel Type / Tape	W	M	A	B	D
13" reel for 16 mm tape	17 ± 0.5	Φ330 ± 2.0	2.0 ± 0.5	Φ13.5 ± 0.5	Φ99.0 ± 1.0
13" reel for 24 mm tape	25 ± 0.5	Φ330 ± 2.0	2.0 ± 0.5	Φ13.5 ± 0.5	Φ99.0 ± 1.0
13" reel for 32 mm tape	33 ± 0.5	Φ330 ± 2.0	2.0 ± 0.5	Φ13.5 ± 0.5	Φ99.0 ± 1.0



## 7. RECOMMENDED LAND PATTERN



Type	Dimensions - in millimeters		
	a	b	i
LS63	1.8	3.4	3.4
LS52	2.70	6.20	5.60
LS75	5.20	8.75	5.60

## 8. INDUCTANCE

The characteristic of Fe/Cr/Al alloy material:

Because of including magnetism, inductor will be generated under high frequency circuit then to cause value shift and influence customer application. If there is related application shall be noted especially or discuss with original factory.

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## 9. REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version 1	29.03.2024		Initial Release



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