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# DEMINT

## Electronics Co., Ltd.

### Current Sense Resistor Series

**DeMint Electronics Co., Ltd.**

Web: [www.direct-token.com](http://www.direct-token.com)

Email: [rfq@direct-token.com](mailto:rfq@direct-token.com)

China: 17P, Nanyuan Maple Leaf Bldg., Nanshan Ave.,  
Nanshan Dist., Shenzhen, Guangdong, China. 518054  
Tel: +86 755 26055363

Taiwan: No.137, Sec. 1, Zhongxing Rd., Wugu District,  
New Taipei City, Taiwan. 248012  
Tel: +886 2981 0109 Fax: +886 2988 7487

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# Terminology & Glossary

## ► Terminology & Glossary

### Terminology & Glossary

#### What is a "Current Sense"?

Current sensing products are the newest and fastest growing resistive products in the industry today. As with most passive products, the majority of new designs are surface mount. These resistors are used to monitor the current in a circuit and translate the amount of current in that circuit into a voltage that can be easily measured and monitored.

#### Current Detecting Resistors

Due to the increase in sales of notebook PCs, the demand for the DC/DC converter has shown rapid growth because of its high-energy conversion efficiency, and its precise current-limiting capability. However, to ensure the performance of the multiple outputs DC/DC converter, the current limiting voltage must be detected precisely to protect an expensive notebook PC from an overload, which is generally due to shorts within the capacitors used in these devices.

For high-energy conversion efficiency various control ICs have been developed that utilize resistive components. To achieve the perfect cutoff mode of the DC load current at the programmed current-limiting voltage of the control IC, a very stable and accurate sense resistor with the following characteristics is required for precise voltage comparison.

- Very Low Ohmic Value should be below  $25\text{m}\Omega$  for minimizing power consumption at the current sensing resistor.
- Tight Tolerance must be  $\pm 1\%$  or tighter for maximizing the current supply within the limit of acceptable current.
- Low TCR is required for current sensing across the ambient temperature range of  $0^{\circ}\text{C}$  to  $60^{\circ}\text{C}$ .
- Low Thermal EMF for an accurate comparison between the programmed current-limiting voltage of the control IC and the detected voltage.

Furthermore, the self-inductance should be for high frequency applications. Recommended types are general purpose current sensing products or a flame retardant type.

#### Flip Chip Resistors

An unencapsulated resistor chip on which bead-type leads terminate on one face to permit "flip" (face down) mounting of the resistor chip by contact of the leads with interconnective circuitry.

#### Hot-Spot Temperature

The maximum temperature measured on the resistor due to both internal heating and the ambient operating temperature.

#### Low Profile

Components designed with "lower than standard heights", to save space and allow clearance when mounted on PCBs.

#### Maximum Working Voltage

The maximum specified voltage that may be applied across a resistor.

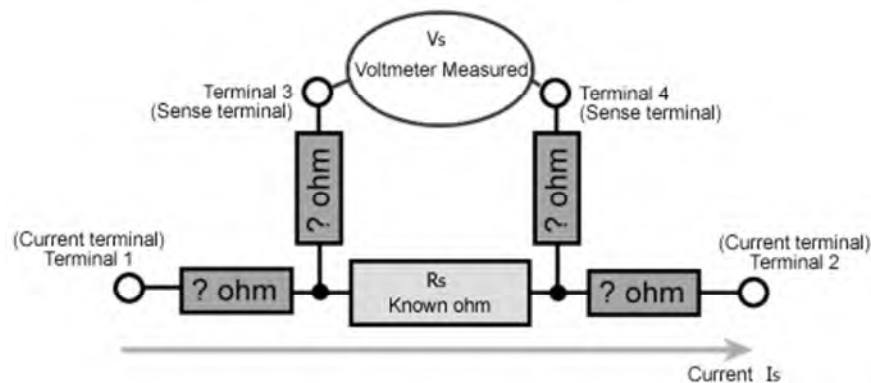


### How 4-Terminal Resistor Works

High precision resistors used for current sensing are usually low Ohmic value devices suitable for four terminal connections. To use a four terminal resistor, we force a current from Terminal 1 to Terminal 2. It's current, so the unknown resistances attached to Terminal 1 and Terminal 2 don't affect the amount of the current. The same number of electrons per second flow through from T1 to T2, regardless of the resistance.

A voltmeter measures the resulting voltage drop across the ultra-precise resistor, measuring through the unknown resistors attached to Terminal 3 and Terminal 4. The voltmeter's input impedance is very, very high compared to the unknown resistors, so the unknown resistors have essentially zero effect (typically less than 0.1 parts-per-million).

So the current flows through the 0.100 ohm resistor, unaffected by the unknown resistors, and we measure the voltage across the 0.100 ohm resistor, unaffected by the unknown resistors. And that's how a 4-terminal resistor works!



How 4-Terminal Sense Resistor Works

### PPM

Parts per million. The terminology used when describing the temperature coefficient.

### Screen

The process of printing a network pattern of thick-film ink or paste onto a substrate by means of a squeegee applied to a photo-etched wire-mesh "silk screen" or metal mask.

### Current Shunt Resistors

Current shunt resistors are precision low resistance resistors used to measure AC or DC electrical currents by the voltage drop those currents create across the resistance. Sometimes called an ammeter shunt, it is a type of current sensor.

### SMT/SMD

Surface-mount technology/surface-mount device.

### Zero Ohm Resistors

Products that look like resistors, but actually have no resistance (very low resistance) and instead perform as jumpers.





# How to Design & Select Current Sense Devices

## ► Design & Selection

### How to Design & Select Current Sense Devices

Generally, a resistor manufacturer will offer their most popular devices as standards creating a reference for Engineers to design from. Typically, and especially true in the Current Sensing category, a standard device is available for most common applications. However, for applications requiring parameters that are not currently considered industry standards, Token is uniquely equipped to offer design and development services at comparatively lower costs than our competitors. In this case, the following information is required to effectively design a current sensing resistor:

#### Power Rating

Calculate the power dissipation under operating conditions

**Equation:**  $P_{avg} = I_{RMS}^2 \times R$ ; where Power (P), Current (I), Root Mean Square (RMS), Resistance (R).

Allowing for transient or fault conditions and high ambient temperature if applicable, select the required power rating.

For many current sense resistors, only the maximum temperature of the solder joints limits the power rating.

Power rating is thus a function of the PCB layout design as well as of component selection (see point 4.).

#### Resistance Value

Determine the minimum suitable resistance value. This is the lowest value of peak sense voltage consistent with an acceptable signal to noise ratio, divided by the peak current to be measured.

#### Temperature Coefficient of Resistance (TCR)

Establish the accuracy needed in terms of a tolerance on the value and of sensitivity to temperature.

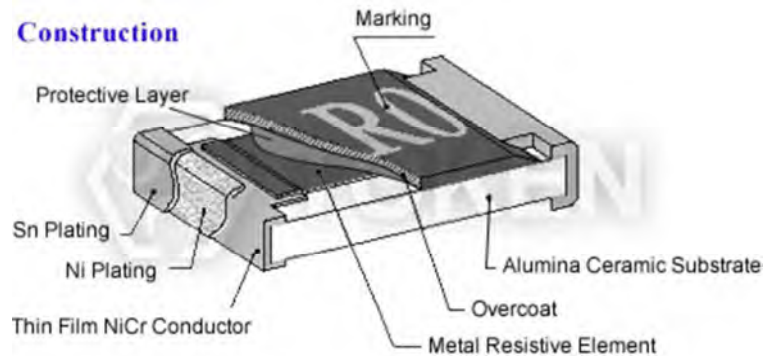
The latter factor is quoted as Temperature Coefficient of Resistance (TCR), defined as the value change in parts per million for a 1°C temperature rise. It is generally higher for low value resistors because the metallic leads or terminations, which have a very high TCR, make up a significant part of the total resistance value.

To achieve acceptable accuracy it is normally necessary to make four-terminal (Kelvin) connections to the resistor. This means connecting the current carrying tracks and the voltage sense tracks directly to the component pads. Even when this is done, there is still some pad area and solder in series with the resistor, which may compromise the actual tolerance and TCR of the soldered part. For very high accuracy or very low values, a four-terminal resistor type is the best choice.



### Thick Film Current-Sensing Chips (CS)

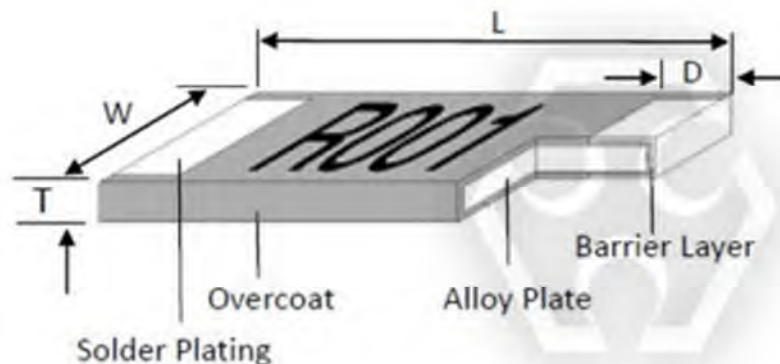
Based on thick film technology, the parasitic inductance of these chips is much lower than that of wire wound and leaded components. Token's thick film Token CS low ohmic current sense chip resistors are low cost, capable of providing low TCR down to  $\pm 100\text{ppm}/^\circ\text{C}$ , resistance values as low as  $1\text{m}\Omega$ , and power consumption up to 3 watts.



Thick Film Current-Sensing Chips (CS Series)

### Metal Plate Current-Sensing Chips (LRC, LRP, LRM, LRE, LREA)

A simple structure without multiple cuts, metal plate current sense resistors provide low TCR down to  $\pm 50\text{ppm}/^\circ\text{C}$ , Up to 5W rated power, high frequency performance and low resistance down to  $0.1\text{m}\Omega$ .



Metal Plate Current-Sensing Chips (LRC, LRP, LRM, LRE, LREA)

### PCB Layout

Care must be taken when laying out a PCB if the stated performance of a sense resistor is to be achieved. The current carrying tracks should be as wide as possible, using multiple layers connected by many vias near the component pad. This also improves the heat sinking of the joints.

The best way to make four-terminal connections to a two-terminal through-hole resistor is to use different sides of the PCB for the current and voltage connections. Failing this, current and voltage tracks should connect to opposite sides of the component pad.

In order to avoid interference from stray magnetic fields, the loop area contained by the sense resistor, the voltage sense tracks and the sense circuit input should be minimized. This means keeping the sense circuitry as close as possible to the sense resistor and running the voltage sense tracks close to each other.



### High Frequency Applications

Where transient or AC currents involving high frequencies are to be sensed, the self-inductance of the resistor must be minimised. Wirewound or spiralled film parts should be avoided, in favour of bulk metal or low value chips.

### High Heat Dissipation

When using a metallic element shunt with high heat dissipation and low sense voltage, consideration may need to be given to thermoelectric voltages. The junction between a metallic resistance element and metal terminations acts as a thermocouple, generating a voltage proportional to the temperature difference across it.

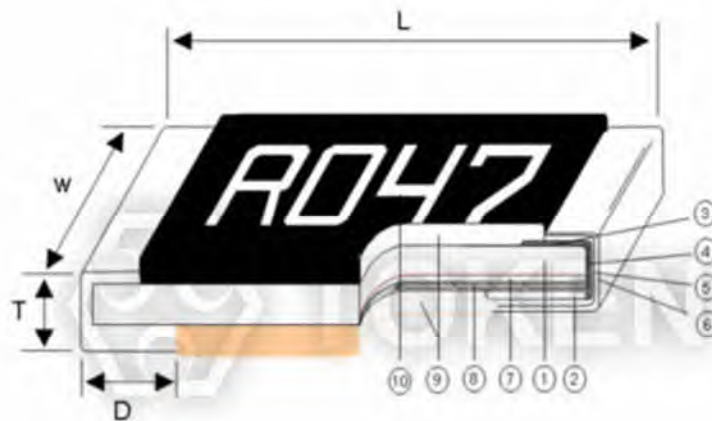
A leaded metallic element sense resistor is therefore like two thermocouples back to back. This means that, if the temperature differences across both junctions are equal, the error voltage is cancelled out. This is achieved by making the design thermally symmetrical, namely, by presenting both terminals with similar heatsinking and by keeping any other heat sources thermally distant.

### Wide Terminal Current-Sensing Chips (CSM)

Using a wider side as the connection in the mounting plate, the wide terminal current sense chip reinforces the solder joint and is reliably held to achieve higher power ratings. The wide-terminal current sensor saves space and reduces the amount of resistors in high-density board designs due to its ideal structure to suppress heat generation

### Metal Foil Current-Sensing Chips (CSM)

Metal foil current sense resistors made of manganese-copper alloy were developed with the substrate to provide better heat dissipation and a wider resistance range of up to 700mΩ. Metal foil The CSM series has a lower EMF under temperature variations.  $\mu 0.03\mu V/^{\circ}C$  is more likely to withstand harsh conditions. In the metal foil type, the TCR ranges from 50 to 100 ppm, the power is up to 5W, and the resistance is as low as 1mΩ.

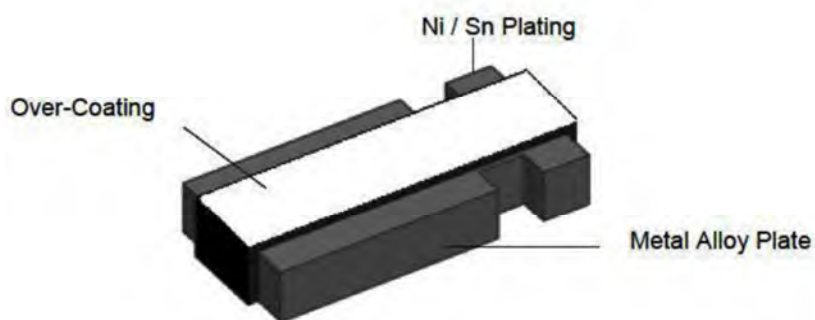


Metal Foil Current-Sensing Chips (CSM)

**Four-Terminal Current-Sensing Chips (LRF)**

For accurate measurement of circuit design, lower power consumption, higher accuracy and smaller space requirements are important features of electronic control units. In order to minimize power consumption, it is necessary to measure the large current across the (Rsense) resistor, and the high-side current sense amplifier IC must accurately monitor the current.

A four-terminal current-sense resistor that separates the current transfer from the voltage-sensing terminal, from the ideal Kelvin configuration, improves voltage and current measurement accuracy. They also improve interference and thermoelectric effects in higher power applications.



**Four-Terminal Current-Sensing Chips (LRF)**

# Chip Current Sense Resistor (CS)

## ► Product Introduction

**DeMint Chip Current Detecting Chip Resistor (CS) saves space and weight.**

### Features :

- Low TCR of  $\pm 100$  PPM/ $^{\circ}\text{C}$ .
- Resistance Values from  $1\text{m}\Omega$  to  $8000\text{m}\Omega$ .
- 3W Power Rating in 1W size, 1225 Package.
- Long size Terminations with Higher Power Rating.
- High Purity Alumina Substrate for High Power Dissipation.
- Products with Pb-free Terminations Meet RoHS Requirements.

### Applications :

- Voltage Regulation Module (VRM).
- Portable Devices (PDA, Cell phone).
- Disk Driver, Switching Power Supply.
- Over Current Protection in Audio Application.
- DC-DC Converter, Battery Pack, Charger, Adaptor.
- Automotive Engine Control, Power Management Applications.

DeMint Electronics has launched the (CS) series, a family of ultra-small and low value surface mount current sensing resistor. These smaller sizes save space on the circuit board, allowing the production of smaller and lighter products.

The new series complements DeMint's existing (LRC) Series, offering metal resistive film on ceramic construction but providing increased choice for product designers in the form of smaller sizes options of 0201, 0402, 0603, 0805, 1206, 2010, 2512, 1225, 3720, 7520, and 0612.

Designed for current detecting in power electronic systems, the fully RoHS compliant (CS) series is suitable for a range of applications including the monitoring of power usage and battery life; and provision of output protection for power supplies; as well as for a range of consumer and automotive products such as satellite navigation, handheld PDAs and digital set-top boxes.

The series offers ohm values as low as  $1\text{m}\Omega$  to minimize power consumption and has an ambient temperature range of  $-55^{\circ}\text{C}$  to  $+155^{\circ}\text{C}$ .

Exhibiting a resistance range up to  $8000\text{m}\Omega$  and excellent heat dissipation qualities, the series offers designers enhanced power handling capabilities and protection from the threat of localized heating, resulting in the production of a more energy efficient product.

As demand continues to grow for reduced size, handheld and portable devices operating at low voltages, designers will look to manufacturers to produce smaller and smaller current sense resistors. DeMint expects that demand for its latest range of small size resistor will be high.

For more chip low ohm thick film resistors, please link to DeMint official website "[Current Sense Resistors](http://www.direct-token.com)". Contact us with your specific needs.



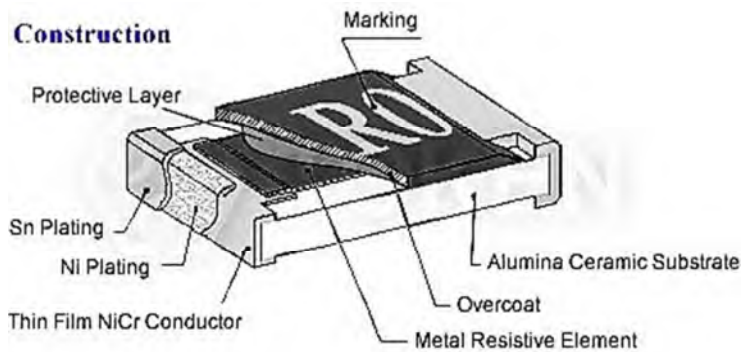


### Construction & Dimensions

#### Construction & Dimensions (Unit: mm)

Type	L (mm)	W (mm)	T (mm)	D1 (mm)	D2 (mm)	Weight (g) / 1000pcs
CS01 (0201)	0.60±0.03	0.30±0.03	0.23±0.05	0.12±0.05	0.15±0.05	0.18
CS02 (0402)	1.00±0.05	0.50±0.05	0.32±0.10	0.25±0.10	0.20±0.10	0.7
CS03 (0603)	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	1.99
CS05 (0805)	2.00±0.10	1.25±0.10	0.55±0.10	0.30±0.20	0.40±0.25	5.3
CS06 (1206)	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.30	0.40±0.25	8.82
CS13 (1210)	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.30	0.50±0.25	15.5
CS10 (2010)	5.00±0.10	2.50±0.15	0.60±0.15	0.60±0.30	0.50±0.25	27.03
CS12 (2512)	6.35±0.10	3.10±0.15	0.60±0.10	0.60±0.30	0.55±0.25	43.08
CS12 (2512) 2W (10 ~ 99)mΩ	6.35±0.20	3.15±0.15	0.74±0.10	0.60±0.30	0.55±0.25	53.08
CS12 (2512) 2W (100 ~ 1000)mΩ	6.35±0.20	3.15±0.15	0.74±0.10	0.60±0.30	2.10±0.10	53.08
CS25 (1225)	3.10±0.15	6.30±0.15	0.90±0.15	0.60±0.30	0.80±0.25	64.88
CS37 (3720)	2.00±0.20	3.75±0.20	0.60±0.10	0.40±0.20	0.40±0.20	19.96
CS75 (7520)	2.00±0.20	7.50±0.30	0.60±0.10	0.40±0.20	0.40±0.20	35.71
CS62 (0612)	1.55±0.10	3.10±0.15	0.55±0.10	0.30±0.15	0.45±0.15	10.19

#### Construction



(CS) Surface Mount Construction

0201/0402/0603/0805/1206/2010/2512



1225/3720/7520



Current Detecting (CS) - Dimensions

#### Marking for 0603 Current Detecting Resistor (CS)

Marking	Value
1R0	1.000Ω
R10	0.100Ω
R01	0.010Ω
138	0.138Ω
039	0.039Ω

## Electrical Specifications

### Standard Electrical Specifications (CS)

Type	Power Rating at 70℃	Operating Temp. Range	Resistance Tolerance (%)	Max. Operating Current (A)	Resistance Range (mΩ)	TCR (PPM/℃)
CS01 (0201)	1/20W	(-55 ~ +155)℃	±1% ±2% ±5%	0.70A	100 - 147 150 - 500 510 - 1000	±1000 ±600 ±300
CS02 (0402)	1/16W			1.11A	50 - 100 102 - 500 510 - 1000	±400 ±300 ±200
CS03 (0603)	1/10W			2.23A	20 - 50 51 - 100 102 - 500 510 - 1000	±600 ±400 ±300 ±200
CS05 (0805)	1/8W			2.50A	20 - 50 51 - 100 102 -196 200 - 1000	±600 ±400 ±300 ±200
CS06 (1206)	1/4W			5.00A	10 - 20 21 - 50 51 - 91 100 - 1000	±600 ±400 ±300 ±200
CS13 (1210)	1/2W			7.07A		
CS10 (2010)	3/4W			8.66A		
CS12 (2512)	1W			10.0A		
CS25 (1225)	3W			31.6A	3 - 5 6 - 20 21 - 30 33 - 8000	±300 ±200 ±150 ±100
CS37 (3720)	1W			10.0A	10 - 18 20 - 500	±300 ±150
CS75 (7520)	2W		±2%,±5%	44.7A	1 - 4	±300
CS62 (0612)	1W		±1% ±2% ±5%	10.0A	5 - 10 11 - 350	±200 ±150
					10 - 27 30 - 91 100 – 499 500 - 1000	±600 ±300 ±200 ±100

- Operating Current  $I = \sqrt{(P / R)}$ , Operating Voltage  $V = \sqrt{(P \cdot R)}$ , or Max. Operating voltage whichever is lower.
- Optional specifications can be required.

### High Power Rating Electrical Specifications Energy Efficient (CS)

Type	Power Rating at 70°C	Operating Temp. Range	Resistance Tolerance (%)	Max. Operating Current (A)	Resistance Range (mΩ)	TCR (PPM/°C)
CS02 (0402)	1/8W	(-55 ~ +155)°C	±1% ±2% ±5%	1.56A	51 - 100	±400
CS03 (0603)	1/8W, 1/5W			1.98A	102 - 500	±300
CS05 (0805)	1/4W			2.21A	510 - 1000	±200
CS06 (1206)	1/2W			7.07A	10 - 20 21 - 50 51 - 91 100 - 1000	±600 ±400 ±300 ±200
CS13 (1210)	3/4W			8.66A		
CS10 (2010)	1W			10.0A		
CS12 (2512)	1.5W			12.2A		
CS12 (2512)	*2W			14.1A		

● \* Ultra High Power

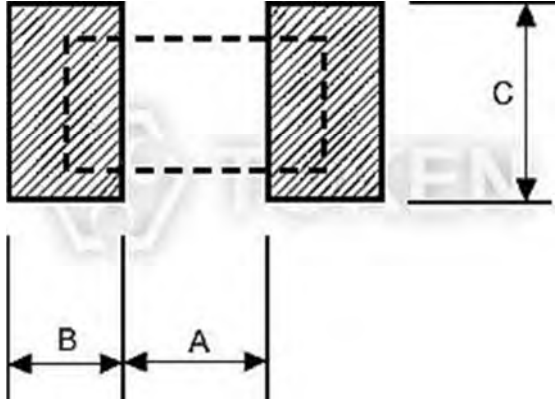
### Low TCR Electrical Specifications (CS)

Type	Power Rating at 70°C	Operating Temp. Range	Resistance Tolerance (%)	Max. Operating Current (A)	Resistance Range (mΩ)	TCR (PPM/°C)
CS05 (0805)	1/8W	(-55 ~ +155)°C	±1% ±2% ±5%	1.11A	100 - 1000	±100
CS06 (1206)	1/4W			1.58A	100 - 1000	±100
CS13 (1210)	1/2W			2.58A	75 - 1000	±100
CS10 (2010)	3/4W			2.58A	50 - 1000	±100
CS12 (2512)	1W			7.07A	20 - 1000	±100
CS12 (2512)	*2W			6.32A	50 - 1000	±100
CS37 (3720)	1W			3.16A	100 - 500	±100
CS75 (7520)	2W			6.32A	50 - 350	±100



### ► Land Pattern

#### Pad Layout (Except For CS12: Ultra High Power Rating Series) (CS)

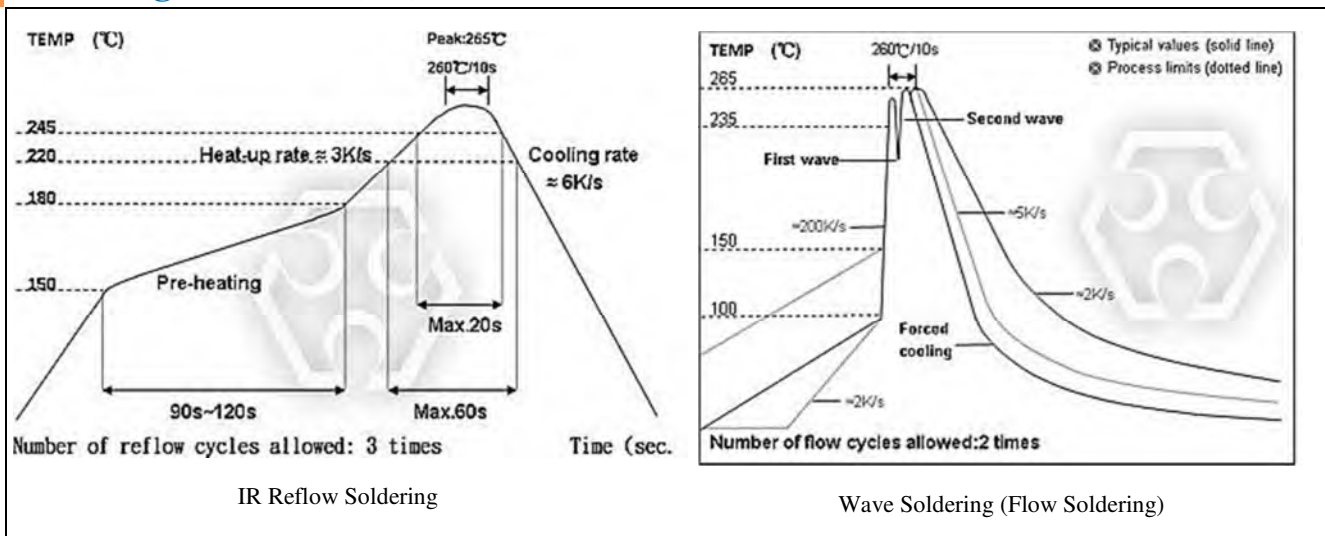
Figure	Codes	A	B	C
 <p>(CS) Recommend Land Pattern</p>	CS01	0.25	0.30	0.40±0.2
	CS02	0.50	0.50	0.60±0.2
	CS03	0.80	1.00	0.90±0.2
	CS05	1.00	1.00	1.35±0.2
	CS06	2.00	1.15	1.70±0.2
	CS13	2.00	1.15	2.50±0.2
	CS10	3.60	1.40	2.50±0.2
	CS12	4.90	1.60	3.20±0.2
	CS25	1.20	2.00	7.00±0.2
	CS37	1.00	1.80	3.90±0.2
	CS75	1.00	1.80	7.60±0.2
	CS62	0.60	1.00	3.20±0.2

#### Pad Layout (For CS12: Ultra High Power Rating Series) (CS)

Codes	Resistance Range	A	B	C
CS12	(10~99)mΩ	4.90	1.60	3.20±0.2
CS12	(100~1000)mΩ	1.00	3.55	3.20±0.2

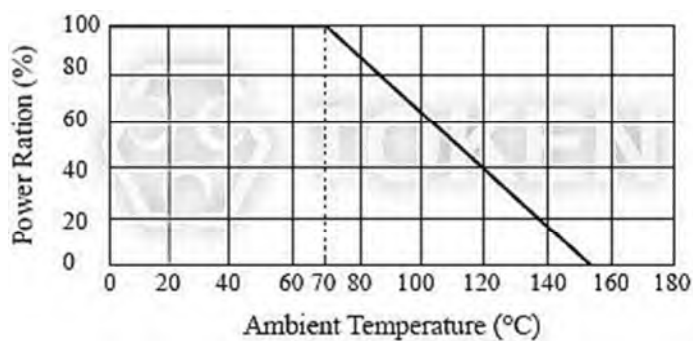
## Soldering & Derating

### Soldering Condition (CS)



- (1) Time of IR reflow soldering at maximum temperature point 260°C : 10s
- (2) Time of wave soldering at maximum temperature point 260°C : 10s
- (3) Time of soldering iron at maximum temperature point 410°C : 5s

### Power Derating Curve (CS)



(CS) Power Derating Curve





## Environmental Characteristics

### Environmental Characteristics (CS)

Item	Specification	Test Method
Temperature Coefficient of Resistance (T.C.R)	As Spec	JIS-C-5201-1 4.8 IEC-60115-1 4.8 -55°C ~ +125°C, 25°C is the reference temperature
Short Time Overload	$\pm(0.5\%+0.05\Omega)$	JIS C 5201-1 4.13 IEC 60115-1 4.13
	$\pm(1.0\%+0.05\Omega)$ For High power rating	RCWV*2.5 or Max. Overload Voltage whichever is less for 5 seconds.
Insulation Resistance	$\geq 10G\Omega$	JIS-C-5201-1 4.6 IEC-60115-1 4.6 Max. Overload Voltage for 1 minute
Endurance	$\pm(1.0\%+0.05\Omega)$	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1 70 $\pm$ 2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	$\pm(0.5\%+0.05\Omega)$	JIS-C-5201-1 4.24 IEC-60115-1 4.24 40 $\pm$ 2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Dry Heat	$\pm(0.5\%+0.05\Omega)$	JIS-C-5201-1 4.23 IEC-60115-1 4.23.2 at +155°C for 1000 hrs
Bending Strength	$\pm(1.0\%+0.05\Omega)$	JIS-C-5201-1 4.33 IEC-60115-1 4.33 Bending once for 5 seconds with 3mm 2010, 2512 sizes: 2mm
Solderability	95% Min. coverage	JIS-C-5201-1 4.17 IEC-60115-1 4.17 245 $\pm$ 5°C for 3 seconds
Resistance to Soldering Heat	$\pm(0.5\%+0.05\Omega)$	JIS-C-5201-1 4.18 IEC-60115-1 4.18 260 $\pm$ 5°C for 10 seconds
Voltage Proof	No breakdown or flashover	JIS-C-5201-1 4.7 IEC-60115-1 4.7 1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area $\leq 5\%$ Total leaching area $\leq 10\%$	JIS-C-5201-1 4.18 IEC-60068-2-58 8.2.1 260 $\pm$ 5°C for 30 seconds
Rapid Change of Temperature	$\pm(0.5\%+0.05\Omega)$	JIS-C-5201-1 4.19 IEC-60115-1 4.19 -55°C to +155°C, 5 cycles

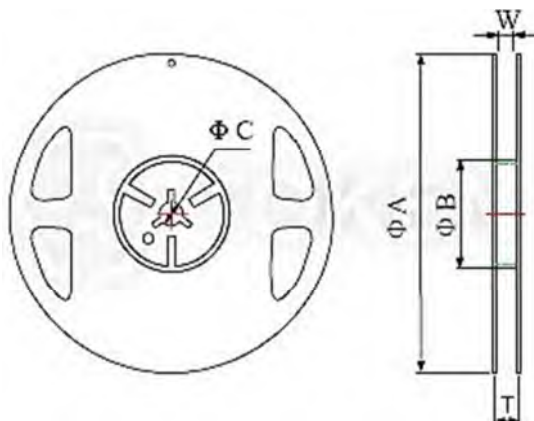
- Rated continuous Working Voltage (RCWV) =  $\sqrt{\text{Power Rating} \times \text{Resistance Value}(\Omega)}$  or Max. Operating voltage whichever is lower.
- Storage Temperature: 15 ~ 28°C; Humidity < 80%RH;



### Reel & Tape

#### Packing Quantity & Reel Specifications (CS)

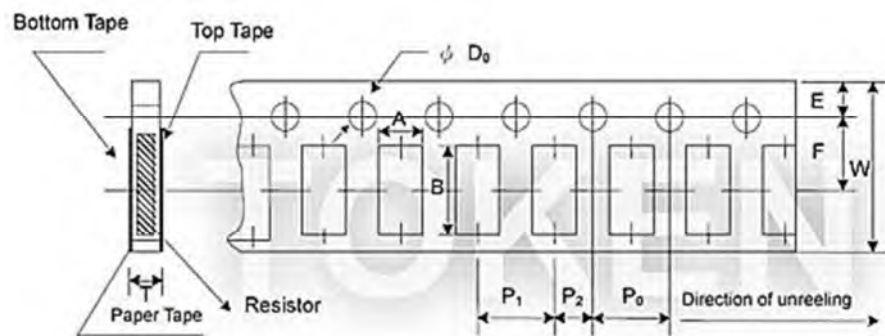
Type	ΦA (mm)	ΦB (mm)	ΦC (mm)	W (mm)	T (mm)	Paper Tape(EA)	Embossed Tape (EA)
CS01	178.0±1.0	60.0+1.0	13.5±0.7	9.5±0.1	11.5±1.0	10,000	-
CS02	178.0±1.0	60.0+1.0	13.5±0.7	9.5±0.1	11.5±1.0	10,000	-
CS03	178.0±1.0	60.0+1.0	13.5±0.7	9.5±0.1	11.5±1.0	5,000	-
CS05	178.0±1.0	60.0+1.0	13.5±0.7	9.5±0.1	11.5±1.0	5,000	-
CS06	178.0±1.0	60.0+1.0	13.5±0.7	9.5±0.1	11.5±1.0	5,000	-
CS13	178.0±1.0	60.0+1.0	13.5±0.7	9.5±0.1	11.5±1.0	5,000	-
CS10	178.0±1.0	60.0+1.0	13.5±0.7	13.5±1.0	15.5±1.0	-	4,000
CS12	178.0±1.0	60.0+1.0	13.5±0.7	13.5±1.0	15.5±1.0	-	4,000
CS12 (2W)	178.0±1.0	60.0+1.0	13.5±0.7	13.5±1.0	15.5±1.0	-	2,000
CS25	178.0±1.0	60.0+1.0	13.5±0.7	13.5±1.0	15.5±1.0	-	2,000
CS37	178.0±1.0	60.0+1.0	13.5±0.7	13.5±1.0	15.5±1.0	-	2,000
CS75	178.0±1.0	60.0+1.0	13.5±0.7	13.5±1.0	15.5±1.0	-	2,000
CS62	178.0±1.0	60.0+1.0	13.5±0.7	9.5±0.1	11.5±1.0	5,000	-



Reel Dimensions

### Paper Tape Specifications (CS)

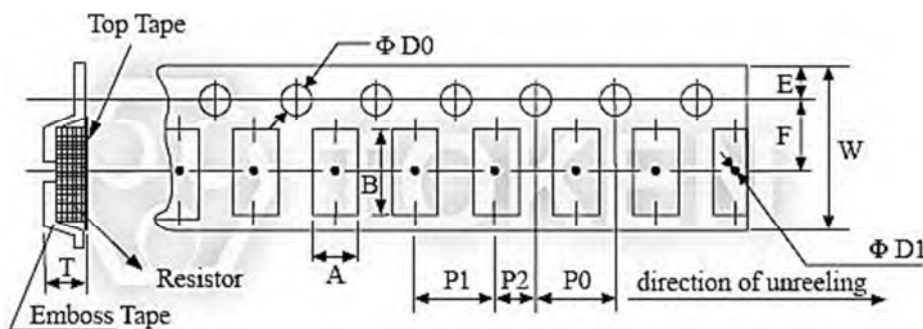
Type	A (mm)	B (mm)	W (mm)	E (mm)	F (mm)	P <sub>0</sub> (mm)	P <sub>1</sub> (mm)	P <sub>2</sub> (mm)	ΦD <sub>0</sub> (mm)	T
CS01	0.38±0.05	0.68±0.05	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.42±0.20
CS02	0.65±0.10	1.15±0.10	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.10
CS03	1.10±0.10	1.90±0.10	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.70±0.10
CS05	1.60±0.10	2.40±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
CS06	1.90±0.10	3.50±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
CS13	2.90±0.10	3.50±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
CS62	1.90±0.10	3.50±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10



Paper Tape Specifications

### Emboss Plastic Tape Specifications (CS)

Type	A (mm)	B (mm)	W (mm)	E (mm)	F (mm)	P <sub>0</sub> (mm)	P <sub>1</sub> (mm)	P <sub>2</sub> (mm)	ΦD <sub>0</sub> (mm)	ΦD <sub>1</sub> (mm)	T
CS10	2.80±0.10	5.50±0.10	12.0±0.30	1.75±0.10	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.4 Min.	1.00±0.20
CS12	3.50±0.10	6.70±0.10	12.0±0.30	1.75±0.10	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.4 Min.	1.00±0.20
CS12 (2W)	3.38±0.10	6.68±0.10	12.0±0.30	1.75±0.10	5.5±0.10	4.00±0.10	4.00±0.10	2.00±0.05	1.55+0.05	1.4 Min.	1.45±0.20
CS25	3.38±0.10	6.68±0.10	12.0±0.30	1.75±0.10	5.5±0.10	4.00±0.10	4.00±0.10	2.00±0.05	1.55+0.05	1.4 Min.	1.45±0.20
CS37	2.50±0.20	4.45±0.20	12.0±0.30	1.75±0.10	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.4 Min.	1.20±0.20
CS75	2.50±0.20	8.30±0.20	16.0±0.30	1.75±0.10	7.8±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.4 Min.	1.20±0.20



Emboss Plastic Tape Specifications

### Order Codes

#### Order Codes (CS)

CS	12	J	TR	G	A	R100	N
Product Type	Dimensions (L×W)(mm)	Resistance Tolerance (%)	Package	TCR (PPM/°C)	Power Rating(W)	Resistance (Ω)	Marking
	01 0201		P Bulk	E ±100	R 3	R010 0.01	N No Marking
	02 0402	J ±5	TR Taping Reel	K ±150	S 2	R100 0.1	W Wide
	03 0603	G ±2		F ±200	A 1.5	1R00 1	
	05 0805	F ±1		G ±300	T 1		
	06 1206			H ±400	Q 3/4		
	13 1210			J ±600	U 1/2		
	10 2010			R ±1000	V 1/4		
	12 2512				W 1/8		
	25 1225				X 1/10		
	37 3720				Y 1/16		
	75 7520						
	62 0612						





# Chip Current Sensing Precision Resistor (TCS)

## ► Product Introduction

**DeMint's TCS (thin film current sensing chip resistor)  
makes sense of current.**

### Features :

- Thin Film Process.
- Resistance Values from 50mΩ to 1Ω.
- Very Tight Tolerance from ±1% to ±0.5%.
- Extremely Low TCR from ±200 PPM/°C to ±50PPM/°C.
- High Purity Alumina Substrate for High Power Dissipation.
- RoHS Requirments with Pb-free Terminations.

### Applications :

- Voltage Regulation Module (VRM),
- Portable Devices (PDA, Cell phone),
- Disk Driver, Switching Power Supply,
- Over Current Protection in Audio Application,
- DC-DC Converter, Battery Pack, Charger, Adaptor,
- Automotive Engine Control, Power Management Applications,

The trend towards smaller handheld and portable electronics equipment has also increased the need for ultra-small current sensing resistor. Devices from the DeMint Electronics' TCS series use a thin film construction that enables them to achieve precision resistance tolerances, low noise and long-term stability.

The DeMint TCS Series precision resistors are nichrome thin film chip resistors with a temperature coefficient of resistance of just ±50PPM/°C and tolerances of ±0.5%.

They offer excellent stability at high frequencies and are suitable for operating high voltages with more options in the smaller form sizes of 0402, 0603, 0402, 0805, 1206, 2010, and 2512.

The full range of values is from 50mΩ to 1Ω. This low ohm devices are particularly suited to car engine management units to act as current shunt resistors.

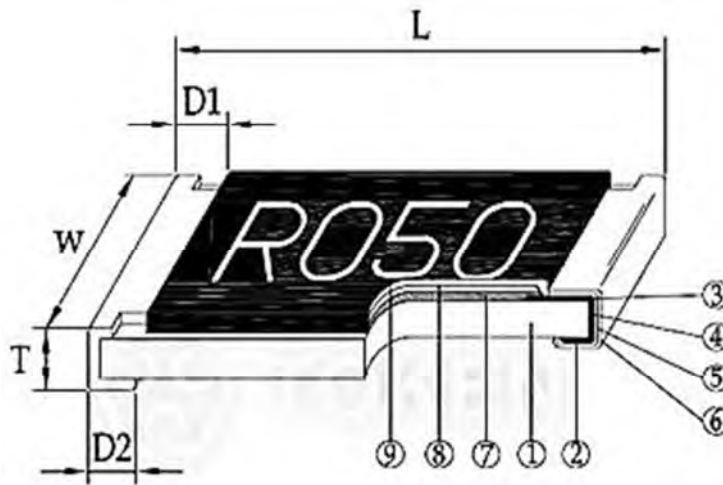
The TCS current sense series is fully RoHS compliant and is supplied in tape and reel packaging ready for use with automated assembly processes.

For more chip low ohm resistors, please link to DeMint official website "[Current Sense Resistors](http://www.direct-token.com)". Contact us with your specific needs.



### Construction & Dimensions

#### Construction & Dimensions (Unit: mm)



Thin Film Chip Construction

①	Alumina Substrate
②	Bottom Electrode
③	Top Electrode
④	Edge Electrode
⑤	Barrier Layer
⑥	External Electrode
⑦	Resistor Layer
⑧	Overcoat
⑨	Marking

Type	L (Unit: mm)	W (Unit: mm)	T (Unit: mm)	D1 (Unit: mm)	D2 (Unit: mm)	Weight(g)/1000pcs
TCS02 (0402)	1.00±0.05	0.50±0.05	0.32±0.10	0.25±0.10	0.20±0.10	0.56
TCS03 (0603)	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	3.1
TCS05 (0805)	2.00±0.15	1.25±0.15	0.55±0.10	0.30±0.20	0.40±0.25	5.6
TCS06 (1206)	3.05±0.15	1.55±0.15	0.55±0.10	0.50±0.30	0.40±0.25	12.3
TCS10 (2010)	5.00±0.20	2.45±0.15	0.60±0.15	0.60±0.30	0.50±0.25	26.7
TCS12 (2512)	6.35±0.20	3.15±0.15	0.60±0.10	0.60±0.30	0.55±0.25	49.6

## Electrical Specifications

### Standard Electrical Specifications Thin Film (TCS)

Type	Power Rating at 70°C	Resistance Tolerance	Resistance Range	TCR	Operating Temp. Range
TCS02 (0402)	1/16W	±0.5%, ±1.0%	500mΩ~1000mΩ	±100PPM/°C ±50PPM/°C	-55 ~ +155°C
TCS03 (0603)	1/10W	±0.5%, ±1.0%	200mΩ~300mΩ	±100PPM/°C	
TCS05 (0805)	1/8W		301mΩ~1000mΩ	±50PPM/°C	
TCS06 (1206)	1/4W	±1.0%	50mΩ~100mΩ	±200PPM/°C	
		±0.5%, ±1.0%	101mΩ~300mΩ 301mΩ~1000mΩ	±100PPM/°C ±50PPM/°C	
TCS10 (2010)	3/4W	±0.5%, ±1.0%	50mΩ~100mΩ	±200PPM/°C	
TCS12 (2512)	1W		101mΩ~300mΩ 301mΩ~1000mΩ	±100PPM/°C ±50PPM/°C	

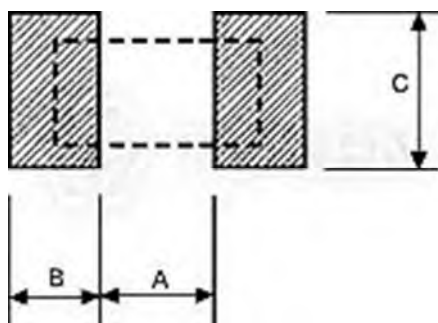
### High Power Rating Electrical Specifications Thin Film (TCS)

Type	Power Rating at 70°C	Resistance Tolerance	Resistance Range	TCR	Operating Temp. Range
TCS12 (2512)	3W	±0.5%, ±1.0%	100mΩ~1000mΩ	±100PPM/°C	-55 ~ +155°C

- DeMint has the ability to manufacture following options based on customer's requirement.

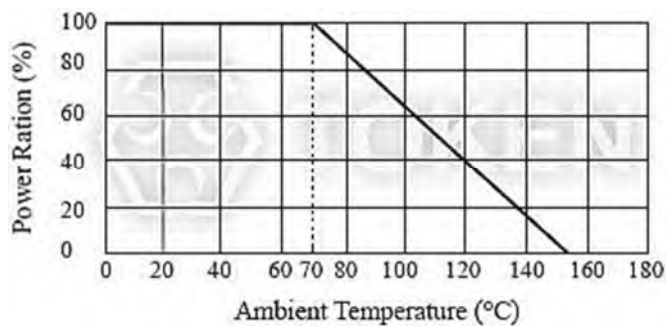
### Recommend Land Pattern (TCS)

Type	A (mm)	B (mm)	C (mm)
TCS02	0.50	0.50	0.60±0.2
TCS03	0.80	1.00	0.90±0.2
TCS05	1.00	1.00	1.35±0.2
TCS06	2.00	1.15	1.70±0.2
TCS10	3.60	1.40	2.50±0.2
TCS12	4.90	1.60	3.10±0.2



Recommend Land Pattern

### Power Derating Curve (TCS)



Power Derating Curve (TCS) Series

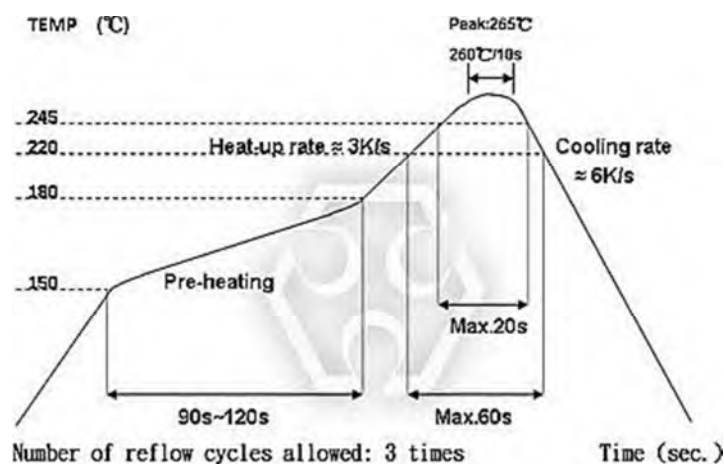
## Environmental Characteristics

### Environmental Characteristics (TCS)

Item	Specification	Test Method
Temperature Coefficient of Resistance	As Spec	MIL-STD-202F Method 304 +25/-55/+25/+125/+25°C
Short Time Overload	±1%	JIS-C-5202-5.5 RCWV*2.5 or Max. overload voltage whichever is lower for 5 seconds
Dielectric Withstand Voltage	by Type	MIL-STD-202F Method 301 Apply Max Overload Voltage for 1 minute
Insulation Resistance	>1000MΩ	MIL-STD-202F Method 302 Apply 100VDC for 1 minute
Thermal Shock	±0.5%	MIL-STD-202F Method 107G -55°C ~150°C, 100cycles
Load Life (Endurance)	±1%	MIL-STD-202F Method 108A 70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Humidity (Damp Heat with Load)	±0.5%	MIL-STD-202F Method 103B 40°C, 90~95%RH, RCWV 1.5 hours ON, 0.5 hours OFF, total 1000 hours
Low Temperature Operation	±0.5%	JIS-C-5202-7.1 1hour, -65°C followed by 45minutes of RCWV
Bending Strength	As Spec	JIS-C-5202-6.1.4 Bending Amplitude 3mm for 10seconds
Solderability	95%Min. coverage	MIL-STD-202F Method 208H 245°C±5°C, 3 seconds
Resistance to Soldering Heat	±0.5%	MIL-STD-202F Method 210E 260±5°C, 10±1 seconds

- Rated continuous Working Voltage (RCWV) =  $\sqrt{\text{Power Rating} \times \text{Resistance Value } (\Omega)}$  or Max. Operating voltage whichever is lower.
- Storage Temperature: 15~28°C, Humidity < 80%RH

### Reflow Soldering (TCS)



Power Derating Curve (TCS) Series

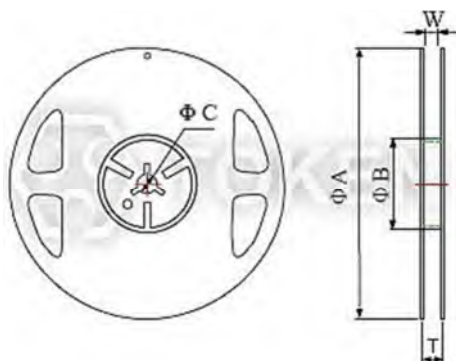




## Reel Tape Specifications

### Packaging Quantity & Reel Specifications (TCS)

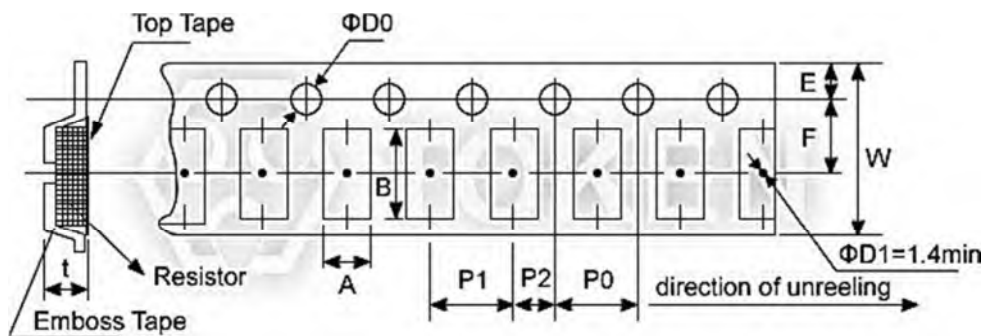
Type	$\Phi A$	$\Phi B$	$\Phi C$	W	T	Paper Tape (EA)	Emboss Plastic Tape (EA)
TCS02	178.0 $\pm$ 1.0	60.0 $\pm$ 1.0	13.5 $\pm$ 0.7	9.5 $\pm$ 1.0	11.5 $\pm$ 1.0	10,000	-
TCS03	178.0 $\pm$ 1.0	60.0 $\pm$ 1.0	13.5 $\pm$ 0.7	9.5 $\pm$ 1.0	11.5 $\pm$ 1.0	5,000	-
TCS05	178.0 $\pm$ 1.0	60.0 $\pm$ 1.0	13.5 $\pm$ 0.7	9.5 $\pm$ 1.0	11.5 $\pm$ 1.0	5,000	-
TCS06	178.0 $\pm$ 1.0	60.0 $\pm$ 1.0	13.5 $\pm$ 0.7	9.5 $\pm$ 1.0	11.5 $\pm$ 1.0	5,000	-
TCS10	178.0 $\pm$ 1.0	60.0 $\pm$ 1.0	13.5 $\pm$ 0.7	13.5 $\pm$ 1.0	15.5 $\pm$ 1.0	-	4,000
TCS12	178.0 $\pm$ 1.0	60.0 $\pm$ 1.0	13.5 $\pm$ 0.7	13.5 $\pm$ 1.0	15.5 $\pm$ 1.0	-	4,000



Packaging Reel Specifications

### Emboss Plastic Tape Specifications (TCS)

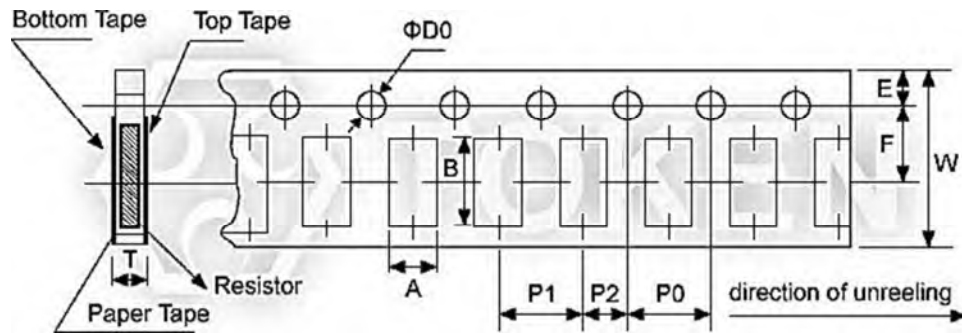
Type	A	B	W	E	F	P0	P1	P2	$\Phi D0$	T
TCS10	2.85 $\pm$ 0.10	5.45 $\pm$ 0.10	12.0 $\pm$ 0.10	1.75 $\pm$ 0.10	5.5 $\pm$ 0.05	4.00 $\pm$ 0.05	4.00 $\pm$ 0.10	2.00 $\pm$ 0.05	1.50 $\pm$ 0.10	1.00 $\pm$ 0.20
TCS12	3.40 $\pm$ 0.10	6.65 $\pm$ 0.10	12.0 $\pm$ 0.10	1.75 $\pm$ 0.10	5.5 $\pm$ 0.05	4.00 $\pm$ 0.05	4.00 $\pm$ 0.10	2.00 $\pm$ 0.05	1.50 $\pm$ 0.10	1.00 $\pm$ 0.20



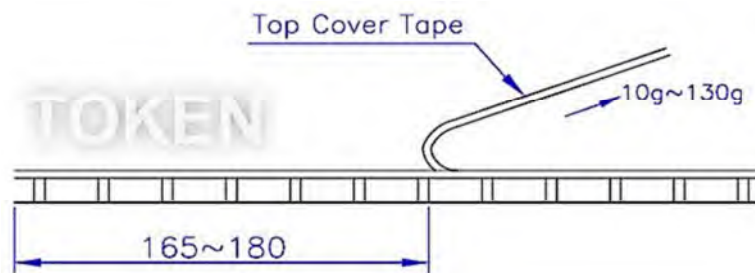
Emboss Plastic Tape Specifications (TCS)

### Paper Tape Specifications (TCS)

Type	A	B	W	E	F	P0	P1	P2	ΦD0	T
TCS02	0.70±0.05	1.16±0.05	8.00±0.10	1.75±0.05	3.50±0.05	4.00±0.10	2.00±0.10	2.00±0.05	1.55±0.05	0.40±0.03
TCS03	1.10±0.05	1.90±0.05	8.00±0.10	1.75±0.05	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.60±0.03
TCS05	1.60±0.05	2.37±0.05	8.00±0.10	1.75±0.05	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.75±0.05
TCS06	2.00±0.05	3.55±0.05	8.00±0.10	1.75±0.05	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.75±0.05



Paper Tape Specifications



Peel - off force

- Peel force of top cover tape
- The peel speed shall be about 300mm/Min.5±5%
- The peel force of top cover tape shall be between 10 to 100g

## Order Codes

### Order Codes (TCS)

TCS	02		D		TR		E				1R00		N	
Part Type	Dimensions (L×W) (mm)		Resistance Tolerance (%)		Package		TCR (ppm/°C)		Power Rating (W)		Resistance (Ω)		Marking	
					P	Bulk								Standard Marking
	02	0402	F	±1	TR	Taping Reel	D	±50		Standard	R010	0.01		
	03	0603	D	±0.5		E	±100	R	3W	R100	0.100	N	No Marking	
	05	0805				F	±200			1R00	1.000			
	06	1206												
	10	2010												
	12	2512												

### 3 Digit Marking (0603) (TCS)

Resistance	1Ω	0.1Ω	0.15Ω	0.01Ω	0.101Ω	0.035Ω
Codes	1R0	R10	R15	R01	101	035

### 4 Digit Marking (0805~2512) (TCS)

Resistance	1Ω	0.1Ω	0.05Ω	0.015Ω	0.01Ω	0.39Ω
Codes	1R00	R100	R050	R015	R010	R390



# Metal Strip Chip Current Sense Resistor (LRC)

## ► Product Introduction

**DeMint (LRC) metal strip current sense chip resistor save space, time, and cost.**

### Features :

- Low TCR  $\pm 50\text{PPM}/^{\circ}\text{C}$ ,  $\pm 100\text{PPM}/^{\circ}\text{C}$ .
- High Wattage Rating Up to 3W.
- Customized Resistance Available.
- Resistance Values from  $0.5\text{m}\Omega$  to  $15\text{m}\Omega$ .
- Without Laser Trimmed with Very Low Inductance.

### Applications :

- For NB power management.
- For MB power management.
- For Monitor power management.
- SWPS: DC-DC converter, Charger, Adaptor.

Providing design engineers with an economical low Ohmic value, metal strip current sense surface mount resistor with high quality performance, DeMint Electronics LRC Series is suitable for applications in the automotive sector for applications that require high power handling (Up to 3W) and low resistance  $0.5\text{m}\Omega$ .

From a certified supplier offering the automotive quality, DeMint's LRC Series gives all round superior performance for current sensing in lamp detection, mirrors, window lift, steering and seat controls.

As a first instance, the LRC Series displays enhanced power handling capabilities, against other technologies.

Thermal conductivity is important for chip resistors - little heat is dissipated directly into the air, and instead, is conducted out through the solder pads.

The heat generated from the specially constructed LRC resistor is more readily dispersed, therefore preventing localized heating, which contributes to TCR and thermal EMF errors, premature aging and possible scorching of the PC board.

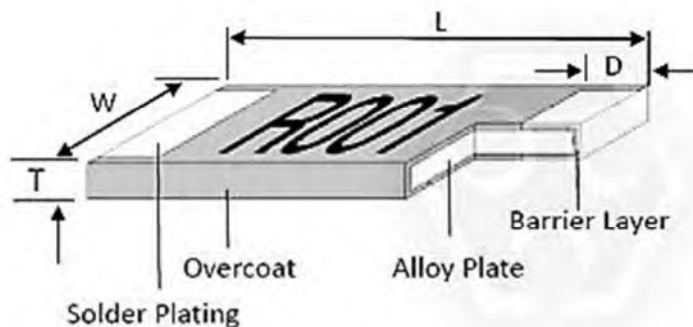
The current sensing resistors (LRC) are rated for ambient operation from  $-55^{\circ}\text{C}$  to  $+170^{\circ}\text{C}$ . The LRC Series is RoHS compliant and lead free.

Need more detail information about (LRC), please link to DeMint official website "[Current Sense Resistors](#)". Contact us with your specific needs.

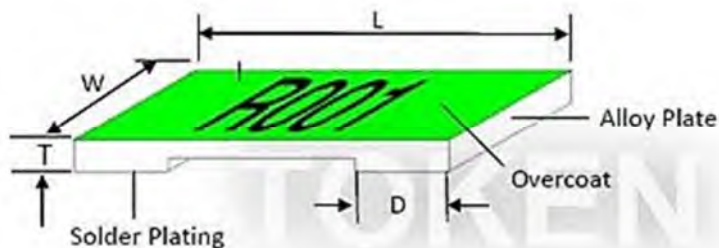


## Construction & Dimensions

### 2512 Construction & Dimension (LRC) (Unit: mm)



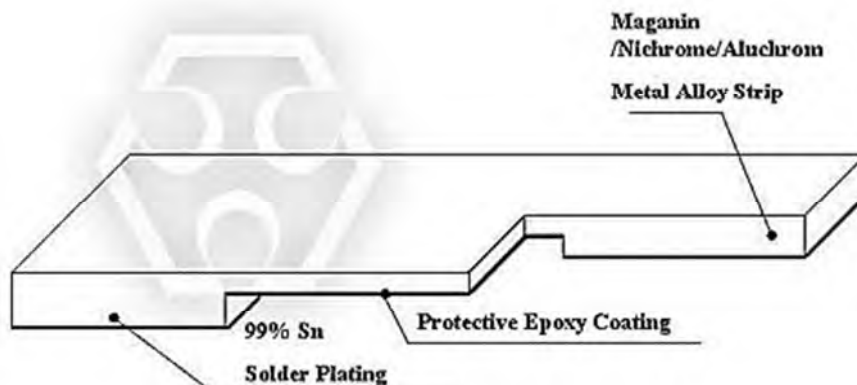
Black 2512 - Wave or IR reflow soldering



Green 2512 - IR reflow soldering only

### 1206 & 2010 Construction (LRC)

Type	Material
0M50 ~ R003	Manganese, Copper
3M5 ~ R010	Aluminum, Iron, Chromium

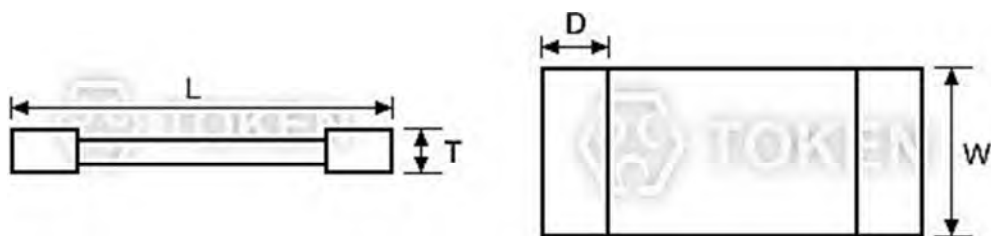


1206 & 2010 Construction



## Chip 2512, 2010, 1206 Dimensions (LRC)

Type	Resistance (mΩ)	L(mm)	W(mm)	T(mm)	D(mm)	Weight(g) / 1000pcs
LRC06*TF0M50	0.50	3.20±0.25	1.60±0.10	0.60±0.20	1.35±0.25	22.6
LRC06*TD0M75	0.75	3.20±0.25	1.60±0.10	0.60±0.20	1.23±0.25	22.6
LRC06*T*****	1.0, 3.5, 4.0, 5.0, 6.0	3.20±0.25	1.60±0.10	0.60±0.20	1.10±0.25	22.6
LRC06*T*****	2.0, 3.0, 10	3.20±0.25	1.60±0.10	0.60±0.20	0.60±0.25	22.6
LRC06*T*****	1.2, 1.5, 7.0, 8.0, 9.0	3.20±0.25	1.60±0.10	0.60±0.20	0.90±0.25	22.6
LRC10*TEA0M50	0.5	5.08±0.25	2.54±0.15	0.60±0.20	2.17±0.25	42.3
LRC10*TDA0M75	0.75	5.08±0.25	2.54±0.15	0.60±0.20	2.04±0.25	42.3
LRC10*TDAR001	1.0	5.08±0.25	2.54±0.15	0.60±0.20	1.84±0.25	42.3
LRC10*TDA****	2.0, 6.0, 7.0, 8.0	5.08±0.25	2.54±0.15	0.60±0.20	1.54±0.25	42.3
LRC10*TDAR003	3.0	5.08±0.25	2.54±0.15	0.60±0.20	1.04±0.25	42.3
LRC10*TDA****	4.0, 5.0	5.08±0.25	2.54±0.15	0.60±0.20	1.84±0.25	42.3
LRC10*TDA****	9.0, 10	5.08±0.25	2.54±0.15	0.60±0.20	1.29±0.25	42.3
LRC12*T**0M50G	0.50	6.35±0.25	3.00±0.20	0.60±0.20	2.68±0.25	59.13
LRC12*T**0M75G	0.75	6.35±0.25	3.00±0.20	0.60±0.20	2.48±0.25	59.13
LRC12*T*****G	1.0, 6.0	6.35±0.25	3.00±0.20	0.60±0.20	1.93±0.25	59.13
LRC12*T*****G	1.5, 6.5, 7.0	6.35±0.25	3.00±0.20	0.60±0.20	1.43±0.25	59.13
LRC12*T*****G	2.0, 2.5, 3.0, 3.5	6.35±0.25	3.00±0.20	0.60±0.20	1.18±0.25	59.13
LRC12*T*****G	4.0, 4.5	6.35±0.25	3.00±0.20	0.60±0.20	2.18±0.25	59.13
LRC12*T*****G	5.0, 6.0	6.35±0.25	3.00±0.20	0.60±0.20	1.93±0.25	59.13
LRC12*T*****G	8.0 - 10	6.35±0.25	3.00±0.20	0.60±0.20	1.18±0.25	59.13
LRC12*T*****G	11 - 15	6.35±0.25	3.00±0.20	0.60±0.20	1.18±0.25	59.13
LRC12*T*0M50	0.50	6.35±0.254	3.18±0.254	1.25±0.20	1.30±0.38	184.11
LRC12*T*0M75	0.75	6.35±0.254	3.18±0.254	0.75±0.20	1.30±0.38	131.11
LRC12*T*R001	1.00	6.35±0.254	3.18±0.254	0.65±0.20	1.30±0.38	110.85
LRC12*T*1M50	1.50	6.35±0.254	3.18±0.254	0.45±0.20	1.30±0.38	67.16
LRC12*T*R002	2.00	6.35±0.254	3.18±0.254	0.35±0.20	1.30±0.38	49.30
LRC12*T*2M50	2.50	6.35±0.254	3.18±0.254	0.65±0.20	1.30±0.38	97.95
LRC12*T*R003	3.00	6.35±0.254	3.18±0.254	0.55±0.20	1.30±0.38	83.49
LRC12*T*R004	4.00	6.35±0.254	3.18±0.254	0.45±0.20	1.30±0.38	62.59
LRC12*T*R005	5.00	6.35±0.254	3.18±0.254	0.35±0.20	1.30±0.38	49.84
LRC12*T*R006	6.00	6.35±0.254	3.18±0.254	0.32±0.20	1.30±0.38	41.76
LRC12*T*6M50	6.50	6.35±0.254	3.18±0.254	0.30±0.20	1.30±0.38	35.85
LRC12*T*R007	7.00	6.35±0.254	3.18±0.254	0.27±0.20	1.30±0.38	34.01
LRC12*T*R010	10.00	6.35±0.254	3.18±0.254	0.25±0.20	1.30±0.38	25.97



Chip 2512, 2010, 1206 Dimensions (LRC)

- Notice: DIRECT is capable of manufacturing the optional spec based on customer's requirement.



## Electrical Specifications

### Standard Electrical Specifications (LRC)

Type	Power Rating at 70°C	Operating Temp. Range	Resistance Tolerance (±%)	Resistance (mΩ)	TCR (±PPM/°C)
LRC06*TF0M50	1W	-55°C ~ +170°C	±1, ±3, ±5	0.5	±200
LRC06*TD****	1W			0.75 - 10	±50
LRC12*TD****	1W			0.5, 0.75, 1, 1.5, 2	±50
LRC12*TW****	1W			6, 6.5, 7	±75
LRC12*TE****	1W			4, 5, 10	±100
LRC12*TK****	1W			2.5, 3	±150
LRC12*TD****G	1W			11, 12, 13, 14, 15	±50

### High Power Rating Electrical Specifications (LRC)

Type	Power Rating at 70°C	Operating Temp. Range	Resistance Tolerance (± %)	Resistance (mΩ)	TCR (±PPM/°C)
LRC10*TEA0M50	1.5W	-55°C ~ +170°C	±1, ±3, ±5	0.5	±100
LRC10*TDA****	1.5W			0.75 - 10	±50
LRC12*TDS****	2W			0.5, 0.75, 1, 1.5, 2	±50
LRC12*TWS****	2W			6, 6.5, 7	±75
LRC12*TES****	2W			4, 5, 10	±100
LRC12*TKS****	2W			2.5, 3	±150
LR1C2*TDS****G	2W			6.5, 7, 8, 9, 10	±50
LRC12*TDB****G	2.5W			4, 4.5, 5, 6	±50
LRC12*TDR****G	3W			1, 1.5, 2, 2.5, 3, 3.5	±50
LRC12*TER****G	3W			0.5, 0.75	±100

● Remark : Operating Current  $I = \sqrt{(P / R)}$  , Operating Voltage  $V = \sqrt{(P * R)}$



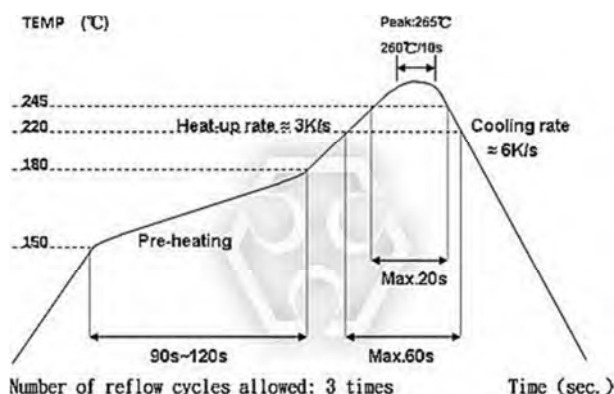
## Environmental Characteristics

### Environmental Characteristics (LRC)

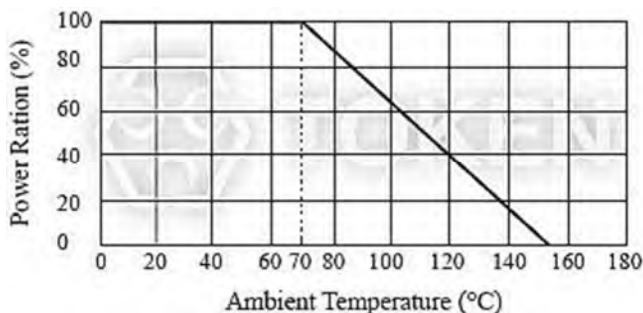
Item	Specification		Test Method
	Black coating	Green coating	
Thermal Shock	±0.5%	±1%	-55℃~150℃, 100 cycles. MIL-STD-202 Method 107G
Short Time Overload	±0.5%	±1%	5*Rated Power for 5 seconds. JIS-C-5202-5.5
Endurance	±1%	±1%	70±2℃, Max. working voltage for 1000 hrs with 1.5 hrs and 0.5 hrs
Dry Heat	±1%	±1%	at +170℃ for 1000 hrs
Resistance to Soldering Heat	±0.5%	±1%	260±5℃, for 10 seconds. MIL-STD-202F Method 210E
Solderability	95% Min. coverage		245±5℃ for 3 seconds. MIL-STD-202F Method 210E
Temperature Coefficient of Resistance	As Spec.		+25/-55/+25/+125/+25℃. MIL-STD-202 Method 304

- Rated continuous Working Voltage (RCWV) =  $\sqrt{\text{Power Rating} \times \text{Resistance Value } (\Omega)}$  or Max. Operating voltage whichever is lower.
- Green coating can't be work with wave soldering bath.
- Humidity < 80% RH; Storage Temperature: 25±3℃

### Soldering Condition (LRC)



Green coating "Reflow Air Convection" is available  
Green coating can't be working with wave soldering bath

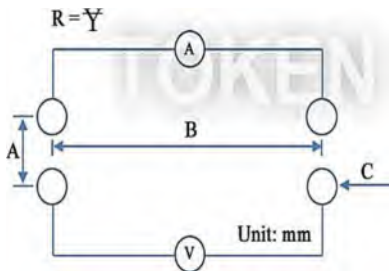


Power Derating Curve



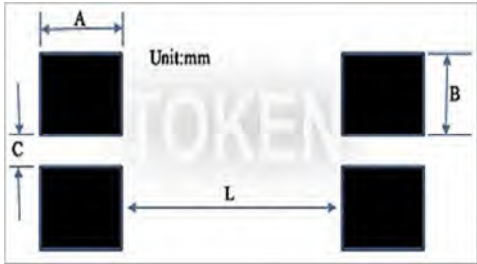
### ► Pad Layout

#### 4-Wire Precision Measurement (LRC)

Figure	Type	A	B	C	Excitation Current (A)	Resistance ( $\Omega$ )
 <p>4-Wire Precision Measurement</p>	LRC12 Black Coating	1.5	5.4	$\Phi 0.5$	3A	0.5m ~ 1.5 m
	LRC12 Black Coating	1.5	5.4	$\Phi 0.5$	1A	2m ~ 10m
	LRC12 Green Coating	1.5	5.4	$\Phi 0.5$	3A	0.5m ~ 1.5m
	LRC12 Green Coating	1.5	5.4	$\Phi 0.5$	1A	2m ~ 15m
	LRC06	1.25	2.6	$\Phi 0.5$	3A	0.5m ~ 1.5m
	LRC06	1.25	2.6	$\Phi 0.5$	1A	2m ~ 10m
	LRC10	1.2	4.32	$\Phi 0.5$	3A	0.5m ~ 1.5m
	LRC10	1.2	4.32	$\Phi 0.5$	1A	2m ~ 10m

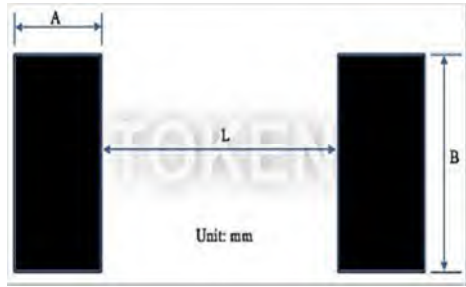
● Note: Equipment: ADEX AX-1152D DC Low Ohm Meter

### 4-Wire Pad Layout (LRC)

Figure	Type	Resistance ( $\Omega$ )	A	B	C	L
 <p>Unit:mm</p> <p><b>4-Wire Pad Layout</b> (recommended for precision current sensing)</p>	<b>LRC12 Black Coating</b>	-	1.0	2.7	2.95	1.45
	<b>LRC12 Green Coating</b>	0M50	3.13	1.2	1.0	0.52
		0M75	2.93	1.2	1.0	0.94
		R001	2.38	1.2	1.0	2.04
		1M5	1.88	1.2	1.0	3.04
		R002~3M5	1.63	1.2	1.0	3.54
		R004~4M5	2.63	1.2	1.0	1.54
		R005~R006	2.38	1.2	1.0	2.04
		6M5~R007	1.88	1.2	1.0	3.04
		R008~R015	1.63	1.2	1.0	3.54
	<b>LRC10</b>	0M50	2.61	1.045	0.8	0.60
		0M75	2.49	1.045	0.8	0.80
		R001	2.29	1.045	0.8	0.95
		R002	1.99	1.045	0.8	1.55
		R003	1.49	1.045	0.8	2.55
		R004~R005	2.29	1.045	0.8	0.95
		R006~R008	1.99	1.045	0.8	1.55
		R009~R010	1.74	1.045	0.8	2.05
	<b>LRC06</b>	0M50	1.80	0.7	0.5	0.55
		0M75	1.68	0.7	0.5	0.55
		R001	1.55	0.7	0.5	0.55
		1M2	1.35	0.7	0.5	0.95
		1M5	1.35	0.7	0.5	1.55
		R002~R003	1.05	0.7	0.5	1.55
		3M5~R006	1.55	0.7	0.5	0.55
		R007~R009	1.35	0.7	0.5	0.95
		R010	1.05	0.7	0.5	1.55

● **Note:** No circuits between pads to avoid short circuit

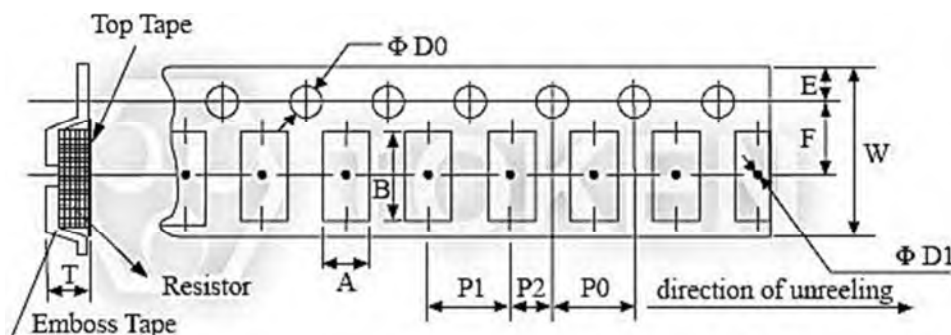
### 2-Wire Pad Layout (LRC)

Figure	Type	Resistance ( $\Omega$ )	A	B	L
 <p>Unit: mm</p> <p>2-Wire Pad Layout</p>	<b>LRC12 Black Coating</b>	-	2.7	3.6	2.95
	<b>LRC12 Green Coating</b>	0M50	3.13	3.4	0.52
		0M75	2.93	3.4	0.94
		R001	2.38	3.4	2.04
		1M5	1.88	3.4	3.04
		R002~3M5	1.63	3.4	3.54
		R004~4M5	2.63	3.4	1.54
		R005~R006	2.38	3.4	2.04
		6M5~R007	1.88	3.4	3.04
		R008~R015	1.63	3.4	3.54
	<b>LRC10</b>	0M50	2.61	2.89	0.60
		0M75	2.49	2.89	0.80
		R001	2.29	2.89	0.95
		R002	1.99	2.89	1.55
		R003	1.49	2.89	2.55
		R004~R005	2.29	2.89	0.95
		R006~R008	1.99	2.89	1.55
		R009~R010	1.74	2.89	2.05
	<b>LRC06</b>	0M50	1.80	1.90	0.55
		0M75	1.68	1.90	0.55
		R001	1.55	1.90	0.55
		1M2	1.35	1.90	0.95
		1M5	1.35	1.90	1.55
		R002~R003	1.05	1.90	1.55
		3M5~R006	1.55	1.90	0.55
		R007~R009	1.35	1.90	0.95
		R010	1.05	1.90	1.55

● Note: No circuits between pads to avoid short circuit

### Reel & Tape

#### Emboss Plastic Tape Specifications (LRC)



Emboss Plastic Tape Specifications

Type	Resistance (mΩ)	P0 (mm)	P1 (mm)	P2 (mm)	ΦD0 (mm)	ΦD1 (mm)	T (mm)
LRC06	0.5 - 10	4.0±0.1	4.0±0.1	2.0±0.05	1.55±0.05	1.0Min.	0.87±0.1
LRC10	0.5 - 10	4.0±0.1	4.0±0.1	2.0±0.05	1.55±0.05	1.4Min.	0.85±0.1
LRC12	0.50 - 0.75	4.0±0.1	4.0±0.1	2.0±0.05	1.55±0.05	1.4Min..	1.45±0.2
	1 - 10	4.0±0.1	4.0±0.1	2.0±0.05	1.55±0.05	1.4Min..	0.81±0.1
LR12 (G)	0.50 - 15	4.0±0.1	4.0±0.1	2.0±0.05	1.55±0.05	1.4Min.	0.85±0.1

- The cumulative tolerance of 10 sprocket whole pitch is ±0.2mm.
- Carrier camber shall be not more than 1mm per 100mm through a length of 250mm.
- A & B measured 0.3mm from the bottom of the packet.
- t measured at a point on the inside bottom of the packet to the top surface of the carrier.
- Pocket position relative to sprocket hole is measured as the true position of the pocket and not the pocket hole.



## Order Codes

### Order Codes (LRC)

LRC	12			H		TR		D				R011		G	
Part Type	Dimensions (L×W)(mm)			Resistance Tolerance (%)		Package		TCR (PPM/℃)		Power Rating (W)		Resistance (Ω)		Protective Coating	
	12	6.3×3.1	EIA2512	J	±5 <th rowspan="4">TR</th> <th rowspan="4">Taping Reel</th> <th>D</th> <td>±50</td> <th></th> <td>Standard<th>0m50</th><td>0.00050<th rowspan="5">G</th><th>Black Coating</th></td></td>	TR	Taping Reel	D	±50		Standard <th>0m50</th> <td>0.00050<th rowspan="5">G</th><th>Black Coating</th></td>	0m50	0.00050 <th rowspan="5">G</th> <th>Black Coating</th>	G	Black Coating
	10	5.1×2.5	EIA2010 <th>H</th> <td>±3<th>W</th><td>±75<th>A</th><td>1.5<th>0m75</th><td>0.00075<th>Green Coating</th></td></td></td></td>	H	±3 <th>W</th> <td>±75<th>A</th><td>1.5<th>0m75</th><td>0.00075<th>Green Coating</th></td></td></td>			W	±75 <th>A</th> <td>1.5<th>0m75</th><td>0.00075<th>Green Coating</th></td></td>	A	1.5 <th>0m75</th> <td>0.00075<th>Green Coating</th></td>	0m75	0.00075 <th>Green Coating</th>		Green Coating
	06	3.2×1.6	EIA1206 <th>F</th> <td>±1<th>E</th><td>±100<th>S</th><td>2<th>1m50</th><td>0.00150<th>No coating / marking</th></td></td></td></td>	F	±1 <th>E</th> <td>±100<th>S</th><td>2<th>1m50</th><td>0.00150<th>No coating / marking</th></td></td></td>			E	±100 <th>S</th> <td>2<th>1m50</th><td>0.00150<th>No coating / marking</th></td></td>	S	2 <th>1m50</th> <td>0.00150<th>No coating / marking</th></td>	1m50	0.00150 <th>No coating / marking</th>		No coating / marking
								F	±200 <th>R</th> <td>3<th>R011</th><td>0.01100<th></th></td></td>	R	3 <th>R011</th> <td>0.01100<th></th></td>	R011	0.01100 <th></th>		
							K	±150 <th>B</th> <td>2.5<th>R002</th><td>0.00200<th></th><th></th></td></td>	B	2.5 <th>R002</th> <td>0.00200<th></th><th></th></td>	R002	0.00200 <th></th> <th></th>			
												R020	0.02000		

### Resistance codes example (3 Marking)

Resistance	0.39mΩ	0.5mΩ	0.75mΩ	330mΩ	5.1Ω
Codes	M39	M50	M75	R33	5R1

### Resistance codes example (4 Marking)

Resistance	1mΩ	1.5mΩ	2mΩ	7mΩ	10mΩ
Codes	R001	1M50	R002	R007	R010



# Four-terminal Kelvin Connected Resistors (LRD)

## ► Product Introduction

**DeMint's open air 4-terminal kelvin connected resistors (LRD) tackle current sensing applications.**

### Features :

- Low inductance.
- 4 leads for Kelvin connection.
- Decimal marked, silicone coated.
- Tinned copper terminal for easy soldering.
- Radial, self-supporting, design is ideal for PC board mounting.

### Applications :

- Surge/Pulse Applications.
- Current Sensing Application.
- Feed Back & Motor Control.
- High Precision Measurement Instrumentation.

Always preferred in current sense applications, DeMint's LRD Series range is available in the 1W, 3W, 5W, 7W and 10W packages, resistance values down to 0.001 ohm, with tolerances as tight as 0.50% and TCRs of 50ppm standard.

The 4 Lead Kelvin configurations enables current to be applied through two opposite terminals and a sensing voltage to be measured across the other two terminals, eliminating the resistance and temperature coefficient of the terminals for a more accurate current measurement.



With up to 10W power rating and TCRs as low as 50ppm/°C, the LRD 4-Lead Kelvin resistors deliver excellent performance, making them ideal for a variety of applications. The resistor is constructed using a low-resistance, low-inductance, high-impulse proprietary metal element that gives the device its extended power and temperature ratings.

Continually upgrading its current sense resistors to take advantage of modern technologies and manufacturing methods, DeMint is now able to offer complete ranges of products which meet the RoHS requirements and in addition to detailing these, the component selector also provides designers with a comprehensive selection of application notes.

The Open Air (LRD) Kelvin 4-terminal Resistor can be manufactured to custom length/width for use as a current shunt. DeMint will also produce outside these specifications to meet customer requirements. Contact us with your specific needs, or link to DeMint official website "[Current Sensing Resistors](http://www.direct-token.com)" for more information.

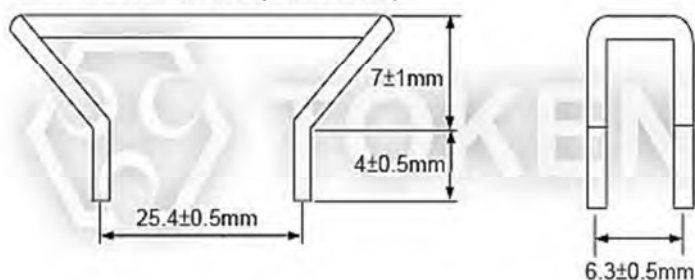


### ► LRD Spec. & Dim

#### Specification & Dimensions (Unit: mm) (LRD)

Type	Rating Current	Resistance Range (mΩ)	Tolerance (%)	TCR (ppm/°C)
LRD-1	1A	1 ~ 10 mΩ	D(±0.5%) F(±1%) G(±2%) J(±5%)	±10 ppm/°C ±20 ppm/°C ±25 ppm/°C ±50 ppm/°C ±100 ppm/°C
LRD-3	3A	1 ~ 10 mΩ		
LRD-5	5A	0.5 ~ 5 mΩ		
LRD-7	7A	0.3 ~ 3 mΩ		
LRD-10	10A	0.1 ~ 1 mΩ		

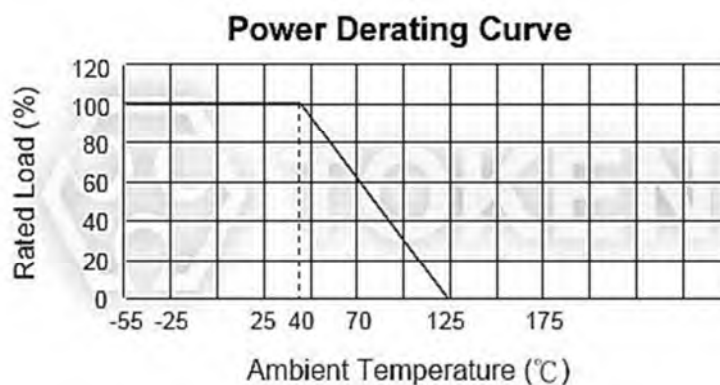
LRD Dimensions (Unit: mm)



4-Terminal Current Sensing Open Air (LRD) Dimensions

### ► Derating Curve

#### Power Derating Curve (LRD)



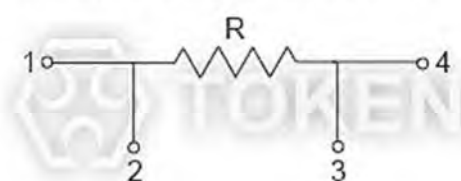
(LRD) Power Derating Curve

### Characteristics

#### Characteristic Specification & 4-Lead Kelvin Connections (LRD)

Test Items	Test Method	Specification
Operating Temperature Range		-55℃ ~ 125℃
Maximum Working Voltage		(P40℃ x R)1/2
Terminal Tensile Strength	50N, 10s	$\Delta R \leq \pm 1.0\% R$
Withstand Voltage	1000V, 1 Min.	No damage on the appearance.
Short Time Overload	5 times rated power, 5s	$\Delta R \leq \pm 4.0\% R$
Thermal Shock	-55℃ ~ +125℃, 5 cycles, 30 Min..	$\Delta R \leq \pm 5.0\% R$
Load Life	70℃, 1000h 1.5 hours on, 0.5 hours off.	$\Delta R \leq \pm 5.0\% R$

**KELVIN ELECTRICAL CONNECTION:**



Terminals 2 & 3 Current Traces.  
Terminals 1 & 4 Sense Traces.

**4 Lead Kelvin Connections (LRD)**

### Order Codes

#### Order Codes (LRD)

LRD	-	5	R005	F	P
Part Number		Rated Current	Resistance Value (Ω)	Tolerance %	Package-Code
LRD		1 1 A	R005 0.005Ω	D ±0.5%	P Bulk
		3 3 A	R05 0.05Ω	F ±1%	
		5 5 A	R1 0.1Ω	G ±2%	
		7 7 A		J ±5%	
		10 10 A			



# 4-Terminal Current Sensing Resistor (LSQ)

## ► Product Introduction

**DeMint's Kelvin style (LSQ) family current sensing 4-terminal resistors handle high-wattage applications.**

### Features :

- Welded & fireproof construction.
- Superior anti-surge capability & Low TCR.
- Special inorganic potting construction provides high moisture resistance and thermal conductivity.
- 4 leads for Kelvin connection with extremely low resistance values.

### Applications :

- Automatic Test Equipment.
- Current Sensing Application.
- High Precision Instrumentation.
- Industrial, Medical and Military.
- Measurement Instrumentation.

Providing ultralow resistance values (to 0.01 ohm) for relatively high current requirements, new four-terminal cement filling resistor from DeMint combine the advantages of a Kelvin configuration with PC board mounting capability.

The Kelvin (or 4-terminal) configuration enables current to be applied through two opposite terminals and a sensing voltage to be measured across the other two terminals, eliminating the resistance and temperature coefficient of the terminals for a more accurate current measurement.



The 4 lead resistors are a new version of DeMint's (LSQ) Precision Current Sensing Family Resistors which was specially designed for use in a Kelvin method where a current is applied through two opposing leads and sensing voltage is measured across the other two leads. DeMint LSQ series is specifically designed for low resistance applications requiring the highest accuracy and temperature stability.

The advantages of Kelvin connection enable the resistance and temperature coefficient of the leads to be effectively eliminated. The need to connect to the leads at precise test points is eliminated, allowing for tighter tolerance on the end application. Also results in a lower temperature coefficient of resistance and lower self-heating drift which may be experienced on two-terminal resistor.

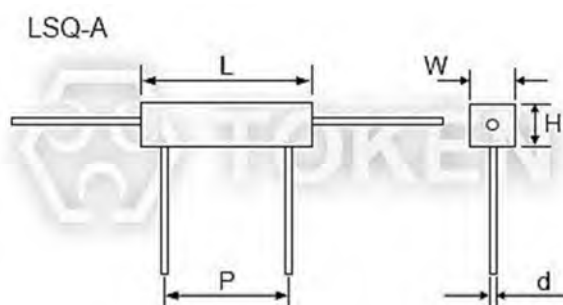
DeMint will also produce low ohmic resistor LSQ series outside these specifications to meet customer requirements. Contact us with your specific needs, or link to DeMint official website "[Current Sensing Resistors](http://www.direct-token.com)" for more information.



### ► LSQ-A Spec. & Dim

#### Specification & Dimensions (Unit: mm) (LSQ-A) for Kelvin Connection

Type	Power (Watts)	Resistance Range (Ω)	Dimensions (Unit: mm)				
			L	W±1	H±1	P±1	d±0.5
LSQ-A-3	3	R01~R1	22±1.0	8	8	14	0.8
LSQ-A-5	5	R01~R1	22±1.5	9.5	9.5	14	0.8
LSQ-A-7	7	R01~R1	35±2.0	9.5	9.5	25	0.8
LSQ-A-10	10	R01~R1	48±2.0	9.5	9.5	36	0.8
LSQ-A-15	15	R01~R1	48±2.0	12.5	12.5	36	0.8



4-T Kelvin Sensing (LSQ-A) Dimensions



### ► LSQ-B Spec. & Dim

#### Specification & Dimensions (Unit: mm) (LSQ-B) for Kelvin Connection

Type	Power (Watts)	Resistance Range (Ω)	Dimensions (Unit: mm)					
			L±2	W±1	H±1	P±1	P <sub>1</sub> ±1	d±0.5
LSQ-B-5	5	R01~R1	26	5	10	20	12	0.8

LSQ-B

4 Terminal Sensing (LSQ-B) Dimensions

### ► LSQ-C Spec. & Dim

#### Specification & Dimensions (Unit: mm) (LSQ-C) for Kelvin Connection

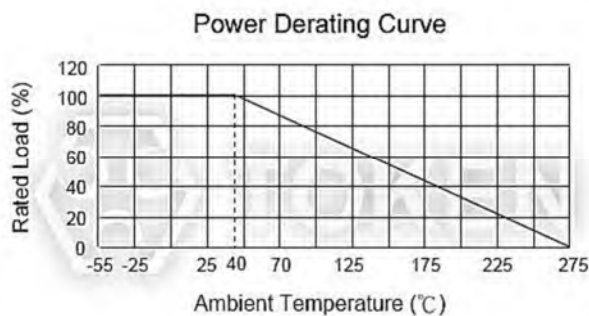
Type	Power (Watts)	Resistance Range (Ω)	Dimensions (Unit: mm)					
			L±2	W±1	H±1	P±1	P <sub>1</sub> ±1	d±0.5
LSQ-C-10	10	R01~R1	18	10.5	20	12	5	1.0

LSQ-C

4-wire Sensing (LSQ-C) Dimensions

### Derating Curve

#### Power Derating Curve (LSQ)



Power Derating Curve (LSQ)

### Characteristics

#### Characteristic Specification (LSQ)

Test Items	Test Method	Specification
Resistance Tolerances		D( $\pm 0.5\%$ ), F( $\pm 1\%$ ), G( $\pm 2\%$ ), J( $\pm 5\%$ )
Temperature Coefficients		$\pm 10 \text{ ppm}/^\circ\text{C}$ , $\pm 20 \text{ ppm}/^\circ\text{C}$ , $\pm 25 \text{ ppm}/^\circ\text{C}$ , $\pm 50 \text{ ppm}/^\circ\text{C}$
Operating Temperature Range		$-55^\circ\text{C} \sim 275^\circ\text{C}$
Maximum Working Voltage		$(P_{40^\circ\text{C}} \times R)^{1/2}$
Terminal Tensile Strength	50N, 10s	$\Delta R \leq \pm 1.0\%R$
Withstand Voltage	1000V, 1 Min.	No damage on the appearance.
Short Time Overload	5 times rated power, 5s	$\Delta R \leq \pm 4.0\%R$
Thermal Shock	$-55^\circ\text{C} \sim +275^\circ\text{C}$ , 5 cycles, 30 Min..	$\Delta R \leq \pm 5.0\%R$
Load Life	$40^\circ\text{C}$ , 1000h 1.5 hours on, 0.5 hours off.	$\Delta R \leq \pm 5.0\%R$

### Order Codes

#### Order Codes (LSQ)

LSQ-A	-	15	R01	J	P
Part Number		Rated Power	Resistance Value ( $\Omega$ )	Tolerance	Package-Code
LSQ-A		3   3 Watt	R01   0.01 $\Omega$	J   $\pm 5\%$	P   Bulk
LSQ-B		5   5 Watt	R05   0.05 $\Omega$		
LSQ-C		7   7 Watt	R1   0.1 $\Omega$		
		10   10 Watt			
		15   15 Watt			



# Power Low Resistance Resistor (BWL)

## ► Product Introduction

**DeMint's low resistance current sensing (BWL) resistor minimizes power consumption.**

### Features :

- Low inductance.
- Excellent load life stability.
- Low temperature coefficient.
- Cooler operation for high power to size ratio.
- Proprietary processing technique produces extremely low resistance values

### Applications :

- Switching and linear power supplies.
- Notebook power management.
- Power amplifiers.
- Instruments.

In response to demand for more energy efficient products, DeMint Electronics has expanded its current sensing series offering with the launch of the BWL series, its lowest resistance value resistor, to minimize power consumption.

The BWL series has been designed for current sensing in power electronic systems and the resistors are available in 0.5W to 10W power ratings, with a wide Ohmic range starting from as low as 0.005Ω.

Products in the economical, low-inductance BWL resistors are axial leads with high temperature mold compound, making them well-suited to the industry trend and are ideal for all types of current sensing applications including switching and linear power supplies, instruments and power amplifiers

In addition, the BWL series utilizes metal strip technology, essential for those involved in constructing devices and circuits for the detection of currents.

DeMint's BWL standard series is lead-free and RoHS compliant and can be a replacement for Vishay, IRC, KOA, Panasonic current sense resistor with more competitive price and short lead time. Contact us with your specific needs. Or link to our official website "[Current Sensing Resistors](#)" to get more information.

### Material:

- Encapsulation: High temperature mold compound.
- BWL metal strip technology utilizes manganin.
- Element: Self-supporting nickel-chrome alloy.
- Terminals: Tinned copper.



### Technical Specifications & Dimensions

#### Technical Specifications & Dimensions (BWL)

Type	Rated Watts at 25°C (W)	Resistance Range (Ω)		Tolerance	Dimensions (Unit: mm)			
		Min	Max		A±0.25	ΦB±0.25	Φd	F
BWL-0.5	0.5	0.01	1	±1% ±2% ±5%	7.0	3.0	0.6	27.0
BWL-1	1.0	0.005	2		11.0	3.0	0.6	31.0
BWL-3	3.0	0.005	2		15.0	5.2	0.8	35.0
BWL-4	4.0	0.005	5		18.0	6.5	0.8	38.0
BWL-5	5.0	0.005	1		24.0	8.4	1.0	44.0
BWL-10	10.0	0.01	1		46.5	10.0	1.0	66.0

Power Derating Curve

(BWL) Power Derating Curve

Low Resistance Resistor (BWL) Dimensions

### Electrical Performance

#### Electrical Performance (BWL)

Test Items	Test Conditions	Specifications
Operating Temp. Range		-55°C ~ 175°C
Insulation Resistance	500V	>1GΩ
Dielectric Withstanding Voltage	500V AC 1 Min.	ΔR ≤ ±0.1%R
Load Life	70°C on~off cycle 1000 Hrs.	ΔR ≤ ±1%R
Moisture-Proof Load Life	40°C 95% RH on~off cycle 21 Hrs.	ΔR ≤ ±0.2%R
Resistance to soldering heat	350°C, 3.5s	ΔR ≤ ±0.1%R
Solderability	235±5°C, 5s(solder bath method)	IEC68-2-20(1968)

### Order Codes

#### Order Codes (BWL)

BWL	-	1W	R01	F	P
Part Number		Power Rating (W)	Resistance ( $\Omega$ )	Resistance Tolerance (%)	Package
		0.5W 0.5	R01 0.01	F $\pm 1$	P Bulk
		1W 1.0	0R1 0.1	G $\pm 2$	
		3W 3.0	1R 1	J $\pm 5$	
		4W 4.0			
		5W 5.0			
		10W 10.0			



# Low Ohmic Resistor (LRA)

## ► Product Introduction

### Open Air Low Ohmic Resistors (LRA) Feature Longer Thermal Path.

#### Features :

- Radial leads.
- Non-inductance.
- Solderable Copper Leads.
- Lead (Pb)-free and RoHS compliant.
- $\pm 1\%$ ,  $\pm 2\%$ ,  $\pm 5\%$ ,  $\pm 10\%$  standard tolerance.
- High stability bare metal element open air style.

#### Applications :

- Automotive, Feedback System.
- Residual Battery Power Detection.
- CPU Drive Control, Power Tool Motor controls.
- Power Supply Shunt, Current Detective, and Current Sensing.
- Inverter and Switching Power Supplies
- High power AC/DC detection.

DeMint's current sense LRA open air resistors are expected to gain wide acceptance in the worldwide market as a result of increased thermal management capabilities.

The LRA series is designed for applications requiring the transfer of heat away from circuits and solder joints. Available in 0.5W, 1W, and 1.5W rating, the resistor is being specified for current sensing, feedback, current detective, supper low inductance, as well as surge and pulse applications.



The hot spot on the LRA open-air resistor is approximately 0.2 degrees higher than on a typical metal strip chip resistor. This results in an increased thermal path for the LRA, reducing heat transfer into the solder joints and circuits.

The flameproof LRA low resistance value resistors are constructed of a wire resistive element with welded copper leads to prevent solder wicking, which can change the device's resistance value in the circuit by as much as 30%. Because of this, the device is ideal for thermally harsh environments, including automotive and aerospace applications, as well as enclosed poorly ventilated circuits in applications such as laptop computers.

The LRA Open Air Series feature a reduced pitch, or spacing between the leads on the circuit board (with a corresponding increase in the board mounted profile), when compared to the standard DeMint LRB Series devices.

The LRA resistors are rated for 1W or 1.5W at 70°C, with resistance values from 0.1Ω to 0.003Ω and tolerances down to  $\pm 1\%$ . Operating temperature range is -50°C to 300°C. The LRA Series is available in bulk packaging in 200 increments.

DeMint will also produce devices outside these specifications to meet customer requirements. A lead-free RoHS-compliant version is available, as is a non-inductive version for high frequency applications. Contact us with your specific needs, or link to DeMint official website "[Current Sensing Resistors](http://www.direct-token.com)" for more information.

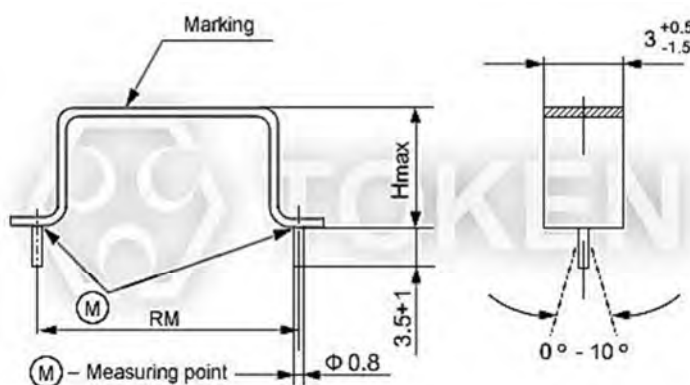




### Dimensions

#### Dimensions (Unit: mm) (LRA)

Type	H Max. (Unit: mm)	RM (Unit: mm)
LRA350-009	6.5	10
LRA351-009	10.5	
LRA352-009	17.0	
LRA351-010	8.0	15
LRA352-010	14.5	
LRA352-010	16.1±1.0	14.5±1.0
LRA352-010	17.1±1.0	14.5±1.0
LRA352-011	12.0	20



Low Ohmic Open Air (LRA) Dimensions

#### Construction:

- 1. The resistive elements consist of a flat metal-band.
- 2. Spot welded Cu-terminals ensure high stability of contacts.
- 3. Thus, this construction results in a non-inductive of both high stability and overload capacity.

## Characteristics

### Characteristic Specification (LRA)

Type	LRA	350-009	351-009 351-010	352-009 352-010 352-011
Power rating P70	W	0.5	1.0	1.5
Resistance range	$\Omega$	R003~R051	R004~R068	R006~R10
E-series		E24 $\geq$ R010		
Tolerances	%	$\pm 1, \pm 2, \pm 5, \pm 10$		
Temperature coefficient	PPM	$\pm 25 \sim \pm 100$		
Max. Cont. working voltage	VRMS	$\sqrt{P70 * R}$ For all styles		
Insulation voltage (1Min..)	VRMS	Non insulated		
Insulation resistance	$\Omega$	Non insulated		
Derating, linear	$^{\circ}\text{C}$	70~300(0W)		
Climatic category		55/200/56		
Temperature range	$^{\circ}\text{C}$	-50~300		
Thermal resistance	KW-1	200	100	70
Failure rate (Total, $V_{0\text{Max.}}$ , 60% conf. lev.)	10-9 * h-1	Ca.10, Depends on value		
Endurance (P70, 70,1000h)	$[\frac{\Delta R}{R}] \%$	$\pm 3.0$		
Damp heat, steady state(40 $^{\circ}\text{C}$ ,93% r.h.,56d)	$[\frac{\Delta R}{R}] \%$	$\pm 0.5$		
Climatic sequence	$[\frac{\Delta R}{R}] \%$	$\pm 0.5$		
Terminal strength	$[\frac{\Delta R}{R}] \%$	$\pm 0.5$		
Terminal tensile strength	N	30		
Resistance to soldering heat ( 260 $^{\circ}\text{C}$ ,10s )	$[\frac{\Delta R}{R}] \%$	$\pm 0.2$ typ.		
Solder ability	s	2.5 Flow time, solder globule test IEC 60068-2-20-T		
Making		Value imprinted		



## Packing Specification

### Packing Specification (LRA)

Type	Package	Pieces	Pack.-Code
LRA350-009	Bulk	200pcs	Bulk
LRA351-009 LRA351-010	Bulk	200pcs	Bulk
LRA352-010 LRA352-011	Bulk	200pcs	Bulk

## Order Codes

### Order Codes (LRA)

LRA351-009	R024	J	P
Part Number	Resistance Value ( $\Omega$ )	Tolerance (%)	Pack. -Code
	R020 0.020 $\Omega$	F $\pm 1\%$	P Bulk
	R022 0.022 $\Omega$	G $\pm 2\%$	
	R024 0.024 $\Omega$	J $\pm 5\%$	
	R100 0.100 $\Omega$	K $\pm 10\%$	

# Metal Strip Chip High Power Low Ohmic Resistor (LRP)

## ► Product Introduction

Things go better with DeMint (LRP) high power metal strip resistors.

### Features :

- Customized Resistance Available.
- Low TCR  $\pm 50\text{PPM}/^\circ\text{C}$ ,  $\pm 75\text{PPM}/^\circ\text{C}$ .
- High power rating from 1 Watts to 3 Watts
- Low resistance values from  $7\text{m}\Omega$  to  $100\text{m}\Omega$ .
- Without Laser Trimmed with very low inductance.

### Applications :

- For NB power management.
- For MB power management.
- For Monitor power management.
- SWPS: DC-DC converter, Charger, Adaptor.

(LRP) Low ohm metal strip resistors from DeMint Electronics offer a wide range of high-power current sensing applications including power management of NB, MB and monitor, automotive, shunts and power amplifiers, DC-DC converter and charger, test & measurement instruments, linear power supplies and switching.

(LRP) Design for applications that require high power handling (Up to 3W) and low resistance values from  $7\text{m}\Omega$  to  $100\text{m}\Omega$  and come with a range of advantages including a wide temperature range and a varied choice of wide range package sizes 2512 with high current capability.

DeMint (LRP) is aiming for very high power-to-footprint size ratio, excellent frequency response and very low inductance in a solid metal nickel-chrome or manganese-copper alloy resistive element with Low TCR  $\pm 50\text{PPM}/^\circ\text{C}$ . Also, (LRP) is ideal for all types of voltage division, current sensing and pulse applications.

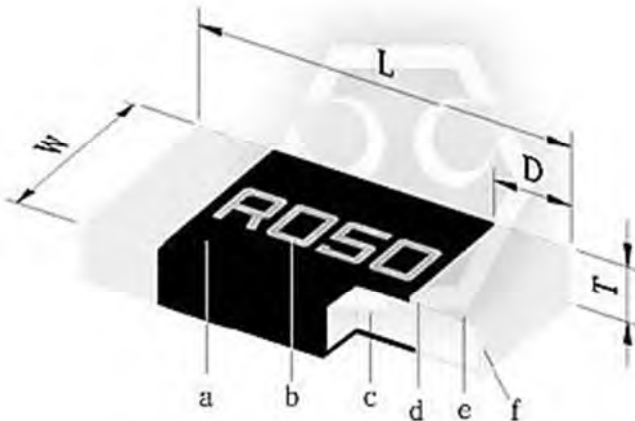
For more power metal strip chip low ohm resistors, please link to DeMint official website "[Current Sense Resistors](http://www.direct-token.com)". Contact us with your specific needs.



### Construction & Dimensions

#### Dimensions Chip 2512 (LRP)

Type	Size (Inch)	L(mm)	W(mm)	T(mm)	D(mm)
LRP12	2512	6.40±0.25	3.20±0.25	0.70±0.20	0.90±0.30



Chip 2512 Dimensions (LRP)

#### Construction (LRP)

a	b	c	d	e	f
Overcoat	Marking	Alloy Plate	Internal Electrode	Barrier Layer	Solder Plating

- Notice: DIRECT is capable of manufacturing the optional spec based on customer's requirement.



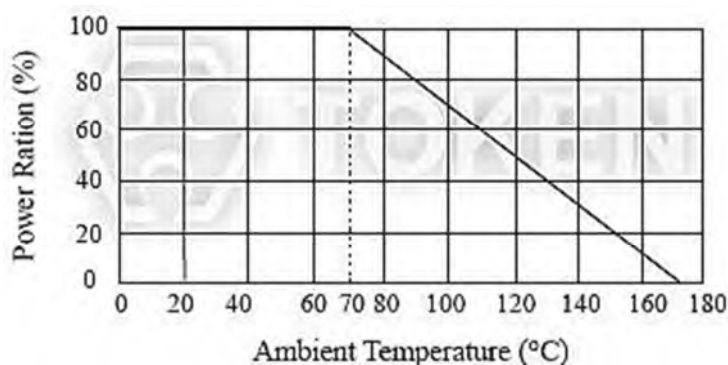
### Electrical Specification

#### Electrical Specifications Chip 2512 (LRP)

Type	Power Rating at 70°C	Operating Temp. Range	Resistance Tolerance (± %)	Resistance (mΩ)	TCR (±PPM/°C)
LRP12 (2512)	1W, 2W, 3W	-55°C ~ +170°C	±0.5%, ±1%, ±5%	15, 18, 20, 22, 25, 30, 33, 35, 39, 40, 47, 50, 60, 68, 70, 75, 80, 82, 90, 91, 100	±50
				7, 8, 9, 10, 12, 15, 18, 20, 22, 25, 30, 33, 35, 39, 40, 47, 50, 60, 68, 70, 75, 80, 82, 90, 91, 100	±75

- Operating Current  $I = \sqrt{(P / R)}$  Operating Voltage  $V = \sqrt{P * R}$  or Max. Operating voltage whichever is lower.
- DeMint is capable of manufacturing the optional spec based on customer's requirement.

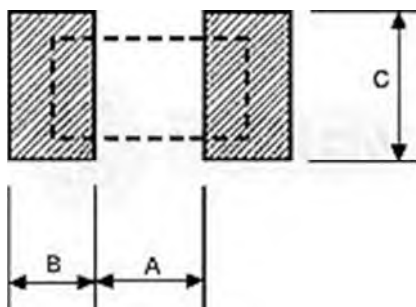
#### Derating Curve (LRP)



(LRP) Power Derating Curve

#### Recommend Land Pattern (LRP)

Type	A (mm)	B (mm)	C (mm)
LRP12	4.00	2.00	3.50



Recommend Land Pattern

- FR4 copper board, 100μm of copper pad thickness.

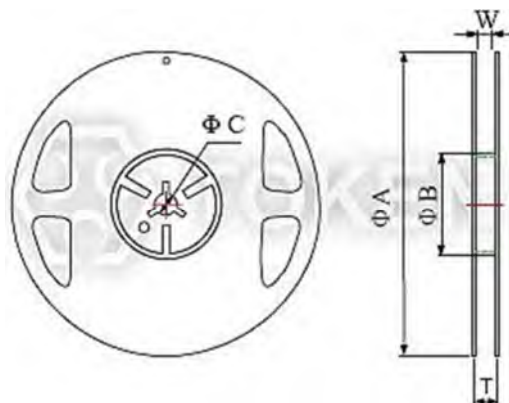




### Reel & Tape

#### Packing Quantity & Reel Specifications (LRP)

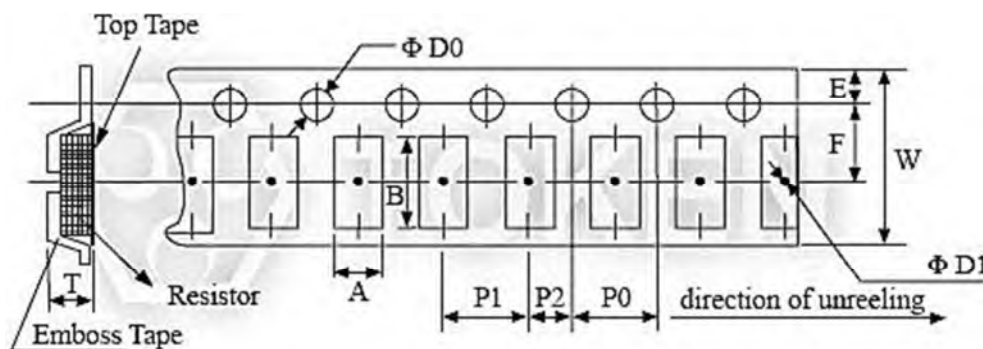
Type	Packaging Quantity	Tape Width	Reel Diameter	ΦA (mm)	ΦB (mm)	ΦC (mm)	W (mm)	T (mm)
LRP12	Embossed 4,000 pcs	12 mm	7 inch	178.0±1.5	60.0±1.0	13.0±0.5	13.0±1.0	15.5±0.5



Reel Specifications Dimensions

#### Emboss Plastic Tape Specifications (LRP)

Type	A (mm)	B (mm)	W (mm)	E (mm)	F (mm)	P <sub>0</sub> (mm)	P <sub>1</sub> (mm)	P <sub>2</sub> (mm)	ΦD <sub>0</sub> (mm)	ΦD <sub>1</sub> (mm)	T
LRP12	3.50±0.10	6.70±0.10	12.0±0.30	1.75±0.10	5.5±0.05	4.0±0.10	4.0±0.10	2.0±0.05	1.50±0.10	1.50±0.25	1.2±0.15



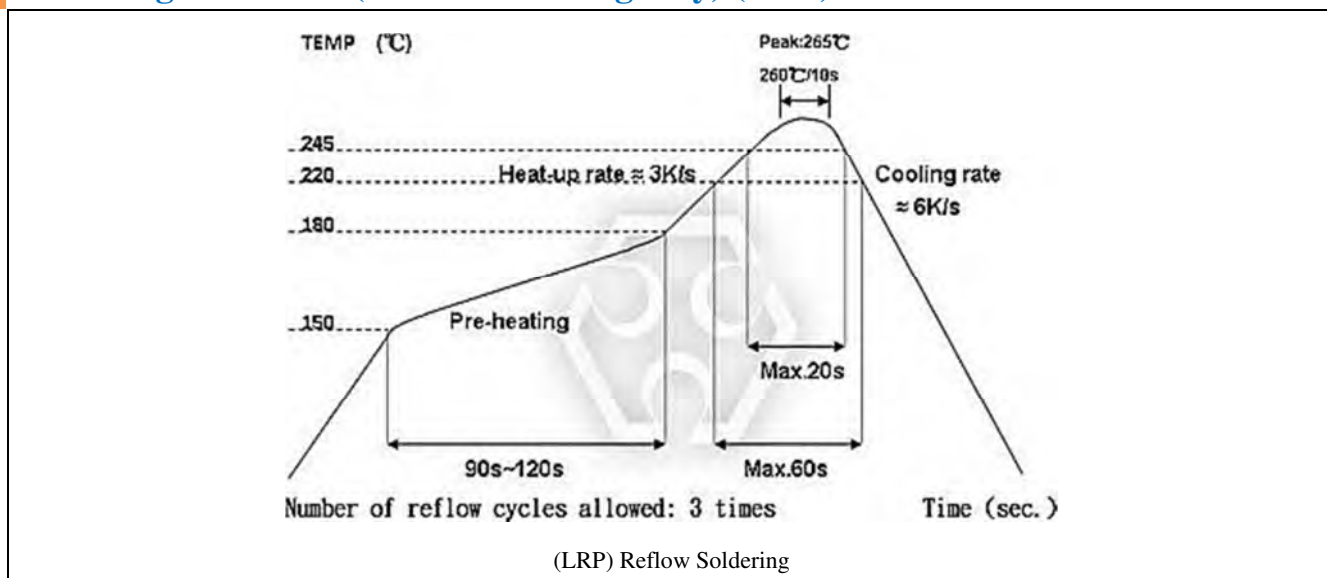
Low Ohm Metal Strip (LRP) Emboss Plastic Tape Specifications

#### Notice:

1. The cumulative tolerance of 10 sprocket hole pitch is  $\pm 0.2\text{mm}$ .
2. Carrier camber shall be not more than 1mm per 100mm through a length of 250mm.
3. A & B measured 0.3mm from the bottom of the packet.
4. t measured at a point on the inside bottom of the packet to the top surface of the carrier.
5. Pocket position relative to sprocket hole is measured as the true position of the pocket and not the pocket hole.

### ► Reflow Soldering

#### Soldering Condition (Reflow soldering only) (LRP)



- Time of IR reflow soldering at maximum temperature point 260°C : 10s
- Time of soldering iron at maximum temperature point 410°C : 5s

## Environmental Characteristics

### Environmental Characteristics (LRP)

Item	Requirement	Test Method
Thermal Shock	±1%	IEC-60115-1 4.19 JIS-C-5201-1 4.19 -55℃ ~ 155℃, 5 cycles
Short Time Overload	±1%	IEC60115-1 4.13 JIS-C-5201-1 4.13 5*rated power for 5 seconds
Low Temperature Storage	±1%	IEC-60115-1 4.23.4 JIS-C-5201-1 4.23.4 at -55℃ for 1000 hrs
Biased Humidity	±1%	MIL-STD-202 Method 103 1000 hrs 85℃/85% RH 10% of operating power
Bending Strength	±1%	IEC-60115-1 4.33 JIS-C-5201-1 4.33 Bending width 2mm once for 5 seconds
Endurance	±1%	IEC60115-1 4.25 JIS-C-5201-1 4.25.1 70±2℃, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Dry Heat	±1%	IEC60115-1 4.23.2 JIS-C-5201-1 4.23.2 at +170℃ for 1000 hrs
Resistance to Soldering Heat	±0.5%	IEC-60115-1 4.18 JIS-C-5201-1 4.18 260±5℃, for 10 seconds
Insulation Resistance	>100MΩ	IEC60115-1 4.6 JIS-C-5201-1 4.13 100V DC for 1 minute
Solderability	95% Min. coverage	IEC-60115-1 4.17 JIS-C-5201-1 4.17 245±5℃ for 3 seconds
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	IEC60115-1 4.8 JIS-C-5201-1 4.8 -55℃ ~ +125℃. (25℃ is the reference temperature)

- Rated continuous Working Voltage (RCWV) =  $\sqrt{\text{Power Rating} \times \text{Resistance Value } (\Omega)}$  or Max. Operating voltage whichever is lower.
- Storage Temperature: 25±3℃; Humidity < 80%RH;



## Order Codes

### Order Codes (LRP)

LRP	12	F	TR	D	S	R050	
Product Type	Dimensions (L×W)(mm)	Resistance Tolerance (%)	Package	TCR (PPM/°C)	Power Rating(W)	Resistance (Ω)	Marking
	12 EIA2512	D ±0.5 F ±1 J ±5	TR Taping Reel	D ±50 W ±75	T 1 S 2 R 3	R015 0.015 R050 0.05	No Marking



# 4 Kelvin Current Sense Resistor (LPS)

## ► Product Introduction

DeMint's low value 4 lead kelvin current sensing (LPS) resistors family offers a variety of possibilities for current shunts.

### Features :

- Radial leads.
- Non-inductance.
- Solderable Copper Leads.
- Lead (Pb)-free and RoHS compliant.
- $\pm 2\%$ ,  $\pm 5\%$ ,  $\pm 10\%$  standard tolerance.
- High stability bare metal element open air resistor.

### Applications :

- Automotive, Feedback System.
- Residual Battery Power Detection.
- CPU Drive Control, Power Tool Motor controls.
- Power Supply Shunt, Current Detective, and Current Sensing.
- Inverter and Switching Power Supplies
- High power AC/DC detection.

The (LPS) family for shunt is expected to gain wide acceptance in the worldwide market as a result of offering a variety of possibilities.

The U-shaped semi-customized LPS family for direct board mounting is specified for precision current sensing, feedback, current detective, supper low inductance, as well as surge and pulse applications. LPS family Available in very low ohm ( $0.002\Omega \sim 0.05\Omega$ ) and high power ( $1W \sim 5W$ ).

The dimension of the semi-customized final unit is designed in accordance with the application requirements of resistance value and required power rating. DeMint's LPS series can be manufactured with 2 or 4 solder tags (terminals). The LPS type B with 2 solder tags (1 pin on each side) is a standard part of LPS series and type A with 4 terminals (2 pin on each side) is used either for Kelvin connections or for high current applications. Depending from the alloy material's thickness, one terminal contact on each side can carry up to 50A ( $A \text{ (Current)} = (W \text{ (Power)} / \Omega \text{ (Resistance)})^{1/2}$ ), so a 4-terminal part can carry 100A (ask DeMint factory).

Operating temperature range is  $-50^{\circ}\text{C}$  to  $300^{\circ}\text{C}$  with tolerances  $\pm 2\%$ ,  $\pm 5\%$ , and  $\pm 10\%$ .

DeMint will also produce low value current sense resistor LPS series outside these specifications to meet customer requirements. Contact us with your specific needs, or link to DeMint official website "[Current Sensing Resistors](#)" for more information.

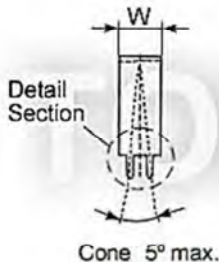
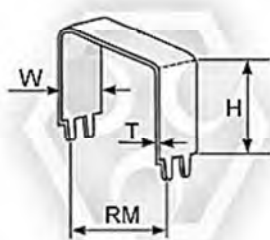


### ► Dimensions

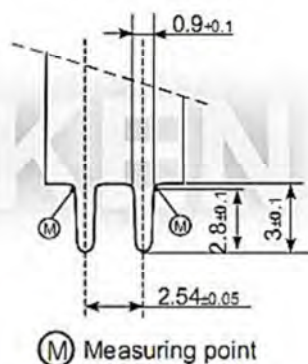
#### Dimensions (Unit: mm) Open Air 4-T & 2-T (LPS)

Type	Power (Watts)	Resistance Range ( $\Omega$ )	RM (mm)	H (mm) Max.
LPS359-008	1	R005~R05	5 ~ 30	20.0
LPS359-009	2	R005~R02		
LPS359-010	3	R003~R01		
LPS359-011	5	R002~R005		

Type A - 4 Terminals

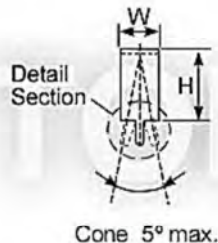
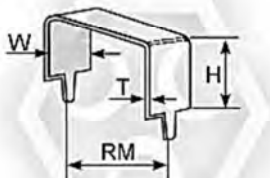


Detail Section

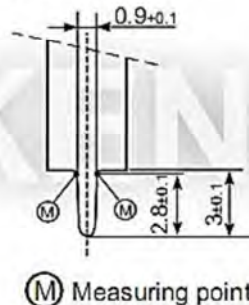


Semi-customized (LPS) Dimensions Type A - Four Terminal for Kelvin Connection

Type B - Two Terminals



Detail Section



Semi-customized (LPS) Dimensions Type B - Open Air Low Value Two Terminal Resistor

#### Construction:

- 1. W, T and H depend on material, resistance value and required power rating.
- 2. RM: 5~30 mm, preferably in 5 mm-steps. Special varieties on request.
- 3. M: Measuring point.



## Characteristics

### Characteristic Specification (LPS)

Test Items	Specification
Resistance range	R002~R05
Tolerances	±2%, ±5%, ±10%
Temperature coefficient	Upon request
Insulation voltage	Non insulated
Insulation resistance	Non insulated
Derating, linear	70~300℃ (0W)
Climatic category	55/155/21
Temperature range	-50~300℃
Endurance (P70, 70℃, 1000 Hrs.)	$\Delta R \leq \pm 2\% R$
Damp heat, steady state (40℃, 93% r.h., 56d)	$\Delta R \leq \pm 2\% R$
Climatic sequence	$\Delta R \leq \pm 0.5\% R$
Terminal strength	None
Terminal tensile strength	None
Resistance to soldering heat (350℃, 3.5s)	$\Delta R \leq \pm 0.5\% R$ typ.
Solderability (Solder bath method 235±5℃, 2±0.5s)	Good tinning (≥ 90 % covered), no visible damage

## Order Codes

### Order Codes (LPS)

LPS359-008	B	3	R024	J	P
Part Number	Terminal Type	Rated Power	Resistance Value (Ω)	Tolerance (%)	Pack. -Code
LPS359-008	A 4 Terminals	1 1 W	R002 0.002	G ±2	P Bulk
LPS359-009	B 2 Terminals	2 2 W	R010 0.010	J ±5	
LPS359-010		3 3 W	R022 0.022	K ±10	
LPS359-011		5 5 W	R050 0.050		



# Metal Strip Low Ohm Power Chip Resistor (LRM)

## ► Product Introduction

**Build DeMint (LRM) Power Low Ohmic Metal Strip resistors into your Design**

### Features :

- Low TCR down to  $\pm 75\text{PPM}/^\circ\text{C}$ .
- Low resistance values from  $1\text{m}\Omega$  to  $100\text{m}\Omega$ .
- High power rating from 1/8 Watts to 3 Watts
- Wide range package sizes 0805, 1206, 2010, and 2512.

### Applications :

- For NB power management.
- For MB power management.
- For Monitor power management.
- SWPS: DC-DC converter, Charger, Adaptor.

(LRM) Low ohm Power Metal Strip resistors from DeMint Electronics offer a wide range of high-power current sensing applications including power DC-DC converter and charger, management of NB, MB and monitor, test & measurement instruments, linear power supplies and switching, automotive, shunts and power amplifiers.

(LRM) Design for applications that require a wide range power handling from 1/8W up to 3W and low resistance values from  $1\text{m}\Omega$  to  $100\text{m}\Omega$  and come with a range of advantages including a wide temperature range and a varied choice of wide range package sizes 0805, 1206, 2010, and 2512 with high current capability.

DeMint (LRM) is aiming for very high power-to-footprint size ratio, excellent frequency response and very low inductance in a solid metal nickel-chrome or manganese-copper allow resistive element with Low TCR  $\pm 75\text{PPM}/^\circ\text{C}$ . Also, ideal for all types of voltage division, current sensing and pulse applications.

For more power metal strip chip low ohm resistors, please link to DeMint official website "[Current Sense Resistors](#)". Contact us with your specific needs.



### Construction & Dimensions

#### Construction (LRM)

a	b	c	d	e	f
Overcoat (molding)	Marking	Alloy Plate	Internal Electrode (Cu)	Barrier Layer (Ni)	Solder Plating (Sn)

**Power Metal Strip Dimensions (LRM)**

#### Dimensions Chip (LRM)

Part No.	Resistance (mΩ)	Material	L (mm)	W (mm)	T (mm)	D (mm)	Weight(g) 1000pcs
LRM05*TE***M	5, 9, 10, 20	MnCu	2.00±0.10	1.25±0.10	0.60±0.20	0.40±0.20	15.00
LRM06*TFR001M	1	MnCu	3.20±0.20	1.60±0.20	0.75±0.20	1.10±0.30	18.00
LRM06*T***M	2 ~ 30	MnCu	3.20±0.20	1.60±0.20	0.60±0.20	0.50±0.30	18.00
LRM10*T***M	5, 6, 10, 15, 20	NiCu	5.00±0.20	2.50±0.20	0.60±0.20	0.60±0.30	40.50
LRM12*T***M	0.5, 0.75	MnCu	6.40±0.20	3.20±0.20	0.60±0.20	2.60±0.20	90.90
LRM12*T***M	5, 10, 20, 25, 30, 40, 50	MnCu	6.40±0.20	3.20±0.20	0.60±0.20	0.90±0.20	90.90
LRM12*T***M	4 ~ 50	NiCu	6.40±0.20	3.20±0.20	0.60±0.20	0.90±0.20	90.90
LRM12*T***M	1, 1.5, 2, 3	NiCu	6.40±0.20	3.20±0.20	0.60±0.20	2.0±0.20	90.90
LRM12*T***M	2, 3, 4	NiCu	6.40±0.20	3.20±0.20	0.70±0.20	2.0±0.20	90.90
LRM12*T***M	10 ~ 100	NiCu	6.40±0.20	3.20±0.20	0.70±0.20	0.90±0.20	90.90

● Notice: DIRECT is capable of manufacturing the optional spec based on customer's requirement.

## Electrical Specification

### MnCu Material - Electrical Specifications (LRM)

Type	Power Rating at 70℃	Operating Temp. Range	Resistance Tolerance (± %)	Resistance (mΩ)	TCR (±PPM/℃)
LRM05 (0805)	1/8W, 1/4W, 1/2W	-55℃ ~ +170℃	±1%, ±5%	5, 9,10, 20	±100
LRM06 (1206)	1/4W, 1/2W, 1W			1	±200
				2, 3, 4, 5, 6, 7, 8, 9,10	±100
				12, 14, 15, 20, 22, 25, 30	±75
LRM12 (2512)	1W, 2W			0.5, 0.75	±200
	1W			5, 10	±100
				20, 25, 30, 40, 50	±75

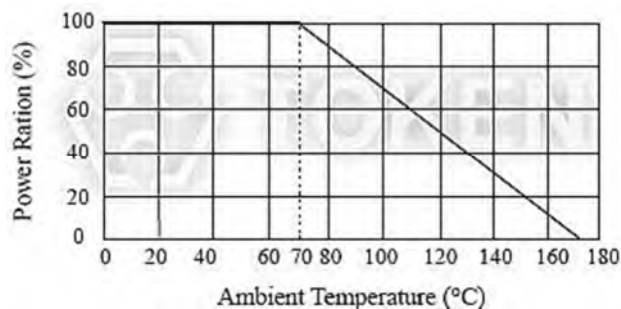
### NiCu Material - Electrical Specifications (LRM)

Type	Power Rating at 70℃	Operating Temp. Range	Resistance Tolerance (± %)	Resistance (mΩ)	TCR (±PPM/℃)
LRM10 (2010)	1/2W, 3/4W, 1W, 1.5W	-55℃ ~ +170℃	±1%, ±5%	5, 6, 10	±100
LRM12 (2512)	1W, 2W			15, 20	±75
				1, 1.5	±275
	1W			2, 3, 4, 5, 6, 7, 8,10	±100
				12, 15, 18, 20, 25, 30, 33, 35, 40, 50	±75
	1W, 2W, 3W			2, 3, 4, 10, 12, 15, 18, 20, 25, 30, 39,40, 50, 60, 70, 80, 100	±75

- Operating Current  $I = \sqrt{(P / R)}$  , Operating Voltage  $V = \sqrt{(P * R)}$  or Max. Operating voltage whichever is lower.
- Optional specifications can be required.



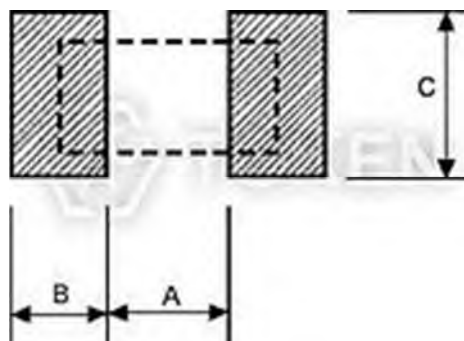
### Derating Curve (LRM)



(LRM) Power Derating Curve

### Recommend Land Pattern (LRM)

Type	A $\pm 0.2$ (mm)	B $\pm 0.2$ (mm)	C $\pm 0.2$ (mm)
LRM05	1.20	1.15	1.40
LRM06 (1m $\Omega$ )	1.00	2.30	1.80
LRM06 (2m $\Omega$ ~ 30m $\Omega$ )	1.60	1.70	1.80
LRM10	3.50	1.50	3.40
LRM12 (0.5m $\Omega$ ~ 3m $\Omega$ )	1.30	3.10	4.00
LRM12 (4m $\Omega$ ~ 100m $\Omega$ )	4.10	2.10	4.00



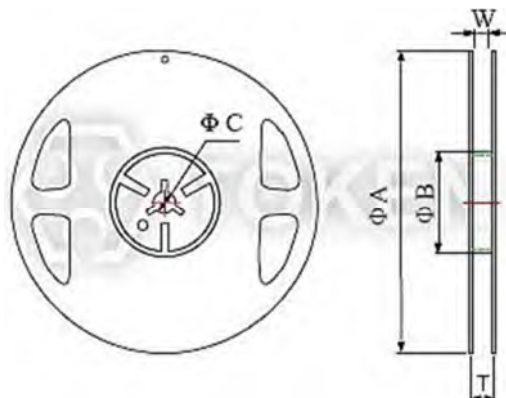
Recommend Land Pattern

- \*FR4 copper board, 100 $\mu$ m of copper pad thickness

### Reel & Tape

#### Packing Quantity & Reel Specifications (LRM)

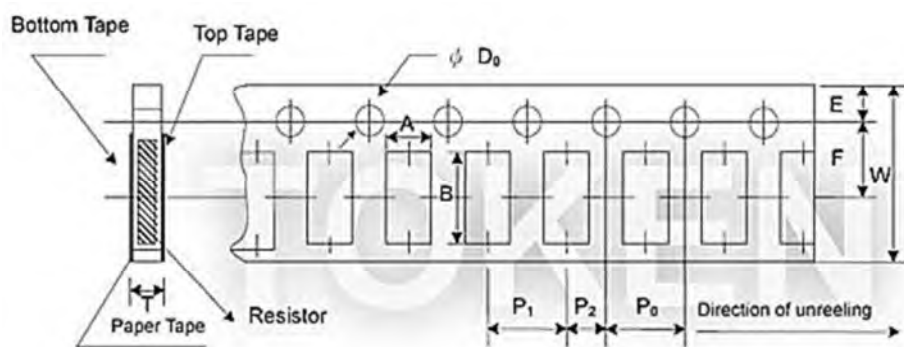
Type	Packaging Quantity	Tape Width	Reel Diameter	$\Phi A$ (mm)	$\Phi B$ (mm)	$\Phi C$ (mm)	W (mm)	T (mm)
LRM05	Paper 5,000 pcs	8 mm	7 inch	178.0 $\pm$ 2.0	60.0 $\pm$ 1.0	13.0 $\pm$ 1.0	9.0.0 $\pm$ 1.0	11.4 $\pm$ 1.0
LRM06	Paper 5,000 pcs	8 mm	7 inch	178.0 $\pm$ 2.0	60.0 $\pm$ 1.0	13.0 $\pm$ 1.0	9.0.0 $\pm$ 1.0	11.5 $\pm$ 1.0
LRM10	Embossed 4,000 pcs	12 mm	7 inch	178.0 $\pm$ 2.0	60.0 $\pm$ 1.0	13.0 $\pm$ 1.0	13.0 $\pm$ 1.0	15.5 $\pm$ 1.0
LRM12	Embossed 4,000 pcs	12 mm	7 inch	180.0+0/-3	60.0 $\pm$ 1.0	13.0 $\pm$ 1.0	13.0 $\pm$ 1.0	15.4 $\pm$ 2.0



Reel Dimensions

#### Paper Tape Specifications (LRM)

Type	A (mm)	B (mm)	W (mm)	E (mm)	F (mm)	$P_0$ (mm)	$P_1$ (mm)	$P_2$ (mm)	$\Phi D_0$ (mm)	T
LRM05	1.60 $\pm$ 0.15	2.40 $\pm$ 0.20	8.00 $\pm$ 0.20	1.75 $\pm$ 0.10	3.50 $\pm$ 0.05	4.00 $\pm$ 0.10	4.00 $\pm$ 0.10	2.00 $\pm$ 0.05	1.50+0.1/-0	0.84 $\pm$ 0.10
LRM06	2.00 $\pm$ 0.15	3.60 $\pm$ 0.20	8.00 $\pm$ 0.20	1.75 $\pm$ 0.10	3.50 $\pm$ 0.05	4.00 $\pm$ 0.10	4.00 $\pm$ 0.10	2.00 $\pm$ 0.05	1.50+0.1/-0	0.84 $\pm$ 0.10

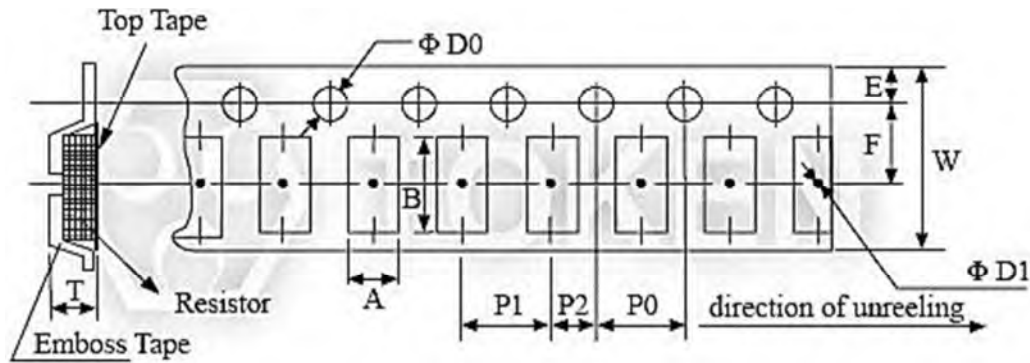


(LRM) Paper Tape Specifications



### Emboss Plastic Tape Specifications (LRM)

Type	A (mm)	B (mm)	W (mm)	E (mm)	F (mm)	P <sub>0</sub> (mm)	P <sub>1</sub> (mm)	P <sub>2</sub> (mm)	ΦD <sub>0</sub> (mm)	ΦD <sub>1</sub> (mm)	T
LRM10	2.80±0.20	5.30±0.20	12.0±0.20	1.75±0.10	5.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.50±0.25	0.85±0.15
LRM12	3.60±0.20	6.90±0.20	12.0±0.30	1.75±0.10	5.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.50±0.25	0.85±0.15
LRM12	3.60±0.20	6.90±0.20	12.0±0.30	1.75±0.10	5.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.50±0.25	1.20±0.15



(LRM) Emboss Plastic Tape Specifications

- 1. The cumulative tolerance of 10 sprocket whole pitch is  $\pm 0.2\text{mm}$ .
- 2. Carrier camber shall be not more than 1mm per 100mm through a length of 250mm.
- 3. A & B measured 0.3mm from the bottom of the packet.
- 4. T measured at a point on the inside bottom of the packet to the top surface of the carrier.
- 5. Pocket position relative to sprocket hole is measured as the true position of the pocket and not the pocket hole.

## Environmental Characteristics

### Environmental Characteristics (LRM)

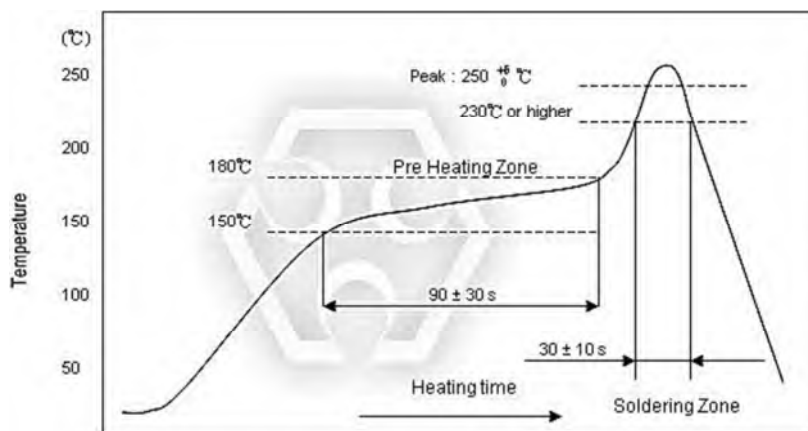
Item	Requirement	Test Method
Thermal Shock	0805, 2010: $\pm 0.5\%$ 1206, 2512: $\pm 1\%$	JIS-C-5201-1 4.19 IEC-60115-1 4.19 -55°C ~ 155°C, 300 cycles, 15min per extreme condition
Short Time Overload	0805, 2010, 2512: $\pm 0.5\%$ 1206: $\pm 1\%$	IEC60115-1 4.13 JIS-C-5201-1 4.13 5*rated power for 5 seconds
Low Temperature Storage	0805, 2010, 2512: $\pm 0.5\%$ 1206: $\pm 1\%$	IEC-60115-1 4.23.4 JIS-C-5201-1 4.23.4 at -55°C for 1000 hrs
Damp Heat no Load	2512 0.5mΩ, 0.75mΩ, 1206: $\pm 0.5\%$ Other sizes: $\pm 1.0\%$	IEC60115-1 4.24.2.1a JIS-C-5201-1 4.24.2.1a 85°C, 85%RH, 1000 hrs
Bending Strength	$\pm 1\%$	IEC-60115-1 4.33 JIS-C-5201-1 4.33 Bending width 2mm once for 5 seconds
Endurance	$\pm 1\%$	IEC60115-1 4.25 JIS-C-5201-1 4.25.1 70 $\pm 2$ °C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Dry Heat	$\pm 1\%$	IEC60115-1 4.23.2 JIS-C-5201-1 4.23.2 at +170°C for 1000 hrs
Resistance to Soldering Heat	$\pm 0.5\%$	IEC-60115-1 4.18 JIS-C-5201-1 4.18 0805, 2010: 260 $\pm 5$ °C for 10 seconds 1206, 2512: 260 $\pm 5$ °C for 20 seconds
Insulation Resistance	>100MΩ	IEC60115-1 4.6 JIS-C-5201-1 4.13 100V DC for 1 minute
Solderability	95% Min. coverage	IEC-60115-1 4.17 JIS-C-5201-1 4.17 245 $\pm 5$ °C for 3 seconds
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	IEC60115-1 4.8 JIS-C-5201-1 4.8 -55°C ~ +125°C. (25°C is the reference temperature)

- Rated continuous Working Voltage (RCWV) =  $\sqrt{\text{Power Rating} \times \text{Resistance Value } (\Omega)}$  or Max. Operating voltage whichever is lower.
- Storage Temperature: 25 $\pm 3$ °C; Humidity < 80%RH;



### Reflow soldering

#### Soldering Condition (Reflow soldering only) (LRM)



(LRM) Reflow Soldering

### Order Codes

#### Order Codes (LRM)

LRM	12	F	TR	D	S	R050	
Product Type	Dimensions (L×W)(mm)	Resistance Tolerance (%)	Package	TCR (PPM/°C)	Power Rating(W)	Resistance (Ω)	Marking
	05 EIA0805		TR Taping Reel	W ±75	W 1/8	R015 0.015	N No Marking
	06 EIA1206	F ±1		E ±100	V 1/4	R050 0.05	M MnCu Material
	10 EIA2010	G ±2		F ±200	O 1/3	R500 0.5	
	12 EIA2512	J ±5		3 ±275	U 1/2		NiCu Material
					Q 3/4		
					T 1		
					A 1.5		
					S 2		
					R 3		



# Open Air Resistors (OAR)

## ► Product Introduction

**DeMint's "tight pitch" version of its open air metal element current sense resistor (OAR) need less PCB space.**

### Features :

- High stability open-air style.
- Precision alloys resistive element.
- Lead (Pb)-free and RoHS compliant.
- Standard tolerance  $\pm 1\%$ ,  $\pm 2\%$ ,  $\pm 5\%$ .
- Low inductance. Solderable copper leads (60/40).
- Radial leads, low resistance value  $0.05\Omega \sim 0.005\Omega$ .

### Applications :

- CPU Drive Control.
- Power Tool Motor controls.
- Automotive, Feedback System.
- Power Supply Shunt, Current Detective.
- Inverter and Switching Power Supplies.
- Residual Battery Power Detection, and Current Sensing.

In response to requests from power electronics design engineers with the means to squeeze more current-sensing capability into crowded power supply designs, DeMint Electronics has developed a "tight pitch" version of its open air metal element current sensing resistor with ratings as high as 5W in a reduced PC board footprint and longer thermal path.

Designated the OAR Series, these through-hole devices offer a high current, flameproof alternative to conventional axial devices and flat chips for current-sense circuits where PC board space is at a premium. The open air resistor's footprint is reduced by extending the height of the device above the board, thus keeping the resistor element's "hot spot" safely off the PC board and providing for increased air circulation under it, which in turn provides increased heat dissipation and cooler operation.

The OAR devices with increased height improve cooling efficiency, and because many power supply designs are already tightly-packed at the PC board level, the additional height does not create any profile issues. The OAR series feature a reduced pitch, or spacing between the leads on the circuit board with a corresponding increase in the board mounted profile.

The OAR low resistance value resistors are power rated for 1W, 2W, 3W, or 5W at  $85^{\circ}\text{C}$ , with resistance values from  $0.05\Omega$  to  $0.005\Omega$ , with tolerances down to  $\pm 1\%$ . They feature TCRs as low as  $\pm 50\text{ppm}/^{\circ}\text{C}$  and inductance values in the single-digit nano henry range (10 nH Max.). Operating temperature range is  $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ . The flameproof OAR resistors are constructed of a wire resistive element with welded copper leads to prevent solder wicking, which can change the device's resistance value in the circuit by as much as 30%.

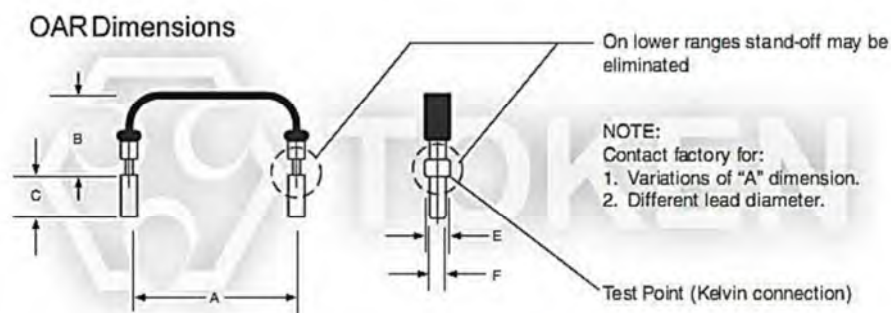
The Low Ohmic Value Current Sense (OAR) Resistor is available in bulk packaging and is RoHS compliant and lead free. For non-standard technical requirements and special applications, please contact us with your specific needs, or link to DeMint official website "[Current Sensing Resistors](http://www.direct-token.com)" for more information.



### OAR Dimensions

#### Dimensions (Unit: mm) (OAR)

Type	Dimensions (Unit: mm)				
	A±1	B±3	C±0.8	E±0.3	F±0.1
OAR-1	10	10	3.5	1.6	1.0
OAR-2	15	15	3.5	1.6	1.0
OAR-3	20	20	3.5	1.6	1.0
OAR-5	20	20	3.5	1.6	1.0



Open Air Current Sensing (OAR) Resistor Dimensions

### Specification

#### Specification (OAR)

Type	Power Rating @ 85°C (W)	Resistance Range (mΩ)	Tolerance (±%)	Temperature Coefficient TCR (ppm/°C)	Inductance (nH)
OAR-1	1	R005~R05	±1% ±2% ±5%	±50	10 Max.
OAR-2	2	R005~R05			
OAR-3	3	R005~R05			
OAR-5	5	R005~R01			

## Characteristics

### Characteristic Specification (OAR)

Test Items	Test Method	Specification
Load Life	1000 hours @ 25℃	$\Delta R/R < 1\%$
Moisture Test	no load for 1000 hours	$\Delta R/R < 1\%$
Temperature Cycling	-40℃ to +125℃ for 1000 cycles	$\Delta R/R < 1\%$
Operating Temperature		-40℃ to +125℃

## Order Codes

### Order Codes (OAR)

OAR	-	1	R01	J	P
Part Number		Rated power (W)	Resistance Value (Ω)	Tolerance (%)	Package-Code
OAR		1 1 W	R005 0.005Ω	F ±1%	P Bulk
		2 2 W	R01 0.01Ω	G ±2%	
		3 3 W	R05 0.05Ω	J ±5%	
		5 5 W			





# Low Ohmic Open Air Resistor (LRB)

## ► Product Introduction

**DeMint's open-air, low inductance, low Ohmic resistor is alternative current shunts.**

### Features :

- Low inductance.
- High stability open-air style.
- Precision alloys resistive element.
- Lead (Pb)-free and RoHS compliant.
- Standard tolerance  $\pm 3\%$ ,  $\pm 5\%$ ,  $\pm 10\%$ .
- Radial leads, low resistance value  $2\text{ m}\Omega \sim 50\text{ m}\Omega$ .

### Applications :

- CPU Drive Control.
- Automotive, Feedback System.
- Residual Battery Power Detection, and Current Sensing.
- Power Supply Shunt, Current Detective.
- Inverter and Switching Power Supplies.
- Power Tool Motor controls.

Developed for current sensing and shunt applications, DeMint's LRB series of bare element resistors have a precision alloys (Ni-Cu) element welded construction. Built-in stand-offs and standard spacing makes for easy mounting.

The bare metal element design allows for maximum cooling via airflow, forcing less heat into the PCB. The flameproof construction offers values down to  $2\text{ m}\Omega$  with low inductance. Customer can specify resistance range designed to satisfy challenging and specific technical requirements.

These factors make the LRB Series an outstanding choice for all types of high current power supplies and power applications requiring a robust part that is impervious to most environmental stresses. The device is ideal for current limited, current balance, and sampling sense in power supplier. It takes on the capability of high overload, and the function easily welding and non-inductance as well.

The Open Air (LRB) Low Ohmic Value Resistor is available in bulk packaging and is RoHS compliant and lead free. For non-standard technical requirements and special applications, please contact us with your specific needs, or link to DeMint official website "[Current Sensing Resistors](http://www.direct-token.com)" for more information.



## LRB Dimensions

### Dimensions (Unit: mm) (LRB)

RM (mm)	H Max. (mm)	B Max. (mm)	Ø (mm)	L1 (mm)
5 ~ 50	20	1	5 ~ 29	3±0.5

LRB Dimensions (Unit: mm)

Current Sensing Open Air Resistors (LRB) Dimensions

## Specification

### Specification (LRB)

Type	Diameter Ø (mm)	Rated Current (A)	Resistance Range (mΩ)	Tolerance (%)	Temperature Coefficient (ppm/°C)	Temperature Range (°C)
LRB-05	0.5	2.5	20~50	±3%(H) ±5%(J) ±10%(K)	±50 ~ ±100	-55 ~ +85
LRB-06	0.6	3.0	20~50			
LRB-07	0.7	4.0	20~50			
LRB-08	0.8	4.5	20~50			
LRB-09	0.9	5.0	10~50			
LRB-10	1.0	5.5	10~30			
LRB-11	1.1	6.0	5~20			
LRB-12	1.2	7.0	5~20			
LRB-13	1.3	7.5	5~20			
LRB-14	1.4	8.0	5~20			
LRB-15	1.5	9.0	5~20			
LRB-16	1.6	9.5	5~15			
LRB-18	1.8	11	3~10			
LRB-20	2.0	12	2~8			
LRB-23	2.3	14	2~8			
LRB-25	2.5	17	2~5			
LRB-29	2.9	21	2~5			



## Order Codes

### Order Codes (LRB)

LRB	-	08	05	R005	K	P
Part Number		Diameter Ø	Leads Pitch RM (mm)	Resistance Value (Ω)	Tolerance %	Package-Code
LRB		05 0.5 mm	05 5 mm	R005 0.005Ω	H ±3%	P Bulk
		06 0.6 mm	10 10 mm	R02 0.02Ω	J ±5%	
		07 0.7 mm	15 15 mm	R05 0.05Ω	K ±10%	
		08 0.8 mm	20 20 mm			
		09 0.9 mm	25 25 mm			
		10 1.0 mm	30 30 mm			
		11 1.1 mm	35 35 mm			
		12 1.2 mm	40 40 mm			
		13 1.3 mm	45 45 mm			
		14 1.4 mm	50 50 mm			
		15 1.5 mm				
		16 1.6 mm				
		17 1.7 mm				
		18 1.8 mm				
		20 2.0 mm				
		23 2.3 mm				
		25 2.5 mm				
		29 2.9 mm				

# Current Shunts Resistors (FL)

## ► Product Introduction

**DeMint's Current Shunt Resistors (FL) for high-current applications aid precision measurement.**

Current shunts are low resistance precision resistors used to measure AC or DC electrical currents by the voltage drop those currents create across the resistance. Sometimes called an ammeter shunt, it is a type of current sensor.

A wide range of precision shunts, designed for use with kilowatt-hour meters and other high-current applications where a high level of accuracy is required, is now available from DeMint Electronics.



The interchangeable shunts (FL) are used to multiply the measuring range of measuring instrument and designed for PCB and bus bar mounting, are manufactured from electron beam welded copper and manganin, and have low temperature coefficients. Featuring low inductance values, shunts FL series can handle permanent currents of up to 10000A at voltage 75 mV.

FLQ-54 type shunt is made of precision alloy board. Its copper terminals spot welded by silver alloy ensure extremely high electric capability. The construction provides a kind of excellent stability and high overloaded ability non-inductive resistor, applied widely as current limited, current balance or sampling sense in communication system, electric equipment and auto-controlling electrical circuit.

The FL Series is available in bulk packaging and is RoHS compliant and lead free. For non-standard technical requirements and special applications, please contact us with your specific needs, or link to DeMint official website "[Current Sensing Resistors](http://www.token.com.tw)" for more information.

**Power Rating:** Watts (W) = Current ( $I^2$ ) × Resistance Value (R)

- Because current shunt is resistor and dissipate heat from the current flowing through them, when they get hot.
- Since that heat can change their resistance and even permanently damage the shunt, so it is often given a power rating or a derating factor.
- In practice current shunt is often rated to be used continuously at only 2/3 of their "rated current".
- The heat produced is power measured in Watts (W).

**Calculate Current:** Current (I) = Voltage (V) / Resistance Value (R)

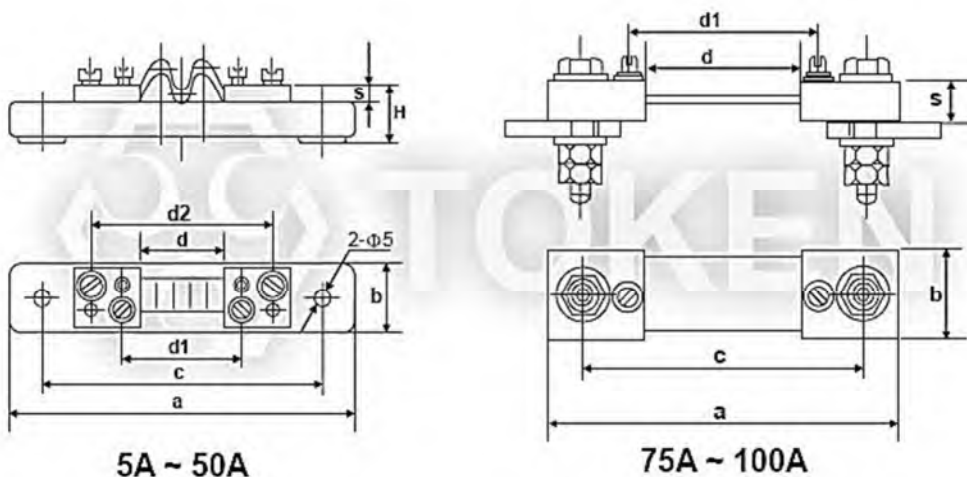
- By inserting a current shunt into a circuit whose current you want to measure you can find the current by measuring the voltage drop across the shunt.
- Then knowing the resistance of the current shunt you can calculate the current using Ohm's law.



### ► FL-2 (5A-10000A)

#### Dimensions (5A-100A, Unit: mm) (FL-2)

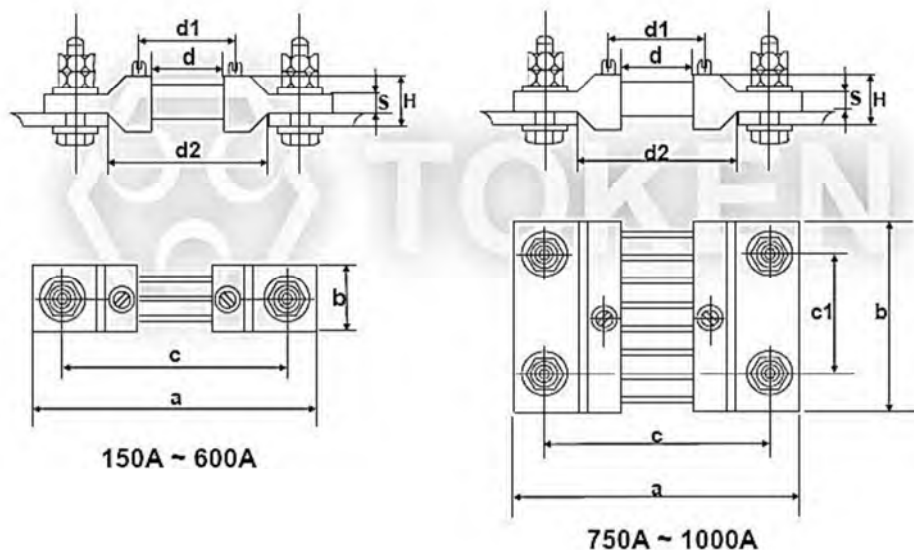
Rating Current (A)	Dimensions (Unit: mm)										High Current Bolt (mm)-PC (Option)	Shunt Voltage Bolt (mm)-PC (Option)
	a	c	b	c1	c2	H	S	d	d1	d2		
5	120	100	20			15	5	30	42	60	M5x6-2	M5x6-2
10	120	100	20			15	5	30	42	60	M5x6-2	
15	120	100	20			15	5	30	42	60	M5x6-2	
20	120	100	20			15	5	30	42	60	M5x6-2	
30	120	100	20			15	5	30	42	60	M5x6-2	
50	120	100	20			15	5	30	42	60	M5x6-2	
75	104	85	22			22	10	40	53		M8x35-2	
100	104	85	22			22	10	40	53		M8x35-2	



FL-2 Type (5A-100A) Shunt

► **Dimensions (150A-1000A, Unit: mm) (FL-2)**

Rating Current (A)	Dimensions (Unit: mm)										High Current Bolt (mm)-PC (Option)	Shunt Voltage Bolt (mm)-PC (Option)
	a	c	b	c1	c2	H	S	d	d1	d2		
150	116	85	22			22	6	30	39	54	M8x35-2	M5x6-2
200	116	85	22			22	6	30	39	54	M8x35-2	
250	126	100	26			22	6	40	49	64	M10x35-2	
300	126	100	26			22	6	40	49	64	M10x35-2	
400	126	100	38			22	6	40	49	64	M10x35-2	
500	126	100	45			22	6	40	49	64	M10x35-2	
600	126	100	62			22	6	40	49	64	M10x35-2	
750	126	100	76	50		22	6	40	49	64	M10x35-4	
1000	126	100	95	50		22	6	40	49	64	M10x35-4	

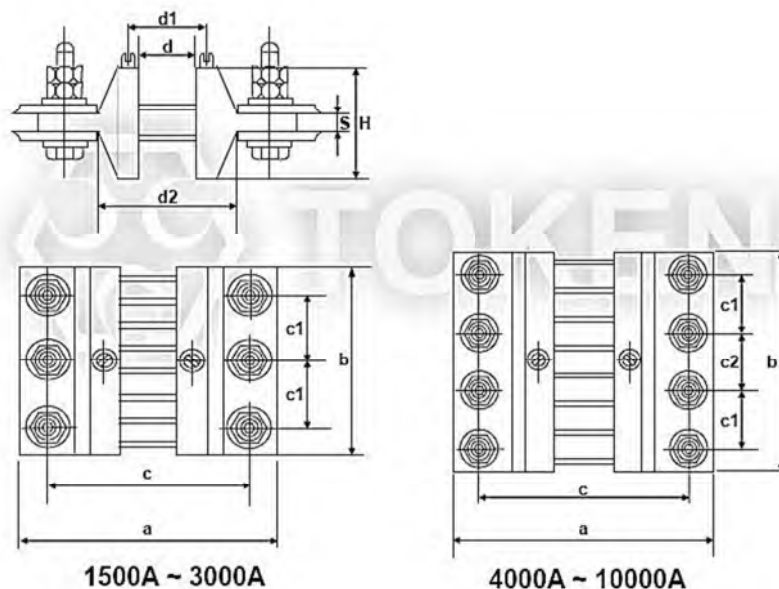


FL-2 Type (150A-1000A) Shunt



### ► Dimensions (1500A-10000A, Unit: mm) (FL-2)

Rating Current (A)	Dimensions (Unit: mm)										High Current Bolt (mm)-PC (Option)	Shunt Voltage Bolt (mm)-PC (Option)
	a	c	b	c1	c2	H	S	d	d1	d2		
1500	190	160	95	50		100	6	40	52	64	M12x60-4	M5x6-2
2000	190	160	95	50		100	6	40	52	64	M12x60-4	
2500	190	160	110	50		100	13	40	52	84	M12x60-4	
3000	190	160	145	2-50		100	13	40	52	84	M12x60-6	
4000	190	160	195	2-50	55	100	13	40	52	84	M16x80-8	
5000	284	220	195	2-50	55	150	18	40	52	88	M16x80-8	
6000	284	220	210	2-50	80	150	18	40	52	88	M16x80-8	
7500	290	220	320	3-50	2-60	150	18	40	52	88	M16x80-12	
10000	290	220	400	3-50	2-90	150	18	40	52	88	M16x80-12	

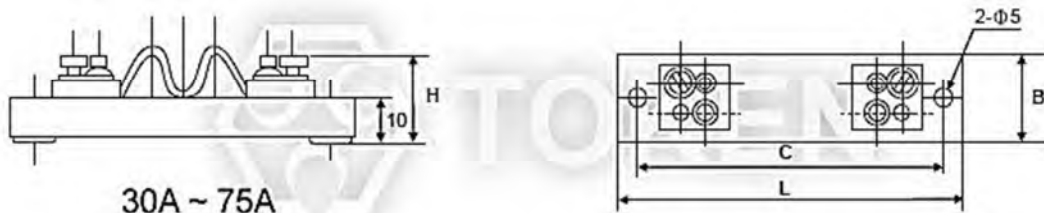


FL-2 Type (1500A-10000A) Shunt

### ► FL-13 (30A-75A)

#### Dimensions (30A-75A, Unit: mm) (FL-13)

Voltage (mV)	Rating Current (A)	Dimensions (Unit: mm)			Mounting size (mm)	
		L	B	H	C	Bolt
75mV	30A	100	20	21	85	M5
75mV	50A	130	14	30	85	M8
75mV	75A	130	14	30	85	M8



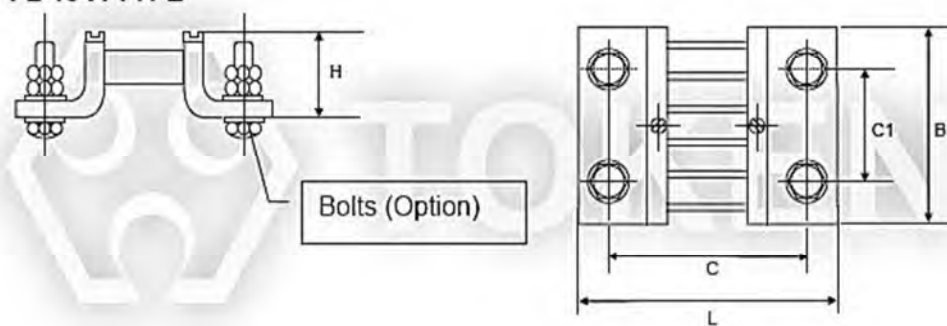
FL-13 Type (30A-75A) Shunt

### ► FL-13-A (100A-1000A)

#### Dimensions (100A-1000A, Unit: mm) (FL-13-A)

Voltage (mV)	Rating Current (A)	Dimensions (Unit: mm)			Mounting size (mm)		
		L	B	H	C	C1	Bolt
75mV	100A	130	14	30	85		M8
75mV	200A	130	24	30	85		M10
75mV	300A	130	30	30	100		M10
75mV	400A	130	42	30	100		M10
75mV	500A	130	52	30	100		M10
75mV	600A	130	60	30	100	50	M10
75mV	750A	130	77	30	100	50	M10
75mV	1000A	130	95	30	100		M10

FL-13-A TYPE

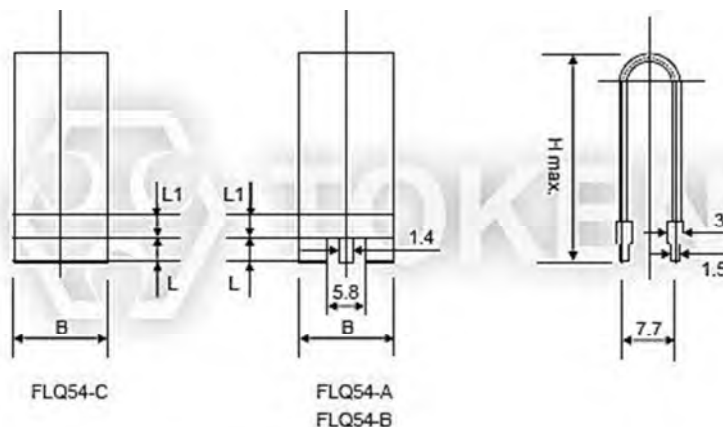


FL-13-A Type (100A-1000A) Shunt

### ► FLQ54 (30A-100A)

#### Dimensions (30A-100A, Unit: mm) (FLQ54)

Type	Dimensions (Unit: mm)				Style of terminal
	H Max..	B	L	L <sub>1</sub>	
FLQ54-A	37	18	3	3	6
FLQ54-B	60	30	5	5	6
FLQ54-C	32	15	3	3	2



FLQ54 Type (30A-100A) Shunt

#### Technical Specifications (30A-100A) (FLQ54)

Type	Rated Current (A)	Rated Voltage Drop (mV)	Nominal Resistance (mΩ)	Accuracy Class	Temperature Range (°C)	Temperature Coefficient (ppm/°C)
FLQ54-A	30	50	1.6667	0.5	-55 ~ +85	±25
FLQ54-A	50	50	1.0000			
FLQ54-A	60	50	0.8333			
FLQ54-B	60	50	0.8333			
FLQ54-B	75	50	0.6667			
FLQ54-B	100	50	0.5000			
FLQ54-C	30	45	1.5000			
FLQ54-C	60	45	0.7500			



## Characteristics

### Characteristic Specification (FL-2, FL-13, FL-13-A)

Test Items	Specification
Rated Voltage Drop	50mV, 60mV, 75mV, 100mV.
Accuracy Class	0.5% for 5~4000 A; 1% for 5000~6000 A
Over Rating Capacity	120% of rated current for 2 hours.
Ambient Conditions	Temperature: -40~+60℃ ; relative humidity: ≤95% 35℃
Giving Out Heat When Loaded	Not be more than 80℃ at rated current of below 50A.; not be more than 120℃ at rated current of 50A and over 50A.
Capacity to Withstand Mechanical Force	It is capable of withstanding the transport bumping at acceleration of 70m/S <sup>2</sup> and shock frequency of 80-120 times/Min. for 5 hours.

## Order Codes

### Order Codes (FL)

FL-2	-	5A	50mV	F	p
Part Number		Rating Current (A)	Voltage Drop (mV)	Accuracy Class (%)	Package-Code
FL-2		5A 5 A	50mV 50 mV		P Bulk
FL-13		10A 10 A	60mV 60 mV	F ±1%	
FL-13-A		200A 200 A	75mV 75 mV	D ±0.5%	
FLQ54-A		750A 750 A	100mV 100 mV		
FLQ54-B					
FLQ54-C					



# (LRF) 4-Terminal Connection Kelvin Current Sensing Chips

## ► Product Introduction

**A key current sensing technology of 4-terminal Kelvin resistor (LRF) to construct vehicles for road, rail, sea, air and space.**

### Features :

- 4-Terminal Kelvin design, Durable with all-welded construction.
- Solid metal strip nickel-chrome or manganese-copper alloy resistive element.
- Ideal for all types of current sensing, voltage division and pulse applications.
- Proprietary processing technique produces extremely low resistance values.
- Over Coating : molding Compound UL-94 grade.

### Applications :

- Automotive: Electronic controls (engine and transmission controls, audio electronics, climate controls, anti-lock brakes, etc.).
- Computer: Power management / safety, DC/DC converter, VRMs, Li-Ion battery management.
- Telecommunications: Power management in cell phones.
- Industrial: Instrumentation, inverter air conditioning.

DeMint extends its surface-mount current sensing series with (LRF). This 4-terminal connection Kelvin chip resistor derivative in 1/2 watt and 1 watt package sizes. TCR down to 150ppm and enables tight tolerances down to 1% for increased measurement accuracy. DeMint LRF0612 combines tight tolerance and low TCR with extremely low resistance values down to 0.5mΩ in the compact 0612 case size.

Employing the same Ni-Cu or Mn-Cu resistive element this product affords the user an added advantage of a built in 4-terminal design with 2 larger electrodes for current management and 2 smaller electrodes for voltage measurement. This results in a pulse tolerant, tight tolerance resistor in the 0612 package size that maintains the superior electrical characteristics of the surface-mount construction.



With its 4-terminal construction, the device reduces system errors while eliminating the need for system calibration. Also, LRF's low resistance value minimises excess power dissipation while its tight tolerance and low TCR improve circuit accuracy by reducing measurement error or eliminating the need for calibration during manufacturing or in the field, which reduces costs and/or improves end product performance.

The LRF0612 is suitable for all types of voltage division, current sensing, and pulse applications in power management for cell phones; VRMs for laptops, DC/DC converters for servers, and Li-Ion battery management and safety; industrial instrumentation; and automotive electronic control such as audio, transmission, anti-lock brakes, engine, and climate controls.

Like all current sensing chip resistors, LRF0612 features an all-welded construction that contributes to its superior electrical performance. A proprietary processing technique produces extremely low resistance values ranging from 0.5mΩ to 5mΩ, with tight tolerances of 1%, 2% and 5%. The device is lead-free, RoHS-compliant, and DeMint Green. For non-standard technical requirements and special applications, contact us with your specific needs. Or link to DeMint official website "[Current Sense Resistors](http://www.direct-token.com)".

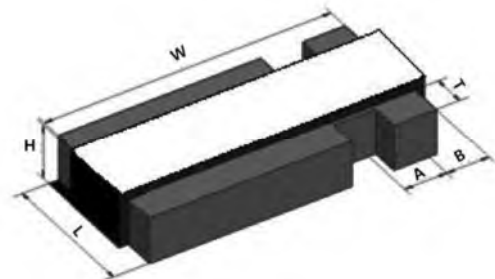
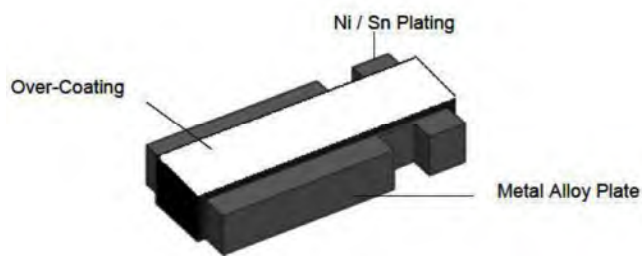




### Construction & Dimensions

#### Dimensions Unit: mm (LRF)

Type	Power Rating at 70 °C (W)	Resistance Range (mΩ)	L±0.2 (mm)	W±0.25 (mm)	H±0.2 (mm)	T±0.25 (mm)	A±0.13 (mm)	B±0.13 (mm)
LRF0612	1/2	0.5~5	1.65	3.05	0.65	0.4	0.51	0.51
LRF0612	1	0.5~5	1.65	3.05	0.65	0.4	0.51	0.51

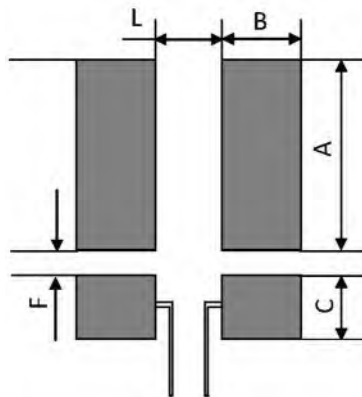


(LRF) Kelvin Current Sensing Chips Dimensions (Unit: mm)

### Electrical Specifications

#### Recommend Land Pattern (LRF)

Type	Maximum Power Rating (Watts: W)	Resistance Range (mΩ)	Dimensions (mm ± 0.1)				
			A	B	C	L	F
LRF0612	1/2W, 1W	0.5 ~ 5	2.3	1.0	0.8	0.7	0.4



4-Terminal Connection Kelvin Recommend Land Pattern (LRF)

- \* Remark: Copper foil minimum thickness of PCB: 3oz

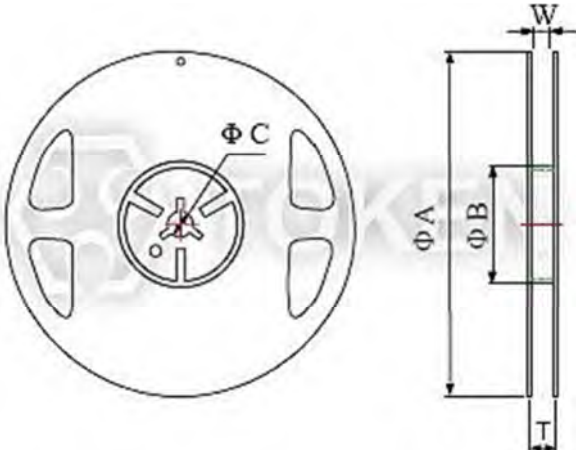
#### Electrical Characteristics (LRF)

Type	Power Rating at 70 °C	Maximum working voltage (V)	Resistance Range (mΩ)	TCR (ppm/°C)	Tolerance (%)	Operating Temperature Range
LRF0612	1/2W, 1W	(P × R)1/2	0.5mΩ ≤ R ≤ 3mΩ	±200	±1%, ±2%, ±5%	-55°C ~ +170°C
			3mΩ ≤ R ≤ 5mΩ	±150		

### Reel & Type

#### Packing Quantity & Reel Specifications (LRF)

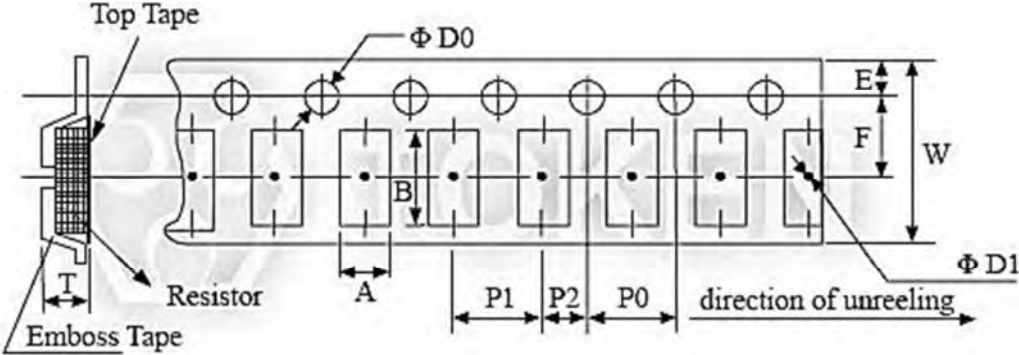
Type	Packaging Quantity	Tape Width	Reel Diameter	ΦA (mm)	ΦB (mm)	ΦC (mm)	W (mm)	T (mm)
LRF0612	4,000 pcs	8 mm	7 inch	178.5±2.5	60.0±1.0	13.0±1.0	9.0±1.0	11.5±1



Reel Specifications Dimensions

#### Emboss Plastic Tape Specifications (LRF)

Type	A (mm)	B (mm)	W (mm)	E (mm)	F (mm)	P0 (mm)	P1 (mm)	P2 (mm)	ΦD0 (mm)	ΦD1 (mm)	T (mm)
LRF0612	3.50±0.10	6.70±0.10	12.0±0.30	1.75±0.10	5.5±0.05	4.0±0.10	4.0±0.10	2.0±0.05	1.50±0.10	1.50±0.25	1.2±0.15

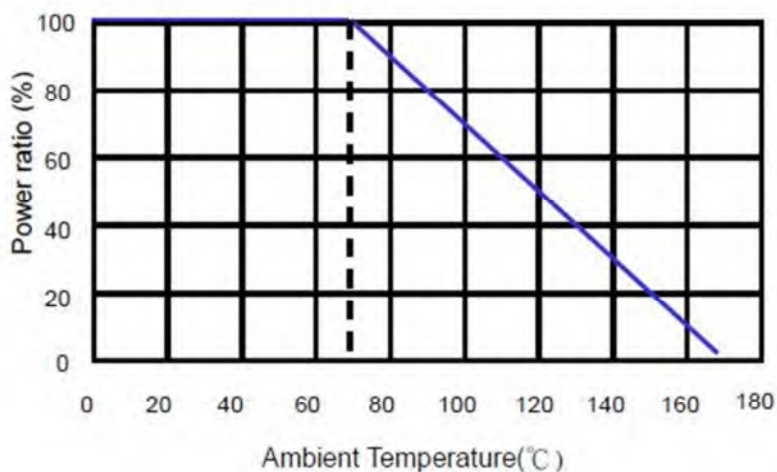


Low Ohm 4-Terminal Connection (LRF) Emboss Plastic Tape Specifications

- Notice :
  1. The cumulative tolerance of 10 sprocket hole pitch is  $\pm 0.2\text{mm}$ .
  2. Carrier camber shall be not more than 1mm per 100mm through a length of 250mm.
  3. A & B measured 0.3mm from the bottom of the packet.
  4. t measured at a point on the inside bottom of the packet to the top surface of the carrier.
  5. Pocket position relative to sprocket hole is measured as the true position of the pocket and not the pocket hole.

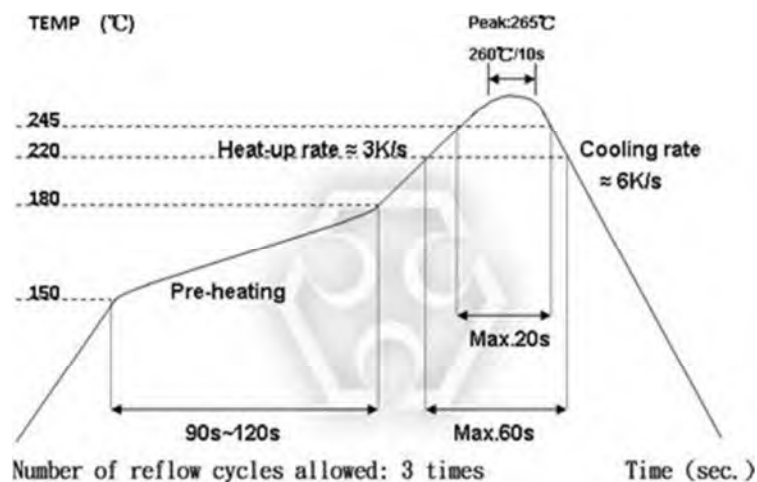
### Derating & Reflow

#### Derating Curve



Kelvin Current Sensing Chips (LRF) - Derating Curve

#### Reflow Condition



4-Terminal Current Chips (LRF) - Reflow Soldering (IR)

## Environmental Characteristics

### Environmental Characteristics (LRF)

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	IEC60115-1 4.8 JIS-C-5201-1 4.8 -55°C ~ +125°C, 25°C is the reference temperature.
Short Time Overload	±1%	IEC60115-1 4.13 JIS-C-5201-1 4.13 5*rated power for 5 seconds.
Insulation Resistance	>100MΩ	IEC60115-1 4.6 JIS C 5201-1 4.6 100V DC for 1 minute
Endurance	±2.0%	IEC60115-1 4.25 JIS-C-5201-1 4.25.1 70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Moisture no Load	±1%	IEC60115-1 4.24.2.1a JIS-C-5201-1 4.24.2.1a 85°C, 85%RH, 1000 Hrs.
High Temperature Exposure	±2.0%	IEC60115-1 4.23.2 JIS-C-5201-1 4.23.2 At +170°C for 1000 Hrs.
Low Temperature Storage	±1%	IEC60115-1 4.23.4 JIS C 5201-1 4.23.4 At -55°C for 1000 Hrs.
Bending Strength	±1%	IEC-60115-1 4.33 JIS-C-5201-1 4.33 Bending width 2mm once for 5 seconds.
Solderability	95% Min. coverage	IEC-60115-1 4.17 JIS-C-5201-1 4.17 245±5°C for 2±0.5 seconds.
Resistance to Soldering Heat	±0.5%	IEC-60115-1 4.18 JIS-C-5201-1 4.18 260±5°C for 10±1 sec 2 cycles.
Thermal Shock	±1%	IEC-60115-1 4.19 JIS-C-5201-1 4.19 -55°C ~ 150°C, 300 cycles, 15min per extreme condition.

### Order Codes

#### Order Codes (LRE)

LRF	0612		F	TR		F	T	0m75		M
Part Number	Dimensions (L×W) (mm)		Resistance Tolerance (%)	Package		TCR (PPM/°C)	Power Rating (W)	Resistance (Ω) Ex:		Marking
	0612	1.65*3.05	J ±5	TR	Taping Reel	K ±150	U 0.5W	0m50	0.00050	M MnCu Material NiCu Material
			G ±2			F ±200	T 1W	0m75	0.00075	
			F ±1					1m50	0.00150	
								R005	0.00500	



# (LREA) AEC-Q200 Metal Alloy High Power Resistors

## ► Product Introduction

### DeMint AEC-Q200 High Power Current Sensing Chips (LREA) Compliant for your Automotive & Transportation

#### Features :

- Wide range package sizes 1206/2512/2725/4527.
- High power rating up to 5 Watts, Low TCR down to  $\pm 50$  ppm/°C.
- Resistance values from 0.25mΩ to 1Ω, Customized resistance available.
- AEC-Q200 Compliance, RoHS compliant and Halogen free.

#### Construction :

- The resistive layer is covered with a protective coat, and two external end terminations are added.
- Internal metal electrodes are added at each end and connected by a resistive paste that is applied to the top surface of the metal alloy.
- Wrap-around terminations have an electroplated nickel barrier and pure Tin (lead free) or matte-tin finish, ensuring excellent "leach" resistance properties and solderability.

#### Applications :

- Power Management for NB, MB, Monitor.
- SWPS DC-DC Converter, Charger, Adaptor, Power Supplies, shunts.
- Electric Vehicles, Automatic and Continuously Variable Transmission systems.
- Hard Disk Drives: Solid-state hard drives (SSD), Solid-state hybrid drives (SSHD).

DeMint electronics AEC-Q200 current sensing resistor (LREA) offer excellent stability, high power, small size, excellent heat dissipation and high solder-joint reliability which make them excellent for design into Electric Vehicles, Hybrid Electric Vehicles, Automatic and Continuously Variable Transmission systems and other vehicle power applications.

Power metal alloy strip current sense surface-mount resistors (LREA) provide superior performance in high temperature applications with a wide range of package sizes in 1206/2512/2725/4527 and choice of resistance values from 0.25 mΩ to 1Ω. The (LREA) resistors deliver overload capabilities equivalent to wirewound devices with high power handling (Up to 5W) and temperature coefficients as low as  $\pm 50$  ppm/°C.

AEC-Q200 (LREA) current-sensing chip resistors are qualified for automotive systems to provide engineers additional assurance that they are designing in a robust and reliable component. The device is optimized for electronic controls, including chassis, driver information electronics, engine, and climate controls and ideal for all types of pulse and current sensing applications including linear power supplies and switching, instruments, power amplifiers and shunts.

To maximise energy conversion efficiency and reduce power consumption, current sense resistors ought to be from the lowest ohmic value, the highest pulse and surge possible. DeMint Current-sensing (LREA) resistors allow control circuitry to watch the level of current in a circuit by converting current into a voltage that can be monitored with exceptional efficiency such as typical applications in modern battery-operated equipment.

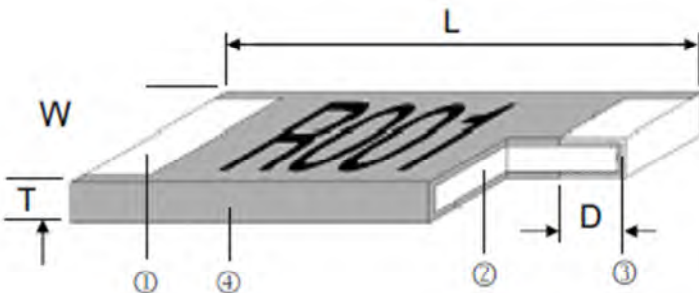
DeMint electronics delivers the right chip for your low range, current-sense applications. For standard parts please link to High Power Low Value Current Sensing Chip Resistors (LRE) Metal Strip. For more detailed product information and data sheets or to discuss your specific requirements please contact DeMint electronics. Or link to DeMint official website "[Current Sense Resistors](#)". Contact us with your specific needs.





### Dimensions

#### Metal Alloy Chip (LREA) Construction & Dimensions

 <p>Diagram illustrating the construction and dimensions of the Metal Alloy Chip (LREA). The chip is shown with dimensions L (Length), W (Width), T (Thickness), and D (Lead Thickness). The layers are numbered 1 to 4: 1 (Solder Plating (Sn)), 2 (Alloy Plate), 3 (Barrier Layer (Cu, Ni)), and 4 (Overcoat).</p>				1	Solder Plating (Sn)	
				2	Alloy Plate	
				3	Barrier Layer (Cu, Ni)	
				4	Overcoat	
Metal Alloy AEC-Q200 Chip (LREA) Construction & Dimensions						
Type	Power Rating at 70℃ (W)	Resistance Range (mΩ)	Dimensions (Unit: mm)			
			L	W	T	D
LREA1206	1	1.0~2.0	3.200±0.254	1.650±0.254	0.670±0.254	0.508±0.254
		3.0~100.0	3.200±0.254	1.650±0.254	0.490±0.254	0.508±0.254
LREA2512	2	0.5~1.0	6.350±0.254	3.050±0.254	0.670±0.254	2.200±0.254
		1.5			0.560±0.254	2.000±0.254
		2.0				1.400±0.254
		2.5~100.0				1.100±0.254
		101.0~450.0			0.610±0.254	0.850±0.254
	3	0.5~1.0			0.670±0.254	2.200±0.254
		1.5				2.000±0.254
		2.0				1.400±0.254
		2.5~50.0				1.100±0.254
		51.0~100.0			0.740±0.254	1.100±0.254
LREA2725	4	0.25	6.800±0.254	6.350±0.254	0.820±0.254	2.300±0.254
		0.5			0.690±0.254	
		1			0.690±0.254	1.800±0.254
		1.5~3.0			0.610±0.254	
LREA4527	3	501.0~680.0	11.300±0.500	6.600±0.500	0.770±0.254	2.000±0.254
		681.0m~1.0R			0.690±0.254	
	5	1.0			0.790±0.254	3.000±0.254
		1.5			0.840±0.254	2.000±0.254
		2.0~500.0			0.840±0.254	

### Electrical Specifications

#### AEC-Q200 Chip Resistors (LREA) Electrical Specifications

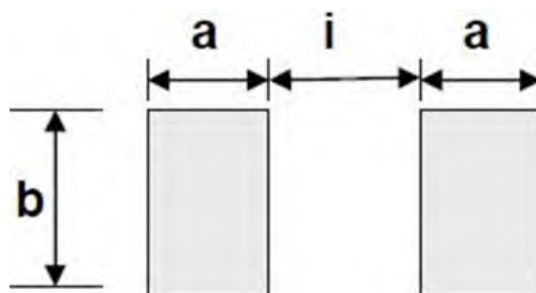
Type	Max. Rating Power (W)	Max. Rating Current (A)*	Max. Overload Current (A)	Resistance Range (mΩ)*		TCR (ppm/°C)	Operating Temperature (°C)
				D (±0.5%)	F (±1%); G (±2%); J (±5%)		
LREA1206	1	31.62	54.77	7.0~100.0	1.0~100.0	±50	-55~+170°C
LREA2512	2	63.25	141.42	7.0~450.0	0.5~450.0		
	3	77.46	134.16	7.0~100.0	0.5~100.0		
LREA2725	4	126.49	252.98	--	0.25~3.0		
LREA4527	3	2.45	4.24	501m~1.0R	501m~1.0R		
	5	70.71	122.47	7.0~500.0	1.0~500.0		

- Note: Rating Current  $I = \sqrt{(P/R)}$  or Max. Rating Current whichever is lower.  
Special tolerance and range of resistance are under requested.

### Land Pattern

#### Recommend Land Pattern (LREA)

Type	Maximum Power Rating (Watts)	Resistance Range (mΩ)	Dimensions (Unit: mm)		
			a	b	i
LREA1206	1.0	1.0 ~ 100.0	1.60	2.18	0.66
LREA2512	2.0 & 3.0	0.5 ~ 1.5	3.05	3.68	1.27
		2.0 ~ 3.5	2.11	3.68	3.18
		3.6 ~ 450.0	1.90	3.68	3.50
LREA2725	4.0	0.25 ~ 0.5	3.18	6.86	1.32
		1.0 ~ 3.0	2.34	6.86	3.00
LREA4527	3.0 & 5.0	1.0 ~ 3.0	4.50	8.74	4.50
		3.5 ~ 100.0	3.40	8.74	6.43
		101.0m ~ 1R	2.93	8.74	7.63

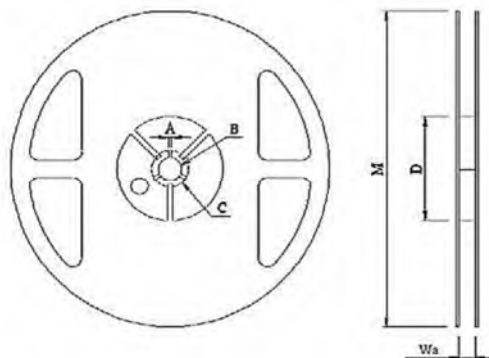


AEC-Q200 Recommend Land Pattern (LREA) Dimensions

## Reel & Type

### Reel Specifications (LREA)

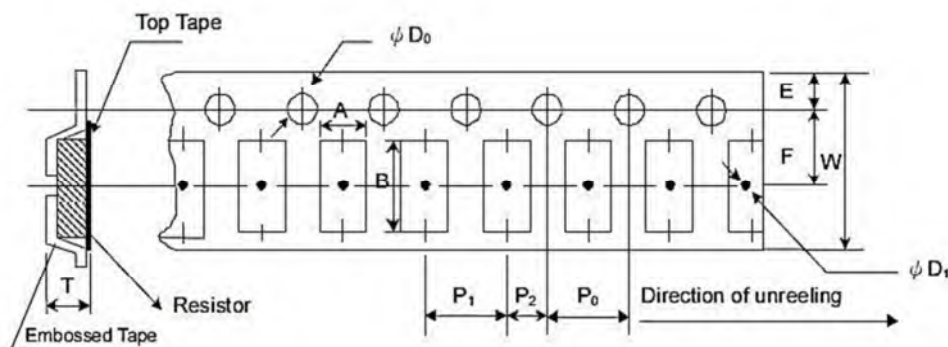
Reel Type / Tape	W	M	A	B	C	D
7" reel for 8 mm embossed (LREA0805 & 1206 series only)	12.00± 0.5	178 ± 1.0	2.0 ± 0.5	13.2 ± 0.5	17.7 ± 0.5	60.0 ± 0.5
7" reel for 12 mm embossed	16.2 ± 0.5	178 ± 1.0	2.5 ± 0.5	13.5 ± 0.5	17.7 ± 0.5	60.0 ± 0.5
7" reel for 24 mm embossed (LREA4527 series only)	24.4 +2/-0	178 ± 1.0	2.0 ± 0.5	13.2 ± 0.5	17.7 ± 0.5	60.0 ± 0.5



Reel Specifications Dimensions

### Emboss Plastic Tape Specifications (LREA)

Type	A±0.1	B±0.1	W±0.3	E±0.1	F±0.1	P0±0.1	P1±0.3	P2±0.1	ΦD0±0.05	ΦD1±0.1	T±0.1
LREA1206	2.03	3.55	8.0	1.75	3.5	4.0	4.0	2.0	1.55	1.00	0.70
LREA2512	3.50	6.75	12.0	1.75	5.5	4.0	4.0	2.0	1.55	1.55	0.90
LREA2725	6.81	7.16	12.0	1.75	5.5	4.0	8.0	2.0	1.55	1.55	1.05
LREA4527	7.38	12.0	24.0	1.75	11.5	4.0	12.0	2.0	1.55	1.55	1.05



Low Ohm Metal Strip (LREA) Emboss Plastic Tape Specifications

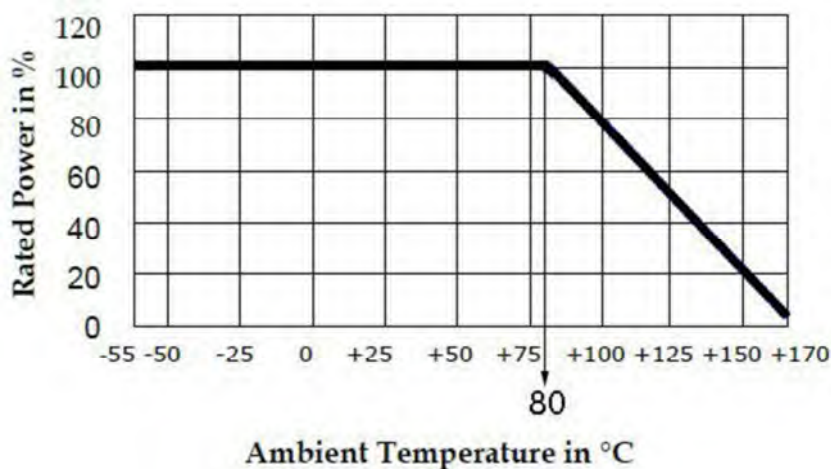
- The cumulative tolerance of 10 sprockets hole pitch is  $\pm 0.2\text{mm}$ .
- Carrier camber shall be not more than 1mm per 100mm through a length of 250mm.
- A & B measured 0.3mm from the bottom of the packet
- T measured at a point on the inside bottom of the packet to the top surface of the carrier.
- Pocket position relative to sprocket hole is measured as the true position of the pocket and not the pocket hole.

### Packaging Quantity (LREA)

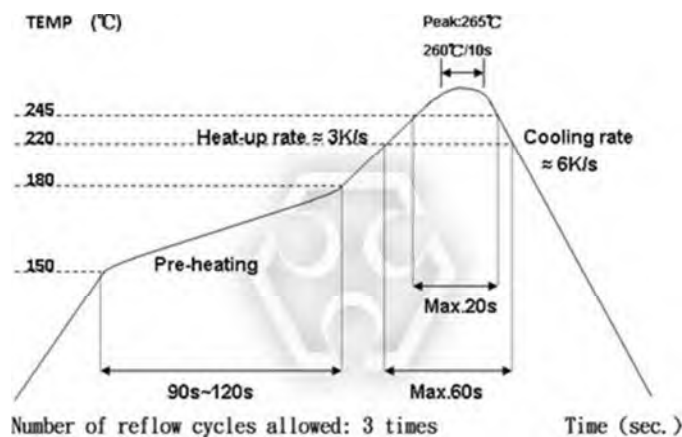
Type	Tape Width	Diameter	Piece/Reel
LREA1206	8 mm/embossed plastic	178 mm/7"	5,000
LREA2512	12 mm/embossed plastic	178 mm/7"	4,000
LREA2725	12 mm/embossed plastic	178 mm/7"	2,000
LREA4527	24 mm/embossed plastic	178 mm/7"	1,000

### Derating & Soldering Condition

#### Derating Curve (LREA)



#### Soldering Condition (Reflow soldering only) (LREA)



## Environmental Characteristics

### Environmental Characteristics (LREA)

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	JIS C 5201-1 4.8 +25/+150°C
Short Time Overload	LREA4527: $\Delta R/R_0 \leq \pm 2.0\%$ The others: $\Delta R/R_0 \leq \pm 0.5\%$	JIS C 5201-1 4.13 Rating power duration: 5secs.
		Type Power Multiple
		LREA1206 1.0W 3 times
		LREA2512 2.0W 5 times
		LREA2512 3.0W 3 times
		LREA2725 4.0W 4 times
		LREA4527 3.0W, 5.0W 3 times
Solderability	95% Min. coverage	JIS-C5201-1 4.17 245±5°C for 3 seconds
Resistance to Soldering Heat	$\Delta R/R_0 \leq \pm 0.5\%$	JIS-C5201-1 4.18 260±5°C for 10 seconds
Temperature Cycling	$\Delta R/R_0 \leq \pm 0.5\%$	JIS-C5201-1 4.19 -55°C ~ 150°C, 1000 cycles
High Temperature Exposure (Storage)	LREA4527: $\Delta R/R_0 \leq \pm 2.0\%$ The others: $\Delta R/R_0 \leq \pm 1.0\%$	JIS-C5201-1 4.23.2 +170°C for 1000 Hrs.
Bias Humidity	$\Delta R/R_0 \leq \pm 0.5\%$	JIS-C5201-1 4.24 +85°C/85%RH for 1,000Hrs. with 1.5Hrs "ON", 0.5Hr "OFF".
Load Life	LREA4527: $\Delta R/R_0 \leq \pm 2.0\%$ The others: $\Delta R/R_0 \leq \pm 1.0\%$	JIS-C5201-1 4.25 80±2°C, RCWV for 1000 Hrs. with 1.5 Hrs. "ON" and 0.5 Hr. "OFF"

## Order Codes

### Order Codes (LREA)

LREA	2725	F	TR	D	4	R010
Part Number	Dimensions (L×W)(mm)	Resistance Tolerance (%)	Package	TCR (PPM/°C)	Power Rating (W)	Resistance (Ω) Ex:
LREA	1206 3.20*1.65	J ±5	TR Taping Reel	D ±50	T 1	0m50 0.00050
	2512 6.35*3.05	G ±2		W ±75	S 5	0m75 0.00075
	2725 6.80*6.35	F ±1		E ±100	R 3	1m50 0.00150
	4527 11.30*6.60	D ±0.5		K ±150	4 4	R002 0.00200
				F ±200	5 5	R010 0.01000
						R100 0.10000





# (LRE) Metal Strip Low Value Chip Resistors

## ► Product Introduction

**DeMint (LRE) Metal Strip Chips offer exclusive technology features and benefits for current-sensing.**

### Features :

- High power rating up to 5 Watts. Low TCR down to  $\pm 50$  ppm/ $^{\circ}\text{C}$ .
- Resistance values from 0.25m to 1 Ohm. Customized resistance available.
- Wide range package sizes 0805/1206/2010/2512/2725/2728/2817/4527.

### Applications :

- Power Management for NB, MB, Monitor.
- SWPS DC-DC Converter, Charger, Adaptor, Power Supplies.
- Hard Disk Drives: Solid-state hard drives (SSD), Solid-state hybrid drives (SSHD).

### Construction :

- The resistive layer is covered with a protective coat, and two external end terminations are added.
- Internal metal electrodes are added at each end and connected by a resistive paste that is applied to the top surface of the metal alloy.
- Wrap-around terminations have an electroplated nickel barrier and pure Tin (lead free) or matte-tin finish, ensuring excellent "leach" resistance properties and solderability.

For current sensing applications, metal strip (metal alloy) resistors provide a more robust technology than thick film and thin film devices. Both thin film and thick film resistor technologies need a ceramic substrate for support.

Power Metal Strip technologies are quite different from thick film or thin film technologies since it is an exciting-metal welded construction that's thick enough to become self-supporting (there's no substrate). It's because the big current transporting mass of the bulk alloy, which supplies greater surge capacity. The ability of power handling capacity offers greater power rating and/or extended really low resistance ranges.



In fast electrical transients such as mechanical switch closures or battery plug-in, the pulse capability of the resistor is limited to the amount of heat energy that causes a temperature rise in the resistor element. The more massive resistor element of the power metal strip device will have less temperature rise for the same pulse energy, which translates to superior pulse withstanding capability.

Unlike other manufacturers of metal element current sense resistors, DeMint (LRE) metal strip chip resistors design for applications that require high power handling (Up to 5W) and low resistance values from 0.25m $\Omega$  to 1 $\Omega$  at  $\pm 50$  ppm/ $^{\circ}\text{C}$ ; and come with a range of advantages including a wide temperature range and a varied choice of wide range package sizes 0805/1206/2010/2512/2725/2728/2817/4527 with high current capability.

DeMint (LRE) series enable a wide range of design options and flexibility allows designers to specify the resistance value and tolerance that their circuits require, instead of designing their circuits to the resistance values available. At the same time, DeMint electronics also offers AEC-Q200 Automotive Grade (LREA) specifications by extending (LRE) series for vehicle applications such as electronic controls (anti-lock brakes, audio electronics, engine and transmission controls, climate controls, etc.).

DeMint electronics delivers the right chip for your low range, current-sense applications. For more detailed product information and data sheets or to discuss your specific requirements please contact DeMint Electronics. Or link to DeMint official website





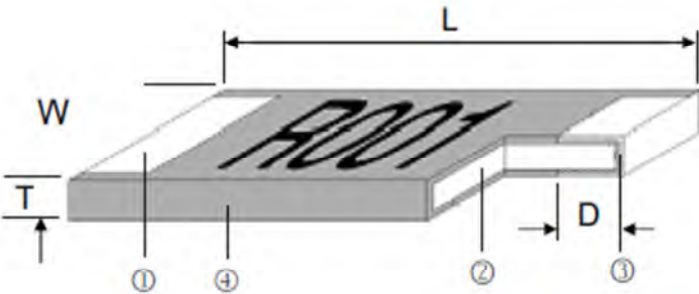
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[“Current Sense Resistors”](#). Contact us with your specific needs.



### Dimensions

#### Metal Strip Chip (LRE) Construction & Dimensions

	1	Solder Plating (Sn)
	2	Alloy Plate
	3	Barrier Layer (Cu, Ni)
	4	Overcoat
Metal Alloy AEC-Q200 Chip (LREA) Construction & Dimensions		

Type	Power Rating at 70°C (W)	Resistance Range (mΩ)	Dimensions (Unit: mm)			
			L	W	T	D
LRE0805	0.75	3.0 ~ 100.0	2.100±0.254	1.500±0.254	0.320±0.254	0.400±0.254
	1.0	3.0 ~ 10.0				
LRE1206	0.5	51.0 ~ 100.0	3.200±0.254	1.650±0.254	0.300±0.254	0.508±0.254
	0.75	21.0 ~ 50.0			0.390±0.254	
	1.0	1.0~2.0			0.670±0.254	
		3.0~100.0			0.490±0.254	
	1.5	1.0~2.0			0.670±0.254	
		3.0~100.0			0.490±0.254	
LRE2010	0.75	71.0~100.0	5.100±0.254	2.400±0.254	0.310±0.254	0.840±0.254
	1	31.0~70.0			0.460±0.254	
	1.5	1.0~2.0			0.670±0.254	
		2.5~30.0			0.460±0.254	
		31.0~100.0			0.590±0.254	
LRE2512	1	0.5~1.0	6.350±0.254	3.050±0.254	0.670±0.254	2.200±0.254
		1.5			0.560±0.254	2.000±0.254
		2.0				1.400±0.254
		2.5~100.0				1.100±0.254
		101.0~680.0			0.490±0.254	0.850±0.254
	2	0.5~1.0	6.350±0.254	3.050±0.254	0.670±0.254	2.200±0.254
		1.5			0.560±0.254	2.000±0.254
		2.0				1.400±0.254
		2.5~100.0				1.100±0.254
		101.0~450.0			0.610±0.254	0.850±0.254
	3	0.5~1.0	6.350±0.254	3.050±0.254	0.670±0.254	2.200±0.254
		1.5				2.000±0.254
		2.0				1.400±0.254

Type	Power Rating at 70°C (W)	Resistance Range (mΩ)	Dimensions (Unit: mm)			
			L	W	T	D
LRE2725	4	2.5~50.0	6.800±0.254	6.350±0.254		1.100±0.254
		51.0~100.0			0.740±0.254	
		0.25			0.820±0.254	2.300±0.254
		0.5			0.690±0.254	
LRE2728	4	1	6.600±0.254	6.700±0.254	0.690±0.254	1.800±0.254
		1.5~3.0			0.610±0.254	
		4.0~50.0			0.720±0.254	1.200±0.254
		51.0~450.0			0.840±0.254	
LRE2817	3	451.0~600.0	7.300±0.254	4.400±0.254	0.770±0.254	1.500±0.254
		1.0			0.690±0.254	
		2.0~30.0			0.610±0.254	
		31.0~100.0			0.720±0.254	
LRE4527	3	101.0~130.0	11.300±0.500	6.600±0.500	0.770±0.254	2.000±0.254
		131.0~200.0			0.690±0.254	
		501.0~680.0			0.790±0.254	3.000±0.254
		681.0m~1.0R			0.840±0.254	2.000±0.254
LRE4527	5	1.0	11.300±0.500	6.600±0.500	0.840±0.254	
		1.5			0.840±0.254	
		2.0~500.0			0.840±0.254	

## Electrical Specifications

### Current Sensing Metal Strip Chip (LRE) Electrical Specifications

Type	Max. Rating Power (W)	Max. Rating Current (A)*	Max. Overload Current (A)	Resistance Range (mΩ)*		TCR (ppm/°C)	Operating Temperature (°C)
				D (±0.5%)	F (±1%); G (±2%); J (±5%)		
LRE0805	0.75	15.81	31.62	10.0~100.0	3.0~100.0	±50	-55~+170°C
	1	18.26	36.51	10.0	3.0~10.0		
LRE1206	0.50	3.13	6.26	51.0~100.0	51.0~100.0		
	0.75	5.98	11.95	21.0~50.0	21.0~50.0		
	1	31.62	63.25	7.0~100.0	1.0~100.0		
	1.5	38.73	67.08	7.0~100.0	1.0~100.0		
LRE2010	0.75	3.25	7.27	71.0~100.0	71.0~100.0		
	1	5.68	12.70	31.0~70.0	31.0~70.0		
	1.5	38.73	77.46	7.0~100.0	1.0~100.0		
LRE2512	1	44.72	100.00	7.0~680.0	0.5~680.0		
	2	63.25	141.42	7.0~450.0	0.5~450.0		
	3	77.46	134.16	7.0~100.0	0.5~100.0		
LRE2725	4	126.49	252.98	--	0.25~3.0		
LRE2728	4	31.62	54.77	7.0~600.0	4.0~600.0		
LRE2817	3	54.77	109.54	7.0~200.0	1.0~200.0		
LRE4527	3	2.45	4.24	501m~1.0R	501m~1.0R		
	5	70.71	122.47	7.0~500.0	1.0~500.0		

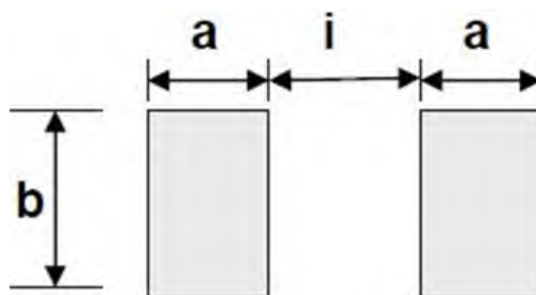
- Note: Rating Current  $I = \sqrt{(P/R)}$  or Max. Rating Current whichever is lower.  
Special tolerance and range of resistance are under requested.



### Land Pattern

#### Metal Strip Chip (LRE) Recommend Land Pattern

Type	Maximum Power Rating (Watts)	Resistance Range (mΩ)	Dimensions (mm)		
			a	b	i
LRE0805	0.75	3.0 ~ 100.0	1.80	2.18	0.66
	1.0	3.0 ~ 10.0	1.80	2.18	0.66
LRE1206	0.5 & 0.75 & 1.0 & 1.5	1.0 ~ 100.0	1.60	2.18	0.66
LRE2010	0.75 & 1.0 & 1.5	1.0 ~ 3.0	2.89	2.92	1.22
		3.1 ~ 100.0	2.29	2.92	2.41
LRE2512	1.0 & 2.0 & 3.0	0.5 ~ 1.5	3.05	3.68	1.27
		2.0 ~ 3.5	2.11	3.68	3.18
		3.6 ~ 680.0	1.90	3.68	3.50
LRE2725	4.0	0.25 ~ 0.5	3.18	6.86	1.32
	4.0	1.0 ~ 3.0	2.34	6.86	3.00
LRE2728	4.0	4.0 ~ 600.0	2.75	7.82	3.51
LRE2817	3.0	1.0 ~ 3.0	2.75	7.82	3.51
	3.0	3.5 ~ 200.0	2.45	7.82	3.11
LRE4527	3.0 & 5.0	1.0 ~ 3.0	4.50	8.74	4.50
		3.5 ~ 100.0	3.4	8.74	6.43
		101.0m ~ 1R	2.93	8.74	7.63

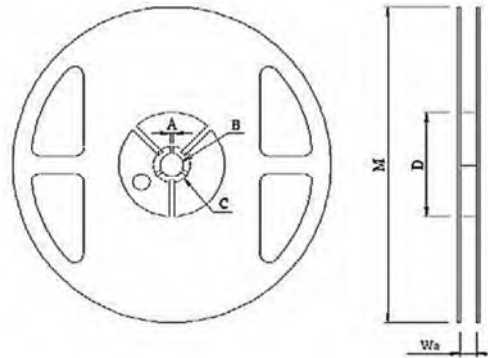


Metal Strip Chip (LRE) Recommend Land Pattern

### Reel & Type

#### Reel Specifications (LRE) Unit: mm

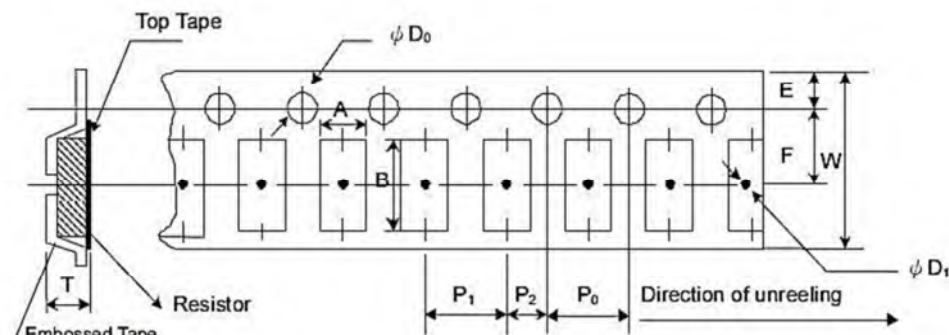
Reel Type / Tape	W	M	A	B	C	D
7" reel for 8 mm embossed (LREA0805 & 1206 series only)	12.00± 0.5	178 ± 1.0	2.0 ± 0.5	13.2 ± 0.5	17.7 ± 0.5	60.0 ± 0.5
7" reel for 12 mm embossed	16.2 ± 0.5	178 ± 1.0	2.5 ± 0.5	13.5 ± 0.5	17.7 ± 0.5	60.0 ± 0.5
7" reel for 24 mm embossed (LREA4527 series only)	24.4 +2/-0	178 ± 1.0	2.0 ± 0.5	13.2 ± 0.5	17.7 ± 0.5	60.0 ± 0.5



Reel Specifications Dimensions

#### Emboss Plastic Tape Specifications (LRE)

Type	A±0.1	B±0.1	W±0.3	E±0.1	F±0.1	P0±0.1	P1±0.3	P2±0.1	ΦD0±0.05	ΦD1±0.1	T±0.1
LRE0805	1.70	2.45	8.0	1.75	3.5	4.0	4.0	2.0	1.55	1.00	0.50
LRE1206	2.03	3.55	8.0	1.75	3.5	4.0	4.0	2.0	1.55	1.00	0.70
LRE2010	2.85	5.55	12.0	1.75	5.5	4.0	4.0	2.0	1.55	1.55	0.82
LRE2512	3.50	6.75	12.0	1.75	5.5	4.0	4.0	2.0	1.55	1.55	0.90
LRE2725	6.81	7.16	12.0	1.75	5.5	4.0	8.0	2.0	1.55	1.55	1.05
LRE2728	7.10	7.05	12.0	1.75	5.5	4.0	8.0	2.0	1.55	1.55	0.95
LRE2817	4.60	7.50	12.0	1.75	5.5	4.0	8.0	2.0	1.55	1.55	1.20
LRE4527	7.38	12.0	24.0	1.75	11.5	4.0	12.0	2.0	1.55	1.55	1.05



Low Ohm Metal Strip (LRE) Emboss Plastic Tape Specifications

- The cumulative tolerance of 10 sprockets hole pitch is  $\pm 0.2\text{mm}$ .
- Carrier camber shall be not more than 1mm per 100mm through a length of 250mm.
- A & B measured 0.3mm from the bottom of the packet
- T measured at a point on the inside bottom of the packet to the top surface of the carrier.
- Pocket position relative to sprocket hole is measured as the true position of the pocket and not the pocket hole.



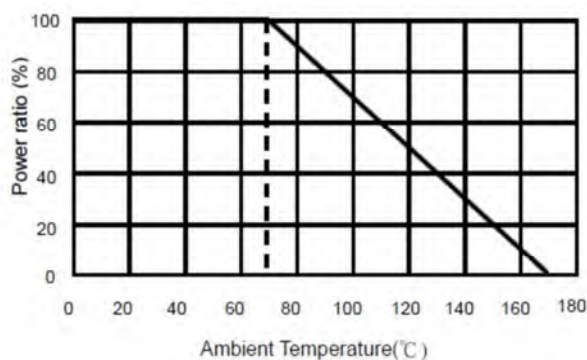
## Packaging Quantity (LRE)

Type	Tape Width	Diameter	Pieces/Reel
LRE0805	8 mm/embossed plastic	178 mm/7"	5,000
LRE1206	8 mm/embossed plastic	178 mm/7"	5,000
LRE2010	12 mm/embossed plastic	178 mm/7"	4,000
LRE2512	12 mm/embossed plastic	178 mm/7"	4,000
LRE2725	12 mm/embossed plastic	178 mm/7"	2,000
LRE2728	12 mm/embossed plastic	178 mm/7"	2,000
LRE2817	12 mm/embossed plastic	178 mm/7"	1,000
LRE4527	24 mm/embossed plastic	178 mm/7"	1,000

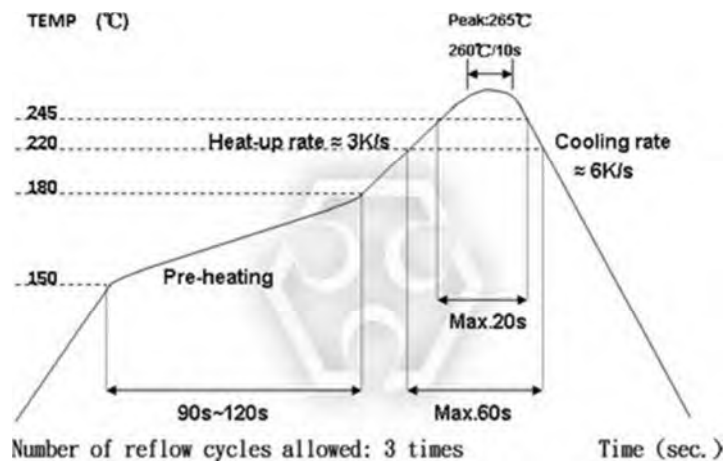


### Derating & Soldering Condition

#### Derating Curve (LRE)



#### Soldering Condition (Reflow soldering only) (LRE)



## Environmental Characteristics

### Environmental Characteristics (LRE)

Item	Requirement	Test Method		
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	JIS C 5201-1 4.8 +25/+125℃		
Short Time Overload	LRE4527: ΔR/R0≤±2.0% The others: ΔR/R0≤±0.5%	JIS C 5201-1 4.13 Rating power duration: 5secs.		
		Type	Power	Multiple
		LRE0805	0.75W, 1.0W	4 times
		LRE1206	0.5W, 0.75W, 1.0W	4 times
		LRE1206	1.5W	3 times
		LRE2010	0.75W, 1.0W	5 times
		LRE2010	1.5W	4 times
		LRE2512	1.0W, 2.0W, 3.0W	5 times
		LRE2725	4.0W	4 times
		LRE2728	4.0W	3 times
		LRE2817	3.0W	4 times
LRE4527	3.0W, 5.0W	3 times		
Solderability	95% Min. coverage	JIS-C5201-1 4.17 245±5℃ for 3 seconds		
Resistance to Soldering Heat	ΔR/R0≤± 0.5%	JIS-C5201-1 4.18 260±5℃ for 10 seconds		
Temperature Cycling	ΔR/R0≤± 0.5%	JIS-C5201-1 4.19 -55℃ ~ 150℃ , 100 cycles		
Bias Humidity	ΔR/R0≤± 0.5%	JIS-C5201-1 4.24 +85℃/85%RH for 1,000Hrs. with 1.5Hrs “ON”, 0.5Hr “OFF”.		
High Temperature Exposure (Storage)	LRE4527: ΔR/R0≤±2.0% The others: ΔR/R0≤±1.0%	JIS-C5201-1 4.23.2 +170℃ for 1000 Hrs.		
Load Life	LRE4527: ΔR/R0≤±2.0% The others: ΔR/R0≤±1.0%	JIS-C5201-1 4.25 70±2℃, RCWV for 1000 Hrs. with 1.5 Hrs. “ON” and 0.5 Hr. “OFF”		

## Order Codes

### Order Codes (LRE)

LRE	2728	F	TR	D	4	R010	
Part Number	Dimensions (L×W) (mm)	Resistance Tolerance (%)	Package	TCR (PPM/°C)	Power Rating (W)	Resistance (Ω) Ex:	Marking
	0805 2.10*1.50	J ±5	TR Taping Reel	D ±50	U 0.5W	0m50 0.00050	<div>*0805</div> <div>Black Coating</div> <div>No Marking</div>
	1206 3.20*1.65	G ±2		W ±75	Q 0.75W	0m75 0.00075	
	2010 5.10*2.40	F ±1		E ±100	T 1W	1m50 0.00150	
	2512 6.35*3.05	D ±0.5		K ±150	A 1.5W	R002 0.00200	
	2725 6.80*6.35			F ±200	S 2W	R010 0.01000	
	2728 6.60*6.70				R 3W	R100 0.10000	
	2817 7.30*4.40				4 4W		
	4527 11.30*6.60				5 5W		

● Note: There is no marking on 0805 series.



# (FLW) Electron Beam Welding Shunts

## ► Product Introduction

**Electron Beam Welded Shunts (FLW) serves precision measurement and battery applications in a new age.**

### Features :

- High precision, Low TCR (Temperature Coefficient of Resistance Value).
- Low resistance, low inductance, Low watt loss, and Long-term stability.
- High power electron beam welding technology

### Applications :

- Electric power distribution, battery management frequency convertors, load test.
- Applied for current limiting, current balance or sampling test of power supply.
- Applied for functional low inductance power supply applications.

Increasing pressure from the international produce higher-quality competition at lower prices In a shorter period of time resulting in the use of specialized process, whenever possible to detect an advantage. Adapting this philosophy to electron beam welding (EBW), DeMint Electronics announced the release of a new and enhanced bus bar shunt of blade terminal in (FLW) series producing by the new generation of load-lock machines fulfilling all these requirements in the area of EB welding.



This is a new Bus-Bar Battery Shunt resistor that has rated voltage drop 75 mV capability with 1.5 mΩ to 0.075 mΩ. Specifically, it is possible to output 75 mV from the voltage terminal with a current from 50 A to 1000 A with precision  $\pm 0.5\%$  and  $\pm 1\%$  tolerance in option.

(FLW) large current shunt resistor is using complete electron beam welding technology, ease assembly, mechanically strong, vibration resistance, and reliable operation in long term. Featuring low inductance values, shunts (FLW) is suitable for energy meters Invertors, AC/DC convertors, UPS, battery management, frequency convertors, and power modules low inductance applications.

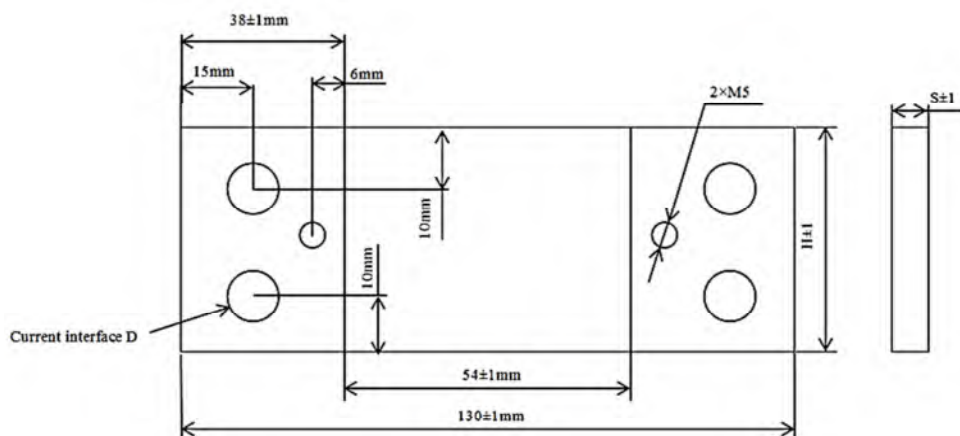
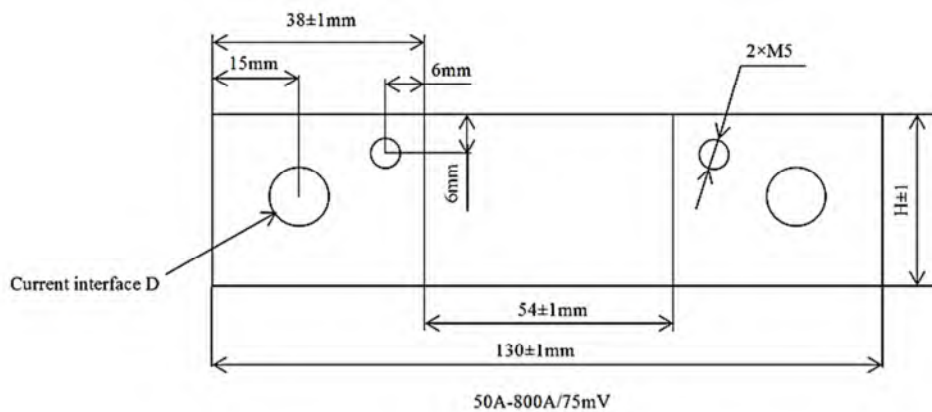
The shape and size of these (FLW) series can be customised and is available in bulk packaging with RoHS compliant and lead free. DeMint engineers will work together with the client to create designs and develop products to meet their specific needs. For non-standard technical requirements and special applications, contact us with your specific needs., or link to DeMint official website "[Current Sensing Resistors](http://www.direct-token.com)" for more information.



### Dimensions & Electrical Specifications

#### Dimensions (Unit: mm) & Electrical Specifications

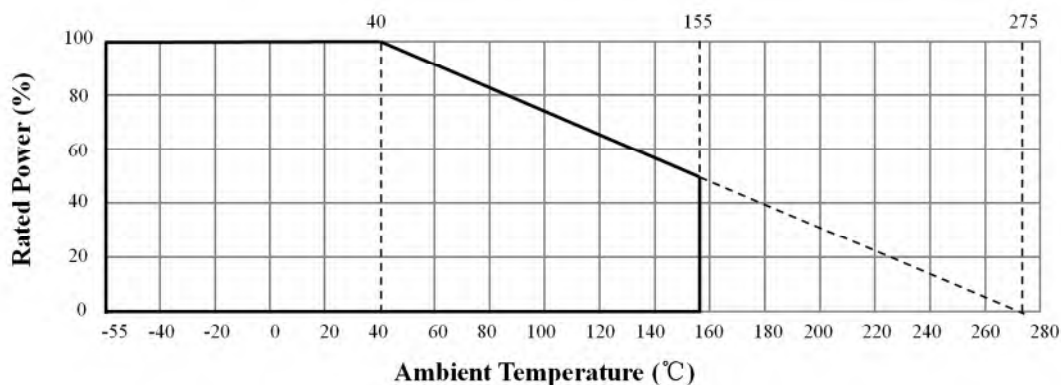
Type	Rated Current (A)	Normal Resistance (mΩ)	Rated Voltage Drop (mV)	Tolerance Range (%)	T.C.R. (X10 <sup>-6</sup> )	Dimensions (mm)		
						S	H	ΦD
FLW	50	1.5	75	± 0.5(D) ± 1(F)	± 20 ± 50	1.5	9	Φ6.5x2
	100	0.75				2.0	16.5	
	150	0.5				2.5	20	
	200	0.375				2.5	26	Φ8.5x2
	300	0.25				3.2	30	
	400	0.1875				4.0	33	
	500	0.15				5.0	33	Φ10.5x2
	600	0.125				6.0	33	
	700	0.1014				6.0	40	
	800	0.0938				6.5	40	Φ10.5x4
	900	0.0833				6.5	45	
	1000	0.075				6.5	50	



Electron Beam Welding Precision Shunt Dimensions (Unit: mm)

### Derating Curve

#### Derating Curve (FLW)



### Environmental Charcs.

#### Characteristic Specification (FLW)

Test Items	Specifications	Test Conditions
Short time overload	$\leq \pm(1\%+0.05\Omega)$	$10P_R$ 、5S
Shock	$\leq \pm(1\%+0.05\Omega)$	$1000m/S^2$ 、6mS
Vibration	$\leq \pm(1\%+0.05\Omega)$	10-1000Hz、0.75mm、 $98m/S^2$
Durability at room temperature	$\leq \pm(2\%+0.05\Omega)$	$25^\circ C$ 、 $P_R$ 、1000h

### Order Codes

#### Order Codes (FL)

FLW	-	50A	75mV	F	p
Part Number		Rating Current (A)	Voltage Drop (mV)	Accuracy Class (%)	Package-Code
FLW		50A 50A	75mV 75 mV	F $\pm 1\%$	P Bulk
		100A 100A		D $\pm 0.5\%$	
		700A 700 A			
		1000A 1000 A			





# (LRJ) Metal Alloy Zero Ohm Jumper Chips

## ► Product Introduction

### New Performance Requirements for True Metal Alloy Zero Ohm Jumper Chip Resistor in High Power Applications.

#### Features :

- High current application with Low profile.
- Ultra-Low resistance values, 0.2 mΩ Max.
- operating temperature range -55°C ~+150°C.
- Wide range package sizes 1206, 2512, 2817, 2725, and 4527.

#### Applications :

- Electrical tools, Power Management
- NB, Mobil Device, Server, Portable Devices
- Automotive, Industrial, Consumer Electronics, Electric Instrument

A zero ohm resistor is often called SMD jumper resistors, milli-ohm resistor, or zero ohm link resistors which are designed to link to circuits to together just like any other wire.

DeMint's true metal alloy strip zero ohm resistors (LRJ) make options with a lot less space and cost than DIP switches and jumper headers. These high current metal alloy jumper resistor chips (LRJ) SMT series, designed to replace zero ohm resistors without changing board designs or layouts. The devices could also be applied in high power applications to replace jumper wire for better stability or buried copper coin PCB for cost saving.



Five jumpers for the different resistor chip sizes are provided a wide range of standard dimensions 1206, 2512, 2817, 2725, and 4527 to make ease of designs along with footprint template compatibility. DeMint (LRJ) SMD metal alloy current jumper resistors designed for applications that require high power handling (Up to 5W) with resistance < 0.2mΩ at operating temperature range -55°C ~+150°C. (LRJ). These new products are distinctively suited as true zero ohm resistor replacements.

DeMint (LRJ) resistor chip jumpers manufactured from metal alloy plate and designed to deliver a extremely low impedance and profile circuit linkage as a zero ohm resistor. Chip jumpers are packaged on tape and reel for compatibility with most vacuum or mechanical pick and place assembly systems. These (LRJ) SMD devices are also suitable for high current, high-density PCB packages on power and aluminum backplanes.

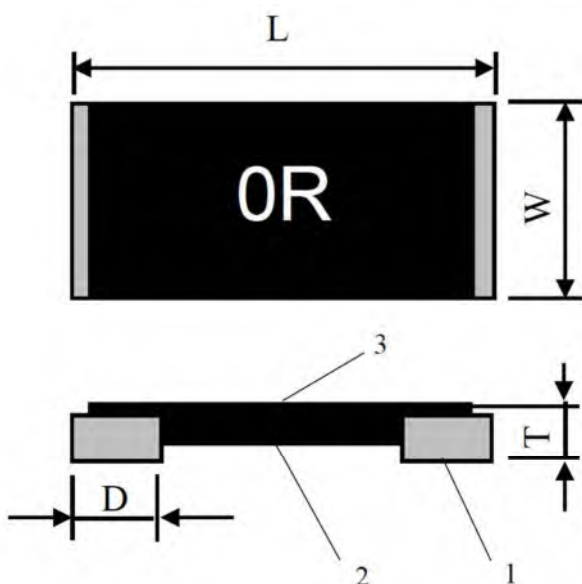
Some circuit boards are designed with multiple functions and configurations in one design. Often these functions and configurations can't coexist in single circuit because they will conflict with each other. To this end, more and more designers use (LRJ) resistor SMD jumpers for single side PCB that has no through-hole but for double-sided PCB. An application is used as a dummy, when through-holes for a not- yet- designed- resistor are prepared by way of precaution, and the holes are short-circuited after all.

DeMint electronics delivers the right chip for your low range, current-sense applications. For more detailed product information and data sheets or to discuss your specific requirements please contact DeMint electronics. Or link to DeMint official website "[Current Sense Resistors](http://www.direct-token.com)".



► **Dimensions**

**Zero Ohm Resistors (LRJ) Construction & Dimensions**

 <p>Zero Ohm Jumper link Resistors (LRJ) Construction &amp; Dimensions</p>		1	Solder Plating (Sn)
		2	Alloy Plate
		3	Overcoat

Type	Power Rating at 70°C(W)	Dimensions (Unit: mm)			
		L	W	T	D
LRJ1206	1	3.200±0.254	1.650±0.254	0.670±0.254	0.508±0.254
LRJ2512	2	6.350±0.254	3.050±0.254	0.670±0.254	1.100±0.254
LRJ2817	3	7.100±0.254	4.200±0.254	0.770±0.254	1.500±0.254
LRJ2725	4	6.800±0.254	6.350±0.254	0.770±0.254	1.800±0.254
LRJ4527	5	11.300±0.500	6.600±0.500	0.770±0.254	2.000±0.254

### Electrical Specifications

#### Zero Ohm Chip Resistors (LRJ) Electrical Specifications

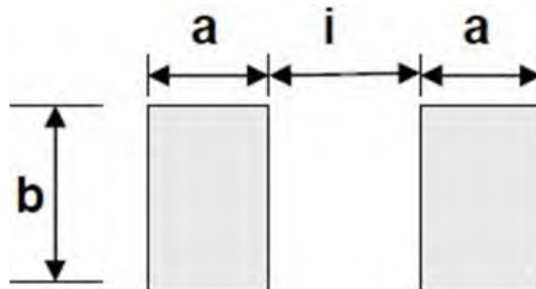
Type	Power Rating at 70℃	Max. Rating Current (A)*	Resistance (mΩ)	Operating Temperature ℃
LRJ1206	1	70.7	< 0.2	-55~+150℃
LRJ2512	2	100	< 0.2	
LRJ2817	3	122	< 0.2	
LRJ2725	4	140	< 0.2	
LRJ4527	5	158	< 0.2	

- Note: Rating Current  $I = \sqrt{(P/R)}$  or Max. Rating Current whichever is lower.  
Special tolerance and range of resistance are under requested.

### Land Pattern

#### Zero Ohm Chips (LRJ) Recommend Land Pattern

Type	Maximum Power Rating (Watts)	Dimensions (Unit: mm)		
		a	b	i
LRJ1206	1	1.00	1.90	1.40
LRJ2512	2	2.11	3.68	3.18
LRJ2817	3	2.45	4.60	3.11
LRJ2725	4	2.34	6.86	3.00
LRJ4527	5	3.40	8.74	6.43

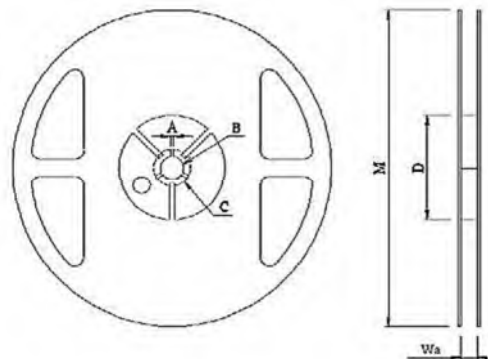


Zero Ohm Chips (LRJ) Recommend Land Pattern

### Reel & Type

#### Reel Specifications (LRJ) (Unit: mm)

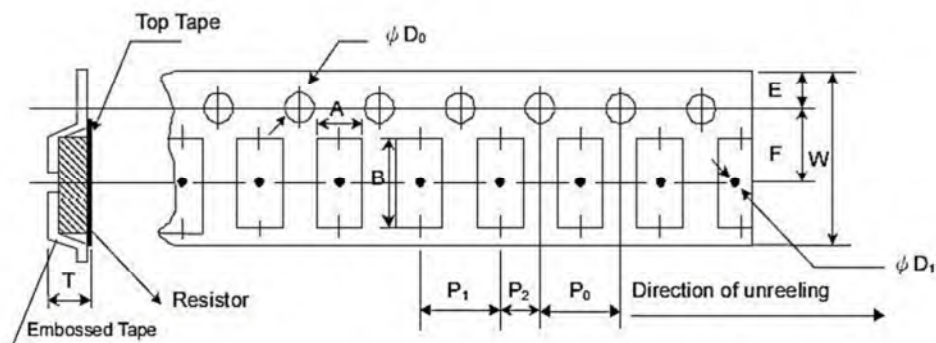
Reel Type / Tape	W	M	A	B	C	D
7" reel for 8 mm embossed (LRJ1206 series only)	12.00± 0.5	178 ± 1.0	2.0 ± 0.5	13.2 ± 0.5	17.7 ± 0.5	60.0 ± 0.5
7" reel for 12 mm embossed LRJ2512, LRJ2725, LRJ2817	16.2 ± 0.5	178 ± 1.0	2.5 ± 0.5	13.5 ± 0.5	17.7 ± 0.5	60.0 ± 0.5
7" reel for 24 mm embossed (LRJ4527 series only)	24.4 +2/-0	178 ± 1.0	2.0 ± 0.5	13.2 ± 0.5	17.7 ± 0.5	60.0 ± 0.5



Reel Specifications Dimensions

#### Emboss Plastic Tape Specifications (LRJ) (Unit: mm)

Type	A±0.1	B±0.1	W±0.3	E±0.1	F±0.1	P0±0.1	P1±0.3	P2±0.1	ΦD0±0.05	ΦD1±0.1	T±0.1
LRJ1206	2.03	3.55	8.0	1.75	3.5	4.0	4.0	2.0	1.55	1.00	1.00
LRJ2512	3.50	6.75	12.0	1.75	5.5	4.0	4.0	2.0	1.55	1.55	0.90
LRJ2725	6.81	7.16	12.0	1.75	5.5	4.0	8.0	2.0	1.55	1.55	1.05
LRJ2817	4.60	7.50	12.0	1.75	5.5	4.0	8.0	2.0	1.55	1.55	1.20
LRJ4527	7.38	12.0	24.0	1.75	11.5	4.0	12.0	2.0	1.55	1.55	1.05



Emboss Plastic Tape Specifications (Unit: mm)

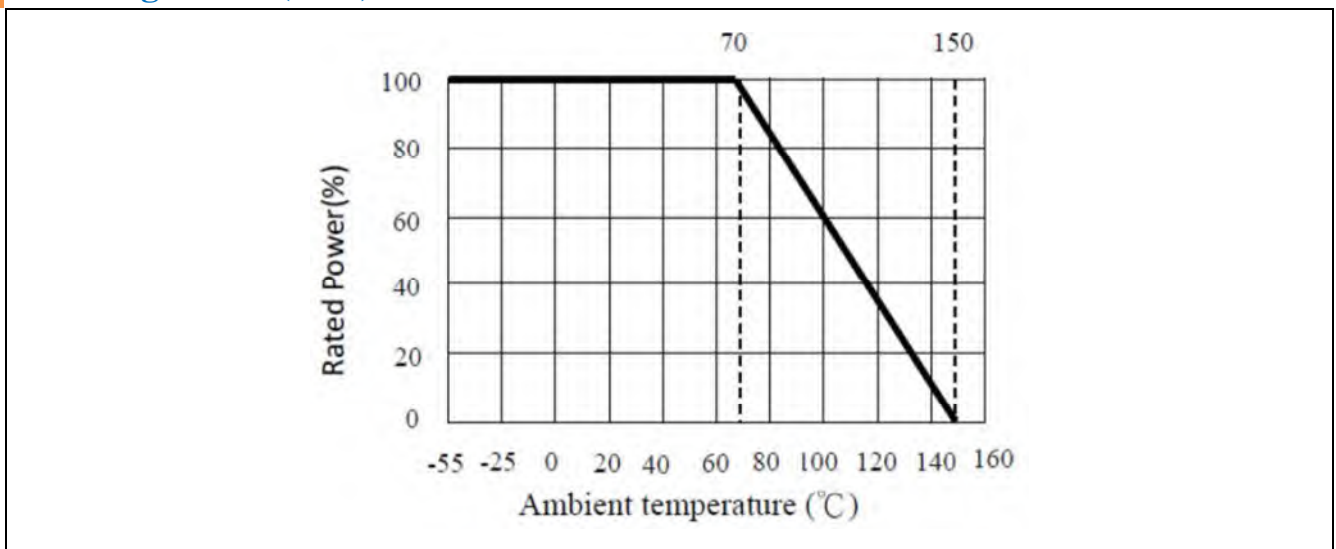
- The cumulative tolerance of 10 sprockets hole pitch is  $\pm 0.2\text{mm}$ .
- Carrier camber shall be not more than 1mm per 100mm through a length of 250mm.
- A & B measured 0.3mm from the bottom of the packet
- T measured at a point on the inside bottom of the packet to the top surface of the carrier.
- Pocket position relative to sprocket hole is measured as the true position of the pocket and not the pocket hole.

### Packaging Quantity (LRJ)

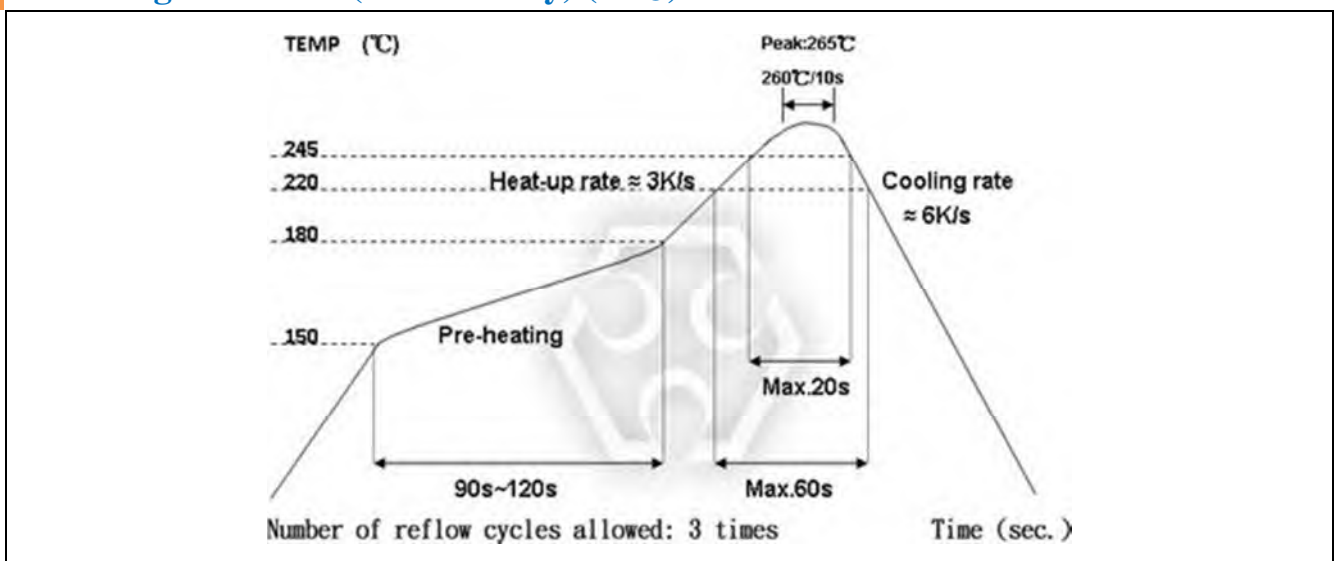
Type	Tape Width	Diameter	Piece/Reel
LRJ1206	8 mm/embossed plastic	178 mm/7"	5,000
LRJ2512	12 mm/embossed plastic	178 mm/7"	4,000
LRJ2725	12 mm/embossed plastic	178 mm/7"	2,000
LRJ2817	12 mm/embossed plastic	178 mm/7"	1,000
LRJ4527	24 mm/embossed plastic	178 mm/7"	1,000

### Derating & Soldering Condition

#### Derating Curve (LRJ)



#### Soldering Condition (Reflow Only) (LRJ)



## Environmental Characteristics

### Environmental Characteristics (LRJ)

Item	Requirement	Test Method
Short Time Overload	$\leq 0.2 \text{ m}\Omega$	JIS C 5201-1 4.13 4 times rated power duration: 5secs.
Load Life	$\leq 0.2 \text{ m}\Omega$	JIS-C5201-1 4.25 70 $\pm$ 2 $^{\circ}\text{C}$ , RCWV for 1000 Hrs. with 1.5 Hrs. "ON" and 0.5 Hr. "OFF"
Bias Humidity	$\leq 0.2 \text{ m}\Omega$	JIS-C5201-1 4.24 +85 $^{\circ}\text{C}$ /85%RH for 1,000Hrs. with 1.5Hrs "ON", 0.5Hr "OFF".
High Temperature Exposure (Storage)	$\leq 0.2 \text{ m}\Omega$	JIS-C5201-1 4.23.2 +150 $^{\circ}\text{C}$ for 1000 Hrs.
Solderability	95% Min. coverage	JIS-C5201-1 4.17 245 $\pm$ 5 $^{\circ}\text{C}$ for 3 seconds
Temperature Cycling	$\leq 0.2 \text{ m}\Omega$	JIS-C5201-1 4.19 -55 $^{\circ}\text{C}$ ~ 150 $^{\circ}\text{C}$ , 100 cycles

## Order Codes

### Order Codes (LREA)

LRJ	1206	TR	T	R000
Part Number	Dimensions (L×W)(mm)	Package	Power Rating (W)	Resistance ( $\Omega$ ) Ex:
LRJ		TR Taping Reel	T 1W S 5W R 3W 4 4W 5 5W	R000 < 0.20m $\Omega$
	1206 3.20*1.65			
	2512 6.35*3.05			
	2817 7.10*4.20			
	2725 6.80*6.35			
	4527 11.30*6.60			





# High Power Chip Current Sensing Resistor Shunts (LRS)

## ► Product Introduction

**The advanced alloy shunt technology of DIRECT (LRS) spells out the high-power current sensing resistor.**

### Features :

- Resistance down to 0.1mΩ to 6mΩ.
- TCR down to  $\pm 20\text{ppm}/^\circ\text{C}$  and  $\pm 50\text{ppm}/^\circ\text{C}$ .
- Sustain high temperature, lead-free and RoHS compliant.
- Welded construction, air cooling, Strong stability of circuit.
- Tolerance  $\pm 1\%$ ,  $\pm 2\%$ , and  $\pm 5\%$ . Rated Power 3W, 5W, 6W, and 7W.

### Applications :

- Frequency converters.
- Automatic control power supply.
- Power modules. Communication system.
- Current sensor for power hybrid applications.
- High current applications for the automotive market.

Design of Bare Open Surface Mounting Chip Alloy allows air flow to achieve maximum cooling effect, so that PCB retains less heat. Welding flame protection structure feature provides 20ppm TCR temperature coefficient, low inductance. These characteristics make LRS an excellent choice for all high-power power supply and power applications that are not impacted by most environmental stresses.

For the development of high current applications for automated control and sensing power supplies, the DIRECT current sensing chip shunt (LRS) uses Manganese Copper (Manganin), Kama Alloy (KAMAR NiCr20AlSi), and Ferro Chrome Aluminum Alloy (FeCrAl) which featuring antioxidant and high temperature resistant thermal corrosion properties as alloy welding structure. Standard surface mounting spacing design is suitable for reflow welding and automatic mounting machine applications.

Designed specifically for high current applications LRS, the power can reach 3W, 5W, 6W, and 7W. The range of ultra-low resistance is from 0.1mΩ to 6mΩ. There are many options in selecting precision tolerances ( $\pm 1\%$ ,  $\pm 2\%$ ,  $\pm 5\%$ ). Two types of chip dimensions are available: standard size 2512, 3920, and 5930; special size 3921, 4026, 4527, and 5931. DIRECT realizes small size, high power design, lower cost and higher performance current sensing shunts.

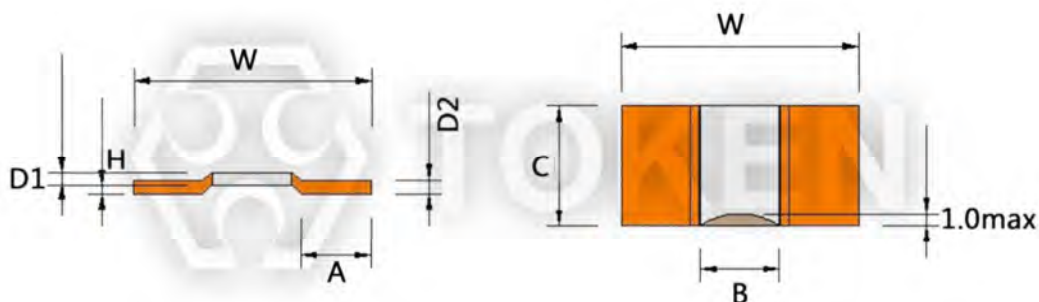
LRS provides embossed tape packaging, size 2512 1Kpcs per reel, 3920 2.5Kpcs per reel, 5930 2Kpcs per reel, products meet RoHS standards and lead-free requirements. Customers can specify resistance, size and specifications to meet the design challenges and specific technical requirements. Please contact DIRECT Business Department for the latest product information. Or link to DeMint official website "[Current Sense Resistors](http://www.direct-token.com)". Contact us with your specific needs.



### LRS - M/K Dim.

#### LRS - M/K Standard Size (Unit : mm)

Type	Power (W)	Material	Size	B (mm)	W (mm)	A (mm)	C (mm)	H (mm)	D1 (mm)	D2 (mm)	Resistance Value (mΩ)
LRS	3	M	2512	3.0±0.3	6.3±0.2	1.2±0.2	3.1±0.3	0.5±0.1	1.5	1.5	0.3
									0.88	0.88	0.5
		K							0.5	0.5	1
									1.31	1.31	1
									0.65	0.65	2
									0.43	0.43	3
	5	M	3920	4.5±0.3	10±0.2	2.2±0.2	5.1±0.4	0.5±0.1	1.5	1.5	0.2
									1.37	1.37	0.3
									0.83	0.83	0.5
									0.4	0.4	1
		K							1.16	1.16	1
									0.37	0.37	3
									0.28	0.28	5
									7	M	5930
	0.75	0.75	0.4								
	0.6	0.6	0.5								
	0.41	0.41	0.75								
	K	0.86	0.86	1							
		0.4	0.4	2							
		0.29	0.29	3							



Alloy Shunt Resistors (LRS) - M/K Series Dimensions

#### LRS - M/K Special Size (Unit : mm)

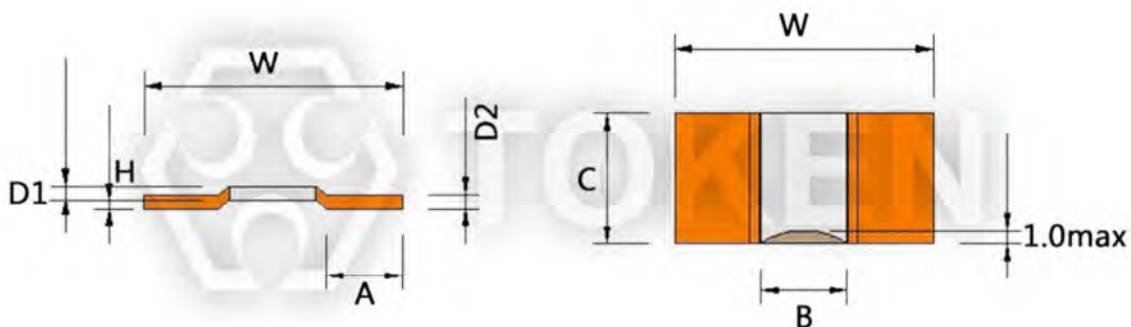
Type	Power (W)	Material	Size	B (mm)	W (mm)	A (mm)	C (mm)	H (mm)	Resistance Value (mΩ)
LRS	5	M	3921	4.5±0.3	10±0.2	2.2±0.2	5.2±0.3	0.5±0.1	0.2 ~ 5
	5	K	3921	4.5±0.3	10±0.2	2.2±0.2	5.2±0.3	0.5±0.1	0.2 ~ 5
	6	M	4026	4.5±0.3	10±0.2	2.2±0.2	6.6±0.4	0.5±0.1	0.2 ~ 3
	6	K	4026	4.5±0.3	10±0.2	2.2±0.2	6.6±0.4	0.5±0.1	0.2 ~ 3
	6	M	4527	4.5±0.3	11.5±0.2	3.0±0.3	6.9±0.4	0.5±0.1	0.4 ~ 3
	6	K	4527	4.5±0.3	11.5±0.2	3.0±0.3	6.9±0.4	0.5±0.1	0.4 ~ 3
	7	M	5931	5.0±0.3	15±0.3	4.2±0.3	7.8±0.4	0.5±0.1	0.1 ~ 0.75
	7	K	5931	5.0±0.3	15±0.3	4.2±0.3	7.8±0.4	0.5±0.1	1 ~ 3



### ► LRS - F Dim.

#### LRS - F Dimensions (Unit : mm)

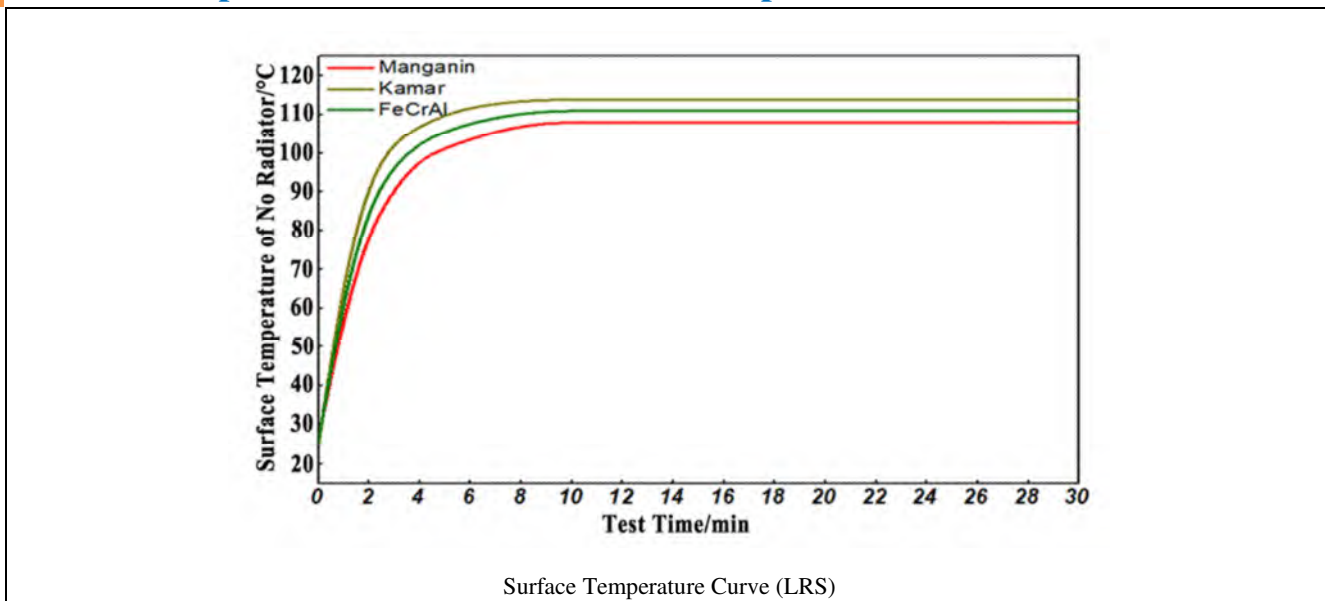
Type	Power (W)	Material	Size	B (mm)	W (mm)	A (mm)	C (mm)	H (mm)	D1 (mm)	D2 (mm)	Resistance Value (mΩ)
LRS	3	F	2512	3.0±0.3	6.3±0.2	1.2±0.2	3.1±0.3	0.5±0.1	1.4	1.4	1
				3.0±0.3	6.3±0.2	1.2±0.2	3.1±0.3	0.5±0.1	0.7	0.7	2
				3.0±0.3	6.3±0.2	1.2±0.2	3.1±0.3	0.5±0.1	3	0.47	0.47
				3.0±0.3	6.3±0.2	1.2±0.2	3.1±0.3	0.5±0.1	0.35	0.35	4
				3.0±0.3	6.3±0.2	1.2±0.2	3.1±0.3	0.5±0.1	0.28	0.28	5
				3.0±0.3	6.3±0.2	1.2±0.2	3.1±0.3	0.5±0.1	0.24	0.24	6
	5	F	3920	4.5±0.3	10.0±0.2	2.2±0.2	5.1±0.4	0.5±0.1	1.28	1.28	1
				4.5±0.3	10.0±0.2	2.2±0.2	5.1±0.4	0.5±0.1	0.64	0.64	2
				4.5±0.3	10.0±0.2	2.2±0.2	5.1±0.4	0.5±0.1	0.43	0.43	3
				4.5±0.3	10.0±0.2	2.2±0.2	5.1±0.4	0.5±0.1	0.32	0.32	4
				4.5±0.3	10.0±0.2	2.2±0.2	5.1±0.4	0.5±0.1	0.26	0.26	5
	7	F	5930	5.0±0.3	15±0.3	4.2±0.3	7.6±0.4	0.5±0.1	0.96	0.96	1
				5.0±0.3	15±0.3	4.2±0.3	7.6±0.4	0.5±0.1	0.48	0.48	2
				5.0±0.3	15±0.3	4.2±0.3	7.6±0.4	0.5±0.1	0.32	0.32	3
				5.0±0.3	15±0.3	4.2±0.3	7.6±0.4	0.5±0.1	0.24	0.24	4



Current Sensing Power Shunts (LRS) - F Series Dimensions

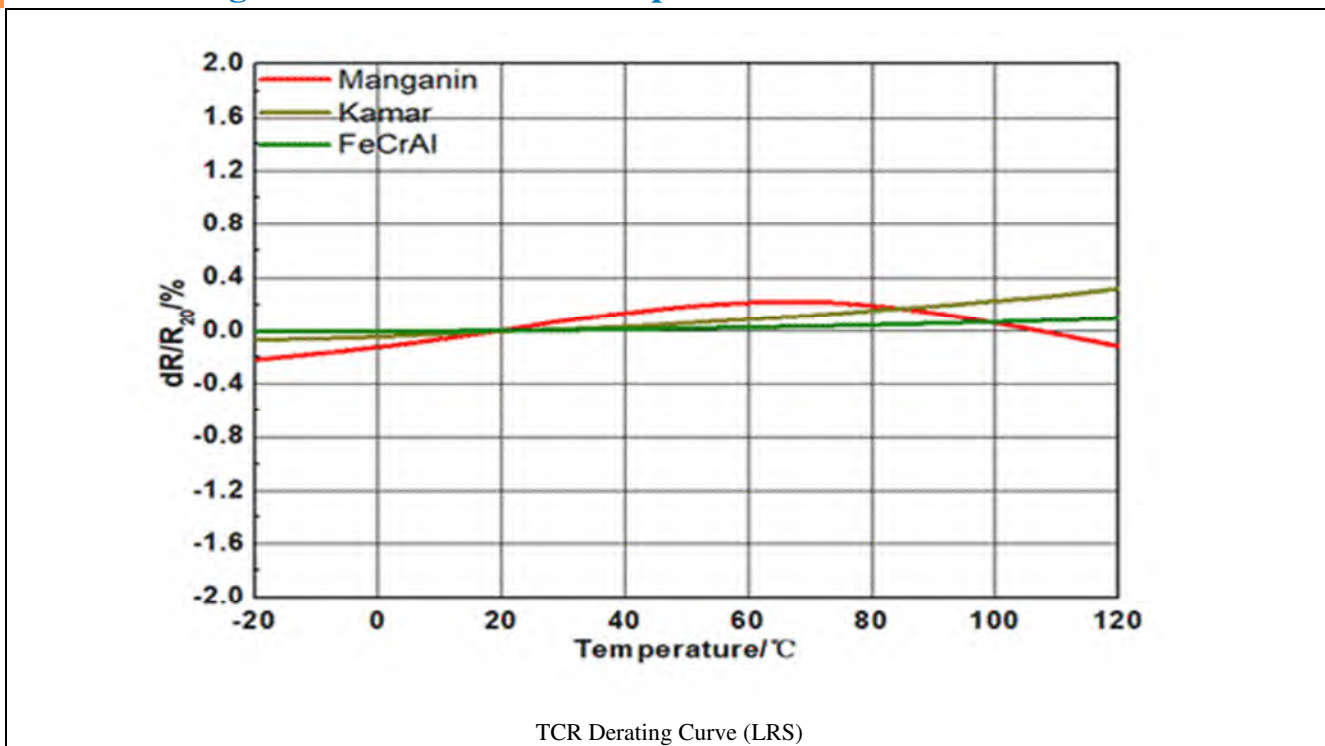
### ► Technical Specifications

#### Surface Temperature Curve LRS - Technical Specifications



- Note : The surface temperature test board is made of aluminium substrate.

#### TCR Derating Curve LRS - Technical Specifications



- Note : The surface temperature test board is made of aluminium substrate.

## Environmental Characteristics

### LRS - Environmental Characteristics

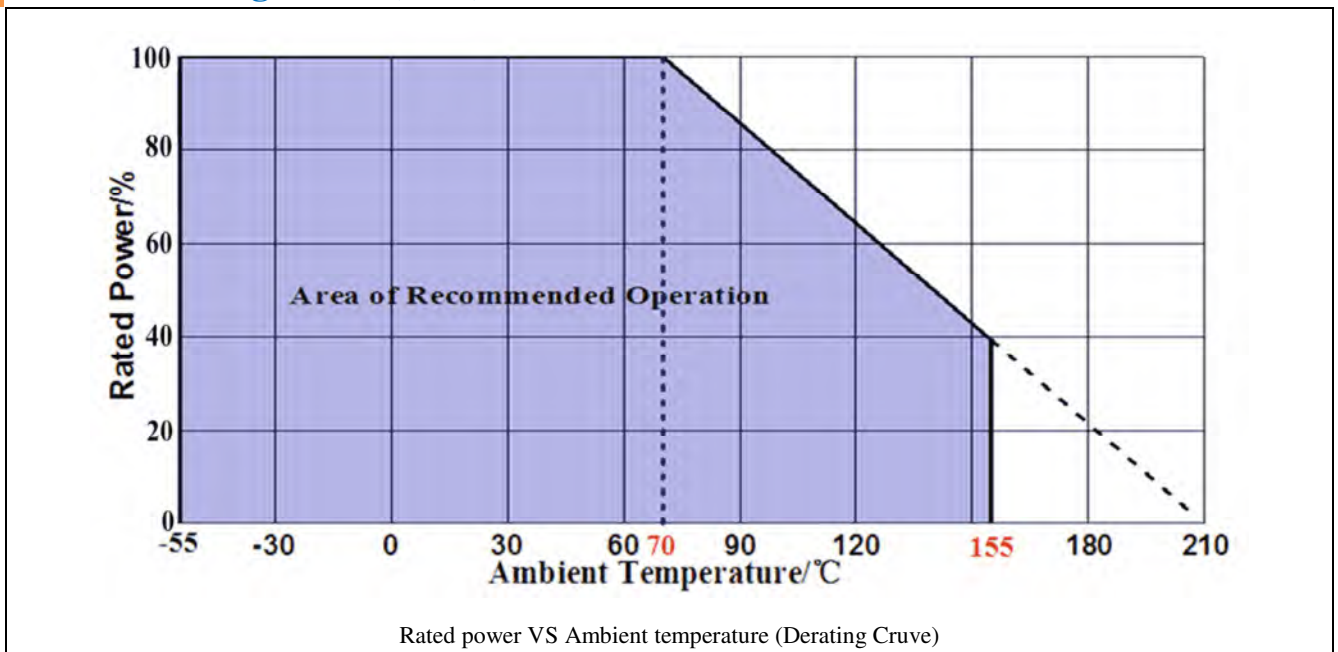
Items	Requirement	Test Methods
Temperature Cycling	$\pm 0.5\%$	JESD22 1000 Cycles ( $-55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ ). Measurement at $24\pm 2$ hours after test conclusion.
High Temperature Exposure	$\pm 0.5\%$	MIL-STD-202 1000hrs. @ $T=125^{\circ}\text{C}$ . Unpowered. Measurement at $24\pm 2$ hours after test conclusion.
Moisture Resistance	$\pm 0.5\%$	MIL-STD-202 $t=24$ hrs/cycle. Measurement at $24\pm 2$ hours after test conclusion. Note: Steps 7a & 7b not required. Unpowered.
Biased Humidity	$\pm 0.5\%$	MIL-STD-202 1000hrs $85^{\circ}\text{C}/85\%$ RH. Measurement at $24\pm 2$ hours after test conclusion. Note: Specified conditions: 10% of operating power.
Operational Life	$\pm 0.5\%$	MIL-STD-202 Condition D Steady State $T_A=125^{\circ}\text{C}$ at rated power. Measurement at $24\pm 2$ hours after test conclusion.
Solderability	95% Coverage Minimum.	J-STD-002C $245^{\circ}\text{C} \pm 5^{\circ}\text{C}$ , $5s \pm 0.5s/-0$ .
Resistance to Soldering Heat	$\pm 0.5\%$	MIL-STD-202 $260^{\circ}\text{C} \pm 5^{\circ}\text{C}$ , $10s \pm 1s$ . Measurement at $24\pm 2$ hours after test conclusion.
Short Time Overload	$\pm 0.5\%$	MIL-STD-202 $5 \times$ Rated power for 5s. Measurement at $24\pm 2$ hours after test conclusion.
Thermal Shock	$\pm 1\%$	MIL-STD-202 $-55^{\circ}\text{C}/+125^{\circ}\text{C}$ , 300 Cycles. Maximum transfer time 20s, Dwell time 15Min..
Vibration	$\pm 0.5\%$	MIL-STD-202 5g's for 20 Min., 12 cycles each of 3 orientations. Note: Use 8"X5" PCB .031" thick 7" secure points on one long side and secure points at corners of opposite sides which parts mounted with in 2 from any secure point. Test from 10-2000 Hz. Measurement at $24\pm 2$ hours after test conclusion.





### ▶ Derating Curve

#### Power Derating Curve (LRS)

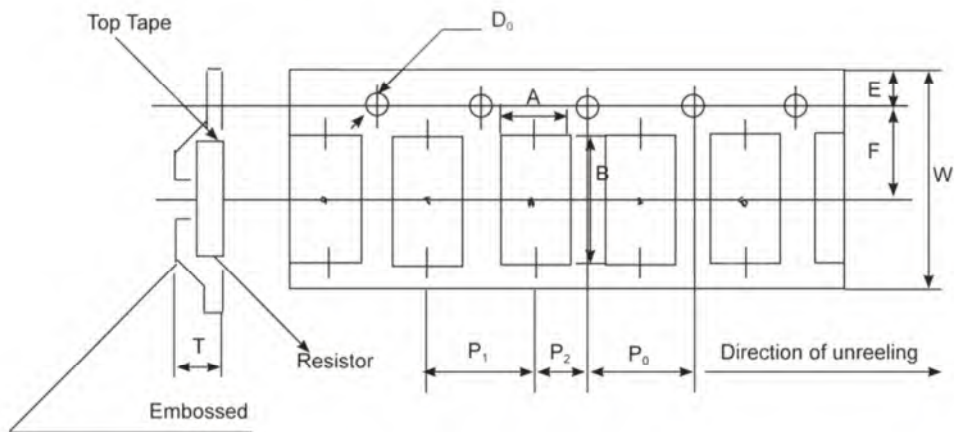




### ► Packaging

#### LRS - Packaging

Size	A (mm)	B (mm)	W (mm)	E (mm)	F (mm)	P <sub>0</sub> (mm)	P <sub>1</sub> (mm)	P <sub>2</sub> (mm)	D <sub>0</sub> (mm)	T (mm)	Quantity (EA)/ Pieces
2512	4.3	7.6	16	1.55	7.5	3.85	7.7	7.7	1.5	1.7	1000
3920	6.0	11	24	1.55	11.2	6	12	12	1.5	2.0	2500
5930	8.6	16	24	1.55	10.8	6	12	12	1.5	2.4	2000



LRS - Embossed Plastic Tape Specifications

## Order Codes

### Large Current Sensing Chip Resistor Shunts LRS - Order Code

LRS	3		M		0m30		J	
Part Number	Power (W)		Material		Resistance ( $\Omega$ )		Tolerance (%)	
LRS	3	3W	F	FeCrAl	0m10	0.0001 $\Omega$	J	$\pm 5$
	5	5W	M	Manganin	0m30	0.0003 $\Omega$	G	$\pm 2$
	7	7W	K	Kamar	R001	0.001 $\Omega$	F	$\pm 1$
					R004	0.004 $\Omega$		
					R005	0.005 $\Omega$		



# Alloy Sampling Shunt Current Sensing Resistors (FLU)

## ► Product Introduction

**"Stamping type" (FLU) precision sampling resistor provides up to 7W power and a TCR as low as 40ppm.**

### Features :

- Tolerance  $\pm 1\%$ ,  $\pm 2\%$  and  $\pm 5\%$ .
- Low resistance  $0.1\text{m}\Omega$  to  $10\text{m}\Omega$ .
- Rated Power  $1\text{W} \sim 7\text{W}$  with low inductance.
- Sustain high temperature.

### Applications :

- Power Electronic.Home Appliance.
- Current Sensing.Communication System.
- Automotive electronics.Drive technology.

Achieving the best detection results in the smallest space is one of the most common requirements of electronic design engineers for circuit systems. This is the advantage of the DeMint Electronics' stamping sampling shunt resistor technology.

Stamping type shunt resistor is also known as current detection alloy resistor, current sensing resistor, sampling shunts, current induction shunts.

The sampling resistance is divided into current sampling and voltage sampling. For current sampling, a resistor with smaller resistance value is connected in series, while for voltage sampling, a resistor with larger resistance value is connected in parallel. The function of sampling resistance is to convert current into voltage signal for current measurement. In the actual circuit, it is connected in series with the load resistor.

Designated the (FLU) through-hole devices offer a high current, flameproof alternative to conventional axial devices and flat chips for current-sense circuits where PC board space is at a premium. The open air resistor's footprint is reduced by extending the height of the device above the board, thus keeping the resistor element's "hot spot" safely off the PC board and providing for increased air circulation under it, which in turn provides increased heat dissipation and cooler operation. The structure adopts advanced alloy stamping and features high temperature resistance with low inductance.

The (FLU) offers a higher current load than conventional axial resistors and SMD resistors, with a wide range pitch of radial pins to choose from. Its rated power can be up to  $1\text{W} \sim 7\text{W}$ , temperature coefficient as low as  $\pm 40\text{ppm}/^\circ\text{C}$ , resistance tolerance accuracy  $\pm 1\%$ ,  $\pm 2\%$ , and  $\pm 5\%$ , resistance range as low as  $0.1\text{m}\Omega$  to  $10\text{m}\Omega$ .

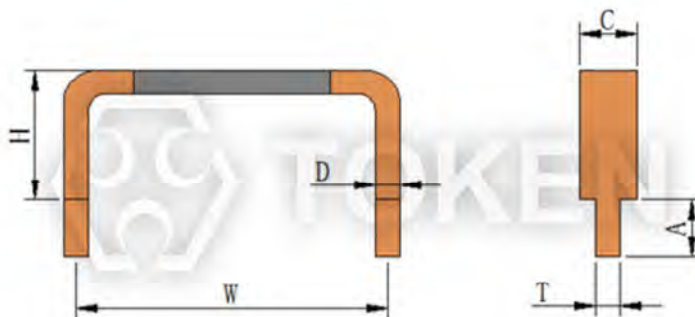
The Low Ohmic Alloy Shunts (FLU) are available in bulk packaging and is RoHS compliant and lead free. For non-standard technical requirements and special applications, contact us with your specific needs.Or link to DeMint official website "[Current Sense Resistors](http://www.direct-token.com)". Contact us with your specific needs.



## ► Dimensions

### Dimensions - FLU (Unit : mm)

Resistance (mΩ)	W (mm)	C (mm)	D (mm)	H (mm)	A (mm)	T (mm)
0.1~10	5~30	10~35	0.3~3	5~30	4±0.2	1.0±0.2 1.5±0.2

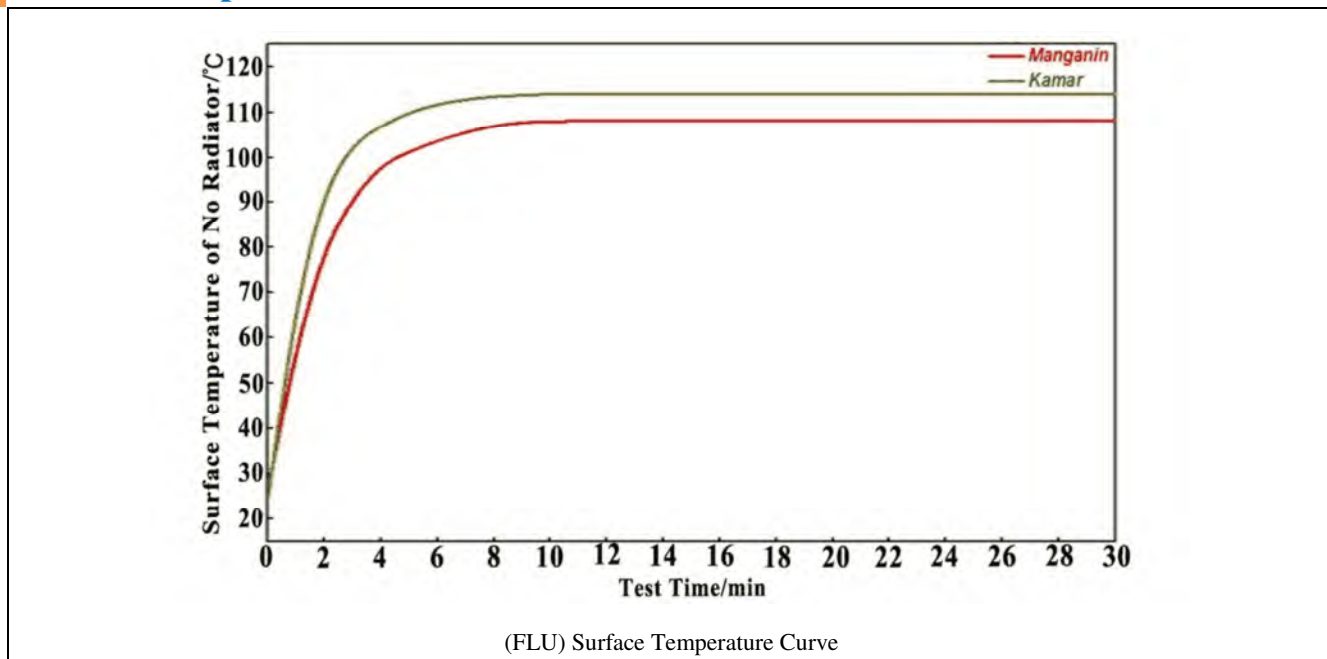


Alloy Current Sensing Resistors (FLU) Dimensions

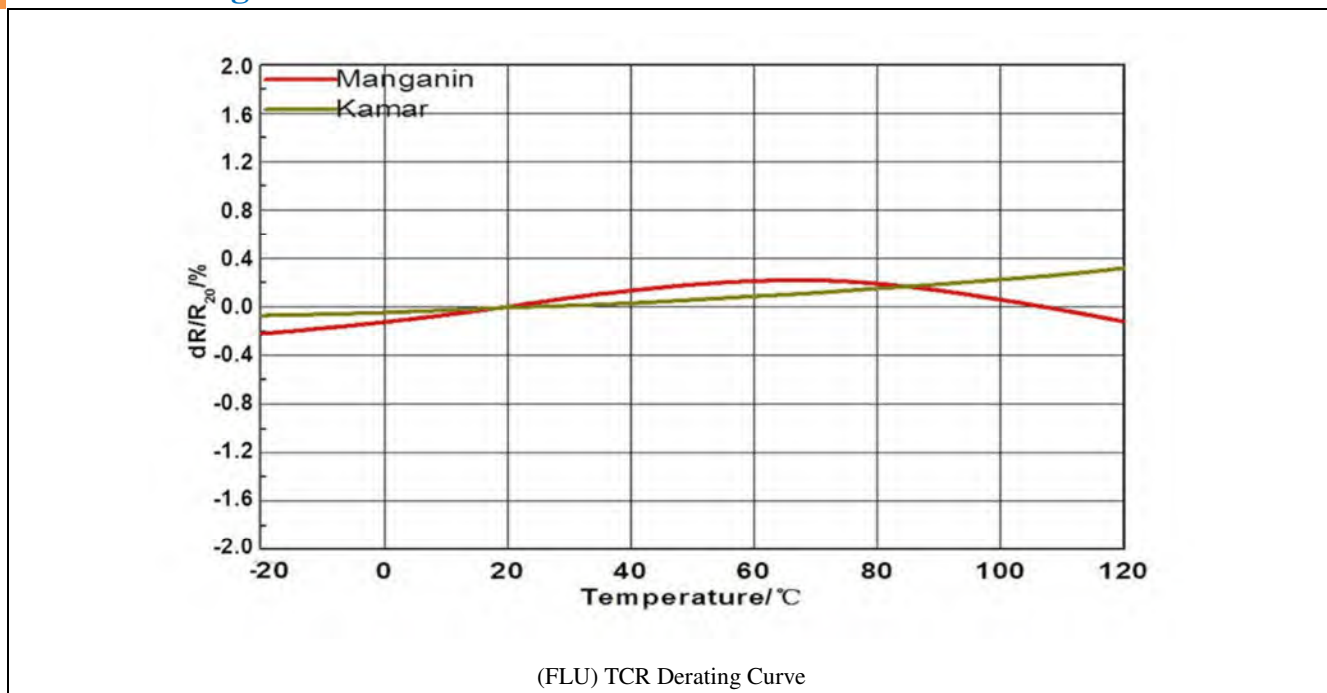
- Note: For non-standard dimensions of pins (A and T), Pitch (W), and Height (H) and variations of Rated current can be on request.

### ► Technical Specifications

#### Surface Temperature Curve - FLU



#### TCR Derating Curve - FLU



## Environmental Characteristics

### Environmental Characteristics - FLU

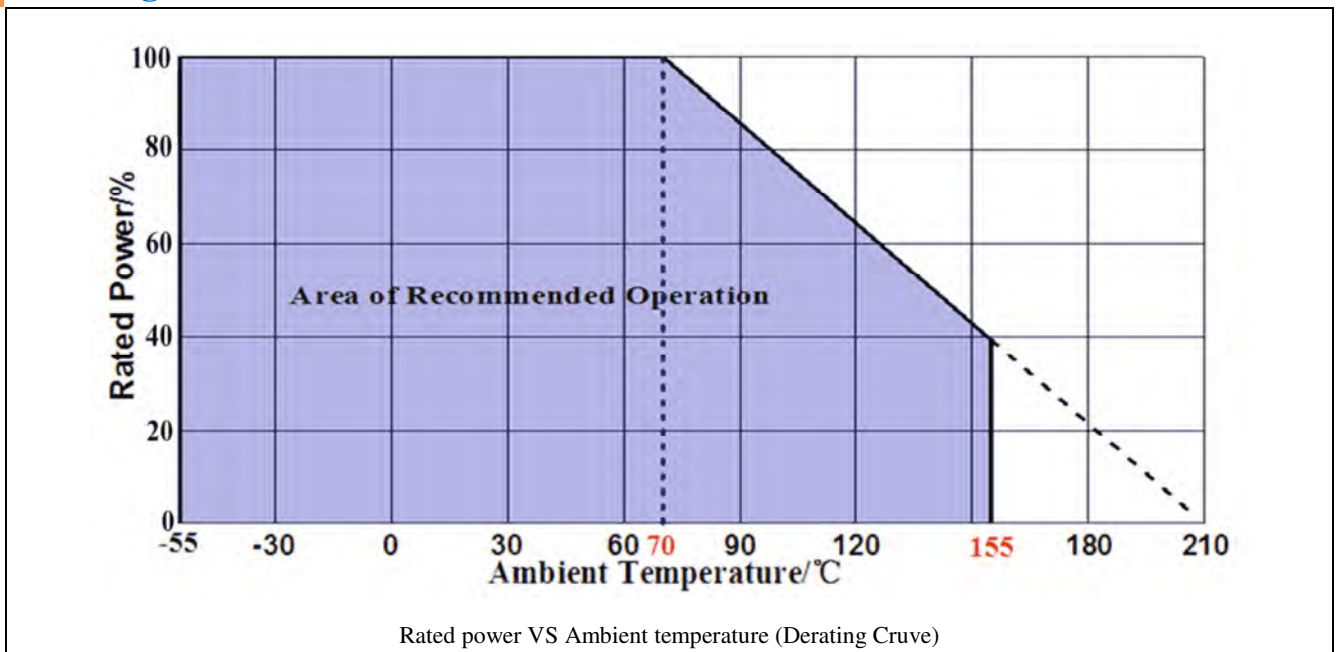
Items	Methods	Requirement
Temperature Cycling	MIL-STD-202 1000 Cycles (-55°C to +125°C). Measurement at 24±2 hours after.	±0.5%
High Temperature	MIL-STD-202 1000hrs. @ T=125°. Unpowered. Measurement at 24±2 hours after.	±0.5%
Moisture Resistance	MIL-STD-202 t=24 hrs/cycle. Note: Steps 7a & 7b not required. Measurement at 24±2 hours after.	±0.5%
Biased Humidity	MIL-STD-202 1000hrs 85°C /85% RH. Note: Specified conditions: 10% of operating power. Measurement at 24±2 hours after.	±0.5%
Operational Life	MIL-STD-202 Condition D Steady State TA=125°C at rated power. Measurement at 24±2 hours after.	±0.5%
Solderability	J-STD-002C 245°C ±5°C, 5s+0.5s/-0.	95% Coverage Minimum.
Vibration	MIL-STD-202 5g's for 20 Min., 12 cycles each of 3 orientations. Note: Use 8"X5" PCB. 0.031" thick 7" square points on one long side and secure points at corners of opposite sides which parts mounted within 2" from any secure point. Test from 10-2000 Hz. Measurement at 24±2 hours after test conclusion.	±0.5%
Resistance to Soldering Heat	MIL-STD-202 260°C ±5°C, 10s±1s. Measurement at 24±2 hours after test conclusion.	±0.5%
Short Time Overload	MIL-STD-202 5 × Rated power for 5s. Measurement at 24±2 hours after test conclusion.	±0.5%
Thermal Shock	MIL-STD-202 -55°C/+125°C, 300 Cycles, Maximum transfer time 20s Dwell.	±1%





### Derating Curve

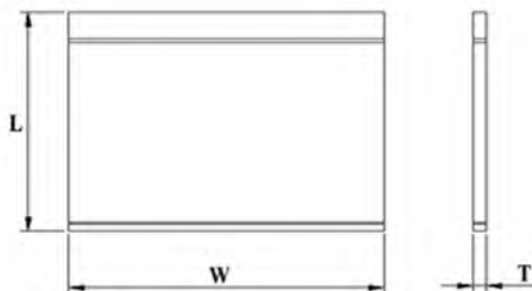
#### Derating Curve - FLU



### ► Packaging

#### FLU - Internal Package

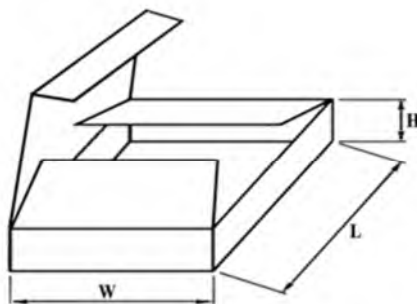
Type	L/mm	W/mm	T/mm
P1	130	130	0.2
P2	160	160	0.2
P3	210	150	0.1



Internal Package (FLU)

#### FLU - External Package

Type	L/mm	W/mm	H/mm
B1	170	120	50
B2	240	180	115
B3	230	170	200
B4	250	250	250
B5	300	300	300



External Package (FLU)

## Order Codes

### Alloy Current Sensing Resistors (FLU) Order Code

FLU	5		0m10		F	
Part Number	Pitch (W)		Resistance ( $\Omega$ )		Tolerance (%)	
FLU	5	5mm	0m10	0.00010 $\Omega$	J	$\pm 5$
	15	15mm	0m50	0.00050 $\Omega$	G	$\pm 2$
	30	30mm	R005	0.00500 $\Omega$	F	$\pm 1$
			R010	0.01000 $\Omega$		

- Note: Plating, tin dipping, or size, please can be required.



# Four-terminal Alloy Shunt Resistors (FLH)

## ► Product Introduction

**Four-terminal Alloy Shunt Resistors (FLH) tackle current sensing applications with TCR 20ppm.**

### Features :

- Resistance values down to 0.0003Ω.
- TCR down to  $\pm 20\text{ppm}/^\circ\text{C}$  and  $\pm 50\text{ppm}/^\circ\text{C}$ .
- Low inductance. RoHS compliant and Lead-free.
- Tolerance  $\pm 1\%$ ,  $\pm 2\%$  and  $\pm 5\%$ . Rated Power 3 Watts.

### Applications :

- Current Sensing, Drive technology.
- Automotive electronics, Power Electronic.
- Communication System, Home Appliance.

DeMint FLH open four-pin alloy shunt series, also known as four-lead sampling shunt, current sensing resistor, or four-pin sampling resistor.

Kelvin four-terminal resistors are used to ensure that the current acts on two opposite terminals and to measure the detection voltage of the other two terminals, thereby reducing the influence of resistance and temperature coefficient between terminals and obtaining more accurate current measurements.

Four-lead alloy shunt FLH adopts U-shaped design and high-pulse special alloy element structure, which can improve the power of the resistor and expand the operating temperature range. It has the characteristics of low resistance, low inductance and high reliability. The temperature coefficient is lower than that of 20 ppm/C, which provides excellent performance and is suitable for various applications.

DeMint FLH devices always preferred in current sense applications, standard rated power 3W is available packages, resistance values down to 0.0003Ω, with tolerances as tight as  $\pm 1\%$ ,  $\pm 2\%$ , and  $\pm 5\%$  with low-inductance 10 nH. TCR is as low as  $\pm 20\text{ppm}/^\circ\text{C}$  and  $\pm 50\text{ppm}/^\circ\text{C}$  with high-impulse proprietary metal element that gives the device its extended power and temperature ratings.

With modern technology and production methods, we continuously upgrade production equipment, provide complete low resistance current detection resistor products, and all aspects of current sensing shunt product information and application information. The products meet RoHS requirements.

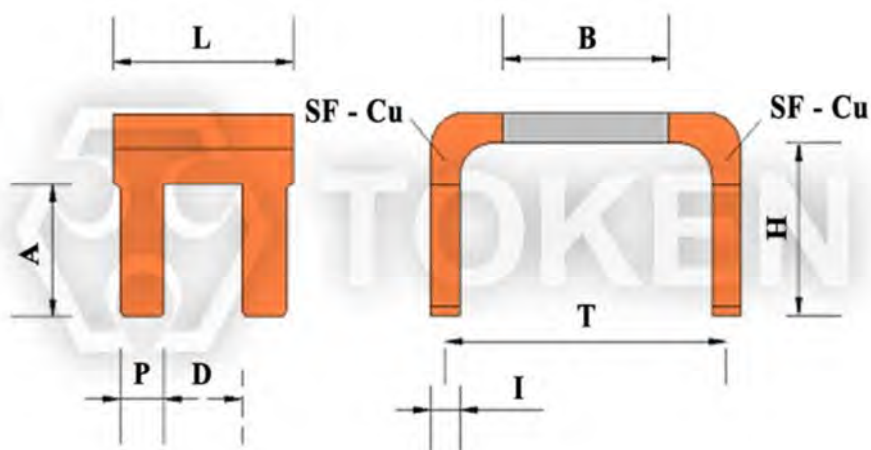
FLH series as current divider and current detection resistor products can be customized according to customers' needs. For special resistance value and latest product information, contact us with your specific needs. Or link to DeMint official website "[Current Sense Resistors](http://www.direct-token.com)". Contact us with your specific needs.



► **Dimensions**

**Alloy Shunt Resistors (FLH) Dimensions (Unit:mm)**

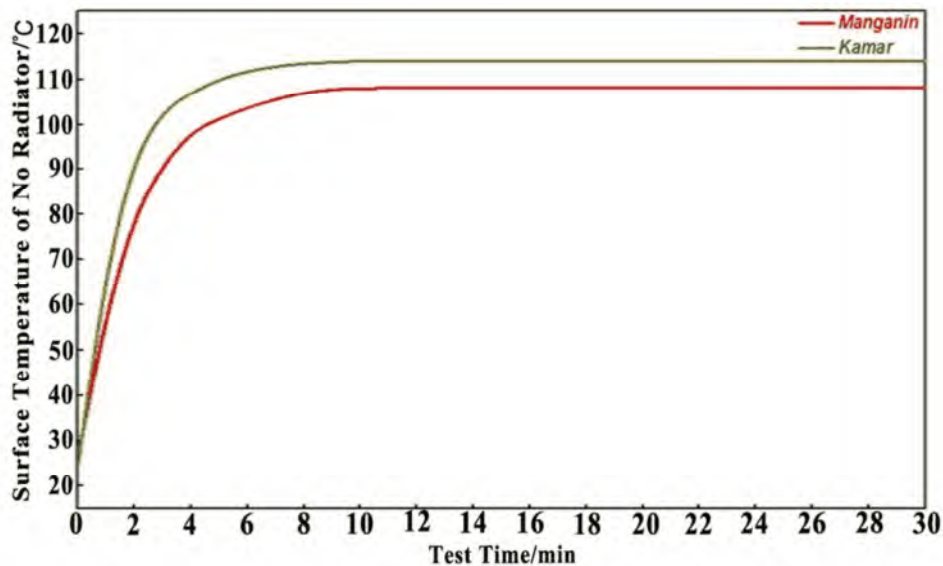
Type	B (mm)	W (mm)	L (mm)	A (mm)	P (mm)	H (mm)	D (mm)	I (mm)
<b>FLH-M-0m30</b>	5.0±0.3	8.3±0.3	5.3±0.3	3.8±0.5	1.3±0.3	5.0±1.0	1.8±0.3	1.43±0.3
<b>FLH-M-0m50</b>	5.0±0.3	8.3±0.3	5.3±0.3	3.8±0.5	1.3±0.3	5.0±1.0	1.8±0.3	0.86±0.3
<b>FLH-M-R001</b>	5.0±0.3	8.3±0.3	5.3±0.3	3.8±0.5	1.3±0.3	5.0±1.0	1.8±0.3	0.44±0.3
<b>FLH-M-R002</b>	5.0±0.3	8.3±0.3	5.3±0.3	3.8±0.5	1.3±0.3	5.0±1.0	1.8±0.3	0.63±0.3
<b>FLH-M-R003</b>	5.0±0.3	8.3±0.3	5.3±0.3	3.8±0.5	1.3±0.3	5.0±1.0	1.8±0.3	0.43±0.3



Alloy Shunt Resistors (FLH) - Dimensions

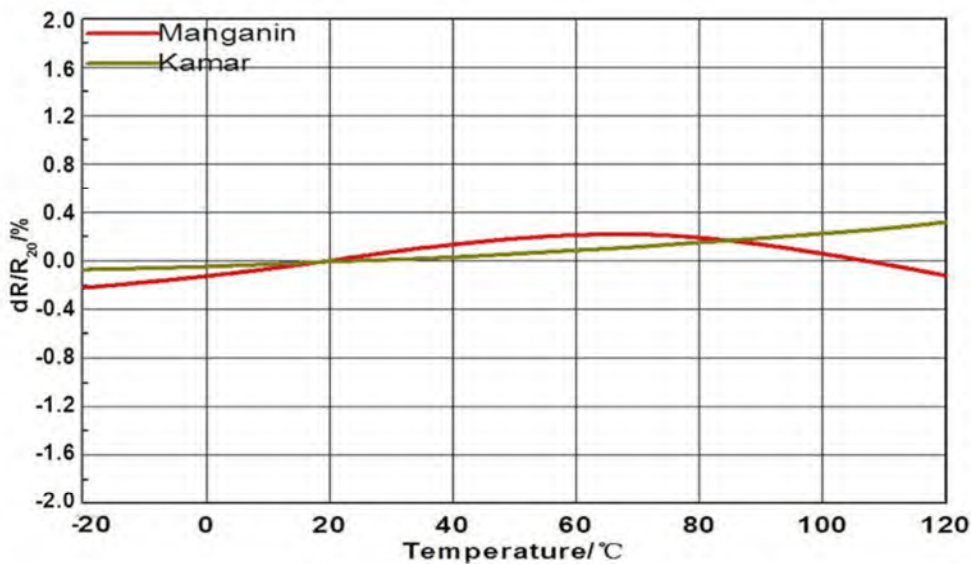
### ► Technical Specifications

#### Alloy Shunt Resistors (FLH) Surface Temperature Curve



FLH - Surface Temperature Curve

#### Alloy Shunt Resistors (FLH) TCR Derating Curve



FLH - TCR Derating Curve





## Environmental Characteristics

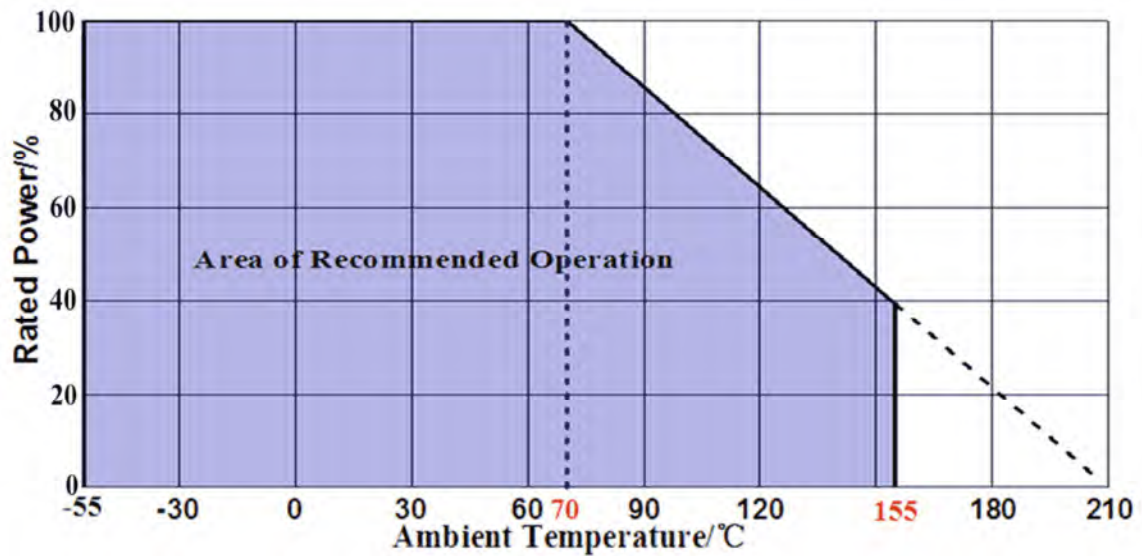
### Alloy Shunt Resistors (FLH) Environmental Characteristics

Items	Requirement	Test Methods
Temperature Cycling	$\pm 0.5\%$	JESD22 1000 Cycles( $-55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ ). Measurement at $24\pm 2$ hours after test conclusion.
High Temperature Exposure	$\pm 0.5\%$	MIL-STD-202 1000hrs. @ $T=125^{\circ}\text{C}$ . Unpowered. Measurement at $24\pm 2$ hours after test conclusion.
Moisture Resistor	$\pm 0.5\%$	MIL-STD-202 $t = 24$ hrs/cycle. Steps 7a & 7b not required. Unpowered. Measurement at $24\pm 2$ hours after test conclusion.
Biased Humidity	$\pm 0.5\%$	MIL-STD-202 1000hrs $85^{\circ}\text{C}/85\%$ RH. Note: Specified conditions: 10% of operating power. Measurement at $24\pm 2$ hours after test conclusion.
Operational Life	$\pm 0.5\%$	MIL-STD-202 Condition D Steady State $T_A=125^{\circ}\text{C}$ at rated power. Measurement at $24\pm 2$ hours after test conclusion.
Solderability	95% Coverage Minimum.	J-STD-002C $245\pm 5^{\circ}\text{C}$ , $5s+0.5s/-0$ .
Vibration	$\pm 0.5\%$	MIL-STD-202 5g's for 20 Min., 12 cycles each of 3 orientations. Note: Use 8"X5" PCB. 0.031" thick 7" secure points on one long side and secure points at corners of opposite sides which parts mounted within 2 from any secure point. Test from 10-2000 Hz. Measurement at $24\pm 2$ hours after test conclusion.
Resistance to Soldering Heat	$\pm 0.5\%$	MIL-STD-202 $260\pm 5^{\circ}\text{C}$ , $10s\pm 1s$ . Measurement at $24\pm 2$ hours after test conclusion.
Short Time Overload	$\pm 0.5\%$	MIL-STD-202 $55\times$ Rated power for 5s. Measurement at $24\pm 2$ hours after test conclusion.
Thermal Shock	$\pm 1\%$	MIL-STD-202 $-55^{\circ}\text{C}/+125^{\circ}\text{C}$ , 300 Cycles. Maximum transfer time 20s, Dwell time 15Min..



► **Derating Curve**

**Alloy Shunt Resistors (FLH) Derating Curve**



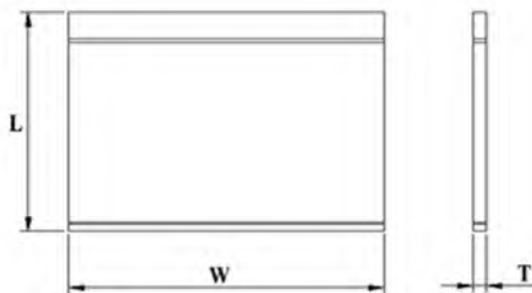
Rated power VS Ambient temperature (Derating Curve)



### ► Packaging

#### Alloy Shunt Resistors (FLH) Internal Package

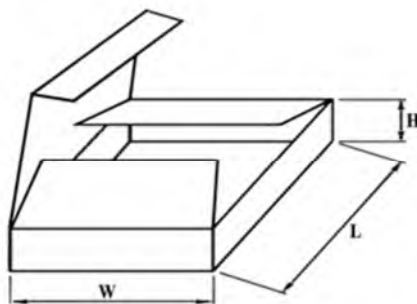
Type	L/mm	W/mm	T/mm
P1	130	130	0.2
P2	160	160	0.2
P3	210	150	0.1



FLH - Internal Package

#### Alloy Shunt Resistors (FLH) External Package

Type	L/mm	W/mm	H/mm
B1	170	120	50
B2	240	180	115
B3	230	170	200
B4	250	250	250
B5	300	300	300



FLH - External Package

### Order Codes

#### Alloy Current Sensing Resistors (FLU) Order Code

FLH	M		0m30		F	
Part Number	Material		Resistance ( $\Omega$ )		Tolerance (%)	
	M	Manganin	0m30	0.0003 $\Omega$	J	$\pm 5$
FLH	K	Kamar	R001	0.001 $\Omega$	G	$\pm 2$
			R003	0.003 $\Omega$	F	$\pm 1$



# Chip Alloy Current Shunt Resistors (FLM)

## ► Product Introduction

**SMD alloy shunt resistance FLM is a key current sensing technology for future vehicle construction.**

### Features :

- Inductance less than 10 nH, Lead-free and RoHS compliant.
- Rated Power 4W ~ 7W. Tolerance  $\pm 1\%$ ,  $\pm 2\%$  and  $\pm 5\%$ .
- TCR down to  $\pm 20\text{ppm}/^\circ\text{C}$  and  $\pm 50\text{ppm}/^\circ\text{C}$ .
- Resistance values down to  $0.0002\Omega$ .

### Applications :

- Power modules, Communication system.
- Current sensor for power hybrid applications.
- High current applications for the automotive market.
- Frequency converters, Automatic control power supply.

DeMint Electronics equipped with (FLM) alloy shunt on its current sensing surface mount devices. It adopts the design of folding terminals outward and inward. Nickel-copper or manganese-copper alloy stamping is used to maintain the superior electrical characteristics of the surface mounting structure. It has the characteristics of pulse resistance and high precision.

Unlike other manufacturers of metal alloy current detection resistors, DeMint metal alloy power chips (FLM) have a number of advantages. Power can reach 4W, 5W, and 7W. The temperature coefficient TCR (20 - 50) ppm, tolerance accuracy 1%, 2%, and 5%, is used to improve the measurement accuracy. The resistance value is as low as  $0.0002\Omega$ , which is the first choice for high-end current sensing and sampling applications.



The (FLM) device is applicable to all types of voltage dividers, current detection and pulse applications in power management, such as sensors and transducers; VRM for notebook computers, DC/DC converters for servers, management and safety of lithium ion batteries; industrial instrumentation; and high current applications in the automotive market, such as audio, transmission, anti-lock braking, and engines.

DeMint Electronics adopts modern technology and production methods, constantly upgrades production equipment, provides complete low resistance current detection components, and all aspects of current sensing shunt product and application information.

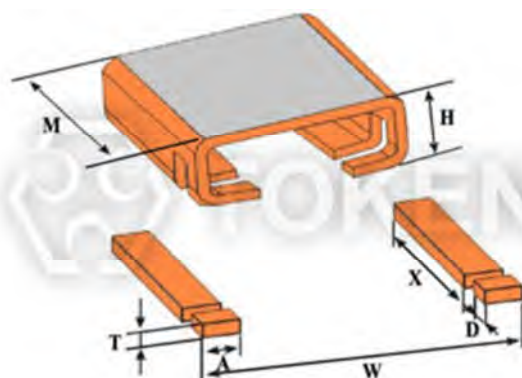
The (FLM) device is available in bulk packaging and is RoHS compliant and lead free. For non-standard technical requirements and special applications, contact us with your specific needs. Or link to DeMint official website "[Current Sense Resistors](http://www.direct-token.com)".



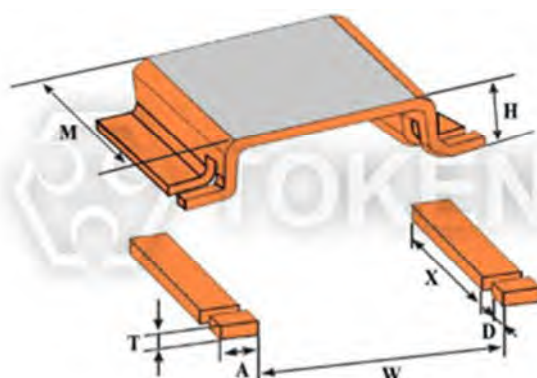
### Dimensions

#### Metal Alloy Power Shunts (FLM) Dimensions (Unit:mm)

Type	Power (W)	M (mm)	W (mm)	H (mm)	X (mm)	D (mm)	A (mm)	T (mm)
FLM-M-0m20	5	6.6±0.3	6.9±0.3	3.0±0.5	4.8±0.3	0.90±0.3	2.5±0.3	0.7±0.3
FLM-M-0m30	5	6.6±0.3	6.9±0.3	3.0±0.5	4.8±0.3	0.90±0.3	2.5±0.3	1.12±0.3
FLM-M-0m50	5	6.6±0.3	6.9±0.3	3.0±0.3	4.8±0.3	0.90±0.3	2.5±0.3	0.66±0.3
FLM-M-R001	5	6.6±0.3	6.9±0.3	3.0±0.3	4.8±0.3	0.90±0.3	2.5±0.3	0.33±0.3
FLM-K-R002	5	6.6±0.3	6.9±0.3	3.0±0.3	4.8±0.3	0.90±0.3	2.5±0.3	0.50±0.3
FLM-K-R003	4	6.6±0.3	6.9±0.3	3.0±0.3	4.8±0.3	0.90±0.3	2.5±0.3	0.34±0.3
FLM-K-R005	4	3.9±0.3	6.9±0.3	3.0±0.3	2.0±0.3	0.34±0.3	2.5±0.3	0.34±0.3
FLM-K-R010	7	6.1±0.3	15.9±0.3	3.0±0.3	4.2±0.3	0.90±0.3	2.5±0.3	0.30±0.3



Alloy Shunt Resistors FLM - Inward Fold (n)

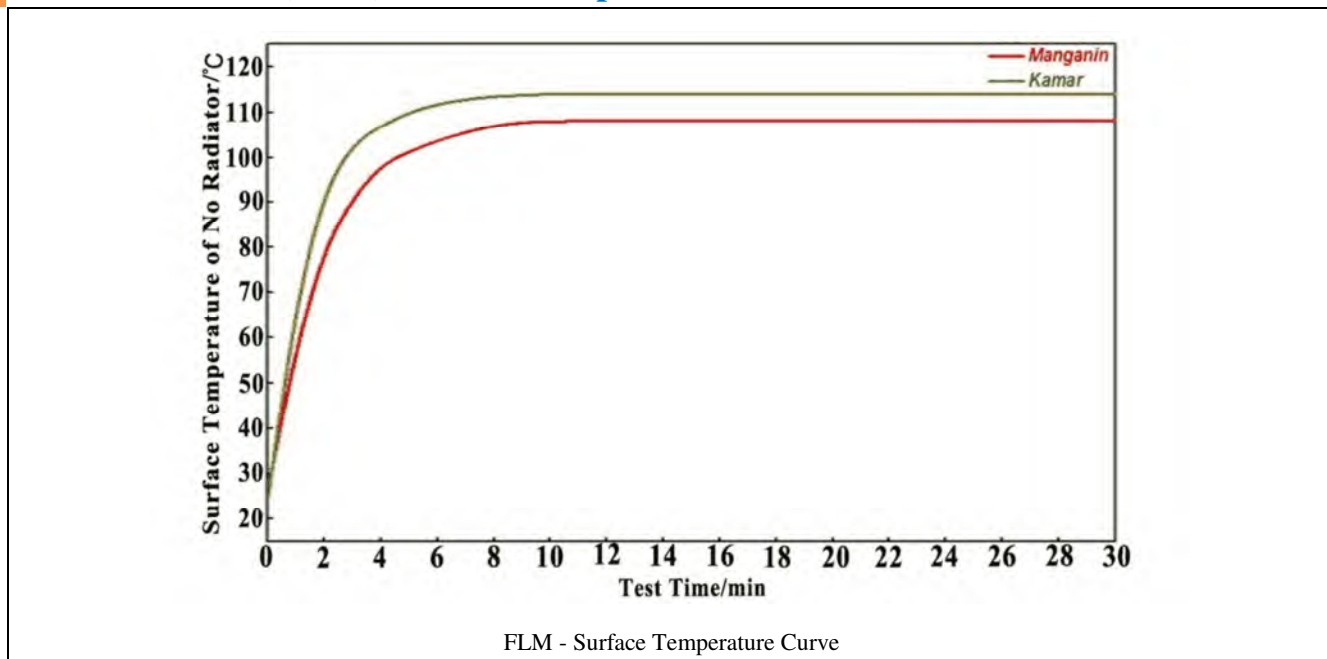


Alloy Shunt Resistors FLM - Outward Fold (y)

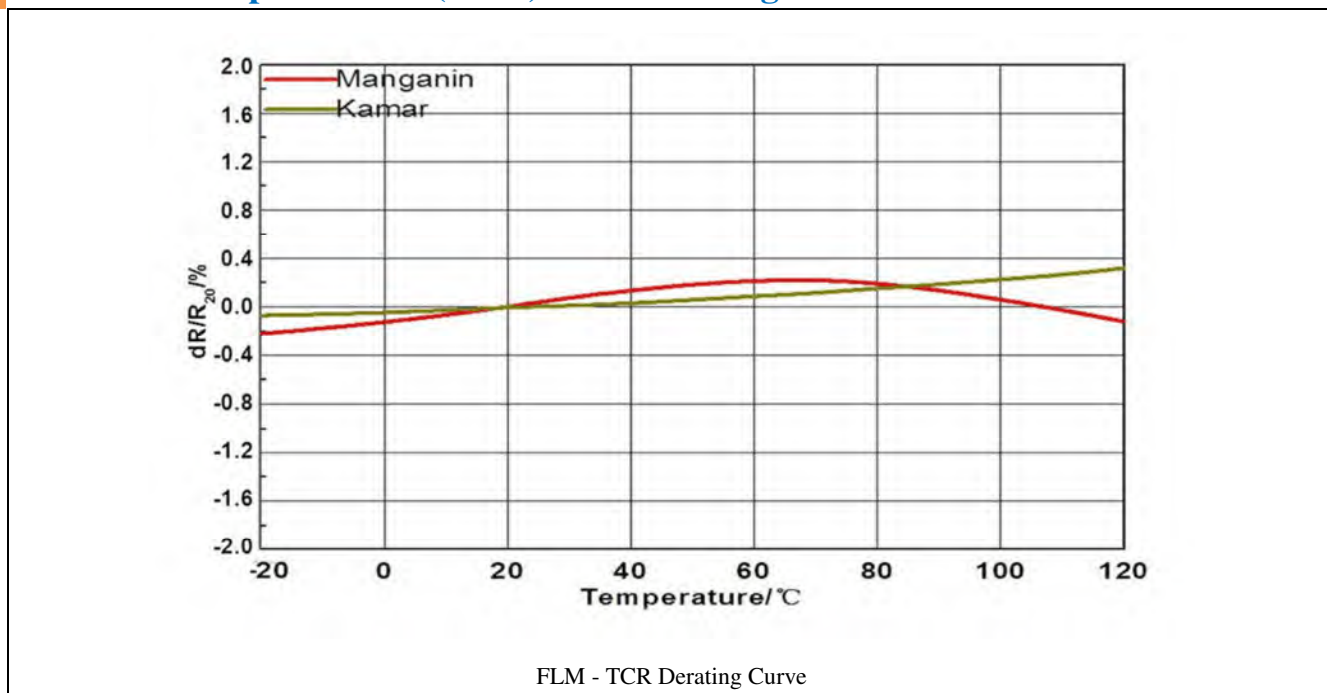


### ► Technical Specifications

#### Current Shunts (FLM) Surface Temperature Curve



#### Low Ohm Chip Resistors (FLM) TCR Derating Curve



## Environmental Characteristics

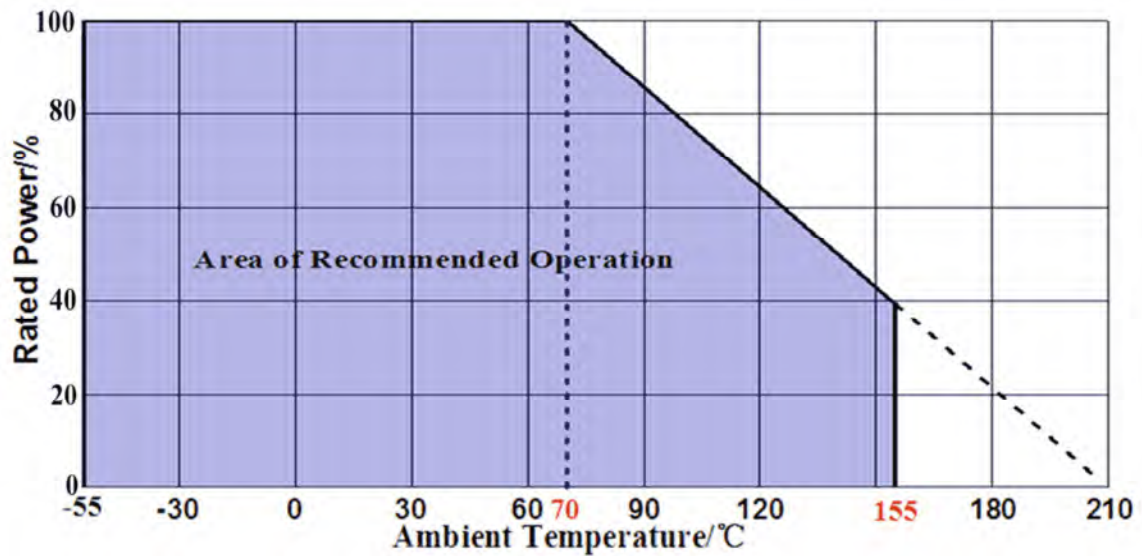
### Alloy Shunt Resistors (FLM) Environmental Characteristics

Items	Requirement	Test Methods
Temperature Cycling	$\pm 0.5\%$	JESD22 1000 Cycles ( $-55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ ). Measurement at $24\pm 2$ hours after test conclusion.
High Temperature Exposure	$\pm 0.5\%$	MIL-STD-202 1000hrs. @ $T=125^{\circ}\text{C}$ . Unpowered. Measurement at $24\pm 2$ hours after test conclusion.
Moisture Resistance	$\pm 0.5\%$	MIL-STD-202 $t=24\text{hrs/cycle}$ . Note: Steps 7a & 7b not required. Unpowered. Measurement at $24\pm 2$ hours after test conclusion.
Biased Humidity	$\pm 0.5\%$	MIL-STD-202 1000hrs $85^{\circ}\text{C}/85\%\text{RH}$ . Note: Specified conditions: 10% of operating power. Measurement at $24\pm 2$ hours after test conclusion.
Operational Life	$\pm 0.5\%$	MIL-STD-202 Condition D Steady State $T_A=125^{\circ}\text{C}$ at rated power. Measurement at $24\pm 2$ hours after test conclusion.
Solderability	95% Coverage Minimum.	J-STD-002C $245^{\circ}\text{C} \pm 5^{\circ}\text{C}$ , $5\text{s} \pm 0.5\text{s}$ .
Resistance to Soldering Heat	$\pm 0.5\%$	MIL-STD-202 $260^{\circ}\text{C} \pm 5^{\circ}\text{C}$ , $10\text{s} \pm 1\text{s}$ . Measurement at $24\pm 2$ hours after test conclusion.
Short Time Overload	$\pm 0.5\%$	MIL-STD-202 $5 \times \text{Rated power}$ for 5s. Measurement at $24\pm 2$ hours after test conclusion.
Thermal Shock	$\pm 1\%$	MIL-STD-202 $-55^{\circ}\text{C}/+125^{\circ}\text{C}$ , 300 Cycles. Maximum transfer time 20s, Dwell time 15Min..
Vibration	$\pm 0.5\%$	MIL-STD-202 5g's for 20 Min., 12 cycles each of 3 orientations. Note: Use 8"X5" PCB .031" thick 7" secure points on one long side and secure points at corners of opposite sides which parts mounted within 2" from any secure point. Test from 10-2000 Hz. Measurement at $24\pm 2$ hours after test conclusion.



### Derating Curve

#### Current Shunts (FLM) Derating Curve



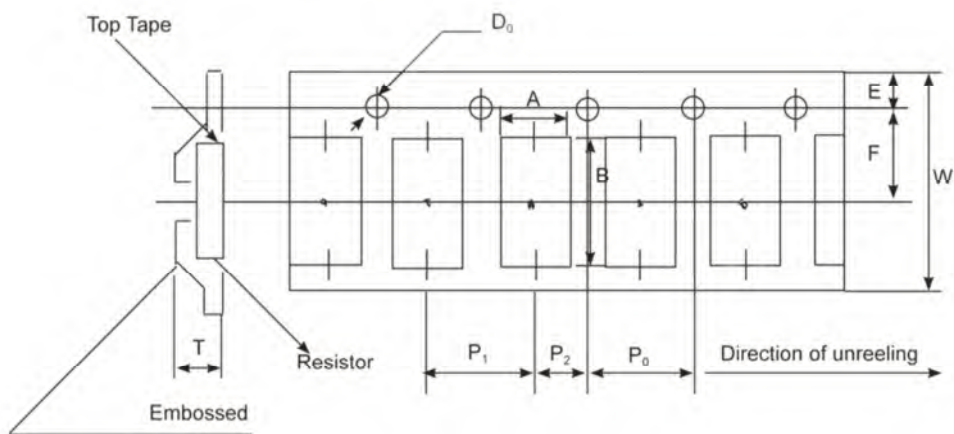
Rated power VS Ambient temperature (Derating Curve)



### ► Packaging

#### Alloy Shunt Resistors (FLM) Packaging

Type	A/mm	B/mm	W/mm	E/mm	F/mm	P <sub>0</sub> /mm	P <sub>1</sub> /mm	P <sub>2</sub> /mm	D <sub>0</sub> /mm	T/mm	Quantity(EA)/pieces
In	7.5	8	16	1.75	7.35	6	12	12	1.5	3.8	3000
Out	7.3	12.1	24	1.75	12.2	6	12	12	1.5	3.5	1000



FLM - Embossed Plastic Tape Specifications

### Order Codes

#### SMD Alloy Current Shunt Resistors (FLM) Order Code

FLM	5		M		0m20		F		y	
Part Number	Power (W)		Material		Resistance ( $\Omega$ )		Tolerance (%)		Shape	
FLM	4	4W	M	Manganin	0m20	0.0002 $\Omega$	J	$\pm 5$	y	outward Fold
	5	5W	K	Kamar	0m50	0.0005 $\Omega$	G	$\pm 2$	n	Intward Fold
	7	7W			R001	0.001 $\Omega$	F	$\pm 1$		
					R002	0.002 $\Omega$				
					R010	0.01 $\Omega$				



# Large Current Sense Resistor Power Shunts (FLP)

## ► Product Introduction

**DeMint's Metal Plate Shunt Resistor (FLP) serves high-current precision measurement applications.**

### Features :

- Inductance less than 10 nH, Lead-free and RoHS compliant.
- Tolerance  $\pm 1\%$ ,  $\pm 2\%$ ,  $\pm 5\%$ . Resistance values down to 0.00005 $\Omega$ .
- Overcurrent capacity 100A ~ 600A, Rated Power 3W ~ 70W.
- TCR down to  $\pm 50\text{ppm}/^\circ\text{C}$  and  $\pm 100\text{ppm}/^\circ\text{C}$ .

### Applications :

- Power Electronic, Home Appliance.
- Current Sensing, Drive technology.
- Automotive electronics, Communication System.

DeMint Electronics provides a wide range of precise shunts designed for high current applications requiring high precision, such as instruments, power supplies, watt-hour meters, automotive control systems, etc.

As one of current sensing resistors, metal plate alloy shunt resistors are precise low resistance which are often used in AC or DC voltage measurement. They are also called ammeter shunts.

The FLP shunt is composed of precise manganese kamar alloy plate, which is easy to weld and ensures the electrical performance of the welding joint. Strong structure provides high reliability, low inductance, and high load capacity. It is widely used in current limiting circuits such as communication systems, electronic machines, automatic control power supply, and current sharing or sampling detection.

Metal Plate FLP shunts can withstand higher current load than traditional resistors and surface mount resistors. Its power can reach 3W~70W, temperature coefficient  $\pm 50\text{ppm}/^\circ\text{C}$ ,  $\pm 100\text{ppm}/^\circ\text{C}$ , inductance is less than 10 nH, resistance is as low as 0.00005 $\Omega$ , tolerance accuracy  $\pm 1\%$ ,  $\pm 2\%$ , and  $\pm 5\%$ , and overcurrent capacity can reach 100A~600A.

DeMint provides bulk FLP series, which meets the lead-free and RoHS compliant. It can be customized according to customer's needs and provide customers with lower resistance series current sensing shunt resistors. Special resistance, size, specifications, and latest product information, please contact our Business Department. Or link to DeMint official website "[Current Sense Resistors](http://www.direct-token.com)". Contact us with your specific needs.

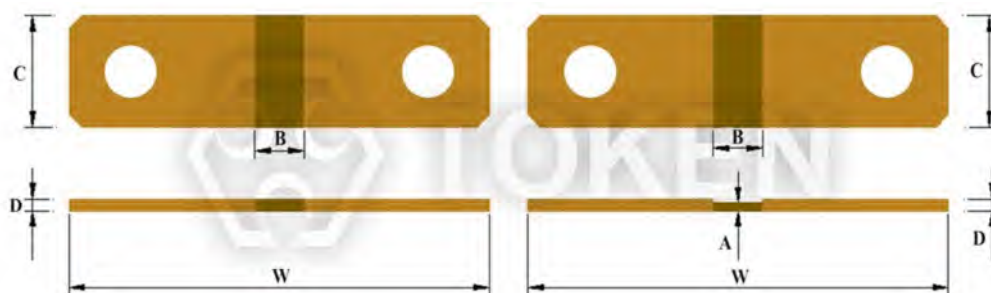




### ► Dimensions

#### Power Shunts (FLP) Dimensions (Unit: mm)

Type	* Over current / A	W (mm)	B (mm)	C (mm)	D (mm)	A (mm)
FLP-M-0m05	600	85±0.5	4.5±0.2	18±0.5	3±0.1	2.15±0.1
FLP-M-0m10	600	84±0.5	10±0.2	20±0.5	3±0.1	2.3±0.1
FLP-M-0m10	400	35±0.5	5±0.2	15±0.5	1.5±0.1	-
FLP-M-0m20	600	50±0.5	10±0.2	10±0.5	3±0.1	2.3±0.1
FLP-M-0m50	150	35±0.5	8±0.2	15±0.5	0.47±0.1	-
FLP-M-R001	100	35±0.5	12±0.2	15±0.5	0.35±0.1	-
FLP-K-R002	150	35±0.5	14±0.2	15±0.5	0.62±0.1	-
FLP-K-R004	100	35±0.5	14±0.2	15±0.5	0.31±0.1	-



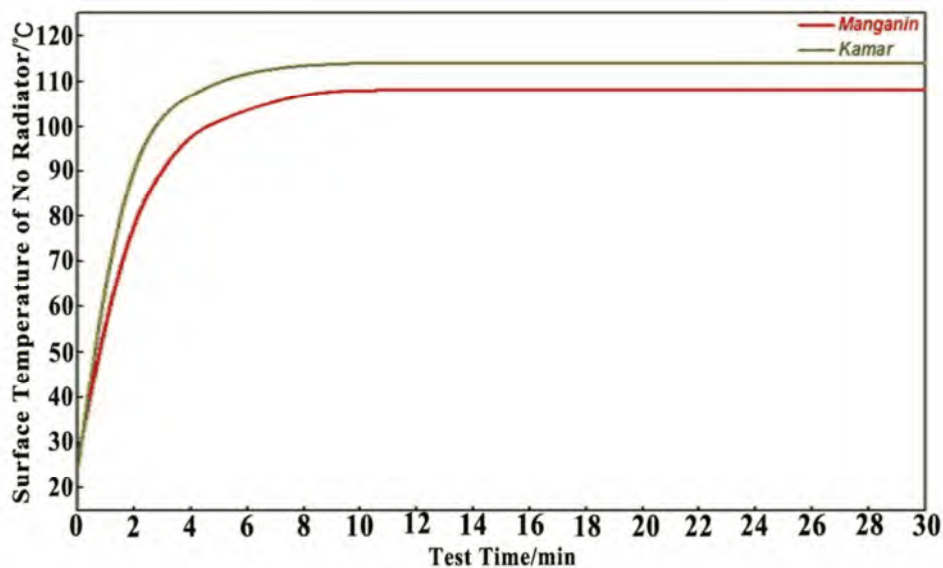
FLP - Power Shunts Dimensions

#### \* Remark:

- Overcurrent is the current exceeds the rated current.
- Circuit currents larger than the rated load current of the circuit conductor are all overcurrent including overload current and short circuit current.
- The difference is that the overcurrent before the circuit insulation damage is called overload current, and the overcurrent after the insulation damage is called short-circuit current.

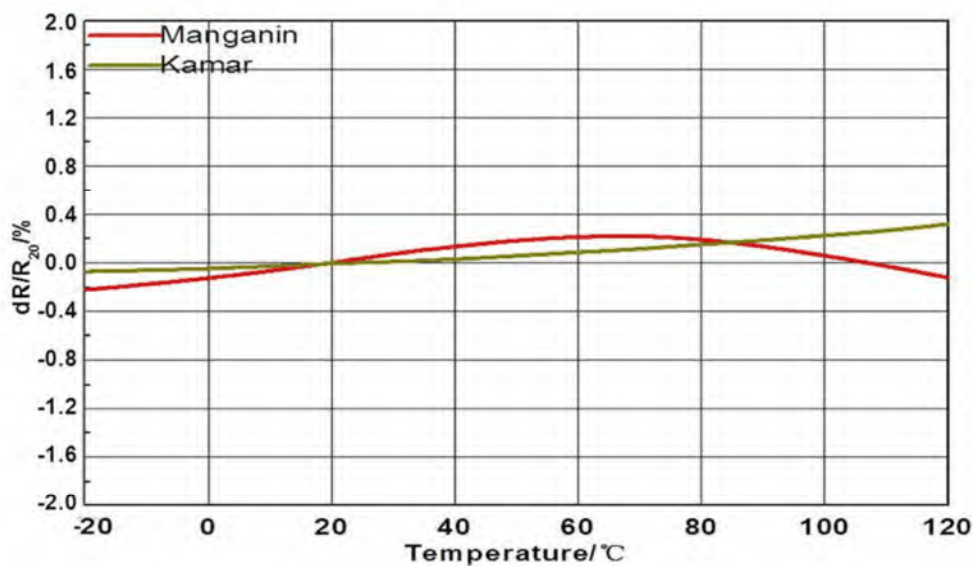
### ► Technical Specifications

#### FLP - Surface Temperature Curve



(FLP) Surface Temperature Curve

#### FLP - TCR Derating Curve



(FLP) TCR Derating Curve



## Environmental Characteristics

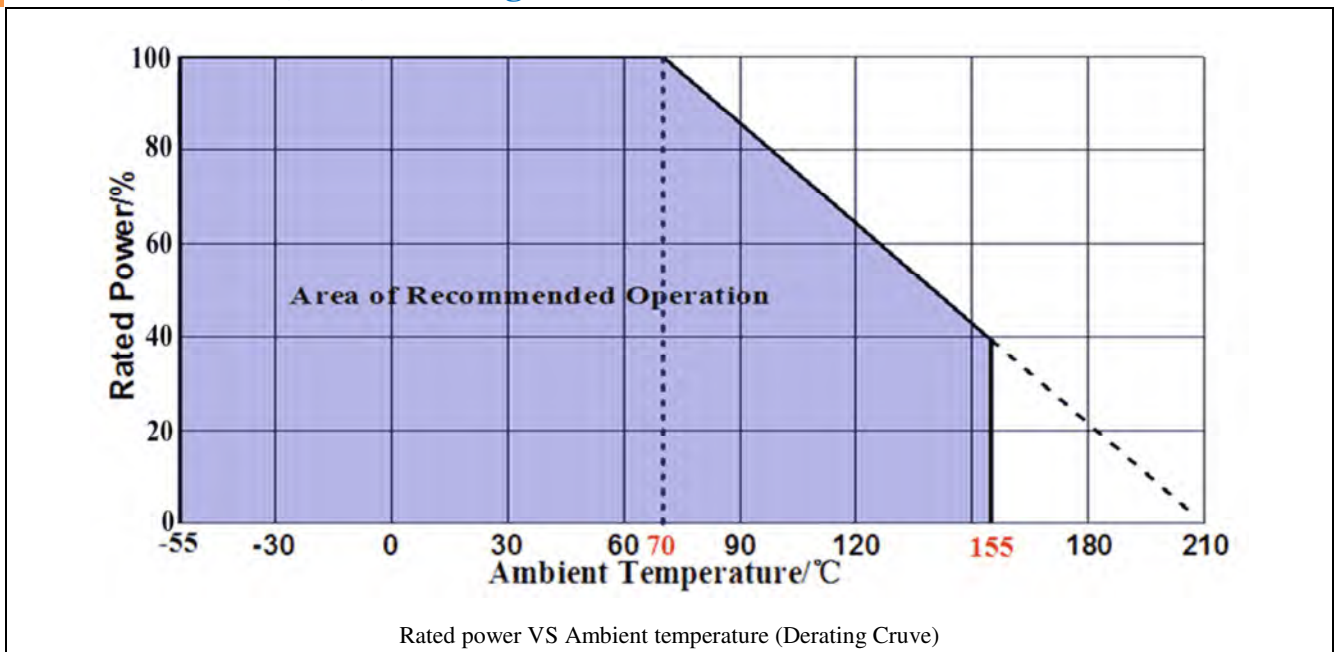
### Shunt Resistors (FLP) Environmental Characteristics

Items	Requirement	Test Methods
Temperature Cycling	$\pm 0.5\%$	JESD22 1000 Cycles ( $-55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ ). Measurement at $24\pm 2$ hours after test.
High Temperature Exposure	$\pm 0.5\%$	MIL-STD-202 1000hrs. @ $T=125^{\circ}\text{C}$ . Unpowered. Measurement at $24\pm 2$ hours after test.
Moisture Resistance	$\pm 0.5\%$	MIL-STD-202 $t=24\text{hrs/cycle}$ . Note: Steps 7a & 7b not required. Unpowered. Measurement at $24\pm 2$ hours after test.
Biased Humidity	$\pm 0.5\%$	MIL-STD-202 1000hrs $85^{\circ}\text{C}/85\% \text{ RH}$ . Note: Specified conditions: 10% of operating power. Measurement at $24\pm 2$ hours after test.
Operational Life	$\pm 0.5\%$	MIL-STD-202 Condition D Steady State $T_A=125^{\circ}\text{C}$ at rated power. Measurement at $24\pm 2$ hours after test.
Solderability	95% Coverage Minimum.	J-STD-002C $245^{\circ}\text{C} \pm 5^{\circ}\text{C}$ , $5\text{s} + 0.5\text{s} / -0$ .
Resistance to Soldering Heat	$\pm 0.5\%$	MIL-STD-202 $260^{\circ}\text{C} \pm 5^{\circ}\text{C}$ , $10\text{s} \pm 1\text{s}$ . Measurement at $24\pm 2$ hours after test.
Short Time Overload	$\pm 0.5\%$	MIL-STD-202 $5 \times$ Rated power for 5s. Measurement at $24\pm 2$ hours after test.
Thermal Shock	$\pm 1\%$	MIL-STD-202 $-55^{\circ}\text{C} / +125^{\circ}\text{C}$ , 300 Cycles. Maximum transfer time 20s, Dwell time 15Min..
Vibration	$\pm 0.5\%$	MIL-STD-202 5g's for 20 Min., 12 cycles each of 3 orientations. Note: Use 8"X5" PCB .031" thick 7" secure points on one long side and secure points at corners of opposite sides which parts mounted within 2 from any secure point. Test from (10-2000)Hz. Measurement at $24\pm 2$ hours after test.



### Derating Curve

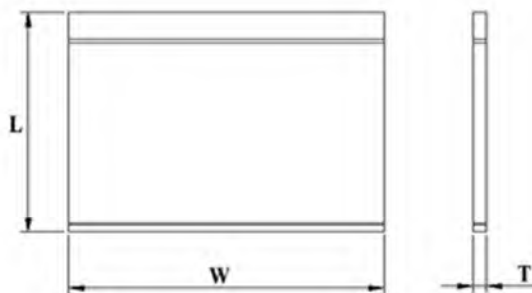
#### Shunt Resistors (FLP) Derating Curve



### ► Packaging

#### Large Current Shunts (FLP) Internal Package

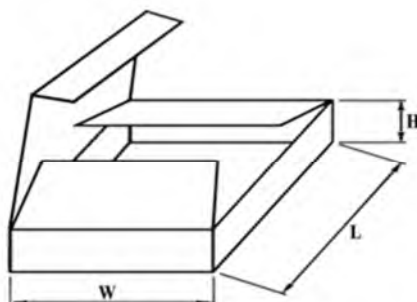
Type	L/mm	W/mm	T/mm
P1	130	130	0.2
P2	160	160	0.2
P3	210	150	0.1



FLP - Internal Package

#### Large Current Shunts (FLP) External Package

Type	L/mm	W/mm	H/mm
B1	170	120	50
B2	240	180	115
B3	230	170	200
B4	250	250	250
B5	300	300	300



FLP - External Package

### Order Codes

#### Metal Plate Large Current Sense Power Shunts (FLP) - Order Code

FLP	600		M		0m20		F	
Part Number	Over Current (A)		Material		Resistance ( $\Omega$ )		Tolerance (%)	
FLP	100	100 A	M	Manganin	0m05	0.00005 $\Omega$	J	$\pm 5$
	150	150 A	K	Kamar	0m20	0.0002 $\Omega$	G	$\pm 2$
	400	400 A			0m50	0.0005 $\Omega$	F	$\pm 1$
	600	600 A			R001	0.001 $\Omega$		
					R004	0.004 $\Omega$		

- Note: Plating, tin dipping, or size, please can be required.





# SMD Large Current Weld Precision Resistor Shunts (LRN)

## ► Product Introduction

**Surface mounted high current shunt, low TCR 20PPM (LRN) is the first choice for high power circuit design.**

### Features :

- Air cooling, Strong stability of circuit.
- Tolerance  $\pm 1\%$ ,  $\pm 2\%$ , and  $\pm 5\%$ . Rated Power 4W and 7W.
- Reflow Soldering applicable. lead-free and RoHS compliant.
- TCR down to  $\pm 20\text{ppm}/^\circ\text{C}$  and  $\pm 50\text{ppm}/^\circ\text{C}$ . Resistance down to  $0.0005\Omega$ .

### Applications :

- Communication system.
- Power modules · Frequency converters.
- Current sensor for power hybrid applications.
- High current applications for the automotive market.

For the development of current detection and shunting applications, DIRECT's high current shunt (LRN) adopts the welding structure of Manganin and KAMAR (NiCr20AlSi) precision resistance alloys. The spacing standard design makes it easy for surface mounting, reflow soldering, and suitable for current sensing and shunting applications.

Open bare alloy element design allows air flow to achieve maximum cooling effect, so that PCB retains less heat. The design of flame protection structure provides  $0.0005\Omega$  low resistance and low inductance. These factors make ruggedness (LRN) an excellent choice for all high current power supply and power applications that are not affected by most environmental stresses.

Specially designed for applications requiring high power processing (LRN). The power is 4W and 7W. The ultra-low resistance ranges from  $0.5\text{m}\Omega$  to  $30\text{m}\Omega$ . There are various tolerance selection advantages ( $\pm 1\%$ ,  $\pm 2\%$ ,  $\pm 5\%$ ), size 4312, and 4320. To achieve compact size and miniaturization, design a smaller, lower cost, higher performance, high power circuit terminal product design.

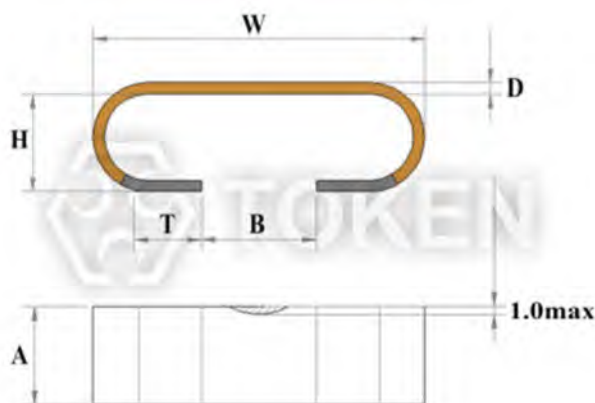
Provide packing with Embossed Plastic Tape, size 4312 2Kpcs per reel, 4320 2Kpcs per reel, products meet the lead-free and RoHS standards. Customers can specify resistance, size and specifications to meet the design challenges and specific technical requirements. Please contact DIRECT Business Department for the latest product information. Or link to DeMint official website "[Current Sense Resistors](http://www.direct-token.com)". Contact us with your specific needs.



### Dimensions

#### Chip Weld Shunts LRN - Dimension Specifications (Unit:mm)

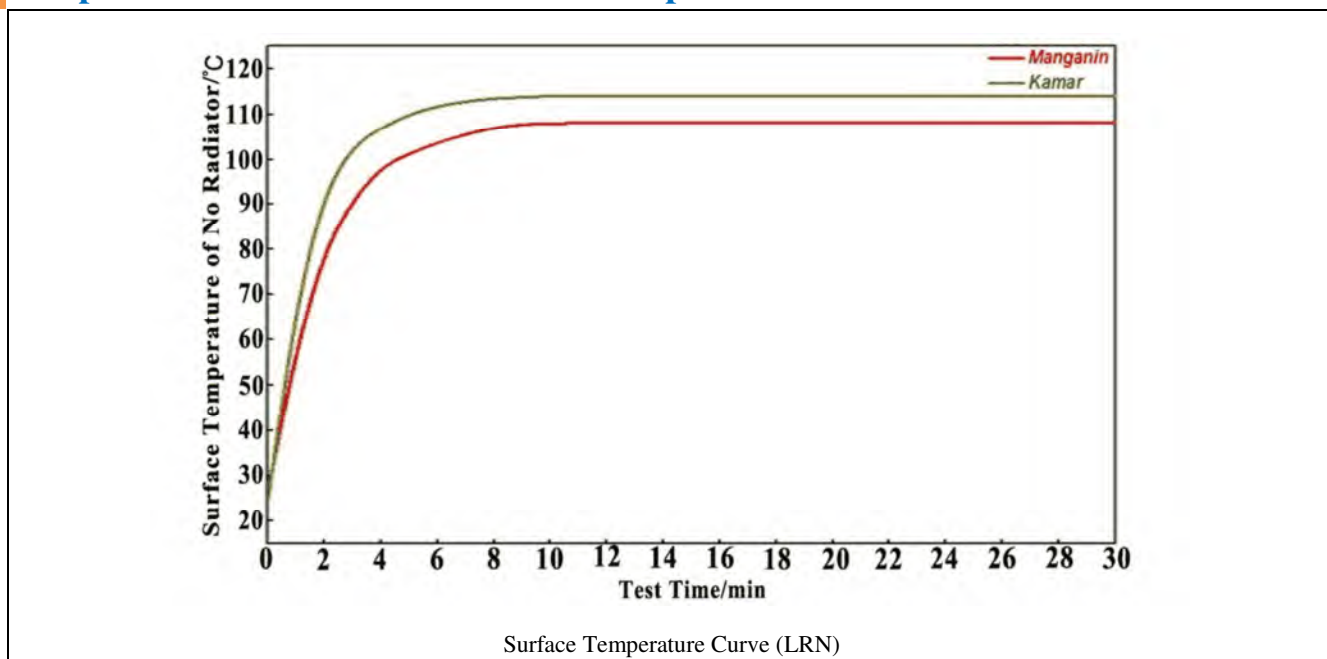
Type	Power (W)	Material	Size	Resistance (mΩ)	D (mm)	H (mm)	B (mm)	W (mm)	T (mm)	A (mm)
LRN	4	M	4312	2	0.59±0.05	3.1±0.3	4.2±0.5	11±0.5	2.8±0.3	3.1±0.3
				3	0.39±0.05	3.1±0.3	4.2±0.5	11±0.5	2.8±0.3	3.1±0.3
				5	0.40±0.05	3.1±0.3	4.2±0.5	11±0.5	2.8±0.3	3.1±0.3
		K	4312	10	0.62±0.05	3.1±0.3	4.2±0.5	11±0.5	2.8±0.3	3.1±0.3
				20	0.62±0.05	3.1±0.3	4.2±0.5	11±0.5	2.8±0.3	3.1±0.3
				30	0.25±0.05	3.1±0.3	4.2±0.5	11±0.5	2.8±0.3	3.1±0.3
	7	M	4320	0.5	0.74±0.05	3.1±0.3	4.2±0.5	11±0.5	2.8±0.3	6.1±0.4
				1	0.37±0.05	3.1±0.3	4.2±0.5	11±0.5	2.8±0.3	6.1±0.4
				5	0.20±0.05	3.1±0.3	4.2±0.5	11±0.5	2.8±0.3	6.1±0.4
		K	4320	5	0.62±0.05	3.1±0.3	4.2±0.5	11±0.5	2.8±0.3	6.1±0.4
				10	0.30±0.05	3.1±0.3	4.2±0.5	11±0.5	2.8±0.3	6.1±0.4
				15	0.20±0.05	3.1±0.3	4.2±0.5	11±0.5	2.8±0.3	6.1±0.4



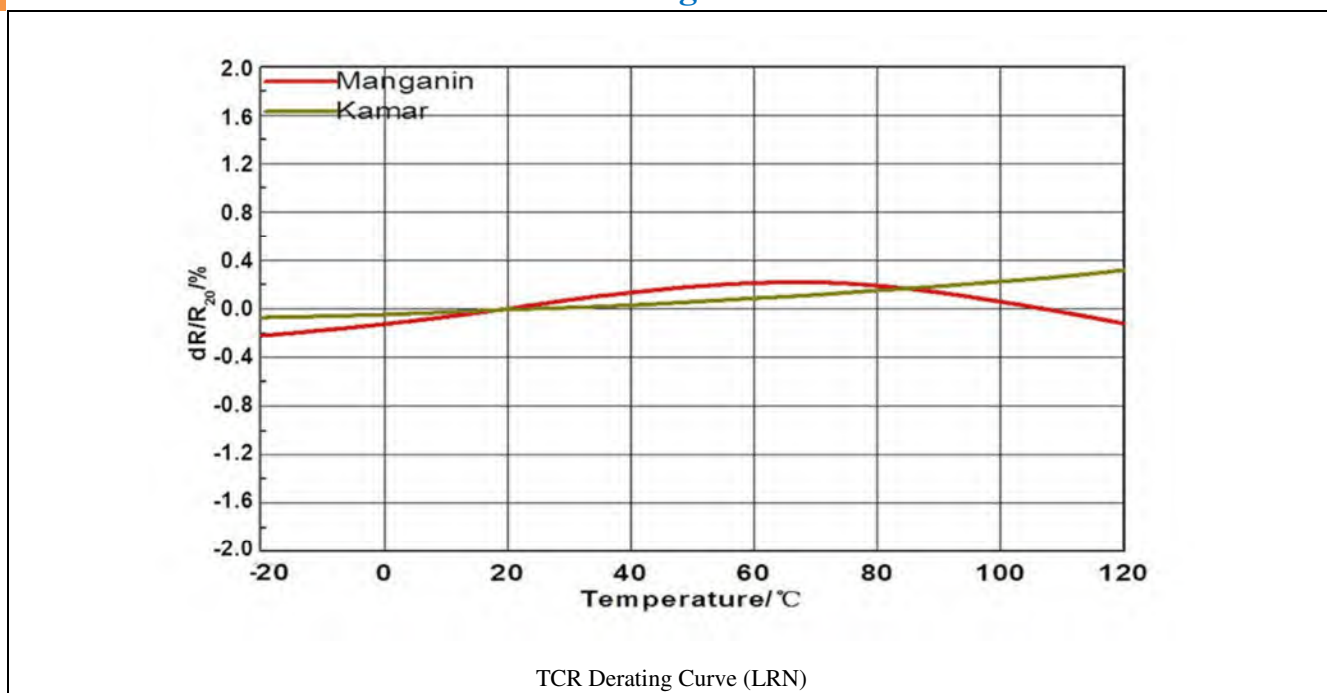
Chip Weld Shunts LRN - Dimensions (Unit:mm)

### ► Technical Specifications

#### Chip Weld Resistors LRN - Surface Temperature Curve



#### SMD Weld Resistors LRN - TCR Derating Curve



## Environmental Characteristics

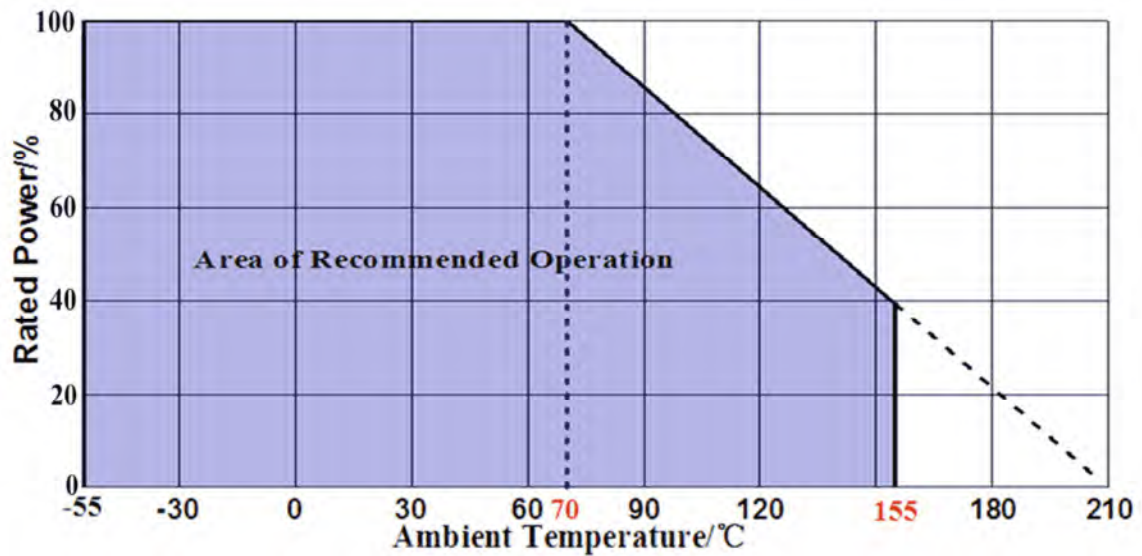
### SMD Weld Resistor LRN - Environmental Characteristics

Items	Requirement	Test Methods
Temperature Cycling	$\pm 0.5\%$	JESD22 1000 Cycles ( $-55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ ). Measurement at $24\pm 2$ hours after test conclusion.
High Temperature Exposure	$\pm 0.5\%$	MIL-STD-202 1000hrs. @ $T=125^{\circ}\text{C}$ . Unpowered. Measurement at $24\pm 2$ hours after test conclusion.
Moisture Resistance	$\pm 0.5\%$	MIL-STD-202 $t=24$ hrs/cycle. Note: Steps 7a & 7b not required. Unpowered. Measurement at $24\pm 2$ hours after test conclusion.
Biased Humidity	$\pm 0.5\%$	MIL-STD-202 1000hrs $85^{\circ}\text{C}/85\%$ RH. Note: Specified conditions: 10% of operating power. Measurement at $24\pm 2$ hours after test conclusion.
Operational Life	$\pm 0.5\%$	MIL-STD-202 Condition D Steady State $T_A=125^{\circ}\text{C}$ at rated power. Measurement at $24\pm 2$ hours after test conclusion.
Solderability	95% Coverage Minimum.	J-STD-002C $245^{\circ}\text{C} \pm 5^{\circ}\text{C}$ , 5s $\pm 0.5$ s/-0.
Resistance to Soldering Heat	$\pm 0.5\%$	MIL-STD-202 $260^{\circ}\text{C} \pm 5^{\circ}\text{C}$ , 10s $\pm 1$ s. Measurement at $24\pm 2$ hours after test conclusion.
Short Time Overload	$\pm 0.5\%$	MIL-STD-202 $5 \times$ Rated power for 5s. Measurement at $24\pm 2$ hours after test conclusion.
Thermal Shock	$\pm 1\%$	MIL-STD-202 $-55^{\circ}\text{C}/+125^{\circ}\text{C}$ , 300 Cycles. Maximum transfer time 20s, Dwell time 15Min..
Vibration	$\pm 0.5\%$	MIL-STD-202 5g's for 20 Min., 12 cycles each of 3 orientations. Note: Use 8"X5" PCB .031" thick 7" secure points on one long side and secure points at corners of opposite sides which parts mounted within 2 from any secure point. Test from 10-2000 Hz. Measurement at $24\pm 2$ hours after test conclusion.



### ▶ Derating Curve

#### LRN - Derating Curve



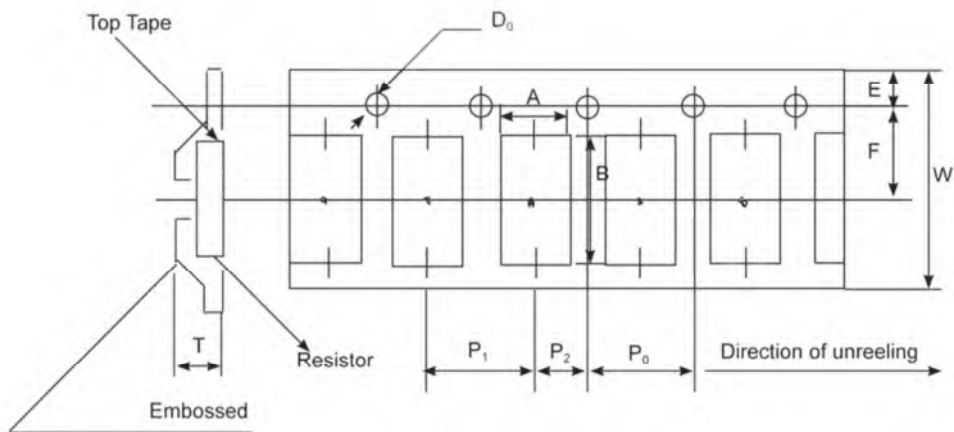
Rated power VS Ambient temperature (Derating Curve)



**Packaging**

**LRN - Packaging**

Size	A/mm	B/mm	W/mm	E/mm	F/mm	P <sub>0</sub> /mm	P <sub>1</sub> /mm	P <sub>2</sub> /mm	D <sub>0</sub> /mm	T/mm	Quantity (EA) / pieces
4312	4.3	12.5	24	1.55	7.5	6	12	12	1.50	3.8	2000
4320	7	12.5	24	1.55	11.2	6	12	12	1.50	3.8	1000



LRN - Embossed Plastic Tape Specifications



### Order Codes

#### SMD Large Current Weld Precision Shunts LRN - Order Code

LRN	4		M		R003		J	
Part Number	Power (W)		Material		Resistance ( $\Omega$ )		Tolerance (%)	
LRN	4	4W	M	Manganin	0m50	0.0005 $\Omega$	J	$\pm 5$
	7	7W	K	Kamar	R002	0.002 $\Omega$	G	$\pm 2$
					R003	0.003 $\Omega$	F	$\pm 1$
					R010	0.01 $\Omega$		
					R030	0.03 $\Omega$		



# Current Sensing Metal Chip Resistors (CSM)

## ► Product Introduction

**New Ultra-low Ohmic Chip Resistors for Current Detection in power electronic systems.**

### Features :

- RoHs compliant and halogen free.
- High precision current sensing and voltage division.
- High power rating in small size. Excellent long term stability.
- Metal foil construction low Resistance TCR/Inductance/EMF (only for MnCu).

### Applications :

- Charger, Measuring instrument. Switching Power Supply.
- Battery Management System. Power Management Applications.
- DC-DC Converter, Adaptor, Voltage Regulation Module (VRM).
- Battery Pack, Over Current Protection in Audio Applications.

Current sense resistors are a rapidly evolving technology that focuses on regulating and monitoring power from the power supply to the end equipment.

In addition, current sensing resistors based on DeMint (CSM) metal alloys are capable of handling higher inrush currents, have better TCR capability, and generally do not suffer from differences in thermal expansion from the PCB. Metal alloy based resistors are a cost-effective solution compared to competing technologies including Hall effect sensors, magnetoresistive sensors and current transformers.

DeMint (CSM) provides high performance and reliability over the entire operating temperature range, with a small enclosure size and high power rating compared to standard current sense resistors. Resistance value starts at 1mΩ and goes to 700mΩ, applications include switches and DC-DC converters, battery packs, chargers, adapters, overcurrent protection in audio applications, power management applications, LED drivers, motor control, electric Tools and power amplifiers.

Ultra low resistance metal chip resistors (CSM) are SMD devices designed for current sensing circuits in power electronics systems. The metal alloy construction ensures high reliability and high performance with a very low and stable TCR (50ppm, 75ppm, 100ppm) value. The small chip size provides high power ratings from 0.5W to 5W and operates from -55°C to +155°C temperature. Accuracy tolerances are ±0.5% and ±1%.

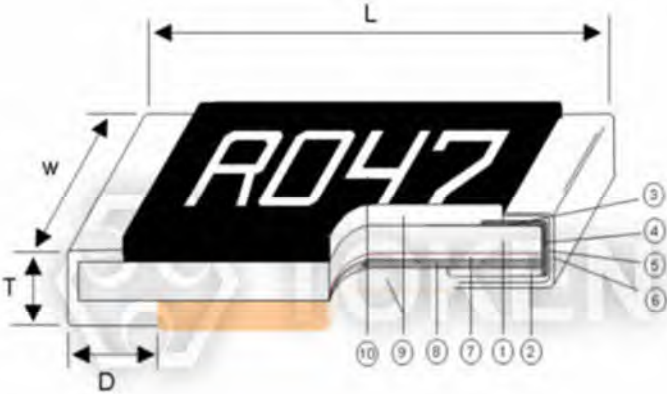
There are many options of popular industry sizes: 0603, 0805, 1206, 2010, 2512, 3921, 4527, 0508, 0612, 0815, 1225, and 2139. 5K pcs per reel in smaller sizes 0603, 0805, 1206, 0508, and 0612. 4K pcs per reel for 2010, 2512, 0815, and 1225. 2K pcs per reel for 2139.

Ultra-low ohmic chip resistors (CSM) for current detection meet RoHS standards and lead-free requirements, please link to DeMint official website "[Current Sense Resistors](#)". Contact us with your specific needs.



### Dimensions

#### CSM - Construction & Dimensions

 <p>Surface Mount (CSM) Construction</p>			①	Alumina Substrate	⑥	External Electrode
			②	Bottom Electrode	⑦	Adhesive
			③	Top Electrode	⑧	Resistor Layer
			④	Edge Electrode	⑨	Primary Overcoat
			⑤	Barrier Layer	⑩	Marking
Type	Power Rating at 70°C (W)	Resistance Range (mΩ)	Dimensions (Unit: mm)			
			L	W	T	D
CSM0603	0.5	5	1.60±0.25	0.80±0.25	0.65±0.20	0.50±0.20
		6~100				0.40±0.20
CSM0805	0.75	4~270	2.00±0.25	1.20±0.25	0.65±0.20	0.50±0.20
CSM1206	1	4~700	3.20±0.25	1.60±0.25	0.65±0.20	0.68±0.30
CSM2010	1.5	2~3	5.08±0.25	2.54±0.25	0.65±0.20	2.10±0.30
		4~500				0.70±0.30
CSM2512	2	2	6.40±0.30	3.20±0.30	0.75±0.20	1.65±0.30
		3			0.75±0.20	1.65±0.30
		4~560			0.65±0.20	1.05±0.30
CSM3921	4	10~50	11.10±0.30	5.10±0.30	0.65±0.30	2.36±0.30
CSM4527	5	10~50	11.60±1.0	7.10±1.0	0.65±0.30	2.70±0.40
CSM0508	1	1~100	1.35±0.20	2.10±0.20	0.65±0.20	0.43±0.20
CSM0612	1.5	1	1.60±0.25	3.20±0.25	0.65±0.20	0.50±0.30
		2~100				0.40±0.20
CSM0815	2	1~20	2.20±0.20	3.80±0.20	0.65±0.20	0.61±0.20
CSM1225	3	1~100	3.20±0.30	6.40±0.30	0.65±0.20	0.60±0.20
CSM2139	5	1~100	5.10±0.40	11.10±0.30	0.65±0.30	0.90±0.30

## Electrical Characteristics

### CSM - Electrical Characteristics

Type	Max. Rating Power (W)	Max. Rating Current (A)*	Max. Overload Current (A)	Resistance Range (mΩ)*		TCR (ppm/°C)	Material
				D (±0.5 %)	F (±1 %)		
CSM0603	0.5	10	15.81	-	5~9	±75	R005~R049: MnCu
		7.07	11.18	10~100		±50	R050~R100: Cu Alloy
CSM0805	0.75	13.69	21.65	-	4~9	±75	R004~R049: MnCu
		8.66	13.69	10~270		±50	R050~R270: Cu Alloy
CSM1206	1	15.81	25	-	4~9	±75	R004~R049: MnCu
		10	15.81	10~700		±50	R050~R700: Cu Alloy
CSM2010	1.5	27.38	43.30	-	2~9	±100	R002~R500: Cu Alloy
		12.24	19.36	10~500		±50	
CSM2512	2	31.62	50	-	2~9	±75	R002~R049: MnCu
		14.14	22.36	10~560		±50	R050~R560: Cu Alloy
CSM3921	4	20	31.62	10~50		±50	R010~R050: Cu Alloy
CSM4527	5	22.36	35.35	10~50		±50	R010~R050: Cu Alloy
CSM0508	1	31.62	50	-	1~9	±100	R001~R009: MnCu
		10	15.81	10~100		±50	R010~R100: Cu Alloy
CSM0612	1.5	38.72	61.23	-	1~9	±100	R001~R009: MnCu
		12.24	19.36	10~100		±50	R010~R100: Cu Alloy
CSM0815	2	44.72	70.71	-	1~9	±100	R001~R020: Cu Alloy
		14.14	22.36	10~20		±50	
CSM1225	3	54.77	86.60	-	1~9	±100	R001~R020: MnCu
		17.32	27.38	10~100		±50	R021~R100: Cu Alloy
CSM2139	5	111.80	70.71	-	1~9	±100	R001~R020: MnCu
		22.36	35.35	10~100		±50	R021~R100: Cu Alloy

● \* Operating Temperature -55°C ~ +155°C

## Environmental Characteristics

### CSM - Environmental Characteristics

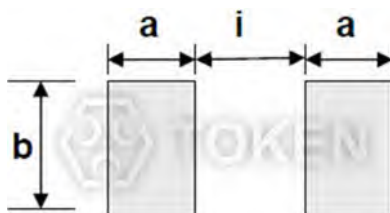
Item	Specification	Test Method
Temperature Coefficient of Resistance (T.C.R)	As Spec.	JIS-C-5201-1 4.8 IEC-60115-1 4.8 -55℃ ~ +125℃, 25℃ is the reference temperature.
Short Time Overload	$\pm(1.0\% + 0.5\text{m}\Omega)$	JIS-C-5201-1 4.13 IEC 60115-1 4.13 RCWV*2.5 or Max Overloading Voltage 5sec.
Solderability	95% Min. coverage.	JIS-C-5201-1 4.17 IEC-60115-1 4.17 245 $\pm$ 5℃ for 3 seconds.
Resistance to Soldering Heat	$\pm(1.0\% + 0.5\text{m}\Omega)$	JIS-C-5201-1 4.18 IEC-60115-1 4.18 260 $\pm$ 5℃ for 10 seconds.
Temperature Cycling	$\pm(1.0\% + 0.5\text{m}\Omega)$	JIS-C-5201-1 4.19 IEC-60115-1 4.19 -55℃ to +155℃, 100 cycles.
Dry Heat	$\pm(1.0\% + 0.5\text{m}\Omega)$	JIS-C-5201-1 4.23 IEC-60115-1 4.23.2 At +155℃ for 1000 Hrs.
Damp Heat with Load	$\pm(2.0\% + 0.5\text{m}\Omega)$	JIS-C-5201-1 4.24 IEC-60115-1 4.24 40 $\pm$ 2℃, 90~95% R.H., load with rated current for 1000 Hrs. with 1.5 Hrs. "ON" and 0.5 Hrs. "OFF".
Endurance	$\pm(2.0\% + 0.5\text{m}\Omega)$	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1 70 $\pm$ 2℃, load with rated current for 1000 Hrs. with 1.5 Hrs. "ON" and 0.5 Hrs. "OFF".
Bending Strength	$\pm(1.0\% + 0.5\text{m}\Omega)$	JIS-C-5201-1 4.33 IEC-60115-1 4.33 Bending once for 5 seconds with 2mm .



### Derating Curve

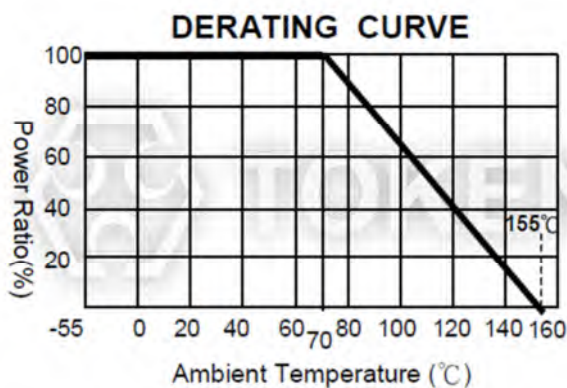
#### CSM - Recommend Land Pattern

Type	Maximum Power Rating (Watts)	Resistance Range (mΩ)	Dimensions (mm)		
			a	b	i
CSM0603	0.5	5	1.35	0.92	0.50
		6~100	1.30	0.92	0.60
CSM0805	0.75	4~270	1.40	1.44	0.80
CSM1206	1	4~700	1.80	1.84	1.20
CSM2010	1.5	2~3	3.65	2.88	0.70
		4~500	2.65	2.88	2.70
CSM2512	2	2~3	3.85	3.57	1.60
		4~560	3.10	3.57	3.10
CSM3921	4	10~50	4.50	5.75	5.00
CSM4527	5	10~50	4.65	8.05	5.20
CSM0508	1	1~100	1.10	2.30	0.60
CSM0612	1.5	1	1.35	3.68	0.50
		2~100	1.30	3.68	0.60
CSM0815	2	1~20	2.40	4.26	0.70
CSM1225	3	1~100	2.35	7.25	1.40
CSM2139	5	1~100	2.80	12.65	2.40



(CSM) Recommend Land Pattern

#### CSM - Derating Curve



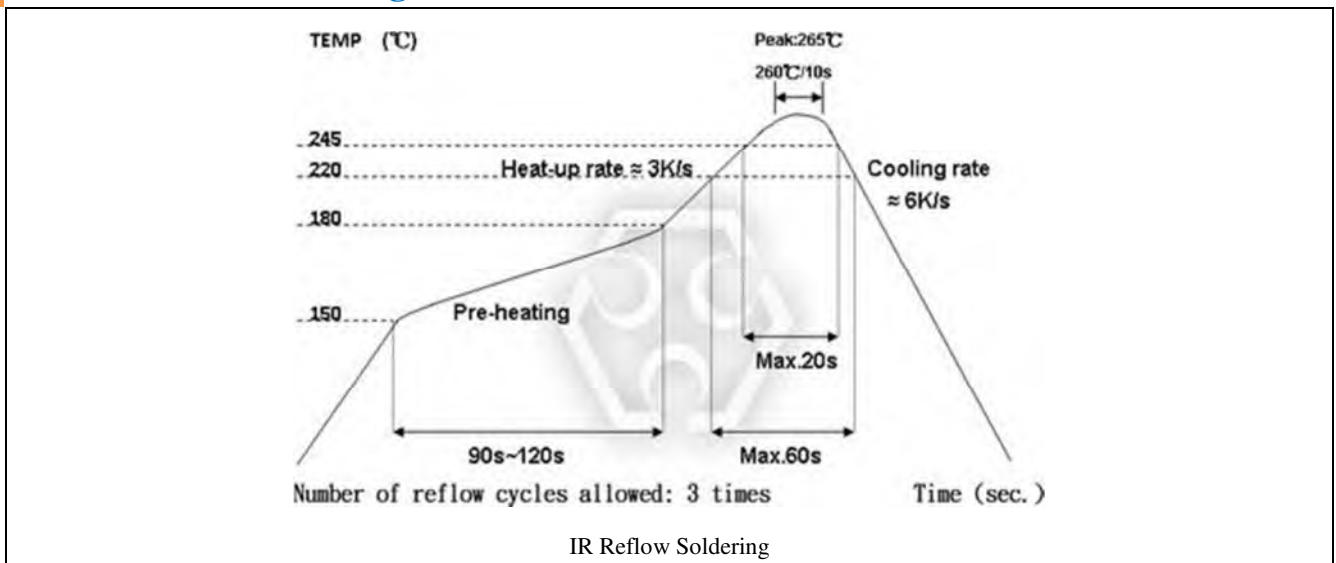
Rated power VS Ambient temperature (Power Derating Curve)



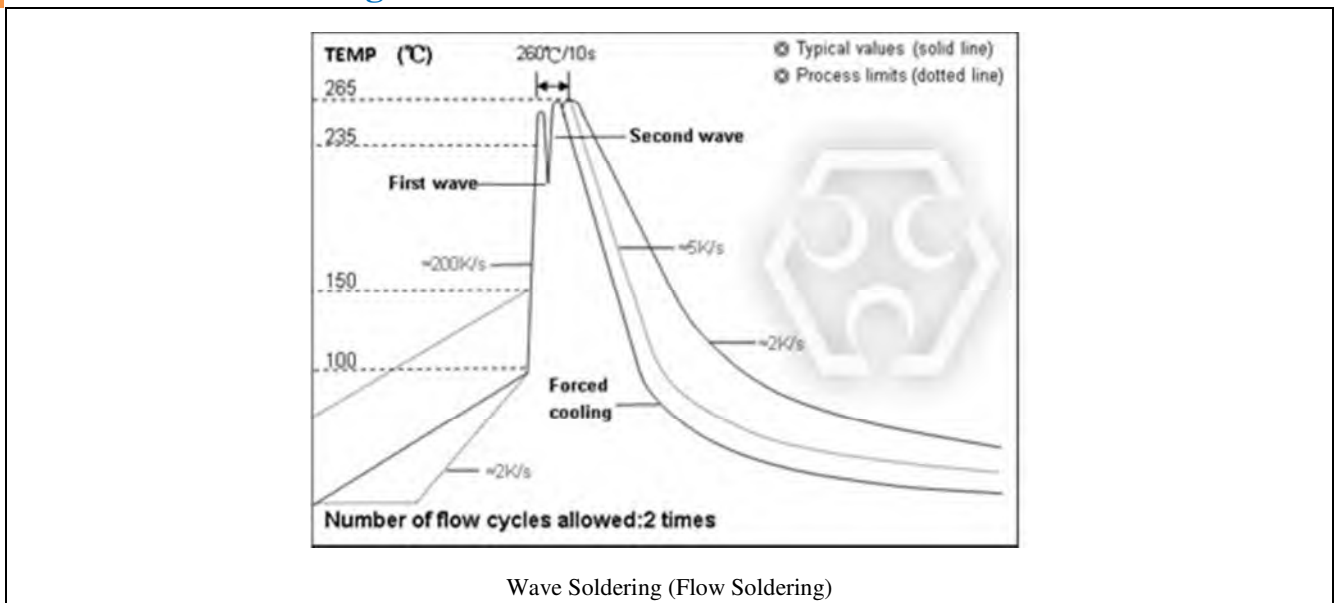


### Soldering

#### CSM - Reflow Soldering



#### CSM - Wave Soldering



#### Remark :

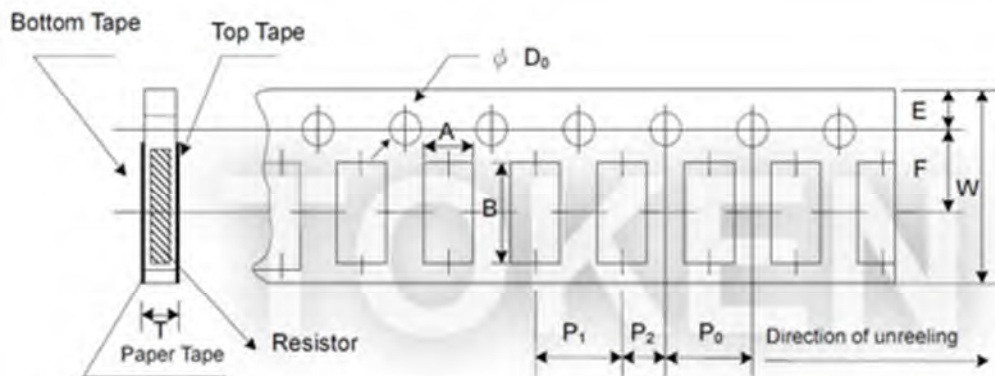
- Time of IR reflow soldering at maximum temperature point 260°C:10s.
- Time of wave soldering at maximum temperature point 260°C:10s.
- Time of soldering iron at maximum temperature point 410°C :5s.



## Packaging

### CSM - Paper Tape Specifications

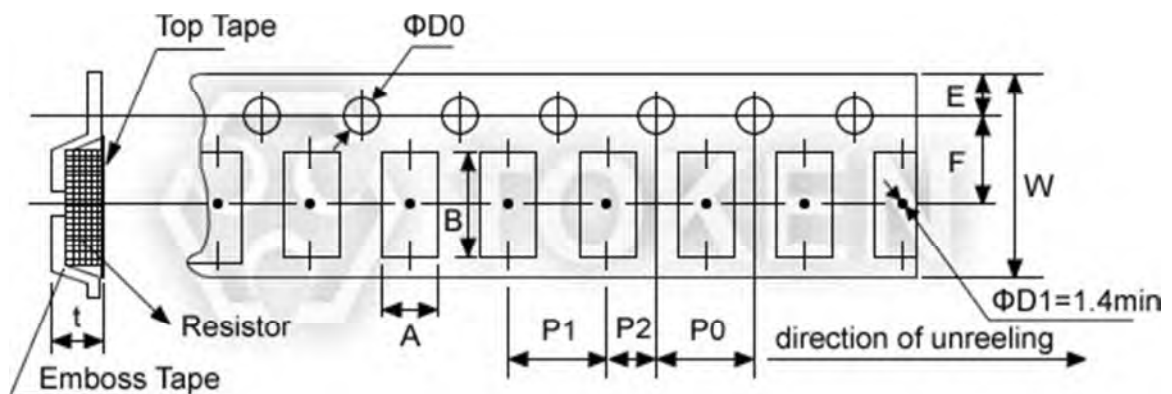
Type	A(mm)	B(mm)	W(mm)	E(mm)	F(mm)	P0(mm)	P1(mm)	P2(mm)	ΦD0(mm)	T(mm)
CSM0603	1.18±0.20	1.98±0.20	8.00±0.30	1.75±0.10	3.50±0.10	4.0±0.10	4.00±0.10	2.00±0.10	1.50+0.1,-0	0.75±0.20
CSM0805	1.68±0.20	2.38±0.20	8.00±0.30	1.75±0.10	3.50±0.10	4.0±0.10	4.00±0.10	2.00±0.10	1.50+0.1,-0	0.87±0.20
CSM0508	1.68±0.20	2.38±0.20	8.00±0.30	1.75±0.10	3.50±0.10	4.0±0.10	4.00±0.10	2.00±0.10	1.50+0.1,-0	0.87±0.20
CSM1206	2.05±0.20	3.65±0.20	8.00±0.30	1.75±0.10	3.50±0.10	4.0±0.10	4.00±0.10	2.00±0.10	1.50+0.1,-0	0.87±0.20
CSM0612	2.05±0.20	3.65±0.20	8.00±0.30	1.75±0.10	3.50±0.10	4.0±0.10	4.00±0.10	2.00±0.10	1.50+0.1,-0	0.87±0.20



Paper Tape Specifications

### Embossed Plastic Tape Specifications

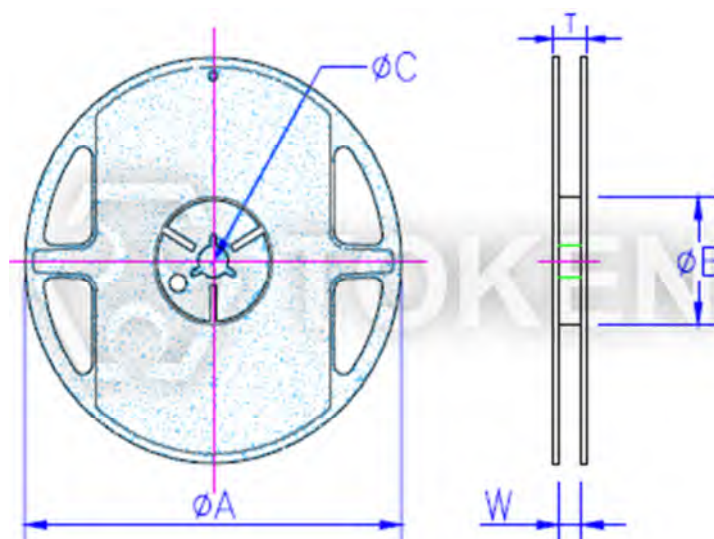
Type	A(mm)	B(mm)	W(mm)	E(mm)	F(mm)	P0(mm)	P1(mm)	P2(mm)	ΦD0(mm)	T(mm)
CSM1508	2.40±0.20	4.10±0.20	12.0±0.30	1.75±0.10	5.50±0.10	4.0±0.10	4.00±0.10	2.00±0.10	1.50+0.1,-0	0.75±0.20
CSM2010	2.85±0.20	5.45±0.20	12.0±0.30	1.75±0.10	5.50±0.10	4.0±0.10	4.00±0.10	2.00±0.10	1.50+0.1,-0	0.80±0.20
CSM2512	3.40±0.20	6.75±0.20	12.0±0.30	1.75±0.10	5.50±0.10	4.0±0.10	4.00±0.10	2.00±0.10	1.50+0.1,-0	1.00±0.20
CSM1225	3.40±0.20	6.75±0.20	12.0±0.30	1.75±0.10	5.50±0.10	4.0±0.10	4.00±0.10	2.00±0.10	1.50+0.1,-0	1.00±0.20
CSM3921	5.50±0.20	11.5±0.20	24.0±0.30	1.75±0.10	11.5±0.10	4.0±0.10	8.00±0.10	2.00±0.10	1.50+0.1,-0	0.90±0.20
CSM2139	5.50±0.20	11.5±0.20	24.0±0.30	1.75±0.10	11.5±0.10	4.0±0.10	8.00±0.10	2.00±0.10	1.50+0.1,-0	0.90±0.20
CSM4527	7.50±0.20	12.0±0.20	24.0±0.30	1.75±0.10	11.5±0.10	4.0±0.10	12.0±0.10	2.00±0.10	1.50+0.1,-0	0.90±0.20



Paper Tape Specifications

### Reel Specifications and Packaging Quantity

Type	Packaging Quantity	Tape width	Reel Diameter	ΦA(mm)	ΦB(mm)	ΦC(mm)	W(mm)	T(mm)
CSM0603	5000Pcs	8mm	7inch	178±5.0	60±2.0	13.0±1.0	9.0±1.0	11.4±1.0
CSM0805	5000Pcs	8mm	7inch	178±5.0	60±2.0	13.0±1.0	9.0±1.0	11.4±1.0
CSM1206	5000Pcs	8mm	7inch	178±5.0	60±2.0	13.0±1.0	9.0±1.0	11.4±1.0
CSM2010	4000Pcs	12mm	7inch	178±5.0	60±2.0	13.0±1.0	13.0±1.0	15.5±1.0
CSM2512	4000Pcs	12mm	7inch	178±5.0	60±2.0	13.0±1.0	13.0±1.0	15.5±1.0
CSM3921	2000Pcs	24mm	7inch	178±5.0	60±2.0	13.0±1.0	24.5±1.0	26.5±1.0
CSM4527	1000Pcs	24mm	7inch	178±5.0	60±2.0	13.0±1.0	24.5±1.0	26.5±1.0
CSM0508	5000Pcs	8mm	7inch	178±5.0	60±2.0	13.0±1.0	9.0±1.0	11.4±1.0
CSM0612	5000Pcs	8mm	7inch	178±5.0	60±2.0	13.0±1.0	9.0±1.0	11.4±1.0
CSM0815	4000Pcs	12mm	7inch	178±5.0	60±2.0	13.0±1.0	13.0±1.0	15.5±1.0
CSM1225	4000Pcs	12mm	7inch	178±5.0	60±2.0	13.0±1.0	13.0±1.0	15.5±1.0
CSM2139	2000Pcs	24mm	7inch	178±5.0	60±2.0	13.0±1.0	24.5±1.0	26.5±1.0



Reel Dimensions



### Order Codes

#### Order Codes (CSM)

CSM	0603		F	TR		D	U	R015		M
Product Type	Dimensions (L×W)(mm)		Resistance Tolerance (%)	Package		TCR (PPM/°C)	Power Rating(W)	Resistance (Ω)		Marking
CSM	0603	1.60x0.80	D ±0.5%	TR	Taping Reel	D ±50 PPM/°C	W 1/8W	R015	0.015Ω	M MnCu
	0805	2.00x1.20	F ±1%			W ±75 PPM/°C	V 1/4W	R050	0.05Ω	C Cu Alloy
	1206	3.20x1.60				E ±100 PPM/°C	O 1/3W	R010	0.01Ω	
	2010	5.08x2.54					U 1/2W			
	2512	6.40x3.20					Q 3/4W			
	3921	11.10x5.10					T 1W			
	4527	11.60x7.10					A 1.5W			
	0508	1.35x2.10					S 2W			
	0612	1.60x3.20					R 3W			
	0815	2.20x3.80					4 4W			
	1225	3.20x6.40					5 5W			
	2139	5.10x11.10								





## General Information

### Applications of Current Detecting Components

DeMint's TCS and CS Series unique form factor provides automotive designers with several advantages. Both TCS and CS Series are ideal for applications involving window lift motors, fuel pump systems, seat belt pretensioners, and pulsewidth modulator feedback.

The wider resistive element and lower resistance enables higher current to pass through the device. DeMint's LRC ultra low ohmic metal strip chip series provides the inherent ability to flex slightly and offers stress relief during extreme temperature cycling on typical or metal substrates. This LRC series is suitable for switch power supply applications (DC-DC Converter, Charger, Adaptor) and power management of monitor.

The open air design of bare element resistor LRA and LRB Series provide a far cooler operation by allowing more air flow under the resistive element to keep excess heat from being transmitted to the PC board. They are suitable for high power AC/DC detection of power supply circuit.

DeMint axial moulded BWL series provides power rating up to 10 watts and lower resistance 0.005Ω, is ideal for all types of current sensing applications including switching and linear power supplies, instruments and power amplifiers..

### Your Current Options - DeMint Current Sense

As the world becomes more and more technology-driven, the uses for current sensing components will continue to increase. The need for even lower resistance value ranges is already becoming evident, as is the need for these resistors to handle more power. The industry-wide trend is the emergence of smaller and smaller products.

DeMint Electronics offers a wide variety of current sensing products from the industry to military standards, such as current sense in Thin-Film / Thick-Film Technology, Bare Element Resistors, and Open Air Shunts. This enables DeMint to present an astounding number of possible solutions for any circuit design needs.

### Cross reference - Current-Sensing Chips

DeMint	Yageo	Vishay	Rohm	KOA	Cyntec	TT/IRC	Susumu	Features
CS	RL/PT	D..LR/ CRCW,RCWE	UCR	SR73/ UR73	RLT	LRC, LRF, LVC	RLT	Thick Film
LRC, LRP, LRM, LRE, LREA, CSM	PR/PE	WSL/WSLP	PMR/PML	TLR	RLT	ULR, LVC	KRL, RL	Metal Alloy
CS02	PT0402	RCWE0402	UCR01	SR731E	RLT0510	LVC0402	RLT0510	Thick Film
CSM, LRE, LREA	PE0603	WSL0603	PMR03	-	RL0816	-	-	Metal Foil
CSM, LRE, LREA	PE0805	WSL0805	PMR10	-	RL1220	-	-	Metal Foil
CSM, LRE, LREA	PE4527	WSR2/3/5	-	SL2/ SLN2	-	-	-	Metal Alloy