

Metal Alloy Low-Resistance Resistor Specifications

November 2010

Specification Number : SPEC-011-14

Issued Date : 2010/11/12



1. Scope:

- 1.1 This specification is covered following products:
 - 1.1.1 LR1206 series.
 - 1.1.2 LR2010 series.
 - 1.1.3 LR2512 series.
 - 1.1.4 LR2725 series.
 - 1.1.5 LR2728 series.

2. Product Features:

- 2.1 Ideal for all types of current sensing, voltage division and pulse applications including switching and linear power supplies, Instruments, power amplifiers.
- 2.2 Proprietary processing technique produces extremely low Resistance values.
- 2.3 High-temperature performance (up to +170°C).
- 2.4 Metal Strip resistive material stable and ultra low T.C.R.. Low and Stable T.C.R. $\leq \pm 50 \text{ppm}/^\circ\text{C}$.
- 2.5 Pure tin plating provides compatibility with lead (Pb) free and lead containing soldering processes.
- 2.6 Compatible with "Restriction of the use of Hazardous Substances" (RoHS) directive 2002/95/EC (issue 2004).
- 2.7 PFOS, PFOA, PAHs, Halogen free and REACH compliant.
- 2.8 Excellent stability ($|\Delta R/R1| \leq \pm 1.0 \%$ for 1,000 h at 70°C) different environmental conditions.
- 2.9 High volume product suitable for commercial and special applications.
- 2.10 Suitable for high precision current sensing circuit protection application.
- 2.11 Miniature size suitable for compact Print Circuit Boards of high-precision electronic products.

Remark: $\Delta R = (\text{resistance after stress} - \text{resistance before stress})$; R1 means resistance before stress

3. Product Applications:

- 3.1 Power Supply.
 - 3.2 Battery Pack.
 - 3.3 DIY Tools.
 - 3.4 Inverter/Converter (AC/DC, DC/DC, DC/AC).
 - 3.5 Measurable Instrument.
 - 3.6 Consumer Electrics.
 - 3.7 Note Book.
 - 3.8 PC Power Pack.
 - 3.9 LED Driver.
 - 3.10 Others (Auto Tronics... etc.).
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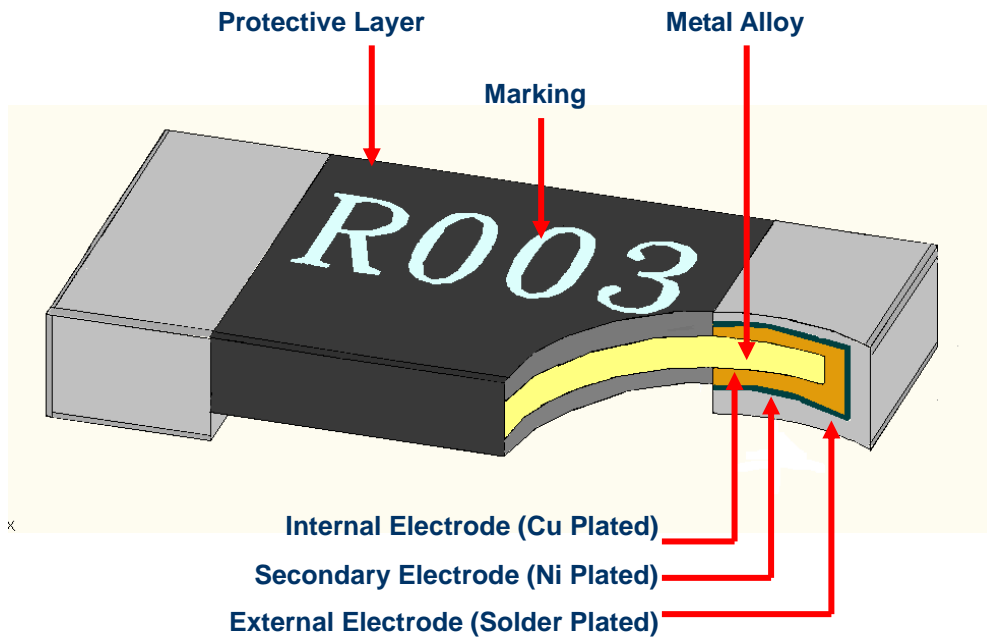
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4. Product Description:

- 4.1 The resistors are constructed in a high grade Materials. 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.
- 4.2 The resistive layer is covered with a protective coat, and two external end terminations are added. Wrap-around terminations have an electroplated nickel barrier and pure Tin (lead free) finish, ensuring excellent 'leach' resistance properties and solderability.



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5. Product Specifications:

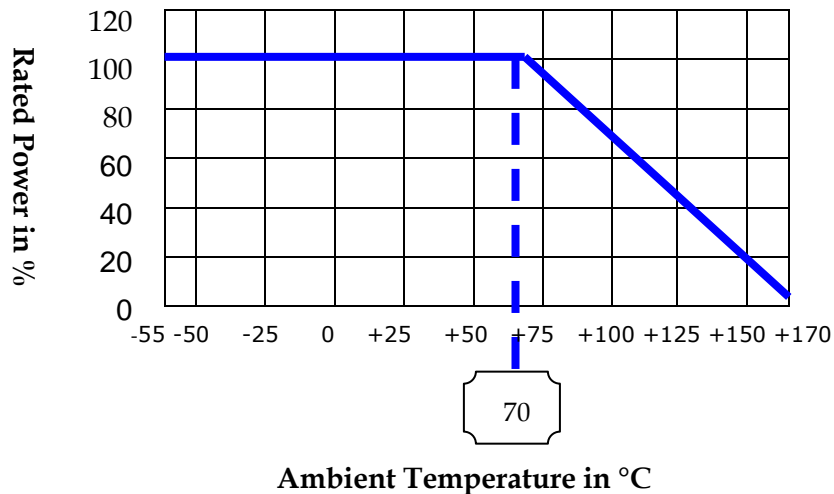
Type	# of Terminals	Max. Rating Power	Max. Rating Current	Max. Overload Current	T.C.R. (ppm/°C)	Resistance Range (mΩ)**		Operating Temperature
						D (±0.5%)	F (±1%); G (±2%); J (±5%)	
LR1206		0.5W	22.36A	44.72A	1.0~4.0m : ±50 4.1~15.0m : ±25 15.1~50.0m : ±15	7.0~50.0	1.0~50.0	-55~+170°C
		1W	31.62A	63.25A	1.0~4.0m : ±50 4.1~15.0m : ±25 15.1~50.0m : ±15	7.0~50.0	1.0~50.0	
LR2010		1W	31.62A	63.25A	1.0~3.0m : ±50 3.1~6.9m : ±25 7.0~100m : ±15	7.0~100	1.0~100	
LR2512	2	1W	44.72A	100.00A	0.5~3.0m : ±50 3.1~6.9m : ±25 7.0~100m : ±15	7.0~100	0.5~100	
		1.5W	54.77A	122.48A	7.0~100m : ±15			
		2W	63.25A	141.42A	0.5~3.0m : ±50 3.1~6.9m : ±25 7.0~75.0m : ±15	7.0~75.0	0.5~75.0	
		3W	77.46A	134.16A	0.5~2.5m : ±50 2.6~10.0m : ±25	7.0~10.0	0.5~10.0	
LR2725		4W	126.49A	252.95A	0.25~0.9m : ±50 1.0~3.0m : ±25	--	0.25~3.0	
LR2728		3W	27.39A	47.43A	4.0~7.0m : ±25 7.1~100m : ±15	4.0~100	4.0~100	
		3.5W	29.58A	51.23A	4.0~7.0m : ±25 7.1~100m : ±15	4.0~100	4.0~100	
		4W	31.62A	63.25A	4.0 ~ 7.0m : ±25 7.1 ~ 50.0m : ±15	4.0~50.0	4.0~50.0	

Remark:

- a. The Max. Power Rating is operated at 70°C.
- b. "***" special tolerance and range of resistance are under requested.

6. Power Derating Curve:

- 6.1 The Operating Temperature Range: -55°C ~+170°C.
- 6.2 For resistors operated in ambient temperatures 70°C, power rating must be derated in accordance with the curve below:



7. Rating Current:

- 7.1 The following equation may be used to determine the DC (Direct Current) or AC (Alternating Current) currents (RMS, root mean square value) of normal rated power. However, if the result value exceeds the highest current of regulated standards (paragraph 5), the highest normal rated power is to be used.

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

Remark:

- a. I: Rating Current.
- b. P: Rating Power.
- c. R: Resistance.

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8. Order Information:

Model (Size)	Number of Terminals	Power Rating (Watts)	Resistance*	Tolerance** (D=±0.5%; F=±1.0%; G=±2%; J=±5.0%)	Packing***
<u>LR1206</u>	<u>2</u>	<u>C</u> (0.5W)	<u>R001</u> EX : R001=1mΩ ; R010=10mΩ	<u>F</u>	<u>4</u>
<u>LR1206</u>	<u>2</u>	<u>1</u>	<u>R001</u> EX : R001=1mΩ ; R010=10mΩ	<u>F</u>	<u>4</u>
<u>LR2010</u>	<u>2</u>	<u>1</u>	<u>R001</u> EX : R001=1mΩ ; R100=100mΩ	<u>F</u>	<u>2</u>
<u>LR2512</u>	<u>2</u>	<u>1</u>	<u>R001</u> EX : R001=1mΩ ; R0005=0.5mΩ	<u>F</u>	<u>2</u>
<u>LR2512</u>	<u>2</u>	<u>A</u> (1.5W)	<u>R001</u> EX : R001=1mΩ ; R010=10mΩ	<u>F</u>	<u>2</u>
<u>LR2512</u>	<u>2</u>	<u>2</u>	<u>R001</u> EX : R001=1mΩ ; R010=10mΩ	<u>F</u>	<u>2</u>
<u>LR2512</u>	<u>2</u>	<u>3</u>	<u>R001</u> EX : R001=1mΩ ; R010=10mΩ	<u>F</u>	<u>2</u>
<u>LR2725</u>	<u>2</u>	<u>4</u>	<u>R001</u> EX : R001=1mΩ ; R00025=0.25mΩ	<u>F</u>	<u>1</u>
<u>LR2728</u>	<u>2</u>	<u>3</u>	<u>R004</u> EX : R004=4mΩ ; R010=10mΩ	<u>F</u>	<u>1</u>
<u>LR2728</u>	<u>2</u>	<u>B</u> (3.5W)	<u>R004</u> EX : R004=4mΩ ; R010=10mΩ	<u>F</u>	<u>1</u>
<u>LR2728</u>	<u>2</u>	<u>4</u>	<u>R004</u> EX : R004=4mΩ ; R010=10mΩ	<u>F</u>	<u>1</u>

Remark:

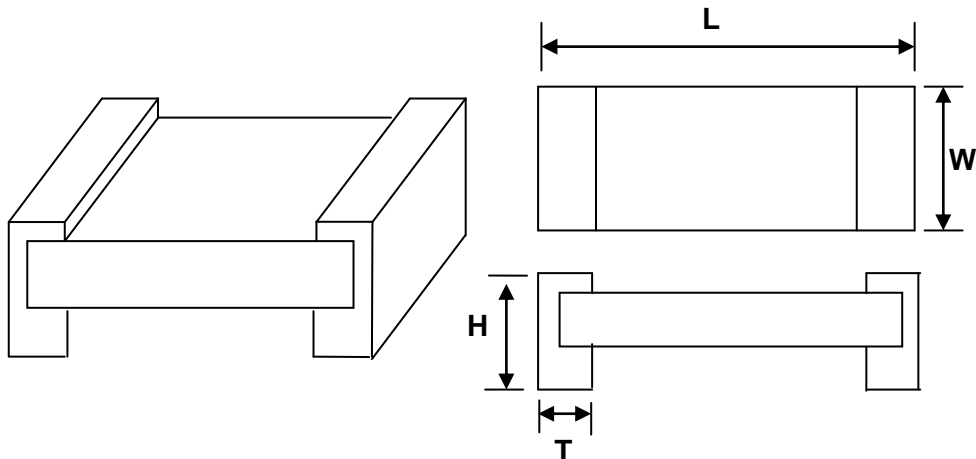
- "*" normal product order information has 4 digits, if includes one decimal point then the order information should be 5 digits (e.g. 0.5mΩ is R0005), if includes 2 decimal points, then it should be 6 digits (e.g. 0.25mΩ is R00025).
- The detail marking format please refer to paragraph 13
- "***" Special tolerance and range of resistance are under requested.

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d. "***" The packing quantity: 4 means 4k pieces per reel; 2 means 2k pieces per reel; 1 means 1k pieces per reel

9. Physical Dimensions:



Type	Maximum Power Rating (Watts)	Resistance Range (mΩ)	Dimensions - in inches (millimeters)					
			L	W	H	T		
LR1206	0.5 & 1.0	1.0 ~ 50.0	0.126±0.010 (3.200±0.254)	0.063±0.010 (1.600±0.254)	0.0254±0.010 (0.645±0.254)	0.020±0.010 (0.508±0.254)		
LR2010	1.0	1.0 ~ 3.0	0.200±0.010 (5.080±0.254)	0.100±0.010 (2.540±0.254)	0.031±0.010 (0.787±0.254)	0.051±0.010 (1.295±0.254)		
		3.1 ~100.0			0.0254±0.010 (0.645±0.254)	0.031±0.010 (0.787±0.254)		
LR2512	1.0 & 1.5	0.5 ~ 4.0	0.246±0.010 (6.248±0.254)	0.130±0.010 (3.302±0.254)	0.031±0.010 (0.787±0.254)	0.074±0.010 (1.880±0.254)		
		4.1 ~75.0			0.0254±0.010 (0.645±0.254)	0.044±0.010 (1.118±0.254)		
		75.1 ~ 100.0			0.0254±0.010 (0.645±0.254)	0.034±0.010 (0.868±0.254)		
LR2512	2.0	0.5 ~ 4.0	0.246±0.010 (6.248±0.254)	0.130±0.010 (3.302±0.254)	0.031±0.010 (0.787±0.254)	0.074±0.010 (1.880±0.254)		
		4.1 ~75.0			0.0254±0.010 (0.645±0.254)	0.044±0.010 (1.118±0.254)		
LR2512	3.0	0.5	0.268±0.010 (6.807±0.254)	0.254±0.010 (6.452±0.254)	0.031±0.010 (0.787±0.254)	0.074±0.010 (1.880±0.254)		
		0.6 ~ 2.9 & 4.1 ~ 10.0				0.044±0.010 (1.118±0.254)		
		3.0 ~ 4.0				0.066±0.010 (1.676±0.254)		
LR2725	4.0	0.25, 0.50	0.268±0.010 (6.807±0.254)	0.254±0.010 (6.452±0.254)	0.039±0.010 (0.991±0.254)	0.085±0.010 (2.159±0.254)		
		1.0					0.043±0.010 (1.092±0.254)	
		1.5					0.039±0.010 (0.991±0.254)	
		2.0					0.035±0.010 (0.889±0.254)	0.071±0.010 (1.803±0.254)
		2.5						0.065±0.010 (1.651±0.254)

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		3.0				0.051±0.010 (1.295±0.254)
LR2728	3.0、3.5 & 4.0	4.0~100.0	0.264±0.010 (6.706±0.254)	0.283±0.010 (7.188±0.254)	0.039±0.010 (0.991±0.254)	0.045±0.010 (1.143±0.254)

10. Product Reliability Performance:

10.1 Electrical Performance:

Test Item	Conditions of Test	Test Method	Test Limits
Temperature Coefficient of Resistance (T.C.R.)	<ul style="list-style-type: none"> T.C.R. (ppm/°C) = $\frac{(R2-R1)}{R1 (T2-T1)} \times 10^6$ R1 : resistance of room temperature (T1) R2 : resistance of 150°C (T2) 	JIS C 5201-1 4.8	Per Spec. (refer to paragraph 5)
Short Time Overload	<p>The number of rated power are as follows:</p> <ul style="list-style-type: none"> LR1206-0.5W : 4 times rated power LR1206-1W : 4 times rated power LR2010-1W : 4 times rated power LR2512-1W : 5 times rated power LR2512-1.5W : 5 times rated power LR2512-2W : 5 times rated power LR2512-3W : 3 times rated power LR2725-4W : 4 times rated power LR2728-3W : 3 times rated power LR2728-3.5W : 3 times rated power LR2728-4W : 4 times rated power <p>Rating power duration: 5secs</p>	JIS C 5201-1 4.13	$(\Delta R/R1) \leq \pm 0.5\%$
Insulation Resistance	100±15V _{DC} for 1 minute	JIS C 5201-1 4.6	$\geq 10^9 \Omega$
Dielectric Withstanding Voltage	Applied 500V _{AC} for 1 minute, and Limit surge current 50 mA (max.)	JIS C 5201-1 4.7	Without break down

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10.2 Mechanical /Constructional Performance:

Test Item	Conditions of Test	Test Method	Test Limits
Resistance to Solder Heat	Solder temp./immersion time: 260±5°C, 10±1secs and 350±10°C, 3.5±0.5secs	JIS C 5201-1 4.18	($\Delta R/R1$) ≤ ±0.5%
Solderability test	Specimen prep.: 4 hours ± 15 min. Steam Aging : Solder Bath/Dip and Look Test, 245±5°C, 3±1secs	JIS C 5201-1 4.17	95% coverage
Vibration	Frequency varied 55Hz in one minute, 3 orientations @ Total duration 12 hours	JIS C 5201-1 4.22	($\Delta R/R1$) ≤ ±0.5%
Resistance to solvent	Immersion time: 60±5secs @ 20°C~25°C	JIS C 5201-1 4.29, 4.30	($\Delta R/R1$) ≤ ±0.5%
Mechanical Shock	100 grams for 6 milliseconds, 5 pulses	JIS C 5201-1 4.21	($\Delta R/R1$) ≤ ±0.5%

10.3 Environmental Performance:

Test Item	Conditions of Test	Test Method	Test Limits
Low Temperature Exposure (Storage)	1,000 hours @ -55°C	JIS C 5201-1 4.23.4	($\Delta R/R1$) ≤ ±0.5%
High Temperature Exposure (Storage)	1,000 hours @ +170°C	JIS C 5201-1 4.23.2	($\Delta R/R1$) ≤ ±1.0%
Temperature Cycling (Rapid Temperature Change)	Air to air, -55°C to +150°C, 1,000 cycles, 15 minutes at each extreme, transition time 2 to 3 minutes	JIS C 5201-1 4.19	($\Delta R/R1$) ≤ ±0.5%
Moisture Resistance (Climatic Sequence)	Mil-STD-202, Method 106, 0% power, 7a and 7b not required, t = 24 h/cycle, 10 cycles, Unpowered,	JIS C 5201-1 4.23	($\Delta R/R1$) ≤ ±0.5%
Bias Humidity	+ 85°C, 85% RH, 10% Bias, 1.5 hours On, 0.5 hours Off; extended life test: 1,000 hours,	JIS C 5201-1 4.24	($\Delta R/R1$) ≤ ±0.5%

10.4 Operational Life Endurance:

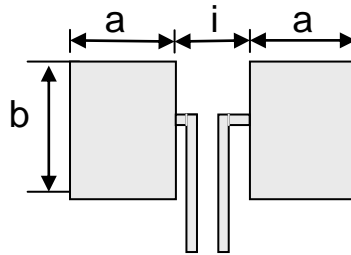
Test Item	Conditions of Test	Test Method	Test Limits
Load Life	Test temperature 70°C rated working voltage, 1.5 hours On , 0.5 hours Off; extended life test: 1,000 hours	JIS C 5201-1 4.25.1	($\Delta R/R1$) ≤ ±1.0%

Remark: ΔR = (resistance after stress – resistance before stress); R1 means resistance before stress

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11. Recommend Solder Pad Dimensions:



Sense

Type	Maximum Power Rating (Watts)	Resistance Range (mΩ)	Dimensions - in inches (millimeters)		
			a	b	i
LR1206	0.5 & 1.0	1.0 ~ 50.0	0.063 (1.60)	0.086 (2.18)	0.026 (0.66)
LR2010	1.0	1.0 ~ 3.0	0.114 (2.89)	0.115 (2.92)	0.048 (1.22)
		3.1 ~ 100.0	0.090 (2.29)	0.115 (2.92)	0.095 (2.41)
LR2512	1.0 & 1.5	0.5 ~ 4.0	0.120 (3.05)	0.145 (3.68)	0.050 (1.27)
		4.1 ~ 100.0	0.083 (2.11)	0.145 (3.68)	0.125 (3.18)
LR2512	2.0	0.5 ~ 4.0	0.120 (3.05)	0.145 (3.68)	0.050 (1.27)
		4.1 ~ 75.0	0.083 (2.11)	0.145 (3.68)	0.125 (3.18)
LR2512	3.0	0.5	0.120 (3.05)	0.145 (3.68)	0.050 (1.27)
		0.6 ~ 2.9 & 4.1 ~ 10.0	0.086 (2.19)	0.145 (3.68)	0.118 (3.00)
		3.0 ~ 4.0	0.110 (2.79)	0.145 (3.68)	0.071 (1.80)
LR2725	4.0	0.25 ~ 3.0	0.125 (3.18)	0.270 (6.86)	0.052 (1.32)
LR2728	3.0、3.5 & 4.0	4.0 ~ 100.0	0.108 (2.75)	0.308 (7.82)	0.138 (3.51)

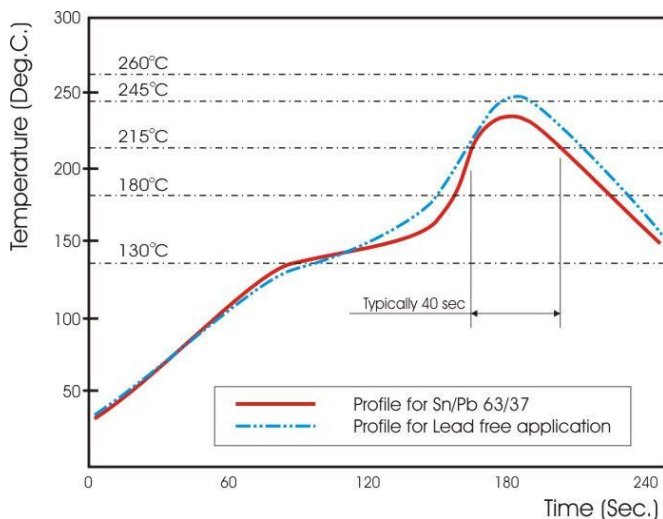
Remark: The total solder pad trace sizes are recommended as follows:

Unit: mm²

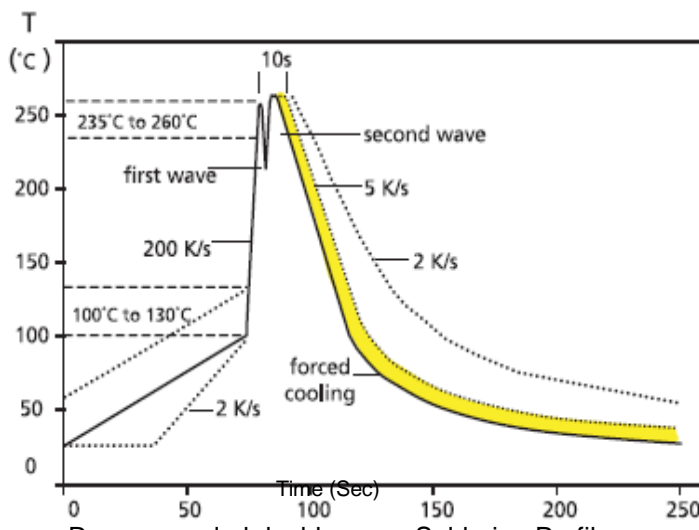
Power	LR1206	LR2010	LR2512	LR2725	LR2728
0.5W	100	--	--	--	--
1.0W	100	100	100	--	--
1.5W	--	--	200	--	--
2.0W	--	--	300	--	--
3.0W	--	--	400	--	300
3.5W	--	--	--	--	350
4.0W	--	--	--	400	400

12. Recommend Soldering Conditions:

12.1 Surface-mount components are tested for solderability at a temperature of 245 °C for 3 seconds. Typical examples of soldering processes that provide reliable joints without any damage are given in below:



Recommended IR Reflow Soldering Profile



Recommended double-wave Soldering Profile

Typical values (solid line)

Process limits (dotted line)

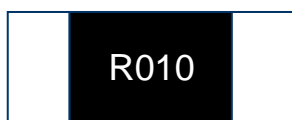
13. Marking Format:

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

- a. "R" designates the decimal location in ohms, e.g.
 - For 1mΩ the product marking is R001;
 - For 25mΩ the product marking is R025;
 - For 100mΩ the product marking is R100.
- b. "m" designates the decimal location in milliohms, e.g.
 - For 0.25mΩ the product marking is 0m25;
 - For 0.5mΩ the product marking is 0m50;
 - For 5.5mΩ the product marking is 5m50;
 - For 25.5mΩ the product marking is 25m5.

Remark: all the products marking are 4 digits.

13.2 LR1206 series:



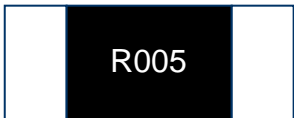
Ex. Resistance 10mΩ (for all LR1206 products)

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13.3 LR2010 series:

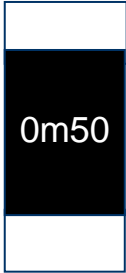


Ex. Resistance 2mΩ (when resistance below or equal than 3mΩ)



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

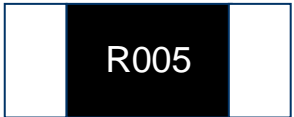
13.4 LR2512 series:



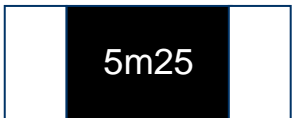
Ex. Resistance 0.5mΩ (when resistance below than 1mΩ)



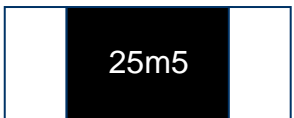
Ex. Resistance 3mΩ (when resistance below or equal than 4mΩ)



Ex. Resistance 5mΩ (when resistance greater than 4mΩ)



Ex. Resistance 5.25mΩ (when resistance greater than 4mΩ)



Ex. Resistance 25.5mΩ (when resistance greater than 4mΩ)

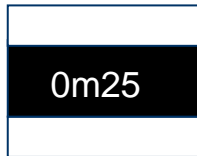
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13.5 LR2725 series:



Ex. Resistance 0.25m Ω (or 0.25m Ω only)

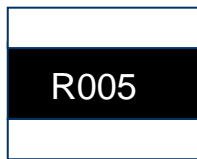


Ex. Resistance 2.5m Ω (for 1.5m Ω and 2.5m Ω only)



Ex. Resistance 3m Ω (for 1m Ω , 2m Ω and 3m Ω only)

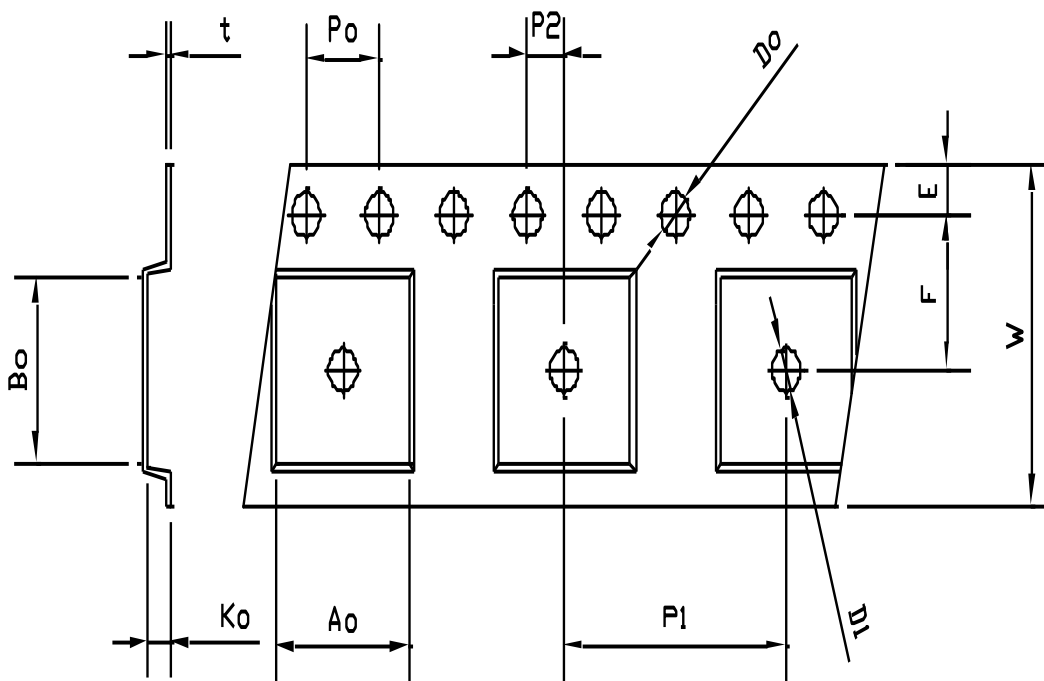
13.6 LR2728 series:



Ex. Resistance 5m Ω (for all LR2728 products)

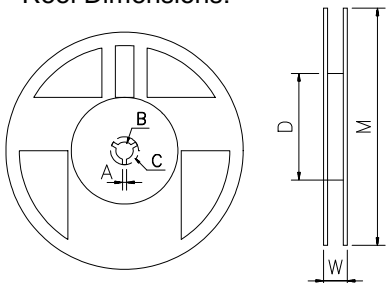
14. Packaging:

14.1 Embossed Dimensions:



Item	W	P1	E	F	Do	D1	P0	Po*10	P2	Ao	Bo	Ko	t
LR1206	8.00	4.00	1.75	3.50	1.55	1.00	4.00	40.00	2.00	1.83	3.48	0.90	0.20
LR2010	12.00	4.00	1.75	5.50	1.50	1.50	4.00	40.00	2.00	2.90	5.45	1.10	0.23
LR2512	12.00	8.00	1.75	5.50	1.55	1.50	4.00	40.00	2.00	3.90	6.74	1.08	0.24
LR2725	12.00	8.00	1.75	5.50	1.50	1.50	4.00	40.00	2.00	6.75	7.15	1.70	0.25
LR2728	12.00	12.00	1.75	5.50	1.55	1.55	4.00	40.00	2.00	7.70	7.15	1.20	0.25
Tolerance	±0.15	±0.10	±0.10	±0.10	±0.05	±0.10	±0.10	±0.20	±0.10	±0.10	±0.10	±0.10	±0.05

14.2 Reel Dimensions:



Reel Type / Tape	W	M	A	B	C	D
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 8 mm embossed (for LR1206 only)	12.00 ± 0.5	178 ± 1.0	2.0 ± 0.5	13.2 ± 0.5	17.7 ± 0.5	60.0 ± 0.5

1. Product overview

Current sensors are indispensable to the accurate sensing of current and advanced technology, miniaturization of and energy saving requirements for electronic devices drastically have increased needs for the current sensors.

Our current sensors consist of a low resistance metal resistive element and stable to changes in temperature. It senses current by the potential difference between both terminals and features the ease of use and cost in comparison with magnetic reluctances or current transformers. In addition, the metal electrodes, the metal resistive element and non-wirewound structure improve "Surge current handling capabilities", "Flexibility against thermal shrinkage/expansion", "Frequency response", "Terminal strength" and "Solderability".

The wide selection of the current sensors such as SMD for miniaturization, 4 terminal type for accurate measurement, metal resistor type and etc. is available.

概要

電流センサは正確な電流の検出のために不可欠な部品であり、近年の電子機器の小型・薄型化、省電力化、高性能化に伴い電流センサのニーズが高まっています。

当社の電流センサは抵抗体に銅ニッケル合金板を使用しているために、温度係数が小さく広い範囲の温度に対して安定し、過渡電力にも強い低抵抗の抵抗器です。SMD型電流センサは抵抗体が金属電極に溶接されエポキシ系樹脂で絶縁モールドした構造をしているため、寸法精度が良く、熱膨張収縮を吸収し、端子強度が強く、半田付け性に優れています。その他、大電流用に絶縁被覆のない金属板型の電流センサがあります。

磁気抵抗素子や電流トランスを使用する方式に比べて非常に簡便、安価です。

2. Features

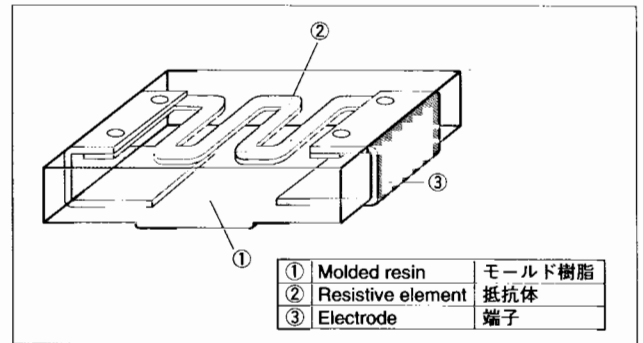
- (1) Wide operating temperature ranges
-55°C to 155°C, -55°C to 180°C
- (2) Small temperature-resistance coefficient
Typical less $\pm 100\text{ppm}/^\circ\text{C}$ (Less $\pm 50\text{ppm}/^\circ\text{C}$ available)
- (3) Flexible to thermal expansion and shrinkage
- (4) Improved surge current handling capabilities
- (5) Excellent frequency response
- (6) Improved physical dimensions tolerance and shock absorbance
- (7) Improved terminal strength and solderability

特徴

- (1) 使用温度範囲が広い。
-55°C~155°C, -55°C~180°C
- (2) 抵抗温度係数が小さい。
 $\pm 100\text{ppm}/^\circ\text{C}$ 以下 ($\pm 50\text{ppm}/^\circ\text{C}$ 以下もある)
- (3) 熱膨張、収縮に強い。
- (4) サージ限界電力が大きい。
- (5) 周波数特性が良い。
- (6) 寸法精度が良く、耐衝撃性に優れている。
- (7) 端子強度、半田付け性に優れている。

3. Structure

構造

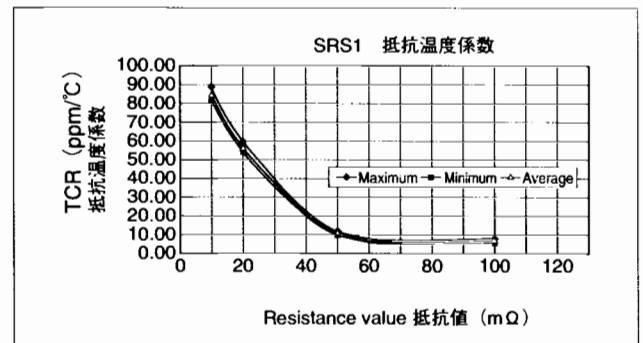


4. Other properties 諸特性

(1) Temperature-coefficient of resistor (TCR) 抵抗温度係数

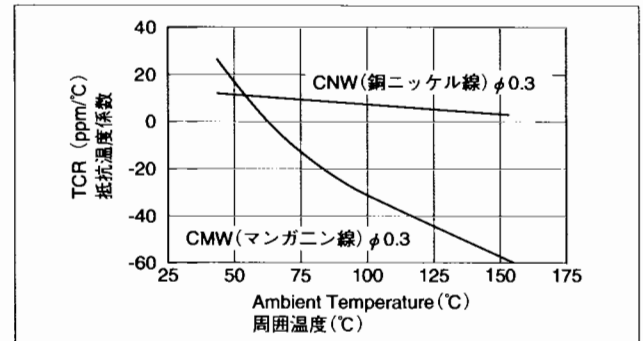
The TCR of our current sensors as follows:

電流センサの抵抗温度係数の実力値を以下に示します。



The Cu-Ni resistive element keeps the TCR stable even at higher temperature range

抵抗体の銅ニッケル合金は高温領域でも温度係数が安定しています。

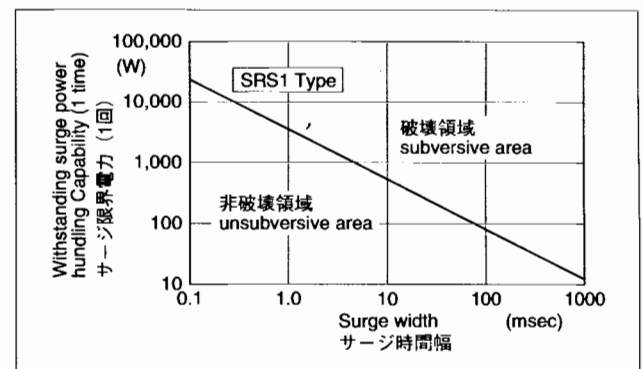


(2) Surge Handling Capability

サージ限界電力

The metal resistive element improves the surge handing capabilities as shown below:

抵抗体が金属板のためサージ限界電力が大きい。



5. Application

(1) Power supply controlling IC circuit

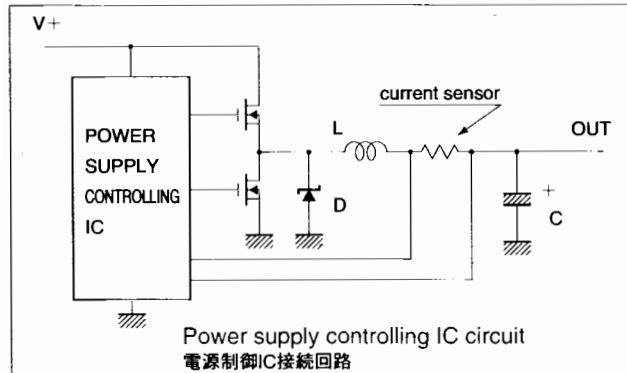
Detection of abnormal current by a current sensor in a protection circuit triggers power supply control IC to regulate or terminate a supply of power to MOSFET thereby protect a rechargeable battery and/or components connected to the circuit.

用途、応用例

バッテリーバック保護

電流センサはノートパソコン等のバッテリーバックを保護するため電源制御用ICと共に使用されます。

電流センサに異常電流が流れるとICが動作しMOSFETへの電圧供給が停止され、MOSFET、HDD等の負荷、バッテリーバック等を保護します。

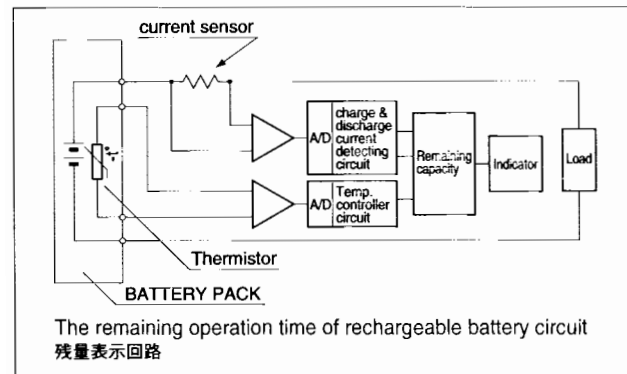


(2) Remaining operation time of rechargeable battery

The remaining operation time of a rechargeable battery is calculated and indicated by monitoring and/or measuring of current level during charge/discharge process by a current sensor to determine a charge status and consumption.

バッテリーバックの残量表示回路

残量表示回路は、電流センサで充放電時の電流を検出し、受電量、使用量を積算して、2次電池の残量を表示します。

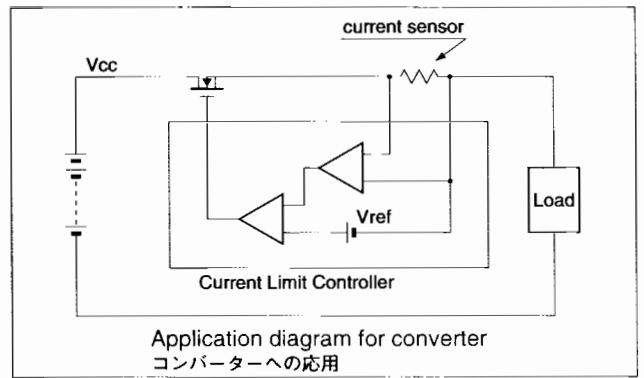


(3) DC-DC converter

Current sensor is utilized to detect the over current in a DC-DC converter and placed inside or outside of the converter. The following is one of examples for the use of a current sensor in the FET activating circuit in a DC-DC converter.

DC-DCコンバータ

電流センサはDC-DCコンバータの過電流を検出するため必要です。コンバータに内蔵する場合と機器本体に取付けられる場合があります。一例としてDC-DCコンバータのFET駆動検出用回路を示します。

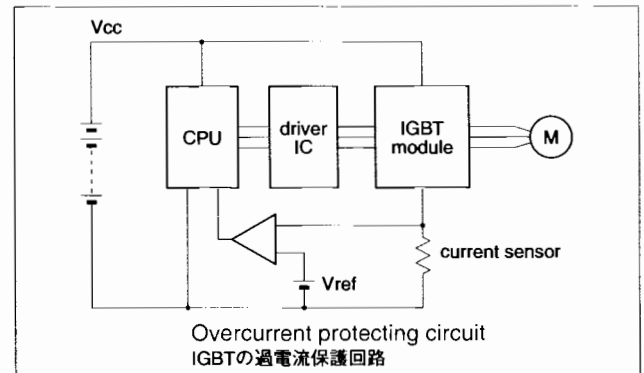


(4) Overcurrent protecting circuit

Current sensor in serial with IGBT in the inverter circuit detect over-current.

インバータ

インバータ回路において電流センサはIGBTに直列接続され、過電流を検出します。

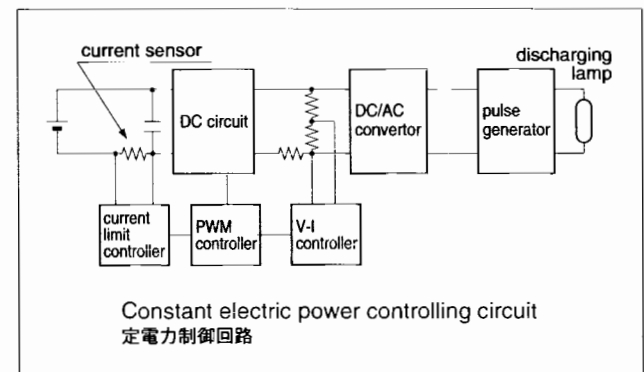


(5) Electric power controlling circuit

Constant electric power circuit for the Metal-Halide Lamp utilizes current sensor to measure the level of current to regulate the input-current to supply the constant power.

自動車のヘッドライト

自動車のメタルハライドランプは、電流センサの検出電流に応じて入力電流を制限し定電力に制御します。



(6) Others

Switching power supply, Measuring device, Household electrical appliances, Electric tools, Fans, Power mirror, Power window, Machine tools

その他の用途

スイッチング電源、測定器、家電製品（クリーナー、ジューサー）、電動工具、ファン、オートミラー、パワーウィンドウ、工作機械等。