LS Series

Low Resistance Metal Strip Current Sensing Chip Resistors

Version. B

FEATURE

- RoHS and Halogen free compliance.
- Low resistance down to 0.5mΩ
- Tight TCR narrow to ±50ppm/℃
- High power up to 7 watts
- Excellent reliability and stability
- High precision current sensing and voltage division
- Applications:
  - Intelligent home appliance
  - Electric tools
  - Consumer electronics
  - Industrial equipment
  - Battery management system
  - Power supply, AC/DC Converter, Battery pack, Charger, Adaptor
  - Voltage Regulation Module (VRM)

MANUFACTURER PART NO.

For example: LS1206F0R001T5100 – LS1206 ±1% 0R001 1W T/R-5,000

Series	Size	Tol.	Value	PKG	SPQ	Power	TCR
2 codes	4 codes	1 code	2~5 codes	1 code	1 code	1 code	2 codes
LS	1206	F	0R001	T	5	1	00
Low Resistance Metal Strip Current Sensing Chip Resistors	1206 2512 4527	D=±0.5% F=±1% G=±2% J=±5%	0R001[1]=0.001Ω, 1mΩ 0R05=0.05Ω, 50mΩ 0R5=0.5Ω, 500mΩ	T=T/R[2]	3=3,000 4=4,000 5=5,000	N=1/2W 1=1W 2=2W 3=3W 4=4W 5=5W 7=7W	50=50PPM/℃ 00=Refer to table as below.

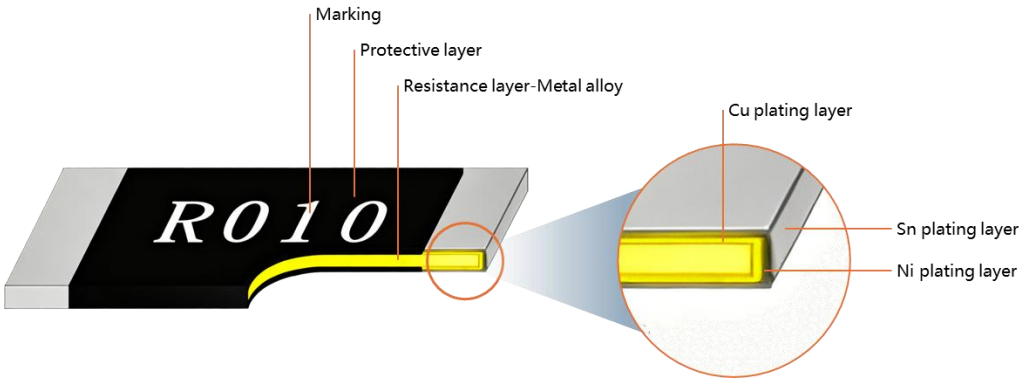
Note: ① R=Radix, 10^0, Ω ② T/R=Taping in Reel Package type

CHARACTERISITICS

Type	Rated power	Value Range ±0.5%/±1%/±2%/±5%	Max. Rated Current (A)	Max. Overload Current (A)	TCR (PPM/℃)	Terminal Type	Working Temp.
LS1206	1/2W	101 mΩ <R<200 mΩ	2.22	4.98	±50	Small	-65℃ ~ +170℃
	1W	1 mΩ≤R≤ 4 mΩ	31.62	70.71	±350	Small	
		5 mΩ≤R≤100 mΩ	14.14	31.62	±50	Small	
LS2512	2W	0.5 mΩ≤R≤ 4 mΩ	63.25	141.42	±50	Big	
		1 mΩ≤R≤ 2 mΩ	44.72	100.00	±350	Small	
		3 mΩ≤R≤500 mΩ	25.82	57.73	±50	Small	
	3W	0.5 mΩ≤R≤ 4 mΩ	77.46	173.21	±50	Big	
		1 mΩ≤R≤ 2 mΩ	54.77	122.47	±350	Small	
		3 mΩ≤R≤500 mΩ	31.62	70.71	±50	Small	
LS4527	4W	101 mΩ <R<200 mΩ	6.29	14.06	±50	Small	
	5W	1 mΩ≤R≤ 3 mΩ	70.71	158.11	±75	Small	
		4 mΩ≤R≤100 mΩ	35.36	79.06	±50	Small	
	7W	1 mΩ≤R≤ 3 mΩ	83.67	187.08	±75	Small	
		4 mΩ≤R≤100 mΩ	41.83	93.54	±50	Small	

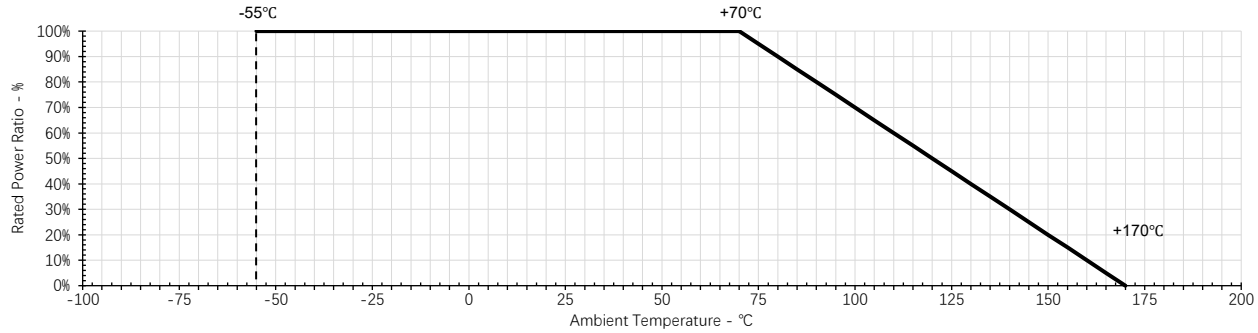
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CONSTRUCTION



Note: Resistive layer component is Manganin alloy.

POWER DERATING CURVE



RATED CURRENT

The resistor shall have a Rated Current which would be DC or AC corresponding to the Rated Power, and it can be calculated by formula as below.

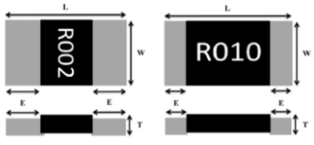
The Rated Current of certain resistance value should be the calculated result or Max. Working Current of product series whichever less.

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

I=Rated current (A)
P=Rated power (W)
R=Nominal resistance (Ω)

DIMENSIONS

Unit: mm

Figure	Type	Terminal Type	L±0.20	W±0.20	T	E±0.20
	LS1206	/	3.20	1.60	0.60±0.20	0.50
	LS2512	Big	6.4	3.2	0.80±0.20	2.20
		Small	6.4	3.2	0.80±0.20	0.90
	LS4527	/	11.6	6.9	1.00±0.10	2.00

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RELIABILITY

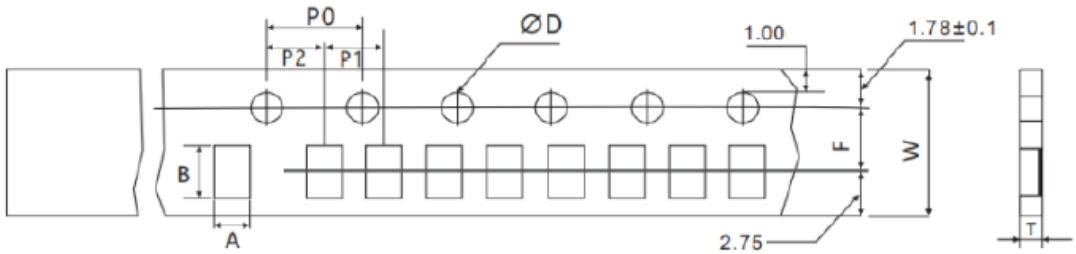
Item	Test Method	Acceptable Criterion
Temperature Coefficient of Resistance	$TCR(PPM/℃) = \frac{(R_2 - R_1)}{R_1(T_2 - T_1)} \times 10^6$ R_1: Resistance value tested at room temperature (Ω) R_2: Resistance value tested at +125℃ or +155℃ T_1: Room temperature (℃) T_2: Test Temperature (℃) Reference: IEC 60115-1 4.8	Refer to Characteristic
High Temperature Exposure (Storage)	T=+125℃, 1000hrs., unpowered. Measurement at 24±4 hrs. after test conclusion. Reference: MIL-STD-202 Method 108	△R/R=±1%
Low Temperature Exposure (Storage)	T=-55±2℃, 1000hrs., unpowered. Measurement at 45 min. after test conclusion. Reference: MIL-STD-202 Method 108	△R/R=±1%
Temperature Cycling	1000 Cycles (-55°C to +125°C) Measurement at 24±4 hours after test conclusion. 30min maximum dwell time at each temperature extreme. 1 min. maximum transition time. Reference: JESD22 Method JA-104	△R/R=±1%
Short time overload	5 times of rated power for 5 sec Reference: IEC60115-1 4.13	△R/R=±1%
Biased Humidity	Load 10% of Rated Power at 85℃, 85%RH, 1000 hrs. Measurement at 24±4 hrs. after test conclusion. Reference: MIL-STD-202 Method 103	△R/R=±1%
Operational life	Put the specimens in a chamber at 70±2℃, and applied rated current for 1.5 hrs. and rest for 0.5 hrs. repeatedly till total test time is 1000^{+48}_{-0}hrs. Measurement after test conclusion. Reference: MIL-STD -202 Method 108	△R/R=±1%
Resistance to Soldering Heat	Dip the terminal in a flux and then dip into a soldering bath at 260±5℃ for 10±1 sec. Measurement after test conclusion. Reference: MIL-STD-202 Method 210	△R/R=±1%
Solderability	Pretreatment: dry heat 155℃, 4 hrs. or PCT aging for 4 hrs. (equivalent), then take them out to stand at room temperature for 2 hrs. Test method: Dip specimens in a flux and dip into a soldering bath at 245±5℃ for 2~3 seconds, then take them out and observe the soldering area by microscope; Reference: J-STD-002B test B	Coverage must be 95% minimum.
Mechanical Shock	100g's, normal duration is 6ms, half sine shock pulse. Measurement after test conclusion. Reference: MIL-STD-202 Method 213	△R/R=±1%
Vibration	5g's for 20min. 12 cycles, 10-2000Hz, Measure the variation of resistance. Reference: MIL-STD-202 Method 204	△R/R=±1%
Terminal Bending	2mm deflection minimum, 60 sec. then measure the variation of resistance. Reference: AEC-Q200-005	△R/R=±1%
Terminal Strength	Applied a 17.7N (1.8Kg) for 60±1 seconds. Reference: AEC-Q200-006	△R/R=±1%
Thermal Shock	-55/+125℃, 300 cycles. Specimens mounted. Maximum transfer time is 20 seconds. Dwelling time is 15 minutes. Air-Air. Measure the variation of resistance. Reference: MIL-STD-202 Method 107	△R/R=±1%
Flammability	V-0 or V-1 are all acceptable. Electrical test not required. Reference: UL-94	/
ESD	2kV, 2 times per 1 second. Reference: AEC-Q200-002	△R/R=±1%

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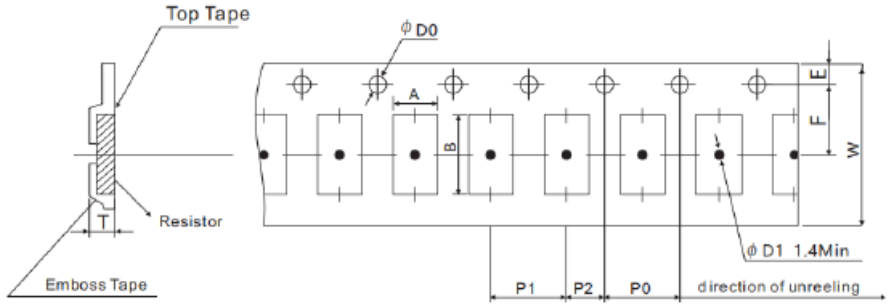
PACKING

- **Taping**

unit: mm



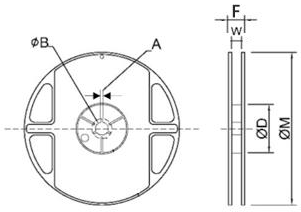
Type	Material	SPQ	A±0.15	B±0.2	$D0^{+0.1}_{0}$	F±0.05	P0±0.1	P1±0.1	P2±0.1	W±0.2	T±0.15
LS1206	Paper	5,000	2.00	3.60	1.50	3.50	4.00	4.00	2.00	8.00	0.81



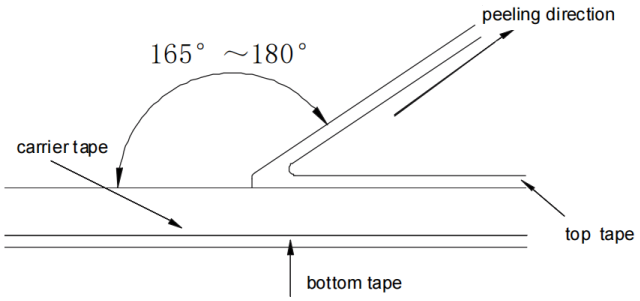
Type	Material	SPQ	A±0.20	B±0.20	W	F	E±0.1	P0±0.1	P1±0.1	P2	$D0^{+0.1}_{0}$	T
LS2512	Embossed	4,000	3.60	6.90	12±0.2	5.5±0.05	1.75	4.0	4.0	2.0±0.05	1.50	1.0±0.15
LS4527	Embossed	3,000	7.40	11.80	24±0.3	11.5±0.1	1.75	4.0	12.0	2.0±0.10	1.50	2.3±0.20

- **Reel**

unit: mm

Figure	Type	øM±2.0	øD±1.0	øB±0.5	F	W±0.3
	LS1206	178	60	13.5	11.40±0.10	9.00
	LS2512	178	60	13.5	15.4±1.00	13.00
	LS4527	330	100	13.5	26.4±0.3	24.00

- **Peel Direction**



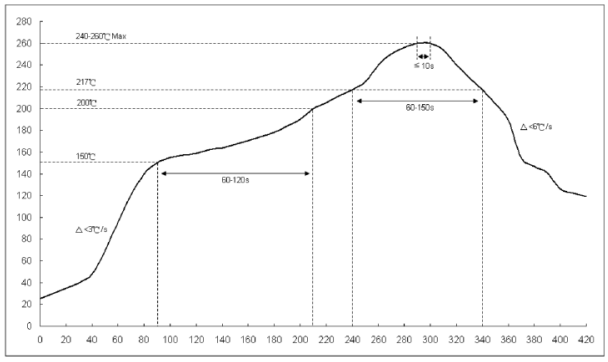
The top cover tape is pulled at a speed of 300 mm/min with the angle between the tape during peel and the direction of unreeling maintained at 165 to 180 degrees shown below.

The peel force of paper carrier tape shall be 0.1N to 0.7N, and 0.3N to 1N for embossed taping.

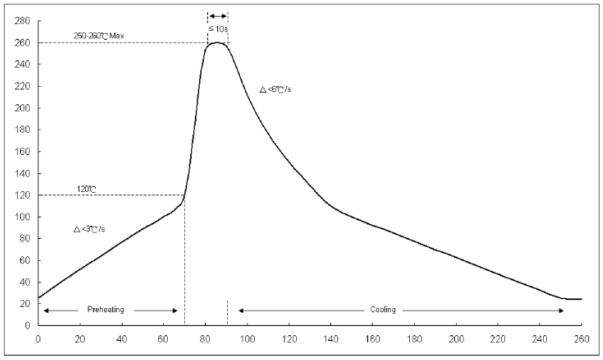
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SOLDERING TEMPERATURE

- Recommendation about soldering temperature as below. Please adjust soldering temperature according to the actual condition.



Reflow Soldering Temperature Curve



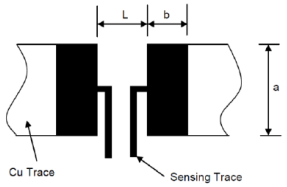
Wave Soldering Temperature Curve

- 350 ± 10℃ is the top temperature if soldering iron operating.

SOLDERING PAD

Resistance value would be higher than nominal value because of joint with soldering material, so designing circuit should adjust the pad size.

Unit: mm

Figure	Type	Terminal Type	a	b	L
	LS1206	1 mΩ~200 mΩ	1.80	1.70	1.60
	LS2512	Big 0.5 mΩ~4 mΩ	4.00	3.10	1.80
		Small 1 mΩ~500 mΩ	4.00	2.10	4.10
	LS4527	1mΩ~200mΩ	8.70	3.40	8.00

WORKING ENVIRONMENT

If users intend to use products in special environments or states (including but not limited to the following), it is necessary to approve special characteristics and reliability for the following or other application environments.

A. High temperature, high moisture.
B. Near the sea, or corrosive gas, such as Cl_2, H_2S, NH_3, SO_2 and NO_2, etc.
C. Unverified liquids, such as water, oil, chemical or organic solvent.
D. Unverified resin or paint to cover products.
E. Products should be washed with water soluble cleaner even if non cleaning flux.

STORAGE/CARRY CONDITION

A. Temperature: 20±15℃
B. Humidity: 60±15%RH
C. Storage life: 2 years, FIFO
D. Please hold box correct orientation when storing and carrying. It is strictly prohibited to fall or squeeze the box, otherwise the product electrode or body may be damaged.

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VERSION HISTORY

Version	Date	Change Item(s)	Description
A	2024/03/12	-	First version
B	2024/05/23	Reliability Legal Disclaimer	Update the TCR test temperature Update the full text.

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