

VSML2512S6 Series, Current Sensor Resistor (Lead / Halogen Free)

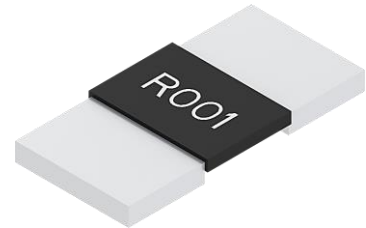
The history of revision change for the specification

| Date | Revision | Changes |
|------------|----------|---|
| 2021/11/24 | A0 | New Approval standard (POYIN) |
| 2021/12/7 | A1 | Revise schematic diagram of P.1 & P.2 (YITING) |
| 2022/3/8 | A2 | Add resistance 0.75 (POYIN) |
| 2022/4/18 | A3 | Add marking (YT) |
| 2022/7/11 | A4 | Add 2 description of care note for storage in care note page (CH) |
| 2022/10/27 | A5 | Add Marking Direction and schematic diagram and revise Care note description(CHW) |
| 2023/2/23 | A6 | Remove ESD test item(CH) |

VSML2512S6 Series, Current Sensor Resistor (Lead / Halogen Free)

Features / Applications:

- High power rating is up to 6W
- Welding construction; excellent long-term stability
- Automotive applications
- RoHS compliant and AEC-Q200 qualified



Electrical Specifications:

| Characteristics ¹ | Feature |
|---|---------------------|
| Power Rating ² | 6 W |
| Resistance Value | 0.3 to 1 mΩ |
| Temperature Coefficient of Resistance (25/125 °C) | From 75 ppm/°C |
| Operation Temperature Range | -65 °C ~ +170 °C |
| Resistance Tolerance | ± 1% |
| Maximum Working Voltage (V) | $(P \cdot R)^{1/2}$ |

1. For detail information, please refer to the table on page 3 P/N list.
2. For resistors operated at terminal temperature over 100 °C, the maximum load shall be derated in accordance with the following curve.

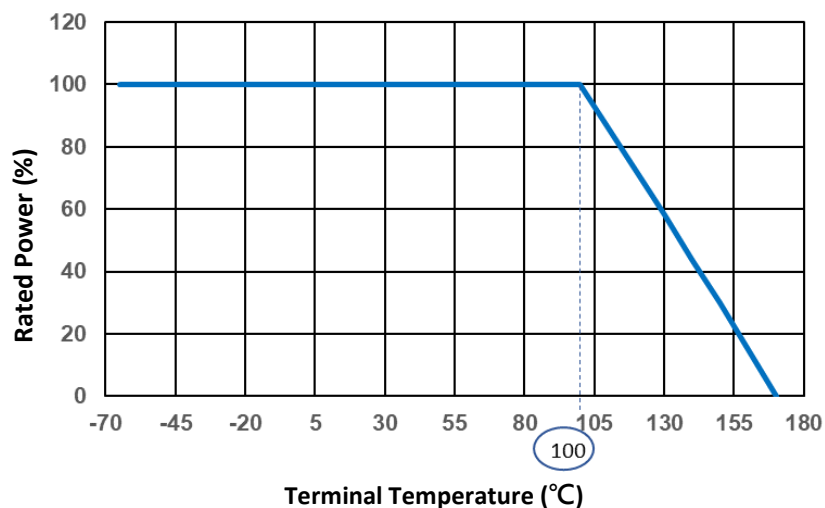
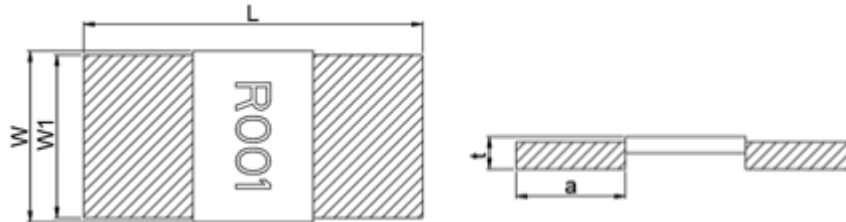
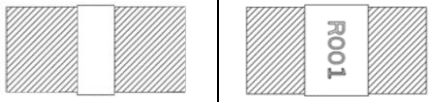


Figure 1.: Power derating curve at terminal temperature

Outline Drawing:

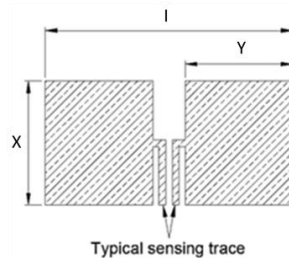
Schematic Diagram and Marking



| Dimensions (mm) | | |
|-----------------------|--|-----------------|
| Resistance Range (mΩ) | 0.3, 0.5, 0.75, 0.8 | 1 |
| L | 6.35 ± 0.25 | |
| W | 3.20 ± 0.25 | |
| W1 | 3.05 ± 0.15 | |
| t | 0.60 ± 0.25 | |
| a | 2.55 ± 0.25 | 2.05 ± 0.25 |
| Marking Direction |  | |

Note: 0.3, 0.5, 0.75, 0.8mΩ without marking

Recommended Solder Pad Dimensions



| Resistance Range | Dimensions | | |
|------------------|------------|--------|--------|
| mΩ | X (mm) | Y (mm) | I (mm) |
| 0.3 to 1 | 3.7 | 3.2 | 7.35 |

Type Designation:

V S M L 2512 S □ — □ □ □ □ □
 (1) (2) (3) (4) (5) (6)

Note:

- (1) Series No.
- (2) Size
- (3) Terminal Type: S = Short terminal
- (4) Power Rating: 6 = 6W
- (5) Resistance Value: R001 = 0.001Ω, 0M50 = 0.0005Ω
- (6) Tolerance: F = ±1%, G = ±2%, J = ±5%

P/N list:

| P/N | R value | TCR | Power Rating | Tolerance | | |
|------------------|---------|---------|--------------|-----------|----|----|
| | (mΩ) | (ppm/K) | (W) | 1% | 2% | 5% |
| VSML2512S6-0M30* | 0.3 | ±125 | 6 | ✓ | | |
| VSML2512S6-0M50* | 0.5 | ±100 | 6 | ✓ | | |
| VSML2512S6-0M75* | 0.75 | ±100 | 6 | ✓ | | |
| VSML2512S6-0M80* | 0.8 | ±100 | 6 | ✓ | | |
| VSML2512S6-R001* | 1.0 | ±75 | 6 | ✓ | | |

* Note: Other values and tolerance would be available, please contact Cyntec.

Characteristics:

Electrical

| Item | Specification and Requirement | Test Method |
|-------------------------------|---|--|
| Temperature Coefficient (TCR) | As follow specification | JIS-C-5201 +25 °C / +125 °C. |
| Short Time Overload | $\Delta R: \pm 0.5\%$ Without damage by flashover, spark, arcing, burning or breakdown | JIS-C-5201-1 4.13 2.5 x rated power for 5 seconds. |
| Insulation Resistance | Over 100 M Ω on Overcoat layer face up | JIS-C-5201-1 4.6 100 V _{DC} for 60 +10/-0 seconds |
| Voltage Proof | $\Delta R: \pm 1\%$ Without damage by flashover, spark, arcing, burning or breakdown | JIS-C-5201-1 4.7 400 V _{AC} (rms.) for 60 +10/-0 seconds |

Mechanical

| Item | Specification and Requirement | Test Method |
|---------------------------|---|--|
| Solderability | The surface of terminal immersed shall be minimum of 95% covered with a new coating of solder | J-STD-002 Method B category 3 245 \pm 5 °C for 5 \pm 0.5 seconds. |
| Resistance to Solder Heat | $\Delta R: \pm 0.5\%$ Without distinct damage in appearance | MIL-STD-202 Method 210 260 \pm 5 °C for 10 \pm 1 seconds. |
| Board Flex | $\Delta R: \pm 1.0\%$ Without mechanical damage such as break. | AEC-Q200-005 Bending value: 2 mm for 60 \pm 1 seconds. |
| Vibration | $\Delta R: \pm 0.5\%$ Without distinct damage in appearance | MIL-STD-202 Method 204 5G's for 20 minutes, 12 cycles each of 3 orientations. Test from 10-2000 Hz. |

| | | |
|----------------------------|---|---|
| Mechanical Shock | $\Delta R: \pm 0.5\%$ Without distinct damage in appearance | MIL-STD-202 Method 213 100G's peak value, 6ms, Half-sine waveform, 12.3 ft/sec. |
| Terminal Strength (SMD) | $\Delta R: \pm 1\%$ Without mechanical damage such as break. | AEC-Q200-006 Force of 1.8 Kg for 60 seconds. |

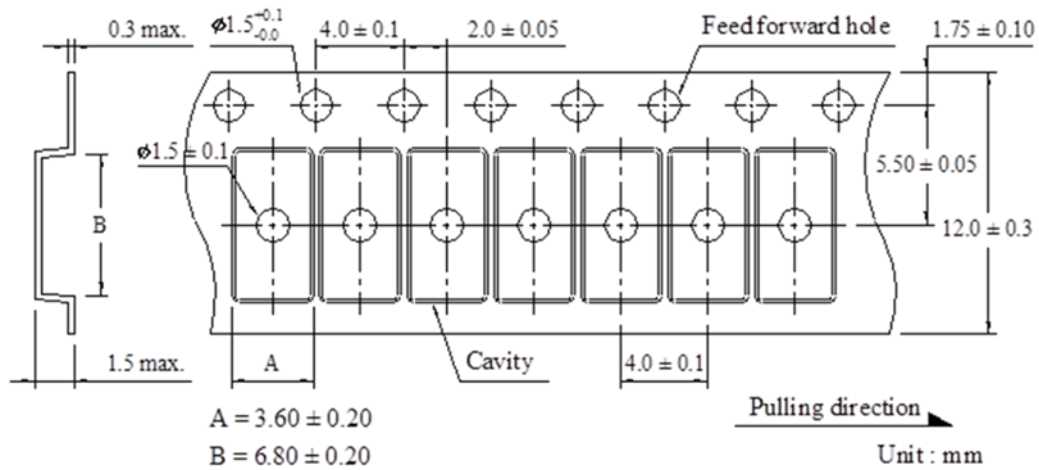
Endurance

| Item | Specification and Requirement | Test Method |
|-----------------------------|--|--|
| Temperature Cycling | $\Delta R: \pm 0.5\%$ Without distinct damage in appearance | JESD22 Method JA-104 -55 °C to 150 °C /1000cycle 30 min maximum dwell time at each temperature on FR4(PCB). |
| Biased Humidity | $\Delta R: \pm 0.5\%$ Without distinct damage in appearance | MIL-STD-202 Method 103 1000 hours, 85 °C /85%R.H, applied for 10% rated power. |
| Operational Life | $\Delta R: \pm 1.0\%$ Without distinct damage in appearance | MIL-STD-202 Method 108 70 °C, 100% rated power 1.5 hours ON, 0.5 hours Off For total 1000 hours |
| High Temperature Storage | $\Delta R: \pm 1.0\%$ Without distinct damage in appearance | MIL-STD-202 Method 108 170 °C for 1000 hours. |
| Moisture Resistance | $\Delta R: \pm 0.5\%$ Without distinct damage in appearance | MIL-STD-202 Method 106 65 °C /90-100%RH, unpowered, 7b not required |

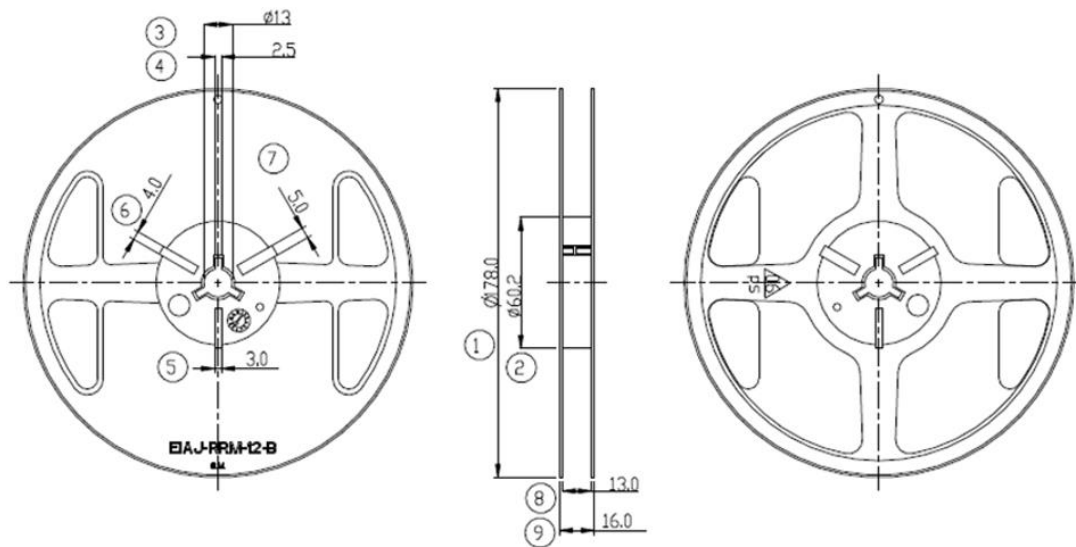
Note: Measurement at 24 ± 4 hours after test conclusion for all reliability tests-parts.

Packing Descriptions:

Dimensions:



Reel Dimensions:

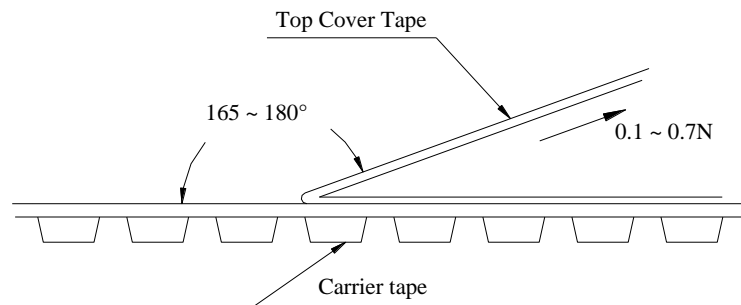


Unit: mm

| Symbol | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|--------|------------------|-------------------|-------------------|------------------|------------------|------------------|------------------|-------------------|--------------------|
| Size | 178.0 ± 1 | 60.2 ± 0.5 | 13.0 ± 0.5 | 2.5 $+0.5/-0$ | 3.0 $+0.5/-0$ | 4.0 $+0.5/-0$ | 5.0 $+0.5/-0$ | 13.0 ± 0.5 | 16.0 ± 0.15 |

Peel Strength of Top Cover Tape:

The peel speed shall be about 300 mm/min and the peel force of top cover tape shall between 0.1 to 0.7 N



Number of Taping:

2,000 pieces / reel

Label Marking:

The following items shall be marked on reel

- (1) Description
- (2) Quantity
- (3) Part No.
- (4) Tapping No.

Care Note:

Care note for storage

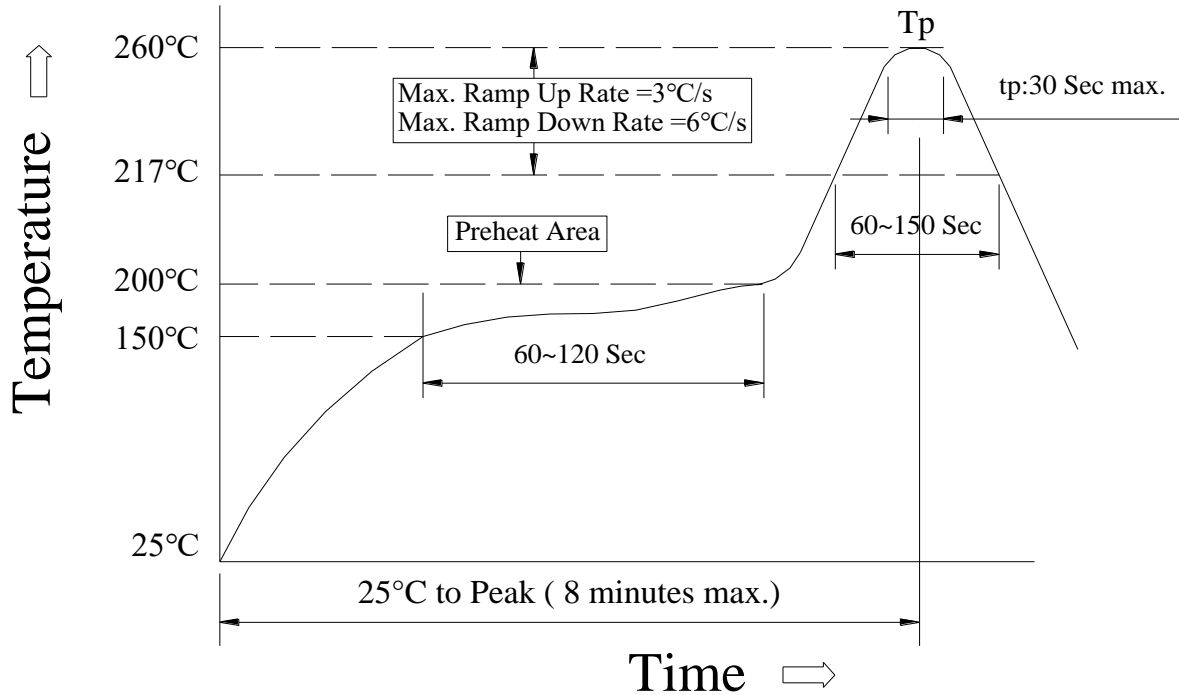
- (1) Current sensor resistor shall be stored in a room where temperature and humidity must be controlled.
(temperature from 5 to 35 °C; humidity < 60% RH. However, humidity should be kept as low as possible.)
- (2) Current sensor resistor shall be stored to prevent from direct sunshine.
- (3) Current sensor resistor shall be stored without moisture, dust and harmful gas (chloridation hydrogen, sulfurous acid, and sulfuration hydrogen), or the current sensor resistor will fail on solderability test.
- (4) Expiration date: One year after shipping date (product is required to return after expiration date)
- (5) Solderability should be confirmed in case of exceeding 12 months.

Care note for operating and handling

- (1) Protect the edge and coating of the sensors from mechanical stress.
- (2) Avoid bending of printing circuit board (PCB) when cutting and fixing it on support body to reduce mechanical stress on sensors.
- (3) Sensor should be used within the condition of specification.
Note: if the voltage loaded on the sensor is higher than specified value, the current sensor resistor may fail due to temperature rise.
- (4) The loaded voltage should consider terminal temperature of the sensor according to the derating curve.
- (5) When applying a high current over suggested specification (pulse current, shock current) to the current sensor resistor, it is necessary to re-evaluate the operating condition before using it.

Reflow profile:

Suggested Reflow Profile



(1) Reflow Soldering Method:

| | | |
|----------------------------------|----------------|-----------------------|
| Reflow Soldering | Tp: 255~260 °C | Max.30 seconds (Tp) |
| | 217 °C | 60~150 seconds |
| Pre-Heat | 150 ~ 200 °C | 60~120 seconds |
| Time (25 °C to peak temperature) | 8 minutes max. | |

Reference: JEDEC J-STD-020E