VSML2512S3 Series, Current Sensor Resistor (Lead / Halogen Free)

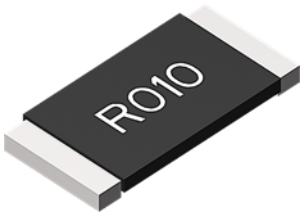
The history of revision change for the specification

Date	Revision	Changes
2021/11/24	A0	New Approval standard (POYIN)
2022/2/17	A1	Modify power derating plot and description as ambient @70(POYIN)
2022/3/8	A2	Add resistance: 0.75, 4, 7, 8, and 9. Removed marking (POYIN)
2022/04/14	A3	Add Marking (YT)
2022/7/11	A4	Add two descriptions of care note for storage in care note chapter (CH)
2022/10/27	A5	Add Marking Direction, schematic diagram and use the same form. Modify description of care note. (CHW)
2023/2/23	A6	Remove ESD test item (CH)

VSML2512S3 Series, Current Sensor Resistor (Lead / Halogen Free)

Features / Applications:

- High power rating is up to 3W
- Welding construction; excellent long-term stability
- Automotive applications
- RoHS compliant and AEC-Q200 qualified



Electrical Specifications:

Characteristics[1]	Feature
Power Rating[2]	3 W
Resistance Value	0.3 to 10 mΩ
Temperature Coefficient of Resistance (25/125 °C)	From 50 ppm/°C
Operation Temperature Range	-65 °C ~ +170 °C
Resistance Tolerance	± 1%
Maximum Working Voltage (V)	$(P*R)^{1/2}$

1. For detail information, please refer to the table on page 3 P/N list.
2. For resistors are operated at ambient temperature over 70 °C, the maximum load shall be derated in accordance with the following curve.

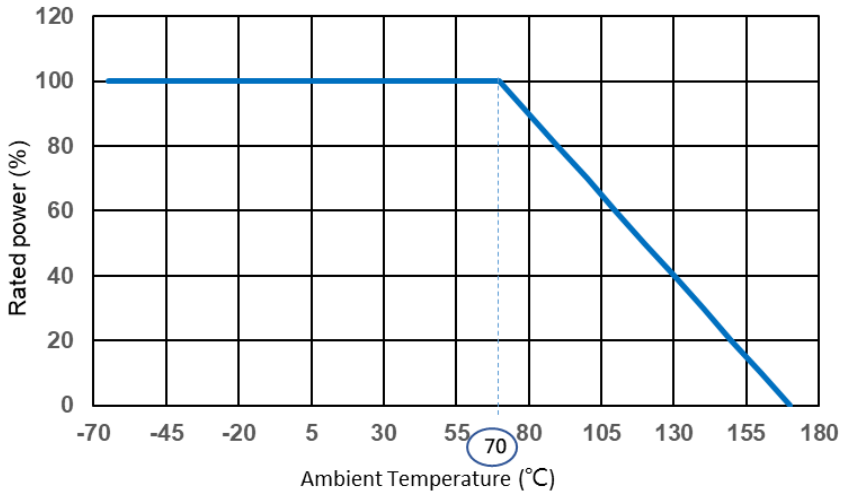
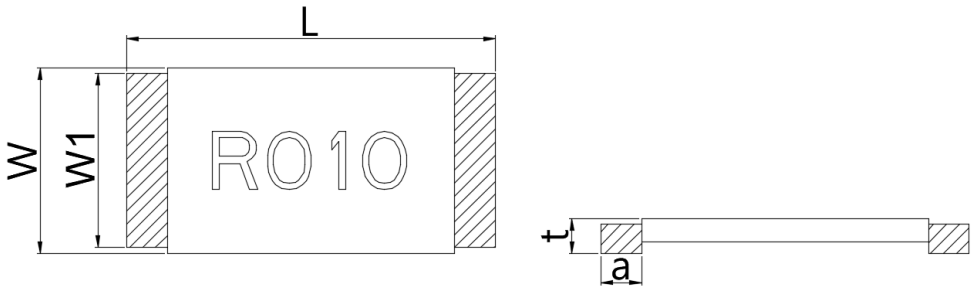


Figure 1.: Power derating curve at ambient temperature

Outline Drawing:

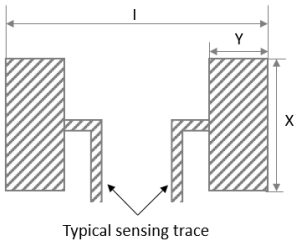
Schematic Diagram and Marking



Dimensions (mm)				
Resistance Range (mΩ)	0.3, 0.5, 0.75, 0.8	1, 1.5, 2, 3, 4	5, 6	7, 8, 9, 10
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	1.15 ± 0.25	0.70 ± 0.25
Marking Direction		R001	R010	

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

Recommended Solder Pad Dimensions



Resistance Range	Dimensions		
mΩ	X (mm)	Y (mm)	I (mm)
0.3 to 4	3.7	3.2	7.35
5 to 6		2.1	
7 to 10		1.65	

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: 3 = 3W

(5) Resistance Value: R003 = 0.003Ω, 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%
VSML2512S3-0M30*	0.3	±125	3	✓		
VSML2512S3-0M50*	0.5	±100	3	✓		
VSML2512S3-0M75*	0.75	±100	3	✓		
VSML2512S3-0M80*	0.8	±100	3	✓		
VSML2512S3-R001*	1.0	±75	3	✓		
VSML2512S3-1M50*	1.5	±75	3	✓		
VSML2512S3-R002*	2.0	±75	3	✓		
VSML2512S3-R003*	3.0	±75	3	✓		
VSML2512S3-R004*	4.0	±75	3	✓		
VSML2512S3-R005*	5.0	±50	3	✓		
VSML2512S3-R006*	6.0	±50	3	✓		
VSML2512S3-R007*	7.0	±50	3	✓		
VSML2512S3-R008*	8.0	±50	3	✓		
VSML2512S3-R009*	9.0	±50	3	✓		
VSML2512S3-R010*	10.0	±50	3	✓		

* 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	△R: ± 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 MΩ on Overcoat layer face up	JIS-C-5201-1 4.6 100 V_{DC} for 60 +10/-0 seconds
Voltage Proof	△R: ± 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 ± 5°C for 5 ± 0.5 seconds.
Resistance to Solder Heat	△R: ± 0.5% Without distinct damage in appearance	MIL-STD-202 Method 210 260 ± 5°C for 10 ± 1 seconds.
Board Flex	△R: ± 1.0% Without mechanical damage such as break.	AEC-Q200-005 Bending value: 2 mm for 60 ± 1 seconds.
Vibration	△R: ± 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	△R: ± 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)	△R: ± 1% Without mechanical damage such as break.	AEC-Q200-006 Force of 1.8 Kg for 60 seconds.

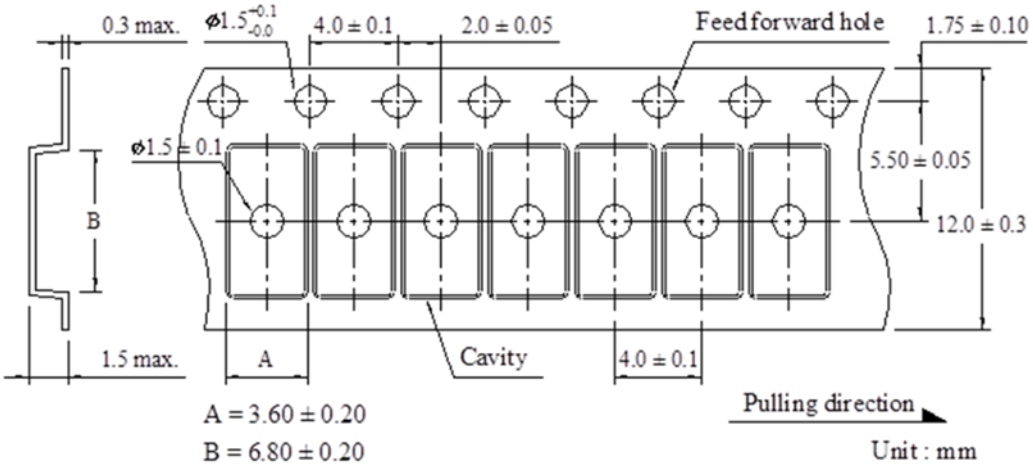
Endurance

Item	Specification and Requirement	Test Method
Temperature Cycling	△R: ± 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	△R: ± 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	△R: ± 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	△R: ± 1.0% Without distinct damage in appearance	MIL-STD-202 Method 108 170 °C for 1000 hours.
Moisture Resistance	△R: ± 0.5% Without distinct damage in appearance	MIL-STD-202 Method 106 65 °C /90-100%RH, unpowered, 7b not required

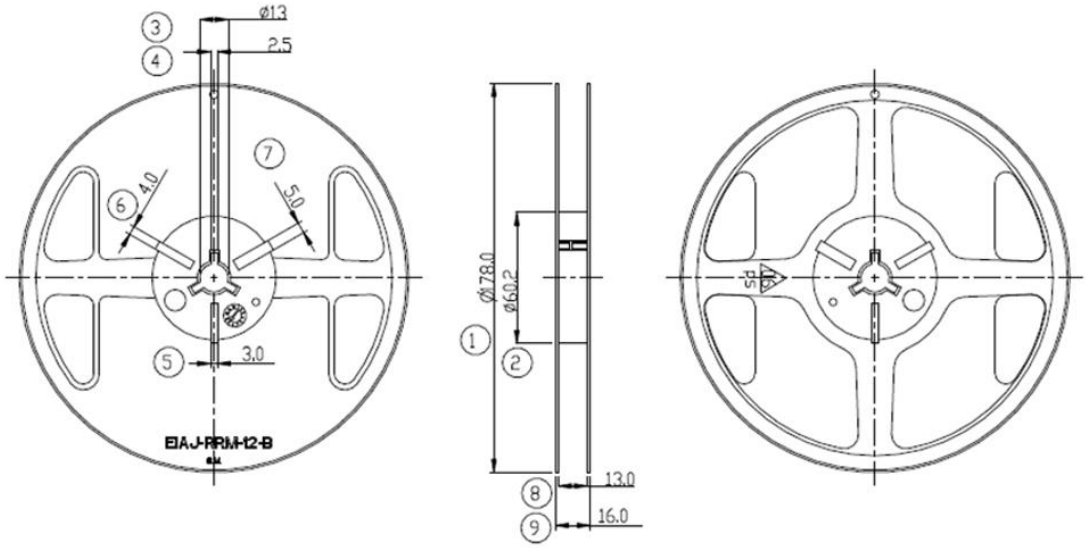
Note: Measurement at 24 ± 4 hours after test conclusion for all reliability tests-parts.

Packing Descriptions:

Dimensions:



Reel Dimensions:

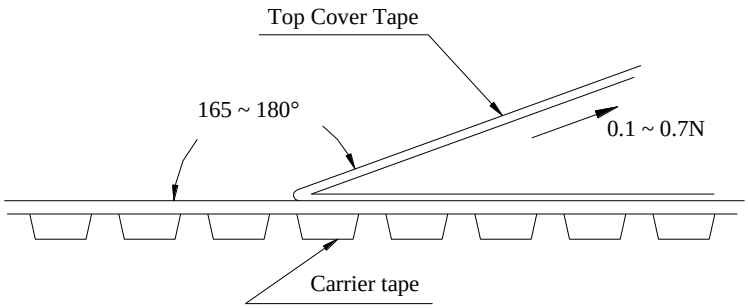


Unit: mm

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.

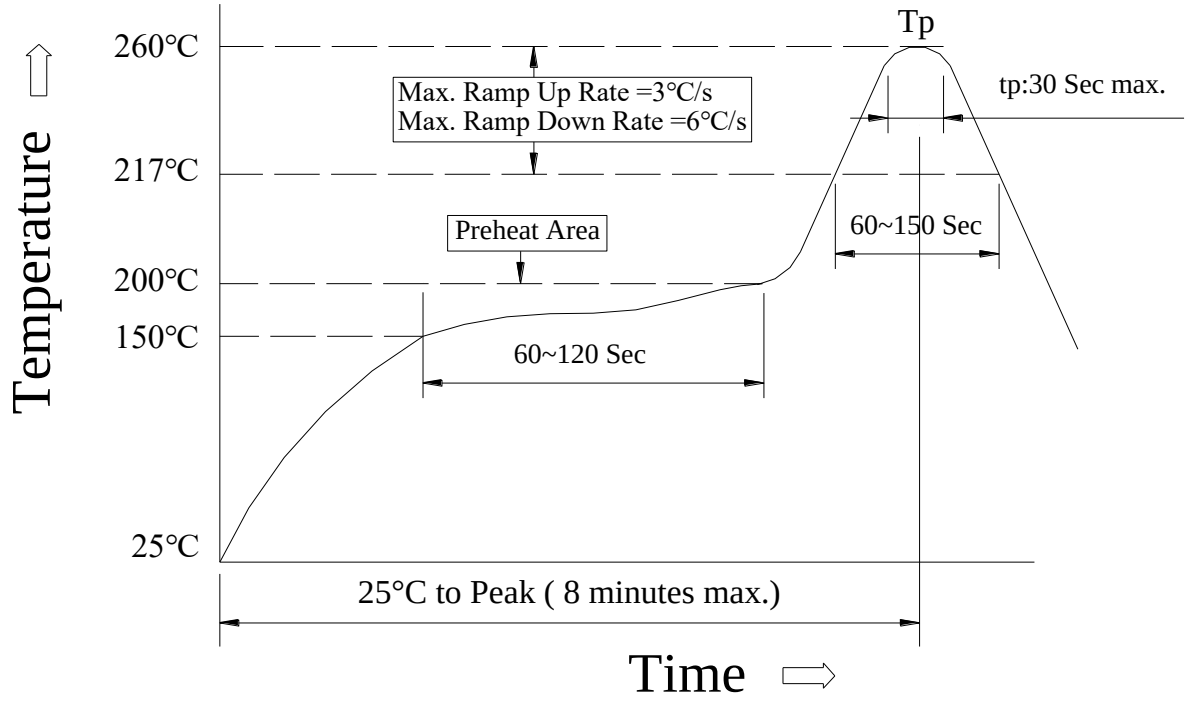
(3) Sensor should be used within the condition of specification.
Note: if the voltage loaded on the sensor is higher than specified value, the current sensor resistor may fail due to temperature rise.

(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