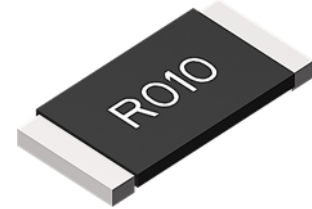


## VSML2512S3 Series, Current Sensor Resistor (Lead / Halogen Free)

### Features / Applications :

- High power rating is up to 3W
- Welding construction; excellent long-term stability
- Automotive applications & Current Sensor Resistor
- Suggested mounting on DBC/IMS/FR4 substrate
- RoHS compliant and AECQ-200 qualified



### Electrical Specifications :

Characteristics <sup>1</sup>	Feature
Power Rating <sup>2</sup>	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)	$(P \cdot R)^{1/2}$

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

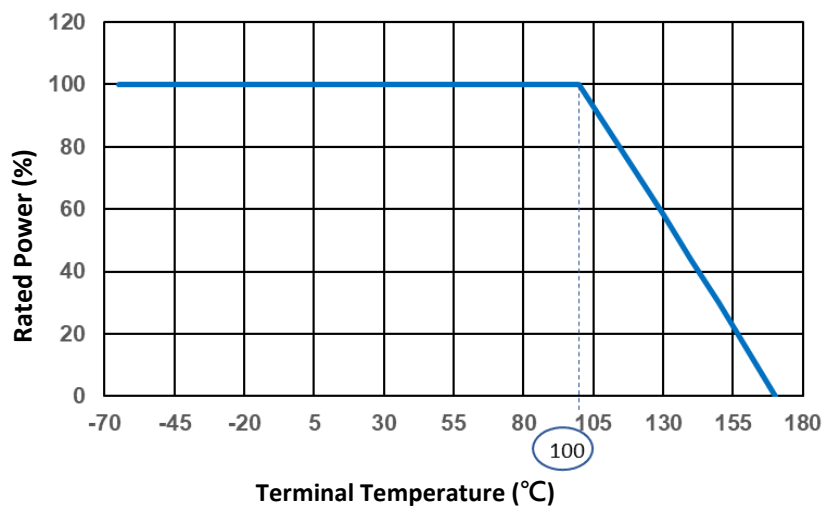
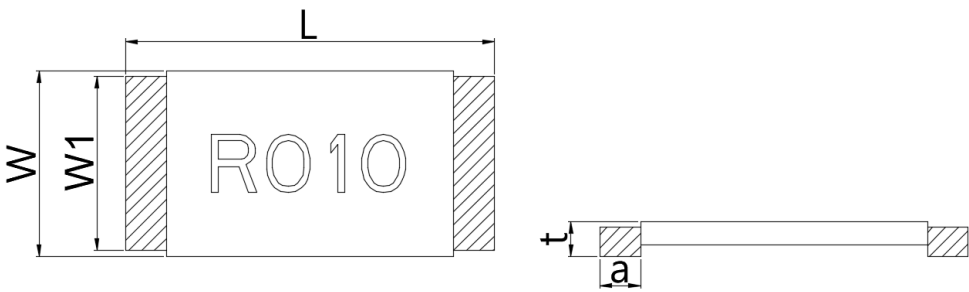


Figure 1. : Power derating curve at terminal temperature

## Outline Drawing :

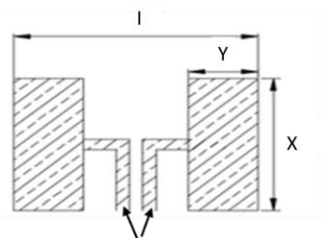
**Construction and Dimension**



Note 1 : 0.3, 0.5, 0.8mΩ without marking

Dimensions (mm)				
Resistance Range (mΩ)	0.3, 0.5, 0.8	1, 1.5, 2, 3	5, 6	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

## Recommended Solder Pad Dimensions



Typical sensing trace

Resistance Range	Dimensions		
mΩ	X (mm)	Y (mm)	I (mm)
0.3 to 3	3.7	3.2	7.35
5 to 6		2.1	
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	✓		
VSML2512S3-0M80*	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-R005*	5.0	±50	3	✓		
VSML2512S3-R006*	6.0	±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	$\Delta R: \pm 0.5\%$ Without damage by flashover, spark, arcing, burning or breakdown	JIS-C-5201-1 4.13 2.5 x rated power for 5 seconds.
ESD	$\Delta R: \pm 1\%$ Without damage by flashover, spark, arcing, burning or breakdown	AEC-Q200-002 Human body, 8KV.
Insulation Resistance	Over 100 M $\Omega$ on Overcoat layer face up	JIS-C-5201-1 4.6 100V <sub>DC</sub> 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 400V <sub>AC</sub> (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 10-2000Hz.

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, 12.3ft/sec.
Terminal Strength (SMD)	$\Delta R: \pm 1\%$ Without mechanical damage such as break.	AEC-Q200-006 Force of 1.8Kg for 60 seconds.

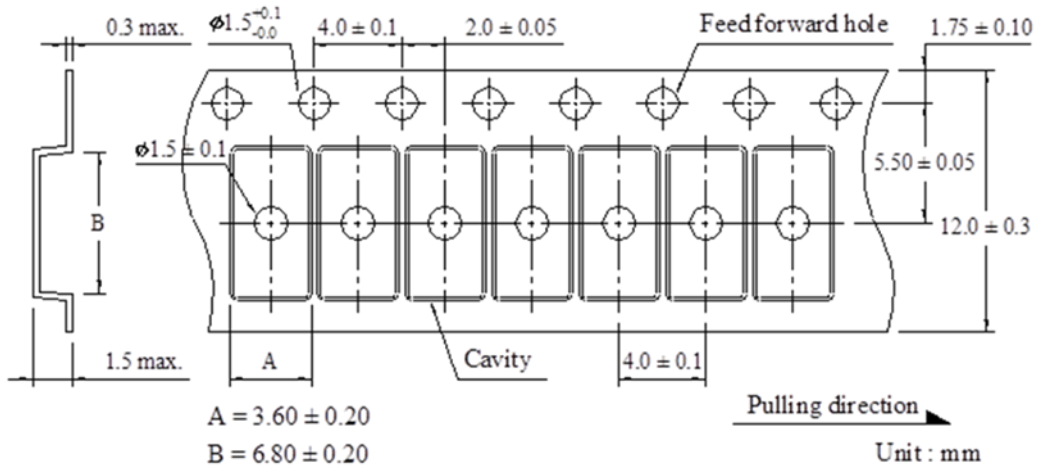
## Endurance

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

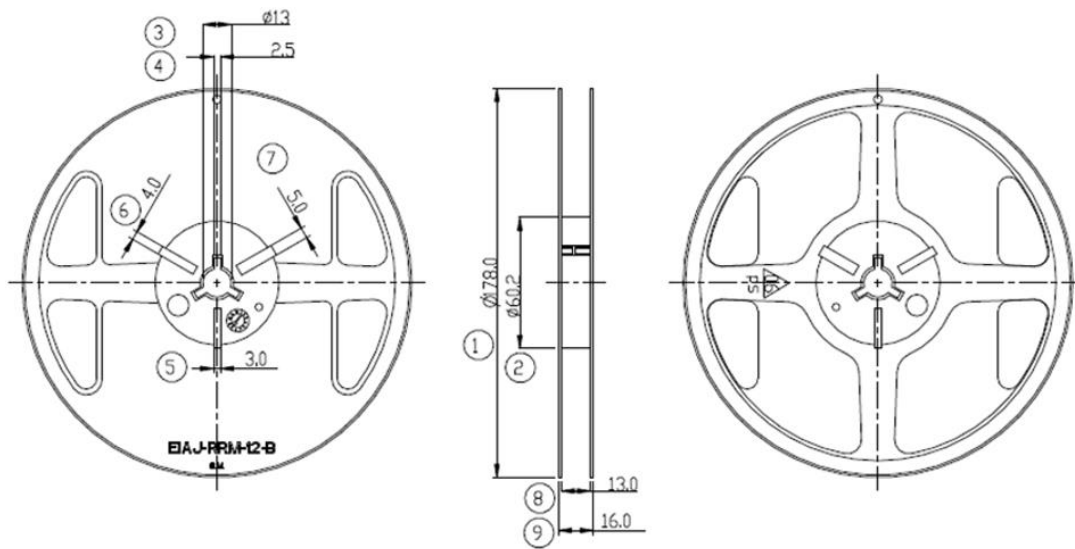
Note : Measurement at 24±4 hours after test conclusion for all reliability tests-parts.

## PACKAGING DESCRIPTIONS :

Dimensions :



Reel dimensions :

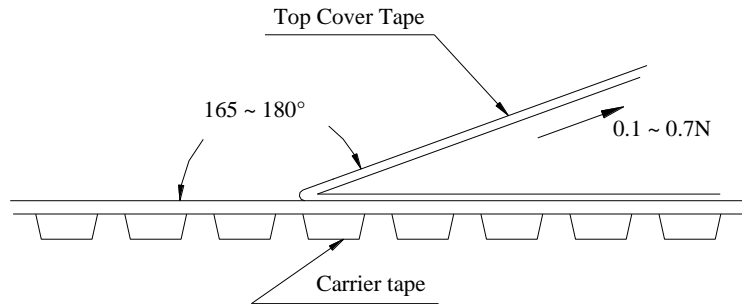


Unit :mm

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

## Peel Strength of Top Cover Tape :

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



## Number of Taping :

2,000 pieces / reel

## Label Marking :

The following items shall be marked on tray

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

## Care Note :

### Care note for storage

- (1) Chip resistor shall be stored in a room where temperature and humidity must be controlled.  
(temperature 5 to 35°C, humidity < 60% RH) However, a humidity keep it low, as it is possible.
- (3) Chip resistor shall be stored as direct sunshine doesn't hit on it.
- (4) Chip resistor shall be stored with no moisture, dust, a material that will make solderability inferior, and a harmful gas (Chloridation hydrogen, sulfurous acid gas, and sulfuration hydrogen)

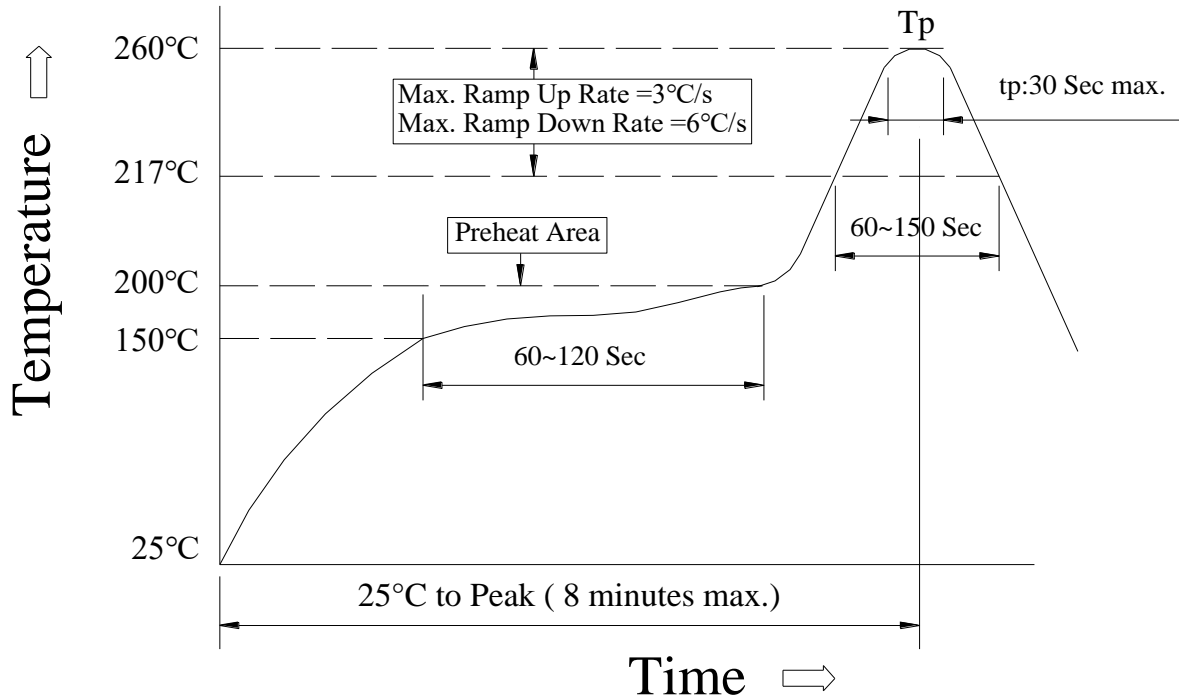
### Care note for operating and handling

- (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: When a voltage higher than specified value is loaded to the sensor, this may damage the sensor material due to temperature rise.
- (4) The loaded voltage should consult terminal temperature of the sensor according to the derating curve.
- (5) When applying a high current exceeding suggested specification (pulse current, shock current) to the sensor, it is necessary to re-evaluate the operating condition before using it in the system.



Reflow profile :

Recommended 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