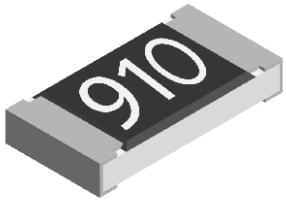
THE DATASHEET OF

M251206BB1009JP500

Fusible Thin Film Chip Resistors



FEATURES

- Metal film on high quality ceramic
- Special protective top coat
- Flame retardant
- Sn solder contacts on Ni barrier layer
- Fusible resistor for constant voltage
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

RoHS COMPLIANT

M25SI fusible thin film chip resistors are designed for overload protection in modern professional electronics. Typical applications include automotive, telecommunication and industrial equipment.

TECHNICAL SPECIFICATIONS	
DESCRIPTION	**M25SI**
Imperial size	1206
Metric size code	RR3216M
Resistance range	5 Ω to 3.9 kΩ
Resistance tolerance	± 5 % (2)
Temperature coefficient	± 100 ppm/K
Rated dissipation, P_{70} (1)	0.250 W
Operating voltage, $U_{max.}$ AC_{RMS}/DC	$\sqrt{P \times R}$
Permissible film temperature, $\vartheta_{F\ max.}$ (1)	125 °C
Operating temperature range (1)	-55 °C to 125 °C
Permissible voltage against ambient (insulation): 1 min; U_{ins}	> 300 V
Failure rate: $FIT_{observed}$	≤ 1 x 10^{-9}/h

Notes

(1) Please refer to APPLICATION INFORMATION below.

(2) Tolerance 1 % on request.

APPLICATION INFORMATION

When the resistor dissipates power, a temperature rise above the ambient temperature occurs, dependent on the thermal resistance of the assembled resistor together with the printed circuit board. The rated dissipation applies only if the permitted film temperature is not exceeded.

These resistors do not feature a limited lifetime when operated within the permissible limits. However, resistance value drift increasing over operating time may result in exceeding a limit acceptable to the specific application, thereby establishing a functional lifetime.

PULSE TEST DATA		
Pulse power (square pulse)	0.9 W	0.3 W
Pulse duration t_i	100 µs	100 ms
Pulse pause t_p	100 ms	1 s
Number of pulses	10^5	10^5
Drift after pulse test	< 0.1 %	< 0.1 %

For technical questions, contact: thinfilmchip@vishay.com

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MAXIMUM RESISTANCE CHANGE AT RATED DISSIPATION

OPERATION MODE		STANDARD
Rated dissipation, P_{70}	M25SI1206	0.250 W
Operating temperature range		-55 °C to 125 °C
Permissible film temperature, ϑ_F max.		125 °C
Max. resistance change at P_{70} for resistance range, $\lvert\Delta R/R\rvert$ after:	M25SI1206	5 Ω to 3.9 kΩ
	1000 h	≤ 1 %

Note

- A suitable low thermal resistance of the circuit board assembly must be safeguarded in order to maintain the film temperature of the resistors within the specified limits. Please consider the application note “Thermal Management in Surface-Mounted Resistor Applications” (www.vishay.com/doc?28844) for information on the general nature of thermal resistance.

TEMPERATURE COEFFICIENT AND RESISTANCE RANGE

TYPE / SIZE	TCR	TOLERANCE	RESISTANCE	E-SERIES
M25SI1206	± 100 ppm/K	± 5 %	5 Ω to 3.9 kΩ	E24

PACKAGING

TYPE / SIZE	CODE	QUANTITY	PACKAGING STYLE	WIDTH	PITCH	PACKAGING DIMENSIONS
M25SI1206	P5	5000	Paper Tape acc. IEC 60286-3 Type 1a	8 mm	4 mm	Ø 180 mm / 7"

PART NUMBER AND PRODUCT DESCRIPTION

Part Number: M251206BB9109JP500

M	2	5	1	2	0	6	B	B	9	1	0	9	J	P	5	0	0

TYPE / SIZE	VERSION	TCR	RESISTANCE	TOLERANCE	PACKAGING
M251206	**B** = SI	**B** = ± 100 ppm/K	3 digit value 1 digit multiplier **Multiplier** **8** = $*10^{-2}$ **9** = $*10^{-1}$ **0** = $*10^{0}$ **1** = $*10^{1}$	**J** = ± 5 %	**P5**

Product Description: M25SI 100 91R 5 % P5

M25SI	100	91R	5 %	P5
TYPE	TCR	RESISTANCE	TOLERANCE	PACKAGING
M25SI	± **100** ppm/K	**91R** = 91 Ω	± **5 %**	**P5**

Note

- Products can be ordered using either the PART NUMBER or PRODUCT DESCRIPTION.

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DESCRIPTION

Production is strictly controlled and follows an extensive set of instructions established for reproducibility. A homogeneous film of metal alloy is deposited on a high grade ceramic substrate Al_2O_3. Specially designed inner contacts are deposited on both sides. A special laser is used to achieve the target value by smoothly cutting a meander groove in the resistive layer without damaging the ceramics. The resistor elements are covered by a protective coating designed for electrical, mechanical and climatic protection. The terminations receive a final pure tin on nickel plating.

The result of the determined production is verified by an extensive testing procedure. Only accepted products are laid directly into the paper tape in accordance with **IEC 60286-3 Type 1a** [(1)].

ASSEMBLY

The resistors are suitable for processing on automatic SMD assembly systems. They are suitable for automatic soldering using wave, reflow or vapor phase as shown in **IEC 61760-1** [(1)]. The encapsulation is resistant to all cleaning solvents commonly used in the electronics industry, including alcohols, esters and aqueous solutions. The use of conformal coating is not permitted. The resistors are RoHS-compliant; the pure tin plating provides compatibility with lead (Pb)-free and lead-containing soldering processes. Solderability is specified for 2 years after production or requalification. The permitted storage time is 20 years. The immunity of the plating against tin whisker growth has been proven under extensive testing.

MATERIALS

Vishay acknowledges the following systems for the regulation of hazardous substances:

- IEC 62474, Material Declaration for Products of and for the Electrotechnical Industry, with the list of declarable substances given therein [(2)]
- The Global Automotive Declarable Substance List (GADSL) [(3)]
- The REACH regulation (1907/2006/EC) and the related list of substances with very high concern (SVHC) [(4)] for its supply chain

The products do not contain any of the banned substances as per IEC 62474, GADSL, or the SVHC list, see www.vishay.com/how/leadfree.
Hence the products fully comply with the following directives:

- 2000/53/EC End-of-Life Vehicle Directive (ELV) and Annex II (ELV II)
- 2011/65/EU Restriction of the Use of Hazardous Substances Directive (RoHS) with amendment 2015/863/EU
- 2012/19/EU Waste Electrical and Electronic Equipment Directive (WEEE)

Vishay pursues the elimination of conflict minerals from its supply chain, see the Conflict Minerals Policy at www.vishay.com/doc?49037.

Notes

(1) The quoted IEC standards are also released as EN standards with the same number and identical contents.
(2) The IEC 62474 list of declarable substances is maintained in a dedicated database, which is available at http://std.iec.ch/iec62474.
(3) The Global Automotive Declarable Substance List (GADSL) is maintained by the American Chemistry Council and available at www.gadsl.org.
(4) The SVHC list is maintained by the European Chemical Agency (ECHA) and available at http://echa.europa.eu/candidate-list-table.

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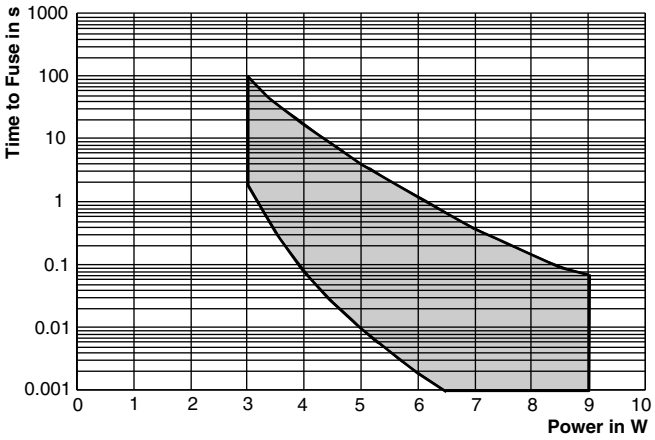
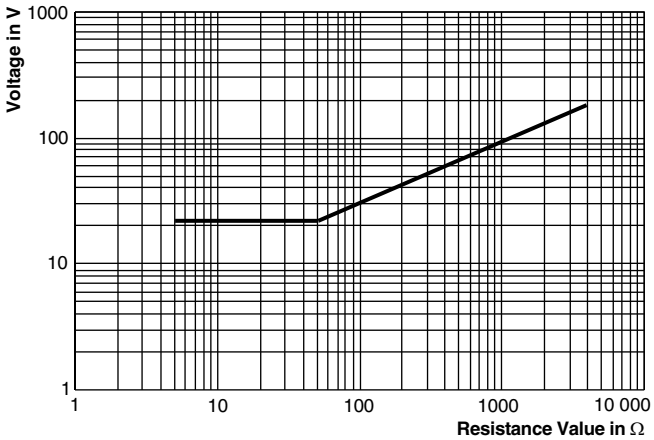
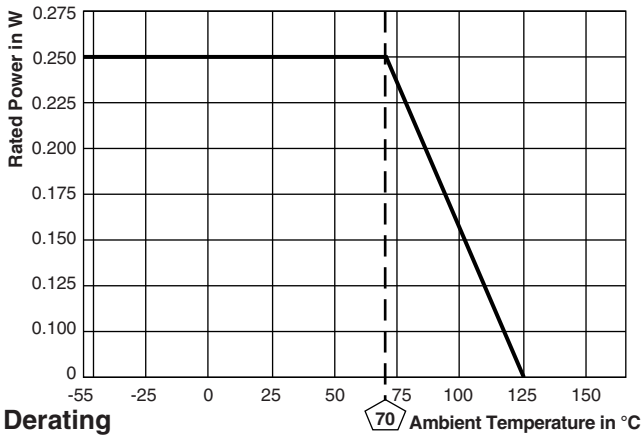
FUNCTIONAL PERFORMANCE



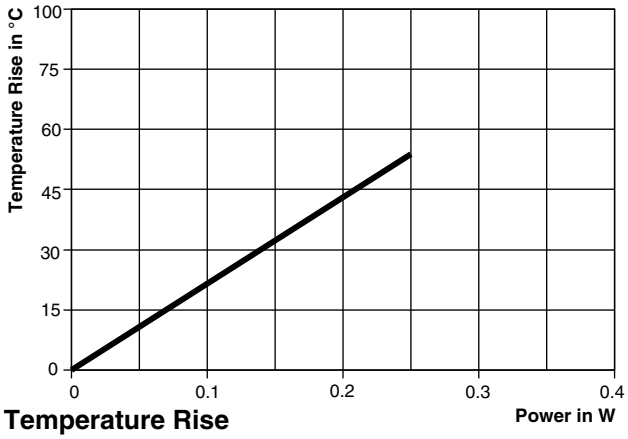
Fusing Performance



Maximum Applicable Voltage after Fusing



Derating



Temperature Rise

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TESTS AND REQUIREMENTS

All tests are carried out in accordance with the following specifications:

EN 60115-1, generic specification

EN 60115-8 (successor of EN 140400), sectional specification

IEC 60068-2-xx, test methods

The table presents only the most important tests, for the full test schedule refer to the documents listed above. However, some additional tests and a number of improvements against those minimum requirements have been included.

The testing also covers most of the requirements specified by EIA/ECA-703 and JIS-C-5201-1.

The tests are carried out under standard atmospheric conditions in accordance with IEC 60068-1, 4.3, whereupon the following values are applied:

Temperature: 15 °C to 35 °C

Relative humidity: 25 % to 75 %

Air pressure: 86 kPa to 106 kPa (860 mbar to 1060 mbar).

A climatic category LCT / UCT / 56 is applied, defined by the lower category temperature (LCT), the upper category temperature (UCT), and the duration of exposure in the damp heat, steady state test (56 days).

The components are mounted for testing on printed circuit boards in accordance with EN 60115-8, 2.4.2, unless otherwise specified.

TEST PROCEDURES AND REQUIREMENTS

EN 60115-1 CLAUSE	IEC 60068-2 (1) TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE (ΔR)
			Stability for product types:	
			M25SI1206	5 Ω to 3.9 kΩ
4.5	-	Resistance	-	± 5 % R
4.8	-	Temperature coefficient	At (20 / -55 / 20) °C and (20 / 125 / 20) °C	± 100 ppm/K
4.25.1	-	Endurance at 70 °C: standard operation mode	$U = \sqrt{P_{70} \times R} \leq U_{max.}$; whichever is the less severe; 1.5 h on; 0.5 h off; 70 °C; 1000 h	≤ ± 1 % R
4.25.3	-	Endurance at upper category temperature	125 °C; 1000 h	≤ ± 1 % R
4.24	78 (Cab)	Damp heat, steady state	(40 ± 2) °C; 56 days; (93 ± 3) % RH	≤ ± 0.5 % R
4.19	14 (Na)	Rapid change of temperature	30 min at LCT; 30 min at UCT; LCT = -55 °C; UCT = 125 °C	≤ ± 0.2 % R
4.18	58 (Td)	Resistance to soldering heat	Solder bath method; (260 ± 5) °C; (10 ± 1) s	≤ ± 0.2 % R

Note

(1) The quoted IEC standards are also released as EN standards with the same number and identical contents.

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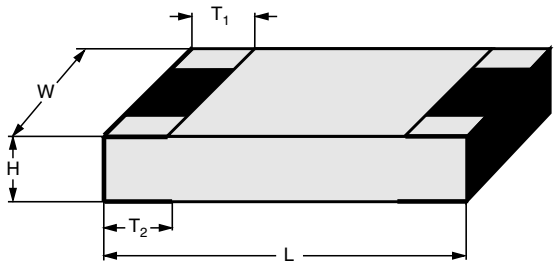
DIMENSIONS

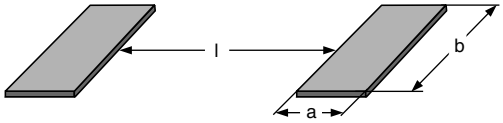


DIMENSIONS AND MASS						
TYPE / SIZE	H (mm)	L (mm)	W (mm)	T_1 (mm)	T_2 (mm)	MASS (mg)
M25SI1206	0.55 ± 0.05	3.20 + 0.10 / - 0.20	1.60 ± 0.15	0.45 ± 0.20	0.40 ± 0.20	10

Note

- Resistors M25SI are marked using the three-character code system of IEC 60062 (1), 4.2.2. on their beige protective coating.

SOLDER PAD DIMENSIONS



RECOMMENDED SOLDER PAD DIMENSIONS						
TYPE / SIZE	WAVE SOLDERING			REFLOW SOLDERING		
	a (mm)	b (mm)	l (mm)	a (mm)	b (mm)	l (mm)
M25SI1206	0.90	1.70	2.00	1.10	1.70	2.30

Notes

- The given solder pad dimensions reflect the considerations for board design and assembly as outlined e.g. in standards IEC 61188-5-x (1), or in publication IPC-7351.

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