Precision Surface Mount Resistors
Wirewound or Metal Film Technologies

FEATURES

- Approved according CECC 40402-801 (wirewound)
- Wide range of ohmic values (0.04 Ω to 1 MΩ)
- Low temperature coefficient (± 25 ppm/°C available)
- Good electrical insulation
- All welded construction and molded encapsulant
- High power ratings (up to 2.5 W)
- Stability class 0.5
- Pure matte tin termination
- Compliant to RoHS Directive 2002/95/EC

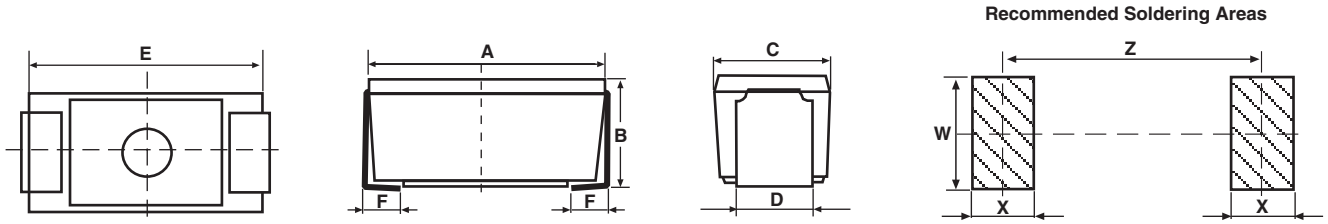
Pb-free

e3

RoHS COMPLIANT

Specially designed for surface mounting, the MSP series uses either wirewound or metal film technology. The molded package ensures mechanical and climatic protection as well as high dielectric insulation. The MSP design is compatible with surface mounting equipment and can withstand wave and reflow soldering techniques.

DIMENSIONS in millimeters



SERIES AND STYLES	A	B	C	D	E	F	W	X	Z	AVERAGE MASS (g)
MSP 1	6.9	3.8	3.8	2.5	6.5	1.4	2.7	2.9	6	0.2
MSP 2	11.4	5	7	5	11	2.4	5.2	4.1	9.4	0.8
MSP 3	14.8	6.6	7	5	14.4	2.4	5.2	4.1	12.7	1.5

Note
• General tolerance: ± 0.2 mm

TECHNICAL SPECIFICATIONS

RESISTIVE TECHNOLOGY		WIREWOUND			METAL FILM	
Vishay Sfernice Series		MSP 1 B	MSP 2 B	MSP 3 B	MSP 1 C	MSP 2 C
CECC 40402-801		RW1	RW2	RW3	-	-
Metric Size		0704M	1107M	1607M	0704M	1107M
Rated Dissipation at + 25 °C, P_{25}		1 W	2 W	2.5 W	0.5 W	1 W
Ohmic Range in Relation to Tolerance (with Prefered Ohmic Value Series)	± 5 % E24 Series	0.04 to 2.2K	0.04 to 4.7K	0.04 to 13K	-	-
	± 2 % E48 Series	0.04 to 2.2K	0.04 to 4.7K	0.05 to 13K	-	-
	± 1 % E96 Series	0.04 to 2.2K	0.04 to 4.7K	0.05 to 13K	10 to 332K	10 to 1M
	± 0.5 % E96 Series	0.4 to 2.2K	0.4 to 4.7K	0.3 to 13K	10 to 332K	10 to 1M
Approved Range CECC 40402-801	1 % or Class 0.5	0.5 1K	0.5 2.2K	0.1 4.12K	-	-
Limiting Element Voltage, $U_{max.}$ AC/DC		50 V	120 V	200 V	300 V	350 V

For technical questions, contact: sfer@vishay.com

TECHNICAL SPECIFICATIONS (continued)

RESISTIVE TECHNOLOGY	Wirewound			Metal Film	
Series	**MSP 1 B**	**MSP 2 B**	**MSP 3 B**	**MSP 1 C**	**MSP 2 C**
Critical Resistance	-	-	-	180K	122.5K
Temperature Coefficient	CECC 40402-801 - 55 °C/+ 200 °C < 1 Ω ± 100 ppm/°C 1 Ω to < 10 Ω ± 50 ppm/°C ≥ 10 Ω ± 25 ppm/°C			- 55 °C/+ 155 °C 10 kΩ to 332 kΩ K3: ± 50 ppm/°C K4: ± 25 ppm/°C > 332 kΩ -	K3: ± 50 ppm/°C
Failure Rate with CECC Approval	E6 10^{-6}/h	E6 10^{-6}/h	E0 or A 10^{-4}/h	-	-

MECHANICAL SPECIFICATIONS

RESISTIVE TECHNOLOGY	Wirewound	Metal Film
Encapsulant	Thermoset	
Resistive Element	CuNi or NiCr	NiCr or NiP
Ceramic Substrate	Alumina or Steatite	Alumina
Termination	Electrolytic pure matte tin	

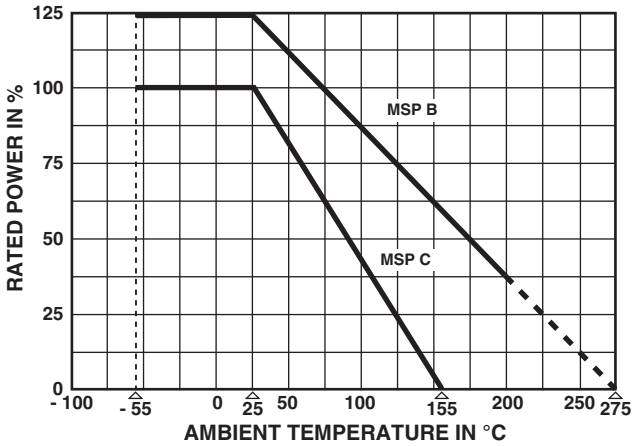
ENVIRONMENTAL SPECIFICATIONS

RESISTIVE TECHNOLOGY	Wirewound	Metal Film
Temperature Range	- 55 °C to 275 °C	- 55 °C to 155 °C
Climatic Category (LCT/UCT/days)	55/200/56	55/125/10

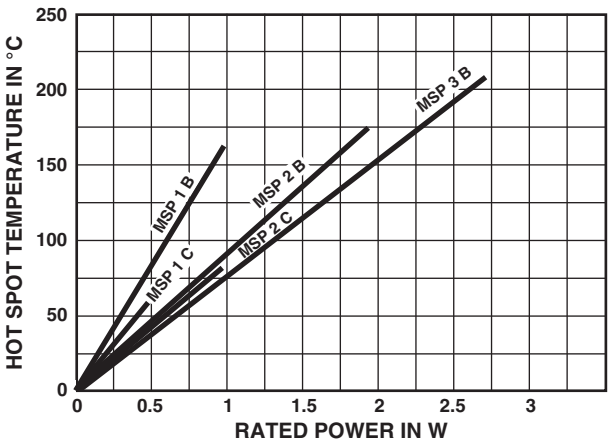
PERFORMANCE

TESTS	CONDITIONS		REQUIREMENTS	
	Wirewound	**Metal Film**	**Wirewound CECC 40402-801**	**Metal Film**
Short Time Overload	IEC 60115-1 5 P_r or U = 2 $U_{max.}$/5 s		± (0.25 % + 0.05 Ω)	± 0.25 %
Load Life	IEC 60115-1 90'/30' cycles 1000 h P_r + 25 °C 8000 h P_r		± (0.5 % + 0.05 Ω) ± (3 % + 0.05 Ω)	± 1 % -
Dielectric w/s Voltage	IEC 60115-1 U_{RMS} = 500 V/60 s		No flashover or breakdown Leakage current < 10 µA	
Rapid Change of Temperature	IEC 60115-1 IEC 60068-2-14 Test Na 5 cycles (30' at LCT/30' at UCT) - 55 °C/+ 200 °C	- 55 °C/+ 125 °C	± (0.25 % + 0.05 Ω)	± 0.25 %
Climatic Sequence	IEC 60115-1 - 55 °C/+ 200 °C	- 55 °C/+ 125 °C	± (0.5 % + 0.05 Ω)	± 0.5 %
Humidity (Steady State)	IEC 60115-1 IEC 60068-2-3 Test Ca 95 % HR/40 °C 56 days	10 days	± (0.5 % + 0.05 Ω)	± 1 %
Substrate Bending Test	IEC 60115-1 IEC 60068-2-21 Test U_{e3} 2 mm/10 times		± (0.25 % + 0.05 Ω)	± 0.25 %
Shock	IEC 60115-1 IEC 60068-2-27 Test Ea 50 *g*'s/half sine/3 times by direction (i.e. 18 shocks)		± (0.25 % + 0.05 Ω)	n/a
Vibration	IEC 60115-1 IEC 60068-2-6 Test Fc 10 Hz/2000 Hz	10 Hz/500 Hz	± (0.25 % + 0.05 Ω)	± 0.25 %
Resistance to Soldering Heat	IEC 60115-1 IEC 60068-2-58 Solder bath 260 °C/10 s		± (0.5 % + 0.05 Ω)	N/A

POWER RATING



TEMPERATURE RISE



SURFACE MOUNTING OF MSP B

Soldering cycle: 2 min at 215 °C or 10 s at 260 °C or with an iron 40 W: 3 s at 350 °C.
Soldering is possible by wave, reflow and vapor phase.

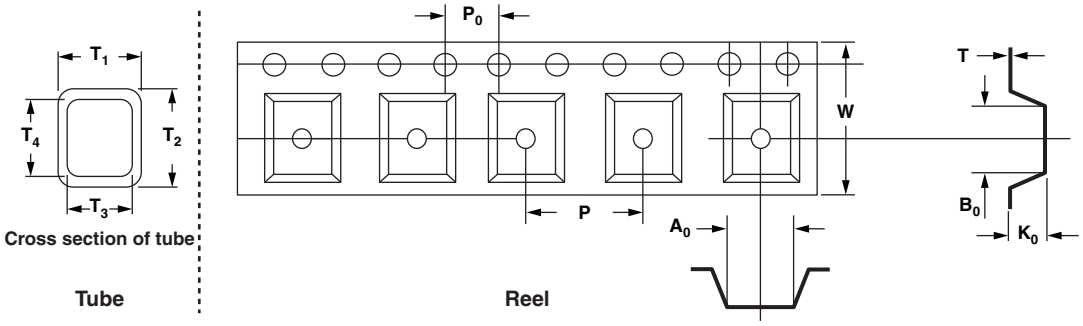
NON INDUCTIVE WINDING FOR MSP B

Non inductive (Ayrton Perry) winding available.
Please consult Vishay Sfernice.

PACKAGING

In bulk (plastic bag of 100 units or multiples)
In tube: MSP1 70 units per tube
MSP2 50 units per tube
MSP3 40 units per tube
In reel of 500 units for MSP1 and MSP2

DIMENSIONS in millimeters - Informative Data



	TUBE PACKAGING					REEL PACKAGING						
	T_1	T_2	T_3	T_4	Length	A_0	B_0	K_0	P_0	W	T	P
MSP 1	6.6	6.8	4.6	4.8	530	3.9	7.35	4.25	4	12	0.254	8
MSP 2	9.2	8.7	8	7.5	615	7.43	11.91	5.36	4	24	0.368	12
MSP 3						N/A						

MARKING

Vishay Sfernice trademark, ohmic value (in Ω), tolerance (in %), series and style, technology, manufacturing date.

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Wirewound or Metal Film Technologies

ORDERING INFORMATION

MSP	1	B		48U7	± 1 %	TC	BA100	e3
SERIES	STYLE	TECHNOLOGY B: Wirewound C: Metal Film	NON INDUCTIVE WINDING Optional	OHMIC VALUE	TOLERANCE	Applicable only in "C" technology	PACKAGING	LEAD (Pb)-FREE

SAP PART NUMBERING GUIDELINES

M	S	P		1	B	4	8	R	7	0	F		T	2	0	E	3

GLOBAL MODEL	OPTION	SIZE	OHMIC VALUE	TOL.	TEMP. COEF.	PACKAGING	SPECIAL	RoHS
MSP	**Blank** or **N** (Non inductive winding)	**1B** **2B** **3B** **1C** **2C** B = Wirewound C = Metal film	The first four digits are significant figures and the last digit specifies the number of zeros to follow. R designates decimal point. **48R70** = 48.7 Ω **48701** = 48 700 Ω **10002** = 100 000 Ω **R0100** = 0.01 Ω **R4700** = 0.47 Ω ...	**B** = 0.1 % **F** = 1 % **G** = 2 % **J** = 5 % **K** = 10 %	**Blank** or Applicable only on metal film technologies 1C and 2C: **E** ≥ K3 or **H** ≥ K4	**S14** = Bag (100 pieces) **R10** = Reel (500 pieces) **T25** = Tube (70 pieces) **T17** = Tube (40 pieces) **T20** = Tube (50 pieces)	As applicable	**E3** = Pure tin

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All product specifications and data are subject to change without notice.

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