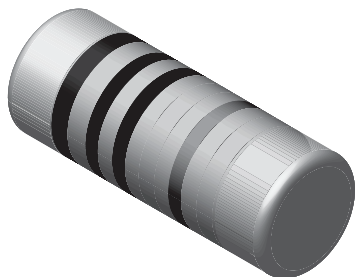


Thin Film Mini-MELF Resistors



FEATURES

- Advanced thin film technology
- AEC-Q200 qualified
- Low TCR and tight tolerances
- Excellent stability in different environmental conditions
- Pure tin termination on nickel barrier, plated on press fit steel caps
- Compliant to RoHS Directive 2002/95/EC

AUTOMOTIVE
GRADERoHS
COMPLIANTGREEN
(5-2008)**

STANDARD ELECTRICAL SPECIFICATIONS

MODEL	POWER RATING P_{70} W	LIMITING ELEMENT VOLTAGE DC or AC _{RMS} V	TEMPERATURE COEFFICIENT ppm/K	TOLERANCE %	RESISTANCE RANGE Ω	E-SERIES
SMM0204	0.25	200	± 15	± 0.1 ± 0.25 ± 0.5	43R to 221K 22R to 221K 10R to 221K	24; 96; 192
SMM0204	0.25	200	± 25	± 0.1 ± 0.25 ± 0.5	43R to 511K 22R to 511K 10R to 1M0	24; 96; 192
SMM0204	0.25	200	± 50	± 0.5 ± 1	10R to 1M0 R82 to 10M	24; 96; 192 24; 96
SMM0204	0.25	200	± 100	± 5	R22 to 10M	24
Zero-Ohm-Resistor: OMM0204 $R_{max.} = 10\text{ m}\Omega$ $I_{max.} = 3\text{ A}$						

Notes

- SMM0204 EN803 E0 and OMM0204 EN803 E0 respectively are available versions with IECQ-CECC approval to EN 140401-803, version A, with nominal failure rate level E0.
- The power dissipation on the resistor generates a temperature rise against the local ambient, depending on the heat flow support of the printed-circuit board (thermal resistance). The rated dissipation applies only if the permitted film temperature of 155 °C is not exceeded.

TECHNICAL SPECIFICATIONS

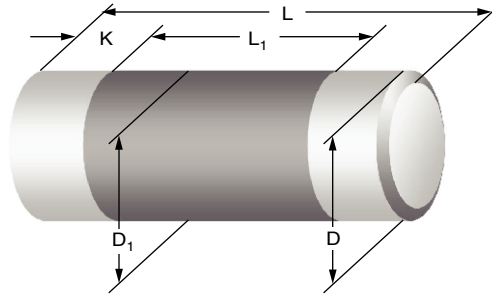
PARAMETER	UNIT	SMM0204
Power rating P_{70}	W	0.25
Limiting element voltage, DC or AC _{RMS}	V	200
Insulation voltage (1 min), DC or AC _{PEAK}	V	300
Insulation resistance	Ω	$\geq 10^{10}$
Category temperature range	°C	- 55 to + 125 (+ 155)
Failure rate: FIT _{observed}	$\leq 0.1 \times 10^{-9}/\text{h}$	

Notes

- The upper temperature limit of 125 °C reflects the prescriptions of the detail specification EN 140401-803. However, the products may be operated up 155 °C, if the tradeoff through decreased drift stability is acceptable to the specific application.
- The power dissipation on the resistor generates a temperature rise against the local ambient, depending on the heat flow support of the printed-circuit board (thermal resistance). The rated dissipation applies only if the permitted film temperature of 125 °C or 155 °C respectively is not exceeded.
- The specification of this product is based on a test board according to EN 140400, providing a thermal resistance of approximately 220 K/W.
- 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.
- The IECQ-CECC approved product versions SMM0204 EN803 E0 and OMM0204 EN803 E0 respectively feature a quality factor $\pi_Q = 3$ for the purpose of system MTBF calculations, compared with $\pi_Q = 10$ for the standard versions.

** Please see document "Vishay Material Category Policy": www.vishay.com/doc?99902

DIMENSIONS

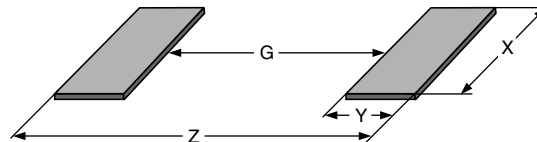


DIMENSIONS AND MASS						
TYPE	L (mm)	D _{max.} (mm)	L ₁ min. (mm)	D ₁ (mm)	K (mm)	MASS (mg)
SMM0204 OMM0204	3.6 + 0/- 0.15	1.4	1.75	D + 0/- 0.15	0.85 + 0/- 0.35	18

Notes

- Color code marking is applied according to IEC 60062 in four bands for 5 % tolerance, or in five bands. Each color band appears as a single solid line, voids are permissible if at least $\frac{2}{3}$ of the band is visible from each radial angle of view. The last color band for tolerance is approximately 50 % wider than the other bands.
- The color of the body coating is light green for jumpers and for a temperature coefficient of ± 50 ppm/K or of ± 100 ppm/K, pink for ± 25 ppm/K, or violet for ± 15 ppm/K.
- Zero ohm jumper are marked with one centered black band.

PATTERN STYLES FOR MELF RESISTORS



RECOMMENDED SOLDER PAD DIMENSIONS								
TYPE	WAVE SOLDERING				REFLOW SOLDERING			
	G (mm)	Y (mm)	X (mm)	Z (mm)	G (mm)	Y (mm)	X (mm)	Z (mm)
SMM0204 OMM0204	1.5	1.5	1.8	4.5	1.6	1.25	1.7	4.1

Note

- The given solder pad dimensions reflect the considerations for board design and assembly as outlined e.g. in standards IEC 61188-5-x, or in publication IPC-7351. They do not guarantee any supposed thermal properties, however, they will be found adequate for most general applications.

PART NUMBER AND PRODUCT DESCRIPTION

Part Number: SMM02040C5620FB000

Part Number: OMM02040000000B000

S	M	M	0	2	0	4	0	C	5	6	2	0	F	B	0	0	0
O	M	M	0	2	0	4	0	0	0	0	0	0	0	B	0	0	0

MODEL	VERSION	TCR	RESISTANCE	TOLERANCE	PACKAGING
SMM0204 OMM0204	0 = Neutral V = EN 140401-803, version A, nominal failure rate level E0	E = ± 15 ppm/K D = ± 25 ppm/K C = ± 50 ppm/K B = ± 100 ppm/K 0 = Jumper	3 digit value 1 digit multiplier 0000 = Jumper MULTIPLIER 7 = $\times 10^{-3}$ 2 = $\times 10^2$ 8 = $\times 10^{-2}$ 3 = $\times 10^3$ 9 = $\times 10^{-1}$ 4 = $\times 10^4$ 0 = $\times 10^0$ 5 = $\times 10^5$ 1 = $\times 10^1$	B = ± 0.1 % C = ± 0.25 % D = ± 0.5 % F = ± 1 % J = ± 5 % 0 = Jumper	B1 B3 B0 M3

Product Description: SMM0204 50 562R 1 % B0

Product Description: OMM0204 0R0 B0

SMM0204	50	562R	1 %	B0	-
OMM0204	-	0R0	-	B0	-
MODEL	TCR	RESISTANCE	TOLERANCE	PACKAGING	VERSION
SMM0204 OMM0204	± 15 ppm/K ± 25 ppm/K ± 50 ppm/K ± 100 ppm/K	100R = 100 Ω 2M21 = 2.21 M Ω 0R0 = Jumper	± 0.1 % ± 0.25 % ± 0.5 % ± 1 % ± 5 %	B1 B3 B0 M3	

Note

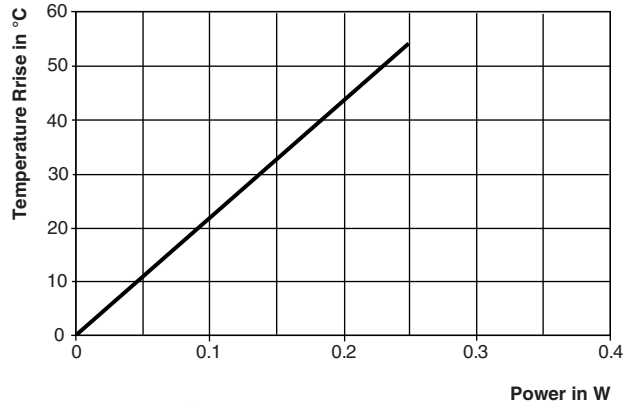
- Products can be ordered using either the PART NUMBER or the PRODUCT DESCRIPTION.

PACKAGING

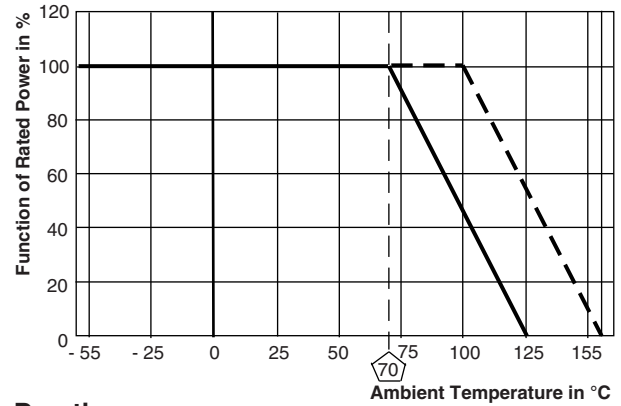
TYPE	CODE	QUANTITY	CARRIER TAPE	WIDTH	PITCH	REEL DIAMETER
SMM0204 OMM0204	B1 ⁽¹⁾	1000 ⁽¹⁾	Blister tape acc. IEC 60286-3 Type II	8 mm	4 mm	180 mm/7"
	B3	3000				330 mm/13"
	B0	10 000				
	M3	3000	Bulk case acc. IEC 60286-6	-	-	-
SMM0204 EN803 E0 OMM0204 EN803 E0	B1	1000	Blister tape acc. IEC 60286-3 Type II	8 mm	4 mm	180 mm/7"
	B3	3000				330 mm/13"
	B0	10 000				

Note

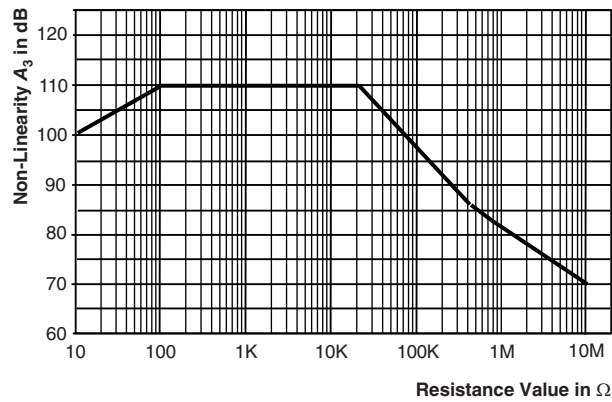
- ⁽¹⁾ Package of 1000 pieces, code B1, is available only for products with TCR ± 25 ppm/K or ± 15 ppm/K, and with tolerance ± 0.25 % or ± 0.1 %.

FUNCTIONAL PERFORMANCE


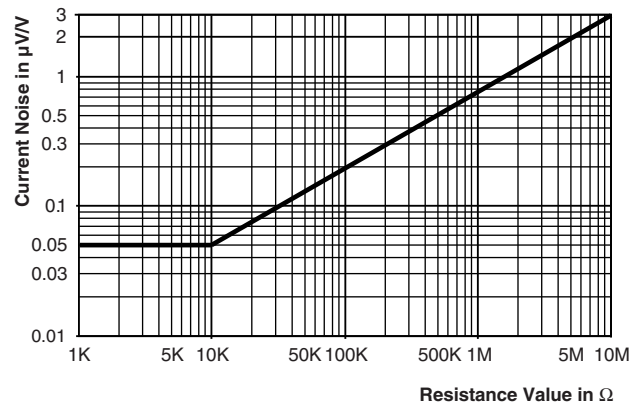
Temperature Rise



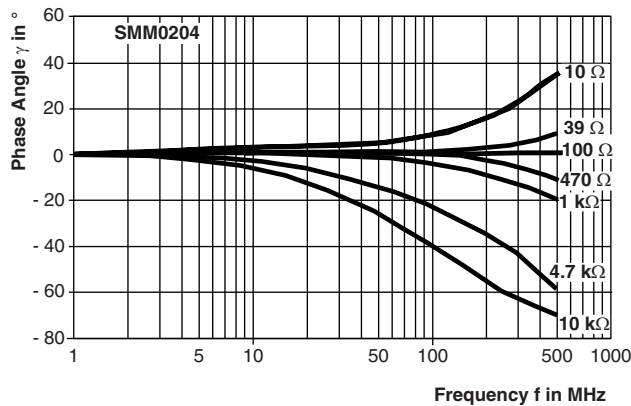
Derating



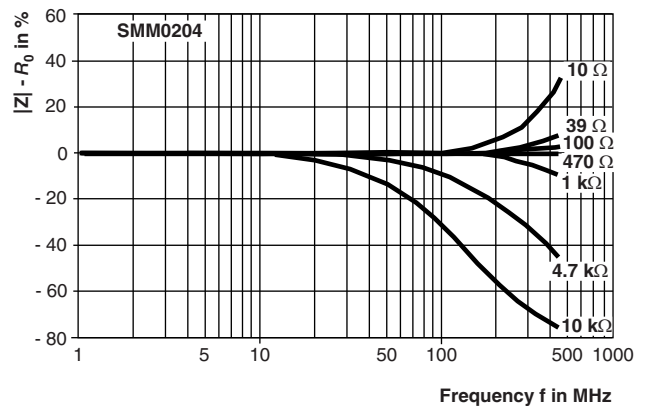
Non-linearity



Current Noise

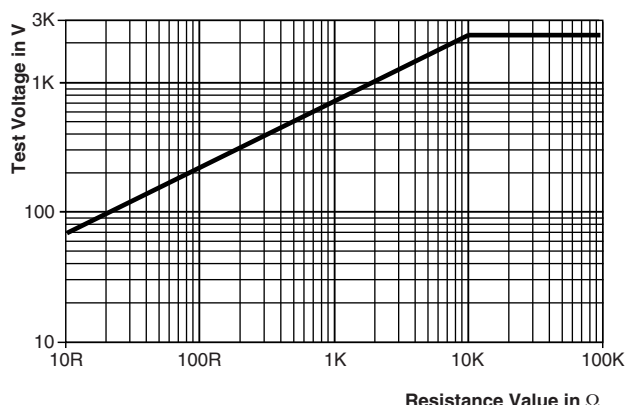


HF - Performance

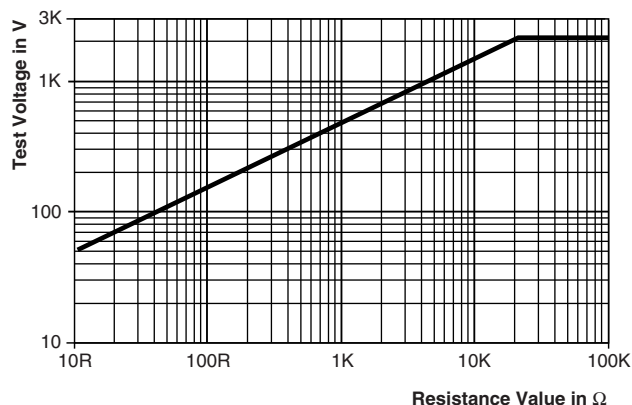


HF - Performance

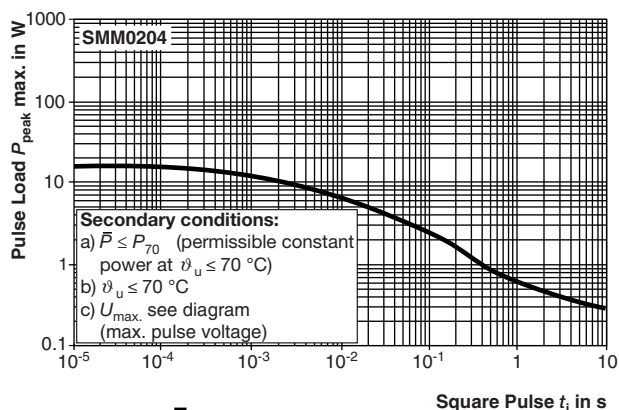
FUNCTIONAL PERFORMANCE



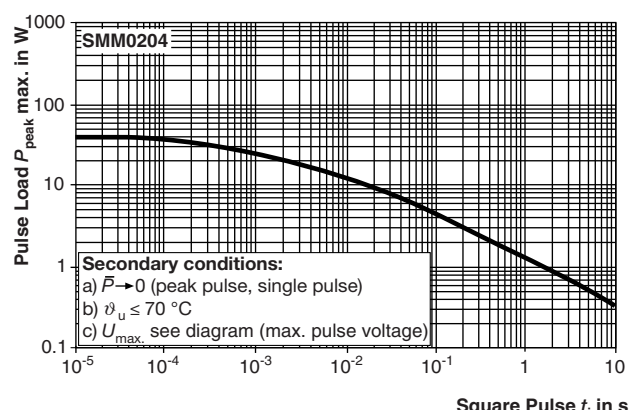
Single pulse high voltage overload capability
1.2/50 acc. EN 60115-1, 4.27



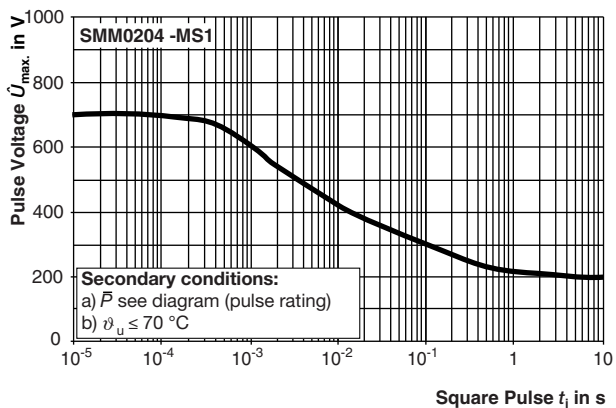
Single pulse high voltage overload capability
10/700 acc. EN 60115-1, 4.27



Pulse Rating $\bar{P} \leq P_{70}$



Pulse Rating $\bar{P} \rightarrow 0$



Maximum Pulse Voltage

TEST PROCEDURES AND REQUIREMENTS

TEST	CONDITIONS OF TEST	REQUIREMENTS PERMISSIBLE CHANGE (ΔR)			
		STABILITY CLASS 0.25	STABILITY CLASS 0.5	STABILITY CLASS 1	STABILITY CLASS 2
		10 Ω to 332 k Ω	1 Ω to 10 Ω	< 1 Ω	> 332 k Ω
Endurance test at 70 °C IEC 60115-1, 4.25.1	$U = \sqrt{P_{70} \times R} \leq U_{\max.};$ 1.5 h “on”, 0.5 h “off” at 70 °C, 1000 h at 70 °C, 8000 h	$\pm (0.25 \% R + 0.05 \Omega)$ $\pm (0.5 \% R + 0.05 \Omega)$			$\pm (0.5 \% R + 0.05 \Omega)$ $\pm (1.0 \% R + 0.05 \Omega)$
Endurance at UCT IEC 60115-1, 4.25.3	at 125 °C, 1000 h	$\pm (0.25 \% R + 0.05 \Omega)$			$\pm (0.5 \% R + 0.05 \Omega)$
Damp heat steady state 40 °C/93 % RH IEC 60115-1, 4.24 and IEC 60068-2-78	56 days; $U = 0.1 \times \sqrt{P_{70} \times R};$ $U_{\max.} = 20 \text{ V}$	$\pm (0.25 \% R + 0.05 \Omega)$	$\pm (0.5 \% R + 0.05 \Omega)$		
Damp heat steady state accelerated 85 °C/85 % RH	1000 h; $U = 0.3 \times \sqrt{P_{70} \times R};$ $U_{\max.} = 40 \text{ V}$	$\pm 1.0 \% R + 0.05 \Omega)^{(1)}$			
Rapid change of temperature; 1000 cycles IEC 60115-1, 4.19 and IEC 60068-2-14	30 min at LCT; 30 min at UCT; LCT = - 55 °C; UCT = 125 °C	$\pm (0.25 \% R + 0.05 \Omega)$			
Overload test IEC 60115-1, 4.13	$U = 2.5 \times \sqrt{P_{70} \times R} \leq 2 \times U_{\max.};$ 2 s	$\pm (0.05 \% R + 0.01 \Omega)$			$\pm (0.1 \% R + 0.05 \Omega)$
Electrostatic discharge (HBM) IEC 60340-3-1	3 positive + 3 negative discharges 2 kV	$\pm (0.5 \% R + 0.05 \Omega)$			
Resistance to soldering heat IEC 60115-1, 4.18.2 and IEC 60068-2-58	Solder bath method (260 $\pm$ 5) °C; 10 s	$\pm (0.05 \% R + 0.01 \Omega)$	$\pm (0.1 \% R + 0.05 \Omega)$		

Note
⁽¹⁾ For resistance > 2M21: $\pm (2.0 \% R + 0.05 \Omega)$.

APPLICABLE SPECIFICATIONS

• EN 60115-1	Generic specification
• EN 140400	Sectional specification
• EN 140401-803	Detail specification
• IEC 60068-2-x	Variety of environmental test procedures
• IEC 60286-3	Packaging of SMD components



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