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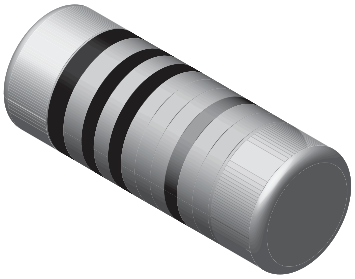
Thin Film Mini-MELF Resistors



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 GRADE

Pb-free

RoHS COMPLIANT

GREEN (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 mΩ		$I_{max.}$ = 3 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

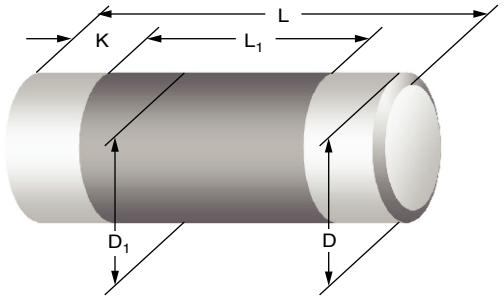
PARAMETER	UNIT	SMM0204
Power rating P_{70}	W	0.25
Limiting element voltage, DC or AC_{RMS}	V	200
Insulation voltage (1 min), DC or AC_{PEAK}	V	300
Insulation resistance	Ω	≥ 10^{10}
Category temperature range	°C	- 55 to + 125 (+ 155)
Failure rate: $FIT_{observed}$	≤ 0.1 x 10^{-9}/h	

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 π_Q = 3 for the purpose of system MTBF calculations, compared with π_Q = 10 for the standard versions.

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

DIMENSIONS

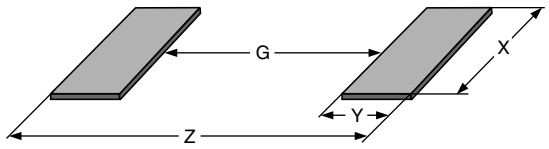


DIMENSIONS AND MASS						
TYPE	L (mm)	$D_{max.}$ (mm)	$L_{1\ min.}$ (mm)	D_1 (mm)	K (mm)	MASS (mg)
SMM0204 OMM0204	3.6 + 0/- 0.15	1.4	1.75	D + 0/- 0.15	0.85 + 0/- 0.35	18

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 $^2/_3$ 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** = $*10^{-3}$ **2** = $*10^{2}$ **8** = $*10^{-2}$ **3** = $*10^{3}$ **9** = $*10^{-1}$ **4** = $*10^{4}$ **0** = $*10^{0}$ **5** = $*10^{5}$ **1** = $*10^{1}$	**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 MΩ **0R0** = Jumper	± **0.1** % ± **0.25** % ± **0.5** % ± **1** % ± **5** %	**B1** **B3** **B0** **M3**	

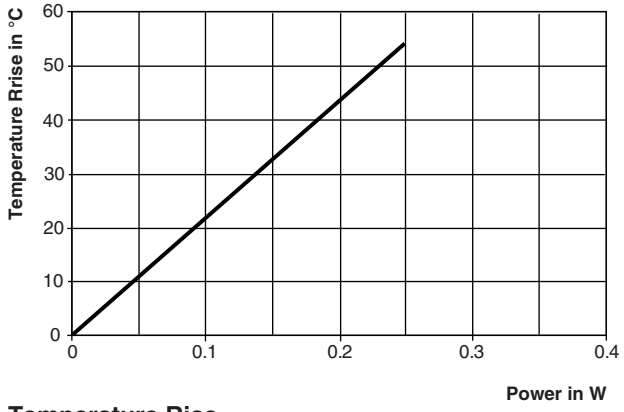
Note
- Products can be ordered using either the PART NUMBER or the PRODUCT DESCRIPTION.

PACKAGING

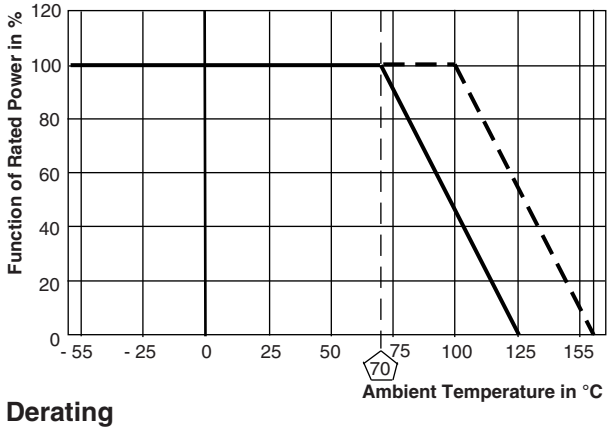
TYPE	CODE	QUANTITY	CARRIER TAPE	WIDTH	PITCH	REEL DIAMETER
SMM0204 OMM0204	B1 (1)	1000 (1)	Blister tape acc. IEC 60286-3 Type II	8 mm	4 mm	180 mm/7"
	B3	3000				
	B0	10 000				330 mm/13"
	M3	3000	Bulk case acc. IEC 60286-6	-	-	-
SMM0204 EN803 E0 OMM0204 EN803 E0	B1	1000	Blister tape acc. IEC 60286-3 Type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

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 %.

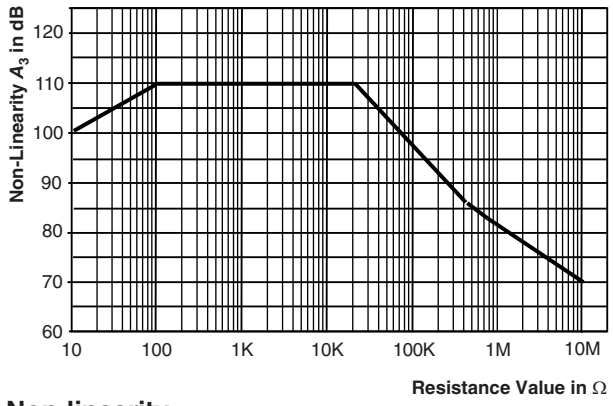
FUNCTIONAL PERFORMANCE



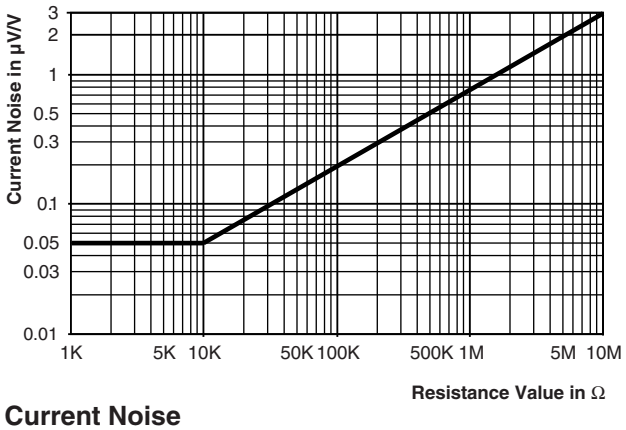
Temperature Rise



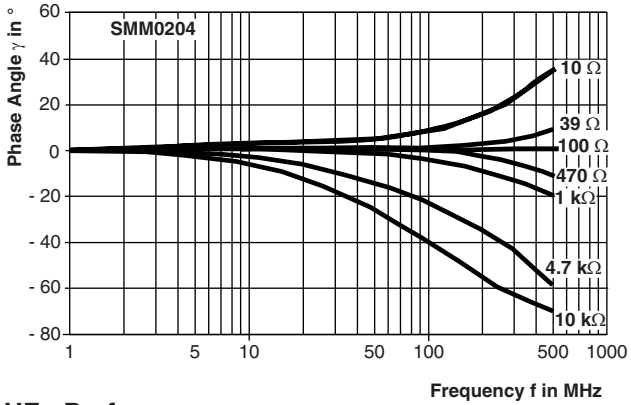
Derating



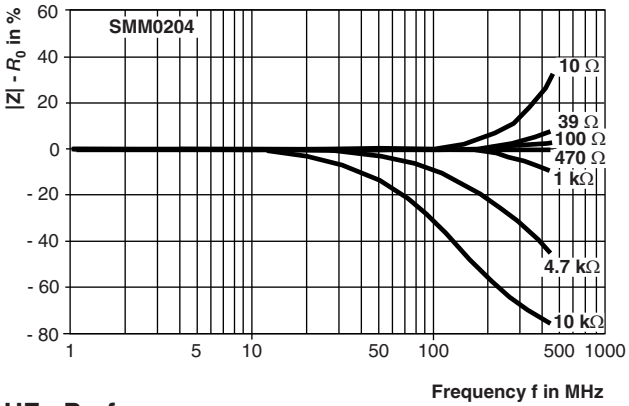
Non-linearity



Current Noise

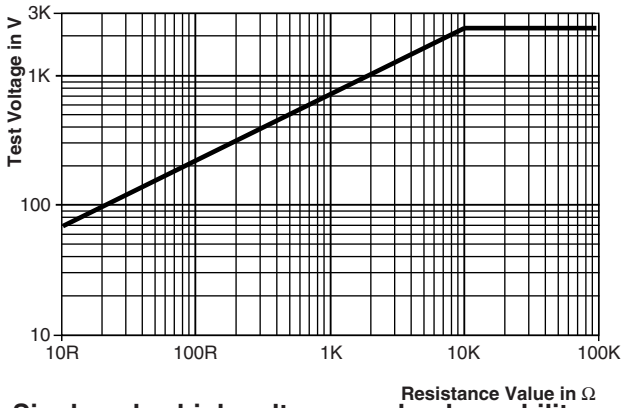


HF - Performance

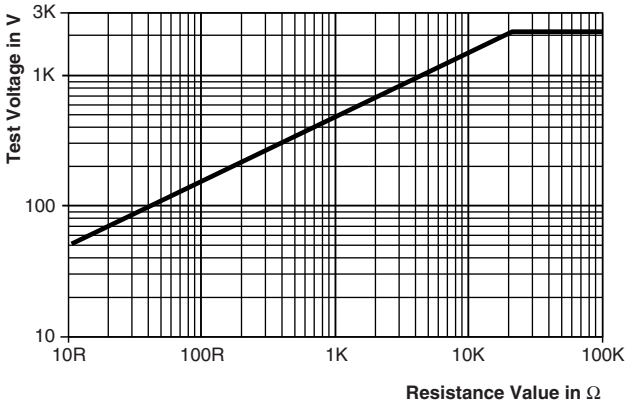


HF - Performance

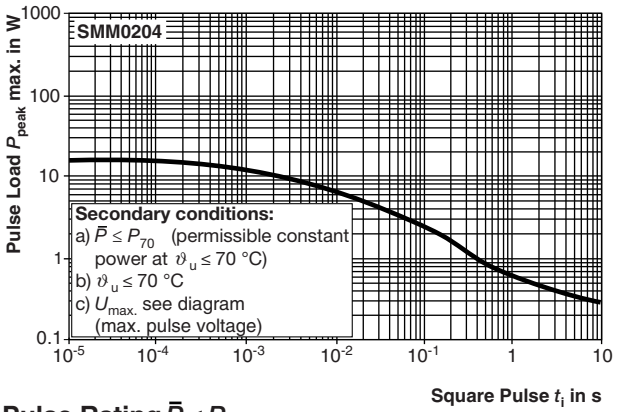
FUNCTIONAL PERFORMANCE



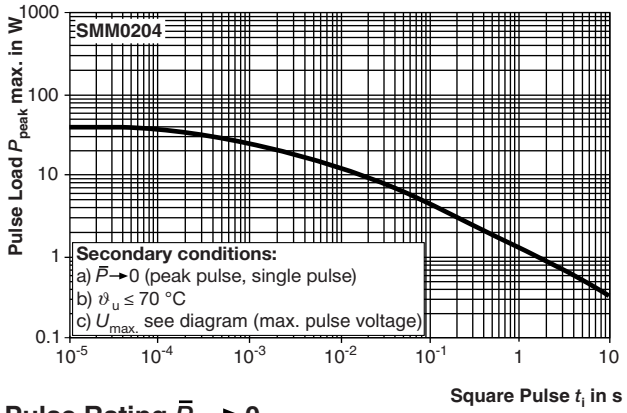
Single pulse high voltage overload capability 1.2/50 acc. EN 60115-1, 4.27



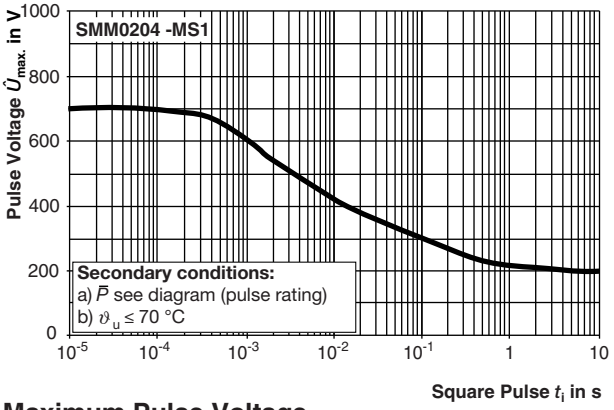
Single pulse high voltage overload capability 10/700 acc. EN 60115-1, 4.27



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 kΩ	1 Ω to 10 Ω	< 1 Ω	> 332 kΩ
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	± (0.25 % R + 0.05 Ω)			± (0.5 % R + 0.05 Ω)
	at 70 °C, 8000 h	± (0.5 % R + 0.05 Ω)			± (1.0 % R + 0.05 Ω)
Endurance at UCT IEC 60115-1, 4.25.3	at 125 °C, 1000 h	± (0.25 % R + 0.05 Ω)			± (0.5 % R + 0.05 Ω)
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 V	± (0.25 % R + 0.05 Ω)	± (0.5 % R + 0.05 Ω)		
Damp heat steady state accelerated 85 °C/85 % RH	1000 h; $U = 0.3 \times \sqrt{P_{70} \times R}$; $U_{max.}$ = 40 V	± 1.0 % R + 0.05 Ω) (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	± (0.25 % R + 0.05 Ω)			
Overload test IEC 60115-1, 4.13	$U = 2.5 \times \sqrt{P_{70} \times R} \leq 2 \times U_{max.}$; 2 s	± (0.05 % R + 0.01 Ω)			± (0.1 % R + 0.05 Ω)
Electrostatic discharge (HBM) IEC 60340-3-1	3 positive + 3 negative discharges 2 kV	± (0.5 % R + 0.05 Ω)			
Resistance to soldering heat IEC 60115-1, 4.18.2 and IEC 60068-2-58	Solder bath method (260 ± 5) °C; 10 s	± (0.05 % R + 0.01 Ω)	± (0.1 % R + 0.05 Ω)		

Note

(1) For resistance > 2M21: ± (2.0 % R + 0.05 Ω).

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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