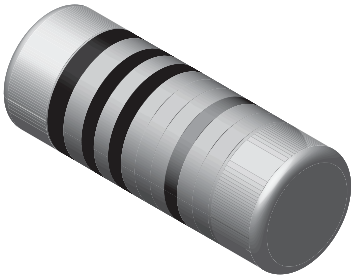
Thin Film Mini-MELF Resistors



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

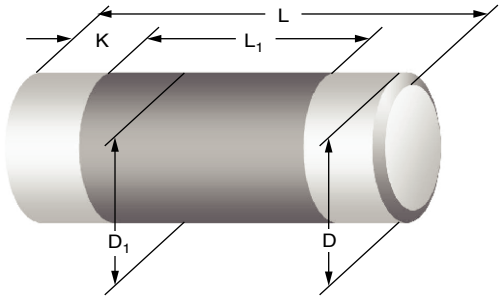
PARAMETER	UNIT	SMM0204
Power rating P_{70}	W	0.25
Limiting element voltage, DC or AC_{RMS}	V	200
Insulation voltage (1 min), DC or AC_{PEAK}	V	300
Insulation resistance	Ω	≥ 10^{10}
Category temperature range	°C	- 55 to + 125 (+ 155)
Failure rate: $FIT_{observed}$	≤ 0.1 x 10^{-9}/h	

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

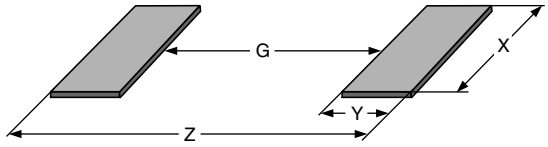


DIMENSIONS AND MASS						
TYPE	L (mm)	$D_{max.}$ (mm)	$L_{1\ min.}$ (mm)	D_1 (mm)	K (mm)	MASS (mg)
SMM0204 OMM0204	3.6 + 0/- 0.15	1.4	1.75	D + 0/- 0.15	0.85 + 0/- 0.35	18

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.

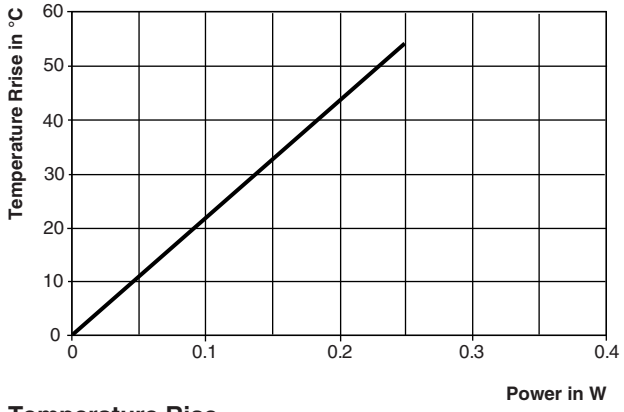
PACKAGING

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"

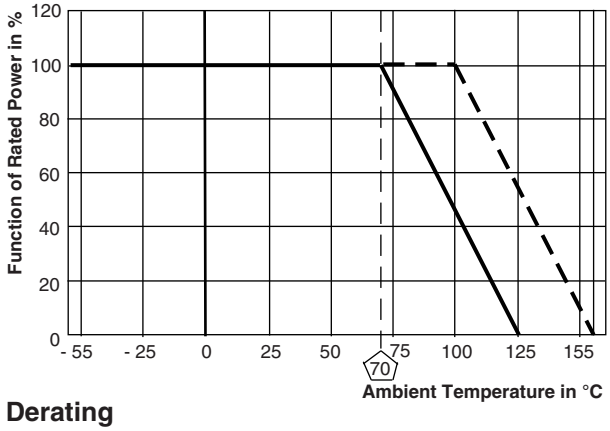
Note

(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 %.

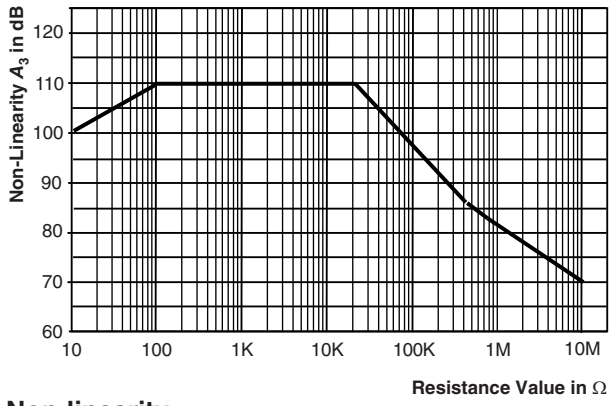
FUNCTIONAL PERFORMANCE



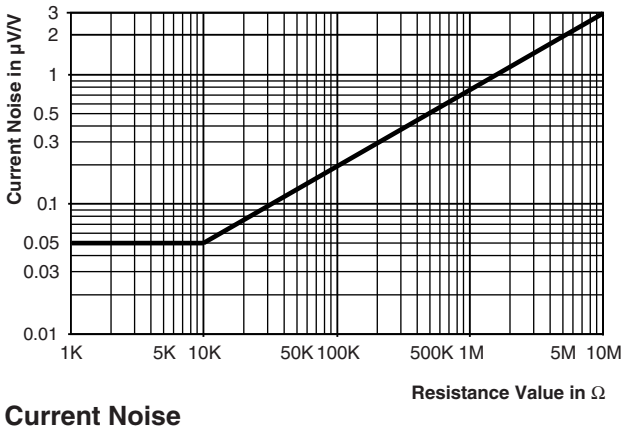
Temperature Rise



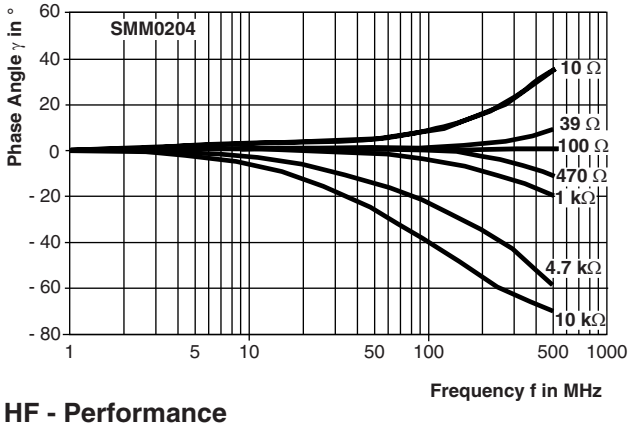
Derating



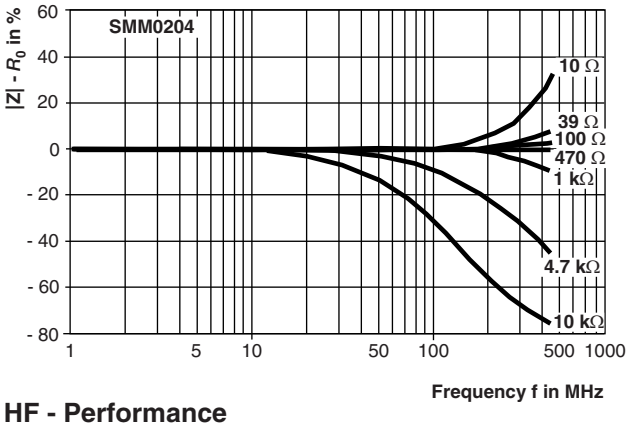
Non-linearity



Current Noise

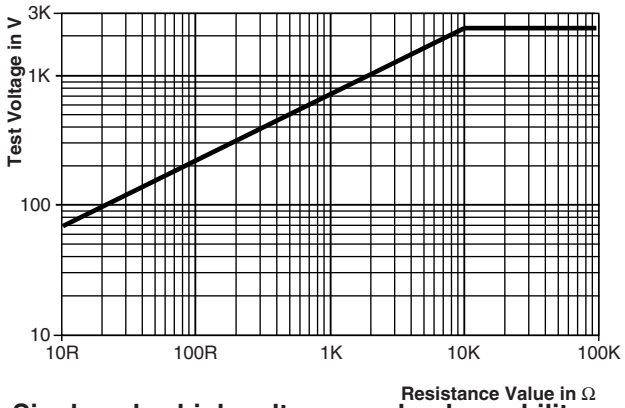


HF - Performance

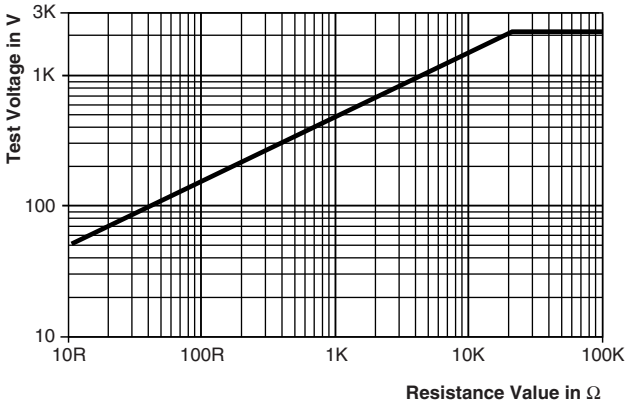


HF - Performance

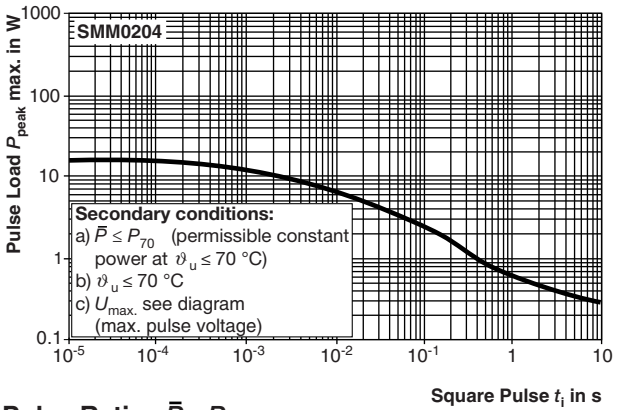
FUNCTIONAL PERFORMANCE



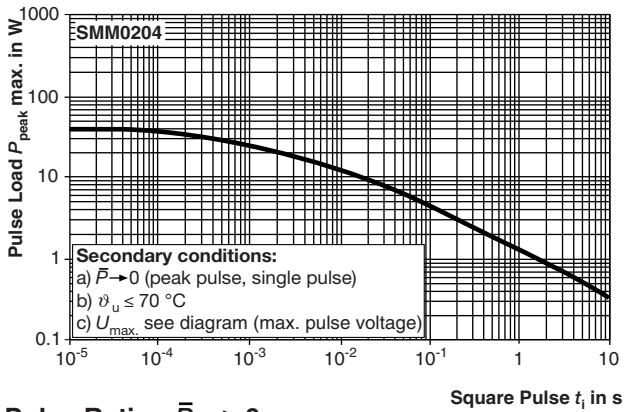
Single pulse high voltage overload capability 1.2/50 acc. EN 60115-1, 4.27



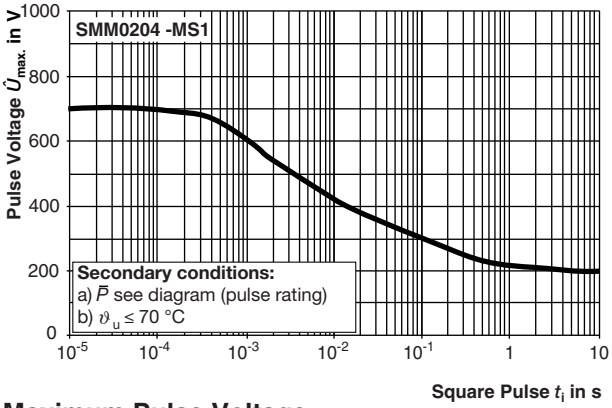
Single pulse high voltage overload capability 10/700 acc. EN 60115-1, 4.27



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

Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, “Vishay”), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay’s knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer’s responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and/or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer’s technical experts. Product specifications do not expand or otherwise modify Vishay’s terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.

Material Category Policy

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.

Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Vishay:

SMM02040C3308FB300 SMM02040C3009FB300 SMM02040C5621FB300 OMM02040000000B000
SMM02040C1100FB300 SMM02040C1109FB300 SMM02040C1208FB300 SMM02040C1210FB300
SMM02040C1300FB300 SMM02040C1301FB300 SMM02040C1303FB300 SMM02040C1470FB300
SMM02040C1471FB300 SMM02040C1472FB300 SMM02040C1504FB300 SMM02040C1541FB300
SMM02040C1621FB300 SMM02040C1622FB300 SMM02040C1783FB300 SMM02040C1822FB300
SMM02040C1823FB300 SMM02040C1828FB300 SMM02040C1872FB300 SMM02040C1960FB300
SMM02040C1961FB300 SMM02040C2052FB300 SMM02040C2102FB300 SMM02040C2152FB300
SMM02040C2159FB300 SMM02040C2261FB300 SMM02040C2401FB300 SMM02040C2408FB300
SMM02040C2431FB300 SMM02040C2432FB300 SMM02040C2611FB300 SMM02040C2612FB300
SMM02040C2613FB300 SMM02040C2708FB300 SMM02040C3001FB300 SMM02040C3012FB300
SMM02040C3013FB300 SMM02040C3481FB300 SMM02040C3602FB300 SMM02040C3651FB300
SMM02040C3652FB300 SMM02040C3830FB300 SMM02040C3831FB300 SMM02040C3832FB300
SMM02040C3839FB300 SMM02040C3900FB300 SMM02040C3903FB300 SMM02040C3921FB300
SMM02040C3929FB300 SMM02040C4021FB300 SMM02040C4022FB300 SMM02040C4120FB300
SMM02040C4221FB300 SMM02040C4301FB300 SMM02040C4302FB300 SMM02040C4321FB300
SMM02040C4422FB300 SMM02040C4642FB300 SMM02040C4704FB300 SMM02040C4753FB300
SMM02040C5101FB300 SMM02040C5102FB300 SMM02040C5110FB300 SMM02040C5113FB300
SMM02040C5600FB300 SMM02040C5609FB300 SMM02040C5622FB300 SMM02040C6041FB300
SMM02040C6191FB300 SMM02040C6199FB300 SMM02040C6201FB300 SMM02040C6808FB300
SMM02040C6813FB300 SMM02040C7152FB300 SMM02040C7503FB300 SMM02040C8253FB300
SMM02040C9091FB300 SMM02040C9092FB300 SMM02040C9101FB300 SMM02040C9530FB300
SMM02040D2001BB300 SMM02040D2003BB300 SMM02040D2490BB300 SMM02040D3003BB300
SMM02040E1001BB300 SMM02040E2001BB300 SMM02040E2003BB300 SMM02040E3322BB300
SMM02040C8252FB300 SMM02040C1509FB300 SMM02040C5608FB300 SMM02040D1003BB300
SMM02040D1502BB300 SMM02040C8259FB300 SMM02040D2002BB300 SMM02040C1209FB300