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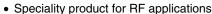


High Frequency MELF Resistors



MMU 0102 HF, MMA 0204 HF and MMB 0207 HF speciality thin film MELF resistors for RF applications are the perfect choice in high frequency circuit designs where the impedance change due to the parasitic inductance of regular and professional resistors can not be accepted. Typical applications are in the fields of telecommunication equipment and industrial electronics.

FEATURES





- Suitable for more than 10 GHz
- Force fitted steel caps, tin plated on nickel barrier
- Pure Sn termination on Ni barrier layer
- Compatible with lead (Pb)-free and lead containing soldering processes
- Lead (Pb)-free and RoHS compliant

APPLICATIONS

- Telecommunication equipment
- Industrial electronics.

METRIC SIZE								
DIN:	0102	0204	0207					
CECC:	RC 2211M	RC 3715M	RC 6123M					

TECHNICAL SPECIFICATIONS							
DESCRIPTION	MMU	0102 HF	MMA 0204 HF		MMB 0207 HF		
Metric CECC size	RC 2	211M	RC 3	715M	RC 6123M		
Resistance range	6.8 Ω to	ο 470 Ω	1.5 Ω to	ο 475 Ω	6.8 Ω to	ο 470 Ω	
Resistance tolerance	± 2	2 %	± 1	I %	± 2	2 %	
Temperature coefficient			± 50 p	opm/K			
Operation mode	standard	power	standard	power	standard	power	
Climatic category (LCT/UCT/days)	55/125/56	55/155/56	55/125/56	55/155/56	55/125/56	55/155/56	
Rated dissipation, $P_{70}^{1)}$	0.2 W	0.3 W	0.25 W	0.4 W	0.4 W	1.0 W ²⁾	
Operating voltage, U _{max} AC/DC	limited	by <i>P</i> ₇₀	limited by P ₇₀		limited by P ₇₀		
Film temperature	125 °C	155 °C	125 °C	155 °C	125 °C	155 °C	
Max. resistance change at P_{70} for resistance range, $ \Delta R/R $ max., after:	6.8 Ω to 470 Ω		1.5 Ω to 475 Ω		6.8 Ω to 470 Ω		
1000 h	≤ 0.25 %	≤ 0.5 %	≤ 0.25 %	≤ 0.5 %	≤ 0.25 %	≤ 0.5 %	
8000 h	≤ 0.5 %	≤ 1.0 %	≤ 0.5 %	≤ 1.0 %	≤ 0.5 %	≤ 1.0 %	
225 000 h	≤ 1.5 %	-	≤ 1.5 %	-	≤ 1.5 %	-	
Permissible voltage against ambient (insulation):	15	0.1/	200	0.1/	50	0.14	
1 minute; <i>U</i> _{ins}	150 V		300 V 75 V		500 V 75 V		
Failure rate	75 V ≤ 2.0 × 10 ⁻⁹ /h		/5 V ≤ 0.7 × 10 ⁻⁹ /h		/5 V ≤ 0.7 × 10 ⁻⁹ /h		

Note: 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.

¹⁾ The power dissipation on the resistor generates a temperature rise against the local ambient, depending on the heatflow support of the printed-circuit board (thermal resistance). The rated dissipation applies only if the permitted film temperature is not exceeded. Furthermore, a high level of ambient temperature or of power dissipation may raise the temperature of the solder joint, hence special solder alloys or board materials may be required to maintain the reliability of the assembly.

²⁾ Specified power rating requires dedicated heat-sink pads.



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12NC INFORMATION

- The resistors have a 12-digit numeric code starting with 2312.
- The subsequent 4 digits indicate the resistor type, specification and packaging; see the 12NC table.
- The remaining 4 digits indicate the resistance value:
 - The first 3 digits indicate the resistance value.
 - The last digit indicates the resistance decade in accordance with the 12NC Indicating Resistance Decade table.

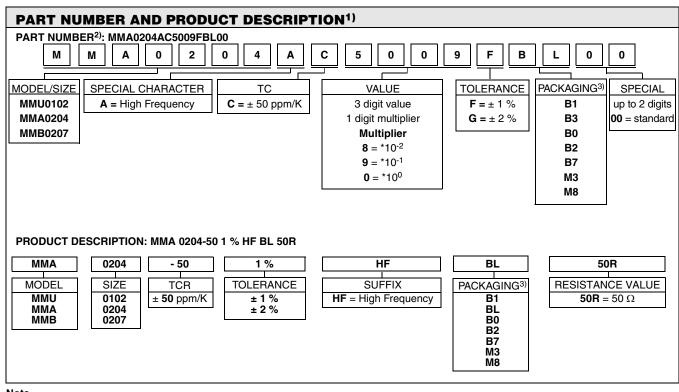
Last Digit of 12NC Indicating Resistance Decade

RESISTANCE DECADE	LAST DIGIT
1 Ω to 9.99 Ω	8
10 Ω to 99.9 Ω	9
100 Ω to 999 Ω	1

12NC Example

The 12NC of a MMU 0102 HF resistor, value 50 Ω and TCR 50 with ± 2 % tolerance, supplied in blister tape of 3000 units per reel is: 2312 168 0500 9.

12NC - resistor type and packaging									
DEC	CDIDTION		ORDERING CODE 2312						
DESCRIPTION				BLISTER TAPE ON REEL BULK CASE					CASE
TYPE	TCR	TOL.	B1	B2	BL	B7	В0	М3	M8
MMU 0102 HF	± 50 ppm/K	±2%	173 0	-	168 0	-	178 0	-	063 0
MMA 0204 HF	± 50 ppm/K	±1%	143 0	-	158 0	-	148 0	043 0	-
MMB 0207 HF	± 50 ppm/K	± 2 %	183 0	198 0	-	188 0	-	-	-



Note

- 1. Products can be ordered using either the PRODUCT DESCRIPTION or the 12NC.
- 2. The PART NUMBER is shown to facilitate the introduction of a unified part numbering system. Currently, this PART NUMBER is applicable in the Americas and in Asia/Pacific only.

3. Please refer to table PACKAGING, see below.

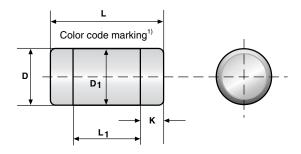
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High Frequency MELF Resistors



PACKAGING							
MODEL	BLISTER TAPE ON REEL ACC. IEC 60286 -3			BULK CASE ACC. IEC 60286 -6			
	DIAMETER	PIECES/REEL	CODE	PIECES/BULK CASE	CODE		
	180 mm/7"	1000	B1				
MMU 0102 HF	180 mm/7"	3000	B3 = BL	8000	M8		
	330 mm/13"	10 000	В0				
	180 mm/7"	1000	B1	3000	M3		
MMA 0204 HF	180 mm/7"	3000	B3 = BL				
	330 mm/13"	10 000	В0				
	180 mm/7"	1000	B1				
MMB 0207 HF	180 mm/7"	2000	B2	-	-		
	330 mm/13"	7000	B7				

DIMENSIONS



DIMENSIONS - MELF resistor types, mass and relevant physical dimensions							
TYPE	L D L _{1 min} D ₁ K (mm) (mm) (mm)						
MMU 0102 HF	2.2 + 0/- 0.1	1.1 + 0/- 0.1	1.2	D + 0/- 0.1	0.4 ± 0.05	7	
MMA 0204 HF	3.6 + 0/- 0.2	1.4 + 0/- 0.1	1.8	D + 0/- 0.15	0.8 ± 0.1	19	
MMB 0207 HF	5.8 + 0/- 0.2	2.2 + 0/- 0.2	2.8	D + 0/- 0.2	1.25 ± 0.15	79	

¹⁾ Color code marking is applied according to IEC 60062* in four bands (E24 series) or five bands (E96 series). Each colour 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 approx, 50 % wider than the other bands. An interrupted band between the 3rd and 4th full band identifies the special high frequency type.

TEMPERATURE COEFFICIENT AND RESISTANCE RANGE							
DESCF	RIPTION		RESISTANCE VALUE ¹⁾				
TCR	TOLERANCE	MMU 0102 HF	MMA 0204 HF	MMB 0207 HF			
± 50 ppm/K	± 2 %	50 $\Omega,$ 6.8 Ω to 470 Ω	-	50 Ω , 6.8 Ω to 470 Ω			
	± 1 %	-	50 Ω , 1.5 Ω to 475 Ω	-			

¹⁾ Resistance value to be selected from E24 series for ± 2 % tolerance and from E96 series for ± 1 % tolerance, for other values please contact the factory.

For technical questions contact: <u>ff3bresistors@vishay.com</u>

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High Frequency MELF Resistors

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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 (85 % Al₂O₃, for MICRO-MELF: 96 % Al₂O₃) ceramic body and conditioned to achieve the desired temperature coefficient. Nickel plated steel termination caps are firmly pressed on the metallised rods. A special laser is used to achieve the target value by smoothly cutting a non helical pattern with a resulting low inductivity 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. Four or five color code rings designate the resistance value and tolerance in accordance with IEC 60062*. Additional black dots near the 3rd colour ring identify the special HF product.

The result of the determined production is verified by an extensive testing procedure performed on 100 % of the individual resistors. Only accepted products are laid directly into the blister tape in accordance with IEC 60286-3* or bulk case in accordance with IEC 60286-6*.

ASSEMBLY

The resistors are suitable for processing on automatic SMD assembly systems. They are suitable for automatic soldering using wave, reflow or vapour phase as shown in IEC 61760-1*. Excellent solderability is proven, even after extended storage in excess of 10 years. The encapsulation is resistant to all cleaning solvents commonly used in the electronics industry, including alcohols, esters and aqueous solutions. The resistors are completely lead (Pb)-free, the pure tin plating provides compatibility with lead (Pb)-free soldering processes. The immunity of the plating against tin whisker growth has been proven under extensive testing.

All products comply with the GADSL1) and the CEFIC-**EECA-EICTA**²⁾ list of legal restrictions on hazardous substances. This includes full compliance with the following directives:

- 2000/53/EC End of Vehicle life Directive (ELV) and Annex II (ELV II)
- 2002/95/EC Restriction of the Substances Directive (RoHS)
- 2002/96/EC Waste Electrical and Electronic Equipment Directive (WEEE)
- 1) Global Automotive Declarable Substance List, see www.gadsl.org
- 2) CEFIC (European Chemical Industry Council), EECA (European Electronic Component Manufacturers Association), EICTA (European trade organisation representing the information and communications technology and consumer electronics), see www.eicta.org -> issues -> environment policy -> chemicals -> chemicals for electronics

APPROVALS

Where applicable the resistors are tested in accordance with EN 140401-803 (superseding CECC 40401-803) which refers to EN 60115-1, EN 140400 and the variety of enviromental test procedures of the IEC 60068* series.

Vishay BEYSCHLAG has achieved "Approval of Manufacturer" in accordance with IEC QC 001002-3, clause 2. The release certificate for "Technology Approval Schedule" in accordance with CECC 240001 based on IEC QC 001002-3, clause 6 is granted for the Vishay BEYSCHLAG manufacturing process.

Note:

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

Document Number: 28718 For technical questions contact: ff3bresistors@vishav.com Revision: 18-Jul-06

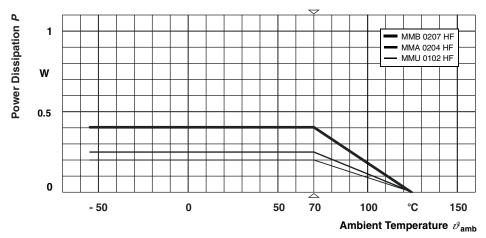
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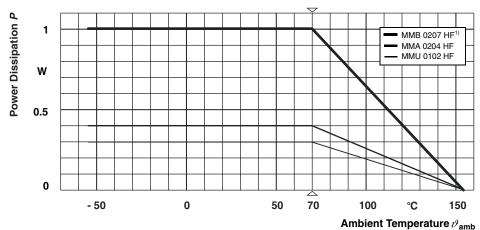
High Frequency MELF Resistors



FUNCTIONAL PERFORMANCE

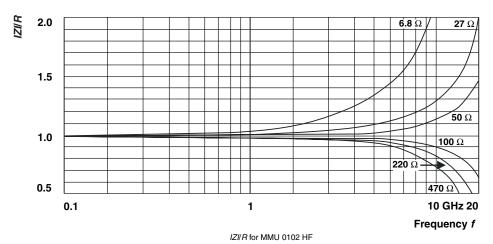


Derating - Standard Operation



1) Specified power rating requires dedicated heat sink pads

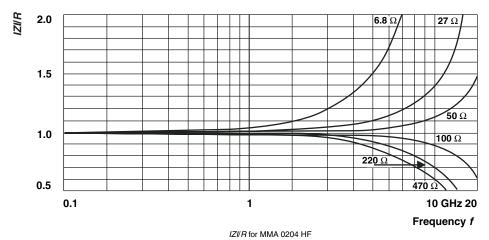
Derating - Power Operation



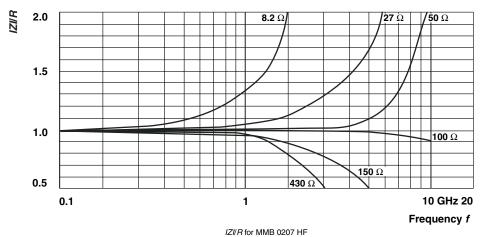
RF - Behavior

High Frequency MELF Resistors

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RF - Behavior



RF - Behavior

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High Frequency MELF Resistors



TESTS AND REQUIREMENTS

Essentially all tests are carried out in accordance with the following specifications:

EN 60115-1, generic specification EN 140400, sectional specification EN 140401-803, detail specification

The Test Procedures and Requirements table contains the applicable tests selected from the documents listed above.

The tests are carried out in accordance with IEC 60068* and under standard atmospheric conditions in accordance with IEC 60068-1, 5.3.* Climatic category LCT/UCT/56 (rated temperature range: Lower Category Temperature, Upper Category Temperature; damp heat, long term, 56 days) is valid.

Unless otherwise specified the following values apply:

Temperature: 15 °C to 35 °C Relative humidity: 45 % to 75 %

Air pressure: 86 kPa to 106 kPa (860 mbar to 1 060 mbar).

The components are mounted for testing on printed-circuit boards in accordance with EN 140400, 2.3.3, unless otherwise specified.

The requirements stated in the Test Procedures and Requirements table are based on the required tests and permitted limits of EN 140401-803.

EN 60115-1 CLAUSE	IEC 60068-2* TEST	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE (△F	
	METHOD				
			stability for product types:		
			MMU 0102 HF	6.8 Ω to 470 Ω	
			MMA 0204 HF	1.5 Ω to 475 Ω	
			MMB 0207 HF	6.8 Ω to 470 Ω	
4.5	-	resistance	MMU 0102 HF, MMB 0207 HF:	± 2 % R	
			MMA 0204 HF:	± 1 % R	
4.8.4.2	-	temperature coefficient	at 20/- 55/20 °C and 20/125/20 °C	± 50 ppm/K	
4.25.1	-	endurance at 70 °C: standard operation mode	$U = \sqrt{P_{70} \times R} \le U_{\text{max}};$ 1.5 h on; 0.5 h off; 70 °C; 1000 h;	± (0.25 % R + 0.05 Ω)	
			70 °C; 8000 h	$\pm (0.5 \% R + 0.05 \Omega)$	
		endurance at 70 °C: power operation mode	$U = \sqrt{P_{70} \times R} \le U_{\text{max}};$ 1.5 h on; 0.5 h off;		
			70 °C; 1000 h 70 °C; 8000 h	\pm (0.5 % R + 0.05 Ω) \pm (1 % R + 0.05 Ω)	
4.25.3	_	endurance at upper category	125 °C; 1000 h	$\pm (0.5 \% R + 0.05 \Omega)$	
		temperature	155 °C; 1000 h	± (1 % R + 0.05 Ω)	
4.24	78 (Cab)	damp heat, steady state	(40 ± 2) °C; 56 days; (93 ± 3) % RH	$\pm (0.5 \% R + 0.05 \Omega)$	
4.23		climatic sequence:			
4.23.2	2 (Ba)	dry heat	UCT; 16 h		
4.23.3	30 (Db)	damp heat, cyclic	55 °C; 24 h; ≥ 90 % RH; 1 cycle		
4.23.4	1 (Aa)	cold	LCT; 2 h		
4.23.5	13 (M)	low air pressure	8.5 kPa; 2 h; (25 ± 10) °C		
4.23.6	30 (Db)	damp heat, cyclic	55 °C; 24 h; ≥ 90 % RH; 5 cycles		
4.23.7	-	d.c. load	$U = \sqrt{P_{70} \times R} \le U_{\text{max}}$; 1 min.		
			LCT = - 10 °C; UCT = 85 °C	$\pm (0.5 \% R + 0.05 \Omega)$	
-	1 (Aa)	cold	- 55 °C; 2 h	± (0.1 % R + 0.01 Ω)	
4.19	14 (Na)	rapid change of temperature	30 minutes at - 55 °C; 30 minutes at 155°C; 5 cycles	± (0.25 % R + 0.05 Ω)	

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TEST P	TEST PROCEDURES AND REQUIREMENTS							
EN IEC 60115-1 60068-2* CLAUSE TEST METHOD		TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE (△ <i>R</i>)				
			stability for product types:					
			MMU 0102 HF	6.8 Ω to 470 Ω				
			MMA 0204 HF	1.5 Ω to 475 Ω				
			MMB 0207 HF	6.8 Ω to 470 Ω				
4.13	_	short time overload; standard operation mode	$U = 2.5 \times \sqrt{P_{70} \times R} \le 2 \times U_{\text{max}};$ 5 s	± (0.1 % R + 0.01 Ω)				
4.13		short time overload; power operation mode	$U = 2.5 \times \sqrt{P_{70} \times R} \le 2 \times U_{\text{max}};$ 5 s	$\pm (0.1 \% R + 0.01 \Omega)$				
4.40	-	electrostatic discharge (Human Body Model)	IEC 61340-3-1*; 3 pos. + 3 neg. discharges MMU 0102 HF: 800 V MMA 0204 HF: 1000 V MMB 0207 HF: 2000 V	\pm (0.5 % R + 50 mΩ)				
4.29	45 (XA)	component solvent resistance	isopropyl alcohol; 50 °C; method 2	no visible damage				
4.30	45 (XA)	solvent resistance of marking	isopropyl alcohol; 50 °C; method 1, toothbrush	marking legible; no visible damage				
4.17.2	58 (Td)	solderability	solder bath method; SnPb40; non-activated flux; (215 ± 3) °C; (3 ± 0.3) s	good tinning (≥ 95 % covered); no visible damage				
			solder bath method; SnAg3Cu0.5 or SnAg3.5; non-activated flux; (235 ± 3) °C; (2 ± 0.2) s	good tinning (≥ 95 % covered); no visible damage				
4.18.2	58 (Td)	resistance to soldering heat	solder bath method; (260 ± 5) °C; (10 ± 1) s	± (0.5 % R + 0.05 Ω)				
4.32	21 (Ue ₃)	shear (adhesion)	45 N	no visible damage				
4.35	-	flammability	IEC 60 695-11-5*, needle flame test; 10 s	no burning after 30 s				

Note:

REVISION HISTORY

Compared to the prior revision of this datasheet, 26-Feb-04, the following changes have been applied:

- Introduction of a standardized part numbering system
- Additional emphasis on the clean balance of materials and on the compliance with various EU directives
- Introduction of a test and requirements for electrostatic discharge (ESD)
- No other change of technical contents
- No product change

^{*} The quoted IEC standards are also released as EN standards with the same number and identical contents.



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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.

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Revision: 02-Oct-12 Document Number: 91000



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- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

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«JONHON» (основан в 1970 г.)

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(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

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