High Frequency Leaded Resistors

FEATURES

- Speciality product for RF applications
- Low-inductance non-helical trimmed product
- Suitable for more than 3 GHz
- Resistance range: 1.5 Ω to 470 Ω
- Green product, supports lead-free soldering.

APPLICATIONS

- Telecommunication equipment
- Industrial electronics.

MBA 0204 HF leaded thin film 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.

METRIC SIZE	
DIN:	0204
CECC:	A

TECHNICAL SPECIFICATIONS

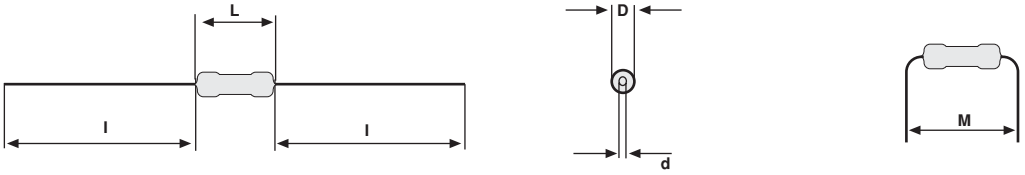
DESCRIPTION	MBA 0204 HF	
CECC size	A	
Resistance range	1.5 Ω to 470 Ω	
Resistance tolerance	± 2 %	
Temperature coefficient	± 50 ppm/K	
Operation mode	long term	standard
Climatic category (LCT/UCT/days)	55/125/56	55/155/56
Rated dissipation, P_{70}	0.25 W	0.4 W
Operating voltage, U_{max} AC/DC	limited by P_{70}	
Film temperature	125 °C	155 °C
Max. resistance change at P_{70}	1.5 Ω to 470 Ω	
1 000 h	≤ 0.25 %	≤ 0.5 %
8 000 h	≤ 0.5 %	≤ 1.0 %
225 000 h	≤ 1.5 %	–
Specified lifetime	225000 h	8000 h
Permissible voltage against ambient:		
1 minute	300 V	
continuous	75 V	
Failure rate	≤ 0.7 × 10^{-9}/h	

ORDERING INFORMATION - type description and ordering code

M	B	A	0204	50	2 %	HF	CT	50 R
FILM TYPE	PRODUCT CODE	SIZE CODE	METRIC DIN SIZE	TEMPERATURE COEFFICIENT	TOLERANCE	SUFFIX	PACKAGING	RESISTANCE VALUE
M = Metal	B = Axial leaded	A = 0204	0204	± 50 ppm/K	± 2 %	HF = High frequency	C1 = 1000 units (cardboard box) CT = 5000 units (cardboard box)	See Temperature coefficient and resistance range table

Note: We recommend that the clear text ordering code is used to minimize the possibility of errors in order handling.

DIMENSIONS



DIMENSIONS - leaded resistor types, mass and relevant physical dimensions						
TYPE	**D_{max} (mm)**	**L_{max} (mm)**	**d_{nom} (mm)**	**l_{min} (mm)**	**M_{min} (mm)**	**MASS (mg)**
MBA 0204 HF	1.6	3.6	0.5	29.0	5.0	125

TEMPERATURE COEFFICIENT AND RESISTANCE RANGE		
DESCRIPTION		**RESISTANCE VALUE**(1)
T.C.	**TOLERANCE**	**MBA 0204 HF**
± 50 ppm/K	± 2 %	1.5 Ω to 470 Ω; 50 Ω

Notes

1. Resistance values to be selected from the E24 series.

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 ceramic body (85 % Al_2O_3) 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 low-inductivity non-helical groove in the resistive layer without damaging the ceramics. Connecting wires of electrolytic copper plated with 100 % pure tin are welded to the termination caps. The resistors are covered by protective coating designed for electrical, mechanical and climatic protection.The terminations receive a final pure tin on nickel plating. Four colour 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 stuck directly on the adhesive tapes in accordance with **IEC 60286-1.**

ASSEMBLY

The resistors are suitable for processing on automatic insertion equipment and cutting and bending machines. Excellent solderability is proven, even after extended storage. They are suitable for automatic soldering using wave or dipping. 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 and lead-containing soldering processes. The immunity of the plating against tin whisker growth has been proven under extensive testing. All products comply with the CEFIC-EECA-EICTA list of legal restrictions on hazardous substances. This includes full compatibility with the following directives:

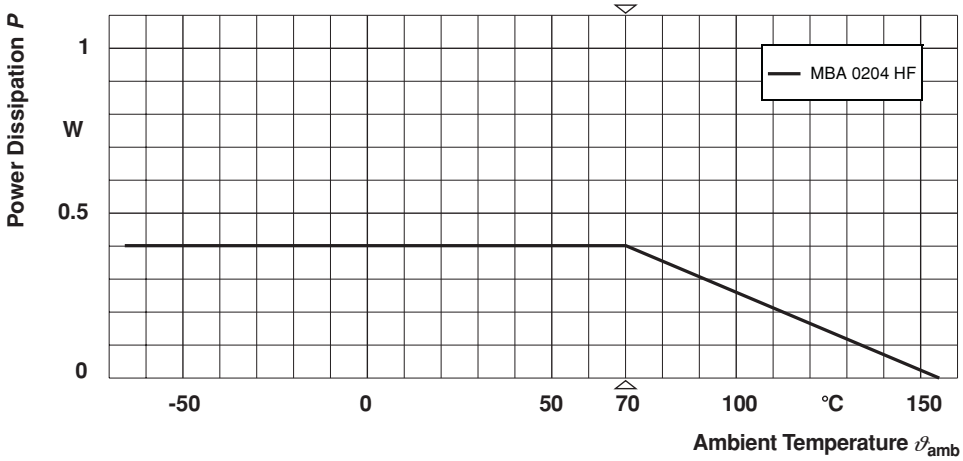
- 2000/53/EC End of Vehicle Life Directive (ELV)
- 2000/53/EC Annex II to End of Vehicle Life Directive (ELV II)
- 2002/95/EC Restriction of the use of Hazardous Substances Directive (RoHS)
- 2002/96/EC Waste Electrical and Electrical Equipment Directive (WEEE)

APPROVALS

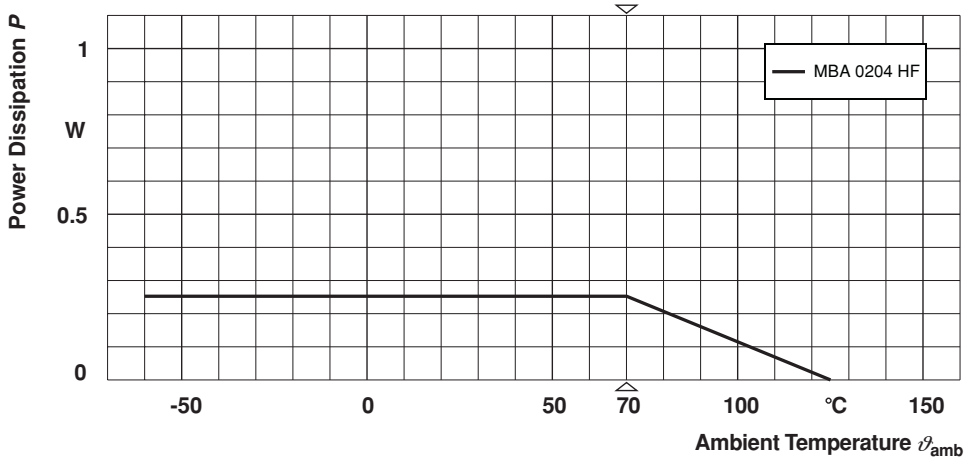
Where applicable, the resistors are tested in accordance with **CECC 40101-806** which refers to **EN 60115-1** and **EN 140100.**

Vishay BEYSCHLAG has achieved **"Approval of Manufacturer"** in accordance with **EN 100114-1.**

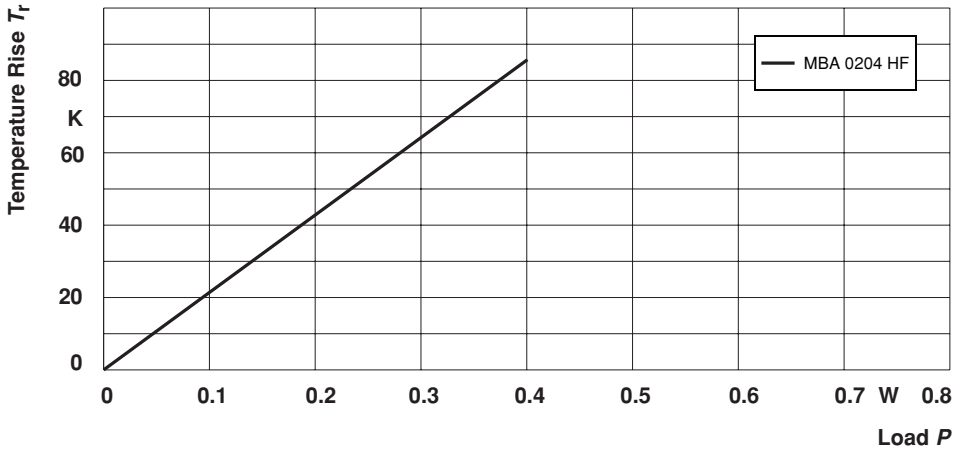
FUNCTIONAL PERFORMANCE



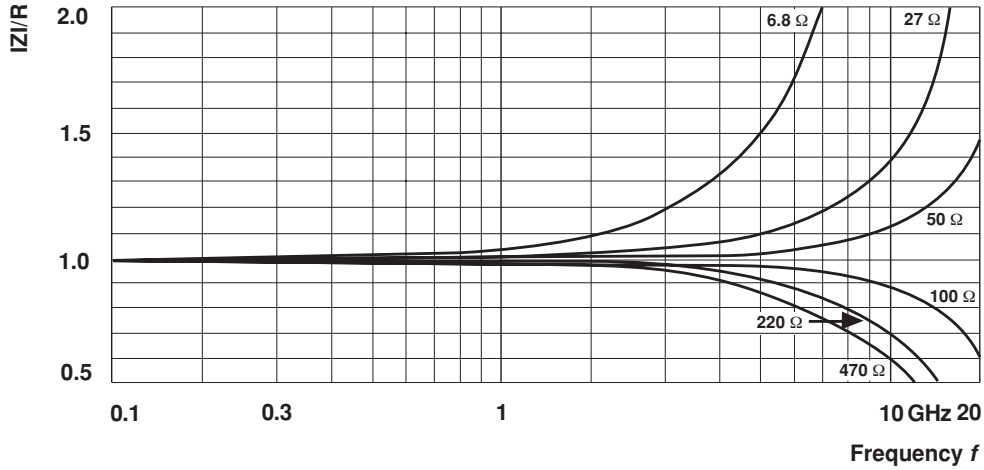
Derating - Standard Operation



Rise of the Surface Temperature



Temperature Rise



IZI/R for MBA 0204 HF

RF - Behaviour

TESTS AND REQUIREMENTS

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

EN 140 000 / IEC 60115-1, Generic specification (includes tests)

EN 140100 / IEC 60115-2, Sectional specification (includes schedule for qualification approval)

CECC 40101-806, Detail specification (includes schedule for conformance inspection)

The following 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 1060 mbar).

For testing the components are mounted on a test board in accordance with IEC 60115-1, 4.31 unless otherwise specified.

In the Test Procedures and Requirements table only the tests and requirements are listed with reference to the relevant clauses of IEC 60115-1 and IEC 60068-2; a short description of the test procedure is also given.

TEST PROCEDURES AND REQUIREMENTS

IEC 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE ($\Delta R/R$)
			stability for product types:	
			MBA 0204 HF	1.5 Ω to 470 Ω
4.5	–	resistance		± 2 %
4.8.4.2	–	temperature coefficient	at 20 / LCT / 20 °C and 20 / UCT / 20 °C	± 50 ppm/K

TEST PROCEDURES AND REQUIREMENTS - continued

IEC 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE ($\Delta R/R$)
			stability for product types:	
			MBA 0204 HF	1.5 Ω to 470 Ω
4.25.1	–	endurance at 70 °C: standard operation mode	$U = \sqrt{P_{70} \times R}$ or $U = U_{max}$; 1.5 h on; 0,5 h off	
			70 °C; 1000 h	± (0.5 % + 0.05 Ω)
			70 °C; 8000 h	± (1 % + 0.1 Ω)
	–	endurance at 70 °C: long term operation mode	$U = \sqrt{P_{70} \times R}$ or $U = U_{max}$; 1.5 h on; 0.5 h off	
			70 °C; 1000 h	± (0.25 % + 0.05 Ω)
			70 °C; 8000 h	± (0.5 % + 0.05 Ω)
4.25.3	–	endurance at upper category temperature		
			125 °C; 1000 h	± (0.25 % + 0.05 Ω)
			155 °C; 1000 h	± (0.5 % + 0.05 Ω)
4.24	78 (Cab)	damp heat, steady state	(40 ± 2) °C; 56 days; (93 ± 3) % RH	± (0.5 % + 0.05 Ω)
4.23		climatic sequence:		
4.23.2	2 (Ba)	dry heat	155 °C; 16 h	
4.23.3	30 (Db)	damp heat, cyclic	55 °C; 24 h; 90 to 100 % RH; 1 cycle	
4.23.4	1 (Aa)	cold	– 55 °C; 2 h	
4.23.5	13 (M)	low air pressure	8.5 kPa; 2 h; 15 to 35 °C	
4.23.6	30 (Db)	damp heat, cyclic	55 °C; 5 days; 95 to 100 % RH; 5 cycles	± (0.5 % + 0.05 Ω) no visible damage
–	1 (Aa)	cold	– 55 °C; 2 h	± (0.1 % + 0.01 Ω)
4.13	–	short time overload	room temperature; $U = 2.5 \times \sqrt{P_{70} \times R}$ or $U = 2 \times U_{max}$; 5 s	± (0.1 % + 0.01 Ω) no visible damage
4.19	14 (Na)	rapid change of temperature	30 minutes at LCT and 30 minutes at UCT; 5 cycles	± (0.1 % + 0.01 Ω) no visible damage
4.29	45 (XA)	component solvent	isopropyl alcohol + 23 °C; toothbrush method	marking legible; no visible damage
4.18.2	20 (Tb)	resistance to soldering heat	unmounted components; (260 ± 5) °C; (10 ± 1) s	± (0.1 % + 0.01 Ω) no visible damage
4.17	20 (Ta)	solderability	+ 235 °C; 2 s; solder bath method	good tinning (≥ 95 % covered); no visible damage
4.22	6 (B4)	vibration	6 h; 10 to 2000 Hz 1.5 mm or 196 m/s^2	± (0.1 % + 0.01 Ω)
4.16	21 (Ua_1) 21 (Ub) 21 (Uc)	robustness of terminations	tensile, bending and torsion	± (0.1 % + 0.01 Ω); no visible damage
4.7	–	voltage proof	U_{rms} = 100 V; 60 s	no flashover or breakdown

ORDERING INFORMATION

Components may be ordered by using either a simple clear text ordering code, see “Type Description and Ordering Code” or the unique 12NC.

Numeric Ordering Code (12NC)

- The resistors have a 12-digit ordering code starting with 2312.
- The subsequent 4 digits indicate the resistor type, specification and packaging.
- The remaining 4 digits indicate the resistance value:
  - The first 3 digits indicate the resistance value.
  - The last digit indicates the resistance decade.

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

Ordering Example

The ordering code of a MBA 0204 HF resistor, value 50 Ω and TC 50 with ± 2 % tolerance, supplied on bandolier, ammopack, in a box of 5000 units is: 2312 908 05009.

12NC ORDERING CODE - resistor type and packaging

DESCRIPTION			ORDERING CODE 2312	
			BANDOLIER IN BOX AMMOPACK	
TYPE	T.C.	TOL.	C1 1000 units	CT 5000 units
MBA 0204 HF	± 50 ppm/K	± 2 %	903 0....	908 0....

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