

High Frequency (> 3 GHz) Leaded Resistors



MBA/SMA 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.

APPLICATIONS

- Telecommunication equipment
- Industrial electronics

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
- Lead (Pb)-free solder contacts
- Pure tin plating provides compatibility with lead (Pb)-free and lead containing soldering processes
- Compatible with "Restriction of the use of Hazardous Substances" (RoHS) directive 2002/95/EC (issue 2004)



METRIC SIZE	
DIN:	0204
CECC:	A

TECHNICAL SPECIFICATIONS			
DESCRIPTION	MBA/SMA 0204 HF		
CECC size	A		
Resistance range	1.5 Ω to 470 Ω		
Resistance tolerance	± 1 %; ± 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} for resistance range, $\Delta R/R$ max., after:	1.5 Ω to 470 Ω		
	1000 h	≤ 0.25 %	≤ 0.5 %
	8000 h	≤ 0.5 %	≤ 1.0 %
	225 000 h	≤ 1.5 %	-
Specified lifetime	225 000 h	8000 h	
Permissible voltage against ambient:	300 V		
	1 minute	75 V	
continuous	75 V		
Failure rate	≤ 0.7 × 10 ⁻⁹ /h		

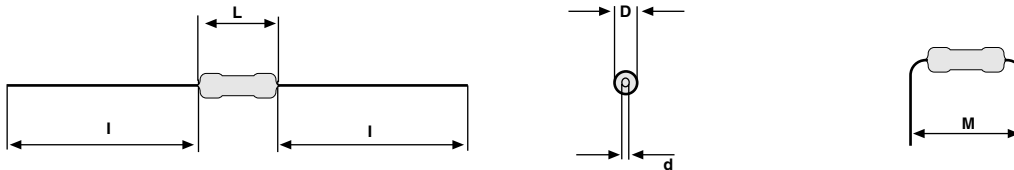
PART NUMBER AND PRODUCT DESCRIPTION																	
PART NUMBER: MBA0204AC5109GCT00																	
M	B	A	0	2	0	4	A	C	5	1	0	9	G	C	T	0	0
MODEL/SIZE		SPECIAL CHARACTER		TCR/MATERIAL		VALUE		TOLERANCE		PACKAGING ¹⁾		SPECIAL					
MBA0204 = MBA/SMA 0204		A = HF High Frequency		C = 50 ppm		3 digit value 1 digit multiplier Multiplier: 8 = *10 ⁻² 9 = *10 ⁻¹ 0 = *10 ⁰		F = ± 1.0 % G = ± 2.0 %		CT C1 RP		00 = standard					
PRODUCT DESCRIPTION: MBA/SMA 0204-50 2% HF CT 51R0																	
MBA/SMA 0204	-	50	2%	HF	CT	51R0											
MODEL/SIZE		TCR	TOLERANCE	SUFFIX	PACKAGING ¹⁾	RESISTANCE VALUE											
MBA/SMA 0204		50 ppm	± 1.0 % ± 2.0 %	HF	CT C1 RP	51R0 = 51 Ω											

¹⁾ Please refer to table PACKAGING for complete information.

Note: The PART NUMBER shown above is to facilitate the unified part numbering system for ordering products.

PACKAGING				
MODEL	REEL		BOX	
	PIECES	CODE	PIECES	CODE
MBA/SMA 0204	5000	RP	1000 5000	C1 CT

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/SMA 0204 HF	1.6	3.6	0.5	29.0	5.0	125

TEMPERATURE COEFFICIENT AND RESISTANCE RANGE		
DESCRIPTION		RESISTANCE VALUE ¹⁾
TCR	TOLERANCE	MBA/SMA 0204 HF
± 50 ppm/K	± 1 %; ± 2 %	1.5 Ω to 470 Ω; 50 Ω

Note

1. Resistance values to be selected for ± 1 % from the E24/E96 series and for ± 2 % from 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:

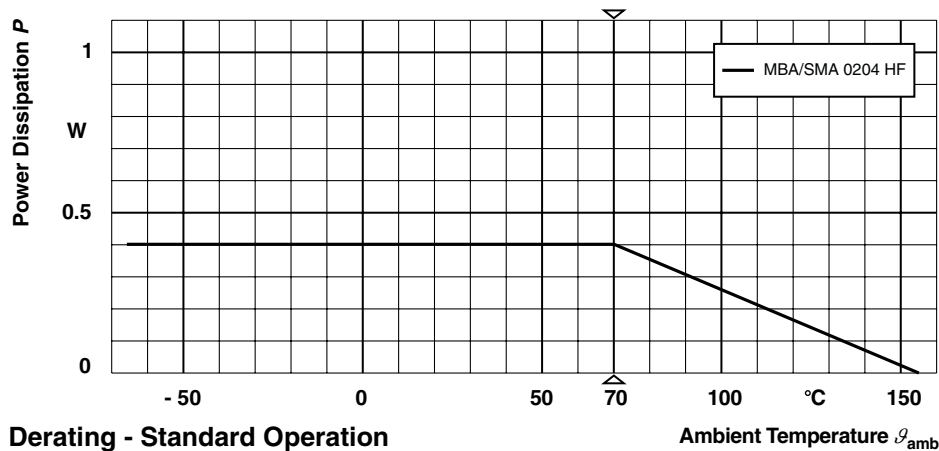
- 2000/53/EC End of Vehicle Life Directive (ELV)
- 2000/53/EC Annex II to End of Vehicle Life Directive (ELV II)
- 2002/95/EC Restriction of the use of Hazardous Substances Directive (RoHS)
- 2002/96/EC Waste Electrical and Electrical Equipment Directive (WEEE)

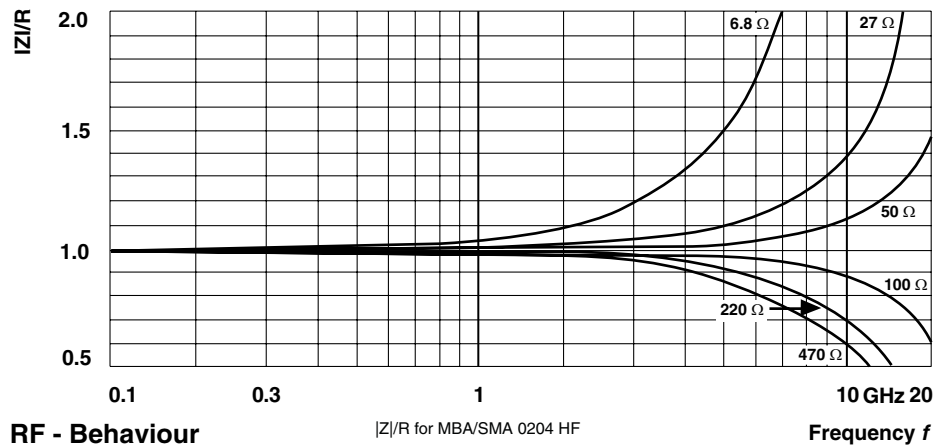
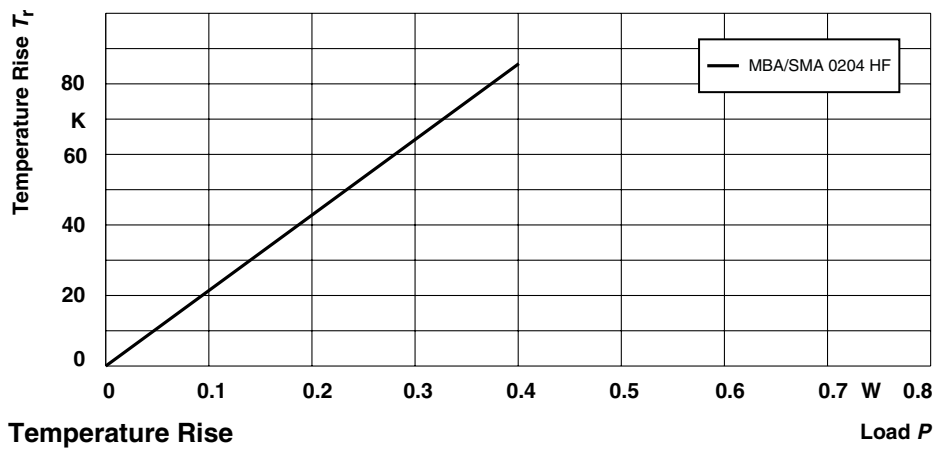
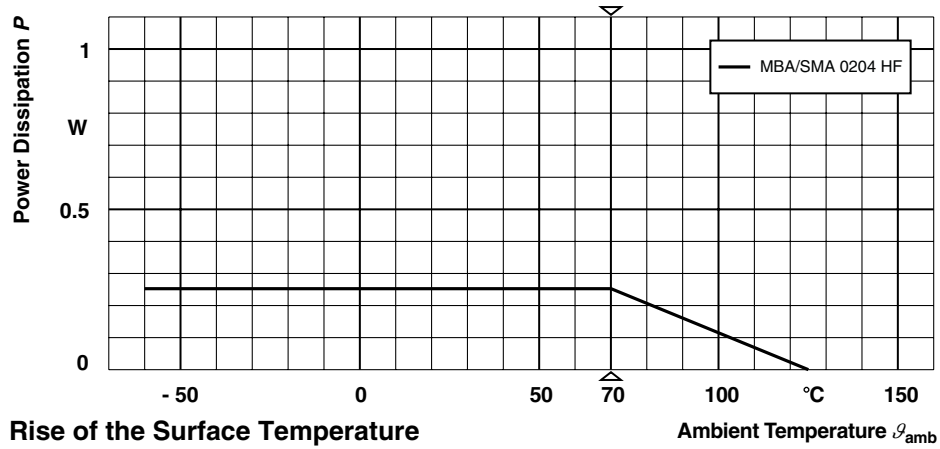
APPROVALS

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







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 (ΔR_{max})
			stability for product types: MBA/SMA 0204 HF	1.5 Ω to 470 Ω
4.5	-	resistance		$\pm 1\%$; $\pm 2\%$
4.8.4.2	-	temperature coefficient	at 20/LCT/20 °C and 20/UCT/20 °C	± 50 ppm/K
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 70 °C; 8000 h	$\pm (0.5\% R + 0.05 \Omega)$ $\pm (1\% R + 0.1 \Omega)$
	-	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 70 °C; 8000 h	$\pm (0.25\% R + 0.05 \Omega)$ $\pm (0.5\% R + 0.05 \Omega)$
4.25.3	-	endurance at upper category temperature	125 °C; 1000 h 155 °C; 1000 h	$\pm (0.25\% R + 0.05 \Omega)$ $\pm (0.5\% R + 0.05 \Omega)$
4.24	78 (Cab)	damp heat, steady state	(40 \pm 2) °C; 56 days; (93 \pm 3) % RH	$\pm (0.5\% R + 0.05 \Omega)$



TEST PROCEDURES AND REQUIREMENTS				
IEC 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE (ΔR_{max})
			stability for product types: MBA/SMA 0204 HF	1.5 Ω to 470 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 °C to 35 °C	
4.23.6	30 (Db)	damp heat, cyclic	55 °C; 5 days; 95 % to 100 % RH; 5 cycles	$\pm (0.5 \% R + 0.05 \Omega)$ no visible damage
–	1 (Aa)	cold	- 55 °C; 2 h	$\pm (0.1 \% R + 0.01 \Omega)$
4.13	–	short time overload	room temperature; $U = 2.5 \times \sqrt{P_{70}} \times R$ or $U = 2 \times U_{max}$; 5 s	$\pm (0.1 \% R + 0.01 \Omega)$ no visible damage
4.19	14 (Na)	rapid change of temperature	30 minutes at LCT and 30 minutes at UCT; 5 cycles	$\pm (0.1 \% R + 0.01 \Omega)$ no visible damage
4.29	45 (XA)	component solvent resistance	isopropyl alcohol + 23 °C; toothbrush method	marking legible; no visible damage
4.18.2	20 (Tb)	resistance to soldering heat	unmounted components; (260 \pm 5) °C; (10 \pm 1) s	$\pm (0.1 \% R + 0.01 \Omega)$ no visible damage
4.17	20 (Ta)	solderability	+ 235 °C; 2 s; solder bath method	good tinning ($\geq 95 \% R$ covered); no visible damage
4.22	6 (B4)	vibration	6 h; 10 to 2000 Hz 1.5 mm or 196 m/s ²	$\pm (0.1 \% R + 0.01 \Omega)$
4.16	21 (Ua ₁) 21 (Ub) 21 (Uc)	robustness of terminations	tensile, bending and torsion	$\pm (0.1 \% R + 0.01 \Omega)$; no visible damage
4.7	–	voltage proof	$U_{rms} = 100 V$; 60 s	no flashover or breakdown

12NC INFORMATION

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 (For historical coding reference of MBA 0204 HF)

The ordering code of a MBA 0204 HF resistor, value 51 Ω and TCR 50 with $\pm 2 \%$ tolerance, supplied on bandolier ammpack, in a box units is: 2312 908 05109.

12NC CODE FOR HISTORICAL CODING REFERENCE OF MBA 0204 HF				
DESCRIPTION			ORDERING CODE 2312	
			BANDOLIER IN BOX AMMPACK	
TYPE	TCR	TOL.	C1 1000 units	CT 5000 units
MBA 0204 HF	± 50 ppm/K	$\pm 2 \%$	903 0....	908 0....



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