

DATA SHEET

MPR24

Ultra precision leaded resistors

Product specification
File under BCcomponents, BC08

2000 Sep 06

Ultra precision leaded resistors**MPR24****FEATURES**

- Ultra high precision resistors
- Ultra high stability
- Ultra low temperature coefficient.

APPLICATIONS

- Test and measurement
- Telecom.

DESCRIPTION

A homogeneous film of metal alloy is deposited on a high grade ceramic body. After a helical groove has been cut in the resistive layer, tinned connecting wires of electrolytic copper are welded to the end-caps. The resistors are coated with lacquer which provides electrical, mechanical, and climatic protection.

QUICK REFERENCE DATA

DESCRIPTION	MPR24	
CECC size	B	
Resistance range	4,99 Ω to 1 MΩ	
Resistance tolerance	±0,05%; ±0,02%; ±0,01%	±0,5%; ±0,25%; ±0,1%
Temperature coefficient	±25 ppm/K; ±15 ppm/K; ±10 ppm/K; ±05 ppm/K	
Climatic category (LCT/UCT/days)	55/125/56	55/155/56
Max. rated dissipation, P_{70}	0,125 W	0,25 W
Operating voltage, U_{max} AC/DC	250 V	
Film temperature	125 °C	155 °C
Max. resistance change for resistance range, $\Delta R/R$ max., after:		
load	±(0,05% + 0,01 Ω)	
climatic tests	±(0,05% + 0,01 Ω)	
soldering	±(0,01% + 0,01 Ω)	
short time overload	±(0,01% + 0,01 Ω)	
Permissible voltage against ambient :		
1 minute	500 V	
continuous	75 V	
Failure rate	≤ 0,3 × 10 ⁻⁹ /h	

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Table 1 Temperature coefficient and resistance range

DESCRIPTION		RESISTANCE VALUE ⁽²⁾
T.C. ⁽¹⁾	TOLERANCE	MPR24
±25 ppm/K	±0,5%	4,99 Ω to 1 MΩ
	±0,25%	4,99 Ω to 1 MΩ
	±0,1%	4,99 Ω to 1 MΩ
	±0,05%	24 Ω to 100 kΩ
	±0,02%	24 Ω to 100 kΩ
	±0,01%	24 Ω to 100 kΩ
±15 ppm/K	±0,5%	4,99 Ω to 1 MΩ
	±0,25%	4,99 Ω to 1 MΩ
	±0,1%	4,99 Ω to 1 MΩ
	±0,05%	24 Ω to 100 kΩ
	±0,02%	24 Ω to 100 kΩ
	±0,01%	24 Ω to 100 kΩ
±10 ppm/K	±0,5%	4,99 Ω to 1 MΩ
	±0,25%	4,99 Ω to 1 MΩ
	±0,1%	4,99 Ω to 1 MΩ
	±0,05%	24 Ω to 100 kΩ
	±0,02%	24 Ω to 100 kΩ
	±0,01%	24 Ω to 100 kΩ
±05 ppm/K	±0,5%	4,99 Ω to 1 MΩ
	±0,25%	4,99 Ω to 1 MΩ
	±0,1%	4,99 Ω to 1 MΩ
	±0,05%	24 Ω to 100 kΩ
	±0,02%	24 Ω to 100 kΩ
	±0,01%	24 Ω to 100 kΩ

Notes

1. The temperature coefficient is specified over the temperature range +20 °C to + 70 °C.
2. Resistance values to be selected from E192 series, for other values please contact the factory.

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ORDERING INFORMATION

Components may be ordered by using either a simple clear text ordering code, see "Type description and ordering code" or BCcomponents' unique 12NC.

Numeric Ordering code (12NC)

- The resistors have a 12-digit ordering code starting with 2322 14.
- The subsequent 3 digits indicate the resistor type, specification and packaging; see Table 2.
- The remaining 3 digits indicate the resistance value. The number is available upon request and is fixed by the supplier.

Table 2 12NC ordering code indicating resistor type and packaging

DESCRIPTION			ORDERING CODE 2322 14.		
			BANDOLIER ⁽¹⁾	IN BOX	BANDOLIER ON REEL
TYPE	T.C.	TOL.	100 units	1000 units	5000 units
MPR24	±25 ppm/K	±0,5%	1 00...	1 10...	3 10...
		±0,25%	1 20...	1 30...	3 30...
		±0,1%	1 40...	1 50...	3 50...
		±0,05%	1 64...	3 64...	–
		±0,02%	1 74...	3 74...	–
		±0,01%	1 84...	3 84...	–
	±15 ppm/K	±0,5%	1 05...	1 15...	3 15...
		±0,25%	1 25...	1 35...	3 35...
		±0,1%	1 45...	1 55...	3 55...
		±0,05%	1 65...	3 65...	–
		±0,02%	1 75...	3 75...	–
		±0,01%	1 85...	3 85...	–
	±10 ppm/K	±0,5%	1 06...	1 16...	3 16...
		±0,25%	1 26...	1 36...	3 36...
		±0,1%	1 46...	1 56...	3 56...
		±0,05%	1 66...	3 66...	–
		±0,02%	1 76...	3 76...	–
		±0,01%	1 86...	3 86...	–
	±05 ppm/K	±0,5%	1 07...	1 17...	3 17...
		±0,25%	1 27...	1 37...	3 37...
		±0,1%	1 47...	1 57...	3 57...
		±0,05%	1 67...	3 67...	–
		±0,02%	1 77...	3 77...	–
		±0,01%	1 87...	3 87...	–

Note

1. Products taped on bandolier are available in 100 units and delivered, according to availability, in tape length, loose in a plastic bag or cardboard box.

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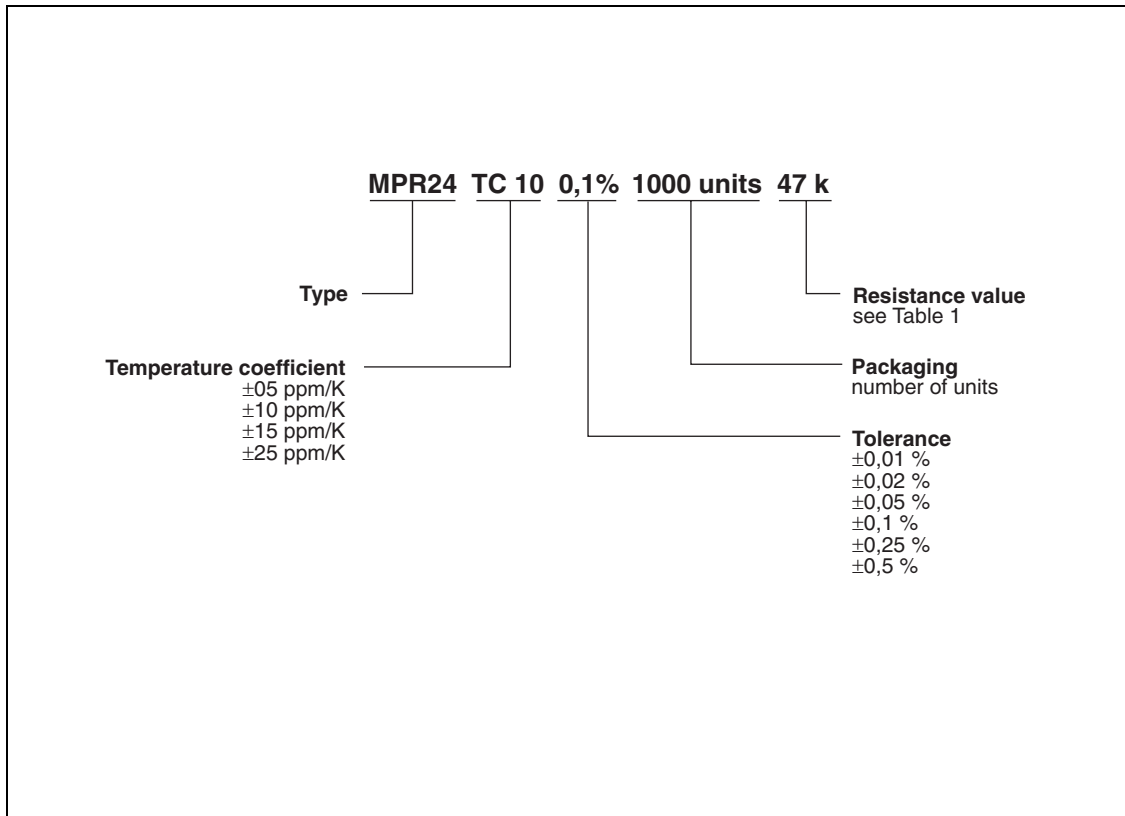
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Ordering example

The ordering code of an MPR24 resistor with tolerance of $\pm 0,02\%$ and TC ± 05 ppm/K, taped on bandolier in box of 100 units starts with 2322 141 77...; the last 3 digits are available upon request and are fixed by the supplier.

Type description and ordering code

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



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FUNCTIONAL DESCRIPTION

Derating

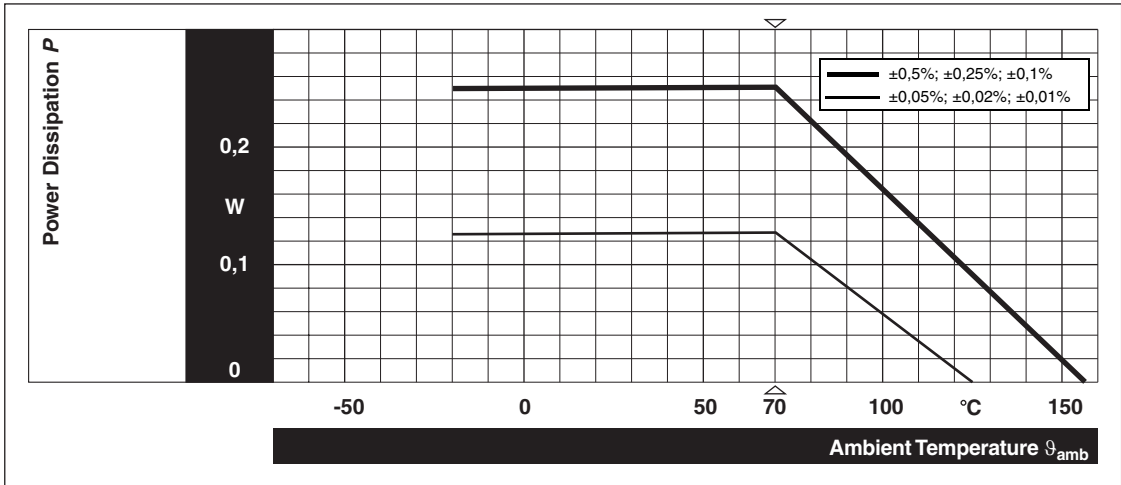


Fig.1 Derating, depending on resistance tolerances.

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MECHANICAL DATA

Outlines

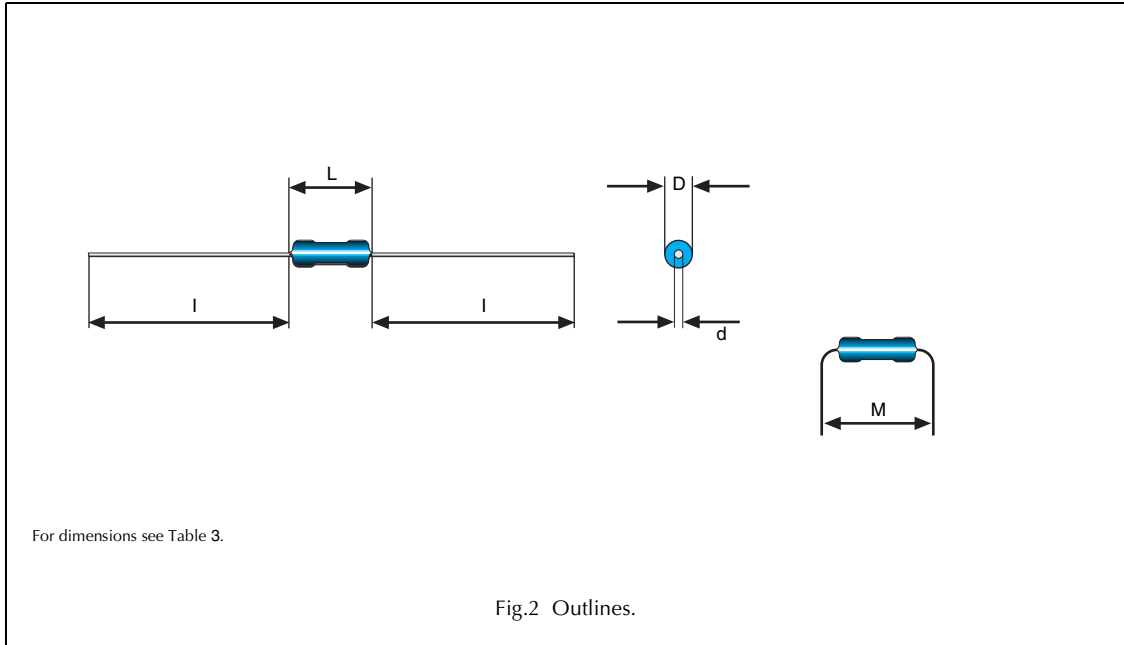


Table 3 Leaded resistor types, mass and relevant physical dimensions; see Fig.2

TYPE	D_{\max} (mm)	L_{\max} (mm)	d_{nom} (mm)	l_{min} (mm)	M_{min} (mm)	MASS (mg)
MPR 24	2.5	6.3	0.6	28.0	7.5	220

SCRIPT MARKING⁽¹⁾

Table 4 Printed resistance value and letter coding for temperature coefficient and tolerance

RESISTANCE VALUE	TC (ppm/K)	LETTER CODE	TOL. (%)	LETTER CODE
Clear text code for value	±25	E	±0,5	D
	±15	F	±0,25	C
	±10	B	±0,1	B
	±05	A	±0,05	A
	–	–	±0,02	P
	–	–	±0,01	T

Note

- Resistors of T.C. ±25 ppm/K in combination with tolerances ±0,5%, ±0,25% and ±0,1% are only available with colour coding in accordance with IEC 60062.

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TESTS AND REQUIREMENTS

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

EN 140000 / 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)

Most of the components are approved in accordance with the European CECC-system, where applicable. Table 5 contains only the most important tests. For the full test schedule refer to the documents listed above. The testing also covers most of the requirements specified by EIA/IS-703 and JIS-C-5202.

The tests are carried out in accordance with IEC 60 068 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).

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

In Table 5 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.

Table 5 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: MPR24	24 Ω to 100 k Ω	4,99 Ω to < 24 Ω ; > 100 k Ω to 1 M Ω
4.5	–	resistance	–	$\pm 0,5\%$; $\pm 0,25\%$; $\pm 0,1\%$; $\pm 0,05\%$; $\pm 0,02\%$; $\pm 0,01\%$	$\pm 0,5\%$; $\pm 0,25\%$; $\pm 0,1\%$
4.8.4.2	–	temperature coefficient	at 20 / 70 / 20 °C at 20 / LCT / 20 °C and 20 / UCT / 20 °C	± 25 ppm/K; ± 15 ppm/K; ± 10 ppm/K; ± 05 ppm/K	± 25 ppm/K
4.25.1	–	endurance	room temperature; $U = \sqrt{P_{70} \times R}$ or $U = U_{\max}$; 1,5 h on; 0,5 h off 70 °C; 2000 h	$\pm(0,05\% + 0,01 \Omega)$	
4.24	3 (Ca)	damp heat, steady state	40 ± 2 °C; 56 days; 93 $\pm 2/-3\%$ RH	$\pm(0,05\% + 0,01 \Omega)$	

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IEC 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE ($\Delta R/R$)	
			Stability for product types: MPR24	24 Ω to 100 k Ω	4,99 Ω to < 24 Ω ; > 100 k Ω to 1 M Ω
4.23		climatic sequence:			
4.23.2	2 (Ba)	dry heat	125 °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	$\pm(0,05\% + 0,01 \Omega)$	no visible damage
4.13	-	short time overload	room temperature; $U = 2,5 \times \sqrt{P_{70}} \times R$ or $U = 2 \times U_{max}$; 5 s	$\pm(0,01\% + 0,01 \Omega)$	no visible damage
4.19	14 (Na)	rapid change of temperature	30 minutes at LCT and 30 minutes at UCT; 5 cycles	$\pm(0,01\% + 0,01 \Omega)$	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 ± 5 °C; 10 ± 1 s	$\pm(0,01\% + 0,01 \Omega)$	no visible damage
4.17	20 (Ta)	solderability	+235 °C; 2 s solder bath method	good tinning ($\geq 95\%$ covered);	no visible damage
4.22	6 (B4)	vibration	6 h; 10 to 2 000 Hz 1,5 mm or 196 m/s ²	$\pm(0,01\% + 0,01 \Omega)$;	no visible damage
4.16	21 (Ua ₁) 21 (Ub) 21 (Uc)	robustness of terminations	tensile, bending and torsion	$\pm(0,01\% + 0,01 \Omega)$;	no visible damage
4.7	-	voltage proof	$U_{rms} = 100$ V; 60 s	no flashover or breakdown	
4.12	-	noise	IEC 60 195: R \leq 100 k Ω R > 100 k Ω	max. 0,25 μ V/V	max. 0,5 μ V/V