

Power chip resistor size 1218

PRC201

FEATURES

- Reduced size of final equipment
- Low assembly costs
- Higher component and equipment reliability
- Excellent performance at high frequency.

APPLICATIONS

- Power supplies in small sized equipment
- Camcorders
- Portable radio, CD and cassette players
- Automotive.

DESCRIPTION

The resistors are constructed on a high grade ceramic body (aluminium oxide). Internal metal electrodes are added at each end and connected by a resistive paste which is applied to the top surface of the substrate. The composition of the paste is adjusted to give the approximate resistance required and the value is trimmed to within tolerance, by laser cutting of this resistive layer.

The resistive layer is covered with a protective coating and printed with the resistance value. Finally, the two external end terminations are added. To guarantee optimum solderability the outer layer consists of a lead-tin alloy.

QUICK REFERENCE DATA

DESCRIPTION	VALUE
Resistance range	0.02 Ω to 1 M Ω
Resistance tolerance and series: 0.02 $\Omega \leq R \leq 1 \text{ M}\Omega$ 0.1 $\Omega \leq R \leq 1 \text{ M}\Omega$	$\pm 5\%$, E24 series $\pm 1\%$, E24/E96 series
Temperature coefficient: 0.020 $\Omega \leq R < 0.033 \Omega$ 0.033 $\Omega \leq R < 0.060 \Omega$ 0.060 $\Omega \leq R < 0.2 \Omega$ 0.2 $\Omega \leq R < 1 \Omega$ 1 $\Omega \leq R < 10 \Omega$ 10 $\Omega \leq R \leq 1 \text{ M}\Omega$	$\leq \pm 2000 \times 10^{-6}/\text{K}$ $\leq \pm 1000 \times 10^{-6}/\text{K}$ $\leq \pm 700 \times 10^{-6}/\text{K}$ $\leq \pm 250 \times 10^{-6}/\text{K}$ $\leq \pm 200 \times 10^{-6}/\text{K}$ $\leq \pm 100 \times 10^{-6}/\text{K}$
Absolute maximum dissipation at $T_{\text{amb}} = 70 \text{ }^\circ\text{C}$	1 W
Maximum permissible voltage	200 V (DC or RMS)
Maximum permissible current	6 A (DC or RMS)
Operating temperature range	$-55 \text{ }^\circ\text{C}$ to $+155 \text{ }^\circ\text{C}$
Basic specification	IEC 115-8
Stability after: load, 1000 hours at $T_{\text{amb}} = 70 \text{ }^\circ\text{C}$: 0.02 $\Omega \leq R < 0.1 \Omega$ 0.1 $\Omega \leq R \leq 1 \text{ M}\Omega$ climatic tests resistance to soldering heat test: 0.02 $\Omega \leq R < 0.1 \Omega$ 0.1 $\Omega \leq R \leq 1 \text{ M}\Omega$ short time overload	$\Delta R/R \text{ max.} : \pm 5\%$ $\Delta R/R \text{ max.} : \pm 3\%$ $\Delta R/R \text{ max.} : \pm 3\%$ $\Delta R/R \text{ max.} : \pm 2\%$ $\Delta R/R \text{ max.} : \pm 1\%$ $\Delta R/R \text{ max.} : \pm 1\%$

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ORDERING INFORMATION

Table 1 Ordering code indicating resistor type and packaging

TYPE	TOL (%)	ORDERING CODE 2322 735	
		EMBOSSED CARRIER TAPE ON REEL	
		1 000 units	5 000 units
PRC201	5%; note 1	30...	60...
	1%	1....	2....
Jumper 0 Ω			
PRC201; note 2	–	90003	90006

Notes

- Code numbers for values less than 0.1 Ω are available on request.
- The jumper has a maximum resistance $R_{\max} = 20 \text{ m}\Omega$ and a rated current $I_R = 6 \text{ A}$.

Ordering code (12NC)

- The resistors have a 12-digit ordering code starting with 2322.
- The subsequent four or five digits indicate the resistor type and packaging; see Table 1.
- The remaining digits indicate the resistance value:
 - The first 2 digits for 5% or 3 digits for 1% tolerance products indicate the resistance value.
 - The last digit indicates the resistance decade in accordance with Table 2.

Table 2 Last digit of 12NC

RESISTANCE DECADE	LAST DIGIT
0.02 to 0.091 Ω	note 1
0.1 to 0.91 Ω	7
1 to 9.1 Ω	8
10 to 91 Ω	9
100 to 910 Ω	1
1 to 9.1 kΩ	2
10 to 91 kΩ	3
100 to 910 kΩ	4
1 MΩ	5

Note

- Code numbers for values less than 0.1 Ω are available on request.

ORDERING EXAMPLE

The ordering code of a PRC201 resistor, value 470 Ω with 5% tolerance, supplied on embossed carrier tape of 5 000 units per reel is: 2322 735 60471.

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FUNCTIONAL DESCRIPTION

Product characterization

Standard values of nominal resistance are taken from the E24 or E96 series for resistors with a tolerance of $\pm 5\%$ or $\pm 1\%$. The values of the E24 series are in accordance with "IEC publication 63".

DERATING

The power that the resistor can dissipate depends on the operating temperature; see Fig.1.

TEMPERATURE COEFFICIENT

Figure 2 shows the typical TC of the low ohmic part of the resistor.

Limiting values

TYPE	LIMITING VOLTAGE ⁽¹⁾ (V)	LIMITING CURRENT (A)	LIMITING POWER (W)
PRC201	200	6	1

Note

1. The maximum voltage that may be continuously applied to the resistor element, see "IEC publication 115-8".

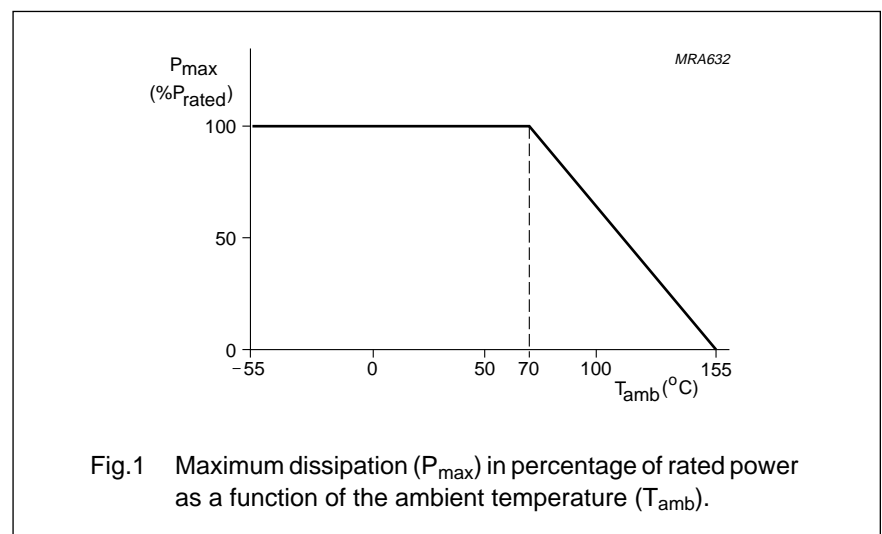


Fig.1 Maximum dissipation (P_{max}) in percentage of rated power as a function of the ambient temperature (T_{amb}).

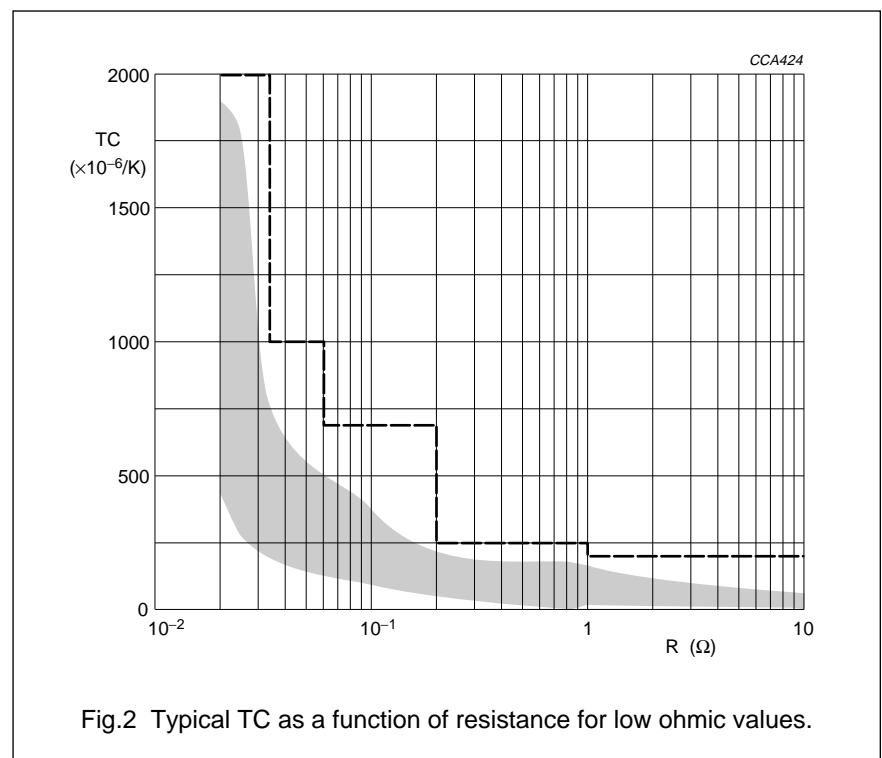
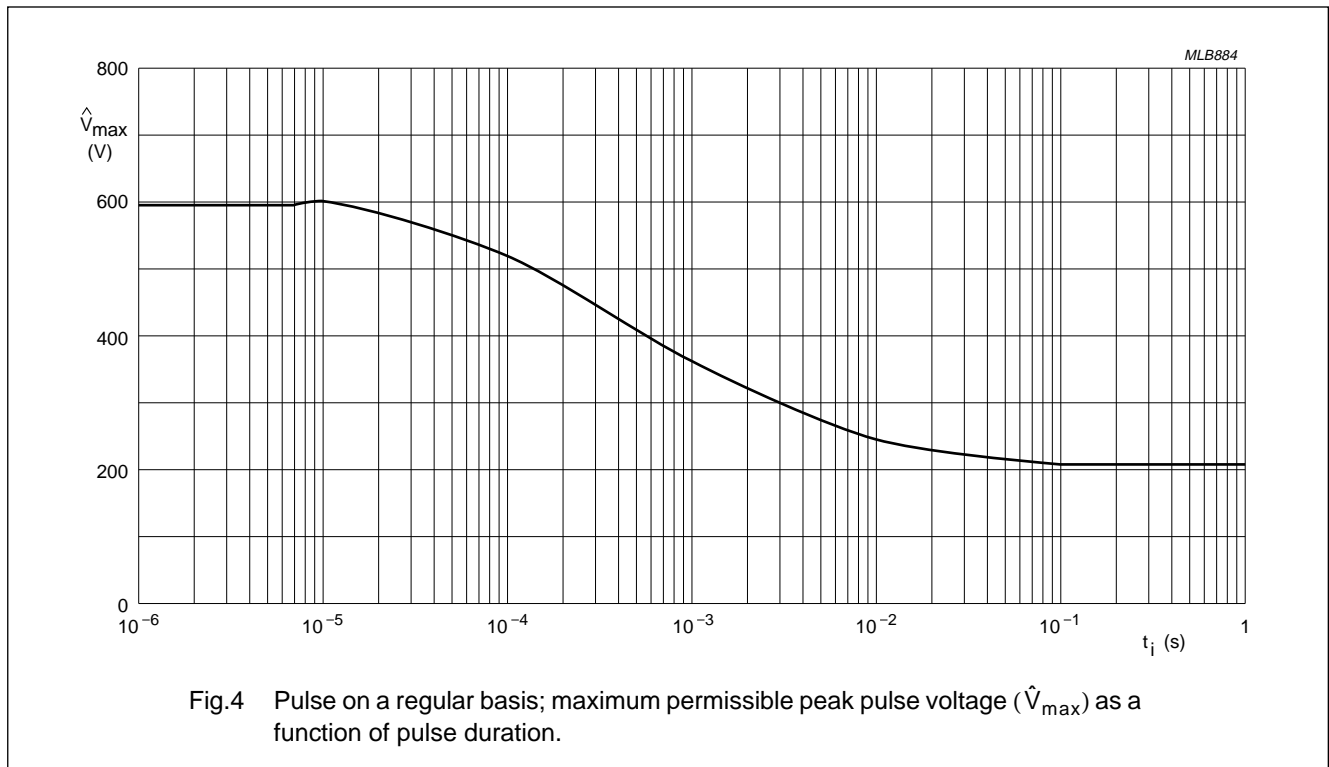
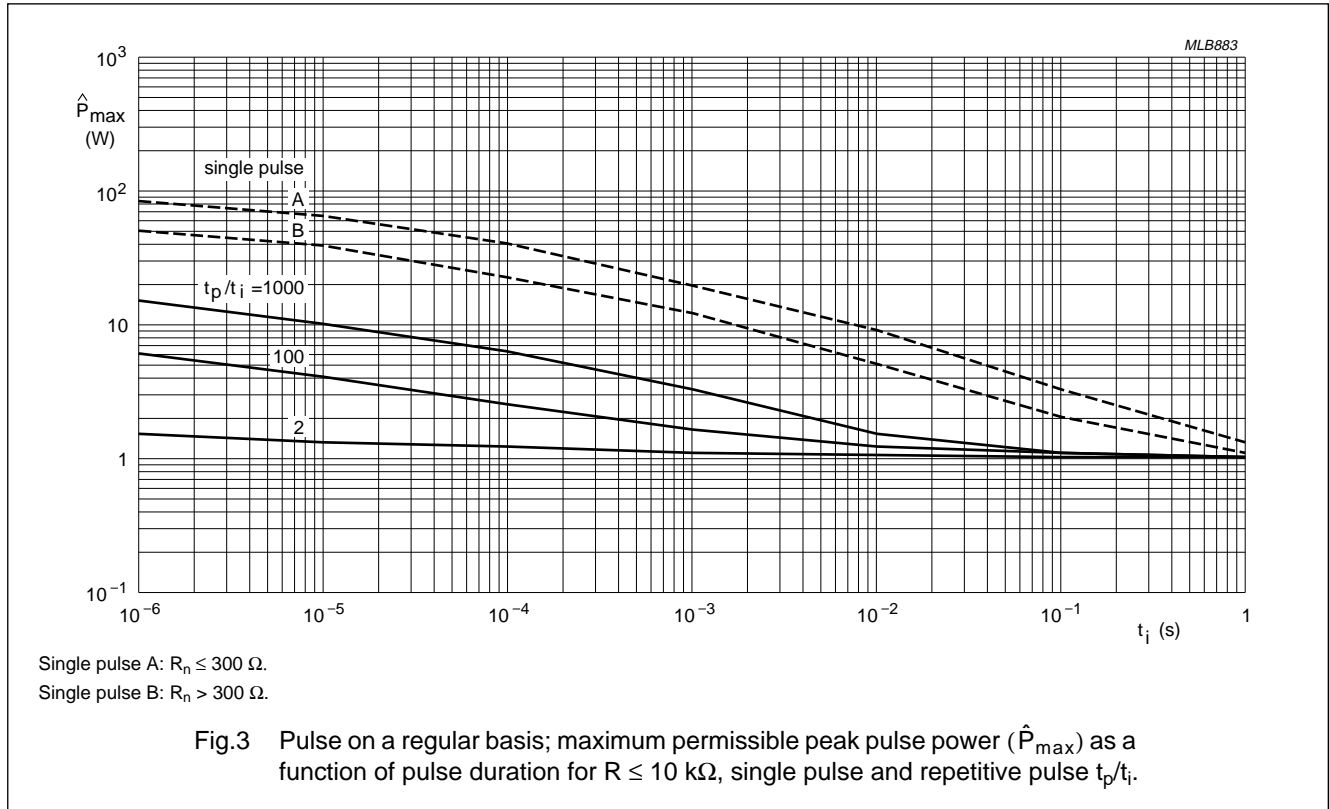


Fig.2 Typical TC as a function of resistance for low ohmic values.

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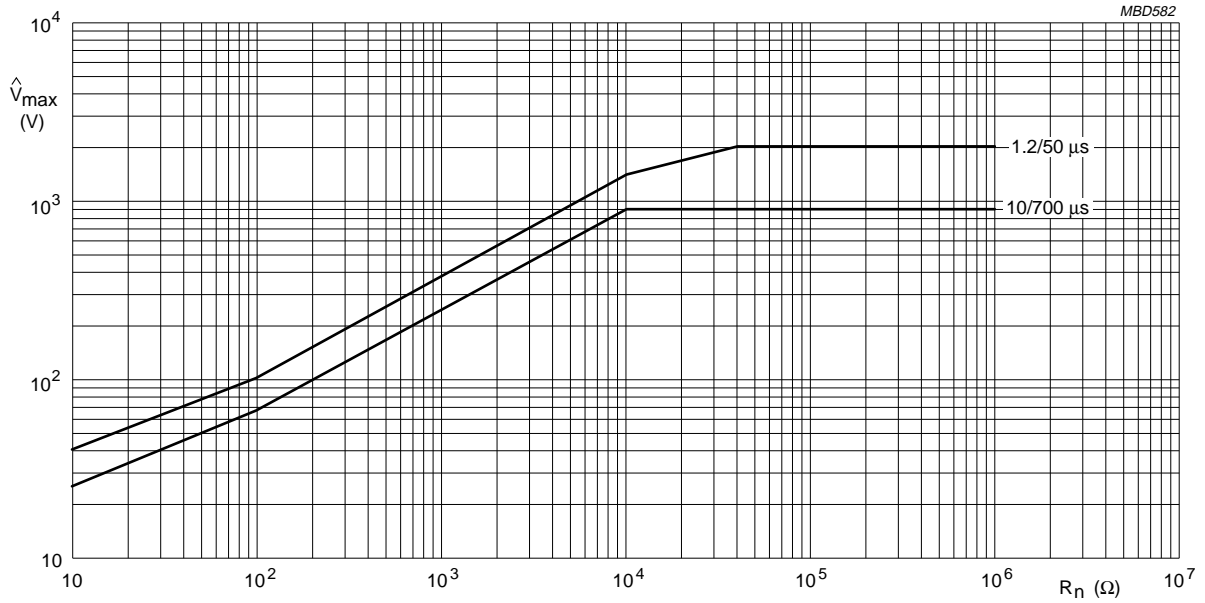
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PULSE LOADING CAPABILITIES



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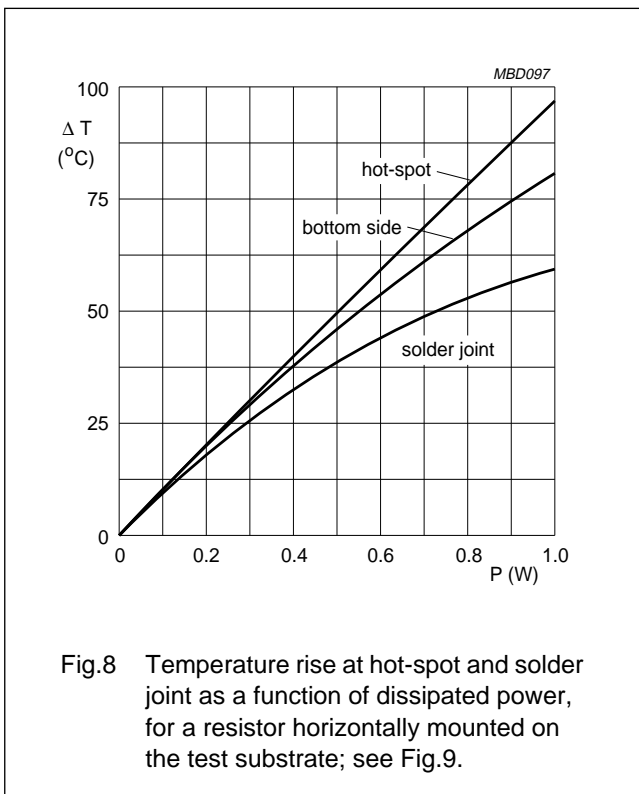
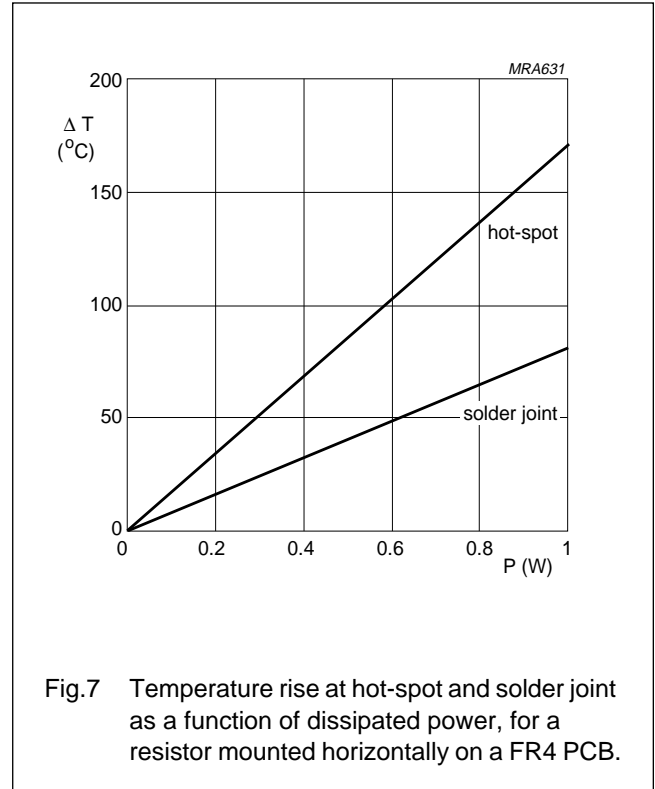
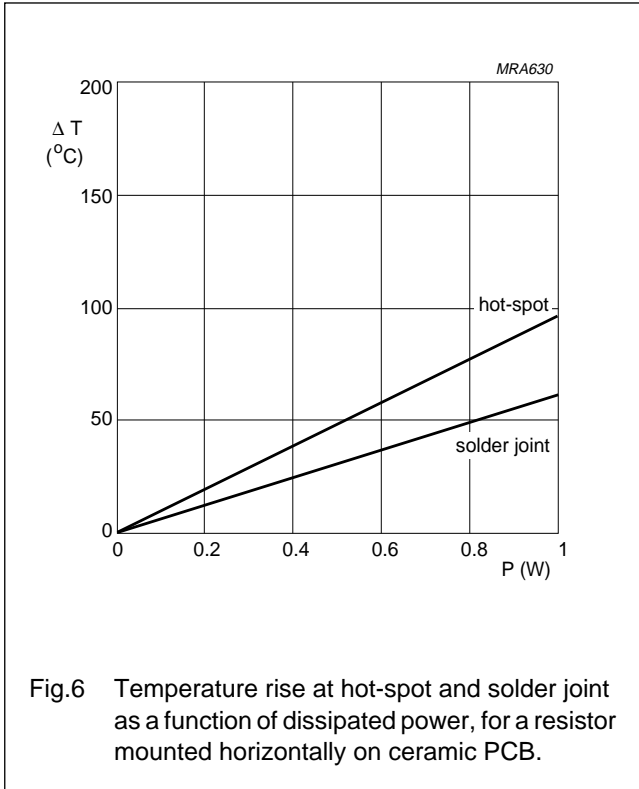
These pulses may not be applied on a regular basis.

Fig.5 Maximum permissible peak pulse voltage without failing to 'open circuit' in accordance with DIN IEC 40 (CO) 533.

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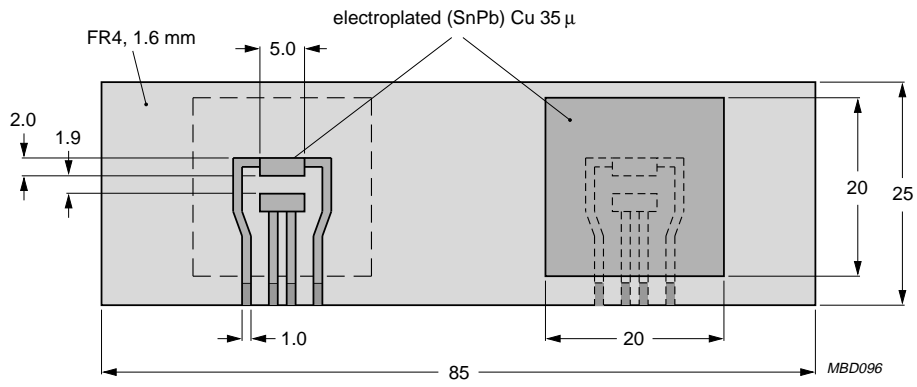
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Application information



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Dimensions in mm.

Fig.9 Test substrate layout. The tracks on the substrate for values below 33 mΩ are wider. With this substrate, the resistance of the tracks becomes significant compared to the resistor tested. Due to the current loading required for resistor testing these tracks may be damaged.

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MECHANICAL DATA

Mass per 100 units

TYPE	MASS (g)
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Marking

Each resistor is marked with the nominal resistance value.

4-DIGIT MARKING

For values up to 910 Ω the R is used as a decimal point. For values of 1 kΩ or greater the letter K or M is used as the decimal point for the kΩ or MΩ indication.

Magnitude indicators

RESISTANCE	INDICATOR
0.02 to 910 Ω	R
1 to 910 kΩ	K
1 MΩ	M

Example

MARKING	RESISTANCE
120R	120 Ω
4K70	4.70 kΩ

The packaging is also marked and includes resistance value, tolerance, TC value, catalogue number, quantity, production period, batch number and source code.

Outlines

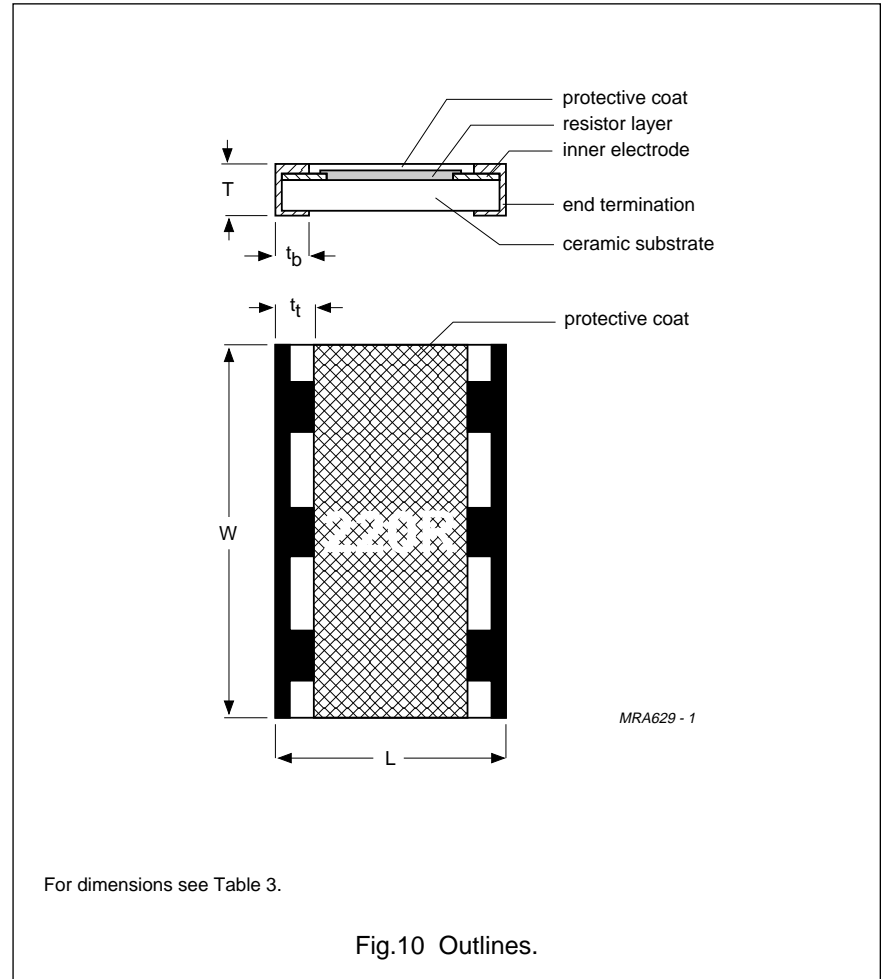


Table 3 Chip resistor type and relevant physical dimensions; see Fig.10

TYPE	L (mm)	W (mm)	T (mm)	t _t (mm)	t _b (mm)
PRC201	3.05 ±0.15	4.60 ±0.20	0.55 ±0.10	0.45 ±0.25	0.50 ±0.25

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TESTS AND REQUIREMENTS

Essentially all tests are carried out in accordance with the schedule of "IEC publication 115-8", category 55/155/56 (rated temperature range -55 to +155 °C; damp heat, long term, 56 days). The testing also covers the requirements specified by EIA and EIAJ.

The tests are carried out in accordance with IEC publication 68, "Recommended basic climatic and mechanical robustness testing procedure for electronic components" and under standard atmospheric conditions in accordance with "IEC 68-1", subclause 5.3.

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).

In Table 4 the tests and requirements are listed with reference to the relevant clauses of "IEC publications 115-8 and 68"; a short description of the test procedure is also given. In some instances deviations from the IEC recommendations were necessary for our method of specifying.

All soldering tests are performed with mildly activated flux.

Table 4 Test procedures and requirements

IEC 115-8 CLAUSE	IEC 68-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS
Tests in accordance with the schedule of IEC publication 115-8				
4.4.1		visual examination		no holes; clean surface; no damage
4.4.2		dimensions (outline)	gauge	$0.45 \text{ mm} \leq T \leq 0.65 \text{ mm}$ $4.4 \text{ mm} \leq W \leq 4.8 \text{ mm}$ $2.9 \text{ mm} \leq L \leq 3.2 \text{ mm}$
4.5		resistance	applied voltage (+0/-10%): R < 10 Ω: 0.1 V 10 Ω ≤ R < 100 Ω: 0.3 V 100 Ω ≤ R < 1 kΩ: 1 V 1 kΩ ≤ R < 10 kΩ: 3 V 10 kΩ ≤ R < 100 kΩ: 10 V 100 kΩ ≤ R < 1 MΩ: 25 V 1 MΩ: 50 V	R – R _{nom} : max. ±5% or 1%
4.18	20 (Tb)	resistance to soldering heat	10 s; 260 ±5 °C; flux 600	$0.020 \text{ } \Omega \leq R < 0.1 \text{ } \Omega$: $\Delta R/R$ max.: ±2% $0.1 \text{ } \Omega \leq R \leq 1 \text{ M}\Omega$: $\Delta R/R$ max.: ±1%
4.29	45 (Xa)	component solvent resistance	isopropyl alcohol; H ₂ O	no visible damage
4.17	20 (Ta)	solderability	unmounted chips completely immersed for 2 ±0.5 s in a solder bath at 235 ±5 °C; flux 600	good tinning (≥95% covered); no damage
4.7		voltage proof on insulation	200 V (RMS) during 1 minute	no breakdown or flashover

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IEC 115-8 CLAUSE	IEC 68-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS
4.13		short time overload	room temperature; dissipation $6.25 \times P_n$; 5 s (voltage not more than $2 \times V_{max}$)	$\Delta R/R$ max.: $\pm 1\%$
4.33		bending	resistors mounted on a 90 mm glass epoxy resin PCB (FR4), bending: 2 mm	no damage $\Delta R/R$ max.: $\pm 1\%$
4.19	14 (Na)	rapid change of temperature	30 minutes at $-55\text{ }^\circ\text{C}$ and 30 minutes at $+155\text{ }^\circ\text{C}$; 5 cycles	no visible damage $\Delta R/R$ max.: $\pm 1\%$
4.23		climatic sequence:		
4.23.2	2 (Ba)	dry heat	16 hours; $155\text{ }^\circ\text{C}$	
4.23.3	30 (D)	damp heat (accelerated) 1st cycle	24 hours; $55\text{ }^\circ\text{C}$; 95 to 100% RH	
4.23.4	1 (Aa)	cold	2 hours; $-55\text{ }^\circ\text{C}$	
4.23.5	13 (M)	low air pressure	1 hour; 8.5 kPa; 15 to $35\text{ }^\circ\text{C}$	
4.23.6	30 (D)	damp heat (accelerated) remaining cycles	5 days; $55\text{ }^\circ\text{C}$; 95 to 100% RH	$\Delta R/R$ max.: $\pm 3\%$
4.6.1.1		insulation resistance	100 V (DC) after 1 minute	R_{ins} min.: 1000 M Ω
4.24.2	3 (Ca)	damp heat (steady state)	56 days; $40\text{ }^\circ\text{C}$; 90 to 95% RH; loaded with $0.01P_n$ (IEC steps: 4 to 100 V)	no visible damage $\Delta R/R$ max.: $\pm 3\%$
4.25.1		endurance (at $70\text{ }^\circ\text{C}$)	1000 hours; loaded with P_n or V_{max} ; 1.5 hours on and 0.5 hours off	no visible damage $0.020\ \Omega \leq R < 0.1\ \Omega$: $\Delta R/R$ max.: $\pm 5\%$ $0.1\ \Omega \leq R \leq 1\ \text{M}\Omega$: $\Delta R/R$ max.: $\pm 3\%$
4.23.2	27 (Ba)	endurance at upper category temperature	1000 hours; $155\text{ }^\circ\text{C}$; no load	no visible damage $\Delta R/R$ max.: $\pm 3\%$

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IEC 115-8 CLAUSE	IEC 68-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS
4.8.4.2		temperature coefficient	at 20/-55/20 °C and 20/155/20 °C	0.020 Ω ≤ R < 0.033 Ω: ΔR/R max.: ±2000 × 10 ⁻⁶ /K 0.033 Ω ≤ R < 0.060 Ω: ΔR/R max.: ±1000 × 10 ⁻⁶ /K 0.060 Ω ≤ R < 0.2 Ω: ΔR/R max.: ±700 × 10 ⁻⁶ /K 0.2 Ω ≤ R < 1 Ω: ΔR/R max.: ±250 × 10 ⁻⁶ /K 1 Ω ≤ R < 10 Ω: ΔR/R max.: ±200 × 10 ⁻⁶ /K 10 Ω ≤ R: ΔR/R max.: ±100 × 10 ⁻⁶ /K
Other tests in accordance with IEC 115 clauses and IEC 68 test method				
4.17	20 (Tb)	solderability (after ageing)	16 hours steam or 16 hours at 155 °C; unmounted chips completely immersed for 2 ±0.5 s in a solder bath at 235 ±5 °C; flux 600	good tinning (≥95% covered); no damage
4.22	6 (Fc)	vibration (mounted state)	frequency: 10 to 500 Hz; displacement 1.5 mm or acceleration 10 g; 3 directions; total 6 hours	no damage ΔR/R max.: ±1%
4.20	29 (Eb)	bump (mounted state)	3 × 1500 bumps in 3 directions; 40 g	no damage ΔR/R max.: ±1%
Other applicable tests				
		leaching	unmounted chips 60 s; 260 ±5 °C	good tinning; no leaching