

Power chip resistor size 2010

PRC111
1%

FEATURES

- Reduced size of final equipment
- Low assembly costs
- Higher component and equipment reliability.

APPLICATIONS

- Converters
- Printer equipment
- Computers
- Battery chargers
- Automotive
- Power supplies.

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	1 Ω to 10 M Ω , E96 series
Resistance tolerance	$\pm 1\%$
Temperature coefficient:	
1 $\Omega \leq R < 4.99 \Omega$	$\leq \pm 300 \times 10^{-6}/K$
5.1 $\Omega \leq R < 9.76 \Omega$	$\leq \pm 200 \times 10^{-6}/K$
10 $\Omega \leq R < 1 \text{ M}\Omega$	$\leq \pm 100 \times 10^{-6}/K$
1 M $\Omega \leq R < 10 \text{ M}\Omega$	$\leq \pm 200 \times 10^{-6}/K$
Absolute maximum dissipation at $T_{\text{amb}} = 70 \text{ }^\circ\text{C}$	0.5 W
Maximum permissible voltage	200 V (DC or RMS)
Climatic category (IEC 60068)	55/125/56
Operating temperature range	$-55 \text{ }^\circ\text{C}$ to $+125 \text{ }^\circ\text{C}$
Basic specification	IEC 60115-8

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ORDERING INFORMATION

Table 1 Ordering code indicating resistor type and packaging

TYPE	RESISTANCE RANGE	TOL. (%)	SERIES	ORDERING CODE 2322 761
				BLISTER TAPE ON REEL
				4000 units
PRC111	1 Ω to 10 MΩ	±1	E96	6....

Ordering code (12NC)

- The resistors have a 12-digit ordering code starting with 2322 761; see Table 1.
- The subsequent digit indicates the resistor type and packaging.
- The remaining digits indicate the resistance value:
 - The first 3 digits 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
1 to 9.76 Ω	8
10 to 97.6 Ω	9
100 to 976 Ω	1
1 to 9.76 kΩ	2
10 to 97.6 kΩ	3
100 to 976 kΩ	4
1 to 9.76 MΩ	5
10 MΩ	6

ORDERING EXAMPLE

The ordering code of a PRC111 resistor, value 4.02 kΩ with 1% tolerance, supplied on blister tape of 4000 units per reel is: 2322 761 64022.

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FUNCTIONAL DESCRIPTION

Product characterization

Standard values of nominal resistance are taken from the E96 series for resistors with a tolerance of $\pm 1\%$. The values of the E96 series are in accordance with "IEC publication 60063".

Limiting values

TYPE	LIMITING VOLTAGE ⁽¹⁾ (V)	LIMITING POWER (W)
PRC111	200	0.5

Note

1. The maximum voltage that may be continuously applied to the resistor element, see "IEC publication 60115-8".

DERATING

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

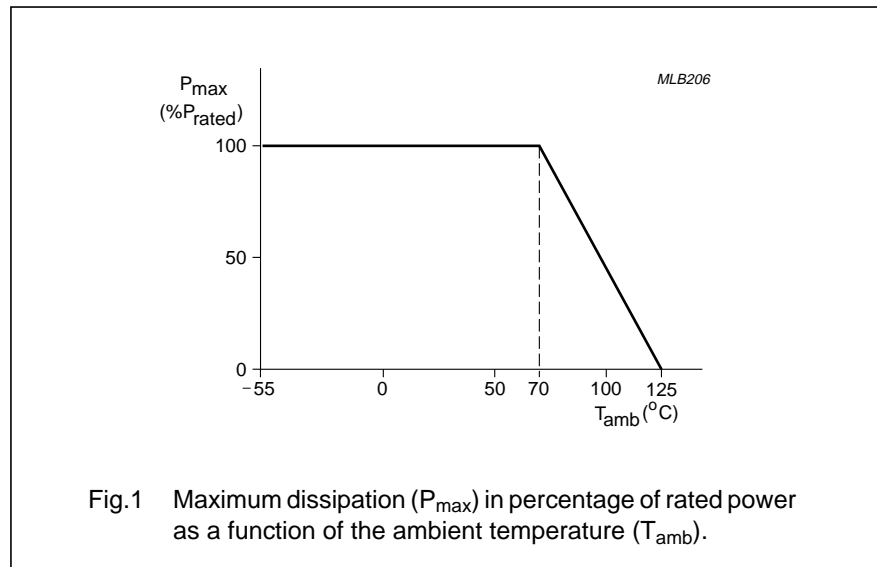


Fig.1 Maximum dissipation (P_{max}) in percentage of rated power as a function of the ambient temperature (T_{amb}).

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MECHANICAL DATA

Mass per 100 units

TYPE	MASS (g)
PRC111	2.50

Marking

Each resistor is marked with the nominal resistance value.

4-DIGIT MARKING

For values up to 976 Ω the R is used as a decimal point. For values of 1 kΩ or greater the first 3 digits apply to the resistance value and the fourth indicates the number of zeros to follow.

Example

MARKING	RESISTANCE
121R	121 Ω
4021	4.02 kΩ
1503	150 kΩ

PACKAGE MARKING

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

Outlines

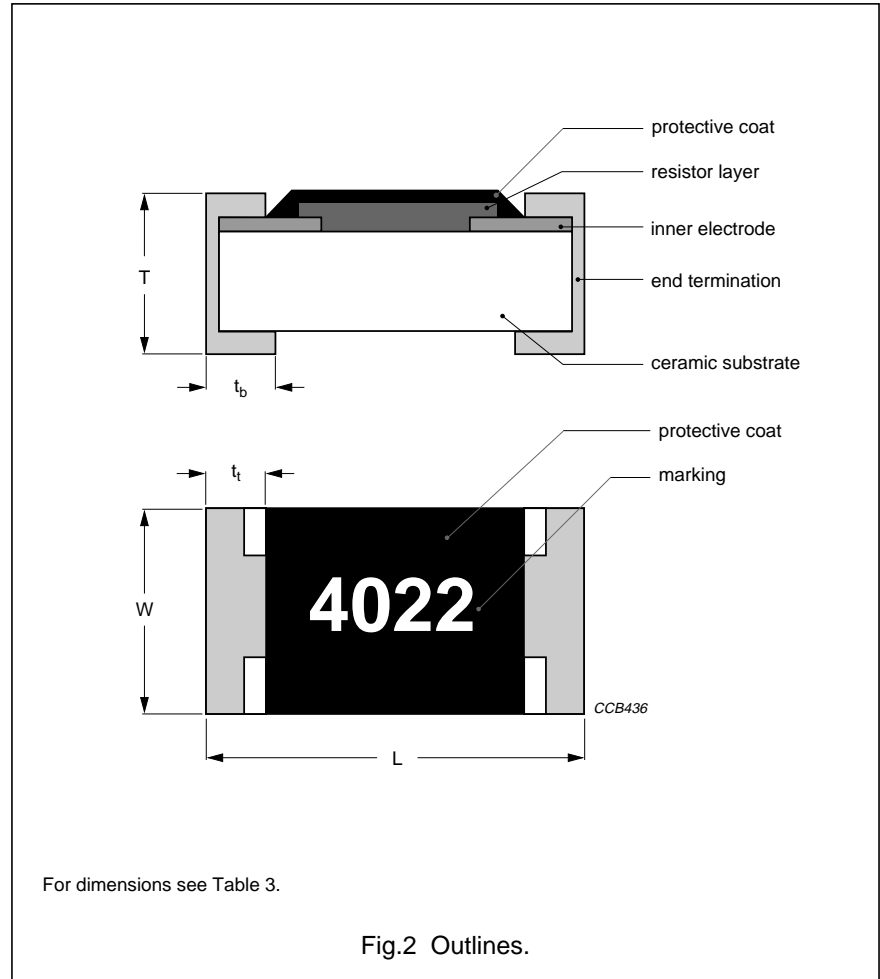


Table 3 Chip resistor type and relevant physical dimensions; see Fig.2

TYPE	L (mm)	W (mm)	T (mm)	t _t (mm)	t _b (mm)
PRC111	5.0 ±0.2	2.5 ±0.2	0.55 ±0.10	0.65 ±0.25	0.90 ±0.25

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TESTS AND REQUIREMENTS

Essentially all tests are carried out in accordance with the schedule of "IEC publication 60115-8", category 55/125/56 (rated temperature range -55 to $+125$ °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 60068, "Recommended basic climatic and mechanical robustness testing procedure for electronic components" and under standard atmospheric conditions in accordance with "IEC 60068-1", 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 60115-8 and 60068"; 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 60115-8 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS
Tests in accordance with the schedule of IEC publication 60115-8				
4.4.1		visual examination		no holes; clean surface; no visible damage
4.17	20 (Ta)	solderability	unmounted chips completely immersed for 2 ± 0.5 s in a solder bath at 235 ± 2 °C	good tinning ($\geq 95\%$ covered); no visible damage
4.18	20 (Tb)	resistance to soldering heat	unmounted chips; 10 ± 1 s; 260 ± 5 °C	no visible damage $\Delta R/R$ max.: $\pm(0.5\% + 0.05 \Omega)$
4.13		short time overload	room temperature; dissipation 6.25×0.5 W; 5 s (voltage not more than $2 \times V_{max}$)	$\Delta R/R$ max.: $\pm(1\% + 0.05 \Omega)$
4.33		bending	resistors mounted on a 90 mm glass epoxy resin PCB (FR4), bending: 2 mm	no visible damage $\Delta R/R$ max.: $\pm(0.5\% + 0.05 \Omega)$
4.19	14 (Na)	rapid change of temperature	30 minutes at LCT and 30 minutes at UCT; 5 cycles	no visible damage $\Delta R/R$ max.: $\pm(0.5\% + 0.05 \Omega)$
4.6.1.1		insulation resistance	200 V (DC) after 1 minute	R_{ins} min.: 10000 M Ω
4.24.2	3 (Ca)	damp heat (steady state)	56 days; 40 ± 2 °C; $93 +2/-3\%$ RH; loaded with $0.01 P_n$	no visible damage $\Delta R/R$ max.: $\pm(1.5\% + 0.05 \Omega)$
4.25.1		endurance	1000 $+48/-0$ hours; nominal dissipation; 1.5 hours on, 0.5 hour off	no visible damage $\Delta R/R$ max.: $\pm(1.5\% + 0.05 \Omega)$
4.8.4.2		temperature coefficient	at 20/LCT/20 °C and 20/UCT/20 °C: $1 \Omega \leq R < 4.99 \Omega$ $5.1 \Omega \leq R < 9.76 \Omega$ $10 \Omega \leq R < 1 \text{ M}\Omega$ $1 \text{ M}\Omega \leq R < 10 \text{ M}\Omega$	$\Delta R/R$ max.: $\pm 300 \times 10^{-6}/K$ $\Delta R/R$ max.: $\pm 200 \times 10^{-6}/K$ $\Delta R/R$ max.: $\pm 100 \times 10^{-6}/K$ $\Delta R/R$ max.: $\pm 200 \times 10^{-6}/K$

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IEC 60115-8 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS
Other tests in accordance with IEC 60115 clauses and IEC 60068 test method				
4.17	20 (Ta)	solderability (after ageing)	8 hours steam or 16 hours at 155 °C; unmounted chips completely immersed for 2 ± 0.5 s in a solder bath at 235 ± 2 °C	good tinning ($\geq 95\%$ covered); no visible damage
Other applicable tests				
		leaching	unmounted chips 60 ± 1 s; 260 ± 5 °C	good tinning; no leaching
	(JIS) C 5202 7.5	resistance to damp heat (steady state)	1000 +48/-0 hours; 40 ± 2 °C; 93 +2/-3% RH; loaded with 1 W or V_{max} ; 1.5 hours on, 0.5 hour off	no visible damage $\Delta R/R$ max.: $\pm(1\% + 0.05 \Omega)$