

DATA SHEET

POWER CHIP RESISTORS

PRC201
5%; 1%
size 1218



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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	1 Ω to 1 M Ω , jumper; E24/E96 series
Resistance tolerance and series	$\pm 5\%$, $\pm 1\%$
Temperature coefficient 1 $\Omega \leq R < 10 \Omega$ 10 $\Omega \leq R \leq 1 \text{ M}\Omega$	$\leq \pm 200 \times 10^{-6}/\text{K}$ $\leq \pm 100 \times 10^{-6}/\text{K}$
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 to +155 $^\circ\text{C}$
Basic specification	IEC 60115-8

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ORDERING INFORMATION

Table 1 Ordering code indicating resistor type and packing

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

Note

- 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 packing; 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
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

ORDERING EXAMPLE

The ordering code of a PRC201 resistor, value 470 Ω with 5% tolerance, supplied on blister tape of 5000 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/E96 series are in accordance with "IEC publication 60063".

Limiting values

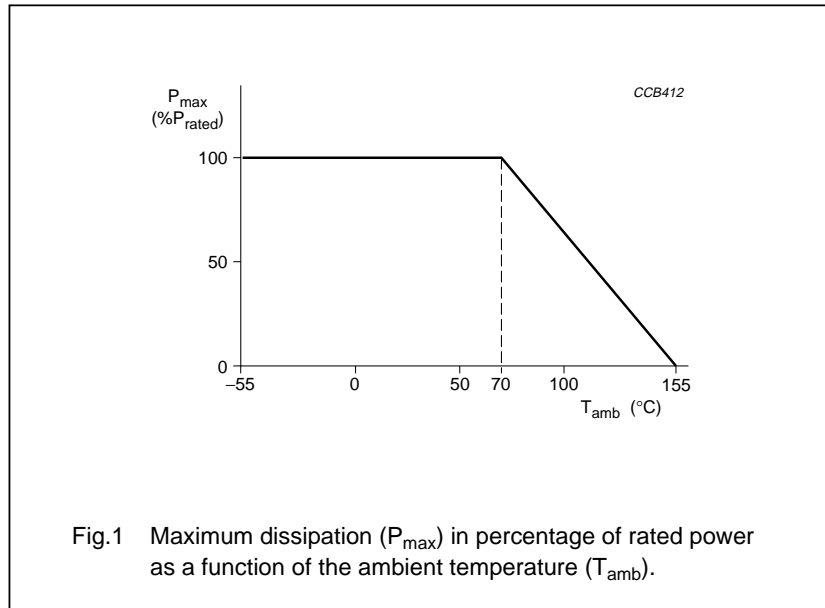
TYPE	LIMITING VOLTAGE ⁽¹⁾ (V)	LIMITING CURRENT (A)	LIMITING POWER (W)
PRC201	200	6	1

Note

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

DERATING

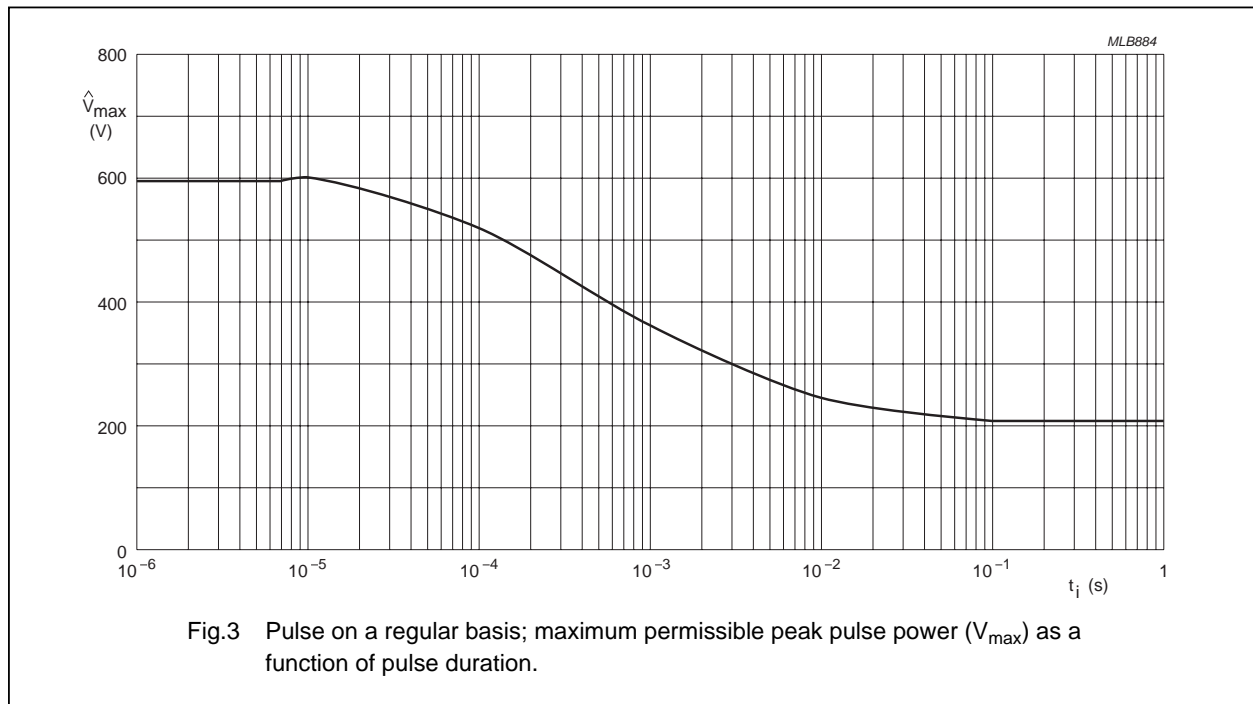
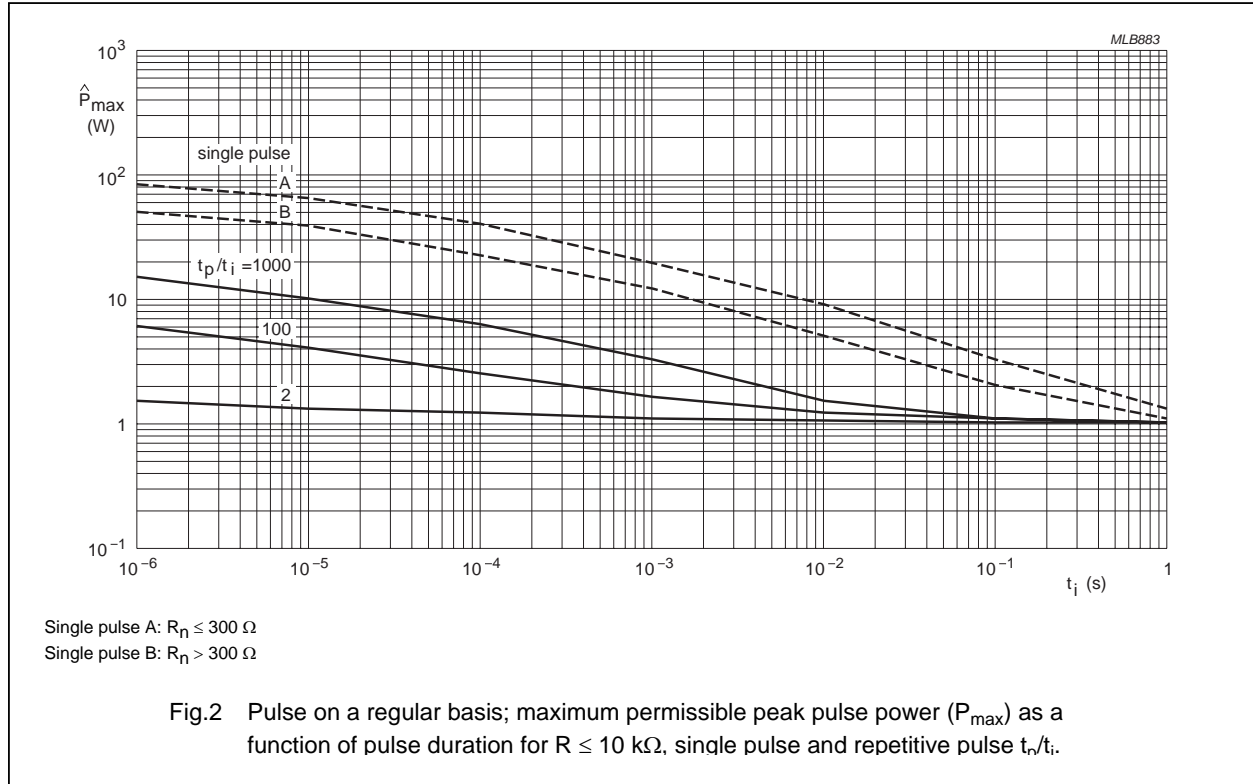
The power that the resistor can dissipate depends on the operating temperature; see Fig.1.

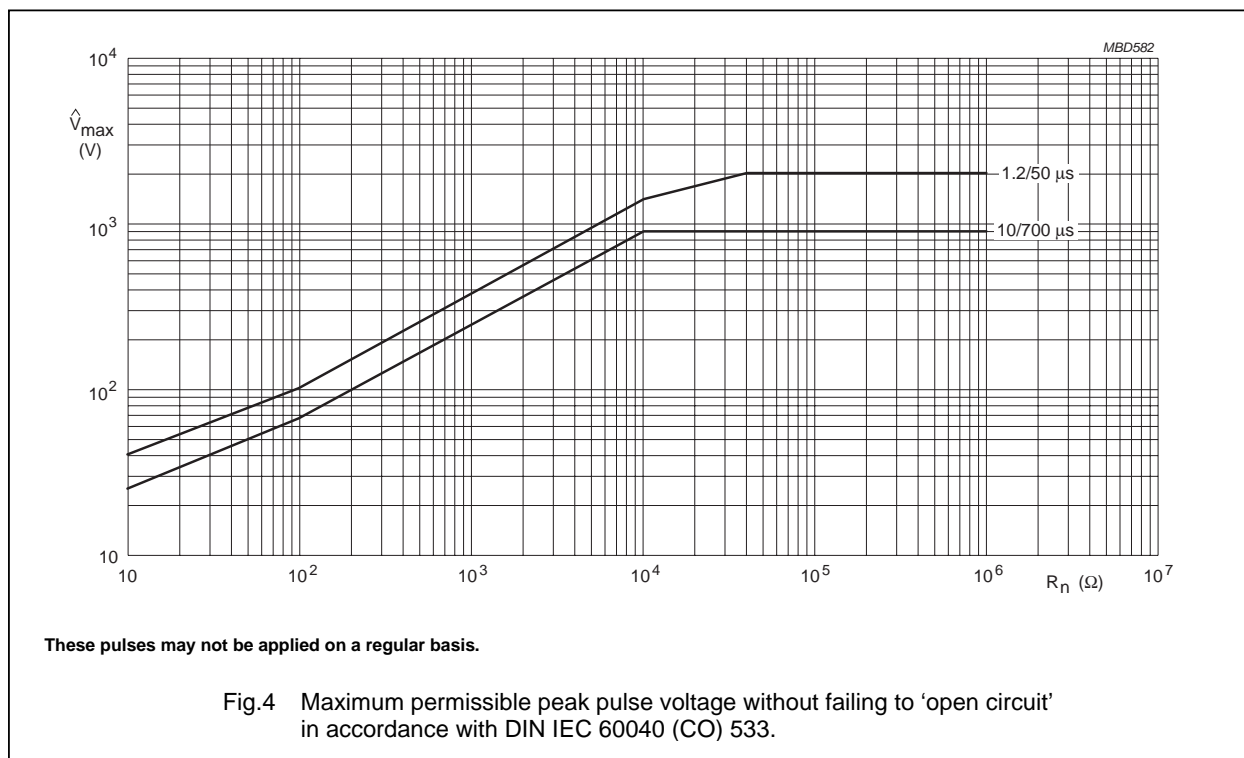


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PULSE LOADING CAPABILITIES



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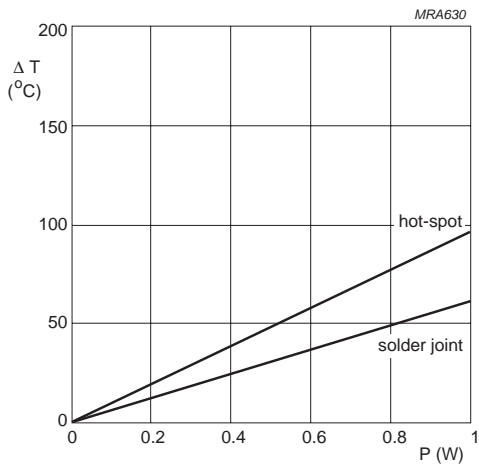


Fig.5 Temperature rise at hot-spot and solder joint as a function of dissipated power, for a resistor mounted horizontally on a ceramic PCB.

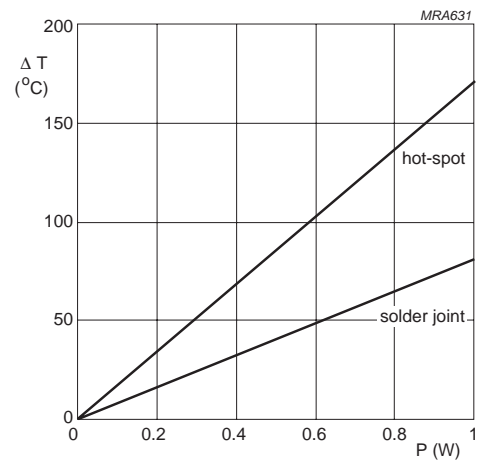


Fig.6 Temperature rise at hot-spot and solder joint as a function of dissipated power, for a resistor mounted horizontally on a FR4 PCB.

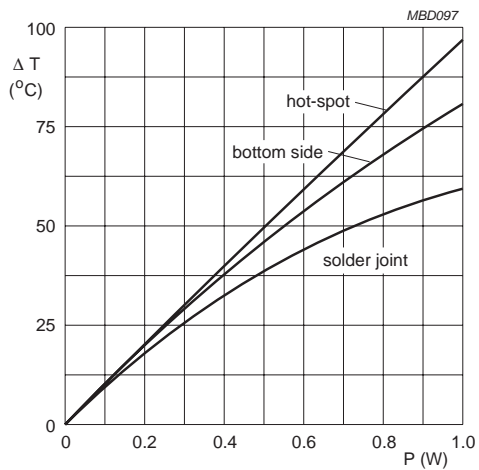
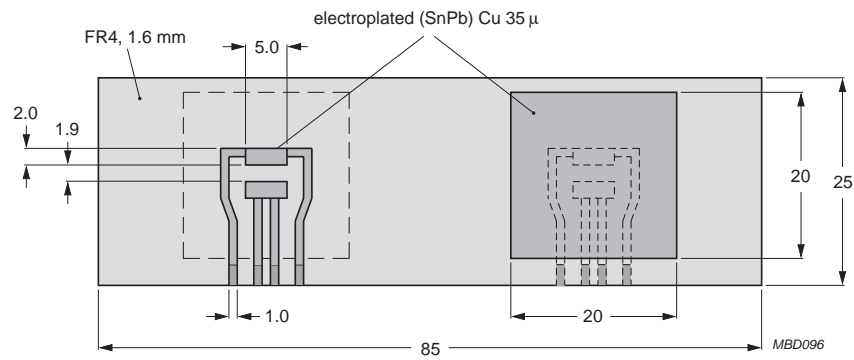


Fig.7 Temperature rise at hot-spot and solder joint as a function of dissipated power, for a resistor horizontally mounted the test substrate; see Fig.8.

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The tracks on the substrate for values below 33 m Ω are wider. With this substrate, the resistance of the tracks comes significant compared to the resistor tested. Due to the current loading required for resistor testing these tracks may be damaged.
Dimensions in mm.

Fig.8 Test substrate layout.

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MECHANICAL DATA

Mass per 100 units

TYPE	MASS (g)
PRC201	3

Marking

All resistors within the E24 series are marked with a 3-digit code and a 4-digit code for resistors of the E96 series, on the protective coat to designate the nominal resistance value.

3-DIGIT MARKING

For values of 10 Ω or greater the first 2 digits are significant, the third indicates the number of zeros to follow.

Example

MARKING	RESISTANCE
220	22 Ω
823	82 k Ω
0	jumper

4-DIGIT MARKING

For values of 1 k Ω or greater the first 3 digits apply to the resistance value and the fourth indicates the number of zeros to follow.

Example

MARKING	RESISTANCE
2200	220 Ω
4021	4.02 k Ω
1503	150 k Ω

PACKAGE MARKING

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

Outlines

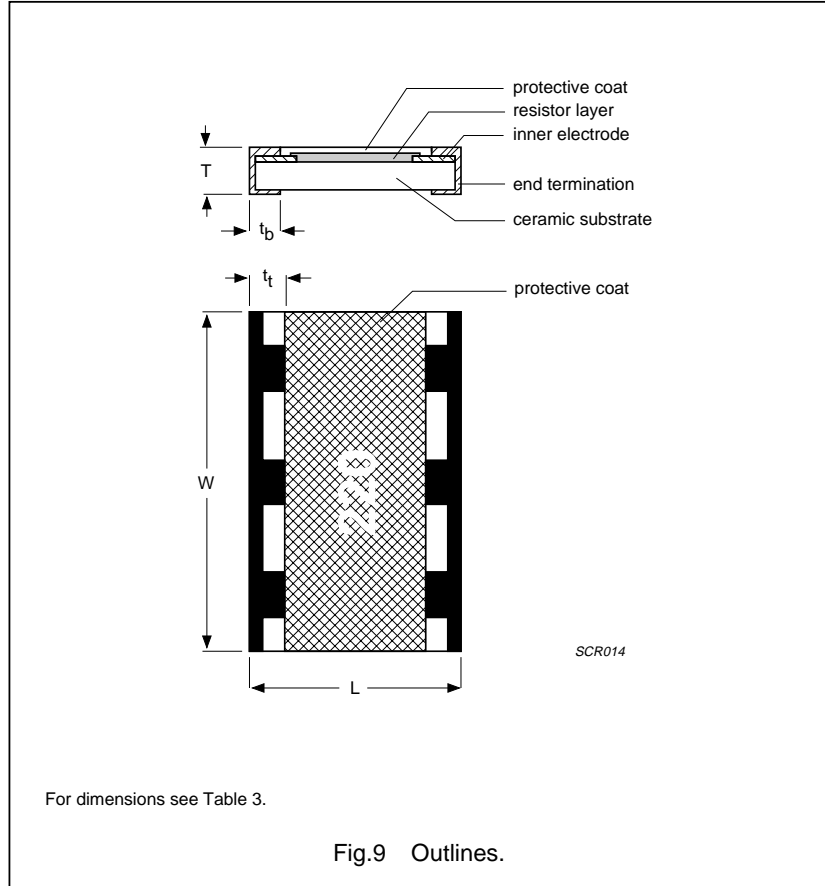


Table 3 Chip resistor type and relevant physical dimensions; see Fig.9

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	0.5 ±0.25

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TEST AND REQUIREMENTS

Essentially all tests are carried out in accordance with the schedule of "IEC publication 60115-8", 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 60068, "Recommended basic

climatic and mechanical robustness testing procedure for electronic components" and under standard atmospheric conditions according to "IEC 60068-1", subclause 5.3.

Unless otherwise specified the following values apply:

Temperature: 15 °C to 35 °C

Relative humidity: 25% 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 damage
4.4.2		dimensions (outline)	gauge	0.45 mm ≤ T ≤ 0.65 mm 0.44 mm ≤ W ≤ 4.8 mm 2.9 mm ≤ L ≤ 3.2 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	unmounted chips: 10 ±1 s; 260 ±5 °C 1 Ω ≤ R ≤ 1 MΩ	ΔR/R max.: ±(1% + 0.05 Ω)
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 ±2 °C	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 60115-8 CLAUSE	IEC 60068-2 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.: $\pm(1\% + 0.05 \Omega)$
4.33		bending	resistors mounted on a 90 mm glass epoxy resin PCB (FR4); bending: 2 mm	no damage $\Delta R/R$ max.: $\pm(1\% + 0.05 \Omega)$
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.: $\pm(1\% + 0.05 \Omega)$
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 ± 2 °C; 93 $\pm 2/-3\%$ RH; loaded with $0.01 P_n$	no visible damage $\Delta R/R$ max.: $\pm(3\% + 0.1 \Omega)$
4.25.1		endurance	1000 $+48/-0$ hours; 70 ± 2 °C; loaded with P_n or V_{max} ; 1.5 hours on and 0.5 hours off $1 \Omega \leq R < 1 M\Omega$	no visible damage $\Delta R/R$ max.: $\pm(3\% + 0.05 \Omega)$
4.23.2	27 (Ba)	endurance at upper category temperature	1000 $+48/-0$ hours; no load	no visible damage $\Delta R/R$ max.: $\pm(3\% + 0.1 \Omega)$
4.8.4.2		temperature coefficient	at 20/LCT/20 °C and 20/UCT/20 °C: $1 \Omega \leq R < 10 \Omega$ $10 \Omega \leq R$	$\Delta R/R$ max $\pm 200 \times 10^{-6}/K$ $\Delta R/R$ max $\pm 100 \times 10^{-6}/K$
Other tests in accordance with IEC 60115 clauses and IEC 60068 test method				
4.17	20 (Ta)	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 ± 2 °C	good tinning ($\geq 95\%$ covered); no damage
Other applicable tests				
		leaching	unmounted chips; 60 ± 1 s; 260 ± 5 °C	good tinning; no leaching

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REVISION HISTORY

Revision	Date	Change Notification	Description
Rev.14	2001 Apr 27	-	- Converted to Phycomp brand
Rev.15	2002 Jun 5	EBB-0176- 2000005/FD 2000 May 15	- 2% range discontinued
Rev.16	2003 Feb 25	-	- Updated company logo
Rev.17	2003 Jul 07	-	- Marking code revised