

# DATA SHEET

## LOW-OHMIC POWER CHIP RESISTORS

LRC12  
1%  
size 0805



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**LRC12**  
**1%**

### FEATURES

- Reduced size of final equipment
- Low assembly costs
- Higher component and equipment reliability
- Low inductance design for sensing applications.

### APPLICATIONS

- Television
- Tape recorders
- Telecommunication equipment
- Notebook computers
- Battery chargers
- Lighting.

### 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	0.01 $\Omega$ to 0.99 $\Omega$ ; E24 series
Resistance tolerance and series	$\pm 1$ %
Temperature coefficient: 0.01 $\Omega \leq R < 0.02 \Omega$ 0.02 $\Omega \leq R < 0.051 \Omega$ 0.051 $\Omega \leq R < 0.10 \Omega$ 0.10 $\Omega \leq R < 0.39 \Omega$ 0.39 $\Omega \leq R < 0.51 \Omega$ 0.51 $\Omega \leq R < 1 \Omega$	$\leq \pm 1500 \times 10^{-6}/K$ $\leq \pm 1000 \times 10^{-6}/K$ $\leq \pm 800 \times 10^{-6}/K$ $\leq \pm 600 \times 10^{-6}/K$ $\leq \pm 300 \times 10^{-6}/K$ $\leq \pm 200 \times 10^{-6}/K$
Absolute maximum dissipation at $T_{amb} = 70^\circ C$	0.125 W
Maximum permissible voltage	150 V (DC or RMS)
Climatic category (IEC 60068)	55/125/56
Basic specification	IEC 60115-8
Stability after: load (1000 hours) climatic test soldering short time overload	$\Delta R/R$ max.: $\pm 3.0\%$ $\Delta R/R$ max.: $\pm 3.0\%$ $\Delta R/R$ max.: $\pm 1.0\%$ $\Delta R/R$ max.: $\pm 1.0\%$

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## ORDERING INFORMATION

**Table 1** Ordering code indicating resistor type and packing

TYPE	TOL. (%)	RESISTANCE VALUE ( $\Omega$ )	SERIES	ORDERING CODE 2350 511 .....
				PAPER TAPE ON REEL
				5 000 units
LRC12	$\pm 1$	0.01 to 0.99	E24	12...

## Ordering code (12NC)

- The resistors have a 12-digit ordering code starting with 2350 511.
- The subsequent two digits indicate the resistor type and packing; see Table 1.
- The remaining digits indicate the resistance value:
  - The first 2 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
0.01 to 0.099 $\Omega$	0
0.10 to 0.99 $\Omega$	7

## ORDERING EXAMPLE

The ordering code of an LRC12 low-ohmic resistor, 0.1 W, value 220 m $\Omega$  with 1% tolerance, supplied on paper tape of 5000 units per reel is: 2350 511 12227.

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### FUNCTIONAL DESCRIPTION

#### Product characterization

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

#### Limiting values

TYPE	LIMITING VOLTAGE <sup>(1)</sup> (V)	LIMITING POWER (W)
LRC12	150	0.125

#### 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.

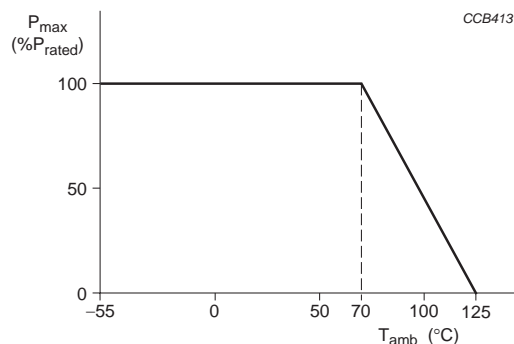


Fig.1 Maximum dissipation ( $P_{max}$ ) in percentage of rated power as a function of the ambient temperature ( $T_{amb}$ ).

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### MECHANICAL DATA

#### Mass per 100 units

TYPE	MASS (g)
LRC12	0.55

#### Marking

Each resistor is marked with the nominal resistance value.

#### 4-DIGIT MARKING

The R is used as a decimal point, the other 3 digits are significant.

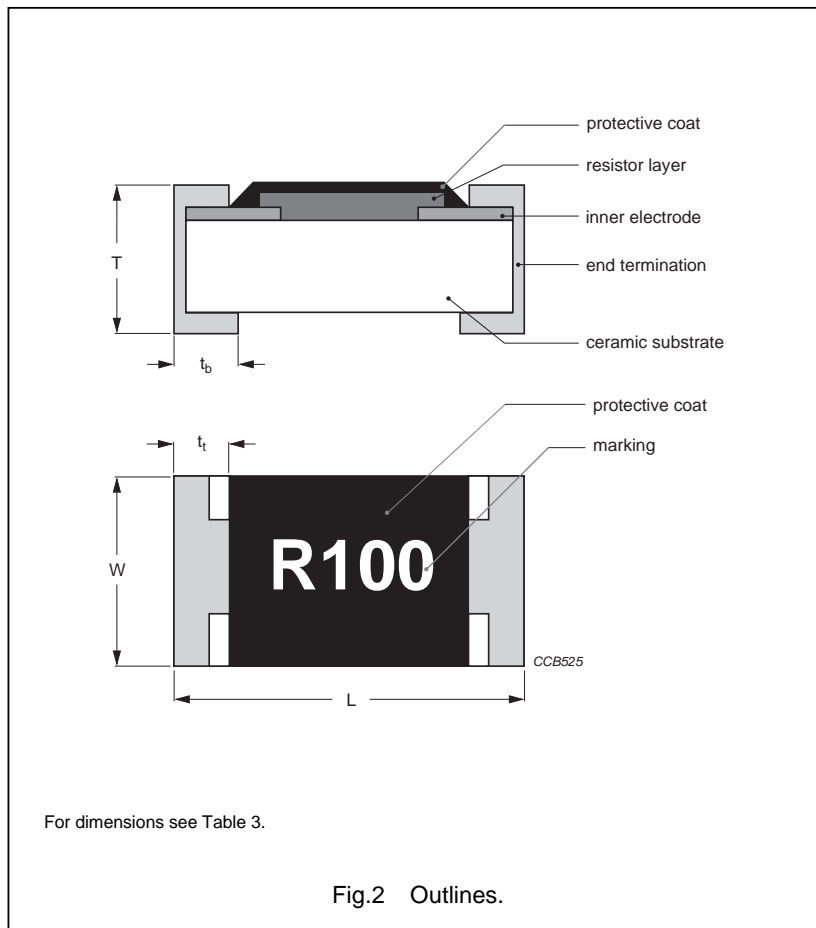
#### Example

MARKING	RESISTANCE
R100	0.100 $\Omega$

#### 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.2

TYPE	L (mm)	W (mm)	T (mm)	t <sub>t</sub> (mm)	t <sub>b</sub> (mm)
LRC12	2.0 ±0.10	1.25 ±0.10	0.50 ±0.10	0.35 ±0.20	0.35 ±0.20

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### TEST AND REQUIREMENTS

Essentially all tests are carried out in accordance with the schedule of "IEC publication 60115-8", category 55/125/56 (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
<b>Tests in accordance with the schedule of IEC publication 60115-8</b>				
4.4.1		visual examination		no holes; clean surface; no damage
4.5		resistance	applied voltage (+0/-10%): 0.1 V	$R - R_{nom}$ : max. $\pm 1\%$
4.18	20 (Tb)	resistance to soldering heat	unmounted chips; 10 $\pm$ 1 s; 260 $\pm$ 5 °C	no visible damage $\Delta R/R$ max.: $\pm 1\%$
4.17	20 (Ta)	solderability	unmounted chips completely immersed for 2 $\pm$ 0.5 s in a solder bath at 235 $\pm$ 2 °C	good tinning ( $\geq 95\%$ covered); no damage
4.7		voltage proof on insulation	150 V (DC or RMS) during 1 minute	no breakdown or flashover
4.13		short time overload	room temperature; dissipation = 6.25 $\times$ $P_n$ ; 5 s (voltage not more than 2 $\times$ $V_{max}$ )	$\Delta$ no visible damage $R/R$ max.: $\pm 1\%$
4.33		bending	resistors mounted on a 90 mm glass epoxy resin PCB (FR4); bending: 5 mm over 90 mm	no visible damage $\Delta R/R$ max.: $\pm 1\%$
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.: $\pm 1\%$
4.6.1.1		insulation resistance	100 V (DC) after 1 minute	$R_{ins}$ min.: 10000 M $\Omega$
4.24.2	3 (Ca)	damp heat (steady state)	56 days; 40 $\pm$ 2 °C; 93 $\pm$ 2/-3% RH; loaded with 0.01 $P_n$	no visible damage $\Delta R/R$ max.: $\pm 3\%$

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IEC 60115-8 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS
		humidity load (JIS)	56 days; $40 \pm 2$ °C; $93 \pm 2/-3\%$ RH; loaded with $P_n$ or $V_{max}$ ; 1.5 hours on and 0.5 hours off	no visible damage $\Delta R/R$ max.: $\pm 3\%$
4.25.1		endurance	1000 +48/-0 hours; $70 \pm 2$ °C; loaded with $P_n$ or $V_{max}$ ; 1.5 hours on and 0.5 hours off	no visible damage $\Delta R/R$ max.: $\pm 3\%$
4.23.2	27 (Ba)	endurance at upper category temperature	1000 +48/-0 hours; 125 °C; no load	no visible damage $\Delta R/R$ max.: $\pm 3\%$
4.8.4.2		temperature coefficient	at 20/LCT/20 °C and 20/UCT/20 °C:  $0.01 \Omega \leq R < 0.02 \Omega$ $0.02 \Omega \leq R < 0.051 \Omega$ $0.051 \Omega \leq R < 0.10 \Omega$ $0.10 \Omega \leq R < 0.39 \Omega$ $0.39 \Omega \leq R < 0.51 \Omega$ $0.51 \Omega \leq R < 1 \Omega$	$\leq \pm 1500 \times 10^{-6}/K$ $\leq \pm 1000 \times 10^{-6}/K$ $\leq \pm 800 \times 10^{-6}/K$ $\leq \pm 600 \times 10^{-6}/K$ $\leq \pm 300 \times 10^{-6}/K$ $\leq \pm 200 \times 10^{-6}/K$
<b>Other tests in accordance with IEC 60115 clauses and IEC 60068 test method</b>				
4.17	20 (Ta)	solderability (after ageing)	16 hours steam or 16 hours at 155 °C; unmounted chips completely immersed for $2 \pm 0.5$ s in a solder bath at $235 \pm 2$ °C	good tinning ( $\geq 95\%$ covered); no damage
<b>Other applicable tests</b>				
		leaching	unmounted chips $60 \pm 1$ s; $260 \pm 5$ °C	good tinning; no leaching

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Revision	Date	Change Notification	Description
Rev.2	2001 Apr 27	-	- Converted to Phycomp brand
Rev.3	2003 May 14	-	- Updated company logo