Innovative Service Around the Globe YAGEO

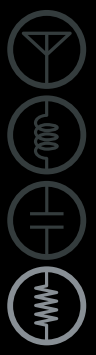
DATA SHEET

FUSIBLE CHIP RESISTORS

FRC01

5%

size 1206



Phycomp

Product Specification – Jul 11, 2003 V.10

Fusible chip resistors size 1206

FRC01 5%

FEATURES

- Overload protection without the risk of fire
- Grey coating for ease of recognition
- Reduced size of final equipment
- Low assembly costs
- Higher component and equipment reliability.

APPLICATIONS

- Power supplies in small sized equipment
- Car telephones
- Portable radio, CD and cassette players.

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 coat and printed with the resistance value. Finally, the two external end terminations are added. For ease of soldering the outer layer of these end terminations is a lead/tin alloy.

To enable recognition of a fusible device, the resistor should be mounted face up.

QUICK REFERENCE DATA

DESCRIPTION	VALUE
Resistance range	1 Ω to 510 Ω; E24/E96 series
Resistance tolerance	±5%
Temperature coefficient:	
1 to 4.7 Ω	$\leq \pm 250 \times 10^{-6}$/K
5.1 to 510 Ω	$\leq \pm 200 \times 10^{-6}$/K
Absolute maximum dissipation at T_{amb} = 70 °C	0.125 W
Maximum permissible voltage	200 V (DC or RMS)
Operating temperature range	−55 to +125 °C
Climatic category (IEC 60068)	55/125/56
Basic specification	IEC 60115-8

ORDERING INFORMATION

Table 1 Ordering code indicating type and packing

TYPE	ORDERING CODE 2322 750 …..
	PAPER TAPE ON REEL
	5000 UNITS
FRC01	6….

Ordering code (12NC)

- The resistors have a 12-digit ordering code starting with 2322.
- The subsequent 4 digits indicate the resistor type and packing; see Table 1.
- The remaining 4 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 510 Ω	1

ORDERING EXAMPLE

The ordering code of an FRC01 resistor, value 200 Ω, packed in paper tape and supplied on a reel of 5000 units is: 2322 750 62001.

Fusible chip resistors size 1206

FRC01 5%

FUNCTIONAL DESCRIPTION

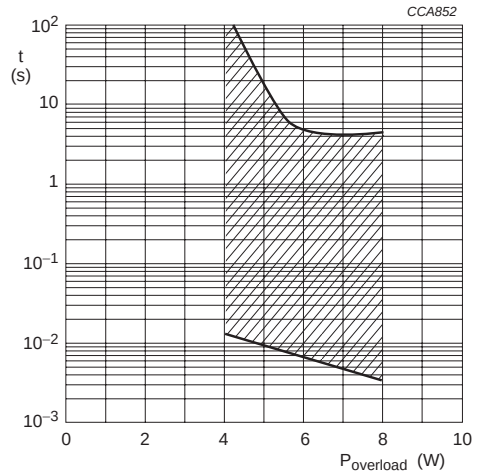
Product characterization

Standard values of nominal resistance are taken from the E24/E96 series for resistors with a tolerance of ±5%. The values of the E24/E96 series are in accordance with "IEC publication 60063".

Fusing characteristics

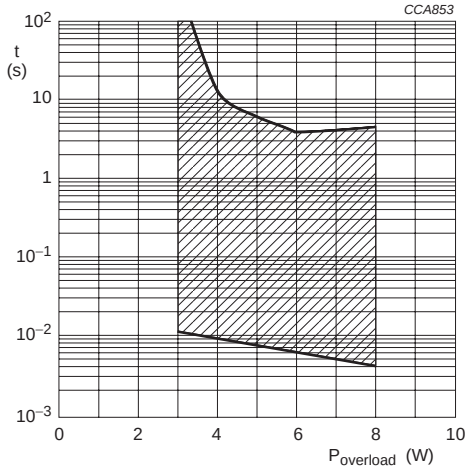
The resistors will fuse without the risk of fire and within an indicated range of overload. Fusing means that the resistive value of the resistor increases at least 100 times; see Figs 1 and 2.

The fusing characteristic is measured under constant voltage with resistors mounted on a ceramic or glass epoxy (FR4) substrate; see Fig.3.



This graph is based on measured data which may deviate according to the application.

Fig.1 Fusing characteristic: 10 Ω ≤ R < 510 Ω, measured using ceramic board material.



This graph is based on measured data which may deviate according to the application.

Fig.2 Fusing characteristic: 1 Ω ≤ R < 510 Ω, measured using glass epoxy (FR4) board material.

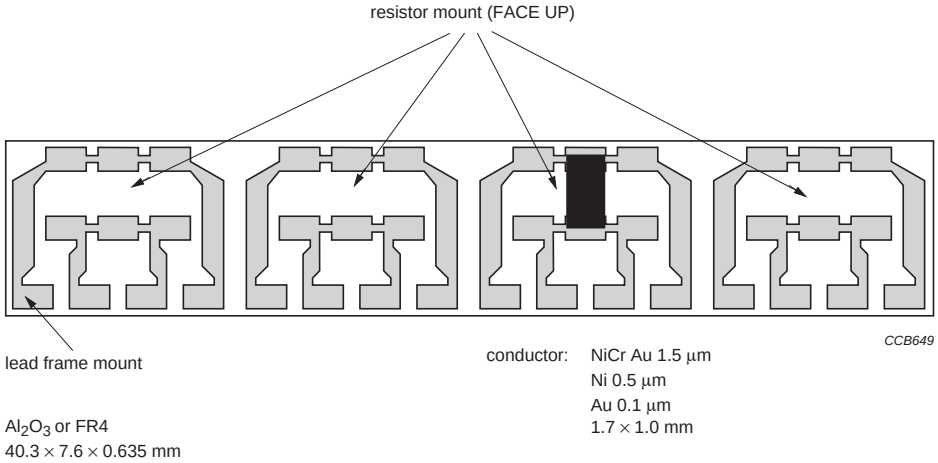


Fig.3 Test substrate layout.

Limiting values

TYPE	LIMITING VOLTAGE(1) (V)	LIMITING POWER (W)
FRC01	200(2)	0.125

Notes

1. The maximum voltage that may be continuously applied to the resistor element, see *"IEC publication 60115-8"*.
2. The maximum voltage that may be applied after fusing is shown in Fig.4.

DERATING

The power that the resistor can dissipate depends on the operating temperature; see Fig.5.

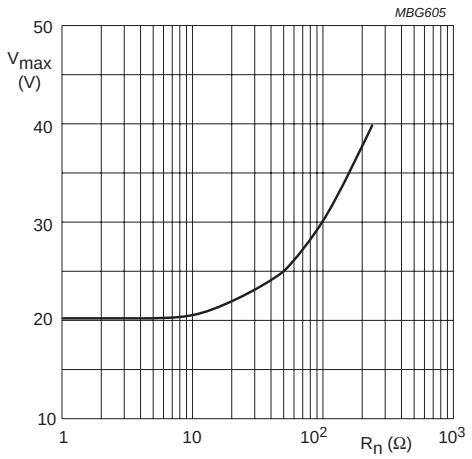


Fig.4 Maximum applied voltage after fusing.

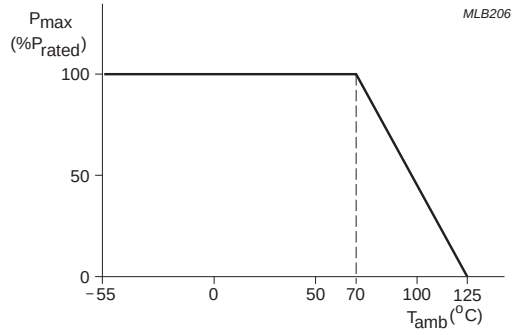
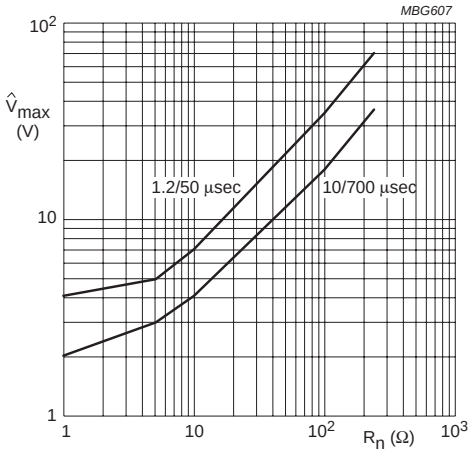


Fig.5 Maximum dissipation (P_{max}) in percentage of rated power as a function of the ambient temperature (T_{amb}).

PULSE LOADING CAPABILITIES



These pulses may not be applied on a regular basis.

Fig.6 Maximum permissible peak pulse voltage without failing to 'open circuit in accordance with DIN IEC 60040 (CO) 533.

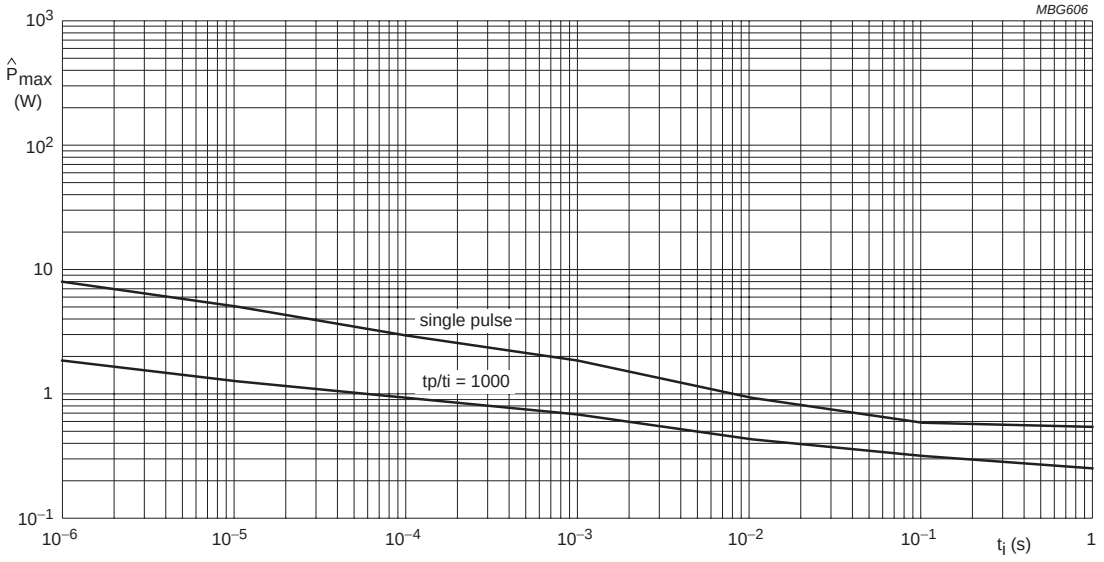


Fig.7 Pulse on a regular basis; maximum permissible peak pulse power (P_{max}) as a function of pulse duration, single pulse and repetitive pulse $t_p/t_j = 1000$.

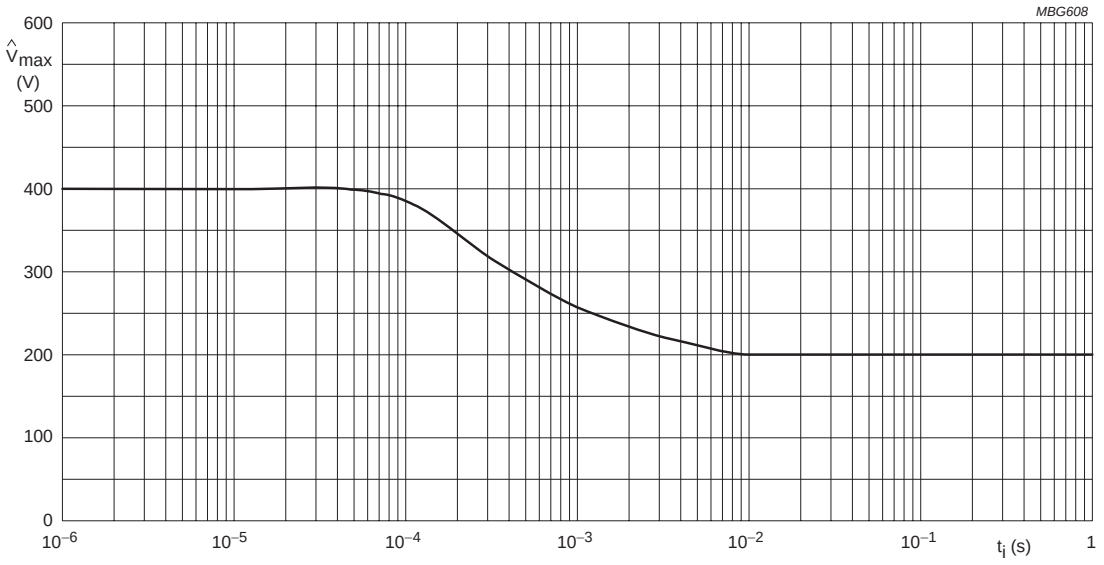


Fig.8 Pulse on a regular basis; maximum permissible peak pulse power (V_{max}) as a function of pulse duration.

Fusible chip resistors size 1206

FRC01 5%

MECHANICAL DATA

Mass per 100 units

TYPE	MASS (g)
FRC01	1.0

Marking

Each resistor is marked with a three digit code on the protective coating to designate the nominal resistance value.

3-DIGIT MARKING

For values of 1 kΩ or greater the first 2 digits apply to the resistance value and the third digit indicates the number of zeros to follow.

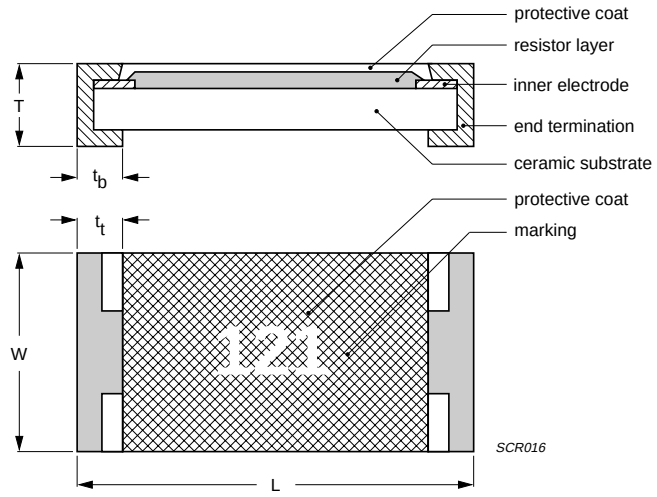
Example

MARKING	RESISTANCE
121	120 Ω

PACKAGE MARKING

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

Outlines



For dimensions see Table 3.

Fig.9 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)
FRC01	3.20 ±0.10/−0.20	1.6 ±0.15	0.55 ±0.10	0.45 ±0.25	0.50 ±0.25

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: 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 damage
4.4.2		dimensions (outline)	gauge (mm)	$0.45 \leq T \leq 0.65$ $1.45 \leq W \leq 1.75$ $3.0 \leq L \leq 3.3$
4.5		resistance	applied voltage (+0/−10%): $R < 10\ \Omega$: 0.1 V $10\ \Omega \leq R < 100\ \Omega$: 0.3 V $100\ \Omega \leq R < 240\ \Omega$: 1 V	$R - R_{nom}$: max. ±5%
4.18	20 (Tb)	resistance to soldering heat	unmounted chips: 10 ±1 s; 260 ±5 °C	no visible damage $\Delta R/R$ max.: $\pm(1\% + 0.05\ \Omega)$
4.29	45 (Xa)	component solvent resistance	isopropyl alcohol or H_2O followed by brushing in accordance with *"MIL 202 F"*	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	maximum voltage (RMS) during 1 minute metal block method	no breakdown or flashover
4.13		short time overload	room temperature; $P = 6.25 \times P_n$; 5 s ($V \leq 2 \times V_{max}$)	$\Delta R/R$ max.: $\pm(1\% + 0.05\ \Omega)$

IEC 60115-8 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS
4.33		bending	resistors mounted on a 90 mm glass epoxy resin PCB (FR4); bending: 3 mm	no visible 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.: $\pm(1\% + 0.05\ \Omega)$
4.24.2	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.: $\pm(3\% + 0.1\ \Omega)$
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	no visible damage $\Delta R/R$ max.: $\pm(3\% + 0.1\ \Omega)$
4.23.2	27 (Ba)	endurance at upper category temperature	1000 +48/−0 hours; no load	$\Delta R/R$ max.: $\pm(3\% + 0.1\ \Omega)$
4.8.4.2		temperature coefficient	at 20/LCT/20 °C and 20/UCT/20 °C: $R < 5\ \Omega$ $R \leq 510\ \Omega$	 $\leq \pm 250 \times 10^{-6}$/K $\leq \pm 200 \times 10^{-6}$/K
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 155 °C; unmounted chips completely immersed for 2 ±0.5 s in a solder bath at 235 ±2 °C	good tinning (≥95% covered); no damage
4.6.1.1		insulation resistance	voltage (DC) after 1 minute, metal block method: 100 V	R_{ins} min.: 10^3 MΩ
4.12		noise	IEC publication 60195 (measured with Quantech-equipment)	max. 2 μV/V
Other applicable tests				
	(JIS) C 5202 7.5	resistance to damp heat (steady state)	1000 +48/−0 hours; 40 ±2 °C; 93 +2/−3% RH; loaded with P_n or V_{max}; 1.5 hours on and 0.5 hours off	$\Delta R/R$ max.: $\pm(5\% + 0.1\ \Omega)$
		leaching	unmounted chips 60 ±1 s; 260 ±5 °C	good tinning; no leaching
		trio damp heat test	1000 +48/−0 hours; 85 ±2 °C; 85 ±5% RH; loaded with 0.1 P_n or V_{max}	$\Delta R/R$ max.: $\pm(5\% + 0.1\ \Omega)$

REVISION HISTORY

Revision	Date	Change Notification	Description
Rev.9	2001 Apr 27	-	- Converted to Phycomp brand
Rev.10	2003 Jul 11	-	- Updated company logo - Marking code revised