Fusible chip resistor size 1206

FRC01

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 fused device, the resistor should be mounted face up.

QUICK REFERENCE DATA

DESCRIPTION	VALUE
Resistance range	1 to 240 Ω; E24 series
Resistance tolerance	±5%
Temperature coefficient:	
1 to 4.7 Ω	$\leq \pm 250 \times 10^{-6}$/K
5.1 to 240 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 °C to +125 °C
Climatic category (IEC 68)	55/125/56
Basic specification	IEC 115-8
Stability after:	
load, 1000 hours at T_{amb} = 70 °C	ΔR/R max.: ±3% +0.10 Ω
climatic tests	ΔR/R max.: ±3% +0.10 Ω
resistance to soldering heat test	ΔR/R max.: ±1% +0.05 Ω
short time overload, 400 V max.	ΔR/R max.: ±1% +0.05 Ω

ORDERING INFORMATION

Table 1 Ordering code indicating type and packaging

TYPE	ORDERING CODE 2322 750 …..	
	EMBOSSED CARRIER TAPE ON REEL	
	5000 units	10000 units
FRC01	6....	7....

Ordering code (12NC)

- The resistors have a 12-digit ordering code starting with 2322
- The subsequent 4 digits indicate the resistor type and packaging; 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 240 Ω	1

ORDERING EXAMPLE

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

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FUNCTIONAL DESCRIPTION

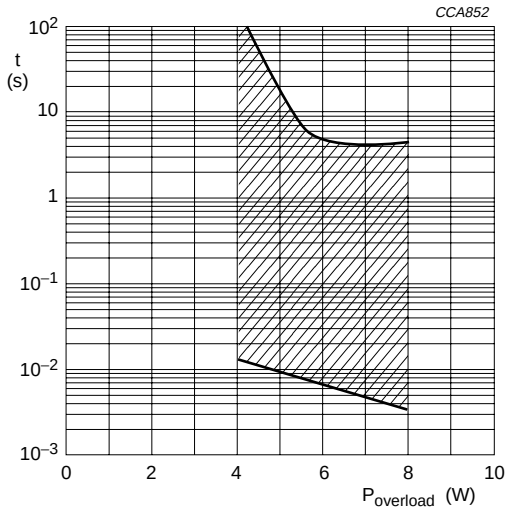
Product characterization

Standard values of nominal resistance are taken from the E24 series for resistors with a tolerance of ±5%. The values of the E24 series are in accordance with *"IEC publication 63"*.

Fusing characteristics

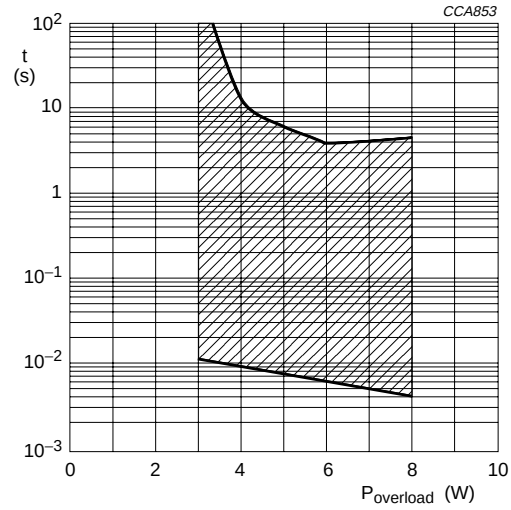
The resistors will fuse without the risk of fire and within an indicated range of overload. Fusing means that the resistive value of the resistor increases at least 100 times; see Figs 1 and 2.

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 < 240 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 < 240 Ω, measured using glass epoxy (FR4) board material.

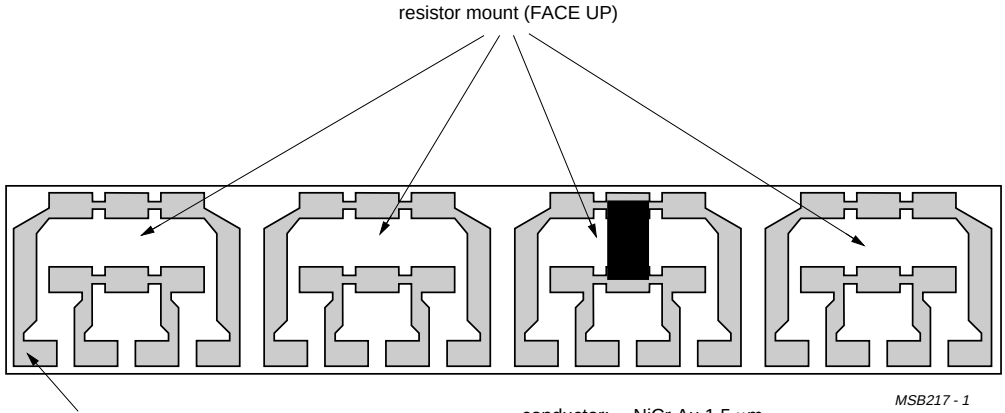


Fig.3 Test substrate layout.

Limiting values

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

Notes

1. The maximum voltage that may be continuously applied to the resistor element, see *"IEC publication 115-8"*.
2. The maximum voltage that may be applied after fusing is shown in Fig.4.

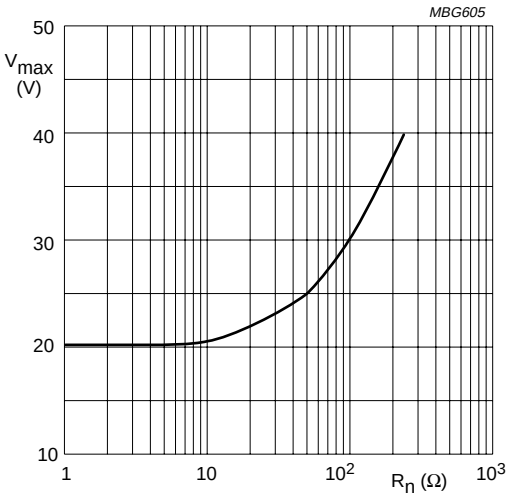


Fig.4 Maximum applicable voltage after fusing.

DERATING

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

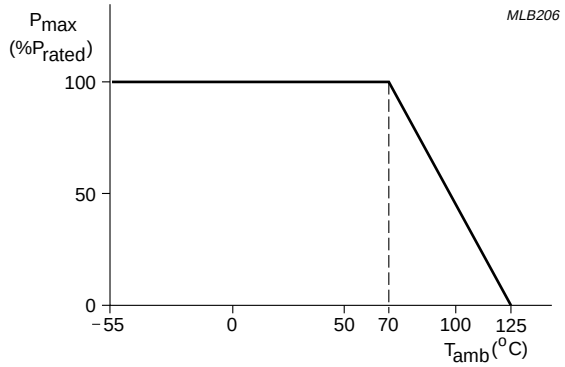
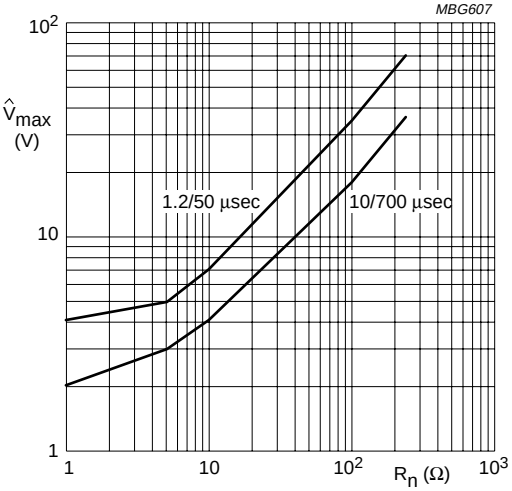


Fig.5 Maximum dissipation (P_{max}) in percentage of rated power as a function of the ambient temperature (T_{amb}).

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 40 (CO) 533.

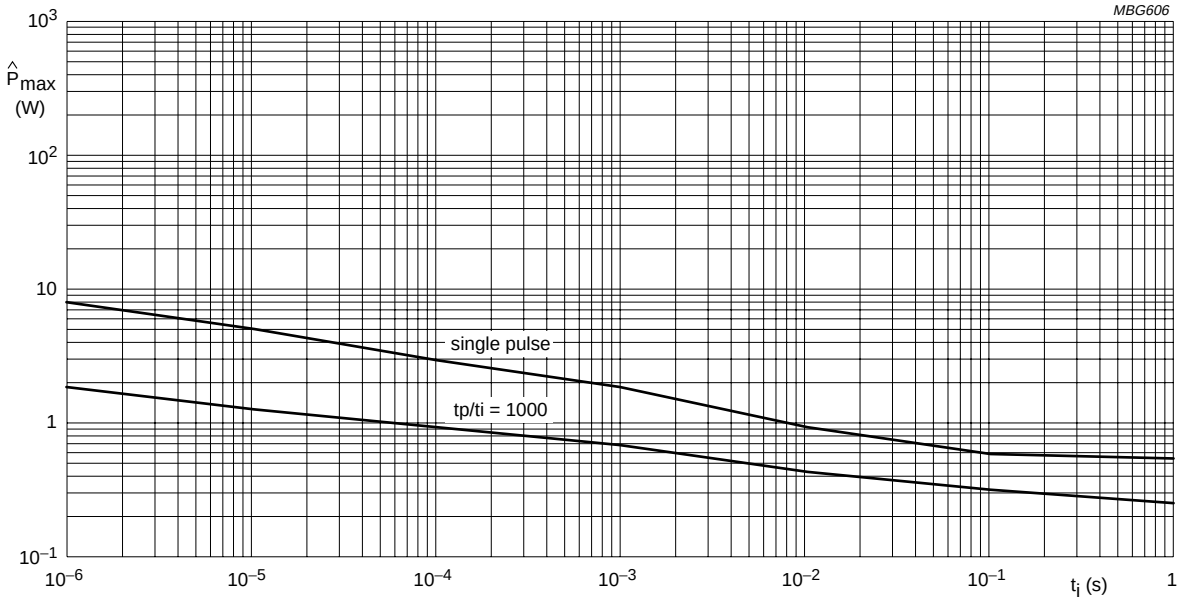


Fig.7 Pulse on a regular basis; maximum permissible peak pulse power ($\hat{P}_{max}$) as a function of pulse duration, single pulse and repetitive pulse $t_p/t_i = 1000$.

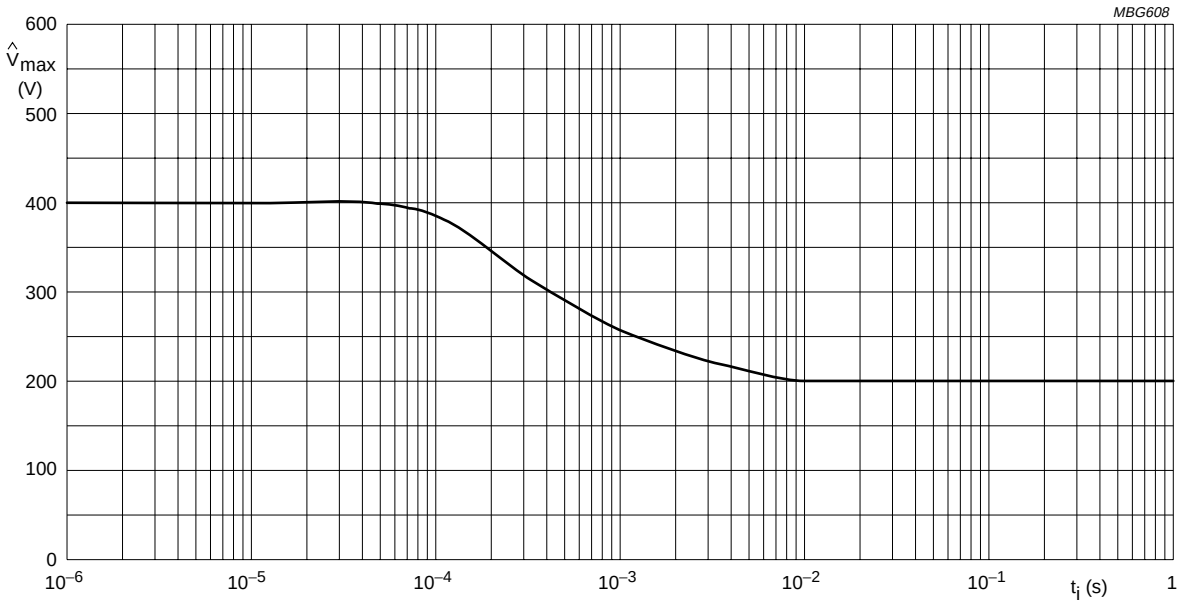


Fig.8 Pulse on a regular basis; maximum permissible peak pulse voltage ($\hat{V}_{max}$) as a function of pulse duration.

MECHANICAL DATA

Mass per 100 units

TYPE	MASS (g)
FRC01	1.0

Marking

All resistors are marked with a four digit code on the protective coat to designate the nominal resistance value.

4-DIGIT MARKING

For all values, the R is used as a decimal point.

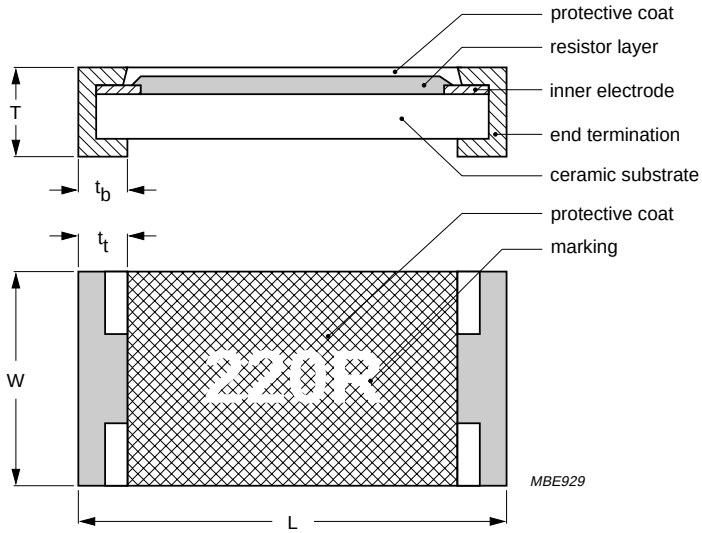
Example

MARKING	RESISTANCE
120R	120 Ω

PACKAGE MARKING

The packaging is also marked and includes resistance value, tolerance, TC value, 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	1.60 ±0.15	0.55 ±0.10	0.45 ±0.25	0.50 ±0.25

TESTS AND REQUIREMENTS

Essentially all tests are carried out in accordance with the schedule of *"IEC publication 115-8"*, category **LCT/UCT/56** (rated temperature range: **L**ower **C**ategory **T**emperature, **U**pper **C**ategory **T**emperature; 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 according to *"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 (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 (Ta)	resistance to soldering heat	unmounted chips; 10 s; 260 ±5 °C	no visual damage $\Delta R/R$ max.: ±1% +0.05 Ω
4.29	45 (Xa)	component solvent resistance	isopropyl alcohol or H_2O followed by brushing in accordance with *"MIL 202 F"*	no visual damage
4.17	20 (Ta)	solderability	unmounted chips completely immersed for 2 ±0.5 s in a solder bath at 235 ±5 °C	good tinning (≥95% covered); no visual 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.: ±1% +0.05 Ω
4.33		bending	resistors mounted on a 90 mm glass epoxy resin PCB (FR4), bending: 3 mm	no visual damage $\Delta R/R$ max.: ±1% +0.05 Ω
4.19	14 (Na)	rapid change of temperature	30 minutes at LCT and 30 minutes at UCT; 5 cycles	no visual damage $\Delta R/R$ max.: ±1% +0.05 Ω

IEC 115-8 CLAUSE	IEC 68-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS
4.23		climatic sequence:		
4.23.3	30 (D)	damp heat (accelerated) 1st cycle		
4.23.6	30 (D)	damp heat (accelerated) remaining cycles	6 days; 55 °C; 95 to 98% RH	R_{ins} min.: 10^4 MΩ ΔR/R max.: ±3% +0.1 Ω
4.24.2	3 (Ca)	damp heat (steady state) (IEC)	56 days; 40 °C; 90 to 95% RH; loaded with 0.01 P_n (IEC steps: 4 to 100 V)	ΔR/R max.: ±3% +0.1 Ω
4.25.1		endurance (at 70 °C)	1000 hours; loaded with P_n or V_{max}; 1.5 hours on and 0.5 hours off	ΔR/R max.: ±3% +0.1 Ω
4.23.2	27 (Ba)	endurance at upper category temperature	1000 hours; no load	ΔR/R max.: ±3% +0.1 Ω
4.8.4.2		temperature coefficient	at 25/LCT/25 °C and 25/UCT/25 °C ($TC \times 10^{-6}$/K):	
			R < 5 Ω	≤ ±250
			R ≤ 240 Ω	≤ ±200
Other tests in accordance with IEC 115 clauses and IEC 68 test method				
4.17	20 (Tb)	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 ±5 °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 195 (measured with Quantech - equipment)	max. 2 μV/V
Other applicable tests				
	(JIS)	humidity load (steady state)	1000 hours; +40 °C; 90 to 95% RH loaded with P_n or V_{max}; 1.5 hours on and 0.5 hours off	ΔR/R max.: ±5% +0.1 Ω
		leaching	unmounted chips 60 s ;260 ±5 °C	good tinning; no leaching
		trio damp heat test	1000 hours; +85 °C; 85% RH loaded with 0.1 P_n or V_{max};	ΔR/R max.: ±5% +0.1 Ω