

## Surge Metal Film Leaded Resistor



A multi layer metal film is deposited on a high grade ceramic body. After a helical groove has been cut in the resistive layer, tinned electrolytic copper wires are welded to the end-caps. The resistors are coated with a light blue non-flammable lacquer, which provides electrical, mechanical, and climatic protection.

The encapsulation is resistant to all cleaning solvents in accordance with "MIL-STD 202E, method 215" and "IEC 60068-2-45".

### FEATURES

- Metal film technology
- High pulse load (up to 10 kV) capability
- Replacement for carbon-composition resistors
- Compatible with lead (Pb)-free and lead containing soldering processes
- Lead (Pb)-free and RoHS compliant



### APPLICATIONS

- Automotive
- Telecommunication
- Industrial
- Medical equipment

TECHNICAL SPECIFICATIONS	
DESCRIPTION	SR37
Resistance Range	220 Ω to 10 kΩ
Resistance Tolerance	± 10 %, ± 20 %, E12 series
Temperature Coefficient	± 250 ppm/K
Climatic Category (LCT/UCT/days)	55/155/56
Rated Dissipation $P_{70}$	0.5 W
Rated Voltage	$\sqrt{P_n \times R}$
Voltage Proof on Insulation	700 V
Basic Specification	IEC 60115-1 and IEC 60115-2
Maximum Resistance Change at $P_{70}$ for Resistance Range, $\Delta R$ max., after:	
Load (1000 h)	± (3 % $R$ + 0.1 Ω)
Climatic Tests	± (3 % $R$ + 0.1 Ω)
Resistance to Soldering Heat	± (1 % $R$ + 0.1 Ω)
High Voltage Pulse Test for R-value ≤ 4.7 kΩ, 10 kV; 1 nF; 50 x 12/min	± 20 %



**12NC INFORMATION FOR HISTORICAL CODING REFERENCE ONLY**

- The resistors have a 12 digit ordering code starting with 2306
- The next 5 digits indicate the resistor type and packaging. The last 3 digits indicate resistance value in which:
  - The first 2 digits indicate the resistance value
  - The last digit indicates the resistance decade in accordance with table

**Last Digit of 12NC Indicating Resistance Decade**

RESISTANCE DECADE	LAST DIGIT
220 Ω to 910 Ω	1
1 kΩ to 9.1 kΩ	2
10 kΩ	3

**12NC Example**

SR37, 1.5 kΩ, ± 10 %, reel 5000 pieces is **2306 245 33152**

12NC - resistor type and packaging				
DESCRIPTION			ORDERING CODE 2306 ... ..	
			BANDOLIER IN AMMOPACK	BANDOLIER ON REEL
TYPE	TAPE WIDTH	TOLERANCE	1000 UNITS	5000 UNITS
SR37	52.5	± 10 %	245 31....	245 33....
		± 20 %	245 11...	245 23...

**PART NUMBER AND PRODUCT DESCRIPTION (1)**

PART NUMBER: SR0370001501KR500

S	R	0	3	7	0	0	0	0	1	5	0	1	K	R	5	0	0
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MODEL/SIZE	SPECIAL CHARACTER	TCR/MATERIAL	VALUE	TOLERANCE	PACKAGING (2)	SPECIAL
SR03700	0 = Neutral	0 = Standard	<b>3 digit value</b> <b>1 digit multiplier</b> <b>MULTIPLIER</b> 3 = *10 <sup>3</sup> 4 = *10 <sup>4</sup> 5 = *10 <sup>5</sup>	K = ± 10 % M = ± 20 %	A1 R5	Up to 2 digits 00 = Standard

PRODUCT DESCRIPTION: SR037 10 % R5 1K5

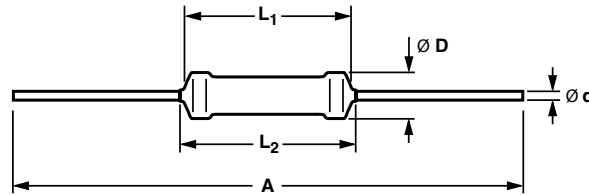
SR037	10 %	R5	1K5
MODEL	TOLERANCE	PACKAGING (2)	RESISTANCE VALUE
SR03700	± 10 % ± 20 %	A1 R5	1K5 = 1.5 kΩ

**Notes:**

(1) The PART NUMBER is shown to facilitate the introduction of the unified part numbering system

(2) Please refer to table PACKAGING, see next page

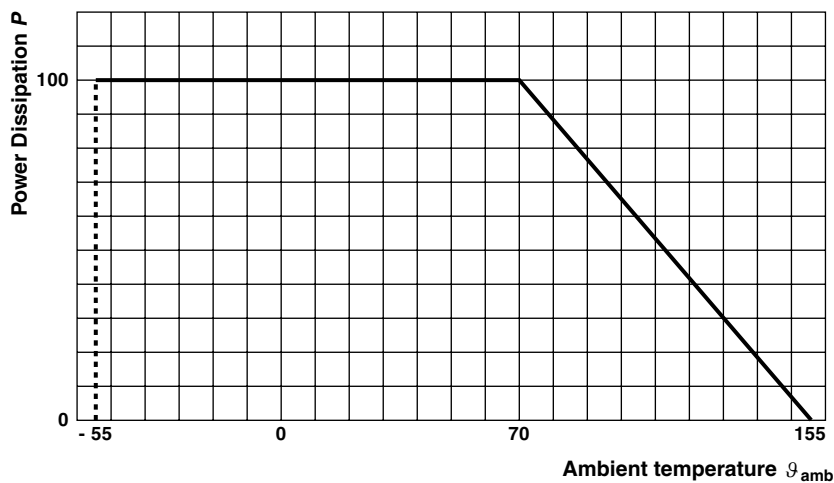
PACKAGING				
MODEL	REEL		BOX	
	PIECES	CODE	PIECES	CODE
SR37	5000	R5	1000	A1

**DIMENSIONS**


DIMENSIONS - resistor types, mass and relevant physical dimensions						
TYPE	$L_1$ max. (mm)	$L_2$ max. (mm)	$D_{max.}$ (mm)	$\varnothing d$ (mm)	A (mm)	MASS (g)/100 pieces
SR37	9.0	11.0	4.0	$0.80 \pm 0.03$	$52.5 \pm 1.5$	50.5

**MARKING**

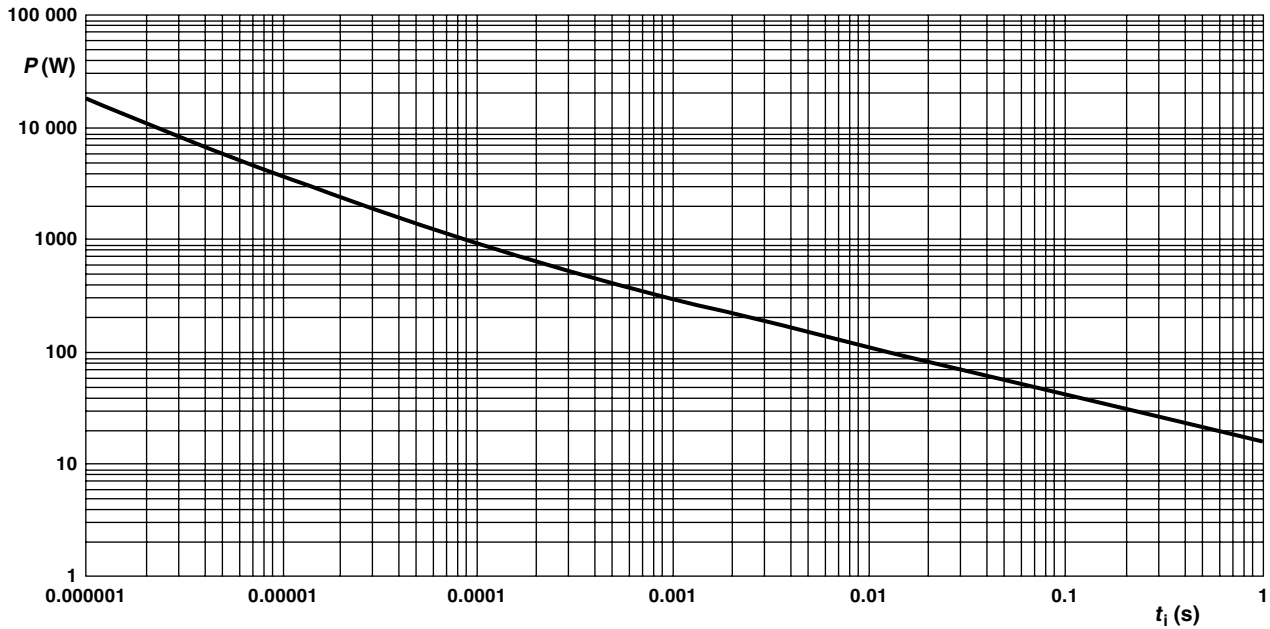
The nominal resistance and tolerance are marked on the resistor using three colored bands for  $\pm 20\%$  tolerance and four bands for  $\pm 10\%$  tolerance in accordance with IEC 60062 "Color code for fixed resistors". Standard values of nominal resistance are taken from the E12 series for resistors with a tolerance of  $\pm 10\%$  or  $\pm 20\%$ . The values of the E12 series are in accordance with IEC 60063.

**FUNCTIONAL PERFORMANCE**

**Derating - Standard Operation**

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



**PULSE LOADING CAPABILITY**



Pulse on a regular basis; maximum permissible peak pulse power ( $P_{max}$ ) as a function of pulse duration ( $t_i$ ) for single pulse condition

**TESTS AND REQUIREMENTS**

Essentially all tests are carried out in accordance with the schedule of IEC 60115-1, category 55/155/56 (rated temperature range - 55 to + 155 °C; damp heat, steady state, 56 days) and along the lines of IEC 60068-2; "Recommended basic climatic and mechanical robustness testing procedure for electronic components" and under standard atmosphere conditions according to IEC 60068-1 subclause 5.3, unless otherwise specified. In some instances deviations from IEC applications were necessary for our specified method.

PERFORMANCE				
IEC 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE ( $\Delta R$ ) SR37
4.8	-	Temperature coefficient	Between - 55 °C and + 155 °C	$\pm 250$ ppm/K
4.25.1	-	Endurance at 70 °C	1000 h; loaded with $P_n$ or $V_{max}$ ; 1.5 h ON; 0.5 h OFF	$\pm (3 \% R + 0.1 \Omega)$
4.24	3 (Ca)	Damp heat, steady state	56 days; 40 °C; 90 % to 95 % RH loaded with 0.01 $P_n$	$\pm (3 \% R + 0.1 \Omega)$
4.23	2 (Ba)	Climatic sequence Dry heat	155 °C; 16 h dry heat	$\pm (3 \% R + 0.1 \Omega)$
4.23.2	30 (Db)	Damp heat (accelerated)	24 h; 25 °C to 55 °C; 90 % to 100 % RH 1 <sup>st</sup> cycle	
4.23.3	1 (Aa)	Cold	- 55 °C; 2 h	
4.23.4	30 (Db)	Damp heat, (accelerated) remaining cycles	5 days; 25 °C to 55 °C 90 % to 100 % RH	

<b>PERFORMANCE</b>				
<b>IEC 60115-1 CLAUSE</b>	<b>IEC 60068-2 TEST METHOD</b>	<b>TEST</b>	<b>PROCEDURE</b>	<b>REQUIREMENTS PERMISSIBLE CHANGE (<math>\Delta R</math>)</b> <b>SR37</b>
4.19	14 (Na)	Rapid change of temperature	30 min at LCT; 30 min at UCT; LCT = - 55 °C; UCT = 155 °C; 5 cycles	No visual damage $\pm (1 \% R + 0.1 \Omega)$
4.26	-	Active flammability "Cheese-cloth test"	5 x Pn (RMS) duration 5 min	No flaming of gauze cylinder
-	-	Passive flammability "Needle-flame test"	Application of test flame for 20 s	No ignition of product no ignition of under-layer burning time less than 30 s
-	-	High voltage pulse test	For R-value $\leq 4.7$ k $\Omega$ , 10 kV; 1 nF; 50 x 12/min (in accordance with IEC 60065 14.1)	$\pm 20 \% R$
4.16	21 (U)	Robustness of terminations:		
4.16.2	21 (Ua1)	Tensile all samples	Load 10 N; 10 s	No damage $\pm (1 \% R + 0.1 \Omega)$
4.16.3	21 (Ub)	Bending half number of samples	Load 5 N; 4 x 90°	
4.16.4	21 (Uc)	Torsion other half of samples	3 x 360° in opposite direction	
4.22	6 (Fc)	Vibration	Endurance by sweeping; 10 Hz to 500 Hz; displacement 1.5 mm or acceleration 10 gms; 6 h (3 x 2 h)	$\pm (1 \% R + 0.1 \Omega)$
4.17	20 (Ta)	Solderability (after ageing)	16 h at 155 °C; immersed in flux 600, leads immersed 2 mm in solder bath at (235 $\pm$ 5) °C for (2 $\pm$ 0.5) s	Good tinning ( $\geq 95 \%$ covered); no visible damage
4.18	20 (Tb)	Resistance to soldering heat	Solder bath method; (350 $\pm$ 10) °C; 6 mm from body; for 3 s	$\pm (1 \% R + 0.1 \Omega)$
4.29	45 (XA)	Component solvent resistance	Isopropyl alcohol followed by brushing in accordance with MIL STD 202	No visible damage
4.6.1.1	-	Insulation resistance	500 V <sub>DC</sub> during 1 min, V-block method	$R_{ins}$ min. 10 <sup>4</sup> M $\Omega$
4.7	-	Voltage proof on insulation	700 V <sub>RMS</sub> during 1 min, V-block method	No flashover or breakdown



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