RoHS COMPLIANT



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High Ohmic/High Voltage Metal Glaze Leaded Resistors





A metal glazed 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 lacquer which provides electrical, mechanical, and climatic protection.

The encapsulation is resistant to all cleaning solvents in accordance with IEC 60068-2-45.

FEATURES

- Technology: Metal glaze
- $R_{\text{max.}} = 68 \text{ M}\Omega; U_{\text{max.}} = 10\ 000 \text{ V}_{\text{DC}}$
- These resistors meet the safety requirements of: UL1676 (510 k Ω to 11 M Ω); File No: E171160 IEC 60065, clause 14.1.a) DIN EN 60065, clause 14.1.a) VDE 0860, clause 14.1.a) CQC, China
- High pulse loading capability (10 kV)
- Small size (0718)
- Pure tin plating provides compatibility with lead (Pb)-free and lead containing soldering processes
- Compliant to RoHS Directive 2002/95/EC

APPLICATIONS

- Where high resistance, high stability and high reliability at high voltage are required
- · Safety component in combination with high voltage
- Picture tubes
- High voltage bleeders
- · Cascade switches

TECHNICAL SPECIFICATIONS				
DESCRIPTION	UNIT	VR68		
Resistance Range ⁽¹⁾	Ω	100K to 68M		
Resistance Tolerance	%	± 1; ± 5		
Resistance Series		± 1 %: E24/E96 series; ± 5 %: E24 series		
Rated Dissipation, P ₇₀	W	1		
Thermal Resistance (R _{th})	K/W	70		
Temperature Coefficient	ppm/K	≤ ± 200		
Maximum Permissible Voltage Umax.:				
DC	v	10 000		
RMS	v	7000		
Dielectric Withstanding Voltage of the Insulation for 1 Min	V	700		
Basic Specifications		IEC 60115		
Safety Requirements		UL1676 (510 k Ω to 11 M Ω); DIN EN 60065, IEC 60065 clause 14.1.a); VDE 0860, clause 14.1.a), CQC		
Climatic Category (IEC 60068-1)		55/155/56		
Max. Resistance Change for Resistance Range, ΔR max., after:				
Load (1000 h, P ₇₀)		± (1.5 % <i>R</i> + 0.1 Ω)		
Long Term Damp Heat Test (56 Days)		± (1.5 % <i>R</i> + 0.1 Ω)		
Soldering (10 s, 260 °C)		± (1.5 % <i>R</i> + 0.1 Ω)		
Noise	μV/V	max. 2.5		

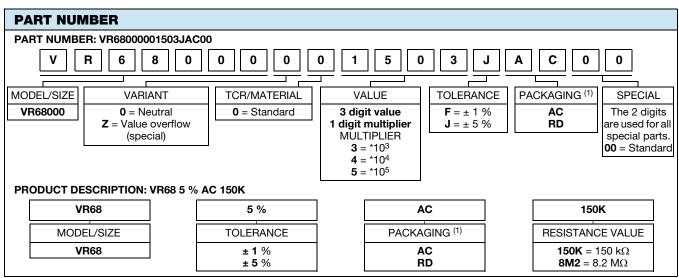
Note

⁽¹⁾ Ohmic values (other than resistance range) are available on request





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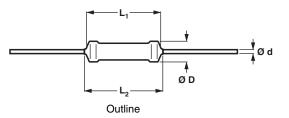
Notes

• The PART NUMBER is shown to facilitate the introduction of a unified part numbering system for ordering products

⁽¹⁾ Please refer to table PACKAGING

PACKAGING					
MODEL	TAPING	АММОРАСК		REEL	
		PIECES	CODE	PIECES	CODE
VR68	Axial, 66 mm	500	AC	750	RD

DIMENSIONS



DIMENSIONS - Resistor type and relevant physical dimensions				
ТҮРЕ	Ø D _{max.} L _{1 max.} L _{2 max.} Ø d			
VR68	6.8	18.0	19.0	0.78 ± 0.05

MASS PER UNIT			
ТҮРЕ	MASS (mg)		
VR68	169		

MARKING

The nominal resistance and tolerance are marked on the resistor using four or five colored bands in accordance with IEC 60062, marking codes for resistors and capacitors.

Yellow and grey are used instead of gold and silver because metal particles in the lacquer could affect high-voltage properties.



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OUTLINES

The length of the body (L_1) is measured by inserting the leads into holes of two identical gauge plates and moving

FUNCTIONAL PERFORMANCE PRODUCT CHARACTERIZATION

Standard values of nominal resistance are taken from the E96/E24/E12 series for resistors with a tolerance of \pm 1 %,

these plates parallel to each other until the resistor body is clamped without deformation (IEC 60294).

or 5 %. The values of the E96/E24 series are in accordance with IEC 60063.

LIMITING VALUES					
LIMITING VOLTAGE ⁽¹⁾ TYPE			LIMITING POWER P ₇₀ (W)		
	DC	RMS	(44)		
VR68	10 000	7000	1.0		

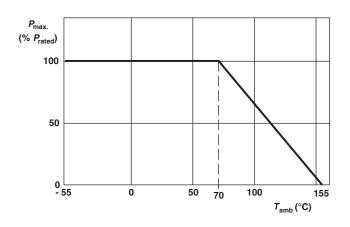
Notes

• The maximum permissible hot-spot temperature is 155 °C

⁽¹⁾ The maximum voltage that may be continuously applied to the resistor element, see IEC 60115-1

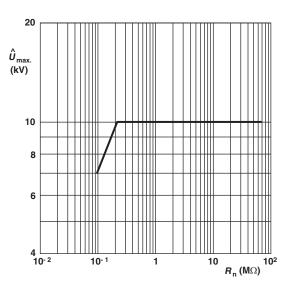
DERATING

The power that the resistor can dissipate depends on the operating temperature.



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

PULSE LOADING CAPABILITY



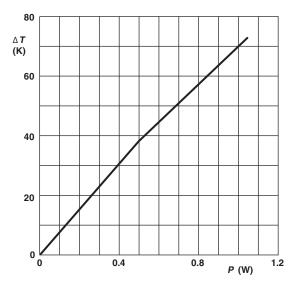
Maximum allowed peak pulse voltage in accordance with IEC 60065, 14.1.a); 50 discharges from a 1 nF capacitor charged to \hat{U}_{max} ; 12 discharges/min (drift $\Delta R/R \le 2$ %)

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APPLICATION INFORMATION

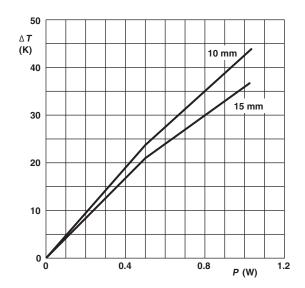


Hot-spot temperature rise (ΔT) as a function of dissipated power

TESTS AND REQUIREMENTS

Essentially all tests are carried out in accordance with IEC 60115-1 specification, category LCT/UCT/56 (rated temperature range: Lower Category Temperature, Upper Category Temperature; damp heat, steady state, test duration: 56 days).

The tests are carried out in accordance with IEC 60068-2-xx. Test method under standard atmospheric conditions according to IEC 60068-1, 5.3.



Temperature rise (ΔT) at the lead end (soldering point) as a function of dissipated power at various lead lengths after mounting

In the Test Procedures and Requirements table the test and requirements are listed with reference to the relevant clauses of IEC 60115-1 and IEC 60068-2-xx test methods. 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.

TEST PF	TEST PROCEDURES AND REQUIREMENTS					
IEC 60115-1 CLAUSE	IEC 60068-2- TEST METHOD	TEST	PROCEDURE	REQUIREMENTS		
4.16		Robustness of terminations:				
4.16.2	21 (Ua1)	Tensile all samples	Ø 0.8 mm; load 10 N; 10 s	Number of failures $< 10 \times 10^{-6}$		
4.16.3	21 (Ub)	Bending half number of samples	Ø 0.8 mm; load 5 N; 4 x 90°	Number of failures $< 10 \times 10^{-6}$		
4.16.4	21 (Uc)	Torsion other half of samples	3 x 360° in opposite directions	No damage ΔR max.: ± (0.5 % R + 0.05 Ω)		
4.17	20 (Ta)	Solderability	2 s; 235 °C: Solder bath method; SnPb40 3 s; 245 °C: Solder bath method; SnAg3Cu0.5	Good tinning (≥ 95 % covered); no damage		
		Solderability (after aging)	8 h steam or 16 h 155 °C; leads immersed 6 mm; for 2 s at 235 °C; solder bath (SnPb40) for 3 s at 245 °C; solder bath (SnAg3Cu0.5) method	Good tinning (≥ 95 % covered); no damage		
4.18	20 (Tb)	Resistance to soldering heat	Thermal shock: 10 s; 260 °C; 3 mm from body	ΔR max.: ± (0.5 % R + 0.05 Ω)		
4.19	14 (Na)	Rapid change of temperature	30 min at - 55 °C and 30 min at + 155 °C; 5 cycles	Δ <i>R</i> max.: ± (0.5 % <i>R</i> + 0.05 Ω)		

Document Number: 28734



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TEST PROCEDURES AND REQUIREMENTS				
IEC 60115-1 CLAUSE	IEC 60068-2- TEST METHOD	TEST	PROCEDURE	REQUIREMENTS
4.20	29 (Eb)	Bump	3 x 1500 bumps in 3 directions; 40 g	No damage ΔR max.: ± (0.5 % R + 0.05 Ω)
4.22	6 (Fc)	Vibration	VibrationFrequency 10 Hz to 500 Hz; displacement 1.5 mm or acceleration 10 g; 3 directions; total 6 h (3 x 2 h)	
4.23		Climatic sequence:		
4.23.2	2 (Ba)	Dry heat	16 h; 155 °C	
4.23.3	30 (Db)	Damp heat (accelerated) 1 st cycle	24 h; 55 °C; 90 % to 100 % RH	$\Delta R_{\text{ins}} \text{ min.: } 10^3 \text{ M}\Omega$ $\Delta R \text{ max.: } \pm (1.5 \% R + 0.1 \Omega)$
4.23.4	1 (Aa)	Cold	2 h; - 55 °C	
4.23.5	13 (M)	Low air pressure	2 h; 8.5 kPa; 15 °C to 35 °C	
4.24	78 (Cab)	Damp heat (steady state)	56 days; 40 °C; 90 % to 95 % RH; dissipation 0.01 <i>P</i> ₇₀ ; limiting voltage <i>U</i> = 100 V _{DC}	Δ <i>R</i> max.: ± (1.5 % <i>R</i> + 0.1 Ω)
4.25.1		Endurance	1000 h at 70 °C; <i>P</i> ₇₀ or <i>U</i> _{max.}	Δ <i>R</i> max.: ± (1.5 % <i>R</i> + 0.1 Ω)
4.8		Temperature coefficient	Between - 55 °C and + 155 °C	≤ ± 200 ppm/K
4.7	4.7 Voltage proof on insulation		U _{RMS} = 700 V during 1 min; V-block method	No breakdown
4.12		Noise	IEC 60195	Max. 2.5 μV/V
4.6.1.1		Insulation resistance	U = 500 V _{DC} during 1 min; V-block method	R _{ins} min.: 10 ⁴ MΩ
4.13		Short time overload	Room temperature; dissipation $6.25 \times P_{70}$ (voltage not more than 2 x limiting voltage; 10 000 V max.); 10 cycles; 5 s ON and 45 s OFF ΔR max.: ± (2.0 % F	

12NC INFORMATION FOR HISTORICAL CODING REFERENCE

- The resistors have a 12-digit numeric code starting with 2322 244
- The subsequent: First digit for 1 % tolerance products (E24 and E96 series) or 2 digits for 5 % (E24 series) indicate the resistor type and packing.
- The remaining digits indicate the resistance value:
 - The first 3 digits for 1 % or 2 digits for 5 % tolerance products indicate the resistance value.
 - The last digit indicates the resistance decade.

Last Digit of 12NC Indicating Resistance Decade

RESISTANCE DECADE	LAST DIGIT
100 k Ω to 976 k Ω	4
1 M Ω to 9.76 M Ω	5
\geq 10 M Ω	6

12NC Example

The 12NC for a VR68, resistor value 7.5 M Ω , 5 % tolerance, supplied on a bandolier of 500 units in ammopack, is: 2322 244 13755.

12NC - Resistor type and packaging				
			2322 244	
ТҮРЕ	TAPE WIDTH (mm)	TOL. (%)	BANDOLIER IN AMMOPACK	BANDOLIER ON REEL
	(500 UNITS	750 UNITS
VR68 66.7	± 1	8	6	
	± 5	13	23	

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5 For technical questions, contact: <u>filmresistorsleaded@vishay.com</u> Document Number: 28734



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