HIGH VOLTAGE RESISTOR – HVR

FEATURES

- Metal film technology
- High pulse loading capability
- Small size
- Meeting safety requirements of:

"UL1676" (HVR37 and HVR68, range 510 KΩ ~ 11 MΩ) - pending
"IEC 60065
"EN 60065"
"VDE 0860"
"BS 60065"

QUICK REFERENCE DATA

DESCRIPTION	HVR25		HVR37		HVR68	
Resistance range	100 kΩ - 22 MΩ	100 kΩ - 10 MΩ	100 kΩ - 33 MΩ	100 kΩ - 10 MΩ	100 kΩ - 10 MΩ	100 kΩ - 10 MΩ
Tolerance and series	±5%, E24	±1%, E24/E96	±5%, E24	±1%, E24/E96	±5%, E24	±1%, E24/E96
Maximum dissipation at T_{amb} = 70 °C	0.25 W		0.50 W		1 W	
Limiting voltage DC RMS	1600 V 1150 V		3500 V 2500 V		10000 V 7000 V	10000 V 7000 V
Temperature coefficient	±200 ppm/°C					
Basic specification	IEC60115-1 and 60115-2					
Climatic category (IEC 60068)	55/155/56					
Stability $\Delta R/R_{max}$ after:						
Load (1000 h)	±5% +0.1Ω	±1.5% +0.1Ω	±5% +0.1Ω	±1.5% +0.1Ω	±5% +0.1Ω	±1,5% +0.1Ω
Climatic tests	±1.5% +0.1Ω	±1.5% +0.1Ω	±1.5% +0.1Ω	±1.5% +0.1Ω	±1.5% +0.1Ω	±1.5% +0.1Ω
Resistance to soldering heat	±1% +0.1Ω	±1% +0.1Ω	±1% +0.1Ω	±1% +0.1Ω	±1% +0.1Ω	±1% +0.1Ω

TECHNOLOGY

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 blue lacquer, which provides electrical, mechanical and climatic protection. The coating is resistant to all cleaning solvents in accordance with “MIL-STD 202, method 215” and “IEC 60068-2-45”.

MECHANICAL DATA

AXIAL STYLE

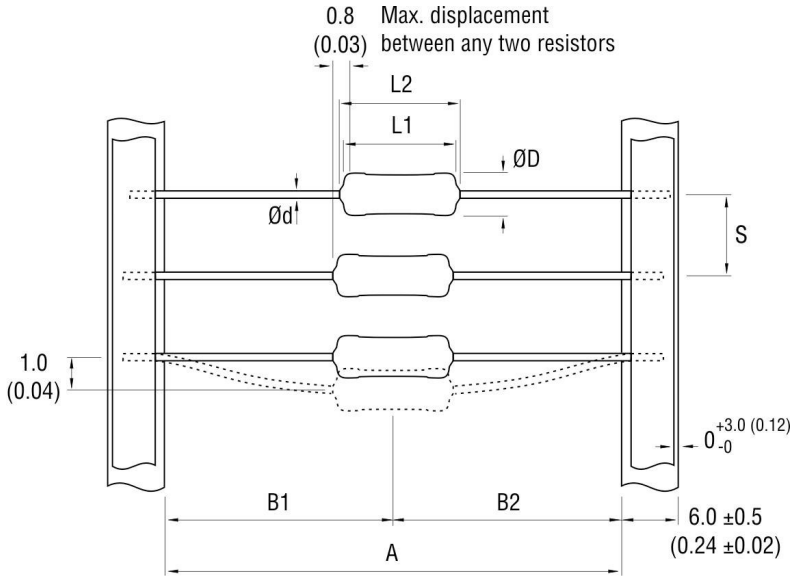


Table 1. Mechanical data.

PRODUCT	L1 max.	L2 max.	ØD max.	Ød	A	|B1 - B2| max.	S	WEIGHT gr/100 pcs
HVR25	6.5 (0.26)	7.5 (0.30)	2.5 (0.10)	0.58 ±0.05 (0.023 ±0.002)	52.5 ±1.5 (2.07 ±0.06)	1.2 (0.05)	5.0 ±0.1 (0.20 ±0.01)	22.0
HVR37	10.0 (0.40)	12.0 (0.47)	4.0 (0.16)	0.80 ±0.03 (0.031 ±0.001)	52.5 ±1.5 (2.07 ±0.06)			50.0
HVR68	16.7 (0.66)	19.5 (0.77)	5.2 (0.21)	0.80 ±0.03 (0.031 ±0.001)	63.0 ±1.5 (2.48 ±0.06)		10.0 ±0.1 (0.40 ±0.01)	110.0

Dimension unless specified in mm (inches)

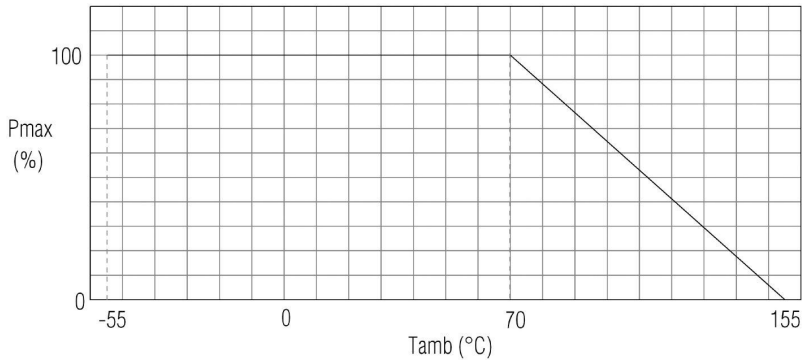
MOUNTING

The resistors are suitable for processing on automatic insertion equipment, cutting and bending machines.

ELECTRICAL CHARACTERISTICS

DERATING

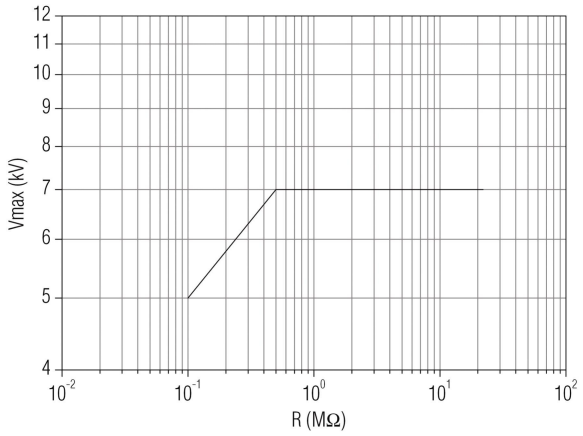
The power that the resistor can dissipate depends on the operating temperature.



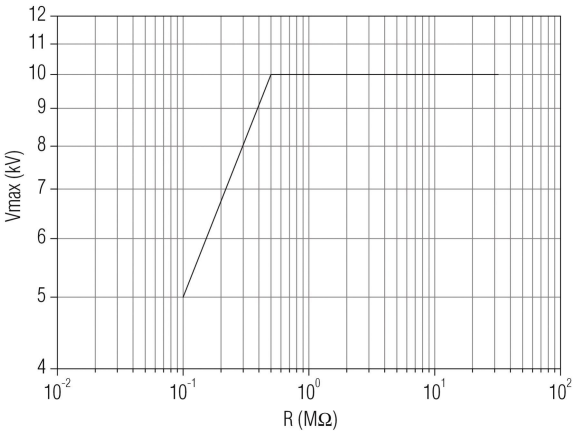
Maximum dissipation (P_{max}) in percentage of rated power as a function of ambient temperature (T_{amb})

PULSE LOADING CAPABILITY

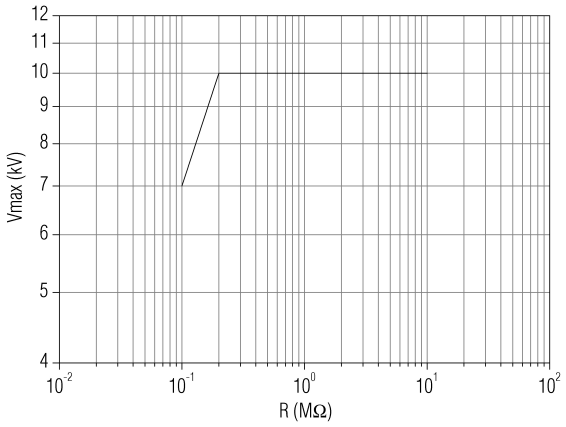
Maximum allowed peak pulse voltage in accordance with “IEC 60065 chapter 14.1”; 50 discharges from a 1 nF capacitor charged to V_{max}; 12 discharges/minute.



HVR25
$\Delta R/R_{max}$ ± 4.0% +0.1Ω



HVR37
For 5% tolerance ➔ $\Delta R/R_{max}$ ± 4.0% +0.1Ω
For 1% tolerance ➔ $\Delta R/R_{max}$ ± 2.0% +0.1Ω



HVR68
$\Delta R/R_{max}$ ± 2.0% +0.1Ω

MARKING

The nominal resistance and tolerance are marked on the resistor using four or five colored bands in accordance with IEC publication 60062 “Color code for fixed resistors”. Standard values of nominal resistance are taken from the E24/E96 series for resistors with a tolerance of ±5% or ±1%. The values of the E24/E96 series are in accordance with IEC publication 60063.

ORDERING INFORMATION

Table 2. Ordering code.

PRODUCT	TOLERANCE	ORDERING CODE	TAPING	LEAD ∅	PACKAGING	QUANTITY (pcs)
HVR25	±5%	2306 241 13xxx	52.5 (2.07)	0.58 Cu (0.023)	AMMOPACK	1000
		2306 241 53xxx			AMMOPACK	5000
		2306 241 23xxx			REEL	5000
	±1%	2306 241 8xxxx	52.5 (2.07)		AMMOPACK	1000
		2306 241 7xxxx			AMMOPACK	5000
		2306 241 6xxxx			REEL	5000
HVR37	±5%	2306 242 13xxx	52.5 (2.07)	0.80 Cu (0.031)	AMMOPACK	1000
		2306 242 23xxx			REEL	5000
	±1%	2306 242 8xxxx	52.5 (2.07)		AMMOPACK	1000
		2306 242 6xxxx			REEL	5000
HVR68	±5%	2306 244 13xxx	63.0 (2.48)	0.80 Cu (0.031)	AMMOPACK	500
	±1%	2306 244 8xxxx				

Dimensions unless specified in mm (inches)

Table 3. Last digit of ordering code

RESISTANCE DECADE (5%)	RESISTANCE DECADE (1%)	LAST DIGIT
100 - 910 kΩ	100 - 976 kΩ	4
1 MΩ	1 MΩ	5
≥ 10 MΩ	≥ 10 MΩ	6

Example:
HVR25, 150 kΩ, ±5%, ammopack 1000 pcs is
2306 241 13154

The resistors have a 12 digit ordering code starting with 2306.
The next 4 or 5 digits indicate the resistor type and packaging see table 2.
For 5% tolerance the last 3 digits indicate the resistance value:
- The first 2 digits indicate the resistance value;
- The last digit indicates the resistance decade in accordance with table 3.
For 1% tolerance the last 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 3.

NAFTA ORDERING INFORMATION

Table 4. NAFTA ordering code.

PRODUCT	TOLERANCE	NAFTA ORDERING CODE	TAPING	LEAD Ø	PACKAGING	QUANTITY (pcs)
HVR25	±5%	5043HVxxxxxJ08AFX	52.5 (2.07)	0.58 Cu (0.023)	AMMOPACK	1000
		5043HVxxxxxJ18AFX			AMMOPACK	5000
		5043HVxxxxxJ12AFX			REEL	5000
	±1%	5043HVxxxxxF08AF5	52.5 (2.07)		AMMOPACK	1000
		5043HVxxxxxF18AFX			AMMOPACK	5000
		5043HVxxxxxF12AFX			REEL	5000
HVR37	±5%	5053HVxxxxxJ08AFX	52.5 (2.07)	0.80 Cu (0.031)	AMMOPACK	1000
		5053HVxxxxxJ12AFX			REEL	5000
	±1%	5053HVxxxxxF08AF5	52.5 (2.07)		AMMOPACK	1000
		5053HVxxxxxF12AFX			REEL	5000
HVR68	±5%	5073HVxxxxxJ08AFX	63.0 (2.48)	0.80 Cu (0.031)	AMMOPACK	500
	±1%	5073HVxxxxxF08AFX				

Dimensions unless specified in mm (inches)

Table 5. Examples of the ohmic value.

VALUE	5 DIGITS
1 Ω	1R000
10 Ω	10R00
100 Ω	100R0
1 kΩ	1K000
10 kΩ	10K00
100 kΩ	100K0
1 MΩ	1M000

The ohmic value in the NAFTA ordering code (see table 4) is represented by the "xxxxx" in the middle of the above ordering code. Table 5 gives some examples on how to use these 5 digits.

Example:
HVR25, 150kΩ, ±5%, ammopack 5000pcs is 5043HV150K0J18AFX

TAPE IN AMMOPACK

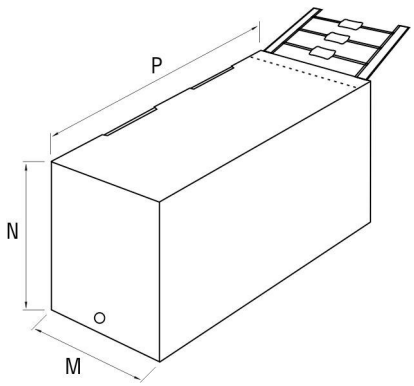


Table 6. Ammopack.

PRODUCT	TAPING	M	N	P	QUANTITY (pcs)
HVR25	52.5 ±1.5 (2.07 ±0.06)	82 (3.3)	28 (1.2)	262 (10.4)	1000
	52.5 ±1.5 (2.07 ±0.06)	78 (3.1)	100 (4.0)	260 (10.3)	5000
HVR35	52.5 ±1.5 (2.07 ±0.06)	78 (3.1)	60 (2.4)	262 (10.4)	1000
HVR68	63.0 ±1.5 (2.48 ±0.06)	86 (3.4)	66 (2.6)	260 (10.3)	500

Dimensions unless specified in mm (inches)

TAPE ON REEL

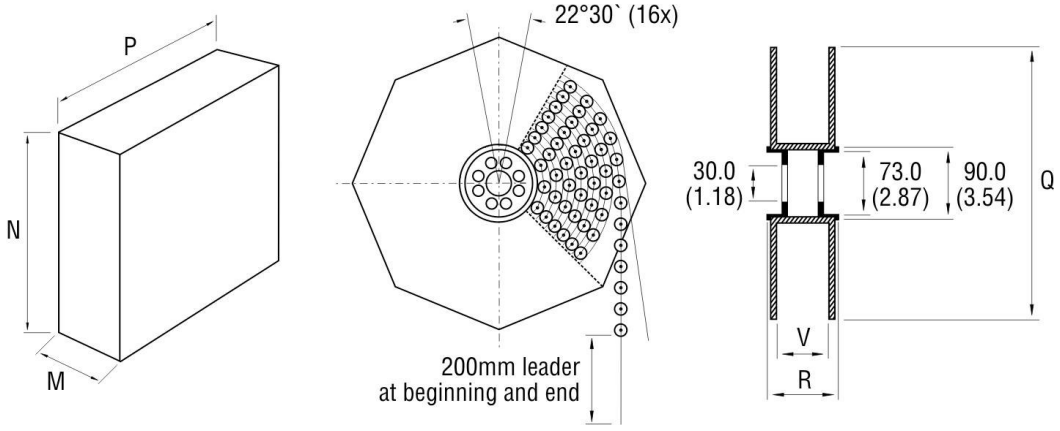


Table 7. Reel.

PRODUCT	TAPING	M	N	P	Q	V	R	QUANTITY (pcs)
HVR25	52.5 ±1.5 (2.07 ±0.06)	92 (3.7)	311 (12.3)	311 (12.3)	305 (12.1)	75 (3.0)	86 (3.4)	5000
HVR37	52.5 ±1.5 (2.07 ±0.06)	92 (3.6)	361 (14.3)	361 (14.3)	355 (14.0)	75 (2.9)	86 (3.4)	5000

Dimensions unless specified in mm (inches)

TESTS AND REQUIREMENTS

Essentially all tests are carried out in accordance with the schedule of IEC publications 60115-1, category 55/155/56 (rated temperature range -55℃ to +155℃; damp heat, long term, 56 days and along the lines of IEC publications 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 the IEC recommendations were necessary for our specified method.

Table 8. Test and requirements.

IEC 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS		
				HVR25	HVR37	HVR68
4.6.1.1	-	Insulation resistance	500 V (DC) during 1 minute; V-block method.	$R_{ins\ min}$ 10^4 MΩ		
4.7	-	Voltage proof on insulation	700 V (RMS) during 1 minute, V-block method.	No breakdown or flashover		
4.8	-	Temperature coefficient	Between -55 ℃ and +155 ℃	±200 ppm/℃		
4.12	-	Noise	"IEC publication 60195"	Max. 5 μV/V	Max. 2.5 μV/V	
4.13	-	Short time overload	Room temperature; dissipation 6.25 x Pn (voltage not more than 2 x limiting voltage, 10000 V_{max}); 10 cycles; 5 s ON and 45 s OFF	For 5% tolerance ➔ $\Delta R/R_{max}$ ±2.0% +0.1Ω For 1% tolerance ➔ $\Delta R/R_{max}$ ±1.0% +0.1Ω		

IEC 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS		
				HVR25	HVR37	HVR68
4.16	21 (U)	Robustness of terminations:		No damage $\Delta R/R_{max}$ ±1.0% +0.1Ω		
4.16.2	21 (Ua1)	Tensile all samples	Load 10 N, 10 s			
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 directions			
4.17	20 (Ta)	Solderability (after ageing)	16 h at 155 °C; immersed in flux 600, leads immersed 2 mm for 2 ±0.5 s in a solder bath at 235 ±5 °C	Good tinning (≥ 95% covered) No damage		
4.18	20 (Tb)	Resistance to soldering heat	Thermal shock: 3 s; 350 ±10 °C; 6 mm from body	$\Delta R/R_{max}$ ±1.0% +0.1Ω		
4.19	14 (Na)	Rapid change of temperature	30 minutes at - 55 °C and 30 minutes at + 155 °C; 5 cycles	No visual damage $\Delta R/R_{max}$ ±1.0% +0.1Ω		
4.22	6 (Fc)	Vibration	Frequency 10 to 500 Hz, displacement 1.5 mm or acceleration 10 g; three directions; total 6 h (3x2 h)	No damage $\Delta R/R_{max}$ ±1.0% +0.1Ω		
4.23		Climatic sequence:		$R_{ins\ min}$ 10^3 MΩ $\Delta R/R_{max}$ ±1.5% +0.1Ω		
4.23.2	2 (Ba)	Dry heat	16 h; 155 °C			
4.23.3	30 (Db)	Damp heat (accelerated) 1st cycle	24 h; 25 °C to 55 °C; 90 to 100% RH			
4.23.4	1 (Aa)	Cold	2 h; - 55 °C			
4.23.6	30 (Db)	Damp heat (accelerated) remaining cycles	5 days; 25 °C to 55 °C; 90 to 100% R.H.			
4.24	3 (Ca)	Damp heat (steady state)	56 days; 40 °C; 90 to 95% R.H. loaded with 0.01Pn	$R_{ins\ min}$ 10^3 MΩ For 5% tolerance ➔ $\Delta R/R_{max}$ ±5.0% +0.1Ω For 1% tolerance ➔ $\Delta R/R_{max}$ ±1.5% +0.1Ω		
4.25.1	-	Endurance (at 70 °C)	1000 h loaded with Pn or $V_{max;}$ 1.5 h ON and 0.5 h OFF	For 5% tolerance ➔ $\Delta R/R_{max}$ ±5.0% +0.1Ω For 1% tolerance ➔ $\Delta R/R_{max}$ ±1.5% +0.1Ω		
4.29	45 (Xa)	Component solvent resistance	Isopropyl alcohol followed by brushing in accordance with MIL STD 202	No visible damage		