Data Sheet No: E08005
Version: V0
Date: 2024/10/24

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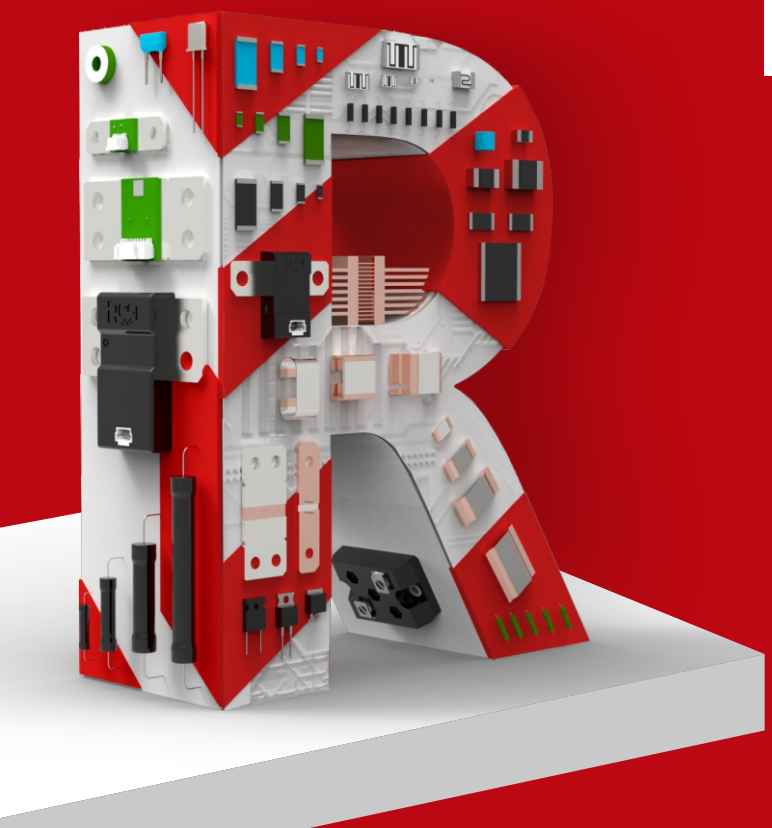
HVHR

High Voltage High Resistance Resistor

Resistance	**1GΩ~10GΩ**
Tolerance	**±1.0%**
TCR	**±100ppm/℃**
Operating Voltage	**15kV$_{max}$**



Applications

Medical Equipment
Electrical Equipment
Instrumentation
Automotive Electronics
Testing & Measurement Equipment

Better Solution for Sustainable High End Manufacturing

Tight Tolerance, High Voltage, Low VCR and High Reliability

Introduction

HVHR series resistor applies self-developed electronic paste on Al_2O_3 ceramic rod by precise thick-film technology. The TCR of HVHR can reach within ±100ppm/℃ in the temperature range of -25℃~+85℃, with ±1.0% tightest tolerance and 0.1ppm/V VCR.

Voltage coefficient of resistance (VCR) is one of the most critical electrical parameters of high voltage resistor. As electronic paste is made by mixing conductive and non-conductive materials, the non-conductive materials are activated to form a parallel resistance in a high-voltage operation, resulting in the change in the resistance value. The low VCR is mainly determined by the quality of manufacturing and processing of electronic paste. HVHR undergoes 100% high-voltage testing after manufactured to ensure the performance of each resistor under high-voltage conditions.

The core materials and processes of HVHR have been independently controllable with stable quality and timely delivery. If the standard specifications cannot meet your needs, please contact our sales.

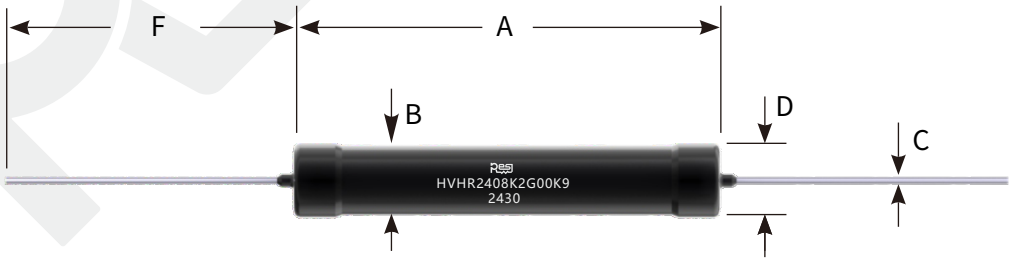
Electrical Parameters

Series	Size	Rated Power (+70°C)	Max. Operating Voltage*	Operating Temperature	TCR ppm/℃	Resistance	Tolerance %	Unit Weight g
HVHR	2408	1.0W	4kV	-55℃~+175℃	±100 (-25℃~+85℃, +25℃ ref)	1GΩ＜R≤10GΩ	±1.0~±10.0	5.16±2
HVHR	3908	1.5W	10kV	-55℃~+175℃	±100 (-25℃~+85℃, +25℃ ref)	1GΩ＜R≤10GΩ	±1.0~±10.0	7.57±2
HVHR	5208	2.5W	15kV	-55℃~+175℃	±100 (-25℃~+85℃, +25℃ ref)	1GΩ＜R≤10GΩ	±1.0~±10.0	9.58±2

*The maximum operating voltage should be the smaller one between $U=\sqrt{(P * R)}$ and Umax.

Dimensions

Unit: mm



Series	Size	A	B	C	D	F
HVHR	2408	24.0±1.5	8.0±1.0	1.0±0.1	9.5±1.0	36±3.0
HVHR	3908	39.0±1.5	8.0±1.0	1.0±0.1	9.5±1.0	36±3.0
HVHR	5208	52.0±1.5	8.0±1.0	1.0±0.1	9.5±1.0	36±3.0

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Performance

Test	Test Method	Standards	Test Results
Voltage Coefficient of Resistance	25 ± 5 ℃, apply 10% rated voltage and 100% rated voltage, load time ≤ 0.5s, interval 5s	MIL-STD-202 Method 309	Typical 0.1ppm/V, Max. 2ppm/V
Voltage Proof	Apply 4500VDC between the lead and the epoxy coating for 60s	IEC 60115-1 4.7	No breakdown or flashover, ▵R≤±0.5%
Thermal Shock	-55°C, 15min~ambient temperature<20s~+150°C, 15min, 1000 Cycles	MIL-STD-202 Method 107	▵R≤±1.0%
Short Time Overload	Apply 5 times rated power for 5s, no more than 1.5 times the max operating voltage	IEC60115-1-2008 4.13	▵R≤±0.5%
Moisture Resistance	+40℃±2℃, 93%±3%RH. Load max. operating voltage or rated voltage (the lower one). 1000h, 90min on, 30min off	MIL-STD-202 Method 103	▵R≤±1.0%
High Temperature Storage	+150°C, 1000h, no load	MIL-STD-202 Method 108	▵R≤±1.0%
Mechanical Shock	Half Sine Wave, peak acceleration 100g's, pulse duration 6ms, 3 times in each of six directions, on three different axes	MIL-STD-202 Method 213	▵R≤±0.5%
Vibration	10-2KHz, 5g's,20min/cycle, 12 cycles in each directions of X Y Z	MIL-STD-202 Method 204	▵R≤±0.5%
Load Life	Apply rated power for 1000 hours, 1.5h on, 0.5h off (ambient temperature 70℃)	MIL-STD-202 Method 108	▵R≤±1.0%
TCR	-25℃ and +85℃, +25℃ Ref.	AEC-Q200 TEST 18 IEC 60115-1 4.8	Within ±100ppm/℃

Part Number Information

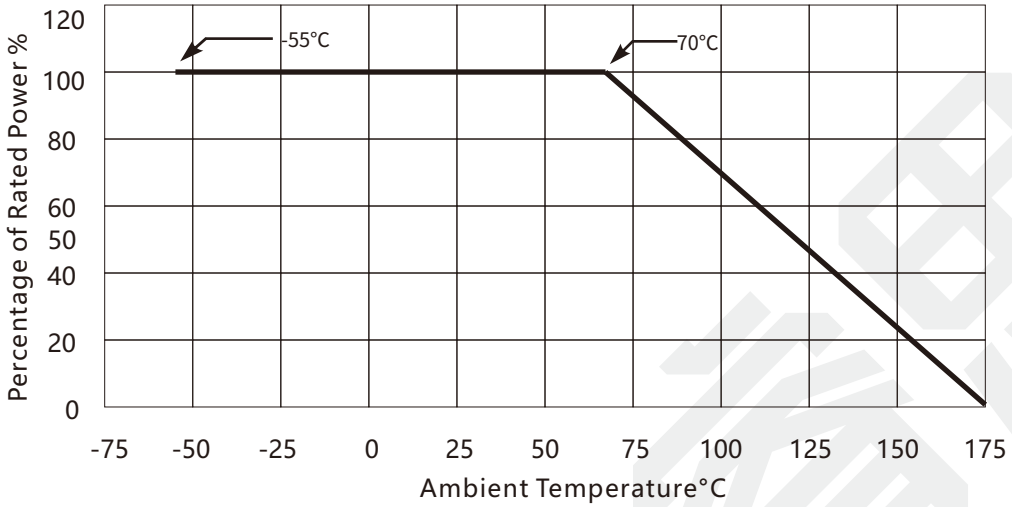
Example：HVHR2408F2G00K9(HVHR 2408 ±1% 2GΩ ±100ppm/℃ Standard)

H	V	H	R	2	4	0	8	K	2	G	0	0	K	9

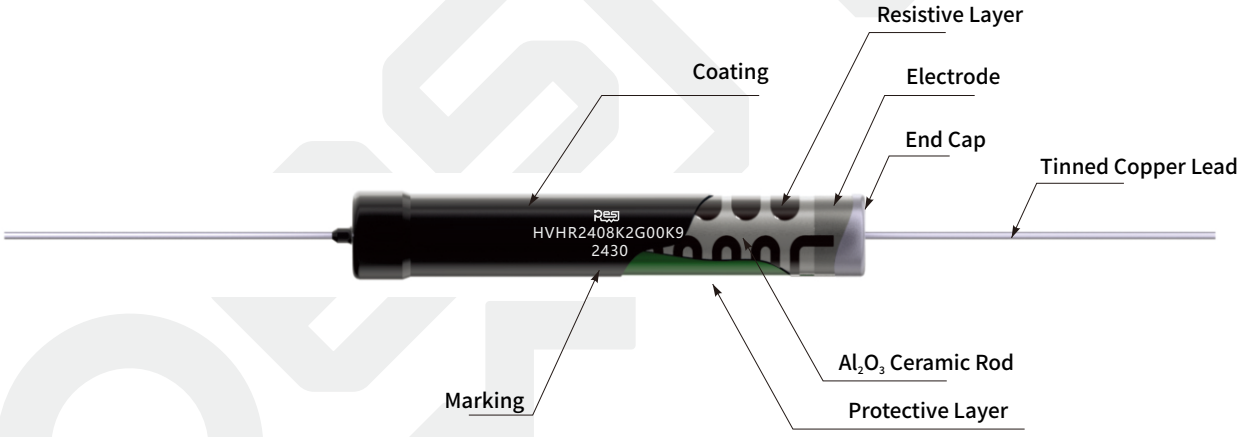
Series	Size	Tolerance	Resistance	TCR	Code
HVHR	2408 3908 5208	F=±1.0% G=±2.0% J=±5.0% K=±10%	2G00=2GΩ 10G0=10GΩ	K=±100ppm/℃	9=Standard 0-8=Custom

If you need products with smaller or larger dimensions, higher voltage, tighter tolerance, and lower TCR, please contact us for customized development.

Derating Curve



Construction



Marking

The first line (four digits) represents brand.
The second line (fifteen digits) represents part number.
The third line (four digits) represents date code.

Size	Illustration	Demonstration
HVHR2408		RESI: Brand HVHR2408K2G00K9: Part Number 2430: Date Code

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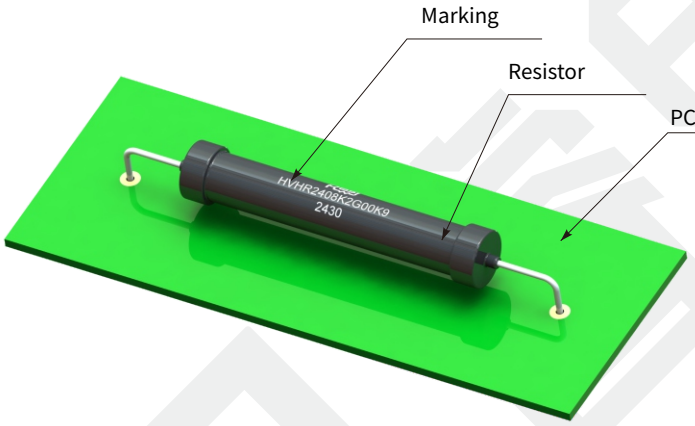
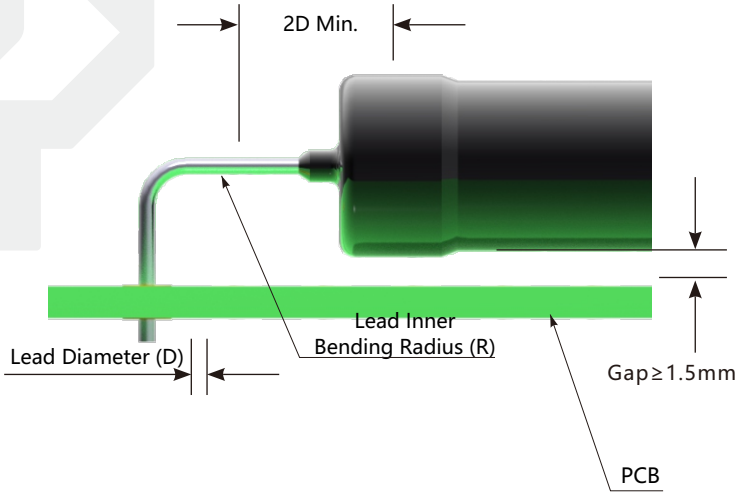
Installation

(1) The following figure shows the HVHR common installation. The resistor should be installed horizontally between two soldering pads and the lengths of the leads at both ends should be consistent.
(2) As shown in the following figure, it is recommended to place the resistor marking facing upwards for reading the product part number and date code.
(3) As shown in the following figure, it is recommended to maintain a gap of ≥ 1.5mm between the resistor and the PCB, because of the high voltage conditions of HVHR.



(4) The minimum inner bending radius of the resistor lead is shown in the following table:

Lead Diameter (D)	Minimum Lead Inner Bending Radius (R)
< 0.6mm	1x Lead Diameter
0.6mm~1.2mm	1.5x Lead Diameter
>1.2mm	2x Lead Diameter



(5) HVHR can be packaged and used in transformer oil.

Storage Instructions

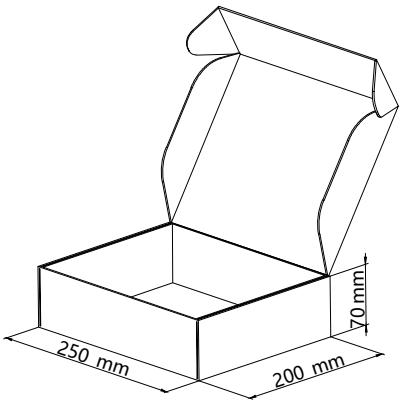
(1) Resistors should be stored at a temperature of 5 ℃ to 35 ℃, humidity ≤ 60% RH, and the humidity should be kept as low as possible.
(2) Resistors should be protected from direct sunlight.
(3) Resistors should be stored in a clean and dry environment, free of harmful gases (hydrogen chloride, sulfuric acid, hydrogen sulfide, etc).
(4) Installation and storage should be handled carefully to prevent mechanical damage or deformation of the leads of the resistor caused by external impact.
(5) Under the above conditions, resistors can be stored for at least 1 year.

Packaging

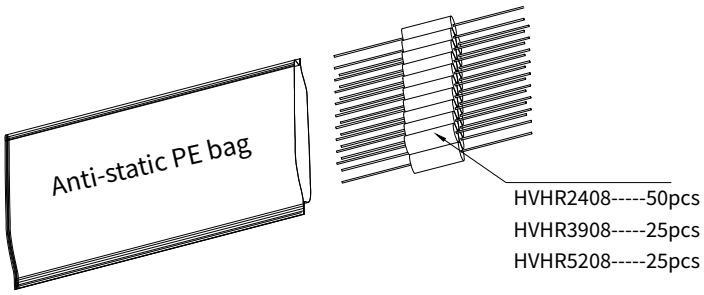
(1) Place resistors into an anti-static PE bag and vacuum seal it. (Bag size: 150mm*130mm)

(2) Place 4 bags into 1 cardboard box with bubble wrap to ensure that the product is not movable.

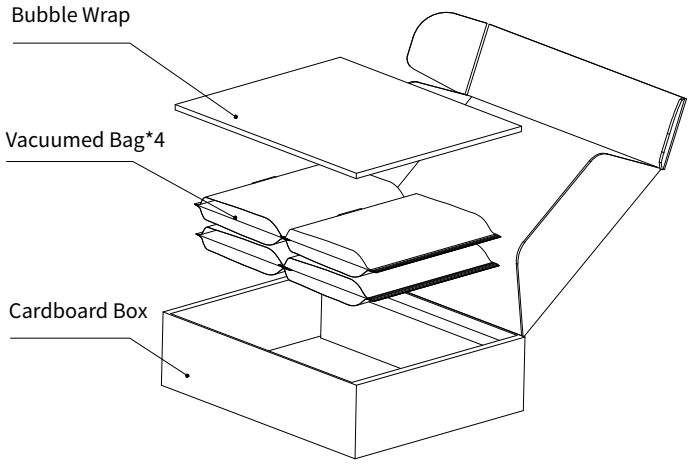
(3)The quantity and size of bubble wrap are depended on the actual situation. (Box size: 250mm*200mm*70mm)



1.Cardboard Box size: 250mm*200mm*70mm



2.Place resistors into an anti-static PE bag and vacuum seal it. (Bag size: 150mm*130mm)



3. Place 4 bags into 1 cardboard box with bubble wrap to ensure that the product is not movable.

4. Seal and label the box.

Popular Part Numbers

Part Number	Size	Tolerance	Resistance	TCR	Power	Max. Operating Voltage	SPQ
HVHR2408F2G00K9	2408	±1%	2GΩ	±100ppm/°C	1.0W	4kV	50
HVHR2408G2G00K9	2408	±2%	2GΩ	±100ppm/°C	1.0W	4kV	50
HVHR2408J2G00K9	2408	±5%	2GΩ	±100ppm/°C	1.0W	4kV	50
HVHR2408K2G00K9	2408	±10%	2GΩ	±100ppm/°C	1.0W	4kV	50
HVHR2408F3G00K9	2408	±1%	3GΩ	±100ppm/°C	1.0W	4kV	50
HVHR2408G3G00K9	2408	±2%	3GΩ	±100ppm/°C	1.0W	4kV	50
HVHR2408J3G00K9	2408	±5%	3GΩ	±100ppm/°C	1.0W	4kV	50
HVHR2408K3G00K9	2408	±10%	3GΩ	±100ppm/°C	1.0W	4kV	50
HVHR2408F4G00K9	2408	±1%	4GΩ	±100ppm/°C	1.0W	4kV	50
HVHR2408G4G00K9	2408	±2%	4GΩ	±100ppm/°C	1.0W	4kV	50
HVHR2408J4G00K9	2408	±5%	4GΩ	±100ppm/°C	1.0W	4kV	50
HVHR2408K4G00K9	2408	±10%	4GΩ	±100ppm/°C	1.0W	4kV	50
HVHR2408F5G00K9	2408	±1%	5GΩ	±100ppm/°C	1.0W	4kV	50
HVHR2408G5G00K9	2408	±2%	5GΩ	±100ppm/°C	1.0W	4kV	50
HVHR2408J5G00K9	2408	±5%	5GΩ	±100ppm/°C	1.0W	4kV	50
HVHR2408K5G00K9	2408	±10%	5GΩ	±100ppm/°C	1.0W	4kV	50
HVHR2408F10G0K9	2408	±1%	10GΩ	±100ppm/°C	1.0W	4kV	50
HVHR2408G10G0K9	2408	±2%	10GΩ	±100ppm/°C	1.0W	4kV	50
HVHR2408J10G0K9	2408	±5%	10GΩ	±100ppm/°C	1.0W	4kV	50
HVHR2408K10G0K9	2408	±10%	10GΩ	±100ppm/°C	1.0W	4kV	50
HVHR3908F2G00K9	3908	±1%	2GΩ	±100ppm/°C	1.5W	10kV	25
HVHR3908G2G00K9	3908	±2%	2GΩ	±100ppm/°C	1.5W	10kV	25
HVHR3908J2G00K9	3908	±5%	2GΩ	±100ppm/°C	1.5W	10kV	25
HVHR3908K2G00K9	3908	±10%	2GΩ	±100ppm/°C	1.5W	10kV	25
HVHR3908F3G00K9	3908	±1%	3GΩ	±100ppm/°C	1.5W	10kV	25
HVHR3908G3G00K9	3908	±2%	3GΩ	±100ppm/°C	1.5W	10kV	25
HVHR3908J3G00K9	3908	±5%	3GΩ	±100ppm/°C	1.5W	10kV	25
HVHR3908K3G00K9	3908	±10%	3GΩ	±100ppm/°C	1.5W	10kV	25
HVHR3908F4G00K9	3908	±1%	4GΩ	±100ppm/°C	1.5W	10kV	25
HVHR3908G4G00K9	3908	±2%	4GΩ	±100ppm/°C	1.5W	10kV	25
HVHR3908J4G00K9	3908	±5%	4GΩ	±100ppm/°C	1.5W	10kV	25
HVHR3908K4G00K9	3908	±10%	4GΩ	±100ppm/°C	1.5W	10kV	25
HVHR3908F5G00K9	3908	±1%	5GΩ	±100ppm/°C	1.5W	10kV	25
HVHR3908G5G00K9	3908	±2%	5GΩ	±100ppm/°C	1.5W	10kV	25
HVHR3908J5G00K9	3908	±5%	5GΩ	±100ppm/°C	1.5W	10kV	25
HVHR3908K5G00K9	3908	±10%	5GΩ	±100ppm/°C	1.5W	10kV	25
HVHR3908F10G0K9	3908	±1%	10GΩ	±100ppm/°C	1.5W	10kV	25
HVHR3908G10G0K9	3908	±2%	10GΩ	±100ppm/°C	1.5W	10kV	25
HVHR3908J10G0K9	3908	±5%	10GΩ	±100ppm/°C	1.5W	10kV	25
HVHR3908K10G0K9	3908	±10%	10GΩ	±100ppm/°C	1.5W	10kV	25
HVHR5208F2G00K9	5208	±1%	2GΩ	±100ppm/°C	2.5W	15kV	25

Popular Part Numbers

Part Number	Size	Tolerance	Resistance	TCR	Power	Max. Operating Voltage	SPQ
HVHR5208G2G00K9	5208	±2%	2GΩ	±100ppm/°C	2.5W	15kV	25
HVHR5208J2G00K9	5208	±5%	2GΩ	±100ppm/°C	2.5W	15kV	25
HVHR5208K2G00K9	5208	±10%	2GΩ	±100ppm/°C	2.5W	15kV	25
HVHR5208F3G00K9	5208	±1%	3GΩ	±100ppm/°C	2.5W	15kV	25
HVHR5208G3G00K9	5208	±2%	3GΩ	±100ppm/°C	2.5W	15kV	25
HVHR5208J3G00K9	5208	±5%	3GΩ	±100ppm/°C	2.5W	15kV	25
HVHR5208K3G00K9	5208	±10%	3GΩ	±100ppm/°C	2.5W	15kV	25
HVHR5208F4G00K9	5208	±1%	4GΩ	±100ppm/°C	2.5W	15kV	25
HVHR5208G4G00K9	5208	±2%	4GΩ	±100ppm/°C	2.5W	15kV	25
HVHR5208J4G00K9	5208	±5%	4GΩ	±100ppm/°C	2.5W	15kV	25
HVHR5208K4G00K9	5208	±10%	4GΩ	±100ppm/°C	2.5W	15kV	25
HVHR5208F5G00K9	5208	±1%	5GΩ	±100ppm/°C	2.5W	15kV	25
HVHR5208G5G00K9	5208	±2%	5GΩ	±100ppm/°C	2.5W	15kV	25
HVHR5208J5G00K9	5208	±5%	5GΩ	±100ppm/°C	2.5W	15kV	25
HVHR5208K5G00K9	5208	±10%	5GΩ	±100ppm/°C	2.5W	15kV	25
HVHR5208F10G0K9	5208	±1%	10GΩ	±100ppm/°C	2.5W	15kV	25
HVHR5208G10G0K9	5208	±2%	10GΩ	±100ppm/°C	2.5W	15kV	25
HVHR5208J10G0K9	5208	±5%	10GΩ	±100ppm/°C	2.5W	15kV	25
HVHR5208K10G0K9	5208	±10%	10GΩ	±100ppm/°C	2.5W	15kV	25

Revision

Version	Revised Content	Date	Approver
V0	Initial Issue	2024.10.24	LWW

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