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(HI80) Ultra-Precision High-Power High-Voltage Resistors

Token Electronics Industry Co., Ltd.

Taiwan: No.137, Sec. 1, Zhongxing Rd., Wugu District,
New Taipei City, Taiwan, R.O.C. 24872
Tel: +886 2981 0109 Fax: +886 2988 7487

China: 12F, Zhong Xing Industry Bld., Chuang Ye Road,
Nan Shan District, Shen Zhen City,
Guang Dong, China 518054
Tel: +86 755 26055363; Fax: +86 755 26055365

Web: www.token.com.tw

mailto:rfq@token.com.tw

Product Introduction

New ruthenium material, extended ultra-precision high-power high-voltage resistors (HI80) breakthrough 300W, precision narrowed to 0.1%.

Features :

- Thick film sensorless design.
- Wide range of resistance.
- Bottom temperature coefficient and high precision.
- Resistance to humidity, heat and electricity.
- Long term performance, stable and reliable.

Applications :

- Impulse voltage generators,
- Arc furnace damping, Energy research,
- Pulse modulators, Radar Pulse-forming networks,
- Capacitor crowbar circuits, High voltage snubber circuits,
- X-ray/imaging equipment, and EMI/lightning supression.

Token electronic ultra-precision high-power high-voltage resistor (HI80) family series take advantage of new ultra-fine ruthenium material, 95% aluminum oxide ceramic rods, and thick film non-inductive Serpentine Pattern Design. Precision can be narrowed to ±0.1%, and power breakthrough 300W. (HI80) featuring heat-resistant, humidity-resistant, resisting electrical pulse, and stable and reliable long-term performance, is specifically designed for general purpose industrial high voltage system applications.

(HI80) family of high-voltage resistors includes conventional high-voltage resistors (HI80D), conventional miniaturized high-voltage resistors (HI80DS), high-power high-voltage resistors (HI80P), and ultra-precision high-voltage resistors (HI80T).

Conventional high voltage resistors (HI80D) have a wide resistance range of 200Ω ~ 10GΩ, rated power 2.5W ~ 20W, accuracy tolerance F (± 1%), J (± 5%), K (± 10%), the lowest temperature coefficient down to 50ppm on request, and the standard temperature coefficient of 100ppm.

(HI80DS) All-film conventional miniature high-voltage resistor relative to (hi80d), with small size, higher power 3W ~ 30W, withstand higher voltage, and none-inductance. The temperature coefficient of the lowest can reach 50ppm (25℃ ~105℃), the standard temperature coefficient of 100ppm. Precision Tolerances F (±1%), J (±5%), K (±10%).

High power high voltage resistors (HI80P) have high rated power 20W ~ 300W, resistance range 1Ω ~ 1GΩ, precision tolerance D (± 0.5%), F (± 1%), J (± 5%), K (± 10%), The temperature coefficient of up to 25ppm (on request), the standard temperature coefficient of 50ppm.

Ultra-precision high-voltage resistor (HI80T) characters 15ppm temperature coefficient, the standard temperature coefficient is 25ppm, the precision tolerance has B (± 0.1%), D (± 0.5%), F (± 1%), the resistance range 1Ω ~ 500MΩ, and the rated power 0.8W ~ 6W to choose from.

Token (HI80) Voltage Resistor series is able to absorb large amounts of energy at high voltage while remaining non-inductive and heavy load characteristics. The HI80 conforms to the RoHS directives and Lead-free. Customed design, and tighter tolerances are available on request.

For customed designs, tighter tolerances, non-standard technical requirements, or custom special applications, please contact our sales for more information or link to Token official website "High Voltage Resistors" to get more information.

HI80D Spec.

Conventional High Voltage Resistor Construction (HI80D)

Membrane Material (a)	Ruthenium Paste
Base Material (b)	95% Aluminum Oxide, Al_2O_3
Encapsulating Material (c)	High Temperature Silicone Resin

Specifications & Painted Dimensions (Unit: mm) (HI80D)

Part Number	Rated power (W) Ambient temperature (75℃)	Max. continuous Oper. Volt (KV)	Resistance range (Ω)		Dimensions (mm)			
			Min.	Max.	L ±0.5mm	E ±3mm	D ±0.5mm	d ±0.1mm
HI80D-15	0.5	3.0	200	1G	15	30	5.0	0.8
HI80D-20	2.5	4.8	200	1G	20	28	8.0	1.0
HI80D-26	3.7	6.4	250	1G	27	28	8.0	1.0
HI80D-32	4.5	8.0	300	1.5G	33	28	8.0	1.0
HI80D-39	5.2	12.8	400	1.5G	39	28	8.0	1.0
HI80D-52	7.5	16	500	2.5G	52	28	8.0	1.0
HI80D-78	11	24	900	4G	78	28	8.0	1.0
HI80D-103	12	32	1K2	6G	103	28	8.0	1.0
HI80D-124	15	40	1K5	8G	124	28	8.0	1.0
HI80D-154	20	45	2K	10G	154	28	8.0	1.0

Conventional High Voltage Resistor Painted Dimensions (Unit: mm) - (HI80D)

HI80DS Spec.

Conventional Miniature High Voltage Resistor Construction (HI80DS)

Membrane Material (a)	Ruthenium Paste
Base Material (b)	95% Aluminum Oxide, Al_2O_3
Encapsulating Material (c)	High Temperature Silicone Resin

Conventional Miniature Specifications & Painted Dimensions (Unit: mm) (HI80DS)

Part Number	Rated power (W) Ambient temperature (75℃)	Max. continuous Oper. Volt (KV)	Resistance range (Ω)		Dimensions (mm)			
			Min.	Max.	L ±0.5mm	E ±3mm	D ±0.5mm	d ±0.1mm
HI80DS-20	3	4.8	200	1G	20.2	30	8.2	1.0
HI80DS-26	5	6.4	250	1G	26.9	30	8.2	1.0
HI80DS-32	7	8.0	300	1.5G	33.0	30	8.2	1.0
HI80DS-39	9	12.8	400	1.5G	39.5	30	8.2	1.0
HI80DS-52	10	16	500	2.5G	52.1	30	8.2	1.0
HI80DS-78	15	24	900	4G	77.7	30	8.2	1.0
HI80DS-103	20	32	1K2	6G	102.9	30	8.2	1.0
HI80DS-124	25	40	1K5	8G	123.7	30	8.2	1.0
HI80DS-154	30	45	2K	10G	153.7	30	8.2	1.0

Conventional Miniature Specifications & Painted Dimensions (Unit: mm) - (HI80DS)

HI80T Spec.

Conventional High Voltage Resistor Construction (HI80D)

Membrane Material (a)	Ruthenium Paste
Base Material (b)	95% Aluminum Oxide, Al_2O_3
Encapsulating Material (c)	High Temperature Silicone Resin

Ultra-Precision High Voltage Resistor Specifications (HI80T)

Part Number	Rated power (W)	Max. continuous Oper. Volt (KV)	Resistance range (Ω)	L ±0.5mm	E ±3mm	D ±0.5mm	d ±0.1mm
HI80T-20	0.8	3	1 ~ 500M	20	30	8	1
HI80T-26	1.0	4	1 ~ 500M	27	30	8	1
HI80T-32	1.2	5	1 ~ 500M	33	30	8	1
HI80T-39	1.5	6	1 ~ 500M	39	30	8	1
HI80T-52	2	10	1 ~ 500M	52	30	8	1
HI80T-78	3	15	1 ~ 500M	78	30	8	1
HI80T-103	4	20	1 ~ 500M	103	30	8	1
HI80T-124	5	25	1 ~ 500M	124	30	8	1
HI80T-154	6	30	1 ~ 500M	154	30	8	1

Ultra-Precision High Voltage Resistor Unpainted Dimensions (Unit: mm) - (HI80T)

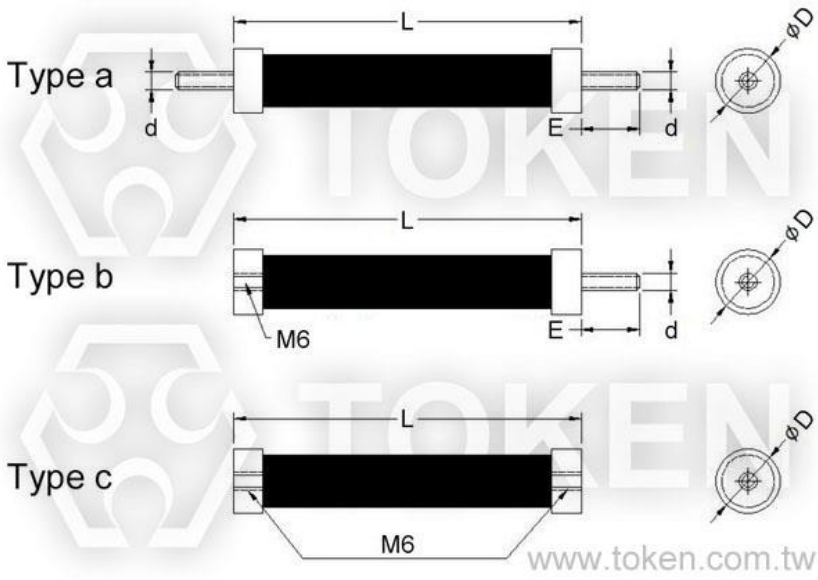
HI80P Specifications

High-Power High Voltage Resistor Construction (Unit: mm) (HI80P)

Membrane Material (a)	Ruthenium Paste
Base Material (b)	95% Aluminum Oxide, Al_2O_3
Encapsulating Material (c)	High Temperature Silicone Resin
Cap (d)	Nickel Plating Copper

High-Power High Voltage Resistor Specifications (Unit: mm) (HI80P)

Part Number	Rated power (W)	Max. continuous Oper. Volt (KV)	Resistance range (Ω)	L ±1mm	E ±1mm	D ±0.5mm	d ±0.01mm
HI80P-20	20	30	1 ~ 1G	116	10	17	M6
HI80P-30	30	30	1 ~ 1G	116	10	19	M6
HI80P-50	50	30	1 ~ 1G	116	10	21	M6
HI80P-80	80	30	1 ~ 1G	130	10	28	M6
HI80P-100	100	35	1 ~ 1G	160	10	28	M6
HI80P-150	150	60	1 ~ 1G	210	10	28	M6
HI80P-200	200	60	1 ~ 1G	260	10	28	M6
HI80P-300	300	80	1 ~ 1G	310	10	33	M6



High-Power High Voltage Resistor Dimensions (Unit: mm) - (HI80P)

Environmental Characteristics

Technical Characteristics - (HI80)

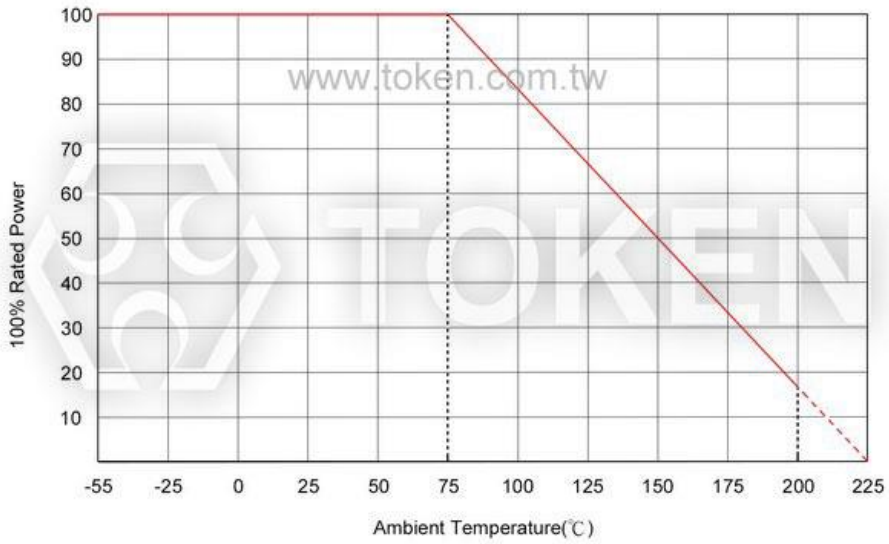
Part Number	Resistance range (Ω)	Tolerance (%)	TCR @25℃ (-55℃ ~ +105℃)	Insulation withstand voltage	Insulation resistance	Operating temp. range
HI80D	200 ~ 10G	±1% ~ ±10%	±100ppm/℃, (±50ppm/℃ on request)	1000VDC	≥ 10GΩ	-55℃ ~ +225℃
HI80DS	200 ~ 10G	±5% ~ ±10%	±100ppm/℃, (±50ppm/℃ on request)			
HI80T	1 ~ 500M	±0.1% ~ ±1%	±25ppm/℃, (±15ppm/℃ on request)			
HI80P	1 ~ 1G	±0.5% ~ ±10%	±50ppm/℃, (±25ppm/℃ on request)			

Environmental Characteristics - (HI80)

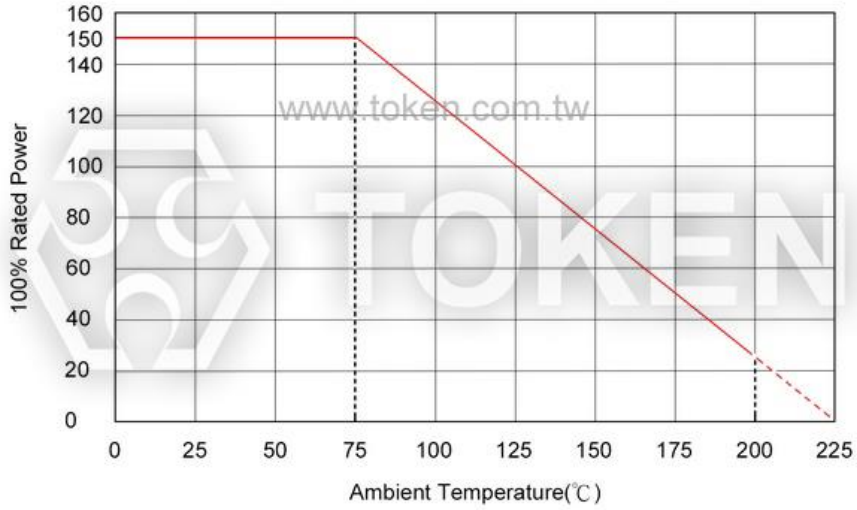
Inspection item	Inspection method	Performance requirement
Overload	5 times the rated power, but not more than 1.5 times the maximum continuous operating voltage, 5 seconds	$\Delta R \leq \pm(0.2\%R + 0.01\Omega)$
Load life	1000 hours under rated power	$\Delta R \leq \pm(0.5\%R + 0.01\Omega)$
Steady-state damp heat	40℃, RH ≥ 95%, 240h	$\Delta R \leq \pm(0.4\%R + 0.01\Omega)$
Temperature shock	-65℃ ~ 155℃, 5 cycle	$\Delta R \leq \pm(0.2\%R + 0.01\Omega)$

Power Derating Curve

Power Derating Curve - (HI80)



Power Derating Curve - (HI80DS)



Serpentine Pattern

Advance Technique of Non-Inductive & Serpentine Pattern (HI80)

Non-Inductive Performance:

- HI80 Non-Inductive Design which uses a serpentine resistive pattern that offers for zigzagging lines to carry current in opposite directions, thereby achieving maximum neutralization of flux fields over the entire length of the resistor.
- This efficient non-inductive construction without derating of any performance advantages is ideal for applications where high frequency is required.

Serpentine Pattern Screen Printing Design:

- Type High Voltage HI80 Precision Resistors combine Token's Non-Inductive serpentine pattern, high thru-put screen printed silicone coating.
- The alignment of the gap in the serpentine resistor pattern with the gap in the coating pattern provides a complete encapsulation of the resistor element.
- The cap and lead assemblies are pressed onto the resistor core, finishing the resistor and providing rugged terminal attachment.

Order Codes

Order Codes (HI80D) Conventional High Voltage Resistor

HI80D	39	1G	F

Part Number	Rated Power (W)		Resistance Value (Ω)		Resistance Tolerance (%)	
HI80D	20	2.5W	1K1	1.1KΩ	F	±1%
	26	3.7W	110K	110KΩ	J	±5%
	39	5.2W	1M1	1.1MΩ	K	±10%
	103	12W	110M	110MΩ		
	154	20W	1G5	1.5GΩ		
			10G	10GΩ		

- Note: TCR 100ppm/℃, (±50ppm/℃ on request).

Order Codes (HI80DS) Conventional Miniature high voltage resistors

HI80DS	124	1G	F

Part Number	Rated Power (W)		Resistance Value (Ω)		Resistance Tolerance (%)	
HI80DS	20	3W	1K1	1.1KΩ	J	±5%
	32	7W	110K	110KΩ	K	±10%
	78	15W	1M1	1.1MΩ		
	103	20W	110M	110MΩ		
	154	30W	1G5	1.5GΩ		
			10G	10GΩ		

- Note: TCR 100ppm/℃, (±50ppm/℃ on request).

Order Codes (HI80T) Ultra-Precision High Voltage Resistor

HI80T	32	500M	B

Part Number	Rated Power (W)		Resistance Value (Ω)		Resistance Tolerance (%)	
HI80T	20	0.8W	10	10Ω	B	±0.1%
	32	1.2W	1K1	1.1KΩ	D	±0.5%
	52	2W	110K	110KΩ	F	±1%
	154	6W	1M1	1.1MΩ		
			500M	500MΩ		

- Note: TCR ±25ppm/℃, (±15ppm/℃ on request).

Order Codes (HI80P) High-Power High Voltage Resistor

HI80P	20	a	1G	F

Part Number	Rated Power (W)		Type	Resistance Value (Ω)		Resistance Tolerance (%)	
HI80P	20	20W	a	10	10Ω	D	±0.5%
	30	30W	b	1K1	1.1KΩ	F	±1%
	150	150W	c	110K	110KΩ	J	±5%
	300	300W		1M1	1.1MΩ	K	±10%
				110M	110MΩ		
				10G	10GΩ		

- **Note: TCR ±50ppm/℃, (±25ppm/℃ on request).**

General Information

Cost Effective Complete Selection of High Voltage Components

Token high voltage series can be specified for use in industrial and general purpose high voltage systems, as well as a complete selection of high resistance, Hi-Meg, high-voltage, high frequency, and bulk ceramic resistors for higher average power dissipation. These High Resistance, High Frequency, High Resistance resistors combine the proven performance of Token resistance system with new cost efficient design elements and high voltage applications.

Detailed specifications, both mechanical and electrical, please contact our sales representative for more information.

High Voltage Applications

Resistors produced from Serpentine Pattern Screen Printing Design or bulk ceramic materials have displayed several key advantages in demanding high-voltage situations, including both continuous-wave and pulse applications. These include radar and broadcast transmitters, x-ray systems, defibrillators, lasers, and high-voltage semiconductor process equipment applications, where resistors must handle peak voltage anywhere from 8KV to 75KV.

Typical applications include current limit in capacitor charge/discharge, crowbar, and tube-arc circuits. In these uses, bulk ceramic resistors provide low inductance, high average power per unit size, stability at high voltage, and durability at extreme peak-power levels. Film resistors typically cannot withstand high-voltage pulse applications.

RF/Digital Loads and High-Frequency Applications

Token Non-Inductive Voltage Resistors are used extensively for high-frequency RF loads in broadcast and communication equipment because of their non-inductive characteristics. They provide excellent non-inductive power-handling capacity at frequencies up to the gigahertz range, with no sacrifice in power dissipation.

Film resistors may provide the needed non-inductive characteristics required by such RF applications, but they have size limitations and present reliability problems due to potential film burnout. This is especially true in advanced digital applications such as digital radio and TV transmitters involving pulses at high frequencies.

Application Notes

- Due to the high voltage which can appear between the end cap and any adjacent metal part, resistors should be mounted at an adequate distance from other conductors.
- An appropriate number of resistors may be screwed together as a stick to provide an assembly which will be capable to withstanding any desired voltage, providing no individual resistor is subject to a greater stress or power dissipation than is recommended in its data sheet, and that appropriate anticorona devices are fitted.
- The axial termination should not be bent closer than twice the diameter of the terminal wire from the body of the resistor.
  When resistors are required to be potted, the preferred encapsulant is a silicone compound.

Oil Immersion

For some high voltage applications it is required to immerse the components in oil or gas to reduce the effects of corona and surface tracking. A special lacquer protected version of the resistor is available, suitable for immersion in transformer oil or SF6.