

Version:  
August 31, 2017



**(HI82)**

# **Ultra-Precision High Voltage Film 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](http://www.token.com.tw)

**mailto:** [rfq@token.com.tw](mailto:rfq@token.com.tw)



## ▶ Product Introduction

### HI82 sets a new standard for high value, ultra-stable precision high voltage film resistors

#### Features :

- High voltage thick film precision technology resistor.
- Resistance up to 10TΩ. Low temperature coefficient, low voltage coefficient.
- Radial leads, variable lead spacing by bending. Climatic protection by silicone coating.

The high performance high-voltage applications require the use of high voltage resistors in applications with long-term stability and good temperature coefficient. Token Electronics has introduced ultra-stable high-precision HI82 high voltage resistors to meet these needs.

Application of Token's proven precision serpentine pattern design capability, developed a precision radial-lead type HI82 resistor to optimize low-temperature coefficient performance and long-term stability. Through the use of new alloy ruthenium film material, and with the best processing characteristics of planar ceramic chip.



Token can control the manufacture of very precise precision, stabilize the performance parameters of the important operating temperature range. This unique process has a specific resistance value in three sizes.

This unique process has a specific resistance value in three sizes, HI82-30, HI82-40, and HI82-50. Resistance range from 1MΩ to 10TΩ, precision tolerance is 0.25% to 30% available, and the temperature coefficient is 25ppm to 1000ppm. To provide the ideal cost-effective, high stability, precision accuracy, high voltage and other characteristics, is suitable for a variety of measurement, voltage divider circuit and control functions, AC and DC or pulse circuit, and high voltage power electronic equipment.

Token HI82 ultra-precision high-voltage resistors conform with RoHS and lead-free standards and provide more competitive prices and fast delivery service. For technical specifications and special applications, please contact your Token's sales representative, or link to Token official website "[High Voltage Resistors](http://www.token.com.tw)" to get more information.



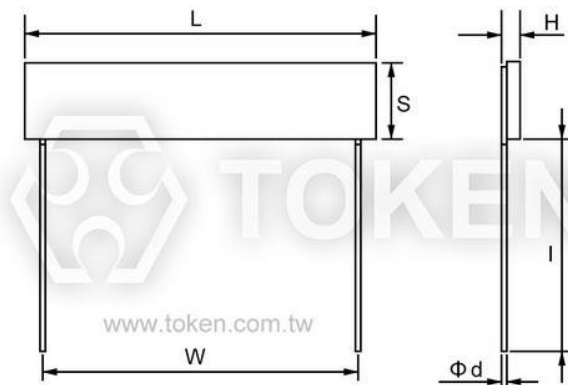
► **Dimensions**

**Composition Structure (HI82)**

	<b>Membrane Material (a)</b>	Ruthenium Paste
	<b>Base Material (b)</b>	95% Aluminum Oxide, Al <sub>2</sub> O <sub>3</sub>
	<b>Encapsulating Material (c)</b>	High Temperature Silicone Resin

**Ultra-Precision High Voltage Film Resistor Dimensions (Unit: mm) (HI82)**

Part Number	L ±2	S ±2	H (Max.)	W ±2	I (Max.)	d ±0.05
HI82-30	30.0	6.0	1.4	27.5	20	0.40
HI82-40	40.0	6.0	1.4	37.8	20	0.40
HI82-50	50.0	12.5	1.4	47.8	20	0.40



Ultra-Precision High Voltage Film Resistor Dimensions (Unit: mm) - (HI82)

**Note:**

- L = Length , S = Width , H = Thickness , d = Wire diameter ◦
- W = Standard lead spacing ( Other spacing possible by bending ) ◦

### ► Electrical Characteristics

#### Technical Characteristics - (HI82)

Part Number	Power Rating P <sub>70</sub> (W)	Working Voltage (V)	Resistance Range (Ω)	Tolerance (%)	TCR <sup>(1)</sup> (ppm)	VCR <sup>(2)</sup> (ppm/V)
<b>HI82-30</b>	1.0	10KV	1M - 100M	0.25/0.5/5/10	25/50/100	2ppm/V
			100M - 1G	1/2/5/10/20	50/100/250	5ppm/V
			1G - 100G	5/10/20/30	250/500	20ppm/V
			100G - 1T	5/10/20/30	500/1000	100ppm/V
<b>HI82-40</b>	1.2	20KV	1M - 100M	0.25/0.5/5/10	25/50/100	1ppm/V
			100M - 1G	1/2/5/10/20	50/100/250	2ppm/V
			1G - 100G	5/10/20/30	250/500	10ppm/V
			100G - 1T	5/10/20/30	500/1000	50ppm/V
<b>HI82-50</b>	3.0	30KV	1M - 100M	0.25/0.5/5/10	25/50/100	1ppm/V
			100M - 1G	1/2/5/10/20	25/50/100	1ppm/V
			1G - 100G	5/10/20/30	100/250	5ppm/V
			100G - 1T	5/10/20/30	250/500	25ppm/V
			1T - 10T	10/20/30	500/1000	100ppm/V

**Note:**

- <sup>(1)</sup> TCR 25/50: Temperature range +25°C ~ +85°C ; <sup>(2)</sup> The voltage coefficient is measured between 10V and 100V.
- Operating Voltage =  $\sqrt{P * R}$  , or Max. Operating Voltage listed in above table whichever is lower.
- Overloading Voltage =  $2.5 * \sqrt{P * R}$  , or Max. Overloading Voltage listed in above table whichever is lower.
- Optional specifications on request.

#### Environmental Characteristic

Continuous operating voltage	$V = \sqrt{P * R}$
Measuring voltage	Standard measuring voltage is 10V (50V for values >1G). Different voltages on request.
TCR	in ppm/K; Temperature range +25°C ... +125°C; TCR25/50 and values above 1G: +25°C ... +85°C
Operating temp. range	-55°C ~ +125°C
Climatic category	to EN 60068-1: 55/125/56
Humidity-/contact protection	Lacquer coating. Resistant to most solvents. Isopropyl alcohol recommended for cleaning; Do not use acetone or methylene chloride. Avoid mechanical stress to coating.
Stability: Storage	(125°C/1000h) ≤10G: <1%; >10G: <2%
Stability at Max. voltage	(Max. voltage/1000h) ≤10G: <1%; >10G: <2%

## ▶ Serpentine Pattern

### Advance Technique of Non-Inductive & Serpentine Pattern (HI82)

#### Non-Inductive Performance:

- HI82 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 HI82 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 (HI82)**

HI82	30		1G		F	
Part Number	Rated Power (W)		Resistance Value ( $\Omega$ )		Resistance Tolerance (%)	
HI82	30	1.0W	1M1	1.1M $\Omega$	C	$\pm 0.25\%$
	40	1.2W	110M	110M $\Omega$	D	$\pm 0.5\%$
	50	3.0W	1G5	1.5G $\Omega$	F	$\pm 1\%$
			10G	10G $\Omega$	J	$\pm 5\%$
				K	$\pm 10\%$	
				M	$\pm 20\%$	
				N	$\pm 30\%$	

**Order Codes (HI80P) High-Power High Voltage Resistor**

HI80P	20		a	1G		F	
Part Number	Rated Power (W)		Type	Resistance Value ( $\Omega$ )		Resistance Tolerance (%)	
HI80P	20	20W	a	10	10 $\Omega$	D	$\pm 0.5\%$
	30	30W	b	1K1	1.1K $\Omega$	F	$\pm 1\%$
	150	150W	c	110K	110K $\Omega$	J	$\pm 5\%$
	300	300W		1M1	1.1M $\Omega$	K	$\pm 10\%$
				110M	110M $\Omega$		
				10G	10G $\Omega$		

**Order Codes (HI80T) Ultra-Precision High Voltage Resistor**

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

## ► 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.

