Version:
December 1, 2022

(HI83) Thick Film Planar Dividers, High Voltage Resistors

Token Electronics Industry Co., Ltd.

Taiwan: No.137, Sec. 1, Zhongxing Rd., Wugu District,
New Taipei City, Taiwan. 248012
Tel: +886 2981 0109 Fax: +886 2988 7487

China: 17P, Nanyuan Maple Leaf Bldg., Nanshan Ave.,
Nanshan Dist., Shenzhen, Guangdong, China. 518054
Tel: +86 755 26055363

Web: www.token.com.tw

Email: rfq@token.com.tw

Product Introduction

Token electronic printing technology to achieve a superior precision, thick film planar high voltage dividers.

Features :

- High precision, Non-Inductance design.
- High voltage, Wide range of resistance.
- Custom design services. RoHS compliant.

Applications :

- Pulse Modulator, Radar Pulse Forming Network.
- X-ray/Imaging Equipment, and EMI lightning suppression.
- Capacitor Arc Suppression Circuit, High Voltage Buffer Circuit.
- Impulse Voltage Generator. Electric Arc Furnace Damping, Energy Research.

Through-hole (HI83) thick film planar divider, high voltage resistor series is a new generation of Token Electronic Technology Co., Ltd. Taking advantage of high-quality ruthenium oxide resistance material to 96% alumina planar ceramic matrix, dividers (HI83) features good thermal conductivity, small size, and high reliability. Custom dividers available with leadwire terminals or with leadless conductive pads.

The planar thick film divider resistor (HI83) provides stable performance over a wide range of resistance values with a voltage rating up to 35KV. The maximum resistance ratio is 1000: 1 (ratio greater than 1000: 1, such as 2000: 1, 4000: 1, and 5000: 1 is available on request) with a minimum resistance ratio of 40: 1.

Low temperature coefficient can be used for high stability circuit applications. Space-saving planar packages provide an alternative to traditional high-voltage resistors. (HI83) is mainly used in precision instruments, drive circuits, power supplies, transformers, high voltage power equipment, and any need to operate in high voltage electrical appliances and other fields.

The main structure of the planar thick film voltage divider (HI83): The terminal connecting conductor and the ruthenium oxide resistive material were printed on the surface of the 96% alumina substrate in a non-inductive pattern. Then apply the screen printing protection, after connect the terminals. Phosphor bronze solder is welded to the lead frame terminal and is immersed in SnAgCu to meet the following IEC weldability requirements.

Thick film (HI83) voltage dividers are RoHS compliant and 100% lead free. For conventional parameters, specifications outside the parameters, or technical requirements, please contact Token, or link to Token official website "High Voltage Resistors" to get more information.

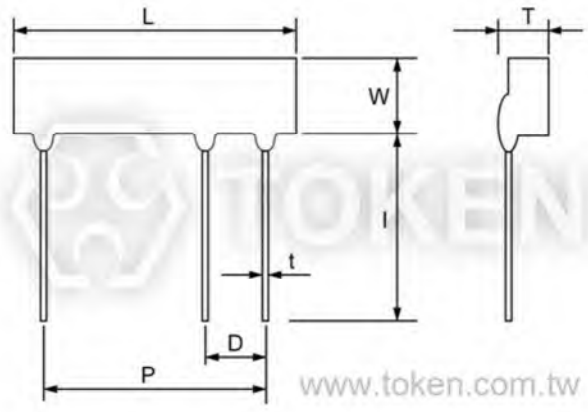
General Specifications

Composition Structure (HI83)

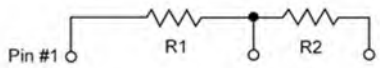
Membrane Material (a)	Ruthenium Paste
Base Material (b)	95% Aluminum Oxide, Al_2O_3
Encapsulating Material (c)	High Temperature Silicone Resin

Dimension Specifications (Unit: mm) (HI83)

Part Number	Power Rating (W)	Max. Working Voltage (KV)	L ±0.5 mm	W ±0.5 mm	P ±1 mm	D ±0.5 mm	I ±1 mm	T ±0.5 mm	t ±0.05 mm
HI83-04	1/4W	10	25	5	22.6	4	20	2	0.6
HI83-02	1/2W	15	35	5	32	5	20	2	0.6
HI83-10	1W	15	38	8	27	6	20	2	0.6
HI83-20	2W	20	45	10	42	6	20	2	0.6
HI83-30	3W	25	60	10	59	8	40	3.5	1
HI83-50	5W	30	80	20	76.5	10	40	3.5	1



Divider Dimension Specifications (Unit: mm) - (HI83)



Electrical Characteristics

Technical Characteristics - (HI83)

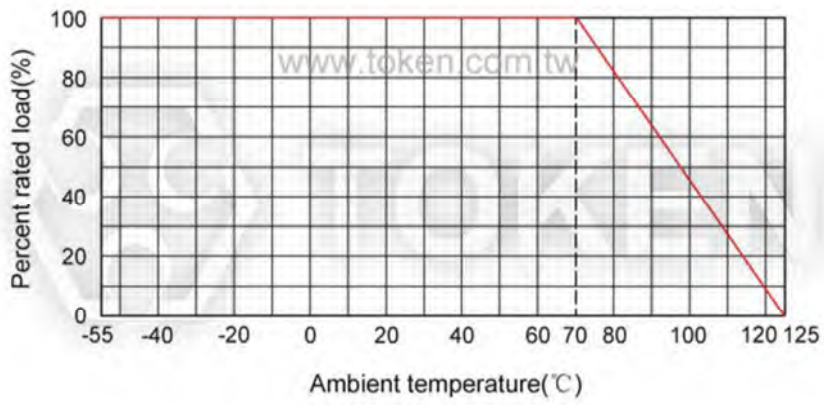
Part Number	HI83-04	HI83-02	HI83-10	HI83-20	HI83-30	HI83-50
Power rating at 70°C (W)	1/4W	1/2W	1W	2W	3W	5W
Limiting element voltage in air dc or ac pk (KV)	6KV	10KV	15KV	15KV	20KV	25KV
Resistance value (Ω)	10K–1G	50K–1G	100K–1G	100K–1G	100K–1G	100K–1G
Resistance tolerance (%)	1, 5					
Ratio tolerance (%)	0.25, 0.5, 1					
TCR (20°C to 70°C) (ppm/°C)	50, 100					
Tracking TCR (20°C to 70°C) (ppm/°C)	25, 50					
Standard values	E24 preferred for (R1 + R2) and R2					
Ambient temperature range (°C)	-55 to +125					
Insulation resistance at 500V (Ω)	>10G					
Dielectric strength of insulation (V)	>1000					

Environmental Characteristics

Environmental characteristics - (HI83)

Test Items	Condition	Spec.
Resistance Temp. Coeff.	-55°C ~ 125°C	±200 ~ ±300 ppm/°C
Overload	1.5 times of rated voltage, 15 Min. (do not exceed Max.. voltage)	ΔR ≤ ±(1%R + 0.05Ω)
Load Life	96 hours at rated power	ΔR ≤ ±(1%R + 0.1%Ω)

Derating Curve



Serpentine Pattern

Advance Technique of Non-Inductive & Serpentine Pattern (HI83)

Non-Inductive Performance:

- HI83 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 HI83 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.

Application Notes

High Voltage Divider Application Notes (HI83)

- Due to the high voltage that may occur between the terminals and any adjacent metal parts, the voltage divider should be installed at a sufficient distance from other conductors.
- For some ultra-high voltage applications, it is necessary to immerse the component in oil or SF6 gas or place it in a void-free silicone compound to reduce surface tracking or corona. The printed protection is right for these applications.
- The planar voltage divider consists of high value R1 and low value R2. The voltage division ratio of the divider is specified by Ratio R2: (R1 + R2).

Order Codes

Order Codes (HI83)

Example:
HI83-20 for a voltage ratio of 1:1000, with R1 = 99.9 megohms and R2 = 100 kilohms (total R1 + R2 = 100 megohms) at 50ppm/°C absolute and 25ppm/°C tracking TCR, 1% absolute and 0.5% ratio tolerance.

HI83	20	C2C3	100M	100K	FD

Part Number	Size		TCR (ppm/°C)		R1 + R2 (Ω)		R2 (Ω)		Resistance Tolerance (%)	
HI83	04	1/4W	C1C2	100ppm absolute and 50ppm tracking	100M	99MΩ + 1MΩ	1M	1MΩ	JF	5% absolute and 1% ratio
	02	1/2W	C1C3	100ppm absolute and 25ppm tracking	100M	99.9MΩ + 100KΩ	100K	100KΩ	FD	1% absolute and 0.5% ratio
	10	1W	C2C3	50ppm absolute and 25ppm tracking	150M	148.5MΩ + 1.5MΩ	1M5	1.5MΩ	FC	1% absolute and 0.25% ratio
	20	2W								
	30	3W								
	50	5W								

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.