

Version:  
November 22, 2017



# Precision High-Megohm High-Value Chip Resistors (HM)

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**▶ Product Introduction**

**Token (HM) non-magnetic chip resistor providing high resistance value and high-temperature application performance.**

**Features :**

- Non-magnetic.
- Non-standard values available.
- Low temperature and voltage dependency.
- Contact areas PtAg for glueing and soldering.
- Untrimmed for higher working voltage up to 6000V.

**Packaging :**

- Halogen-free, compliant to RoHS directive 2002/95/EC.
- Bilk in plastic bags or tubes - MOQ 100 pieces.
- Blister tape IEC60286-3 - MOQ 1000 pieces.
- Reel diameter 180mm or 330mm.

Token non-magnetic SMD resistor (HM) series, applied to the field of medical high magnetic fields, such as electronic circuits located in magnetic resonance (MRI) and computed tomography (CT), or in the extreme environment of oil and gas industries, such as downhole instruments for oil wells, or flight control in aerospace applications.

(HM) SMD Resistor series its junction area does not contain nickel, they are made of metal alloy PtAg, can be used as thick film slurry, suitable for roll coating or impregnation process to the packaging chipset parts area. The standard SMD soldering process can also be used in the bonding process of silver conductive epoxy resins. The bonding technology of conductive epoxy resin is mainly used in the case of welding technology can not be applied, such as the temperature sensitive component which is affected by the high welding temperature, or the semiconductor without cladding on the same board. PtAg terminals are suitable for high temperature welding applications, which can be higher than the 155°C of typical soldering.

Similarly, (HM) chip resistors do not contain organic materials, no tin or tin lead layer, and resistance and conductive layer at 850°C high-temperature sintering, so the resistor chip will not have a substantial change, and has a stable electrical characteristics. The terminal material also affects the VCR (the voltage coefficient of the resistor), which is an important characteristic of the high-voltage resistor, and lower VCR is also designed for the Token of the non-magnetic SMD resistor.

Token non-magnetic thick flim chip resistor (HM) series, it consists of two main categories: (HMM) Precision High Value Chips and (HMS) Conventional Precision Megohm Chips. Sizes are 0402, 0603, 0805, 1206, 1210, 2512, and 4020 available. Resistance range from 100KΩ to the highest value 10TΩ. Operating voltage can reach 6000V. Precision tolerance has 0.25%/0.5%/1%/2%/5%/10%/20%/30% alternative. The temperature coefficient is low to 25ppm/°C. The voltage factor VCR can be specified within the range, from low to 25ppm/v.

(HM) chips compliant with RoHS and lead-free standards. Provide more competitive prices and fast delivery services. For technical requirements and special applications outside the specification, please contact the business representative of the Token Electronics, or link to Token official website "[High Voltage Resistors](http://www.token.com.tw)" to get more information.



## Dimensions

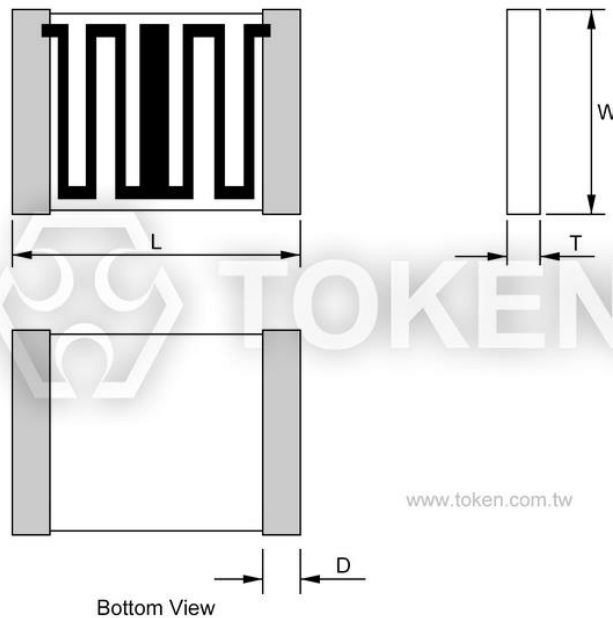
### Precision Non-magnetic Chip Dimensions (Unit: mm)

(HMM) Precision High Value Chip Resistors				
Part Number	L (mm)	W (mm)	T (mm)	D (mm)
HMM-0805	2.00 <sup>+0.15/-0.05</sup>	1.25 <sup>+0.15/-0.05</sup>	0.40 <sup>+0.15/-0.05</sup>	0.30 <sup>+0.20/-0.10</sup>
HMM-1206	3.20 <sup>+0.15/-0.05</sup>	1.50 <sup>+0.20/-0.05</sup>	0.40 <sup>+0.15/-0.05</sup>	0.30 <sup>+0.20/-0.10</sup>
HMM-1210	3.20 <sup>+0.15/-0.05</sup>	2.50 <sup>+0.20/-0.05</sup>	0.50 <sup>+0.15/-0.05</sup>	0.80 <sup>±0.20</sup>
HMM-2010	5.10 <sup>+0.15/-0.05</sup>	2.50 <sup>+0.20/-0.05</sup>	0.60 <sup>+0.20/-0.10</sup>	1.20 <sup>±0.20</sup>
HMM-2512	6.30 <sup>+0.15/-0.05</sup>	3.50 <sup>+0.20/-0.05</sup>	0.60 <sup>+0.15/-0.05</sup>	0.90 <sup>±0.20</sup>
HMM-4020	10.20 <sup>+0.20/-0.05</sup>	5.10 <sup>+0.20/-0.05</sup>	0.60 <sup>+0.20/-0.10</sup>	0.90 <sup>±0.20</sup>

Note: L = Length, H = Width, T = Thickness, D = width of wrap around ◦

(HMS) Conventional Precision Megohm Chip Resistors				
Part Number	L (mm)	W (mm)	T (mm)	D (mm)
HMS-0402	1.04 <sup>±0.05</sup>	0.50 <sup>±0.05</sup>	0.30 <sup>±0.05</sup>	0.10 <sup>+0.10/-0.05</sup>
HMS-0603	1.50 <sup>+0.15/-0.05</sup>	0.80 <sup>+0.15/-0.05</sup>	0.40 <sup>+0.15/-0.05</sup>	0.20 <sup>+0.20/-0.10</sup>
HMS-0805	2.00 <sup>+0.15/-0.05</sup>	1.25 <sup>+0.15/-0.05</sup>	0.40 <sup>+0.15/-0.05</sup>	0.30 <sup>+0.20/-0.10</sup>
HMS-1206	3.20 <sup>+0.15/-0.05</sup>	1.50 <sup>+0.20/-0.05</sup>	0.40 <sup>+0.15/-0.05</sup>	0.30 <sup>+0.20/-0.10</sup>
HMS-1210	3.20 <sup>+0.15/-0.05</sup>	2.50 <sup>+0.20/-0.05</sup>	0.50 <sup>+0.15/-0.05</sup>	0.80 <sup>±0.20</sup>
HMS-2512	6.30 <sup>+0.15/-0.05</sup>	3.50 <sup>+0.20/-0.05</sup>	0.60 <sup>+0.15/-0.05</sup>	0.90 <sup>±0.20</sup>
HMS-4020	10.20 <sup>+0.15/-0.05</sup>	5.10 <sup>+0.20/-0.05</sup>	0.60 <sup>+0.15/-0.05</sup>	0.90 <sup>±0.20</sup>

Note: L = Length, H = Width, T = Thickness, D = width of wrap around ◦



Precision Non-magnetic Chip Dimensions (Unit: mm)

## ► HMM Electrical characteristics

### Technical Characteristics - (HMM)

Part Number	Power Rating P <sub>70</sub> (mW)	Working Voltage (V)		Resistance Range (Ω)	Tolerance (%)	TCR <sup>(2)</sup> (ppm/°C)	VCR <sup>(3)</sup> (ppm/V)
		trimmed	untrimmed				
HMM-0805	125	200	600	100K - 100M	0.5/1/5/10	TC25/50/100	<50ppm/V
				>100M - 1G	2/5/10/20	TC50/100/250	<250ppm/V
				>1G - 10G	5/10/20	TC100/250	<500ppm/V
				>10G - 100G	10/20/30	TC1000/2000	<1000ppm/V
				>100G - 1T	-	-	-
				>1T - 10T	-	-	-
HMM-1206	250	600	1000	100K - 100M	0.5/1/2/5/10	TC25/50/100	<50ppm/V
				>100M - 1G	2/5/10/20	TC50/100/250	<100ppm/V
				>1G - 10G	5/10/20	TC100/250	<250ppm/V
				>10G - 100G	10/20/30	TC500/1000	<1000ppm/V
				>100G - 1T	10/20/30	TC1000/2000	<2000ppm/V
				>1T - 10T	-	-	-
HMM-1210	350	1000	1200	100K - 100M	0.5/1/2/5/10	TC25/50/100	<25ppm/V
				>100M - 1G	1/2/5/10/20	TC25/50/100	<50ppm/V
				>1G - 10G	2/5/10/20	TC50/100	<100ppm/V
				>10G - 100G	5/10/20/30	TC500/1000	<500ppm/V
				>100G - 1T	5/10/20/30	TC500/1000	<1000ppm/V
				>1T - 10T	-	-	-
HMM-2010	500	1500	2000	100K - 100M	0.5/1/2/5/10	TC25/50/100	<25ppm/V
				>100M - 1G	1/2/5/10/20	TC25/50/100	<50ppm/V
				>1G - 10G	2/5/10/20	TC50/100	<100ppm/V
				>10G - 100G	5/10/20/30	TC250/500	<500ppm/V
				>100G - 1T	5/10/20/30	TC500/1000	<1000ppm/V
				>1T - 10T	-	-	-
HMM-2512	1000 <sup>(1)</sup>	2000	3000	100K - 100M	0.5/1/2/5/10	TC25/50/100	<10ppm/V
				>100M - 1G	1/2/5/10/20	TC25/50/100	<25ppm/V
				>1G - 10G	2/5/10/20	TC500/100	<100ppm/V
				>10G - 100G	5/10/20/30	TC250/500	<250ppm/V
				>100G - 1T	5/10/20/30	TC500/1000	<500ppm/V
				>1T - 10T	10/20/30	TCR VCR	on request
HMM-4020	1500 <sup>(1)</sup>	4000	6000	100K - 100M	0.25/.../10	TC25/50/100	<10ppm/V
				>100M - 1G	0.5/.../20	TC25/50/100	<10ppm/V
				>1G - 10G	1/2/5/10/20	TC25/50/100	<25ppm/V
				>10G - 100G	2/5/10/20/30	TC250/500	<100ppm/V
				>100G - 1T	5/10/20/30	TC500/1000	<250ppm/V
				>1T - 10T	10/20/30	TCR VCR	on request

**Note:**

- <sup>(1)</sup> At continuous power dissipation the dimensions of solder-pads have to secure sufficient heat-conduction.
- <sup>(2)</sup> TCR 25/50: Temperature range +25°C ~ +85°C ; <sup>(3)</sup> VCR: Typical values.
- Lower values of tolerance, TCR and VCR on request and agreement.

## Environmental Characteristic

Temperature range	-55°C ~ +155°C		
Climatic category acc. to IEC 60068	55/155/56		
Max. soldering temperature acc. IEC60068 T2-20, Ta Meth.1 <sup>(4)</sup>	235°C 5s		
Max. soldering temperature acc. IEC60068 T2-20, Tb Meth.1A	260°C 10s		
Long term stability	<1G	<10G	≥10G
Storage 125°C/1000h	<0.5%	<1%	<2%
Load life 70°C/1000h	<0.25%	<0.5%	<1%

**Note:**

- <sup>(4)</sup> Up to 6 months after shipment resp, at storage in Nitrogen.
- Data not specified according CECC 40401-802.

## ► HMS Electrical characteristics

### Technical Characteristics - (HMS)

Part Number	Power Rating P <sub>70</sub> (mW)	Working Voltage (V)		Resistance Range (Ω)	Tolerance (%)	TCR <sup>(2)</sup> (ppm/°C)	VCR <sup>(3)</sup> (ppm/V)
		trimmed	untrimmed				
HMS-0402	50	30	90	1M - 100M	5/10/20	TC100/250	<500ppm/V
				>100M - 500M	5/10/20	TC250/500	<1000ppm/V
				>500M - 1G	5/10/20	TC250/500	<1000ppm/V
				>1G - 10G	10/20/30	TC1000/2000	<2000ppm/V
				>10G - 100G	-	-	-
				>100G - 1T	-	-	-
HMS-0603	75	75	200	1M - 100M	1/5/10/20	TC100/250	<250ppm/V
				>100M - 500M	2/5/10/20	TC100/250	<250ppm/V
				>500M - 1G	5/10/20	TC250/500	<500ppm/V
				>1G - 10G	5/10/20/30	TC500/1000	<2000ppm/V
				>10G - 100G	10/20/30	TC1000/2000	<5000ppm/V
				>100G - 1T	-	-	-
HMS-0805	125	100	300	1M - 100M	1/5/10/20	TC50/100	<100ppm/V
				>100M - 500M	2/5/10/20	TC100/250	<250ppm/V
				>500M - 1G	5/10/20	TC250/500	<250ppm/V
				>1G - 10G	5/10/20	TC500/1000	<1000ppm/V
				>10G - 100G	10/20/30	TC1000/2000	<2000ppm/V
				>100G - 1T	10/20/30	TC3000	<5000ppm/V
HMS-1206	250	200	600	1M - 100M	1/5/10/20	TC25/50/100	<100ppm/V
				>100M - 500M	2/5/10/20	TC50/100/250	<100ppm/V
				>500M - 1G	5/10/20	TC100/250	<250ppm/V
				>1G - 10G	5/10/20	TC500/1000	<1000ppm/V
				>10G - 100G	10/20/30	TC1000/2000	<2000ppm/V
				>100G - 1T	10/20/30	TC3000	<5000ppm/V
HMS-1210	350	300	900	1M - 100M	1/5/10/20	TC25/50/100	<50ppm/V
				>100M - 500M	2/5/10/20	TC50/100/250	<100ppm/V
				>500M - 1G	5/10/20	TC100/250	<100ppm/V
				>1G - 10G	5/10/20	TC250/500	<500ppm/V
				>10G - 100G	5/10/20	TC500/1000	<1000ppm/V
				>100G - 1T	5/10/20/30	TC1000/2000	<2000ppm/V
HMS-2512	1000 <sup>(1)</sup>	1000	2000	1M - 100M	1/.../20	TC25/50/100	<10ppm/V
				>100M - 500M	1/5/10/20	TC25/50/100	<25ppm/V
				>500M - 1G	1/5/10/20	TC100/250	<25ppm/V
				>1G - 10G	2/5/10/20	TC250/500	<100ppm/V
				>10G - 100G	5/10/20	TC250/500	<250ppm/V
				>100G - 1T	5/10/20	TC500/1000	<500ppm/V
HMS-4020	1500 <sup>(1)</sup>	4000	6000	1M - 100M	1/.../10	TC25/50/100	<5ppm/V
				>100M - 500M	0.5/1/5/10/20	TC25/50/100	<10ppm/V
				>500M - 1G	1/5/10/20	TC25/50/100	<10ppm/V
				>1G - 10G	2/5/10/20	TC50/100	<25ppm/V
				>10G - 100G	5/10/20/30	TC100/250	<100ppm/V
				>100G - 1T	5/10/20/30	TC250/500	<250ppm/V

**Note:**

- <sup>(1)</sup> At continuous power dissipation the dimensions of solder-pads have to secure sufficient heat-conduction.
- <sup>(2)</sup> TCR 25/50: Temperature range +25°C ~ +85°C ; <sup>(3)</sup> VCR mesdured between 10V and 100V.
- Lower values of tolerance, TCR and VCR on request and agreement.

## Environmental Characteristic

Temperature range	-55°C ~ +155°C		
Climatic category acc. to IEC 60068	55/155/56		
Max. soldering temperature acc. IEC60068 T2-20, Ta Meth.1 <sup>(4)</sup>	235°C 5s		
Max. soldering temperature acc. IEC60068 T2-20, Tb Meth.1A	260°C 10s		
Long term stability	<1G	<10G	≥10G
Storage 125°C/1000h	<1%	<2%	<5%
Load life 70°C/1000h	<0.5%	<1%	<2%

**Note:**

- <sup>(4)</sup> Up to 6 months after shipment resp, at storage in Nitrogen.
- Data not specified according CECC 40401-802.



## Order Codes

### Order Codes (HMM) - Precision High Value Chip Resistors

HMM	0805		1G		M		E	
Part Number	Rated Power (W)		Resistance Value ( $\Omega$ )		Resistance Tolerance (%)		TCR (ppm/ $^{\circ}$ C)	
HMM	0805	125mW	1M1	1.1M $\Omega$	C	$\pm 0.25\%$	C	$\pm 25\text{ppm}/^{\circ}\text{C}$
	1206	250mW	110M	110M $\Omega$	D	$\pm 0.5\%$	D	$\pm 50\text{ppm}/^{\circ}\text{C}$
	1210	350mW	1G5	1.5G $\Omega$	F	$\pm 1\%$	E	$\pm 100\text{ppm}/^{\circ}\text{C}$
	2010	500mW	10G	10G $\Omega$	G	$\pm 2\%$	L	$\pm 250\text{ppm}/^{\circ}\text{C}$
	2512	1000mW	1T	1T $\Omega$	J	$\pm 5\%$	I	$\pm 500\text{ppm}/^{\circ}\text{C}$
	4020	1500mW	10T	10T $\Omega$	K	$\pm 10\%$	R	$\pm 1000\text{ppm}/^{\circ}\text{C}$
					M	$\pm 20\%$	S	$\pm 2000\text{ppm}/^{\circ}\text{C}$
					N	$\pm 30\%$		

### Order Codes (HMS) - Conventional Precision Megohm Chip Resistors

HMS	0402		1G		M		E	
Part Number	Rated Power (W)		Resistance Value ( $\Omega$ )		Resistance Tolerance (%)		TCR (ppm/ $^{\circ}$ C)	
HMS	0402	50mW	1M1	1.1M $\Omega$	D	$\pm 0.5\%$	C	$\pm 25\text{ppm}/^{\circ}\text{C}$
	0603	75mW	110M	110M $\Omega$	F	$\pm 1\%$	D	$\pm 50\text{ppm}/^{\circ}\text{C}$
	0805	125mW	1G5	1.5G $\Omega$	G	$\pm 2\%$	E	$\pm 100\text{ppm}/^{\circ}\text{C}$
	1206	250mW	10G	10G $\Omega$	J	$\pm 5\%$	L	$\pm 250\text{ppm}/^{\circ}\text{C}$
	1210	350mW	1T	1T $\Omega$	K	$\pm 10\%$	I	$\pm 500\text{ppm}/^{\circ}\text{C}$
	2512	1000mW			M	$\pm 20\%$	R	$\pm 1000\text{ppm}/^{\circ}\text{C}$
	4020	1500mW			N	$\pm 30\%$	S	$\pm 2000\text{ppm}/^{\circ}\text{C}$
							T	$\pm 3000\text{ppm}/^{\circ}\text{C}$

- Note: If no requirements for TCR, measuring voltage and taping are given, the standard value (highest value in table) will be supplied, measuring voltage of 10V is used and packaging is bulk.



## ► 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.

