EMI Cores

ESD-R-NC Toroidal Nanocrystal Cores for Round Cables for Low & High Frequency (with case & with fixing base)

Overview

The KEMET ESD-R-NC Series solid toroidal cores are designed for use on round cables. KEMET's nanocrystal material allows effective noise suppression in a wide frequency range, which is an impressive solution for any conducted or radiated noise in the kHz to MHz regions. The base type allows fixing the core in the application to avoid contact with other components or stabilizing the cables, and in addition the base's structure can connect the cores together for make it even easier to install.

EMI cores are part of a family of passive components which address the issues of noise or electromagnetic interference (EMI) in circuits or systems.

Applications

- General purpose inverters
- HVAC
- Air conditioners
- Power conditioners
- Industrial equipment
- Business multifunction printers

Benefits

- Wide frequency range
- Solid construction
- From small to large diameter ring type
- Wide operating temperature range from −40°C to +120°C for standard type and −40°C to +130°C for base type
- UL94 V-0 flame retardant rated case
- Easy to install the with fixing base type with two screws

Standard Case Type

With Fixing Base Type

Part Number System

ESD-	R-	291216H-	NC	23	-BT
Series	Shape Type	Core Size OD & ID & T Code (mm)	Core Material	Material Specification	Type
ESD-	Ring	See Table 1	Nanocrystal	21 23	Blank = Standard case BT = With fixing base

Turns and Impedance Characteristics

When the desired performance of an EMI core cannot be obtained with a single pass through the core, the impedance characteristics can be changed with multiple turns.

A turn is counted by the number of lead-wire windings which pass through the inner hole of the core. Windings on the outside of the core do not count.

See Figure 1 for examples of one, two, and three turns.

Adding turns will result in higher impedance while also lowering the effective frequency range.

See Figure 2 for an example.

Figure 1 – How to count turns

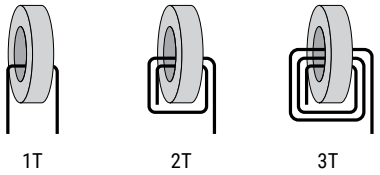
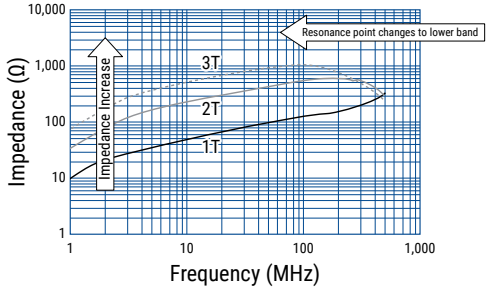


Figure 2 – Relationship between impedance and turn count. (Representative example: ESD-R-16C)

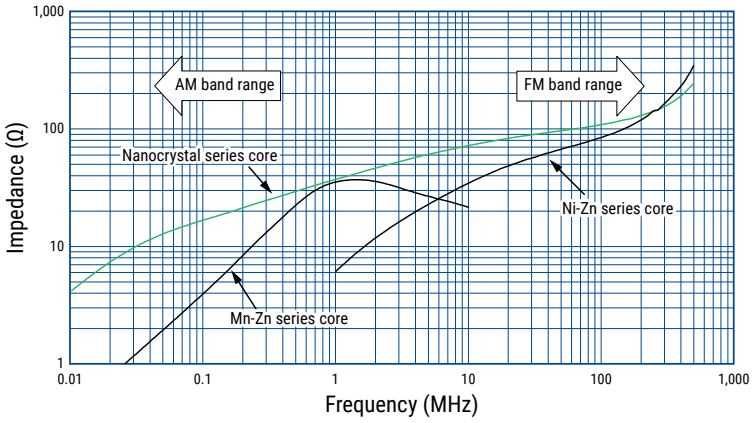


Core Material and Effective Frequency Range

The Nanocrystal core material is typically effective for frequencies in the broadband range. See Figure 3.

It is recommended to measure the actual frequency range effectiveness in the target application.

Figure 3 - Effective band range of Nanocrystal core material. (Representative example, measured with same-dimension ring core)



Magnetic Permeability of Ferrite Material

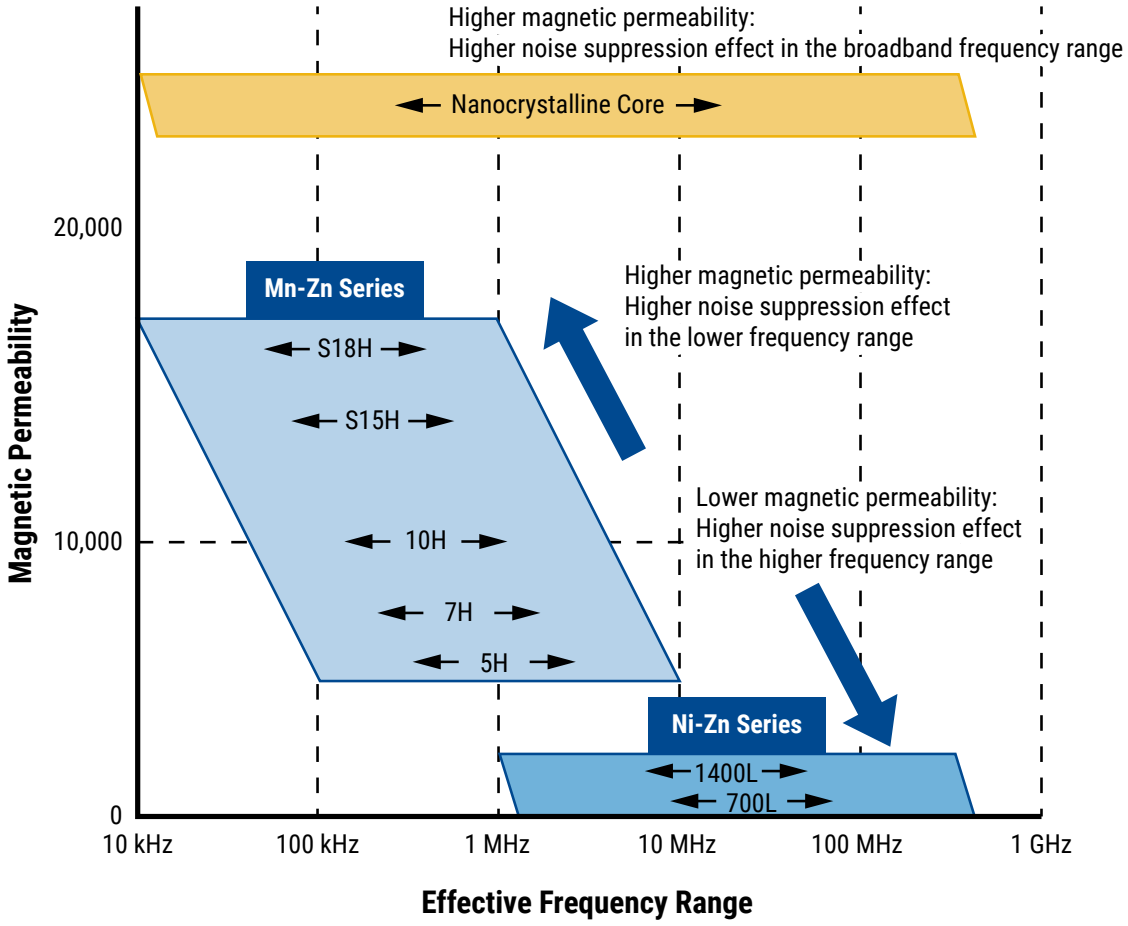
In order to achieve most efficient noise reduction, it is important to select the material according to the target frequency band. Depending on its magnetic permeability, a particular ferrite material or metal material will be effective in a certain frequency band. A schematic representation of the relationship between the magnetic permeability of each material and the corresponding effective band range is shown in Figure 4.

Ferrite materials with higher magnetic permeability are effective in the lower frequency range, while those with lower magnetic permeability are effective in the higher frequency range. Thus, Mn-Zn products are mainly used for reducing conduction noise, while Ni-Zn products are commonly used for radiation noise countermeasures. Metal materials on the other hand are effective throughout the broadband frequency range, in low as well as high frequencies.

The effective frequency range varies depending on core shape, size and number of turns. This frequency dependence of the magnetic permeability as shown in the figure serves for reference purposes only and it should be tested on the actual device to determine its effectiveness.

S18H, S15H, 10H, 7H, 5H, 1400L and 700L are KEMET's proprietary ferrite material names.
Other materials can also be available on request.

Figure 4 - Relationship between the magnetic permeability of each material and its effective frequency range

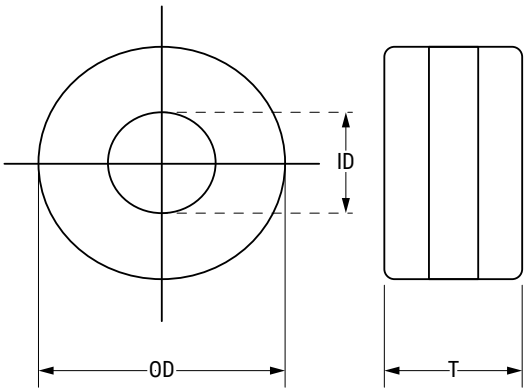


Environmental Compliance

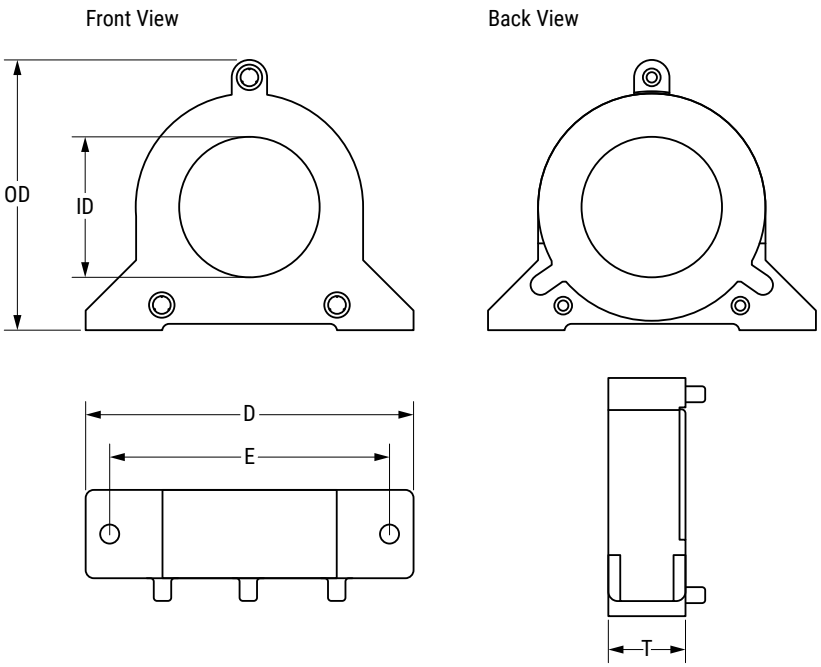
All KEMET EMI cores are RoHS compliant.

Dimensions – Millimeters

Standard Case Type



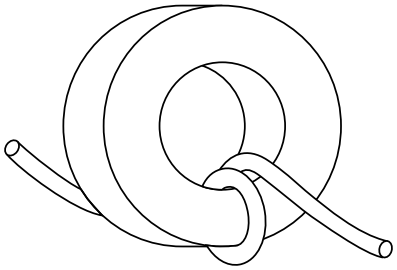
With Fixing Base Type



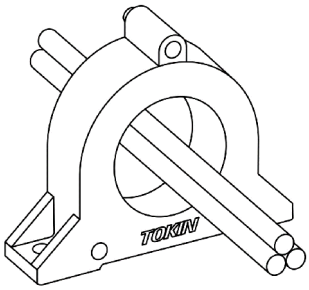
See Table 1 for dimensions

Installation Example

Standard Case Type



With Fixing Base Type

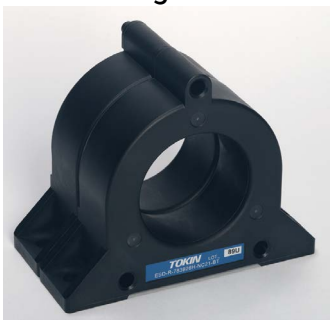


2x M5 screws for ESD-R-783926H-NC21-BT
2x M6 screws for ESD-R-1317426H-NC21-BT

Front

Back

Connecting



Performance Characteristics

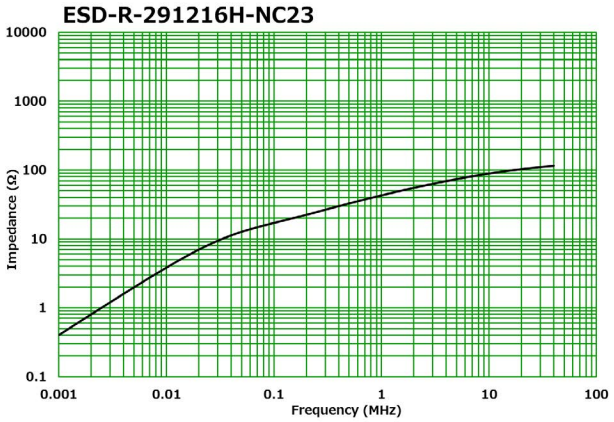
Item	Performance Characteristics
Operating temperature	Standard case : −40°C to +120°C
	With fixing base : −40°C to +130°C
Frequency range	Broadband (low and high) frequency
Outer diameter	29.0 – 146.0 mm
Inner diameter	12.7 – 96.0 mm
Thickness	16.0 – 37.0 mm
Type	Case, and with fixing base
Case flame resistant rating	UL94 V–0
Material	Nanocrystal

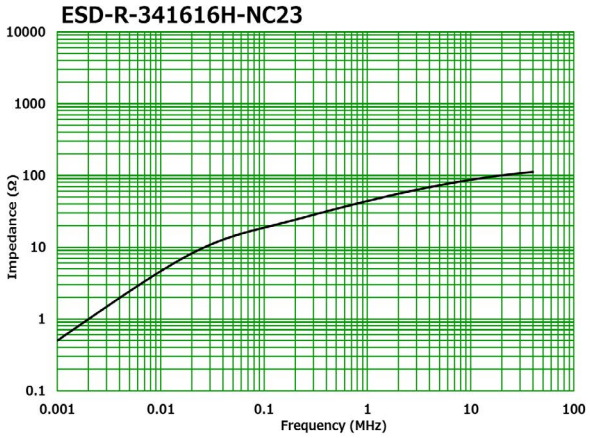
Table 1 – Ratings & Part Number Reference

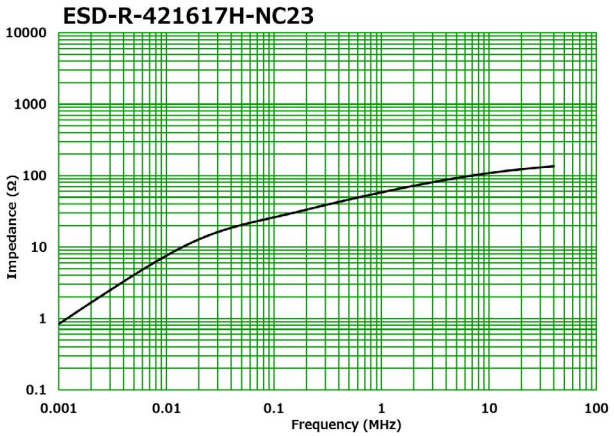
Part Number	Dimensions (mm)					Weight	Case Color	Frequency Range[1]		Material
	OD Maximum	ID	T Maximum	D Maximum	E	(g)		≤ 10 MHz (AM band range)	≤ 300 MHz (FM band range)	
ESD-R-291216H-NC23	29.0	12.7 ±1.0	16.0	-	-	20	Black with yellow tape	X	X	Nanocrystal
ESD-R-341616H-NC23	34.0	16.5 ±1.0	16.0	-	-	30	Black with yellow tape	X	X	Nanocrystal
ESD-R-421617H-NC23	42.0	16.7 ±1.0	17.0	-	-	57	Black with yellow tape	X	X	Nanocrystal
ESD-R-512936H-NC23	51.0	29.5 ±1.0	36.0	-	-	145	Black with yellow tape	X	X	Nanocrystal
ESD-R-512419H-NC23	51.0	24.4 ±1.0	19.0	-	-	68	Black with yellow tape	X	X	Nanocrystal
ESD-R-613325H-NC23	61.0	33.2 ±1.0	25.0	-	-	186	Black with yellow tape	X	X	Nanocrystal
ESD-R-854626H-NC23	85.0	46.0 ±1.0	26.0	-	-	345	Black with yellow tape	X	X	Nanocrystal
ESD-R-1105826H-NC23	110.0	58.5 ±1.0	26.0	-	-	615	Black with yellow tape	X	X	Nanocrystal
ESD-R-1469637H-NC23	146.0	96.0 ±1.0	37.0	-	-	1200	Black with yellow tape	X	X	Nanocrystal
ESD-R-783926H-NC21-BT	78.0	39.5 Min.	26.0	95.0	80.0 ±0.5	186	Black	X	X	Nanocrystal
ESD-R-1317426H-NC21-BT	131.0	74.0 Min.	26.0	181.0	150.0 ±0.5	560	Black	X	X	Nanocrystal

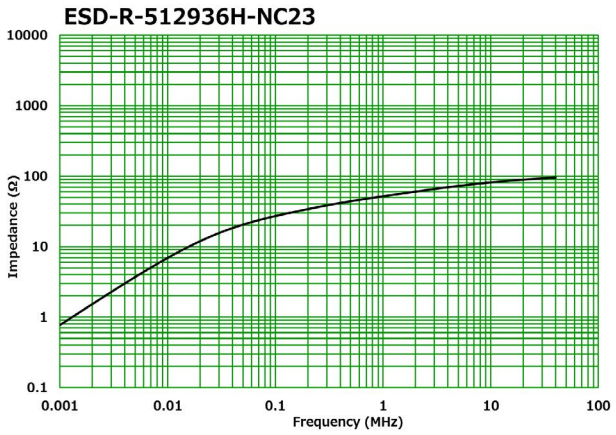
[1] *Frequency range is for reference only. Please test with actual device before use.*

Impedance vs. Frequency



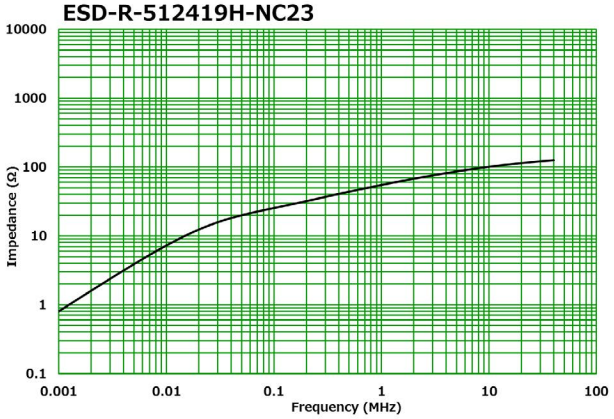




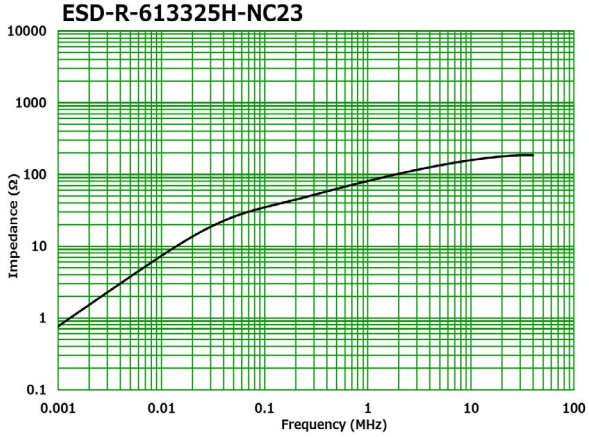


Impedance vs. Frequency cont.

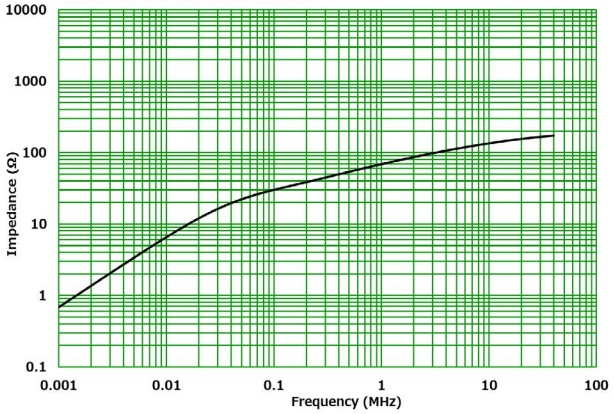
ESD-R-512419H-NC23



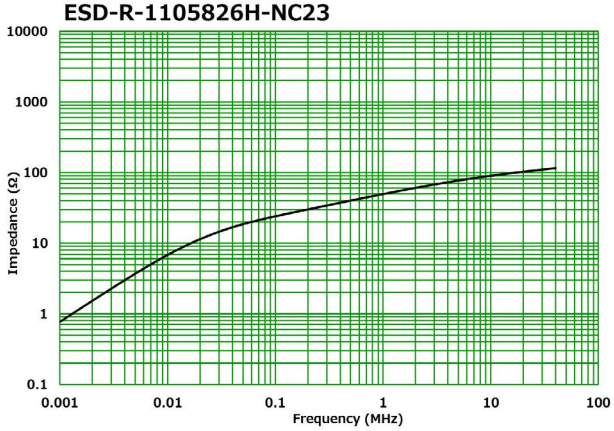
ESD-R-613325H-NC23



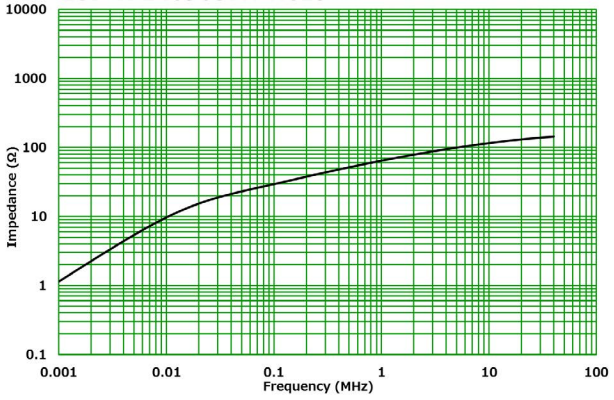
ESD-R-854626H-NC23



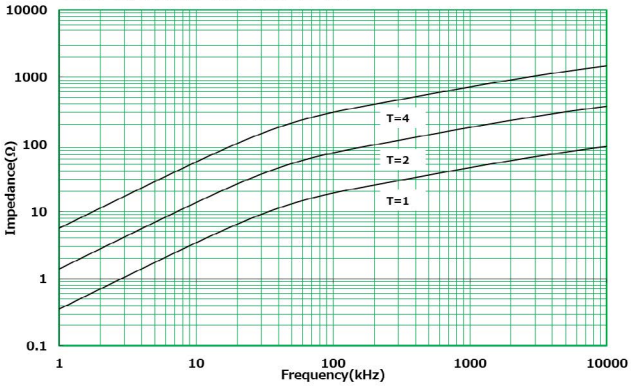
ESD-R-1105826H-NC23



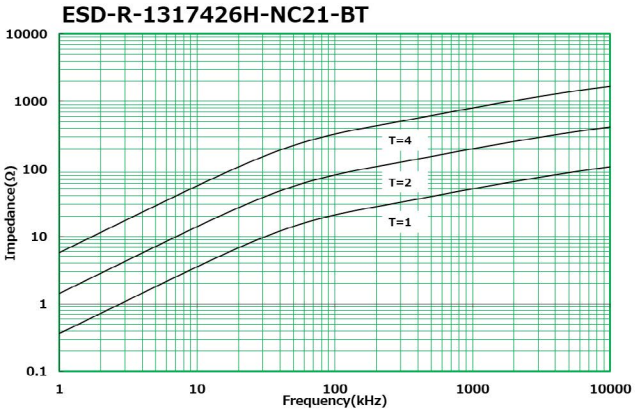
ESD-R-1469637H-NC23



ESD-R-783926H-NC21-BT



Impedance vs. Frequency cont.



Packaging

Part Number	Packaging Type	Pieces per Box
ESD-R-291216H-NC23	Tray	300
ESD-R-341616H-NC23		
ESD-R-421617H-NC23		200
ESD-R-512936H-NC23		60
ESD-R-512419H-NC23		100
ESD-R-613325H-NC23		60
ESD-R-854626H-NC23		24
ESD-R-1105826H-NC23		12
ESD-R-1469637H-NC23		6
ESD-R-783926H-NC21-BT		30
ESD-R-1317426H-NC21-BT		9

Handling Precautions

EMI Cores should be stored in normal working environments. While the EMI Cores themselves are quite robust in other environments, avoid exposure to high temperatures, high humidity, corrosive atmospheres and long term storage for case, snap-on and split types.

KEMET recommends that maximum storage temperature not exceed 40°C and maximum storage humidity not exceed 75% relative humidity. Atmospheres should be free of chlorine, sulfur and alkali bearing compounds. Avoid also storage near strong magnetic fields as this might magnetize the product.

Temperature fluctuations should be minimized to avoid condensation or cracks on the parts. Mechanical shocks can bring to cracks as well.

Export Control

For customers in Japan
For products that are controlled items subject to the “Foreign Exchange and Foreign Trade Law” of Japan, the export license specified by the law is required for export.

For customers outside Japan
EMI Core products should not be used or sold for use in the development, production, stockpiling or utilization of any conventional weapons or mass-destructive weapons (nuclear weapons, chemical or biological weapons, or missiles), or any other weapons.

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