EMI Cores

ESD-FPL Series Solid Cores for Flat Cables for High Frequency (Bare)

Overview

The KEMET ESD-FPL Series solid cores are designed for use on flat cables. A wide range of Nickel Zinc (NiZn) options are available in bare type and allows for targeting of specific high frequency ranges.
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

- Office equipment
- Home appliances
- Inkjet printers
- Consumer electronics
- Industrial equipment
- Test and measurement equipment
- Medical equipment
- Audio-visual equipment

Benefits

- NiZn ≤ 500 MHz (FM band range) options available
- Solid construction
- Wide range of products available
- Thin and minimal gap solutions available

Part Number System

ESD-	FPL-	14.5-	3
Series	Form Type	Core Size Outer Length Code (mm)	Core Size Thickness (mm)
ESD-	Solid	See Table 1	See Table 1

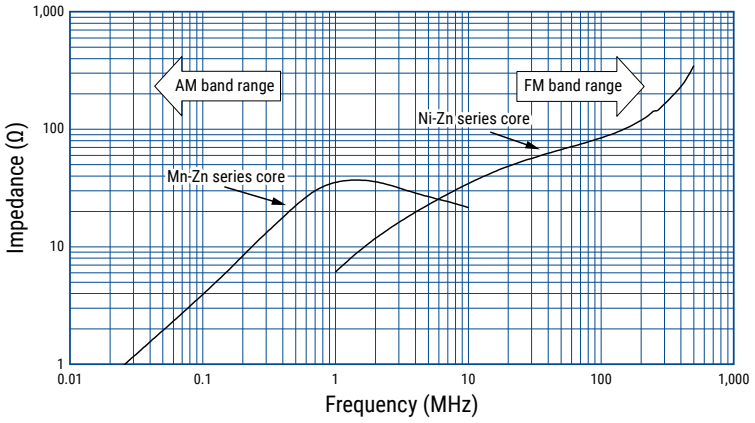
Core Material and Effective Frequency Range

There are two ferrite material options for KEMET EMI Cores: Nickel-Zinc (NiZn) and Manganese Zinc (MnZn). Each core material has a different resistance and effective frequency range. The MnZn core material has a lower resistance compared to the NiZn; therefore, adequate insulation is required before use.

The NiZn core material is typically effective for frequencies in the MHz band range such as the FM-band, while the MnZn core material is typically effective for the kHz band range such as the AM-band. See Figure 1.

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

Figure 1 – Effective band range of Mn-Zn and Ni-Zn ferrite core material. (Representative example, measured with same-dimension ring core)



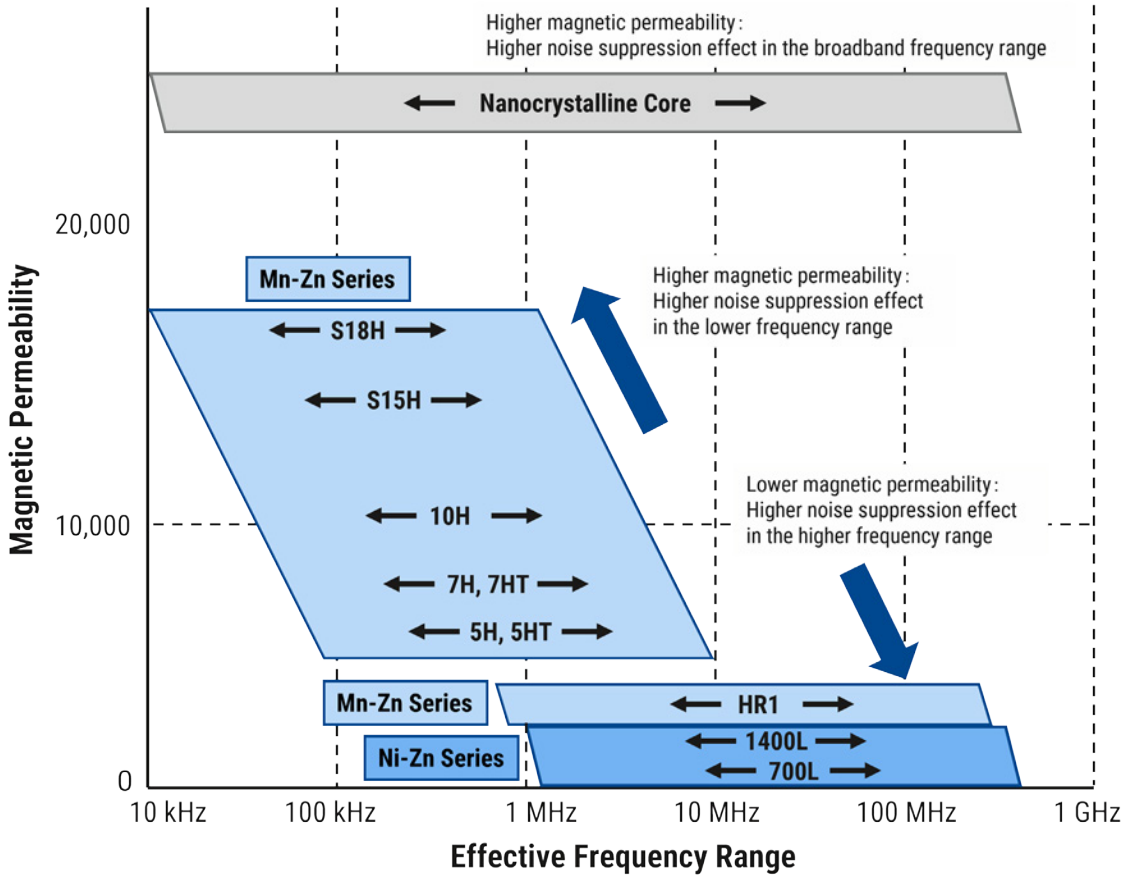
Magnetic Permeability of Ferrite Material

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 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.
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.

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, 7HT, 5H, 5HT, HR1, 1400L and 700L are KEMET's proprietary ferrite material names.
Other materials can also be available on request.

Figure 2 - Relationship between the magnetic permeability of each material and its effective frequency range



Environmental Compliance

All KEMET EMI cores are RoHS compliant.

Dimensions – Millimeters

Figure 1

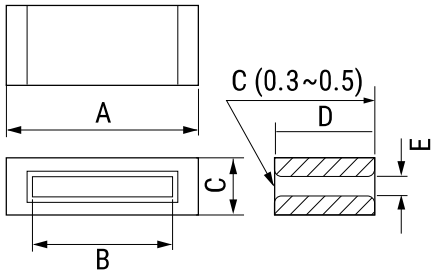


Figure 2

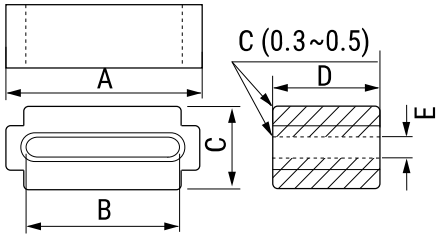
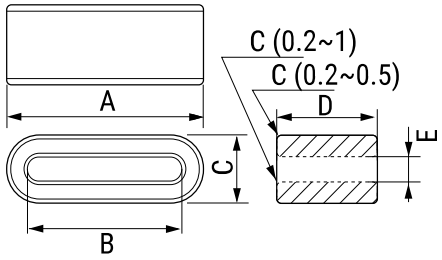
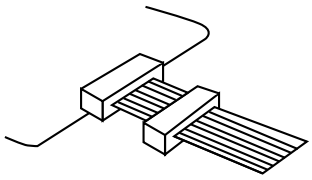


Figure 3



See Table 1 for dimensions

Installation Example



Performance Characteristics

Item	Performance Characteristics
Operating temperature	–25°C to +85°C
Frequency range	High frequency
Outer length	14.5 – 80.0 mm
Outer width	2.75 – 12.0 mm
Inner length	11.0 – 68.6 mm
Inner width	0.7 – 2.2 mm
Thickness	3.0 – 15.0 mm
Type	Bare
Material	NiZn 700L

Table 1A – Ratings & Part Number Reference

Part Number	Dimensions (mm)					Weight	Applicable Cable	Shape	Remarks	Frequency Range[1]	Material	
	A	B	C	D	E	(g)				≤ 500 MHz (FM band range)	MnZN	NiZn
ESD-FPL-14.5-3	14.5 ±0.5	11.0 ±0.7	2.75 ±0.3	3.0 ±0.3	0.80 ±0.15	0.40	FPC, FFC	Figure 3	Thin type	X	–	700L
ESD-FPL-14.5-5	14.5 ±0.7	11.0 ±0.8	2.75 ±0.4	5.0 ±0.5	0.80 ±0.30	0.70	FPC, FFC	Figure 3	Thin type	X	–	700L
ESD-FPL-14.5-8	14.5 ±0.7	11.0 ±0.8	2.75 ±0.4	8.0 ±0.5	0.80 ±0.30	1.10	FPC, FFC	Figure 3	Thin type	X	–	700L
ESD-FPL-14.5-10	14.5 ±0.6	11.0 ±0.8	2.75 ±0.4	10.0 ±0.5	0.80 ±0.20	1.40	FPC, FFC	Figure 3	Thin type	X	–	700L
ESD-FPL-16-12	16.0 ±0.5	11.5 ±0.3	4.5 ±0.3	12.0 ±0.4	0.85 ±0.15	3.40	8 Core	Figure 3		X	–	700L
ESD-FPL-18-8	18.0 ±1.0	14.0 ±0.6	5.0 ±0.4	8.0 ±0.5	1.00 ±0.20	2.90	10 Core	Figure 3		X	–	700L
ESD-FPL-18-12	18.0 ±0.7	14.0 ±0.5	5.0 ±0.3	12.0 ±0.3	1.00 ±0.15	4.50	FPC, FFC	Figure 3		X	–	700L
ESD-FPL-18.7-3	18.7 ±0.6	15.0 ±0.6	2.75 ±0.4	3.0 ±0.5	0.70 ±0.20	0.50	FPC, FFC	Figure 3	Thin type	X	–	700L
ESD-FPL-18.7-12	18.7 ±0.6	15.0 ±0.6	2.75 ±0.4	12.0 ±0.5	0.70 ±0.20	2.10	FPC, FFC	Figure 3	Thin type	X	–	700L
ESD-FPL-21-8	21.0 ±0.8	17.0 ±0.7	5.0 ±0.3	8.0 ±0.3	0.80 ±0.30	3.50	FPC, FFC	Figure 3		X	–	700L
ESD-FPL-13	23.8 ±0.7	18.8 ±0.5	6.3 ±0.5	15.0 ±0.6	1.10 ±0.50	9.30	13 Core	Figure 3		X	–	700L
ESD-FPL-24.5-8	24.5 ±1.0	20.0 ±0.8	4.5 ±0.5	8.0 ±0.5	0.90 ±0.20	3.50	FPC, FFC	Figure 3		X	–	700L
ESD-FPL-25-12	25.0 ±0.9	21.0 ±0.8	5.0 ±0.5	12.0 ±0.6	0.85 ±0.35	5.70	16 Core	Figure 3		X	–	700L
ESD-FPL-27-8	27.0 ±1.0	22.0 ±0.7	6.5 ±0.3	8.0 ±0.2	1.30 ±0.15	5.50	16 Core	Figure 3		X	–	700L
ESD-FPL-7	28.0 ±0.6	23.5 ±0.5	7.7 ±0.3	7.0 ±0.6	1.50 ±0.25	5.80	16 Core	Figure 2		X	–	700L
ESD-FPL-15	28.0 ±0.5	23.0 ±0.4	7.7 ±0.3	14.6 ±0.4	1.50 ±0.20	12.40	16 Core	Figure 2		X	–	700L
ESD-FPL-28-10	28.0 ±1.0	24.0 ±0.8	5.0 ±0.5	10.0 ±0.5	0.80 +0.50,-0.30	5.50	FPC, FFC	Figure 3		X	–	700L
ESD-FPL-32-8	32.0 ±1.0	28.0 ±0.7	5.0 ±0.3	8.0 ±0.3	0.80 ±0.15	5.40	FPC, FFC	Figure 3		X	–	700L
ESD-FPL-32-12	32.0 ±1.0	28.0 ±0.7	5.0 ±0.3	12.0 ±0.3	0.80 ±0.15	8.00	FPC, FFC	Figure 3		X	–	700L
ESD-FPL-20-12	33.2 ±1.0	27.0 ±1.0	8.0 ±0.6	12.0 ±0.6	1.50 ±0.60	12.20	20 Core	Figure 3		X	–	700L
Part Number	A	B	C	D	E	(g)	Applicable Cable	Shape	Remarks	≤ 300 MHz (FM band range)	MnZn	NiZn
	Dimensions					Weight				Frequency Range[1]	Material	

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

** Other sizes available on request. Please contact KEMET.*

Table 1A – Ratings & Part Number Reference cont.

Part Number	Dimensions (mm)					Weight	Applicable Cable	Shape	Remarks	Frequency Range[1]	Material	
	A	B	C	D	E	(g)				≤ 500 MHz (FM band range)	MnZN	NiZn
ESD-FPL-20-15	33.2 ±0.8	27.0 ±0.8	8.0 ±0.5	15.0 ±0.4	1.50 ±0.50	15.40	20 Core	Figure 3		X	–	700L
ESD-FPL-33.5-8	33.5 ±1.0	27.5 ±0.8	6.5 ±0.5	8.0 ±0.4	1.50 ±0.40	7.00	20 Core	Figure 3		X	–	700L
ESD-FPL-34-15	34.0 ±1.0	30.0 ±0.7	6.0 ±0.3	15.0 ±0.3	0.80 ±0.15	12.60	FPC, FFC	Figure 3		X	–	700L
ESD-FPL-35-8	35.0 ±1.5	30.0 ±1.0	8.0 ±0.5	8.0 ±0.8	1.30 ±0.35	8.80	22 Core	Figure 3		X	–	700L
ESD-FPL-16	37.0 ±0.8	25.4 ±0.8	12.0 ±0.4	12.7 ±0.4	1.90 ±0.20	24.90	16 Core	Figure 1		X	–	700L
ESD-FPL-38-12	38.0 ±1.2	34.0 ±0.8	5.0 ±0.5	12.0 ±0.5	0.80 ±0.30	9.40	FPC, FFC	Figure 3		X	–	700L
ESD-FPL-38.5-8	38.5 ±1.2	35.0 ±0.8	4.0 ±0.5	8.0 ±0.5	0.80 ±0.25	4.90	FPC, FFC	Figure 3		X	–	700L
ESD-FPL-38.5-12	38.5 ±1.2	35.0 ±0.8	4.0 ±0.5	12.0 ±0.6	0.80 ±0.30	7.30	FPC, FFC	Figure 3		X	–	700L
ESD-FPL-40-10	40.0 ±1.5	34.8 ±1.0	6.5 ±0.5	10.0 ±0.5	1.30 ±0.30	10.20	26 Core	Figure 3		X	–	700L
ESD-FPL-40-12	40.0 ±1.5	34.8 ±1.5	6.5 ±0.5	12.0 ±0.8	1.30 ±0.55	11.90	26 Core	Figure 3		X	–	700L
ESD-FPL-40-15	40.0 ±1.0	34.8 ±1.0	6.5 ±0.5	15.0 ±0.6	1.30 ±0.25	15.10	26 Core	Figure 3		X	–	700L
ESD-FPL-26	41.2 ±1.0	35.0 ±1.0	7.7 ±0.6	15.0 ±0.4	1.50 ±0.60	18.20	26 Core	Figure 3		X	–	700L
ESD-FPL-45.2-8	45.2 ±1.2	40.0 ±1.0	6.5 ±0.5	8.0 ±0.5	1.30 ±0.30	9.50	30 Core	Figure 3		X	–	700L
ESD-FPL-45-12	45.2 ±1.0	40.0 ±1.0	6.5 ±0.6	12.0 ±0.6	1.50 ±0.40	13.70	30 Core	Figure 3		X	–	700L
ESD-FPL-49.6-12	49.6 ±1.2	44.5 ±1.0	6.5 ±0.7	12.0 ±0.5	1.30 ±0.40	15.00	32 Core	Figure 3		X	–	700L
ESD-FPL-57.6-12	57.6 ±1.2	52.0 ±1.0	6.5 ±0.8	12.0 ±0.7	1.30 ±0.70	17.70	40 Core	Figure 3		X	–	700L
ESD-FPL-34	60.0 ±0.8	48.5 ±0.8	12.0 ±0.8	12.7 ±0.5	2.20 ±0.30	37.70	34 Core	Figure 1		X	–	700L
ESD-FPL-50	80.0 ±1.0	68.6 ±1.0	12.0 ±1.0	12.7 ±0.5	1.90 ±0.30	51.20	50 Core	Figure 1		X	–	700L
Part Number	A	B	C	D	E	(g)	Applicable Cable	Shape	Remarks	≤ 300 MHz (FM band range)	MnZn	NiZn
	Dimensions					Weight				Frequency Range[1]	Material	

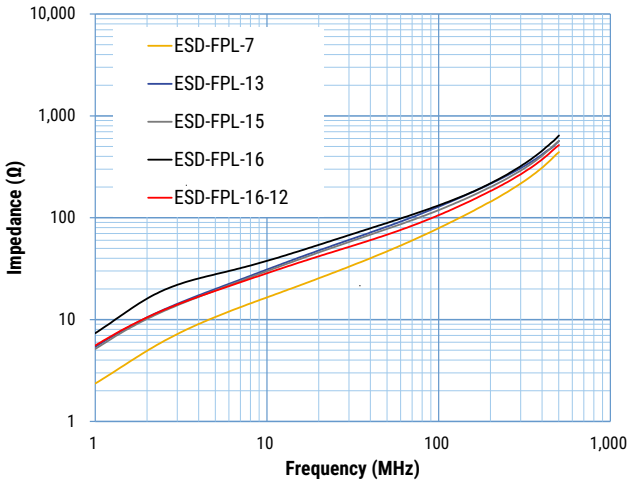
[1] Frequency range is for reference only. Please test with actual device before use.

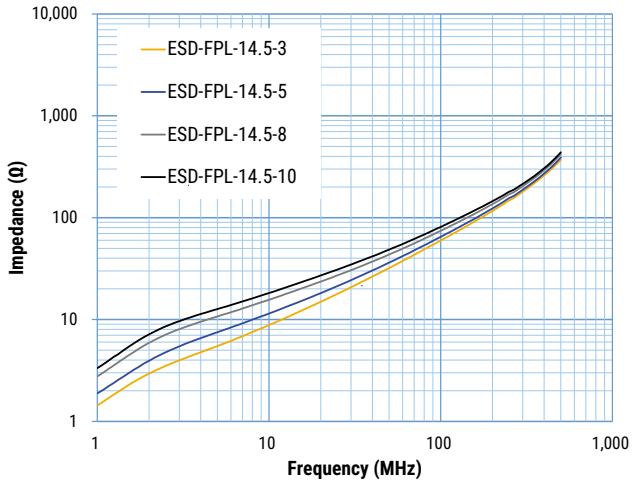
** Other sizes available on request. Please contact KEMET.*

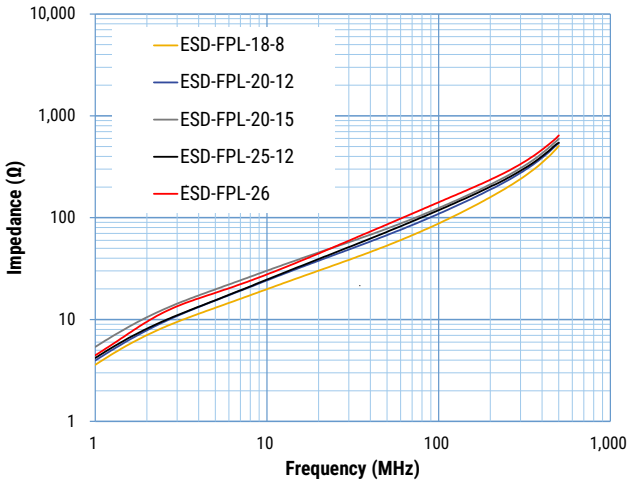
Table 1B – Not for New Design Ratings & Part Number Reference

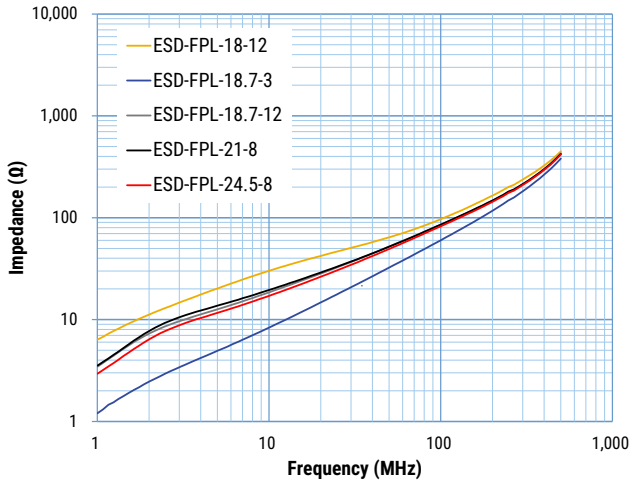
Part Number	Dimensions (mm)					Applicable Cable	Shape	Remarks
	A	B	C	D	E			
ESD-FPL-18-6	18.0	14.0	5.00	6	1.00	FPC, FFC	Figure 3	
ESD-FPL-18.7-7	18.7	15.0	2.75	7	0.70	FPC, FFC	Figure 3	Thin type
ESD-FPL-18.7-10	18.7	15.0	2.75	10	0.70	FPC, FFC	Figure 3	Thin type
ESD-FPL-21.5-8	21.5	16.5	6.50	8	1.30	12 Core	Figure 3	
ESD-FPL-23.8-7	23.8	18.8	6.30	7	1.10	12 Core	Figure 3	
ESD-FPL-24-8	24.0	19.0	6.50	8	1.30	14 Core	Figure 3	
ESD-FPL-24.5-6	24.5	20.0	4.50	6	0.90	FPC, FFC	Figure 3	
ESD-FPL-31-9	31.0	27.0	5.00	9	0.55	FPC	Figure 3	Minimal gap type
ESD-FPL-31-12	31.0	27.0	5.00	12	0.55	FPC	Figure 3	Minimal gap type
ESD-FPL-33.5-10	33.5	27.5	6.50	10	1.30	20 Core	Figure 3	
ESD-FPL-33.5-12	33.5	27.5	6.50	12	1.30	20 Core	Figure 3	
ESD-FPL-35-5	35.0	30.0	8.00	5	1.30	22 Core	Figure 3	
Part Number	A	B	C	D	E	Applicable Cable	Shape	Remarks
	Dimensions							

Impedance vs. Frequency

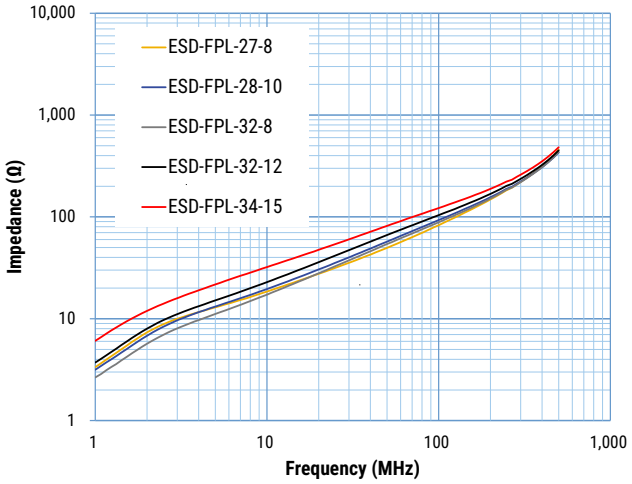


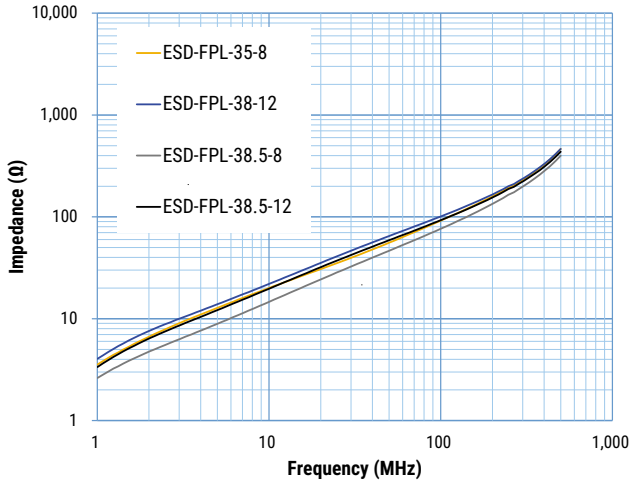


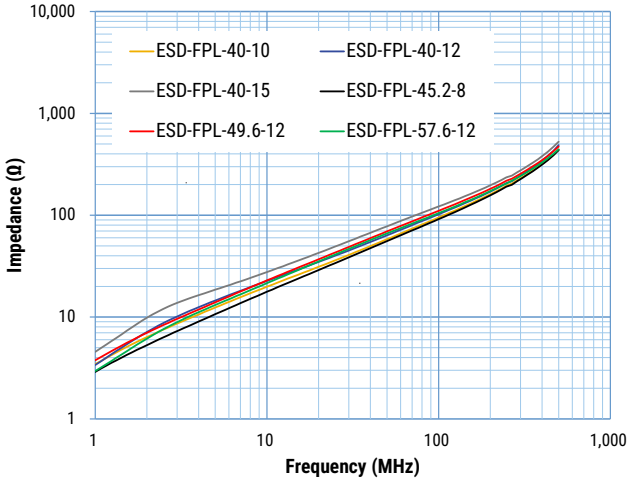


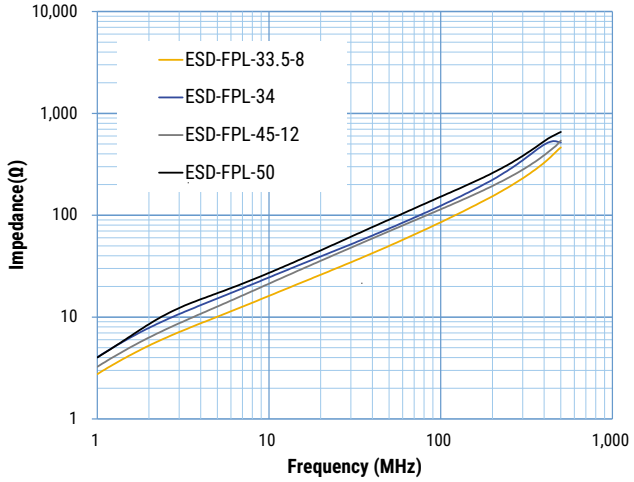


Impedance vs. Frequency cont.

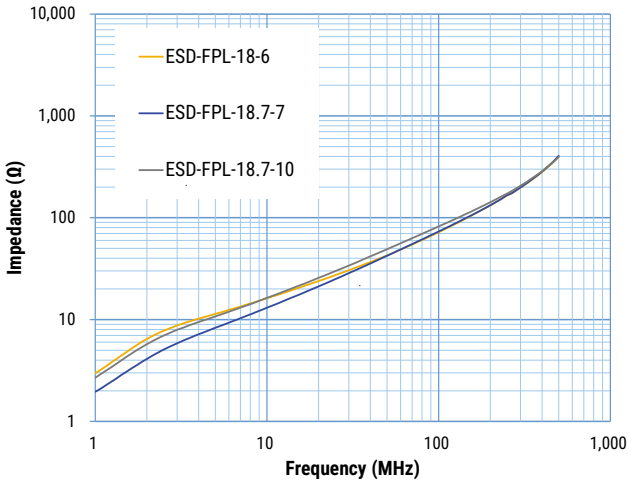


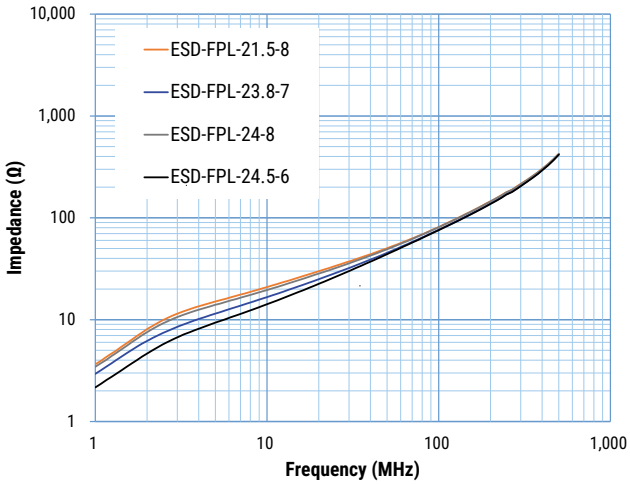


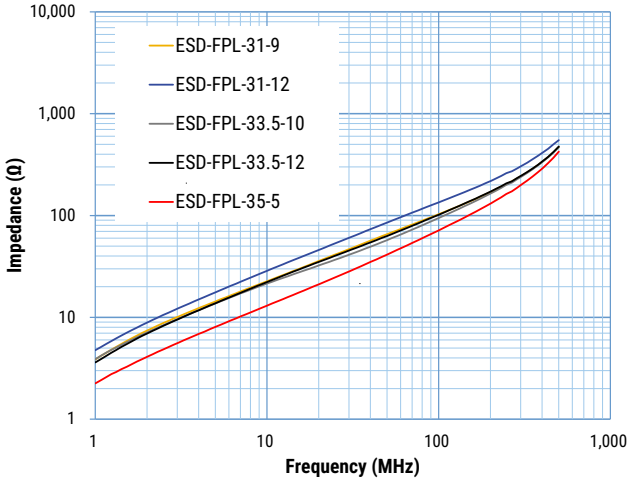




Impedance vs. Frequency - Not for New Design







Packaging

Part Number	Packaging Type	Pieces per Box
ESD-FPL-14.5-3	Tray	8,100
ESD-FPL-14.5-5		5,040
ESD-FPL-14.5-8		3,240
ESD-FPL-14.5-10		2,700
ESD-FPL-16-12		1,650
ESD-FPL-18-8		2,000
ESD-FPL-18-12		1,800
ESD-FPL-18.7-3		5,760
ESD-FPL-18.7-12		1,800
ESD-FPL-21-8		2,400
ESD-FPL-13		840
ESD-FPL-24.5-8		1,800
ESD-FPL-25-12		1,600
ESD-FPL-27-8		960
ESD-FPL-7		900
ESD-FPL-15		720
ESD-FPL-28-10		1,200
ESD-FPL-32-8		960
ESD-FPL-32-12		720
ESD-FPL-20-12		800
ESD-FPL-20-15		
ESD-FPL-33.5-8		1,200
ESD-FPL-34-15		320
ESD-FPL-35-8		880
ESD-FPL-16		656
ESD-FPL-38-12		900
ESD-FPL-38.5-8		1,500
ESD-FPL-38.5-12		1,125
ESD-FPL-40-10		750
ESD-FPL-40-12		540
ESD-FPL-40-15		480
ESD-FPL-26		960
ESD-FPL-45.2-8		880
ESD-FPL-45-12		720
ESD-FPL-49.6-12		540
ESD-FPL-57.6-12		480
ESD-FPL-34		240
ESD-FPL-50		180

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.

KEMET Electronics Corporation Sales Offices

For a complete list of our global sales offices, please visit www.kemet.com/sales.

Disclaimer

YAGEO Corporation and its affiliates do not recommend the use of commercial or automotive grade products for high reliability applications or manned space flight.

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Although KEMET designs and manufactures its products to the most stringent quality and safety standards, given the current state of the art, isolated component failures may still occur. Accordingly, customer applications which require a high degree of reliability or safety should employ suitable designs or other safeguards (such as installation of protective circuitry or redundancies) in order to ensure that the failure of an electrical component does not result in a risk of personal injury or property damage.

Although all product–related warnings, cautions and notes must be observed, the customer should not assume that all safety measures are indicated or that other measures may not be required.

When providing KEMET products and technologies contained herein to other countries, the customer must abide by the procedures and provisions stipulated in all applicable export laws and regulations, including without limitation the International Traffic in Arms Regulations (ITAR), the US Export Administration Regulations (EAR) and the Japan Foreign Exchange and Foreign Trade Act.