Flex Suppressor®

EF Series

Overview

The EF Series Flex Suppressor® is an effective suppressor for high frequency noise generated from electronic devices. The flexible sheet is a polymer base blended with micron sized magnetic powders dispersed into the material. The EF Series are effective for resonance and wave suppression, and can be cut into virtually any shape.

Applications

- Radiation noise suppression for electronic equipment
- Quasi-microwave range interference prevention inside and in between electronics
- Mobile communications equipment, wireless equipment (Wi-Fi, Bluetooth), office automation equipment (personal computers, TFT LCD's etc.), communication terminals in audio/video equipment, digital exchanges, etc.
- ESD (electro static discharge) countermeasure

Benefits

- Usable in quasi-microwave ranges
- Can be used in high-speed clocks (Up to 10 GHz)
- Thin, flexible material used in portable equipment
- Virtually no limitation in where it can be used
- Less time required for installation
- Resonance suppression – controls the high frequency current and suppresses unwanted electromagnetic resonance by creating impedance
- Electromagnetic wave suppression – suppresses the electromagnetic wave intruding the sheet by the magnetic loss of its composition

Part Number System

EFR	(01)-	240x240	T08	00
Series Type	Thickness	Standard Dimensions (mm)	Tape 1 Type Adhesive Tape Thickness	Tape 2 Type
EFR EFX EFF EFA EFH EFG	(003)- = 0.03 mm (005)- = 0.05 mm (007)- =0.07 mm (01)- = 0.1 mm (02)- = 0.2 mm (03)- = 0.3 mm (05)- = 0.5 mm (10)- = 1.0 mm	240 x 240	T08 = 0.03 mm T15 = 0.14 mm T22 = 0.05 mm T29 = 0.01 mm Blank = No adhesive tape	00 = Without PET tape Blank = Without Tape 1 Type

Specifications

Features	Standard Specifications	**High** Magnetic Permeability Type	Extra High Magnetic Permeability Type	Flame Retardant Type, Red Phosphorus Free Type	**High** Frequency	**High** Temp. Reflow
Type	EFR	EFX	EFF	EFA	EFG	EFH
Effective Frequency	Up to 10 GHz					
Operating Temperature (°C)	−40 to +105					
Thickness (mm)	0.05/0.1/0.2/ 0.3/0.5/1.0	0.05/0.1/0.2/ 0.3/0.5	0.07/0.1/0.2/0.3	0.03/0.05/0.1/ (0.2/0.3)[2]	0.05/0.1/ 0.2/0.3	0.05/0.1
Standard Dimensions (mm)	240 x 240			240 x 240 (roll on request)	240 x 240	
Specific Gravity[1]	2.8 typical	3.2 typical	3.6 typical	3.1 typical	3.0 typical	3.1 typical
Tensile Strength (Mpa)	3.6 minimum	6.8 minimum	6.9 minimum	6.8 minimum	3.5 minimum	6.8 minimum
Surface Resistance (Ω)	1.0 x 10^6					

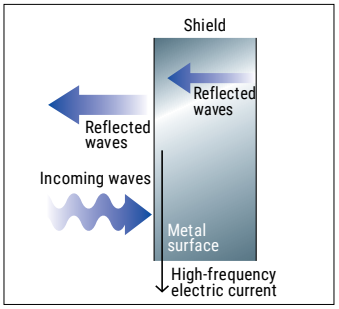
Table 1 – Ratings & Part Number Reference

Part Number	Series	Thickness (mm)	**Tape** Thickness (mm)	Relative Magnetic Permeability at 3 MHz	Specific Gravity (typical)	Tensile Strength **(Mpa** minimum)	Surface Resistance (Ω minimum)	Thermal Conductivity (W/m K)
EFR(005)-240x240T0800	EFR	0.05	0.03	60	2.8	3.6	1.0 x 10^6	0.22
EFR(01)-240x240T0800	EFR	0.1	0.03	60	2.8	3.6	1.0 x 10^6	0.22
EFR(02)-240x240	EFR	0.2	--	60	2.8	3.6	1.0 x 10^6	0.22
EFR(02)-240x240T0800	EFR	0.2	0.03	60	2.8	3.6	1.0 x 10^6	0.22
EFR(03)-240x240	EFR	0.3	--	60	2.8	3.6	1.0 x 10^6	0.22
EFR(03)-240x240T0800	EFR	0.3	0.03	60	2.8	3.6	1.0 x 10^6	0.22
EFR(05)-240x240	EFR	0.5	--	60	2.8	3.6	1.0 x 10^6	0.22
EFR(05)-240x240T1500	EFR	0.5	0.14	60	2.8	3.6	1.0 x 10^6	0.22
EFR(10)-240x240	EFR	1	--	60	2.8	3.6	1.0 x 10^6	0.22
EFR(10)-240x240T1500	EFR	1	0.14	60	2.8	3.6	1.0 x 10^6	0.22
EFX(005)-240x240T0800	EFX	0.05	0.03	100	3.2	6.8	1.0 x 10^5	0.22
EFX(01)-240x240T0800	EFX	0.1	0.03	100	3.2	6.8	1.0 x 10^5	0.22
EFX(02)-240x240	EFX	0.2	--	100	3.2	6.8	1.0 x 10^5	0.22
EFX(02)-240x240T0800	EFX	0.2	0.03	100	3.2	6.8	1.0 x 10^5	0.22
EFX(03)-240x240	EFX	0.3	--	100	3.2	6.8	1.0 x 10^5	0.22
EFX(03)-240x240T0800	EFX	0.3	0.03	100	3.2	6.8	1.0 x 10^5	0.22
EFX(05)-240x240	EFX	0.5	--	100	3.2	6.8	1.0 x 10^5	0.22
EFX(05)-240x240T1500	EFX	0.5	0.14	100	3.2	6.8	1.0 x 10^5	0.22
EFF(007)-240x240T0800	EFF	0.07	0.03	130	3.6	6.9	1.0 x 10^5	0.4
EFF(01)-240x240T0800	EFF	0.1	0.03	130	3.6	6.9	1.0 x 10^5	0.4
EFF(02)-240x240	EFF	0.2	--	130	3.6	6.9	1.0 x 10^5	0.4
EFF(02)-240x240T0800	EFF	0.2	0.03	130	3.6	6.9	1.0 x 10^5	0.4
EFF(03)-240x240	EFF	0.3	--	130	3.6	6.9	1.0 x 10^5	0.4
EFF(03)-240x240T0800	EFF	0.3	0.03	130	3.6	6.9	1.0 x 10^5	0.4
EFA(003)-240x240T0800	EFA	0.03	0.03	60	3.1	6.8	1.0 x 10^6	1.3
EFA(005)-240x240T0800	EFA	0.05	0.03	60	3.1	6.8	1.0 x 10^6	1.3
EFA(01)-240x240T0800	EFA	0.1	0.03	60	3.1	6.8	1.0 x 10^6	1.3
EFA(02)-240x240	EFA	0.2	--	60	3.1	6.8	1.0 x 10^6	1.3
EFA(02)-240x240T0800	EFA	0.2	0.03	60	3.1	6.8	1.0 x 10^6	1.3
EFA(03)-240x240	EFA	0.3	--	60	3.1	6.8	1.0 x 10^6	1.3
EFA(03)-240x240T0800	EFA	0.3	0.03	60	3.1	6.8	1.0 x 10^6	1.3
EFG(005)-240x240T0800	EFG	0.05	0.03	20	3	3.5	1.0 x 10^5	0.22
EFG(01)-240x240T0800	EFG	0.1	0.03	20	3	3.5	1.0 x 10^5	0.22
EFG(02)-240x240	EFG	0.2	--	20	3	3.5	1.0 x 10^5	0.22
EFG(02)-240x240T0800	EFG	0.2	0.03	20	3	3.5	1.0 x 10^5	0.22
EFG(03)-240x240	EFG	0.3	--	20	3	3.5	1.0 x 10^5	0.22
EFG(03)-240x240T0800	EFG	0.3	0.03	20	3	3.5	1.0 x 10^5	0.22
EFH(005)-240x240T2200	EFH	0.05	0.05	60	3.1	6.8	1.0 x 10^6	1.3
EFH(01)-240x240T2200	EFH	0.1	0.05	60	3.1	6.8	1.0 x 10^6	1.3

Shielding

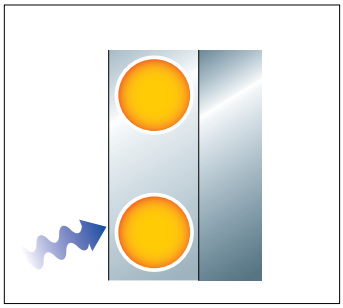
Shielding materials
(metal, electrically conductive material)

While transmitted waves can be minimized, most of the incoming waves are reflected, causing internal interference. High-frequency electric current occurs on the metal surfaces and reflected noise occurs at the shielding joints, metal openings, and other parts when the grounding is poor.



Shielding material + radio wave absorber

Shielding material + Radio wave absorber transmitted waves and reflected waves can be minimized by mounting metal plates on the back of radio wave absorbers.



Radio wave absorbers

To prevent reflection, electromagnetic energy is absorbed and converted into heat.

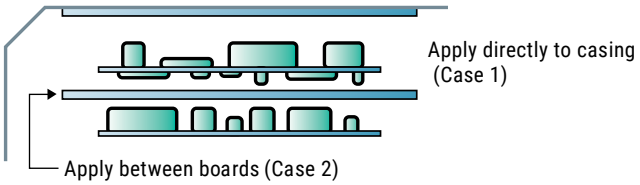
Reference: Other absorbing and reflecting examples

	Absorbing	Reflecting
Radio Waves	Radio waves absorbers	Metals
Light	Black objects	White objects, Mirrors
Sound	Absorbers, Felt	Solid bodies (Concrete, etc.)

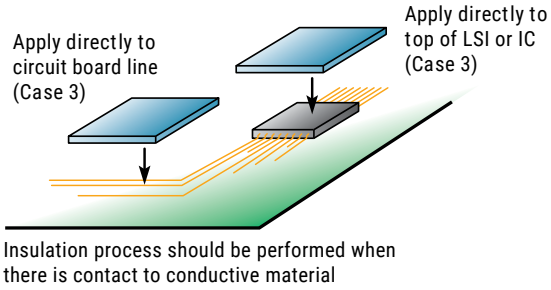
Applications

Case 1 – To suppress noise reflected by casing

Case 2 – To suppress cross talk between substrates

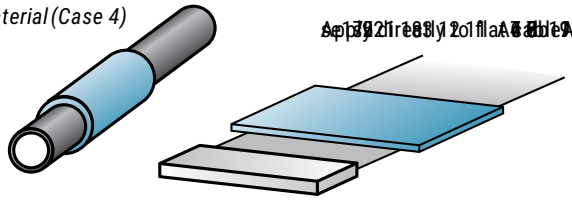


Case 3 – To suppress radiation noises from LSI and IC



Case 4 – To suppress noise from cables

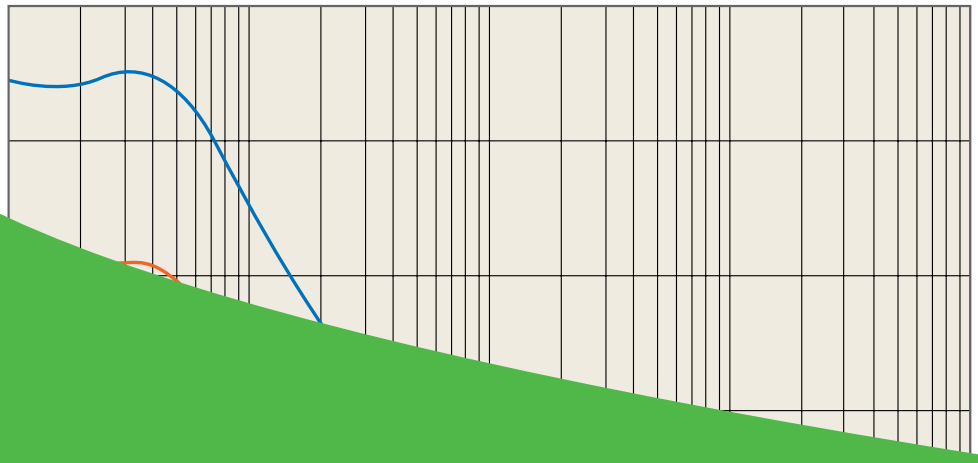
Wrap Flex Suppressor® around cable.
Caution: Must be covered with heat shrink material (Case 4)



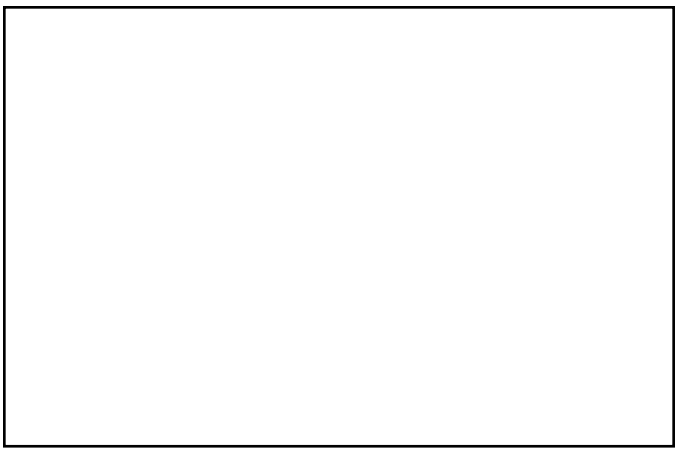
Examples of Shapes

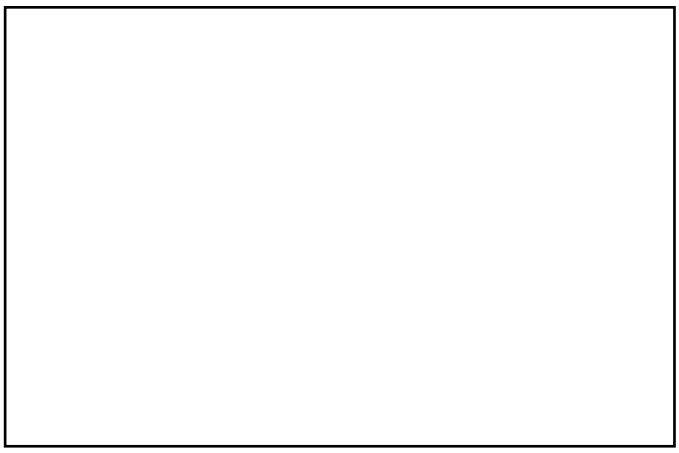
Can be cut in a variety of shapes and sizes.

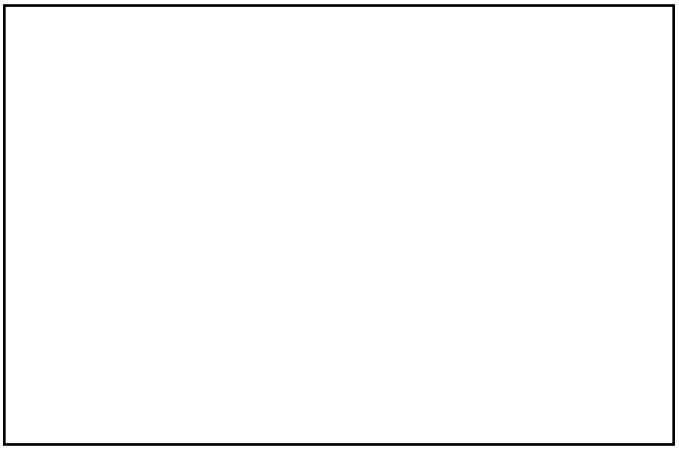
Permeable Characteristics

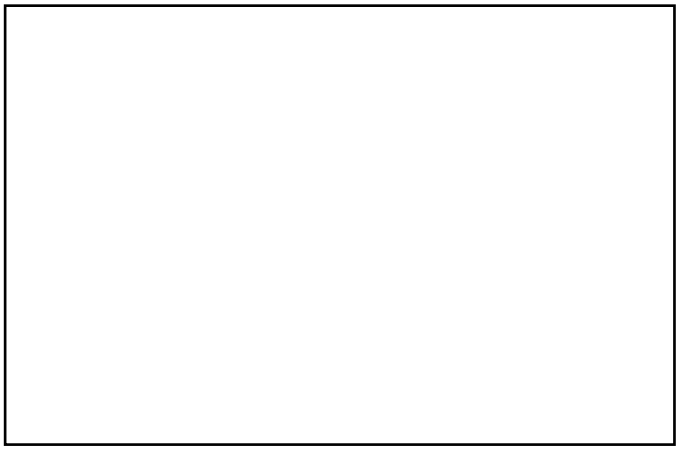


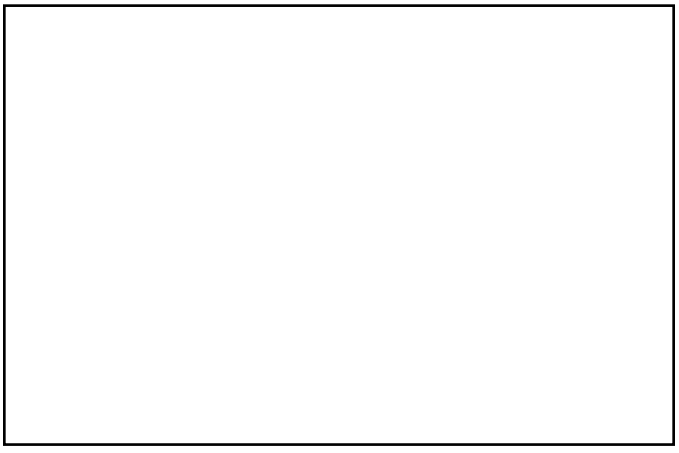
Electrical Characteristics

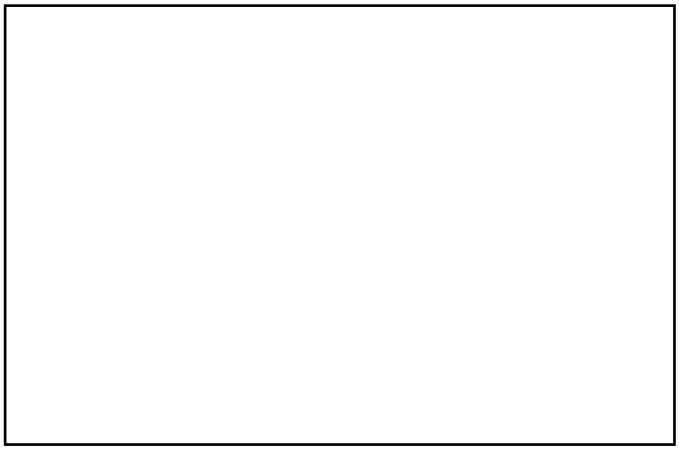






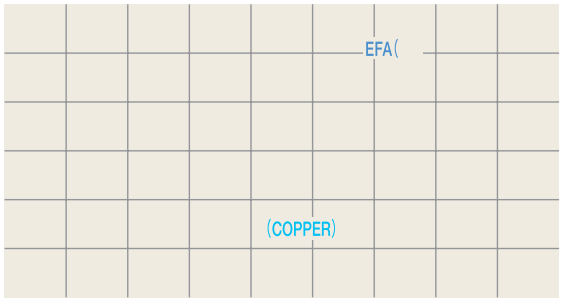






Electrical Characteristics cont'd

EFA – Attenuation of transmission noise



EFA – Attenuation of coupling noise

EFH – Attenuation of transmission noise

EFH – Attenuation of coupling noise

Above data are not guaranteed values.

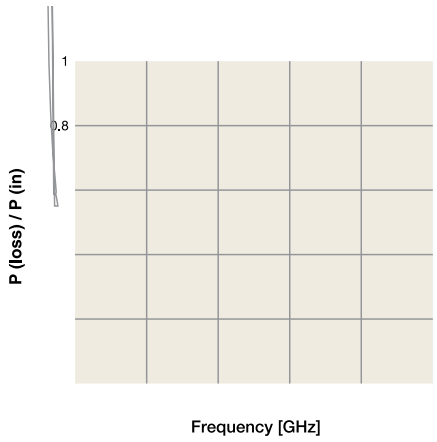
Measuring Method of Electrical Characteristics

Attenuation of transmission noise

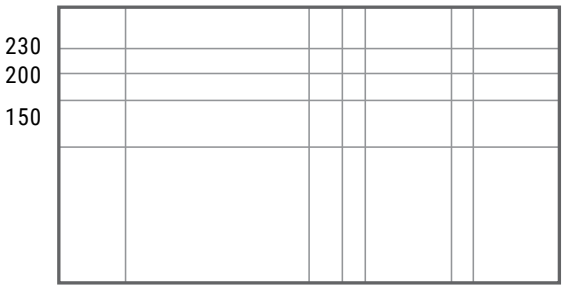
Attenuation of coupling noise

Transmission Noise Attenuation Characteristics

Shown in graphs below are values of transmission loss calculated from the transmission characteristics S11 and S21 measured on
Z_0 = 50Ω type MSL (Micro Strip Line) with a Flex Suppressor® attached.



Soldering Process



Information on environmentally in f uential substances

The Flex Suppressor® does not contain substances listed below:

(1) Ozone depleting substance
- CFC (chloro f uorocarbon)
- Halon
- Carbon tetrachloride
- 1,1,1-Trichloroethane
- HCFC (hydrochloro f uorocarbon)
- HBFC (hydrobrom f uorcarbon)
- Methyl bromide

(2) Substances regulated by RoHS order
- Lead and lead compound
- Mercury and mercury compound
- Cadmium and cadmium compound (content of plastics are below 5ppm)
- Hexavalent chromium and hexavalent chromium compound
- PBB (polybrominated biphenyl) and its kind
- PBDE (polybrominated diphenylether)

(3) Other environmentally in f uential substances (examples)
- PCB (polychlorinated biphenyl)
- Polychlorinated naphthalene
- Hexachlorobenzene
- Organotin compounds (tributyl tin, triphenyl tin)
- Asbestos
- Azo compound
- Chlorinated paraf f n and its kind (paraf f n chloride, Chlorinated paraf f n and chloroparaf f n)
- Radioactive substance
- PVC

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