

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 is 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
- Can be manufactured in a variety of shapes/sizes
- 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 | 20 x 20 | T08 | 00 | S |
|-------------|----------------------------|--------------------------|--|--|---|
| Series Type | Thickness | Standard Dimensions (mm) | Tape 1 Type Adhesive Tape Thickness | Tape 2 Type | Precut Type* |
| EFR | 005 = 0.05 mm | 240 x 240 | T08 = 0.03 mm | 00 = Without PET tape Blank = With PET tape | Blank = No precut (standard dimensions) S = Precut (non-standard dimensions) |
| EFX | 007 = 0.07 mm | | T15 = 0.14 mm | | |
| EFF | 01 = 0.1 mm | | T22 = 0.05 mm | | |
| EFA | 02 = 0.2 mm | | T29 = 0.01 mm | | |
| EFH | 03 = 0.3 mm | | Blank = No adhesive tape | | |
| EFG | 05 = 0.5 mm 10 = 1.0 mm | | | | |

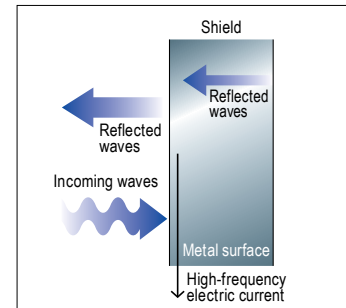
* Flex Suppressor® and adhesive layer are being cut into designated form but the release paper below is left uncut for handling convenience.

Shielding

Shielding materials

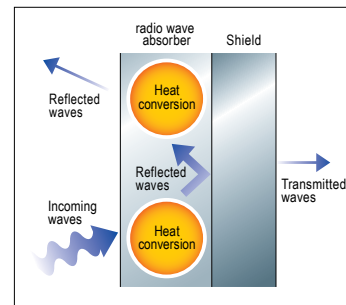
(metal, electrically conductive material)

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.



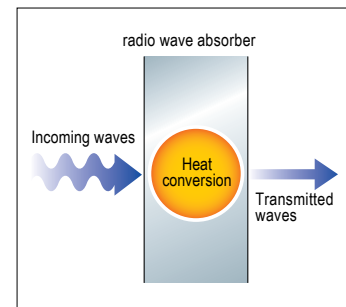
Shielding material + radio wave absorber

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.



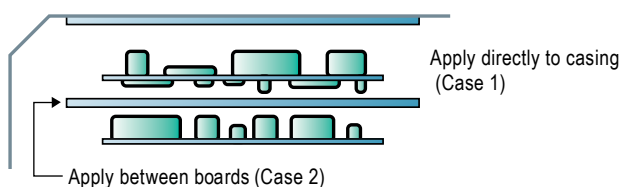
Reference: Other absorbing and reflecting examples

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

Applications

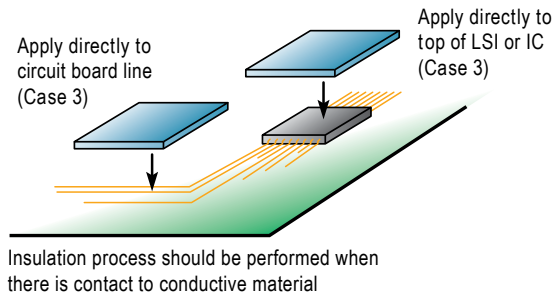
Case 1 – To suppress noise reflected by casing

Case 2 – To suppress cross talk between substrates

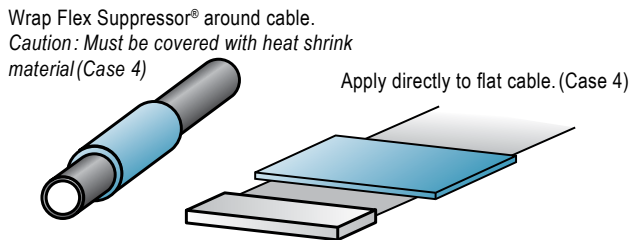


Applications cont'd

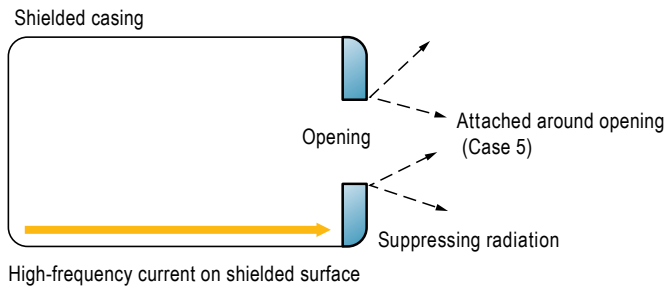
Case 3 – To suppress radiation noises from LSI and IC



Case 4 – To suppress noise from cables



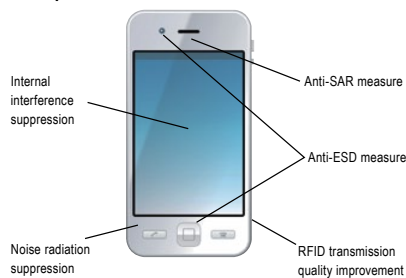
Case 5 – To suppress noise radiation (reflected noise) from the opening of shield, casing, etc.



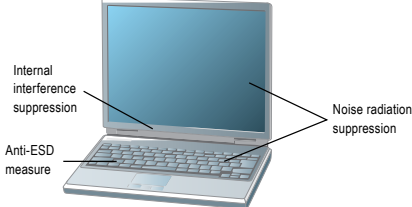
Applications cont'd

| Devices | Noise Radiation Suppression | Internal Interference Suppression | RFID Transmission Quality Improvement | Anti-ESD Measure | Anti-SAR Measure |
|--------------------------|--|--|--|--|------------------------------------|
| Mobile Phone | On main CPU | On FPC and LSI for LCD module and camera module On main CPU – reception improvement | On loop antenna – Communication distance improvement | On FPC and LSI of LCD module and camera module On metal parts such as chassis | Near antenna Around touch panel |
| Digital Camera | On CCD module FPD, image processing LSI, and Memory slot On CPU and GPU On cables inside LCD panel On I/O e.g. PCMCIA and memory slot | On the board | — | On the board and FPC On metal parts such as chassis | — |
| Notebook PC | On LSI and FPC near optical pickup On MPEG chip | On wireless LAN module | On loop antenna and metal parts near antenna – Communication distance improvement | On CPU and GPU On metal parts such as chassis | — |
| DVD/BD | On LSI, flexible board | On GPS receiver and TV tuner On LSI for LCD – Radio reception improvement | — | On metal parts such as chassis | — |
| Car Audio & Visual | — | — | On loop antenna, and metal parts near antenna – Communication distance improvement | — | — |
| Optical Reception Module | — | On the interior of the chassis and on LSI – error rate improvement | — | — | — |
| Wireless LAN | — | On Cable and co-axial cable – Reception improvement | — | — | — |
| Scanner | On scanner head board and FPC | — | — | — | — |
| HDD | On I/F cable | — | — | — | — |

Mobile phone



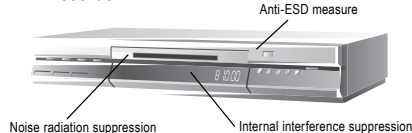
Notebook PC



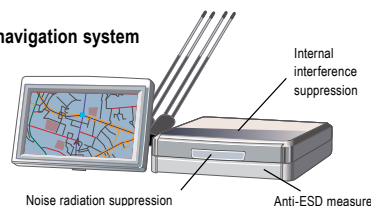
Digital still camera



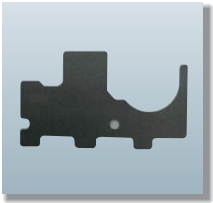
DVD recorder



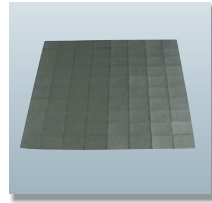
Car navigation system



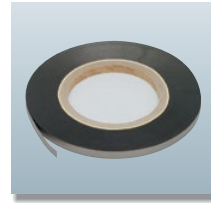
Typical shapes



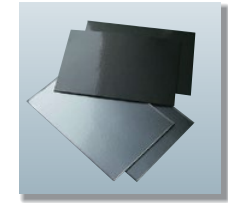
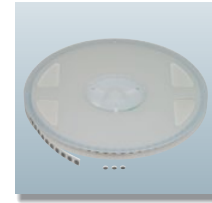
With holes, cut-out shapes, circular shapes



Precut

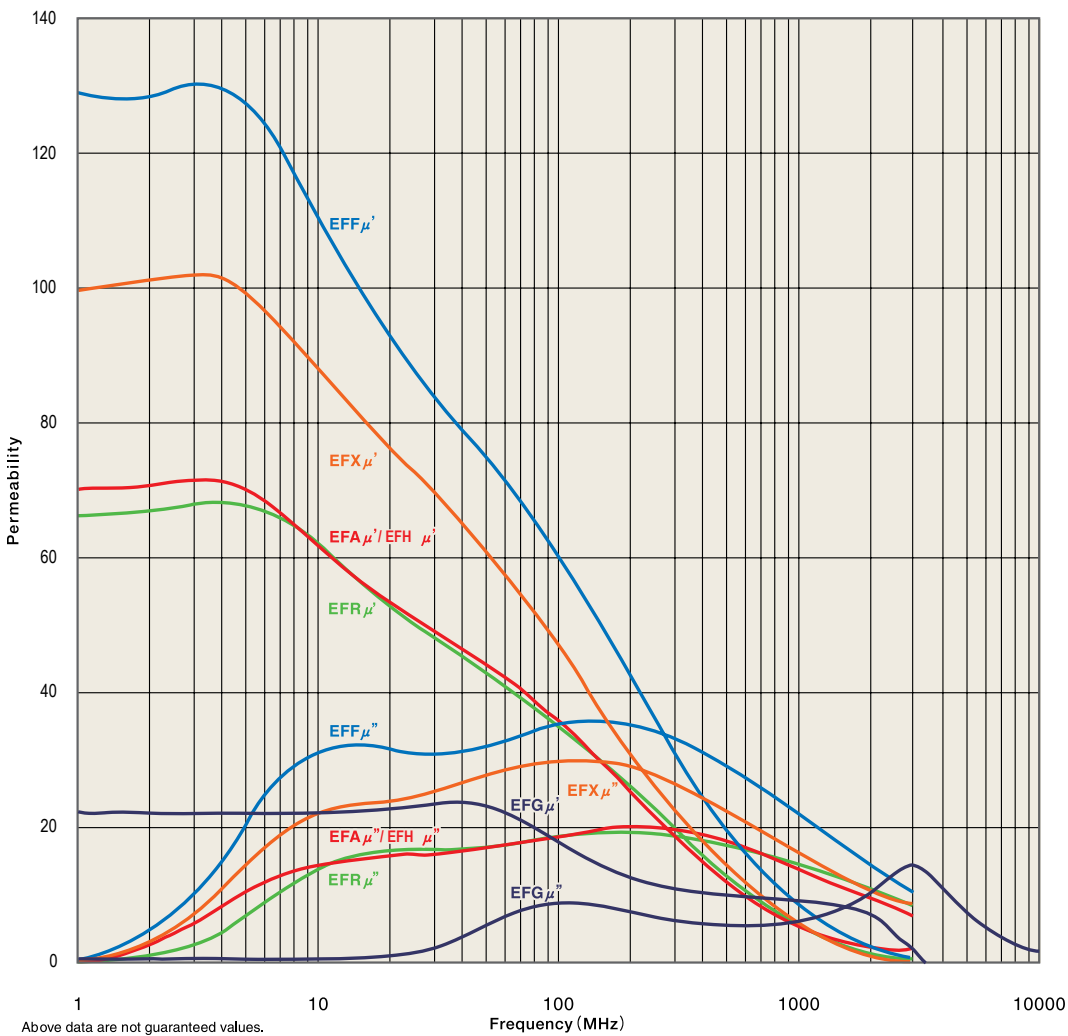


Tape & reel



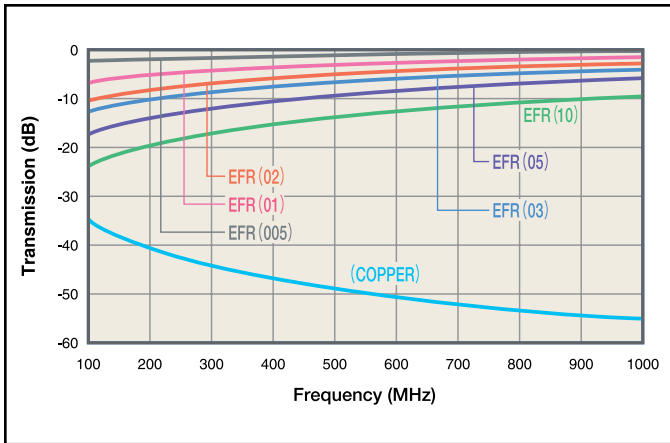
With aluminum

Permeable Characteristics

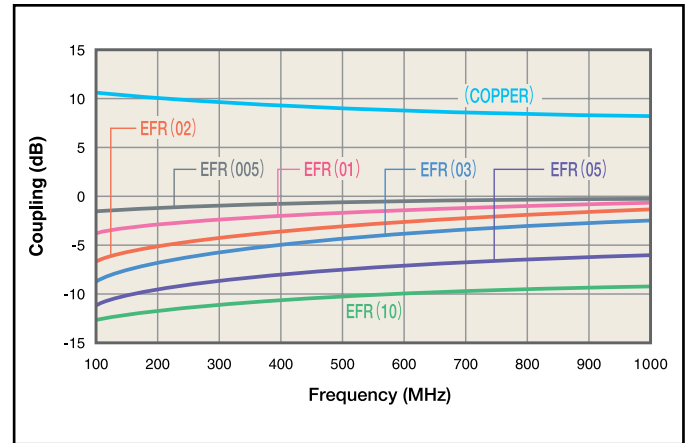


Electrical Characteristics

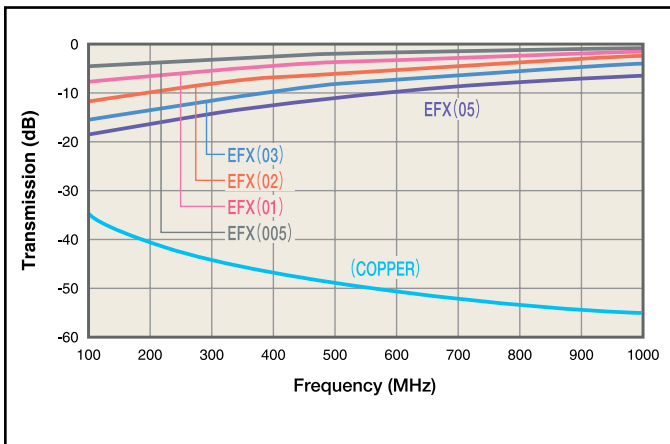
EFR – Attenuation of transmission noise



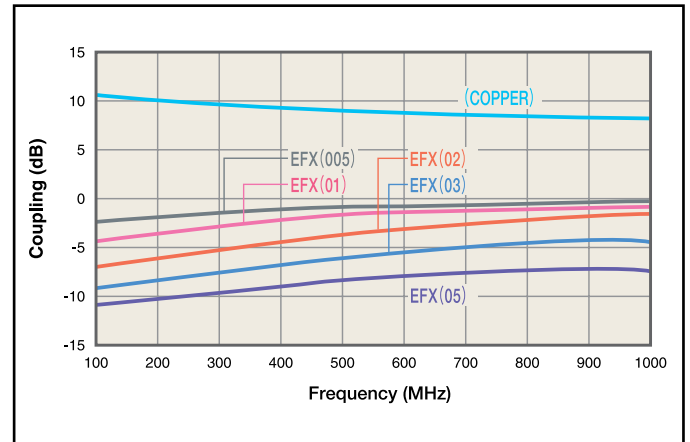
EFR – Attenuation of coupling noise



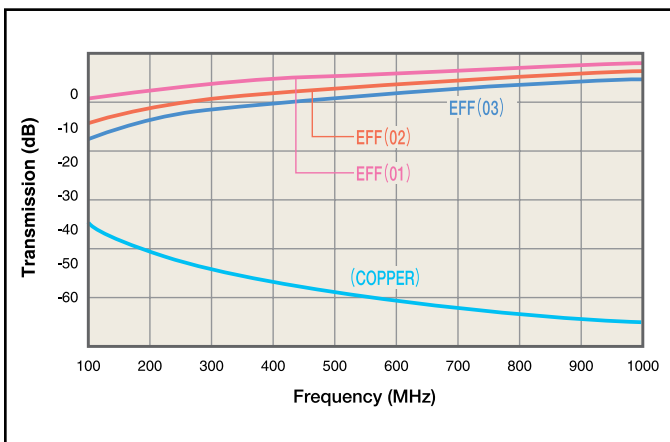
EFX – Attenuation of transmission noise



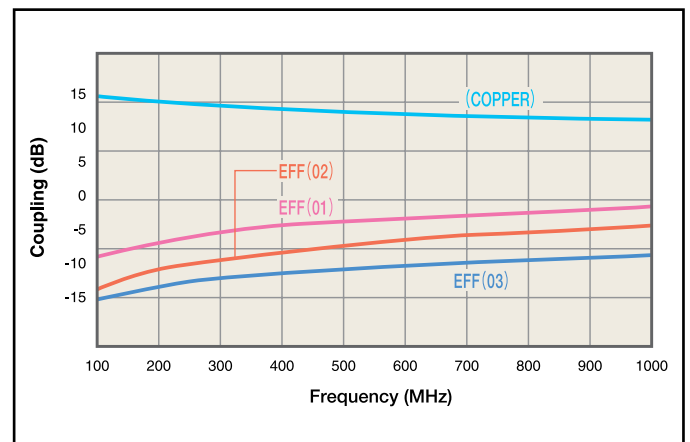
EFX – Attenuation of coupling noise



EFF – Attenuation of transmission noise



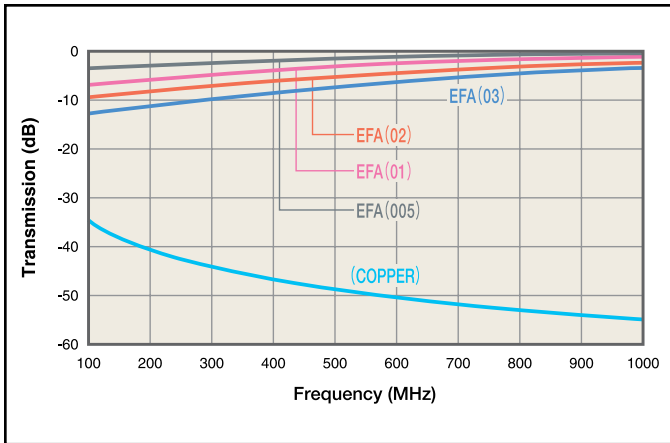
EFF – Attenuation of coupling noise



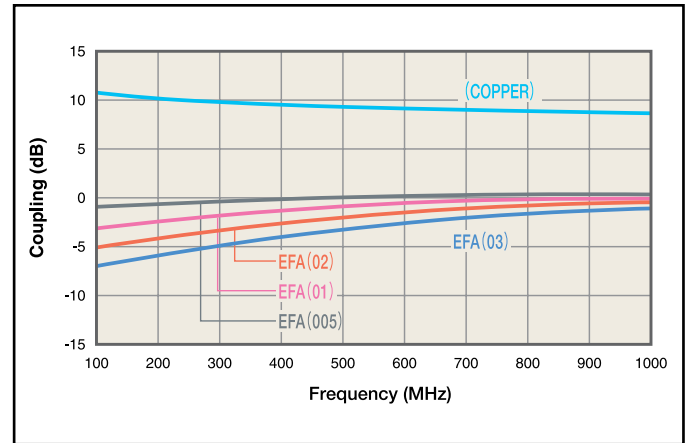
Above data are not guaranteed values.

Electrical Characteristics cont'd

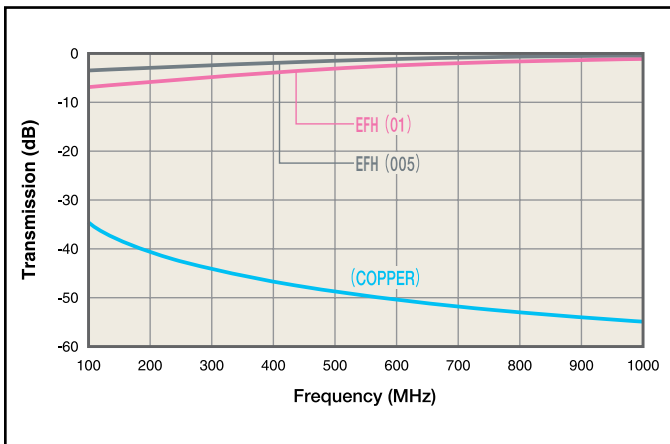
EFA – Attenuation of transmission noise



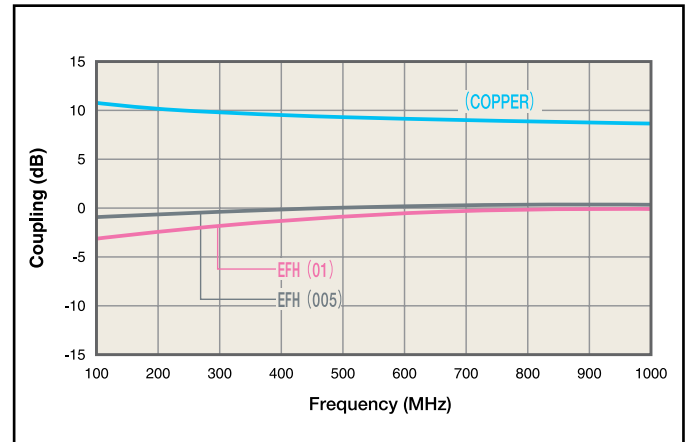
EFA – Attenuation of coupling noise



EFH – Attenuation of transmission noise



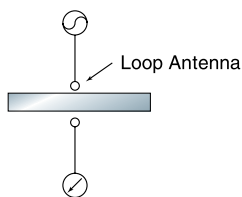
EFH – Attenuation of coupling noise



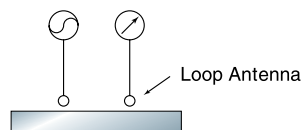
Above data are not guaranteed values.

Measuring Method of Electrical Characteristics

Attenuation of transmission noise

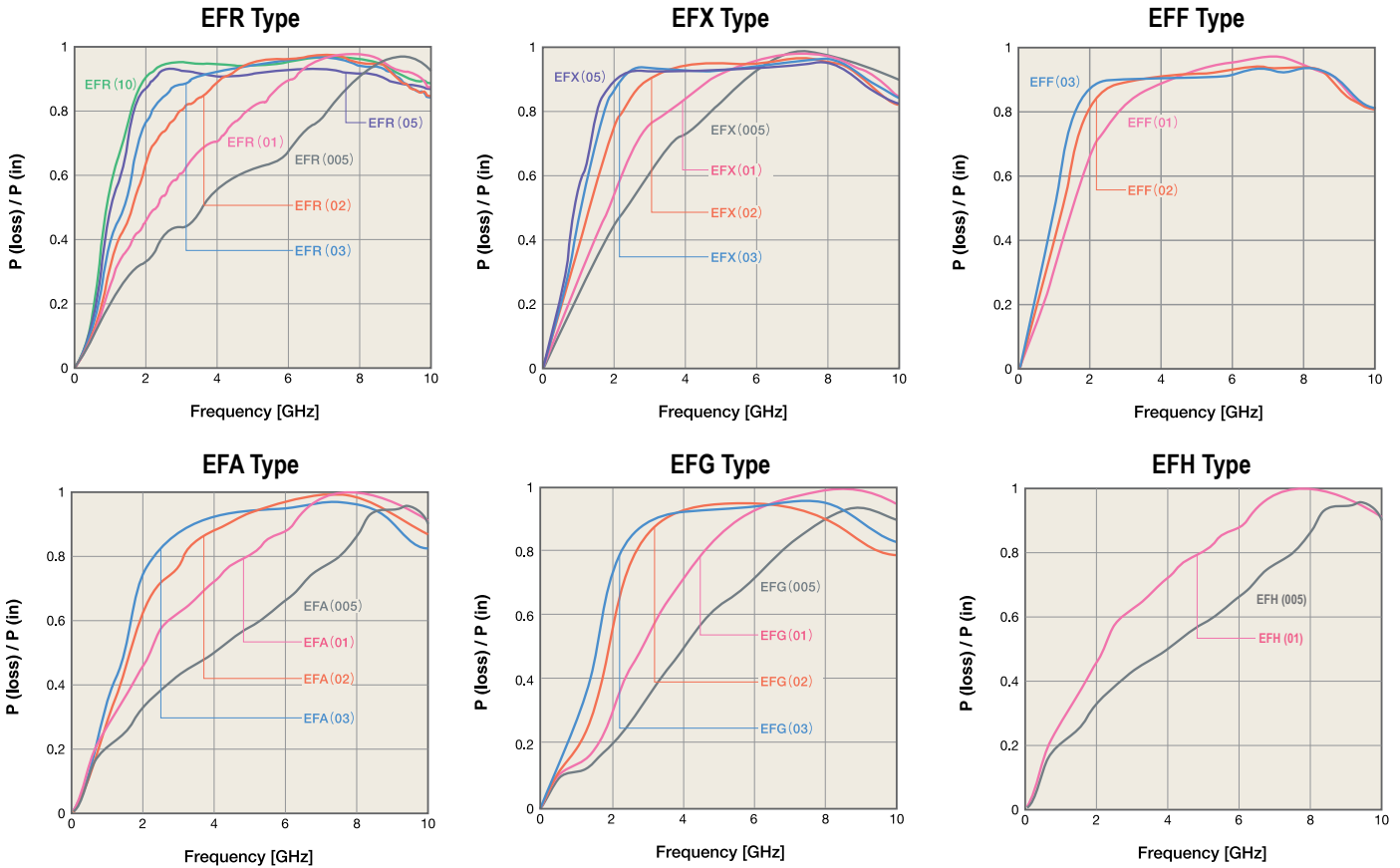


Attenuation of coupling noise



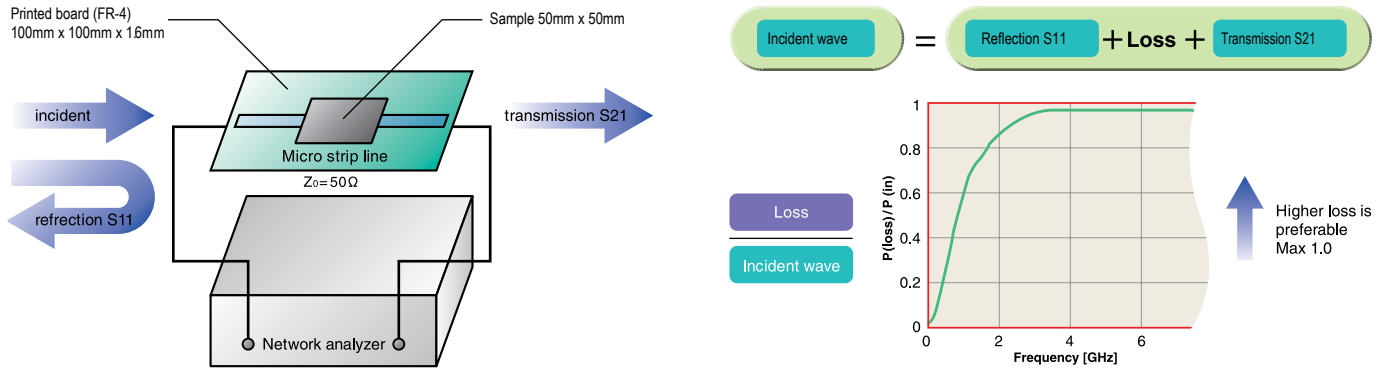
Transmission Noise Attenuation Characteristics

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



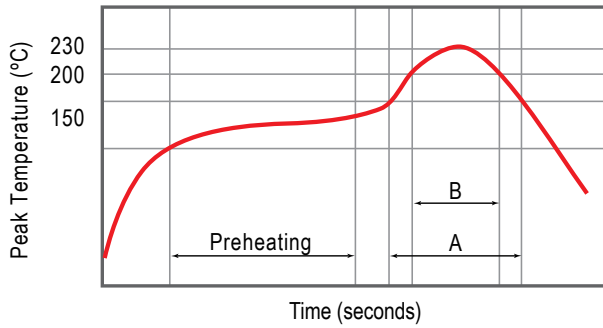
Above data are not guaranteed values.

Measuring Method of Transmission Noise Attenuation Characteristics



Soldering Process

Reflow Profile



| | |
|------------------|-----------------------------------|
| Peak Temperature | +260°C |
| Preheating | 150 – 180°C 90 seconds maximum |
| A | 200°C or more, 60 seconds maximum |
| B | 230°C or more, 40 seconds maximum |
| Number of Times | 2 times maximum |

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 acceptable | 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 minimum | 1.0 x 10 ⁵ minimum | 1.0 x 10 ⁵ minimum | 1.0 x 10 ⁶ minimum | 1.0 x 10 ⁵ minimum | 1.0 x 10 ⁶ minimum |
| Thermal Conductivity (W/m K) | 0.22 | 0.22 | 0.4 | 1.3 | 0.22 | 1.3 |
| Approved Standard | UL94 V-0 | UL94 HB | UL94 V-0 | | UL94 V-1 | UL94 V-0 |
| | UL File No. E176124 | | | | | UL File No. E176124 |
| Environment | RoHS | Compliant | | | | |
| | Halogen | Free | | | | |
| | PVC | Free | | | | |
| | Lead | Free | | | | |
| | Red Phosphorus | — | Free | — | Free | — |
| Relative Magnetic Permeability (at 3 MHz) | 60 typical | 100 typical | 130 typical | 60 typical | 20 typical | 60 typical |
| Remarks | μ60 high permeability Various thickness Flame retardant (UL 94 V-0 certified) | μ100 high permeability Various thickness | Industry's highest magnetic permeability of μ130 with halogen free composition. Flame retardant (UL 94 V-0 certified) | μ60 high permeability. Red phosphorus free Flame retardant (UL 94 V-0 certified) | Excellent suppression of high frequency noise in Wi-Fi and higher bandwidths. | Can be mounted before reflowing |

Above specifications are for the Flex Suppressor® alone (adhesives and etc. not included)

¹ Value in 23°C atmosphere

² Sheets with 0.2 mm and 0.3 mm thickness are lamination of 0.1 mm sheets.

Handling Precautions

Avoid high-temperature, humidity and direct sunlight. Storage environment should be below 40°C and below 70% relative humidity.

The surface resistance value listed in this catalog is a reference value of the circuit parameter to indicate noise suppression. The value does not mean the product's insulation characteristics. The value may become lower if an excess pressure is applied to the product.

Products in this catalog are not insulators. Please handle them as conductors. When in actual use, please be careful so that conductive material does not contact the surface or the edge of the Flex Suppressor® sheet. Insulation process should be performed when contact to conductive material is probable.

Depending upon the processing procedure, powdery substance may drop out from sheet surface or edge if cutting of the sheet is performed by the customer. Please be careful as this powder may effect the component's performance depending on the location.

Clean away any dust, oil or moisture from the surface of the installing area when attaching the sheet using adhesive tape.

Information on environmentally influential substances

The Flex Suppressor® does not contain substances listed below:

(1) Ozone depleting substance

- CFC (chlorofluorocarbon)
- Halon
- Carbon tetrachloride
- 1,1,1-Trichloroethane
- HCFC (hydrochlorofluorocarbon)
- HBFC (hydrobromfluorocarbon)
- 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 influential substances (examples)

- PCB (polychlorinated biphenyl)
- Polychlorinated naphthalene
- Hexachlorobenzene
- Organotin compounds (tributyl tin, triphenyl tin)
- Asbestos
- Azo compound
- Chlorinated paraffin and its kind (paraffin chloride, Chlorinated paraffin and chloroparaffin)
- Radioactive substance
- PVC

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Taipei, Taiwan
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Southeast Asia
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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.

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