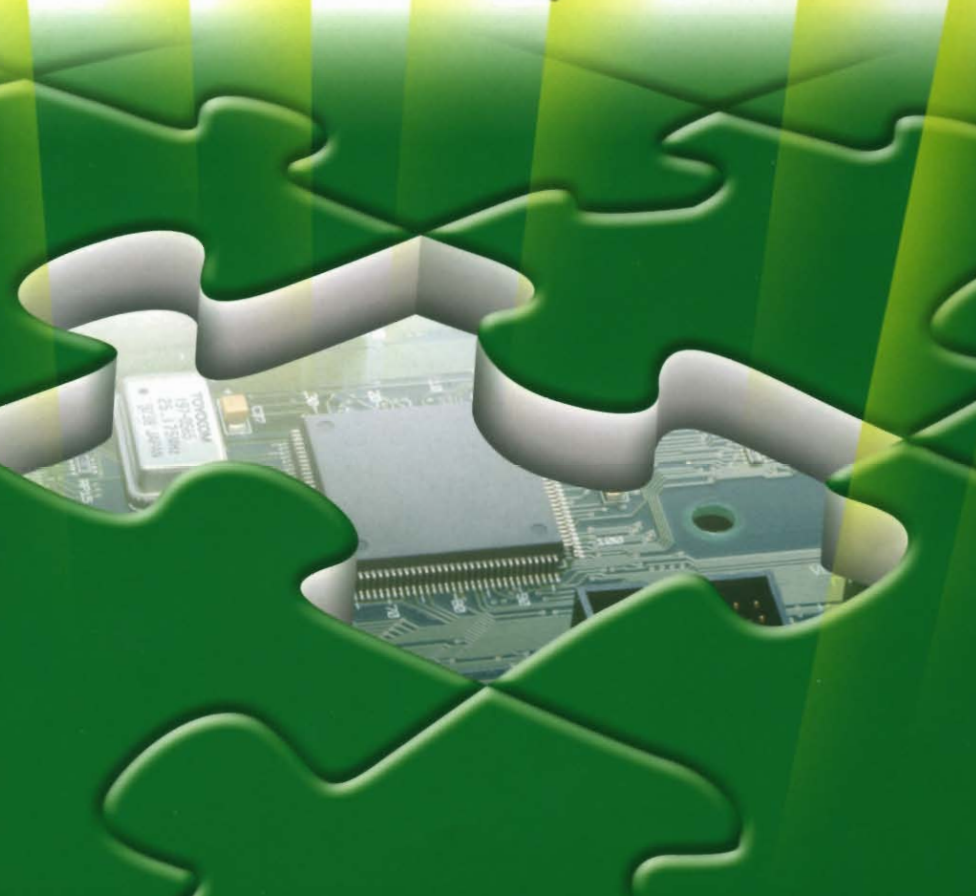
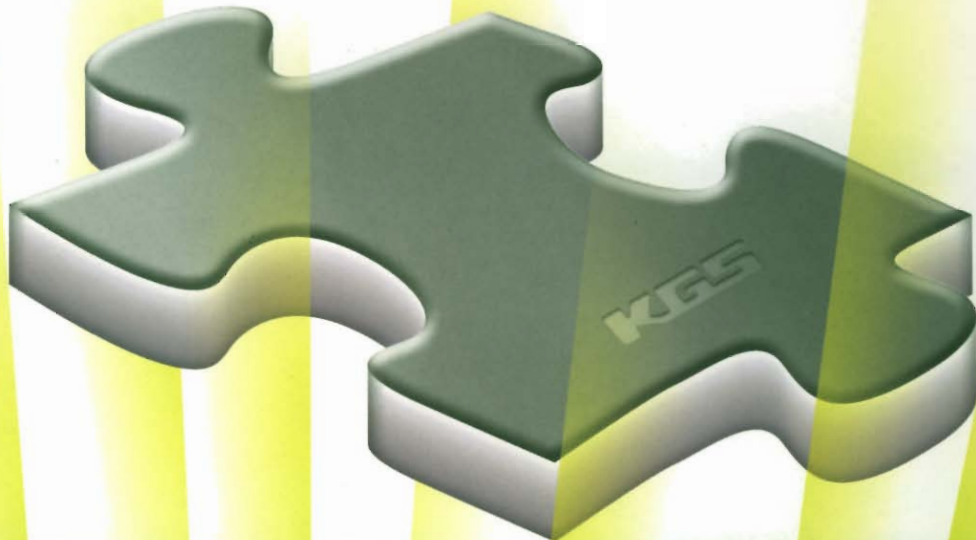


# EMI Noise Absorption Products

*The Last Unknown Piece of Your Big Puzzle*



**KGS** KITAGAWA INDUSTRIES CO., LTD.

## The Best Solutions to Your Troubles



Wide array of products are available for a broad range of applications.

### Sheet (Magnetic metal material - Soft ferrite)

Flexible resin based absorber in easy-to-handle sheet form



### Products for EMC + Thermal Management

Dual-purpose absorber sheet with excellent thermal conductivity for both EMC purpose and thermal management



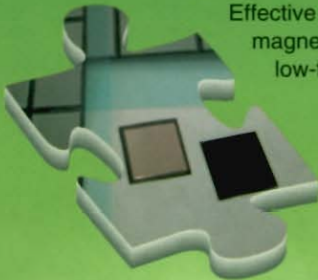
### Plate Type Core

Ferrite sintered into the form of plate  
Designed to be attached on CPU, etc.



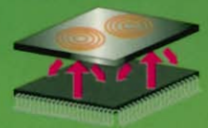
### Magnetic Foil Film

Effective for leakage magnetic flux and low-frequency noise

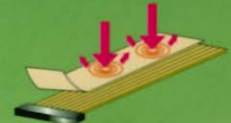


### Resonance Absorber

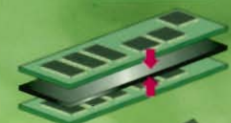
Significant absorption effectiveness in a certain frequency band



ATTACH



SANDWICH



WRAP

Main board

Radio frequency from CPU

Imaging chip

CCD circuit periphery

Interference to sensor

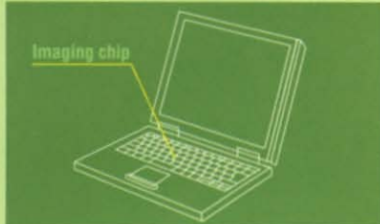
EMI interference to RF

Internal interference to GPS

# Long-accumulated know-how and fundamental research on EMC are utilized in our products.

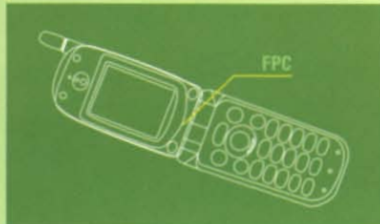
## Application Example

### Notebook PC



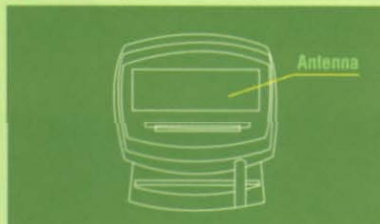
- Problem** Heat sink installed on imaging chip works as an antenna and radiates noise.
- Solution** Use CGE (thermally conductive sheet) between the chip and heat sink.
- Effect** Noise suppression and improvement of cooling effect due to better adhesion with heat sink

### Mobile Phone



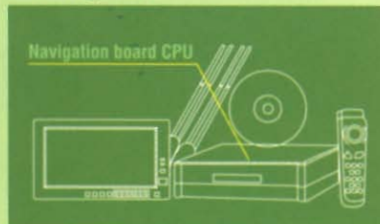
- Problem** Performance deterioration because of interference by IC and RF circuit
- Solution** Attach MG Absorption Sheet to FPC
- Effect** Stabilization of RF performance

### IC Card Reader



- Problem** Deterioration of antenna efficiency because of interference with metals (enclosure, board)
- Solution** Attach MG Absorption Sheet between antenna and enclosure
- Effect** Improvement of antenna efficiency and extension of distance of calls

### Car Navigation



- Problem** GPS (1.5GHz band) reception is interfered because of unwanted radiation wave from navigation board CPU
- Solution** Attach EMI Absorption Sheet to CPU
- Effect** Stabilization of reception by noise attenuation effect in 1.5 GHz band

## Research & Development

Based on know-how and fundamental research we have accumulated for over 20 years as a leading manufacturer of EMC products, we develop products best suited for problem solving and materials with new functionality.



## Manufacturing and Processing

Utilizing our state-of-the-art manufacturing and processing facilities inside/outside Japan as well as accumulated processing technologies, we are able to supply various high quality products.

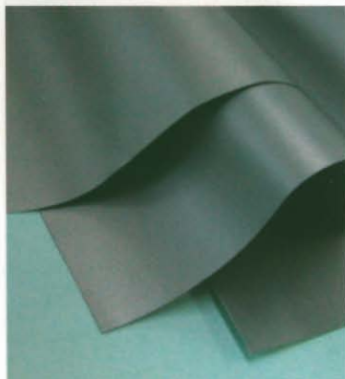


## Environmental Management

In order to supply environmentally-friendly products to our customers, we are committed to introducing chemical substance analyzers and strengthening management on hazardous substances.



## Magnetic Metal (High Performance) Type



### MG ABSORPTION SHEET / MG series

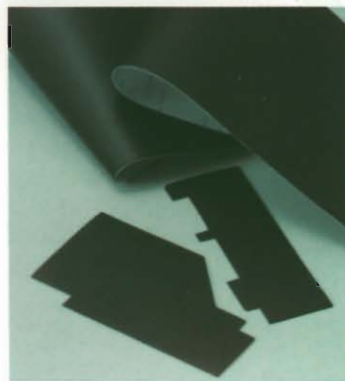
High-performance type composed of flexible resin mixed with magnetic metal filler

- MG-03A is heat-resistant rubber based and has improved heat resistance up to 150°C.
- MG-04 has excellent permeability ( $\mu=31 / 10\text{MHz}$ ), and 0.05mm ultrathin type is available.
- MG-05, -05A has super excellent permeability ( $\mu=50 / 10\text{MHz}$ ).

Part number	MG-03A	MG-04	MG-05A <b>NEW</b>	MG-05 <b>NEW</b>
Thickness (mm)	0.5 / 1.0	0.05 / 0.1	0.25 / 0.5	0.1
Recommended operating temp.(°C)	-40~150	-25~80	-45~85	
Volume resistivity ( $\Omega \cdot \text{cm}$ )	10 <sup>7</sup>		10 <sup>11</sup>	
Flame retardancy	—	Equivalent to UL94V-0	UL94V-0*	
Material	Magnetic metal filler + Rubber	Magnetic metal filler + Resin		
Feature	Improved heat resistance	Thin, High permeability	Super high permeability	

\* Except for adhesive

## Soft Ferrite (Standard) Type



### EMI ABSORPTION SHEET / MAB series

Standard type composed of flexible resin mixed with soft ferrite

Part number	MAB-03	MAB-04
Thickness (mm)	0.4 / 1.0 / 2.0 / 4.0	0.1 (incl. Adhesive)
Recommended operating temp.(°C)	-25~80	
Volume resistivity ( $\Omega \cdot \text{cm}$ )	10 <sup>12</sup>	10 <sup>13</sup>
Flame retardancy	UL94V-0*	Equivalent to UL94VTM-1
Material	Soft ferrite + Resin	
Feature	Wide variety of thickness	Thin (film-coated type)

\* For 4.0mm thick sheet, flame retardancy is equivalent to UL94V-0

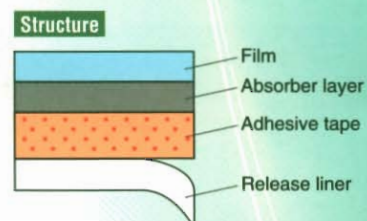
## Soft Ferrite (Film Coated) Type



### REACH FILM / RFM1

Flexible and bending-resistant absorption sheet composed of absorber layer sandwiched by film and adhesive tape

The sheet can be bent or wrapped around cables without any crack caused.

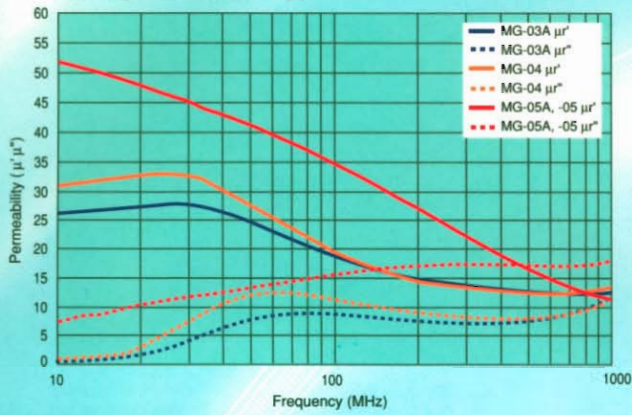


Part number	RFM1
Thickness (mm)	0.27 (incl. Adhes ve)
Recommended operating temp.(°C)	-25~80
Volume resistivity ( $\Omega \cdot \text{cm}$ )	10 <sup>12</sup>
Flame retardancy	Equivalent to UL94VTM-1
Material	Soft ferrite + Resin
Feature	Resistant to bending

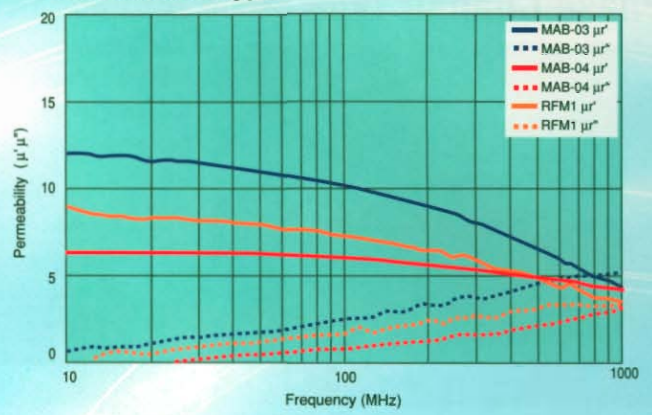
# Property\*

## Permeability

### ●Magnetic metal type

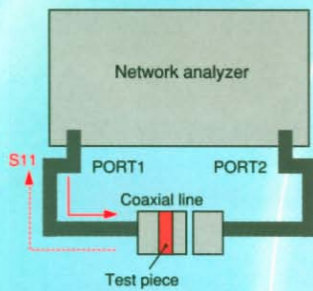


### ●Soft ferrite type

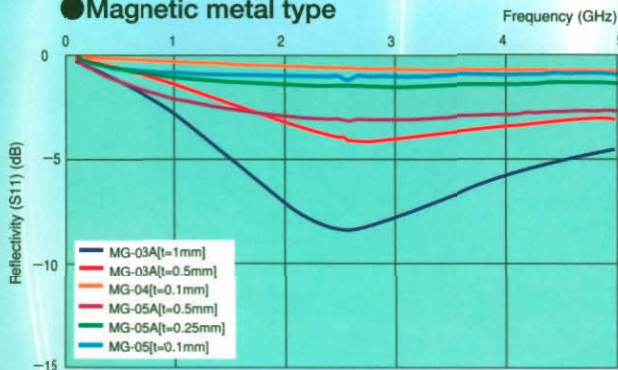


## Reflection loss

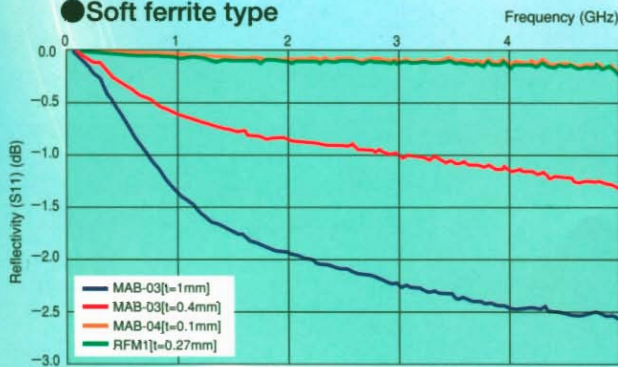
### ●Measurement method



### ●Magnetic metal type

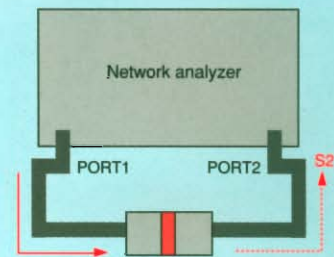


### ●Soft ferrite type

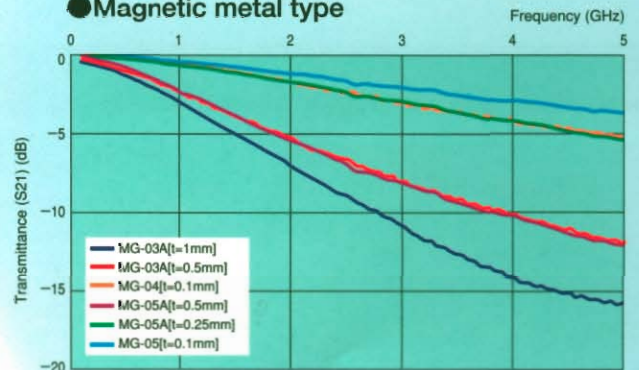


## Transmission loss

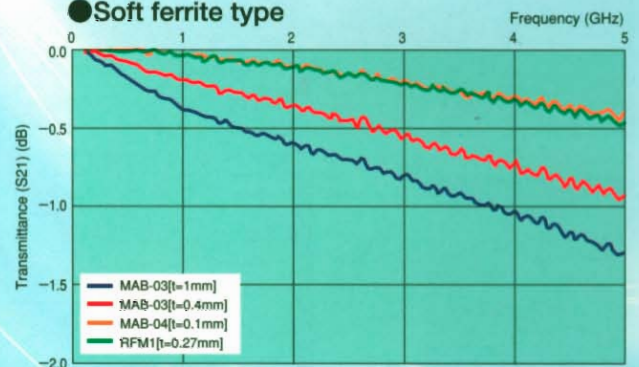
### ●Measurement method



### ●Magnetic metal type



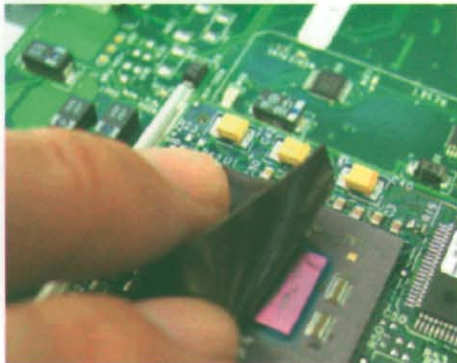
### ●Soft ferrite type



\* The values are based on measurement at our EMC Center, and they are not guaranteed values.

## EMC + Thermal Management

### Phase Change Type



### CHANGE GEL® / CGE / CGER

- Electromagnetic absorption sheet with high thermal conductivity
- 50°C phase change material—Secures the close contact with heating elements (Will be solidified again at room temperature)

Part number	CGE-0.25	CGER-0.25
Thickness (mm)	0.25	
Permeability (100MHz)	7	
Thermal conductivity (W/m·K)	1.5	
Volume resistivity (Ω·cm)	10 <sup>13</sup>	
Flame retardancy	—	
Material	Soft ferrite + Resin	
Feature	Double-side tackiness	One-side tackiness*

\* Easy to peel off when solidified again

### Sheet Type

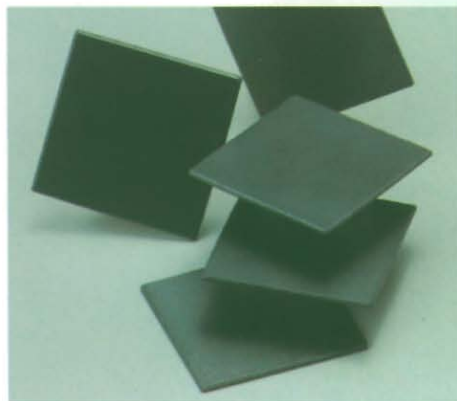


### COOL PROVIDE® / EMPV

- Electromagnetic absorption sheet with high thermal conductivity
- Easy-to-process, flexible sheet

Part number	EMPV
Thickness (mm)	0.5 / 1.0 / 2.0
Permeability (100MHz)	6
Thermal conductivity (W/m·K)	1.1
Volume resistivity (Ω·cm)	10 <sup>13</sup>
Flame retardancy	UL94V-1
Material	Soft ferrite + Silicone
Feature	—

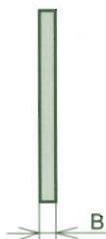
## Ferrite (Plate Type Core)



### CPU CORE / SD

- Soft ferrite sintered into the form of plate
- Also available with CPU-PAD backing (thermally conductive adhesive tape)

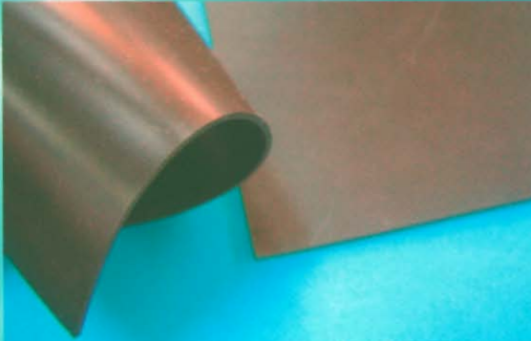
Part number	SD
Recommended operating temp.(°C)	-25~+85
AC initial permeability	600
Thermal conductivity (W/m·K)	3.5
Volume resistivity (Ω·cm)	10 <sup>8</sup>
Material	Soft ferrite



Dimension	A (mm)	B (mm)
SD-28-28-0.8	28	0.8
SD-28-28-0.8T*	28	0.8 + (0.14/CPU-PAD)
SD-38-38-2	38	2

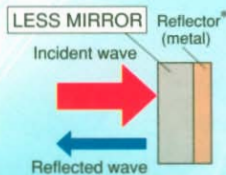
\* Please make sure to check the adhesive power of CPU-PAD before use.

## Resonance Absorber



### Mechanism

By mounting LESS MIRROR on reflector, significant absorption effectiveness is achieved as the reflected wave interferes with (or offsets) incident wave inside the LESS MIRROR layer.

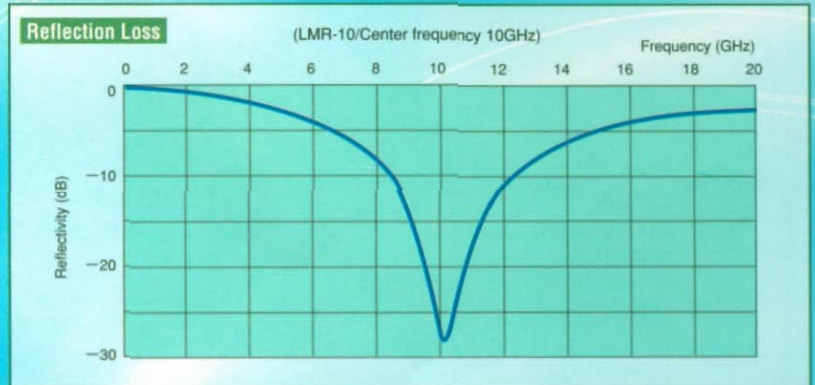


\* This product does not include

## LESS MIRROR® / LMR NEW

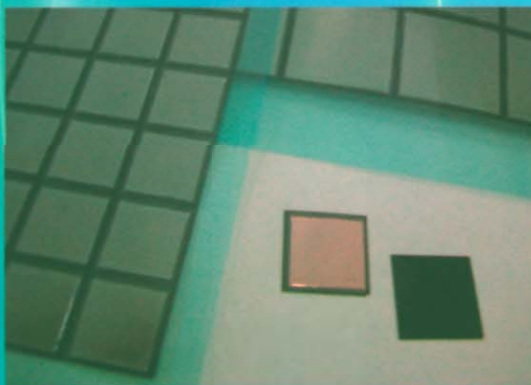
- Significant absorption effectiveness in a certain frequency band
- For each item, absorption effectiveness of 20dB or more is achieved at the center frequency.

(We are able to meet your requirements for frequencies not listed below.)



Part number	LMR-2.4	LMR-2.6	LMR-5.2	LMR-5.8	LMR-10	LMR-10.5	LMR-12	LMR-14
Center frequency (GHz)	2.4	2.6	5.2	5.8	10	10.5	12	14
Sheet thickness (mm)	2.9	2.79	2.05	1.95	1.56	1.57	1.45	1.27
Recommended operating temp.(°C)	-40~100°C							
Volume resistivity (Ω·cm)	10 <sup>5</sup> ~10 <sup>6</sup>							
Flame retardancy	—							
Material	Soft ferrite + Magnetic metal filler + Silicone							
Application	Wireless LAN, RFID	Digital broadcasting	Wireless LAN	ETC	Satellite broadcasting	Satellite broadcasting	Satellite broadcasting	Radio, etc.

## Magnetic Foil Film

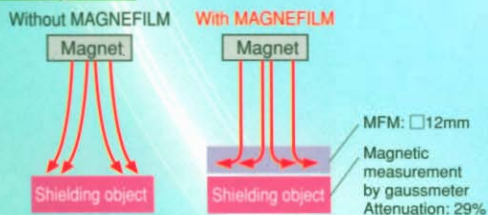


## MAGNE FILM / MFM NEW

- Magnetic foil laminated with resin film
- Effective for leakage magnetic flux and low-frequency noise from IC, etc. for which conventional absorption sheets are not very effective

Part number	MFM-1-0.2-012012T	MFM-1-0.2-020020T
Dimension (mm)	□12(magnetic foil) □14(laminate)	□20(magnetic foil) □22(laminate)
Thickness (mm)	0.2 (incl. adhesive)	
Permeability (10MHz)	65	
Flame retardancy	—	
Material	Magnetic metal foil + Resin film	

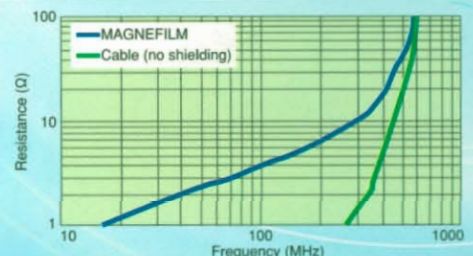
### For Magnetism



### For Electromagnetic Wave

#### Measurement of resistance component

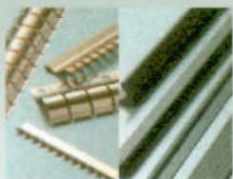
Resistance was measured with MAGNEFILM on both sides of FPC (L=10cm).



# KITAGAWA INDUSTRIES GLOBAL NETWORK



## EMC Products



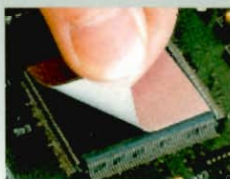
Shields, filters and grounds electromagnetic noise having negative effects on electronic devices and human body.

## Electronic Components



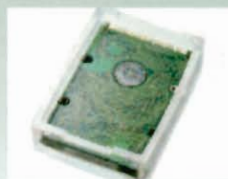
Fixes and protects PCBs, cables, and so on in electronic devices.

## Thermal Management Products



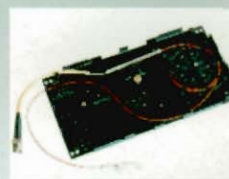
Effectively conducts and insulates "heat", a problem occurring with miniaturization and speed-up of devices.

## Vibration and Shock Control Products



Protects products and peripherals from vibration and shock, and prevents malfunction, damage, noise, and so on.

## Optical Components



Optical fibers, connectors, wiring accessories, tools, various scopes, and so on.

**KGS KITAGAWA INDUSTRIES CO., LTD.**

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 460-0012, Japan  
 Tel. 81-52-261-5521 Fax. 81-52-249-1681  
 URL. <http://www.kitagawa-ind.com>