

EMC

PRODUCTS

FILTERING 
SHIELDING 
GROUNDING 

ELECTRO-**M**AGNETIC **C**OMPATIBILITY

SYMBIOSIS & COLLABORATION

KITAGAWA INDUSTRIES CO., LTD.

A global technology group providing high quality for life's amenities through "Symbiosis & Collaboration"

The high pace of industrial technology innovation can lead to various problems.

We carry out the research and propose the solutions to the problems in order to provide a clean electromagnetic environment.



R&D bases



Technology Center



Kasugai factory



Inazawa factory



Thailand factory



Wuxi (China) factory

Material Developments

Functional film



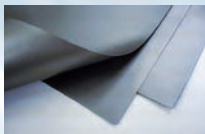
Sputtering technology applied at the nano-Level for producing functional coatings provides greater design exibility for high density electronic equipment.

KG-GEL(vibration damping and shock buffering)



KG-GEL is a special polystyrene gel with super-low hardness of ASKER FP, which provides excellent shock buffering, vibration and noise damping for equipment and sub-assembly components.

LOSTOMER(vibration damping)



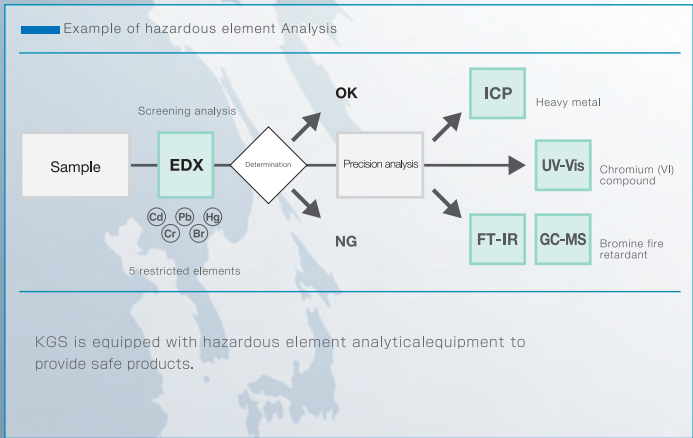
High vibration damping and heat resistant properties (100°c) for a wide range of applications. Can be produced in customized profile.

COOLPROVIDE (Thermal+EMC)



Using our original composite technology we develop multifunctional materials for simultaneous management of EMC and thermal problems.

Environmental policy



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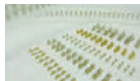
ON-BOARD (with support for automated mounting)



GROUNDING CONTACTS
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GROUNDING COMPONENTS
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GROUNDING CLIPS
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EMC GROUNDING



For CABLES
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For BOARDS, ENCLOSURES
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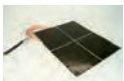


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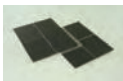
ELECTROMAGNETIC WAVE MANAGEMENT SHEETS



ELECTROMAGNETIC NOISE SUPPRESSION SHEETS
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USED For WIRELESS CHARGING
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USED For RFID/NFC
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EMC FILTER PRODUCTS



LOW FREQUENZ SUPPRESSION CORES
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INTERMEDIATE FREQUENZ SUPPRESSION CORES
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HIGH FREQUENZ SUPPRESSION CORES
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CABLE SHIELDS



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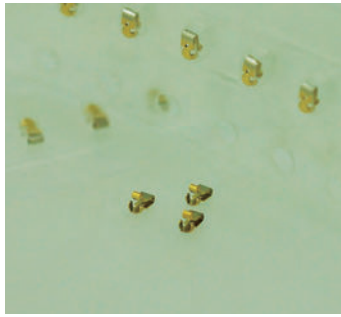
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ON-BOARD CONTACT / OG-160810S

P.5



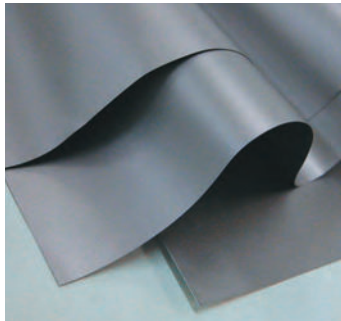
On-board contact for super-narrow gaps

Feature

- The spring contact is applicable to surface mounters, usable for antennas and power supplies, and also functions as grounding reinforcement.
- The mounting area is approx. 60% reduced compared with conventional products.
- Useful for reducing size and weight of devices.
- Recommended height :0.7~0.9mm.
- Standard Package Quantity :3500pcs/Reel

EMI ABSORPTION SHEET / MG-13

P.24



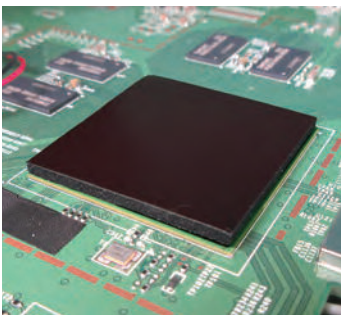
2-6GHz range noise suppression sheet.

Feature

- Highly effective for suppressing electromagnetic emission and immunity.
- Ideal for management of internal interference issues in Sub-6 GHz such as Wi-Fi, 5G, and GPS wireless devices.

COOLPROVIDE™ / EMPV5

P.27



EMC noise suppression sheet in broad frequency band with high thermal conductivity

Feature

- Original composition is realized EMC noise suppression in broad band from 500MHz to 3GHz.
- Silicone-free, no siloxane outgassing.
- Oil bleeding is reduced compared to silicone-based thermal materials.

High μ FERRITE CLAMP / KTFC

P.45



Split FERRITE CLAMP for intermediate frequency range from 3 to 50MHz

Feature

- Effective for suppression both of conducted noise up to 30MHz and radiated noise over 30MHz.
- Split FERRITE CLAMP with plastic housing enables to attach assembled cable and cables with connector.
- Cable tie can assist to hold electric wires and enables the product to be fixed to wire harness.
- Wire guiding system prevent wires from being pinched when winding assembly.
- With optional mounting fixture, the product can be assembled on enclosure by M4 screw.

BROAD EFFECT CORE / BRE-A

P.35



Oval Nanocrystalline Alloy Core

Feature

- Oval-shape provides space-saving, lower profile than ring cores.
- With high impedance, effective for suppressing noise across a broad frequency range.
- Vibration resistance complies with in-vehicle vibration test standard (ISO 16750-3 II).
- Stable EMI performance from low to high temperature range.
- Operating temperature: -40°C to +125°C
- UL94V-0 rated plastic case with excellent electrical insulation.

How to read the Catalog

How to retrieval contents pages

Product Classification

Page No.

Part Name

Main Category

Sub Categories

How to read the Catalog

How to retrieval contents pages

ON-BOARD (with support for automated mounting)

GROUNDING CONTACTS

For stable grounding contact between PC boards and PC board and chassis

Compact / Space saving / Large height type / Centered pick up

Side contact

GROUNDING COMPONENTS

For low impedance grounding contact and screw securing areas

Plates

Lug terminals

GROUNDING CLIPS

For shielding can fixing and EMC grounding

GROUNDING CLAMPS

For cable fixing on PC board

[ANNOTATION]

- All specifications and characteristics shown herein are subject to change or discontinue the production without notice for improvements or changes in specification.
- All specifications and characteristics shown herein are typical value, but are not guaranteed.
- Product specifications should be requested and identified details prior to actual use.
- KGS does not warrant any trouble and/or defects caused by misuse of product without characteristics, rating or range of applications described in the product specifications. Please contact us if you have any questions about product.
- Products in this catalog are mainly for the purpose of suppressing EMC (Electromagnetic Compatibility) for general electronics devices and equipments. In case of special application such as higher reliability requirement or using where may be caused damage to the assets, prior consent is necessary.
- KGS expends all possible means to improve quality and reliability of product, however misuse of product brings about the possibility of physical injury, fire or social loss. Please contact us if you have any questions about product application.
- Product might not be for sale by country or region.
- It is prohibited reprint of the article in this brochure without prior written consent by Kitagawa Industries Co., Ltd.



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GROUNDING CONTACTS

For stable grounding contact between PC boards and PC board and chassis

Compact / Space saving / Large height type / Centered pick up



ON-BOARD CONTACT

Sidecontact



SIDE CONTACT

GROUNDING COMPONENTS

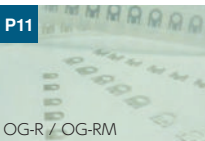
For low impedance grounding contact and screw securing areas

Plates



ON-BOARD PLATE

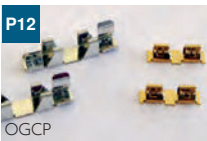
Lug terminals



ON-BOARD LUG
TERMINAL

GROUNDING CLIPS

For shielding can fixing and EMC grounding



ON-BOARD CLIP



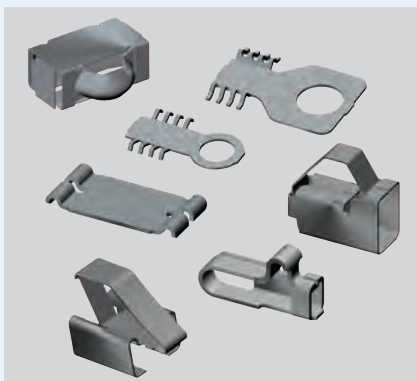
ON-BOARD SHIELD GUIDE

GROUNDING CLAMPS

For cable fixing on PC board



ON-BOARD CLAMP



Grounding components, with support for automated mounting on PC board.

Feature

- Space saving and FG reinforcement at design stage of PC board.
- Supplied with embossed tape for automated mounting by chip mounter.
- Suitable management for emission and ESD immunity.

ON-BOARD CONTACT

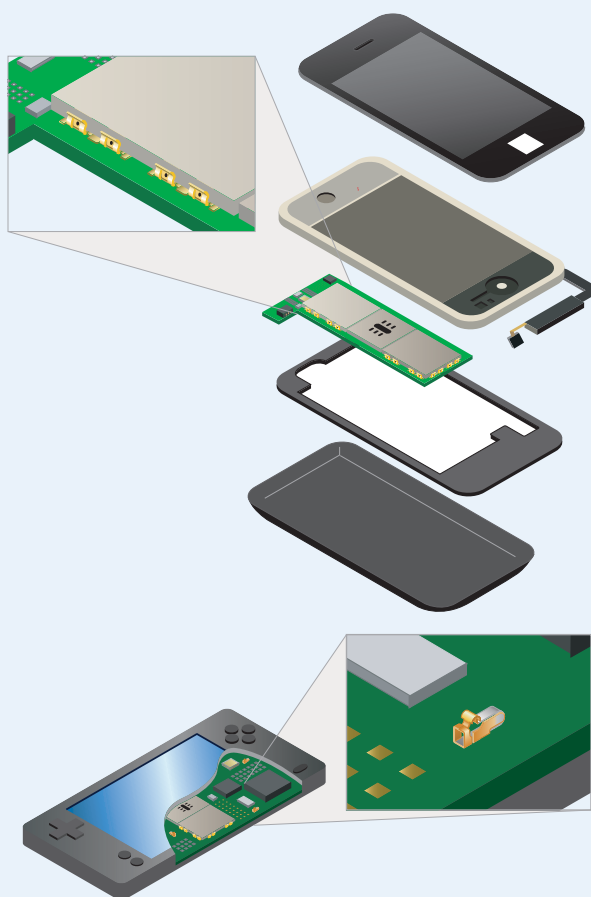


Upper faces of mounted make contact with chassis, PC board and component, etc.

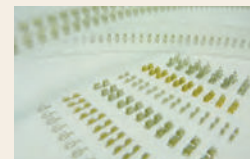
SIDE CONTACT



Side face of mounted parts makes contact with chassis, PC board and metal frame, etc.



ON-BOARD CLIP



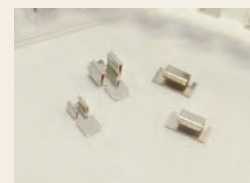
Clip mechanism enables stable fixing and grounding for shielding can.

ON-BOARD SHIELDING GUIDE



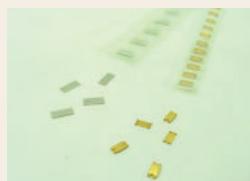
Displacement prevention mechanism improves shielding can grounding.

ON-BOARD CLAMP



Space-saving cable wiring on PC boards.

ON-BOARD PLATE



Reinforcement at contact points provided for reliable grounding.

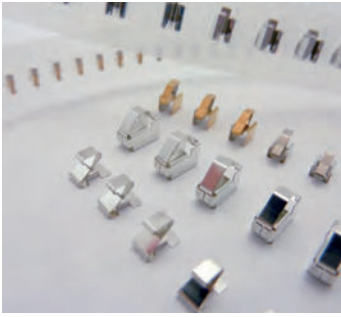
ON-BOARD LUG TERMINAL



Improved grounding reliability at screw area.

●Notes for On-Board series

Please contact our sales department for mounting specifications such as recommended pad dimensions, etc.
Trial mounting using our products is required prior to purchase. Please check the notes indicated on the back cover.
Galvanic corrosion may occur by contact with other metals.
With regard to sales lot and delivery lead time, please contact our sales department.



Super-compact grounding components with wide variations

Feature

- Space saving, FG facilitated even where screws are precluded.
- Grounding component product can be mounted by pick and place machine,
- Box structure is introduced for distortion, deformation and damage prevention.(excluding some part numbers)

Material

- As described below

■ Compact type



Down-sized compact type for narrow space configurations.

■ Space saving type



For space saving at pad area on PC board

■ Large height type



For large clearances

■ Centered vacuum pick-up type

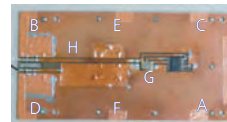


Vacuum pick-up point is placed at center

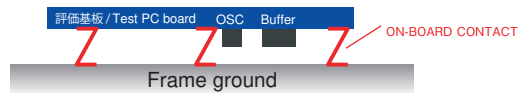
■ Suppression of radiated emission by multi point grounding

<Experimental contents>

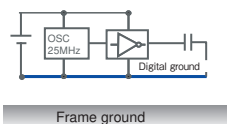
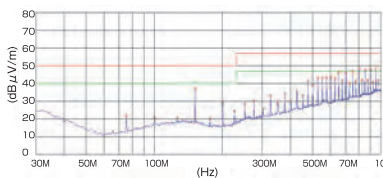
- Exp 1: PC board + Metal plate (without grounding)
- Exp 2: PC board + Metal plate (4 points : A, B, C, D)
- Exp 3: PC board + Metal plate (8 points : A, B, C, D, E, F, G, H)



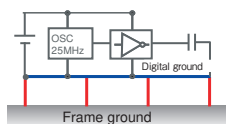
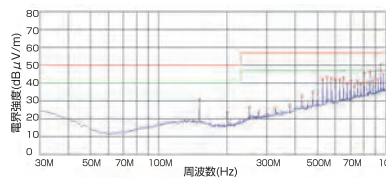
GND point on test PC board



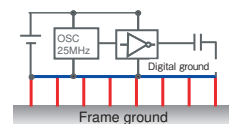
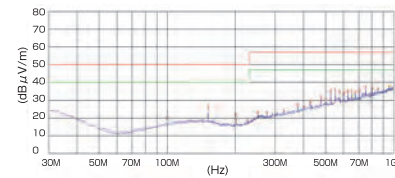
1) Without FG connection



2) points grounding



3) 8 points grounding



Multi point grounding enables large suppression effectiveness.

Working Range Chart for Precision

ON-BOARD (with support for automated mounting)

Product name and form	Part No.	(mm) Initial height (mm)	Working height (mm) Min.~Max.																										
						0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5					
ON-BOARD CONTACT            	OG-321605	0.5		~	0.35																								
	OG-321605G	0.5		~	0.35																								
	OG-160810S	1	0.7	~	0.9																								
	OG-301012	1.2	0.6	~	1.1																								
	OG-320816	1.6	1.1	~	1.4																								
	OG-450818	1.8	1.2	~	1.6																								
	OG-321022	2.2	1.5	~	2																								
	OG-542925	2.5	1.5	~	2.3																								
	OG-453239-A	3.9	2.8	~	3.5																								
	OG-363040	4	2.2	~	3.4																								
	OG-363040G	4	2.2	~	3.4																								
	OG-363040HD	4	2.2	~	3.4																								
	OG-363040HDR	4	2.2	~	3.4																								
	OG-503040	4	2.2	~	3.6																								
	OG-232242	4.2	3.2	~	3.8																								
	OG-282543HDR	4.3	2.5	~	3.9																								
	OG-453048	4.8	2.7	~	4.4																								
	OG-363050	5	3.2	~	4.4																								
	OG-363050G	5	3.2	~	4.4																								
	OG-363050HD	5	3.2	~	4.4																								
	OG-363050HDR	5	3.2	~	4.4																								
	OG-362550	5	3.6	~	4.5																								
	OG-503253-A	5.3	3.5	~	4.5																								
	OG-453060	6	4.2	~	5.5																								
	OG-603060	6	4.2	~	5.5																								
	OG-453065	6.5	4.2	~	6																								
	OG-363065HD	6.5	4.7	~	5.9																								
	OG-603070	7	5	~	6.5																								
	OG-453070	7	5.3	~	6.5																								
	OG-684296	9.6	7	~	9																								

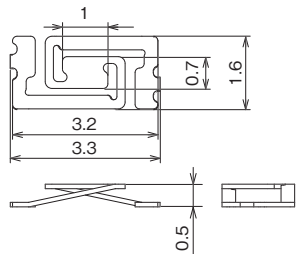
Contacts

Grounding components

Clips

Clamps

OG-321605

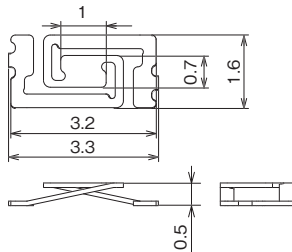


Material :Phosphor bronze for spring(t =0.1mm)

Surface treatment : Sn reflow plating

Recommended height :0.35mm or less

OG-321605G

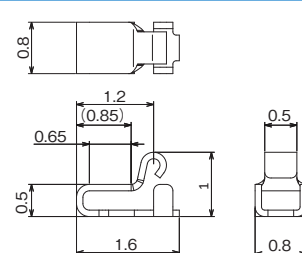


Material :Phosphor bronze for spring(t =0.1mm)

Surface treatment : Partial Au plating
(Ni Base plating)

Recommended height :0.35mm or less

OG-160810S



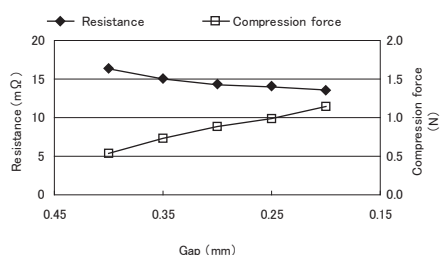
Material :Beryllium copper

Surface treatment : Partial Au plating
(Ni Base plating)

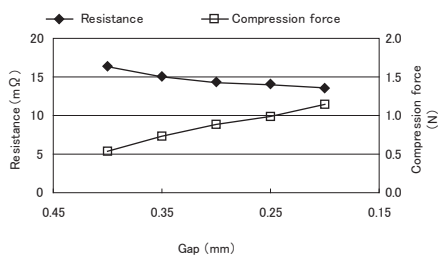
Recommended height :0.7~0.9mm

Compression force vs Electric resistance

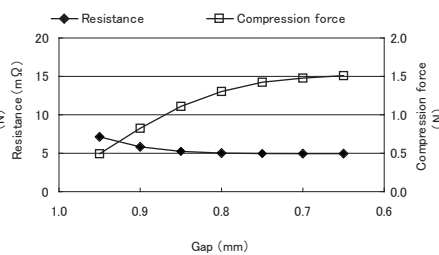
OG-321605



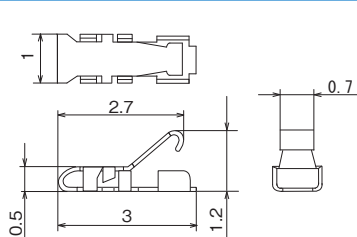
OG-321605



OG-160810S



OG-301012



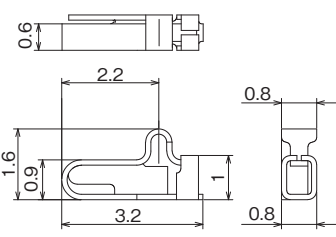
Material :Phosphor bronze for spring(t=0.08mm)

Surface treatment : Partial Au plating

Recommended height :0.6~1.1mm

Unit:mm

OG-320816

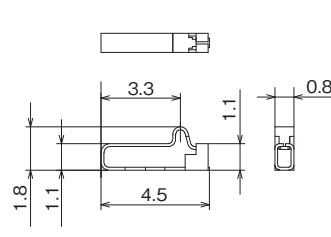


Material :Phosphor bronze for spring(t=0.12mm)

Surface treatment :Partial Au plating

Recommended height :1.1~1.4mm

OG-450818



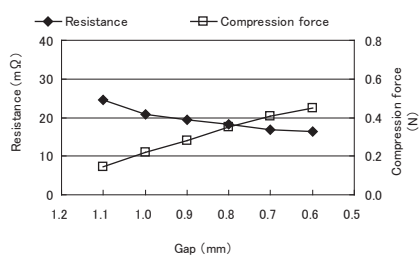
Material :Beryllium copper(t=0.12mm)

Surface treatment : Partial Au plating

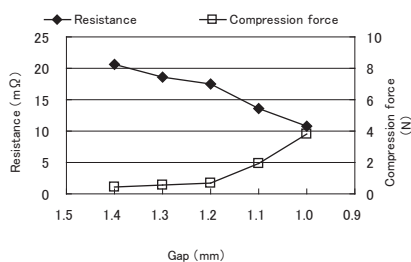
Recommended height :1.2~1.6mm

Compression force vs Electric resistance

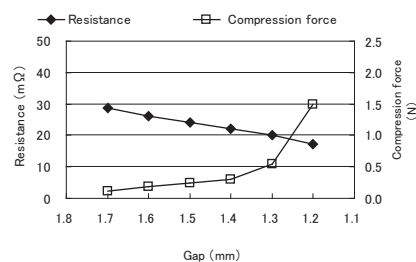
OG-301012



OG-320816

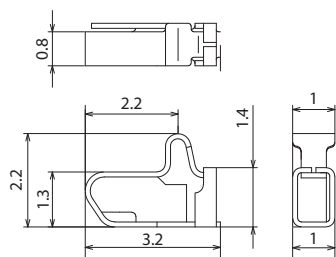


OG-450818



※Please confirm "Notes for Onboard series" on page 2 prior to purchase.
 ※The values are measured data for reference, not guaranteed.

OG-321022

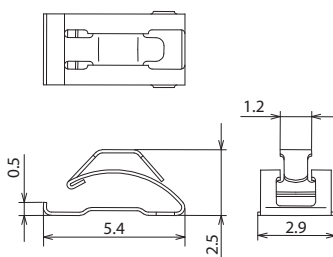


Material : Phosphor bronze for spring (t=0.12mm)

Surface treatment : Partial Au plating

Recommended height : 1.5~2mm

OG-542925

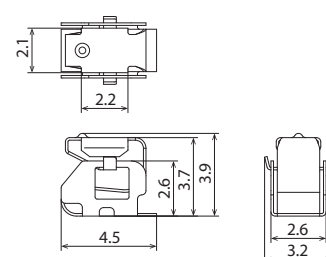


Material : Phosphor bronze for spring (t=0.12mm)

Surface treatment : Partial Au plating

Recommended height : 1.5~2.3mm

OG-453239-A



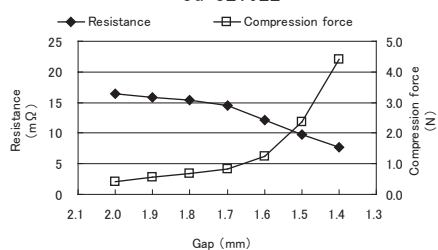
Material : Beryllium copper (t=0.12mm)

Surface treatment : Sn reflow plating (Cu Base plating)

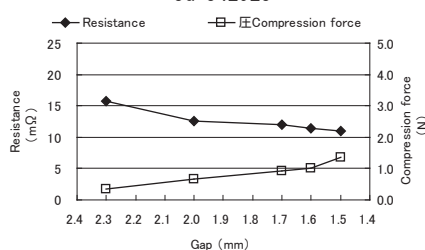
Recommended height : 2.8~3.5mm

Compression force vs Electric resistance

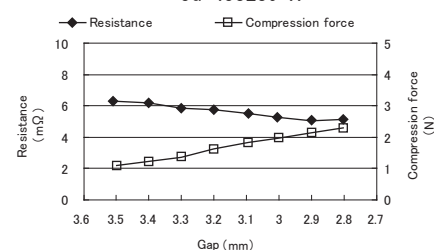
OG-321022



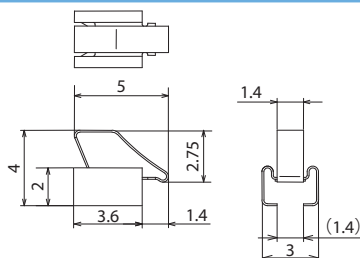
OG-542925



OG-453239-A



OG-363040

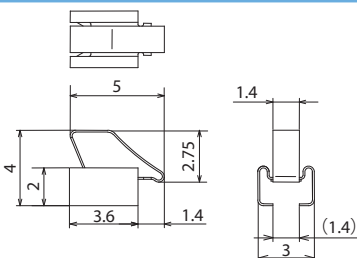


Material : Beryllium copper (t=0.1mm)

Surface treatment : Sn reflow plating (Ni plated contacts)

Recommended height : 2.2~3.4mm

OG-363040G

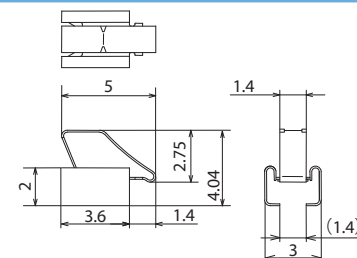


Material : Beryllium copper (t=0.1mm)

Surface treatment : Partial Au plating

Recommended height : 2.2~3.4mm

OG-363040HD



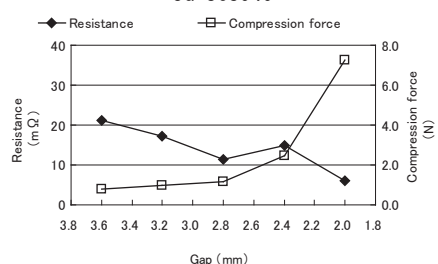
Material : Beryllium copper (t=0.1mm)

Surface treatment : Sn reflow plating (Ni plated contacts)

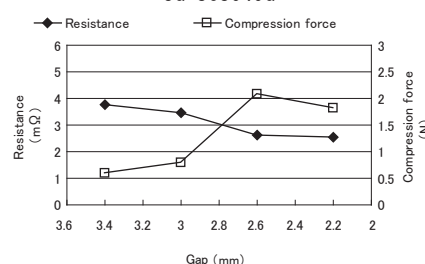
Recommended height : 2.2~3.4mm

Compression force vs Electric resistance

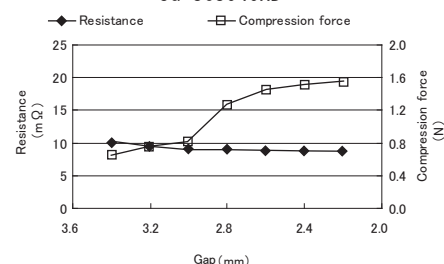
OG-363040



OG-363040G



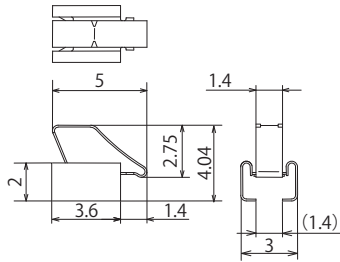
OG-363040HD



※Please confirm "Notes for Onboard series" on page 2 prior to purchase.

※The values are measured data for reference, not guaranteed.

OG-363040HDR

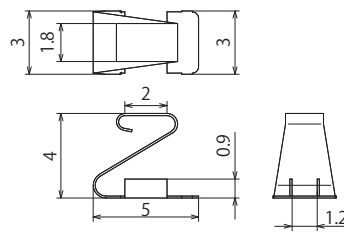


Material : Phosphor bronze for spring (t=0.1mm)

Surface treatment : Sn reflow plating

Recommended height : 2.2~3.4mm

OG-503040

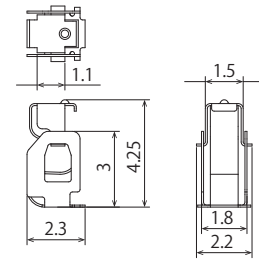


Material : Beryllium copper (t=0.1mm)

Surface treatment : Sn plating

Recommended height : 2.2~3.6mm

OG-232242



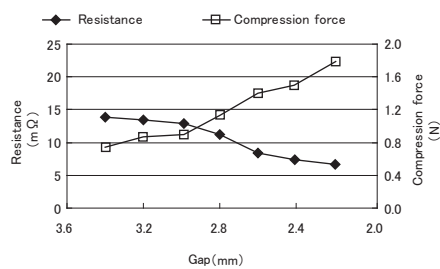
Material : Phosphor bronze for spring (t=0.8mm)

Surface treatment : Sn reflow plating (Cu Base plating)

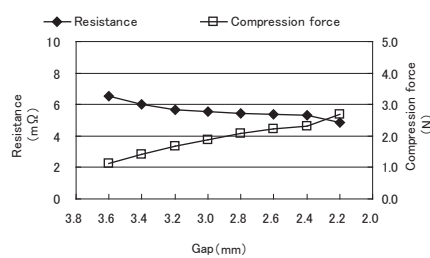
Recommended height : 3.2~4.0mm

Compression force vs Electric resistance

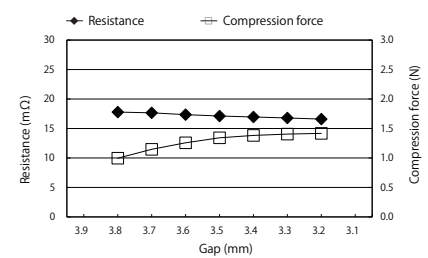
OG-363040HDR



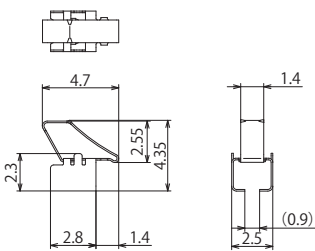
OG-503040



OG-232242



OG-282543HDR

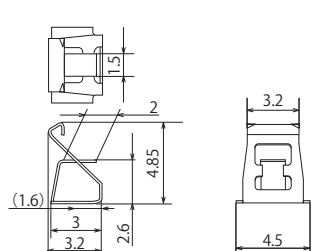


Material : Phosphor bronze for spring (t=0.1mm)

Surface treatment : Sn reflow plating

Recommended height : 2.5~3.9mm

OG-453048

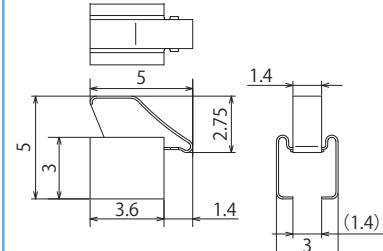


Material : Phosphor bronze for spring (t=0.1mm)

Surface treatment : Sn reflow plating

Recommended height : 2.7~4.4mm

OG-363050



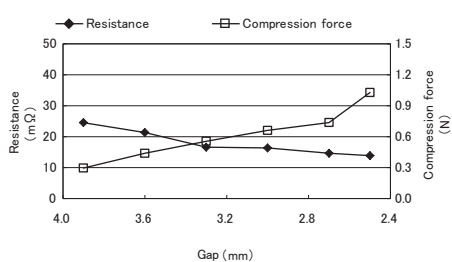
Material : Beryllium copper (t=0.1mm)

Surface treatment : Sn reflow plating (Ni plated contacts)

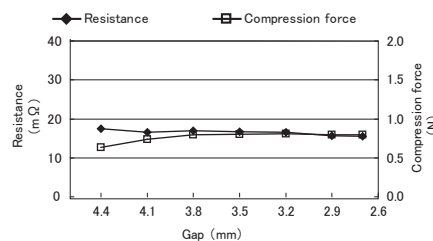
Recommended height : 3.2~4.4mm

Compression force vs Electric resistance

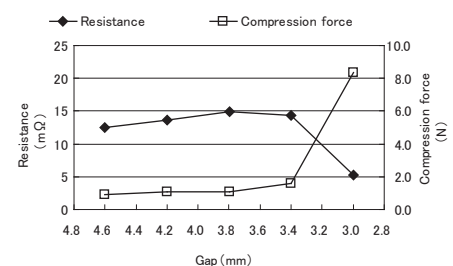
OG-282543HDR



OG-453048



OG-363050



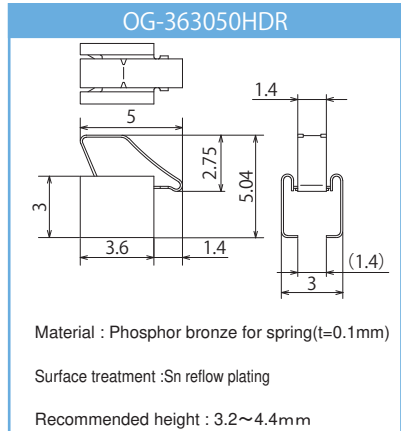
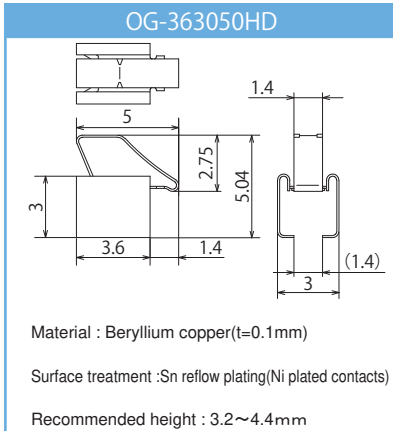
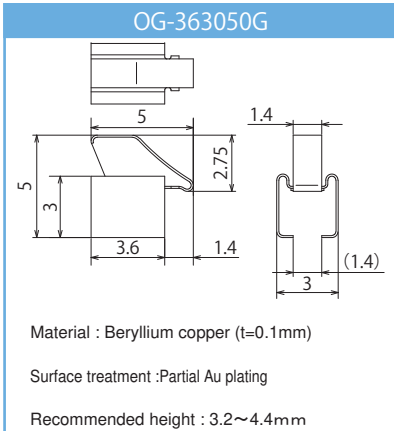
Contacts

Grounding components

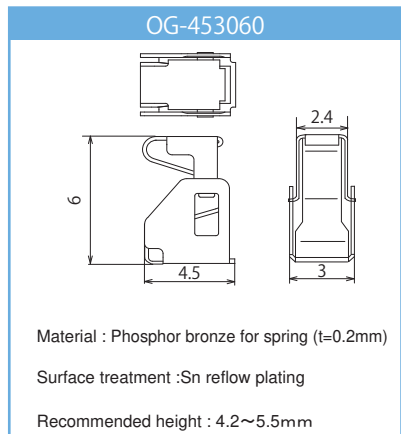
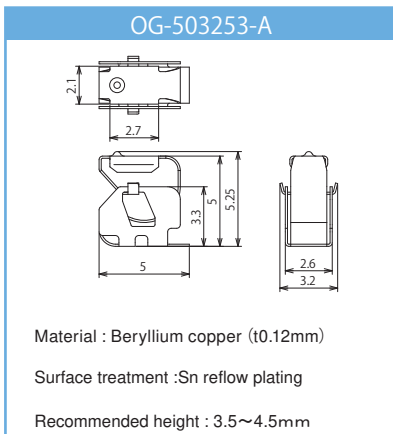
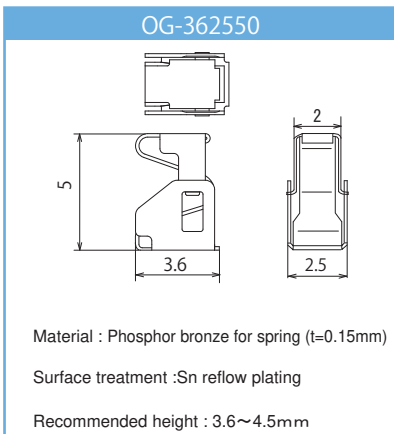
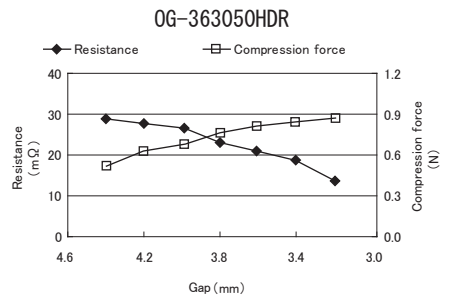
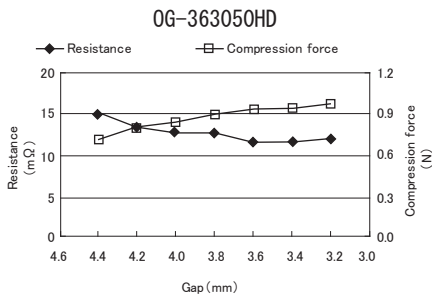
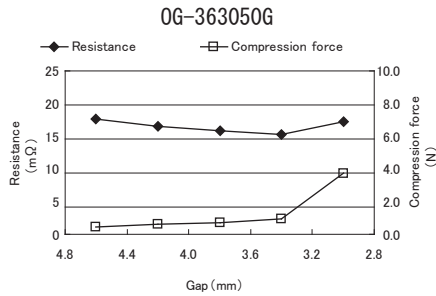
Clips

Clamps

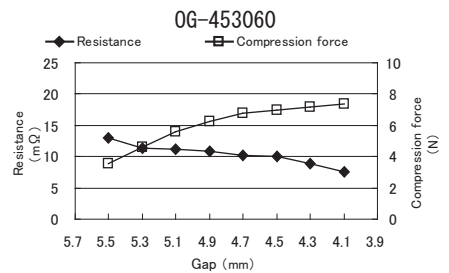
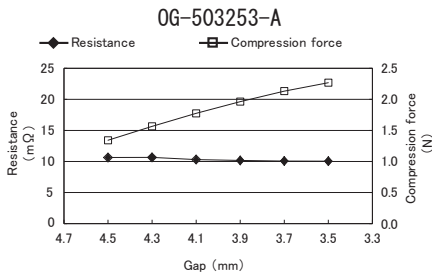
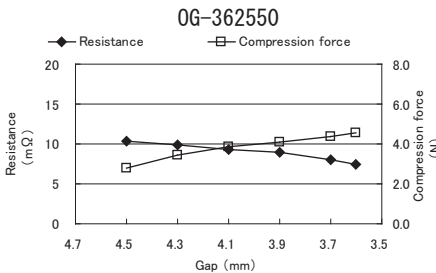
※Please confirm "Notes for Onboard series" on page 2 prior to purchase.
 ※The values are measured data for reference, not guaranteed.



Compression force vs Electric resistance

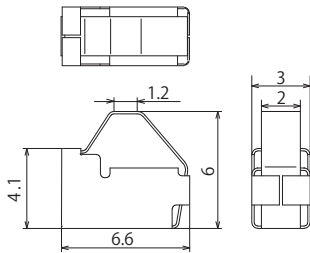


Compression force vs Electric resistance



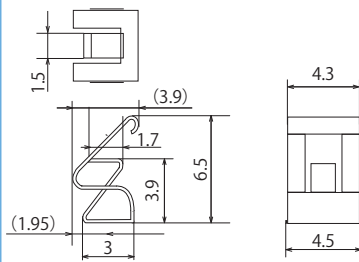
※Please confirm "Notes for Onboard series" on page 2 prior to purchase.
 ※The values are measured data for reference, not guaranteed.

OG-603060



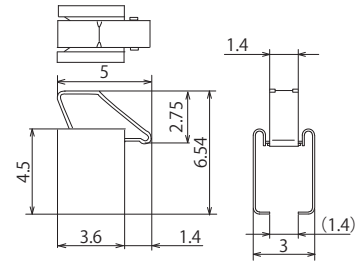
Material : Phosphor bronze for spring (t=0.12mm)
Surface treatment :Sn reflow plating
Recommended height : 4.2~5.5mm

OG-453065



Material : Phosphor bronze for spring (t=0.15mm)
Surface treatment :Sn reflow plating.
Recommended height : 4.2~6.0mm

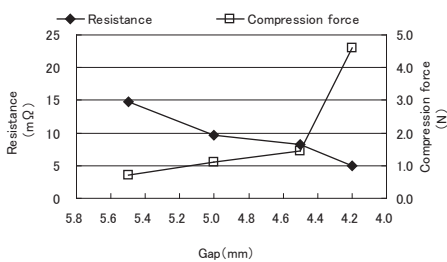
OG-363065HD



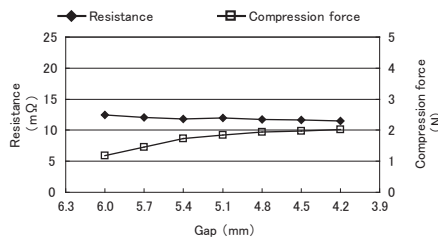
Material : Beryllium copper(t=0.1mm)
Surface treatment :Sn reflow plating(Ni plated contacts)
Recommended height : 4.7~5.9mm

圧縮抵抗特性データ / Compression force vs Electric resistance

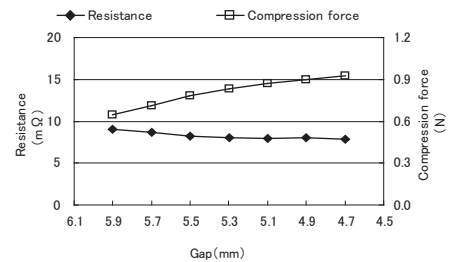
OG-603060



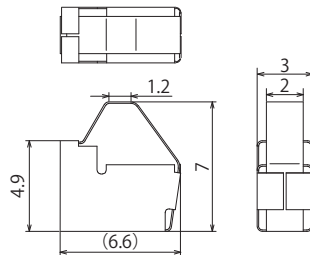
OG-453065



OG-363065HD

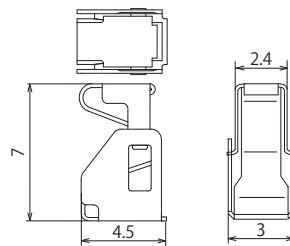


OG-603070



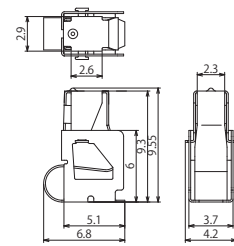
Material : Phosphor bronze for spring (t=0.08mm)
Surface treatment :Sn reflow plating
Recommended height : 5~6.5mm

OG-453070



Material : Phosphor bronze for spring (t=0.2mm)
Surface treatment :Sn reflow plating
Recommended height : 5.3~6.5mm

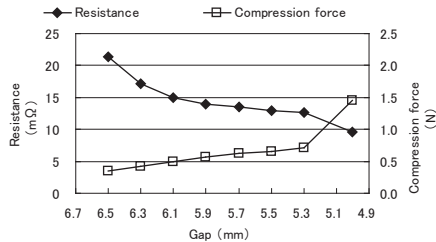
OG-684296



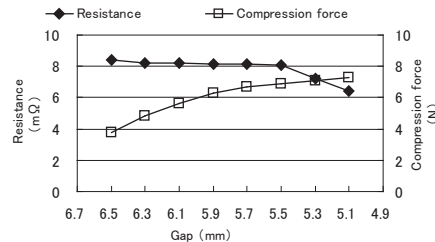
Material : Beryllium copper (t=0.15mm)
Surface treatment :Sn reflow plating
Recommended height : 7.0~9.0mm

Compression force vs Electric resistance

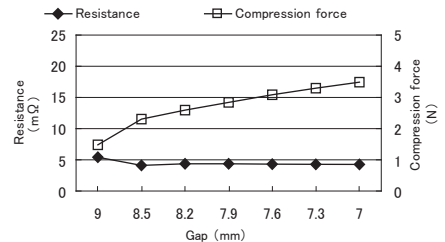
OG-603070



OG-453070



OG-684296



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Contacts

Grounding components

Clips

Clamps



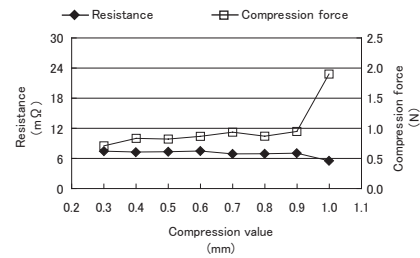
Automated mounting applicable component for grounding with side-contact on PC board.

Feature

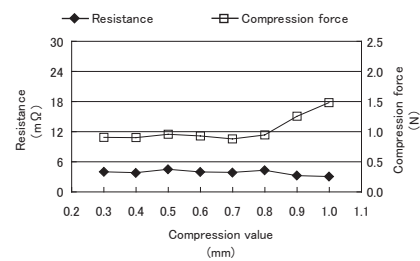
- Side-contact is applicable on PC board edge against chassis.
- Grounding contact is applicable between mother PC board and vertically placed daughter board.

Compression force vs Electric resistance

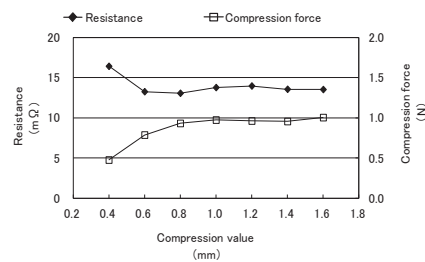
■ OGSC-T-302020



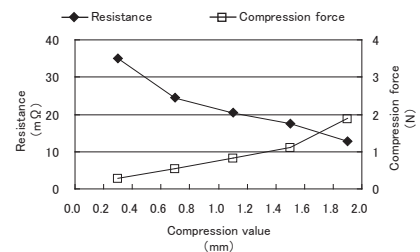
■ OGSC-B-302020



■ OGSC-402030

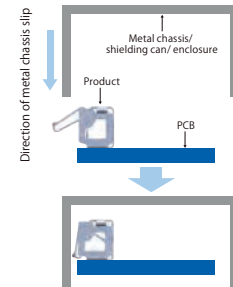


■ OGSC-756030

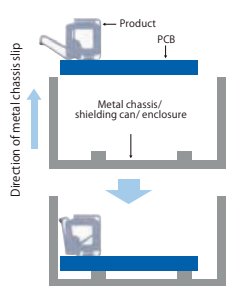


Application examples

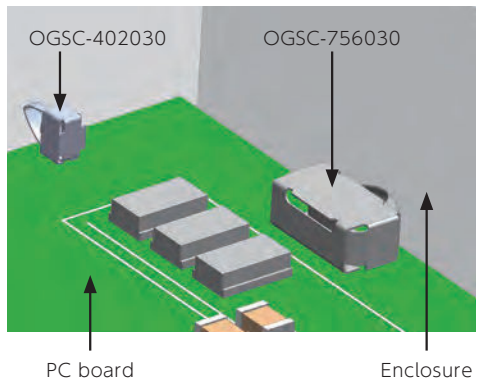
■ OGSC-T-302020



■ OGSC-B-302020



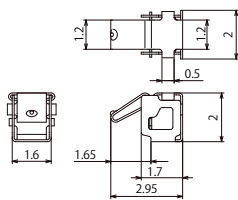
■ OGSC-402030 / OGSC-756030



PC board

Enclosure

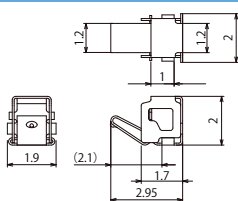
OGSC-T-302020



Material :Corson alloy(t =0.08mm)

Surface treatment : Sn reflow plating

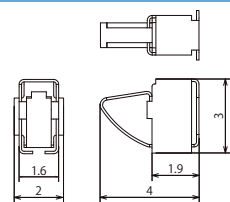
OGSC-B-302020



Material :Corson alloy(t =0.08mm)

Surface treatment : Sn reflow plating

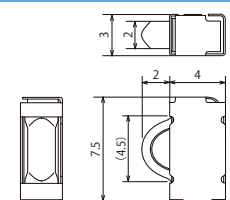
OGSC-402030



Material :Phosphor bronze for spring(t =0.1mm)

Surface treatment : Sn reflow plating

OGSC-756030

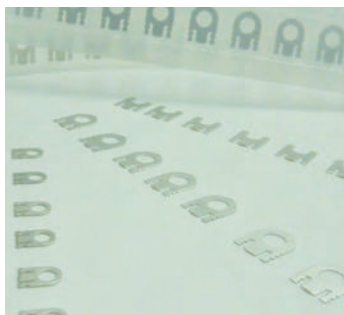


Material :Phosphor bronze for spring(t =0.1mm)

Surface treatment : Sn reflow plating

Unit:mm

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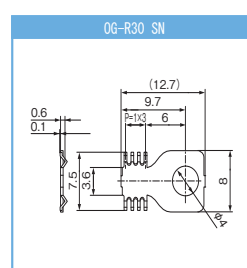
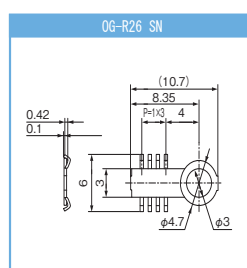
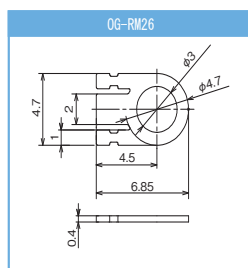
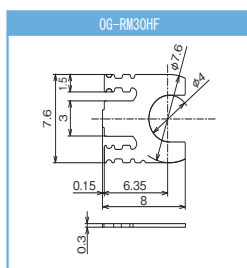
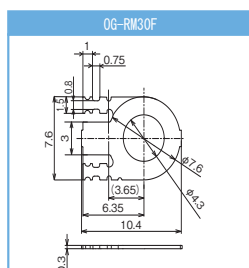
Secure contact of screwed area

Feature

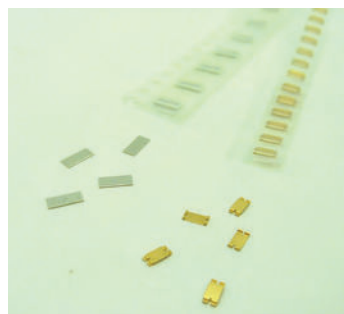
- FG reinforcement and reliable contact are achieved.
- Prevention of screw loosening caused by vibration.
- OG-RM is a space-saving fully-flat shape.
- OG-RM30HF provides even further space saving.

Material

- Tough pitch copper* (Sn plating)
- ※OG-RM26 is made of brass.



ON-BOARD PLATE / OGP-2520, -3216, -4520



OGP configuration ensures reliable contact

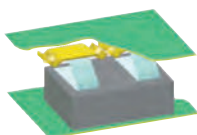
Feature

- OGP solves contact failure problems caused by solder flux.
- Reliable contact is provided at FG improvement of PC board.

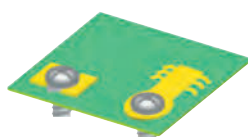
Material

- Brass (OGP-3216~ / Sn reflow plating, OGP-2520 / Sn reflow plating)

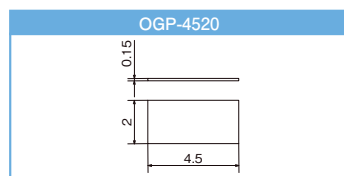
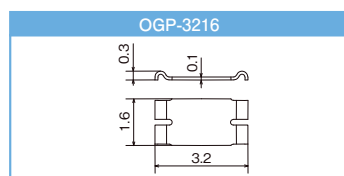
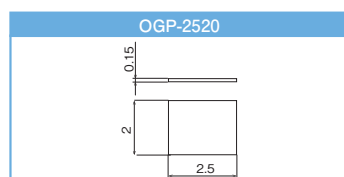
Application examples



- Effective contact
- OGP protects PC board from damage such as circuit pattern damage by vibration etc at FG area.
- Gold plating is available at the required location on PC board.



- Alternative components to washers and lug terminals
- More compact than conventional lug terminals.
- OGP prevents loosening of screws when subject to vibration.



Unit: mm

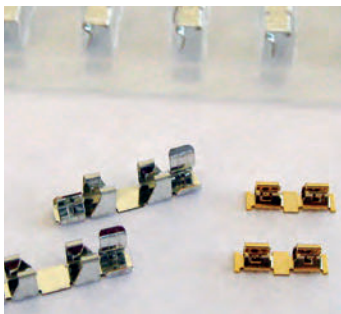
※Please confirm "Notes for On-board series" on page 2 prior to purchase.

Contacts

Grounding components

Clips

Clamps



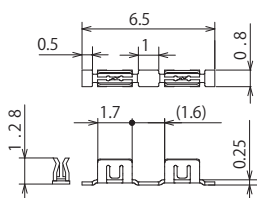
Automated mounting applicable fixture "On-Board Clip" for shielding can.

Feature

- Clip structure enables easy removal of shielding can.
 - Multi-point GND is provided to shielding can. Improved shielding effect can be achieved.
 - OGCP-502423: Wide opening (A) provides easy insertion of a shielding can.
 - OGCP-1182435: Separate structure of clip and support portion resistant to side slide loading.
 - OGCP-702020: Locking structure provides "click feel" on installation.
- It provides certainty and improved workability.



OGCP-650813R

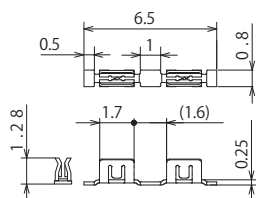


Material : Phosphor bronze for spring

Surface treatment : Sn reflow plating

Applicable thickness : $t=0.15\sim0.2$

OGCP-650813G

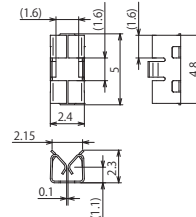


Material : Titanium Copper alloy

Surface treatment : Partial Au plating (Ni plated contacts)

Applicable thickness : $t=0.15\sim0.2$

OGCP-502423

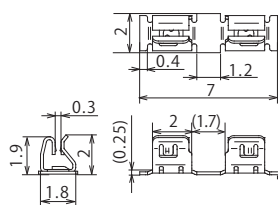


Material : Phosphor bronze for spring

Surface treatment : Sn reflow plating

Applicable thickness : $t=0.28\sim0.56$

OGCP-702020

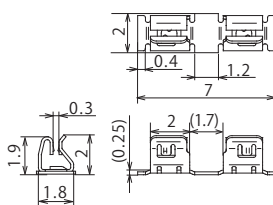


Material : Phosphor bronze for spring

Surface treatment : Sn reflow plating

Applicable thickness : $t=0.3\pm0.02$

OGCP-702020G

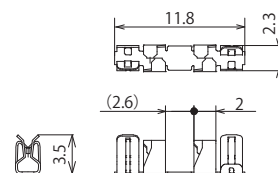


Material : Phosphor bronze for spring

Surface treatment : Partial Au plating

Applicable thickness : $t=0.3\pm0.02$

OGCP-1182435



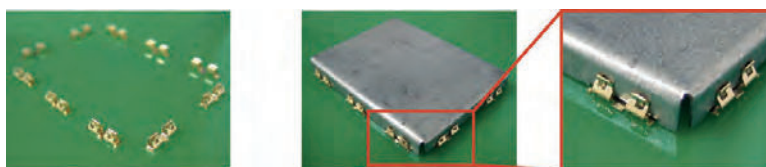
Material : Phosphor bronze for spring

Surface treatment : Sn reflow plating

Applicable thickness : $t=0.3\pm0.02$

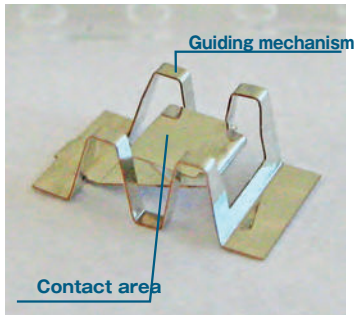
Unit : mm

Installation example



※ Suffix "G" means Au plating. Please contact our sales representatives for details.

- ※ Shielding can fixing is not guaranteed if the clip only is used.
- ※ Verification of actual use conditions is required prior to use.
- ※ Please confirm "Notes for Onboards series" on page 2 prior to purchase.



Displacement prevention mechanism improves grounding of shielding cans.

Feature

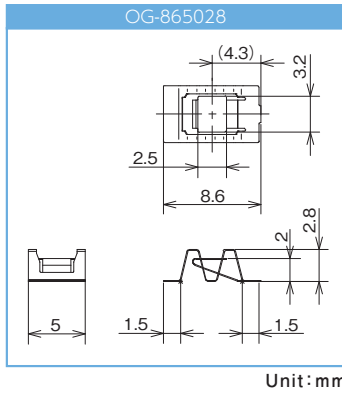
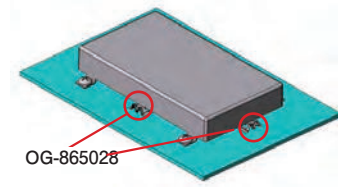
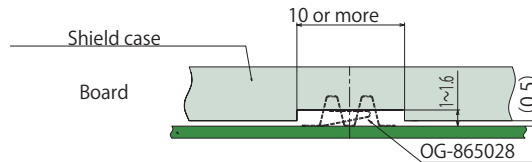
- Guiding mechanism makes easy installation for shielding cans.
- Applicable even at corners of shielding cans.
- Multi-point contact with the shielding can provides higher shielding effectiveness.

Material

- Phosphor bronze for spring (Sn reflow plating)

Reference Installation Specifications

Applicable plate thickness : $t=1.9$ or less



※The values are measured data for reference, not guaranteed.

Reference

■ Metal grouping (reference)

※Galvanic corrosion may occur by contact with other metals.

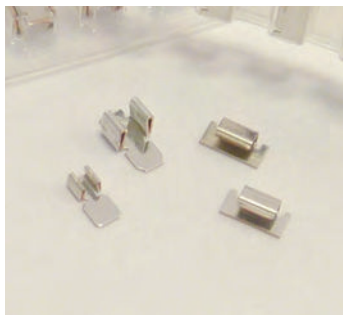
anode			
Group I	Group II	Group III	Group IV
Mg	Al	Cd plating	Brass
Mg alloy	Al alloy	carbon steel	stainless steel
Al	Zn・Zn plating	Fe	Be-Cu
Al alloy	Cr plating	Ni-Cr plating	Cu, Cu alloy
Zn・Zn plating	Cd plating	Sn・Sn plating	Ni-Cu alloy
Cr plating	carbon steel	Sn・Pb solder	Monel
	Fe	Pb	Ag
	Ni, Ni plating	Brass	Graphite
	Sn, Sn plating	stainless steel	Rb
	Sn・Pb solder	Be-Cu	Ti
		Cu, Cu alloy	Pt
		Ni-Cu alloy	Au
cathode			

Contacts

Grounding components

Clips

Clamps



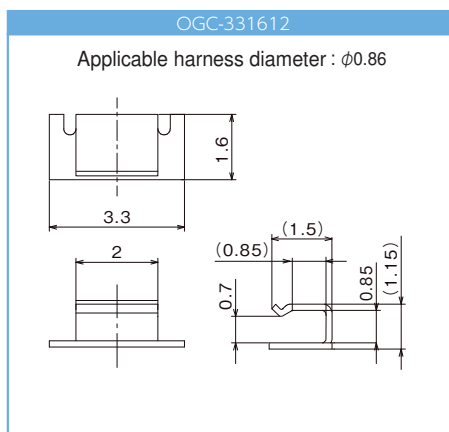
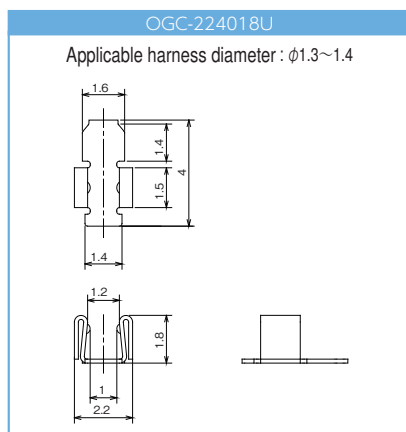
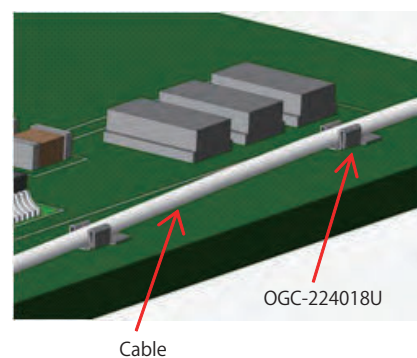
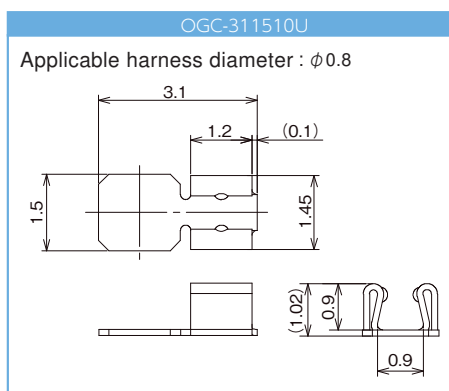
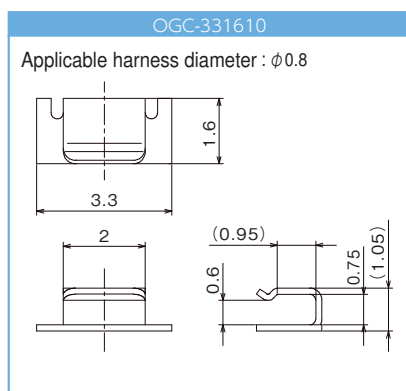
Compact cable clamp applicable to automated mounting on PC board.

Feature

- Supporting wire harness on PC board.
- Side and top insertion types are available.
- Automated mounting and reflow soldering on PC board are applicable without boring.
- Wiring on PC board edges is available which brings space saving of equipment design.

Material

- Phosphor bronze for spring (Sn reflow plating)



Unit : mm

※Please confirm "Notes for Onboard series" on page 2 prior to purchase.

EMC GROUNDING

For CABLES

Plastic clamps with grounding function

Clamps



For BOARDS, ENCLOSURES

Plastic fasteners with grounding function

Spacers



Guide rail for PC boards



Metal grounding components

Contacts



Straps

Wire mesh



Metal foil





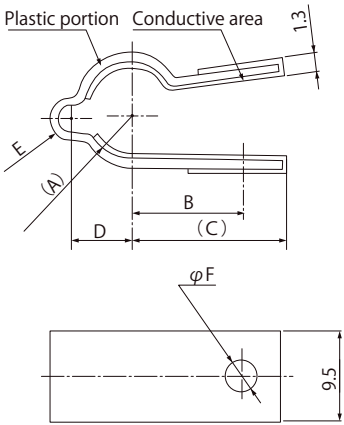
Plastic fastening and reliable copper foil grounding is provided simultaneously.

Feature

- Plastic body enables conductive layer to fit the cable and provides stable effectivity.
- Conductive area employs highly reliable copper foil.
- Plastic materials prevent the clamp from damaging the cable.

Material

- Plastic portion / nylon 66 (light gray / UL94V-0)
- Conductive area / Copper foil



M3 screw assembly type

Unit:mm

Part No.	(A)	B	(C)	D	E	F	Applicable cable diameter
FGC-3	R1.8	9.5	13.5	3.0	R1.5	$\phi 3.2$	$\phi 2.7 \sim \phi 3.5$
FGC-5	R3.0	10.7	14.7	4.3	R2.0		$\phi 5.0 \sim \phi 5.5$
FGC-8	R4.8	12.5	16.6	6.5	R2.3		$\phi 8.2 \sim \phi 9.0$

M4 screw assembly type

Unit:mm

Part No.	(A)	B	(C)	D	E	F	Applicable cable diameter
FGC-3 M4	R1.8	9.5	13.5	3.0	R1.5	$\phi 4.2$	$\phi 2.7 \sim \phi 3.5$
FGC-5 M4	R3.0	10.7	14.7	4.3	R2.0		$\phi 5.0 \sim \phi 5.5$
FGC-8 M4	R4.8	12.5	16.6	6.5	R2.3		$\phi 8.2 \sim \phi 9.0$



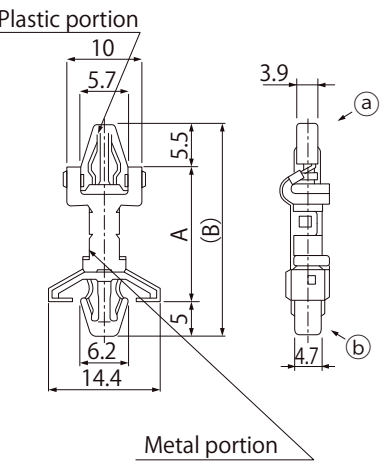
Screw free fixing spacer is combined with EMC grounding function.

Feature

- Grounding at the center of the PC board is easily achieved.
- Suitable for total cost downsizing through high workability and reduction of part numbers.

Material

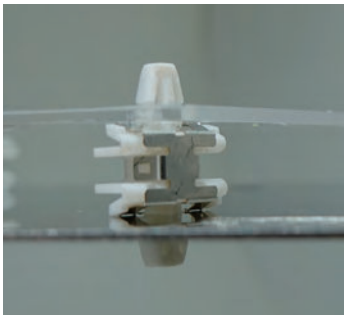
- Plastic portion / PA66 (Black / UL94V-0)
- Metal portion / Phosphor bronze (Sn plating)



Installation specifications

- (a) : Board thickness / $t=1.6\sim2.0\text{mm}$
Hole diameter / $\phi 4.0^{+0.1}_0\text{mm}$
- (b) : Board thickness / $t=1\sim2.0\text{mm}$
Hole diameter / $\phi 4.8^{+0.1}_0\text{mm}$

Part No.	Unit:mm	
	A	(B)
FGS-3S	9.8	20.3
FGS-4S 1	11.4	21.9
FGS-6S	14.4	24.9
FGS-8S	17.7	28.2
FGS-9S	20.0	30.5



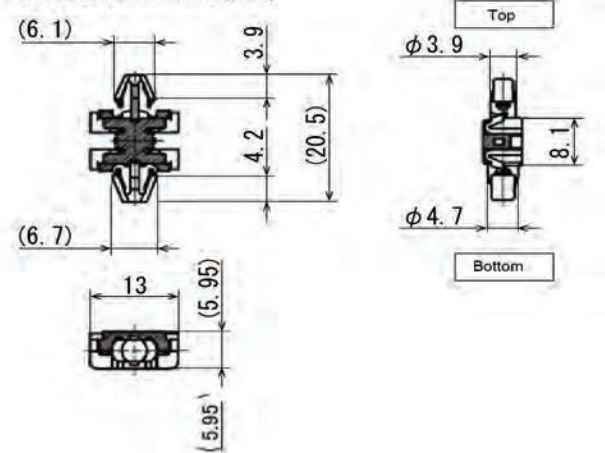
New EMC grounding spacer engineered with residual flux removal mechanism

Feature

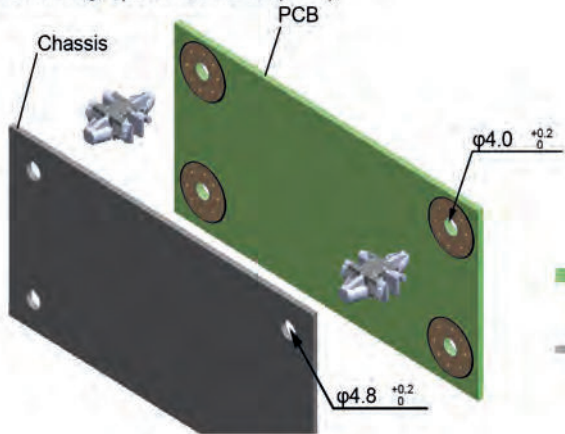
- Frame ground reinforcement spacer suppresses EMC noise and improves electrostatic resistance
- Functions as both a spacer between the PCB and chassis as well as for frame grounding.
- Offers cost advantages over screw-mount PCB collar spacers by decreasing the number of components and streamlining installation
- Uniquely engineered structure helps eliminate residual flux and oxidation from the PCB/metal surface.

	Top	Bottom
Panel thickness	t 1.6 ~ 2.2 mm	t 1.6 ~ 1.2 mm
Mounting hole size*	φ 4.0 + 0.2/0 mm	φ 4.8 + 0.2/0 mm
Spacing height	8.1 mm	
Initial snap removal force	Min 38N	
Initial DC resistance	Max 100mΩ	
Operating temperature range	40°C ~ 85°C	

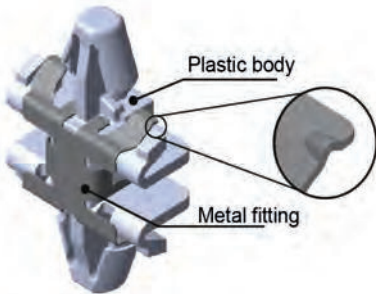
Product dimensions (mm)

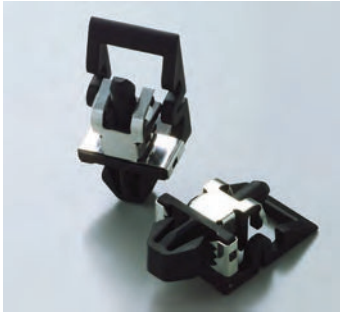


Mounting specifications (mm)



Mechanism to remove residual flux





EMC grounding function is added to the spacer whose specialty lever system enables easy fixing and removal of PC board.

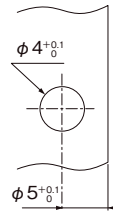
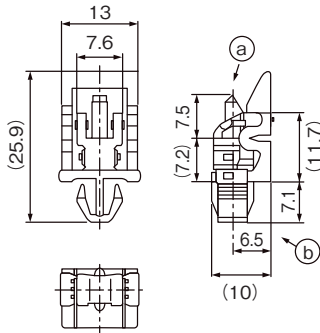
Feature

- Easy fixing, opening and closing of PC board are provided as well grounding function.
- The flux which is on the metal contact surface on the chassis side can be removed when fixing.
- High workability and reduction of part numbers enable total cost downsizing.

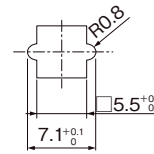
Material

- Plastic portion / PA66 (Color : Black / Flammability : UL94V-0)
- Metal portion / Phosphor bronze (Sn reflow plating)

Installation specifications



④ Board side : $t1.6 \pm 0.15$



⑤ Chassis side : $t0.8 \sim 2.3$

Unit:mm

FG GUIDE RAIL / FGR-80WSP



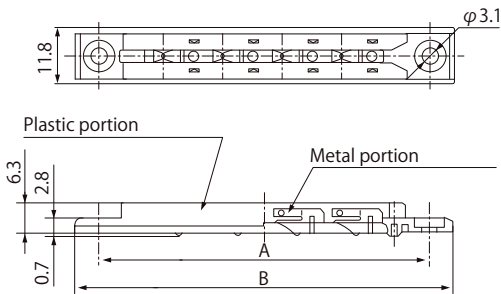
Grounding function added to the PC board guide rail

Feature

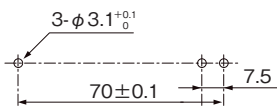
- Contact fingers of the guide sandwiches the PC board so that grounding is achieved from either top or bottom face.
- Spherical profile of the contact area prevents any damage to the PC board pattern.
- Assemble using M3 screws or nylon rivets.

Material

- Plastic portion / Polycarbonate (Black / UL94V-2)
- Metal portion / Phosphor bronze (Sn plating)



Installation specifications



Unit:mm		
Part No.	A	B
FGR-80WSP	70	80

FG MESH / FGM



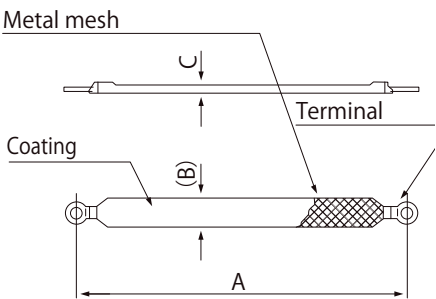
Metal mesh employed EMC grounding material

Feature

- Excellent flexible structure comprises metal wires braided into a cylinder mesh, coated with insulator.
- Large surface area of conductive mesh provides excellent impedance characteristics in the high frequency range.

Material

- Mesh / Tinned copper wire
- Terminal / Round terminal
- Coating / Heat shrink tube (black)



M3 screw assembly type

Unit:mm

Part No.	A	(B)	C
FGM-50-M3	50	8.5	2.5
FGM-100-M3	100		
FGM-150-M3	150		
FGM-200-M3	200		

M4 screw assembly type

Unit:mm

Part No.	A	(B)	C
FGM-50-M4	50	8.5	2.5
FGM-100-M4	100		
FGM-150-M4	150		
FGM-200-M4	200		
FGM-265-M4	265		
FGM-300-M4	300		
FGM-400-M4	400		

※Please contact our sales department for sizes outside of those specified.

FG STRAP / GFGST



Metal foil employed EMC grounding material

Feature

- Flexible coated metal foil allows applications in narrow space configurations.

Material

- ① Copper foil / Tough Pitch Copper (t0.1mm)
- ② Heat shrink tubing / Polyolefin

Size variation

	Part No.	A	B
M3	GFGST-50-8-M3	50	Φ3.2
	GFGST-100-8-M3	100	Φ3.2
	GFGST-150-8-M3	150	Φ3.2
M4	GFGST-50-8-M4	50	Φ4.2
	GFGST-100-8-M4	100	Φ4.2
	GFGST-130-8-M4	130	Φ4.2
	GFGST-150-8-M4	150	Φ4.2
	GFGST-220-8-M4	220	Φ4.2

Impedance characteristics

Unit: Ω

MHz Frequency	GFGST-50-8-M3	GFGST-100-8-M3
1	0.13	0.28
25	3.19	7.01
100	12.79	28.38
500	72.03	225.57

Properties

- Surface resistance 0.002Ω
(Value shown was measured with GFGST-50-8-M3 between both terminal ends)

※ All specifications and characteristics shown herein are typical values, but are not guaranteed.

※ All specifications and characteristics shown herein are subject to change without notice for improvements or changes in specification.

HIGH-POINT CONTACT / HPC



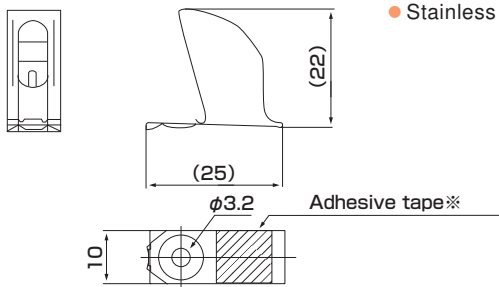
Suitable for contact in large clearance applications

Feature

- Special profile allows the contact clearance to vary from 10 to 20 mm.
- No change in spring length when compressed results in space saving.
- Assembled by screw or double-sided adhesive tape.

Material

- Stainless steel (SUS304 / t=0.15mm)



※ HPC-10-20T only

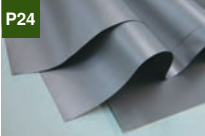
Unit: mm

Part No.	Specification
HPC-10-20T	Double-sided adhesive tape attached
HPC-10-20	Double-sided adhesive tape un-attached

ELECTROMAGNETIC NOISE SUPPRESSION SHEETS

Near field EMI suppression with easy assembly, simply attach, sandwich and wrap around

Magnetic metal filler type



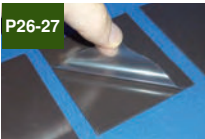
MG ABSORPTION SHEET

Soft ferrite



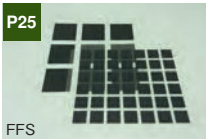
EMI ABSORPTION SHEET

Thermal conductivity + Electromagnetic noise suppression



COOLPROVIDE

Ferrite sheet

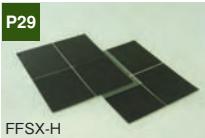


SMARTPLY

For RFID/NFC

RFID·NFC(13.56MHz)
Improvement of the communication
efficiency of RFID/NFC(13.56MHz)

Ferrite sheet

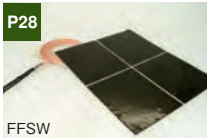


SMARTPLY

For WIRELESS CHARGING

Suitable for improvement of wireless charging efficiency and its
shielding of leakage magnetic field.

Ferrite sheet



SMARTPLY

Electromagnetic noise
suppression sheets

Used for RFID/NFC

Used for wireless
charging

Electromagnetic absorption
productcharging

Magnetic shielding
sheet

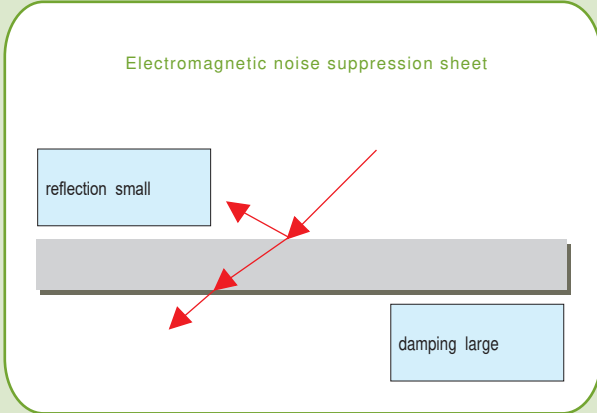
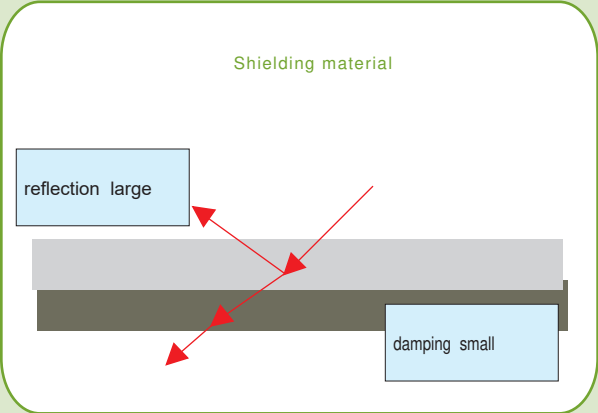
Effective suppression of electronic equipment noise

Feature

- Easily suppressing noise with the simple assembly. Attach, sandwich and wrap around.
- Broad range of variations, sheet, core, heat-conductive types etc.
- Custom cutting and secondary processing are available.

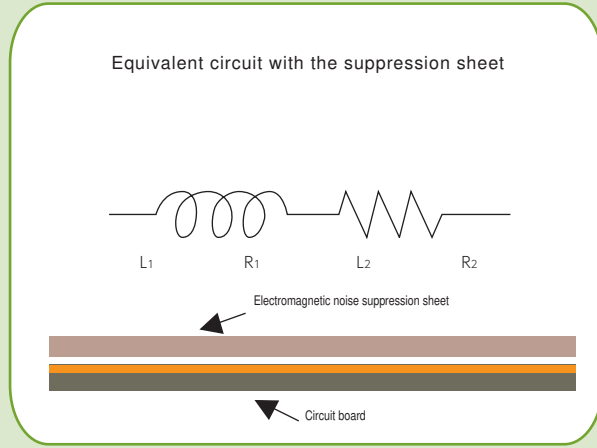
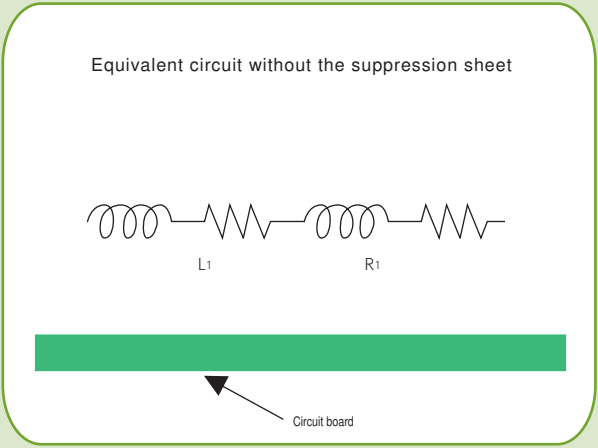
Noise damping

Noise level is lowered by loss effect of magnetic substance, with smaller reflection suffered by conductive shielding materials.



Suppression of antenna effects decreases the noise.

Radiation noise is emitted by cables or patterns acting as an antenna. The magnetic substance reduce the noise by minimizing such antenna effects.



Electromagnetic noise suppression sheets

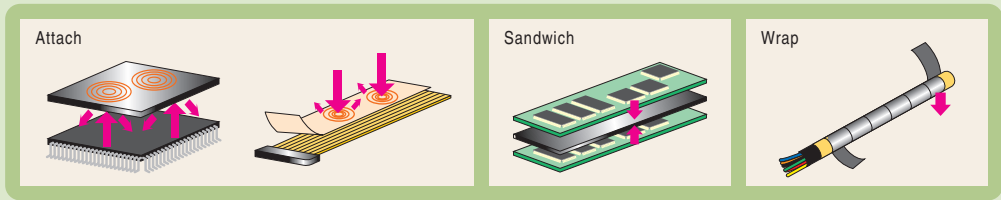
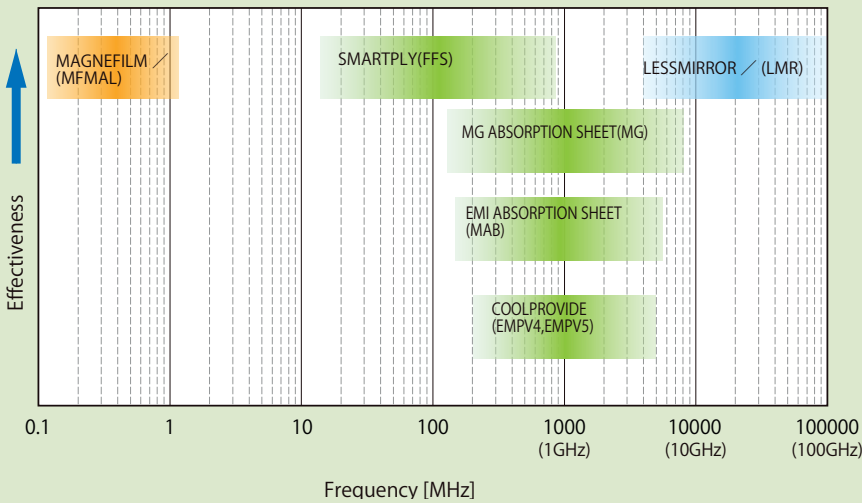
Used for RFID/NFC

Used for wireless charging

Electromagnetic absorption product charging

Magnetic shielding sheet

Property comparison (reference)



Precautions for use

1. These products are designed and manufactured for the purpose of suppressing electromagnetic wave generated by a general electronic device. When intending to use them with applications such as for equipment or devices required high reliability and high accuracy (e.g. involving human lives at risk etc.), please contact our sales representatives in advance.
2. When using these products, it is necessary to first attach them to the actual equipment and then check the condition, such as the suppression effectiveness of electromagnetic wave, the strength of double-sided adhesives etc, in advance.
3. These products are not intended to use for the purpose of insulating any electrical or electronic parts. None of these products should be applied to areas, such as of parts used for a power supply section, requiring insulation.
4. Special care should be taken when attaching these products due to the reason that scratching, folding or tugging these products may cause damage such as cracks. And after attaching them, external stress, such as folding, tugging etc, should be avoided when using.
5. Once the product is attached, it is not easily removed. Removal may cause damage. If reattachment is necessary, please use a new product.



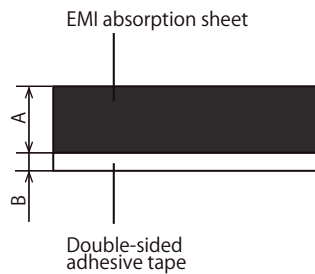
Flexible sheet consists of resin with soft ferrite filler

Feature

- Sheet thickness, 0.4 - 4.0mm are available.
- Flexible and easy handling.

Material

- Soft ferrite + resin

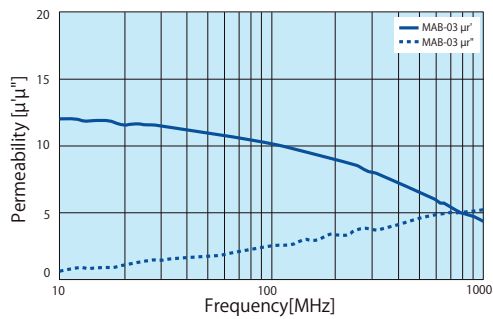


Part No.	Unit	Standard	MAB-03
A	mm	—	0.4/1.0/2.0/4.0
B	mm	—	0.16
Color*	—	—	Black
Volume resistivity*	$\Omega \cdot \text{cm}$	JIS K 6911 compliant	10^{12}
Flame resistance*	—	UL94	V-0
Operating temp*	$^{\circ}\text{C}$	—	-40~85

※Double-sided adhesive tape not included

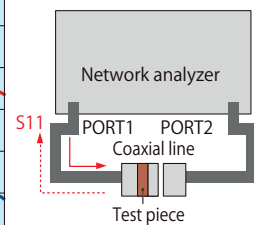
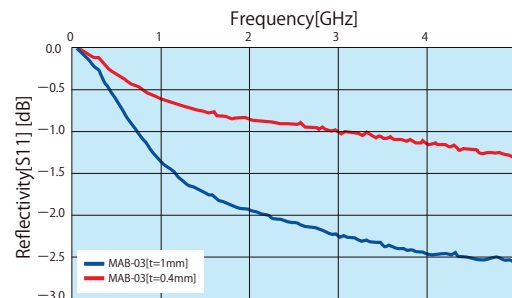
Properties

■ Permeability

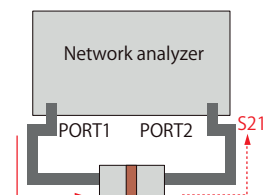
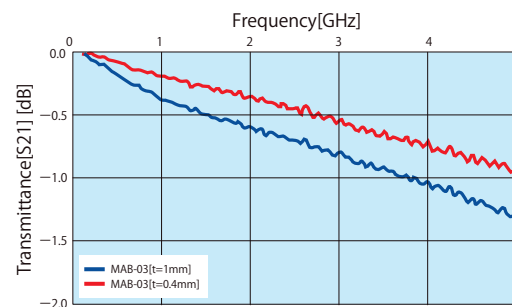


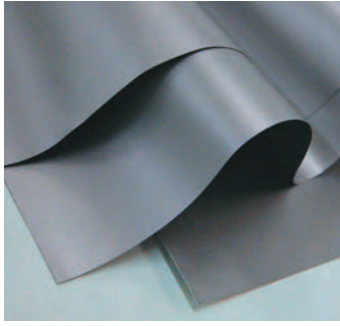
※The values are measured data for reference, not guaranteed.

■ Reflection loss



■ Transmission loss





Electromagnetic noise suppression sheets compounded with magnetic metal filler

Feature

- Noise Suppression is available with simply attaching it onto ICs or Cables.
- Its flexibility achieves attaching on bending portion.
- Excellent processability, with secondary processing provided to fit the specific application.

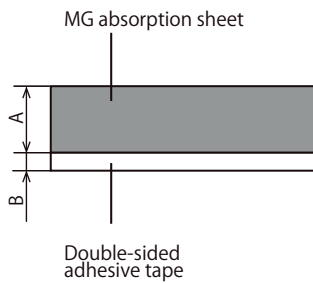
Material

● Refer to the table below.

※Double-sided adhesive tape not included

Part No.	Unit	Standard	MG-03A	MG-12	MG-13
type			Heat resistant	UL94 V-0 complaint	for GHz range
A	mm	—	0.5/1.0	0.1/0.25/0.5	0.3/0.5
B	mm	—	0.14	0.03	0.14
	—	—	Silver		
Permeability*	$\mu r'$	—	25/10MHz	95/1MHz	$\geq 30/1$ MHz
Volume resistivity*	$\Omega \cdot \text{cm}$	JIS K 6911 compliant	10^7	10^7	10^7
Flame resistance*	—	UL94	HB equivalent	V-0	HB equivalent
Material*	—	—	Magnetic metal material + rubber	Magnetic metal material + resin	Magnetic metal material + resin
Operating temp	$^{\circ}\text{C}$	—	-40~150	-40~105	

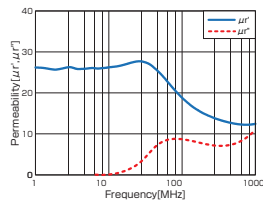
Variations



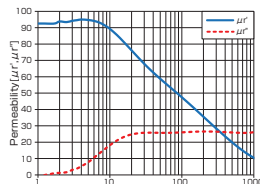
Properties

■ Permeability

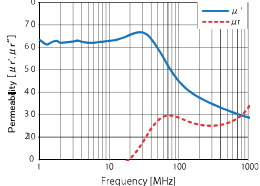
MG-03A Series



MG-12 Series

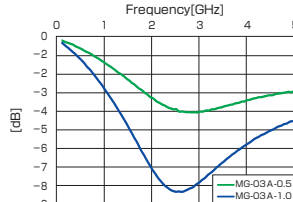


MG-13 Series

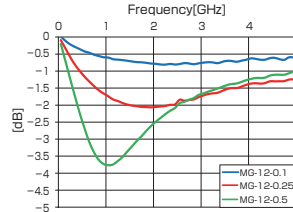


■ Reflection loss

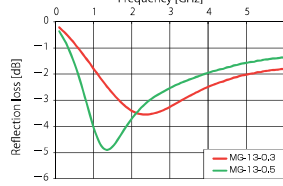
MG-03A Series



MG-012 Series

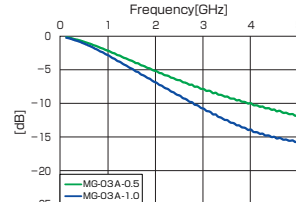


MG-13 Series

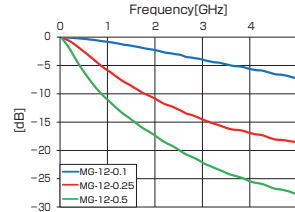


■ Transmission loss

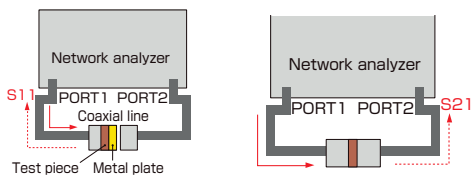
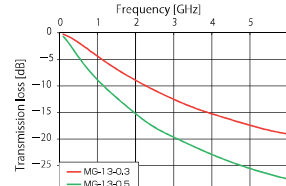
MG-03A Series



MG-12 Series



MG 13 Series



※The values are measured data for reference, not guaranteed.

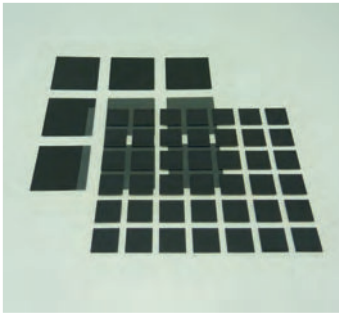
Electromagnetic noise suppression sheets

Used for RFID/NFC

Used for wireless charging

Electromagnetic absorption sheet

Magnetic shielding sheet



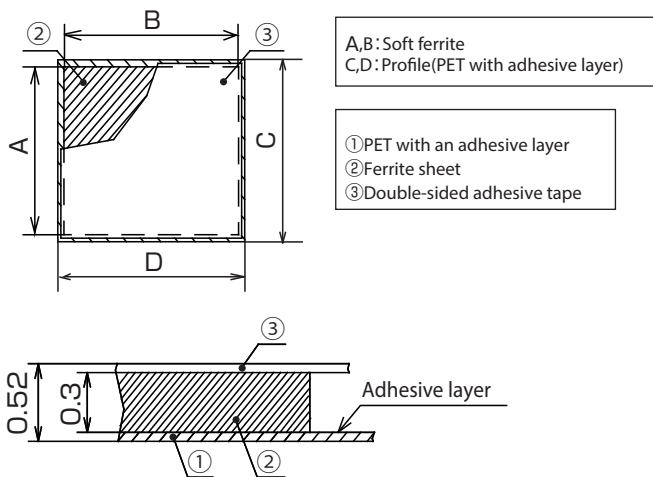
High performance ferrite sheet achieves excellent noise suppression simply by affixing it to desired areas.

Feature

- Excellent noise suppression in low frequency range compared to metal filler electromagnetic noise suppression sheet.
- Heat resistant tape allows application for areas where temperature can be elevated.
- Excellent insulation property due to its sintered body.

Material

- PET with adhesive layer
- Ferrite sheet
- Double-sided adhesive tape



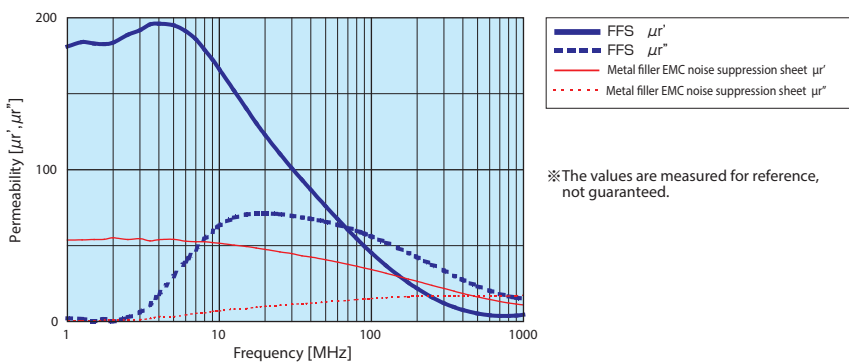
Dimensions

Unit : mm

Part No.	A	B	C	D
FFS-0.3-1010T	10	10	11.5	11.5
FFS-0.3-1020T		20		21.5
FFS-0.3-1515T	15	15	16.5	16.5
FFS-0.3-2020T		20		21.5
FFS-0.3-2030T	20	30	21.5	31.5
FFS-0.3-2525T	25	25	26.5	26.5
FFS-0.3-3030T	30	30	31.5	31.5
FFS-0.3-5050T	50	50	55	55

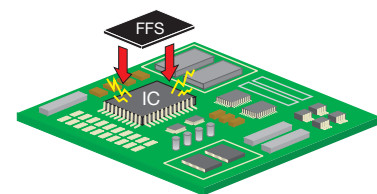
※ Custom designs available.
Please contact our sales representative for further information.

Properties

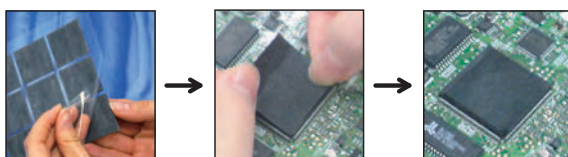


Application

- EMC suppression for IC

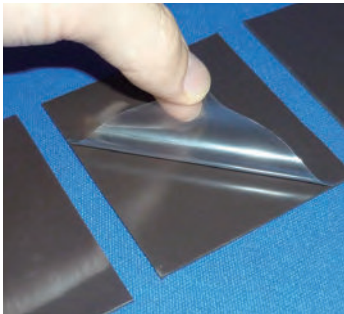


Mounting FFS onto IC device



Gently bend the liner while take the ferrite sheet off.

※ It is not advisable to reuse the product once it is removed.



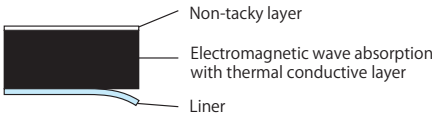
Electromagnetic noise suppression sheet with high permeability and possible thermal management

Feature

- Lower hardness(ASKER C40), high permeability(μ' =13) was realized as non silicone thermally conductive sheet.
- Due to lower hardness, it enables intimate contact and low load to the element while in mounting.
- Because of a non-silicon material, siloxane is not contained.
- Recommended operating temperature range is -40℃~110℃.

Test type	Unit	Standard	EMPV4-F
Thermal Conductivity	W/m·K	JIS R 2616 (Hot-wire method)	1.5
		ISO22007-2 (Hot Disc method)	1.3
Color	—	—	Black
Thickness	mm	—	1.0 / 1.5 / 2.0 / 2.5 / 3.0 / 3.5
Specific Gravity	—	JIS Z 8807	3.55
Hardness	ASKER C	JIS K 7312	40
	Shore 00	ASTM D 2240	70
Tensile strength	MPa	JIS K 6251	0.51
Elongation	%	JIS K 6251	16
Volume Resistivity	$\Omega \cdot \text{cm}$	JIS K 6911 compliant	1.0×10^{12}
Breakdown voltage	kV/mm	JIS C 2110-1 compliant	6.0
Withstanding voltage	kV/mm	JIS C 2110-1 compliant	4.2
Dielectric constant	1MHz	Company standard	12.7
Loss tangent	1MHz	Company standard	0.13
Flammability	—	UL94	V-0 equivalent
Permeability (at 10MHz)	—	—	13
Operating temperature	℃	—	-40 ~ 110
Available max. dimension ^{*1}	mm	—	210 × 510

※ 1) Please contact us for available pcs/sheet.



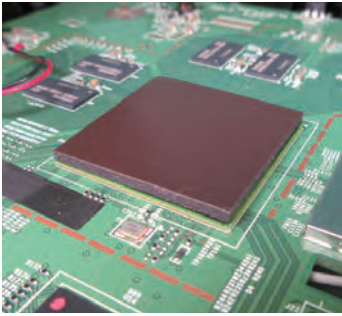
Electromagnetic noise suppression sheets

Used for RFID/NFC

Used for wireless charging

Electromagnetic absorption product charging

Magnetic shielding sheet

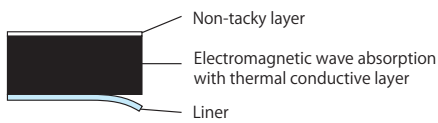


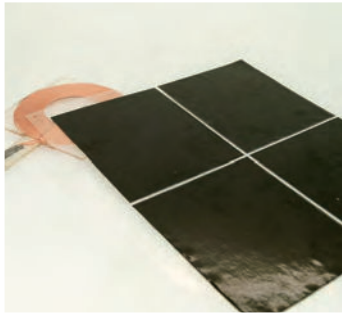
EMC noise suppression sheet in broad frequency band with high thermal conductivity

Feature

- Original composition is realized EMC noise suppression in broad band from 500MHz to 3GHz.
- Silicone-free, no siloxane outgassing.
- Oil bleeding is reduced compared to silicone-based thermal materials.

Test type	Unit	Standard	EMPV5-F
Thermal Conductivity	W/m·K	ISO22007-2 (Hot-disk method)	0.8
Color	—	—	Black
Thickness	mm	—	1.0 / 1.5 / 2.0 / 2.5 / 3.0 / 3.5
Hardness	ASKER C	JIS K 7312	30
	Shore 00	ASTM D 2240	60
Volume Resistivity	$\Omega \cdot \text{cm}$	JIS K 6911 compliant	1.0×10^{11}
Breakdown voltage	kV/mm	JIS C 2110-1 compliant	8.8
Withstanding voltage	kV/mm	JIS C 2110-1 compliant	5.0
Flammability	—	UL94	V-0 equivalent
Permeability (at 10MHz)	—	—	7
Operating temperature	°C	—	-40 ~ 110
Available max. dimension ^{※1}	mm	—	210 × 510





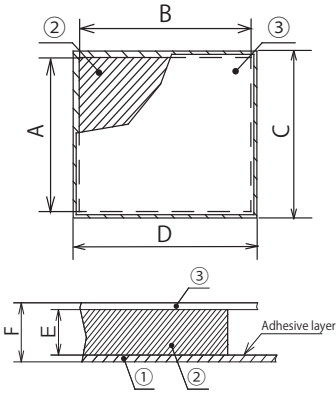
Thinner and flexible ferrite sheet for wireless charging

Feature

- It is higher permeability magnetic sheet which is suitable for magnetic shield and improving performance of wireless charging system according to international standard around 100kHz such as Qi standard.
- Sintered ferrite material with flexibility enables higher drop impact resistance.
- Suitable for thinner design of module. (Total thickness of product: 0.21mm)
- Custom profile is available upon request.

Material

- PET with adhesive layer
- Ferrite sheet
- Double-sided adhesive tape



A,B: Soft ferrite
C,D: Profile (PET with adhesive layer)

① PET with an adhesive layer
② Ferrite sheet
③ Double-sided adhesive tape

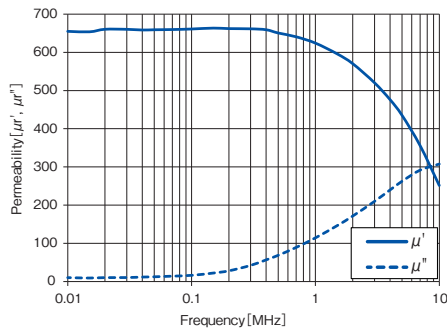
Part No.	A	B	C	D	E	F
FFSW-O.1-5060T	50	60	52	62	0.1	0.21

Unit : mm

※Custom designs available. Please contact our sales representative for further information.

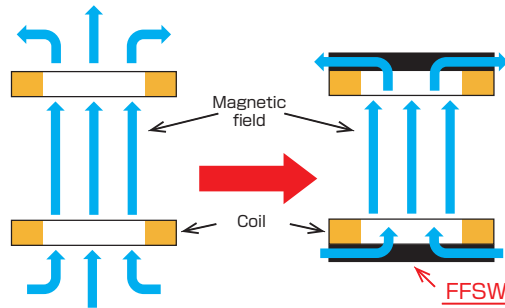
Properties

Permeability



Application

Wireless charging system

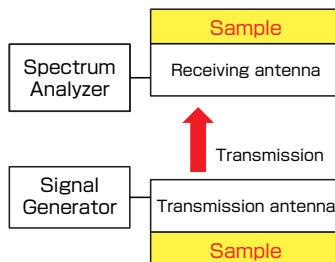


- Magnetic field generated in charge is shield, and do not affect the other elements.
- It is improved magnetic rotation and charging efficiency, too.

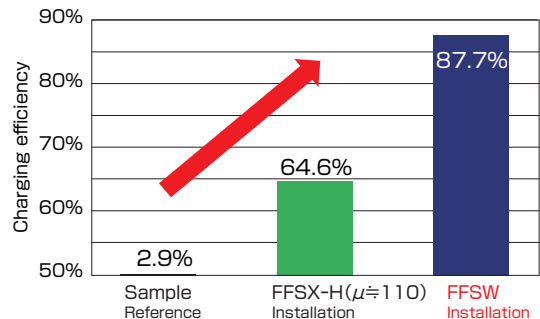
Charging efficiency between antennas.

Test specification

Operating frequency	100kHz
Gap between two antennas	10mm
Antenna size	φ50mm

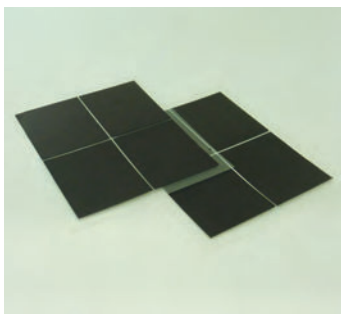


Measurement results



Charging efficiency is improved !!

※The values are measured data for reference, not guaranteed.



RFID・NFC(13.56MHz)

Thinner and flexible ferrite sheet for metal interference solution for RFID and NFC (13.56MHz).

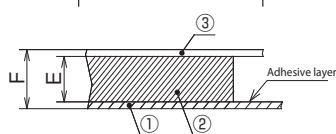
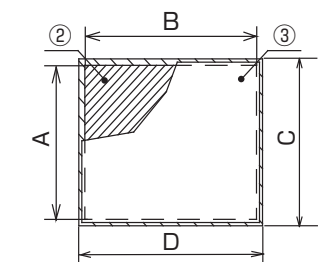
Feature

- Improve the communication performance of RFID reader and tag by suppressing the metal interference.
- Ferrite material in which Q factor has been maximized at 13.56MHz is used for the sheet.
- Sintered material but thin with excellent in flexibility that enables easy design of custom profiles.

Material

- PET with adhesive layer
- Ferrite sheet
- Double-sided adhesive tape

Dimensions



A,B: Soft ferrite
C,D: Profile(PET with adhesive layer)

① PET with an adhesive layer
② Ferrite sheet
③ Double-sided adhesive tape

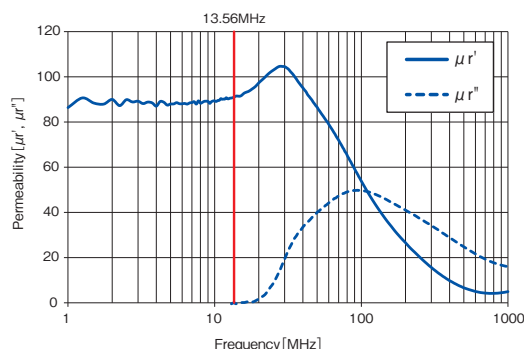
Part No.	A	B	C	D	E	F
FFSX-0.1H-5060T					0.1	0.21
FFSX-0.2H-5060T	50	60	51.5	61.5	0.2	0.31
FFSX-0.3H-5060T					0.3	0.41

Unit : mm

※Custom designs available. Please contact our sales representative for further information.

Properties

Permeability



※The values are measured data for reference, not guaranteed.

Coupling loss between antennas

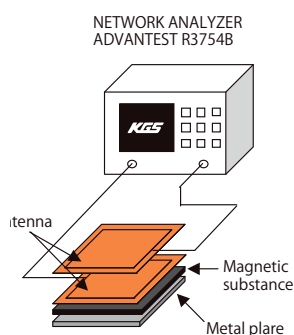
Test specification

Antenna

Size	31×42mm (Inner diameter)
Number of turn	3turns
Gap between antennas	3mm
Gap to metal plate	1mm

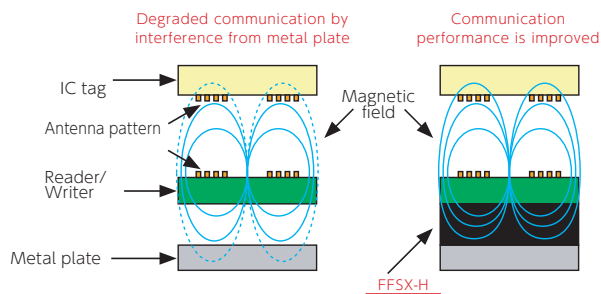
Magnetic substance

Size	50×60mm
Gap to antenna	0mm(Contact)
Thickness	FFSX-0.3H:t0.3mm FFSX-0.3:t0.3mm

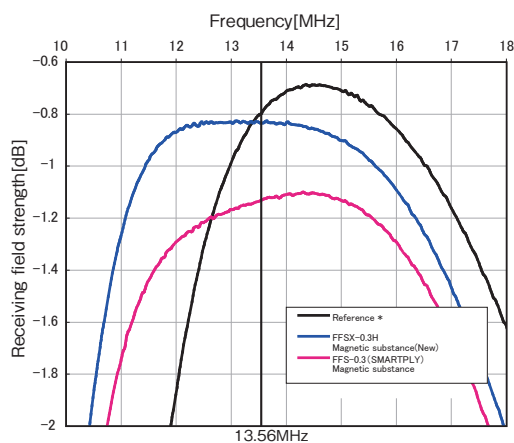


Application

Contactless IC smart card system



Receiving field strength measurement



※ Metal plate, No magnetic substance

ELECTROMAGNETIC WAVE MANAGEMENT SHEET

Electromagnetic noise suppression sheets	Used for RFID/NFC	Used for wireless charging	Electromagnetic absorption product/charging	Magnetic shielding sheet
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TOROIDAL / SLEEVE TYPE

Provided with plastic housing and fixtures for labor-saving assembly

Sleeve cores with plastic housing

Split type



SLEEVE FERRITE CLAMP



HIGH μ FERRITE CLAMP



LOW CUT FERRITE CLAMP

Heat resistant type



LOW CUT FERRITE CLAMP

Heat resistant type



SLEEVE FERRITE CLAMP



LOW CUT FERRITE CLAMP



LOW CUT FERRITE CLAMP

Toroidal cores with plastic housing

Split type



HIGH μ FERRITE CLAMP



TOROIDAL FERRITE CLAMP



TOROIDAL FERRITE CLAMP



TOROIDAL FERRITE CLAMP

Non Split type



SLEEVE CORE



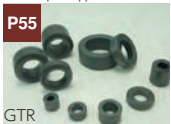
GRIP CORE



RIB CORE

Toroidal cores

Non Split type



TOROIDAL CORE



TOROIDAL CORE



TOROIDAL CORE WITH HOUSING



TOROIDAL CORE



LOW CUT CORE TOROIDAL CORE



LOW CUT CORE



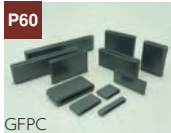
LOW CUT CORE (High μ type)

FLAT TYPE

For a flat cable and FPC

Flat cores

Non Split type



GFPC CORE

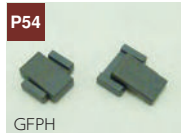


FLAT CORE

Split type



FLAT CORE



SPLIT FPC CORE



OPEN CIRCUIT CORE

Smartply



SMARTPLY

Flat cores with resin clamp

Split type



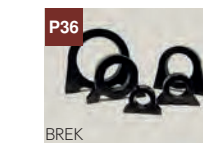
BLOCK CORE

Others

Other ferrite



BROAD EFFECT CORE



BROAD EFFECT CORE



METAL CORE

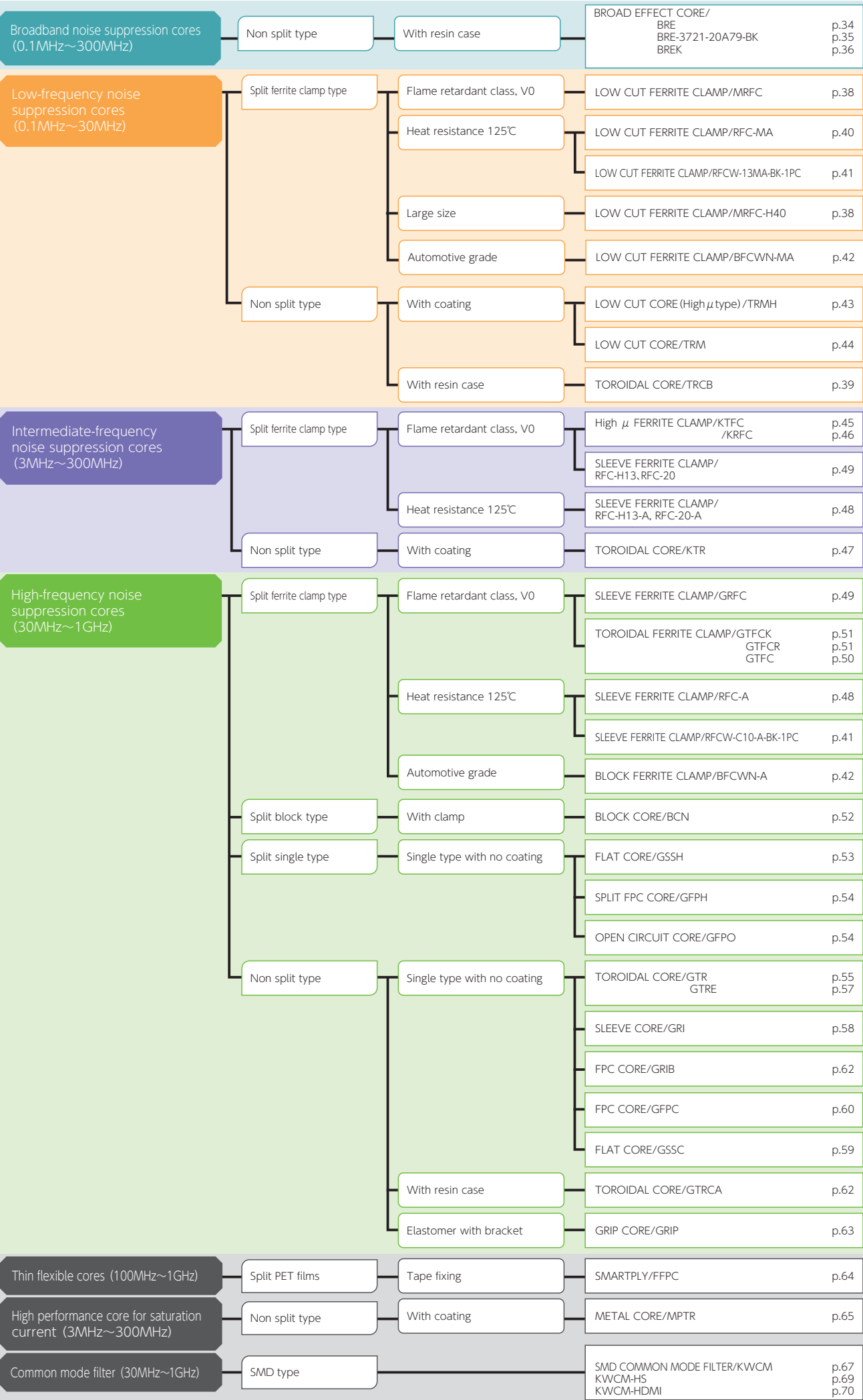


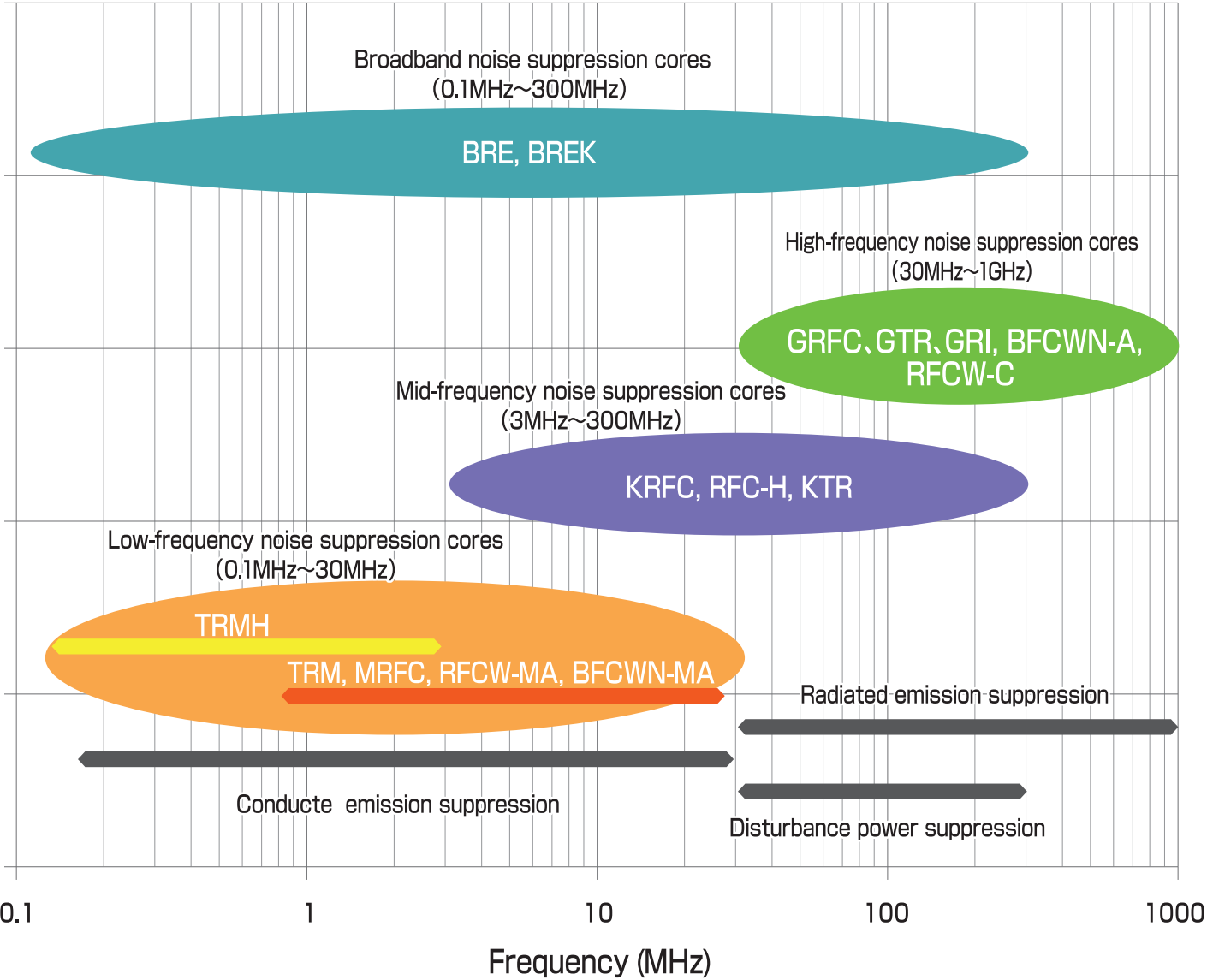
SMD COMMON MODE FILTER



CHIP BEADS FILTER

FERRITE FILTER SELECTION CHART







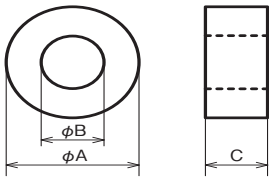
Highly effective measure for EMC noise suppression in broad frequency band

Feature

- Effective for suppression of conducted/radiated noise.
- High impedance characteristics decrease the number of cable turns.
- Since the variation in impedance characteristics against temperature is small, stable effect is ensured in wide temperature range.
- Plastic housing provides higher insulation properties.
- The material of the plastic housing is UL94V-0 certified.

Material

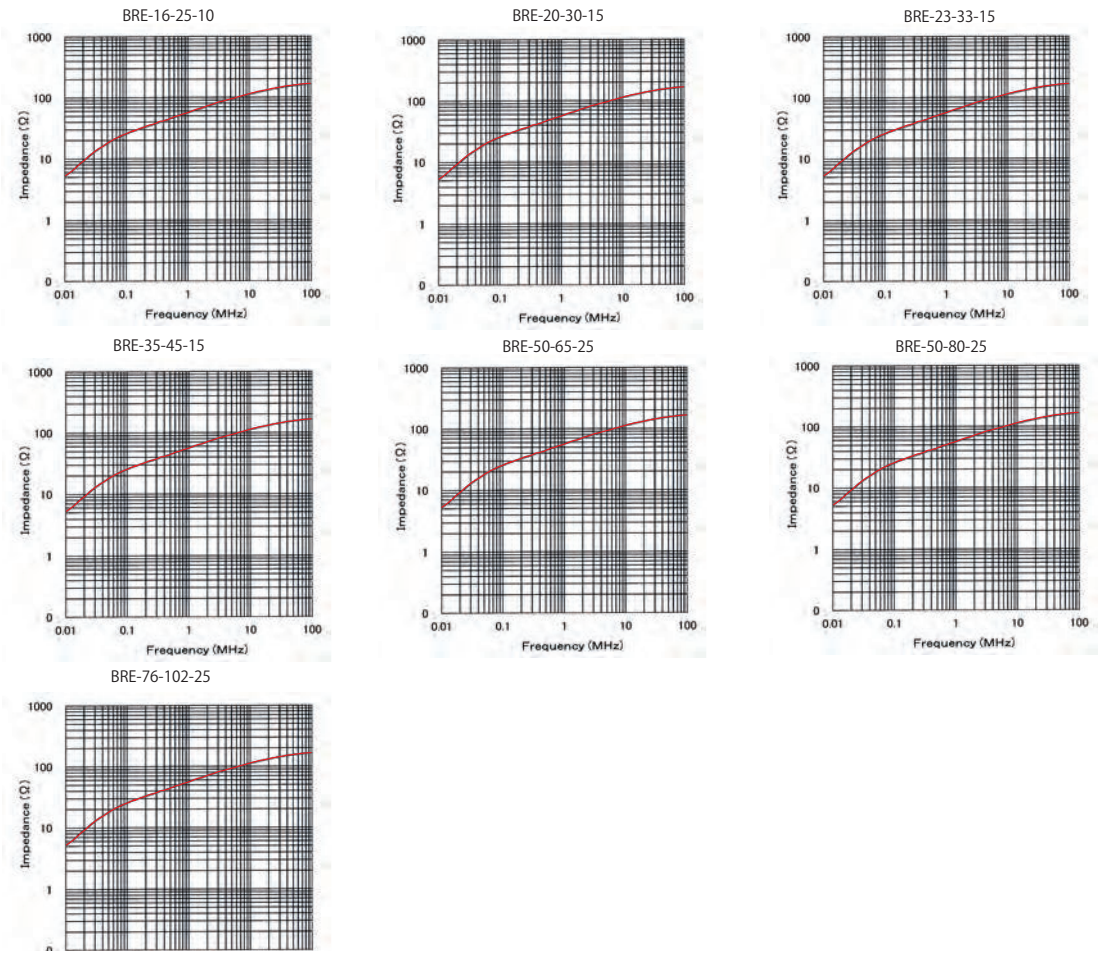
- Core: Nanocrystalline Alloys Housing: PBT (Color:Black/Flammability:UL94V-0)



Unit:mm

Part No.	A	B	C	Impedance* Ω /1MHz (1turn)
BRE-16-25-10	27.5	13.8	12.6	≥ 28
BRE-20-30-15	33.5	17.7	17.9	≥ 36
BRE-23-33-15	36.3	21.0	18.0	≥ 28
BRE-35-45-15	48.6	31.6	18.5	≥ 21
BRE-50-65-25	68.4	46.7	28.7	≥ 34
BRE-50-80-25	84.0	47.0	29.2	≥ 38
BRE-76-102-25	107.9	70.2	30.4	≥ 31

Impedance vs frequency



Broad Effect Core

Split ferrite clamp

Non split type



Oval Nanocrystalline Alloy Core

Feature

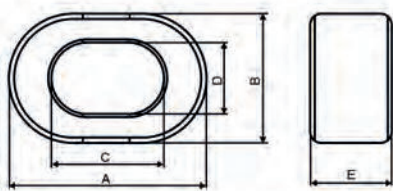
- Oval-shape provides space-saving, lower profile than ring cores.
- With high impedance, effective for suppressing noise across a broad frequency range.
- Vibration resistance complies with in-vehicle vibration test standard (ISO 16750-3 II).
- Stable EMI performance from low to high temperature range.
- Operating temperature: -40°C to +125°C
- UL94V-0 rated plastic case with excellent electrical insulation.

Material

- Core: Nanocrystalline Alloys Housing: PBT (Color:Black/Flammability:UL94V-0)

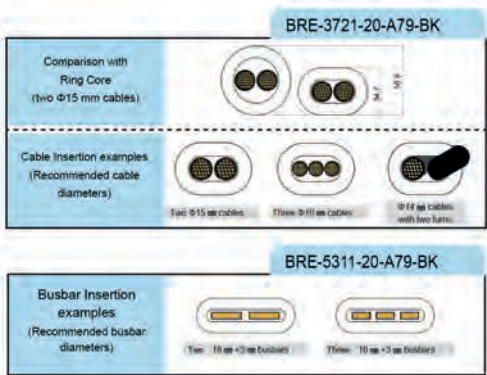
■ Specifications

- Product dimensions



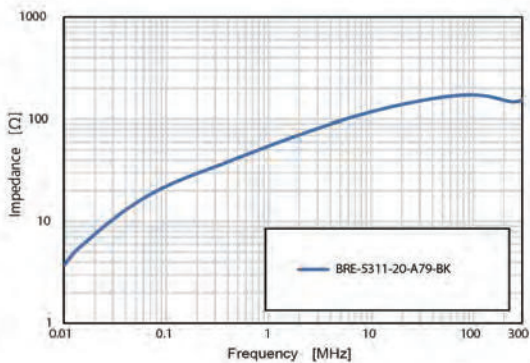
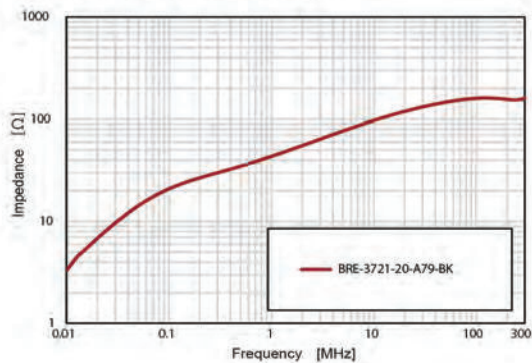
Unit:mm

Product	A	B	C	D	E
BRE-3721-20-A79-BK	50.9	34.7	33.1	16.9	23.8
NEW BRE-5311-20-A79-BK	69.8	28.3	48.5	7.0	23.8



- Application Examples
Inverters, servo amplifiers, switching power supplies

■ Impedance vs Frequency





High-performance noise suppression core with secure screw fixation

Feature

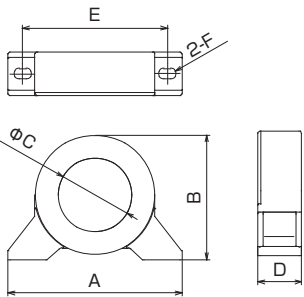
- The product can be securely fixed using screws.
- Effective for suppression of conducted/radiated noise.
- High impedance characteristics decrease the number of cable turns.
- Since the variation in impedance characteristics against temperature is small, stable effect is ensured in wide temperature range.
- Plastic housing provides higher insulation properties.
- The material of the plastic housing is UL94V-0 certified.

Material

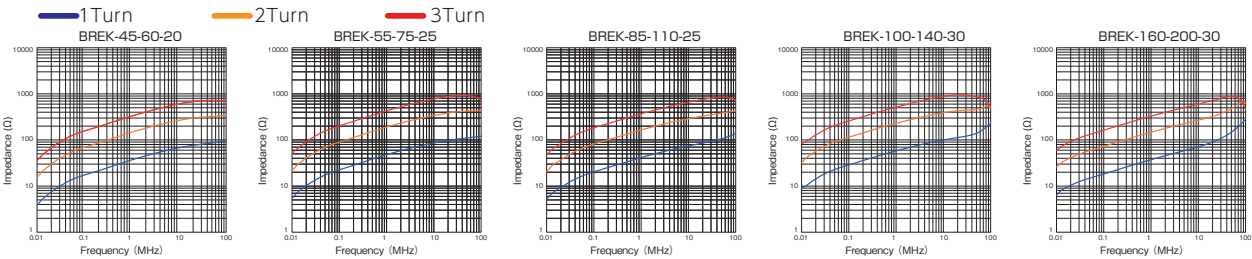
- Core: Nanocrystalline Alloys Housing: PBT (Color:Black/Flammability:UL94V-0)

Unit:mm

Part No.	A	B	C	D	E	F (Applicable screw)	Impedance Ω/1MHz (1 turn)
BREK-45-60-20	94	67	40	25	80	M5	≧ 20
BREK-55-75-25	120	86	50.6	30	100	M6	≧ 27
BREK-85-110-25	180	133	76.8	30.5	150	M6	≧ 28
BREK-100-140-30	180	154	96.2	35	160	M6	≧ 40
BREK-160-200-30	241	211	155	36	220	M6	≧ 27



Impedance vs frequency



FERRITE CORE PRODUCTS

Broad Effect Core	Split ferrite clamp	Non split type



※MRFC-20 is provided with mounting fixtures on both side.

FERRITE CLAMP for low-frequency range with UL94V-0 housing.

Feature

- Effective solutions for suppression of disturbance from switching power supply and motor.
- Due to conditioning the ferrite material, the product is suitable for suppressing low frequency noise from 150kHz to 30MHz.
- With optional mounting fixture, the product can be assembled on enclosure by M4 screw. (MRFC-13, MRFC-20)
- Fixing by M6 screw is available. (MRFC-H40)

Material

- Ferrite Core:Soft ferrite
- Housing:PA66 (Color:Light gray / Flammability:UL94V-0)
- ※MRFC-H40:PC/ABS (Color:Black / Flammability:UL94V-0)

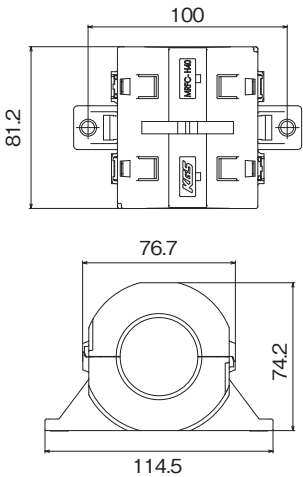
MRFC-H40



Assembly with cable tie



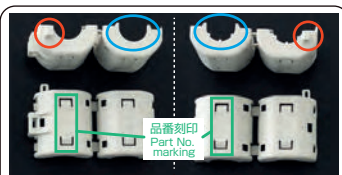
Split parts of top and bottom before assembly



How to distinguish this product MRFC series (for low frequency) from GRFC series (for high frequency)

① Cable tie insertion position

② Cable clamp opening profile



MRFC

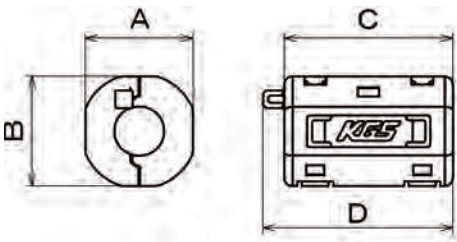
GRFC

① Left side

① Right side

② No protrusion

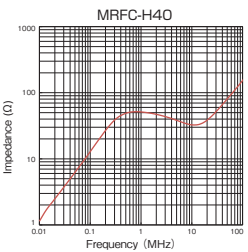
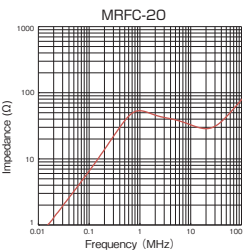
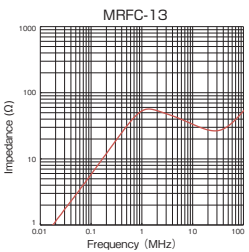
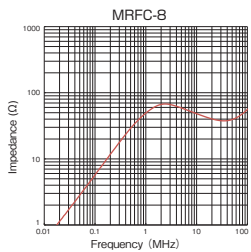
② With protrusions



Unit:mm

Part No.	A	B	C	D	Applicable cable diameter	Impedance Ω /10MHz (1turn)
MRFC-8	20.1	20.4	31.5	35.5	Max. ϕ 8.5	≥ 20
MRFC-13※1	29.1	33.05	32.3	37.1	Max. ϕ 13.5	≥ 20
MRFC-20※1	40.3	40	47	53.5	Max. ϕ 20.0	≥ 20
MRFC-H40	Shown in dimensional drawing ※2				Max. ϕ 40.0	≥ 25 (1 MHz)

Impedance vs frequency



※The values are measured data for reference, not guaranteed.



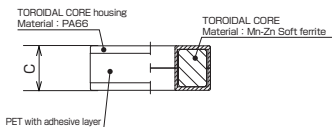
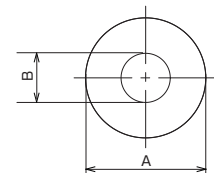
TOROIDAL CORE with housing which is suitable solution for suppressing noise in low-frequency range.

Feature

- With plastic housing preventing from cracking and chipping of the ferrite core.
- Effective noise filter for suppressing low-frequency noise in kHz to MHz range with the higher impedance characteristics.

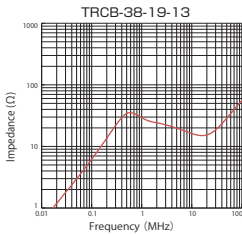
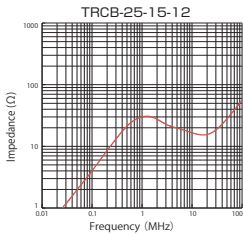
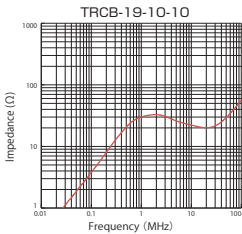
Material

- Torodial Core: Mn-Zn Soft ferrite
- Housing:PA66(Color:Natural / Flammability:UL94V-0)
- PET with adhesive layer



Unit:mm

Part No.	A	B	C	Impedance* Ω/10MHz (1 turn)
TRCB-19-10-10	20.0	8.1	(11.7)	≧ 11
TRCB-25-15-12	26.7	13.3	(13.5)	≧ 8
TRCB-38-19-13	40.5	16.6	(15.1)	≧ 7



※The values are measured data for reference, not guaranteed.



Ferrite clamp with excellent heat resistance, effective for prevention of conducted/radiated noise in low-frequency range

Feature

- Operating temperature: -40°C to +125°C
- Suitable for suppression of low-frequency noise (150kHz to 30MHz) of power supply system.
- Split type Ferrite Clamp, making it easy to apply to assembled wires.
- Housing with anti-strike-slip means for cable tie around its outer side. *Excluding RFC-20MA

Material

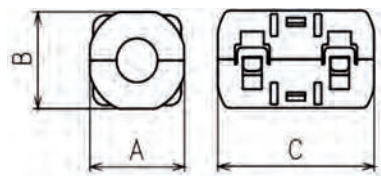
- Ferrite Core: Soft ferrite
- Housing: PA66 (Color: Natural / Flammability: UL94V-2)

Application

- Vehicle ECU, inverter, low-frequency noise prevention by motor drive

Specification

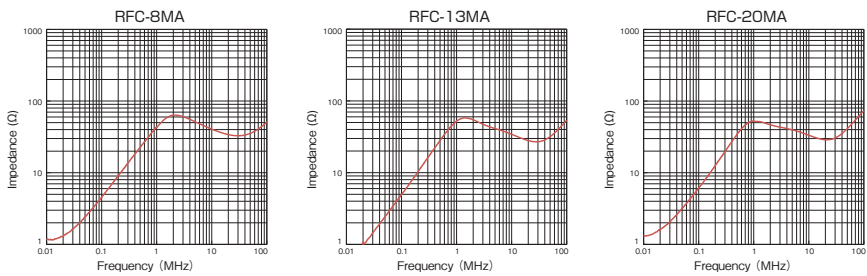
slip-proof for band



Unit: mm

Part No.	A	B	C	Applicable cable diameter	Impedance Ω /10MHz (1 turn)
RFC-8MA	20.6	19.8	34.0	Max. ϕ 8.5	≥ 20
RFC-13MA	29.6	28.4	34.0	ϕ 12.5 ~ 13.5	≥ 20
RFC-20MA	40.0	40.0	47.0	Max. ϕ 20	≥ 20

Impedance vs frequency



※The values are measured data for reference, not guaranteed.



Noise filter, usable in engine rooms

Feature

- Conducted noise suppression filter for applications up to 125°C and 10G vibration.
- Applicable to vehicle vibrations requirements: ISO-16750-3-II equivalent for passenger car transmission.
- High-frequency (RFCW-C10) and low-frequency (RFCW-13MA) noise versions.
- Tight fixing is available by its permanent lock structure.

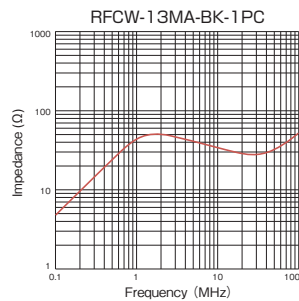
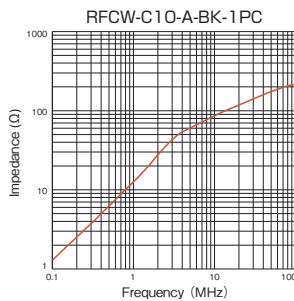
Material

- Ferrite Core: Soft ferrite
- Housing: PA66 (Color: Black/Flammability: UL94V-2)

Unit:mm

Part No.	A	B	C	D	Applicable cable diameter	Impedance* $\Omega/100\text{MHz}(1 \text{ turn})$
RFCW-C10-A-BK-1PC	34.6	36.8	35.0	58.7	$\phi 10$ Corrugated tube	≥ 140
RFCW-13MA-BK-1PC	31.4	33.6	34.8	58.3	Max. $\phi 13.5$	$\geq 20\Omega(10\text{MHz}(1 \text{ turn}))$

Impedance vs frequency



■ Fixing onto cable and chassis are available



Its bracket fixture enables securing it with tape.

■ Metal springs used



Housing with anti-slip means.

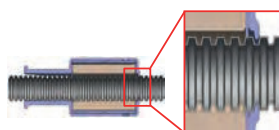
■ Easy to reopen



Heat-resistant and vibration-proof performance improves by embedded metal spring.



Removal with plug-in of flat-bladed screwdriver.



※RFCW-C10-A-BK-1PC
The bracket fixture allows temporary fixation on tube corrugations.



This product is in 1 set of configurations in two identical parts. (1pair=2pcs)

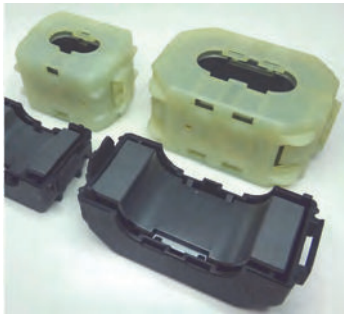
※The values are measured data for reference, not guaranteed.

Low-frequency cores

Split ferrite clamp

Non split type

LOW-CUT FERRITE CLAMP / BFCWN-MA
BLOCK FERRITE CLAMP / BFCWN-A



Low height noise filter saves space

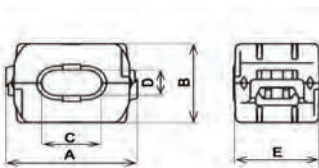
Feature

- Satisfied requirement of ISO 16750-3 II vibration test for road vehicles.
- Operating temperature range is -40°C +125°C.
- The case has rib structures to prevent cable ties from slipping. Cable ties enable double protection by maintaining ferrite cores' function even if the lock of case is damaged.
- The Optimum for suppressing conducted noise in cables and inverter's out-put cables of on-vehicle rechargers.
- Low profile provides 30% space saving compared with the conventional type.

Material

- Ferrite core: Soft ferrite
- Housing: PA66 (High-frequency / Color: Black, Flammability: UL94V-2)
(Low-frequency / Color: Natural, Flammability: UL94V-2)

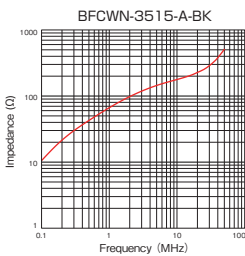
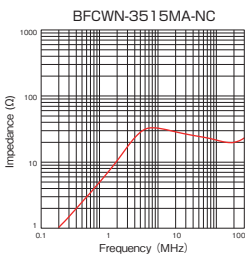
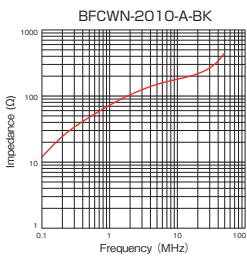
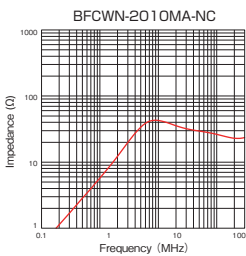
Specification



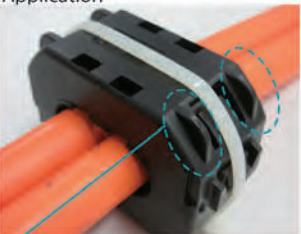
Unit: mm

Part No.	Frequency	A	B	C	D	E	Applicable cable diameter	Impedance Ω /100MHz (1 turn)
BFCWN-2010MA-NC	Low-frequency	45	32	20	10	30	$\phi 9 \times$ two cables	$\geq 20\Omega$ (1MHz)
BFCWN-2010-A-BK	High-frequency							≥ 117
BFCWN-3515MA-NC	Low-frequency	67	44	35	15	31	$\phi 14 \times$ two cables	$\geq 16\Omega$ (1MHz)
BFCWN-3515-A-BK	High-frequency							≥ 117

Impedance vs frequency



Application



Cable tie
anti-slippage
rib structure

※The values are measured data for reference, not guaranteed.



Most suitable ferrite core for suppressing conductive noise at 1 MHz or less

Feature

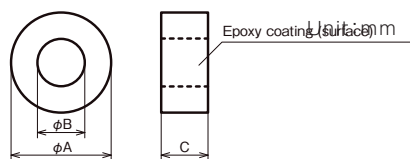
- Due to the higher impedance in the frequency range of 1 MHz or less, the product is effective for suppressing conductive noise around 150kHz.
- As the number of turns increases, the impedance improves and a better effectiveness of noise suppression can be obtained.
- Resin coated core prevents from cables getting damaged by the edge of the core.
- The wide variation of size is available. ($\phi 7.2 \sim \phi 87.9$)

Material

- Mn-Zn soft ferrite (epoxy coating)

Specification

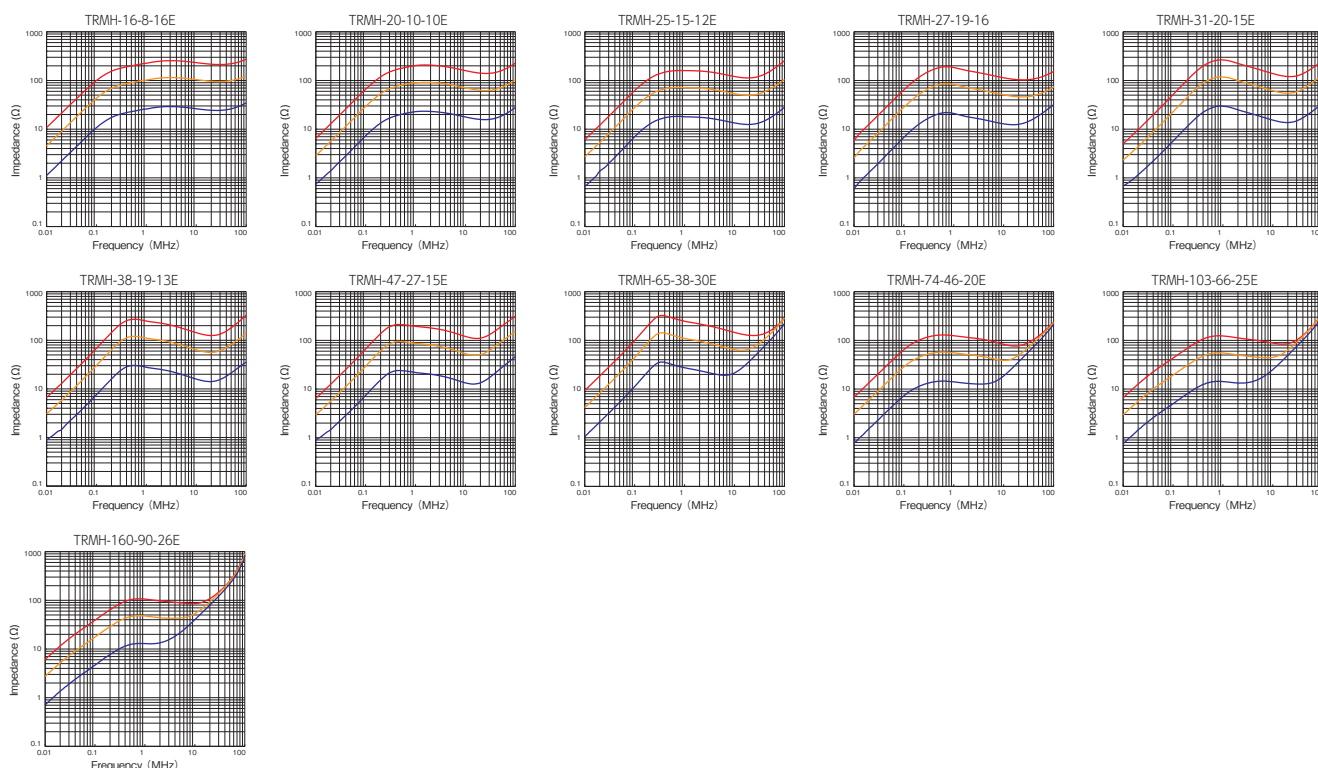
Unit:mm



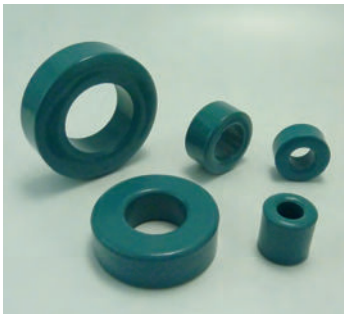
Part No.	A	B	C	Impedance $\Omega/1\text{MHz}$ (1turn)
TRMH-16-8-16E	16.9	7.2	16.8	≥ 18
TRMH-20-10-10E	21.0	9.2	10.9	≥ 11
TRMH-25-15-12E	25.9	14.1	12.8	≥ 9
TRMH-27-19-15	27.0	19.0	15.0	≥ 9
TRMH-31-20-15E	32.1	19.0	15.9	≥ 9
TRMH-38-19-13E	39.1	18.0	13.9	≥ 11
TRMH-47-27-15E	48.3	26.0	15.9	≥ 10
TRMH-65-38-30E	67.3	36.6	31.1	≥ 12
TRMH-74-46-20E	75.76	44.22	21.0	≥ 6
TRMH-103-66-25E	105.6	63.1	26.9	≥ 6
TRMH-160-90-26E	165.1	87.9	28.1	≥ 6

Impedance vs frequency

— 1Turn — 2Turn — 3/Turn



※The values are measured data for reference, not guaranteed.



"Mn" ferrite cores, suitable solutions for conductive and radiation noise in low frequency range

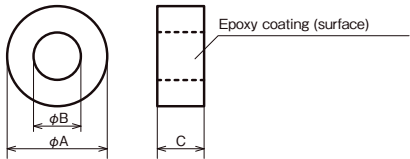
Feature

- High impedance noise filter in low frequency (kHz to MHz) range.
- Epoxy coated ferrite core has rounded corners to reduce load on cable.

Material

- Mn-Zn soft ferrite (epoxy coating)

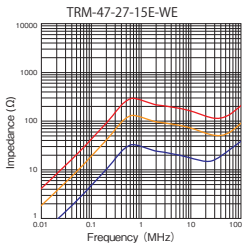
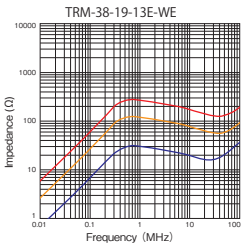
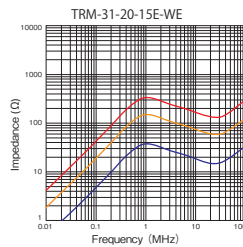
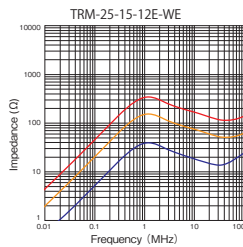
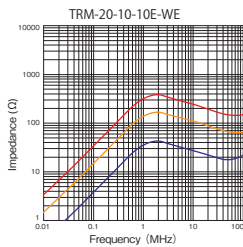
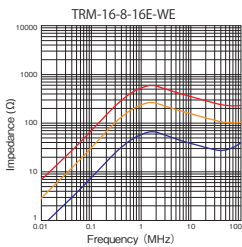
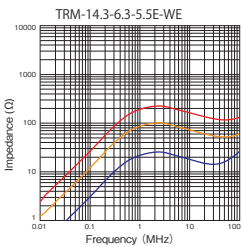
Unit:mm



Impedance vs frequency

1 Turn 2 Turn 3 Turn

Part No.	A	B	C	Impedance* Ω /10MHz (2turn)
TRM-14.3-6.3-5.5E-WE	15.0	5.6	6.2	≥ 40
TRM-16-8-16E-WE	17.0	7.1	16.9	≥ 70
TRM-20-10-10E-WE	21.0	9.1	10.9	≥ 35
TRM-25-15-12E-WE	26.0	14.1	12.9	≥ 35
TRM-31-20-15E-WE	32.1	19.0	15.9	≥ 30
TRM-38-19-13E-WE	39.2	17.9	14.0	≥ 35
TRM-47-27-15E-WE	48.5	25.7	16.3	≥ 25



Low-frequency cores

Split ferrite clamp

Non split type

※The values are measured data for reference, not guaranteed.



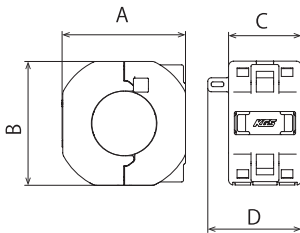
Split ferrite clamp for intermediate frequency range from 3 to 50MHz.

Feature

- Effective for suppression both of conducted noise up to 30MHz and radiated noise over 30MHz.
- Split ferrite clamp with plastic housing enables to attach assembled cable and cables with connector.
- Cable tie can assist to hold electric wires and enables the product to be fixed to wire harness.
- Wire guiding system prevent wires from being pinched when winding assembly.
- With optional mounting fixture, the product can be assembled on enclosure by M4 screw.

Material

- Ferrite Core: Soft ferrite
- Housing: PA66 (Color: natural / Flammability: UL94V-0)

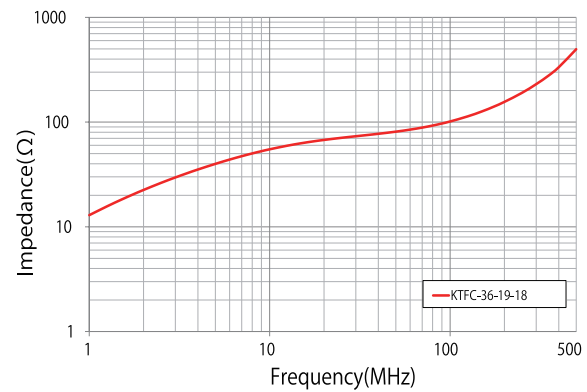
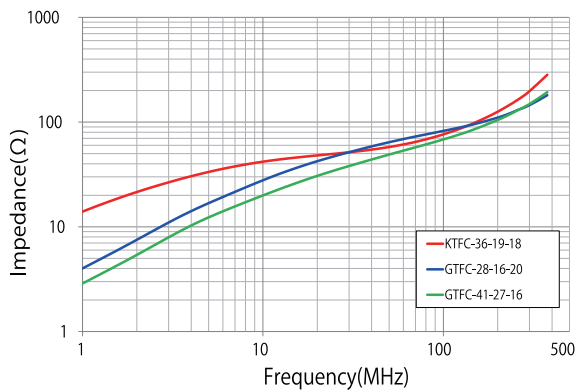


※1) P/N for the product with fixture:
KTFC2-36-19-18



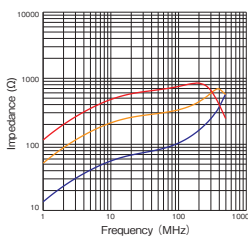
Part No.	A	B	C	D	Applicable cable diameter	Impedance Ω /100MHz (1 turn)
KTFC-36-19-18 ^{※1}	36.3	36.4	21.4	27.5	MAX ϕ 18.5	≥ 66

Impedance vs Frequency characteristic (Number of turns in the wire: 1 turn)



Impedance vs frequency

— 1 Turn — 2 Turn — 3 Turn





Split ferrite clamp for Mid-frequency range from 3 to 50MHz.

Feature

- Effective for suppression both of conducted noise up to 30MHz and radiated noise over 30MHz.
- Split FERRITE CLAMP with plastic housing enables to attach assembled cable and cables with connector.
- Cable tie can assist to hold electric wires and enables the product to be fixed to wire harness. (Excluding KRFC-4)
- Wire guiding system prevent wires from being pinched when winding assembly.
- With optional mounting fixture, the product can be assembled on enclosure by M4 screw.(KRFC-15)

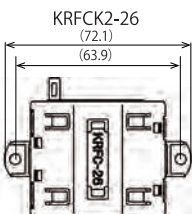
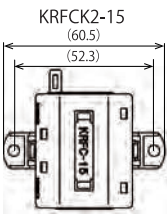
Material

- Ferrite Core:Soft ferrite
- Housing:PA66 (Color:natural/Flammability:UL94V-0)

Unit:mm

Part No.		A	B	C	D	Applicable cable diameter	Impedance(Ω) 100MHz (1 Turn)
KRFC-4	①	13.7	13.5	27.5	—	ϕ 3.5~4.5	$\geq$ 70
KRFC-6	①	18.1	18.4	31.5	35.5	ϕ 5.5~6.5	$\geq$ 110
KRFC-8	①	20.1	20.4	31.5	35.5	ϕ 7.5~8.5	$\geq$ 80
KRFC-9	①	20.1	20.4	31.5	35.5	ϕ 8.5~9.5	$\geq$ 80
KRFC-10	①	26.3	26.4	32.4	37.2	ϕ 9.5~10.5	$\geq$ 120
KRFC-13	①	29.1	29.4	31.5	36.3	ϕ 12.5~13.5	$\geq$ 105
KRFC-15 ^{*1}	②	36.1	40.1	42.8	52.3	Max ϕ 15.5	$\geq$ 221
KRFC-26 ^{*1}	②	52.8	52.1	44.8	54.3	Max ϕ 26.0	$\geq$ 196

There are Part Nos.
with optional parts

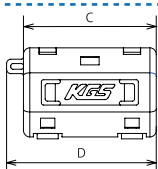
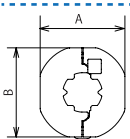


● Dimensions

Profile : ①

Cable slippage protection

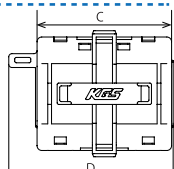
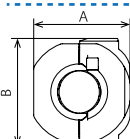
Wire guide



Profile : ②

Wire guide

There are Part Nos.
with optional parts



Wire guide

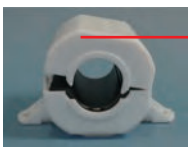


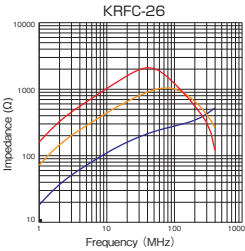
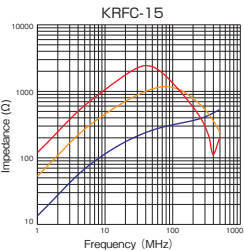
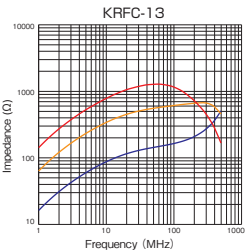
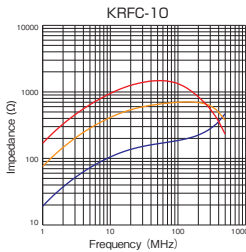
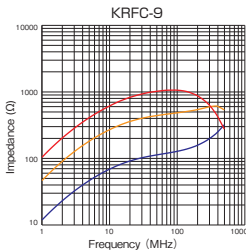
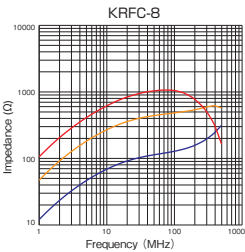
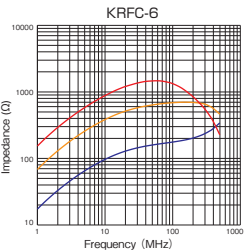
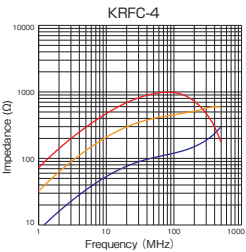
Photo A: KRFC2-15

Wire-guiding System
prevents wires/cables from being
pinched when winding assembly

Cable slippage protection



Cable Anti-slippage System
Opening has protrusions to firmly
hold cables.
Easy to use on the exterior of
machines since no additional tools
are required and it reduces clutter.





Non-split toroidal core for intermediate frequency range from 3 to 50MHz.

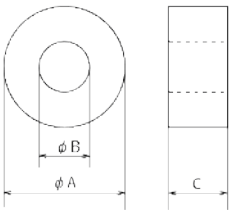
Feature

- Effective for suppression both of conducted noise upto 30MHz and radiated noise over 30MHz.
- With regard to variation of size, please contact our sales department.

Material

- Soft ferrite

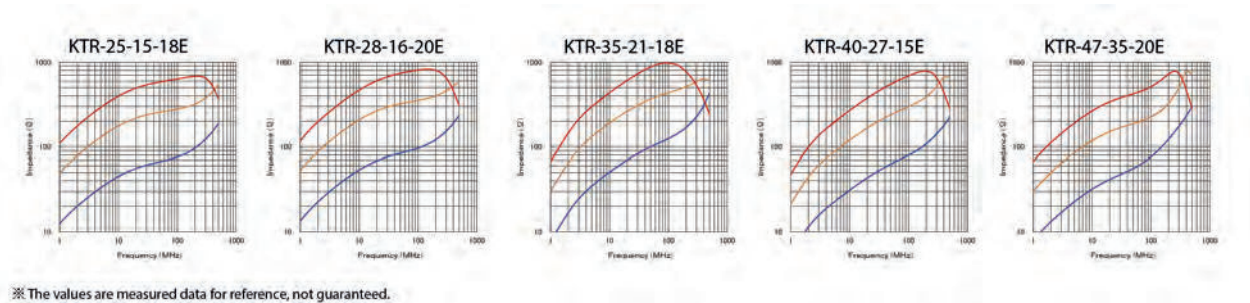
Unit:mm



Part No.	A	B	C	Impedance(Ω) 100MHz (1 Turn)
KTR-25-15-18E	25.0	15.0	18.0	≥ 54
KTR-28-16-20E	28.0	16.0	20.0	≥ 65
KTR-35-21-18E	34.6	20.8	18.0	≥ 80
KTR-40-27-15E	40.6	27.4	15.0	≥ 50
KTR-47-35-20E	47	35.0	20.0	≥ 54

Impedance vs frequency

— 1 Turn — 2 Turn — 3 Turn



※ The values are measured data for reference, not guaranteed.



FERRITE CLAMP with excellent heat resistance

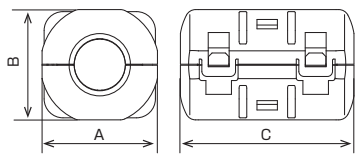
Feature

- Split type Ferrite Clamp, making it easy to apply to assembled wires.
- Housing structure with anti-slip means for cable tie.
- Highly reliable because of the lock of the housing as well as the fastening of the tie.
(※Excluding RFC-20-A)
- Operating temperature range: -40°C to +125°C.

Material

- Ferrite Core: Soft ferrite
- Housing: PA66 (Color: Black / Flammability: UL94V-2)

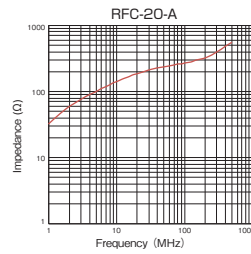
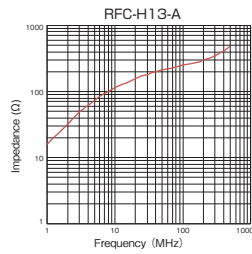
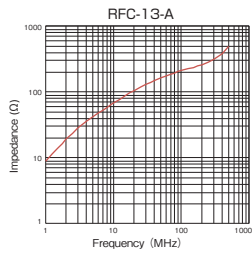
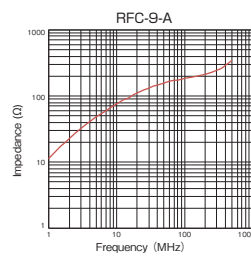
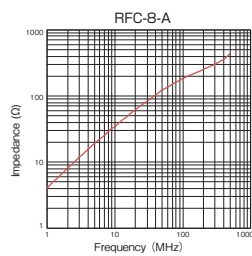
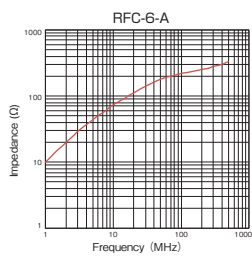
Housing with anti-slip-means



Unit : mm

Part No.	A	B	C	Applicable cable diameter	Impedance Ω/100MHz (1turn)
RFC-6-A	18.5	18.1	34.0	Max. φ6.0	≧ 135
RFC-8-A	20.6	20.1	34.0	Max. φ8.5	≧ 120
RFC-9-A	22.6	21.7	34.0	Max. φ9.5	≧ 125
RFC-13-A	29.6	28.4	34.0	Max. φ13.5	≧ 123
RFC-H13-A	31.7	29.4	41.0	Max. φ13.5	≧ 170
RFC-20-A	40.0	40.0	47.0	Max. φ20	≧ 180

Impedance vs frequency



※The values are measured data for reference, not guaranteed.



Fair-Surface type with no protrusion of snap or hinge parts

Feature

- Split ferrite cores with plastic housing for easy fixing on assembled cables or cables with connectors.
- Cable tie can assist to hold electric wires and enables the product to be fixed to wire harness. (Excluding GRFC-3/4, RFC-H13, RFC-20)
- Wire guiding system prevents wires from being pinched when winding assembly.
- Light gray or black plastic case color available (except RFC-20), based on the color of your cable.

Material

- Ferrite Core: Soft ferrite
- Housing: PA66 (Color: Light gray / Flammability: UL94V-0)
(Color: Black / Flammability: UL94V-2)

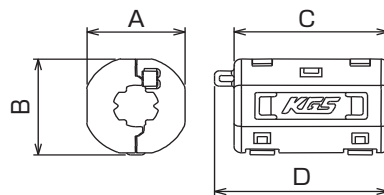
※ Black type has "BK" at the end of the part number.

※ RFC-H13, RFC-20 have different configurations. Contact us for the details.

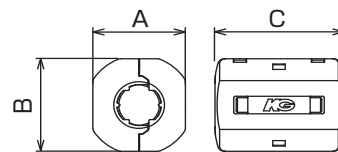


RFCK2-20 (RFC-20 with mounting fixture is available. Contact us for the details.)

Profile ①



Profile ②

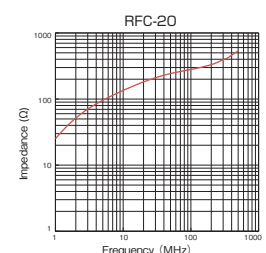
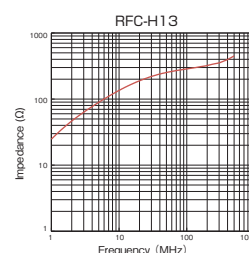
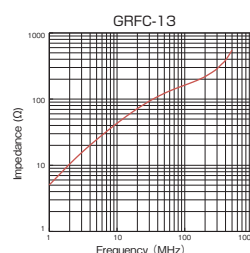
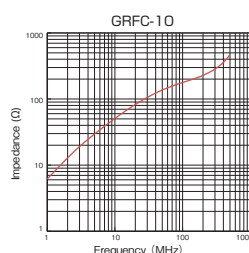
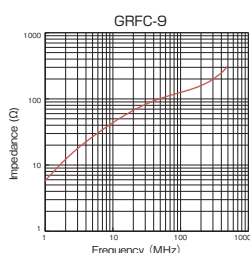
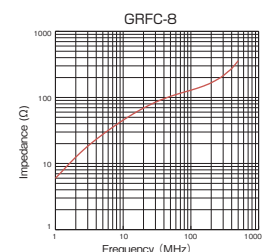
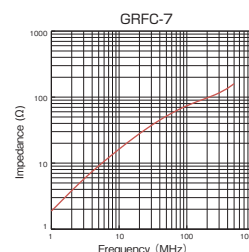
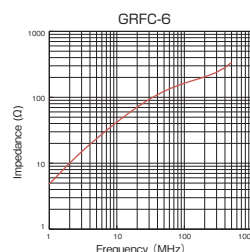
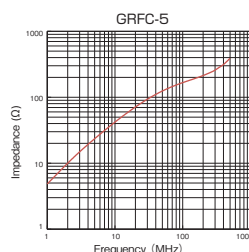
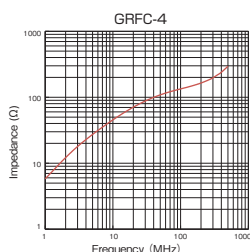
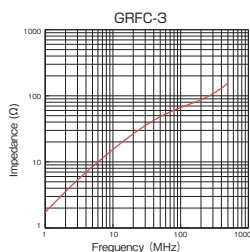


Unit: mm

Part No.	Profile	A	B	C	D	Applicable cable diameter	Impedance* Ω /100MHz (1 turn)
GRFC-3	※	13.7	13.5	18.0	—	$\phi 3.0 \sim 4.0$	≥ 35
GRFC-4	※	13.7	13.5	27.5	—	$\phi 3.5 \sim 4.5$	≥ 75
GRFC-5	①	18.1	18.4	31.5	35.5	$\phi 4.5 \sim 5.5$	≥ 100
GRFC-6	①	18.1	18.4	31.5	35.5	$\phi 5.5 \sim 6.5$	≥ 100
GRFC-7	※	14.25	15.8	20.0	24.0	Max. $\phi 7$	≥ 45
GRFC-8	①	20.1	20.4	31.5	35.5	$\phi 7.5 \sim 8.5$	≥ 75
GRFC-9	①	20.1	20.4	31.5	35.5	$\phi 8.5 \sim 9.5$	≥ 75
GRFC-10	①	26.3	26.4	32.4	37.2	$\phi 9.5 \sim 10.5$	≥ 105
GRFC-13	①	29.1	29.4	31.5	36.3	$\phi 12.5 \sim 13.5$	≥ 95
RFC-H13	②	29.4	31.7	41.0	—	$\phi 12.5 \sim 13.5$	≥ 170
RFC-20	※	40.0	40.0	47.0	—	Max. $\phi 20$	≥ 180

※ GRFC-3, GRFC-4, GRFC-7 and RFC-20 have a slightly different configurations. Contact our sales department for details.

Impedance vs frequency



※ The values are measured data for reference, not guaranteed.



Toroidal design that makes cable easy to turn around it

Feature

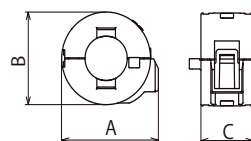
- Split ferrite cores with plastic housing for easy fixing on assembled cables or cables with connectors.
- Cable tie can assist to hold electric wires and enables the product to be fixed to wire harness. (Excluding GTFC-41-27-16)
- Wire guiding system prevents wires from being pinched when winding assembly.

Material

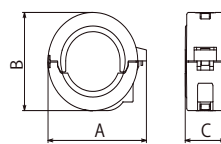
- Ferrite Core : Soft ferrite
- Housing : PA66 (Color : Light gray / Flammability : UL94V-0)

GTFC-**-**-**

Profile ①



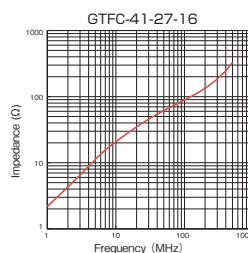
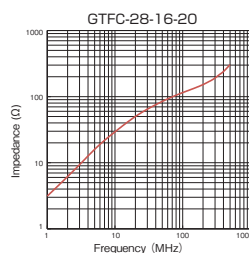
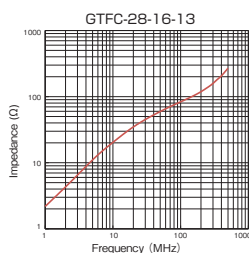
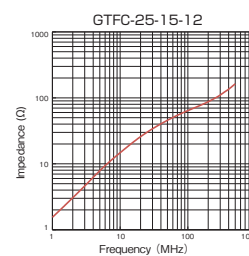
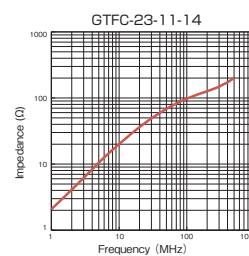
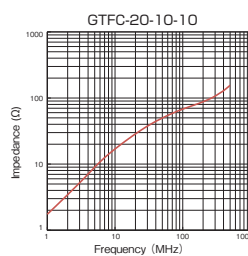
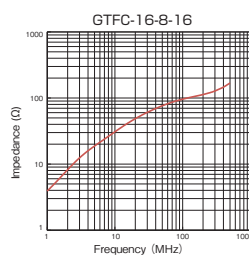
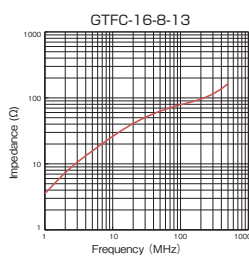
Profile ② (GTFC-41-27-16)



Unit : mm

Part No.	Profile	Applicable cable diameter	A	B	C	Impedance Ω /100MHz (1 turn)
GTFC-16-8-13	①	Max. ϕ 7.2	22.3	20.1	18.9	≥ 45
GTFC-16-8-16	①	Max. ϕ 7.2	22.3	20.1	21.9	≥ 55
GTFC-20-10-10	①	Max. ϕ 8.5	27.1	24.9	16	≥ 40
GTFC-23-11-14	①	Max. ϕ 10.5	30.5	28.3	20.2	≥ 55
GTFC-25-15-12	①	Max. ϕ 13	31.1	28.9	17.8	≥ 40
GTFC-28-16-13	①	Max. ϕ 14.7	35.1	32.9	18.8	≥ 50
GTFC-28-16-20	①	Max. ϕ 14.7	35.1	32.9	25.8	≥ 70
GTFC-41-27-16	②	Max. ϕ 26	48.2	44.5	19.6	≥ 50

Impedance vs frequency



*The values are measured data for reference, not guaranteed.

※Contact us for the measurement conditions.

TOROIDAL FERRITE CLAMP / GTFCK



Toroidal cores with easily mounting fixture on chassis

Feature

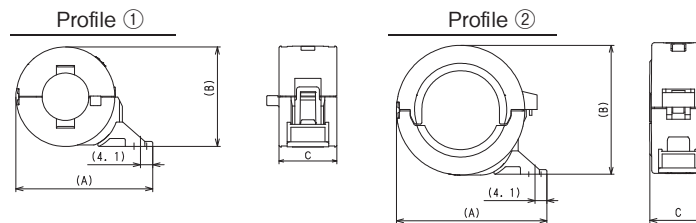
- The product can be assembled on enclosure by M4 screw.

Material

- Ferrite Core : Soft ferrite
- Housing : PA66 (Color : Light gray / Flammability : UL94V-0)

Unit : mm

Part No.	Profile	Applicable cable diameter	A	B	C	Impedance Ω /100MHz (1turn)
GTFCK-16-8-13	①	Max. ϕ 7.2	32.5	20.4	18.9	$\geq$ 45
GTFCK-16-8-16	①	Max. ϕ 7.2	32.5	20.4	21.9	$\geq$ 55
GTFCK-20-10-10	①	Max. ϕ 8.5	37.1	24.9	16	$\geq$ 40
GTFCK-23-11-14	①	Max. ϕ 10.5	40.5	28.3	20.2	$\geq$ 55
GTFCK-25-15-12	①	Max. ϕ 13	41.2	28.9	17.8	$\geq$ 40
GTFCK-28-16-13	①	Max. ϕ 14.7	45.3	32.9	18.8	$\geq$ 50
GTFCK-28-16-20	①	Max. ϕ 14.7	45.3	32.9	25.8	$\geq$ 70
GTFCK-41-27-16	②	Max. ϕ 26	51.8	44.5	19.6	$\geq$ 50



TOROIDAL FERRITE CLAMP / GTFCR



Toroidal cores with removable fixture

Feature

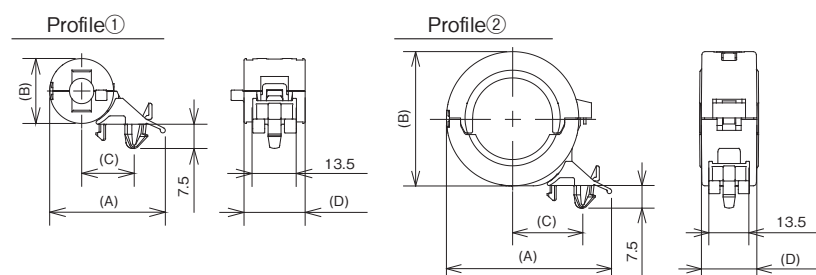
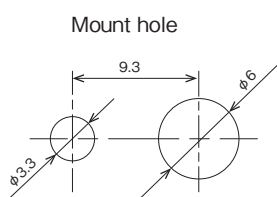
- Snap fastener for re-use is available for the product with fixture "GTFCR".

Material

- Ferrite Core : Soft ferrite
- Housing : PA66 (Color : Light gray / Flammability : UL94V-0)

Unit : mm

Part No.	Profile	Applicable cable diameter	A	B	C	D	Impedance Ω /100MHz (1turn)
GTFCR-16-8-16	①	Max. ϕ 7.2	35.8	20.1	16.3	21.9	$\geq$ 55
GTFCR-41-27-16	②	Max. ϕ 26	55.2	44.5	23.6	19.6	$\geq$ 50



※The values are measured data for reference, not guaranteed.



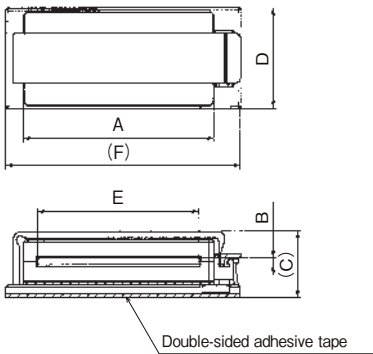
Labor-saving assembly and fixing by combination with plastic clamp

Feature

- Split core type, easy assembly on wired or connected ribbon cables.
- Plastic clamp integrated type allows easy assembly.

Material

- Core / Soft ferrite
- Clamp / Nylon 66 (Light gray / UL94V-0)

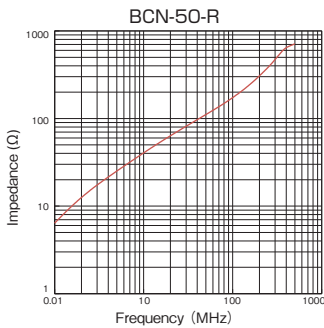
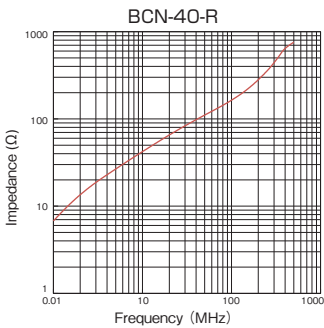
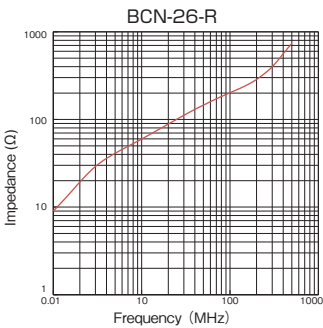


Unit:mm

Part No.	A	B	(C)	D	E	(F)	Impedance* Ω /100MHz (1 turn)
BCN-26-R	45.0	2.0	19.6	30.0	34.0	59.5	≥ 125
BCN-40-R	63.0		19.5		52.0	76.5	≥ 95
BCN-50-R	76.5				64.5	90.7	≥ 105

※Contact us for the measurement conditions.

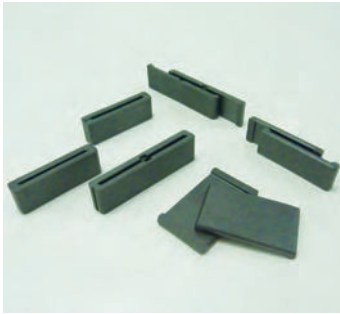
Impedance vs frequency



High-frequency cores

Split ferrite clamp

Non split type



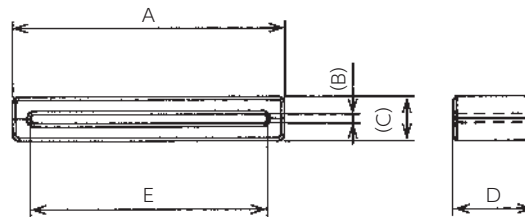
Split core type for easy assembly on wired or connected cables

Feature

- For filtering noise emission from ribbon cables, FPC etc..

Material

- Soft ferrite

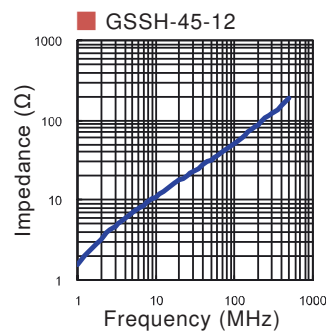
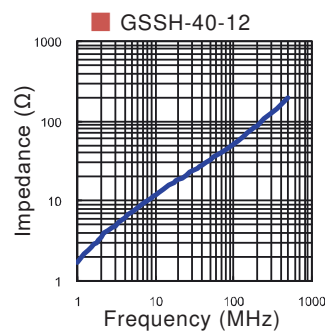
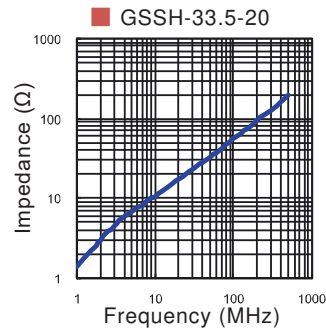
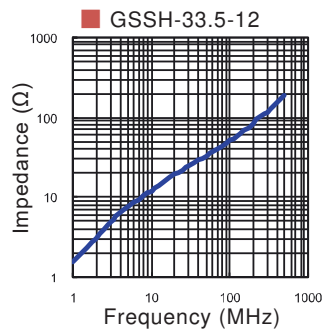


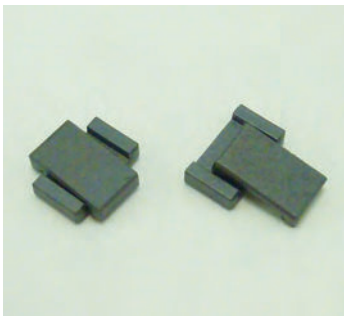
Unit:mm

Part No.	A	(B)	(C)	D	E	Impedance* Ω /100MHz (1 turn)
GSSH-33.5-12	33.5	1.2	6.6	12.0	27.0	≥ 35
GSSH-33.5-20	33.5			20.0	27.0	≥ 50
GSSH-40-12	40.0			12.0	34.8	≥ 35
GSSH-45-12	45.2			12.0	40.0	≥ 35

※Contact us for the measurement conditions.

Impedance vs frequency





Split core for convenient fitting on pre-wired cables

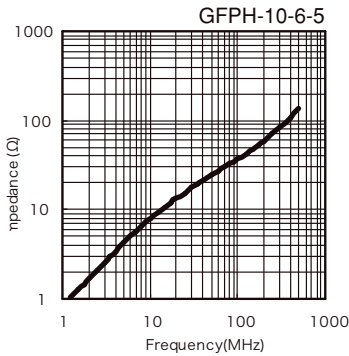
Feature

- GFPH ferrite core for effective filtering emission noise from FPC.

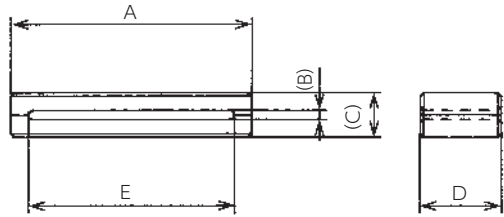
Material

- Soft ferrite

Impedance vs frequency



*The values are measured data for reference, not guaranteed.

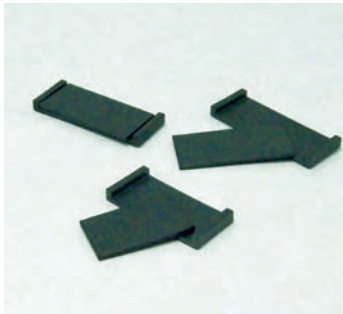


Unit:mm

Part No.	A	(B)	(C)	D	E	Impedance* Ω/100MHz (1 turn)
GFPH-10-6-5	10.0	1.8	5.0	6.0	6.8	≥ 25

※Contact us for the measurement conditions.

OPEN CIRCUIT CORE / GFPO



Open magnetic circuit structure provides high impedance with close contact on FPC

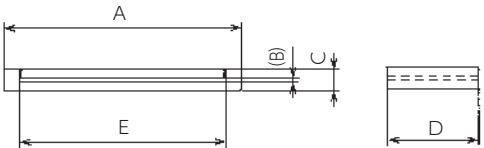
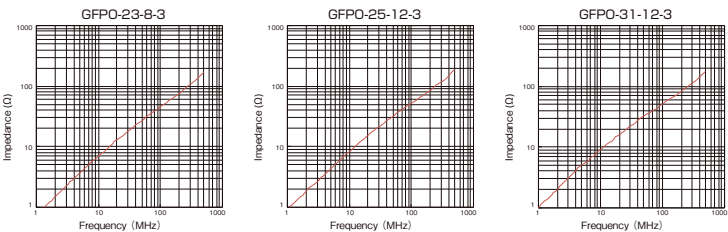
Feature

- Effective for noise attenuation over a broad frequency range, because the structure leads to a small impedance difference between individual cables of the FPC.

Material

- Soft ferrite

Impedance vs frequency



Unit:mm

Part No.	A	B	C	D	E	Impedance * Ω/100MHz(1 turn)
GFPO-23-8-3	23.0	0.5	2.8	8.0	19.0	≥ 30
GFPO-25-12-3	25.0			12.0	21.0	≥ 35
GFPO-31-12-3	31.0			12.0	27.0	≥ 35

*The values are measured data for reference, not guaranteed.

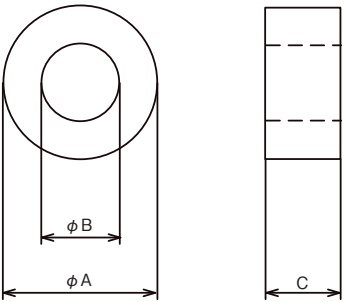
*Contact us for the measurement conditions.



Non-split toroidal cores

Material

- Soft ferrite



Unit:mm

Part No.	ϕA	ϕB	C	Impedance* $\Omega/100\text{MHz}$ (1 turn)
GTR-7-3-4	7	3.5	4	≥ 20
GTR-9-5-8	9	5	8	≥ 30
GTR-10-5-5	10	5	5	≥ 25
GTR-11-5-9	11	5	9	≥ 45
GTR-12.5-8-12	12.6	8.1	12	≥ 35
GTR-13-7-6	13	7	6	≥ 25
GTR-13-7-12.7	13	7.1	12.7	≥ 45
GTR-14.5-10-8	14.5	10.2	8	≥ 20
GTR-16-8-13	16.5	8.2	13	≥ 55
GTR-16-8-16	16.5	8.2	16	≥ 65
GTR-16-10-7	16	10	7	≥ 25
GTR-16-10-10	16	10	10	≥ 30
GTR-18-10-6	18	10	6	≥ 25
GTR-20-10-5	20.5	10.2	5	≥ 25
GTR-20-10-10	20.5	10.2	10	≥ 45
GTR-21-13-6	21.2	12.7	6	≥ 25
GTR-22-14-10	22	14	10	≥ 30
GTR-23-11-14	23.6	11.4	14	≥ 60
GTR-25-15-8	25	15	8	≥ 30
GTR-25-15-12	25	15	12	≥ 40
GTR-28-16-13	28	16	13	≥ 45
GTR-28-16-20	28	16	20	≥ 70
GTR-31-19-8	31	19	8	≥ 30
GTR-31-19-16	31	19	16	≥ 60
GTR-40-27-15	40.6	27.4	15	≥ 45

*Contact us for the measurement conditions.

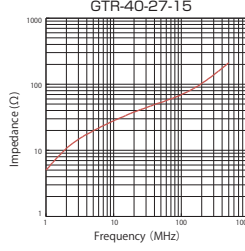
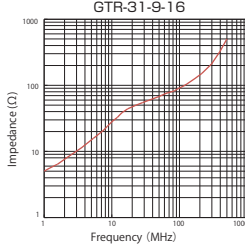
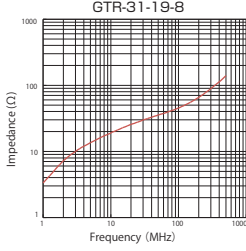
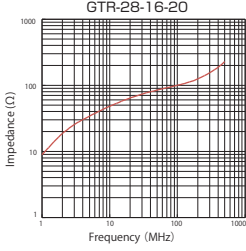
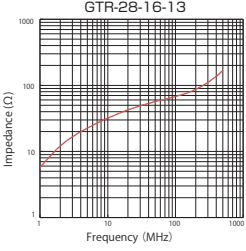
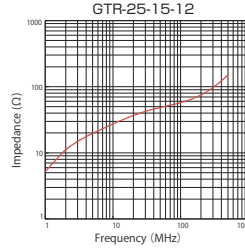
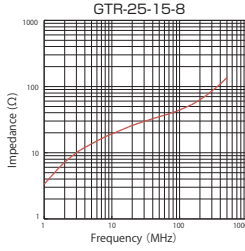
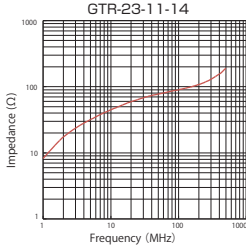
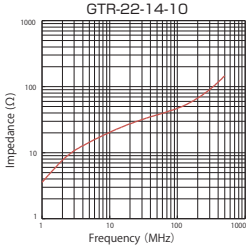
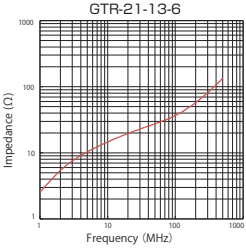
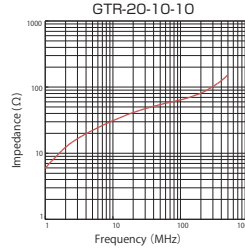
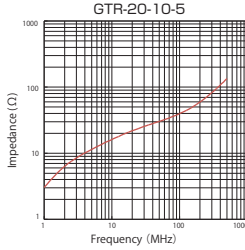
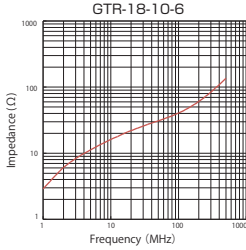
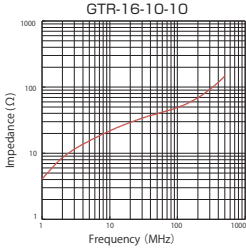
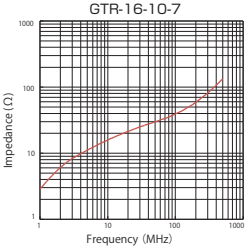
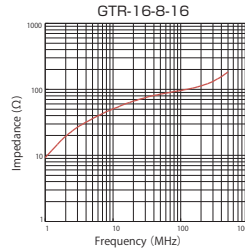
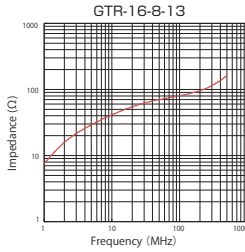
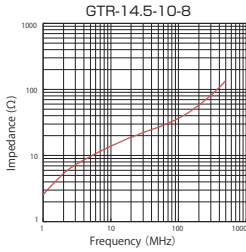
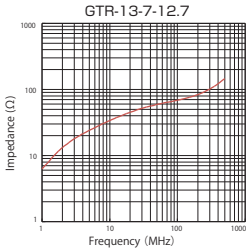
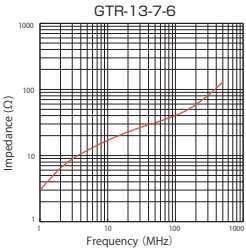
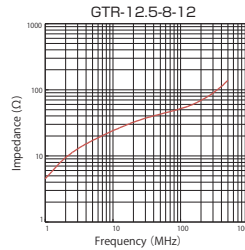
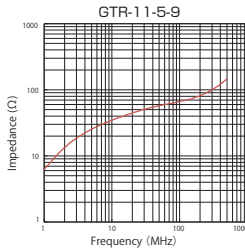
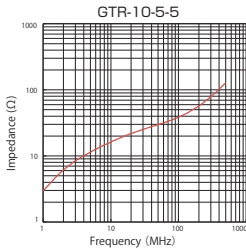
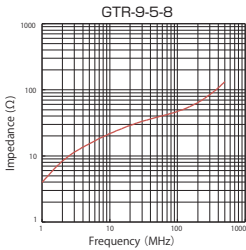
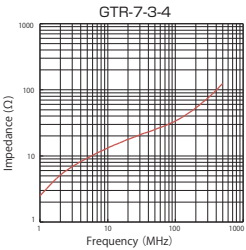
Impedance vs frequency

EMC FILTER PRODUCTS

High-frequency cores

Split ferrite clamp

Non split type





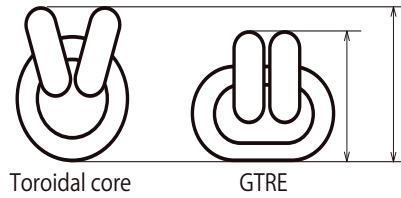
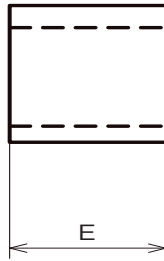
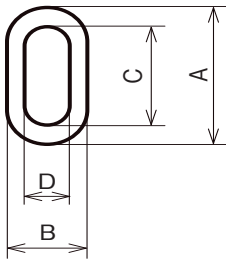
Oval style enables space-saving compared with toroidal type

Feature

- With cable either single or multiple turns, the over-all profile is lower than toroidal cores (refer to Fig. below).
- Oval shape allows assembly on connected cables with rectangular connectors, etc.

Material

- Soft ferrite



Toroidal core

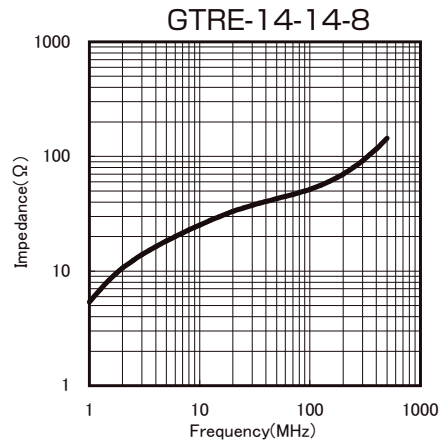
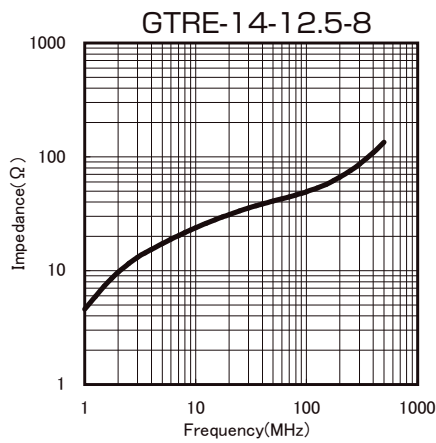
GTRE

Unit:mm

Part No.	A	B	C	D	E	Impedance* Ω /100MHz (1 turn)
GTRE-14-12.5-8	14.0	8.0	10.0	4.0	12.5	≥ 30
GTRE-14-14-8					14.0	≥ 35

※Contact us for the measurement conditions.

Impedance vs frequency



※The values are measured data for reference, not guaranteed.

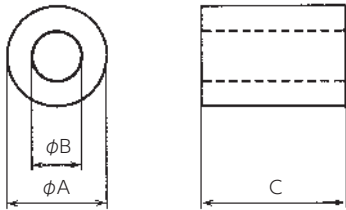


Non-split sleeve cores

Material

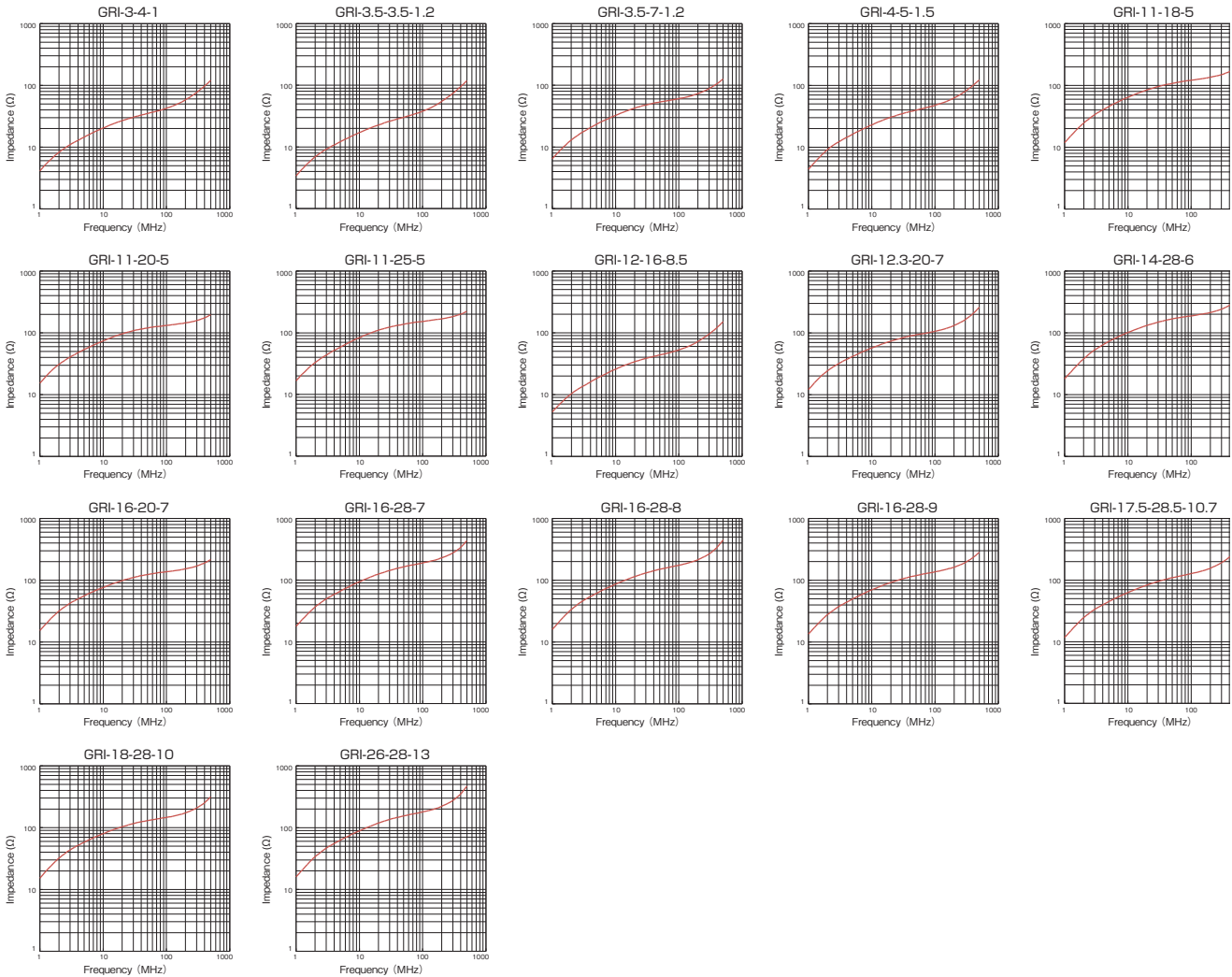
● Soft ferrite

Unit:mm



Part No.	ϕA	ϕB	C	Impedance* Ω /100MHz (1turn)
GRI-3-4-1	3	1	4	≥ 25
GRI-3.5-3.5-1.2	3.5	1.2	3.5	≥ 25
GRI-3.5-7-1.2	3.5	1.2	7	≥ 40
GRI-4-5-1.5	4	1.5	5	≥ 30
GRI-11-18-5	11	5	18.5	≥ 85
GRI-11-20-5	11	5	20	≥ 90
GRI-11-25-5	11	5	25	≥ 105
GRI-12-16-8.5	12	8.5	16	≥ 35
GRI-12.3-20-7	12.3	7	20	≥ 70
GRI-14-28-6	14.3	6.3	28.6	≥ 130
GRI-16-20-7	16	7	20	≥ 95
GRI-16-28-7	16	7	28	≥ 130
GRI-16-28-8	16	8	28	≥ 115
GRI-16-28-9	16	9	28	≥ 95
GRI-17.5-28.5-10.7	17.5	10.7	28.5	≥ 85
GRI-18-28-10	18	10	28	≥ 100
GRI-26-28-13	26	13	28	≥ 120

Impedance vs frequency



*The values are measured data for reference, not guaranteed.

High-frequency cores

Split ferrite clamp

Non split type

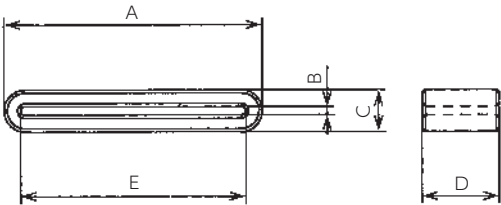
Noise suppression for ribbon cables

Feature

- GSSC suppresses emission noise for ribbon cables, FPC etc.

Material

- Soft ferrite

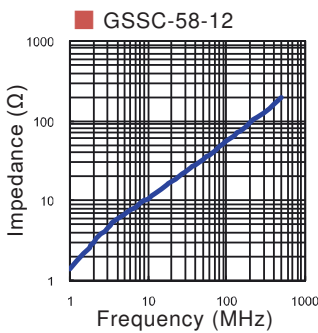
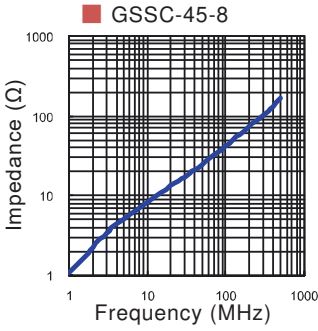
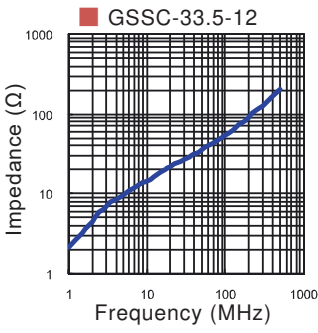
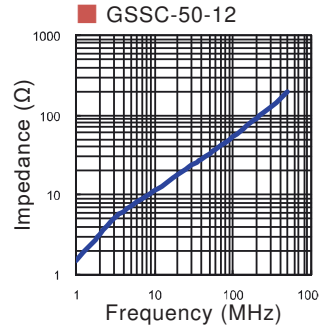
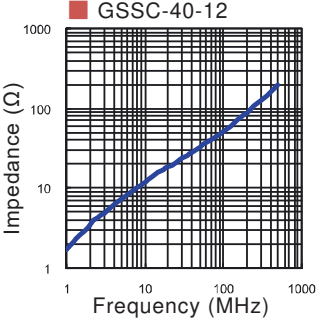
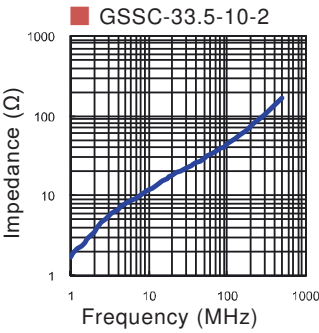
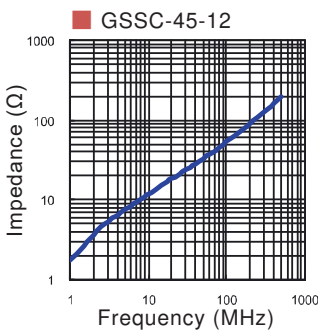
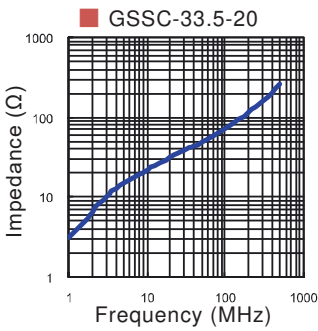
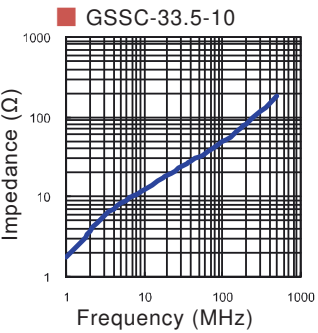
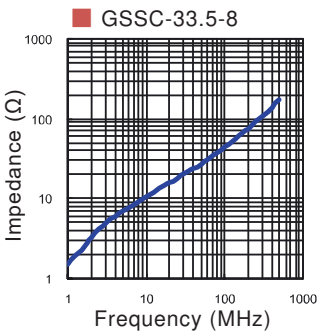


Unit:mm

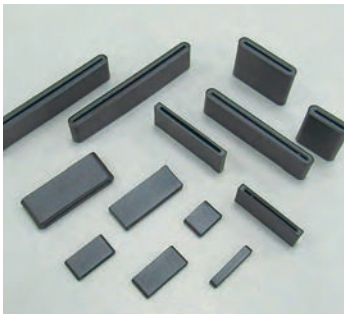
Part No.	A	B	C	D	E	Impedance*Ω/100MHz (1turn)
GSSC-33.5-8	33.5	1.4	6.5	8.0	28.4	≧ 30
GSSC-33.5-10	33.5	1.4		10.0	28.4	≧ 30
GSSC-33.5-10-2	33.5	2.2	7.4	10.0	27.0	≧ 30
GSSC-33.5-12	33.5	1.4	6.5	12.0	28.4	≧ 35
GSSC-33.5-20	33.5	1.3		20.0	27.8	≧ 50
GSSC-40-12	40.0	1.3		12.0	35.0	≧ 35
GSSC-45-8	45.2	1.3		8.0	40.0	≧ 30
GSSC-45-12	45.2	1.3		12.0	40.0	≧ 35
GSSC-50-12	50.0	1.4		12.0	44.9	≧ 35
GSSC-58-12	57.6	1.3		12.0	52.0	≧ 35

※Contact us for the measurement conditions.

Impedance vs frequency



*The values are measured data for reference, not guaranteed.



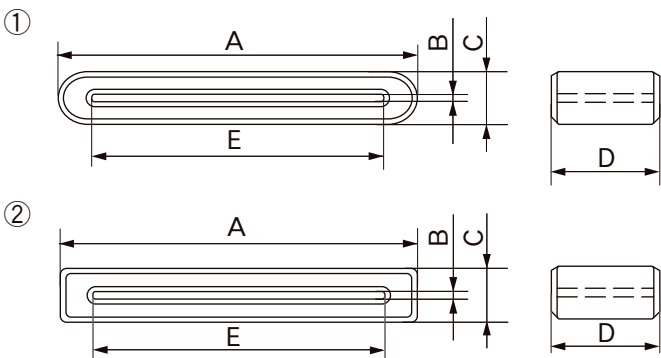
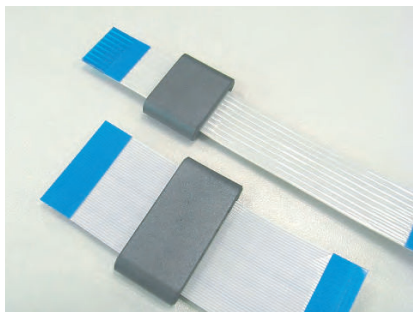
Suitable solutions for FPC noise problems

Feature

- Provided with 3mm and 5mm and 2.3mm thickness types.
- Effective filtering performance for emission noise from FPC.

Material

- Soft ferrite



Unit:mm

Part No.	Profile	A	B	C	D	E	Impedance*Ω/100MHz (1turn)
GFPC-11-8-2	①	11.0	0.7	2.3	8.0	9.0	≥ 25
GFPC-16-8-2	①	15.5	0.7		8.0	12.0	≥ 25
GFPC-18-3-2	①	18.0	0.7		3.0	14.5	≥ 20
GFPC-18-8-2	①	18.0	0.7		8.0	14.5	≥ 25
GFPC-22-8-2	①	21.5	0.7		8.0	18.0	≥ 25
GFPC-16-5-3	①	16.0	0.5	3.0	5.0	11.5	≥ 20
GFPC-16-8-3	①	16.0	0.5		8.0	11.5	≥ 25
GFPC-24-12-3	②	23.3	0.9		12.0	20.0	≥ 30
GFPC-25-10-3	②	25.5	0.8		10.0	21.5	≥ 25
GFPC-25-15-3	②	25.5	0.8		15.0	21.5	≥ 35
GFPC-31-12-3	②	31.0	1.0		12.0	27.0	≥ 30
GFPC-16-12	①	16.0	0.5	5.0	12.0	11.5	≥ 45
GFPC-16-20	①	16.0	0.8		20.0	11.5	≥ 60
GFPC-25-12	①	24.5	0.5		12.0	20.0	≥ 35
GFPC-25-20	①	24.5	0.5		20.0	20.0	≥ 50
GFPC-31-12	①	31.0	0.5		12.0	27.0	≥ 40
GFPC-46-12	①	46.0	0.5		12.0	41.5	≥ 40
GFPC-56-12	①	56.2	0.5		12.0	52.4	≥ 35

*The values are measured data for reference, not guaranteed.

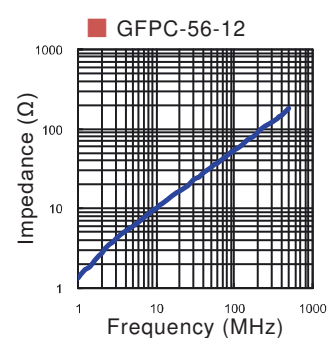
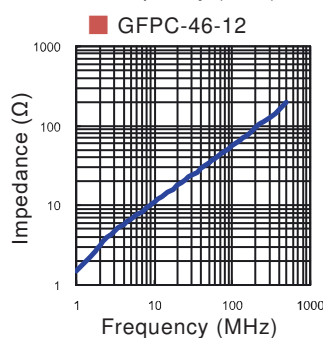
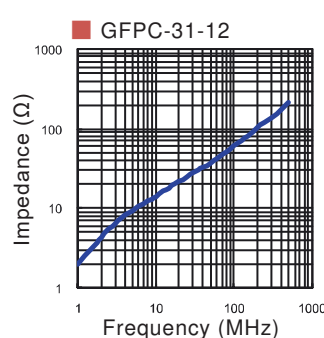
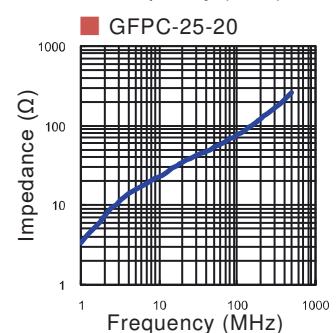
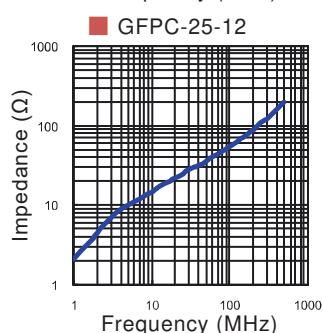
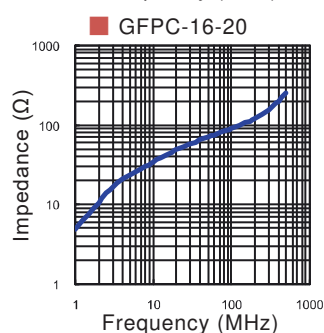
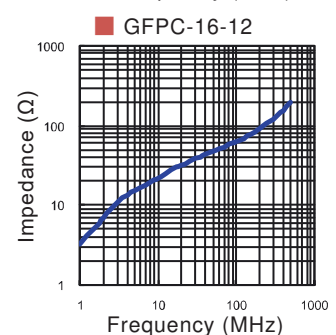
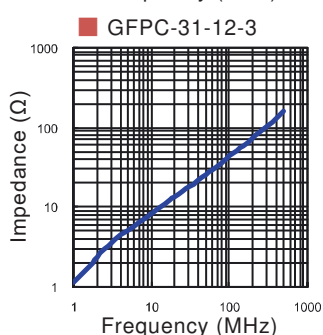
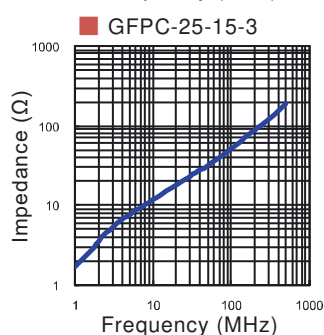
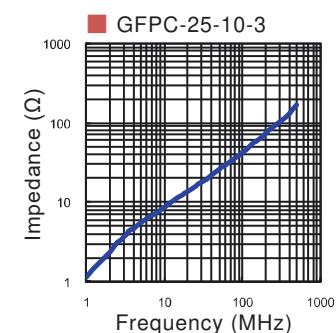
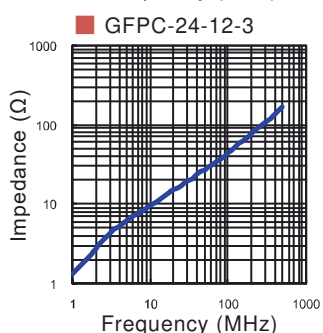
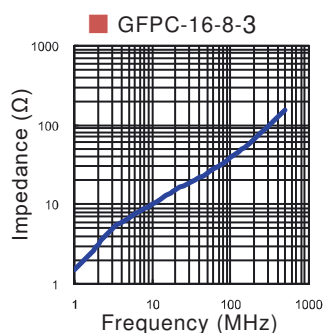
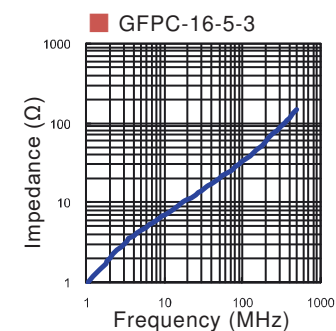
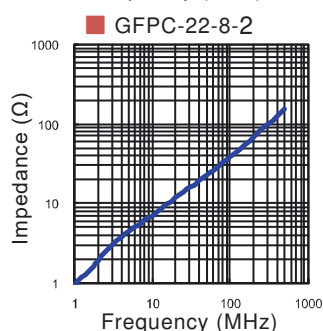
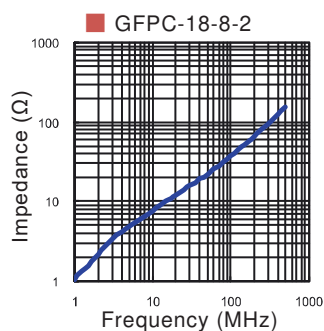
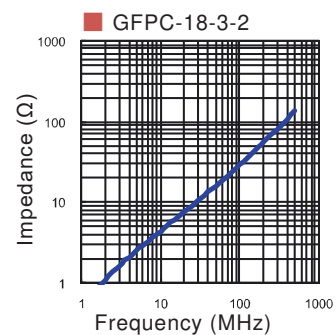
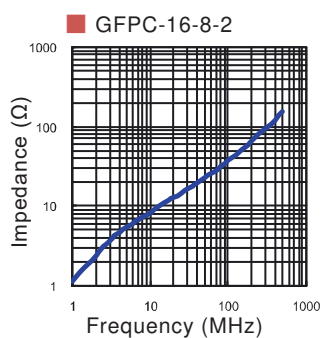
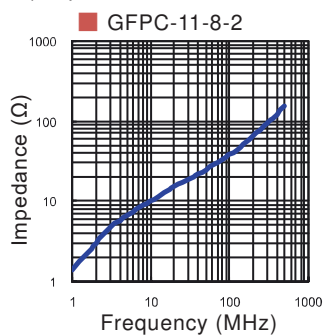
*Contact us for the measurement conditions.

High-frequency cores

Split ferrite clamp

Non split type

Impedance vs frequency



*The values are measured data for reference, not guaranteed.

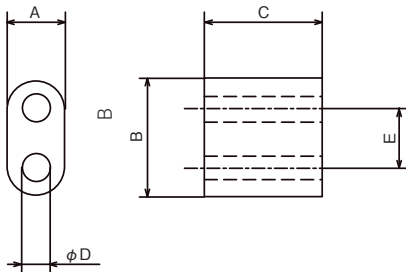
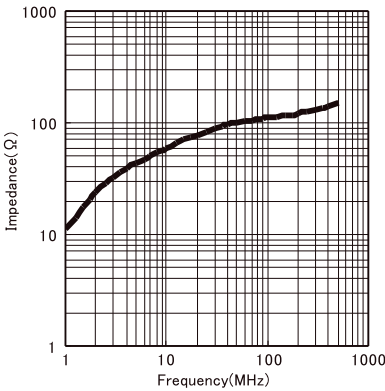


2 hole type small core

Material

- Soft ferrite

Impedance vs frequency
GRIB-3.5-7-7



Unit:mm

Part No.	A	B	C	φD	E	Impedance* Ω/100MHz (1 turn)
GRIB-3.5-7-7	3.4	6.9	7.0	1.5	3.5	≥ 75

※Contact us for the measurement conditions.

TOROIDAL CORE / GTRCA

High-frequency cores

Split ferrite clamp

Non split type



TOROIDAL CORE with housing which is suitable solution for suppressing noise in high-frequency range.

Feature

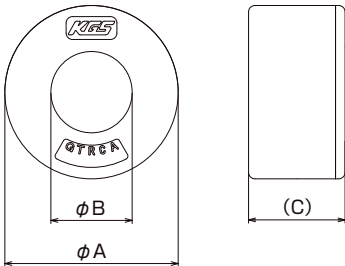
- With plastic housing preventing from cracking and chipping of the ferrite core.

Material

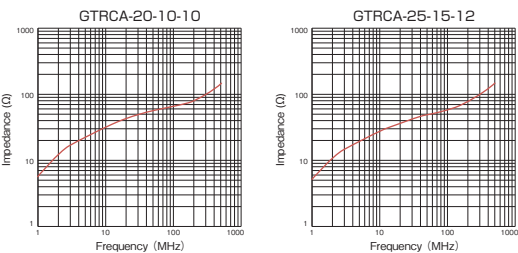
- Ferrite Core:Soft ferrite
- Housing: PA66 (Color: Light gray / Flammability:UL94V-0)

Unit:mm

Part No.	A	B	(C)	Impedance* Ω/100MHz (1 turn)
GTRCA-20-10-10	22.6	8.2	13.3	≥ 45
GTRCA-25-15-12	27.3	12.8	15.2	≥ 40



Impedance vs frequency



※The values are measured data for reference, not guaranteed.

GRIP CORE / GRIP-3.5-1.8-2

Ferrite core applicable to discrete device without adhesive

Feature

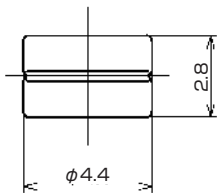
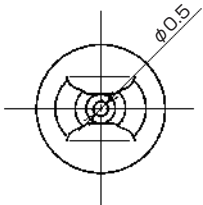
- Because temporary fasten is available, it is much easy installation of discrete device with the product onto PC board.
- Fastening with no adhesive can be reduced conventional adhesive dispensing process.
- Ringing suppression is available from FET or diode.

Material

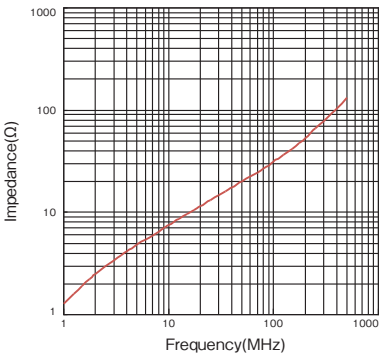
- Soft ferrite
- Silicone rubber

Unit:mm

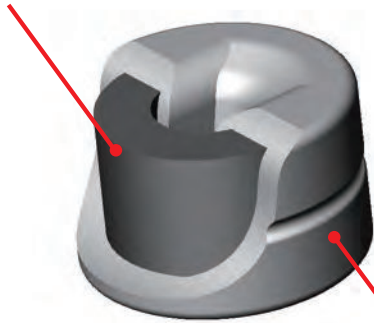
Part No.	Profile	Height	Cylindrical Lead Outer Diameter	Rectangular Lead cross-sectional dimension
GRIP-3.5-1.8-2	φ 4.4	2.8	φ 0.6~1.6	0.8~1.5(Width)/0.3~0.7(Thickness)



Impedance vs frequency

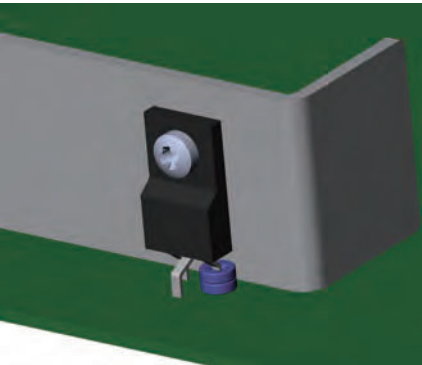


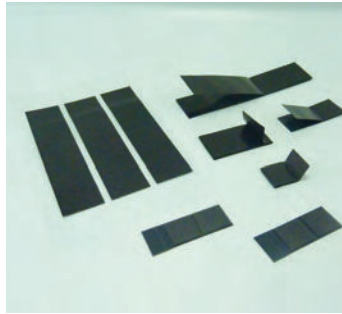
Ferrite core



Silicone rubber

Application





Thin Ferrite Sheet provides optimal EMC solution for FPC and FFC.

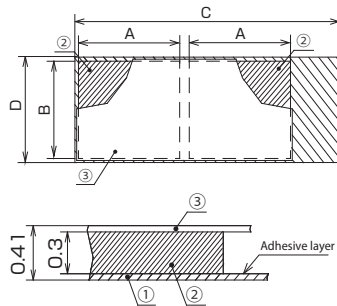
Feature

- Product design enables the sandwiching of FPC or FFC from top and bottom to suppress EMC.
- Suitable for mobile devices with its thin and light properties.
- Its flexible property does not impair FPC's flexibility.
- Prevent cracking and scattering of ferrite with PET and adhesives.

Material

- PET with adhesive layer
- Ferrite sheet
- Double-sided adhesive tape

Dimensions



A,B: Soft ferrite
C,D: Profile(PET with adhesive layer)

① PET with an adhesive layer
② Ferrite sheet
③ Double-sided adhesive tape

Unit : mm

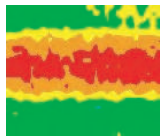
Part No.	A	B	C	D	Applicable cable width	Part No.	A	B	C	D	Applicable cable width
FFPC-0.3-10-5	10	5	32.5	6.5	10	FFPC-0.3-22-8	22	8	60.5	9.5	22
FFPC-0.3-10-10		10	30	11		FFPC-0.3-22-14			54	15	
FFPC-0.3-12-8	12	8	38.5	9.5	12	FFPC-0.3-27-14	27	14	70.5	15.5	27
FFPC-0.3-14-14	14	14	38	15	14	FFPC-0.3-44-14	44		98	15	44

※ Custom profiles design is also available. Please contact our sales representative for further information.

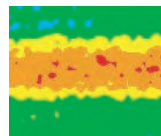
Properties

Higher insertion loss and excellent EMC suppression in low frequency range (30MHz~300MHz) compared to metal filler electromagnetic noise suppression sheet.

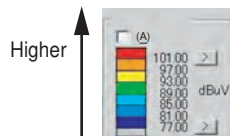
Radiated emission level from differential signal cable with component.



Metal filler EMC noise suppression sheet



SMARTPLY

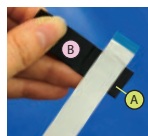


Emission level

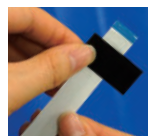
Mounting FFPC onto flexible cable



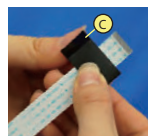
1. Gently bend the liner while take the ferrite sheet off.



2. Attach SMARTPLY to the cable on part A.



3. Attach on part B and wrap with SMARTPLY around the cable.

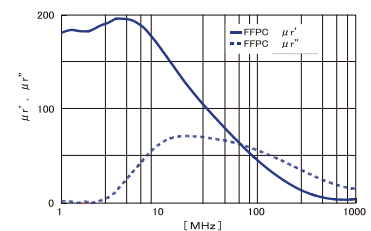


4. Fold part C so as to attach part C on the back side of part B. It's ready by simple procedure.

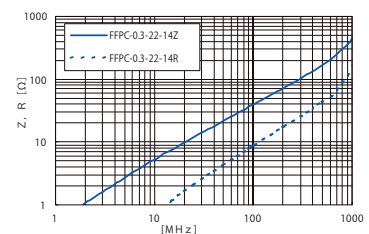


※ It is not advisable to reuse the product once it is removed.

Permeability



Impedance vs frequency



※ The values are measured data for reference, not guaranteed.

SMARTPLY ENGINEERING SAMPLE KIT / ESF-18



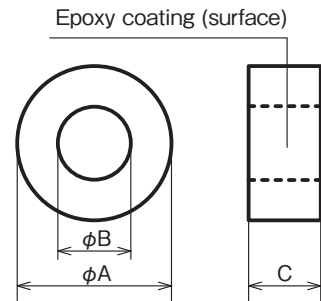
Various Smartplys in one booklet



Normal-mode noise suppressing core with excellent DC superposition property

Feature

- Impedance is not lowered by current superposition (Current at 20A or less) because of higher saturation magnetic flux density compare to ferrite. Possible to suppress normal-mode noise.
- Due to higher Curie temperature material, it enables stable temperature characteristics under condition of -40 °C to +85 °C, which does not allow impedance to be lowered.
- Resin-coated surface of the core, preventing its edge from damaging cables.

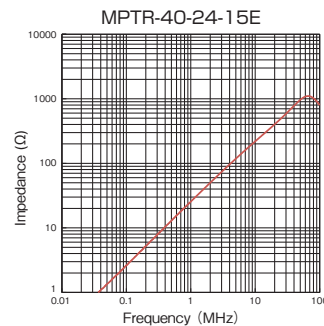
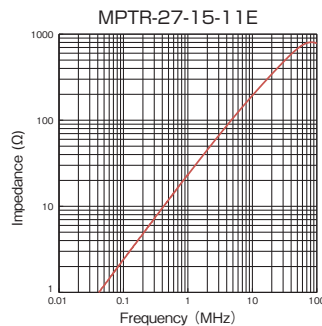
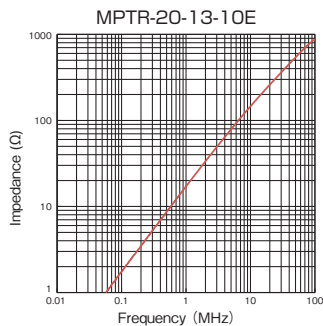


Dimensions

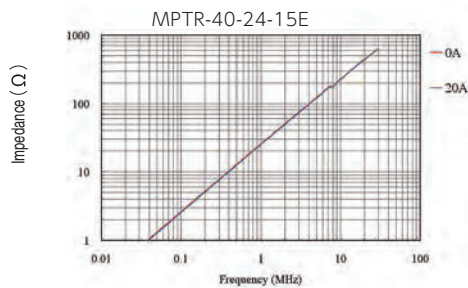
Unit:mm

Part No.	Outer Diameter max.	Internal Diameter min.	Length max.	Impedance* Ω/1MHz (5turn)
MPTR-20-13-10E	21.2	11.8	10.9	≒ 7
MPTR-27-15-11E	27.8	13.8	12.1	≒ 12
MPTR-40-24-15E	40.9	23.1	15.48	≒ 12

Impedance vs frequency



● Impedance with DC superposition (20A)



※Measurement conditions: Impedance measurement: 5 turns / DC superposition: 1 turn

※The values are measured data for reference, not guaranteed.



Design Kit with various of Ferrite Series for automotive applications.

Ferrite Core for Automotive Application

© Solutions for High frequency (HF Band) / Low frequency (LF Band) noise.

Ferrite Core Series for Automotive Application

KITAGAWA GmbH

Ferrite Core for Automotive Application

© Solutions for High frequency (HF Band) / Low frequency (LF Band) noise.

Ferrite Core Series for Automotive Application

KITAGAWA GmbH

FERRITE DESIGN KIT ESF-41



Design Kit with various of Ferrite Series for high frequency, low frequency and intermediate frequency suppression.

Ferrite sample kit / High frequency noise suppression cores (30MHz ~ 1GHz)

KITAGAWA GmbH

Ferrite sample kit / High frequency noise suppression cores (30MHz ~ 1GHz)

KITAGAWA GmbH

Ferrite sample kit / Low frequency noise suppression cores (10MHz ~ 30MHz)

KITAGAWA GmbH

Ferrite sample kit / Low frequency noise suppression cores (10MHz ~ 30MHz)

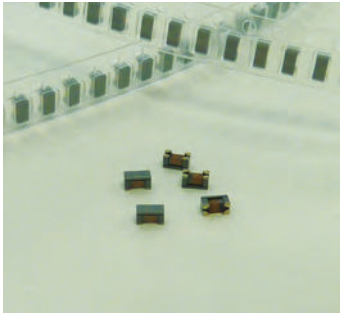
KITAGAWA GmbH

FERRITE DESIGN KIT ESF-42



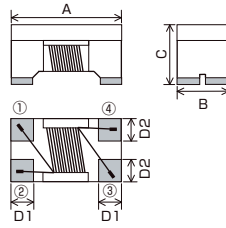
Design Kit with various of Ferrite Series for high frequency, low frequency and intermediate frequency suppression.

SMD COMMON MODE FILTER / KWCM

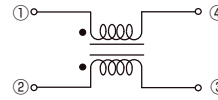


Wire-wound Common Mode Filter applicable to automated mounting on PC board.

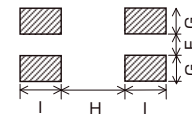
■ Outside dimensions



■ Equivalent circuit



■ Recommended pad dimensions



KWCM Series

- Wire-wound Common Mode Filter optimal for the High-speed differential signal(Applicable reflow soldering.)
- 2012 (2.0x1.2mm),3216 (3.2x1.6mm):2 size variation.

Unit:mm

Part Number / Size	A	B	C	D1 TYP	D2 TYP	F TYP	G TYP	H TYP	I TYP
KWCM-2012	2.0±0.2	1.2±0.2	1.2±0.2	0.45	0.4	0.4	0.4	0.8	0.9
KWCM-3216	3.2±0.2	1.6±0.2	2.0±0.2	0.6	0.6	0.4	0.6	1.6	1.05

Part Number Guide

KWCM - 2012 - 900 T

(1) (2) (3) (4)

- (1) Product classification
(2) Size
(3) Impedance
(4) Packing specification

Electrical characteristics

Part No.	Common Mode Impedance (Ω) at 100MHz	DC Resistance (Ω) max.	Rated Current (mA.) max.	Rated Voltage (V) max.
KWCM-2012-120T	≥ 12±25%	0.20	450	50 (DC)
KWCM-2012-240T	≥ 24±25%	0.25	420	50 (DC)
KWCM-2012-320T	≥ 32±25%	0.25	400	50 (DC)
KWCM-2012-500T	≥ 50±25%	0.25	400	50 (DC)
KWCM-2012-670T	≥ 67±25%	0.25	400	50 (DC)
KWCM-2012-900T	≥ 90±25%	0.30	400	50 (DC)
KWCM-2012-121T	≥ 120±25%	0.30	370	50 (DC)

Part No.	Common Mode Impedance (Ω) at 100MHz	DC Resistance (Ω) max.	Rated Current (mA.) max.	Rated Voltage (V) max.
KWCM-2012-141T	≥ 140±25%	0.32	360	50 (DC)
KWCM-2012-161T	≥ 160±25%	0.35	350	50 (DC)
KWCM-2012-181T	≥ 180±25%	0.35	330	50 (DC)
KWCM-2012-201T	≥ 200±25%	0.40	300	50 (DC)
KWCM-2012-221T	≥ 220±25%	0.40	300	50 (DC)
KWCM-2012-261T	≥ 260±25%	0.40	300	50 (DC)
KWCM-2012-371T	≥ 370±25%	0.45	280	50 (DC)

Part No.	Common Mode Impedance (Ω) at 100MHz	DC Resistance (Ω) max.	Rated Current (mA.) max.	Rated Voltage (V) max.
KWCM-3216-330T	≥ 33±25%	0.20	400	50 (DC)
KWCM-3216-500T	≥ 50±25%	0.25	400	50 (DC)
KWCM-3216-900T	≥ 90±25%	0.35	400	50 (DC)
KWCM-3216-121T	≥ 120±25%	0.30	400	50 (DC)
KWCM-3216-161T	≥ 160±25%	0.40	350	50 (DC)
KWCM-3216-221T	≥ 220±25%	0.45	300	50 (DC)
KWCM-3216-261T	≥ 260±25%	0.50	310	50 (DC)

Part No.	Common Mode Impedance (Ω) at 100MHz	DC Resistance (Ω) max.	Rated Current (mA.) max.	Rated Voltage (V) max.
KWCM-3216-501T	≥ 500±25%	0.80	260	50 (DC)
KWCM-3216-601T	≥ 600±25%	0.80	260	50 (DC)
KWCM-3216-102T	≥ 1000±25%	1.20	250	50 (DC)
KWCM-3216-222T	≥ 2200±25%	1.20	200	50 (DC)

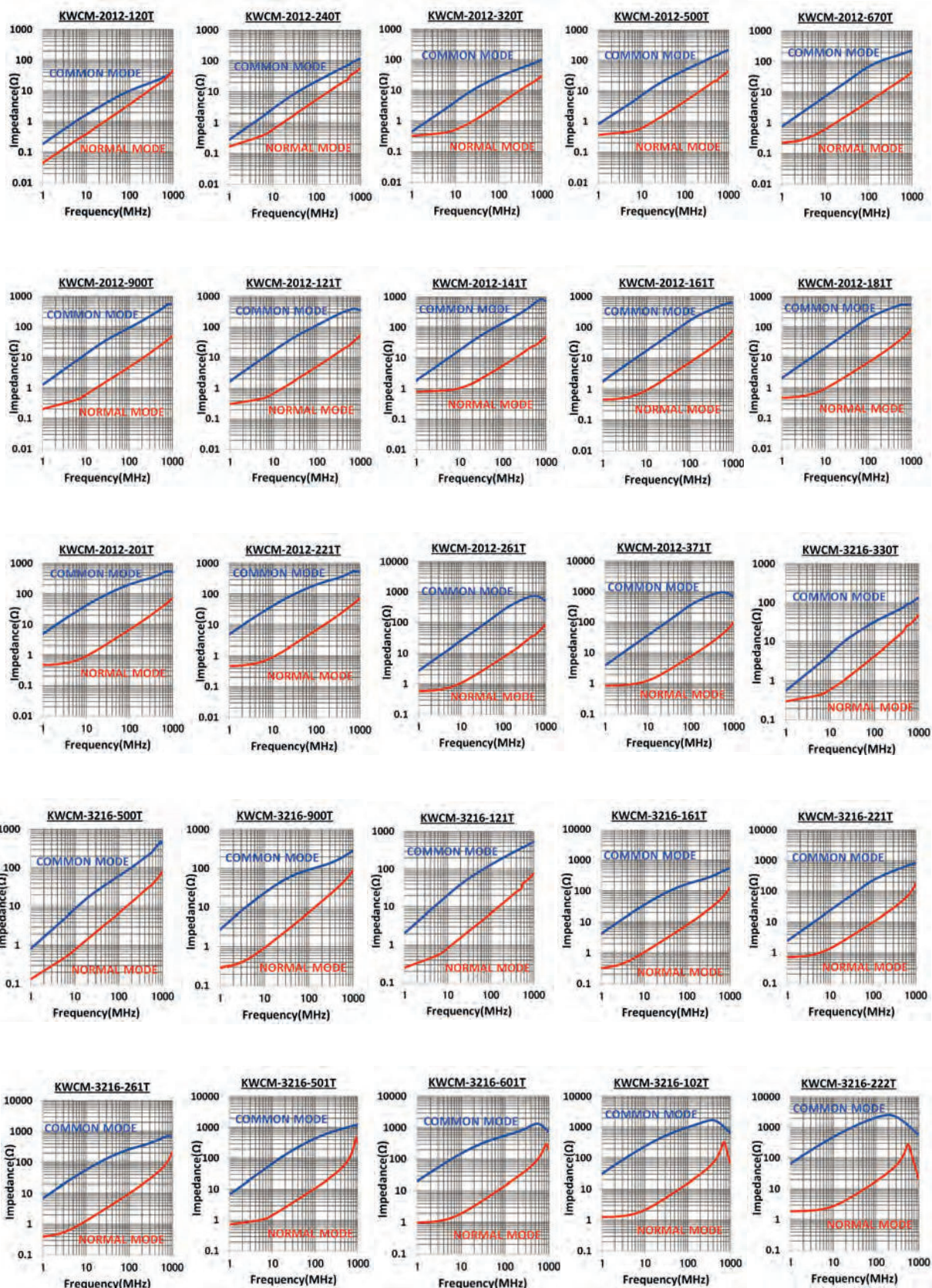
Impedance vs Frequency characteristics

EMC FILTER PRODUCTS

Others

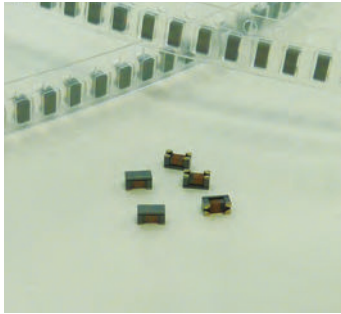
Split PET films

Non split type



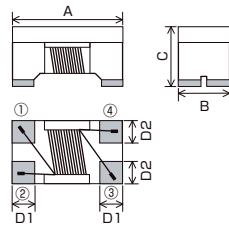
※ The values are measured data for reference, not guaranteed.

SMD COMMON MODE FILTER / KWCM-HS

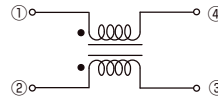


Wire-wound Common Mode Filter applicable to automated mounting on PC board.

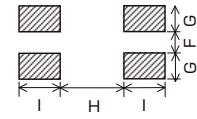
Outside dimensions



Equivalent circuit



Recommended pad dimensions



KWCM-HS Series

- Wire-wound Common Mode Filter optimal for the ultra-high-speed differential signal. (reflow applicable)
- 1210 (1.2x1.0mm), 1212 (2.0x1.2mm): 2 size variation.
- Smaller negative effect to high speed differential signal due to the lower insertion-loss.

Part Number Guide

KWCM - 2012 - HS - 900 T

- (1) Product classification
(2) Size
(3) Type
(4) Impedance
(5) Packing specification

Unit: mm

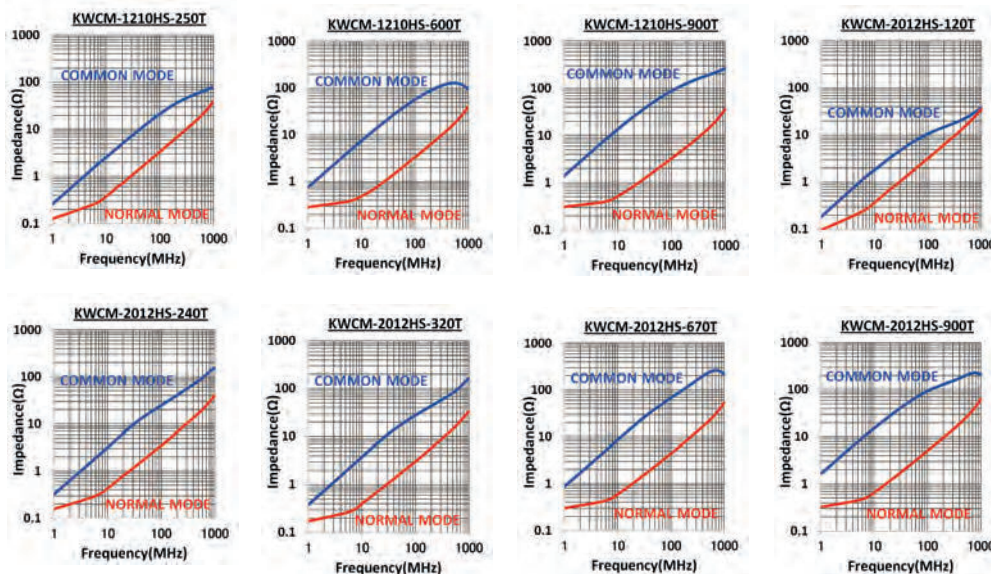
Part Number / Size	A	B	C	D1 TYP	D2 TYP	F TYP	G TYP	H TYP	I TYP
KWCM-1210HS	1.2±0.2	1.0±0.2	0.9±0.2	0.36	0.38	0.3	0.45	0.6	0.45
KWCM-2012HS	2.0±0.2	1.2±0.2	1.2±0.2	0.45	0.4	0.4	0.4	0.8	0.9

Electrical characteristics

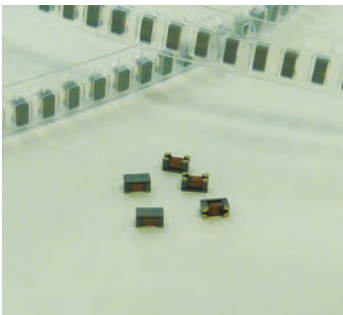
Part No.	Common Mode Impedance (Ω) at 100MHz	DC Resistance (Ω) max.	Rated Current (mA.) max.	Rated Voltage (V) max.
KWCM-1210HS-250T	≥ 25±25%	0.25	420	50 (DC)
KWCM-1210HS-600T	≥ 60±25%	0.25	400	50 (DC)
KWCM-1210HS-900T	≥ 90±25%	0.30	400	50 (DC)
KWCM-2012HS-120T	≥ 12±25%	0.20	450	50 (DC)

Part No.	Common Mode Impedance (Ω) at 100MHz	DC Resistance (Ω) max.	Rated Current (mA.) max.	Rated Voltage (V) max.
KWCM-2012HS-240T	≥ 24±25%	0.25	420	50 (DC)
KWCM-2012HS-320T	≥ 32±25%	0.25	400	50 (DC)
KWCM-2012HS-670T	≥ 67±25%	0.25	400	50 (DC)
KWCM-2012HS-900T	≥ 90±25%	0.30	400	50 (DC)

Impedance vs Frequency characteristics

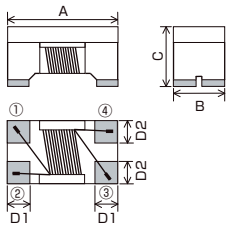


※The values are measured data for reference, not guaranteed.

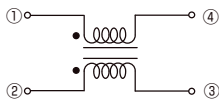


Wire-wound Common Mode Filter applicable to automated mounting on PC board.

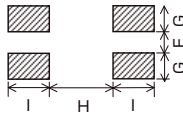
Outside dimensions



Equivalent circuit



Recommended pad dimensions



KWCM-HDMI Series

- Wire-wound Common Mode Filter optimal for the signal HDMI. (reflow applicable)
- Matching the characteristic impedance of 100Ω.
- Smaller negative effect to high speed differential signal due to the lower insertion-loss.

Unit:mm

Part Number / Size	A	B	C	D1 TYP	D2 TYP	F TYP	G TYP	H TYP	I TYP
KWCM-2012HDMI	2.0±0.2	1.2±0.2	1.2±0.2	0.45	0.4	0.4	0.4	0.8	0.9

Part Number Guide

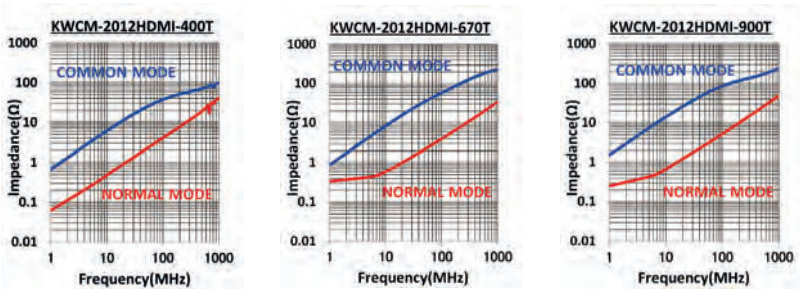
KWCM - 2012 - HDMI - 900 T
(1) (2) (3) (4) (5)

- (1) Product classification
- (2) Size
- (3) Type
- (4) Impedance
- (5) Packing specification

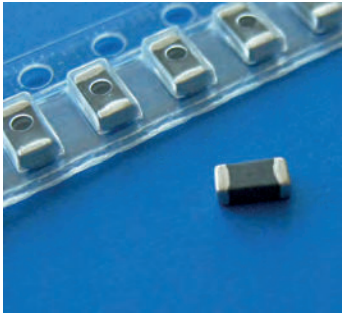
Electrical characteristics

Part No.	Common Mode Impedance (Ω) at 100MHz	DC Resistance (Ω) max.	Rated Current (mA.) max.	Rated Voltage (V) max.
KWCM-2012HDMI-400T	≥ 40±25%	0.25	400	50 (DC)
KWCM-2012HDMI-670T	≥ 67±25%	0.25	400	50 (DC)
KWCM-2012HDMI-900T	≥ 90±25%	0.30	400	50 (DC)

Impedance vs Frequency characteristics



※The values are measured data for reference, not guaranteed.



Ferrite Chip Bead, normal type

Feature

- MLB (Normal type) generates an impedance from the relatively lower to high frequency.
- Effective in noise suppression in the wide frequency range
- Impedance Range : 28 to 2000 ohm
- Rated Current Range : 100 mA to 500 mA
- Operating temperature Range : -40°C to +125°C
- Soldering Method : Reflow of Wave soldering, suitable for lead free soldering
- Packaging Method : Tape & Reel (per EIA Specifications)
- Storage Temperature : max.40°C, RH 70%

Application

- General I/O wide band EMI suppression
- It is particular effective with unstable grounding.
- High frequency EMI prevention of computers, printers, VCRs, TVs, and portable telephone.

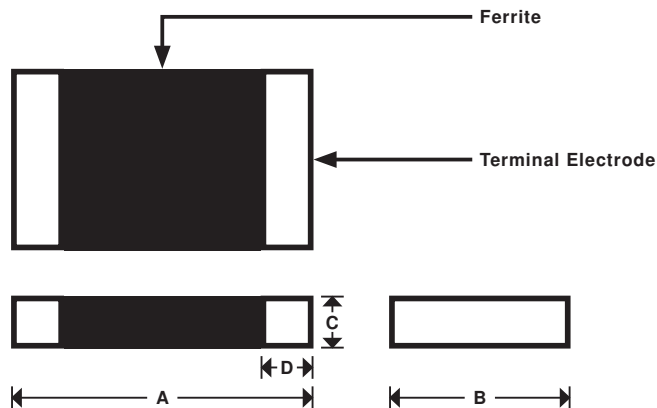
Part Number Code

MLB	-	160808	-	0010	N	01
Series Name		Size Code		Impedance (ex.0010=10 Ω ± 25%)	Classification N=Normal	Rated Current 01=100 mA

Notes for MLB Series

Please contact our sales department for the application other than above mentioned indication.
Please ask individual data sheet to verify detailed specification and performance.

Shape and Dimensions



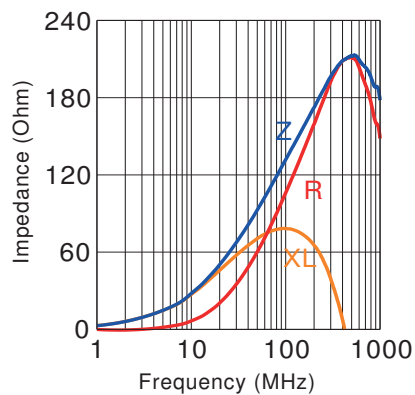
Unit: mm

SIZE CODE	A	B	C	D	Chips/reel
100505(0402)	1.00+/-0.1	0.50+/-0.1	0.50+/-0.1	0.25+/-0.1	10000
160808(0603)	1.60+/-0.2	0.80+/-0.2	0.80+/-0.2	0.3+/-0.2	4000
201209(0805)	2.00+/-0.2	1.20+/-0.2	0.90+/-0.2	0.5+/-0.3	4000
321611(1206)	3.20+/-0.2	1.60+/-0.2	1.10+/-0.2	0.5+/-0.3	3000

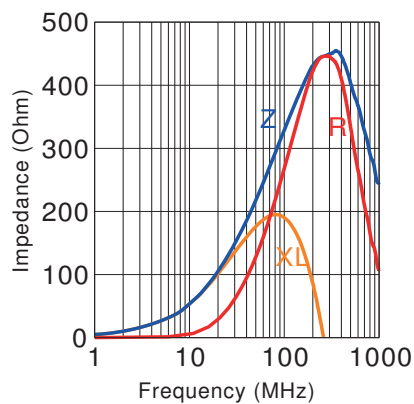
Part No.	Impedance (Ω)@100MHz $\pm$ 25%	DCR (Ω)max	Rated Current (mA) max
MLB-100505-0120N015	120	0,500	150
MLB-100505-0300N01	300	0,800	100
MLB-100505-0600N01	600	1,000	100
MLB-160808-0028N03	28	0,300	300
MLB-160808-0060N03	60	0,200	300
MLB-160808-0080N03	80	0,300	300
MLB-160808-0090N03	90	0,300	300
MLB-160808-0120N02	120	0,300	200
MLB-160808-0150N02	150	0,400	200
MLB-160808-0220N02	220	0,400	200
MLB-160808-0300N02	300	0,500	200
MLB-160808-0600N02	600	0,600	200
MLB-160808-1000N01	1000	1,000	100
MLB-201209-0030N05	30	0,150	500
MLB-201209-0060N04	60	0,300	400
MLB-201209-0080N04	80	0,300	400
MLB-201209-0090N03	90	0,300	300
MLB-201209-0120N03	120	0,300	300
MLB-201209-0300N02	300	0,400	200
MLB-201209-0600N02	600	0,600	200
MLB-201209-1000N02	1000	0,800	200
MLB-321611-0032N05	32	0,150	500
MLB-321611-0090N04	90	0,300	400
MLB-321611-0120N04	120	0,300	400
MLB-321611-0300N03	300	0,500	300
MLB-321611-0600N02	600	0,600	200
MLB-321611-1000N02	1000	0,800	200
MLB-321611-1500N01	1500 (50MHz)	0,900	100
MLB-321611-2000N01	2000 (50MHz)	1,200	100

Please contact us if other specification
(Size, Impedance, Rated Current etc.) is needed.

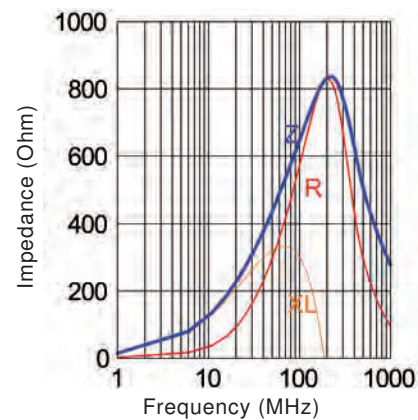
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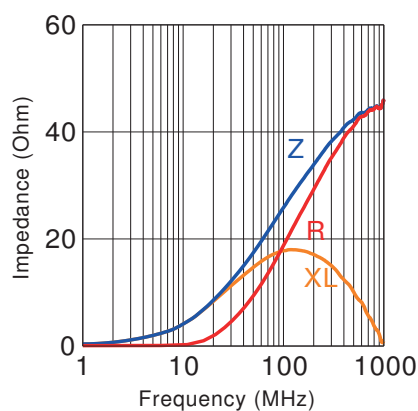
MLB-100505-0300N01



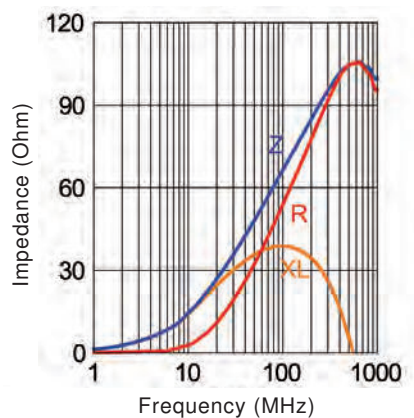
MLB-100505-0600N01



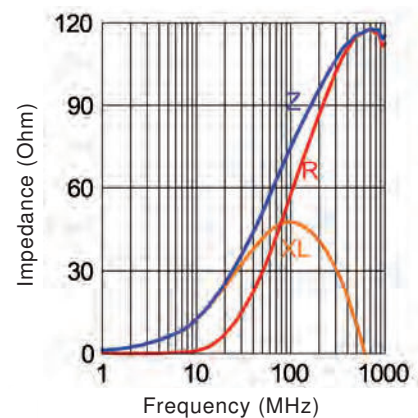
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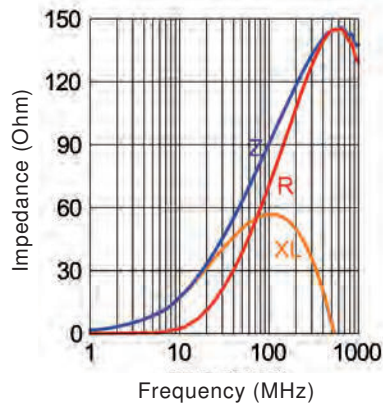
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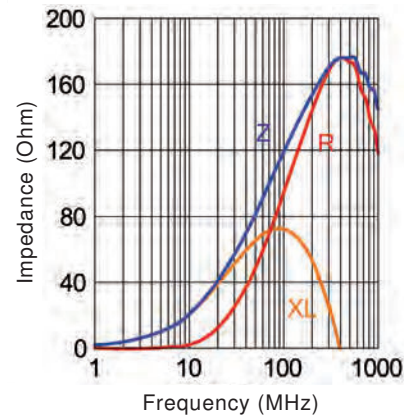
MLB-160808-0080N03



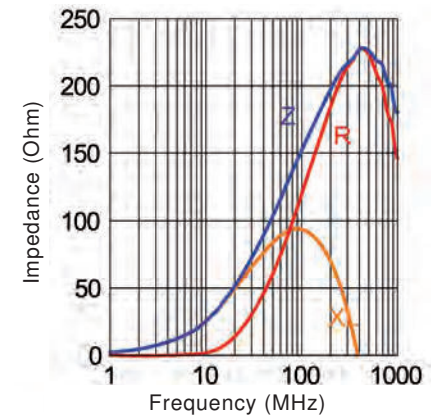
MLB-160808-0090N03



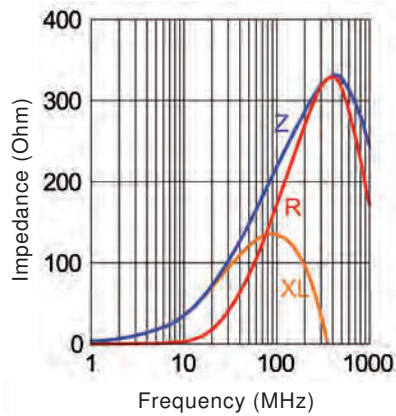
MLB-160808-0120N02



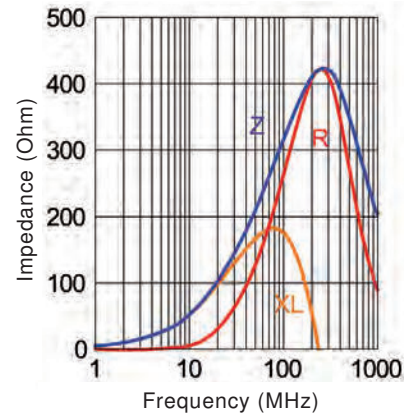
MLB-160808-0150N02



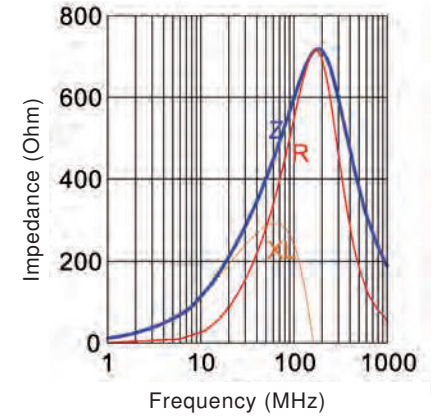
MLB-160808-0220N02



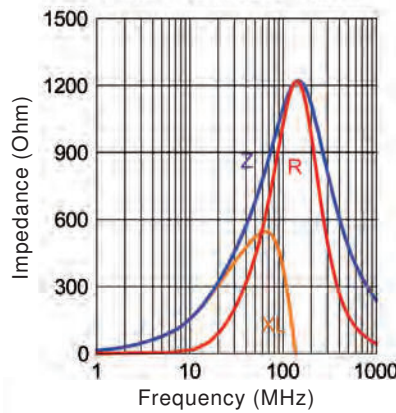
MLB-160808-0300N02



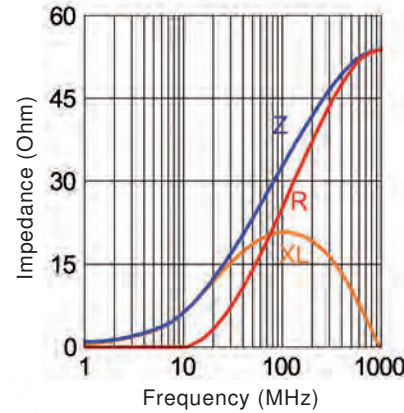
MLB-160808-0600N02



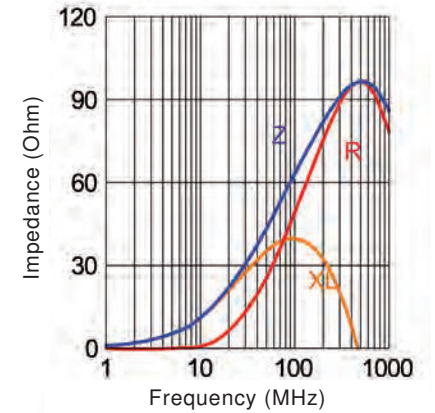
MLB-160808-1000N01



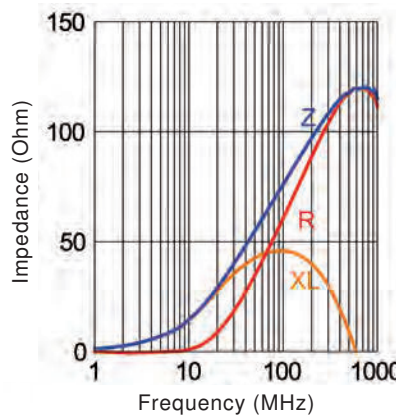
MLB-201209-0030N05



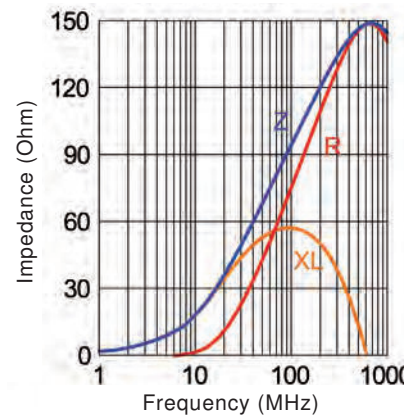
MLB-201209-0060N04



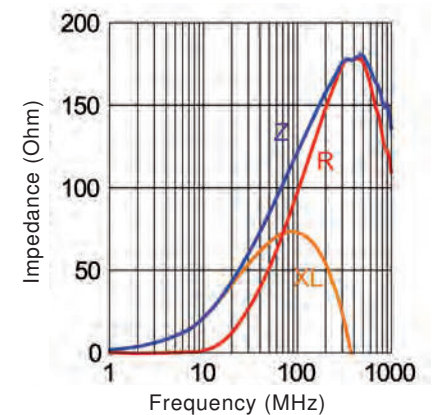
MLB-201209-0080N04



MLB-201209-0090N03



MLB-201209-0120N03

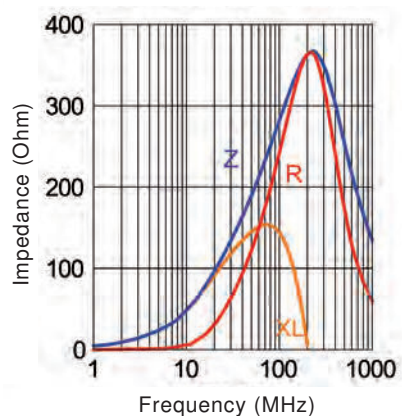


Others

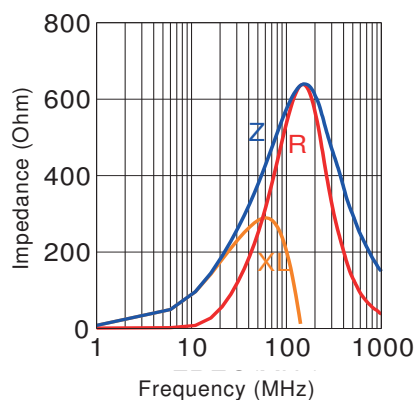
Split PET films

Non split type

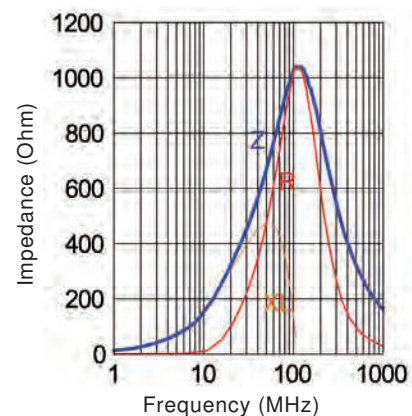
■ MLB-201209-0300N02



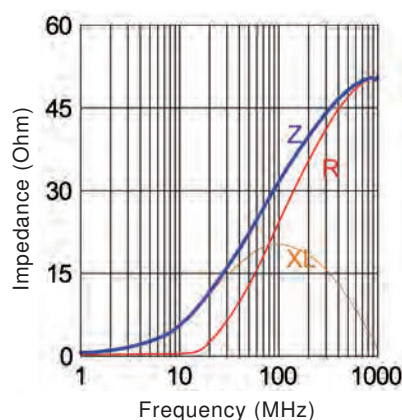
■ MLB-201209-0600N02



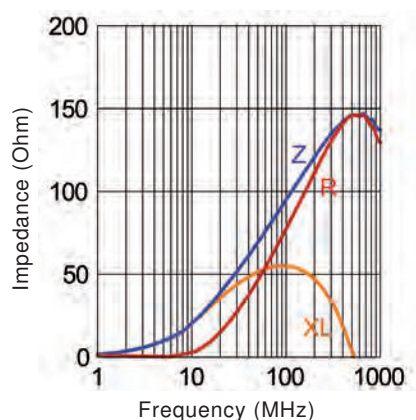
■ MLB-201209-1000N02



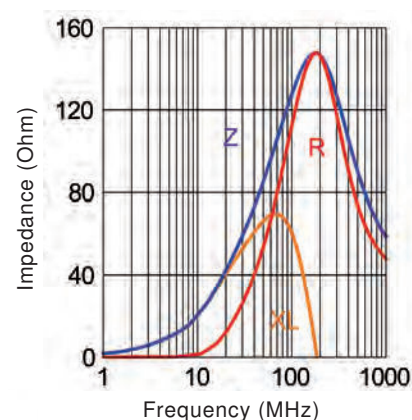
■ MLB-321611-0032N05



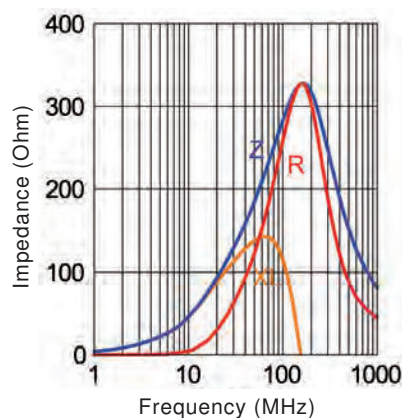
■ MLB-321611-0090N04



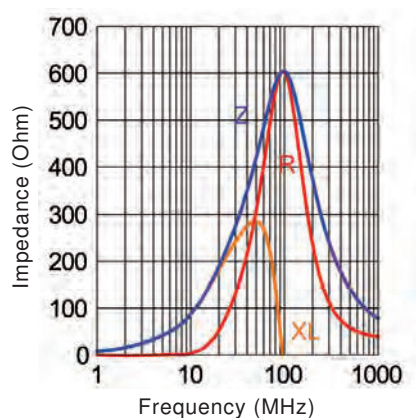
■ MLB-321611-0120N04



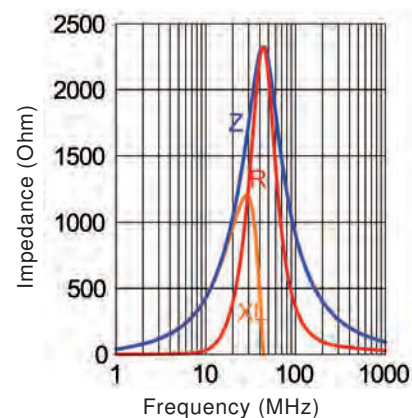
■ MLB-321611-0300N03



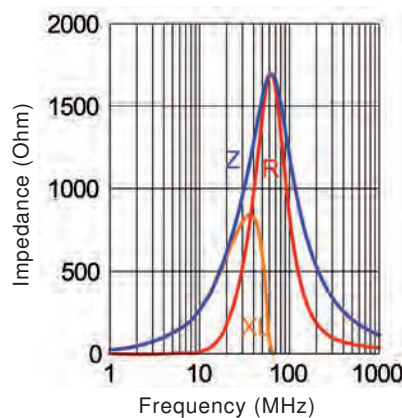
■ MLB-321611-0600N02



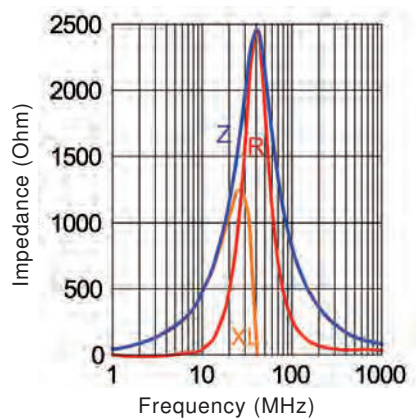
■ MLB-321611-1000N02

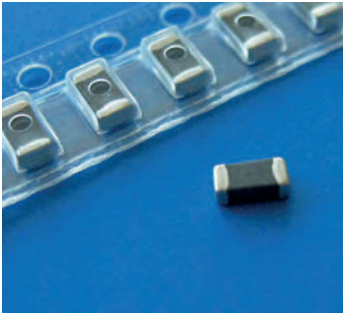


■ MLB-321611-1500N01



■ MLB-321611-2000N01





Ferrite Chip Bead, high current type

Feature

- MLB (high current type) can be used in high current circuit due to its low DC resistance.
- It can match power line to a maximum of 6A DC.
- Impedance Range : 30 to 1000 ohm
- Rated Current Range : 1000 mA to 6000 mA
- Operating temperature Range : -40°C to +125°C
- Soldering Method : Reflow of Wave soldering, suitable for lead free soldering
- Packaging Method : Tape & Reel (per EIA Specifications)
- Storage Temperature : max.40°C, RH 70%

Application

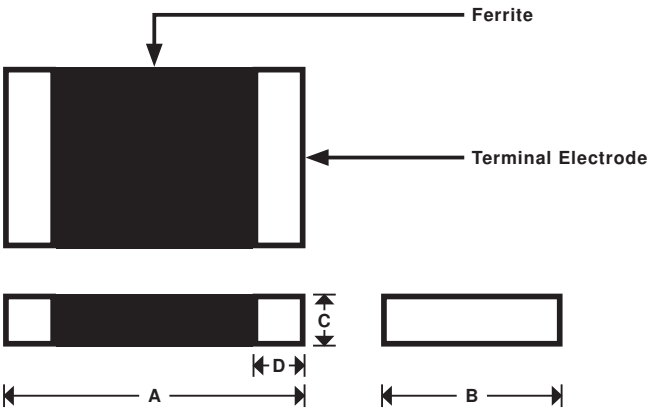
- EMI prevention for power line to a maximum of 6A DC.
- It is particularly effective with unstable grounding.
- High frequency EMI prevention of computers, printers, VCRs, TVs, and portable telephone.

Part Number Code

MLB	-	160808	-	0010	C	25
Series Name		Size Code		Impedance (ex. 0030=30 Ω ± 25%)	Classification	Rated Current
					C=High Current application	25=2500 mA

Notes for MLB Series
Please contact our sales department for the application other than above mentioned indication.
Please ask individual data sheet to verify detailed specification and performance.

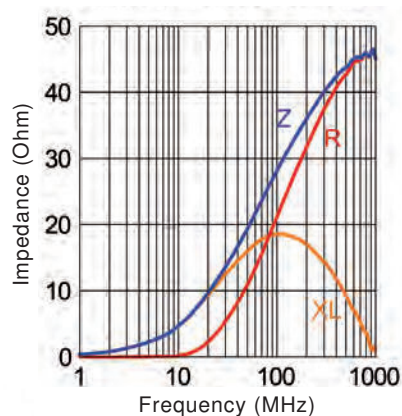
Shape and Dimensions



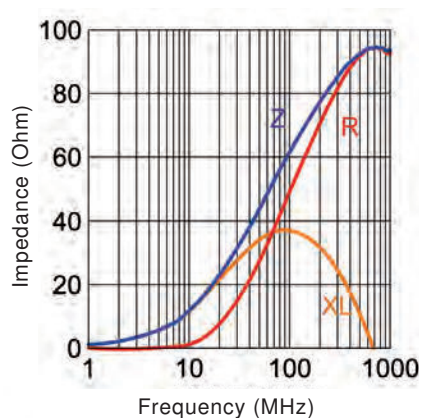
Unit: mm

SIZE CODE	A	B	C	D	Chips/reel
160808(0603)	1.60+/-0.2	0.80+/-0.2	0.80+/-0.2	0.3+/-0.2	4000
201209(0805)	2.00+/-0.2	1.20+/-0.2	0.90+/-0.2	0.5+/-0.3	4000
321611(1206)	3.20+/-0.2	1.60+/-0.2	1.10+/-0.2	0.5+/-0.3	3000

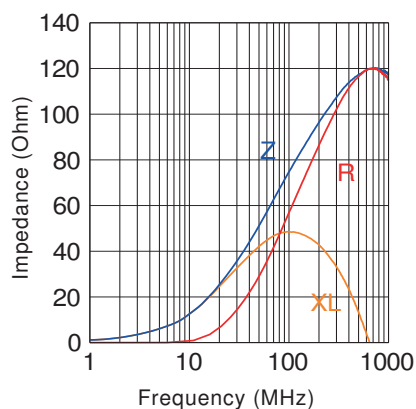
■ MLB-160808-0030C25



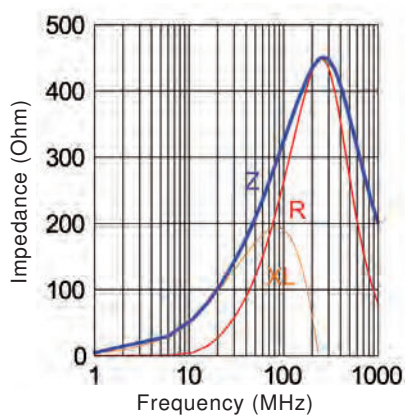
■ MLB-160808-0060C30



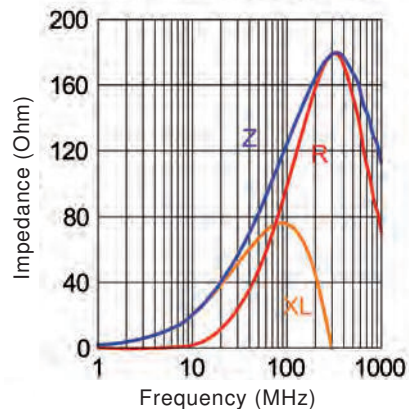
■ MLB-160808-0080C30



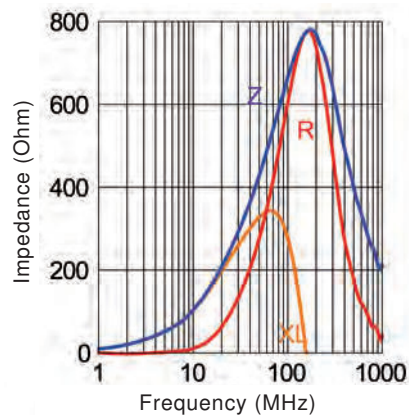
■ MLB-160808-0300C20



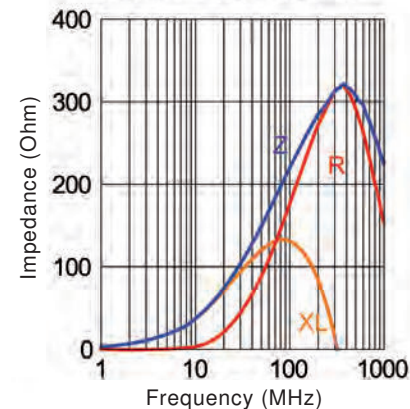
■ MLB-160808-0120C30



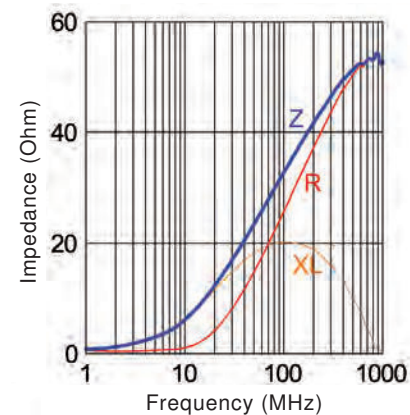
■ MLB-160808-0600C10



■ MLB-160808-0220C15



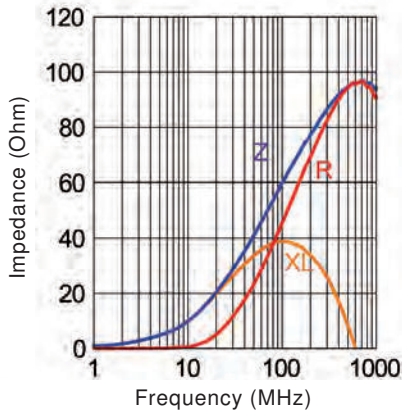
■ MLB-201209-0033C40



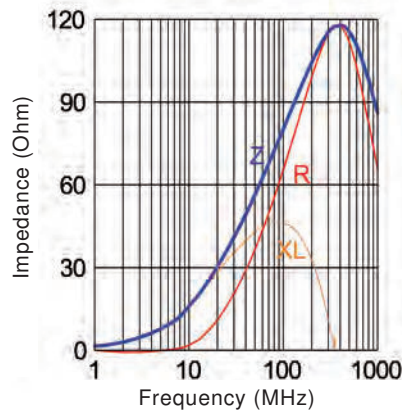
Part Co.	Impedance (Ω)@100MHz±25%	DCR (Ω)max	Rated Current (mA) max
MLB-160808-0030C25	30	0,050	2500
MLB-160808-0060C30	60	0,040	3000
MLB-160808-0080C30	80	0,040	3000
MLB-160808-0120C30	120	0,040	3000
MLB-160808-0220C15	220	0,150	1500
MLB-160808-0300C20	300	0,100	2000
MLB-160808-0600C10	600	0,200	1000
MLB-201209-0033C40	33	0,035	4000
MLB-201209-0060C40	60	0,035	4000
MLB-201209-0080C50	80	0,020	5000
MLB-201209-0120C50	120	0,020	5000
MLB-201209-0250C30	250	0,040	3000
MLB-201209-0300C30	300	0,040	3000
MLB-201209-0600C20	600	0,100	2000
MLB-201209-1000C10	1000	0,200	1000
MLB-321611-0080C40	80	0,035	4000
MLB-321611-0120C60	120	0,010	6000
MLB-321611-0300C10	300	0,200	1000
MLB-321611-0600C30	600	0,040	3000
MLB-321611-1000C10	1000	0,200	1000

Please contact us if other specification
(Size, Impedance, Rated Current etc.) is needed.

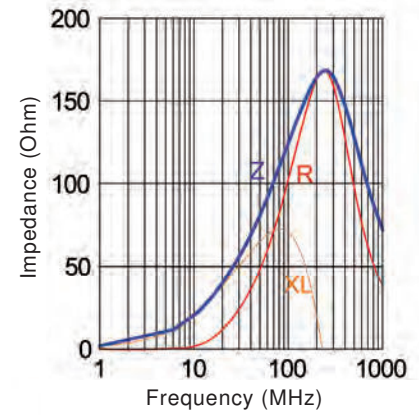
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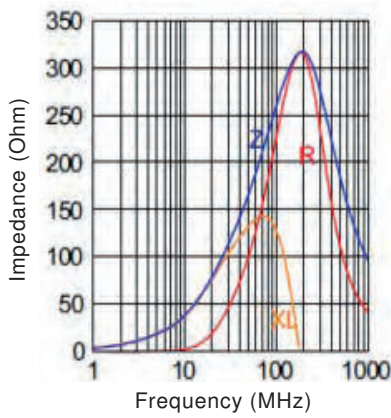
MLB-201209-0080C50



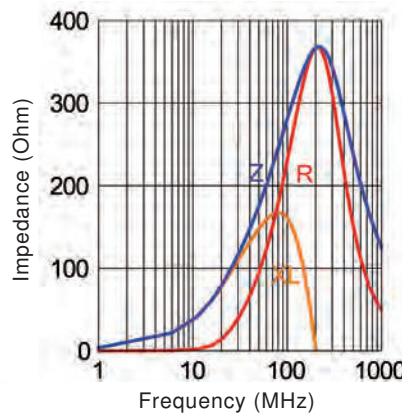
MLB-201209-00120C50



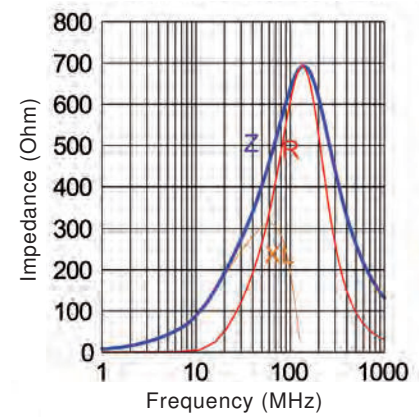
MLB-201209-0250C30



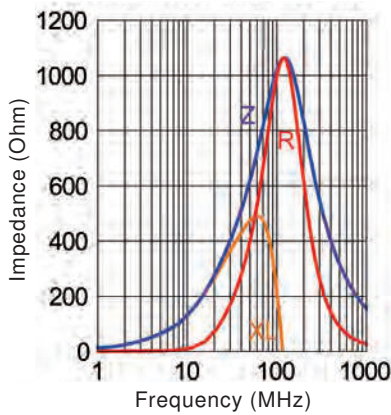
MLB-201209-0300C30



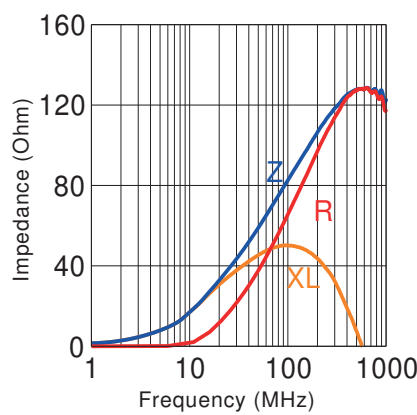
MLB-201209-0600C20



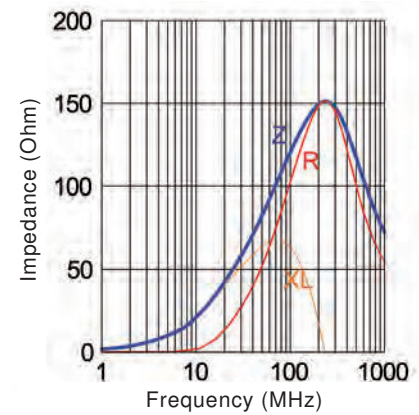
MLB-201209-1000C10



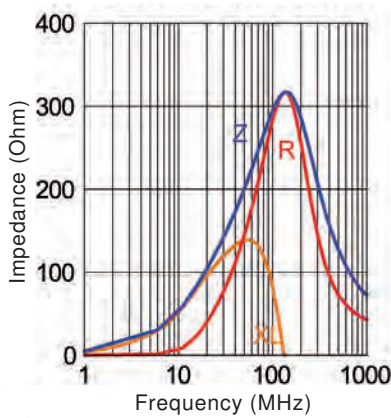
MLB-321611-0080C40



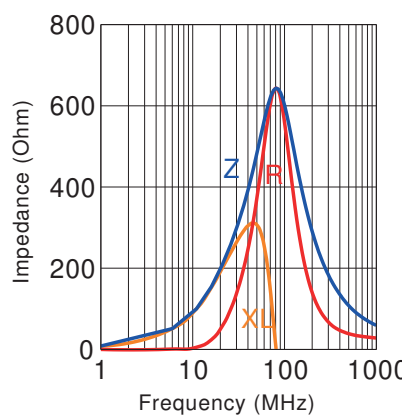
MLB-321611-0120C60



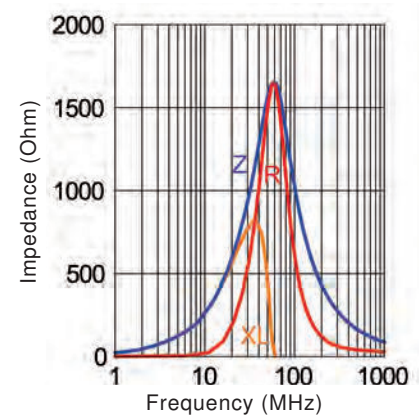
MLB-321611-0300C10



MLB-321611-0600C30



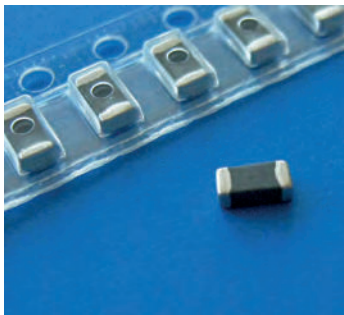
MLB-321611-1000C10



Others

Split PET films

Non split type



Ferrite Chip Bead for high speed application

Feature

- MLB (for High speed) can minimize attenuation of the signal wave form for high speed signal due to ist sharp impedance characteristics. That is much lower impedance in frequency range lower than 100MHz.
- Impedance Range: 26 to 1000 ohm
- Rated Current Range: 100 mA to 500 mA
- Operating temperature Range: -40°C to +125°C
- Soldering Method: Reflow of Wave soldering, suitable for lead free soldering
- Packaging Method : Tape & Reel (per EIA Specifications)
- Storage Temperature : max.40°C, RH 70%

Application

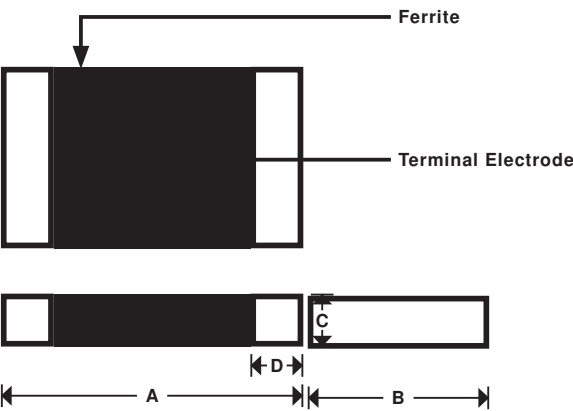
- EMI suppression for various electric equipment by addition of impedance to the circuit.
- It is particular effective with unstable grounding.
- High frequency EMI prevention of computers, printers, VCRs,TVs, and portable telephone.
- High speed signal or frequency (clock) harmonics EMI suppression.
- Clock, VGA data

Part Number Code

MLB	-	160808	-	0600	S	01
Series Name		Size Code		Impedance (ex.0600=600 Ω ± 25%)	Classification	Rated Current
					S=For High Speed Application	01=200 mA

Notes for MLB Series
Please contact our sales department for the application other than above mentioned indication.
Please ask individual data sheet to verify detailed specification and performance.

Shape and Dimensions



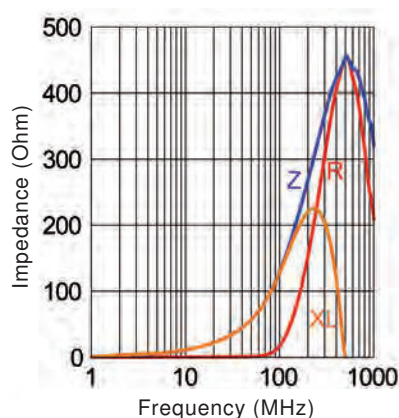
Unit: mm

SIZE CODE	A	B	C	D	Chips/reel
100505(0402)	1.00+/-0.1	0.50+/-0.1	0.50+/-0.1	0.25+/-0.1	10000
160808(0603)	1.60+/-0.2	0.80+/-0.2	0.80+/-0.2	0.3+/-0.2	4000
201209(0805)	2.00+/-0.2	1.20+/-0.2	0.90+/-0.2	0.5+/-0.3	4000
321611(1206)	3.20+/-0.2	1.60+/-0.2	1.10+/-0.2	0.5+/-0.3	3000

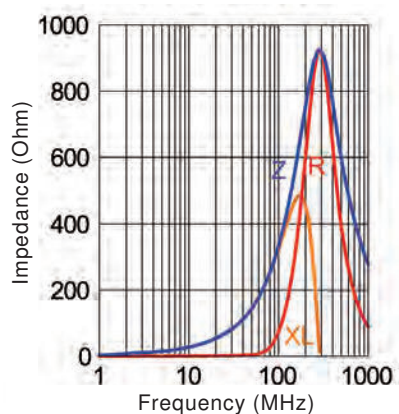
Part No.	Impedance (Ω)@100MHz±25%	DCR (Ω)max	Rated Current (mA) max
MLB-100505-0120S015	120	0,500	150
MLB-100505-0300S01	300	0,900	100
MLB-160808-0030S03	30	0,300	300
MLB-160808-0060S03	60	0,300	300
MLB-160808-0080S03	80	0,300	300
MLB-160808-0120S02	120	0,300	200
MLB-160808-0150S02	150	0,400	200
MLB-160808-0220S02	220	0,400	200
MLB-160808-0300S02	300	0,500	200
MLB-160808-0600S02	600	0,600	200
MLB-160808-1000S01	1000	1,000	100
MLB-201209-0026S05	26	0,200	500
MLB-201209-0060S04	60	0,300	400
MLB-201209-0120S03	120	0,300	300
MLB-201209-0300S02	300	0,500	200
MLB-201209-0600S02	600	0,600	200
MLB-201209-1000S02	1000	0,800	200
MLB-321611-0120S04	120	0,300	400
MLB-321611-0600S02	600	0,600	200

Please contact us if other specification (Size, Impedance, Rated Current etc.) is needed.

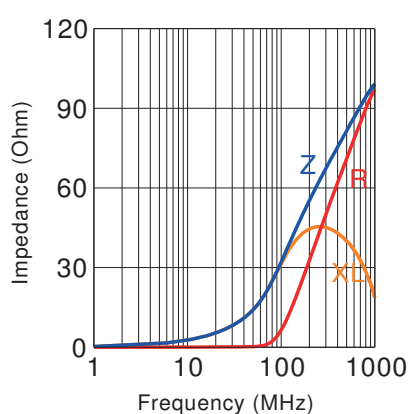
■ MLB-100505-0120S015



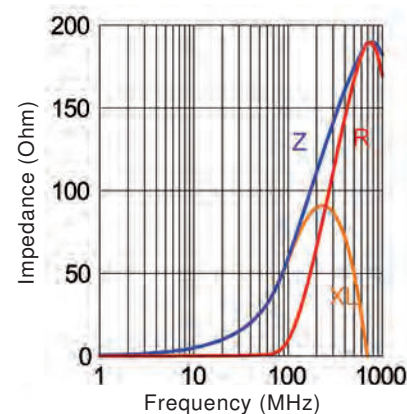
■ MLB-100505-0300S01



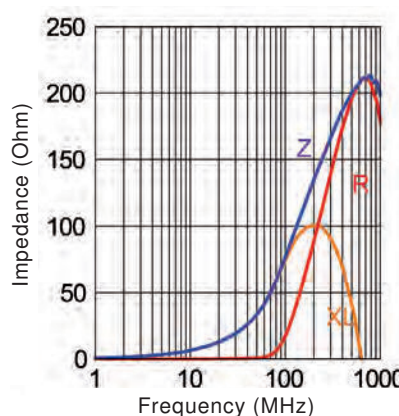
■ MLB-160808-0030S03



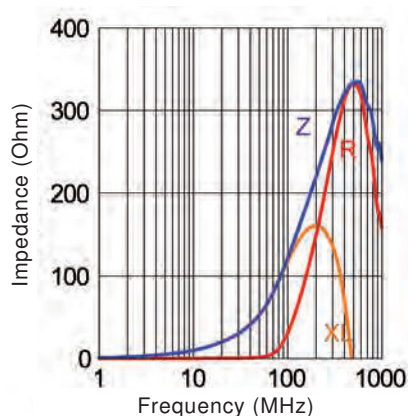
■ MLB-160808-0060S03



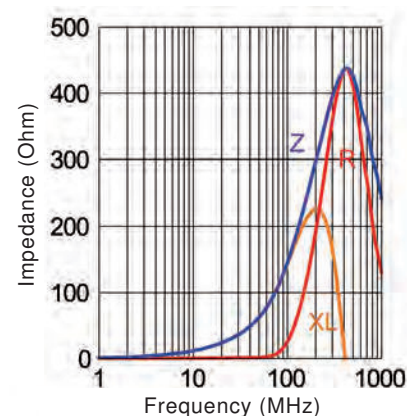
■ MLB-160808-0080S03



■ MLB-160808-0120S02



■ MLB-160808-0150S02

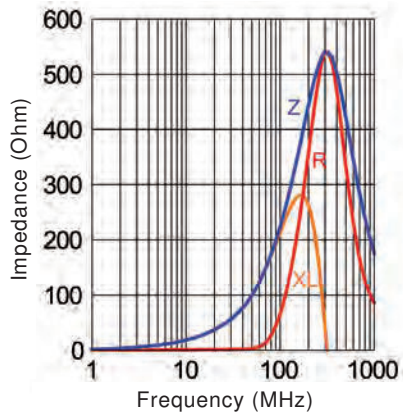


Others

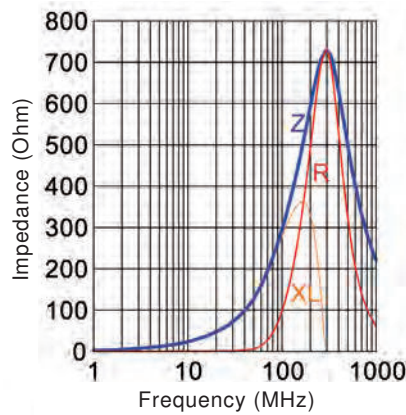
Split PET films

Non split type

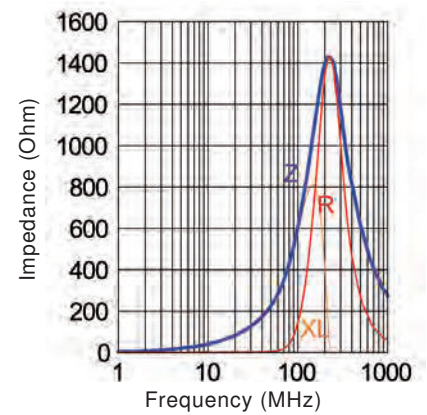
MLB-160808-0220S02



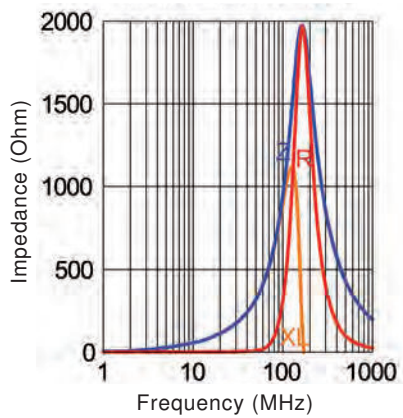
MLB-160808-0300S02



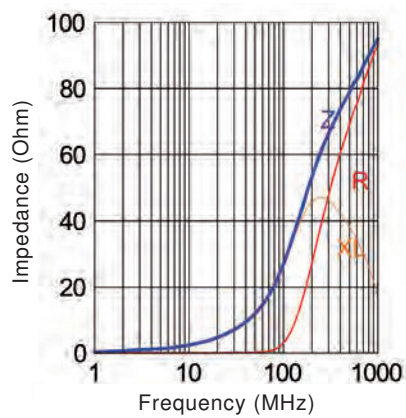
MLB-160808-0600S02



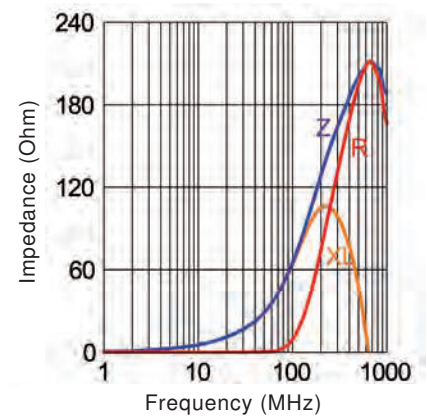
MLB-160808-1000S01



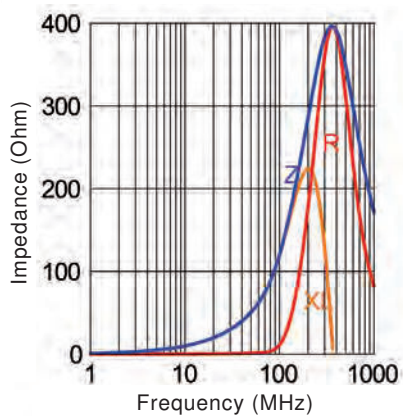
MLB-201209-0026S05



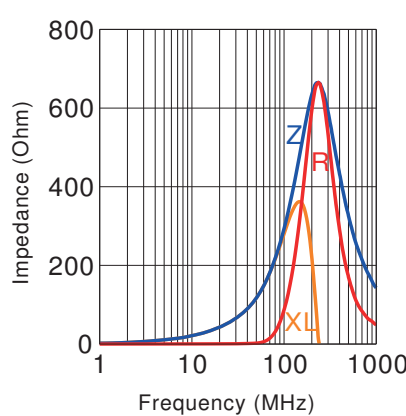
MLB-201209-0060S04



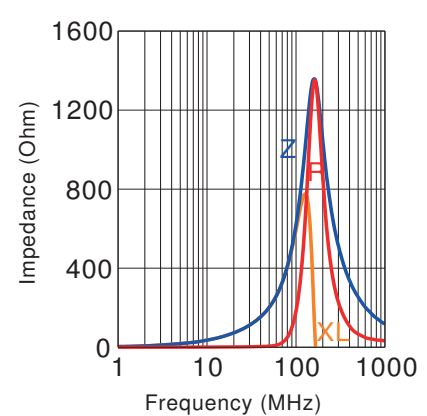
MLB-201209-0120S03



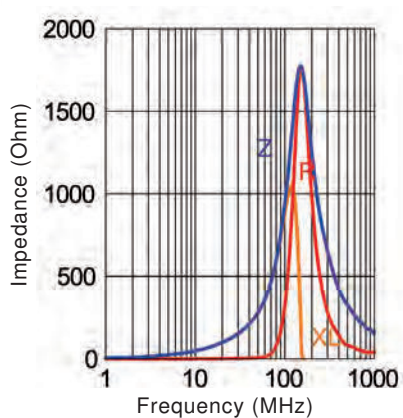
MLB-201209-0300S02



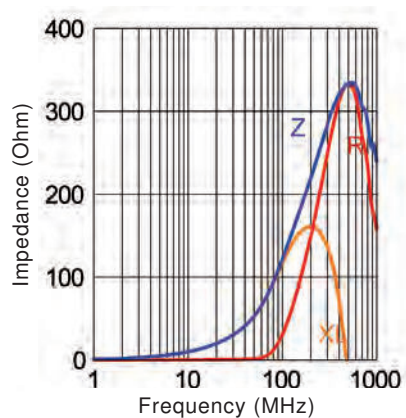
MLB-201209-0600S02



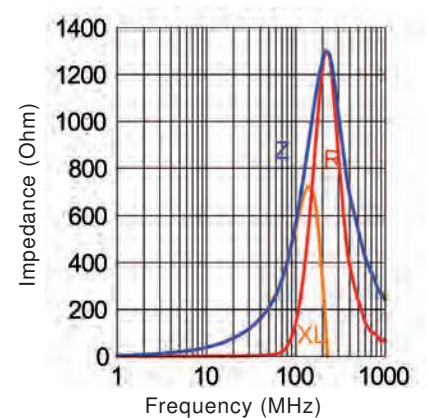
MLB-201209-1000S02

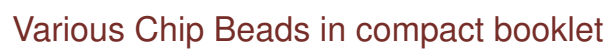


MLB-321611-0120S04



MLB-321611-0600S02



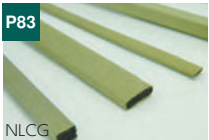


MEMO

SOFT

Stable performance provided with low-compression force

Foam



SOFT GASKET



CONDUCTIVE FOAM

Elastomer



CARBON RUBBER

WIRE MESH

Wire braided mesh type

Wire mesh



WIRE MESH

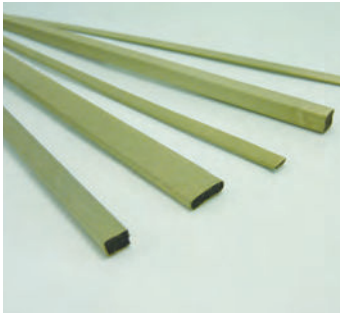
Wire mesh+Elastomer core



ELASTO MESH



ELASTO MESH



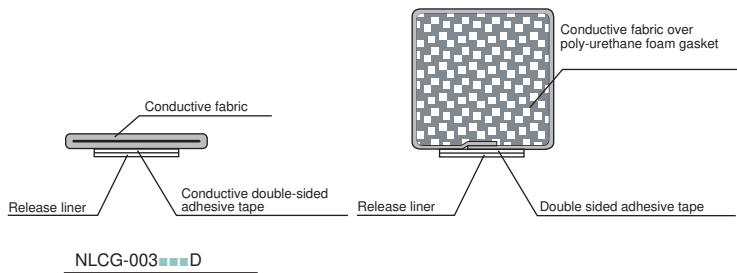
Stable electrical conductivity provided with low-compression force.

Feature

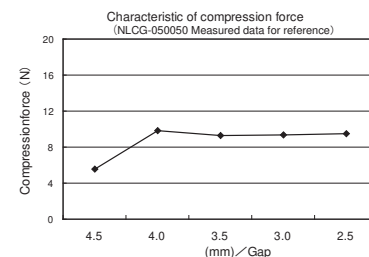
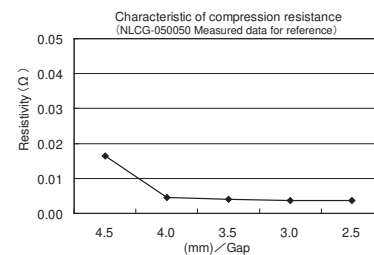
- Easy installation onto enclosure, etc. by adhesive tape.
(Conductive adhesive tape is also available)
- UL94V-0 certified. (Conductive fabric over poly-urethane foam gasket portion.)
(Except gaskets thinner 1.0 mm)
- UL94 VTM-0 certified adhesive tape.
(Except conductive adhesive tape)
- Easy processing by scissors.
(Please contact sales division for custom processing)
- Operating temperature range: -20°C to +70°C

■ Standard length: 1 m

Structure



Properties



Part Number Guide

NLCG- [Width] [Height] L: [Length]

Length in mm (not necessary for the standard length of 1 m)

Suffix "(D)": means customer can choose between conductive adhesive tape or adhesive tape.
 Suffix "D": means conductive adhesive tape.
 Suffix "NO TAPE": means without adhesive tape.
 Without Suffix: means adhesive tape.

Width : e.g) 050=5mm / 100=10mm
 Height : e.g) 010=1mm / 120=12mm

e.g) :NLCG-010050 → Height 1mm × Width 5mm

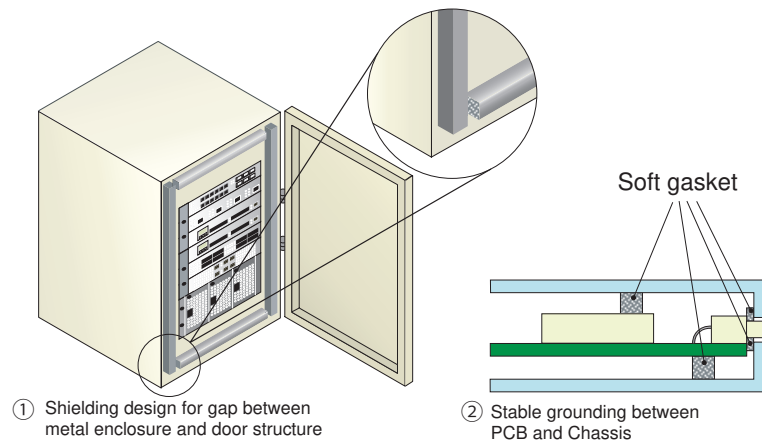
Secondary processing



Kiss cut



Customized thin-out kiss cut



※All specifications and characteristics shown herein are subject to change without notice for improvements or changes in specification.
 ※Galvanic corrosion may occur by contact with other metals.

※The values are measured data for reference, not guaranteed.

NLCG-003030 D Height:0.3mm Width:3mm	NLCG-003050 D Height:0.3mm Width:5mm	NLCG-003300 D Height:0.3mm Width:30mm	NLCG-010030 (D) Height:1mm Width:3mm
NLCG-010040 Height:1mm Width:4mm	NLCG-010050 (D) Height:1mm Width:5mm	NLCG-010070 (D) Height:1mm Width:7mm	NLCG-010100 (D) Height:1mm Width:10mm
NLCG-010130 Height:1mm Width:13mm	NLCG-010250 Height:1mm Width:25mm	NLCG-015030 (D) Height:1.5mm Width:3mm	NLCG-015050 (D) Height:1.5mm Width:5mm
NLCG-015070 (D) Height:1.5mm Width:7mm	NLCG-015100 (D) Height:1.5mm Width:10mm	NLCG-020040 Height:2mm Width:4mm	NLCG-020050 (D) Height:2mm Width:5mm
NLCG-020060 (D) Height:2mm Width:6mm	NLCG-020070 (D) Height:2mm Width:7mm	NLCG-020100 (D) Height:2mm Width:10mm	NLCG-020150 Height:2mm Width:15mm
NLCG-020210 Height:2mm Width:21mm	NLCG-020235 NT Height:2mm Width:23.5mm	NLCG-020350 Height:2mm Width:35mm	NLCG-020510 NT Height:2mm Width:51mm
NLCG-020560 Height:2mm Width:56mm	NLCG-025100 NT Height:2.5mm Width:10mm	NLCG-030040 (D) Height:3mm Width:4mm	NLCG-030050 (D) Height:3mm Width:5mm

※Suffix "(D)": means customer can choose between conductive adhesive tape or adhesive tape.
※Suffix "D ": means conductive adhesive tape.
※Suffix "NO TAPE": means without adhesive tape.
※Without Suffix: means adhesive tape.
※The values are measured data for reference, not guaranteed.

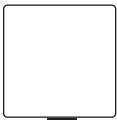
SOFT GASKET / NLCG

R-PROFILE

SHIELDING GASKETS

Soft

Wire mesh

NLCG-030100 (D)  Height:3mm Width:10mm	NLCG-035090  Height:3.5mm Width:9mm	NLCG-035120  Height:3.5mm Width:12mm	NLCG-040040  Height:4mm Width:4mm
NLCG-040050 (D)  Height:4mm Width:5mm	NLCG-040080 (D)  Height:4mm Width:8mm	NLCG-040100 (D)  Height:4mm Width:10mm	NLCG-040130  Height:4mm Width:13mm
NLCG-050050 (D)  Height:5mm Width:5mm	NLCG-050080  Height:5mm Width:8mm	NLCG-050100 (D)  Height:5mm Width:10mm	NLCG-050150 D  Height:5mm Width:15mm
NLCG-060060  Height:6mm Width:6mm	NLCG-060100  Height:6mm Width:10mm	NLCG-065060  Height:6.5mm Width:6mm	NLCG-070100  Height:7mm Width:10mm
NLCG-070130  Height:7mm Width:13mm	NLCG-080080  Height:8mm Width:8mm	NLCG-080100 (D)  Height:8mm Width:10mm	NLCG-095090  Height:9.5mm Width:9mm
NLCG-100100  Height:10mm Width:10mm	NLCG-100120  Height:10mm Width:12mm	NLCG-120100 (D)  Height:12mm Width:10mm	NLCG-130100 (D)  Height:13mm Width:10mm
NLCG-130120 NT  Height:13mm Width:12mm	NLCG-150150  Height:15mm Width:15mm		

- ※Suffix "(D)": means customer can choose between conductive adhesive tape or adhesive tape.
 ※Suffix "D ": means conductive adhesive tape.
 ※Suffix "NO TAPE": means without adhesive tape.
 ※Without Suffix: means adhesive tape.
 ※The values are measured data for reference, not guaranteed.

Size variation Rectangular Profile

Unit: mm

● : Double sided adhesive tape type
○ : Conductive adhesive tape type

Height \ Width	3	4	5	6	7	8	9	10	12	13	15	21	23.5	25	30	35	51	56
0.3	○		○												○			
1	●○	●	●○		●○			●○		●				○	○			
1.5	●○		●○		●○			●○										
2		●	●○	●○	●○			●○			●	●				○		●
2.5																		
3		●○	●○					●○										
3.5							○		○									
4		●○	●○			●○		●○		○								
5			●○			●		●○			○							
6				●				●										
6.5				●														
7								●		●								
8						●		●○										
9.5							●		●○									
10								●	●									
12								●○										
13								●○										
15											●							

SOFT GASKET / NLCG

D-PROFILE

NLCG-D015030 (D)



Height:1.5mm Width:3mm

NLCG-D020050 NT



Height:2mm Width:5mm

NLCG-D025020 D



Height:2.5mm Width:2mm

NLCG-D030030 (D)



Height:3mm Width:3mm

NLCG-D030070



Height:3mm Width:7mm

NLCG-D035030 NT



Height:3.5mm Width:3mm

NLCG-D040060



Height:4mm Width:6mm

NLCG-D065090



Height:6.5mm Width:9mm

NLCG-D095120 (D)



Height:9.5mm Width:12mm

※Suffix "(D)": means customer can choose between conductive adhesive tape or adhesive tape.
※Suffix "D ": means conductive adhesive tape.
※Suffix "NO TAPE": means without adhesive tape.
※Without Suffix: means adhesive tape.
※The values are measured data for reference, not guaranteed.



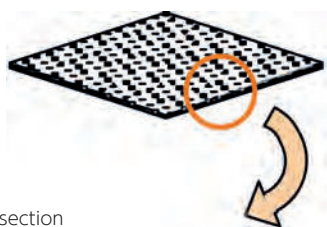
Thin EMI sheet gasket made with conductive foam

Feature

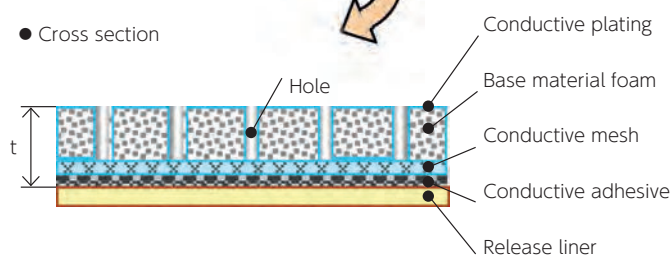
- Suitable solution for grounding for space saving areas such as mobile equipments, flat panel monitors etc.
- Thin and well cushioned foam gasket.
- Through hole process is provided. Conductivity between top and bottom surface is available. Custom profiles such as cutting, punching etc. are also available. (Conductive adhesive is used.)

Product structure

● Outline



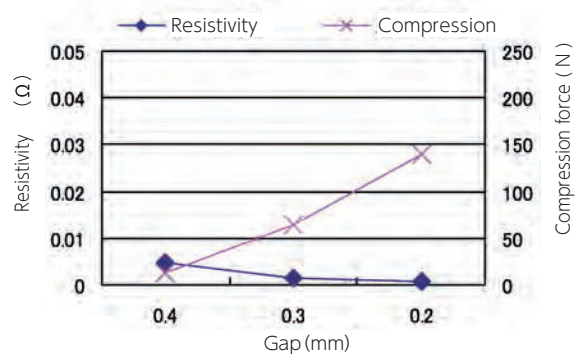
● Cross section



Properties

● Compression vs. Contact resistance (XYT-0.5)

Size: 25 x 25 mm



Specifications

Part No.	XYT-0.3	XYT-0.5	XYT-0.7
Base material	Foam: Olefinic foam / Mesh: Polyester		
Plating	Ni-Sn/Cu plating		
Conductive adhesive	Acrylic conductive adhesive		
Color	Black		
Total thickness t (mm)	0.3	0.5	0.7
Resistivity in the thickness direction (25mm ² / 1kg load)	< 0.1 Ω		
Peel adhesion at 180°(25mm width)	Min 1kgf		

※All specifications and characteristics shown herein are typical values, but are not guaranteed.

※All specifications and characteristics shown herein are subject to change without notice for improvements or changes in specification.



Carbon filled silicone based rubber.

Feature

- Carbon Rubber is a good shielding gasket and an excellent environmental seal.
- Excellent formability available in the form of sheet as well as various extruded shapes as shown below.

Material

- Conductive silicone

*Custom cutting is available upon request.

Part No.	CSR
Hardness (TYPE A)	67
Tensile strength (MPa)	5.8
Tensile elongation rate (%)	270
Volume Resistivity ($\Omega \cdot \text{cm}$)	3~10
Flammability	UL94 V-0
Operating temp ($^{\circ}\text{C}$)	-40~150

R type



Unit: mm

Part No.	A
CSR-R-15	1.5
CSR-R-20	2.0
CSR-R-30	3.0
CSR-R-40	4.0
CSR-R-50	5.0

O type



Unit: mm

Part No.	A	B
CSR-O-25-15	2.5	1.5
CSR-O-60-30	6.0	3.0
CSR-O-65-30	6.5	3.0
CSR-O-100-65	10.0	6.5

P type



Unit: mm

Part No.	A	B	C
CSR-P-125-50	12.5	5.0	6.0
CSR-P-170-72	17.0	7.2	7.5
CSR-P-240-77	24.0	7.7	11.0

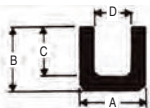
D type



Unit: mm

Part No.	A	B
CSR-D-40-15	4.0	1.5
CSR-D-45-25	4.5	2.5

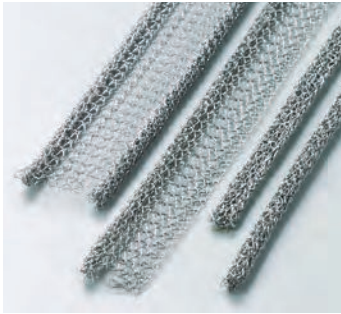
U type



Unit: mm

Part No.	A	B	C	D
CSR-U-48-48	4.8	4.8	3.2	1.6
CSR-U-55-110	5.5	11.0	8.0	2.5
CSR-U-80-130	8.0	13.0	9.5	3.5
CSR-U-95-130	9.5	13.0	9.5	5.0

WIRE MESH / WMS • WMR • WMH • WMD



Standard wire mesh gaskets

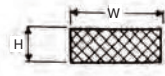
Feature

- Mesh structure conforms to irregular surfaces providing reliable shielding effects.
- No unbraiding or wire loosening type also available, allowing cutting to desired length.

Material

- Nickel-copper alloy (Monel) wire
- Custom cutting is available up on request

Rectangular



Unit: mm

Part No.	H	W
WMS-15-15-M	1.5	1.5
WMS-15-32-M	1.5	3.2
WMS-23-23-M	2.3	2.3
WMS-23-32-M	2.3	3.2
WMS-32-32-M	3.2	3.2
WMS-32-39-M	3.2	3.9
WMS-47-47-M	4.7	4.7

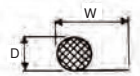
Round



Unit: mm

Part No.	D
WMR-18-M	1.8
WMR-24-M	2.4
WMR-32-M	3.2
WMR-39-M	3.9
WMR-47-M	4.7
WMR-63-M	6.3
WMR-92-M	9.2

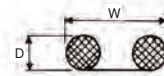
P section



Unit: mm

Part No.	D	W
WMH-19-95-M	1.9	9.5
WMH-25-128-M	2.5	12.8
WMH-32-126-M	3.2	12.6
WMH-63-158-M	6.3	15.8

Double P section



Unit: mm

Part No.	D	W
WMD-19-92-M	1.9	9.2
WMD-19-126-M	1.9	12.6
WMD-19-158-M	1.9	15.8
WMD-25-126-M	2.5	12.6

ELASTO MESH / ETAB



Elastomer core with arrowhead allows easy installation on enclosures.

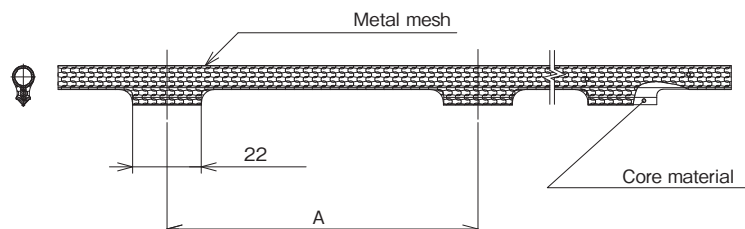
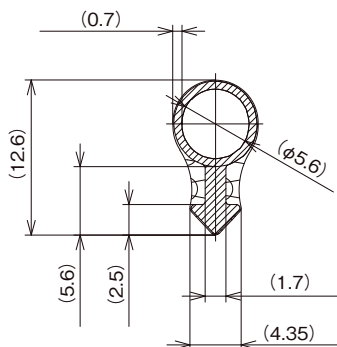
Feature

- Easier installation compared with conventional formed gaskets (rectangular or round).
- Small compression force, the special structure prevents fall-off of the gasket.
- No unbraiding or wire loosening type, allowing cutting to desired length.

Material

- Metal mesh / Nickel-copper alloy (Monel) wire
- Core material / Silicone

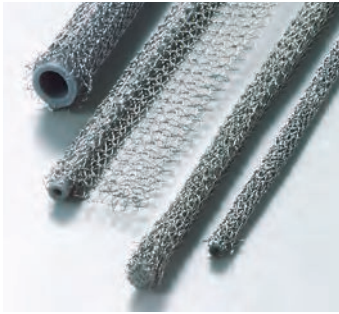
Cross-section



Unit: mm

Part No.	A
ETAB-79.5-*****	79.5
ETAB-100 -*****	100

*** indicates overall length and the length between the cut face and the starting point of the arrowhead. (Contact us for the details.)



Wire mesh gasket with an excellent elasticity elastomer core

Feature

- EMI/RFL gasket with silicone or chloroprene etc core enclosed in a wire mesh.
- High effectiveness can be gained with excellent elasticity and form recovery properties providing secure contact between the wire mesh and the metal face.

Material

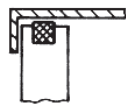
- Metal mesh / Nickel-copper alloy (Monel) wire
- Core material / Right table

※Custom cutting is available upon request.

End of Part number	Material
LS	Latex Sponge Outside Skin: Chloroprene Rubber
SS	Silicone Sponge
ST	Silicone Tube
TT	Elastomer tube (Silicone free)

Installation example

Rectangular



Insertion in groove assembly

Round



Rectangular



Adhesive assembly

P section

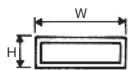


Spot-welding assembly



Rivet assembly

Rectangular



Unit:mm

Part No.	H	W
EMS-50-150-MLS	5	15
EMS-100-100-MLS	10	10
EMS-100-150-MLS	10	15
EMS-100-200-MLS	10	20
EMS-150-150-MLS	15	15
EMS-150-200-MLS	15	20
EMS-200-200-MLS	20	20

Unit:mm

Part No.	H	W
EMS-16-32-MSS	1.6	3.2
EMS-32-32-MSS	3.2	3.2
EMS-32-47-MSS	3.2	4.7

(Wire-loosening protection type is available)

Round (Gasket type)



Unit:mm

品番 / Part No.	D
EMR-15-MST	1.5
EMR-18-MST	1.8
EMR-24-MST	2.4
EMR-32-MST	3.2
EMR-47-MST	4.7
EMR-62-MST	6.2

(Wire-loosening protection type is available)

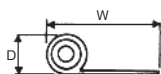
Round (Cable shield type)



Unit:mm

Part No.	D1	(D2)
EMC-40-20-MST	4.5	2.0
EMC-60-40-MST	6.5	4.0

P section



Unit:mm

Part No.	D	W
EMH-32-126-MST	3.2	12.6

Round



Unit:mm

Part No.	D
ETC-20-14-FMSTT	2.4
ETC-20-14-FMS-ST	2.2

CONDUCTIVE FABRIC

Conductive fabric tape with excellent flexibility.

Conductive fabric



CONDUCTIVE FABRIC TAPE

METAL FOIL

Low-resistivity type using embossed metal foil and conductive adhesive material.

Metal foil

Standard type



CONDUCTIVE TAPE

TRANSPARENT CONDUCTIVE FILM

Transparent conductive film has superior optical transparency.

Transparent conductive film



TRANSPARENT CONDUCTIVE FILM

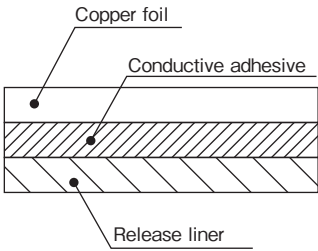
THIN FILM

Super-thin conductive film with thickness of 35μm.

Thin film



REMILESS



Thin and flexible metal foil tape backed by a conductive filler adhesive

Feature

- Highly conductive adhesive provides high shielding effectiveness.
- Easy punching and half-cutting to optimal configurations.

Material

- Base material / CCT-C : Copper foil, CCT-A : Aluminum foil
- Adhesive layer / Conductive adhesive

- Standard length:20m

Part No.	Width	Thickness	adhesive strength	Resistivity
CCT-8-C	8	0.075	9.4N/25mm	0.004 Ω/inch ²
CCT-10-C	10			
CCT-13-C	13			
CCT-20-C	20			
CCT-25-C	25			
CCT-50-C	50			
CCT-100-C	100			
CCT-600-C	600			
CCT-250-C※1	(□250)	0.09	8.6N/25mm	0.008 Ω/inch ²
CCT-A4-C※1	(A4)			
CCT-6-A	6			
CCT-8-A	8			
CCT-15-A	15			
CCT-20-A	20			
CCT-25-A	25			
CCT-A4-A※1	(A4)			

※ 1)Sheet type
※The values are measured data for reference, not guaranteed.

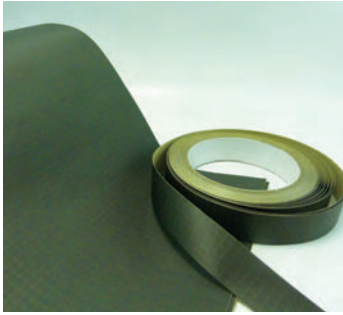
Electrically conductive fabric

Metal foil

Thin film

GHz shield

Transparent conductive film



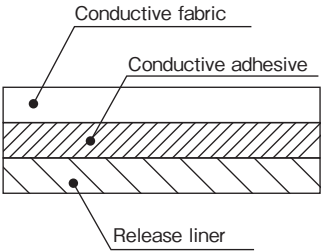
Thin and durable carbon-coated type

Feature

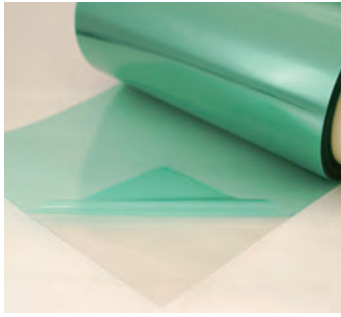
- Carbon-coating protects from the galvanic corrosion suffered by metal foils.
- Carbon-coated special knitting provides no yarn-loosening or fuzz on the surface.
- Carbon-coated tape with low resistivity, effective against electrostatic discharge.

Material

- Conductive woven fabric / Cu-Ni plated woven fabric with carbon-coating (UL510FR)
- Standard length: 20m



Part No.	(mm) Width	(mm) Thickness	adhesive strength	Surface Resistivity	Resistivity
CSTK-008	8	0.1	8.6N/25mm/ Width	$\frac{0.04}{\square 20\text{mm}}$	UL 510A
CSTK-010	10				
CSTK-015	15				
CSTK-020	20				
CSTK-025	25				
CSTK-030	30				
CSTK-040	40				
CSTK-060	60				
CSTK-250	250				
CSTK-300	300				



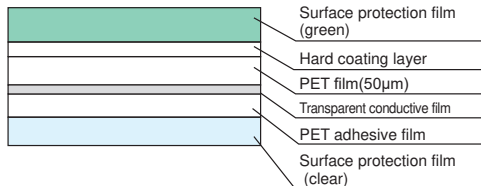
Sheet Film improving design for EMC and electro static discharge of LCD and its peripheral components.

Feature

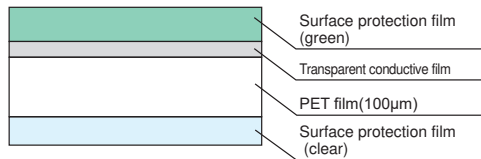
- Sheet Film, improving EMC design and electro-static discharge of LCD and its peripheral components.
- Electrically conductive film with superior optical transparency.
- Flexible sheet film allows custom sheet cutting, punching, adhesive tape attachment etc. upon request.

Product structure

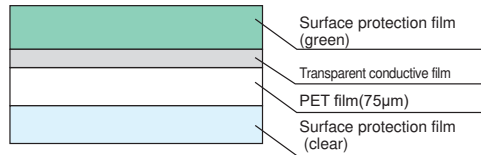
WINAL50-005



WINAL100-020



WINAL75-080

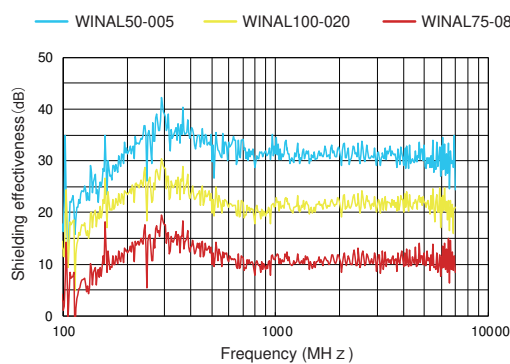


Properties

Item	Unit	Standard	WINAL50-005	WINAL100-020	WINAL75-080
Thickness ^{※1}	μm	—	94	100	75
Surface resistance	Ω/□	JIS K 7194	≤10	≤30	80±30
Total light transmittance	%	JIS K 7136	≥70		
Surface temperature range for use	°C	—	-30~80		
Flame retardancy	—	UL94	—	VTM-2 equivalent	

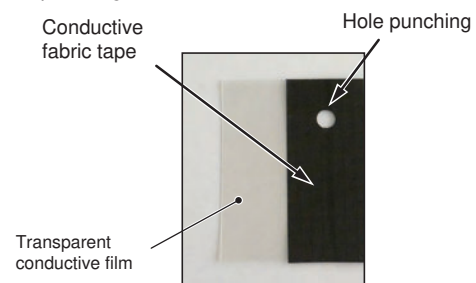
※1) Surface protection film not included

Electric shielding properties (MIL-STD-285)

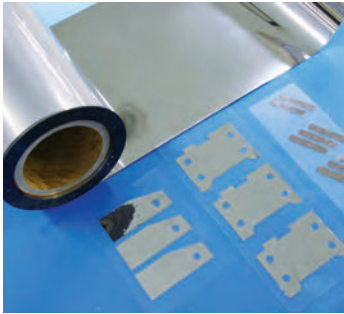


Additional process

- Attaching conductive fabric tape
- Cutting in any size
- Holepunching, etc.



※The values are measured data for reference, not guaranteed.



Super-thin surface-conductive film

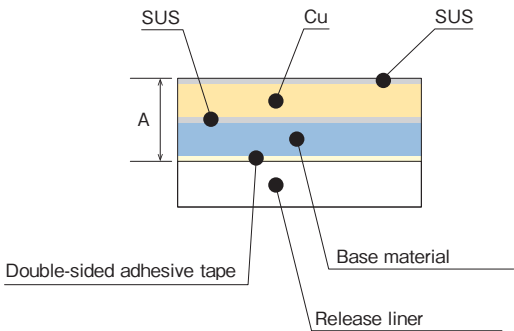
Feature

- Overall thickness 35μm (-FS,-SC)
- Provides high-shielding effectiveness and galvanic corrosion resistance.
- Safer handling compared with metal foil tapes.
- Suitable noise control for flexible cables.

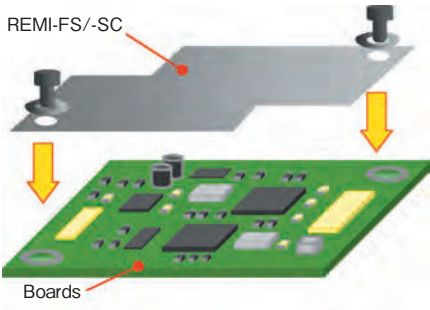
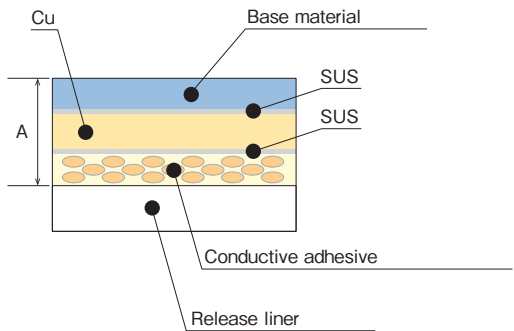
Material

- Base material / PET(-FS,-FA) PPS(-SC,-AC)
- Metal membrane / SUS・Cu

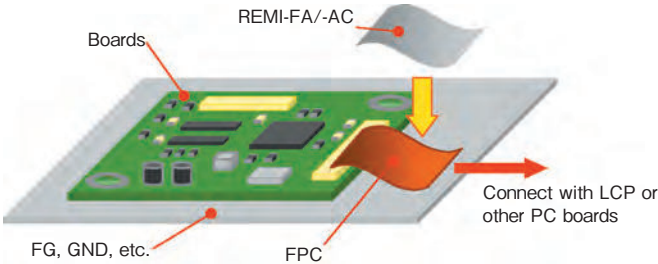
REMI-FS/-SC (Surface conductive type)



REMI-FA/-AC (Adhesive layer conductive type)

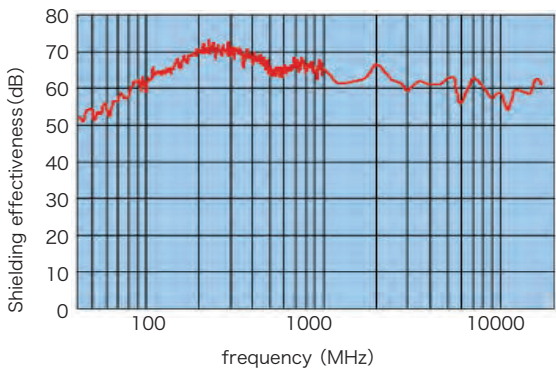


Application example) Shielding small boards using metal membrane face



Application example) Shielding and frame-grounding for FPC

Property



The values are measured data for reference, not guaranteed.

	REMI-FS	REMI-FA	REMI-SC	REMI-AC
Base material	PET		PPS	
Metal membrane	SUS/Cu			
Surface resistance ¹ (Ω/□)	<0.5		<0.5	
Thickness A (mm)	0.035	0.055	0.035	0.055
Flame retardant	—	—	UL94 VTM-0 ^{*2} Equivalent to UL94 VTM-0	UL 510A

※ 1) Measured in film state ※ 2) Double-sided adhesive tape excluded

WIRE MESH

Metal wire braided mesh

WIRE MESH



MESH TAPES

JACKETS

Jacket type can be assembled on wired cables.

Hook and loop fastener type



CABLE SHIELD



CABLE SHIELD

Zipper type



SHIELD TUBE



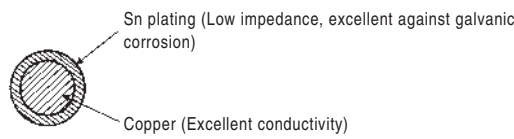
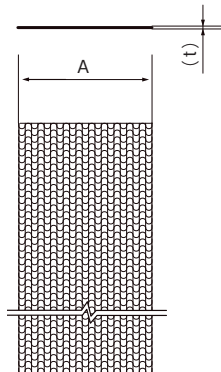
Extremely fine (0.12mm) metal wires braided into a cylinder mesh provides excellent flexibility

Feature

- Flexible material can be used by wrapping around cables or inserting cables in the mesh cylinder.

Material

- SN plated copper wire

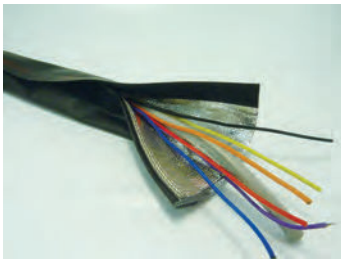


Unit: mm

Part No.	Dimensions	
	A	(t)
MT-17-CT	17	0.4
MT-25-CT	25	
MT-30-CT	30	
MT-35-CT	35	
MT-40-CT	40	
MT-55-CT	55	0.8
MT-85-CT	85	
MT-95-CT	95	
MT-120-CT	120	
MT-150-CT	150	
MT-175-CT	175	
MT-230-CT	230	

Contact us for other sizes not listed above.

CABLE SHIELD / ECBR-AL



Hook and loop fastener allows for easy assembly

Feature

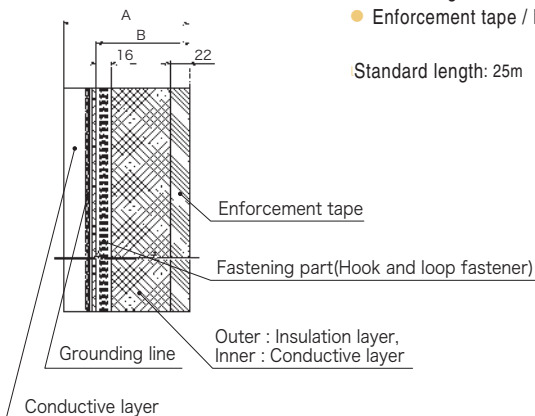
Installation on pre-wired cables or later insertion of additional cables is possible.

- Hook and loop fastener is attached on the fabric by melting so can be easily cut to the intended length without tape detachment.

Material

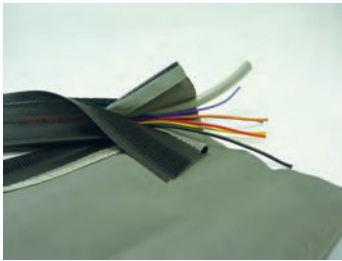
- Conductive layer / Aluminium foil
- Insulation layer / PET fabric based urethane
- Fastening part / Nylon
- Grounding line / Sn plated copper wire
- Enforcement tape / PET fabric based polyurethane

Standard length: 25m



Unit: mm

Part No.	A	B
ECBR-AL-15G	83	64
ECBR-AL-20G	135	100
ECBR-AL-30G	165	130
ECBR-AL-40G	195	160
ECBR-AL-50G	240	195
ECBR-AL-70G	295	240
ECBR-AL-100G	415	350



Highly flexible cable shield using conductive fabric.

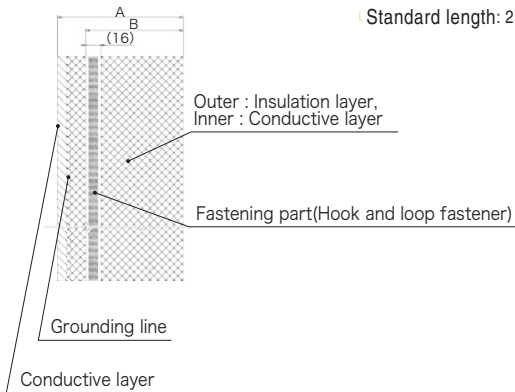
Feature

- Light weight and flexibility allowing winding along the cable.
- Assembly on pre-wired cables or later insertion of additional cables is possible.

Material

- Ni/Cu conductive fabric
- Insulation layer / PET fabric based urethane
- Fastening part / Nylon
- Grounding line / Sn plated copper wire

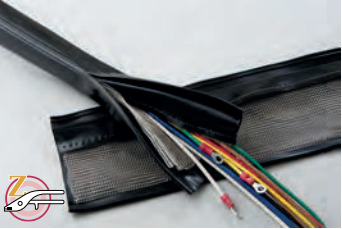
Standard length: 25m



Part No.	Unit: mm	
	A	B
ECBR-CF-20G	134	104
ECBR-CF-30G	164	134
ECBR-CF-40G	194	164
ECBR-CF-50G	224	194

SHIELD TUBE / ZTZX

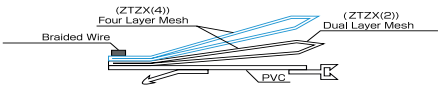
ZIPPERTUBING (JAPAN), LTD.



Protective, Voltage Proof Sealing material

Feature

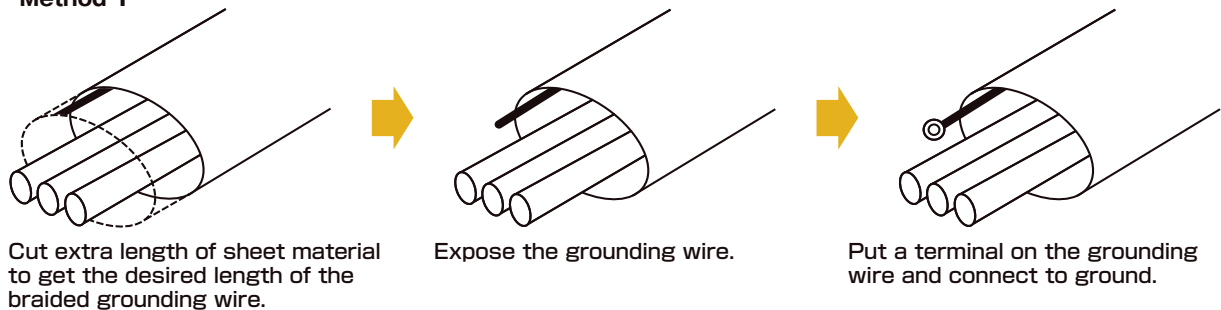
- Can easily be attached even after wiring has been connected
- Features our unique (Zipper Closing Mechanism), perfect for lengthwise closures
- ZT Pliers make bundling quick and easy
- Zipper Closing Mechanism ensures super strong closure mating



Item Name	ZTZX(2)	ZTZX(4)
Standard Length	25m	
Diameter (φ)	15,20,25,30,40,50,70,100	
Sheet	FR flexible PVC	
	Thickness:0.5mm	
Closing Mechanism	Zipper(FR semirigid PVC)	
Braided Ground Wire	Tin-plated soft copper wire	
Additional Shielding Material	Metallic Mesh(Dual Layer) Tin-plated soft copper wire	Metallic Mesh(Four Layer) Tin-plated soft copper wire
Color	Black	
Operating Temperature	-15~+105℃ (Sheet)	

AL foil type

Method 1



Mesh / Conductive Cloth Type

Method 2 (or 1)



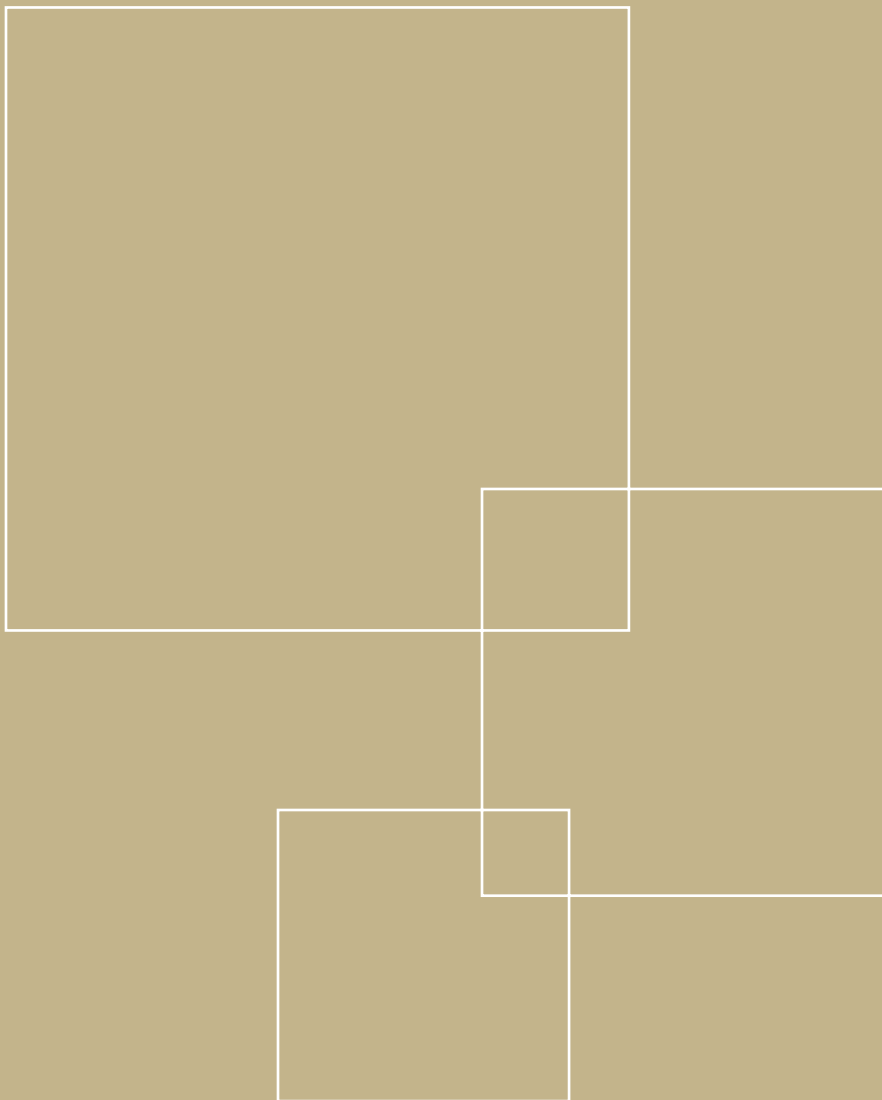
ZT Pliers



Products with this mark, please use the dedicated zipper type pliers.



ISO Certificate / Index /
General Terms of Delivery and Payment



ISO Certificate

This is a translation of the certificate DE12/81839360

The management system of
KGS KITAGAWA GmbH
Birkenwaldstraße 38, DE 63179 Oberhausen

has been assessed and certified as meeting the requirements of
ISO 9001:2015
For the following activities
Trading of electronic components and EMC solutions.

This certificate is valid from 21 April 2023 until 15 June 2024 and remains valid subject to satisfactory surveillance audits.
Issue 7. Certified since 21 April 2023.
Organization certified since 10 June 2015 and first certified by SGS under SAS since 21 April 2023.

D. Willenmin für Sie

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SGS Société Générale de Surveillance SA
Technoparkstrasse 1, 8005, Zurich, Switzerland
t +41 (0)44 445-16-80 • www.sgs.com

Authorized by: Jan Meenen
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This is a translation of the certificate DE12/81839359

The management system of
KGS KITAGAWA GmbH
Birkenwaldstraße 38, DE 63179 Oberhausen

has been assessed and certified as meeting the requirements of
ISO 14001:2015
For the following activities
Trading of electronic components and EMC solutions.

This certificate is valid from 21 April 2023 until 15 June 2024 and remains valid subject to satisfactory surveillance audits.
Issue 6. Certified since 21 April 2023.
Organization certified since 16 June 2012 and first certified by SGS under SAS since 21 April 2023.

D. Willenmin für Sie

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IATF 16949
Management System Certificate

Certificate Number : JQA-AU0368 / IATF Certificate Number : 0450315 1 / 2

Organization :
KITAGAWA INDUSTRIES CO., LTD.
KASUGAI FACTORY
1423-101 AZA-TOMIYO, AKECHI-CHO, KASUGAI-CITY, AICHI, JAPAN

Scope of Registration:
- CUTTING OF SOFT GASKETS AND ELECTROMAGNETIC NOISE SUPPRESSION SHEETS.
- DESIGN AND MANUFACTURING OF FERRITE PRODUCTS FOR ELECTROMAGNETIC COMPATIBILITY MEASURES.
- DESIGN AND MANUFACTURING OF INJECTION MOLDED PARTS.
- DESIGN AND MANUFACTURING OF HEAT TRANSFER SHEETS AND ANTI-VIBRATION SHEETS.

JQA (JAOB-1016) certifies that the above organization operates the Quality Management System within the above scope and complies with the requirements of the following standard:

IATF 16949:2016

Last Renewal Date : July 8, 2022
Expiry Date : July 7, 2025
Fee free to extend JQA for the validity of this certificate.

N. Kobayashi
NORIAKI KOBAYASHI
PRESIDENT
1-25 KANDASUJOCHO, CHYODAI-KU, TOKYO, JAPAN

JAPAN QUALITY ASSURANCE ORGANIZATION
To be used in conjunction with attached Appendix.

JQA 1736 0761475

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	FGES	FG EDGE SPACER	17
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Z	ZTZX	SHIELD TUBE	100

1. Scope of Application

1.1 The latest version of these General Terms and Conditions of Delivery and Payment (GTC) shall apply to all deliveries and other services provided by us.

1.2 Conflicting or deviating general terms and conditions of the Customer shall not apply unless Kitagawa GmbH has explicitly consented to their validity in writing. The GTC of Kitagawa GmbH shall also apply if Kitagawa GmbH performs the services for the Customer without reservation in the knowledge of conflicting or deviating terms and conditions of the Customer.

1.3 Individual contractual agreements between Kitagawa GmbH and the customer that deviate from the GTC require the written form.

1.4 These GTC of Kitagawa GmbH apply exclusively to entrepreneurs within the meaning of Section 310 (1) BGB (German Civil Code). The GTC shall apply accordingly to pre-contractual relationships.

2. Conclusion of the Contract

2.1 The offers of Kitagawa GmbH are subject to change. The ordering of goods by the customer shall be deemed a binding contractual offer, whereby the customer also acknowledges the applicability of these GTC.

2.2 A contract between Kitagawa GmbH and the customer is only concluded in accordance with the content of the order confirmation in written or text form by Kitagawa GmbH or by delivery of the goods or provision of the agreed service by Kitagawa GmbH. A mere confirmation of receipt does not constitute acceptance or the conclusion of a contract.

2.3 The customer is bound to his order for three weeks. Kitagawa GmbH reserves the right to deviate from the customer's specifications in the order confirmation. This shall constitute a new offer which the customer must accept within a period of two weeks. After this deadline, it expires.

2.4 The product descriptions which are available on the website of Kitagawa GmbH or which are contained in the sales and advertising catalogs of Kitagawa GmbH (including, but not limited to, prices, technical information, etc.) are subject to change and non-binding. Kitagawa GmbH is entitled to change the design and manufacture of its products at any time without prior notice. This also applies to goods already ordered, provided that this does not result in the contractually agreed quality of the goods being undercut and the change is reasonable for the customer. The modification of contractual goods already delivered cannot be demanded retrospectively.

2.5 Insofar as Kitagawa GmbH provides the customer with drafts, illustrations, drawings, data, documents, calculations etc. (documentation) relating to the goods offered or presents the respective project at the customer's request, Kitagawa GmbH expressly reserves the right of

ownership and copyright to this documentation as well as to the entire stock of goods and the projects developed. Neither the documentation nor the details of the range of goods or the development may be passed on to third parties, made public, copied, reproduced or

used in any other way without the written and express permission of Kitagawa GmbH.

2.6 The customer is obliged to return the documentation to Kitagawa GmbH upon written request. If a contract is concluded, Kitagawa GmbH will provide the customer with the documentation free of charge.

3. Delivery Periods and Delay

3.1 The delivery time of the goods shall be determined by the written order confirmation of Kitagawa GmbH.

3.2 Specified delivery periods shall commence upon dispatch of the written order confirmation. In the event that the customer is obliged to make advance payment, the delivery period shall start upon the customer's contractual advance payment being received by Kitagawa GmbH.

3.3 If the customer requests changes to the contractually agreed services after the order has been confirmed in writing, Kitagawa GmbH shall be entitled to extend the delivery period appropriately if necessary.

3.4 If Kitagawa GmbH is unable to comply with binding delivery deadlines through no fault of its own, Kitagawa GmbH shall inform the customer of this without culpable delay and at the same time notify the customer of the expected new delivery deadline if delivery will still be possible.

Kitagawa GmbH shall not be liable for failures or delays in the fulfillment of its obligations which have become practically impossible due to circumstances beyond the control of Kitagawa GmbH.

These circumstances include in particular

- a) natural disasters
- b) acts of terrorism
- c) labor disputes or work stoppages
- d) war
- e) official measures or orders
- f) epidemics, pandemics or the outbreak of communicable diseases
- g) quarantines
- h) national or regional emergencies
- i) or other reasons beyond the reasonable control of Kitagawa GmbH in particular force majeure or any other kind, regardless of whether they are similar to the aforementioned or not.

Kitagawa GmbH shall give written notice of non-performance or delay in performance due to above reasons as soon as possible. All delivery dates affected by the above reasons shall be suspended for its duration. If possible and reasonable, Kitagawa GmbH will not cancel the corresponding obligations and deliveries, but will reschedule them as soon as this is possible after the force majeure has ceased.

Equivalent to this are cases in which Kitagawa GmbH does not receive its deliveries on time or in the correct form.

3.5 If a delivery date promised by Kitagawa GmbH is not met for reasons for which Kitagawa GmbH is responsible, the customer shall be entitled to set Kitagawa GmbH a grace period of two weeks after expiry of the agreed delivery period by means of a registered letter. After fruitless expiry of this period, the customer shall be entitled to withdraw from the contract.

Compensation for delay due to slight negligence on the part of Kitagawa GmbH is excluded.

3.6 Kitagawa GmbH is entitled to make partial deliveries if this appears necessary for speedy processing and the partial delivery is not exceptionally unreasonable for the customer. Partial delivery is deemed reasonable in particular if the customer can use the partial performance - even without the subsequent deliveries - as intended.

4. Dispatch and Passing of Risk

4.1 Delivery shall be ex works. This is also the contractual place of performance. At the customer's request and expense, the goods shall be dispatched to another destination (sale to destination).

4.2 Kitagawa GmbH is entitled to determine the type of dispatch (in particular transport company, dispatch route, packaging etc.) itself. The transport packaging and all other packaging in accordance with the German Packaging Ordinance will not be taken back unless explicitly agreed otherwise in writing. The customer is obliged to dispose of the disposable packaging at his own expense.

4.3 The risk of accidental loss and accidental deterioration of the goods shall pass to the customer at the latest upon handover. If the customer is in default, this shall be deemed equivalent to handover.

4.4 In the case of sale to destination, the risk of accidental loss and accidental deterioration of the goods as well as the risk of delay shall already pass to the customer upon handover of the goods to the transport company or the person otherwise selected and designated to carry out the dispatch.

4.5 The rights of the customer pursuant to Section 9 of these GTC and the statutory rights of Kitagawa GmbH, in particular in the event of an exclusion of the obligation to perform due to impossibility, unreasonableness of performance, etc., shall remain unaffected.

4.6 If the customer fails to cooperate as required, is in default of acceptance or Kitagawa GmbH's performance is delayed for other reasons for which the customer is responsible, Kitagawa GmbH is entitled to demand compensation in line with the resulting damage, including additional expenses (e.g. storage costs).

5. Price

5.1 The prices in euros are based on the respective order confirmation from Kitagawa GmbH plus statutory VAT from the agreed place of delivery. Unless otherwise agreed, the prices notified to the customer shall apply ex warehouse plus statutory VAT.

5.2 In the case of sale to destination, the customer shall bear the transportation costs ex warehouse. Transport insurance shall only be taken out at the request and expense of the customer.

6. Payment Conditions

6.1 Unless explicitly agreed otherwise, the invoice amount shall be payable without any deductions 30 days after the due date and delivery of the invoice. Receipt of payment by Kitagawa GmbH shall be decisive for the timeliness of payment. Checks shall only be accepted on account of performance.

6.2 Upon expiry of the payment period, the customer shall be in default without the need for a separate reminder. Interest shall be charged on the purchase price during the period of default at the applicable statutory default interest rate (Section 288 (2) BGB). Kitagawa GmbH reserves the right to assert further claims for damages caused by default.

6.3 If the customer is in arrears with payment, Kitagawa GmbH reserves the right to demand advance payments or the provision of security before making further deliveries. The same shall apply if the financial circumstances of the customer give cause for concern as to whether the payment obligations will be properly fulfilled.

6.4 The customer may only offset Kitagawa GmbH's claim against legally established or undisputed counterclaims. The customer is only authorized to exercise a right of retention to the extent that his counterclaim is based on the same contractual relationship.

7. Retention of Ownership

7.1 All goods shall remain the property of Kitagawa GmbH until full payment of all present and future claims arising from the purchase contract and from the business relationship with Kitagawa GmbH.

7.2 The customer shall be entitled to resell the goods subject to retention of title in the ordinary course of business. In this case, the customer hereby assigns to Kitagawa GmbH all claims resulting from the resale, irrespective of whether the goods have been further processed or not. Kitagawa GmbH hereby accepts this assignment. Without affecting Kitagawa GmbH's right to demand payment, the customer is authorized to demand payment on the assigned claims. For this purpose, Kitagawa GmbH shall not demand payment on the assigned claims provided that the customer fulfills all his payment obligations and there is no threat of insolvency or similar proceedings or default of payment.

7.3 The goods subject to Kitagawa GmbH's retention of ownership may not be pledged to third parties or assigned as security before the secured claims have been paid in full. The customer shall inform Kitagawa GmbH immediately in writing if and insofar as third parties seize the goods belonging to Kitagawa GmbH.

7.4 By processing the goods subject to retention of title sold, the customer does not acquire ownership of the wholly or partially manufactured items; the processing is carried out free of charge exclusively for Kitagawa GmbH as processor within the meaning of § 950 BGB. Should this retention of ownership nevertheless expire due to any circumstances, the customer and Kitagawa GmbH hereby agree that ownership of the goods shall be transferred to Kitagawa GmbH upon processing, that Kitagawa GmbH accepts this transfer of ownership and that the customer shall remain the custodian of the goods free of charge. If Kitagawa GmbH's retained goods are processed or inseparably mixed with

items still owned by third parties, Kitagawa GmbH shall acquire co-ownership of the new items or mixed stock. The extent of the co-ownership is determined by the ratio of the invoice value of the reserved goods delivered by Kitagawa GmbH to the invoice value of the other goods.

7.5 The customer is authorized to collect the assigned claim in his own name. However, Kitagawa GmbH shall be entitled to revoke this direct debit authorization at any time, in particular if the customer does not meet his contractual obligations to Kitagawa GmbH (in particular if he is in default of payment), insolvency proceedings or application to open such proceedings have been filed or any other deficiency in his ability to pay is apparent. In the event of revocation, the customer shall be obliged to provide or hand over to Kitagawa GmbH all information and documents necessary to assert the assigned claims and to disclose the assignments to his customers. In the event of default of payment by the customer, Kitagawa GmbH is entitled to notify the customer's purchasers about the assignment.

7.6 The customer is obliged to provide Kitagawa GmbH at any time with information on the whereabouts of the goods subject to retention of title and on the claims arising from their resale. The customer is obliged to notify Kitagawa GmbH in writing of any access by third parties to the goods subject to retention of title or to the claims assigned to Kitagawa GmbH and to inform the third party of the rights of Kitagawa GmbH. Furthermore, the customer is obliged to support Kitagawa GmbH in asserting and enforcing its rights against third parties, in particular to take the necessary immediate legal action/remedies to protect the rights of Kitagawa GmbH at its own expense.

7.7 If the customer fails to meet his contractual obligations to Kitagawa GmbH (in particular in the event of non-payment of the purchase price due), Kitagawa GmbH shall be entitled to withdraw from

the contract in accordance with the statutory provisions and to demand the return of the goods on the basis of the retention of title and the withdrawal.

7.8 The customer is obliged to treat the delivered goods subject to retention of title with care. In particular, he shall be obliged to insure the reserved goods adequately at his own expense against destruction, damage by fire, water, burglary or theft. The customer hereby assigns his insurance claims in this respect to Kitagawa GmbH. Kitagawa GmbH hereby accepts the assignment and declares the reassignment to the customer with the proviso that this becomes effective if and as soon as the retention of title has expired.

7.9 Insofar as the claims of Kitagawa GmbH as a whole are secured beyond doubt by more than 125% by the assignments or reservations declared above, the surplus of the outstanding amounts or the reserved goods within the meaning of Section 7.1 above shall be released by Kitagawa GmbH at the request of the customer at its discretion.

8. Warranty

8.1 Kitagawa GmbH warrants for a period of twelve months that the goods are free of defects upon passing of risk. This warranty shall commence upon delivery of the goods.

8.2 Drawings, illustrations, dimensions, weights and/or other performance data are non-binding and do not constitute a quality agreement or warranty. Unless explicitly agreed otherwise, they describe the general condition of the goods, but not their individual properties. Changes within the meaning of section 2.4 of the GTC do not constitute a defect in the goods.

8.3 No warranty shall be provided in the event of improper use, non-compliance with assembly or operating instructions, incorrect installation, incorrect operation, etc. Likewise, no warranty shall be provided for cases of damage caused by the operation of the goods together with devices whose compatibility has not been explicitly confirmed in writing by Kitagawa GmbH.

8.4 The customer's claims for defects presuppose that he has complied with his statutory duties of inspection and notification of defects (Section 377 HGB (German Commercial Code)). If a defect is discovered during the inspection or later, Kitagawa GmbH must be notified of this in writing without delay. The notification shall be deemed immediate if it is made within two weeks of delivery or later discovery, whereby the timely dispatch of the notification shall suffice to meet the deadline. Irrespective of these obligations to inspect and give notice of defects, the customer must notify Kitagawa GmbH in writing of obvious defects (including incorrect and short deliveries) within two weeks of delivery, whereby the timely dispatch of the notification is also sufficient to meet the deadline.

8.5 If the customer fails to properly inspect the goods or to report defects, Kitagawa GmbH's liability for the unreported defect shall be excluded and Kitagawa GmbH's performance shall be deemed to have been provided free of defects.

8.6 In the event of defects, the warranty is provided at the discretion of Kitagawa GmbH for subsequent performance through free rectification or replacement delivery. The customer is obliged to give Kitagawa GmbH the time and opportunity required for the subsequent performance owed, in particular to allow Kitagawa GmbH to inspect the defective goods. If the rectification of defects also fails at the second attempt or if the second replacement delivery is also defective or if Kitagawa GmbH does not fulfill its obligation to make a subsequent delivery or replacement delivery within a reasonable period of time, the customer is entitled to reduce the purchase price or withdraw from the contract. The right of withdrawal is excluded if the defect is insignificant.

8.7 If the customer's request for rectification of defects proves to be unjustified, Kitagawa GmbH shall be entitled to demand reimbursement from the customer of the costs incurred for subsequent performance.

8.8 Claims of the customer for damages or compensation for useless expenses shall only exist in accordance with the following Section 9 of these GTC and are excluded beyond this.

9. Liability

9.1 Kitagawa GmbH is only liable in the event of willful intent or gross negligence.

9.2 In the event of ordinary negligence, the Kitagawa GmbH is only liable for damages caused by loss of life, physical injury or harm to health, and for damages from a breach of a material contractual obligation (cardinal obligations). In the case of the latter, however, Kitagawa GmbH's liability is limited to compensation of foreseeable, typically damages.

9.3 In the absence of a warranted characteristic of the goods, liability shall be limited to the damage to be expected in the normal course of events. Further claims due to defective goods are excluded.

9.4 Otherwise, any liability of Kitagawa GmbH beyond this, in particular for indirect and consequential losses, lost profit, unrealized savings etc., is excluded. This excludes consequential damages due to a breach of cardinal obligations.

9.5 The customer may withdraw from or terminate the agreement due to a breach of obligations that does not consist of a defect of the product only insofar as the Kitagawa GmbH is responsible for this breach.

9.6 Claims from the customer according to the Produkthaftungsgesetz (German Product Liability Act) are unaffected.

10. Limitation Period

10.1 By way of deviation from Sec. 438 (1) No. 3 BGB, the general limitation period for claims to quality and title defects is one year from delivery.

10.2 The above limitation periods under commercial law also apply to contractual and non-contractual claims from the customer for damages based on a defect in the goods, unless applying the regular statutory limitation periods would in the specific case lead to a shorter limitation period.

10.3 The limitation periods of the Produkthaftungsgesetz are unaffected.

11. Miscellaneous

11.1 The Customer shall not be entitled to assign rights and obligations arising from the contract concluded with Kitagawa GmbH to third parties without the prior consent of Kitagawa GmbH, with the exception of the cases regulated within the GTC.

11.2 These GTCs and all contractual relationships between the Kitagawa GmbH and its customers are subject to German law under exclusion of the UN CISG.

11.3 The exclusive place of jurisdiction for all disputes and types of proceedings arising from or in connection with the contractual relationship between the parties is Offenbach am Main.

11.4 The invalidity of individual provisions of these GTC of Kitagawa GmbH shall not affect the validity of the remaining provisions. Ineffective provisions shall be deemed to be replaced by such effective provisions as are suitable to realize the economic purpose of the omitted provision as far as possible.

11.5 The German version of this General Terms of Conditions shall be binding. The English Version shall only serve for information purposes.

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GTC Kitagawa GmbH (As of: February 2024)

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