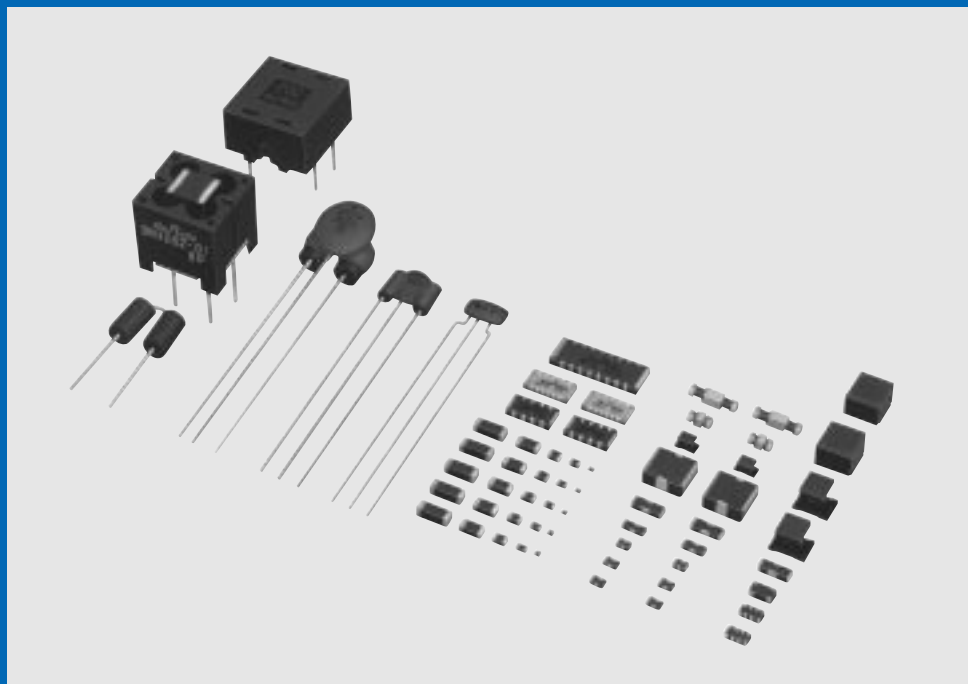


On-Board Type (DC) EMI Suppression Filters (EMIFIL®)

Murata EMC Solutions : <http://www.murata.co.jp/emc/>

EMI SUPPRESSION FILTERS



muRata *Innovator
in Electronics*

Murata
Manufacturing Co., Ltd.

Cat.No.C31E-6

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● **Part Numbering** (The structure of the "Global Part Numbers" that have been adopted since June 2001 and the meaning of each code are described herein.)
 (If you have any questions about details, inquire at your usual Murata sales office or distributor.)

Chip EMIFIL® Inductor Type

(Global Part Number)

BL	M	18	AG	102	S	N	1	D
①	②	③	④	⑤	⑥	⑦	⑧	⑨

① Product ID

Product ID	
BL	Chip Ferrite Beads

② Type

Code	Type
A	Array Type
M	Monolithic Type
D	Monoblock Type

③ Dimension (L×W)

Code	Dimension (L×W)	EIA
15	1.00×0.50mm	0402
18	1.60×0.80mm	0603
21	2.00×1.25mm	0805
31	3.20×1.60mm	1206
32	3.20×2.50mm	1210
41	4.50×1.60mm	1806

④ Characteristics

Code	Characteristics
A □ *1	for General Use
B □ *2	for High-speed Signal Lines
P □ *3	for Power Supplies
RK	for Digital Interface
HG	for GHz Band General Use
HD	for GHz Band High-speed Signal Line

*1 For standard type, □ is expressed by "G".

*2 □ is expressed by "A", "B" or "D".

*3 □ is expressed by "G", "M", "B", "F".

⑤ Impedance

Expressed by three figures. The unit is in ohm (Ω). The first and second figures are significant digits, and the third figure expresses the number of zeros which follow the two figures.

⑥ Performance

Expressed by an alphabet.

Ex.)

Code	Performance
S	Sn Plating

⑦ Category

Code	Category
N	Standard Type
H	for Automotive Electronics

⑧ Numbers of Circuit

Code	Numbers of Circuit
1	1Circuit
4	4Circuit
6	6Circuit
8	8Circuit

⑨ Packaging

Code	Packaging
K	Plastic Taping (ø330mm Reel)
L	Plastic Taping (ø180mm Reel)
B	Bulk
J	Paper Taping (ø330mm Reel)
D	Paper Taping (ø180mm Reel)
C	Bulk Case

Chip EMIFIL[®] Capacitor Type

(Global Part Number) **NF** **M** **3D** **CC** **102** **R** **1H** **3** **L**
 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

① Product ID

Product ID	
NF	Chip EMI Filters Capacitor Type

② Structure

Code	Structure
M	Capacitor Type

③ Dimension (L×W)

Code	Dimension (L×W)	EIA
21	2.00×1.25mm	0805
3D	3.20×1.25mm	1206
31	3.20×1.60mm	1206
41	4.50×1.60mm	1806
55	5.70×5.00mm	2200

④ Features

Code	Features
CC	Capacitor Type for Signal Lines
PC	Capacitor Type for Large Current
HC	Capacitor Type for Automotive Electronics

⑤ Capacitance

Expressed by three figures. The unit is in pico-farad (pF). The first and second figures are significant digits, and the third figure expresses the number of zero which follow the two figures.

⑥ Capacitance Change

Code	Capacitance Change
B	±10%
F	+30/-80%
R	±15%
U	-750 ±120ppm
S	+350 to -1000ppm

⑦ Rated Voltage

Code	Rated Voltage
1A	10V
1C	16V
1E	25V
1H	50V
2A	100V

⑧ Electrode/Others

Expressed by a figure.

Ex.)

Code	Electrode
3	Sn Plating
4	Solder Coating
9	Others

⑨ Packaging

Code	Packaging
L	Plastic Taping (ø180mm Reel)
B	Bulk
D	Paper Taping (ø180mm Reel)

Chip EMIFIL® Capacitor Array Type

(Global Part Number) **NF** **A** **31** **CC** **101** **S** **1E** **4** **B**
 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

① Product ID

Product ID	
NF	Chip EMI Filters Capacitor Type

② Structure

Code	Structure
A	Array Type

③ Dimension (L×W)

Code	Dimension (L×W)
31	3.20×1.60mm
6C	6.30×3.20mm
C1	12.5×4.5mm

④ Features

Code	Features
CC	Capacitor Type for Signal Lines

⑤ Capacitance

Expressed by three figures. The unit is in pico-farad (pF). The first and second figures are significant digits, and the third figure expresses the number of zero which follow the two figures.

⑥ Capacitance Change

Code	Capacitance Change
F	+30/-80%
R	±15%
S	+350 to -1000ppm

⑦ Rated Voltage

Code	Rated Voltage
1C	16V
1E	25V
1H	50V

⑧ Numbers of Circuit

Code	Number of Circuit
4	4 circuit
6	6 circuit
8	8 circuit

⑨ Packaging

Code	Packaging
B	Bulk
D	Paper Taping (ø180mm Reel)
L	Plastic Taping (ø180mm Reel)

Chip EMIFIL[®] LC Combined Type

(Global Part Number) **NF** **W** **31** **SP** **206** **X** **1E** **4** **L**
 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

① Product ID

Product ID	
NF	Chip EMI Filters LC Combined Type

② Structure

Code	Structure
L	Monolithic, LC Combined Type
W	Winding, LC Combined Type
E	Block, LC Combined Type

③ Dimension (L×W)

Code	Dimension (L×W)	EIA
21	2.0×1.25mm	0805
31	3.20×1.60mm	1206
61	6.80×1.60mm	2606

④ Features

Code	Features
SP	π Circuit for Signal Lines
PT	T Circuit for Large Current
HP	π Circuit for Automotive Electronics
HT	T Circuit for Automotive Electronics

⑤ Cut-off Frequency (NFL/NFW Series)

Expressed by three figures. The unit is in hertz (Hz). The first and second figures are significant digits, and the third figure expresses the number of zeros which follow the two figures.

⑥ Capacitance (NFE Series)

Expressed by three figures. The unit is in pico-farad (pF). The first and second figures are significant digits, and the third figure expresses the number of zero which follow the two figures.

⑦ Characteristics (NFL/NFW Series)

Code	Characteristics
X	Cut off Frequency

⑧ Capacitance Change (NFE Series)

Code	Capacitance Change
B	±10%
C	±20%, ±22%
D	+20/-30%, +22/-33%
E	+20/-55%, +22/-56%
F	+30/-80%, +22/-82%
R	±15%
U	-750 ±120ppm/ °C
Z	Other

⑨ Rated Voltage

Code	Rated Voltage
1C	16V
1E	25V
1H	50V
2A	100V

⑩ Electrode

Expressed by a figure.

Ex.)

Code	Electrode
0	Ag / Pd Outer Electrode
3	Sn Plating
4	Solder Coating
9	Others

⑪ Packaging

Code	Packaging
K	Plastic Taping (ø330mm Reel)
L	Plastic Taping (ø180mm Reel)
B	Bulk
J	Paper Taping (ø330mm Reel)
D	Paper Taping (ø180mm Reel)

Chip EMIFIL® RC Combined Type

(Global Part Number)

NF	R	21	GD	470	470	2	L
①	②	③	④	⑤	⑥	⑦	⑧

① Product ID

Product ID	
NF	EMIFIL®

② Structure

Code	Structure
R	RC Combined Type

③ Dimension (L×W)

Code	Dimension (L×W)	EIA
21	2.00×1.25mm	0805
3D	3.20×1.25mm	1206

④ Features

Code	Features
GD	RC Combined Type for Signal Lines

⑤ Capacitance

Expressed by three figures. The unit is in pico-farad (pF). The first and second figures are significant digits, and the third figure expresses the number of zero which follow the two figures. If there is a decimal point, it is expressed by capital letter "R". In this case, all figure are significant digits.

⑥ Resistance

Expressed by three figures. The unit is in ohm (Ω). The first and second figures are significant digits, and the third figure expresses the number of zero which follow the two figures. If there is a decimal point, it is expressed by capital letter "R". In this case, all figures are significant digits.

⑦ Electrode/Others

Code	Electrode
1	Ag Plating
2	Sn Plating

⑧ Packaging

Code	Packaging
L	Plastic Taping (ø180mm Reel)
B	Bulk
D	Paper Taping (ø180mm Reel)

Chip EMIFIL® RC Combined Array Type

(Global Part Number)

NF	A	31	GD	100	101	4	D
①	②	③	④	⑤	⑥	⑦	⑧

① Product ID

Product ID	
NF	EMIFIL®

② Structure

Code	Structure
A	Array Type

③ Dimension (L×W)

Code	Dimension (L×W)
31	3.20×1.60mm

④ Features

Code	Features
GD	RC Combined Type for Signal Lines

⑤ Capacitance

Expressed by three figures. The unit is in pico-farad (pF). The first and second figures are significant digits, and the third figure expresses the number of zero which follow the two figures. If there is a decimal point, it is expressed by capital letter "R". In this case, all figure are significant digits.

⑥ Resistance

Expressed by three figures. The unit is in ohm (Ω). The first and second figures are significant digits, and the third figure expresses the number of zero which follow the two figures. If there is a decimal point, it is expressed by capital letter "R". In this case, all figures are significant digits.

⑦ Numbers of Circuit

Code	Numbers of Circuit
4	4 Circuit

⑧ Packaging

Code	Packaging
B	Bulk
D	Paper Taping (ø180mm Reel)

Chip EMIFIL® Common Mode Choke Coils

(Global Part Number) **DL** **M** **31** **K** **N** **281** **S** **J** **2** **L**
 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩

① Product ID

Product ID	
DL	Chip Common Mode Choke Coils

② Structure

Code	Structure
W	Monolithic Type
M	Winding Type
P	Film Type

③ Dimension (L×W)

Code	Dimension (L×W)	EIA
21	2.00×1.20mm	0805
31	3.20×1.60mm	1206
2H	2.50×2.00mm	-
5A	5.00×3.60mm	-
5B	5.00×5.00mm	-

④ Type

Code	Type
S	Magnetically Shielded One Circuit Type
D	Magnetically Shielded Two Circuit Type
H	Open Magnetic One Circuit Type
K	Magnetically Monolithic Type (bifilar winding)
G	Magnetically Monolithic Type (sectional winding)

⑤ Category

Code	Category
N	Standard Type

⑥ Impedance

Typical impedance at 100MHz is expressed by three figures. The unit is in ohm (Ω). The first and second figures are significant digits, and the third figure expresses the number of zero which follow the two figures.

⑦ Circuit

Code	Circuit
S	Standard Type

⑧ Features

Expressed by an alphabet.

⑨ Numbers of Signal Line

Code	Number of Signal Line
2	Two Lines
3	Three Lines
4	Four Lines

⑩ Packaging

Code	Packaging
K	Plastic Taping (ϕ 330mm Reel)
L	Plastic Taping (ϕ 180mm Reel)
B	Bulk

Lead Type EMIFIL® Inductor Type

(Global Part Number) **BL** **02** **RN** **2** **R1** **K** **2** **B**

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Product ID

Product ID	
BL	Ferrite Beads Inductors

② Series

Code	Series
01	Beads ø3.6
02	Beads ø3.4
03	Beads ø2.3 max.

③ Beads Core Material

Code	Beads Core Material
RN	Standard Type

④ Numbers of Beads Core

Code	Numbers of Beads Core
1	1
2	2

⑤ Lead Type

Code	Lead Type
A1	Axial Straight Type
A2	Axial Crimp Type
R1	Radial Straight Type
R2	Radial Straight and wave formed Leads Type

⑥ Lead Length, Space

Code	Lead Length, Space
A	Bulk, Axial Type, 3.7mm
B	Bulk, Axial Type, 4.6mm
C	Bulk, Axial Type, 10.0mm
D	Bulk, Axial Type, 47.0mm
E	Taping Axial Type, 26.0mm
F	Taping, Axial Type, 52.0mm
G	Bulk, Radial Type, 3.5mm
H	Bulk, Radial Type, 4.0mm
J	Bulk, Radial Type, 5.0mm
K	Bulk, Radial Type, 6.0mm
L	Bulk, Radial Type, 8.0mm
M	Bulk, Radial Type, 10.0mm
N	Taping, Radial Type, 16.5mm
P	Taping, Radial Type, 18.5mm
Q	Taping, Radial Type, 20.0mm

⑦ Lead Diameter

Code	Lead Diameter
1	ø0.60mm
2	ø0.65mm

⑧ Packaging

Code	Packaging
A	Ammo Pack
B	Bulk
J	Paper Reel (ø320mm)

Lead Type EMIFIL[®] Capacitor Type

(Global Part Number) **DS** **S** **9** **H** **B3** **2E** **271** **Q55** **B**
 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

① Product ID

Product ID	
DS	Three-terminals Capacitor

② Structure

Code	Structure
N	No Ferrite Beads Type
S	Built-in Ferrite Beads Type
T	with Ferrite Beads Type

③ Style

Code	Style
6	Diameter 8.0mm Type
9	Diameter 9.5mm Type

④ Category

Code	Category
N	for General Use
H	for Heavy-duty

⑤ Temperature Characteristics

Code	Temperature Characteristics
B3	±10% (Temperature Range : -25°C to +85°C)
D3	+20/-30% (Temperature Range : -25°C to +85°C)
E3	+20/-55% (Temperature Range : -25°C to +85°C)
F3	+30/-80% (Temperature Range : -25°C to +85°C)
Z8	+30/-85% (Temperature Range : -10°C to +60°C)

⑥ Rated Voltage

Code	Rated Voltage
1C	16V
1H	50V
2A	100V
2E	250V

⑦ Capacitance

Expressed by three figures. The unit is in pico-farad (pF). The first and second figures are significant digits, and the third figure expresses the number of zero which follow the two figures.

⑧ Lead Type

Code	Lead Type
Q□□	Straight Type
T□□, U□□	Others

⑨ Packaging

Code	Packaging
A	Ammo Pack
B	Bulk
J	Paper Reel (ø320mm)

Lead Type Common Mode Choke Coils / AC Line Filters

(Global Part Number) **PL A 10 A S 152 2R0 R 2 B**
 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩

① Product ID

Product ID	
PL	Common Mode Choke Coils

② Type

Code	Type
T	DC Type
A	Standard Type
H	High-frequency Type
Y	Hybrid Choke Coils Type

③ Applications

Code	Applications
08	for DC Line
09	for DC Line High-frequency Type
10	for AC Line

④ Structure

Code	Structure
A	Core Vertical Type
H	Core Horizontal Type
C	Case Type

⑤ Features

Code	Features
S	Safety Recognized
N	General Use

⑥ Inductance

Expressed by three figures. The unit is micro-henry (μH). The first and second figures are significant digits, and the third figure expresses the number of zero which follow the two figures. If there is a decimal point, it is expressed by capital letter "R". In this case, all figures are significant digits. If inductance is less than 0.1 μH , the inductance code is expressed by combination of two figures and capital letter "N", and the unit of inductance is nano-henry (nH). Capital letter "N" indicates the unit of "nH", and also expresses a decimal point. In this case, all figure are significant digits.

⑦ Rated Current

Expressed by three figures. The unit is in ampere (A). A decimal point is expressed capital letter "R". In this case, all figures are significant digits.

⑧ Winding Mode

Code	Winding Mode
D	Sectional Winding Type
R	Standard Type
P	Aligned Winding Type
T	Troidal Type

⑨ Lead Dimensions

Code	Lead Dimensions
2	3.5mm
1	5mm
0	4mm (PLT)
3	4mm (Except for PLT)

⑩ Packaging

Code	Packaging
B	Bulk
M	Magazine Package

•Please contact us for FKOB type.

Chip Varistors

(Global Part Number)

VC	M	18	R	N	180	D	S	1	L
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩

① Product ID

Product ID	
VC	Chip Varistor

② Structure

Code	Structure
M	Monolithic Type

③ Dimension (L×W)

Code	Dimension (L×W)	EIA
18	1.60×0.80mm	0603
21	2.00×1.25mm	0805

④ Style

Code	Style
R	Standard Type

⑤ Category

Code	Category
N	Standard Type

⑥ Rated Voltage

Expressed by three figures. The unit is in volts (V). The first and second figures are significant digits, and the third figure expresses the number of zero which follow the two figures. If there is a decimal point, it is expressed by capital letter "R". In this case, all figures are significant digits.

⑦ Electrode

Expressed by a figure.

Ex.)

Code	Electrode
D	Ag/Pd
S	Sn

⑧ Characteristics

Code	Characteristics
S	Standard Type

⑨ Number of Circuit

Code	Number of Circuit
1	1 Circuit

⑩ Packaging

Code	Packaging
L	Plastic Taping (ø180mm Reel)
B	Bulk

Chip EMIGUARD® (EMIFIL® with Varistor Function)

(Global Part Number)

VF	M	41	R	N	222	N	1C	L
①	②	③	④	⑤	⑥	⑦	⑧	⑨

① Product ID

Product ID	
VF	Chip Solid EMIGUARD®

② Structure

Code	Structure
M	Monolithic Type

③ Dimension (L×W)

Code	Dimension (L×W)
41	4.50×1.60mm

④ Outer Electrode

Code	Outer Electrode
R	Standard Type

⑤ Category

Code	Category
N	Standard

⑥ Capacitance

Expressed by three figures. The unit is in pico-farad (pF). The first and second figures are significant digits, and the third figure expresses the number of zero which follow the two figures.

⑦ Capacitance Tolerance

Code	Capacitance Tolerance
N	±30%

⑧ Rated Voltage

Code	Rated Voltage
1C	16V

⑨ Packaging

Code	Packaging
L	Plastic Taping (ø180mm Reel)
B	Bulk

Lead Type EMIGUARD® (EMIFIL® with Varistor Function)

(Global Part Number) **VF** **S** **6** **V** **D8** **1E** **221** **T51** **B**
 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

① Product ID

Product ID	
VF	EMIGUARD® Lead Type

② Structure

Code	Structure
S	Built-in Ferrite Beads Type
R	with Resistance

③ Style

Code	Style
3	Size is expressed by a figure
6	
9	

④ Features

Code	Features
V	with Varistor Function

⑤ Temperature Characteristics

Code	Temperature Characteristics
D8	+20/-30% (Temperature Range : -40°C~+105°C)
D3	+20/-30% (Temperature Range : -25°C~+85°C)

⑥ Rated Voltage

Code	Rated Voltage
1E	25V
1B	12V

⑦ Capacitance

Expressed by three figures. The unit is in pico-farad (pF). The first and second figures are significant digits, and the third figure expresses the number of zero which follow the two figures.

⑧ Lead Type






Code	Lead Type
Q□□	Straight Type
T□□, U□□	Others


⑨ Packaging

Code	Packaging
B	Bulk
J	Taping (Reel)
A	Flat Pack


Products Guide /Effective Frequency Range








■ Products Guide


Type	Series	Dimensions		Effective Frequency Range						Page				
		(mm)	EIA Code	10kHz	100kHz	1MHz	10MHz	100MHz	1GHz		10GHz			
Inductor Type	For Digital Interface 	BLM18R	1.6 ■ ±0.8	0603									24-68	
		BLM21R	2.0 ■ ±1.25	0805										
	Standard Type 	BLM15A	1.0 ■ ±0.5	0402										
		BLM18A	1.6 ■ ±0.8	0603										
		BLM21A	2.0 ■ ±1.25	0805										
		BLM31A	3.2 ■ ±1.6	1206										
		BLM41A	4.5 ■ ±1.6	1806										
		BLA31A (4 circuits array)	3.2 ■ ±1.6	1206										
	For High Speed Signal 	BLM15B	1.0 ■ ±0.5	0402										24-68
		BLM18B	1.6 ■ ±0.8	0603										
BLM21B		2.0 ■ ±1.25	0805											
BLM31B		3.2 ■ ±1.6	1206											
BLA31B (4 circuits array)		3.2 ■ ±1.6	1206											
For Large Current 	BLM18P	1.6 ■ ±0.8	0603									24-68		
	BLM21P	2.0 ■ ±1.25	0805											
	BLM31P	3.2 ■ ±1.6	1206											
	BLM41P	4.5 ■ ±1.6	1806											
For GHz Range Noise Suppression 	BLM18HG	1.6 ■ ±0.8	0603									55-62		
	BLM18HD	1.6 ■ ±0.8	0603											
	BLM18HK	1.6 ■ ±0.8	0603											

Continued on the following page. 

Products Guide /Effective Frequency Range

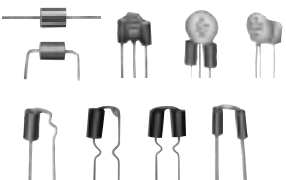


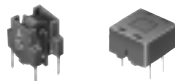
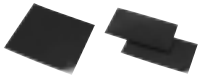
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Type	Series	Dimensions		Effective Frequency Range						Page			
		(mm)	EIA Code	10kHz	100kHz	1MHz	10MHz	100MHz	1GHz		10GHz		
Capacitor Type	Standard Type 	NFM21C	$\frac{2.0}{\blacksquare} \times 11.25$	0805								69-71	
		NFM3DC	$\frac{3.2}{\blacksquare} \times 11.25$	1205									
		NFM41C	$\frac{4.5}{\blacksquare} \times 11.6$	1806									
		NFAC1C (8 circuits array)	$\frac{12.5}{\blacksquare} \times 4.5$	5018									72-74
		NFA6CC (6 circuits array)	$\frac{6.3}{\blacksquare} \times 3.2$	2512									
		NFA31C (4 circuits array)	$\frac{3.2}{\blacksquare} \times 11.6$	1206									
For Signal Line		NFL21S	$\frac{2.0}{\blacksquare} \times 11.25$	0805								81	
		NFR21G	$\frac{2.0}{\blacksquare} \times 11.25$	0805								75-78	
		NFA31G (4 circuits array)	$\frac{3.2}{\blacksquare} \times 11.6$	1206								79-80	
		NFW31S	$\frac{3.2}{\blacksquare} \times 11.6$	1206								82-83	
For Large Current		NFM21P	$\frac{2.0}{\blacksquare} \times 11.25$	0805								87-90	
		NFM3DP	$\frac{3.2}{\blacksquare} \times 11.25$	1205									
		NFM41P	$\frac{4.5}{\blacksquare} \times 11.6$	1806									
		NFM55P	$\frac{5.7}{\blacksquare} \times 5.0$	2220									
T Filter for Large Current		NFE31P	$\frac{3.2}{\blacksquare} \times 11.6$	1206								84-86	
		NFE61P(H)	$\frac{6.8}{\blacksquare} \times 11.6$	2706									
With Varistor Function		VFM41R	$\frac{4.5}{\blacksquare} \times 11.6$	1806								104-108	
Common Mode Choke Coil		DLP31S	$\frac{3.2}{\blacksquare} \times 11.6$	1206								109	
		DLP31D	$\frac{3.2}{\blacksquare} \times 11.6$	1206								110	
		DLM31K	$\frac{3.2}{\blacksquare} \times 11.6$	1206								111	
		DLW21S	$\frac{2.0}{\blacksquare} \times 11.2$	0805									
		DLW31S	$\frac{3.2}{\blacksquare} \times 11.6$	1206									
		DLW5BS (DLW5AH)	$\frac{5.0}{\blacksquare} \times \frac{5.0}{(3.6)}$	2020 (2014)									
Chip Varistor		VCM18R	$\frac{1.6}{\blacksquare} \times 0.8$	0603								120-124	
		VCM21R	$\frac{2.0}{\blacksquare} \times 11.25$	0805									

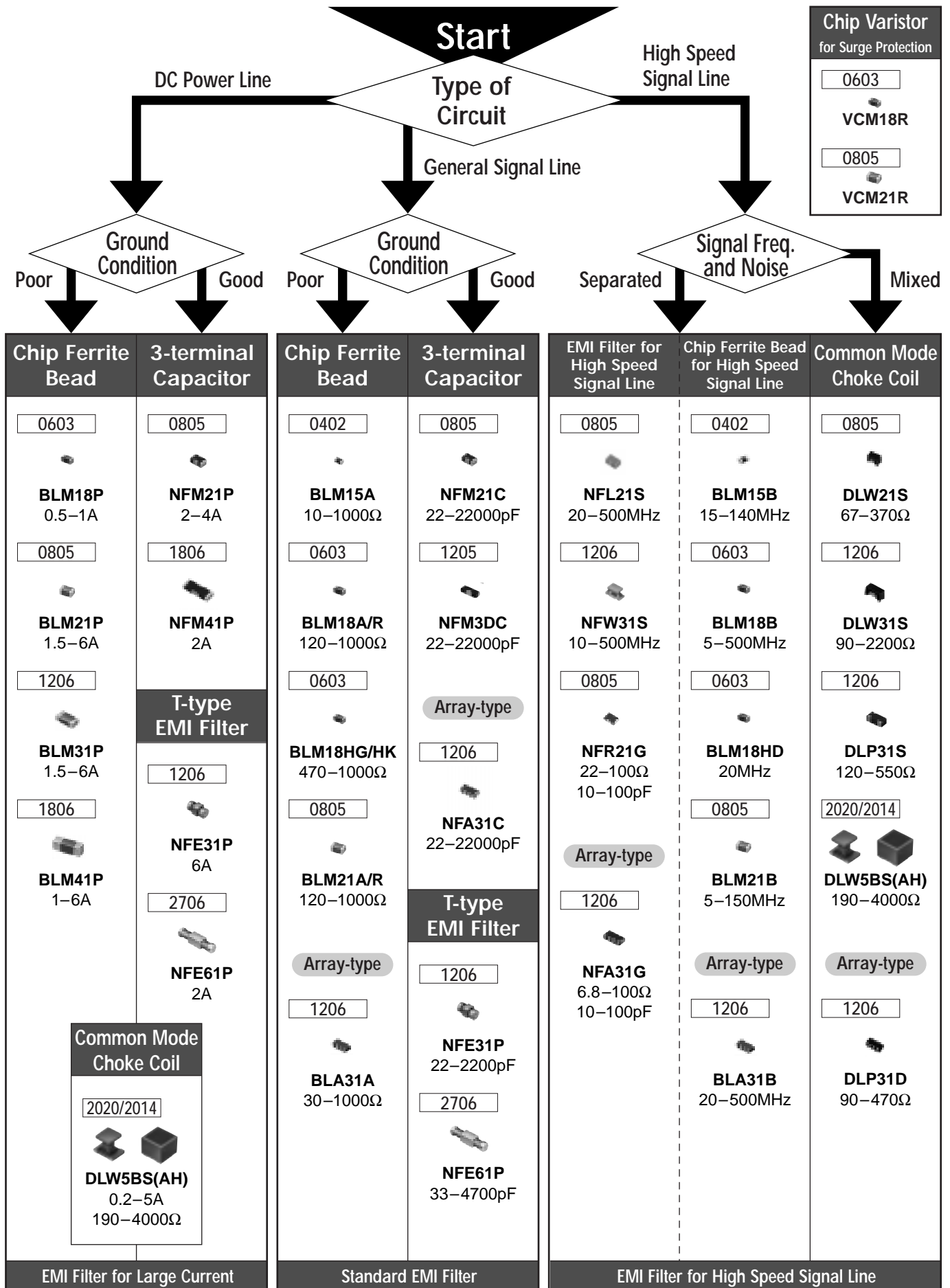
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Products Guide /Effective Frequency Range

Continued from the preceding page.

Type	Series	Dimensions		Effective Frequency Range							Page	
		(mm)	EIA Code	10kHz	100kHz	1MHz	10MHz	100MHz	1GHz	10GHz		
Disc Type EMIFIL® 	BL01/02/03 DSN6/9(H) DSS6/9(H) DST9(H)											129-137
EMIGUARD® 	VFR3V VFS6V/9V											138-143
Block Type EMIFIL® 	BNP/BNX											145-147
Common Mode Choke Coil 	PLT08C/09H											148-149
EMC Absorber 	EA10/20/21											151-152








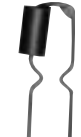
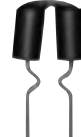



Selection Guide of EMI Filters



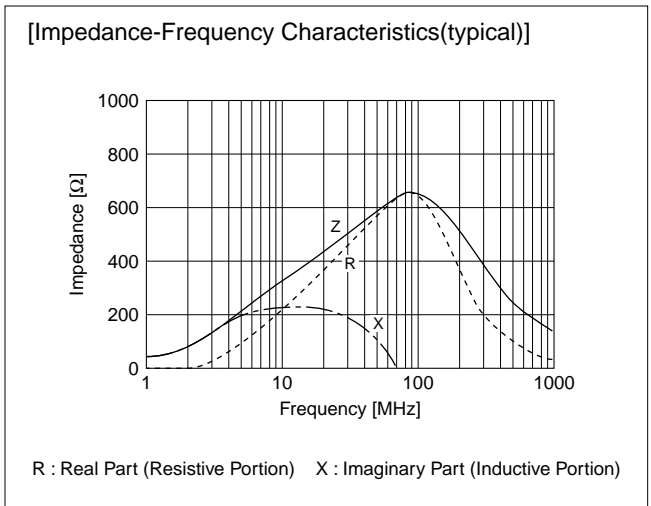
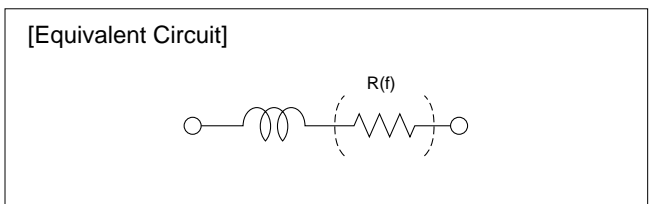
Impedance is typical value at 100MHz.

Outlines of EMI Suppression Filter (EMIFIL[®]) for DC Line

- Chip Ferrite Bead
- Ferrite Bead Inductor

Chip Ferrite BeadP.24-65 <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  BLM15 </div> <div style="text-align: center;">  BLM18 </div> <div style="text-align: center;">  BLM21 </div> </div> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 20px;"> <div style="text-align: center;">  BLM31 </div> <div style="text-align: center;">  BLM41 </div> <div style="text-align: center;">  BLA31 </div> </div>	Ferrite Bead InductorP.129-130 <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  BL01 </div> <div style="text-align: center;">  BL02RN1R3J2B </div> <div style="text-align: center;">  BL02RN2R3J2B </div> </div> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 20px;"> <div style="text-align: center;">  BL02RN1 </div> <div style="text-align: center;">  BL02RN2R1M2B </div> <div style="text-align: center;">  BL03RN2R1M1B </div> </div>
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- Inductor type EMI suppression filters are effective for frequencies ranging from a few MHz to a few GHz. Inductor type filters are widely used as a low noise countermeasure, as well as a universal noise suppression component.
- The inductor type EMIFIL[®] produce a micro inductance in the low frequency range. At high frequencies, however, the resistive component of the inductor produces the primary impedance. When inserted in series in the noise producing circuit, the resistive impedance of the inductor prevents noise propagation.

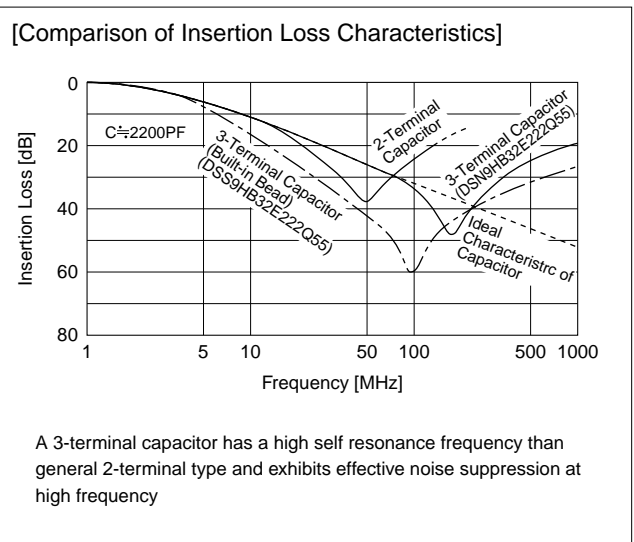


Outlines of EMI Suppression Filter (EMIFIL®) for DC Line

- Chip Solid EMIFIL®
- T-type Chip EMIFIL®
- Disk Type EMIFIL®







<p>Chip Solid EMIFIL®P.69–74 P.87–90</p> <p>NFM21C NFM21P NFA6CC</p> <p>NFM3DC NFAC1C NFA31C</p>	<p>T-type Chip EMIFIL®P.84–86</p> <p>NFE31P NFE61P/H</p>
<p>Disk Type EMIFIL®P.132–137</p> <p>DS□6 DS□9 DS□9H</p>	

- This capacitor type EMI suppression filter has a large noise suppression effect at frequencies ranging from a few MHz to hundreds of MHz. This type of filter is used widely as a universal, high performance EMI suppression component.
- The chip solid EMIFIL® incorporates a built-in three-terminal capacitor, eliminating the lead wire and thereby increasing the high-frequency performance characteristic.
- The T-type chip EMIFIL® is a chip EMI suppression filter with a built-in feed-thru capacitor. The use of ferrite beads on input and output terminals minimizes resonance with surrounding circuits.
- Whatever the situation, 3-terminal construction reduces residual inductance, thereby substantially improving noise suppression at frequencies over 10MHz.

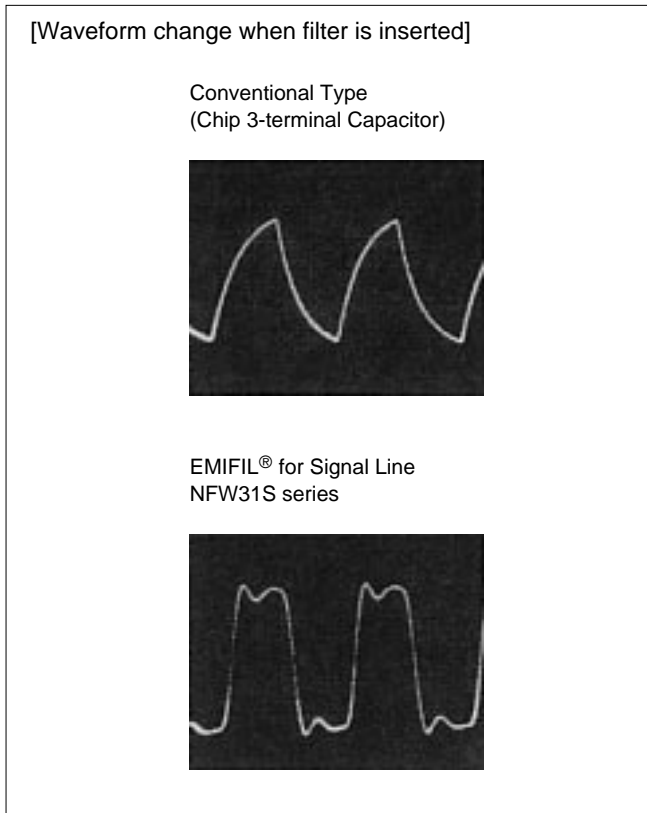
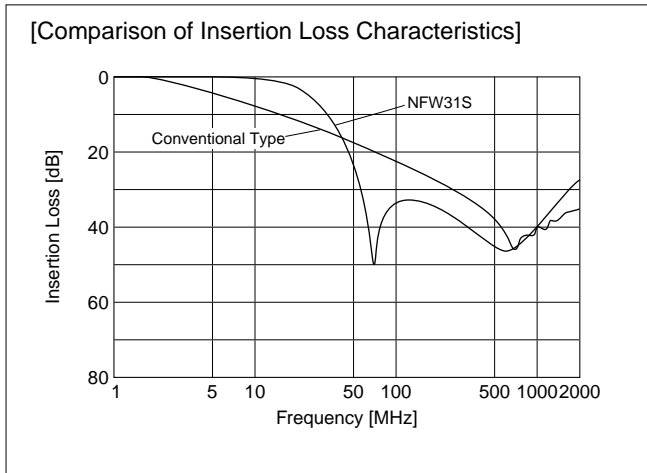


Outlines of EMI Suppression Filter (EMIFIL®) for DC Line

- Chip EMIFIL® for Signal Line
- Chip EMIFIL® with Waveform Distortion Suppressing Function

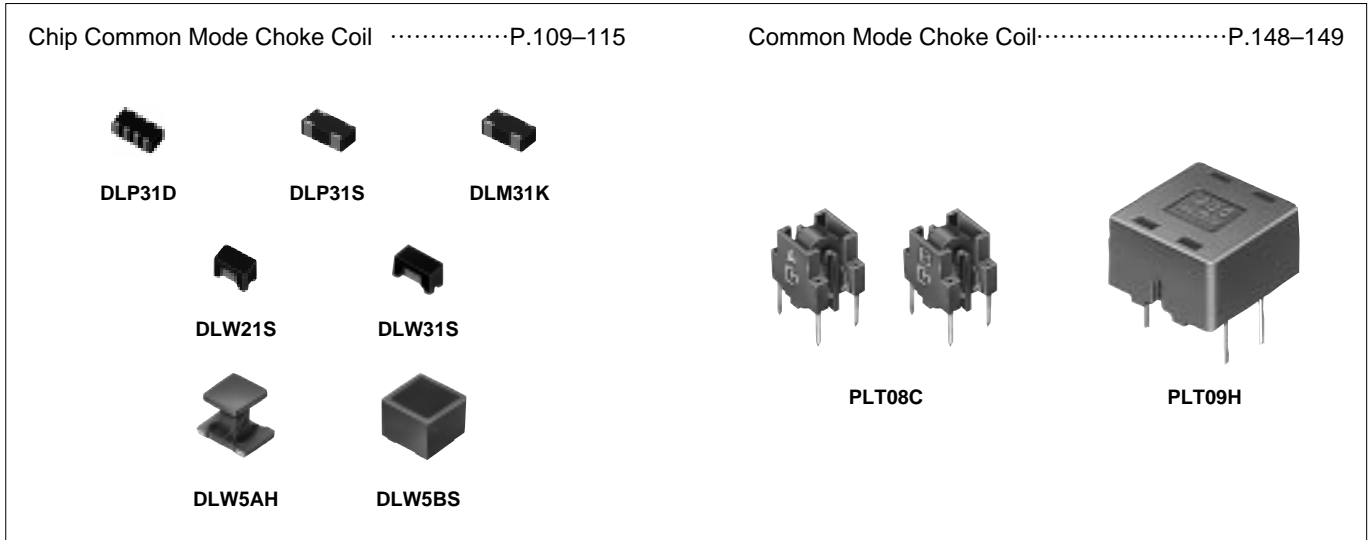
<p>Chip EMIFIL® for Signal LineP.31–48 P.81–82</p> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 20px;"> <div style="text-align: center;"> NFW31S</div> <div style="text-align: center;"> NFL21S</div> <div style="text-align: center;"> BLM18B/18HD</div> <div style="text-align: center;"> BLM21B</div> </div>	<p>Chip EMIFIL® with Waveform Distortion Suppressing FunctionP.75–80</p> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 20px;"> <div style="text-align: center;"> NFR21G</div> <div style="text-align: center;"> NFA31G</div> </div>
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- High-speed signal application EMIFIL® are high performance EMI suppression filters which increase the slope of insertion loss frequency characteristic curves (shape factor), thereby improving noise and signal separation. These are used for high speed signal applications in which noise and signal frequency approach the same value. To avoid the elimination of both the noise and specific signal components, 3-terminal capacitors and other components are applied. An NFW31S with a built-in capacitor and an inductor type BLM□□B are available. BLM18HD has additional performance for suppressing GHz range noise after cut off frequency.
- The EMIFIL® with waveform distortion suppressing function suppresses waveform distortion caused by the resonance of digital ICs and surrounding circuits.

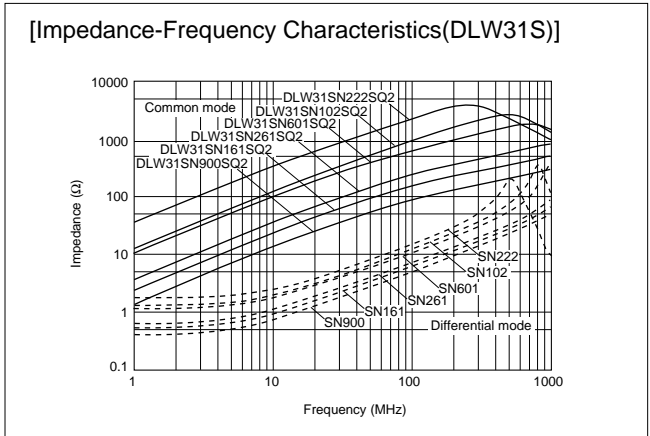
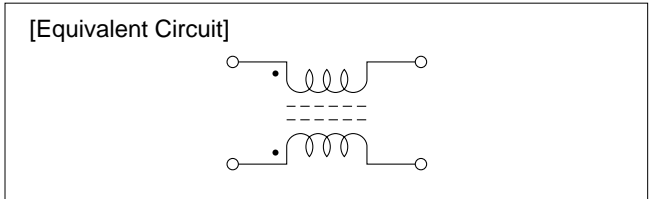
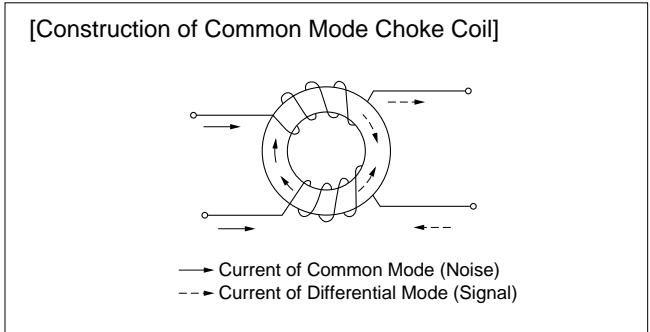


Outlines of EMI Suppression Filter (EMIFIL[®]) for DC Line

- Chip Common Mode Choke Coil
- Common Mode Choke Coil



- These choke coils reduce common mode noise, which causes problems on balanced transmission lines, and are effective against common mode noise in the several MHz to several 100 MHz frequency range. They are ideally suited for use on DC power supply lines and interface cables.
- There are two types of chip common mode choke coils: the high-performance wound wire DLW5BS/(AH). They offer particular characteristics to match the specific application.



Outlines of EMI Suppression Filter (EMIFIL[®]) for DC Line

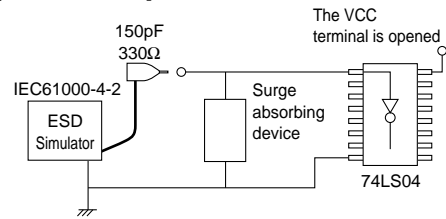
● Chip Varistor

Chip VaristorP.120-121

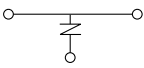
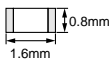
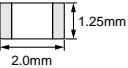
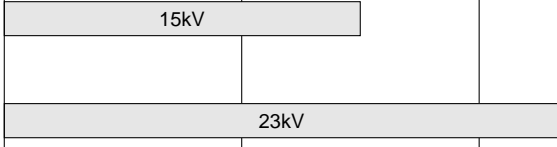
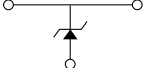
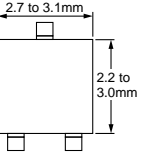
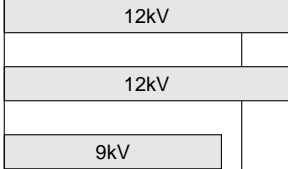
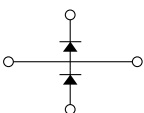
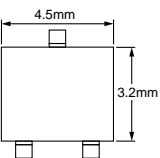



- Chip varistor is surge absorbing components by inserting surge entrance line and ground line. ESD (Electro Static Discharge) breaks IC inside of equipment. Chip varistor suppress surge voltage and results to protect circuits.
- Chip varistor has twice IC protection performance as zener diode or diode.

[Surge Test Circuit]





■ Surge Protection Performance

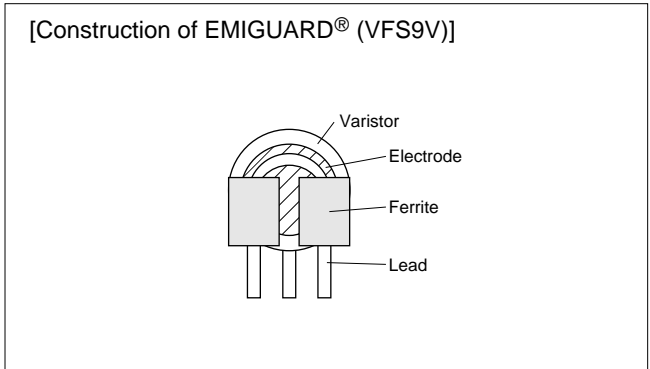
Type of Filter	Dimensions	Electrostatic discharge voltage during breakdown
Without a surge absorbing device		Under 1kV
Chip Varistor 	 VCM18R  VCM21R	
Zener diode 		
Diode 		

Outlines of EMI Suppression Filter (EMIFIL[®]) for DC Line

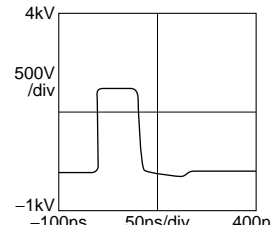
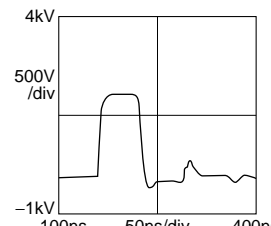
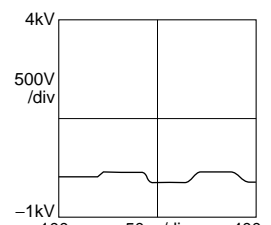
- Chip EMIGUARD[®]
- EMIGUARD[®]

Chip EMIGUARD [®]P.104	EMIGUARD [®]P.138-139
 VFM41R	 VFR3V VFS6V VFS9V

- EMIGUARD[®] eliminates both surge noises and EMI noises due to its dielectric varistor material.
- Effective when high frequency noise and high voltage surge suppression are required, and also in situations when surging starts at extremely high speeds. This type of surging cannot be eliminated with general type varistors.
- VFM41R is chip type of EMIGUARD[®].



■ Surge Absorption Effect of EMIGUARD[®]

Type of Filter	Surge Absorption Effect of EMIGUARD [®]
No filter	
3-terminal capacitor is used to suppress the surge.	
EMIGUARD [®] is used to suppress the surge. (VFS6V)	

Outlines of EMI Suppression Filter (EMIFIL®) for DC line

●Block Type EMIFIL®

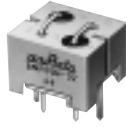
Block Type EMIFIL®P.145-146



BNP002-02



BNP002-03



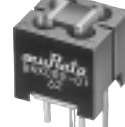
BNP004-02



BNX002-01



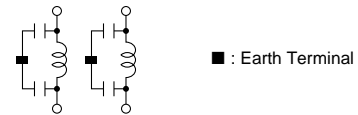
BNX003-01



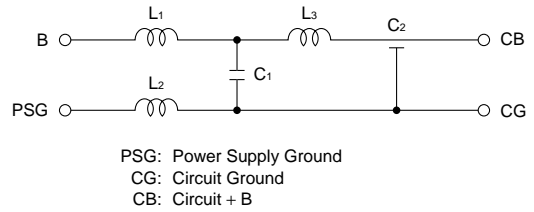
BNX005-01

- Block type EMIFIL® are resin encased, built-in, high performance EMI suppression filters, which use a feed-thru capacitor having excellent high frequency characteristics.
- Used when the noise frequency is high, or when extreme countermeasures are required.
- The BNP filter series features high performance filters, which are used to suppress noise with frequencies greater than several megahertz in signal circuits. With a current capacity of up to 10A, however, this filter can also be used in DC power circuits (available with 2 or 3 circuits per block).
- The high performance EMIFIL® BNX series exhibits significant noise suppression effects over a wide frequency band (extending from 100kHz to 1GHz) in DC power lines.

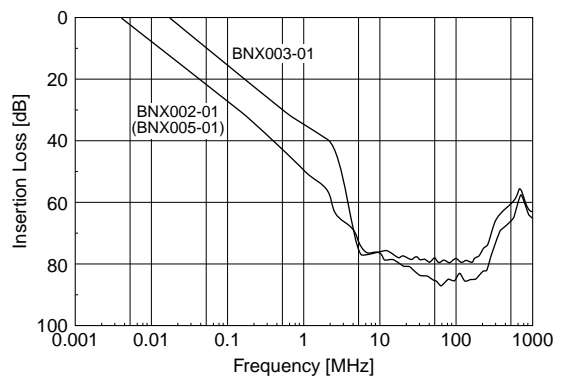
[Equivalent Circuit (BNP Series)]



[Equivalent Circuit (BNX Series)]



[Insertion Loss Characteristics(BNX Series)]



On-Board Type (DC) EMI Suppression Filters(EMIFIL®)



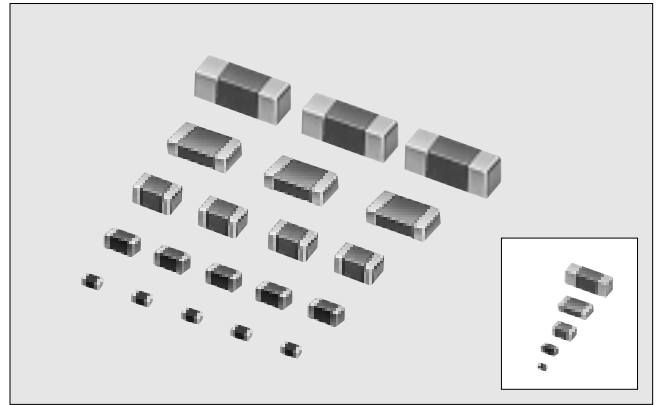
Chip Ferrite Bead BLM Series

Essential for Noise Suppression in High Speed Signal Lines and DC Power Lines

The chip ferrite bead BLM series comprises ferrite bead inductors in the shape of a chip. This inductor generates a high impedance which at high frequencies mainly consists of a resistance element. The BLM series is effective in circuits without stable ground lines because the BLM series does not need a connection to ground.

Chip sizes of 1.0X0.5, 1.6X0.8, 2.0X1.25, 3.2X1.6 and 4.5X1.6mm are cataloged. (The BLA series of array type chip ferrite bead is also cataloged.)

The nickel barrier structure of the external electrodes provides excellent solder heat resistance. Both flow and reflow soldering methods can be employed.



■Features

The BLM series comprises, the R series (for digital interface), the A series (for standard), the B series (for high speed signal), and the P series (for large current).

1. BLM□□R series-For Digital Interface

The BLM-R series can be used in Digital Interface. Resistance of BLM-R series especially grows in the lower frequency range. Therefore BLM-R series is less effect for digital signal waveform at low frequency range and can suppress the ringing.

2. BLM□□A series-For Standard

The BLM-A series generates an impedance from the relatively low frequencies. Therefore the BLM-A series is effective in noise suppression in the wide frequency range (30MHz-Several hundred MHz).

3. BLM□□B series-For High Speed Signal

The BLM-B series can minimize attenuation of the signal waveform due to its sharp impedance characteristics. Various impedances are available to match signal frequency

4. BLM□□P series-For Large Current

The BLM-P series can be used in high current circuits due to its low DC resistance. It can match power lines to a maximum of 6A DC (BLM41P).

■Difference between A Series, B Series and R Series

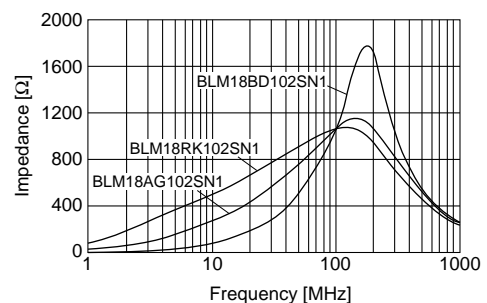
The BLM□□B series has sharp impedance characteristics and it does not affect the signal frequency. The BLM□□R series has resistance especially growing in the lower frequency range. Therefore it can suppress the ringing effectively.

■Equivalent Circuit Diagram



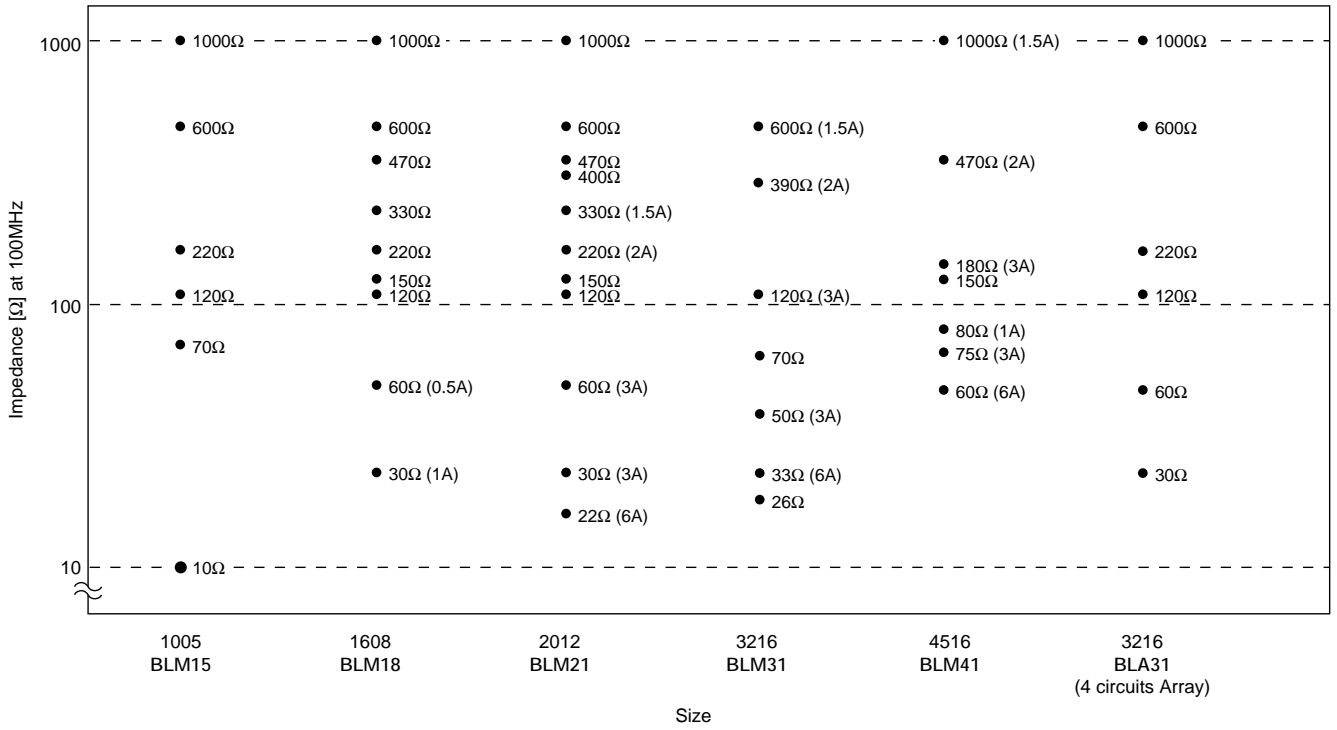
(Resistance element becomes dominant at high frequencies.)

[Impedance Characteristics]

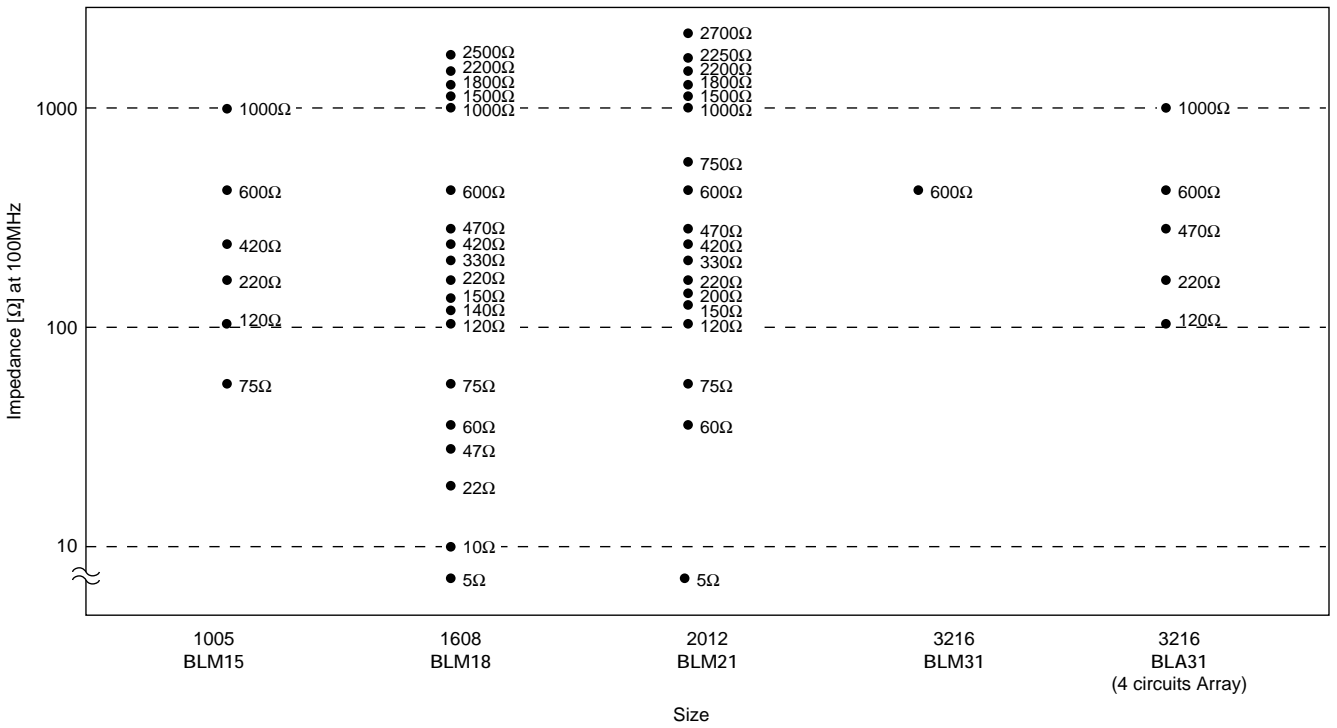


■ Selection Guide

● BLM□□A series-Standard / BLM□□R series-For Digital Interface / BLM□□P series-For Large Current




● BLM□□B series-For High Speed Signal



1


■ BLM Series


Type	Size(mm)	Part Number	Impedance (Ω) at 100MHz	Rated Current (mA)
BLM□□R Series -For Digital Interface	1.6×0.8	BLM18RK121SN1	120±25%	200
		BLM18RK221SN1	220±25%	
		BLM18RK471SN1	470±25%	
		BLM18RK601SN1	600±25%	
		BLM18RK102SN1	1000±25%	
	2.0×1.25	BLM21RK121SN1	120±25%	
		BLM21RK221SN1	220±25%	
		BLM21RK471SN1	470±25%	
		BLM21RK601SN1	600±25%	
		BLM21RK102SN1	1000±25%	
BLM□□A Series -For Standard	1.0×0.5	BLM15AG100PN1	10 (Typ.)	500
		BLM15AG700PN1	70 (Typ.)	200
		BLM15AG121PN1	120 (Typ.)	100
		BLM15AG221PN1	220±25%	
		BLM15AG601PN1	600±25%	50
		BLM15AG102PN1	1000±25%	
	1.6×0.8	BLM18AG121SN1	120±25%	200
		BLM18AG151SN1	150±25%	
		BLM18AG221SN1	220±25%	
		BLM18AG331SN1	330±25%	
		BLM18AG471SN1	470±25%	
		BLM18AG601SN1	600±25%	
	2.0×1.25	BLM21AG121SN1	120±25%	200
		BLM21AG151SN1	150±25%	
		BLM21AG221SN1	220±25%	
		BLM21AG331SN1	330±25%	
		BLM21AJ401SN1	400±25%	
		BLM21AG471SN1	470±25%	
BLM21AG601SN1		600±25%		
BLM21AJ601SN1		1000±25%		
BLM21AG102SN1				
3.2×1.6	BLM31AJ260SN1	26±25%	500	
	BLM31AF700SN1	70±25%	200	
	BLM31AJ601SN1	600±25%		
4.5×1.6	BLM41AF800SN1	80±25%	500	
	BLM41AF151SN1	150±25%	200	
BLM□□B Series -For High Speed Signal (Sharp impedance characteristic)	1.0×0.5	BLM15BB750PN1	75±25%	100
		BLM15BB121PN1	120±25%	50
		BLM15BB221PN1	220±25%	
		BLM15BD421PN1	420±25%	
		BLM15BD601PN1	600±25%	
		BLM15BD102PN1	1000±25%	
	1.6×0.8	BLM18BA050SN1	5±25%	
		BLM18BB050SN1		700
		BLM18BA100SN1	10±25%	500
		BLM18BB100SN1		
		BLM18BA220SN1		
		BLM18BB220SN1	22±25%	300
		BLM18BA470SN1	47±25%	
		BLM18BB470SN1		
		BLM18BB600SN1	60±25%	200
		BLM18BB750SN1	75±25%	300
		BLM18BA750SN1		
		BLM18BA121SN1	120±25%	200
BLM18BB121SN1				

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Type	Size(mm)	Part Number	Impedance (Ω) at 100MHz	Rated Current (mA)	
BLM□□B Series -For High Speed Signal (Sharp impedance characteristic)	1.6×0.8	BLM18BD121SN1	120±25%	200	
		BLM18BB141SN1	140±25%		
		BLM18BB151SN1	150±25%		
		BLM18BD151SN1			
		BLM18BB221SN1	220±25%		
		BLM18BD221SN1			
		BLM18BB331SN1	330±25%		
		BLM18BD331SN1			
		BLM18BD421SN1	420±25%		
		BLM18BB471SN1	470±25%		50
		BLM18BD471SN1			200
		BLM18BD601SN1	600±25%		100
		BLM18BD102SN1	1000±25%		50
		BLM18BD152SN1	1500±25%		
		BLM18BD182SN1	1800±25%		
		BLM18BD222SN1	2200±25%		
BLM18BD252SN1	2500±25%	200			
BLM□□B Series -For High Frequency (Sharp impedance characteristic)	2.0×1.25		BLM21BB050SN1	5±25%	500
			BLM21BB600SN1	60±25%	
			BLM21BB750SN1	75±25%	
			BLM21BB121SN1	120±25%	
			BLM21BD121SN1		
			BLM21BB151SN1	150±25%	
			BLM21BD151SN1		
			BLM21BB201SN1	200±25%	
			BLM21BB221SN1	220±25%	
			BLM21BD221SN1		
			BLM21BB331SN1	330±25%	
			BLM21BD331SN1		
			BLM21BD421SN1	420±25%	
			BLM21BB471SN1	470±25%	
			BLM21BD471SN1		
		BLM21BD601SN1	600±25%		
BLM21BD751SN1	750±25%				
BLM21BD102SN1	1000±25%				
BLM21BD152SN1	1500±25%				
BLM21BD182SN1	1800±25%				
BLM21BD222SN1*	2250 (Typ.)				
BLM21BD222TN1	2200±25%				
BLM21BD272SN1	2700±25%				
	3.2×1.6	BLM31BE601FN1	600±25%	300	

* Impedance±25% guarantee type is also available. Please contact for further details.

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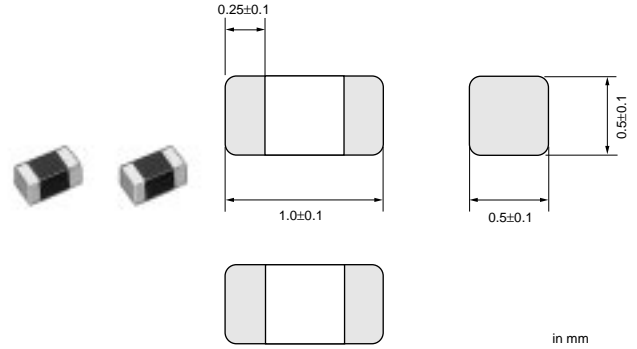
Type	Size(mm)	Part Number	Impedance (Ω) at 100MHz	Rated Current (mA)	
BLM□□P Series* -For Large Current	1.6×0.8	BLM18PG300SN1	30 (Typ.)	1000	
		BLM18PG600SN1	60 (Typ.)	500	
	2.0×1.25	BLM21PG220SN1	22 (Typ.)	6000	
		BLM21PG300SN1	30 (Typ.)	3000	
		BLM21PG600SN1	60 (Typ.)		
		BLM21PG221SN1	220 (Typ.)	2000	
		BLM21PG331SN1	330 (Typ.)	1500	
		3.2×1.6	BLM31PG330SN1	33 (Typ.)	6000
	BLM31PG500SN1		50 (Typ.)	3000	
	BLM31PG121SN1		120 (Typ.)		
	BLM31PG391SN1		390 (Typ.)	2000	
	BLM31PG601SN1		600 (Typ.)	1500	
	4.5×1.6	BLM41PG600SN1	60 (Typ.)	6000	
		BLM41PG750SN1	75 (Typ.)	3000	
		BLM41PF800SN1	80 (Typ.)	1000	
		BLM41PG181SN1	180 (Typ.)	3000	
		BLM41PG471SN1	470 (Typ.)	2000	
		BLM41PG102SN1	1000 (Typ.)	1500	
BLM□□H□ Series For GHz Range Noise Suppression	BLM□□HG Series -For Standard	BLM18HG471SN1	470±25%	200	
		BLM18HG601SN1	600±25%		
		BLM18HG102SN1	1000±25%		
	BLM□□HD Series -For High Speed Signal	1.6×0.8	BLM18HD471SN1	470±25%	100
			BLM18HD601SN1	600±25%	
			BLM18HD102SN1	1000±25%	50
			BLM18HK331SN1	330±25%	200
	BLM18HK471SN1		470±25%		
	BLM□□HK Series -For Digital Interface		BLM18HK601SN1	600±25%	100
			BLM18HK102SN1	1000±25%	50

On-Board Type (DC) EMI Suppression Filters(EMIFIL®)



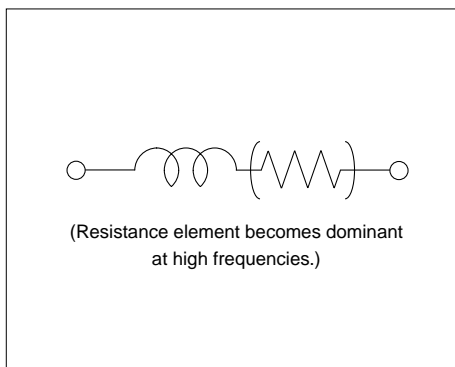
Chip Ferrite Beads BLM15/BLM18/BLM21/BLM31/BLM41 Series

BLM15 Series(1005 Size)

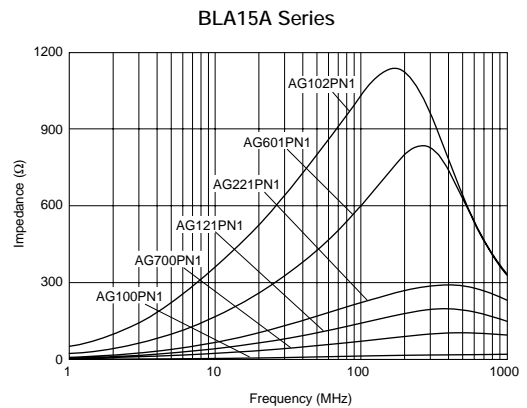


Part Number	Impedance (at 100MHz) (ohm)	Rated Current (mA)	DC Resistance(max.) (ohm)	Operating Temperature Range (°C)
BLM15AG100PN1	10 (Typ.)	500	0.05	-55 to 125
BLM15AG700PN1	70 (Typ.)	200	0.40	-55 to 125
BLM15AG121PN1	120 (Typ.)	200	0.50	-55 to 125
BLM15AG221PN1	220 ±25%	100	0.70	-55 to 125
BLM15AG601PN1	600 ±25%	50	1.10	-55 to 125
BLM15AG102PN1	1000 ±25%	50	1.50	-55 to 125
BLM15BB750PN1	75 ±25%	100	0.80	-55 to 125
BLM15BB121PN1	120 ±25%	50	1.10	-55 to 125
BLM15BB221PN1	220 ±25%	50	1.40	-55 to 125
BLM15BD421PN1	420 ±25%	50	1.30	-55 to 125
BLM15BD601PN1	600 ±25%	50	1.50	-55 to 125
BLM15BD102PN1	1000 ±25%	50	1.30	-55 to 125

Equivalent Circuit



Impedance-Frequency (Typical)



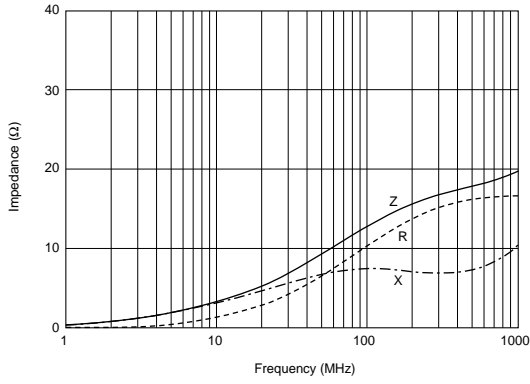
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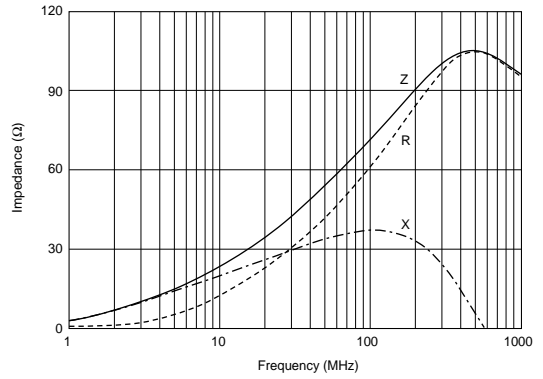
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Impedance-Frequency Characteristics

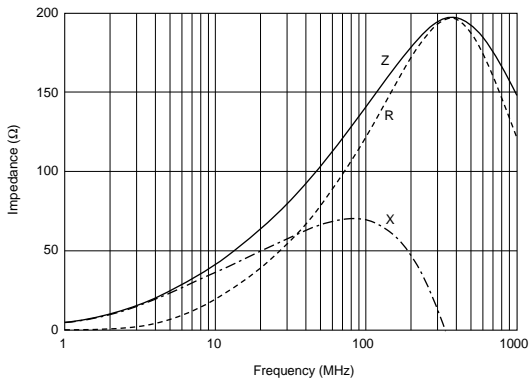
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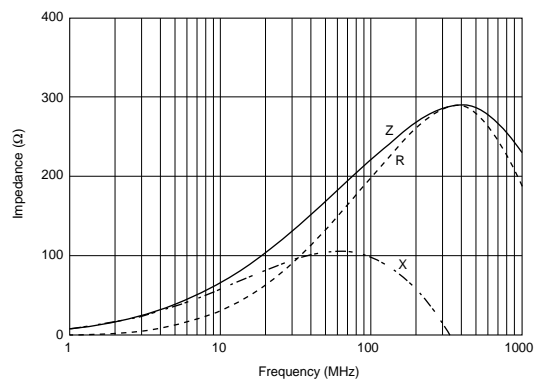
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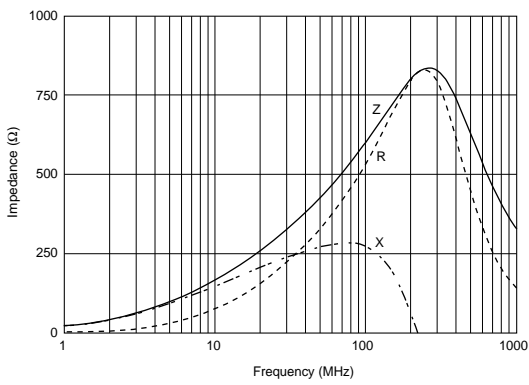
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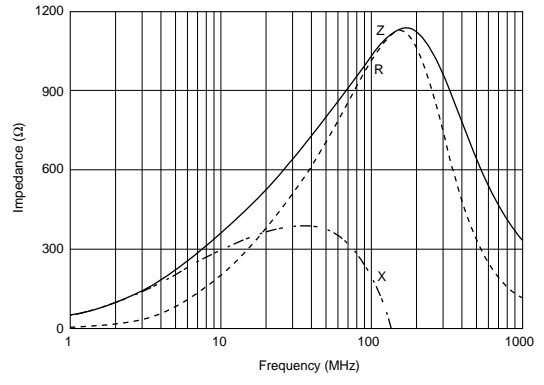
BLM15AG221PN1



BLM15AG601PN1

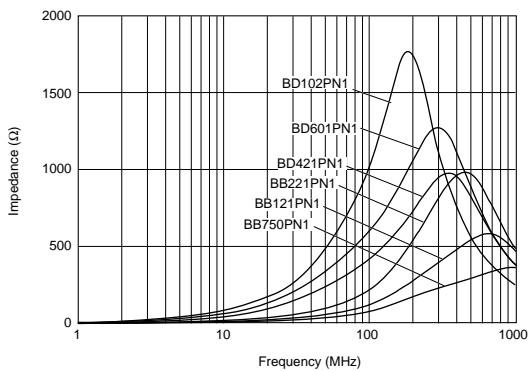


BLM15AG102PN1



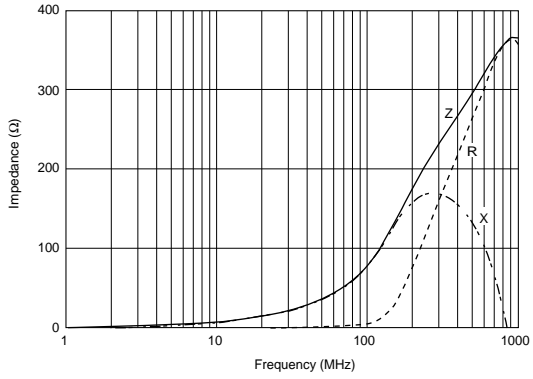
Impedance-Frequency (Typical)

BLA15B Series

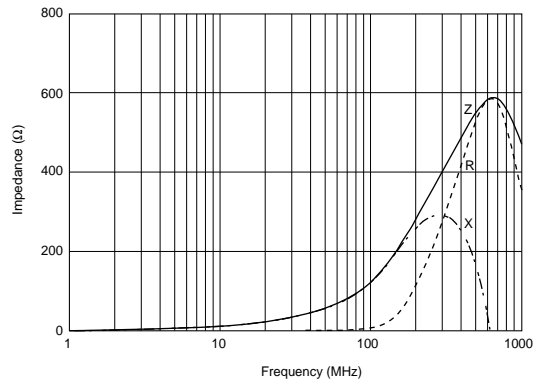


Impedance-Frequency Characteristics

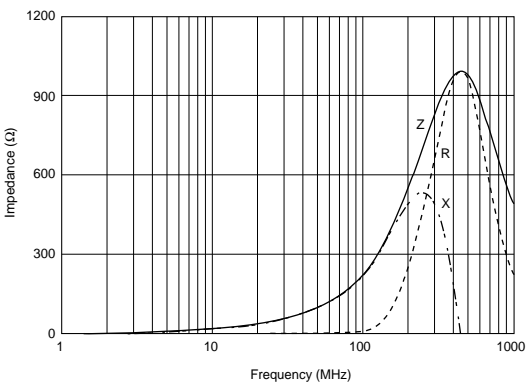
BLM15BB750PN1



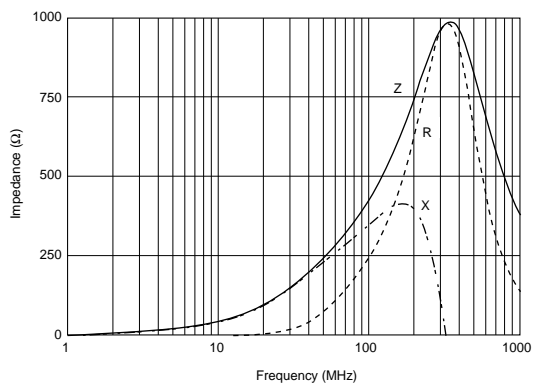
BLM15BB121PN1



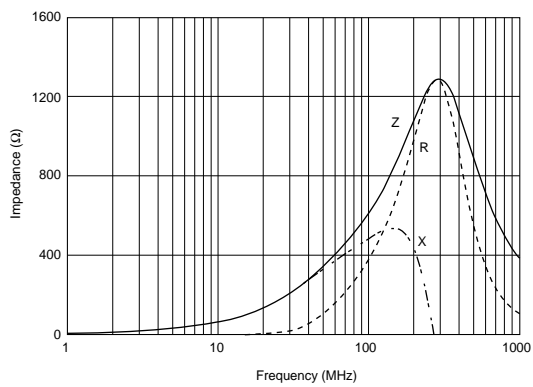
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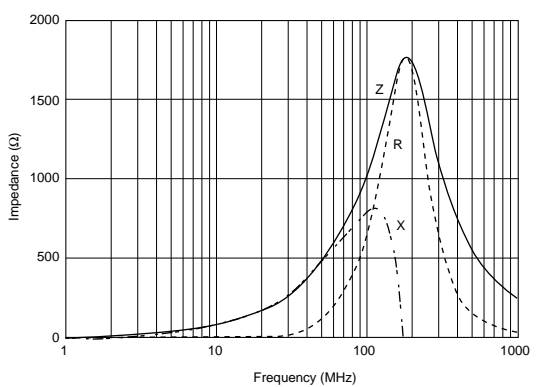
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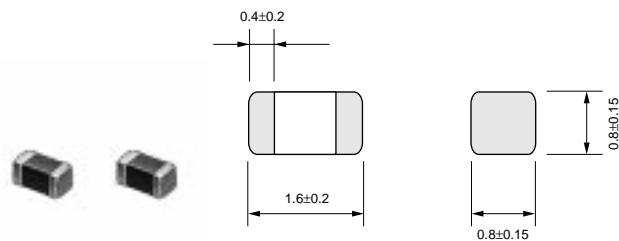


BLM15BD601PN1



BLM15BD102PN1



BLM18 Series(1608 Size)

in mm

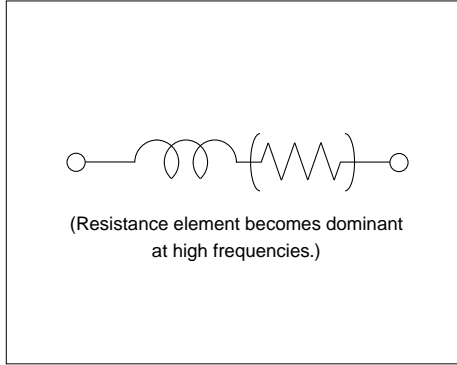
Part Number	Impedance (at 100MHz) (ohm)	Rated Current (mA)	DC Resistance(max.) (ohm)	Operating Temperature Range (°C)
BLM18AG121SN1	120 ±25%	200	0.20	-55 to 125
BLM18AG151SN1	150 ±25%	200	0.25	-55 to 125
BLM18AG221SN1	220 ±25%	200	0.30	-55 to 125
BLM18AG331SN1	330 ±25%	200	0.45	-55 to 125
BLM18AG471SN1	470 ±25%	200	0.50	-55 to 125
BLM18AG601SN1	600 ±25%	200	0.50	-55 to 125
BLM18AG102SN1	1000 ±25%	100	0.70	-55 to 125
BLM18BA050SN1	5 ±25%	500	0.20	-55 to 125
BLM18BA100SN1	10 ±25%	500	0.25	-55 to 125
BLM18BA220SN1	22 ±25%	500	0.35	-55 to 125
BLM18BA470SN1	47 ±25%	300	0.55	-55 to 125
BLM18BA750SN1	75 ±25%	300	0.70	-55 to 125
BLM18BA121SN1	120 ±25%	200	0.90	-55 to 125
BLM18BB050SN1	5 ±25%	700	0.10	-55 to 125
BLM18BB100SN1	10 ±25%	500	0.15	-55 to 125
BLM18BB220SN1	22 ±25%	500	0.25	-55 to 125
BLM18BB470SN1	47 ±25%	500	0.30	-55 to 125
BLM18BB600SN1	60 ±25%	200	0.35	-55 to 125
BLM18BB750SN1	75 ±25%	200	0.35	-55 to 125
BLM18BB121SN1	120 ±25%	200	0.50	-55 to 125
BLM18BB141SN1	140 ±25%	200	0.55	-55 to 125
BLM18BB151SN1	150 ±25%	200	0.55	-55 to 125
BLM18BB221SN1	220 ±25%	200	0.65	-55 to 125
BLM18BB331SN1	330 ±25%	200	0.75	-55 to 125
BLM18BB471SN1	470 ±25%	50	1.00	-55 to 125
BLM18BD121SN1	120 ±25%	200	0.40	-55 to 125
BLM18BD151SN1	150 ±25%	200	0.40	-55 to 125
BLM18BD221SN1	220 ±25%	200	0.45	-55 to 125
BLM18BD331SN1	330 ±25%	200	0.5	-55 to 125
BLM18BD421SN1	420 ±25%	200	0.55	-55 to 125
BLM18BD471SN1	470 ±25%	200	0.55	-55 to 125
BLM18BD601SN1	600 ±25%	200	0.65	-55 to 125
BLM18BD102SN1	1000 ±25%	100	0.85	-55 to 125
BLM18BD152SN1	1500 ±25%	50	1.20	-55 to 125
BLM18BD182SN1	1800 ±25%	50	1.50	-55 to 125
BLM18BD222SN1	2200 ±25%	50	1.50	-55 to 125
BLM18BD252SN1	2500 ±25%	50	1.50	-55 to 125
BLM18PG300SN1	30 (Typ.)	1000	0.05	-55 to 125
BLM18PG600SN1	60 (Typ.)	500	0.10	-55 to 125
BLM18RK121SN1	120 ±25%	200	0.25	-55 to 125
BLM18RK221SN1	220 ±25%	200	0.30	-55 to 125
BLM18RK471SN1	470 ±25%	200	0.50	-55 to 125

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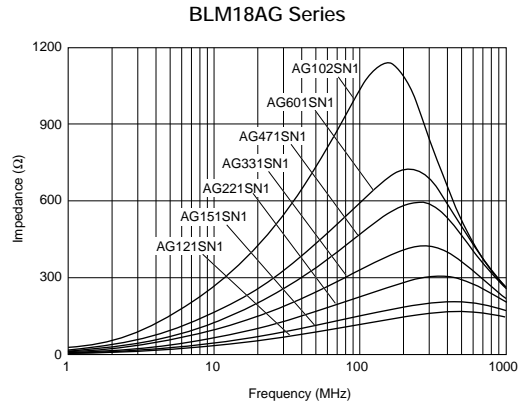
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Part Number	Impedance (at 100MHz) (ohm)	Rated Current (mA)	DC Resistance(max.) (ohm)	Operating Temperature Range (°C)
BLM18RK601SN1	600 ±25%	200	0.60	-55 to 125
BLM18RK102SN1	1000 ±25%	100	0.80	-55 to 125

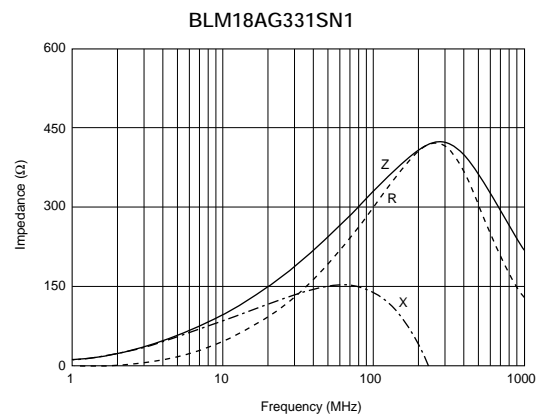
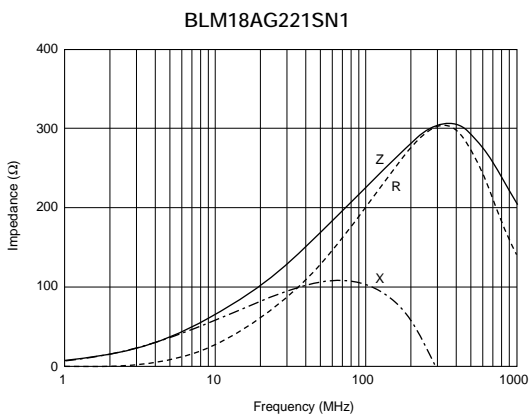
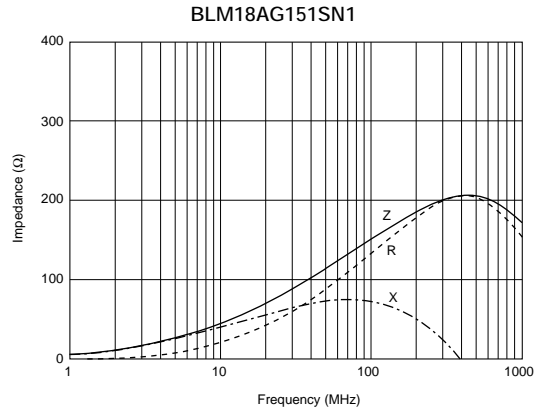
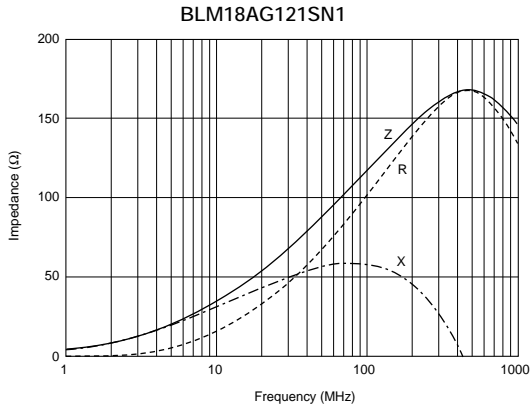
■ Equivalent Circuit



■ Impedance-Frequency (Typical)



■ Impedance-Frequency Characteristics

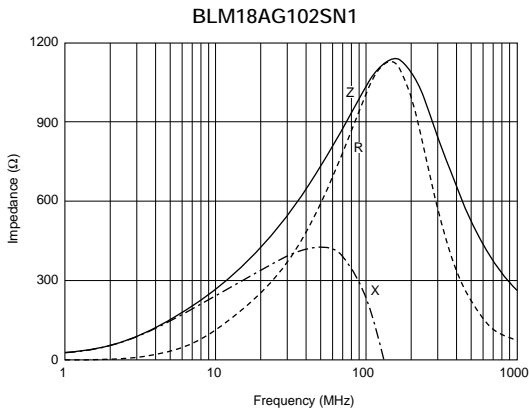
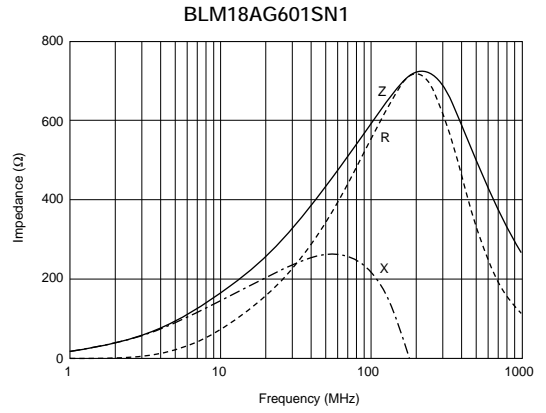
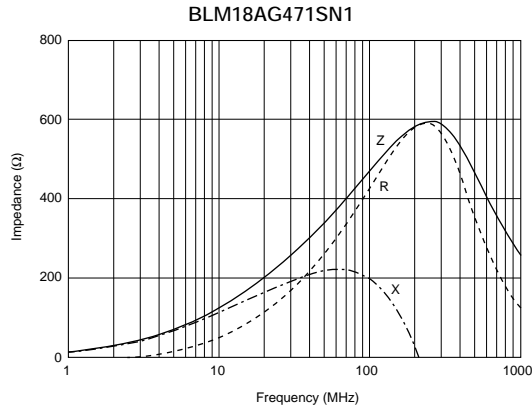


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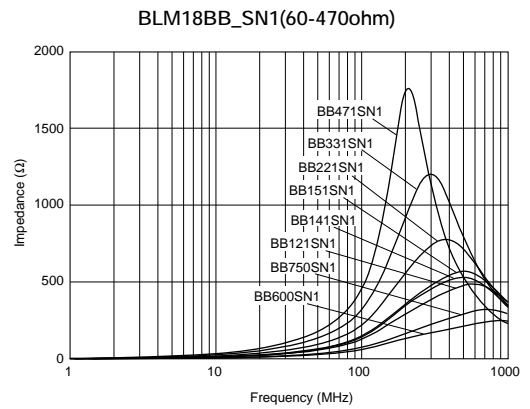
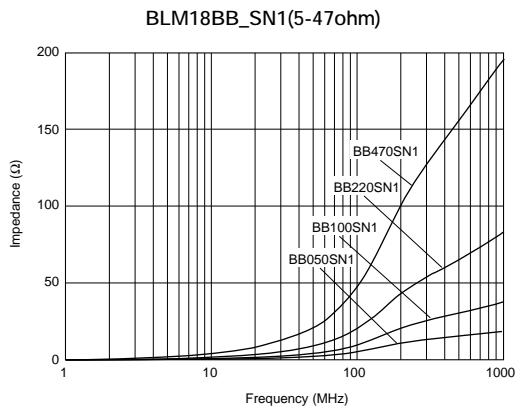
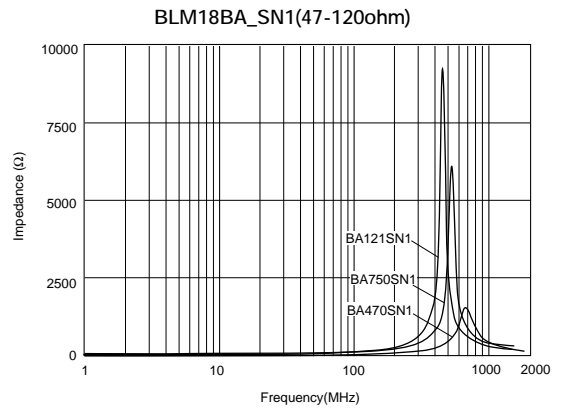
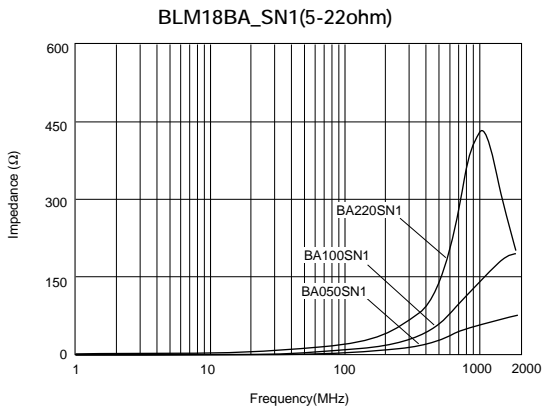
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Impedance-Frequency Characteristics



Impedance-Frequency (Typical)

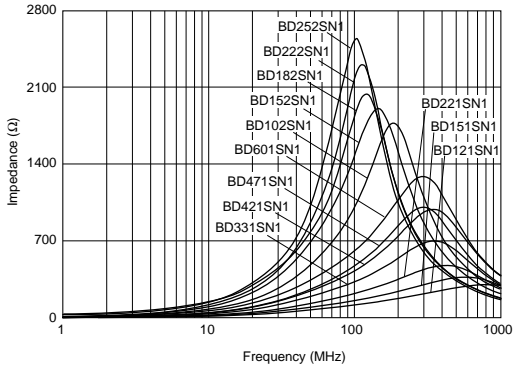


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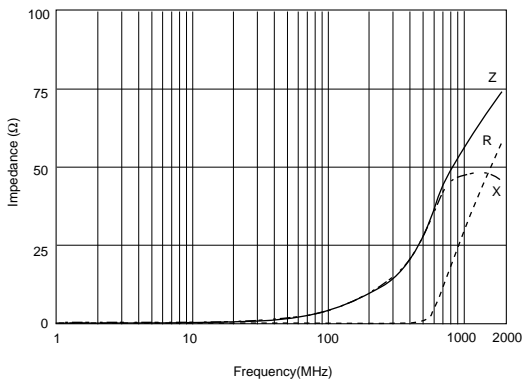
Impedance-Frequency (Typical)

BLM18BD_SN1

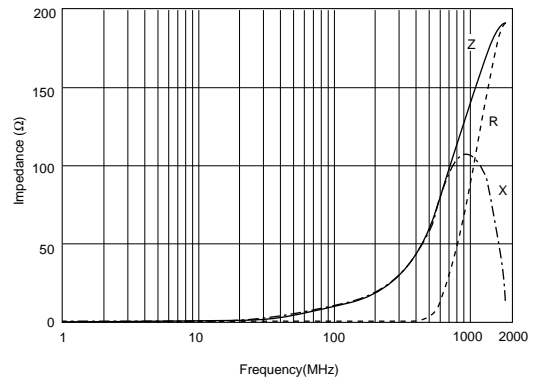


Impedance-Frequency Characteristics

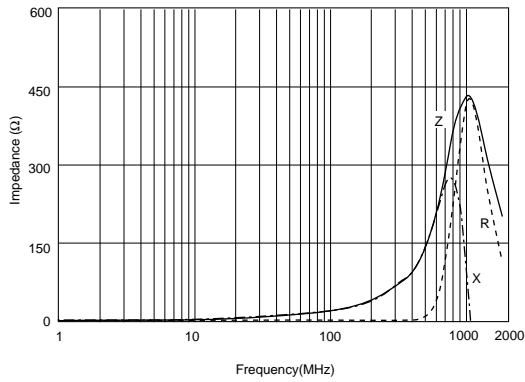
BLM18BA050SN1



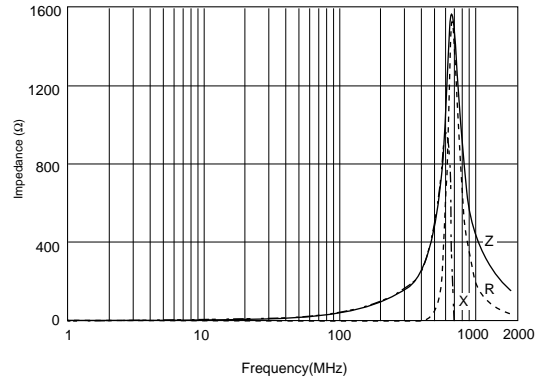
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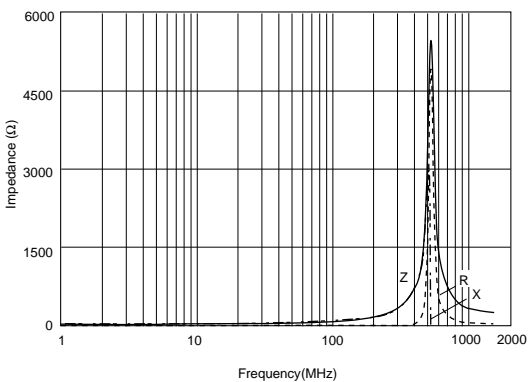
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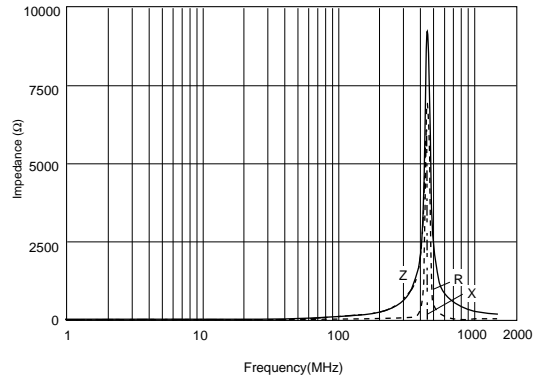
BLM18BA470SN1



BLM18BA750SN1



BLM18BA121SN1



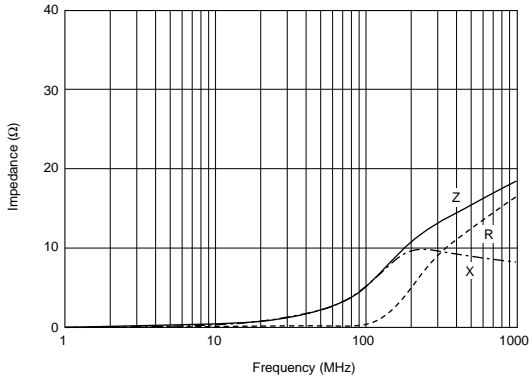
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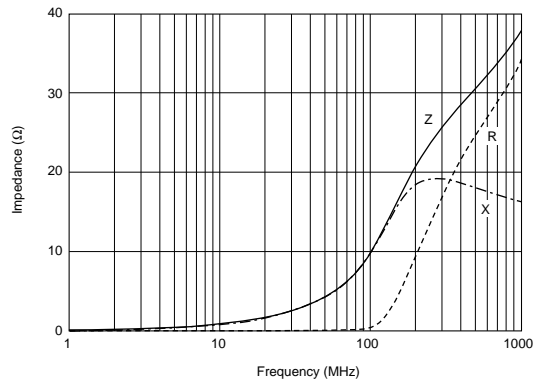
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Impedance-Frequency Characteristics

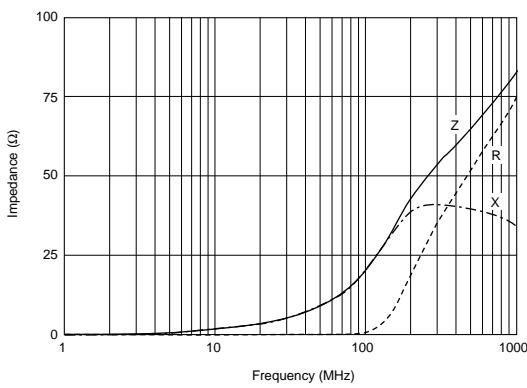
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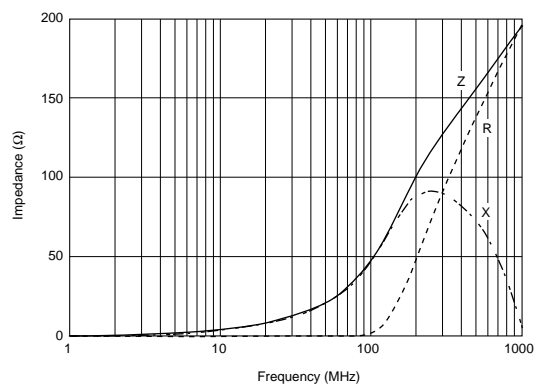
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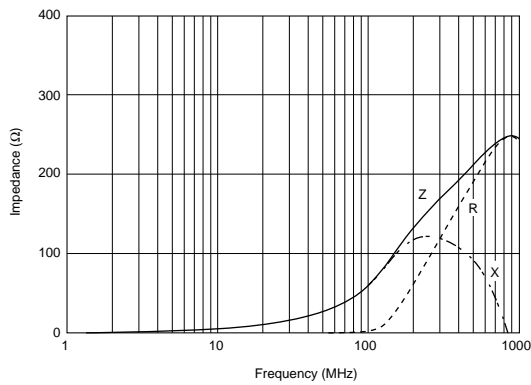
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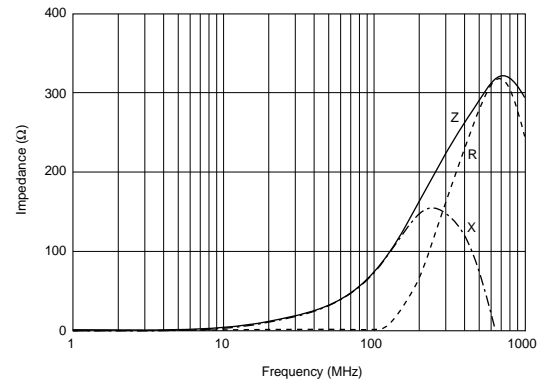
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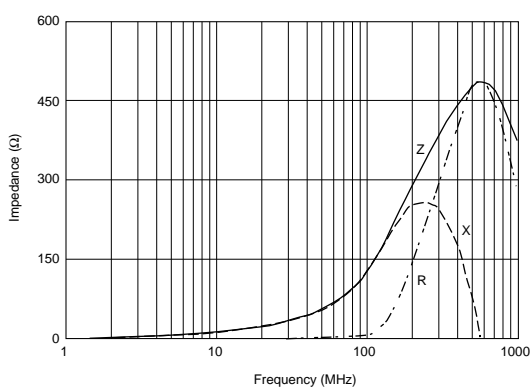
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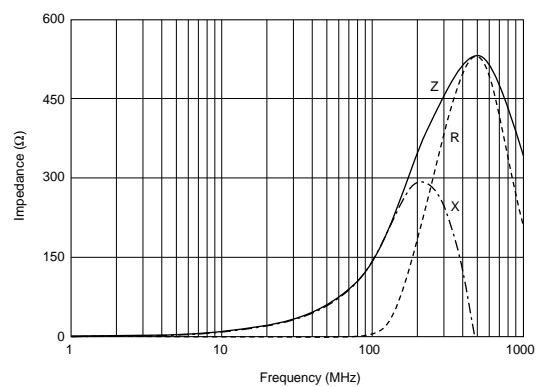
BLM18BB750SN1



BLM18BB121SN1



BLM18BB141SN1

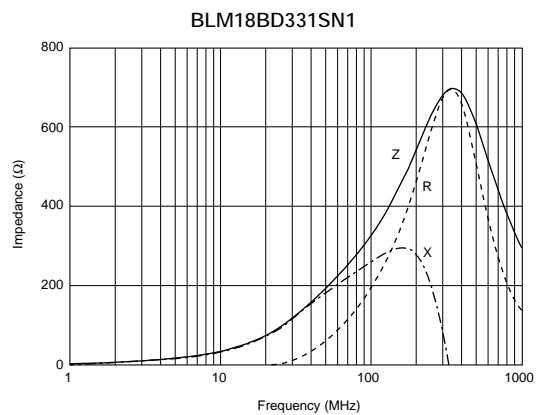
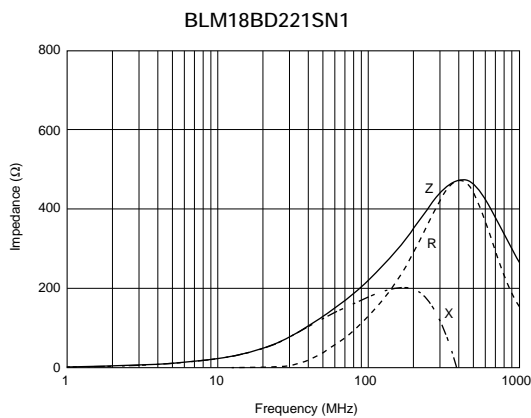
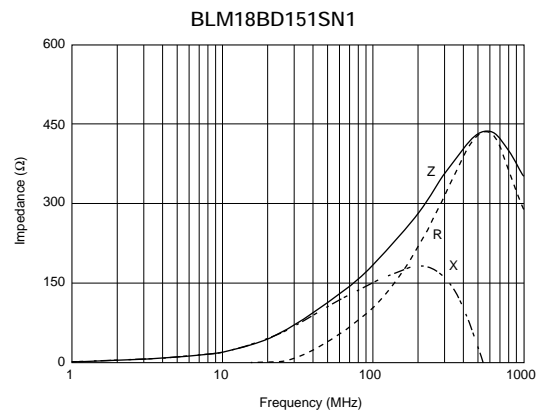
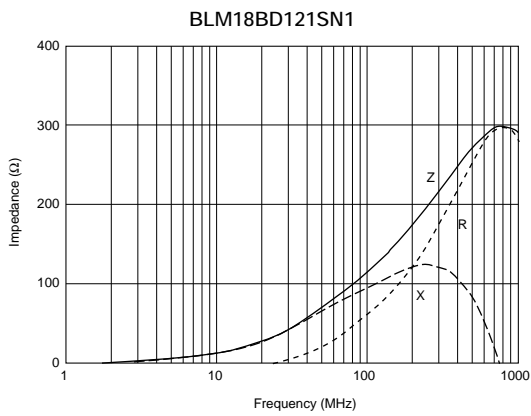
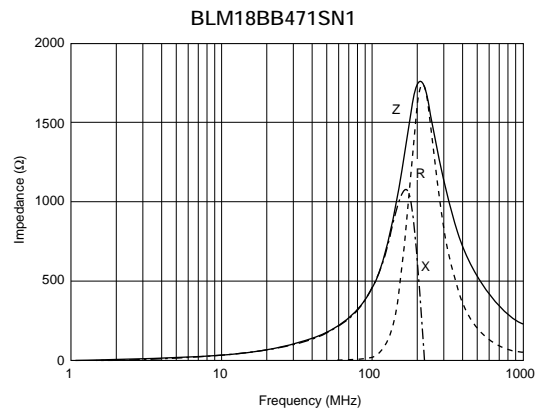
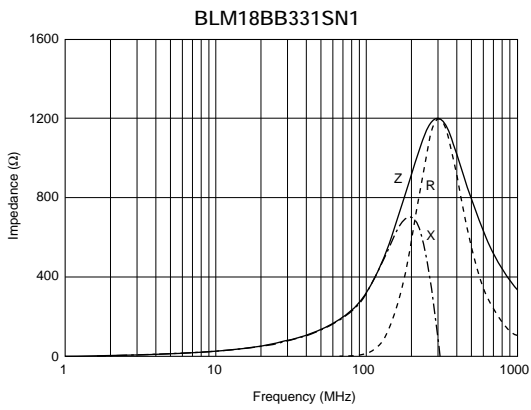
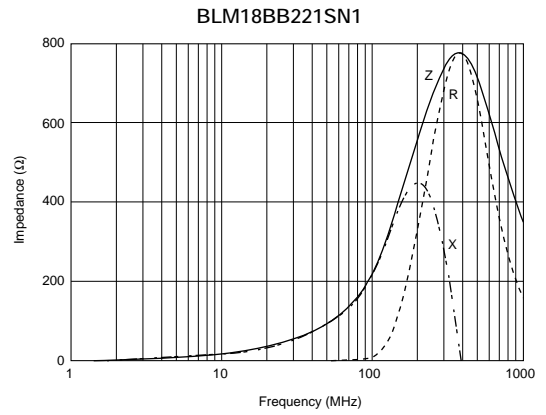
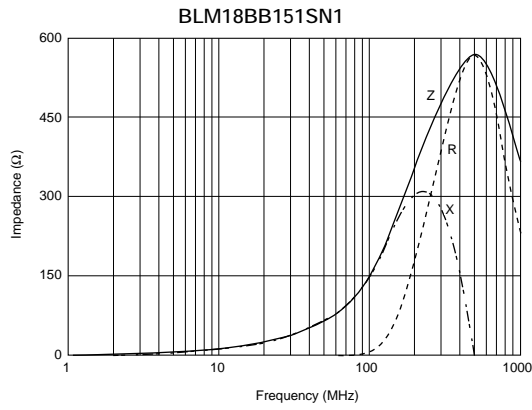


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Impedance-Frequency Characteristics

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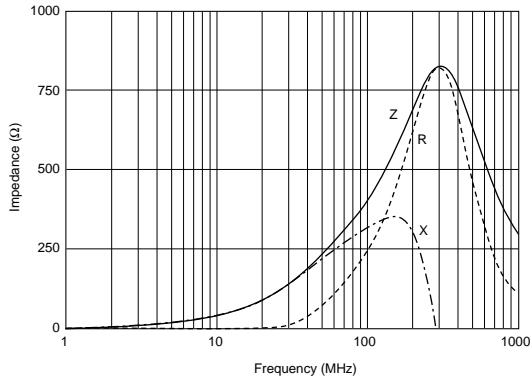
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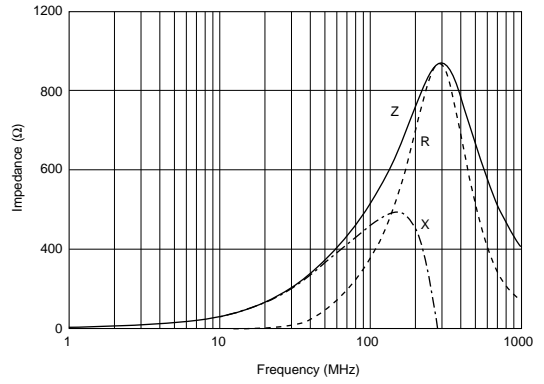
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Impedance-Frequency Characteristics

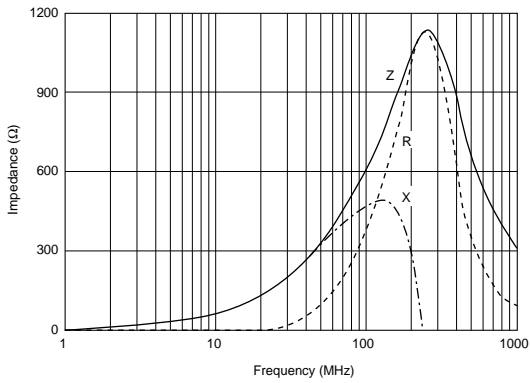
BLM18BD421SN1



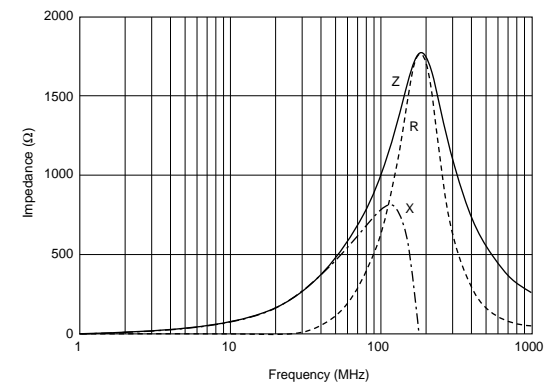
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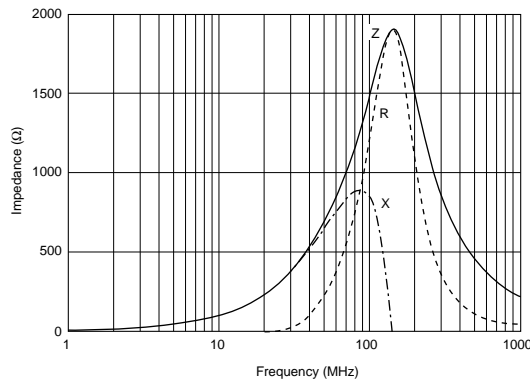
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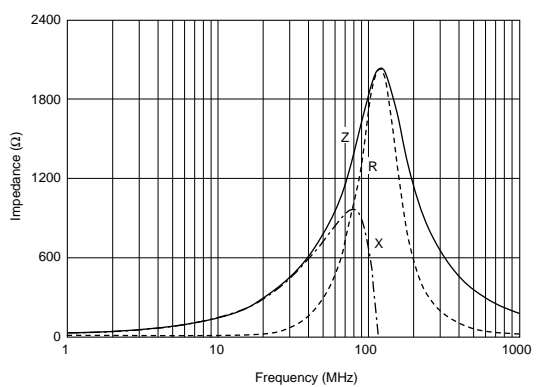
BLM18BD102SN1



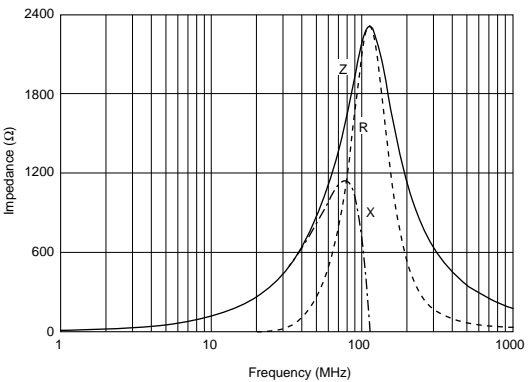
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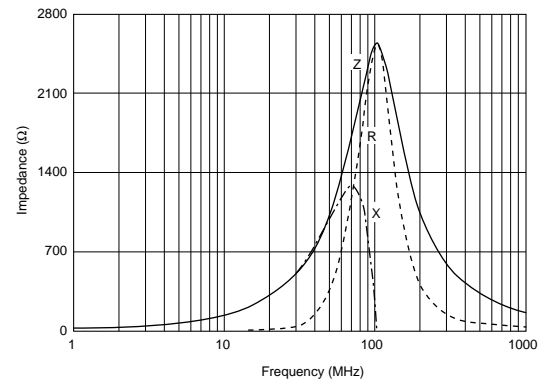
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BLM18BD222SN1

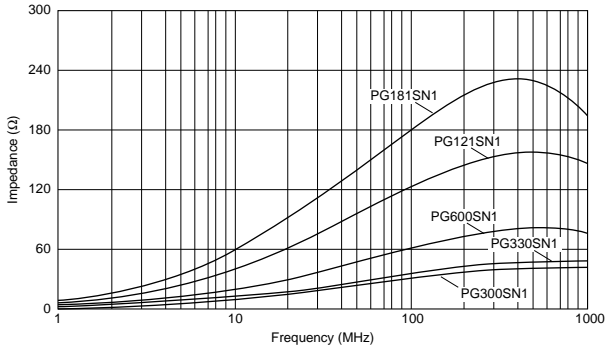


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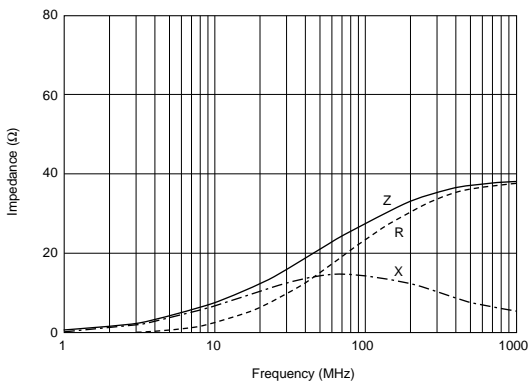
■ Impedance-Frequency (Typical)

BLM18P Series

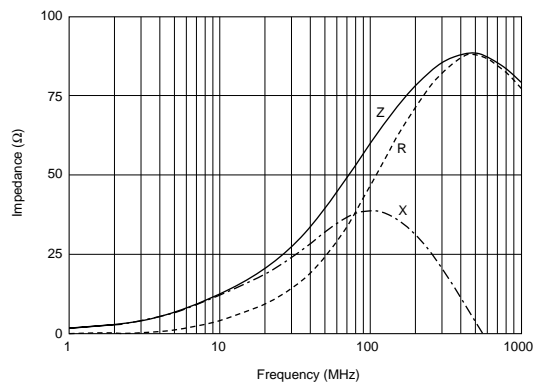


■ Impedance-Frequency Characteristics

BLM18PG300SN1

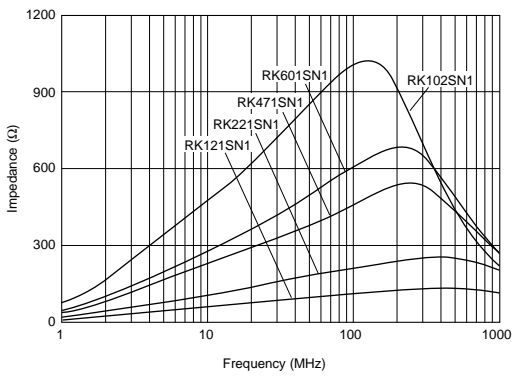


BLM18PG600SN1



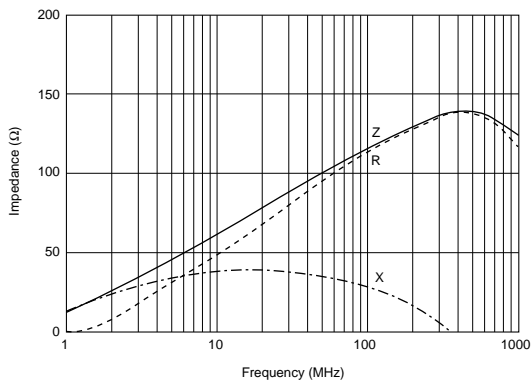
■ Impedance-Frequency (Typical)

BLM18R Series

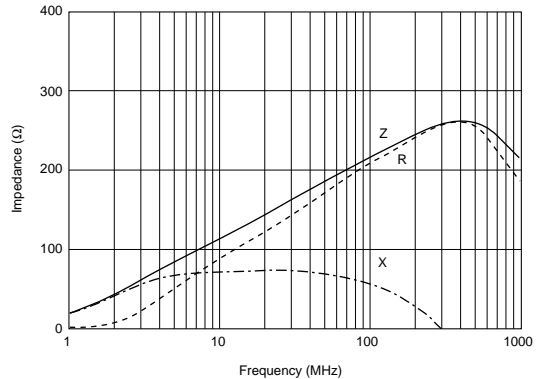


■ Impedance-Frequency Characteristics

BLM18RK121SN1



BLM18RK221SN1

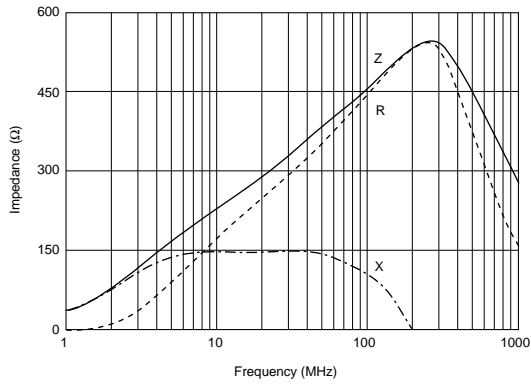


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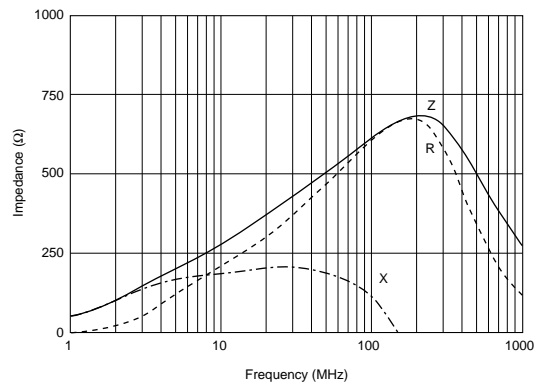
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Impedance-Frequency Characteristics

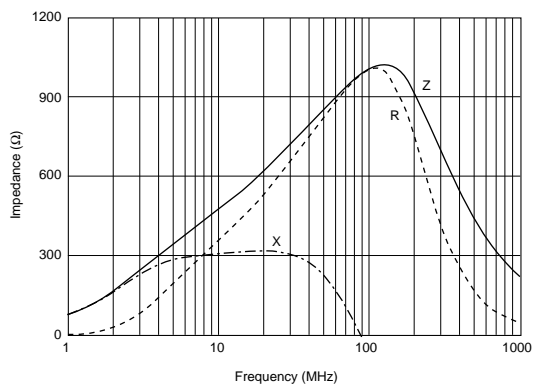
BLM18RK471SN1



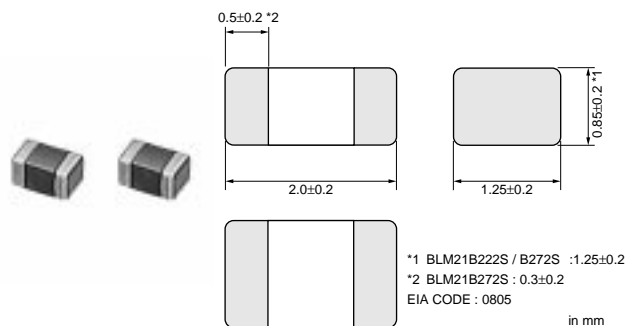
BLM18RK601SN1



BLM18RK102SN1



BLM21 Series(2012 Size)



Part Number	Impedance (at 100MHz) (ohm)	Rated Current (mA)	DC Resistance(max.) (ohm)	Operating Temperature Range (°C)
BLM21AG121SN1	120 ±25%	200	0.15	-55 to 125
BLM21AG151SN1	150 ±25%	200	0.15	-55 to 125
BLM21AG221SN1	220 ±25%	200	0.20	-55 to 125
BLM21AG331SN1	330 ±25%	200	0.25	-55 to 125
BLM21AG471SN1	470 ±25%	200	0.25	-55 to 125
BLM21AG601SN1	600 ±25%	200	0.30	-55 to 125
BLM21AG102SN1	1000 ±25%	200	0.45	-55 to 125
BLM21AH102SN1	1000 ±25%	200	0.45	-55 to 85
BLM21AJ401SN1	400 ±25%	200	0.85	-55 to 125
BLM21AJ601SN1	600 ±25%	200	1.10	-55 to 125
BLM21BB050SN1	5 ±25%	500	0.07	-55 to 125
BLM21BB600SN1	60 ±25%	200	0.20	-55 to 125
BLM21BB750SN1	75 ±25%	200	0.25	-55 to 125
BLM21BB121SN1	120 ±25%	200	0.25	-55 to 125
BLM21BB151SN1	150 ±25%	200	0.25	-55 to 125
BLM21BB201SN1	200 ±25%	200	0.35	-55 to 125
BLM21BB221SN1	220 ±25%	200	0.35	-55 to 125
BLM21BB331SN1	330 ±25%	200	0.40	-55 to 125
BLM21BB471SN1	470 ±25%	200	0.45	-55 to 125
BLM21BD121SN1	120 ±25%	200	0.25	-55 to 125
BLM21BD151SN1	150 ±25%	200	0.25	-55 to 125
BLM21BD221SN1	220 ±25%	200	0.25	-55 to 125
BLM21BD331SN1	330 ±25%	200	0.30	-55 to 125
BLM21BD421SN1	420 ±25%	200	0.30	-55 to 125
BLM21BD471SN1	470 ±25%	200	0.35	-55 to 125
BLM21BD601SN1	600 ±25%	200	0.35	-55 to 125
BLM21BD751SN1	750 ±25%	200	0.40	-55 to 125
BLM21BD102SN1	1000 ±25%	200	0.40	-55 to 125
BLM21BD152SN1	1500 ±25%	200	0.45	-55 to 125
BLM21BD182SN1	1800 ±25%	200	0.50	-55 to 125
BLM21BD222TN1	2200 ±25%	200	0.60	-55 to 125
BLM21BD222SN1	2250 (Typ.)	200	0.60	-55 to 125
BLM21BD272SN1	2700 ±25%	200	0.80	-55 to 125
BLM21PG220SN1	22 (Typ.)	6000	0.01	-55 to 125
BLM21PG300SN1	30 (Typ.)	3000	0.015	-55 to 125
BLM21PG600SN1	60 (Typ.)	3000	0.025	-55 to 125
BLM21PG221SN1	220 (Typ.)	2000	0.050	-55 to 125
BLM21PG331SN1	330 (Typ.)	1500	0.09	-55 to 125
BLM21RK121SN1	120 ±25%	200	0.15	-55 to 125
BLM21RK221SN1	220 ±25%	200	0.20	-55 to 125
BLM21RK471SN1	470 ±25%	200	0.25	-55 to 125
BLM21RK601SN1	600 ±25%	200	0.30	-55 to 125

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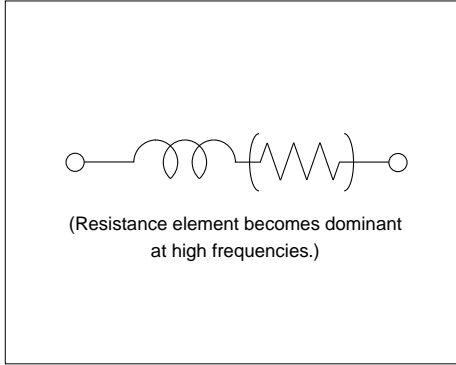
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Part Number	Impedance (at 100MHz) (ohm)	Rated Current (mA)	DC Resistance(max.) (ohm)	Operating Temperature Range (°C)
BLM21RK102SN1	1000 ±25%	200	0.50	-55 to 125

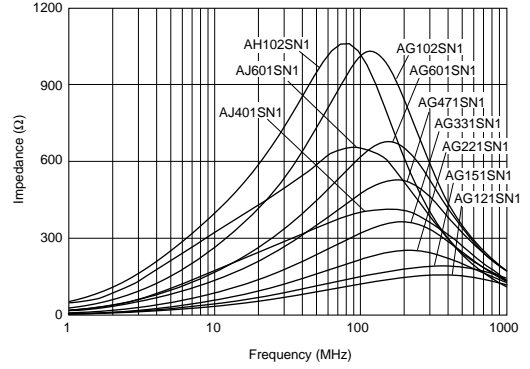
BLM21P series require derating above 85°C ambient. Please contact us for details.

■ Equivalent Circuit

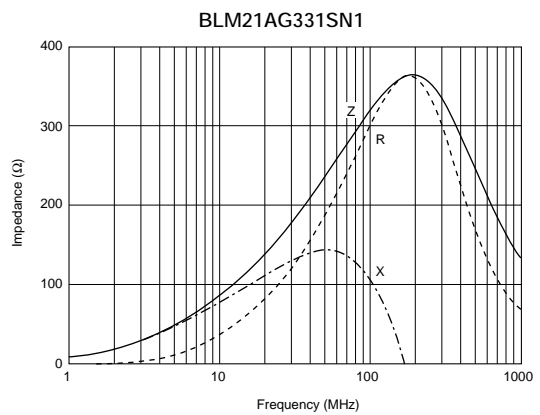
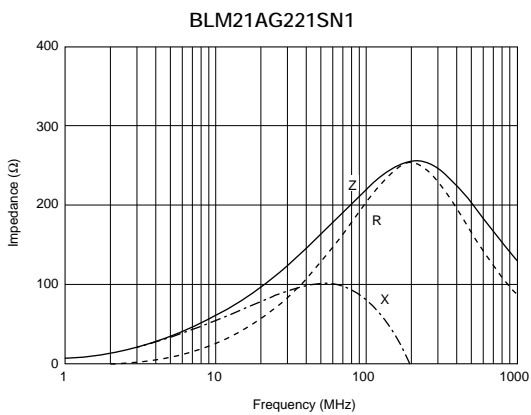
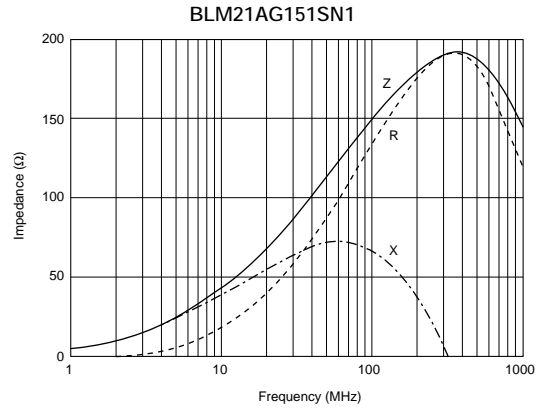
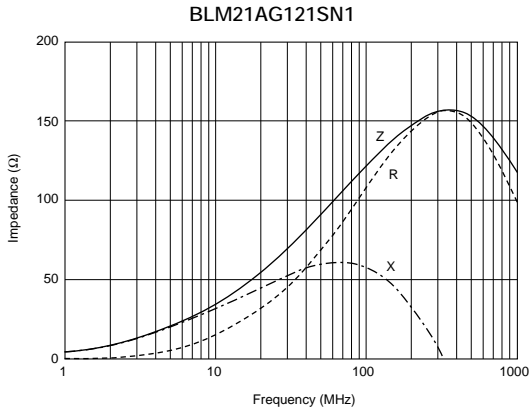


■ Impedance-Frequency (Typical)

BLM21A Series



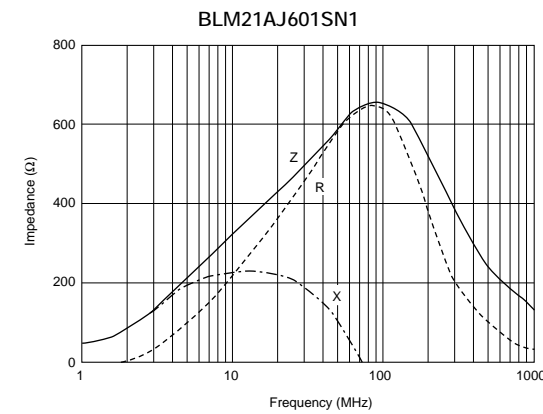
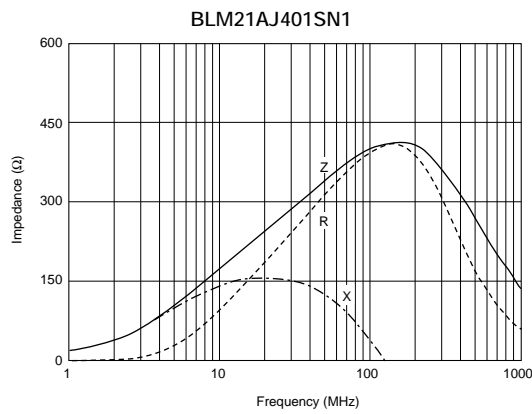
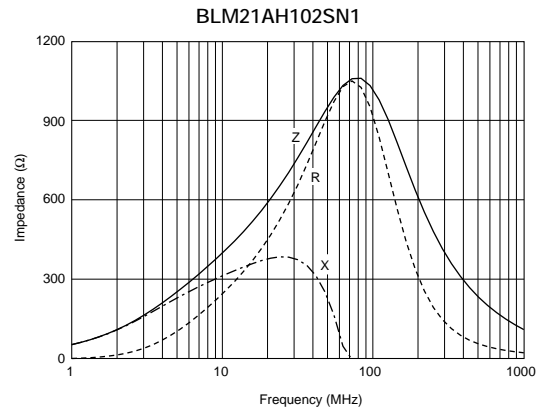
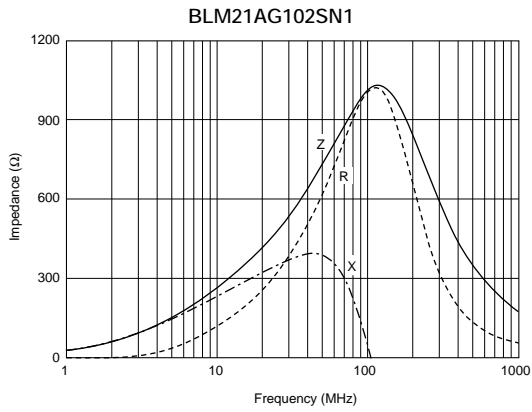
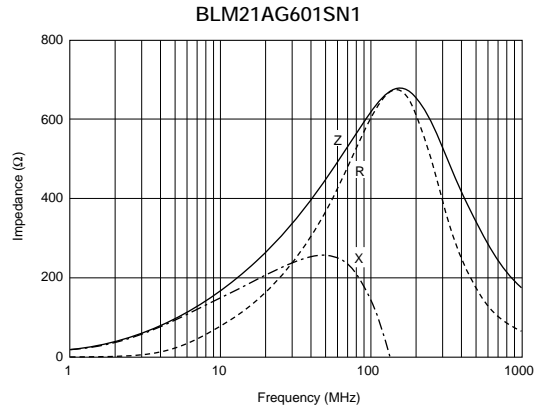
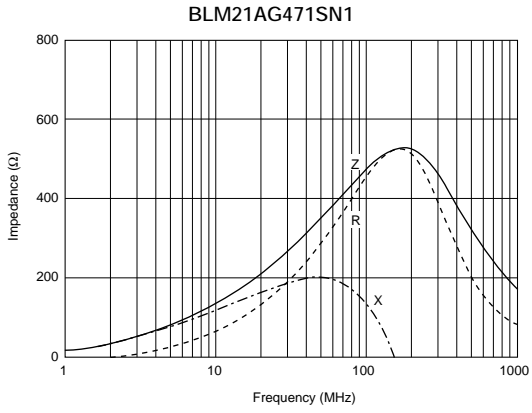
■ Impedance-Frequency Characteristics



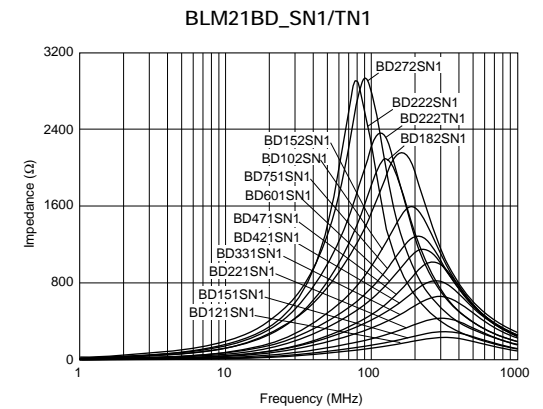
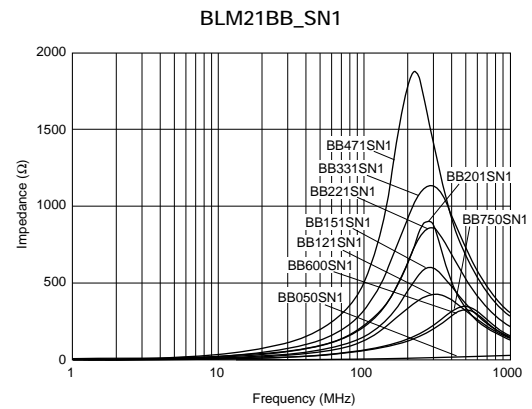
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Impedance-Frequency Characteristics

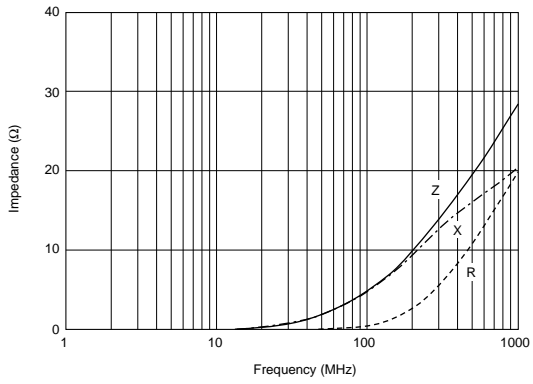


Impedance-Frequency (Typical)

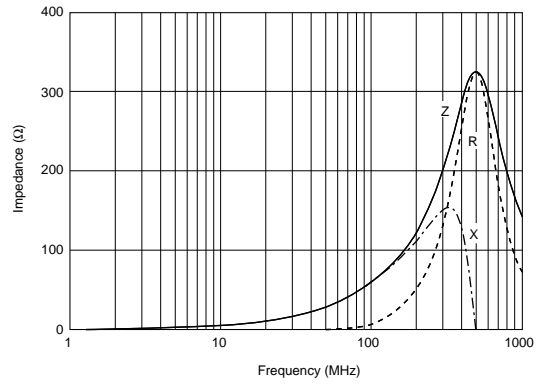


■ Impedance-Frequency Characteristics

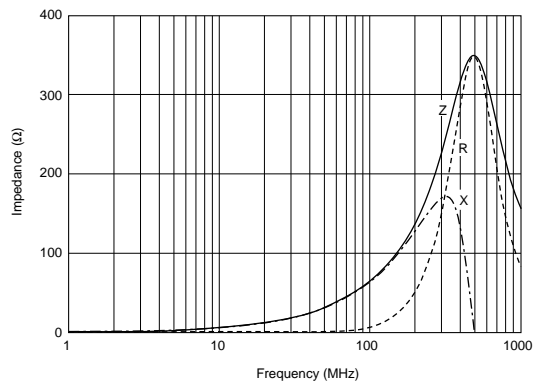
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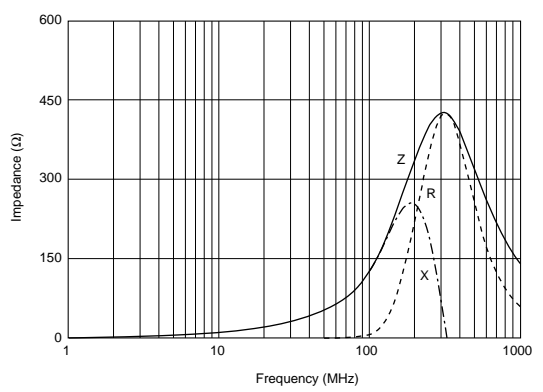
BLM21BB600SN1



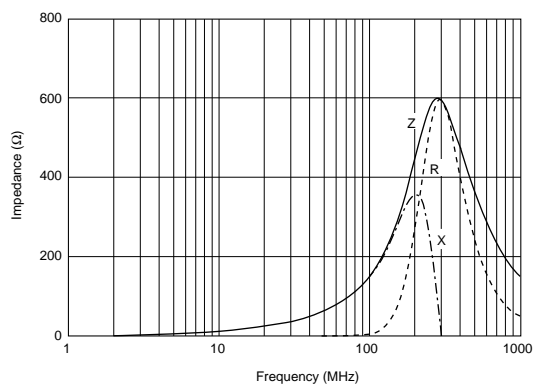
BLM21BB750SN1



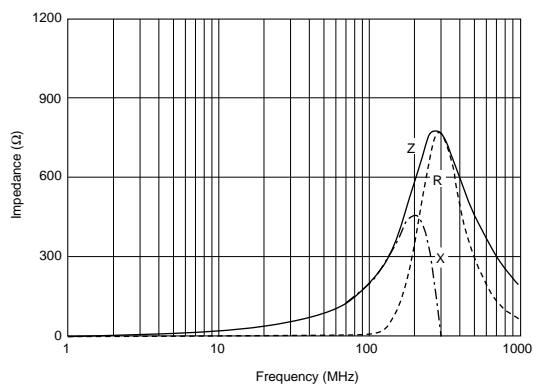
BLM21BB121SN1



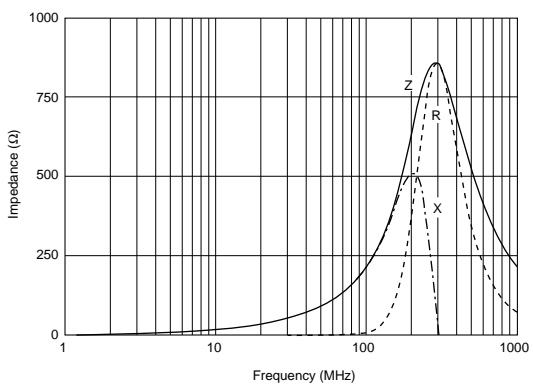
BLM21BB151SN1



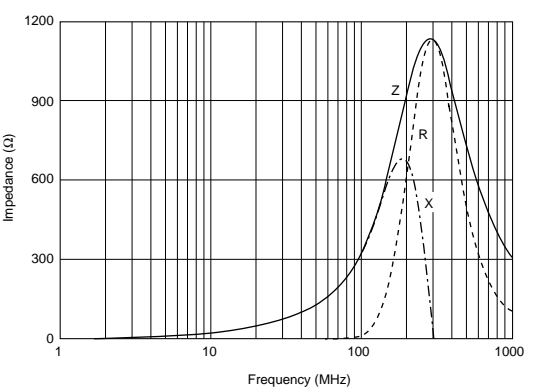
BLM21BB201SN1



BLM21BB221SN1



BLM21BB331SN1

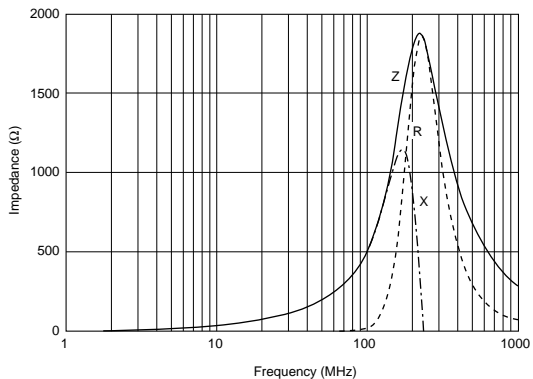


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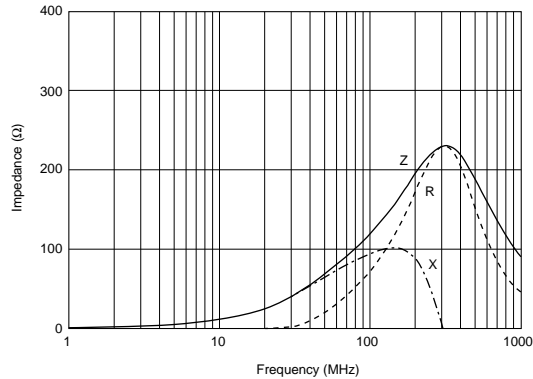
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Impedance-Frequency Characteristics

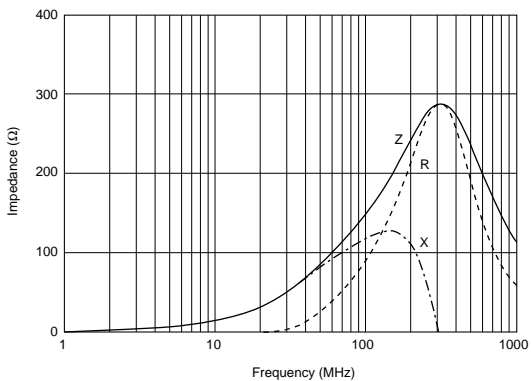
BLM21BB471SN1



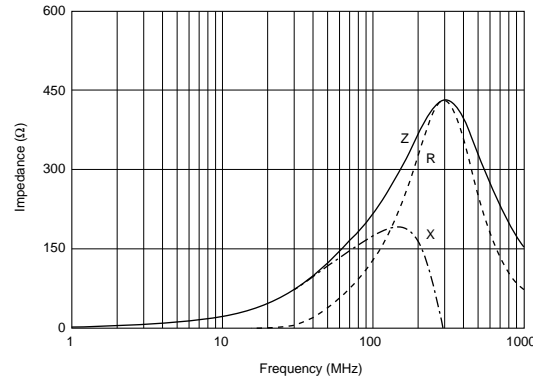
BLM21BD121SN1



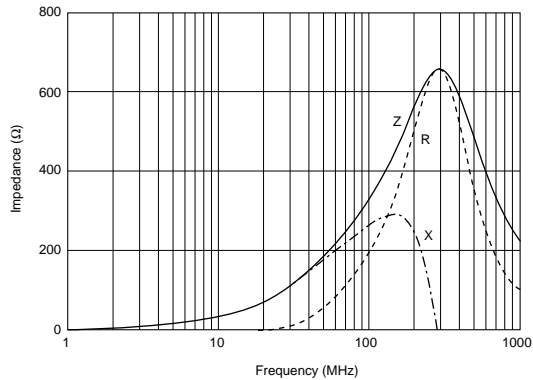
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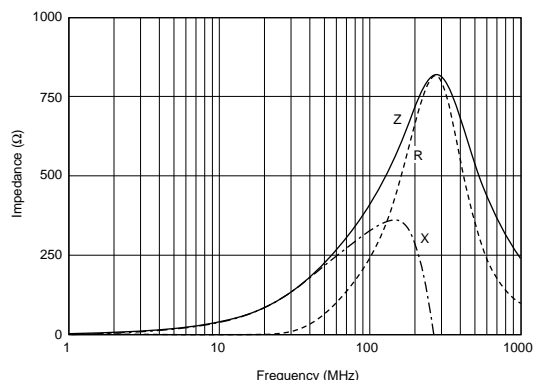
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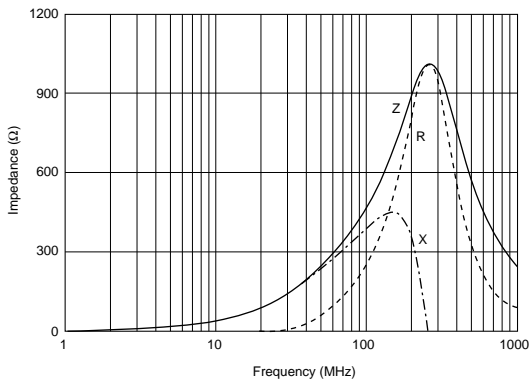
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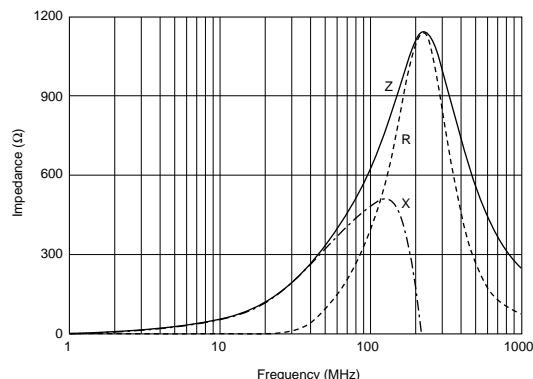
BLM21BD421SN1



BLM21BD471SN1



BLM21BD601SN1



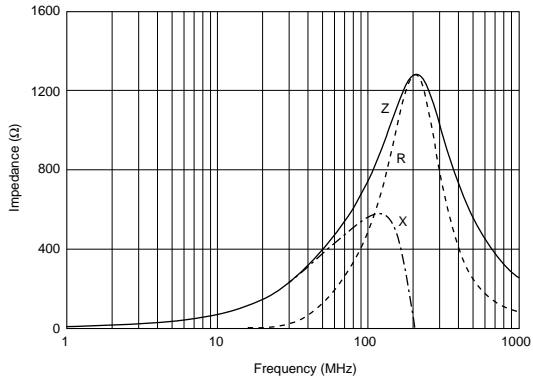
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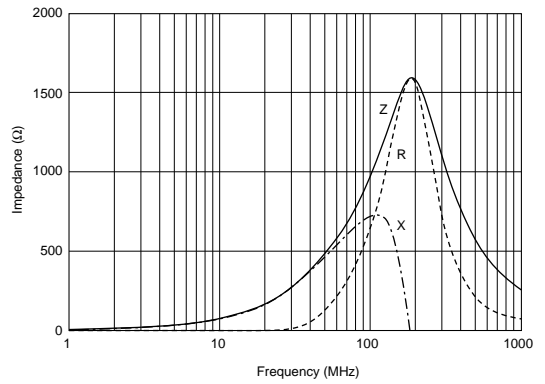
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Impedance-Frequency Characteristics

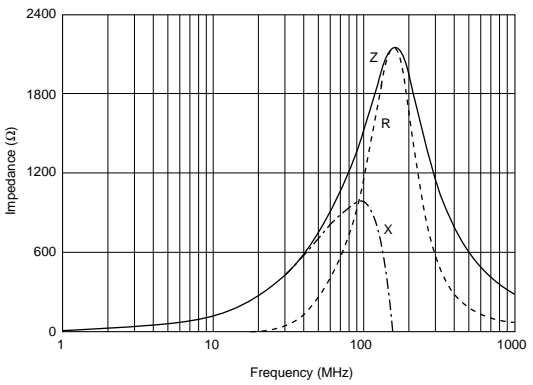
BLM21BD751SN1



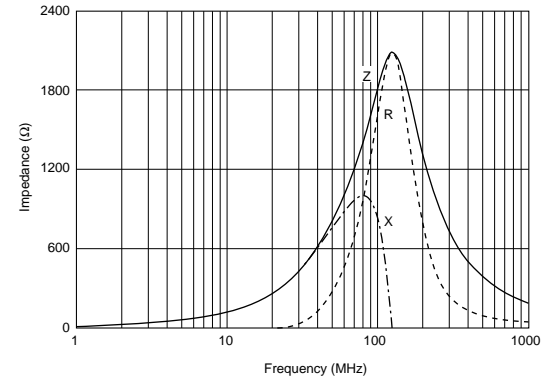
BLM21BD102SN1



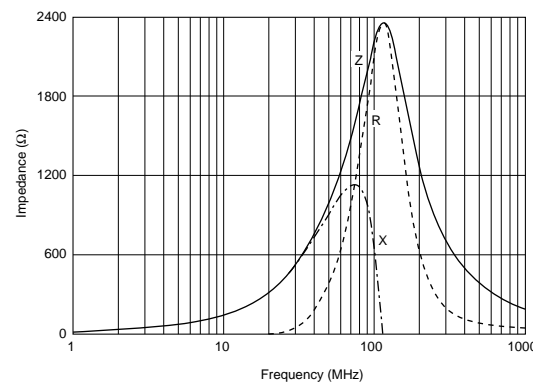
BLM21BD152SN1



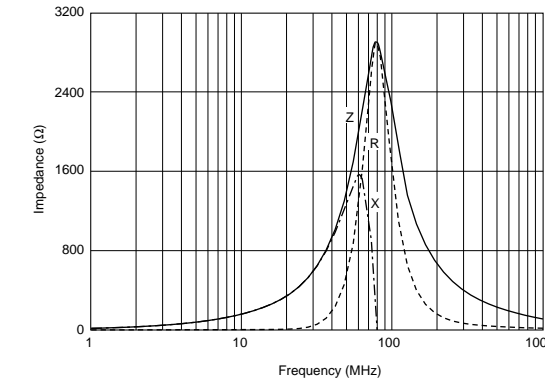
BLM21BD182SN1



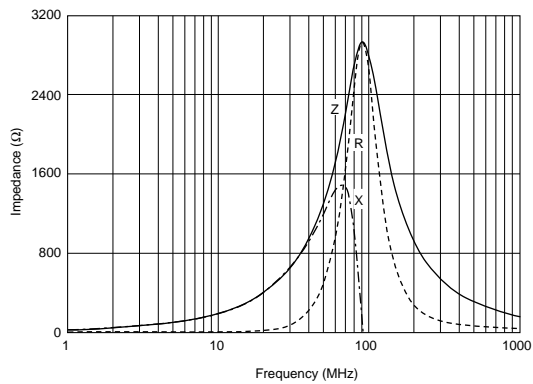
BLM21BD222TN1



BLM21BD222SN1

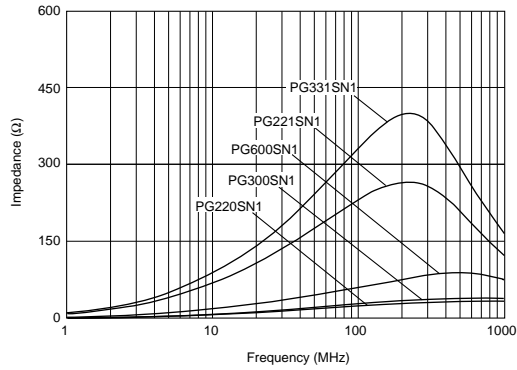


BLM21BD272SN1



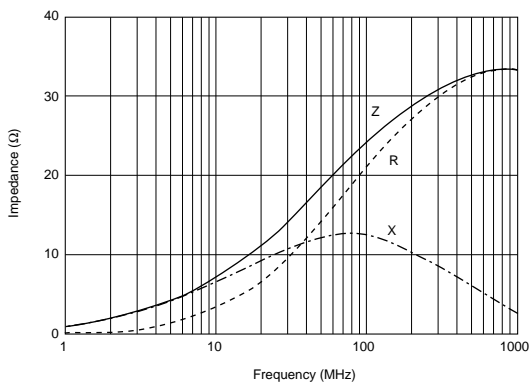
■ Impedance-Frequency (Typical)

BLM21P Series

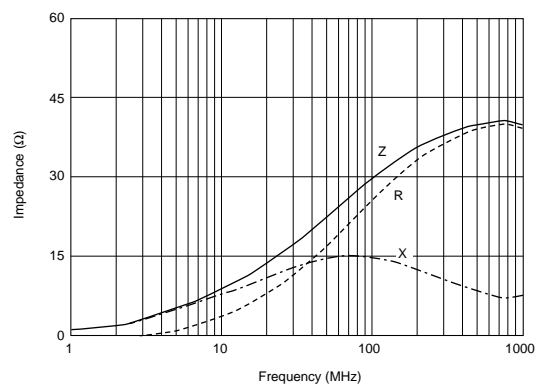


■ Impedance-Frequency Characteristics

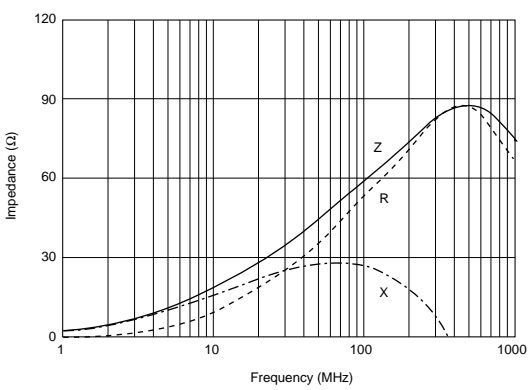
BLM21PG220SN1



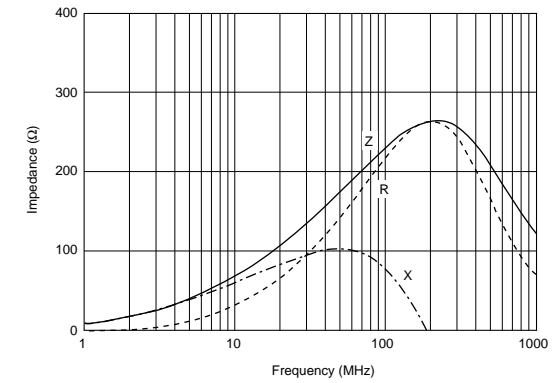
BLM21PG300SN1



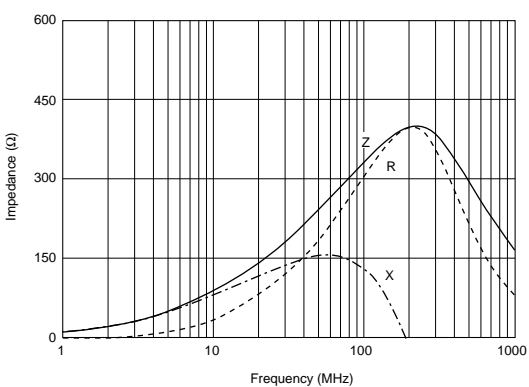
BLM21PG600SN1



BLM21PG221SN1



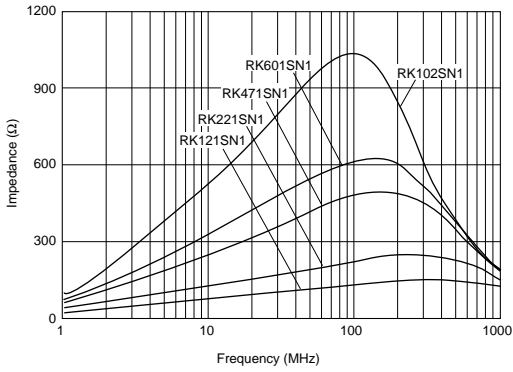
BLM21PG331SN1



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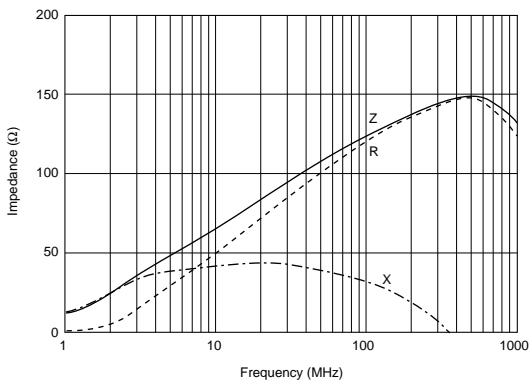
■ Impedance-Frequency (Typical)

BLM21R Series

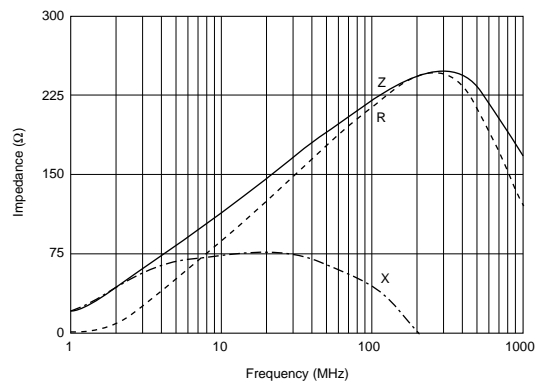


■ Impedance-Frequency Characteristics

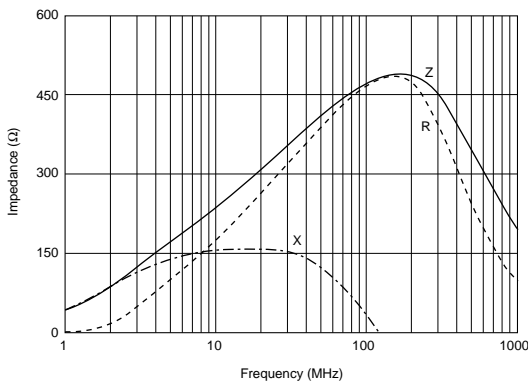
BLM21RK121SN1



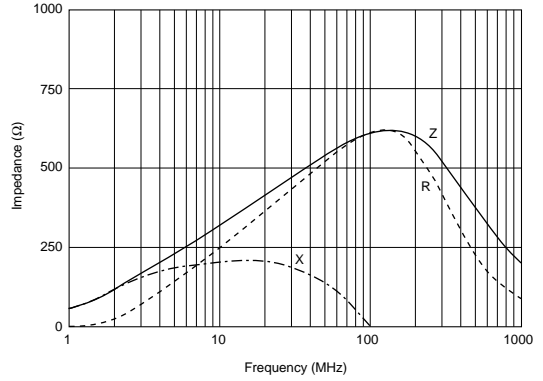
BLM21RK221SN1



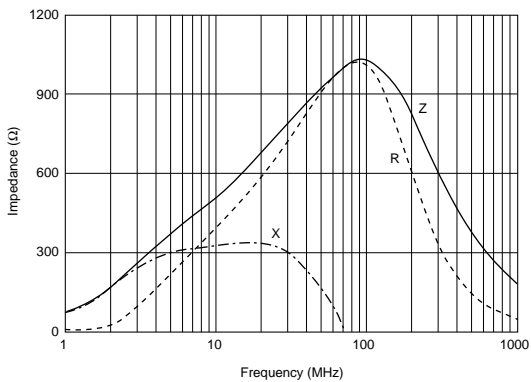
BLM21RK471SN1



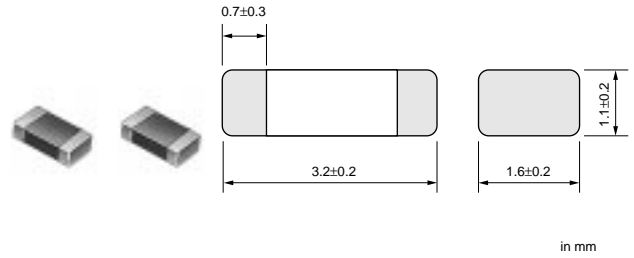
BLM21RK601SN1



BLM21RK102SN1



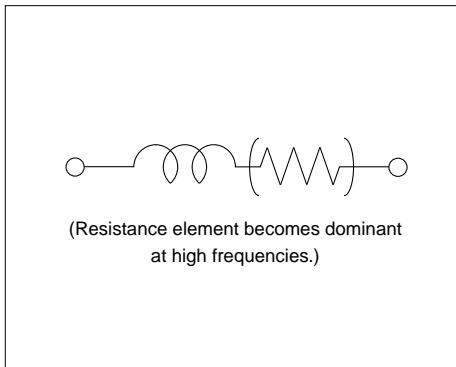
BLM31 Series(3216 Size)



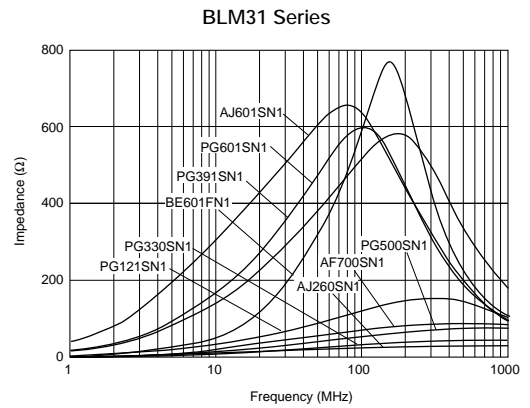
Part Number	Impedance (at 100MHz) (ohm)	Rated Current (mA)	DC Resistance(max.) (ohm)	Operating Temperature Range (°C)
BLM31AF700SN1	70 ±25%	200	0.15	-55 to 125
BLM31AJ260SN1	26 ±25%	500	0.05	-55 to 125
BLM31AJ601SN1	600 ±25%	200	0.90	-55 to 125
BLM31BE601FN1	600 ±25%	300	0.35	-55 to 125
BLM31PG330SN1	33 (Typ.)	6000	0.01	-55 to 125
BLM31PG500SN1	50 (Typ.)	3000	0.025	-55 to 125
BLM31PG121SN1	120 (Typ.)	3000	0.025	-55 to 125
BLM31PG391SN1	390 (Typ.)	2000	0.05	-55 to 125
BLM31PG601SN1	600 (Typ.)	1500	0.09	-55 to 125

BLM31P series require derating above 85°C ambient. Please contact us for details.

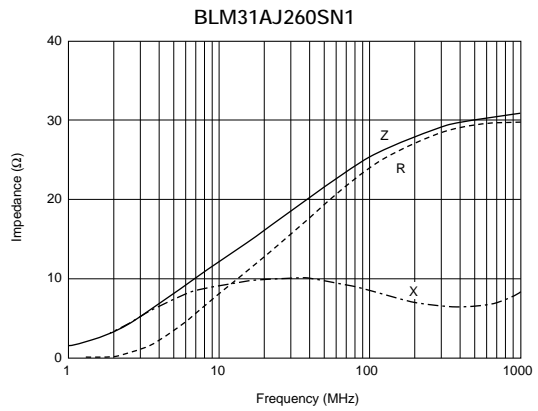
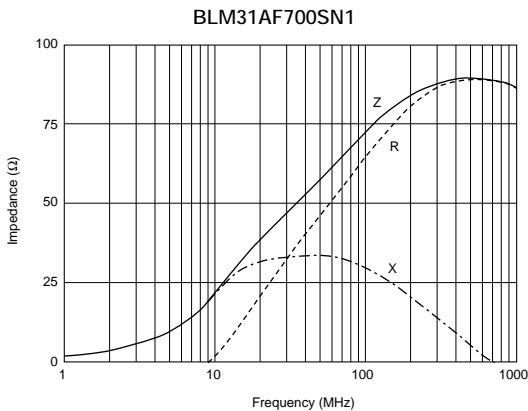
■ Equivalent Circuit



■ Impedance-Frequency (Typical)



■ Impedance-Frequency Characteristics



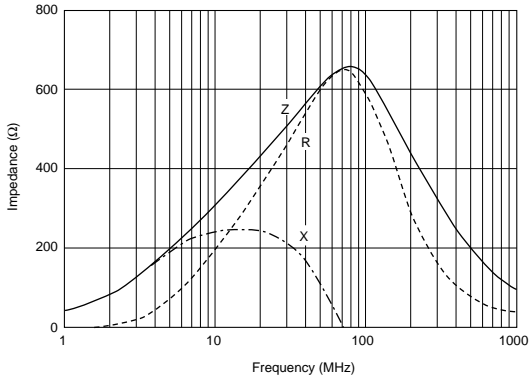
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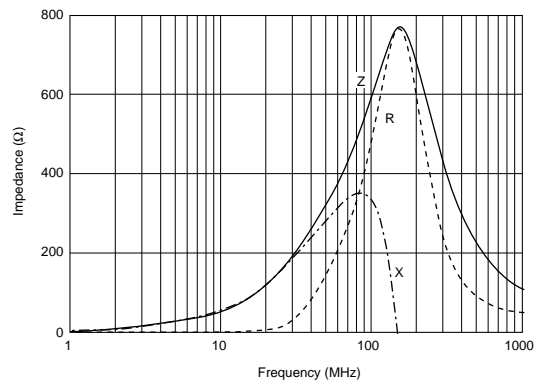
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Impedance-Frequency Characteristics

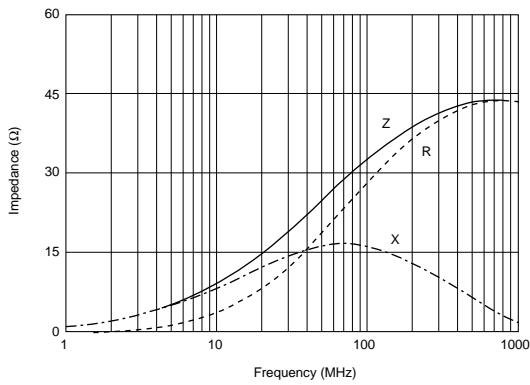
BLM31AJ601SN1



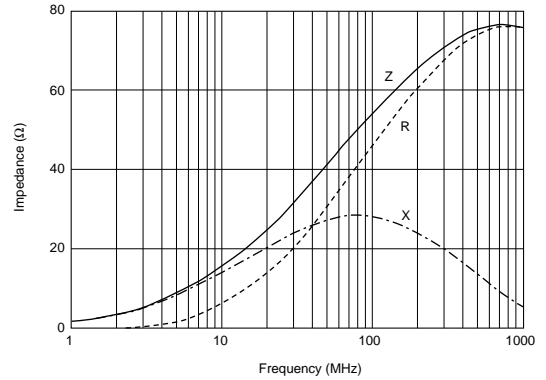
BLM31BE601SN1



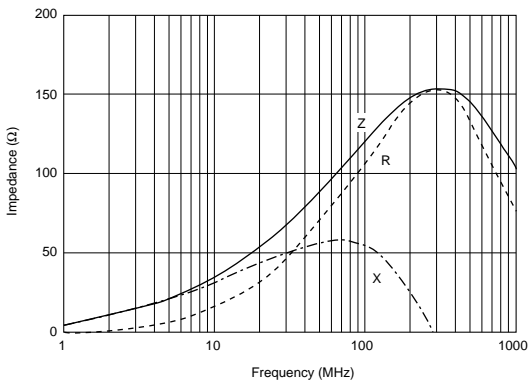
BLM31PG330SN1



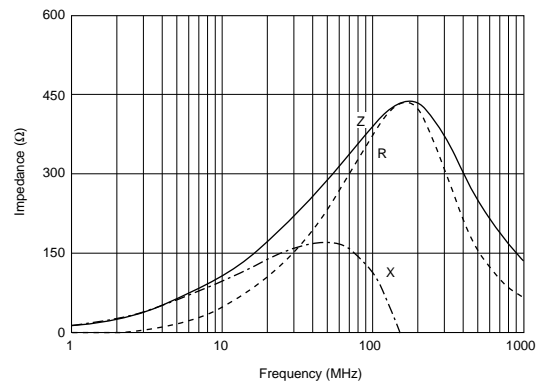
BLM31PG500SN1



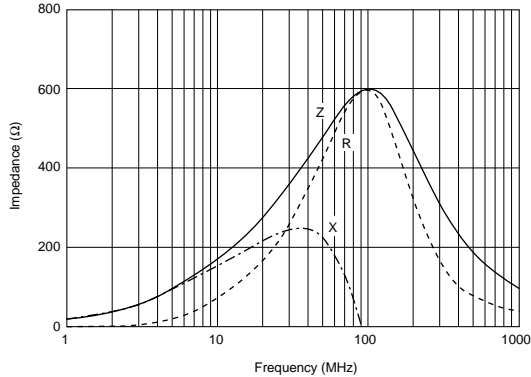
BLM31PG121SN1



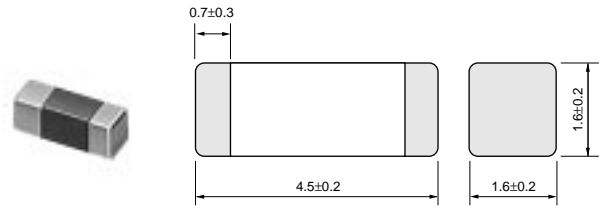
BLM31PG391SN1



BLM31PG601SN1



BLM41 Series(4516 Size)

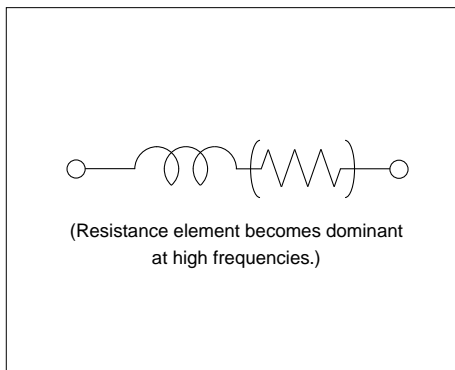


in mm

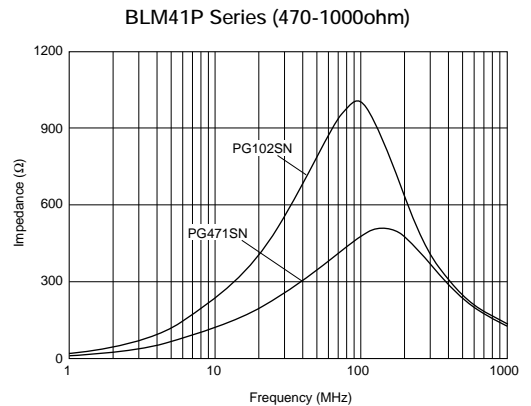
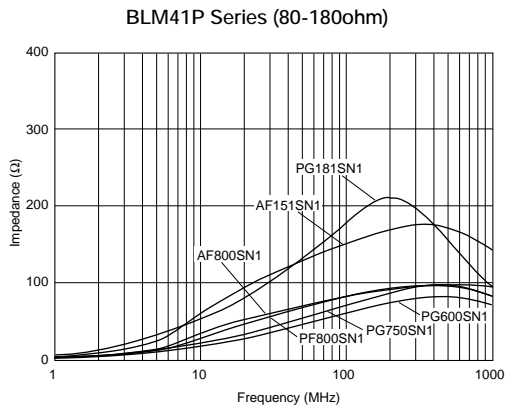
Part Number	Impedance (at 100MHz) (ohm)	Rated Current (mA)	DC Resistance(max.) (ohm)	Operating Temperature Range (°C)
BLM41AF800SN1	80 ±25%	500	0.10	-55 to 125
BLM41AF151SN1	150 ±25%	200	0.50	-55 to 125
BLM41PF800SN1	80 (Typ.)	1000	0.10	-55 to 125
BLM41PG600SN1	60 (Typ.)	6000	0.01	-55 to 125
BLM41PG750SN1	75 (Typ.)	3000	0.025	-55 to 125
BLM41PG181SN1	180 (Typ.)	3000	0.025	-55 to 125
BLM41PG471SN1	470 (Typ.)	2000	0.05	-55 to 125
BLM41PG102SN1	1000 (Typ.)	1500	0.09	-55 to 125

BLM41P series require derating above 85°C ambient. Please contact us for details.

■ Equivalent Circuit

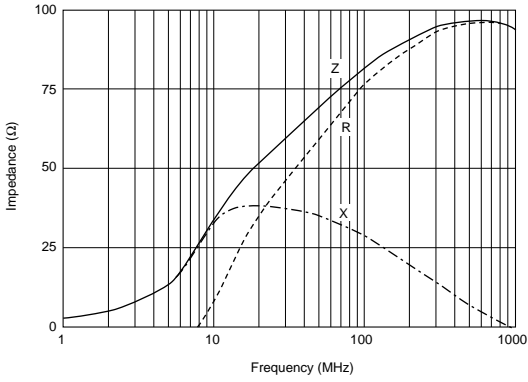


■ Impedance-Frequency (Typical)

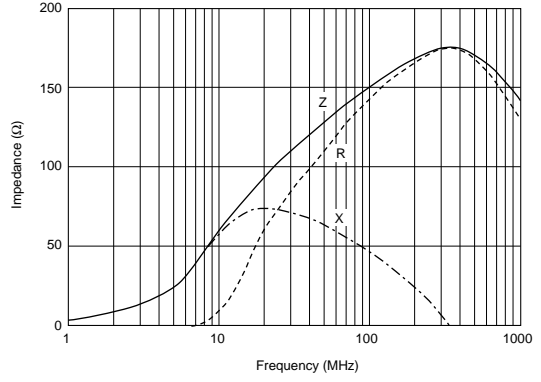


■ Impedance-Frequency Characteristics

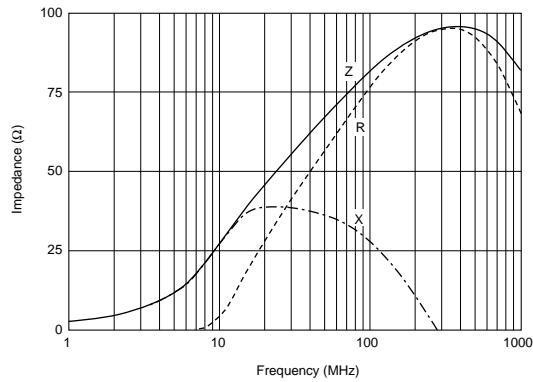
BLM41AF800SN1



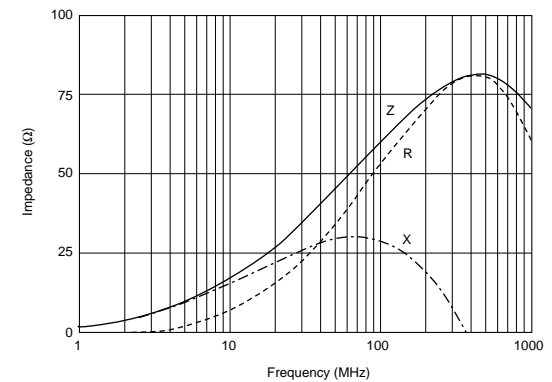
BLM41AF151SN1



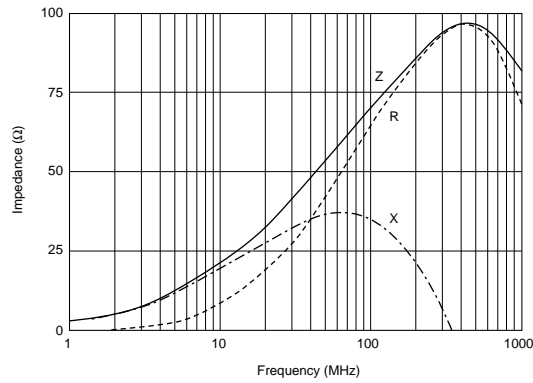
BLM41PF800SN1



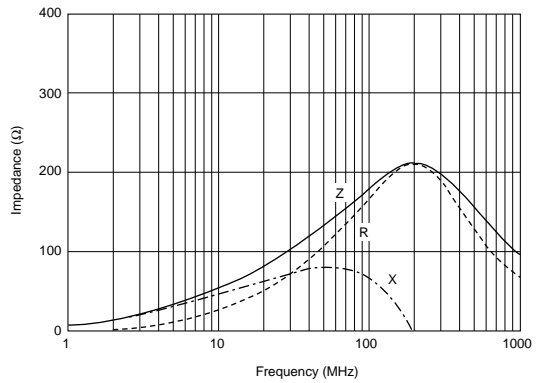
BLM41PG600SN1



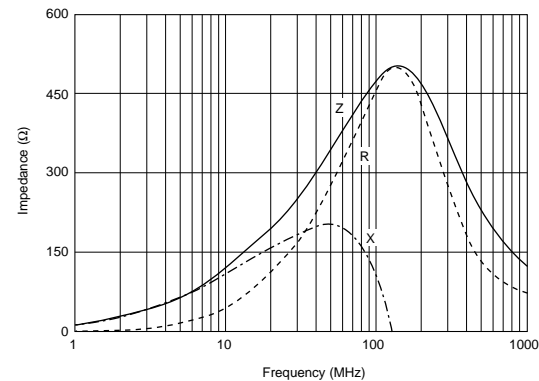
BLM41PG750SN1



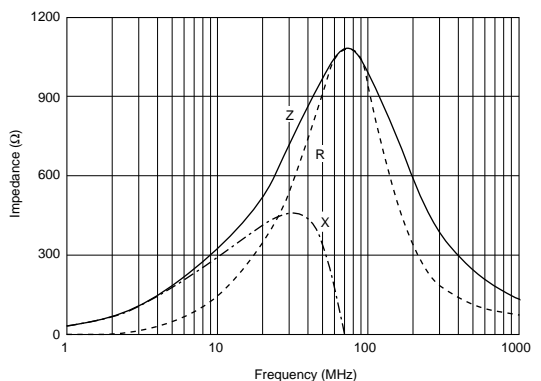
BLM41PG181SN1




BLM41PG471SN1



BLM41PG102SN1

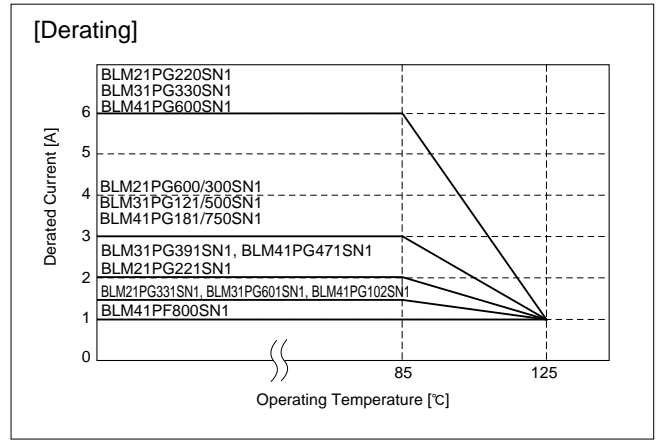


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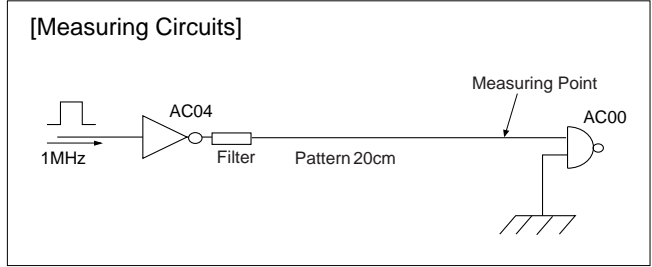
Notice (Rating)

When the BLM□□P series is for Large-current used in operating temperatures exceeding + 85°C, derating of current is necessary. Please apply the derating curve shown below according to the operating temperature.



Noise Suppression Effect of BLM_R Series

Waveform Distortion Suppressing Performance of BLM□□R Series



Type of Filter	EMI Suppression Effect / Description		
<p>Initial (No filter)</p>	<p>Signal waveform (100nsec/div, 2V/div)</p>	<p>Expand (10nsec/div, 2V/div)</p>	<p>Spectrum</p>
<p>Resister (47Ω) is used</p>	<p>Signal waveform (100nsec/div, 2V/div)</p>	<p>Expand (10nsec/div, 2V/div)</p>	<p>Spectrum</p>
<p>BLM18RK221SN1 (220Ω at 100MHz) is used</p>	<p>Signal waveform (100nsec/div, 2V/div)</p>	<p>Expand (10nsec/div, 2V/div)</p>	<p>Spectrum</p>

Ringing is caused on the signal waveform
Such ringing contains several hundred MHz harmonic components and generates noise.

Comparing initial waveform, ringing is suppressed a little.
However there still remains high level waveform distortion.

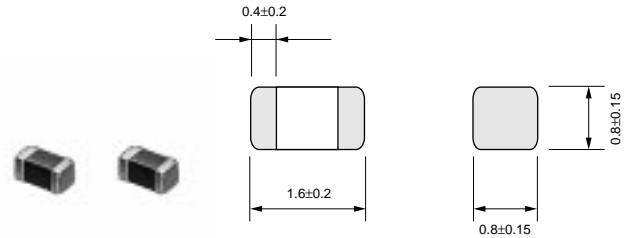
BLM18R has excellent performance for noise suppression and waveform distortion suppression.
BLM18R suppresses drastically not only spectrum level in more than 100MHz range but waveform distortion.

On-Board Type (DC) EMI Suppression Filters(EMIFIL®)

GHz Noise Suppression Chip Ferrite Beads BLM18H Series

2

The chip ferrite bead BLM18H series comprises ferrite bead inductors in the shape of a chip. This inductor generates a high impedance which at high frequencies mainly consists of a resistance element. The BLM18H series is effective in circuits without stable ground lines because the BLM18H series does not need a connection to ground.



■ Features

The BLM18HG, BLM18HD series has a modified internal electrode structure, that minimizes stray capacitance and increases the effective frequency range. Impedance values of 1000 ohm can be attained at frequency of 1GHz and greater.

1. The BLM18HG, BLM18HD series is similar to the existing BLM at frequency below 100MHz, however at 1GHz the impedance is approx. 3 times larger.
2. The BLM18HG is intended for standard signal lines as this series provides significant impedance across a broad frequency range. The BLM18HD provides a sharper roll-off after the cut off frequency, therefore this series is ideal for high speed signal lines.
3. The magnetic shielded structure minimizes crosstalk.

The BLM18HK series is chip ferrite beads for GHz range noise suppression of digital interface. The BLM18HK series has a modified internal electrode structure that minimizes stray capacitance and increases the effective frequency range.

Resistance especially grows in the lower frequency range, therefore BLM18HK series can suppress the ringing.

■ Features

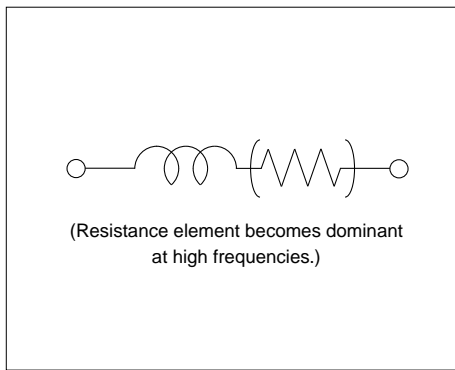
1. The BLM18HK series is realized high impedance at 1GHz and suitable for noise suppression from 500MHz to GHz range.
2. The BLM18HK series is effective in suppressing the ringing because resistance especially grows in the lower frequency.
3. The magnetic shielded structure minimizes cross talk.

■ Applications

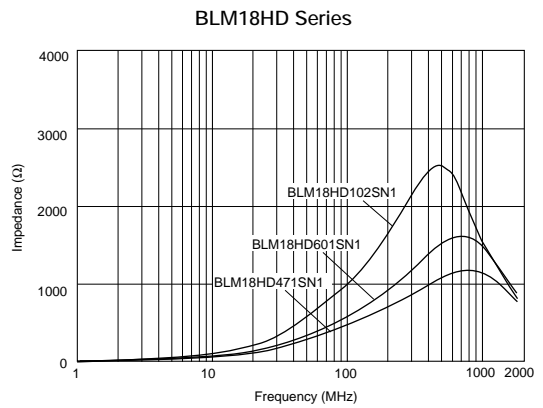
- Interface line of computer that has high-speed CPU & high-speed bus and other digital equipment like HDD.
- Suitable for noise suppression from 500MHz to GHz range.

Part Number	Impedance (at 100MHz) (ohm)	Rated Current (mA)	DC Resistance(max.) (ohm)	Operating Temperature Range (°C)
BLM18HD471SN1	470 ±25% (1000 ohm (Typ.) at 1GHz)	100	1.20	-55 to 125
BLM18HD601SN1	600 ±25% (1200 ohm (Typ.) at 1GHz)	100	1.50	-55 to 125
BLM18HD102SN1	1000 ±25% (1700 ohm (Typ.) at 1GHz)	50	1.80	-55 to 125
BLM18HG471SN1	470 ±25% (600 ohm (Typ.) at 1GHz)	200	0.85	-55 to 125
BLM18HG601SN1	600 ±25% (700 ohm (Typ.) at 1GHz)	200	1.00	-55 to 125
BLM18HG102SN1	1000 ±25% (1000 ohm (Typ.) at 1GHz)	100	1.60	-55 to 125
BLM18HK331SN1	330 (400 ohm (Typ.) at 1GHz)	200	0.50	-55 to 125
BLM18HK471SN1	470 (600 ohm (Typ.) at 1GHz)	200	0.70	-55 to 125
BLM18HK601SN1	600 (700 ohm (Typ.) at 1GHz)	100	0.90	-55 to 125
BLM18HK102SN1	1000 (1200 ohm (Typ.) at 1GHz)	50	1.50	-55 to 125

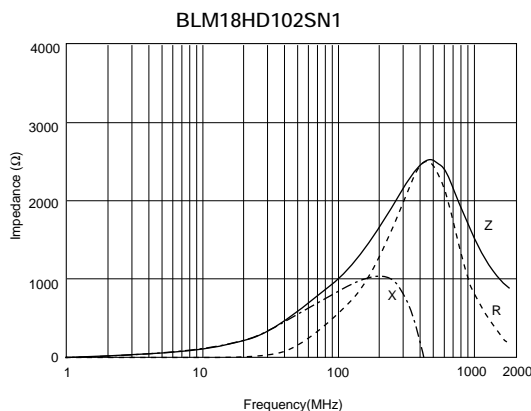
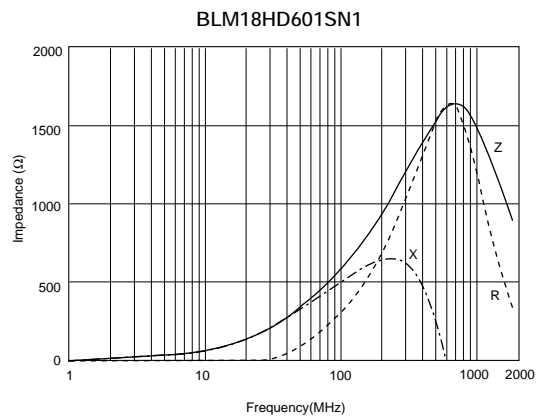
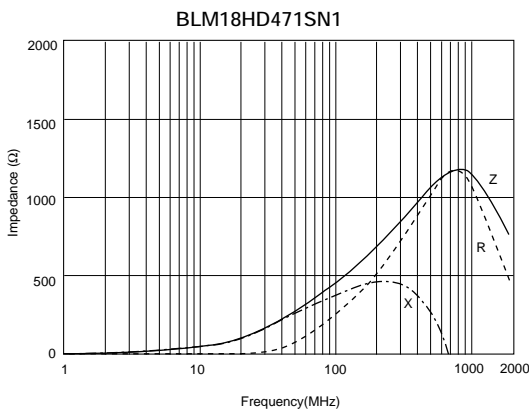
■ Equivalent Circuit



■ Impedance-Frequency (Typical)

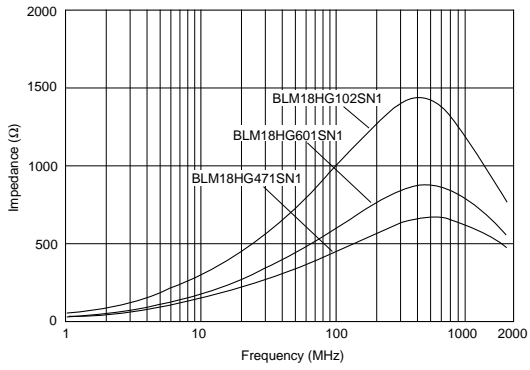


■ Impedance-Frequency Characteristics



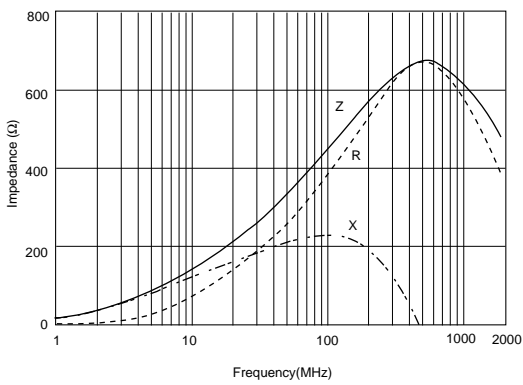
■ Impedance-Frequency (Typical)

BLM18HG Series

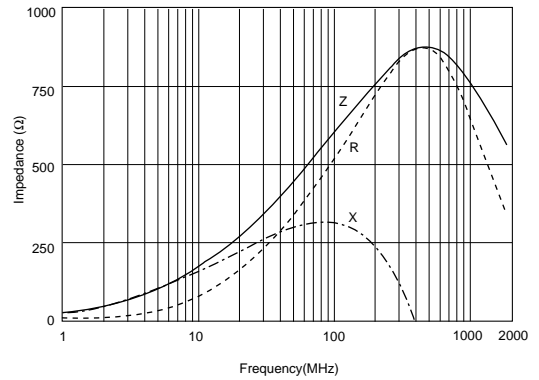


■ Impedance-Frequency Characteristics

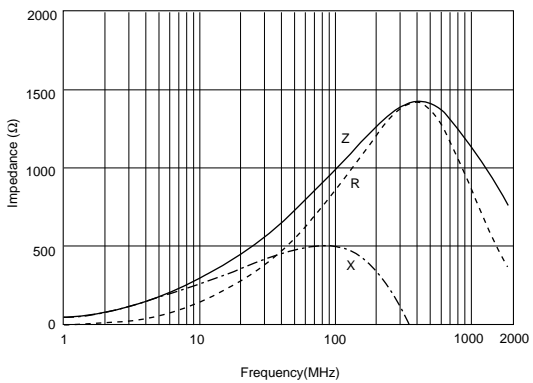
BLM18HG471SN1



BLM18HG601SN1

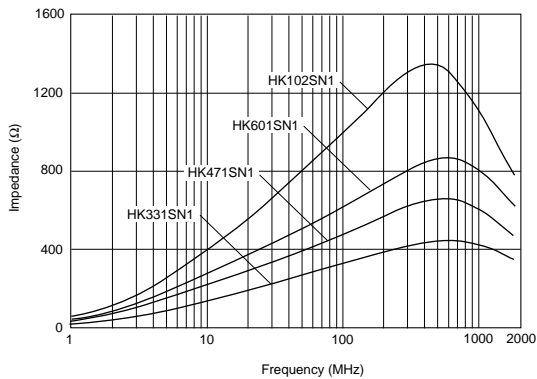


BLM18HG102SN1



■ Impedance-Frequency (Typical)

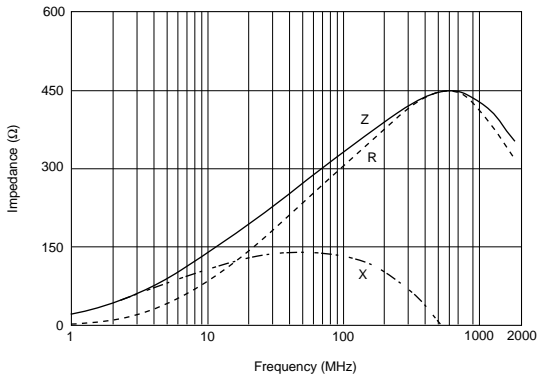
BLM18HK Series



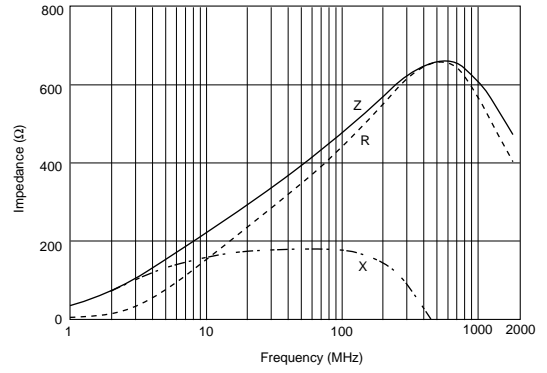
■ Impedance-Frequency Characteristics

2

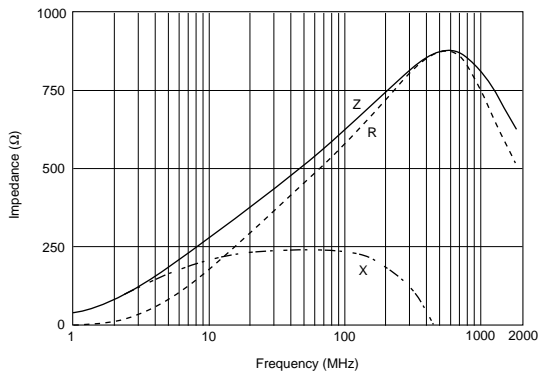
BLM18HK331SN



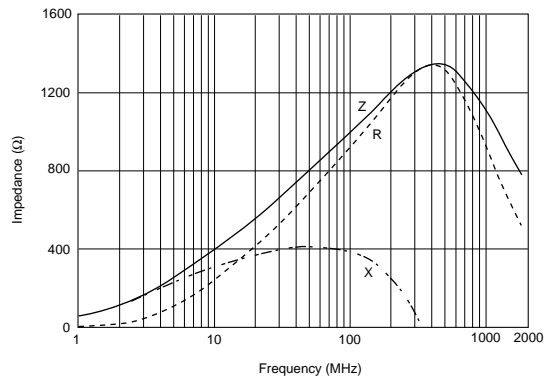
BLM18HK471SN



BLM18HK601SN

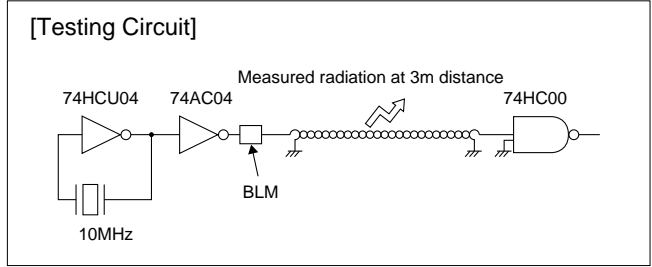


BLM18HK102SN



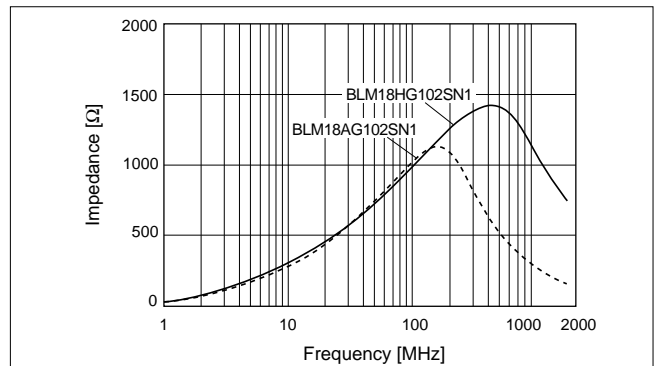
Noise Suppression Effect of BLM18H Series

■ Noise Suppression in UHF Range



Type of Filter	EMI Suppression Effect	Description
Initial (No filter)		
Conventional Type BLM18AG102SN1 (1000Ω at 100MHz)		Current BLM are effective in suppressing noise in the range between 300MHz and 700MHz.
for GHz Noise Suppression BLM18HG102SN1 (1000Ω at 100MHz)		In addition to the effectiveness of current BLM, BLM18HG suppresses noise in the range beyond 700MHz.

Comparison between BLM18HG102SN1 and BLM18AG102SN1 (CURRENT ITEM)



BLM Series Notice (Soldering and Mounting)

1. Standard Land Pattern Dimensions

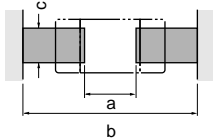
Do not apply narrower pattern than listed above to BLM_P.

Narrow pattern can cause excessive heat or open circuit.

BLM Series

(Except BLM21P/31P/41P)

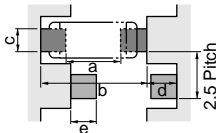
■ Land Pattern
□ Solder Resist



Type	Size (mm)				
	L	W	a	b	c
*BLM15 (Reflow)	1.0	0.5	0.4	1.2-1.4	0.5
BLM18 (Flow)	1.6	0.8	0.7	2.2-2.6	0.7
BLM18 (Reflow)	1.6	0.8	0.7	1.8-2.0	0.7
BLM21	2.0	1.25	1.2	3.0-4.0	1.0
BLM31	3.2	1.6	2.0	4.2-5.2	1.2
BLM41	4.5	1.6	3.0	5.5-6.5	1.2

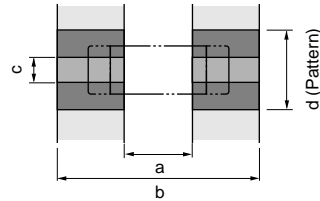
*BLM15 is specially adapted for reflow soldering.

Flow Mounting in High Density for BLM31/41



Type	Size (mm)				
	a	b	c	d	e
BLM31	2.0	4.2-5.2	1.2	1.3	1.35
BLM41	3.0	5.5-6.5	1.2	1.8	1.5

BLM21P/31P/41P



Type	Rated Current (A)	Size (mm)			Land pad thickness and Dimension d		
		a	b	c	18μm	35μm	70μm
BLM21PG331SN1	1.5				1.0	1.0	1.00
BLM21PG221SN1	2				1.2	1.0	1.00
BLM21PG300SN1	3	1.2	3.0-4.0	1.0	2.4	1.2	1.00
BLM21PG600SN1							
BLM21PG220SN1	6				6.4	3.3	1.65
BLM31PG330SN1	6						
BLM31PG500SN1	3	2.0	4.5-5.2	1.2	2.4	1.2	1.20
BLM31PG121SN1							
BLM31PG391SN1	2						
BLM31PG601SN1	1.5						
BLM41PF800SN1	1				1.2	1.2	1.20
BLM41PG102SN1	1.5						
BLM41PG471SN1	2						
BLM41PG750SN1	3	3.0	5.5-6.5	1.2	2.4	1.2	1.20
BLM41PG181SN1							
BLM41PG600SN1	6				6.4	3.3	1.65

2. Solder Paste Printing and Adhesive Application

When reflow soldering the chip EMI suppression filter, the printing must be conducted in accordance with the following cream solder printing conditions. If too much solder is applied, the chip will prone to be damaged by mechanical and thermal stress from the PCB and may crack. In contrast, if too little solder is applied, there is the potential that the termination strength will be insufficient, creating the potential for detachment. Standard land dimensions should be used for resist and copper foil patterns.

When flow soldering the EMI suppression filter, apply the adhesive in accordance with the following conditions. If too much adhesive is applied, then it may overflow into the land or termination areas and yield poor solderability. In contrast, if insufficient adhesive is applied, or if the adhesive is not sufficiently hardened, then the chip may become detached during flow soldering process.

Continued on the following page.

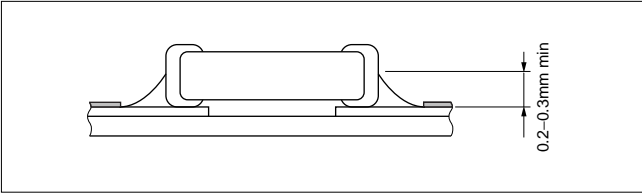
BLM Series Notice (Soldering and Mounting)

Continued from the preceding page.

(1) Solder Paste Printing

BLM Series

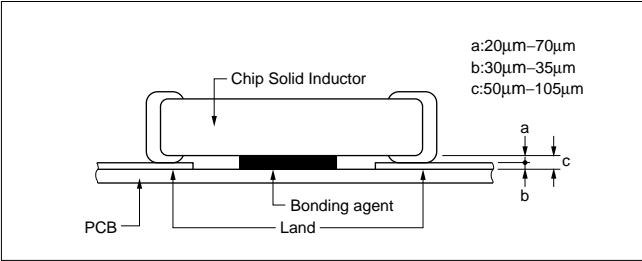
- Ensure that solder is applied smoothly to a minimum height of 0.2mm to 0.3mm at the end surface of the part.
- Coat the solder paste a thickness of 100µm to 200µm.



(2) Adhesive Application

BLM Series

- Coating amount is illustrated in the following diagram.



3. Standard Soldering Conditions

(1) SOLDERING METHODS

Use flow and reflow soldering methods only.

Use standard soldering conditions when soldering chip EMI suppression filters.

In cases where several different parts are soldered, each having different soldering conditions, use those conditions requiring the least heat and minimum time.

- Ensure that solder is applied smoothly to a minimum height of 0.2mm to 0.3mm at the end surface of the part.
- Coat the solder paste a thickness of 100µm to 200µm.

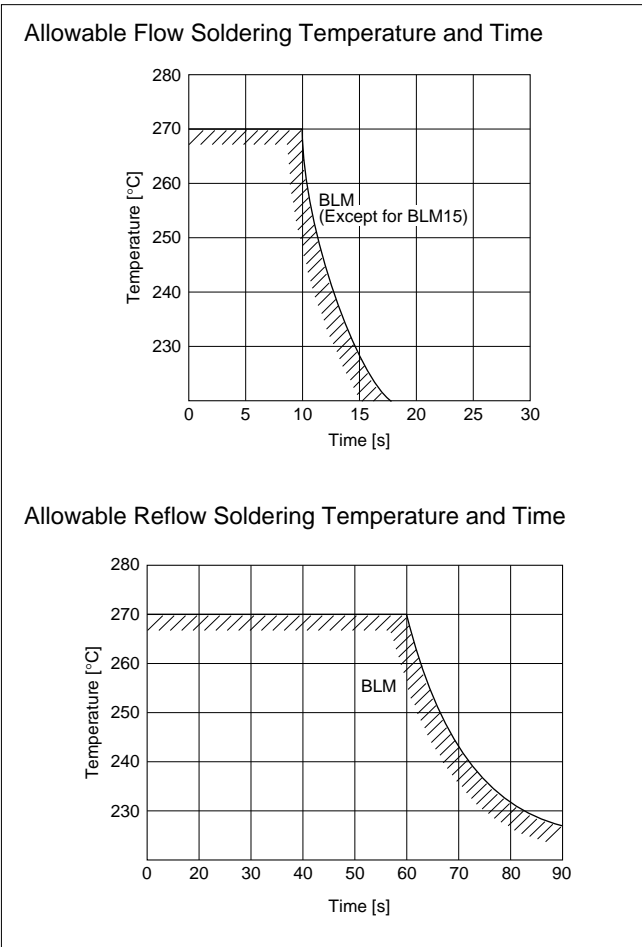
(2) SOLDERING TEMPERATURE AND TIME

To prevent external electrode solder leaching and performance deterioration, solder within the temperature and time combinations illustrated by the slanted lines in the following graphs. If soldering is repeated, please note that the allowed time is the accumulated time.

Solder : H60A H63A solder(JIS Z 3238)


Flux :

- Use Rosin-based fulx(when using RA type solder, clean products sufficiently to avoid residual fulx.
- Do not use strong acidic fulx(with chlorine content exceeding 0.20wt%)
- Do not use water-soluble fulx.



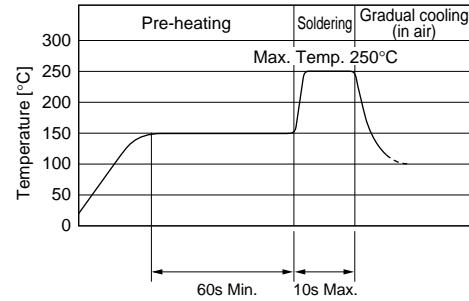
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BLM Series Notice (Soldering and Mounting)

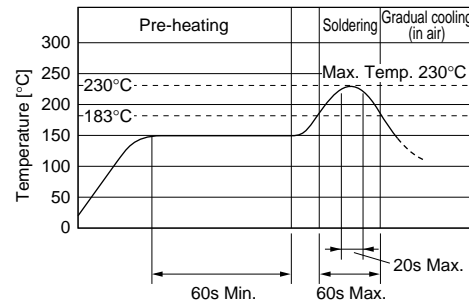
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(3) SOLDERING CONDITIONS

Flow Solder



Reflow Solder



(4) REWORKING WITH SOLDER IRON

The following conditions must be strictly followed when using a soldering iron.

- Pre-heating : 150°C 60 second Min.
- Soldering iron power output : 30W Max.
- Temperature of soldering iron tip : 280°C Max.
- Soldering time : 10 second Max.

Do not allow the tip of the soldering iron directly to contact the chip.

For additional methods of reworking with soldering iron, please contact Murata engineering.

4. Cleaning

Following conditions should be observed when cleaning chip EMI filter.

- (1) Cleaning Temperature : 60degree C max. (40degree C max. for CFC alternatives and alcohol cleaning agents)
- (2) Ultrasonic
 - Output : 20W/liter max.
 - Duration : 5 minutes max.
 - Frequency : 28kHz to 40kHz
- (3) Cleaning agent

The following list of cleaning agents have been tested on the individual components. Evaluation of final assembly should be completed prior to production.

- a) CFC alternatives and alcohol cleaning agents
 - Isopropyl alcohol (IPA)
 - HCFC-225

b) Aqueous cleaning agent

- Surface active agent (Clean Thru 750H)
- Hydrocarbon (Techno Cleaner 335)
- High grade alcohol (Pine Alpha ST-100S)
- Alkaline saponifier (Aqua Cleaner 240 -cleaner should be diluted within 20% using deionized water.)

- (4) Ensure that flux residue is completely removed. Component should be thoroughly dried after aqueous agent has been removed with deionized water.
- (5) Some products may become slightly whitened. However, product performance or usage is not affected. For additional cleaning methods, please contact Murata engineering.

On-Board Type (DC) EMI Suppression Filters(EMIFIL[®])



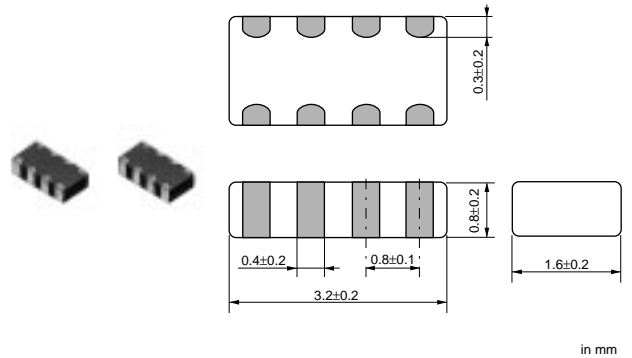
Chip Ferrite Beads Arrays BLA31A/BLA31B Series

The miniaturize of electronic equipment requires high performance EMI filters which enables high density mounting. BLA31A/B series consists of 4 circuit of ferrite bead inductor.

BLA31A/B is suitable for EMI suppression in smaller digital equipment.

■ Features

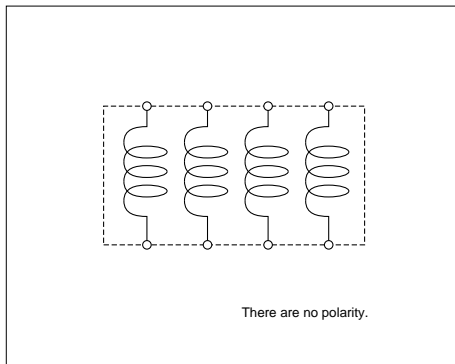
1. BLA31A/B have 4 circuits in 3.2x1.6mm body with 0.8mm pitch.
2. Provides attenuation across a broad frequency range.
Two types of impedance are available which meets general signal line and high speed signal line.
3. Original inner electrode structure enables extra low crosstalk.
4. The nickel barrier structure of the external electrodes provides excellent solder heat resistance.
Both flow and reflow soldering methods can employed.



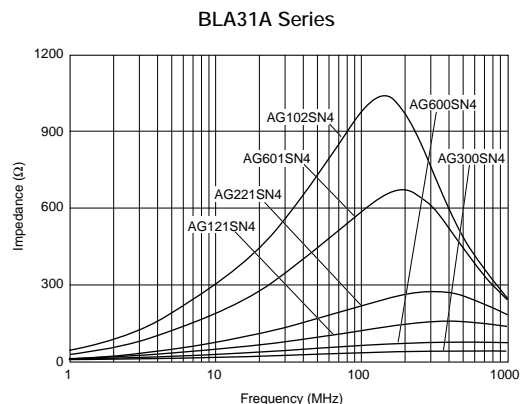
Part Number	Impedance (at 100MHz) (ohm)	Rated Current (mA)	DC Resistance(max.) (ohm)	Operating Temperature Range (°C)
BLA31AG300SN4	30 ±25%	200	0.10	-55 to 125
BLA31AG600SN4	60 ±25%	200	0.25	-55 to 125
BLA31AG121SN4	120 ±25%	150	0.30	-55 to 125
BLA31AG221SN4	220 ±25%	150	0.30	-55 to 125
BLA31AG601SN4	600 ±25%	100	0.50	-55 to 125
BLA31AG102SN4	1000 ±25%	50	0.70	-55 to 125
BLA31BD121SN4	120 ±25%	150	0.40	-55 to 125
BLA31BD221SN4	220 ±25%	150	0.45	-55 to 125
BLA31BD471SN4	470 ±25%	100	0.55	-55 to 125
BLA31BD601SN4	600 ±25%	100	0.65	-55 to 125
BLA31BD102SN4	1000 ±25%	50	0.55	-55 to 125

Number of Circuit : 4


■ Equivalent Circuit



■ Impedance-Frequency (Typical)



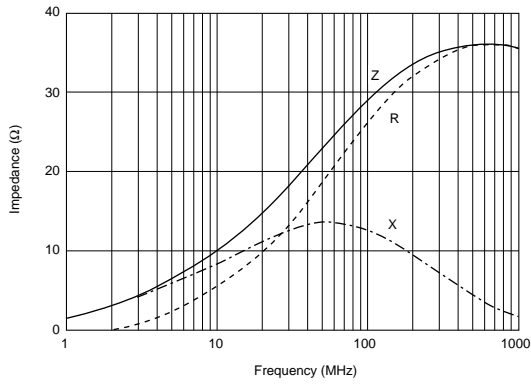
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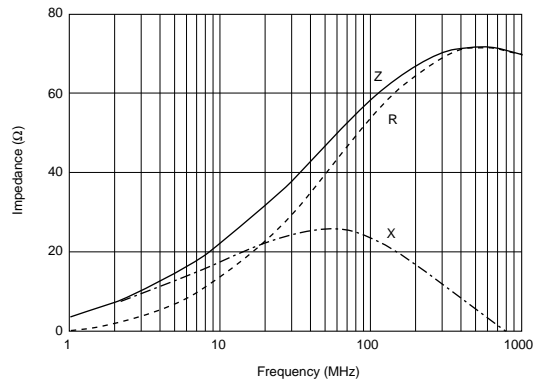
Impedance-Frequency Characteristics

3

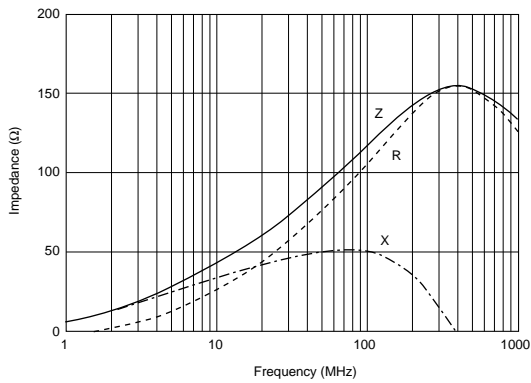
BLA31AG300SN4



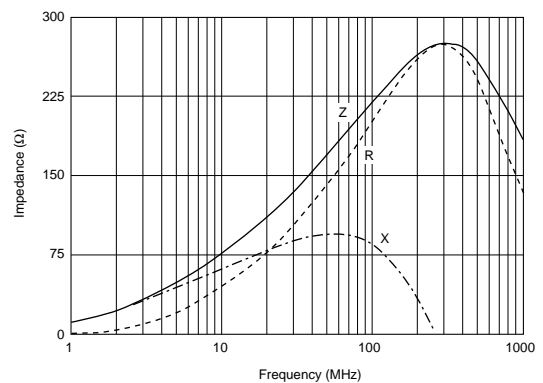
BLA31AG600SN4



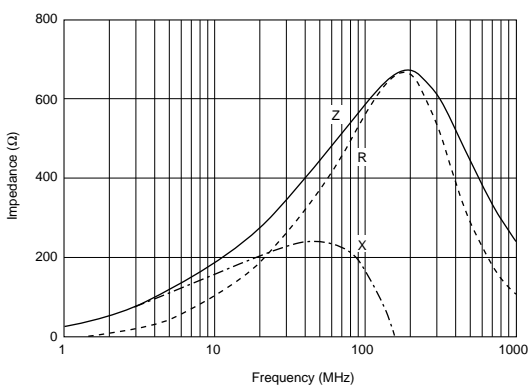
BLA31AG121SN4



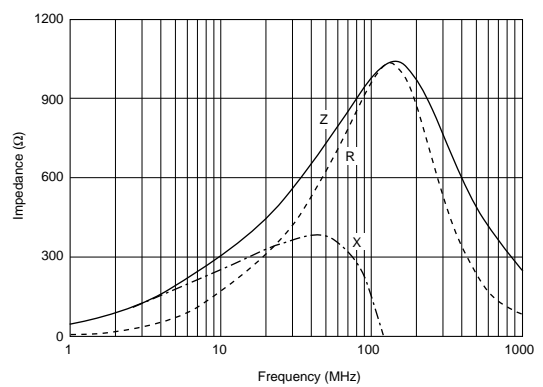
BLA31AG221SN4



BLA31AG601SN4

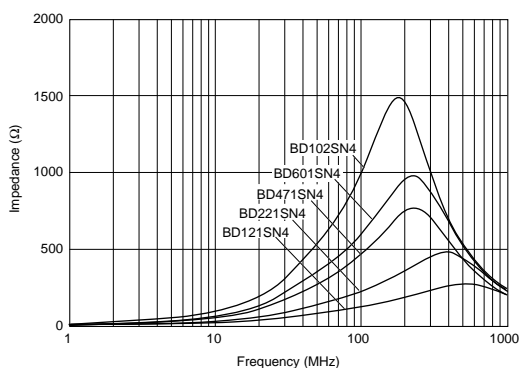


BLA31AG102SN4



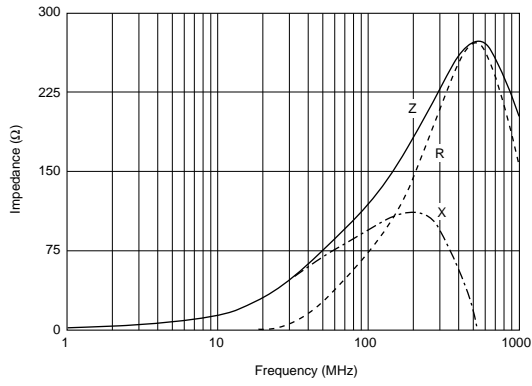
Impedance-Frequency (Typical)

BLA31B Series

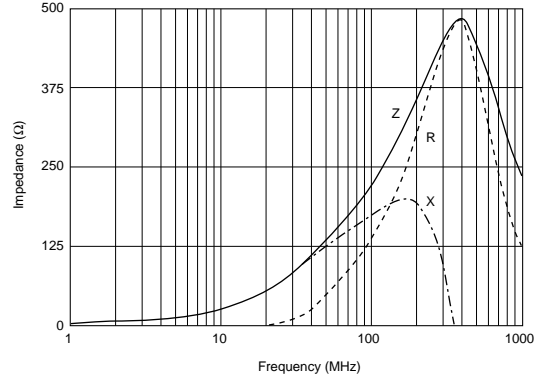


■ Impedance-Frequency Characteristics

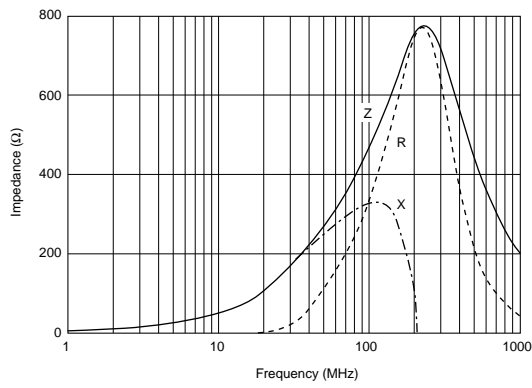
BLA31BD121SN4



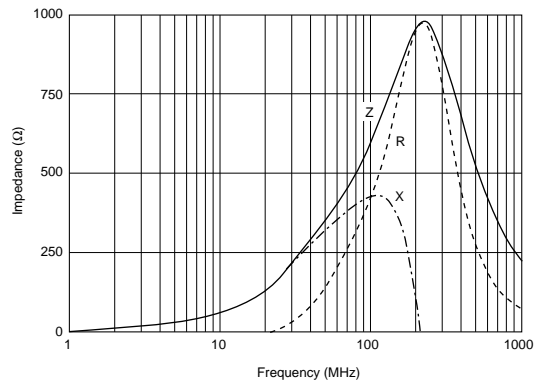
BLA31BD221SN4



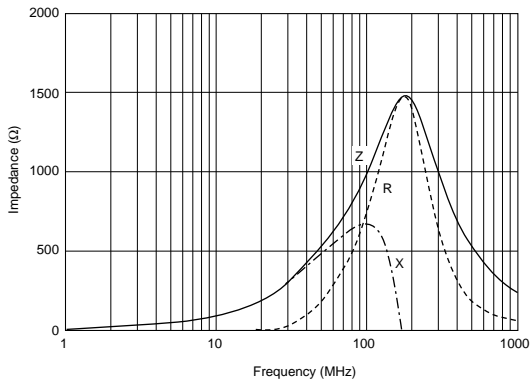
BLA31BD471SN4



BLA31BD601SN4



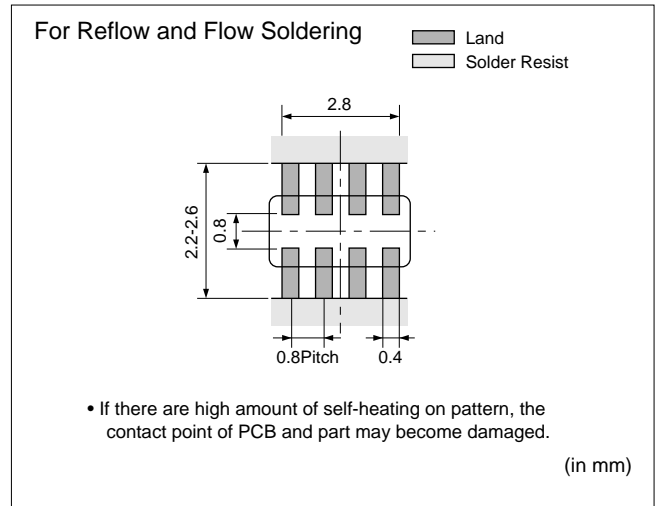
BLA31BD102SN4



3

BLA Series Notice (Soldering and Mounting)

1. Standard Land Pattern Dimensions



2. Solder Paste Printing and Adhesive Application

When reflow soldering the chip EMI suppression filter, the printing must be conducted in accordance with the following cream solder printing conditions. If too much solder is applied, the chip will prone to be damaged by mechanical and thermal stress from the PCB and may crack. In contrast, if too little solder is applied, there is the potential that the termination strength will be insufficient, creating the potential for detachment. Standard land dimensions should be used for resist and copper foil

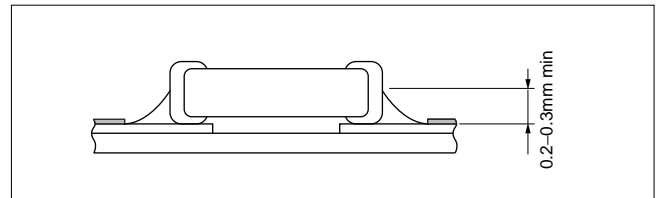
patterns.

When flow soldering the EMI suppression filter, apply the adhesive in accordance with the following conditions. If too much adhesive is applied, then it may overflow into the land or termination areas and yield poor solderability. In contrast, if insufficient adhesive is applied, or if the adhesive is not sufficiently hardened, then the chip may become detached during flow soldering process.

(1) Solder Paste Printing

BLA31Series

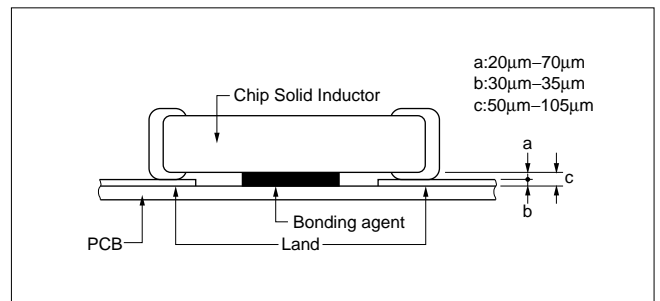
- Ensure that solder is applied to a minimum height of 0.2mm to 0.3mm at the end surface of the part.
- Coat the solder paste a thickness of 100 μ m to 200 μ m.



(2) Adhesive Application

BLA31Series

- Coating amount is illustrated in the following diagram.



Continued on the following page.

BLA Series Notice (Soldering and Mounting)

Continued from the preceding page.

3. Standard Soldering Conditions

(1) SOLDERING METHODS

Use flow and reflow soldering methods only.
 Use standard soldering conditions when soldering chip EMI suppression filters.
 In cases where several different parts are soldered, each having different soldering conditions, use those conditions requiring the least heat and minimum time.

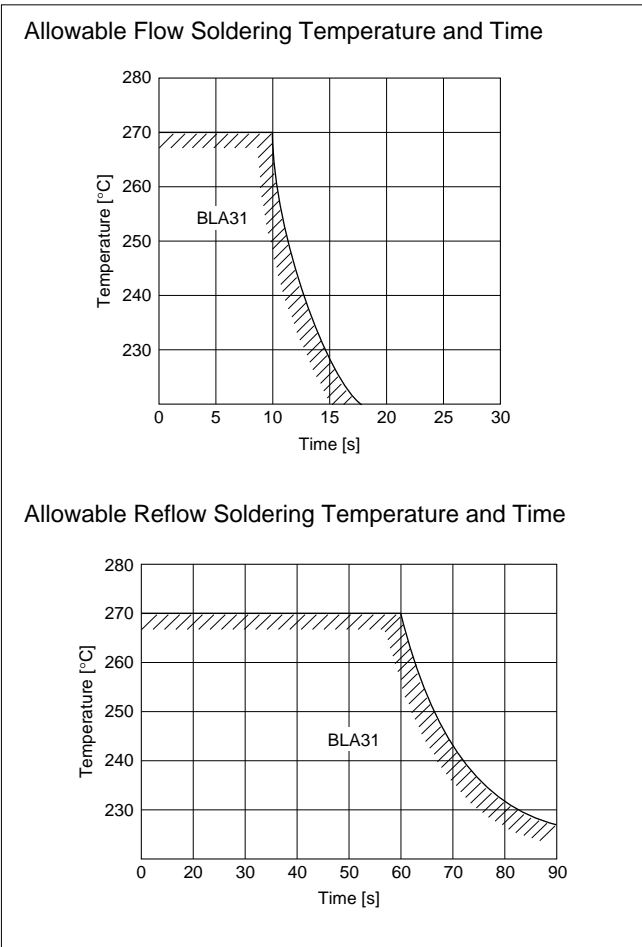
(2) SOLDERING TEMPERATURE AND TIME

To prevent external electrode solder leaching and performance deterioration, solder within the temperature and time combinations illustrated by the slanted lines in the following graphs. If soldering is repeated, please note that the allowed time is the accumulated time.

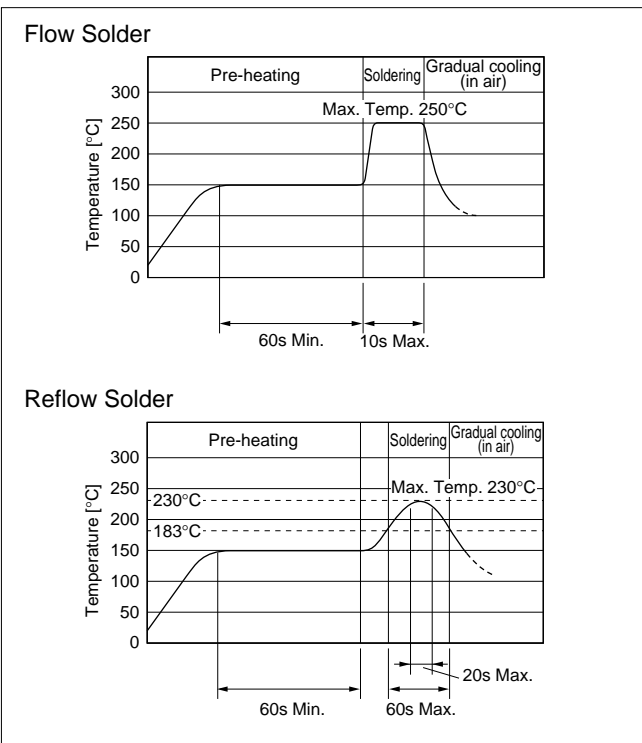
Solder: H60A H63A solder(JIS Z 3238)

Flux :

- Use Rosin-based fulx(when using RA type solder, clean products sufficiently to avoid residual fulx.)
- Do not use strong acidic fulx(with chlorine content exceeding 0.20wt%)
- Do not use water-soluble fulx.




(3) SOLDERING CONDITION



Continued on the following page.

BLA Series Notice (Soldering and Mounting)

 Continued from the preceding page.

(4) REWORKING WITH SOLDER IRON

The following conditions must be strictly followed when using a soldering iron.

Pre-heating	: 150°C 60 second Min.
Soldering iron power output	: 30W Max.
Temperature of soldering iron tip	: 280°C Max.
Soldering time	: 10 second Max.

Do not allow the tip of the soldering iron directly to contact the chip.

For additional methods of reworking with soldering iron, please contact Murata engineering.

4. Cleaning

Following conditions should be observed when cleaning chip EMI filter.

(1) Cleaning Temperature : 60degree C max. (40degree C max. for CFC alternatives and alcohol cleaning agents)

(2) Ultrasonic

Output : 20W/liter max.

Duration : 5 minutes max.

Frequency : 28kHz to 40kHz

(3) Cleaning agent

The following list of cleaning agents have been tested on the individual components. Evaluation of final assembly should be completed prior to production.

a) CFC alternatives and alcohol cleaning agents

Isopropyl alcohol (IPA)

HCFC-225

b) Aqueous cleaning agent

Surface active agent (Clean Thru 750H)

Hydrocarbon (Techno Cleaner 335)

High grade alcohol (Pine Alpha ST-100S)

Alkaline saponifier (Aqua Cleaner 240 -cleaner should be diluted within 20% using deionized water.)

(4) Ensure that flux residue is completely removed.

Component should be thoroughly dried after aqueous agent has been removed with deionized water.

(5) Some products may become slightly whitened.

However, product performance or usage is not affected. For additional cleaning methods, please contact Murata engineering.

On-Board Type (DC) EMI Suppression Filters(EMIFIL®)



Chip EMIFIL® NFM21C/NFM3DC/NFM41C Series

The chip solid "EMIFIL" series is a chip type 3-terminal EMI suppression filter. It can reduce residual inductance to an extremely low level making it excellent for noise suppression at high frequencies. An electrostatic capacitance range of 22pF to 22,000pF enables suppression of noise at specific frequencies.

■ Features

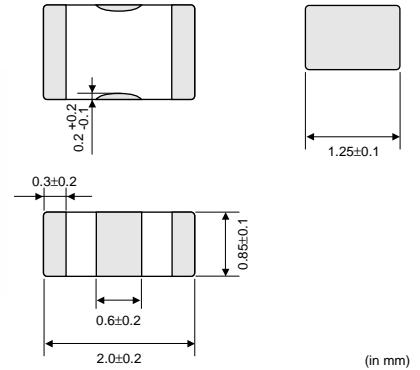
1. Small and low profile of 2.0mmx1.25mmx0.85mm (NFM21C) enables high density mounting.
2. The 3 terminal structure enables high performance in high frequency range.
3. Use original electrode structure which realize excellent solderability.

■ Applications

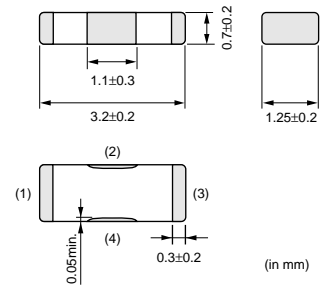
- PCs and peripherals which emit high amount of noise
- Compact size equipment such as PDA, PC card and mobile telecommunication equipments
- Severe EMI suppression and high impedance circuits such as digital circuits



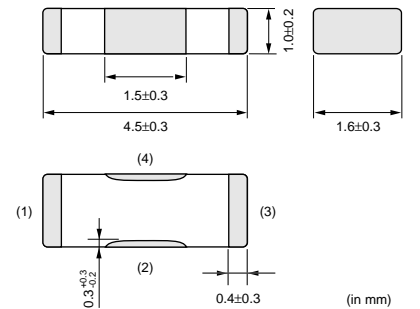
NFM21C



NFM3DC



NFM41C

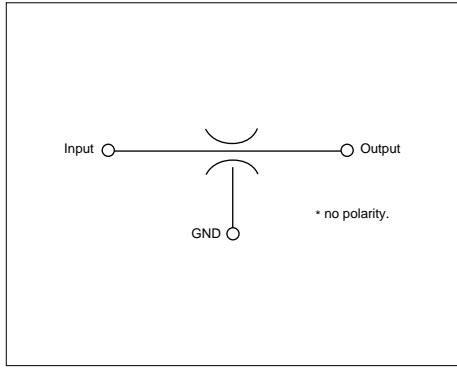


NFM21C Series

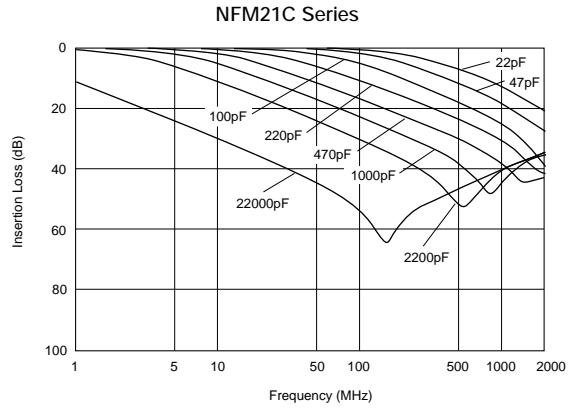
Part Number	Capacitance (pF)	Rated Voltage (Vdc)	Rated Current	Insulation Resistance (M ohm)	Operating Temperature Range (°C)
NFM21CC220U1H3	22 +20%, -20%	50	300mA	1000 min.	-55 to 125
NFM21CC470U1H3	47 +20%, -20%	50	300mA	1000 min.	-55 to 125
NFM21CC101U1H3	100 +20%, -20%	50	300mA	1000 min.	-55 to 125
NFM21CC221R1H3	220 +20%, -20%	50	300mA	1000 min.	-55 to 125
NFM21CC471R1H3	470 +20%, -20%	50	300mA	1000 min.	-55 to 125
NFM21CC102R1H3	1000 +20%, -20%	50	300mA	1000 min.	-55 to 125
NFM21CC222R1H3	2200 +20%, -20%	50	300mA	1000 min.	-55 to 125
NFM21CC223R1H3	22000 +20%, -20%	50	1A	1000 min.	-55 to 125

4

■ Equivalent Circuit



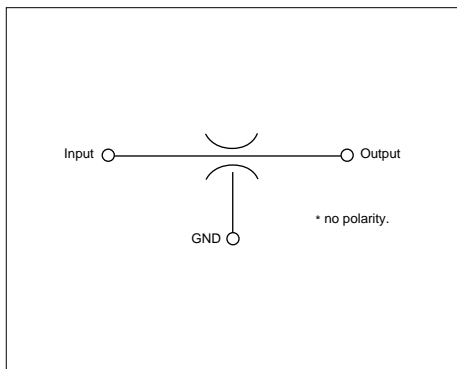
■ Insertion Loss Characteristics (Typical)



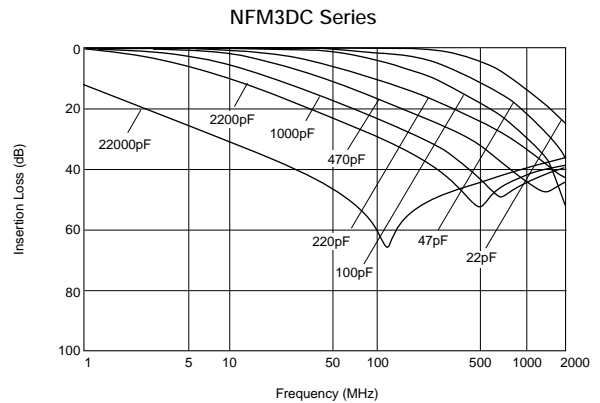
NFM3DC Series

Part Number	Capacitance (pF)	Rated Voltage (Vdc)	Rated Current (mA)	Insulation Resistance (M ohm)	Operating Temperature Range (°C)
NFM3DCC220U1H3	22 +50%, -20%	50	300	1000 min.	-55 to 125
NFM3DCC470U1H3	47 +50%, -20%	50	300	1000 min.	-55 to 125
NFM3DCC101U1H3	100 +50%, -20%	50	300	1000 min.	-55 to 125
NFM3DCC221R1H3	220 +50%, -20%	50	300	1000 min.	-55 to 125
NFM3DCC471R1H3	470 +50%, -20%	50	300	1000 min.	-55 to 125
NFM3DCC102R1H3	1000 +50%, -20%	50	300	1000 min.	-55 to 125
NFM3DCC222R1H3	2200 +50%, -20%	50	300	1000 min.	-55 to 125
NFM3DCC223R1H3	22000 +50%, -20%	50	300	1000 min.	-55 to 125

■ Equivalent Circuit



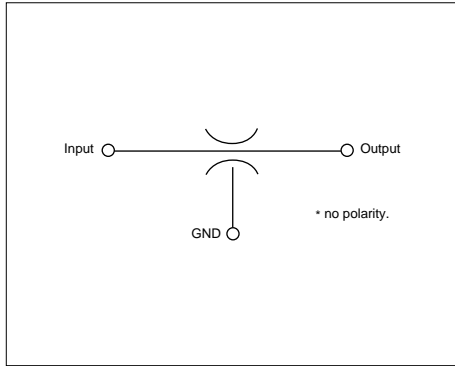
■ Insertion Loss Characteristics (Typical)



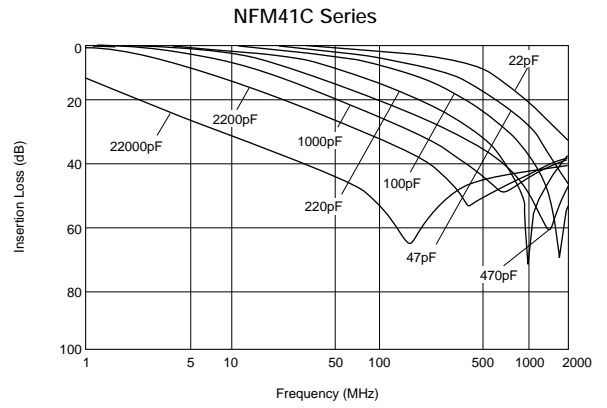
NFM41C Series

Part Number	Capacitance (pF)	Rated Voltage (Vdc)	Rated Current (mA)	Insulation Resistance (M ohm)	Operating Temperature Range (°C)
NFM41CC220U2A3	22 +50%, -20%	100	300	10000 min.	-55 to 125
NFM41CC470U2A3	47 +50%, -20%	100	300	10000 min.	-55 to 125
NFM41CC101U2A3	100 +50%, -20%	100	300	10000 min.	-55 to 125
NFM41CC221U2A3	220 +50%, -20%	100	300	10000 min.	-55 to 125
NFM41CC471R2A3	470 +50%, -20%	100	300	10000 min.	-55 to 125
NFM41CC102R2A3	1000 +50%, -20%	100	300	10000 min.	-55 to 125
NFM41CC222R2A3	2200 +50%, -20%	100	300	10000 min.	-55 to 125
NFM41CC223R2A3	22000 +50%, -20%	100	300	10000 min.	-55 to 125

■ Equivalent Circuit



■ Insertion Loss Characteristics (Typical)



On-Board Type (DC) EMI Suppression Filters(EMIFIL®)

Chip EMIFIL® Arrays NFAC1C/NFA6CC/NFA31C Series

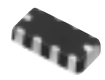


5

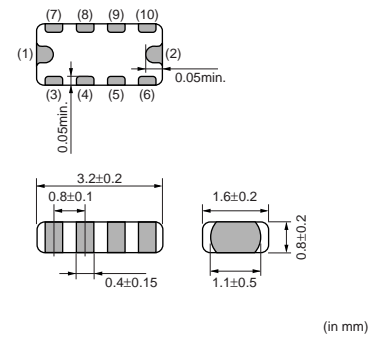
The NFA series of chip EMI suppression filters is designed for surface mount applications. 4, 6 or 8 circuits are condensed into one package. The series is well suited for EMI suppression in digital I/O lines of varied electronic equipment such as notebook size PCs.

■ Features

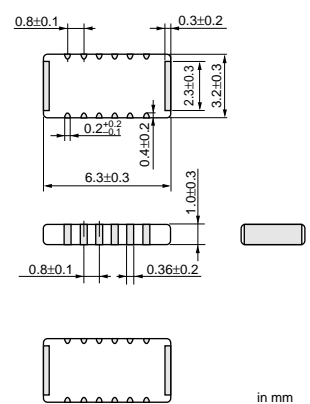
1. The 3-terminal structure realizes excellent EMI suppression at high frequencies. The series has a unique internal structure that minimizes crosstalk.
2. The filter has two ground terminals to provide perfect ground conditions for all filter circuits. In this way, excellent EMI suppression in a narrow path can be realized using uncomplicated land designs.
3. The nickel barrier structure of the external electrodes provides excellent solder heat resistance. Both flow and reflow soldering techniques are possible.



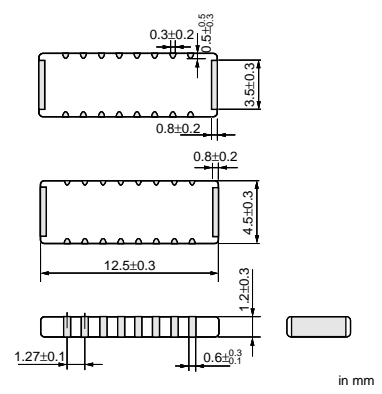
NFA31C



NFA6CC



NFAC1C



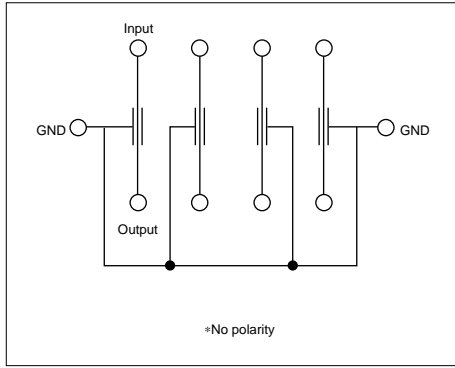
NFA31C Series

Part Number	Capacitance (pF)	Rated Voltage (Vdc)	Rated Current (mA)	Insulation Resistance (M ohm)	Operating Temperature Range (°C)
NFA31CC220S1E4	22 +20%, -20%	25	200	1000 min.	-40 to 85
NFA31CC470S1E4	47 +20%, -20%	25	200	1000 min.	-40 to 85
NFA31CC101S1E4	100 +20%, -20%	25	200	1000 min.	-40 to 85
NFA31CC221S1E4	220 +20%, -20%	25	200	1000 min.	-40 to 85
NFA31CC471R1E4	470 +20%, -20%	25	200	1000 min.	-40 to 85
NFA31CC102R1E4	1000 +20%, -20%	25	200	1000 min.	-40 to 85
NFA31CC222R1E4	2200 +20%, -20%	25	200	1000 min.	-40 to 85
NFA31CC223R1C4	22000 +20%, -20%	16	200	1000 min.	-40 to 85

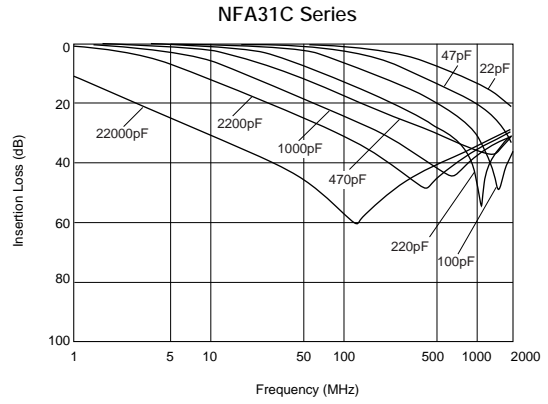
Number of Circuit : 4



■ Equivalent Circuit



■ Insertion Loss Characteristics (Typical)



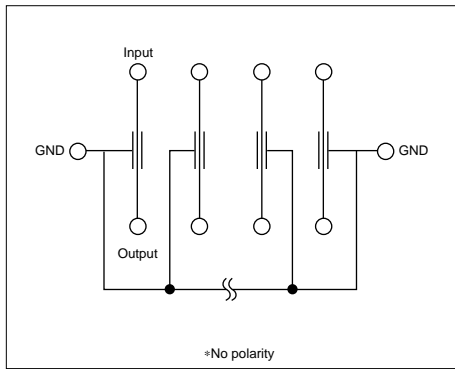
5

NFA6CC Series

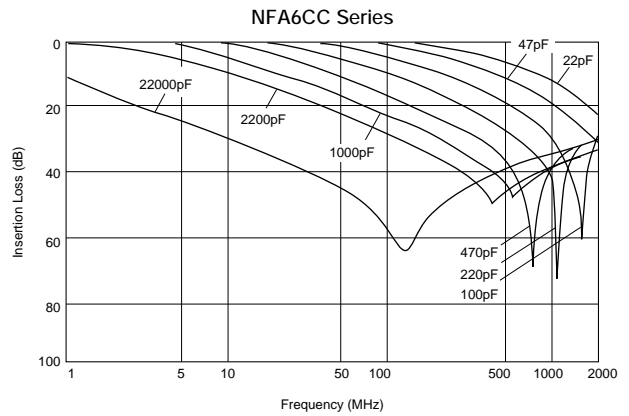
Part Number	Capacitance (pF)	Rated Voltage (Vdc)	Rated Current (mA)	Insulation Resistance (M ohm)	Operating Temperature Range (°C)
NFA6CCC220S1H6	22 +50%, -20%	50	200	1000 min.	-55 to 85
NFA6CCC470S1H6	47 +50%, -20%	50	200	1000 min.	-55 to 85
NFA6CCC101S1H6	100 +50%, -20%	50	200	1000 min.	-55 to 85
NFA6CCC221S1H6	220 +50%, -20%	50	200	1000 min.	-55 to 85
NFA6CCC471S1H6	470 +50%, -20%	50	200	1000 min.	-55 to 85
NFA6CCC102S1H6	1000 +50%, -20%	50	200	1000 min.	-55 to 85
NFA6CCC222R1H6	2200 +50%, -20%	50	200	1000 min.	-55 to 85
NFA6CCC223R1H6	22000 +50%, -20%	50	200	1000 min.	-55 to 85

Number of Circuit : 6

■ Equivalent Circuit



■ Insertion Loss Characteristics (Typical)

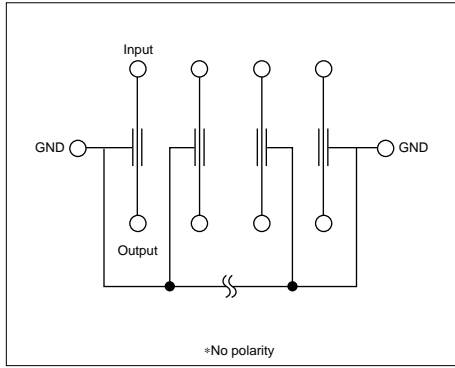


NFAC1C Series

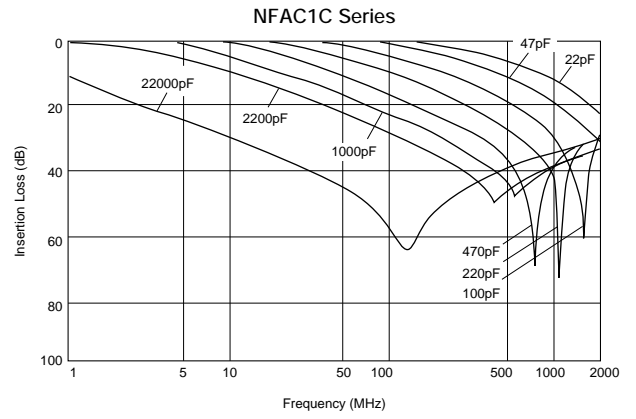
Part Number	Capacitance (pF)	Rated Voltage (Vdc)	Rated Current (mA)	Insulation Resistance (M ohm)	Operating Temperature Range (°C)
NFAC1CC220S1H8	22 +50%, -20%	50	300	1000 min.	-55 to 125
NFAC1CC470S1H8	47 +50%, -20%	50	300	1000 min.	-55 to 125
NFAC1CC101S1H8	100 +50%, -20%	50	300	1000 min.	-55 to 125
NFAC1CC221S1H8	220 +50%, -20%	50	300	1000 min.	-55 to 125
NFAC1CC471S1H8	470 +50%, -20%	50	200	1000 min.	-55 to 125
NFAC1CC102R1H8	1000 +50%, -20%	50	200	1000 min.	-55 to 125
NFAC1CC222R1H8	2200 +50%, -20%	50	200	1000 min.	-55 to 125
NFAC1CC223R1H8	22000 +50%, -20%	50	300	1000 min.	-55 to 125

Number of Circuit : 8

■ Equivalent Circuit



■ Insertion Loss Characteristics (Typical)



On-Board Type (DC) EMI Suppression Filters(EMIFIL[®])



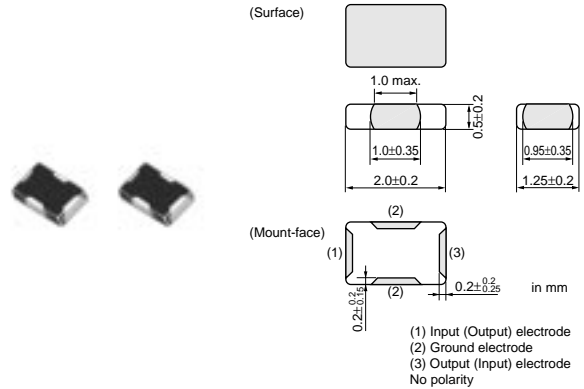
Chip EMIFIL[®] RC Combined Type NFR21G Series

■ Features

The NFR21G series comprise high performance EMI suppression filter which can suppress distortion of waveform. The NFR21G series can be used in interface lines and clock lines where signals are tend to be distorted.

The NFR21G series has various line up of resistance (22-100ohm) and capacitance(10-100pF). Various items are to be used, considering circuit impedance and no ise condition.

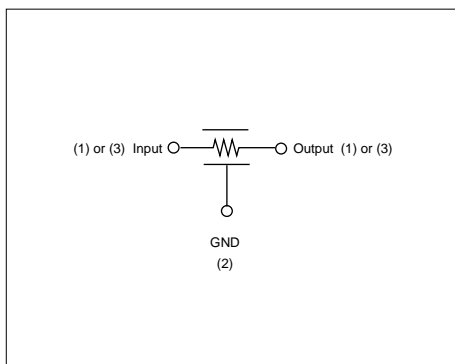
1. MURATA's original inner design realized small and low profile of 2.0mmx1.25mmx0.5mm.
2. Distributed constant circuit realizes smooth change of impedance which prevents reflection of signal and distortion of wave shape.
3. The NFR21G series is effective in the line where ground is not stable, because the resistance element in the filter absorb noise and return it to ground line.
4. The NFR21G series has no polarity so that it can be used in dual direction transport lines.



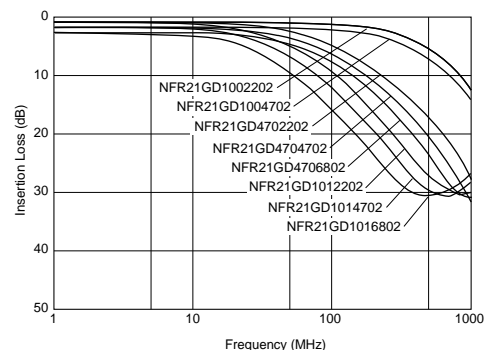
Part Number	Capacitance (pF)	Resistance (ohm)	Rated Current (mA)	Rated Voltage (Vdc)	Insulation Resistance (M ohm)	Operating Temperature Range (°C)
NFR21GD1002202	10 +20%,-20%	22 +30%,-30%	50	50	1000 min.	-40 to 85
NFR21GD1004702	10 +20%,-20%	47 +30%,-30%	35	50	1000 min.	-40 to 85
NFR21GD4702202	47 +20%,-20%	22 +30%,-30%	50	50	1000 min.	-40 to 85
NFR21GD4704702	47 +20%,-20%	47 +30%,-30%	35	50	1000 min.	-40 to 85
NFR21GD4706802	47 +20%,-20%	68 +30%,-30%	30	50	1000 min.	-40 to 85
NFR21GD4701012	47 +20%,-20%	100 +30%,-30%	25	50	1000 min.	-40 to 85
NFR21GD1012202	100 +20%,-20%	22 +30%,-30%	50	50	1000 min.	-40 to 85
NFR21GD1014702	100 +20%,-20%	47 +30%,-30%	35	50	1000 min.	-40 to 85
NFR21GD1016802	100 +20%,-20%	68 +30%,-30%	30	50	1000 min.	-40 to 85
NFR21GD1011012	100 +20%,-20%	100 +30%,-30%	25	50	1000 min.	-40 to 85

Number of Circuit : 1


■ Equivalent Circuit



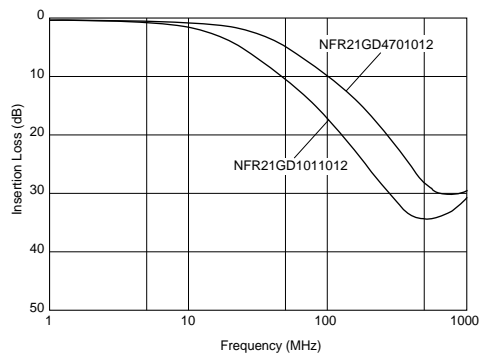
■ Insertion Loss Characteristics (Typical)



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■ Insertion Loss Characteristics (Typical)

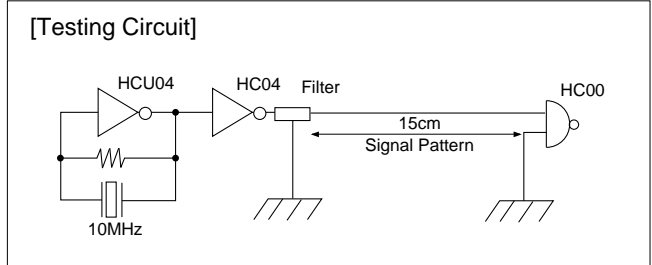


6

Noise Suppression Effect of NFR21G Series

Effect of Noise Suppression by NFR21G

The NFR21G is effective even if ground line is not stable enough due to its distribute constant circuit structure.



With Stable Ground Line

Type of Filter	EMI Suppression Effect	Description
Noise Level without Filter		
Filter Mounting Condition Standard Type Chip EMIFIL® (100pF)		The standard type chip EMIFIL® is effective on stable ground line.
Filter Mounting Condition NFR21GD4701012		The NFR21G has some advantage to standard type EMIFIL® on stable ground line.

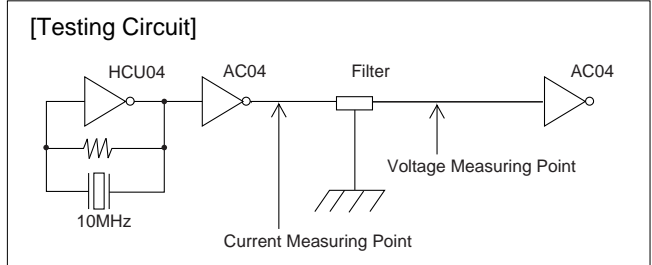
With Poor Ground Line

Type of Filter	EMI Suppression Effect	Description
Noise Level without Filter		
Filter Mounting Condition Standard Type Chip EMIFIL® (100pF)		The standard type EMIFIL® lose efficiency on poor ground line.
Filter Mounting Condition NFR21GD4701012		The NFR21G is effective even on poor ground line because of its distribute constant circuit structure and unique system to limit rush current.

6

Noise Suppression Effect of NFR21G Series

Waveform Distortion Suppressing Function by NFR21G



6

Type of Filter	EMI Suppression Effect	Description
Initial Waveform (no filter)	<p>Voltage Waveform</p> <p>Current Waveform</p>	<p>Resonance between the internal capacitance of the IC and the inductance of the print pattern causes waveform overshooting and undershooting.</p>
When Ordinary Capacitor Filter is Used	<p>Output Voltage Waveform</p> <p>Input Current Waveform</p>	<p>Ordinary capacitor filters have no waveform distortion suppressing capability, and they cannot suppress disturbances in the waveforms.</p> <p>The current needed to charge and discharge the capacitor raises the peak level of current that flows out of the driver side IC, increasing the load on the IC.</p>
NFR21G	<p>Output Voltage Waveform</p> <p>Input Current Waveform</p>	<p>The waveform distortion suppressing function of the NFR21G minimizes disturbances of waveforms.</p> <p>The NFR21G also includes a current limiting function, reducing the load on driver ICs.</p>

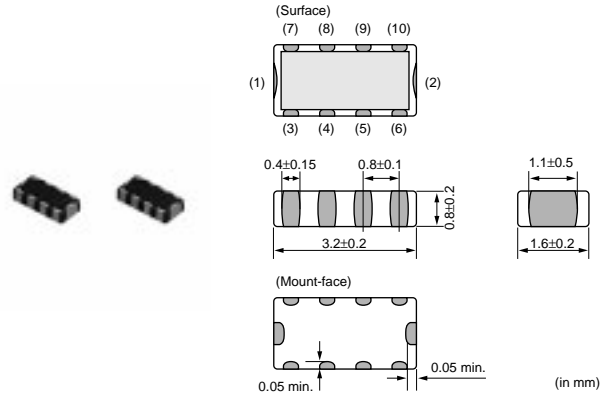
On-Board Type (DC) EMI Suppression Filters(EMIFIL®)

Chip EMIFIL® Arrays RC Combined Type NFA31G Series

NFA31G series is high performance EMI suppression filter array which designed 4 circuits noise filter in 3.2x1.6mm size. NFA31G realizes high density mounting.

■ Features

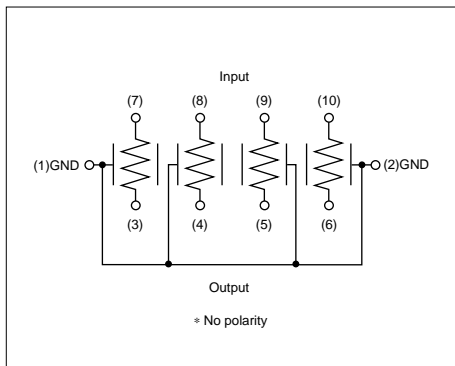
1. NFA31G has 4 circuits noise filter in 3.2x1.6mm size with 0.8mm pitch. High density mounting is available.
2. 3 terminal structure is achieved excellent high frequency performance.
3. Distributed constant circuit realizes smooth change of impedance which prevents reflection of signal and distortion of wave shape.
4. NFA31G series is effective in the line where ground is not stable, because the resistance element in the filter absorb noise and return it to ground line.



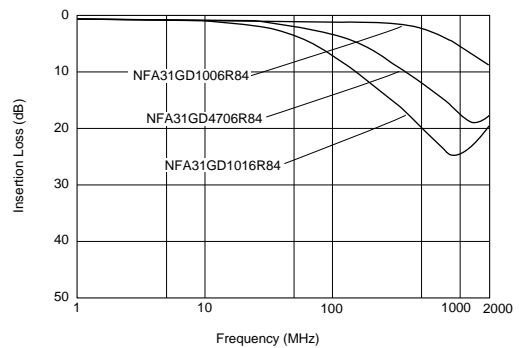
Part Number	Capacitance (pF)	Resistance (ohm)	Rated Current (mA)	Rated Voltage (Vdc)	Insulation Resistance (M ohm)	Operating Temperature Range (°C)
NFA31GD1006R84	10 +20%,-20%	6.8 +40%,-40%	50	6	1000 min	-40 to 85
NFA31GD1004704	10 +20%,-20%	47 +30%,-30%	20	6	1000 min	-40 to 85
NFA31GD1001014	10 +20%,-20%	100 +30%,-30%	15	6	1000 min	-40 to 85
NFA31GD4706R84	47 +20%,-20%	6.8 +40%,-40%	50	6	1000 min	-40 to 85
NFA31GD4704704	47 +20%,-20%	47 +30%,-30%	20	6	1000 min	-40 to 85
NFA31GD4701014	47 +20%,-20%	100 +30%,-30%	15	6	1000 min	-40 to 85
NFA31GD1016R84	100 +20%,-20%	6.8 +40%,-40%	50	6	1000 min	-40 to 85
NFA31GD1014704	100 +20%,-20%	47 +30%,-30%	20	6	1000 min	-40 to 85
NFA31GD1011014	100 +20%,-20%	100 +30%,-30%	15	6	1000 min	-40 to 85


Number of Circuit : 4


■ Equivalent Circuit



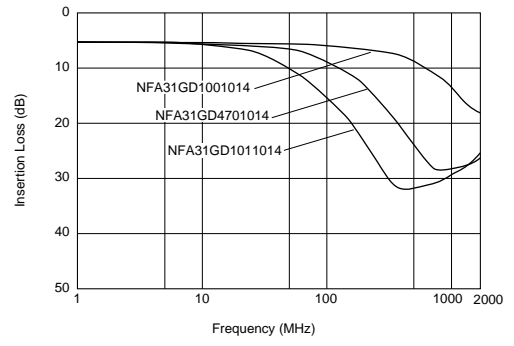
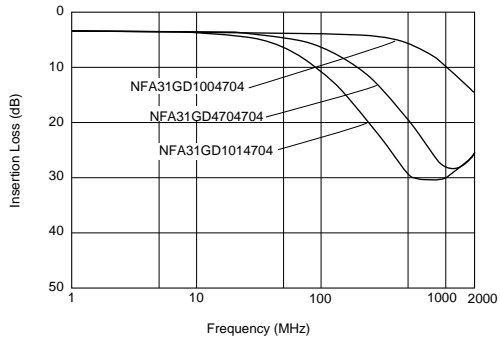
■ Insertion Loss Characteristics



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■ Insertion Loss Characteristics

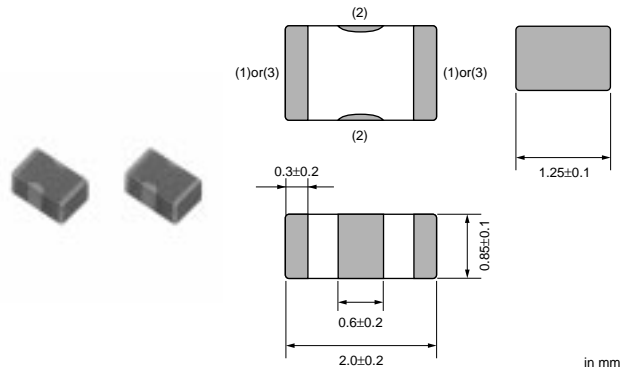


7

On-Board Type (DC) EMI Suppression Filters(EMIFIL[®])

Chip EMIFIL[®] LC Combined Monolithic Type NFL21S Series

The signal line chip "EMIFIL" NFL21S series consists of high performance EMI suppression filters. These filters achieve a 60dB/dec. (Typ.) damping characteristics in 0805 size made possible by Murata's process technology. This makes these chips effective in applications where the signal and noise frequencies are close to each other.



■ Features

1. The filters suppress noise with little or no attenuation of the signal itself.
2. Murata's original internal structure design enables excellent noise suppression up to high frequencies.
3. The NFL21S series are available in nine different values of cutoff frequency ranging from 20MHz up to 500MHz.

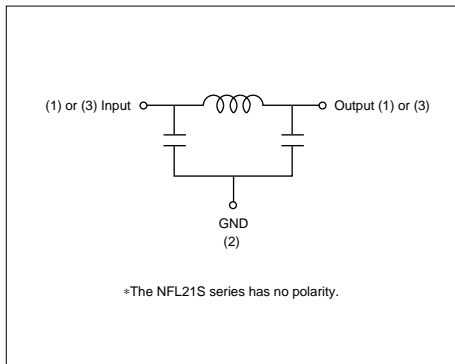
■ Applications

- Suppression of high magnitude radiated noise generated by high speed digital circuits such as clock and RGB.

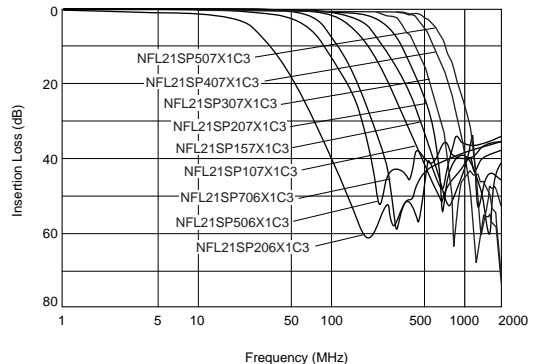
Part Number	Cut-off Frequency (MHz)	Capacitance (pF)	Inductance (nH)	Rated Voltage (Vdc)	Rated Current (mA)	Insulation Resistance (M ohm)	Operating Temperature Range (°C)
NFL21SP206X1C3	20	240 +20%,-20%	700 +20%,-20%	16	100	1000 min.	-55 to 125
NFL21SP506X1C3	50	84 +20%,-20%	305 +20%,-20%	16	150	1000 min.	-55 to 125
NFL21SP706X1C3	70	76 +20%,-20%	185 +20%,-20%	16	150	1000 min.	-55 to 125
NFL21SP107X1C3	100	44 +20%,-20%	135 +20%,-20%	16	200	1000 min.	-55 to 125
NFL21SP157X1C3	150	28 +20%,-20%	128 +20%,-20%	16	200	1000 min.	-55 to 125
NFL21SP207X1C3	200	22 +20%,-20%	72 +20%,-20%	16	250	1000 min.	-55 to 125
NFL21SP307X1C3	300	19 +20%,-20%	45 +20%,-20%	16	300	1000 min.	-55 to 125
NFL21SP407X1C3	400	16 +20%,-20%	34 +20%,-20%	16	300	1000 min.	-55 to 125
NFL21SP507X1C3	500	12 +20%,-20%	31 +20%,-20%	16	300	1000 min.	-55 to 125

Number of Circuits : 1

■ Equivalent Circuit



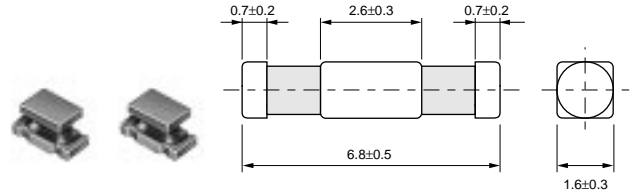
■ Insertion Loss Characteristics (Typical)



On-Board Type (DC) EMI Suppression Filters(EMIFIL[®])

Chip EMIFIL[®] LC Combined Winding Type NFW31S Series

The signal line chip EMI filter NFW31S series consist of high performance EMI suppression filters. They are designed for noise suppression in high speed signal digital circuits in which the signal harmonics are prone to becoming noise sources. These filters achieve a 100dB/dec. (typ.) damping characteristic with Murata's innovative circuit design. This makes these chips effective in applications where the signal and noise frequencies are close to each other.



in mm

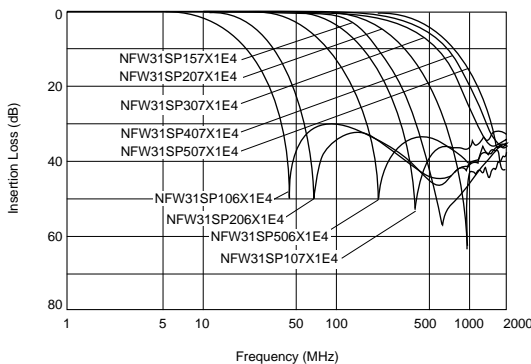
■ Features

1. The filters suppress signal noise with little or no attenuation of the signal itself.
2. Murata's original internal structure design enables excellent noise suppression up to high frequencies (40dB at 1GHz typ.).
3. The NFW31 series is available in six different values of cutoff frequency ranging from 10MHz up to 500MHz.

Part Number	Nominal Cutoff Freq. (MHz)	Attenuation at 10MHz (dB)	Attenuation at 20MHz (dB)	Attenuation at 50MHz (dB)	Attenuation at 100MHz (dB)	Attenuation at 150MHz (dB)	Attenuation at 200MHz (dB)	Attenuation at 300MHz (dB)	Attenuation at 400MHz (dB)	Attenuation at 500MHz (dB)	Attenuation at 1000MHz (dB)
NFW31SP106X1E4	10	6 max.	5 min.	25 min.	25 min.	-	25 min.	-	-	30 min.	30 min.
NFW31SP206X1E4	20	-	6 max.	5 min.	25 min.	-	25 min.	-	-	30 min.	30 min.
NFW31SP506X1E4	50	-	-	6 max.	10 min.	-	30 min.	-	-	30 min.	30 min.
NFW31SP107X1E4	100	-	-	-	6 max.	-	5 min.	-	-	20 min.	30 min.
NFW31SP157X1E4	150	-	-	-	-	6 max.	-	10 min.	20 min.	30 min.	30 min.
NFW31SP207X1E4	200	-	-	-	-	-	6 max.	-	-	10 min.	30 min.
NFW31SP307X1E4	300	-	-	-	-	-	-	6 max.	-	5 min.	15 min.
NFW31SP407X1E4	400	-	-	-	-	-	-	-	6 max.	-	10 min.
NFW31SP507X1E4	500	-	-	-	-	-	-	-	-	6 max.	10 min.

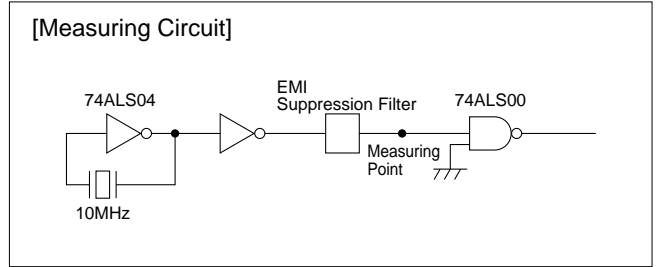
Rated Current : 200mA Rated Voltage : 25Vdc Operating Temperature Range : -40°C to 85°C

■ Insertion Loss Characteristics (Typical)



Noise Suppression Effect of NFW31S Series

Example of EMI Suppression in an Actual Circuit



Type of Filter	Signal Wave Form (20ns/div, 1V/div)	EMI Suppression Effect	Description
Signal Waveform and Noise Spectrum before Filter Mounting	 Signal Waveform (20ns/div, 1V/div)	 Noise Spectrum (10:1 Active Probe)	
NFW31S Series (Cut-off frequency 50MHz)	 Signal Waveform (20ns/div, 1V/div)	 Noise Level [dBμV] vs Frequency [MHz]. Level before filter mounting (dashed line). Level after filter mounting (solid line).	The NFW31S's steep attenuation characteristic means excellent EMI suppression without waveform cornering.
Conventional Chip Solid type EMI Filter (NFM41CC 470pF)	 Signal Waveform (20ns/div, 1V/div)	 Noise Level [dBμV] vs Frequency [MHz]. Level before filter mounting (dashed line). Level after filter mounting (solid line).	3-terminal capacitors suppress signal frequencies as EMI frequencies so the signal waveform is distorted.
Filter Combined with Conventional LCs	 L : Chip Inductor C : Chip Capacitor (270pF)	 Signal Waveform (20ns/div, 1V/div)	Combinations of inductors and capacitors can yield a steep attenuation characteristic, but they require a great deal more mounting space. Moreover, at high frequencies the EMI suppression is less than that obtained by the NFW31S.

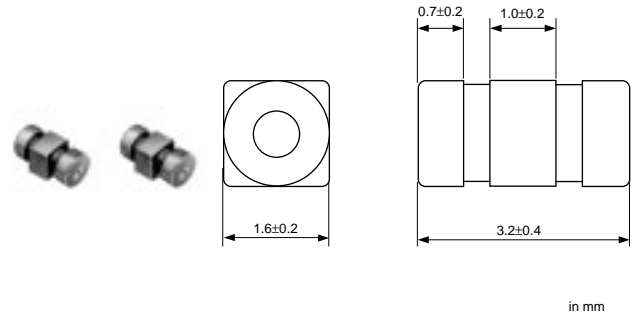
On-Board Type (DC) EMI Suppression Filters(EMIFIL[®])



Chip EMIFIL[®] LC Combined Type for Large Current NFE31P/NFE61P/NFE61H Series

NFE31P Series

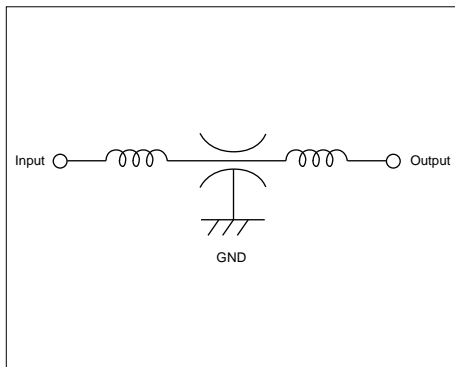
Chip "EMIFIL" NFE31P is small size T-type circuit EMI filter. Its large rated current of 6A and low voltage drop due to small DC resistance are suitable for DC power lines. The structure incorporates built-in ferrite beads which minimize resonance with surrounding circuits.



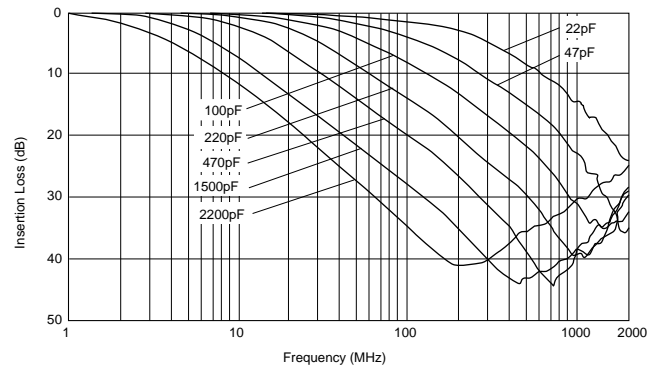
10

Part Number	Capacitance (pF)	Rated Voltage (Vdc)	Rated Current (A)	Insulation Resistance (M ohm)	Operating Temperature Range (°C)
NFE31PT220R1E9	22 +30%,-30%	25	6	1000 min.	-40 to 85
NFE31PT470C1E9	47 +50%,-20%	25	6	1000 min.	-40 to 85
NFE31PT101C1E9	100 +80%,-20%	25	6	1000 min.	-40 to 85
NFE31PT221D1E9	220 +50%,-20%	25	6	1000 min.	-40 to 85
NFE31PT471F1E9	470 +50%,-20%	25	6	1000 min.	-40 to 85
NFE31PT152Z1E9	1500 +50%,-20%	25	6	1000 min.	-40 to 85
NFE31PT222Z1E9	2200 +50%,-50%	25	6	1000 min.	-40 to 85

Equivalent Circuit

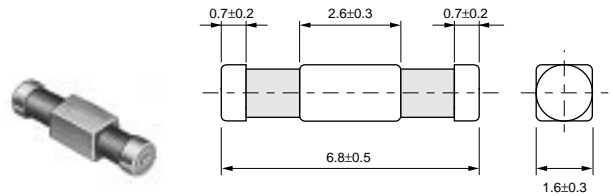


Insertion Loss Characteristics (Typical)



NFE61H Series

The T-type chip EMI filter NFE61H series consists of a 3-terminal capacitor with sufficient current capacity (2A) for DC power circuit applications. This series consists of a T-type filter circuit incorporating ferrite bead inductor to suppress undesirable oscillation. The NFE61H series is reliable in rugged environments such as automobile circuitry.

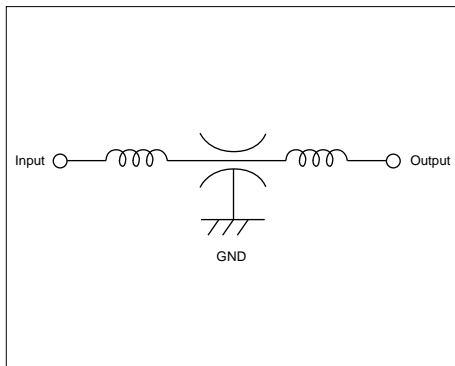


in mm

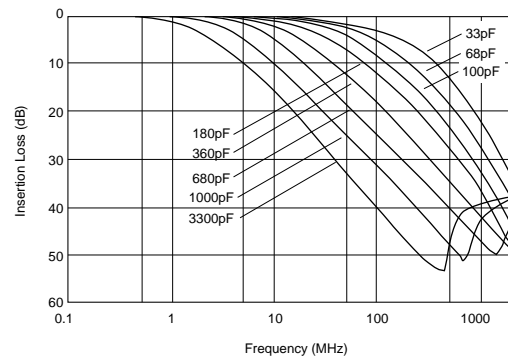
Part Number	Capacitance (pF)	Rated Voltage (Vdc)	Rated Current (A)	Insulation Resistance (M ohm)	Operating Temperature Range (°C)
NFE61HT330U2A9	33 +30%, -30%	100	2	1000 min.	-55 to 125
NFE61HT680R2A9	68 +30%, -30%	100	2	1000 min.	-55 to 125
NFE61HT101Z2A9	100 +30%, -30%	100	2	1000 min.	-55 to 125
NFE61HT181C2A9	180 +30%, -30%	100	2	1000 min.	-55 to 125
NFE61HT361C2A9	360 +20%, -20%	100	2	1000 min.	-55 to 125
NFE61HT681D2A9	680 +30%, -30%	100	2	1000 min.	-55 to 125
NFE61HT102F2A9	1000 +80%, -20%	100	2	1000 min.	-55 to 125
NFE61HT332Z2A9	3300 +80%, -20%	100	2	1000 min.	-55 to 125

10

Equivalent Circuit

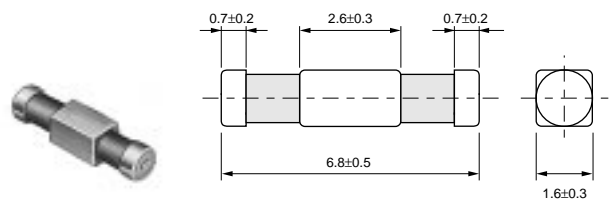


Insertion Loss Characteristics (Typical)



NFE61P Series

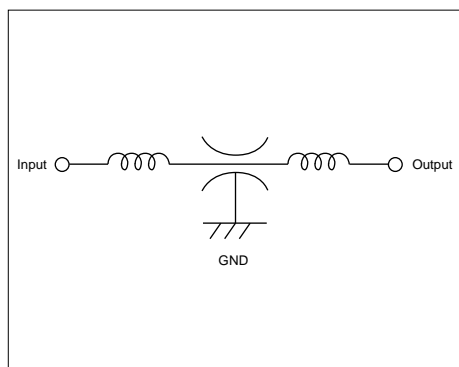
The T-type chip EMI filter NFE61P series consists of a 3-terminal capacitor with sufficient current capacity (2A) for DC power circuit applications. This series consists of a T-type filter circuit incorporating ferrite bead inductor to suppress undesirable oscillation.



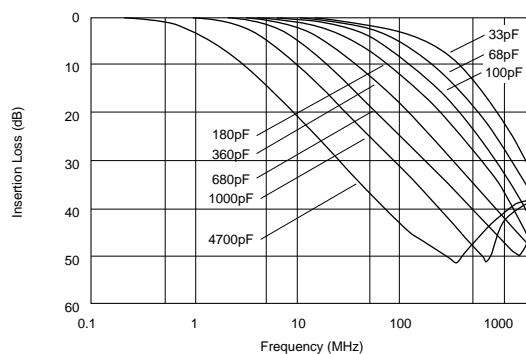
in mm

Part Number	Capacitance (pF)	Rated Voltage (Vdc)	Rated Current (A)	Insulation Resistance (M ohm)	Operating Temperature Range (°C)
NFE61PT330B1H9	33 +30%,-30%	50	2	1000 min.	-25 to 85
NFE61PT680B1H9	68 +30%,-30%	50	2	1000 min.	-25 to 85
NFE61PT101Z1H9	100 +30%,-30%	50	2	1000 min.	-25 to 85
NFE61PT181B1H9	180 +30%,-30%	50	2	1000 min.	-25 to 85
NFE61PT361B1H9	360 +20%,-20%	50	2	1000 min.	-25 to 85
NFE61PT681B1H9	680 +30%,-30%	50	2	1000 min.	-25 to 85
NFE61PT102E1H9	1000 +80%,-20%	50	2	1000 min.	-25 to 85
NFE61PT472C1H9	4700 +80%,-20%	50	2	1000 min.	-25 to 85

■ Equivalent Circuit



■ Insertion Loss Characteristics (Typical)



10

On-Board Type (DC) EMI Suppression Filters(EMIFIL[®])



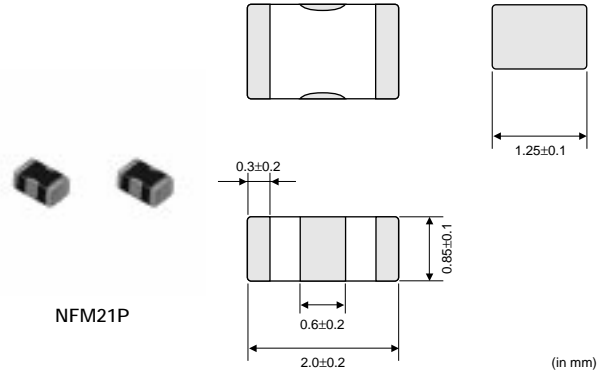
Chip EMIFIL[®] for Large Current NFM21P/NFM3DP/NFM41P/NFM55P Series

NFM21P Series

NFM21P is 3 terminal structure component. This product can be applied to large current DC power lines. NFM21P is suitable for noise suppression of DC power lines where relatively operates large current.

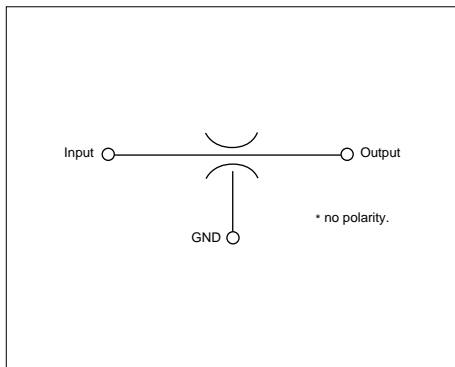
■ Features

1. The rated current of 4A is suitable for IC's individual power line.
2. Small dimension enables higher density packaging. NFM21P is much smaller size.(2.0x1.25x0.85mm)
3. Murata's original internal electrode structure design which realizes excellent EMI suppression effect from low frequency to high frequency.

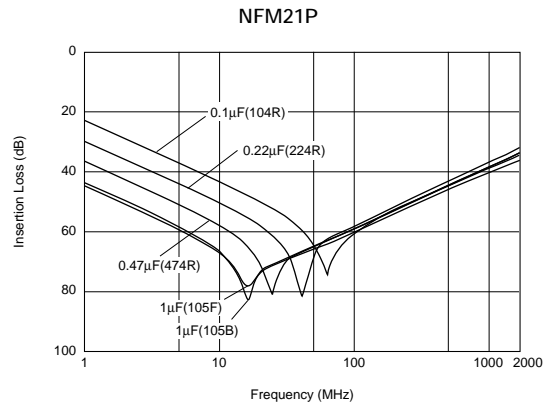


Part Number	Capacitance (pF)	Rated Voltage (Vdc)	Rated Current (A)	Insulation Resistance (M ohm)	Operating Temperature Range (°C)
NFM21PC104R1E3	100000 +20%,-20%	25	2	1000 min.	-55 to 125
NFM21PC224R1C3	220000 +20%,-20%	16	2	1000 min.	-55 to 125
NFM21PC474R1C3	470000 +20%,-20%	16	2	1000 min.	-55 to 125
NFM21PC105B1A3	1000000 +20%,-20%	10	4	500 min.	-40 to 85
NFM21PC105F1C3	1000000 +80%,-20%	16	2	500 min.	-40 to 85

■ Equivalent Circuit



■ Insertion Loss Characteristics



NFM3DP Series

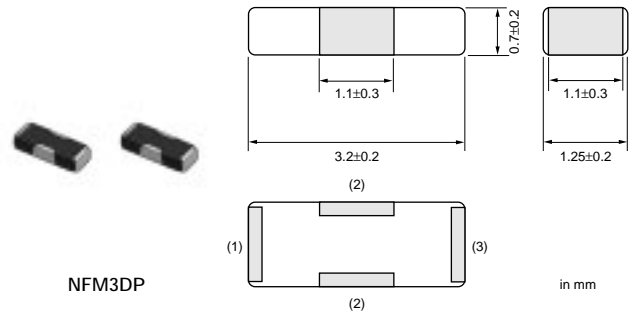
The chip solid "EMIFIL" NFM3DP is a chip type 3-terminal capacitor with high rated current of 2A. This series is suited for noise suppression in DC power supply lines of digital instruments.

■ Features

1. Large rated current (2A) and low voltage drop due to a small DC resistance (0.05ohm) are suitable for the application in DC power line.
2. High electrostatic capacitance and remarkable high frequency performance are effective for the immunity against the surge noise and the pulse noise.

■ Applications

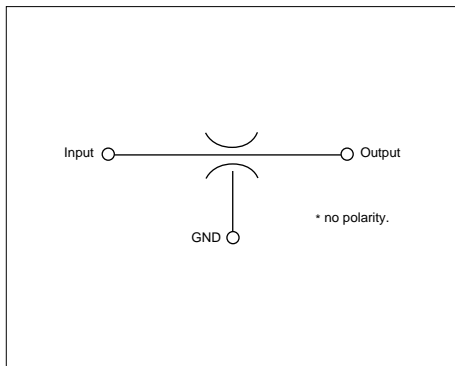
- Personal computers, Word processors and Peripherals
- Telephones, PPCs, Communication equipments, etc.
- Digital TVs, VCRs
- Telecommunication equipment



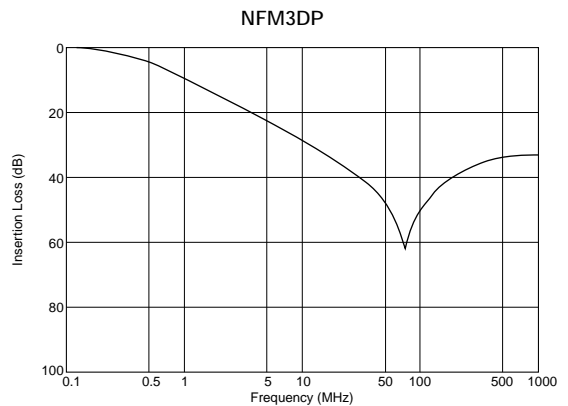
11

Part Number	Capacitance (pF)	Rated Voltage (Vdc)	Rated Current (A)	Insulation Resistance (M ohm)	Operating Temperature Range (°C)
NFM3DPC223R1H2	22000 +20%, -20%	50	2	1000 min.	-55 to 85

■ Equivalent Circuit



■ Insertion Loss Characteristics



NFM41P Series

Chip solid "EMIFIL" NFM41P are 3 terminal structure SMT components. These components are able to be applied to large current DC power lines. NFM41P are suitable in noise suppression DC lines where relatively large currents operate.

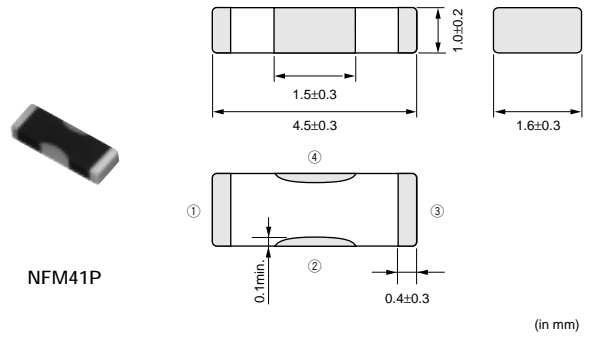
Using base metal to the electrode.

Features

1. Large rated current (2A) and low voltage drop due to a small DC resistance (0.04ohm) are suitable for the application in DC power line.
2. High electrostatic capacitance and remarkable high frequency performance are effective for the immunity against the surge noise and the pulse noise.

Applications

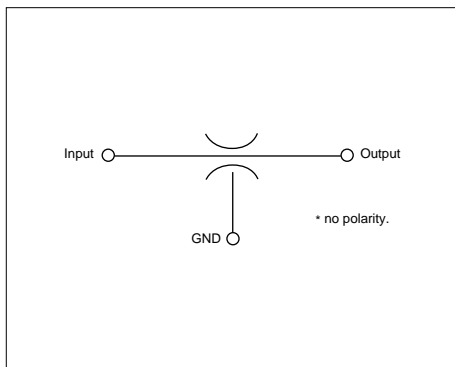
- Personal computers, Word processors and Peripherals
- Telephones, PPCs, Communication equipments, etc.
- Digital TVs, VCRs
- Telecommunication equipment



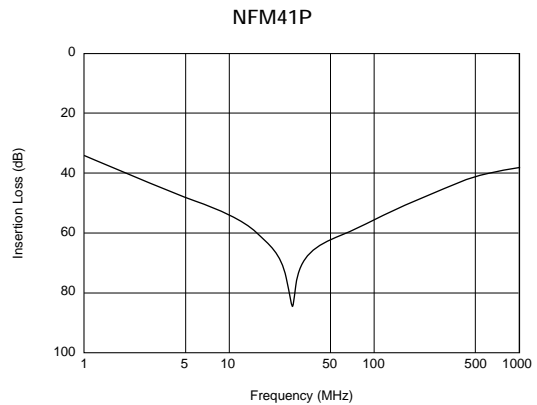
NFM41P

Part Number	Capacitance (pF)	Rated Voltage (Vdc)	Rated Current (A)	Insulation Resistance (M ohm)	Operating Temperature Range (°C)
NFM41PC204F1H3	200000 +80%, -20%	50	2	1000 min.	-55 to 85

Equivalent Circuit



Insertion Loss Characteristics



NFM55P Series

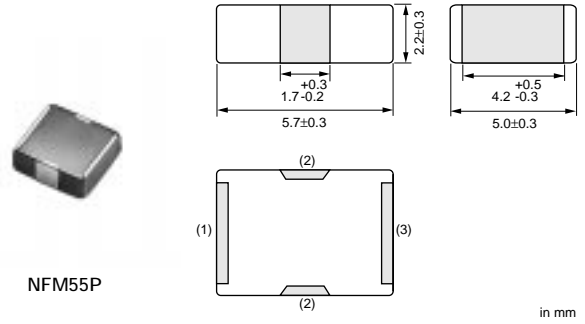
The chip solid "EMIFIL" NFM55P is a chip type 3-terminal capacitor with high rated current of 6A. This series is suited for noise suppression in DC power lines where high rated current and large capacitance is required.

■ Features

1. Large rated current (6A) and low voltage drop due to a small DC resistance (0.01ohm) are suitable for the application in DC power line.
2. High electrostatic capacitance and remarkable high frequency performance are effective for the immunity against the surge noise and the pulse noise.
3. Only reflow soldering should be applied.

■ Applications

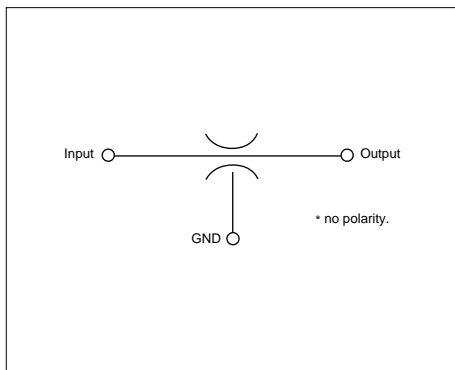
- Personal computers, Word processors and Peripherals
- Telephones, PPCs, Communication equipments, etc.
- Digital TVs, VCRs
- Telecommunication equipment



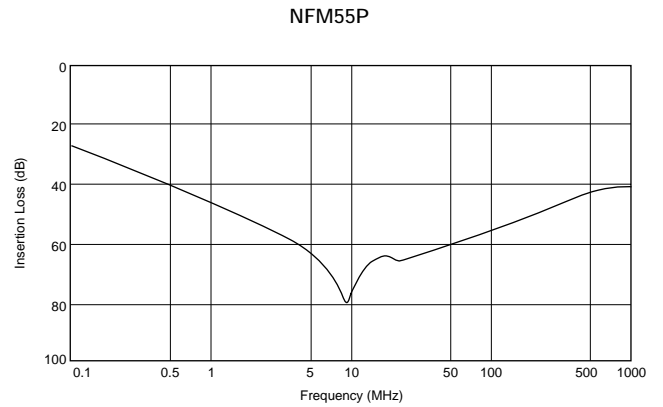
11

Part Number	Capacitance (pF)	Rated Voltage (Vdc)	Rated Current (A)	Insulation Resistance (M ohm)	Operating Temperature Range (°C)
NFM55PC155F1H4	1500000 +80%,-20%	50	6	100 min.	-55 to 85

■ Equivalent Circuit



■ Insertion Loss Characteristics



NFM/NFR/NFL Series Notice (Soldering and Mounting)

1. Standard Land Pattern Dimensions

The capacitor type chip EMI suppression filters (NF□ series) suppress noise by conducting the high-frequency noise element to ground. Therefore, to obtain maximum performance from these filters, the ground pattern should be made as large as possible during the PCB design stage. As shown in the right, one side of the PCB is used for chip mounting, and the other is used for grounding. Small diameter feedthrough holes are then used to connect the grounds on each side of the PCB. This reduces the high-frequency impedance of the grounding and maximizes the filter's performance. Please contact us if using thinner land pad than 18μm for NFM55P.

For Reflow Soldering

Part Number	Size (mm)			
	a	b	c	d
NFM21C/NFM21P NFR21G/NFL21S	0.8	1.4	2.6	0.6
NFM3DC NFM3DP	1.4	2.5	4.4	1.0
NFM41C NFM41P	2.0	3.5	6.0	1.2

NFM55P

(in mm)


- NFM21C/21P, NFR21G, NFL21S and NFM55P are specially adapted for reflow soldering.

For Flow Soldering

Part Number	Size (mm)						
	a	b	c	d	e	f	g
NFM3DC NFM3DP	1.0	1.4	2.5	4.4	1.0	2.0	2.4
NFM41C NFM41P	1.5	2.0	3.5	6.0	1.2	2.6	3.0

Continued on the following page.

NFM/NFR/NFL Series Notice (Soldering and Mounting)

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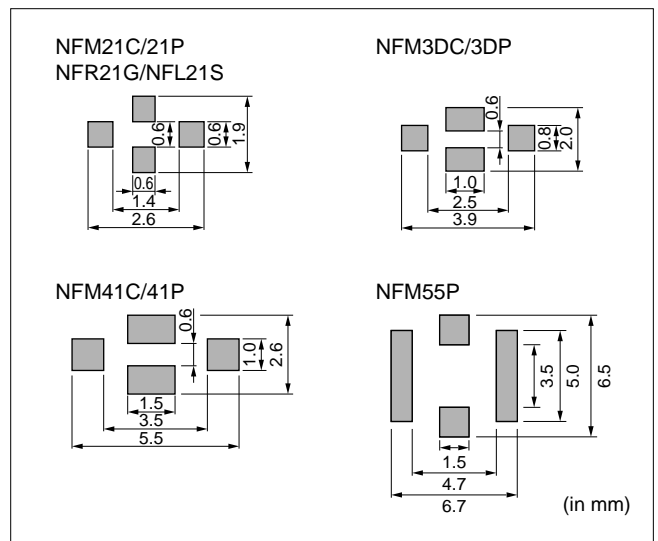
2. Solder Paste Printing and Adhesive Application

When reflow soldering the chip EMI suppression filters, the printing must be conducted in accordance with the following cream solder paste printing conditions. If too much solder is applied, the chip will prone to be damaged by mechanical and thermal stress from the PCB and may crack. In contrast, if too little solder is applied, there is the potential that the termination strength will be insufficient, creating the potential for detachment. Standard land dimensions should be used for resist and copper foil patterns.

When flow soldering the EMI suppression filter, apply the adhesive in accordance with the following conditions. If too much adhesive is applied, then it may overflow into the land or termination areas and yield poor solderability. In contrast, if insufficient adhesive is applied, or if the adhesive is not sufficiently hardened, then the chip may become detached during flow soldering process.

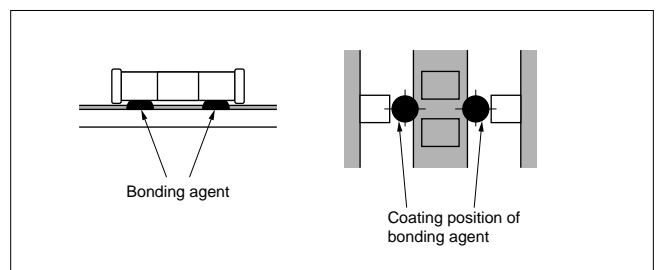
(1) Solder Paste Printing


- ① Coat the solder paste a thickness
 - 100μm to 150μm : NFM21C/21P/3DC/3DP
NFR21G
NFL21S
 - 100μm to 200μm : NFM41C/41P
 - 150μm to 200μm : NFM55P
- ② Use H60A solder for pattern printing.



(2) Adhesive Application

- Apply 0.1mg for NFM41C/41P and 0.06mg for NFM3DC/3DP of bonding agent at each chip, and ensure not to cover electrodes.



Continued on the following page. 

NFM/NFR/NFL Series Notice (Soldering and Mounting)

Continued from the preceding page.

3. Standard Soldering Conditions

(1) SOLDERING METHODS

Use flow and reflow soldering methods only.
 Use standard soldering conditions when soldering chip EMI suppression filters.
 In cases where several different parts are soldered, each having different soldering conditions, use those conditions requiring the least heat and minimum time.

(2) SOLDERING TEMPERATURE AND TIME

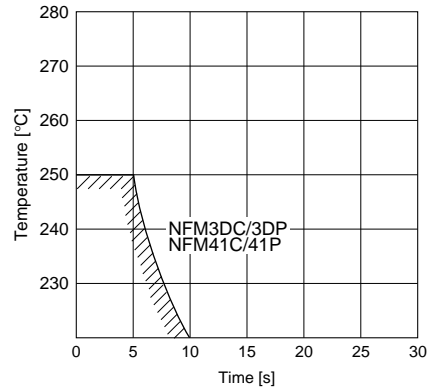
To prevent external electrode solder leaching and performance deterioration, solder within the temperature and time combinations illustrated by the slanted lines in the following graphs. If soldering is repeated, please note that the allowed time is the accumulated time.

Solder : H60A H63A solder(JIS Z 3238)

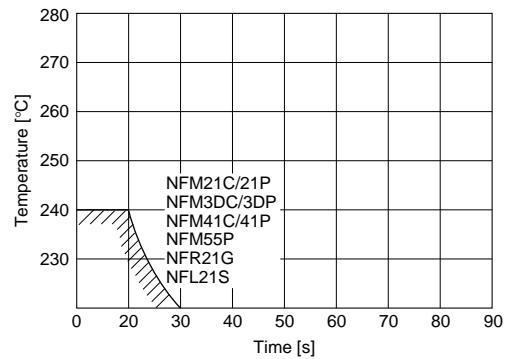
Flux :

- Use Rosin-based fulx(when using RA type solder, clean products sufficiently to avoid residual fulx.
- Do not use strong acidic fulx(with chlorine content exceeding 0.20wt%)
- Do not use water-soluble fulx.

Allowable Flow Soldering Temperature and Time

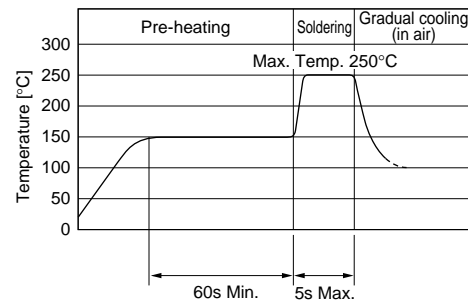


Allowable Reflow Soldering Temperature and Time

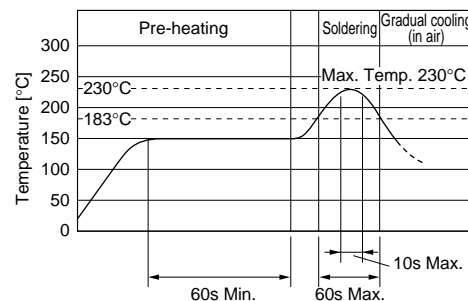


(3) SOLDERING CONDITIONS

Flow Solder




Reflow Solder



Continued on the following page.

NFM/NFR/NFL Series Notice (Soldering and Mounting)

 Continued from the preceding page.

(4) REWORKING WITH SOLDER IRON

The following conditions must be strictly followed when using a soldering iron.

Pre-heating	: 150°C 60 second Min.
Soldering iron power output	: 30W Max.
Temperature of soldering iron tip	: 280°C Max.
Soldering time	: 10 second Max.

Do not allow the tip of the soldering iron directly to contact the chip.

For additional methods of reworking with soldering iron, please contact Murata engineering.

4. Cleaning

Following conditions should be observed when cleaning chip EMI filter.

(1) Cleaning Temperature : 60degree C max. (40degree C max. for CFC alternatives and alcohol cleaning agents)

(2) Ultrasonic

Output : 20W/liter max.

Duration : 5 minutes max.

Frequency : 28kHz to 40kHz

(3) Cleaning agent

The following list of cleaning agents have been tested on the individual components. Evaluation of final assembly should be completed prior to production.

a) CFC alternatives and alcohol cleaning agents

Isopropyl alcohol (IPA)

HCFC-225

b) Aqueous cleaning agent

Surface active agent (Clean Thru 750H)

Hydrocarbon (Techno Cleaner 335)

High grade alcohol (Pine Alpha ST-100S)

Alkaline saponifier (Aqua Cleaner 240 -cleaner should be diluted within 20% using deionized water.)

(4) Ensure that flux residue is completely removed.

Component should be thoroughly dried after aqueous agent has been removed with deionized water.

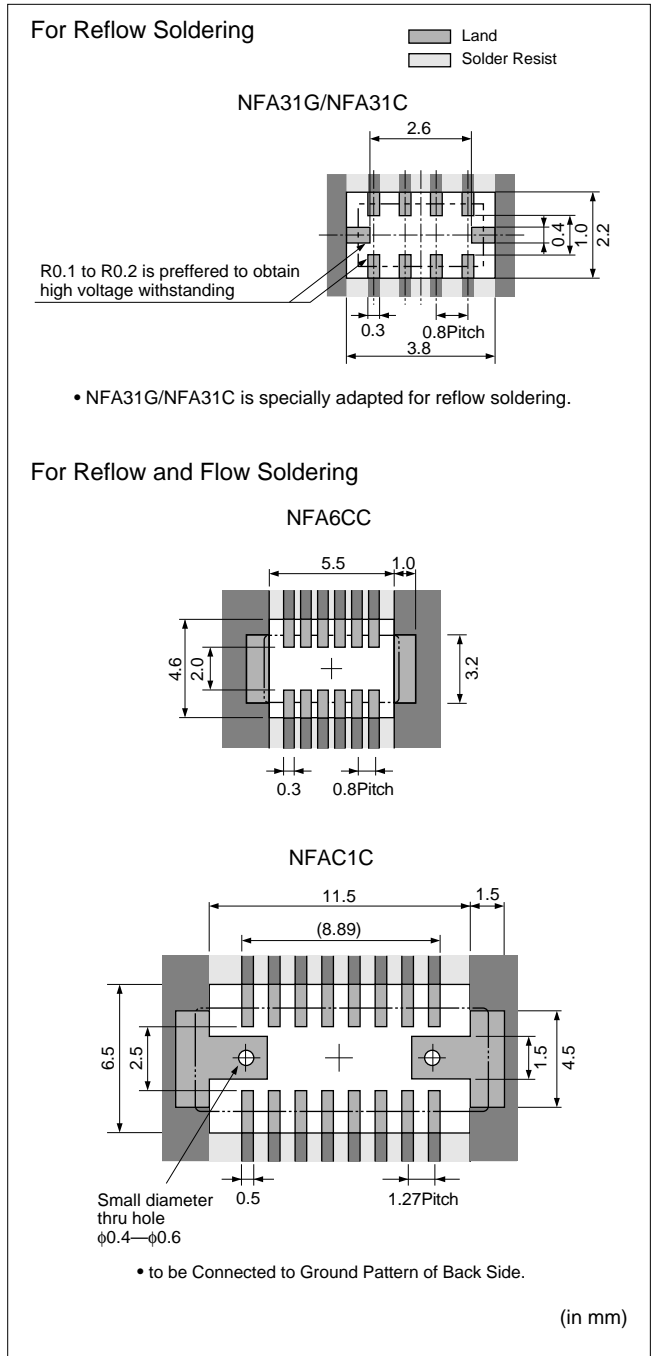
(5) Some products may become slightly whitened.

However, product performance or usage is not affected. For additional cleaning methods, please contact Murata engineering.

NFA Series Notice (Soldering and Mounting)

1. Standard Land Pattern Dimensions

The capacitor type chip EMI suppression filters (NF□ series) suppress noise by conducting the high-frequency noise element to ground. Therefore, to obtain maximum performance from these filters, the ground pattern should be made as large as possible during the PCB design stage. As shown bellow, one side of the PCB is used for chip mounting, and the other is used for grounding. Small diameter feedthrough holes are then used to connect the grounds on each side of the PCB. This reduces the high-frequency impedance of the grounding and maximizes the filter's performance.



2. Solder Paste Printing and Adhesive Application


When reflow soldering the chip EMI suppression filter arrays, the printing must be conducted in accordance with the following cream solder printing conditions. If too much solder is applied, the chip will prone to be damaged by mechanical and thermal stress from the PCB and may crack. In contrast, if too little solder is applied, there is the potential that the termination strength will be insufficient, creating the potential for detachment. Standard land dimensions should be used for resist and copper foil

patterns.

When flow soldering the chip EMI suppression filter arrays, apply the adhesive in accordance with the following conditions. If too much adhesive is applied, then it may overflow into the land or termination areas and yield poor solderability. In contrast, if insufficient adhesive is applied, or if the adhesive is not sufficiently hardened, then the chip may become detached during flow soldering process.

Continued on the following page.

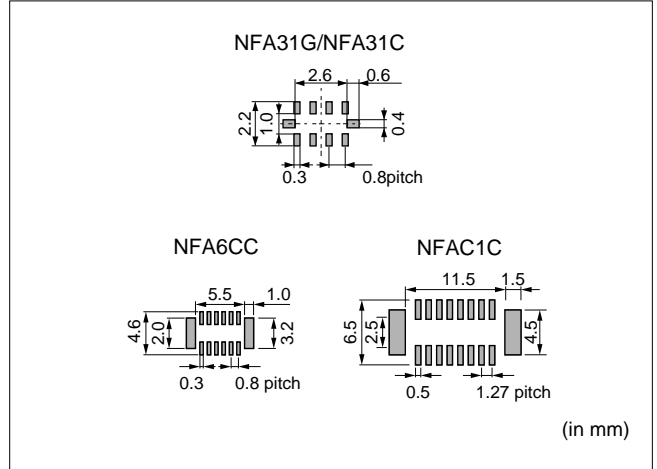
NFA Series Notice (Soldering and Mounting)

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(1) Solder Paste Printing

NFA Series

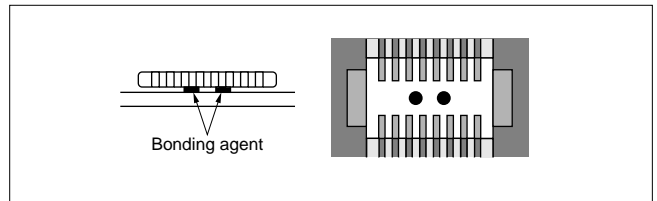
- Coat the solder paste a thickness of 100μm to 200μm.
- Use H60A solder for pattern printing.



(2) Adhesive Application

NFA Series

- Apply 0.5mg to 0.9mg for NFAC1C and 0.25mg to 0.6mg for NFA6CC of bonding agent at each chip, and ensure not to cover electrodes.



3. Standard Soldering Conditions

(1) SOLDERING METHODS

- Use flow and reflow soldering methods only.
- Use standard soldering conditions when soldering chip EMI suppression filters.
- In cases where several different parts are soldered, each having different soldering conditions, use those conditions requiring the least heat and minimum time.

(2) SOLDERING TEMPERATURE AND TIME

- To prevent external electrode solder leaching and performance deterioration, solder within the temperature and time combinations illustrated by the slanted lines in the following graphs. If soldering is repeated, please note that the allowed time is the accumulated time.

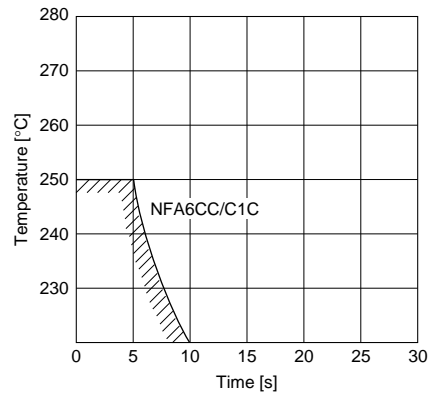
Solder and Flux

Solder : H60A H63A solder(JIS Z 3238)

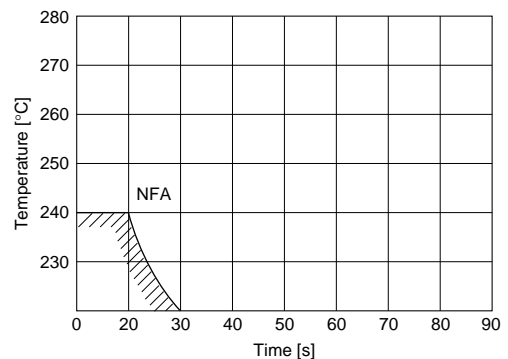
Flux :


- Use Rosin-based fulx(when using RA type solder, clean products sufficiently to avoid residual fulx.
- Do not use strong acidic fulx(with chlorine content exceeding 0.20wt%)
- Do not use water-soluble fulx.

Allowable Flow Soldering Temperature and Time




Allowable Reflow Soldering Temperature and Time

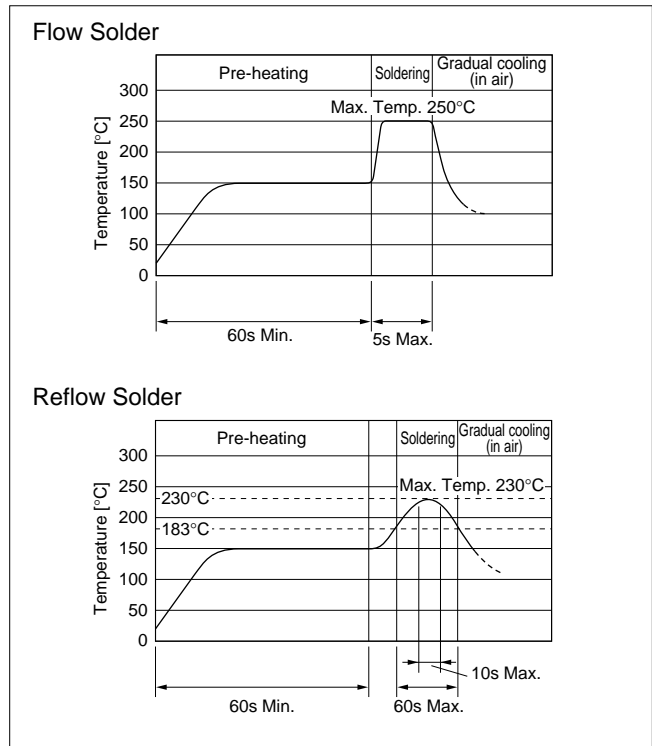


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NFA Series Notice (Soldering and Mounting)

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(3) SOLDERING CONDITIONS



(4) REWORKING WITH SOLDER IRON

The following conditions must be strictly followed when using a soldering iron.

- Pre-heating : 150°C 60 second Min.
- Soldering iron power output : 30W Max.
- Temperature of soldering iron tip : 280°C Max.
- Soldering time : 10 second Max.

Do not allow the tip of the soldering iron directly to contact the chip.

For additional methods of reworking with soldering iron, please contact Murata engineering.

4. Cleaning

Following conditions should be observed when cleaning chip EMI filter.

- (1) Cleaning Temperature : 60degree C max. (40degree C max. for CFC alternatives and alcohol cleaning agents)
- (2) Ultrasonic
 - Output : 20W/liter max.
 - Duration : 5 minutes max.
 - Frequency : 28kHz to 40kHz
- (3) Cleaning agent

The following list of cleaning agents have been tested on the individual components. Evaluation of final assembly should be completed prior to production.

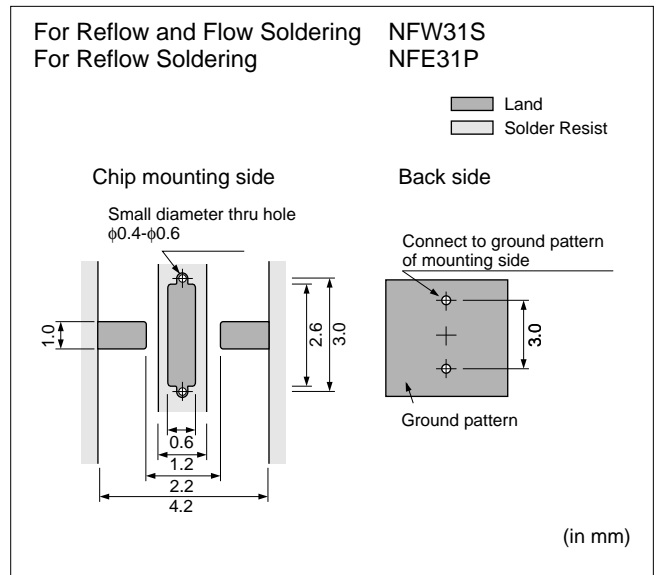
- a) CFC alternatives and alcohol cleaning agents
 - Isopropyl alcohol (IPA)
 - HCFC-225

- b) Aqueous cleaning agent
 - Surface active agent (Clean Thru 750H)
 - Hydrocarbon (Techno Cleaner 335)
 - High grade alcohol (Pine Alpha ST-100S)
 - Alkaline saponifier (Aqua Cleaner 240 -cleaner should be diluted within 20% using deionized water.)
- (4) Ensure that flux residue is completely removed. Component should be thoroughly dried after aqueous agent has been removed with deionized water.
 - (5) Some products may become slightly whitened. However, product performance or usage is not affected. For additional cleaning methods, please contact Murata engineering.

NFW/NFE31 Series Notice (Soldering and Mounting)

1. Standard Land Pattern Dimensions

The capacitor type chip EMI suppression filters (NFW series) suppress noise by conducting the high-frequency noise element to ground. Therefore, to obtain maximum performance from these filters, the ground pattern should be made as large as possible during the PCB design stage. As shown bellow, one side of the PCB is used for chip mounting, and the other is used for grounding. Small diameter feedthrough holes are then used to connect the grounds on each side of the PCB. This reduces the high-frequency impedance of the grounding and maximizes the filter's performance.



2. Solder Paste Printing and Adhesive Application

When reflow soldering the chip EMI suppression filter, the printing must be conducted in accordance with the following cream solder printing conditions. If too much solder is applied, the chip will prone to be damaged by mechanical and thermal stress from the PCB and may crack. In contrast, if too little solder is applied, there is the potential that the termination strength will be insufficient, creating the potential for detachment. Standard land dimensions should be used for resist and copper foil

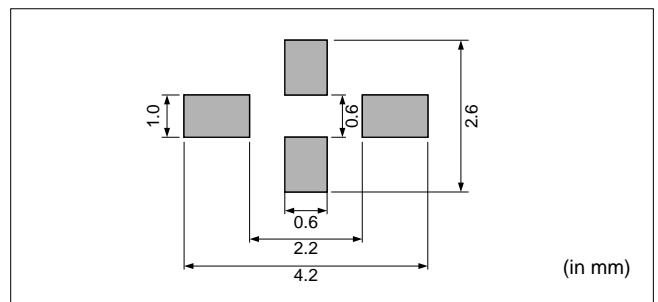
patterns.

When flow soldering the EMI suppression filter, apply the adhesive in accordance with the following conditions. If too much adhesive is applied, then it may overflow into the land or termination areas and yield poor solderability. In contrast, if insufficient adhesive is applied, or if the adhesive is not sufficiently hardened, then the chip may become detached during flow soldering process.

(1) Solder Paste Printing

NFW31S/NFE31P Series

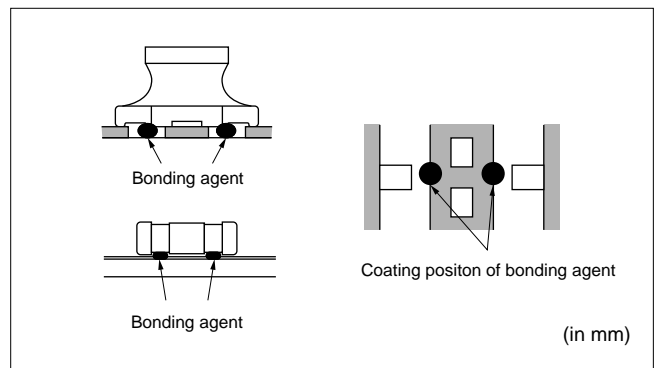
- Coat the solder paste a thickness of 150 μ m to 200 μ m.
- Use H60A solder for pattern printing.



(2) Adhesive Application

NFW31S/NFE31P Series

- Apply 0.2mg of bonding agent at each chip, and ensure not to cover electrodes.



Continued on the following page.

NFW/NFE31 Series Notice (Soldering and Mounting)

Continued from the preceding page.

3. Standard Soldering Conditions

(1) SOLDERING METHODS

Use flow and reflow soldering methods only.
 Use standard soldering conditions when soldering chip EMI suppression filters.
 In cases where several different parts are soldered, each having different soldering conditions, use those conditions requiring the least heat and minimum time.

(2) SOLDERING TEMPERATURE AND TIME

To prevent external electrode solder leaching and performance deterioration, solder within the temperature and time combinations illustrated by the slanted lines in the following graphs. If soldering is repeated, please note that the allowed time is the accumulated time.

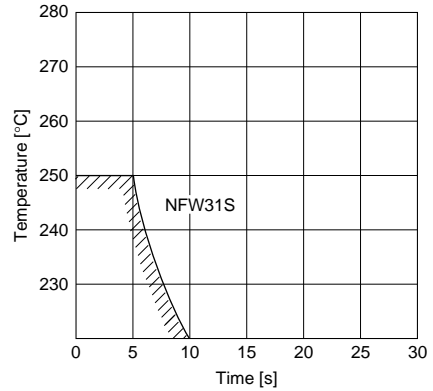
Solder : H60A H63A solder(JIS Z 3238)

Flux :

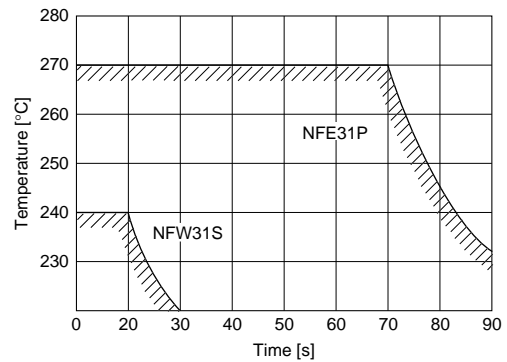
- Use Rosin-based fulx(when using RA type solder, clean products sufficiently to avoid residual fulx.
- Do not use strong acidic fulx(with chlorine content exceeding 0.20wt%)
- Do not use water-soluble fulx.

(3) SOLDERING CONDITIONS

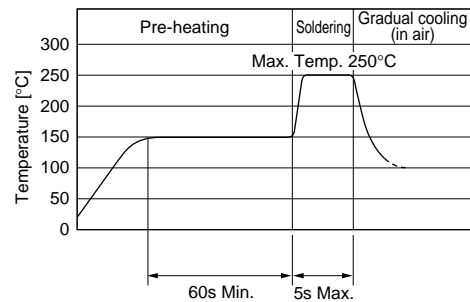
Allowable Flow Soldering Temperature and Time



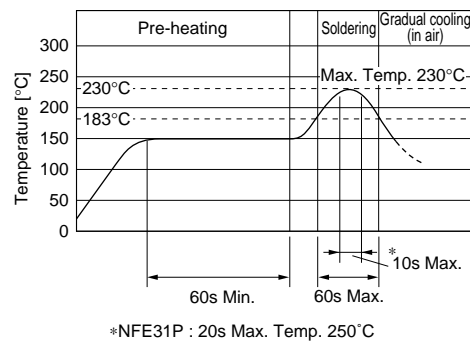
Allowable Reflow Soldering Temperature and Time



Flow Solder




Reflow Solder



Continued on the following page.

NFW/NFE31 Series Notice (Soldering and Mounting)

 Continued from the preceding page.

(4) REWORKING WITH SOLDER IRON

The following conditions must be strictly followed when using a soldering iron.

Pre-heating	: 150°C 60 second Min.
Soldering iron power output	: 30W Max.
Temperature of soldering iron tip	: 280°C Max.
Soldering time	: 10 second Max.

Do not allow the tip of the soldering iron directly to contact the chip.

For additional methods of reworking with soldering iron, please contact Murata engineering.

4. Cleaning

Following conditions should be observed when cleaning chip EMI filter.

(1) Cleaning Temperature : 60degree C max. (40degree C max. for CFC alternatives and alcohol cleaning agents)

(2) Ultrasonic

Output : 20W/liter max.

Duration : 5 minutes max.

Frequency : 28kHz to 40kHz

(3) Cleaning agent

The following list of cleaning agents have been tested on the individual components. Evaluation of final assembly should be completed prior to production.

a) CFC alternatives and alcohol cleaning agents

Isopropyl alcohol (IPA)

HCFC-225

b) Aqueous cleaning agent

Surface active agent (Clean Thru 750H)

Hydrocarbon (Techno Cleaner 335)

High grade alcohol (Pine Alpha ST-100S)

Alkaline saponifier (Aqua Cleaner 240 -cleaner should be diluted within 20% using deionized water.)

(4) Ensure that flux residue is completely removed.

Component should be thoroughly dried after aqueous agent has been removed with deionized water.

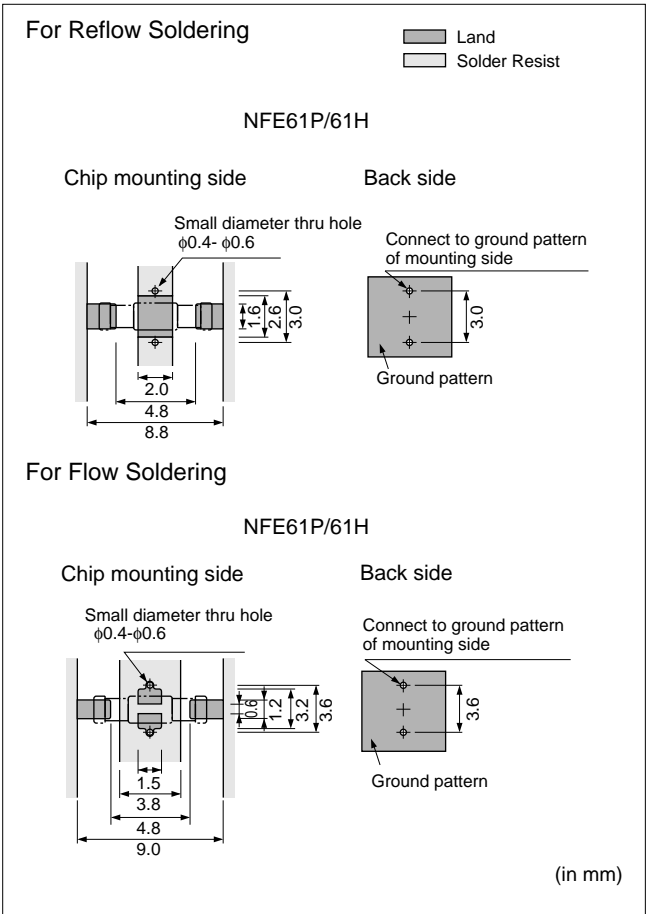
(5) Some products may become slightly whitened.

However, product performance or usage is not affected. For additional cleaning methods, please contact Murata engineering.

NFE61 Series Notice (Soldering and Mounting)

1. Standard Land Pattern Dimensions

The capacitor type chip EMI suppression filters (NFE series) suppress noise by conducting the high-frequency noise element to ground. Therefore, to obtain maximum performance from these filters, the ground pattern should be made as large as possible during the PCB design stage. As shown below, one side of the PCB is used for chip mounting, and the other is used for grounding. Small diameter feedthrough holes are then used to connect the grounds on each side of the PCB. This reduces the high-frequency impedance of the grounding and maximizes the filter's performance.



2. Solder Paste Printing and Adhesive Application

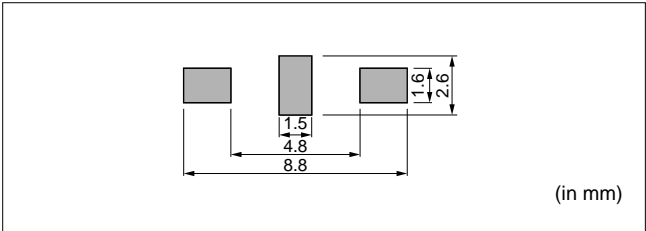
When reflow soldering the chip EMI suppression filter, the printing must be conducted in accordance with the following cream solder printing conditions. If too much solder is applied, the chip will prone to be damaged by mechanical and thermal stress from the PCB and may crack. In contrast, if too little solder is applied, there is the potential that the termination strength will be insufficient, creating the potential for detachment. Standard land dimensions should be used for resist and copper foil

patterns. When flow soldering the EMI suppression filter, apply the adhesive in accordance with the following conditions. If too much adhesive is applied, then it may overflow into the land or termination areas and yield poor solderability. In contrast, if insufficient adhesive is applied, or if the adhesive is not sufficiently hardened, then the chip may become detached during flow soldering process.

(1) Solder Paste Printing


NFE61P/61H

- Coat the solder paste a thickness of 150μm to 200μm.
- Use H60A solder for pattern printing.



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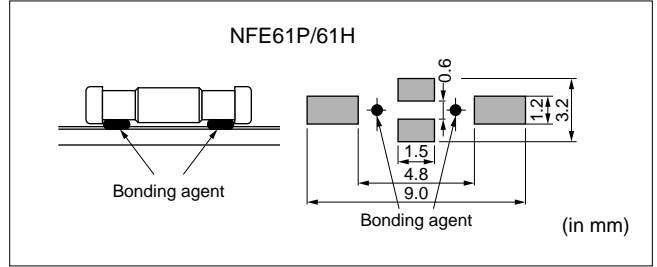
NFE61 Series Notice (Soldering and Mounting)

 Continued from the preceding page.

(2) Adhesive Application

NFE61P/61H

- Apply 1.0mg of bonding agent at each chip, and ensure not to cover electrodes.



3. Standard Soldering Conditions

(1) SOLDERING METHODS

Use flow and reflow soldering methods only.
 Use standard soldering conditions when soldering chip EMI suppression filters.
 In cases where several different parts are soldered, each having different soldering conditions, use those conditions requiring the least heat and minimum time.

(2) SOLDERING TEMPERATURE AND TIME

To prevent external electrode solder leaching and performance deterioration, solder within the temperature and time combinations illustrated by the slanted lines in the following graphs. If soldering is repeated, please note that the allowed time is the accumulated time.

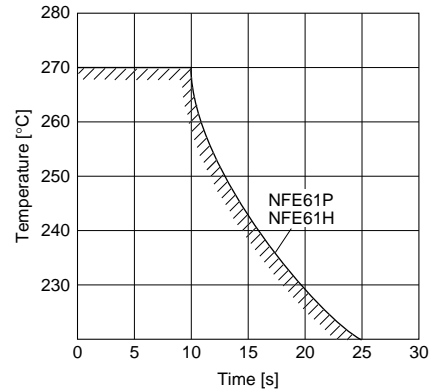
Solder and Flux

Solder : H60A H63A solder(JIS Z 3238)

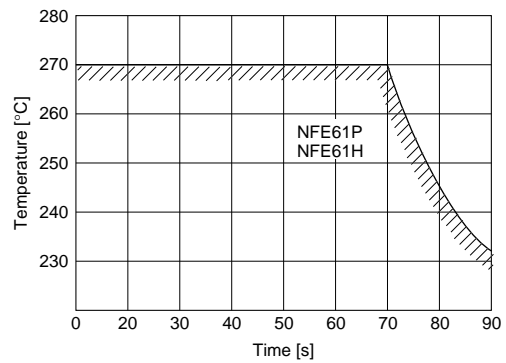
Flux :


- Use Rosin-based flux(when using RA type solder, clean products sufficiently to avoid residual flux).
- Do not use strong acidic flux(with chlorine content exceeding 0.20wt%)
- Do not use water-soluble flux.

Allowable Flow Soldering Temperature and Time



Allowable Reflow Soldering Temperature and Time

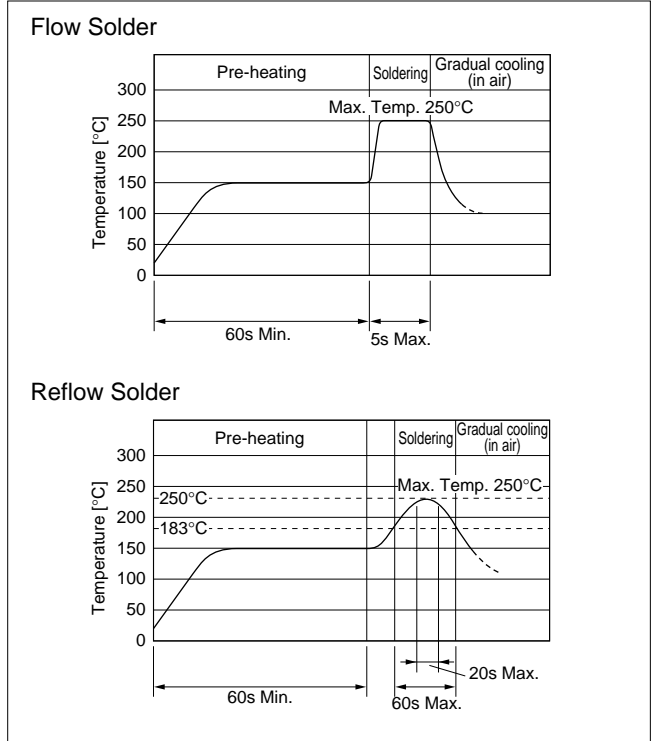


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NFE61 Series Notice (Soldering and Mounting)

Continued from the preceding page.

(3) SOLDERING CONDITIONS



(4) REWORKING WITH SOLDER IRON

The following conditions must be strictly followed when using a soldering iron.

- Pre-heating : 150°C 60 second Min.
- Soldering iron power output : 30W Max.
- Temperature of soldering iron tip : 280°C Max.
- Soldering time : 10 second Max.

Do not allow the tip of the soldering iron directly to contact the chip.

For additional methods of reworking with soldering iron, please contact Murata engineering.

4. Cleaning

Following conditions should be observed when cleaning chip EMI filter.

- (1) Cleaning Temperature : 60degree C max. (40degree C max. for CFC alternatives and alcohol cleaning agents)
- (2) Ultrasonic
 - Output : 20W/liter max.
 - Duration : 5 minutes max.
 - Frequency : 28kHz to 40kHz
- (3) Cleaning agent

The following list of cleaning agents have been tested on the individual components. Evaluation of final assembly should be completed prior to production.

- a) CFC alternatives and alcohol cleaning agents
 - Isopropyl alcohol (IPA)
 - HCFC-225

- b) Aqueous cleaning agent
 - Surface active agent (Clean Thru 750H)
 - Hydrocarbon (Techno Cleaner 335)
 - High grade alcohol (Pine Alpha ST-100S)
 - Alkaline saponifier (Aqua Cleaner 240 -cleaner should be diluted within 20% using deionized water.)
- (4) Ensure that flux residue is completely removed. Component should be thoroughly dried after aqueous agent has been removed with deionized water.
- (5) Some products may become slightly whitened. However, product performance or usage is not affected. For additional cleaning methods, please contact Murata engineering.

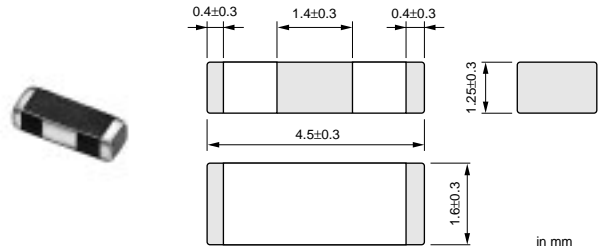
On-Board Type (DC) EMI Suppression Filters(EMIFIL[®])

Chip EMIGUARD[®] (with Varistor Function EMIFIL) VFM41R Series

The VFM41R series is a chip type EMI filter with varistor function. Its 3-terminal structure provides high performance by suppressing high frequency noise and absorbing surge noise. VFM41R can meet both EMI noise and surge noise.

Applications

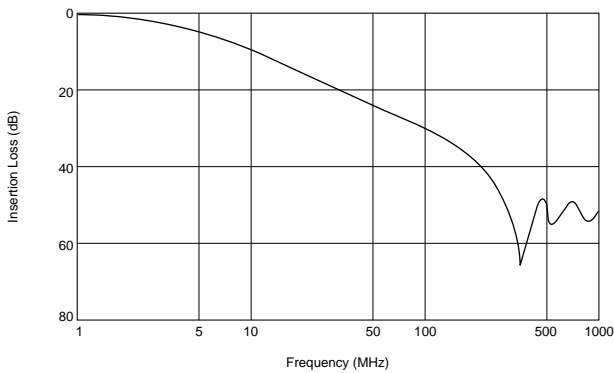
- ESD surge protection and EMI suppression in various electric equipment such as car electronic equipment, portable electronic equipment, telecommunication terminals, office automation equipment, home automation equipment or factory automation equipment.



Part Number	Rated Voltage (Vdc)	Varistor Voltage (V)	Clamping Voltage (max.)	Capacitance (pF)	Rated Current (mA)	Peak Pulse Current (A)	Operating Temperature Range (°C)
VFM41RN222N1C	16	27 +5%,-5%	-	2200 +30%,-30%	200	50	-40 to 125

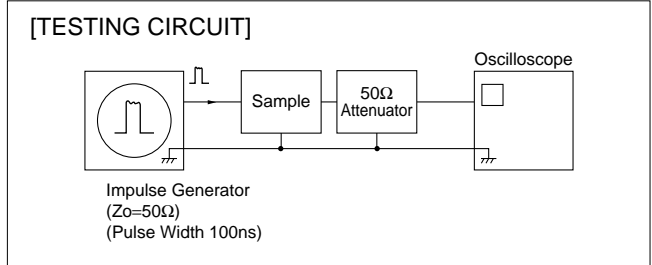
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Insertion Loss Characteristics



Noise Suppression Effect of VFM Series

Impulse Noise Absorption (Comparison between VFM41R and Standard 2-terminal Varistor)



Type of Filter	EMI Suppression Effect	Description
Original Waveform	<p>Voltage Waveform</p> <p>Frequency Spectrum</p>	<p>The Lower chart is a frequency response of the upper chart. Note that the scale of original wave chart and that of the output wave chart is different because of circumstances.</p>
The commonly used 2-terminal varistor	<p>* Final voltage comes below 0V because of the affect of signal reflection.</p> <p>Voltage Waveform</p> <p>Frequency Spectrum</p>	<p>The rising part of pulse, which is mostly consists of high-frequency element, remains because inductance in electrodes becomes obstacle.</p>
Chip Solid EMIGUARD® VFM41R	<p>Voltage Waveform</p> <p>Frequency Spectrum</p>	<p>The 3-terminal structure minimizes the effect of inductance in electrodes and pulse rising noise is absorbed completely.</p>

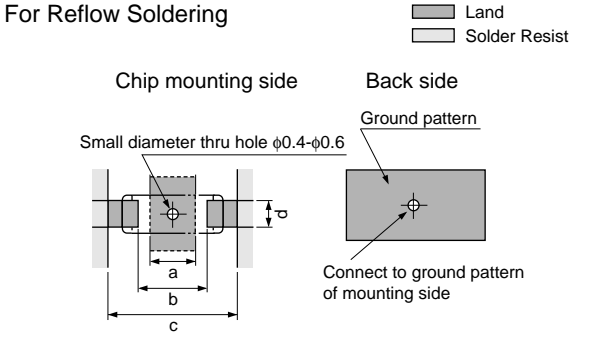
12

VFM Series Notice (Soldering and Mounting)

1. Standard Land Pattern Dimensions

Chip EMI suppression filters with Varistor (VFM41R Series) Function suppress noise by conducting the high-frequency noise element to ground. Therefore, to obtain maximum performance from these filters, the ground pattern should be made as large as possible during the PCB design stage. As shown in the right, one side of the PCB is used for chip mounting, and the other is used for grounding. Small diameter feedthrough holes are then used to connect the grounds on each side of the PCB. This reduces the high-frequency impedance of the grounding and maximizes the filter's performance.

For Reflow Soldering



Chip mounting side Back side

Small diameter thru hole $\phi 0.4-\phi 0.6$

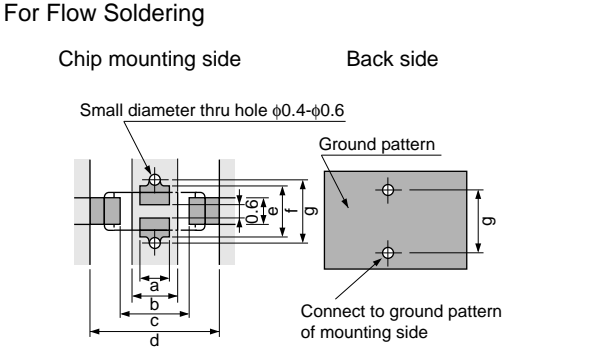
Ground pattern

Connect to ground pattern of mounting side

Part Number	Size (mm)			
	a	b	c	d
VFM41R	2.0	3.5	6.0	1.2

• NFM21C/21P, NFR21G is specially adapted for reflow soldering.

For Flow Soldering



Chip mounting side Back side

Small diameter thru hole $\phi 0.4-\phi 0.6$

Ground pattern


Connect to ground pattern of mounting side

Part Number	Size (mm)						
	a	b	c	d	e	f	g
VFM41R	1.5	2.0	3.5	6.0	1.2	2.6	3.0

2. Solder Paste Printing and Adhesive Application

When reflow soldering the chip EMI suppression filter, the printing must be conducted in accordance with the following cream solder paste printing conditions. If too much solder is applied, the chip will prone to be damaged by mechanical and thermal stress from the PCB and may crack. In contrast, if too little solder is applied, there is the potential that the termination strength will be insufficient, creating the potential for detachment. Standard land dimensions should be used for resist and copper foil patterns.

When flow soldering the EMI suppression filter, apply the adhesive in accordance with the following conditions. If too much adhesive is applied, then it may overflow into the land or termination areas and yield poor solderability. In contrast, if insufficient adhesive is applied, or if the adhesive is not sufficiently hardened, then the chip may become detached during flow soldering process.

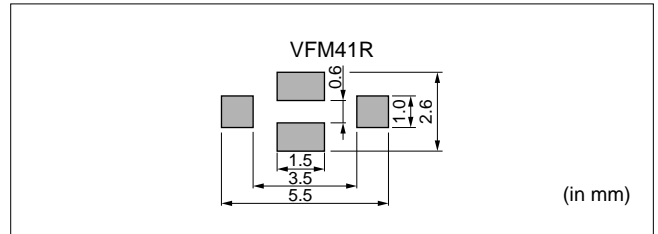
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VFM Series Notice (Soldering and Mounting)

Continued from the preceding page.

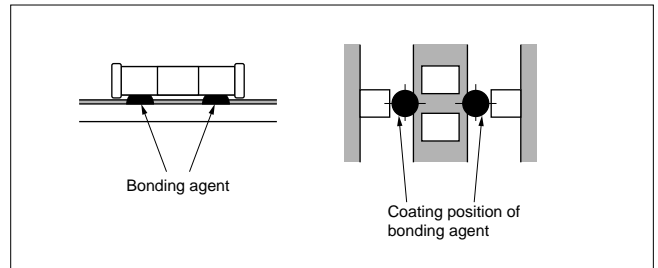
(1) Solder Paste Printing

- Coat the solder paste a thickness of 100μm to 200μm .
- Use H60A solder for pattern printing.



(2) Adhesive Application

- Apply 0.1mg of bonding agent at each chip, and ensure not to cover electrodes.



3. Standard Soldering Conditions

(1) SOLDERING METHODS

Use flow and reflow soldering methods only.
 Use standard soldering conditions when soldering chip EMI suppression filters.
 In cases where several different parts are soldered, each having different soldering conditions, use those conditions requiring the least heat and minimum time.

(2) SOLDERING TEMPERATURE AND TIME

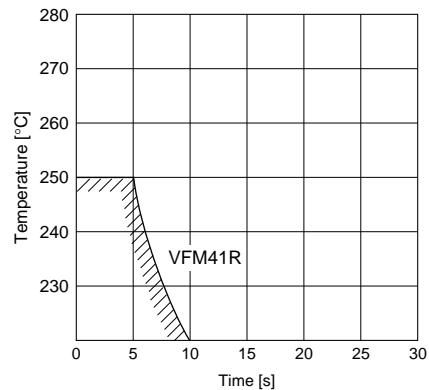
To prevent external electrode solder leaching and performance deterioration, solder within the temperature and time combinations illustrated by the slanted lines in the following graphs. If soldering is repeated, please note that the allowed time is the accumulated time.

Solder : H60A H63A solder(JIS Z 3238)

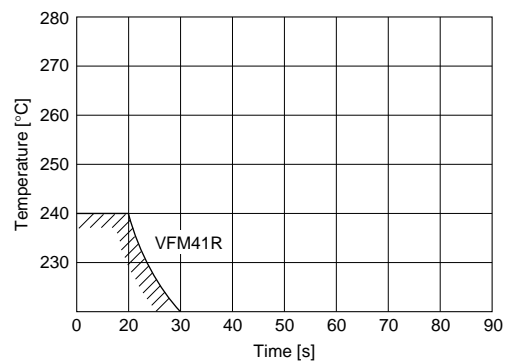
Flux :

- Use Rosin-based flux(when using RA type solder, clean products sufficiently to avoid residual flux.
- Do not use strong acidic flux(with chlorine content exceeding 0.20wt%)
- Do not use water-soluble flux.

Allowable Flow Soldering Temperature and Time



Allowable Reflow Soldering Temperature and Time

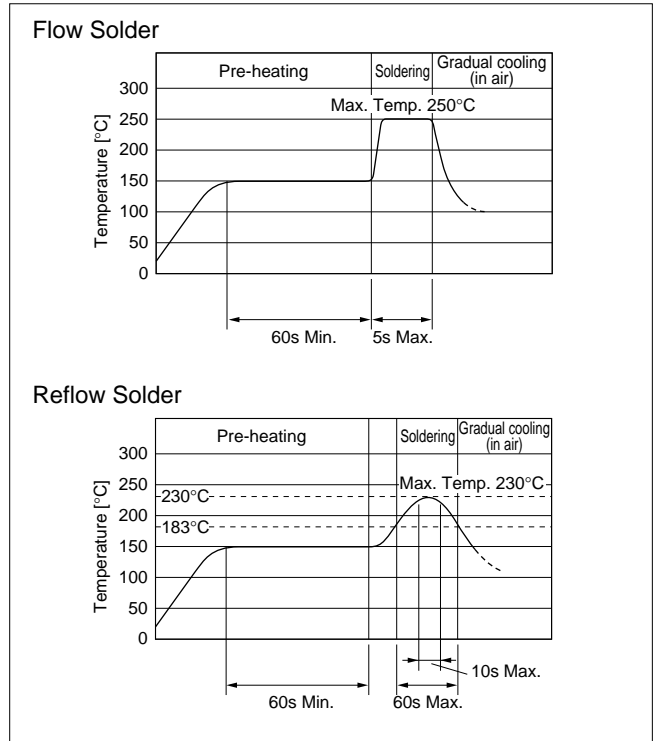


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VFM Series Notice (Soldering and Mounting)

Continued from the preceding page.

(3) SOLDERING CONDITIONS



(4) REWORKING WITH SOLDER IRON

The following conditions must be strictly followed when using a soldering iron.

- Pre-heating : 150°C 60 second Min.
- Soldering iron power output : 30W Max.
- Temperature of soldering iron tip : 280°C Max.
- Soldering time : 10 second Max.

Do not allow the tip of the soldering iron directly to contact the chip.

For additional methods of reworking with soldering iron, please contact Murata engineering.

4. Cleaning

Following conditions should be observed when cleaning chip EMI filter.

- (1) Cleaning Temperature : 60°C max. (40°C max. for CFC alternatives and alcohol cleaning agents)
- (2) Ultrasonic
 - Output : 20W/liter max.
 - Duration : 5 minutes max.
 - Frequency : 28kHz to 40kHz
- (3) Cleaning agent

The following list of cleaning agents have been tested on the individual components. Evaluation of final assembly should be completed prior to production.

- a) CFC alternatives and alcohol cleaning agents
 - Isopropyl alcohol (IPA)
 - HCFC-225

- b) Aqueous cleaning agent
 - Surface active agent (Clean Thru 750H)
 - Hydrocarbon (Techno Cleaner 335)
 - High grade alcohol (Pine Alpha ST-100S)*
 - *VFM41R series cannot be cleaned with high grade alcohol type aqueous cleaning agent.
 - Alkaline saponifier (Aqua Cleaner 240 -cleaner should be diluted within 20% using deionized water.)
- (4) Ensure that flux residue is completely removed. Component should be thoroughly dried after aqueous agent has been removed with deionized water.
- (5) Some products may become slightly whitened. However, product performance or usage is not affected. For additional cleaning methods, please contact Murata engineering.

On-Board Type (DC) EMI Suppression Filters(EMIFIL[®])

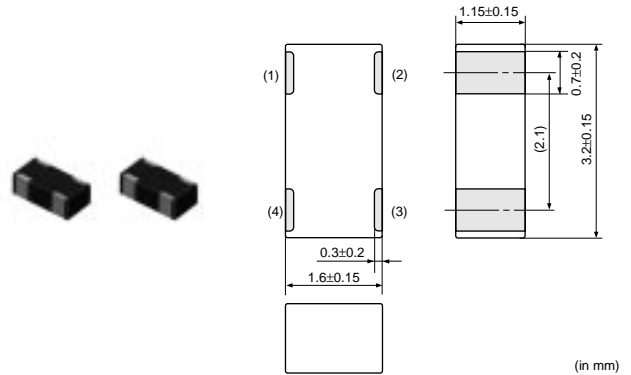


Chip Common Mode Choke Coils Film Type DLP31S Series

The DLP31S series is chip common mode choke coil that is realized high impedance in small size with ferrite material technology and thin film processing. The DLP31S has excellent performance at high frequency range. DLP31S is suitable for differential signal line application.

■ Features

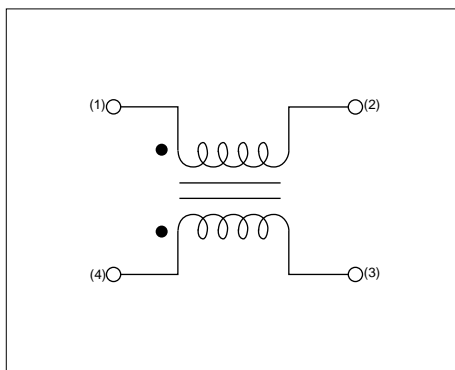
1. DLP31S is common mode choke coil that realized small size, low profile, SMD.
3.2x1.6x1.15mm (tolerance:0.15mm)
2. DLP31S has high common mode impedance (550ohm at 100MHz typ.) in small size.
3. DLP31S suppress high frequency noise that was unable to be suppressed with existing common mode choke coils.
Suitable for differential signal line as like USB, because DLP31S does not provide distortion to high speed signal transmission due to its high coupling (Coupling coefficient:0.98 min.)



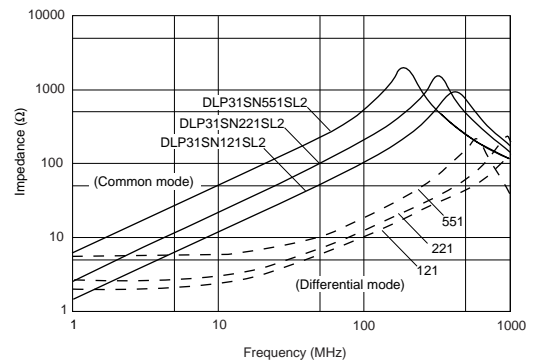
Part Number	Common Mode Impedance (ohm)	Rated Current (A)	Rated Voltage (Vdc)	Insulation Resistance (M ohm)	Withstand Voltage (Vdc)	DC Resistance (max.) (ohm)
DLP31SN551SL2	550 (Typ.) at 100MHz	0.1	16	100 min.	40	3.6
DLP31SN221SL2	220 (Typ.) at 100MHz	0.1	16	100 min.	40	2.5
DLP31SN121SL2	120 (Typ.) at 100MHz	0.1	16	100 min.	40	2.0

Operating Temperature Range : -40°C to 85°C

■ Equivalent Circuit



■ Impedance-Frequency Characteristics



On-Board Type (DC) EMI Suppression Filters(EMIFIL®)



Chip Common Mode Choke Coils Arrays Film Type DLP31D Series

The DLP31D series is chip common mode choke coil array which is realized high coupling and high impedance in small size with ferrite material technology and thin film processing.
 The DLP31D series has excellent performance at high frequency range. It is suitable for high-speed differential signal line application.

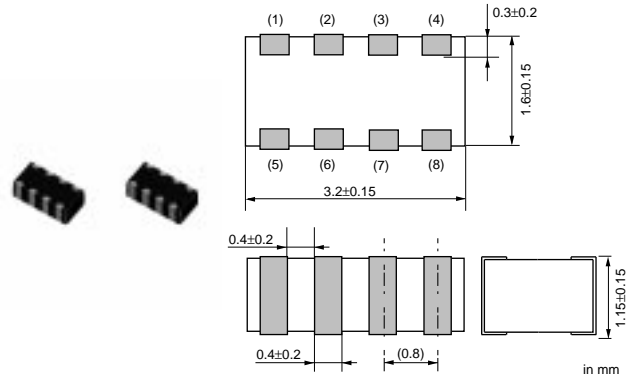
■ Features

1. 2 components are included in 3.2x1.6mm
2. Thin type 1.15mm
3. High common mode impedance characteristics (470ohm Max. at 100MHz)
4. The DLP31D can suppress common mode noise without distortion to high speed signal transmission due to its high coupling.

■ Applications

Prevention of common mode noise for differential signal line

- IEEE1394
- LVDS

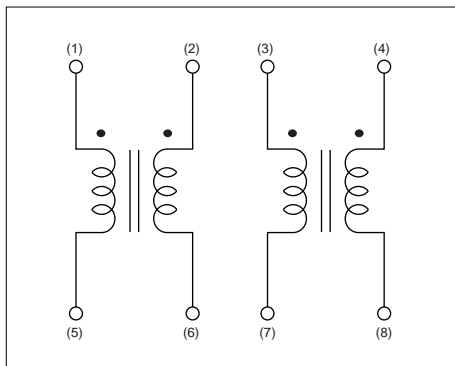


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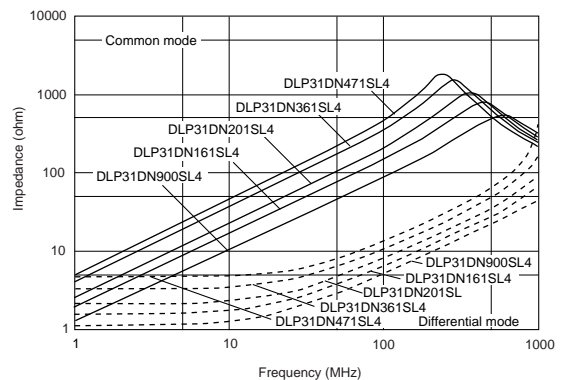
Part Number	Common Mode Impedance (ohm)	Rated Current (mA)	Rated Voltage (Vdc)	Insulation Resistance (M ohm)	Withstand Voltage (Vdc)	DC Resistance (max.) (ohm)
DLP31DN471SL4	470 ±20%(Typ.) at 100MHz	100	10	100 min.	25	3.0
DLP31DN361SL4	360 ±20%(Typ.) at 100MHz	100	10	100 min.	25	2.5
DLP31DN201SL4	200 ±20%(Typ.) at 100MHz	100	10	100 min.	25	1.6
DLP31DN161SL4	160 ±20%(Typ.) at 100MHz	100	10	100 min.	25	1.2
DLP31DN900SL4	90 ±20%(Typ.) at 100MHz	100	10	100 min.	25	0.7

Operating Temperature Range : -40°C to 85°C

■ Equivalent Circuit



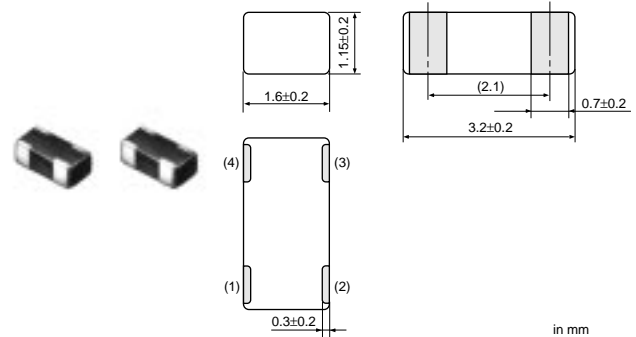
■ Impedance-Frequency Characteristics



On-Board Type (DC) EMI Suppression Filters(EMIFIL[®])

Chip Common Mode Choke Coils Monolithic Type DLM31K Series

The DLM31K is effective in high frequency noise suppression and suitable for suppression of radiation noise in signal cables. The common mode choke coil structure enable noise suppression without damaging the signal. Murata's original material technology and monolithic technology enable a compact size of 3.2x 1.6x 1.15mm.



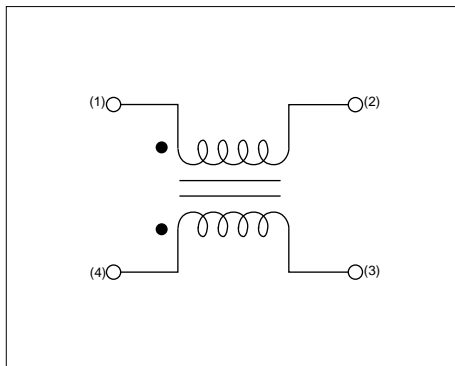
■ Applications

- Prevention of common mode noise on signal line in personal computers, computer built in equipment, facsimiles, digital telephones, etc.

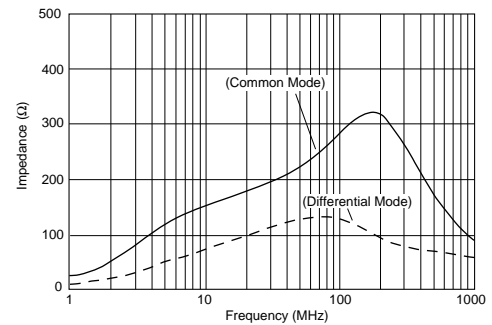
Part Number	Common Mode Impedance (ohm)	Rated Current (mA)	Rated Voltage (Vdc)	Insulation Resistance (M ohm)	Withstand Voltage (Vdc)	DC Resistance (max.) (ohm)
DLM31KN281SJ2	280 (Typ.) at 100MHz	200	50	100 min.	125	2.0

Operating Temperature Range : -55°C to 85°C

■ Equivalent Circuit



■ Impedance-Frequency Characteristics



On-Board Type (DC) EMI Suppression Filters(EMIFIL®)



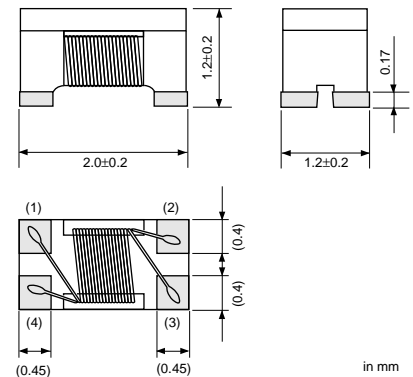
Chip Common Mode Choke Coils Winding Type DLW21S/DLW31S Series

■ Features (DLW21S Series)

- DLW21S series realizes small size and low profile.
2.0x1.2x1.2mm
- High common mode impedance at high frequency effects excellent noise suppression performance.
- Various common mode impedance items of 67 to 370ohm can be used, considering noise level and signal frequency.
- Suitable for differential signal line like USB2.0, IEEE1394 and LVDS, because DLW21S does not provide distortion to high speed signal transmission due to its high coupling.
- Lead is not contained in the product.
- Small dimension enables higher density packaging.



DLW21S



■ Applications

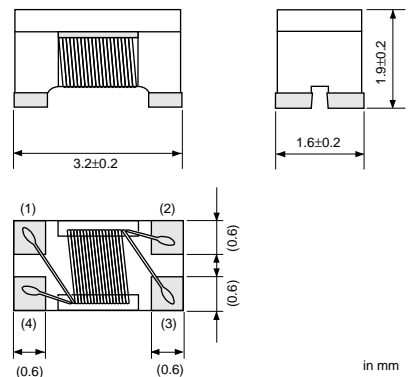
- Common mode noise suppression of signal lines in high speed and high density digital equipment such as personal computers and peripherals.

■ Features (DLW31S Series)

- DLW31S realizes small size and low profile.
3.2mmx1.6mmx1.9mm.
- High common mode impedance at high frequency effects excellent noise suppression performance.
- Various common mode impedance items of 90 to 2200ohm can be used, considering noise level and signal frequency.
- Suitable for differential signal line like IEEE1394 and LVDS, because DLW31S dose not provide distortion to high speed signal transmission due to its high coupling.
- Lead is not contained in the product.
- Small dimension enables higher density packaging.



DLW31S



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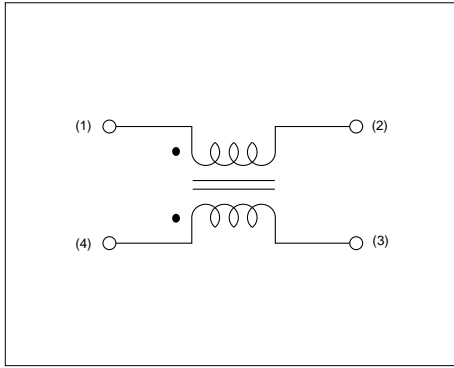
Part Number	Common Mode Impedance (ohm)	Rated Current (mA)	Rated Voltage (Vdc)	Insulation Resistance (M ohm)	Withstand Voltage (Vdc)	DC Resistance (max.) (ohm)
DLW31SN222SQ2	2200 (Typ.) at 100MHz	200	50	10 min.	125	1.2
DLW31SN102SQ2	1000 (Typ.) at 100MHz	230	50	10 min.	125	1.0
DLW31SN601SQ2	600 (Typ.) at 100MHz	260	50	10 min.	125	0.8
DLW21SN371SQ2	370 (Typ.) at 100MHz	280	50	10 min.	125	0.45
DLW21SN261SQ2	260 (Typ.) at 100MHz	300	50	10 min.	125	0.40
DLW31SN261SQ2	260 (Typ.) at 100MHz	310	50	10 min.	125	0.5
DLW21SN181SQ2	180 (Typ.) at 100MHz	330	50	10 min.	125	0.35
DLW31SN161SQ2	160 (Typ.) at 100MHz	340	50	10 min.	125	0.4
DLW21SN121SQ2	120 (Typ.) at 100MHz	370	50	10 min.	125	0.30
DLW31SN900SQ2	90 (Typ.) at 100MHz	370	50	10 min.	125	0.3
DLW21SN670SQ2	67 (Typ.) at 100MHz	400	50	10 min.	125	0.25

Operating Temperature Range : -40°C to 85°C



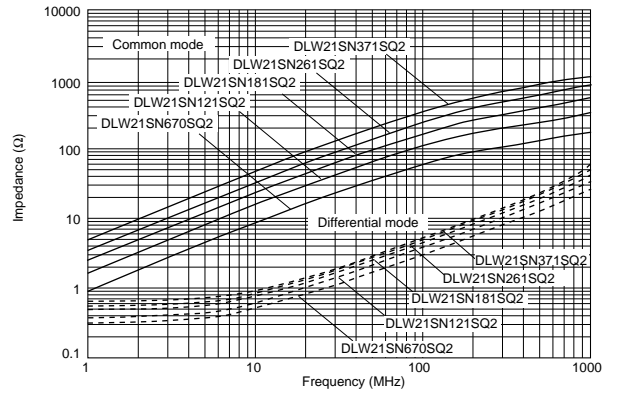
■ Equivalent Circuit

DLW21S



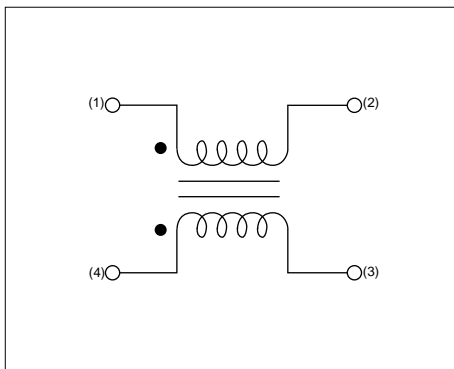
■ Impedance-Frequency Characteristics

DLW21S



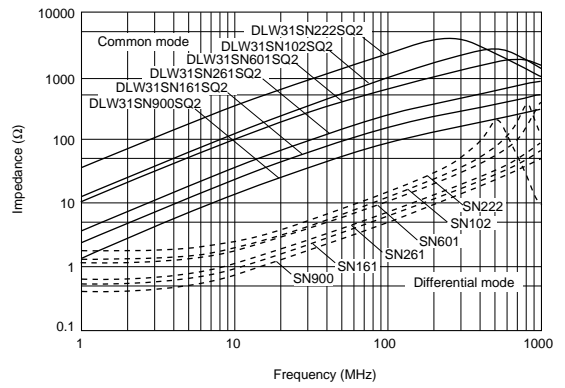
■ Equivalent Circuit

DLW31S



■ Impedance-Frequency Characteristics

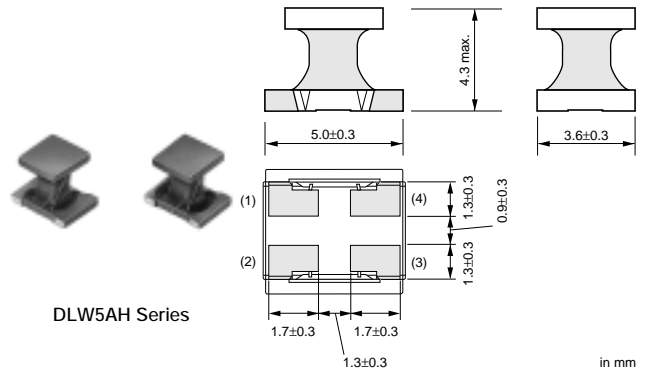
DLW31S



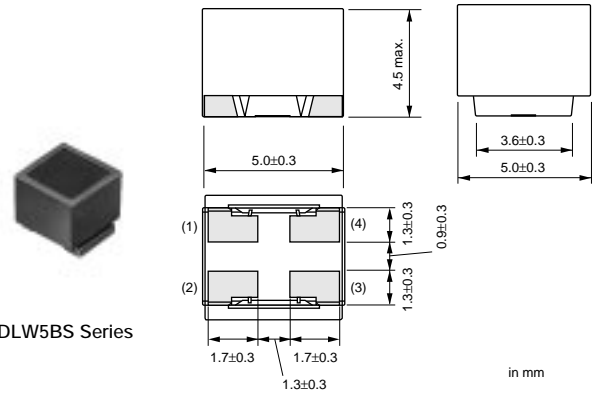
On-Board Type (DC) EMI Suppression Filters(EMIFIL®)

Chip Common Mode Choke Coils Winding Type for Large Current DLW5AH/DLW5BS Series

The DLW5AH/5BS series is high performance wound type chip common mode choke coil. Its high impedance characteristic enables great noise suppression, but it does not damage high speed signal due to low normal mode impedance. High rated current up to 5A enables power line use.



DLW5AH Series

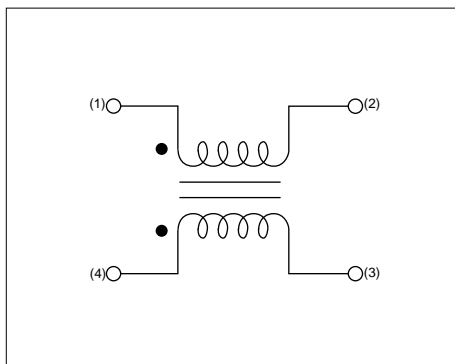


DLW5BS Series

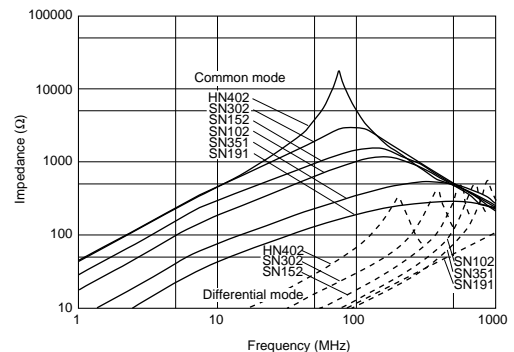
Part Number	Common Mode Impedance (ohm)	Rated Current (mA)	Rated Voltage (Vdc)	Insulation Resistance (M ohm)	Withstand Voltage (Vdc)	DC Resistance (max.) (ohm)
DLW5AHN402SQ2	4000 (Typ.) at 100MHz	200	50	10 min.	125	3.0
DLW5BSN302SQ2	3000 (Typ.) at 100MHz	500	50	10 min.	125	0.3
DLW5BSN152SQ2	1500 (Typ.) at 100MHz	1000	50	10 min.	125	0.1
DLW5BSN102SQ2	1000 (Typ.) at 100MHz	1500	50	10 min.	125	0.06
DLW5BSN351SQ2	350 (Typ.) at 100MHz	2000	50	10 min.	125	0.04
DLW5BSN191SQ2	190 (Typ.) at 100MHz	5000	50	10 min.	125	0.02


Operating Temperature Range : -25°C to 85°C


Equivalent Circuit



Impedance-Frequency (Typical)

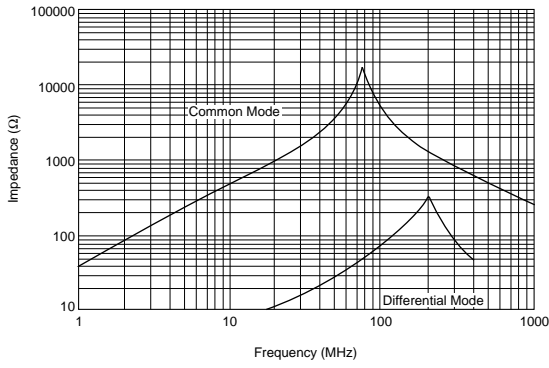


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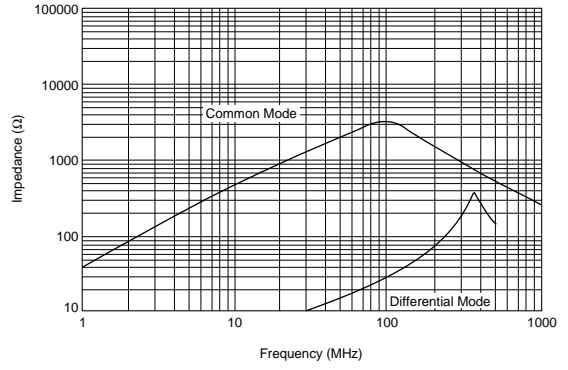
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■ Impedance-Frequency Characteristics

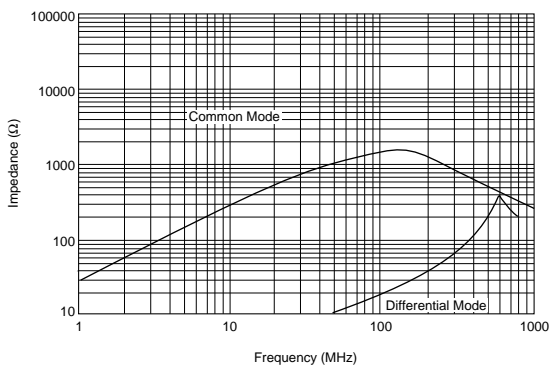
DLW5AHN402SQ2



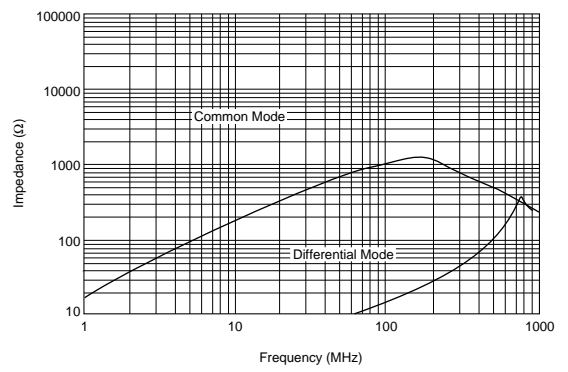
DLW5BSN302SQ2



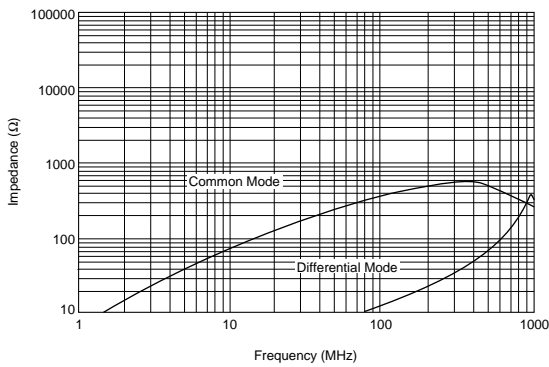
DLW5BSN152SQ2



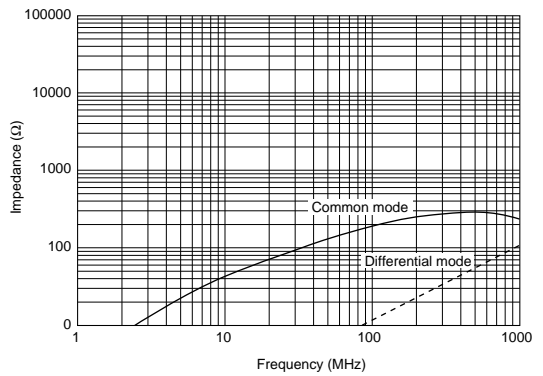
DLW5BSN102SQ2



DLW5BSN351SQ2



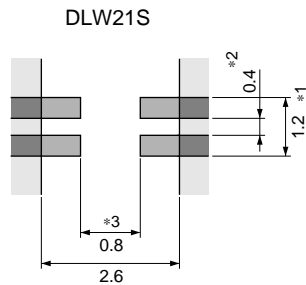
DLW5BSN191SQ2



DLP/DLM/DLW Series Notice (Soldering and Mounting)

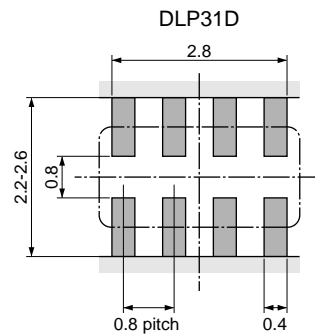
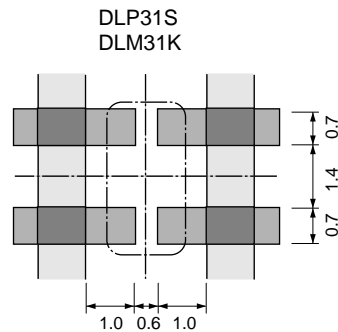
1. Standard Land Pattern Dimensions

For Reflow and Flow Soldering

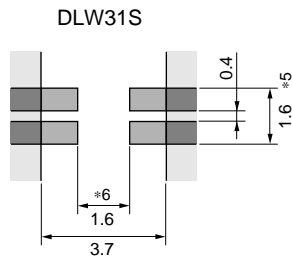


- * 1 : If the pattern is made with wider than 1.2mm. It will result to let components turn around, because melting speed is different. In the worst case, short circuit between lines may be occurred.
 - * 2 : If the pattern is made with less than 0.4mm, in the worst case, short circuit between lines may be occurred deu to spread of soldering paste or mount placeing accuracy.
 - * 3 : If the pattern is made with wider than 0.8mm, the strength of bending will be reduced.
- In case you use gilded pattern, a copper wire may cause open by dissolution of metallization, if you supply with heat exceed permissible area.

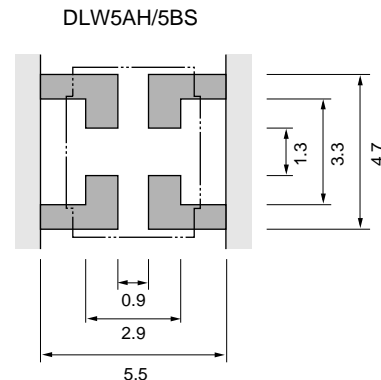
■ Land
□ Solder Resist



For Reflow Soldering



- * 4 : If the pattern is made with wider than 1.6mm, it will result to let components turn around, because melting speed is different. In the worst case, short circuit between lines may be occurred.
 - * 5 : If the pattern is made with less than 0.4mm, in the worst case, short circuit between lines may be occurred deu to spread of soldering paste or mount placeing accuracy.
 - * 6 : If the pattern is made with wider than 1.6mm, the strength of bending will be reduced.
- In case you use gilded pattern, a copper wire may cause open by dissolution of metallization, if you supply with heat exceed permissible area.



(in mm)

Continued on the following page.

DLP/DLM/DLW Series Notice (Soldering and Mounting)

Continued from the preceding page.

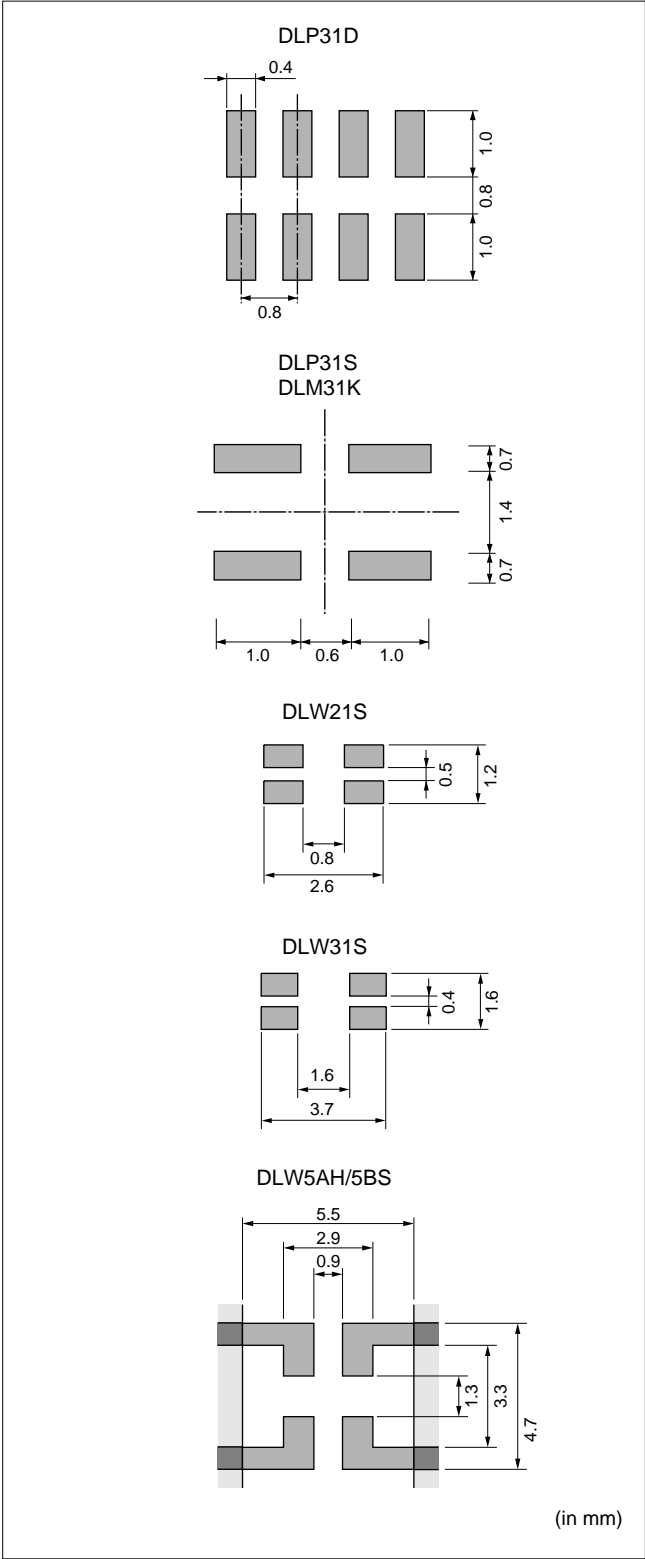
2. Solder Paste Printing and Adhesive Application

When reflow soldering the chip common mode choke coils, the printing must be conducted in accordance with the following cream solder printing conditions. If too much solder is applied, the chip will prone to be damaged by mechanical and thermal stress from the PCB and may crack. In contrast, if too little solder is applied, there is the potential that the termination strength will be insufficient, creating the potential for detachment. Standard land dimensions should be used for resist and copper foil patterns.

When flow soldering the chip common mode choke coils, apply the adhesive in accordance with the following conditions. If too much adhesive is applied, then it may overflow into the land or termination areas and yield poor solderability. In contrast, if insufficient adhesive is applied, or if the adhesive is not sufficiently hardened, then the chip may become detached during flow soldering process.

(1) Solder Paste Printing

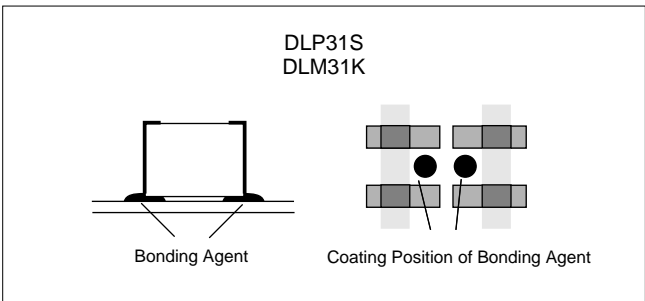
- ① Coat the solder paste a thickness
 - 100μm to 150μm : DLW21S/31S
 - 150μm to 200μm : DLP31D/31S
 - DLM31K
 - DLW5AH/5BS
- ② Use H60A solder for pattern printing.



(2) Adhesive Application

DLP31S
DLM31K

- Apply 0.3mg of bonding agent at each chip, and ensure not to cover electrodes.



Continued on the following page.

DLP/DLM/DLW Series Notice (Soldering and Mounting)

Continued from the preceding page.

3. Standard Soldering Conditions

(1) SOLDERING METHODS

Use flow and reflow soldering methods only.
 Use standard soldering conditions when soldering chip EMI suppression filters.
 In cases where several different parts are soldered, each having different soldering conditions, use those conditions requiring the least heat and minimum time.

(2) SOLDERING TEMPERATURE AND TIME

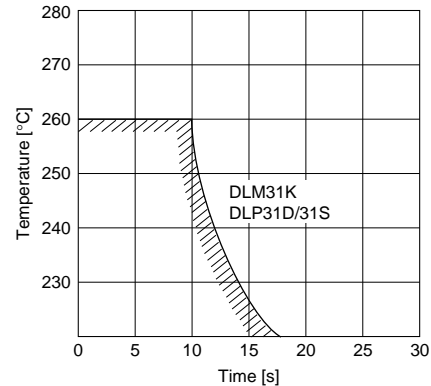
To prevent external electrode solder leaching and performance deterioration, solder within the temperature and time combinations illustrated by the slanted lines in the following graphs. If soldering is repeated, please note that the allowed time is the accumulated time.

Solder : H60A H63A solder(JIS Z 3238)

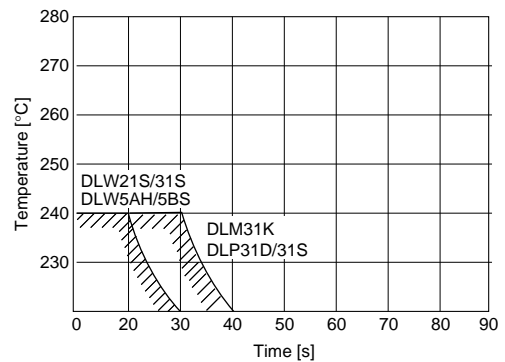
Flux :

- Use Rosin-based fulx(when using RA type solder, clean products sufficiently to avoid residual fulx.
- Do not use strong acidic fulx(with chlorine content exceeding 0.20wt%)
- Do not use water-soluble fulx.

Allowable Flow Soldering Temperature and Time

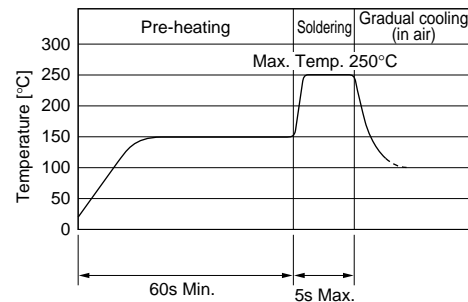


Allowable Reflow Soldering Temperature and Time

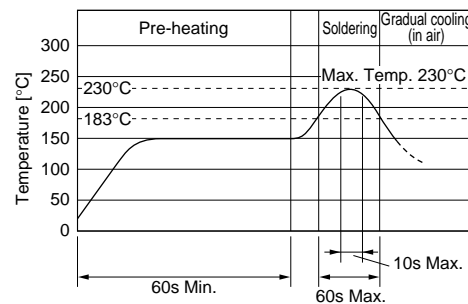


(3) SOLDERING CONDITIONS

Flow Solder




Reflow Solder



Continued on the following page.

DLP/DLM/DLW Series Notice (Soldering and Mounting)

 Continued from the preceding page.

(4) REWORKING WITH SOLDER IRON

The following conditions must be strictly followed when using a soldering iron.

Pre-heating	: 150°C 60 second Min.
Soldering iron power output	: 30W Max.
Temperature of soldering iron tip	: 280°C Max.
Soldering time	: 10 second Max.

Do not allow the tip of the soldering iron directly to contact the chip.

For additional methods of reworking with soldering iron, please contact Murata engineering.

4. Cleaning

Following conditions should be observed when cleaning chip EMI filter.

(1) Cleaning Temperature : 60degree C max. (40degree C max. for CFC alternatives and alcohol cleaning agents)

(2) Ultrasonic

Output : 20W/liter max.

Duration : 5 minutes max.

Frequency : 28kHz to 40kHz

(3) Cleaning agent

The following list of cleaning agents have been tested on the individual components. Evaluation of final assembly should be completed prior to production.

Do not clean DLW5AH/5BS, DLW31S series. In case of cleaning, please contact Murata engineering.

a) CFC alternatives and alcohol cleaning agents

Isopropyl alcohol (IPA)

HCFC-225

b) Aqueous cleaning agent

Surface active agent (Clean Thru 750H)

Hydrocarbon (Techno Cleaner 335)

High grade alcohol (Pine Alpha ST-100S)

Alkaline saponifier (Aqua Cleaner 240 -cleaner should be diluted within 20% using deionized water.)

(4) Ensure that flux residue is completely removed.

Component should be thoroughly dried after aqueous agent has been removed with deionized water.

(5) Some products may become slightly whitened.

However, product performance or usage is not affected. For additional cleaning methods, please contact Murata engineering.

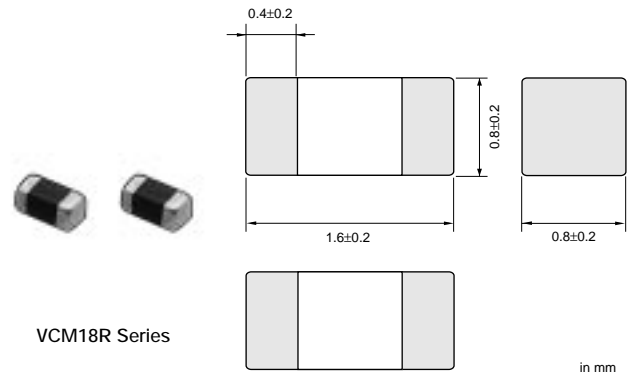
On-Board Type (DC) EMI Suppression Filters(EMIFIL®)

Chip Varistors VCM18R/VCM21R Series

The surge test on electronic equipment tends to be popular because of the regulation for immunity. This situation requires surge absorb components smaller dimension, lower cost and higher performance.

VCM18R is designed as absorbing devices which, with MURATA's advanced technic, has higher performance in spite of its small dimension.

VCM18R absorbs surge voltage, results to protect circuit simply by inserting between surge entrance line and ground line.



■ Features

1. It is effective in high density packaging, because of smaller dimension than diode which is generally used as surge countermeasure devices.
2. The small clamping voltage ratio enables effective absorption of surge noise.
3. VCM18R has capacitance. Therefore by-pass capacitor for noise suppression is not needed.
4. The nickel barrier structure of the external electrodes provides excellent solder heat resistance. Both flow and reflow soldering methods can be applied.

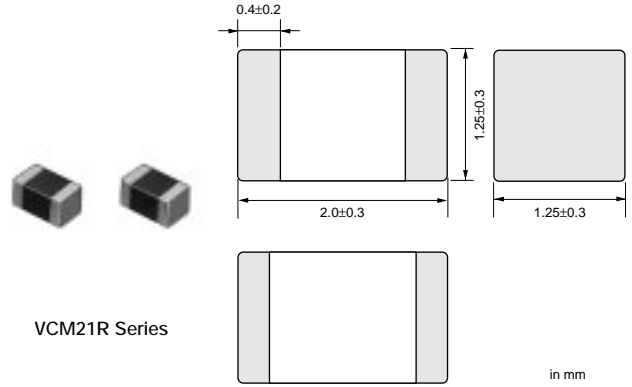
■ Applications

- ESD protection for Input/Output interface of compact size digital equipment (cellular phone, digital camera)
- Surge absorption in communication ports such as RS-232C
- Motor/relay noise absorption
- Electro static protection in I/O port of computers

The surge test on electronic equipment tends to be popular because of the regulation for immunity. This situation requires surge absorb components smaller dimension, lower cost and higher performance.

VCM21R is designed as absorbing devices which, with MURATA's advanced technic, has higher performance in spite of its small dimension.

VCM21R absorbs surge voltage, results to protect circuit simply by inserting between surge entrance line and ground line.



■ Features

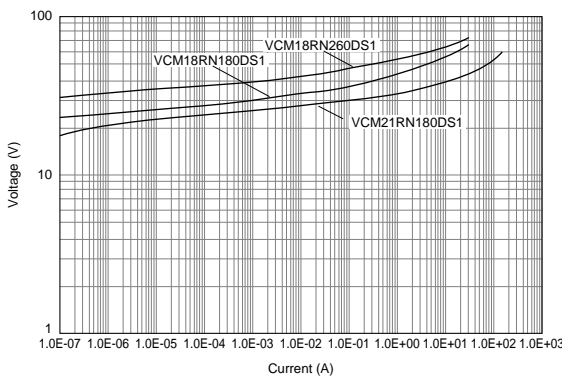
1. It is effective in high density packaging, because of smaller dimension than diode which is generally used as surge countermeasure devices.
2. The small clamping voltage ratio enables effective absorption of surge noise.
3. The large peak current of VCM21R, up to 150A, enables high reliability against surge.
4. VCM21R can be applied to ISO-7637-1. Test pulse condition.
5. The nickel barrier structure of the external electrodes provides excellent solder heat resistance. Both flow and reflow soldering methods can be applied.

■ Applications

- Surge absorption in communication ports such as RS-232C
- Motor/relay noise absorption
- Electro static protection in I/O port of computers

Part Number	Rated Voltage (Vdc)	Varistor Voltage (V)	Clamping Voltage (max.)	Capacitance (pF)	Peak Pulse Current (A)	Operating Temperature Range (°C)
VCM18RN180DS1	18	29 V1mA +5V,-5V	50V(V1A)	100 +30%,-30%	30 8/20µs	-40 to 125
VCM21RN180DS1	18	25 V1mA +5V,-5V	45V(V10A)	1000 +30%,-30%	150 8/20µs	-40 to 125

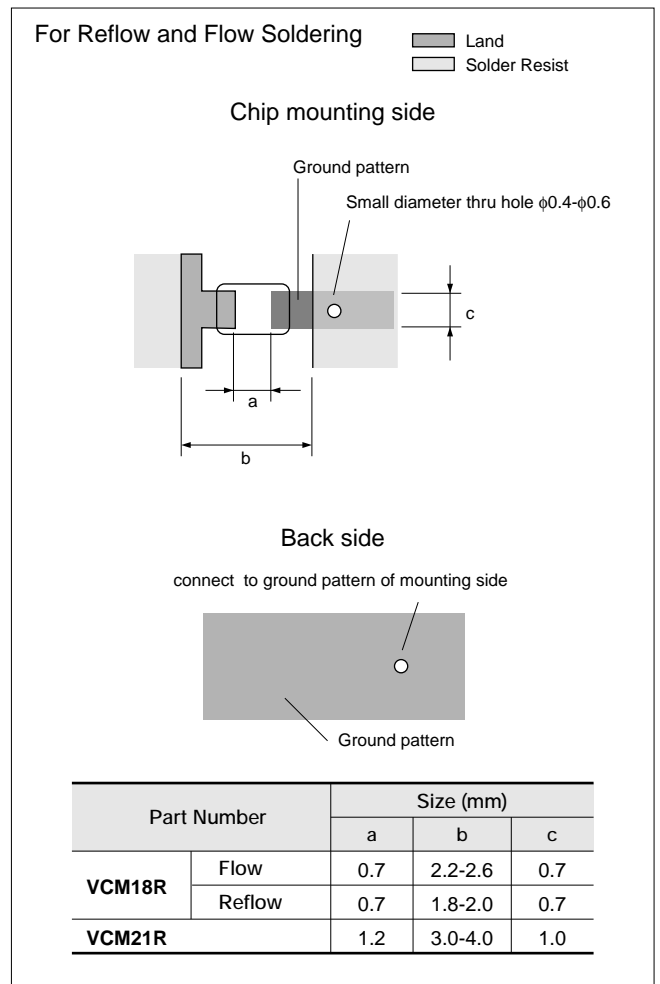
■ Voltage-Current Characteristics



VCM Series Notice (Soldering and Mounting)

1. Standard Land Pattern Dimensions

The chip varistor suppress noise by conducting the high-frequency noise element to ground. Therefore, to obtain maximum performance from these filters, the ground pattern should be made as large as possible during the PCB design stage. As shown in the right, one side of the PCB is used for chip mounting, and the other is used for grounding. Small diameter feedthrough holes are then used to connect the grounds on each side of the PCB. This reduces the high-frequency impedance of the grounding and maximizes the filter's performance.



2. Solder Paste Printing and Adhesive Application

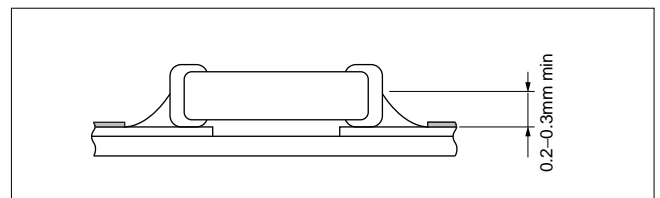
When reflow soldering the chip varistor, the printing must be conducted in accordance with the following solder paste printing conditions. If too much solder is applied, the chip will be prone to be damaged by mechanical and thermal stress from the PCB and may crack. In contrast, if too little solder is applied, there is the potential that the termination strength will be insufficient, creating the potential for detachment. Standard land dimensions

should be used for resist and copper foil patterns. When flow soldering the chip varistor, apply the adhesive in accordance with the following conditions. If too much adhesive is applied, then it may overflow into the land or termination areas and yield poor solderability. In contrast, if insufficient adhesive is applied, or if the adhesive is not sufficiently hardened, then the chip may become detached during flow soldering process.

(1) Solder Paste Printing

VCM Series

- Ensure that solder is applied to a minimum height of 0.2mm to 0.3mm at the end surface of the part.
- Coat the solder paste a thickness of 100µm to 200µm.



Continued on the following page.

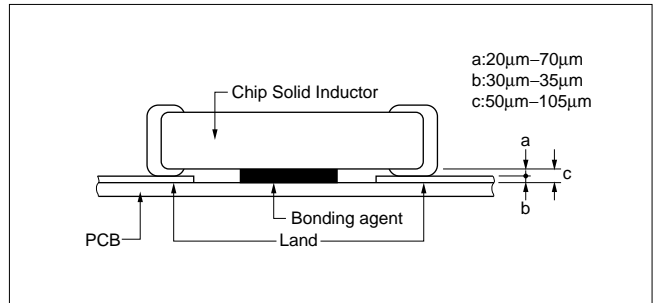
VCM Series Notice (Soldering and Mounting)

Continued from the preceding page.

(2) Adhesive Application

VCM Series

- Coating amount is illustrated in the following diagram.



3. Standard Soldering Conditions

(1) SOLDERING METHODS

Use flow and reflow soldering methods only.

Use standard soldering conditions when soldering chip varistor.

In cases where several different parts are soldered, each having different soldering conditions, use those conditions requiring the least heat and minimum time.

(2) SOLDERING TEMPERATURE AND TIME

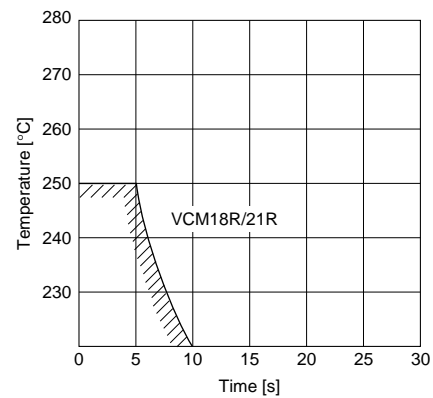
To prevent external electrode solder leaching and performance deterioration, solder within the temperature and time combinations illustrated by the slanted lines in the following graphs. If soldering is repeated, please note that the allowed time is the accumulated time.

Solder: H60A H63A solder(JIS Z 3238)

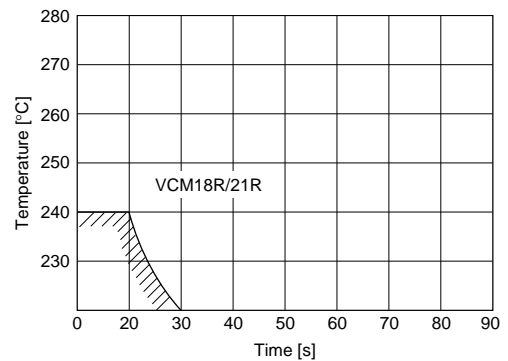
Flux :

- Use Rosin-based flux(when using RA type solder, clean products sufficiently to avoid residual flux.)
- Do not use strong acidic flux(with chlorine content exceeding 0.20wt%)
- Do not use water-soluble flux.

Allowable Flow Soldering Temperature and Time



Allowable Reflow Soldering Temperature and Time

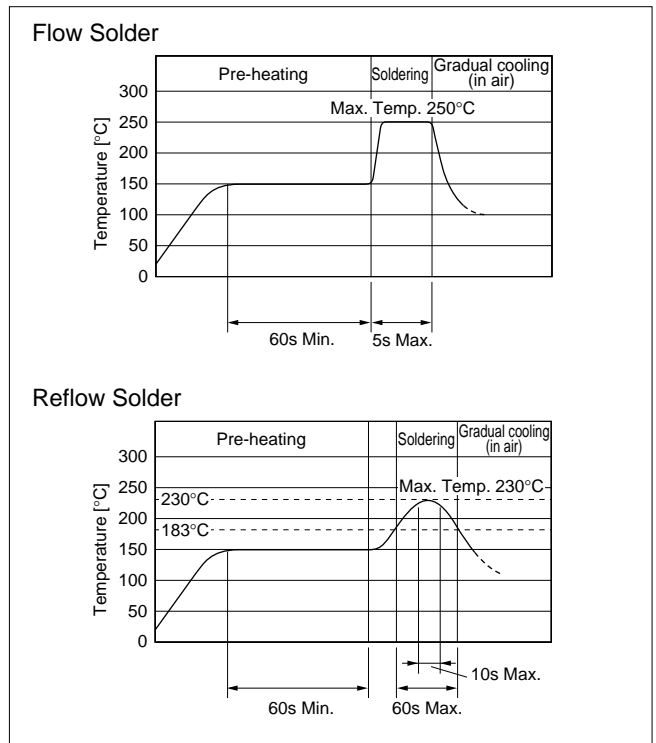


Continued on the following page. ↗

VCM Series Notice (Soldering and Mounting)

Continued from the preceding page.

(3) SOLDERING CONDITIONS



(4) REWORKING WITH SOLDER IRON

The following conditions must be strictly followed when using a soldering iron.

Pre-heating : 150°C 60 second Min.
 Soldering iron power output : 30W Max.
 Temperature of soldering iron tip : 280°C Max.
 Soldering time : 10 second Max.

Do not allow the tip of the soldering iron directly to contact the chip.

For additional methods of reworking with soldering iron, please contact Murata engineering.

4. Cleaning

Following conditions should be observed when cleaning chip EMI filter.

- (1) Cleaning Temperature : 60degree C max. (40degree C max. for CFC alternatives and alcohol cleaning agents)
- (2) Ultrasonic
 - Output : 20W/liter max.
 - Duration : 5 minutes max.
 - Frequency : 28kHz to 40kHz
- (3) Cleaning agent

The following list of cleaning agents have been tested on the individual components. Evaluation of final assembly should be completed prior to production.

- a) CFC alternatives and alcohol cleaning agents
 - Isopropyl alcohol (IPA)
 - HCFC-225

- b) Aqueous cleaning agent

Surface active agent (Clean Thru 750H)

Hydrocarbon (Techno Cleaner 335)

High grade alcohol (Pine Alpha ST-100S)*

*VCM18R/21R series cannot be cleaned with high grade alcohol type aqueous cleaning agent.

Alkaline saponifier (Aqua Cleaner 240 -cleaner should be diluted within 20% using deionized water.)

- (4) Ensure that flux residue is completely removed.

Component should be thoroughly dried after aqueous agent has been removed with deionized water.

- (5) Some products may become slightly whitened.

However, product performance or usage is not affected. For additional cleaning methods, please contact Murata engineering.

■ ⚠ Caution (Soldering and Mounting)

Give special attention when mounting chip "EMIFIL" BLM_P/NFM_P series close to other product that radiate heat. The excessive heat by other products may cause deterioration of insulation resistance and excessive heat at this product, resulting in the fire.

■ Notice (Storage and Operating Conditions)

< Cleaning >

Following conditions should be observed when cleaning chip EMI filter.

1. Cleaning Temperature: 60 C.max.(40 C. max. for CFC alternatives and alcohol cleaning agents)
2. Ultrasonic
 - Output : 20W/liter max.
 - Duration : 5 minutes max.
 - Frequency : 28kHz to 40kHz
3. Cleaning agent

The following list of cleaning agents have been tested on the individual components. Evaluation of final assembly should be completed prior to production.

Do not clean DLW5AH/5BS, DLW31S series. In case of cleaning, please contact Murata engineering.

(1) CFC alternatives and alcohol cleaning agents
Isopropyl alcohol (IPA)

■ Notice (Soldering and Mounting)

< Operating Environment >

Do not use products in a chemical atmosphere such as chlorine gas, acid or sulfide gas.

< Storage and Handling requirements >

1. Storage Period

Products which inspected in Murata over 12 months ago should be examined and used, which can be confirmed with inspection No.marked on the container.

■ Notice (Rating)

Noise suppression levels resulting from MURATA's EMI suppression filters "EMIFIL" may vary, depending on the circuits and ICs used, type of noise, mounting pattern, lead wire length, mounting location, and other operating conditions. Be sure to check and confirm in advance, the noise suppression effect of each filter, in actual circuits, etc. before applying the filter in a commercial-purpose equipment design.

HCFC-225

- (2) Aqueous cleaning agent
 - Surface active agent (Clean Thru 750H)
 - Hydrocarbon (Techno Cleaner 335)
 - High grade alcohol (Pine Alpha ST-100S)*

*VFM41R, VCM18R/21R series cannot be cleaned with high grade alcohol type aqueous cleaning agent.

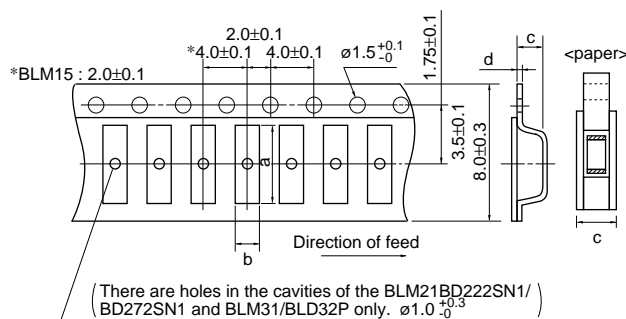
Alkaline saponifier (Aqua Cleaner 240 -cleaner should be diluted within 20% using deionized water.)
 4. Ensure that flux residue is completely removed. Component should be thoroughly dried after aqueous agent has been removed with deionized water.
 5. Some products may become slightly whitened. However, product performance or usage is not affected.
- For additional cleaning methods, please contact Murata engineering.

Solderability should be checked if this period is exceeded. (NFM41P/55P, VCM series should be used within 6 months.)

2. Storage conditions
 - (1) Storage temperature : -10 to 40 C.
Relative humidity : 30 to 70%
Avoid sudden changes in temperature and humidity.
 - (2) Do not store products in a chemical atmosphere such as chlorine gas, acid or sulfide gas.

Chip EMIFIL[®] Packaging

Minimum Quantity and Dimensions of 8mm Width Paper / Plastic Tape



Part Number	Cavity Size				Minimum QTY. (pcs.)		Type
	a	b	c	d	$\phi 180\text{mm}$ reel	$\phi 330\text{mm}$ reel	
BLM15	1.15	0.65	0.8	-	10000	50000	Paper
BLM18	1.85	1.05	1.1	-	4000	10000	Paper
BLM21 (BD222SN1/BD272SN1)	2.25 (2.25)	1.45 (1.45)	1.1 (1.3)	- (0.2)	4000 (3000)	10000 (10000)	Paper (Plastic)
BLA31	3.4	1.8	1.1	-	4000	10000	Paper
NFA31G/NFA31C	3.5	2.0	1.1	-	4000	-	Paper
NFM21P/NFM21C/NFR21G/NFL21S	2.3	1.55	1.1	-	4000	-	Paper
BLM31 (AF700SN1)	3.5 (3.5)	1.9 (1.9)	1.3 (1.75)	0.2	3000 (2500)	10000 (8000)	Plastic
NFM3DP NFM3DC	3.4	1.4	0.85	0.2	4000	-	Plastic
NFW31S/NFE31P	3.6	1.9	2.0	0.2	2000	-	Plastic
VCM18R	1.85	1.05	0.95	0.25	4000	-	Plastic
VCM21R	2.25	1.45	1.3	0.3	3000	-	Plastic
DLM2HG	2.75	2.25	1.3	0.25	3000	-	Plastic
DLM31K DLP31S/31D	3.5	1.9	1.3	0.25	3000	-	Plastic
DLW21S	2.25	1.45	1.4	0.3	2000	-	Plastic
DLW31S	3.6	2.0	2.1	0.3	2000	-	Plastic

• Please contact us for BLM15/18 in bulk case.

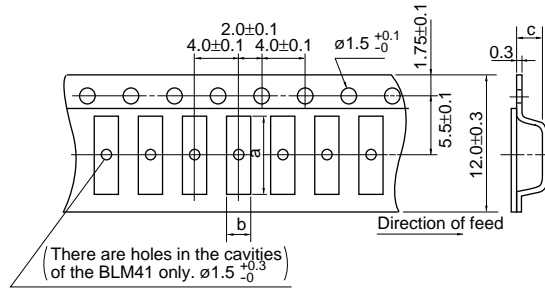
(in mm)

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Chip EMIFIL® Packaging

Continued from the preceding page.

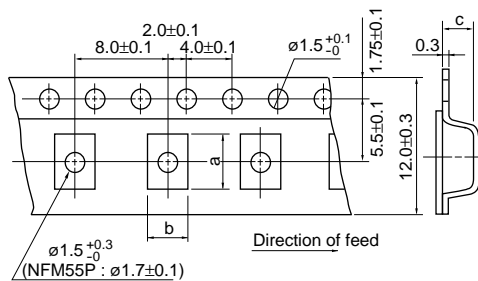
Minimum Quantity and Dimensions of 12mm Width Plastic Tape



Part Number	Cavity Size			Minimum QTY. (pcs.)	
	a	b	c	φ180mm reel	φ330mm reel
BLM41	4.8	1.9	1.75	2500	8000
NFM41	4.8	1.8	1.1	4000	-
NFE61P	7.2	1.9	1.75	2500	8000
VFM41R	4.8	1.8	1.35	2500	-

(in mm)

Minimum Quantity and Dimensions of 12mm Width Plastic Tape



Part Number	Cavity Size			Minimum QTY. (pcs.)	
	a	b	c	φ180mm reel	φ330mm reel
NFA6CC	6.6	3.5	1.13	1000	-
NFM55P	6.0	5.3	2.5	500	-
DLW5BS (DLW5AH)	5.5 (5.4)	5.4 (4.1)	4.7 (4.4)	400 (400)	1500 (1500)

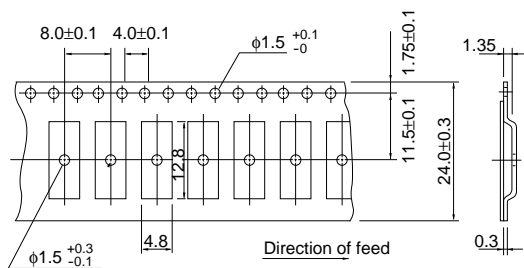
(in mm)

Continued on the following page.

Chip EMIFIL[®] Packaging

Continued from the preceding page.

Minimum Quantity and Dimensions of 24mm Width Plastic Tape



Part Number	Minimum QTY. (pcs.)	
	φ180mm reel	φ330mm reel
NFAC1C	1000	5000

(in mm)

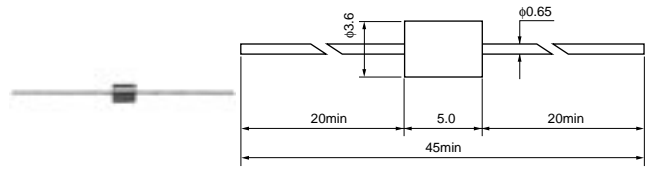
On-Board Type (DC) EMI Suppression Filters(EMIFIL®)



Ferrite Bead Inductors BL01/BL02/BL03 Series

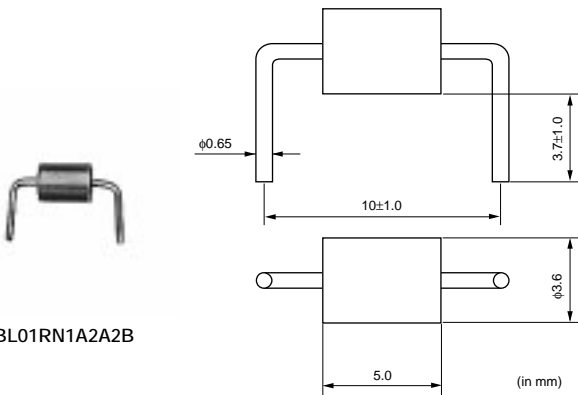
■ Features

These ferrite bead inductors are useful because they can suppress noise only by inserting them in circuit lines. They are suitable for the circuit with unstable ground because they do not need the connection to ground line.



BL01RN1A2A2B

(in mm)

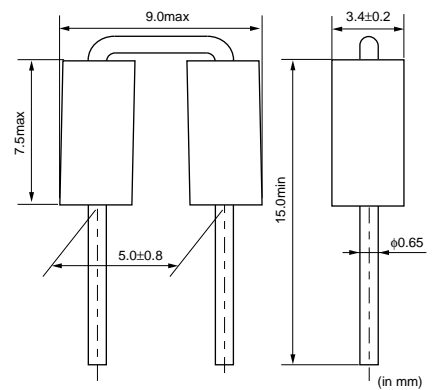


BL01RN1A2A2B

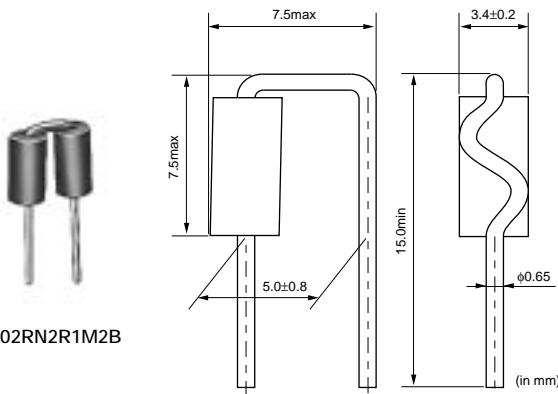
(in mm)



BL02RN1R2M2B



(in mm)

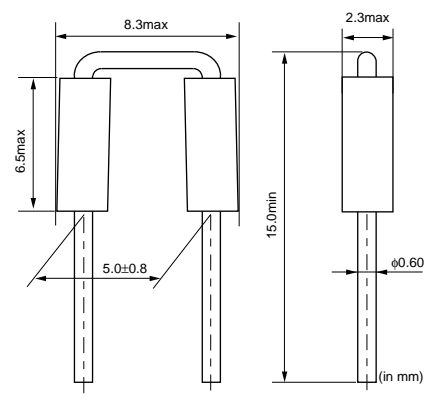


BL02RN2R1M2B

(in mm)



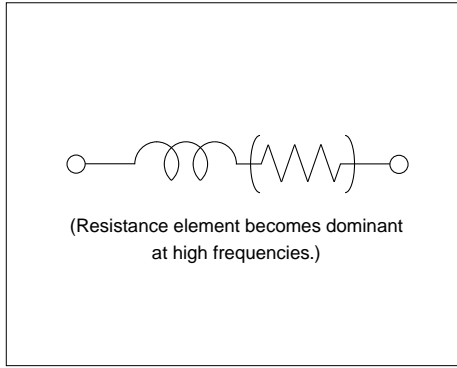
BL03RN2R1M1B



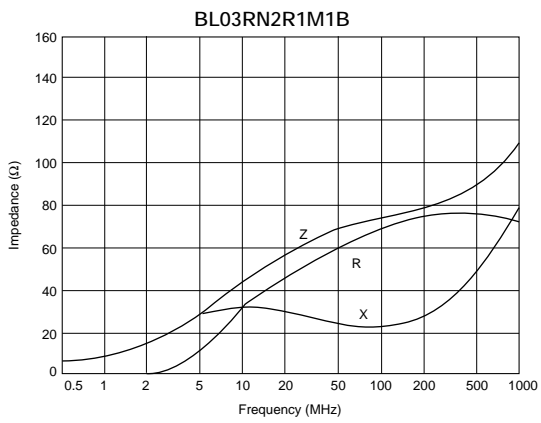
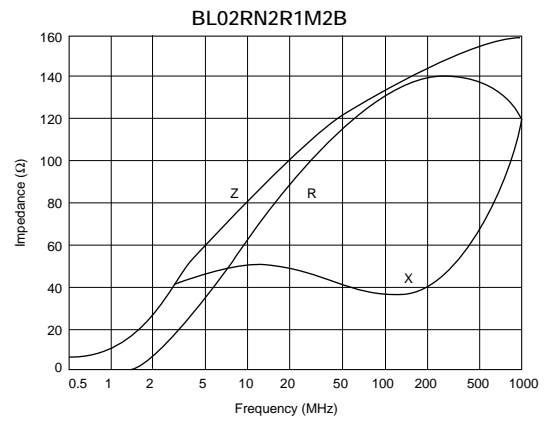
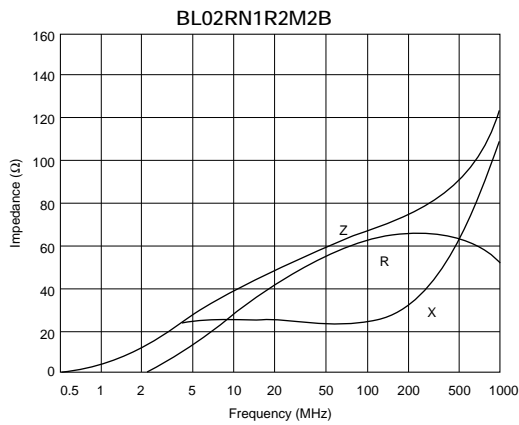
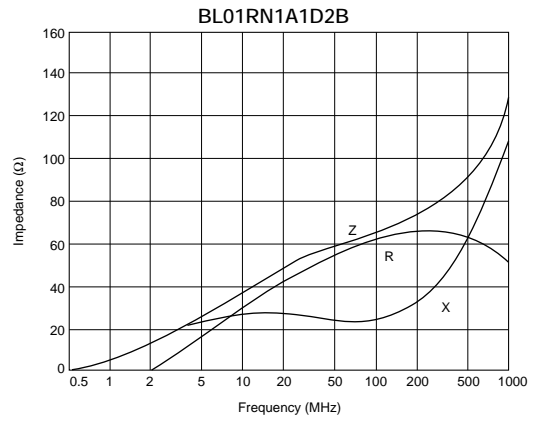
(in mm)

Part Number	Rated Current (mA)	Operating Temperature Range (°C)
BL01RN1A1D2B	7000	-40 to 85
BL01RN1A2A2B	7000	-40 to 85
BL02RN1R2M2B	7000	-40 to 85
BL02RN2R1M2B	7000	-40 to 85
BL03RN2R1M1B	6000	-40 to 85

■ Equivalent Circuit



■ Impedance-Frequency Characteristics



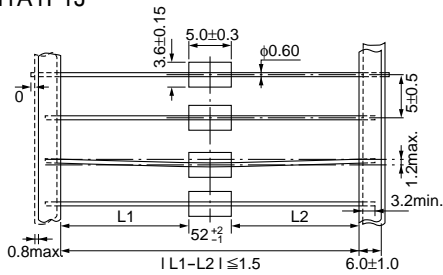
Ferrite Beads Inductors Packaging

Minimum Quantity

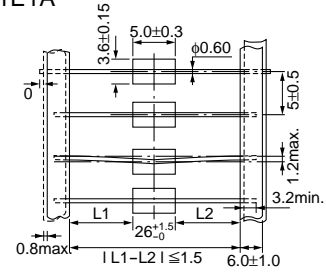
Part Number	Minimum Order Quantity (order in sets only) (Pcs.)		
	Flat Pack	ø330mm Reel Plastic Tape	Bulk (Bag)
BL01RN1A1F1J	—	2000	500
BL01RN1A1E1A	1000	—	500
BL02RN1R2P1A	1500	—	500
BL02RN1R3N1A	1500	—	500
BL02RN2R2P1A	1500	—	500
BL02RN2R3N1A	1500	—	500
BL03RN2R2P1A	2000	—	1000

Taping Dimensions

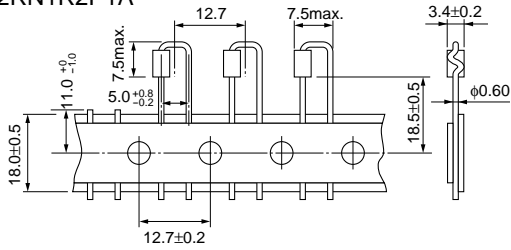
BL01RN1A1F1J



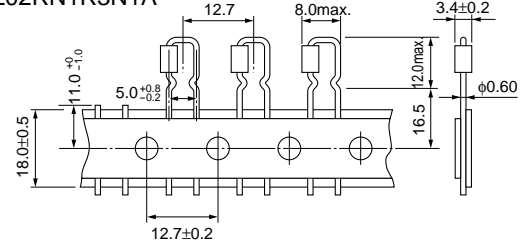
BL01RN1A1E1A



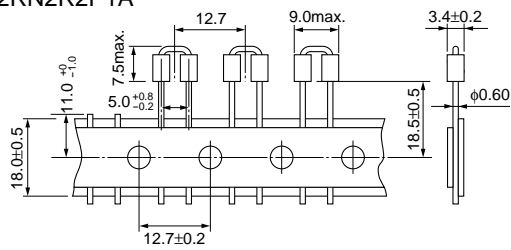
BL02RN1R2P1A



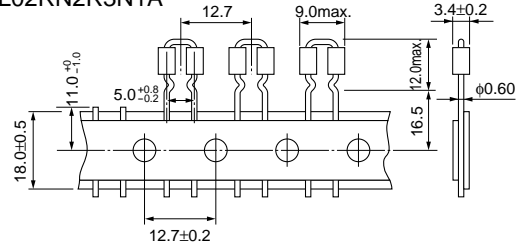
BL02RN1R3N1A



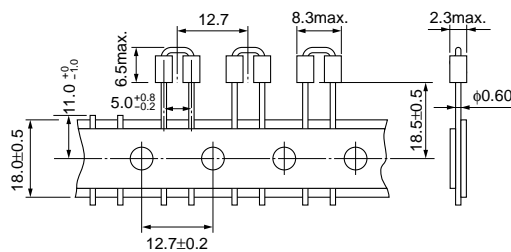
BL02RN2R2P1A



BL02RN2R3N1A



BL03RN2R2P1A



(in mm)

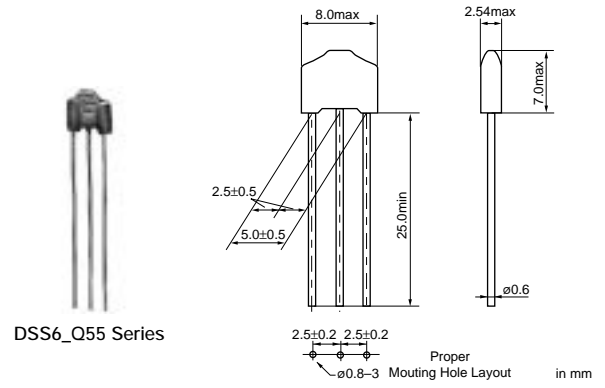
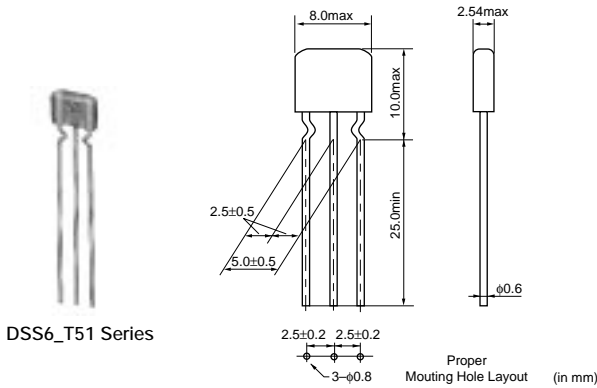
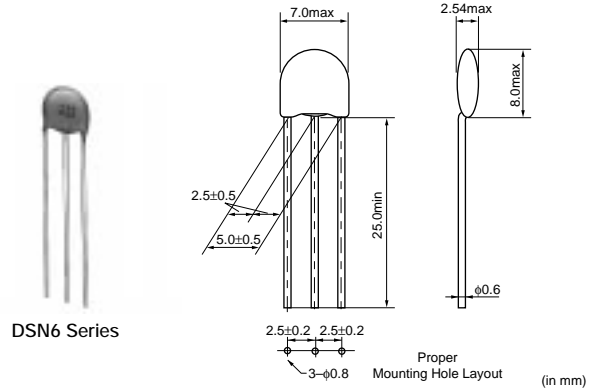
On-Board Type (DC) EMI Suppression Filters(EMIFIL®)



Disc Type EMIFIL® DSN6/DSS6 Series

■ Features

DS*6 is compact, high performance lead type EMI suppression filter which can be mounted 2.54mm pitch. Its 3-terminal structure enables nice high frequency performance.

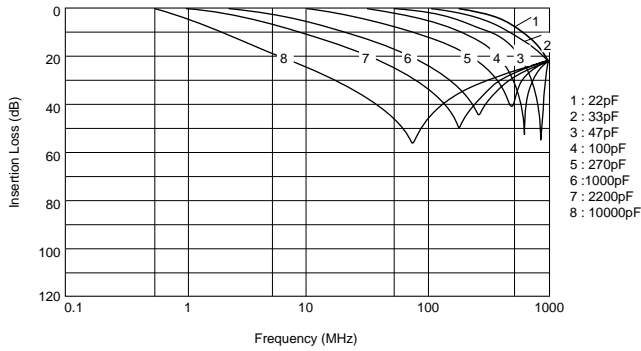


DSN6 Series

Part Number	Capacitance (pF)	Rated Voltage (Vdc)	Rated Current (A)	Operating Temperature Range (°C)
DSN6NC51H220Q55	22 +20%, -20%	50	6	-25 to 85
DSN6NC51H330Q55	33 +20%, -20%	50	6	-25 to 85
DSN6NC51H470Q55	47 +20%, -20%	50	6	-25 to 85
DSN6NC51H101Q55	100 +20%, -20%	50	6	-25 to 85
DSN6NC51H271Q55	270 +20%, -20%	50	6	-25 to 85
DSN6NC51H102Q55	1000 +20%, -20%	50	6	-25 to 85
DSN6NC51H222Q55	2200 +20%, -20%	50	6	-25 to 85
DSN6NZ81H103Q55	10000 +80%, -20%	50	6	-25 to 85

■ Insertion Loss Characteristics (Typical)

DSN6 Series



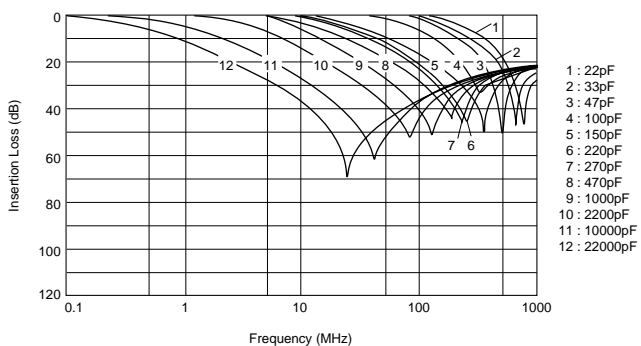
Built-in Ferrite Beads DSS6 Series

Part Number	Capacitance (pF)	Rated Voltage (Vdc)	Rated Current (A)	Operating Temperature Range (°C)
DSS6NC52A220Q55	22 +20%, -20%	100	6	-25 to 85
DSS6NC52A220T51	22 +20%, -20%	100	6	-25 to 85
DSS6NC52A330Q55	33 +20%, -20%	100	6	-25 to 85
DSS6NC52A330T51	33 +20%, -20%	100	6	-25 to 85
DSS6NC52A470Q55	47 +20%, -20%	100	6	-25 to 85
DSS6NC52A470T51	47 +20%, -20%	100	6	-25 to 85
DSS6NC52A101Q55	100 +20%, -20%	100	6	-25 to 85
DSS6NC52A101T51	100 +20%, -20%	100	6	-25 to 85
DSS6NC52A151Q55	150 +20%, -20%	100	6	-25 to 85
DSS6NC52A151T51	150 +20%, -20%	100	6	-25 to 85
DSS6NC52A221Q55	220 +20%, -20%	100	6	-25 to 85
DSS6NC52A221T51	220 +20%, -20%	100	6	-25 to 85
DSS6NC52A271Q55	270 +20%, -20%	100	6	-25 to 85
DSS6NC52A271T51	270 +20%, -20%	100	6	-25 to 85
DSS6NC52A471Q55	470 +20%, -20%	100	6	-25 to 85
DSS6NC52A471T51	470 +20%, -20%	100	6	-25 to 85
DSS6NC52A102Q55	1000 +20%, -20%	100	6	-25 to 85
DSS6NC52A102T51	1000 +20%, -20%	100	6	-25 to 85
DSS6NE52A222Q55	2200 +80%, -20%	100	6	-25 to 85
DSS6NE52A222T51	2200 +80%, -20%	100	6	-25 to 85
DSS6NZ82A103Q55	10000 +30%, -30%	100	6	-25 to 85
DSS6NZ82A103T51	10000 +30%, -30%	100	6	-25 to 85
DSS6NF31C223Q55	22000 +80%, -20%	16	6	-25 to 85
DSS6NF31C223T51	22000 +80%, -20%	16	6	-25 to 85

20

■ Insertion Loss Characteristics (Typical)

DSS6 Series

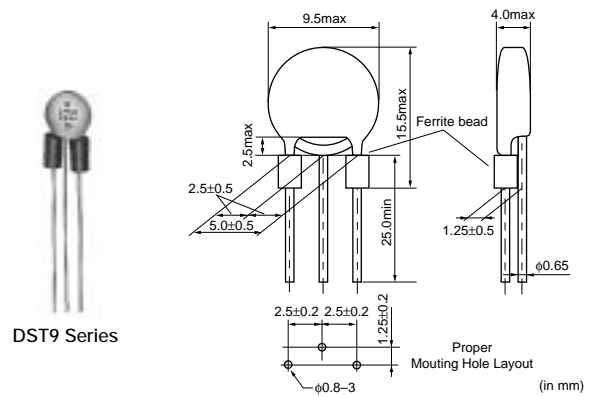
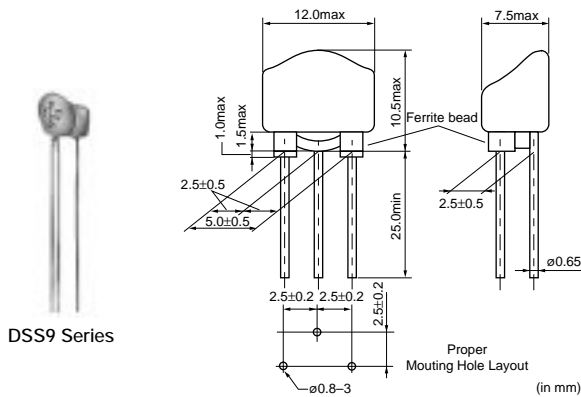
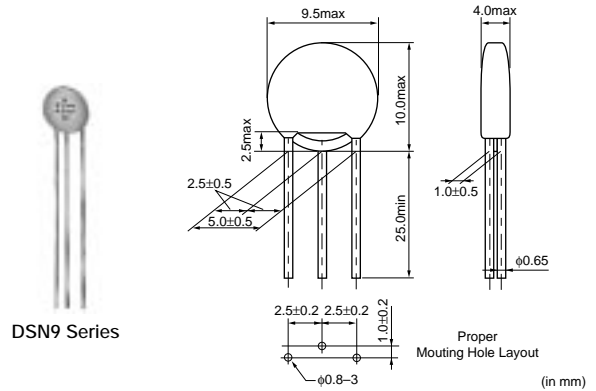


On-Board Type (DC) EMI Suppression Filters(EMIFIL®)



Disc Type EMIFIL® Broad Type DSN9/DSS9/DST9 Series

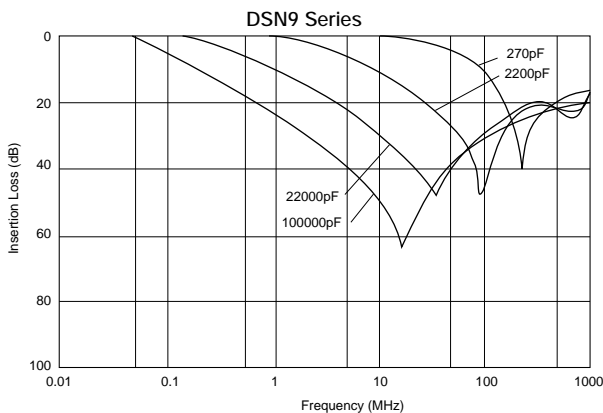
DS*9 is basic type EMI suppression filter which can obtain high insertion loss in wide frequency range. Its 3-terminal structure enables nice high frequency performance.



DSN9 Series

Part Number	Capacitance (pF)	Rated Voltage (Vdc)	Rated Current (A)	Operating Temperature Range (°C)
DSN9NC52A271Q55	270 +20%,-20%	100	7	-25 to 85
DSN9NC52A222Q55	2200 +20%,-20%	100	7	-25 to 85
DSN9NC51H223Q55	22000 +50%,-20%	50	7	-25 to 85
DSN9NC51C104Q55	100000 +20%,-20%	16	7	-25 to 85

■ Insertion Loss Characteristics (Typical)



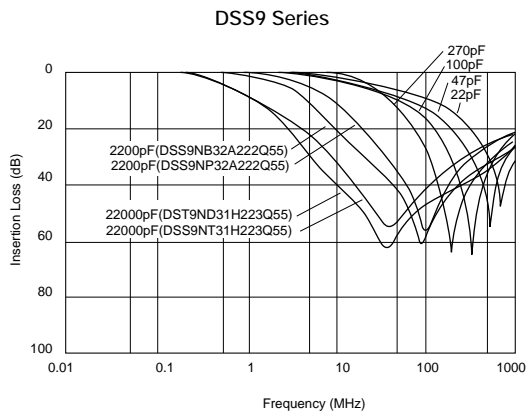
21



Built-in Ferrite Beads DSS9 Series

Part Number	Capacitance (pF)	Rated Voltage (Vdc)	Rated Current (A)	Operating Temperature Range (°C)
DSS9NC52A220Q55	22 +20%, -20%	100	7	-25 to 85
DSS9NC52A470Q55	47 +20%, -20%	100	7	-25 to 85
DSS9NC52A101Q55	100 +20%, -20%	100	7	-25 to 85
DSS9NC52A271Q55	270 +20%, -20%	100	7	-25 to 85
DSS9NC52A222Q55	2200 +20%, -20%	100	7	-25 to 85
DSS9NP32A222Q55	2200 +20%, -20%	100	7	-25 to 85
DSS9NC51H223Q55	22000 +50%, -20%	50	7	-25 to 85
DSS9NT31H223Q55	22000 +50%, -20%	50	7	-25 to 85

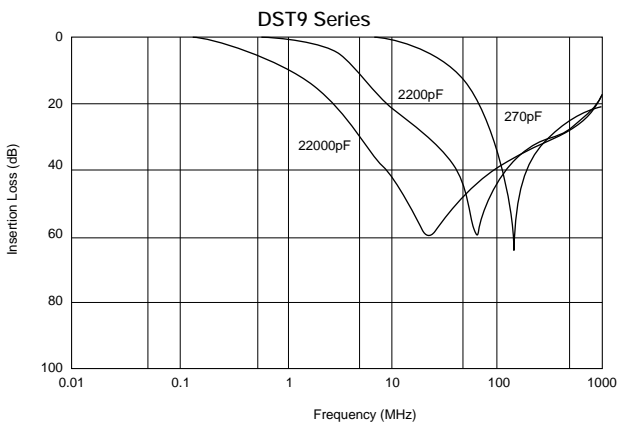
■ Insertion Loss Characteristics (Typical)



With Ferrite Beads DST9 Series

Part Number	Capacitance (pF)	Rated Voltage (Vdc)	Rated Current (A)	Operating Temperature Range (°C)
DST9NC52A271Q55	270 +20%, -20%	100	7	-25 to 85
DST9NC52A222Q55	2200 +20%, -20%	100	7	-25 to 85
DST9NC51H223Q55	22000 +50%, -20%	50	7	-25 to 85

■ Insertion Loss Characteristics (Typical)

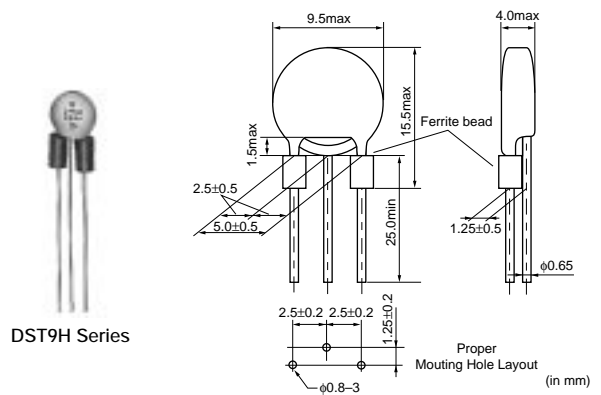
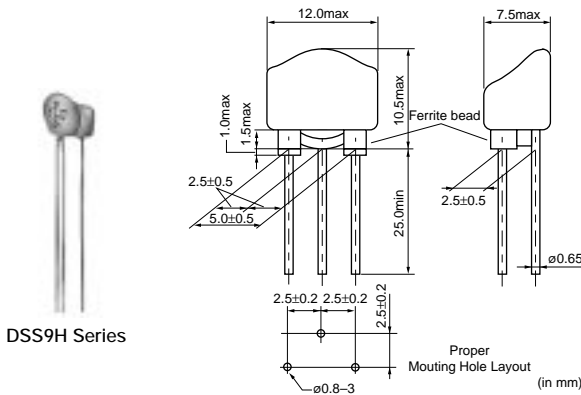
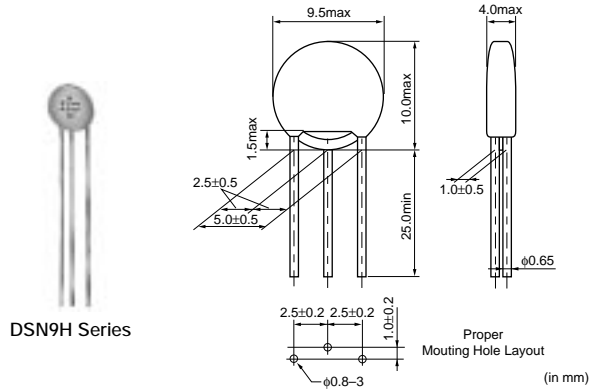


On-Board Type (DC) EMI Suppression Filters(EMIFIL®)



Disc Type EMIFIL® Heavy-duty Type DSN9H/DSS9H/DST9H Series

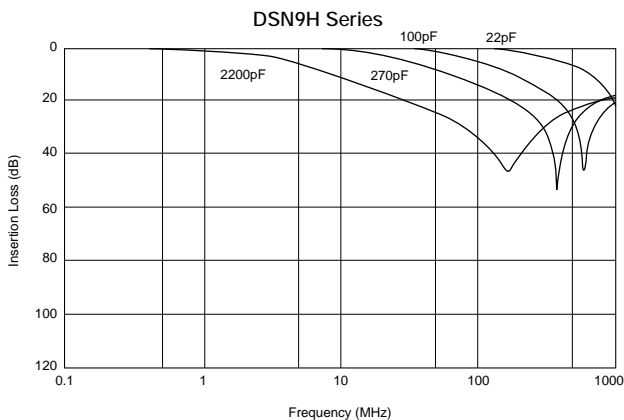
DS*9H is basic type EMI suppression filter which can obtain high insertion loss in wide frequency range. Its 3-terminal structure enables nice high frequency performance. High rated voltage of 250Vdc and wide operating temperature range from -40°C to 105°C are suitable for high reliability circuits.



DSN9H Series

Part Number	Capacitance (pF)	Rated Voltage (Vdc)	Rated Current (A)	Operating Temperature Range (°C)
DSN9HB32E220Q55	22 +20%, -20%	250	6	-40 to 105
DSN9HB32E101Q55	100 +20%, -20%	250	6	-40 to 105
DSN9HB32E271Q55	270 +20%, -20%	250	6	-40 to 105
DSN9HB32E222Q55	2200 +20%, -20%	250	6	-40 to 105

■ Insertion Loss Characteristics (Typical)



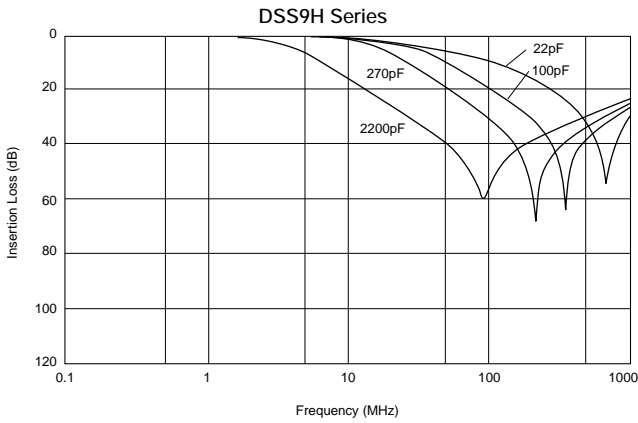
22



Built-in Ferrite Beads DSS9H Series

Part Number	Capacitance (pF)	Rated Voltage (Vdc)	Rated Current (A)	Operating Temperature Range (°C)
DSS9HB32E220Q55	22 +20%,-20%	250	6	-40 to 105
DSS9HB32E101Q55	100 +20%,-20%	250	6	-40 to 105
DSS9HB32E271Q55	270 +20%,-20%	250	6	-40 to 105
DSS9HB32E222Q55	2200 +20%,-20%	250	6	-40 to 105

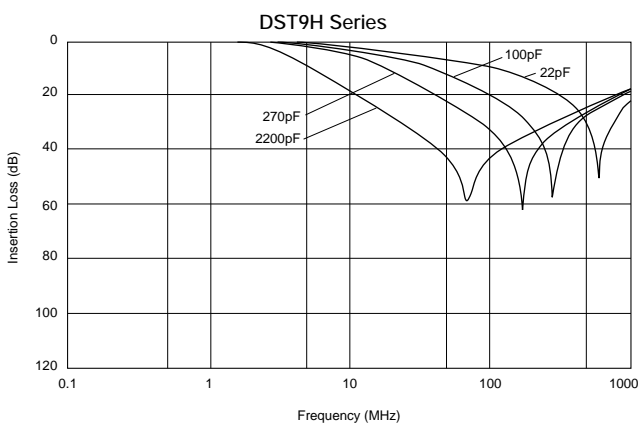
■ Insertion Loss Characteristics (Typical)



With Ferrite Beads DST9H Series

Part Number	Capacitance (pF)	Rated Voltage (Vdc)	Rated Current (A)	Operating Temperature Range (°C)
DST9HB32E220Q55	22 +20%,-20%	250	6	-40 to 105
DST9HB32E101Q55	100 +20%,-20%	250	6	-40 to 105
DST9HB32E271Q55	270 +20%,-20%	250	6	-40 to 105
DST9HB32E222Q55	2200 +20%,-20%	250	6	-40 to 105

■ Insertion Loss Characteristics (Typical)



On-Board Type (DC) EMI Suppression Filters(EMIFIL®)



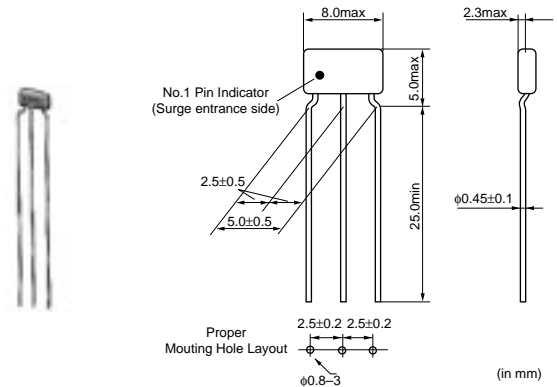
Chip EMIGUARD® (EMIFIL® with Varistor Function EMIFIL) VFR3V/VFS6V/VFS9V Series

for Semiconductor Protection VFR3V Series

The VFR3V series is designed for ESD surge protection of IC. It absorbs ESD surge rushed into IC's I/O terminal efficiently.

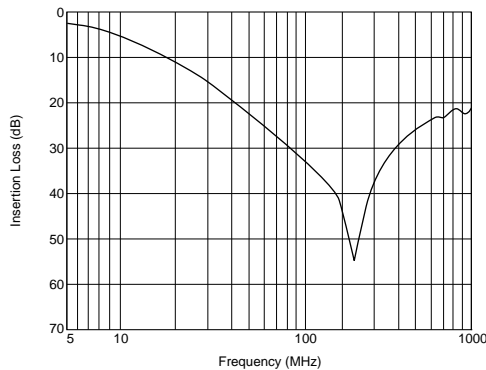
Applications

Elimination of noise and protection of semiconductors in office equipment, including computers and peripheral equipment, copy machines, and communication terminals.



Part Number	Rated Voltage (Vdc)	Varistor Voltage (Vdc)	Capacitance (pF)	Rated Current (mA)	Peak Pulse Current (A)	Operating Temperature Range (°C)
VFR3VD31E131T51	25	50 +20%,-20%	130 +20%,-20%	20	15	-25 to 85

Insertion Loss Characteristics

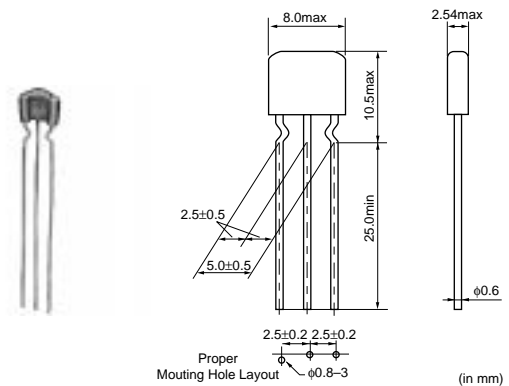


for Signal-Line VFS6V Series

The VFS6V series is designed for surge protection of signal line. It protects electric circuit from surges such as static electricity and suppress EMI noise. Built-in ferrite bead gives excellent EMI suppression.

Applications

Elimination of noise and protection of semiconductors in office equipment, including computers and peripheral equipment, copy machines, and communication terminals.

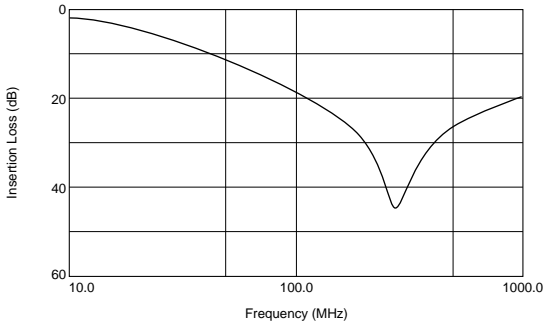


Part Number	Rated Voltage (Vdc)	Varistor Voltage (Vdc)	Capacitance (pF)	Rated Current (A)	Peak Pulse Current (A)	Operating Temperature Range (°C)
VFS6VD81E221T51	25	50 +20%,-20%	220 +20%,-20%	6	100	-40 to 105

23



■ Insertion Loss Characteristics

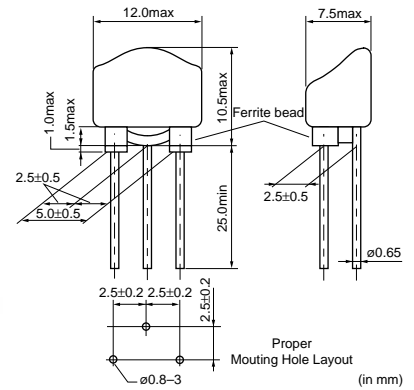


for Large-Current VFS9V Series

The VFS9V series is designed for surge protection of power supply line. It protects electric circuit from surges such as static electricity and suppress EMI noise. Its large capacitance value enables high insertion loss for EMI noise.

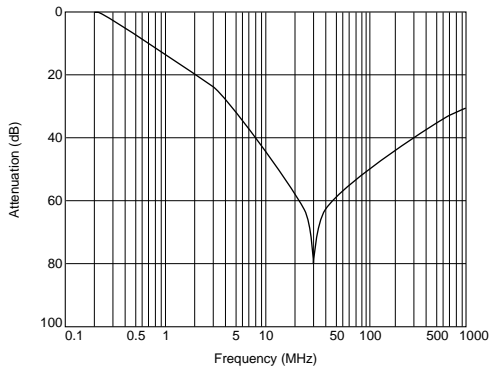
■ Applications

For circuit protection and noise suppression in electronics equipment such as computers and Dc motors and in electronics systems installed in cars such as car audio equipment and engine controllers.

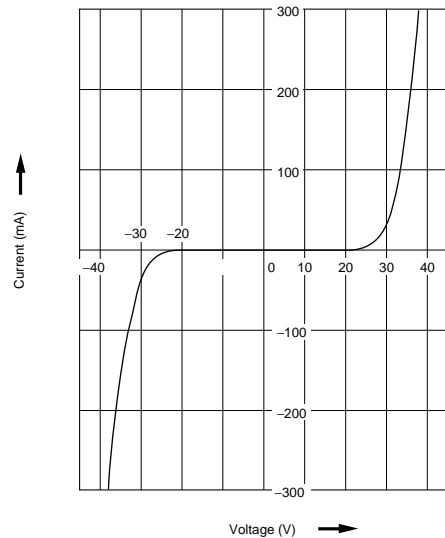


Part Number	Rated Voltage (Vdc)	Varistor Voltage (Vdc)	Capacitance (pF)	Rated Current (A)	Operating Temperature Range (°C)
VFS9VD31B223Q55	12	22 +20%,-20%	22000 +50%,-20%	7	-40 to 100

■ Insertion Loss Characteristics



■ Voltage-Current Characteristics

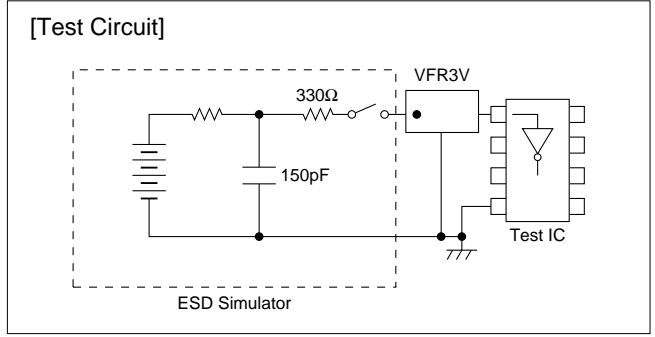


Noise Suppression Effect of VFR/VFS Series

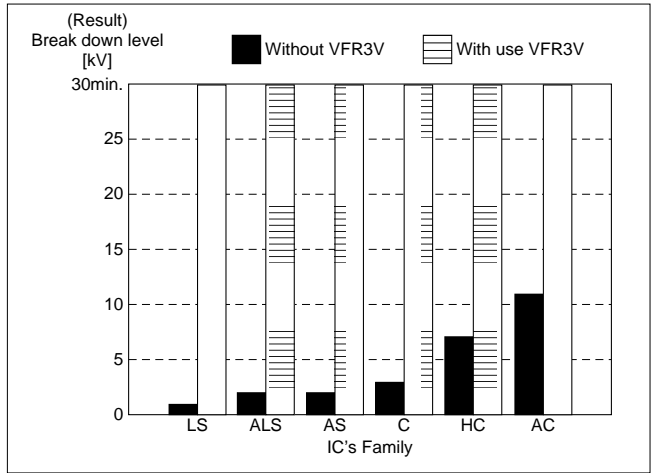
Example of IC Protection

Testing Method

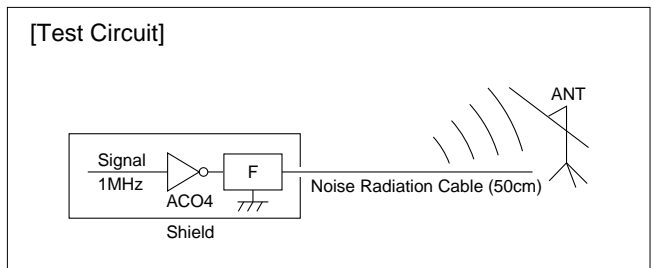
1. Put ESD surge to IC (7404 family) input terminal with ESD simulator based on IEC 801-2.
2. Check IC's operation.
3. If IC's operation is normal, increase ESD voltage in 1kV step.
4. Continue above steps 1 to 3 till IC's operation become abnormal.



Result



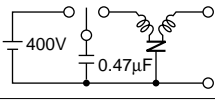
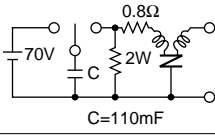
Example of EMI Suppression Effect



Type of Filter	EMI Suppression Effect	Description
Before Countermeasures (No Filters)		
Use VFR3VD31E131T51		

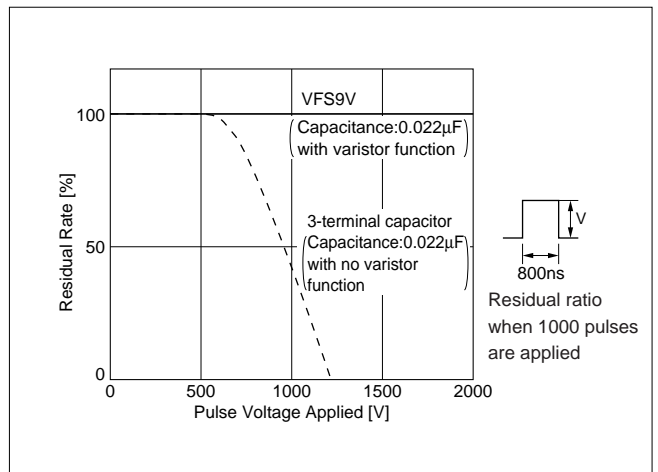
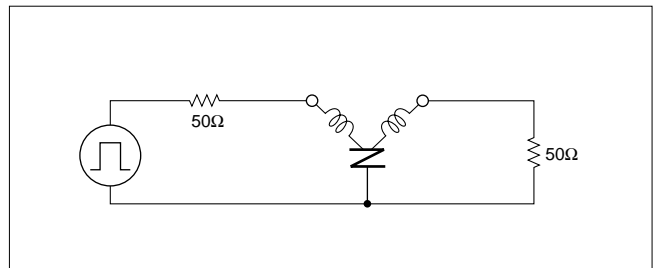
Noise Suppression Effect of VFR/VFS Series

Features

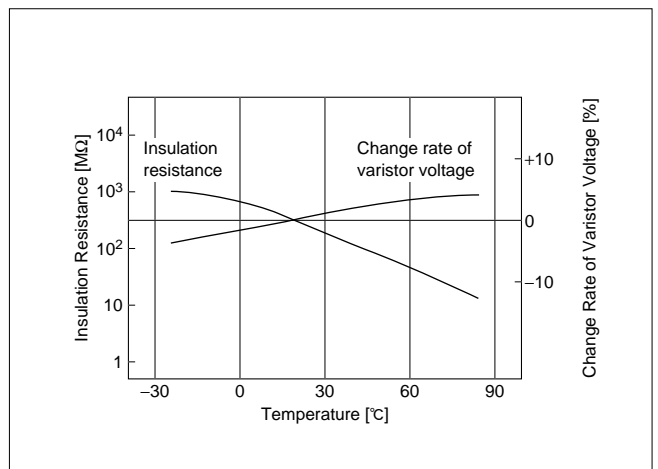
Items	Test methods	Rated values										
Overload	1.4 times the varistor voltage (V_1) is applied for 5 minutes at room temperature.	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #cccccc;"> <th style="width: 50%;">Items</th> <th style="width: 50%;">Specifications</th> </tr> </thead> <tbody> <tr> <td>Rated Capacitance Change</td> <td>Within $\pm 15\%$</td> </tr> <tr> <td>Insulation Resistance</td> <td>500kΩ min</td> </tr> <tr> <td>Rated of Change in Varistor Voltage V_1^*</td> <td>Within $\pm 15\%$</td> </tr> <tr> <td>Voltage Rate</td> <td>1.30 max</td> </tr> </tbody> </table> <p><small>*V_1 : Voltage when 1mA is applied</small></p>	Items	Specifications	Rated Capacitance Change	Within $\pm 15\%$	Insulation Resistance	500k Ω min	Rated of Change in Varistor Voltage V_1^*	Within $\pm 15\%$	Voltage Rate	1.30 max
Items	Specifications											
Rated Capacitance Change	Within $\pm 15\%$											
Insulation Resistance	500k Ω min											
Rated of Change in Varistor Voltage V_1^*	Within $\pm 15\%$											
Voltage Rate	1.30 max											
Surge Test (1)	At room temperature. Surge are applied are 10^5 times every 2 seconds. Then after 1 or 2 hours, the sample is measured. 											
Surge Test (2)	At room temperature. Capacitor "C" is charged with 70V, then discharged to apply the voltage to the sample. Tested once (resuming JASO A-1). 											
High Temperature Load	At a temperature of $85 \pm 3^\circ\text{C}$. The varistor voltage V_1 is continuously applied to the sample for 1000 to 1024 hours. Then it is left at room temperature, for 4 to 24 hours before measuring.											


Pulse-Voltage Breakdown Characteristic

The VFS9V EMIGUARD[®] use a self healing varistor-capacitor, so that it can be used under a 500 to 600V surge which would break conventional disk type EMI filters. As shown in figure below the EMIGUARD[®] withstands 2000V impulses applied 1000 times.



Temperature Characteristics of Varistor Voltage-Insulation Resistance

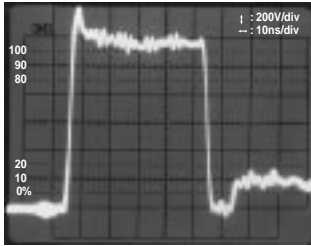
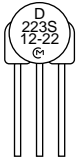
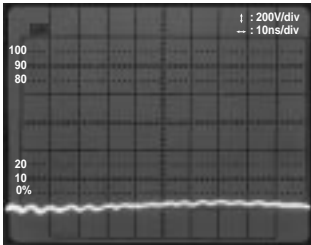


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Noise Suppression Effect of VFR/VFS Series

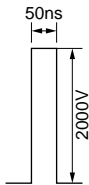
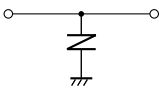
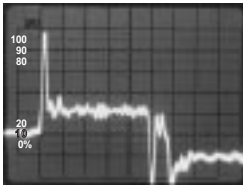
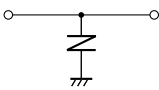
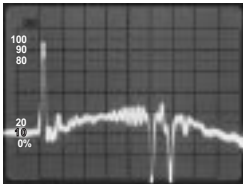

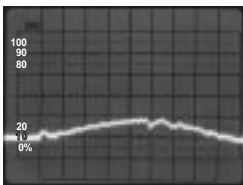
Continued from the preceding page.


Noise Absorption Effect of EMIGUARD®

Type of Filter	EMI Suppression Effect	Description
without EMIGUARD®		Waveform when EMIGUARD® is not used. (Surge from a noise simulator)
with EMIGUARD® 		Waveform after the noise passed through EMIGUARD®. Little noise is recorded.

Comparative Data

1. Absorption of quick-rising, high-frequency noise (10ns/div, 100V/div)

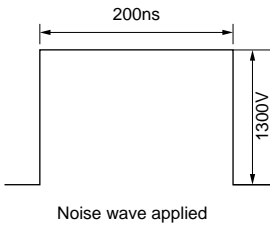
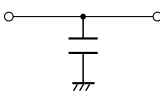
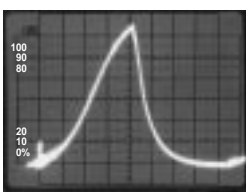
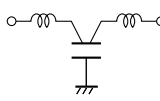
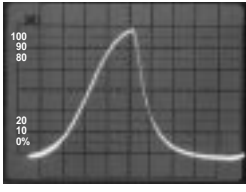
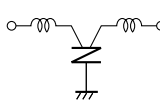
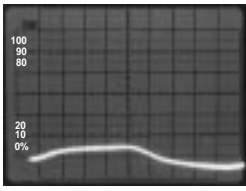
Type of Filter	EMI Suppression Effect	Description
without Filters	 Noise wave applied	
Conventional varistor 		As with the 2-terminal capacitor.
2-terminal capacitor (with varistor function) 		The 2-terminal capacitor is influenced by lead line inductance, leaving behind some of the rising and falling edges. The residual noise can cause system to malfunction.
VFS9V 		The 3-terminal structure eliminates most of the lead line inductance. This allows the VFS9V to completely absorb the rising and falling edges of the applied pulses.

Continued on the following page. 

Noise Suppression Effect of VFR/VFS Series

Continued from the preceding page.

2. Absorption of wide-pulse noise (50ns/div, 200V/div)

Type of Filter	EMI Suppression Effect	Description
without Filters	 <p style="text-align: center;">Noise wave applied</p>	
2-terminal capacitor 		<p>In case of capacitors, the voltage of the residual surge, 1300V is higher than that of the above example. The wave height is almost the same as the original.</p>
3-terminal capacitor (with ferrite bead) 		<p>Conventional EMI filters do not work for wide-pulse noise because capacitors are saturated. In this example, the residual 1200V surge can cause system to breakdown.</p>
VFS9V 		<p>Bypassing high-voltage, the varistor-capact.</p>

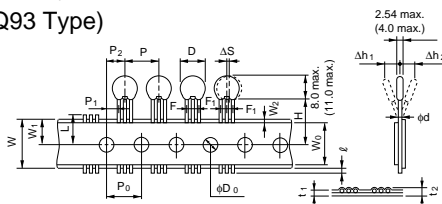
Lead EMIFIL[®] and EMIGUARD[®] Packaging

Minimum Quantity

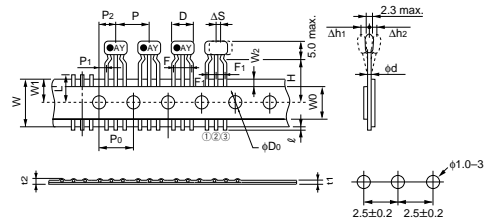
Part Number	Minimum Order Quantity (order in sets only) (Pcs.)		
	Flat Pack	ø330mm Reel Plastic Tape	Bulk (Bag)
VFR3V Series	2000	—	—
DS□6/VFS6V Series	2000	—	250
DSN9/9H Series	2000	—	250
DST9/9H Series	1000	—	200
DSS9/9H Series	—	800	200
VFS9V Series	—	800	—

Taping Dimensions

DSN6(Q93 Type)
DSN9(Q93 Type)

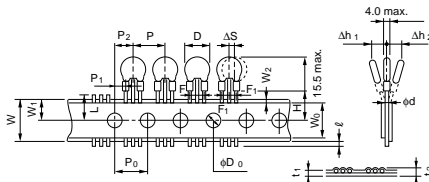


VFR3V(U31 Type)

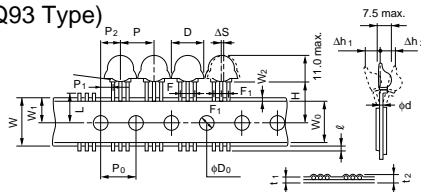


(in mm)

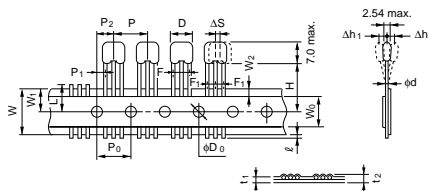
DST9/9H(Q93 Type)



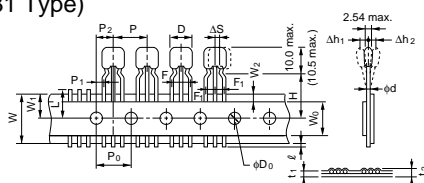
DSS9/9H(Q93 Type)
VFS9V(Q93 Type)



DSS6(Q93 Type)



DSS6(U31 Type)
VFS6V(U31 Type)



Item	Code	Dimensions (mm)	Remarks
Pitch of Component	P	12.7	Product inclination ΔS determines tolerance
Pitch of Sprocket Hole	P0	12.7±0.2	
Length from Hole Center to Component Center	P1	3.85±0.7	
	P2	6.35±1.3	Tape deviation in feeding direction
Width of Body	D	7.0 max.	DSN6N
		8.0 max.	DST(S)6N/VFS6V/VFR3V
		9.5 max.	DSN9N(H)/DST9N(H)
		12.0 max.	DSS9N(H)/VFS9V
Deviation along Tape, Left or Right	ΔS	0±1.0	
Carrier Tape Width	W	18.0±0.5	
Position of Sprocket Hole	W1	9.0+0/-0.5	Tape width deviation
Protrusion Length	ℓ	+0.5 to -10	
Diameter of Sprocket Hole	D0	ø4.0±0.1	
Lead diameter	d	ø0.6	ø0.45±0.1 (VFR)
Total Tape Thickness Total Thickness, Tape and Lead Wire	t1	0.7±0.2	Including bonding tape thickness
	t2	1.5 max.	
Deviation across Tape	Δh1	1.0 max.	
	Δh2	1.0 max.	
Portion to Cut in Case of Defect	L	11.0+0/-1.0	
Hold Down Tape Width	W0	12.0±0.5	
Hold Down Tape Position	W2	1.5±1.5	
Lead Distance between Reference and Bottom Planes	H	1.85±1.0	16.5 mm and 20.0 mm lengths are also available (Except of VFS6V/VFR3V series)
Lead Spacing	F	5.0+0.8/-0.2	
	F1	2.5+0.4/-0.2	

On-Board Type (DC) EMI Suppression Filters(EMIFIL[®])

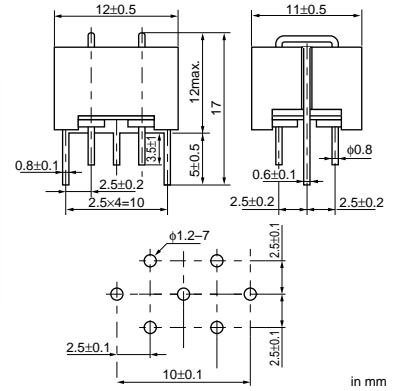


Block Type EMIFIL[®] BNP/BNX Series

BNP Series

■ Features

1. The "EMIFIL" BNP002 incorporates through-type barrier layer capacitors and p circuits, allowing it to obtain significantly large insertion losses throughout an extremely wide frequency range from 15MHz up to 1GHz.
2. The cut-off frequency is designed to be at several MHz, which is ideal for eliminating noise from any circuit in which the signal frequency and the noise frequency are relatively close together.
3. Since all noise in plural signal lines can be eliminated by one filter block, the filter is extremely compact.
4. There are no connection routes in the current circuits, thus ensuring highly reliable performance.
5. Both the input/output terminals and the grounding terminal are aligned in the same direction, permitting fast and easy installation on any type of P.C. board.



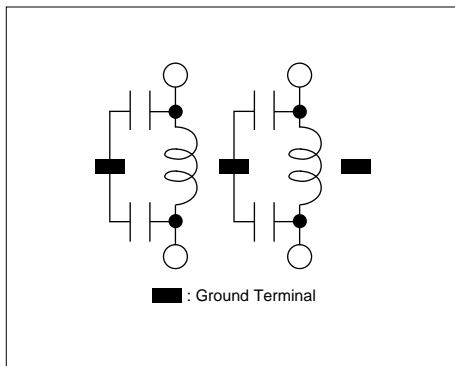
■ Applications

Noise elimination from signal lines and DC power sources in engine control units, digital equipment and computer terminals.

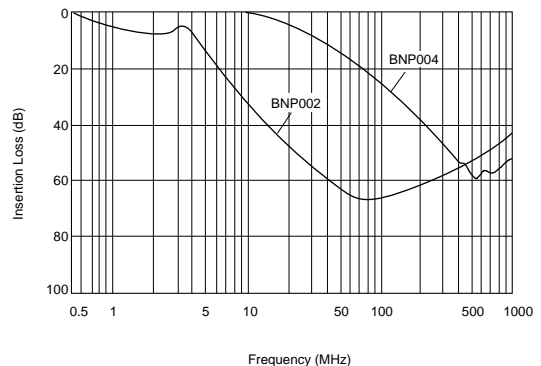
Part Number	Rated Voltage (Vdc)	Withstand Voltage (Vdc)	Rated Current (A)	Insulation Resistance(min.) (M ohm)	DC Resistance(max.) (ohm)	Insertion Loss	Number of Circuit
BNP002-02	50	300	10	1000	0.05 (20 to 25°C)	20MHz to 500MHz:40dB min.(20 to 25°C)	2
BNP002-03	50	300	10	1000	0.05 (20 to 25°C)	20MHz to 500MHz:40dB min.(20 to 25°C)	3
BNP004-02	50	125	10	1000	0.05 (20 to 25°C)	300MHz to 1000MHz:40dB min.(20 to 25°C)	2

Operating Temperature Range : -40°C to 100°C

■ Equivalent Circuit



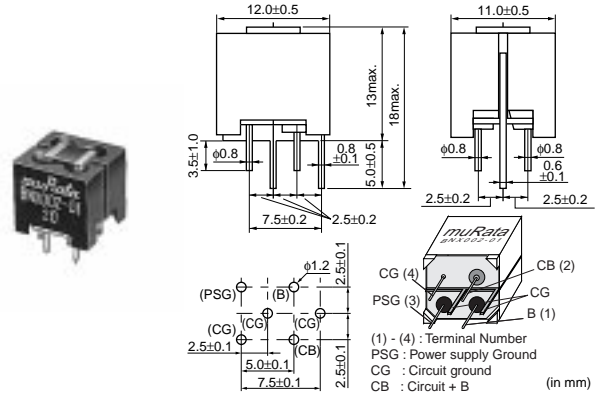
■ Insertion Loss Characteristics (Typical)



BNX Series

■ Features

1. The "EMIFIL" BNX002 incorporates a through-type barrier layer capacitor and a four-terminal capacitor which are interconnected. This combination enables the BNX002 to achieve a significantly large insertion loss throughout the extremely wide frequency range of 0.5MHz to 1GHz which covers the AM and UHF-TV broadcast frequency bands.
2. The filter is extremely compact since only one filter block is needed to completely eliminate noise from both the positive and negative lines.
3. There are no connection routes in the current circuits, thus ensuring highly reliable performance.
4. Both the input/output terminals and the grounding terminal are aligned in the same direction, permitting fast and easy installation on any type of P.C. board.
5. BNX003-01 features high dielectric constant, that is the rated voltage 150V.



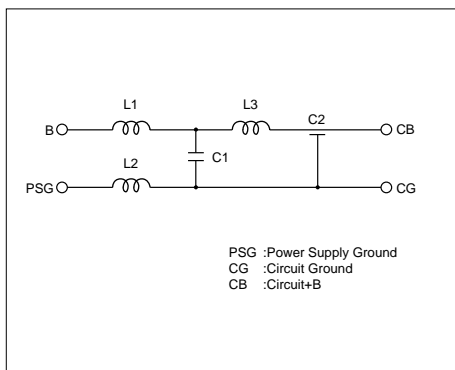
■ Application

Noise elimination from DC power sources in a variety of switching power sources, engine control units, digital equipment and computer terminals.

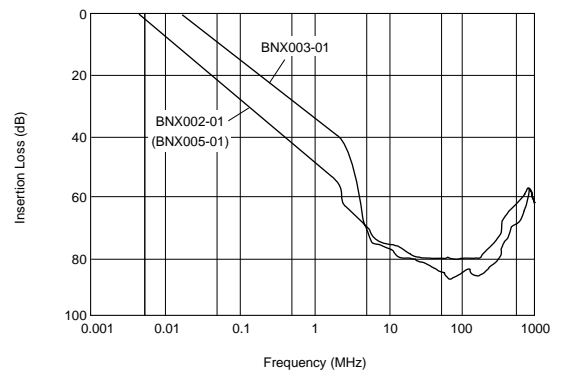
Part Number	Rated Voltage (Vdc)	Withstand Voltage (Vdc)	Rated Current (A)	Insulation Resistance(min.) (M ohm)	Insertion Loss
BNX002-01	50	125	10	100	1MHz to 1GHz:40dB min.(20 to 25°C line impedance=50 ohm)
BNX003-01	150	375	10	100	5MHz to 1GHz:40dB min.(20 to 25°C line impedance=50 ohm)
BNX005-01	50	125	15	100	1MHz to 1GHz:40dB min.(20 to 25°C line impedance=50 ohm)

Operating Temperature Range : -30°C to 85°C

■ Equivalent Circuit

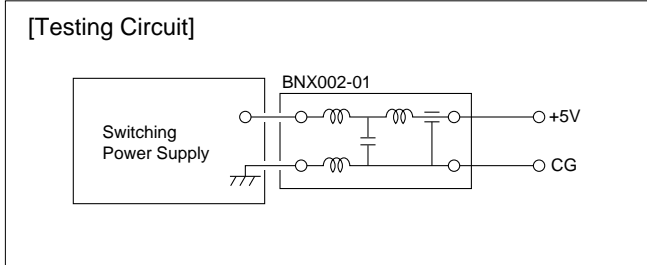


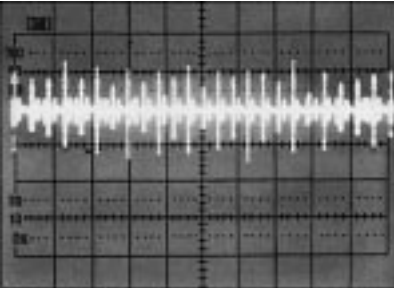
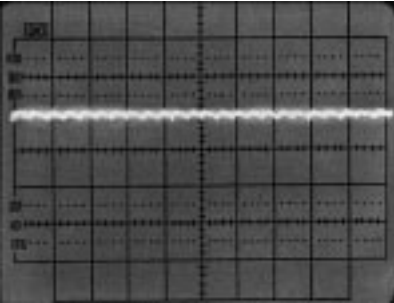
■ Insertion Loss Characteristics (Typical)



Noise Suppression Effect of BNX Series

■ Suppression of DC Side Ripple of the Switching Power Supply



Type of Filter	EMI Suppression Effect	Description
When BNX002 is not used	<p>+5.0V → 50μs/div 0.2V/div</p> 	High frequency noise, max. 0.5V, can be seen.
When BNX002 is used	<p>+5.0V → 50μs/div 0.2V/div</p> 	Noise can be almost suppressed by BNX002.

On-Board Type (DC) EMI Suppression Filters(EMIFIL®)



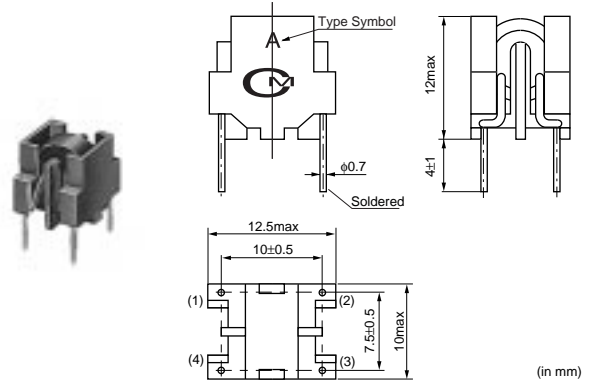
Common Mode Choke Coils (for DC Line) PLT08C/PLT09H Series

PLT08C Series

The PLT08C series is common mode choke coil for DC line. It is effective against the common mode noise that can cause radiative noise in power supply lines and interface lines. The high coupling factor enables effective suppression of common mode noise without appreciably altering the normal mode signal waveforms even when the signal and noise frequencies are close to each other.

Applications

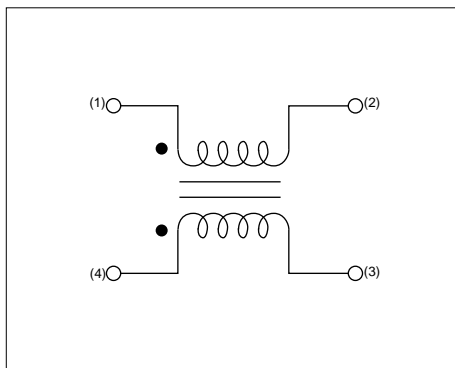
- For suppressing noise radiation from interface cables of digital equipment such as computers and computer peripherals.
- For suppressing noise radiation from the power supply cords of digital equipment that uses AC adapters.



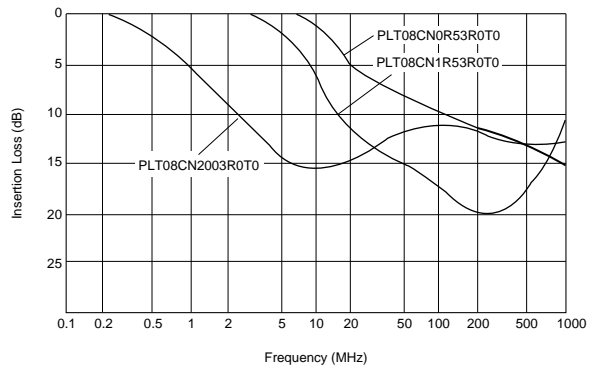
Part Number	Common Mode Inductance (μH)	Rated Current (A)	Rated Voltage (Vdc)	Withstand Voltage (Vdc)
PLT08CN0R53R0T0	0.5 min.	3	50	125
PLT08CN1R53R0T0	1.5 min.	3	50	125
PLT08CN2003R0T0	20 min.	3	50	125

Operating Temperature Range : -25°C to 60°C

Equivalent Circuit



Insertion Loss Characteristics (Typical)

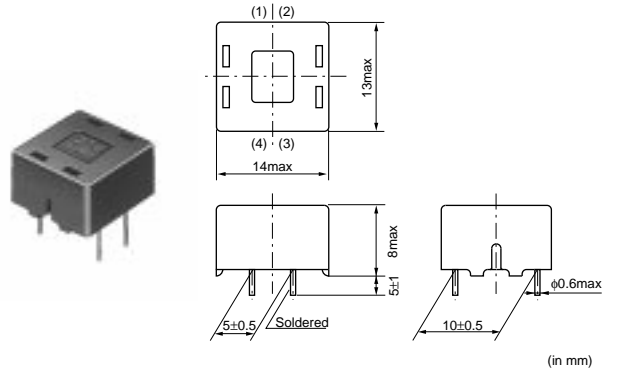


PLT09H Series

The PLT09H series is common mode choke coil for DC line. It is effective against the common mode noise that can cause radiative noise in power supply lines and interface lines. The additional normal mode inductance enables high suppression effect to radiation noise.

Applications

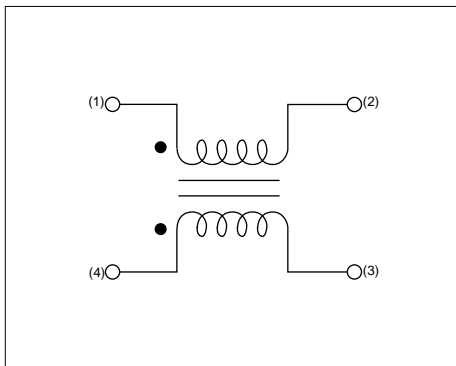
1. This is a wide frequency range type, applicable in applications ranging from a few MHz to several 100 MHz.
2. It features a low-profile design.



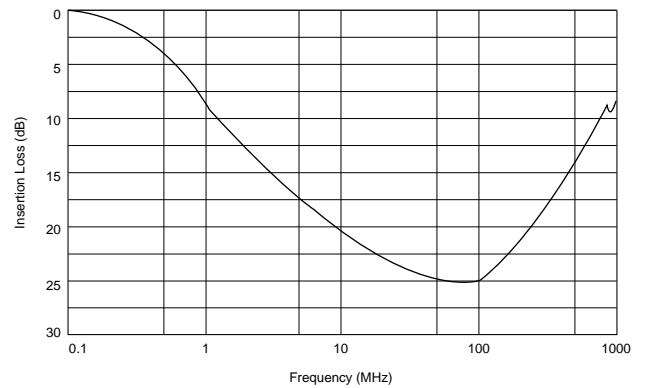
Part Number	Common Mode Inductance (μH)	Rated Current (A)	Rated Voltage (Vdc)	Withstand Voltage (Vdc)
PLT09HN2003R0P1	20 min.	3	50	125

Operating Temperature Range : -40°C to 85°C

Equivalent Circuit



Insertion Loss Characteristics



Lead Type EMIFIL[®] ⚠ Caution/Notice

■ ⚠ Caution (Rating)

Do not use products beyond the rated current and the rated voltage, or deterioration of the insulation resistance, excessive heat may catch fire.

■ ⚠ Caution (Soldering and Mounting)

Mounting holes should be designed as specified in this specifications. Other design than shown in this specifications may cause cracks in ceramics which may lead to smoking or firing.

■ Notice (Storage and Operation Condition)

< Operating Environment >

1. Do not use products in a chemical atmosphere such as chlorine gas, acid or sulfide gas.
2. Do not use products near water, oil or organic solvents. Avoid environment where dust or dirt may adhere to product.

< Concerned to "EMIGUARD" >

VFR3V series is designed only to absorb electro-static surges. Do not use this product to absorb

large energy surges such as lighting or switching related surges.

< Storage and Handling Requirements >

1. Storage conditions

Storage temperature : -10 to 40 C.

Relative humidity : 30 to 70%

Avoid sudden changes in temperature and humidity.

2. Do not store products in a chemical atmosphere such as chlorine gas, acid or sulfide gas.

■ Notice (Rating)

Noise suppression levels resulting from MURATA's EMI suppression filters "EMIFIL" may vary, depending on the circuits and ICs used, type of noise, mounting pattern, lead wire length, mounting location, and other operating conditions. Be sure to check and confirm in advance, the noise suppression effect of each filter, in actual circuits, etc. before applying the filter in a commercial-purpose equipment design.

■ Notice (Soldering and Mounting)

< Soldering >

1. Rosin-based flux is to be used. Do not use strong acidic flux with halide content exceeding 0.2%wt. (chlorine conversion value)
2. When soldering, do not exceed 5 seconds and keep 240 to 260 C..
3. When soldering, avoid mechanical stress to main body or lead wire terminal of product.

< Cleaning >

1. Do not clean VFR3V, PLT09H and VFS6V series.
2. Clean other parts on following condition.

- (1) Cleaning Temperature : 60 C. max.

(40 C. max. for CFC alternatives and alcohol cleaning agents)

- (2) Ultrasonic

Output : 20W/liter max.

Duration : 5 minutes max.

Frequency : 28kHz to 40kHz

3. Cleaning agent

The following list of cleaning agents have been tested on the individual components. Evaluation of final assembly should be completed prior to

production.

- (1) CFC alternatives and alcohol cleaning agents.

Isopropyl alcohol (IPA)

HCFC-225

- (2) Aqueous cleaning agent

(PLT09H and PLT08C series cannot be cleaned)

Surface active agent (Clean Thru 750H)

Hydrocarbon (Techno Cleaner 335)

High grade alcohol (Pine Alpha ST-100S)

Alkaline saponifier (Aqua Cleaner 240 -cleaner

should be diluted within

20% using deionized water.)

4. Ensure that flux residue is completely removed.

Component should be thoroughly dried after aqueous agent has been removed with deionized water.

5. Some products may become slightly whitened.

However, product performance or usage is not affected.

For additional cleaning methods, please contact Murata engineering.

On-Board Type (DC) EMI Suppression Filters(EMIFIL®)

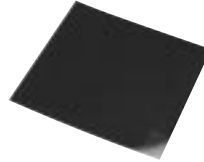


Microwave Absorbers EA10/EA20/EA21 Series

EA10 Series

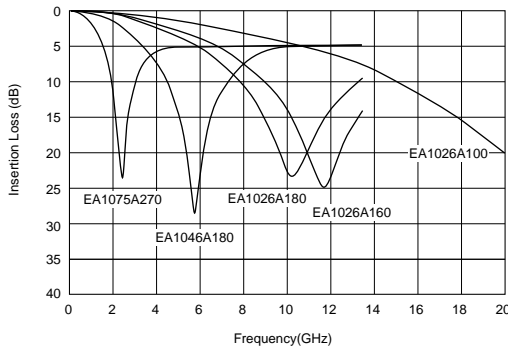
■ Features

1. Excellent elasticity and durability with silicon rubber.
2. Suitable for prevention abnormal oscillation in high frequency module, suppression suprious spectra and interference between circuits.
3. Holding easily in equipments with adhesive tape.



Part Number	Applicable Frequency	Thickness (mm)	Flame Resisting	Halogen	Operating Temperature Range
EA1026A100	20.0 GHz (Typ.)	1.0 (Typ.)	-	Halogen Free	-40 to +80 °C
EA1026A160	11.5 GHz (Typ.)	1.6 (Typ.)	-	Halogen Free	-40 to +80 °C
EA1026A180	10.0 GHz (Typ.)	1.8 (Typ.)	-	Halogen Free	-40 to +80 °C
EA1046A180	5.8 GHz (Typ.)	1.8 (Typ.)	UL94V-0	Halogen Free	-40 to +80 °C
EA1075A270	2.5 GHz (Typ.)	2.7 (Typ.)	UL94V-0	Halogen Free	-40 to +80 °C

■ Refraction Loss



EA20/21 Series

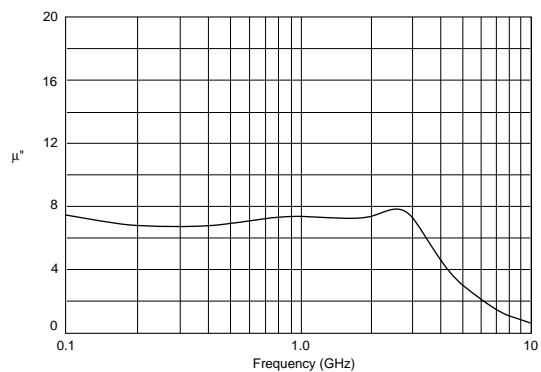
■ Features

1. High- μ and High-loss characteristics with magnetically shielded can suppress noise in wide frequency band for digital equipments.
2. Thin (0.2mm-1.0mm) and flexible sheet makes easy handling in assembly process.
3. Holding easily in equipments with adhesive tape.
4. EA20xx series : Non Halogen type
EA21xx series : UL94V-0 comformity



Part Number	Applicable Frequency	Thickness (mm)	Flame Resisting	Halogen	Operating Temperature Range
EA2070A050	0.1 - 3.0 GHz (Typ.)	0.5 (Typ.)	-	Halogen Free	-40 to +105 °C
EA2070A100	0.1 - 3.0 GHz (Typ.)	1.0 (Typ.)	-	Halogen Free	-40 to +105 °C
EA2070B020	0.1 - 3.0 GHz (Typ.)	0.2 (Typ.)	-	Halogen Free	-40 to +105 °C
EA2100A050	0.1 - 3.0 GHz (Typ.)	0.5 (Typ.)	UL94V-0	-	-40 to +105 °C
EA2100A100	0.1 - 3.0 GHz (Typ.)	1.0 (Typ.)	UL94V-0	-	-40 to +105 °C
EA2100B020	0.1 - 3.0 GHz (Typ.)	0.2 (Typ.)	UL94V-0	-	-40 to +105 °C

■ Magnetic Permeability-Reluctance (Typical)



Chip EMI Suppression Filter Design Kits



●EKEM11UC (Chip Ferrite Beads 1608 Size/for Large-current P Type)

No.	Part Number	Quantity (pcs.)	Impedance (at 100MHz)	Rated Current (mA)	DC Resistance (Ω)
1	BLM18AG121SN1	20	120 Ω	200	0.2
2	BLM18AG221SN1	20	220 Ω	200	0.3
3	BLM18AG471SN1	20	470 Ω	200	0.5
4	BLM18AG601SN1	20	600 Ω	200	0.5
5	BLM18AG102SN1	20	1000 Ω	100	0.7
6	BLM18BA050SN1	20	5 Ω	500	0.2
7	BLM18BA100SN1	20	10 Ω	500	0.25
8	BLM18BA220SN1	20	22 Ω	500	0.35
9	BLM18BA470SN1	20	47 Ω	300	0.55
10	BLM18BA750SN1	20	75 Ω	300	0.35
11	BLM18BA121SN1	20	120 Ω	200	0.9
12	BLM18BB100SN1	20	10 Ω	500	0.15
13	BLM18BB220SN1	20	22 Ω	500	0.25
14	BLM18BB470SN1	20	47 Ω	500	0.3
15	BLM18BB600SN1	20	60 Ω	200	0.35
16	BLM18BB121SN1	20	120 Ω	200	0.5
17	BLM18BB221SN1	20	220 Ω	200	0.65
18	BLM18BB471SN1	20	470 Ω	50	1
19	BLM18BD121SN1	20	120 Ω	200	0.4
20	BLM18BD221SN1	20	220 Ω	200	0.45
21	BLM18BD471SN1	20	470 Ω	200	0.55
22	BLM18BD601SN1	20	600 Ω	200	0.65
23	BLM18BD102SN1	20	1000 Ω	100	0.85
24	BLM18BD182SN1	20	1800 Ω	50	1.5
25	BLM18BD252SN1	20	2500 Ω	50	1.5
26	BLM18HG471SN1	20	470 Ω	200	0.85
27	BLM18HG601SN1	20	600 Ω	200	1
28	BLM18HG102SN1	20	1000 Ω	100	1.6
29	BLM18HD471SN1	20	470 Ω	100	1.2
30	BLM18HD601SN1	20	600 Ω	100	1.5
31	BLM18HD102SN1	20	1000 Ω	50	1.8
32	BLM18PG300SN1	20	30 Ω	1000	0.05
33	BLM18PG600SN1	20	60 Ω	500	0.1
34	BLM21PG300SN1	20	30 Ω	3000	0.015
35	BLM21PG221SN1	20	220 Ω	2000	0.05
36	BLM21PG331SN1	20	330 Ω	1500	0.09
37	BLM31PG330SN1	20	33 Ω	6000	0.01
38	BLM31PG121SN1	20	120 Ω	3000	0.025
39	BLM31PG391SN1	20	390 Ω	2000	0.05
40	BLM31PG601SN1	20	600 Ω	1500	0.9
41	BLM41PG600SN1	20	60 Ω	6000	0.01
42	BLM41PG750SN1	20	75 Ω	3000	0.025
43	BLM41PG181SN1	20	180 Ω	3000	0.025
44	BLM41PG471SN1	20	470 Ω	2000	0.05
45	BLM41PG102SN1	20	1000 Ω	1500	0.09

· Please use the products in this Design Kit for experiment or test production, but do not use for mass production.

When using for mass production, please order them after confirming detailed specifications by approving the appropriate individual specification sheet.

Chip EMI Suppression Filter Design Kits

●EKEM12UD (Chip EMIFIL Capacitor Type/LC Combined Type/RC Combined Type)

No.	Part Number	Quantity (pcs.)	Nominal Cutoff Frequency or Capacitance	Resistance	Rated Current
1	NFW31SP106X1E4	20	10MHz	—	200mA
2	NFW31SP206X1E4	20	20MHz	—	200mA
3	NFW31SP506X1E4	20	50MHz	—	200mA
4	NFW31SP107X1E4	20	100MHz	—	200mA
5	NFW31SP157X1E4	20	150MHz	—	200mA
6	NFW31SP207X1E4	20	200MHz	—	200mA
7	NFW31SP307X1E4	20	300MHz	—	200mA
8	NFW31SP407X1E4	20	400MHz	—	200mA
9	NFW31SP507X1E4	20	500MHz	—	200mA
10	NFR21GD1002202	20	10pF	22Ω	50mA
11	NFR21GD1004702	20	10pF	47Ω	35mA
12	NFR21GD4702202	20	47pF	22Ω	50mA
13	NFR21GD4704702	20	47pF	47Ω	35mA
14	NFR21GD4706802	20	47pF	68Ω	30mA
15	NFR21GD4701012	20	47pF	100Ω	25mA
16	NFR21GD1012202	20	100pF	22Ω	50mA
17	NFR21GD1014702	20	100pF	47Ω	35mA
18	NFR21GD1016802	20	100pF	68Ω	30mA
19	NFR21GD1011012	20	100pF	100Ω	25mA
20	NFM21CC220U1H3	20	22pF	—	300mA
21	NFM21CC470U1H3	20	47pF	—	300mA
22	NFM21CC101U1H3	20	100pF	—	300mA
23	NFM21CC221R1H3	20	220pF	—	300mA
24	NFM21CC471R1H3	20	470pF	—	300mA
25	NFM21CC102R1H3	20	1000pF	—	300mA
26	NFM21CC222R1H3	20	2200pF	—	300mA
27	NFM21CC223R1H3	20	22000pF	—	1A
28	NFM21PC104R1E3	20	0.1μF	—	2A
29	NFM21PC224R1C3	20	0.22μF	—	2A
30	NFM21PC474R1C3	20	0.47μF	—	2A
31	NFM21PC105B1A3	20	1μF	—	4A
32	NFM21PC105F1C3	20	1μF	—	2A
33	NFE31PT220R1E9	20	22pF	—	6A
34	NFE31PT470C1E9	20	47pF	—	6A
35	NFE31PT101C1E9	20	100pF	—	6A
36	NFE31PT221D1E9	20	220pF	—	6A
37	NFE31PT471F1E9	20	470pF	—	6A
38	NFE31PT152Z1E9	20	1500pF	—	6A
39	NFE31PT222Z1E9	20	2200pF	—	6A
40	NFE61PT681B1H9	20	680pF	—	2A
41	NFE61PT102E1H9	20	1000pF	—	2A
42	NFE61PT472C1H9	20	4700pF	—	2A
43	NFA31GD1006R84	20	10pF	6.8Ω	50mA
44	NFA31GD1004704	20	10pF	47Ω	20mA
45	NFA31GD1001014	20	10pF	100Ω	15mA
46	NFA31GD4706R84	20	47pF	6.8Ω	50mA
47	NFA31GD4704704	20	47pF	47Ω	20mA
48	NFA31GD4701014	20	47pF	100Ω	15mA
49	NFA31GD1016R84	20	100pF	6.8Ω	50mA
50	NFA31GD1014704	20	100pF	47Ω	20mA
51	NFA31GD1011014	20	100pF	100Ω	15mA
52	NFA31CC220S1E4	20	22pF	—	200mA
53	NFA31CC470S1E4	20	47pF	—	200mA
54	NFA31CC101S1E4	20	100pF	—	200mA
55	NFA31CC221S1E4	20	220pF	—	200mA
56	NFA31CC471R1E4	20	470pF	—	200mA
57	NFA31CC102R1E4	20	1000pF	—	200mA
58	NFA31CC222R1E4	20	2200pF	—	200mA
59	NFA31CC223R1C4	20	22000pF	—	200mA

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Chip EMI Suppression Filter Design Kits

●EKEM13UB (Chip Ferrite Beads 1005 Size)

No.	Part Number	Quantity (pcs.)	Impedance (at 100MHz)	Rated Current (mA)	DC Resistance (Ω)
1	BLM15AG100PN1	20	10 Ω	500	0.05
2	BLM15AG700PN1	20	70 Ω	200	0.4
3	BLM15AG121PN1	20	120 Ω	200	0.5
4	BLM15AG221PN1	20	220 Ω	100	0.7
5	BLM15AG601PN1	20	600 Ω	50	1.1
6	BLM15AG102PN1	20	1000 Ω	50	1.5
7	BLM15BB750PN1	20	75 Ω	100	0.8
8	BLM15BB121PN1	20	120 Ω	50	1.1
9	BLM15BB221PN1	20	220 Ω	50	1.4
10	BLM15BD421PN1	20	420 Ω	50	1.3
11	BLM15BD601PN1	20	600 Ω	50	1.5
12	BLM15BD102PN1	20	1000 Ω	50	1.3

●EKEM14UB (Chip Ferrite Beads 2012/3216/4216 Size)

No.	Part Number	Quantity (pcs.)	Impedance (at 100MHz)	Rated Current (mA)	DC Resistance (Ω)
1	BLM21AG121SN1	20	120 Ω	200	0.15
2	BLM21AG221SN1	20	220 Ω	200	0.2
3	BLM21AG471SN1	20	470 Ω	200	0.25
4	BLM21AG601SN1	20	600 Ω	200	0.3
5	BLM21AJ601SN1	20	600 Ω	200	1.1
6	BLM21AG102SN1	20	1000 Ω	200	0.45
7	BLM21AH102SN1	20	1000 Ω	200	0.45
8	BLM21BB600SN1	20	60 Ω	200	0.2
9	BLM21BB750SN1	20	75 Ω	200	0.25
10	BLM21BB121SN1	20	120 Ω	200	0.25
11	BLM21BB221SN1	20	220 Ω	200	0.35
12	BLM21BB471SN1	20	470 Ω	200	0.45
13	BLM21BD121SN1	20	120 Ω	200	0.25
14	BLM21BD221SN1	20	220 Ω	200	0.25
15	BLM21BD471SN1	20	470 Ω	200	0.35
16	BLM21BD601SN1	20	600 Ω	200	0.35
17	BLM21BD102SN1	20	1000 Ω	200	0.4
18	BLM21BD182SN1	20	1800 Ω	200	0.5
19	BLM21BD222SN1	20	2200 Ω	200	0.6
20	BLM21BD222TN1	20	2200 Ω	200	0.6
21	BLM21BD272SN1	20	2700 Ω	200	0.8
22	BLM31AF700SN1	20	70 Ω	200	0.15
23	BLM31AJ601SN1	20	600 Ω	200	0.9
24	BLM41AF800SN1	20	80 Ω	500	0.1
25	BLM41AF151SN1	20	150 Ω	200	0.5

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Chip EMI Suppression Filter Design Kits

●EKEM15UC (Chip Common Mode Choke Coils)

No.	Part Number	Quantity (pcs.)	Common Mode Impedance (at 100MHz)	Rated Current (A)
1	DLP31SN121SL2	20	120Ω	0.1
2	DLP31SN221SL2	20	220Ω	0.1
3	DLP31SN551SL2	20	550Ω	0.1
4	DLW31SN900SQ2	20	90Ω	0.37
5	DLW31SN161SQ2	20	160Ω	0.34
6	DLW31SN261SQ2	20	260Ω	0.31
7	DLW31SN601SQ2	20	600Ω	0.26
8	DLW31SN102SQ2	20	1000Ω	0.23
9	DLW31SN222SQ2	20	2200Ω	0.2
10	DLW5AHN402SQ2	10	4000Ω	0.2
11	DLW5BSN302SQ2	10	3000Ω	0.5
12	DLW5BSN152SQ2	10	1500Ω	1
13	DLW5BSN102SQ2	10	1000Ω	1.5
14	DLW5BSN351SQ2	10	350Ω	2
15	DLW5BSN191SQ2	10	190Ω	5
16	DLP31DN900SL4	20	90Ω	0.1
17	DLP31DN161SL4	20	160Ω	0.1
18	DLP31DN201SL4	20	200Ω	0.1
19	DLP31DN361SL4	20	360Ω	0.1
20	DLP31DN471SL4	20	470Ω	0.1
21	DLW21SN670SQ2	20	67Ω	0.4
22	DLW21SN121SQ2	20	120Ω	0.37
23	DLW21SN181SQ2	20	180Ω	0.33
24	DLW21SN261SQ2	20	260Ω	0.3
25	DLW21SN371SQ2	20	370Ω	0.28

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Lead Type EMI Suppression Filter Design Kits



●EK015D (Lead Type EMIFIL®)

No.	Part Number	Quantity (pcs.)	Remark	
1	BNX002-01	3	Block type EMIFIL®	for use in DC Power Line
2	BNX003-01	3		
3	BNX005-01	3		
4	BNP002-03	3		π -type EMIFIL® for Signal Circuit
5	BNP004-02	3		
6	BL01RN1A1D2B	50	Ferrite Beads Inductor	Axial-type
7	BL02RN2R1M2B	50		Radial-type
8	BL03RN2R1M1B	50		
9	DSN6NC51H470Q55	20	3-Terminal Capacitor	2.5mm Pitch for Automatic Insertion Miniature Disk Type EMIFIL®
10	DSN6NC51H101Q55	20		
11	DSN6NC51H271Q55	20		
12	DSN6NC51H102Q55	20		
13	DSN6NC51H222Q55	20		
14	DSN6NZ81H103Q55	20		
15	DSS6NC52A220Q55	50		
16	DSS6NC52A470Q55	50		
17	DSS6NC52A101Q55	50		
18	DSS6NC52A221Q55	50		
19	DSS6NC52A471Q55	50		
20	DSS6NC52A102Q55	50		
21	DSS6NE52A222Q55	50		
22	DSS6NZ82A103Q55	50		
23	DSS6NF31C223Q55	50		
24	DSN9NC51H223Q55	20		Wide Band Disk-type EMIFIL® for Noise Suppression
25	DSN9NC51C104Q55	20		
26	DSS9NC51H223Q55	20		
27	DSS9HB32E220Q55	20		Heavy Duty Disk-type EMIFIL®
28	DSS9HB32E101Q55	20		
29	DSS9HB32E271Q55	20		
30	DSS9HB32E222Q55	20		
31	VFS6VD81E221T51	20	Varistor-capacitor	
32	VFS9VD31B223Q55	5		
33	VFR3VD31E131T51	5		
34	PLT08CN0R53R0T0	3	DC Common Mode Choke Coil	for use in DC Power Line
35	PLT08CN1R53R0T0	3		
36	PLT09HN2003R0P1	3		

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Outlines of Major Noise Regulation Standards

1. EMI Regulations

Equipment		Countries	Information Regulation	Japan	USA	Europe
Emission	Generic Standard		IEC61000-6-3 IEC61000-6-4			EN50081-1 EN50081-2
	ITE : Information Technology Equipment Printer, Personal computer Word processor, Display		CISPR Pub. 22	VCCI Electrical Appliance Regulation	FCC Part 15 Subpart B	EN55022
	ISM equipment Microwave		CISPR Pub. 11	Electrical Appliance Regulation	ECC Part 18	EN55011
	Igniter (Automobile, Motorboat)		CISPR Pub.12	JASO	FCC Part 15 Subpart B	Automotive Directive
	TV, Radio, Audio, VTR		CISPR Pub.13	Electrical Appliance Regulation	FCC Part 15 Subpart B	EN55013
	Household electrical equipment Portable tool		CISPR Pub.14	Electrical Appliance Regulation		EN55014
	Fluorescent Lamp Luminary		CISPR Pub.15	Electrical Appliance Regulation		EN55015
	Transceiver		CCIR	Radio Act	FCC Part 15 Subpart C FCC Part 22	ETS300 Series
	(Reference) Power Supply Higher Harmonte		IEC555 IEC61000-3	Industrial Voluntary Regulation		EN60555 EN61000-3
Immunity	Basic Standard		IEC61000-4	In the process of Regulating at JIS		EN61000-4 Series
	Generic Standard		IEC61000-6-1 IEC61000-6-2	In the process of Regulating at JIS		EN50082-1 EN50082-2
	Industrial Process Measurement and Control Equipment		IEC801 Series	Industrial Voluntary Action		
	Radio, TV		CISPR Pub. 20			EN55020
	ITE : Information Technology Equipment		CISPR Pub. 24			EN55024

There are EMI regulation in each country to meet EMI noise level emitted from digital equipment.

In the countries which regulates EMI, equipments which do not satisfy with regulations are not allowed to be sold.

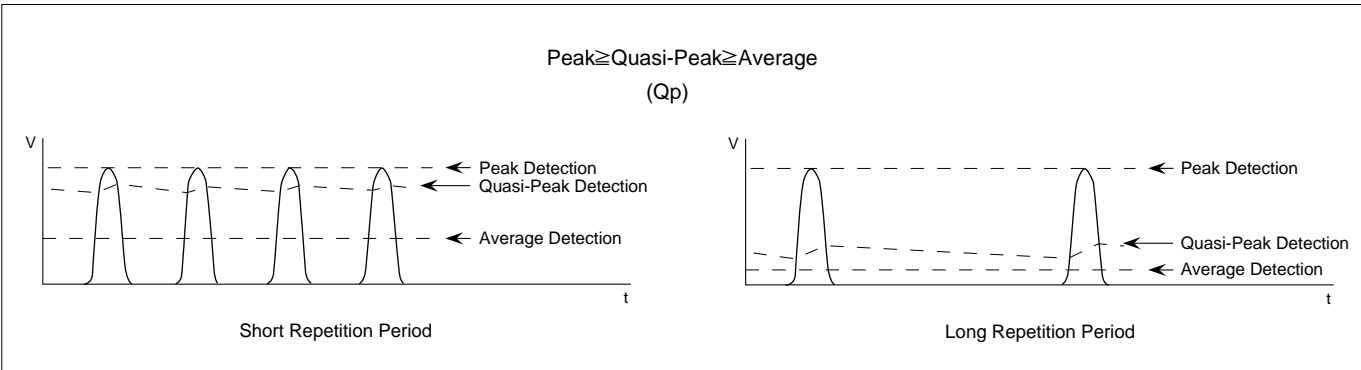
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Outlines of Major Noise Regulation Standards

Continued from the preceding page.

2. Measurement Point and Noise Detection

Regulation	Measuring Item	Polarization and Measuring Point	Frequency (Hz)	Detection	Measuring Devices
CISPR Pub.22/ EN55022	Radiated Interference	Horizontal Pol. Vertical Pol.	30M to 1GHz	Quasi-Peak Detection	Antenna
	Mains Interference Voltage	AC Mains Ports	150k to 30MHz	Quasi-Peak Detection Mean Detection	Artificial Mains Network
VCCI	Radiated Interference	Horizontal Pol. Vertical Pol.	30M to 1GHz	Quasi-Peak Detection	Dipole Antenna
	Mains Interference Voltage	AC Mains Ports	150k to 30MHz	Quasi-Peak Detection Mean Detection	Artificial Mains Network
FCC Part 15	Radiated Interference	Horizontal Pol. Vertical Pol.	30M to 1GHz	Quasi-Peak Detection Mean Detection	Antenna
	Mains Interference Voltage	AC Mains Ports	150k to 30MHz	Quasi-Peak Detection	Artificial Mains Network



3. Limits of CISPR Pub. 22/EN55022

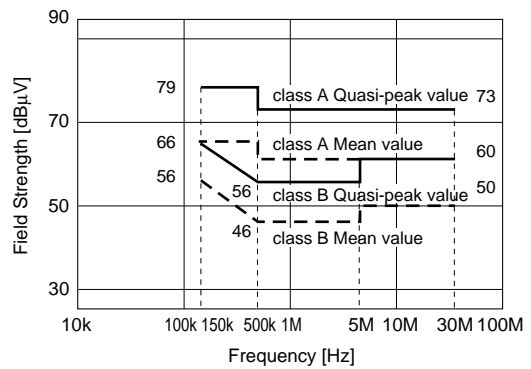
(1) CISPR Pub.22 recommends measurement at 10m distance.

However, other distance is acceptable if the limitation is converted according to following calculation. Limitation show left is converted to limitation for 3m distance.

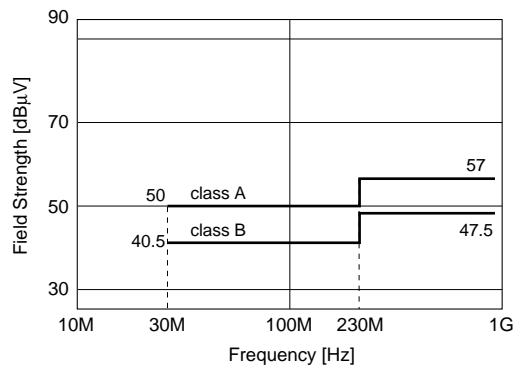
Conversion

Limitation for 10m Distance	→	Limitation for 3m Distance
R_{10} (dB μ V/m)		R_3 (dB μ V/m)
r_{10} (μ V/m)		r_3 (μ V/m)
$R_{10}=20 \log r_{10}$		$R_3=20 \log r_3$
$R_3=R_{10}+20 (1-\log 3)$		
$r_3 = \frac{10}{3} r_{10}$		

[Mains Terminal Interference Voltage (Power Supply)]



[Radiated Interference]



On the border frequency, lower limit shall be applied.

Class A Equipment : The equipment which is used in light industries area or commercial area.

Class B Equipment : The equipment which is used in residential area.

Continued on the following page.

Outlines of Major Noise Regulation Standards

Continued from the preceding page.

(2) Scope of CISPR Pub.22 Regulation

This regulation applies to information technology equipment (ITE) which are defined as :

- (a) Equipment that receive data from external signal sources ;
- (b) Equipment that processes received data ;
- (c) Equipment that output data
- (d) Equipment that has less than 600V rated voltage in power supply

[CISPR Regulations]

- Pub.10 Organization, Regulations and Procedures of CISPR
- Pub.11 Industrial, Scientific and Medical (ISM) Radio-Frequency Equipment
- Pub.12 Vehicles, Motor Boats and Spark-Ignited Enginedriven
- Pub.13 Sound and Television Receivers
- Pub.14 Household Electrical Appliances, Portable Tools and Similar Electrical Apparatus
- Pub.15 Fluorescent Lamps and luminaries
- Pub.16 Radio Interference Measuring Apparatus and Measurement Methods
- Pub.17 Passive Radio Interference Filters and Suppression Components
- Pub.18 Power Transmission Cables and High Voltage Equipments
- Pub.19 Microwave Ovens for Frequencies above 1GHz
- Pub.20 Immunity of Sound and TV Broadcast Receivers Veceivers and Associated Equipment
- Pub.21 Interference to Mobile Radiocommunications in the Presence of Impulsive Noise
- Pub.22 Information Technology Equipment
- Pub.23 Industrial Scientific and Medical (ISM) Equipment
- Pub.24 Immunity Regulation of Information Technology Equipment

4. Limits of VCCI Voluntary Regulation

(1)VCCI recommend measurement at 10m distance. 3m or 30m distance measurement are also allowed.

Main Terminal Interference Voltage of 150kHz to 526.5kHz.
 From 1999 April, New products shall be applied with easing 10dB.
 From 2001 April, New products shall be applied with easing 0dB.

(2) Scope of VCCI Voluntary Regulation

This regulation applies to information technology equipment (same as CISPR Pub.22), but the application is excluded on the following equipments :

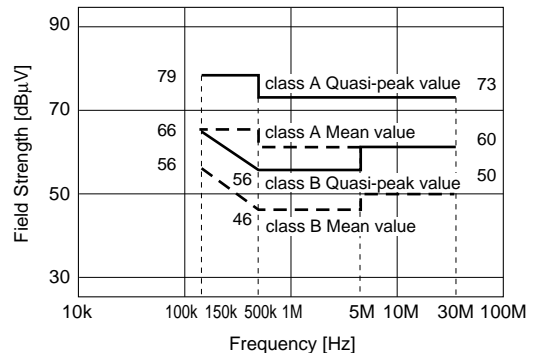
- Equipment for which other regulations already exist (e.g., household electrical appliances, radio and TV receivers)
- In station equipment principal purpose of which is electrical communication
- Industrial plant control system for which information processing is a secondary system function
- Industrial, commercial and medical testing and measuring systems for which data processing is a secondary system function
- Information equipment for which CISPR is conducting further deliberation

VCCI is the acronym of Voluntary Control Council for Interference by Data Processing Equipment and Electronic Office Machines.

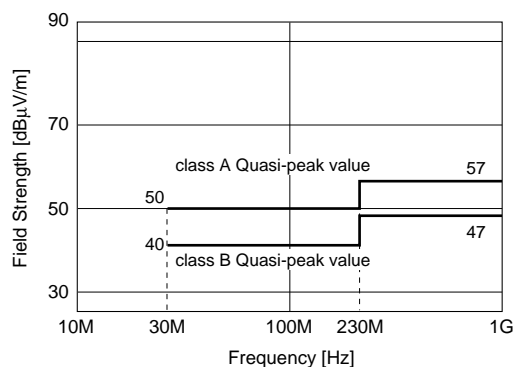
VCCI is organized by the following organizations :

- Japan Electronic Industry Development Association (JEIDA)
- Japan Business Machine Makers Association (JBMA)
- Electronic Industries Association of Japan (EIAJ)
- Communication Industries Association of Japan (CIAJ)

[Mains Terminal Interference Voltage (Power Supply)]



[Radiated Interference]



On the border frequency, lower limit shall be applied.

Class B ITE : Equipment that designed to be used at home.

Class A ITE : Equipment that does not meet interference limit of class B equipment. However satisfying interference limit of class A equipment.

Outlines of Major Noise Regulation Standards

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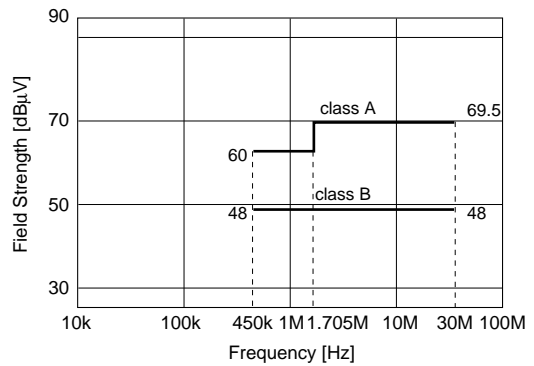
5. Limits of FCC Part 15 Subpart B

- (1) Class A recommend to be measured with 10m distance.
Class B recommend to be measured with 3m distance.
- (2) The FCC Part 15 regulation controls radiated interference by establishing quasi-peak and mean value limits for frequencies ranging from 30MHz to 40GHz (or maximum frequency's fifth harmonic, whichever is lower).
For AC main ports, the FCC Part 15 regulation controls mains terminal interference voltage by establishing quasi-peak value limits for frequencies ranging from 450kHz to 30MHz.

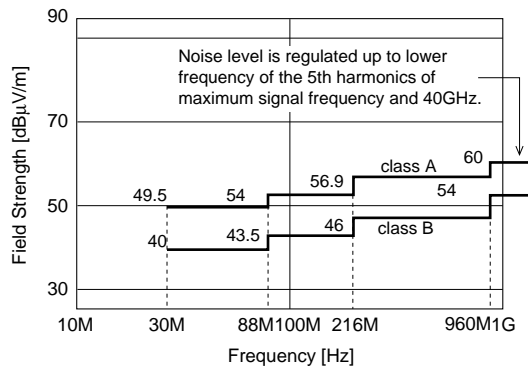
Measurement Frequency Range for Radiated Interference

Maximum Frequency the Equipment Internally Generates, Uses or Operates or Synchronizes (MHz)	Upper End of Measurement Frequency Range
Less than 1.705	30
1.705 to 108	1000
108 to 500	2000
500 to 1000	5000
Over 1000	Maximum Frequency's Fifth Harmonic or 40GHz, Whichever is Lower

[Mains Terminal Interference Voltage (Power Supply)]



[Radiated Interference]



On the border frequency, lower limit shall be applied.

Class A Equipment : The digital equipment that is sold to in the commercial, industrial and office use.

Class B Equipment : The digital equipment that is sold to be used in residential area.


- (3) There is no regulation on interference power.

[FCC Regulations]

- Part 1 Procedures
- Part 2 Frequency Division and Radio Wave Treaty Issues and General Rules
- Part 15 Radio Wave Equipment
 - Intentionally electromagnetic radiation equipment
 - Non-intentionally electromagnetic radiation equipment
 - Incidentally electromagnetic radiation equipment
- Part 18 Industrial, Scientific and Medical Equipment
- Part 22 Public Mobile Wireless Operations
- Part 68 Connecting Terminal Equipment to Telephone Circuit Network
- Part 76 Cable Television

Continued on the following page.

Outlines of Major Noise Regulation Standards

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6. Immunity Regulations in Europe Union

All electric/electronic equipment cannot be sold in Europe without CE marking. To use CE marking, they must satisfy related EC directive such as EMC directive. In EMC directive, EMI regulations are integrated, and immunity regulations are applied. Although these immunity regulations are prepared by CENELEC, almost all contents are same as standards issued by IEC or CISPR.

All products which are sold in EU must satisfy EC directive which contains immunity regulation.

Principal EC Directive	
EMC Directive	89/336/EEC 92/31/EEC
Low-Voltage Electrical Products Directive	73/23/EEC
Machines Directive	89/392/EEC

Noise regulations in EU is prepared by CENELEC. Their contents are almost same as IEC or CISPR regulations.

Standard	Application	IEC	CISPR	CENELEC
Basic Standard		IEC61000-4		EN61000-4
Generic Standard		Residential, Commercial and Light Industry In the process of IEC61000-6-1 (IEC61000-6-3) Industrial In the process of IEC61000-6-2 (IEC61000-6-4)		Residential, Commercial and Light Industry EN50082-1 (EN50081-1) Industrial EN50082-2 (EN50081-2)
Product Family Standard	Radio, TV		CISPR Pub. 20 (CISPR Pub. 13)	EN55020 (EN55013)
	Information Technology Equipment		CISPR Pub. 24 (CISPR Pub. 22)	EN55024 (EN55022)
Product Standard				

Standards in bracket are Emission Standards.

Noise Suppression Principles by DC EMIFIL®

1. Function of DC EMI Suppression Filters

DC EMI suppression filters absorb and eliminate high frequency noise which may produce electromagnetic interference in PC board circuits.

These filters are used in secondary circuits, and are small in size and light in weight, which further enhances their excellent noise suppression functions.

Chip and adhesive type filters can be mounted on PC boards automatically.

These filters are effective in the suppression of radiation noise in computers, peripheral equipment, and digital circuit application equipment (including various types of microcomputer application equipment), and function to suppress noise in audio/visual equipment, which uses digital memory chips and DSP.

These filters are also effective for improving the noise immunity of equipment used in noisy environments (such as electronic equipment for automobiles).

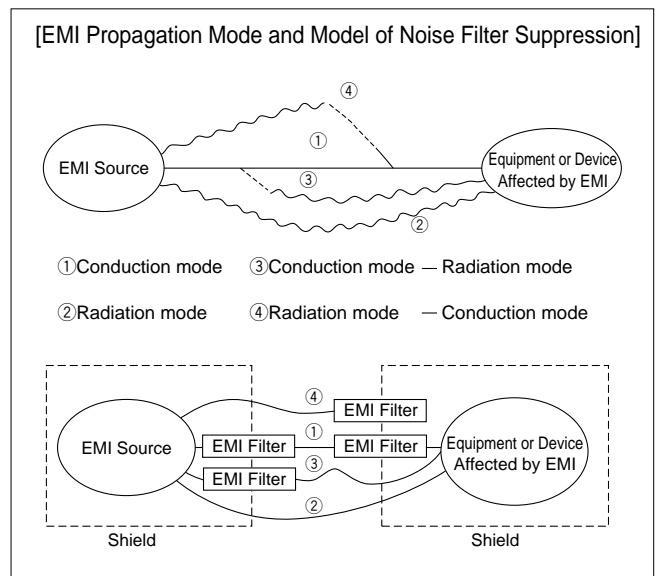
2. Noise Filter Suppression Principles

Generally, noise problems occur when the noise source and electronic equipment sensitive to the influence of noise are located in close proximity to one another.

In such situations, as shown in Fig, noise is conducted through a conductor, which produces an inductive field around the noise source.

To overcome such noise problems, it is preferable to reduce the amount of noise generated by the noise source or improve the noise resistance of adjacent equipment.

In order to satisfy equipment performance specifications and eliminate noise effectively at the same time, however, it is customary to reduce the amount of noise generated by the noise source, if it can't be eliminated altogether.



3. Configuration of EMI Suppression Filters (DC)

DC EMI suppression filters are used to suppress noise produced by conductors. Noise radiation can be suppressed, if it is eliminated with a filter in advance.

Generally, such noise suppression is achieved with DC EMI suppression filters, according to the capacitive and inductive frequency characteristics of the respective conductors in the circuit.

Filters of this kind can be roughly divided into those :

- (1) employing a capacitor,
- (2) employing an inductor,
- (3) employing a capacitor and inductor combination.

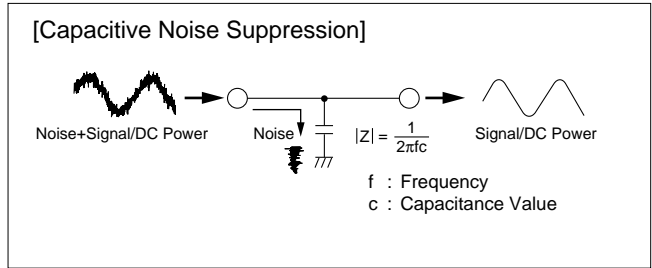
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Noise Suppression Principles by DC EMIFIL[®]

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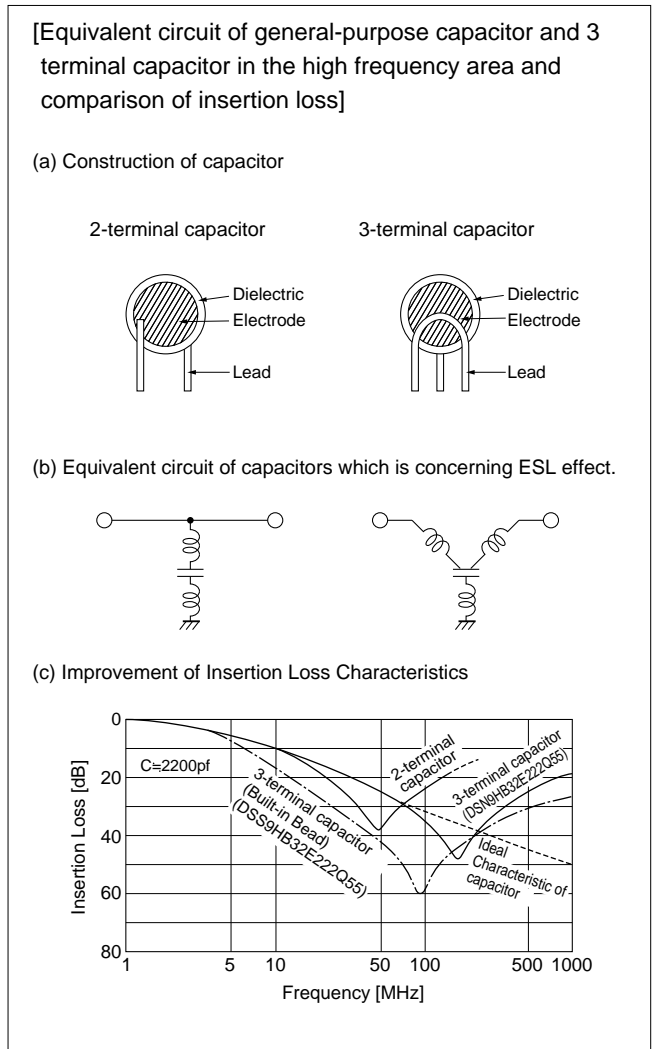
4. Capacitive Noise Suppression

When a capacitor is connected (bypass capacitor) to ground from a noisy signal line or power line, the circuit impedance decreases as the frequency increases. Since noise is a high frequency phenomenon, it flows to ground if a capacitor has been connected to ground, thereby making it possible to eliminate noise. (See Fig.) EMI suppression filters employing a capacitor in this way are used to eliminate this type of noise.



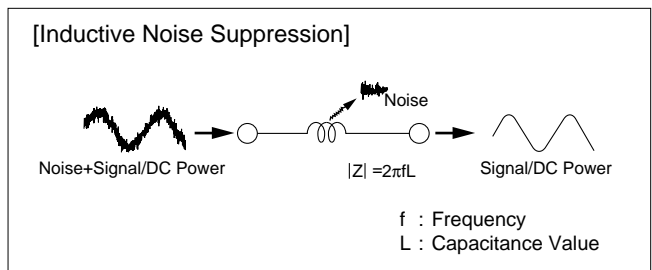
5. High frequency Capacitor Characteristics Used for EMI Suppression Filters

Even general-purpose capacitors can be used for noise suppression. However, since noise has an extremely high frequency range, general-purpose capacitors may not function as effective bypass capacitors, due to the large residual inductance built into the capacitor. All the capacitors used in MURATA's EMI suppression filters employ a 3 terminal structure or thru-type structure, which functions effectively even at high frequencies, thereby minimizing the influence of residual inductance. Consequently, an effective filter circuit can be formed even at frequencies exceeding 1GHz. (Refer to Fig.)



6. Inductive Noise Suppression

When an inductor is inserted in series in a noise producing circuit (See Fig.), its impedance increases with frequency. In this configuration it is possible to attenuate and eliminate noise components (high frequency components). The MURATA EMI suppression filter functions in this way.



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Noise Suppression Principles by DC EMIFIL[®]

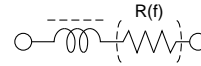
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7. Characteristics of Inductors Used in EMI Suppression Filters

General-purpose inductors also function to suppress noise when configured in series with a noise producing circuit. However, when general-purpose inductors are used, resonance may result in peripheral circuits, signal wave forms may become distorted, and satisfactory impedance may not be obtained at noise frequencies (due to insufficient high frequency impedance characteristics).

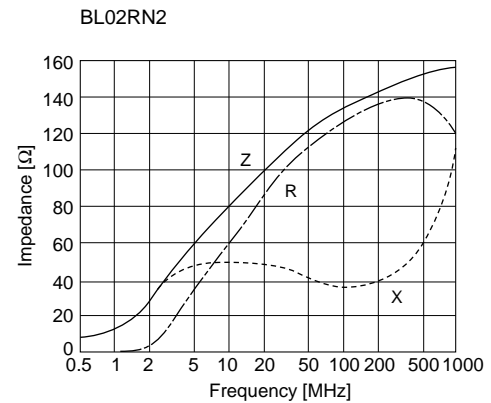
The inductors used for MURATA's EMI suppression filters are designed to function nearly as a resistor at noise frequencies, which greatly reduces the possibility of resonance and leaves signal wave forms undistorted. And since sufficient impedance is obtained for frequencies ranging to hundreds of MHz, these specifically designed inductors operate effectively to suppress high-frequency noise. (See Fig.)

[Equivalent Circuit]



(Resistance element becomes dominant at high frequency.)

[Example of impedance frequency characteristics of inductor type EMIFIL[®]]



8. Capacitive-Inductive EMI Suppression Filters

If a capacitive and inductive suppression characteristics are combined, it is possible to configure a much higher performance filter. In signal circuit applications where this combination is applied, noise suppression effects which have little influence on the signal wave form become possible.

This type of filter is also effective in the suppression of high-speed signal circuit noise. When used in DC power circuits, capacitive-inductive filters prevent resonance from occurring in peripheral circuits, thus making it possible to achieve significant noise suppression under normal service conditions.

9. Other EMI Suppression Filters

In addition to the capacitive-inductive filter, MURATA also has an EMI suppression filter (EMI-GUARD[®]) combining a capacitor with a varistor, useful for surge absorption; and a common mode choke coil effective, for common mode noise suppression.

MURATA also has a range of built-in filter connectors which greatly reduce filter mounting space requirements.

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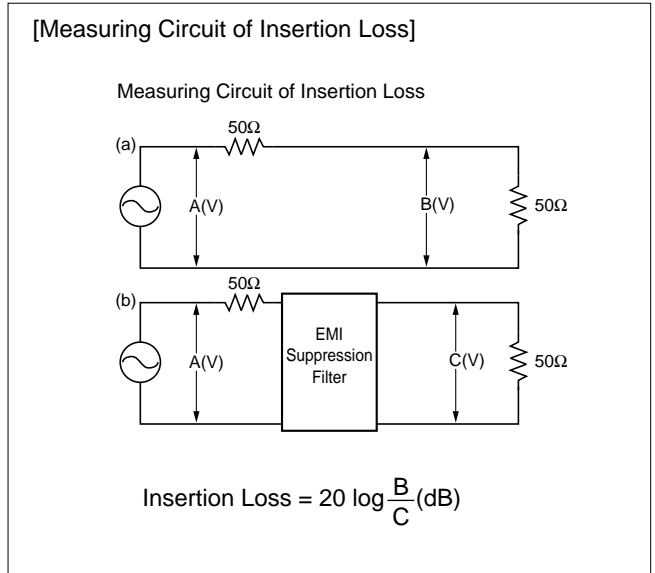
Noise Suppression Principles by DC EMIFIL®

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10. Expressing EMI Suppression Filter Effects

EMI Suppression Filter effects are expressed in terms of the insertion loss measured in the circuit, normally specified in MIL-STD 220A. As shown in the 50Ω impedance circuit in Fig., insertion loss is represented by the logarithmic ratio of the circuit output voltage with and without a filter in the circuit, which is multiplied by 20 and expressed in dB.

Therefore, an insertion loss of 20dB indicates an out put voltage ratio (B/C) of 1/10, and an insertion loss of 40dB indicates an output voltage ratio (B/C) of 1/100.



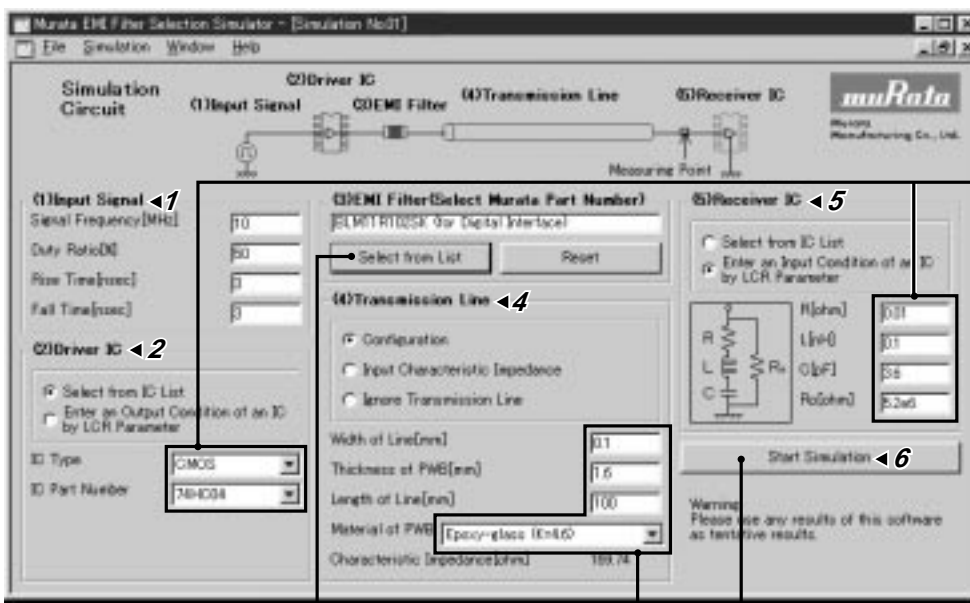
Murata EMI Filter Selection Simulator

The Murata EMI Filter Selection Simulator simulates effects of Murata EMI Filters.

Simulation results are displayed with a Voltage-Waveform chart and a Spectrum-Frequency chart. The filters can be simulated under various circuit conditions.

■ Operation

1. Enter "Input Signal" in the Simulation window.
2. Enter LCR values or select Driver IC from the pull-down list.
3. Enter the part number or select EMI Filter from the pull-down list.
4. Set Transmission Line. (Three ways can be selected.)
5. Enter LCR values or select Receiver IC from the pull-down list.
6. Click on the "Start Simulation" button.
7. Simulation results are displayed on the new window.



Two ways of setting the driver/receiver IC parameter.

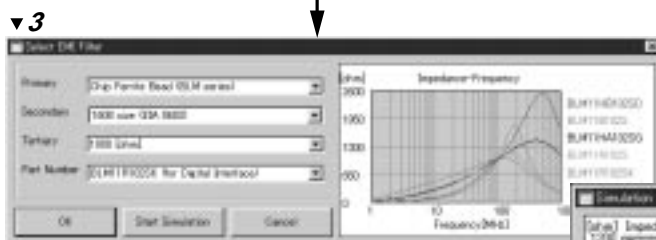
The logic IC of TTL and CMOS can be selected from pull-down list. LCR values can also be entered.

Impedance automatically calculated.

Impedance characteristics under actual pattern are automatically calculated.

(When the "Configuration" is selected.)

Voltage waveform and voltage-spectrum charts are displayed in the same window. They can also be printed and copied to clipboard.



EMI filters can be selected from the "Select EMI Filter" window.



This application can be downloaded from Murata web site.

<http://www.murata.co.jp/emc/mefss.html>

⚠ Note:**1. Export Control**

〈For customers outside Japan〉

Murata products should not be used or sold for use in the development, production, stockpiling or utilization of any conventional weapons or mass-destructive weapons (nuclear weapons, chemical or biological weapons, or missiles), or any other weapons.

〈For customers in Japan〉

For products which are controlled items subject to the "Foreign Exchange and Foreign Trade Law" of Japan, the export license specified by the law is required for export.

2. Please contact our sales representatives or product engineers before using our products listed in this catalog for the applications listed below which require especially high reliability for the prevention of defects which might directly cause damage to the third party's life, body or property, or when intending to use one of our products for other applications than specified in this catalog.

- ① Aircraft equipment
- ② Aerospace equipment
- ③ Undersea equipment
- ④ Power plant equipment
- ⑤ Medical equipment
- ⑥ Transportation equipment (vehicles, trains, ships, etc.)
- ⑦ Traffic signal equipment
- ⑧ Disaster prevention / crime prevention equipment
- ⑨ Data-processing equipment
- ⑩ Application of similar complexity and/or reliability requirements to the applications listed in the above

3. Product specifications in this catalog are as of April 2001. They are subject to change or our products in it may be discontinued without advance notice. Please check with our sales representatives or product engineers before your ordering. If there are any questions, please contact our sales representatives or product engineers.**4. The parts numbers and specifications listed in this catalog are for information only. You are requested to approve our product specification or to transact the approval sheet for product specification, before your ordering.****5. Please note that unless otherwise specified, we shall assume no responsibility whatsoever for any conflict or dispute that may occur in connection with the effect of our and/or third party's intellectual property rights and other related rights in consideration of your using our products and/or information described or contained in our catalogs. In this connection, no representation shall be made to the effect that any third parties are authorized to use the rights mentioned above under licenses without our consent.****6. None of ozone depleting substances (ODS) under the Montreal Protocol is used in manufacturing process of us.****Murata Manufacturing Co., Ltd.**<http://www.murata.co.jp/products/>**Head Office**

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