Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!

Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
Email & Skype: info@chipsmall.com Web: www.chipsmall.com
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

C30E.pdf
May 9,2016

muRata
INNOVATOR IN ELECTRONICS

EMI Suppression Filters (Lead Type EMIFIL®)

EU RoHS Compliant

- All the products in this catalog comply with EU RoHS.
- EU RoHS is "the European Directive 2011/65/EU on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment."
- For more details, please refer to our website 'Murata's Approach for EU RoHS' (http://www.murata.com/en-eu/support/compliance/rohs).

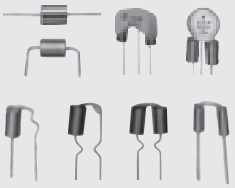
Contents

Product specifications are as of January 2016.

Please check the MURATA website (**http://www.murata.com/**)
if you cannot find a part number in this catalog.

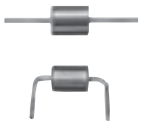
muRata

Product Guide/Effective Frequency Range

Type	Series	Effective Frequency Range 10kHz 100kHz 1MHz 10MHz 100MHz 1GHz 10GHz
Disc Type EMIFIL® **Ferrite Bead Inductor** 	**BL01/02/03** **DSN9H** **DSS1** **DST9H**	
EMIGUARD® **(EMI Filters with varistor functions)** 	**VFC2H**	
	**VFR3V** **VFS6V/9V**	
Common Mode Choke Coils 	**PLT09H**	

Outline of EMI Suppression Filters (EMIFIL®) for DC Line

●Ferrite Bead Inductor



BL01

BL02RN1

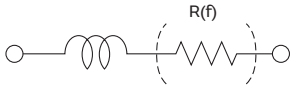
BL02RN2

BL03RN2

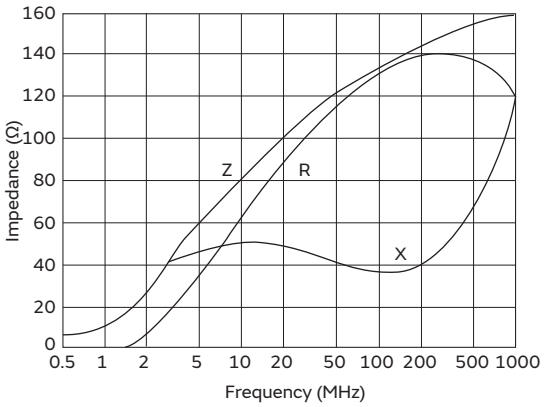
Outline

- Ferrite Bead Inductors are effective for frequencies ranging from a few MHz to a few GHz. Ferrite Bead Inductors are widely used as a low noise countermeasure, as well as a universal noise suppression component.
- Ferrite Bead Inductors produce a micro inductance in a 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.

Equivalent Circuit



Impedance - Frequency Characteristics (typical)



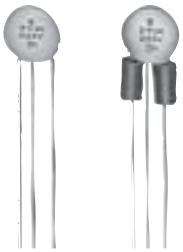
R: Real Part (Resistive Portion) X: Imaginary Part (Inductive Portion)

Outline of EMI Suppression Filters (EMIFIL®) for DC Line

●Disc Type EMIFIL®

Disc Type EMIFIL® ·····p.12–15

DSS1



DS□9H

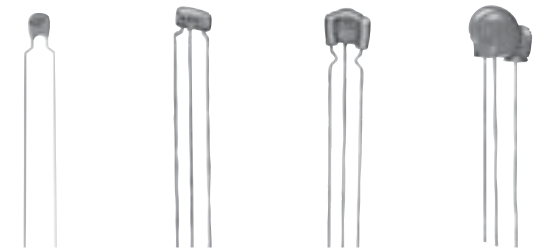
Outline

- 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.
- Three-terminal construction reduces residual inductance, thereby substantially improving noise suppression at frequencies over 10MHz.

Outline of EMI Suppression Filters (EMIFIL®) for DC Line

●EMIGUARD®

EMIGUARD® ·····p.17–24

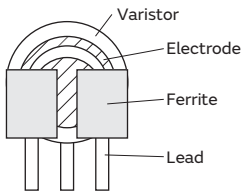


VFC2H　VFR3V　VFS6V　VFS9V

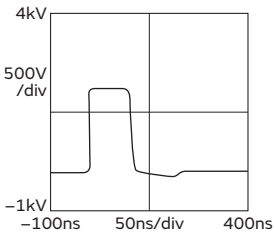
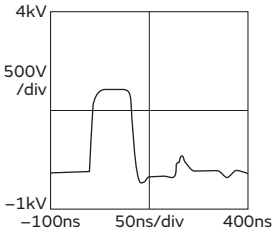
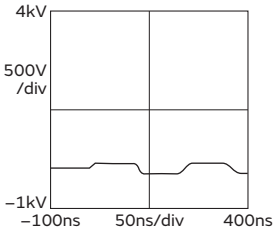
Outline

- EMIGUARD® eliminates both surge noise and EMI noise applying some unique design like the use of dielectric varistor material to a 3 terminal capacitor.
- 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.

Construction of EMIGUARD® (VFS9V)



Surge Absorption Effect of EMIGUARD®

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

Outline of EMI Suppression Filters (EMIFIL®) for DC Line

●Common Mode Choke Coil

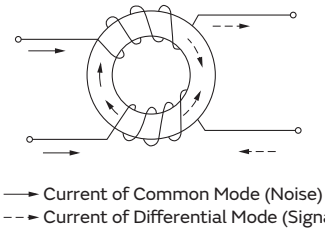
Common Mode Choke Coil ·····p.26

PLT09H

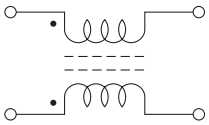
Outline

● 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 100MHz frequency range.
They are ideally suited for noise suppression on DC power supply lines and interface cables.

Construction of Common Mode Choke Coil



Equivalent Circuit



EMI Suppression Filters (Lead Type EMIFIL®)

Ferrite Beads Inductors Part Numbering

Ferrite Beads Inductors

(Part Number) BL 02 RN 2 R1 M 2 B
❶ ❷ ❸ ❹ ❺ ❻ ❼ ❽

❶Product ID

Product ID	
BL	Ferrite Beads Inductors

❷Series

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

❸Beads Core Material

Code	Beads Core Material
RN	Standard Type

❹Numbers of Beads Core

Code	Numbers of Beads Core
1	1
2	2

❺Lead Type

Code	Lead Type	Series
A1	Axial Straight Type	BL01
A2	Axial Crimp Type	BL01
R1	Radial Straight Type	BL02/BL03
R2	Radial Straight and Wave Formed Leads Type	BL02
R3	Radial Incrimp Type	BL02

❻Lead Length, Space

Code	Lead Length, Space	Series
A	Bulk, Axial Type, 3.7mm	BL01
D	Bulk, Axial Type, 45.0mm	
E	Taping, Axial Type, 26.0mm	
F	Taping, Axial Type, 52.0mm	
J	Bulk, Radial Type, 5.0mm	BL02/BL03
M	Bulk, Radial Type, 10.0mm	
N	Taping, Radial Type, 16.5mm	
P	Taping, Radial Type, 18.5mm	
Q	Taping, Radial Type, 20.0mm	

❼Lead Diameter

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

❽Packaging

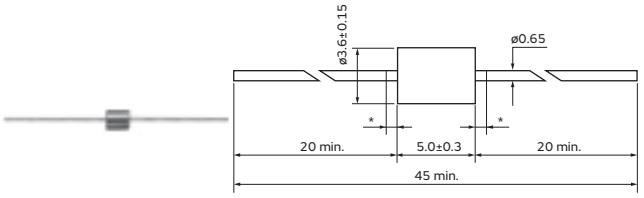
Code	Packaging	Series
A	Ammo Pack	BL01/BL02/BL03
B	Bulk	All Series

EMI Suppression Filters (Lead Type EMIFIL®)

Ferrite Beads Inductors BL01/02/03 Series

Features

BL01/02/03 series are ferrite beads with lead wires to produce a high frequency loss for suppression of noise. Simple construction and easy-to-use, effective for low impedance circuits such as power supplies and grounds. Effective also for preventing overshoot and undershoot of digital signal in clocks or the like, and suppressing the higher harmonic wave. Suitable for prevention of abnormal oscillation at high frequency amplifying circuit.

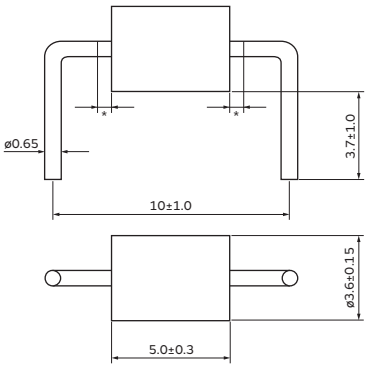


*Coating extending on leads : 1.5 max.

BL01RN1A1D2B

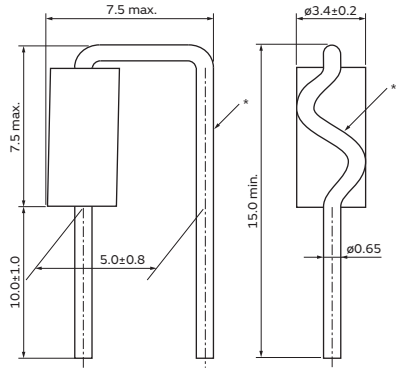
(in mm)

BL01RN1A2A2B



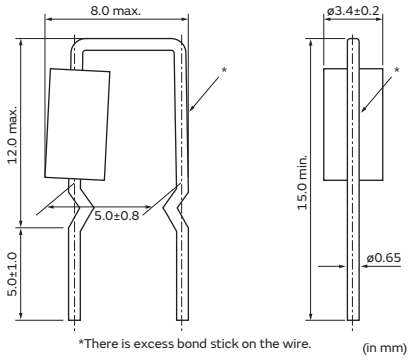
*Coating extending on leads : 1.5 max. (in mm)

BL02RN1R2M2B



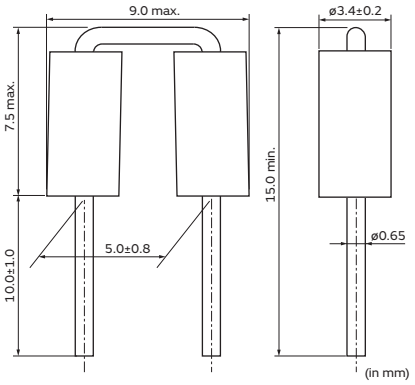
*There is excess bond stick on the wire. (in mm)

BL02RN1R3J2B



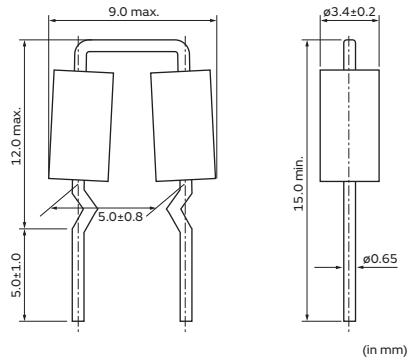
*There is excess bond stick on the wire. (in mm)

BL02RN2R1M2B



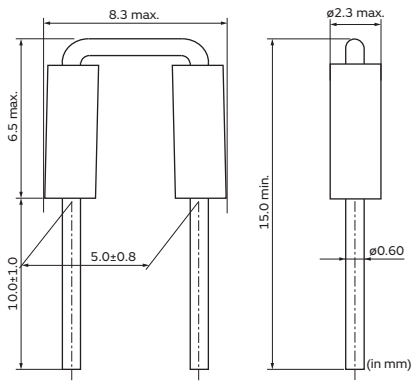
(in mm)

BL02RN2R3J2B



(in mm)

BL03RN2R1M1B



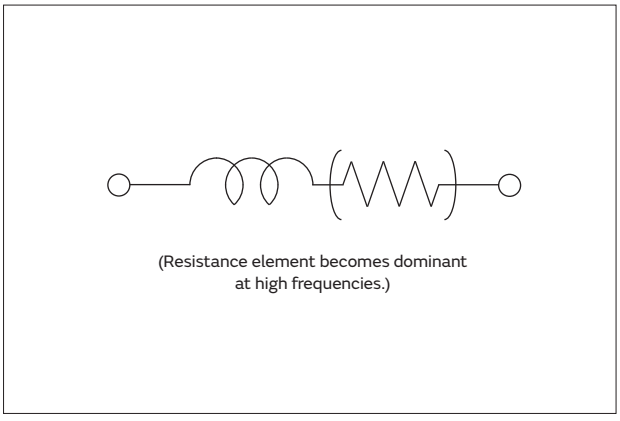
(in mm)

BL01/BL02/BL03 Series

Part Number	Rated Current (A)	Operating Temperature Range
BL01RN1A1D2B	7	-40 to +85°C
BL01RN1A1E1A	6	-40 to +85°C
BL01RN1A1F1A	6	-40 to +85°C
BL01RN1A2A2B	7	-40 to +85°C
BL02RN1R2M2B	7	-40 to +85°C
BL02RN1R2N1A	6	-40 to +85°C
BL02RN1R2P1A	6	-40 to +85°C
BL02RN1R2Q1A	6	-40 to +85°C
BL02RN1R3J2B	7	-40 to +85°C
BL02RN1R3N1A	6	-40 to +85°C
BL02RN2R1M2B	7	-40 to +85°C
BL02RN2R1N1A	6	-40 to +85°C
BL02RN2R1P1A	6	-40 to +85°C
BL02RN2R1Q1A	6	-40 to +85°C
BL02RN2R3J2B	7	-40 to +85°C
BL02RN2R3N1A	6	-40 to +85°C
BL03RN2R1M1B	6	-40 to +85°C
BL03RN2R1N1A	6	-40 to +85°C
BL03RN2R1P1A	6	-40 to +85°C
BL03RN2R1Q1A	6	-40 to +85°C

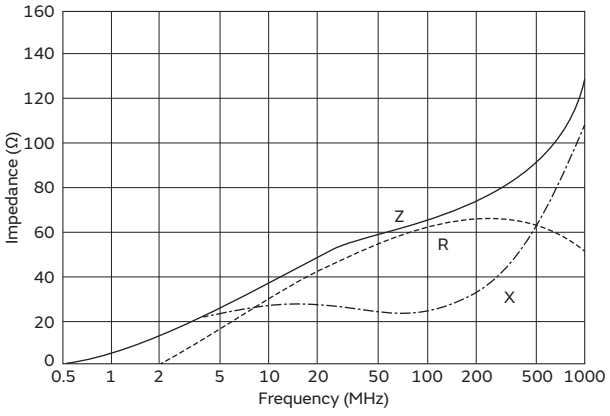
Please refer to p.30, "Packaging" for Dimensions of Part Numbers Except for 'B' for the last code.

Equivalent Circuit

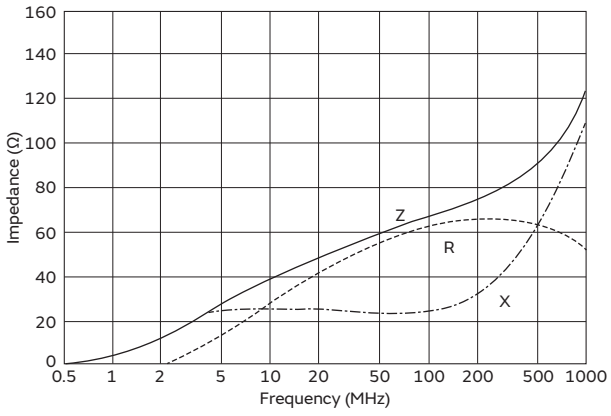


Impedance - Frequency Characteristics

BL01RN1



BL02RN1

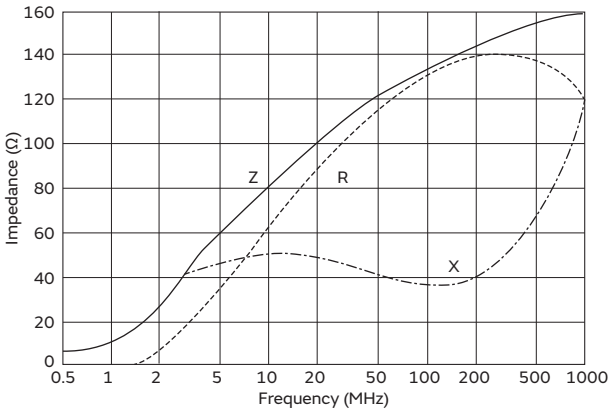


Continued on the following page. ↗

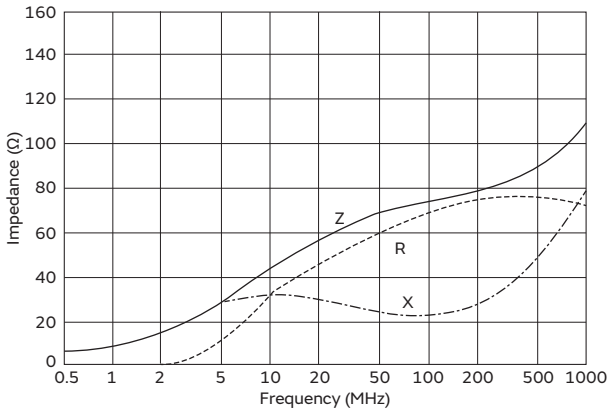
Continued from the preceding page.↘

Impedance - Frequency Characteristics

BL02RN2



BL03RN2



EMI Suppression Filters (Lead Type EMIFIL®)

Disc Type EMIFIL® Part Numbering

Disc Type EMIFIL®

(Part Number)

DS	N	9	H	B3	2E	101	Q92	A
❶	❷	❸	❹	❺	❻	❼	❽	❾

❶Product ID

Product ID	
DS	Three-terminal Capacitor

❷Structure

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

❸Style

Code	Style
1	Expressed by a letter.
9	

❹Category

Code	Category
N	for General Use
H	for Heavy-duty

❺Temperature Characteristics

Code	Capacitance Change
B3	±10% (Temperature Range: -25˚C to +85˚C)

❻Rated Voltage

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

❼Capacitance

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

❽Lead Type/❾Packaging

Code	Lead Type	Lead Length* (mm)	Packaging	Series
Q55B	Straight	25.0 min.	Bulk	All series
Q50B		4.0±0.5		DST9H
Q91A		20.0±1.0	Ammo Pack	DSN9H, DSS1N
Q92A		16.5±1.0		DS□9H
Q93A		18.5±1.0		

*Lead Distance between Reference and Bottom Planes Except for Bulk.

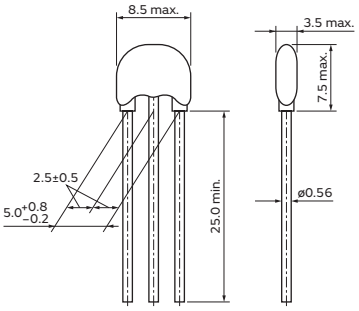
EMI Suppression Filters (Lead Type EMIFIL®)

Disc Type EMIFIL® DSS1 Series

Features

DSS1 series is a compact, high performance lead type 3 terminal capacitor which can be mounted in 2.54mm pitch.
Its three terminal structure enables nice high frequency performance.
Wide capacitance variation enables flexible selection for various noise frequencies.
High speed mounting is available with automatic insertion machine.

DSS1_Q55B Series



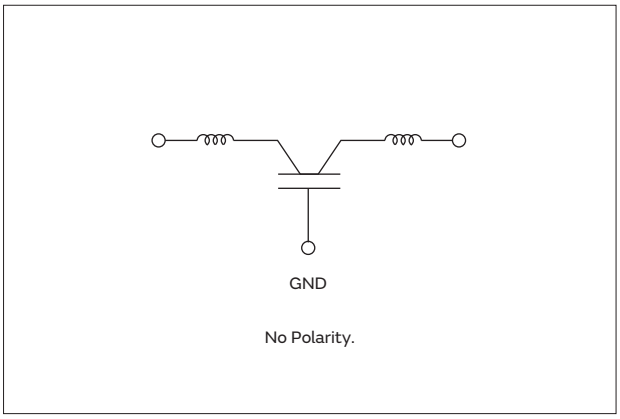
(in mm)

Built-in Ferrite Beads DSS1 Series

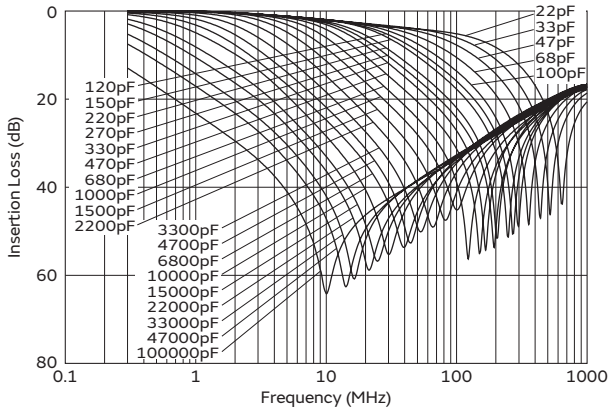
Part Number	Capacitance (pF)	Rated Voltage (Vdc)	Rated Current (A)	Operating Temperature Range
DSS1NB32A220	22 ±10%	100	6	-40 to +85°C
DSS1NB32A330	33 ±10%	100	6	-40 to +85°C
DSS1NB32A470	47 ±10%	100	6	-40 to +85°C
DSS1NB32A680	68 ±10%	100	6	-40 to +85°C
DSS1NB32A101	100 ±10%	100	6	-40 to +85°C
DSS1NB32A121	120 ±10%	100	6	-40 to +85°C
DSS1NB32A151	150 ±10%	100	6	-40 to +85°C
DSS1NB32A221	220 ±10%	100	6	-40 to +85°C
DSS1NB32A271	270 ±10%	100	6	-40 to +85°C
DSS1NB32A331	330 ±10%	100	6	-40 to +85°C
DSS1NB32A471	470 ±10%	100	6	-40 to +85°C
DSS1NB32A681	680 ±10%	100	6	-40 to +85°C
DSS1NB32A102	1000 ±10%	100	6	-40 to +85°C
DSS1NB32A152	1500 ±10%	100	6	-40 to +85°C
DSS1NB32A222	2200 ±10%	100	6	-40 to +85°C
DSS1NB32A332	3300 ±10%	100	6	-40 to +85°C
DSS1NB32A472	4700 ±10%	100	6	-40 to +85°C
DSS1NB32A682	6800 ±10%	100	6	-40 to +85°C
DSS1NB32A103	10000 ±10%	100	6	-40 to +85°C
DSS1NB32A153	15000 ±10%	100	6	-40 to +85°C
DSS1NB32A223	22000 ±10%	100	6	-40 to +85°C
DSS1NB31H333	33000 ±10%	50	6	-40 to +85°C
DSS1NB31H473	47000 ±10%	50	6	-40 to +85°C
DSS1NB31H104	100000 ±10%	50	6	-40 to +85°C

Please refer to Part Numbering for Type and Length of Lead.

Equivalent Circuit



Insertion Loss Characteristics



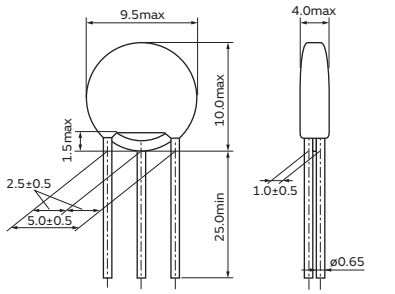
EMI Suppression Filters (Lead Type EMIFIL®)

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

Features

DS_9H is a basic type EMI suppression filter which can obtain high insertion loss in a wide frequency range.
Its three terminal structure enables nice high frequency performance. High rated voltage of 250Vdc and wide operating temperature range from -40 degrees C to 105 degrees C are suitable for high reliability circuits.

DSN9H_Q55B

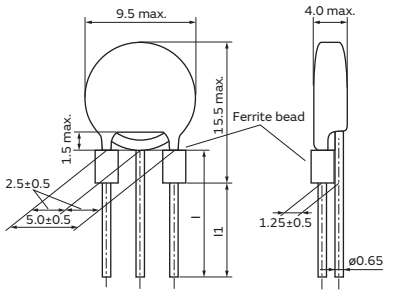


(in mm)

Supplement

Diameter of lead is 0.6mm for taping type.
Taping type is three terminal in-line arrangement.

DST9H_Q55B



Q55 Type: l = 25.0 min.
Q50 Type: l1 = 4.0±0.5

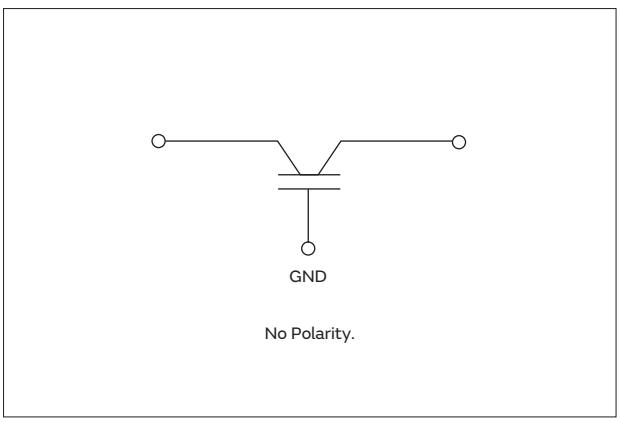
(in mm)

DSN9H Series

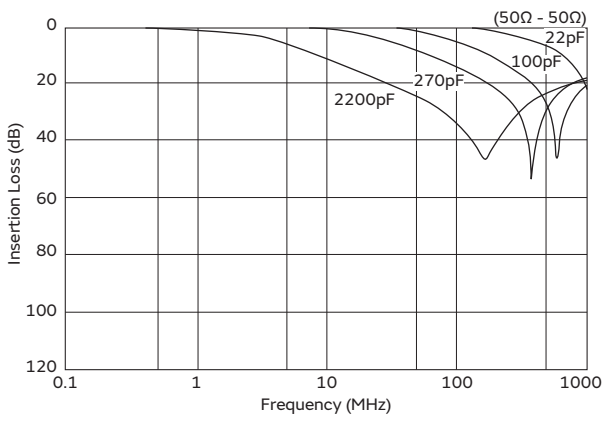
Part Number	Capacitance (pF)	Rated Voltage (Vdc)	Rated Current (A)	Operating Temperature Range
DSN9HB32E220	22 ±20%	250	6	-40 to +105°C
DSN9HB32E101	100 ±20%	250	6	-40 to +105°C
DSN9HB32E271	270 ±20%	250	6	-40 to +105°C
DSN9HB32E222	2200 ±20%	250	6	-40 to +105°C

Please refer to Part Numbering for Type and Length of Lead.

Equivalent Circuit



Insertion Loss Characteristics

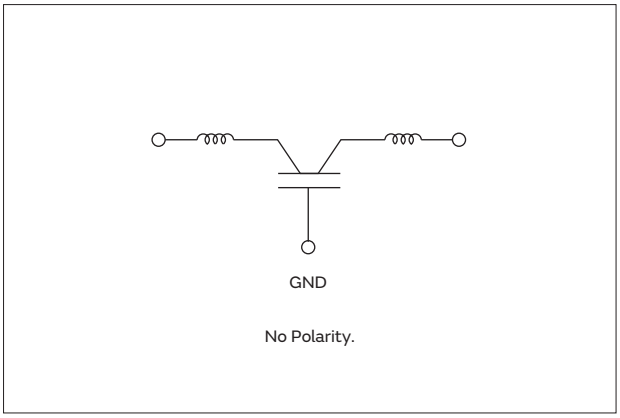


With Ferrite Beads DST9H Series

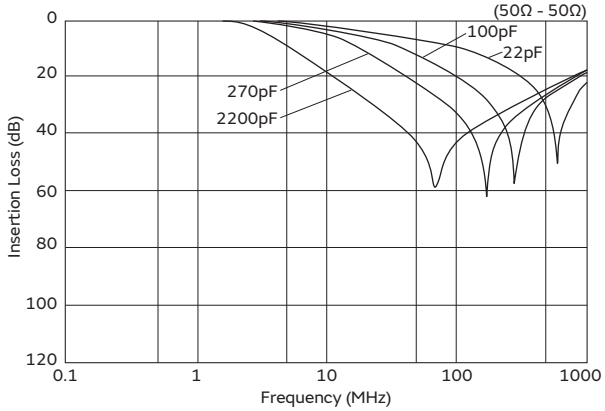
Part Number	Capacitance (pF)	Rated Voltage (Vdc)	Rated Current (A)	Operating Temperature Range
DST9HB32E220	22 ±20%	250	6	-40 to +105°C
DST9HB32E101	100 ±20%	250	6	-40 to +105°C
DST9HB32E271	270 ±20%	250	6	-40 to +105°C
DST9HB32E222	2200 ±20%	250	6	-40 to +105°C

Please refer to Part Numbering for Type and Length of Lead.

Equivalent Circuit



Insertion Loss Characteristics



EMI Suppression Filters (Lead Type EMIFIL®)

EMIGUARD® (EMIFIL® with Varistor Function) Part Numbering

EMIGUARD® (EMIFIL® with Varistor Function)

(Part Number)

VF	S	6	V	D8	1E	221				T51	B
❶	❷	❸	❹	❺	❻	❼				❿	⓫

VF	C	2	H	R7	1D	105	K	2	T51	B
❶	❷	❸	❹	❺	❻	❼	❽	❾	❿	⓫

❶Product ID

Product ID	
VF	EMIGUARD® Lead Type

❷Structure

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

❸Style

Code	Style
2	Size is expressed by a digit
3	
6	
9	

❹Features

Code	Features
V	with Varistor Function
H	with Varistor Function (for Automotive)

❺Temperature Characteristics

Code	Capacitance Change
D8	+20/-30% (Temperature Range: -40˚C to +105˚C)
D3	+20/-30% (Temperature Range: -25˚C to +85˚C)
R7	±15% (Temperature Range: -55˚C to +125˚C)

❻Rated Voltage

Code	Rated Voltage
1B	12V
1D	22V
1E	25V

❼Capacitance

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

❽Capacitance

Code	Capacitance
K	±10%

❾Varistor Voltage

Code	Varistor Voltage
2	27V

❿Lead Type/⓫Packaging

Code	Lead Type	Lead Length*	Packaging	Series
T51B	Incrimp	25.0mm min.	Bulk	VFR3/VFS6
U31A		18.5±1.0mm	Ammo Pack	
Q55B	Straight	25.0mm min.	Bulk	VFS9
Q91J		20.0±1.0mm	Paper Reel (ø320mm)	
Q92J		16.5±1.0mm		
Q93J		18.5±1.0mm		

*Lead Distance between Reference and Bottom Planes Except for Bulk.

Code	Lead Type	Lead Length*	Packaging	Series
K1B	Inside Crimp	26.0±1.0mm	Bulk	VFC2
M1A		18.0±1.0mm	Ammo Pack	
M1J			Paper Reel (ø320mm)	

*From bottom of the crimp.

EMI Suppression Filters (Lead Type EMIFIL®)

EMIGUARD® (EMIFIL® with Varistor Function) VFC2H/VFR3V/VFS6V/VFS9V Series

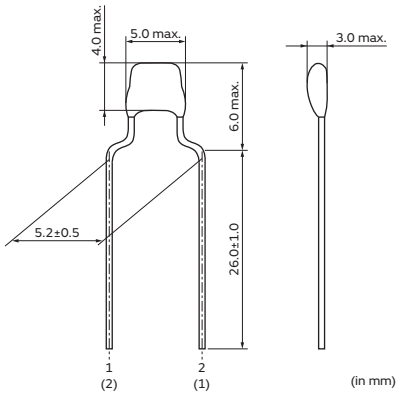
VFC2H Series

VFC2H series is EMI suppression filters of lead type that combines the varistor and capacitor.

Features

1. Suitable for absorbing surge voltages occurred from inductive load of motors, relays, etc.
2. High maximum energy
3. Smaller size, High capacitance
4. Taping is capable of fast implementation of automatic insertion.

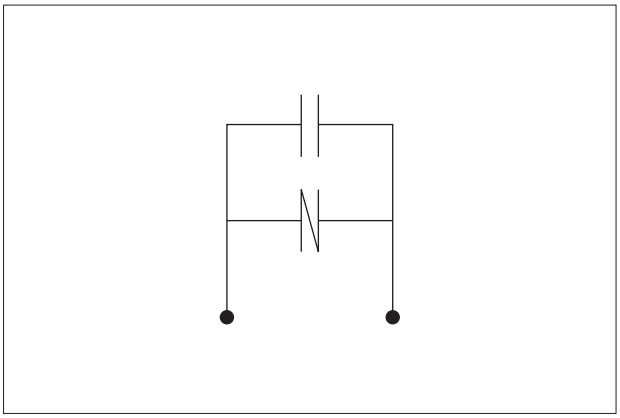
VFC2H Series



Part Number	Varistor Voltage (Vdc)	Capacitance (μF)	Temperature Characteristics	Rated Voltage (Vdc)	Rated Current	Insulation Resistance (min.) (M ohm)	Operating Temperature Range
VFC2HR71D105K2	27 +5/-3V	1.0 ±10%	R7 (±15%)	22	-	1	-55 to 125°C

Please refer to Part Numbering for Type and Length of Lead.

Equivalent Circuit



Semiconductor Protection VFR3V Series

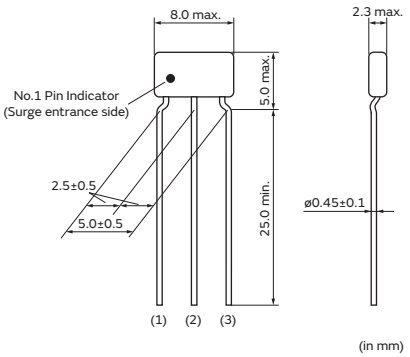
Features

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

Applications

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

VFR3V Series

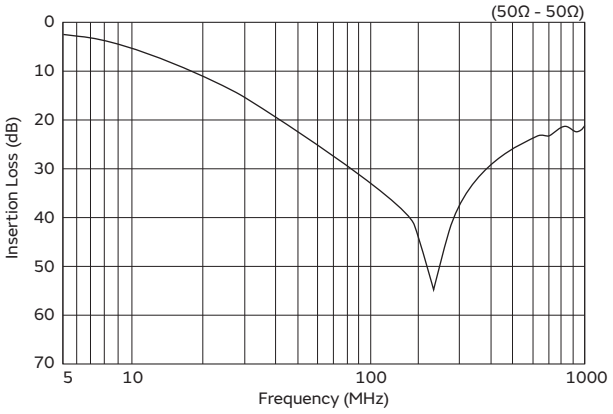


(in mm)

Part Number	Varistor Voltage (Vdc)	Capacitance (pF)	Rated Voltage (Vdc)	Rated Current (mA)	Peak Pulse Current (A)	Operating Temperature Range
VFR3VD31E131	50 ±20%	130 ±20%	25	20	30	-25 to 85°C

Please refer to Part Numbering for Type and Length of Lead.

Insertion Loss Characteristics



muRata

Signal Line VFS6V Series

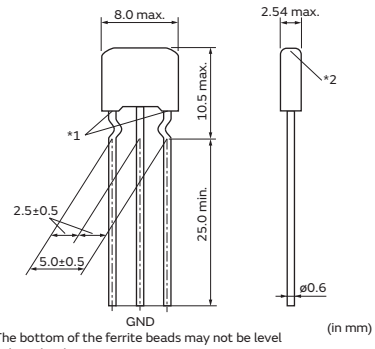
Features

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

Applications

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

VFS6V Series



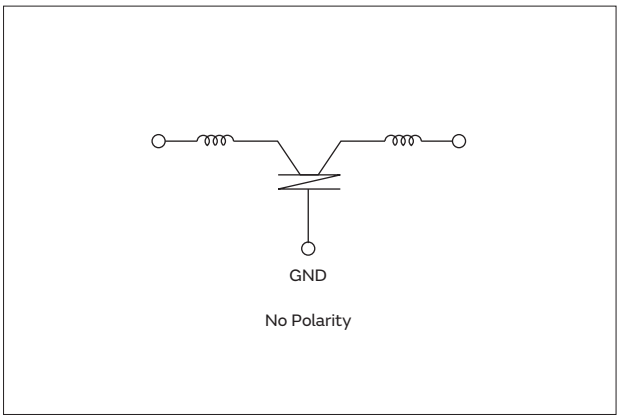
(in mm)

*1 The bottom of the ferrite beads may not be level with each other.
*2 There may be a hole on the top of ferrite beads, which causes no characteristics deterioration.

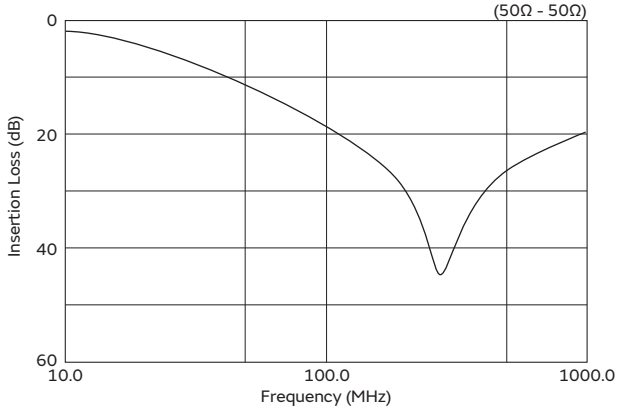
Part Number	Varistor Voltage (Vdc)	Capacitance (pF)	Rated Voltage (Vdc)	Rated Current (A)	Peak Pulse Current (A)	Operating Temperature Range
VFS6VD81E221	50 ±20%	220 ±20%	25	6	100	-40 to 105°C

Please refer to Part Numbering for Type and Length of Lead.

Equivalent Circuit



Insertion Loss Characteristics



Large Current VFS9V Series

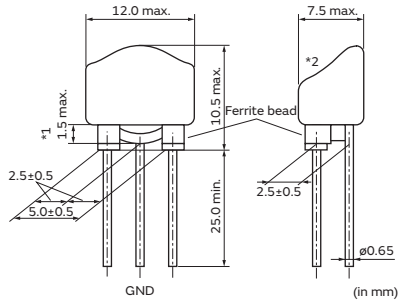
Features

VFS9V series is designed for surge protection of the power supply. It protects electric circuits from surge such as static electricity and suppresses 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.

VFS9V Series

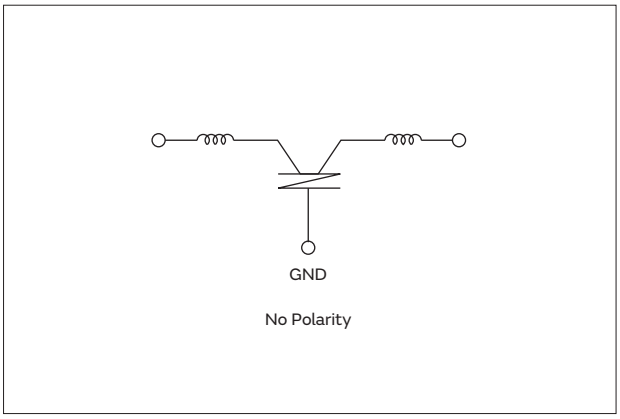


*1 Coating extending on leads does not exceed the tangent line. Exposed electrode, if any, is covered by solder, etc.
*2 If there is a hole in the top of the filter, the ferrite bead should not be exposed.

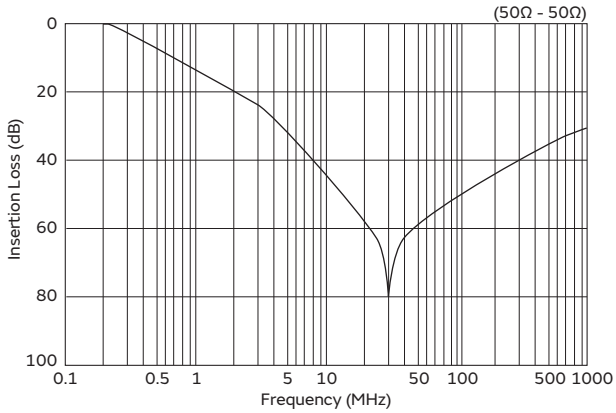
Part Number	Varistor Voltage (Vdc)	Capacitance (pF)	Rated Voltage (Vdc)	Rated Current (A)	Operating Temperature Range
VFS9VD31B223	22 ±20%	22000 +50/-20%	12	7	-40 to 100°C

Rated current is 7A for bulk type and 6A for taping type.
Rated current of taping type is 6A because the diameter of the lead is 0.6mm and its lead layout is the in-line type.
Please refer to Part Numbering for Type and Length of Lead.

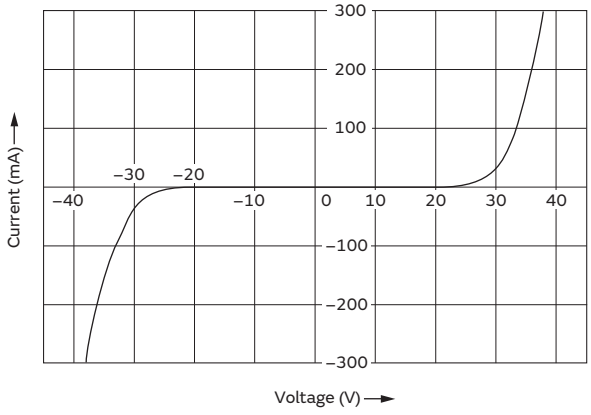
Equivalent Circuit



Insertion Loss Characteristics



Voltage - Current Characteristics

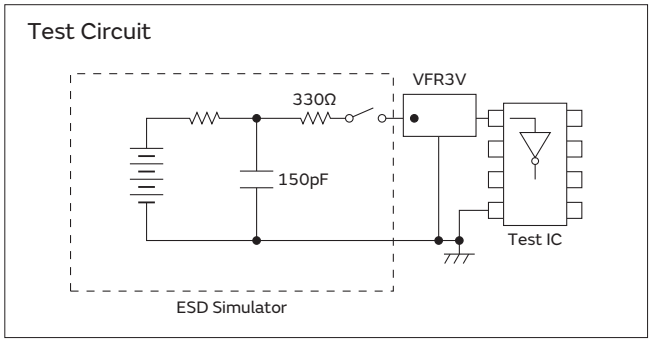


Noise Suppression Effect of VFR/VFS Series

Example of IC Protection (VFR3V)

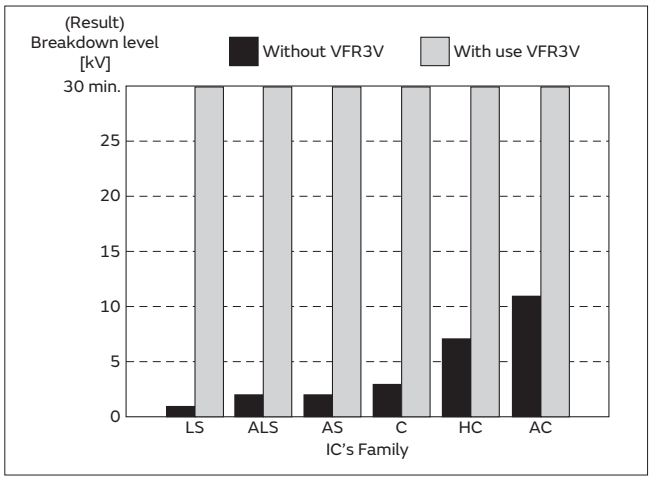
● Testing Method

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 steps.
4. Continue above steps 1 to 3 till IC's operation becomes abnormal.

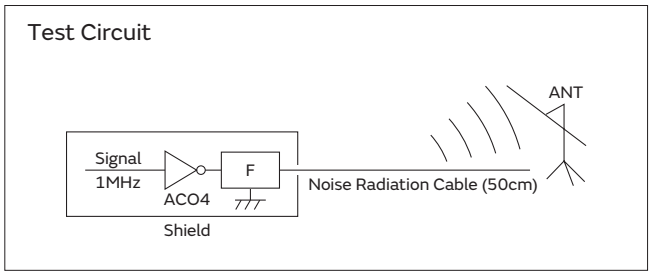


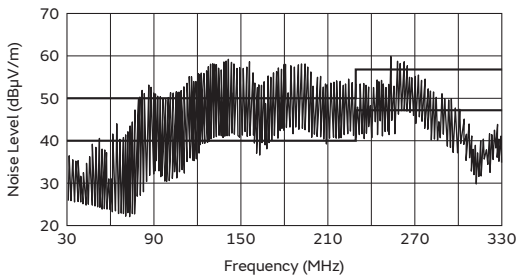
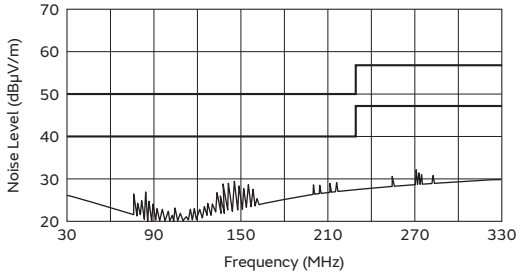
● Result

Varistor VFR3V can protect IC from ESD.



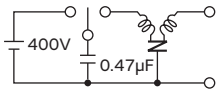
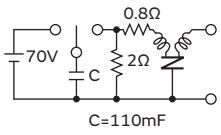
Example of EMI Suppression Effect



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

Noise Suppression Effect of VFR/VFS Series

Features (VFS9V)

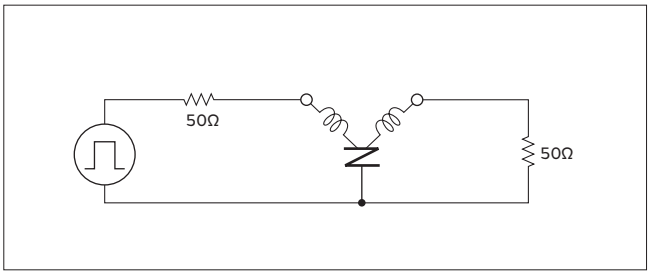
Items	Test methods	Rated values
Overload	1.4 times the varistor voltage (V_1) is applied for 5 minutes at room temperature.	
Surge Test (1)	At room temperature, Surges are applied 10^5 times every 2 seconds. Then after 1 or 2 hours, the sample is measured. 	
Surge Test (2)	At room temperature, the capacitor "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±3°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.	

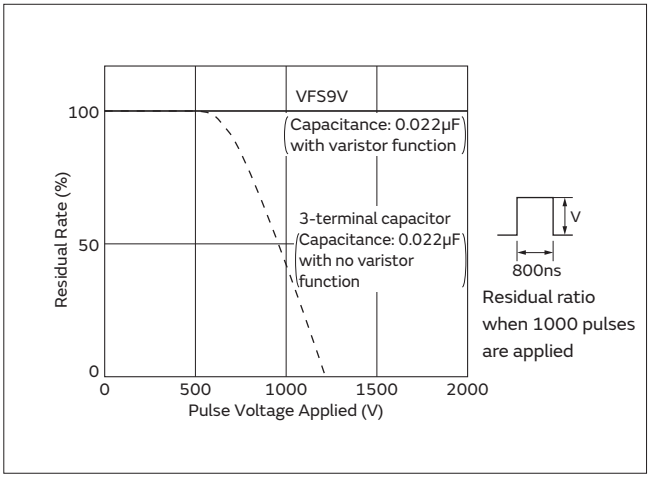
Items	Specifications
Rated Capacitance Change	Within±15%
Insulation Resistance	500kΩ min.
Rated of Change in Varistor Voltage V_1*	Within±15%
Voltage Rate	1.30 max.

*V_1: Voltage when 1mA is applied

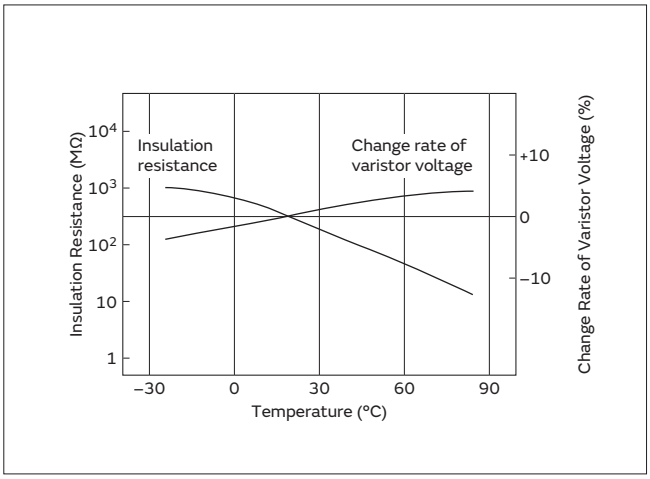
Pulse-Voltage Breakdown Characteristic (VFS9V)

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





Temperature Characteristics of Varistor Voltage - Insulation Resistance (VFS9V)

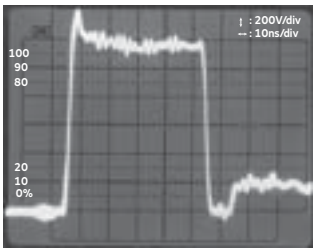
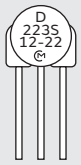
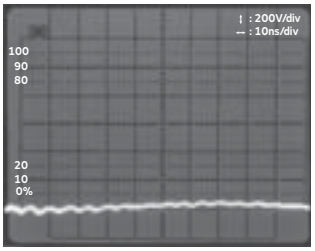


Continued on the following page.↗

Noise Suppression Effect of VFR/VFS Series

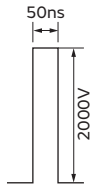
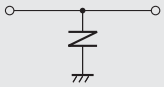
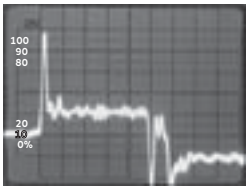
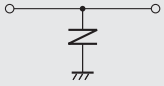
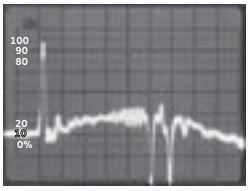
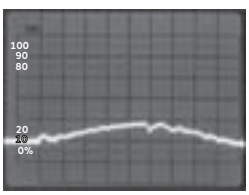
Continued from the preceding page.↘

Noise Absorption Effect of EMIGUARD® (VFS9V)

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 (VFS9V)

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 two-terminal capacitor
Two-terminal capacitor (with varistor function) 		The two-terminal capacitor is influenced by lead line inductance, leaving behind some of the rising and falling edges. The residual noise can cause the system to malfunction.
VFS9V 		The three-terminal structure eliminates most of the lead line inductance. This allows VFS9V to completely absorb the rising and falling edges of the applied pulses.

Continued on the following page.↗