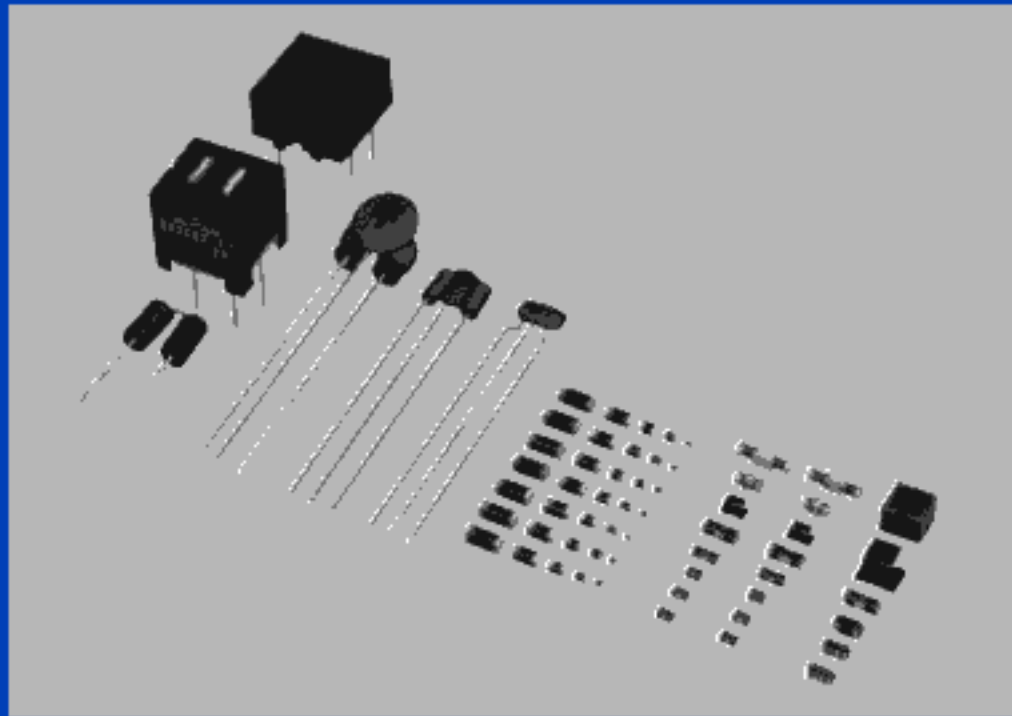


# On-Board Type (DC) EMI Suppression Filters (EMIFIL<sup>®</sup>)

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

[www.DataSheet4U.com](http://www.DataSheet4U.com)

## EMI SUPPRESSION FILTERS



**murata** *Innovator  
in Electronics*  
Murata  
Manufacturing Co., Ltd.

[www.DataSheet4U.com](http://www.DataSheet4U.com)

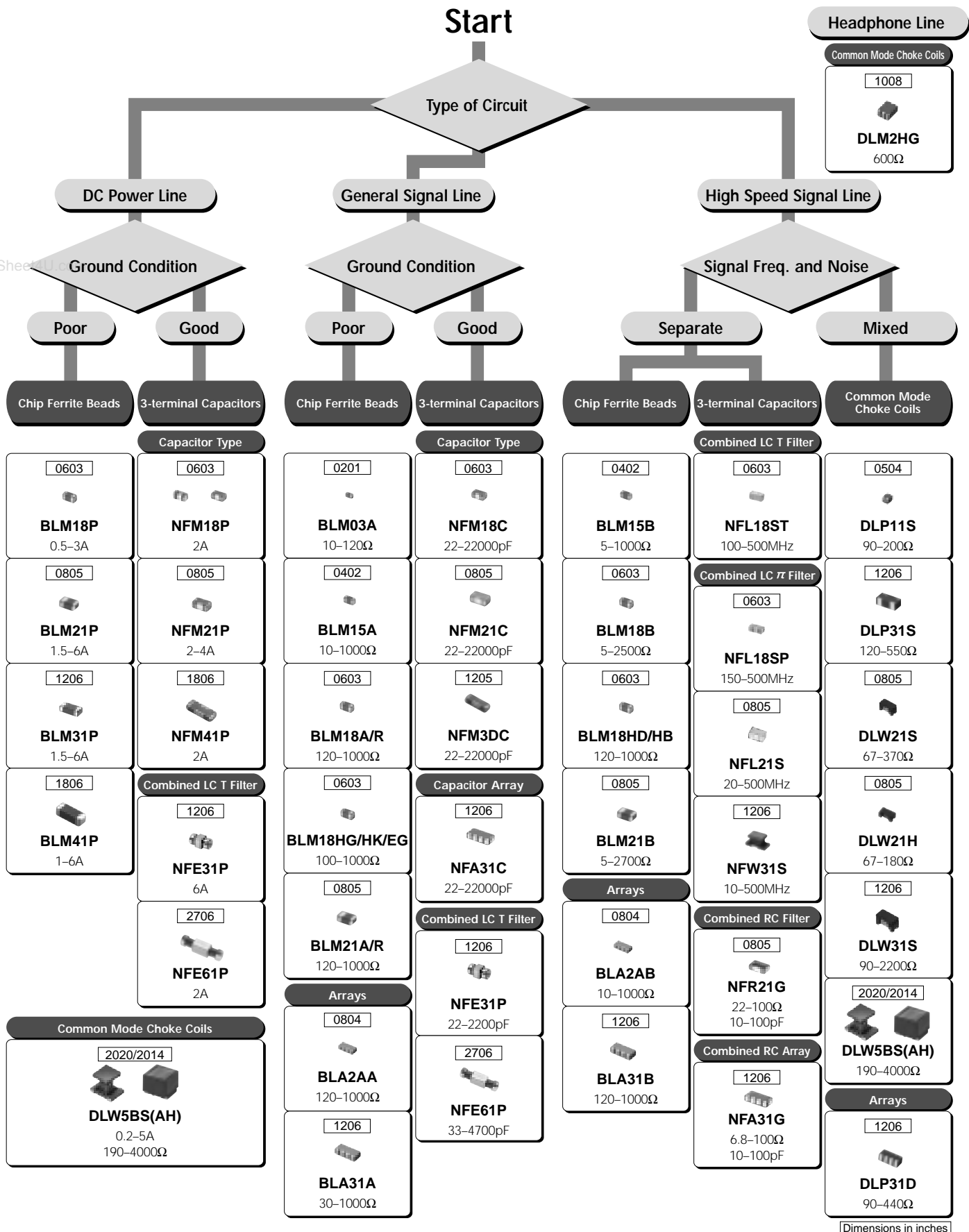
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EMIFIL®, EMIGUARD®, "EMIFIL" and "EMIGUARD" in this catalog are the trademarks of Murata Manufacturing Co., Ltd.

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# Selection Guide of EMI Filters



**High Current EMI Filters**

**Standard EMI Filters**

**EMI Filters for High Speed Signal Lines**

Impedance is typical value at 100MHz.

## Products Guide/Effective Frequency Range

### Product Guide

| Inductor Type                   | Type                         | Series                       | Dimensions   |             | Effective Frequency Range |        |      |       |        |      |       |  |  |
|---------------------------------|------------------------------|------------------------------|--------------|-------------|---------------------------|--------|------|-------|--------|------|-------|--|--|
|                                 |                              |                              | (mm)         | EIA Code    | 10kHz                     | 100kHz | 1MHz | 10MHz | 100MHz | 1GHz | 10GHz |  |  |
| www.DataSheet4U.com             | For Digital Interfaces       | BLM18R                       | 1.6<br>±0.8  | 0603        |                           |        |      |       |        |      |       |  |  |
|                                 |                              | BLM21R                       | 2.0<br>±1.25 | 0805        |                           |        |      |       |        |      |       |  |  |
|                                 | Standard                     | BLM03A                       | 0.6<br>±0.3  | 0201        |                           |        |      |       |        |      |       |  |  |
|                                 |                              | BLM15A                       | 1.0<br>±0.5  | 0402        |                           |        |      |       |        |      |       |  |  |
|                                 |                              | BLM18A                       | 1.6<br>±0.8  | 0603        |                           |        |      |       |        |      |       |  |  |
|                                 |                              | BLM21A                       | 2.0<br>±1.25 | 0805        |                           |        |      |       |        |      |       |  |  |
|                                 |                              | BLM31A                       | 3.2<br>±1.6  | 1206        |                           |        |      |       |        |      |       |  |  |
|                                 |                              | BLM41A                       | 4.5<br>±1.6  | 1806        |                           |        |      |       |        |      |       |  |  |
|                                 |                              | BLA2AA<br>(4 circuits array) | 2.0<br>±1.0  | 0804        |                           |        |      |       |        |      |       |  |  |
|                                 |                              | BLA31A<br>(4 circuits array) | 3.2<br>±1.6  | 1206        |                           |        |      |       |        |      |       |  |  |
|                                 |                              | For High Speed Signals       | BLM15B       | 1.0<br>±0.5 | 0402                      |        |      |       |        |      |       |  |  |
|                                 | BLM18B                       |                              | 1.6<br>±0.8  | 0603        |                           |        |      |       |        |      |       |  |  |
|                                 | BLM21B                       |                              | 2.0<br>±1.25 | 0805        |                           |        |      |       |        |      |       |  |  |
|                                 | BLM31B                       |                              | 3.2<br>±1.6  | 1206        |                           |        |      |       |        |      |       |  |  |
|                                 | BLA2AB<br>(4 circuits array) |                              | 2.0<br>±1.0  | 0804        |                           |        |      |       |        |      |       |  |  |
|                                 | BLA31B<br>(4 circuits array) |                              | 3.2<br>±1.6  | 1206        |                           |        |      |       |        |      |       |  |  |
|                                 | For High Current             | BLM18P                       | 1.6<br>±0.8  | 0603        |                           |        |      |       |        |      |       |  |  |
|                                 |                              | BLM21P                       | 2.0<br>±1.25 | 0805        |                           |        |      |       |        |      |       |  |  |
|                                 |                              | BLM31P                       | 3.2<br>±1.6  | 1206        |                           |        |      |       |        |      |       |  |  |
|                                 |                              | BLM41P                       | 4.5<br>±1.6  | 1806        |                           |        |      |       |        |      |       |  |  |
| For GHz Range Noise Suppression | BLM18HG                      | 1.6<br>±0.8                  | 0603         |             |                           |        |      |       |        |      |       |  |  |
|                                 | BLM18HB                      | 1.6<br>±0.8                  | 0603         |             |                           |        |      |       |        |      |       |  |  |
|                                 | BLM18HD                      | 1.6<br>±0.8                  | 0603         |             |                           |        |      |       |        |      |       |  |  |
|                                 | BLM18HK                      | 1.6<br>±0.8                  | 0603         |             |                           |        |      |       |        |      |       |  |  |
|                                 | BLM18EG                      | 1.6<br>±0.8                  | 0603         |             |                           |        |      |       |        |      |       |  |  |

Continued on the following page.

## Products Guide/Effective Frequency Range

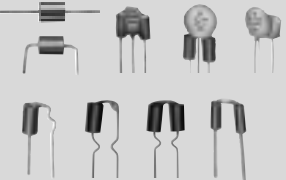




Continued from the preceding page.

| Type               | Series                    | Dimensions                   |                | Effective Frequency Range |        |      |       |        |      |       |  |  |
|--------------------|---------------------------|------------------------------|----------------|---------------------------|--------|------|-------|--------|------|-------|--|--|
|                    |                           | (mm)                         | EIA Code       | 10kHz                     | 100kHz | 1MHz | 10MHz | 100MHz | 1GHz | 10GHz |  |  |
| Capacitor Type     | Standard Type             | NFM18C                       | 1.6<br>±0.8    | 0603                      |        |      |       |        |      |       |  |  |
|                    |                           | NFM21C                       | 2.0<br>±1.25   | 0805                      |        |      |       |        |      |       |  |  |
|                    |                           | NFM3DC                       | 3.2<br>±1.25   | 1205                      |        |      |       |        |      |       |  |  |
|                    |                           | NFM41C                       | 4.5<br>±1.6    | 1806                      |        |      |       |        |      |       |  |  |
|                    |                           | NFA31C<br>(4 circuits array) | 3.2<br>±1.6    | 1206                      |        |      |       |        |      |       |  |  |
|                    | For Signal Lines          | NFL18ST                      | 1.6<br>±0.8    | 0603                      |        |      |       |        |      |       |  |  |
|                    |                           | NFL18SP                      | 1.6<br>±0.8    | 0603                      |        |      |       |        |      |       |  |  |
|                    |                           | NFL21S                       | 2.0<br>±1.25   | 0805                      |        |      |       |        |      |       |  |  |
|                    |                           | NFR21G                       | 2.0<br>±1.25   | 0805                      |        |      |       |        |      |       |  |  |
|                    |                           | NFA31G<br>(4 circuits array) | 3.2<br>±1.6    | 1206                      |        |      |       |        |      |       |  |  |
|                    |                           | NFW31S                       | 3.2<br>±1.6    | 1206                      |        |      |       |        |      |       |  |  |
|                    | For High Current          | NFM18P                       | 1.6<br>±0.8    | 0603                      |        |      |       |        |      |       |  |  |
|                    |                           | NFM21P                       | 2.0<br>±1.25   | 0805                      |        |      |       |        |      |       |  |  |
|                    |                           | NFM3DP                       | 3.2<br>±1.25   | 1205                      |        |      |       |        |      |       |  |  |
|                    |                           | NFM41P                       | 4.5<br>±1.6    | 1806                      |        |      |       |        |      |       |  |  |
|                    | T Filter for High Current | NFE31P                       | 3.2<br>±1.6    | 1206                      |        |      |       |        |      |       |  |  |
|                    |                           | NFE61P(H)                    | 6.8<br>±1.6    | 2706                      |        |      |       |        |      |       |  |  |
|                    | With Varistor Function    | VFM41R                       | 4.5<br>±1.6    | 1806                      |        |      |       |        |      |       |  |  |
|                    | Common Mode Choke Coils   | DLP11S                       | 1.25<br>±1.0   | 0504                      |        |      |       |        |      |       |  |  |
| DLP31S             |                           | 3.2<br>±1.6                  | 1206           |                           |        |      |       |        |      |       |  |  |
| DLP31D             |                           | 3.2<br>±1.6                  | 1206           |                           |        |      |       |        |      |       |  |  |
| DLM2HG             |                           | 2.5<br>±2.0                  | 1008           |                           |        |      |       |        |      |       |  |  |
| DLW21S             |                           | 2.0<br>±1.2                  | 0805           |                           |        |      |       |        |      |       |  |  |
| DLW21H             |                           | 2.0<br>±1.2                  | 0805           |                           |        |      |       |        |      |       |  |  |
| DLW31S             |                           | 3.2<br>±1.6                  | 1206           |                           |        |      |       |        |      |       |  |  |
| DLW5BS<br>(DLW5AH) |                           | 5.0<br>±5.0<br>(3.6)         | 2020<br>(2014) |                           |        |      |       |        |      |       |  |  |

Continued on the following page

## Products Guide/Effective Frequency Range

↳ Continued from the preceding page.

| Type  | Series  | Dimensions |          | Effective Frequency Range |        |      |       |        |      |       |  |  |
|---|---|------------|----------|---------------------------|--------|------|-------|--------|------|-------|--|--|
|   |   | (mm)       | EIA Code | 10kHz                     | 100kHz | 1MHz | 10MHz | 100MHz | 1GHz | 10GHz |  |  |
| Disc EMIFIL®<br>                                       | BL01/02/03<br>DSN6/9(H)<br>DSS6/9(H)<br>DST9(H) |            |          |                           |        |      |       |        |      |       |  |  |
| EMIGUARD®<br>(EMI Filters with varistor functions)<br> | VFR3V<br>VFS6V/9V                               |            |          |                           |        |      |       |        |      |       |  |  |
| Block EMIFIL®<br>                                      | BNX   |            |          |                           |        |      |       |        |      |       |  |  |
| Common Mode Choke Coils<br>                           | PLT09H  |            |          |                           |        |      |       |        |      |       |  |  |
| EMC Absorber<br>                                     | EA10/20/21                                      |            |          |                           |        |      |       |        |      |       |  |  |

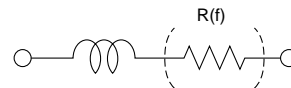
## Outline of EMI Suppression Filters (EMIFIL<sup>®</sup>) for DC Line

- Chip Ferrite Bead
- Ferrite Bead Inductor

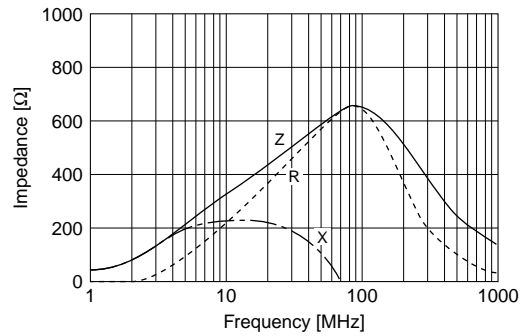
|   |  |
|---|--|
| Chip Ferrite Bead .....P.18–65  | Ferrite Bead Inductor .....P.106–108   |
| <p>BLM03   BLM15   BLM18   BLA2A</p> <p>BLM21   BLM31   BLM41   BLA31</p> | <p>BL01   BL02RN1R3J2B   BL02RN2R3J2B</p> <p>BL02RN1   BL02RN2R1M2B   BL03RN2R1M1B</p> |

- Chip Ferrite Beads are effective for frequencies ranging from a few MHz to a few GHz. Chip Ferrite Beads are widely used as a low noise countermeasure, as well as a universal noise suppression component.
- Chip Ferrite Beads 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.

[Equivalent Circuit]













[Impedance-Frequency Characteristics (typical)]



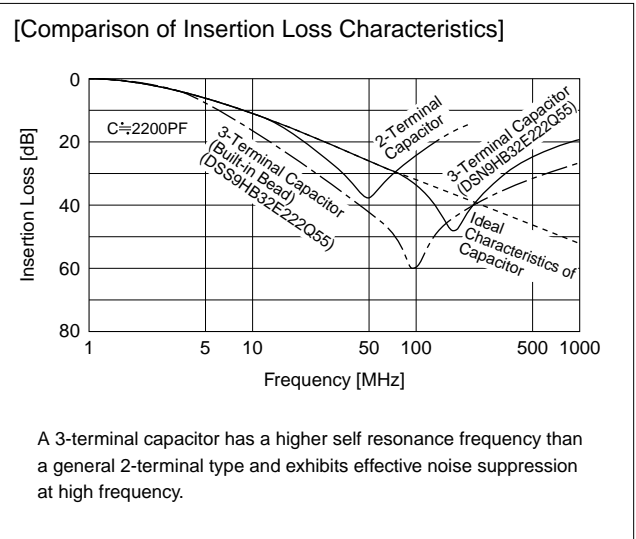
R : Real Part (Resistive Portion)   X : Imaginary Part (Inductive Portion)

## Outline of EMI Suppression Filters (EMIFIL<sup>®</sup>) for DC Line

- Chip EMIFIL<sup>®</sup>
- T-type Chip EMIFIL<sup>®</sup>
- Disk Type EMIFIL<sup>®</sup>

|  |  |
|--|--|
| <p>Chip EMIFIL<sup>®</sup> .....P.70–73<br/>P.74<br/>P.89–92</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <br/> <b>NFM18P</b> </div> <div style="text-align: center;"> <br/> <b>NFM21C</b> </div> <div style="text-align: center;"> <br/> <b>NFM21P</b> </div> </div> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 20px;"> <div style="text-align: center;"> <br/> <b>NFM3DC</b> </div> <div style="text-align: center;"> <br/> <b>NFA31C</b> </div> </div> | <p>T-type Chip EMIFIL<sup>®</sup> .....P.86–88</p> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 20px;"> <div style="text-align: center;"> <br/> <b>NFE31P</b> </div> <div style="text-align: center;"> <br/> <b>NFE61P/H</b> </div> </div> |
| <p>Disk Type EMIFIL<sup>®</sup> .....P.110–116</p> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 20px;"> <div style="text-align: center;"> <br/> <b>DS□6</b> </div> <div style="text-align: center;"> <br/> <b>DS□9</b> </div> <div style="text-align: center;"> <br/> <b>DS□9H</b> </div> </div>   |  |



- 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 EMIFIL<sup>®</sup> incorporates a built-in three-terminal capacitor, eliminating the lead wire and thereby increasing the high-frequency performance characteristic.
- The T-type chip EMIFIL<sup>®</sup> 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.





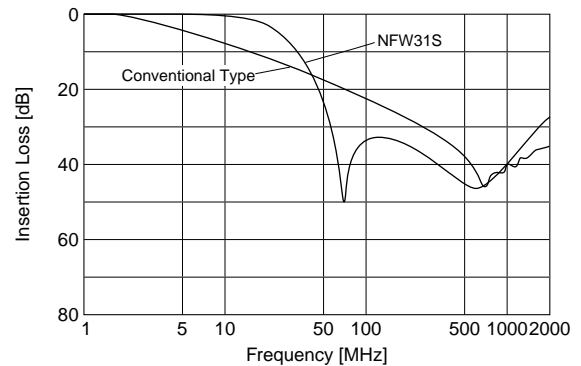
## Outline of EMI Suppression Filters (EMIFIL<sup>®</sup>) for DC Line

- Chip EMIFIL<sup>®</sup> for Signal Line
- Chip EMIFIL<sup>®</sup> with Waveform Distortion Suppressing Function

|   |  |
|---|--|
| Chip EMIFIL <sup>®</sup> for Signal Line .....P.30–39<br>P.53–56<br>P.81–85   | Chip EMIFIL <sup>®</sup> with Waveform<br>Distortion Suppressing Function .....P.75–80                   |
|  <p>NFW31S NFL18ST NFL18SP NFL21S BLM18B/18HD BLM21B</p> |  <p>NFR21G NFA31G</p> |

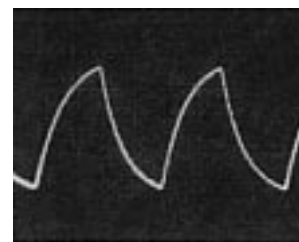
- High-speed signal application EMIFIL<sup>®</sup> are high performance EMI suppression filters which increase the slope of insertion loss frequency characteristic curves (shape factor), thereby improving noise and signal separation. These are used for high speed signal applications in which noise and 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<sup>®</sup> with waveform distortion suppressing function suppresses waveform distortion caused by the resonance of digital ICs and surrounding circuits.

[Comparison of Insertion Loss Characteristics]

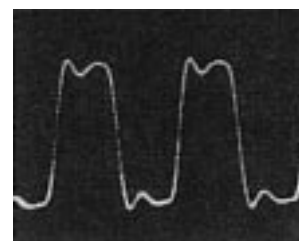


[Waveform change when filter is inserted]

Conventional Type  
(Chip 3-terminal Capacitor)













EMIFIL<sup>®</sup> for Signal Line  
NFW31S series

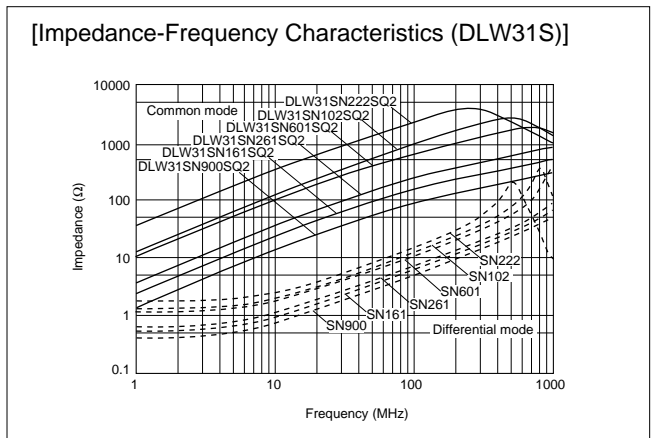
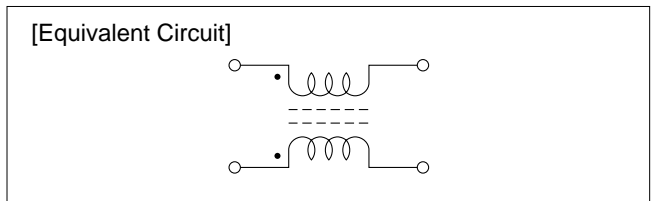
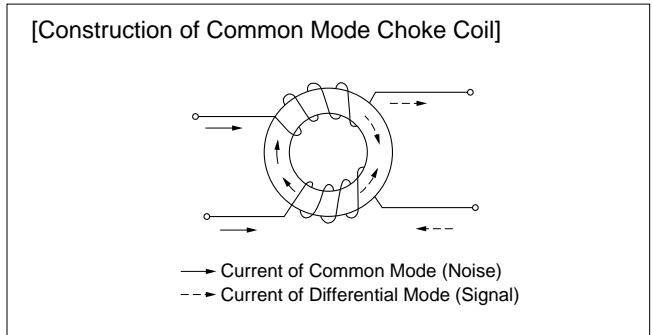


## Outline of EMI Suppression Filters (EMIFIL<sup>®</sup>) for DC Line

- Chip Common Mode Choke Coil
- Common Mode Choke Coil



|  |  |
|--|--|
| <p>Chip Common Mode Choke Coil .....P.97-104</p> <div style="display: flex; flex-wrap: wrap; justify-content: space-around; align-items: center;"> <div style="text-align: center; margin: 5px;"> <br/> <b>DLW31S</b> </div> <div style="text-align: center; margin: 5px;"> <br/> <b>DLP31S</b> </div> <div style="text-align: center; margin: 5px;"> <br/> <b>DLP31D</b> </div> <div style="text-align: center; margin: 5px;"> <br/> <b>DLM2HG</b> </div> <div style="text-align: center; margin: 5px;"> <br/> <b>DLW21S</b> </div> <div style="text-align: center; margin: 5px;"> <br/> <b>DLW21H</b> </div> <div style="text-align: center; margin: 5px;"> <br/> <b>DLW31S</b> </div> <div style="text-align: center; margin: 5px;"> <br/> <b>DLW5AH</b> </div> <div style="text-align: center; margin: 5px;"> <br/> <b>DLW5BS</b> </div> </div> | <p>Common Mode Choke Coil .....P.128</p> <div style="text-align: center; margin: 20px;"> <br/> <b>PLT09H</b> </div> |
|--|--|

- 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 noise suppression on DC power supply lines and interface cables.



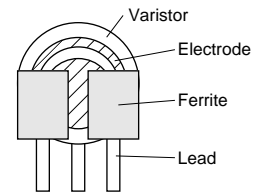
## Outline of EMI Suppression Filters (EMIFIL<sup>®</sup>) for DC Line

- Chip EMIGUARD<sup>®</sup>
- EMIGUARD<sup>®</sup>

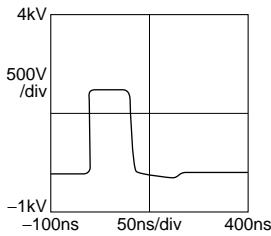
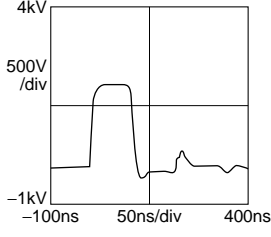
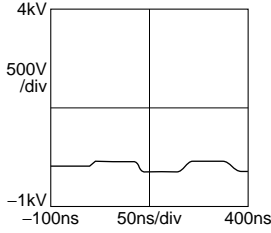
|  |  |
|--|--|
| Chip EMIGUARD <sup>®</sup> .....P.94–95  | EMIGUARD <sup>®</sup> .....P.118–124   |
| <br><b>VFM41R</b> | <br><b>VFR3V      VFS6V      VFS9V</b> |

- EMIGUARD<sup>®</sup> 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<sup>®</sup>.

[Construction of EMIGUARD<sup>®</sup> (VFS9V)]

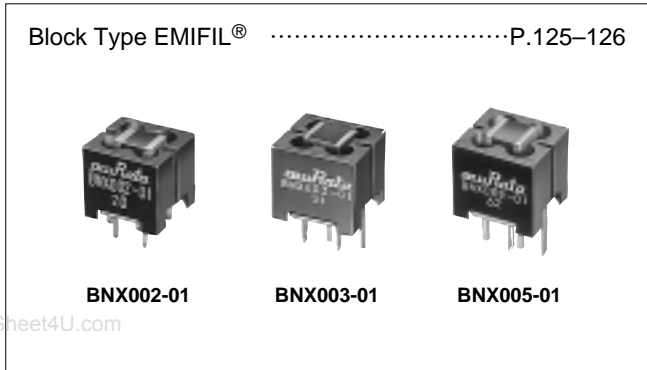


### ■Surge Absorption Effect of EMIGUARD<sup>®</sup>

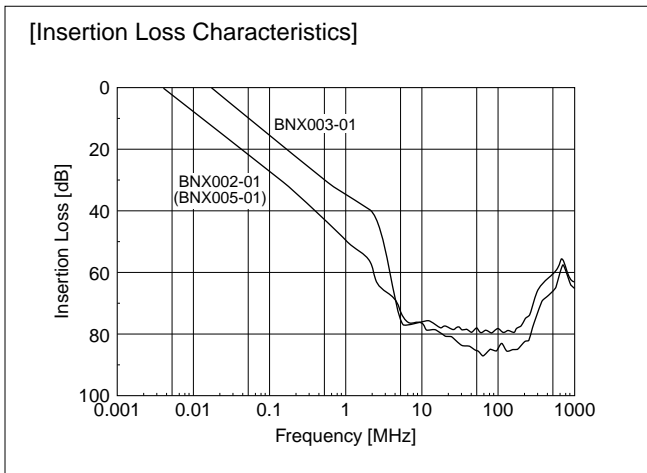
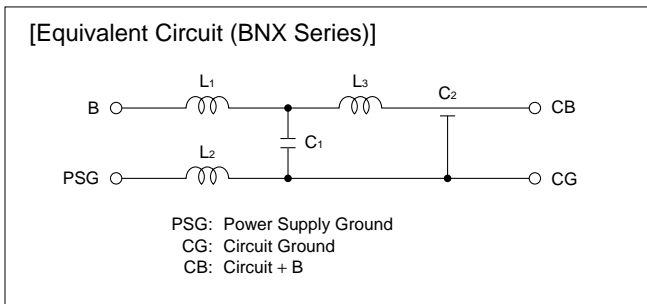
| Type of Filter   | Surge Absorption Effect of EMIGUARD <sup>®</sup>                                     |
|--|--|
| No filter  |  |
| 3-terminal capacitor is used to suppress the surge.          |  |
| EMIGUARD <sup>®</sup> is used to suppress the surge. (VFS6V) |  |

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

### ●Block Type EMIFIL®



- 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 high performance EMIFIL® BNX series exhibits significant noise suppression effects over a wide frequency band (extending from 100kHz to 1GHz) in DC power lines.



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



## Chip Ferrite Beads Part Numbering

### Chip Ferrite Beads

(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 |                    |
|------------|--------------------|
| <b>BL</b>  | Chip Ferrite Beads |

#### ② Type

| Code     | Type            |
|----------|-----------------|
| <b>A</b> | Array Type      |
| <b>M</b> | Monolithic Type |

#### ③ Dimensions (L×W)

| Code      | Dimensions (L×W) | EIA  |
|-----------|------------------|------|
| <b>03</b> | 0.6×0.3mm        | 0201 |
| <b>15</b> | 1.0×0.5mm        | 0402 |
| <b>18</b> | 1.6×0.8mm        | 0603 |
| <b>2A</b> | 2.0×1.0mm        | 0804 |
| <b>21</b> | 2.0×1.25mm       | 0805 |
| <b>31</b> | 3.2×1.6mm        | 1206 |
| <b>41</b> | 4.5×1.6mm        | 1806 |

#### ④ Characteristics/Applications

| Code *1   | Characteristics/Applications                      | Series   |
|-----------|---|--|
| <b>AF</b> | for General Use                                   | <b>BLM31/BLM41</b>                               |
| <b>AG</b> |   | <b>BLM03/BLM15/BLM18/BLM21/BLM31/BLA2A/BLA31</b> |
| <b>AJ</b> |   | <b>BLM21/BLM31</b>                               |
| <b>AH</b> |   | <b>BLM21</b>                                     |
| <b>BA</b> | for High-speed Signal Lines                       | <b>BLM18</b>                                     |
| <b>BB</b> |   | <b>BLM15/BLM18/BLM21/BLA2A</b>                   |
| <b>BD</b> |   | <b>BLM15/BLM18/BLM21/BLA31</b>                   |
| <b>BE</b> |   | <b>BLM31</b>                                     |
| <b>PF</b> |   | <b>BLM41</b>                                     |
| <b>PG</b> | for Power Supplies                                | <b>BLM18/BLM21/BLM31/BLM41</b>                   |
| <b>RK</b> | for Digital Interface                             | <b>BLM18/BLM21</b>                               |
| <b>HG</b> | for GHz Band General Use                          | <b>BLM18</b>                                     |
| <b>EG</b> | for GHz Band General Use (Low DC Resistance type) |  |
| <b>HB</b> | for GHz Band High-speed Signal Line               |  |
| <b>HD</b> |   |  |
| <b>HK</b> | for GHz Band Digital Interface                    | <b>BLM18</b>                                     |

\*1 Frequency characteristics vary with each code.

#### ⑤ Packaging

| Code     | Packaging                    | Series   |
|----------|------------------------------|--|
| <b>K</b> | Plastic Taping (ø330mm Reel) | <b>BLM31/BLM41/BLM21</b> *1                            |
| <b>L</b> | Plastic Taping (ø180mm Reel) |  |
| <b>B</b> | Bulk                         | All series   |
| <b>J</b> | Paper Taping (ø330mm Reel)   | <b>BLM15/BLM18/BLM21</b> *2 / <b>BLA31</b>             |
| <b>D</b> | Paper Taping (ø180mm Reel)   | <b>BLM03/BLM15/BLM18/BLM21</b> *2 / <b>BLA2A/BLA31</b> |
| <b>C</b> | Bulk Case                    | <b>BLM15/BLM18</b>                                     |

\*1 BLM21BD222SN1/BLM21BD272SN1 only.

\*2 Except BLM21BD222SN1/BLM21BD272SN1

#### ⑥ 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.

#### ⑦ Performance

Expressed by a letter.

Ex.)

| Code     | Performance |
|----------|-------------|
| <b>S</b> | Sn Plating  |

#### ⑧ Category

| Code     | Category       |
|----------|----------------|
| <b>N</b> | Standard Type  |
| <b>H</b> | for Heavy-duty |

#### ⑨ Number of Circuits

| Code     | Number of Circuits |
|----------|--------------------|
| <b>1</b> | 1 Circuit          |
| <b>4</b> | 4 Circuits         |

# 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

1

The chip ferrite bead BLM series comprises ferrite beads in the shape of a chip. This ferrite bead 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 0.6×0.3, 1.0×0.5, 1.6×0.8, 2.0×1.25, 3.2×1.6 and 4.5×1.6mm are cataloged. (The BLA series of array type chip ferrite beads is also cataloged.)

The nickel barrier structure of the external electrodes provides excellent solder heat resistance.

### ■Features

The BLM series comprises the R series (for digital interface), the A series (for standard), the B series (for high speed signal), the P series (for large current), and the H/E series (for GHz range noise suppression).

#### 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 effective 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.

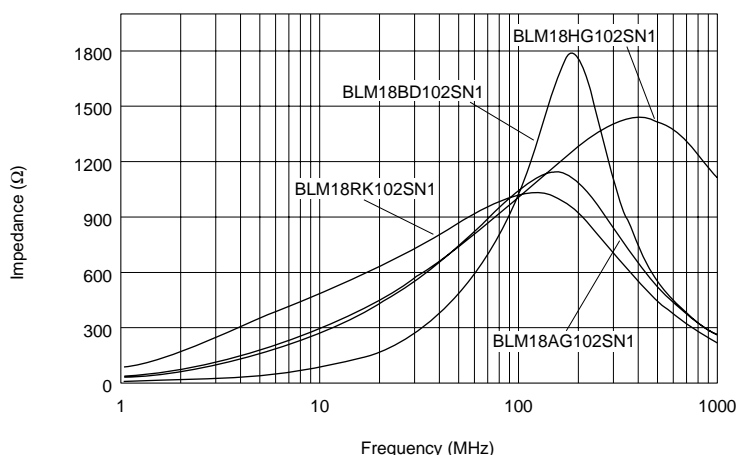
#### 4. BLM□□P series – For Large Current

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).

#### 5. BLM18H/E series – For GHz Range Noise Suppression

The BLM18H/E series has a modified internal electrode structure that minimizes stray capacitance and increases the effective frequency range.

[Impedance Characteristics]





■BLM Series

| Size (inches)  | Type   | Part Number   | Impedance (Ω) |              | Rated Current (mA) |         |   |     |
|--|--|---------------|---------------|--------------|--------------------|---------|---|-----|
|  |  |               | at 100MHz     | at 1GHz      |                    |         |   |     |
| 0603   | For Standard   | BLM03AG100SN1 | 10 (Typ.)     | -            | 500                |         |   |     |
|  |  | BLM03AG700SN1 | 70 (Typ.)     | -            | 200                |         |   |     |
|  |  | BLM03AG121SN1 | 120±25%       | -            | 200                |         |   |     |
| 0402   | For Standard   | BLM15AG100SN1 | 10 (Typ.)     | -            | 1000               |         |   |     |
|  |  | BLM15AG700SN1 | 70 (Typ.)     | -            | 500                |         |   |     |
|  |  | BLM15AG121SN1 | 120±25%       | -            | 300                |         |   |     |
|  |  | BLM15AG221SN1 | 220±25%       | -            | 200                |         |   |     |
|  |  | BLM15AG601SN1 | 600±25%       | -            |                    |         |   |     |
|  |  | BLM15AG102SN1 | 1000±25%      | -            |                    |         |   |     |
|  | For High Speed Signal<br>(Sharp impedance characteristics) | BLM15BB050SN1 | 5±25%         | -            | 500                |         |   |     |
|  |  | BLM15BB100SN1 | 10±25%        | -            | 300                |         |   |     |
|  |  | BLM15BB220SN1 | 22±25%        | -            |                    |         |   |     |
|  |  | BLM15BB470SN1 | 47±25%        | -            |                    |         |   |     |
|  |  | BLM15BB750SN1 | 75±25%        | -            |                    |         |   |     |
|  |  | BLM15BB121SN1 | 120±25%       | -            |                    |         |   |     |
|  |  | BLM15BB221SN1 | 220±25%       | -            |                    |         |   |     |
|  |  | 200           | BLM15BD471SN1 | 470±25%      | -                  |         |   |     |
|  |  |               | BLM15BD601SN1 | 600±25%      | -                  |         |   |     |
|  |  |               | BLM15BD102SN1 | 1000±25%     | -                  |         |   |     |
|  |  |               | 0603          | For Standard | BLM18AG121SN1      | 120±25% | - | 200 |
|  |  |               |               |              | BLM18AG151SN1      | 150±25% | - |     |
| BLM18AG221SN1  | 220±25%  |               |               |              | -                  |         |   |     |
| BLM18AG331SN1  | 330±25%  | -             |               |              |                    |         |   |     |
| BLM18AG471SN1  | 470±25%  | -             |               |              |                    |         |   |     |
| BLM18AG601SN1  | 600±25%  | -             |               |              |                    |         |   |     |
| BLM18AG102SN1  | 1000±25%   | -             |               |              | 100                |         |   |     |
| For High Speed Signal<br>(Sharp impedance characteristics) | BLM18BA050SN1  | 5±25%         | -             | 500          |                    |         |   |     |
|  | BLM18BB050SN1  |               | -             | 700          |                    |         |   |     |
|  | BLM18BA100SN1  | 10±25%        | -             | 500          |                    |         |   |     |
|  | BLM18BB100SN1  |               | -             |              |                    |         |   |     |
|  | BLM18BA220SN1  | 22±25%        | -             | 300          |                    |         |   |     |
|  | BLM18BB220SN1  |               | -             |              |                    |         |   |     |
|  | BLM18BA470SN1  | 47±25%        | -             | 500          |                    |         |   |     |
|  | BLM18BB470SN1  |               | -             | 200          |                    |         |   |     |
|  | BLM18BB600SN1  | 60±25%        | -             | 300          |                    |         |   |     |
|  | BLM18BA750SN1  | 75±25%        | -             | 200          |                    |         |   |     |
|  | BLM18BB750SN1  |               | -             |              |                    |         |   |     |
|  | 200  | BLM18BA121SN1 | 120±25%       | -            |                    |         |   |     |
|  |  | BLM18BB121SN1 |               | -            |                    |         |   |     |
|  |  | BLM18BD121SN1 |               | -            |                    |         |   |     |
|  |  | BLM18BB141SN1 | 140±25%       | -            |                    |         |   |     |
|  |  | BLM18BB151SN1 | 150±25%       | -            | 200                |         |   |     |
|  |  | BLM18BD151SN1 |               | -            |                    |         |   |     |
|  |  | BLM18BB221SN1 | 220±25%       | -            |                    |         |   |     |
|  |  | BLM18BD221SN1 |               | -            |                    |         |   |     |
|  |  | BLM18BB331SN1 | 330±25%       | -            |                    |         |   |     |
| BLM18BD331SN1  |  | -             |               |              |                    |         |   |     |
| BLM18BD421SN1  |  | 420±25%       | -             |              |                    |         |   |     |
| BLM18BB471SN1  |  | 470±25%       | -             | 50           |                    |         |   |     |
| BLM18BD471SN1  |  |               | -             | 200          |                    |         |   |     |
| BLM18BD601SN1  | 600±25%  | -             | 200           |              |                    |         |   |     |
| BLM18BD102SN1  | 1000±25%   | -             | 100           |              |                    |         |   |     |
| BLM18BD152SN1  | 1500±25%   | -             | 50            |              |                    |         |   |     |
| BLM18BD182SN1  | 1800±25%   | -             |               |              |                    |         |   |     |
| BLM18BD222SN1  | 2200±25%   | -             |               |              |                    |         |   |     |
| BLM18BD252SN1  | 2500±25%   | -             |               |              |                    |         |   |     |

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1



Continued from the preceding page.

| Size (inches) | Type                  |              | Part Number                           | Impedance (Ω) |               | Rated Current (mA) |               |          |             |       |
|---------------|-----------------------|--------------|---------------------------------------|---------------|---------------|--------------------|---------------|----------|-------------|-------|
|               |                       |              |                                       | at 100MHz     | at 1GHz       |                    |               |          |             |       |
| 0603          | For Digital Interface |              | BLM18RK121SN1                         | 120±25%       | -             | 200                |               |          |             |       |
|               |                       |              | BLM18RK221SN1                         | 220±25%       | -             |                    |               |          |             |       |
|               |                       |              | BLM18RK471SN1                         | 470±25%       | -             |                    |               |          |             |       |
|               |                       |              | BLM18RK601SN1                         | 600±25%       | -             |                    |               |          |             |       |
|               |                       |              | BLM18RK102SN1                         | 1000±25%      | -             |                    |               |          |             |       |
|               | For Large Current     |              | BLM18PG300SN1                         | 30 (Typ.)     | -             | 1000               |               |          |             |       |
|               |                       |              | BLM18PG330SN1                         | 33±25%        | -             | 3000*              |               |          |             |       |
|               |                       |              | BLM18PG600SN1                         | 60 (Typ.)     | -             | 500                |               |          |             |       |
|               |                       |              | BLM18PG121SN1                         | 120±25%       | -             | 2000*              |               |          |             |       |
|               |                       |              | BLM18PG181SN1                         | 180±25%       | -             | 1500*              |               |          |             |       |
|               | GHz Range             |              | For Standard                          |               | BLM18HG471SN1 | 470±25%            | 600 (Typ.)    | 200      |             |       |
|               |                       |              |                                       |               | BLM18HG601SN1 | 600±25%            | 700 (Typ.)    |          |             |       |
|               |                       |              |                                       |               | BLM18HG102SN1 | 1000±25%           | 1000 (Typ.)   |          | 100         |       |
|               |                       |              | For High Speed Signal                 |               |               |                    | BLM18HB121SN1 | 120±25%  | 500±40%     | 200   |
|               |                       |              |                                       |               |               |                    | BLM18HB221SN1 | 220±25%  | 1100±40%    | 100   |
|               |                       |              |                                       |               |               |                    | BLM18HB331SN1 | 330±25%  | 1600±40%    | 50    |
|               |                       |              |                                       |               |               |                    | BLM18HD471SN1 | 470±25%  | 1000 (Typ.) | 100   |
|               |                       |              |                                       |               |               |                    | BLM18HD601SN1 | 600±25%  | 1200 (Typ.) |       |
|               |                       |              |                                       |               |               |                    | BLM18HD102SN1 | 1000±25% | 1700 (Typ.) | 50    |
|               |                       |              | For Digital Interface                 |               |               |                    | BLM18HK331SN1 | 330±25%  | 400±40%     | 200   |
|               |                       |              |                                       |               |               |                    | BLM18HK471SN1 | 470±25%  | 600±40%     |       |
|               |                       |              |                                       |               |               |                    | BLM18HK601SN1 | 600±25%  | 700±40%     | 100   |
|               |                       |              |                                       |               |               |                    | BLM18HK102SN1 | 1000±25% | 1200±40%    | 50    |
|               |                       |              | For Standard (Low DC Resistance Type) |               |               |                    | BLM18EG101TN1 | 100±25%  | 140 (Typ.)  | 2000* |
|               |                       |              |                                       |               |               |                    | BLM18EG121SN1 | 120±25%  | 145 (Typ.)  | 2000* |
|               |                       |              |                                       |               |               |                    | BLM18EG391TN1 | 390±25%  | 520 (Typ.)  | 500   |
|               |                       |              |                                       |               | BLM18EG601SN1 | 600±25%            | 700 (Typ.)    | 300      |             |       |
|               | 0805                  | For Standard |                                       | BLM21AG121SN1 | 120±25%       | -                  | 200           |          |             |       |
| BLM21AG151SN1 |                       |              |                                       | 150±25%       | -             |                    |               |          |             |       |
| BLM21AG221SN1 |                       |              |                                       | 220±25%       | -             |                    |               |          |             |       |
| BLM21AG331SN1 |                       |              |                                       | 330±25%       | -             |                    |               |          |             |       |
| BLM21AJ401SN1 |                       |              |                                       | 400±25%       | -             |                    |               |          |             |       |
| BLM21AG471SN1 |                       |              |                                       | 470±25%       | -             |                    |               |          |             |       |
| BLM21AG601SN1 |                       |              |                                       | 600±25%       | -             |                    |               |          |             |       |
| BLM21AJ601SN1 |                       |              |                                       |               | -             |                    |               |          |             |       |
| BLM21AG102SN1 |                       |              |                                       | 1000±25%      | -             |                    |               |          |             |       |
| BLM21AH102SN1 |                       |              |                                       |               | -             |                    |               |          |             |       |

\* Please see P. 51 "Derating of Rated Current".

Continued on the following page. 

Continued from the preceding page.

| Size (inches)         | Type   | Part Number   | Impedance (Ω) |         | Rated Current (mA) |
|-----------------------|--|---------------|---------------|---------|--------------------|
|                       |  |               | at 100MHz     | at 1GHz |                    |
| 0805                  | For High Speed Signal<br>(Sharp impedance characteristics) | BLM21BB050SN1 | 5±25%         | -       | 500                |
|                       |  | BLM21BB600SN1 | 60±25%        | -       | 200                |
|                       |  | 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%      | -             |         |                    |
| For Digital Interface | BLM21RK121SN1  | 120±25%       | -             | 200     |                    |
|                       | BLM21RK221SN1  | 220±25%       | -             |         |                    |
|                       | BLM21RK471SN1  | 470±25%       | -             |         |                    |
|                       | BLM21RK601SN1  | 600±25%       | -             |         |                    |
|                       | BLM21RK102SN1  | 1000±25%      | -             |         |                    |
| For Large Current     | BLM21PG220SN1  | 22±25%        | -             | 6000*   |                    |
|                       | BLM21PG300SN1  | 30 (Typ.)     | -             | 3000*   |                    |
|                       | BLM21PG600SN1  | 60±25%        | -             | 2000*   |                    |
|                       | BLM21PG221SN1  | 220±25%       | -             | 1500*   |                    |
|                       | BLM21PG331SN1  | 330±25%       | -             |         |                    |
| 1206                  | For Standard   | BLM31AJ260SN1 | 26±25%        | -       | 500                |
|                       |  | BLM31AF700SN1 | 70±25%        | -       | 200                |
|                       |  | BLM31AJ601SN1 | 600±25%       | -       |                    |
|                       | For High Speed Signal<br>(Sharp impedance characteristics) | BLM31BE601FN1 | 600±25%       | -       | 300                |
|                       | For Large Current  | BLM31PG330SN1 | 33±25%        | -       | 6000*              |
|                       |  | BLM31PG500SN1 | 50 (Typ.)     | -       | 3000*              |
| BLM31PG121SN1         |  | 120±25%       | -             |         |                    |
| BLM31PG391SN1         |  | 390±25%       | -             | 2000*   |                    |
| BLM31PG601SN1         | 600±25%  | -             | 1500*         |         |                    |
| 1806                  | For Standard   | BLM41AF800SN1 | 80±25%        | -       | 500                |
|                       |  | BLM41AF151SN1 | 150±25%       | -       | 200                |
|                       | For Large Current  | BLM41PG600SN1 | 60 (Typ.)     | -       | 6000*              |
|                       |  | BLM41PG750SN1 | 75 (Typ.)     | -       | 3000*              |
|                       |  | BLM41PF800SN1 | 80 (Typ.)     | -       | 1000*              |
|                       |  | BLM41PG181SN1 | 180±25%       | -       | 3000*              |
|                       |  | BLM41PG471SN1 | 470±25%       | -       | 2000*              |
| BLM41PG102SN1         | 1000±25%   | -             | 1500*         |         |                    |

\* Please see P.51 "Derating of Rated Current".

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



## Chip Ferrite Beads BLM03/BLM15/BLM18/BLM21/BLM31/BLM41 Series

1

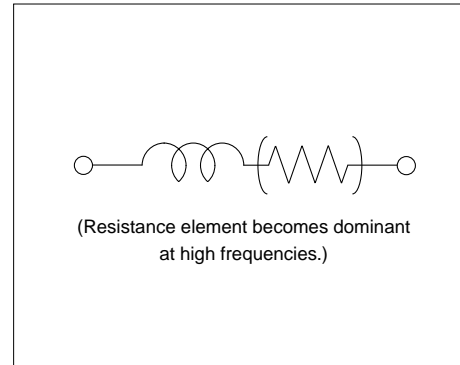
### ■ Features (BLM\_A Series)

The chip ferrite bead BLM series comprises ferrite beads in the shape of a chip. This ferrite bead generates a high impedance which at high frequency 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.

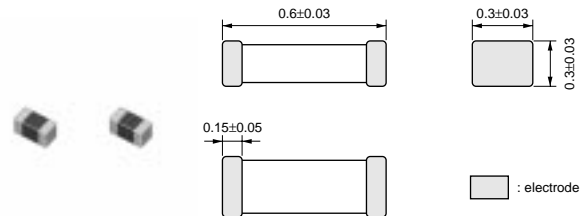
The nickel barrier structure of the external electrodes provides excellent solder heat resistance. BLM\_A series generates an impedance from the relatively low frequencies. Therefore BLM\_A series is effective in noise suppression in a wide frequency range (30MHz - several hundred MHz).

The small size of BLM03 series (0.6x0.3mm) is suitable for noise suppression in small equipment such as PA modules for cellular phones.

### ■ Equivalent Circuit



### BLM03A Series (0201 Size)

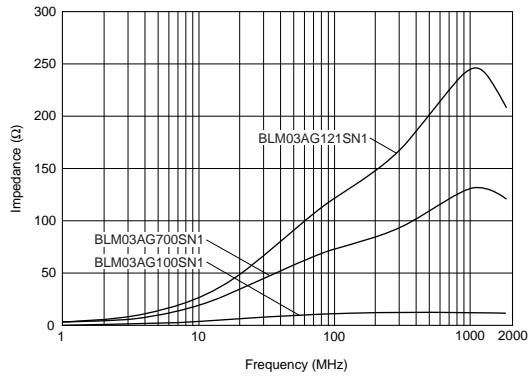


(in mm)

| Part Number   | Impedance<br>(at 100MHz, 20 degree C)<br>(ohm) | Rated Current<br>(mA) | DC Resistance (max.)<br>(ohm) | Operating<br>Temperature Range<br>(°C) |
|---------------|--|-----------------------|-------------------------------|--|
| BLM03AG100SN1 | 10 (Typ.)                                      | 500                   | 0.1                           | -55 to 125                             |
| BLM03AG700SN1 | 70 (Typ.)                                      | 200                   | 0.5                           | -55 to 125                             |
| BLM03AG121SN1 | 120 ±25%                                       | 200                   | 0.8                           | -55 to 125                             |

■ Impedance-Frequency (Typical)

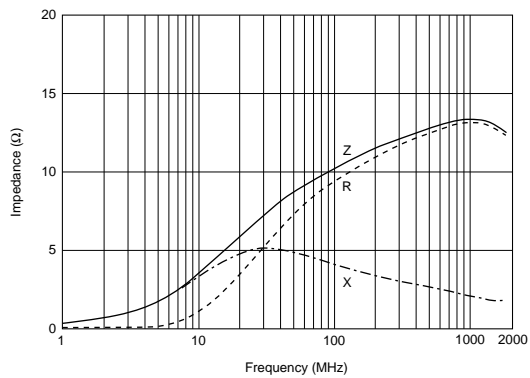
BLM03 Series



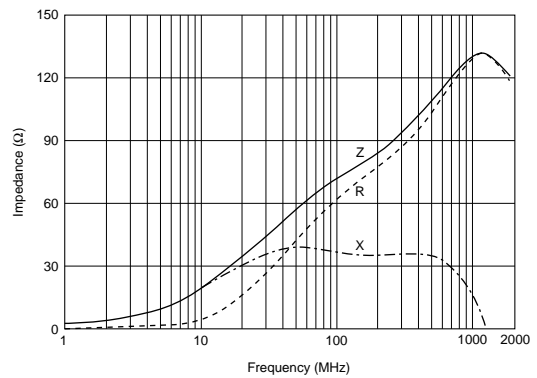
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■ Impedance-Frequency Characteristics

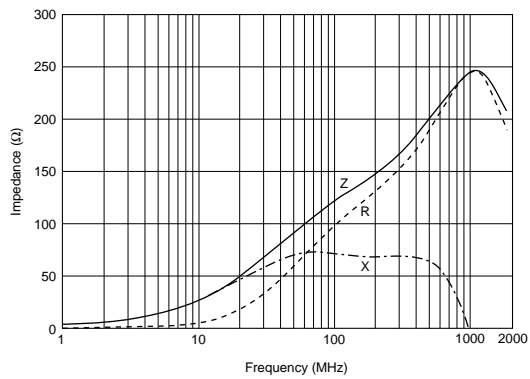
BLM03AG100SN1



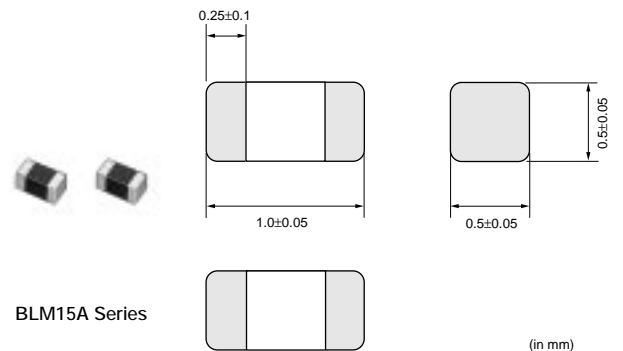
BLM03AG700SN1



BLM03AG121SN1



**BLM15A Series (0402 Size)**

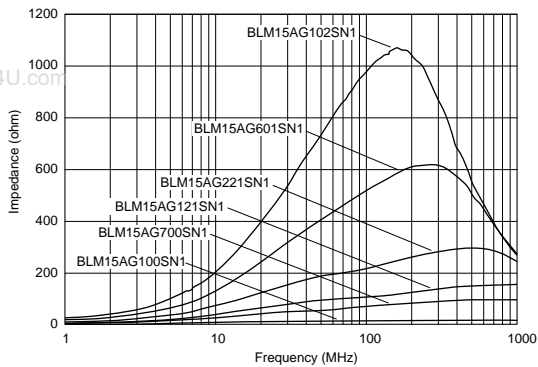


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| Part Number          | Impedance<br>(at 100MHz, 20 degree C)<br>(ohm) | Rated Current<br>(mA) | DC Resistance (max.)<br>(ohm) | Operating<br>Temperature Range<br>(°C) |
|----------------------|--|-----------------------|-------------------------------|--|
| <b>BLM15AG100SN1</b> | 10 (Typ.)                                      | 1000                  | 0.05                          | -55 to 125                             |
| <b>BLM15AG700SN1</b> | 70 (Typ.)                                      | 500                   | 0.15                          | -55 to 125                             |
| <b>BLM15AG121SN1</b> | 120 ±25%                                       | 500                   | 0.25                          | -55 to 125                             |
| <b>BLM15AG221SN1</b> | 220 ±25%                                       | 300                   | 0.35                          | -55 to 125                             |
| <b>BLM15AG601SN1</b> | 600 ±25%                                       | 300                   | 0.6                           | -55 to 125                             |
| <b>BLM15AG102SN1</b> | 1000 ±25%                                      | 200                   | 1.0                           | -55 to 125                             |

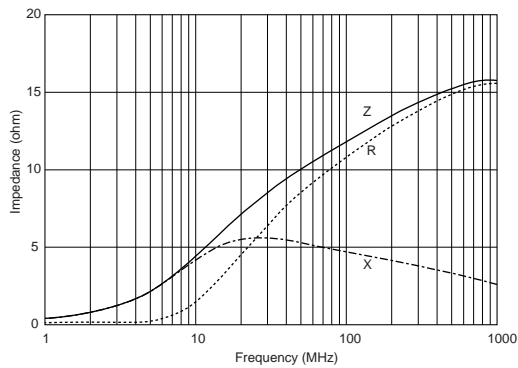
■ Impedance-Frequency (Typical)

BLM15A Series

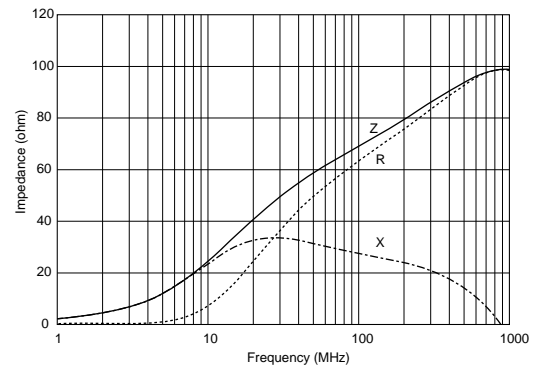


■ Impedance-Frequency Characteristics

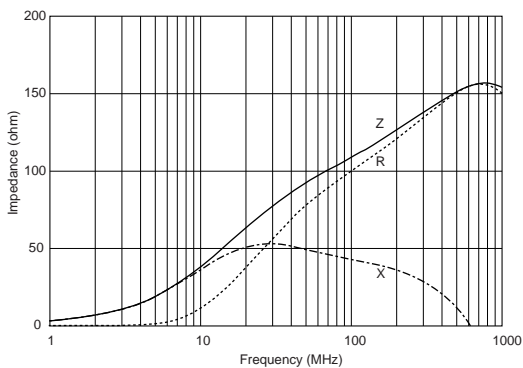
BLM15AG100SN1



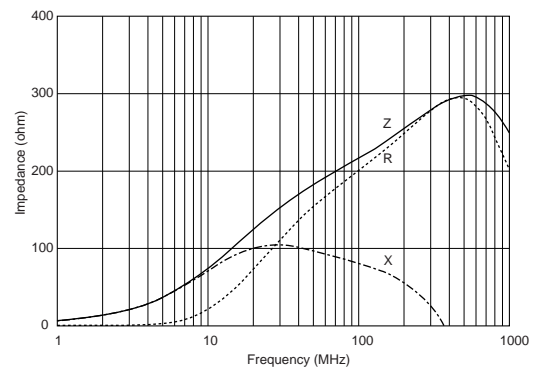
BLM15AG700SN1



BLM15AG121SN1



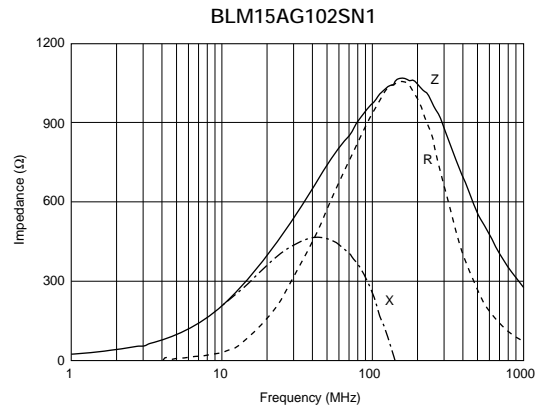
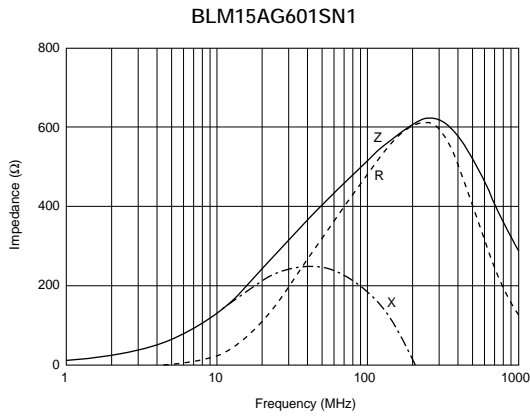
BLM15AG221SN1



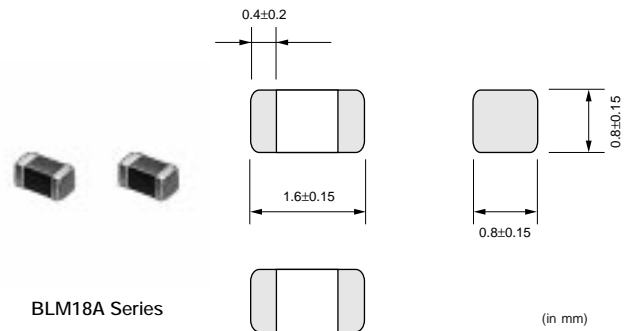
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### Impedance-Frequency Characteristics

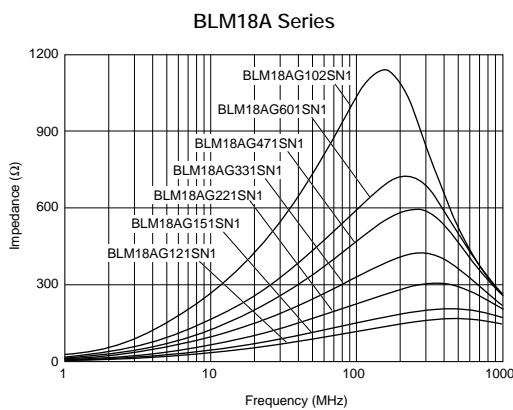


### BLM18A Series (0603 Size)

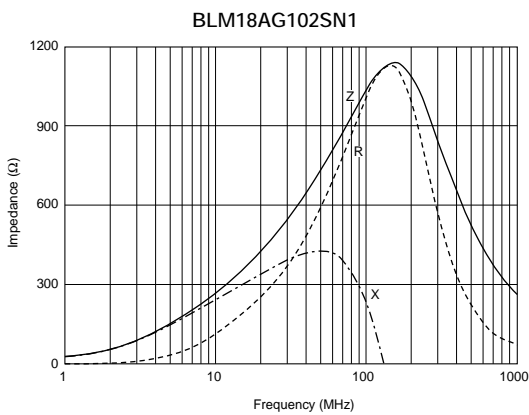
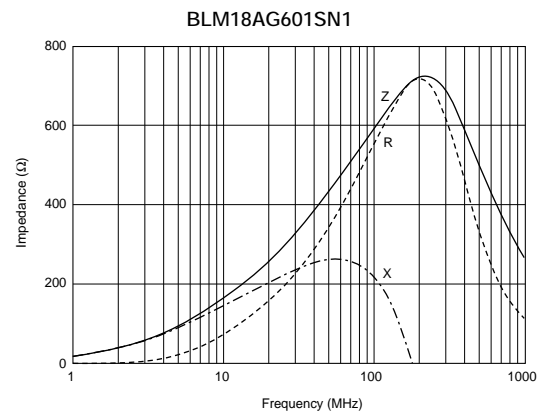
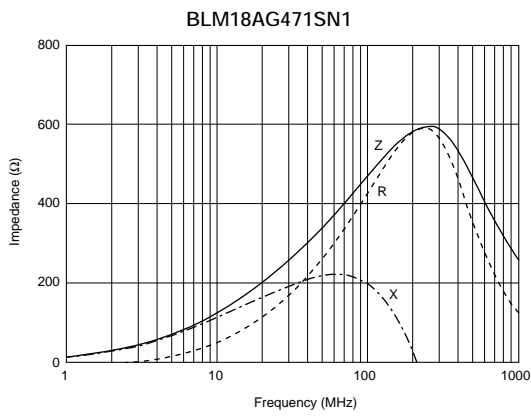
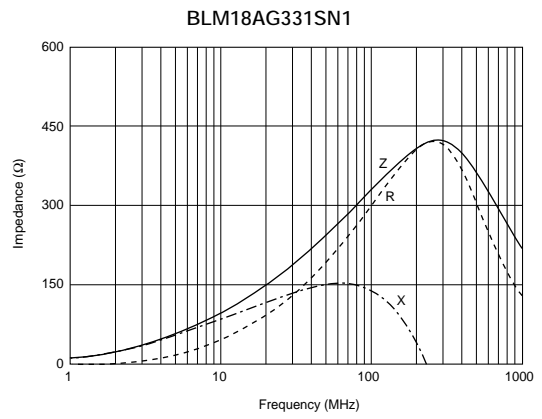
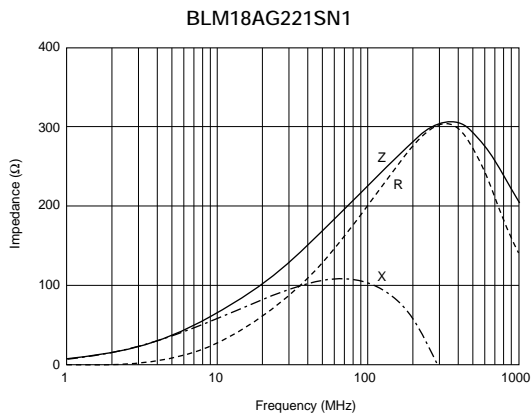
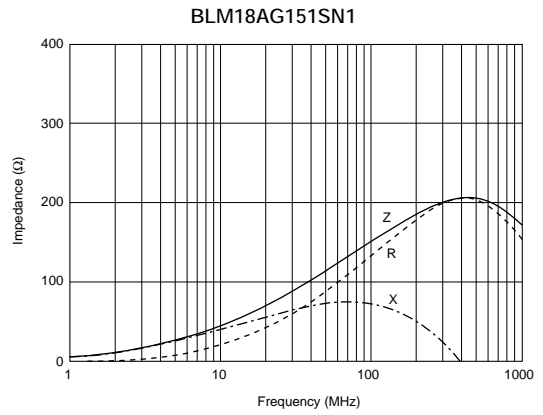
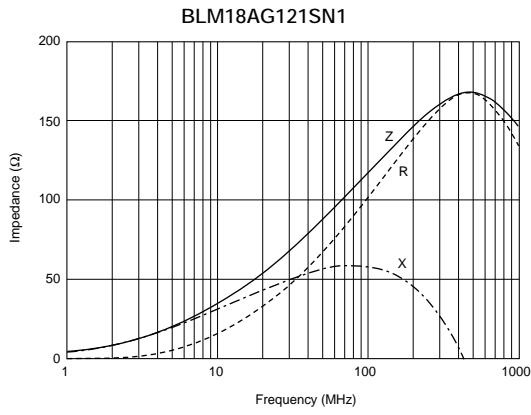


| Part Number   | Impedance (at 100MHz, 20 degree C) (ohm) | Rated Current (mA) | DC Resistance (max.) (ohm) | Operating Temperature Range (°C) |
|---------------|--|--------------------|----------------------------|----------------------------------|
| BLM18AG121SN1 | 120 ±25%                                 | 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                       |

### Impedance-Frequency (Typical)



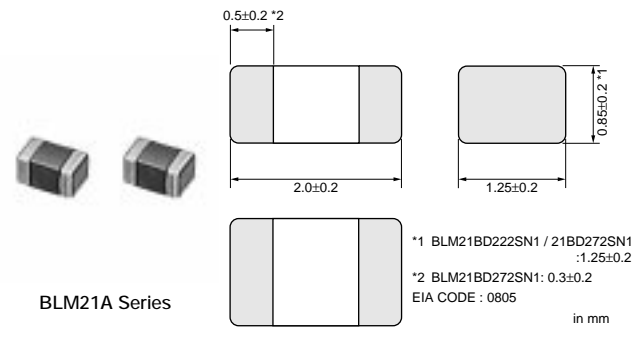
## ■ Impedance-Frequency Characteristics



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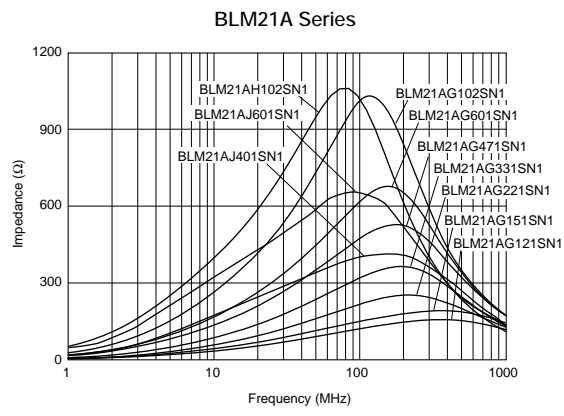
**BLM21A Series (0805 Size)**



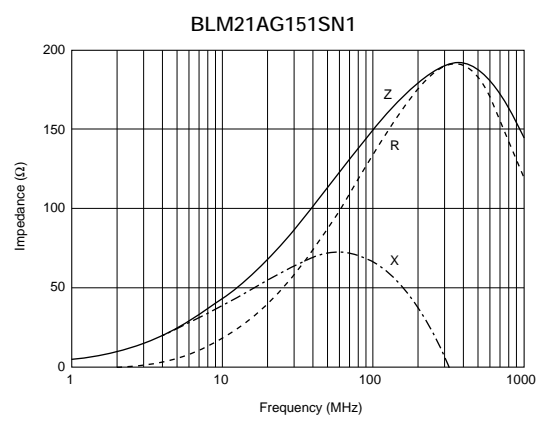
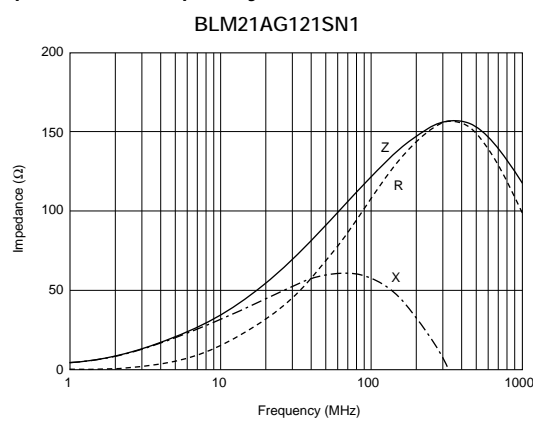
www.DataSheet4U.com

| Part Number   | Impedance (at 100MHz, 20 degree C) (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                       |
| BLM21AJ401SN1 | 400 ±25%                                 | 200                | 0.85                       | -55 to 125                       |
| BLM21AG471SN1 | 470 ±25%                                 | 200                | 0.25                       | -55 to 125                       |
| BLM21AG601SN1 | 600 ±25%                                 | 200                | 0.30                       | -55 to 125                       |
| BLM21AJ601SN1 | 600 ±25%                                 | 200                | 1.10                       | -55 to 125                       |
| BLM21AG102SN1 | 1000 ±25%                                | 200                | 0.45                       | -55 to 125                       |
| BLM21AH102SN1 | 1000 ±25%                                | 200                | 0.45                       | -55 to 85                        |

■ Impedance-Frequency (Typical)



■ Impedance-Frequency Characteristics

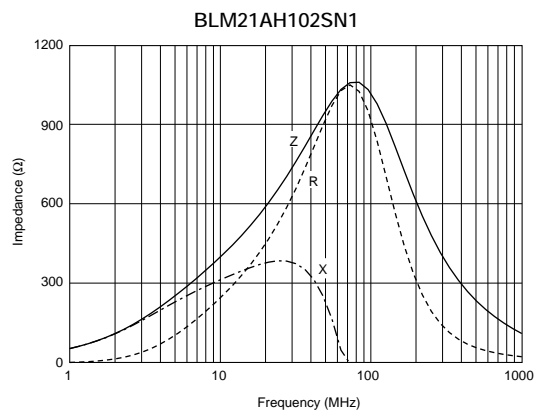
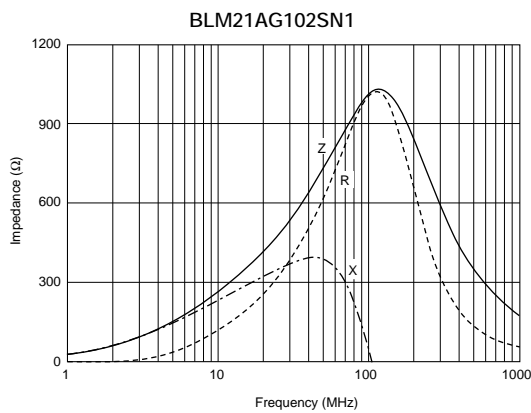
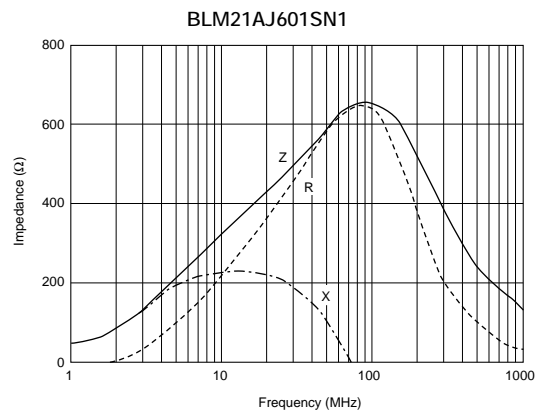
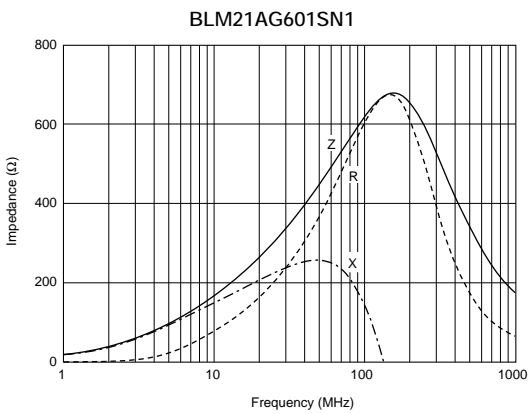
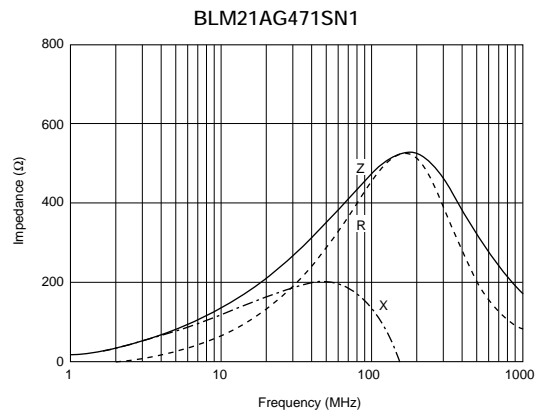
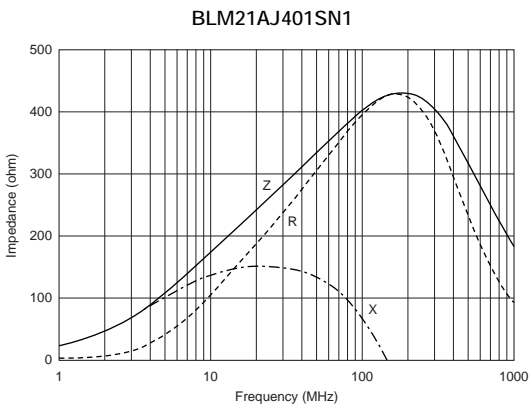
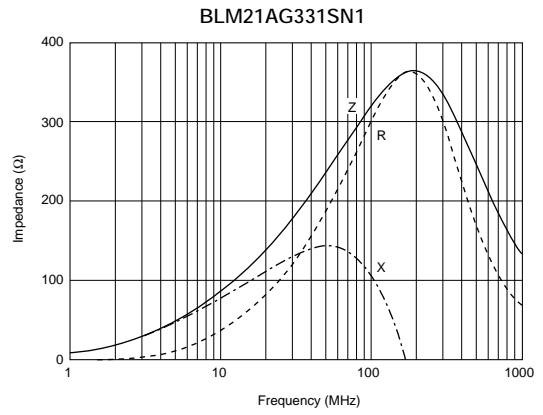
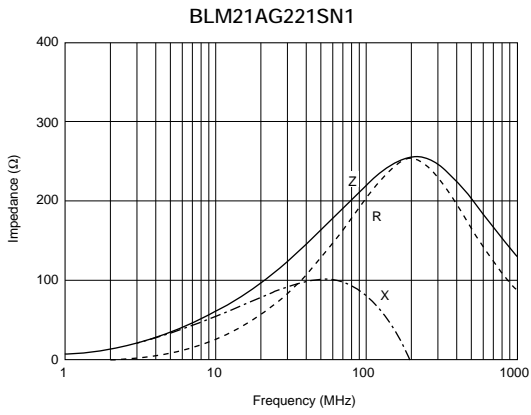


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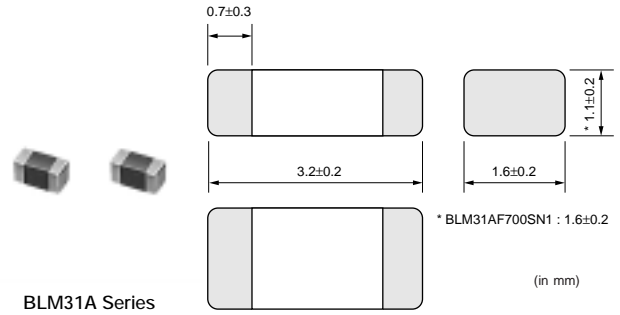
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### Impedance-Frequency Characteristics



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**BLM31A Series (1206 Size)**



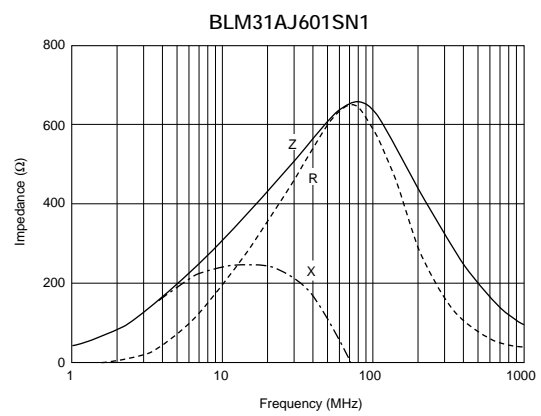
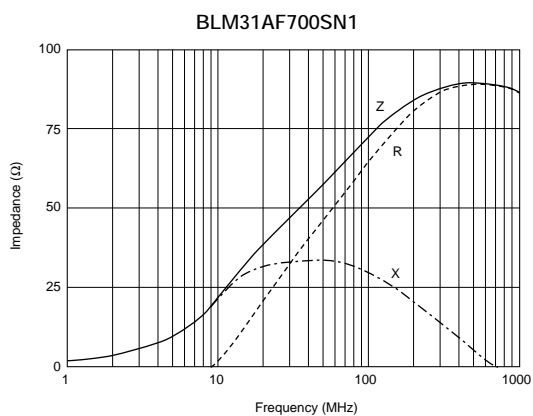
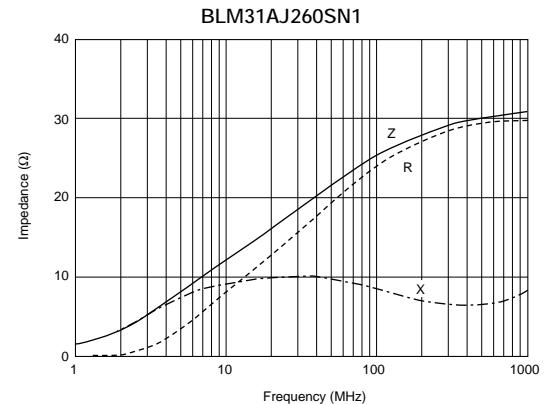
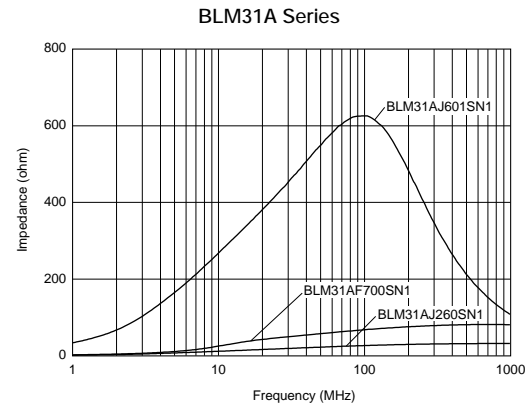
1

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| Part Number          | Impedance (at 100MHz, 20 degree C) (ohm) | Rated Current (mA) | DC Resistance (max.) (ohm) | Operating Temperature Range (°C) |
|----------------------|--|--------------------|----------------------------|----------------------------------|
| <b>BLM31AJ260SN1</b> | 26 ±25%                                  | 500                | 0.05                       | -55 to 125                       |
| <b>BLM31AF700SN1</b> | 70 ±25%                                  | 200                | 0.15                       | -55 to 125                       |
| <b>BLM31AJ601SN1</b> | 600 ±25%                                 | 200                | 0.90                       | -55 to 125                       |

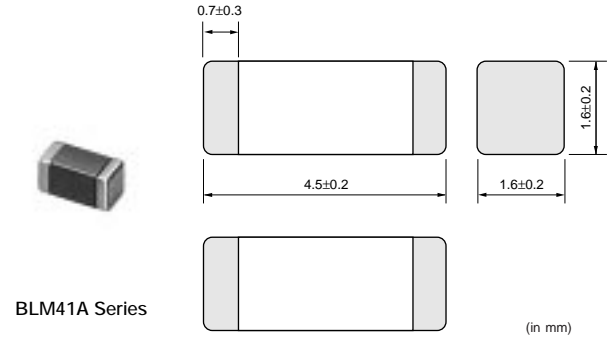
■ Impedance-Frequency (Typical)

■ Impedance-Frequency Characteristics



## BLM41A Series (1806 Size)

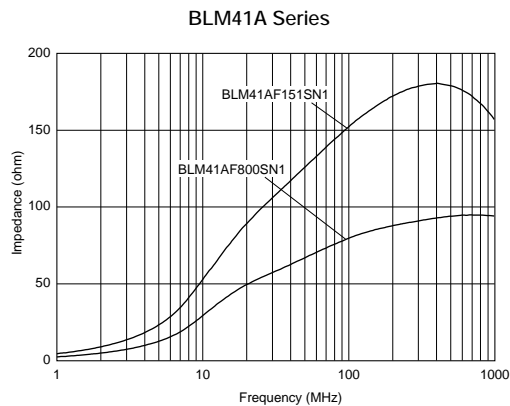
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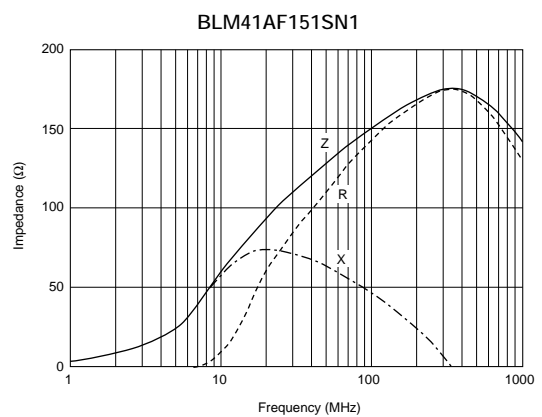
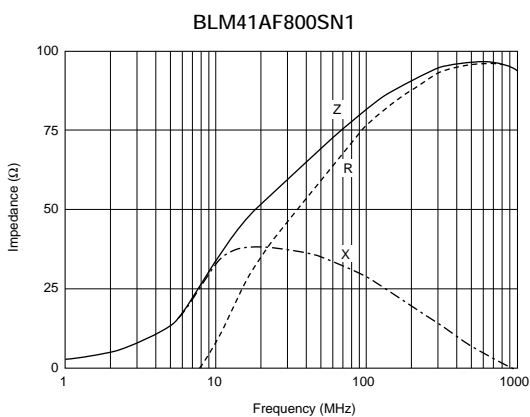
www.DataSheet4U.com

| Part Number          | Impedance (at 100MHz, 20 degree C) (ohm) | Rated Current (mA) | DC Resistance (max.) (ohm) | Operating Temperature Range (°C) |
|----------------------|--|--------------------|----------------------------|----------------------------------|
| <b>BLM41AF800SN1</b> | 80 ±25%                                  | 500                | 0.10                       | -55 to 125                       |
| <b>BLM41AF151SN1</b> | 150 ±25%                                 | 200                | 0.50                       | -55 to 125                       |

### ■ Impedance-Frequency (Typical)



### ■ Impedance-Frequency Characteristics

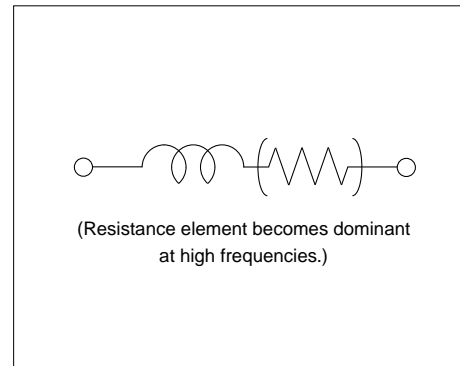


## ■ Features (BLM\_B Series)

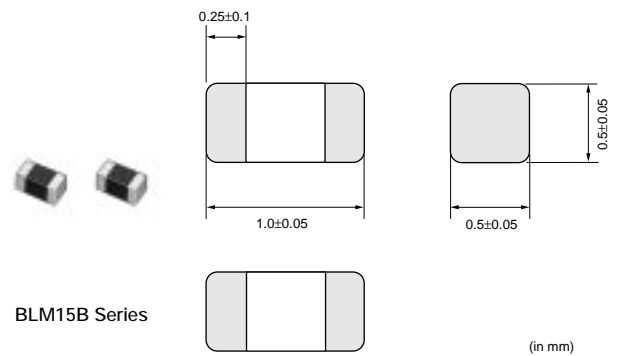
The chip ferrite bead BLM series comprises ferrite beads in the shape of a chip. This ferrite bead generates a high impedance which at high frequencies mainly consists of a resistance element. The BLM series is effective in circuits without stable ground lines because the BLM series does not need a connection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

The nickel barrier structure of the external electrodes provides excellent solder heat resistance. 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.

## ■ Equivalent Circuit



## BLM15B Series (0402 Size)

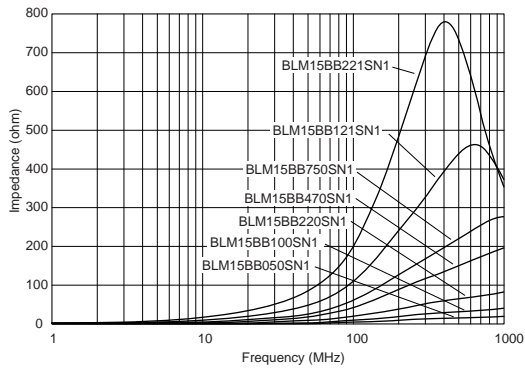


| Part Number   | Impedance<br>(at 100MHz, 20 degree C)<br>(ohm) | Rated Current<br>(mA) | DC Resistance (max.)<br>(ohm) | Operating<br>Temperature Range<br>(°C) |
|---------------|--|-----------------------|-------------------------------|--|
| BLM15BB050SN1 | 5 ±25%   | 500                   | 0.08                          | -55 to 125                             |
| BLM15BB100SN1 | 10 ±25%  | 300                   | 0.10                          | -55 to 125                             |
| BLM15BB220SN1 | 22 ±25%  | 300                   | 0.20                          | -55 to 125                             |
| BLM15BB470SN1 | 47 ±25%  | 300                   | 0.35                          | -55 to 125                             |
| BLM15BB750SN1 | 75 ±25%  | 300                   | 0.40                          | -55 to 125                             |
| BLM15BB121SN1 | 120 ±25%                                       | 300                   | 0.55                          | -55 to 125                             |
| BLM15BB221SN1 | 220 ±25%                                       | 200                   | 0.80                          | -55 to 125                             |
| BLM15BD471SN1 | 470 ±25%                                       | 200                   | 0.60                          | -55 to 125                             |
| BLM15BD601SN1 | 600 ±25%                                       | 200                   | 0.65                          | -55 to 125                             |
| BLM15BD102SN1 | 1000 ±25%                                      | 200                   | 0.90                          | -55 to 125                             |

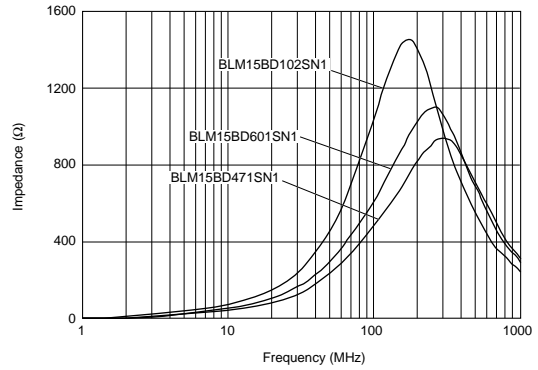
Rated current is 6A for taping type.

## ■ Impedance-Frequency (Typical)

BLM15BB Series



BLM15BD Series

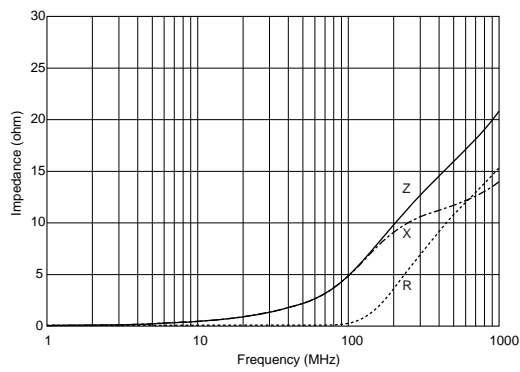


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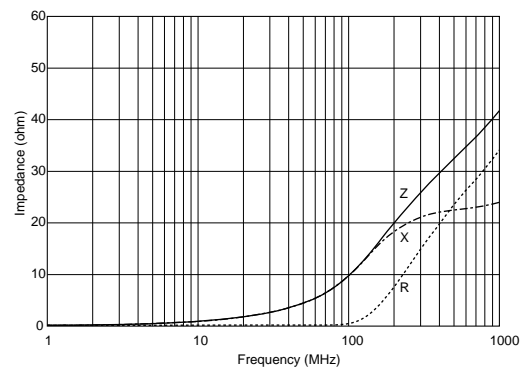
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## ■ Impedance-Frequency Characteristics

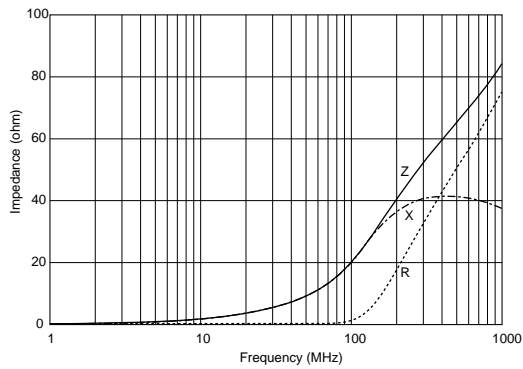
BLM15BB050SN1



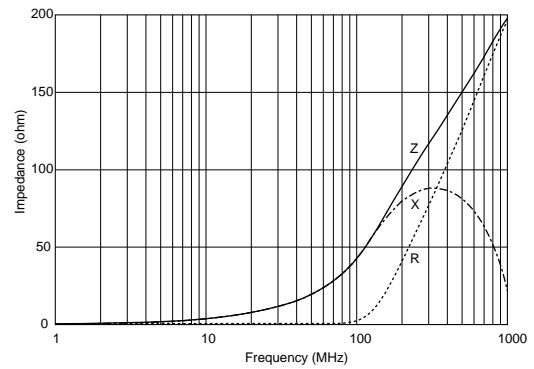
BLM15BB100SN1



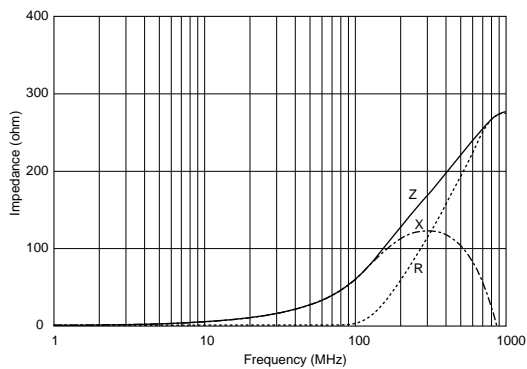
BLM15BB220SN1



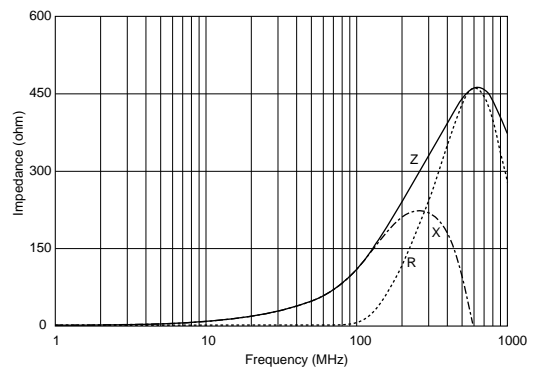
BLM15BB470SN1



BLM15BB750SN1



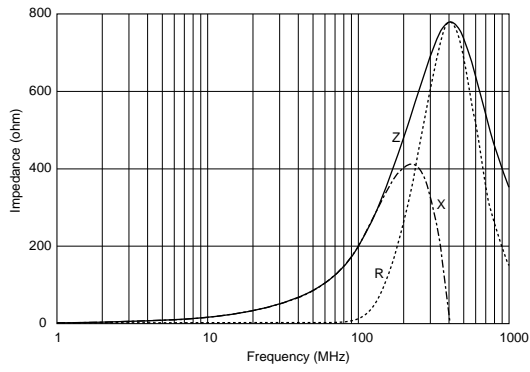
BLM15BB121SN1



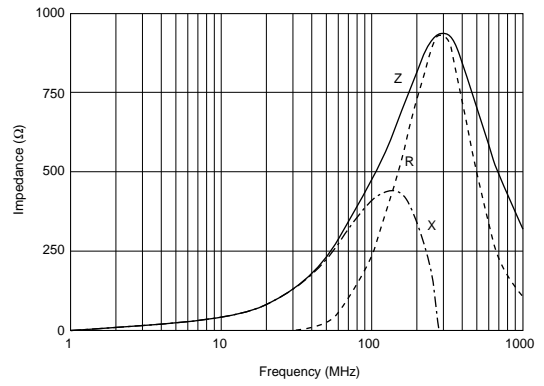
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### Impedance-Frequency Characteristics

BLM15BB221SN1

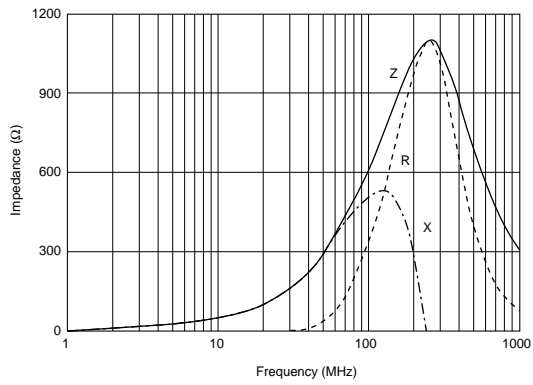


BLM15BD471SN1

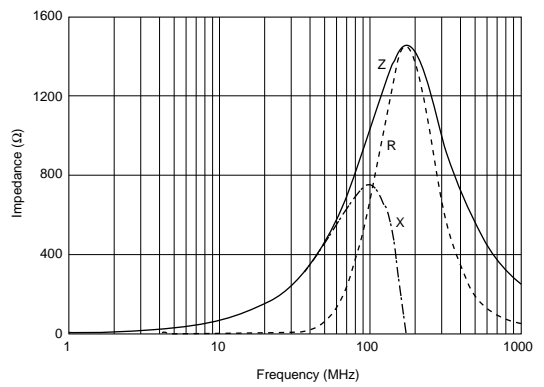


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BLM15BD601SN1

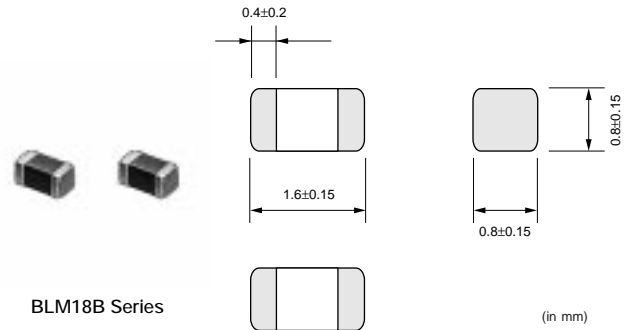


BLM15BD102SN1



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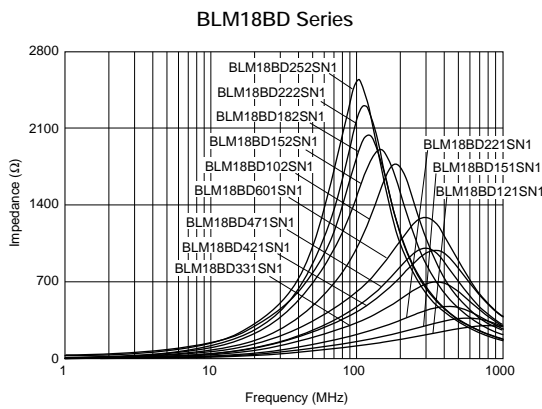
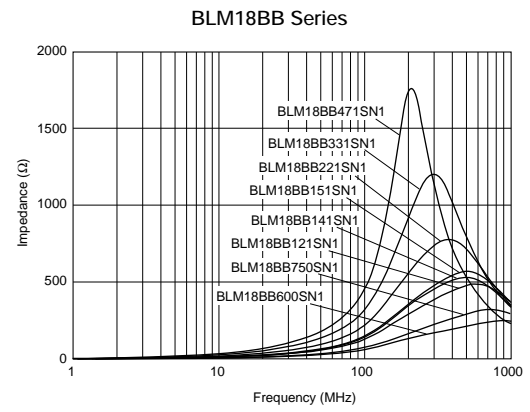
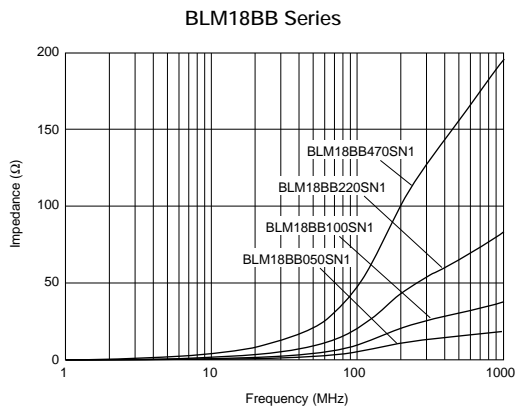
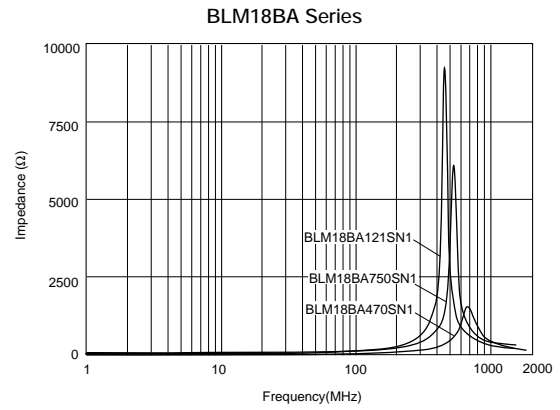
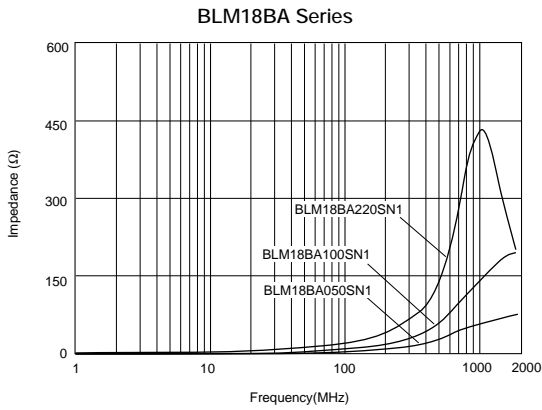
## BLM18B Series (0603 Size)



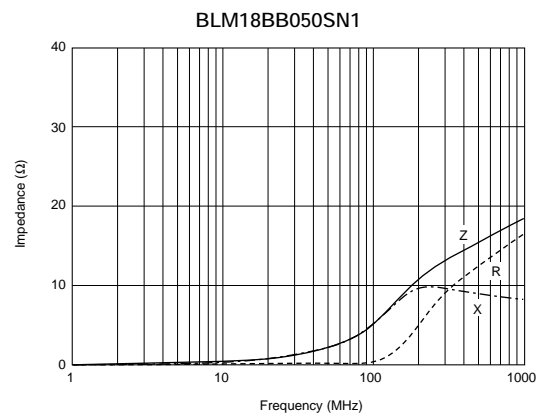
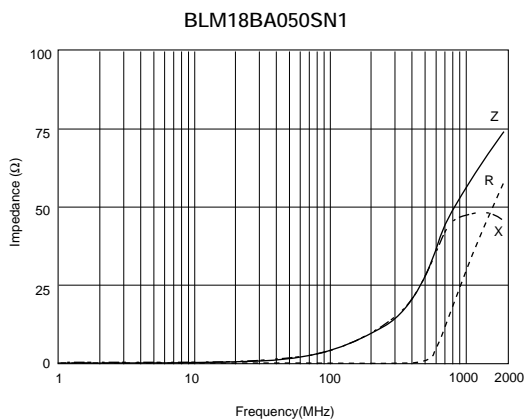
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| Part Number   | Impedance<br>(at 100MHz, 20 degree C)<br>(ohm) | Rated Current<br>(mA) | DC Resistance (max.)<br>(ohm) | Operating<br>Temperature Range<br>(°C) |
|---------------|--|-----------------------|-------------------------------|--|
| BLM18BA050SN1 | 5 ±25%   | 500                   | 0.20                          | -55 to 125                             |
| BLM18BB050SN1 | 5 ±25%   | 700                   | 0.10                          | -55 to 125                             |
| BLM18BA100SN1 | 10 ±25%  | 500                   | 0.25                          | -55 to 125                             |
| BLM18BB100SN1 | 10 ±25%  | 500                   | 0.15                          | -55 to 125                             |
| BLM18BA220SN1 | 22 ±25%  | 500                   | 0.35                          | -55 to 125                             |
| BLM18BB220SN1 | 22 ±25%  | 500                   | 0.25                          | -55 to 125                             |
| BLM18BA470SN1 | 47 ±25%  | 300                   | 0.55                          | -55 to 125                             |
| BLM18BB470SN1 | 47 ±25%  | 500                   | 0.30                          | -55 to 125                             |
| BLM18BB600SN1 | 60 ±25%  | 200                   | 0.35                          | -55 to 125                             |
| BLM18BA750SN1 | 75 ±25%  | 300                   | 0.70                          | -55 to 125                             |
| BLM18BB750SN1 | 75 ±25%  | 200                   | 0.35                          | -55 to 125                             |
| BLM18BA121SN1 | 120 ±25%                                       | 200                   | 0.90                          | -55 to 125                             |
| BLM18BB121SN1 | 120 ±25%                                       | 200                   | 0.50                          | -55 to 125                             |
| BLM18BD121SN1 | 120 ±25%                                       | 200                   | 0.40                          | -55 to 125                             |
| BLM18BB141SN1 | 140 ±25%                                       | 200                   | 0.55                          | -55 to 125                             |
| BLM18BB151SN1 | 150 ±25%                                       | 200                   | 0.55                          | -55 to 125                             |
| BLM18BD151SN1 | 150 ±25%                                       | 200                   | 0.40                          | -55 to 125                             |
| BLM18BB221SN1 | 220 ±25%                                       | 200                   | 0.65                          | -55 to 125                             |
| BLM18BD221SN1 | 220 ±25%                                       | 200                   | 0.45                          | -55 to 125                             |
| BLM18BB331SN1 | 330 ±25%                                       | 200                   | 0.75                          | -55 to 125                             |
| BLM18BD331SN1 | 330 ±25%                                       | 200                   | 0.50                          | -55 to 125                             |
| BLM18BD421SN1 | 420 ±25%                                       | 200                   | 0.55                          | -55 to 125                             |
| BLM18BB471SN1 | 470 ±25%                                       | 50                    | 1.00                          | -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                             |

■ Impedance-Frequency (Typical)



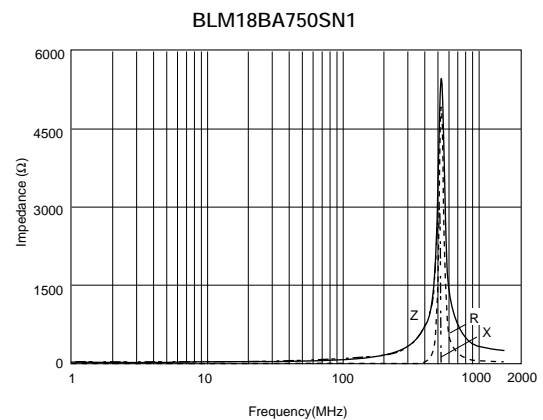
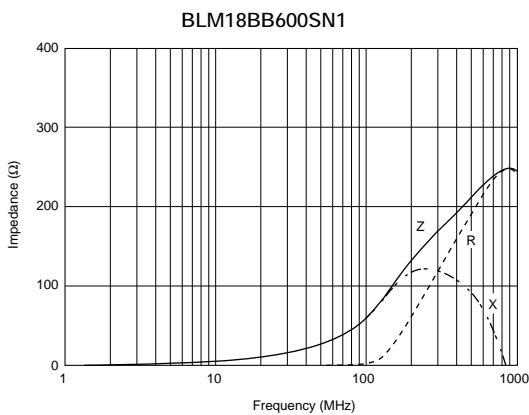
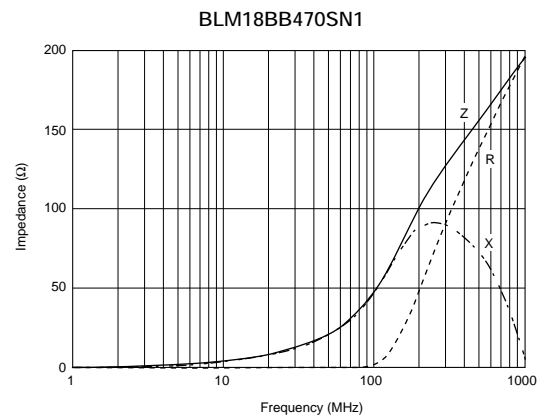
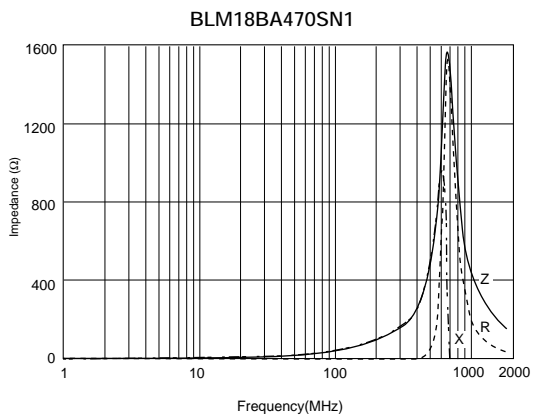
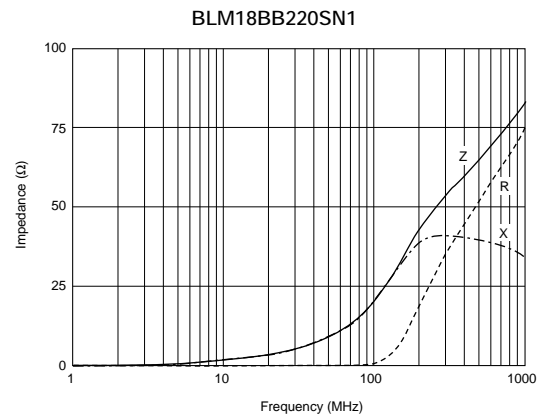
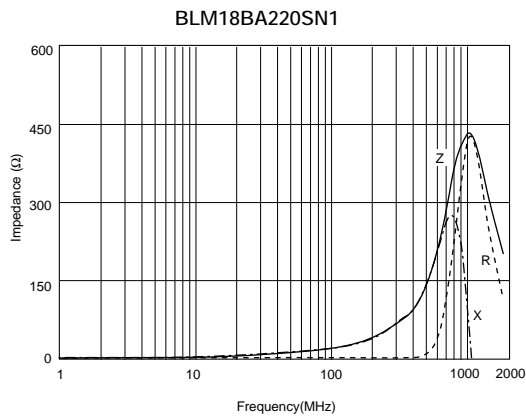
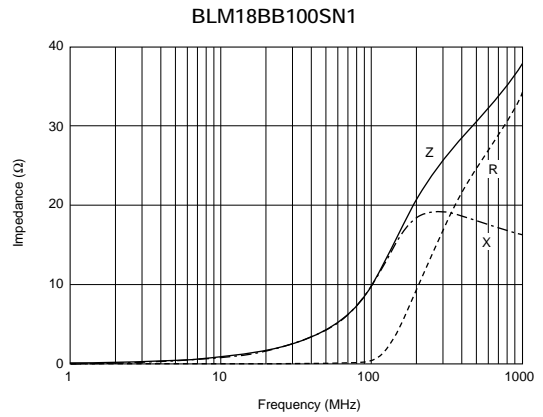
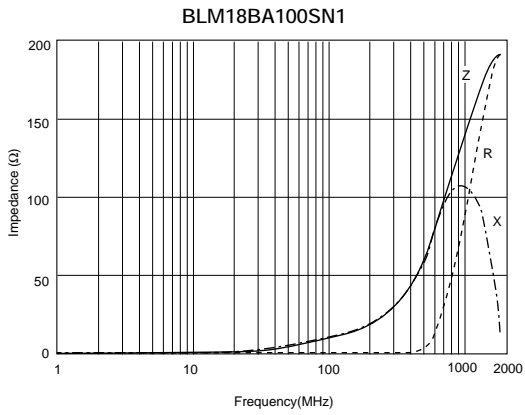
■ Impedance-Frequency Characteristics





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### ■ Impedance-Frequency Characteristics

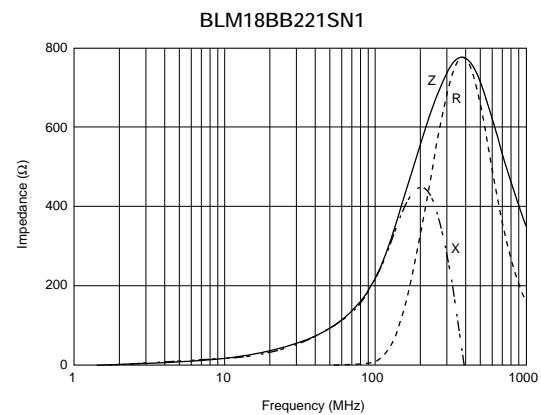
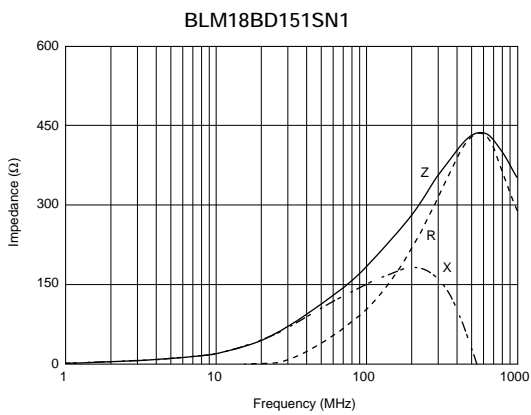
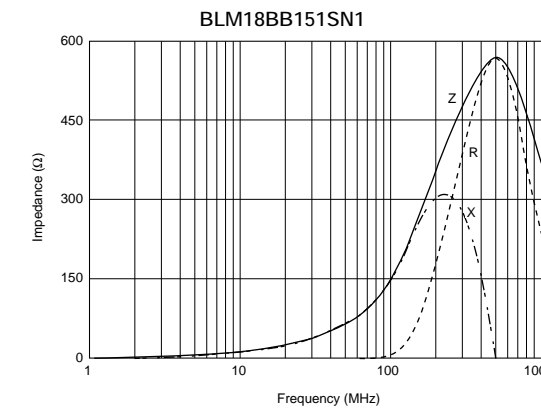
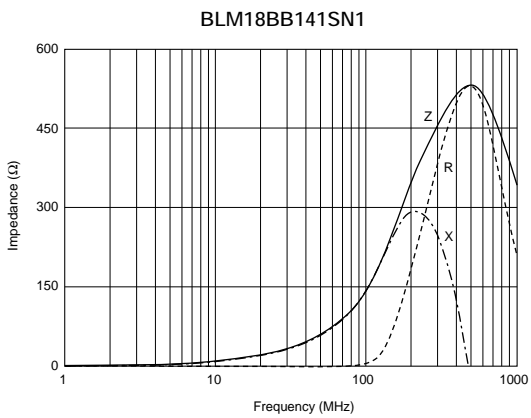
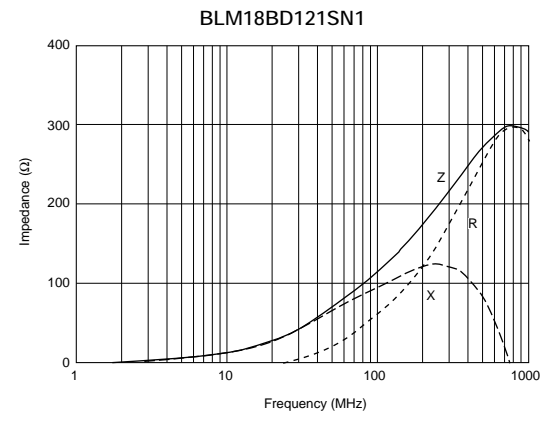
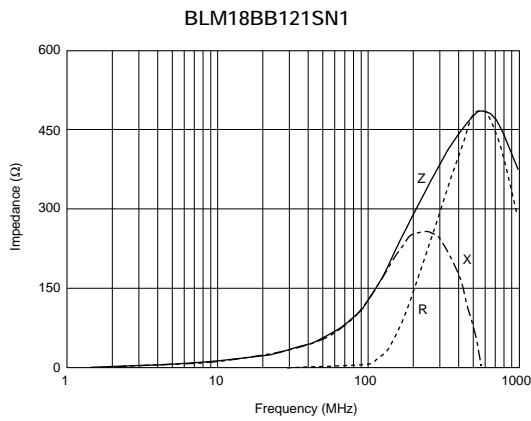
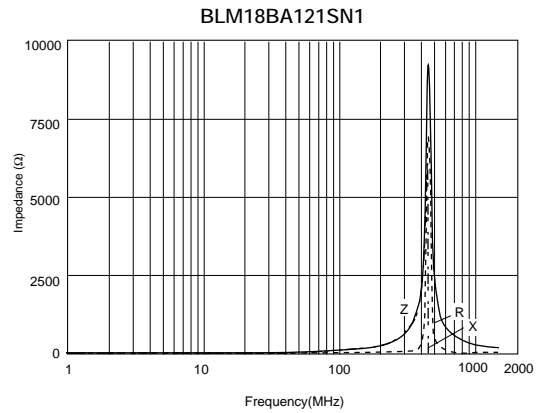
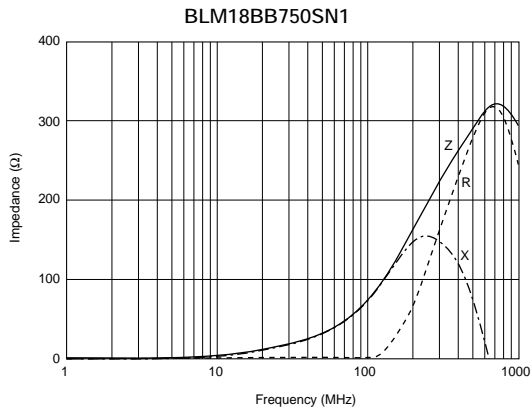


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### Impedance-Frequency Characteristics

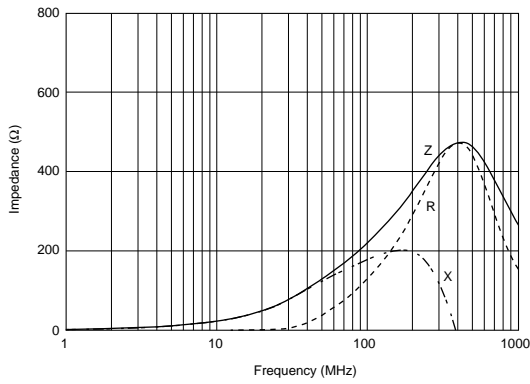


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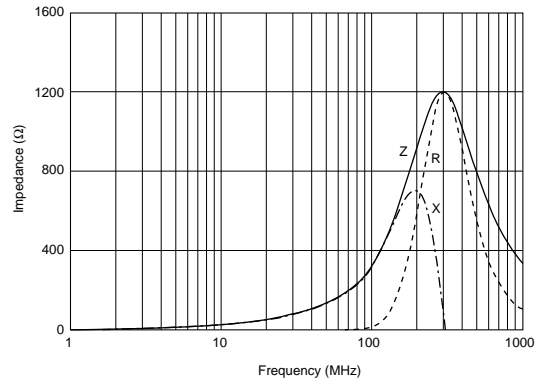
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## Impedance-Frequency Characteristics

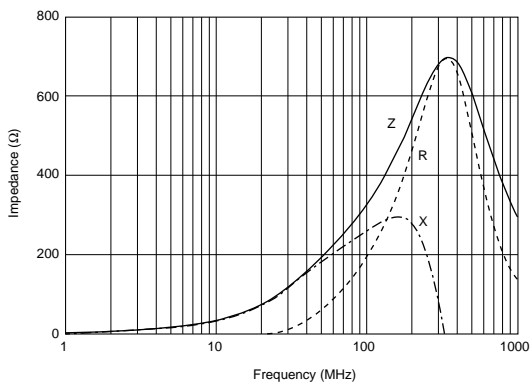
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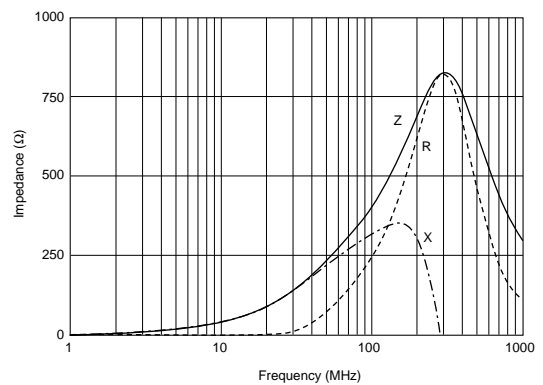
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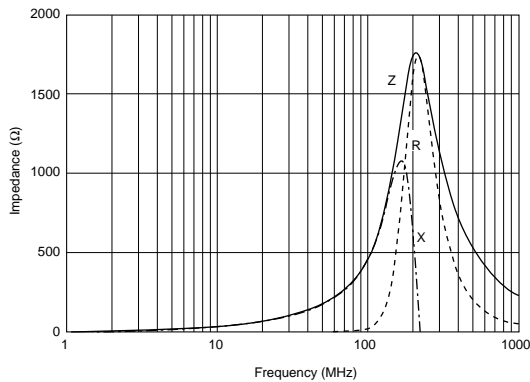
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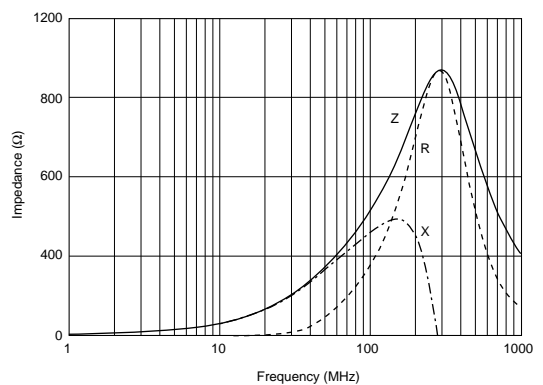
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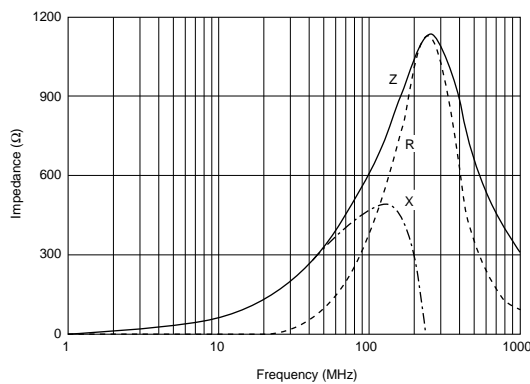
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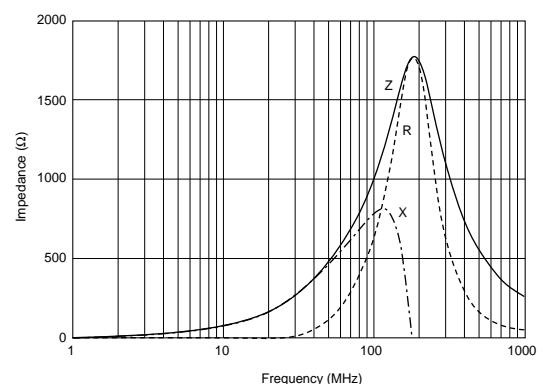
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BLM18BD601SN1



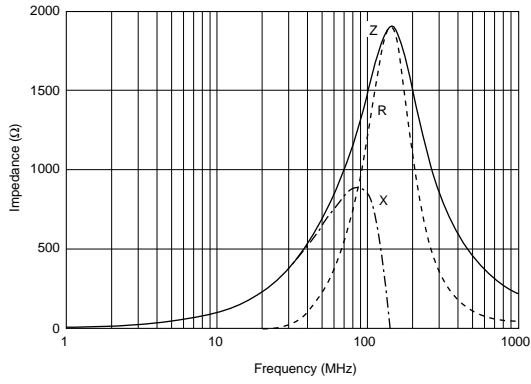
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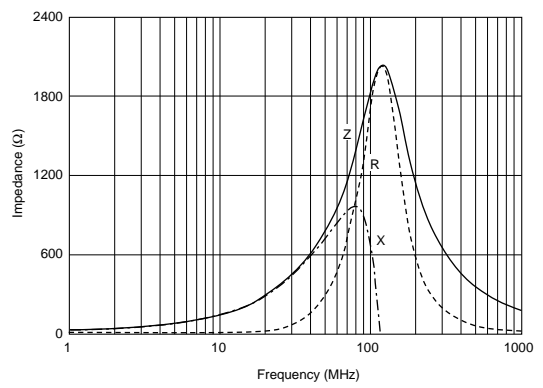
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■ Impedance-Frequency Characteristics

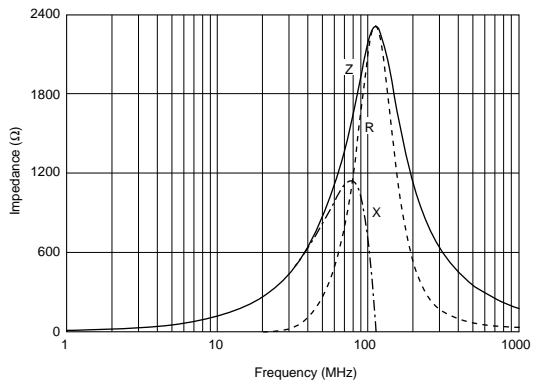
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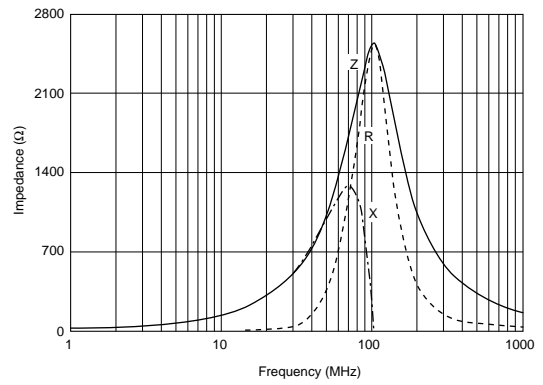
BLM18BD182SN1



BLM18BD222SN1



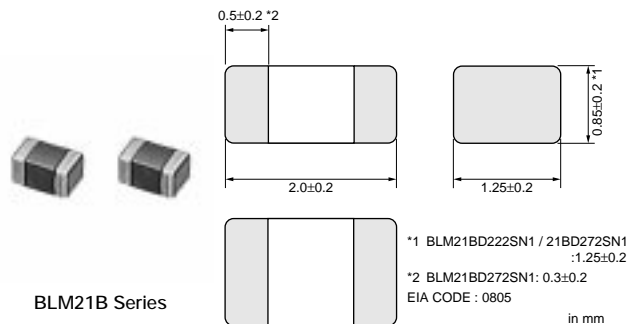
BLM18BD252SN1



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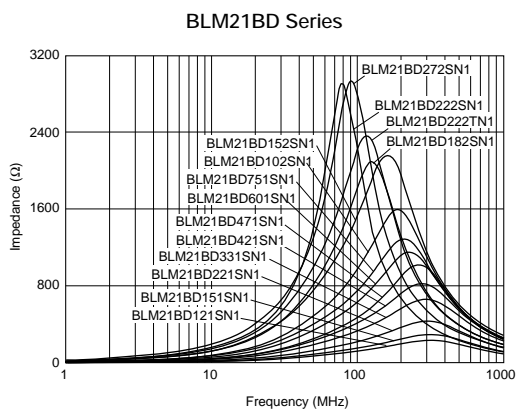
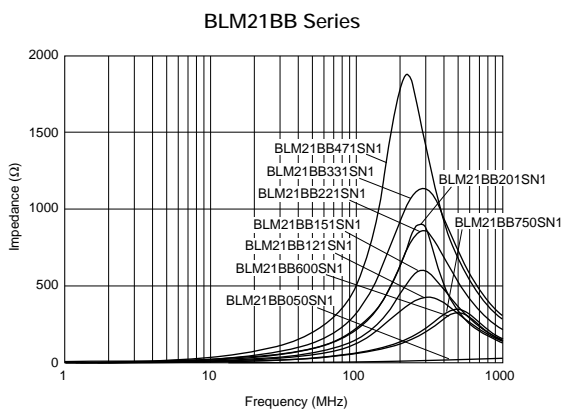
## BLM21B Series (0805 Size)



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| Part Number   | Impedance (at 100MHz, 20 degree C) (ohm) | Rated Current (mA) | DC Resistance (max.) (ohm) | Operating Temperature Range (°C) |
|---------------|--|--------------------|----------------------------|----------------------------------|
| 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                       |
| BLM21BD121SN1 | 120 ±25%                                 | 200                | 0.25                       | -55 to 125                       |
| BLM21BB151SN1 | 150 ±25%                                 | 200                | 0.25                       | -55 to 125                       |
| BLM21BD151SN1 | 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                       |
| BLM21BD221SN1 | 220 ±25%                                 | 200                | 0.25                       | -55 to 125                       |
| BLM21BB331SN1 | 330 ±25%                                 | 200                | 0.40                       | -55 to 125                       |
| BLM21BD331SN1 | 330 ±25%                                 | 200                | 0.30                       | -55 to 125                       |
| BLM21BD421SN1 | 420 ±25%                                 | 200                | 0.30                       | -55 to 125                       |
| BLM21BB471SN1 | 470 ±25%                                 | 200                | 0.45                       | -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                       |

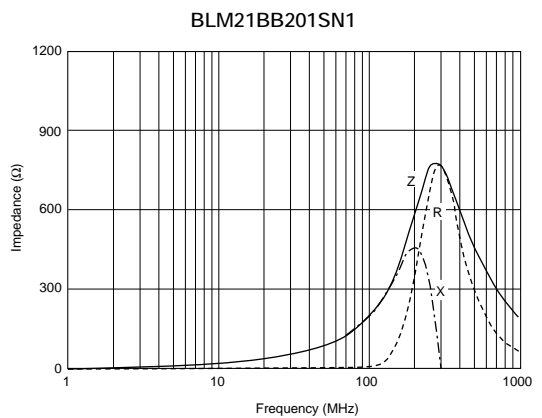
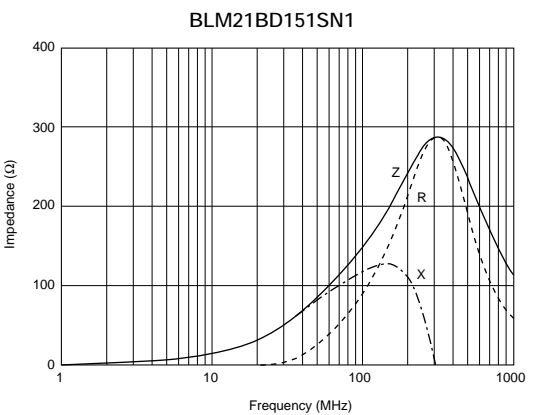
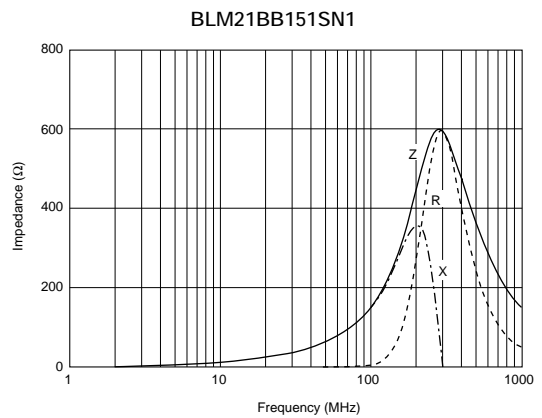
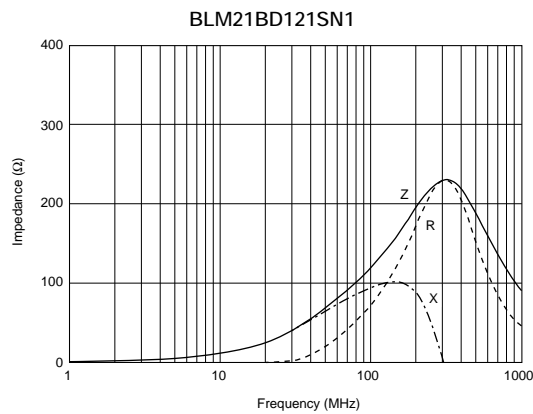
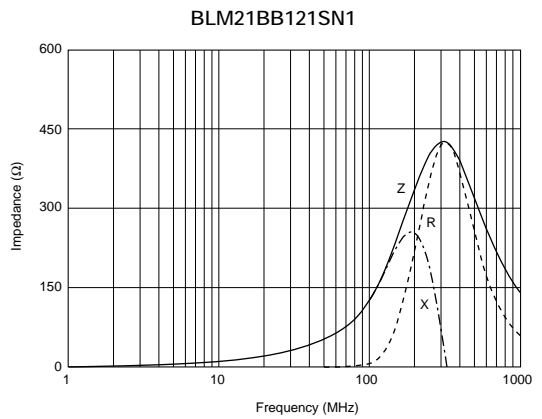
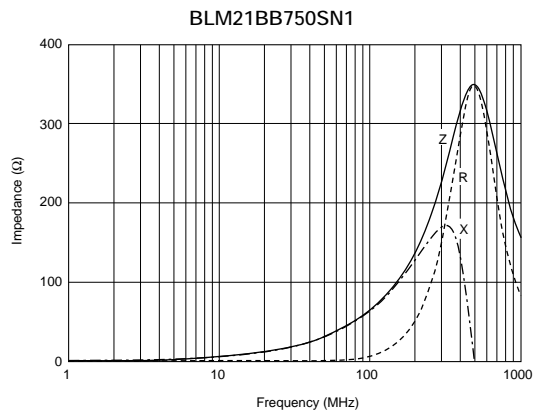
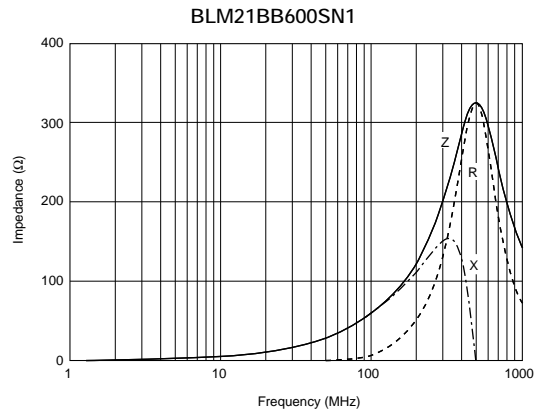
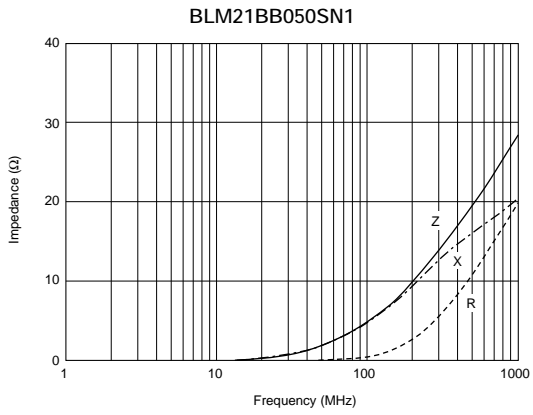
### ■ Impedance-Frequency (Typical)



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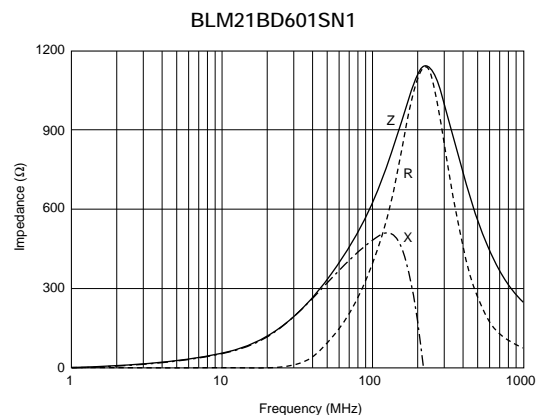
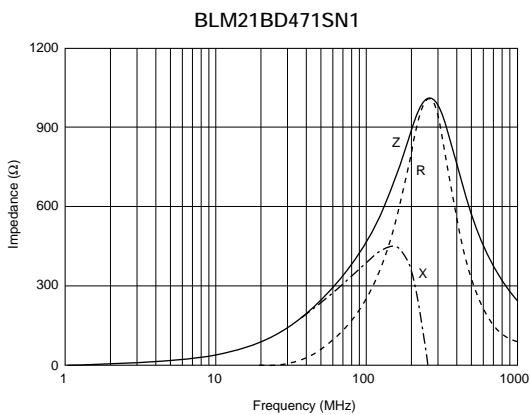
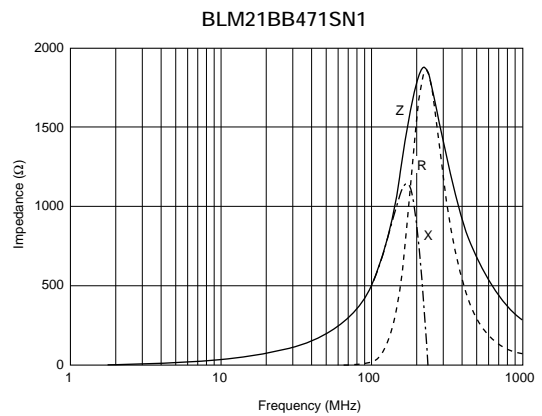
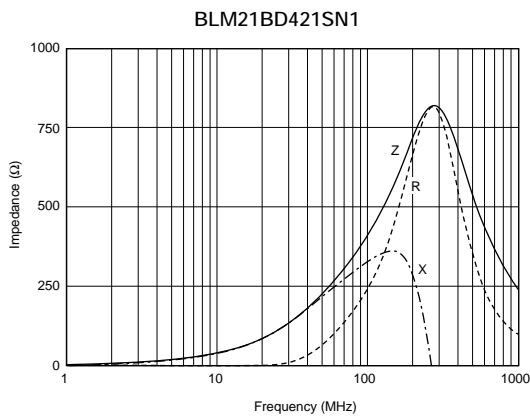
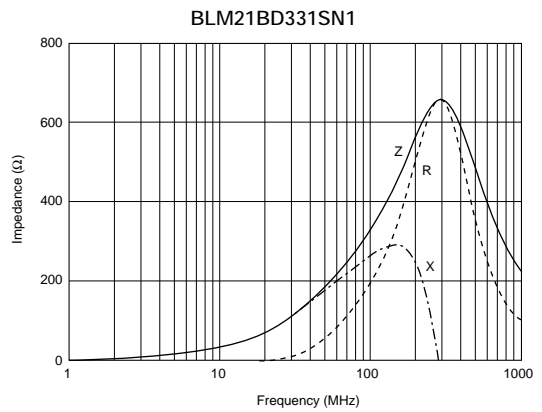
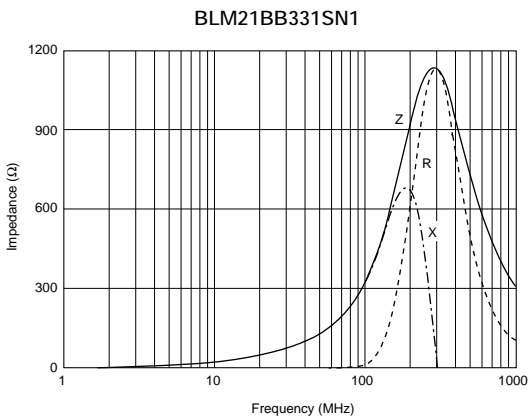
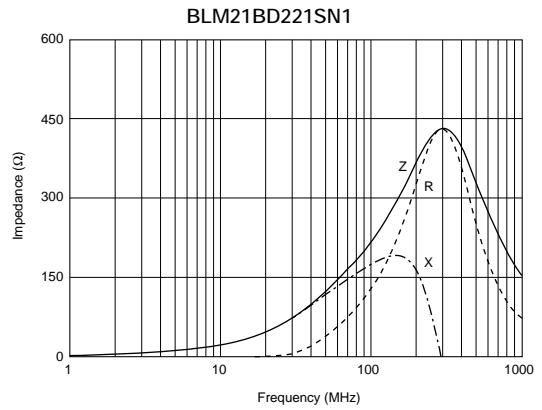
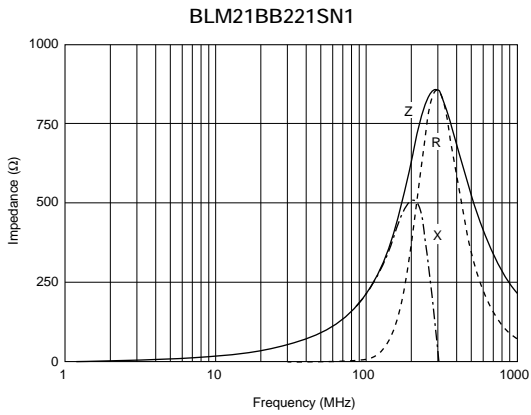
### ■ Impedance-Frequency Characteristics



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**Impedance-Frequency Characteristics**



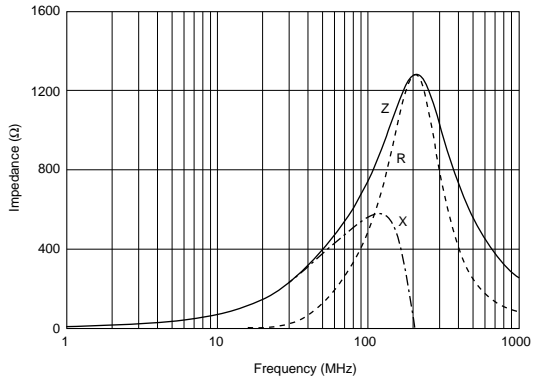
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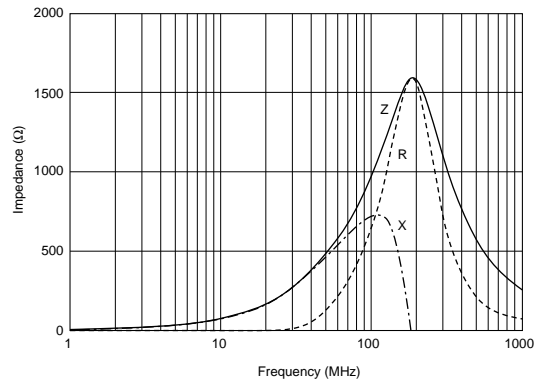
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### Impedance-Frequency Characteristics

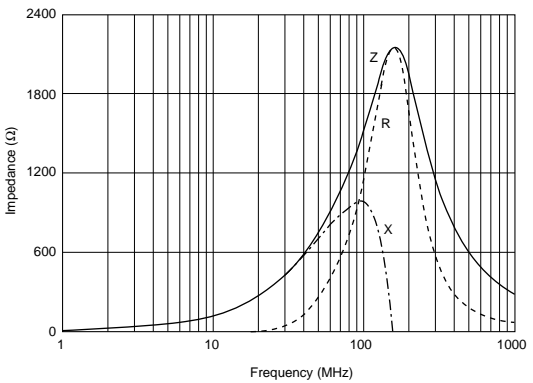
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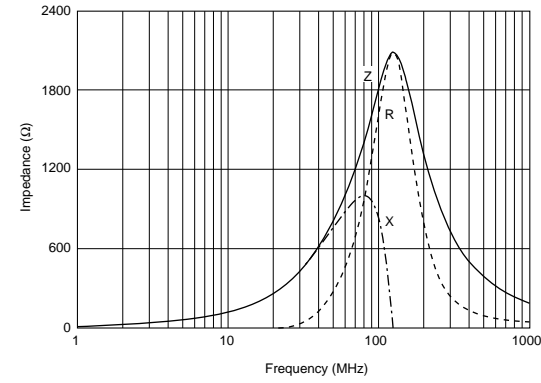
BLM21BD102SN1



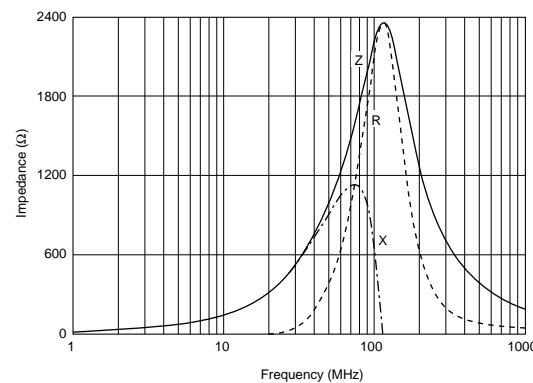
BLM21BD152SN1



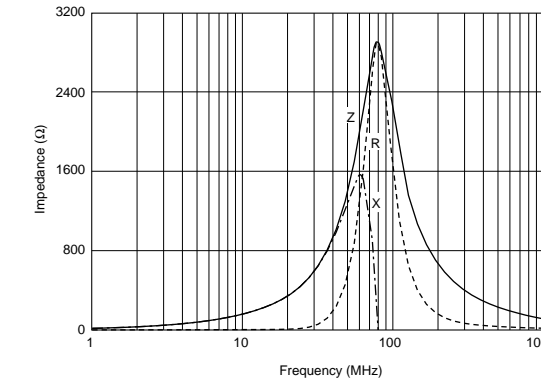
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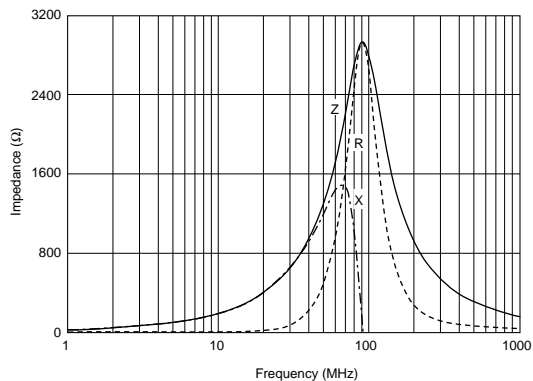
BLM21BD222TN1



BLM21BD222SN1



BLM21BD272SN1

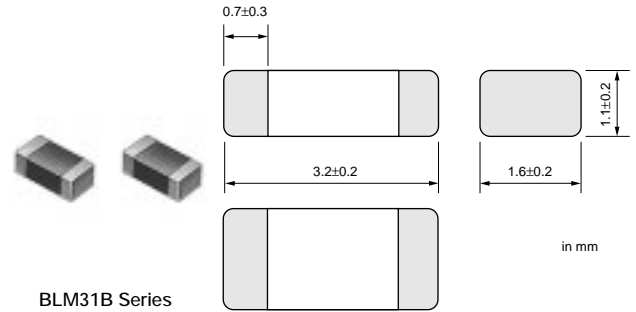


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**BLM31B Series (1206 Size)**

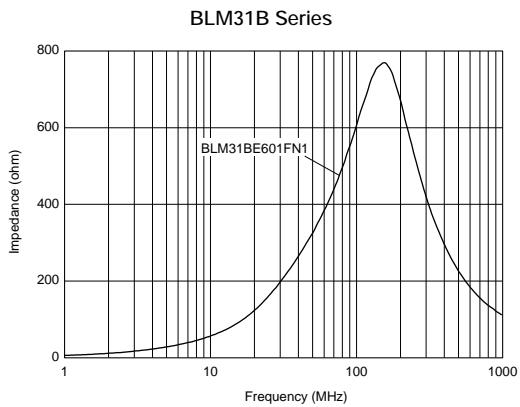


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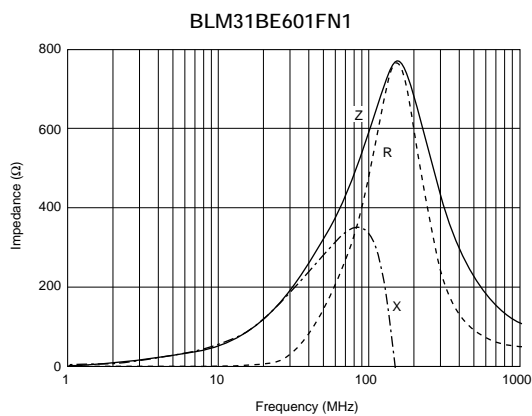
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| Part Number          | Impedance<br>(at 100MHz, 20 degree C)<br>(ohm) | Rated Current<br>(mA) | DC Resistance (max.)<br>(ohm) | Operating<br>Temperature Range<br>(°C) |
|----------------------|--|-----------------------|-------------------------------|--|
| <b>BLM31BE601FN1</b> | 600 ±25%                                       | 300                   | 0.35                          | -55 to 125                             |

■ Impedance-Frequency (Typical)



■ Impedance-Frequency Characteristics

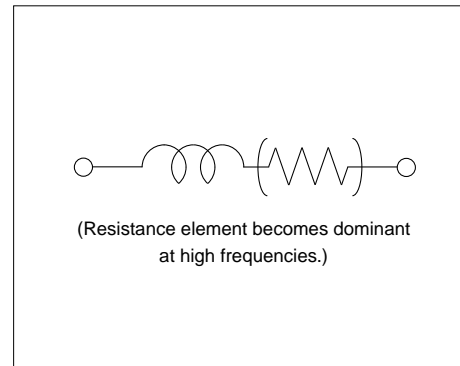


## ■ Features (BLM\_R Series)

The chip ferrite bead BLM series comprises ferrite beads in the shape of a chip. This ferrite bead 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.

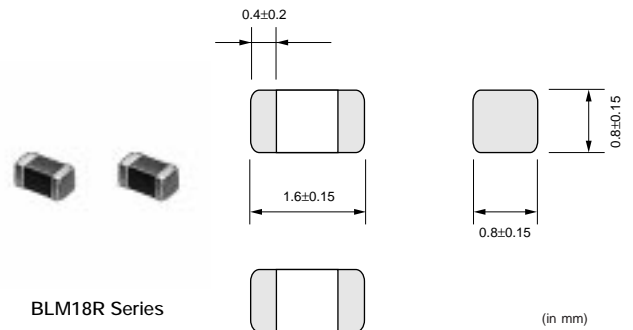
The nickel barrier structure of the external electrodes provides excellent solder heat resistance. The BLM\_R series can be used in a digital interface. Resistance of BLM\_R series especially grows in the lower frequency range. Therefore BLM\_R series is less effective for digital signal waveform at low frequency range and can suppress the ringing.

## ■ Equivalent Circuit



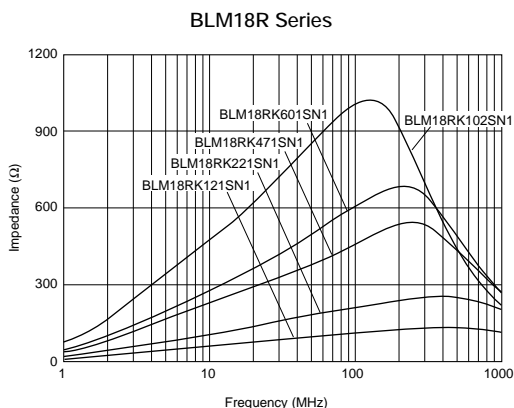
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### BLM18R Series (0603 Size)

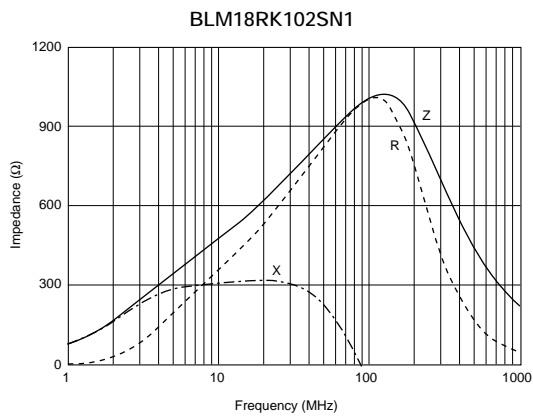
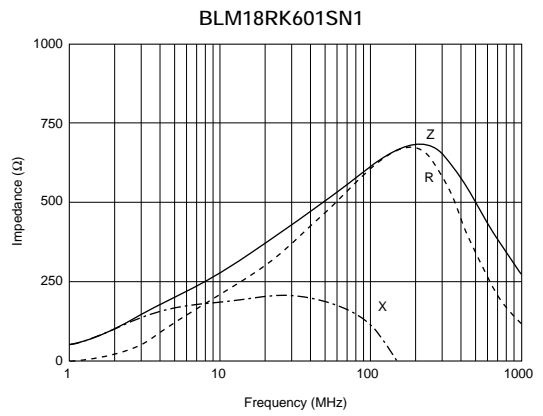
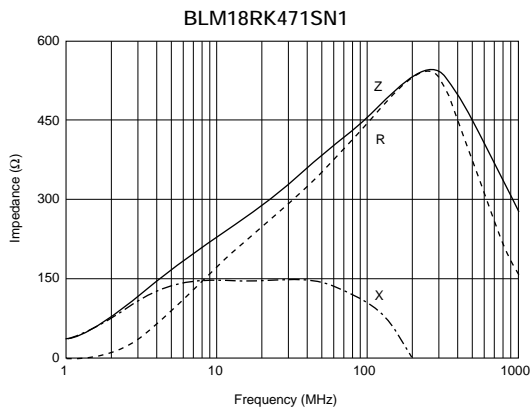
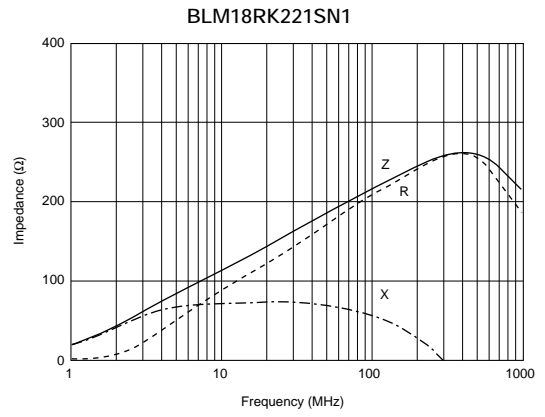
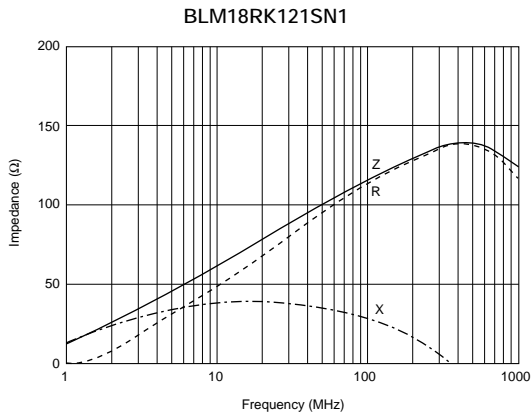


| Part Number   | Impedance (at 100MHz, 20 degree C) (ohm) | Rated Current (mA) | DC Resistance (max.) (ohm) | Operating Temperature Range (°C) |
|---------------|--|--------------------|----------------------------|----------------------------------|
| BLM18RK121SN1 | 120 ±25%                                 | 200                | 0.25                       | -55 to 125                       |
| BLM18RK221SN1 | 220 ±25%                                 | 200                | 0.30                       | -55 to 125                       |
| BLM18RK471SN1 | 470 ±25%                                 | 200                | 0.50                       | -55 to 125                       |
| BLM18RK601SN1 | 600 ±25%                                 | 200                | 0.60                       | -55 to 125                       |
| BLM18RK102SN1 | 1000 ±25%                                | 200                | 0.80                       | -55 to 125                       |

## ■ Impedance-Frequency (Typical)



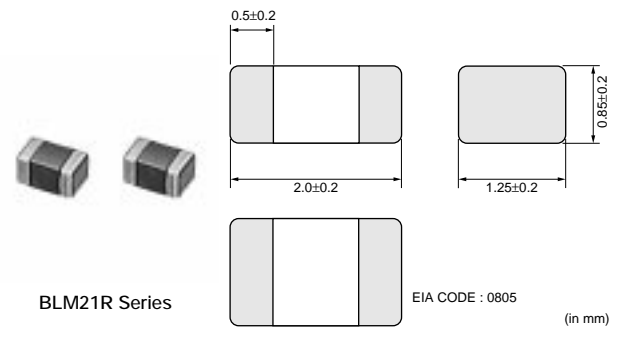
## ■ Impedance-Frequency Characteristics



1

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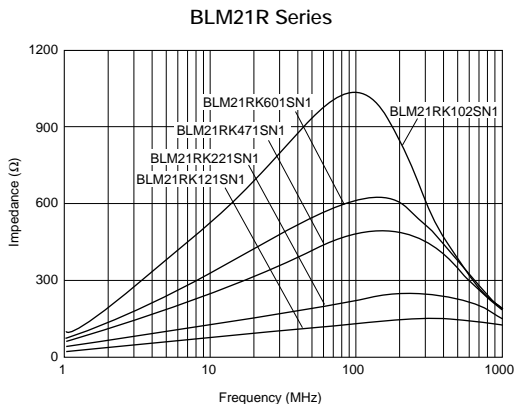
**BLM21R Series (0805 Size)**



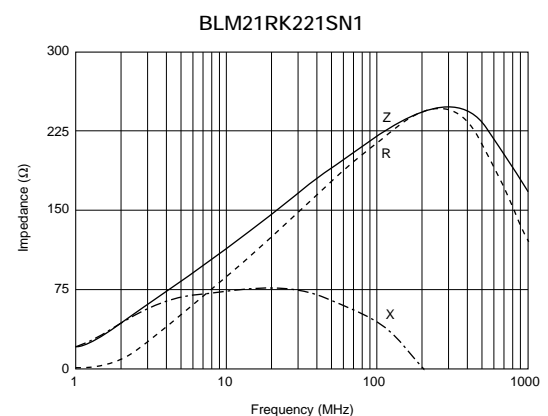
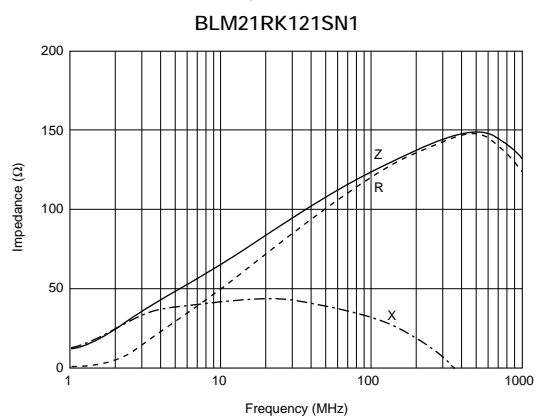
www.DataSheet4U.com

| Part Number          | Impedance (at 100MHz, 20 degree C) (ohm) | Rated Current (mA) | DC Resistance (max.) (ohm) | Operating Temperature Range (°C) |
|----------------------|--|--------------------|----------------------------|----------------------------------|
| <b>BLM21RK121SN1</b> | 120 ±25%                                 | 200                | 0.15                       | -55 to 125                       |
| <b>BLM21RK221SN1</b> | 220 ±25%                                 | 200                | 0.20                       | -55 to 125                       |
| <b>BLM21RK471SN1</b> | 470 ±25%                                 | 200                | 0.25                       | -55 to 125                       |
| <b>BLM21RK601SN1</b> | 600 ±25%                                 | 200                | 0.30                       | -55 to 125                       |
| <b>BLM21RK102SN1</b> | 1000 ±25%                                | 200                | 0.50                       | -55 to 125                       |

■ Impedance-Frequency (Typical)



■ Impedance-Frequency Characteristics

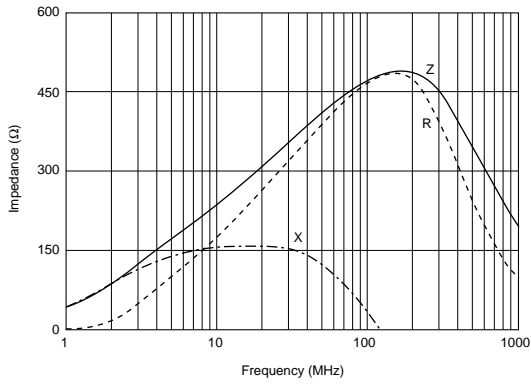


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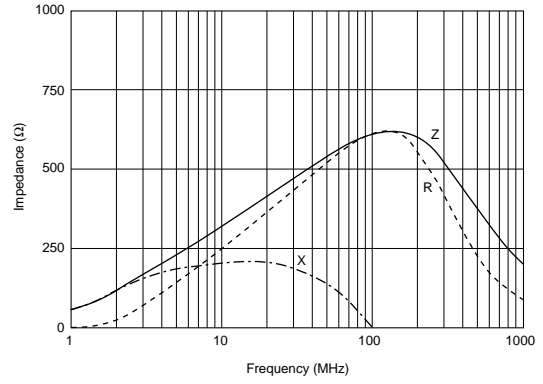
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### ■ Impedance-Frequency Characteristics

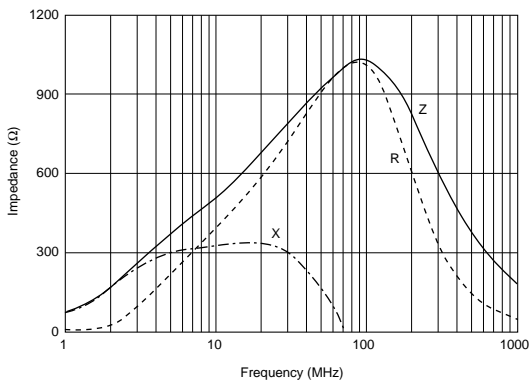
BLM21RK471SN1



BLM21RK601SN1



BLM21RK102SN1



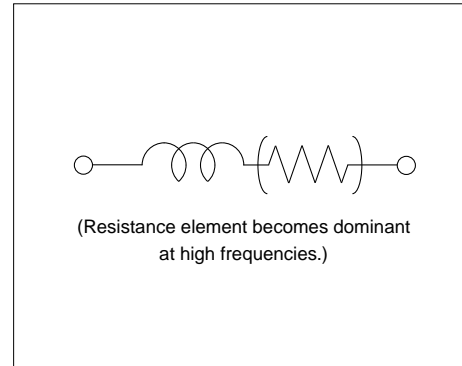
1

### ■ Features (BLM\_P Series)

The chip ferrite bead BLM series comprises ferrite beads in the shape of a chip. This ferrite bead 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.

The nickel barrier structure of the external electrodes provides excellent solder heat resistance. 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).

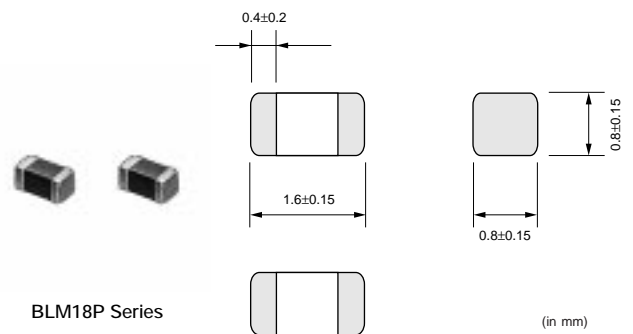
### ■ Equivalent Circuit



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### BLM18P Series (0603 Size)

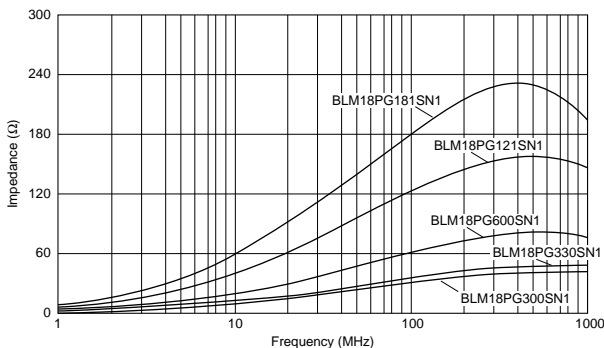


| Part Number   | Impedance (at 100MHz, 20 degree C) (ohm) | Rated Current (mA) | DC Resistance (max.) (ohm) | Operating Temperature Range (°C) |
|---------------|--|--------------------|----------------------------|----------------------------------|
| BLM18PG300SN1 | 30 (Typ.)                                | 1000               | 0.05                       | -55 to 125                       |
| BLM18PG330SN1 | 33 ±25%                                  | 3000               | 0.025                      | -55 to 125                       |
| BLM18PG600SN1 | 60 (Typ.)                                | 500                | 0.10                       | -55 to 125                       |
| BLM18PG121SN1 | 120 ±25%                                 | 2000               | 0.05                       | -55 to 125                       |
| BLM18PG181SN1 | 180 ±25%                                 | 1500               | 0.09                       | -55 to 125                       |

At rated current upper than 1500mA, derating is required.  
Please refer P. 51, "Derating of Rated Current".

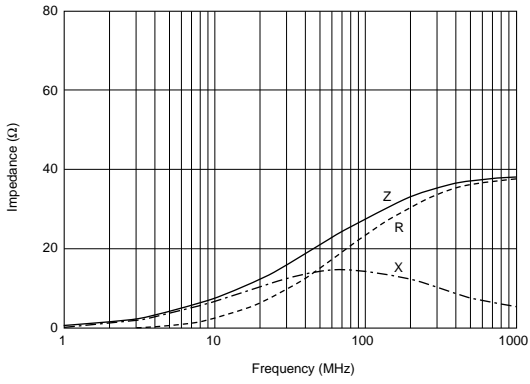
### ■ Impedance-Frequency (Typical)

BLM18P Series

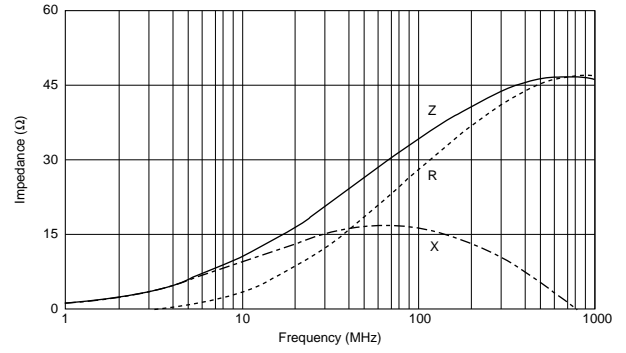


## ■ Impedance-Frequency Characteristics

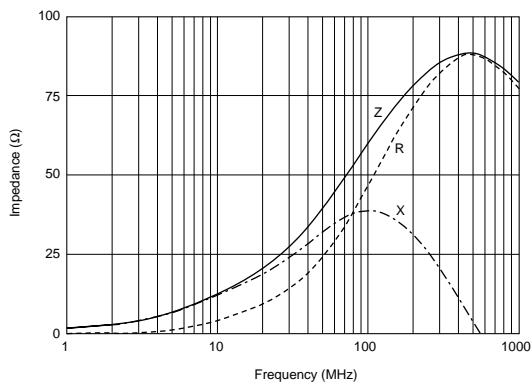
BLM18PG300SN1



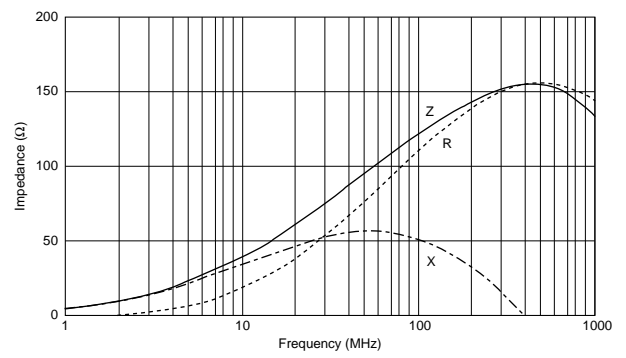
BLM18PG330SN1



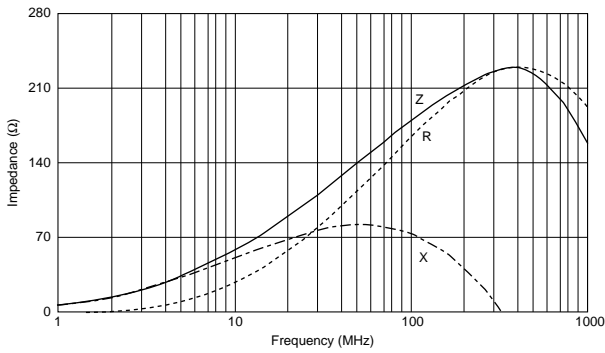
BLM18PG600SN1



BLM18PG121SN1



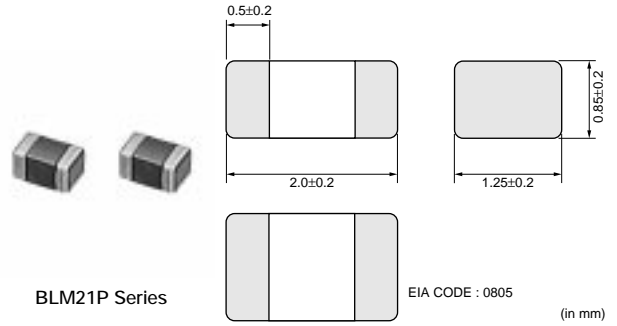
BLM18PG181SN1



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## BLM21P Series (0805 Size)



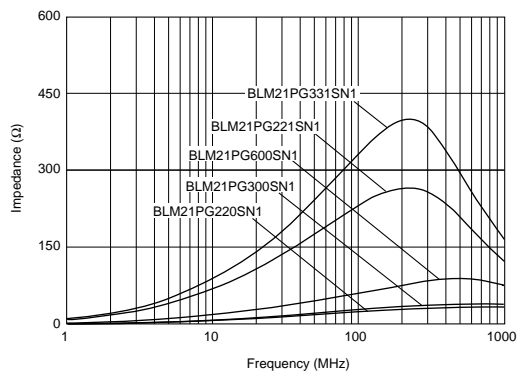
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| Part Number          | Impedance<br>(at 100MHz, 20 degree C)<br>(ohm) | Rated Current<br>(mA) | DC Resistance (max.)<br>(ohm) | Operating<br>Temperature Range<br>(°C) |
|----------------------|--|-----------------------|-------------------------------|--|
| <b>BLM21PG220SN1</b> | 22 ±25%  | 6000                  | 0.01                          | -55 to 125                             |
| <b>BLM21PG300SN1</b> | 30 (Typ.)                                      | 3000                  | 0.015                         | -55 to 125                             |
| <b>BLM21PG600SN1</b> | 60 ±25%  | 3000                  | 0.025                         | -55 to 125                             |
| <b>BLM21PG221SN1</b> | 220 ±25%                                       | 2000                  | 0.050                         | -55 to 125                             |
| <b>BLM21PG331SN1</b> | 330 ±25%                                       | 1500                  | 0.09                          | -55 to 125                             |

At rated current upper than 1500mA, derating is required.  
Please refer P. 51, "Derating of Rated Current".

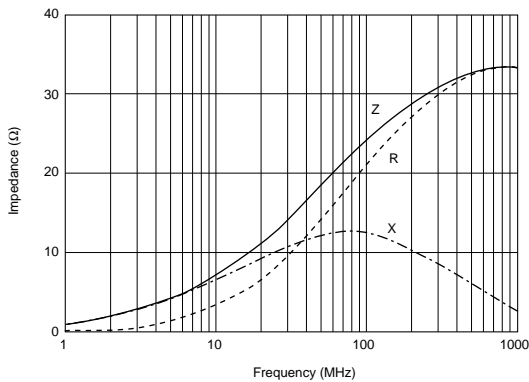
### ■ Impedance-Frequency (Typical)

BLM21P Series

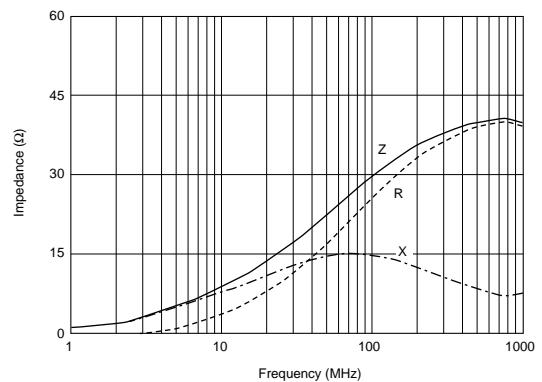


### ■ Impedance-Frequency Characteristics

BLM21PG220SN1



BLM21PG300SN1



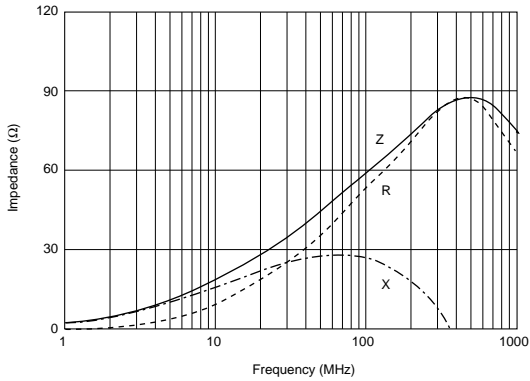
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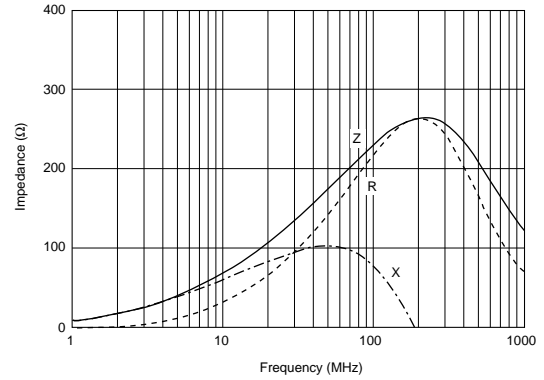
Continued from the preceding page.

### Impedance-Frequency Characteristics

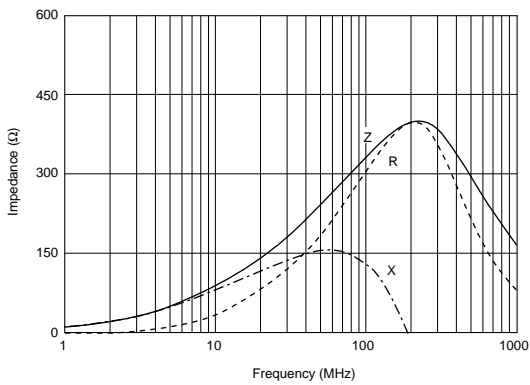
BLM21PG600SN1



BLM21PG221SN1

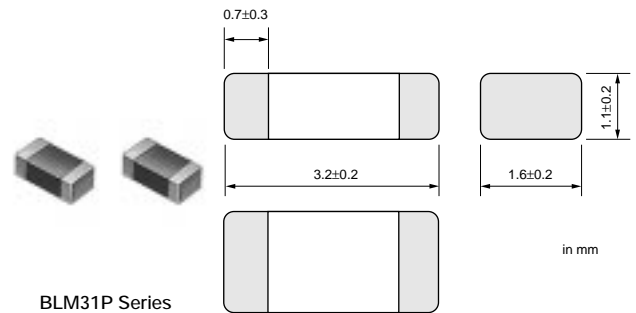


BLM21PG331SN1



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### BLM31P Series (1206 Size)

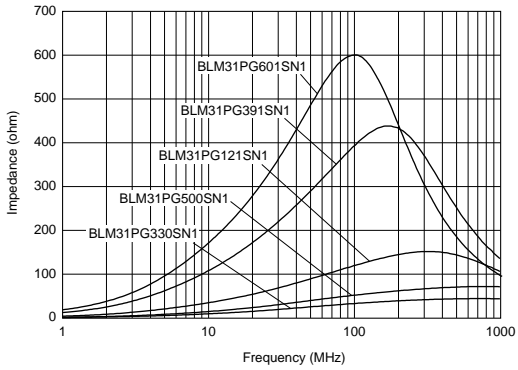


| Part Number   | Impedance (at 100MHz, 20 degree C) (ohm) | Rated Current (mA) | DC Resistance (max.) (ohm) | Operating Temperature Range (°C) |
|---------------|--|--------------------|----------------------------|----------------------------------|
| BLM31PG330SN1 | 33 ±25%                                  | 6000               | 0.01                       | -55 to 125                       |
| BLM31PG500SN1 | 50 (Typ.)                                | 3000               | 0.025                      | -55 to 125                       |
| BLM31PG121SN1 | 120 ±25%                                 | 3000               | 0.025                      | -55 to 125                       |
| BLM31PG391SN1 | 390 ±25%                                 | 2000               | 0.05                       | -55 to 125                       |
| BLM31PG601SN1 | 600 ±25%                                 | 1500               | 0.09                       | -55 to 125                       |

At rated current upper than 1500mA, derating is required.  
Please refer P. 51, "Derating of Rated Current".

## ■ Impedance-Frequency (Typical)

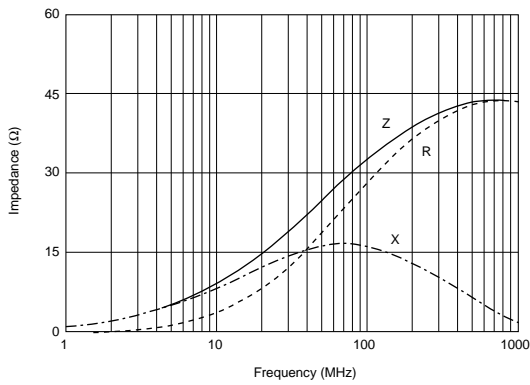
BLM31P Series



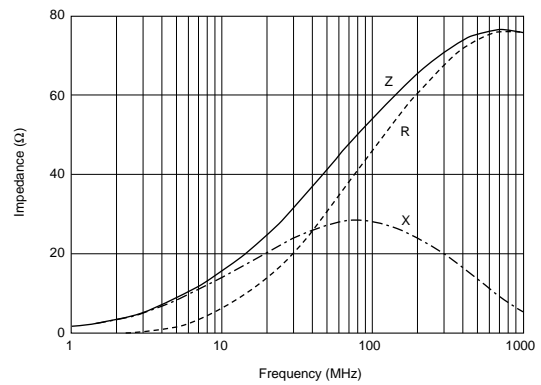
www.DataSheet4U.com

## ■ Impedance-Frequency Characteristics

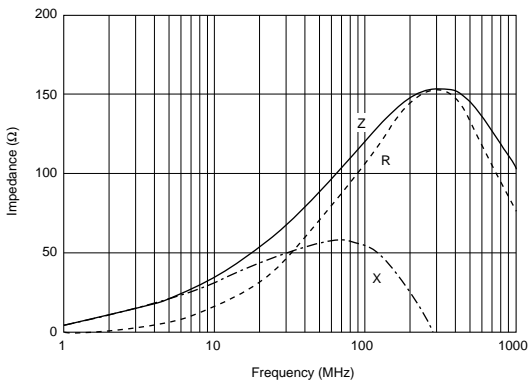
BLM31PG330SN1



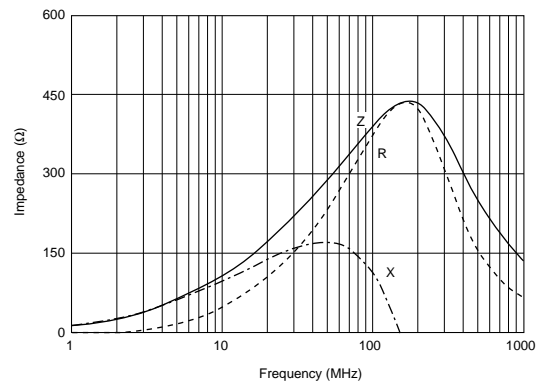
BLM31PG500SN1



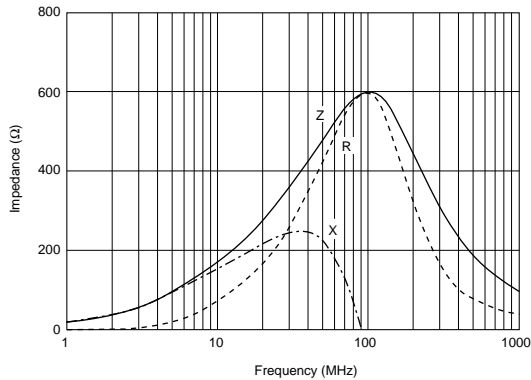
BLM31PG121SN1



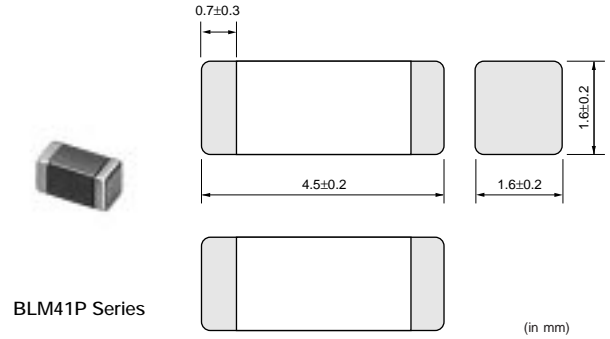
BLM31PG391SN1



BLM31PG601SN1



## BLM41P Series (1806 Size)

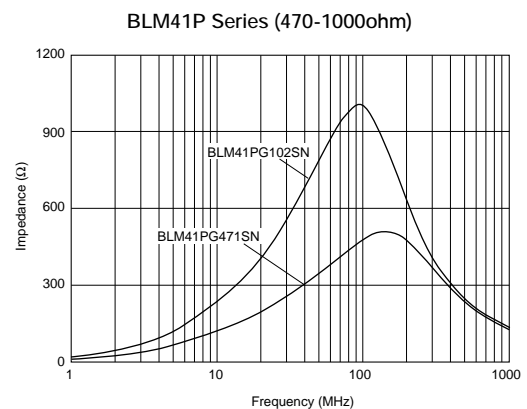
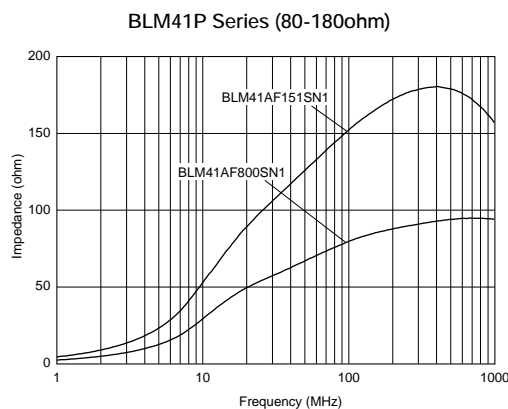


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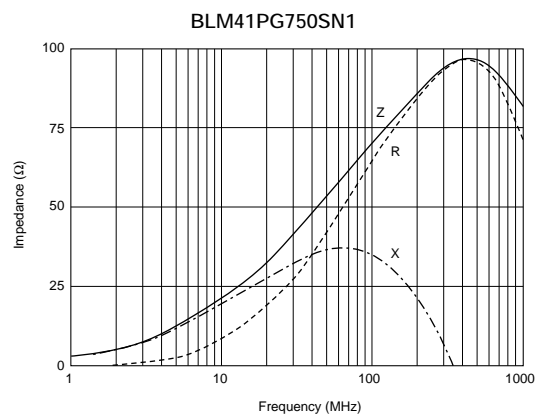
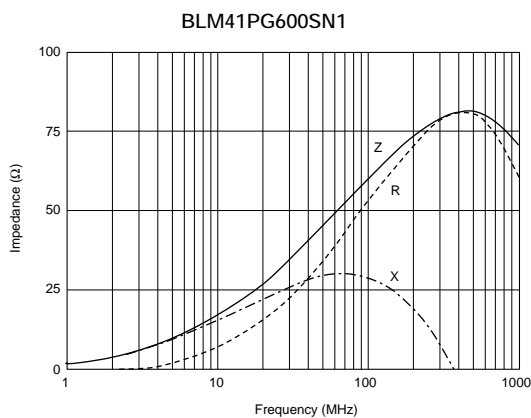
| Part Number          | Impedance (at 100MHz, 20 degree C) (ohm) | Rated Current (mA) | DC Resistance (max.) (ohm) | Operating Temperature Range (°C) |
|----------------------|--|--------------------|----------------------------|----------------------------------|
| <b>BLM41PG600SN1</b> | 60 (Typ.)                                | 6000               | 0.01                       | -55 to 125                       |
| <b>BLM41PG750SN1</b> | 75 (Typ.)                                | 3000               | 0.025                      | -55 to 125                       |
| <b>BLM41PF800SN1</b> | 80 (Typ.)                                | 1000               | 0.10                       | -55 to 125                       |
| <b>BLM41PG181SN1</b> | 180 ±25%                                 | 3000               | 0.025                      | -55 to 125                       |
| <b>BLM41PG471SN1</b> | 470 ±25%                                 | 2000               | 0.05                       | -55 to 125                       |
| <b>BLM41PG102SN1</b> | 1000 ±25%                                | 1500               | 0.09                       | -55 to 125                       |

At rated current upper than 1500mA, derating is required.  
Please refer P. 51, "Derating of Rated Current".

### ■ Impedance-Frequency (Typical)



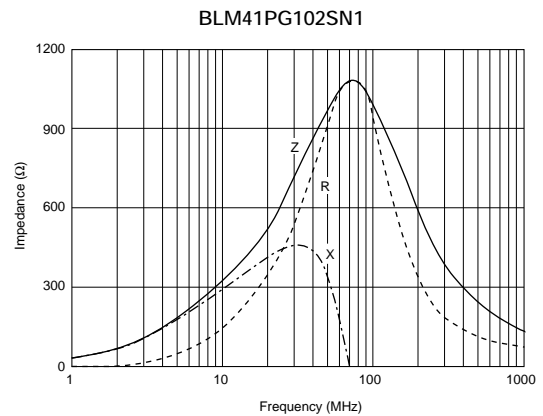
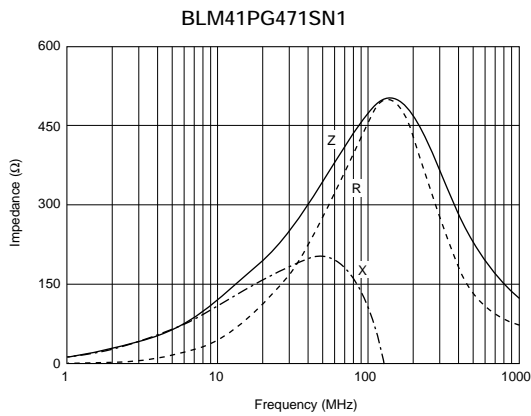
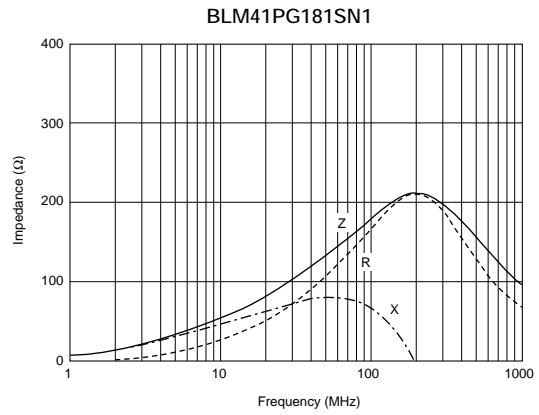
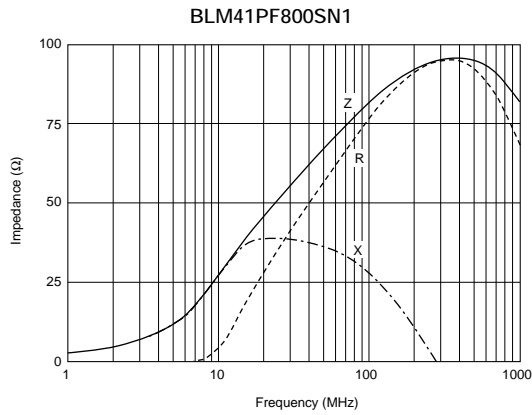
### ■ Impedance-Frequency Characteristics



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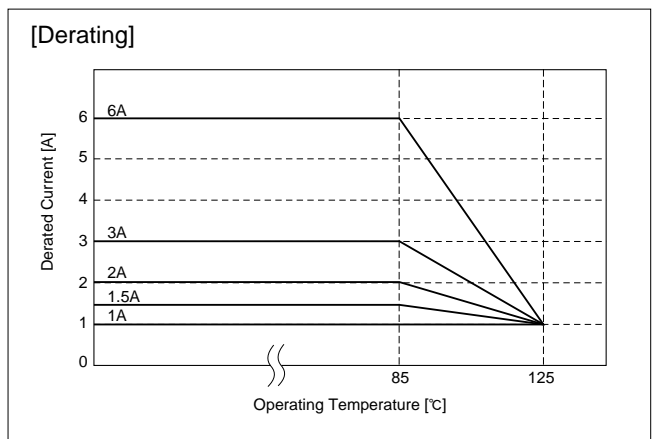
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### ■ Impedance-Frequency Characteristics



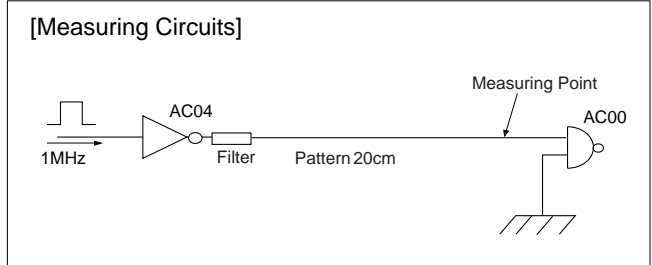
### ■ Notice (Rating)

In operating temperatures exceeding +85°C, derating of current is necessary for chip Ferrite Beads for which rated current is 1.5A or over. 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



1

| Type of Filter   | EMI Suppression Effect / Description         |                                    |   |
|--|--|------------------------------------|---|
| <p>Initial<br/>(No filter)</p>                               | <p>Signal waveform (100nsec/div, 2V/div)</p> | <p>Expand (10nsec/div, 2V/div)</p> | <p>Spectrum</p> <p>Ringing is caused on the signal waveform.<br/>Such ringing contains several hundred MHz harmonic components and generates noise.</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>Comparing initial waveform, ringing is suppressed a little.<br/>However there still remains high level waveform distortion.</p>  |
| <p><b>BLM18RK221SN1</b><br/>(220Ω at 100MHz)<br/>is used</p> | <p>Signal waveform (100nsec/div, 2V/div)</p> | <p>Expand (10nsec/div, 2V/div)</p> | <p>Spectrum</p> <p>BLM18R has excellent performance for noise suppression and waveform distortion suppression.<br/>BLM18R suppresses drastically not only spectrum level in more than 100MHz range but waveform distortion.</p> |

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



## GHz Noise Suppression Chip Ferrite Beads BLM18H/BLM18E Series

BLM18H/BLM18E series has a modified internal electrode structure, that minimizes stray capacitance and increases the effective frequency range.

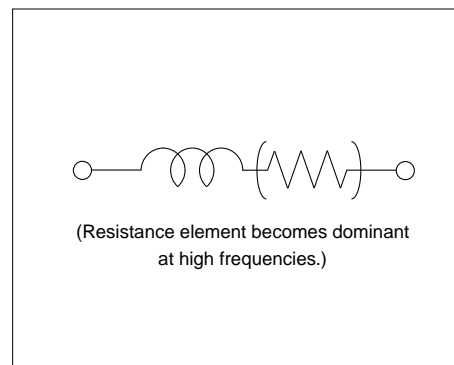
### ■ Equivalent Circuit

#### ■ Features (BLM18H series)

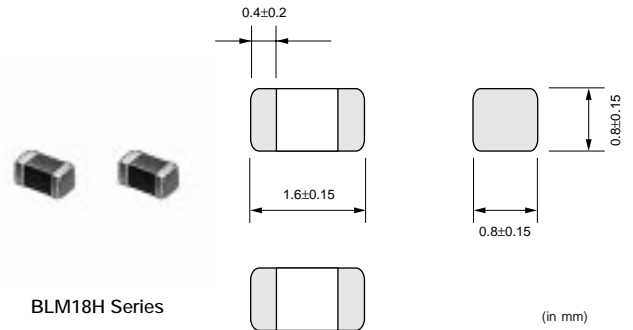
1. BLM18H series is realized high impedance at 1GHz and suitable for noise suppression from 500MHz to GHz range. The impedance value of HG/HD-type is about three times as large as that of A/B-type at 1GHz, though the impedance characteristic of HG/HD-type is similar to A-type at 100MHz or less.
2. HG-type is effective in noise suppression in wide frequency range (several MHz to several GHz). HB/HD-type for high-speed signal line provides a sharper roll-off after the cut off frequency. HK-type for digital interface is effective in suppressing the ringing because resistance especially grows in the lower frequency.
3. The magnetic shielded structure minimizes crosstalk.

#### ■ Features (BLM18E series)

1. Low DC Resistance and a large Rated Current are suitable for noise suppression of the driver circuit.
2. Excellent direct current characteristics
3. Thin type (t=0.5mm) is suitable for small and low profile equipment such as DSC, cellular phones.



## BLM18H Series (0603 Size)

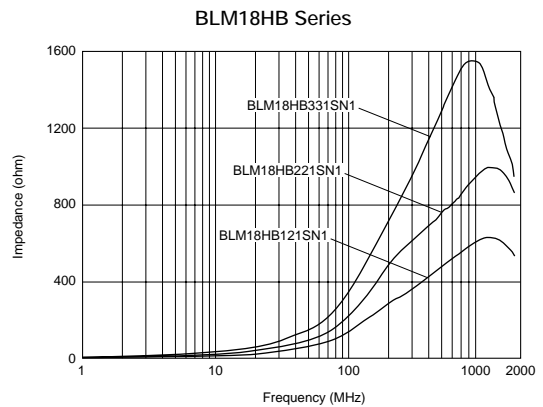
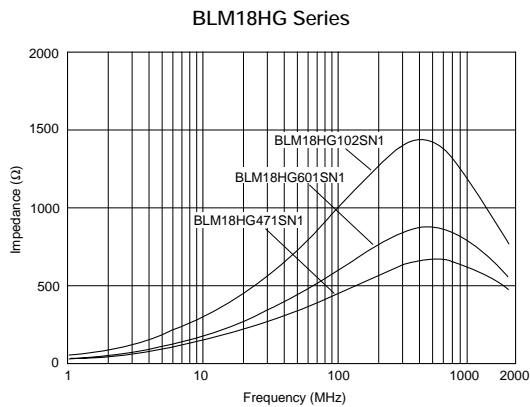


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| Part Number          | Impedance<br>(at 100MHz, 20 degree C)<br>(ohm) | Impedance<br>(at 1GHz, 25 degree C)<br>(ohm) | Rated Current<br>(mA) | DC Resistance (max.)<br>(ohm) | Operating<br>Temperature Range<br>(°C) |
|----------------------|--|--|-----------------------|-------------------------------|--|
| <b>BLM18HG471SN1</b> | 470 ±25%                                       | 600 (Typ.)                                   | 200                   | 0.85                          | -55 to 125                             |
| <b>BLM18HG601SN1</b> | 600 ±25%                                       | 700 (Typ.)                                   | 200                   | 1.00                          | -55 to 125                             |
| <b>BLM18HG102SN1</b> | 1000 ±25%                                      | 1000 (Typ.)                                  | 100                   | 1.60                          | -55 to 125                             |
| <b>BLM18HB121SN1</b> | 120 ±25%                                       | 500 ±40%                                     | 200                   | 0.50                          | -55 to 125                             |
| <b>BLM18HB221SN1</b> | 220 ±25%                                       | 1100 ±40%                                    | 100                   | 0.80                          | -55 to 125                             |
| <b>BLM18HB331SN1</b> | 330 ±25%                                       | 1600 ±40%                                    | 50                    | 1.20                          | -55 to 125                             |
| <b>BLM18HD471SN1</b> | 470 ±25%                                       | 1000 (Typ.)                                  | 100                   | 1.20                          | -55 to 125                             |
| <b>BLM18HD601SN1</b> | 600 ±25%                                       | 1200 (Typ.)                                  | 100                   | 1.50                          | -55 to 125                             |
| <b>BLM18HD102SN1</b> | 1000 ±25%                                      | 1700 (Typ.)                                  | 50                    | 1.80                          | -55 to 125                             |
| <b>BLM18HK331SN1</b> | 330 ±25%                                       | 400 ±40%                                     | 200                   | 0.50                          | -55 to 125                             |
| <b>BLM18HK471SN1</b> | 470 ±25%                                       | 600 ±40%                                     | 200                   | 0.70                          | -55 to 125                             |
| <b>BLM18HK601SN1</b> | 600 ±25%                                       | 700 ±40%                                     | 100                   | 0.90                          | -55 to 125                             |
| <b>BLM18HK102SN1</b> | 1000 ±25%                                      | 1200 ±40%                                    | 50                    | 1.50                          | -55 to 125                             |

### ■ Impedance-Frequency (Typical)

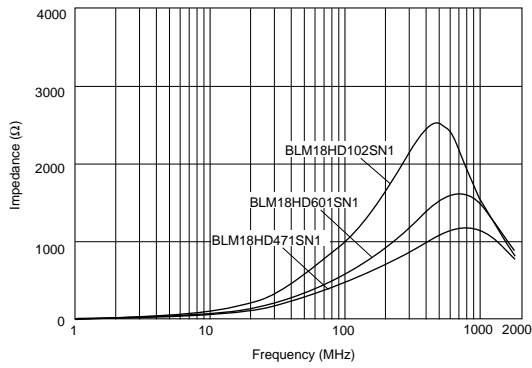


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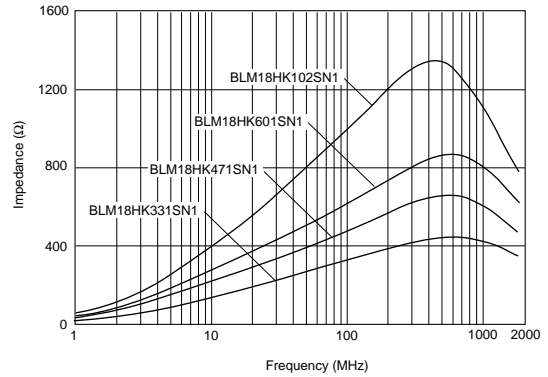
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### Impedance-Frequency (Typical)

BLM18HD Series



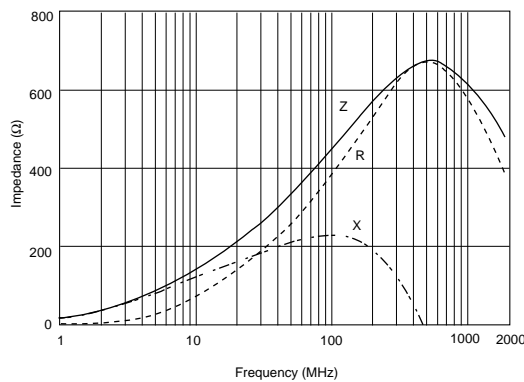
BLM18HK Series



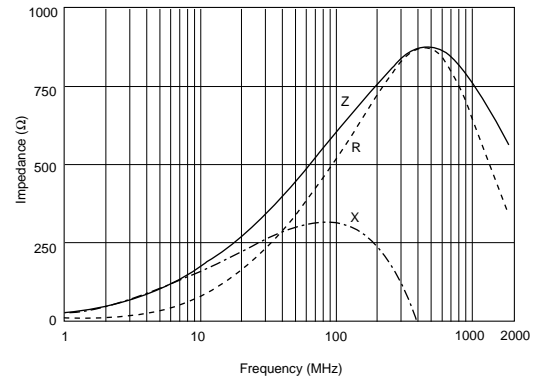
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### Impedance-Frequency Characteristics

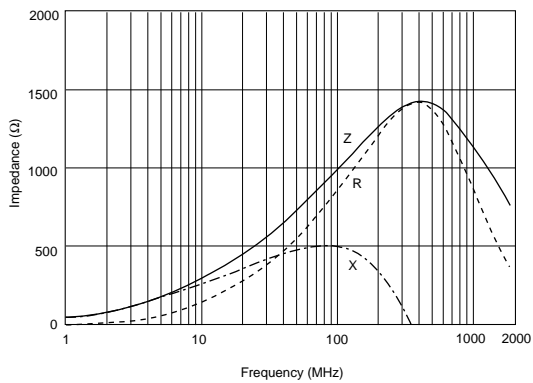
BLM18HG471SN1



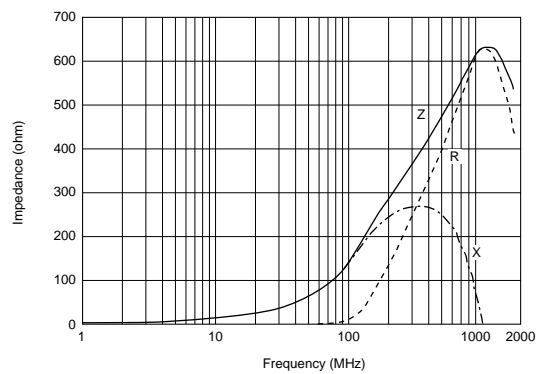
BLM18HG601SN1



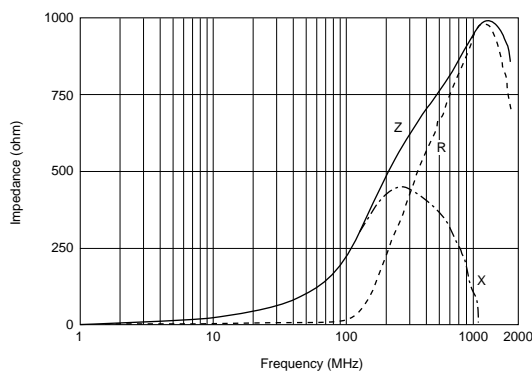
BLM18HG102SN1



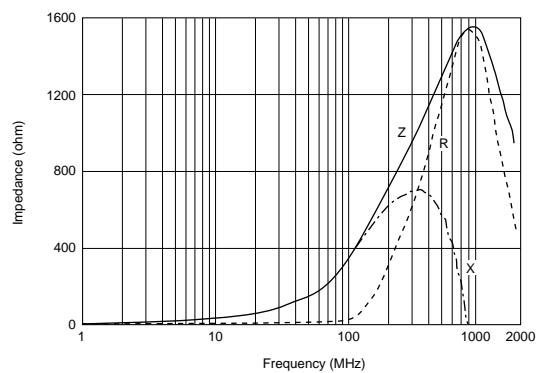
BLM18HB121SN1



BLM18HB221SN1



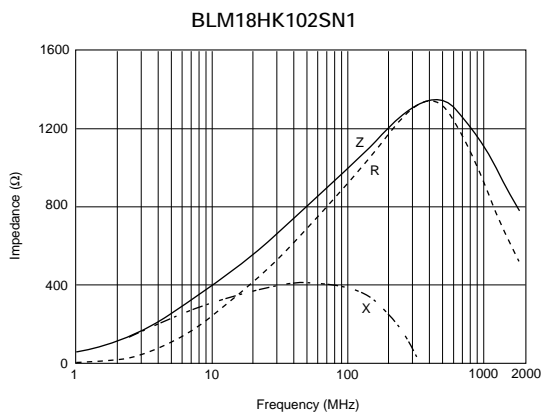
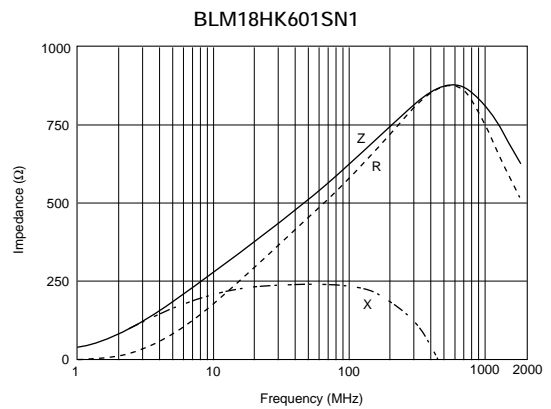
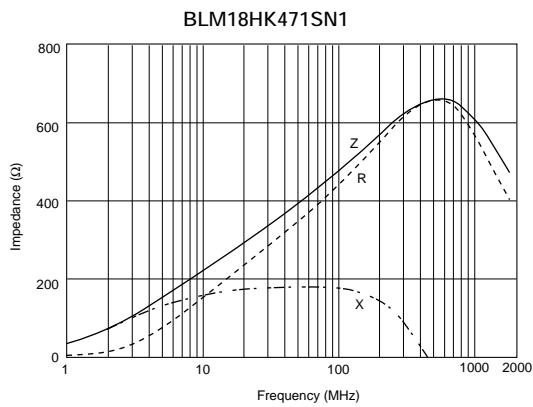
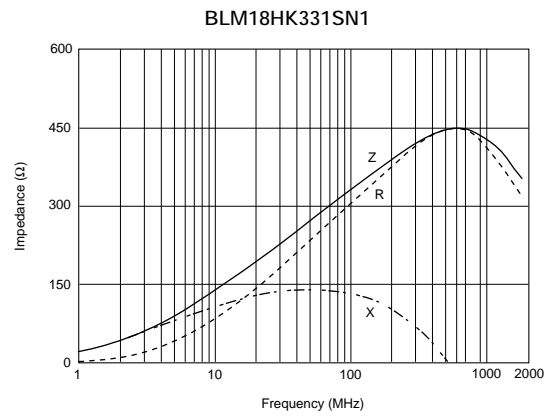
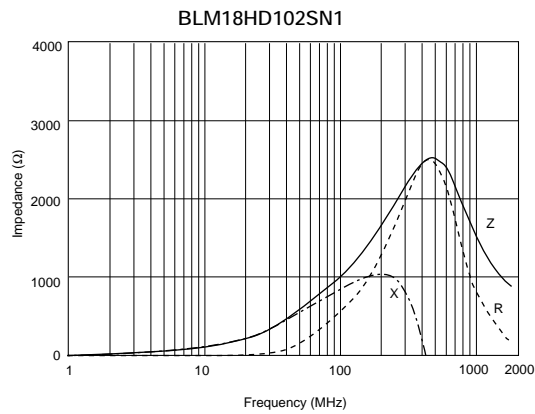
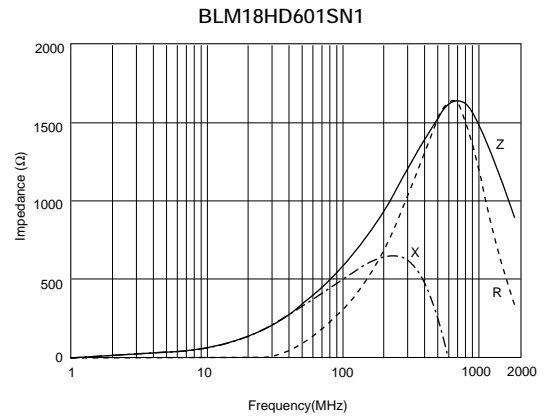
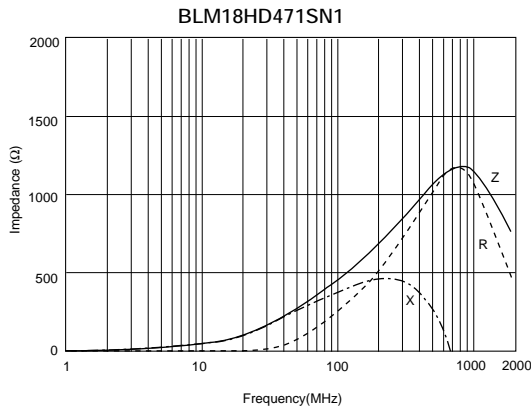
BLM18HB331SN1





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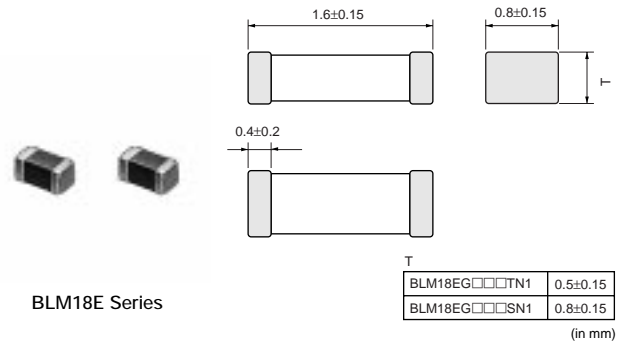
### Impedance-Frequency Characteristics



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## BLM18E Series (0603 Size)



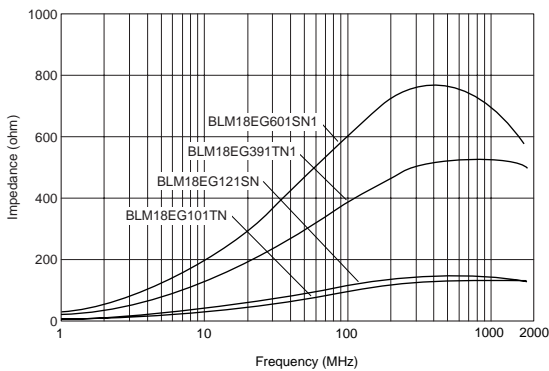
BLM18E Series

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| Part Number          | Impedance (at 100MHz, 20 degree C) (ohm) | Impedance (at 1GHz, 25 degree C) (ohm) | Rated Current (mA) | DC Resistance (max.) (ohm) | Operating Temperature Range (°C) |
|----------------------|--|--|--------------------|----------------------------|----------------------------------|
| <b>BLM18EG101TN1</b> | $100 \pm 25\%$                           | 140 (Typ.)                             | 2000               | 0.04                       | -55 to 125                       |
| <b>BLM18EG121SN1</b> | $120 \pm 25\%$                           | 145 (Typ.)                             | 2000               | 0.03                       | -55 to 125                       |
| <b>BLM18EG391TN1</b> | $390 \pm 25\%$                           | 520 (Typ.)                             | 500                | 0.3                        | -55 to 125                       |
| <b>BLM18EG601SN1</b> | $600 \pm 25\%$                           | 700 (Typ.)                             | 300                | 0.35                       | -55 to 125                       |

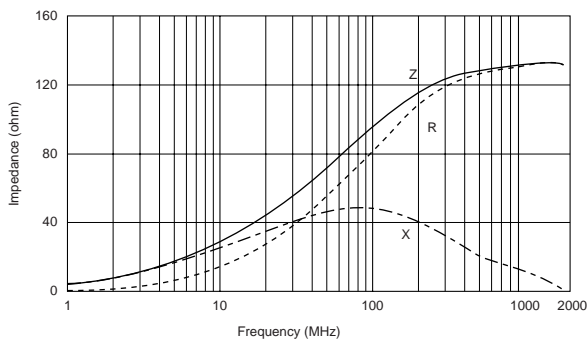
At rated current 2000mA, derating is required.  
Please refer P. 51, "Derating of Rated Current".

### ■ Impedance-Frequency (Typical)

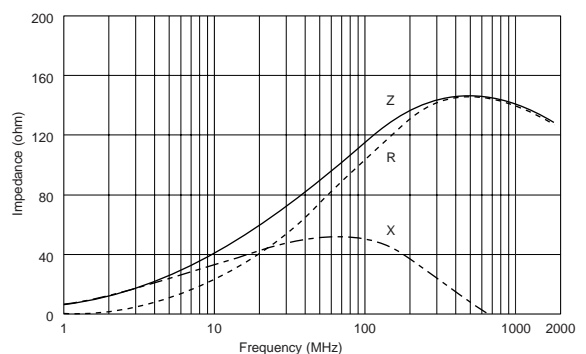


### ■ Impedance-Frequency Characteristics

BLM18EG101TN1



BLM18EG121SN1

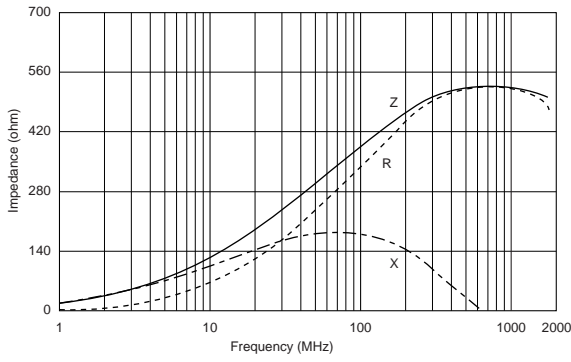


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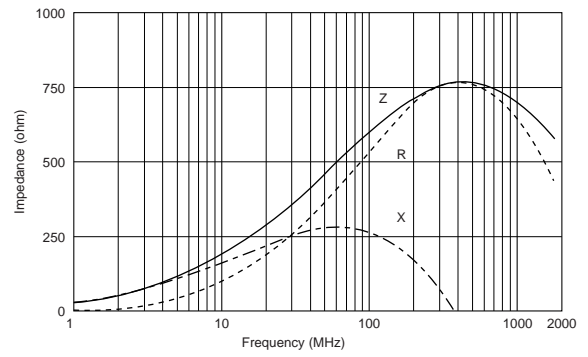
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### ■ Impedance-Frequency Characteristics

BLM18EG391TN1



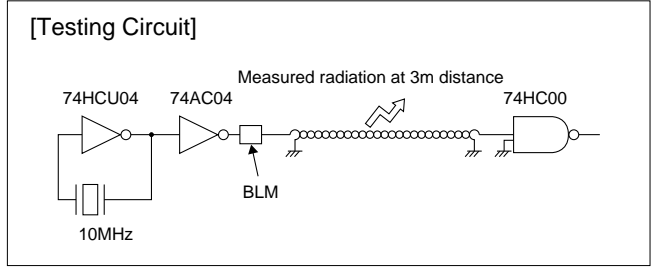
BLM18EG601SN1



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# Noise Suppression Effect

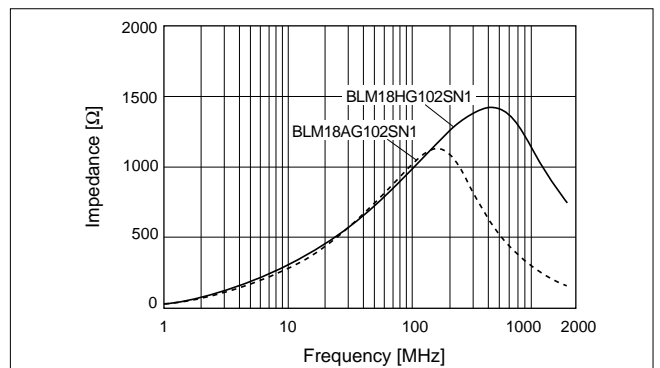
## ■ Noise Suppression in UHF Range



1

| Type of Filter   | EMI Suppression Effect | Description   |
|--|------------------------|---|
| Initial<br>(No filter)   |                        |   |
| Conventional Type<br><b>BLM18AG102SN1</b><br>(1000Ω at 100MHz)         |                        | Current BLM are effective in suppressing noise in the range between 300MHz and 700MHz.                |
| for GHz Noise Suppression<br><b>BLM18HG102SN1</b><br>(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)



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



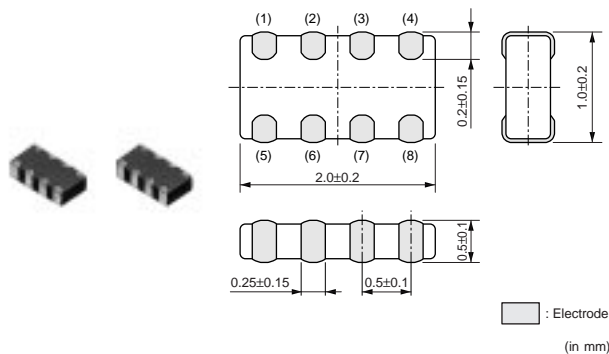
## Chip Ferrite Beads Arrays BLA2AA/BLA2AB/BLA31A/BLA31B Series

1

### BLA2AA/BLA2AB Series

#### ■ Features

1. BLA2AA/2AB series has 4 circuits in 2.0x1.0mm body with 0.5mm pitch.
2. Provides attenuation across a broad frequency range.  
Two types of impedance characteristics are available; one is for general signal line and the other is for 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.



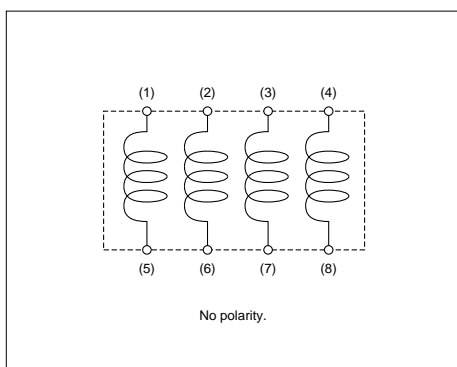
#### ■ Applications

Notebook size PC, PDA and other compact size digital equipment

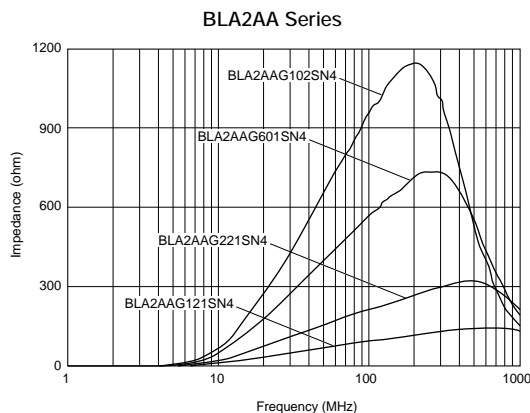
| Part Number   | Impedance (at 100MHz, 20 degree C) (ohm) | Rated Current (mA) | DC Resistance (max.) (ohm) | Operating Temperature Range (°C) |
|---------------|--|--------------------|----------------------------|----------------------------------|
| BLA2AAG121SN4 | 120 ±25%                                 | 100                | 0.50                       | -55 to 125                       |
| BLA2AAG221SN4 | 220 ±25%                                 | 50                 | 0.70                       | -55 to 125                       |
| BLA2AAG601SN4 | 600 ±25%                                 | 50                 | 1.10                       | -55 to 125                       |
| BLA2AAG102SN4 | 1000 ±25%                                | 50                 | 1.30                       | -55 to 125                       |
| BLA2ABB100SN4 | 10 ±25%                                  | 200                | 0.1                        | -55 to 125                       |
| BLA2ABB220SN4 | 22 ±25%                                  | 200                | 0.2                        | -55 to 125                       |
| BLA2ABB470SN4 | 47 ±25%                                  | 200                | 0.35                       | -55 to 125                       |
| BLA2ABB121SN4 | 120 ±25%                                 | 50                 | 0.60                       | -55 to 125                       |
| BLA2ABB221SN4 | 220 ±25%                                 | 50                 | 0.90                       | -55 to 125                       |
| BLA2ABD471SN4 | 470 ±25%                                 | 100                | 0.65                       | -55 to 125                       |
| BLA2ABD601SN4 | 600 ±25%                                 | 100                | 0.80                       | -55 to 125                       |
| BLA2ABD102SN4 | 1000 ±25%                                | 50                 | 1.00                       | -55 to 125                       |

Number of Circuits : 4

#### ■ Equivalent Circuit



#### ■ Impedance-Frequency (Typical)

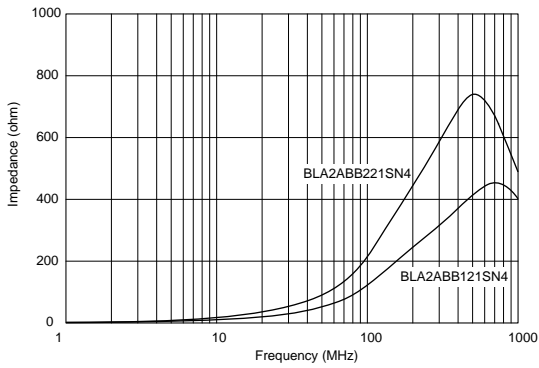


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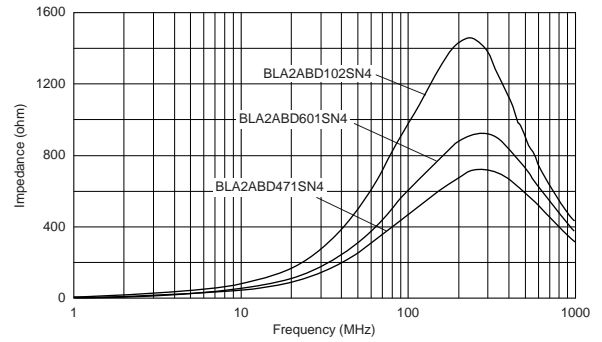
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### Impedance-Frequency (Typical)

BLA2ABB Series



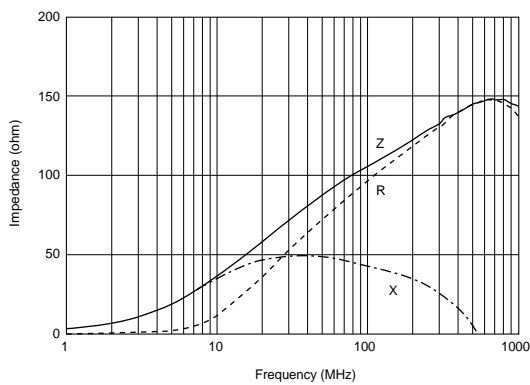
BLA2ABD Series



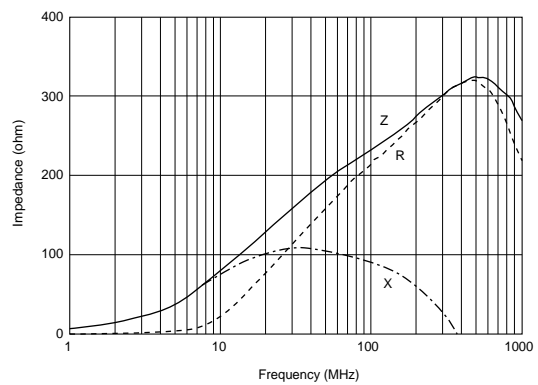
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### Impedance-Frequency Characteristics

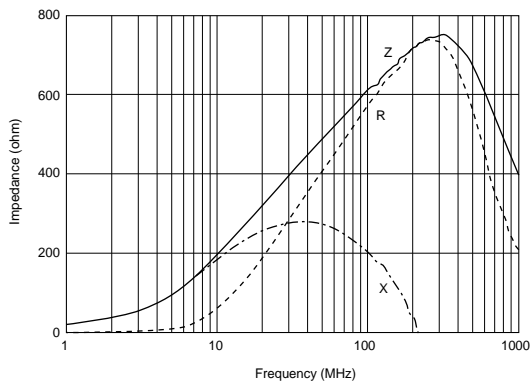
BLA2AAG121SN4



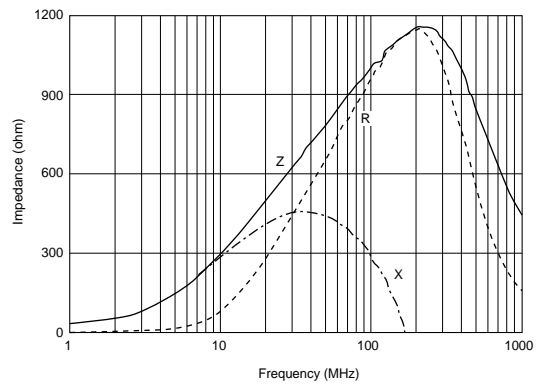
BLA2AAG221SN4



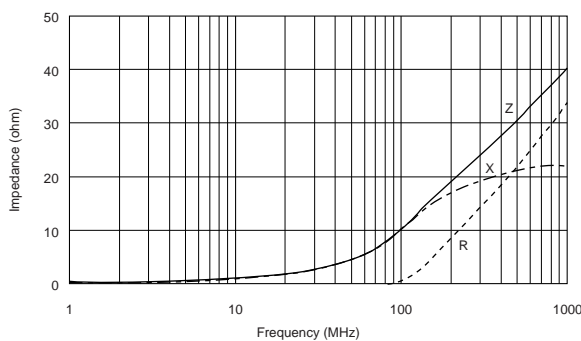
BLA2AAG601SN4



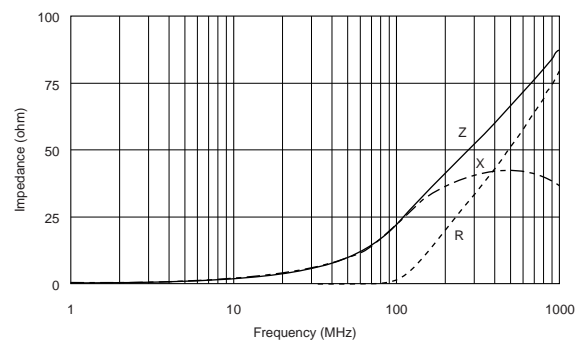
BLA2AAG102SN4



BLA2ABB100SN4



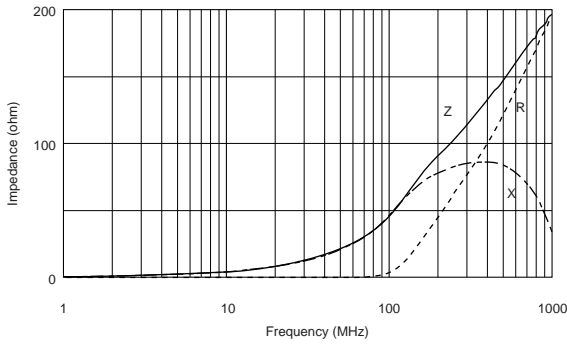
BLA2ABB220SN4



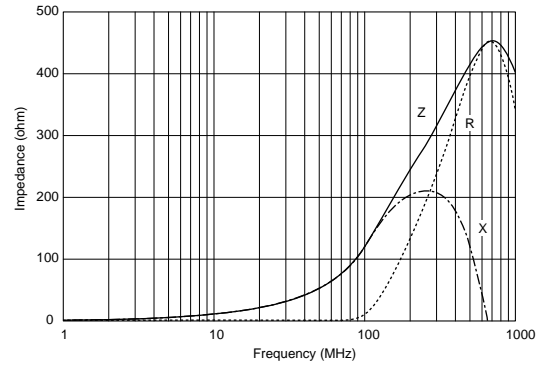
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## Impedance-Frequency Characteristics

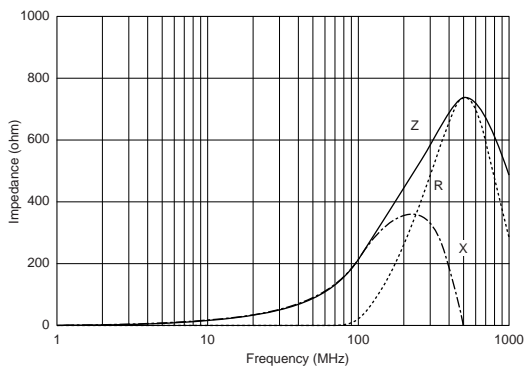
BLA2ABB470SN4



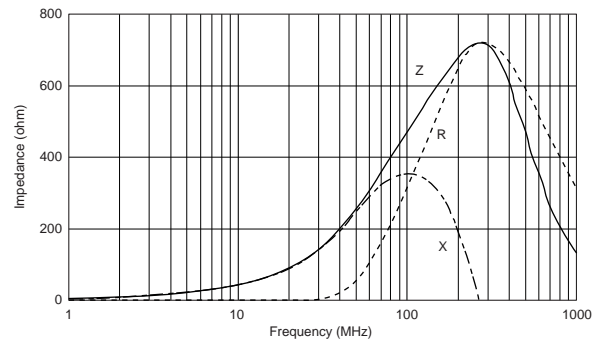
BLA2ABB121SN4



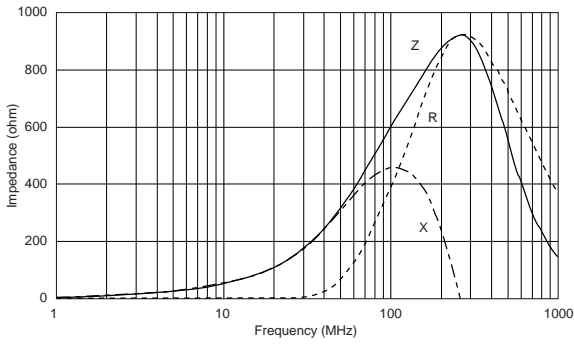
BLA2ABB221SN4



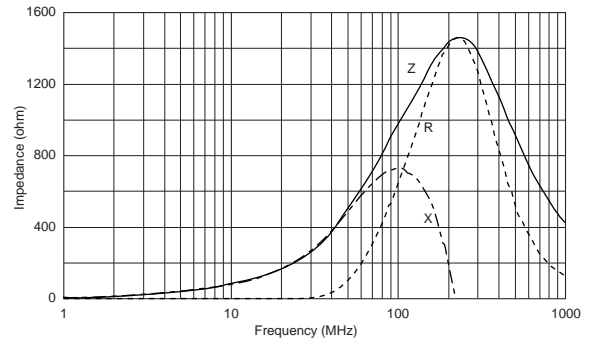
BLA2ABD471SN4



BLA2ABD601SN4



BLA2ABD102SN4



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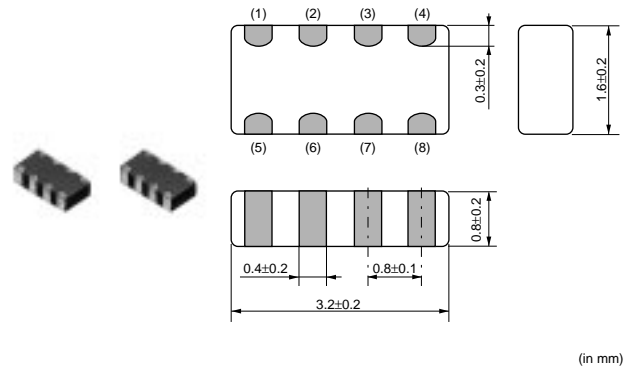
## BLA31A/BLA31B Series

The miniaturization of electronic equipment requires high performance EMI filters which enable high density mounting. BLA31A/B series consists of 4 circuits of ferrite beads.

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

### ■ Features

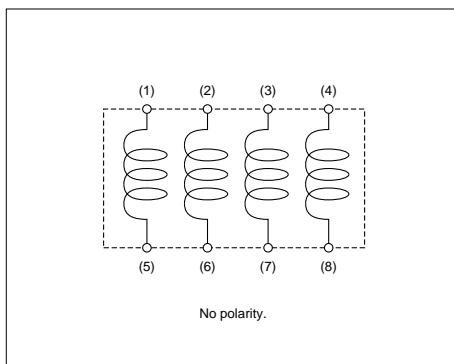
1. BLA31A/B has 4 circuits in 3.2x1.6mm body with 0.8mm pitch.
2. Provides attenuation across a broad frequency range.  
Two types of impedance are available which meet general signal line and high speed signal line.
3. Original inner electrode structure enables extra low crosstalk.
4. The nickel barrier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



| Part Number   | Impedance<br>(at 100MHz, 20 degree C)<br>(ohm) | Rated Current<br>(mA) | DC Resistance (max.)<br>(ohm) | Operating<br>Temperature Range<br>(°C) |
|---------------|--|-----------------------|-------------------------------|--|
| BLA31AG300SN4 | 30 ±25%  | 200                   | 0.10                          | -55 to 125                             |
| BLA31AG600SN4 | 60 ±25%  | 200                   | 0.15                          | -55 to 125                             |
| BLA31AG121SN4 | 120 ±25%                                       | 150                   | 0.20                          | -55 to 125                             |
| BLA31AG221SN4 | 220 ±25%                                       | 150                   | 0.25                          | -55 to 125                             |
| BLA31AG601SN4 | 600 ±25%                                       | 100                   | 0.35                          | -55 to 125                             |
| BLA31AG102SN4 | 1000 ±25%                                      | 50                    | 0.45                          | -55 to 125                             |
| BLA31BD121SN4 | 120 ±25%                                       | 150                   | 0.30                          | -55 to 125                             |
| BLA31BD221SN4 | 220 ±25%                                       | 150                   | 0.35                          | -55 to 125                             |
| BLA31BD471SN4 | 470 ±25%                                       | 100                   | 0.40                          | -55 to 125                             |
| BLA31BD601SN4 | 600 ±25%                                       | 100                   | 0.45                          | -55 to 125                             |
| BLA31BD102SN4 | 1000 ±25%                                      | 50                    | 0.55                          | -55 to 125                             |

Number of Circuits : 4

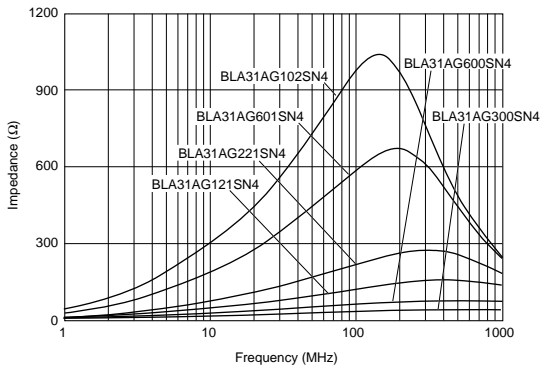
### ■ Equivalent Circuit



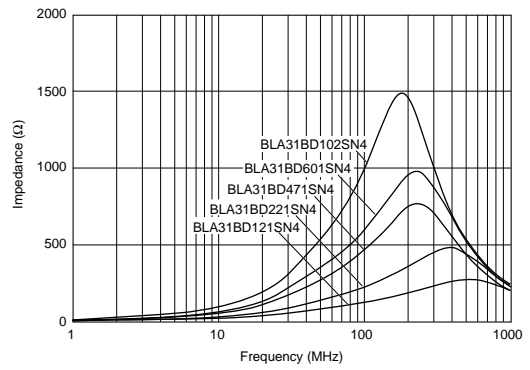


## ■ Impedance-Frequency (Typical)

BLA31A Series



BLA31B Series

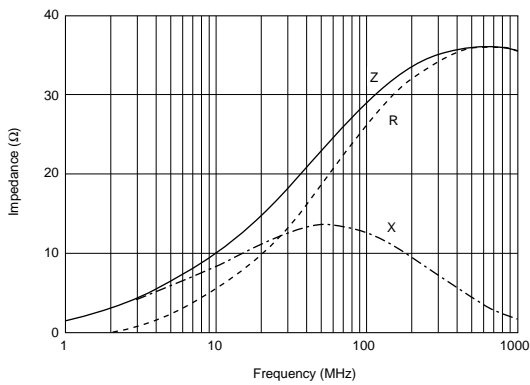


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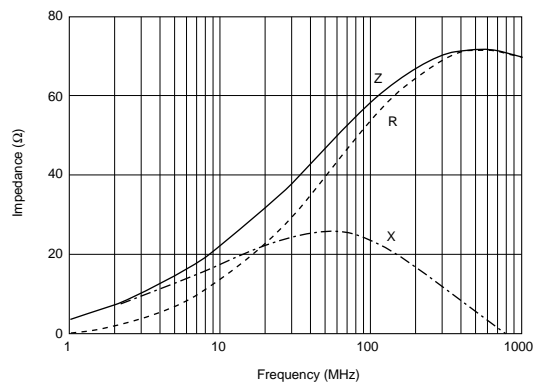
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## ■ Impedance-Frequency Characteristics

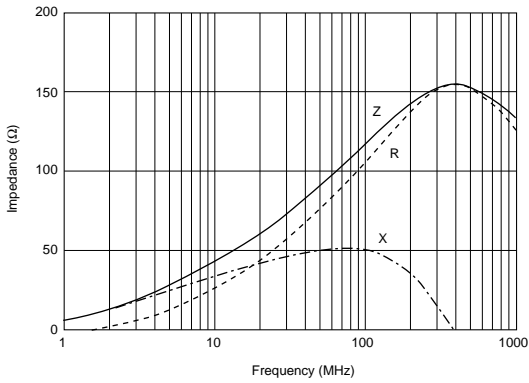
BLA31AG300SN4



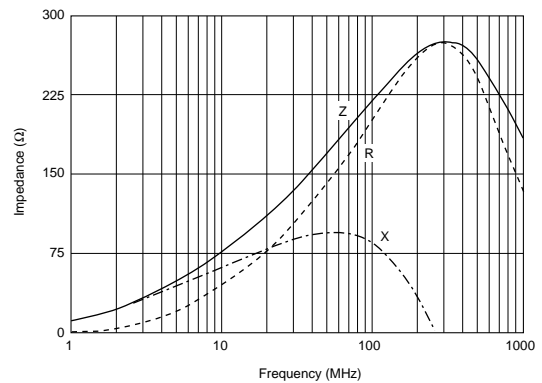
BLA31AG600SN4



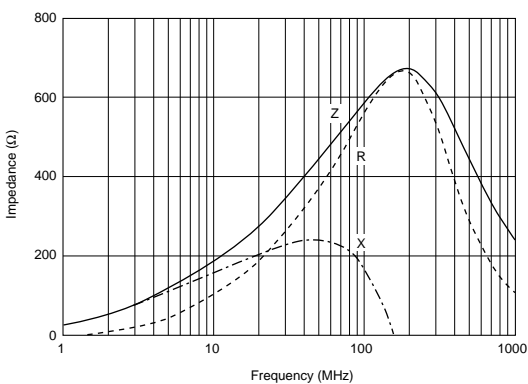
BLA31AG121SN4



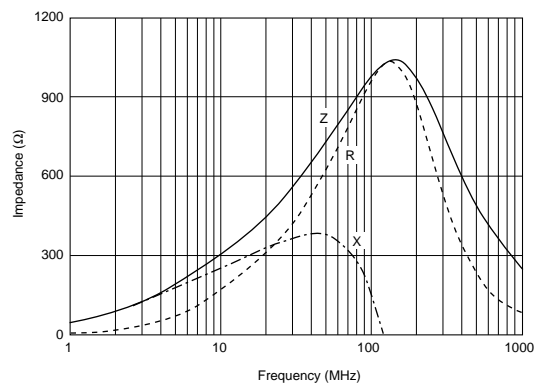
BLA31AG221SN4



BLA31AG601SN4

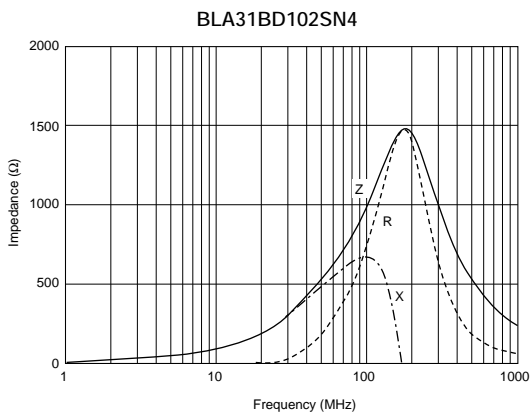
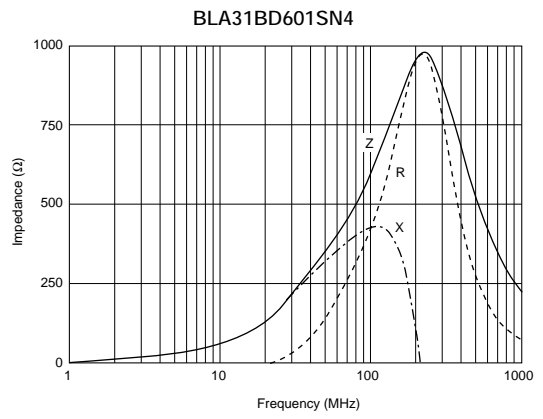
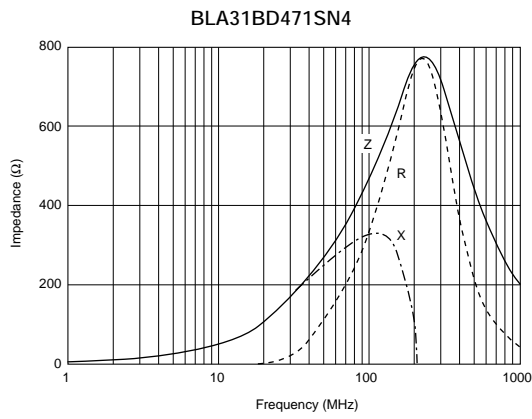
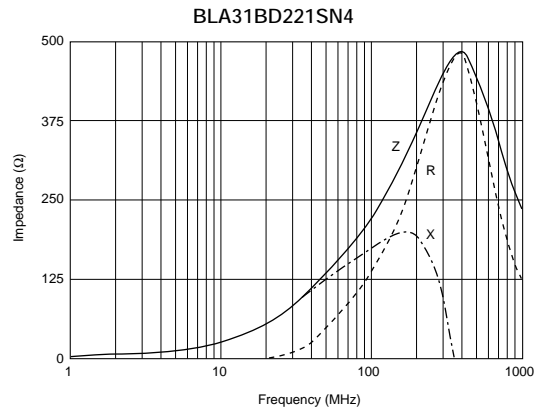
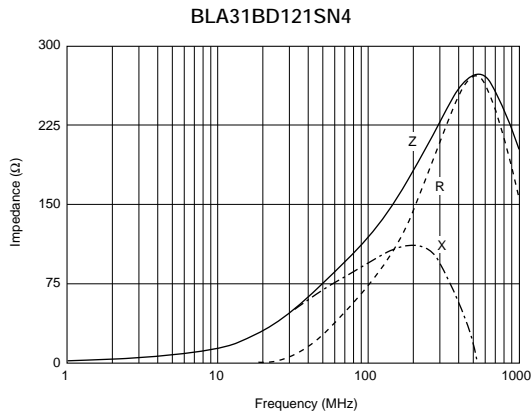


BLA31AG102SN4



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### Impedance-Frequency Characteristics



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



## Chip EMIFIL® Part Numbering

### 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 |                                 |
|------------|---------------------------------|
| <b>NF</b>  | Chip EMI Filters Capacitor Type |

#### ② Structure

| Code     | Structure      |
|----------|----------------|
| <b>M</b> | Capacitor Type |

#### ③ Dimensions (L×W)

| Code      | Dimensions (L×W) | EIA  |
|-----------|------------------|------|
| <b>18</b> | 1.6×0.8mm        | 0603 |
| <b>21</b> | 2.0×1.25mm       | 0805 |
| <b>3D</b> | 3.2×1.25mm       | 1206 |
| <b>41</b> | 4.5×1.6mm        | 1806 |

#### ④ Features

| Code      | Features                         |
|-----------|----------------------------------|
| <b>CC</b> | Capacitor Type for Signal Lines  |
| <b>PC</b> | Capacitor Type for Large Current |

#### 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 zeros which follow the two figures.

#### ⑨ Packaging

| Code     | Packaging                    | Series             |
|----------|------------------------------|--------------------|
| <b>L</b> | Plastic Taping (ø180mm Reel) | <b>NFM3D/NFM41</b> |
| <b>B</b> | Bulk                         | All series         |
| <b>D</b> | Paper Taping (ø180mm Reel)   | <b>NFM18/NFM21</b> |

#### ⑥ Characteristics

| Code     | Capacitance Change  |
|----------|---------------------|
| <b>B</b> | ±10%                |
| <b>F</b> | +30/-80%            |
| <b>R</b> | ±15%                |
| <b>U</b> | -750 ±120ppm/°C     |
| <b>S</b> | +350 to -1000ppm/°C |

#### ⑦ Rated Voltage

| Code      | Rated Voltage |
|-----------|---------------|
| <b>0J</b> | 6.3V          |
| <b>1A</b> | 10V           |
| <b>1C</b> | 16V           |
| <b>1E</b> | 25V           |
| <b>1H</b> | 50V           |
| <b>2A</b> | 100V          |

#### ⑧ Electrode/Others

| Code     | Electrode  |
|----------|------------|
| <b>3</b> | Sn Plating |

## 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 |                                 |
|------------|---------------------------------|
| <b>NF</b>  | Chip EMI Filters Capacitor Type |

### ② Structure

| Code     | Structure  |
|----------|------------|
| <b>A</b> | Array Type |

### ③ Dimensions (L×W)

| Code      | Dimensions (L×W) |
|-----------|------------------|
| <b>31</b> | 3.2×1.6mm        |

### ④ Features

| Code      | Features                        |
|-----------|---------------------------------|
| <b>CC</b> | 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 zeros which follow the two figures.

### ⑥ Characteristics

| Code     | Capacitance Change  |
|----------|---------------------|
| <b>R</b> | ±15%                |
| <b>S</b> | +350 to -1000ppm/°C |

### ⑦ Rated Voltage

| Code      | Rated Voltage |
|-----------|---------------|
| <b>1C</b> | 16V           |
| <b>1E</b> | 25V           |

### ⑧ Number of Circuits

| Code     | Number of Circuits |
|----------|--------------------|
| <b>4</b> | 4 Circuits         |

### ⑨ Packaging

| Code     | Packaging                  |
|----------|----------------------------|
| <b>B</b> | Bulk                       |
| <b>D</b> | Paper Taping (ø180mm Reel) |

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2

### 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 Dimensions (L×W)**

| Code | Dimensions (L×W) | EIA  |
|------|------------------|------|
| 21   | 2.0×1.25mm       | 0805 |

**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 zeros which follow the two figures.

**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 zeros which follow the two figures.

**⑦ Electrode/Others**

| Code | Electrode  |
|------|------------|
| 2    | Sn Plating |

**⑧ Packaging**

| Code | Packaging                    |
|------|------------------------------|
| L    | Plastic Taping (ø180mm Reel) |
| B    | Bulk                         |

### 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 Dimensions (L×W)**

| Code | Dimensions (L×W) |  |
|------|------------------|--|
| 31   | 3.2×1.6mm        |  |

**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 zeros which follow the two figures. If there is a decimal point, it is expressed by the capital letter "R". In this case, all figures 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 zeros which follow the two figures. If there is a decimal point, it is expressed by the capital letter "R". In this case, all figures are significant digits.

**⑦ Number of Circuits**

| Code | Number of Circuits |
|------|--------------------|
| 4    | 4 Circuits         |

**⑧ Packaging**

| Code | Packaging                  |
|------|----------------------------|
| B    | Bulk                       |
| D    | Paper 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 |                                   |
|------------|-----------------------------------|
| <b>NF</b>  | Chip EMI Filters LC Combined Type |

### ② Structure

| Code     | Structure                    |
|----------|------------------------------|
| <b>L</b> | Monolithic, LC Combined Type |
| <b>W</b> | Winding, LC Combined Type    |
| <b>E</b> | Block, LC Combined Type      |

### ③ Dimensions (L X W)

| Code      | Dimensions (L X W) | EIA  |
|-----------|--------------------|------|
| <b>18</b> | 1.6 X 0.8mm        | 0603 |
| <b>21</b> | 2.0 X 1.25mm       | 0805 |
| <b>31</b> | 3.2 X 1.6mm        | 1206 |
| <b>61</b> | 6.8 X 1.6mm        | 2606 |

### ④ Features

| Code      | Features                    |
|-----------|-----------------------------|
| <b>SP</b> | π Circuit for Signal Lines  |
| <b>ST</b> | T Circuit for Signal Lines  |
| <b>PT</b> | T Circuit for Large Current |
| <b>HT</b> | T Circuit for Heavy-duty    |

### 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 zeros which follow the two figures.

### ⑨ Packaging

| Code     | Packaging                    | Series                 |
|----------|------------------------------|------------------------|
| <b>K</b> | Plastic Taping (ø330mm Reel) | <b>NFW31/NFE</b>       |
| <b>L</b> | Plastic Taping (ø180mm Reel) | <b>NFW31/NFE</b>       |
| <b>B</b> | Bulk                         | <b>NFL18/NFL21/NFE</b> |
| <b>D</b> | Paper Taping (ø180mm Reel)   | <b>NFL18/NFL21</b>     |

### ⑥ Characteristics (NFL/NFW Series)

| Code     | Characteristics   |
|----------|-------------------|
| <b>X</b> | Cut off Frequency |

### ⑥ Characteristics (NFE Series)

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

### ⑦ Rated Voltage

| Code      | Rated Voltage |
|-----------|---------------|
| <b>1A</b> | 10V           |
| <b>1C</b> | 16V           |
| <b>1E</b> | 25V           |
| <b>1H</b> | 50V           |
| <b>2A</b> | 100V          |

### ⑧ Electrode

Expressed by a figure.

Ex.)

| Code     | Electrode      | Series     |
|----------|----------------|------------|
| <b>3</b> | Sn Plating     | <b>NFL</b> |
| <b>4</b> | Solder Coating | <b>NFW</b> |
| <b>9</b> | Others         | <b>NFE</b> |

# On-Board Type (DC) EMI Suppression Filters (EMIFIL<sup>®</sup>)



## Chip EMIFIL<sup>®</sup> Capacitor Type NFM18C/NFM21C/NFM3DC/NFM41C Series

### NFM18C Series

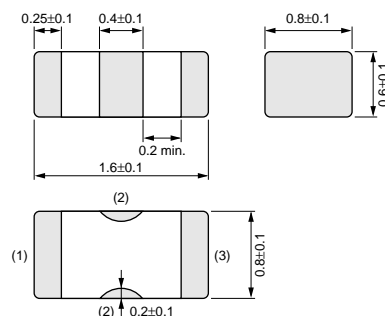
The NFM18CC series is a 1.6x0.8mm EMI suppression filter for signal lines which has a 3-terminal structure using Murata's multilayer technology.

#### ■ Features

1. Ultra small size in 1.6x0.8x0.6mm enable high density mounting.
2. 3-terminal structure with low residual inductance (ESL)\* characteristics achieves large insertion loss characteristics even in high frequency area.
3. The NFM18cc series covers capacitance range from 22 to 22000pF.



NFM18C



(in mm)

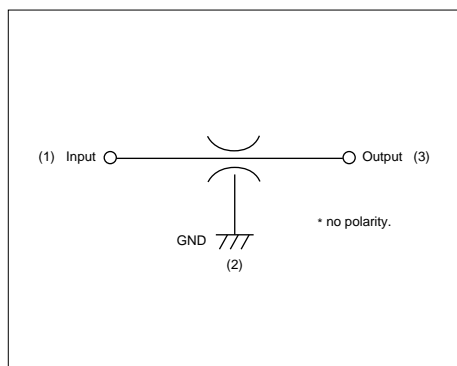
#### ■ Applications

1. EMI suppression of circuit for insertion loss in quantity.
2. Noise suppression up to GHz.

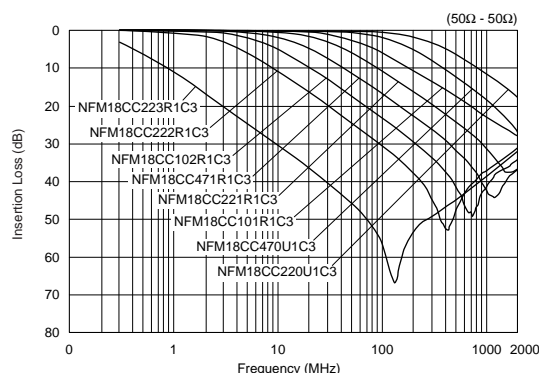
\* Not exceeding one-tenth of monolithic ceramic capacitors (2-terminal).

| Part Number    | Capacitance (pF) | Rated Voltage (Vdc) | Rated Current (mA) | Insulation Resistance (M ohm) | Operating Temperature Range (°C) |
|----------------|------------------|---------------------|--------------------|-------------------------------|----------------------------------|
| NFM18CC220U1C3 | 22 +20%, -20%    | 16                  | 300                | 1000 min.                     | -55 to 125                       |
| NFM18CC470U1C3 | 47 +20%, -20%    | 16                  | 300                | 1000 min.                     | -55 to 125                       |
| NFM18CC101R1C3 | 100 +20%, -20%   | 16                  | 300                | 1000 min.                     | -55 to 125                       |
| NFM18CC221R1C3 | 220 +20%, -20%   | 16                  | 300                | 1000 min.                     | -55 to 125                       |
| NFM18CC471R1C3 | 470 +20%, -20%   | 16                  | 300                | 1000 min.                     | -55 to 125                       |
| NFM18CC102R1C3 | 1000 +20%, -20%  | 16                  | 300                | 1000 min.                     | -55 to 125                       |
| NFM18CC222R1C3 | 2200 +20%, -20%  | 16                  | 300                | 1000 min.                     | -55 to 125                       |
| NFM18CC223R1C3 | 22000 +20%, -20% | 16                  | 1000               | 1000 min.                     | -55 to 125                       |

#### ■ Equivalent Circuit



#### ■ Insertion Loss Characteristics (Typical)

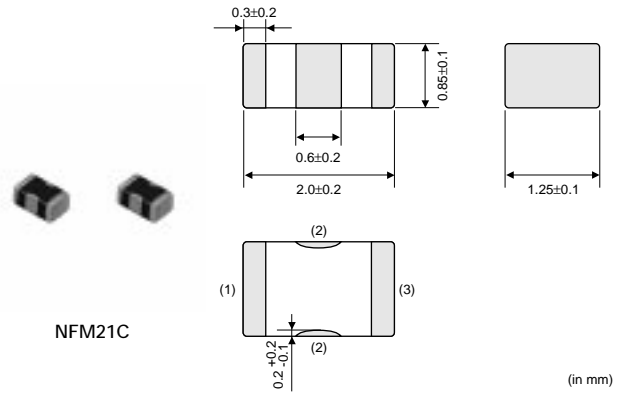


## NFM21C Series

The chip "EMIFIL" NFM21C 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.

### ■ Features

1. Small and low profile of 2.0x1.25x0.85mm (NFM21C) enables high density mounting.
2. 3-terminal structure enables high performance in high frequency range.
3. Uses original electrode structure which realizes excellent solderability.
4. An electrostatic capacitance range of 22 to 22000pF enables suppression of noise at specific frequencies.

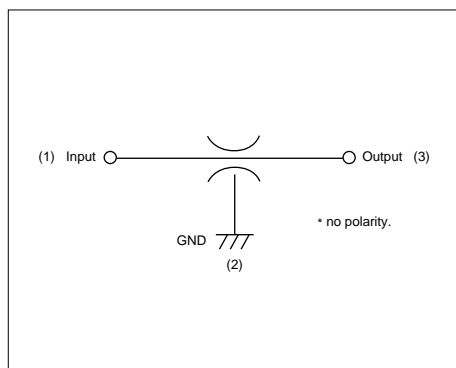


### ■ Applications

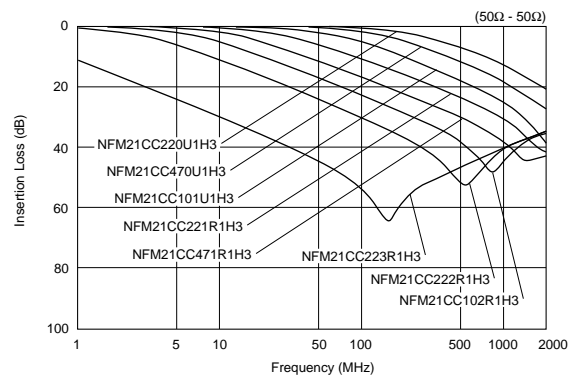
1. PCs and peripherals which emit high amount of noise
2. Compact size equipment such as PDA, PC card and mobile telecommunications equipment
3. Severe EMI suppression and high impedance circuits such as digital circuits

| Part Number    | Capacitance (pF) | Rated Voltage (Vdc) | Rated Current (mA) | Insulation Resistance (M ohm) | Operating Temperature Range (°C) |
|----------------|------------------|---------------------|--------------------|-------------------------------|----------------------------------|
| NFM21CC220U1H3 | 22 +20%,-20%     | 50                  | 300                | 1000 min.                     | -55 to 125                       |
| NFM21CC470U1H3 | 47 +20%,-20%     | 50                  | 300                | 1000 min.                     | -55 to 125                       |
| NFM21CC101U1H3 | 100 +20%,-20%    | 50                  | 300                | 1000 min.                     | -55 to 125                       |
| NFM21CC221R1H3 | 220 +20%,-20%    | 50                  | 300                | 1000 min.                     | -55 to 125                       |
| NFM21CC471R1H3 | 470 +20%,-20%    | 50                  | 300                | 1000 min.                     | -55 to 125                       |
| NFM21CC102R1H3 | 1000 +20%,-20%   | 50                  | 300                | 1000 min.                     | -55 to 125                       |
| NFM21CC222R1H3 | 2200 +20%,-20%   | 50                  | 300                | 1000 min.                     | -55 to 125                       |
| NFM21CC223R1H3 | 22000 +20%,-20%  | 50                  | 2000               | 1000 min.                     | -55 to 125                       |

### ■ Equivalent Circuit



### ■ Insertion Loss Characteristics (Typical)





## NFM3DC Series

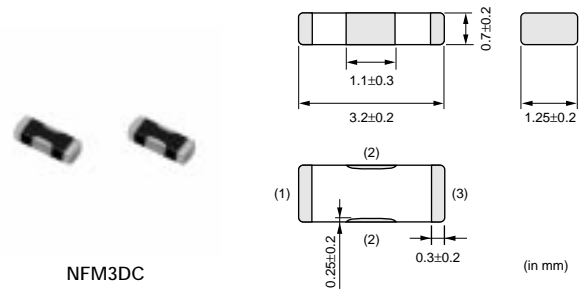
The chip "EMIFIL" NFM3DC series is a chip type 3-terminal EMI suppression filter. It can reduce residual inductance to an extremely low level making it excellent for noise suppression at high frequencies.

### ■ Feature

An electrostatic capacitance range of 22 to 22,000pF enables suppression of noise at specific frequencies.

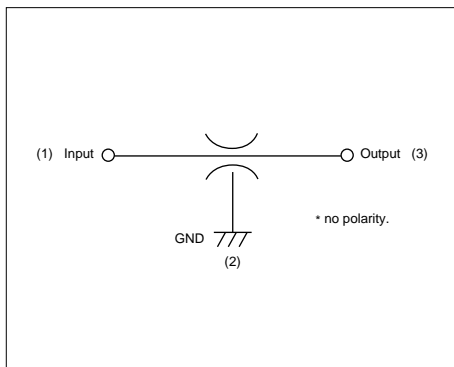
### ■ Application

1. High noise radiation and high impedance circuits such as digital circuits

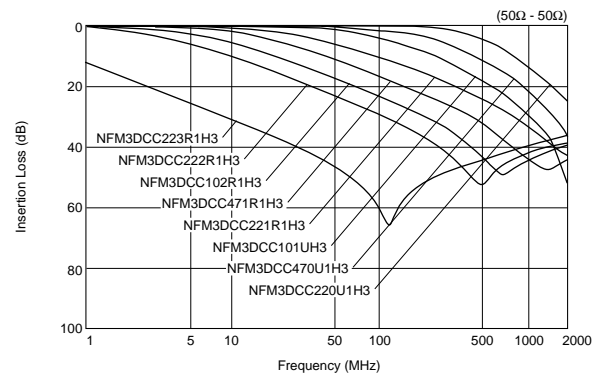


| Part Number    | Capacitance (pF) | Rated Voltage (Vdc) | Rated Current (mA) | Insulation Resistance (M ohm) | Operating Temperature Range (°C) |
|----------------|------------------|---------------------|--------------------|-------------------------------|----------------------------------|
| NFM3DCC220U1H3 | 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

The chip "EMIFIL" NFM41C 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.

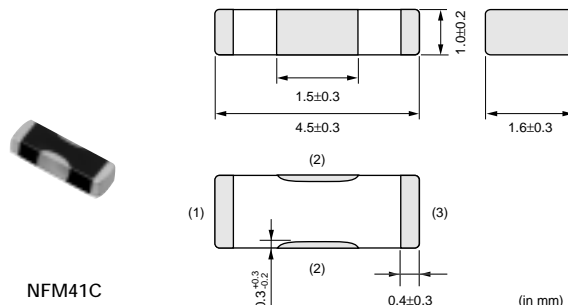
### ■ Features

An electrostatic capacitance range of 22 to 22,000pF enables suppression of noise at specific frequencies.

### ■ Applications

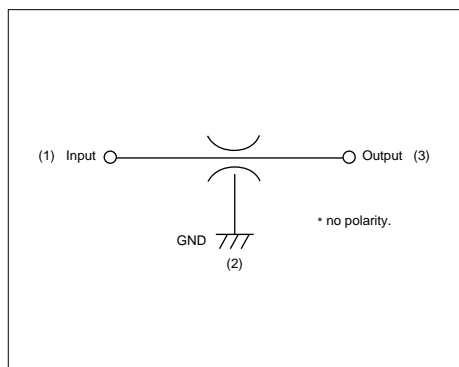
1. High noise radiation and high impedance circuits such

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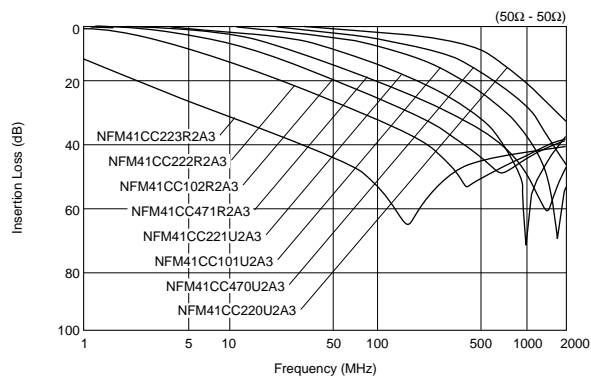


| Part Number    | Capacitance (pF) | Rated Voltage (Vdc) | Rated Current (mA) | Insulation Resistance (M ohm) | Operating Temperature Range (°C) |
|----------------|------------------|---------------------|--------------------|-------------------------------|----------------------------------|
| NFM41CC220U2A3 | 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)

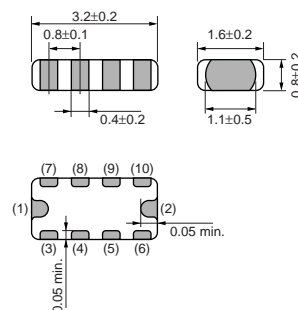


# On-Board Type (DC) EMI Suppression Filters (EMIFIL<sup>®</sup>)



## Chip EMIFIL<sup>®</sup> Capacitor Array Type NFA31C Series

The NFA31C series is a chip EMI suppression filter for surface mount applications by using Murata's ceramic processing technology and filter design technology. The series is well suited for EMI suppression in digital I/O lines of varied electronic equipment such as notebook size PCs.



(in mm)

### Features

1. High density mounting can be realized because of 4 circuits in one package with 0.8mm pitch.
2. Suitable for high frequency noise suppression because of low residual inductance of 3-terminal structure.
3. Excellent EMI suppression can be realized because of 2-terminal simple GNDs for 4 circuits.
4. 20 to 22,000pF lineups can be used depending on noise frequency.

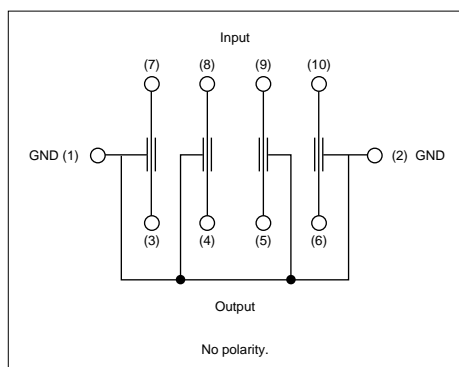
### Applications

1. Personal computers and peripherals
2. Telephones, PPCs, communications equipment
3. Digital TVs, VCRs

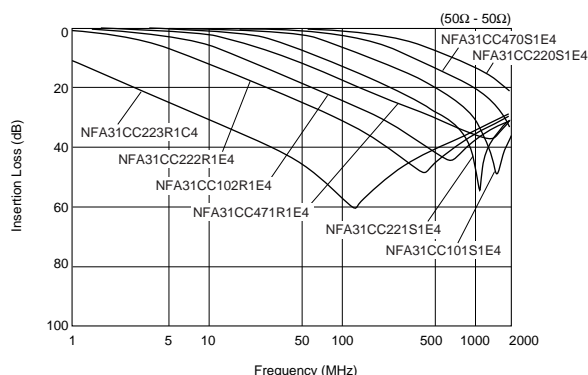
| Part Number    | Capacitance (pF) | Rated Voltage (Vdc) | Rated Current (mA) | Insulation Resistance (M ohm) | Operating Temperature Range (°C) |
|----------------|------------------|---------------------|--------------------|-------------------------------|----------------------------------|
| NFA31CC220S1E4 | 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 Circuits : 4

### Equivalent Circuit



### Insertion Loss Characteristics (Typical)



# On-Board Type (DC) EMI Suppression Filters (EMIFIL<sup>®</sup>)



## Chip EMIFIL<sup>®</sup> RC Combined Type NFR21G Series

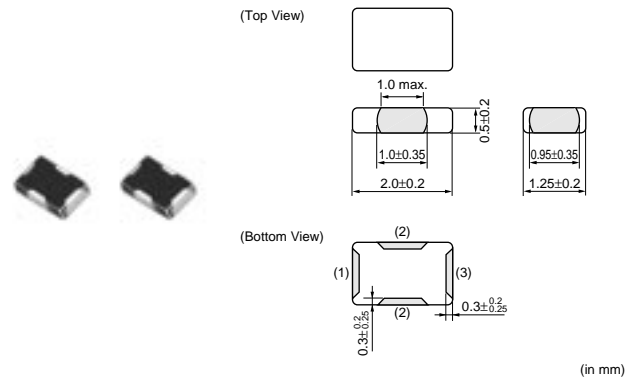
The NFR21G series comprises high performance EMI suppression filters which can suppress distortion of waveform. Various items may be used, considering circuit impedance and noise condition.

### ■ Features

1. Murata's original inner design realizes small and low profile of 2.0x1.25x0.5mm.
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 a line where ground is not stable, because the resistance element in the filter absorbs noise and returns it to ground line.
4. The NFR21G series has no polarity so it can be used in dual direction transport lines.
5. The NFR21G series has various lineups of resistance (22 to 100ohm) and capacitance (10 to 100pF).

### ■ Applications

Interface lines and clock lines where signals are tend to be distorted

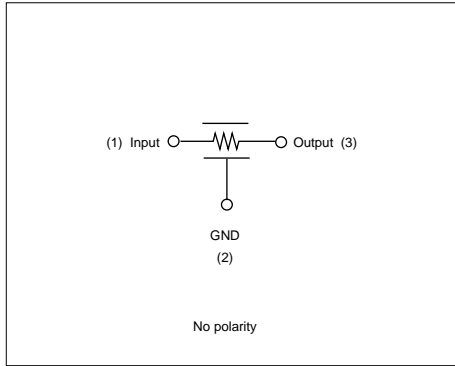


2

| 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                        |

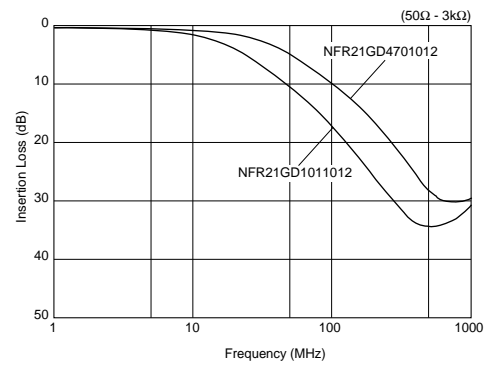
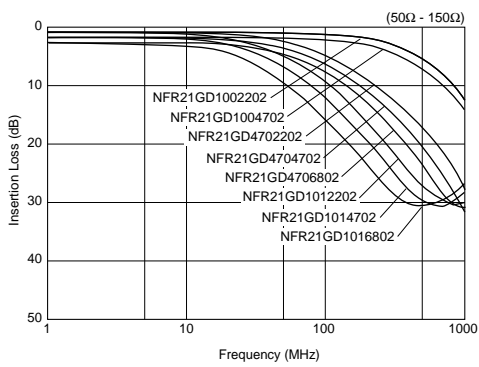
Number of Circuits : 1

## ■ Equivalent Circuit



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## 2 ■ Insertion Loss Characteristics (Typical)

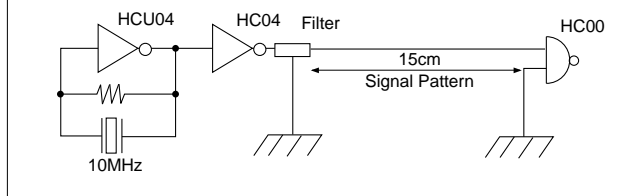


## Noise Suppression Effect of NFR21G Series

### ■Effect of Noise Suppression by NFR21G

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

[Testing Circuit]



### With Stable Ground Line

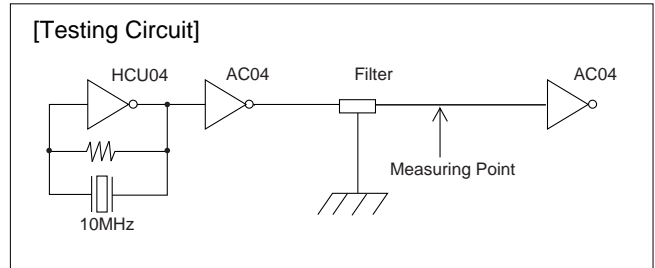
| Type of Filter   | EMI Suppression Effect | Description   |
|--|------------------------|---|
| Noise Level without Filter   |                        |   |
| Filter Mounting Condition<br>Standard Type Chip EMIFIL®<br>(100pF) |                        | The standard type chip EMIFIL® is effective on stable ground lines.             |
| Filter Mounting Condition<br><b>NFR21GD4701012</b>                 |                        | The NFR21G has some advantages to standard type EMIFIL® on stable ground lines. |

### With Poor Ground Line

| Type of Filter   | EMI Suppression Effect | Description  |
|--|------------------------|--|
| Noise Level without Filter   |                        |  |
| Filter Mounting Condition<br>Standard Type Chip EMIFIL®<br>(100pF) |                        | The standard type EMIFIL® loses efficiency on poor ground lines.   |
| Filter Mounting Condition<br><b>NFR21GD4701012</b>                 |                        | The NFR21G is effective even on poor ground lines because of its distributed constant circuit structure and unique system to limit rush current. |

## Noise Suppression Effect of NFR21G Series

### Waveform Distortion Suppressing Function by NFR21G



| Type of Filter                         | EMI Suppression Effect                               | Description   |
|--|--|---|
| Initial Waveform (no filter)           | <p>Voltage Waveform</p> <p>↑ :1V/div → :20ns/div</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>Voltage Waveform</p> <p>↑ :1V/div → :20ns/div</p> | <p>Ordinary capacitor filters have no waveform distortion suppressing capability, and they cannot suppress disturbances in the waveforms.</p>       |
| NFR21G                                 | <p>Voltage Waveform</p> <p>↑ :1V/div → :20ns/div</p> | <p>The waveform distortion suppressing function of the NFR21G minimizes disturbances of waveforms.</p>  |

2

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

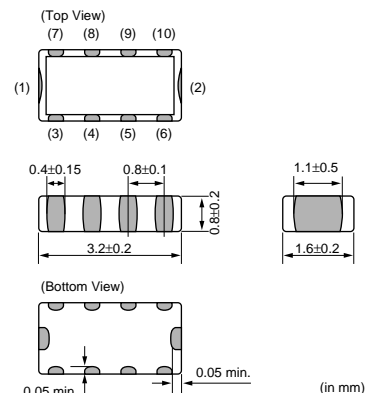


## Chip EMIFIL® RC Combined Array Type NFA31G Series

NFA31G series is a high performance EMI suppression filter array with a 4-circuit noise filter in 3.2x1.6mm size. NFA31G realizes high density mounting.

### ■ Features

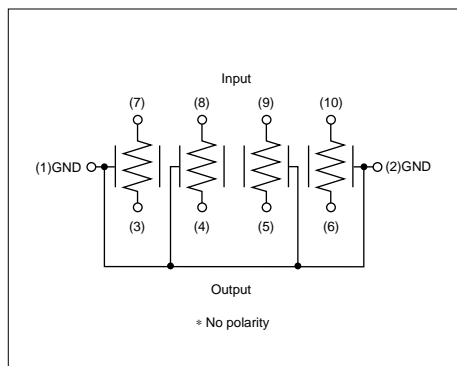
1. NFA31G is a 4-circuit noise filter in 3.2x1.6mm size with 0.8mm pitch. High density mounting is available.
2. 3-terminal structure enables excellent high frequency performance.
3. Distributed constant circuit realizes smooth change of impedance which prevents reflection of signal and distortion of wave shape.
4. NFA31G series is effective in lines where ground is not stable, because the resistance element in the filter absorbs noise and returns 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                        |

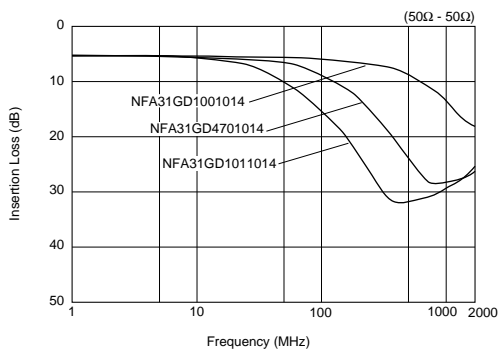
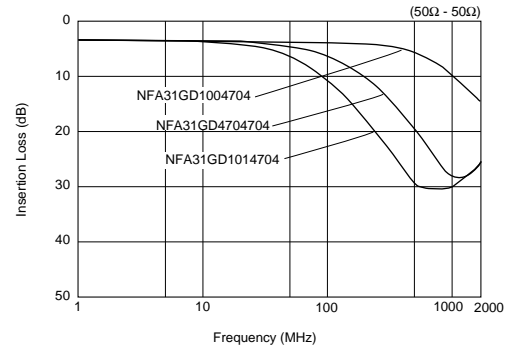
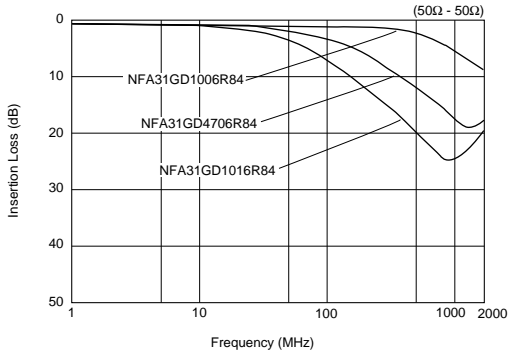
Number of Circuits : 4

### ■ Equivalent Circuit





## ■ Insertion Loss Characteristics



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2

# On-Board Type (DC) EMI Suppression Filters (EMIFIL<sup>®</sup>)



## Chip EMIFIL<sup>®</sup> LC Combined Monolithic Type NFL18ST/NFL18SP/NFL21S Series

### NFL18ST Series

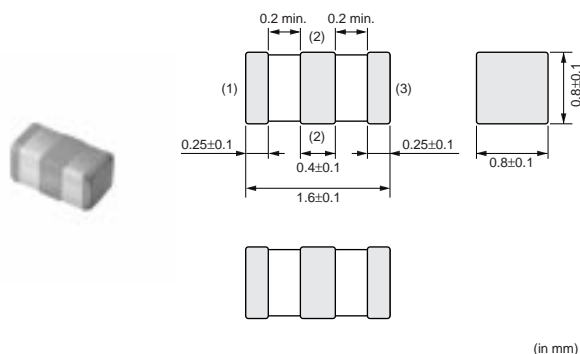
This NFL18ST series is an EMI suppression filter for high speed signal lines, achieving T-type structure in 1.6x0.8mm size with Murata's multilayer technology.

#### ■ Features

1. Ultra-small size in 1.6x0.8x0.8mm
2. Steep insertion loss characteristics realize excellent noise suppression and prevent distortion of signal waveform.
3. By minimizing stray capacitance of inductor, achieves high performance in noise suppression in high frequency range.
4. Five different values of cut-off frequency are available, ranging from 100MHz up to 500MHz.
5. No polarity using the same structure on all the side electrodes.

#### ■ Applications

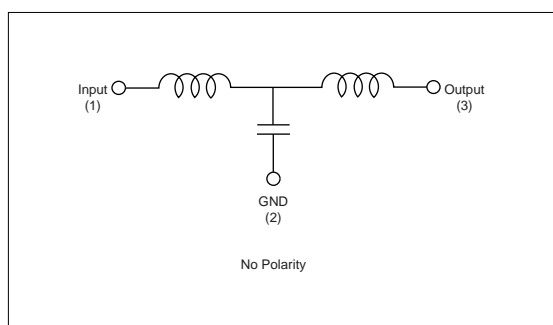
Noise suppression for video signal lines (RGB lines) and high speed clock lines



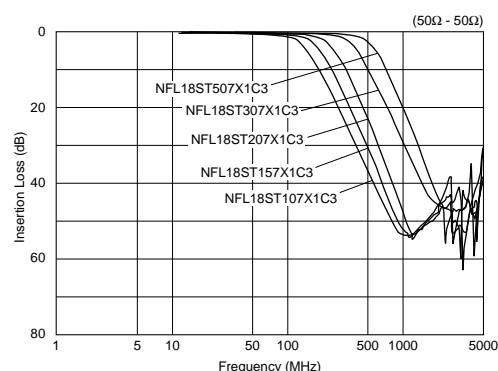
| Part Number    | Cut-off Frequency (MHz) | Capacitance (pF) | Inductance (nH) | Rated Voltage (Vdc) | Rated Current (mA) | Insulation Resistance (M ohm) | Operating Temperature Range (°C) |
|----------------|-------------------------|------------------|-----------------|---------------------|--------------------|-------------------------------|----------------------------------|
| NFL18ST107X1C3 | 100                     | 40 +20%, -20%    | 175 +20%, -20%  | 16                  | 100                | 1000 min.                     | -55 to 125                       |
| NFL18ST157X1C3 | 150                     | 32 +20%, -20%    | 140 +20%, -20%  | 16                  | 100                | 1000 min.                     | -55 to 125                       |
| NFL18ST207X1C3 | 200                     | 25 +20%, -20%    | 110 +20%, -20%  | 16                  | 150                | 1000 min.                     | -55 to 125                       |
| NFL18ST307X1C3 | 300                     | 18 +20%, -20%    | 62 +20%, -20%   | 16                  | 200                | 1000 min.                     | -55 to 125                       |
| NFL18ST507X1C3 | 500                     | 10 +20%, -20%    | 43 +20%, -20%   | 16                  | 200                | 1000 min.                     | -55 to 125                       |

Number of Circuits : 1

#### ■ Equivalent Circuit



#### ■ Insertion Loss Characteristics (Typical)

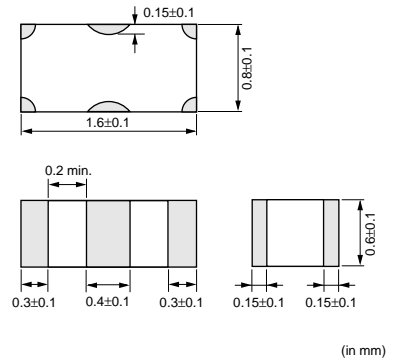


## NFL18SP Series

The chip "EMIFIL" NFL18SP series is an EMI suppression filter for high speed signal lines, achieving pi-type structure in 0603 size with Murata's multilayer technology.

### ■ Features

1. Ultra-small size in 1.6x0.8x0.6 mm
2. Achieves high performance in noise suppression over wide frequency range.
3. Steep insertion loss characteristics realize excellent noise suppression and prevent distortion of signal waveform.
4. Line up 4 items of cut-off frequency range from 150 to 500MHz.



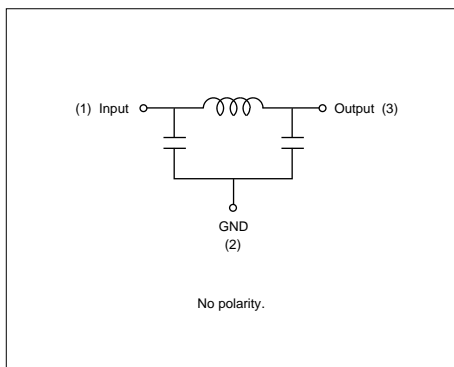
### ■ Applications

EMI suppression for digital signal line such as RGB and high speed clock lines

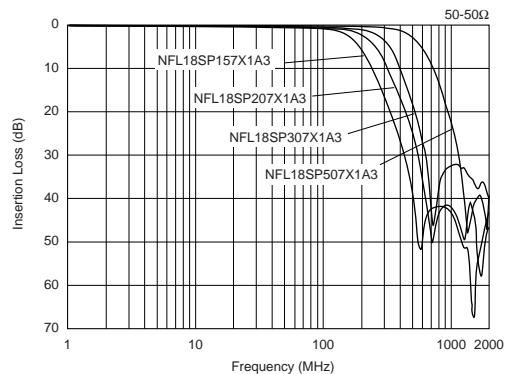
| Part Number           | Cut-off Frequency (MHz) | Capacitance (pF) | Inductance (nH) | Rated Voltage (Vdc) | Rated Current (mA) | Insulation Resistance (M ohm) | Operating Temperature Range (°C) |
|-----------------------|-------------------------|------------------|-----------------|---------------------|--------------------|-------------------------------|----------------------------------|
| <b>NFL18SP157X1A3</b> | 150                     | 34 +20%, -20%    | 100 +20%, -20%  | 10                  | 100                | 1000 min.                     | -55 to 125                       |
| <b>NFL18SP207X1A3</b> | 200                     | 24 +20%, -20%    | 80 +20%, -20%   | 10                  | 100                | 1000 min.                     | -55 to 125                       |
| <b>NFL18SP307X1A3</b> | 300                     | 19 +20%, -20%    | 60 +20%, -20%   | 10                  | 100                | 1000 min.                     | -55 to 125                       |
| <b>NFL18SP507X1A3</b> | 500                     | 11 +20%, -20%    | 38 +20%, -20%   | 10                  | 100                | 1000 min.                     | -55 to 125                       |

Number of Circuits : 1

### ■ Equivalent Circuit



### ■ Insertion Loss Characteristics (Typical)

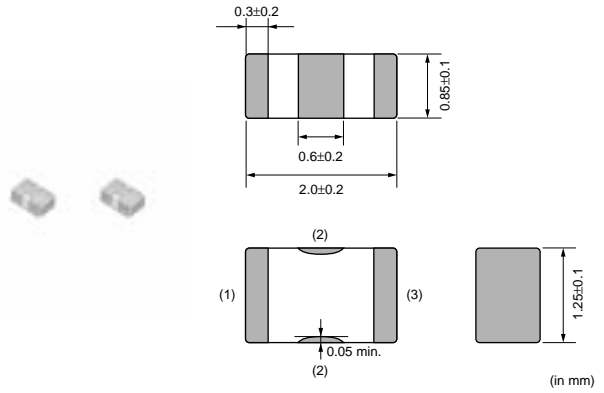


## NFL21S Series

The chip "EMIFIL" NFL21S series is a high performance EMI suppression filter in 2.0x1.25mm size for high speed signal lines by using Murata's processing technology.

### ■ Features

1. Suppresses noise with few effects on the signal itself due to its steep filtering characteristics.
2. Murata's original internal structure design enables excellent noise suppression up to high frequencies.
3. Available in nine different values of cut-off frequency ranging from 20MHz up to 500MHz.



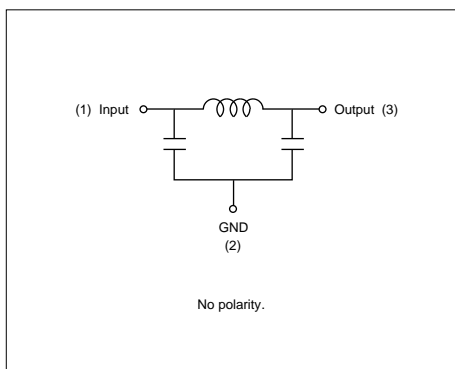
### ■ Applications

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

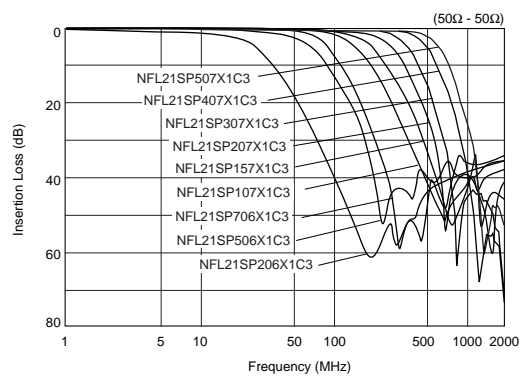
| Part Number    | Cut-off Frequency (MHz) | Capacitance (pF) | Inductance (nH) | Rated Voltage (Vdc) | Rated Current (mA) | Insulation Resistance (M ohm) | Operating Temperature Range (°C) |
|----------------|-------------------------|------------------|-----------------|---------------------|--------------------|-------------------------------|----------------------------------|
| 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 +10%, -10%    | 45 +10%, -10%   | 16                  | 300                | 1000 min.                     | -55 to 125                       |
| NFL21SP407X1C3 | 400                     | 16 +10%, -10%    | 34 +10%, -10%   | 16                  | 300                | 1000 min.                     | -55 to 125                       |
| NFL21SP507X1C3 | 500                     | 12 +10%, -10%    | 31 +10%, -10%   | 16                  | 300                | 1000 min.                     | -55 to 125                       |

Number of Circuits : 1

### ■ Equivalent Circuit



### ■ Insertion Loss Characteristics (Typical)

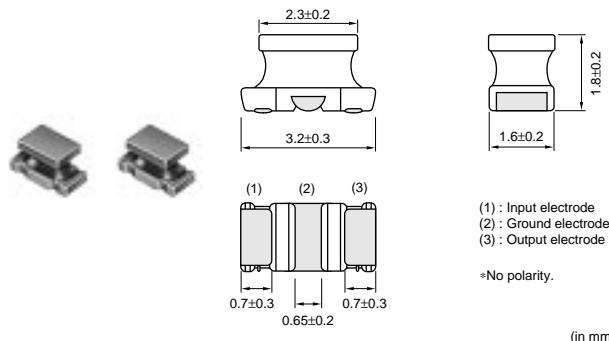


# On-Board Type (DC) EMI Suppression Filters (EMIFIL®)



## Chip EMIFIL® LC Combined Winding Type NFW31S Series

The signal line chip EMI filter NFW31S series consists 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.



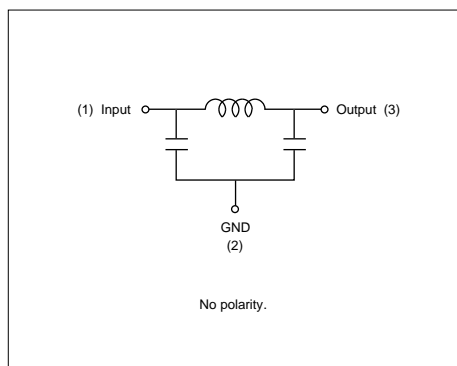
### ■ Features

1. Suppresses 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 NFW31S series is available in six different values of cut-off frequency ranging from 10MHz up to 500MHz.

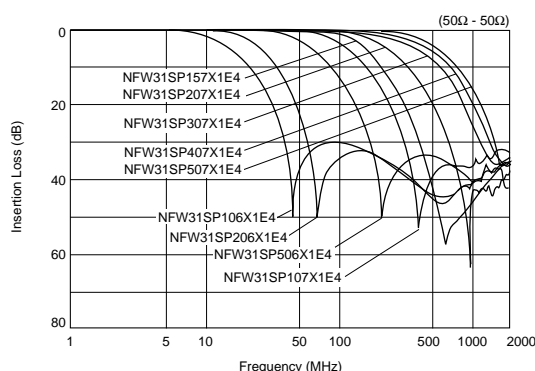
| Part Number    | Nominal Cut-off Freq. (MHz) | Attenuation at 10MHz (dB) | Attenuation at 20MHz (dB) | Attenuation at 50MHz (dB) | Attenuation at 100MHz (dB) | Attenuation at 150MHz (dB) | Attenuation at 200MHz (dB) | Attenuation at 300MHz (dB) | Attenuation at 400MHz (dB) | Attenuation at 500MHz (dB) | 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

### ■ Equivalent Circuit

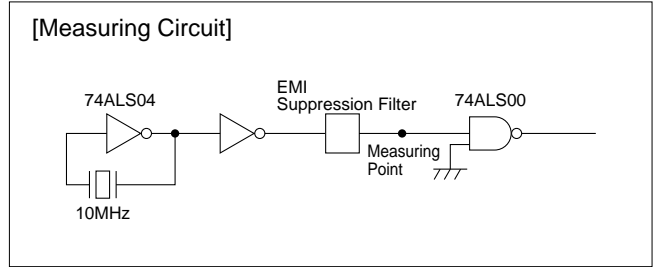


### ■ Insertion Loss Characteristics (Typical)



## 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  | <br>Signal Waveform (20ns/div, 1V/div) | <br>Noise Spectrum (10:1 Active Probe)    |   |
| <b>NFW31S Series</b><br>(Cut-off frequency 50MHz)          | <br>Signal Waveform (20ns/div, 1V/div) | <br>Noise Level [dBμV] vs Frequency [MHz] | The NFW31S's steep attenuation characteristic means excellent EMI suppression without waveform cornering.   |
| Conventional Chip Solid type EMI Filter<br>(NFM41CC 470pF) | <br>Signal Waveform (20ns/div, 1V/div) | <br>Noise Level [dBμV] vs Frequency [MHz] | 3-terminal capacitors suppress signal frequencies as EMI frequencies so the signal waveform is distorted.   |
| Filter Combined with Conventional LCs                      | <br>Signal Waveform (20ns/div, 1V/div) | <br>Noise Level [dBμV] vs Frequency [MHz] | 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. |

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2

# On-Board Type (DC) EMI Suppression Filters (EMIFIL<sup>®</sup>)



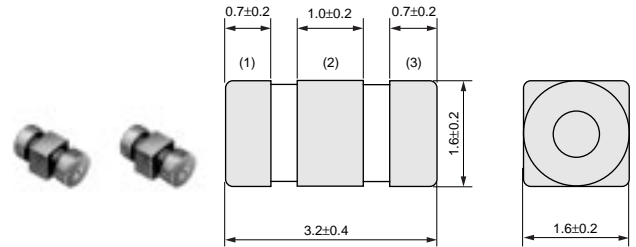
## Chip EMIFIL<sup>®</sup> LC Combined Type for Large Current NFE31P/NFE61P/NFE61H Series

### NFE31P Series

The chip "EMIFIL" NFE31P is a small size T-type circuit EMI suppression filter.

#### ■ Features

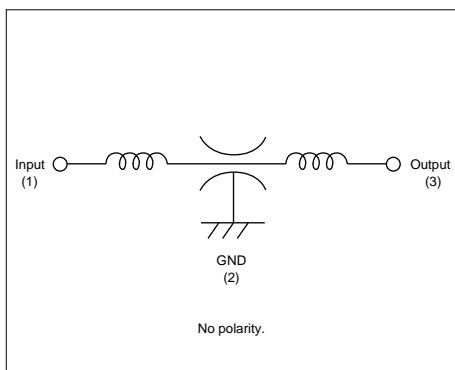
1. Its large rated current of 6A and low voltage drop due to small DC resistance are suitable for DC power line use.
2. The feedthrough capacitor realizes excellent high frequency characteristics.
3. The structure incorporates built-in ferrite beads which minimize resonance with surrounding circuits.
4. 22 to 22,000pF lineups can be used for signal lines.



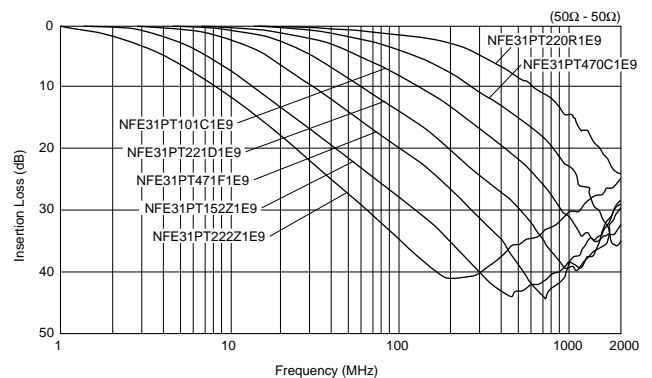
(in mm)

| 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)

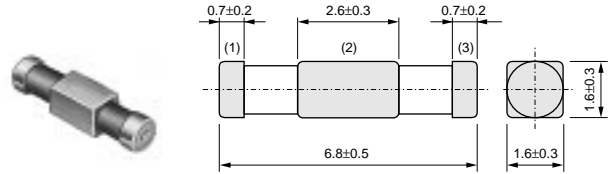


## NFE61P Series

The chip "EMIFIL" NFE61P is a T-type circuit EMI suppression filter.

### Feature

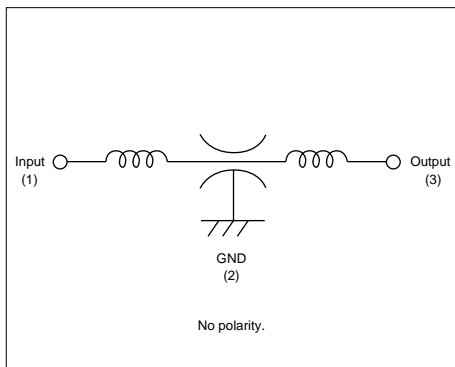
1. Its large rated current of 2A and low voltage drop due to small DC resistance are suitable for DC power line use.
2. The feedthrough capacitor realizes excellent high frequency characteristics.
3. The structure incorporates built-in ferrite beads which minimize resonance with surrounding circuits.
4. 33 to 4,700pF lineups can be used for signal lines.



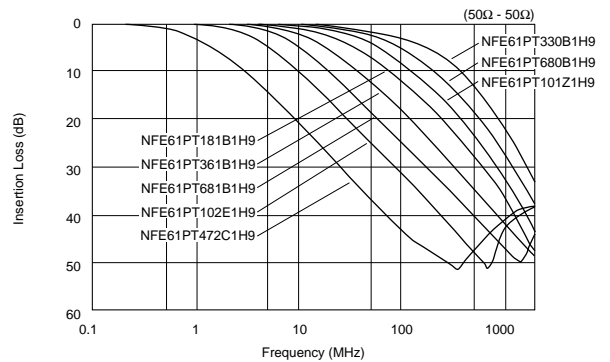
(in mm)

| 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)





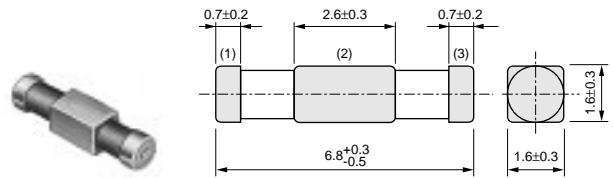
## NFE61H Series

The T-type chip EMI Filter NFE61H series consists of a feedthrough capacitor and ferrite beads.

Extending the operating conditions of NFE61P, NFE61H series can be used in an application set under severe operating conditions.

### ■ Features

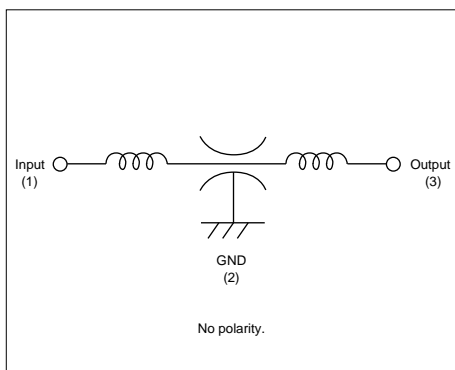
1. These filters have an extended operating temperature range of -55 to +125 degree C.
2. Its large rated current of 2A and low voltage drop due to small DC resistance are suitable for DC power line use.
3. The feedthrough capacitor realizes excellent high frequency characteristics.
4. The structure incorporates built-in ferrite beads which minimize resonance with surrounding circuits.
5. 33 to 3,300pF lineups can be used for signal lines.



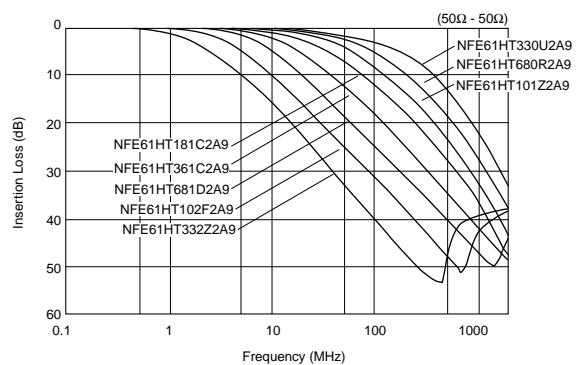
(in mm)

| 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                       |

### ■ Equivalent Circuit



### ■ Insertion Loss Characteristics (Typical)



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



## Chip EMIFIL® for Large Current NFM18P/21P/3DP/41P Series

### NFM18P Series

The NFM18P series is an EMI suppression filter for high speed IC power lines which realizes large capacitance 1 microF max. and rated current 2A in 1608 size by Murata's multilayer technology.

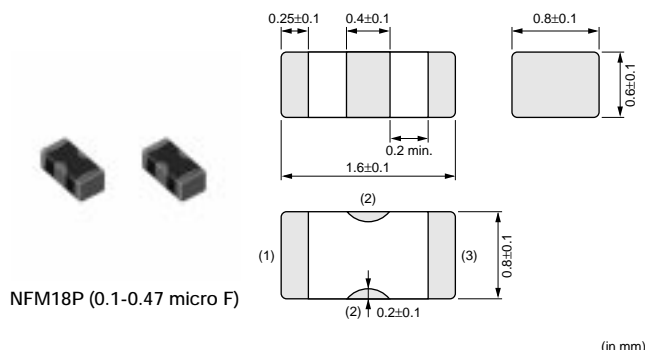
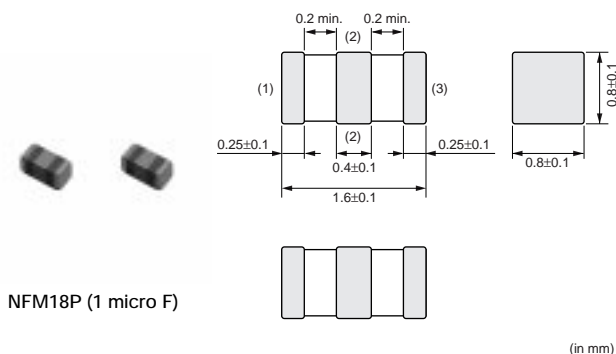
#### Features

1. Ultra-small size in 1.6x0.8mm.
2. 3-terminal structure with low residual (ESL)\* and large capacitance 1 microF (max.) realize large insertion loss characteristics over wide frequency range.
3. Large rated current 2A is suitable for noise suppression of circuits which require large current.
4. The NFM18P series has line up of capacitance 0.1 to 1.0 microF.

\* Not exceeding one-tenth of monolithic ceramic capacitors (2-terminal).

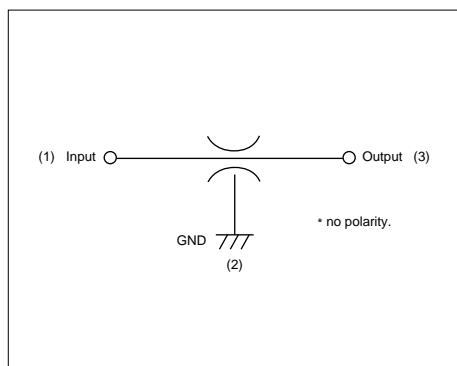
#### Applications

1. Noise suppression for large capacitance circuits such as high speed IC power lines
2. Control change of voltage for high speed IC



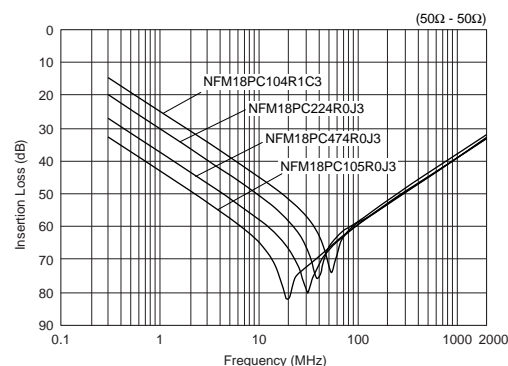
| Part Number    | Capacitance (μF) | Rated Voltage (Vdc) | Rated Current (A) | Insulation Resistance (M ohm) | Operating Temperature Range (°C) |
|----------------|------------------|---------------------|-------------------|-------------------------------|----------------------------------|
| NFM18PC104R1C3 | 0.1 +20%, -20%   | 16                  | 2                 | 1000 min.                     | -55 to 125                       |
| NFM18PC224R0J3 | 0.22 +20%, -20%  | 6.3                 | 2                 | 1000 min.                     | -55 to 125                       |
| NFM18PC474R0J3 | 0.47 +20%, -20%  | 6.3                 | 2                 | 1000 min.                     | -55 to 125                       |
| NFM18PC105R0J3 | 1.0 +20%, -20%   | 6.3                 | 2                 | 500 min.                      | -55 to 105                       |

#### Equivalent Circuit



#### Insertion Loss Characteristics

NFM18P Series

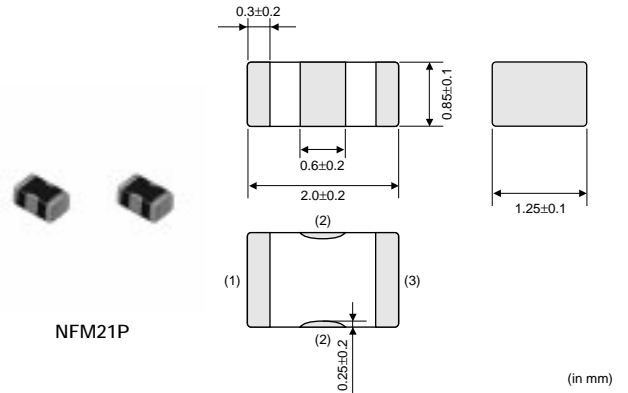


## NFM21P Series

NFM21P is a 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

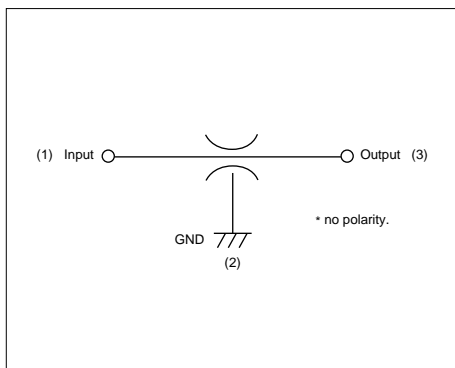
1. The rated current of 4A is suitable for IC's individual power lines.
2. Small dimension enables higher density packaging.  
NFM21P is much smaller size (2.0x1.25x0.85mm).
3. Murata's original internal electrode structure design realizes excellent EMI suppression effects from low frequency to high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



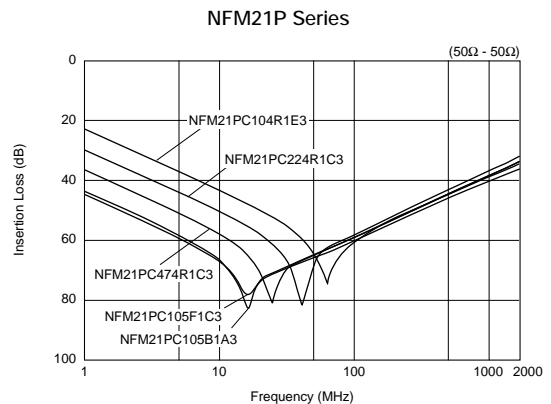
2

| Part Number           | Capacitance (μF) | Rated Voltage (Vdc) | Rated Current (A) | Insulation Resistance (M ohm) | Operating Temperature Range (°C) |
|-----------------------|------------------|---------------------|-------------------|-------------------------------|----------------------------------|
| <b>NFM21PC104R1E3</b> | 0.1 +20%, -20%   | 25                  | 2                 | 1000 min.                     | -55 to 125                       |
| <b>NFM21PC224R1C3</b> | 0.22 +20%, -20%  | 16                  | 2                 | 1000 min.                     | -55 to 125                       |
| <b>NFM21PC474R1C3</b> | 0.47 +20%, -20%  | 16                  | 2                 | 1000 min.                     | -55 to 125                       |
| <b>NFM21PC105B1A3</b> | 1.0 +20%, -20%   | 10                  | 4                 | 500 min.                      | -40 to 85                        |
| <b>NFM21PC105F1C3</b> | 1.0 +80%, -20%   | 16                  | 2                 | 500 min.                      | -40 to 85                        |

### ■ Equivalent Circuit



### ■ Insertion Loss Characteristics



## NFM3DP Series

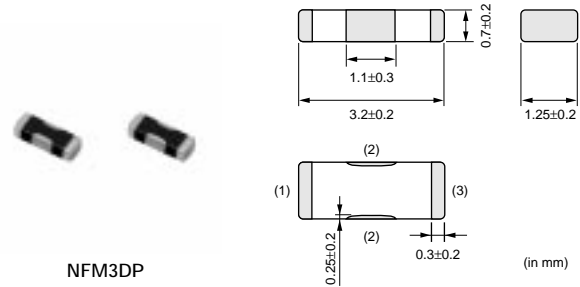
The chip "EMIFIL" NFM3DP is a chip type 3-terminal capacitor with high rated current of 2A. This series is suited for noise suppression in DC power supply lines of digital instruments.

### ■ Features

1. Large rated current (2A) is suitable for application in DC power lines.
2. Small size (3.2x1.25mm) and low profile (0.7mm max.)

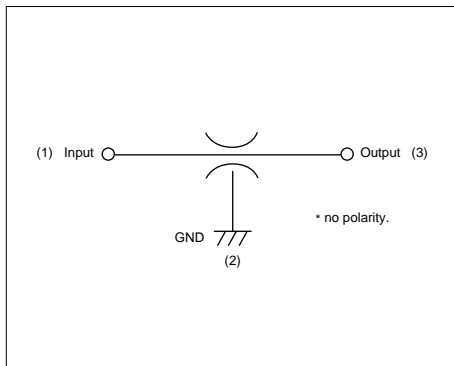
### ■ Applications

1. Personal computers, word processors and peripherals
2. Telephones, PPCs, communications equipment, etc.
3. Digital TVs, VCRs
4. Telecommunications equipment

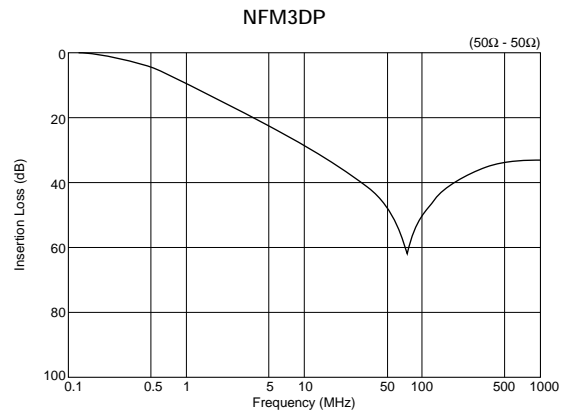


| Part Number    | Capacitance (μF) | Rated Voltage (Vdc) | Rated Current (A) | Insulation Resistance (M ohm) | Operating Temperature Range (°C) |
|----------------|------------------|---------------------|-------------------|-------------------------------|----------------------------------|
| NFM3DPC223R1H3 | 0.022 +20%,-20%  | 50                  | 2                 | 1000 min.                     | -55 to 85                        |

### ■ Equivalent Circuit

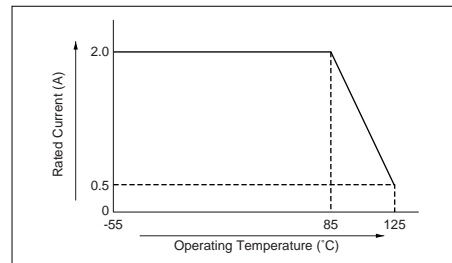


### ■ Insertion Loss Characteristics



### ■ Notice (Rating)

When the NFM3DP series is used in operating temperatures exceeding +85°C, derating of current is necessary. Please apply the derating curve shown below according to the operating temperature.



## NFM41P Series

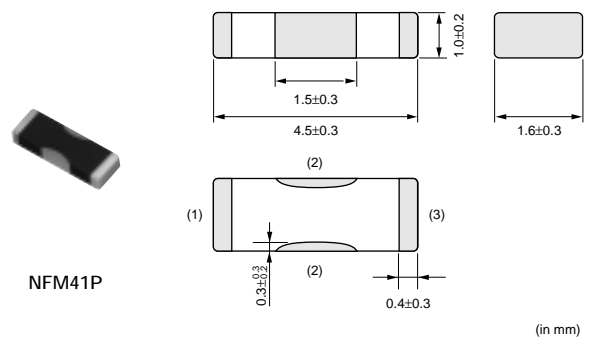
The chip "EMIFIL" NFM41P series consists of 3-terminal structure SMT components. These components are able to be applied to large current DC power lines. NFM41P series are suitable in noise suppression in DC lines where relatively large currents operate.

### ■ Features

1. Large rated current (2A) is suitable for the application in DC power lines.
2. High electrostatic capacitance and remarkable high frequency performance are effective for immunity against surge noise and pulse noise.

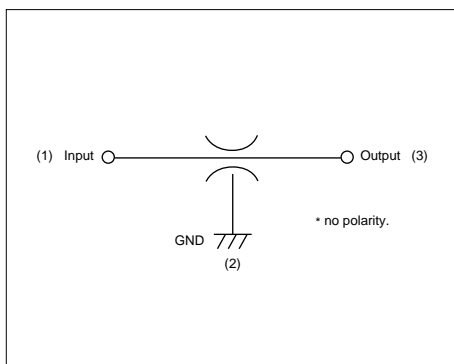
### ■ Applications

1. Personal computers, word processors and peripherals
2. Telephones, PPCs, communications equipment, etc.
3. Digital TVs, VCRs
4. Telecommunications equipment

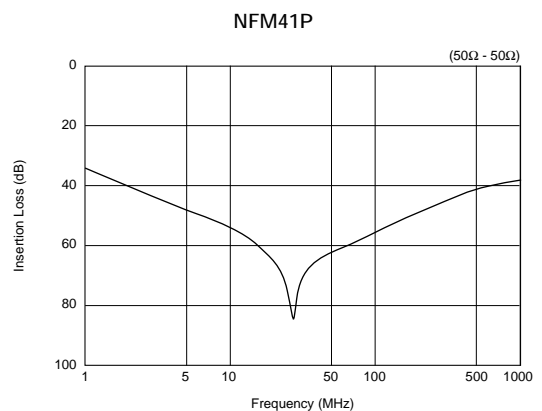


| Part Number           | Capacitance (μF) | Rated Voltage (Vdc) | Rated Current (A) | Insulation Resistance (M ohm) | Operating Temperature Range (°C) |
|-----------------------|------------------|---------------------|-------------------|-------------------------------|----------------------------------|
| <b>NFM41PC204F1H3</b> | 0.2 +80%, -20%   | 50                  | 2                 | 1000 min.                     | -55 to 85                        |

### ■ Equivalent Circuit



### ■ Insertion Loss Characteristics



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



## Chip EMIGUARD® (EMIFIL® with Varistor Function) Part Numbering

### 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 |                |
|------------|----------------|
| <b>VF</b>  | Chip EMIGUARD® |

#### ② Structure

| Code     | Structure       |
|----------|-----------------|
| <b>M</b> | Monolithic Type |

#### ③ Dimensions (L×W)

| Code      | Dimensions (L×W) | EIA  |
|-----------|------------------|------|
| <b>41</b> | 4.5×1.6mm        | 1806 |

#### ④ Outer Electrode

| Code     | Outer Electrode |
|----------|-----------------|
| <b>R</b> | Standard Type   |

#### ⑤ Category

| Code     | Category |
|----------|----------|
| <b>N</b> | 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 zeros which follow the two figures.

#### ⑦ Capacitance Tolerance

| Code     | Capacitance Tolerance |
|----------|-----------------------|
| <b>N</b> | ±30%                  |

#### ⑧ Rated Voltage

| Code      | Rated Voltage |
|-----------|---------------|
| <b>1C</b> | 16V           |

#### ⑨ Packaging

| Code     | Packaging                    |
|----------|------------------------------|
| <b>L</b> | Plastic Taping (ø180mm Reel) |
| <b>B</b> | Bulk                         |

3

# On-Board Type (DC) EMI Suppression Filters (EMIFIL<sup>®</sup>)



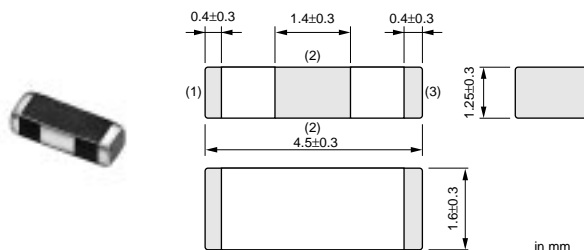
## Chip EMIGUARD<sup>®</sup> (EMIFIL<sup>®</sup> with Varistor Function) VFM41R Series

### ■ Features

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

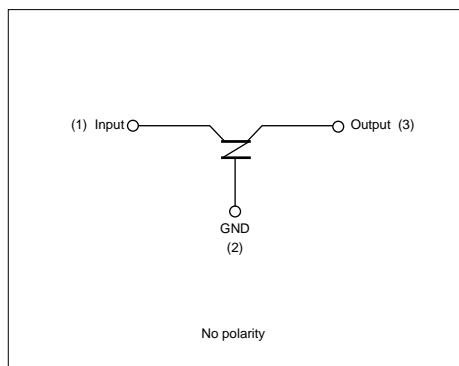
ESD surge protection and EMI suppression in various electric equipment such as car electronic equipment, portable electronic equipment, telecommunication terminals, office automation equipment, home automation equipment or factory automation equipment



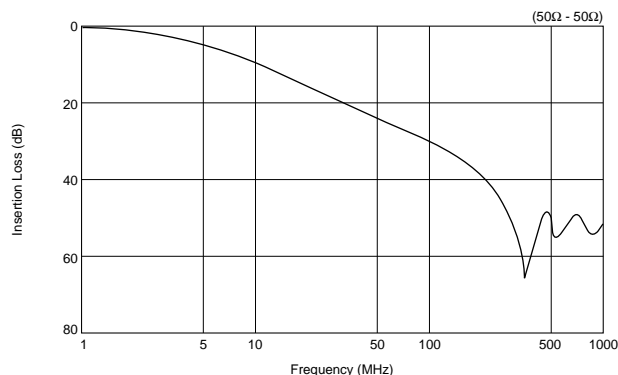
| Part Number   | Rated Voltage (Vdc) | Varistor Voltage (V) | Clamping Voltage (max.) | Capacitance (pF) | Rated Current (mA) | Peak Pulse Current (A) | Operating Temperature Range (°C) |
|---------------|---------------------|----------------------|-------------------------|------------------|--------------------|------------------------|----------------------------------|
| VFM41RN222N1C | 16                  | 27 +5V,-5V           | 50V(V2A)                | 2200 +30%,-30%   | 200                | 50                     | -40 to 125                       |

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

### ■ Equivalent Circuit

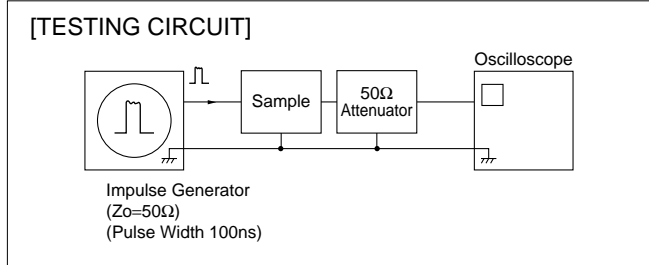


### ■ Insertion Loss Characteristics



# Noise Suppression Effect of VFM Series

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



| Type of Filter                               | EMI Suppression Effect  | Description  |
|--|---|--|
| <p>Original Waveform</p>                     | <p><b>Voltage Waveform</b></p> <p><b>Frequency Spectrum</b></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> |
| <p>The commonly used 2-terminal varistor</p> | <p>* Final voltage falls below 0V because of the effect of signal reflection.</p> <p><b>Voltage Waveform</b></p> <p><b>Frequency Spectrum</b></p> | <p>The rising part of pulse, which is mostly consists of high-frequency element, remains because inductance in electrodes becomes obstacle.</p>  |
| <p>Chip Solid EMIGUARD® VFM41R</p>           | <p><b>Voltage Waveform</b></p> <p><b>Frequency Spectrum</b></p>   | <p>The 3-terminal structure minimizes the effect of inductance in electrodes and pulse rising noise is absorbed completely.</p>  |



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



## Chip Common Mode Choke Coils Part Numbering

### Chip Common Mode Choke Coils

(Global Part Number) 

|    |   |    |   |   |     |   |   |   |   |
|----|---|----|---|---|-----|---|---|---|---|
| DL | W | 21 | S | N | 371 | S | Q | 2 | L |
| ①  | ② | ③  | ④ | ⑤ | ⑥   | ⑦ | ⑧ | ⑨ | ⑩ |

#### ① Product ID

| Product ID |                              |
|------------|------------------------------|
| <b>DL</b>  | Chip Common Mode Choke Coils |

#### ② Structure

| Code     | Structure       |
|----------|-----------------|
| <b>W</b> | Winding Type    |
| <b>M</b> | Monolithic Type |
| <b>P</b> | Film Type       |

#### ③ Dimensions (L×W)

| Code      | Dimensions (L×W) | EIA  |
|-----------|------------------|------|
| <b>11</b> | 1.25×1.0mm       | 0504 |
| <b>21</b> | 2.0×1.2mm        | 0805 |
| <b>31</b> | 3.2×1.6mm        | 1206 |
| <b>2H</b> | 2.5×2.0mm        | 1008 |
| <b>5A</b> | 5.0×3.6mm        | 2014 |
| <b>5B</b> | 5.0×5.0mm        | 2020 |

#### ④ Type

| Code     | Type   |
|----------|--|
| <b>S</b> | Magnetically Shielded One Circuit Type           |
| <b>D</b> | Magnetically Shielded Two Circuit Type           |
| <b>H</b> | Open Magnetic One Circuit Type                   |
| <b>G</b> | Magnetically Monolithic Type (sectional winding) |

#### ⑩ Packaging

| Code     | Packaging                    | Series               |
|----------|------------------------------|----------------------|
| <b>K</b> | Plastic Taping (ø330mm Reel) | <b>DLW5AH/DLW5BS</b> |
| <b>L</b> | Plastic Taping (ø180mm Reel) | All series           |
| <b>B</b> | Bulk                         | All series           |

#### ⑤ Category

| Code     | Category      |
|----------|---------------|
| <b>N</b> | Standard Type |

#### ⑥ Impedance

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

#### ⑦ Circuit

Ex.)

| Code     | Circuit       | Series               |
|----------|---------------|----------------------|
| <b>S</b> | Standard Type | except <b>DLP31D</b> |
| <b>M</b> |               | <b>DLP31D</b>        |

#### ⑧ Features

| Code     | Features               |
|----------|------------------------|
| <b>L</b> | Expressed by a letter. |
| <b>Q</b> |                        |
| <b>Z</b> |                        |

#### ⑨ Number of Signal Line

| Code     | Number of Signal Line |
|----------|-----------------------|
| <b>2</b> | Two Lines             |
| <b>3</b> | Three Lines           |
| <b>4</b> | Four Lines            |

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



## Chip Common Mode Choke Coils Film Type DLP11S/DLP31S Series

### DLP11S Series

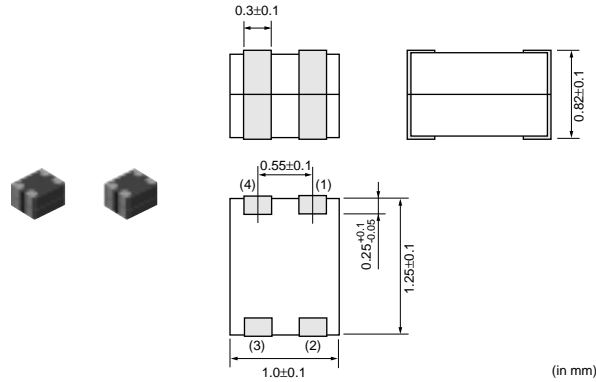
#### ■ Features

1. Small size and tight dimensional tolerance  
SIZE : 1.25x1.0x0.82mm tolerance : +/-0.1mm
2. Useful impedance line-up 90/120/160/200ohm
3. High noise suppression for high frequency
4. No distortion to high-speed signal transmission

#### ■ Applications

Common mode noise suppression of high speed differential signal lines for USB, IEEE1394, LVDS.

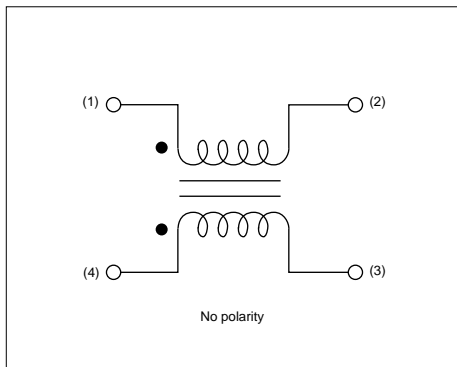
1. Note PC, PDA
2. Cellular phone
3. Digital Still Camera, Digital Video Camera



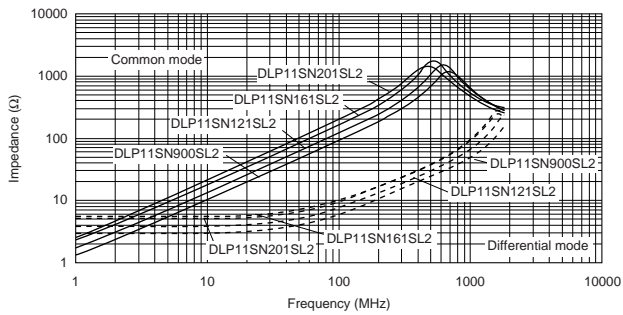
| Part Number   | Common Mode Impedance (at 100MHz, 20 degree C) (ohm) | Rated Current (mA) | Rated Voltage (Vdc) | Insulation Resistance (M ohm) | Withstand Voltage (Vdc) | DC Resistance (ohm) |
|---------------|--|--------------------|---------------------|-------------------------------|-------------------------|---------------------|
| DLP11SN900SL2 | 90 ±20%  | 160                | 5                   | 100 min.                      | 12.5                    | 1.4 ±25%            |
| DLP11SN121SL2 | 120 ±20%   | 140                | 5                   | 100 min.                      | 12.5                    | 2.0 ±25%            |
| DLP11SN161SL2 | 160 ±20%   | 120                | 5                   | 100 min.                      | 12.5                    | 2.7 ±25%            |
| DLP11SN201SL2 | 200 ±20%   | 130                | 5                   | 100 min.                      | 12.5                    | 2.5 ±25%            |

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

#### ■ Equivalent Circuit



#### ■ Impedance-Frequency Characteristics



## DLP31S Series

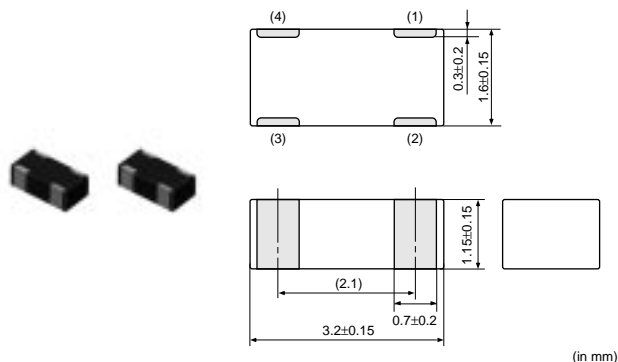
DLP31S series is chip common mode choke coil that realizes high impedance in a small size with ferrite material technology and film processing technology. DLP31S series has excellent performance at high frequency range. It is suitable for differential signal line application.

### ■ Features

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

### ■ Applications

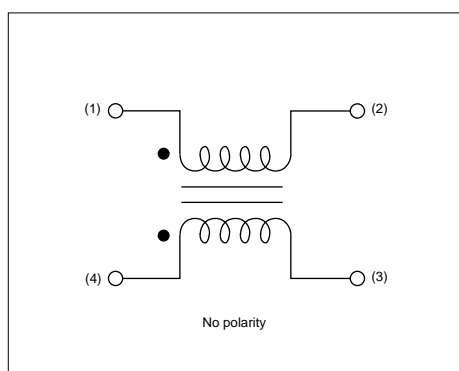
1. USB lines of PC, peripheral equipment.
2. LVDS lines of Note-PC, LCD.
3. USB lines of digital AV equipment such as digital cameras.



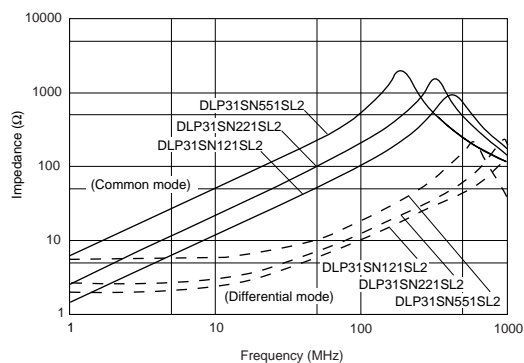
| Part Number   | Common Mode Impedance (at 100MHz, 20 degree C) (ohm) | Rated Current (mA) | Rated Voltage (Vdc) | Insulation Resistance (M ohm) | Withstand Voltage (Vdc) | DC Resistance (ohm) |
|---------------|--|--------------------|---------------------|-------------------------------|-------------------------|---------------------|
| DLP31SN121SL2 | 120 ±20%   | 100                | 16                  | 100 min.                      | 40                      | 2.0 max.            |
| DLP31SN221SL2 | 220 ±20%   | 100                | 16                  | 100 min.                      | 40                      | 2.5 max.            |
| DLP31SN551SL2 | 550 ±20%   | 100                | 16                  | 100 min.                      | 40                      | 3.6 max.            |

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

### ■ Equivalent Circuit



### ■ Impedance-Frequency Characteristics



# On-Board Type (DC) EMI Suppression Filters (EMIFIL<sup>®</sup>)



## Chip Common Mode Choke Coils Arrays Film Type DLP31D Series

### DLP31D Series

DLP31D series is chip common mode choke coil array which realizes high coupling and high impedance in a small size with ferrite material technology and thin film processing technology.

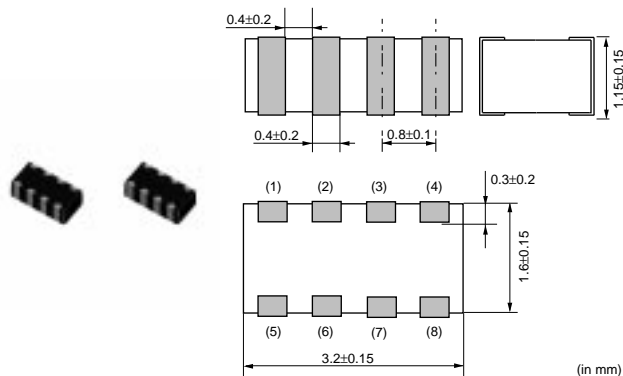
#### ■ Features

1. 2 components are included in 3.2x1.6mm
2. Thin type 1.15mm
3. High common mode Impedance characteristics (max. 440ohm, at 100MHz)
4. The DLP31D can suppress common mode noise without damage to signal wave.

#### ■ Applications

Common mode noise suppression of high speed differential signal lines for USB, IEEE1394, LVDS.

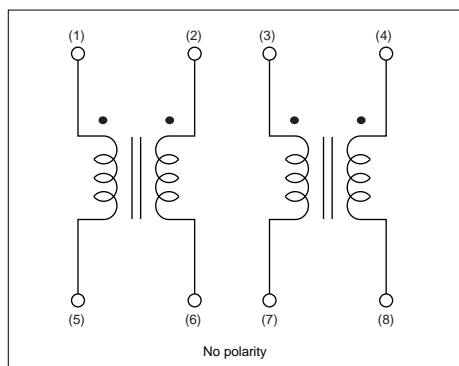
1. Main board of personal computer, note PC
2. Printer, Scanner
3. LCD monitor
4. Game equipment
5. PC peripheral equipment



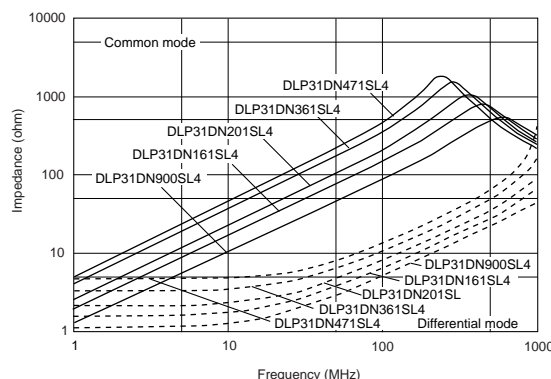
| Part Number   | Common Mode Impedance (at 100MHz, 20 degree C) (ohm) | Rated Current (mA) | Rated Voltage (Vdc) | Insulation Resistance (M ohm) | Withstand Voltage (Vdc) | DC Resistance (ohm) |
|---------------|--|--------------------|---------------------|-------------------------------|-------------------------|---------------------|
| DLP31DN900ML4 | 90 ±20%  | 160                | 10                  | 100 min.                      | 25                      | 1.1 max.            |
| DLP31DN131ML4 | 130 ±20%   | 120                | 10                  | 100 min.                      | 25                      | 1.6 max.            |
| DLP31DN201ML4 | 200 ±20%   | 100                | 10                  | 100 min.                      | 25                      | 2.2 max.            |
| DLP31DN321ML4 | 320 ±20%   | 80                 | 10                  | 100 min.                      | 25                      | 3.5 max.            |
| DLP31DN441ML4 | 440 ±20%   | 70                 | 10                  | 100 min.                      | 25                      | 4.3 max.            |

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

#### ■ Equivalent Circuit



#### ■ Impedance-Frequency Characteristics



# On-Board Type (DC) EMI Suppression Filters (EMIFIL<sup>®</sup>)



## Chip Common Mode Choke Coils Monolithic Type DLM2HG Series

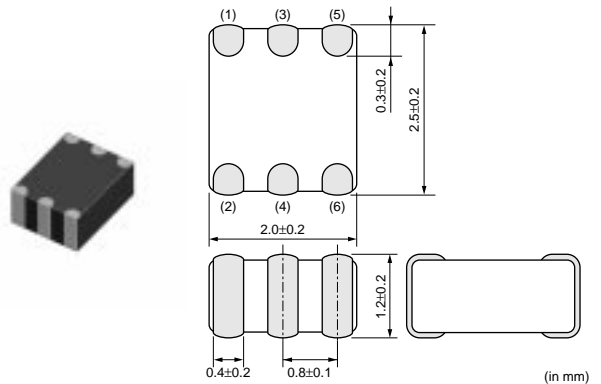
DLM2HG Series is a high quality noise suppression filter for headphone lines of high quality digital music equipment.

### ■ Features

1. Low distortion in audio signal, Low crosstalk.
2. Effective in noise suppression both of common mode and of differential mode.
3. Small size, low profile, SMD 2.5x2.0x1.2mm

### ■ Application

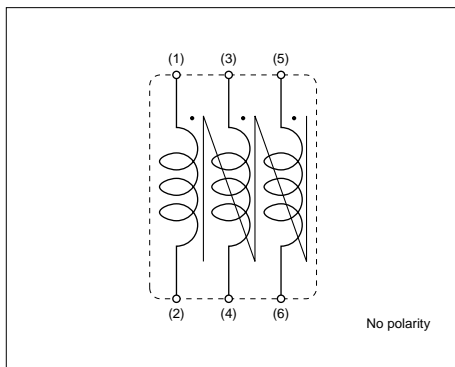
1. Headphone lines of digital music equipment such as DVD, MD player.
2. Headphone lines of Note-PC, PDA



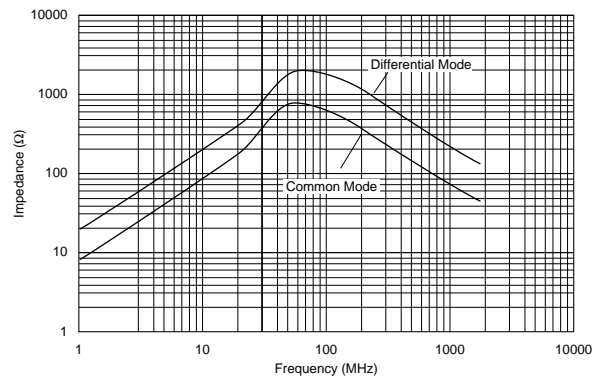
| Part Number          | Common Mode Impedance (at 100MHz, 20 degree C) (ohm) | Rated Current (mA) | Rated Voltage (Vdc) | Insulation Resistance (M ohm) | Withstand Voltage (Vdc) | DC Resistance (ohm) |
|----------------------|--|--------------------|---------------------|-------------------------------|-------------------------|---------------------|
| <b>DLM2HGN601SZ3</b> | 600 ±25%   | 100                | 16                  | 100 min.                      | 100                     | 0.40 max.           |

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

### ■ Equivalent Circuit



### ■ Impedance-Frequency Characteristics



4

# On-Board Type (DC) EMI Suppression Filters (EMIFIL<sup>®</sup>)



## Chip Common Mode Choke Coils Winding Type DLW21S/DLW21H/DLW31S Series

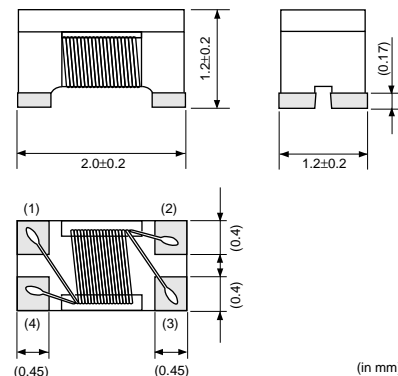
### DLW21S Series

#### ■ Features

- 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.
- DLW21S series enables noise suppression for differential signal line without distortion in high speed signal transmission due to its high coupling.
- Lead is not contained in the product.
- Small dimension enables higher density packaging.



DLW21S



(in mm)

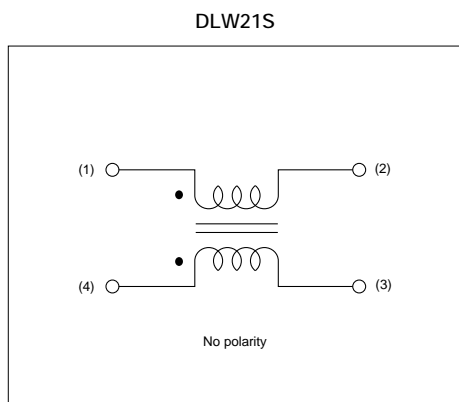
#### ■ Applications

- USB lines of PC, Peripheral equipment.
- LVDS lines of Note-PC, LCD.
- USB lines of Small digital AV equipment such as digital camera.

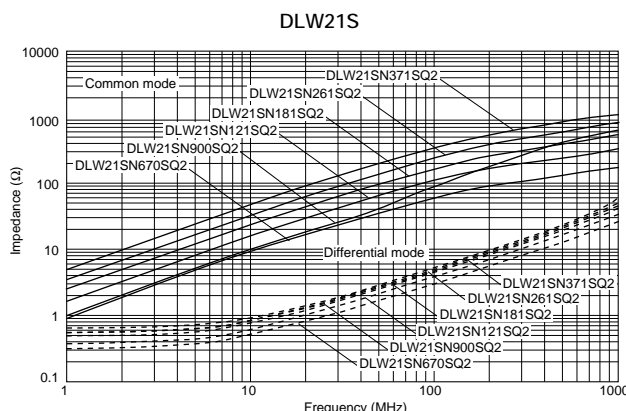
| Part Number   | Common Mode Impedance (at 100MHz, 20 degree C) (ohm) | Rated Current (mA) | Rated Voltage (Vdc) | Insulation Resistance (M ohm) | Withstand Voltage (Vdc) | DC Resistance (ohm) |
|---------------|--|--------------------|---------------------|-------------------------------|-------------------------|---------------------|
| DLW21SN670SQ2 | 67 ±25%  | 400                | 50                  | 10 min.                       | 125                     | 0.25 max.           |
| DLW21SN900SQ2 | 90 ±25%  | 330                | 50                  | 10 min.                       | 125                     | 0.35 max.           |
| DLW21SN121SQ2 | 120 ±25%   | 370                | 50                  | 10 min.                       | 125                     | 0.30 max.           |
| DLW21SN181SQ2 | 180 ±25%   | 330                | 50                  | 10 min.                       | 125                     | 0.35 max.           |
| DLW21SN261SQ2 | 260 ±25%   | 300                | 50                  | 10 min.                       | 125                     | 0.40 max.           |
| DLW21SN371SQ2 | 370 ±25%   | 280                | 50                  | 10 min.                       | 125                     | 0.45 max.           |

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

#### ■ Equivalent Circuit



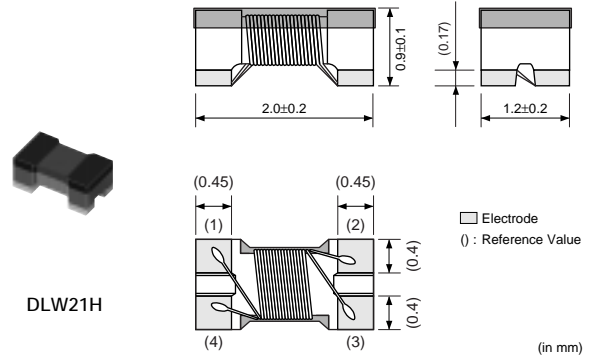
#### ■ Impedance-Frequency Characteristics



## DLW21H Series

### ■ Features

- Small size and low profile (2.0x1.2x0.9mm).  
Excellent noise suppression for sets of small and thin size.
- High common mode impedance at high frequency effects excellent noise suppression performance.
- Various common mode impedance from 67 to 180 ohm can be used, selected depending on noise level and signal frequency.
- Suitable for differential signal line like USB2.0, IEEE1394 and LVDS, because DLW21H does not provide distortion to high speed signal transmission due to its high coupling. (USB2.0: DLW21HN900SQ2)
- Lead is not contained in the product.
- Small dimension enables higher density mounting.

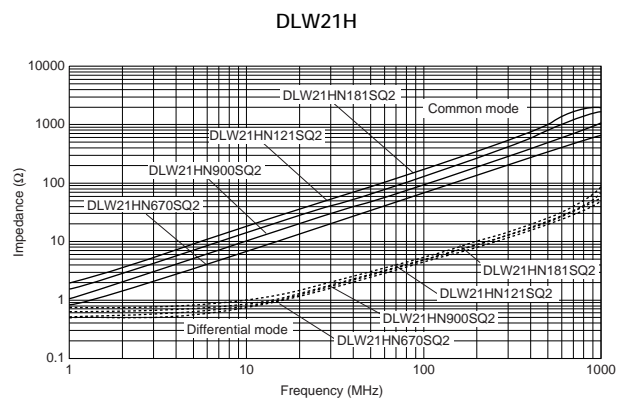
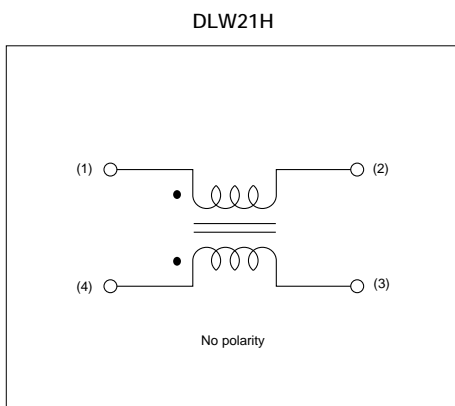


### ■ Applications

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

| Part Number   | Common Mode Impedance (at 100MHz, 20 degree C) (ohm) | Rated Current (mA) | Rated Voltage (Vdc) | Insulation Resistance (M ohm) | Withstand Voltage (Vdc) | DC Resistance (ohm) |
|---------------|--|--------------------|---------------------|-------------------------------|-------------------------|---------------------|
| DLW21HN670SQ2 | 67 (Typ.)  | 330                | 50                  | 10 min.                       | 125                     | 0.35 max.           |
| DLW21HN900SQ2 | 90 (Typ.)  | 330                | 50                  | 10 min.                       | 125                     | 0.35 max.           |
| DLW21HN121SQ2 | 120 (Typ.)   | 280                | 50                  | 10 min.                       | 125                     | 0.45 max.           |
| DLW21HN181SQ2 | 180 (Typ.)   | 250                | 50                  | 10 min.                       | 125                     | 0.50 max.           |

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



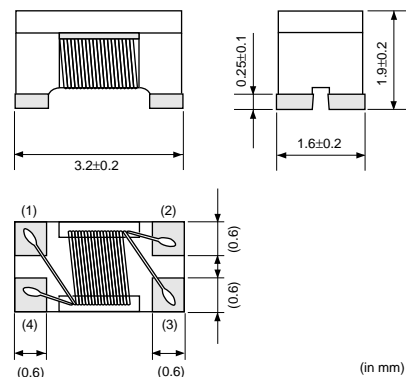
## DLW31S Series

### ■ Features

- DLW31S realizes small size and low profile.  
3.2x1.6x1.9mm.
- 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.
- DLW31S series enables noise suppression for differential signal line without distortion in high speed signal transmission due to its high coupling.
- Lead is not contained in the product.
- Small dimension enables higher density packaging.



DLW31S



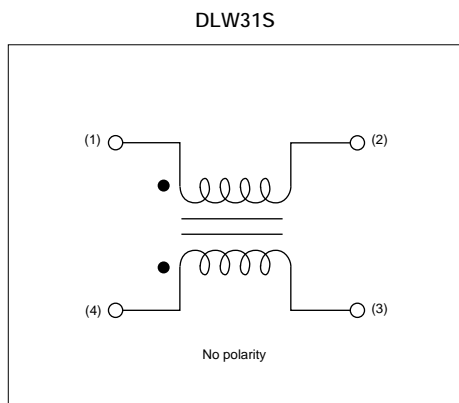
### ■ Applications

- USB lines of PC, Peripheral equipment.
- LVDS lines of Note-PC, LCD.

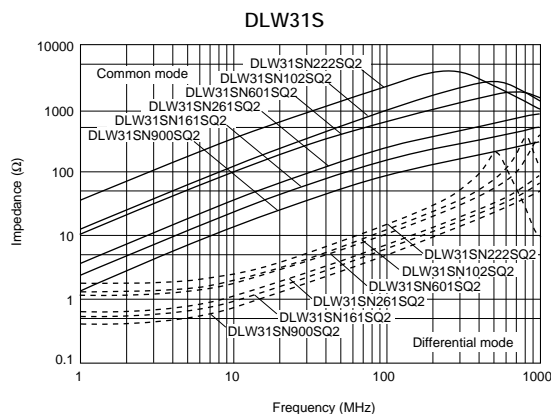
| Part Number   | Common Mode Impedance (at 100MHz, 20 degree C) (ohm) | Rated Current (mA) | Rated Voltage (Vdc) | Insulation Resistance (M ohm) | Withstand Voltage (Vdc) | DC Resistance (ohm) |
|---------------|--|--------------------|---------------------|-------------------------------|-------------------------|---------------------|
| DLW31SN900SQ2 | 90 (Typ.)  | 370                | 50                  | 10 min.                       | 125                     | 0.3 max.            |
| DLW31SN161SQ2 | 160 (Typ.)   | 340                | 50                  | 10 min.                       | 125                     | 0.4 max.            |
| DLW31SN261SQ2 | 260 (Typ.)   | 310                | 50                  | 10 min.                       | 125                     | 0.5 max.            |
| DLW31SN601SQ2 | 600 (Typ.)   | 260                | 50                  | 10 min.                       | 125                     | 0.8 max.            |
| DLW31SN102SQ2 | 1000 (Typ.)  | 230                | 50                  | 10 min.                       | 125                     | 1.0 max.            |
| DLW31SN222SQ2 | 2200 (Typ.)  | 200                | 50                  | 10 min.                       | 125                     | 1.2 max.            |

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

### ■ Equivalent Circuit



### ■ Impedance-Frequency Characteristics





# On-Board Type (DC) EMI Suppression Filters (EMIFIL<sup>®</sup>)



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

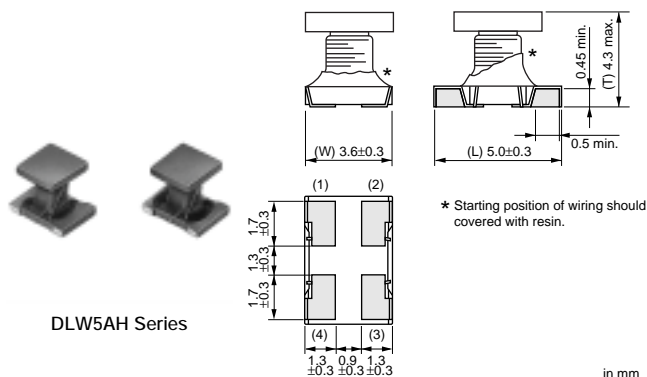
The DLW5AH/5BS series is high performance wound type chip common mode choke coil.

### ■ Features

1. High impedance (max. of 4000ohm at 100MHz : DLW5AH) enables great noise suppression.
2. Large rated current (max. of 5A) is suitable for power line use.
3. DLW5AH/BS series does not damage high speed signal due to high coupling common mode choke coil structure.
4. Automatic mounting can be applied.

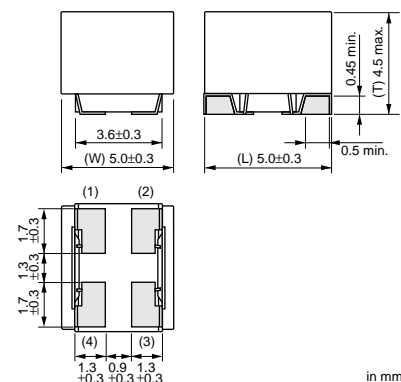
### ■ Applications

1. DC power lines in AC adapter of Portable equipment.
2. DC power lines of DC-DC converter, battery charger.



DLW5AH Series

DLW5BS Series

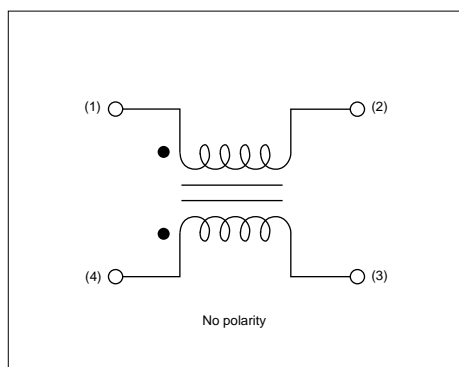


4

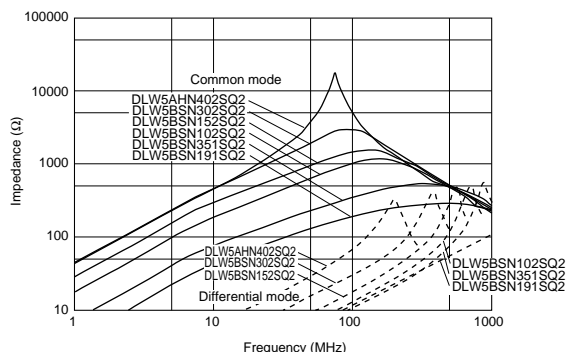
| Part Number   | Common Mode Impedance (at 100MHz, 20 degree C) (ohm) | Rated Current (mA) | Rated Voltage (Vdc) | Insulation Resistance (M ohm) | Withstand Voltage (Vdc) | DC Resistance (ohm) |
|---------------|--|--------------------|---------------------|-------------------------------|-------------------------|---------------------|
| DLW5AHN402SQ2 | 4000 (Typ.)  | 200                | 50                  | 10 min.                       | 125                     | 3.0 max.            |
| DLW5BSN191SQ2 | 190 (Typ.)   | 5000               | 50                  | 10 min.                       | 125                     | 0.02 max.           |
| DLW5BSN351SQ2 | 350 (Typ.)   | 2000               | 50                  | 10 min.                       | 125                     | 0.04 max.           |
| DLW5BSN102SQ2 | 1000 (Typ.)  | 1500               | 50                  | 10 min.                       | 125                     | 0.06 max.           |
| DLW5BSN152SQ2 | 1500 (Typ.)  | 1000               | 50                  | 10 min.                       | 125                     | 0.1 max.            |
| DLW5BSN302SQ2 | 3000 (Typ.)  | 500                | 50                  | 10 min.                       | 125                     | 0.3 max.            |

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

### ■ Equivalent Circuit



### ■ Impedance-Frequency (Typical)



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



## Ferrite Beads Inductors Part Numbering

### Ferrite Beads Inductors

(Global Part Number) **BL 02 RN 2 R1 M 2 B**  
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

#### ① Product ID

| Product ID |                         |
|------------|-------------------------|
| <b>BL</b>  | Ferrite Beads Inductors |

#### ② Series

| Code      | Series          |
|-----------|-----------------|
| <b>01</b> | Beads ø3.6      |
| <b>02</b> | Beads ø3.4      |
| <b>03</b> | Beads ø2.3 max. |

#### ③ Beads Core Material

| Code      | Beads Core Material |
|-----------|---------------------|
| <b>RN</b> | Standard Type       |

#### ④ Numbers of Beads Core

| Code     | Numbers of Beads Core |
|----------|-----------------------|
| <b>1</b> | 1                     |
| <b>2</b> | 2                     |

#### ⑤ Lead Type

| Code      | Lead Type                                  |
|-----------|--|
| <b>A1</b> | Axial Straight Type                        |
| <b>A2</b> | Axial Crimp Type                           |
| <b>R1</b> | Radial Straight Type                       |
| <b>R2</b> | Radial Straight and wave formed Leads Type |
| <b>R3</b> | Radial Crimp Type                          |

#### ⑧ Packaging

| Code     | Packaging           | Series                |
|----------|---------------------|-----------------------|
| <b>A</b> | Ammo Pack           | <b>BL01/BL02/BL03</b> |
| <b>B</b> | Bulk                | All series            |
| <b>J</b> | Paper Reel (ø320mm) | <b>BL01</b>           |

#### ⑥ Lead Length, Space

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

#### ⑦ Lead Diameter

| Code     | Lead Diameter |
|----------|---------------|
| <b>1</b> | ø0.60mm       |
| <b>2</b> | ø0.65mm       |

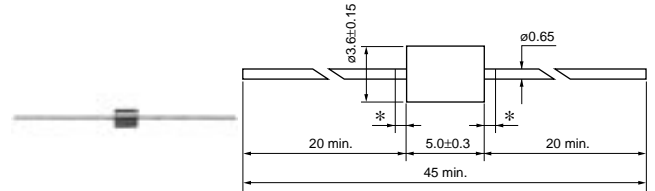
# On-Board Type (DC) EMI Suppression Filters (EMIFIL®)



## Ferrite Beads Inductors BL01/BL02/BL03 Series

### ■ Features

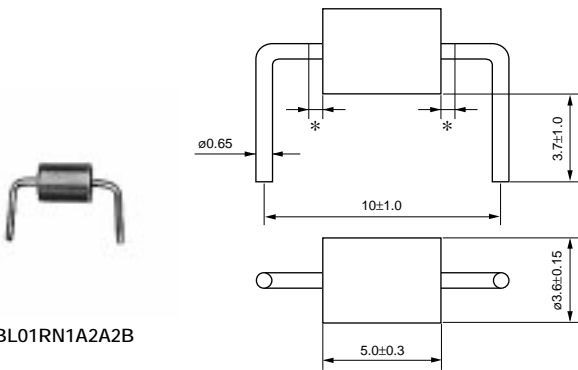
BL01/02/03 series are ferrite beads with lead wires to produce a high frequency loss for suppression of noise. Simple construction and easy-to-use. Effective for low impedance circuits such as power supplies and grounds. Effective also for preventing overshoot and undershoot the digital signal in clocks 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.

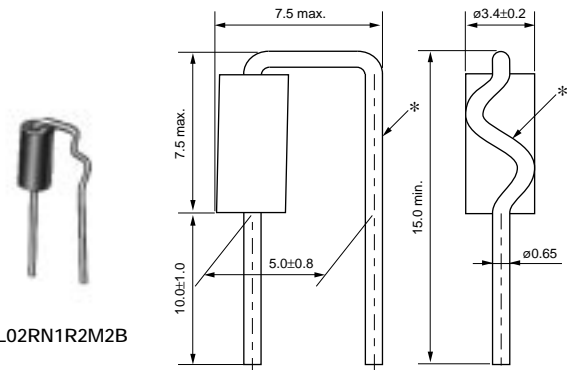
BL01RN1A1D2B

(in mm)



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

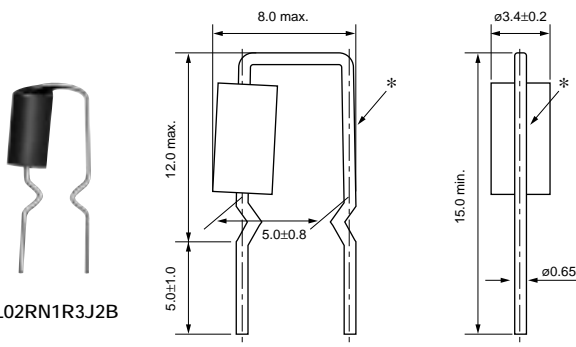
BL01RN1A2A2B



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

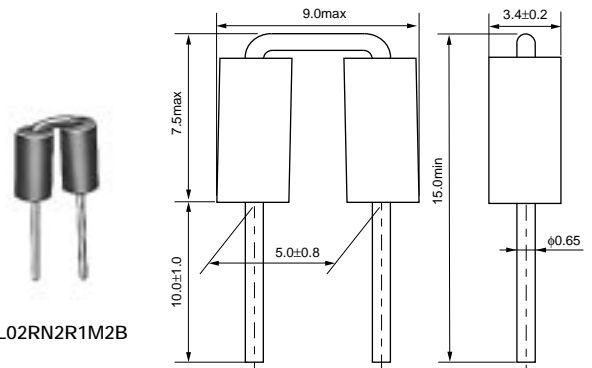
BL02RN1R2M2B

(in mm)



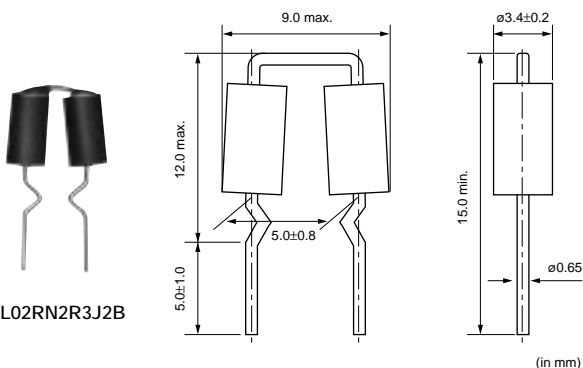
\*There is excess bond stick on the wire. (in mm)

BL02RN1R3J2B



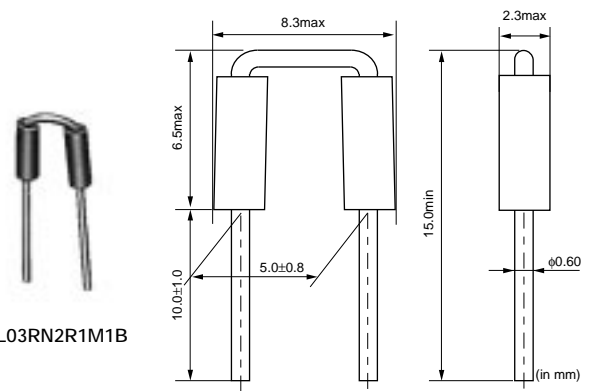
(in mm)

BL02RN2R1M2B



(in mm)

BL02RN2R3J2B



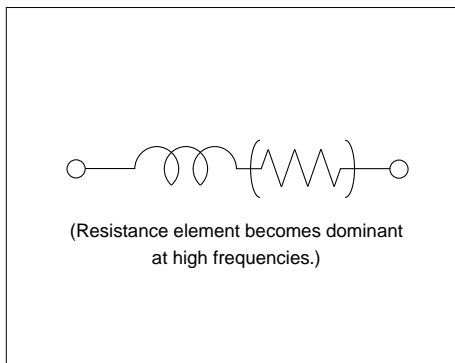
(in mm)

BL03RN2R1M1B

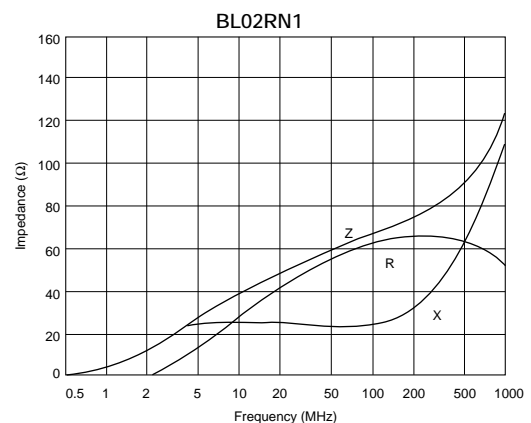
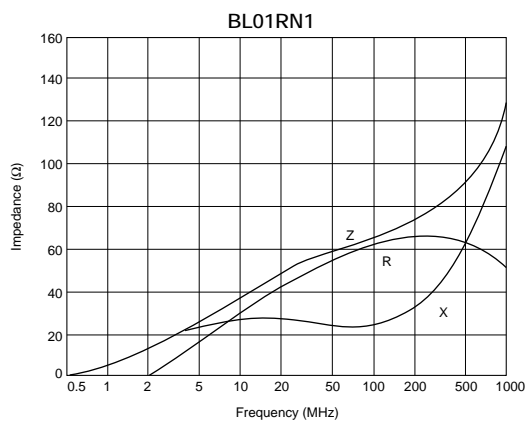
5

| Part Number  | Rated Current (A) | Operating Temperature Range (°C) |
|--------------|-------------------|----------------------------------|
| BL01RN1A1D2B | 7                 | -40 to 85                        |
| BL01RN1A1E1A | 6                 | -40 to 85                        |
| BL01RN1A1F1J | 6                 | -40 to 85                        |
| BL01RN1A2A2B | 7                 | -40 to 85                        |
| BL02RN1R2M2B | 7                 | -40 to 85                        |
| BL02RN1R2N1A | 6                 | -40 to 85                        |
| BL02RN1R2P1A | 6                 | -40 to 85                        |
| BL02RN1R2Q1A | 6                 | -40 to 85                        |
| BL02RN1R3J2B | 7                 | -40 to 85                        |
| BL02RN1R3N1A | 6                 | -40 to 85                        |
| BL02RN2R1M2B | 7                 | -40 to 85                        |
| BL02RN2R1N1A | 6                 | -40 to 85                        |
| BL02RN2R1P1A | 6                 | -40 to 85                        |
| BL02RN2R1Q1A | 6                 | -40 to 85                        |
| BL02RN2R3J2B | 7                 | -40 to 85                        |
| BL02RN2R3N1A | 6                 | -40 to 85                        |
| BL03RN2R1M1B | 6                 | -40 to 85                        |
| BL03RN2R1N1A | 6                 | -40 to 85                        |
| BL03RN2R1P1A | 6                 | -40 to 85                        |
| BL03RN2R1Q1A | 6                 | -40 to 85                        |

■ Equivalent Circuit



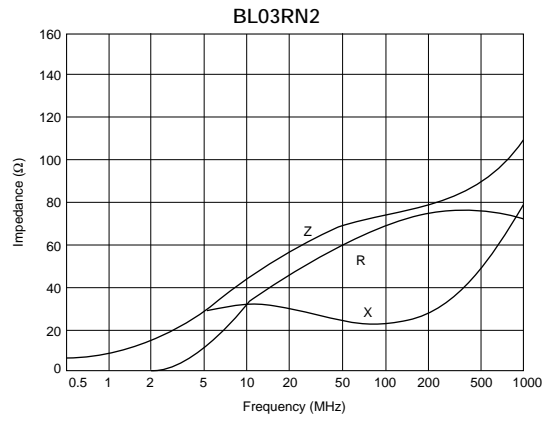
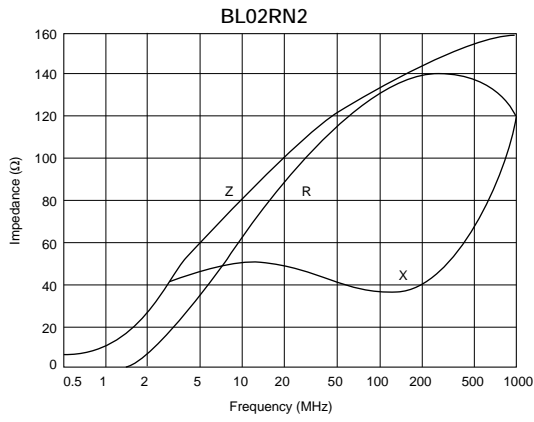
■ Impedance-Frequency Characteristics



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↳ Continued from the preceding page.

■ Impedance-Frequency Characteristics



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



## Disc Type EMIFIL® Part Numbering

### Disc Type EMIFIL®

(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 |                           |
|------------|---------------------------|
| <b>DS</b>  | Three-terminals Capacitor |

#### ② Structure

| Code     | Structure                   |
|----------|-----------------------------|
| <b>N</b> | No Ferrite Beads Type       |
| <b>S</b> | Built-in Ferrite Beads Type |
| <b>T</b> | with Ferrite Beads Type     |

#### ③ Style

| Code     | Style               |
|----------|---------------------|
| <b>6</b> | Diameter 8.0mm Type |
| <b>9</b> | Diameter 9.5mm Type |

#### ④ Category

| Code     | Category        |
|----------|-----------------|
| <b>N</b> | for General Use |
| <b>H</b> | for Heavy-duty  |

#### ⑤ Temperature Characteristics

| Code      | Capacitance Change                            |
|-----------|---|
| <b>B3</b> | ±10% (Temperature Range : -25°C to +85°C)     |
| <b>C5</b> | ±22% (Temperature Range : -25°C to +85°C)     |
| <b>D3</b> | +20/-30% (Temperature Range : -25°C to +85°C) |
| <b>E3</b> | +20/-55% (Temperature Range : -25°C to +85°C) |
| <b>E5</b> | +22/-56% (Temperature Range : -25°C to +85°C) |
| <b>F3</b> | +30/-80% (Temperature Range : -25°C to +85°C) |
| <b>Z8</b> | +30/-85% (Temperature Range : -10°C to +60°C) |

#### ⑥ Rated Voltage

| Code      | Rated Voltage |
|-----------|---------------|
| <b>1C</b> | 16V           |
| <b>1H</b> | 50V           |
| <b>2A</b> | 100V          |
| <b>2E</b> | 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 zeros which follow the two figures.

#### ⑧ Lead Type/⑨ Packaging

| Code        | Lead Type | Lead Length* (in mm) | Packaging           | Series                           |
|-------------|-----------|----------------------|---------------------|----------------------------------|
| <b>Q55B</b> | Straight  | 25.0 min.            | Bulk                | All series                       |
| <b>Q50B</b> |           | 4.0±0.5              |                     | <b>DST9N/H</b>                   |
| <b>Q52B</b> |           | 6.0±1.0              |                     | <b>DST9N</b>                     |
| <b>Q54B</b> |           | 4.0±0.5              |                     | <b>DSN6/9, DSS6/9</b>            |
| <b>Q56B</b> |           | 6.0±1.0              |                     | <b>DSS6N</b>                     |
| <b>T41B</b> | Incrimp   | 4.0±0.5              | Paper Reel (ø320mm) | <b>DSS9N/H, DST9N</b>            |
| <b>T51B</b> |           | 25.0 min.            |                     | <b>DSS9N/H</b>                   |
| <b>Q91J</b> | Straight  | 20.0±1.0             | Ammo Pack           | <b>DS□6, DSN9N/H</b>             |
| <b>Q92J</b> |           | 16.5±1.0             |                     | All series except <b>DSS9N/H</b> |
| <b>Q93J</b> |           | 18.5±1.0             |                     | <b>DSS6N</b>                     |
| <b>Q91A</b> |           | 20.0±1.0             |                     |                                  |
| <b>Q92A</b> |           | 16.5±1.0             |                     |                                  |
| <b>Q93A</b> | 18.5±1.0  |                      |                     |                                  |
| <b>U21A</b> | Incrimp   | 16.5±1.0             |                     |                                  |
| <b>U31A</b> |           | 18.5±1.0             |                     |                                  |

\*Lead Distance between Reference and Bottom Planes except Bulk.

5

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

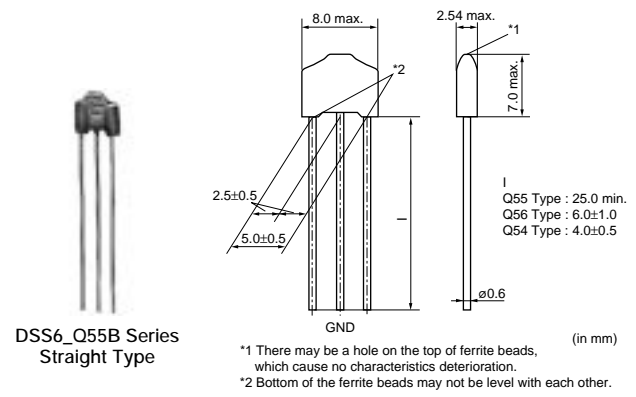
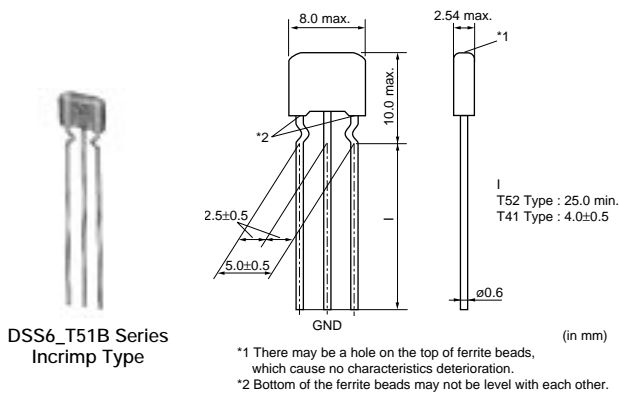
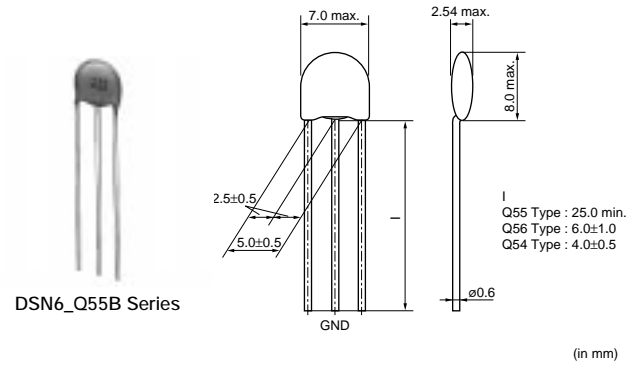


## Disc Type EMIFIL® DSN6/DSS6 Series

### ■ 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.

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### DSN6 Series

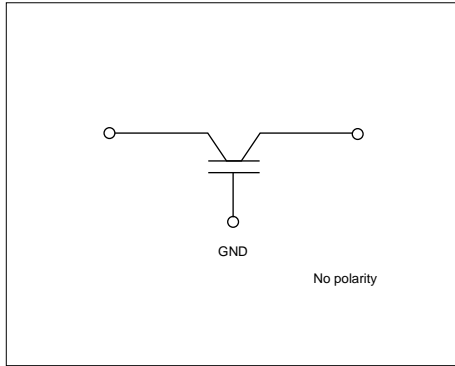
| Part Number  | Capacitance (pF) | Rated Voltage (Vdc) | Rated Current (A) | Operating Temperature Range (°C) |
|--------------|------------------|---------------------|-------------------|----------------------------------|
| DSN6NC51H220 | 22 +20%, -20%    | 50                  | 6                 | -25 to 85                        |
| DSN6NC51H330 | 33 +20%, -20%    | 50                  | 6                 | -25 to 85                        |
| DSN6NC51H470 | 47 +20%, -20%    | 50                  | 6                 | -25 to 85                        |
| DSN6NC51H101 | 100 +20%, -20%   | 50                  | 6                 | -25 to 85                        |
| DSN6NC51H271 | 270 +20%, -20%   | 50                  | 6                 | -25 to 85                        |
| DSN6NC51H102 | 1000 +20%, -20%  | 50                  | 6                 | -25 to 85                        |
| DSN6NC51H222 | 2200 +20%, -20%  | 50                  | 6                 | -25 to 85                        |
| DSN6NZ81H103 | 10000 +80%, -20% | 50                  | 6                 | -25 to 85                        |

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

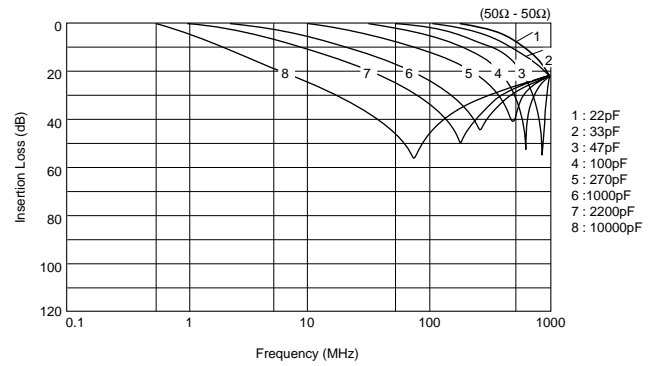
5



■ Equivalent Circuit



■ Insertion Loss Characteristics (Typical)

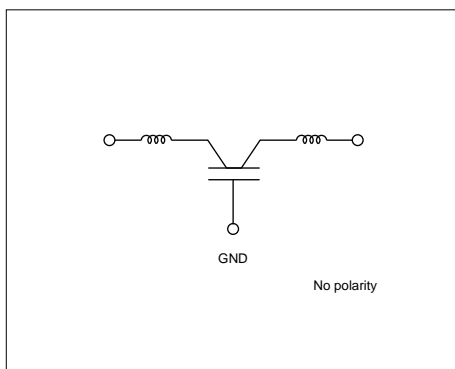


**Built-in Ferrite Beads DSS6 Series Incrimp Type**

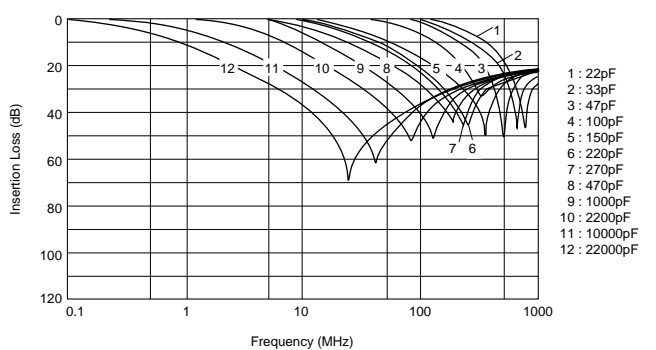
| Part Number  | Capacitance (pF) | Rated Voltage (Vdc) | Rated Current (A) | Operating Temperature Range (°C) |
|--------------|------------------|---------------------|-------------------|----------------------------------|
| DSS6NC52A220 | 22 +20%, -20%    | 100                 | 6                 | -25 to 85                        |
| DSS6NC52A330 | 33 +20%, -20%    | 100                 | 6                 | -25 to 85                        |
| DSS6NC52A470 | 47 +20%, -20%    | 100                 | 6                 | -25 to 85                        |
| DSS6NC52A101 | 100 +20%, -20%   | 100                 | 6                 | -25 to 85                        |
| DSS6NC52A151 | 150 +20%, -20%   | 100                 | 6                 | -25 to 85                        |
| DSS6NC52A221 | 220 +20%, -20%   | 100                 | 6                 | -25 to 85                        |
| DSS6NC52A271 | 270 +20%, -20%   | 100                 | 6                 | -25 to 85                        |
| DSS6NC52A471 | 470 +20%, -20%   | 100                 | 6                 | -25 to 85                        |
| DSS6NC52A102 | 1000 +20%, -20%  | 100                 | 6                 | -25 to 85                        |
| DSS6NE52A222 | 2200 +80%, -20%  | 100                 | 6                 | -25 to 85                        |
| DSS6NZ82A103 | 10000 +30%, -30% | 100                 | 6                 | -25 to 85                        |
| DSS6NF31C223 | 22000 +80%, -20% | 16                  | 6                 | -25 to 85                        |

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

■ Equivalent Circuit



■ Insertion Loss Characteristics (Typical)



5

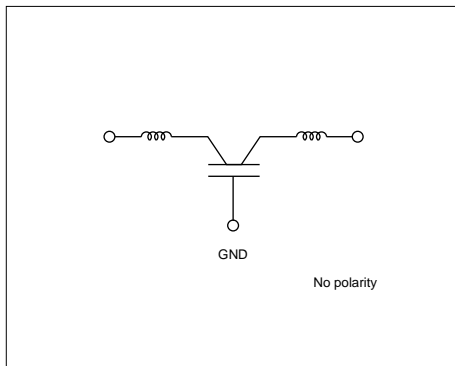


## Built-in Ferrite Beads DSS6 Series Straight Type

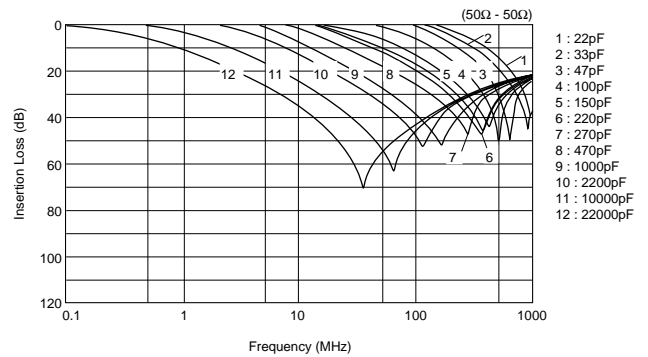
| Part Number  | Capacitance (pF) | Rated Voltage (Vdc) | Rated Current (A) | Operating Temperature Range (°C) |
|--------------|------------------|---------------------|-------------------|----------------------------------|
| DSS6NC52A220 | 22 +20%, -20%    | 100                 | 6                 | -25 to 85                        |
| DSS6NC52A330 | 33 +20%, -20%    | 100                 | 6                 | -25 to 85                        |
| DSS6NC52A470 | 47 +20%, -20%    | 100                 | 6                 | -25 to 85                        |
| DSS6NC52A101 | 100 +20%, -20%   | 100                 | 6                 | -25 to 85                        |
| DSS6NC52A151 | 150 +20%, -20%   | 100                 | 6                 | -25 to 85                        |
| DSS6NC52A221 | 220 +20%, -20%   | 100                 | 6                 | -25 to 85                        |
| DSS6NC52A271 | 270 +20%, -20%   | 100                 | 6                 | -25 to 85                        |
| DSS6NC52A471 | 470 +20%, -20%   | 100                 | 6                 | -25 to 85                        |
| DSS6NC52A102 | 1000 +20%, -20%  | 100                 | 6                 | -25 to 85                        |
| DSS6NE52A222 | 2200 +80%, -20%  | 100                 | 6                 | -25 to 85                        |
| DSS6NZ82A103 | 10000 +30%, -30% | 100                 | 6                 | -25 to 85                        |
| DSS6NF31C223 | 22000 +80%, -20% | 16                  | 6                 | -25 to 85                        |

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

### Equivalent Circuit



### Insertion Loss Characteristics (Typical)



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

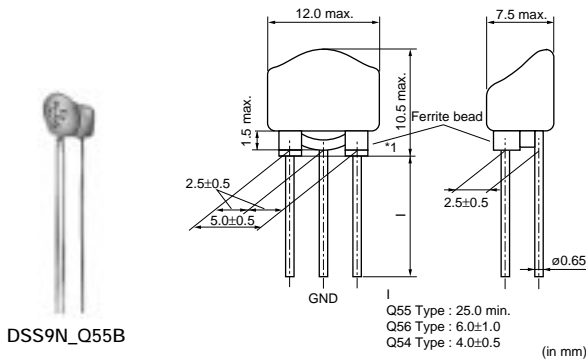
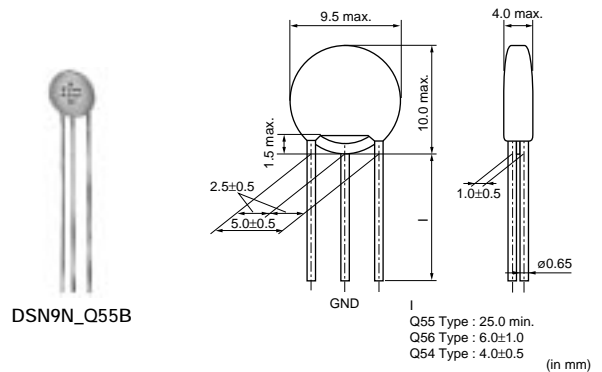


## Disc Type EMIFIL® Broad Type DSN9/DSS9/DST9 Series

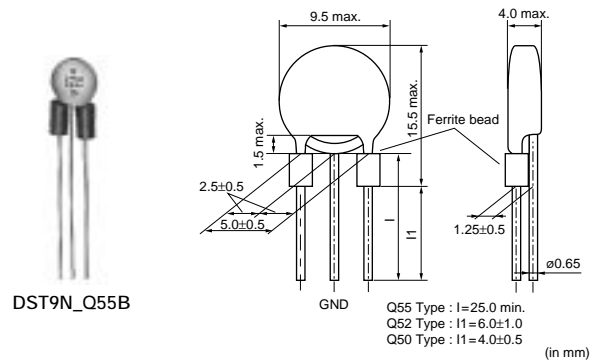
### ■ Features

DS\_9 is a basic type EMI suppression filter which can obtain high insertion loss in a wide frequency range. Its 3-terminal structure enables nice high frequency performance. DSS9NP32A222/DSS9NT31H223 are low distortion type for audio circuits.

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\*1 Bottom of the ferrite beads may not be level with each other.



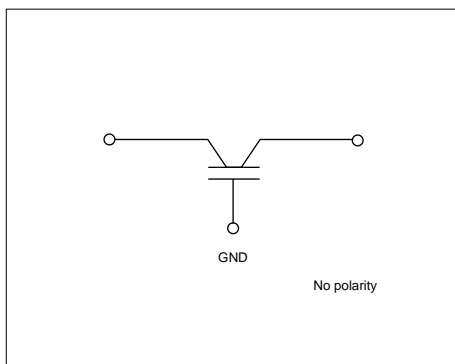
### DSN9 Series

| Part Number  | Capacitance (pF) | Rated Voltage (Vdc) | Rated Current (A) | Operating Temperature Range (°C) |
|--------------|------------------|---------------------|-------------------|----------------------------------|
| DSN9NC52A271 | 270 +20%,-20%    | 100                 | 7                 | -25 to 85                        |
| DSN9NC52A222 | 2200 +20%,-20%   | 100                 | 7                 | -25 to 85                        |
| DSN9NC51H223 | 22000 +50%,-20%  | 50                  | 7                 | -25 to 85                        |
| DSN9NC51C104 | 100000 +20%,-20% | 16                  | 7                 | -25 to 85                        |

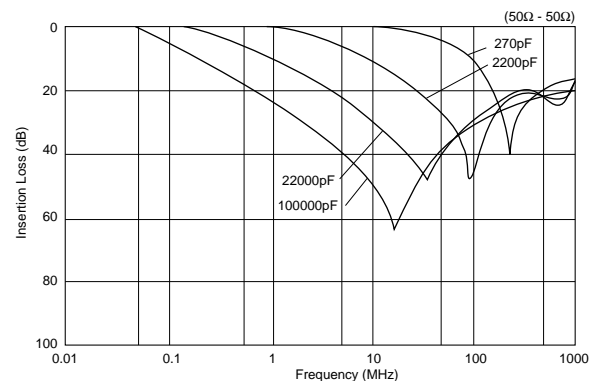
Rated current is 6A for taping type.

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

### ■ Equivalent Circuit



### ■ Insertion Loss Characteristics (Typical)



## Built-in Ferrite Beads DSS9 Series

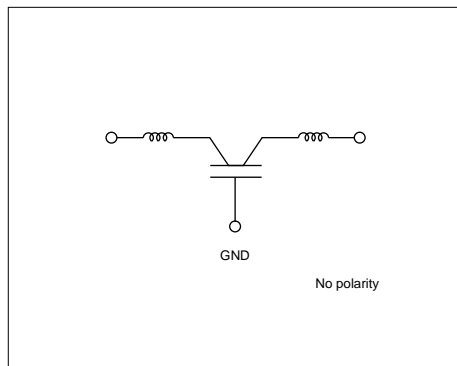
| Part Number  | Capacitance (pF) | Rated Voltage (Vdc) | Rated Current (A) | Operating Temperature Range (°C) |
|--------------|------------------|---------------------|-------------------|----------------------------------|
| DSS9NC52A220 | 22 +20%, -20%    | 100                 | 7                 | -25 to 85                        |
| DSS9NC52A470 | 47 +20%, -20%    | 100                 | 7                 | -25 to 85                        |
| DSS9NC52A101 | 100 +20%, -20%   | 100                 | 7                 | -25 to 85                        |
| DSS9NC52A271 | 270 +20%, -20%   | 100                 | 7                 | -25 to 85                        |
| DSS9NC52A222 | 2200 +20%, -20%  | 100                 | 7                 | -25 to 85                        |
| DSS9NP32A222 | 2200 +20%, -20%  | 100                 | 7                 | -25 to 85                        |
| DSS9NC51H223 | 22000 +50%, -20% | 50                  | 7                 | -25 to 85                        |
| DSS9NT31H223 | 22000 +50%, -20% | 50                  | 7                 | -25 to 85                        |

Rated current is 6A for taping type.

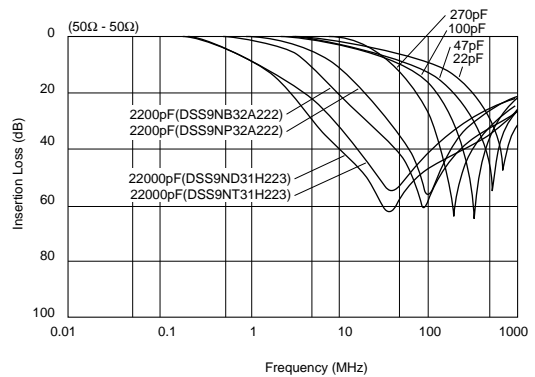
DSS9NP32A222/DSS9NT31H223 are low distortion types for audio IF circuits.

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

### Equivalent Circuit



### Insertion Loss Characteristics (Typical)



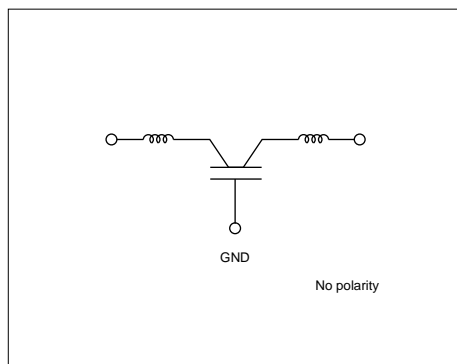
## With Ferrite Beads DST9 Series

| Part Number  | Capacitance (pF) | Rated Voltage (Vdc) | Rated Current (A) | Operating Temperature Range (°C) |
|--------------|------------------|---------------------|-------------------|----------------------------------|
| DST9NC52A271 | 270 +20%, -20%   | 100                 | 7                 | -25 to 85                        |
| DST9NC52A222 | 2200 +20%, -20%  | 100                 | 7                 | -25 to 85                        |
| DST9NC51H223 | 22000 +50%, -20% | 50                  | 7                 | -25 to 85                        |

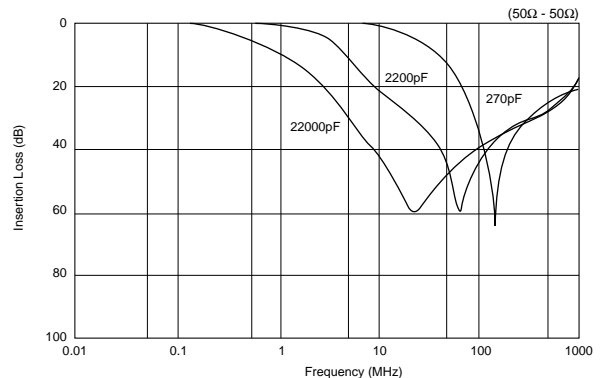
Rated current is 6A for taping type.

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

### Equivalent Circuit



### Insertion Loss Characteristics (Typical)



5

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

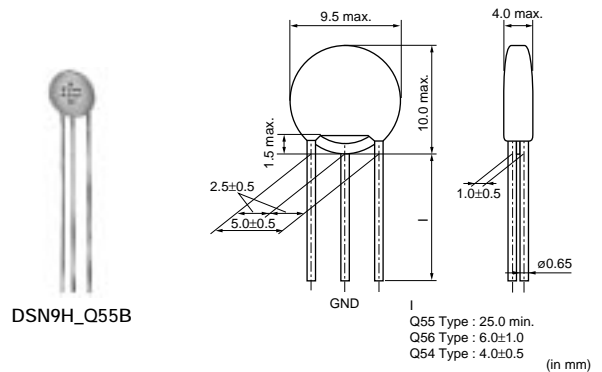


## Disc Type EMIFIL® Heavy-duty Type DSN9H/DSS9H/DST9H Series

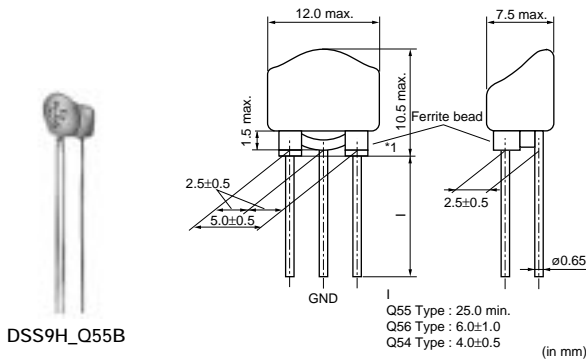
### ■ Features

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 degree C to 105 degree C are suitable for high reliability

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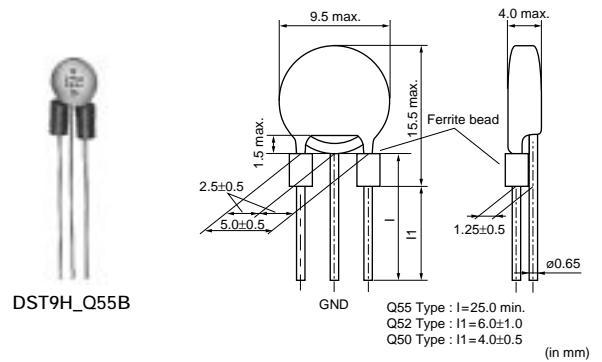


DSN9H\_Q55B



DSS9H\_Q55B

\*1 Bottom of the ferrite beads may not be level with each other.



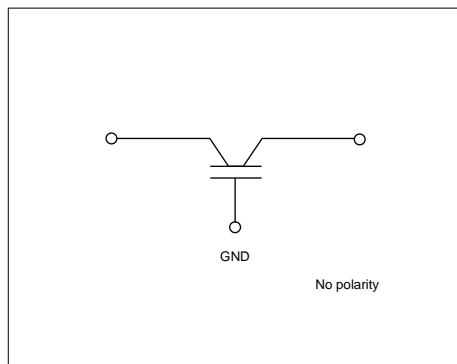
DST9H\_Q55B

### DSN9H Series

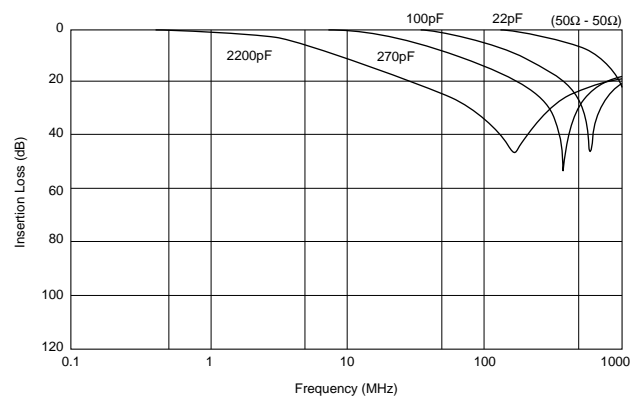
| Part Number  | Capacitance (pF) | Rated Voltage (Vdc) | Rated Current (A) | Operating Temperature Range (°C) |
|--------------|------------------|---------------------|-------------------|----------------------------------|
| DSN9HB32E220 | 22 +20%, -20%    | 250                 | 6               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

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

### ■ Equivalent Circuit



### ■ Insertion Loss Characteristics (Typical)

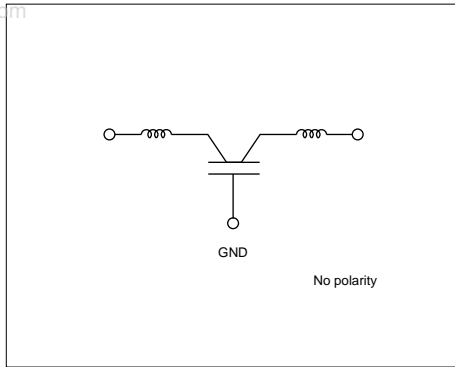


## Built-in Ferrite Beads DSS9H Series

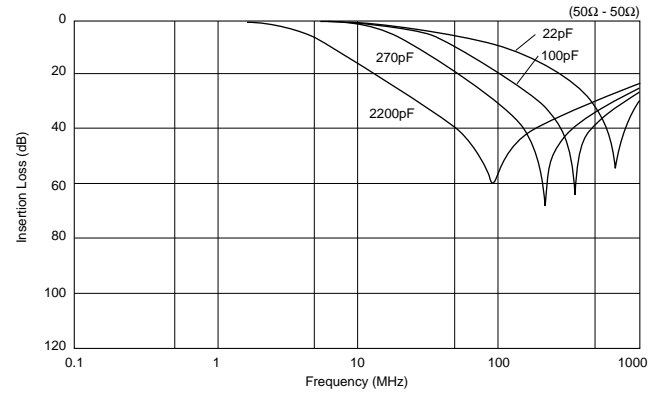
| Part Number  | Capacitance (pF) | Rated Voltage (Vdc) | Rated Current (A) | Operating Temperature Range (°C) |
|--------------|------------------|---------------------|-------------------|----------------------------------|
| DSS9HB32E220 | 22 +20%, -20%    | 250                 | 6                 | -40 to 105                       |
| DSS9HB32E101 | 100 +20%, -20%   | 250                 | 6                 | -40 to 105                       |
| DSS9HB32E271 | 270 +20%, -20%   | 250                 | 6                 | -40 to 105                       |
| DSS9HB32E222 | 2200 +20%, -20%  | 250                 | 6                 | -40 to 105                       |

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

### Equivalent Circuit



### Insertion Loss Characteristics (Typical)

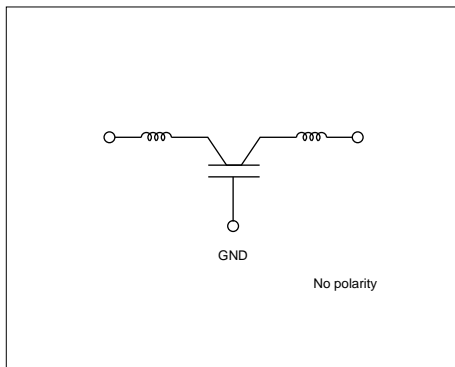


## With Ferrite Beads DST9H Series

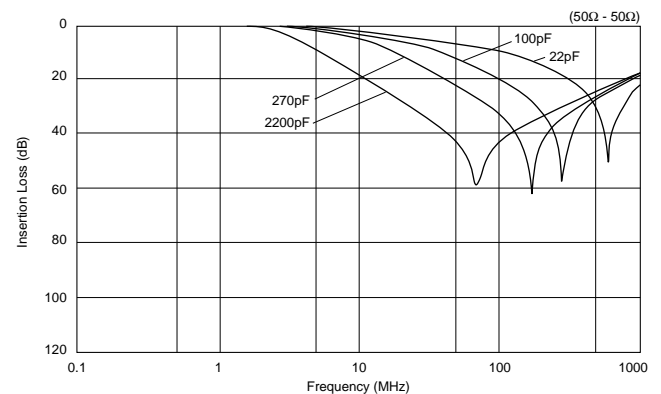
| Part Number  | Capacitance (pF) | Rated Voltage (Vdc) | Rated Current (A) | Operating Temperature Range (°C) |
|--------------|------------------|---------------------|-------------------|----------------------------------|
| DST9HB32E220 | 22 +20%, -20%    | 250                 | 6               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

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

### Equivalent Circuit



### Insertion Loss Characteristics (Typical)



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



## Lead Type EMIGUARD® (EMIFIL® with Varistor Function) Part Numbering

### 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 |                     |
|------------|---------------------|
| <b>VF</b>  | EMIGUARD® Lead Type |

#### ② Structure

| Code     | Structure                   |
|----------|-----------------------------|
| <b>S</b> | Built-in Ferrite Beads Type |
| <b>R</b> | with Resistance             |

#### ③ Style

| Code     | Style                         |
|----------|-------------------------------|
| <b>3</b> | Size is expressed by a figure |
| <b>6</b> |                               |
| <b>9</b> |                               |

#### ④ Features

| Code     | Features               |
|----------|------------------------|
| <b>V</b> | with Varistor Function |

#### ⑤ Temperature Characteristics

| Code      | Capacitance Change                          |
|-----------|---|
| <b>D8</b> | +20/-30% (Temperature Range : -40°C~+105°C) |
| <b>D3</b> | +20/-30% (Temperature Range : -25°C~+85°C)  |

#### ⑥ Rated Voltage

| Code      | Rated Voltage |
|-----------|---------------|
| <b>1E</b> | 25V           |
| <b>1B</b> | 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 zeros which follow the two figures.

#### ⑧ Lead Type/⑨ Packaging

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

\*Lead Distance between Reference and Bottom Planes except Bulk.

# On-Board Type (DC) EMI Suppression Filters (EMIFIL<sup>®</sup>)



## Lead Type EMIGUARD<sup>®</sup> (EMIFIL<sup>®</sup> with Varistor Function) VFR3V/VFS6V/VFS9V Series

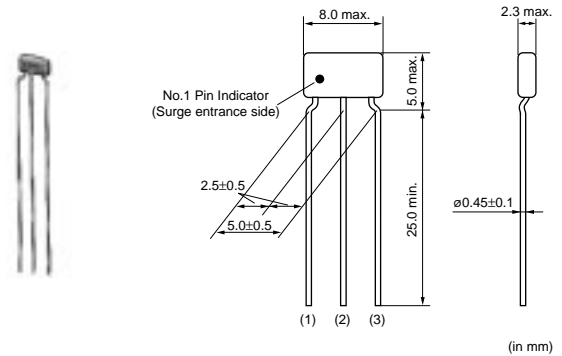
### for Semiconductor Protection VFR3V Series

#### ■ Features

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

#### ■ Applications

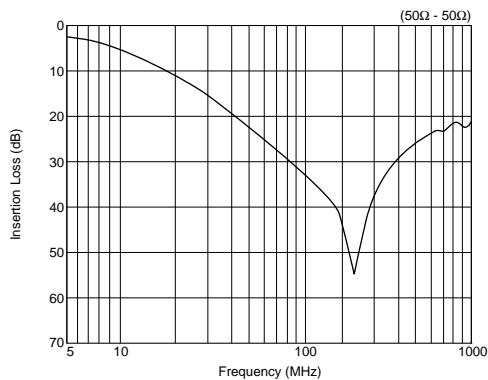
Elimination of noise and protection of semiconductors in office equipment, including computers and peripheral equipment, copy machines, and communication terminals.



| Part Number  | Rated Voltage (Vdc) | Varistor Voltage (Vdc) | Capacitance (pF) | Rated Current (mA) | Peak Pulse Current (A) | Operating Temperature Range (°C) |
|--------------|---------------------|------------------------|------------------|--------------------|------------------------|----------------------------------|
| VFR3VD31E131 | 25                  | 50 +20%,-20%           | 130 +20%,-20%    | 20                 | 15                     | -25 to 85                        |

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

#### ■ Insertion Loss Characteristics



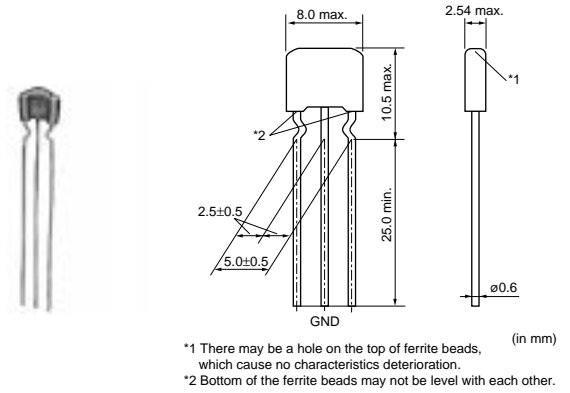
## for Signal-Line VFS6V Series

### ■ Features

The 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.

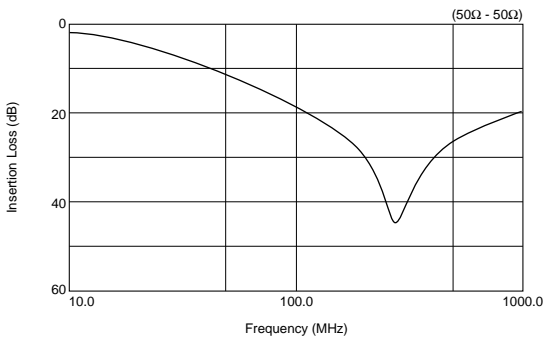


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| Part Number  | Rated Voltage (Vdc) | Varistor Voltage (Vdc) | Capacitance (pF) | Rated Current (A) | Peak Pulse Current (A) | Operating Temperature Range (°C) |
|--------------|---------------------|------------------------|------------------|-------------------|------------------------|---------------------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

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

### ■ Insertion Loss Characteristics





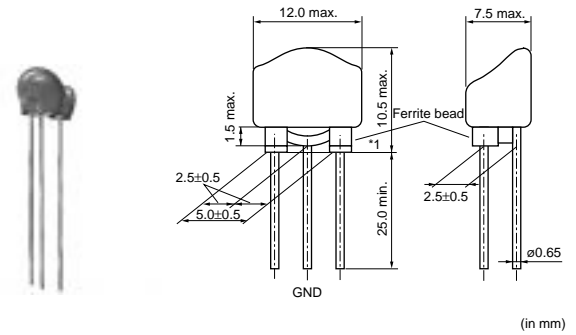
## for Large-Current VFS9V Series

### ■ Features

The VFS9V series is designed for surge protection of the power supply line. It protects electric circuits from surges 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.

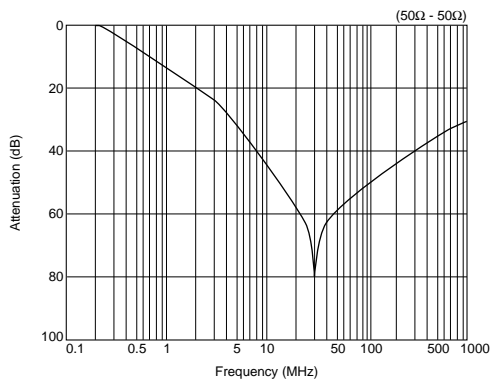


(in mm)  
\*1 Bottom of the ferrite beads may not be level with each other.

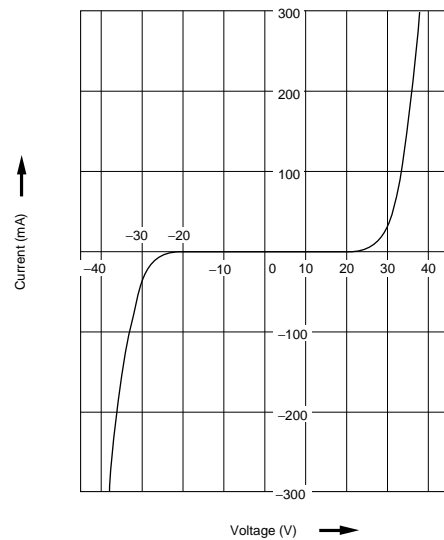
| Part Number  | Rated Voltage (Vdc) | Varistor Voltage (Vdc) | Capacitance (pF) | Rated Current (A) | Operating Temperature Range (°C) |
|--------------|---------------------|------------------------|------------------|-------------------|----------------------------------|
| VFS9VD31B223 | 12     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

Rated current: 6A (Taping Type)/7A (Bulk Type)  
Please refer to Part Numbering for Type and Length of Lead.

### ■ Insertion Loss Characteristics



### ■ Voltage-Current Characteristics

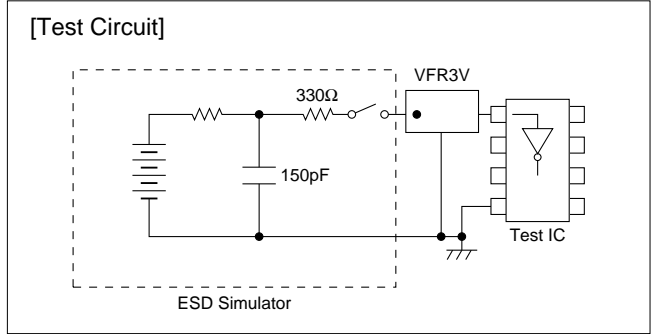


## Noise Suppression Effect of VFR/VFS Series

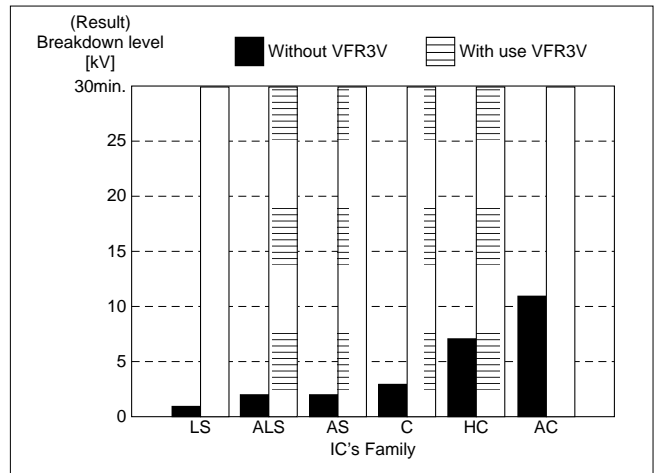
### Example of IC Protection

#### Testing Method

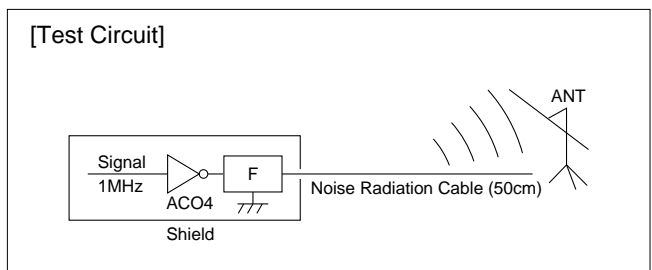
1. Put ESD surge to IC (7404 family) input terminal with ESD simulator based on IEC 801-2.
2. Check IC's operation.
3. If IC's operation is normal, increase ESD voltage in 1kV step.
4. Continue above steps 1 to 3 till IC's operation becomes abnormal.



#### Result



### Example of EMI Suppression Effect



| Type of Filter                         | EMI Suppression Effect | Description |
|--|------------------------|-------------|
| Before Countermeasures<br>(No Filters) |                        |             |
| Use VFR3VD31E131T51                    |                        |             |

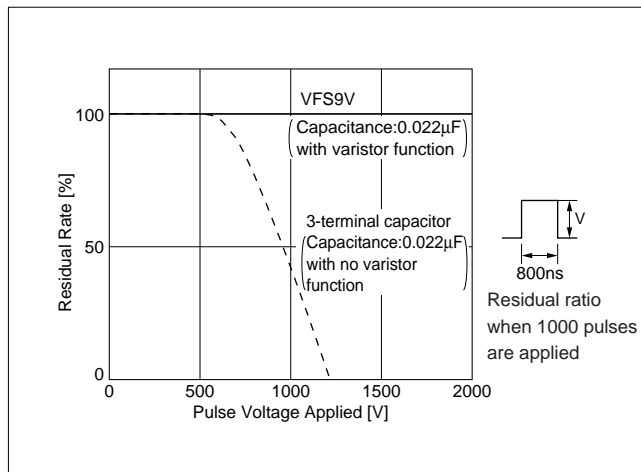
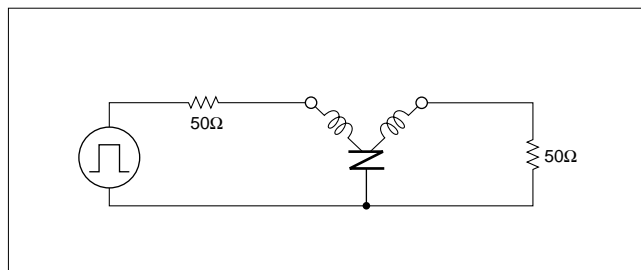
## Noise Suppression Effect of VFR/VFS Series

### ■Features (VFS9V)

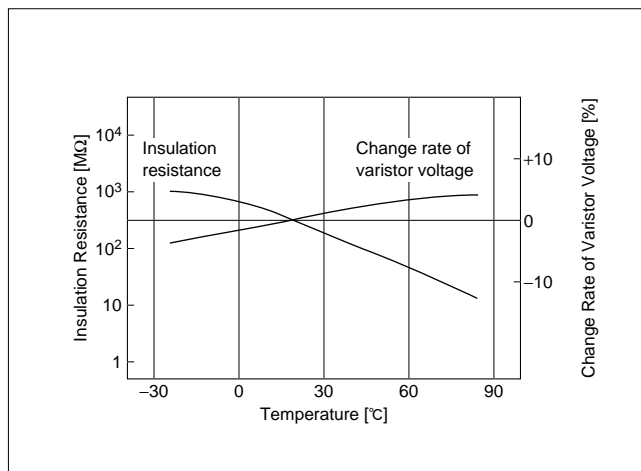
| Items                                       | Test methods   | Rated values   |       |                |                          |                   |                       |                   |   |                   |              |          |
|---|--|--|-------|----------------|--------------------------|-------------------|-----------------------|-------------------|---|-------------------|--------------|----------|
| Overload                                    | 1.4 times the varistor voltage ( $V_1$ ) is applied for 5 minutes at room temperature.   | <table border="1"> <thead> <tr> <th>Items</th> <th>Specifications</th> </tr> </thead> <tbody> <tr> <td>Rated Capacitance Change</td> <td>Within <math>\pm 15\%</math></td> </tr> <tr> <td>Insulation Resistance</td> <td>500k<math>\Omega</math> min</td> </tr> <tr> <td>Rated of Change in Varistor Voltage <math>V_1^*</math></td> <td>Within <math>\pm 15\%</math></td> </tr> <tr> <td>Voltage Rate</td> <td>1.30 max</td> </tr> </tbody> </table> <p>*<math>V_1</math> : Voltage when 1mA is applied</p> | Items | Specifications | Rated Capacitance Change | Within $\pm 15\%$ | Insulation Resistance | 500k $\Omega$ 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 $\Omega$ min  |  |       |                |                          |                   |                       |                   |   |                   |              |          |
| Rated of Change in Varistor Voltage $V_1^*$ | Within $\pm 15\%$  |  |       |                |                          |                   |                       |                   |   |                   |              |          |
| Voltage Rate                                | 1.30 max   |  |       |                |                          |                   |                       |                   |   |                   |              |          |
| Surge Test (1)                              | At room temperature. Surges 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 (VFS9V)

The VFS9V EMIGUARD<sup>®</sup> 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<sup>®</sup> 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®

| Type of Filter    | EMI Suppression Effect | Description  |
|-------------------|------------------------|--|
| without EMIGUARD® |                        | Waveform when EMIGUARD® is not used.<br>(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                               |                        |  |
| 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 the 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.         |

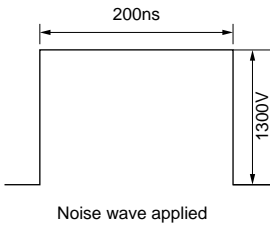
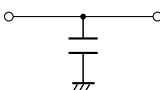
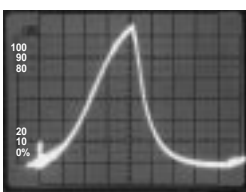
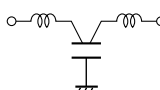
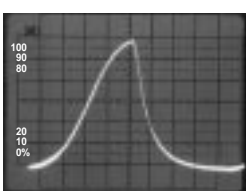
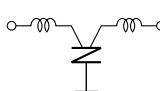
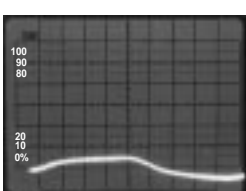
Continued on the following page.

5

## 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>Noise wave applied</p> |   |
| <p>2-terminal capacitor</p>                       |                            | <p>In 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>                    |
| <p>3-terminal capacitor (with ferrite bead)</p>  |                           | <p>Conventional EMI filters do not work for wide-pulse noise because capacitors are saturated. In this example, the residual 1200V surge can cause the system to breakdown.</p> |
| <p>VFS9V</p>                                    |                          | <p>Bypassing the high voltage to the ground, voltage can be suppressed.</p>   |

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



## Block Type EMIFIL® BNX Series

### BNX Series

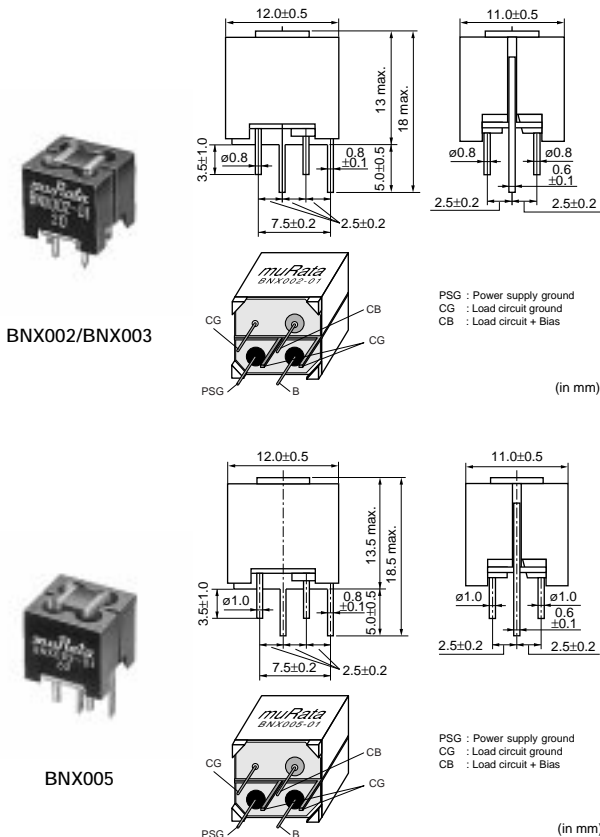
The block type "EMIFIL" BNX series incorporates through-type capacitor, monolithic chip capacitors and bead. The BNX is high performance for use in DC power circuits.

#### ■ Features

1. The filter enables obtaining high insertion loss in wide frequency ranges from 0.5MHz to 1GHz.
2. The only one filter block enables noise suppression of both the positive and negative lines.
3. There are no connection routes in the current circuits, thus ensuring highly reliable performance.

#### ■ Applications

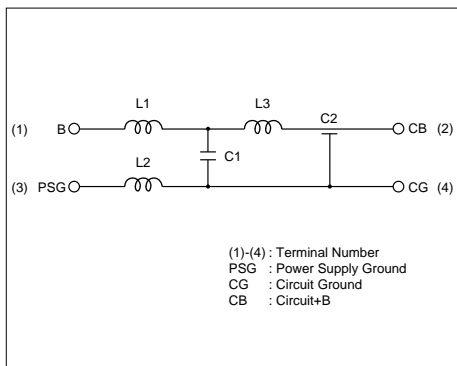
Noise elimination from DC power sources in a variety of switching power sources, engine control units, digital equipment and computer terminals.



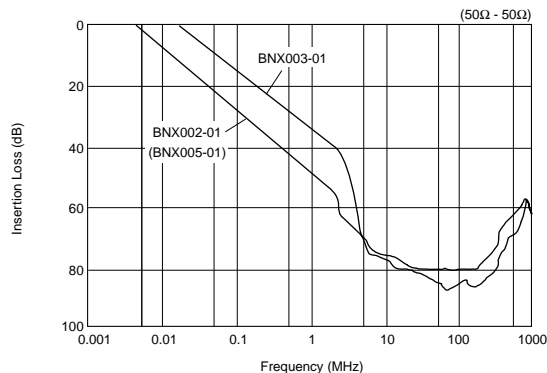
| Part Number      | Rated Voltage (Vdc) | Withstand Voltage (Vdc) | Rated Current (A) | Insulation Resistance (min.) (M ohm) | Insertion Loss   |
|------------------|---------------------|-------------------------|-------------------|--------------------------------------|--|
| <b>BNX002-01</b> | 50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



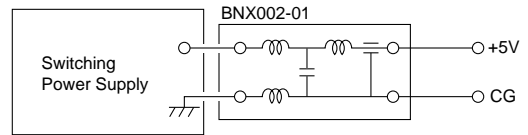
#### ■ Insertion Loss Characteristics (Typical)



## Noise Suppression Effect of BNX Series

### ■ Suppression of DC Side Ripple of the Switching Power Supply

[Testing Circuit]



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

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



## Common Mode Choke Coils Part Numbering

### Common Mode Choke Coils

(Global Part Number) **PL T 09 H N 200 3R0 P 1 B**  
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩

#### ① Product ID

| Product ID |                         |
|------------|-------------------------|
| <b>PL</b>  | Common Mode Choke Coils |

#### ② Type

| Code     | Type    |
|----------|---------|
| <b>T</b> | DC Type |

#### ③ Applications

| Code      | Applications                    |
|-----------|---------------------------------|
| <b>09</b> | for DC Line High-frequency Type |

#### ④ Structure

| Code     | Structure            |
|----------|----------------------|
| <b>H</b> | Core Horizontal Type |

#### ⑤ Features

| Code     | Features    |
|----------|-------------|
| <b>N</b> | 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 zeros which follow the two figures. If there is a decimal point, it is expressed by the 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 a combination of two figures and the capital letter "N", and the unit of inductance is nano-henry (nH). The capital letter "N" indicates the unit of "nH", and also expresses a decimal point. In this case, all figures are significant digits.

#### ⑦ Rated Current

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

#### ⑧ Winding Mode

| Code     | Winding Mode         |
|----------|----------------------|
| <b>P</b> | Aligned Winding Type |

#### ⑨ Lead Dimensions

| Code     | Lead Dimensions |
|----------|-----------------|
| <b>1</b> | 5mm             |

#### ⑩ Packaging

| Code     | Packaging | Series     |
|----------|-----------|------------|
| <b>B</b> | Bulk      | All series |

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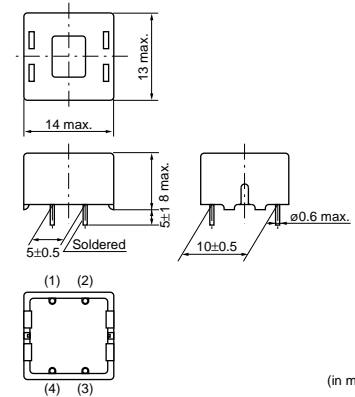


# On-Board Type (DC) EMI Suppression Filters (EMIFIL<sup>®</sup>)



## Common Mode Choke Coils (for DC Line) 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.



(in mm)

### ■ Features

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

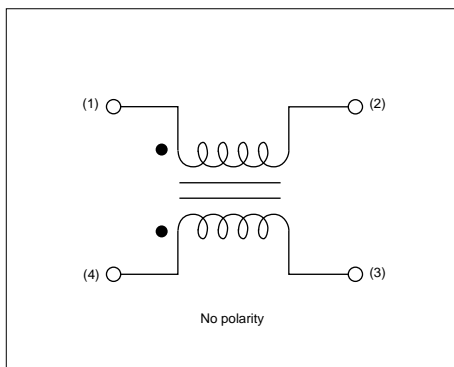
### ■ Applications

1. Noise suppression of SW power supply, DC-DC converter.
2. DC power lines in AC adapter of Portable equipment.

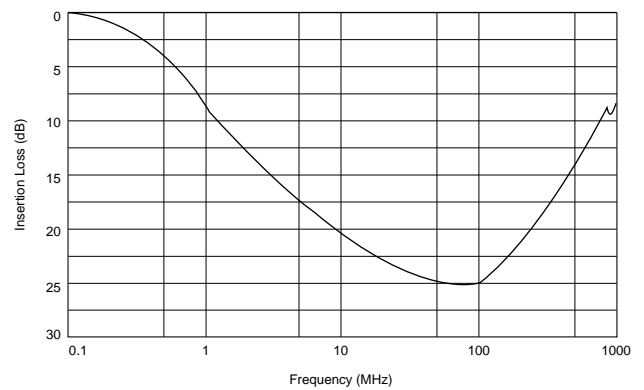
| Part Number     | Common Mode Inductance (μH) | Rated Current (A) | Rated Voltage (Vdc) | Withstand Voltage (Vdc) |
|-----------------|-----------------------------|-------------------|---------------------|-------------------------|
| PLT09HN2003R0P1 | 20 min.                     | 3             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

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

### ■ Equivalent Circuit



### ■ Insertion Loss Characteristics (Typical)



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



## Microwave Absorbers Part Numbering

### Microwave Absorber

(Global Part Number) **EA** **1026** **A** **160** **M** **200** **200**  
① ② ③ ④ ⑤ ⑥ ⑦

#### ① Product ID

| Product ID |                    |
|------------|--------------------|
| <b>EA</b>  | Microwave Absorber |

#### ② Sheet Type

| Code         | Sheet Type                             |
|--------------|--|
| <b>10</b> □□ | Iron carbonyl type                     |
| <b>2070</b>  | Metal Flake Powder (non Halogen type)  |
| <b>2100</b>  | Metal Flake Powder (UL certified type) |

#### ③ Adhesive Tape Type

| Code     | Adhesive Tape Type      |
|----------|-------------------------|
| <b>A</b> | Standard tape type      |
| <b>B</b> | Thin Adhesive tape type |
| <b>L</b> | No tape type            |
| <b>U</b> | UL certified type       |

#### ④ Sheet Thickness

Expressed by 3 digits including the second decimal place in mm.

Ex.)

| Code       | Sheet Thickness |
|------------|-----------------|
| <b>020</b> | 0.20mm          |

#### ⑤ Unit of Dimension

One capital letter expresses Unit of dimension (⑤) and Dimensions Length (⑦).

| Code     | Unit of Dimension |
|----------|-------------------|
| <b>M</b> | in mm (Standard)  |
| <b>C</b> | in cm (Standard)  |

Standard shape is a rectangle.  
Please contact us for other shapes.

#### ⑥ Dimension (Length)

Expressed by 3 digits including the first decimal place.

#### ⑦ Dimension (Width)

Expressed by 3 digits including the first decimal place.

Ex.)

| Code           | Dimension (Length × Width) |
|----------------|----------------------------|
| <b>M300150</b> | 30.0×15.0 mm               |
| <b>C150100</b> | 15.0×10.0 cm               |

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

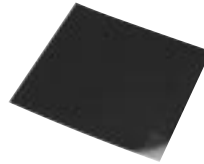


## Microwave Absorbers EA10/EA20/EA21 Series

### EA10 Series

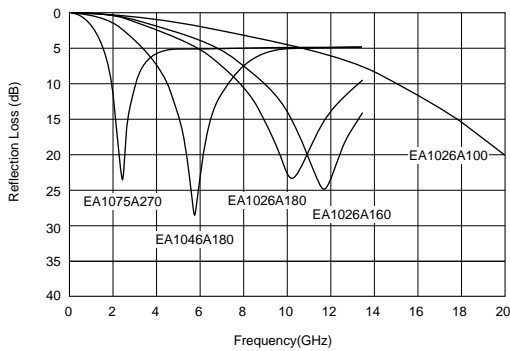
#### ■ Features

1. Excellent elasticity and durability with silicon rubber.
2. Suitable for prevention of abnormal oscillation in high frequency modules, suppression of spurious spectra and prevention interference between circuits.
3. Holds easily in equipment with adhesive tape.



| Part Number | Applicable Frequency | Thickness (mm) | Flame Resistance | 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

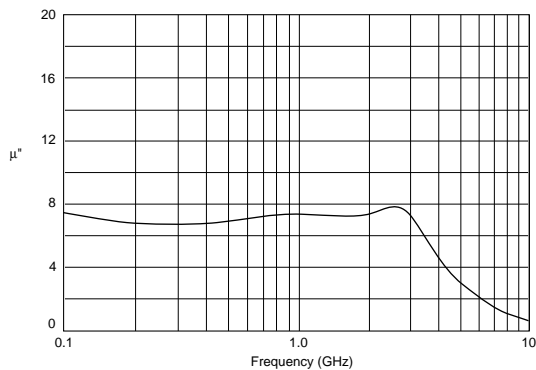
1. Magnetically-shielded high-micro and high-loss characteristics can suppress noise in a wide frequency band for digital equipment.
2. Thin (0.2mm-1.0mm) and flexible sheet makes easy handling in assembly process.
3. Holds easily in equipment with adhesive tape.
4. EA20xx series : Non Halogen type  
EA21xx series : UL94V-0 certified material is used.



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| Part Number | Applicable Frequency | Thickness (mm) | Flame Resistance | Halogen      | Operating Temperature Range |
|-------------|----------------------|----------------|------------------|--------------|-----------------------------|
| EA2070A020  | 0.1 - 3.0GHz (Typ.)  | 0.2 (Typ.)     | -                | Halogen Free | -40 to +105 °C              |
| 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              |
| EA2070B005  | 0.1 - 3.0 GHz (Typ.) | 0.05 (Typ.)    | -                | Halogen Free | -40 to +105 °C              |
| EA2070B010  | 0.1 - 3.0 GHz (Typ.) | 0.10 (Typ.)    | -                | Halogen Free | -40 to +105 °C              |
| EA2070B013  | 0.1 - 3.0 GHz (Typ.) | 0.13 (Typ.)    | -                | Halogen Free | -40 to +105 °C              |
| EA2070B020  | 0.1 - 3.0 GHz (Typ.) | 0.2 (Typ.)     | -                | Halogen Free | -40 to +105 °C              |
| EA2070B050  | 0.1 - 3.0 GHz (Typ.) | 0.5 (Typ.)     | -                | Halogen Free | -40 to +105 °C              |
| EA2100A020  | 0.1 - 3.0 GHz (Typ.) | 0.2 (Typ.)     | UL94V-0          | -            | -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              |
| EA2100B050  | 0.1 - 3.0 GHz (Typ.) | 0.5 (Typ.)     | UL94V-0          | -            | -40 to +105 °C              |
| EA2100B100  | 0.1 - 3.0 GHz (Typ.) | 1.0 (Typ.)     | UL94V-0          | -            | -40 to +105 °C              |

### ■ Magnetic Permeability-Reluctance (Typical)



## Chip EMIFIL<sup>®</sup> ⚠Caution/Notice

### ■ ⚠Caution (Soldering and Mounting)

Give special attention when mounting chip "EMIFIL" BLM\_P/NFM\_P series close to other products that radiate heat. The excessive heat by other products may cause deterioration of the insulation resistance and result in excessive heat or fire.

### ■ Notice (Storage and Operating Conditions)

< 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

BLM/BLA/VFM41R/DLP31S/DLM2HG series should be used within 6 months, the other series should be used within 12 months. Solderability should be

checked if this period is exceeded.

#### 2. Storage conditions

(1) Storage temperature : -10 to 40 degree 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)

< 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 inspected by Murata over 12 months ago should be examined prior to use. Date can be confirmed with inspection No. marked on the container.

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.

## 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 may result in excessive heat or fire.

### ■ ⚠Caution (Soldering and Mounting)

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

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### ■ 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 lightning or switching related surges.

< Storage and Handling Requirements >

#### 1. Storage Period

Use the products within 12 months after delivery;

solderability should be checked if this period is exceeded.

#### 2. Storage conditions

- (1) Storage temperature : -10 to 40 degree 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.
- (3) When restoring taping type (BL01RN1R1F1J), please attach the Spacer between flanges of reel. The Spacer is corrugated paper which is attached when shipping.

### ■ 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.

# EMIFIL® (Soldering and Mounting)

## 1. Standard Land Pattern Dimensions

The capacitor type Chip EMIFIL® (NF□ series) / Chip EMIGUARD® (VFM 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.

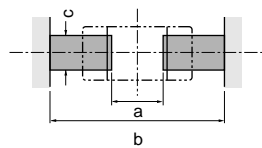
Small diameter feedthrough holes are then used to connect the grounds on each side of the PCB. This reduces the high-frequency impedance of the grounding and maximizes the filter's performance. Please contact us if using a thinner land pad than 18μm for NFM55P.

Land Pattern + Solder Resist  
 Land Pattern  
 Solder Resist (in mm)

**BLM03**  
**BLM15**  
**BLM18**  
**BLM21**  
**BLM31**  
**BLM41**

### ●Reflow and Flow

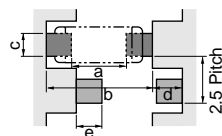
BLM Series (Except BLM□□P series)



| Type                        | Soldering       | a       | b       | c   |
|-----------------------------|-----------------|---------|---------|-----|
| * BLM03                     | Reflow          | 0.2-0.3 | 0.6-0.9 | 0.3 |
| * BLM15                     | Reflow          | 0.4     | 1.2-1.4 | 0.5 |
| BLM18<br>(except 18PG type) | Flow            | 0.7     | 2.2-2.6 | 0.7 |
|                             | Reflow          |         | 1.8-2.0 |     |
| BLM21<br>(except 21PG type) | Flow/<br>Reflow | 1.2     | 3.0-4.0 | 1.0 |
| BLM31<br>(except 31PG type) |                 | 2.0     | 4.2-5.2 | 1.2 |
| BLM41<br>(except 41P□ type) |                 | 3.0     | 5.5-6.5 |     |

\*BLM03/15 is specially adapted for reflow soldering.

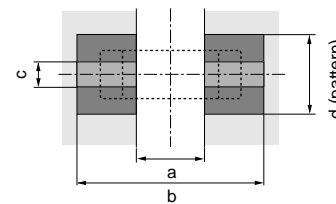
### Flow Mounting in High Density for BLM31/41



| Type  | 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  |

●Do not apply narrower pattern that listed above to BLM□□P.  
Narrow pattern can cause excessive heat or open circuit.

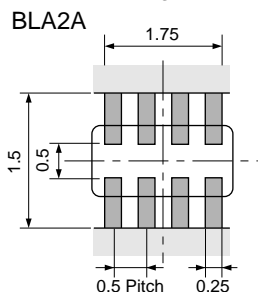
### BLM□□P



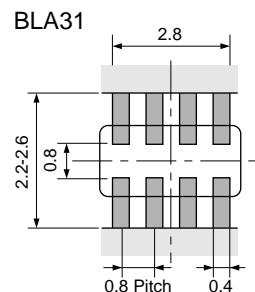
| Type    | Rated Current (A) | Soldering                            | a   | b       | c   | Land pad thickness and dimension d |      |      |
|---------|-------------------|--------------------------------------|-----|---------|-----|------------------------------------|------|------|
|         |                   |                                      |     |         |     | 18μm                               | 35μm | 70μm |
| BLM18PG | 0.5-1.5           | Flow<br>2.2-2.6<br>Reflow<br>1.8-2.0 | 0.7 | 0.7     | 0.7 | 0.7                                | 0.7  | 0.7  |
|         | 2                 |                                      |     |         |     | 1.2                                | 0.7  | 0.7  |
|         | 3                 |                                      |     |         |     | 2.4                                | 1.2  | 0.7  |
| BLM21PG | 1.5               | Flow/<br>Reflow                      | 1.2 | 3.0-4.0 | 1.0 | 1.0                                | 1.0  | 1.0  |
|         | 2                 |                                      |     |         |     | 1.2                                | 1.0  | 1.0  |
|         | 3                 |                                      |     |         |     | 2.4                                | 1.2  | 1.0  |
|         | 6                 |                                      |     |         |     | 6.4                                | 3.3  | 1.65 |
| BLM31PG | 1.5/2             | Flow/<br>Reflow                      | 2.0 | 4.2-5.2 | 1.2 | 1.2                                | 1.2  | 1.2  |
|         | 3                 |                                      |     |         |     | 2.4                                | 1.2  | 1.2  |
|         | 6                 |                                      |     |         |     | 6.4                                | 3.3  | 1.65 |
| BLM41P□ | 1-2               | Flow/<br>Reflow                      | 3.0 | 5.5-6.5 | 1.2 | 1.2                                | 1.2  | 1.2  |
|         | 3                 |                                      |     |         |     | 2.4                                | 1.2  | 1.2  |
|         | 6                 |                                      |     |         |     | 6.4                                | 3.3  | 1.65 |

**BLA2A**  
**BLA31**

### ●Reflow soldering



### ●Reflow and Flow



● If there are high amounts of self-heating on pattern, the contact points of PCB and part may become damaged.

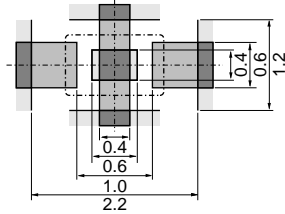
# EMIFIL® (Soldering and Mounting)

Continued from the preceding page.

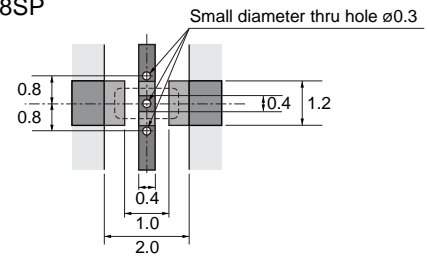
Land Pattern + Solder Resist  
 Land Pattern  
 Solder Resist (in mm)

## NFM18

### Reflow Soldering NFM18C/NFM18P/NFL18ST



### NFL18SP

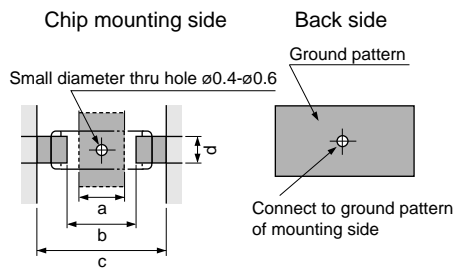


The chip EMI filter suppress noise by passing the high-frequency noise to ground. Therefore, to get noise suppression effectively, it is recommended to put through holes (ø0.3 mm) into the center and both sides of ground-pattern to connect to ground-plane.

- NFM18, NFL21 are specially adapted for reflow soldering.

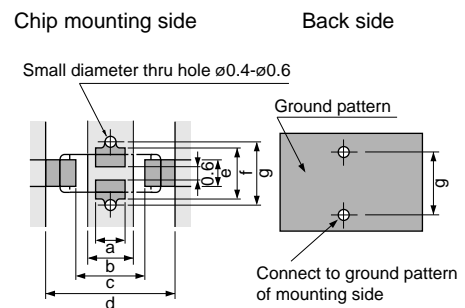
## NFM21 NFM3D NFM41 NFR21G NFL21S VFM41R

### ● Reflow Soldering



| Part Number                    | Size (mm) |     |     |     |
|--------------------------------|-----------|-----|-----|-----|
|                                | a         | b   | c   | d   |
| NFM21C/NFM21P<br>NFR21G/NFL21S | 0.8       | 1.4 | 2.6 | 0.6 |
| NFM3DC<br>NFM3DP               | 1.4       | 2.5 | 4.4 | 1.0 |
| NFM41C<br>NFM41P               | 2.0       | 3.5 | 6.0 | 1.2 |
| VFM41R                         | 2.0       | 3.5 | 6.0 | 1.2 |

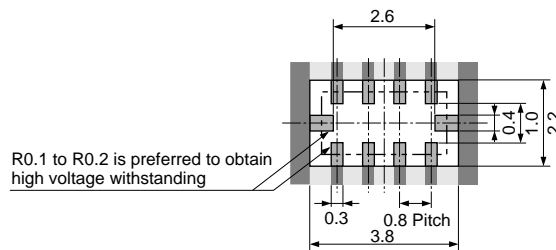
### ● Flow Soldering



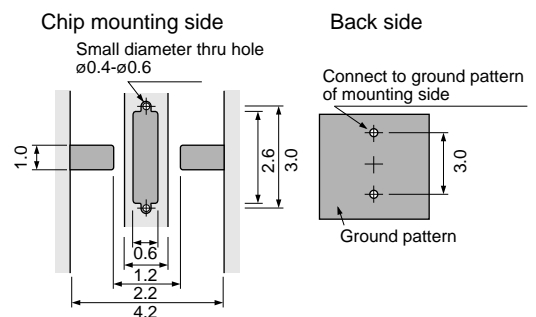
| Part Number      | Size (mm) |     |     |     |     |     |     |
|------------------|-----------|-----|-----|-----|-----|-----|-----|
|                  | a         | b   | c   | d   | e   | f   | g   |
| NFM3DC<br>NFM3DP | 1.0       | 1.4 | 2.5 | 4.4 | 1.0 | 2.0 | 2.4 |
| NFM41C<br>NFM41P | 1.5       | 2.0 | 3.5 | 6.0 | 1.2 | 2.6 | 3.0 |
| VFM41R           | 1.5       | 2.0 | 3.5 | 6.0 | 1.2 | 2.6 | 3.0 |

## NFA31G NFA31C NFW31S NFE31P

### ● Reflow Soldering NFA31G/31C



### ● Reflow and Flow NFW31S ● Reflow Soldering NFE31P



Continued on the following page. ↗



# EMIFIL® (Soldering and Mounting)

Continued from the preceding page.

Land Pattern  
 + Solder Resist  
 Land Pattern  
 Solder Resist  
 (in mm)

| <p><b>NFE61P</b><br/><b>NFE61H</b></p>   | <p><b>● Reflow Soldering</b></p> <p>Chip mounting side      Back side</p>   | <p><b>● Flow Soldering (Except NFE61H3321)</b></p> <p>Chip mounting side      Back side</p> |        |     |   |   |   |                 |     |     |     |     |               |     |     |     |     |
|--|---|---|--------|-----|---|---|---|-----------------|-----|-----|-----|-----|---------------|-----|-----|-----|-----|
| <p><b>DLM2HG</b><br/><b>DLP31S</b><br/><b>DLP31D</b><br/><b>DLP11S</b><br/><b>DLW21S</b><br/><b>DLW21H</b><br/><b>DLW31S</b><br/><b>DLW5AH</b><br/><b>DLW5BS</b></p> | <p><b>● Reflow and Flow</b></p> <p style="text-align: center;">DLM2HG                      DLP31S                      DLP31D</p>   |   |        |     |   |   |   |                 |     |     |     |     |               |     |     |     |     |
|  | <p><b>● Reflow Soldering</b></p> <p style="text-align: center;">DLP11S                      DLW21/DLW31S</p>  |   |        |     |   |   |   |                 |     |     |     |     |               |     |     |     |     |
|  | <p style="text-align: center;">DLW5AH/5BS</p>   |   |        |     |   |   |   |                 |     |     |     |     |               |     |     |     |     |
|  | <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>Series</th> <th>a</th> <th>b</th> <th>c</th> <th>d</th> </tr> </thead> <tbody> <tr> <td><b>DLW21S/H</b></td> <td>0.8</td> <td>2.6</td> <td>0.4</td> <td>1.2</td> </tr> <tr> <td><b>DLW31S</b></td> <td>1.6</td> <td>3.7</td> <td>0.4</td> <td>1.6</td> </tr> </tbody> </table> <p style="font-size: small;">                     * 1 : If the pattern is made with wider than 1.2mm (DLW21) / 1.6mm (DLW31S) it may result in components turning around, because melting speed is different. In the worst case, short circuit between lines may occur.<br/>                     * 2 : If the pattern is made with less than 0.4mm, in the worst case, short circuit between lines may occur due to spread of soldering paste or mount placing accuracy.<br/>                     * 3 : If the pattern is made with wider than 0.8mm (DLW21) / 1.6mm (DLW31S), the bending strength will be reduced.<br/>                     With gild pattern, excess soldering heat may dissolve metal of a copper wire.                 </p> |   | Series | a   | b | c | d | <b>DLW21S/H</b> | 0.8 | 2.6 | 0.4 | 1.2 | <b>DLW31S</b> | 1.6 | 3.7 | 0.4 | 1.6 |
| Series   | a   | b   | c      | d   |   |   |   |                 |     |     |     |     |               |     |     |     |     |
| <b>DLW21S/H</b>  | 0.8   | 2.6   | 0.4    | 1.2 |   |   |   |                 |     |     |     |     |               |     |     |     |     |
| <b>DLW31S</b>  | 1.6   | 3.7   | 0.4    | 1.6 |   |   |   |                 |     |     |     |     |               |     |     |     |     |

Continued on the following page. ↗

# EMIFIL® (Soldering and Mounting)

Continued from the preceding page.

## 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 be prone to damage 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

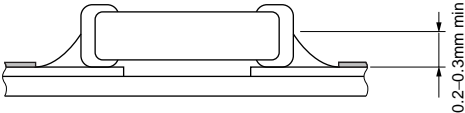
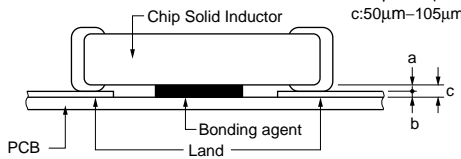
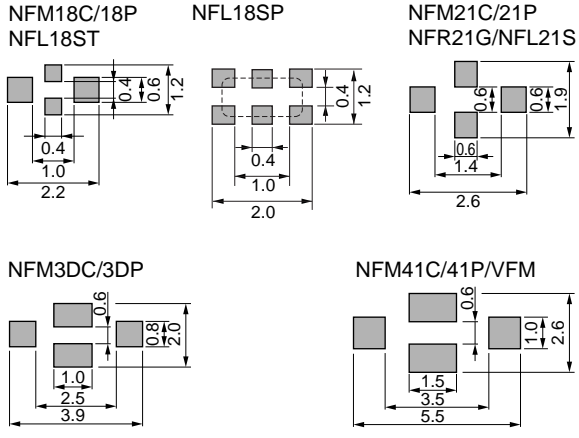
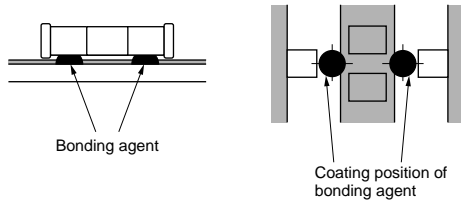
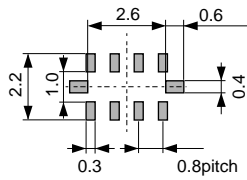
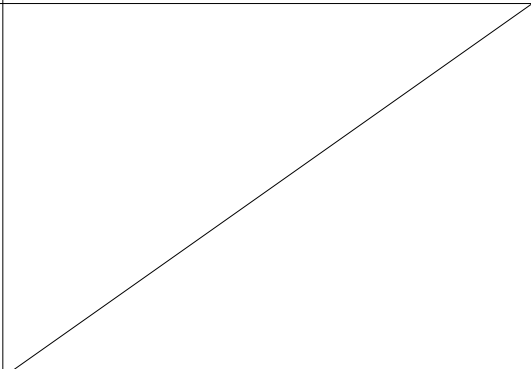
copper foil patterns.

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.

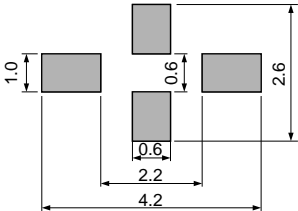
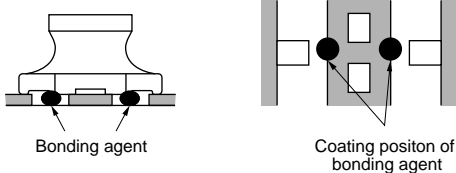
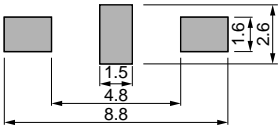
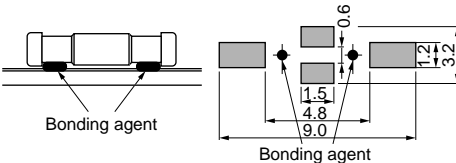
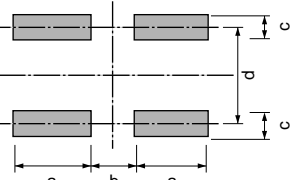
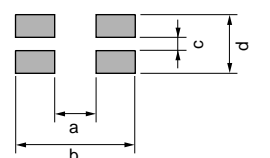
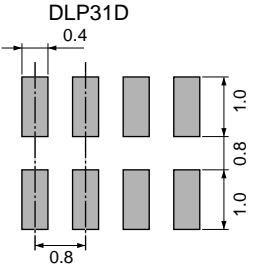
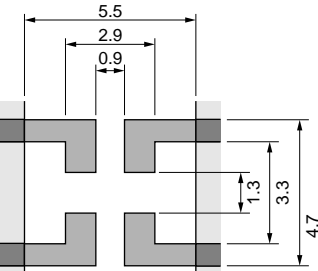
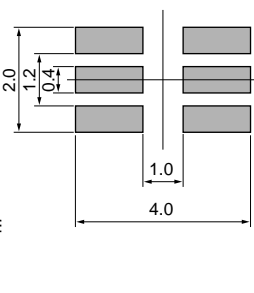
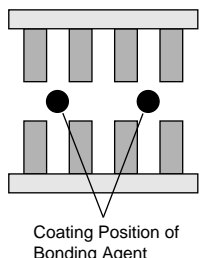
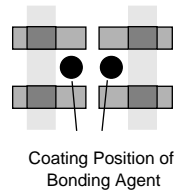
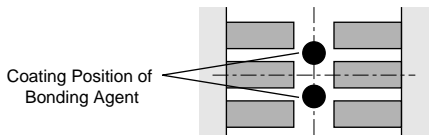
(in mm)

| Series   | Solder Paste Printing   | Adhesive Application   |
|--|---|--|
| <b>BLM</b><br><b>BLA</b>                             | <ul style="list-style-type: none"> <li>● Ensure that solder is applied smoothly to a minimum height of 0.2mm to 0.3mm at the end surface of the part.</li> <li>● Coat the solder paste a thickness:<br/>                     100-150µm: BLM03<br/>                     100-200µm: BLM15/18/21/31/41, BLA</li> </ul>  | <p>Coating amount is illustrated in the following diagram.</p>   |
| <b>NFM</b><br><b>NFR</b><br><b>NFL</b><br><b>VFM</b> | <ul style="list-style-type: none"> <li>● Use H60A solder for pattern printing.</li> <li>● Coat the solder paste a thickness:<br/>                     100-150µm: NFM18/21/3D, NFR, NFL<br/>                     100-200µm: NFM41, VFM</li> </ul>   | <p>Apply 0.1mg for NFM41C/41P/VFM and 0.06mg for NFM3DC/3DP of bonding agent at each chip. Do not cover electrodes.</p>  |
| <b>NFA</b>   | <ul style="list-style-type: none"> <li>● Use H60A solder for pattern printing.</li> <li>● Coat the solder paste a thickness: 100-200µm</li> </ul>    |    |

# EMIFIL® (Soldering and Mounting)

Continued from the preceding page.

(in mm)

| Series                                 | Solder Paste Printing   | Adhesive Application   |     |      |   |   |               |     |      |     |      |               |     |     |     |     |        |   |   |   |   |                 |     |     |     |     |               |     |     |     |     |  |
|--|---|--|-----|------|---|---|---------------|-----|------|-----|------|---------------|-----|-----|-----|-----|--------|---|---|---|---|-----------------|-----|-----|-----|-----|---------------|-----|-----|-----|-----|--|
| <b>NFW31S</b><br><b>NFE31P</b>         | <ul style="list-style-type: none"> <li>●Use H60A solder for pattern printing.</li> <li>●Coat the solder paste a thickness: 150-200µm</li> </ul>    | <p>NFW31S Series<br/>Apply 0.2mg of bonding agent at each chip.</p>  |     |      |   |   |               |     |      |     |      |               |     |     |     |     |        |   |   |   |   |                 |     |     |     |     |               |     |     |     |     |  |
| <b>NFE61P</b><br><b>NFE61H</b>         | <ul style="list-style-type: none"> <li>●Use H60A solder for pattern printing.</li> <li>●Coat the solder paste a thickness: 150-200µm</li> </ul>    | <p>Apply 1.0mg of bonding agent at each chip.</p>                    |     |      |   |   |               |     |      |     |      |               |     |     |     |     |        |   |   |   |   |                 |     |     |     |     |               |     |     |     |     |  |
| <b>DLP</b><br><b>DLW</b><br><b>DLM</b> | <ul style="list-style-type: none"> <li>●Use H60A solder for pattern printing.</li> <li>●Coat the solder paste a thickness:<br/>100-150µm: DLW21S/21H/31S/DLP11S<br/>150-200µm: DLP31D/31S, DLM2HG, DLW5AH/5BS</li> </ul> <div style="display: flex; justify-content: space-around;"> <div data-bbox="327 1108 622 1344"> <p>DLP11S/31S</p>  </div> <div data-bbox="646 1108 917 1321"> <p>DLW21S/DLW21H/DLW31S</p>  </div> </div> <table border="1" data-bbox="343 1355 614 1456"> <thead> <tr> <th>Series</th> <th>a</th> <th>b</th> <th>c</th> <th>d</th> </tr> </thead> <tbody> <tr> <td><b>DLP11S</b></td> <td>0.7</td> <td>0.55</td> <td>0.3</td> <td>0.55</td> </tr> <tr> <td><b>DLP31S</b></td> <td>1.0</td> <td>0.6</td> <td>0.7</td> <td>2.1</td> </tr> </tbody> </table> <table border="1" data-bbox="638 1355 909 1456"> <thead> <tr> <th>Series</th> <th>a</th> <th>b</th> <th>c</th> <th>d</th> </tr> </thead> <tbody> <tr> <td><b>DLW21S/H</b></td> <td>0.8</td> <td>2.6</td> <td>0.5</td> <td>1.2</td> </tr> <tr> <td><b>DLW31S</b></td> <td>1.6</td> <td>3.7</td> <td>0.4</td> <td>1.6</td> </tr> </tbody> </table> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div data-bbox="343 1489 598 1758"> <p>DLP31D</p>  </div> <div data-bbox="343 1758 662 2083"> <p>DLW5AH/5BS</p>  </div> <div data-bbox="662 1758 917 2027"> <p>DLM2HG</p>  </div> </div> | Series   | a   | b    | c | d | <b>DLP11S</b> | 0.7 | 0.55 | 0.3 | 0.55 | <b>DLP31S</b> | 1.0 | 0.6 | 0.7 | 2.1 | Series | a | b | c | d | <b>DLW21S/H</b> | 0.8 | 2.6 | 0.5 | 1.2 | <b>DLW31S</b> | 1.6 | 3.7 | 0.4 | 1.6 | <p>DLP31S/DLM2HG<br/>Apply 0.3mg of bonding agent at each chip.</p> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div data-bbox="981 1131 1181 1444"> <p>DLP31D</p>  </div> <div data-bbox="1260 1131 1444 1400"> <p>DLP31S</p>  </div> </div> <div style="display: flex; justify-content: center; margin-top: 20px;"> <div data-bbox="1013 1444 1444 1612"> <p>DLM2HG</p>  </div> </div> |
| Series                                 | a   | b  | c   | d    |   |   |               |     |      |     |      |               |     |     |     |     |        |   |   |   |   |                 |     |     |     |     |               |     |     |     |     |  |
| <b>DLP11S</b>                          | 0.7   | 0.55   | 0.3 | 0.55 |   |   |               |     |      |     |      |               |     |     |     |     |        |   |   |   |   |                 |     |     |     |     |               |     |     |     |     |  |
| <b>DLP31S</b>                          | 1.0   | 0.6  | 0.7 | 2.1  |   |   |               |     |      |     |      |               |     |     |     |     |        |   |   |   |   |                 |     |     |     |     |               |     |     |     |     |  |
| Series                                 | a   | b  | c   | d    |   |   |               |     |      |     |      |               |     |     |     |     |        |   |   |   |   |                 |     |     |     |     |               |     |     |     |     |  |
| <b>DLW21S/H</b>                        | 0.8   | 2.6  | 0.5 | 1.2  |   |   |               |     |      |     |      |               |     |     |     |     |        |   |   |   |   |                 |     |     |     |     |               |     |     |     |     |  |
| <b>DLW31S</b>                          | 1.6   | 3.7  | 0.4 | 1.6  |   |   |               |     |      |     |      |               |     |     |     |     |        |   |   |   |   |                 |     |     |     |     |               |     |     |     |     |  |

## EMIFIL® (Soldering and Mounting)

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### 3. Standard Soldering Conditions

#### (1) Soldering Methods

Use flow and reflow soldering methods only.

Use standard soldering conditions when soldering chip EMI suppression filters 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

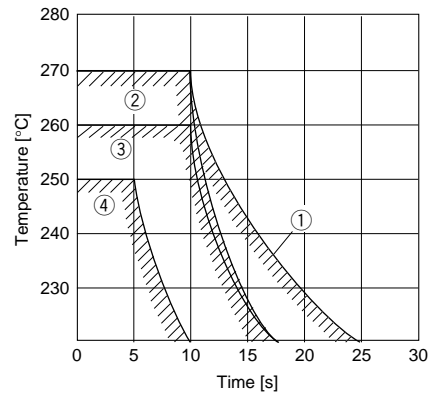
To prevent external electrode solder leaching and performance deterioration, solder within the temperature and time combinations illustrated by the slanted lines in the following graphs. If soldering is repeated, please note that the allowed time is the accumulated time.

Solder : H60A H63A solder(JIS Z 3238)

Flux :

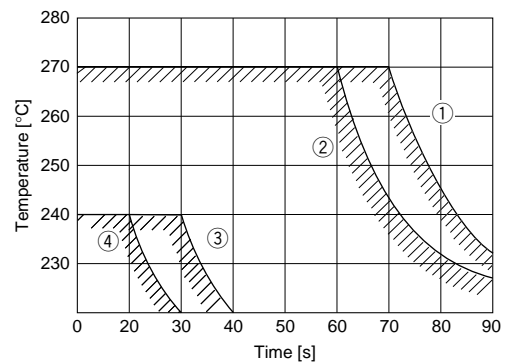
- Use Rosin-based flux (when using RA type solder, clean products sufficiently to avoid residual flux.
- Do not use strong acidic flux (with chlorine content exceeding 0.20wt%)
- Do not use water-soluble flux.

#### ● Allowable Flow Soldering Temperature and Time



|   |                                    |
|---|------------------------------------|
| ① | NFE61P/H(Except NFE61HT332)        |
| ② | BLM(Except BLM03/15), BLA31        |
| ③ | DLM2HG, DLP31D/S                   |
| ④ | VFM41R, NFM3DC/P, NFM41C/P, NFW31S |

#### ● Allowable Reflow Soldering Temperature and Time



|   |   |
|---|---|
| ① | NFE31P/NFE61P/H                         |
| ② | BLM/BLA                                 |
| ③ | DLM2HG, DLP31D/S, DLP11S                |
| ④ | NFM, NFL, NFA, NFR, HFW31S, DLW, VFM41R |

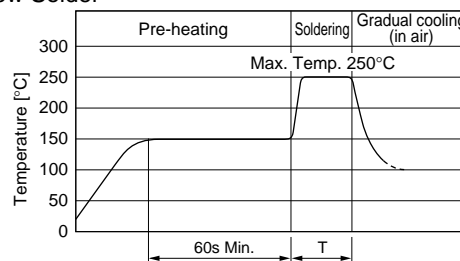
Continued on the following page. ☐

## EMIFIL<sup>®</sup> (Soldering and Mounting)

Continued from the preceding page.

### (3) Soldering Conditions

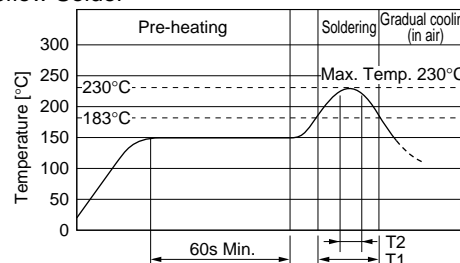
#### ●Flow Solder



| Series  | Pre-heating (150°C) | Soldering Time(T) | Soldering Temp.(C) |
|---|---------------------|-------------------|--------------------|
| BLM(Except BLM03/15), BLA31                               | 60s min.            | 10s max.          | 250                |
| NFM3DC/P, NFM41C/P, NFW31S, NFE61P/H*, DLM2HG, DLP31D/31S |                     | 5s max.           |                    |
| VFM   |                     |                   |                    |

\*Except NFE61HT332

#### ●Reflow Solder



| Series            | Pre-heating (150°C) | Soldering Time |                 |
|-------------------|---------------------|----------------|-----------------|
|                   |                     | T1(183°C)      | T2(230°C)       |
| NFE31/61          | 60s min.            | 60s max.       | 250°C, 20s max. |
| BLM, BLA          |                     |                | 20s max.        |
| NFM, NFL, NFR     |                     |                | 10s max.        |
| NFW, NFA, DLM/P/W |                     |                |                 |
| VFM               |                     |                |                 |

### (4) Reworking with Solder Iron

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

Pre-heating : 150°C 60 s min.

Soldering iron power output : 30W max.

Temperature of soldering iron tip / Soldering time : 280°C max./10s max. or 300°C max./3s max.\*

\*NFE31PT152Z1E9/VFM : 280°C max./10 s max. only

BLM : 350°C max./3 s max.

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

For additional methods of reworking with to 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 alcohol type cleaner)

(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 DLW21S/31S/5AH/5BS series.

In case of cleaning, please contact Murata engineering.

a) Alcohol cleaning agent

Isopropyl alcohol (IPA)

b) Aqueous cleaning agent

Surface active agent (Clean Thru 750H)

Hydrocarbon (Cold Cleaner 375)

High grade alcohol (Pine Alpha ST-100S)

\*VFM41R series cannot be cleaned with high grade alcohol type aqueous cleaning agent.

Alkaline saponifier (Aqua Cleaner 210SEI-cleaner should be diluted within 15% 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.

## Lead Type EMIFIL® (Soldering and Mounting)

### 1. Mounting Hole

Mounting holes should be designed as specified below.

| Part number                    | Bulk type (in mm)       | Taping type (in mm)                      |
|--------------------------------|-------------------------|--|
| DSN6<br>DSS6<br>VFR3V<br>VFS6V |                         |  |
| DSN9<br>DSN9H                  |                         |  |
| DST9<br>DST9H                  |                         |  |
| DSS9<br>DSS9H<br>VFS9V         |                         |  |
| BNX                            | <p>[Component Side]</p> | <p>[TERMINAL LAYOUT (Bottom figure)]</p> |

### 2. Using THE block type EMIFIL® effectively

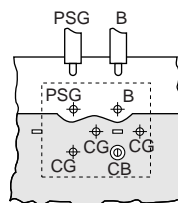
The block type EMIFIL® effectively prevents unwanted reflections and external noise from entering the equipment circuitry and power lines by grounding all the high frequency components which make up the noise. Therefore, if grounding is improperly done, the filters may be unable to achieve the performance they are capable of. To prevent this, be sure to observe the following instructions.

- (1) When designing the P.C. board, use all the available grounding terminals, and arrange the grounding circuit so that the area of the foil for the grounding circuit is maximized.
- (2) Minimize the distance between the P.C. board ground and the filter's grounding plate. Use through-hole P.C. boards.
- (3) Whichever P.C. board is used, push the filter into the P.C. board up to the terminal roots.
- (4) Do not connect PSG to CG by any other means except through the filter. (See the item 1. TERMINAL LAYOUT)

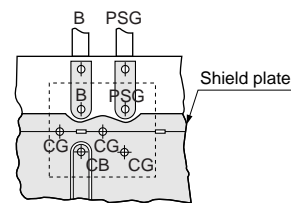
#### [P.C.B. BOARD PATTERNS]

Use a bilateral P.C. board. Insert the BNX into the P.C. board until the root of the terminal is secured. then solder.

(1) FRONT VIEW



(2) BOTTOM VIEW



PSG : Power supply ground  
CG : Load circuit ground  
CB : Load circuit + Bias

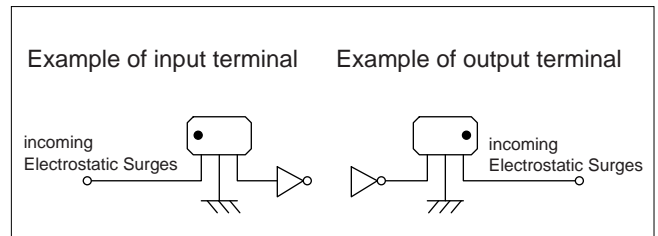
## Lead Type EMIFIL<sup>®</sup> (Soldering and Mounting)

☐ Continued from the preceding page.

### 3. Using EMIGUARD<sup>®</sup> effectively

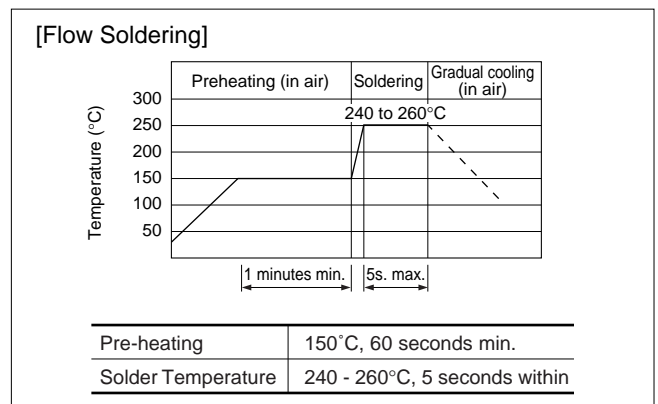
- (1) Terminal (with mark) should be connected to the line of incoming electrostatic surge. (There is polarity.)  
Otherwise, no effect in ESD suppression can be expected. (VFR3V)
- (2) Products should be used at rated voltage or less and rated current or less.
- (3) Products should not be applied for the absorption of surges which have large energy (ex. induced lightning surges, switching surges) because it is designed for the absorption of electrostatic surges. (VFR3V)
- (4) Electrostatic test should be done on the following conditions. (VFR3V)  

$$n \cdot [C / R \cdot V^2]^2 < 8.0 \times 10^5$$
  - n : Times applies
  - C : Charging Capacitance (pF)
  - V : Testing Voltage (kV)
  - R : Charging Resistance ( $\Omega$ )



### 4. Soldering

- (1) Use Rosin-based flux. Do not use strong acidic flux with halide content exceeding 0.2 (wt)% (chlorine conversion value).
- (2) Standard flow soldering profile.
- (3) Products and the leads should not be subjected to any mechanical stress during the soldering process, or while subjected to the equivalent high temperatures.



### 5. Cleaning Conditions

Do not clean VFR3V, PLT09H and VFS6Vseries.  
Clean other parts in the following conditions.

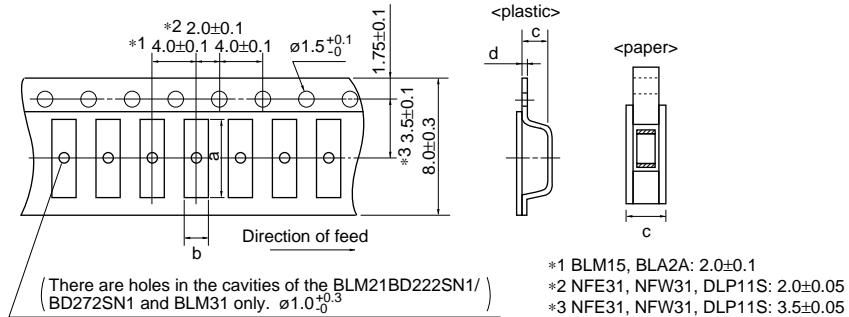
- (1) Cleaning temperature should be limited to 60°C  
max.(40°C max for alcohol type cleaner.)
- (2) Ultrasonic cleaning should be comply with the following conditions, avoiding the resonance phenomenon at the mounted products and P.C.B.  
Power : 20 W / l max. Frequency : 28kHz to 40kHz  
Time : 5 min. max.
- (3) Cleaner
  - a) Alcohol type cleaner
    - Isopropyl alcohol (IPA)
  - b) Aqueous agent (PLT series cannot be cleaned)
    - Surface Active Agent Type (CLEANTHROUGH 750H)

- Hydrocarbon Type (COLDCLEANER 375)
- Higher Alcohol Type (PINE ALPHA ST-100S)
- Alkali Saponification Type (\*AQUACLEANER 210SEI)
- \* Alkali saponification should be diluted to 15% volume with de-ionized water.

- (4) There should be no residual flux or residual cleaner after cleaning.  
In the case of using aqueous agent, products should be dried completely after rinsing with de-ionized water in order to remove the cleaner.
- (5) Other cleaning : Please contact us.

## Chip EMIFIL® Packaging

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



| Part Number                                   | Cavity Size |      |             |          | Minimum Qty. (pcs.) |              |             |               | Bulk |
|---|-------------|------|-------------|----------|---------------------|--------------|-------------|---------------|------|
|   |             |      |             |          | ø180mm reel         |              | ø330mm reel |               |      |
|   | a           | b    | c           | d        | Paper Tape          | Plastic Tape | Paper Tape  | Plastic Tape  |      |
| <b>BLM03</b>                                  | 0.70        | 0.40 | 0.55        | -        | 15000               | -            | -           | -             | 1000 |
| <b>BLM15</b>                                  | 1.15        | 0.65 | 0.8         | -        | 10000               | -            | 50000       | -             | 1000 |
| <b>BLM18<br/>(BLM18E_TN1)</b>                 | 1.85        | 1.05 | 1.1<br>0.75 | -        | 4000                | -            | 10000       | -             | 1000 |
| <b>BLM21<br/>(BD222SN1/BD272SN1)</b>          | 2.25        | 1.45 | 1.1<br>1.3  | -<br>0.2 | 4000<br>-           | -<br>3000    | 10000<br>-  | -<br>10000    | 1000 |
| <b>BLM31<br/>(AF700SN1)</b>                   | 3.5         | 1.9  | 1.3<br>1.75 | 0.2      | -<br>-              | 3000<br>2500 | -<br>-      | 10000<br>8000 | 1000 |
| <b>BLA2A</b>                                  | 2.2         | 1.2  | 0.8         | -        | 10000               | -            | -           | -             | 1000 |
| <b>BLA31</b>                                  | 3.4         | 1.8  | 1.1         | -        | 4000                | -            | 10000       | -             | 1000 |
| <b>NFM18/NFL18S<br/>NFM18PC (Except 105R)</b> | 1.85        | 1.05 | 0.9         | -        | 4000                | -            | -           | -             | 500  |
| <b>NFL18ST/NFM18PC105R</b>                    |             |      | 1.1         | -        | 4000                | -            | -           | -             | 500  |
| <b>NFM21/NFL21S</b>                           | 2.3         | 1.55 | 1.1         | -        | 4000                | -            | -           | -             | 500  |
| <b>NFM3DC/3DP</b>                             | 3.4         | 1.4  | 0.85        | 0.2      | -                   | 4000         | -           | -             | 500  |
| <b>NFA31G/31C</b>                             | 3.5         | 2.0  | 1.1         | -        | 4000                | -            | -           | -             | 100  |
| <b>NFE31P</b>                                 | 3.6         | 1.9  | 2.0         | 0.2      | -                   | 2000         | -           | 8000          | 500  |
| <b>NFR21G</b>                                 | 2.3         | 1.55 | 0.7         | 0.25     | -                   | 4000         | -           | -             | 500  |
| <b>NFW31S</b>                                 | 3.6         | 1.9  | 2.0         | 0.2      | -                   | 2000         | -           | 7500          | -    |
| <b>DLM2HG</b>                                 | 2.75        | 2.25 | 1.3         | 0.25     | -                   | 3000         | -           | -             | 1000 |
| <b>DLP11S</b>                                 | 1.4         | 1.2  | 0.98        | 0.25     | -                   | 3000         | -           | -             | 500  |
| <b>DLP31D/31S</b>                             | 3.5         | 1.9  | 1.3         | 0.25     | -                   | 3000         | -           | -             | 500  |
| <b>DLW21S</b>                                 | 2.25        | 1.45 | 1.4         | 0.3      | -                   | 2000         | -           | -             | 500  |
| <b>DLW21H</b>                                 | 2.3         | 1.55 | 1.1         | 0.25     | -                   | 3000         | -           | -             | 500  |
| <b>DLW31S</b>                                 | 3.6         | 2.0  | 2.1         | 0.3      | -                   | 2000         | -           | -             | 500  |

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

(in mm)

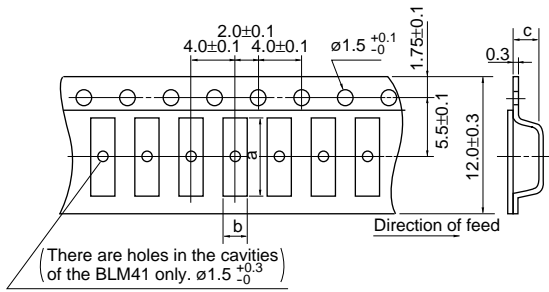
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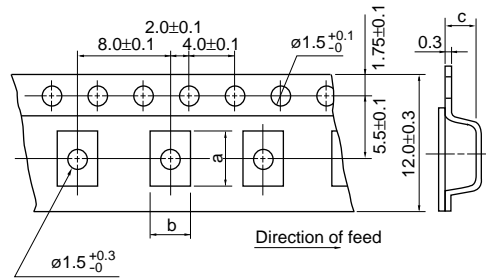
## Chip EMIFIL<sup>®</sup> Packaging

Continued from the preceding page.

### Minimum Quantity and Dimensions of 12mm Width Plastic Tape



| Part Number   | Cavity Size |     |      | Minimum Qty. (pcs.) |             |      |
|---------------|-------------|-----|------|---------------------|-------------|------|
|               | a           | b   | c    | ø180mm reel         | ø330mm reel | Bulk |
| <b>BLM41</b>  | 4.8         | 1.9 | 1.75 | 2500                | 8000        | 1000 |
| <b>NFM41</b>  | 4.8         | 1.8 | 1.1  | 4000                | -           | 500  |
| <b>NFE61</b>  | 7.2         | 1.9 | 1.75 | 2500                | 8000        | 500  |
| <b>VFM41R</b> | 4.8         | 1.8 | 1.35 | 2500                | -           | 500  |



| Part Number   | Cavity Size |     |     | Minimum Qty. (pcs.) |             |      |
|---------------|-------------|-----|-----|---------------------|-------------|------|
|               | a           | b   | c   | ø180mm reel         | ø330mm reel | Bulk |
| <b>DLW5AH</b> | 5.4         | 4.1 | 4.4 | 400                 | 1500        | 100  |
| <b>DLW5BS</b> | 5.5         | 5.4 | 4.7 | 400                 | 1500        | 100  |

(in mm)

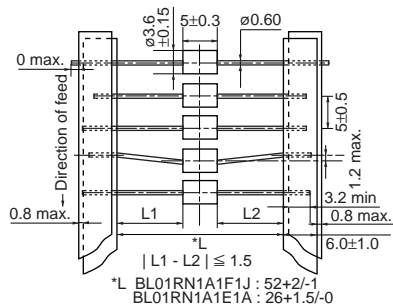
## Ferrite Beads Inductors Packaging

### ■ Minimum Quantity (Pcs.)

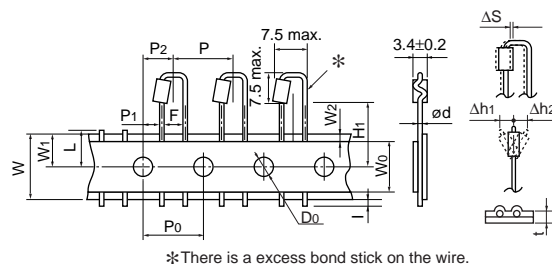
| Series | Bulk | Ammo Pack | ø320mm Paper reel |
|--------|------|-----------|-------------------|
| BL01RN | 500  | 1000      | 2000              |
| BL02RN | 500  | 1500      | —                 |
| BL03RN | 1000 | 2000      | —                 |

### ■ Taping Dimensions

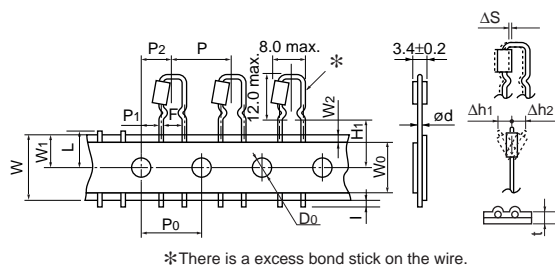
BL01RN



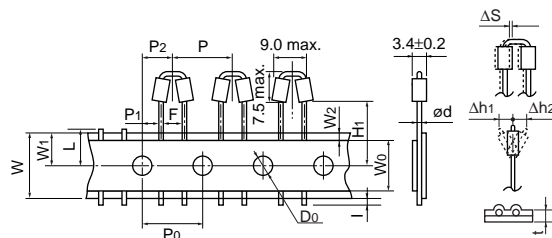
BL02RN1R2□1A



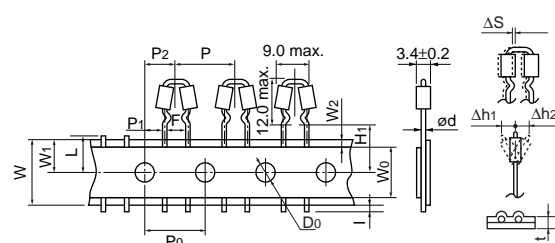
BL02RN1R3N1A



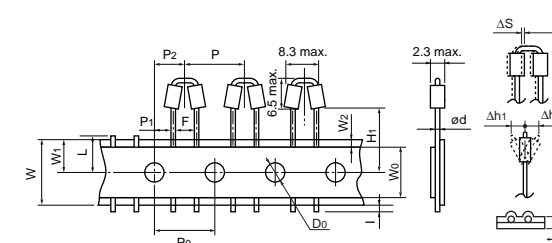
BL02RN2R1□1A



BL02RN2R3N1A



BL03RN2R1□1A



| Description  | Symbol   | Dimension (mm)                      | Remarks                                     |
|--|----------|-------------------------------------|---|
| Pitch of component                                     | P        | 12.7                                | Product inclination ΔS determines tolerance |
| Pitch of sprocket hole                                 | P0       | 12.7±0.2                            |   |
| Lead spacing   | F        | 5.0 <sup>+0.8</sup> <sub>-0.2</sub> |   |
| Hole center to lead                                    | P1       | 3.85±0.7                            |   |
| Hole center to component center                        | P2       | 6.35±1.3                            | Tape deviation in feeding direction         |
| Deviation along tape, left or right                    | ΔS       | ±1.0                                |   |
| Carrier tape width                                     | W        | 18.0±0.5                            |   |
| Position of sprocket hole                              | W1       | 9.0 <sup>+0</sup> <sub>-0.5</sub>   | Tape with deviation                         |
| Lead length between sprocket hole and forming position | H1       | Lead Length Number : N              | 16.5±0.5                                    |
|  |          | Lead Length Number : Q              | 20.0±0.5                                    |
|  |          | Lead Length Number : P              | 18.5±0.5                                    |
| Protruding length                                      | l        | +0.5 to -1.0                        |   |
| Diameter of sprocket hole                              | D0       | ø4.0±0.1                            |   |
| Lead Diameter  | ød       | ø0.60                               |   |
| Total tape thickness                                   | t        | 0.7±0.2                             | Including bonding tape thickness            |
| Deviation across tape, Deviation across tape rear      | Δh1, Δh2 | 1.0 max.                            |   |
| Cutting position of failure                            | L        | 11.0 <sup>+0</sup> <sub>-1.0</sub>  |   |
| Hold down tape width                                   | W0       | 12.0±0.5                            |   |
| Hold down tape position                                | W2       | 1.5±1.5                             |   |

(in mm)

# Disc Type EMIFIL<sup>®</sup> and EMIGUARD<sup>®</sup> Packaging

## Minimum Quantity

| Part Number       | Minimum Order Quantity (order in sets only) (Pcs.) |                    |            |
|-------------------|--|--------------------|------------|
|                   | Ammo Pack  | ø320mm Paper reel  | Bulk (Bag) |
| VFR3V Series      | 2000   | —                  | 250        |
| DS□6/VFS6V Series | 2000   | —                  | 250        |
| DSN9/9H Series    | 2000   | —                  | 250        |
| DST9/9H Series    | 1000 <sup>*1</sup>                                 | 1000 <sup>*2</sup> | 200        |
| DSS9/9H Series    | —  | 800                | 200        |
| VFS9V Series      | —  | 800                | 200        |

\*1 : Q92, Q93 \*2 : Q91

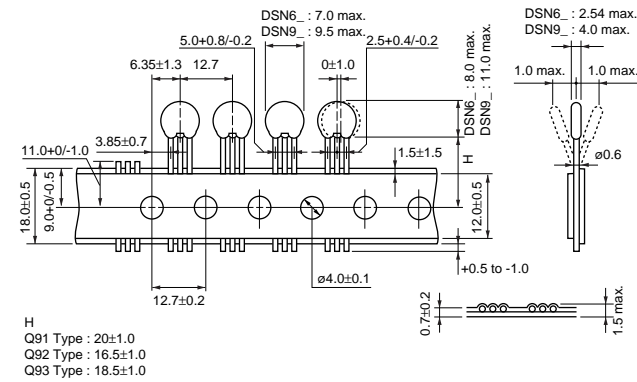
## Lead Type Code

| Lead Type code |              | Lead length (H) |
|----------------|--------------|-----------------|
| Straight Type  | Incrimp Type |                 |
| Q91            | -            | 20.0±1.0mm      |
| Q92            | U21          | 16.5±1.0mm      |
| Q93            | U31          | 18.5±1.0mm      |

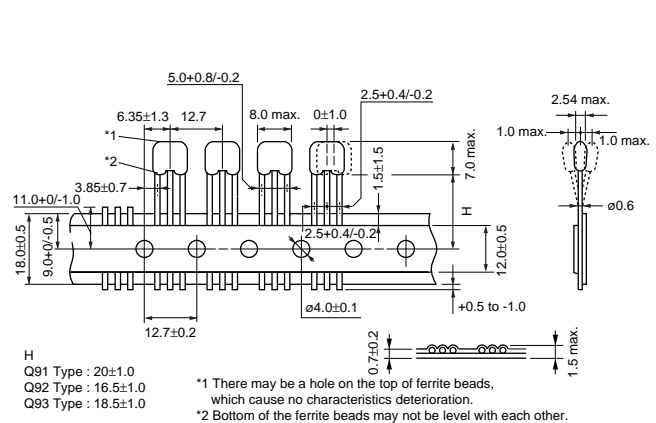
## Taping Dimensions

### DSN6\_Q91/Q92/Q93

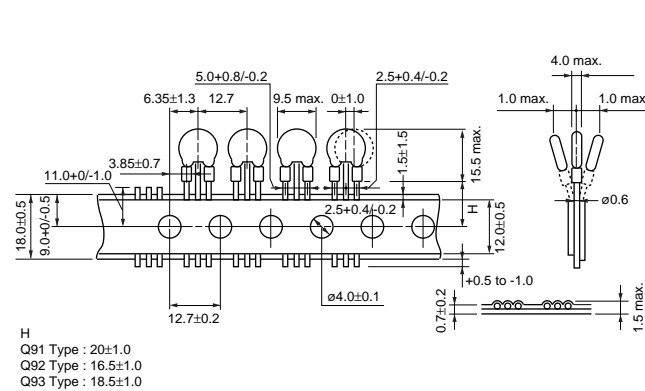
### DSN9\_Q91/Q92/Q93



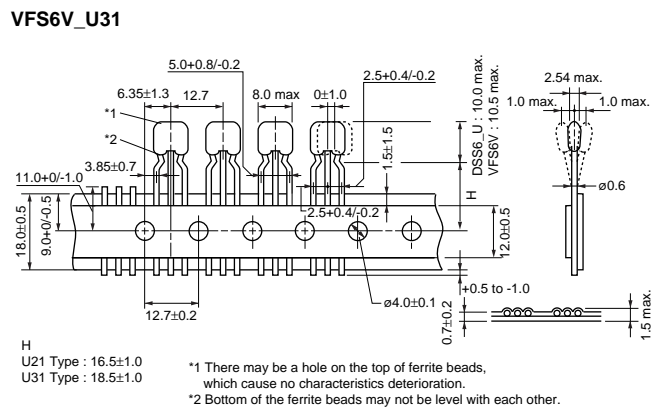
### DSS6\_Q91/Q92/Q93



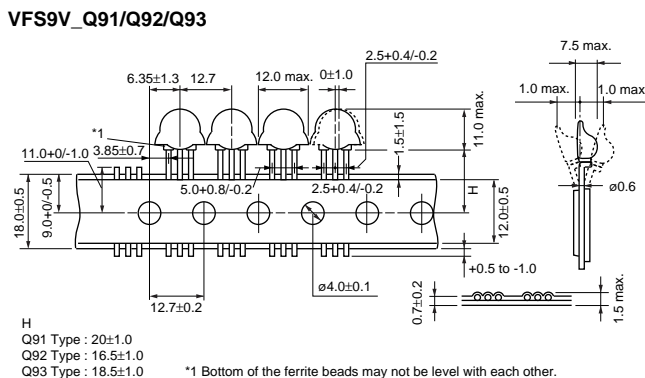
### DST9\_Q91/Q92/Q93



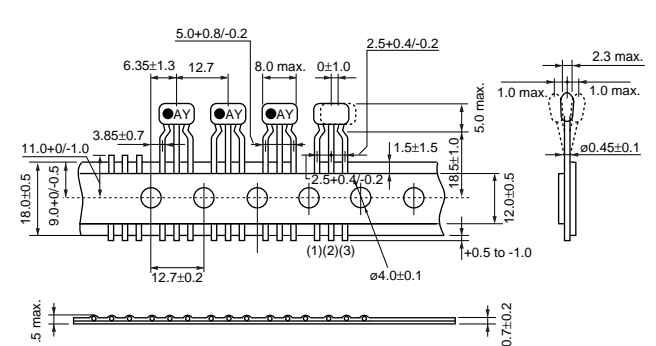
### DSS6\_U21/U31



### DSS9\_Q91/Q92/Q93

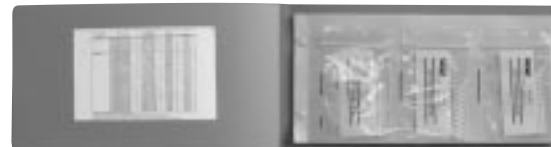


### VFR3V\_U31



(in mm)

## Chip EMI Suppression Filter Design Kits



### ●EKEMBL15C (Chip Ferrite Beads 0402 Size)

| No. | Part Number   | Quantity (pcs.) | Impedance typ.<br>(at 100MHz, 20 degree C) | Rated Current (mA) | DC Resistance (Ω) max. |
|-----|---------------|-----------------|--|--------------------|------------------------|
| 1   | BLM15AG100SN1 | 20              | 10Ω (Typ.)                                 | 1000               | 0.05                   |
| 2   | BLM15AG700SN1 | 20              | 70Ω (Typ.)                                 | 500                | 0.15                   |
| 3   | BLM15AG121SN1 | 20              | 120Ω±25%                                   | 500                | 0.25                   |
| 4   | BLM15AG221SN1 | 20              | 220Ω±25%                                   | 300                | 0.35                   |
| 5   | BLM15AG601SN1 | 20              | 600Ω±25%                                   | 300                | 0.60                   |
| 6   | BLM15AG102SN1 | 20              | 1000Ω±25%                                  | 200                | 1.00                   |
| 7   | BLM15BB050SN1 | 20              | 5Ω±25%                                     | 500                | 0.08                   |
| 8   | BLM15BB100SN1 | 20              | 10Ω±25%                                    | 300                | 0.10                   |
| 9   | BLM15BB220SN1 | 20              | 22Ω±25%                                    | 300                | 0.20                   |
| 10  | BLM15BB470SN1 | 20              | 47Ω±25%                                    | 300                | 0.35                   |
| 11  | BLM15BB750SN1 | 20              | 75Ω±25%                                    | 300                | 0.40                   |
| 12  | BLM15BB121SN1 | 20              | 120Ω±25%                                   | 300                | 0.55                   |
| 13  | BLM15BB221SN1 | 20              | 220Ω±25%                                   | 200                | 0.80                   |
| 14  | BLM15BD471SN1 | 20              | 470Ω±25%                                   | 200                | 0.60                   |
| 15  | BLM15BD601SN1 | 20              | 600Ω±25%                                   | 200                | 0.65                   |
| 16  | BLM15BD102SN1 | 20              | 1000Ω±25%                                  | 200                | 0.90                   |

### ●EKEMBL18A (Chip Ferrite Beads 0603 Size/ for Large-current P Type)

| No. | Part Number   | Quantity (pcs.) | Impedance typ.<br>(at 100MHz, 20 degree C) | Rated Current (mA) | DC Resistance (Ω) max. |
|-----|---------------|-----------------|--|--------------------|------------------------|
| 1   | BLM18AG121SN1 | 20              | 120Ω±25%                                   | 200                | 0.20                   |
| 2   | BLM18AG221SN1 | 20              | 220Ω±25%                                   | 200                | 0.30                   |
| 3   | BLM18AG471SN1 | 20              | 470Ω±25%                                   | 200                | 0.50                   |
| 4   | BLM18AG601SN1 | 20              | 600Ω±25%                                   | 200                | 0.50                   |
| 5   | BLM18AG102SN1 | 20              | 1000Ω±25%                                  | 100                | 0.70                   |
| 6   | BLM18BA050SN1 | 20              | 5Ω±25%                                     | 500                | 0.20                   |
| 7   | BLM18BA100SN1 | 20              | 10Ω±25%                                    | 500                | 0.25                   |
| 8   | BLM18BA220SN1 | 20              | 22Ω±25%                                    | 500                | 0.35                   |
| 9   | BLM18BA470SN1 | 20              | 47Ω±25%                                    | 300                | 0.55                   |
| 10  | BLM18BA750SN1 | 20              | 75Ω±25%                                    | 300                | 0.35                   |
| 11  | BLM18BA121SN1 | 20              | 120Ω±25%                                   | 200                | 0.90                   |
| 12  | BLM18BB100SN1 | 20              | 10Ω±25%                                    | 500                | 0.15                   |
| 13  | BLM18BB220SN1 | 20              | 22Ω±25%                                    | 500                | 0.25                   |
| 14  | BLM18BB470SN1 | 20              | 47Ω±25%                                    | 500                | 0.30                   |
| 15  | BLM18BB600SN1 | 20              | 60Ω±25%                                    | 200                | 0.35                   |
| 16  | BLM18BB121SN1 | 20              | 120Ω±25%                                   | 200                | 0.50                   |
| 17  | BLM18BB221SN1 | 20              | 220Ω±25%                                   | 200                | 0.65                   |
| 18  | BLM18BB471SN1 | 20              | 470Ω±25%                                   | 50                 | 1.00                   |
| 19  | BLM18BD121SN1 | 20              | 120Ω±25%                                   | 200                | 0.40                   |

## Chip EMI Suppression Filter Design Kits

Continued from the preceding page.

| No. | Part Number   | Quantity (pcs.) | Impedance typ.<br>(at 100MHz, 20 degree C) | Rated Current (mA) | DC Resistance (Ω) max. |
|-----|---------------|-----------------|--|--------------------|------------------------|
| 20  | BLM18BD221SN1 | 20              | 220Ω±25%                                   | 200                | 0.45                   |
| 21  | BLM18BD471SN1 | 20              | 470Ω±25%                                   | 200                | 0.55                   |
| 22  | BLM18BD601SN1 | 20              | 600Ω±25%                                   | 200                | 0.65                   |
| 23  | BLM18BD102SN1 | 20              | 1000Ω±25%                                  | 100                | 0.85                   |
| 24  | BLM18BD182SN1 | 20              | 1800Ω±25%                                  | 50                 | 1.50                   |
| 25  | BLM18BD252SN1 | 20              | 2500Ω±25%                                  | 50                 | 1.50                   |
| 26  | BLM18HG471SN1 | 20              | 470Ω±25%                                   | 200                | 0.85                   |
| 27  | BLM18HG601SN1 | 20              | 600Ω±25%                                   | 200                | 1.00                   |
| 28  | BLM18HG102SN1 | 20              | 1000Ω±25%                                  | 100                | 1.60                   |
| 29  | BLM18HD471SN1 | 20              | 470Ω±25%                                   | 100                | 1.20                   |
| 30  | BLM18HD601SN1 | 20              | 600Ω±25%                                   | 100                | 1.50                   |
| 31  | BLM18HD102SN1 | 20              | 1000Ω±25%                                  | 50                 | 1.80                   |
| 32  | BLM18PG330SN1 | 20              | 33Ω±25%                                    | 3000               | 0.025                  |
| 33  | BLM18PG121SN1 | 20              | 120Ω±25%                                   | 2000               | 0.05                   |
| 34  | BLM18PG181SN1 | 20              | 180Ω±25%                                   | 1500               | 0.09                   |
| 35  | BLM21PG221SN1 | 20              | 220Ω (Typ.)                                | 2000               | 0.05                   |
| 36  | BLM21PG331SN1 | 20              | 330Ω (Typ.)                                | 1500               | 0.09                   |
| 37  | BLM31PG121SN1 | 20              | 120Ω (Typ.)                                | 3000               | 0.025                  |
| 38  | BLM31PG391SN1 | 20              | 390Ω (Typ.)                                | 2000               | 0.05                   |
| 39  | BLM31PG601SN1 | 20              | 600Ω (Typ.)                                | 1500               | 0.9                    |
| 40  | BLM41PG181SN1 | 20              | 180Ω (Typ.)                                | 3000               | 0.025                  |
| 41  | BLM41PG471SN1 | 20              | 470Ω (Typ.)                                | 2000               | 0.05                   |
| 42  | BLM41PG102SN1 | 20              | 1000Ω (Typ.)                               | 1500               | 0.09                   |
| 43  | BLM18RK121SN1 | 20              | 120Ω±25%                                   | 200                | 0.25                   |
| 44  | BLM18RK221SN1 | 20              | 220Ω±25%                                   | 200                | 0.3                    |
| 45  | BLM18RK471SN1 | 20              | 470Ω±25%                                   | 200                | 0.5                    |
| 46  | BLM18RK601SN1 | 20              | 600Ω±25%                                   | 200                | 0.6                    |
| 47  | BLM18RK102SN1 | 20              | 1000Ω±25%                                  | 200                | 0.8                    |
| 48  | BLM18HK471SN1 | 20              | 470Ω±25%                                   | 200                | 0.7                    |
| 49  | BLM18HK601SN1 | 20              | 600Ω±25%                                   | 100                | 0.9                    |
| 50  | BLM18HK102SN1 | 20              | 1000Ω±25%                                  | 50                 | 1.5                    |

### ●EKEMBL21A (Chip Ferrite Beads 0805 Size)

| No. | Part Number   | Quantity (pcs.) | Impedance typ.<br>(at 100MHz, 20 degree C) | Rated Current (mA) | DC Resistance (Ω) max. |
|-----|---------------|-----------------|--|--------------------|------------------------|
| 1   | BLM21AG121SN1 | 20              | 120Ω±25%                                   | 200                | 0.15                   |
| 2   | BLM21AG221SN1 | 20              | 220Ω±25%                                   | 200                | 0.20                   |
| 3   | BLM21AG471SN1 | 20              | 470Ω±25%                                   | 200                | 0.25                   |
| 4   | BLM21AG601SN1 | 20              | 600Ω±25%                                   | 200                | 0.30                   |
| 5   | BLM21AJ601SN1 | 20              | 600Ω±25%                                   | 200                | 1.10                   |
| 6   | BLM21AG102SN1 | 20              | 1000Ω±25%                                  | 200                | 0.45                   |
| 7   | BLM21AH102SN1 | 20              | 1000Ω±25%                                  | 200                | 0.45                   |
| 8   | BLM21BB600SN1 | 20              | 60Ω±25%                                    | 200                | 0.20                   |
| 9   | BLM21BB750SN1 | 20              | 75Ω±25%                                    | 200                | 0.25                   |
| 10  | BLM21BB121SN1 | 20              | 120Ω±25%                                   | 200                | 0.25                   |
| 11  | BLM21BB221SN1 | 20              | 220Ω±25%                                   | 200                | 0.35                   |
| 12  | BLM21BB471SN1 | 20              | 470Ω±25%                                   | 200                | 0.45                   |
| 13  | BLM21BD121SN1 | 20              | 120Ω±25%                                   | 200                | 0.25                   |
| 14  | BLM21BD221SN1 | 20              | 220Ω±25%                                   | 200                | 0.25                   |
| 15  | BLM21BD471SN1 | 20              | 470Ω±25%                                   | 200                | 0.35                   |
| 16  | BLM21BD601SN1 | 20              | 600Ω±25%                                   | 200                | 0.35                   |
| 17  | BLM21BD102SN1 | 20              | 1000Ω±25%                                  | 200                | 0.40                   |

Continued on [www.DataSheet4U.com](http://www.DataSheet4U.com)

## Chip EMI Suppression Filter Design Kits

Continued from the preceding page.

| No. | Part Number          | Quantity (pcs.) | Impedance typ.<br>(at 100MHz, 20 degree C) | Rated Current (mA) | DC Resistance (Ω) max. |
|-----|----------------------|-----------------|--|--------------------|------------------------|
| 18  | <b>BLM21BD182SN1</b> | 20              | 1800Ω±25%                                  | 200                | 0.50                   |
| 19  | <b>BLM21BD222SN1</b> | 20              | 2250Ω (Typ.)                               | 200                | 0.60                   |
| 20  | <b>BLM21BD222TN1</b> | 20              | 2200Ω±25%                                  | 200                | 0.60                   |
| 21  | <b>BLM21BD272SN1</b> | 20              | 2700Ω±25%                                  | 200                | 0.80                   |

### ●EKEMFL18B (Chip EMIFIL LC Combined Type)

| No. | Part Number           | Quantity (pcs.) | Cut off Frequency | Rated Voltage | Rated Current | Insulation Resistance (MΩ min.) | DC Resistance max. |
|-----|-----------------------|-----------------|-------------------|---------------|---------------|---------------------------------|--------------------|
| 1   | <b>NFL18ST107X1C3</b> | 20              | 100MHz            | 16 V          | 100mA         | 1000                            | 4.5Ω               |
| 2   | <b>NFL18ST157X1C3</b> | 20              | 150MHz            | 16 V          | 100mA         | 1000                            | 4.0Ω               |
| 3   | <b>NFL18ST207X1C3</b> | 20              | 200MHz            | 16 V          | 150mA         | 1000                            | 3.5Ω               |
| 4   | <b>NFL18ST307X1C3</b> | 20              | 300MHz            | 16 V          | 200mA         | 1000                            | 1.8Ω               |
| 5   | <b>NFL18ST507X1C3</b> | 20              | 500MHz            | 16 V          | 200mA         | 1000                            | 1.5Ω               |
| 6   | <b>NFL18SP157X1A3</b> | 20              | 150MHz            | 10 V          | 100mA         | 1000                            | 3.0Ω               |
| 7   | <b>NFL18SP207X1A3</b> | 20              | 200MHz            | 10 V          | 100mA         | 1000                            | 3.0Ω               |
| 8   | <b>NFL18SP307X1A3</b> | 20              | 300MHz            | 10 V          | 100mA         | 1000                            | 3.0Ω               |
| 9   | <b>NFL18SP507X1A3</b> | 20              | 500MHz            | 10 V          | 100mA         | 1000                            | 2.0Ω               |
| 10  | <b>NFL21SP206X1C3</b> | 20              | 20MHz             | 16 V          | 100mA         | 1000                            | 8.5Ω               |
| 11  | <b>NFL21SP506X1C3</b> | 20              | 50MHz             | 16 V          | 150mA         | 1000                            | 3.5Ω               |
| 12  | <b>NFL21SP706X1C3</b> | 20              | 70MHz             | 16 V          | 150mA         | 1000                            | 3.0Ω               |
| 13  | <b>NFL21SP107X1C3</b> | 20              | 100MHz            | 16 V          | 200mA         | 1000                            | 2.0Ω               |
| 14  | <b>NFL21SP157X1C3</b> | 20              | 150MHz            | 16 V          | 200mA         | 1000                            | 2.0Ω               |
| 15  | <b>NFL21SP207X1C3</b> | 20              | 200MHz            | 16 V          | 250mA         | 1000                            | 1.5Ω               |
| 16  | <b>NFL21SP307X1C3</b> | 20              | 300MHz            | 16 V          | 300mA         | 1000                            | 1.2Ω               |
| 17  | <b>NFL21SP407X1C3</b> | 20              | 400MHz            | 16 V          | 300mA         | 1000                            | 1.2Ω               |
| 18  | <b>NFL21SP507X1C3</b> | 20              | 500MHz            | 16 V          | 300mA         | 1000                            | 1.2Ω               |

| No. | Part Number           | Quantity (pcs.) | Cut off Frequency | Attenuation (dB min.) |         |         |         |         |         |         |         |         |      | Rated Current | Rated Voltage |
|-----|-----------------------|-----------------|-------------------|-----------------------|---------|---------|---------|---------|---------|---------|---------|---------|------|---------------|---------------|
|     |                       |                 |                   | 10MHz                 | 20MHz   | 50MHz   | 100MHz  | 150MHz  | 200MHz  | 300MHz  | 400MHz  | 500MHz  | 1GHz |               |               |
| 19  | <b>NFW31SP106X1E4</b> | 20              | 10MHz             | 6dB max               | 5       | 25      | 25      | -       | 25      | -       | -       | 30      | 30   | 200mA         | 25V           |
| 20  | <b>NFW31SP206X1E4</b> | 20              | 20MHz             | -                     | 6dB max | 5       | 25      | -       | 25      | -       | -       | 30      | 30   | 200mA         | 25V           |
| 21  | <b>NFW31SP506X1E4</b> | 20              | 50MHz             | -                     | -       | 6dB max | 10      | -       | 30      | -       | -       | 30      | 30   | 200mA         | 25V           |
| 22  | <b>NFW31SP107X1E4</b> | 20              | 100MHz            | -                     | -       | -       | 6dB max | -       | 5       | -       | -       | 20      | 30   | 200mA         | 25V           |
| 23  | <b>NFW31SP157X1E4</b> | 20              | 150MHz            | -                     | -       | -       | -       | 6dB max | -       | 10      | 20      | 30      | 30   | 200mA         | 25V           |
| 24  | <b>NFW31SP207X1E4</b> | 20              | 200MHz            | -                     | -       | -       | -       | -       | 6dB max | -       | -       | 10      | 30   | 200mA         | 25V           |
| 25  | <b>NFW31SP307X1E4</b> | 20              | 300MHz            | -                     | -       | -       | -       | -       | -       | 6dB max | -       | 5       | 15   | 200mA         | 25V           |
| 26  | <b>NFW31SP407X1E4</b> | 20              | 400MHz            | -                     | -       | -       | -       | -       | -       | -       | 6dB max | -       | 10   | 200mA         | 25V           |
| 27  | <b>NFW31SP507X1E4</b> | 20              | 500MHz            | -                     | -       | -       | -       | -       | -       | -       | -       | 6dB max | 10   | 200mA         | 25V           |

### ●EKEMFA31B (Chip EMIFIL Capacitor Array Type/ Capacitor Type/ LC Combined Type)

| No. | Part Number           | Quantity (pcs.) | Capacitance | Rated Voltage | Rated Current | Insulation Resistance (MΩ min.) |
|-----|-----------------------|-----------------|-------------|---------------|---------------|---------------------------------|
| 1   | <b>NFA31CC220S1E4</b> | 20              | 22pF±20%    | 25 V          | 200mA         | 1000                            |
| 2   | <b>NFA31CC470S1E4</b> | 20              | 47pF±20%    | 25 V          | 200mA         | 1000                            |
| 3   | <b>NFA31CC101S1E4</b> | 20              | 100pF±20%   | 25 V          | 200mA         | 1000                            |
| 4   | <b>NFA31CC221S1E4</b> | 20              | 220pF±20%   | 25 V          | 200mA         | 1000                            |
| 5   | <b>NFA31CC471R1E4</b> | 20              | 470pF±20%   | 25 V          | 200mA         | 1000                            |
| 6   | <b>NFA31CC102R1E4</b> | 20              | 1000pF±20%  | 25 V          | 200mA         | 1000                            |
| 7   | <b>NFA31CC222R1E4</b> | 20              | 2200pF±20%  | 25 V          | 200mA         | 1000                            |
| 8   | <b>NFA31CC223R1C4</b> | 20              | 22000pF±20% | 16 V          | 200mA         | 1000                            |
| 9   | <b>NFA31GD1006R84</b> | 20              | 10pF±20%    | 6 V           | 50mA          | 1000                            |
| 10  | <b>NFA31GD1004704</b> | 20              | 10pF±20%    | 6 V           | 20mA          | 500                             |

## Chip EMI Suppression Filter Design Kits

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### ●EKEMFA31B (Chip EMIFIL Capacitor Array Type/ Capacitor Type/ LC Combined Type)

| No. | Part Number    | Quantity (pcs.) | Capacitance | Rated Voltage | Rated Current | Insulation Resistance (MΩ min.) |
|-----|----------------|-----------------|-------------|---------------|---------------|---------------------------------|
| 11  | NFA31GD1001014 | 20              | 10pF±20%    | 6 V           | 15mA          | 1000                            |
| 12  | NFA31GD4706R84 | 20              | 47pF±20%    | 6 V           | 50mA          | 1000                            |
| 13  | NFA31GD4704704 | 20              | 47pF±20%    | 6 V           | 20mA          | 1000                            |
| 14  | NFA31GD4701014 | 20              | 47pF±20%    | 6 V           | 15mA          | 1000                            |
| 15  | MFA31GD1016R84 | 20              | 100pF±20%   | 6 V           | 50mA          | 1000                            |
| 16  | NFA31GD1014704 | 20              | 100pF±20%   | 6 V           | 20mA          | 1000                            |
| 17  | NFA31GD1011014 | 20              | 100pF±20%   | 6 V           | 15mA          | 1000                            |

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### ●EKEMDL21C (Chip Common Mode Choke Coils)

| No. | Part Number   | Quantity (pcs.) | Common Mode Impedance typ. (at 100MHz, 20 degree C) | Rated Voltage | Rated Current | Insulation Resistance (MΩ min.) |
|-----|---------------|-----------------|---|---------------|---------------|---------------------------------|
| 1   | DLW21SN670SQ2 | 10              | 67Ω (Typ.)  | 50V           | 400mA         | 10                              |
| 2   | DLW21SN900SQ2 | 10              | 90Ω (Typ.)  | 50V           | 330mA         | 10                              |
| 3   | DLW21SN121SQ2 | 10              | 120Ω (Typ.)   | 50V           | 370mA         | 10                              |
| 4   | DLW21SN181SQ2 | 10              | 180Ω (Typ.)   | 50V           | 330mA         | 10                              |
| 5   | DLW21SN261SQ2 | 10              | 260Ω (Typ.)   | 50V           | 300mA         | 10                              |
| 6   | DLW21SN371SQ2 | 10              | 370Ω (Typ.)   | 50V           | 280mA         | 10                              |
| 7   | DLW31SN900SQ2 | 10              | 90Ω (Typ.)  | 50V           | 370mA         | 10                              |
| 8   | DLW31SN161SQ2 | 10              | 160Ω (Typ.)   | 50V           | 340mA         | 10                              |
| 9   | DLW31SN261SQ2 | 10              | 260Ω (Typ.)   | 50V           | 310mA         | 10                              |
| 10  | DLW31SN601SQ2 | 10              | 600Ω (Typ.)   | 50V           | 260mA         | 10                              |
| 11  | DLW31SN102SQ2 | 10              | 1000Ω (Typ.)  | 50V           | 230mA         | 10                              |
| 12  | DLW31SN222SQ2 | 10              | 2200Ω (Typ.)  | 50V           | 200mA         | 10                              |
| 13  | DLW5AHN402SQ2 | 5               | 4000Ω (Typ.)  | 50V           | 200mA         | 10                              |
| 14  | DLW5BSN302SQ2 | 5               | 3000Ω (Typ.)  | 50V           | 500mA         | 10                              |
| 15  | DLW5BSN152SQ2 | 5               | 1500Ω (Typ.)  | 50V           | 1000mA        | 10                              |
| 16  | DLW5BSN102SQ2 | 5               | 1000Ω (Typ.)  | 50V           | 1500mA        | 10                              |
| 17  | DLW5BSN351SQ2 | 5               | 350Ω (Typ.)   | 50V           | 2000mA        | 10                              |
| 18  | DLW5BSN191SQ2 | 5               | 190Ω (Typ.)   | 50V           | 5000mA        | 10                              |
| 19  | DLP31DN900ML4 | 10              | 90Ω±20%   | 10V           | 160mA         | 100                             |
| 20  | DLP31DN131ML4 | 10              | 130Ω±20%  | 10V           | 120mA         | 100                             |
| 21  | DLP31DN201ML4 | 10              | 200Ω±20%  | 10V           | 100mA         | 100                             |
| 22  | DLP31DN321ML4 | 10              | 320Ω±20%  | 10V           | 80mA          | 100                             |
| 23  | DLP31DN441ML4 | 10              | 440Ω±20%  | 10V           | 70mA          | 100                             |

### ●EKEMNFMPA

| No. | Part Number    | Quantity (pcs.) | Capacitance     | Rated Voltage | Rated Current | Insulation Resistance (MΩ min.) |
|-----|----------------|-----------------|-----------------|---------------|---------------|---------------------------------|
| 1   | NFM18PC104R1C3 | 20              | 0.1μF±20%       | 16 V          | 2A            | 1000                            |
| 2   | NFM18PC105R0J3 | 20              | 1μF±20%         | 6.3 V         | 2A            | 500                             |
| 3   | NFM21PC104R1E3 | 20              | 0.1μF±20%       | 25 V          | 2A            | 1000                            |
| 4   | NFM21PC224R1C3 | 20              | 0.22μF±20%      | 16 V          | 2A            | 1000                            |
| 5   | NFM21PC474R1C3 | 20              | 0.47μF±20%      | 16 V          | 2A            | 1000                            |
| 6   | NFM21PC105B1A3 | 20              | 1μF±20%         | 10 V          | 4A            | 500                             |
| 7   | NFM21PC105F1C3 | 20              | 1μF +80/-20%    | 16 V          | 2A            | 500                             |
| 8   | NFE31PT152Z1E9 | 20              | 1500pF +50/-20% | 25 V          | 6A            | 1000                            |
| 9   | NFE31PT222Z1E9 | 20              | 2200pF±50%      | 25 V          | 6A            | 1000                            |
| 10  | NFE61PT102E1H9 | 20              | 1000pF +80/-20% | 50 V          | 2A            | 1000                            |
| 11  | NFE61PT472C1H9 | 20              | 4700pF +80/-20% | 50 V          | 2A            | 1000                            |
| 12  | NFM41PC204F1H3 | 20              | 0.2μF +80/-20%  | 50 V          | 2A            | 1000                            |

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## Chip EMI Suppression Filter Design Kits

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●EKEMNFMCA

| No. | Part Number           | Quantity (pcs.) | Capacitance | Rated Voltage | Rated Current | Insulation Resistance (MΩ min.) |
|-----|-----------------------|-----------------|-------------|---------------|---------------|---------------------------------|
| 1   | <b>NFM18CC220U1C3</b> | 20              | 22pF±20%    | 16 V          | 300mA         | 1000                            |
| 2   | <b>NFM18CC470U1C3</b> | 20              | 47pF±20%    | 16 V          | 300mA         | 1000                            |
| 3   | <b>NFM18CC101R1C3</b> | 20              | 100pF±20%   | 16 V          | 300mA         | 1000                            |
| 4   | <b>NFM18CC221R1C3</b> | 20              | 220pF±20%   | 16 V          | 300mA         | 1000                            |
| 5   | <b>NFM18CC471R1C3</b> | 20              | 470pF±20%   | 16 V          | 300mA         | 1000                            |
| 6   | <b>NFM18CC102R1C3</b> | 20              | 1000pF±20%  | 16 V          | 300mA         | 1000                            |
| 7   | <b>NFM18CC222R1C3</b> | 20              | 2200pF±20%  | 16 V          | 300mA         | 1000                            |
| 8   | <b>NFM18CC223R1C3</b> | 20              | 22000pF±20% | 16 V          | 1000mA        | 1000                            |
| 9   | <b>NFM21CC220U1H3</b> | 20              | 22pF±20%    | 50 V          | 300mA         | 1000                            |
| 10  | <b>NFM21CC470U1H3</b> | 20              | 47pF±20%    | 50 V          | 300mA         | 1000                            |
| 11  | <b>NFM21CC101U1H3</b> | 20              | 100pF±20%   | 50 V          | 300mA         | 1000                            |
| 12  | <b>NFM21CC221R1H3</b> | 20              | 220pF±20%   | 50 V          | 300mA         | 1000                            |
| 13  | <b>NFM21CC471R1H3</b> | 20              | 470pF±20%   | 50 V          | 300mA         | 1000                            |
| 14  | <b>NFM21CC102R1H3</b> | 20              | 1000pF±20%  | 50 V          | 300mA         | 1000                            |
| 15  | <b>NFM21CC222R1H3</b> | 20              | 2200pF±20%  | 50 V          | 300mA         | 1000                            |
| 16  | <b>NFM21CC223R1H3</b> | 20              | 22000pF±20% | 50 V          | 2000mA        | 1000                            |



## Outlines of Major Noise Regulation Standards

### 1. EMI Regulations

| Equipment |   | Countries | Information Regulation   | Japan                                       | USA                                     | Europe   |
|-----------|---|-----------|--|---|---|--|
| Emission  | Generic Standard  |           | CISPR61000-6-3<br>(Residential, Commercial and Light Industry)<br>IEC61000-6-4<br>(Industrial) |   |   | EN50081-1<br>(Residential, Commercial and Light Industry)<br>EN50081-2<br>(Industrial) |
|           | ITE : Information Technology Equipment<br>Printer, Personal computer<br>Word processor, Display |           | CISPR 22   | VCCI<br>*1                                  | FCC Part 15<br>Subpart B                | EN55022  |
|           | ISM equipment, Microwave  |           | CISPR 11   | *1  | FCC Part 18                             | EN55011  |
|           | Igniter<br>(Automobile, Motorboat)  |           | CISPR 12   | JASO  | FCC Part 15<br>Subpart B                | Automotive<br>Directive  |
|           | TV, Radio, Audio, VTR   |           | CISPR 13   | *1  | FCC Part 15<br>Subpart B                | EN55013  |
|           | Household electrical equipment<br>Portable tool   |           | CISPR 14   | *1  |   | EN55014  |
|           | Fluorescent Lamp, Luminary  |           | CISPR 15   | *1  |   | EN55015  |
|           | Transceiver   |           | ITU-T  | Radio Act<br>ARIB<br>(Voluntary Regulation) | FCC Part 15<br>Subpart C<br>FCC Part 22 | ETS300 Series  |
|           | (Reference) Power Supply<br>Higher Harmonic   |           | IEC61000-3   | Industrial Voluntary<br>Regulation          |   | EN61000-3  |
| Immunity  | Basic Standard  |           | IEC61000-4   | In the process of<br>Regulating at JIS      |   | EN61000-4 Series   |
|           | Generic Standard  |           | IEC61000-6-1<br>(Residential, Commercial and Light Industry)<br>IEC61000-6-2<br>(Industrial)   | In the process of<br>Regulating at JIS      |   | EN50082-1<br>(Residential, Commercial and Light Industry)<br>EN50082-2<br>(Industrial) |
|           | Industrial Process Measurement and Control Equipment  |           |  | Industrial Voluntary<br>Action              |   |  |
|           | Radio, TV   |           | CISPR 20   |   |   | EN55020  |
|           | ITE : Information Technology Equipment  |           | CISPR 24   |   |   | EN55024  |

\*1 Electrical Appliance and Material Safety Law

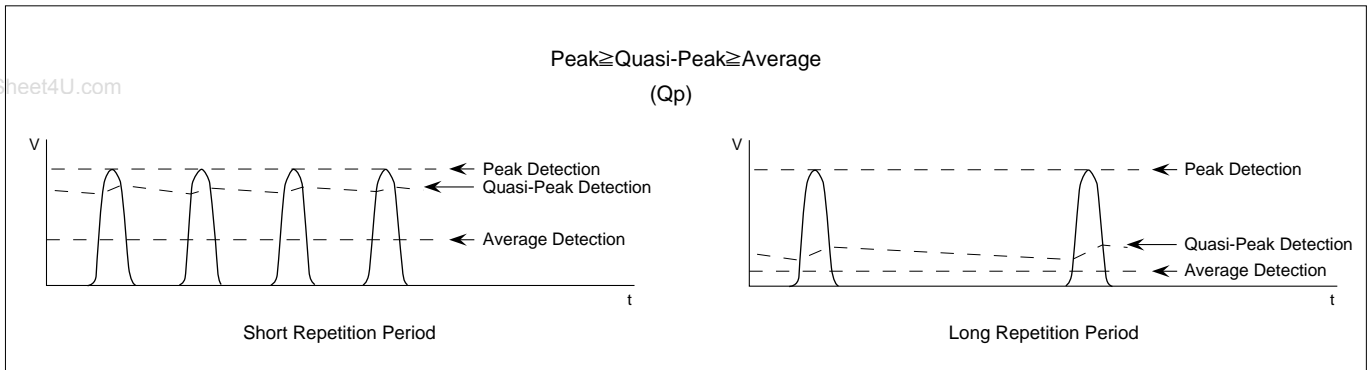
There are EMI regulations in each country to meet EMI noise levels emitted from digital equipment. In the countries which regulate EMI, equipment which does not satisfy with regulations is not allowed to be sold.

# 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 22/<br>EN55022 | Radiated Interference     | Horizontal Pol. Vertical Pol.    | 30M to 1GHz    | Quasi-Peak Detection                | Antenna                 |
|                      | Main Interference Voltage | AC Main Ports                    | 150k to 30MHz  | Quasi-Peak Detection Mean Detection | Artificial Main Network |
| VCCI                 | Radiated Interference     | Horizontal Pol. Vertical Pol.    | 30M to 1GHz    | Quasi-Peak Detection                | Dipole Antenna          |
|                      | Main Interference Voltage | AC Main Ports                    | 150k to 30MHz  | Quasi-Peak Detection Mean Detection | Artificial Main Network |
| FCC Part 15          | Radiated Interference     | Horizontal Pol. Vertical Pol.    | 30M to 40GHz   | Quasi-Peak Detection Mean Detection | Antenna                 |
|                      | Main Interference Voltage | AC Main Ports                    | 150k to 30MHz  | Quasi-Peak Detection                | Artificial Main Network |



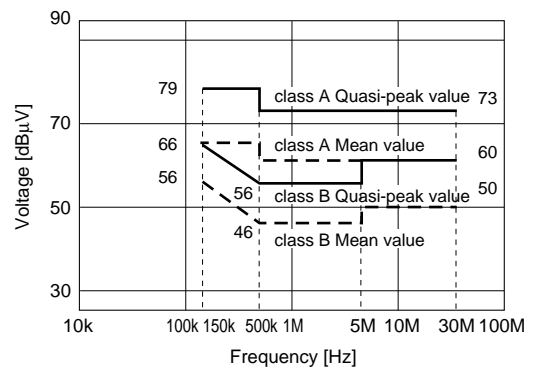
## 3. Limits of CISPR 22/EN55022

(1) CISPR 22 recommends measurement at 10m distance.  
However, other distance is acceptable if the limitation is converted according to the following calculation.  
Limitation shown left is converted to limitation for 3m

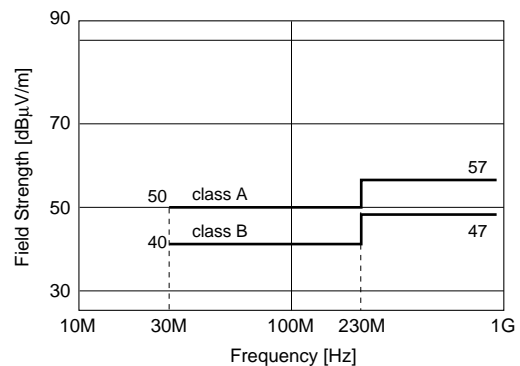
Conversion

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

[Main Terminal Interference Voltage (Power Supply)]



[Radiated Interference]



On the border frequency, lower limit should be applied.

Class A Equipment : The equipment which is used in light industrial commercial areas.

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

## Outlines of Major Noise Regulation Standards

☐ Continued from the preceding page.

### (2) Scope of CISPR 22 Regulation

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

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

### [CISPR Regulations]

- CISPR 10 Organization, Regulations and Procedures of CISPR
- CISPR 11 Industrial, Scientific and Medical (ISM) Radio-Frequency Equipment
- CISPR 12 Vehicles, Motor Boats and Spark-Ignited Engine driven
- CISPR 13 Sound and Television Receivers
- CISPR 14 Household Electrical Appliances, Portable Tools and Similar Electrical Apparatus
- CISPR 15 Fluorescent Lamps and luminaries
- CISPR 16 Radio Interference Measuring Apparatus and Measurement Methods
- CISPR 17 Passive Radio Interference Filters and Suppression Components
- CISPR 18 Power Transmission Cables and High Voltage equipment
- CISPR 19 Microwave Ovens for Frequencies above 1GHz
- CISPR 20 Immunity of Sound and TV Broadcast Receivers Receivers and Associated Equipment
- CISPR 21 Interference to Mobile Radiocommunications in the Presence of Impulsive Noise
- CISPR 22 Information Technology Equipment
- CISPR 23 Industrial Scientific and Medical (ISM) Equipment
- CISPR 24 Immunity Regulation of Information Technology Equipment
- CISPR 25 Receiver used on board vehicles, boats, and on devices

### 4. Limits of VCCI Voluntary Regulation

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

### (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 equipment:

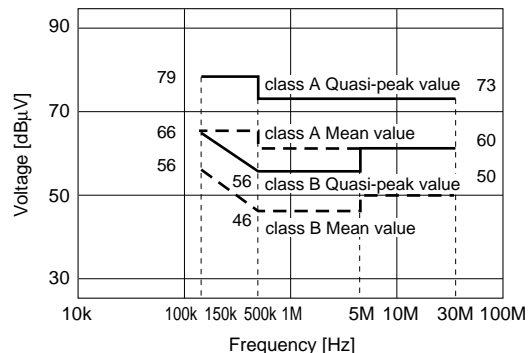
- Equipment for which other regulations already exist (e.g., household electrical appliances, radio and TV receivers)
- In station equipment principal purpose of which is electrical communication
- Industrial plant control system for which information processing is a secondary system function
- Industrial, 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.

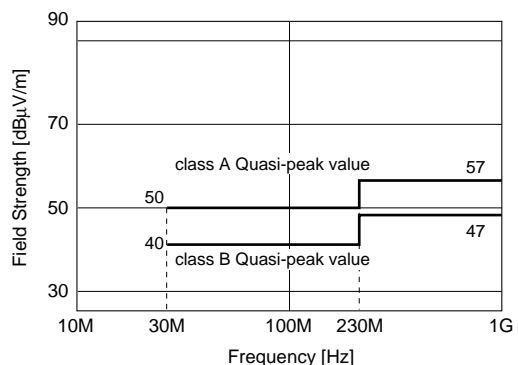
VCCI is organized by the following organizations:

- Japan Electronics and Information Technology Industries Association (JEITA)
- Japan Business Machine and Information System Industries Association (JBMIA)
- Communication and Information network Association of Japan (CIAJ)

### [Main Terminal Interference Voltage (Power Supply)]



### [Radiated Interference]



On the border frequency, lower limit should be applied.

Class B ITE : Equipment that designed to be used at home.  
Class A ITE : Equipment that does not meet interference limits of class B equipment, but satisfies interference limits of class A equipment.

Continued on the following page. ☐

## Outlines of Major Noise Regulation Standards

☐ Continued from the preceding page.

### 5. Limits of FCC Part 15 Subpart B

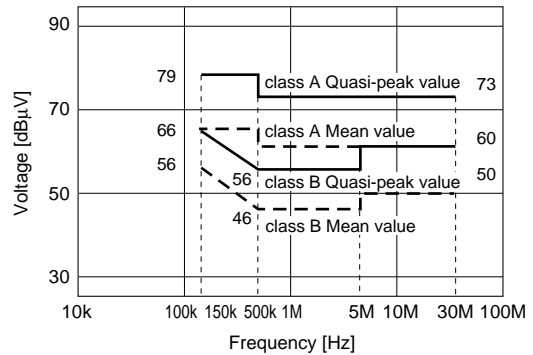
- (1) Class A recommend to be measured with 10m distance.  
Class B recommend to be measured with 3m distance.
- (2) The FCC Part 15 regulation controls radiated interference by establishing quasi-peak and mean value limits for frequencies ranging from 30MHz to 40GHz (or maximum frequency's fifth harmonic,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

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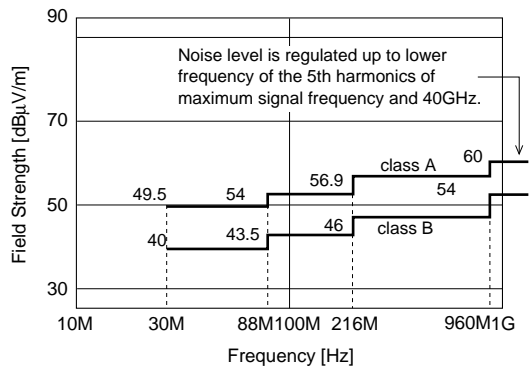
#### Measurement Frequency Range for Radiated Interference

| Maximum Frequency the Equipment Internally Generates, Uses or Operates or Synchronizes (MHz) | Upper End of Measurement Frequency Range (MHz)                  |
|--|---|
| 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 |

#### [Main Terminal Interference Voltage (Power Supply)]



#### [Radiated Interference]



On the border frequency, lower limit should 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 power interference.

#### [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

☐ Continued from the preceding page.

### 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 directives such as EMC directives. For Information Technology Equipment, in EMC directive, emission 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<br>92/31/EEC |
| Low-Voltage Electrical Products Directive | 73/23/EEC               |
| Machines Directive                        | 89/392/EEC              |

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### 7. Immunity Regulations in Japan

| Equipment                              | Association  |
|--|--|
| TV, Radio, Audio                       | JEITA (Japan Electronics and Information Technology)   |
| ITE                                    |  |
| Office Machine                         | JBMA (Japan Business Machine and Information System Industries Association)  |
| Mi                                     | CIAJ (Communication and Information network Association of Japan)<br>ARIB (Association of Radio Industries and Business) |
| Machine To Builders                    | JMTBA (Japan Machine Tool Builders' Association)   |
| Industrial Measuring Control Equipment | JEMIMA (Japan Electric Measuring Instruments Manufacturers' Association)   |
| Industrial Robot                       | JARA (Japan Robot Association)   |

The table on the right shows the preparation situation of JIS for EMC. At this moment, the immunity standards by JIS does not have a legal force like Electrical Application and Material Safety Law/VCCI.

| Classification   | Information Regulation          | JIS               |
|------------------|---------------------------------|-------------------|
| Terms            | ISO60050-161<br>(IEV terms 161) | JIS C 0161        |
| Basic Standard   | IEC61000-4- 2                   | JIS C 1000-4-2    |
|                  | IEC61000-4- 3                   | JIS C 1000-4-3    |
|                  | IEC61000-4- 4                   | JIS C 1000-4-4    |
|                  | IEC61000-4- 5                   | JIS C 1000-4-5    |
|                  | IEC61000-4- 6                   | JIS C 1000-4-6    |
|                  | IEC61000-4- 7                   | JIS C 1000-4-7    |
|                  | IEC61000-4- 8                   | Under preparation |
|                  | IEC61000-4-11                   |                   |
|                  | IEC61000-4-14                   |                   |
|                  | IEC61000-4-17                   |                   |
| Generic Standard | IEC61000-6-1                    | Under preparation |
|                  | IEC61000-6-2                    |                   |

# 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).

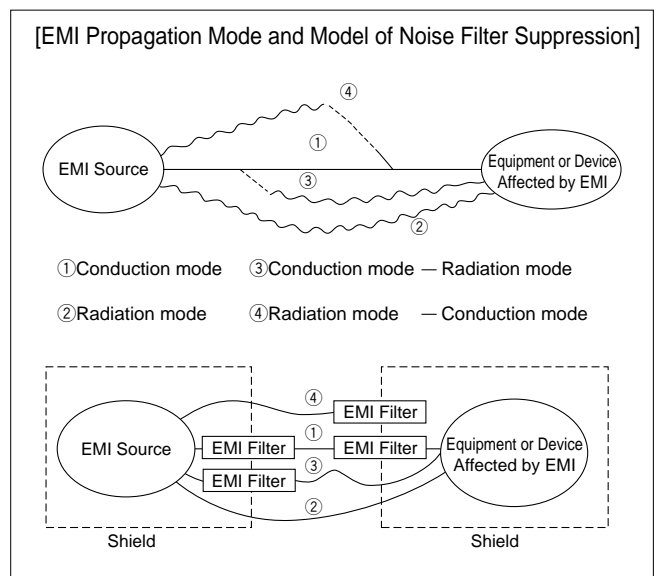
## 2. Noise Filter Suppression Principles

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 Figure at right, 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.

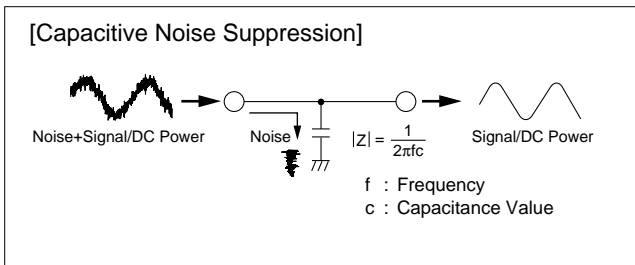
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## Noise Suppression Principles by DC EMIFIL<sup>®</sup>

☐ Continued from the preceding page.

### 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.

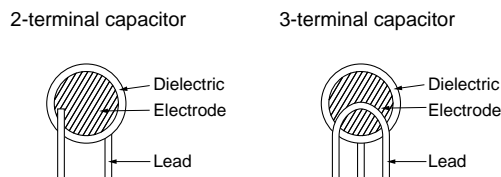


### 5. High frequency Capacitor Characteristics Used for EMI Suppression Filters

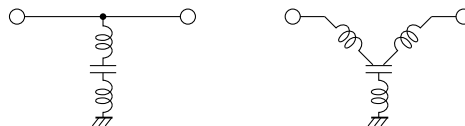
Even general-purpose capacitors can be used for noise suppression. However, since noise has an extremely high frequency range, general-purpose capacitors may not function as effective bypass capacitors, due to the large residual inductance built into the capacitor. All the capacitors used in MURATA's 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.)

[Equivalent circuit of general-purpose capacitor and 3 terminal capacitor in the high frequency area and comparison of insertion loss]

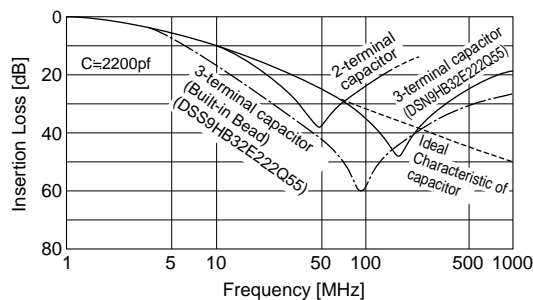
(a) Construction of capacitor



(b) Equivalent circuit of capacitors which is concerning ESL effect.

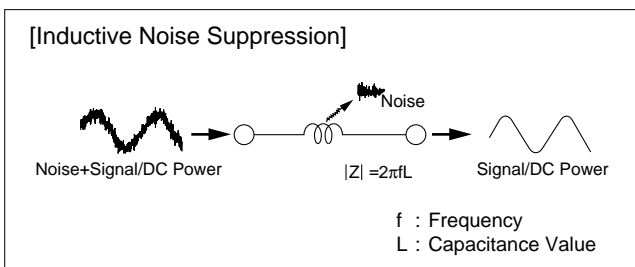


(c) Improvement of Insertion Loss Characteristics



### 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.



Continued on the following page. ☐

## Noise Suppression Principles by DC EMIFIL®

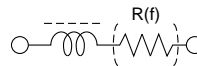
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### 7. Characteristics of Inductors Used in EMI Suppression Filters

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).

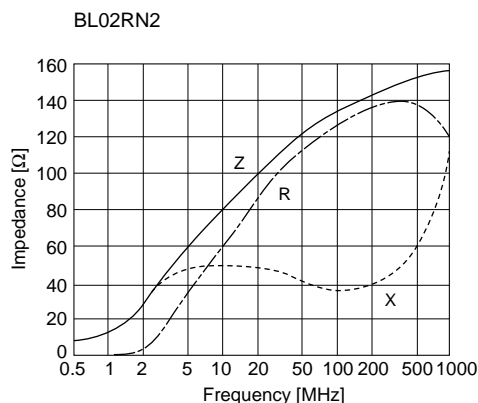
The inductors used for MURATA's EMI suppression filters are designed to function nearly as a resistor at noise frequencies, which greatly reduces the possibility of resonance and leaves signal wave forms undistorted. And since sufficient impedance is obtained for frequencies ranging to hundreds of MHz, 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 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 (EMIGUARD®) 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.

Continued on the following page. ☐➤



## Noise Suppression Principles by DC EMIFIL<sup>®</sup>

☑ Continued from the preceding page.

### 10. Expressing EMI Suppression Filter Effects

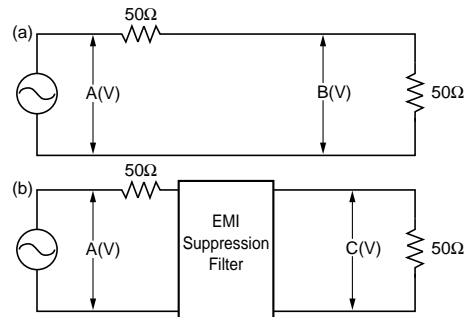
EMI Suppression Filter effects are expressed in terms of the insertion loss measured in the circuit, normally specified in MIL-STD 220A. As shown in the 50Ω impedance circuit in the Figure at right, insertion loss is represented by the logarithmic ratio of the circuit output voltage with and without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

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

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[Measuring Circuit of Insertion Loss]

Measuring Circuit of Insertion Loss



$$\text{Insertion Loss} = 20 \log \frac{B}{C} \text{ (dB)}$$

# Murata EMI Filter Selection Simulator Ver.2.5.0

— Recommended Chip Ferrite Beads Search procedure has been added —

**1 Select circuit.**

(Select a new simulation circuit from File menu.)

**2 Enter "Input Signal".**

**3 Set Driver IC.**

**4 Select filter.**

(EMI filters or/and chip capacitor from the pull-down list.)

**5 Set Transmission Line.**

**6 Set Receiver IC.**

**7 Click measuring point.**

(Only for chip ferrite bead)

**8 Click "Start Simulation" button.**

**9 Simulation results are displayed.**

- Simulation results with various charts are quickly displayed on your PC.
- Results can be displayed in standard format or user defined scaling.
- Simulates various types of circuit such as Differential Mode Transmission, ceramic capacitor, EMIFIL® three terminal capacitor AND chip ferrite beads.
- Provides a simulation function that select best suited Chip Ferrite Beads.

**1 Select circuit.**

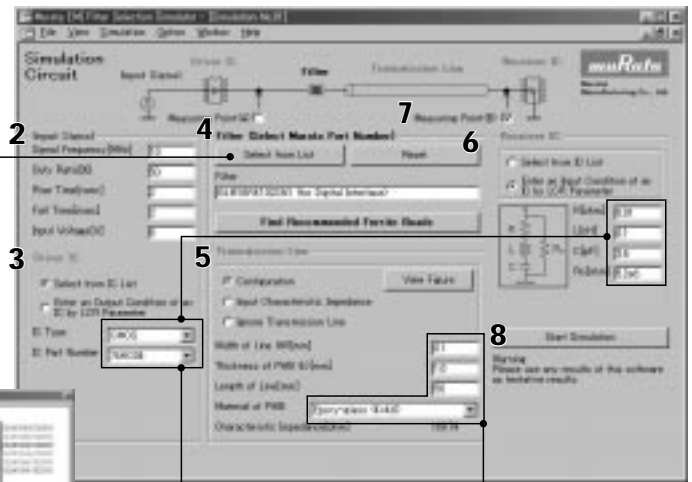
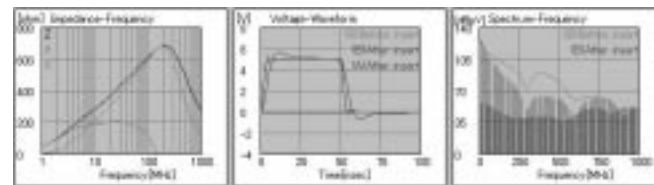


Select a new simulation circuit from File menu.

**4 Filters can be selected from "frequency-impedance characteristics" charts.**



**9 Simulation results are shown in the window.**



**Two ways of setting the driver/receiver IC parameter**  
The logic IC of TTL and CMOS can be selected from pull-down list or the LCR values can also be created.

**Impedance automatically calculated.**  
Impedance characteristics of transmission line are automatically calculated.

**Find Recommended Ferrite Beads NEW**

The software will recommend the most appropriate ferrite beads solution based on specified search condition.

The recommended parts will be displayed along with electrical characteristics, the voltage waveform and spectrum chart.

EMIFIL® is the trademark of Murata Manufacturing Co., Ltd.

This simulator can be downloaded from Murata web site.

<http://www.murata.com/emi/>

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  - 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
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**Head Office**  
2-26-10, Tenjin Nagaokakyo-shi, Kyoto 617-8555, Japan Phone: 81-75-951-9111

**International Division**  
3-29-12, Shibuya, Shibuya-ku, Tokyo 150-0002, Japan [www.DataSheet4U.com](http://www.DataSheet4U.com)  
Phone: 81-3-5469-6123 Fax: 81-3-5469-6155 E-mail: [intl@murata.co.jp](mailto:intl@murata.co.jp)