

3 How to Select and Use EMI Suppression Filters

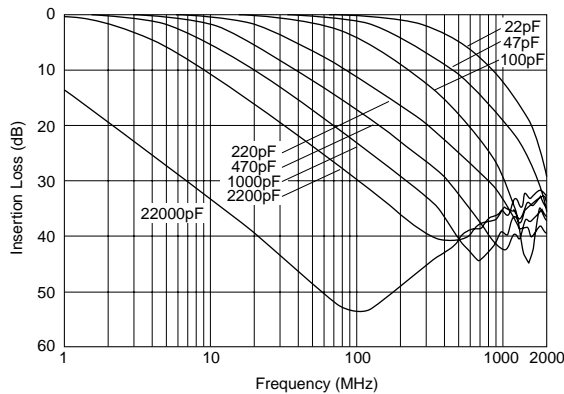
3.1 Relation between EMI Filter's Noise Suppression Performance and Signal Waveform Distortion

Relation between EMI Filter's Noise Suppression Performance and Signal Waveform Distortion (1)

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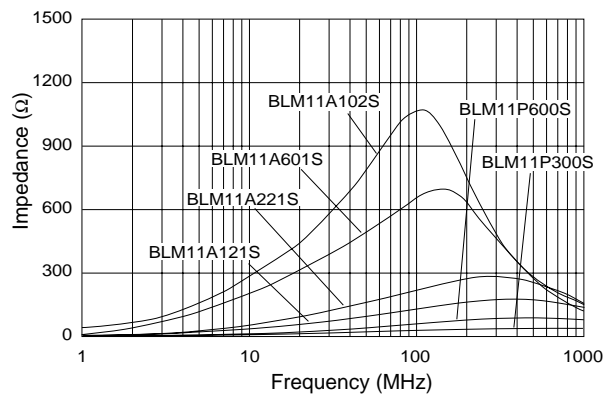
■ Example of Capacitor Type EMI Suppression Filter's Insertion Loss

**Chip Three-terminal Capacitor
(Chip solid EMI FILTER NFM39R Series)**



■ Example of Inductor Type EMI Suppression Filter's Impedance Characteristic

**Chip Ferrite Bead Inductor
(BLM11A/P Series)**



In addition to suppressing noise, EMI filters may cause distortion of signal waveform. Attention must be paid to this item, to ensure signal integrity.

When the capacitance value of three-terminal capacitor is increased, impedance of inductor is raised, or cutoff frequency of EMI suppression filter for signal lines is lowered, the noise suppression performance is increased but the distortion of signal waveform also increases. Murata has a series of EMI filter products, allowing the selection of the correct one for each specific application.

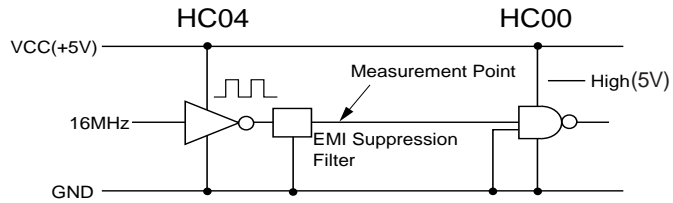
[Memo]

3 How to Select and Use EMI Suppression Filters

3.1 Relation between EMI Filter's Noise Suppression Performance and Signal Waveform Distortion

Relation between EMI Filter's Noise Suppression Performance and Signal Waveform Distortion (2)

■ Test Circuit



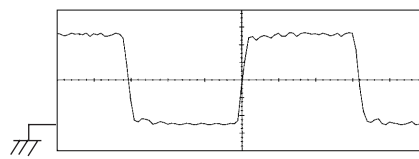
■ Relation between EMI Suppression Filter's Noise Suppression Performance and Signal Waveform Rounding

[EMI Suppression Filter]

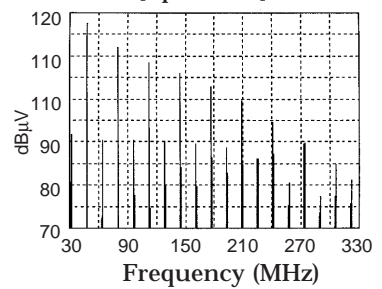
[Signal Waveform]

[Spectrum]

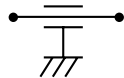
No Filter



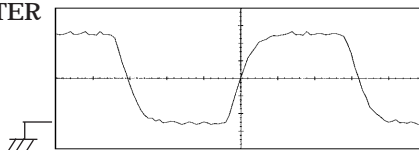
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V: 1V/div



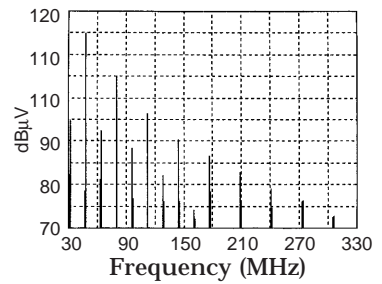
Chip Solid EMI FILTER



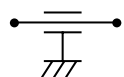
NFM39R02C470
(47pF)



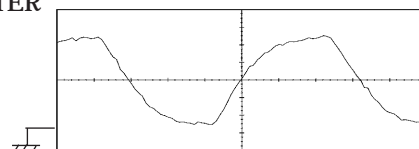
H: 10ns/div
V: 1V/div



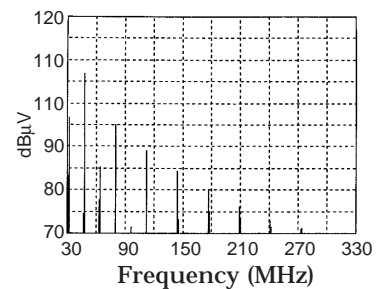
Chip Solid EMI FILTER



NFM39R02C101
(100pF)



H: 10ns/div
V: 1V/div



[Memo]

Waveforms and spectrum distributions are shown above when EMI suppression filters are used. The above data clearly shows that EMI suppression filter causes distortion of waveform and suppresses noise causing higher harmonic components. In the case of Chip Solid EMI Filter, the principal type of three-terminal capacitor, larger the capacitance, the more waveform distortion occurs while reducing noise levels.

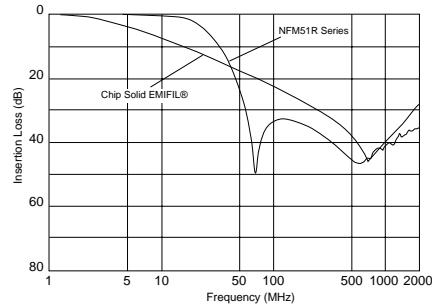
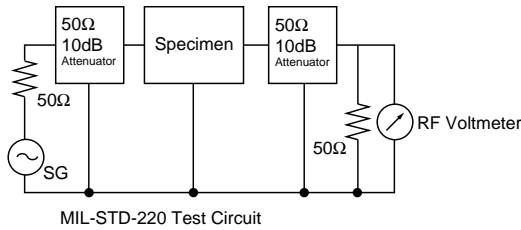
3 How to Select and Use EMI Suppression Filters

3.1 Relation between EMI Filter's Noise Suppression Performance and Signal Waveform Distortion

Relation between EMI Filter's Noise Suppression Performance and Signal Waveform Distortion (3)

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■ EMI Suppression Filter's Insertion Loss Characteristic

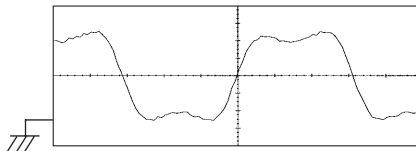


[EMI Suppression Filter]

EMI Suppression Filter for Signal Lines

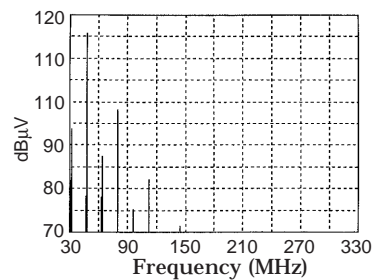
30Ω+NFM51R00P506
(Cutoff frequency: 50 MHz)

[Signal Waveform]

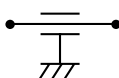


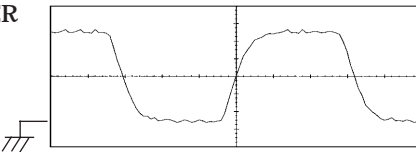
H: 10ns/div
V: 1V/div

[Spectrum]

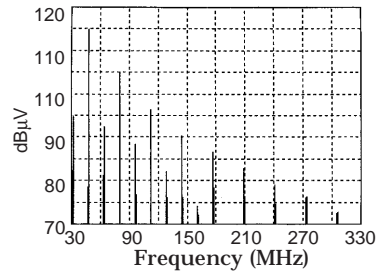


Chip Solid EMI FILTER

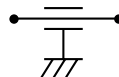

NFM39R02C470
(47pF)

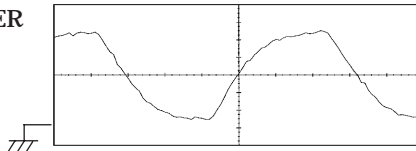


H: 10ns/div
V: 1V/div

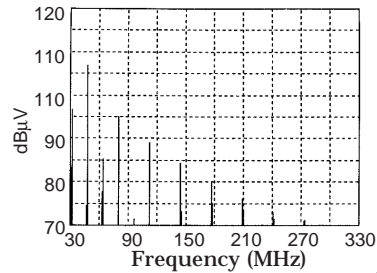


Chip Solid EMI FILTER


NFM39R02C101
(100pF)



H: 10ns/div
V: 1V/div



High-frequency signals contain high level harmonics up to the very high frequency range, causing it to generate noise. The higher the signal frequency, the closer the signal and noise frequencies become. A line that carries such signal requires an EMI suppression filter that has good noise suppression capability with sharp frequency cutoff characteristic.

[Memo]