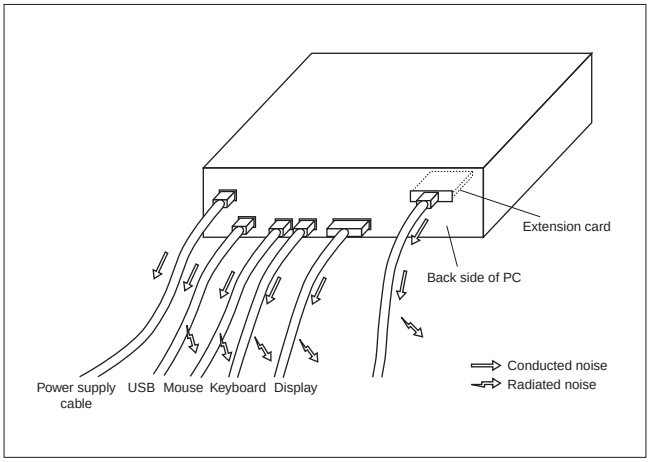
1 Example of Noise Suppression in Desktop PCs

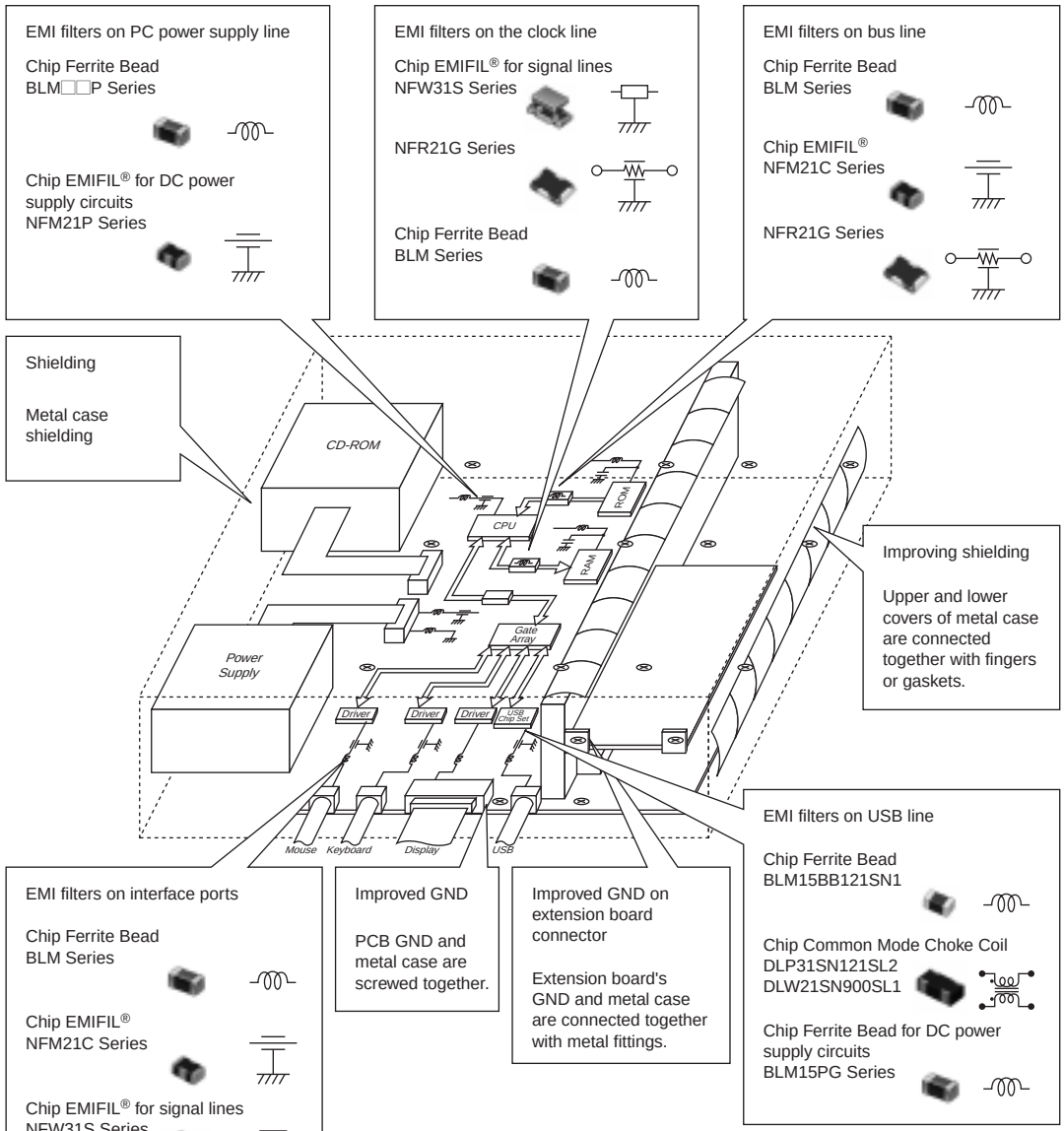
Noise Emission Status :
Noise is emitted from the cables connected to a personal computer.

When using a computer case that does not have efficient shielding, radiated noise from the computer body may sometimes cause problems.



Noise Suppression Content in Personal Computers

A PC contains many sources of noise inside and out, with many connected cables. Therefore, it is necessary to use EMI filters on the interface cables, in addition to shielding and improving GND connections.
The PCB incorporates many signal lines that contain high-level noise. The EMI filters should also be mounted on potential noise sources such as the clock line, bus line and DC power supply line, to suppress noise conduction to the cable.



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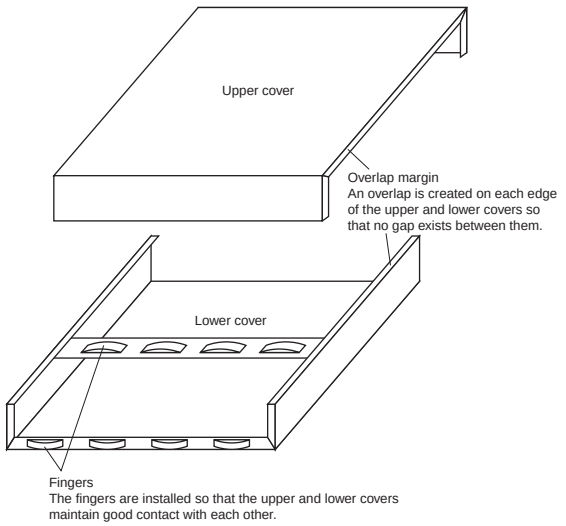
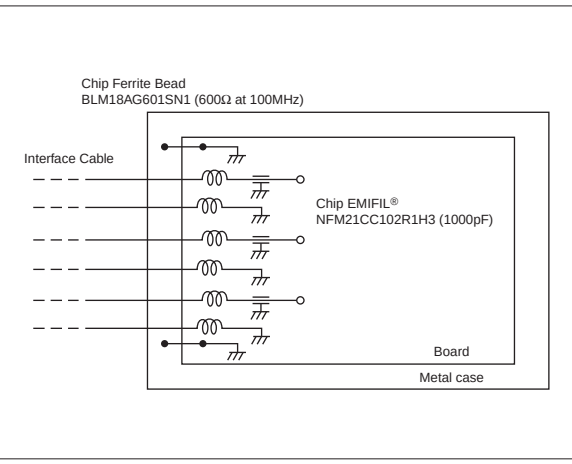
Improving Shielding

Parts of the metal case make contact with each other by surface contact, where fingers and gaskets are used where necessary to minimize the impedance of contact points at high frequencies. Overlaps should be provided for each edge of upper and lower covers to eliminate any gaps between the covers.



Installing EMI filters on Interface Cable Ports

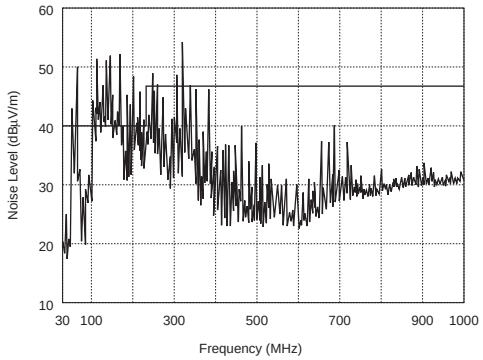
On the interface cable connection, three terminal capacitor NFM21C series, and Chip Ferrite Bead BLM series are used together to achieve better noise suppression. In some cases, the EMIFIL® for signal lines is used. It is important to design the circuitry to minimize the high frequency impedance between the EMI filter's GND (of circuit board) and the metal case.



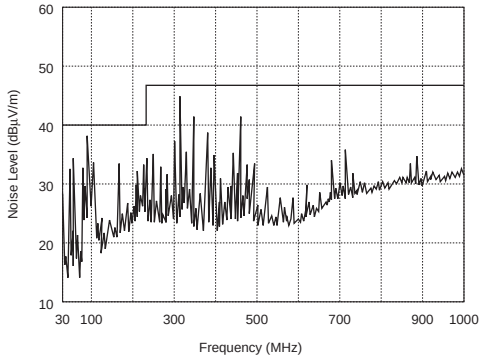
Example of effects produced when improving the GND and installing EMI filters on the cable connector port

In the data above the GND is improved by increasing the number of connection points between the board and chassis, and then an EMI filter, NFM21CC222R1H3 is installed on the cable. This suppresses the noise level by 10dB.

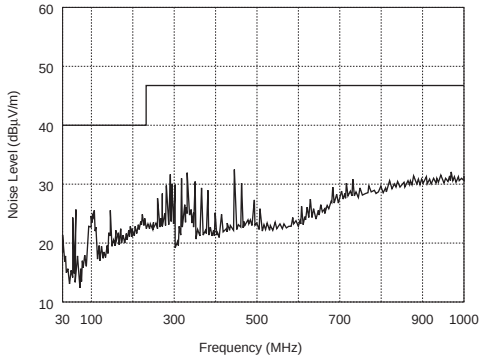
Before improving the GND



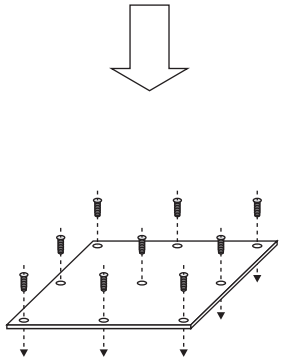
After improving the GND



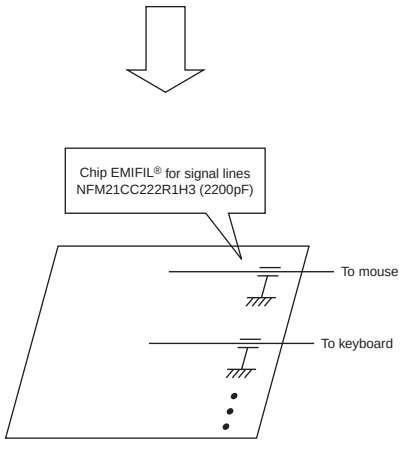
Installing an EMI filter on the cable connector port



Before improving the GND



After improving the GND



Installing an EMI filter on the cable connector port

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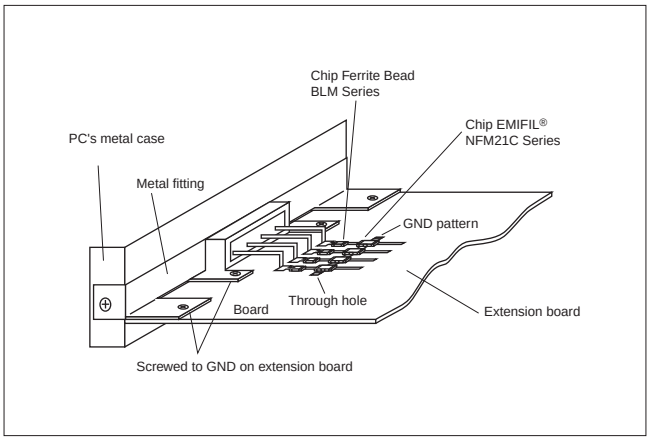
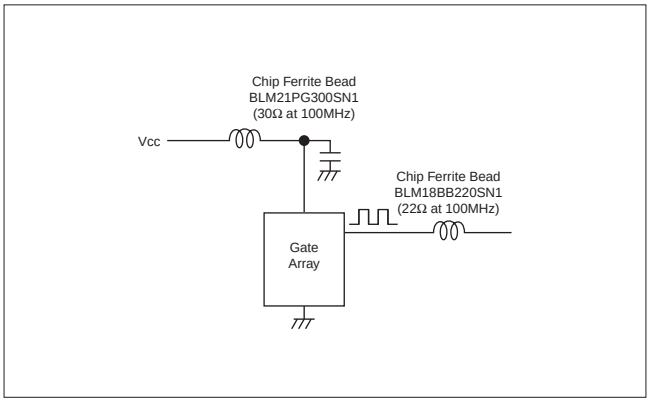
Improving the GND on Extension Boards

In case of installing an extension board with a cable, noise may conduct to the cable when GND noise level is high. This results in high-level noise radiation from the cable. Therefore, the board's GND must be stabilized by connecting the GND with the metal fitting (which is connected to the metal case of the personal computer) with screws so that high frequency impedance is low. In addition, EMI filters are installed on the cable connector port.



Installing EMI filters on the Clock Lines

High frequency clock signals generate high frequency noise. Noise and signal frequencies may be close to each other. Therefore, an EMI filter with high and steep attenuation is used such as the NFW31S series (Chip EMIFIL® for signal lines), or the BLM□□B series (Chip Ferrite Bead for high-speed signal lines).
Noise caused by transient currents is also generated on the power supply line. Therefore, a chip ferrite bead is installed, as well as a by-pass capacitor, to suppress noise on the power supply line.



Installing EMI filters on Bus Lines

Bus lines contain many lines that switch on and off simultaneously. Especially on data and address bus lines, an instantaneous large current flows into the GND and power supply lines. Therefore, it is necessary to suppress the current flow on the signal lines. The BLM series (Chip Ferrite Bead) is generally used for this purpose.
On the control bus line, especially at high operating speeds and high noise levels, a filter with resistance components is used, such as the NFR21G series (Chip EMIFIL®).