



Primary EMI Filtration of Telecomms, VME and VXI Racks

Overview

Consider rack systems used in many electronic applications, they will be found in Telecom Systems, VME and VXI systems to name a few.

A common rack exists in which various PCBs slot into and connect onto a backplane connector, which is mounted on a backplane PCB.

The backplane allows interconnection between the various PCB's and then interfaces these to other peripheral systems.

It is usual for such rack systems to have a common power supply to provide power to all of the PCB's in the rack. The common voltage will be in the region of +5V to +12V and if other voltages are required on individual PCB's, they can be met with the use of step up or step down DC-DC converters.

Application

The common voltage supplied to the rack system will vary in current depending on the power requirement of the system.

Typically, this common voltage will be supplied by a switch mode power supply switching at 300KHz to 800KHz with typical output currents of 10A, 20A, 30A or 40A.

The nature of a switch mode power supply can create switching noise on the output voltage. If the power supply is switching at 600KHz, there can be harmonics of this 600KHz on the DC output voltage, e.g. an 11th harmonic of the 600KHz fundamental could exist as a 6.6MHz conducted EMI signal.

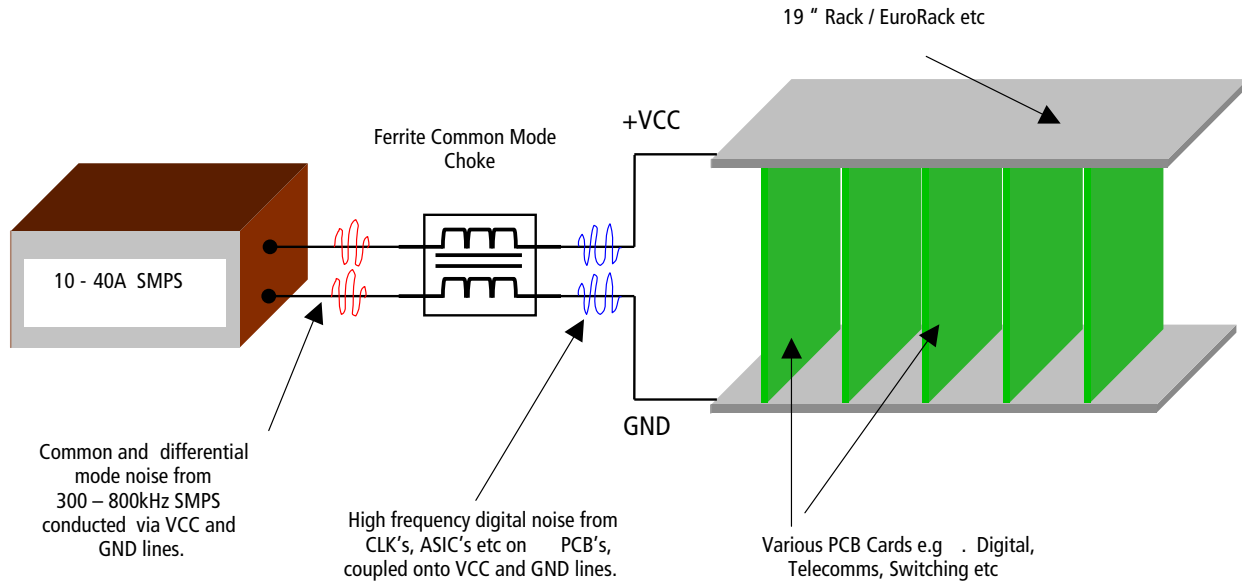
Within the Rack System the PCBs will have different functions and different technologies, however it will be certain that there will be high speed Clocks, PLLs and high frequency data signaling within the PCBs. Given the probability that high frequency EMI signals will be generated within these PCBs, then it follows that this high frequency EMI can be coupled onto the DC voltage from the switch mode power supply.

On the common DC voltage there is now the possibility of switching noise from the SMPS and high frequency noise from the PCB's.

The noise present on the DC voltage is likely to be both differential mode and common mode in nature.

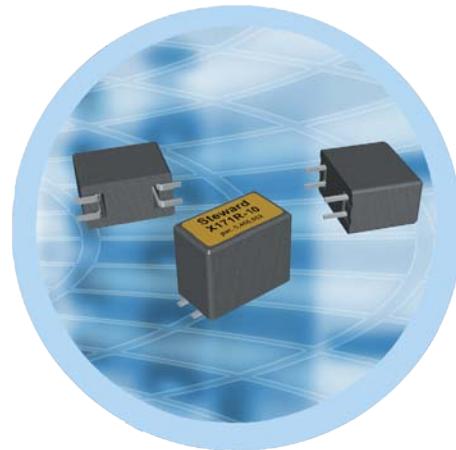
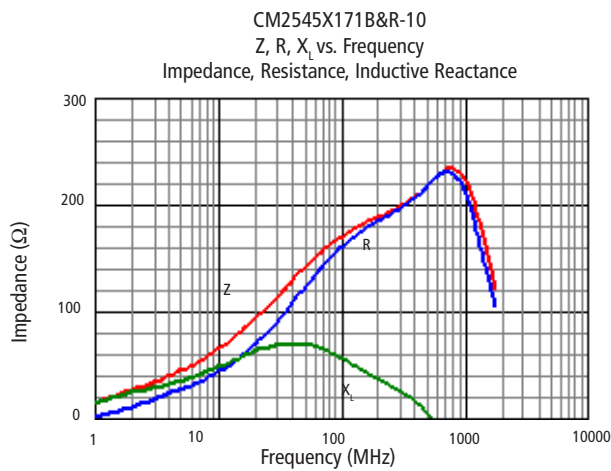
The solution is to use a broad band frequency response common mode choke as shown in the diagram.

The ideal location of the choke within the system is a direct connection on the backplane PCB of the rack.

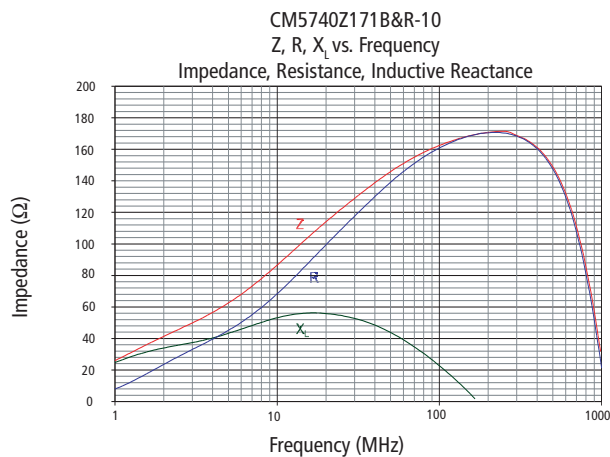


With a broad band ferrite common mode choke in place the effects of a high current are negated and thus saturation of the choke is not an issue.

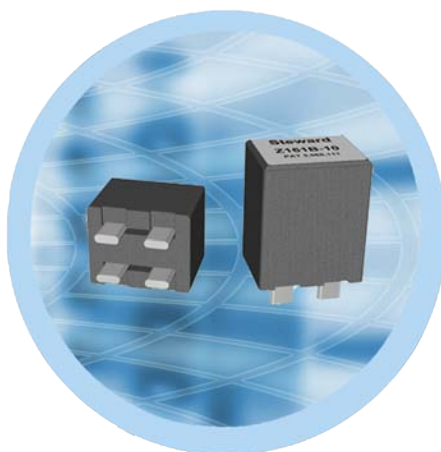
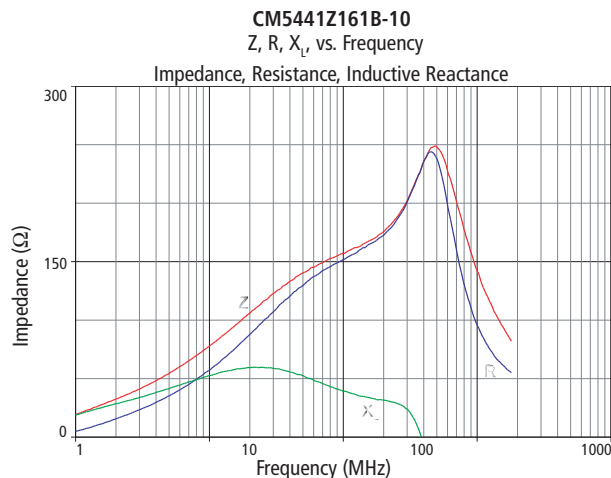
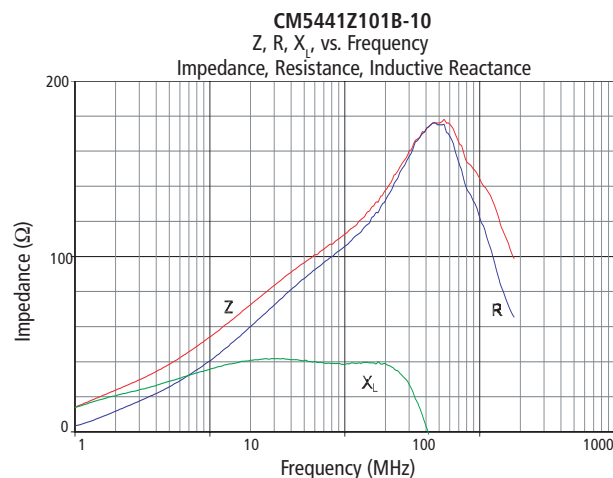
For 10A systems use Laird Technologies' part CM2545X171B/R-10



For up to 20A systems use Laird Technologies' part CM3440Z171B/R-10 or CM5740Z171B/R-10*



For up to 40A systems use Laird Technologies' parts CM5441Z101B-10 or CM5441Z161B-10, the choice of which part depending on the impedance frequency response required.



From the graphs above it can be seen that part CM5441Z161B-10 offers a broad band frequency response with over 50 ohms from 6MHz to greater than 1000MHz.

*CM5740Z171B/R-10 is a 4 channel common mode choke array and can be used for dual output voltage systems for V1 & GND and V2 & GND. It can also be wired in a multi-turn configuration, where the output of one signal pair is fed back into the input of the adjacent signal pair to give a multiplication of the fundamental impedance.

