2kV single stage SiC Based Solar Power Converter

Technical Assistant Request

In designing a high frequency, high voltage in the range of 20-50 kHz, transfomerless inverters and converters, present significant technical challenges. Even though faster switching capabilities of SiC devices bring many advantages, at the same time high dv/dt and di/dt issues bring many disadvantages. Therefore, system designers have to take an extreme care of designing the DC bus power structure, selection of the DC capacitors, and the protection schemes.

When designing the laminated DC bus structures for SiC applications, where the di/dt's is in the range of several kA/μs, and therefore the equivalent inductance seen by the switching devices has to be in the range of single digit of Nano-Henry's. Therefore, the laminated DC bus structure needs lots of pre-design magnetic analysis to ensure that the optimum design is selected. However, when it comes to EMC/EMI Imagen Energy does not have a sophisticated EMI/EMC simulator, and even with simulator the nature of EMI, it is usually far different from actual measurement. Imagen would like to get assistance in improving EMI simulation, and with actual EMI testing for conducted and radiated emission.

The other parameter that is critical is the power module stray inductance. Especially at the higher current level, it is extremely difficult to design to achieve a single digit nano-henry stray inductance, as the module gets bigger. Imagen is extremely happy that Infineon Technologies, the major module manufacturer with so much knowledge in module design and packaging is willing to partner with Imagen to develop an application specific power module. In addition to the device stare inductance; there will be other stare inductance in the assembly that could cause additional common mode nosie due the high dv/dt.