

The Industry Needs Bus Bars

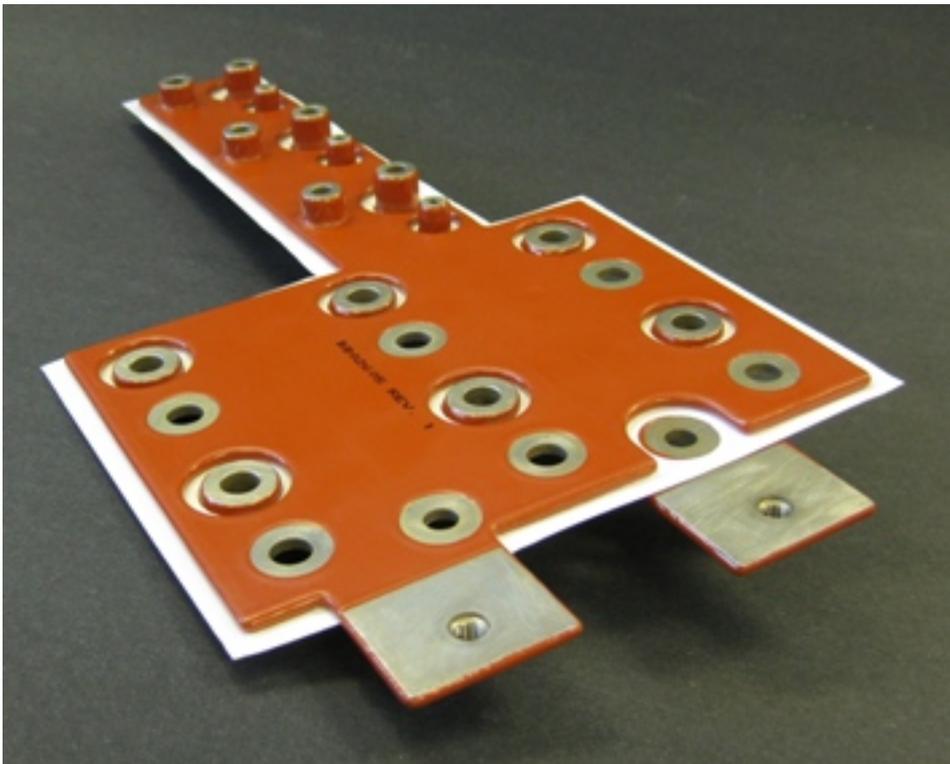
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Today's semiconductor designers are continually improving their technology. Having higher voltage ratings, lower conduction losses and faster switching speeds, devices like MOSFETs, IGBTs and diodes have evolved considerably and are performing at levels one could only imagine 10 to 15 years ago. Without bus bars, the benefits of these advancements, specifically increased switching speed, could not be applied successfully.

The fundamental purpose of a bus bar, like a wire or cable, is to connect two or more points of a circuit. However, bus bars offer many other advantages over conventional cables. For example, an effective method of minimizing circuit stray inductance is the use of a laminated multi-layer bus bar. In this arrangement, the capacitors and IGBT modules are intimately connected to the conductors of the bus bar. These are typically made of copper and plated with Sn, Ni or other metal to slow oxidation and improve connection integrity. Component terminal effects are compensated for with bushings or formed areas of the bus bar conductors themselves. The formed and plated conductors are then laminated together, separated by a thin layer or multiple layers of material having a high dielectric strength such as Mylar or Nomex.

If the conductors are properly shaped/distributed so that current flows equally and in the opposite direction through each, their opposing magnetic fields will effectively cancel each other, resulting in little added circuit inductance. The closer the conductors are together, the more this effect is realized; therefore, the dielectric material selected should be as thin as possible but having a dielectric strength appropriately in excess of the application voltage. The majority of the remaining circuit inductance is typically due to the leads and external lead connection of the bus capacitors. Many modern semiconductor packages employ miniature versions of multi-layer bus bars internally; therefore, contribute very little to the overall circuit inductance themselves.



The bus bar's contribution to improved circuit performance often goes unnoticed. Well beyond the capability of cables or wires, only with a multi-layer bus bar's proper design and use can cause the circuit designer to fully realize the performance benefits of today's modern power semiconductors. Even high-voltage semiconductors (rated above 200V) have evolved to the point where low inductance circuit construction is an absolute necessity. Laminated multi-layer bus bars are the time-proven method of choice and offer numerous advantages over other interconnect methods. As a true enabling technology, these bus bars can be an essential part of every high-performance switching application.

Visit [Custom Electronics, Inc.](#) [1] to learn more about the company's bus bar solutions.

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