

Packaging of TVS devices in Connectors – New methods at Jerrik

The ideal location for diodes to act as Transient Voltage Suppression devices for modern avionics boards and boxes is inside the interface connectors. When considering the higher density multi-pin connectors commonly used, finding the room to package these diodes is a challenge.

Proper design with common off the shelf components can yield packages no larger than common EMI filter connectors. These are lighter in weight and cost less than conventional TVS connectors.

Often the connector industry makes use of leaded diode devices, mounted into printed circuit boards to meet this challenge. The result is what is known as 'cord wood' stacking of the devices around the periphery of the connector contact pattern. In other words, for a 25 pin connector, the center of the connector would house the standard 25 contacts while additional space and weight would be added to the outer edges of the connector to house 25 individually packaged leaded diodes. Often this 'cord wood' connector is double in size of a non TVS equivalent. Depending on the screening level specified for the diodes, lead times and costs for the diodes can be excessive.

The solution to these issues is packaging the diodes with the PCBs and treating the PCB assembly like a planar capacitor. By using this concept of embedding the diodes with the PCBs the designer can make use of tighter packaging and off the shelf die to create a connector that matches the size of EMI filter connectors.

To offer this size and weight savings, the diodes are formed when the semiconductor die devices, pre-packaged, are mounted directly adjacent to the connector signal pins, using concise board design. Via solder, both the cathode and anode sides of the devices are attached to the boards. In our previous example, one or two boards might be used, depending on the density of the 25 contact pattern. Using board layering, each circuit is then completed to the connector shell via the same spring mechanism used with the planar capacitor arrays of an EMI filter. These OTS devices are readily available and are much less expensive than their leaded diode equivalents.

Jerrik Inc, a Conesys Company, has employed this patent pending design for diode packaging in applications for military aircraft and helicopter environments. These qualified designs have saved space, weight, shortened delivery cycles and generated cost savings for the marketplace.

In conclusion, the military and aerospace avionics suppliers can design lightning protection into their modern equipment without requiring more space or weight than a filter connector. Properly designed, today's TVS connector packages can be delivered with very competitive lead-times and price.