

## VXS, A High Speed Cu Switch Fabric Interconnect for VME

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### **Abstract**

VXS provides the VME architecture with an infusion of new technology and a roadmap for evolution while remaining backwards compatible. These seemingly opposing goals were achieved by careful planning and judicious selection of technologies. The platform level enhancements over the existing VME platform include improvements in mechanical packaging, 10 Gbs switch fabric interconnect technology, system management features, alignment and keying strategy, 2X power improvements, and cooling strategies. This work was done within the context of the VSO industry standards body to promote an eco-system of developers, vendors, and users.

The focus of this paper is the 10 Gbs switch fabric interconnect technology. In the maximum configuration defined by the VXS standard, the interconnect technology allows up to eighteen payload and two switch boards to be topologically connected with redundant 4x LVDS (Low Voltage Differential Signaling) links in a dual star configuration that fits within a 19" rackmount chassis. The connector technology, MultiGig RT2, is based on a non-traditional PCB chicklets mounted on the plug-in daughter card that has carefully controlled impedance and optimized footprints. The backplane connector uses traditional beam contacts. Density and robustness of the connector exceed most conventional pin and socket interconnects.

Electrical testing was carried out as part of the standards work to measure the performance of the interconnect. Testing was performed on both the stand-alone connector, as well as an all-inclusive system utilizing the RT2 connectors. Data was captured in the frequency domain (insertion loss) and time domain (impedance, connector noise, eye patterns). Eye pattern system data was collected at 3.125 Gbps and 10.0 Gbps data rates. Connector-only testing uses 0.063"

boards on either side of the connector with optimized footprints and board parasitics to minimize board effects. The system configuration is constructed of 16" or 24" traces on 0.200" thick backplanes with 4" traces on 0.125" thick daughtercards on either end. Trace widths are 6 mils, and layer connections vary.

All boards are built with a common FR4 material. The results reported minimal insertion loss across the RT2 connector (-2 dB at 5.5 GHz), with acceptable eye openings of 32 % and 50 % for different system configurations at 3.125 Gbps. The combined use of the RT2 connector and advanced silicon techniques additionally demonstrated acceptable and exciting performance results at 10 Gbps.

The historical problems with card edge connectors in military and unattended applications made addressing these concerns a high priority for selection of a VXS connector that would be acceptable by the military and telecom companies. To address the COTS/Military concerns, it was decided that COTS/Military testing should be carried out on the MultiGig RT-3 connector to (1) determine if problems arise when the connector is subjected to the usual COTS/Military environmental tests for electronics, and (2) if the tests reveal no problems, give users of VME equipment in the COTS/Military markets a level of confidence that VXS will perform as expected. One additional concern of the VXS standards development task group was the effects of vibration on connectors carrying very high data rates. Very little test data could be found the effects of vibration on contact impedance and nano-second discontinuities.

Telecordia GR12-17 and Tyco Design Objectives 1082072 test requirements, were compared to MIL-STD-1344A, and were non-existent or less stringent, M1344A testing was performed. Salt Fog, Thermal Shock, Humidity (condensing) per M1344A, and Discontinuity per Test method EIA-367-87 [6] for "Nanosecond-Event Detection for Electrical Connectors, Contacts and Sockets. Pass-fail criteria shall be a changes in impedance of 10 Ohms or greater at a minimum event duration of 10.0 ns. From EIA-367-87, this is Test Condition D, Method 2.