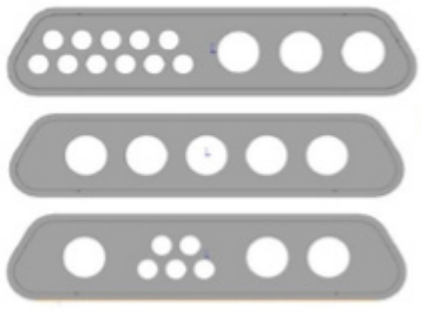
OMNETICS
CONNECTOR CORPORATION

Compact & Rugged Hybrid Micro-D Connectors with Integrated VITA 67.3 NanoRF Contacts for Embedded Defense Systems

Modern defense and aerospace systems demand compact, high-frequency, and robust interconnect solutions capable of handling both RF and signal requirements in harsh environments. This presentation introduces a novel hybrid Micro-D connector integrating VITA 67.3 NanoRF compliant contacts developed by Omnetics in collaboration with Teledyne Storm Microwave. The solution addresses stringent SWaP (Size, Weight, and Power) constraints while providing superior RF performance, signal integrity, and mechanical reliability. We explore the benefits, specifications, vand use cases for these connectors in next-generation radar, EW, and embedded systems.



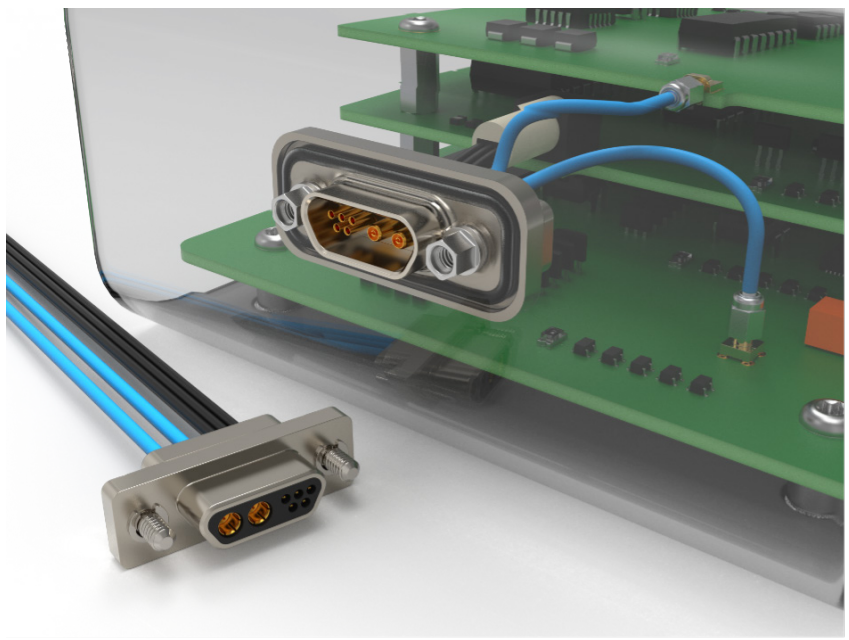
Military and aerospace platforms are under constant pressure to reduce size and weight while enhancing performance and reliability. Traditional VITA RF modules often fall short—especially when signal integration is required alongside RF—limiting their flexibility in compact embedded systems. This document presents a new hybrid solution leveraging Omnetics' Micro-D connectors and Teledyne Storm Microwave's VITA 67.3 NanoRF contacts.

Background and Motivation

The shift toward modular open VPX architectures and multifunction radar systems necessitates connectors that can handle high-speed RF and signal transmission in a small footprint. Hybrid Micro-D connectors offer the capability to combine these functionalities without requiring additional RF blocks or housing.

Connector Design Overview

The connector integrates VITA 67.3 NanoRF contacts directly into a MIL-DTL-83513 style Micro-D housing. NanoRF contacts are designed for frequencies up to 40 GHz and offer blind-mate compatibility with floating inserts, allowing for rugged and precise mating even in demanding environments.



Space and Performance Advantages

The hybrid Micro-D connector provides multiple advantages in terms of both space savings and high-performance signal handling. By integrating RF and signal lines within a single, compact footprint, it eliminates the need for separate coaxial blocks, thereby reducing the overall size and complexity of embedded systems. This integration contributes directly to meeting SWaP goals in modern defense platforms.

The connector is compatible with StormFlex™ 047 and 086 cables, known for their excellent phase stability, and supports superior RF performance with a Voltage Standing Wave Ratio (VSWR) as low as 1.25:1 from DC to 26.5 GHz and 1.4:1 up to 40 GHz.

Signal Capabilities

In addition to handling high-frequency RF signals, the hybrid Micro-D connector is designed to support a variety of signal types essential for modern embedded applications. It accommodates digital protocols such as SPI, UART, and GPIO for control and communication, as well as clock synchronization lines critical for timing in ADC/DAC and phased array systems. Furthermore, the connector can carry analog sensor feedback, diagnostics, and power management signals, which are vital for the monitoring and operation of RF paths and subsystems.

Mechanical and Environmental Performance

The mechanical and environmental reliability of the hybrid Micro-D connector has been thoroughly validated through rigorous testing. The contact system has been tested to withstand shock using a sawtooth pulse of 100g over 6 milliseconds. It has also passed vibration tests in accordance with MIL-STD-202 Method 214, Condition I, Curve D, ensuring signal stability under harsh conditions.

The connector operates reliably within a temperature range of −55°C to +85°C, and all signal contacts are qualified according to MIL-STD-202 standards, ensuring long-term performance in rugged defense and aerospace environments.

Configuration Flexibility

The hybrid Micro-D connector offers exceptional flexibility to adapt to a wide range of application needs. Designers can choose from configurations supporting up to 11 RF contacts and 31 signal contacts within a single connector. Housing sizes are available from 9 to 51 positions, allowing for tailored solutions depending on space constraints and system complexity.

Additionally, both edge-launch and cabled terminations are supported, providing flexibility in system layout and board design. Split RF configurations can also be implemented to separate signal domains or facilitate modular upgrades.

Use Cases and Applications

Thanks to its compact design, rugged performance, and integration capabilities, the hybrid Micro-D connector is well suited for a range of demanding defense and aerospace applications. It is ideal for AESA radar modules, where both RF transmission and control signal routing are critical within limited physical space. The connector also excels in electronic warfare (EW) systems, where high-frequency signals and durable construction are essential.

Further use cases include UAVs and avionics systems, missile guidance and targeting systems, and embedded platforms that adopt VPX or VPX-REDI architectures. In all these scenarios, the hybrid connector supports efficient packaging and signal integrity under severe operating conditions.

Conclusion

Omnetics' Hybrid Micro-D with VITA 67.3 NanoRF contacts offers a next-generation interconnect solution that combines miniaturization, high-frequency RF capability, and robust signal integration. Designed to meet the toughest military and aerospace requirements, this hybrid solution supports the future of embedded system design.

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