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# STARSHIELD™-ENABLED MODEM MODULE (SMM)

## Empowering connectivity with Starshield™ and Starlink™ Low-Earth-Orbit (LEO) constellations

**The SMM is the latest technology Sensor Open Systems Architecture (SOSA)-aligned 3U VPX Plug-In Card (PIC) designed for seamless airborne-, ground- and surface-based Beyond Line-of-Sight (BLOS) communications using the SpaceX® LEO constellations. It provides enhanced Commercial Satellite Internet (CSI) and hybrid SATCOM functionality to open standards aligned systems enabling reliable and efficient connectivity through advanced digital modulation and satellite acquisition features. The SMM delivers low latency and high throughput satellite communications.**

### PRODUCT DESCRIPTION

The SMM is a cutting-edge communication solution that combines advanced technology, high reliability and versatile applications to meet the demanding needs of modern hybrid SATCOM communication systems. With its seamless integration into the SpaceX Starshield constellation, adherence to SOSA standards and robust performance capabilities, the SMM stands out as an essential component for both military and commercial communication networks. Whether for tactical operations, commercial aviation, or emergency services, the SMM delivers unmatched connectivity and performance, ensuring mission-critical data is transmitted accurately and securely. This module is designed to be used in conjunction with a system supporting a SOSA wired chassis, GPS timing source and antenna, Inertial Navigation System (INS) data and Positioning, Navigation and Timing (PNT).



Front View



Rear View


The appearance of U.S. Department of War visual information does not imply or constitute DoW endorsement.

## Delivers Unmatched Connectivity, Reliability and Performance for Multi-Domain Communications

### KEY FEATURES

- **Seamless Integration:** Compatible with SpaceX Starshield Constellation
- **Advanced Modulation:** Utilizes proprietary Starshield waveform for efficient IP packet transport
- **High Reliability:** Designed for robust air, surface and maritime communications
- **Compact Design:** 3U form factor for space-saving installation
- **SOSA-Aligned:** Adheres to SOSA standards for rapid system integration
- **Versatile Applications:** Suitable for military and commercial systems
- **Enhanced Performance:** Provides superior connectivity and communication efficiency
- **RASOR Product Line:** Secures faster lead times, continuous maintenance and long-term product roadmap support

## SPECIFICATIONS

SMM is a state-of-the-art communication solution engineered to provide unparalleled connectivity and performance for air-to-ground communications. Designed to seamlessly integrate with the SpaceX Starshield constellation of LEO satellites, the SMM leverages advanced digital modulation techniques and incorporates interface architectures designed for compatibility with SpaceX approved antennas to ensure efficient and reliable IP packet transport across a broad range of platforms.

| KEY FEATURES AND CAPABILITIES | |
|---|---|
| **Communications** | High-bandwidth air, surface and maritime Beyond Line-of-Sight (BLOS) communications using SpaceX Starshield or Starlink Constellations of LEO satellites |
| **Waveform** | Uses the proprietary SpaceX Starshield waveform for IP packet transport |
| **Health Status** | Power-up Built-In-Test (PBIT), Continuous Built-In-Test (CBIT), Initiated Built-In-Test (IBIT), Elapsed Time Indicator (ETI), temperature, voltage and current sensors |
| **Over-the-Air (OTA) Updates** | Standalone operation or in a RASOR cluster environment, the included Dynamic Software Capabilities Orchestrator (DSCO) GUI and API uploads new skills or uploads updates to existing skills |
| **System Integration** | Standalone operation (as a simple network node) or RASOR cluster environment (using RASOR Network Manager) for rapid networking and systems integration |
| **High Reliability** | Designed to meet stringent environmental standards |
| **Compact and Efficient** | Based on ANSI/VITA 46.0, VITA 48.0 and SOSA standards, the 3U form factor allows for space-saving installation in various platforms, optimizing available space without compromising performance |
| **Pointing Options** | Optional antenna pointing skill to meet the customer's unique configuration |
| **Product Line Supported** | Part of the RASOR family of products |

| CERTIFICATIONS AND COMPLIANCE | |
|---|---|
| **Standards** | Designed to ANSI/VITA 46, VITA 48, SOSA Edition 1.0 |
| **Environmental** | VITA 47 (statement of compliance available on request) |
| **Quality Assurance** | Manufactured according to IPC-A-610 and MIL-HDBK-454 guidelines within an AS9100D and AS9102C facility, ensuring high quality |

| INTERFACES | |
|---|---|
| **IPMI** | VITA 46.11 Tier 3 compliant |
| **Clock References** | Internal 100MHz MEMS TCXO Reference Clock,<br>1 Pulse-Per-Second (1PPS) input |
| **Networking** | Control and Data 10GBASE-KR[1] |
| **Discretes** | Non Volatile Memory Read Only (NVMRO), System Reset, Geographical Addressing, Maskable Reset, GDISCRETE (future use), LVDS Input/Output pairs (8X) |
| **Navigation Reference** | > GPS LVDS UART interface<br>> IMU LVDS UART interface<br>> IMU LVDS RESET. |
| **Pointing Interfaces** | Ku/Ka Antenna/Modem Protocol (KAMP) and modified OpenAMIP(tm) protocol when using optional antena pointing skill |
| **Security** | Secure Element (SE), Trusted Platform Management (TPM) |
| **Debug** | Programming Logic (PL), Processing System (PS), Intelligent Platform Management Interface (IPMI) |

| CONFIGURATION DETAILS | |
|---|---|
| **Slot Profile** | SLT3-PAY-1F1U1S1S1U1U2F1H-14.6.11-12<br>(adaptable to SLT3-PAY-1F1U1S1S1U1U2F1H-14.6.11-4) |
| **Processors** | Zynq MPSoC ZU19EG with quad-core ARM Cortex-A53, dual-core ARM Cortex-R5, ARM Mali-400 MP2 GPU |
| **FPGA Fabric** | 1143K System logic cells, 1045K CLB FFs, 523K CLB LUTs, 34.6Mb Total Block RAM, 1968 DSP slices |
| **Memory** | 8GB DDR4 w/ECC, 16GB eMMC, 256MB QSPI,<br>256KB EEPROM |

| SWAP | |
|---|---|
| **Size** | 3.931 W x 6.716 D x 0.947 H in<br>Compatible with 3U x 160 mm |
| **Weight** | Less than 1.35 lbs. |
| **Temperature** | > -40°C to 73°C (operating, module rail)<br>> -40°C to 85°C (non-operating)<br>> Conduction cooled |
| **Power Consumption** | 42 W typical, 56 W maximum |

1. While control and data are 10GBASE-KR at the physical layer, data rates may be limited by other factors.

**Starshield-Enabled Modem Module (SMM)**

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