TXMISSION

Quest™ Onboard Smallsat Modem

Overview

Our revolutionary high data rate Quest™ DVB-S2/S2X and CCSDS-compliant Software Defined Radio has been designed specifically for smallsats. It forms part of our comprehensive, off-the-shelf, end-to-end satellite communications solution covering not only the satellite comms subsystem but also ground station satellite modems and network management systems.

Support for numerous electrical interfaces and communications protocols ensure the Quest™ modem is compatible with all of the popular CubeSat/smallsat ecosystems. It can also be used in a protocol-agnostic mode where any type of data in any format can be sent transparently to and from the satellite.

Benefits

DVB-S2/S2X is the most spectrally-efficient waveform available. It provides between two and three times the throughput of Viterbi/Reed-Solomon (or, alternatively, the same throughput but at a much lower transmit power level).

Both our Viterbi/Reed-Solomon and our DVB-S2/S2X support the CCSDS protocol, meaning that existing CCSDS solutions can be upgraded to use DVB-S2/S2X without having to change any of the data processing on the satellite or on the ground.

For applications with imaging payloads, the efficiency of data downloads can be further dramatically increased using our onboard hardware H.265 video compression engine.

Features

- **Data rates up to 500Mbps (over 100Msps)**

- **S-band & X-band RF hardware options**

- **DVB-S2 & DVB-S2X waveforms**

- **CCSDS telemetry standard with Viterbi-RS & DVB-S/S2/S2X**

- **H.265 (HEVC) video compression**

- **Option to host flight computer**

- **128GB payload mass storage option**

- **Data interfaces: Gigabit Ethernet, LVDS, SDI/ASI, USB3, SpaceWire, RS485, UART, CAN, I2C & SPI**

- **Radiation tolerant option**

- **Power saving modes**

- **Unique DVB-S2/S2X OQPSK option for low transmit power**

- **Transmit predistortion (reduces required power)**

- **-40ºC to +85ºC**

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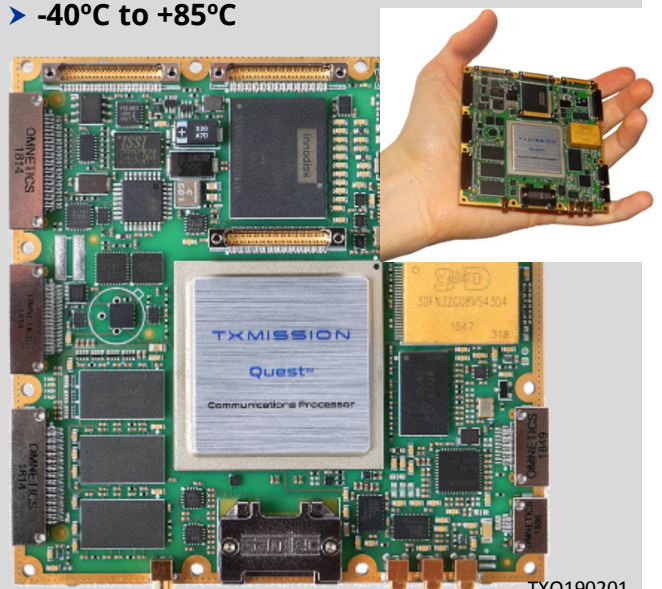
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Key Features

Primary Function	CubeSat/smallsat onboard satellite communications subsystem
Secondary Functions	• Option to host flight computer (OBC) • Option to host payload processor (includes mass storage device & sensor interfaces)
Waveforms	DVB-S2 (EN 302 307-1) DVB-S2X (EN 302 307-2) CCSDS DVB-S2 (CCSDS 131.3-B-1) CCSDS DVB-S2X (proprietary CCSDS extension) CCSDS Viterbi/Reed-Solomon (CCSDS 131.0-B-1) CCSDS 4TCM (CCSDS 401)
Data Rate (Tx & Rx)	DVB-S2/DVB-S2X: 50kbps to 500Mbps Viterbi/Reed-Solomon: 9.6kbps to 50Mbps
Symbol Rate (Tx & Rx)	DVB-S2/DVB-S2X: 100ksps to 125Msps Viterbi/Reed-Solomon: 9.6ksps to 40Msps

Frequency	Onboard option:
	  Tx/Rx IF/L-band/S-band (75MHz to 6GHz)
	  SMA connectors
	Offboard option (additional RF card):
	  Tx/Rx X-band (7.25GHz to 8.4GHz)

Data Interfaces	Gigabit Ethernet, LVDS, SDI/ASI, USB3, SpaceWire, RS485, UART, CAN, I2C, SPI
Spectral Roll-off	Root-raised cosine filter provides choice of 5%, 10%, 15%, 20%, 25%, 35% & 40% carrier roll-off factors
DVB-S2/S2X ACM	Varies data rate with satellite position during a satellite pass, maximising throughput for the strength of signal being received
Adaptive Tx Predistorter	Corrects for linear and non-linear distortion in the RF chain; maximises linear output power & minimises required back-off; up to 2dB performance gain
Real-time Video Compression	Hardware video compression of sensor video data to the H.264/H.265 (HEVC) standards at 4K/Ultra High Definition resolutions and 60Hz frame rate, massively reducing storage requirements and size of data down-load
Radiation Tolerance	• High-reliability lock-step processors • Automatic memory error correction • Radiation hardened PSU • Radiation hardened flash memory • Radiation absorbent conformal coating

General Description

- High-performance Software Defined Radio (SDR) powered by TXMission's own system-on-a-chip; supports multiple modem communication standards; software upgradeable via the TT&C uplink, allowing addition of new functionality
- Powerful 1.5GHz multi-core processing engine
- Optimised for low power operation; various power saving modes

Waveforms / Forward Error Correction

DVB-S2X (EN 302 307-2)	Normal Frame:
	  QPSK 13/45, 9/20, 11/20
	  8PSK 23/36, 25/36, 13/18
	  8APSK-L 5/9, 26/45
	  16APSK 26/45, 3/5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90
	  16APSK-L 5/9, 8/15, 1/2, 3/5, 2/3
	  32APSK 32/45, 11/15, 7/9
	  32APSK-L 2/3
	  64APSK 11/15, 7/9, 4/5, 5/6
	  64APSK-L 32/45
	Short Frame:
	  QPSK 11/45, 4/15, 14/45, 7/15, 8/15, 32/45
	  8PSK 7/15, 8/15, 26/45, 32/45
	  16APSK 7/15, 8/15, 26/45, 3/5, 32/45
	  32APSK 2/3, 32/45

DVB-S2 (EN 302 307-1)	QPSK 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 8PSK 3/5, 2/3, 3/4, 5/6, 8/9, 9/10 16APSK 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 32APSK 3/4, 4/5, 5/6, 8/9, 9/10
Proprietary Extension to DVB-S2/S2X	OQPSK 1/2, 2/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 (OQPSK reduces the peak-to-average-power ratio of the transmitted signal compared to QPSK, reducing the required back-off and allowing a higher transmit power to be used without impairing the signal)

CCSDS-compliant Viterbi & Reed-Solomon (CCSDS 131.0-B-1)	Viterbi:
	  BPSK, QPSK & OQPSK 1/2, 2/3, 3/4, 5/6, 7/8
	Reed-Solomon:
	  Symbols per codeword: 255
	  Error correction values: 8 & 16
	  Codes include (255, 233) & (255, 239) plus shortened codeblocks
	  Interleaver depth: 1, 2, 3, 4, 5 & 8

CCSDS-compliant 4TCM (CCSDS 401)	CCSDS 4D 8PSK TCM 3/4, 8/9, 9/10, 10/11, 11/12

Telemetry, Tracking and Command (TT&C)

Telnet	A command line interface can be used to securely log in to the satellite modem over the TT&C uplink. This can be used to monitor and configure every aspect of the modem
Web User Interface	The satellite modem supports a built-in web server that serves web pages to any web browser for TT&C purposes. This may be useful for both pre-deployment testing and in-orbit operational use
MissionSpan NMS	This application forms part of the ground station control network. It allows all modems (in orbit and on the ground) to be monitored and controlled through a single application

Mechanical/Environmental

Size	90mm x 90mm x 18mm (excludes mezzanine card)
Weight	< 120g (excludes mezzanine card & enclosure)
Power Consumption	5W to 15W depending on data rate & options
Input Voltage	5V (non-regulated)
Emissions & Immunity	Emissions: EN 55032:2015 Immunity: EN 55024:2010, A1
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Conformal Coating	Space-compliant PCB conformal coating
Testing	Environmental testing: functional, electrical, vibration, shock, thermal, vacuum, EMC (including ionising dose)

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Ordering Information: Please select from the following options when placing an order

Feature		Options	Description
Hardware Platform	Select 1 option	A (High Performance)	Provides radiation tolerance, video compression & 128GB mass storage; meets all other specifications provided the relevant feature options are selected
		B (Low Cost)	No radiation tolerance, no video compression & only 32GB mass storage; meets all other specifications provided the relevant feature options are selected
RF	Select 1 option	None	Provides a high-speed digital I/O interface to the user's own RF solution
		S-band	S-band support is provided through a plug-in mezzanine card
		X-band	X-band support is provided through a plug-in mezzanine card
Data Rate	Select 1 option	100Mbps	Tx and Rx data rates to 100Mbps (50Msps)
		300Mbps	Tx and Rx data rates to 300Mbps (100Msps)
		500Mbps	Tx and Rx data rates to 500Mbps (125Msps)
Waveforms	Select at least 1 option	DVB-S2	DVB-S2 QPSK, 8PSK, 16APSK & 32APSK operation per EN 302 307-1. Includes 5%, 10%, 15%, 20%, 25%, 35% & 40% spectral roll-offs
		DVB-S2X	DVB-S2X QPSK, 8PSK, 8APSK, 16APSK, 32APSK & 64APSK operation per EN 302 307-2. Includes 5%, 10%, 15%, 20%, 25%, 35% & 40% spectral roll-offs
		CCSDS DVB-S2/S2X	Note: requires the selection of the DVB-S2 and/or the DVB-S2X option CCSDS DVB-S2 per CCSDS 131.3-B-1 CCSDS DVB-S2X (proprietary CCSDS extension)
		CCSDS Viterbi/RS	CCSDS Viterbi/Reed-Solomon (CCSDS 131.0-B-1)
		DVB-S2/S2X OQPSK	Proprietary extension to DVB-S2/S2X to provide OQPSK modulation
		CCSDS 4TCM	CCSDS 4D 8PSK TCM (CCSDS 401)
ACM		DVB-S2/S2X ACM	Adaptive Coding and Modulation (ACM) mode for use with DVB-S2 and DVB-S2X
Compress-ion		Video Compression	H.264/H.265 (HEVC) hardware video compression (included as standard when Hardware Platform A is selected)
Predistort-ion		Adaptive Tx Predistorter	Predistorts the Tx output in order to compensate for linear and non-linear distortion in the received signal

For more information, including pricing, or to place an order, please contact us directly at:

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