

## NM-SBT-4561

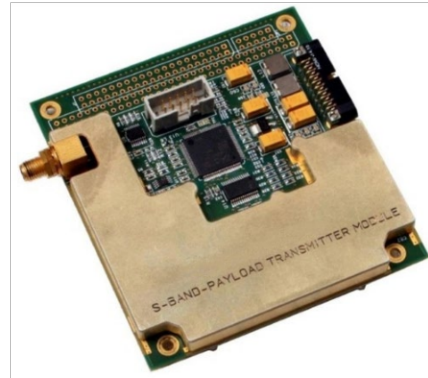
## S-Band Transmitter

### KEY FEATURES AND BENEFITS

- Programmable carrier frequency from 2.2GHz to 2.5GHz
- Supports data rates from 9.6kbps to 2Mbps
- Supports BPSK / QPSK / OQPSK modulations with 1Mbps data rate
- Framing as per CCSDS / IBS protocol
- Configurable Field Equipment Controller (FEC) with 1/2, 1/4, 1/8, 3/4 and 7/8 modes
- Low power consumption
- Programmable transmit power from 24dBm to 30dBm in 0.5dB steps.

### APPLICATIONS

- CUBESAT kit communication systems
- Satellite communication as Payload / Telemetry Transmitter
- Rovers or other remotely operated vehicles



### OVERVIEW

The S-Band Transmitter is a PC104 form factor based transmitter module specifically used for a high data rate down link requirements. The module is operated with a +5V and +3.3V supply. The complete functionality of the module is achieved by two major design blocks the digital controller and the RF transmitter.

### BLOCK LEVEL EXPLANATION

#### DIGITAL CONTROLLER

The digital controller has an FPGA block and a DAC unit to interface the module with an On Board Computer (OBC) / Data handler system. The OBC/ Data handler system collects the payload data through an SPI interface. Data framing, encoding and base band filtering are done in FPGA and the payload data is delivered in the form of interleaved I and Q digital data to a parallel DAC. The configuration commands for carrier frequency, power level, data rate and modulation scheme can be selected / programmed through an I<sup>2</sup>C interface.

#### RF TRANSMITTER

The RF transmitter has a modulator and RF amplifiers. Modulator is used to generate the carrier signal for IQ modulation. It modulates the incoming I&Q data (from DAC) with the programmed carrier signal. The module has an on-chip Phase Lock Loop (PLL) and a Temperature Compensated Crystal Oscillator (TCXO) for carrier generation. The modulated signal is amplified for 1W output and passed through a Low Pass Filter (LPF) to remove the harmonics signals. Power amplifier output is coupled through a directional coupler and monitored using a log amplifier and ADC.

The module supports programmable carrier frequency through software register settings and programmable transmit power of +24dBm to +30dBm with a 0.5dB step size.

The module also has a provision to monitor the transmitted RF output power, power amplifier temperature and power amplifier current.

## SPECIFICATIONS

### TRANSMITTER PERFORMANCE

Power consumption	: < 6 W (for maximum RF output)
Modulations	: BPSK, QPSK and OQPSK
Programmable data rate	: 38.4Kbps to 2 Mbps
Programmable output power	: +24dBm to +30dBm with 0.5dB steps
Data interface with OBC	: 1. SPI for payload data transfer 2. I <sup>2</sup> C interface for configuration command
Spurious response	: > 30dBc
TX Signal to Noise Ratio (SNR)	: > 20dB

# Hardware configuration for any custom carrier frequency

### ELECTRICAL

Power requirement: 5V  
3.3V

### MECHANICAL

Form factor	: Standard CUBESAT
Dimension in mm (LxBxW)	: 96x90x16
Weight in grams	: <100

### ENVIRONMENTAL

Operating temperature : -50°C to +110°C

### CONNECTORS

SMA right angle connector	: Output RF signal
20 Pin custom interface connector	: For power and communication signal interface.
104 Pin PC104 stack through connector (optional mount)	: For power and communication signal interface.
JTAG interface connector (14 pin header)	: FPGA programming

### ORDERING INFORMATION

NM-SBT-4561-6X0

- Reserved
- 0 - 20 Pin custom interface connector
- 3 - 104 Pin PC104 stack through connector
- 6 - Rugged

BLOCK DIAGRAM OF S-BAND TRANSMITTER

