MYTE (SCC002) Satellite Transmitter

Theory of Operation

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REVISION HISTORY

Date	Rev	Description	Name
13 Mar 12	1.0	Initial Product Release	GAN

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1. Description

The MYTE (SCC002) device is a radio transmitter module that creates the radio frequency (RF) signals to relay small packets of data to the Globalstar Simplex Data Service satellite network. The MYTE serves as a communication gateway in an embedded application to send transmit-only (simplex) data. Data packets are in small, 9-byte segments. The MYTE supports 9, 18, 27 or 36 byte data payloads. The Globalstar Simplex Data Service comprises a set of low-earth-orbit (LEO) satellites operating as bent-pipe data relay devices to ground earth data collection points. This specification stipulates the operational and physical requirements for the MYTE transmitter device that is compatible with this satellite network system.

The MYTE device is the radio transmitter only. This specification does not stipulate application requirements or the radiating (antenna) requirements of an application. The MYTE must be fully integrated into a larger application device to provide utility. This specification provides the physical, electrical and integration requirements to enable application development.

1.1. Definitions

The following definitions used herein shall have the meanings as defined below:

Globalstar

a) Globalstar. The term “Globalstar” means Globalstar, Inc., a Delaware USA Corporation having offices at 461 South Milpitas Blvd, Milpitas, California 95035

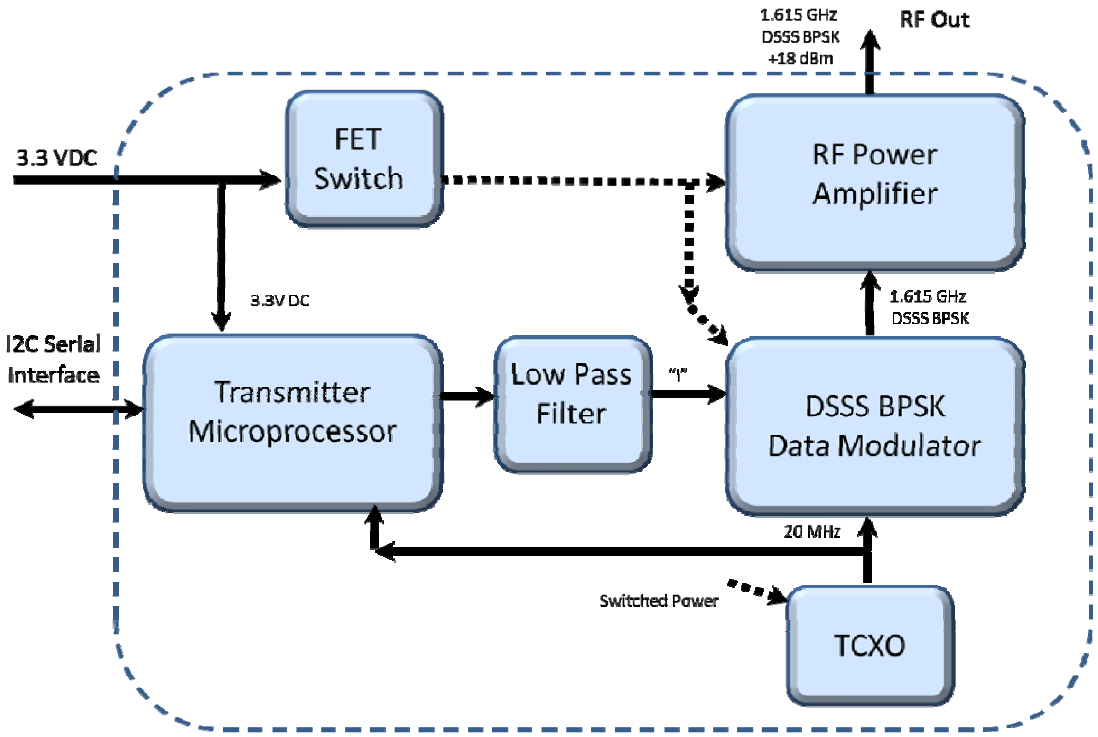
b) Globalstar Simplex Data Service. The term “Globalstar Simplex Data Service” refers to communications from simplex transmitters relayed over Globalstar’s network of low earth orbit satellites to Globalstar gateways for distribution to end customers.

c) LEO. The term LEO is an acronym meaning low earth orbit.

d) GPS. The term GPS is an acronym meaning global positioning system.

2. MYTE Device Theory of Operation

The MYTE device is a radio transmitter module that contains the functionality to accept configuration and data from a host application and convey data to the Globalstar Simplex Data Service satellite system. The block diagram below depicts the integral components of the MYTE device to fulfill this functionality.



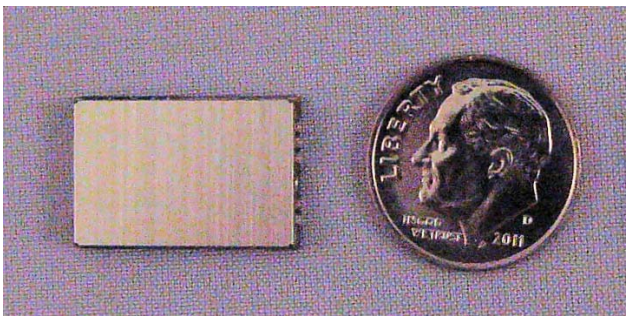
The MYTE module contains a microprocessor that controls the transmitter functions, provides power management and controls the RF transmitter functions. The MYTE module switches the input DC power to create the voltages necessary to minimize power and manage the transmit function.

The microprocessor operates in low power state using an internal 32.768 kHz oscillator. During transmit operations, the microprocessor enables the DC power to the RF circuitry and temperature compensated crystal oscillator (TCXO) to generate the clock reference for the BPSK modulator. The TCXO clock frequency may is 20 MHz. The microprocessor also uses the TCXO clock during the transmit process.

The BPSK modulator outputs the transmit signal at frequency to a power amplifier section which provides the signal gain for the transmitter.

The MYTE module is a single layer board assembly measuring ½" x ¾" and interfaces to the host application via a 11 pin surface mount pad-style connector. The connector provides power, I2C serial communications and the RF transmit signal.

The MYTE module depicted below performs the transmit functions described when serially tasked by the host application processor via the I2C serial interface. When idle, the MYTE module assumes a low-power state drawing mere microAmps.



3. RF Modulation

The MYTE transmits data using Direct Sequence Spread Spectrum (DSSS) carrier with a Binary Phase Shift Keyed (BPSK) data modulation. The MYTE can be configured to send data on one of four radio center frequencies. Globalstar operational requirements for channel usage must be observed by application developers. Generally, channel A is used for North American operations except where the device is in proximity of Radio Astronomy Sites (RAS), where channel C is prescribed. Use in other global regions uses channel C. The channels are specified as:

RF Channel
Channel A = 1611.25 MHz center frequency
Channel B = 1613.75 MHz center frequency
Channel C = 1616.25 MHz center frequency
Channel D = 1618.75 MHz center frequency

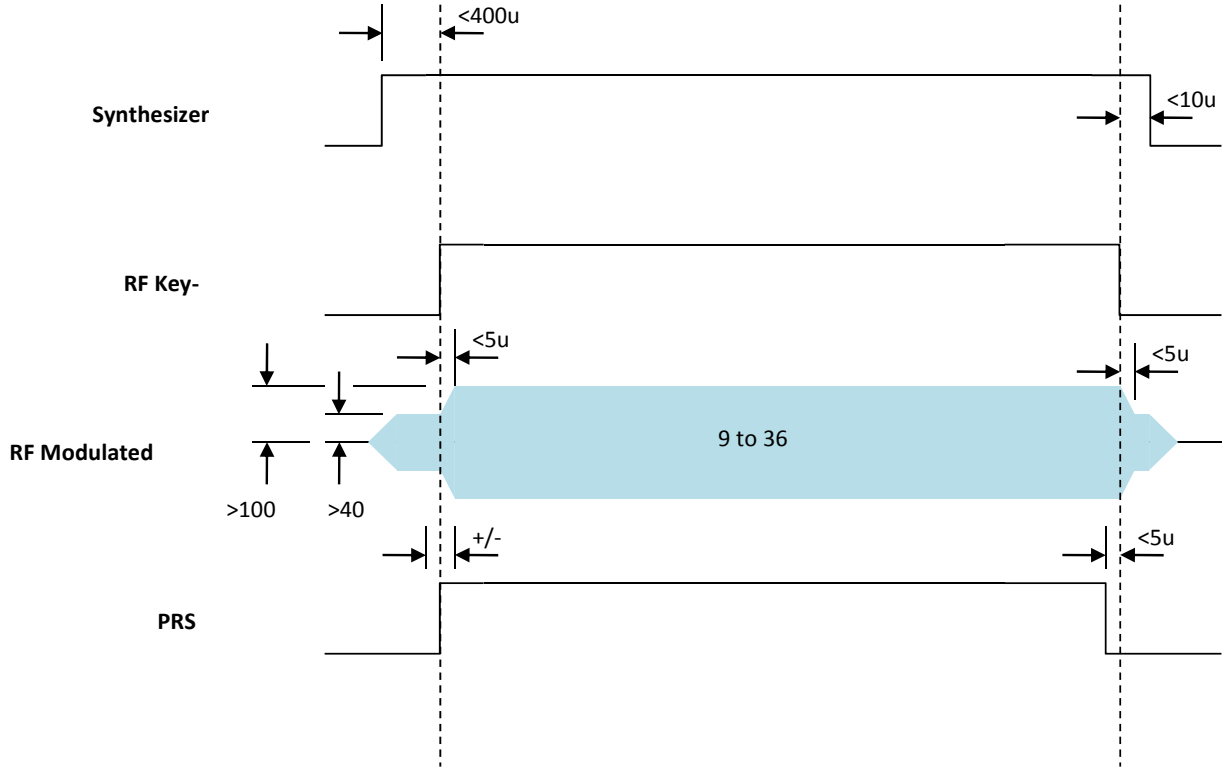
The DSSS carrier is generated using a pseudo random maximal length feedback shift register utilizing a polynomial code prescribed by Globalstar. This PSR is 8 bits in length, denoting a repetition length of 25 chips.

The PSR chip rate is 1.25 Mchip/sec. The frequency accuracy is ± 10 ppm total frequency error over all operating conditions, with no more than 0.3 ppm error during a transmission of a single packet. Chipping rate and RF frequency are coherent.

The symbol rate is 100.04 bps, derived from 49 PSR code repetitions, with symbol boundary occurring at epoch. Transmit output power is 18 dBm ± 2 dB RMS over all operating conditions. The EVM (Error Vector Magnitude) is less than 15 % RMS for 1020 symbols. This corresponds to an RMS phase error of less than 18 degrees and a magnitude error of less than 10%. The following timing considerations with regard to RF key-on will be observed:

- PRS code must be applied within ± 5 us of RF key-on
- RF output power is greater than 100 dB below nominal output power for RF key-off
- RF synthesizer is not to be turned on more than 400 us before the RF key-on. Transmit power will be attenuated a minimum of 40 dB from nominal output power during this period.
- RF key-off occurs no later than 10 us following data transmission
- RF power and data modulation is stable within 5 usec of RF key-on
- RF key-off function occurs within 5 usec
- PRS code is disabled no sooner than 5 usec before PA is turned off.
- The MYTE will not transmit if the RF generation circuitry is not locked and modulation is stable.

The diagram below depicts the RF modulation operation timing.



The RF spectrum shall not contain harmonic levels that exceed -20 dBm when measured in a 5 MHz bandwidth. Non-harmonic related discrete spurs shall not exceed -30 dBm when measured in a 100 KHz bandwidth.