STM3 FCC

Operational Description

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Revision History

Revision	Revision Date	Description of the Changes
1.0	August 24, 2010	Initial version

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1.0 DESCRIPTION OF STM3

The STM3 device provides simplex modem functionality that sends packet-switched data containing user information through a satellite constellation to ground stations and then to the end user via the Internet (see Figure 1). **Error! Reference source not found.** is a photo of the STM3 device.

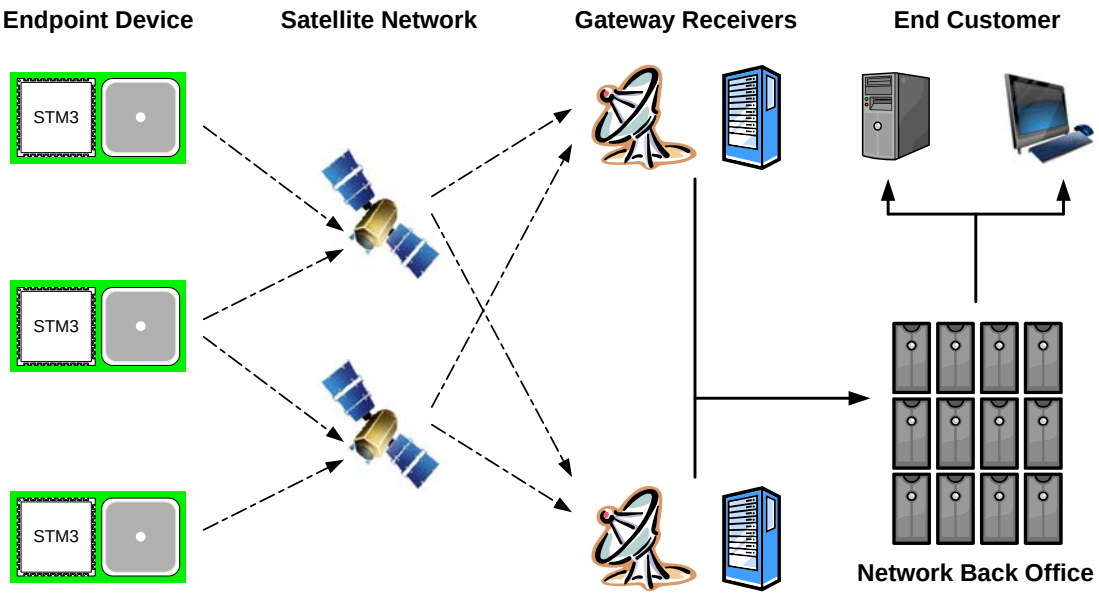

Figure 1: System Overview

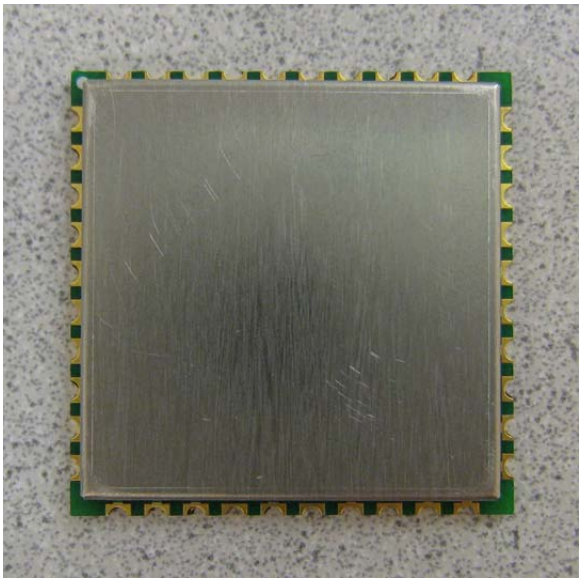

Figure 2: STM3

2.0 HOW IT WORKS

The STM3 device accepts commands and queries via a Universal Asynchronous Receiver/Transmitter (UART) or a serial peripheral interface (SPI) communications channel. The primary function of the device is to receive message data via one of the communications ports and then packetize and transmit the data to the satellite constellation. Depending on the configuration set by the host, the STM3 will repeat those messages up to 20 times at user-selected intervals in order to improve the probability of the message successfully being decoded at a Gateway Receiver. The number and interval of transmissions is set by user command and executed by the STM3 device.

To remain as power conscious as possible, the default state of the STM3 device is sleep mode. The STM3 microcontroller is awakened by a user signal and responds to request the when it is ready to receive commands. Commands are then sent by the user and acted upon by the device. When a command/response transaction is complete the device re-enters sleep mode. While a message transmission cycle is under way, the STM3 enters sleep mode between each transmission attempt until all attempts are made, at which time it permanently enters sleep mode until the user initiates another command transaction.

3.0 BASIC ARCHITECTURE

The STM3 device is built on a 1.15" x 1.15" printed circuit board (PCB). The circuitry is covered by a metal radio frequency (RF) shield.

The STM3 circuitry consists of a microcontroller for command processing and system control and a complex programmable logic device (CPLD) that integrates the data with the spreading code. The CPLD is followed with a synthesizer, a mixer, and a power amplifier to up-convert and amplify the baseband data for transmission.

4.0 TYPICAL INTEGRATION

The STM3 device is intended to be a module in a larger system. The system must have means of providing adequate power (low noise and relatively high-current) and must possess an electrical signaling mechanism compatible with the module. The system into which the STM3 is integrated also must provide a path for the RF energy to move from the STM3 to an appropriate antenna. Caution also must be exercised to ensure that transmitted and leakage RF energy do not cause interference with the nominal operation of the components on the user's circuit board.

5.0 OVER-THE-AIR INTERFACE

Once a packet is created, it is sent over the air multiple times (called transmission attempts). The number of transmission attempts, as well as the interval range between transmission attempts, are adjustable parameters. These parameters are selected by the integrator to balance the best throughput for each application with the amount of energy required for the multiple transmissions.

The interval between transmission attempts is randomly selected (uniform distribution) between the minimum and maximum values. The seed for the random interval is based on the Electronic Serial Number (ESN) of the STM3.

When several OTA interface packets are required for a message the packets are transmitted in the sequence pictured below. Note that each OTA packet can hold up to 9 bytes of user data, so this example represents the case where the user message is between 19 and 27 bytes, therefore requiring three packets for transmission. Additionally, this example shows a transmission configuration of 2 transmission attempts.