CUBESAT VHF/UHF Transceiver

KEY FEATURES AND BENEFITS
- Receiver sensitivity -117dBm
- In-built Automatic Frequency Correction (AFC) for doppler correction
- Full duplex operation
- VHF (144MHz - 148MHz) uplink and UHF (400 to 440MHz) downlink
- Supports HDLC / AX.25 / RAW frame formats
- UART interface for telecommand and telemetry
- Low power operation
- RSSI, PA Temp, FWD PWR and supply voltage monitoring
- Shielded enclosure for reduced interference
- ESD protection on antenna terminals

APPLICATONs
- Micro / nano satellite systems
- High altitude balloon missions
- Rovers or other remotely operated vehicles
- Remote embedded systems

DESCRIPTION
The VHF/UHF transceiver module is a telecommand receiver and telemetry transmitter module compatible with CUBESAT PC104 form factor. This module receives telecommand from VHF(144MHz-148MHz) signals and sends telemetry data over UHF (400-440MHz) signals. It supports HDLC / AX.25 protocol / RAW pattern of data formats for both up-link and down-link communication. The LO signal for UHF receiver and VHF transmitter are generated from on-chip PLL & TCXO available in the module. The module operates with +5V regulated supply. Receiver and transmitter are powered through two independent ports.

The VHF receiver has a sensitivity of -117dBm and operates in the dynamic range of -117 to -60dBm. The receiver monitors the Received Signal Strength Indicator (RSSI), current doppler offset and input supply voltages. The module has an UART interface (in RS422 level), SPI interface and GPIO’s for sub system command / control.

The UHF transmitter can deliver output power upto 0.5W minimum. The forward output power from power amplifier is coupled through a directional coupler and monitored using a Log amplifier and ADC. It also monitors the Power Amplifier (PA) temperature and input supply voltages. The transmitter has dedicated UART interface (in RS422 level) for data transfer from processor / external system.
## TRANSMITTER

- **Frequency range**: 400MHz to 440MHz
- **RF output power**: +27dBm (Min.)
- **Spurious response**: >50dB
- **Frequency stability**: ±3ppm
- **DC power**: <3W @ +27dBm RF power
- **Data rate**: 1.2kbps to 115.2kbps (AFSK 1.2kbps only)
- **Modulation**: FSK and AFSK
- **Forward error correction**: Viterbi decoder for HDLC protocol
- **Protocol**: HDLC / AX.25 / RAW pattern match
- **Communication interface**:
  - a) UART in RS422 level - 1 channel
  - b) SPI interface - 1 channel
  - c) GPIO's - 4Nos. (Tx)

## RECEIVER

- **Frequency**: 144MHz - 148MHz
- **Sensitivity**: -117dBm for BER of 10^-1
- **Adjacent channel rejection**: 40dB
- **Dynamic range**: -117dBm to -60dBm
- **Frequency stability**: ±3ppm
- **DC power**: <350mW
- **Doppler correction**: ±4KHz
- **Data rate**: 1.2kbps to 38.4kbps (AFSK 1.2kbps only)
- **Modulation**: FSK and AFSK
- **Forward error correction**: Viterbi decoder for HDLC protocol
- **Protocol**: HDLC / AX.25 / RAW pattern match
- **Communication interface**:
  - a) UART in RS422 level - 1 channel
  - b) SPI interface - 1 channel
  - c) GPIO's - 8Nos. (Rx)

## CONNECTORS

- **RF interface**: SMA, female, 50Ω (input / output)
- **I/O interface**:
  - a) 40 pin custom interface connector - for power & communication signal interface
  - b) 104 pin PC104 stack connector (optional mount)

## MECHANICAL

- **Dimension in mm (LxWxH)**: (95.9X 90.2X15.8)±0.2
- **Weight in gram**: <100

## SPECIFICATIONS

<table>
<thead>
<tr>
<th>Form factor</th>
<th>Standard CUBESAT module (PC104 form factor)</th>
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<tr>
<td>Voltage</td>
<td>+5V for Telecommand RX +5V for Telemetry TX</td>
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**ENVIRONMENTAL SPECIFICATIONS** *(with proper packaging)*

- **Operating temperature**: -15°C to +55°C
- **Storage temperature**: -40°C to +85°C
- **Vibration**: Qualified for 20 GRMS

*Note*: For more details about environmental specifications contact Data Patterns (India) Pvt. Ltd.

## AVAILABLE ADDITIONAL OPTIONS

- **Frequency**: Custom frequency range
- **Modulation**: GFSK, MSK, GMSK, 4-FSK, FM, ASK & PSK
- **Encryption**: AES-128, AES-192, and AES-256 encryption and K9NG/G3RUH Scrambling

## ORDERING INFORMATION

- **DP-CRF-5549-600**:
  - Reserved
  - Reserved
  - Rugged
BLOCK DIAGRAM OF DP-CRF-5549

V / UHF Transceiver Module

UHF Transmitter – 400 to 440MHz

Low Power Microcontroller

ANTENNA 400-440MHz

SMA

0.5W/Min
+2/-4dBm/Min

Power Detector

Low Power Microcontroller

Transmitter / Modulator

SMA

Antenna -117 dBm
-60 dBm

Receive / Demodulator

BPF

-L17 dBm
-60 dBm

LNA

-144 to 148MHz

VHF Receiver – 144 to 148MHz

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