TELXX-YYWW_CE CONRAD

DS00001

Rev: A04

Cem Eden

2019–07–12

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1 Introduction

1.1 Quick Description

The TELXX-YYWW_CE (Conrad) board is the main telemetry board intended to be used in medium sized rockets or similarly sized aviation equipment. Its main function is to provide radio communications, GPS positioning as well as basic atmospheric data gathering.

1.2 Main features

The Conrad board includes an attachment position to provide a secure connection for an XTrend radio module (XTPB-DMD-001) to provide radio communications. To allow for maximum range, the module is powered with 5V, with a 3V voltage level shifter IC to allow for seamless communication with the main flight computer.

The board itself contains a GPS module (RMX-GNS-TM) to provide accurate positioning data for flight tracking purposes. To counter long locking GPS period on initial powerup, the board allows for a selectable power supply for the internal clock of the GPS module. The selection can be made using a soldered jumper, located in close proximity to the GPS module.

For increased Positioning accuracy, the Conrad board includes an accelerometer (BMX055).

For basic atmospheric data gathering the Conrad board contains a combined temperature, pressure and humidity IC (BME280). This module is intended to provide basic atmospheric information, but due to its hard positioning will be used for interior monitoring of the vehicle.

Due to limitations of the intended flight computer, communication busses are limited. To counteract this, the accelerometer IC and atmospheric probe share a common SPI bus. Selecting an IC to communicate with is realized by GPIO pins (More information in chapter 3).

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2 Electrical Specifications

2.1 Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
V_{cc}	Power supply	5.5	V
V_{bat}	GPS backup battery	4.3	V
V_{in}	Signal input voltages	3.6	V
T_{op}	Operating temperature range	-40 to +85	°C

2.2 Electrical Characteristics

Symbol	Parameter	Testing Conditions	Min.	Typ.	Max.	Unit
V_{cc}	Power supply	Operative condition	4.75	5	5.5	V
I_{cc}	Peak V_{cc} current	Peak			2000	mA
V_{IO}	GPIO voltages	Operative condition $_{bat}$	1.2	3.3	3.6	V
V_{bat}	GPS backup battery	JMP1 = V_{bat}	2.0		4.3	V
T_{op}	Operating temperature	Operative condition	-40	+25	+80	°C

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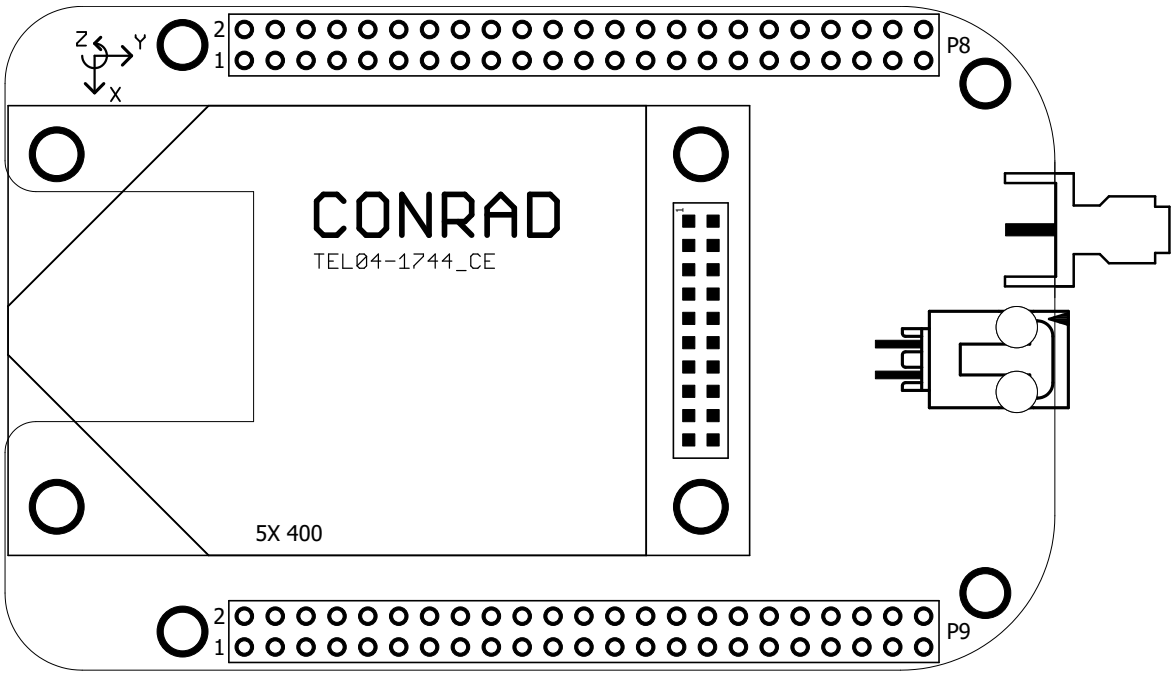
2.3 Pin Layout



Pin name	Pin number(s)	Functionality
V_{cc}	P9.5, P9.6	Power supply
GND	P8.1, P8.2, P9.1, P9.2, P9.43, P9.44, P9.45, P9.46	Circuit ground
UART1_TX	P9.13	Radio module serial
UART1_RX	P9.11	
UART1_CTSN	P8.32	
UART1_RTSN	P8.33	
UART2_TX	P8.38	GPS module serial
UART2_RX	P8.37	
SPI_CLK	P9.22	SPI Bus
SPI_CS	P9.17	
SPI_SDI	P9.18	
SPI_SDO	P9.21	
A0	P8.26	SPI chip select addressing
A1	P8.27	
A2	P8.28	

3 Communication

3.1 RMX-GNS-TM (GPS)

Communications with the GPS is realized using a serial interface. By default, the data rate is set to 9,600bps with 8 data bits, 1 start bit, 1 stop bit and no parity. The GPS uses the serial pins UART2.

3.2 XTPB-DMD-001 (Radio)

Communications with the radio interface is realized through a serial interface. The data rate is defined by the settings in the XTPB-DMD-001 module, and will have to be accounted for when establishing initial communications. After a factory reset of the radio module, the baud rate will be set to be 9,600bps with 1 start bit, 1 stop bit and no parity. The radio module uses the serial pins UART1.

3.3 BME280 (Atmospheric probe)

Communications with the BME280 is realized using the SPI bus. However, the chip is multiplexed with other SPI devices with the use a chip select. In order to select the BME280, the address pins A[2:0] have to be set to 000. The BMX280 uses the SPI pins for the SPI bus.

3.4 BMX055 (Accelerometer/Gyroscope/Magnetometer)

Communications with the BMX055 is realized using the SPI bus. However, The BMX055 is multiplexed with other SPI devices, as well as its own functionalities. The BMX055 uses the SPI pins for the SPI bus. The BMX055 uses three addresses on A[2:0] of 1 through 3 inclusive. The addresses of each functionality is given in the table below:

Function	Address A[2:0]
Accelerometer	001
Gyroscope	010
Magnetometer	011

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4 Usage

4.1 Device Tree Overlays

The Conrad board is designed to be used as a cape for a Beaglebone Black. To set the correct modes for the used pins, a device tree overlay(dto) has to be loaded prior to using some of the features provided by the Conrad board. Information on where to find and how to use the device tree overlay can be found in the "software and Setup" manual.

4.2 Software

To utilize the ICs on the Conrad board, software is required. Previously written software may be used, for which information can be found in the "Software and Setup" manual. Custom software can also be written to handle tasks for which previous software may be insufficient.

5 Product Code

Each version of the Conrad board is uniquely identified by an alphanumeric product code. This code is comprised by a version number, date of last design alteration and initials of the original designer.

The Code is defined as shown below:

TELXX-YYWW_AA

XX - Version | YY - Year | WW - Week | AA - Original Designer

As of writing, the most recent version of the Conrad board is TEL04-1744_CE.

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