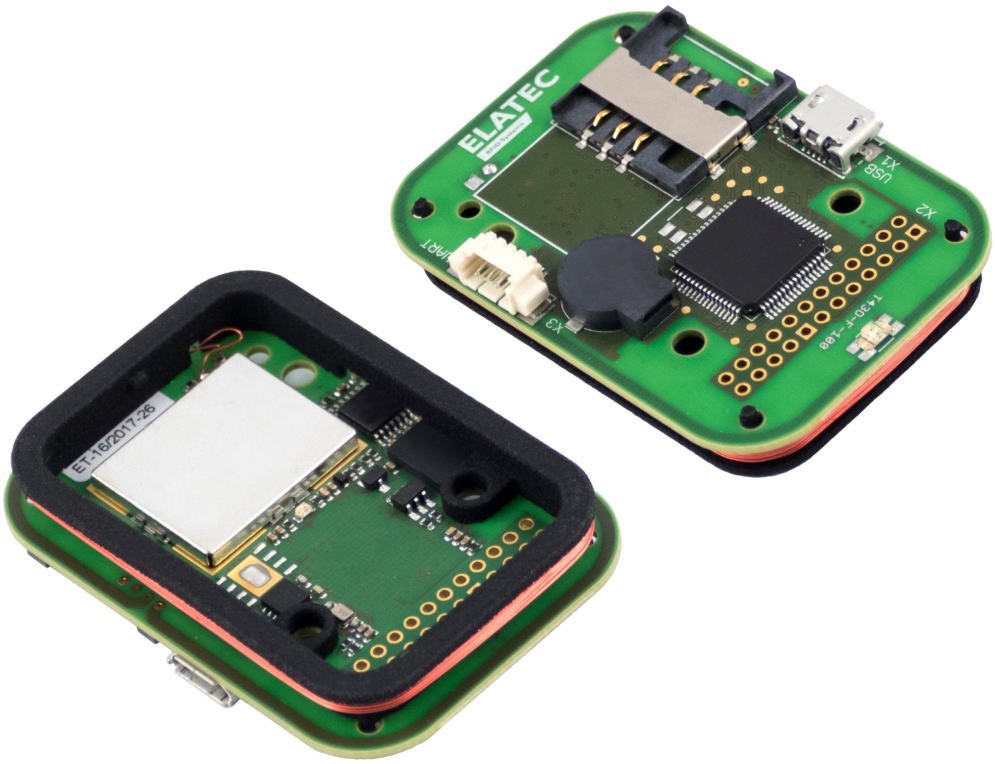
TWN4 MultiTech 3 BLE

Technical Handbook

DocRev9, November 7, 2022



ELATEC GmbH

Contents

1 Introduction

The TWN4 MultiTech 3 BLE is a configurable Reader/Writer for RFID transponders. This addition to the TWN4 family offers the Bluetooth Low Energy (BLE) interface. The module has both low (125kHz, 134.2kHz) and high (13.56MHz) frequency antennas, allowing the User access to a wide range of RFID standards.

This Technical Handbook provides the details needed to get started using the TWN4 MultiTech 3 BLE: a functional overview of the board, listing the features and interface options available.

A custom User App can be loaded onto the module using the AppBlaster software. For more information regarding the programming of the TWN4 module please see a dedicated User Guide for AppBlaster.

2 TWN4 MultiTech 3 BLE PCB

2.1 Functional Overview

The TWN4 MultiTech 3 BLE is a complete RFID Reader system that requires a 5V or 3.3V power source and connection to a host to work. The majority of the circuitry responsible for processing the RFID card information and executing the module firmware is shielded as shown on Figure 2.2. The device can be connected to the host via USB interface. A more generic breakout interface to the main controller is available; its pinout is shown in Table 2.2. The TWN4 MultiTech 3 BLE also offers a SAM slot and a speaker on board.

The TWN4 MultiTech 3 BLE can interact with the User via Bluetooth Low-Energy interface. This development pack contains documentation on BLE protocol and API implemented on the module.

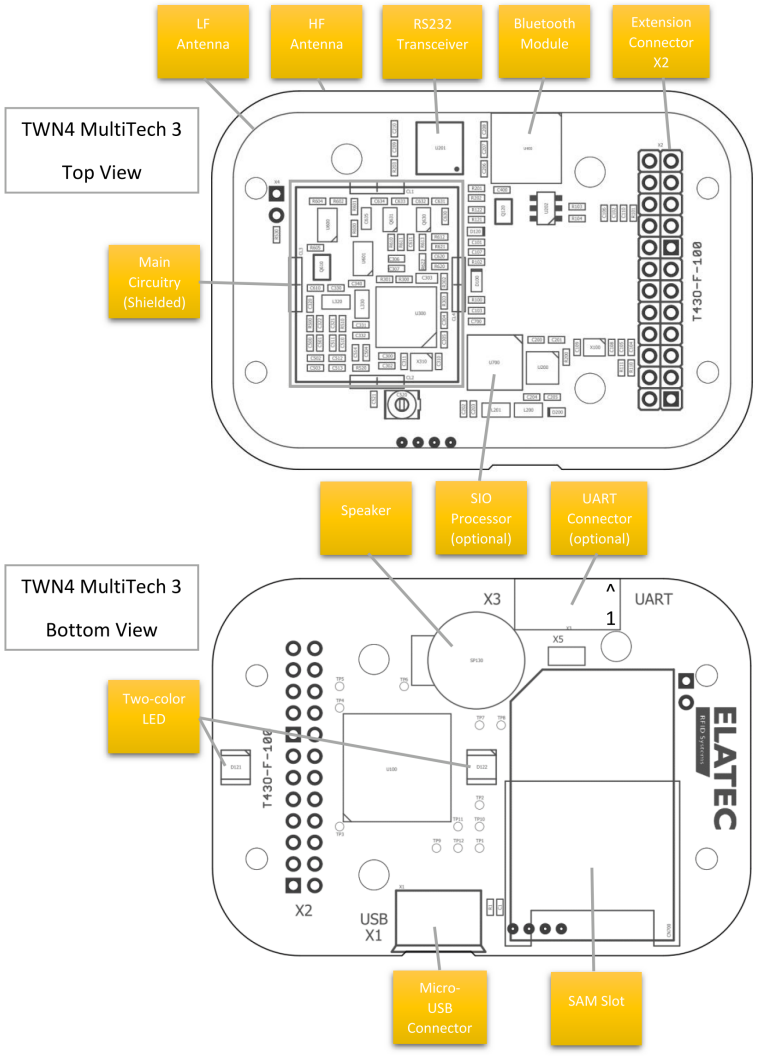


Figure 2.1: TWN4 MultiTech 3 BLE View Functional

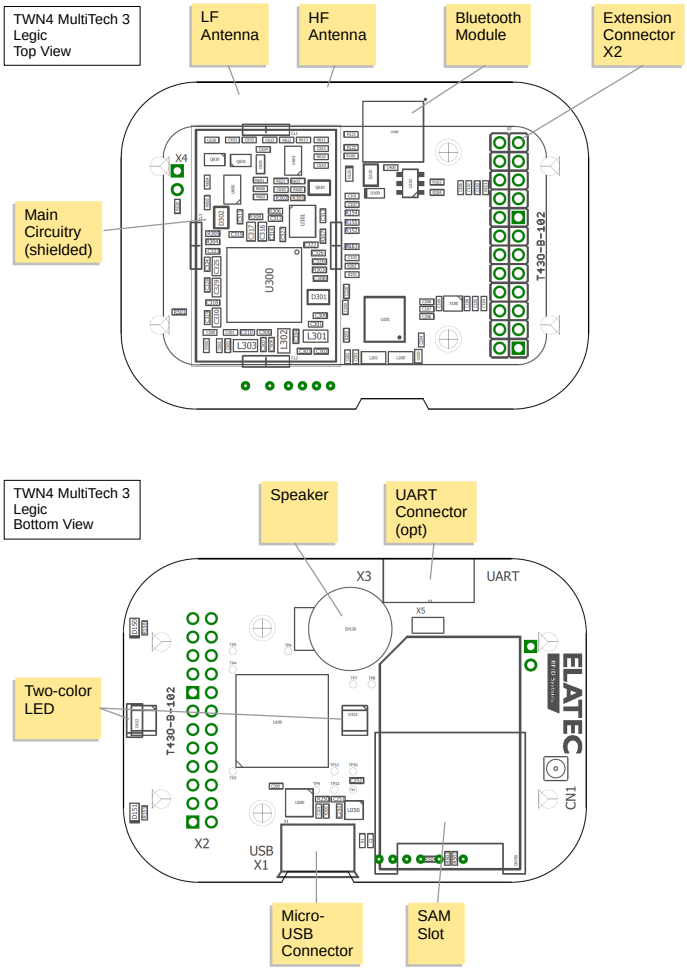


Figure 2.2: TWN4 MultiTech 3 Legic View Functional

2.2 Dimensions

Figure 2.3 provides the physical dimensions of the TWN4 MultiTech 3 BLE. All dimensions in mm unless otherwise stated.

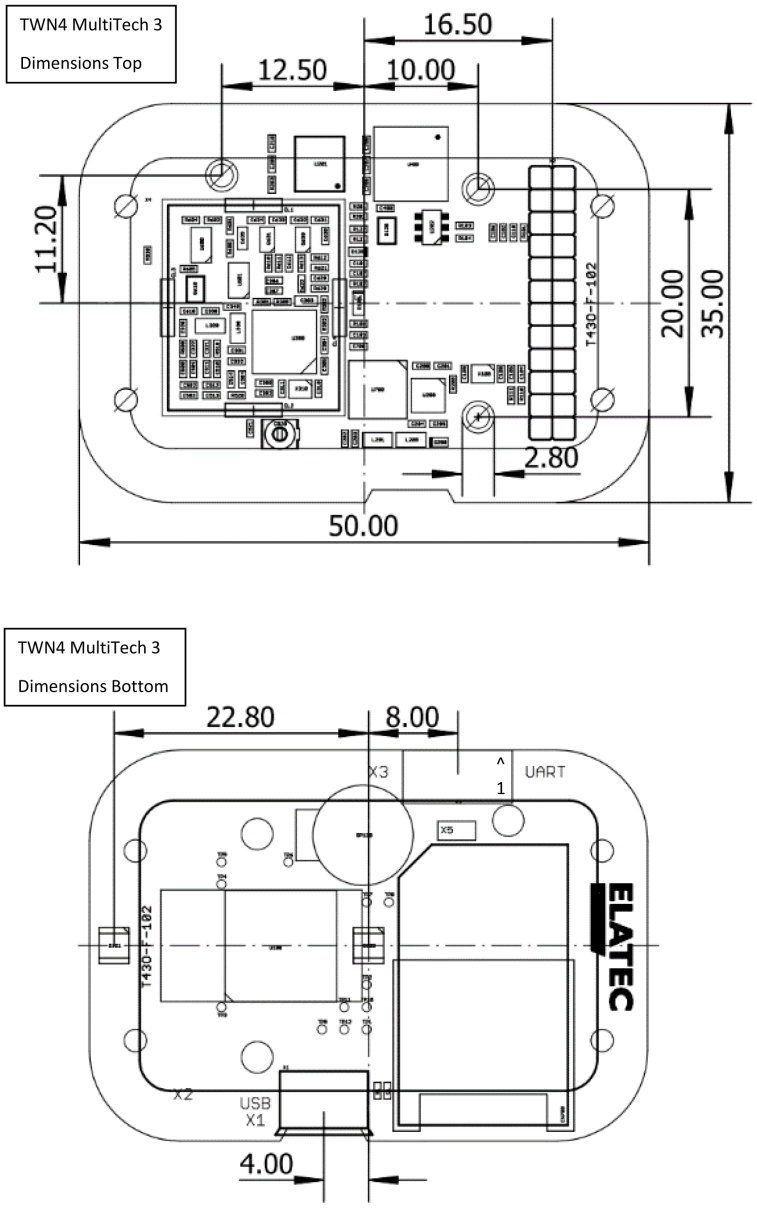


Figure 2.3: PCB Dimensions

Figure 2.4 provides the physical dimensions of the TWN4 MultiTech 3 Legic. All dimensions in mm unless otherwise stated.

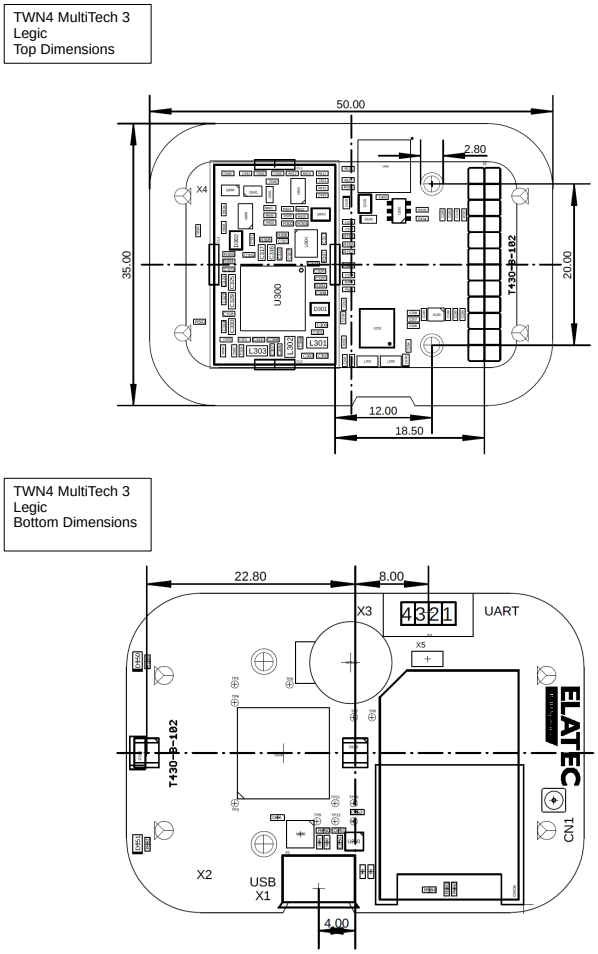


Figure 2.4: PCB Dimensions

2.3 Pinout

2.3.1 USB (X1)

Pin	Pin Name	Function
1	UVCC	USB VCC (5V)
2	USB_DM_P	USB Data -
3	USB_DP_P	USB Data +
4	NC	not connected
5	UGND	USB Ground

Table 2.1: Main USB connector (X1) Pin Configuration

2.3.2 Generic Interface (X2)

The module provides a generic access port that allows the User to bypass the main USB connector and interact with the TWN4 MultiTech 3 BLE microcontroller directly. The port name is X2 and the polarity of its pins is shown in Figure 2.5. A double row pin header with a pitch of 2 mm can be populated, e.g. Samtec PTT-124-01-S-D. The pinout is provided in Table 2.2.

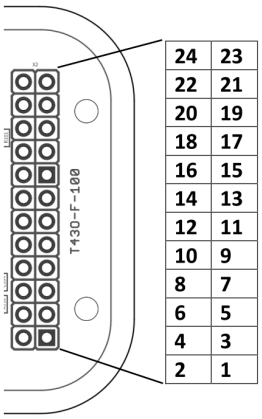


Figure 2.5: Connector X2

Pin	Pin Name	Function
1	CAN_TX	TTL TX pin of CAN interface. An external interface circuit is required.
2	CAN_RX	TTL RX pin of CAN interface. An external interface circuit is required.
3	I2C_SCL	Clock pin of I2C interface. No internal pull up.
4	I2C_SDA	Data pin of I2C interface. No internal pull up.
5	SPI_MOSI	Pin MOSI of SPI interface
6	SPI_MISO	Pin MISO of SPI interface
7	SPI_SS-	Pin SS- of SPI interface
8	SPI_SCK	Pin SCK of SPI interface
9	V24_TXD	RS232 TXD (Output)
10	HOSTSENSE	Host channel selector: Low (connect to GND) = COM1 (no USB enumeration); high (connect to VCC) = USB. This pin is internally pulled high.
11	V24_RXD	RS232 RXD (Input)
12	GND	Ground
13	UVCC	USB VCC (5V)
14	USB_DM_P	USB Data -
15	UGND	USB Ground
16	USB_DP_P	USB Data +
17	COM1_TX	Low active TTL output (push/pull) of asynchronous TXD from COM1.
18	COM1_RX	Low active TTL input with internal pull-up resistor of asynchronous RXD to COM1.
19	VCC	Direct access to 3.3V supply net after Regulator. Microcontroller and majority of circuitry is powered by this.
20	GPIO4	I/O pin for general purposes.
21	GPIO5	I/O pin for general purposes.
22	GPIO6	I/O pin for general purposes.
23	PWRDWN-	Low active TTL input with internal pull-up resistor for turning off the voltage regulator.
24	RESET-	Low active TTL input with internal pull-up resistor for hard reset.

Table 2.2: Generic Interface (X2) Pin Configuration

2.3.3 UART (X3)

Pin	Pin Name	Function
1	+5V	5V supply
2	COM1_RX	Low active TTL input with internal pull-up resistor of asynchronous RXD to COM1.
3	COM1_TX	Low active TTL output (push/pull) of asynchronous TXD from COM1.
4	GND	Ground

Table 2.3: UART connector (X3) Pin Configuration

2.4 Versions

Various versions of TWN4 MultiTech 3 are available: One full-featured version and three cost-optimized versions which support LF (125kHz, 134.2kHz) and/or HF (13.56MHz) transponders. Table 2.4 and 2.5 lists the different features of the corresponding model:

Feature	**TWN4 MultiTech 3 BLE**	**TWN4 MultiTech 3**	**TWN4 MultiTech 3 LF**	**TWN4 MultiTech 3 HF**
LF	√	√	√	-
HF	√	√	-	√
BLE	√	-	-	-
Nr of SAM-Slots	1	1	-	1

Table 2.4: Different features of TWN4 MultiTech 3 Versions

Feature	**TWN4 MultiTech 3 BLE LEGIC**
LF	√
HF	√
BLE	√
Nr of SAM-Slots	1

Table 2.5: Different features of TWN4 MultiTech 3 LEGIC Versions

3 Bluetooth Low Energy (BLE) Feature

The traditional Bluetooth standard is convenient for constant-flow media transfer applications such as video streaming. The Bluetooth Low Energy standard was introduced for applications requiring a lower power consumption profile. Data is sent in bursts, followed by periods of electrical idle.

The TWN4 MultiTech 3 BLE uses the BGM121 module from Silicon Labs. The chip implements the Physical, Link and L2CAP Layers of the BLE Protocol. The API is implemented within the firmware of the main TWN4 microcontroller. The two chips interact via the COM2 port and GPIO7 (connected to Reset of BGM121) of the TWN4 microcontroller, thereby making COM2 and GPIO7 unavailable for custom user functions.

For more information regarding the Bluetooth Low Energy Standard please see document *"Designing for Bluetooth Low Energy"* from Silicon Labs.

For the description of all the BLE-related commands available, please see the TWN4 API document.

4 Power states and current consumption breakdown

The TWN4 MultiTech 3 BLE supports 3 power states that can be used to reduce the current consumption of the reader when the application calls for it.

In Normal state the reader can accommodate a request to search for a high-/low-frequency tag, perform a BLE action or interact with peripherals on short notice; the current consumption in this state is the highest.

In Sleep state the reader is not capable of any of the above, but consumes considerably less current. The reader can be woken by communication on USB/COM ports, predefined timeout, or a Low-Power-Card-Detection (LPCD) event and taken to Normal state.

In Stop state the reader consumes the least current and can be woken up via external/internal interrupt, or a Low-Power-Card-Detection (LPCD) event and taken to Normal state.

Changing the LPCD poll time will change the current consumption, which can be estimated with the following formula:

$$I_{LPCD} = 0.5mA + \frac{0.1mAs}{t_{Poll}[s]}$$

The first section of Table 4.1 shows the expected *typical* current draw in the 3 states described above, depending on the reader interface used. The second section of the table lists the *maximum* additional current drawn by the device's peripherals; these values are to be added to those in the "Normal Idle" base state. It is assumed that a +5V DC Power Source is used.

Host Connection	USB	UART-TTL
Typical Consumption in Base System States		
Normal Idle	65	59
Sleep	15	6,8
Sleep LPCD Option	15,3	7,0
Stop	N/A	0,45
Stop LPCD Option	N/A	0,8
Maximum Consumption by Function wrt. Normal Idle System State		
SearchTag-HF	+140	
SearchTag-LF	+25	
RS232	+4	
BLE Active Packet Reception	+9	
BLE Active Transmission (0 dBm output power)	+9	
BLE Active Transmission (8 dBm output power)	+24	
Speaker Constant Tone	+80	
LED (Red)	+2	
LED (Green)	+6	

Table 4.1: Current Consumption Breakdown given +5V DC Supply (mA)

5 Disclaimer

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