TWN4 Slim

Technical Handbook

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1 Introduction

1 Introduction

The TWN4 Slim is a configurable Reader/Writer of RFID transponders. This addition to the TWN4 family offers the Bluetooth Low Energy (BLE) interface. The Module has both the 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 Slim. We begin with a functional overview of the board, listing the features and interface options available. We then proceed with short introduction to the BLE Standard itself and the details of its implementation on the board.

The 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.

There are two versions available:

- TWN4 Slim
- TWN4 Slim LEGIC 63

2 TWN4 Slim

2.1 Functional Overview

The TWN4 Slim is a complete RFID Reader system that requires a 5V power source and connection to host to work. The majority of the circuitry responsible for processing the RFID card information and executing the module firmware is included as shown on Figure 2.1. The device can be connected to the host via USB interface with a micro USB cable. The cable can be simply connected with no extra configuration required. The TWN4 Slim also offers one SAM slots and a speaker on board.

The TWN4 Slim can also 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 Slim View Functional

2.2 Dimensions

Figure 2.2 provides the physical dimensions of the TWN4 Slim. All dimensions in mm unless otherwise stated.
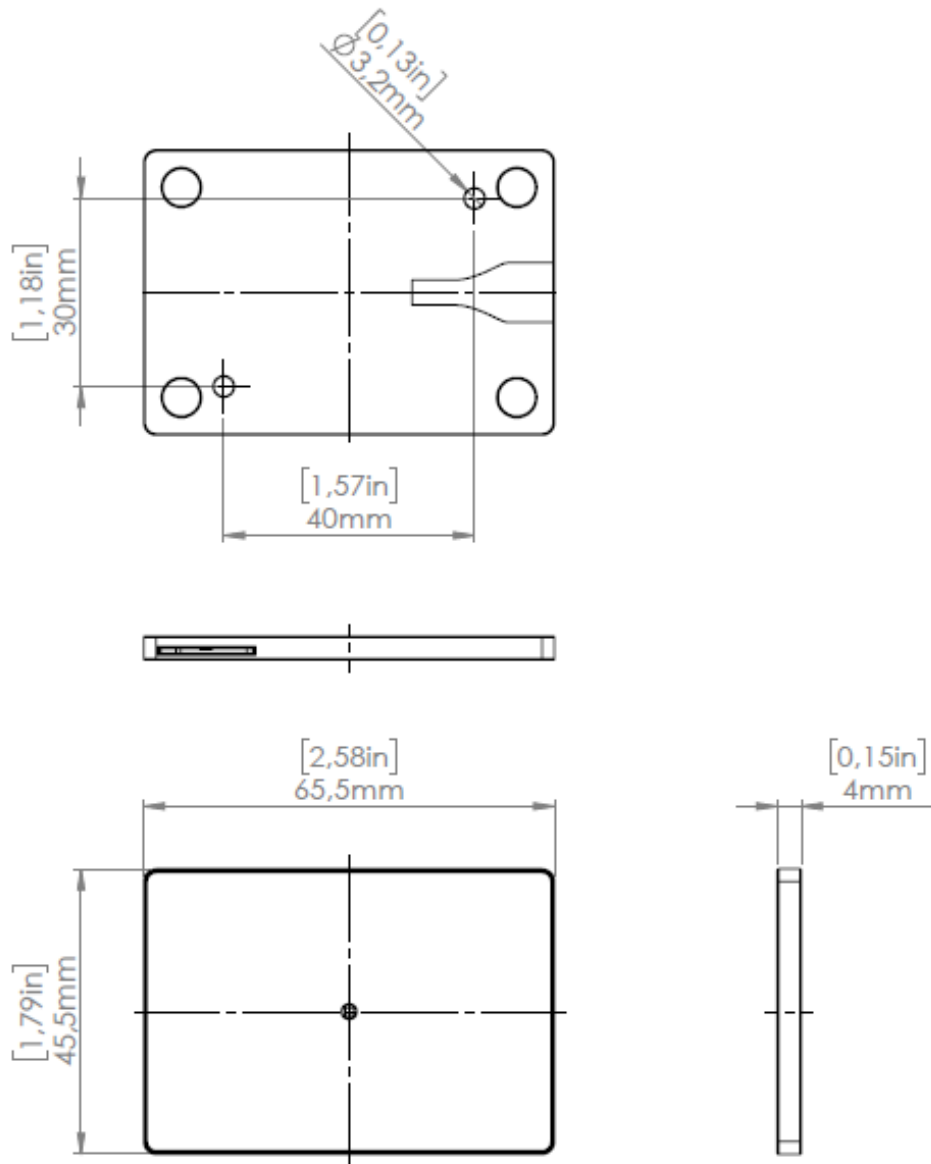

Figure 2.2: Dimensions

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 Slim uses the BGM11s 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 2 chips interact via the COM2 port of the microcontroller, thereby rendering this port unavailable for custom user functions.

Devices supporting the BLE standard communicate using a protocol named *Generic Attribute Profile (GATT)*. GATT defines two roles: Server and Client. A GATT Server stores attributes of the device and sends them to a Client upon request. The TWN4 Slim acts as a GATT server, receiving requests for information from the link partner (ex. cellphone) and transmitting relevant attributes back.

For more information regarding the Bluetooth Low Energy Standard please see document *"Designing for Bluetooth Low Energy"*[1] from Silicon Labs.

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

3.1 LEGIC Connect (TWN4 Slim LEGIC 63 only)

The TWN4 Slim LEGIC 63 variant support BLE to connect to LEGIC Connect based mobile apps as well as to connect to other LEGIC reader chips or any other third-party BLE device.

The reader manages most of the complexity of the BLE interface while connected to a LEGIC Connect mobile app. For more information about LEGIC Connect please refer to the LEGIC Connect documentation.

4 Power states and current consumption breakdown

The TWN4 Slim 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 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.

Typical Consumption in Base System States		
Value	TWN4 Slim	TWN4 Slim LEGIC 63
Normal Idle	70	76
Sleep	15	15
Sleep LPCD Option	N/A	N/A
Maximum Consumption by Function wrt. Normal Idle System State		
SearchTag-HF	+100	+70
SearchTag-LF	+20	+20
BLE Active Packet Reception	+9	+5
BLE Active Transmission (0 dBm output power)	+9	+5
BLE Active Transmission (8 dBm output power)	+24	+10
Speaker Constant Tone	+120	+120
LED (Red)	+3	+3
LED (Green)	+2	+2
LED (Blue)	+2	+2

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

5 Disclaimer

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6 Bibliography

1. Silicon Labs Website. Application Note *"Designing for Bluetooth Low Energy Applications"*, taken from http://www.silabs.com on 24. January, 2017