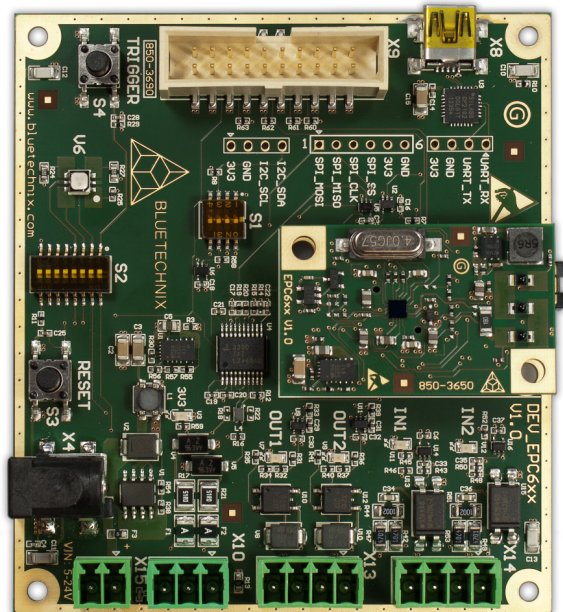


BLUETECHNIX
Embedding Ideas

Tiny ToF Development Board

Hardware User Manual

Version 1.2





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Table of Contents

1	General Information.....	6
1.1	Symbols Used.....	6
1.2	Certification.....	6
2	Introduction.....	7
2.1	Overview.....	7
2.2	Key Features.....	7
2.2.1	Active components.....	8
3	General Description.....	9
3.1	Functional Description.....	9
3.1.1	EPC6xx ToF Module connector (p).....	9
3.1.2	Power Supply (k, l).....	9
3.1.3	JTAG (d).....	10
3.1.4	USB/UART (b).....	10
3.1.5	Reset Button (j).....	10
3.1.6	Trigger Button (g).....	10
3.1.7	Dual Color LED (h).....	10
3.1.8	GPIOs (o, n).....	10
3.1.9	SPI (c).....	11
3.1.10	I2C (e).....	11
3.1.11	Modulation (ModLight) Interface (r).....	11
3.1.12	RS-232/RS-485 (m).....	11
3.1.13	Configuration Switch 1 (f).....	11
3.1.14	Configuration Switch 2 (i).....	12
4	Specifications.....	13
4.1	Electrical Specifications.....	13
4.1.1	Operating Conditions.....	13
4.1.2	Absolute Maximum Ratings.....	13
4.1.3	ESD Sensitivity.....	13
5	Connector Description.....	14
5.1	EPC6xx ToF Module connector.....	14
6	Mechanical Outline.....	15
6.1	Top View.....	15
7	Support.....	16
7.1	General Support.....	16
8	Ordering Information.....	17
9	Product History.....	18

9.1	Version Information	18
9.1.1	Tiny ToF Development Board	18
9.2	Anomalies.....	18
10	Document Revision History	19
11	List of Abbreviations	20
A	List of Figures and Tables	21

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Information

For further information on technology, delivery terms and conditions and prices please contact Bluetechnix (<http://www.bluetechnix.com>).

Warning

Due to technical requirements components may contain dangerous substances.

1 General Information

This guide applies to the Tiny ToF Development Board from Bluetechnix GmbH. Follow this guide chapter by chapter to set up and understand your product.

The document applies to the X-Grade product.

1.1 Symbols Used

This guide makes use of a few symbols and conventions:



Warning

Indicates a situation which, if not avoided, could result in minor or moderate injury and/or property damage or damage to the device.



Caution

Indicates a situation which, if not avoided, may result in minor damage to the device, in malfunction of the device or in data loss.



Note

Notes provide information on special issues related to the device or provide information that will make operation of the device easier.

Procedures

A procedure always starts with a headline

1. The number indicates the step number of a certain procedure you are expected to follow. Steps are numbered sequentially.

This sign ➤ indicates an expected result of your action.

References

 This symbol indicates a cross reference to a different chapter of this manual or to an external document.

1.2 Certification



X-Grade Version

X-Grade version of the products are not intended for sale and have therefore no certifications. The user is responsible for a correct usage in order with federal laws.

2 Introduction

2.1 Overview

The Tiny ToF Development Board is a low cost rapid development platform designed to decrease time-to-market of customized applications. It supports Bluetechnix' EPC6xx ToF modules. The development board provides all interfaces on dedicated connectors or pinheads. The form factor of the Tiny ToF Development Board allows easy integration of the board into OEM products.

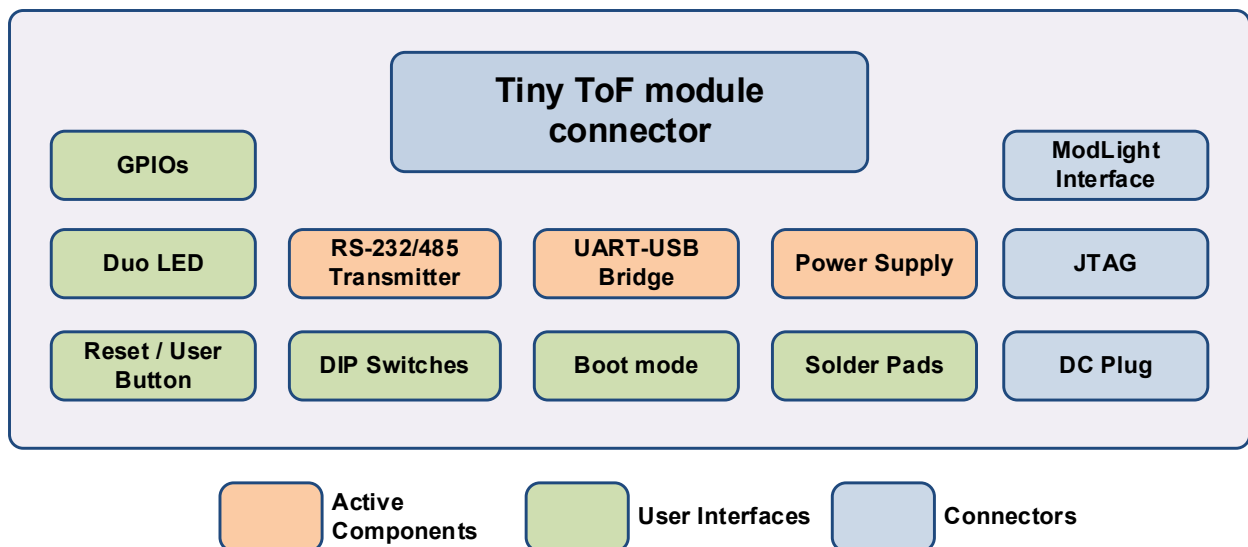


Figure 2-1 Overview of the main components

2.2 Key Features

- Size: 90 x 80mm
- 20-Pin EPC6xx ToF Module Connector
- RS485/RS232 Interface
- USB/UART Debug Interface
- 2 Inputs (with galvanic isolation, up to 50V input voltage)
- 2 Outputs (with galvanic isolation)
- Modlight Interface for external illumination
- I2C, SPI and UART on pinheads
- Duo color LEDs
- Trigger button
- Reset button
- JTAG
- 5V-24V power supply



2.2.1 Active components

- USB/UART Bridge (CP2102)
- RS-232/RS-485 Transceiver (ISL3330)
- StepDown Converter (MPM3620)



3 General Description

The following chapters describes the functions of the board interfaces.

- a. UART interface
- b. USB/UART interface
- c. SPI interface
- d. JTAG connector
- e. I²C interface
- f. Configuration switch 1
- g. Trigger button
- h. Dual color LED
- i. Configuration switch 2
- j. Reset button
- k. DC10 power connector
- l. Terminal power connector
- m. RS232/485
- n. Outputs
- o. Inputs
- p. Module connector
- q. Modulation signal port
- r. ModLight interface

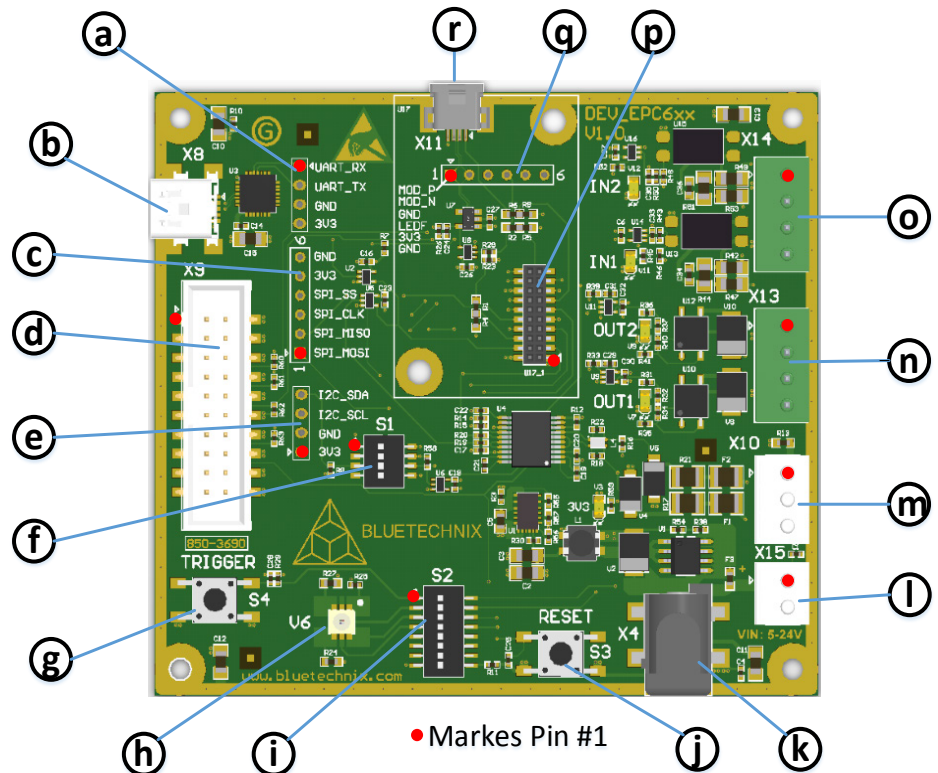


Figure 3-1 Tiny ToF Development Board connectors and interfaces

3.1 Functional Description

3.1.1 EPC6xx ToF Module connector (p)

The Tiny ToF Development Board provides a 20 pin connector to connect an EPC6xx ToF module to it (p).

For further information see Hardware User Manual of EPC610 ToF Module.

3.1.2 Power Supply (k, l)

The Tiny ToF Development Board must be powered by an external 5V-24V power supply connected to power connector (k) or (l).

Pin assignment on the power connectors:

DC10 connector (k): Connector Type: 2.1mm ID / 5.5mm OD

Voltage: 5-24V (1,5W)

Polarity: 

Terminal connector (l): Pin #1: +5V-24V, Pin#2: GND

3.1.3 JTAG (d)

A standard ARM JTAG connector (20 pins, 2.54mm pitch) **(d)** is available for processor debugging.

3.1.4 USB/UART (b)

An EPC6xx ToF module UART is routed through a USB/UART bridge (CP2102 Silicon Labs) to the connector **(b)**. The same UART is also available on pinheads **(a)**.



Note

Switch 8 of DIP switch **(i)** must be in OFF position.

3.1.5 Reset Button (j)

The Tiny ToF Development Board provides a reset button **(j)** to reset the EPC6xx ToF module.

3.1.6 Trigger Button (g)

The Tiny ToF Development Board provides a trigger button **(g)** which is connected to pin 14 of the EPC6xx ToF module connector.



Note

Switch 1 of DIP switch **(i)** must be in ON position.

3.1.7 Dual Color LED (h)

The Dual Color LED **(h)** is connected to the pins 6 and 12 of the module connector and can be used for status signaling.



Note

Switches 6 and 7 of DIP switch **(i)** must be in ON position.

3.1.8 GPIOs (o, n)

Two galvanic isolated inputs **(o)** and two galvanic isolated outputs **(n)** are available on the Tiny ToF Development Board. The current status of the GPIOs are shown by Status LEDs (IN1, IN2, OUT1, OUT2).



Note

Switches 6, 7 and 8 of DIP switch **(i)** must be in OFF position.


Warning

Do not exceed the maximum allowed voltages and currents. (see 4.1.1)

3.1.9 SPI (c)

The SPI interface of the EPC6xx ToF module is available on pinheads **(c)**.

3.1.10 I2C (e)

The I2C interface of the EPC6xx ToF module is available on pinheads **(e)**.

3.1.11 Modulation (ModLight) Interface (r)

For connection of an external IR light source, a Modulation light signal connector is available on the Tiny ToF Development Board. The same signals are also available on pinheads **(q)**.


Note

Resistors R4 and R9 must be depopulated and resistors R1 and R6 must be populated (0R, 0402).

The used EPC6xx ToF module must be configured for external illumination. (For further information see Hardware User Manual of EPC610 ToF Module).


Note

Keep the connection between the ModLight interface and the external IR light source as short as possible.

3.1.12 RS-232/RS-485 (m)

A RS-232/485 interface is available on the Tiny ToF Development Board.


Note

Switch 8 of DIP switch **(i)** must be in ON position.

Switch 3 of DIP switch **(f)** must be in ON position.

Switch 2 of DIP switch **(f)** switches between RS-232 (OFF) and RS-285 (ON).

3.1.13 Configuration Switch 1 (f)

Switch No.	Switch Position	Commend
1	ON	EPC6xx ToF module UART Bootloader enabled
1	OFF	EPC6xx ToF module boots from flash
2	ON	RS-485 mode enabled
2	OFF	RS-232 mode enabled
3	ON	EPC6xx ToF module pin 11 (I2C.SDA) is used as nUART_RX_EN
3	OFF	EPC6xx ToF module pin 11 (I2C.SDA) us used as I2C data

Switch No.	Switch Position	Commend
4	ON	RS-485 terminating resistor enabled
4	OFF	RS-485 terminating resistor disabled

Figure 3-2 Configuration switch 1 options

3.1.14 Configuration Switch 2 (i)

Switch No.	Switch Position	Commend
1	ON	EPC6xx ToF module pin 14 (GPIO3) is connected to the Trigger button
1	OFF	EPC6xx ToF module pin 14 (GPIO3) is connected to input 1
2	ON	EPC6xx ToF module pin 12 (GPIO2) is connected to the green LED
2	OFF	EPC6xx ToF module pin 12 (GPIO2) is connected to output 2
3	ON	EPC6xx ToF module pin 6 (GPIO4) is connected to the red LED
3	OFF	EPC6xx ToF module pin 6 (GPIO4) is connected to the to output 1
4	ON	Not connected
4	OFF	Not connected
5	ON	Not connected
5	OFF	Not connected
6	ON	Not connected
6	OFF	Not connected
7	ON	Not connected
7	OFF	Not connected
8	ON	RS-232/485 interface enabled
8	OFF	USB/UART interface enabled

Figure 3-3 Configuration switch 2 options

4 Specifications

4.1 Electrical Specifications

4.1.1 Operating Conditions

Symbol	Parameter	Min	Typical	Max	Unit
V_{IN}	Power supply voltage	5	12	24	V
P_{LED}	Power consumption during ToF integration ¹⁾			3	W
V_{OC}	Allowed level on open collector output pins	5		50	V
I_o	Output current on output pins	-200		200	mA
V_{IH}	High level input voltage	2.5		50	V
V_{IL}	Low level input voltage	0		2.4	V
T_{OP}	Operating temperature on PCB	-20		65	°C
ϕ_{AMB}	Relative ambient humidity (non condensing)	0		90	%

Table 4.1: Electrical characteristics

Note 1) Average power for a ToF modulation signal with 50% duty cycle (52ms integration time).

4.1.2 Absolute Maximum Ratings

Stressing the device above the rating listed in the absolute maximum ratings table may cause permanent damage to the device. These are stress ratings only. Operation of the device at these or any other conditions greater than those indicated in the operating sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Symbol	Parameter	Min	Max	Unit
V_{IN}	Power supply voltage	-0.3	24	V
T_{AMB}	Ambient temperature	-20	65	°C
T_{STO}	Storage temperature	-55	125	°C
ϕ_{AMB}	Relative ambient humidity	0	90	%

Table 4.2: Absolute maximum ratings

4.1.3 ESD Sensitivity



ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

5 Connector Description

5.1 EPC6xx ToF Module connector

The following table shows the pin-out of the 20-pin EPC6xx ToF Module connector:

Pin #	Type	Signal name	Description
1	PWR	VCC	Input Voltage
2	PWR	GND	Power Ground
3	O	UART.TX	UART Transmit Data
4	I	UART.RX	UART Receive Data
5	I/O	GPIO5	Output ^[1]
6	I/O	GPIO4	PWM Output ^[1]
7	I	SPI.MOSI	SPI Master Out Slave In
8	O	SPI.CLK	SPI Clock
9	I/O	SPI.SS / GPIO1	SPI Slave Select / Output ^[1]
10	O	SPI.MISO	SPI Master In Slave Out
11	I/O	I2C.SDA	I2C Data
12	I/O	GPIO2	Input ^[1]
13	I/O	I2C.SCL	I2C Clock
14	I/O	GPIO3	Input ^[1]
15	I	nBMODE	Bootmode Entry (pull high to enter Uart Bootmode)
16	PWR	GND	Power Ground
17	I	SWD.CLK	Serial Wire Debug Clock
18	I	nRESET	Module Reset
19	O	3V3_Out	3V3 Output (max. 100mA)
20	I/O	SWD.IO	Serial Wire Debug IO

Table 5.1 Pin-out of the EPC6xx module connector

^[1] GPIO type configuration with standard firmware.

6 Mechanical Outline

All Dimensions in the drawings below are given in Millimeters.

6.1 Top View

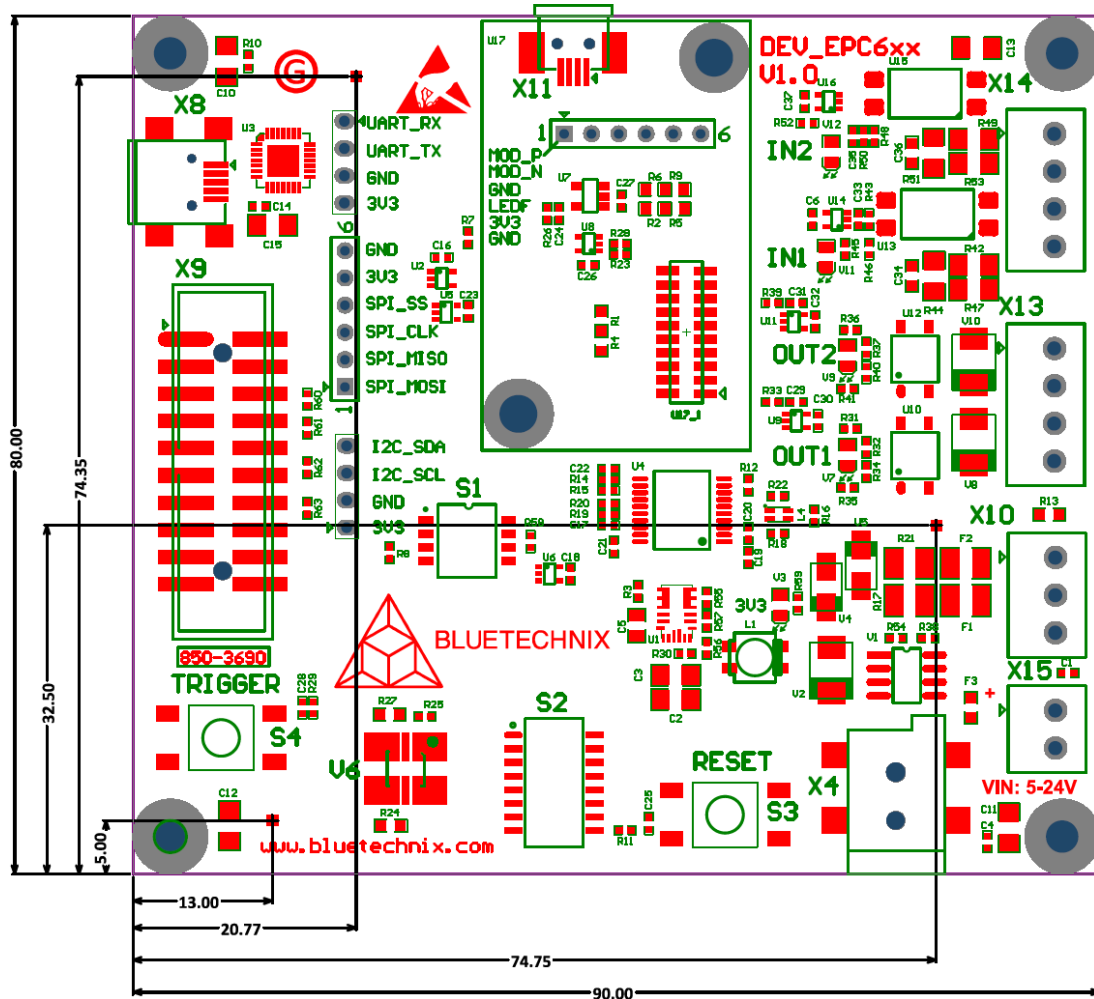


Figure 6-1: Top side Dimensions

7 Support

7.1 General Support

General support for products can be found at Bluetechnix' support site <http://support.bluetechnix.at>



8 Ordering Information

PON	Name	Note
150-2301-1	Tiny ToF Development Board	

Table 8.1: Order Information

9 Product History

9.1 Version Information

9.1.1 Tiny ToF Development Board

Version	Component	Type
1.0.0		First release

Table 9.1: Overview Tiny ToF Development Board product changes

9.2 Anomalies

Version	Date	Description
V1.0	2014 23 04	No anomalies reported yet.

Table 9.2 – Product anomalies



10 Document Revision History

Version	Date	Document Revision
1	2014 04 23	First release V1.0 of the Document
2	2014 07 14	Corrected DIP switch numbers (chapters 3.1.4 and 3.1.6)

Table 10.1: Revision history



11 List of Abbreviations

Abbreviation	Description
ESD	Electrostatic Discharge
GPIO	General Purpose Input Output
I	Input
I²C	Inter-Integrated Circuit
I/O	Input/Output
MTBF	Mean Time Between Failure
NC	Not Connected
O	Output
PWR	Power
SPI	Serial Peripheral Interface
UART	Universal Asynchronous Receiver Transmitter
USB	Universal Serial Bus

Table 11.1: List of abbreviations

A List of Figures and Tables

Figures

Figure 2-1 Overview of the main components	7
Figure 3-1 Tiny ToF Development Board connectors and interfaces	9
Figure 3-2 Configuration switch 1 options	12
Figure 3-3 Configuration switch 2 options	12
Figure 6-1: Top side Dimensions	15

Tables

Table 4.1: Electrical characteristics.....	13
Table 4.2: Absolute maximum ratings.....	13
Table 5.1 Pin-out of the EPC6xx module connector	14
Table 8.1: Order Information	17
Table 9.1: Overview Tiny ToF Development Board product changes	18
Table 9.2 – Product anomalies	18
Table 10.1: Revision history	19
Table 11.1: List of abbreviations	20