



TEI0004 TRM

Revision: v.31

Exported on: 06/09/2023

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2 Overview

<https://wiki.trenz-electronic.de/display/PD/TEI0004+TRM> for the current online version of this manual and other available documentation. Arrow USB Programmer2 is an FT2232H based JTAG Adapter supported by Intel Quartus.

2.1 Key Features

- Supported by Intel Quartus (JTAG Mode only)
- Intel JTAG Compatible Pinout
- Additional UART Channel available
- Based on FTDI FT2232H USB2 Interface
- Micro USB Connector
- RED activity LED
- GREEN Power-on LED

2.2 Block Diagram

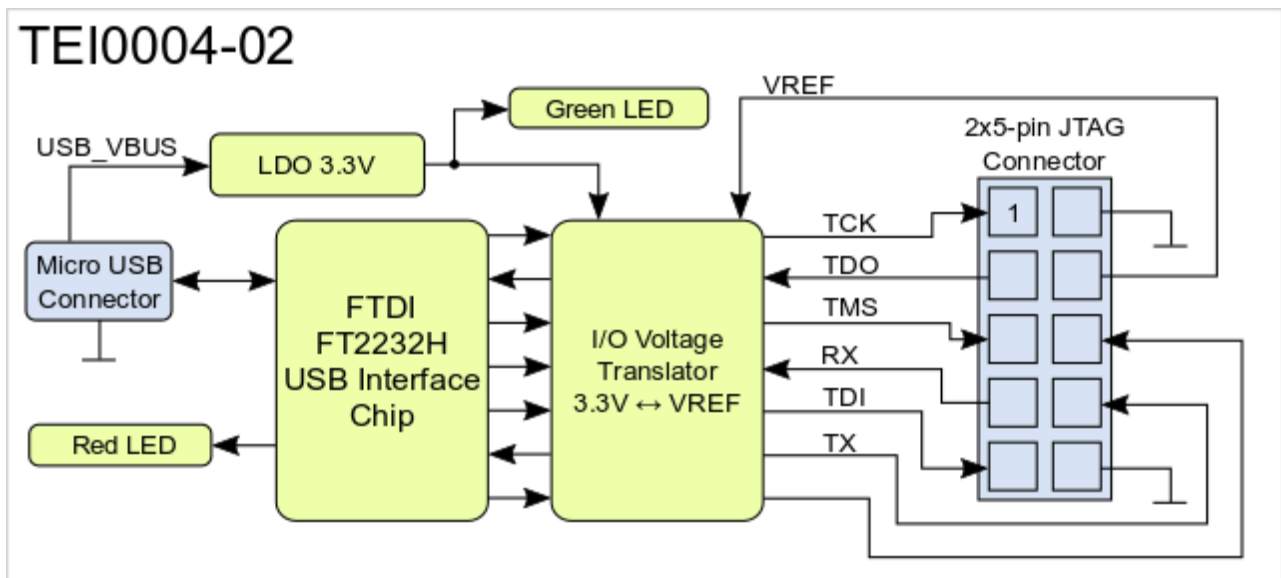


Figure 1: TEI0004-02 Block Diagram.

2.3 Main Components

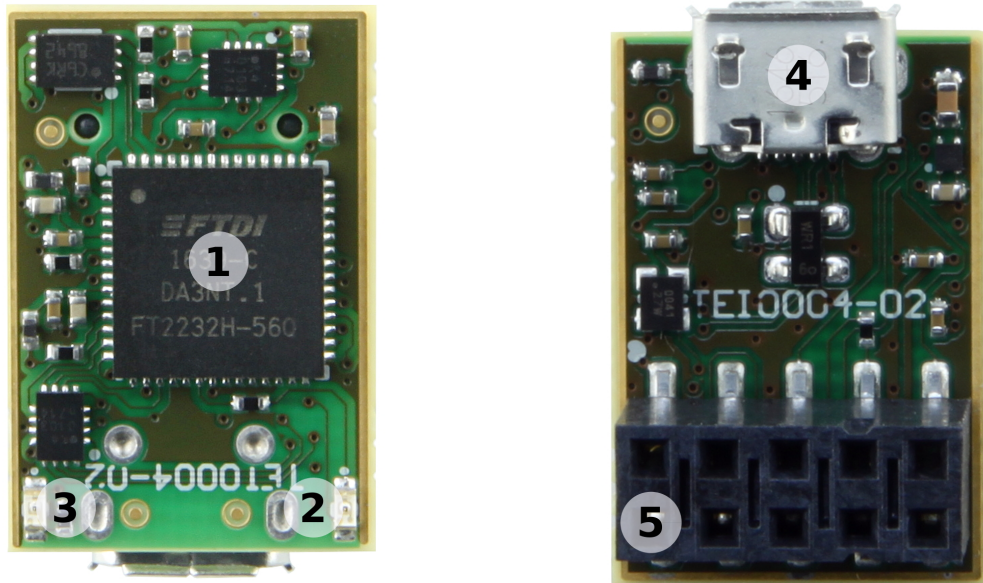


Figure 2: TEI0004-02 main components.

1. FTDI FT2232H IC
2. RED LED (Activity)
3. Green LED (Power-on)
4. Micro USB2 Connector
5. 2x5-pin JTAG Connector (White dot marks Pin 1)

3 Signals, Interfaces and Pins

3.1 JTAG Connector Pinout

The 2x5 female socket have to be connected to the corresponding pin header on the target system. The signal assignment of the pin header on the adapter board is fully compatible to original USB blaster. Furthermore there is also an UART interface available and I/O-pin reserved for future use.

Following table describes the pin-assignment to the signals of the interfaces:

Signal	Pin Number	Pin Number	Signal
TCK (output from adapter)	1	2	GND
TDO (input to adapter)	3	4	Reference I/O-voltage from target board for JTAG and UART
TMS (output from adapter)	5	6	Reserved Output (May be used as Processor Reset in future software releases)
UART RX (input to adapter)	7	8	UART TX (output from adapter)
TDI (output from adapter)	9	10	GND

Table 1: JTAG Connector pin assignment.

3.2 USB Interface

The USB interface is provided by the FTDI FT2232H IC. The entire USB protocol is handled on chip and compatible to USB 2.0 High Speed (480 MBps) and Full Speed (12 MBps).

4 On-board Peripherals

4.1 FTDI FT2232H IC

FTDI FT2232H IC Channel A is used in MPPSE Mode for JTAG, Channel B is available as UART. FT2232H EEPROM is programmed with Arrow Programmer2 Identifier to be recognized by the support library for Quartus.

4.2 On-board LEDs

On-board LEDs indicating power-on and JTAG activity:

Color	Description
Green	Power-on LED
Red	JTAG activity

Table 2: On-board LEDs.

5 Power

5.1 Power supply of the adapter board

Arrow Programmer2 is powered via USB.

6 Technical Specifications

6.1 Absolute Maximum Ratings

Parameter	Min	Max	Units	Reference Document
VREF	-0.5	4.6	V	Nexperia 74AVCH4T245 data sheet
USB VBUS	4.75	5.25	V	USB 2.0 Specification
Voltage on I/O pins	-0.5	4.6	V	Nexperia 74AVCH4T245 data sheet
Storage temperature	-40	+90	°C	LED 19-213/R6C-AL1M2VY/3T data sheet

Table 3: Absolute maximum ratings.

6.2 Recommended Operating Conditions

Parameter	Min	Max	Units	Reference Document
VREF	0.8	3.6	V	Nexperia 74AVCH4T245 data sheet
USB VBUS	4.75	5.25	V	USB 2.0 Specification
Voltage on I/O pins	0	VREF	V	Nexperia 74AVCH4T245 data sheet
Operating temperature	-40	+85	°C	FTDI FT2232H data sheet

Table 4: Recommended operating conditions.

6.3 Operating Temperature Range

Industrial grade: -40°C to +85°C.

Arrow Programmer2 can be used within industrial temperature range.

6.4 Physical Dimensions

- Module size: 14.2mm × 20.8mm. Please download the assembly diagram for exact numbers.
- Highest part on PCB: 7.37 mm. Please download the step model for exact numbers.

All dimensions are given in millimeters and mil.

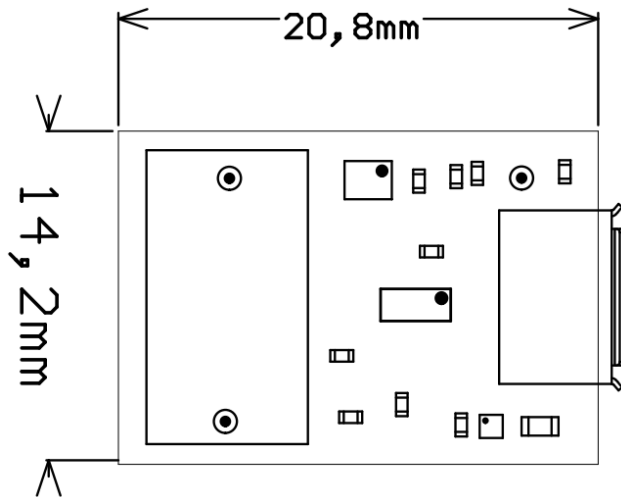


Figure 3: Physical dimensions drawing.

7 Revision History

7.1 Hardware Revision History

Date	Revision	Notes	PCN	Documentation Link
-	01	Prototypes	-	-
-	02	First production release.	-	TEI0004

Table 5: Hardware revision history.

Hardware revision number can be found on the PCB board together with the module model number separated by the dash.

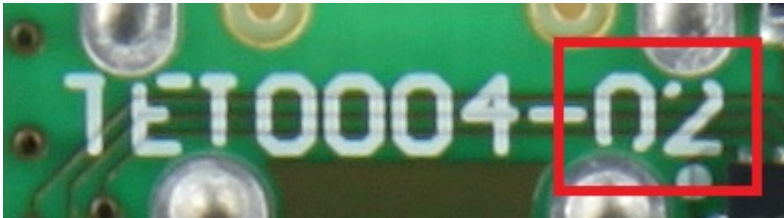


Figure 4: Revision number.

7.2 Document Change History

Date	Revision	Contributors	Description
 2023-06-09	v.51	John Hartfiel	Bugfix VREF recommended voltage range
2022-05-05	v.50	John Hartfiel	renaming
2017-11-23	v.31	Ali Naseri	updated block diagram
2017-11-21	v.25	Ali Naseri	First TRM release

Table 6: Document change history.

8 Disclaimer

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Please also note our data protection declaration at <https://www.trenz-electronic.de/en/Data-protection-Privacy>

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 2019-06-07

 02.09.2017