



TEI0005 TRM

Revision: v.13

Exported on: 02/02/2018

1 Table of Contents

1	Table of Contents.....	2
2	Overview.....	3
2.1	Key Features.....	3
2.2	Block Diagram.....	3
3	Signals, Interfaces and Pins.....	4
3.1	Module Pinout.....	4
3.2	USB Interface.....	5
4	On-board Peripherals.....	6
4.1	FTDI FT2232H IC.....	6
4.2	On-board LEDs.....	6
5	Power.....	7
5.1	Power supply of the adapter board.....	7
6	Technical Specifications.....	8
6.1	Absolute Maximum Ratings.....	8
6.2	Recommended Operating Conditions.....	8
6.3	Operating Temperature Range.....	8
6.4	Physical Dimensions.....	8
7	Revision History.....	10
7.1	Hardware Revision History.....	10
7.2	Document Change History.....	10
8	Disclaimer.....	11
8.1	Document Warranty.....	11
8.2	Limitation of Liability.....	11
8.3	Copyright Notice.....	11
8.4	Technology Licenses.....	11
8.5	Environmental Protection.....	11
8.6	REACH, RoHS and WEEE.....	11

2 Overview

<https://wiki.trenz-electronic.de/display/PD/TEI0005+TRM> for the current online version of this manual and other available documentation.

Arrow USB Programmer2 SMD module is a FT2232H based JTAG programmer supported by Intel Quartus. It's designed as Surface-mount module and have to be fitted on the target board in Surface Mount Technology. Furthermore, there is also an UART interface available and two I/O-pins reserved for future use.

2.1 Key Features

- Supported by Intel Quartus (JTAG Mode only)
- Designed as Surface-mount module
- Compatible to SMT Pick and Place Assembly Process
- Delivery Option in Standard JEDEC Tray
- 17 x 17 mm
- Based on FTDI FT2232H USB2 Interface
- Additional UART channel available
- Activity LEDs

2.2 Block Diagram

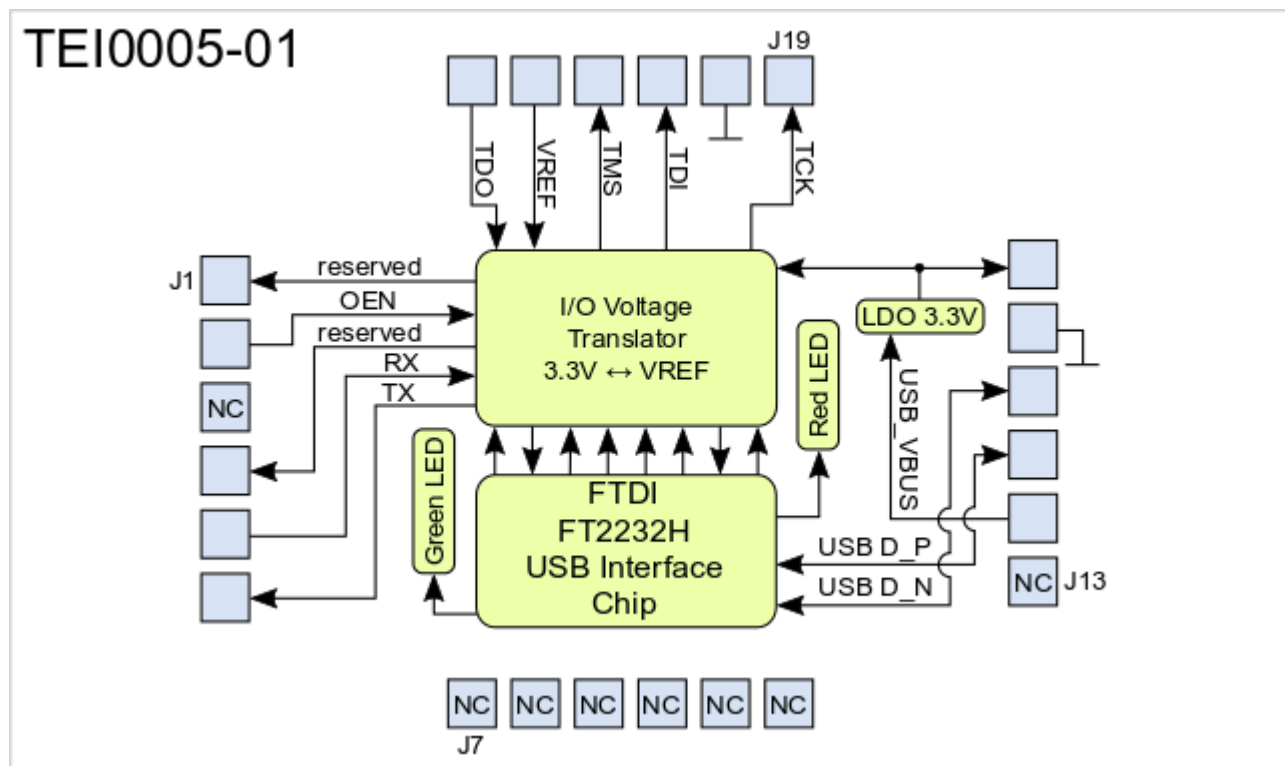


Figure 1: TEI0005-01 Block Diagram.

3 Signals, Interfaces and Pins

3.1 Module Pinout

Mechanical drawing below shows the positions of the signal pins on the PCB of the module labeled with designators J1 ... J24. Followed by pin description table.

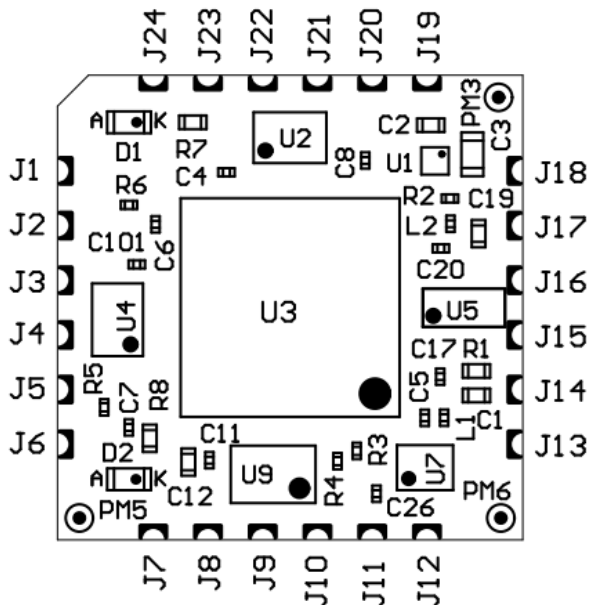


Figure 2: JTAG Module mechanical drawing (Top View).

Pin Designator	Signal	Module Direction
J1	reserved for future use	out
J2	OEN (enable data transmitting), low active	in
J3	Do not connect (reserved for future use)	-
J4	reserved for future use	out
J5	UART RX	in
J6	UART TX	out
J7...J13	Do not connect (reserved for future use)	-
J14	USB-VBUS (USB Host supply voltage)	in
J15	USB Data -	bidir
J16	USB Data +	
J17	GND	-

Pin Designator	Signal	Module Direction
J18	3.3V output voltage from module	out
J19	TCK	out
J20	GND	-
J21	TDI	out
J22	TMS	out
J23	VREF (Reference I/O-voltage from target board for JTAG and UART)	in
J24	TDO	in

Table 1: JTAG module 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 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 UART and JTAG activity:

Color	Description
Green	UART activity
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
USB VBUS	4.75	5.25	V	USB 2.0 Specification
VREF	-0.5	4.6	V	Nexperia 74AVCH4T245 data sheet
Voltage on I/O pins	-0.5	4.6	V	Nexperia 74AVCH4T245 data sheet
Storage temperature	-55	+85	°C	LED LTST-C191KRKT

Table 3: Absolute maximum ratings.

6.2 Recommended Operating Conditions

Parameter	Min	Max	Units	Reference Document
USB VBUS	4.75	5.25	V	USB 2.0 Specification
VREF	0.8	3.6	V	Nexperia 74AVCH4T245 data sheet (VCCB)
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: 17.0mm × 17.0mm. Please download the assembly diagram for exact numbers.
- PCB thickness: ca. 1.2mm
- Highest part on the PCB is 1mm, the overall height of the module is up to 2.4mm max.

All dimensions are given in millimeters.

Top View

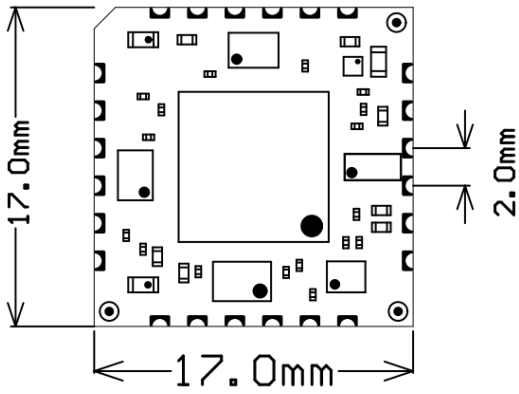


Figure 3: Physical dimensions drawing.

7 Revision History

7.1 Hardware Revision History

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

Table 5: Hardware revision history.

7.2 Document Change History


Date	Revision	Contributors	Description
 2018-01-23	v.13	John Hartfiel	<ul style="list-style-type: none"> • update "Recommended Operating condition"
2018-01-12	v.12	John Hartfiel	<ul style="list-style-type: none"> • updated physical dimensions
2017-11-24	v.11	Ali Naseri	<ul style="list-style-type: none"> • updated physical dimensions
2017-11-23	v.10	Ali Naseri	<ul style="list-style-type: none"> • First TRM release

Table 6: Document change history.

8 Disclaimer

8.1 Document Warranty

The material contained in this document is provided “as is” and is subject to being changed at any time without notice. Trenz Electronic does not warrant the accuracy and completeness of the materials in this document. Further, to the maximum extent permitted by applicable law, Trenz Electronic disclaims all warranties, either express or implied, with regard to this document and any information contained herein, including but not limited to the implied warranties of merchantability, fitness for a particular purpose or non infringement of intellectual property. Trenz Electronic shall not be liable for errors or for incidental or consequential damages in connection with the furnishing, use, or performance of this document or of any information contained herein.

8.2 Limitation of Liability

In no event will Trenz Electronic, its suppliers, or other third parties mentioned in this document be liable for any damages whatsoever (including, without limitation, those resulting from lost profits, lost data or business interruption) arising out of the use, inability to use, or the results of use of this document, any documents linked to this document, or the materials or information contained at any or all such documents. If your use of the materials or information from this document results in the need for servicing, repair or correction of equipment or data, you assume all costs thereof.

8.3 Copyright Notice

No part of this manual may be reproduced in any form or by any means (including electronic storage and retrieval or translation into a foreign language) without prior agreement and written consent from Trenz Electronic.

8.4 Technology Licenses

The hardware / firmware / software described in this document are furnished under a license and may be used / modified / copied only in accordance with the terms of such license.

8.5 Environmental Protection

To confront directly with the responsibility toward the environment, the global community and eventually also oneself. Such a resolution should be integral part not only of everybody's life. Also enterprises shall be conscious of their social responsibility and contribute to the preservation of our common living space. That is why Trenz Electronic invests in the protection of our Environment.

8.6 REACH, RoHS and WEEE

REACH

Trenz Electronic is a manufacturer and a distributor of electronic products. It is therefore a so called downstream user in the sense of [REACH](#). The products we supply to you are solely non-chemical products (goods). Moreover and under normal and reasonably foreseeable circumstances of application, the goods supplied to you shall not release any substance. For that, Trenz Electronic is obliged to neither register nor to provide safety data sheet. According to present knowledge and to best of our knowledge, no [SVHC \(Substances of Very High Concern\) on the Candidate List](#) are contained in our products. Furthermore, we will immediately and unsolicited inform our customers in compliance with REACH - Article 33 if any substance present in our goods (above a concentration of 0,1 % weight by weight) will be classified as SVHC by the [European Chemicals Agency \(ECHA\)](#).

RoHS


Trenz Electronic GmbH herewith declares that all its products are developed, manufactured and distributed RoHS compliant.

WEEE

Information for users within the European Union in accordance with Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE).

Users of electrical and electronic equipment in private households are required not to dispose of waste electrical and electronic equipment as unsorted municipal waste and to collect such waste electrical and electronic equipment separately. By the 13 August 2005, Member States shall have ensured that systems are set up allowing final holders and distributors to return waste electrical and electronic equipment at least free of charge. Member States shall ensure the availability and accessibility of the necessary collection facilities. Separate collection is the precondition to ensure specific treatment and recycling of waste electrical and electronic equipment and is necessary to achieve the chosen level of protection of human health and the environment in the European Union. Consumers have to actively contribute to the success of such collection and the return of waste electrical and electronic equipment. Presence of hazardous substances in electrical and electronic equipment results in potential effects on the environment and human health. The symbol consisting of the crossed-out wheeled bin indicates separate collection for waste electrical and electronic equipment.

Trenz Electronic is registered under WEEE-Reg.-Nr. DE97922676.

 02.09.2017