TE0703 TRM

Revision: v.33

Exported on: 06/13/2018

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2 Overview

The Trenz Electronic TE0703 Carrier Board is a base-board for 4x5 SoM's, which exposes the MIO- and the PS/PL-pins of the SoM to accessible connectors and provides a whole range of on-board-components to test and evaluate Trenz Electronic 4x5 SoM's.

See page "4 x 5 cm carriers" to get information about the SoM's supported by the TE0703 Carrier Board.

Refer to http://trenz.org/te0703-info for the current online version of this manual and other available documentation.

2.1 Block Diagram
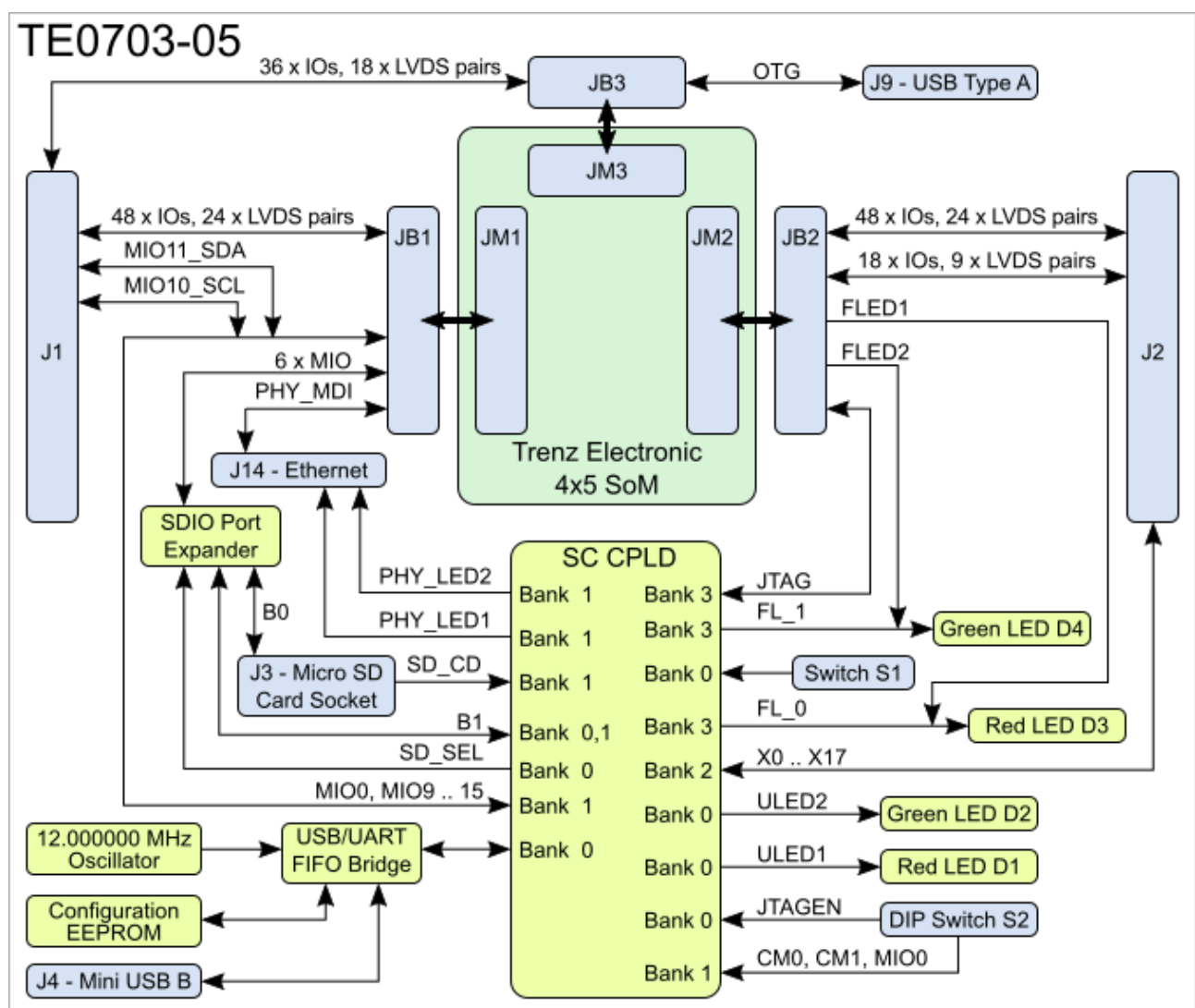
2.2 Main Components
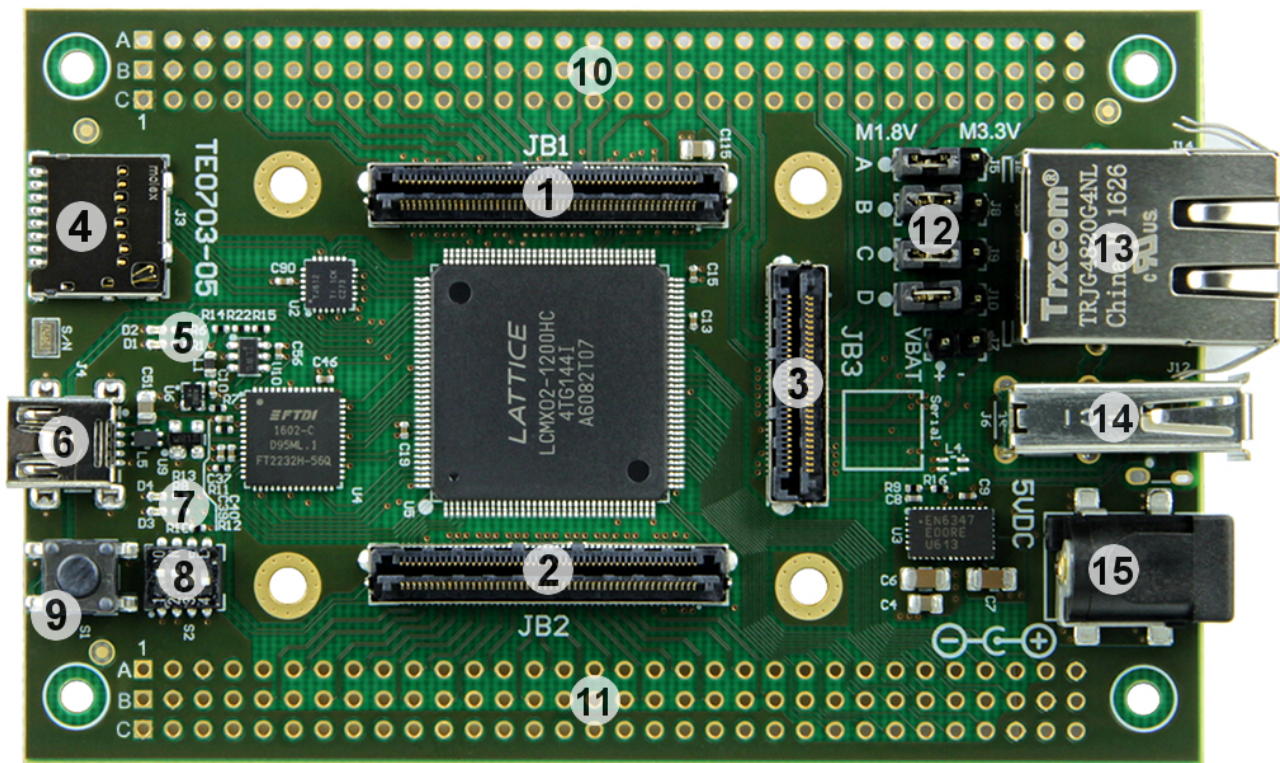
1. Samtec Razor Beam™ LSHM-150 B2B connector, JB1
2. Samtec Razor Beam™ LSHM-150 B2B connector, JB2
3. Samtec Razor Beam™ LSHM-130 B2B connector, JB3
4. Micro SD card socket with detect switch, J3
5. LED indicators D1 and D2
6. Mini-USB type B connector, J4
7. LED indicators D3 and D4
8. Configuration DIP switches, S2 (see table under "DIP switches" section)
9. User push button (Reset), S1
10. External connector (VG96) placeholder, J1
11. External connector (VG96) placeholder, J2
12. VCCIO voltage selection jumper block, J5, J8, J9 and J10 (see "Power and Power-On Sequence" section)
13. Trxcom 1000Base-T Gigabit RJ45 Magjack, J14
14. USB type A receptacle, J6 (optional micro USB 2.0 type B receptacle available, J12)
15. 5V power connector jack, J13

2.3 Key Features

- 2 x VG96 backplane connectors (mounting holes and solder pads)
- SDIO port expander with voltage-level translation
- Micro SD card socket, can be used to boot system
- 4 x user LED's, 2 x red and 2 x green
- Mini-USB connector (USB JTAG and UART interface)
- 1 x user push-button routed to CPLD. By default it is configured as system reset button
- RJ45 Gigabit Ethernet socket with 4 integrated LED's
- USB Host Connector
- Barrel jack for 5V power supply input

- 4A high-efficiency power SoC DC-DC step-down converter(Enpirion EN6347) for 3.3V power supply
- Trenz 4x5 module connector strips (3 x Samtec LSHM series connectors)
- USB JTAG and UART interface (FTDI FT2232H), compatible with Xilinx Tools (also with many other tools)
- 2 x user configurable DIP switches

2.4 Initial Delivery State

Board is shipped in following configuration:

- VCCIO voltage selection jumpers are all set to 1.8 V.
- S1 switch configured as reset button in CPLD.
- Two VG96 backplane connectors are not soldered to the board, but they are included in the package as separate components.
- S2 DIP switches are configured as follows:

Switch	Position	Description
S2-1	ON	Mode control MC1.
S2-2	ON	FPGA access on module (need also S2-3 ON)
S2-3	ON	FPGA access on module (need also S2-2 ON)
S2-4	OFF	Boot mode set to QSPI.

Different delivery configurations are available upon request.

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3 Signals, Interfaces and Pins

3.1 Board to Board (B2B) I/O's

For detailed information about the B2B pin out, please refer to the Master Pin-out Table.

3.2 Micro SD Card Socket

Micro SD card socket is connected to the B2B connector through a Texas Instruments TXS02612 SDIO port expander for voltage translation. The Micro SD card has 3.3V signal voltage level while most 4x5 modules use 1.8V for the SD card interface.

3.3 USB JTAG and UART

TE0703 has on-board USB JTAG and UART solution based on UART/FIFO controller from FTDI. FTDI EEPROM is pre-programmed with license code to support Xilinx programming tools.

> ⚠ Do not access the FT2232H EEPROM using FTDI programming tools, doing so will erase normally invisible user EEPROM content and invalidate stored Xilinx JTAG license. Without this license the on-board JTAG will not be accessible any more with any Xilinx tools. Software tools from FTDI website do not warn or ask for confirmation before erasing user EEPROM content.

3.4 Ethernet

On-board Ethernet jack J14 pins are routed to B2B connector JB1. Ethernet jack J14 LEDs PHY_LED1 and PHY_LED2 are both routed to System Controller CPLD bank 1.

3.5 USB Interface

TE0703 board has two physical USB sockets:

- J4 as mini-USB type B socket wired to the on-board FTDI FT2232H chip.
- J6 as USB type A wired to B2B connector JB3 (USB transceiver used depends on the SoM model used).

3.6 JTAG Interface

JTAG access to the System Controller CPLD and Xilinx Zynq chip on the SoM is provided via mini-USB JTAG interface (FTDI FT2232H) and controlled by DIP switch S2-3. JTAG signals from System Controller CPLD to the JB2 connector are routed as follows:

JTAG Signal	B2B Connector Pin
TCK	JB2-100
TDO	JB2-98
TDI	JB2-96
TMS	JB2-94

3.7 LEDs

There are four on-board LEDs:

LED	Color	Description
D1	Red	FTDI UART receive activity.
D2	Green	FTDI UART transmit activity.
D3	Red	CPLD signal FL_0.
D4	Green	CPLD signal FL_1.

LEDs D3 and D4 are also connected to the B2B connector JB2 pins FLED1 and FLED2 respectively and can be controlled by SoM FPGA firmware.

3.8 DIP switches

DIP switch settings are CPLD Firmware depends, default firmware:

Switch	ON	OFF	Notes
S2-1	Force CD Pin to module to GND	set CD Pin to module to SD CD Pin	TE0703 CPLD - CC703S
S2-2	Module FPGA JTAG access (if S2-3 ON)	Module CPLD JTAG access (if S2-3 ON)	TE0703 CPLD - CC703S
S2-3	Module FPGA/CPLD JTAG access (depends on S2-3)	Carrier CPLD JTAG access	TE0703 CPLD - CC703S
S2-4	Boot from SD Card (set Pin to GND)	Boot from QSPI flash on module (set Pin to VDD)	TE0703 CPLD - CC703S Boot Mode is also module depends

Mode status is displayed on TE0703 LEDs, see TE0703 CPLD - CC703S#CC703S-LED.

4 Power

Power supply with minimum current capability of 3A for system startup is recommended.

4.1 Power Supply

Single power supply with minimum current capability of 3A at 5V for system startup is recommended.

4.2 **Power Consumption**

Power Input Pin	Max Current
VIN (power connector jack J13)	4A

Typical power consumption for TE0703-05 + TE0715-01 module with SD micro card inserted, Ethernet connected and link up, system booted into Linux prompt and idling is 5V / 0.55A.

4.3 Power-On Sequence

It is not allowed to feed any voltage to any external I/O pin before there is no power indication on M3.3VOUT pins. Presence of 3.3V on B2B JB2 connector pins 9 and 11 indicates that module is properly powered up and ready.

If any of the VCCIOA, VCCIOB, VCCIOC or VCCIOD will be powered through external connectors J1 or J2, then corresponding VCCIO jumper should also be removed altogether, see next chapter.

4.4 VCCIO voltage selection jumpers J5, J8, J9 and J10

Refer to the 4x5 Module Integration Guide for VCCIO voltages options.
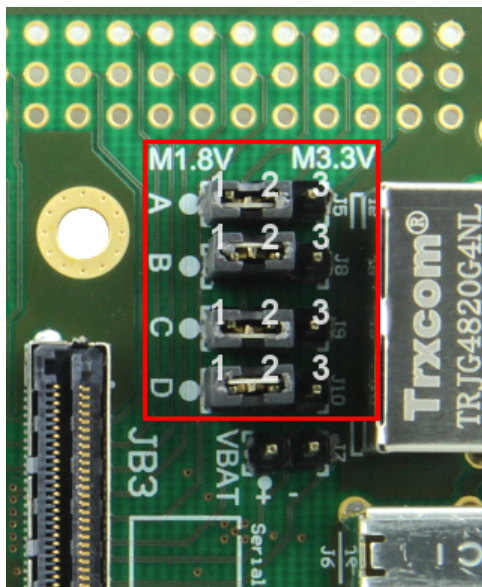
Jumper J5	1-2	2-3	Voltage
VCCIOA	ON	OFF	1.8 V
VCCIOA	OFF	ON	3.3 V

Jumper J8	1-2	2-3	Voltage
VCCIOB	ON	OFF	1.8 V
VCCIOB	OFF	ON	3.3 V

Jumper J9	1-2	2-3	Voltage
VCCIOC	ON	OFF	1.8 V
VCCIOC	OFF	ON	3.3 V

Jumper J10	1-2	2-3	Voltage
VCCIOD	ON	OFF	1.8 V
VCCIOD	OFF	ON	3.3 V

⚠ Take care of the VCCO voltage ranges of the particular PL IO-banks (HR, HP) of the mounted SoM, otherwise damages may occur to the FPGA. Therefore, refer to the TRM of the mounted SoM to get the specific information of the voltage ranges.

It is recommended to set and measure the PL IO-bank supply-voltages before mounting of TE 4 x 5 module to avoid failures and damages to the functionality of the mounted SoM.

5 Board to Board Connectors

> ⚠️ These connectors are hermaphroditic. Odd pin numbers on the module are connected to even pin numbers on the baseboard and vice versa.

4 x 5 modules use two or three Samtec Razor Beam LSHM connectors on the bottom side.

- 2 x REF-189016-02 (compatible to LSHM-150-04.0-L-DV-A-S-K-TR), (100 pins, "50" per row)
- 1 x REF-189017-02 (compatible to LSHM-130-04.0-L-DV-A-S-K-TR), (60 pins, "30" per row) (depending on module)

5.1 Connector Mating height

When using the same type on baseboard, the mating height is 8mm. Other mating heights are possible by using connectors with a different height

Order number	Connector on baseboard	compatible to	Mating height
23836	REF-189016-01	LSHM-150-02.5-L-DV-A-S-K-TR	6.5 mm
	LSHM-150-03.0-L-DV-A-S-K-TR	LSHM-150-03.0-L-DV-A-S-K-TR	7.0 mm
23838	REF-189016-02	LSHM-150-04.0-L-DV-A-S-K-TR	8.0 mm
	LSHM-150-06.0-L-DV-A-S-K-TR	LSHM-150-06.0-L-DV-A-S-K-TR	10.0mm
26125	REF-189017-01	LSHM-130-02.5-L-DV-A-S-K-TR	6.5 mm
	LSHM-130-03.0-L-DV-A-S-K-TR	LSHM-130-03.0-L-DV-A-S-K-TR	7.0 mm
24903	REF-189017-02	LSHM-130-04.0-L-DV-A-S-K-TR	8.0 mm
	LSHM-130-06.0-L-DV-A-S-K-TR	LSHM-130-06.0-L-DV-A-S-K-TR	10.0mm

The module can be manufactured using other connectors upon request.

5.2 Connector Speed Ratings

The LSHM connector speed rating depends on the stacking height; please see the following table:

Stacking height	Speed rating
12 mm, Single-Ended	7.5 GHz / 15 Gbps
12 mm, Differential	6.5 GHz / 13 Gbps
5 mm, Single-Ended	11.5 GHz / 23 Gbps
5 mm, Differential	7.0 GHz / 14 Gbps

5.3 Current Rating

Current rating of Samtec Razor Beam™ LSHM B2B connectors is 2.0A per pin (2 adjacent pins powered).

5.4 Connector Mechanical Ratings

- Shock: 100G, 6 ms Sine
- Vibration: 7.5G random, 2 hours per axis, 3 axes total

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5.5 Manufacturer Documentation

Geändert

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6 Technical Specifications

6.1 Absolute Maximum Ratings

Parameter	Min	Max	Units	Reference document
5VIN supply voltage	-0.3	7	V	MP5010A, EN6347QI data sheet
Storage temperature	-40	+100	°C	ROHM Semiconductor SML-P11 Series datasheet

6.2 Recommended Operating Conditions

| Parameter	Min	Max	Units	Reference document
5VIN supply voltage	4.75	5.25	V	USB2.0 specification concerning 'VBUS' voltage
Operating temperature	-40	+85	°C	FTDI FT2232H datasheet

⚠ Assembly variants for higher storage temperature range are available on request.

⚠ Please check components datasheets for complete list of absolute maximum and recommended operating ratings.

6.3 Physical Dimensions

- Board size: 100 mm × 64.5 mm. Notice that the mini-USB jack on the left and ethernet RJ-45 jack on the right are hanging slightly over the edge of the PCB making the total width of the longer side approximately 106 mm. Please download the assembly diagram for exact numbers.
- Mating height of the module with standard connectors: 8 mm
- PCB thickness: 1.65 mm
- Highest parts on the PCB are USB type A jack and ethernet RJ-45 jack, approximately 15 mm. Please download the step model for exact numbers.

All dimensions are given in millimeters.
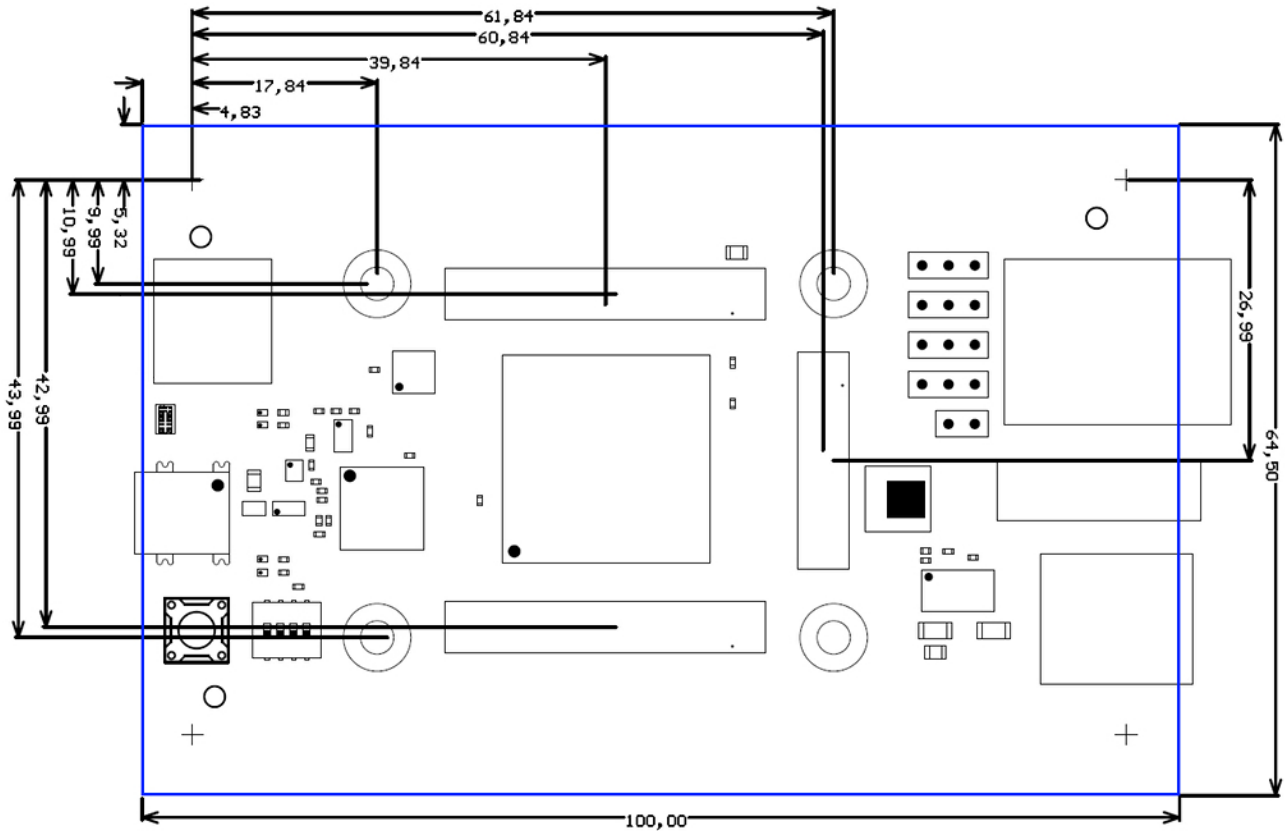
6.4 Operating Temperature Ranges

The carrier board itself is capable to be operated at industrial grade temperature range.

Please check the operating temperature range of the mounted modules which determines the relevant operating temperature range of the overall system.

6.5 Weight

42g - Plain board.

13g - 2 x VG96 connectors.

7 Revision History

7.1 Hardware Revision History

Date	Revision	Notes	PCN	Documents
2016-09-07	05	Added VCCIO Jumpers	PCN-20161122	TE0703
-	04	Corrected FTDI EEPROM connection	-	TE0703-04
-	03	Added VCCIO strapping resistors	-	
-	02	First series boards	-	
-	01	Prototypes	-	

Hardware revision number is printed on the PCB board next to the module model number separated by the dash.
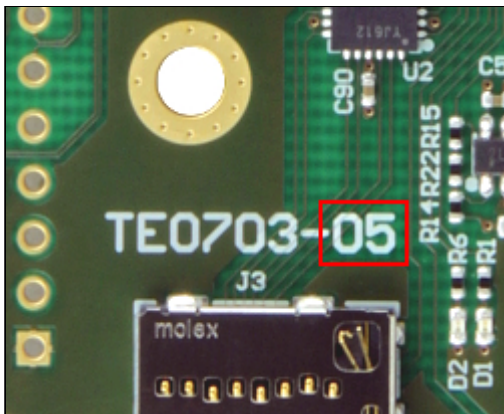
7.2 Document Change History

Date	Revision	Contributors	Description
2018-06-13	v.33	Ali Naseri	• updating operating conditions
2017-02-07	v.28	John Hartfiel	• Add DIP setting description
2017-11-09	v.26	John Hartfiel	• add B2B connector section
2017-02-21	v.19	Jan Kumann	• New block diagram.
2017-02-02	v.16	Jan Kumann	• New board image with silk screen pin markings for VG96 connectors J1 and J2.
2016-12-22	v.14	Jan Kumann	• Block diagram added.
2016-12-08	v.10	Jan Kumann	• Document structure revised.
2016-12-05	v.5	John Hartfiel	• Corrected Boot Mode table.
2016-09-06	v.1	Jan Kumann, John Hartfiel	• Initial document.

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8.1 Data privacy

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

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