TE0820 TRM

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Overview

The Trenz Electronic TE0820 is a powerful 4 x 5 cm industrial/extended module integrated with a Xilinx Zynq UltraScale+ MPSoC. In addition, the module is equipped with 2x 8 Gb DDR4 SDRAM chip, up to 64 Gb eMMC chip, 2x 512 Mb flash memory for configuration and data storage, as well as powerful switching power supplies for all required voltages. The module is equipped with a Lattice Mach XO2 CPLD for system controlling. 3x Robust high-speed connectors provide a large number of inputs and outputs. Additionally the module provides Gigabit Ethernet and USB2.0 Transceivers.

The highly integrated modules are smaller than a credit card and are offered in several variants at an affordable price-performance ratio. Modules with a 4 x 5 cm form factor are completely mechanically and largely electrically compatible with each other.

All components cover at least the industrial temperature range. The temperature range in which the module can be used depends on the customer design and the selected cooling. Please contact us for special solutions.

Refer to http://trenz.org/te0820-info for the current online version of this manual and other available documentation.

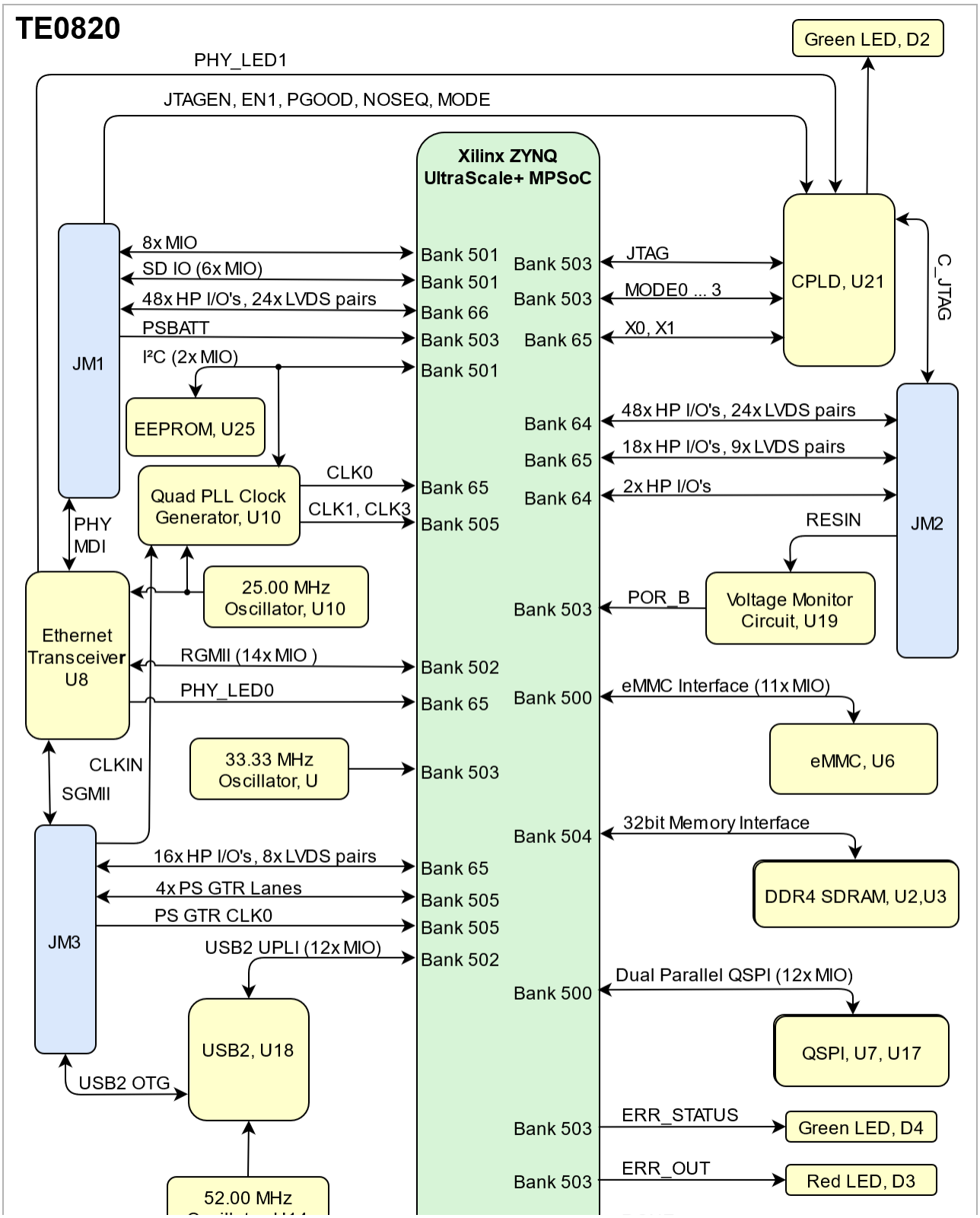
Key Features

- **SoC/FPGA**
  - Package: SFVC784
  - Device: ZU2 ... ZU5, *
  - Engineering Sample, ES2, *
  - Speed Rating: -1L, -2L, 3, *, **
  - Temperature: I, E, *, **
- **RAM/Storage**
  - 2x DDR4 SDRAM,
    - Data Width: 16 Bit
    - Size: 8 Gb, *
    - Speed: 2400 Mbps, ***
  - 2x QSPI boot Flash in dual parallel mode
    - Data Width: 8 Bit
    - Size: 512 Mb, *
  - eMMC Memory
    - Data Width: 16 Bit
    - Size: 8 Gb, *
  - MAC address serial EEPROM
- **On Board**
  - Lattice Mach XO2 CPLD
  - Programmable Clock Generator
  - Hi-speed USB2 ULPI Transceiver
  - 4x LEDs
- **Interface**
  - 1 Gbps RGMII Ethernet interface
  - Hi-speed USB2 ULPI transceiver with full OTG support
  - Graphic Processor Mali-400 MP2, *
  - 132x High Performance (HP)
  - 4 x serial PS GTR transceivers

        - PCI Express interface
        - SATA 3.1 interface
        - DisplayPort interface with video resolution up to 4k x 2k
        - 2x USB 3.0 specification compliant interface implementing a 5 Gbit/s line rate
- **Power**
    - All power regulators on board
- **Dimension**
    - 40 x 50 mm
- **Note**
    - * depends on assembly version
    - ** also non low power assembly options possible
    - *** depends on used U+ Zynq and DDR4 combination
    - Rugged for shock and high vibration

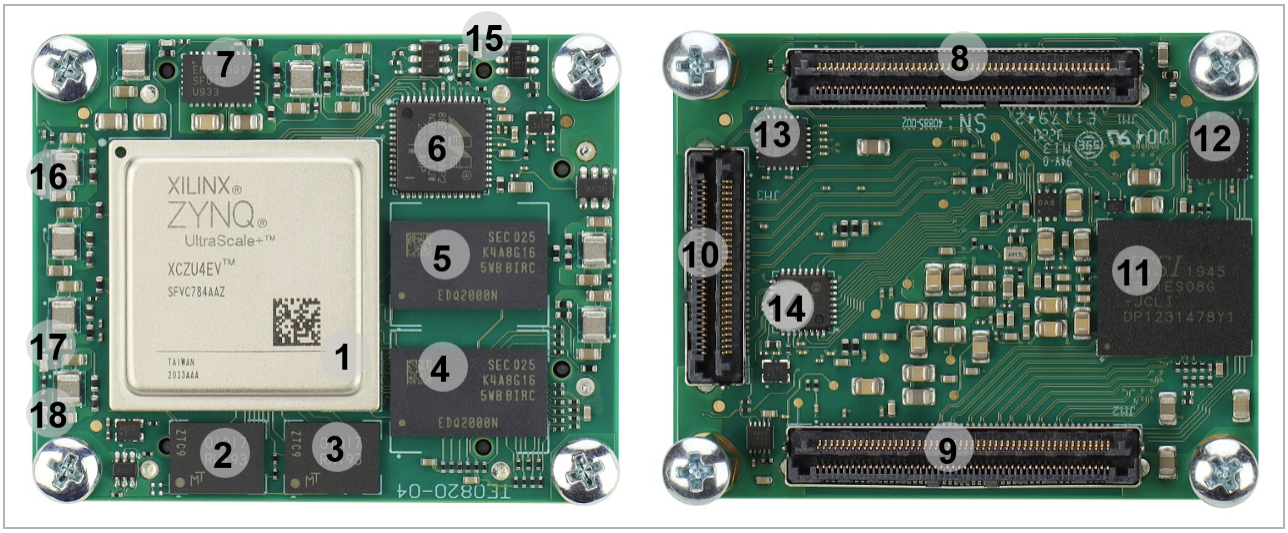
Additional assembly options are available for cost or performance optimization upon request.

Block Diagram


TE0820
Green LED, D2
PHY_LED1
JTAGEN, EN1, PGOOD, NOSEQ, MODE
Xilinx ZYNQ
UltraScale+ MPSoC
JM1
8x MIO
SD IO (6x MIO)
48x HP I/O's, 24x LVDS pairs
PSBATT
I²C (2x MIO)
Bank 501
Bank 501
Bank 66
Bank 503
Bank 501
Bank 503
Bank 503
Bank 65
JTAG
MODE0 ... 3
X0, X1
CPLD, U21
C_JTAG
EEPROM, U25
Quad PLL Clock Generator, U10
CLK0
CLK1, CLK3
Bank 65
Bank 505
Bank 64
Bank 65
Bank 64
48x HP I/O's, 24x LVDS pairs
18x HP I/O's, 9x LVDS pairs
2x HP I/O's
RESIN
JM2
PHY MDI
25.00 MHz Oscillator, U10
Ethernet Transceiver U8
RGMII (14x MIO)
PHY_LED0
Bank 502
Bank 65
Bank 503
POR_B
Voltage Monitor Circuit, U19
Bank 500
eMMC Interface (11x MIO)
eMMC, U6
CLKIN
SGMII
33.33 MHz Oscillator, U
Bank 503
Bank 504
32bit Memory Interface
DDR4 SDRAM, U2,U3
JM3
16x HP I/O's, 8x LVDS pairs
4x PS GTR Lanes
PS GTR CLK0
USB2 UPLI (12x MIO)
Bank 65
Bank 505
Bank 505
Bank 502
Bank 500
Dual Parallel QSPI (12x MIO)
QSPI, U7, U17
USB2, U18
USB2 OTG
Bank 503
ERR_STATUS
Green LED, D4
Bank 503
ERR_OUT
Red LED, D3
52.00 MHz

TE0820-03 block diagram

Main Components



TE0820-03 main components

1. Xilinx Zynq UltraScale+ MPSoC, U1
2. 1.8V, 512 Mbit QSPI flash memory, U7
3. 1.8V, 512 Mbit QSPI flash memory, U17
4. 8 Gbit (512 x 16) DDR4 SDRAM, U2
5. 8 Gbit (512 x 16) DDR4 SDRAM, U3
6. Marvell Alaska 88E1512 integrated 10/100/1000 Mbps energy efficient ethernet transceiver, U8
7. 6A PowerSoC DC-DC converter (PL_VCCINT, 0.85V), U5
8. B2B connector Samtec Razor Beam™ LSHM-150, JM1
9. B2B connector Samtec Razor Beam™ LSHM-150, JM2
10. B2B connector Samtec Razor Beam™ LSHM-130, JM3
11. 8 GByte eMMC memory, U6
12. Lattice Semiconductor MachXO2 System Controller CPLD, U21
13. I2C programmable, any frequency , any output quad clock generator, U10
14. Highly integrated full featured hi-speed USB 2.0 ULPI transceiver, U18
15. LED D1(Red) Done Pin
16. LED D2 (Green) CPLD Status, User LED
17. LED D3 (Red) PS Error
18. LED D4 (Green) PS Error Status

Initial Delivery State

Storage device name	Content	Notes
Dual QSPI Flash Memory	Not programmed	
eMMC Memory	Not programmed	
DDR4 SDRAM	Not programmed	
Programmable Clock Generator	Not programmed	

CPLD (LCMXO2-256HC)	Programmed	TE0820 CPLD

Initial delivery state of programmable devices on the module

Configuration Signals

Two different firmware versions are available, one with the QSPI boot option and other with the SD Card boot option.

MODE Pin	Boot Mode
High	QSPI*
Low	SD Card*

*changable also with other CPLD Firmware: TE0820 CPLD

Boot process.

Signal	B2B	I/O	Note
EN1	JM1-28	Input	CPLD Enable Pin
RESIN	JM2-18	Input	General Reset

Reset process.

Signals, Interfaces and Pins

Board to Board (B2B) I/Os

Zynq MPSoC's I/O banks signals connected to the B2B connectors:

Bank	Type	B2B Connector	I/O Signal Count	Voltage	Notes
64	HP	JM2	48x Single Ended, 24x LVDS Pairs	Variable	Max voltage 1.8V
64	HP	JM2	2x Single Ended	Variable	Max voltage 1.8V
65	HP	JM2	18x Single Ended, 9x LVDS Pairs	Variable	Max voltage 1.8V
65	HP	JM3	16x Single Ended, 8x LVDS Pairs	Variable	Max voltage 1.8V
66	HP	JM1	48x Single Ended, 24x LVDS Pairs	Variable	Max voltage 1.8V
500	MIO	JM1	8x Single Ended	1.8V	
501	MIO	JM1	6x Single Ended	3.3V	
505	GTR	JM3	16x Single Ended, 8x LVDS Pairs	-	4x Lanes
505	GTR CLK	JM3	1x differential Clock	-	

General PL I/O to B2B connectors information

For detailed information about the pin-out, please refer to the Pin-out table.

MGT Lanes

The Xilinx Zynq UltraScale+ device used on the TE0820 module has 4 GTR transceivers. All 4 are wired directly to B2B connector JM3. MGT (Multi Gigabit Transceiver) lane consists of one transmit and one receive (TX/RX) differential pairs, four signals total per one MGT lane. Following table lists lane number, FPGA bank number, transceiver type, signal schematic name, board-to-board pin connection and FPGA pins connection:

Lane	Bank	Signal Name	B2B Pin	Note
0	505	• B505_RX0_P • B505_RX0_N • B505_TX0_P • B505_TX0_N	• JM3-26 • JM3-28 • JM3-25 • JM3-27	
1	505	• B505_RX1_P • B505_RX1_N • B505_TX1_P • B505_TX1_N	• JM3-20 • JM3-22 • JM3-19 • JM3-21	
2	505	• B505_RX2_P • B505_RX2_N • B505_TX2_P • B505_TX2_N	• JM3-14 • JM3-16 • JM3-13 • JM3-15	
3	505	• B505_RX3_P • B505_RX3_N • B505_TX3_P • B505_TX3_N	• JM3-8 • JM3-10 • JM3-7 • JM3-9	

MGT Lanes connection

There are 3 clock sources for the GTR transceivers. B505_CLK0 is connected directly to B2B connector JM3, so the clock can be provided by the carrier board. Clocks B505_CLK1 and B505_CLK3 are provided by the on-board clock generator (U10). As there are no capacitive coupling of the data and clock lines that are connected to the connectors, these may be required on the user's PCB depending on the application.

Clock signal	Bank	Connected to	Notes
B505_CLK0_P	505	B2B, JM3-31	Supplied by the carrier board
B505_CLK0_N	505	B2B, JM3-33	Supplied by the carrier board
B505_CLK1_P	505	U10, CLK2A	On-board Si5338A
B505_CLK1_N	505	U10, CLK2B	On-board Si5338A
B505_CLK2_P	505	N/A	Not connected
B505_CLK2_N	505	N/A	Not connected
B505_CLK3_P	505	U10, CLK1A	On-board Si5338A
B505_CLK3_N	505	U10, CLK1B	On-board Si5338A

MGT Clock Sources Information

JTAG Interface

JTAG access to the Xilinx Zynq-7000 is provided through B2B connector JM2.

JTAG Signal	B2B Connector Pin	Notes
TMS	JM2-93	
TDI	JM2-95	
TDO	JM2-97	
TCK	JM2-99	
JTAGEN	JM1-89	Pulled Low: Xilinx Zynq UltraScale+ MPSoC Pulled High: Lattice MachXO CPLD

JTAG pins connection

Pin 89 JTAGEN of B2B connector JM1 is used to control which device is accessible via JTAG. If set to low or grounded, JTAG interface will be routed to the Xilinx Zynq MPSoC. If pulled high, JTAG interface will be routed to the System Controller CPLD.

I2C Addresses

On-board I^2C devices are connected to MIO38 (SCL) and MIO39 (SDA) which are configured as I^2C0 by default. Addresses for on-board I^2C slave devices are listed in the table below:

I2C Device	I2C Address	Notes
PLL Clock Generator, U10	0x70/ 0x71	
EEPROM, U25	0x50	

Address table of the I2C bus slave devices

MIOs

MIO Pin	Connected to	B2B	Notes
0...5	QSPI Flash, U7	-	SPI Flash
7...12	QSPI Flash, U17	-	SPI Flash
13...23	eMMC, U6		eMMC
24	ETH Transceiver, U8	-	ETH_RST
25	USB2.0 Transceiver, U18	-	OTG_RST
26...33	User MIO	JM1	
34...37	N.C	-	N.C
38...39	EEPROM, U25	-	I2C_SDA/SCL
40...45	N.C		N.C
46...51	SD Card	JM1	
52...63	USB2.0 Transceiver, U18	-	
63...77	Ethernet Transceiver, U8	-	

MIOs pins

Test Points

Test Point	Signal	Connected to	Notes
1	PS_LP0V85	Voltage Regulator, U12	
2	DDR_2V5	Voltage Regulator, U4	
3	PS_AVCC	Voltage Regulator, U9	
4	DDR_1V2	Voltage Regulator, U15	
5	PS_AVTT	Voltage Regulator, U3	
6	VTT	Regulator, U16	
7	PS_FP0V85	Voltage Regulator, U26	
8	VREFA	Regulator, U16	
10	PS_PLL	Voltage Regulator, U23	
11	PL_VCCINT	Voltage Regulator, U5	
15	PL_VCCINT_IO	Voltage Regulator, U27	
16	PL_VCU	Voltage Regulator, U24	

Test Points Information

On-board Peripherals

Chip/Interface	Designator	Notes
QSPI Flash	U7, U17	
EEPROM	U25	
DDR4 SDRAM	U2,U3	
GigaBit Ethernet	U8	
USB2.0 Transceiver	U18	
eMMC Memory	U6	
Oscillators	U32, U14, U11	
Programmable Clock Generator	U10	
CPLD	U21	
LEDs	D1...3	

On board peripherals

System Controller CPLD

The System Controller CPLD (U21) is provided by Lattice Semiconductor LCMXO2-256HC (MachXO2 product family). It is the central system management unit with module specific firmware installed to monitor and control various signals of the FPGA, on-board peripherals, I/O interfaces and module.

Special purpose pins are connected to System Controller CPLD and have following default configuration:

Pin Name	Mode	Function	Default Configuration

EN1	Input	Power Enable	No hard wired function on PCB. When forced low, PGOOD goes low without effect on power management
PGOOD	Output	Power Good	Only indirect used for power status, see CPLD description
NOSEQ	-	-	No used for Power sequencing, see CPLD description
RESIN	Input	Reset	Active low reset, gated to POR_B
JTAGEN	Input	JTAG Select	Low for normal operation, high for CPLD JTAG access

System Controller CPLD special purpose pins

Please check the entire information at TE0820 CPLD.

See also TE0820 System Controller CPLD page.

eMMC Memory

eMMC Flash memory device(U6) is connected to the ZynqMP PS MIO bank 500 pins MIO13..MIO23. eMMC chips IS21ES08G-JCLI (FLASH - NAND Speicher-IC (64 Gb x 1) MMC) is used.

DDR4 Memory

The TE0820 SoM has dual 8 Gb volatile DDR4 SDRAM IC for storing user application code and data.

- Part number: K4A8G165WB-BIRC
- Supply voltage: 1.2V
- Speed: 2400 Mbps
- Temperature: -40 ~ 95 °C

Quad SPI Flash Memory

Two quad SPI compatible serial bus flash MT25QU512ABB8E12-0SIT memory chips are provided for FPGA configuration file storage. After configuration completes the remaining free memory can be used for application data storage. All four SPI data lines are connected to the FPGA allowing x1, x2 or x4 data bus widths to be used. The maximum data transfer rate depends on the bus width and clock frequency.

Gigabit Ethernet

On-board Gigabit Ethernet PHY (U8) is provided with Marvell Alaska 88E1512 IC (U8). The Ethernet PHY RGMII interface is connected to the ZynqMP Ethernet3 PS GEM3. I/O voltage is fixed at 1.8V for HSTL signaling. The reference clock input of the PHY is supplied from an on-board 25.000000 MHz oscillator (U11).

High-speed USB ULPI PHY

Pin	Schematic	Connected to	Note
MDIP0...3	PHY_MDI0...3	B2B, JM1	
MDC	ETH_MDC	MIO76	

MDIO	ETH_MDIO	MIO77	
S_IN	S_IN	B2B, JM3	
S_OUT	S_OUT	B2B, JM3	
TXD0..3	ETH_TXD0...3	MIO65...68	
TX_CTRL	ETH_TXCTL	MIO69	
TX_CLK	ETH_TXCK	MIO64	
RXD0...3	ETH_RXD0...3	MIO71...74	
RX_CTRL	ETH_RXCTL	MIO75	
RX_CLK	ETH_RXCK	MIO70	
LED1	PHY_LED1	CPLD, U21	
RESETn	ETH_RST	MIO24	

GigaBit Ethernet connection

USB2.0 Transceiver

Hi-speed USB ULPI PHY (U18) is provided with USB3320 from Microchip. The ULPI interface is connected to the Zynq PS USB0 via MIO52..63, bank 502. The I/O voltage is fixed at 1.8V and PHY reference clock input is supplied from the on-board 52.00 MHz oscillator (U14).

PHY Pin	ZYNQ Pin	B2B Name	Notes
ULPI	MIO52..63	-	Zynq USB0 MIO pins are connected to the USB PHY.
REFCLK	-	-	52.000000 MHz from on-board oscillator (U14).
REFSEL[0..2]	-	-	Reference clock frequency select, all set to GND selects 52.000000 MHz.
RESETB	MIO25	-	Active low reset.
CLKOUT	MIO52	-	Connected to 1.8V, selects reference clock operation mode.
DP, DM	-	OTG_D_P, OTG_D_N	USB data lines routed to B2B connector JM3 pins 47 and 49.
CPEN	-	VBUS_V_EN	External USB power switch active high enable signal, routed to JM3 pin 17.
VBUS	-	USB_VBUS	Connect to USB VBUS via a series of resistors, see reference schematics, routed to JM3 pin 55.
ID	-	OTG_ID	For an A-device connect to ground, for a B-device left floating. routed from JM3 pin 23.

General overview of the USB PHY signals

EEPROM

There is a 2Kb EEPROM (U25) provided on the module TE0820.

MIO Pin	Schematic	U25 Pin	Notes
MIO39	I2C_SDA	SDA	
MIO38	I2C_SCL	SCL	

I2C EEPROM interface MIOs and pins

Programmable Clock Generator

There is a Silicon Labs I^2C programmable clock generator Si5338A (U10) chip on the module. It's output frequencies can be programmed using the I^2C bus address 0x70 or 0x71. Default address is 0x70, IN4 /I2C_LSB pin must be set to high for address 0x71.

A 25.000000 MHz oscillator is connected to the pin IN3 and is used to generate the output clocks. The oscillator has its output enable pin permanently connected to 1.8V power rail, thus making output frequency available as soon as 1.8V is present. Three of the Si5338 clock outputs are connected to the FPGA. One is connected to a logic bank and the other two are connected to the GTR banks.

Once running, the frequency and other parameters can be changed by programming the device using the I^2C bus connected between the FPGA (master) and clock generator (slave). For this, proper I^2C bus logic has to be implemented in FPGA.

U25 Pin	Signal	Connected to	Direction	Note
IN0..1	CLK_IN	JM3	IN	
IN2	CLK_25M	Oscillator, U11	IN	
SCL	I2C_SCL	EEPROM,U25	INOUT	
SDA	I2C_SDA	EEPROM,U25	INOUT	
CLK0	CLK0	JM3	OUT	
CLK1	B505_CLK3	FPGA Bank 505	IN	
CLK2	B505_CLK1	FPGA Bank 505	IN	
CLK3	CLK3_N		IN	

Programmable Clock Generator Inputs and Outputs

Clock Sources

Designator	Description	Frequency	Clock Destination
U32	MEMS Oscillator	33.33 MHz	
U11	MEMS Oscillator	25 MHz	
U14	MEMS Oscillator	52 MHz	

Osillators

LEDs

Designator	Color	Connected to	Active Level	Note

D1	Red	DONE	Low	
D2	Green	USR_LED	High	
D3	Red	ERR_OUT	High	
D4	Green	ERR_STATUS	High	

On-board LEDs

Power and Power-on Sequence

Power Supply

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

Power Consumption

Power Input Pin	Typical Current
VIN	TBD*
3.3VIN	TBD*

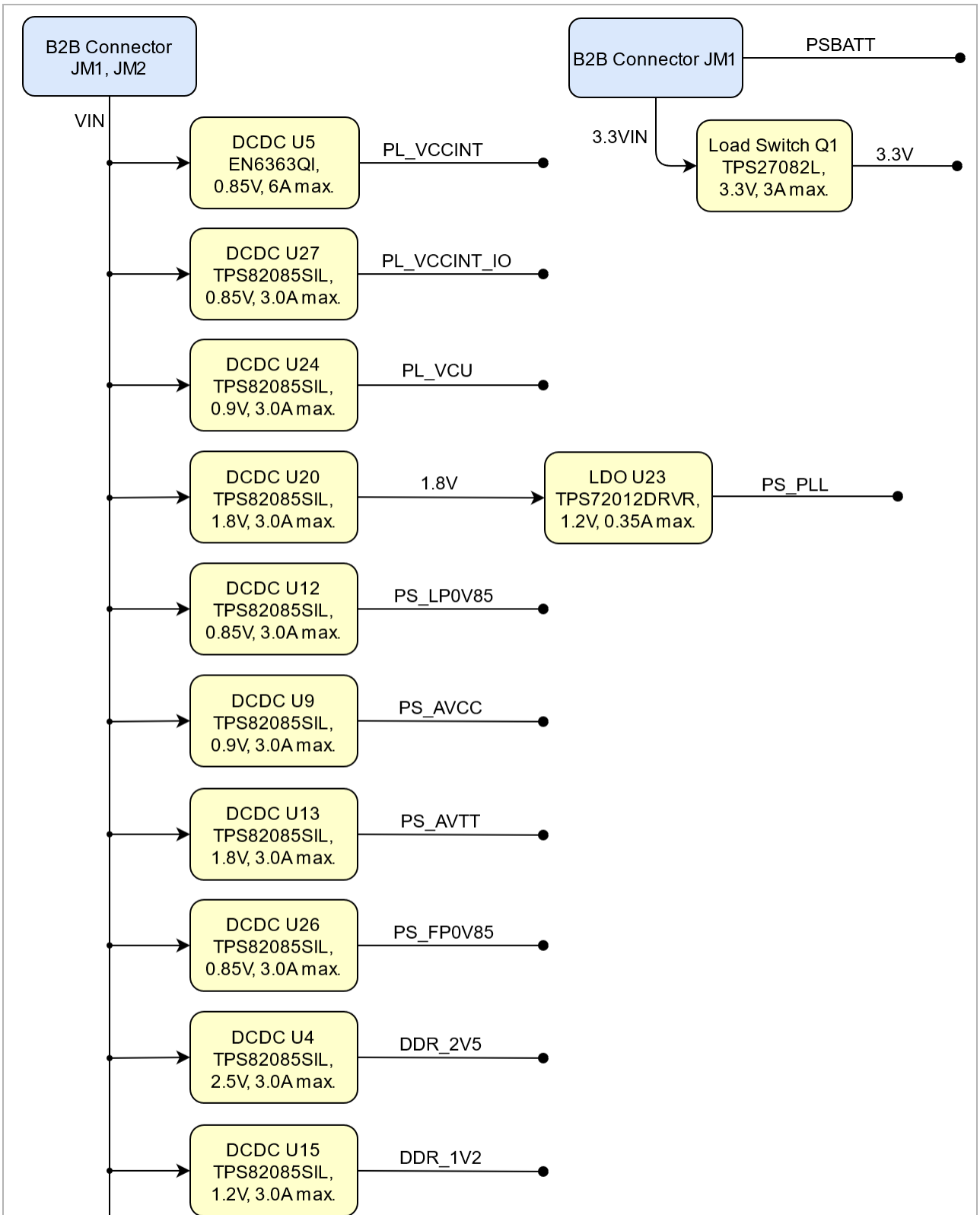
Power Consumption

* TBD - To Be Determined soon with reference design setup.

For the lowest power consumption and highest efficiency of the on-board DC-DC regulators it is recommended to power the module from one single 3.3V supply. All input power supplies should have a nominal value of 3.3V. Although the input power supplies can be powered up in any order, it is recommended to power them up simultaneously.

To avoid any damage to the module, check for stabilized on-board voltages should be carried out (i.e. power good and enable signals) before powering up any Zynq's I/O bank voltages VCCO_x. All I/Os should be tri-stated during power-on sequence.

Power Distribution Dependencies


B2B Connector JM1, JM2
VIN
DCDC U5 EN6363QI, 0.85V, 6A max.
PL_VCCINT
DCDC U27 TPS82085SIL, 0.85V, 3.0A max.
PL_VCCINT_IO
DCDC U24 TPS82085SIL, 0.9V, 3.0A max.
PL_VCU
DCDC U20 TPS82085SIL, 1.8V, 3.0A max.
1.8V
LDO U23 TPS72012DRVR, 1.2V, 0.35A max.
PS_PLL
DCDC U12 TPS82085SIL, 0.85V, 3.0A max.
PS_LP0V85
DCDC U9 TPS82085SIL, 0.9V, 3.0A max.
PS_AVCC
DCDC U13 TPS82085SIL, 1.8V, 3.0A max.
PS_AVTT
DCDC U26 TPS82085SIL, 0.85V, 3.0A max.
PS_FP0V85
DCDC U4 TPS82085SIL, 2.5V, 3.0A max.
DDR_2V5
DCDC U15 TPS82085SIL, 1.2V, 3.0A max.
DDR_1V2
B2B Connector JM1
PSBATT
3.3VIN
Load Switch Q1 TPS27082L, 3.3V, 3A max.
3.3V

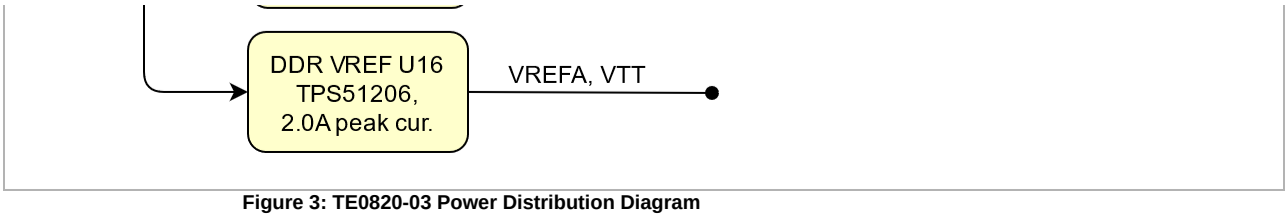


Figure 3: TE0820-03 Power Distribution Diagram

See also Xilinx datasheet DS925 for additional information. User should also check related base board documentation when intending base board design for TE0820 module.

Power-On Sequence

The TE0820 SoM keeping a specific sequence of enabling the on-board DC-DC converters dedicated to the particular functional units of the Zynq chip and powering up the on-board voltages.

Following diagram clarifies the sequence of enabling the particular on-board voltages, which will power-up in descending order as listed in the blocks of the diagram:

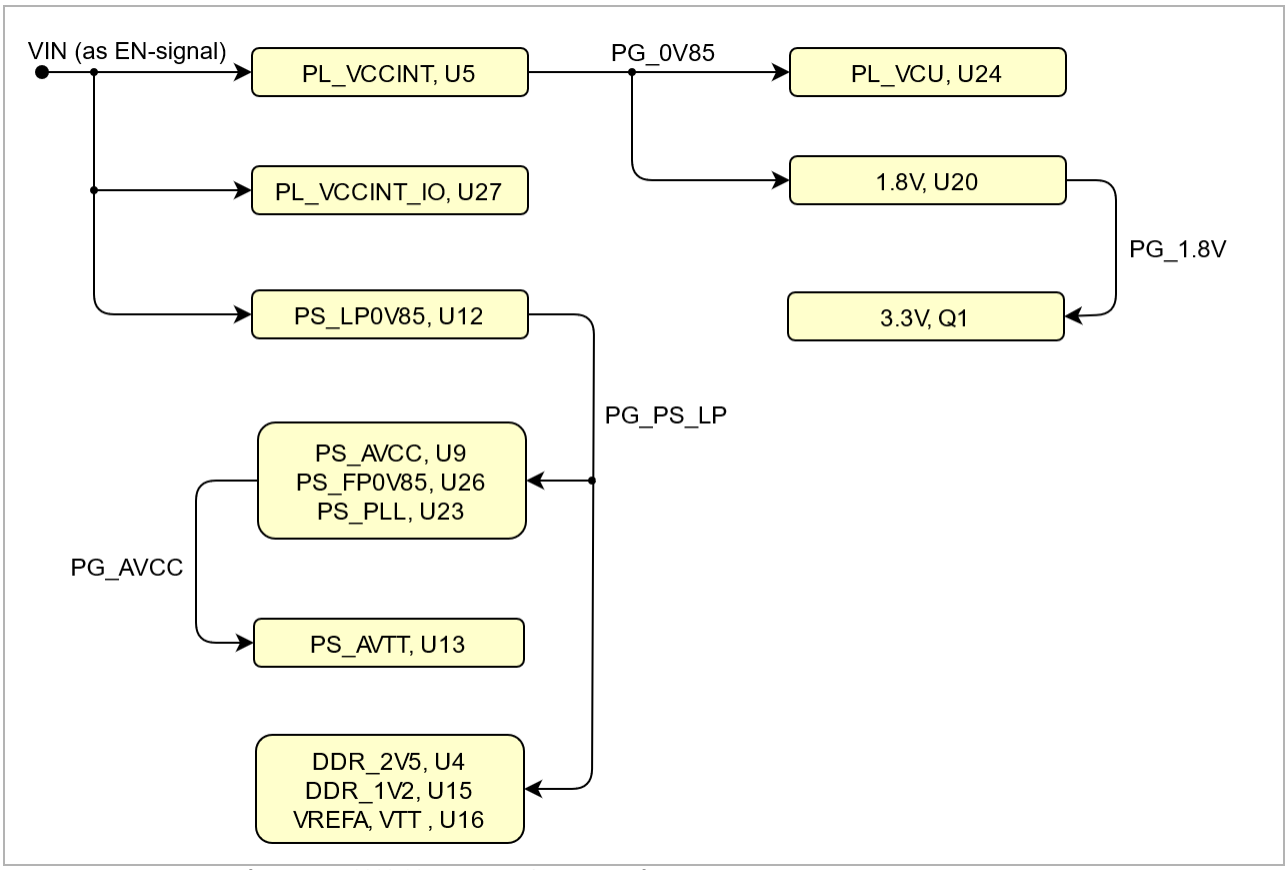


Figure 4: TE0820-03 Power-on Sequence Diagram

For highest efficiency of the on-board DC-DC regulators, it is recommended to use one 3.3V power source for both VIN and 3.3VIN power rails. Although VIN and 3.3VIN can be powered up in any order, it is recommended to power them up simultaneously.

It is important that all carrier board I/Os are 3-stated at power-on until 3.3V_out or 1.8V_out is present on B2B connector JM2 pins 10 and 12, indicating that all on-module voltages have become stable and module is properly powered up.

See Xilinx datasheet DS925 for additional information. User should also check related carrier board documentation when choosing carrier board design for TE0715 module.

Power Rails

Power Rail Name on B2B Connector	JM1 Pins	JM2 Pins	Direction	Notes
VIN	1, 3, 5	2, 4, 6, 8	Input	Supply voltage from the carrier board
3.3V	-	10, 12	Output	Internal 3.3V voltage level
3.3VIN	13, 15	-	Input	Supply voltage from the carrier board
1.8V	39	-	Output	Internal 1.8V voltage level
JTAG VREF	-	91	Output	JTAG reference voltage. Attention: Net name on schematic is "3.3 VIN"
VCCO_64	-	7, 9	Input	High performance I /O bank voltage
VCCO_65	-	5	Input	High performance I /O bank voltage
VCCO_66	9, 11	-	Input	High performance I /O bank voltage

Module power rails.

Bank Voltages

FPGA Bank	Schematic	Voltage	Note
Bank 24 HD		N.C.	Not Connected
Bank 25 HD		N.C.	Not Connected
Bank 26 HD		N.C.	Not Connected
Bank 44 HD		N.C.	Not Connected
Bank 64 HP	VCCO_64	Variable	Max voltage 1.8V
Bank 65 HP	VCCO_65	Variable	Max voltage 1.8V
Bank 66 HP	VCCO_66	Variable	Max voltage 1.8V
Bank 500 PSMIO	VCCO_PSIO0_500	1.8V	
Bank 501 PSMIO	VCCO_PSIO1_501	3.3V	
Bank 502 PSMIO	VCCO_PSIO2_502	1.8V	

Bank 503 PSCONFIG	VCCO_PSIO3_503	1.8V	
Bank 504 PSDDR	DDR_1V2	1.2V	

Zynq SoC bank voltages.

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)

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

Connectors.

The module can be manufactured using other connectors upon request.

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

Speed rating.

Current Rating

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

Connector Mechanical Ratings

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

Manufacturer Documentation

File	Modified
PDF File hsc-report_lshm-lshm-05mm_web.pdf High speed test report	07 04, 2016 by Thorsten Trenz
PDF File lshm_dv.pdf LSHM catalog page	07 04, 2016 by Thorsten Trenz
PDF File LSHM-1XX-XX.X-X-DV-A-X-X-TR-FOOTPRINT(1).pdf Recommended layout and stencil drawing	07 04, 2016 by Thorsten Trenz
PDF File LSHM-1XX-XX.X-XX-DV-A-X-X-TR-MKT.pdf Technical drawing	07 04, 2016 by Thorsten Trenz
PDF File REF-189016-01.pdf Technical Drawing	07 04, 2016 by Thorsten Trenz
PDF File REF-189016-02.pdf Technical Drawing	07 04, 2016 by Thorsten Trenz
PDF File REF-189017-01.pdf Technical Drawing	07 04, 2016 by Thorsten Trenz
PDF File REF-189017-02.pdf Technical Drawing	07 04, 2016 by Thorsten Trenz
PDF File TC0923--2523_report_Rev_2_qua.pdf Design qualification test report	07 04, 2016 by Thorsten Trenz
PDF File tc0929--2611_qua(1).pdf Shock and vibration report	07 04, 2016 by Thorsten Trenz

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Technical Specifications

Absolute Maximum Ratings

Parameter	Min	Max	Units	Notes
VIN supply voltage	-0.3	7	V	See EN6347QI and TPS82085SIL datasheets
3.3VIN supply voltage	-0.1	3.630	V	Xilinx DS925 and TPS27082L datasheet
PS I/O supply voltage, VCCO_PSIO	-0.5	3.630	V	Xilinx document DS925
PS I/O input voltage	-0.5	VCCO_PSIO + 0.55	V	Xilinx document DS925
HP I/O bank supply voltage, VCCO	-0.5	2.0	V	Xilinx document DS925
HP I/O bank input voltage	-0.55	VCCO + 0.55	V	Xilinx document DS925
PS GTR reference clocks absolute input voltage	-0.5	1.1	V	Xilinx document DS925
PS GTR absolute input voltage	-0.5	1.1	V	Xilinx document DS925
Voltage on SC CPLD pins	-0.5	3.75	V	Lattice Semiconductor MachXO2 datasheet
Storage temperature	-40	+85	°C	See eMMC datasheet

PS absolute maximum ratings

Recommended Operating Conditions

Parameter	Min	Max	Units	Notes
VIN supply voltage	3.3	6	V	See TPS82085S datasheet
3.3VIN supply voltage	3.3	3.465	V	See LCMXO2-256HC, Xilinx DS925 datasheet
PS I/O supply voltage, VCCO_PSIO	1.710	3.465	V	Xilinx document DS925
PS I/O input voltage	–0.20	VCCO_PSIO + 0.20	V	Xilinx document DS925
HP I/O banks supply voltage, VCCO	0.950	1.9	V	Xilinx document DS925
HP I/O banks input voltage	-0.20	VCCO + 0.20	V	Xilinx document DS925
Voltage on SC CPLD pins	-0.3	3.6	V	Lattice Semiconductor MachXO2 datasheet

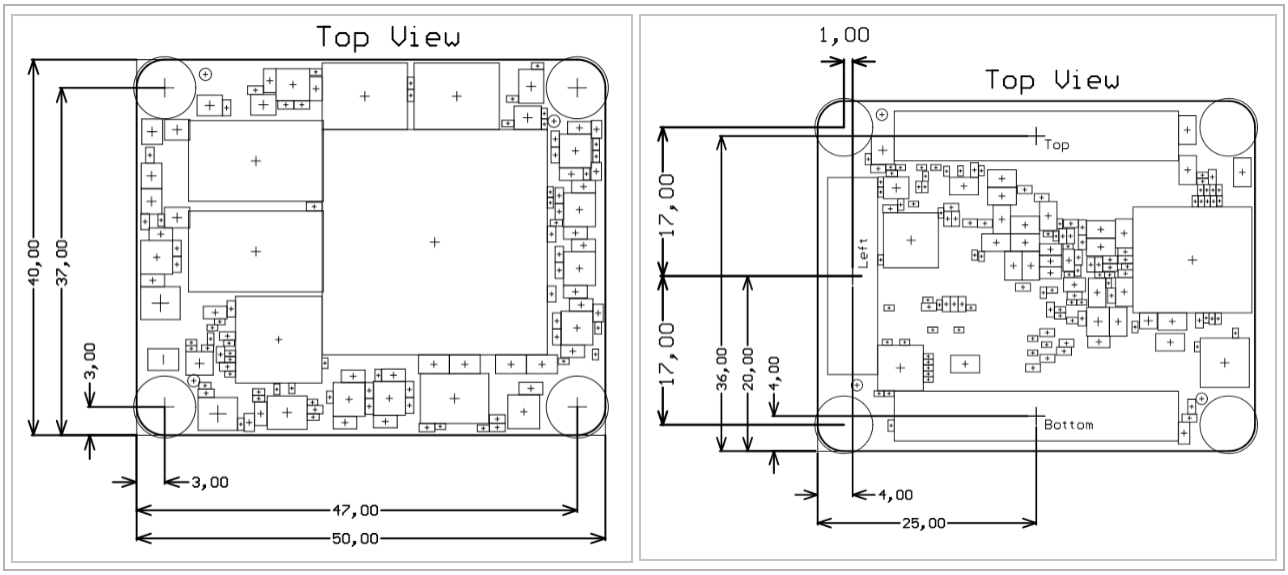
Operating Temperature Range	0	85	°C	Xilinx document DS925, extended grade Zynq temperarure range

Recommended operating conditions.

Physical Dimensions

- Module size: 50 mm × 40 mm. Please download the assembly diagram for exact numbers.
- Mating height with standard connectors: 8 mm
- PCB thickness: 1.6 mm
- Highest part on PCB: approximately 5 mm. Please download the step model for exact numbers.

All dimensions are shown in millimeters.



Physical Dimension

Currently Offered Variants

Trenz shop TE0820 overview page	
English page	German page

Trenz Electronic Shop Overview

Revision History

Hardware Revision History

Date	Revision	Changes	Documentation Link	

2020-08-14	04	• Fixed DDR4 connection (BG1), support B-die DDR4 Industrial grade chips • Added R93, changed value C62, change obsolete U28 • Added R89 (10R) • Added additional caps 4.7uF to PS_AVTT /PS_AVCC (Xilinx doc UG583) • Changed R51 20k ->10K (PS_AVCC = 0.85V, Xilinx doc DS925 v1.17) • Fixed DDR4 connection (Alert) • Added 3.3V signal to CPLD • Added testpoints • LIB components update	PCN-20200616	TE0820-4
2019-01-02	03	• Fixed VCU connection: add additional DCDC (0.9V) • LIB components update • Change package 1K resistors (0402 -> 0201) • Added LEDs (1x user LED, 1x LED for ERR_STATUS, 1xLED for ERR_OUT) • Change obsolete 2xSPI Flash (256MBit) -> 2xSPI Flash (512MBit) • Added additional DCDCs (PL_VCCINT_IO, PS_FP0V85) • Changed DCDC (U5) 6A (optional 4A)	PCN-20190110	TE0820-03

2017-08-17	02	• Added MAC EEPROM (slave address) • LIB components update • Fixed SD Card connection • Fixed sense connection from DCDC • Made correct power connection for VCU (removed DCDC, added resistors and caps like as Xilinx recommended) • Added resistors for variants (ZU+ with/without VCU) • Added termination resistors (240R) to VRP pins fro all HP-banks	PCN-20171117	TE0820-02
2016-12-23	01	Prototype only	-	TE0820-01

Hardware Revision History

Figure 6: Module hardware revision number

Document Change History

Date	Revision	Contributor	Description
Error rendering macro 'page-info' Ambiguous	**Error rendering macro 'page-info'** Ambiguous	**Error rendering macro 'page-info'** Ambiguous	• Corrected Key features

method overloading for method jdk.proxy241.$Proxy3496#hasContentLevelPermission. Cannot resolve which method to invoke for [null, class java.lang.String, class com.atlassian.confluence.pages.Page] due to overlapping prototypes between: [interfac

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method overloading for method jdk.proxy241.$Proxy3496#hasContentLevelPermission. Cannot resolve which method to invoke for [null, class java.lang.String, class com.atlassian.confluence.pages.Page] due to overlapping prototypes between: [interfac

e com.atlassian.confluence.user.ConfluenceUser, class java.lang.String, class com.atlassian.confluence.core.ContentEntityObject] [interface com.atlassian.user.User, class java.lang.String, class com.atlassian.confluence.core.ContentEntityObject]	e com.atlassian.confluence.user.ConfluenceUser, class java.lang.String, class com.atlassian.confluence.core.ContentEntityObject] [interface com.atlassian.user.User, class java.lang.String, class com.atlassian.confluence.core.ContentEntityObject]	e com.atlassian.confluence.user.ConfluenceUser, class java.lang.String, class com.atlassian.confluence.core.ContentEntityObject] [interface com.atlassian.user.User, class java.lang.String, class com.atlassian.confluence.core.ContentEntityObject]	

2021-12-17	v.99	Vadim Yunitski	• Corrected 'Bank voltages' table
2021-07-14	v.98	John Hartfiel	• bugfix boot mode
2021-07-05	v.97	John Hartfiel	• published • style changes
2020-09-18	v.95	Pedram Babakhani	• Update to REV04 • Update the TRM format • Technical Information update
2020-03-16	v.87	John Hartfiel	• Corrected PLL section • Corrected Designators USB, ETH PHY, CLK section
2020-02-03	v.85	Martin Rohrmüller	• Corrected #MIOs for QSPI and USB in block diagram
2019-11-28	v.81	Martin Rohrmüller	• typo and designator in section USB interface corrected
2019-10-30	v.80	John Hartfiel	• typo correction
2019-09-17	v79	Martin Rohrmüller	• Updated according to PCN-20190110: eMMC, QSPI-Flash
2019-07-17	v.78	Martin Rohrmüller	• Corrected PJTAG Mio Pin29 in table 8
2019-05-08	v.77	John Hartfiel	• Corrected EEPROM I2C Address • Correction USB PHY connection
2018-11-12	v.74	John Hartfiel	• update boot section

2018-08-30	v.73	John Hartfiel	• typo correction • update CPLD section • add LEDs to component list • add 3D picture of REV03 instead of REV01 picture
2018-07-12	v.69	Ali Naseri	• Update PCB Rev03
2018-06-11	v.61	John Hartfiel	• Rework chapter currently available products • add PJTAG note to MIOtable
2018-03-12	v.54		• Correction Power Rail Section
2017-11-20	v.51	John Hartfiel	• Correction Default MIO Configuration Table
2017-11-10	v.50	John Hartfiel	• Replace B2B connector section
2017-10-18	v.49	John Hartfiel	• add eMMC section
2017-09-25	v.48	John Hartfiel	• Correction in the "Board to Board (B2B) I/Os" section • Update in the "Variants Currently In Production" section
2017-09-18	v.47	John Hartfiel	• Update PS MIO table
2017-08-30	v.46	Jan Kumann	• MGT lanes section added.
2017-08-24	v.36	John Hartfiel	• Correction in the "Key Features" section.
2017-08-21	v.34	John Hartfiel	• "Initial delivery state" section updated.

2017-08-21	v.33	Jan Kumann	• HW revision 02 block diagram added. • Power distribution and power-on sequence diagram added. • System Controller CPLD and DDR4 SDRAM sections added. • TRM update to the template revision 1.6 • Weight section removed. • Few minor corrections.
2017-08-18	v.7	John Hartfiel	• Style changes • Updated "Boot Mode", "HW Revision History", "Variants Currently In Production" sections • Correction of MIO SD Pin-out, System Controller chapter • Update and new sub-sections on "On Board Peripherals and Interfaces" sections
2017-08-07	v.5	Jan Kumann	• Initial version
--	all	**Error rendering macro 'page-info'** Ambiguous method overloading for method jdk.proxy241.$Proxy	• --

3496#hasContentLevelPermission. Cannot resolve which method to invoke for [null, class java.lang.String, class com.atlassian.confluence.pages.Page] due to overlapping prototypes between: [interface com.atlassian.confluence.user.ConfluenceUser

		, class java. lang. String, class com. atlassian . confluen ce.core. Content EntityOb ject] [interfac e com. atlassian .user. User, class java. lang. String, class com. atlassian . confluen ce.core. Content EntityOb ject]	

Document change history.

Table 21: Document change history

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