# **TE0835 TRM**

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The Trenz Electronic (ED83) is an extended-grade module based on Xilinx Zynq UltraScale+ RFSoC. The module is equipped with 4x 8Gb DDR4 SDRAM Memory, 2x 512Mb SPI Flash Memory, USB2.0, Ethernet Transceiver and 2x Samtec Razor Beam Borard to Board (B2B) Connectors. The system controller CPLD is provided by Lattice MachXO2.

The Zynq Ultra Scale RFSC family integrates key subsystems for multiband, multi-mode cellular radios and cable infrastructure (DOCSIS) into an SoC platform that contains a feature-rich 64-bitquad-core Arm

Cortex-A53 and dital-core Arm Cortex-R5 based processing system. On-board Peripherals Refer to http://trong.cord.ed35-informer. System Controller CPLD documentation. USB2.0

- ° Ethernet
- EEPROM
- LEDs

# Key Features

- Programmable Clock Generator
- PcSac/ATRGAower-On Sequence
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  - Polengrin DestDRution Dependencies
  - ° Pospeedn-Sequienze-L2
  - Pollemperasure: E, I\*
- RAM/Storageoltages
- Board to Board Bob DBR4rs
- Technical Spe5ifi2MboSPI Flash
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  - On Board Derating Conditions
     Physical Machine 22 CPLD
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- Disclaimer 4x User LEDs
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   Dimensionnology Licenses
   Crygronsental Protection
   Note
   REACH, RoHS and WEEE
  - ° \* Different packages, speed and temperature range are available on assembly options

## **Block Diagram**





TE0835 block diagram

### **Main Components**



#### TE0835 main components

- 1. Xilinx UltraScale+ RFSoC, U1
- 2. 8Gb DDR4 SDRAM, U2,U3,U5,U9
- Voltage Regulators, U4,U6,U7
   User Red LEDs, D2...5
   Error/Status Red LEDs, D6...7

- 6. Programmable Glock Generator, U15
- 7. Lattice MachXO2 CPLD, U31
   8. Dual SPI Flash, U24-U25
- 9. USB2.0 Transceiver, U11
- 10. Pin Header 3x1, J3 (not Soldered)
- 11. Green LED, D1
- 12. Gigabit Ethernet Transceiver, U20
- 13. EEPROM, U23
- 14. B2B Connectors, J1 15. B2B Connectors, J2

## **Initial Delivery State**

Storage device name	Content	Notes
2x SPI Flash	Not Programmed	
System Controller CPLD	Programmed	
EEPROM	Not Programmed	
4x DDR4 SDRAM	Not Programmed	
Programmable Clock Generator	Not Programmed	

Initial delivery state of programmable devices on the module

## **Configuration Signals**

Configuration must be set through CPLD,U31 by setting MODE0...3 signals.

MODE[3:0]	Boot Mode	Note
0000	PS_JTAG	Refer to CPLD Page
0001	Quad SPI Flash	Refer to CPLD Page
0101	SD Card	Refer to CPLD Page

Boot process.

The reset pin is active low.

Signal	B2B	I/O	Note
RESETN	J1-36	Input	Pulled up to 3.3V_CPLD
Reset process			

Reset process.

## Signals, Interfaces and Pins

## Board to Board (B2B) I/Os

FPGA bank number and number of I/O signals connected to the B2B connector:

FPGA Bank	B2B Connector	Number of I/Os	Voltage Level	Notes
Bank 500	J1	12x Single Ended	1.8V	MIO1425
Bank 501	J1	20x Single Ended	1.8V	MIO2651
Bank 505	J1	18x Single Ended, 9x Differential pairs	0.85V	EXT_CLKIN_PSMG T, RX/TX03
Bank 128	J1	2x Differnetial CLK Input, 8x Differential Transceiver		B128_CLK, RX /TX03
Bank 129	J1	2x Differnetial CLK Input 8x Differential Transceiver		B129_CLK, RX /TX03
Bank 65	J2	24x Single Ended, 12x Differential pairs	1.8V	HP Bank
Bank 88	J2	16x Single Ended, 8x Differential pairs	3.3V	HD Bank
ADC	J2	<ul><li>16x Single Ended,</li><li>8x Differential pairs</li><li>4x Differential Clocks</li></ul>	Variable	

DAC	J2	16x Single Ended, 8x Differential pairs	Variable	
		3x Differential Clocks		

General PL I/O to B2B connectors information

## **JTAG Interface**

JTAG access to the Xilinx UltraScale+ MPSoC is through B2B connector JM1. JTAG signals routed directly through the CPLD to FPGA. Access between CPLD and FPGA can be multiplexed via JTAGEN (logical one for CPLD, logical zero for FPGA) on B2B. When the CPLD\_JTAGEN is 0 or off, it provides FPGA access and when it is 1 or ON, it provides CPLD access.

JTAG Signal	B2B Connector
JTAG_TMS	J1-24
JTAG_TDI	J1-20
JTAG_TDO	J1-18
JTAG_TCK	J1-22

JTAG pins connection

### **MIO Pins**

MIO Pin	Connected to	B2B	Notes
MIO012	SPI FLash, U24-U25	-	Dual SPI FLash
MIO13	LED Green, D1	-	3.3V_CPLD
MIO1425	FPGA Bank 500,U1	J1	PSMIO
MIO2627	FPGA Bank 501,U1	J1	PSMIO
MIO2829	CPLD, U31	-	UART_TX, UART_RX
MIO3031	FPGA Bank 501, U1	J1	PSMIO
MIO3233	EEPROM,U23	-	I2C_SCL, I2C_SDA
MIO3435	FPGA Bank 501,U1	J1	PSMIO
MIO36	Gigabit ETH, U20	-	ETH_RST
MIO37	USB2.0, U11	-	USB_RST
MIO3851	FPGA Bank 501, U1	J1	PSMIO
MIO5262	USB2.0, U11	-	USB
MIO6377	Gigabit ETH, U20	-	ETH

MIOs pins

## **Test Points**

Test Point	Signal	Connected to	Notes
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TP1	CLKOUT	Voltage Regulator, U7
TP2	PLL_RSTN	Programmable Clock Generator, U15
TP4	CPLD_JTAGEN	B2B, J1
		CPLD, U31
TP5	JTAG_TDO	B2B, J1
		CPLD, U31
TP6	JTAG_TDI	B2B, J1
		CPLD, U31
TP7	JTAG_TCK	B2B, J1
		CPLD, U31
TP8	JTAG_TMS	B2B, J1
		CPLD, U31
TP9	GND	GND
TP1011	IO_L1P_AD15P_88,	FPGA Bank 88, U1
	O_L4N_AD12N_88	
TP12	VIN	B2B, J1
TP1314	GND	GND
TP1516	MIO32-MIO33	EEPROM,U23
		FPGA Bank 501, U1
TP17	GND	GND
TP18	ADC_AVCC	LDO Voltage Regulator, U8
TP19	ADC_AVCCAUX	LDO Voltage Regulator, U10
TP20	3.3V_CPLD	CPLD, U31
		B2B, J1
T21	CPLD_JT AGEN	B2B, J1
		CPLD, U31

Test Points Information

# **On-board Peripherals**

Chip/Interface	Designator	Notes
QSPI Flash	U24, U25	
DDR4 SDRAM	U2, U3, U5, U9	
CPLD	U31	
USB2.0	U11	
Gigabit Ethernet	U20	
Programmable Clock Generator	U15	

EEPROM	U22	
Oscillators	U14, U21, U12	
LEDs	D07	

On board peripherals

## **Quad SPI Flash Memory**

The TE0835 is a Dual SPI Flash module equipped with two SPI Flash U24, U25 connected to PSMIO FPGA bank 500.

MIO Pin	Schematic	U24 Pin	U25 Pin	Notes
MIO0	MIO0_QSPI	CLK	-	
MIO1	MIO1_QSPI	DO	-	
MIO2	MIO2_QSPI	nWP	-	
MIO3	MIO3_QSPI	nHOLD	-	
MIO4	MIO4_QSPI	DI	-	
MIO5	MIO5_QSPI	nCS	-	
MIO7	MIO5_QSPI	-	nCS	
MIO8	MIO5_QSPI	-	DI	
MIO9	MIO5_QSPI	-	DO	
MIO10	MIO5_QSPI	-	nWP	
MIO11	MIO5_QSPI	-	nHOLD	
MIO12	MIO5_QSPI	-	CLK	

Quad SPI interface MIOs and pins

## System Controller CPLD

The System Controller CPLD (U31) is provided by Lattice Semiconductor LCMXO2-460HC. The CPLD provides JTAG routing, boot mode, User IOs, LEDs, firmware and power management access. For more information please refer to the TE0835 CPLD page.

Schematic/Pin	Connected to	Description	Note
MODE03	FPGA Bank 503, U1	Boot Mode	
POR_B	FPGA Bank 503, U1	Programming Status	Pulled up
PORG_B	FPGA Bank 503, U1	Programming Status	Pulled up
INIT_B	FPGA Bank 503, U1	Configuration initialization	Pulled up
DONE	FPGA Bank 503, U1	Configuration Done Status	Pulled up
F_TCK	FPGA Bank 503, U1	FPGA JTAG	
F_TDI	FPGA Bank 503, U1	FPGA JTAG	
F_TMS	FPGA Bank 503, U1	FPGA JTAG	
F_TDO	FPGA Bank 503, U1	FPGA JTAG	
JTAG_TDO	B2B, J1	CPLD JTAG	

JTAG_TMS	B2B, J1	CPLD JTAG	
JTAG_TDI	B2B, J1	CPLD JTAG	
JTAG_TCK	B2B, J1	CPLD JTAG	
CPLD_JTAGEN	B2B, J1	CPLD JTAG Enable	
CPLDIO03	B2B, J1	CPLD IOs	
RESETN	B2B, J1	Reset	
MIO13	LED Green, D1	3.3V_CPLD	
MIO28	FPGA Bank 501, U1	UART_TX	
MIO29	FPGA Bank 501, U1	UART_RX	
FPGA_IO01	FPGA Bank 65, U1	IOs	
EN_PS_PL	Voltage Regulators, U6, U7, U29	PS/PL Enable Signals	Pulled Down
EN_GR1	Voltage Regulators, U19, U27, U28	MGTAVTT, PSLL	Pulled Down
EN_GR2	Voltage Regulators, U38, U18, U38	PS_MGTRAVTT, 3.3, DDR2. 5V	Pulled Down
EN_RF_ADC	Voltage Regulators, U8	Enable ADC	Pulled Down
PG_RF_DAC	Voltage Regulators, U17	ADC Power Good Status	Pulled Down
PG_PS_PL	Voltage Regulators, U6, U7, U29	PS/PL Power Good Status	Pulled Down
EN_RF_DAC	Voltage Regulators, U13	Enable DAC	Pulled Down
PG_RF_DAC	Voltage Regulators, U10	DAC Power Good Status	Pulled Down
LICD2 0 interfaces	ennections and nine		

USB2.0 interface connections and pins

### **USB2.0**

The TE0835 is equipped with a USB2.0, U11.

U11 Pin	Schematic	Connected to	Notes
RESETB	USB0_RST	FPGA Bank 501, U1	
VDDIO	1.8V	1.8V	
CPEN	USB0_CPE	B2B, J1	
VBUS	USB0_VBUS	B2B, J1	
ID	USB0_ID	B2B, J1	
DP	USB0_D_P	B2B, J1	
DM	USB0_D_N	B2B, J1	
REFCLK	USB_CLK	Oschillator, U12	
STP	USB0_STP	FPGA Bank 502, U1	
NXT	USB0_NXT	FPGA Bank 502, U1	
DIR	USB0_DIR	FPGA Bank 502, U1	
CLKOUT	USB_CLK	Oschillator, U12	
DATA07	USB0_DATA08	FPGA Bank 502, U1	

USB2.0 interface connections and pins

## Ethernet

The module TE0835 is equipped with a Gigabit Ethernet Transceiver, U20.

U20 Pin	Signal Name	Connected to	Signal Description	Note
MDIO	ETH_MDIO	FPGA Bank 502, U1	Data Management	
MDC	ETH_MDC	FPGA Bank 502, U1	Data Management clock reference for the serial interface	
TX_CLK	ETH_TXCK	FPGA Bank 502, U1	Transmit Clock	
TX_CTRL	ETH_TXCTL	FPGA Bank 502, U1	Transmit Control	
TXD03	ETH_TXD03	FPGA Bank 502, U1	Transmit Data	
RX_CLK	ETH_RXCK	FPGA Bank 502, U1	Receive Clock	
RX_CTRL	ETH_RXCTL	FPGA Bank 502, U1	Receive Control	
RXD03	ETH_RXD03	FPGA Bank 502, U1	Receive Data	
RESETn	ETH_RST	FPGA Bank 501, U1	Ethernet reset, Active low.	
XTAL_IN	ETH_XTAL_IN	Oscillator, U21	Reference Clock	
MDI03	PHY_MDI03	B2B, J1	Media Dependent Interface 03	
LED01	PHY_LED01	B2B, J1	LED output	
LED/INT	PHY_LED2	B2B, J1	LED interrupt	

Ethernet connections

## **EEPROM**

The module TE0835 has an EEPROM IC (U23) connected to PSMIO FPGA Bank 501.

MIO Pin	Schematic	U23 Pin	Notes		
MIO32	MIO32_I2C1_SCL	SCL			
MIO33	MIO33_I2C1_SDA	SDA			
I2C EEPROM interface MIOs and pins					

MIO Pin	I2C Address	Designator	Notes
MIO3233	0xA1	U23	

I2C address for EEPROM

## LEDs

Designa	torColo	r Connecte	ed Mactive Le	veNote
D1	Green	MIO13	Active High	3.3V CPLD
D25	Red	DBG_LE D03	Active Low	User LED

D6	Red	ERR_OUT	Active High	
D7	Red	ERR_ST ATUS	Active High	

On-board LEDs

#### **DDR4 SDRAM**

The TE0835 SoM has 4x 1 Gigabyte volatile DDR4 SDRAM IC for storing user application code and data.

- Part number: K4A8G165WB

- Supply voltage: 1.2 V
  Speed: 2400 Mbps
  Temperature: -40 ~ 95 °C

## **Clock Sources**

Designator	Description	Frequency	Note
U14, U21	MEMS Oscillator	25MHz	
U22	MEMS Oscillator	33.33 MHz	
Y1	Crystal Oscillator	54 MHz	
U12	MEMS Oscillator	52MHz	
U15	Programmable Clock Generator	Variable	
Ossillatera			

Oscillators

## **Programmable Clock Generator**

There is a Silicon Labs I<sup>2</sup>C programmable clock generator on-board (U10) in order to generate reference clocks for the module. Programming can be done using I<sup>2</sup>C via PIN header J3. The I<sup>2</sup>C Address is 0x69.

U15 Pin	Signal	Connected	d toDirection	Note
IN0	IN0_P	Oscillator, U14	Input	
IN1	-	N.C	-	
IN2	EXT_CL K_IN1	B2B,J2	Input	
IN3	-	N.C		
nRST	PLL_RS TN	FPGA Bank 65, U1	Input	
SCL	MIO32_I 2C1_SCL	Pin Header, J3	Input	I2C
SDA	MIO33_I 2C1_SDA	Pin Header, J3	Input	I2C
OUT0	CLKC	B2B,J2	Output	Differential Clock
OUT1	CLKB	B2B,J2	Output	Differential Clock
OUT2	CLKA	B2B,J2	Output	Differential Clock

OUT3	CLKD	B2B,J2	Output	Differential Clock
OUT4	CLKE	B2B,J2	Output	Differential Clock
OUT5	CLKF	B2B,J2	Output	Differential Clock
OUT6	B128_C LK0	FPGA Bank 128, U1	Output	
OUT7	B129_C LK0	FPGA Bank 129, U1	Output	
OUT8	CLK8	FPGA Bank 65, U1	Output	
OUT9	PSMGT _100MHZ	FPGA Bank 505, U1	Output	
OUT9A	CLK0A_ 100MHZ	B2B, J1	Output	

Programmable Clock Generator Inputs and Outputs

# Power and Power-On Sequence

## **Power Supply**

Power supply with minimum current capability of 2.5A for system startup is recommended.

## **Power Consumption**

Power Input Pin	Typical Current
VIN (5V)	TBD*

Power Consumption

\* TBD - To Be Determined

## **Power Distribution Dependencies**





Power Distribution

**Power-On Sequence** 



5.5V, Max 500 mA	3.3V,	wax	300	IIIA	
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Power Sequency

## **Power Rails**

Power Rail Name	B2B J1 Pin	B2B J2 Pin	Direction	Notes
VIN	1,2,3,4,5,6,8	-	Input	
PSBATT	14	-	Input	
3.3V_CPLD	16	-	Output	

Module power rails.

## **Bank Voltages**

Bank	Schematic Name	Voltage	Notes
Bank 65 HP	VCCO_65	1.8V	
Bank 503 PSCONFIG	VCCO_PSIO3_503	1.8V	
Bank 88 HD	VCCO_88	3.3V	
Bank 128 GTY	MGTAVCC	0.9V	
Bank 129 GTY	MGTAVCC	0.9V	
Bank 500 PSMIO	VCCO_PSIO0_500	1.8V	
Bank 501 PSMIO	VCCO_PSIO0_501	1.8V	
Bank 502	VCCO_PSIO0_502	1.8V	
Bank 504 PSDDR	VCCO_PSDDR_504	1.2V	
Bank 505 PSGTR	PS_MGTRAVCC	0.85V	

Zynq SoC bank voltages.

## **Board to Board Connectors**

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# **Technical Specifications**

# **Absolute Maximum Ratings**

Symbols	Description	Min	Max	Unit
VIN	Input Supply Voltage	0	5	V
T_STG	Storage Temperature	-40	95	٥°

PS absolute maximum ratings

# **Recommended Operating Conditions**

Operating temperature range depends also on customer design and cooling solution. Please contact us for options.

Parameter	Min	Max	Units	Reference Document
VIN	4.5	5.5	V	See Schematic
T_OPR	-40	85	°C	See USB2.0 Datasheet

Recommended operating conditions.

## **Physical Dimensions**

- Module size: 90 mm × 65 mm. Please download the assembly diagram for exact numbers.
  Mating height with standard connectors: 7 mm.

PCB thickness: 1.65 mm.



Physical Dimension

# **Currently Offered Variants**

Trenz shop TE0835 overview page	
English page	German page
Trenz Electronic Shop Overview	·

**Revision History** 

## Hardware Revision History

Date	Revision	Changes	Documentation Link
2019-11-05	REV01	Initial Release	REV01
2020-06-17	REV02	1. Added a VRP resistor on bank 65;	REV02
		2. LDO U33 is changed on ADP7102ACPZ;	
		3. Signal FPGA IO0 is connected on AE18 pin of FPGA;	
		4. Signal DBG_LED3 is connected on AD18 pin of FPGA;	
		5. Signal MIO13_25 connected to J1 pin 33 instead MIO25.	
		6. Resistor R84 is removed;	
		7. LED D1 moved on edge of PCB;	
		8. Added THT testpoints J4 on CPLD_JTAGEN, R76 was removed;	
		9. Signals B49_XX_X are renamed in B88_XX_X;	
		10. C241 is changed on 1nF;	
		11. Length of CLK signals on RFADC and RFDAC are adjusted;	
		12. Wrong connection on U8 is fixed (PCB);	
		13. Wrong connection PGOOD1 pin of U7 is fixed;	
		14. R17 is changed from 35,5K to 33K for VCC_PL_PS correction.	

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



Board hardware revision number.

## **Document Change History**

Date	Revision	Contributor	Description
			Bugfix Overview
			Picture
Error	Error	Error	
renderi	renderi	renderi	
ng	ng	ng	
macro	macro	macro	
'page-	'page-	'page-	
info'	info'	info'	
Ambiguo	Ambiguo	Ambiguo	
us	us	us	
method	method	method	
overload	overload	overload	
ing for	ing for	ing for	
method	method	method	
jdk.	jdk.	jdk.	
proxy24	proxy24	proxy24	
1.\$Proxy	1.\$Proxy	1.\$Proxy	
3496#ha	3496#ha	3496#ha	
sConten	sConten	sConten	
tLevelPe	tLevelPe	tLevelPe	
rmission	rmission	rmission	
Cannot	Cannot	Cannot	
resolve	resolve	resolve	
which	which	which	
method	method	method	
to	to	to	
invoke	invoke	invoke	
for [null,	for [null,	for [null,	
class	class	class	
java.	java.	java.	
lang.	lang.	lang.	
String,	String,	String,	
class	class	class	
com.	com.	com.	
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Document change history.

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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.

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com.atlassian.confluence.core.ContentEntityObject]

#### Error rendering macro 'page-info'

Ambiguous 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: [interface 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