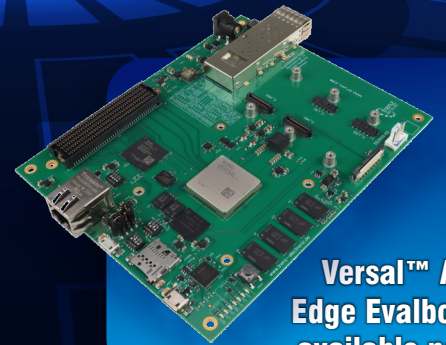


# TRENZ ELECTRONIC CATALOGUE




## Electronic Design Service

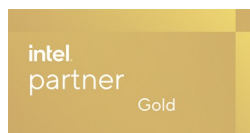
Development, manufacturing and supply  
of FPGA & SoC modules and customized  
turnkey solutions



**Versal™ AI  
Edge Evalboard  
available now!**

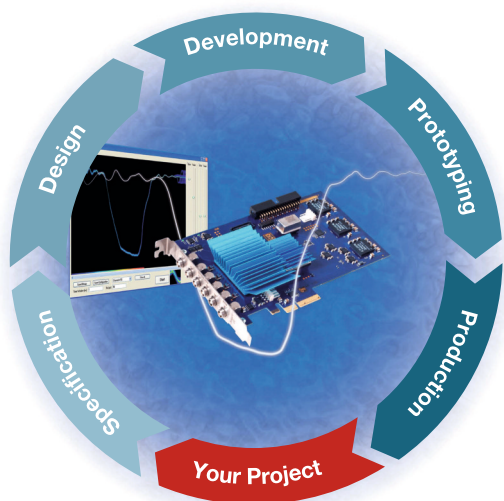
updated  
April 2024

 [www.trenz-electronic.de](http://www.trenz-electronic.de)  
 [shop.trenz-electronic.de](http://shop.trenz-electronic.de)  
 [info@trenz-electronic.de](mailto:info@trenz-electronic.de)



Forging **FPGA** Frontiers

Trenz Electronic GmbH operates as a provider of development services in the electronic industry since 1992. Our services include design-in support as well as turnkey designs which typically covers all steps from product specification, hardware and software design up to prototyping and production.



We are particularly specialized in the design of high-speed data acquisition, high-accuracy measurement and embedded digital signal processing systems based on FPGA and CPU architectures.

Many of our products are compatible with some widespread form factors. We also provide SoM products for Automotive industry and high-end applications.

In the event that an off-the-shelf FPGA board won't fit the customers requirements, the design can be easily adapted by our comprehensive engineering design service.

Our in-house EMS (Electronic Manufacturing Service) and worldwide supply of FPGA and SoC modules complete the portfolio. All modules produced by Trenz Electronic GmbH are developed and manufactured in Germany.

Other assembly options of our modules for cost or performance optimization plus high volume prices are available on request. Also, cooling solutions and several carrier boards are at hand.

## Hardware Design

- System architecture and design
- Hardware integration (Design-In)
- Ultrafast digital logic
- Analog and mixed signal
- Digital signal processing
- Schematic capture and PCB layout

## HDL Design

- FPGA and System-On-Chip design
- System design and synthesis
- HDL design (VHDL, Verilog)
- Integration of soft-cores
- USB, PCI-Express, Gigabit Ethernet
- Ultrafast ADC/DAC interfaces

## Software Development

- Device driver and application software development
- Software and Firmware development

- **Extended device life cycle**
- **Rugged for industrial applications**
- **Automotive grade available**
- **Small and powerful**
- **Customizable**
- **Development and design service**
- **Rapid Prototyping**
- **Cooling solutions**
- **Carrier and testboards**
- **Free documentation and designs**
- **Sales worldwide**
- **In-house EMS**
- **Developed & produced in Germany**



ISO 9001:2015  
(quality management)  
certified



ISO 14001:2015  
(environmental  
management) certified



Company Profile / Index .....	2-3	TEC0089 Development Platform (AMD Kintex™ 7) .....	29
Product availability „In our own behalf“ .....	4	TEC0330 PCIe FMC Carrier (AMD Virtex™ 7) .....	30
<b>New Products</b>		TEF1001 PCIe FMC Carrier (AMD Kintex™ 7) .....	30
AM0030 (AMD Versal™ AI Edge) .....	5	TEF1002 PCIe FMC Carrier .....	31
TEI0187 (AMD Zynq™ UltraScale+™) .....	5	TEI0022 „DataStorm DAQ“ (Intel® Cyclone® V) .....	31
TE0950 (AMD Versal™ AI Edge) .....	6	TEB0911 UltraRack+ Board (AMD Zynq™ UltraScale+™) .....	32
TEG2000 (Cologne Chip GateMate A1) .....	6	<b>Products with Intel FPGA</b>	
AM0070 (AMD Zynq™ UltraScale+™) .....	7	TEI0006 (Intel® Cyclone® 10) .....	33
TE0825 (AMD Zynq™ UltraScale+™) .....	7	TEIB0006 Carrier Board for TEI0006 .....	33
TE0717 (AMD Spartan™ 7) .....	8	TEI0001 "MAX1000" (Intel® MAX® 10) .....	34
TE0806 (AMD Zynq™ UltraScale+™) .....	8	TEI0003 "CYC1000" (Intel® Cyclone® 10) .....	34
TE0865 (AMD Zynq™ UltraScale+™) .....	9	TEI0009 "CYC10LP RefKit" (Intel® Cyclone® 10) .....	34
TEI0050 (Intel® Cyclone® V) .....	9	<b>Products with Lattice FPGA</b>	
TEL0003 (Lattice CertusPro-NX) .....	10	TEL0001 "LXO2000" (Lattice XO2) .....	35
TEL0004 (Lattice Avant) .....	10	TE0876 "IceZero" (Lattice ICE40) .....	35
TE0830 (AMD Zynq™ UltraScale+™) .....	11	<b>Products with Microchip FPGA</b>	
TEI1000 (Intel® Stratix® 10 SX or GX) .....	11	TEM0001 "SMF2000" (Microchip SmartFusion® 2) .....	36
TE0763 (AMD Artix™ 7) .....	12	TEM0005 (Microchip SmartFusion® 2) .....	36
TEC0217 (AMD Artix™/Kintex™ Ultrascale+™) .....	12	TEM0007 (Microchip PolarFire® SoC) .....	37
<b>Products with AMD FPGA</b>		TEM0008 (Microchip PolarFire® SoC) .....	37
TE0710 (AMD Artix™ 7) .....	13	<b>JTAG Adapter/Programmer</b>	
TE0711 (AMD Artix™ 7) .....	13	TE0790 XMOD FTDI JTAG Adapter .....	38
TE0712 (AMD Artix™ 7) .....	14	TEM0009 FPGA USB-Programmer JTAG .....	38
TE0713 (AMD Artix™ 7) .....	14	TEI0004 FPGA USB-Programmer2 JTAG (Arrow) .....	38
TE0715 (AMD Zynq™ 7000) .....	15	TEI0005 FPGA USB-Programmer2 SMD Module .....	38
TE0720 (AMD Zynq™ 7000) .....	15	<b>CRUVI</b>	
TE0741 (AMD Kintex™ 7) .....	16	CRUVI Overview .....	39
TE0841 (AMD Kintex™ UltraScale™) .....	16	CR00140 (AMD Zynq™ 7000) .....	40
TE0812 (AMD Zynq™ UltraScale+™) .....	17	CR00100 (Intel® MAX® 10 CRUVI Baseboard) .....	41
AM0010 (AMD Zynq™ UltraScale+™) .....	17	CR00103 (Lattice Certus-NX) .....	41
TE0820 (AMD Zynq™ UltraScale+™) .....	18	CR00109 (Intel® Cyclone® 10 LP Development Board) .....	41
TE0821 (AMD Zynq™ UltraScale+™) .....	18	CRUVI Adapter .....	42/43
TE0823 (AMD Zynq™ UltraScale+™) .....	19	<b>Other Trenz Electronic Products</b>	
TE0724 (AMD Zynq™ 7000) .....	19	Trenz Electronic Carrier Boards for 4 x 5 .....	44
TE0803/813 "UltraSoM+" (AMD Zynq™ UltraScale+™) .....	20	Trenz Electronic Carrier Boards for Custom Modules .....	45
TE0807/817 "UltraSoM+" (AMD Zynq™ UltraScale+™) .....	20	Trenz Electronic Starter Kits Overview .....	46
TE0808/818 "UltraSoM+" (AMD Zynq™ UltraScale+™) .....	21	Trenz Electronic Cooling Solutions .....	47
TE0726 "ZynqBerry" (AMD Zynq™ 7000) .....	21	<b>Comparison Tables</b>	
TE0723 "ArduZynq" (AMD Zynq™ 7000) .....	22	Module Comparison Table (AMD) .....	48/49
TE0835/836 RFSoc (AMD UltraScale+™ RFSoc) .....	22	Module Comparison Table (Intel, Lattice, Microchip) .....	50/51
TEF0008 FMC Card .....	23	<b>Sundance Multiprocessor Technology</b>	
TE0802 Development Board (AMD Zynq™ UltraScale+™) .....	23	Sundance VCS <sup>1</sup> , VCS <sup>2</sup> .....	52
TE0890 "S7 Mini" (AMD Spartan™ 7) .....	24	Sundance VCS <sup>3</sup> .....	53
TE0714 (AMD Artix™ 7) .....	24		
TE0727 "ZynqBerryZero" (AMD Zynq™ 7000) .....	25		
TE0725 (AMD Artix™ 7) .....	25		
TE0716 (AMD Zynq™ 7000) .....	26		
TE0728 (AMD Zynq™ 7000) .....	26		
TE0729 (AMD Zynq™ 7000) .....	27		
TE0745 (AMD Zynq™ 7000) .....	27		
TE0782 (AMD Zynq™ 7000) .....	28		
TE0783 (AMD Zynq™ 7000) .....	28		

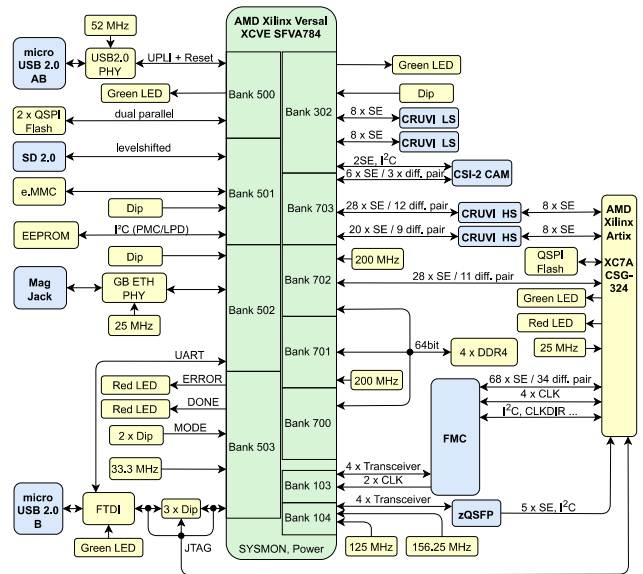




**NEW TE0950 Versal™ AI Edge Evalboard**  
Evaluation Board with AMD Versal™ AI Edge



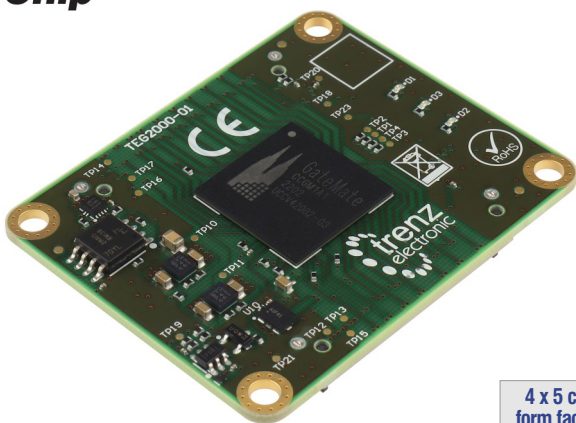
15 x 12 cm form factor



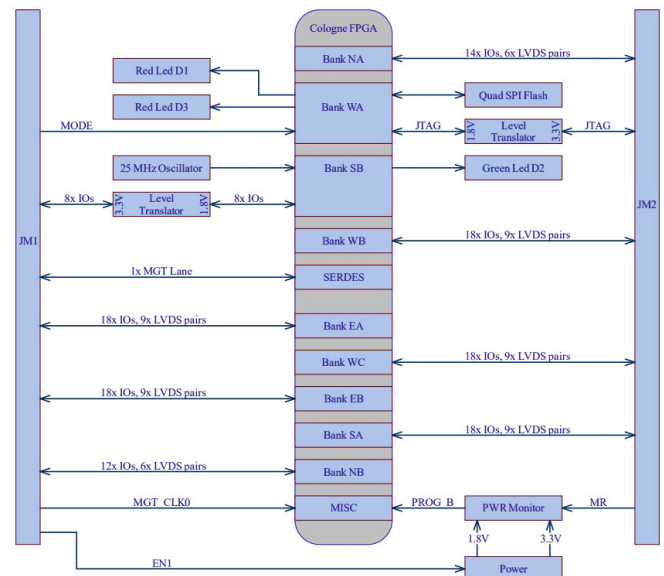
<http://trenz.org/te0950-info>

Device list	Pin Packages	Connectors	SDRAM max	Flash	e.MMC	Ethernet	USB	Other Features
Versal™ AI Edge VE2302	A784	zQSFP, 2 x CRUVI HS, 2 x CRUVI LS, CSI-2, FMC	8 GB DDR4	128 MB SPI	32 GB	1 Gbit RJ45	USB2.0, JTAG + UART	AMD Artix™7 FPGA as configurable Levelshifter, EEPROM with MAC-Address, 2 LEDs, push button, dip switches, reset button

**NEW TEG2000**  
Cologne Chip GateMate A1



4 x 5 cm form factor



<http://trenz.org/teg2000-info>

Device list	Interface	Flash	On Board	Other Features
GateMate CCGM1A1	Plug-on-Module with 2 x 100-Pin Razor Beam B2B connector, Diverse I/O- and LVDS configurations	16 MB QSPI	25 MHz Clock Oscillator, Level Shifters	All power supplies on board

**NEW** AM0070 Andromeda RFSoc Series  
 AMD Zynq™ UltraScale+™ RFSoc, DDR4, Flash, Ethernet

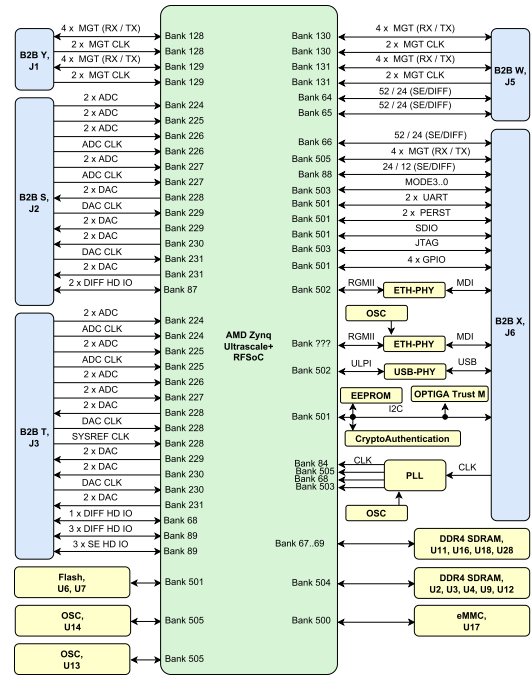


**AMD**  
**ZYNQ**  
 UltraScale+



6.4 x 8 cm form factor

<http://trenz.org/am0070-info>

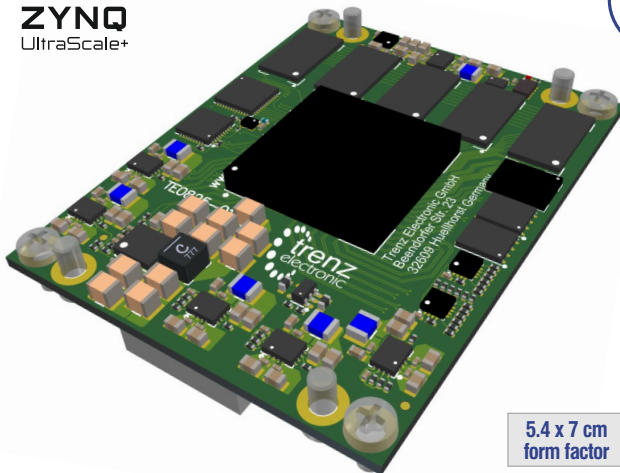


Device list	Connectors	SDRAM max	Flash	e.MMC	Ethernet	USB	Other Features
ZU29DR, ZU39DR, ZU49DR	5 x Samtec ADM6 4 x 60-pin	4 GB DDR4 64-bit (PS) with ECC 8 GB DDR4 64-bit (PL)	2 x 64 MB	8 GB	2 x 1 Gbit	USB2.0	OPTIGA Trust M, Crypto Authentication, Oscillator

**NEW** TE0825 Series  
 AMD Zynq™ UltraScale+™ MPSoC, Automotive, DDR4, Flash, EEPROM

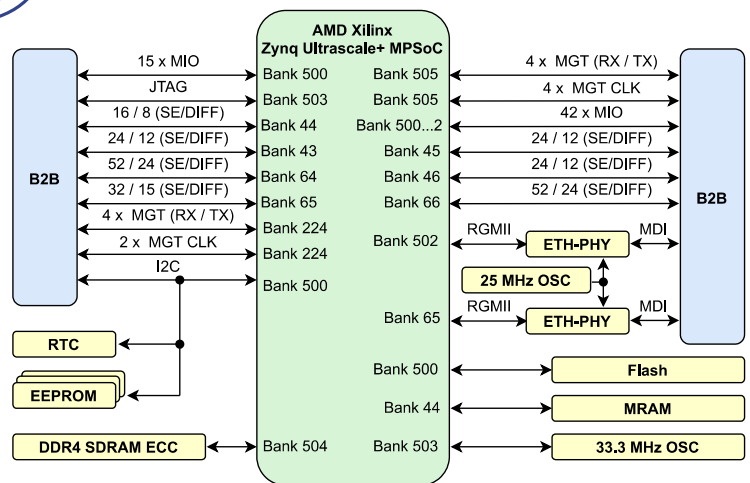


**AMD**  
**ZYNQ**  
 UltraScale+



5.4 x 7 cm form factor

<http://trenz.org/te0825-info>



Device list	Connectors	SDRAM	Flash	EEPROM	Ethernet PHY	Total I/O	Gbit Transceiver	Other Features
ZU2, ZU3, ZU4, ZU5	2 x Samtec ADM6, 1 x Samtec UMPT, 4 x 60 pin	8 GB DDR4 with ECC	256 MB	64 kByte, 2 x with MAC address	2 x 1 Gbit	136 PL HP + 88 PL HD 57 PS MIO	4 x GTR + 4 x GTH	real time clock, Oscillator, power connector (UMPT), ETH, JTAG



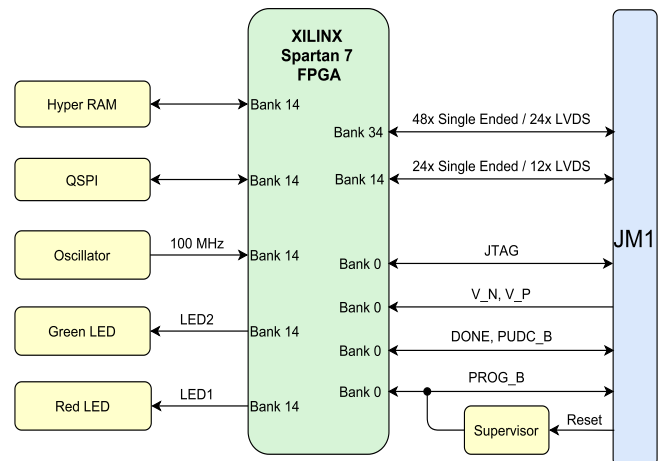
**NEW TE0717 Series**  
**AMD Spartan™ 7, HyperRAM, Flash, 100MHz Oscillator**



**AMD**  
**SPARTAN™ 7**



2.5 x 3.5 cm  
 form factor



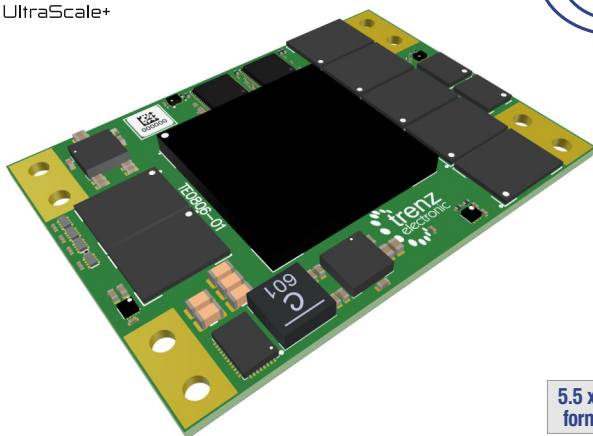
<http://trenz.org/te0717-info>

Device list	Connector	HyperRAM	Flash	Other Features
S6, S15, S25, S50	1 x Samtec 100-pin LSHM	64 Mbit	64 Mbit	Baseboard available, oscillator 100 MHz, green and red LED, single supply

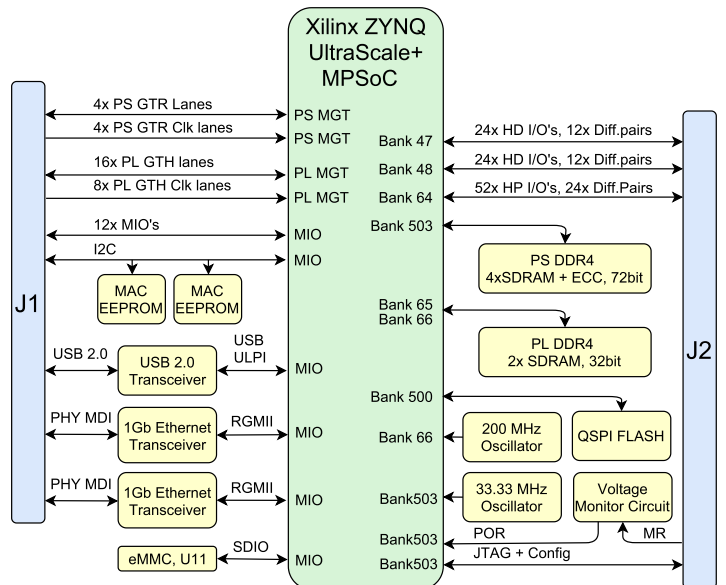
**NEW TE0806 Series**  
**AMD Zynq™ UltraScale+™ MPSoC, DDR4 (PS + PL domain), Flash, Ethernet, USB**



**AMD**  
**ZYNQ**  
 UltraScale+



5.5 x 7.6 cm  
 form factor



<http://trenz.org/te0806-info>

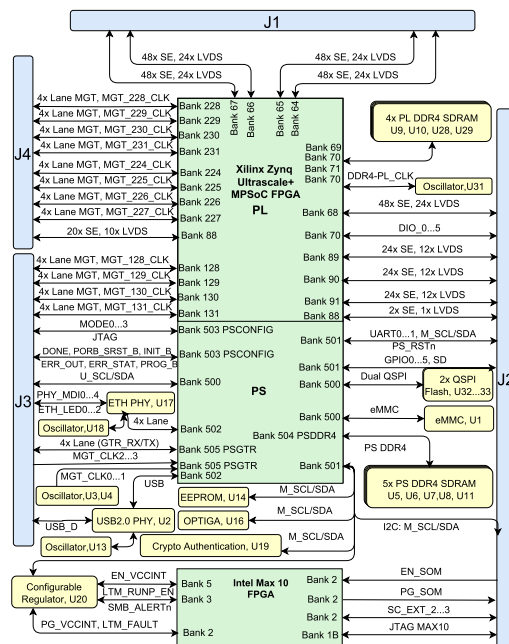
Device list	Connectors	SDRAM max	Flash max	e.MMC max	Ethernet PHY	USB PHY	Total I/O	Gbit Transceiver	Other Features
ZU4, ZU5, ZU7, CG, EG, EV support, 900 Pin packages	2 x Samtec ADM6	8 GB DDR4 64-bit (PS) with ECC 4 GB DDR4 32-bit (PL)	512 MB	64 GB	2 x 1 Gbit	USB2.0 OTG	48 PI HD + 52 PL HP 14 MIOs + I2C	4 x GTR + 16 x GTH	Transceiver clock in-/outputs, 2 x MAC address serial EEPROM, single 5-12V power required

# NEW TE0865 Series

AMD Zynq™ UltraScale+™ MPSoC, DDR4, Flash, Ethernet, USB



7.5 x 10 cm form factor



<http://trenz.org/te0865-info>

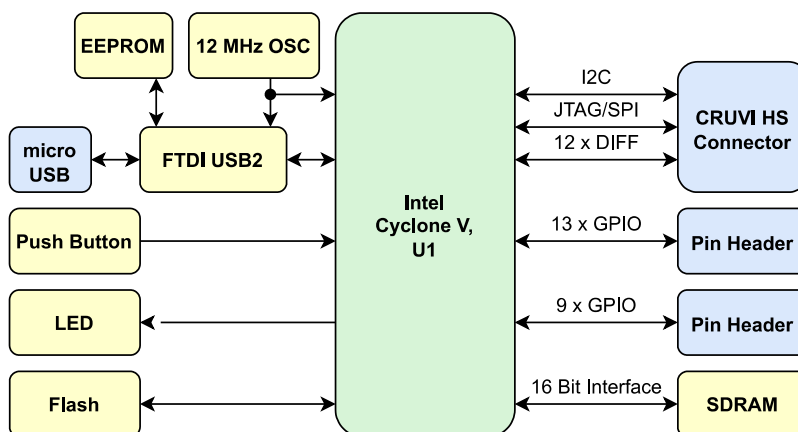
Device list	Pin Packages	Connectors	SDRAM max	Flash	Ethernet PHY	Total I/O	Gbit Transceivers	Other Features
ZU11, ZU17, ZU19	C1760	4 x Samtec ADM6 4 x 60-pin	8 GB DDR4 64-bit (PS) with ECC, 8 GB DDR4 64-bit (PL)	2 x 64 MB	1 Gbit	240 PL HP 96 PL HD 21 MIOs	32 x GTH, 16 x GTY, 4 x GTR	USB PHY, eMMC, 12V single supply

# NEW TEI0050 Series

Intel® Cyclone® V, SDRAM, Flash, EEPROM



2.5 x 7.07 cm form factor

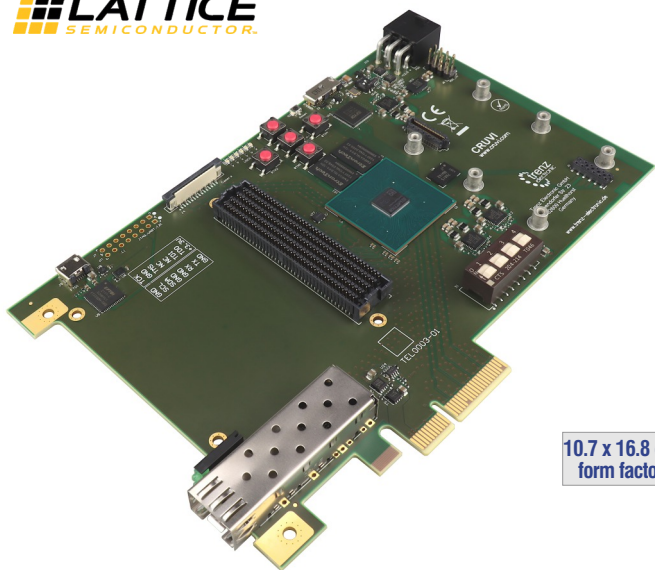


<http://trenz.org/tei0050-info>

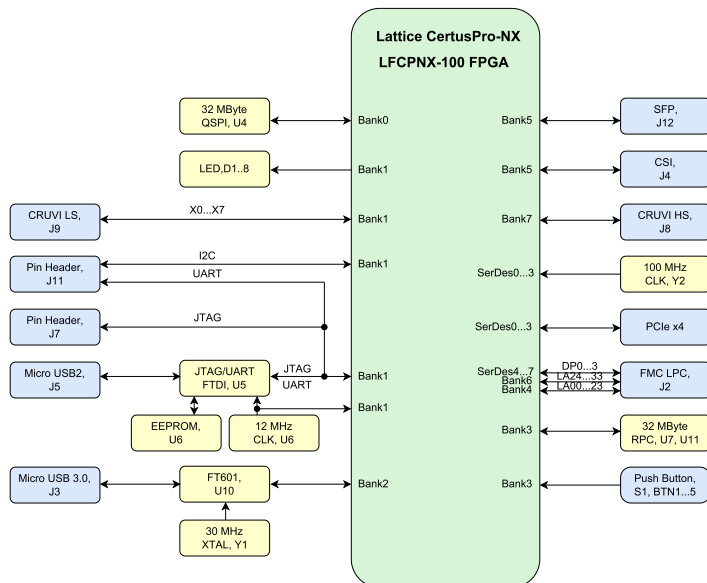
Device list	Pin Package	Connectors	SDRAM	Flash	Other Features
Intel® Cyclone® V	U15 Ultra FineLine BGA 324 Pins	CRUVI, 2 x 14 Pin Header	8 MB	up to 256 MB possible	USB-to-JTAG/GPIO-FTDI, user push buttons and LEDs



**NEW TEL0003 Series**  
**Lattice CertusPro™ -NX, CRUVI, DRAM, Flash**



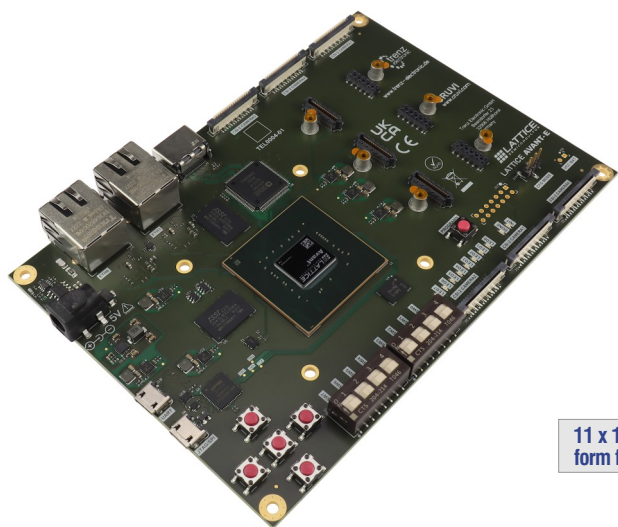
10.7 x 16.8 cm form factor



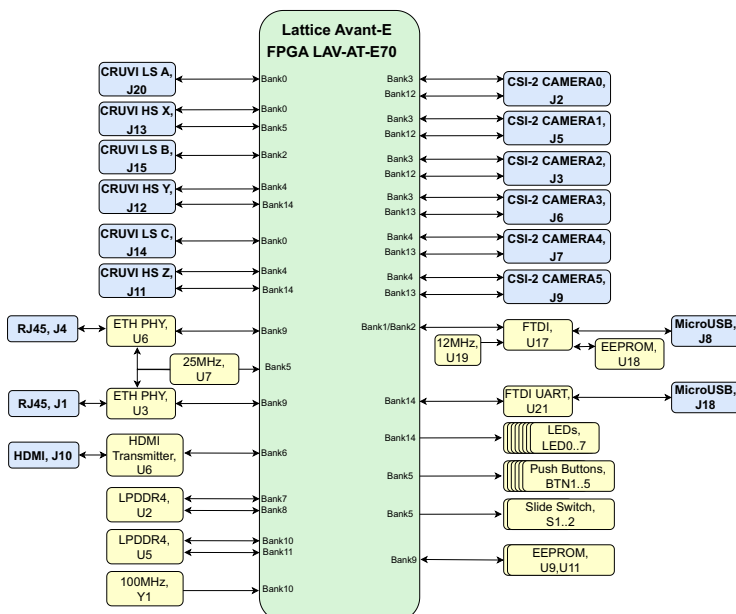
<http://trenz.org/tel0003-info>

Device list	On-Board	DRAM	Flash	Interface	Other Features
CertusPro™ -NX LFCPNX-100	USB3.0 to FIFO Bridge USB to FIFO FTDI	2 x 32 MB RPC	32 MB QSPI	CRUVI, PCI x 4, FMC (MGT/GPIO/JTAG/I2C), SFP+, USB3.0, USB2.0 (JTAG + UART), 3 x Pin Header	Oscillator, user LEDs, push buttons, DIP Switch, EEPROM

**NEW TEL0004 Series**  
**Lattice Avant™ Evaluation Board, CRUVI, DRAM, Flash**



11 x 16 cm form factor



<http://trenz.org/tel0004-info>

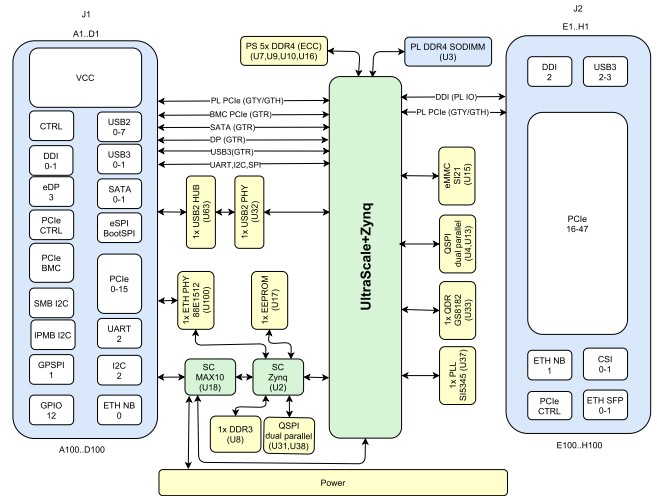
Device list	SDRAM	Flash	Interface	Other Features
Lattice Avant™ AT-E (LAV-AT- E70)	2 x 8 Gbit LPDDR4	32 MB SPI/QUAD Boot	2 x GBit Ethernet, HDMI Transmitter, 2 x Micro-USB connector, 6 x MIPI CSI-2, 3 x CRUVIs	user LEDs, push buttons, Slide Switch, 2 x EEPROM with MAC address

**NEW TE0830 Series (COM-HPC™ PICMG Standard)**  
**AMD Zynq™ UltraScale+™ Module, ZU11EG up to ZU19EG, 12 x 12 cm (Client Size B)**



12 x 12 cm form factor

COM-HPC™ is the new released PICMG standard for high-performance Computer-on-Modules (COMs). The pinout and majority of the functionality were recently officially approved.



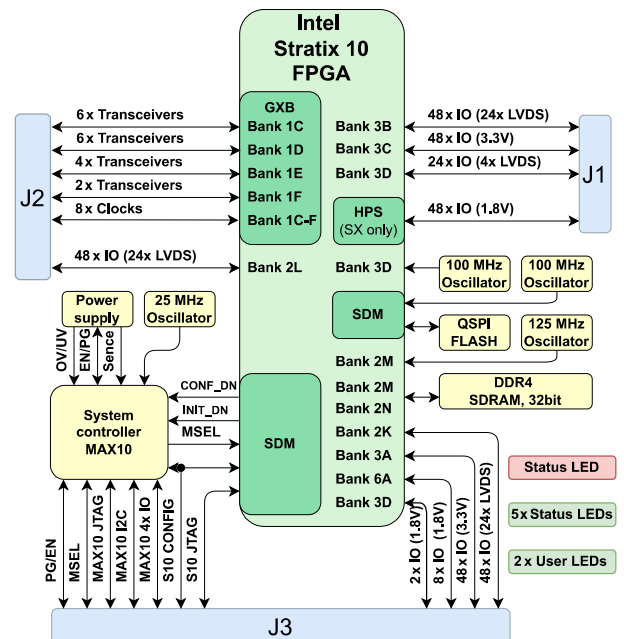
<http://trenz.org/te0830-info>

Device list	Pin Packages	Connectors	SDRAM max	Gbit Transceivers	Other Features
ZU11, ZU17, ZU19	FFVC1760	2 x 400 Pin COM-HPC	bis 8 GB DDR4 (PS) with ECC bis 16 GB DDR4 (SODIMM) (PL)	32 x GTH, 16 x GTY, 4 x GTR	1 Gbit ETH PHY, USB PHY, e.MMC, System Controller, CLK Management, diverse IOs, 12V single supply

**NEW TEI1000 Series**  
**Intel® Stratix® 10 SX or GX, SDRAM, Flash, MAX10 System Controller**



6 x 8 cm form factor



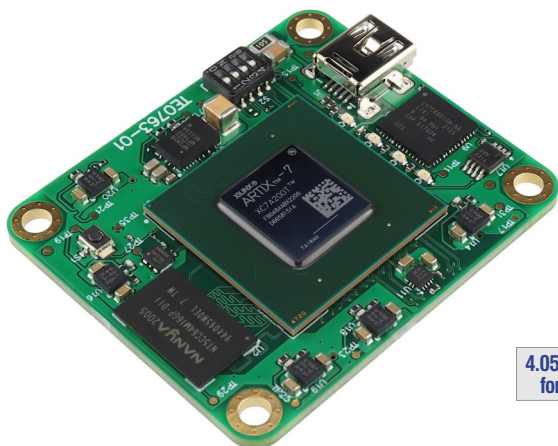
<http://trenz.org/tei1000-info>

Device list	Connector	SDRAM	QSPI Flash	Gbit Transceivers	Total IOs	Other Features
Stratix® 10 SX or GX	3 x 240 pin BGA	max.2 Gbyte DDR4	512 Mbit	18 x GXT	250 x PL 48 x CPU	MAX® 10 System Controller, Status and User LEDs, 1.8V, 3.3V and variable IO

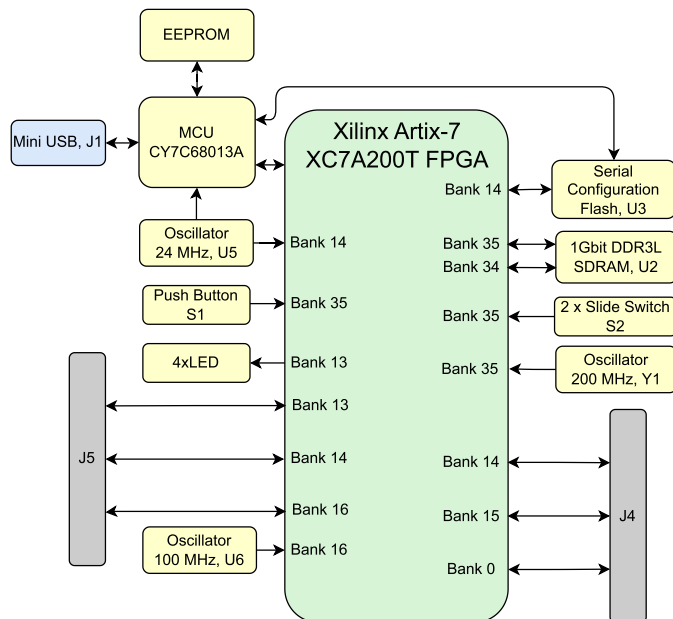


**NEW TE0763 Series**  
**AMD Artix™ 7 FPGA, 200K, DDR3L, Flash**

**AMD**  
**ARTIX 7**



4.05 x 4.75 cm form factor



<http://trenz.org/te0763-info>

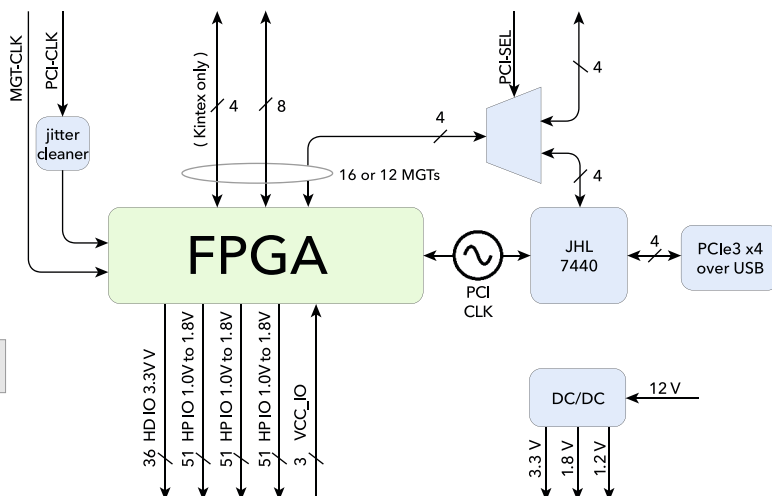
Device list	On-Board	DRAM	Flash	Interface	Other Features
200T	HS-USB Microcontroller	125 MB DDR3L SDRAM	32 MB SPI/QUAD Boot	2 x 80 pin B2B connectors, B2B USB, Reset IN, 100 x IOs, 6 x CLK IN, FPGA JTAG	user LEDs, push buttons, DIP Switch,

**NEW TEC0217 Series**  
**Micromodule with Artix™/Kintex™ Ultrascale+**

TEC0217 is an FPGA module optimized to provide high MGT performance at relatively low cost. All 12 or 16 MGT lanes are available on the B2B connector. Of these, 4 lanes can optionally be routed to an onboard intel Thunderbolt 4 device controller JHL7440 to access the board via PCI over USB. An interface like this can connect to any Thunderbolt port and to USB ports that support PCIe over USB.



5.2 x 9.6 cm form factor



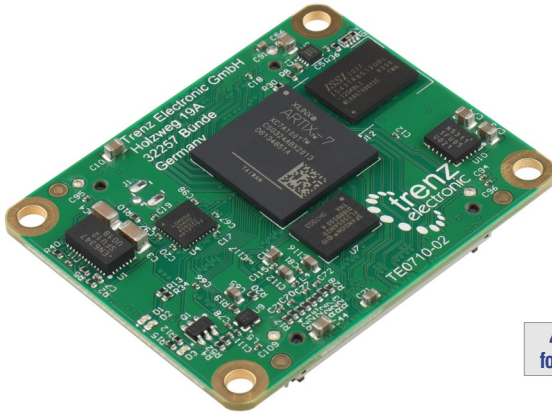
<http://trenz.org/tec0217-info>

Device list	MGT count	MGT speed	MGT Type	PCI	System Logic Cells (K)	UltraRAM (Mb)	DSP Slices	HP IO (3 Banks with individually selectable IO voltage)	HD IO 3.3V
AU10P, AU15P, AU20P, AU25P, KU3P, KU5P	12-16	16.3 - 32.75 Gbps	GTH GTY	PCIe4x8 PCIe3x8 PCIe3x16	96 up to 475	only for KU3P (13.5) and KU5P (18.0)	400 up to 1.824	153	58 in 29 differential pairs

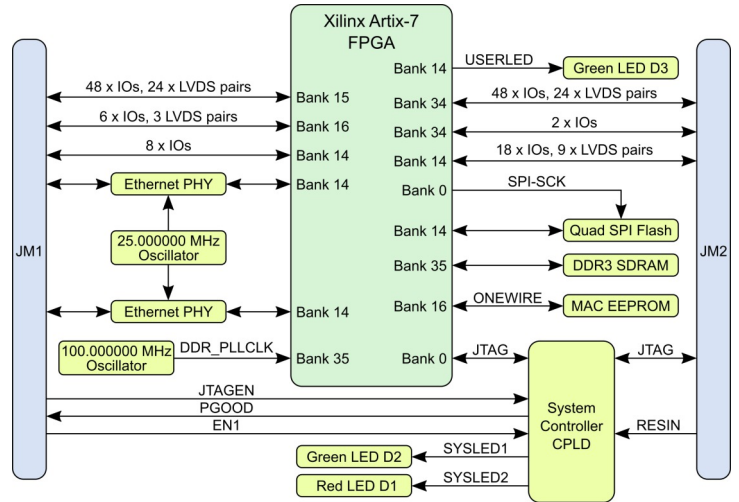
# TE0710 Series

## AMD Artix™7, DDR3, Flash, 2 x 100 Mbit Ethernet, EEPROM

**AMD**  
**ARTIX™7**



4 x 5 cm form factor



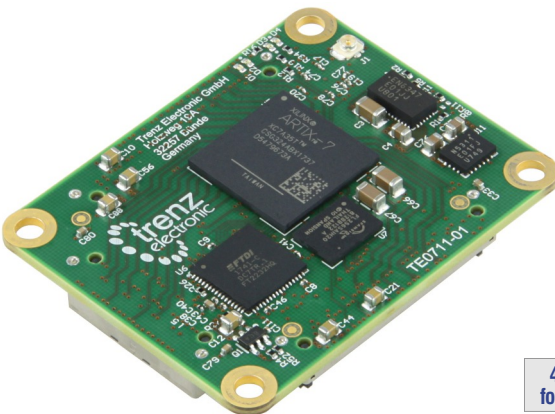
<http://trenz.org/te0710-info>

Device list	Connectors	SDRAM max	Flash	Ethernet PHY	Total I/O	Other Features
35T, 50T, 75T, 100T	2 x Samtec LSHM	512 MB DDR3	32 MB	2 x 100 Mbit	112 (51 differential pairs + 10 single-ended)	JTAG, 100 MHz MEMS oscillator, user LED, single supply

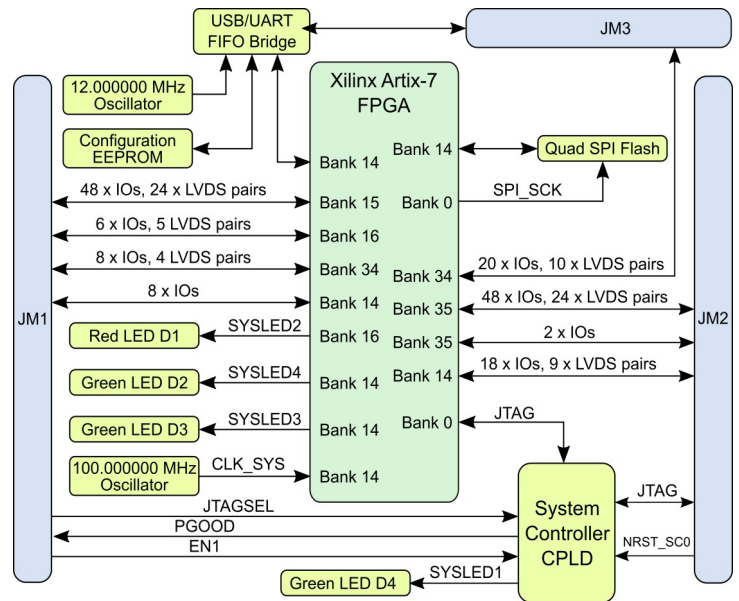
# TE0711 Series

## AMD Artix™7, Flash, USB, FTDI USB to UART/FIFO bridge, high pin count

**AMD**  
**ARTIX™7**



4 x 5 cm form factor



<http://trenz.org/te0711-info>

Device list	Connectors	Flash	MEMS Oscillator	USB PHY	Total I/O	Other Features
35T, 50T, 75T, 100T	3 x Samtec LSHM	32 MB	100 MHz	USB2.0 UART/FIFO	178 (84 differential pairs)	4 LEDs, single supply

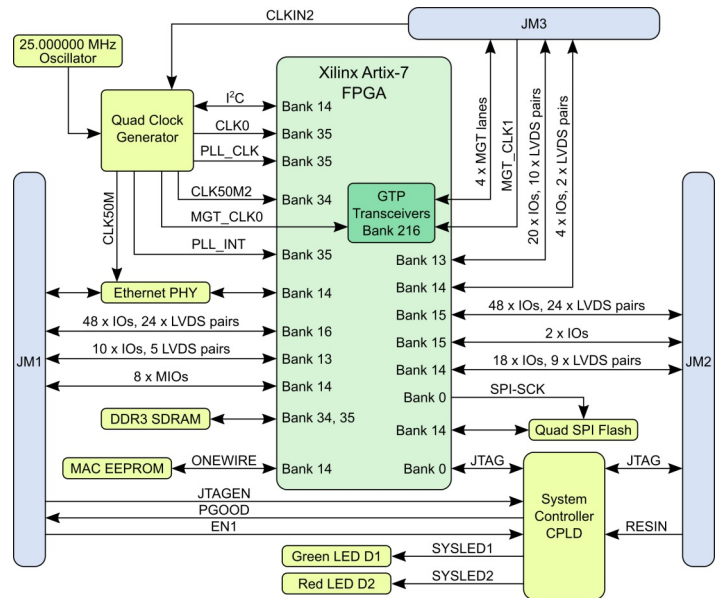
# TE0712 Series

## AMD Artix™7, DDR3, Flash, Ethernet, 4 x GTP Transceiver

**AMD**  
**ARTIX™7**



4 x 5 cm form factor



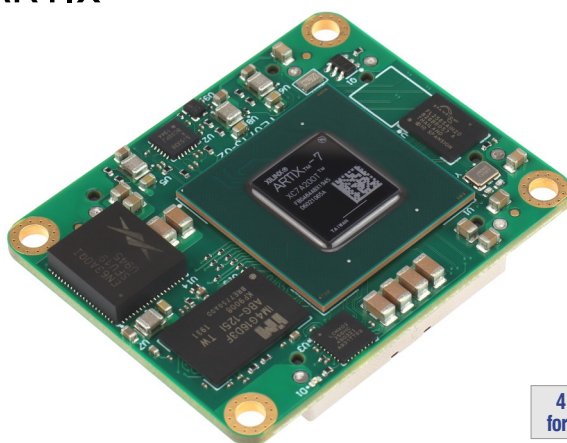
<http://trenz.org/te0712-info>

Device list	Connectors	SDRAM max	Flash	EEPROM	Ethernet PHY	Total I/O	Gbit Transceivers	Other Features
75T, 100T, 200T (with restrictions: 15T, 35T, 50T)	3 x Samtec LSHM	1 GB DDR3	32 MB	MAC Address	100 Mbit	158	4 x GTP	Programmable clock generator, single supply

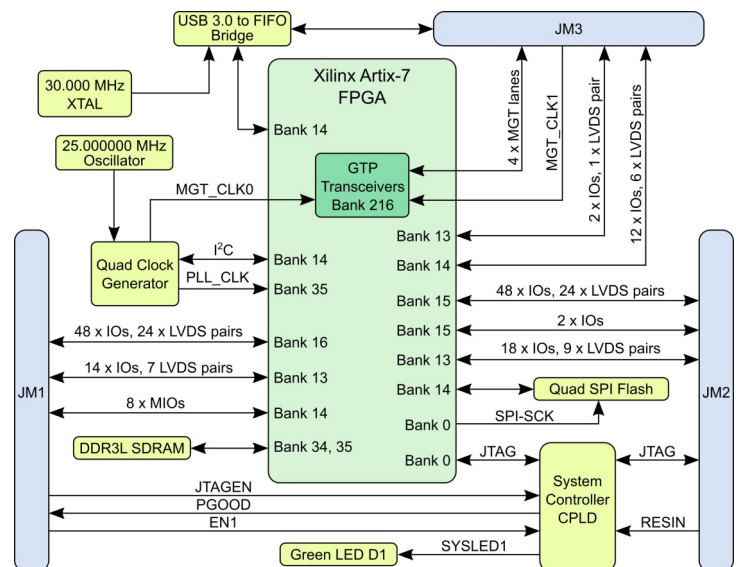
# TE0713 Series

## AMD Artix™7, DDR3L, Flash, USB3.0 to FIFO Bridge, 4 x GTP Transceiver

**AMD**  
**ARTIX™7**



4 x 5 cm form factor



<http://trenz.org/te0713-info>

Device list	Connectors	SDRAM max	Flash	USB PHY	Total I/O	Gbit Transceivers	Other Features
75T, 100T, 200T (with restrictions: 15T, 35T, 50T)	3 x Samtec LSHM	1 GB DDR3L	32 MB	USB3.0	152	4 x GTP	Programmable clock generator, single supply

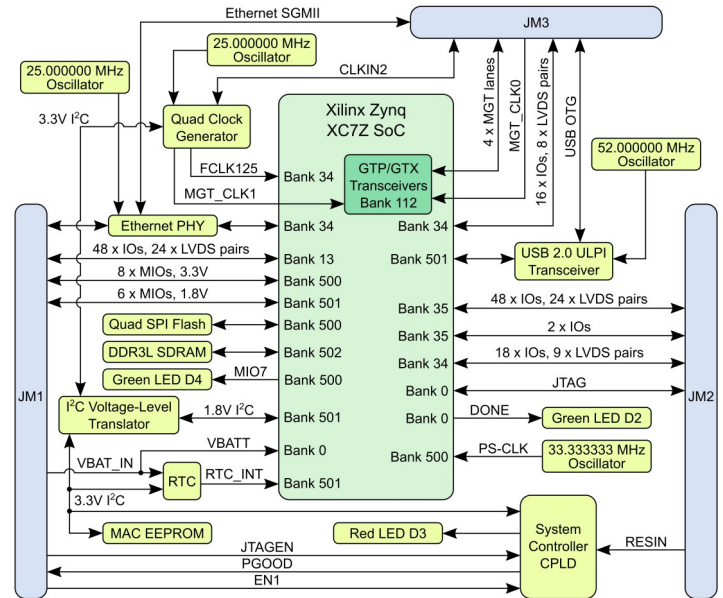


# TE0715 Series

AMD Zynq™ 7000, DDR3, Flash, Ethernet, USB, 4 High Speed Serial Transceivers



4 x 5 cm form factor

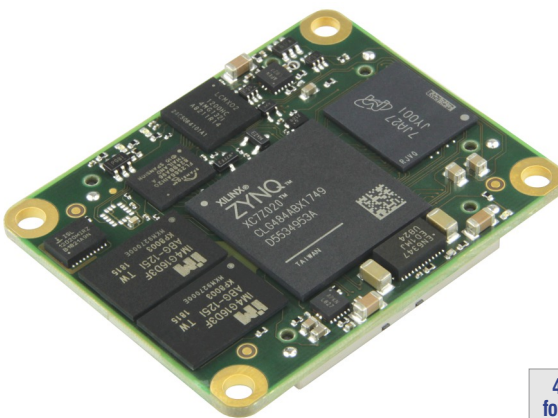


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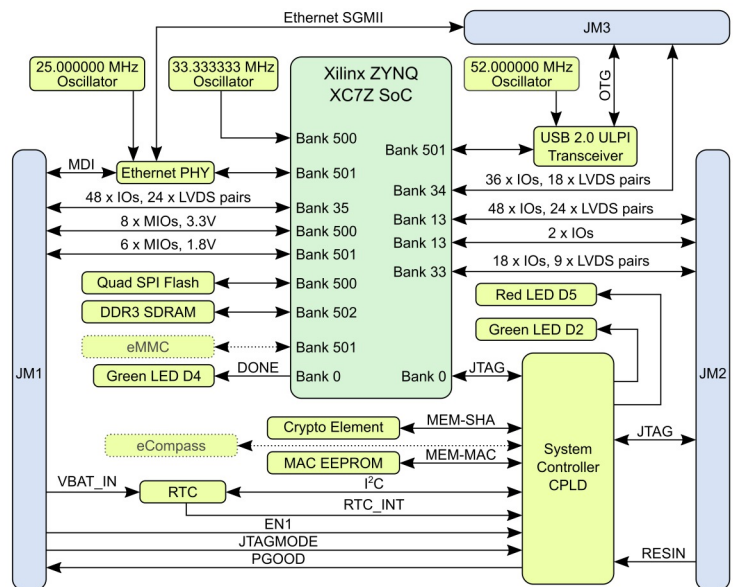
Device list	Connectors	SDRAM max	Flash	Ethernet PHY	USB PHY	Total I/O	Gbit Transceivers	Other Features
Z-7015, Z-7030, Z-7012S	3 x Samtec LSHM	1 GB DDR3	32 MB	1 Gbit	USB2.0	132 + 14 MIO	Z-7015: 4 x GTP Z-7030: 4 x GTX	Programmable clock generator, real time clock, single supply

# TE0720 GigaZee Series

AMD Zynq™ 7000, DDR3, Flash, Ethernet, USB, e.MMC, Automotive Grade available



4 x 5 cm form factor

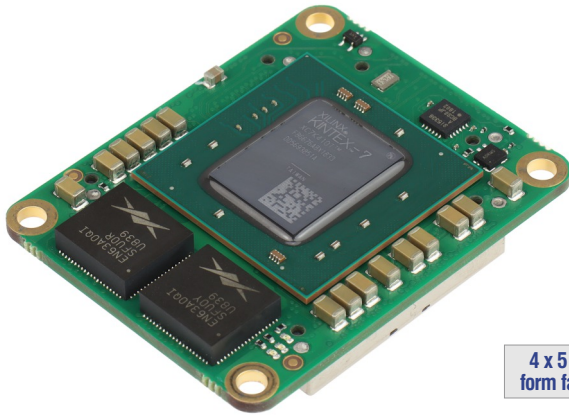


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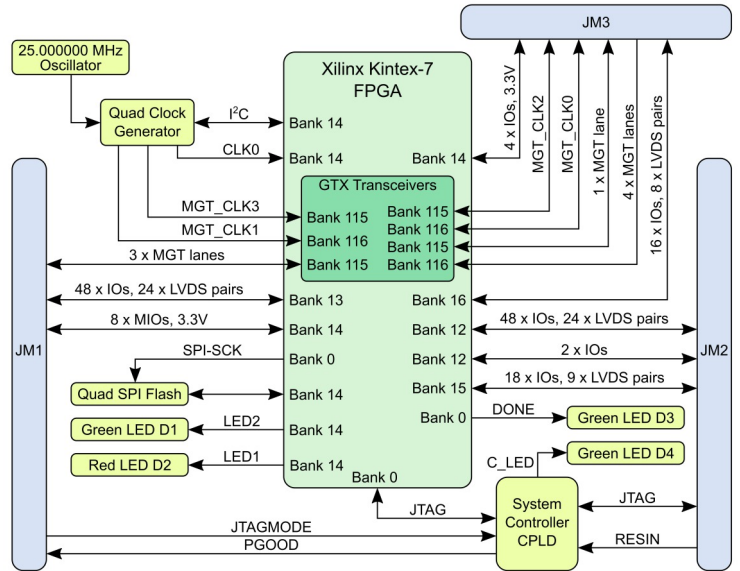
Device list	Connectors	SDRAM max	Flash max	e.MMC max	Ethernet PHY	USB PHY	Total I/O	Other Features
Z-7020, Z-7014S, XA7Z020-1CLG484Q	3 x Samtec LSHM	1 GB DDR3	64 MB	32 GB	1 Gbit	USB2.0	152 + 14 MIO	Real time clock, MAC address, 2k serial EEPROM, 3 user LEDs, single supply

# TE0741 Series

AMD Kintex™ 7, Flash, 8 High Speed Serial Transceivers, 25 MHz Oscillator



4 x 5 cm form factor

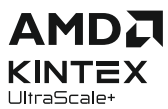


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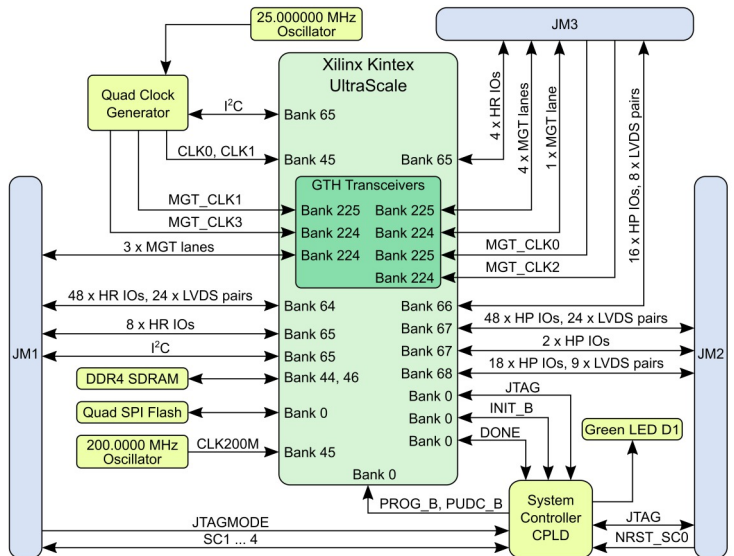
Device list	Connectors	Flash	Total I/O	Gbit Transceivers	Other Features
70T, 160T, 325T, 410T	3 x Samtec LSHM	32 MB	144 (94 for 70T variant)	8 x MGTs	Programmable clock generator, single supply

# TE0841 Series

AMD Kintex™ UltraScale™, DDR4, Flash, 8 x GTH Transceiver



4 x 5 cm form factor



<http://trenz.org/te0841-info>

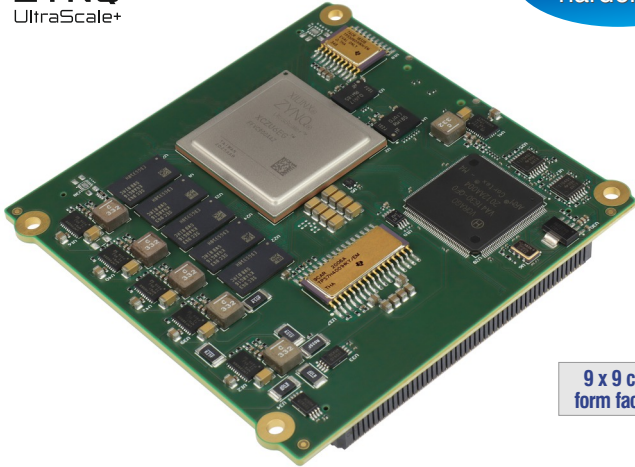
Device list	Connectors	SDRAM max	Flash	Total I/O	Gbit Transceivers	Other Features
KU035, KU040	3 x Samtec LSHM	4 GB DDR4	64 MB	60 x HR I/Os 84 x HP I/Os	8 x GTH	Programmable clock generator, single supply

# TE0812 Series

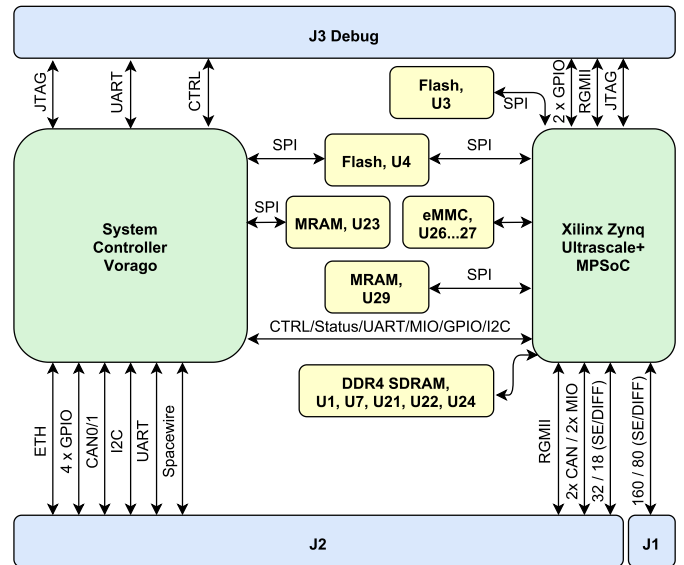
Latest MPSoC chip technology in space, designed for cubesat missions



Radiation hardened



9 x 9 cm form factor



<http://trenz.org/te0812-info>

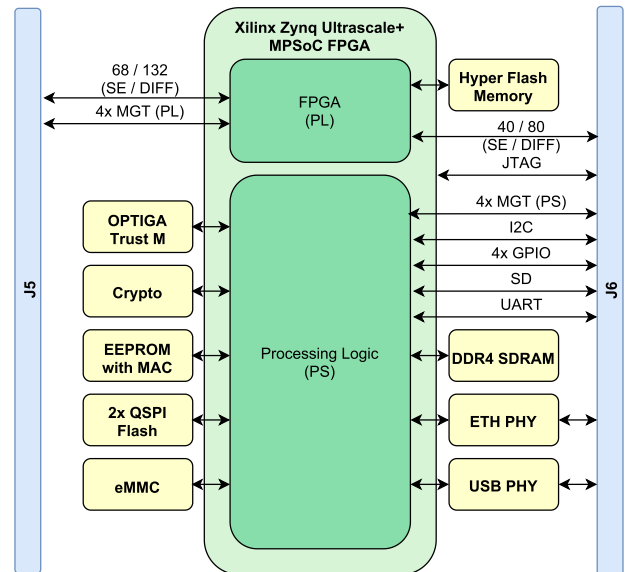
Device list	Pin Packages	Connectors	SDRAM max	e.MMC	Flash	Total I/O	Gbit Transceivers	Other Features
ZU6, ZU9, ZU15	C900	2 x B2B Samtec APM6 1 x Debug Samtec LSHM	4 GB DDR4 with ECC	2 x 32 GB	2 x 128 MB	127	16 (12 x PL; 4 x PS)	2 x 4 MByte MRAM, on board Vorago VA41630, ETH, 2x Analog input, UART, 2 x CAN, PPSin/PPSout, I2C, 12V power supply

# AM0010 Andromeda MPSoC Series

AMD Zynq™ UltraScale+™ MPSoC, DDR4, Flash, Ethernet, USB



4 x 5.6 cm form factor



<http://trenz.org/am0010-info>

Device list	Connectors	SDRAM max	Flash	e.MMC	Ethernet	USB	Other Features
ZU1CG-ZU5CG, ZU1EG-ZU5EG, ZU4EV, ZU5EV	2 x Samtec ADM6 4 x 60-pin	4 GB DDR4 64-bit (PS) with ECC	2 x 64 MB	8 GB	1 Gbit	USB2.0 OTG	Total I/O: 204, optional HyperRAM, MAC address serial EEPROM with EU1-48 node identity, security controller, Crypto Authentication

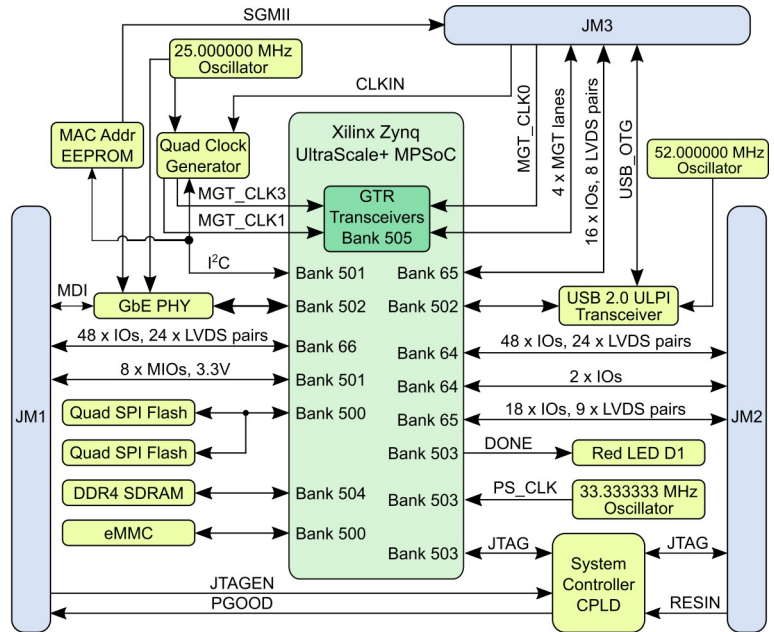


# TE0820 Series

AMD Zynq™ UltraScale+™, DDR4, Flash, USB, Ethernet, e.MMC



4 x 5 cm form factor



<http://trenz.org/te0820-info>

Device list	Pin Packages	Connectors	SDRAM max	Flash	e.MMC	Ethernet PHY	USB PHY	Total I/O	Gbit Transceiver	Other Features
ZU2CG - ZU5CG, ZU2EG - ZU5EG, ZU4EV, ZU5EV	784	3 x Samtec LSHM	4 GB DDR4	128 MB	8 - 64 GB	1 Gbit	USB2.0 OTG	132 + 14 MIO	4 x PS GTR	GPU/VCU depending on device, programmable clock generator, single supply

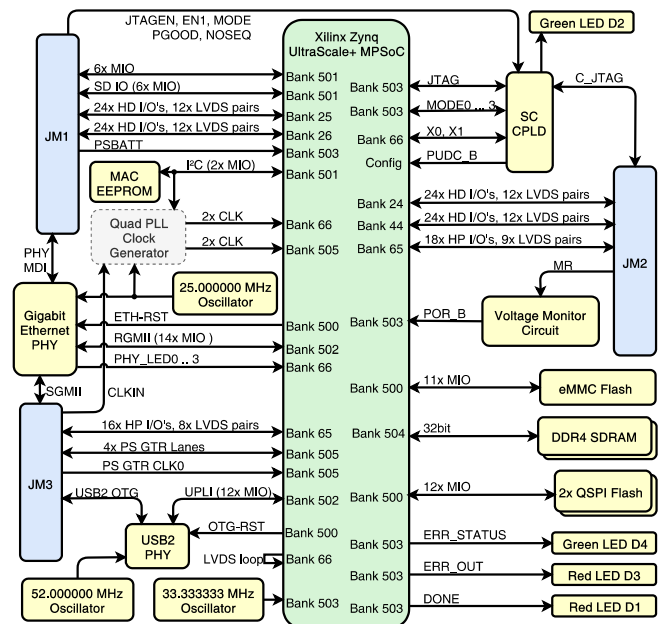
# TE0821 Series

AMD Zynq™ UltraScale+™, DDR4, Flash, USB, Ethernet, e.MMC



Pin compatible with TE0820

4 x 5 cm form factor



<http://trenz.org/te0821-info>

Device list	Pin Packages	Connectors	SDRAM max	Flash	e.MMC	Ethernet PHY	USB PHY	Total I/O	Gbit Transceiver	Other Features
ZU2CG - ZU5CG, ZU2EG - ZU5EG, ZU4EV, ZU5EV	784	3 x Samtec LSHM	4 GB DDR4	128 MB	8 - 64 GB	1 Gbit	USB2.0 OTG	34 x HP 96 x HD 14 MIO	4 x PS GTR	GPU/VCU depending on device, programmable clock generator, single supply

# TE0823 Series

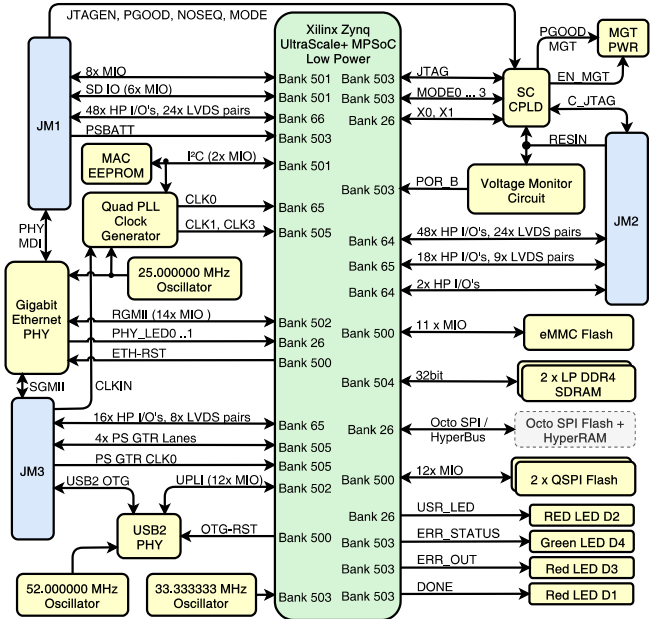
AMD Zynq™ UltraScale+™ Low Power FPGA, LPDDR4, Flash, USB, Ethernet, e.MMC



Optional HyperRAM/  
OctalRAM/HyperFlash/  
xSPI Flash



4 x 5 cm  
form factor

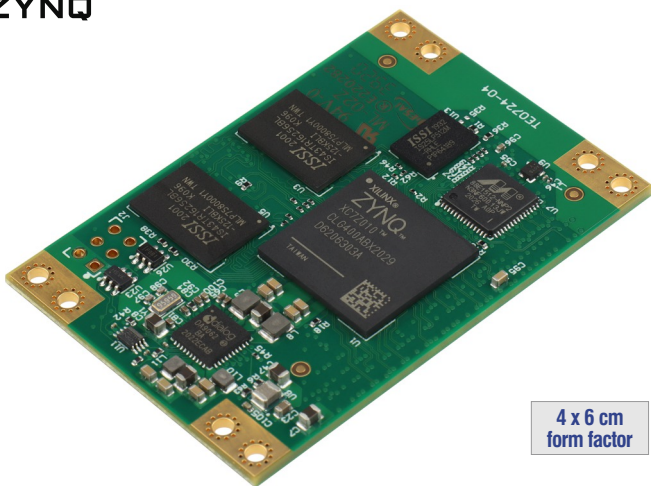


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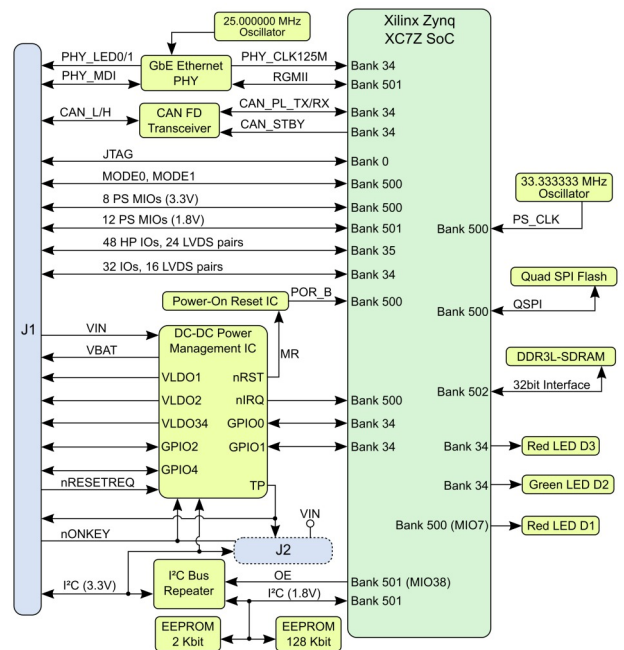
Device list	Pin Packages	Connectors	SDRAM max	Flash	e.MMC	Ethernet PHY	USB PHY	Total I/O	Gbit Transceiver	Other Features
ZU2CG - ZU5CG, ZU2EG - ZU5EG, ZU4EV, ZU5EV	784	3 x Samtec LSHM	2 GB LPDDR4	128 MB	8 - 64 GB	1 Gbit	USB2.0 OTG	132 HP + 14 MIO	4 x PS GTR	GPU/VCU depending on device, programmable clock generator, single supply

# TE0724 Series

AMD Zynq™ 7000, DDR3L, Flash, Ethernet, EEPROM, CAN



4 x 6 cm  
form factor

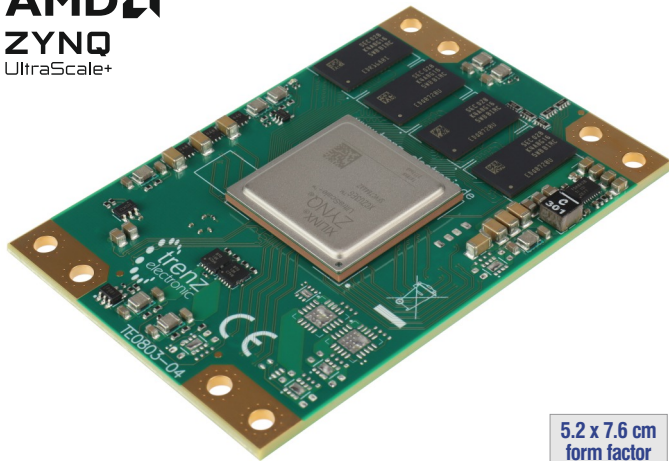


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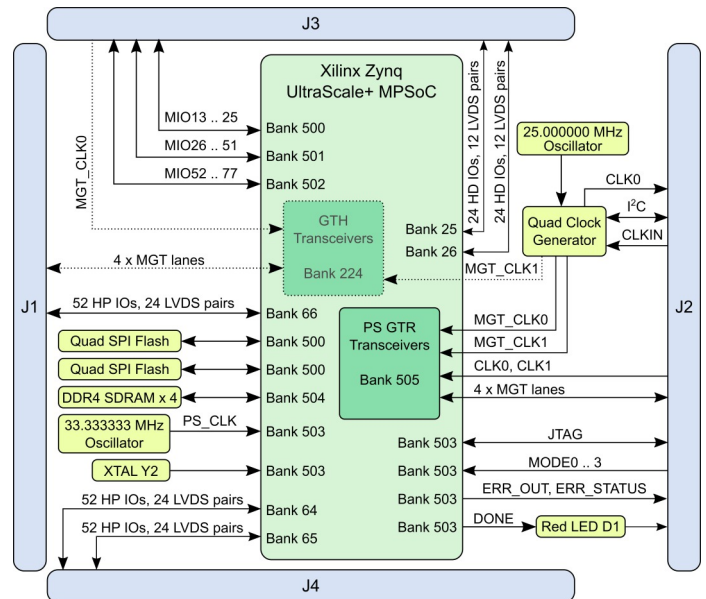
Device list	Connectors	SDRAM max	Flash max	EEPROM	Ethernet PHY	Total I/O	Other Features
Z-7010, Z-7020	1 x Samtec ST5	1 GB DDR3L	64 MB	MAC Address	1 Gbit	PL: 80 PS: 20	CAN, single supply

# TE0803/TE0813 "UltraSoM+" Series

## AMD Zynq™ UltraScale+™, DDR4, Flash, 8 High Speed Serial Transceivers



5.2 x 7.6 cm form factor



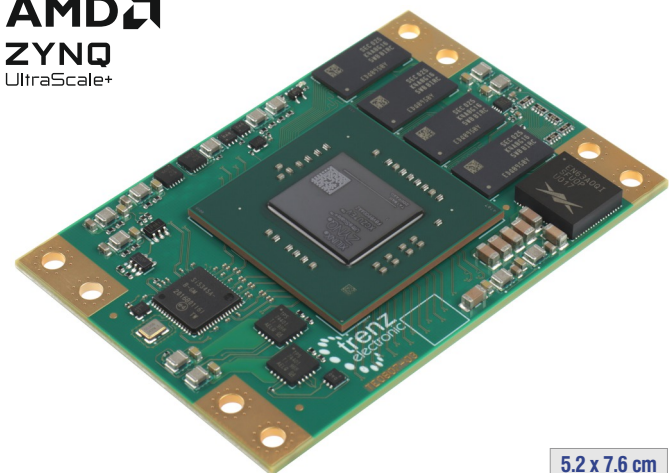
Compatible with TEBF0808/818

<http://trenz.org/te0803-info>

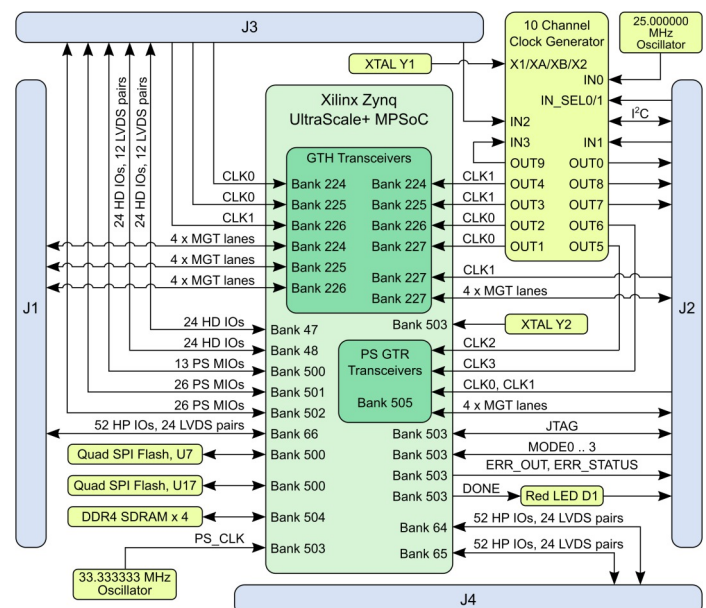
Device list	Pin Packages	Connectors	SDRAM max	Flash	Total I/O	Gbit Transceivers	Other Features
ZU2CG - ZU5CG, ZU2EG - ZU5EG, ZU4EV, ZU5EV	C784	4 x Samtec ST5 (TE0803) 4 x Samtec ADM6 (TE0813)	8 GB DDR4	128	204 + 65 MIO	4 x PS GTR 4 x PL GTH (ZU4+ZU5 only)	GPU/VCU depending on device, EEPROM MAC address, programmable clock generator, single supply

# TE0807/TE0817 "UltraSoM+" Series

## AMD Zynq™ UltraScale+™, DDR4, Flash, 20 High Speed Serial Transceivers



5.2 x 7.6 cm form factor



Compatible with TEBF0808/818

<http://trenz.org/te0807-info>

Device list	Pin Package	Connectors	SDRAM max	Flash	Total I/O	Gbit Transceivers	Other Features
ZU4CG - ZU7CG, ZU4EG - ZU7EG, ZU4EV - ZU7EV	B900	4 x Samtec ST5 (TE0807) 4 x Samtec ADM6 (TE0817)	8 GB DDR4	128 MB	204 + 65 MIO	4 x GTR, 16 x GTH	GPU and VCU, programmable clock generator, single supply

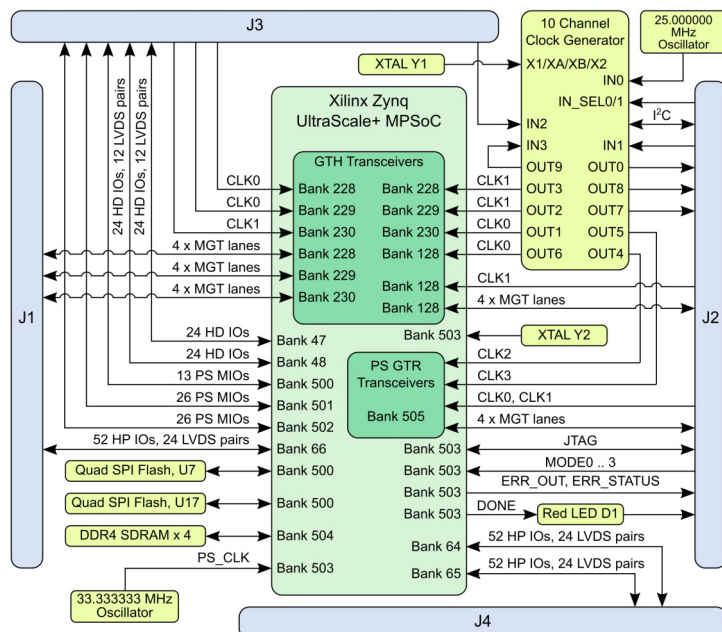


# TE0808/TE0818 "UltraSoM+" Series

## AMD Zynq™ UltraScale+™, DDR4, Flash, 20 High Speed Serial Transceivers



5.2 x 7.6 cm form factor



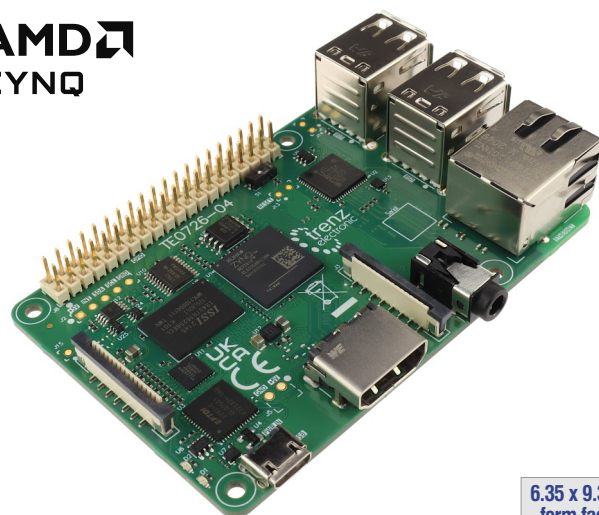
Compatible with  
TEBF0808/818

<http://trenz.org/te0808-info>

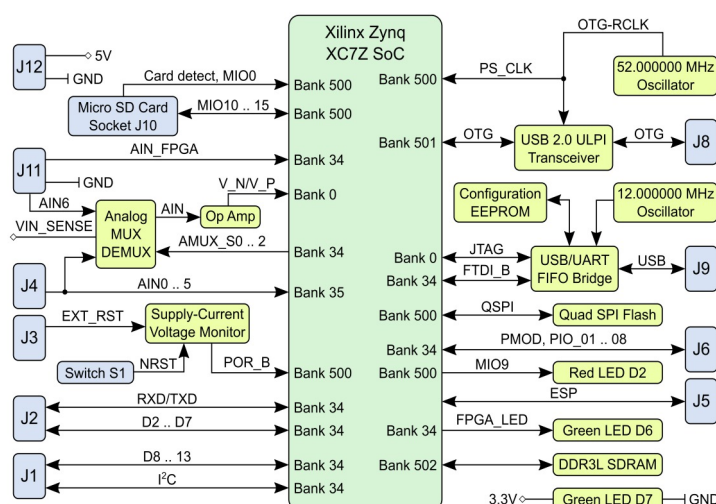
Device list	Pin Package	Connectors	SDRAM max	Flash	Total I/O	Gbit Transceivers	Other Features
ZU6CG, ZU9CG, ZU6EG, ZU9EG, ZU15EG	C900	4 x Samtec ST5 (TE0808) 4 x Samtec ADM6 (TE0818)	8 GB DDR4	128 MB	204 + 65 MIO	4 x GTR, 16 x GTH	GPU/VCU depending on device, programmable clock generator, single supply

# TE0726 "ZynqBerry" Series

## AMD Zynq™ 7000, DDR3L, Flash, Ethernet, USB, HDMI



6.35 x 9.3 cm form factor



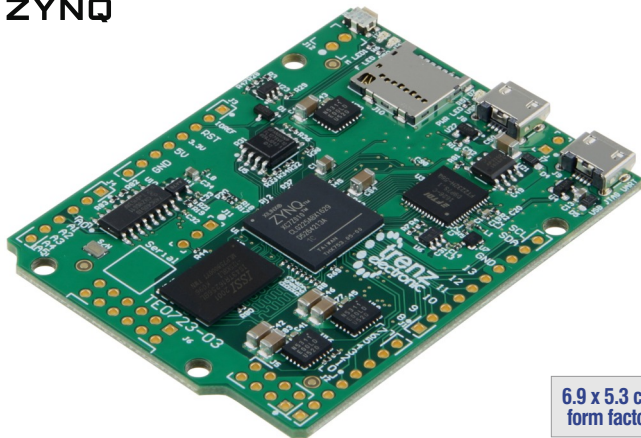
Raspberry Pi 2  
compatible

<http://trenz.org/te0726-info>

Device list	Connectors	SDRAM max	Flash	Ethernet PHY	USB PHY	Total I/O	Other Features
Z-7010, Z-7007S	40-pin "HAT" headers	512 MB DDR3L	16 MB	100 Mbit	4 x USB2.0 Host	26	DSI display connector, CSI-2 camera connector, micro SD card slot, 3.5 mm audio plug, HDMI type A

# TE0723 "ArduZynq" Series

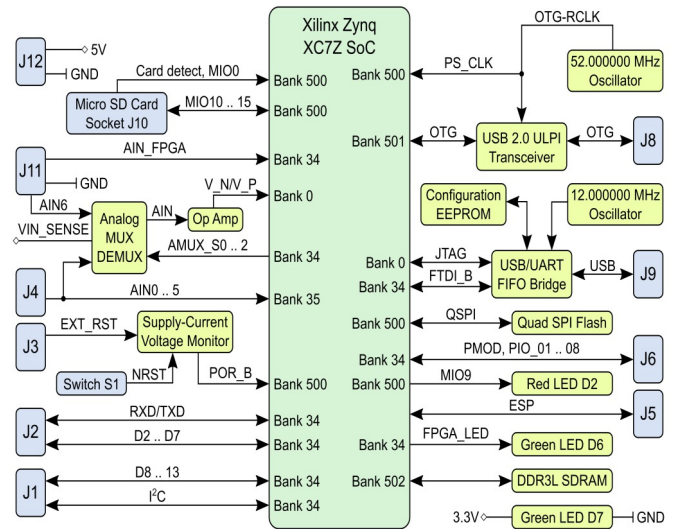
## AMD Zynq™ 7000, Form Factor like Arduino Shield, DDR3L, Flash, USB OTG



6.9 x 5.3 cm form factor

Arduino Shield compatible

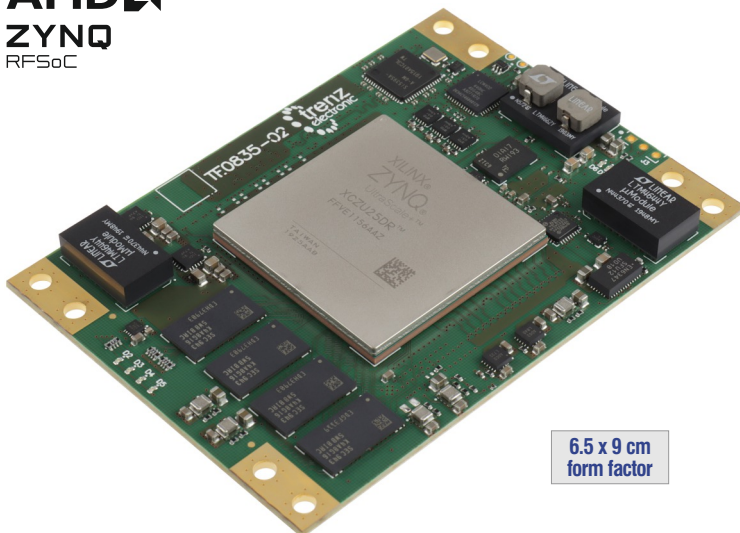
<http://trenz.org/te0723-info>



Device list	Connectors	SDRAM max	Flash	USB PHY	Total I/O	Other Features
Z-7010, Z-7007S	Arduino Pmod headers	512 MB DDR3L	16 MB	Micro USB OTG, micro USB, FT2232, JTAG/UART/FIFO	30	Micro SD, on-board USB JTAG and UART

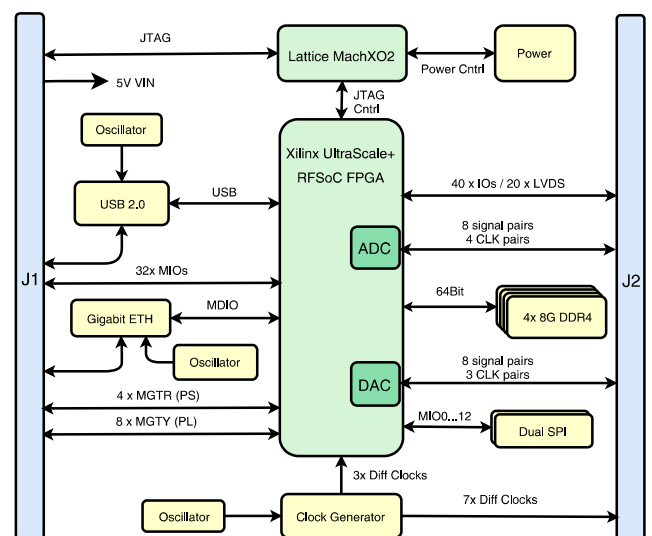
# TE0835/TE0836 RFSoc Series

## AMD Zynq™ UltraScale+™ RFSoc, DDR4, Flash, Ethernet, USB, EEPROM



6.5 x 9 cm form factor

<http://trenz.org/te0835-info>



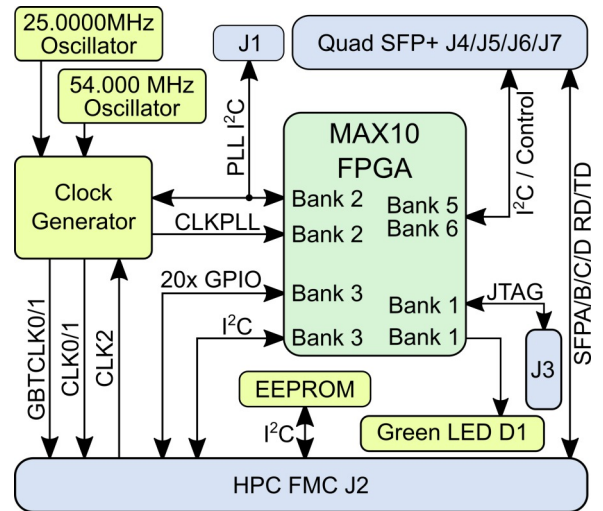
Device list	Pin Packages	Connectors	SDRAM	Flash	Ethernet PHY	Total I/O	Gbit Transceivers	Other Features
ZU25DR, ZU47DR	E1156, speedgrade -1	2 x Samtec ST5 (TE0835) 2 x Samtec ADM6 (TE0836)	4 x 1 GB DDR4	128 MB	1 x Gbit	40 x I/O/ 20 LVDS + 32 MIO	8 x GTY, 4 x GTR	USB 2.0 OTG, MAC EEPROM

# TEF0008 Series

FMC Card with four SFP+ 10 Gbit Ports based on VITA 57.1 FMC HPC Standard



6.9 x 8.4 cm form factor



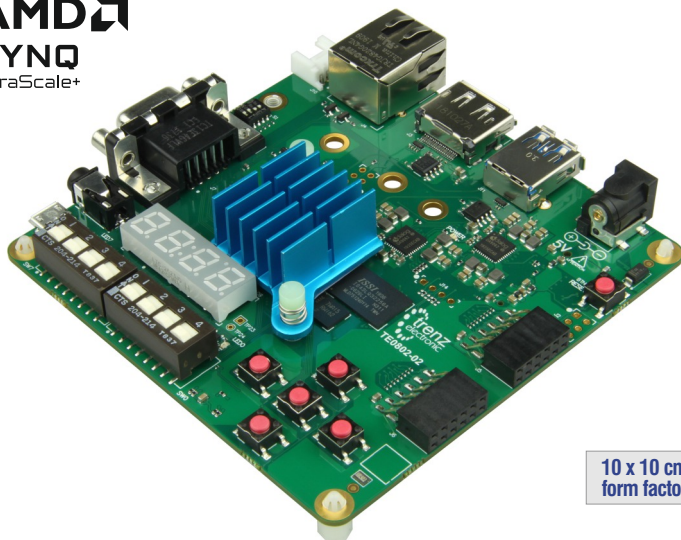
It is intended for use on a FMC HPC carrier and can not be used stand-alone.

<http://trenz.org/tef0008-info>

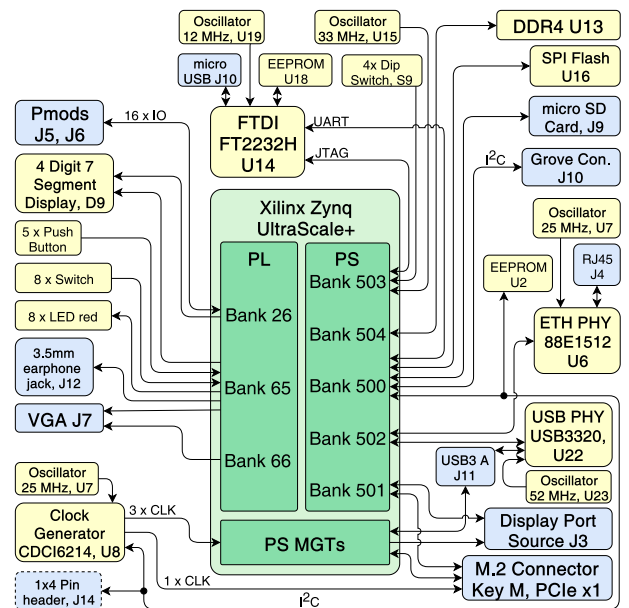
Connector	Dimension	SFP+	Other Features
HPC FMC	69 x 84 mm, SFP+ connector excluded (+ 5.5 mm)	4 SFP+ 10 Gbit ports for fiber optical SFP modules	Low-jitter programmable clock generator, 3.3V to 1.8V DCDC converter, 128 Kbit EEPROM, status LED (green)

# TE0802 MPSoC Development Board

AMD Zynq™ UltraScale+™, LPDDR4, Flash, Ethernet, USB, Audio, Display



10 x 10 cm form factor



<http://trenz.org/te0802-info>

Device list	SDRAM max	Flash	Ethernet RJ45	USB	User I/O	Audio	Other Features
ZU1CG ZU2CG	2 GB LPDDR4	32 MB	1 Gbit	USB3.0 Host (type A connector)	2 Pmod connectors	3.5 mm jack (PWM output)	EEPROM, USB JTAG/UART microUSB, microSD card, M2 PCIe SSD support, display, power: 5V plug



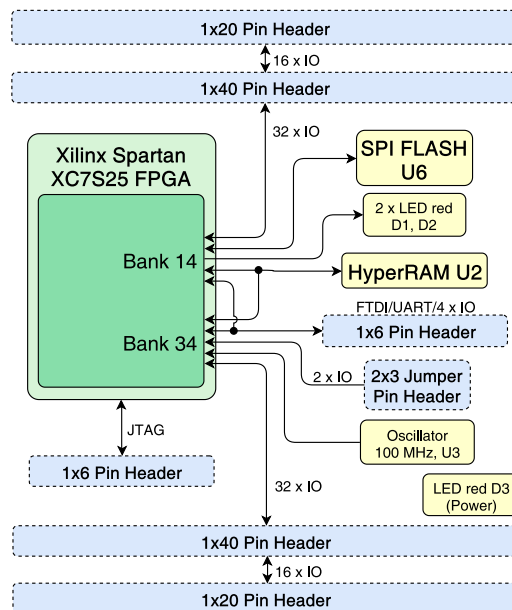
# TE0890 "S7 Mini" Series

## AMD Spartan™ 7, Fully Open-Source Module with HyperRAM

**AMD**  
**SPARTAN™ 7**



2.7 x 5.2 cm  
form factor



<http://trenz.org/te890-info>

Device list	Footprint compatible	Config PROM	HyperRAM DRAM	Total I/O	Interface(s)	Supply	Other Features
7S25	7S6, 7S15, 7S50 FTGB-196 devices	64 Mb	64 Mb	Dual-Pinout DIP-40 or 50mil 80 pin for 32 or 64 FPGA 3.3V I/Os	Standard 1x6 FTDI cable serial	5V input	23K Logic Cells, 29K Flops, 45 36Kb BRAMs, 80 mults., fully open source

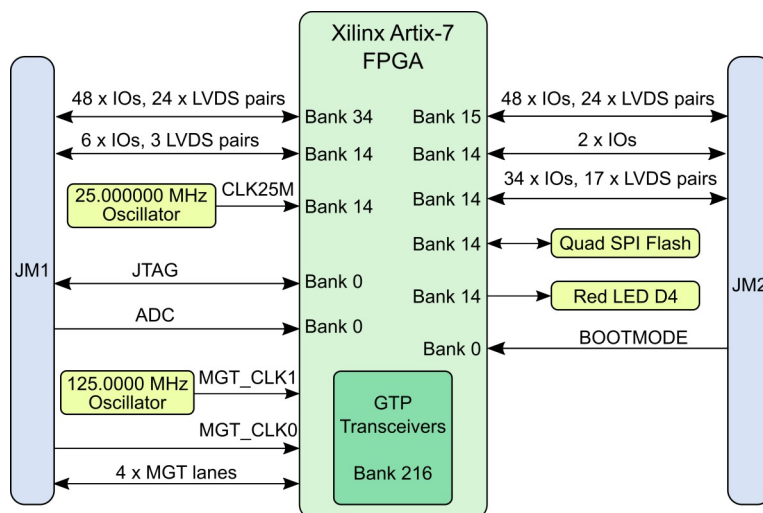
# TE0714 Series

## AMD Artix™ 7, Flash, 4 x GTP Transceiver, Form Factor 3 x 4 cm only

**AMD**  
**ARTIX™ 7**



3 x 4 cm  
form factor

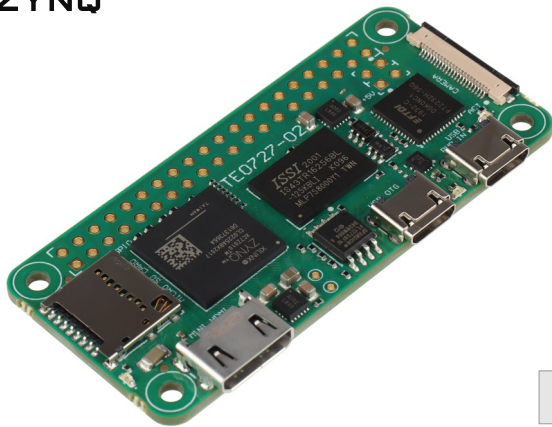


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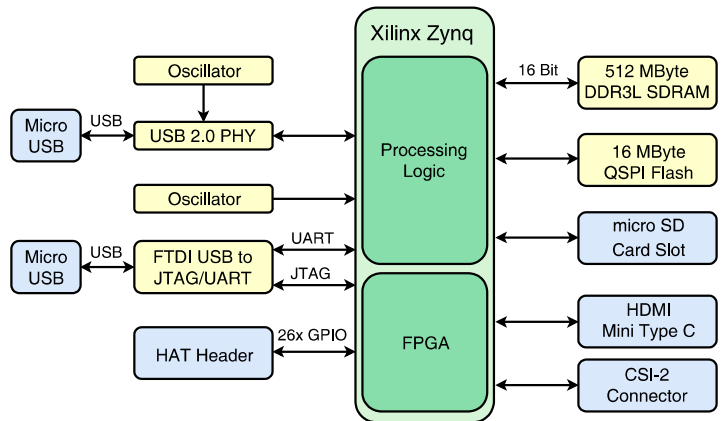
Device list	Pin Packages	Connectors	Flash	Total I/O	Gbit Transceivers	Config. Voltage (B14)	Other Features
15T, 35T, 50T	CSG325	2 x Samtec LSHM	16 MB	138 + 5 (QSPI or user I/Os)	4 x GTP	3.3V or 1.8V	Differential MEMS oscillator for MGT clocking, XADC analog Input, eFUSE bit-stream encryption (AES), single supply

# TE0727 "ZynqBerryZero" Series

AMD Zynq™ 7000, Raspberry Pi Zero Form Factor, DDR3L, Flash, USB, mini HDMI



3 x 6.5 cm form factor

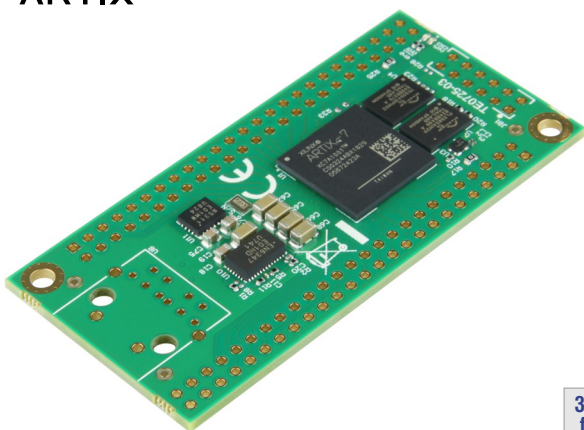


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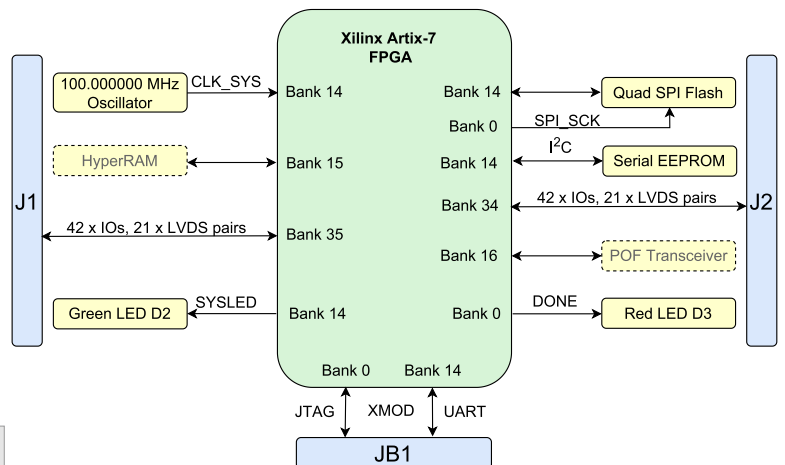
Device list	SDRAM max	Flash	HAT header	Total I/O	Other Features
Z-7010	512 MB DDR3L	16 MB	40-pin	26 GPIO	2 x micro USB2.0, microSD card slot, Mini HDMI type C, CSI-2 connector (camera)

# TE0725 Series

AMD Artix™ 7, Flash, HyperRAM, 2 x 50-pin Headers, 2.54 mm Pitch



3.5 x 7.3 cm form factor



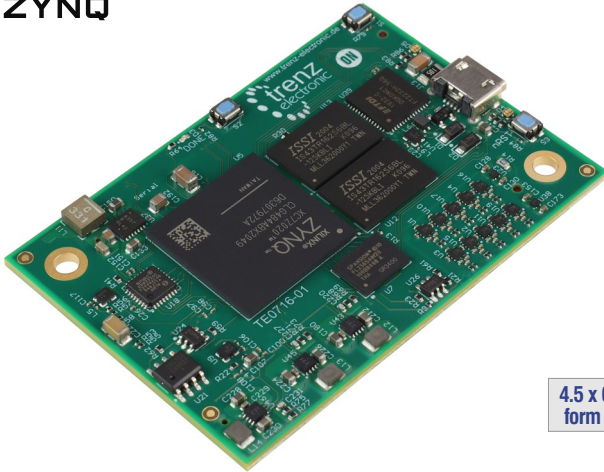
The TE0725LP series is the same form factor, but w/o POF adapter and depending on variant 3.3 or 1.8V main power VIN, 4 diff. pairs in extra header J3, system clock 25 MHz (can be customized on request).

<http://trenz.org/te0725-info>

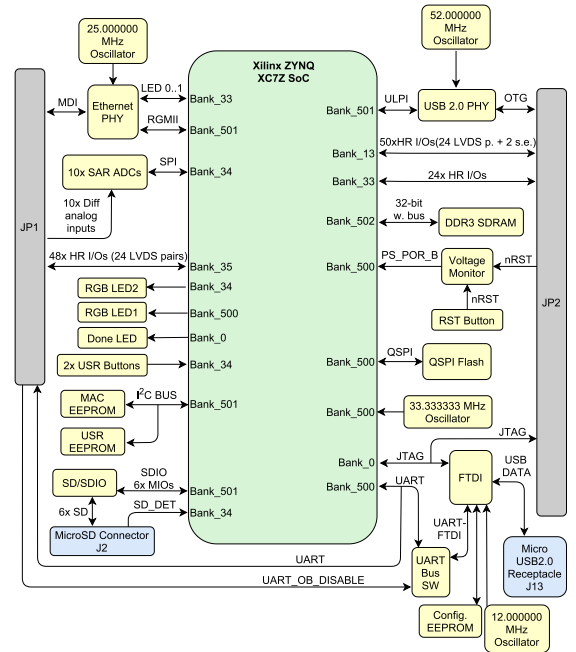
Device list	Pin Packages	Connectors	HyperRAM max	Flash	EEPROM	Total I/O	Other Features
15T, 35T, 50T, 75T, 100T	CSG324	2 x 50-pin headers	8 MB	32 MB	16 KB	87	Optional POF (Plastic Optical Fiber) adapter (125/250 Mbit/s), single supply

# TE0716 Series

AMD Zynq™ 7000, DDR3L, Flash, Ethernet, USB PHY, low power SAR ADCs



4.5 x 6.5 cm form factor

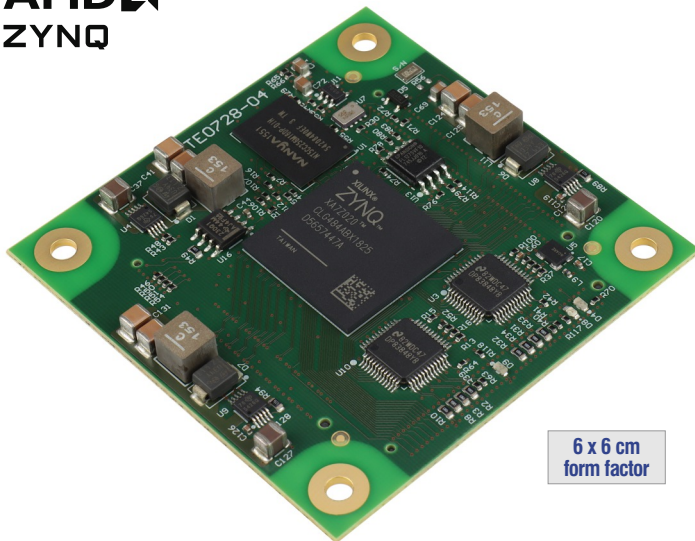


<http://trenz.org/te0716-info>

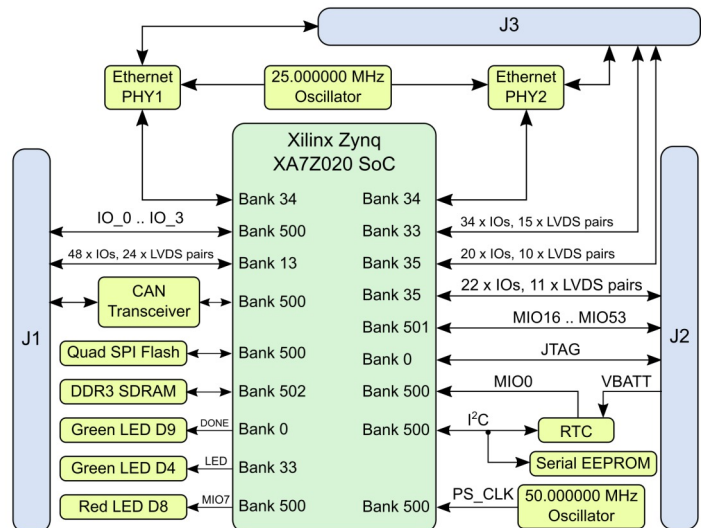
Device list	Connectors	SDRAM max	Flash	Ethernet PHY	USB PHY	Total I/O	Gbit Transceiver	Other Features
Z-7020	2 x FCI Bergstak	1 GB DDR3L	32 MB	1 Gbit	USB2.0	120 x HR PL	2 x PS MIOs	On board 10x 12-bit low power SAR ADCs up to 2 MSPS, low power oscillators, USB2.0 to UART/JTAG interface, EEPROM

# TE0728 Series

AMD Zynq™ 7000, DDR3, Flash, Ethernet, CAN, Automotive



6 x 6 cm form factor



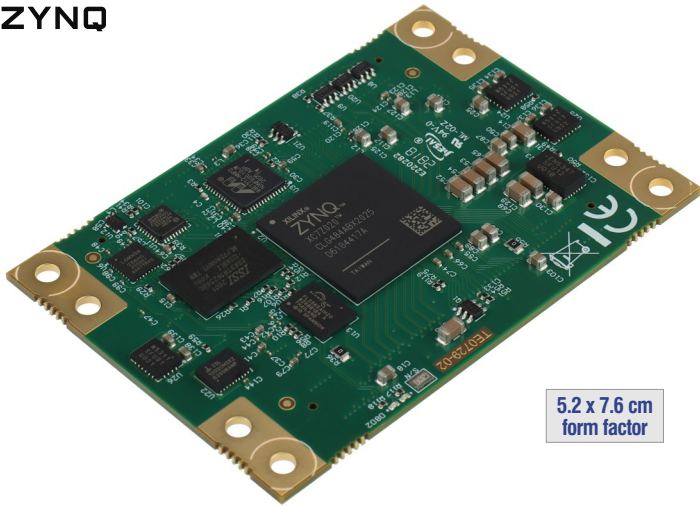
<http://trenz.org/te0728-info>

Device list	Connectors	SDRAM max	Flash	EEPROM	Ethernet PHY	Total I/O	Other Features
XA7Z020 (automotive FPGA)	3 x Samtec SEM	512 MB DDR3	16 MB	8 KByte	2 x 100 Mbit	124 + 30 MIO	Automotive, real time clock, CAN, single supply

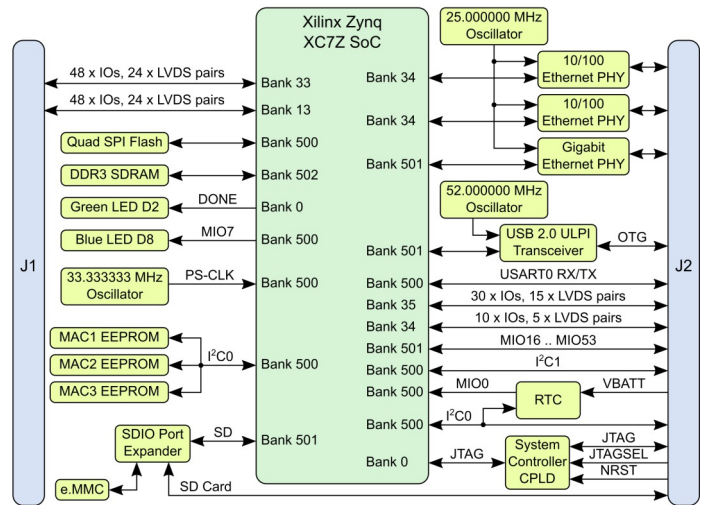


# TE0729 Series

AMD Zynq™ 7000, DDR3, Flash, Ethernet, EEPROM, USB, e.MMC



5.2 x 7.6 cm form factor

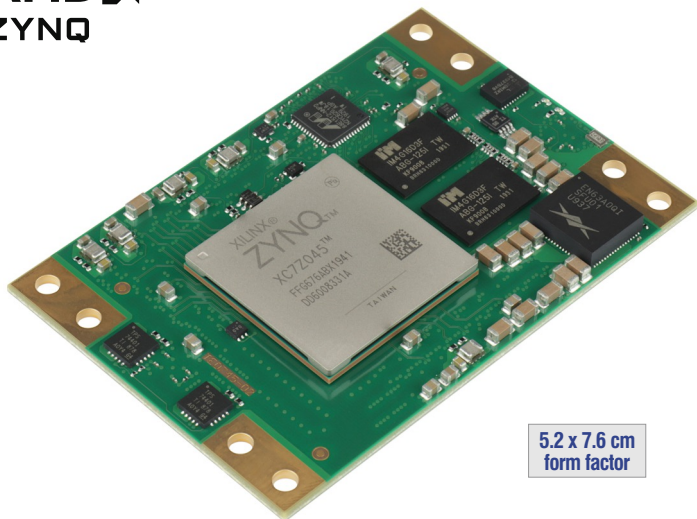


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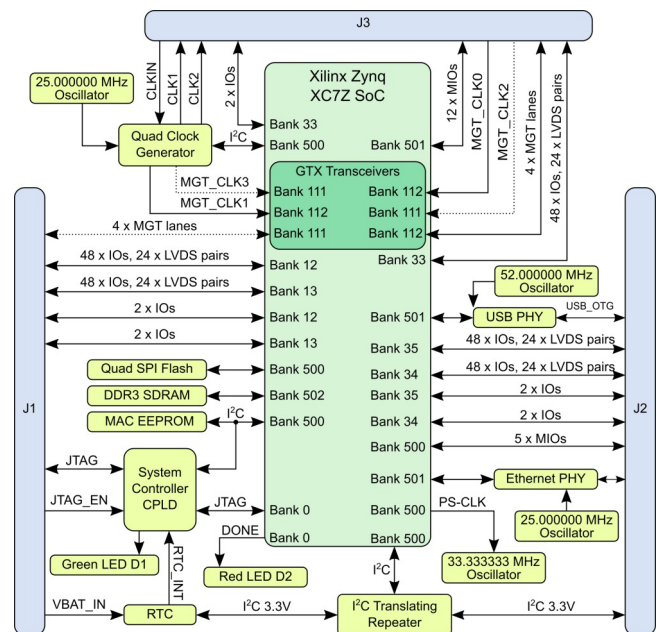
Device list	Connectors	SDRAM max	Flash	e.MMC	Ethernet PHY	USB PHY	EEPROM	Total I/O	Other Features
Z-7020	3 x Samtec LSHM	512 MB DDR3	32 MB	4 - 64 GB	2 x 100 Mbit, 1 Gbit	USB2.0 OTG	3 x MAC address	136 + 14 MIO	Real time clock, single supply

# TE0745 Series

AMD Zynq™ 7000, DDR3L, Flash, USB, Ethernet, 8 x GTX



5.2 x 7.6 cm form factor

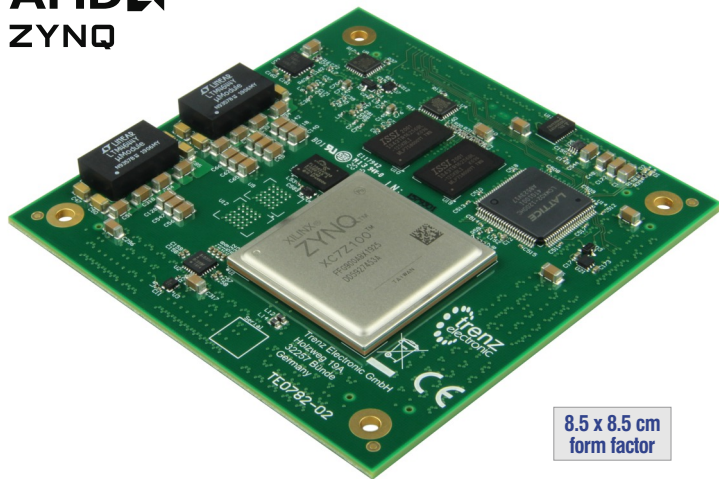


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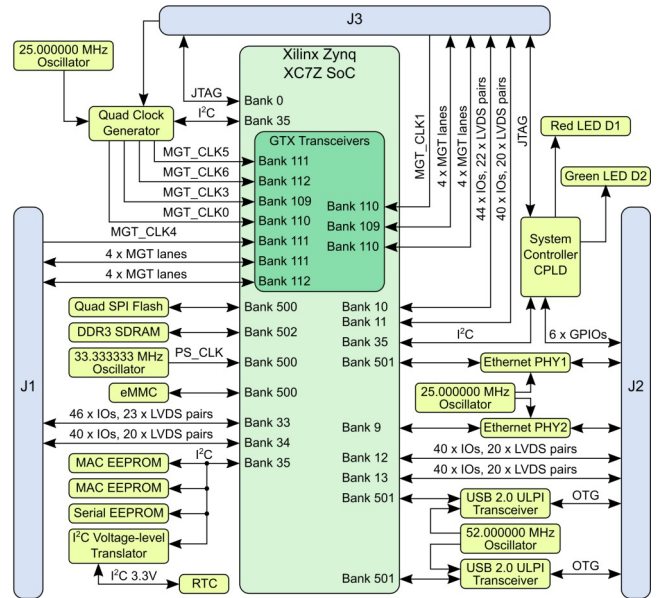
Device list	Connectors	SDRAM max	Flash	Ethernet PHY	USB PHY	Total I/O	Gbit Transceivers	Other Features
Z-7030, Z-7035, Z-7045	3 x Samtec ST5	1 GB DDR3L	64 MB	1 Gbit	USB2.0 OTG	250 + 6 MIO	8 x GTX	Real time clock, single supply

# TE0782 Series

AMD Zynq™ 7000, DDR3, Flash, 2 x GBit Ethernet, 2 x USB, e.MMC, 16 x Transceivers



8.5 x 8.5 cm form factor



<http://trenz.org/te0782-info>

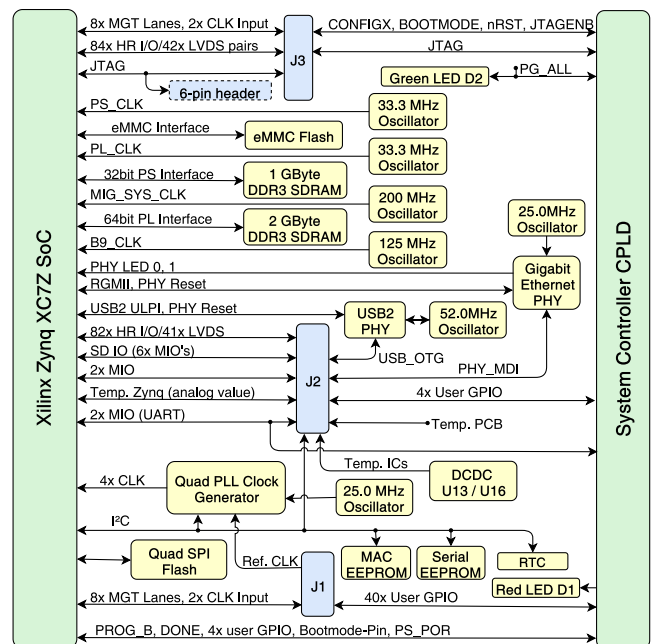
Device list	Connectors	SDRAM max	Flash	e.MMC	Ethernet PHY	USB PHY	Total I/O	Gbit Transceivers	Other Features
Z-7035, Z-7045, Z-7100	3 x Samtec QTH	1 GB DDR3	32 MB	4 - 64 GB	2 x 1 Gbit	2 x USB2.0 OTG	250 + 2 MIO	16 x GTX	Programmable clock generator, real time clock, single supply

# TE0783 Series

AMD Zynq™ 7000, Memory on both PS and PL, Flash, Ethernet, USB, e.MMC



8.5 x 8.5 cm form factor



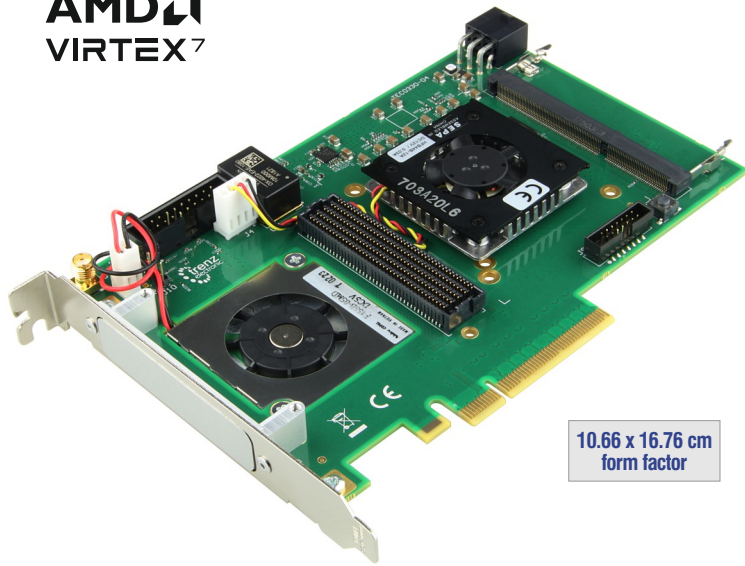
<http://trenz.org/te0783-info>

Device list	Connectors	SDRAM max	Flash	e.MMC	Ethernet PHY	Total I/O	Gbit Transceivers	Other Features
Z-7035, Z-7045, Z-7100	3 x Samtec QTH	1 GB DDR3 32-bit (PS) 2 GB DDR3 64-bit (PL)	32 MB	4 - 64 GB	1 Gbit	166	16 x GTX 4 x GT	USB2.0 OTG, programmable clock generator, real time clock, single supply

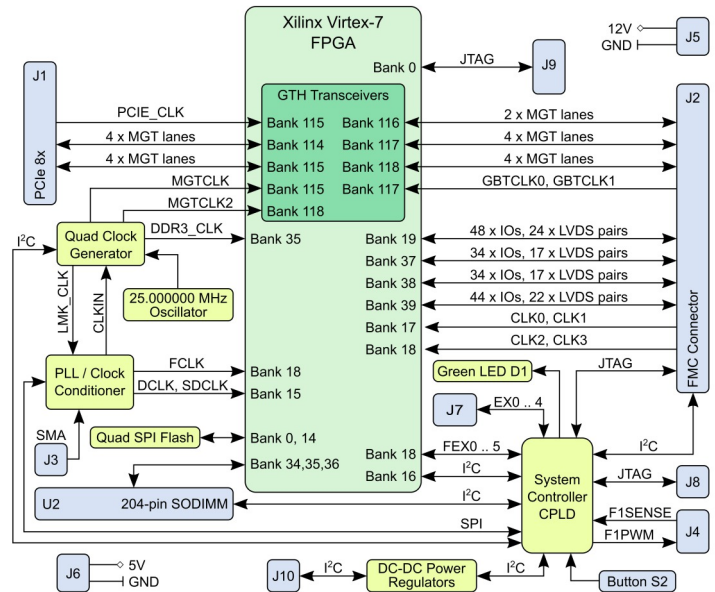


# TEC0330 PCIe FMC Carrier

## AMD Virtex™7, FMC HPC, 8 lane PCIe GEN2 card, DDR3 SODIMM Socket



10.66 x 16.76 cm form factor

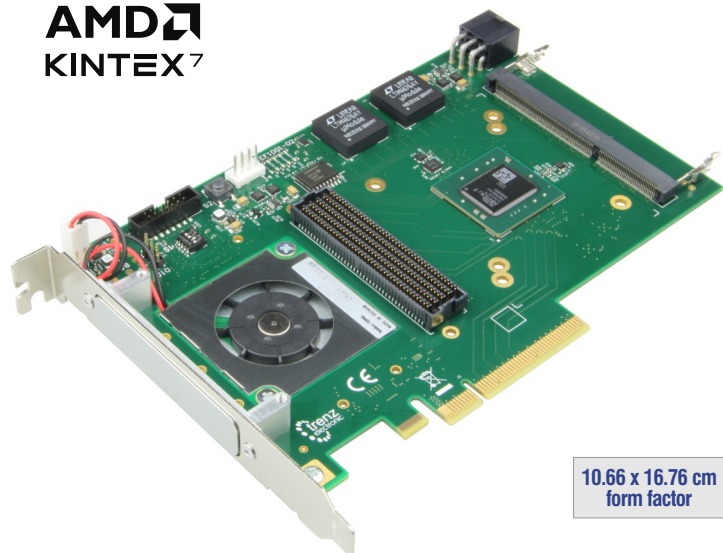


<http://trenz.org/tec0330-info>

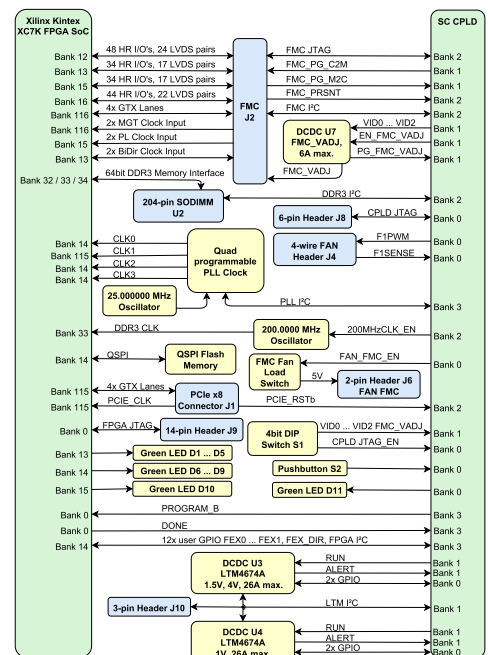
Device list	SDRAM	Flash	Total I/O	Gbit Transceivers	Gbit Transceivers Transmission Rate	Other Features
XC7VX330T	DDR3 SODIMM Socket	32 MB	Up to 202 FPGA I/O pins on FMC connector	10 on FMC 8 on PCIe lanes	13.1 Gbit/s	FMC High Pin Count (HPC) connector, programmable clock generator

# TEF1001 PCIe FMC Carrier

## AMD Kintex™7, FMC HPC, 4 lane PCIe GEN2 card, DDR3 SO-DIMM Socket



10.66 x 16.76 cm form factor



<http://trenz.org/tef1001-info>

Device list	SDRAM	Flash	Total I/O	Gbit Transceivers	Other Features
XC7K160T	8 GB DDR3 (max) SODIMM Socket	32 MB	160 on FMC connector	4 on FMC 4 on PCIe lanes	Vita 57.1 FMC HPC slot, programmable clock generator, 200 MHz low jitter LVDS oscillator

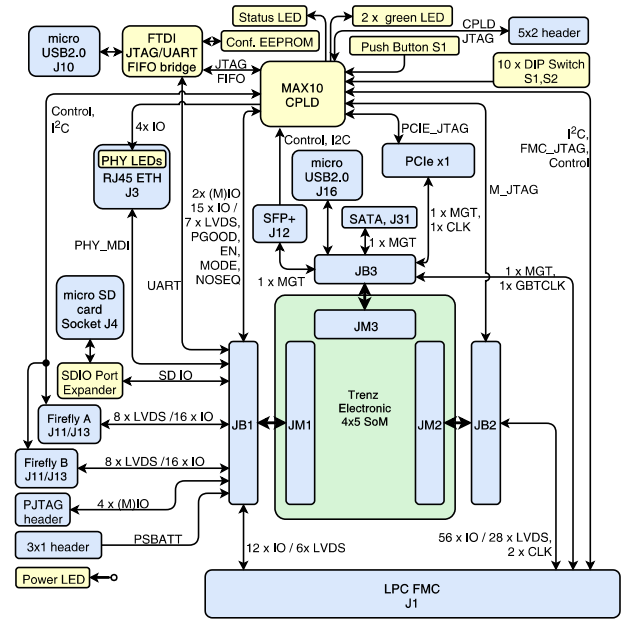


# TEF1002 PCIe FMC Carrier

## PCIe Carrier for Trenz Electronic 4 x 5 Modules and LPC FMC



10.66 x 16.76 cm form factor

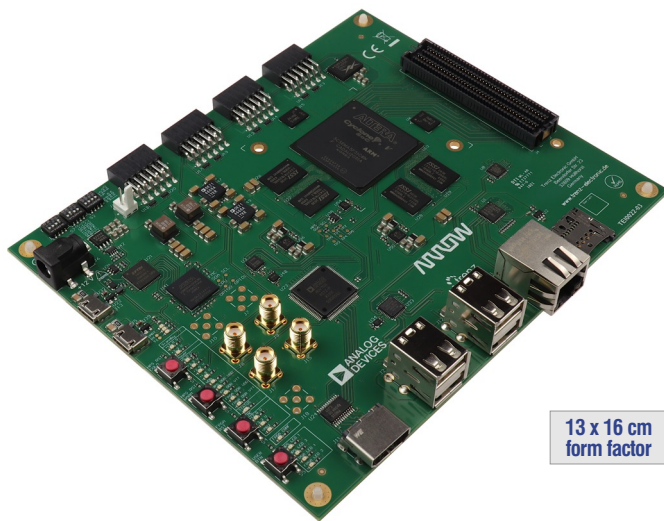


<http://trenz.org/tef1002-info>

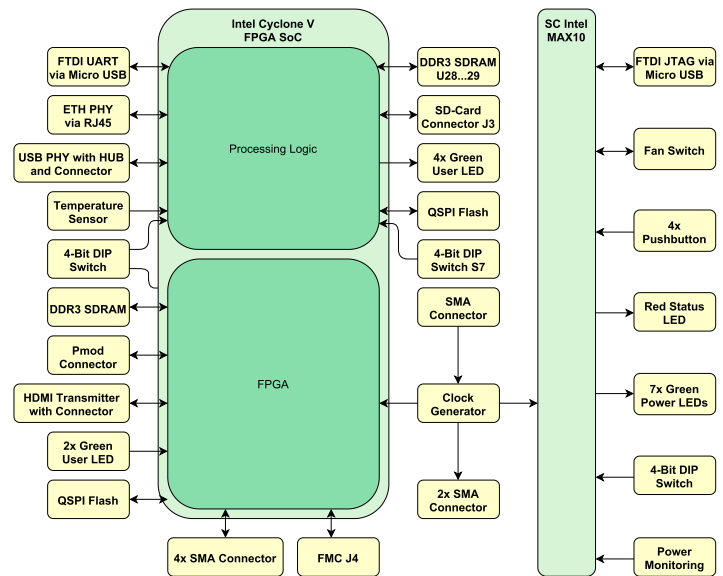
PCIe Carrier	Connectors	Other Features
For 4 x 5 cm modules	LPC FMC, SFP+, PCIe x1, SATA with pin 7 power configuration for SATADoM, RJ45 Gigabit Ethernet, micro USB to JTAG/UART bridge, 2 x 8 LVDS (FireFly), microUSB, microSD card	MAX 10 CPLD, 4 x LED, module reset button, 10 x configuration/user dip switch

# TEI0022 DataStorm DAQ

## M-Board FMC Carrier for M-Series Precision Converters

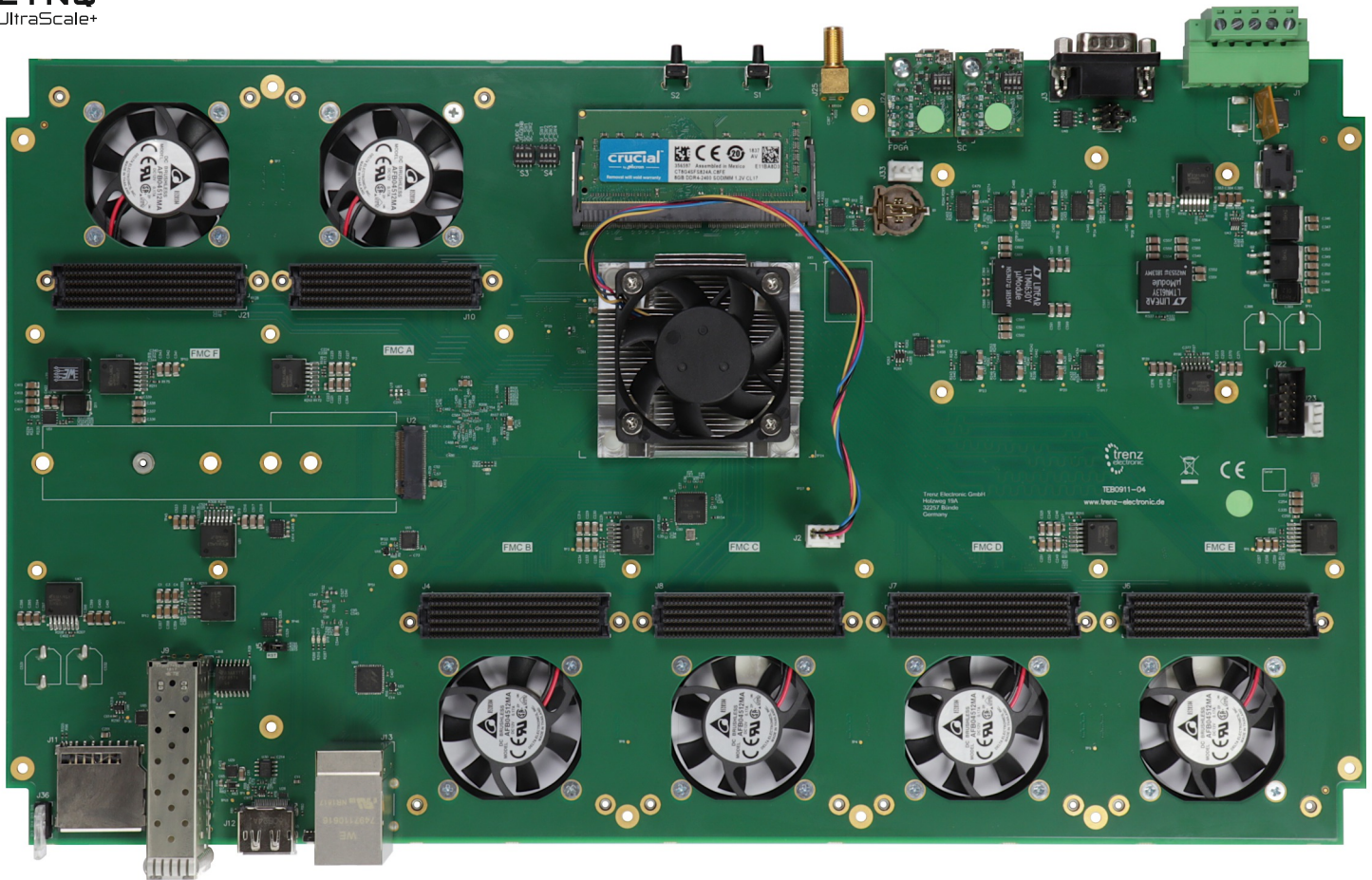


13 x 16 cm form factor



<http://trenz.org/tei0022-info>

Device list	SDRAM max	Flash	On Board	Interface	Other Features
Cyclone® V 5CSEMA5F31C8N	1 GB for HPS 1 GB for FPGA	32 MB SPI for HPS 32 MB SPI for FPGA	up to 7 x SMA connector, temperature sensor, Intel® MAX® 10 for board management	Connectors: LPC FMC, 4 x Pmod, JTAG, UART via microUSB B (for FPGA and HPS), 4 x USB2.0 host, Ethernet, SD card, HDMI	Power: 12V input supply voltage



## Key Features

The TEB0911 UltraRack+ board is integrating a AMD Zynq™ UltraScale+™ MPSoC with 2 x 64 MByte Flash memory for configuration and operation, DDR4-SDRAM SO-DIMM socket with 64-bit wide data bus, 22 MGT lanes and powerful switch-mode power supplies for all on-board voltages. The TEB0911 board exposes the pins of the Zynq™ MPSoC to accessible connectors and provides a whole range of on-board components to test and evaluate the Zynq™ UltraScale+™ MPSoC and for developing purposes. The board is capable to be fitted to an enclosure, whereby on the enclosure's rear and front panel, I/O's, LVDS-pairs and MGT lanes are accessible through 6 on-board FMC connectors and other standard high-speed interfaces, namely USB3, SFP+, SSD, GbE, etc.

- AMD Zynq™ UltraScale+™ MPSoC
  - 1156 Pin Package
  - Assembly options: ZU6, ZU9, ZU15
- 64-bit DDR4 SODIMM (PS connected)
- M2 PCIe SSD (1-Lane)
- e.MMC (bootable)
- 2 x 64 MByte Dual QSPI Flash (bootable)
- System controller (LCMX02-7000HC)
  - Power sequencing
  - IO expander
- Configurable PLLs
  - GTH/GTP reference CLKs

### Front Panel

- 4 x FMC
  - 4 GTH per FMC
  - 68 ZynqMP PL IO per FMC
- DisplayPort (2-lanes)
- RJ45 ETH + dual USB3 combo
- Dual Stack SFP+
- SD (bootable)
- Status LEDs

### Back Panel

- 2 x FMC
  - 4/2 GTH
  - 12 ZynqMP PL IO per FMC
- 56 SC IO
- USB JTAG/UART ZynqMP
- USB JTAG/GPIO FMC
- CAN FD (DB9 connector)
- SMA (external CLK)
- 5-pin 24V power connector

### Additional Information

- 40.6 x 23.43 cm board size
- Other assembly options for cost or performance optimization plus high volume prices available on request.

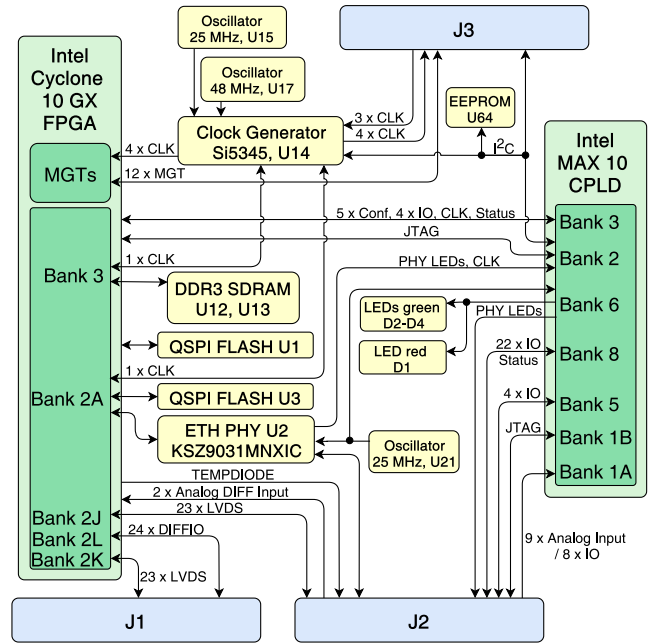


# TEI0006 Series

Intel® Cyclone® 10 GX SoM, DDR3, Flash, Ethernet, MAX 10 as power sequencer



6 x 8 cm form factor



<http://trenz.org/tei0006-info>

Device list	Connectors	SDRAM	Flash	Ethernet	Other Features
10CX220, 10CX150, 10CX105	3 x Samtec ST5	2 GB DDR3	256 MB	1 Gbit	Intel® MAX® 10 as power sequencer, EEPROM, 4 LEDs, 5V input voltage

# TEIB0006

Development Carrier Board for Trenz Electronic's TEI0006 FPGA Module



12 x 15 cm form factor

## Key Features

### RAM/Storage

- EEPROM

### On Board

- 3 x LEDs (power, 2 x user)
- 3 x I/O expanders
- 3 x push buttons (2 x user, system controller config)
- DIP switch

### Interface

- 2 x SFP connectors
- 3 x Samtec ST5 B2B connectors
- FMC HPC connector (10 x transceiver, 34 x LVDS on LA, 10 x LVDS on HA), VADJ=1.8V
- Gigabit Ethernet connector
- USB2.0 - microUSB (JTAG/UART)
- USB3.0 - type C

### Power

- 12V input voltage

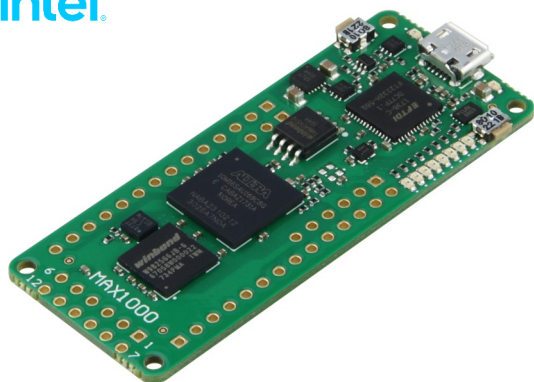
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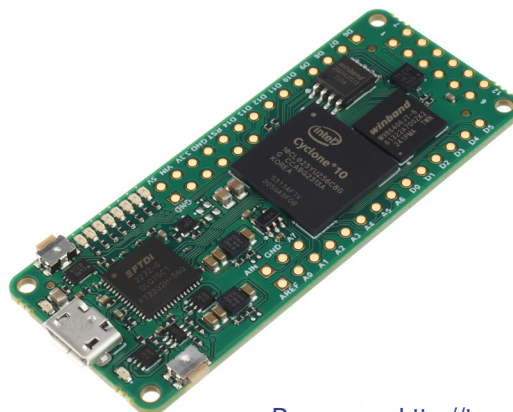
# TEI0001 "MAX1000" and TEI0003 "CYC1000" Series

## Arduino MKR Standard 2.5 x 6.15 cm

intel



Resources <http://trenz.org/tei0001-info>



Resources <http://trenz.org/tei0003-info>

TEI0001 series "MAX<sup>®</sup>1000" IoT Maker board

- 10M02, 10M04, 10M08, 10M16
- 8 or 16 kLE
- 8 to 32 MByte SDRAM (max. 64 Mbyte)
- 8 MByte Flash
- USB programmer on-board
- JTAG and UART over Micro USB2.0 connector
- ADC 8 x 12 Bit, 12 MHz oscillator
- optional MEMS oscillator
- optional Pmod headers
- supply USB/pins, 2 switches, 8 configurable and 2 status LEDs
- 5V power supplied from the USB port or via a pin

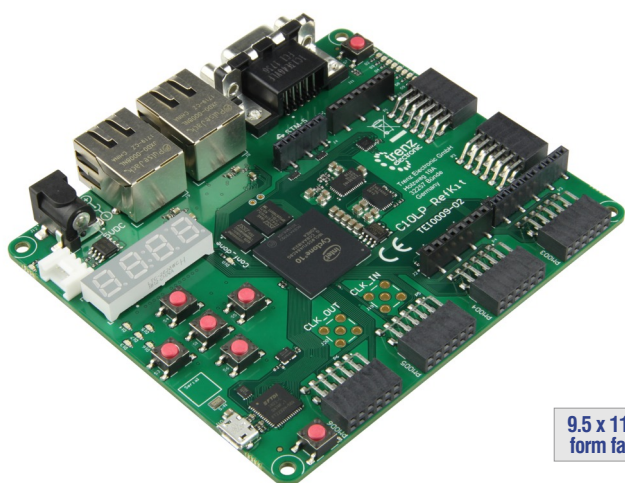
TEI0003 series "CYC1000" with Intel<sup>®</sup> Cyclone<sup>®</sup>

- 10CL006, 10CL010, 10CL016, 10CL025
- 25 kLE
- 8 MByte SDRAM
- 2 MByte Flash
- 21 I/O Arduino MKR compatible headers
- JTAG and UART over Micro USB2.0 connector
- LIS3DH 3-axis accelero-meter
- 2 x 14-pin headers providing 23 GPIOs
- 1 x 3-pin header providing 2 GPIOs
- Pmod: 2 x 6-pin support
- 8 configurable and 2 status LEDs, user push button
- 5V single power supply with on-board voltage regulators

# TEI0009 C10LP RefKit Development Board

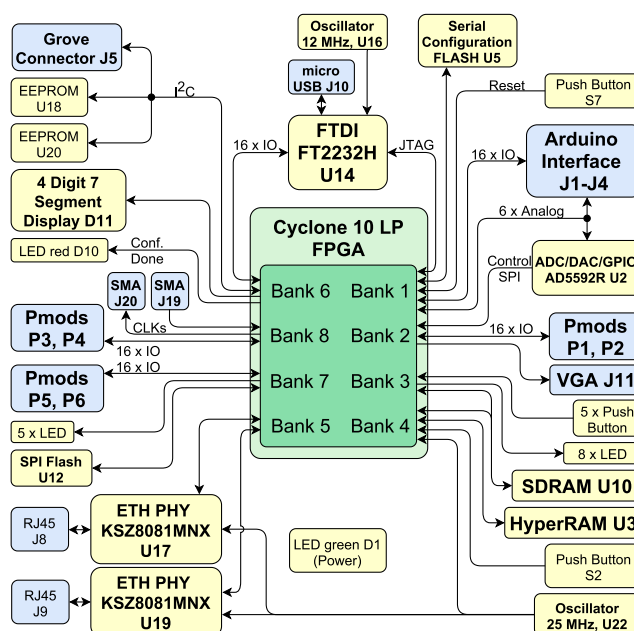
## Intel<sup>®</sup> Cyclone<sup>®</sup> 10 LP, Integrated USB Programmer<sup>2</sup>, 2 x 10/100 Ethernet, USB2.0

intel



9.5 x 11 cm form factor

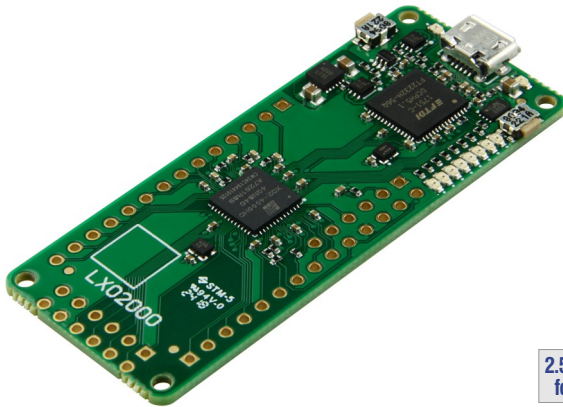
<http://trenz.org/tei0009-info>



Device list	Connectors	SDRAM max	User Flash QSPI	HyperRAM max	Flash max	Ethernet PHY	USB	Other Features
10CL055	QSE (for LVDS), Pmod, Arduino, SMA	512 Mbit	Up to 512 Mbit	128 Mbit	32 Mbit	2 x 10/100	USB2.0	Integrated USB programmer <sup>2</sup>

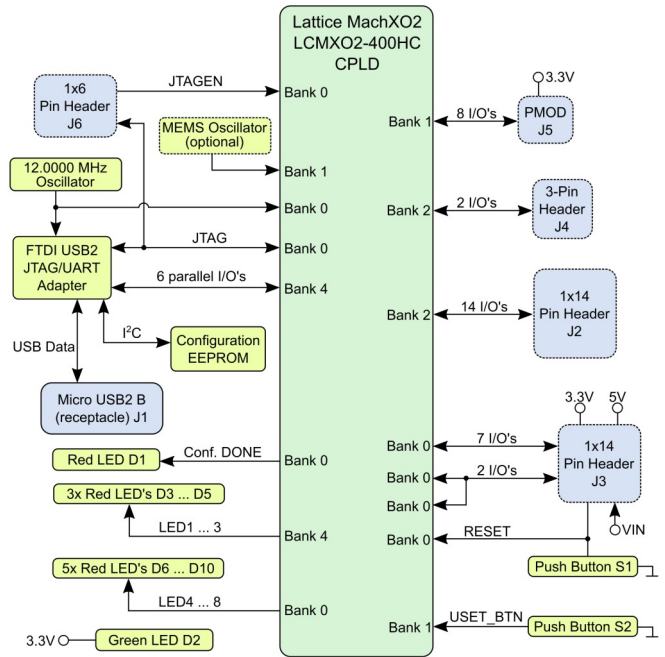
# TEL0001 "LXO2000" Series

Lattice X02 FPGA, Arduino MKR Standard, on-board USB/JTAG and USB/serial



2.5 x 6.15 cm form factor

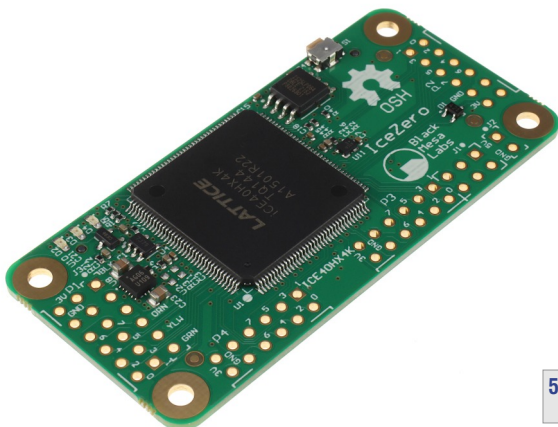
<http://trenz.org/tel0001-info>



Device list	On-Board	Total I/O	Clock Oscillator	Other Features
LCMXO2-4000HC	USB/JTAG, USB/serial	22 on MKR header, 2 I/O on additional header, optional Pmod header +8	100 MHz MEMS	8 LEDs, 2 push buttons, supply: USB or 5V from pin header, RC-networks

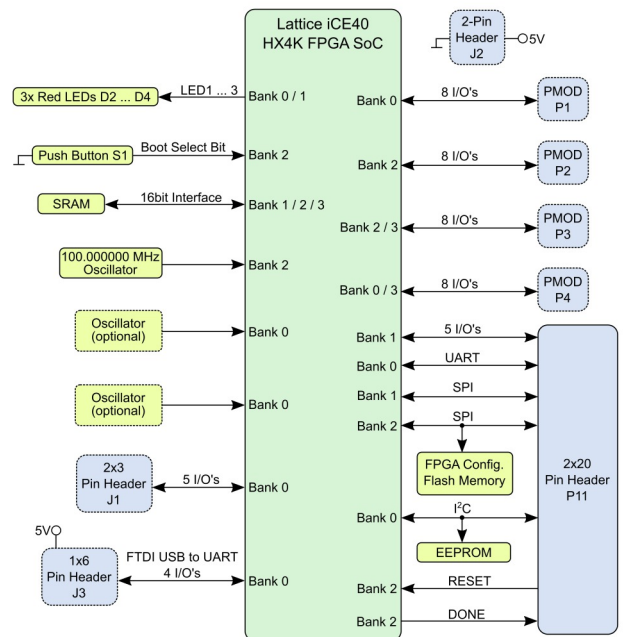
# TE0876 IceZero Series

Lattice ICE40HX, Raspberry Pi HAT compatible, SRAM, Flash, Open-Source



5.6 x 3.05 cm form factor

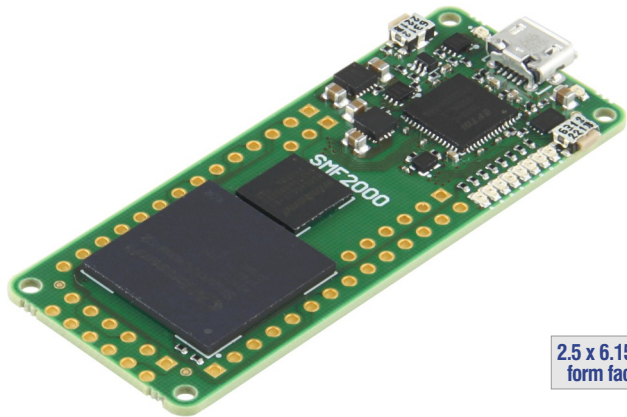
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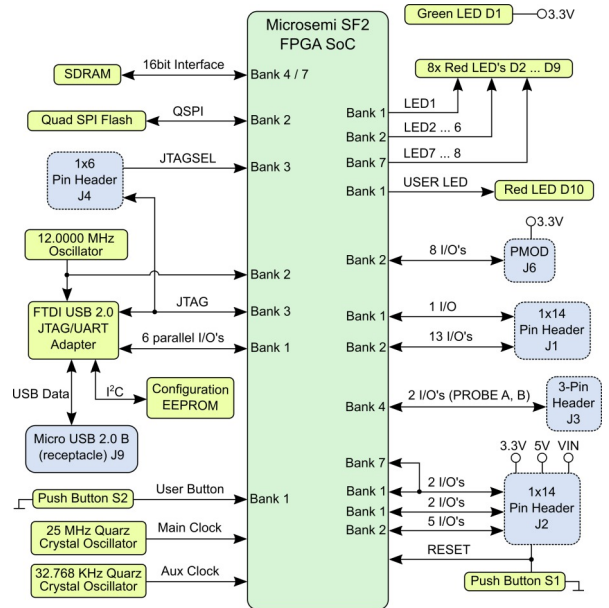
Device list	Connectors	SDRAM max	Flash	Other Features
iCE40HX	4 2x6-pin Pmod connectors (no default)	4 Mbit external SRAM	8 MB	100 MHz user clock, 3 user LED, supported by fully open source FPGA toolchain, fast FPGA configuration from Raspberry Pi, full FPGA design flow on Raspberry Pi (all open source)

# TEM0001 "SMF2000" Series

Microchip SmartFusion<sup>®</sup> 2, Arduino MKR Standard, SDRAM, Flash, UART/JTAG



2.5 x 6.15 cm form factor



<http://trenz.org/smf2000-info>

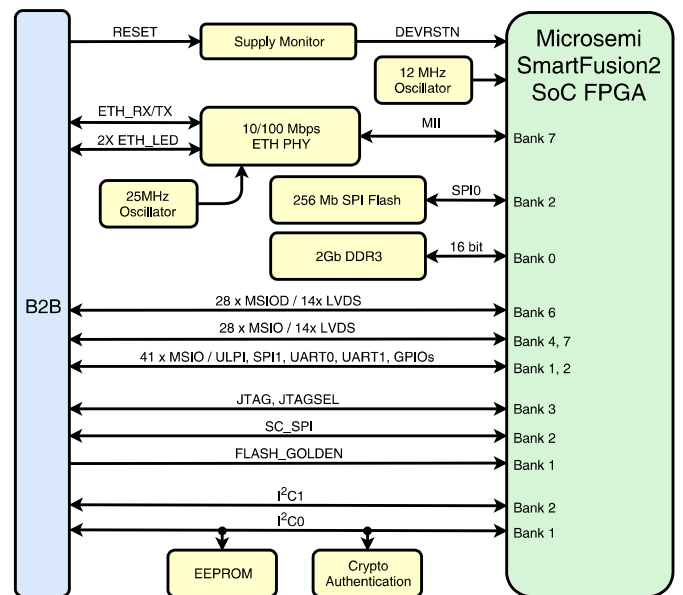
Device list	SDRAM	Flash	Clocks	JTAG/UART	Total I/O	Other Features
M2S005, M2S010, M2S025, M2S050, M2S060	8 MB	8 MB	25 MHz system clock 32.768 kHz auxiliary clock	microUSB2.0 connector	31 (8 I/O 1 x Pmod header, 23 I/O 2 x 14-pin header)	1 x 3-pin header for LiveProbes, 9 user LEDs, 1 user push button

# TEM0005 Series

Microchip SmartFusion<sup>®</sup> 2 SoC, DDR3, Flash, Ethernet, EEPROM



3.1 x 5.6 cm form factor



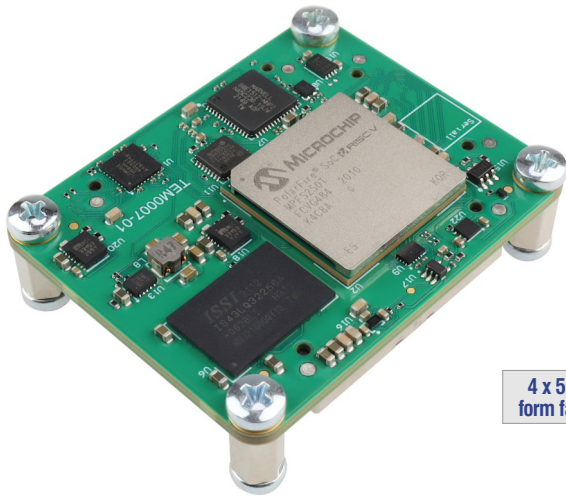
<http://trenz.org/tem0005-info>

Device list	Connectors	SDRAM max	Flash	Ethernet PHY	Total I/O	Other Features
M2S005, M2S010, M2S025, M2S050, M2S060	1 x Samtec ST5 160 pin	8 Gb DDR3, optional DDR3L	32 MB	100 Mbps	105	Optional crypto authentication device, serial EEPROM for MAC address, power supply monitor

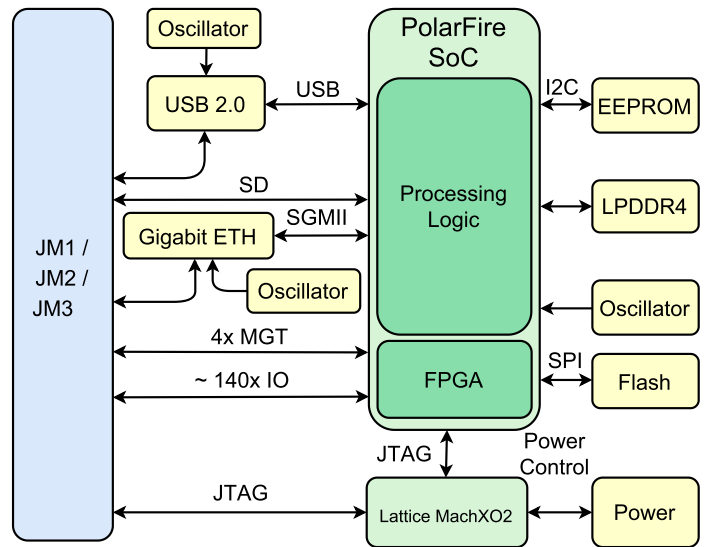


# TEM0007 Series

Microchip PolarFire® Multi-Core RISC-V SoC FPGA, LPDDR4, Flash, Ethernet, EEPROM



4 x 5 cm form factor

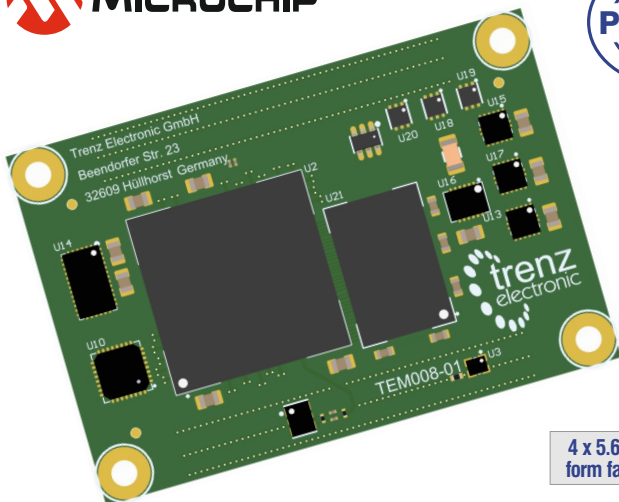


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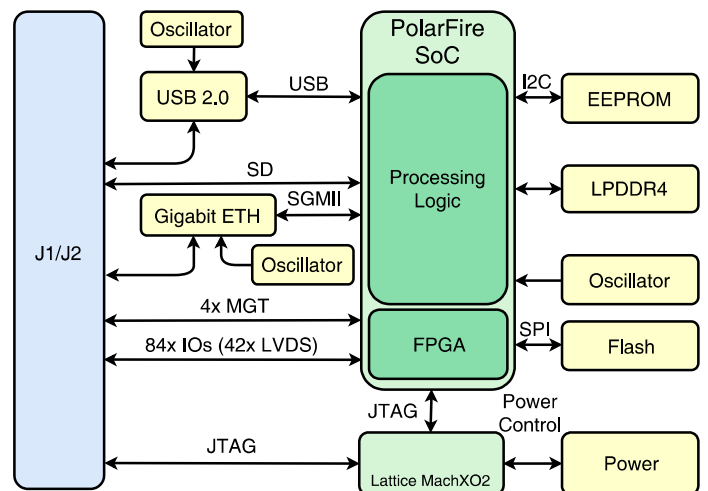
Device list	Pin Package	Connectors	SDRAM max	Flash	Ethernet	Other Features
MPFS025T, MPFS095T, MPFS160T, MPFS250T	FCVG484I	3 x Samtec LSHM	1 GB LPDDR4	64 MB	1 Gbit	EEPROM MAC address, USB2.0

# TEM0008 Series

Microchip PolarFire® Multi-Core RISC-V SoC FPGA, LPDDR4, Flash, Ethernet, USB



4 x 5.6 cm form factor



<http://trenz.org/tem0008-info>

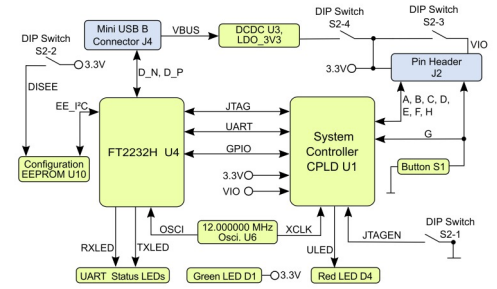
Device list	Pin Package	Connectors	SDRAM max	Flash	Ethernet	Other Features
MPFS025T, MPFS095T, MPFS160T, MPFS250T	FCVG484	2 x Samtec ADM6	1 GB LPDDR4	64 MB	1 Gbit	EEPROM MAC address, USB2.0

## TE0790 and TE0790-L FTDI JTAG Adapter XMOD Form Factor, FT2232H, Lattice X02-256 CPLD



for **AMD** or **LATTICE SEMICONDUCTOR**

- Two versions available:
- 1) Compatible with AMD tools (TE0790)
  - 2) Not compatible with AMD tools (TE0790-L) can be used independently.



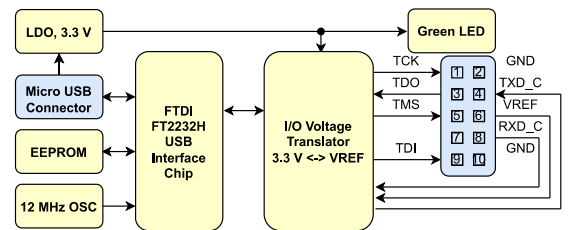
Device	Form Factor	FT2232H	Total I/O	Other Features
Lattice X02-256 CPLD	XMOD, M3 mounting hole	Mini USB connector, channel B RX/TX LEDs, EEPROM	8 universal I/O pins	Step down DCDC converter for optional power supply via USB-power, 4 position DIP switch

<http://trenz.org/te0790-info>

## TEM0009 FPGA USB-Programmer JTAG For Development with Microchip FPGAs



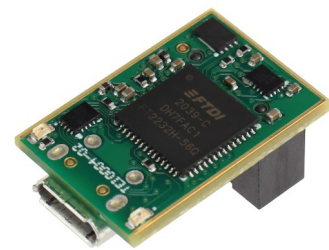
for **MICROCHIP**



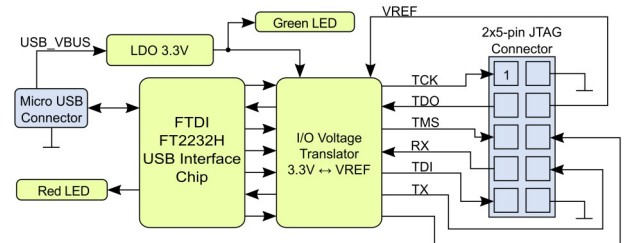
Supported by	JTAG Connector	USB	Voltage levels	Other Features
Libero SoC	Standard 2 x 5-pin header	MicroUSB connector USB2.0 HS support	0.8V - 3.6V	Green power-on LED

<http://trenz.org/tem0009-info>

## TEI0004 ARROW USB Programmer2 For Development with Intel® FPGAs



for **intel**



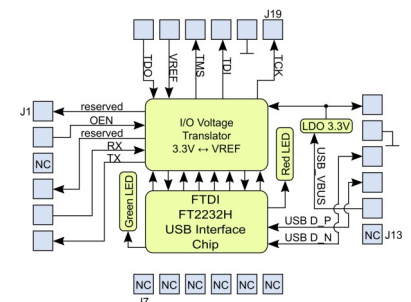
Supported by	JTAG Connector	USB	Voltage levels	Other Features
Intel® Quartus® programmer	Standard 2 x 5-pin 2.54 mm header	MicroUSB connector USB2.0 HS support	0.8V - 3.6V	Additional support for UART, red activity LED, green power-on LED

<http://trenz.org/tei0004-info>

## TEI0005 FPGA Programmer2 SMD Module FT2232H based JTAG Programmer, Surface-Mount Module

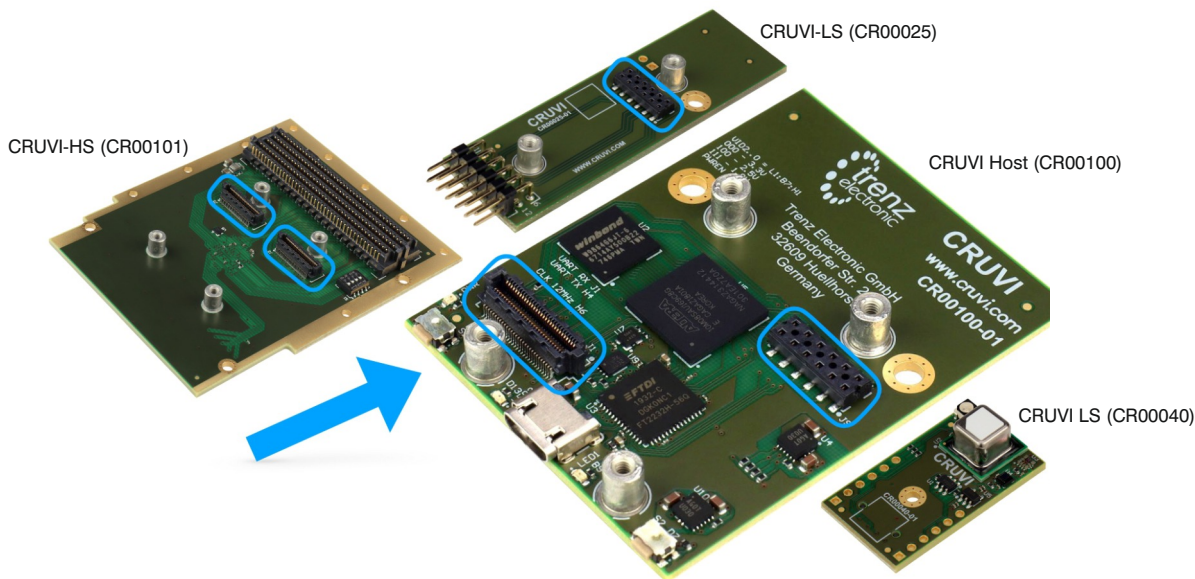


for **intel**



Device list	Supported	Powered	Compatible	Other Features
FTDI FT2232H USB2.0 interface	by Intel® Quartus® (JTAG mode)	via USB	SMT pick and place assembly process	Additional UART channel available, activity LEDs, UART interface available, two I/O pins reserved for future use

<http://trenz.org/tei0005-info>



The picture shows FMC to CRUVI-HS, Pmod to CRUVI-LS, CRUVI Host with LS and HS slot and CRUVI LS modules. CRUVI fills the space between Pmod and FMC card, it can be smaller and cheaper than SYZGY.

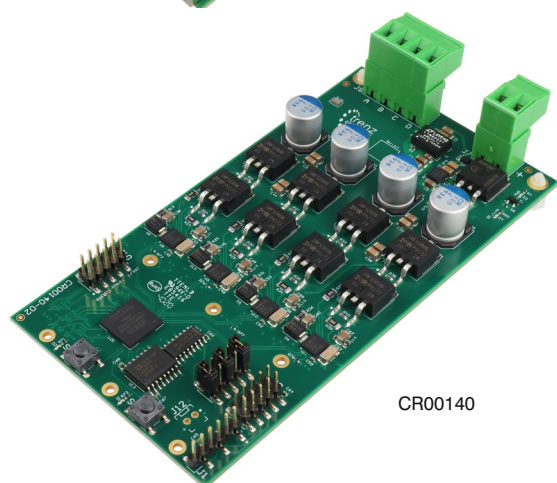
	FMC LPC	SYZGY	CRUVI HS	Pmod	CRUVI LS
Single ended I/O	68	28	37 (28+9)	8	8
Differential I/O pairs	36	10	12	-	-
Management I2C	I2C	SmartVIO	I2C/SMBUS	No	I2C (shared)
Mounting hole(s)	Yes	2 one side	1..6	No	1..6
Power Supply	Adj., 3.3V, 12V	Adj., 3.3V, 5V	Adj., 3.3V, 5V	3.3V	3.3V, 5V
License	VITA \$\$\$	Free	Free	Free	Free



TEB0707

### CRUVI Carrier board with 3 CRUVI slots (3 x HS, 1 x LS)

This board accepts Trenz 4 x 5 SoM and converts into a CRUVI compatible host carrier board. Three CRUVI slots are provided with HS connector support. One slot supports also LS.



CR00140

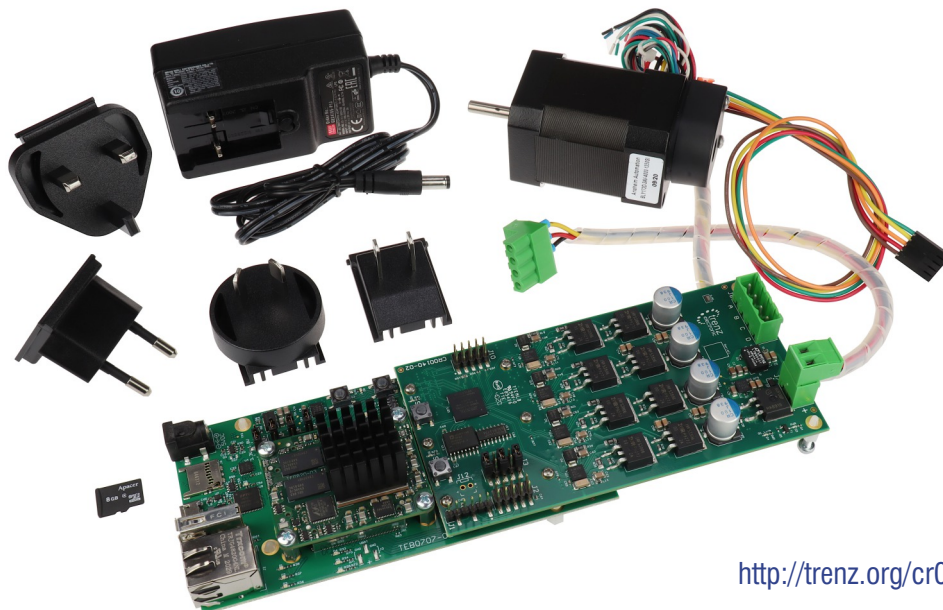
### Industrial Motor controller board with CRUVI connector

This board allows motor control applications with any CRUVI carrier that supports at least one HS slot. IO Voltage range supported 1.2 to 3.3V. There are total 4 phases available for either one 3 phase or two 2 phase motors. Pin headers are available for rotation sensor connections. There is current measurement on two phases and DC link voltage.



# CR00140 Control Development Kit

## AMD Zynq™ 7000



<http://trenz.org/cr00140-info>

### Motor Control Development Kits:

A CRUVI motor driver module CR00140-02, a carrier board TEB0707 and a MPSoC (TE0820/AMD UltraScale+™) or SoC (TE0720/AMD Zynq™ 7020) module including a heat sink. Supplied with a universal plug-in power supply with four adapters, a DC motor including cable for CRUVI CR00140 and an 8 GB micro SD card.

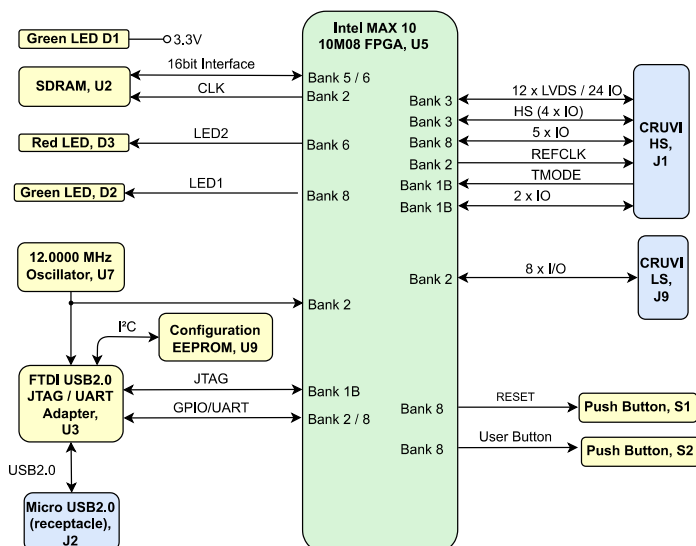
- CR00140-02-K0A with MPSoC TE0820
- CR00140-02-K1A with SoC TE0720

# CR00100 CRUVI Series

## Intel® MAX® 10 CRUVI, SDRAM, USB



4.5 x 5.7 cm form factor

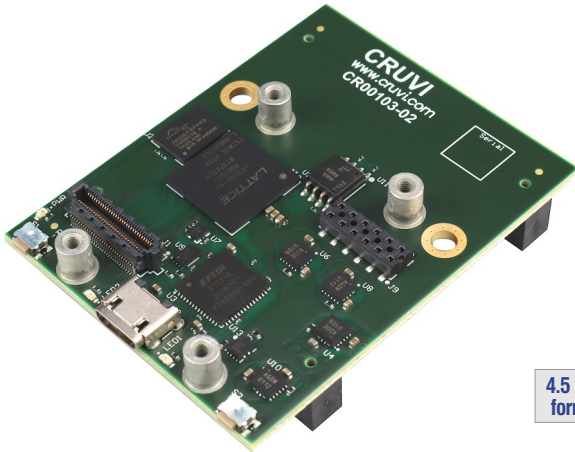


<http://trenz.org/cr00100-info>

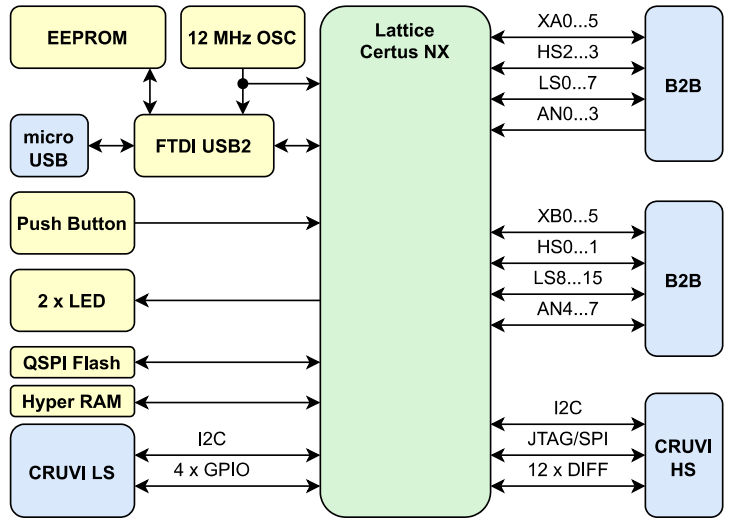
Device list	Connectors	SDRAM max	Total I/O	Other Features
10M08	CRUVI (1 x HS, 1 x LS), 2 x 34 Pin Header	8 MB	37 + 8	USB2.0, user push button and LEDs

# CR00103 CRUVI Certus-NX Baseboard

Lattice Certus™ -NX, HyperRAM, Flash, USB



4.5 x 5,7 cm form factor

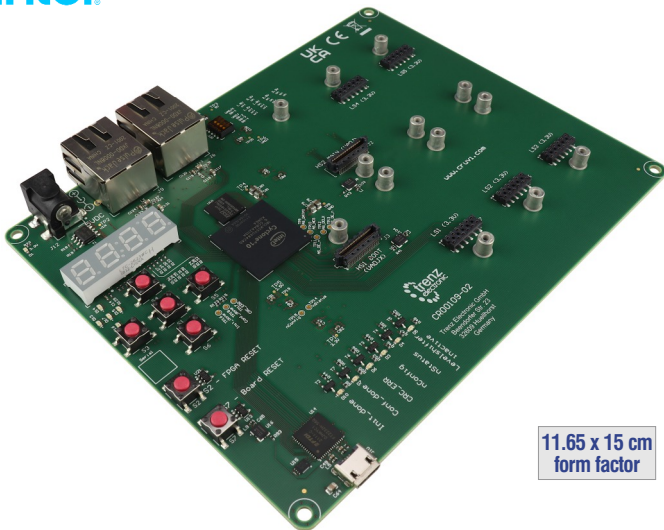


<http://trenz.org/cr00103-info>

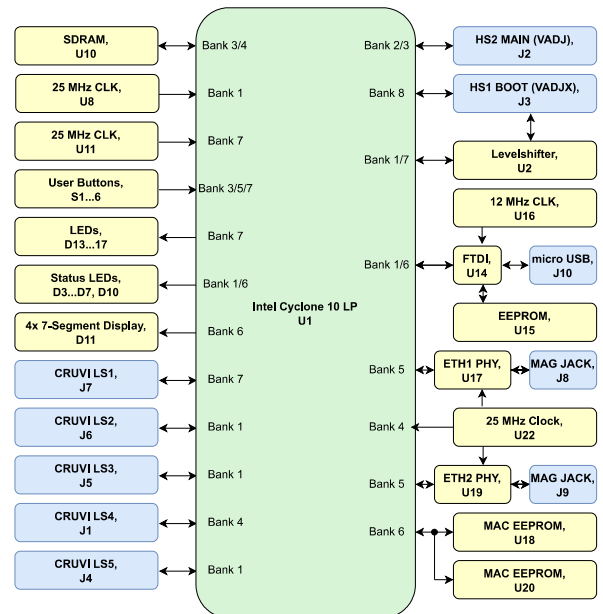
Device list	Interface	RAM	Flash	Other Features
LFD21X-40	CRUVI (2 x 34 Pin Header, 1 x High Speed 60 Pin Header, 1 x Low Speed 12 Pin Header), micro USB	16 MB HyperRAM	32 MB	USB to FIFO FTDI (JTAG/GPIO), user LEDs, push buttons

# CR00109 CRUVI Development Board

Intel® Cyclone® 10 LP, with CRUVI LS and CRUVI HS, 2 x 10/100 Ethernet, microUSB



11.65 x 15 cm form factor



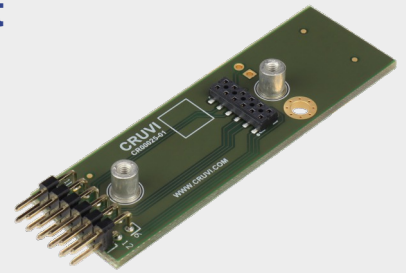
<http://trenz.org/cr00109-info>

Device list	Connectors	SDRAM max	Other Features
Cyclone® 10 LP	CRUVI LS, CRUVI HS, CRUVI HS & BOOT, USB to Multipurpose FIFO IC, 2xRJ45, micro USB	8 MB SDRAM	2 x 10/100 Ethernet PHY, 2 x MAC EEPROM, Oscillator, 4 x 7-Segment-Display, user buttons, user LEDs, status LEDs

Small sized mezzanine module standard providing option for high speed and ultra low cost modules.

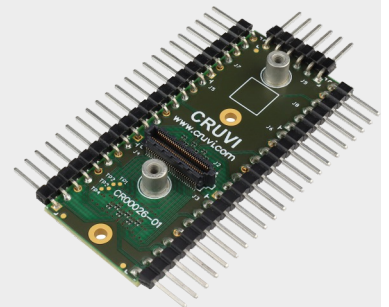
## CR00025 Pmod to CRUVI low speed Host Slot

- On Board
- Steel Spacer
  - M3-Hole
  - Board-to-Board & Mezzanine connector
- Power via CRUVI



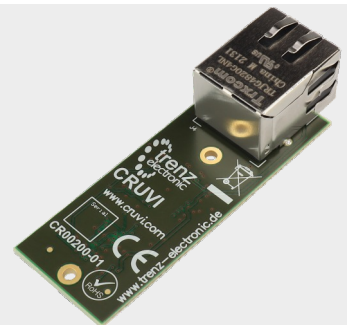
## CR00026 Signal breakout debug Adapter

- On Board
- CRUVI HS Host connector
  - CRUVI HS Device connector
  - 100 mil pin headers
- Power via CRUVI



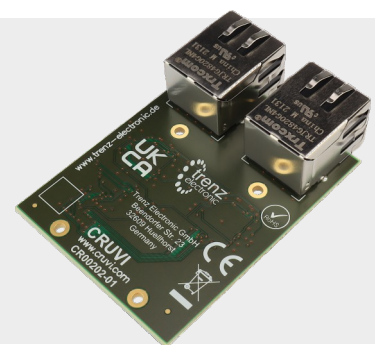
## CR00200 HS Ethernet PHY Adapter

- On Board
- CRUVI HS connector
  - ETH PHY and 25 MHz Oscillator
- Memory
- Serial EEPROM with EUI-48 Node Identity
- Interface
- CRUVI and RJ45
- Power via CRUVI



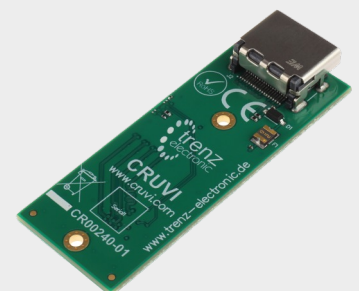
## CR00202 HS Dual Ethernet PHY Adapter

- On Board
- CRUVI HS connector
  - 2 x ETH PHY and 25 MHz Oscillator
- Memory
- 2 x Serial EEPROM with EUI-48 Node Identity
- Interface
- CRUVI and 2 x RJ45
- Power via CRUVI



## CR00240 HDMI Adapter

- On Board
- Serial EEPROM with EUI-48 Node Identity
  - HDMI/DVI level shifter with active DDC Puffer (PTN3363BSMP)
- Interface
- Samtec ST4-30-1.50-L-D-P-TR (Ultra-Fine Pitch Header 60 pins)
  - HDMI connector
- Power via CRUVI





Small sized mezzanine module standard providing option for high speed and ultra low cost modules.

## CR00045 AP Memory x8/x16 Xccela PSRAM Board

On Board

- AP Memory IoT RAM (OPI & HPI):  
256 Mbit x8/x16 1.8V 200 MHz DDR PSRAM
- Serial EEPROM with EUI-48 Node Identity

Interface

- 1.8V 200 MHz DDR x8/x16 Xccela PSRAM
- I2C

Power via CRUVI



## CR00049 E.MMC expansion Module

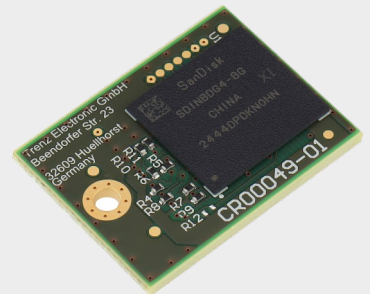
On Board

- e.MMC: 8 GB 1,8V / 3,3V e.MMC (SDINBDG4-8G-XI2)
- Serial EEPROM with EUI-48 Node Identity

Interface

- 1,8V / 3,3V e.MMC 5.1 with HS400
- I2C

Power via CRUVI

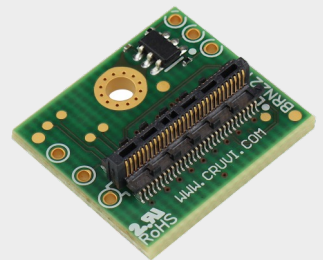


## CR00091 Loopback Adapter

On Board

- 25 Mhz Oscillator (REFCLK)
- EEPROM (SMB BUS)
- LED indicators for all three power rails and SMB\_ALERT

Power via CRUVI

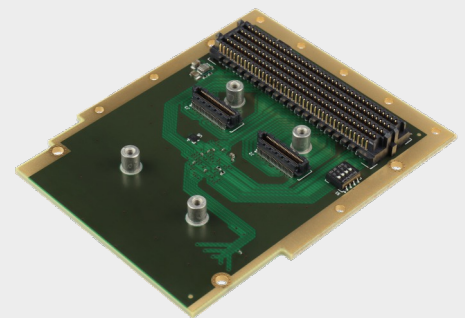


## CR00101 FMC to CRUVI Adapter

On Board

- 1 x FMC HPC connector and 2 x CRUVI HS connectors
- 4 x Steel Spacer
- Intel® MAX® 10 FPGA 8kLE and Internal Flash
- 128 kbit I2C EEPROM and Clock generator 100 Mhz
- 2 x LEDs (red, green), 4 x DIP Switch

Power via CRUVI



## CR00300 Camera Adapter

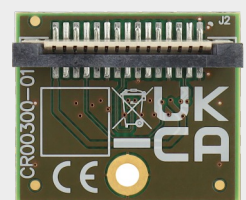
Memory

- Serial EEPROM with EUI-48 Node Identity

Interface

- Samtec ST4-30-1.50-L-D-P-TR (Ultra-Fine Pitch Header 60 pins)
- ZIF FFC/FPC CSI-2 15 pol Camera connector

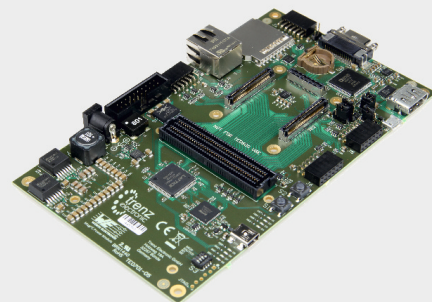
Power via CRUVI



The carrier boards are baseboards for 4 x 5 SoMs, which exposes the modules B2B-connector-pins to accessible connectors and provides a whole range of on-board components to test and evaluate Trenz Electronic 4 x 5 SoMs.

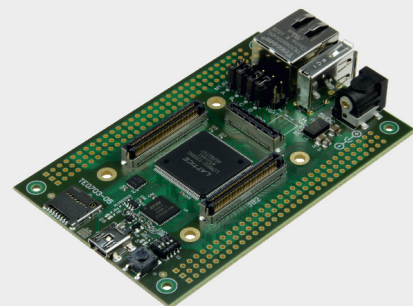
### TE0701

- Overvoltage-, undervoltage- and reversed- supply-voltage-protection
- Barrel jack for 12V power supply
- Carrier Board System-Controller CPLD
- Mini CameraLink connector
- RJ45 Gigabit Ethernet MagJack
- FPGA Mezzanine Card (FMC-LPC) connector
- USB JTAG- and UART interface with Mini-USB connector
- HDMI transmitter with HDMI connector
- 8 x user LEDs, 2 x user push buttons, 2 x DIP switch
- Pmod connectors, Micro SD card socket and Micro-USB interface



### TE0703

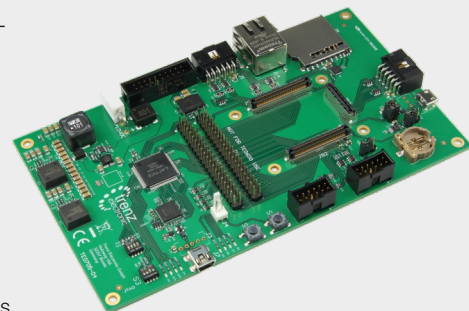
- 2 x VG96 connectors (mounting holes and solder pads)
- SDIO port expander with voltage-level translation
- Micro SD card socket
- 4 x user LEDs, 1 x user-push button, 2 x user configurable DIP switches
- Mini USB connector (USB JTAG and UART interface)
- RJ45 Gigabit Ethernet socket with 4 integrated LED's.
- USB host connector
- Barrel jack for 5V power supply input
- DCDC step-down converter for 3.3V power supply
- USB JTAG and UART interface



### TE0705

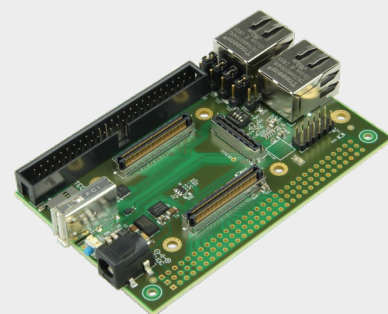
TE0705 carrier board is a simplified version of the TE0701. It provides a cost-effective way to connect Trenz 4 x 5 modules and connect them to your own circuits. As little as possible has been changed in functionality except the functionality that was removed. Changes from TE0701:

- Pmod connectors changed to IDC headers
- HDMI removed
- CL connector removed
- USB connector position changed
- 5 pin header support added on both USB interfaces
- 12V DC power input connector changed to different type
- FMC connector removed and replaced by two dual row 100 mil pin headers



### TE0706

- VG96 connector and 50-pin IDC male connector socket
- SDIO port expander with voltage-level translation
- Micro SD card socket and a USB type A connector
- One user push button, user configurable DIP switch
- Two RJ45 Gigabit Ethernet MagJack
- One Ethernet PHY
- Barrel jack for 5 V power supply input
- DCDC step- down converter for 3.3V power supply
- JTAG pins on 12-pin header
- Three VCCIO selection jumper



### TEB0707

TEB0707 is a carrier board for 4 x 5 Trenz Electronic modules. It provides three high speed and one low speed CRUVI extension connectors.

- Intel® MAX® 10 FPGA
- FTDI FT2223
- Gigabit RJ45 LAN socket
- MicroSD card socket
- Micro USB2.0 socket
- USB A socket
- 6 x user LEDs (3 x green, 3 x red)
- 5V input power supply



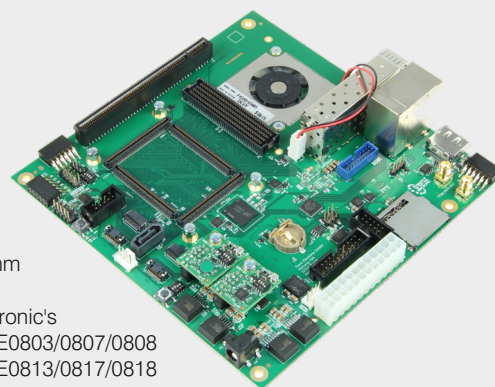
Following carrier boards are baseboards for specific Trenz Electronic SoMs, which exposes the module's B2B-connector-pins to accessible connectors and provides a whole range of on-board components to test and evaluate Trenz Electronic SoMs.

## TEBF0808/ TEBF0818

- Mini-ITX form factor
- ATX power supply connector (12V only supply required)
- Optional 12V standard power plug
- USB3.0 with USB3.0 HUB
- FMC HPC slot (1.8V max VCCIO)
- MicroSD card (bootable) and e.MMC (bootable)
- PCIe slot - one PCIe lane (16 lane connector)
- Fan connectors, PC enclosure, FMC fan
- Intel front panel- and HDA audio-connector
- CAN FD transceiver (10 pin IDC connector)
- Displayport Single Lane
- One SATA Connector

- Dual SFP+
- Gigabit Ethernet RJ45
- One Samtec FireFly (4 GT lanes bidir.)
- One Samtec FireFly connector for reverse loopback
- 20 pins ARM JTAG connector (PS JTAG0)
- Size: 170 mm × 170 mm

Designed for Trenz Electronic's TE080x MPSoC series TE0803/0807/0808 TE081x MPSoC series TE0813/0817/0818

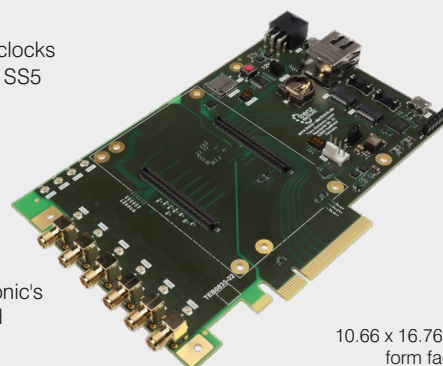


## TEB0835/ TEB0836

- 4 kb EEPROM
- programmable clock generators
- I2C switch IC
- 6 x green user LEDs
- 16 x RF transformation
- reset push button
- temperature sensor
- FT2232H FTDI
- SDIO port expander
- DIP switch for mode
- Pin headers and PCIe 6 connector
- microSD card socket
- microUSB2.0

- 21 x UMCC connectors
- 6 x SMA connectors for clocks
- 2 x Samtec Razor Beam SS5
- RJ45 LAN socket
- 2 x UEC5 connectors
- 2 x UCC8 connectors
- PCI x8 card
- 12V input supply

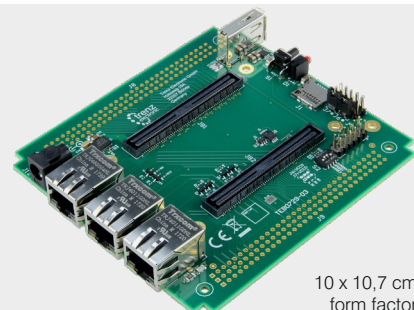
Designed for Trenz Electronic's TE0835 RFSoc series and TE0836 RFSoc series



10.66 x 16.76 cm form factor

## TEB0729

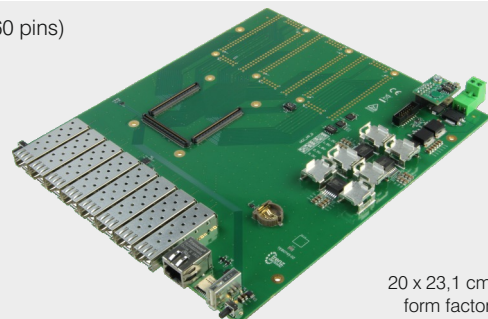
- Trenz TE0729 module socket (2 x Samtec BTE/BSE connectors 120 pins)
- 5V board supply via DC jack
- Three RJ45 Ethernet sockets
- One MicroUSB and one SD card connector
- One 128K I2C CMOS Serial EEPROM
- One 2K I2C Serial EEPROM
- XMOD (TE0790) pin header
- Two pin header FPGA bank power supply
- One VBat pin header and two VG96 pin header
- One user push button, one LED (red), user switch FPGA boot mode



10 x 10,7 cm form factor

## TEB0745

- Trenz Electronic TE0745 module socket (3 x Samtec ST5 connectors 160 pins)
- 24V power supply over ARKZ950/2 connecting terminal
- XMOD (TE0790) Pin Header (JTAG / UART)
- One EMI Network Filter
- MicroSD connector
- RJ45 Ethernet connector
- USB Host connector
- Eight SFP connector
- Six pin header 50 pol. (FPGA bank I/O and power)
- Six pin header 12 pol. (FPGA bank I/O and power)



20 x 23,1 cm form factor



# Trenz Electronic Starter Kits

## Pre-assembled and ready-to-use

In general our Starter Kits contain a Trenz Electronic micromodule with a pre-assembled heat sink mounted on a Trenz Electronic baseboard. The TE08xx series modules are build in a black Core V1 Mini-ITX Enclosure. All this provided with a fitting power supply including different adapters, a micro SD card, a USB cable plus screws and bolts. Different module variants can be integrated on request.

	Starter Kit 720	Starter Kit 729	Starter Kit 813	Starter Kit 817	Starter Kit 818
<b>Module</b>	TE0720	TE0729	TE0813	TE0817	TE0818
<b>FPGA</b>	AMD Zynq™ 7020	AMD Zynq™ 7020	AMD Zynq™ UltraScale+™	AMD Zynq™ UltraScale+™	AMD Zynq™ UltraScale+™
<b>Baseboard</b>	TE0703	TEB0729	TEBF0818	TEBF0818	TEBF0818
<b>Enclosure</b>	-	-	Core V1 Mini-ITX	Core V1 Mini-ITX	Core V1 Mini-ITX
<b>Power Supply</b>	Universal power supply unit	Universal power supply unit	Be Quiet! 400W ATX Power Supply	Be Quiet! 400W ATX Power Supply	Be Quiet! 400W ATX Power Supply
<b>Heat Sink</b>	Heat sink for TE0720, spring-loaded embedded	KK0729-02TE TE custom built	SuperGRIP	SuperGRIP	SuperGRIP
<b>USB Cable</b>	✓	✓	✓	✓	✓
<b>MicroSD Card</b>	✓	✓	✓	✓	✓
<b>Screws &amp; Bolts</b>	✓	✓	✓	✓	✓



Starter Kit 720



Starter Kit 729



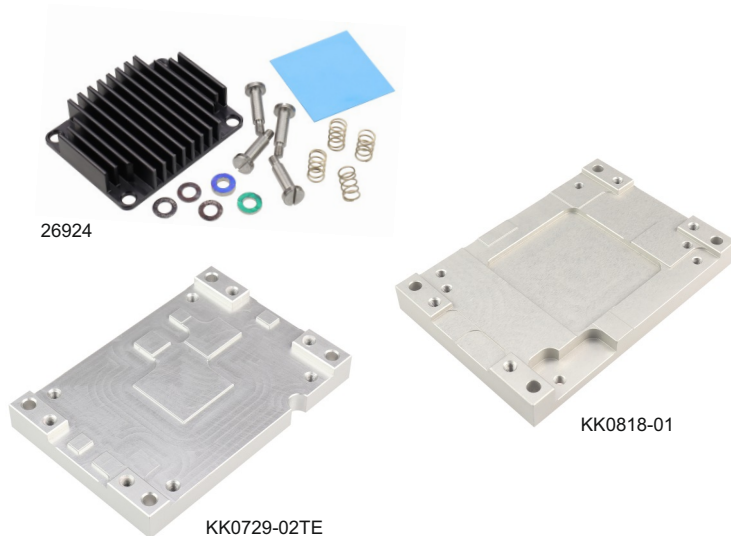
Starter Kit 80x

Photo shows similar product.

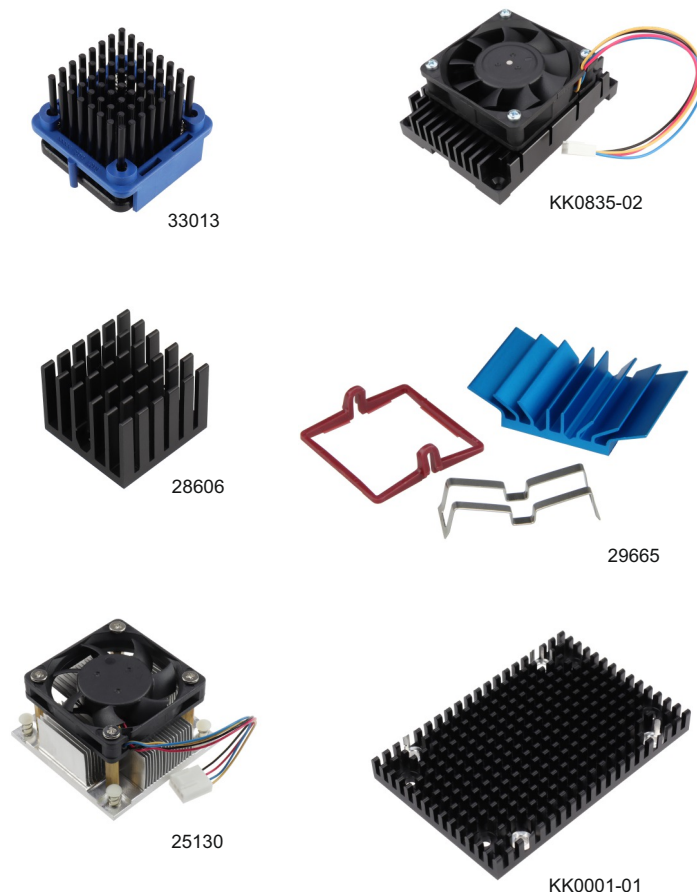
The individual cooling solutions from Trenz Electronic are required for efficient and effective cooling of the modules and serve to ensure the long-term functional reliability of the systems. The product portfolio includes both active and passive cooling solutions.

## Available cooling solutions

Trenz Electronic Cooling Solution	
TE Series	Article Number
TE0600	26920
TE0710	26925
TE0712	26924
TE0713	26924
TE0714	KK0714-04
TE0715	26923
TE0720	33337
TE0724	30829
TE0729	KK0729-02TE
TE0741	33013, 33866
TE0745	KK0745-03
TE0803/TE0813	KK0803-04A, KK0813,02, 29665
TE0807/TE0817	KK0807-02A, KK0817-01
TE0808/TE0818	KK0808-05, KK0818-01, 29664
TE0820	33338, 28606
TE0821	33338, 28606
TE0823	28606
TE0835	KK0835-02
TE0841	28606
TEB0911	25130
TEF1001	25130
Heat Spreader Extension	KK0001-01



**Please contact us  
for custom solutions!**



We are offering different customized cooling solutions for a selection of modules. Please ask for special solutions at [sales@trenz-electronic.de](mailto:sales@trenz-electronic.de).

# Module series comparison table for Trenz Electronic Modules



Other assembly options for cost or performance optimization available on request.

	Device family	Device list	Form Factor/ size [in cm]	Connectors	Processing system	max. SDRAM [in MByte]	Flash [in MByte]
AM0010	Zynq™ UltraScale+™	ZU1CG-ZU5CG, ZU1EG-ZU5EG, ZU4EV, ZU5EV	4 x 5.6	2 x Samtec ADM6	Up to 4 x Cortex A53 + 2 x Cortex R5	8192 DDR4 64-bit (PS) with ECC	2 x 64
AM0030	Versal™ AI Edge	VE2202, VE2302	4 x 5.6	2 x Samtec ADM6	2 x Cortex A72 2 x Cortex R5F	8192 DDR4 64-bit (PS) with ECC	64
AM0070	Zynq™ UltraScale+™ RFSoc	ZU29DR, ZU39DR, ZU49DR	6.4 x 8	5 x Samtec ADM6	Up to 4 x Cortex A53 + 2 x Cortex R5	4096 DDR4 64-bit (PS) with ECC 8192 DDR4 64-bit (PL)	2 x 64
TE0710	Artix™ 7	35T, 50T, 75T, 100T	4 x 5	2 x Samtec LSHM	MicroBlaze	512 DDR3	32
TE0711	Artix™ 7	35T, 50T, 75T, 100T	4 x 5	2 x Samtec LSHM	MicroBlaze	-	32
TE0712	Artix™ 7	35T, 50T, 75T, 100T, 200T	4 x 5	3 x Samtec LSHM	MicroBlaze	1024 DDR3	32
TE0713	Artix™ 7	75T, 100T, support with restrictions: 15 T, 35T, 50T	4 x 5	3 x Samtec LSHM	MicroBlaze	1024 DDR3L	32
TE0714	Artix™ 7	15T, 35T, 50T	4 x 3	2 x Samtec LSHM	MicroBlaze	-	16
TE0715	Zynq™ 7000	Z-7015, Z-7030	4 x 5	3 x Samtec LSHM	2 x Cortex A9	1024 DDR3	32
TE0716	Zynq™ 7000	Z-7020	4.5 x 6.5	2 x FCI BergStak	2 x Cortex A9	1024 DDR3L	32
TE0717	Spartan™ 7	S6, S15, S25, S50	2.5 x 3.5	1 x Samtec LSHM	MicroBlaze	-	8
TE0720	Zynq™ 7000	Z-7020, Z-014S	4 x 5	3 x Samtec LSHM	2 x Cortex A9	1024 DDR3	32
TE0724	Zynq™ 7000	Z-7010, Z7020	6 x 4	1 x Samtec ST5	2 x Cortex A9	1024 DDR3L	64
TE0725	Artix™ 7	15T, 35T, 50T, 75T, 100T	3.5 x 7.3	2 x 50-pin headers	MicroBlaze	8192 HyperRAM	32
TE0729	Zynq™ 7000	Z-7020	5.2 x 7.6	2 x Samtec BTE	2 x Cortex A9	512 DDR3	32
TE0741	Kintex™ 7	70T, 160T, 325T, 410T	4 x 5	3 x Samtec LSHM	MicroBlaze	-	32
TE0745	Zynq™ 7000	Z-7030, Z-7035, Z-7045	5.2 x 7.6	3 x Samtec ST5	2 x Cortex A9	1024 DDR3L	64
TE0763	Artix™ 7	200T	4.05 x 4.75	2 x Hirose DF17	MicroBlaze, HS-USB Microcontroller	1024 DDR3	32
TE0782	Zynq™ 7000	Z-7035, Z-7045, Z-1000	8.5 x 8.5	3 x Samtec QTH	2 x Cortex A9	1024 DDR3	32
TE0783	Zynq™ 7000	Z-7035, Z-7045, Z-1000	8.5 x 8.5	3 x Samtec QTH	2 x Cortex A9	2048 DDR3 64-bit (PL) 1024 DDR3 32-bit (PS)	32
TE0803/ TE0813	Zynq™ UltraScale+™	ZU2CG-ZU5CG, ZU2EG- ZU5EG, ZU4EV, ZU5EV	5.2 x 7.6	4 x Samtec ST5/ 4 x Samtec ADM6	Up to 4 x Cortex A53 + 2 x Cortex R5	8192 DDR4	128
TE0806	Zynq™ UltraScale+™	ZU4, ZU5, ZU7, CG, EG, EV support	5.5 x 7.6	2 x Samtec ADM6	Up to 4 x CortexA53 + 2 x Cortex R5	8192 DDR4 64-bit (PS) with ECC 4096 DDR4 32-bit (PL)	2 x 64
TE0807/ TE0817	Zynq™ UltraScale+™	ZU4CG-ZU7CG, ZU4EG- ZU7EG, ZU4EV-ZU7EV	5.2 x 7.6	4 x Samtec ST5/ 4 x Samtec ADM6	Up to 4 x Cortex A53 + 2 x Cortex R5	8192 DDR4	128
TE0808/ TE0818	Zynq™ UltraScale+™	ZU6EG, ZU9 EG, ZU15EG	5.2 x 7.6	4 x Samtec ST5/ 4 x Samtec ADM6	Up to 4 x Cortex A53 + 2 x Cortex R5	8192 DDR4	128
TE0820	Zynq™ UltraScale+™	ZU2CG-ZU5CG, ZU2EG- ZU5EG, ZU4EV, ZU5EV	4 x 5	3 x Samtec LSHM	Up to 4 x Cortex A53 + 2 x Cortex R5	4096 DDR4	128
TE0821	Zynq™ UltraScale+™	ZU2CG-ZU5CG, ZU2EG- ZU5EG	4 x 5	3 x Samtec LSHM	Up to 4 x Cortex A53 + 2 x Cortex R5	4096 DDR4	128
TE0823	Zynq™ UltraScale+™	ZU2CG-ZU5CG, ZU2EG- ZU5EG	4 x 5	3 x Samtec LSHM	Up to 4 x Cortex A53 + 2 x Cortex R5	2048 LPDDR4	128
TE0825	Zynq™ UltraScale+™	ZU2...ZU5, CG, EG, EV support, automotive support	5.4 x 7	2 x Samtec ADM6 1 x Samtec UMP	Up to 4 x Cortex A53 + 2 x Cortex R5	8192 DDR4 with ECC	256
TE0835/ TE0836	Zynq™ UltraScale+™ RFSoc	ZU25DR, ZU47DR	6.5 x 9	2 x Samtec ST5/ 2 x Samtec ADM6	Up to 4 x Cortex A53 + 2 x Cortex R5	4096 DDR4	128
TE0841	Kintex™ UltraScale™	KU35, KU40	4 x 5	3 x Samtec LSHM	MicroBlaze	4096 DDR4	64
TE0865	Zynq™ UltraScale+™	ZU11, ZU17, ZU19	7.5 x 10	4 x Samtec ADM6	Up to 4 x Cortex A53 + 2 x Cortex R5	8192 DDR4 64-bit (PS) with ECC 8192 DDR4 64-bit (PL)	2 x 64
TE0950	Versal™ AI Edge	VE2302	15 x 12	zQSPF; 2 x CRUVI HS, 2 x CRUVI LS, CSI-2, FMC	2 x Cortex A72, 2 x Cortex R5F	8192 DDR4	2 x 64
TEB0911	Zynq™ UltraScale+™	ZU6, ZU9, ZU15 (CG, EG)	40.6 x 23.43	6 x FMC HPC	Up to 4 x Cortex A53 + 2 x Cortex R5	8192 64-Bit DDR4 SODIMM (PS)	2 x 64



# Module series comparison table

## for Trenz Electronic Modules



EEPROM	e.MMC	Ethernet PHY	USB PHY	Total I/O	Gbit Transceiver	Other Features
1 x MAC	4-64 GByte	1 Gbit	USB2.0 OTG	PL: 204 MIO: 22	4 x GTR, 4 x GTH	GPU/VCU depending on device, security controller, crypto authentication
1 x MAC	64 GByte	1 Gbit	USB2.0	100	8 x GTYP	Clock Generator for PS, PHY and DDR4, UART, I <sup>2</sup> C, SDIO
1 x MAC	8 GByte	2 x 1 Gbit	USB2.0	180 + 22 MIO 16 ADC, 16 DAC	4 x GTR 16 x GTY	OPTIGA Trust M, crypto authentication, oscillator
-	-	2 x 100 Mbit	-	112	-	Single supply
-	-	-	USB2.0 UART/FIFO	178	-	Single supply
MAC address	-	100 Mbit	-	158	4 x GTP	Programmable clock generator, single supply
-	-	-	USB3.0	152	4 x GTP	Programmable clock generator, single supply
-	-	-	-	144	4 x GTP	Differential MEMS osc. for MGT clocking, XADC analog input, GT reference clock input, single supply
MAC address	-	1 Gbit	USB2.0 OTG	132 + 14 MIO	Z-7015: 4 x GTP Z-7030: 4 x GTX	Programmable clock generator, real time clock, single supply
1 x MAC + 64 KByte	-	1 Gbit	USB2.0	120 x HR PL	2 x PS MIOs	On board 10 x 12-bit low power SAR ADCs up to 2 MSPS, low power oscillators, USB2.0 to UART/JTAG interface, single supply
-	-	-	-	72 HR	-	HyperRAM, 100 MHz clock oscillator, red and green LED, single supply
MAC address	4 - 64 GByte	1 Gbit	USB2.0 OTG	152 + 14 MIO	-	Real time clock, single supply, automotive grade available
MAC address	-	1 Gbit	-	PL: 80 PS: 20	-	CAN, single supply
16 KByte	-	-	-	HR: 84	-	Optional POF adapter (125/250 Mbit/s), single supply
3 x MAC address	4 - 64 GByte	2 x 100 Mbit, 1 Gbit	USB2.0 OTG	136 + 14 MIO	-	Real time clock, single supply
-	-	-	-	144	8 x GTX	Programmable clock generator, single supply
MAC address	-	1 Gbit	USB2.0 OTG	250 + 6 MIO	8 x GTX	Real time clock, single supply
16 KByte	-	-	-	98	-	user LEDs, push buttons, DIP Switch, USB Microcontroller
2 x MAC + 16 KByte	4 - 64 GByte	2 x 1 Gbit	2 x USB2.0 OTG	250 + 2 MIO	16 x GTX	Programmable clock generator, real time clock, single supply
1 x MAC + 16 KByte	4 - 64 GByte	1 Gbit	USB2.0 OTG	166 + 12 MIO + 40 CPLD muxed IO	16 x GTX	Programmable clock generator, real time clock, single supply
-	-	-	-	156 + 65 MIO	4 x GTR (PS)	GPU/VCU depending on device, programmable clock generator, single supply
2 x MAC address	4-64 GByte	2 x 1 Gbit	USB2.0 OTG	48 PL HD + 52 PL HP 14 MIOs + I <sup>2</sup> C	4 x GTR, 16 x GTH	GPU/VCU depending on device, transceiver clock in-/outputs, single 5-12V power required
16 KByte	-	-	-	204 + 65 MIO	4 x GTR, 16 x GTH	GPU/VCU depending on device, programmable clock generator, single supply
16 KByte	-	-	-	204 + 65 MIO	4 x GTR, 16 x GTH	GPU/VCU depending on device, programmable clock generator, single supply
-	8 - 64 GByte	1 Gbit	USB2.0 OTG	132 + 14 MIO	4 x GTR (PS)	GPU/VCU depending on device, programmable clock generator, real time clock, single supply
1 x MAC	8 - 64 GByte	1 Gbit	USB2.0 OTG	34 HR, 96 HD + 14 MIO	4 x GTR (PS)	GPU/VCU depending on device, programmable clock generator, single supply
1 x MAC	8 - 64 GByte	1 Gbit	USB2.0 OTG	132 HP + 14 MIO	4 x GTR (PS)	GPU/VCU depending on device, programmable clock generator, single supply
64 KByte	-	2 x 1 Gbit	-	PL: 136 +88 PS: 57	-	(Automotive), real time clock, oscillator
1 x MAC	-	1 Gbit	USB2.0 OTG	132 + 14 MIO	4 x GTR (PS)	Programmable clock generator, real time clock, single supply
-	-	1 Gbit	-	144	8 x GTH	Programmable clock generator, single supply
1 x MAC	8 GByte	1 Gbit	USB2.0	240 PL HP 96 PL HD 21 MIOs	32 x GTH, 16 x GTY, 4 x GTR	12V single supply
1 x MAC	32 GByte	1 Gbit	USB2.0, OTG	16 HD 54 XP 68 FMC via Artix	8 x GTYP	AMD Artix™7 FPGA as configurable Levelshifter, JTAG + UART to USB bridge, LEDs, push button, dip switches, reset button
3 x MAC + 16 KByte	8 GByte	1 Gbit	USB2.0	408	22 x GTH	Active heat sink, GPU/VCU depending on device, M2 PCIe SSD, system controller, DisplayPort, RJ34 ETH + Dual USB3 Combo, Dual Stack SFP+, SD (bootable), USB JTAG/UART ZynqMP, USB JTAG/GPIO FMC, CAN FD (DB9 Connector), SMA (external CLK), 5-pin 24 V power connector

# Module series comparison table for Trenz Electronic Modules



Other assembly options for cost or performance optimization available on request.

	Device family	Device list	Form Factor/size [in cm]	Connectors	Processing system (HW/SW)	max. SDRAM [in MByte]	Flash [in MByte]
<b>CR00100</b>	MAX® 10	10M08	4.48 x 5.75	CRUVI (1 x HS, 1 x LS)	-/+	8	-
<b>TEI0001</b>	MAX® 10	10M02, 10M04, 10M08, 10M16	2.5 x 6.15	-	-/+	8 - 64	8
<b>TEI0003</b>	Cyclone® 10 LP	10CL006, 10CL010, 10CL016, 10CL025	2.5 x 6.15	-	-/+	8	2
<b>TEI0006</b>	Cyclone® 10 GX	10CX220, 10CX150, 10CX105	6 x 8	3 x Samtec ST5	-/+	1024 - 2048	256
<b>TEI0009</b>	Cyclone® 10 LP	10CL055	9.5 x 11	-	-/+	64	64
<b>TEI1000</b>	Stratix® 10	Gx400, GX650 Sx400, SX650	6 x 8	3 x Samtec ADM6	GX: -/+ SX: +/-	2048 DDR4	64
<b>TEI0022</b>	Cyclone® V	5CSEMA5F31C8N	13 x 16	-	+/+	1024 DDR3 (HPS) 1024 DDR3 (FPGA)	32 for HPS 32 for FPGA
<b>TEI0050</b>	Cyclone® V	5CEBA2U15C8N	2.5 x 7.07	CRUVI HS, 2 x 14 pin header	+/+	8	8
<b>TEI0187</b>	Agilex® 5E	Device Group A5E A: 013, 028, 043A, 052, E065 Device Group A5E B: 008, 013, 028, 043, 052, 065(default)	5.2 x 7.6	3 x Samtec ADM6	+/+	2048 LPDDR4 (HPS) 2048 LPDDR4 (FPGA)	256



Other assembly options for cost or performance optimization available on request.

	Device family	Device list	Form Factor/size [in cm]	Connectors	Processing system (HW/SW)	max. SDRAM [in MByte]	Flash [in MByte]
<b>TEL0001</b>	Mach X02	LCMX02-4000HC	2.5 x 6.15	Pmod, pin header, micro USB	-/-	-	-
<b>TEL0003</b>	CertusPro™-NX	LFCPNX-100	10.7 x 16.8 (PCIe)	CRUVI HS, CRUVI LS, CSI-2, SFP+, FMC, PCIe x4	-/+	2 x 32 RPC DRAM	32
<b>TEL0004</b>	Avant™ AT-E	LAV-AT-E70	11 x 16	HDMI, micro USB, MIPI CSI-2, CRUVIs	-/+	2 x 1024 LPDDR4	32
<b>CR00103</b>	Certus™-NX	LFD21X-40	4.5 x 5.7	micro USB2.0, CRUVI HS, CRUVI LS, 2x Samtec SSM	-/+	8 MByte HyperRAM	16/32
<b>TE0876</b>	Mobile FPGA	iCE40HX	3.0 x 6.5	Raspberry PI Socket, Pmod connectors, pin header	-/-	4 Mbit external SRAM	8



Other assembly options for cost or performance optimization available on request.

	Device family	Device list	Form Factor/size [in cm]	Connectors	Processing system (HW/SW)	max. SDRAM [in MByte]	Flash [in MByte]
<b>TEM0001</b>	SmartFusion® 2	M2S005, M2S010, M2S025, M2S050, M2S060	2.5 x 6.15	JTAG and UART over micro USB2.0, 3-pin header, Pmod	+/-	8	8
<b>TEM0005</b>	SmartFusion® 2	M2S005, M2S010, M2S025, M2S050, M2S060	3.1 x 5.6	Samtec ST5 160 pin	+/-	256	32
<b>TEM0007</b>	PolarFire® SoC	MPFS025T, MPFS095T, MPFS160T, MPFS250T	4 x 5	3 x Samtec LSHM	+/-	1 Gbyte LPDDR4	64
<b>TEM0008</b>	PolarFire® SoC	MPFS025T, MPFS095T, MPFS160T, MPFS250T	5,6 x 3,8	2 x Samtec ADM6	+/-	1 Gbyte LPDDR4	64

# Module series comparison table for Trenz Electronic Modules



EEPROM	e.MMC	Ethernet PHY	USB PHY	Total I/O	Gbit Transceiver	Other Features
Config. EEPROM	-	-	-	24 + 4	-	User Push Button and LEDs
Config. EEPROM	-	-	USB2.0	31	-	3-axis accelerometer, on-board USB Programmer, JTAG/UART over micro USB2.0 connector, Pmod header, 2 x 14 pin headers, 1 x 3 pin header, single supply
-	-	-	USB2.0	21	-	3-axis accelerometer, Pmod: 2 x 6 pin support, 8 user LED, 1 user push button, single supply
2 Kbit	-	1 Gbit	-	226	-	Intel® MAX® 10 as system controller (CPLD), programmable oscillator, single supply, baseboard available
2 x MAC address	-	2 x 10/100 MBit/s	USB2.0	70	-	Up to 128 MByte HyerRAM, integrated USB Programmer2, Arduino and Pmod compatible pin headers, Grove connector, D-SUB connector for VGA, SMA connectors, 7-segment display
-	-	-	-	GX: 248 SX: 296	18 x	Intel® MAX® 10 system controller, Status and user LED
2 Kbit	-	-	USB2.0	29	-	MEMS 3-axis accelerometer, fully calibrated single-chip temperature sensor, smoke detector, USB/JTAG programmer, single supply
Config. EEPROM	-	-	-	24 + 24	-	USB-to-JTAG/GPIO-FTDI, user push button and LEDs
1 x 2 Kbit 1 x 128 Kbit	-	1 Gbit	USB2.0 (Support USB 3.1)	331 96 Diff10 19 HPS	up to 24 channels at 28 Gbps (Group A) up to 24 channels at 17 Gbps (Group B)	configurable HPS IOs as SDIO, UART, I <sup>2</sup> C, SPI, etc. 12V single supply

EEPROM	e.MMC	Ethernet PHY	USB PHY	Total I/O	Gbit Transceiver	Other Features
4 Kbit	-	-	USB2.0, UART/FIFO	22 + 8	-	push buttons, LEDs, 100 Mhz MEMS oscillator, Power supply via USB or 5 V via pin header, USB-to-JTAG/GPIO-FTDI
1 Kbit	-	-	USB2.0/USB3.0	-	4x up to 10,3125 Gbps	Oscillator, push buttons, LEDs, 1x4 positons dip switch, PCIe or Power connector
2 x MAC address	-	2 x Gbit	micro USB	-	-	user LEDs, user push buttons, user slide switches, 5V plug
4 Kbit	-	-	USB2.0, UART/ FIFO	Rasberry PI Socket: 18, B2B: 56, CRUVI: 28	-	LEDs, user push buttons, Power supply via micro USB or pin connector, USB-to-JTAG/GPIO-FTDI, Rasberry Pi socket
2 Kbit	-	-	-	Rasberry PI Socket: 18, CRUVI: 32, Other: 4+5	-	user clock, user LEDs, push button, supported by fully open source FPGA toolchain, fast FPGA configuration from Rasberry Pi, full FPGA design flow on Rasberry Pi (all open source), push button

EEPROM	e.MMC	Ethernet PHY	USB PHY	Total I/O	Gbit Transceiver	Other Features
4 Kbit	-	-	-	22 + 8	-	User LEDs, user push button, 1 x 3-pin header for Live Probes, Power supply via micro USB or pin connector, USB-to-JTAG/GPIO-FTDI
serial EEPROM for MAC address	-	100 Mbps	-	105	-	Power supply monitor, optional crypto authentication device
serial EEPROM for MAC address	-	1 Gbit	USB2.0	HSIO: 34*, GPIO: 84 MSIO: 14	4 + 1	On-board DC-DC converter, *highly dependant on used SoC
serial EEPROM for MAC address	-	1 Gbit	USB2.0	TBD	4 x	Preview board, On board, DC-DC convctor

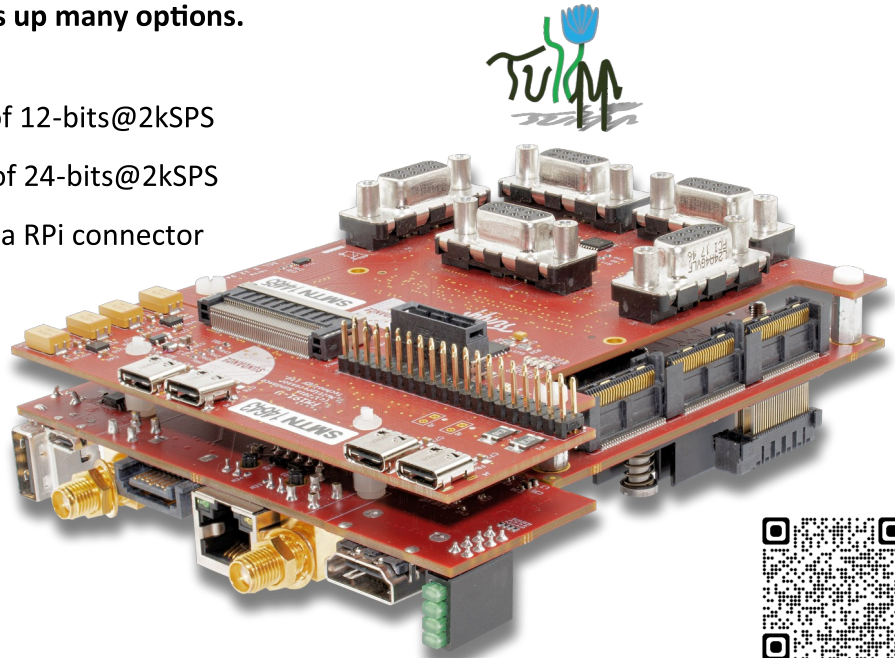


Our VCS (Vision, Control and Sensors) systems have been designed as complete solutions for precision robotics. Here you can see the progression from the VCS<sup>1</sup>, developed as the hardware solution for the TULIPP project, on to the VCS<sup>2</sup> which was designed for the VineScout project, and finally on to the newly released VCS<sup>3</sup>.

## VCS<sup>1</sup>

The VCS<sup>1</sup> is a PCIe/104 OneBank™ Development Platform. It is compatible with any of Trenz Electronic's 40mm x 50mm System-on-Modules with an AMD® ZYNQ™ MPSoC that offer Dual-Core or Quad-Core A53 CPU. An FMC expansion interface opens up many options.

- 12x analogue inputs with a resolution of 12-bits@2kSPS
- 8x analogue outputs with a resolution of 24-bits@2kSPS
- 28x single-ended digital I/Os 5V TTL on a RPi connector
- Four USB3.0 connections
- 15x High-Speed I/O, 2.5V-only
- Ethernet, HDMI, SATA, USB2 Interfaces
- PCIe/104 Expansion connector

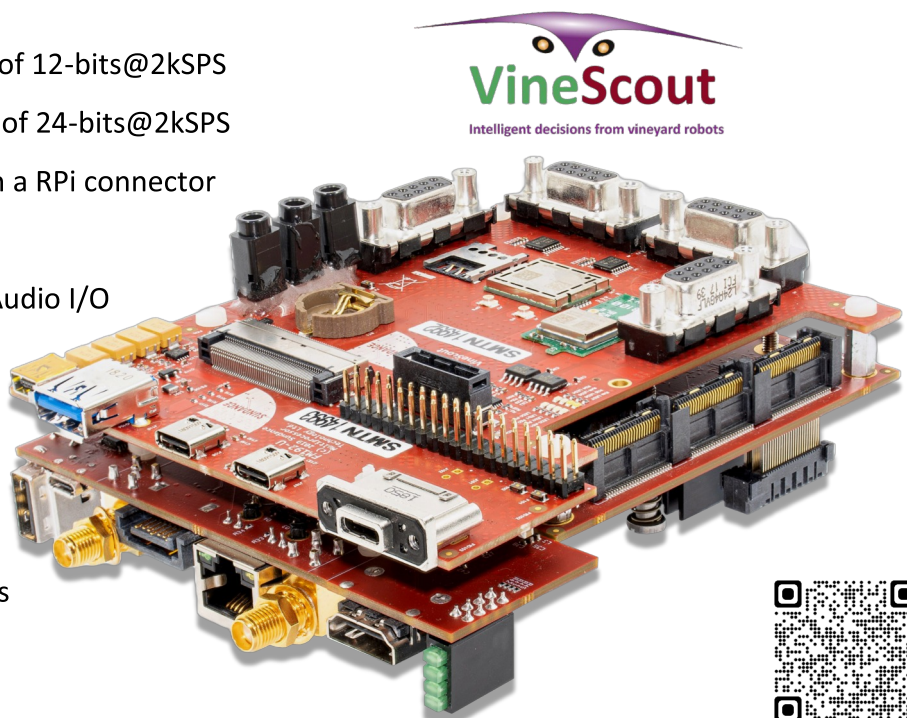


[store.sundance.com/VCS1/](http://store.sundance.com/VCS1/)

## VCS<sup>2</sup>

The VCS<sup>2</sup> is a PCIe/104 OneBank™ Development Platform. It is compatible with any of Trenz Electronic's 40mm x 50mm System-on-Modules with an AMD® ZYNQ™ MPSoC that offer Dual-Core or Quad-Core A53 CPU. An FMC expansion interface opens up many options.

- 12x analogue inputs with a resolution of 12-bits@2kSPS
- 8x analogue outputs with a resolution of 24-bits@2kSPS
- 26x single-ended digital I/Os 5V TTL on a RPi connector
- IEEE 802.11 a/b/g/n WiFi + Bluetooth
- Humidity and Temperature sensor & Audio I/O
- 4G + GNSS/GPS, IMU sensor
- Four USB3.0 connections
- Two 5Mbps CAN-BUS Interfaces
- PCIe/104 Expansion connector
- Ethernet, HDMI, SATA, USB2 Interfaces

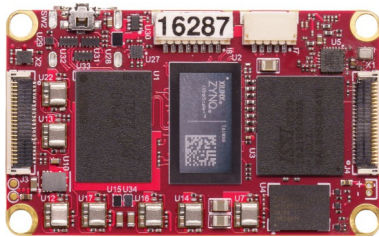


[store.sundance.com/VCS2/](http://store.sundance.com/VCS2/)

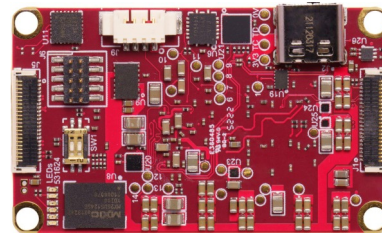
## VCS<sup>3</sup>

The result of this evolution, the VCS<sup>3</sup> is probably the Worlds smallest "Single-Board-Computer" with an AMD® ZYNQ™ device with integrated ARM CPUs and FPGA fabric. Measuring just 30mm x 50mm, this tiny workhorse can be placed almost anywhere, opening up the benefits of FPGAs to many more applications.

The VCS<sup>3</sup> utilizes an AMD UltraScale+ MPSoC coupled with high-speed LP-DDR4 memory to produce a highly compact evaluation platform. With four 22-way FPC connectors with 14x High-Speed I/O and 3.3V power-out, a 9-axis IMU, and a CAN-BUS interface, this platform is ideally suited for autonomous machines, cameras or automation.

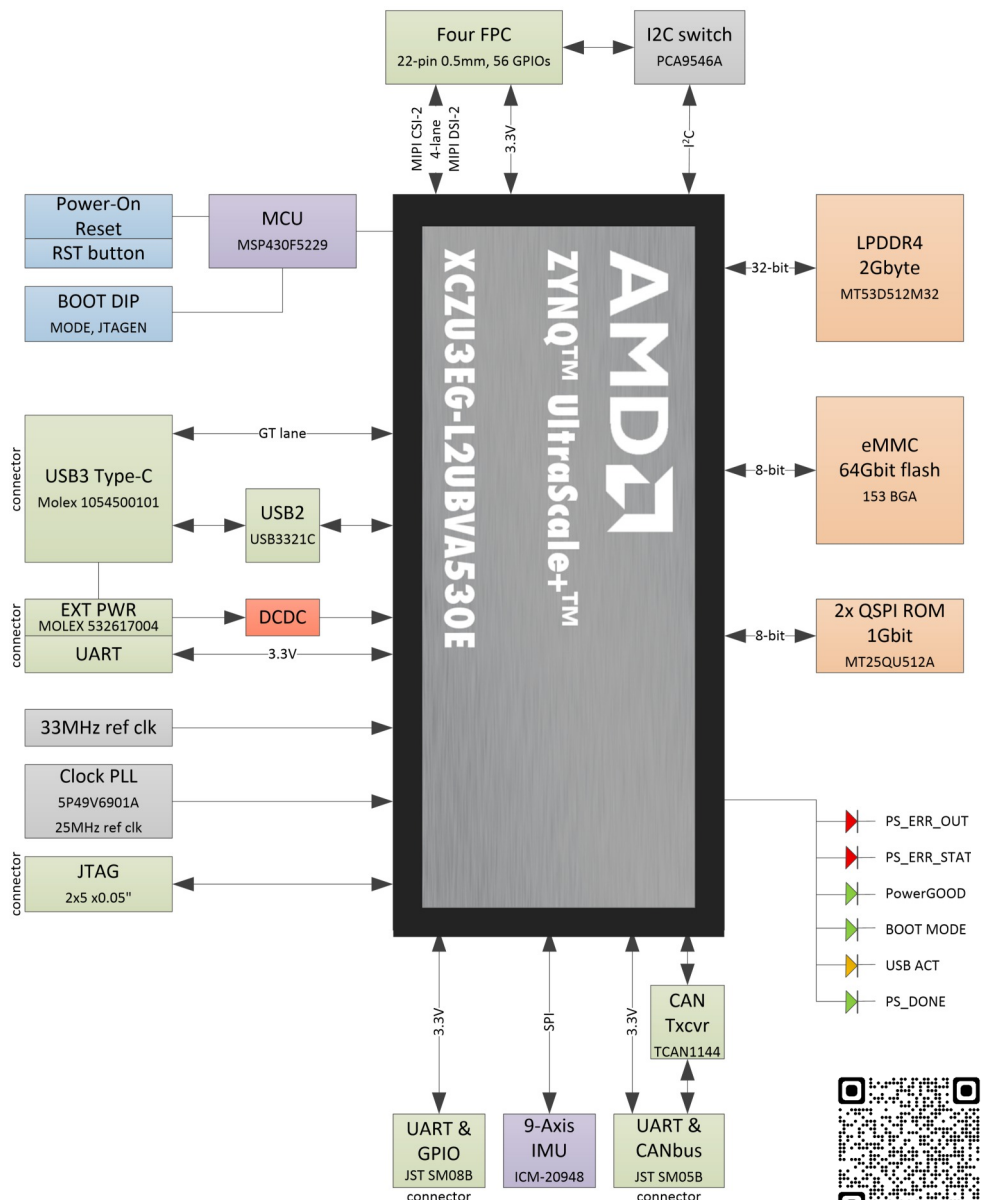


1:1 scale VCS<sup>3</sup>



### Features:

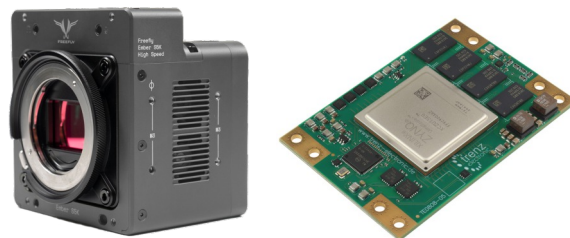
- AMD® ZYNQ® UltraScale+ ZU1, ZU2 or ZU3 in InFO Package
- Dual or Quad A53 ARM CPU
- Four FPC connectors, 22 way CSI/DSI for Cameras/Displays 3.3V Out & 56x GPIO
- 1Gb, 2Gb or 4Gb of LP-DDR4
- 64Gbit of eMMC Flash
- Dual 1Gbit QSPI ROM
- 9-axis IMU
- 5Mbps CAN-BUS
- Fast GPIO & UART
- USB-C for data connection and/or power supply
- Weight: 10g / 30g with heatsink
- Supply Voltage: +5V ±5%
- Typical Power Consumption: 3 Watts
- Dimensions: 50mm x 30mm



Innovative, flexible, and technically adept – these are the cornerstones of our customer relationships. Our extensive project experience enables us to collaborate with other companies in developing innovative solutions and successfully bringing them to market.

Let's delve into some of our notable collaborations:

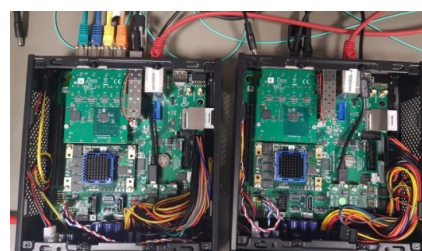
**The most powerful 4K Camera (Off the shelf):**



In close partnership with Freely, we supply them with the processing hardware (an off the shelf product) for their Ember Camera. This powerful camera is specifically designed for aerial photography and drone flights. It stands out for its compact size, high image quality, and advanced stabilization technology. Inside the camera is the Trenz Electronic TE0808 module, which provides impressive images. The Ember Camera allows breathtaking aerial shots and is an essential tool for professional filmmakers and photographers.

*"Freely chose the Trenz TE0808 to help speed the design of our latest camera 'Ember'. Trenz delivers high quality parts with the connectivity and processing we need to enable cutting edge imaging systems" - Tabb Firchau (Freely CEO)*

**Shift-Left solutions (Assembly variant / custom solution):**



Trenz Electronic GmbH and MLE have established a close engineering collaboration, and a track record of "Shift-Left", namely, accelerating FPGA projects by integrating FPGA Full System Stacks with off-the-shelf FPGA System-on-Modules (SoMs) for Compute, Video, Storage and/or Network Acceleration. The "Shift-Left" solutions not only shorten time-to-market but also reduce the risks and costs. In the project of TEBF0807, we completed and validated within days the PoC of low-latency SD-WAN access on the SoM and Devkit's carrierboard with the Network Protocol Acceleration Platform Full System Stacks integrated. Then we quickly designed a custom carrierboard that contained only the I/Os required by the client for low-risk cost optimization. The design re-use method greatly reduces the development time, costs and risks to shift-left clients' projects.

**RFSoc Chip-Down for LIDAR detection in an automotive surrounding:**



TEC0203 represents a bespoke board, tailored for integration within the LIDAR system. Its primary function revolves around the digitization of analogue signals sourced from optical sensors, followed by the processing of resulting digital signals. At its core lies a AMD Zynq™ UltraScale+™ RFSoc, complemented by 4 x 512 MByte DDR4 SDRAM for robust memory capabilities. Additionally, the board is equipped with a dual 512 MByte Flash memory configuration, essential for both initialization and ongoing operations. The analog part of the module also includes additional analog-to-digital converters (ADCs) for processing low-frequency signals. Ensuring efficient power distribution, the board features potent switch-mode power supplies catering to all onboard voltages. A dedicated system controller housed on LCMX03D enhances operational control and coordination. Furthermore, facilitating seamless connectivity and control, the board incorporates a PCIe, Ethernet, USB2.0.