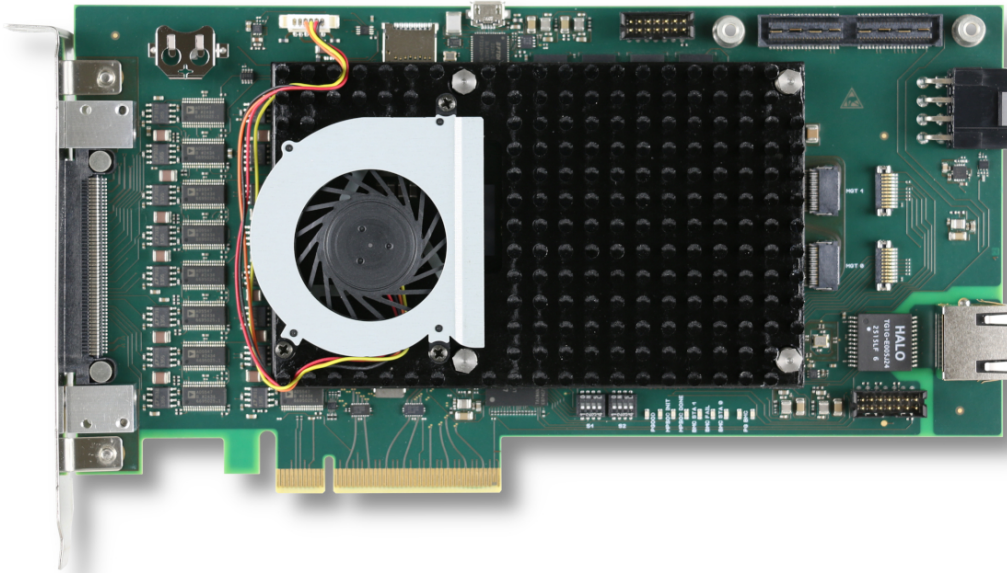


## TPCE646 Reconfigurable MPSoC with 32 x 16 bit Analog Output and 8 x 16 bit differential Analog Input



TPCE646-10R

### Application Information

The TPCE646 is a X8 PCIe compatible module providing a user configurable AMD Zynq™ UltraScale+™ MPSoC with 32 DAC output channels and 8 ADC input channels.

The TPCE646 DAC output channels are based on the Dual 16bit AD5547 DAC. Each DAC output is designed as a single-ended bipolar  $\pm 10$  V analog output.

The TPCE646 ADC input channels are based on the Dual 16-Bit 5Msps Differential-Input LTC2323-16 ADC. The TPCE646 provides 8 ADC channels. Each of the 8 channels has a resolution of 16bit and can work at up to 5Msps. The analog input circuit is designed to allow input voltages up to  $\pm 10$  V on each input-pin (results in  $\pm 20$ Vpp differential voltage range).

Additionally the TPCE646 provides four differential LVDS I/O lanes on the front I/O interface.

For customer specific I/O extension or inter-board communication, the TPCE646 provides 64 MPSoC I/Os on a rear I/O connector (directly connected) and 8 PL Multi-Gigabit-Transceiver on Samtec Firefly connectors (two quad interfaces). Digital rear I/O lines

can be configured as 64 single ended LVCMOS18 or as 32 differential LVDS interfaces

The PL memory interface of the Zynq™ UltraScale+™ MPSoC is connected to a 4GB, 64 bit wide DDR4 SDRAM and the PS memory interface is connected to a 4GB, 64bit wide DDR4 SDRAM.

For communication of the Zynq™ UltraScale+™ MPSoC PS, a rear I/O Ethernet port, a USB to UART channel based on an FTDI chip and a PCIe X4 interface multiplexed with the X8 PCIe interface are available.

The Zynq™ UltraScale+™ MPSoC is configured by two dual QSPI flash devices. Depending on the device size it might be required to use the AMD Tandem Configuration Feature for PCIe conforming configuration. The QSPI flash device is in-system programmable. A micro SD card slot is available as an alternative configuration source. An in-circuit PL and PS debugging option is available via a JTAG header.

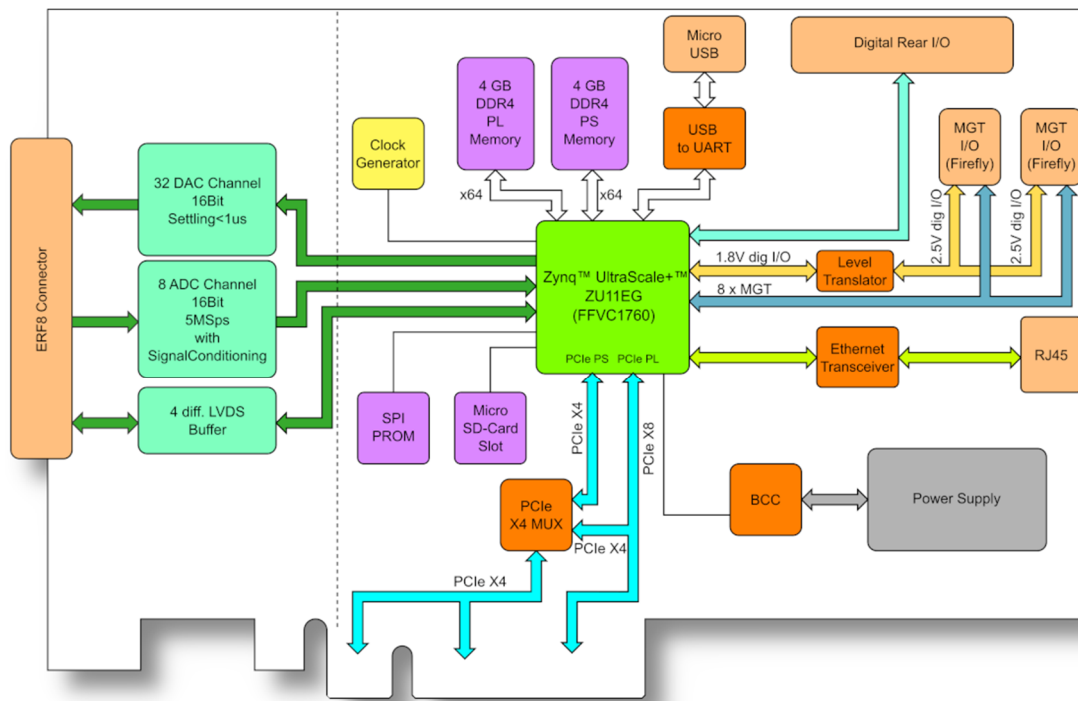
User applications for the TPCE646 with Zynq™ UltraScale+™ MPSoC can be developed using the

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design software AMD Vivado™ and AMD Vitis™.  
Licenses for the development tools are required.

### Technical Information

- Form Factor: X8 PCIe
  - Board size: 98 mm x 154 mm
- PCI Express x8 Gen 3 Link from PCIe Card edge connector to MPSoC PL.
- Optional PCI Express x4 Gen2 Link to MPSoC PS.
- TPCE646 MPSoC options:
  - -10R Xilinx XCZU11EG-1FFVC1760I
- Serial Flash for MPSoC Configuration
- FPGA clock options:
  - Local clock generator as source for the MPSoC internal PLL
- DDR4 SDRAM PL bank, 64 Bit 4GB
  - (up to 8GB)
- DDR4 SDRAM PS bank, 64 Bit 4GB
  - (up to 8GB)
- 8 MPSoC PS Multi-Gigabit-Transceiver on a separate Samtec FireFly(c) connector.
- Front I/O lines
  - 8 differential analog inputs
    - 16 bit resolution
    - 5Msps
    - Factory calibration
  - 32 differential analog outputs
    - 16 bit resolution
    - max. ±10V single ended output
    - Factory calibration
  - 4 differential digital LVDS I/O lines
- Rear I/O lines
  - 64 single ended or 32 differential rear I/O lines on a rear 68pin Samtec QTE© connector.
  - 8 MPSoC PS Multi-Gigabit-Transceiver on two separate rear Samtec FireFly© connector.
  - 10/100/1000 Mbps RJ45 Ethernet Interface
  - Operating temperature: -40°C to +60°C
  - MTBF (MIL-HDBK217F/FN2 GB 20°C): 104000h



Block Diagram TPCE646

## Order Information

### RoHS Compliant

**TPCE646-10R** Zynq™ UltraScale+™ MPSoC  
XCZU11EG-1 FFVC1760I, 2x4GB DDR4

32 x Analog Out, 8 x Analog In, and 64 direct logic  
rear I/O Lines, 8 MGTs on FireFly connector ©

Further Zynq™ UltraScale+™ MPSoC options on request.

### Software

**TPCE646-SW-25** GreenHills Integrity Device Driver  
**TPCE646-SW-42** VxWorks Device Driver  
**TPCE646-SW-65** Windows Device Driver  
**TPCE646-SW-82** Linux Device Driver  
**TPCE646-SW-95** QNX Neutrino Device Driver

For other operating systems please contact TEWS.