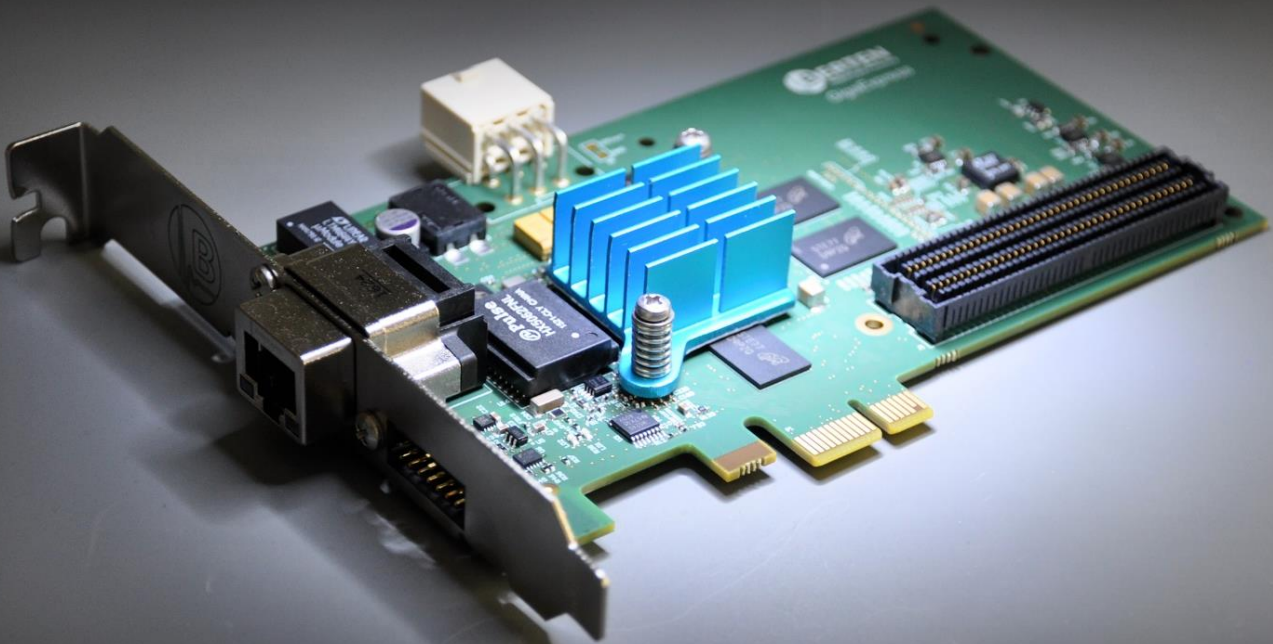


GigaExpress SBC

Rugged FMC Carrier | Dual PS/PL DDR3 RAM
Zynq® SoC 7012S/7015/7030 | Extended Temperature Range



Overview

The GigaExpress is the world's smallest Zynq® FMC carrier. This rugged, low power, and small form-factor Single Board Computer (SBC) features Xilinx's Zynq® SoC and DDR3L RAM for both the processing system (PS) and the programmable logic (PL).

The GigaExpress is a VITA 57 compliant FMC carrier, supporting up to 10W mezzanine modules. The Gigabit Ethernet and PCI Express interfaces add flexibility and simplify installation in different platforms.

The rugged design and extended operating temperature range (-40°C to 85°C) make the board suitable for final integrations in avionics, ground stations, rack-mount units, and custom housings.

Processing Platform

The GigaExpress core unit is a Xilinx Zynq®-7000 AP SoC XC7Z012S, XC7Z015 or XC7Z030, which integrates the software programmability of an ARM®-based processor with the hardware of an FPGA. The Cortex™-A9 MPCore™ with CoreSight™ and NEON™ extension enables efficient floating point processing and multiple operating systems support, including Linux, FreeRTOS, or VxWorks. The Artix®-7 or Kintex®-7 Zynq® programmable logic adds real-time processing capabilities with the performance, flexibility, and power efficiency of the FPGA technology.

The Zynq® XC7Z012S features 55K Logic Cells and 120 DSP Slices, the XC7Z015 74K Logic Cells and 160 DSP Slices, and the most powerful XC7Z030 includes 125K Logic Cells and 400 DSP Slices. Low power versions are available for XC7Z015/30. The SoC interfaces with a 10/100/1000 Gigabit Ethernet transceiver, low voltage DDR3L SDRAM, SPI Flash Memory, JTAG programming interface, PCIe x1 board edge connector, and a Low Pin count (LPC) FMC interface.

Accurate clock oscillators are implemented as reference to derive all the Zynq® clocks, making the GigaExpress SBC suitable for demanding processing applications such as wideband communications, radar, navigation, or avionics. PS reference clock features an overall frequency stability of ±10ppm, while PL clock shows an excellent stability of ±5ppm.

DDR3L SDRAM & Flash Memories

The GigaExpress SBC implements 1GB DDR3L (x32) SDRAM in the processing system, clocked at 533MHz. In addition, a 512MB DDR3L (x16) SDRAM module, clocked at 333MHz, is available in the programmable logic, a key feature for implementing real time processing algorithms with demanding memory requirements.

The processing system and programmable logic software and firmware are stored in a 512Mbit Quad SPI Flash memory.

FMC Interface

The GigaExpress SBC is a compliant VITA 57 carrier, and it has been designed to accept mezzanine modules consuming up to 3A@3.3V and 0.5A@12V. The position of the connector and the four mounting holes, minimise the dimension of the assembly and increase the integration robustness.

The FMC interfaces with up to 34 differential signal pairs, two clocks, and one high speed serial transceiver (GTP/GTX) running up to 6.6 Gbps.

The XC7Z012S/15 includes two voltage-adjustable high range banks (1.5V, 1.8V, 2.5V, 3.3V) routed to the FMC, while the two high performance banks of the XC7Z030 are voltage-adjustable to 1.5V or 1.8V.

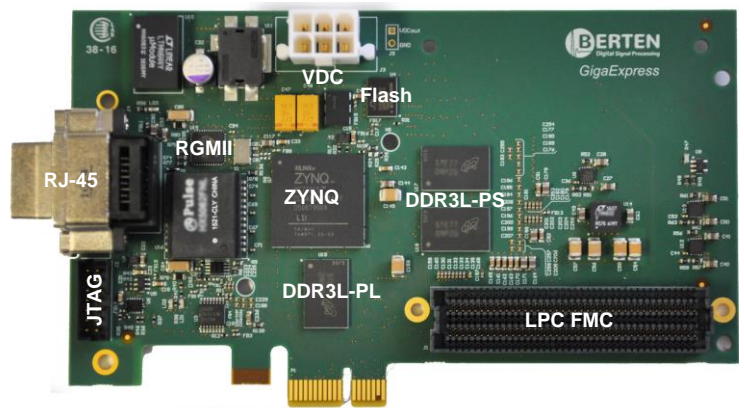
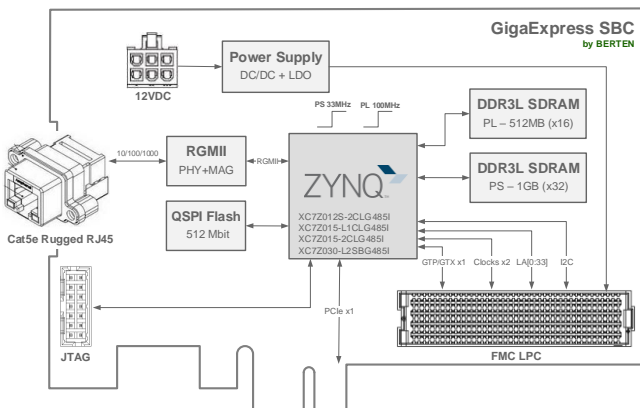
Ethernet & PCI Express

A 1000BASE-T Ethernet interface is available, implementing a rugged Cat5e RJ45 connector that may provide sealing up to IP-68. As an option, the GigaX lwIP plugin is available for High-speed PS-PL Data Transfer.

A PCIe x1 board edge connector is available for integration in other platforms and motherboards. It interfaces with Zynq® Gigabit Transceiver Channel 3.

JTAG

GigaExpress board includes a standard JTAG Molex connector mating the Xilinx platform cable. Both vertical and right angle versions are available for mounting. The implemented JTAG chain allows programming both GigaExpress carrier and FMC module devices.



Specifications

Type	VITA 57 FMC carrier	
Xilinx Zynq®-7000 SoC	XC7Z012S-2CLG485I	Speed Grade 2
	XC7Z015-L1CLG485I	Speed Grade 1, Low Power
	XC7Z015-2CLG485I	Speed Grade 2
	XC7Z030-L2SBG485I	Speed Grade 2, Low Power
Memory	512 Mbit QSPI Flash Memory, 52MB/s 1GB DDR3L (x32) SDRAM, 533MHz, 4GB/s (PS) 512MB DDR3L (x16) SDRAM, 333MHz, 1.33GB/s (PL)	
Reference Clocks	33.33MHz Reference Clock Oscillator, ±10ppm (PS) 100MHz Reference TCXO, ±5ppm (PL)	
FMC Interface	Adjustable V _{ADJ} replacing a resistor (1.8V default) - Z-7012S/15: 1.5V, 1.8V, 2.5V, 3.3V - Z-7030: 1.5V, 1.8V Zynq®-FMC interface signals: - 34x differential signal pairs LA[0:33] - 2x differential clocks - 1x GTP/GTX up to 6.25/3.75/6.6Gbps (Z-7012S/15/30) - System Management I2C	
Ethernet Interface	1000BASE-T, Rugged IP-68 RJ45 connector	
PCI Express Interface	Gen1 X1 (7015-1L) / Gen2 X1 (7012S-2, 7015-2, 7030-2L) Board edge connector	
JTAG Interface	Molex 14-pin Milli-Grid™ (Vertical or Right Angle)	
Power supply interface	Molex 6-pin Vertical Mini-Fit® Jr. (mating PCIe ATX connector)	
DC Supply Voltage (Vin)	+5V to +14V	Maximum Rating: -0.3V to +15V +12V required if used by FMC module
Current Consumption - Idle	0.2A (typ.)	@Vin=12V, T _A =25°C Heatsink, Natural Convention No FMC Module
Current Consumption - Dynamic (*)	0.30A to 0.63A (Z-7012S) 0.30A to 0.65A (Z-7015) 0.30A to 0.88A (Z-7030)	(*) FPGA utilisation dependant
Operating Board Temperature	-40°C to +85°C	
Board Dimensions	138.1mm x 82.4mm	
RoHS	Yes	Sn-Pb soldering available
Export Classification	EAR99, NLR	

Power Supply

The board is supplied via a Molex 6-pin Vertical Mini-Fit® Jr., mating standard +12V PCIe ATX interfaces. If not used with an FMC module requiring 12P0V input voltage, the board can be supplied with input voltages from +5V to +14V. After the power supply connector and before regulation, it implements a slow blow fuse for overcurrent protection following by an EMI filter.

The GigaExpress SBC supports full VITA 47 power specifications, allowing the connection of FMC modules demanding 1A@12V, 3A@3.3V and/or 2A@VADJ.

Environment & Thermal Management

The GigaExpress is designed for operating in harsh environmental conditions. It includes vibration robustness components, and a RJ45 connector compliant with IP68 applications per IEC 60529 specification.

The heatsink attached to the Zynq has a thermal resistance of 18°C/W at natural convection and 6°C/W at 250 LFM of ducted airflow. It uses PEMS and compression springs to ensure shock and vibration robustness.

The operating board temperature is from -40°C to +85°C. Figure 1 shows the estimated maximum operating ambient temperature as a function of the programmable logic utilisation for natural convection and ducted air flow.

Additional thermal management and cooling techniques may be required when using the GigaExpress as FMC carrier with high logic utilisation and a module sinking high current through the 3P3V and VADJ FMC interface.

The board is RoHS compliant; however, a Sn-Pb soldering is available if required for specific applications.

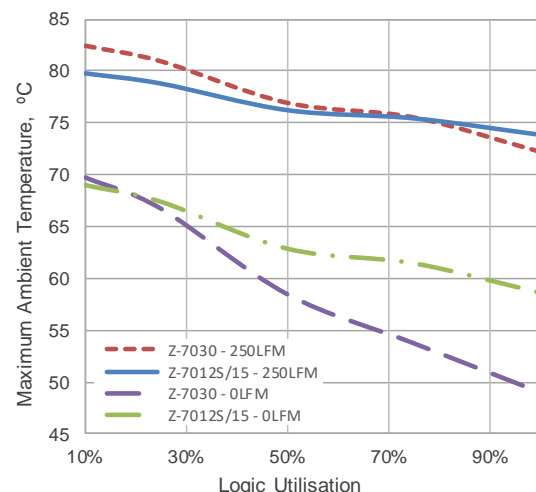


Figure 1. Maximum Operating Ambient Temperature vs Logic Utilisation (Heatsink, Still air & 250LFM)

Key Features

- Rugged FMC Carrier
- Zynq® 7012S/7015/7030
- Dual PS/PL DDR3 RAM
- Extended Temperature
- Small Form Factor
- lwIP Plug-in for GigaE-to-PL data transfer

Applications

- Embedded Computing
- Wideband Communications
- Image/Video Processing
- Software Acceleration
- Signal Processing
- VITA 57 Carrier Board
- On-board Equipment

Ordering Information

GigaExpress SBC variants and custom options includes:

- Zynq® device and associated PCIe speed.
- Vertical or Right-Angle versions of the JTAG and Power Supply connectors. Programming through the PCIe bracket requires the JTAG Right Angle version.
- Lead-Free or Sn-Pb soldering.

Part Numbering		GE	-	XXXXX	XXXX	-	I	X	XX
GigaExpress SBC									
Programmable Device									
7Z012S	Zynq XC7Z012S-2CLG485I								
7Z015	Zynq XC7Z015-L1CLG485I -2CLG485I								
7Z030	Zynq XC7Z030-L2SBG485I								
PCI Express Interface									
G1X1	Gen1, Link Width x1								
G2X1	Gen2, Link Width x1								
Temperature Range									
I	-40°C ... +85°C								
Connectors									
A	Vertical Headers								
B	Right-Angle Headers								
Lead Soldering									
LF	Lead-Free Soldering ✓RoHS								
PB	Sn-Pb Soldering								

Outline Drawing

Complete 3D models (step, iges) and drawings are available for download. Figure 2 outlines the GigaExpress SBC with the vertical headers option.

Kit Contents

- GigaExpress SBC Board.
- Heatsink with Threaded Standoffs (PEMS) and compression springs.
- Accessories:
 - 12V 4A AC/DC Adapter - Molex 6-pin connector
 - Cable Adapter - Molex 6-pin to 4-pin
 - PCIe Bracket
 - RJ45 Dust Cover
 - UNC 4-40 Screws and Spacers
- Board Documentation: User Manual, Test Report, CoC.
- Configuration Files:
 - Zynq PS Preset TCL File
 - UCF and XDC Constraints Files for PL RAM
 - MIG Configuration File for PL RAM

Related Products

GigaX API for Zynq SoC

This software API for Zynq PS enables high-speed GigaE to PL data transfer and TCP/UDP frames management up to 200 Mbps.

BERTEN provides support for a fast implementation of a VIVADO/SDK project including GigaX, providing instant access to FPGA processing of GigaE data.

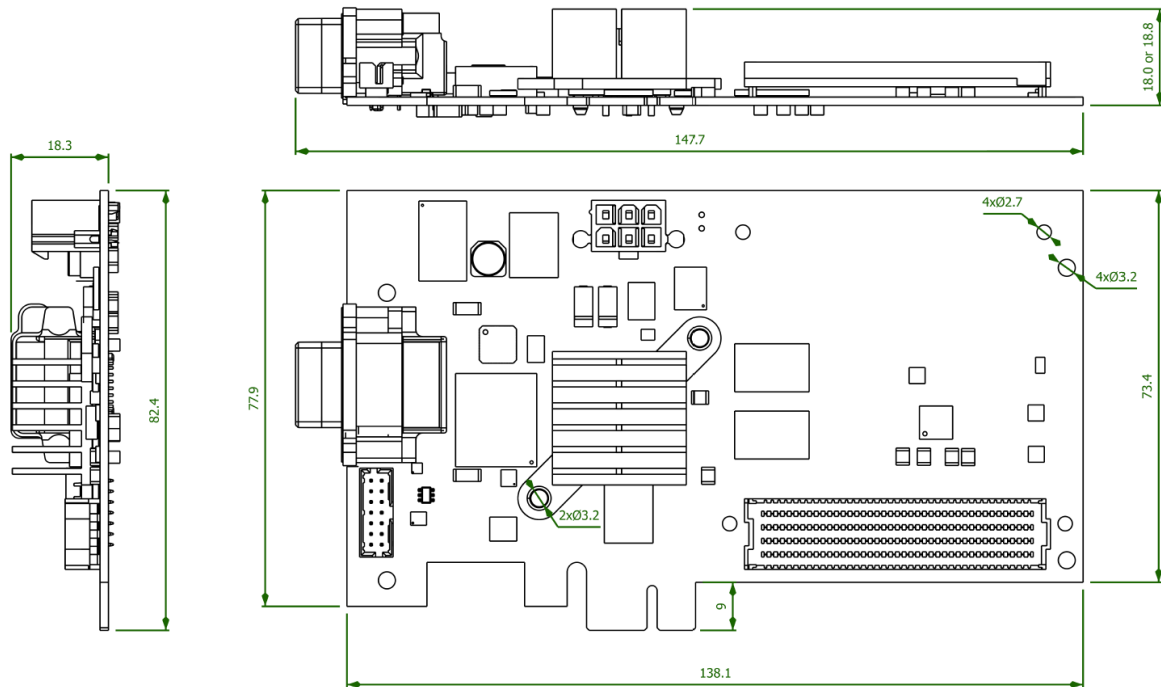


Figure 2. Outline Drawing with Vertical Header Connectors