



GEB Enterprise S.r.l.

General Electronics Business

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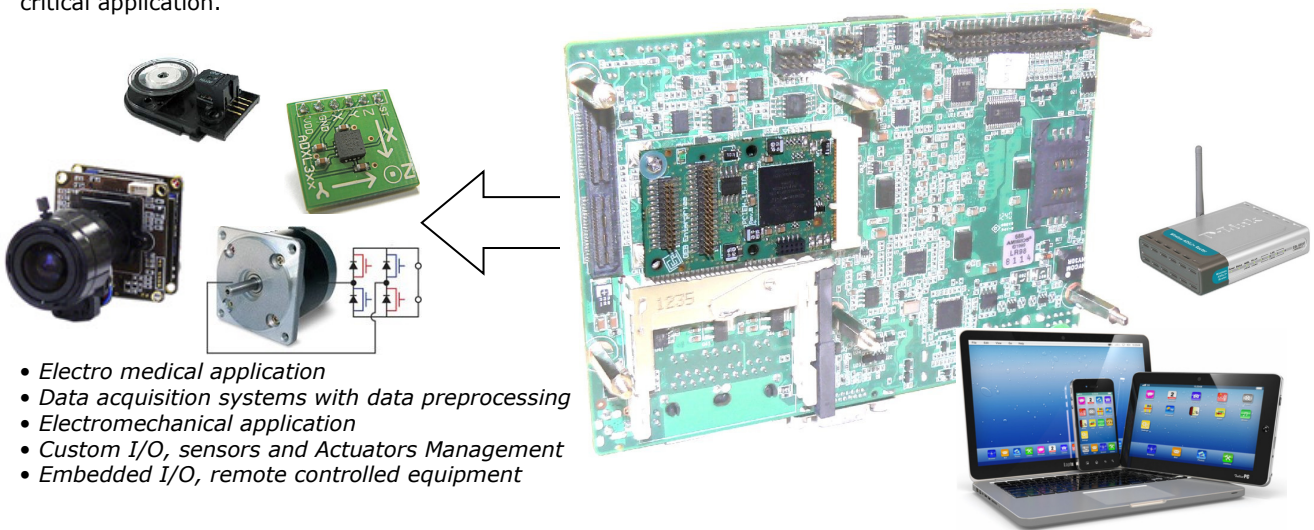
SOPC

System On Programmable Chip

SOPC PCI Express Family

Application

Typical applications are in all types of remote I/O controller with Industrial Motherboard SBC (Mini-Itx, 3.5" SBC...). The Fpga capability allow the SBC to interface all types of actuators and sensors with optional Hardware and/or Firmware (on NIOSII) and/or DSP preprocessing and with/without DMA capability to SBC memory. Optional FPGA NIOSII softcore can support custom instruction and a faster interrupt response (about 1-2us) to support processing/time critical application.



- Electro medical application
- Data acquisition systems with data preprocessing
- Electromechanical application
- Custom I/O, sensors and Actuators Management
- Embedded I/O, remote controlled equipment

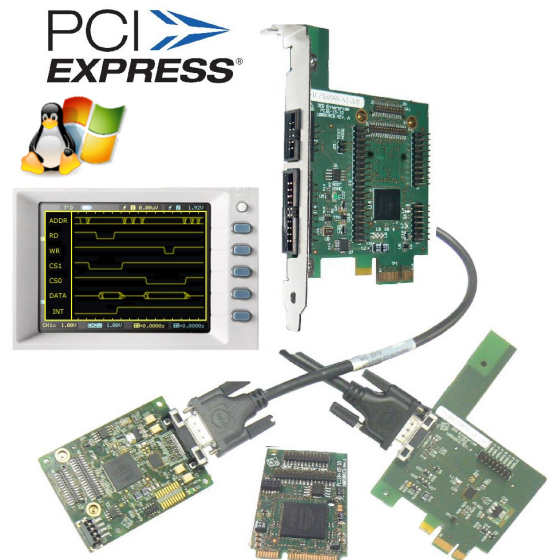
Overview

PCI (Peripheral Component Interconnect) Express (name PCIe) is a scalable I/O serial bus technology set to replace parallel PCI bus. In the next part of 2004 PCI Express slots began appearing on PC motherboard alongside standard slots, starting a gradual transition.

PCI Express has several advantages, it can be implemented as a unifying I/O structure for desktops, mobiles, servers, workstations and **embedded systems**, and it's cheaper than PCI or AGP based system board level implementation. This reduces the overall costs for consumers. It has been also designed for PCIe software drives compatibility with existing Operating Systems.

By physical point of view, PCI Express is a *point-to-point* connection cabling/wiring. PCIe also allows "hot swapping" or "hot plugging" and consumes less power than PCI bus. However the most important feature is its *scalability*: higher bandwidth can be achieved by adding "bus lanes," ostensibly future-proofing into the next decade. The initial rollout of PCI-Express provides three bus configurations: x1, x4, and x16, which represent the number of lanes. Each bus lane has a logical bi-directional behavior, physically implemented by two differential mono-directional RX/TX signals pairs. The data transfer rate supported by each bus lane is 250 Mbyte/s for each signal pair, corresponding to 500 Mbyte/s for each bus lane.

Currently, there are two most important PCIe extensions card available in the PCIe embedded application market: The first one is **PCIe MiniCard** that has a form factor smaller than standard PCIe board (about 30x50mm), the second one is the **PCIe on cable**, which allows to remote the PCIe peripheral devices up to 7 meters from the host and without any software add-on.

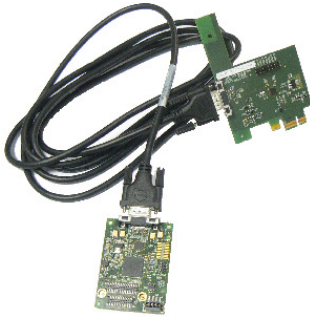


The MiniCard standard is also called Mini PCIe. The Minicard format has a small form factor board and is used to implement the PCI Express interface on remote interface. The card size is 30mm wide by 50.95mm long by 5mm high. The Minicard uses a 52-pin card edge connector, the card pins are PCB fingers placed at the smallest edge of the card.

PCI Express Mini Card (also known as Mini PCI Express, Mini PCIe, and Mini PCI-E) is a replacement for the Mini PCI form factor based on PCI Express. Its standard has been developed by the PCI-SIG organization. The host device supports PCI Express and USB connectivity, and each card can be used in both ways. There is a 52 pin edge connector, made of two staggered rows on a 0.8 mm pitch. Each row has 8 contacts, a contact-less gap of 4 contact spaces, then a further 18 contacts. A half-length card is also specified 30x26.8 mm. The cards have a thickness of 1.0 mm (excluding components). **Typical applications are in all types of remote I/O controller with Industrial Motherboard SBC (Mini-Itx, 3.5" SBC...).**

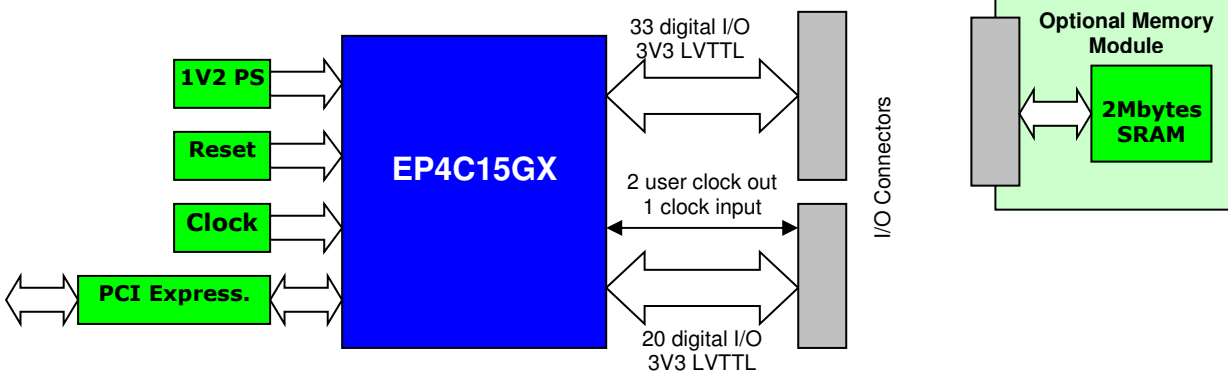


PCI Express External Cabling (also known as External PCI Express or Cabled PCI Express) specifications were released by the PCI-SIG in February 2007. Standard cables and connectors have been defined for x1, x4, x8, and x16 link widths, with a transfer rate of 500 Mbyte/s per lane. PCI Express Cable is a standard developed by the PCI-SIG to transmit the host PCI Express bus over a high-speed cable. This can be done internal to a system enclosure or external in a box-to-box type application. Using a PCIe cable is possible to extend the PCI Express bus up to seven meters from the host CPU complex and without any circuitry for suppressing the inherent noise. Transmitting the host bus over copper cables opens a new world to the embedded designer. The PCIe Cable allows splitting the host PCIe environment by the remote embedded I/O subsystems one. Moreover, the PCIe cable allows different form factors for both the host and I/O sub-system and according to their specific system requires. For example, a high-end, dual Intel Xeon class host system can provide the user with the computing power and a high-speed data link to a high-end embedded I/O subsystem based on MicroTCA, PC/104, 3U CompactPCI Express, or proprietary form factor.



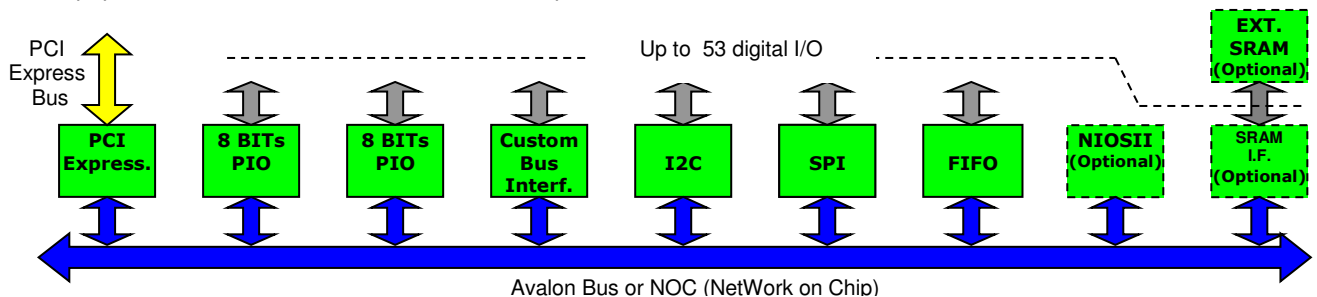
SOPC PCIe Cards Family Features

GEB High Performance System On Card (Sopc-Card) includes, all-in-one, whatever needed to start a PCIe design using the advanced features of Altera CycloneIV-GX family and features a socketed board with an **EP4CGX15** or **EP4CGX30** device in a BGA169 package.



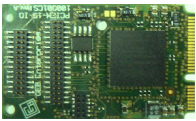
All technology FPGA, power management, distribution and decoupling, fine pitch or BGA package connection, multilayer PCB manufacturing, double side PCB mounting and testing requirements are met by Sopc-Card board. One programming interface port, on the board support in-system programming (ISP), and using Altera Byte Blaster and JTAG programming and testing, is available as well.

The hardware design can be easily implemented using SOPC builder or QSYS builder Altera tools, VHDL language or a combination them. Jungo driver tool supports Altera PCIe easy driver development under various Operative System such as popular Microsoft Windows series, Linux or specific RT/OS.



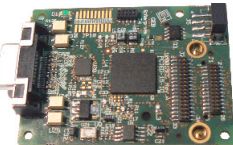
GEB Enterprise Boards and Systems

PClem-15-10



Mini-PCIe form factor, The best and cheapest solution for systems on box allows the user to control electrical interface of your SBC to external I/O resources (i.e. motors, transducers, sensor, CCD and so on). Altera Fpga provides the user with up to 53 general purpose I/O and 4 dedicated Clocks with PLL, up to 2Mbytes of on board SRAM, 80DSP blocks, about 30 or 15KLE FPGA resources. The product can be easily connected to your interface using low cost Samtec Cable. The mini JTAG connector allows the ISP programming using an ALTERA standard USB blaster. GEB can provide you with a cable adapter, free of charge, for connecting Altera programmer box. A lot of GEB standard systems can be implemented in the product. Altera QSYS allows the user to create a custom system in few minutes.

PCled-15-10

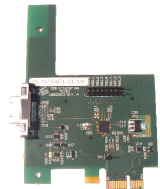


PCIe on Cable Downstream Board, The best and cheapest solution for **distributed system** allows the user to control the communication interfaces of your computer (i.e. Standard PCI, Laptop, PXI, SBC...) versus the external I/O resources (motors, transducers, sensor and so on). Altera Fpga provides the user with up to 53 general purpose I/O and 4 dedicated Clocks with PLL, up to 2Mbytes of on board SRAM, 80 DSP blocks, about 30 or 15KLE FPGA resources. The Board can be easily connected to the user interface by using a low cost Samtec Cable. Moreover, the product can be plugged as a daughter board on the user mother board using the high density

high reliability Samtec connector the product is provided with. Furthermore, a mini JTAG connector allows the user for ISP programming, and using an ALTERA standard USB blaster. GEB can provide the user with a cable adapter, free of charge, for connecting Altera programmer box. Most of GEB standard systems can be implemented in the product. Altera QSYS allows the user to create a custom system in few minutes.

PCleu

PCIe on Cable Upstream Board, The logical companion of PCIe boards family, interface PCIeX1 slot on computer for remote I/O PCIe compliant sub-systems. The product has a PCI standard size and is pluggable into DeskTop and MiniTower computers. Using a compatible PCIeX1 cable, the users are remote electromechanical hardware up to 7 meters. This system's distance can be also further extended by using cable repeaters.



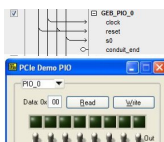
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PCI Board. This PCI standard form factor product is tailored to make sample more custom interfaces using it's Santa Cruz connectors to host every electrical interface. Altera Fpga can host the logical interface by up to 53 general purpose I/O and 4 dedicated Clocks with PLL, up to 2Mbytes of on board SRAM, 80 DSP blocks, about 30 or 15KLEFPGA resources.. A JTAG connector, available on the front panel, allows ISP programming using an ALTERA standard USB blaster. Most of GEB standard systems can be implemented. Altera allows the user to develop a custom system in few minutes.

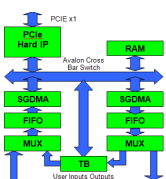
PCIe I/O

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Registers System

It is targeted for help the designers in the starting projects that requires control PCIe mapped registers used both to control I/O internal logic. The SDK includes the drivers and some demo and examples, avoiding a startup issues



PCIe Dma System

It is designed to help the designers in the starting phase of projects that requires fast DMA straight way in PC virtual memory. It includes a QSYS system with 2 SGDMA configured one in input and one in output that can be wired to your application hardware, a Test bench peripherals can be used to test the system and measure the performances, drivers, and demo program



PCIe IOBUS System

It is targeted to allow the users to connect on PCIe bus their hardware. The Fpga system is a bridge between the PCIe target interface hosted in the fpga and a general-purpose parallel bus 32 bits wide with user programmable timing in 16ns steps and user interrupt.

Customization Service

GEB is available to develop on PCIe boards the hardware/software subsystem to your needs, integrating your hardware blocks, analyzing and foreseeing the performance, developing the SOPC system and drivers on GEB or on Customer Boards. During the design, all know-how needed to maintain the system in the next years will be taught to the customers.

Features Summary

Board Name/ Features	PCIe-15-IO	PCIem-15-IO	PCIed-15-IO
Board Size standard reference	PCI Express	Mini-PCIe (30x51mm)	Custom 50x67mm
PCIe lanes	X1	X1	X1
Power supply voltages	3.3V +/- 5%	3.3V +/- 5%	3.3V +/- 5%
I/O connectors, 34+26 pins Dual Row 50 mills header connectors interface to Samtec FFSD cable or FLE connectors	YES	YES	YES
I/O connectors, 34+26 pins Dual Row 50 mills header connectors interface to Samtec CLP connectors	YES	YES	YES
I/O connectors, 60 pins High density with lock (Samtec QTH-030-01-L-D-A-RT1) interface to Samtec QSH-030-01-L-D-A-RT1 connectors	YES	NO	YES
SantaCruz Header Connector	YES	NO (*1)	NO (*1)
External Power Connector	NO	NO	YES
User LVTTTL 3V3 digital I/O channels, each with independent sense, drive, bi-directional, and tri-state capabilities	53	51+ WLED	53
User LVTTTL output Clocks (Osc. Clock/Clock with dedicated PLL)	1/1	1/1	1/1
User LVTTTL input Clocks with dedicated PLL	1	1	1
Fpga resource EP4CGX15BF14C7N versions	LE: 14,400 SRAM: 540Kbits PLLs: 3	LE: 14,400 SRAM: 540Kbits PLLs: 3	LE: 14,400 SRAM: 540Kbits PLLs: 3
Fpga resource EP4CGX30BF14C6N versions	LE: 29,440 SRAM: 1080Kbits PLLs: 4 DSP: 80 (18X18)	LE: 29,440 SRAM: 1080Kbits PLLs: 4 DSP: 80 (18X18)	LE: 29,440 SRAM: 1080Kbits PLLs: 4 DSP: 80 (18X18)
External ram resource (Optional)	2 Mbytes	2 Mbytes	2 Mbytes
Boot device with ISP (In System Programming)	YES	YES	YES
Power monitor and Reset	YES	YES	YES
Core Power Supply	YES	YES	YES
Crystal Oscillator	25MHz	25MHz	25MHz
Fully-compatible with JTAG/IEEE 1149.1 boundary-scan standard	STANDARD	MINI	MINI
Pheripheral to Host wake-up support	YES	YES	YES
Host to Pheripheral Remote Power On	NO	YES	NO
Operative temperature range	-40/+85 °C	-40/+85 °C	-40/+85 °C
Storage temperature range	-40/+150°C	-40/+150°C	-40/+150°C
Digital Output Level	Vol=0.4V max., Voh=2.4V min.	Vol=0.4V max., Voh=2.4V min.	Vol=0.4V max., Voh=2.4V min.
Digital Input Level	Vil=0.8V max., Vih=2.0V min.	Vil=0.8V max., Vih=2.0V min.	Vil=0.8V max., Vih=2.0V min.

(*1) SantaCruz interface can be supported by a mechanical adapter

Ordering Information (*2)

Product Name	GEB Code	Description
PCIEM-15-IO	100801A1	Mini-PCIe, 53 I/O, No External Ram, interface to Samtec CLP connectors
PCIEM-15-IO	100801A2	Mini-PCIe, 53 I/O, No External Ram, interface to Samtec FFSD or FLE connectors
PCIE-RAM	100996A1	2MBytes Memory module
PCIED-15-IO	100816A1	PCIe on cable downstream board, 53 I/O, No External Ram, interface to Samtec FFSD cable and QSH-030-01-L-D-A-RT1 connector
PCIEU-15-IO	100926A1	PCIe on cable upstream board
PCIEU-15-IO	100926A1	PCIe standard format, 53 I/O, No External Ram, interface to Samtec FFSD cable, QSH-030-01-L-D-A-RT1. One SantatCruz Header slot at 3V3 level.

(*2) The boards and System can bought online at Buy online <http://www.geb-enterprise-shop.com/>



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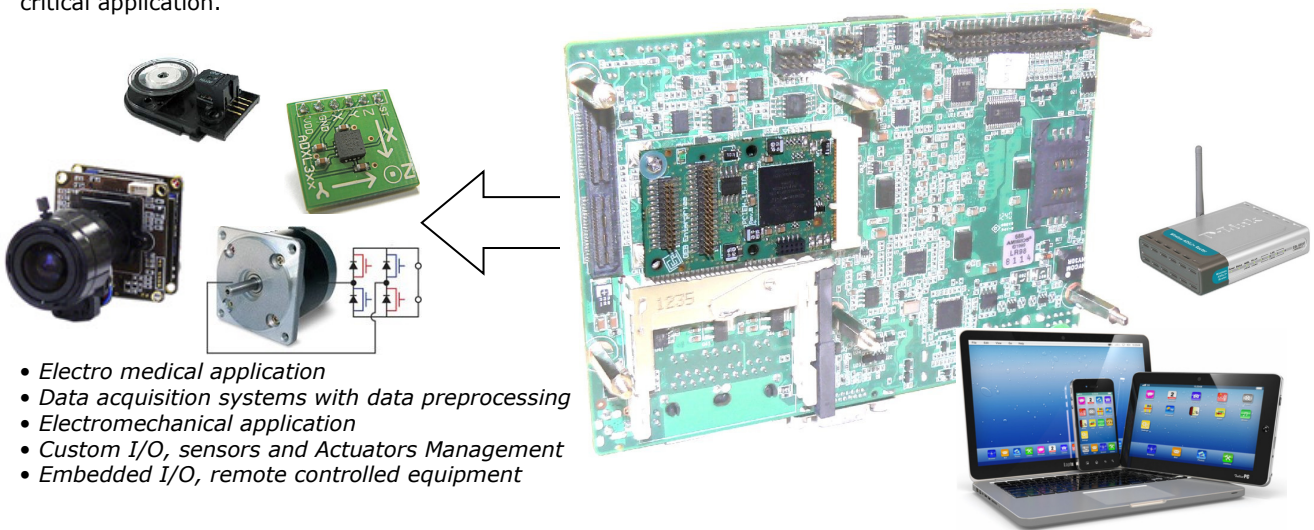
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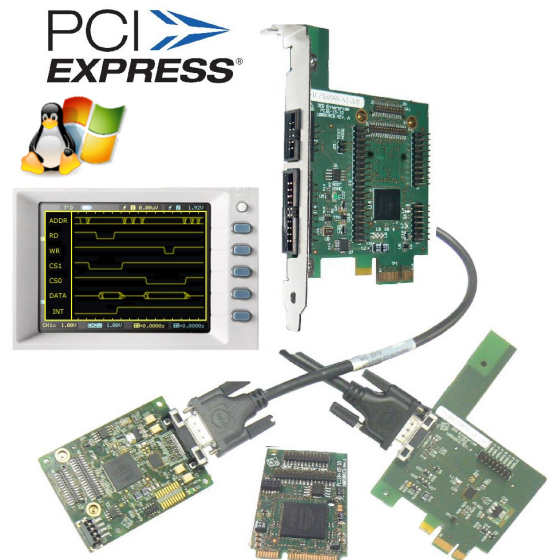
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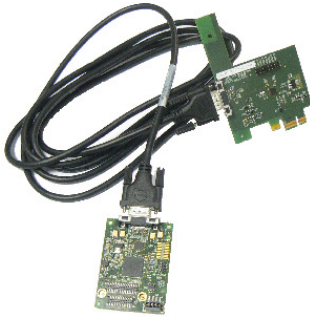


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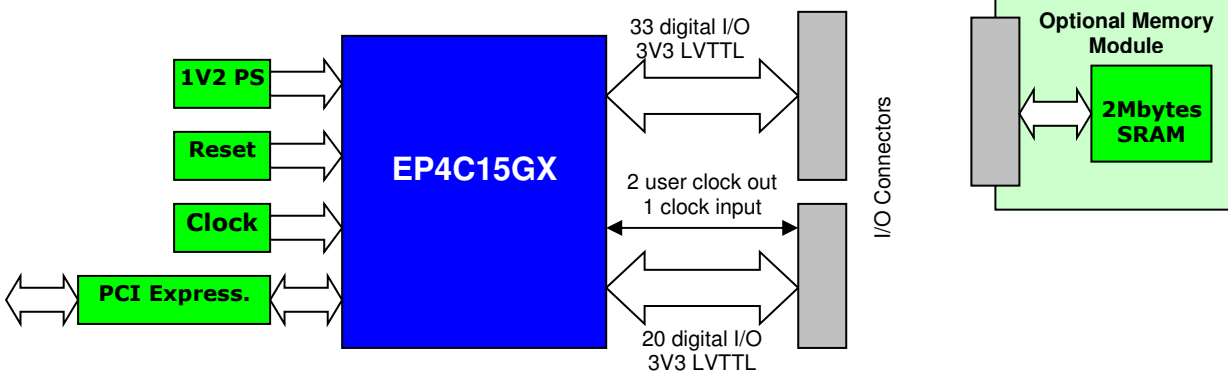


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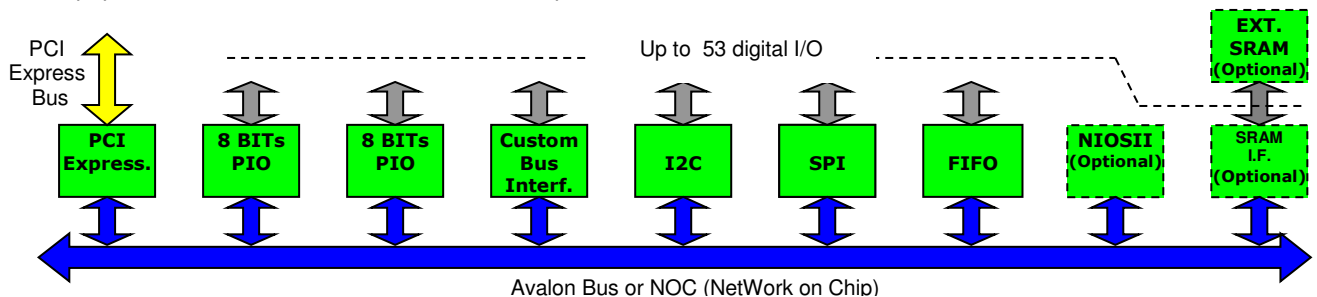
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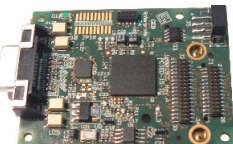
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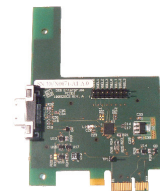


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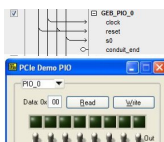
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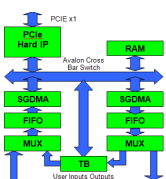
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Features Summary

Board Name/ Features	PCIe-15-IO	PCIem-15-IO	PCIed-15-IO
Board Size standard reference	PCI Express	Mini-PCIe (30x51mm)	Custom 50x67mm
PCIe lanes	X1	X1	X1
Power supply voltages	3.3V +/- 5%	3.3V +/- 5%	3.3V +/- 5%
I/O connectors, 34+26 pins Dual Row 50 mills header connectors interface to Samtec FFSD cable or FLE connectors	YES	YES	YES
I/O connectors, 34+26 pins Dual Row 50 mills header connectors interface to Samtec CLP connectors	YES	YES	YES
I/O connectors, 60 pins High density with lock (Samtec QTH-030-01-L-D-A-RT1) interface to Samtec QSH-030-01-L-D-A-RT1 connectors	YES	NO	YES
SantaCruz Header Connector	YES	NO (*1)	NO (*1)
External Power Connector	NO	NO	YES
User LVTTTL 3V3 digital I/O channels, each with independent sense, drive, bi-directional, and tri-state capabilities	53	51+ WLED	53
User LVTTTL output Clocks (Osc. Clock/Clock with dedicated PLL)	1/1	1/1	1/1
User LVTTTL input Clocks with dedicated PLL	1	1	1
Fpga resource EP4CGX15BF14C7N versions	LE: 14,400 SRAM: 540Kbits PLLs: 3	LE: 14,400 SRAM: 540Kbits PLLs: 3	LE: 14,400 SRAM: 540Kbits PLLs: 3
Fpga resource EP4CGX30BF14C6N versions	LE: 29,440 SRAM: 1080Kbits PLLs: 4 DSP: 80 (18X18)	LE: 29,440 SRAM: 1080Kbits PLLs: 4 DSP: 80 (18X18)	LE: 29,440 SRAM: 1080Kbits PLLs: 4 DSP: 80 (18X18)
External ram resource (Optional)	2 Mbytes	2 Mbytes	2 Mbytes
Boot device with ISP (In System Programming)	YES	YES	YES
Power monitor and Reset	YES	YES	YES
Core Power Supply	YES	YES	YES
Crystal Oscillator	25MHz	25MHz	25MHz
Fully-compatible with JTAG/IEEE 1149.1 boundary-scan standard	STANDARD	MINI	MINI
Pheripheral to Host wake-up support	YES	YES	YES
Host to Pheripheral Remote Power On	NO	YES	NO
Operative temperature range	-40/+85 °C	-40/+85 °C	-40/+85 °C
Storage temperature range	-40/+150°C	-40/+150°C	-40/+150°C
Digital Output Level	Vol=0.4V max., Voh=2.4V min.	Vol=0.4V max., Voh=2.4V min.	Vol=0.4V max., Voh=2.4V min.
Digital Input Level	Vil=0.8V max., Vih=2.0V min.	Vil=0.8V max., Vih=2.0V min.	Vil=0.8V max., Vih=2.0V min.

(*1) SantaCruz interface can be supported by a mechanical adapter

Ordering Information (*2)

Product Name	GEB Code	Description
PCIEM-15-IO	100801A1	Mini-PCIe, 53 I/O, No External Ram, interface to Samtec CLP connectors
PCIEM-15-IO	100801A2	Mini-PCIe, 53 I/O, No External Ram, interface to Samtec FFSD or FLE connectors
PCIE-RAM	100996A1	2MBytes Memory module
PCIED-15-IO	100816A1	PCIe on cable downstream board, 53 I/O, No External Ram, interface to Samtec FFSD cable and QSH-030-01-L-D-A-RT1 connector
PCIEU-15-IO	100926A1	PCIe on cable upstream board
PCIEU-15-IO	100926A1	PCIe standard format, 53 I/O, No External Ram, interface to Samtec FFSD cable, QSH-030-01-L-D-A-RT1. One SantatCruz Header slot at 3V3 level.

(*2) The boards and System can bought online at Buy online <http://www.geb-enterprise-shop.com/>



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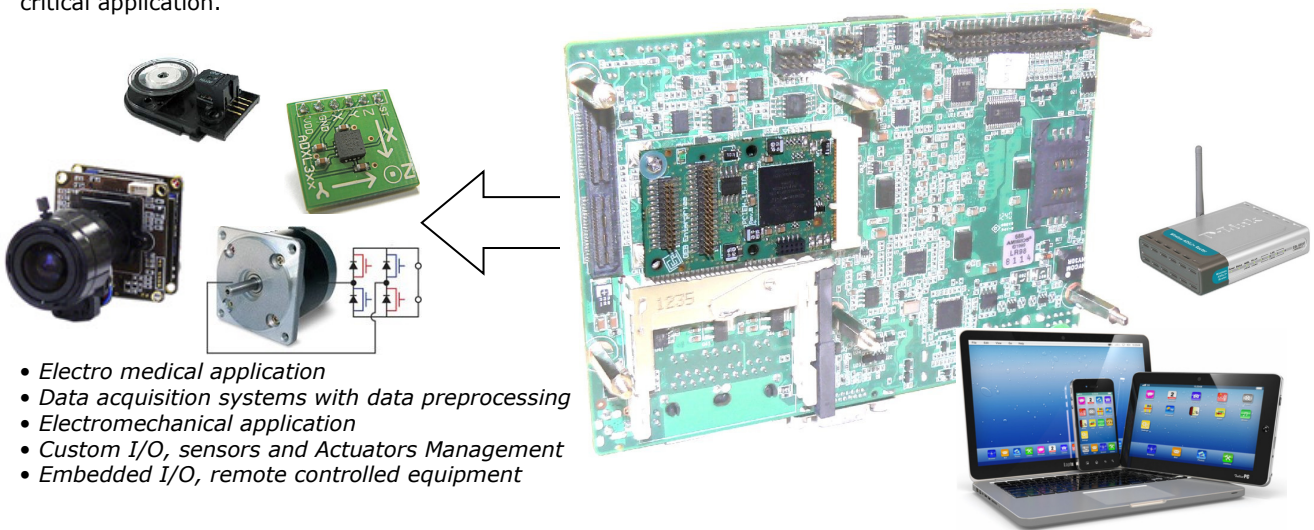
SOPC

System On Programmable Chip

SOPC PCI Express Family

Application

Typical applications are in all types of remote I/O controller with Industrial Motherboard SBC (Mini-Itx, 3.5" SBC...). The Fpga capability allow the SBC to interface all types of actuators and sensors with optional Hardware and/or Firmware (on NIOSII) and/or DSP preprocessing and with/without DMA capability to SBC memory. Optional FPGA NIOSII softcore can support custom instruction and a faster interrupt response (about 1-2us) to support processing/time critical application.



- Electro medical application
- Data acquisition systems with data preprocessing
- Electromechanical application
- Custom I/O, sensors and Actuators Management
- Embedded I/O, remote controlled equipment

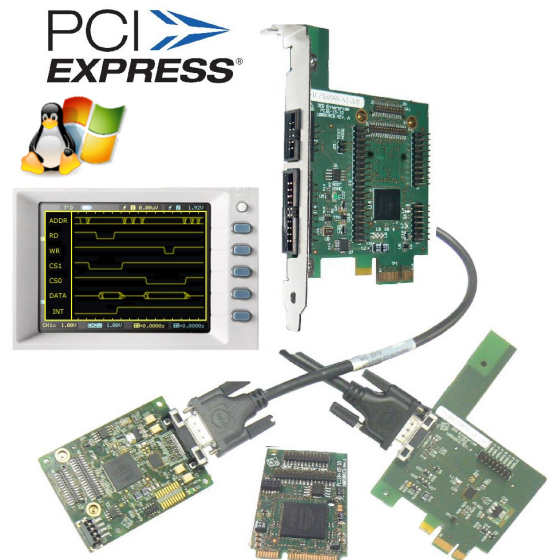
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PCI Express has several advantages, it can be implemented as a unifying I/O structure for desktops, mobiles, servers, workstations and **embedded systems**, and it's cheaper than PCI or AGP based system board level implementation. This reduces the overall costs for consumers. It has been also designed for PCIe software drives compatibility with existing Operating Systems.

By physical point of view, PCI Express is a *point-to-point* connection cabling/wiring. PCIe also allows "hot swapping" or "hot plugging" and consumes less power than PCI bus. However the most important feature is its *scalability*: higher bandwidth can be achieved by adding "bus lanes," ostensibly future-proofing into the next decade. The initial rollout of PCI-Express provides three bus configurations: x1, x4, and x16, which represent the number of lanes. Each bus lane has a logical bi-directional behavior, physically implemented by two differential mono-directional RX/TX signals pairs. The data transfer rate supported by each bus lane is 250 Mbyte/s for each signal pair, corresponding to 500 Mbyte/s for each bus lane.

Currently, there are two most important PCIe extensions card available in the PCIe embedded application market: The first one is **PCIe MiniCard** that has a form factor smaller than standard PCIe board (about 30x50mm), the second one is the **PCIe on cable**, which allows to remote the PCIe peripheral devices up to 7 meters from the host and without any software add-on.

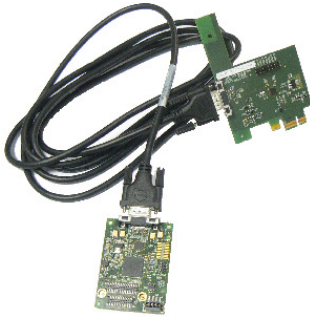


The MiniCard standard is also called Mini PCIe. The Minicard format has a small form factor board and is used to implement the PCI Express interface on remote interface. The card size is 30mm wide by 50.95mm long by 5mm high. The Minicard uses a 52-pin card edge connector, the card pins are PCB fingers placed at the smallest edge of the card.

PCI Express Mini Card (also known as Mini PCI Express, Mini PCIe, and Mini PCI-E) is a replacement for the Mini PCI form factor based on PCI Express. Its standard has been developed by the PCI-SIG organization. The host device supports PCI Express and USB connectivity, and each card can be used in both ways. There is a 52 pin edge connector, made of two staggered rows on a 0.8 mm pitch. Each row has 8 contacts, a contact-less gap of 4 contact spaces, then a further 18 contacts. A half-length card is also specified 30x26.8 mm. The cards have a thickness of 1.0 mm (excluding components). **Typical applications are in all types of remote I/O controller with Industrial Motherboard SBC (Mini-Itx, 3.5" SBC...).**

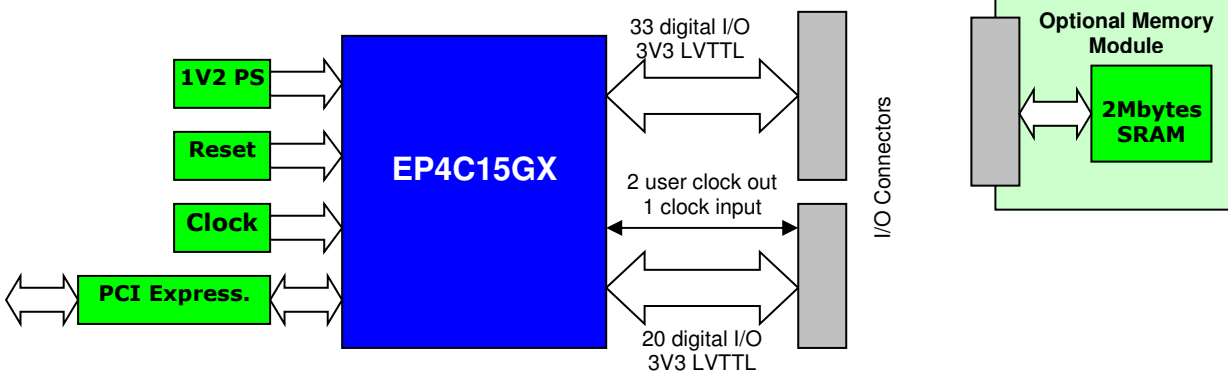


PCI Express External Cabling (also known as External PCI Express or Cabled PCI Express) specifications were released by the PCI-SIG in February 2007. Standard cables and connectors have been defined for x1, x4, x8, and x16 link widths, with a transfer rate of 500 Mbyte/s per lane. PCI Express Cable is a standard developed by the PCI-SIG to transmit the host PCI Express bus over a high-speed cable. This can be done internal to a system enclosure or external in a box-to-box type application. Using a PCIe cable is possible to extend the PCI Express bus up to seven meters from the host CPU complex and without any circuitry for suppressing the inherent noise. Transmitting the host bus over copper cables opens a new world to the embedded designer. The PCIe Cable allows splitting the host PCIe environment by the remote embedded I/O subsystems one. Moreover, the PCIe cable allows different form factors for both the host and I/O sub-system and according to their specific system requires. For example, a high-end, dual Intel Xeon class host system can provide the user with the computing power and a high-speed data link to a high-end embedded I/O subsystem based on MicroTCA, PC/104, 3U CompactPCI Express, or proprietary form factor.



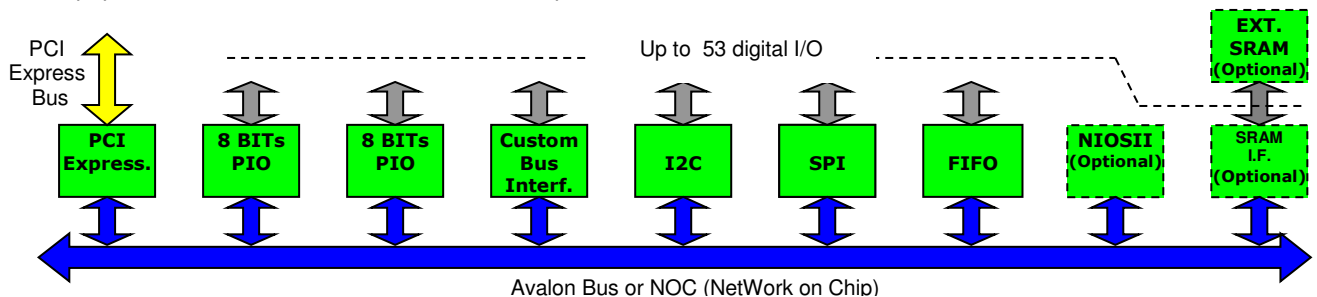
SOPC PCIe Cards Family Features

GEB High Performance System On Card (Sopc-Card) includes, all-in-one, whatever needed to start a PCIe design using the advanced features of Altera CycloneIV-GX family and features a socketed board with an **EP4CGX15** or **EP4CGX30** device in a BGA169 package.



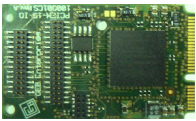
All technology FPGA, power management, distribution and decoupling, fine pitch or BGA package connection, multilayer PCB manufacturing, double side PCB mounting and testing requirements are met by Sopc-Card board. One programming interface port, on the board support in-system programming (ISP), and using Altera Byte Blaster and JTAG programming and testing, is available as well.

The hardware design can be easily implemented using SOPC builder or QSYS builder Altera tools, VHDL language or a combination them. Jungo driver tool supports Altera PCIe easy driver development under various Operative System such as popular Microsoft Windows series, Linux or specific RT/OS.



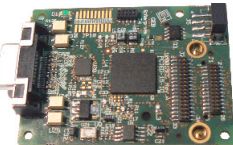
GEB Enterprise Boards and Systems

PClem-15-10



Mini-PCIe form factor, The best and cheapest solution for systems on box allows the user to control electrical interface of your SBC to external I/O resources (i.e. motors, transducers, sensor, CCD and so on). Altera Fpga provides the user with up to 53 general purpose I/O and 4 dedicated Clocks with PLL, up to 2Mbytes of on board SRAM, 80DSP blocks, about 30 or 15KLE FPGA resources. The product can be easily connected to your interface using low cost Samtec Cable. The mini JTAG connector allows the ISP programming using an ALTERA standard USB blaster. GEB can provide you with a cable adapter, free of charge, for connecting Altera programmer box. A lot of GEB standard systems can be implemented in the product. Altera QSYS allows the user to create a custom system in few minutes.

PCled-15-10

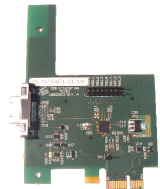


PCIe on Cable Downstream Board, The best and cheapest solution for **distributed system** allows the user to control the communication interfaces of your computer (i.e. Standard PCI, Laptop, PXI, SBC...) versus the external I/O resources (motors, transducers, sensor and so on). Altera Fpga provides the user with up to 53 general purpose I/O and 4 dedicated Clocks with PLL, up to 2Mbytes of on board SRAM, 80 DSP blocks, about 30 or 15KLE FPGA resources. The Board can be easily connected to the user interface by using a low cost Samtec Cable. Moreover, the product can be plugged as a daughter board on the user mother board using the high density

high reliability Samtec connector the product is provided with. Furthermore, a mini JTAG connector allows the user for ISP programming, and using an ALTERA standard USB blaster. GEB can provide the user with a cable adapter, free of charge, for connecting Altera programmer box. Most of GEB standard systems can be implemented in the product. Altera QSYS allows the user to create a custom system in few minutes.

PCleu

PCIe on Cable Upstream Board, The logical companion of PCIe boards family, interface PCIex1 slot on computer for remote I/O PCIe compliant sub-systems. The product has a PCI standard size and is pluggable into DeskTop and MiniTower computers. Using a compatible PCIeX1 cable, the users are remote electromechanical hardware up to 7 meters. This system's distance can be also further extended by using cable repeaters.



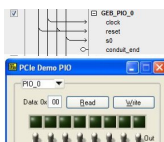
PCle-15-10

PCIe Board. This PCI standard form factor product is tailored to make sample more custom interfaces using it's Santa Cruz connectors to host every electrical interface. Altera Fpga can host the logical interface by up to 53 general purpose I/O and 4 dedicated Clocks with PLL, up to 2Mbytes of on board SRAM, 80 DSP blocks, about 30 or 15KLEFPGA resources.. A JTAG connector, available on the front panel, allows ISP programming using an ALTERA standard USB blaster. Most of GEB standard systems can be implemented. Altera allows the user to develop a custom system in few minutes.



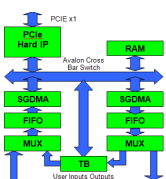
PCIe I/O

phase of pins or lot of



Registers System

It is targeted for help the designers in the starting projects that requires control PCIe mapped registers used both to control I/O internal logic. The SDK includes the drivers and some demo and examples, avoiding a startup issues



PCIe Dma System

It is designed to help the designers in the starting phase of projects that requires fast DMA straight way in PC virtual memory. It includes a QSYS system with 2 SGDMA configured one in input and one in output that can be wired to your application hardware, a Test bench peripherals can be used to test the system and measure the performances, drivers, and demo program



PCIe IOBUS System

It is targeted to allow the users to connect on PCIe bus their hardware. The Fpga system is a bridge between the PCIe target interface hosted in the fpga and a general-purpose parallel bus 32 bits wide with user programmable timing in 16ns steps and user interrupt.

Customization Service

GEB is available to develop on PCIe boards the hardware/software subsystem to your needs, integrating your hardware blocks, analyzing and foreseeing the performance, developing the SOPC system and drivers on GEB or on Customer Boards. During the design, all know-how needed to maintain the system in the next years will be taught to the customers.

Features Summary

Board Name/ Features	PCIe-15-IO	PCIem-15-IO	PCIed-15-IO
Board Size standard reference	PCI Express	Mini-PCIe (30x51mm)	Custom 50x67mm
PCIe lanes	X1	X1	X1
Power supply voltages	3.3V +/- 5%	3.3V +/- 5%	3.3V +/- 5%
I/O connectors, 34+26 pins Dual Row 50 mills header connectors interface to Samtec FFSD cable or FLE connectors	YES	YES	YES
I/O connectors, 34+26 pins Dual Row 50 mills header connectors interface to Samtec CLP connectors	YES	YES	YES
I/O connectors, 60 pins High density with lock (Samtec QTH-030-01-L-D-A-RT1) interface to Samtec QSH-030-01-L-D-A-RT1 connectors	YES	NO	YES
SantaCruz Header Connector	YES	NO (*1)	NO (*1)
External Power Connector	NO	NO	YES
User LVTTTL 3V3 digital I/O channels, each with independent sense, drive, bi-directional, and tri-state capabilities	53	51+ WLED	53
User LVTTTL output Clocks (Osc. Clock/Clock with dedicated PLL)	1/1	1/1	1/1
User LVTTTL input Clocks with dedicated PLL	1	1	1
Fpga resource EP4CGX15BF14C7N versions	LE: 14,400 SRAM: 540Kbits PLLs: 3	LE: 14,400 SRAM: 540Kbits PLLs: 3	LE: 14,400 SRAM: 540Kbits PLLs: 3
Fpga resource EP4CGX30BF14C6N versions	LE: 29,440 SRAM: 1080Kbits PLLs: 4 DSP: 80 (18X18)	LE: 29,440 SRAM: 1080Kbits PLLs: 4 DSP: 80 (18X18)	LE: 29,440 SRAM: 1080Kbits PLLs: 4 DSP: 80 (18X18)
External ram resource (Optional)	2 Mbytes	2 Mbytes	2 Mbytes
Boot device with ISP (In System Programming)	YES	YES	YES
Power monitor and Reset	YES	YES	YES
Core Power Supply	YES	YES	YES
Crystal Oscillator	25MHz	25MHz	25MHz
Fully-compatible with JTAG/IEEE 1149.1 boundary-scan standard	STANDARD	MINI	MINI
Pheripheral to Host wake-up support	YES	YES	YES
Host to Pheripheral Remote Power On	NO	YES	NO
Operative temperature range	-40/+85 °C	-40/+85 °C	-40/+85 °C
Storage temperature range	-40/+150°C	-40/+150°C	-40/+150°C
Digital Output Level	Vol=0.4V max., Voh=2.4V min.	Vol=0.4V max., Voh=2.4V min.	Vol=0.4V max., Voh=2.4V min.
Digital Input Level	Vil=0.8V max., Vih=2.0V min.	Vil=0.8V max., Vih=2.0V min.	Vil=0.8V max., Vih=2.0V min.

(*1) SantaCruz interface can be supported by a mechanical adapter

Ordering Information (*2)

Product Name	GEB Code	Description
PCIEM-15-IO	100801A1	Mini-PCIe, 53 I/O, No External Ram, interface to Samtec CLP connectors
PCIEM-15-IO	100801A2	Mini-PCIe, 53 I/O, No External Ram, interface to Samtec FFSD or FLE connectors
PCIE-RAM	100996A1	2MBytes Memory module
PCIED-15-IO	100816A1	PCIe on cable downstream board, 53 I/O, No External Ram, interface to Samtec FFSD cable and QSH-030-01-L-D-A-RT1 connector
PCIEU-15-IO	100926A1	PCIe on cable upstream board
PCIEU-15-IO	100926A1	PCIe standard format, 53 I/O, No External Ram, interface to Samtec FFSD cable, QSH-030-01-L-D-A-RT1. One SantatCruz Header slot at 3V3 level.

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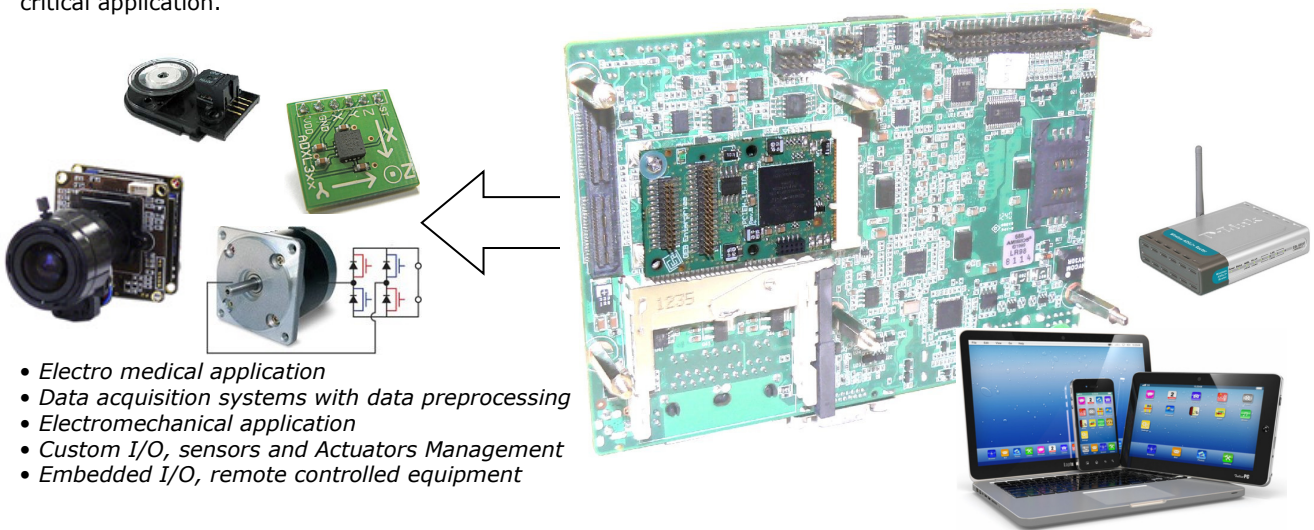
SOPC

System On Programmable Chip

SOPC PCI Express Family

Application

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- Electro medical application
- Data acquisition systems with data preprocessing
- Electromechanical application
- Custom I/O, sensors and Actuators Management
- Embedded I/O, remote controlled equipment

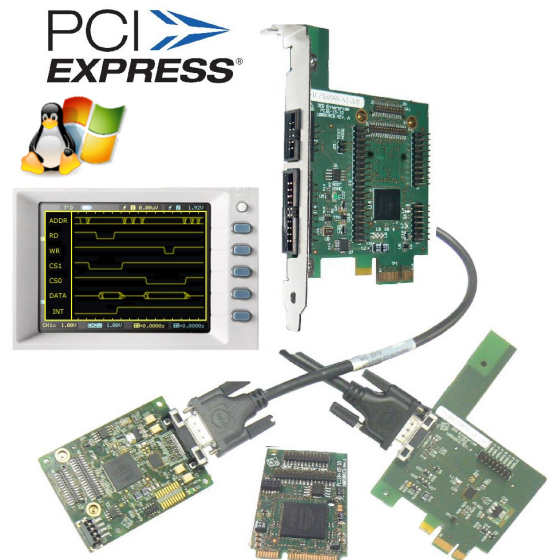
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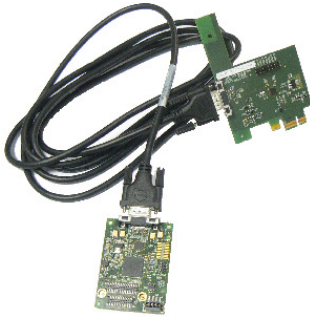


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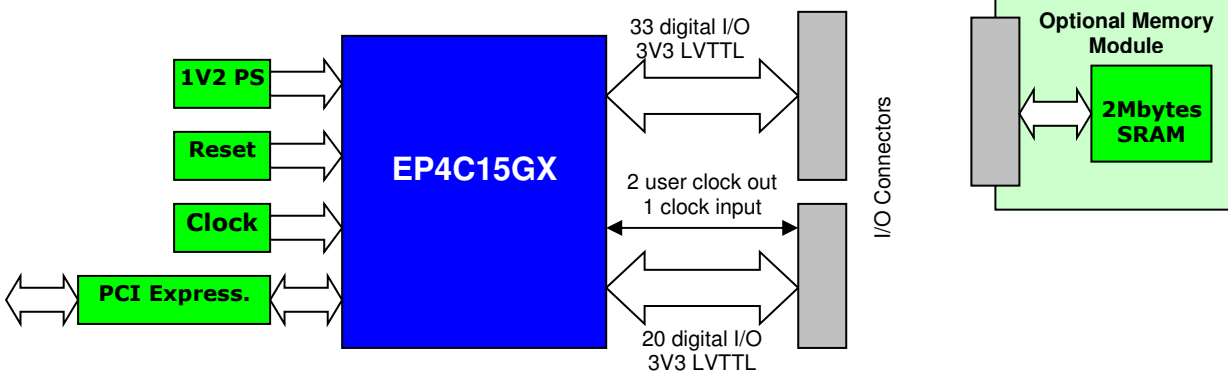


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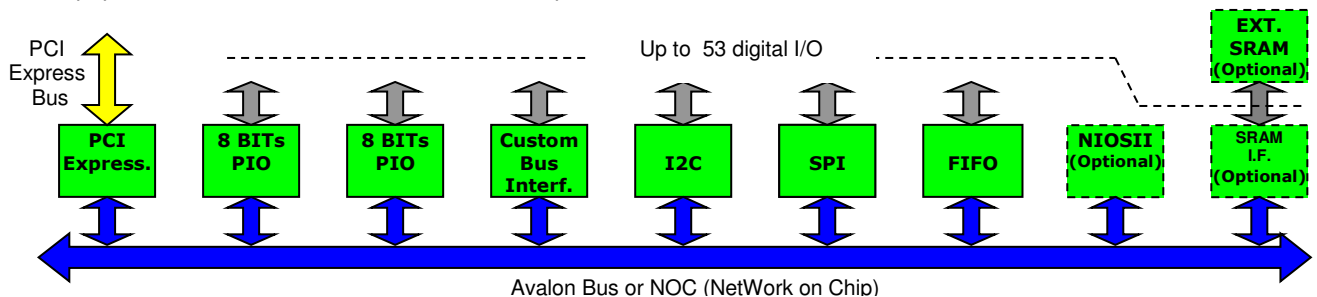
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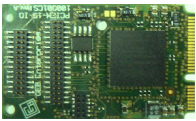
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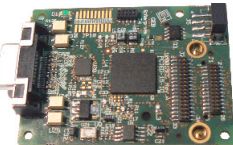
GEB Enterprise Boards and Systems

PClem-15-10



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PCled-15-10

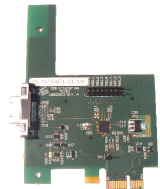


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PCleu

PCIe on Cable Upstream Board, The logical companion of PCIe boards family, interface PCIeX1 slot on computer for remote I/O PCIe compliant sub-systems. The product has a PCI standard size and is pluggable into DeskTop and MiniTower computers. Using a compatible PCIeX1 cable, the users are remote electromechanical hardware up to 7 meters. This system's distance can be also further extended by using cable repeaters.



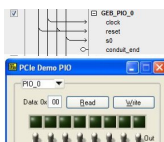
PCle-15-10

PCIe Board. This PCI standard form factor product is tailored to make sample more custom interfaces using it's Santa Cruz connectors to host every electrical interface. Altera Fpga can host the logical interface by up to 53 general purpose I/O and 4 dedicated Clocks with PLL, up to 2Mbytes of on board SRAM, 80 DSP blocks, about 30 or 15KLEFPGA resources.. A JTAG connector, available on the front panel, allows ISP programming using an ALTERA standard USB blaster. Most of GEB standard systems can be implemented. Altera allows the user to develop a custom system in few minutes.



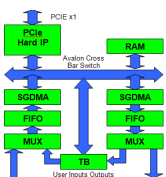
PCIe I/O

phase of pins or lot of



Registers System

It is targeted for help the designers in the starting projects that requires control PCIe mapped registers used both to control I/O internal logic. The SDK includes the drivers and some demo and examples, avoiding a startup issues



PCIe Dma System

It is designed to help the designers in the starting phase of projects that requires fast DMA straight way in PC virtual memory. It includes a QSYS system with 2 SGDMA configured one in input and one in output that can be wired to your application hardware, a Test bench peripherals can be used to test the system and measure the performances, drivers, and demo program



PCIe IOBUS System

It is targeted to allow the users to connect on PCIe bus their hardware. The Fpga system is a bridge between the PCIe target interface hosted in the fpga and a general-purpose parallel bus 32 bits wide with user programmable timing in 16ns steps and user interrupt.

Customization Service

GEB is available to develop on PCIe boards the hardware/software subsystem to your needs, integrating your hardware blocks, analyzing and foreseeing the performance, developing the SOPC system and drivers on GEB or on Customer Boards. During the design, all know-how needed to maintain the system in the next years will be taught to the customers.

Features Summary

Board Name/ Features	PCIe-15-IO	PCIem-15-IO	PCIed-15-IO
Board Size standard reference	PCI Express	Mini-PCIe (30x51mm)	Custom 50x67mm
PCIe lanes	X1	X1	X1
Power supply voltages	3.3V +/- 5%	3.3V +/- 5%	3.3V +/- 5%
I/O connectors, 34+26 pins Dual Row 50 mills header connectors interface to Samtec FFSD cable or FLE connectors	YES	YES	YES
I/O connectors, 34+26 pins Dual Row 50 mills header connectors interface to Samtec CLP connectors	YES	YES	YES
I/O connectors, 60 pins High density with lock (Samtec QTH-030-01-L-D-A-RT1) interface to Samtec QSH-030-01-L-D-A-RT1 connectors	YES	NO	YES
SantaCruz Header Connector	YES	NO (*1)	NO (*1)
External Power Connector	NO	NO	YES
User LVTTTL 3V3 digital I/O channels, each with independent sense, drive, bi-directional, and tri-state capabilities	53	51+ WLED	53
User LVTTTL output Clocks (Osc. Clock/Clock with dedicated PLL)	1/1	1/1	1/1
User LVTTTL input Clocks with dedicated PLL	1	1	1
Fpga resource EP4CGX15BF14C7N versions	LE: 14,400 SRAM: 540Kbits PLLs: 3	LE: 14,400 SRAM: 540Kbits PLLs: 3	LE: 14,400 SRAM: 540Kbits PLLs: 3
Fpga resource EP4CGX30BF14C6N versions	LE: 29,440 SRAM: 1080Kbits PLLs: 4 DSP: 80 (18X18)	LE: 29,440 SRAM: 1080Kbits PLLs: 4 DSP: 80 (18X18)	LE: 29,440 SRAM: 1080Kbits PLLs: 4 DSP: 80 (18X18)
External ram resource (Optional)	2 Mbytes	2 Mbytes	2 Mbytes
Boot device with ISP (In System Programming)	YES	YES	YES
Power monitor and Reset	YES	YES	YES
Core Power Supply	YES	YES	YES
Crystal Oscillator	25MHz	25MHz	25MHz
Fully-compatible with JTAG/IEEE 1149.1 boundary-scan standard	STANDARD	MINI	MINI
Pheripheral to Host wake-up support	YES	YES	YES
Host to Pheripheral Remote Power On	NO	YES	NO
Operative temperature range	-40/+85 °C	-40/+85 °C	-40/+85 °C
Storage temperature range	-40/+150°C	-40/+150°C	-40/+150°C
Digital Output Level	Vol=0.4V max., Voh=2.4V min.	Vol=0.4V max., Voh=2.4V min.	Vol=0.4V max., Voh=2.4V min.
Digital Input Level	Vil=0.8V max., Vih=2.0V min.	Vil=0.8V max., Vih=2.0V min.	Vil=0.8V max., Vih=2.0V min.

(*1) SantaCruz interface can be supported by a mechanical adapter

Ordering Information (*2)

Product Name	GEB Code	Description
PCIEM-15-IO	100801A1	Mini-PCIe, 53 I/O, No External Ram, interface to Samtec CLP connectors
PCIEM-15-IO	100801A2	Mini-PCIe, 53 I/O, No External Ram, interface to Samtec FFSD or FLE connectors
PCIE-RAM	100996A1	2MBytes Memory module
PCIED-15-IO	100816A1	PCIe on cable downstream board, 53 I/O, No External Ram, interface to Samtec FFSD cable and QSH-030-01-L-D-A-RT1 connector
PCIEU-15-IO	100926A1	PCIe on cable upstream board
PCIEU-15-IO	100926A1	PCIe standard format, 53 I/O, No External Ram, interface to Samtec FFSD cable, QSH-030-01-L-D-A-RT1. One SantatCruz Header slot at 3V3 level.

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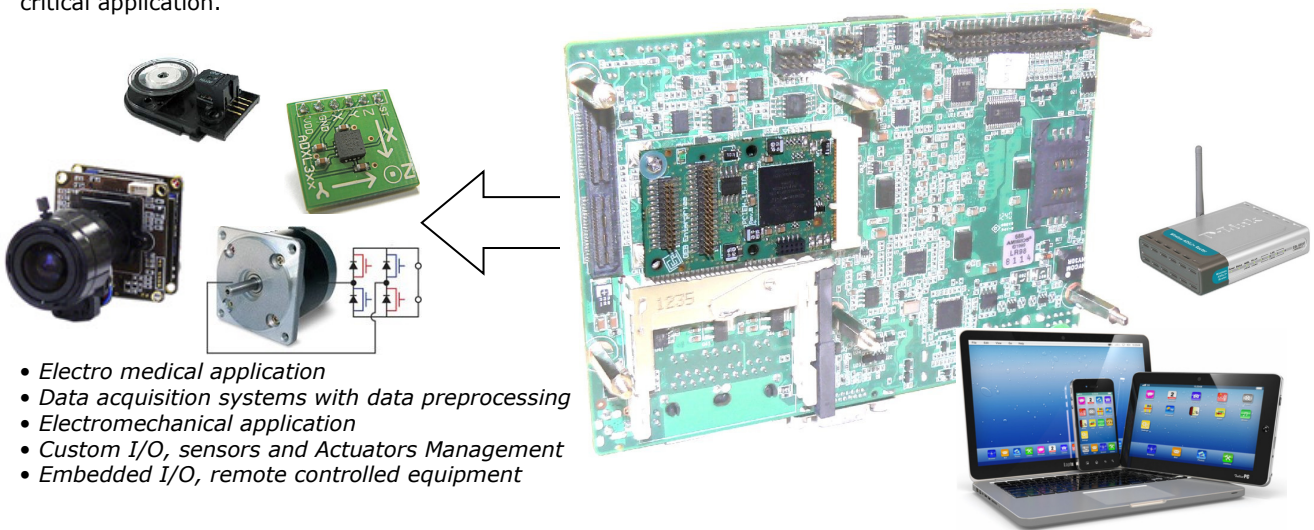
SOPC

System On Programmable Chip

SOPC PCI Express Family

Application

Typical applications are in all types of remote I/O controller with Industrial Motherboard SBC (Mini-Itx, 3.5" SBC...). The Fpga capability allow the SBC to interface all types of actuators and sensors with optional Hardware and/or Firmware (on NIOSII) and/or DSP preprocessing and with/without DMA capability to SBC memory. Optional FPGA NIOSII softcore can support custom instruction and a faster interrupt response (about 1-2us) to support processing/time critical application.



- Electro medical application
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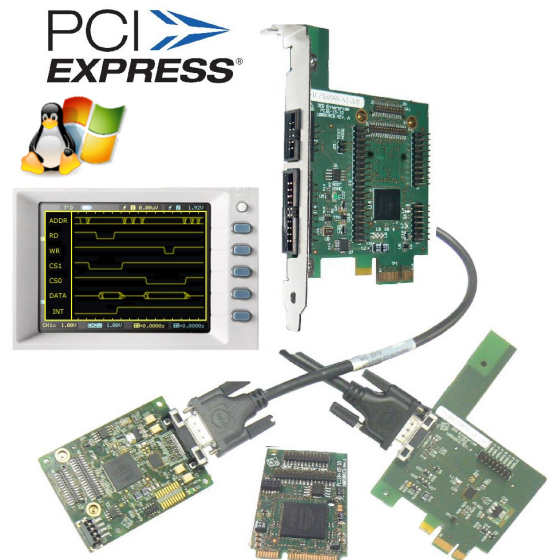
Overview

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PCI Express has several advantages, it can be implemented as a unifying I/O structure for desktops, mobiles, servers, workstations and **embedded systems**, and it's cheaper than PCI or AGP based system board level implementation. This reduces the overall costs for consumers. It has been also designed for PCIe software drives compatibility with existing Operating Systems.

By physical point of view, PCI Express is a *point-to-point* connection cabling/wiring. PCIe also allows "hot swapping" or "hot plugging" and consumes less power than PCI bus. However the most important feature is its *scalability*: higher bandwidth can be achieved by adding "bus lanes," ostensibly future-proofing into the next decade. The initial rollout of PCI-Express provides three bus configurations: x1, x4, and x16, which represent the number of lanes. Each bus lane has a logical bi-directional behavior, physically implemented by two differential mono-directional RX/TX signals pairs. The data transfer rate supported by each bus lane is 250 Mbyte/s for each signal pair, corresponding to 500 Mbyte/s for each bus lane.

Currently, there are two most important PCIe extensions card available in the PCIe embedded application market: The first one is **PCIe MiniCard** that has a form factor smaller than standard PCIe board (about 30x50mm), the second one is the **PCIe on cable**, which allows to remote the PCIe peripheral devices up to 7 meters from the host and without any software add-on.

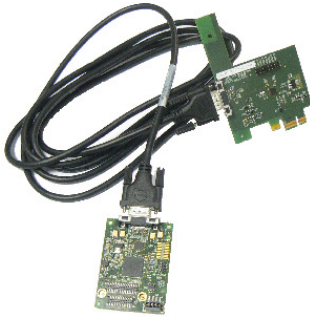


The MiniCard standard is also called Mini PCIe. The Minicard format has a small form factor board and is used to implement the PCI Express interface on remote interface. The card size is 30mm wide by 50.95mm long by 5mm high. The Minicard uses a 52-pin card edge connector, the card pins are PCB fingers placed at the smallest edge of the card.

PCI Express Mini Card (also known as Mini PCI Express, Mini PCIe, and Mini PCI-E) is a replacement for the Mini PCI form factor based on PCI Express. Its standard has been developed by the PCI-SIG organization. The host device supports PCI Express and USB connectivity, and each card can be used in both ways. There is a 52 pin edge connector, made of two staggered rows on a 0.8 mm pitch. Each row has 8 contacts, a contact-less gap of 4 contact spaces, then a further 18 contacts. A half-length card is also specified 30x26.8 mm. The cards have a thickness of 1.0 mm (excluding components). **Typical applications are in all types of remote I/O controller with Industrial Motherboard SBC (Mini-Itx, 3.5" SBC...).**

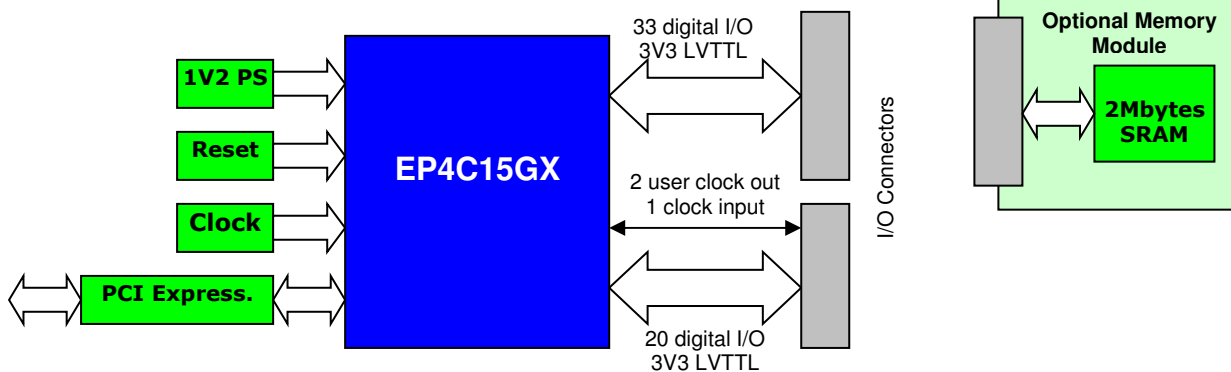


PCI Express External Cabling (also known as External PCI Express or Cabled PCI Express) specifications were released by the PCI-SIG in February 2007. Standard cables and connectors have been defined for x1, x4, x8, and x16 link widths, with a transfer rate of 500 Mbyte/s per lane. PCI Express Cable is a standard developed by the PCI-SIG to transmit the host PCI Express bus over a high-speed cable. This can be done internal to a system enclosure or external in a box-to-box type application. Using a PCIe cable is possible to extend the PCI Express bus up to seven meters from the host CPU complex and without any circuitry for suppressing the inherent noise. Transmitting the host bus over copper cables opens a new world to the embedded designer. The PCIe Cable allows splitting the host PCIe environment by the remote embedded I/O subsystems one. Moreover, the PCIe cable allows different form factors for both the host and I/O sub-system and according to their specific system requires. For example, a high-end, dual Intel Xeon class host system can provide the user with the computing power and a high-speed data link to a high-end embedded I/O subsystem based on MicroTCA, PC/104, 3U CompactPCI Express, or proprietary form factor.



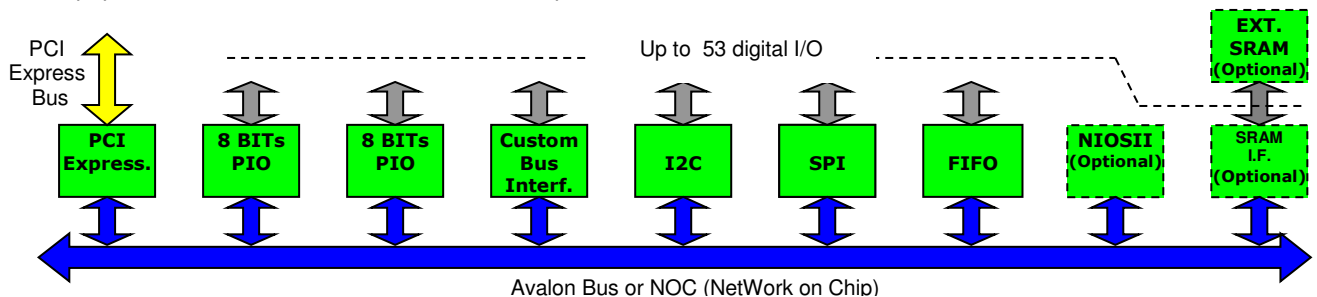
SOPC PCIe Cards Family Features

GEB High Performance System On Card (Sopc-Card) includes, all-in-one, whatever needed to start a PCIe design using the advanced features of Altera CycloneIV-GX family and features a socketed board with an **EP4CGX15** or **EP4CGX30** device in a BGA169 package.



All technology FPGA, power management, distribution and decoupling, fine pitch or BGA package connection, multilayer PCB manufacturing, double side PCB mounting and testing requirements are met by Sopc-Card board. One programming interface port, on the board support in-system programming (ISP), and using Altera Byte Blaster and JTAG programming and testing, is available as well.

The hardware design can be easily implemented using SOPC builder or QSYS builder Altera tools, VHDL language or a combination them. Jungo driver tool supports Altera PCIe easy driver development under various Operative System such as popular Microsoft Windows series, Linux or specific RT/OS.



GEB Enterprise Boards and Systems

PCIem-15-10



Mini-PCIe form factor, The best and cheapest solution for systems on box allows the user to control electrical interface of your SBC to external I/O resources (i.e. motors, transducers, sensor, CCD and so on). Altera Fpga provides the user with up to 53 general purpose I/O and 4 dedicated Clocks with PLL, up to 2Mbytes of on board SRAM, 80DSP blocks, about 30 or 15KLE FPGA resources. The product can be easily connected to your interface using low cost Samtec Cable. The mini JTAG connector allows the ISP programming using an ALTERA standard USB blaster. GEB can provide you with a cable adapter, free of charge, for connecting Altera programmer box. A lot of GEB standard systems can be implemented in the product. Altera QSYS allows the user to create a custom system in few minutes.

PCled-15-10

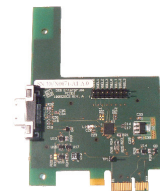


PCIe on Cable Downstream Board, The best and cheapest solution for **distributed system** allows the user to control the communication interfaces of your computer (i.e. Standard PCI, Laptop, PXI, SBC...) versus the external I/O resources (motors, transducers, sensor and so on). Altera Fpga provides the user with up to 53 general purpose I/O and 4 dedicated Clocks with PLL, up to 2Mbytes of on board SRAM, 80 DSP blocks, about 30 or 15KLE FPGA resources. The Board can be easily connected to the user interface by using a low cost Samtec Cable. Moreover, the product can be plugged as a daughter board on the user mother board using the high density

high reliability Samtec connector the product is provided with. Furthermore, a mini JTAG connector allows the user for ISP programming, and using an ALTERA standard USB blaster. GEB can provide the user with a cable adapter, free of charge, for connecting Altera programmer box. Most of GEB standard systems can be implemented in the product. Altera QSYS allows the user to create a custom system in few minutes.

PCIeu

PCIe on Cable Upstream Board, The logical companion of PCIe boards family, interface PCIeX1 slot on computer for remote I/O PCIe compliant sub-systems. The product has a PCI standard size and is pluggable into DeskTop and MiniTower computers. Using a compatible PCIeX1 cable, the users are remote electromechanical hardware up to 7 meters. This system's distance can be also further extended by using cable repeaters.



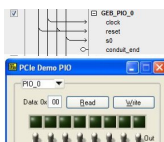
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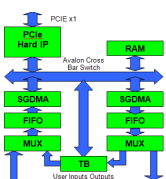
PCIe I/O

phase of pins or lot of



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It is targeted for help the designers in the starting projects that requires control PCIe mapped registers used both to control I/O internal logic. The SDK includes the drivers and some demo and examples, avoiding a startup issues



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It is designed to help the designers in the starting phase of projects that requires fast DMA straight way in PC virtual memory. It includes a QSYS system with 2 SGDMA configured one in input and one in output that can be wired to your application hardware, a Test bench peripherals can be used to test the system and measure the performances, drivers, and demo program



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Customization Service

GEB is available to develop on PCIe boards the hardware/software subsystem to your needs, integrating your hardware blocks, analyzing and foreseeing the performance, developing the SOPC system and drivers on GEB or on Customer Boards. During the design, all know-how needed to maintain the system in the next years will be taught to the customers.

Features Summary

Board Name/ Features	PCIe-15-IO	PCIem-15-IO	PCIed-15-IO
Board Size standard reference	PCI Express	Mini-PCIe (30x51mm)	Custom 50x67mm
PCIe lanes	X1	X1	X1
Power supply voltages	3.3V +/- 5%	3.3V +/- 5%	3.3V +/- 5%
I/O connectors, 34+26 pins Dual Row 50 mills header connectors interface to Samtec FFSD cable or FLE connectors	YES	YES	YES
I/O connectors, 34+26 pins Dual Row 50 mills header connectors interface to Samtec CLP connectors	YES	YES	YES
I/O connectors, 60 pins High density with lock (Samtec QTH-030-01-L-D-A-RT1) interface to Samtec QSH-030-01-L-D-A-RT1 connectors	YES	NO	YES
SantaCruz Header Connector	YES	NO (*1)	NO (*1)
External Power Connector	NO	NO	YES
User LVTTTL 3V3 digital I/O channels, each with independent sense, drive, bi-directional, and tri-state capabilities	53	51+ WLED	53
User LVTTTL output Clocks (Osc. Clock/Clock with dedicated PLL)	1/1	1/1	1/1
User LVTTTL input Clocks with dedicated PLL	1	1	1
Fpga resource EP4CGX15BF14C7N versions	LE: 14,400 SRAM: 540Kbits PLLs: 3	LE: 14,400 SRAM: 540Kbits PLLs: 3	LE: 14,400 SRAM: 540Kbits PLLs: 3
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External ram resource (Optional)	2 Mbytes	2 Mbytes	2 Mbytes
Boot device with ISP (In System Programming)	YES	YES	YES
Power monitor and Reset	YES	YES	YES
Core Power Supply	YES	YES	YES
Crystal Oscillator	25MHz	25MHz	25MHz
Fully-compatible with JTAG/IEEE 1149.1 boundary-scan standard	STANDARD	MINI	MINI
Pheripheral to Host wake-up support	YES	YES	YES
Host to Pheripheral Remote Power On	NO	YES	NO
Operative temperature range	-40/+85 °C	-40/+85 °C	-40/+85 °C
Storage temperature range	-40/+150°C	-40/+150°C	-40/+150°C
Digital Output Level	Vol=0.4V max., Voh=2.4V min.	Vol=0.4V max., Voh=2.4V min.	Vol=0.4V max., Voh=2.4V min.
Digital Input Level	Vil=0.8V max., Vih=2.0V min.	Vil=0.8V max., Vih=2.0V min.	Vil=0.8V max., Vih=2.0V min.

(*1) SantaCruz interface can be supported by a mechanical adapter

Ordering Information (*2)

Product Name	GEB Code	Description
PCIEM-15-IO	100801A1	Mini-PCIe, 53 I/O, No External Ram, interface to Samtec CLP connectors
PCIEM-15-IO	100801A2	Mini-PCIe, 53 I/O, No External Ram, interface to Samtec FFSD or FLE connectors
PCIE-RAM	100996A1	2MBytes Memory module
PCIED-15-IO	100816A1	PCIe on cable downstream board, 53 I/O, No External Ram, interface to Samtec FFSD cable and QSH-030-01-L-D-A-RT1 connector
PCIEU-15-IO	100926A1	PCIe on cable upstream board
PCIEU-15-IO	100926A1	PCIe standard format, 53 I/O, No External Ram, interface to Samtec FFSD cable, QSH-030-01-L-D-A-RT1. One SantatCruz Header slot at 3V3 level.

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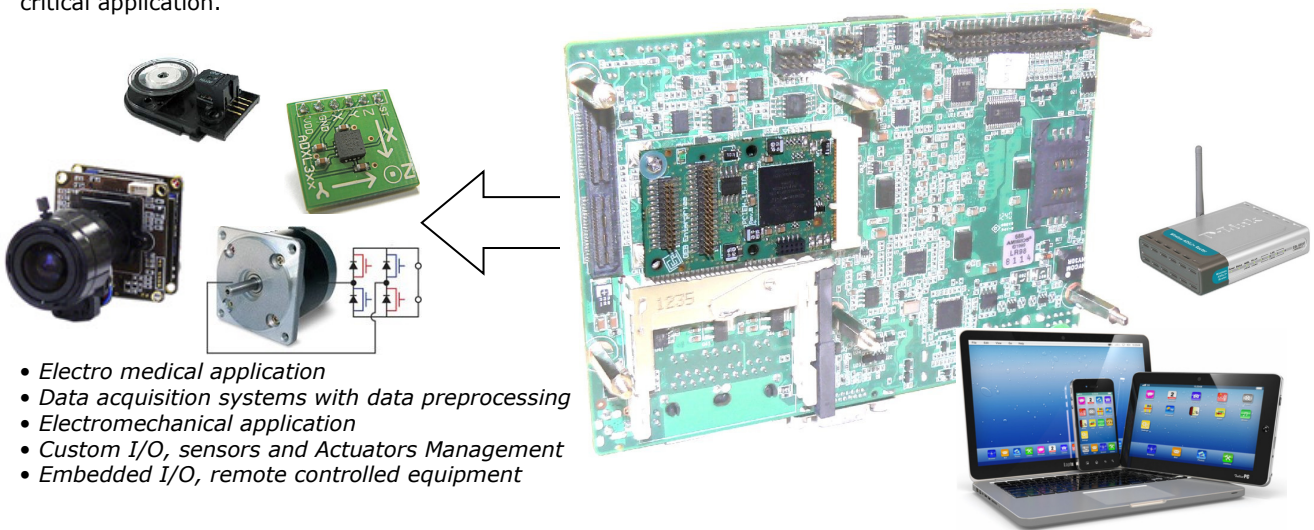
SOPC

System On Programmable Chip

SOPC PCI Express Family

Application

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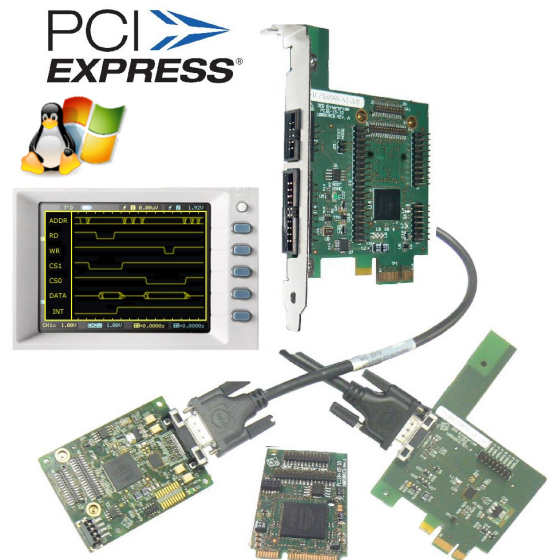
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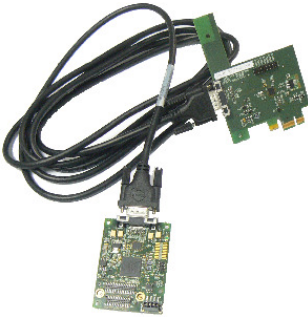


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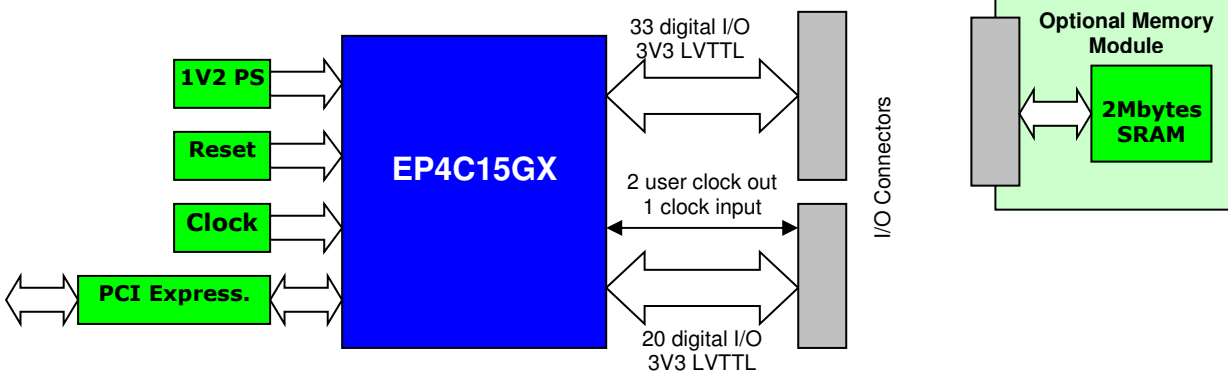


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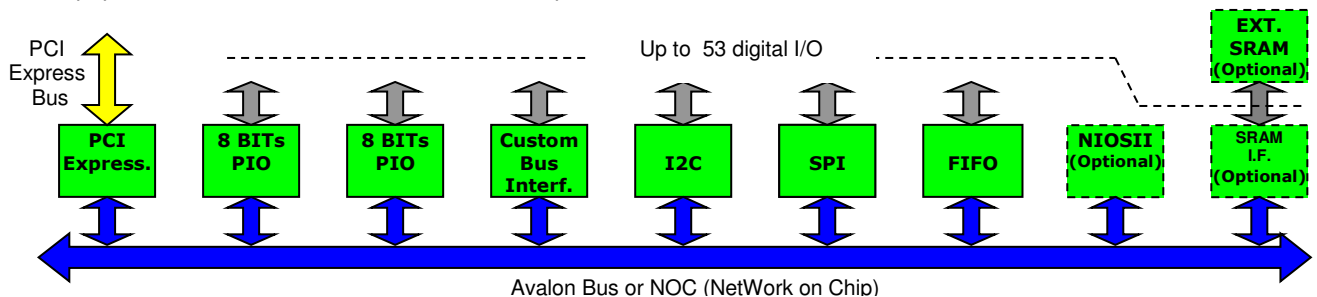
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All technology FPGA, power management, distribution and decoupling, fine pitch or BGA package connection, multilayer PCB manufacturing, double side PCB mounting and testing requirements are met by Sopc-Card board. One programming interface port, on the board support in-system programming (ISP), and using Altera Byte Blaster and JTAG programming and testing, is available as well.

The hardware design can be easily implemented using SOPC builder or QSYS builder Altera tools, VHDL language or a combination them. Jungo driver tool supports Altera PCIe easy driver development under various Operative System such as popular Microsoft Windows series, Linux or specific RT/OS.



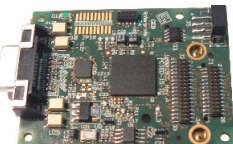
GEB Enterprise Boards and Systems

PClem-15-10



Mini-PCIe form factor, The best and cheapest solution for systems on box allows the user to control electrical interface of your SBC to external I/O resources (i.e. motors, transducers, sensor, CCD and so on). Altera Fpga provides the user with up to 53 general purpose I/O and 4 dedicated Clocks with PLL, up to 2Mbytes of on board SRAM, 80DSP blocks, about 30 or 15KLE FPGA resources. The product can be easily connected to your interface using low cost Samtec Cable. The mini JTAG connector allows the ISP programming using an ALTERA standard USB blaster. GEB can provide you with a cable adapter, free of charge, for connecting Altera programmer box. A lot of GEB standard systems can be implemented in the product. Altera QSYS allows the user to create a custom system in few minutes.

PCled-15-10

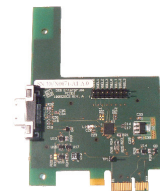


PCIe on Cable Downstream Board, The best and cheapest solution for **distributed system** allows the user to control the communication interfaces of your computer (i.e. Standard PCI, Laptop, PXI, SBC...) versus the external I/O resources (motors, transducers, sensor and so on). Altera Fpga provides the user with up to 53 general purpose I/O and 4 dedicated Clocks with PLL, up to 2Mbytes of on board SRAM, 80 DSP blocks, about 30 or 15KLE FPGA resources. The Board can be easily connected to the user interface by using a low cost Samtec Cable. Moreover, the product can be plugged as a daughter board on the user mother board using the high density

high reliability Samtec connector the product is provided with. Furthermore, a mini JTAG connector allows the user for ISP programming, and using an ALTERA standard USB blaster. GEB can provide the user with a cable adapter, free of charge, for connecting Altera programmer box. Most of GEB standard systems can be implemented in the product. Altera QSYS allows the user to create a custom system in few minutes.

PCleu

PCIe on Cable Upstream Board, The logical companion of PCIe boards family, interface PCIeX1 slot on computer for remote I/O PCIe compliant sub-systems. The product has a PCI standard size and is pluggable into DeskTop and MiniTower computers. Using a compatible PCIeX1 cable, the users are remote electromechanical hardware up to 7 meters. This system's distance can be also further extended by using cable repeaters.



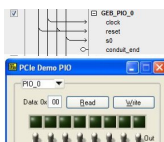
PCle-15-10

PCIe Board. This PCI standard form factor product is tailored to make sample more custom interfaces using it's Santa Cruz connectors to host every electrical interface. Altera Fpga can host the logical interface by up to 53 general purpose I/O and 4 dedicated Clocks with PLL, up to 2Mbytes of on board SRAM, 80 DSP blocks, about 30 or 15KLEFPGA resources.. A JTAG connector, available on the front panel, allows ISP programming using an ALTERA standard USB blaster. Most of GEB standard systems can be implemented. Altera allows the user to develop a custom system in few minutes.



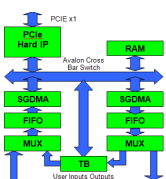
PCIe I/O

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Registers System

It is targeted for help the designers in the starting projects that requires control PCIe mapped registers used both to control I/O internal logic. The SDK includes the drivers and some demo and examples, avoiding a startup issues



PCIe Dma System

It is designed to help the designers in the starting phase of projects that requires fast DMA straight way in PC virtual memory. It includes a QSYS system with 2 SGDMA configured one in input and one in output that can be wired to your application hardware, a Test bench peripherals can be used to test the system and measure the performances, drivers, and demo program



PCIe IOBUS System

It is targeted to allow the users to connect on PCIe bus their hardware. The Fpga system is a bridge between the PCIe target interface hosted in the fpga and a general-purpose parallel bus 32 bits wide with user programmable timing in 16ns steps and user interrupt.

Customization Service

GEB is available to develop on PCIe boards the hardware/software subsystem to your needs, integrating your hardware blocks, analyzing and foreseeing the performance, developing the SOPC system and drivers on GEB or on Customer Boards. During the design, all know-how needed to maintain the system in the next years will be taught to the customers.

Features Summary

Board Name/ Features	PCIe-15-IO	PCIem-15-IO	PCIed-15-IO
Board Size standard reference	PCI Express	Mini-PCIe (30x51mm)	Custom 50x67mm
PCIe lanes	X1	X1	X1
Power supply voltages	3.3V +/- 5%	3.3V +/- 5%	3.3V +/- 5%
I/O connectors, 34+26 pins Dual Row 50 mills header connectors interface to Samtec FFSD cable or FLE connectors	YES	YES	YES
I/O connectors, 34+26 pins Dual Row 50 mills header connectors interface to Samtec CLP connectors	YES	YES	YES
I/O connectors, 60 pins High density with lock (Samtec QTH-030-01-L-D-A-RT1) interface to Samtec QSH-030-01-L-D-A-RT1 connectors	YES	NO	YES
SantaCruz Header Connector	YES	NO (*1)	NO (*1)
External Power Connector	NO	NO	YES
User LVTTTL 3V3 digital I/O channels, each with independent sense, drive, bi-directional, and tri-state capabilities	53	51+ WLED	53
User LVTTTL output Clocks (Osc. Clock/Clock with dedicated PLL)	1/1	1/1	1/1
User LVTTTL input Clocks with dedicated PLL	1	1	1
Fpga resource EP4CGX15BF14C7N versions	LE: 14,400 SRAM: 540Kbits PLLs: 3	LE: 14,400 SRAM: 540Kbits PLLs: 3	LE: 14,400 SRAM: 540Kbits PLLs: 3
Fpga resource EP4CGX30BF14C6N versions	LE: 29,440 SRAM: 1080Kbits PLLs: 4 DSP: 80 (18X18)	LE: 29,440 SRAM: 1080Kbits PLLs: 4 DSP: 80 (18X18)	LE: 29,440 SRAM: 1080Kbits PLLs: 4 DSP: 80 (18X18)
External ram resource (Optional)	2 Mbytes	2 Mbytes	2 Mbytes
Boot device with ISP (In System Programming)	YES	YES	YES
Power monitor and Reset	YES	YES	YES
Core Power Supply	YES	YES	YES
Crystal Oscillator	25MHz	25MHz	25MHz
Fully-compatible with JTAG/IEEE 1149.1 boundary-scan standard	STANDARD	MINI	MINI
Pheripheral to Host wake-up support	YES	YES	YES
Host to Pheripheral Remote Power On	NO	YES	NO
Operative temperature range	-40/+85 °C	-40/+85 °C	-40/+85 °C
Storage temperature range	-40/+150°C	-40/+150°C	-40/+150°C
Digital Output Level	Vol=0.4V max., Voh=2.4V min.	Vol=0.4V max., Voh=2.4V min.	Vol=0.4V max., Voh=2.4V min.
Digital Input Level	Vil=0.8V max., Vih=2.0V min.	Vil=0.8V max., Vih=2.0V min.	Vil=0.8V max., Vih=2.0V min.

(*1) SantaCruz interface can be supported by a mechanical adapter

Ordering Information (*2)

Product Name	GEB Code	Description
PCIEM-15-IO	100801A1	Mini-PCIe, 53 I/O, No External Ram, interface to Samtec CLP connectors
PCIEM-15-IO	100801A2	Mini-PCIe, 53 I/O, No External Ram, interface to Samtec FFSD or FLE connectors
PCIE-RAM	100996A1	2MBytes Memory module
PCIED-15-IO	100816A1	PCIe on cable downstream board, 53 I/O, No External Ram, interface to Samtec FFSD cable and QSH-030-01-L-D-A-RT1 connector
PCIEU-15-IO	100926A1	PCIe on cable upstream board
PCIEU-15-IO	100926A1	PCIe standard format, 53 I/O, No External Ram, interface to Samtec FFSD cable, QSH-030-01-L-D-A-RT1. One SantatCruz Header slot at 3V3 level.

(*2) The boards and System can bought online at Buy online <http://www.geb-enterprise-shop.com/>



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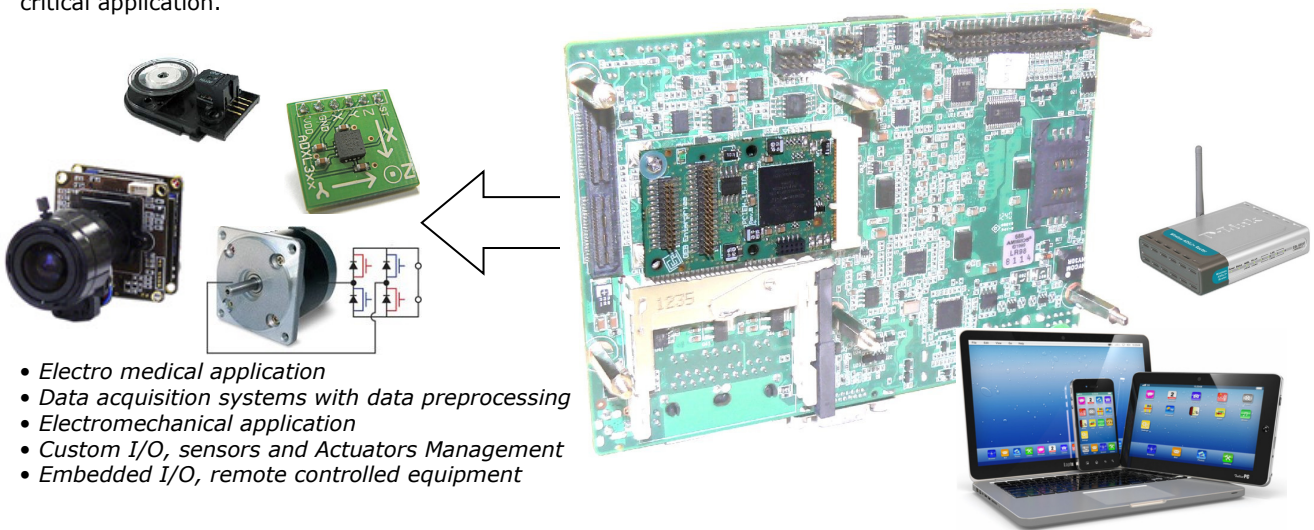
SOPC

System On Programmable Chip

SOPC PCI Express Family

Application

Typical applications are in all types of remote I/O controller with Industrial Motherboard SBC (Mini-Itx, 3.5"SBC...). The Fpga capability allow the SBC to interface all types of actuators and sensors with optional Hardware and/or Firmware (on NIOSII) and/or DSP preprocessing and with/without DMA capability to SBC memory. Optional FPGA NIOSII softcore can support custom instruction and a faster interrupt response (about 1-2us) to support processing/time critical application.



- Electro medical application
- Data acquisition systems with data preprocessing
- Electromechanical application
- Custom I/O, sensors and Actuators Management
- Embedded I/O, remote controlled equipment

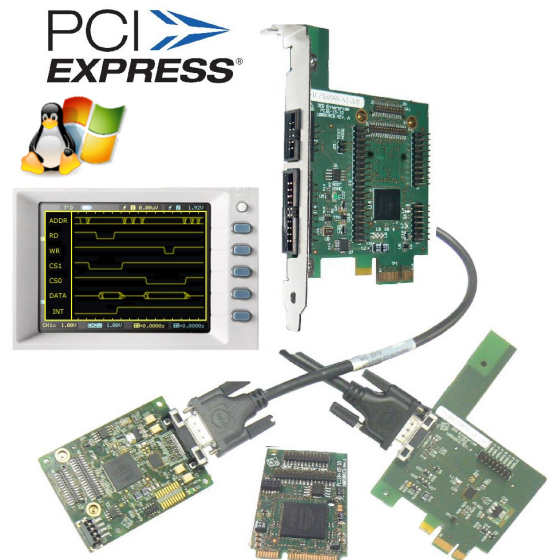
Overview

PCI (Peripheral Component Interconnect) Express (name PCIe) is a scalable I/O serial bus technology set to replace parallel PCI bus. In the next part of 2004 PCI Express slots began appearing on PC motherboard alongside standard slots, starting a gradual transition.

PCI Express has several advantages, it can be implemented as a unifying I/O structure for desktops, mobiles, servers, workstations and **embedded systems**, and it's cheaper than PCI or AGP based system board level implementation. This reduces the overall costs for consumers. It has been also designed for PCIe software drives compatibility with existing Operating Systems.

By physical point of view, PCI Express is a *point-to-point* connection cabling/wiring. PCIe also allows "hot swapping" or "hot plugging" and consumes less power than PCI bus. However the most important feature is its *scalability*: higher bandwidth can be achieved by adding "bus lanes," ostensibly future-proofing into the next decade. The initial rollout of PCI-Express provides three bus configurations: x1, x4, and x16, which represent the number of lanes. Each bus lane has a logical bi-directional behavior, physically implemented by two differential mono-directional RX/TX signals pairs. The data transfer rate supported by each bus lane is 250 Mbyte/s for each signal pair, corresponding to 500 Mbyte/s for each bus lane.

Currently, there are two most important PCIe extensions card available in the PCIe embedded application market: The first one is **PCIe MiniCard** that has a form factor smaller than standard PCIe board (about 30x50mm), the second one is the **PCIe on cable**, which allows to remote the PCIe peripheral devices up to 7 meters from the host and without any software add-on.

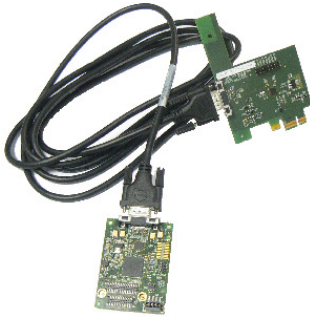


The MiniCard standard is also called Mini PCIe. The Minicard format has a small form factor board and is used to implement the PCI Express interface on remote interface. The card size is 30mm wide by 50.95mm long by 5mm high. The Minicard uses a 52-pin card edge connector, the card pins are PCB fingers placed at the smallest edge of the card.

PCI Express Mini Card (also known as Mini PCI Express, Mini PCIe, and Mini PCI-E) is a replacement for the Mini PCI form factor based on PCI Express. Its standard has been developed by the PCI-SIG organization. The host device supports PCI Express and USB connectivity, and each card can be used in both ways. There is a 52 pin edge connector, made of two staggered rows on a 0.8 mm pitch. Each row has 8 contacts, a contact-less gap of 4 contact spaces, then a further 18 contacts. A half-length card is also specified 30x26.8 mm. The cards have a thickness of 1.0 mm (excluding components). **Typical applications are in all types of remote I/O controller with Industrial Motherboard SBC (Mini-Itx, 3.5" SBC...).**

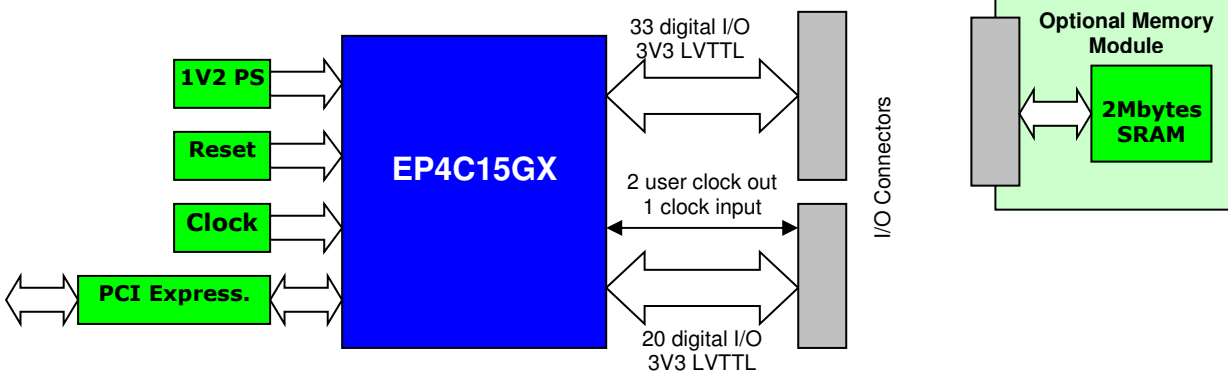


PCI Express External Cabling (also known as External PCI Express or Cabled PCI Express) specifications were released by the PCI-SIG in February 2007. Standard cables and connectors have been defined for x1, x4, x8, and x16 link widths, with a transfer rate of 500 Mbyte/s per lane. PCI Express Cable is a standard developed by the PCI-SIG to transmit the host PCI Express bus over a high-speed cable. This can be done internal to a system enclosure or external in a box-to-box type application. Using a PCIe cable is possible to extend the PCI Express bus up to seven meters from the host CPU complex and without any circuitry for suppressing the inherent noise. Transmitting the host bus over copper cables opens a new world to the embedded designer. The PCIe Cable allows splitting the host PCIe environment by the remote embedded I/O subsystems one. Moreover, the PCIe cable allows different form factors for both the host and I/O sub-system and according to their specific system requires. For example, a high-end, dual Intel Xeon class host system can provide the user with the computing power and a high-speed data link to a high-end embedded I/O subsystem based on MicroTCA, PC/104, 3U CompactPCI Express, or proprietary form factor.



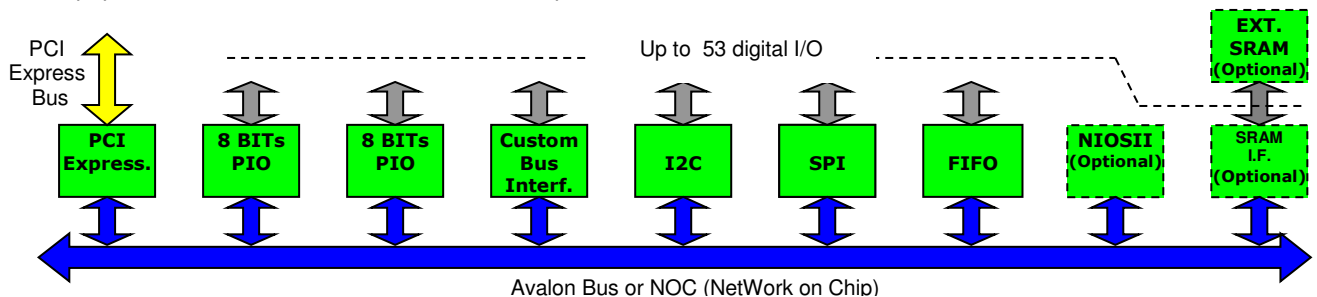
SOPC PCIe Cards Family Features

GEB High Performance System On Card (Sopc-Card) includes, all-in-one, whatever needed to start a PCIe design using the advanced features of Altera CycloneIV-GX family and features a socketed board with an **EP4CGX15** or **EP4CGX30** device in a BGA169 package.



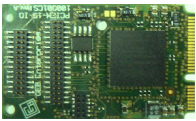
All technology FPGA, power management, distribution and decoupling, fine pitch or BGA package connection, multilayer PCB manufacturing, double side PCB mounting and testing requirements are met by Sopc-Card board. One programming interface port, on the board support in-system programming (ISP), and using Altera Byte Blaster and JTAG programming and testing, is available as well.

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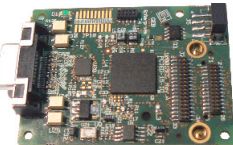
GEB Enterprise Boards and Systems

PClem-15-10



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PCled-15-10

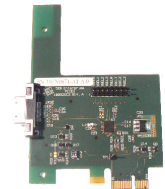


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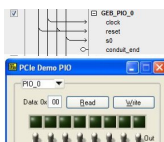
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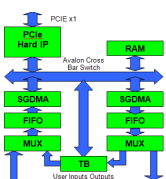
PCIe I/O

phase of pins or lot of



Registers System

It is targeted for help the designers in the starting projects that requires control PCIe mapped registers used both to control I/O internal logic. The SDK includes the drivers and some demo and examples, avoiding a startup issues



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It is designed to help the designers in the starting phase of projects that requires fast DMA straight way in PC virtual memory. It includes a QSYS system with 2 SGDMA configured one in input and one in output that can be wired to your application hardware, a Test bench peripherals can be used to test the system and measure the performances, drivers, and demo program



PCIe IOBUS System

It is targeted to allow the users to connect on PCIe bus their hardware. The Fpga system is a bridge between the PCIe target interface hosted in the fpga and a general-purpose parallel bus 32 bits wide with user programmable timing in 16ns steps and user interrupt.

Customization Service

GEB is available to develop on PCIe boards the hardware/software subsystem to your needs, integrating your hardware blocks, analyzing and foreseeing the performance, developing the SOPC system and drivers on GEB or on Customer Boards. During the design, all know-how needed to maintain the system in the next years will be taught to the customers.

Features Summary

Board Name/ Features	PCIe-15-IO	PCIem-15-IO	PCIed-15-IO
Board Size standard reference	PCI Express	Mini-PCIe (30x51mm)	Custom 50x67mm
PCIe lanes	X1	X1	X1
Power supply voltages	3.3V +/- 5%	3.3V +/- 5%	3.3V +/- 5%
I/O connectors, 34+26 pins Dual Row 50 mills header connectors interface to Samtec FFSD cable or FLE connectors	YES	YES	YES
I/O connectors, 34+26 pins Dual Row 50 mills header connectors interface to Samtec CLP connectors	YES	YES	YES
I/O connectors, 60 pins High density with lock (Samtec QTH-030-01-L-D-A-RT1) interface to Samtec QSH-030-01-L-D-A-RT1 connectors	YES	NO	YES
SantaCruz Header Connector	YES	NO (*1)	NO (*1)
External Power Connector	NO	NO	YES
User LVTTTL 3V3 digital I/O channels, each with independent sense, drive, bi-directional, and tri-state capabilities	53	51+ WLED	53
User LVTTTL output Clocks (Osc. Clock/Clock with dedicated PLL)	1/1	1/1	1/1
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Fpga resource EP4CGX15BF14C7N versions	LE: 14,400 SRAM: 540Kbits PLLs: 3	LE: 14,400 SRAM: 540Kbits PLLs: 3	LE: 14,400 SRAM: 540Kbits PLLs: 3
Fpga resource EP4CGX30BF14C6N versions	LE: 29,440 SRAM: 1080Kbits PLLs: 4 DSP: 80 (18X18)	LE: 29,440 SRAM: 1080Kbits PLLs: 4 DSP: 80 (18X18)	LE: 29,440 SRAM: 1080Kbits PLLs: 4 DSP: 80 (18X18)
External ram resource (Optional)	2 Mbytes	2 Mbytes	2 Mbytes
Boot device with ISP (In System Programming)	YES	YES	YES
Power monitor and Reset	YES	YES	YES
Core Power Supply	YES	YES	YES
Crystal Oscillator	25MHz	25MHz	25MHz
Fully-compatible with JTAG/IEEE 1149.1 boundary-scan standard	STANDARD	MINI	MINI
Pheripheral to Host wake-up support	YES	YES	YES
Host to Pheripheral Remote Power On	NO	YES	NO
Operative temperature range	-40/+85 °C	-40/+85 °C	-40/+85 °C
Storage temperature range	-40/+150°C	-40/+150°C	-40/+150°C
Digital Output Level	Vol=0.4V max., Voh=2.4V min.	Vol=0.4V max., Voh=2.4V min.	Vol=0.4V max., Voh=2.4V min.
Digital Input Level	Vil=0.8V max., Vih=2.0V min.	Vil=0.8V max., Vih=2.0V min.	Vil=0.8V max., Vih=2.0V min.

(*1) SantaCruz interface can be supported by a mechanical adapter

Ordering Information (*2)

Product Name	GEB Code	Description
PCIEM-15-IO	100801A1	Mini-PCIe, 53 I/O, No External Ram, interface to Samtec CLP connectors
PCIEM-15-IO	100801A2	Mini-PCIe, 53 I/O, No External Ram, interface to Samtec FFSD or FLE connectors
PCIE-RAM	100996A1	2MBytes Memory module
PCIED-15-IO	100816A1	PCIe on cable downstream board, 53 I/O, No External Ram, interface to Samtec FFSD cable and QSH-030-01-L-D-A-RT1 connector
PCIEU-15-IO	100926A1	PCIe on cable upstream board
PCIEU-15-IO	100926A1	PCIe standard format, 53 I/O, No External Ram, interface to Samtec FFSD cable, QSH-030-01-L-D-A-RT1. One SantatCruz Header slot at 3V3 level.

(*2) The boards and System can bought online at Buy online <http://www.geb-enterprise-shop.com/>



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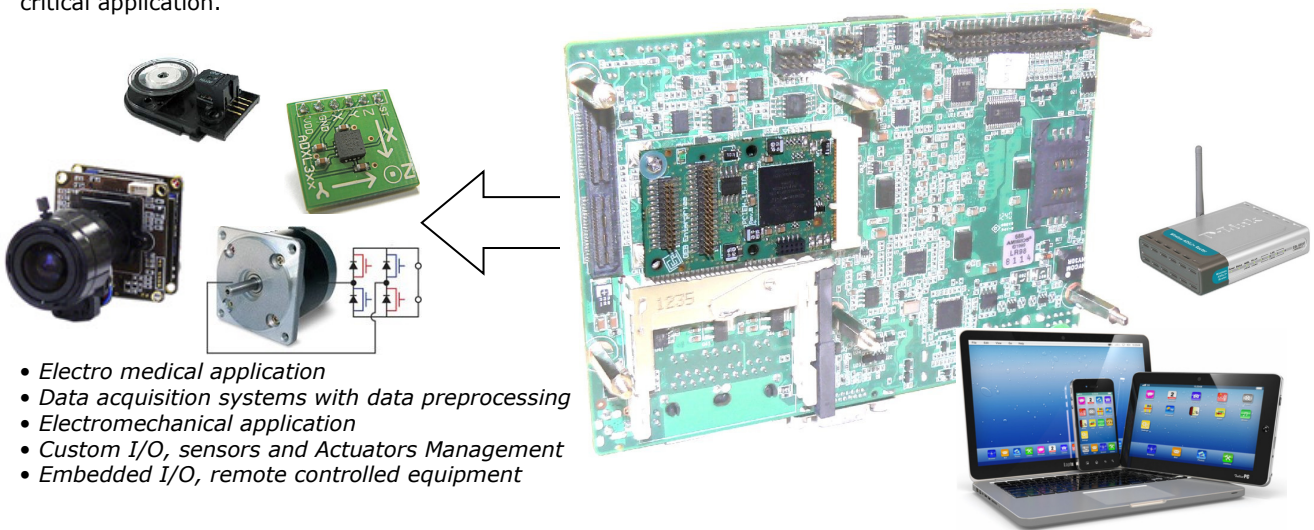
SOPC

System On Programmable Chip

SOPC PCI Express Family

Application

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- Electro medical application
- Data acquisition systems with data preprocessing
- Electromechanical application
- Custom I/O, sensors and Actuators Management
- Embedded I/O, remote controlled equipment

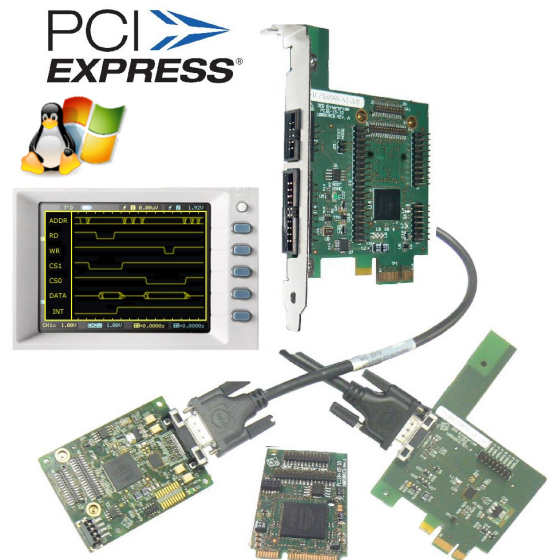
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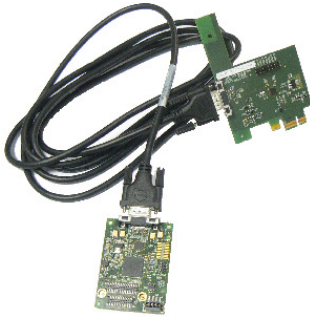


The MiniCard standard is also called Mini PCIe. The Minicard format has a small form factor board and is used to implement the PCI Express interface on remote interface. The card size is 30mm wide by 50.95mm long by 5mm high. The Minicard uses a 52-pin card edge connector, the card pins are PCB fingers placed at the smallest edge of the card.

PCI Express Mini Card (also known as Mini PCI Express, Mini PCIe, and Mini PCI-E) is a replacement for the Mini PCI form factor based on PCI Express. Its standard has been developed by the PCI-SIG organization. The host device supports PCI Express and USB connectivity, and each card can be used in both ways. There is a 52 pin edge connector, made of two staggered rows on a 0.8 mm pitch. Each row has 8 contacts, a contact-less gap of 4 contact spaces, then a further 18 contacts. A half-length card is also specified 30x26.8 mm. The cards have a thickness of 1.0 mm (excluding components). **Typical applications are in all types of remote I/O controller with Industrial Motherboard SBC (Mini-Itx, 3.5" SBC...).**

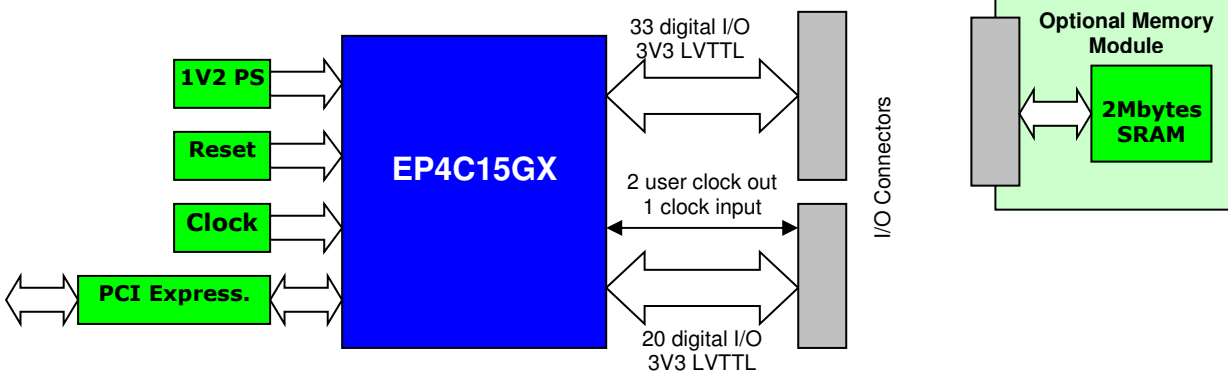


PCI Express External Cabling (also known as External PCI Express or Cabled PCI Express) specifications were released by the PCI-SIG in February 2007. Standard cables and connectors have been defined for x1, x4, x8, and x16 link widths, with a transfer rate of 500 Mbyte/s per lane. PCI Express Cable is a standard developed by the PCI-SIG to transmit the host PCI Express bus over a high-speed cable. This can be done internal to a system enclosure or external in a box-to-box type application. Using a PCIe cable is possible to extend the PCI Express bus up to seven meters from the host CPU complex and without any circuitry for suppressing the inherent noise. Transmitting the host bus over copper cables opens a new world to the embedded designer. The PCIe Cable allows splitting the host PCIe environment by the remote embedded I/O subsystems one. Moreover, the PCIe cable allows different form factors for both the host and I/O sub-system and according to their specific system requires. For example, a high-end, dual Intel Xeon class host system can provide the user with the computing power and a high-speed data link to a high-end embedded I/O subsystem based on MicroTCA, PC/104, 3U CompactPCI Express, or proprietary form factor.



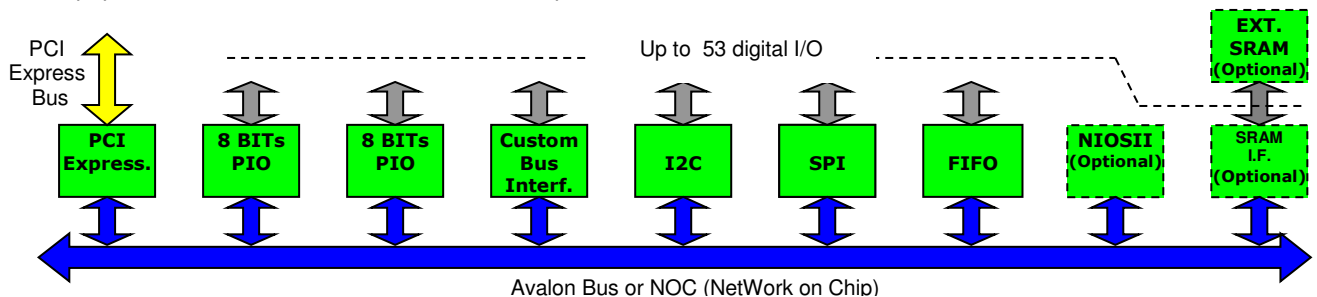
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All technology FPGA, power management, distribution and decoupling, fine pitch or BGA package connection, multilayer PCB manufacturing, double side PCB mounting and testing requirements are met by Sopc-Card board. One programming interface port, on the board support in-system programming (ISP), and using Altera Byte Blaster and JTAG programming and testing, is available as well.

The hardware design can be easily implemented using SOPC builder or QSYS builder Altera tools, VHDL language or a combination them. Jungo driver tool supports Altera PCIe easy driver development under various Operative System such as popular Microsoft Windows series, Linux or specific RT/OS.



GEB Enterprise Boards and Systems

PClem-15-10



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PCled-15-10

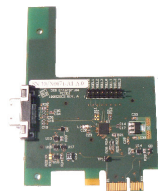


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high reliability Samtec connector the product is provided with. Furthermore, a mini JTAG connector allows the user for ISP programming, and using an ALTERA standard USB blaster. GEB can provide the user with a cable adapter, free of charge, for connecting Altera programmer box. Most of GEB standard systems can be implemented in the product. Altera QSYS allows the user to create a custom system in few minutes.

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PCIe on Cable Upstream Board, The logical companion of PCIe boards family, interface PCIeX1 slot on computer for remote I/O PCIe compliant sub-systems. The product has a PCI standard size and is pluggable into DeskTop and MiniTower computers. Using a compatible PCIeX1 cable, the users are remote electromechanical hardware up to 7 meters. This system's distance can be also further extended by using cable repeaters.



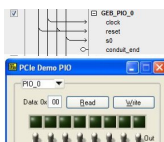
PCle-15-10



PCI Board. This PCI standard form factor product is tailored to make sample more custom interfaces using it's Santa Cruz connectors to host every electrical interface. Altera Fpga can host the logical interface by up to 53 general purpose I/O and 4 dedicated Clocks with PLL, up to 2Mbytes of on board SRAM, 80 DSP blocks, about 30 or 15KLEFPGA resources.. A JTAG connector, available on the front panel, allows ISP programming using an ALTERA standard USB blaster. Most of GEB standard systems can be implemented. Altera allows the user to develop a custom system in few minutes.

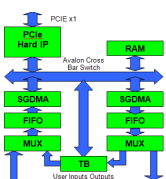
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PCIe IOBUS System

It is targeted to allow the users to connect on PCIe bus their hardware. The Fpga system is a bridge between the PCIe target interface hosted in the fpga and a general-purpose parallel bus 32 bits wide with user programmable timing in 16ns steps and user interrupt.

Customization Service

GEB is available to develop on PCIe boards the hardware/software subsystem to your needs, integrating your hardware blocks, analyzing and foreseeing the performance, developing the SOPC system and drivers on GEB or on Customer Boards. During the design, all know-how needed to maintain the system in the next years will be taught to the customers.

Features Summary

Board Name/ Features	PCIe-15-IO	PCIem-15-IO	PCIed-15-IO
Board Size standard reference	PCI Express	Mini-PCIe (30x51mm)	Custom 50x67mm
PCIe lanes	X1	X1	X1
Power supply voltages	3.3V +/- 5%	3.3V +/- 5%	3.3V +/- 5%
I/O connectors, 34+26 pins Dual Row 50 mills header connectors interface to Samtec FFSD cable or FLE connectors	YES	YES	YES
I/O connectors, 34+26 pins Dual Row 50 mills header connectors interface to Samtec CLP connectors	YES	YES	YES
I/O connectors, 60 pins High density with lock (Samtec QTH-030-01-L-D-A-RT1) interface to Samtec QSH-030-01-L-D-A-RT1 connectors	YES	NO	YES
SantaCruz Header Connector	YES	NO (*1)	NO (*1)
External Power Connector	NO	NO	YES
User LVTTTL 3V3 digital I/O channels, each with independent sense, drive, bi-directional, and tri-state capabilities	53	51+ WLED	53
User LVTTTL output Clocks (Osc. Clock/Clock with dedicated PLL)	1/1	1/1	1/1
User LVTTTL input Clocks with dedicated PLL	1	1	1
Fpga resource EP4CGX15BF14C7N versions	LE: 14,400 SRAM: 540Kbits PLLs: 3	LE: 14,400 SRAM: 540Kbits PLLs: 3	LE: 14,400 SRAM: 540Kbits PLLs: 3
Fpga resource EP4CGX30BF14C6N versions	LE: 29,440 SRAM: 1080Kbits PLLs: 4 DSP: 80 (18X18)	LE: 29,440 SRAM: 1080Kbits PLLs: 4 DSP: 80 (18X18)	LE: 29,440 SRAM: 1080Kbits PLLs: 4 DSP: 80 (18X18)
External ram resource (Optional)	2 Mbytes	2 Mbytes	2 Mbytes
Boot device with ISP (In System Programming)	YES	YES	YES
Power monitor and Reset	YES	YES	YES
Core Power Supply	YES	YES	YES
Crystal Oscillator	25MHz	25MHz	25MHz
Fully-compatible with JTAG/IEEE 1149.1 boundary-scan standard	STANDARD	MINI	MINI
Pheripheral to Host wake-up support	YES	YES	YES
Host to Pheripheral Remote Power On	NO	YES	NO
Operative temperature range	-40/+85 °C	-40/+85 °C	-40/+85 °C
Storage temperature range	-40/+150°C	-40/+150°C	-40/+150°C
Digital Output Level	Vol=0.4V max., Voh=2.4V min.	Vol=0.4V max., Voh=2.4V min.	Vol=0.4V max., Voh=2.4V min.
Digital Input Level	Vil=0.8V max., Vih=2.0V min.	Vil=0.8V max., Vih=2.0V min.	Vil=0.8V max., Vih=2.0V min.

(*1) SantaCruz interface can be supported by a mechanical adapter

Ordering Information (*2)

Product Name	GEB Code	Description
PCIEM-15-IO	100801A1	Mini-PCIe, 53 I/O, No External Ram, interface to Samtec CLP connectors
PCIEM-15-IO	100801A2	Mini-PCIe, 53 I/O, No External Ram, interface to Samtec FFSD or FLE connectors
PCIE-RAM	100996A1	2MBytes Memory module
PCIED-15-IO	100816A1	PCIe on cable downstream board, 53 I/O, No External Ram, interface to Samtec FFSD cable and QSH-030-01-L-D-A-RT1 connector
PCIEU-15-IO	100926A1	PCIe on cable upstream board
PCIEU-15-IO	100926A1	PCIe standard format, 53 I/O, No External Ram, interface to Samtec FFSD cable, QSH-030-01-L-D-A-RT1. One SantatCruz Header slot at 3V3 level.

(*2) The boards and System can bought online at Buy online <http://www.geb-enterprise-shop.com/>



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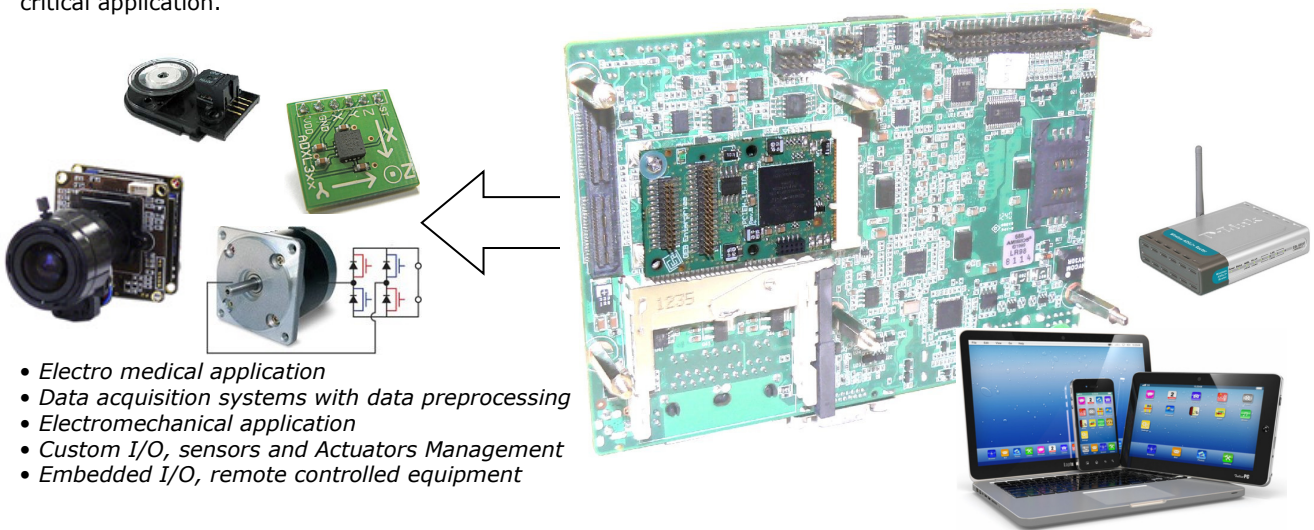
SOPC

System On Programmable Chip

SOPC PCI Express Family

Application

Typical applications are in all types of remote I/O controller with Industrial Motherboard SBC (Mini-Itx, 3.5" SBC...). The Fpga capability allow the SBC to interface all types of actuators and sensors with optional Hardware and/or Firmware (on NIOSII) and/or DSP preprocessing and with/without DMA capability to SBC memory. Optional FPGA NIOSII softcore can support custom instruction and a faster interrupt response (about 1-2us) to support processing/time critical application.



- Electro medical application
- Data acquisition systems with data preprocessing
- Electromechanical application
- Custom I/O, sensors and Actuators Management
- Embedded I/O, remote controlled equipment

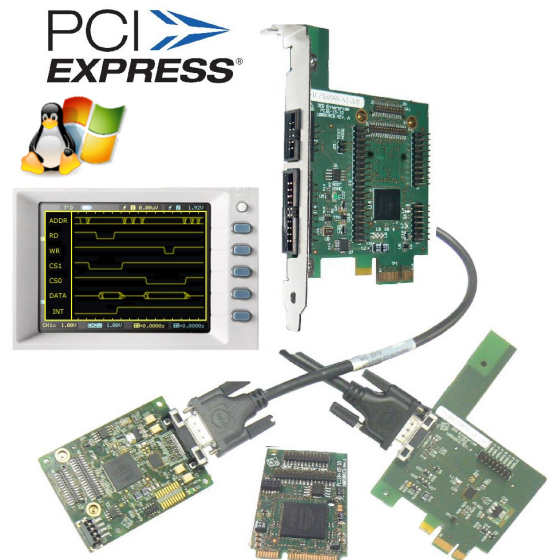
Overview

PCI (Peripheral Component Interconnect) Express (name PCIe) is a scalable I/O serial bus technology set to replace parallel PCI bus. In the next part of 2004 PCI Express slots began appearing on PC motherboard alongside standard slots, starting a gradual transition.

PCI Express has several advantages, it can be implemented as a unifying I/O structure for desktops, mobiles, servers, workstations and **embedded systems**, and it's cheaper than PCI or AGP based system board level implementation. This reduces the overall costs for consumers. It has been also designed for PCIe software drives compatibility with existing Operating Systems.

By physical point of view, PCI Express is a *point-to-point* connection cabling/wiring. PCIe also allows "hot swapping" or "hot plugging" and consumes less power than PCI bus. However the most important feature is its *scalability*: higher bandwidth can be achieved by adding "bus lanes," ostensibly future-proofing into the next decade. The initial rollout of PCI-Express provides three bus configurations: x1, x4, and x16, which represent the number of lanes. Each bus lane has a logical bi-directional behavior, physically implemented by two differential mono-directional RX/TX signals pairs. The data transfer rate supported by each bus lane is 250 Mbyte/s for each signal pair, corresponding to 500 Mbyte/s for each bus lane.

Currently, there are two most important PCIe extensions card available in the PCIe embedded application market: The first one is **PCIe MiniCard** that has a form factor smaller than standard PCIe board (about 30x50mm), the second one is the **PCIe on cable**, which allows to remote the PCIe peripheral devices up to 7 meters from the host and without any software add-on.

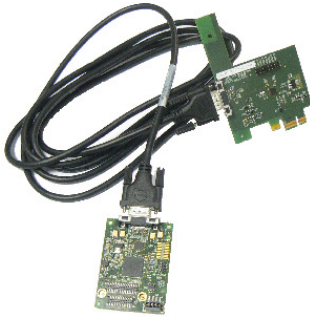


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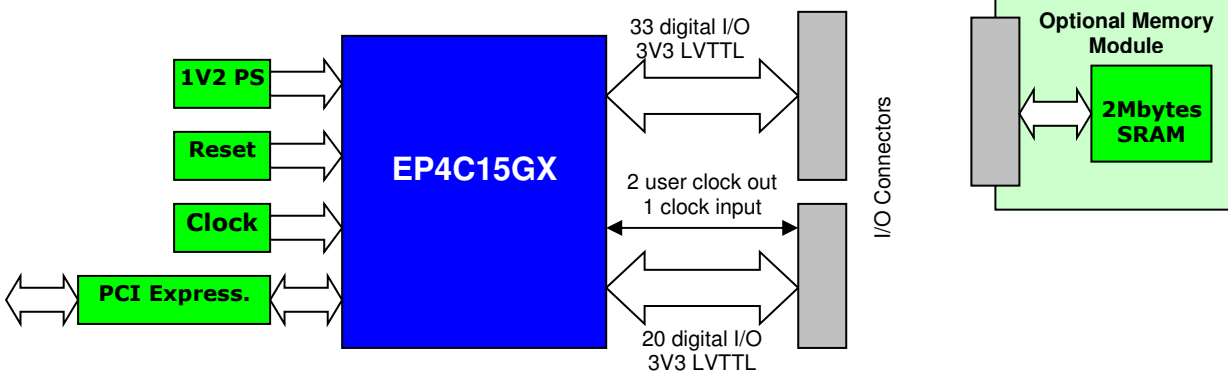


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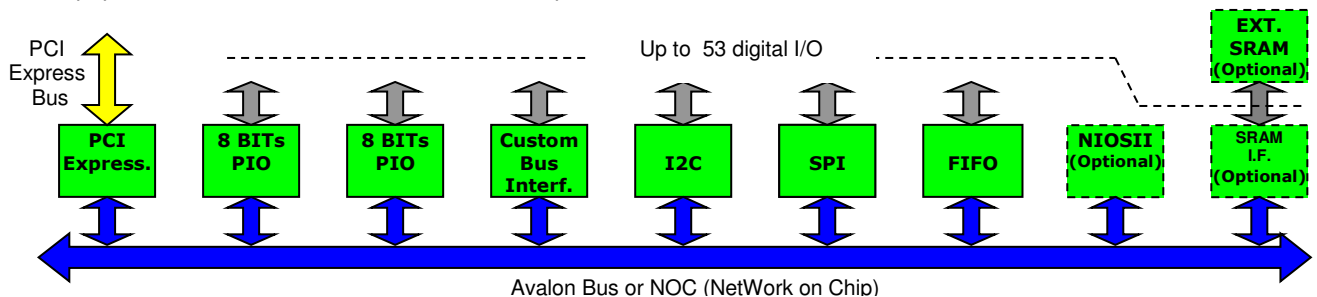
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GEB Enterprise Boards and Systems

PClem-15-10



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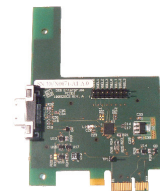


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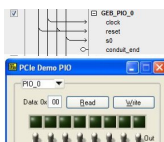
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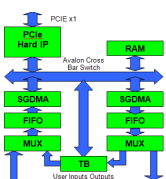
PCIe I/O

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Customization Service

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Features Summary

Board Name/ Features	PCIe-15-IO	PCIem-15-IO	PCIed-15-IO
Board Size standard reference	PCI Express	Mini-PCIe (30x51mm)	Custom 50x67mm
PCIe lanes	X1	X1	X1
Power supply voltages	3.3V +/- 5%	3.3V +/- 5%	3.3V +/- 5%
I/O connectors, 34+26 pins Dual Row 50 mills header connectors interface to Samtec FFSD cable or FLE connectors	YES	YES	YES
I/O connectors, 34+26 pins Dual Row 50 mills header connectors interface to Samtec CLP connectors	YES	YES	YES
I/O connectors, 60 pins High density with lock (Samtec QTH-030-01-L-D-A-RT1) interface to Samtec QSH-030-01-L-D-A-RT1 connectors	YES	NO	YES
SantaCruz Header Connector	YES	NO (*1)	NO (*1)
External Power Connector	NO	NO	YES
User LVTTTL 3V3 digital I/O channels, each with independent sense, drive, bi-directional, and tri-state capabilities	53	51+ WLED	53
User LVTTTL output Clocks (Osc. Clock/Clock with dedicated PLL)	1/1	1/1	1/1
User LVTTTL input Clocks with dedicated PLL	1	1	1
Fpga resource EP4CGX15BF14C7N versions	LE: 14,400 SRAM: 540Kbits PLLs: 3	LE: 14,400 SRAM: 540Kbits PLLs: 3	LE: 14,400 SRAM: 540Kbits PLLs: 3
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External ram resource (Optional)	2 Mbytes	2 Mbytes	2 Mbytes
Boot device with ISP (In System Programming)	YES	YES	YES
Power monitor and Reset	YES	YES	YES
Core Power Supply	YES	YES	YES
Crystal Oscillator	25MHz	25MHz	25MHz
Fully-compatible with JTAG/IEEE 1149.1 boundary-scan standard	STANDARD	MINI	MINI
Pheripheral to Host wake-up support	YES	YES	YES
Host to Pheripheral Remote Power On	NO	YES	NO
Operative temperature range	-40/+85 °C	-40/+85 °C	-40/+85 °C
Storage temperature range	-40/+150°C	-40/+150°C	-40/+150°C
Digital Output Level	Vol=0.4V max., Voh=2.4V min.	Vol=0.4V max., Voh=2.4V min.	Vol=0.4V max., Voh=2.4V min.
Digital Input Level	Vil=0.8V max., Vih=2.0V min.	Vil=0.8V max., Vih=2.0V min.	Vil=0.8V max., Vih=2.0V min.

(*1) SantaCruz interface can be supported by a mechanical adapter

Ordering Information (*2)

Product Name	GEB Code	Description
PCIEM-15-IO	100801A1	Mini-PCIe, 53 I/O, No External Ram, interface to Samtec CLP connectors
PCIEM-15-IO	100801A2	Mini-PCIe, 53 I/O, No External Ram, interface to Samtec FFSD or FLE connectors
PCIE-RAM	100996A1	2MBytes Memory module
PCIED-15-IO	100816A1	PCIe on cable downstream board, 53 I/O, No External Ram, interface to Samtec FFSD cable and QSH-030-01-L-D-A-RT1 connector
PCIEU-15-IO	100926A1	PCIe on cable upstream board
PCIEU-15-IO	100926A1	PCIe standard format, 53 I/O, No External Ram, interface to Samtec FFSD cable, QSH-030-01-L-D-A-RT1. One SantatCruz Header slot at 3V3 level.

(*2) The boards and System can bought online at Buy online <http://www.geb-enterprise-shop.com/>



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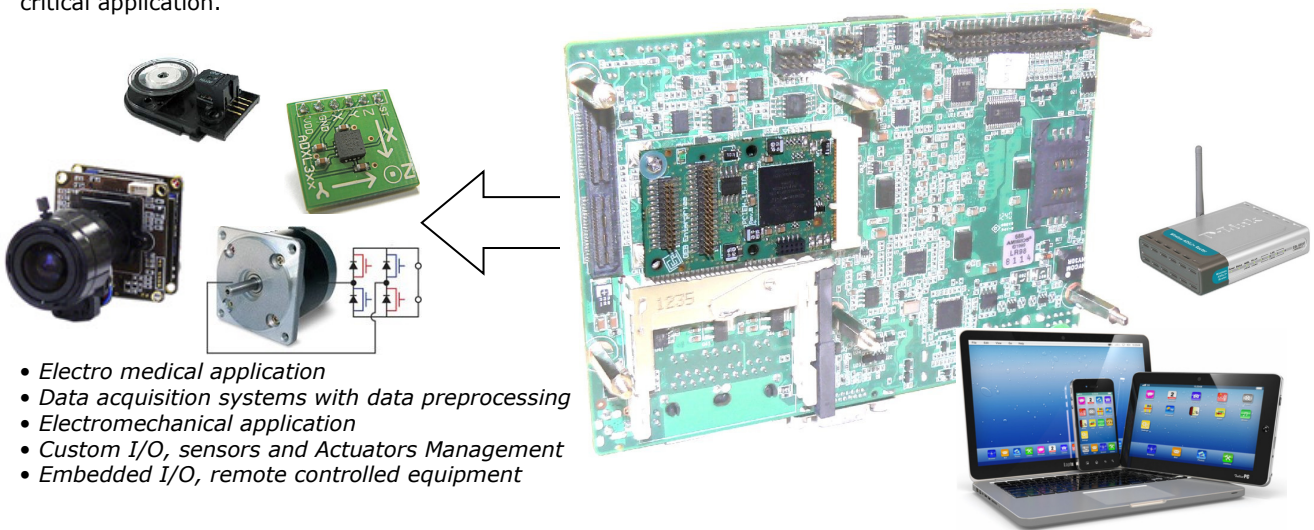
SOPC

System On Programmable Chip

SOPC PCI Express Family

Application

Typical applications are in all types of remote I/O controller with Industrial Motherboard SBC (Mini-Itx, 3.5"SBC...). The Fpga capability allow the SBC to interface all types of actuators and sensors with optional Hardware and/or Firmware (on NIOSII) and/or DSP preprocessing and with/without DMA capability to SBC memory. Optional FPGA NIOSII softcore can support custom instruction and a faster interrupt response (about 1-2us) to support processing/time critical application.



- Electro medical application
- Data acquisition systems with data preprocessing
- Electromechanical application
- Custom I/O, sensors and Actuators Management
- Embedded I/O, remote controlled equipment

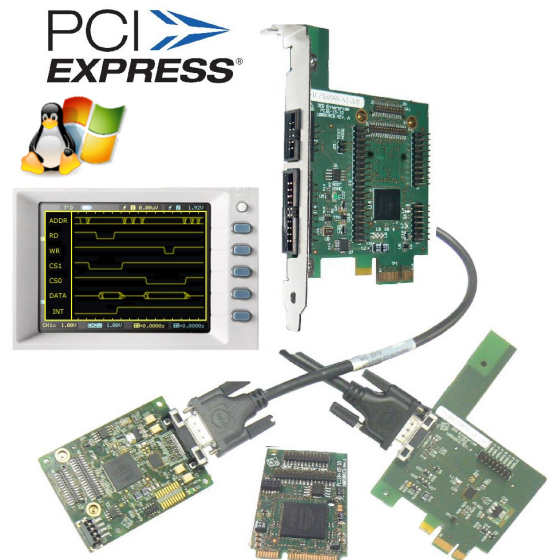
Overview

PCI (Peripheral Component Interconnect) Express (name PCIe) is a scalable I/O serial bus technology set to replace parallel PCI bus. In the next part of 2004 PCI Express slots began appearing on PC motherboard alongside standard slots, starting a gradual transition.

PCI Express has several advantages, it can be implemented as a unifying I/O structure for desktops, mobiles, servers, workstations and **embedded systems**, and it's cheaper than PCI or AGP based system board level implementation. This reduces the overall costs for consumers. It has been also designed for PCIe software drives compatibility with existing Operating Systems.

By physical point of view, PCI Express is a *point-to-point* connection cabling/wiring. PCIe also allows "hot swapping" or "hot plugging" and consumes less power than PCI bus. However the most important feature is its *scalability*: higher bandwidth can be achieved by adding "bus lanes," ostensibly future-proofing into the next decade. The initial rollout of PCI-Express provides three bus configurations: x1, x4, and x16, which represent the number of lanes. Each bus lane has a logical bi-directional behavior, physically implemented by two differential mono-directional RX/TX signals pairs. The data transfer rate supported by each bus lane is 250 Mbyte/s for each signal pair, corresponding to 500 Mbyte/s for each bus lane.

Currently, there are two most important PCIe extensions card available in the PCIe embedded application market: The first one is **PCIe MiniCard** that has a form factor smaller than standard PCIe board (about 30x50mm), the second one is the **PCIe on cable**, which allows to remote the PCIe peripheral devices up to 7 meters from the host and without any software add-on.

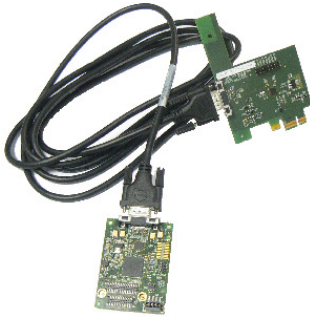


The MiniCard standard is also called Mini PCIe. The Minicard format has a small form factor board and is used to implement the PCI Express interface on remote interface. The card size is 30mm wide by 50.95mm long by 5mm high. The Minicard uses a 52-pin card edge connector, the card pins are PCB fingers placed at the smallest edge of the card.

PCI Express Mini Card (also known as Mini PCI Express, Mini PCIe, and Mini PCI-E) is a replacement for the Mini PCI form factor based on PCI Express. Its standard has been developed by the PCI-SIG organization. The host device supports PCI Express and USB connectivity, and each card can be used in both ways. There is a 52 pin edge connector, made of two staggered rows on a 0.8 mm pitch. Each row has 8 contacts, a contact-less gap of 4 contact spaces, then a further 18 contacts. A half-length card is also specified 30x26.8 mm. The cards have a thickness of 1.0 mm (excluding components). **Typical applications are in all types of remote I/O controller with Industrial Motherboard SBC (Mini-Itx, 3.5" SBC...).**

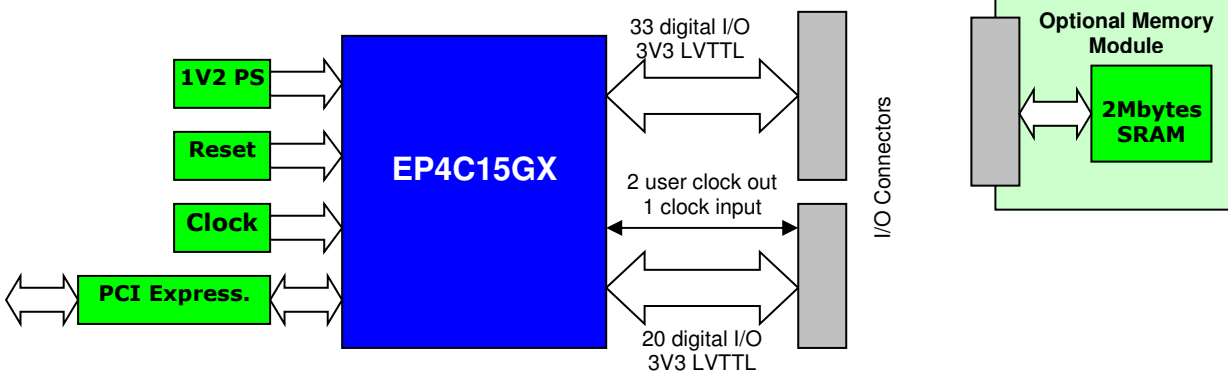


PCI Express External Cabling (also known as External PCI Express or Cabled PCI Express) specifications were released by the PCI-SIG in February 2007. Standard cables and connectors have been defined for x1, x4, x8, and x16 link widths, with a transfer rate of 500 Mbyte/s per lane. PCI Express Cable is a standard developed by the PCI-SIG to transmit the host PCI Express bus over a high-speed cable. This can be done internal to a system enclosure or external in a box-to-box type application. Using a PCIe cable is possible to extend the PCI Express bus up to seven meters from the host CPU complex and without any circuitry for suppressing the inherent noise. Transmitting the host bus over copper cables opens a new world to the embedded designer. The PCIe Cable allows splitting the host PCIe environment by the remote embedded I/O subsystems one. Moreover, the PCIe cable allows different form factors for both the host and I/O sub-system and according to their specific system requires. For example, a high-end, dual Intel Xeon class host system can provide the user with the computing power and a high-speed data link to a high-end embedded I/O subsystem based on MicroTCA, PC/104, 3U CompactPCI Express, or proprietary form factor.



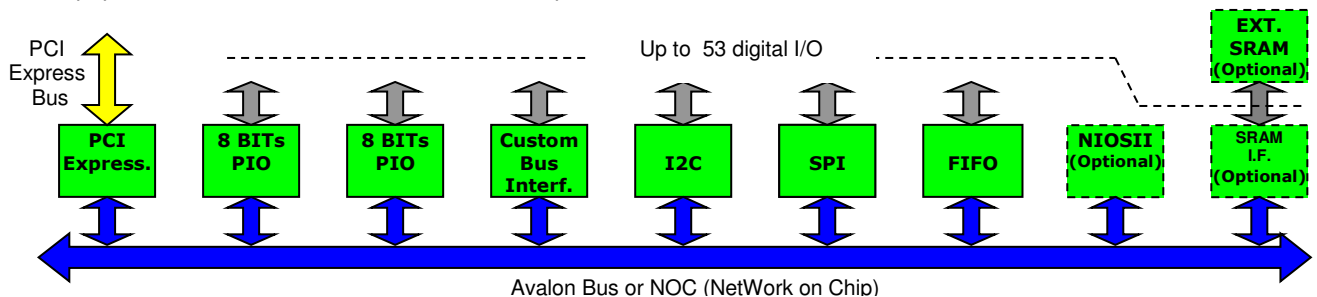
SOPC PCIe Cards Family Features

GEB High Performance System On Card (Sopc-Card) includes, all-in-one, whatever needed to start a PCIe design using the advanced features of Altera CycloneIV-GX family and features a socketed board with an **EP4CGX15** or **EP4CGX30** device in a BGA169 package.



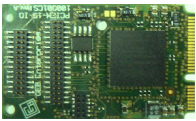
All technology FPGA, power management, distribution and decoupling, fine pitch or BGA package connection, multilayer PCB manufacturing, double side PCB mounting and testing requirements are met by Sopc-Card board. One programming interface port, on the board support in-system programming (ISP), and using Altera Byte Blaster and JTAG programming and testing, is available as well.

The hardware design can be easily implemented using SOPC builder or QSYS builder Altera tools, VHDL language or a combination them. Jungo driver tool supports Altera PCIe easy driver development under various Operative System such as popular Microsoft Windows series, Linux or specific RT/OS.



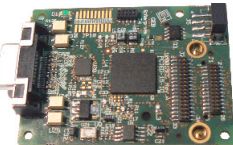
GEB Enterprise Boards and Systems

PClem-15-10



Mini-PCIe form factor, The best and cheapest solution for systems on box allows the user to control electrical interface of your SBC to external I/O resources (i.e. motors, transducers, sensor, CCD and so on). Altera Fpga provides the user with up to 53 general purpose I/O and 4 dedicated Clocks with PLL, up to 2Mbytes of on board SRAM, 80DSP blocks, about 30 or 15KLE FPGA resources. The product can be easily connected to your interface using low cost Samtec Cable. The mini JTAG connector allows the ISP programming using an ALTERA standard USB blaster. GEB can provide you with a cable adapter, free of charge, for connecting Altera programmer box. A lot of GEB standard systems can be implemented in the product. Altera QSYS allows the user to create a custom system in few minutes.

PCled-15-10

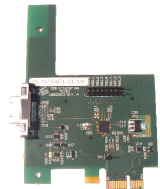


PCIe on Cable Downstream Board, The best and cheapest solution for **distributed system** allows the user to control the communication interfaces of your computer (i.e. Standard PCI, Laptop, PXI, SBC...) versus the external I/O resources (motors, transducers, sensor and so on). Altera Fpga provides the user with up to 53 general purpose I/O and 4 dedicated Clocks with PLL, up to 2Mbytes of on board SRAM, 80 DSP blocks, about 30 or 15KLE FPGA resources. The Board can be easily connected to the user interface by using a low cost Samtec Cable. Moreover, the product can be plugged as a daughter board on the user mother board using the high density

high reliability Samtec connector the product is provided with. Furthermore, a mini JTAG connector allows the user for ISP programming, and using an ALTERA standard USB blaster. GEB can provide the user with a cable adapter, free of charge, for connecting Altera programmer box. Most of GEB standard systems can be implemented in the product. Altera QSYS allows the user to create a custom system in few minutes.

PCleu

PCIe on Cable Upstream Board, The logical companion of PCIe boards family, interface PCIex1 slot on computer for remote I/O PCIe compliant sub-systems. The product has a PCI standard size and is pluggable into DeskTop and MiniTower computers. Using a compatible PCIeX1 cable, the users are remote electromechanical hardware up to 7 meters. This system's distance can be also further extended by using cable repeaters.



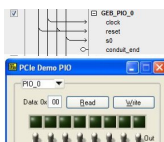
PCle-15-10

PCIe Board. This PCI standard form factor product is tailored to make sample more custom interfaces using it's Santa Cruz connectors to host every electrical interface. Altera Fpga can host the logical interface by up to 53 general purpose I/O and 4 dedicated Clocks with PLL, up to 2Mbytes of on board SRAM, 80 DSP blocks, about 30 or 15KLEFPGA resources.. A JTAG connector, available on the front panel, allows ISP programming using an ALTERA standard USB blaster. Most of GEB standard systems can be implemented. Altera allows the user to develop a custom system in few minutes.



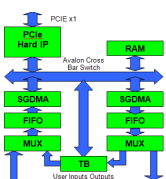
PCIe I/O

phase of pins or lot of



Registers System

It is targeted for help the designers in the starting projects that requires control PCIe mapped registers used both to control I/O internal logic. The SDK includes the drivers and some demo and examples, avoiding a startup issues



PCIe Dma System

It is designed to help the designers in the starting phase of projects that requires fast DMA straight way in PC virtual memory. It includes a QSYS system with 2 SGDMA configured one in input and one in output that can be wired to your application hardware, a Test bench peripherals can be used to test the system and measure the performances, drivers, and demo program



PCIe IOBUS System

It is targeted to allow the users to connect on PCIe bus their hardware. The Fpga system is a bridge between the PCIe target interface hosted in the fpga and a general-purpose parallel bus 32 bits wide with user programmable timing in 16ns steps and user interrupt.

Customization Service

GEB is available to develop on PCIe boards the hardware/software subsystem to your needs, integrating your hardware blocks, analyzing and foreseeing the performance, developing the SOPC system and drivers on GEB or on Customer Boards. During the design, all know-how needed to maintain the system in the next years will be taught to the customers.

Features Summary

Board Name/ Features	PCIe-15-IO	PCIem-15-IO	PCIed-15-IO
Board Size standard reference	PCI Express	Mini-PCIe (30x51mm)	Custom 50x67mm
PCIe lanes	X1	X1	X1
Power supply voltages	3.3V +/- 5%	3.3V +/- 5%	3.3V +/- 5%
I/O connectors, 34+26 pins Dual Row 50 mills header connectors interface to Samtec FFSD cable or FLE connectors	YES	YES	YES
I/O connectors, 34+26 pins Dual Row 50 mills header connectors interface to Samtec CLP connectors	YES	YES	YES
I/O connectors, 60 pins High density with lock (Samtec QTH-030-01-L-D-A-RT1) interface to Samtec QSH-030-01-L-D-A-RT1 connectors	YES	NO	YES
SantaCruz Header Connector	YES	NO (*1)	NO (*1)
External Power Connector	NO	NO	YES
User LVTTTL 3V3 digital I/O channels, each with independent sense, drive, bi-directional, and tri-state capabilities	53	51+ WLED	53
User LVTTTL output Clocks (Osc. Clock/Clock with dedicated PLL)	1/1	1/1	1/1
User LVTTTL input Clocks with dedicated PLL	1	1	1
Fpga resource EP4CGX15BF14C7N versions	LE: 14,400 SRAM: 540Kbits PLLs: 3	LE: 14,400 SRAM: 540Kbits PLLs: 3	LE: 14,400 SRAM: 540Kbits PLLs: 3
Fpga resource EP4CGX30BF14C6N versions	LE: 29,440 SRAM: 1080Kbits PLLs: 4 DSP: 80 (18X18)	LE: 29,440 SRAM: 1080Kbits PLLs: 4 DSP: 80 (18X18)	LE: 29,440 SRAM: 1080Kbits PLLs: 4 DSP: 80 (18X18)
External ram resource (Optional)	2 Mbytes	2 Mbytes	2 Mbytes
Boot device with ISP (In System Programming)	YES	YES	YES
Power monitor and Reset	YES	YES	YES
Core Power Supply	YES	YES	YES
Crystal Oscillator	25MHz	25MHz	25MHz
Fully-compatible with JTAG/IEEE 1149.1 boundary-scan standard	STANDARD	MINI	MINI
Pheripheral to Host wake-up support	YES	YES	YES
Host to Pheripheral Remote Power On	NO	YES	NO
Operative temperature range	-40/+85 °C	-40/+85 °C	-40/+85 °C
Storage temperature range	-40/+150°C	-40/+150°C	-40/+150°C
Digital Output Level	Vol=0.4V max., Voh=2.4V min.	Vol=0.4V max., Voh=2.4V min.	Vol=0.4V max., Voh=2.4V min.
Digital Input Level	Vil=0.8V max., Vih=2.0V min.	Vil=0.8V max., Vih=2.0V min.	Vil=0.8V max., Vih=2.0V min.

(*1) SantaCruz interface can be supported by a mechanical adapter

Ordering Information (*2)

Product Name	GEB Code	Description
PCIEM-15-IO	100801A1	Mini-PCIe, 53 I/O, No External Ram, interface to Samtec CLP connectors
PCIEM-15-IO	100801A2	Mini-PCIe, 53 I/O, No External Ram, interface to Samtec FFSD or FLE connectors
PCIE-RAM	100996A1	2MBytes Memory module
PCIED-15-IO	100816A1	PCIe on cable downstream board, 53 I/O, No External Ram, interface to Samtec FFSD cable and QSH-030-01-L-D-A-RT1 connector
PCIEU-15-IO	100926A1	PCIe on cable upstream board
PCIEU-15-IO	100926A1	PCIe standard format, 53 I/O, No External Ram, interface to Samtec FFSD cable, QSH-030-01-L-D-A-RT1. One SantatCruz Header slot at 3V3 level.

(*2) The boards and System can bought online at Buy online <http://www.geb-enterprise-shop.com/>



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