



Product Information

SX2-SLIDE

CompactPCI® Serial • PCI Express® External Cabling
Host Side Adapter • Dual PCIe x4 Cable Connectors

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General

Most computer systems are based on the PCI Express® standard as a high speed backbone for interconnection of peripheral components with a host CPU. Typically all PCI Express® based devices are located closely in a common enclosure.

The PCI-SIG PCI Express® External Cabling Specification addresses extended applications, such as split-systems or I/O expansion by means of a suitable copper cable, available e.g. for a x4 PCI Express® link, up to 7m length. When used with an AOC (Active Optical Cable), distances of up to 300m can be bridged between host and target systems.

The SX2-SLIDE is a CompactPCI® Serial host adapter card for PCIe x4 external cabling. The board is provided with two PCIe x4 front panel connectors, for attachment of one or two remote target systems via PCI Express® x4 links. The SX2-SLIDE has been designed for operation in a CompactPCI® Serial fat pipe slot (PCIe x 8), but will also work in standard peripheral slot (PCIe x4 preferred). The on-board PCIe packet switch splits the upstream link (x 8 or x4) into two equal downstream links (x4), each delivering up to 20Gbps to an associated target system. Dual clocking is provided on the SX2-SLIDE, which allows usage of CFC limited cables (such as AOC) in a SSC host system.



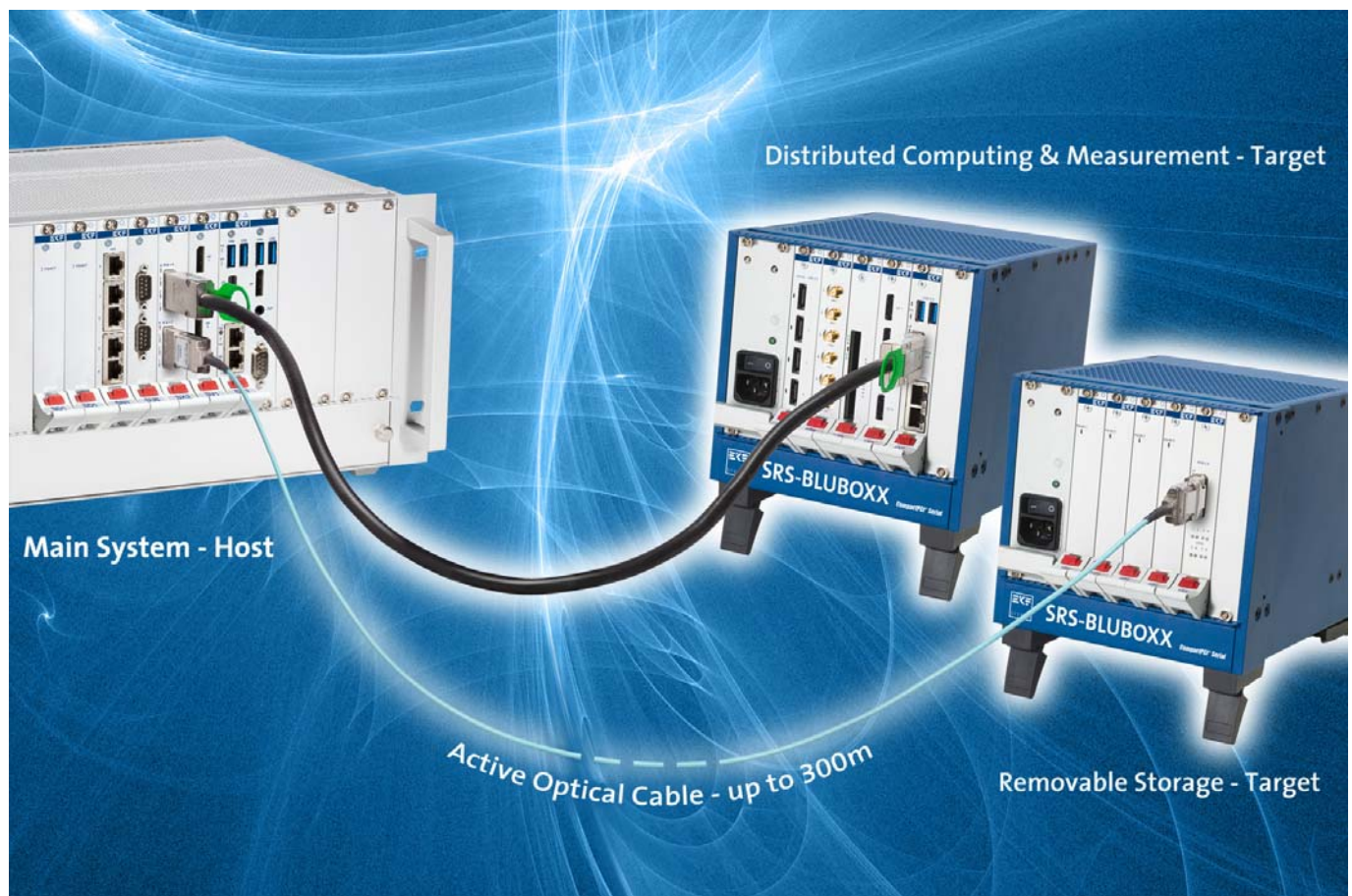
SX2-SLIDE

System Integration

The SX2-SLIDE allows to control a remote PCI Express® based target (downstream) system by a CompactPCI® Serial host CPU via PCI Express® external cabling. The target system may be any PCI Express® based hardware with an external cabling adapter, not necessarily a CompactPCI® Serial system.

By means of the SX2-SLIDE, a CompactPCI® Serial system backplane, with respect to its PCI Express® resources, can be virtually extended. Hence, PCI Express® based devices in a remote target system can be controlled by the CompactPCI® Serial host system CPU in an identical manner as its local resources.

Typical Application



By means of the Dolphin PCIe Networking Software also peer to peer computing can be realized. The Dolphin drivers establish a 'Super Sockets' named TCP/IP stack (based on Berkeley Socket), so that existing software which is running over Ethernet can be used also across a PCIe connection between two SX2-SLIDE adapter cards, with 20Gbps transfer rate and low latency down to 0.6us. The Super Sockets are available for Linux, Windows, RTX and VXworks. Please contact sales@ekf.com if interested.

Feature Summary

General

- ▶ PCI Express® external cabling host side adapter
- ▶ PICMG® CompactPCI® Serial (CPCI-S.0) fat pipe slot (x8) or peripheral slot (x4) recommended
- ▶ Single Size Eurocard 3U 4HP 100x160mm²
- ▶ cPCI-S Backplane connectors P1, P2 for x4 or x8 PCI Express® lanes

Cabling

- ▶ *PCI Express® External Cabling Specification Rev. 2.0*
- ▶ Two connectors PCIe x4 38-pos. (front panel), iPass™ (Molex)
- ▶ Two target systems or devices can be attached simultaneously
- ▶ Suitable for remote target systems to be controlled by a CompactPCI® Serial host
- ▶ Connects to any PCIe based target system or target device with PCI Express® x4 external cabling adapter or interface conforming to the specification
- ▶ Copper cable assemblies 0.5m to 7m length available
- ▶ Active optical cable assemblies (AOC) up to 300m length available (Samtec)
- ▶ PCIe Gen2 x4 allows for up to 20Gbps aggregated bandwidth

Special Features

- ▶ Gen2 PCI Express® 16-lanes packet switch on-board
- ▶ Dual clocking option for separation from host system spread spectrum clock (SSC) domain, cable ports can be setup to constant frequency clock (CFC), as required for active optical cables (AOC)
- ▶ Selectable protocol for cable ports PCIe Gen1 or Gen2

Feature Summary

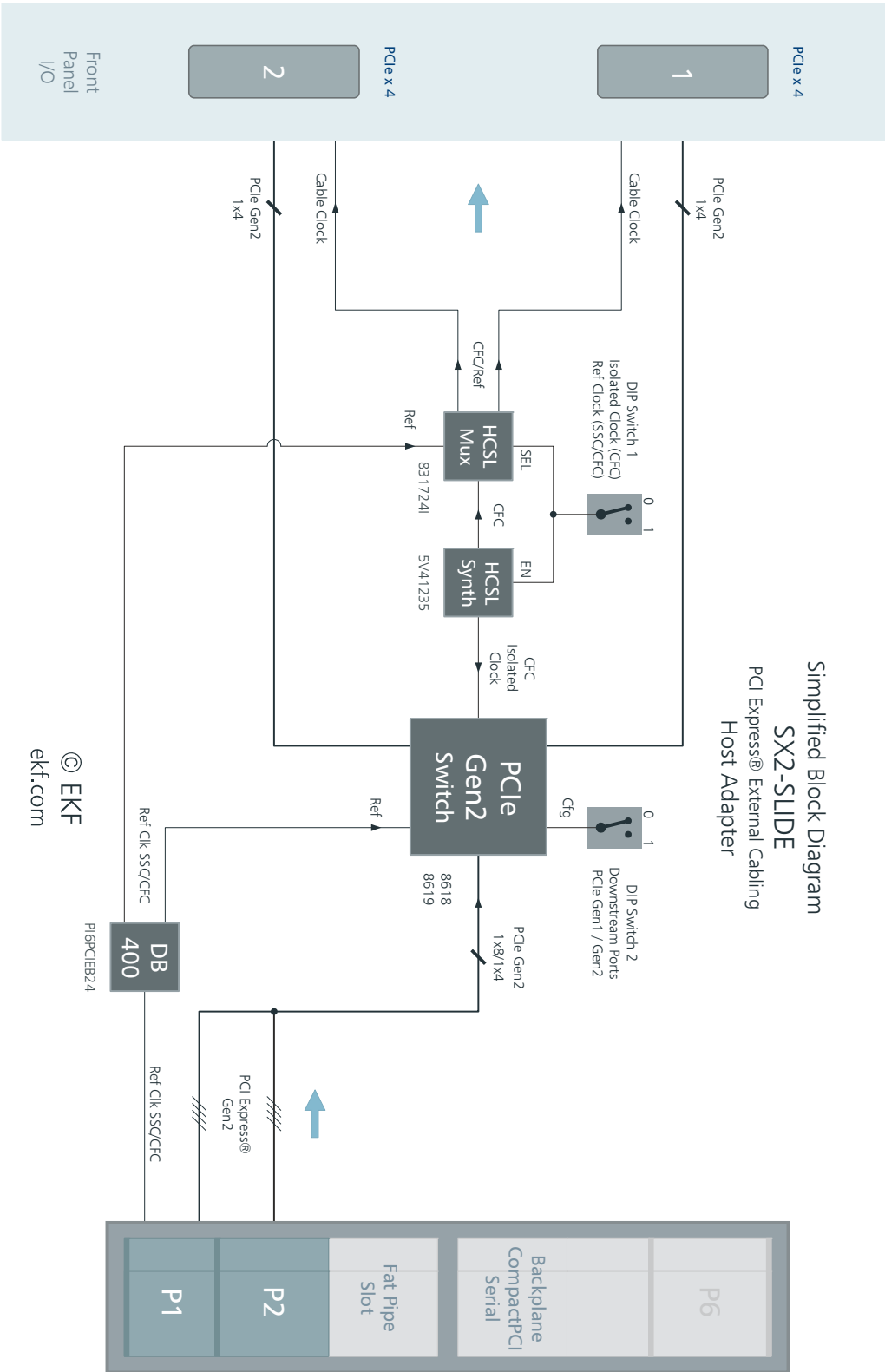
Applications

- ▶ For lowest latency at fastest speed connected systems
- ▶ Distributed computing - host to target system hierarchy
- ▶ Peer to peer computing - special TCP/IP stack (Dolphin) available
- ▶ Split-systems, hybrid systems, or system expansion applications
- ▶ Direct host to target device connection (e.g. PCIe based remote NVMe mass storage)
- ▶ Vision systems with high resolution cameras directly attached

Regulatory

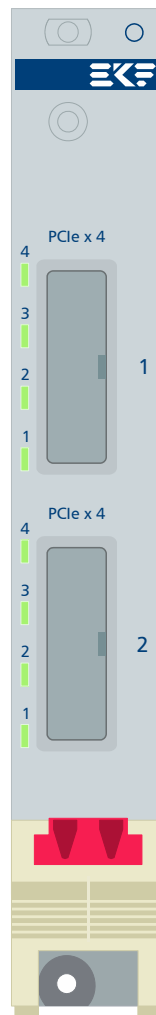
- ▶ Long term availability
- ▶ Designed & manufactured in Germany
- ▶ ISO 9001 certified quality management
- ▶ Rugged solution (coating, sealing, underfilling on request)
- ▶ RoHS compliant
- ▶ Commercial and industrial temperature range
- ▶ Humidity 5% ... 95% RH non condensing
- ▶ Altitude -300m ... +3000m
- ▶ Shock 15g 0.33ms, 6g 6ms
- ▶ Vibration 1g 5-2000Hz
- ▶ MTBF 75.5 years
- ▶ EC Regulations EN55022, EN55024, EN60950-1 (UL60950-1/IEC60950-1)

Block Diagram



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Front Panel



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SX2-SLIDE

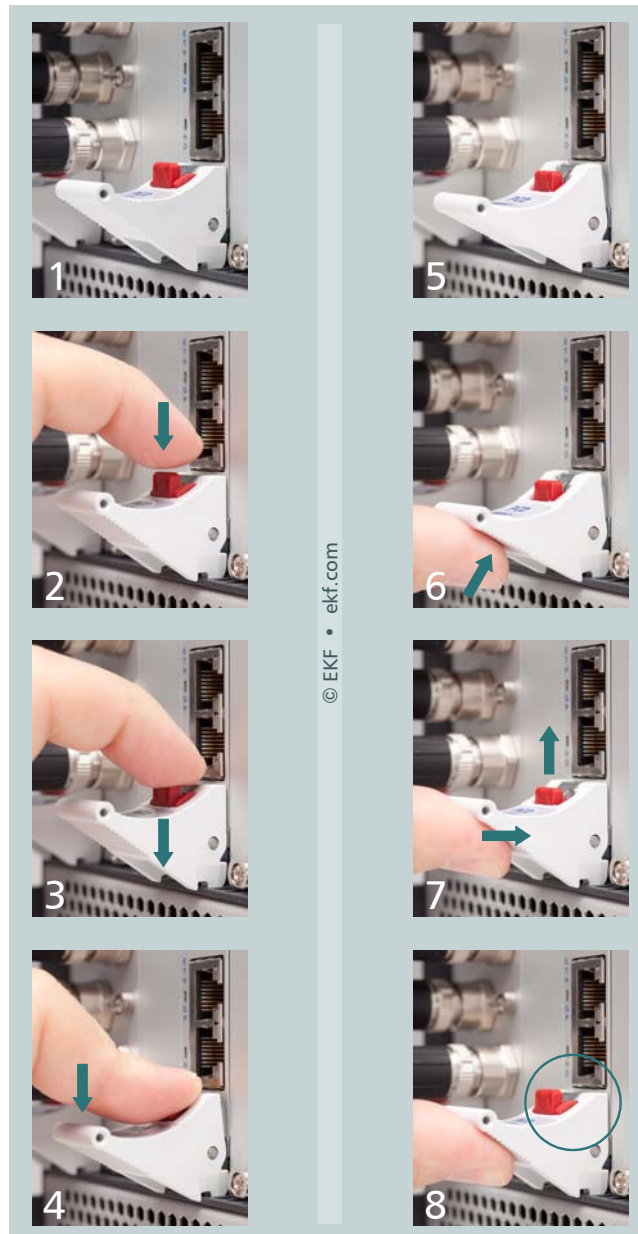
LEDs assigned to particular PCI Express® lanes
LED off - no PCIe link established for this lane *
LED on - PCIe Gen2 link established
LED blinking - PCIe Gen1 link established

* As result of the PCI Express® link training, a link is established which is suitable for communication between both sides, i.e. host controller (SX2-SLIDE) and target side adapter. The link width can vary between 1 - 2 - 4, and the data transfer rate may be either 2.5GT/s (Gen1) or 5GT/s (Gen2). With respect to the SX9-HOWL and SXS-STRING target side adapters, all lane LEDs of the corresponding SX2-SLIDE port should be steady on (x4 @ Gen2).



SX2-SLIDE

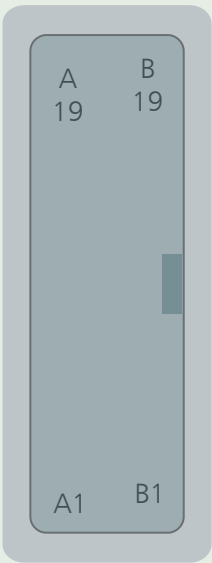
Please note: The front handle is provided with a built-in microswitch, which is used to disable the on-board power circuit when released. Vice versa, the *on-board devices are enabled not before the handle gets locked*. Please refer to the illustration below and make sure that the eject lever has reached its final position for proper board operation, as shown in picture 8. A gentle click should be audible, when the red actuator pin moves into its raised position, indicating that the board is locked and ready for use.



1 - 4: remove board
5 - 8: install board

1 & 8: on-board power enabled
2-7: on-board power disabled

PCIe x4 Cable Connectors

Front Panel Connectors PCIe x4				
EKF Parts #255.3.4.038.00 (Receptacle) & 255.3.4.138.00 (Guide Frame)				
 <p>Part #255.3.4.038.00 & 255.3.4.138.00 draft - do not scale • © EKF • ekf.com</p>	GND	A1	B1	GND
	PETp0	A2	B2	PERp0
	PETn0	A3	B3	PERn0
	GND	A4	B4	GND
	PETp1	A5	B5	PERp1
	PETn1	A6	B6	PERn1
	GND	A7	B7	GND
	PETp2	A8	B8	PERp2
	PETn2	A9	B9	PERn2
	GND	A10	B10	GND
	PETp3	A11	B11	PERp3
	PETn3	A12	B12	PERn3
	GND	A13	B13	GND
	CREFLKp	A14	B14	PWR +3.3V
	CREFLKn	A15	B15	PWR +3.3V
	GND	A16	B16	PWR_RTN 1)
	SB_RTN 2)	A17	B17	PWR_RTN 1)
	CPRSNT# 3)	A18	B18	CWAKE# 3)
	CPWRON 4)	A19	B19	CPERST# 4)

PWR +3.3V - protected by on-board PolyFuse 1.5A

For signal descriptions please refer to PCI Express External Cabling Specification Rev. 2.0

- 1) connected to GND
- 2) Sideband reference GND
- 3) Input from Downstream System (Target) to Upstream System (Host)
- 4) Output from Upstream System (Host) to Downstream System (Target)

PCIe x4 Cable Assemblies	
255.3.4.938.0.020	PCIe x4 external cable assembly, 38-circuit, 2m
255.3.4.938.0.040	PCIe x4 external cable assembly, 38-circuit, 4m
255.3.4.938.0.050	PCIe x4 external cable assembly, 38-circuit, 5m
255.3.4.938.0.070	PCIe x4 external cable assembly, 38-circuit, 7m
255.3.4.938.8.0100	PCIe x4 external active optical cable assembly, 10m
other configurations on request	

For distances up to 300m between host system and target system active optical cables (AOC) are recommended. Below 7m (e.g. when connecting racks in a common enclosure) a low cost copper cable is sufficient. *Please note, that an AOC employs a host side connector and a target side connector, which must not be interchanged.* A PCI Express® copper cable however is configured identical at both endings. While a copper cable is spread spectrum clock (SSC) compatible, the AOC requires a constant frequency clock (CFC). For proper operation over AOC, setup the host interface (SX2-SLIDE) for CFC.



Active Optical Cable Connector



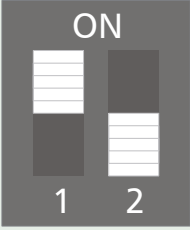
Copper Cable Connector



SX2-SLIDE

upper port shown with AOC
lower port has twinaxial copper cable attached

Cable Port Setup

On-Board DIP Switch EKF Part 160.15.02.0			
		1 - Cable Clock	2 - Cable Speed
 <p>160.15.02.0 © EKF • ekf.com</p>	Dual (Split) Clock Discrete CFC assigned to cable ports 3) (Default)	ON	PCIe Gen 1 1)
	Reference Clock System clock SSC/CFC passed through to cable ports 4)	OFF	PCIe Gen 2 2) (Default)

Settings are common to both cable ports

- 1) Forces PCIe switch to fall back to Gen1 (downstream cable ports only)
- 2) Cable ports self-adjusting for PCIe Gen1 / Gen2 speed according to target side capability
- 3) Optical cables require CFC (constant frequency clock)
- 4) Copper cables up to 7m length are compliant with both SSC & CFC

Power Sequencing

Please understand, that host and connected target hardware should be considered as distributed parts of a common computer system. During BIOS POST the whole system will be explored for PCI Express® devices attached to the PCIe® root complex (processor on host system CPU card). Devices which are not active (powered up) at this time, will not be enumerated by the BIOS and are consequently not available for the operating system afterwards.

Hence a power sequencing procedure must be observed for host system and target system. The rule is simple: **Power up the target system before the host system, or simultaneously.** If power sequencing conditions cannot be maintained, the host system must be restarted again, until the remote target devices are visible to the host CPU.

If the host system is equipped with an EKF processor board such as the SC3-LARGO or higher, a startup time delay up to 12s can be configured via BIOS setup:

Setup (F2): Advanced -> Miscellaneous Configuration -> Execute Delay after Reset

The adjusted delay would be executed before enumeration and initialization of PCI Express® devices, thus permitting a reasonable power up time lag for the remote target system. The delay countdown is indicated by a red blinking LED GP in the CPU card front panel.

P1 CompactPCI® Serial Backplane Connector

P1 CompactPCI® Serial Peripheral Slot Backplane Connector												
EKF Part #250.3.1206.20.02 • 72 pos. 12x6, 14mm Width												
P1	A	B	C	D	E	F	G	H	I	J	K	L
6	GND	1 PE TX02+	1 PE TX02-	GND	1 PE RX02+	1 PE RX02-	GND	1 PE TX03+	1 PE TX03-	GND	1 PE RX03+	1 PE RX03-
5	1 PE TX00+	1 PE TX00-	GND	1 PE RX00+	1 PE RX00-	GND	1 PE TX01+	1 PE TX01-	GND	1 PE RX01+	1 PE RX01-	GND
4	GND	<i>1</i> <i>USB2+</i>	<i>1</i> <i>USB2-</i>	GND	PE_CLK IN+	PE_CLK IN-	GND	<i>1</i> <i>SATA</i> <i>TX+</i>	<i>1</i> <i>SATA</i> <i>TX-</i>	GND	<i>1</i> <i>SATA</i> <i>RX+</i>	<i>1</i> <i>SATA</i> <i>RX-</i>
3	<i>1</i> <i>USB3</i> <i>TX+</i>	<i>1</i> <i>USB3</i> <i>TX-</i>	GA0	<i>1</i> <i>USB3</i> <i>RX+</i>	<i>1</i> <i>USB3</i> <i>RX-</i>	GA1	<i>SATA</i> <i>SDI</i>	<i>SATA</i> <i>SDO</i>	GA2	<i>SATA</i> <i>SCL</i>	<i>SATA</i> <i>SL</i>	GA3
2	GND	I2C SCL	I2C SDA	GND	<i>RSV</i>	<i>RSV</i>	GND	RST#	WAKE#	GND	PE_ EN#	SYS EN#
1	+12V	STBY	GND	+12V	+12V	GND	+12V	+12V	GND	+12V	+12V	GND

pin positions printed white/italic: not connected

For signal descriptions please refer to PICMG CPCI-S.0 R1.0 CompactPCI® Serial Specification

P2 CompactPCI® Serial Backplane Connector

P2 CompactPCI® Serial Fat Pipe Peripheral Slot Backplane Connector												
EKF Part #250.3.1208.20.00 • 96 pos. 12x8, 16mm Width												
P2	A	B	C	D	E	F	G	H	I	J	K	L
8	GND	<i>IO</i>	<i>IO</i>	GND	<i>IO</i>	<i>IO</i>	GND	<i>IO</i>	<i>IO</i>	GND	<i>IO</i>	<i>IO</i>
7	<i>IO</i>	<i>IO</i>	GND	<i>IO</i>	<i>IO</i>	GND	<i>IO</i>	<i>IO</i>	GND	<i>IO</i>	<i>IO</i>	GND
6	GND	<i>IO</i>	<i>IO</i>	GND	<i>IO</i>	<i>IO</i>	GND	<i>IO</i>	<i>IO</i>	GND	<i>IO</i>	<i>IO</i>
5	<i>IO</i>	<i>IO</i>	GND	<i>IO</i>	<i>IO</i>	GND	<i>IO</i>	<i>IO</i>	GND	<i>IO</i>	<i>IO</i>	GND
4	GND	<i>IO</i>	<i>IO</i>	GND	<i>IO</i>	<i>IO</i>	GND	<i>IO</i>	<i>IO</i>	GND	<i>IO</i>	<i>IO</i>
3	<i>IO</i>	<i>IO</i>	GND	<i>IO</i>	<i>IO</i>	GND	<i>IO</i>	<i>IO</i>	GND	<i>IO</i>	<i>IO</i>	GND
2	GND	1 PE TX06+	1 PE TX06-	GND	1 PE RX06+	1 PE RX06-	GND	1 PE TX07+	1 PE TX07-	GND	1 PE RX07+	1 PE RX07-
1	1 PE TX04+	1 PE TX04-	GND	1 PE RX04+	1 PE RX04-	GND	1 PE TX05+	1 PE TX05-	GND	1 PE RX05+	1 PE RX05-	GND

pin positions printed italic/white: not connected

For signal descriptions please refer to PICMG CPCI-S.0 R1.0 CompactPCI® Serial Specification

Related Documents

Related Cards Using PCIe External Cabling	
SX5-STREAM	CompactPCI® Serial • PCIe External Cabling • Host Side Dual Gen3 x8 www.ekf.com/s/sx5/sx5.html
SX9-HOWL	CompactPCI® Serial • PCIe External Cabling • Target Side Gen2 x4 • PCIe System Slot Replicator www.ekf.com/s/sx9/sx9.html
SXC-LOOP	CompactPCI® Serial • PCIe External Cabling • Target Side Gen3 x8 • PCIe System Slot Replicator 2 x Gen3 x8 Fat Pipe Slots www.ekf.com/s/sxc/sxc.html
SXS-STRING	CompactPCI® Serial • PCIe External Cabling • Target Side Gen2 x4 • 8-Port SATA RAID www.ekf.com/s/sxs/sxs.html
DC2-STAG	XMC Mezzanine Module • PCIe External Cabling • Host Side Dual Gen2 x4 http://www.ekf.com/d/dpxc/dc2/dc2.html

Reference Documents		
Term	Document	Origin
CompactPCI® Serial	CPCI-S.0	www.picmg.org
PCI Express®	PCI Express® External Cabling Specification 2.0	www.pcisig.com

Ordering Information

Ordering Information

For popular SX2-SLIDE SKUs please refer to
www.ekf.com/liste/liste_21.html#SX2

Vision Systems

Top-end image processing applications are PCI Express® enabled. This solution offers the shortest latency time, as well as very high data transfer rates, as required for high resolution and high frame rate image capture.

Some industrial cameras are already provided with the PCIe x4 cable connector. The SX2-SLIDE would allow to attach two PCIe cameras at a nominal data transfer rate of 20Gbps each.



Application Example - High Performance Vision System w. SX2-SLIDE



Beyond All Limits: EKF High Performance Embedded

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boards. systems. solutions.

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