EKF
SYSTEM

Product Information

SXS-STRING

CompactPCI® Serial • PCI Express® External Cabling
Target Side Adapter • SATA Controller

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 SXS-STRING is a target system adapter card for PCIe x4 external cabling. The board fits into the system slot of a CompactPCI® Serial backplane. Two on-board quad-port SATA 6G RAID controllers are used to distribute eight SATA channels across a CompactPCI® Serial backplane. Thus, up to eight SATA based CompactPCI® Serial peripheral slot cards in a target system can be controlled by a remote host system CPU, with a maximum PCI Express® transfer rate of 20Gbps.

The SXS-STRING serves as a high performance SATA controller, suitable e.g. for configuring industrial storage systems.
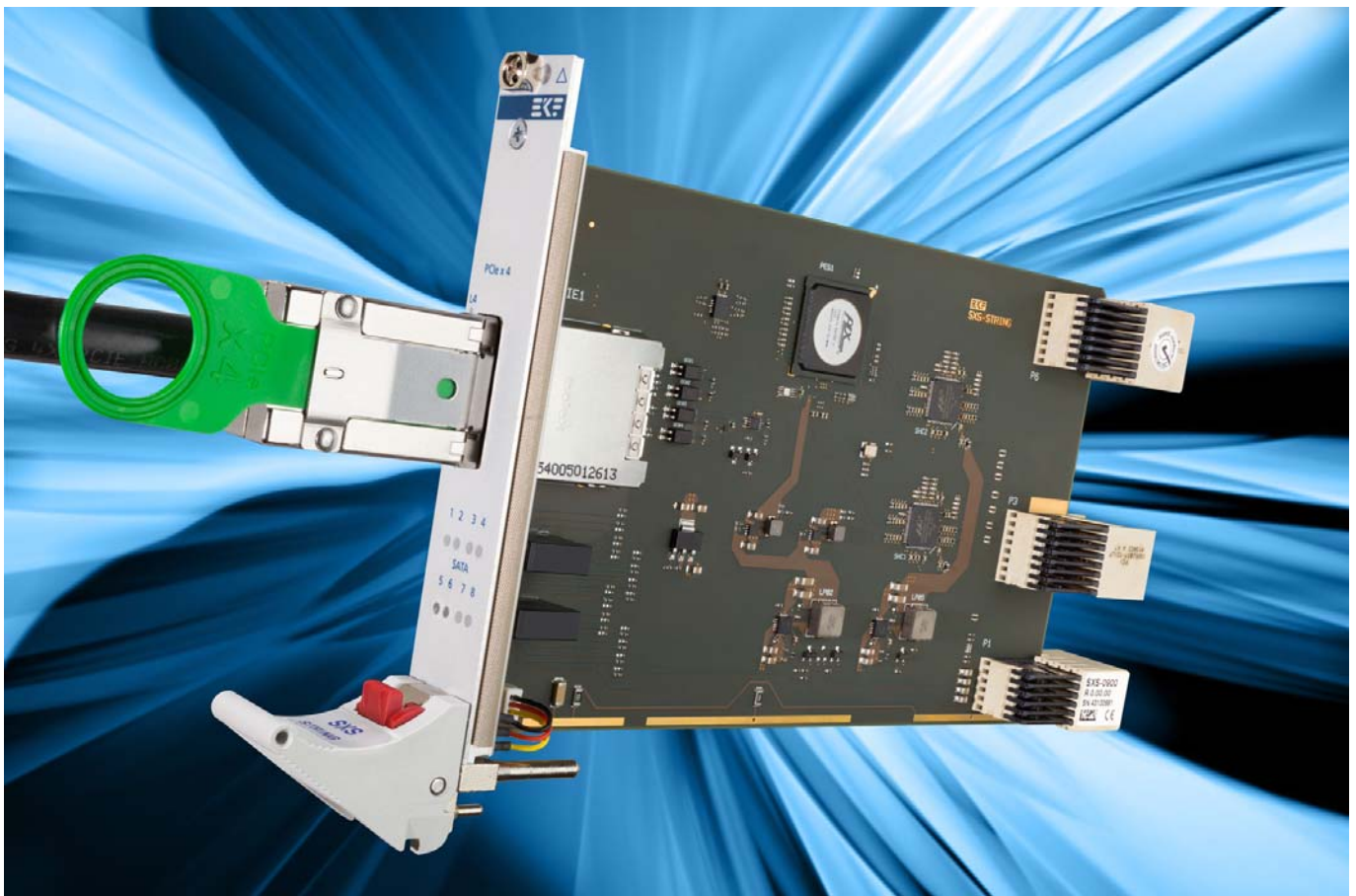
SXS-STRING

Feature Summary

General

▸ PCI Express® external cabling target side adapter
▸ PICMG® CompactPCI® Serial (CPCI-S.0) system slot card (SATA resources only)
▸ Single Size Eurocard 3U 4HP 100x160mm^2
▸ cPCI-S Backplane connectors P1, P3 for 8 SATA channels (2 x 4)
▸ P6 connector for even more mechanical ruggedness (option on request)

PCI Express®

▸ *PCI Express® External Cabling Specification Rev.2*
▸ Front Panel x4 connector 38-pos. (aka iPass™ series)
▸ Suitable for CompactPCI® Serial target systems to be controlled by a remote host
▸ Split-systems, hybrid systems, or system expansion applications
▸ Suitable for any host system with PCI Express® x4 external cabling host adapter
▸ Copper cable assemblies 0.5m to 7m length available
▸ Active optical cable assemblies (AOC) up to 300m length available
▸ PCIe Gen2 x4 allows for up to 20Gbps bandwidth

SATA Storage Controller

▸ 2 x Marvell 88SE9230 SATA RAID host controllers
▸ Quad port (each controller), 6G SATA (3G, 1.5G backward compliant)
▸ Native Command Queuing
▸ Hardware RAID 0/1/10 or JBOD configuration
▸ On-the-fly AES encryption 128/256-bit
▸ AHCI compatible
▸ Non-RAID or RAID operation individually configurable for each controller
▸ Driver and RAID management software available for download (to be installed on the host system)

Applications

▸ Suitable for high throughput remote industrial data storage systems

▸ Lower latency compared to NAS storage solutions

▸ Data transfer rate twice as much compared to a 10GbE NAS

▸ SSD configuration control directly by host system

▸ Redundancy by concurrent hardware RAID (target) and software RAID (host)

▸ Can be used with any computer system providing a PCIe x4 cabling host controller

▸ Can be combined with up to eight SD1-DISCO SATA SSD carrier cards on a standard CompactPCI® Serial backplane

▸ Can be combined with up to eight SD8-STEEL SATA SSD carrier cards (front door mobile rack) on a standard CompactPCI® Serial backplane

▸ SDC-0100-SATA cassette for 8 x 2.5-inch SATA SSD horizontal mounting available for lowest space requirements

▸ SDC-9100-SATA custom backplane available to be combined with the SATA cassette

▸ SX2-SLIDE dual port host adapter recommended for CompactPCI® Serial systems (can control two SXS-STRING target adapters simultaneously)
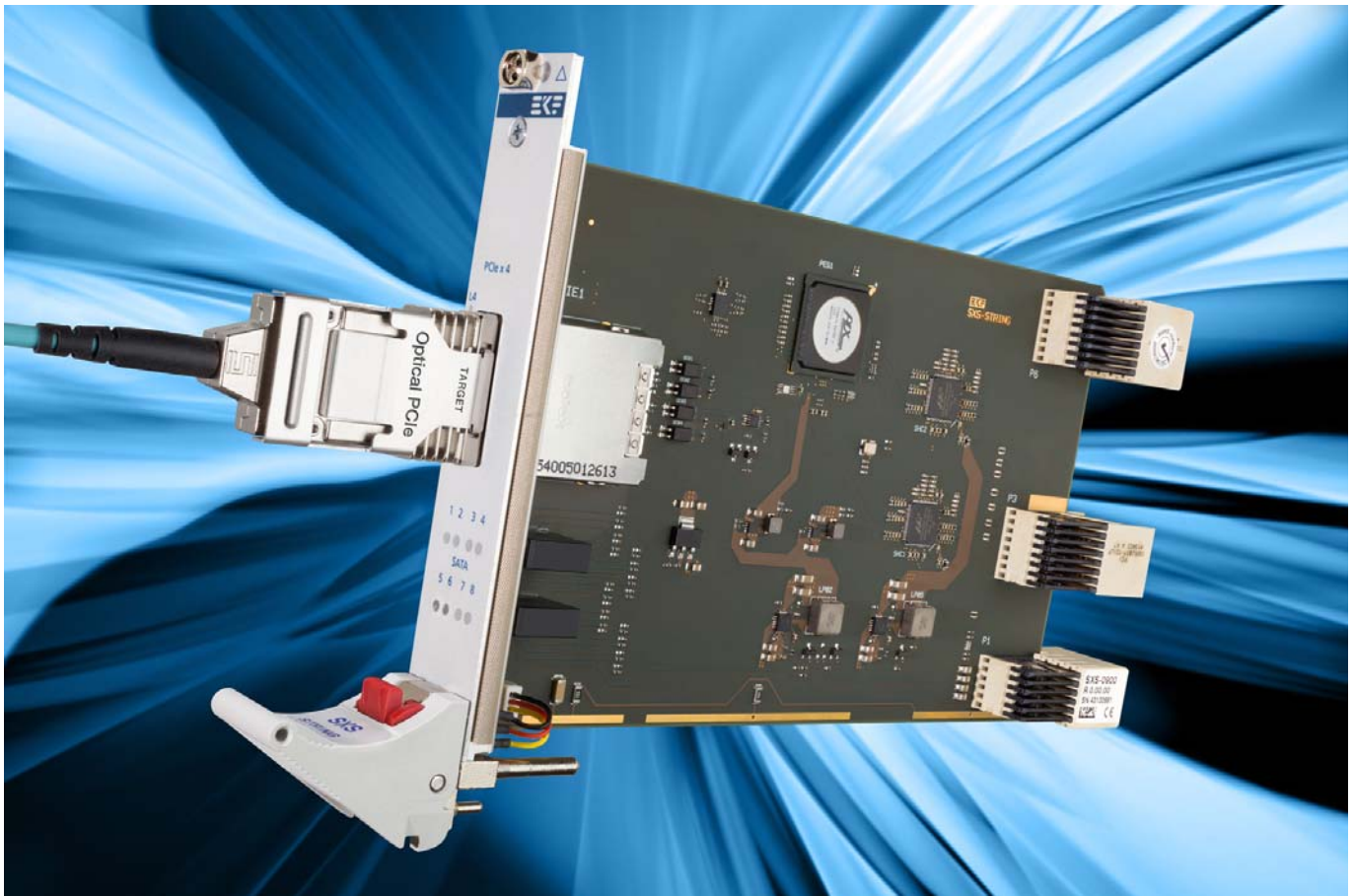
Regulatory

▸ Long term availability

▸ Designed & manufactured in Germany

▸ ISO 9001 certified quality management

▸ Rugged solution (coating, sealing, underfilling on request)

▸ RoHS compliant 2002/95/EC

▸ 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 44.8 years

▸ EC Regulations EN55022, EN55024, EN60950-1 (UL60950-1/IEC60950-1)
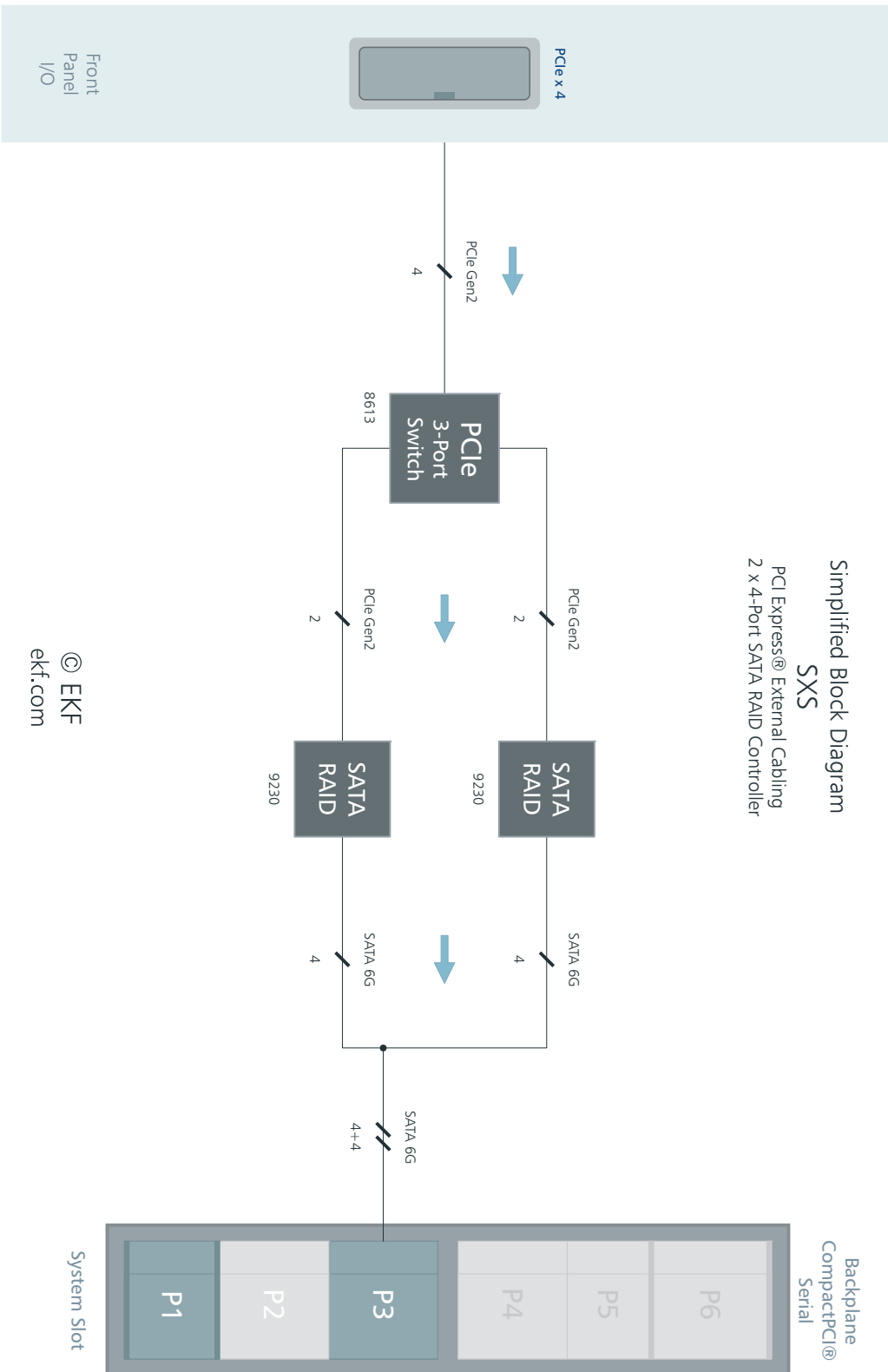
Theory of Operation

The SXS-STRING allows to control a CompactPCI® Serial target (downstream) system by a remote host CPU via PCI Express® external cabling. The host (upstream) system may be any computer with a PCI Express® external cabling adapter, not necessarily a CompactPCI® Serial system.

The SXS-STRING must be inserted into the system slot of the CompactPCI® Serial target system. Being mainly a powerful SATA controller, the SXS-STRING is organized similar to a CompactPCI® Serial system slot controller card, however restricted to the SATA resources of the CompactPCI® Serial backplane.
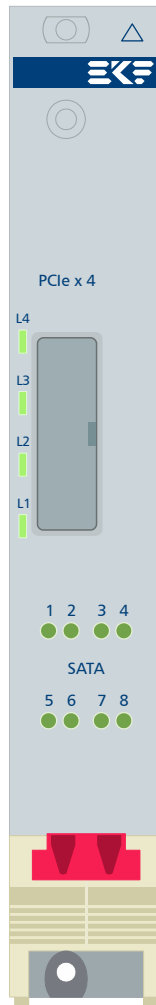
The SXS-STRING is connected to the host system by a PCI Express® x4 front panel cabling connector. An on-board PCI Express® packet switch establishes dedicated PCIe links for two attached SATA controllers. Eight SATA channels in total are available via the relevant backplane connectors P1/P3, sufficient for up to eight SATA based CompactPCI® Serial peripheral cards in a target system. Since the SXS-STRING is equipped with two quad port SATA 6G controllers, the SATA devices of the CompactPCI® Serial target system are organized as 2 x 4 drives. Each controller can be individually configured for RAID level 0/1/10, or non-RAID operation.

Block Diagram

Front
Panel
I/O

PCIe x 4

PCIe Gen2
4

PCIe
3-Port
Switch
8613

PCIe Gen2
2

PCIe Gen2
2

SATA
RAID
9230

SATA
RAID
9230

SATA 6G
4

SATA 6G
4

SATA 6G
4+4

System Slot

P1	P2	P3	P4	P5	P6

Backplane
CompactPCI®
Serial

Simplified Block Diagram
SXS
PCI Express® External Cabling
2 x 4-Port SATA RAID Controller

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Front Panel

PCIe x 4

L4
L3
L2
L1

1 2 3 4

SATA

5 6 7 8

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SXS-STRING

| Front Panel LEDs	
L1 - L4	Cable port PCI Express® Link • Lane 1 - 4 permanent on: PCIe Gen2 over external cable blinking: PCIe Gen1 over external cable
SATA 1 - 8	permanent on: drive attached - idle blinking: drive attached - SATA activity

Cable Port Configuration

1 - PCIe
ON - Gen1
OFF- Gen2

2 - Power Control
ON - Enabled with CPWRON#
OFF - Permanently Enabled

ON
1   2

PCIe x 4
Cable Port
Settings

PCIe
Gen2
Switch

PCIE x 4

SATA 2

SATA 1

LED 1-2-3-4

LED 5-6-7-8

SXS-STRING
CompactPCI® Serial
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PP1

P6

P3

P1

SXS-STRING • CompactPCI® Serial • © EKF • ekf.com
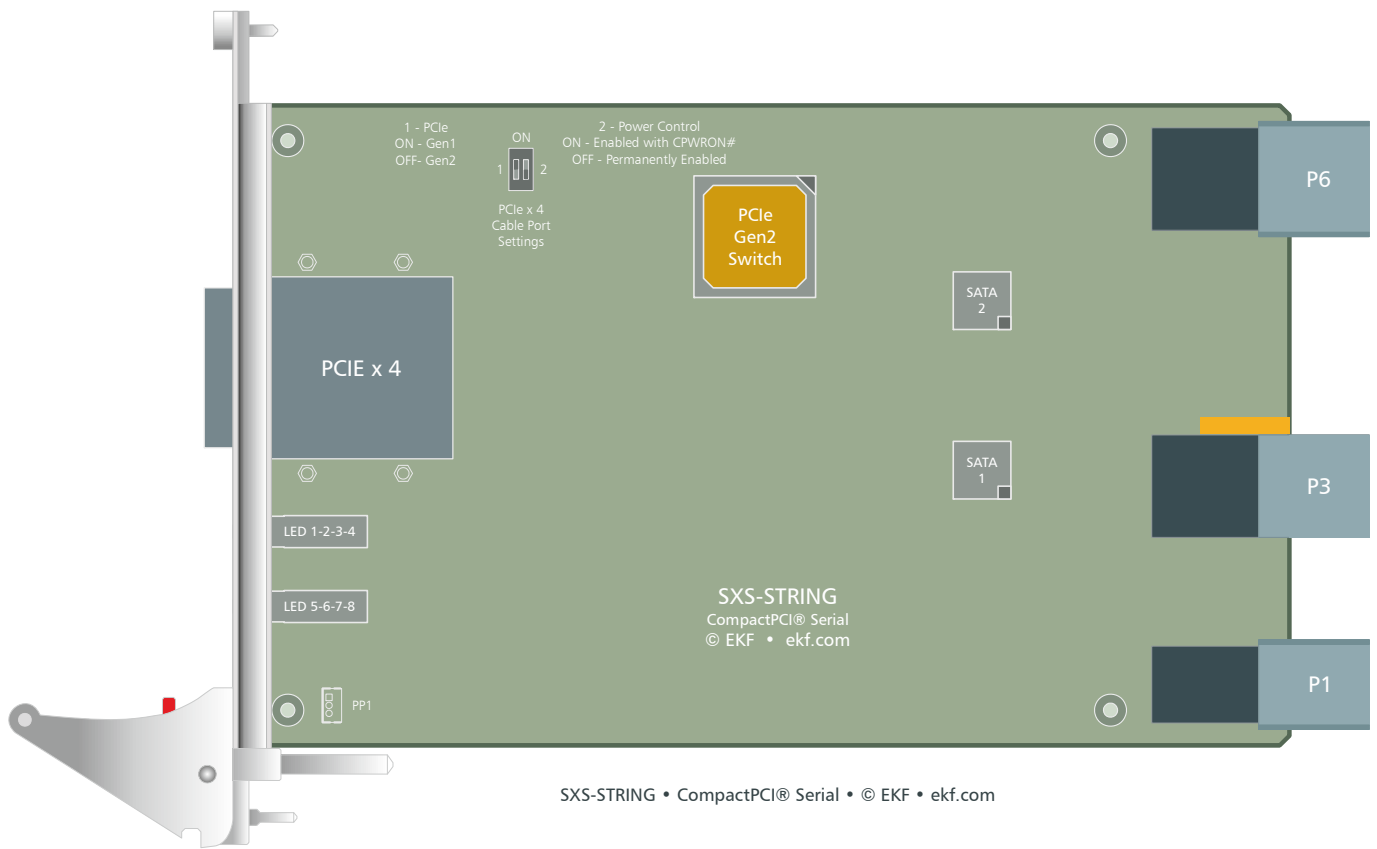
Dip Switch DSW Cable Port Setup		
1		2
forces PCIe Gen1 transfer mode	ON	local power regulators enabled when CPWRON# is driven active low by upstream system (default)
PCIe Gen1/Gen2 according to upstream system capability (default)	OFF	local power regulators permanently enabled, ignoring CPWRON#

160.15.02.0
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ON
1   2

PCIe x 4 Connector

Front Panel Connector PCIe x 4			
EKF Parts #255.3.4.038.00 (Receptacle) & 255.3.4.138.00 (Guide Frame)			
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
CREFCLKp	A14	B14	PWR +3.3V
CREFCLKn	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)

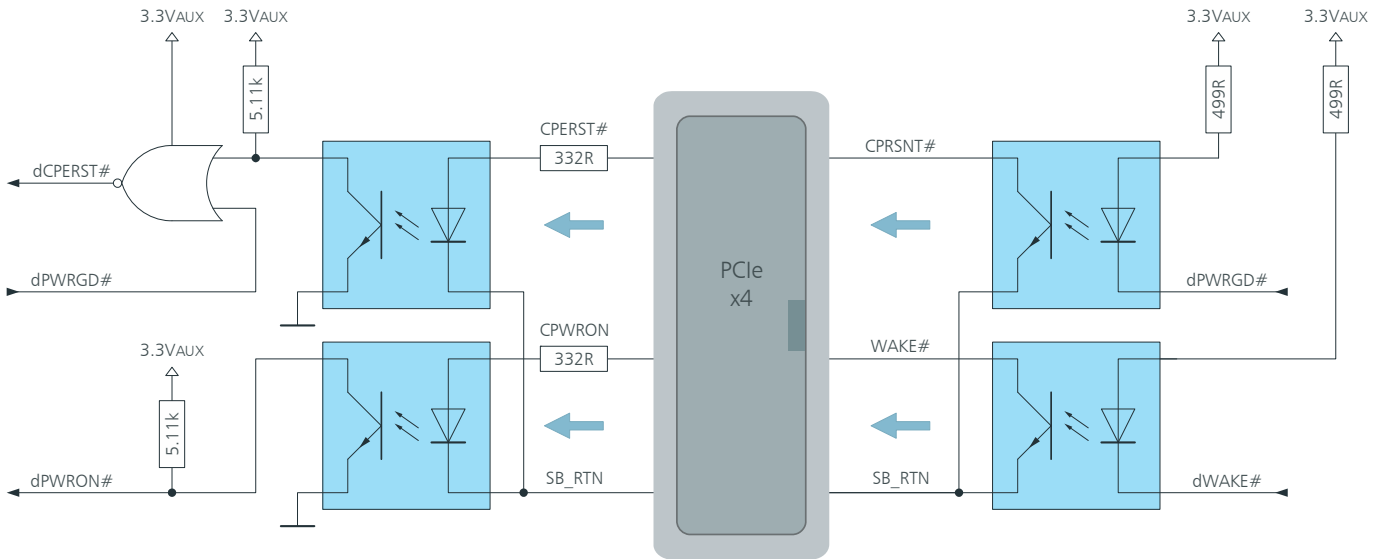PCIe x 4

A 19   B 19

A1   B1
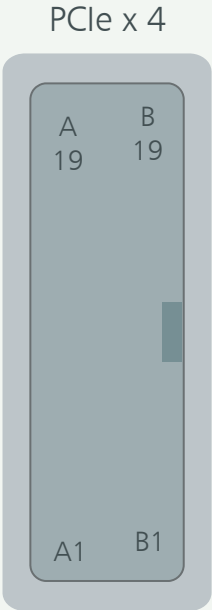
Part #255.3.4.038.00 & 255.3.4.138.00
draft - do not scale • © EKF • ekf.com

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, isolated from GND
3)   Output from Downstream System (Target) to Upstream System (Host)
        Isolated via photocoupler TLP281
4)   Input from Upstream System (Host) to Downstream System (Target)
        Isolated via photocoupler TLP281

Power-Domain Isolation SX* Target Adapters (Downstream Subsystem) • © EKF

EKF Part # PCIe x 4 Cable Assemblies	
255.3.4.938.0.005	PCIe x 4 external cable assembly, 38-circuit, 0.5m
255.3.4.938.0.020	PCIe x 4 external cable assembly, 38-circuit, 2m
255.3.4.938.0.040	PCIe x 4 external cable assembly, 38-circuit, 4m
255.3.4.938.0.050	PCIe x 4 external cable assembly, 38-circuit, 5m
255.3.4.938.0.070	PCIe x 4 external cable assembly, 38-circuit, 7m
255.3.4.938.8.0100	PCIe x 4 external active optical cable assembly (AOC), 10m
other configurations on request	

Typical Application
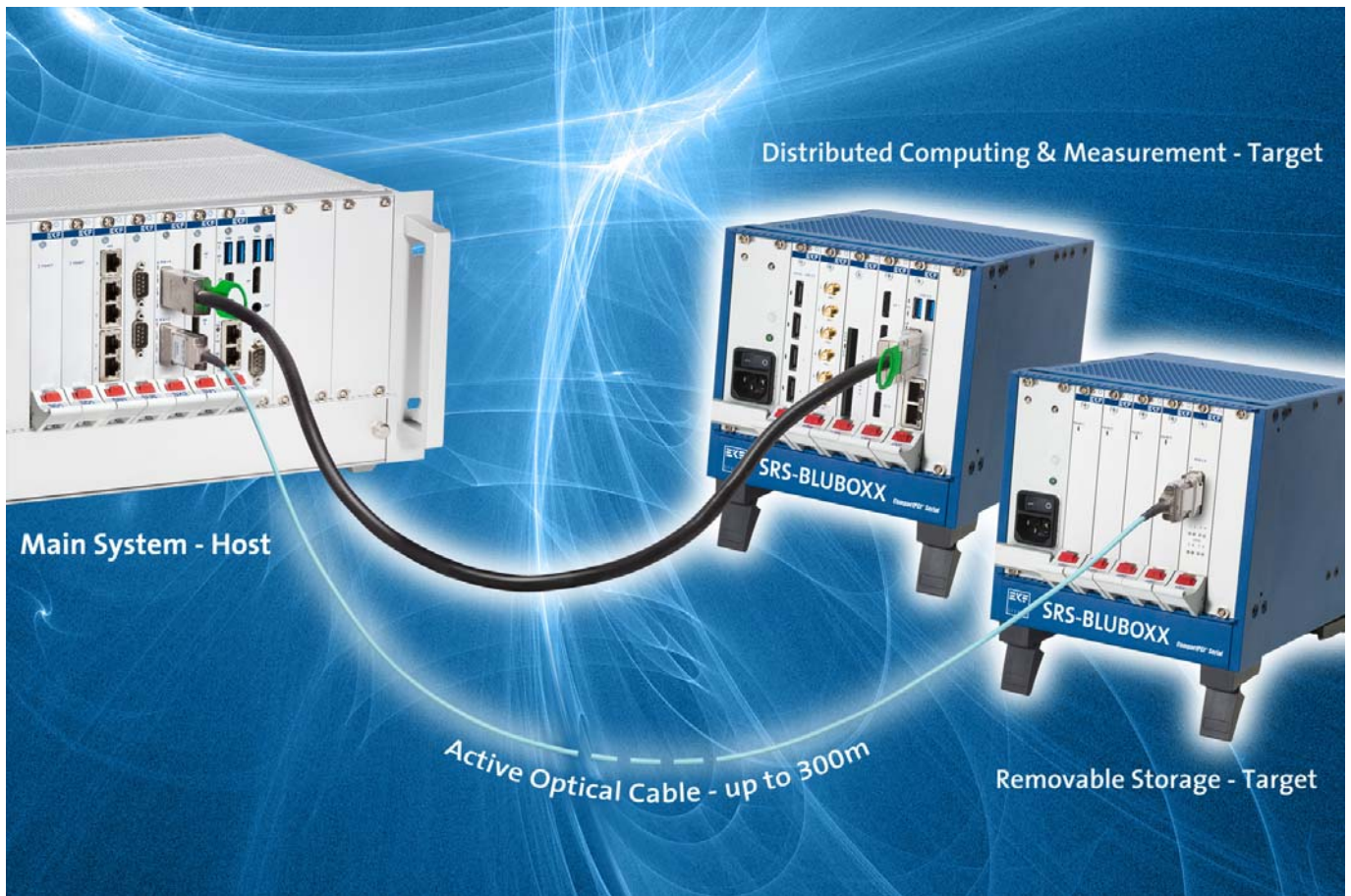
For distances up to 300m between host system and target system active optical cables (AOC) are recommended. Below 7m (e.g. when connecting racks in a common enclosure) a low cost copper cable is sufficient. Please note, that an AOC employs a host side connector and a target side connector, which must 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 (e.g. SX2-SLIDE) for CFC.

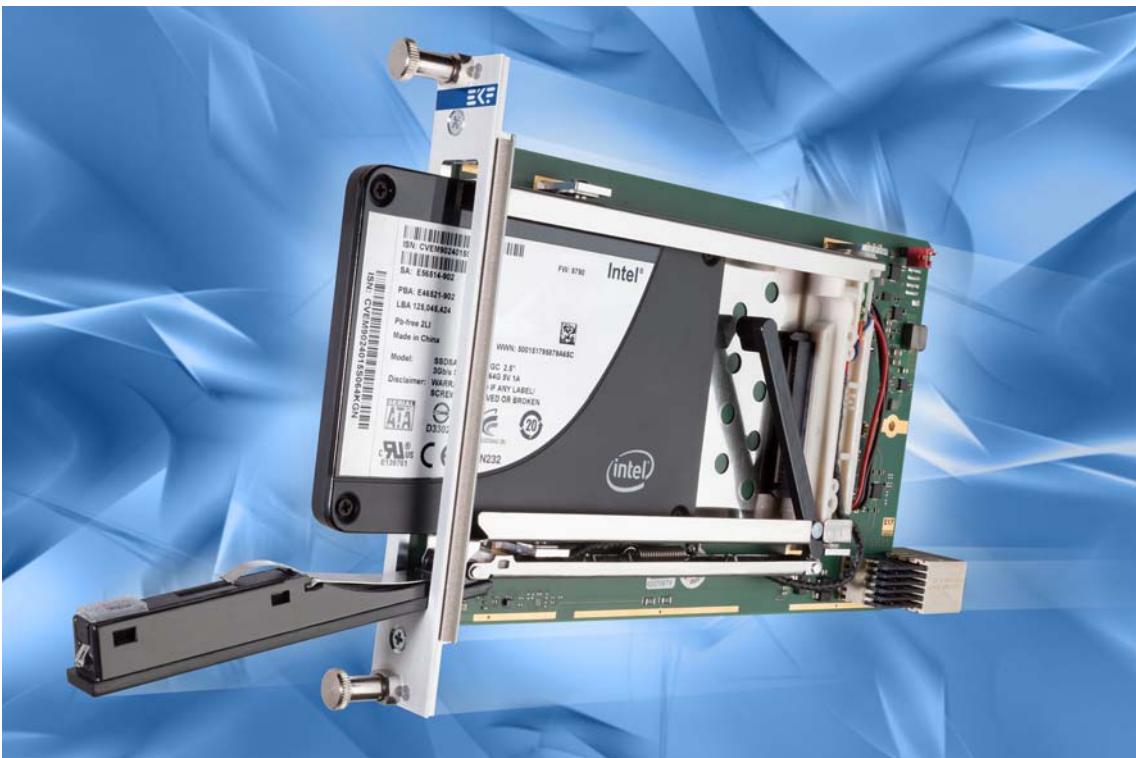
Active Optical Cable Connector

Copper Cable Connector

SATA Storage Cards

SD1-DISCO

SD8-STEEL

SDC-SATA Storage Cassette and Custom Backplane

Host System PCIe Cabling Adapter

SX2-SLIDE Dual Port PCIe Cabling Host Adapter

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 later, 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 System Slot Backplane Connector

P1 CompactPCI® Serial System 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	1 USB2+	1 USB2-	GND	RSV	RSV	GND	1 SATA TX+	1 SATA TX-	GND	1 SATA RX+	1 SATA RX-
3	1 USB3 TX+	1 USB3 TX-	PWR BTN#	1 USB3 RX+	1 USB3 RX-	PWR_FAIL#	SATA SDI	SATA SDO	GND GA2	SATA SCL	SATA SL	GND GA3
2	GND	I2C SCL	I2C SDA	GND	GND PS_ON#	RST#	GND	PRST#	WAKE#	GND	RSV	SYS EN#
1	+12V	STBY	GND	+12V	+12V	GND	+12V	+12V	GND	+12V	+12V	GND

pin positions printed gray: not supported, PU terminated

pin positions printed italic/white: not connected

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

P3 CompactPCI® Serial System Slot Backplane Connector

P3 CompactPCI® Serial System Slot Backplane Connector											
EKF Part #250.3.1208.20.00 • 96 pos. 12x8, 16mm Width											
P3	A	B	C	D	E	F	G	H	I	J	K	L

P3	A	B	C	D	E	F	G	H	I	J	K	L
8	GND	7 SATA Tx+	7 SATA Tx-	GND	7 SATA Rx+	7 SATA Rx-	GND	8 SATA Tx+	8 SATA Tx-	GND	8 SATA Rx+	8 SATA Rx-
7	5 SATA Tx+	5 SATA Tx-	GND	5 SATA Rx+	5 SATA Rx-	GND	6 SATA Tx+	6 SATA Tx-	GND	6 SATA Rx+	6 SATA Rx-	GND
6	GND	3 SATA Tx+	3 SATA Tx-	GND	3 SATA Rx+	3 SATA Rx-	GND	4 SATA Tx+	4 SATA Tx-	GND	4 SATA Rx+	4 SATA Rx-
5	*8 USB3 Tx+*	*8 USB3 Tx-*	GND	*8 USB3 Rx+*	*8 USB3 Rx-*	GND	2 SATA Tx+	2 SATA Tx-	GND	2 SATA Rx+	2 SATA Rx-	GND
4	GND	*6 USB3 Tx+*	*6 USB3 Tx-*	GND	*6 USB3 Rx+*	*6 USB3 Rx-*	GND	*7 USB3 Tx+*	*7 USB3 Tx-*	GND	*7 USB3 Rx+*	*7 USB3 Rx-*
3	*4 USB3 Tx+*	*4 USB3 Tx-*	GND	*4 USB3 Rx+*	*4 USB3 Rx-*	GND	*5 USB3 Tx+*	*5 USB3 Tx-*	GND	*5 USB3 Rx+*	*5 USB3 Rx-*	GND
2	GND	*2 USB3 Tx+*	*2 USB3 Tx-*	GND	*2 USB3 Rx+*	*2 USB3 Rx-*	GND	*3 USB3 Tx+*	*3 USB3 Tx-*	GND	*3 USB3 Rx+*	*3 USB3 Rx-*
1	*5 USB2 +*	*5 USB2 -*	GND	*6 USB2 +*	*6 USB2 -*	GND	*7 USB2 +*	*7 USB2 -*	GND	*8 USB2 +*	*8 USB2 -*	GND

pin positions printed italic/white: not connected

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

Related Information

SXS-STRING Driver Download	
SXS-STRING	CompactPCI® Serial • PCIe External Cabling • Target Side • 8 x SATA www.ekf.com/s/sxs/sxs.html

Similar Cards Using PCIe Gen2 External Cabling	
SX2-SLIDE	CompactPCI® Serial • PCIe External Cabling • Host Side Dual Gen2 x4 www.ekf.com/s/sx2/sx2.html
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
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
SATA	Serial ATA Rev. 3.0 Specification, June 2, 2009	www.sata-io.org

Ordering Information

Ordering Information
For popular SXS-STRING SKUs please refer to www.ekf.com/liste/liste_21.html#SXS

Industrial Computers Made in Germany

boards.   systems.   solutions.