EKF SYSTEM

Product Information

CompactPCI ® *Serial* • SB1-OBOE

Quad Port USB 3.0 & eSATA Hostadapter

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General

The SB1-OBOE is a peripheral slot board for PICMG® CompactPCI® Serial systems, equipped with four USB3/eSATA front panel combo connectors. The card is comprised of an USB 3.0 SuperSpeed controller, and a SATA III RAID controller. Hence each front panel connector is suitable for attachment of either USB 3.0, USB 2.0 or eSATA based peripheral devices.

The SB1-OBOE is provided with a PCI Express® 2.0 package switch, and can be installed into any peripheral slot of a CompactPCI® Serial backplane. A single PCIe lane would be sufficient for operation, but the optimum performance will be achieved when the SB1-OBOE is inserted into a CompactPCI® Serial fat pipe slot.

SB1-OBOE

Feature Summary

▸ PICMG® CompactPCI® Serial standard (CPCI-S.0) Peripheral Slot card

▸ Single Size Eurocard 3U 4HP 100x160mm^2

▸ CPCI-S backplane connector P1

▸ Triple port PCI Express® Gen2 package switch

▸ Upstream port: 4 x PCI Express® lanes Gen2 (5.0Gbps) or Gen1 (2.5Gbps) supported

▸ Texas Instruments PCI Express® to quad-port USB 3.0 controller

▸ PCI Express® x 1 Gen2 interface for optimum performance

▸ USB 3.0 xHCI (eXtensible host controller interface) SuperSpeed

▸ USB 2.0 high-speed, full-speed, low-speed supported

▸ V_{BUS} (+5V) 1.5A high current for each port eliminates need for external power supplies

▸ Four front bezel USB 3.0 type A combo receptacles for attachment of external USB devices

▸ Marvell® PCI Express® 2.0 to SATA III host controller

▸ PCI Express® x 2 Gen2 interface for optimum performance

▸ Four SATA 6Gbps interface ports (backward support 3Gbps and 1.5Gbps)

▸ Native Command Queuing

▸ Hardware RAID 0/1/10

▸ On-the-fly AES encryption 128/256-bit

▸ AHCI driver support, Marvell® Storage Management (Windows® & Linux)

▸ Four front bezel eSATA combo connectors for attachment of external eSATA devices

▸ +5V 1.5A eSATAp (power over eSATA) with suitable cable harness (USB V_{BUS})

▸ Concurrent usage of eSATA and USB devices through any combo connector by means of a splitter cable (results in 8 external devices maximum)

▸ Long term availability

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

▸ RoHS compliant 2002/95/EC

▸ Operating temperature: 0°C to +65°C (industrial temperature range on request)

▸ Storage temperature: -40°C to +85°C, max. gradient 5°C/min

▸ Humidity 5% ... 95% RH non condensing

▸ Altitude -300m ... +3000m

▸ Shock 15g 0.33ms, 6g 6ms

▸ Vibration 1g 5-2000Hz

▸ MTBF tbd

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

Theory of Operation

The SB1-OBOE is equipped with the Texas Instruments TUSB7340 single chip PCI Express® to USB 3.0 bridge. The xHCI (SuperSpeed) compliant host controller supports four downstream ports. Each downstream port has individual power control and overcurrent detection (V_{BUS} >1.5A), and is USB 2.0 compatible.

In addition, the SB1-OBOE accommodates the Marvell® 88SE9230 four-channel PCI Express® to SATA 6Gbps controller, suitable for RAID or non RAID operation, and incorporating speed negotiation to backward support 3Gbps and 1.5Gbps (eSATA limited by specification to 3GBps).

Four 3-in-1 USB/eSATA combo connectors are provided at SB1-OBOE front panel. Each connector is wired to a dedicated USB I/O port, and concurrently to a SATA I/O channel. The combo receptacles accept either an USB 3.0 or USB 2.0 type A cable connector, or an eSATA cable connector, for attachment of an external device, either USB 3.0, USB 2.0, or eSATA.
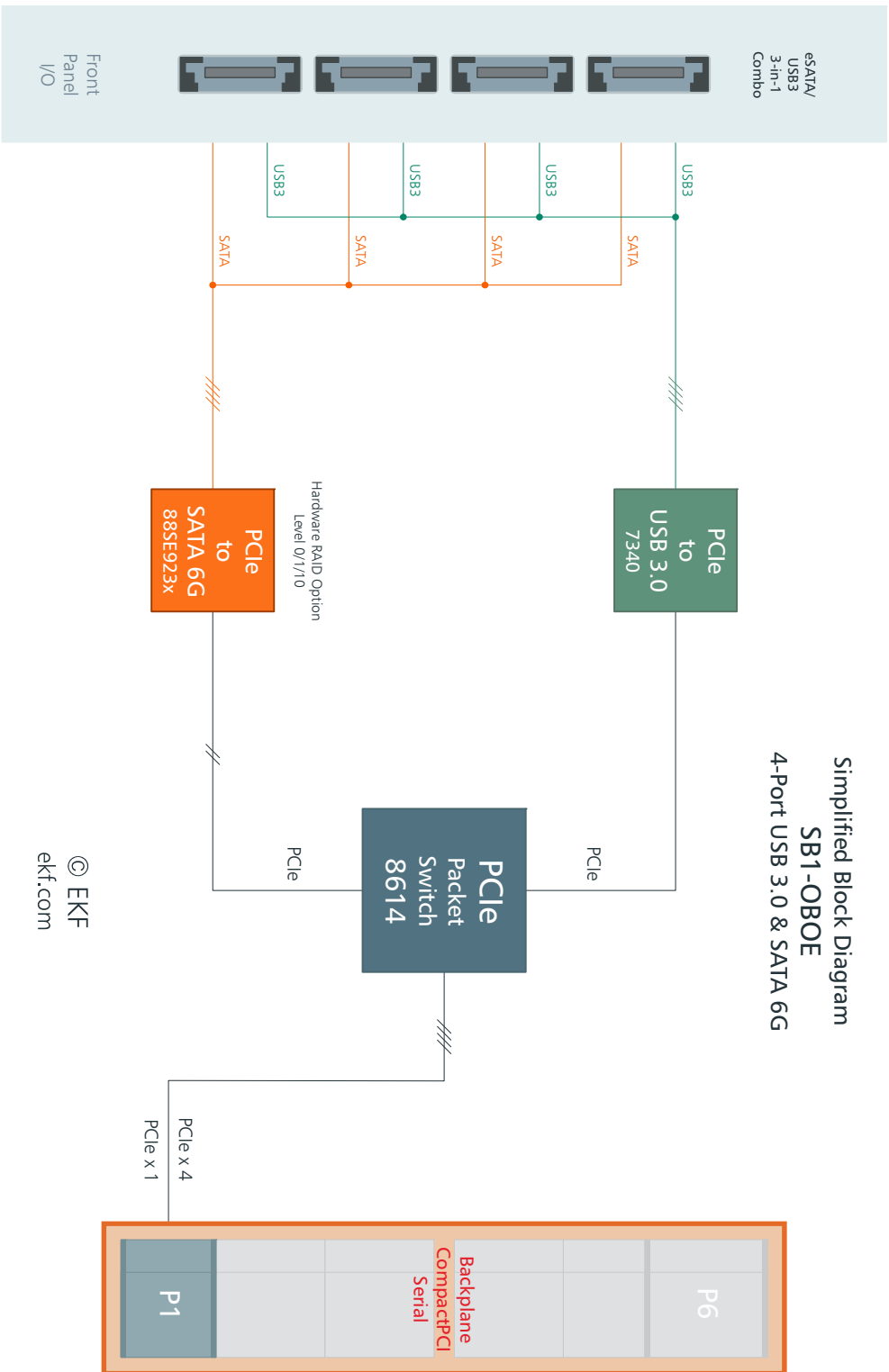
The SB1-OBOE is based on PCI Express® 2.0 5.0Gbps technology. A PCIe packet switch is provided as flexible interface between one to four PCI Express® lanes derived from the CompactPCI® Serial backplane connector P1 (upstream port), and the on-board USB and SATA controllers (downstream ports).

When used in a CompactPCI® Serial plain *peripheral slot*, only one PCI Express® lane is typically available as upstream (host) connection to the PCIe packet switch, which may degrade the maximum performance of the SB1-OBOE, especially with 2.5Gbps PCI Express® 1.0 sourced peripheral slots.

If optimum data throughput is required, especially the SATA RAID controller performance may profit from installation of the SB1-OBOE in a CompactPCI® Serial *fat pipe slot,* which offers four PCI Express® lanes on the J1 backplane connector, and with 5Gbps PCI Express® 2.0 technology more likely found here.

Block Diagram

Front Panel I/O

eSATA/ USB3 3-in-1 Combo

USB3

USB3

USB3

USB3

SATA

SATA

SATA

SATA

PCIe to SATA 6G 88SE923x

Hardware RAID Option Level 0/1/10

PCIe to USB 3.0 7340

PCIe

PCIe

PCIe Packet Switch 8614

Simplified Block Diagram
SB1-OBOE
4-Port USB 3.0 & SATA 6G

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PCIe x 4

PCIe x 1

P1

Backplane CompactPCI Serial

P6

System Integration Options

The SB1-OBOE is a CompactPCI® Serial peripheral card. CompactPCI® Serial (CPCI-S.0) is a PICMG® standard for modular industrial computers, which provides high speed serial I/O (PCI Express®, SATA, USB, Gigabit Ethernet) over the backplane. The CPCI-S mechanical design is fully backward compatible to CompactPCI® Classic and will interoperate with existing systems, by means of a hybrid backplane.

Hybrid systems (providing card slots for both CPCI Classic & CPCI Serial) can be configured by means of a CompactPCI® PlusIO CPU card such as the PC1-GROOVE or PC2-LIMBO in combination with a suitable hybrid backplane.

Native CompactPCI® Serial systems (up to 8 CPCI Serial peripheral card slots) can be built around a suitable system slot CPU board such as the SC1-ALLEGRO.

SB1-OBOE

Front Panel

eSATA - USB3.0

1

2

3

4
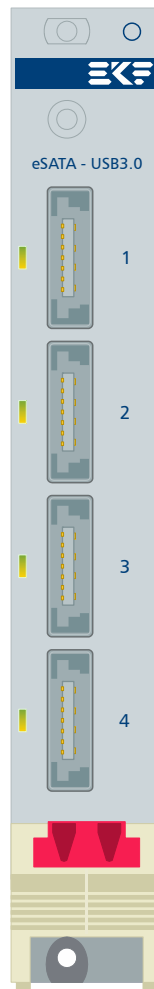
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SB1-OBOE

LED Function

Green - Power
Yellow - SATA

Front Panel Connectors

The SB1-OBOE is equipped with four front bezel combo receptacles, suitable for USB 3.0 or USB 2.0 type A cable connectors (USB root hub), or eSATA cable connectors. Dedicated on-board controllers are provided, the Texas Instruments TUSB7340 with respect to USB 3.0, and the Marvell® 88SE9230 regarding SATA. Optimum usage of either type of I/O interface may require prior installation of software drivers.

Front Panel 3-in-1 Combo Receptacles EKF Part #256.011.30.01		
	U1	VBUS +5V 1.5Amax
	U2	USB D-
	U3	USB D+
	U4	GND
	U5	SS RX-
	U6	SS RX+
	U7	GND
	U8	SS TX-
	U9	SS TX+
	E1	GND
	E2	SATA TX+
	E3	SATA TX-
	E4	GND
	E5	SATA RX-
	E6	SATA RX+
	E7	GND

Each front panel connector can be used for attachment of USB peripherals. When connected to USB 2.0 compliant devices, only the classic 4 USB contacts (data pair, +5V V_{BUS} and GND) are in use. USB 3.0 devices in addition communicate via the SuperSpeed differential transmit and receive signal pairs, available across another 5 contact pins. Each connector provides +5V (V_{BUS}) for powering external devices. Electronic switches limit the maximum output current of each individual USB connector to a safe level. The electronic switches used on the SB1-OBOE for USB VBUS are rated at >2A current limit typically, which is suitable even for applications where heavy capacitive loads are likely to be encountered. With respect to all four front panel connectors, this would imply a maximum peak current of >8A to be delivered from the SB1-OBOE in total.

Texas Instruments provides WHQL xHCI drivers for Windows® 7 users. No USB 3.0 xHCI expansion ROM is available on-board, hence booting from an USB drive is not intended as of current. Future operating systems will have xHCI drivers inherently implemented.

Each front panel connector can be also used for attachment of eSATA based drives. Normal eSATA cables are suitable for self powered devices only. However, eSATAp +5V cable assemblies are available, which make use of the USB V_{BUS} +5V pin of the combo connector, in order to power an external eSATAp +5V compatible drive. Do not confuse eSATAp +12V (not supported by the SB1-OBOE) with eSATAp +5V.

Despite the Marvell® 88SE9320 SATA controller is suitable for SATA 6Gbps, the eSATA specification limits the maximum data transfer rate to 3Gbps. Another limitation is the maximum cable length, which is rated at 2m by the specification, though eSATA cable assemblies up to 5m length are available.

The SB1-OBOE is provided with a SATA expansion ROM, which allows booting from an attached eSATA drive. Hardware RAID level 0/1/10 operation is also supported across all eSATA ports by means of an integrated ARM processor. Marvell® SATA driver software is available for download, but the installation is not mandatory in many cases due to the AHCI driver compatibility of the controller.

By means of proprietary splitter cable assemblies, each SB1-OBOE front panel combo connector could be used for attachment of an USB and an eSATA device concurrently. This would increase the maximum number of attached peripherals to 8.

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	PE TX02+	PE TX02-	GND	PE RX02+	PE RX02-	GND	PE TX03+	PE TX03-	GND	PE RX03+	PE RX03-
5	PE TX00+	PE TX00-	GND	PE RX00+	PE RX00-	GND	PE TX01+	PE TX01-	GND	PE RX01+	PE RX01-	GND
4	GND	USB2+	USB2-	GND	PE CLK+	PE CLK-	GND	SATA TX+	SATA TX-	GND	SATA RX+	SATA RX-
3	USB3 TX+	USB3 TX-	GA0	USB3 RX+	USB3 RX-	GA1	SATA SDI	SATA SDO	GA2	SATA SCL	SATA SL	GA3
2	GND	I2C SCL	I2C SDA	GND	RSV	RSV	GND	RST#	WAKE#	GND	PE EN#	SYS EN#
1	+12V	STBY	GND	+12V	+12V	GND	+12V	+12V	GND	+12V	+12V	GND

pin positions printed gray: not connected

The on-board PCI Express® switch is suitable for generation 1 and 2 (up to 5Gbps). A maximum of four PCI Express® lanes is provided over the backplane connector P1 as upstream link, when the SB1-OBOE is positioned on a 'Fat Pipe' CompactPCI® Serial peripheral slot (if available on a backplane, the fat pipe slot(s) would be adjacent to the system slot). When inserted into a standard peripheral slot, only a single PCI Express® lane is typically available, which may reduce the maximum data throughput of the SB1-OBOE.

SB1-OBOE Links	
SB1-OBOE Home	www.ekf.com/s/sb1/sb1.html
CompactPCI® Serial Overview	www.ekf.com/s/cpci_serial_overview.pdf

Driver Software	
USB 3.0 TUSB7340 xHCI Driver	www.ti.com/product/tusb7340#toolssoftware
SATA RAID 88SE9320 Marvell® Storage Management Windows® & Linux	www.ekf.com/s/sb1/drv/sata/

Ordering Information
For popular SB1-OBOE SKUs please refer to www.ekf.com/liste/liste_21.html#SB1

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