



Product Information

SK4-WALTZ

CompactPCI® Serial • XMC Module Carrier PCIe® x8
Full Length Module 74mm x 149mm • Rear I/O Option

Document No. 8449 • 7 June 2019



General

The SK4-WALTZ is a peripheral slot board for CompactPCI® Serial systems and acts as carrier card for an XMC-style mezzanine module. XMC modules are specified by ANSI/VITA 42, as an advanced replacement for PMC modules. While using a similar form factor as PMC cards, XMC modules are provided with a PCI Express® interface. The SK4-WALTZ can be used together with 74x149mm² full length or 74x139mm² short length XMC mezzanine cards.

The SK4-WALTZ is equipped with a bidirectional 8-lane PCI Express® Gen3 redriver, for optimum high speed signal integrity, and should be installed into a fat pipe peripheral slot of a CompactPCI® Serial backplane. As an option, the SK4-WALTZ can be populated with rear I/O connectors. The XMC carrier connector J16 signals are available across the CompactPCI® Serial backplane connectors P4/P5, and J14 has been routed to P3.



SK4-0200-WALTZ w. Sample 149mm Length XMC Module

Theory of Operation

The SK4-WALTZ requires at least a single PCI Express® lane from the backplane, passed over across the backplane connector P1 to the on-board PCIe redriver circuit. Up to eight PCI Express® lanes are supported, when the SK4-WALTZ is installed into a CompactPCI® Serial *fat pipe* peripheral slot (P1/P2 backplane connectors in use). With a total link bandwidth of 64Gbps, even very demanding applications can be realized, such as a 10/40GBps Ethernet or USB 3.1 Gen2 XMC mezzanine module e.g.

The on-board 8-lane bidirectional redriver is suitable up to 8.0Gbps (PCIe 3.0) data transfer rate per lane, and ensures optimum signal integrity (wider opening with respect to the eye diagrams). The XMC module connector J15 is directly tied to the redriver circuit. In addition, a zero delay PCIe Gen3 clock buffer is provided on-board. The SK4-WALTZ front panel is covered by a 17.5mm protruding metal shell, which allows 149mm full length XMC mezzanine modules to be accommodated.



SK4-0100-WALTZ (w/o Rear I/O)

Feature Summary

Dimensions

- ▶ PICMG® CompactPCI® Serial standard (CPCI-S.0) peripheral slot card
- ▶ Single size Eurocard 3U 4HP 100x160mm²
- ▶ CompactPCI® Serial backplane connectors P1 & P2 (fat pipe slot up to PCIe x8)
- ▶ Optional backplane connectors P3, P4, P5 for rear I/O usage

XMC Mezzanine I/F

- ▶ Suitable for 74x149mm² or 74x139mm² XMC modules according to VITA 42
- ▶ XMC module connector J15 (specified by VITA 42 as PCIe Gen1 interface)
- ▶ Option XMC 2.0 module connector J15 (VITA 61) recommended for PCIe Gen2
- ▶ 8 x PCI Express® lanes Gen1 (2.5GT/s as specified by VITA 42), Gen2 (5.0GT/s as specified by VITA 61) or Gen3 (8GT/s)
- ▶ 8-lane bidirectional PCIe Gen3 redriver/repeater for optimum signal integrity
- ▶ PCI Express® Gen3 clock buffer for optimum signal integrity
- ▶ +12V XMC VPWR
- ▶ -12V regulator option (J15 Pin F8)
- ▶ Option XMC module connector J14 (usable for rear I/O across P3)
- ▶ Option XMC module connector J16 (usable for rear I/O across P4/P5)

Option Rear I/O

- ▶ Option CompactPCI® Serial backplane connectors P3, P4, P5
- ▶ XMC rear I/O connector J14 wired to P3 (64 single ended signals)
- ▶ XMC rear I/O connector J16 wired to P4 and P5 (78 signals)
- ▶ P5 can also deliver power to the rear I/O module (+12V, +5V, +3.3V)
- ▶ Suitable e.g. for PIM carrier rear I/O module (VITA 36 Draft)
- ▶ EKF offers custom specific rear I/O module development

Applications

- ▶ System integration of special functions not available as CompactPCI® Serial card
- ▶ I/O controllers with front I/O connectors
- ▶ FPGA or GPU based parallel computing XMC modules

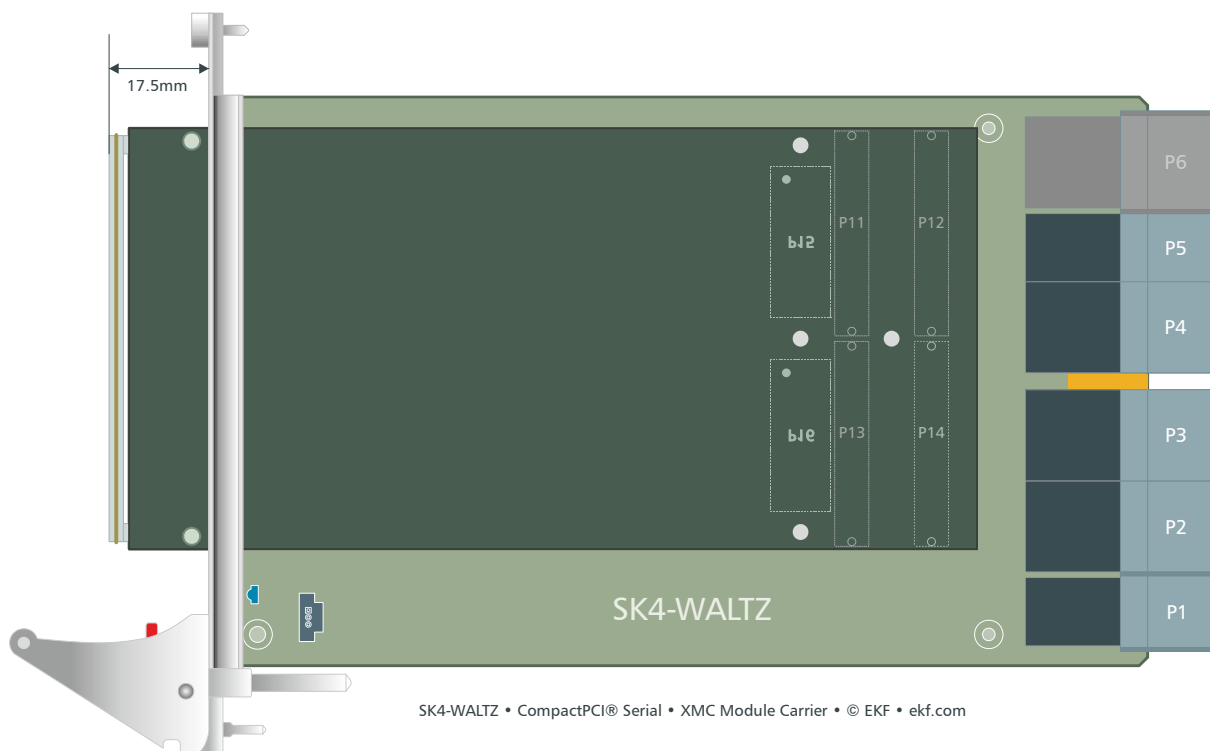
Feature Summary

Regulatory, Environment

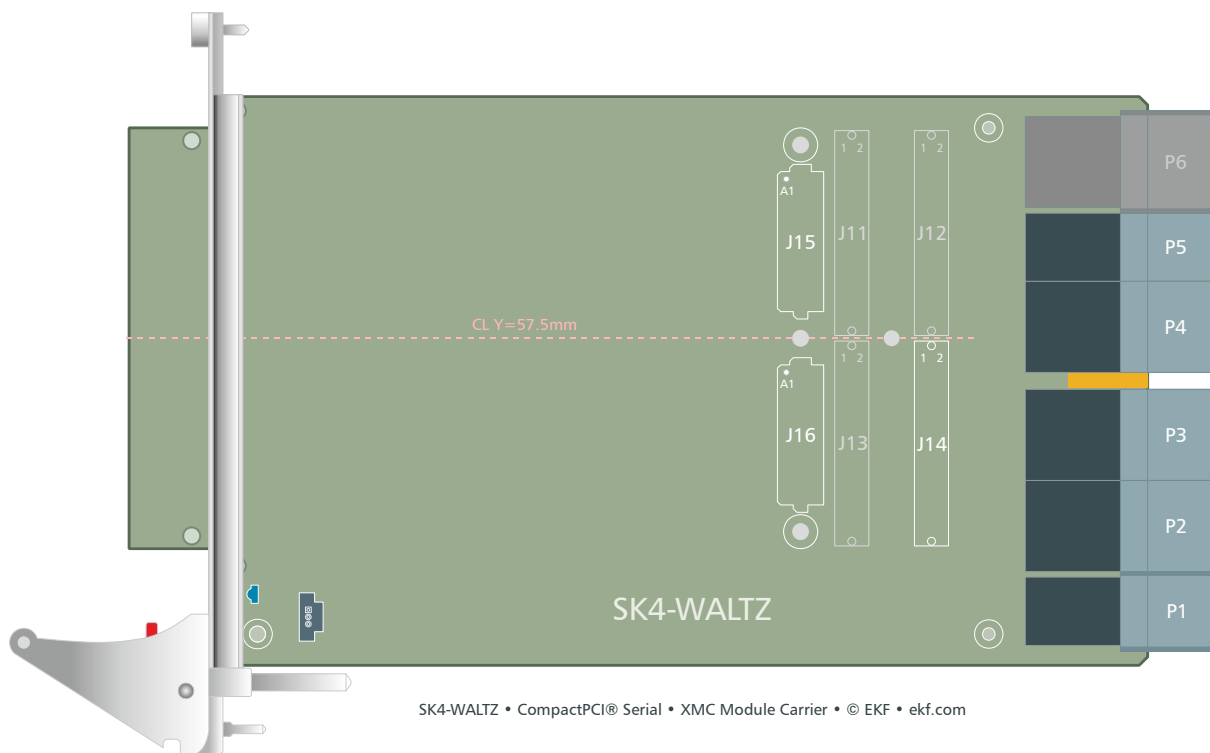
- ▶ Designed & manufactured in Germany
- ▶ ISO 9001 certified quality management system
- ▶ Long term availability
- ▶ Coating, sealing, underfilling on request
- ▶ RoHS compliant 2011/65/EC
- ▶ Operating temperature -40°C to +85°C (industrial temperature range)
- ▶ Storage temperature -40°C to +85°C, 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 64.2 years
- ▶ EC Regulatory EN55022, EN55024, EN60950-1 (UL60950-1/IEC60950-1)



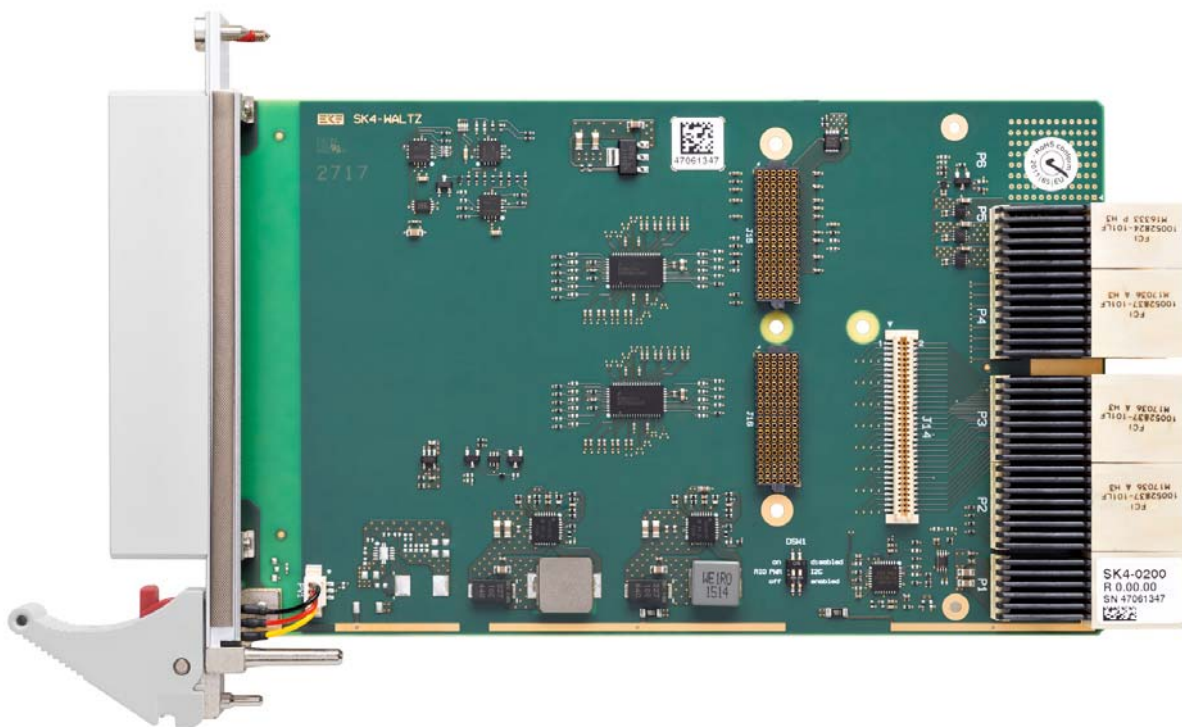
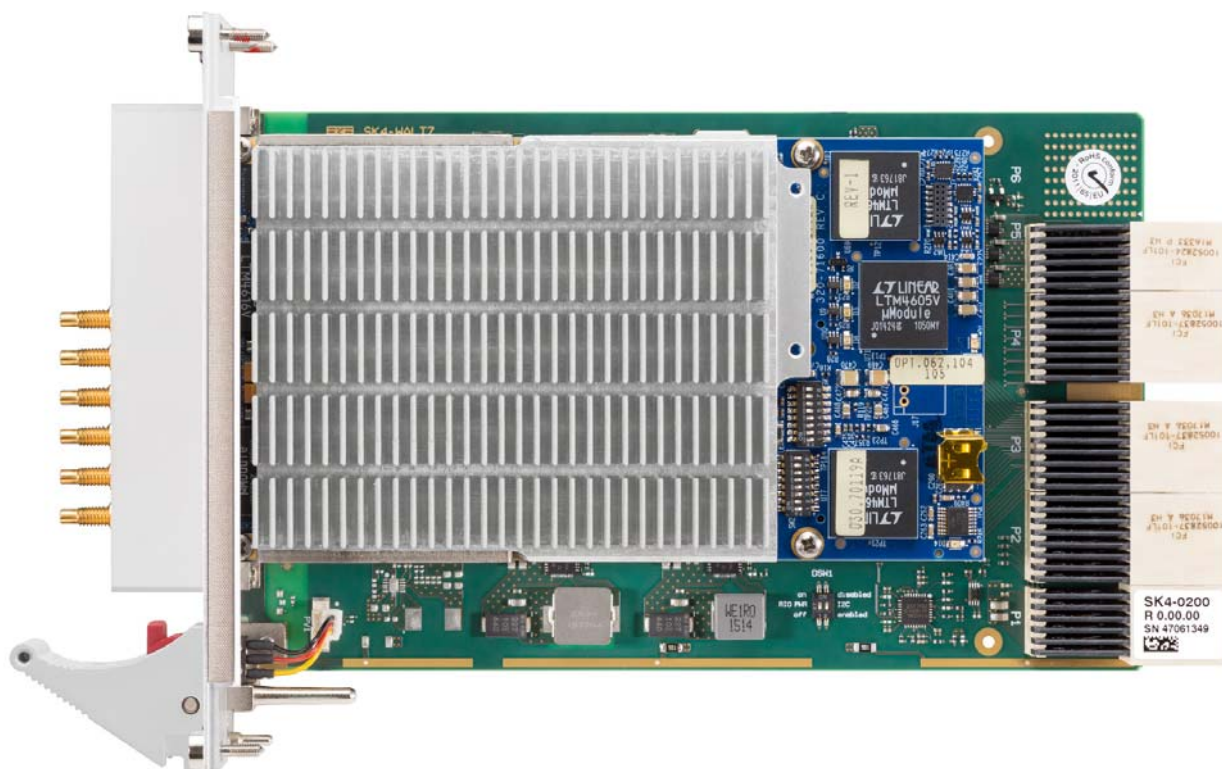
Board Assembly



Front Shell not Shown



Front Shell not Shown



Front Panel



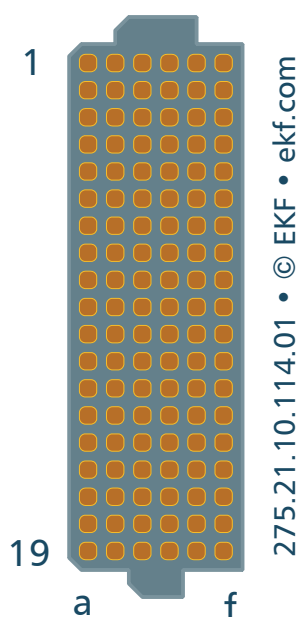
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SK4-WALTZ

XMC Socket J15

ANSI/VITA 42.3 defines a primary **XMC** connector, which is mandatory for PCIe fabric. The secondary XMC connector is optional (either fabric or user I/O).

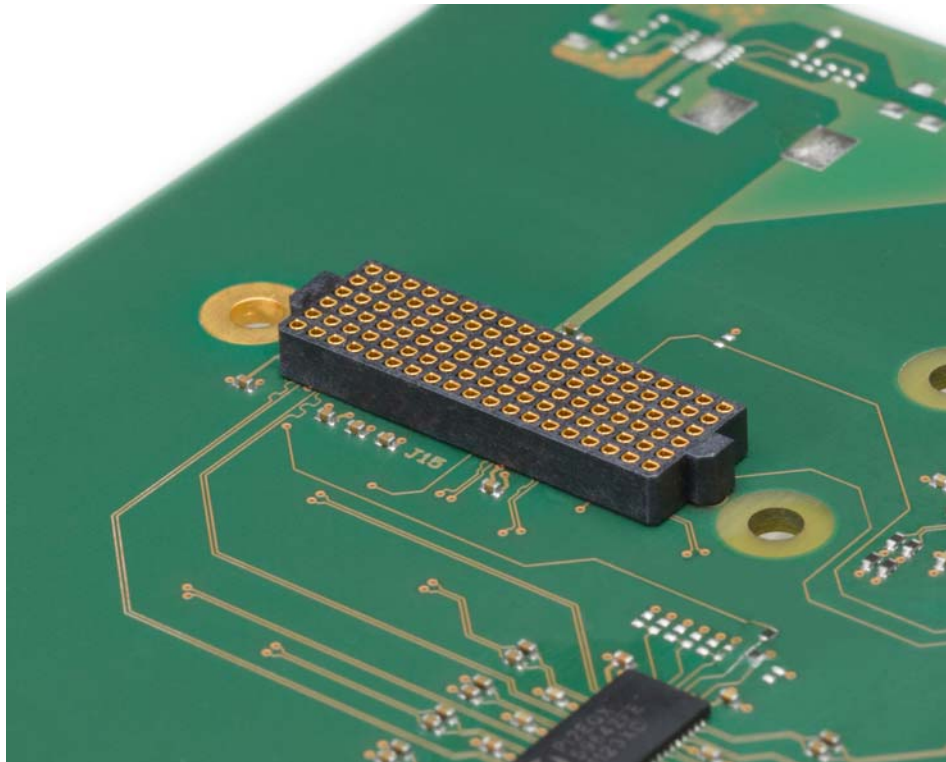
The SK4-WALTZ is an XMC carrier board with a 8-Lane PCI Express® host interface, which is wired through the primary connector XMC J15. A secondary connector is not provided.



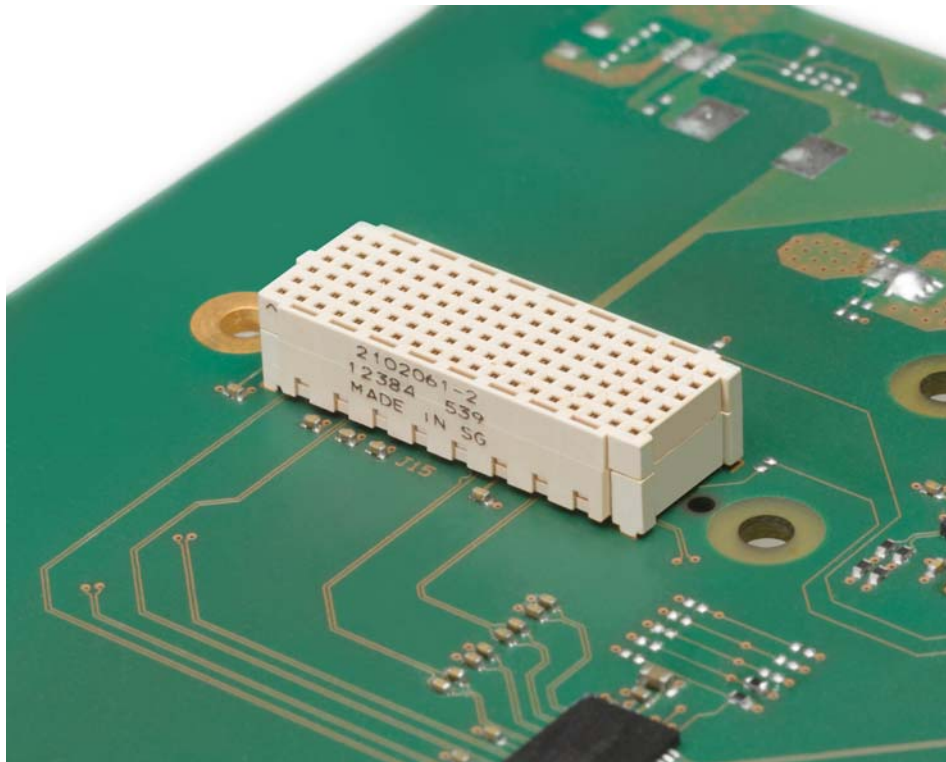
XMC Receptacle

CompactPCI® Serial cards are supplied by +12V only. This voltage is therefore used to feed the XMC connector J15 VPWR pins, across a power FET which is turned on when the front panel microswitch is activated (ejector lever position up = card locked). A switching regulator on the SK4-WALTZ provides +3.3V up to 3A to the XMC connector J15 3.3V pins. In addition, -12V can be generated by an optional inverting regulator.

As an option, the SK4-WALTZ can be equipped with a **XMC 2.0** type connector J15, as specified by VITA 61.0. With MIL/Aero environment in mind, the new connector incorporates a number of features for improved mechanical performance, and has been electrically characterized to support 5GHz+ allowing PCI Express® 2.0 (the VITA 42 connector in contrast has only been characterized to 3.125 Ghz). Since XMC (VITA 42) and XMC 2.0 (VITA 61) connectors are not intermateable, both the XMC carrier card and the XMC module must be populated with the same type of connector. The VITA 61 XMC 2.0 connector housing is off-white in colour as a visual key to differentiate it from the black VITA 42 legacy connector. Please specify your needs to sales@ekf.com when ordering the SK4-WALTZ.



Classic J15 XMC Connector



Advanced J15 XMC 2.0 Connector (Option)

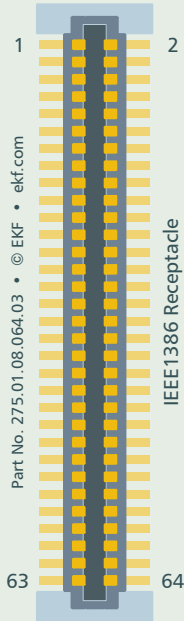
XMC Connector J15 - PCIe Fabric • EKF Part No. 275.21.10.114.01						
	a	b	c	d	e	f
1	PETOP0	PETON0	+3.3V	PETOP1	PETON1	+12V VPWR
2	GND	GND	TRST# ¹¹⁾	GND	GND	MRSTI# ⁶⁾
3	PETOP2	PETON2	+3.3V	PETOP3	PETON3	+12V VPWR
4	GND	GND	TCK	GND	GND	MRSTO# ⁷⁾
5	PETOP4	PETON4	+3.3V	PETOP5	PETON5	+12V VPWR
6	GND	GND	TMS	GND	GND	+12V VPWR
7	PETOP6	PETON6	+3.3V	PETOP7	PETON7	+12V VPWR
8	GND	GND	TDI	GND	GND	-12V ⁸⁾
9	<i>RFU</i>	<i>RFU</i>	<i>RFU</i>	<i>RFU</i>	<i>RFU</i>	+12V VPWR
10	GND	GND	TDO	GND	GND	GA0 ³⁾
11	PEROP0	PERON0	MBIST#	PEROP1	PERON1	+12V VPWR
12	GND	GND	GA1 ³⁾	GND	GND	MPRESENT# ⁹⁾
13	PEROP2	PERON2	+3.3V ⁴⁾	PEROP3	PERON3	+12V VPWR
14	GND	GND	GA2 ³⁾	GND	GND	MSDA ¹⁰⁾
15	PEROP4	PERON4	<i>RFU</i>	PEROP5	PERON5	+12V VPWR
16	GND	GND	MVMRO ⁵⁾	GND	GND	MSCL ¹⁰⁾
17	PEROP6	PERON6	<i>RFU</i>	PEROP7	PERON7	<i>RFU</i>
18	GND	GND	<i>RFU</i>	GND	GND	<i>RFU</i>
19	CLKP_XMC	CLKN_XMC	<i>RFU</i>	WAKE#	<i>ROOT0#</i>	<i>RFU</i>

pin positions printed italic/gray: reserved by specification / not connected

- ³⁾ GA2 GA1 GA0 (I2C address assigned to module) strapped to 1 0 1 by default
- ⁴⁾ Module +3.3V AUX
- ⁵⁾ MVMRO (Module Volatile Memory Read Only) is an optional input to the XMC module, connected to an optional on-board GPIO
- ⁶⁾ MRSTI# (Module Reset Input) tied to platform reset
- ⁷⁾ MRSTO# (Module Reset Output) is an optional output by the XMC module, connected to an optional on-board GPIO
- ⁸⁾ -12V is provided by the SK4-WALTZ as an option only (inverting regulator, -12V 0.2A)
- ⁹⁾ MPRESENT# (Module Present), connected to backplane connector P1 signal PCIE_EN#
- ¹⁰⁾ MSCL/MSDA derived from backplane connector P1 signals I2C SDA/SCL via optional I2C switch
- ¹¹⁾ 10k to GND

XMC Connector J14 - Rear I/O (Option)

XMC-J14 - Rear I/O				
1	P3 B8	P3 C8		2
3	P3 E8	P3 F8		4
5	P3 H8	P3 I8		6
7	P3 K8	P3 L8		8
9	P3 A7	P3 B7		10
11	P3 D7	P3 E7		12
13	P3 G7	P3 H7		14
15	P3 J7	P3 K7		16
17	P3 B6	P3 C6		18
19	P3 E6	P3 F6		20
21	P3 H6	P3 I6		22
23	P3 K6	P3 L6		24
25	P3 A5	P3 B5		26
27	P3 D5	P3 E5		28
29	P3 G5	P3 H5		30
31	P3 J5	P3 K5		32
33	P3 B4	P3 C4		34
35	P3 E4	P3 F4		36
37	P3 H4	P3 I4		38
39	P3 K4	P3 L4		40
41	P3 A3	P3 B3		42
43	P3 D3	P3 E3		44
45	P3 G3	P3 H3		46
47	P3 J3	P3 K3		48
49	P3 B2	P3 C2		50
51	P3 E2	P3 F2		52
53	P3 H2	P3 I2		54
55	P3 K2	P3 L2		56
57	P3 A1	P3 B1		58
59	P3 D1	P3 E1		60
61	P3 G1	P3 H1		62
63	P3 J1	P3 K1		64



XMC Connector J16 - Rear I/O (Option)

XMC Connector J16 - Rear I/O • EKF Part No. 275.21.10.114.01						
	a	b	c	d	e	f
1	P5 J3 DP00+	P5 K3 DP00-	P5 L2 UD_SE	P5 E4 DP01+	P5 F4 DP01-	P5 E3 UD_SE
2	GND	GND	P5 K2 UD_SE	GND	GND	P5 D3 UD_SE
3	P5 J1 DP02+	P5 K1 DP02-	P5 L8 UD15-	P5 E2 DP03+	P5 F2 DP03-	P5 E1 UD14-
4	GND	GND	P4 K8 UD15+	GND	GND	P5 D1 UD14+
5	P4 E8 DP04+	P4 F8 DP04-	P4 K7 UD13-	P4 H8 DP05+	P4 I8 DP05-	P4 C8 UD12-
6	GND	GND	P4 J7 UD13+	GND	GND	P4 B8 UD12+
7	P4 D7 DP06+	P4 E7 DP06-	P4 L6 UD5-	P4 G7 DP07+	P4 H7 DP07-	P4 B7 UD17-
8	GND	GND	P4 K6 UD5+	GND	GND	P4 A7 UD17+
9	P4 E6 DP08+	P4 F6 DP08-	P4 K5 UD4-	P4 H6 DP09+	P4 I6 DP09-	P4 C6 UD1-
10	GND	GND	P4 J5 UD4+	GND	GND	P4 B6 UD1+
11	P4 D5 DP10+	P4 E5 DP10-	P4 L5 UD11-	P4 G5 DP11+	P4 H5 DP11-	P4 B5 UD6-
12	GND	GND	P4 K4 UD11+	GND	GND	P4 A5 UD6+
13	P4 E4 DP12+	P4 F5 DP12-	P4 K3 UD16-	P4 H4 DP13+	P4 I4 DP13-	P4 C4 UD2-
14	GND	GND	P4 J3 UD16+	GND	GND	P4 B4 UD2+
15	P4 D3 DP14+	P4 E3 DP14-	P4 L2 UD3-	P4 G3 DP15+	P4 H3 DP15-	P4 B3 UD8-
16	GND	GND	P4 K2 UD3+	GND	GND	P4 A3 UD8+
17	P4 E2 DP16+	P4 F2 DP16-	P4 K1 UD9-	P4 H2 DP17+	P4 I2 DP17-	P4 C2 UD7-
18	GND	GND	P4 J1 UD9+	GND	GND	P4 B2 UD7+
19	P4 A1 DP18+	P4 B1 DP18-	P4 D1 UD_SE	P4 G1 DP19+	P4 H1 DP19-	P4 E1 UD_SE

P1/P2 CompactPCI® Serial Backplane Connectors

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® signal redrivers/repeaters are suitable for generation 1, 2 and 3 (up to 8Gbps). Both the PE receive/transmit signals and the PE reference clock are buffered. Operation with Gen2 or Gen3 speed may be functional but cannot be guaranteed however, since not specified by VITA42, mainly with respect to the XMC mezzanine connector. If possible, choose XMC 2.0 connectors (white housings) on both the carrier card and the XMC mezzanine card for reliable PCI Express® Gen2/3 operation.

A maximum of eight PCI Express® lanes is provided over the backplane connectors P1/P2, when the SK4-WALTZ is positioned on a 'Fat Pipe' CompactPCI® Serial peripheral slot (typically adjacent to the system slot).

For XMC modules which employ only a single PCIe lane, the SK4-WALTZ can also be installed in any ordinary CompactPCI® Serial peripheral slot, without any performance loss.

P2 CompactPCI® Serial 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			GND			GND			GND		
7			GND			GND			GND			GND
6	GND			GND			GND			GND		
5			GND			GND			GND			GND
4	GND			GND			GND			GND		
3			GND			GND			GND			GND
2	GND	PE TX06+	PE TX06-	GND	PE RX06+	PE RX06-	GND	PE TX07+	PE TX07-	GND	PE RX07+	PE RX07-
1	PE TX04+	PE TX04-	GND	PE RX04+	PE RX04-	GND	PE TX05+	PE TX05-	GND	PE RX05+	PE RX05-	GND

pin positions left empty: not connected

P3 CompactPCI® Serial Backplane Connector (Option Rear I/O)

P3 CompactPCI® Serial Peripheral 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
8	GND	J14 1	J14 2	GND	J14 3	J14 4	GND	J14 5	J14 6	GND	J14 7	J14 8
7	J14 9	J14 10	GND	J14 11	J14 12	GND	J14 13	J14 14	GND	J14 15	J14 16	GND
6	GND	J14 17	J14 18	GND	J14 19	J14 20	GND	J14 21	J14 22	GND	J14 23	J14 24
5	J14 25	J14 26	GND	J14 27	J14 28	GND	J14 29	J14 30	GND	J14 31	J14 32	GND
4	GND	J14 33	J14 34	GND	J14 35	J14 36	GND	J14 37	J14 38	GND	J14 39	J14 40
3	J14 41	J14 42	GND	J14 43	J14 44	GND	J14 45	J14 46	GND	J14 47	J14 48	GND
2	GND	J14 49	J14 50	GND	J14 51	J14 52	GND	J14 53	J14 54	GND	J14 55	J14 56
1	J14 57	J14 58	GND	J14 59	J14 60	GND	J14 61	J14 62	GND	J14 63	J14 64	GND

P3 can be used e.g. for a rear I/O PIM carrier module. XMC P14/J14 derived signals would be routed across P3/rJ3 to the J14/P14 connectors of a VITA 36 PMC I/O module (aka PIM).

P4 CompactPCI® Serial Backplane Connector (Option Rear I/O)

P4 CompactPCI® Serial Peripheral Slot Backplane Connector												
EKF Part #250.3.1208.20.00 • 96 pos. 12x8, 16mm Width												
P4	A	B	C	D	E	F	G	H	I	J	K	L
8	GND	J16 F6 UD12+	J16 F5 UD12-	GND	J16 A5 DP04+	J16 B5 DP04-	GND	J16 D5 DP05+	J16 E5 DP05-	GND	J16 C4 UD15+	J16 C3 UD15-
7	J16 F8 UD17+	J16 F7 UD17-	GND	J16 A7 DP06+	J16 B7 DP06-	GND	J16 D7 DP07+	J16 E7 DP07-	GND	J16 C6 UD13+	J16 C5 UD13-	GND
6	GND	J16 F10 UD1+	J16 F9 UD1-	GND	J16 A9 DP08+	J16 B9 DP08-	GND	J16 D9 DP09+	J16 E9 DP09-	GND	J16 C8 UD5+	J16 C7 UD5-
5	J16 F12 UD6+	J16 F11 UD6-	GND	J16 A11 DP10+	J16 B11 DP10-	GND	J16 D11 DP11+	J16 E11 DP11-	GND	J16 C10 UD4+	J16 C9 UD4-	GND
4	GND	J16 F14 UD2+	J16 F13 UD2-	GND	J16 A13 DP12+	J16 B13 DP12-	GND	J16 D13 DP13+	J16 E13 DP13-	GND	J16 C12 UD11+	J16 C11 UD11-
3	J16 F16 UD8+	J16 F15 UD8-	GND	J16 A15 DP14+	J16 B15 DP14-	GND	J16 D15 DP15+	J16 E15 DP15-	GND	J16 C14 UD16+	J16 C13 UD16-	GND
2	GND	J16 F18 UD7+	J16 F17 UD7-	GND	J16 A17 DP16+	J16 B17 DP16-	GND	J16 D17 DP17+	J16 E17 DP17-	GND	J16 C16 UD3+	J16 C15 UD3-
1	J16 A19 DP18+	J16 B19 DP18-	GND	J16 C19 UD_SE	J16 F19 UD_SE	GND	J16 D19 DP19+	J16 E19 DP19-	GND	J16 C18 UD9+	J16 C17 UD9-	GND

pin positions printed white/italic: not connected

DP**+/DP**- are differential signal pairs, assignment according VITA 42.0 table 5-4

UD**+/UD**- are differential signal pairs, user definable by customer

UD_SE are single ended signals, user definable by customer

P5 CompactPCI® Serial Backplane Connector (Option Rear I/O)

P5 CompactPCI® Serial Peripheral Slot Backplane Connector												
EKF Part #250.3.1206.20.00 • 72 pos. 12x6, 12mm Width												
P5	A	B	C	D	E	F	G	H	I	J	K	L
6	GND	+12V	+12V	GND	+12V	+12V	GND	+5V	+5V	GND	+5V	+5V
5	+3.3V	+3.3V	GND	+3.3V	+3.3V	GND	GPIO SATA SDI *	GPIO SATA SDO *	GND	GPIO SATA SCL *	GPIO SATA SL *	GND
4	GND	<i>IO</i>	<i>IO</i>	GND	J16 D1 DP01+	J16 E1 DP01-	GND	<i>IO</i>	<i>IO</i>	GND	RST 1)	<i>IO</i>
3	<i>IO</i>	<i>IO</i>	GND	J16 F2 UD_SE	J16 F1 UD_SE	GND	<i>I2C Data 2)</i>	<i>I2C Clock 2)</i>	GND	J16 A1 DP00+	J16 B1 DP00-	GND
2	GND	<i>IO</i>	<i>IO</i>	GND	J16 D3 DP03+	J16 E3 DP03-	GND	<i>IO</i>	<i>IO</i>	GND	J16 C2 UD_SE	J16 C1 UD_SE
1	<i>IO</i>	<i>IO</i>	GND	J16 F4 UD14+	J16 F3 UD14-	GND	<i>IO</i>	<i>IO</i>	GND	J16 A3 DP02+	J16 B3 DP02-	GND

pin positions printed white/italic: not connected

* custom specific usage - wired to P1 - partial support only by EKF CPU cards

1) buffered platform reset signal from P1

2) wired to on-board SMBus/I2C logic

DP**+/DP**- are differential signal pairs, assignment according VITA 42.0 table 5-4

UD**+/UD**- are differential signal pairs, user definable by customer

UD_SE are single ended signals, user definable by customer



Sample Application FPGA/PCIe Fabrics



Ordering Information

For popular SK4-WALTZ SKUs please refer to
www.ekf.com/liste/liste_21.html#SK4

SK4-WALTZ Links

SK4-WALTZ Home	www.ekf.com/s/sk4/sk4.html
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Related Links

SK2-SESSION Home Suitable for 149mm Length XMC PCIe x4	www.ekf.com/s/sk2/sk2.html
SK3-MEDLEY Home Suitable for 139mm Length XMC PCIe x8	www.ekf.com/s/sk3/sk3.html
SK5-BALL Home Suitable for 149mm Length XMC PCIe x8	www.ekf.com/s/sk5/sk5.html
EK4-WALTZ Home CompactPCI® Express (PXI Express™)	www.ekf.com/e/ek4/ek4.html
CompactPCI® Serial Overview	www.ekf.com/s/smart_solution.pdf

XMC Mezzanine Modules from EKF

XMC Overview		www.ekf.com/d/xmc_concise.pdf
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