Product Information

SCJ-VEENA

Quad 2500BASE-T Ethernet NIC

&

M.2 NVMe Mass Storage (PCIe® SSD)

Mezzanine I/O Expansion Board (CPU Side Card)

Preliminary Edition

General

The SCJ-VEENA is a mezzanine side card for EKF CPU boards, provided with a socket for a PCI Express® based M.2 mass storage module, and four independent 2.5Gbps Ethernet controllers for universal networking.

The SCJ-VEENA is suitable for EKF CPU cards such as the SC5-FESTIVAL or SC9-TOCCATA, which are equipped with two HSE (high speed expansion) mezzanine connectors, for eight PCIe® Gen3 or Gen4 lanes.

The M.2 socket can accommodate an NVMe type SSD module up to the 2280 form factor, with a PCIe® x4 Gen3 or Gen4 interface for superior data transfer rates.

Four Intel® I225-IT networking controllers supporting Time Sensitive Networking are wired to RJ45 front panel connectors, and can be operated individually at 10BASE-T, 100BASE-TX, 1000BASE-T and 2500BASE-T speed.

Features

Feature Summary

General

- Mixed function mezzanine side card for EKF CompactPCI® PlusIO & Serial CPU boards
- Based on new mezzanine connectors HSE1/HSE2 (8 x PCIe® Gen3/4)
- Suitable e.g. for use with CPU cards SC5- & PC7-FESTIVAL or SC9-TOCCATA
- Provides 2.5Gbps Ethernet front panel I/O (4 x RJ45)
- Provides mass storage capability (M.2 NVMe/SATA)
- 8HP assembly together with CPU card
- Proprietary PCB dimensions (short card) for optimized CPU board processor heat sink

Front Panel I/O

- 4 x RJ45 front panel receptacles
- 2500BASE-T, 1000BASE-T, 100BASE-TX, 10BASE-T compliant data transfer rate
- USB3 Type-A receptacle (5G or 10G, dependent on CPU carrier card)

Networking

- Four individual Intel® I225-IT networking interface controllers (NIC)
- 2500BASE-T, 1000BASE-T, 100BASE-TX, 10BASE-T 802.3 specifications
- -40°C to +85°C operating temperature 10M/100M/1G
- -40°C to +70°C operating temperature 2.5G
- UDP, TCP and IP checksum offload
- 9KB Jumbo Frame support
- Four transmit and four receive queues
- IEEE 802.3az Energy Efficient Ethernet
- Ultra-low power at cable disconnect (5mW)
- Time Sensitive Networking (TSN)
- IEEE 1588 - Basic time-sync (Precision Time Protocol)
- IEEE 802.1AS-Rev - Higher precision time synchronization with multiple (dual) clock masters
- IEEE 802.1Qav - Credit Based Shaping and Basic scheduling
- IEEE 802.1Qbu - Frame Preemption
- IEEE 802.1Qbv - Time Aware Shaper
- IEEE 802.3br - Interspersing Express Traffic
- PCIe® PTM for synchronization between the NIC and Host timers

Feature Summary

On-Board Mass Storage

- M.2 (formerly known as NGFF) socket for an NVMe type SSD module up to 2280 size
- PCI Express® Gen3 or Gen4 x4 interface (M-key socket)
- Socket height 4.2H (double sided module allowed)
- Capacity up to 4TB as of current
- Suitable for operating system installation (boot device)
- Autosensing low cost M.2 SATA SSD B-M key as alternate (w. SC5- PC7-FESTIVAL only)

Applications

- Local expansion (side card) for EKF CPU boards
- Industrial networks - IIoT - TSN
- Router and gateway
- Data acquisition
- Edge computing

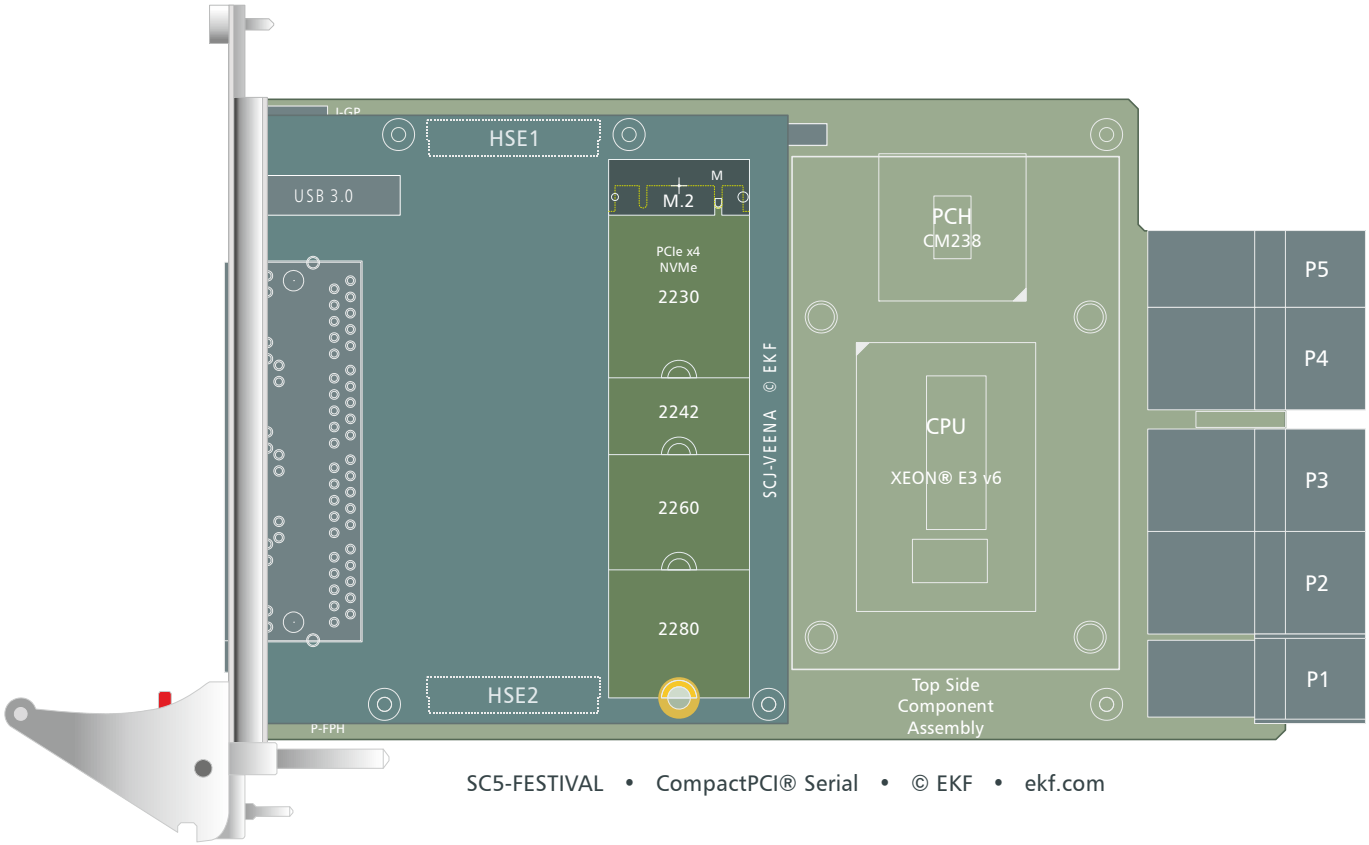
Environmental, Regulatory

- Designed & manufactured in Germany
- ISO 9001 certified quality management
- Custom specific development available on request
- Long term availability
- Rugged solution
- Coating, sealing, underfilling on request
- RoHS compliant
- 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
- EC Regulations EN55022, EN55024, EN60950-1 (UL60950-1/IEC60950-1)
- MTBF tbd years

System Requirements

The SCJ-VEENA is a mezzanine side card, to be fixed on top of a suitable CPU carrier board. The pitch between carrier PCB and mezzanine PCB is 4HP, resulting in a 8HP common front panel for the entire assembly. Two mezzanine inter-board connectors are provided, for distribution of PCI Express® signals from the CPU carrier to the SCJ-VEENA side board.

The SCJ-VEENA accommodates an M.2 NVMe SSD storage module. PCIe® Gen4 operation requires the SC9-TOCCATA CPU carrier card. In order to prevent loss of a peripheral slot, a backplane is recommended which provides the CPU card system slot right aligned (the SCJ-VEENA is then positioned out of the backplane shape).

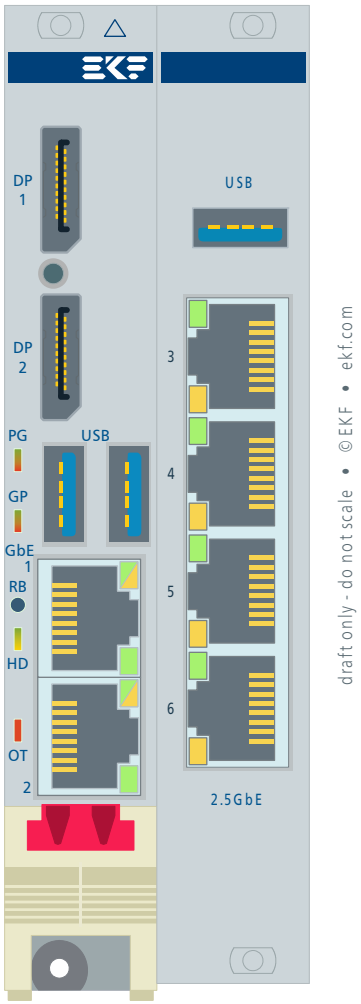


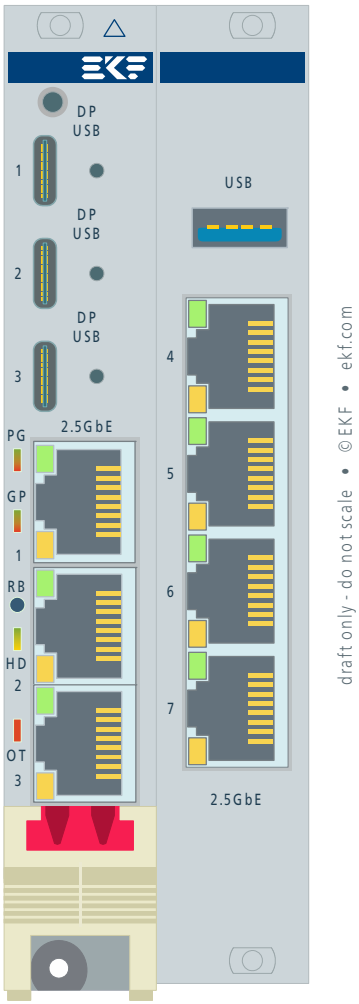
SC5-FESTIVAL • CompactPCI® Serial • © EKF • ekf.com

The SCJ-VEENA can be used e.g. with the SC5-FESTIVAL or PC7-FESTIVAL CPU cards. The SCJ PCB does not cover the CPU board with respect to the heat sink area.

Hence, the CPU card may be equipped with a heat sink which utilises the full 8HP height available for the assembly unit, for optimized heat dissipation.

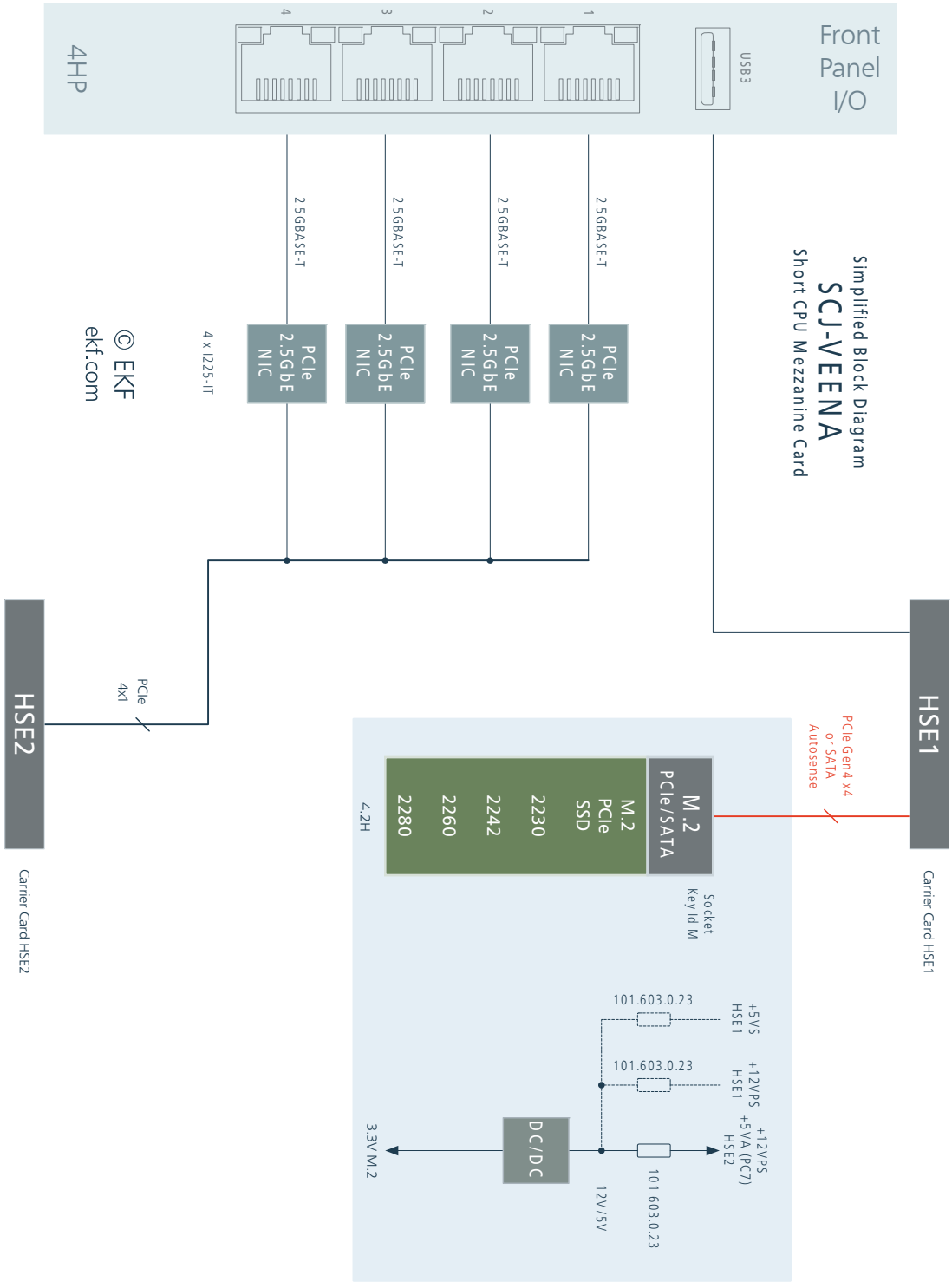
Front Panel





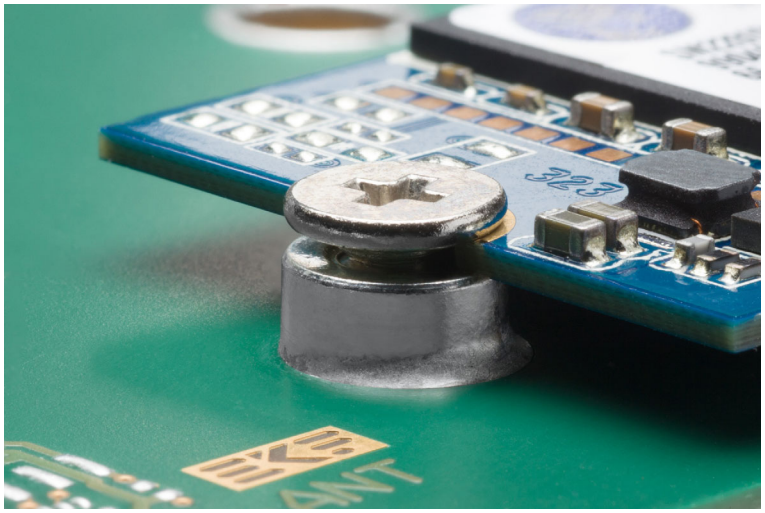
8HP Assembly Shown

Block Diagram



M.2 Connector

The SCJ-VEENA is provided with an M.2 NVMe module host connector (M-key). After inserted, the M.2 module must be locked manually by a screw, in order to withstand shock and vibration.



M.2 Module Fixation (Picture Similar)

With respect to the SC5-FESTIVAL and PC7-FESTIVAL CPU carrier cards, also a low cost M.2 B-M key SATA SSD can be used on the SCJ-VEENA. The CPU board switches the PCIe® lane 0 to SATA operation automatically depending on the M.2 pin 69 signal level (PEDET).

The maximum performance can be achieved with a Gen4 PCIe® M.2 SSD, combined with the SC9-TOCCATA CPU carrier board.

NVMe PCIe x4 M.2 M-Key • Pin 1 - 38 EKF Part #255.50.2.2223.10			
GND	1	2	+3.3V
GND	3	4	+3.3V
PETN3	5	6	NC
PETP3	7	8	NC
GND	9	10	LED1#
PERN3	11	12	+3.3V
PERP3	13	14	+3.3V
GND	15	16	+3.3V
PETN2	17	18	+3.3V
PETP2	19	20	NC
GND	21	22	NC
PERN2	23	24	NC
PERP2	25	26	NC
GND	27	28	NC
PETN1	29	30	NC
PETP1	31	32	NC
GND	33	34	NC
PERN1	35	36	NC
PERP1	37	38	NC

NVMe PCIe x4 M.2 M-Key continued • Pin 39 - 75			
GND	39	40	SMB_CLK *
PETN0	41	42	SMB_DATA *
PETP0	43	44	*ALERT**
GND	45	46	NC
PERN0	47	48	NC
PERP0	49	50	PERST#
GND	51	52	*CLKREQ#*
REFCLKN	53	54	*PEWAKE#*
REFCLKP	55	56	RSV
GND	57	58	RSV
M-Key	59	60	M-Key
M-Key	61	62	M-Key
M-Key	63	64	M-Key
M-Key	65	66	M-Key
NC	67	68	*SUSCLK*
PEDET	69	70	+3.3V
GND	71	72	+3.3V
GND	73	74	+3.3V
GND	75		

* Logic level 1.8V signals - LSF0204 level shifter to 3.3V on-board

PCI Express® M.2 Specification Socket 3 PCIe-based Module Pinout (Module Key M)

Mezzanine Connectors HSE1, HSE2

The SCJ-VEENA is provided with two male mezzanine connectors on the bottom side of the PCB, which mate with the female mezzanine connectors on the carrier CPU card, for a resulting board-to-board mounting height of 18.7mm (4HP effective pitch, 8HP F/P width in total).

HSE1

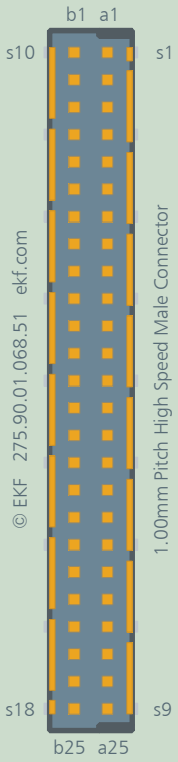
HSE1 is used to pass a PCIe® x4 link from the CPU carrier card to the on-board M.2 NVMe connector, for a suitable SSD mass storage module. The SC5/PC7-FESTIVAL CPU cards can switch the PCIe® lane 0 to SATA mode, depending on the M.2 signal pin PEDET. In addition, HSE1 comprises an USB3 port (5G/10G speed depends on CPU carrier card).

HSE2

HSE2 is provided to supply the SCJ-VEENA side card with additional PCIe® lanes. A PCIe® x1 link is established for each of the on-board I225-IT Gigabit Ethernet controllers. This requires the CPU carrier card HSE2 connector configured to PCIe® 4x1 (and not PCIe® 1x4 or 2x2).

Sufficient +3.3V power is essential for high performance SSDs. A switching regulator is equipped on-board which can deliver 8A@3.3V or even more to the M.2 socket power pins. Since CompactPCI® PlusIO backplanes provide only a single +12V pin per card slot, or +12V is not at all present in such a classic system, the HSE2 connector pins a24 - b25 are used for +5VS on CompactPCI® PlusIO CPU carrier cards as the PC7-FESTIVAL, for optimum power sourcing. This is not an issue however with CompactPCI® Serial systems, which are +12V based.

Carrier card connector 8mm female ERNI Microspeed 275.90.08.068.01
Supplement 10mm male connector for nominal height 18mm (SC* side card, B2B 18.7mm)

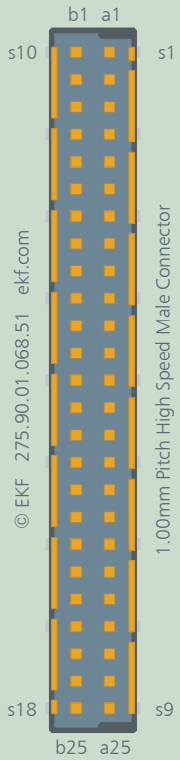


High Speed Expansion P-HSE1			
CFG_34 *	b1	a1	CFG_12 *
3_PCIE_TXP	b2	a2	1_PCIE_TXP
3_PCIE_TXN	b3	a3	1_PCIE_TXN
GND	b4	a4	GND
3_PCIE_RXN	b5	a5	1_PCIE_RXN
3_PCIE_RXP	b6	a6	1_PCIE_RXP
GND	b7	a7	GND
4_PCIE_TXP	b8	a8	2_PCIE_TXP
4_PCIE_TXN	b9	a9	2_PCIE_TXN
GND	b10	a10	GND
4_PCIE_RXN	b11	a11	2_PCIE_RXN
4_PCIE_RXP	b12	a12	2_PCIE_RXP
GND	b13	a13	GND
2_USB3_TXP	b14	a14	*1_USB2_P*
2_USB3_TXN	b15	a15	*1_USB2_N*
GND	b16	a16	GND
2_USB3_RXP	b17	a17	2_USB2_P
2_USB3_RXN	b18	a18	2_USB2_N
GND	b19	a19	GND
PCIE_CLK_P	b20	a20	1_2_USB_OC#
PCIE_CLK_N	b21	a21	PLTRST#
+5VS [1)]	b22	a22	+3.3VS [1)]
+5VS [1)]	b23	a23	+3.3VS [1)]
+5VPS [2)]	b24	a24	+3.3VA [3)]
+12VPS [2)]	b25	a25	+12VPS [2)]

* CFG_12 and CFG_34 = open (10k PU on CPU carrier board) indicating that a PCIe x4 link is requested

1) Power rail switched on in S0 state only
2) Power rail switched on in S0-S4 state
3) Power always on

Carrier card connector 8mm female ERNI Microspeed 275.90.08.068.01
Supplement 10mm male connector for nominal height 18mm (SC* side card, B2B 18.7mm)



High Speed Expansion P-HSE2			
3_PCIE_TXP	b1	a1	1_PCIE_TXP
3_PCIE_TXN	b2	a2	1_PCIE_TXN
GND	b3	a3	GND
3_PCIE_RXN	b4	a4	1_PCIE_RXN
3_PCIE_RXP	b5	a5	1_PCIE_RXP
GND	b6	a6	GND
4_PCIE_TXP	b7	a7	*2_PCIE_TXP*
4_PCIE_TXN	b8	a8	*2_PCIE_TXN*
GND	b9	a9	GND
4_PCIE_RXN	b10	a10	2_PCIE_RXN
4_PCIE_RXP	b11	a11	2_PCIE_RXP
GND	b12	a12	GND
DP_LANE2_P	b13	a13	*DP_LANE0_P*
DP_LANE2_N	b14	a14	*DP_LANE0_N*
GND	b15	a15	GND
DP_LANE3_P	b16	a16	*DP_LANE1_P*
DP_LANE3_N	b17	a17	*DP_LANE1_N*
GND	b18	a18	GND
DP_AUX_P	b19	a19	PCIE_CLK_P
DP_AUX_N	b20	a20	PCIE_CLK_N
DP_CFG1	b21	a21	GND
DP_HPD	b22	a22	SMB_SCL [1)]
PLTRST#	b23	a23	SMB_SDA [1)]
+12VPS [2) 3)]	b24	a24	+12VPS [2) 3)]
+12VPS [2) 3)]	b25	a25	+12VPS [2) 3)]

italic/grey pins are NC (shown for reference only)

PCIe® can pre-configured 1x4, 2x2, 4x1 via soft-straps (Flash image CPU carrier card). For the SCJ-VEENA PCIe® 4x1 is mandatory. If misaligned, only one or two NICs will be present after system enumeration.

1) Connection to SMBus, isolated after system reset
2) Power rail switched on in S0-S4 state
3) As an exception, the PC7-FESTIVAL CPU carrier card must be configured for +5VS here

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

Please note that the SCJ-VEENA is a carrier card which typically comes without M.2 module populated, unless otherwise expressly ordered. Photos shown within this document and at other places may be equipped with M.2 modules just for application demonstration. If you need a turnkey solution with an M.2 NVMe storage module populated, please contact sales@ekf.com before ordering.

Related Documents CompactPCI® Serial	
Basics / Overview CompactPCI® Serial	www.ekf.com/s/smart_solution.pdf
CompactPCI® Serial Home	www.ekf.com/s/serial.html

Recommended CPU Cards	
SC5-FESTIVAL	www.ekf.com/s/sc5/sc5.html
SC9-TOCCATA	*www.ekf.com/s/sc9/sc9.html*
PC7-FESTIVAL	www.ekf.com/p/pc7/pc7.html

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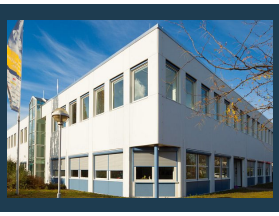

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