Product Information

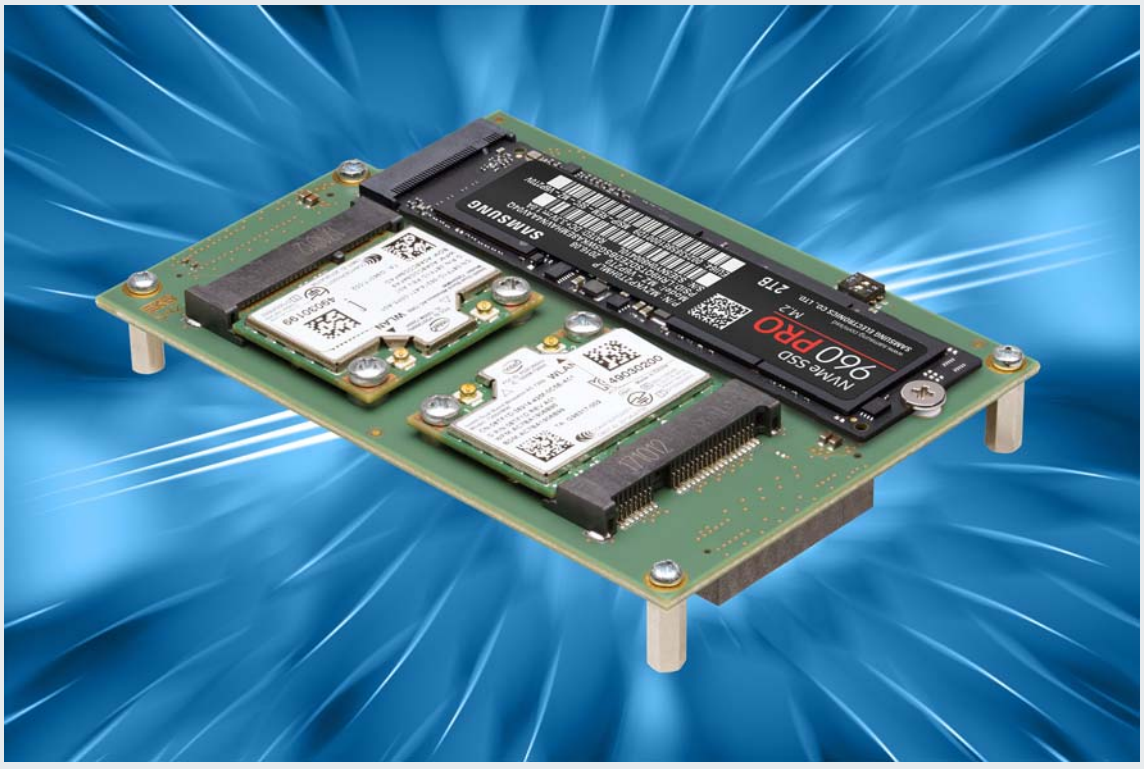
S42-MC

Low Profile Mezzanine Expansion Card for CPU Boards

M.2 NVMe Mass Storage • Dual Mini Card Sockets

Document No. 9107 • 1 August 2019

Preliminary



General

The S42-MC is a low profile mezzanine module for EKF CompactPCI® Serial CPU boards. It can accommodate either two PCI Express® Half-Mini Cards, or one Full-Mini Card (PCIe® Gen3 and USB 2.0), suitable e.g. for wireless applications such as WiFi or Bluetooth, or fieldbus I/O (CAN-FD). In addition, the S42-MC is equipped with an on-board M.2 PCI Express® (NVMe) or SATA mass storage module socket, for operating system installation.

The S42-MC is suitable for EKF CPU carrier cards such as the SC4-CONCERTO or SC5-FESTIVAL, which are equipped with two HSE (high speed expansion) mezzanine connectors, for eight PCIe® Gen3 lanes. The CPU carrier board and S42-MC side card assembly basically requires 4HP front panel width. If SMA antenna or any other front I/O connectors (e.g. D-Sub for CAN bus) are required, EKF offers custom specific 8HP front panel design for the assembly.

Feature Summary

General

- Low profile mezzanine module for EKF CompactPCI® Serial CPU boards
- Proprietary size 66mm x 95mm
- Fits basically into the 4HP (20.32mm) envelope of the CPU carrier board
- Typically delivered as a ready to use assembly unit (including CPU card)
- Mounting position right (on top of a CPU board)
- Dual PCI Express® Mini Card sockets (2 x Half-Mini or 1 x Full-Mini)
- Provides mass storage capability M.2 NVMe/SATA

Mini Card Connectors

- Two sockets for PCI Express® Half-Mini Cards
- Rugged mounting (screw fixed)
- Suitable for PCI Express® up to Gen3 and/or USB 2.0 based Mini Cards
- Alternate usage with single Full-Mini Card
- Custom specific 8HP front panel design available for Mini Card front I/O connectors (e.g. antenna, CAN)

Mass Storage

- M.2 (formerly known as NGFF) socket for an NVMe type SSD module up to 2280 size
- PCI Express® Gen3 x4 interface (M-key socket)
- Maximum (theoretical) 32Gbps I/O data transfer rate (Gen3 PCIe® 8GT/s)
- Capacity up to 2TB as of current
- Suitable for operating system installation (boot device)
- Alternate usage with a low cost 6Gbps SATA type M.2 SSD B-M key
- Autosensing for selection between PCIe® and SATA operation
- M.2 socket height 3.2H (double sided module allowed)
- M.2 component height labels S1 - S5 (single sided) and D1 - D4 (double sided)

Mezzanine Connectors

- High speed mezzanine connectors suitable e.g. for PCI Express® Gen3 and SATA 6G
- Bottom mount male connectors HSE1 and HSE2 (high speed expansion)
- Mating with the corresponding carrier card female connectors
- Board-to-board height 10.0mm for a 4HP assembly
- HSE1: PCI Express® 1x4 support or SATA 6G (dedicated to the M.2 SSD module socket)
- HSE2: PCI Express® 4x1 support (dedicated to the PCI Express® Mini Card sockets)

Feature Summary

Applications

- Low cost local expansion (mezzanine module) for EKF CPU boards
- Adds Mini Card based functions e.g. CAN-FD or WLAN/Bluetooth
- Mass storage expansion via M.2 module NVMe/SATA SSD

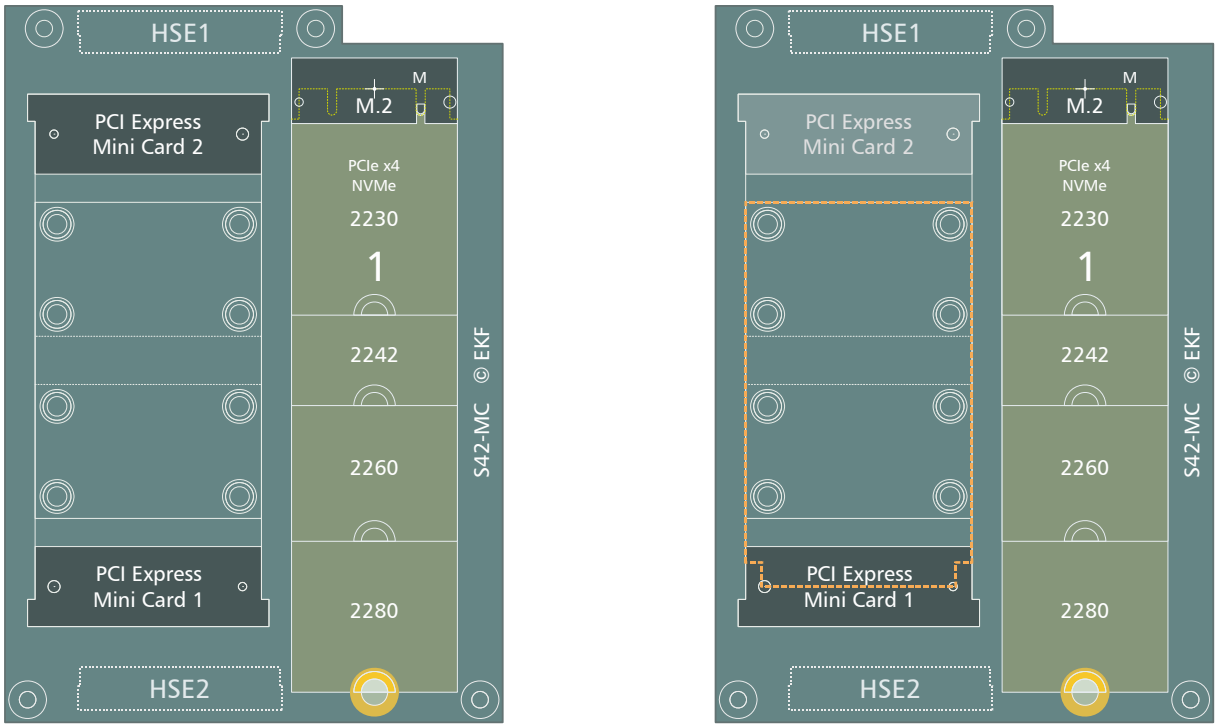
Environmental, Regulatory

- Designed & manufactured in Germany
- ISO 9001 certified quality management
- Long term availability
- Rugged solution
- Coating, sealing, underfilling on request
- Lifetime application support
- 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 139.3 years
- Custom specific modifications and alternate design available on request

*) depends also on M.2 and Mini Card modules in use, and CPU carrier board

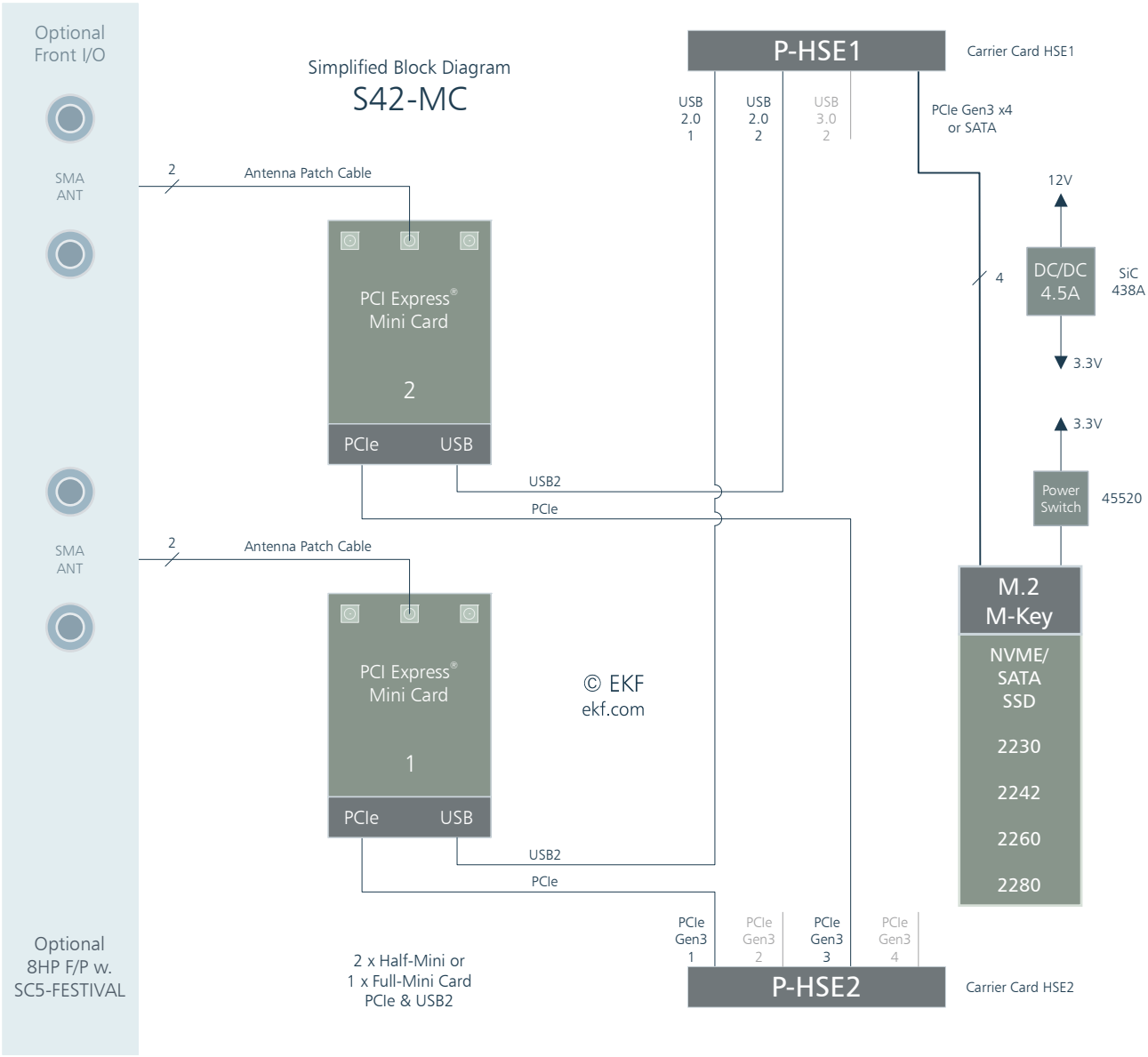
all items are subject to technical changes w/o further notice

Component Orientation



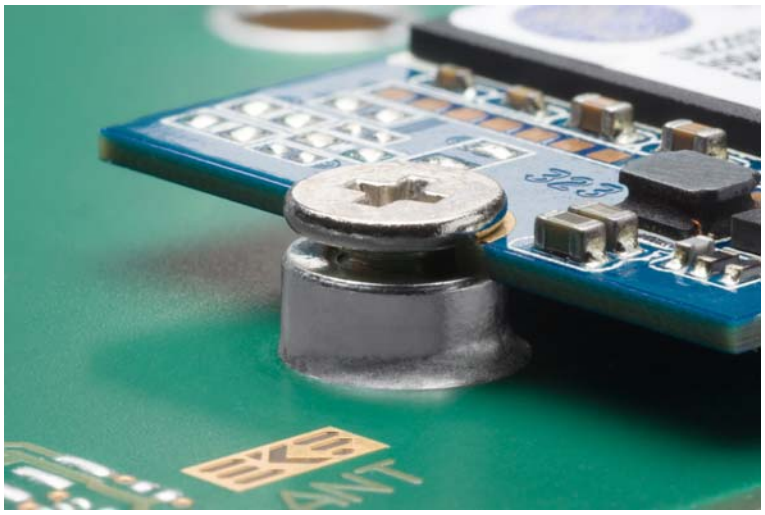
Threaded inserts for any mounting position 2 x Half-Mini or 1 x Full-Mini

Block Diagram



M.2 Connector

The S42-MC is provided with an M.2 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)

Mechanical details and pin-out configurations are described by the PCI-SIG 'PCI Express M.2 Specification'. The M.2 pin-out complies with the '*Socket 3 M SSD Drive*', with module dimensions from 'Type 2242 to 2280', either height option 'S2, D2, S3, D3, D5'.

Basically, the M-key coded M.2 connector is suitable for an NVMe SSD module and provides a PCIe® Gen3 x4 link, derived from the HSE1 mezzanine connector, for a data transfer rate of up to 32Gbps.

As an alternate, the M.2 socket can also be used together with an SATA SSD module. Typically, SATA modules accept both B and M coded host connectors. The S42-MC is provided with an autosensing circuitry, which can detect an SATA style M.2 SSD via pin 69 of the M.2 socket (PEDET). By specification, this signal is GND for SATA modules (open for PCIe® operation). Wired to the HSE1 mezzanine connector (CFG_12 pin a1), the CPU carrier card changes over the correspondent PCIe® lane to SATA.

M1 • NVMe PCIe x4 or SATA 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*

M1 • NVMe PCIe x4 or SATA M.2 M-Key continued • Pin 39 - 75			
GND	39	40	*SMB_CLK **
PETN0 (SATA B+)	41	42	*SMB_DATA **
PETP0 (SATA B-)	43	44	*ALERT **
GND	45	46	*NC*
PERN0 (SATA A-)	47	48	*NC*
PERP0 (SATA A+)	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*

** PEDET signal used to select between PCIe® and SATA mode

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

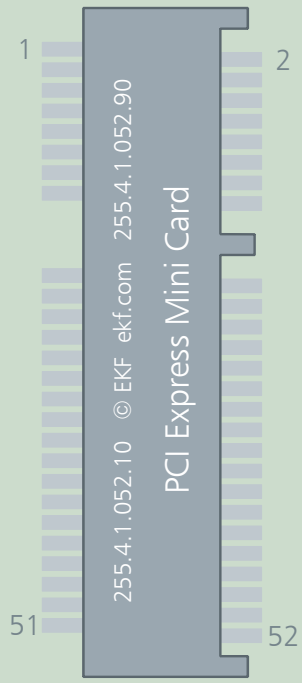
Power: The socket can supply up to +3.3V/6A (shared w. Mini Cards)

Mini Card Host Connector

The S42-MC is provided with two PCI Express® Mini Card host connectors. Either one Full-Mini Card or two Half-Mini Cards can be accommodated. Both sockets are suitable for PCIe® based modules, and also USB 2.0 driven Mini Card modules. Due to space restrictions on the PCB, no SIM card holders are populated.

MC1/MC2 • PCI Express® Mini Card

PCI Express® Mini Card Socket (255.4.1.052.14)



PCIE_WAKE#	1	2	+3.3V
COEX1 (GPIO2/6/10/14)	3	4	GND
COEX2 (GPIO3/7/11/15)	5	6	+1.5V
CLKREQ# (NC)	7	8	*UIM_C1*
GND	9	10	*UIM_C7*
PCIE_CLK-	11	12	*UIM_C3*
PCIE_CLK+	13	14	*UIM_C2*
GND	15	16	*UIM_C6*
UIM_C8	17	18	GND
UIM_C4	19	20	*W_DIS1# (GPIO0/4/8/12)*
GND	21	22	RST#
PCIE_RN	23	24	+3.3V
PCIE_RP	25	26	GND
GND	27	28	+1.5V
GND	29	30	*SMB_CLK*
PCIE_TN	31	32	*SMB_DAT*
PCIE_TP	33	34	GND
GND	35	36	USB_D-
GND	37	38	USB_D+
+3.3V	39	40	GND
+3.3V	41	42	*LED_WWAN#*
GND	43	44	*LED_WLAN#*
RSV (NC)	45	46	*LED_WPAN#*
RSV (NC)	47	48	+1.5V
RSV (NC)	49	50	GND
RSV (NC)	51	52	+3.3V

Power: The sockets can supply up to +3.3V/6A in total (shared w. M.2 module)
Option: +1.5V/1A in total switching regulator (may be not stuffed by default)

Mini Cards must be fastened manually by screws M2.5x4mm to corresponding M2.5 soldered nuts provided on the S42-MC PCB. 0.5mm height nylon washers are required in addition.

Mezzanine Connectors HSE1, HSE2

The S42-MC 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 10mm (4HP envelope).

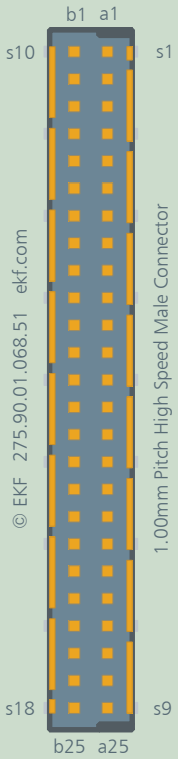
HSE1

HSE1 is used to pass a PCIe® x4 link from the CPU carrier card to the S42-MC on-board M.2 NVMe connector, for a suitable SSD mass storage module. For low cost M.2 SATA modules, two HSE1 configuration pins allow autosensing conversion from PCIe® to SATA. The Mini Card sockets USB 2.0 connection is also routed across HSE1. With respect to the CPU boards SC4-CONCERTO and SC5-FESTIVAL all resources provided by the HSE1/2 mezzanine connectors are derived from the carrier card CM238 PCH.

HSE2

HSE2 is provided to supply the S42-MC side card with additional PCIe® lanes. For each Mini Card a PCIe® x1 link is available. This requires the CPU carrier card HSE2 connector to be configured to PCIe® 4x1 (or 2x2), but not PCIe® 1x4. Since this is done by soft-strapping (i.e. Flash memory) on the CPU card, the S42-MC and SC4/SC5 CPU card must be ordered as an complementary assembly.

ERNI Microspeed 275.90.10.068.51
10mm male connector for nominal height 18mm w. mating carrier card 8mm female connector (B2B 18.7mm)



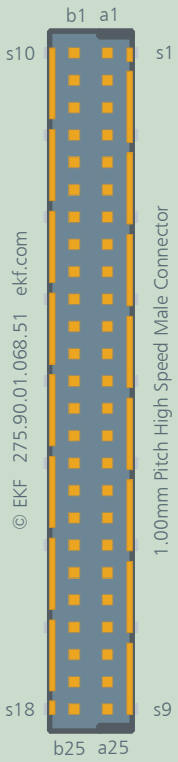
High Speed Expansion P-HSE1			
*CFG_34 **	b1	a1	CFG_12 *
3_PCIE_TXP	b2	a2	1_PCIE_TXP
3_PCIE_TXN	b3	a3	1_PCIE_TXN
GND	b4	a4	GND
3_PCIE_RXN	b5	a5	1_PCIE_RXN
3_PCIE_RXP	b6	a6	1_PCIE_RXP
GND	b7	a7	GND
4_PCIE_TXP	b8	a8	2_PCIE_TXP
4_PCIE_TXN	b9	a9	2_PCIE_TXN
GND	b10	a10	GND
4_PCIE_RXN	b11	a11	2_PCIE_RXN
4_PCIE_RXP	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]

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

* 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

ERNI Microspeed 275.90.02.068.51
2mm male connector for nominal height 10mm w. mating carrier card 8mm female connector



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)]	b24	a24	*+12VPS* [2)]
+12VPS [2)]	b25	a25	*+12VPS* [2)]

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 S42-MC PCIe® 4x1 or 2x2 is mandatory. If misaligned, devices may not be present after system enumeration.

1) Connection to SMBus, isolated after system reset 2) Power rail switched on in S0-S4 state
PCIe® lane usage: 1 = Mini Card 1 3 = Mini Card 2

Ordering Information
For popular S42-MC SKUs please refer to www.ekf.com/liste/liste_21.html#S42

Please note that the S42-MC typically comes without M.2 or Mini Card modules populated, unless otherwise expressly ordered. Photos shown within this document and at other places may be equipped with M.2 and/or Mini Card modules just for application demonstration. If you need a turnkey solution e.g. 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	
SC4-CONCERTO	www.ekf.com/s/sc4/sc4.html
SC5-FESTIVAL	www.ekf.com/s/sc5/sc5.html


DP 1
DP 2
PG
USB
GP
GbE 1
RB
HD
OT 2
1
2
3
4
NVMe SSD
960 PRO
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SC5 FESTIVAL

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