



Product Information

P82-GBE

Low Profile Mezzanine Module for PC7-FESTIVAL CPU Card
M.2 NVMe® SSD Storage • Dual Backplane 2.5GBASE-T Ethernet

Preliminary

Overview

The P82-GBE is a low profile mezzanine expansion module which comes as a 4HP assembly together with the PC7-FESTIVAL CPU carrier card. It provides a Solid-State Drive mass storage solution, and in addition can supply the CompactPCI® PlusIO backplane with two Gigabit Ethernet ports.

The P82-GBE is equipped with an M.2 style PCIe® x4 socket, suitable for a NVMe® or SATA type SSD module, for installation of the operating system and also for data storage.

Two discrete Gigabit Ethernet controllers are provided on the P82-GBE, for CompactPCI® PlusIO backplane communication via the carrier CPU card J2 connector. The Intel® I226-IT NICs support 4-speed operation 10BASE-Te, 100BASE-TX, 1000BASE-T and 2.5GBASE-T.

The Ethernet backplane ports can be used either for a hybrid backplane as CompactPCI® Serial system expansion, or with a J2 rear I/O module.

Feature Summary

Form Factor

- ▶ Proprietary size mezzanine module for PC7-FESTIVAL CPU card
- ▶ Fits basically into the 4HP (20.3mm) 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)

Suitable CPU Carrier Card

- ▶ PC7-FESTIVAL (2022 version) as of current

Host I/F Connectors

- ▶ High speed mezzanine connectors
- ▶ Suitable for PCI Express® Gen3
- ▶ Bottom mount connectors HSE1, HSE2 (high speed expansion) and GBE (Ethernet)
- ▶ Mating with the carrier card connectors HSE1/2 and GBE
- ▶ Board-to-board height 10.0mm for a 4HP assembly

- ▶ HSE1
PCI Express® x4 support from CPU card to P82 (dedicated to the NVMe SSD module M.2 socket)

- ▶ HSE2
PCI Express® 4x1 support from CPU Card to P82 (dedicated to the on-board Gigabit Ethernet controllers, two of 4 PCIe® links in use)

- ▶ GBE
Dual Gigabit Ethernet support from P82 to the CPU Card (wired there to the J2 backplane connector according to the CompactPCI® PlusIO specification pin assignment)

Feature Summary

M.2 NVMe Module Connector

- ▶ Single M.2 (formerly known as NGFF) socket, maximum M.2 size 2280
- ▶ Suitable for an M.2 NVMe SSD module, key Id M, PCIe x4 I/F
- ▶ PCIe x4 sourced via HSE1 mezzanine connector (option SATA)
- ▶ Maximum (theoretical) 32Gbps I/O data transfer rate (Gen3 PCIe 8GT/s)
- ▶ M.2 SATA SSD option (auto detect, only available with PC7-FESTIVAL CPU carrier card)
- ▶ Power switch, undervoltage lockout, short-circuit protection, quick discharge
- ▶ Module dimensions 2230/2242/2260/2280, screw fixed
- ▶ Module height (Label) D1-D4, S1-S5

Gigabit Ethernet NICs

- ▶ Two individual Intel® I225/226-IT networking interface controllers (NIC)
- ▶ 2.5GBASE-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 (I225)
- ▶ -40°C to +85°C operating temperature 2.5G (I226)
- ▶ 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

* The CompactPCI® PlusIO Specification does not include Ethernet speeds >1000BASE-T

Feature Summary

Mezzanine Expansion Option

- ▶ Option side card connector (HSE3) 5 x USB 3.0
- ▶ 4 x USB 3.0 via optional μ PD720201 on-board controller, 1 x derived from HSE1 connector (CPU card)
- ▶ Erni/Tyco Microspeed mezzanine connector for board-to-board space 7mm
- ▶ 8HP assembly stack with side card
- ▶ Custom specific side card design offered by EKF

Applications

- ▶ Low profile mezzanine module for EKF CPU Card PC7-FESTIVAL
- ▶ 4HP assembly CPU carrier board and P82-GBE mezzanine card
- ▶ Adds SSD mass storage and backplane Ethernet networking to the CPU carrier
- ▶ M.2 based mass storage, 1 x M.2 PCIe x4 socket (NVMe) or SATA
- ▶ On-board GbE NICs for backplane communication (CompactPCI® Serial slots) or passive RIO module

Environment & Regulatory

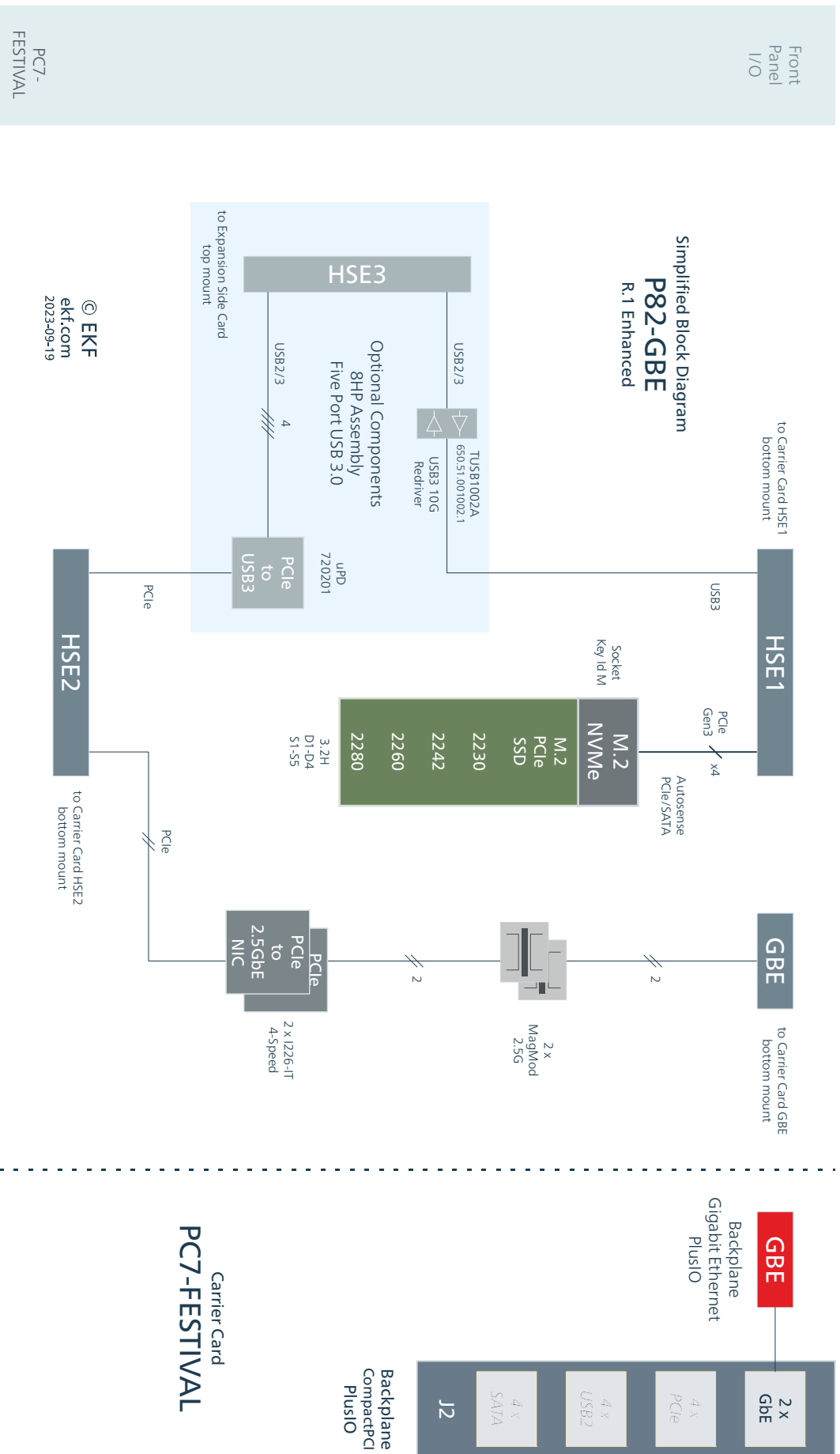
- ▶ Designed & manufactured in Germany
- ▶ Certified quality management according to ISO 9001
- ▶ Long term availability
- ▶ Rugged solution
- ▶ Coating, sealing, underfilling on request
- ▶ Lifetime application support
- ▶ RoHS compliant
- ▶ Operating temperature -40°C to +85°C (industrial temperature 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
- ▶ MTBF tbd years (MIL-HDBK-217F, SN29500 @+40°C)
- ▶ EC Regulatory EN55024, EN55032, EN62368-1

Custom specific modifications or development on request

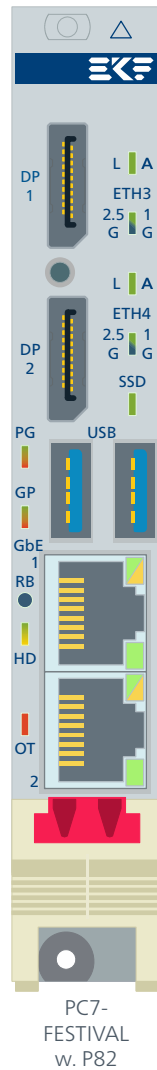
All items are subject to technical changes

M.2 SSD modules shown in some photos are not scope of delivery

Block Diagram

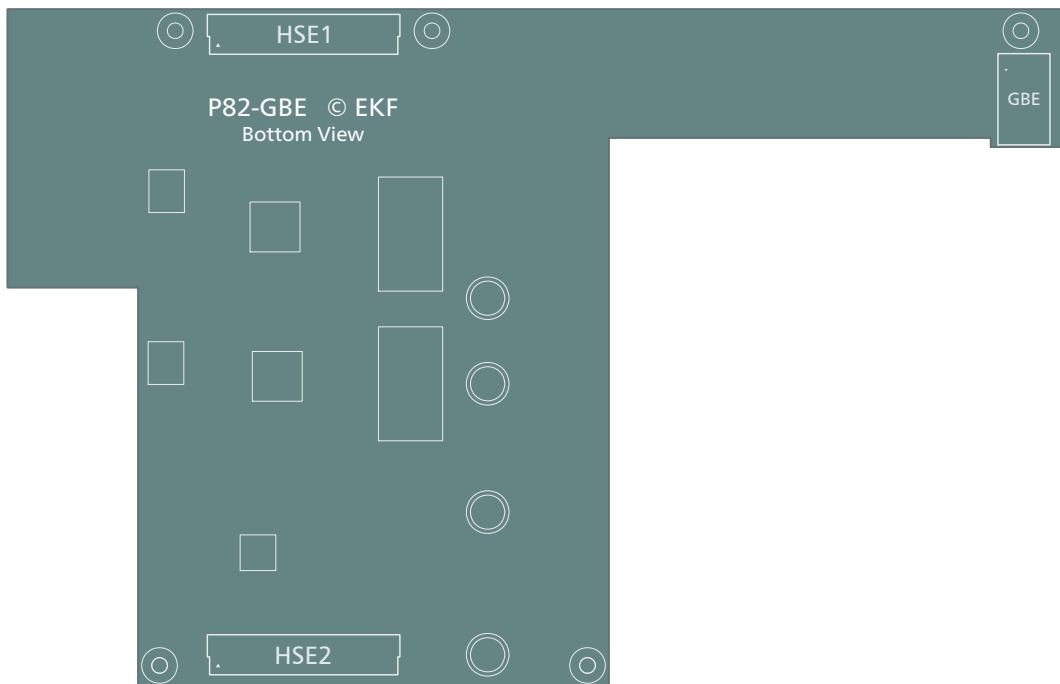
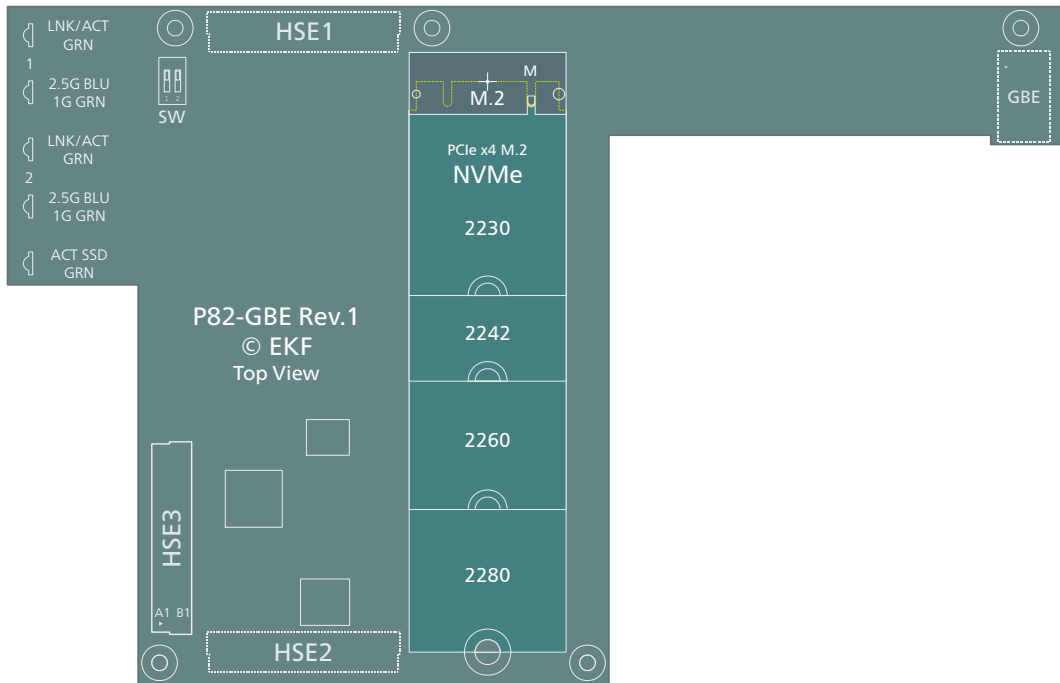


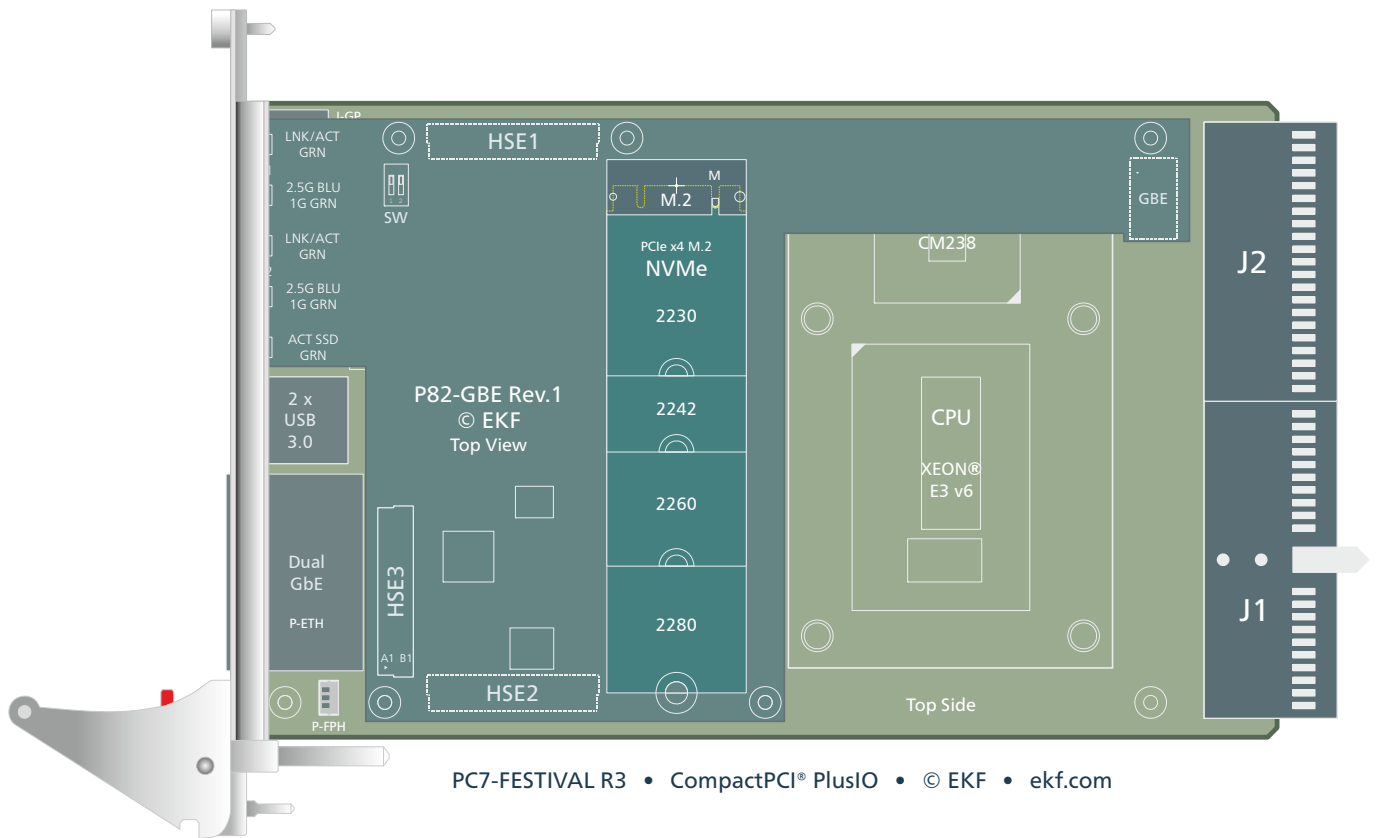
Front Panel



P82-GBE Front Panel LEDs		
ETH3 (J2 1_ETH)	L/A	Link (steady green) • Activity (blink green)
	2.5G/1G	Speed 2.5G (blue) • 1G (green)
ETH4 (J2 2_ETH)	L/A	Link (steady green) • Activity (blink green)
	2.5G/1G	Speed 2.5G (blue) • 1G (green)
SSD		M.2 SSD Activity (green)

Top/Bottom View Component Assembly

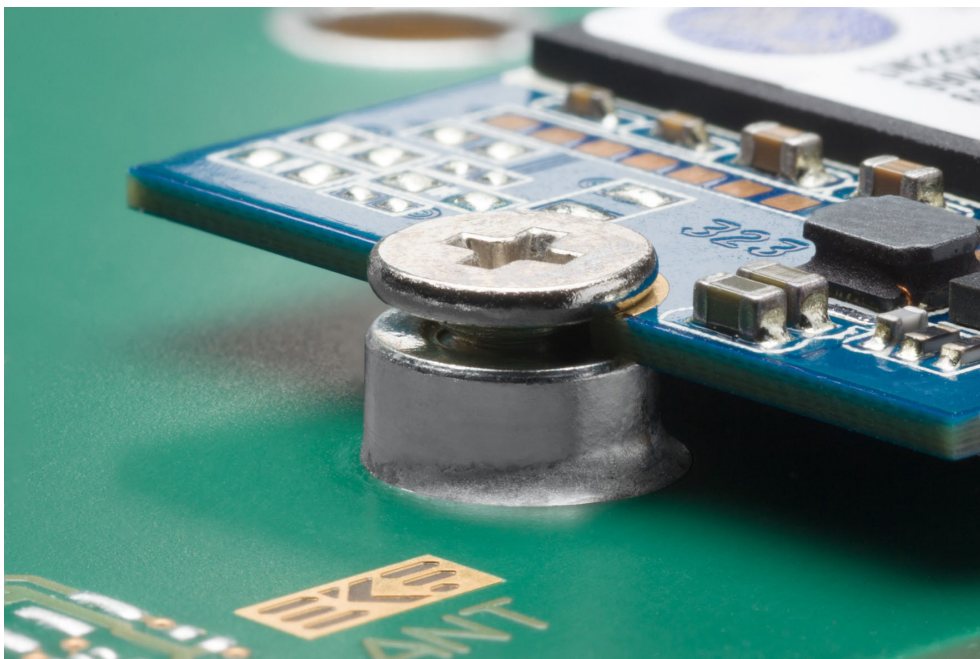




M.2 SSD Host Connector

The P82-GBE is provided with an M.2 (formerly NGFF) module host connector. This socket is M-keyed, for a PCIe® x4 based SSD module. After inserted, the M.2 module must be locked manually by a screw (M2.5 threaded inserts provided on the PCB), in order to withstand shock and vibration. The P82-GBE accepts module sizes up to 2280, labelled D1-D4, S1-S5.

As an option, a classic style M.2 SATA SSD can be mounted (PC7-FESTIVAL CPU carrier only). The module type is sensed and the PC7 will be configured automatically for SATA instead of PCIe®.



M.2 Module Fixation (Picture Similar)

Please note that the P82-GBE is a carrier card which typically comes without M.2 module(s) 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.

NVMe PCIe x4 M.2 M-Key • Pin 1 - 38 EKF Part #255.50.2.2232.10			
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 *
PETNO	41	42	SMB_DATA *
PETPO	43	44	ALERT#
GND	45	46	NC
PERNO	47	48	NC
PERPO	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 Connector GBE

The PC7-FESTIVAL CPU card does not provide backplane Ethernet ports by itself. Instead, the P82-GBE can be used in addition when backplane Ethernet is required. The PC7-FESTIVAL and the P82-GBE mezzanine come as a 4HP assembly unit.

The P82-GBE delivers two four-speed xBASE-T Ethernet ports to its mezzanine connector GBE. Across the carrier card mating connector 2x8 Ethernet signals are passed to the CPU backplane connector J2.

GBE Expansion Connector for CompactPCI® PlusIO Backplane Ethernet			
Zero8 2x10 pos mid profile height 7.85mm socket 275.92.08.020.01			
Used on P82-GBE low profile mezzanine module			
for signal names refer to J2 backplane connector according to the CompactPCI® PlusIO specification			
1_ETH_B+	B1	A1	1_ETH_A+
1_ETH_B-	B2	A2	1_ETH_A-
GND	B3	A3	GND
1_ETH_D+	B4	A4	1_ETH_C+
1_ETH_D-	B5	A5	1_ETH_C-
2_ETH_B+	B6	A6	2_ETH_A+
2_ETH_B-	B7	A7	2_ETH_A-
GND	B8	A3	GND
2_ETH_D+	B9	A9	2_ETH_C+
2_ETH_D-	B10	A10	2_ETH_C-

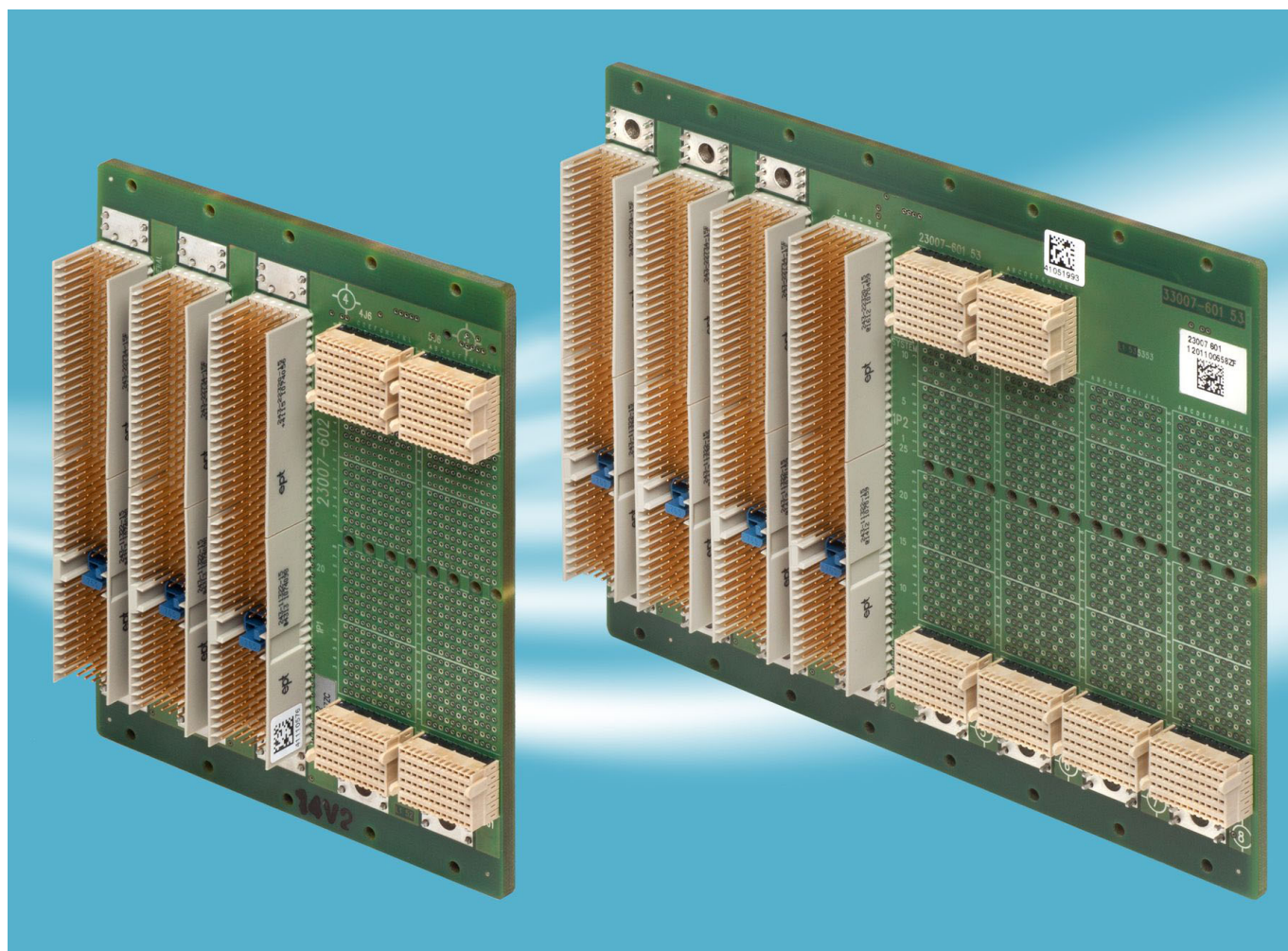
CPU Carrier Card Backplane Connector J2

Via the mezzanine connector pair GBE, two Ethernet ports are available at the CPU card backplane connector J2, according to the CompactPCI® PlusIO J2 pin assignment. A split backplane CompactPCI® Classic and CompactPCI® Serial can route the Ethernet ports to slots for CompactPCI® Serial peripheral cards. As an alternate, a simple passive rear I/O module can be used, with RJ45 connectors for external networking (in addition to the CPU card front ports).

J2	A	B	C	D	E
22	GA4 ²⁾	GA3 ²⁾	GA2 ²⁾	GA1 ²⁾	GA0 ²⁾
21	CLK6	GND	2_ETH_B+	1_ETH_D+	1_ETH_B+
20	CLK5	GND	2_ETH_B-	1_ETH_D-	1_ETH_B-
19	GND	GND	2_ETH_A+	1_ETH_C+	1_ETH_A+
18	2_ETH_D+	2_ETH_C+	2_ETH_A-	1_ETH_C-	1_ETH_A-
17	2_ETH_D-	2_ETH_C-	PRST# RST# ⁷⁾	REQ6# ¹⁾	GNT6#
16	4_PE_CLK-	2_PE_CLK+	DEG# ^{1) 4)}	GND	<i>reserved</i> ²⁾
15	4_PE_CLK+	2_PE_CLK-	FAL# ¹⁾ (PSON#) ⁶⁾	REQ5# ¹⁾	GNT5#
14	3_PE_CLK-	1_PE_CLK+	4_PE_CLKE#	PPS ⁵⁾ SATA_SCL ⁴⁾	<i>reserved</i> ²⁾
13	3_PE_CLK+	1_PE_CLK-	3_PE_CLKE#	PPM ⁵⁾ SATA_SDO ⁴⁾	SATA_SL ⁴⁾
12	4_PE_RX00+	1_PE_CLKE#	2_PE_CLKE#	SATA_SDI ⁴⁾	4_SATA_RX+
11	4_PE_RX00-	4_PE_TX00+	4_USB2+	4_SATA_TX+	4_SATA_RX-
10	3_PE_RX00+	4_PE_TX00-	4_USB2-	4_SATA_TX-	3_SATA_RX+
9	3_PE_RX00-	3_PE_TX00+	3_USB2+	3_SATA_TX+	3_SATA_RX-
8	2_PE_RX00+	3_PE_TX00-	3_USB2-	3_SATA_TX-	2_SATA_RX+
7	2_PE_RX00-	2_PE_TX00+	2_USB2+	2_SATA_TX+	2_SATA_RX-
6	1_PE_RX00+	2_PE_TX00-	2_USB2-	2_SATA_TX-	1_SATA_RX+
5	1_PE_RX00-	1_PE_TX00+	1_USB2+	1_SATA_TX+	1_SATA_RX-
4	V(I/O)	1_PE_TX00-	1_USB2-	1_SATA_TX-	<i>reserved</i> ²⁾
3	CLK4	GND	GNT3#	REQ4# ¹⁾	GNT4#
2	CLK2	CLK3	SYSEN# ³⁾	GNT2#	REQ3# ¹⁾
1	CLK1	GND	REQ1# ¹⁾	GNT1#	REQ2# ¹⁾

A passive rear I/O Ethernet module would basically need only the RJ45 connectors and TVS protection, since the P82-GBE is provided already with transformers. For Hipot 1.5kV_{eff} however EKF recommends a secondary set of transformers or RJ45 with integrated magnetics.

Gigabit Ethernet for CompactPCI® Serial Peripheral Cards



On a hybrid (split) backplane the center slot with P1/P2 connectors is reserved for the CompactPCI® PlusIO CPU card (system slot). To the left there are CompactPCI® classic peripheral card slots (32-bit). On the right side CompactPCI® Serial peripheral cards can be plugged. Neighbouring to the CPU card slot, two CompactPCI® Serial slots are Gigabit Ethernet enabled, via their J6 backplane connectors.

Gigabit Ethernet for CompactPCI® PlusIO Rear I/O Modules

The P82-GBE Gigabit Ethernet ports can be used for a rear I/O module, together with other I/O natively provided by the PC7-FESTIVAL. EKF can offer custom specific RIO design - please contact sales@ekf.de.



Sample PlusIO RIO Module

Download PC7-FESTIVAL Carrier Card Documentation	
PC7-FESTIVAL	https://www.ekf.com/p/pc7/pc7.html

Reference Documents		
Term	Document	Origin
CompactPCI® PlusIO	CompactPCI® PlusIO Specification, PICMG® 2.30	www.picmg.org
CompactPCI® Serial	CompactPCI® Serial Specification, PICMG® CPCI-S.0	www.picmg.org
Ethernet	IEEE Std 802.1, 802.3, 802.3bz	standards.ieee.org
M.2	PCI Express® M.2 Specification Rev. 4.0 Ver. 1.1	www.pcisig.com
NVMe®	NVM Express Specification 2.0b	https://.nvmexpress.org

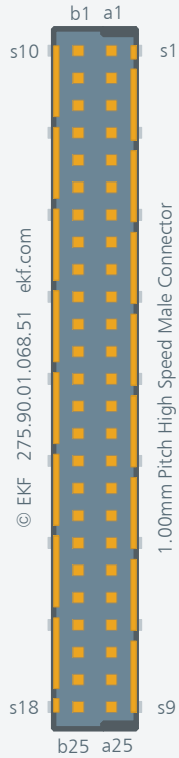
Ordering Information
For popular P82-GBE SKUs please refer to www.ekf.com/liste/liste_21.html#P82

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Alternate Low Profile CPU Card Mezzanine Storage Modules	
S48-SSD	Dual M.2 NVMe, 1 x Type-C Front I/O

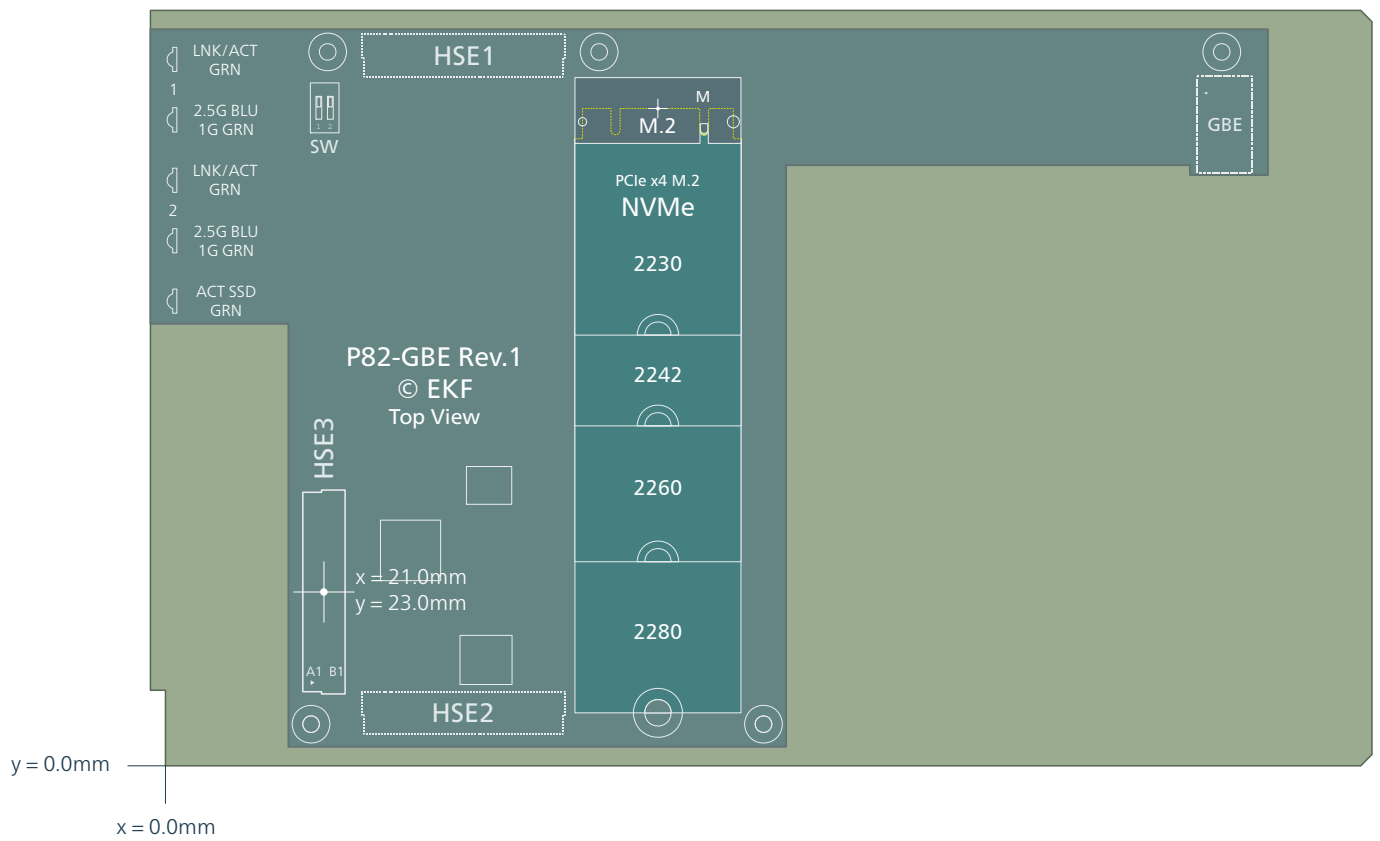
Addendum - Option Mezzanine Connector HSE3

HSE3				
	GND	b1	a1	GND
	3_USB3_TXP	b2	a2	1_USB3_TXP
	3_USB3_TXN	b3	a3	1_USB3_TXN
	GND	b4	a4	GND
	3_USB3_RXN	b5	a5	1_USB3_RXN
	3_USB3_RXP	b6	a6	1_USB3_RXP
	GND	b7	a7	GND
	4_USB3_TXP	b8	a8	2_USB3_TXP
	4_USB3_TXN	b9	a9	2_USB3_TXN
	GND	b10	a10	GND
	4_USB3_RXN	b11	a11	2_USB3_RXN
	4_USB3_RXP	b12	a12	2_USB3_RXP
	GND	b13	a13	GND
	3_USB2_P	b14	a14	1_USB2_P
	3_USB2_N	b15	a15	1_USB2_N
	GND	b16	a16	GND
	4_USB2_P	b17	a17	2_USB2_P
	4_USB2_N	b18	a18	2_USB2_N
	GND	b19	a19	GND
	5_USB3_TXP	b20	a20	5_USB2_P
	5_USB3_TXN	b21	a21	5_USB2_N
	GND	b22	a22	GND
	5_USB3_RXP	b23	a23	+5V
	5_USB3_RXN	b24	a24	+5V
	GND	b25	a25	+5V



1_USB - 4_USB via USB Controller μ PD720201
 5_USB derived from HSE1 mezzanine connector (CPU board)

This option is available from PCB Rev.1 off. Board-to-board space to the mezzanine side card is 7.18mm nominal for an 8HP assembly stack (CPU - P82 - side card). The mating side card connector is an Erni/Tyco part no. 224512-E MicroSpeed female 6mm height.



Mounting Position HSE3

Beyond All Limits: EKF High Performance Embedded



Industrial Computers Made in Germany
boards. systems. solutions.

Document No. 10133 • 19 September 2023

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