



Product Information

SC8-FLUTE • CompactPCI® Serial • CPU Card

Intel® Atom™ x6000 Series Processor • Elkhart Lake SoC

Preliminary Edition



General

The SC8-FLUTE is a low power CompactPCI® Serial CPU board, based on an Intel® Atom™ x6000RE (Elkhart Lake Industrial) System-on-Chip processor. The front panel is provided with three 2.5Gbps RJ45 Ethernet jacks, and three Type-C USB3/DisplayPort connectors. The board is equipped with 16GB directly soldered DDR4 IBECC RAM, and in addition a DDR4 SODIMM socket for another 16GB.

High speed PCIe® x4 SSD mass storage is available via low profile mezzanine modules (4HP assembly), or multi-function side cards (8HP). The SC8-FLUTE backplane connectors comply with the CompactPCI® Serial system board specification, suitable for reasonable system expansion via 3 x PCIe®, 4 x SATA (two ports configurable as hardware RAID 0/1), and USB3.



Feature Summary

General

- ▶ CompactPCI® Serial (PICMG® CPCI-S.0) System Slot Controller
- ▶ Form factor single size Eurocard (board dimensions 100x160mm²)
- ▶ Mounting height 3U
- ▶ Front panel width 4HP (8HP/12HP assembly with optional mezzanine side card)
- ▶ Front panel I/O for versatile system configuration (3 x USB3/DisplayPort, 3 x 2.5Gbps Ethernet)
- ▶ Backplane communication via CompactPCI® Serial connectors
- ▶ On-board PCIe® mezzanine expansion option for mass storage modules or side cards
- ▶ Side cards and low profile mass storage modules available as COTS and also as custom specific

SoC (Processor)

- ▶ Intel® Atom® Industrial SoC x6000RE Series (Elkhart Lake)
- ▶ x6425RE • 4 Cores • 1.9GHz • 12W TDP • 400MHz/32EUs Gfx
- ▶ x6416RE • 4 Cores • 1.7GHz • 9W TDP • 450MHz/16EUs Gfx
- ▶ x6414RE • 4 Cores • 1.5GHz • 9W TDP • 400MHz/16EUs Gfx
- ▶ x6214RE • 2 Cores • 1.4GHz • 6W TDP • 400MHz/16EUs Gfx
- ▶ x6212RE • 2 Cores • 1.2GHz • 6W TDP • 350MHz/16EUs Gfx

all frequencies not final and subject to change

- ▶ *Intel® Atom® Embedded SoC x6000E Series (Elkhart Lake)*
- ▶ *x6425E • 4 Cores • 2.0GHz • 12W TDP • 500MHz/32EUs Gfx*
- ▶ *x6413E • 4 Cores • 1.5GHz • 9W TDP • 500MHz/16EUs Gfx*
- ▶ *x6211E • 2 Cores • 1.3GHz • 6W TDP • 350MHz/16EUs Gfx*
- ▶ *Intel® Atom® Industrial FuSa SoC x6000FE Series (Elkhart Lake)*
- ▶ *x6427FE • 4 Cores • 1.9GHz • 12W TDP • 400MHz/32EUs Gfx • FuSa*
- ▶ *x6200FE • 2 Cores • 1.0GHz • 4.5W TDP • tbd MHz/tbd EUs Gfx • FuSa*

italic grey: SKUs not plan of release

- ▶ In-band ECC
- ▶ Intel® Programmable Services Engine
- ▶ Intel® Time Coordinate Computing (Intel® TCC) and TSN
- ▶ Operating life 10 years up to 100% active
- ▶ T_a -40°C to 85°C

Feature Summary

Firmware

- ▶ Phoenix® UEFI (Unified Extensible Firmware Interface) V2.7 with CSM*
- ▶ Phoenix® SCT (SecureCore Technology) Release V4.3.0
- ▶ ACPI tbd
- ▶ Fully customizable by EKF
- ▶ Secure Boot and Measured Boot supported
- ▶ Windows®, Linux and other (RTOS)' supported

* CSM (Compatibility Support Module) emulates a legacy BIOS environment, which allows to boot a legacy operating system such as DOS, 32-bit Windows and some RTOS'

Main Memory

- ▶ Integrated memory controller fo up to 32GB DDR4 w. IB ECC, 3200MT/s
- ▶ 16GB Soldered memory for rugged applications
- ▶ 16GB SODIMM socket

Mass Storage

- ▶ 128Mbit SPI Flash (UEFI firmware and customer application data)
- ▶ Option eMMC (embedded MMC 5.0 64GByte soldered)
- ▶ PCIe® based SSD module options via P-HSE1 & P-HSE2 mezzanine connectors
- ▶ M.2 socket(s) on low profile mezzanine modules (4HP) or side cards (8HP)
- ▶ Up to 2 x M.2 NVMe SSD size 2280, PCIe x4 (P-HSE1) and PCIe x1 (P-HSE2)
- ▶ Option custom specific mezzanine mass storage board design on request

Graphics

- ▶ Intel® UHD Graphics, 4kp60 (4096x2160@60Hz) on three simultaneous displays
- ▶ 2D/3D Hardware acceleration
- ▶ H.265/HEVC Decode/Encode
- ▶ H.264 Decode/Encode
- ▶ MPEG2 Decode
- ▶ VC1/WMV9 Decode
- ▶ VP8 Decode
- ▶ VP9 Decode/Encode
- ▶ JPEG/MPEG Decode/Encode
- ▶ HDCP 2.3, PAVP
- ▶ 3 x Type-C front panel connectors (DisplayPort Alternate Mode)
- ▶ DisplayPort™ 1.4 MST (multiple displays if monitor is equipped with bridge chip)

Feature Summary

Networking

- ▶ Up to 11 Gigabit Ethernet networking interfaces in total
- ▶ 3 x 2.5GBASE-T RJ45 front ports via integrated MACs & SGMII PHYs Marvell® AQR115C
- ▶ Option 8 x 1000BASE-T backplane w. S80-P6 mezzanine module - Marvell® Peridot switch
- ▶ Option 4 x 1000BASE-T backplane w. S82-P6 mezzanine module - 4 x Intel® I210-IT NIC
- ▶ Option 4 x 2.5GBASE-T backplane w. S83-P6 mezzanine module - 4 x Intel® I226-IT NIC
- ▶ Option 4 x 2.5GBASE-T RJ45 front w. SCJ-VEENA short side card - 4 x Intel® I226-IT NIC (8HP)
- ▶ Option 4 x 1000BASE-T M12-X front w. SCL-RHYTHM short side card - 4 x Intel® I210-IT NIC (8HP)
- ▶ Option RJ45 port 1 jack replacement by M12-X connector w. S02-M12 mezzanine (8HP)
- ▶ TSN Precision time protocol (Time-Sensitive-Networking) as required for OPC UA and OpenAvnu
- ▶ Enables ultra-reliable low-latency communication (URLLC)
- ▶ Intel® Time Coordinated Computing (Intel® TCC) for time synchronisation and timeliness

EHL SoC I/O Usage

- ▶ 3 x USB Type-C front panel connectors (DP Alt Mode)
- ▶ 3 x 2.5GBASE-T SGMII PHYs to RJ45 front ports
- ▶ 4 x PCIe® Gen3 to HSE1 mezzanine connector (configurable 1x4 or 4x1 links)
- ▶ 4 x PCIe® Gen3 to HSE2 mezzanine connector (4x1 links via Gen3 switch)
- ▶ 3 x PCIe® Gen3 to backplane connectors (x1 links, 1 derived from SoC, 2 x via Gen3 switch)
- ▶ 1 x PCIe® Gen3 to 1:7 switch (1 x USB controller, 2 x backplane use, 4 x HSE2 mezzanine)
- ▶ e•MMC 5.1 (ordering option, mass storage device up to 64GB)
- ▶ 1 x SATA 3.2 for backplane usage
- ▶ eSPI, Audio, I2C, UART, CAN-FD, Time Sync to mezzanine expansion connector N-EXP
- ▶ TPM 2.0 module

Additional Building Blocks

- ▶ Additional on-board devices, PCIe® based
- ▶ PCIe® Gen3 packet switch PI7C9X3G808GP (8-port, 8-lane)
- ▶ Quad port PCIe® USB3 controller uPD720201 (Type-C, backplane, HSE1, RAID controller)
- ▶ Option JMS562 USB to SATA RAID 0/1 controller (backplane SATA)

Security

- ▶ Trusted Platform Module
- ▶ TPM 2.0 for highest level of certified platform protection
- ▶ Infineon Optiga™ SLM9670 cryptographic processor
- ▶ Conforming to TCG 2.0 specification
- ▶ AES hardware acceleration support (Intel® AES-NI)

Feature Summary

Front Panel I/O (4HP)

- ▶ 3 x 2.5 Gigabit Ethernet RJ45 (2.5GBASE-T, 1000BASE-T, 100BASE-TX, 10BASE-Te)
- ▶ 3 x DisplayPort (Type-C Alt Mode)
- ▶ 3 x USB 3 Type-C (same as DP connectors), 1 x USB 3.1 Gen1 5G (top connector), 2 x USB 3.1 Gen2 10G (mid & lower receptacles)

Front Panel I/O (8HP)

- ▶ Variety of side cards available, common front panel 8HP/12HP with CPU card
- ▶ Various I/O ports e.g. UART, Audio, RJ45 Ethernet, M12-X Ethernet, Wireless (SMA)
- ▶ Custom specific front panel and side card design

CompactPCI® Serial Backplane Resources

- ▶ PICMG® CompactPCI® Serial CPU card (system slot controller)
- ▶ Support for up to three PCIe® based peripheral boards, Gen3 x1 links
- ▶ 1 x PCIe® derived from EHL SoC, 2 x PCIe® via PI7C9X3G808GP switch
- ▶ Support for 1 x native SATA (6Gbps)
- ▶ Option 3 x SATA in addition with JMS562 controller (2 x SATA RAID 0/1)
- ▶ Support for 1 x USB2/3 (5Gbps) via uPD720201 controller
- ▶ Option 8 x Gigabit Ethernet Switch (S80-P6 low profile mezzanine module)
- ▶ Option 4 x Gigabit Ethernet NICs (S82-P6 low profile mezzanine module)
- ▶ Option 4 x 2.5Gigabit Ethernet NICs (S83-P6 low profile mezzanine module)

Feature Summary

Local Expansion

- ▶ Mezzanine side card connectors for optional local expansion
- ▶ HSE1 - High speed expansion connector, PCIe® Gen3 fully configurable, derived from EHL SoC
- ▶ HSE2 - High speed expansion connector, PCIe® Gen3 configured 4x1, via PCIe® packet switch
- ▶ EXP - Sideband expansion connector, e.g. eSPI, Audio, UART (from EHL SoC)

- ▶ 4HP Low profile mezzanine module options (to be ordered separately)
- ▶ S20-NVME Mezzanine module - 1 x M.2 2280 NVME SSD socket, 1 x Type-C USB F/P connector
- ▶ S40-NVME Mezzanine module - 1 x M.2 2280 NVME SSD socket, 1 x M.2 2280 SATA SSD socket, 2 x Type-C USB F/P Connector
- ▶ S42-MC Mezzanine module - 1 x M.2 2280 NVME SSD socket, 2 x Mini Card sockets
- ▶ S48-SSD Mezzanine Module - 2 x M.2 2280 NVME SSD sockets, 1 x USB Type-C
- ▶ S80-P6 Mezzanine module - 1 x M.2 2280 NVMe SSD socket, 8 x Gigabit Ethernet via P6 backplane connector
- ▶ S82-P6 Mezzanine module - M.2 NVMe SSD & 4 x GbE NIC via P6 backplane connector
- ▶ S83-P6 Mezzanine module - M.2 NVMe SSD & 4 x 2.5GbE NIC via P6 backplane connector
- ▶ Custom specific module design

- ▶ 8HP Mezzanine side card option (to be ordered separately)
- ▶ SCJ-VEENA Quad RJ45 2.5GbE NIC & M.2 SSD storage
- ▶ SCL-RHYTHM Quad M12-X GbE NIC & M.2 SSD storage
- ▶ SCZ-NVM Dual M.2 NVMe SSD, quad UART
- ▶ S02-M12 - RJ45 port 1 replacement by M12-X connector (top or bottom mount)
- ▶ Custom specific side card design

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
- ▶ MTBF 20.6 years (MIL-HDBK-217F, SN29500 @+40°C)
- ▶ EC Regulatory EN55035, EN55032, EN62368-1 (CE)

Feature Summary

RT OS Board Support Packages & Driver

- ▶ Please contact sales@ekf.de

Applications

- ▶ General low power industrial computing, for x86 based software
- ▶ Rugged systems (e.g. transportation, construction machines, harvester)
- ▶ Data concentrator, router, gateway, kiosk systems, IoT
- ▶ Stand-alone computer (fog computing), scalable via mezzanine I/O expansion options
- ▶ Small modular CompactPCI® Serial systems for expansion with up to four peripheral cards

all items are subject to changes w/o further notice



Related Information

SC8-FLUTE Home	www.ekf.com/s/sc8/sc8.html
CompactPCI® Serial Home	www.ekf.com/s/serial.html

Related Mezzanine Modules and Side Cards

S20-NVME M.2 NVMe SSD	www.ekf.com/s/s20/s20.html
S40-NVME Low Profile Mezzanine	www.ekf.com/s/s40/s40.html
S42-MC Low Profile Mezzanine	www.ekf.com/s/s42/s42.html
S48-SSD Low Profile Mezzanine	www.ekf.com/s/s48/s48.html
S80-P6 Low Profile Mezzanine	www.ekf.com/s/s80/s80.html
S82-P6 Low Profile Mezzanine	www.ekf.com/s/s82/s82.html
S83-P6 Low Profile Mezzanine	www.ekf.com/s/s83/s83.html
SCJ-VEENA Mezzanine Side Card	www.ekf.com/s/scj/scj.html
SCL-RHYTHM Mezzanine Side Card	www.ekf.com/s/scl/scl.html
SCZ-NVM Mezzanine Side Card	www.ekf.com/s/scz/scz.html

Ordering Information

For popular SC8-FLUTE SKUs please refer to www.ekf.com/liste/liste_21.html#SC8



SC8-FLUTE - Soldered RAM Top/Bottom





SC8-FLUTE - SODIMM on Top of Soldered RAM



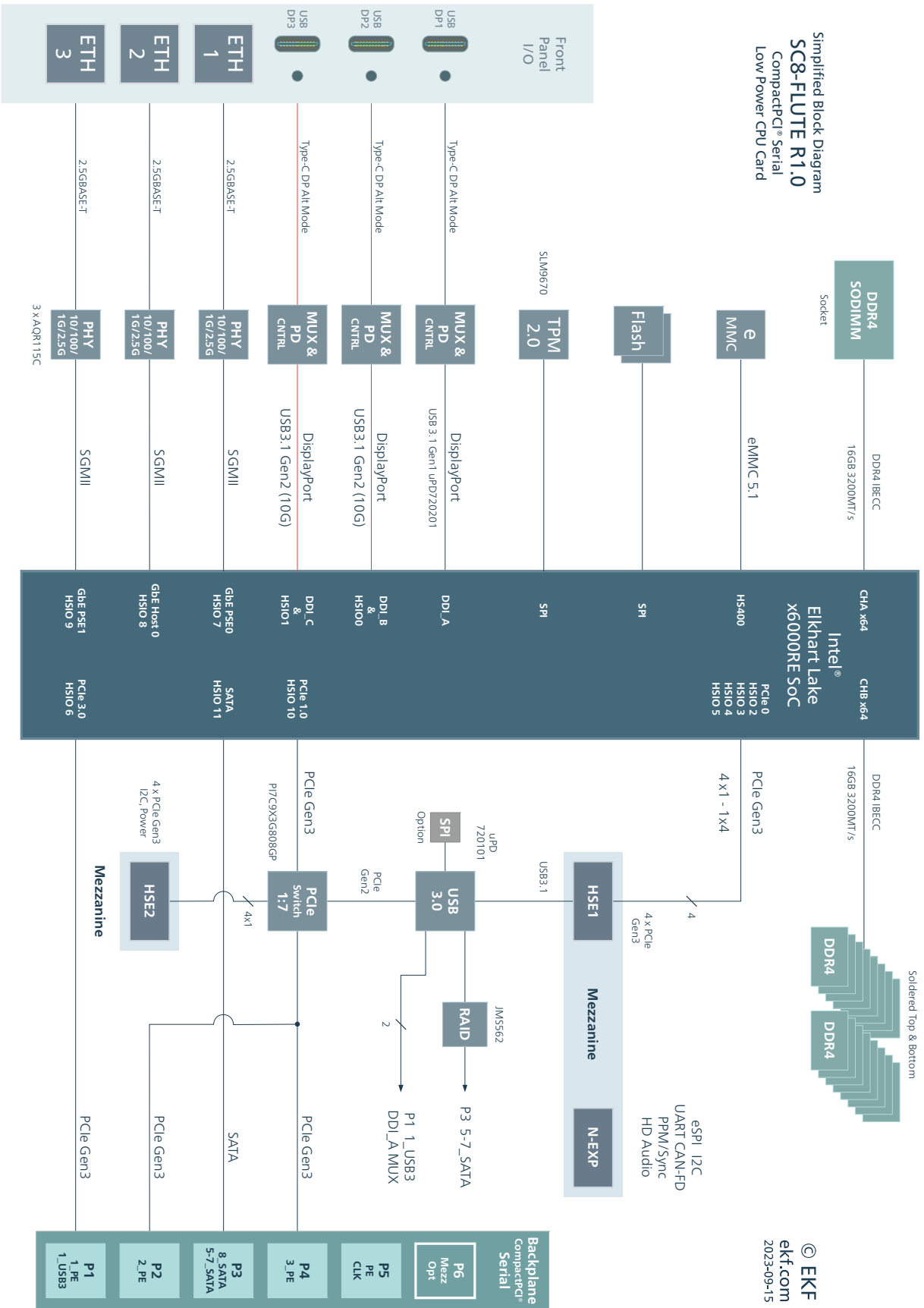
CompactPCI® Serial

While mechanically compliant to CompactPCI® Classic, CompactPCI® Serial defines a superior card slot, based on PCI Express®, SATA, GbE and USB data lines. A passive backplane is used for high speed signal distribution from the system slot to peripheral card slots.

Most CompactPCI® Serial peripheral cards require only the backplane connector P1, which comprises PCIe® and other signals, resulting in a concise and inexpensive peripheral board design. For optional Gigabit Ethernet backplane communication the connector P6 will be required.

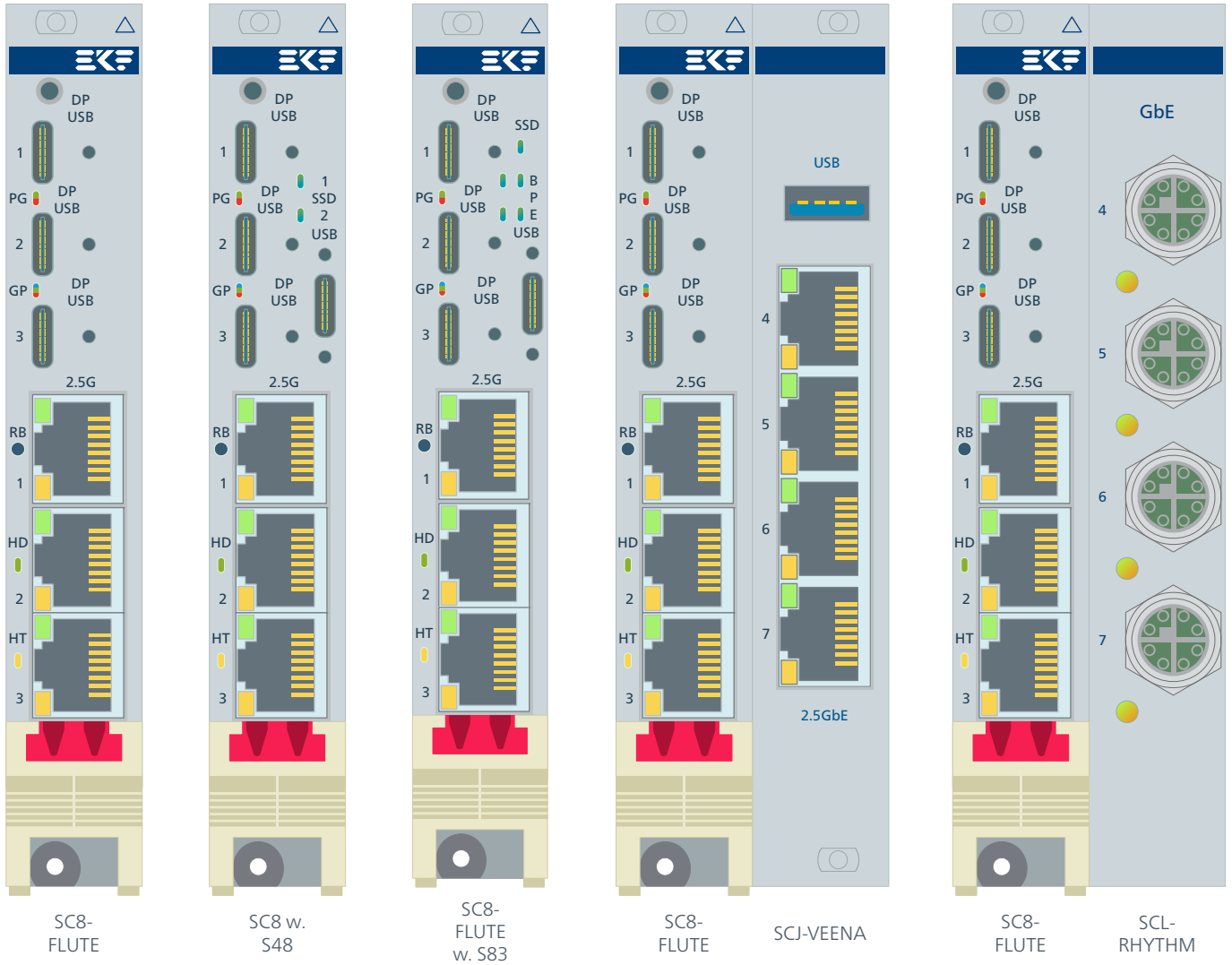


Block Diagram

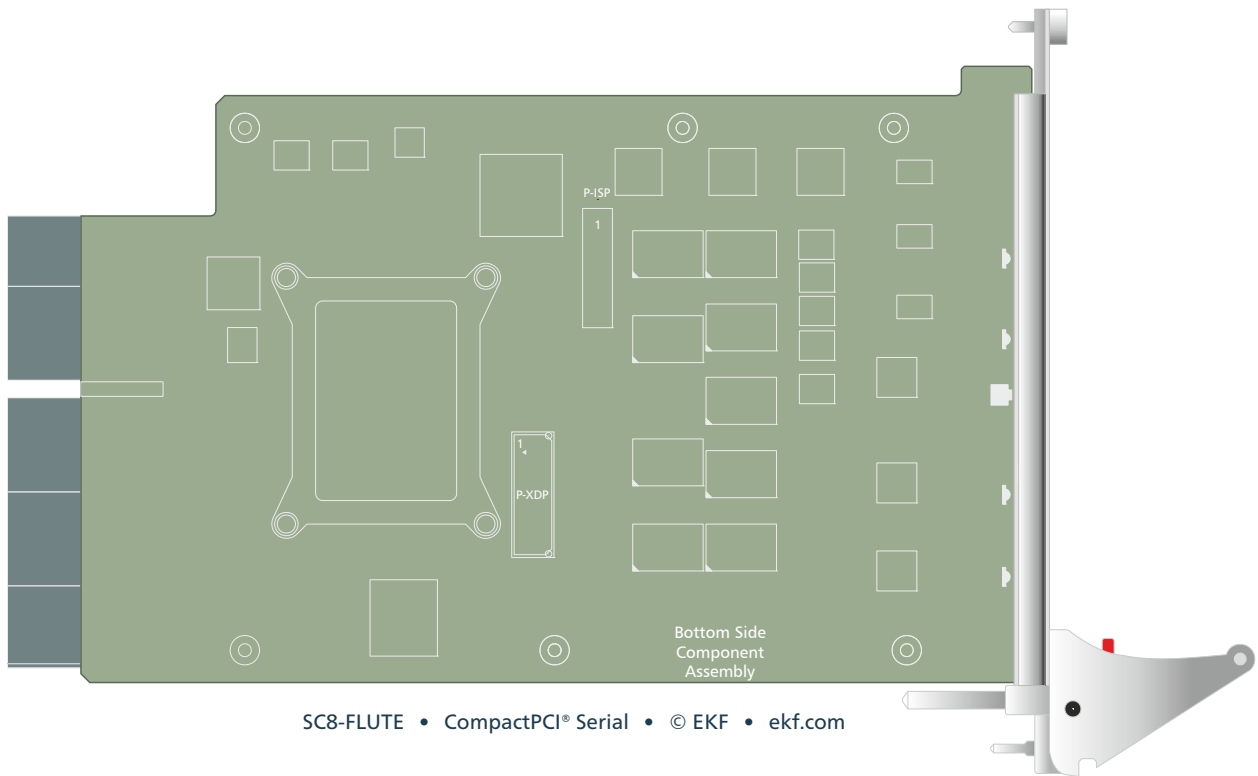
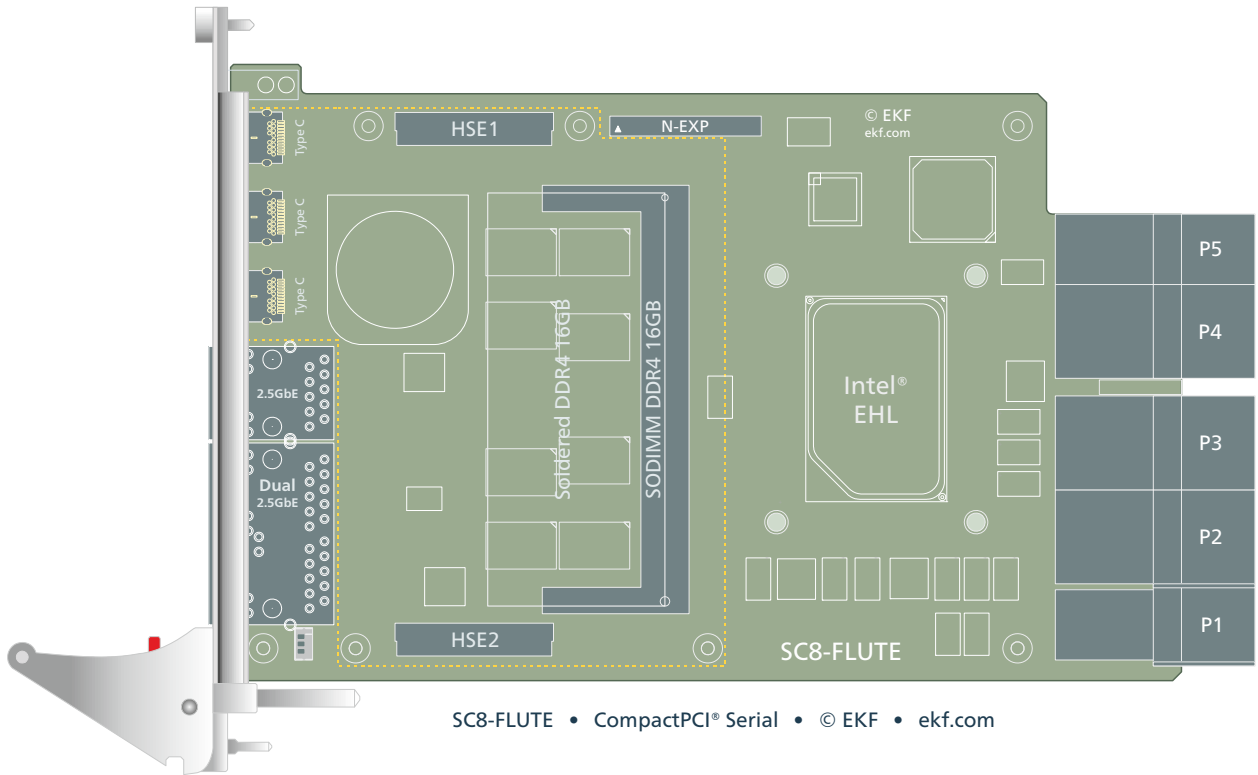


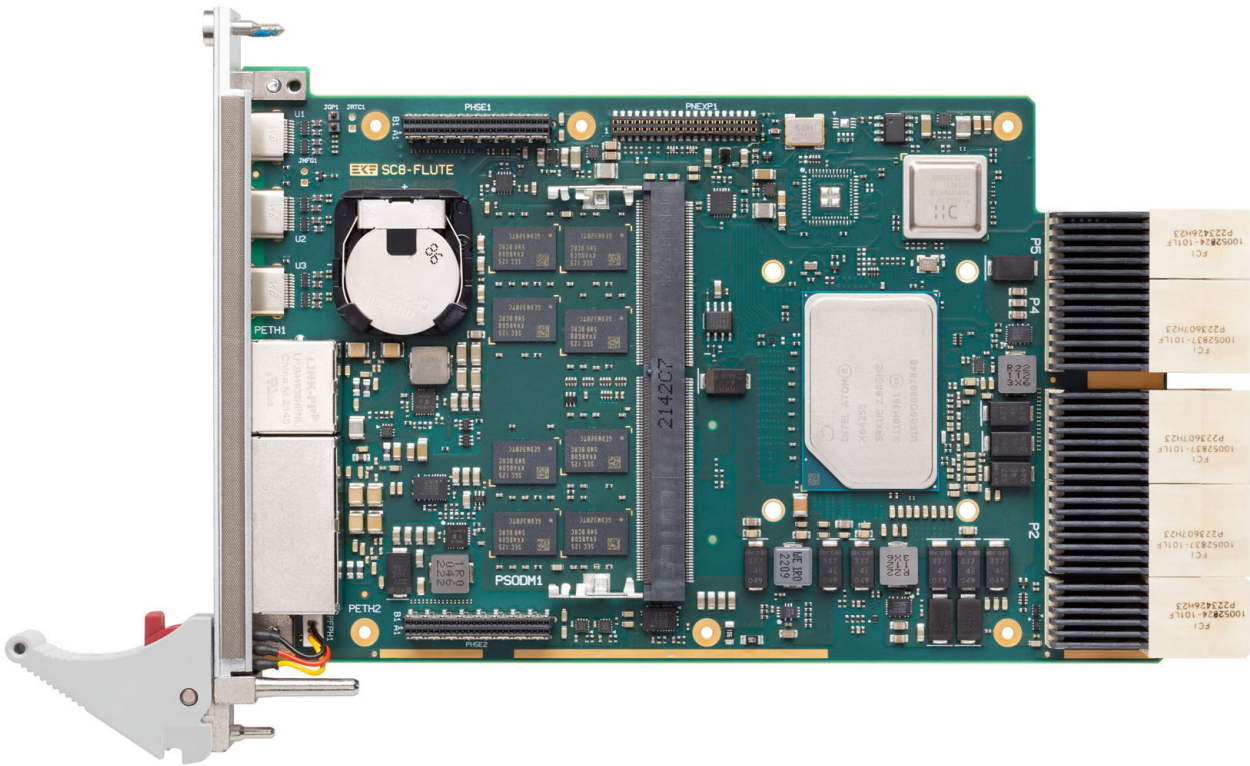
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Front Panel

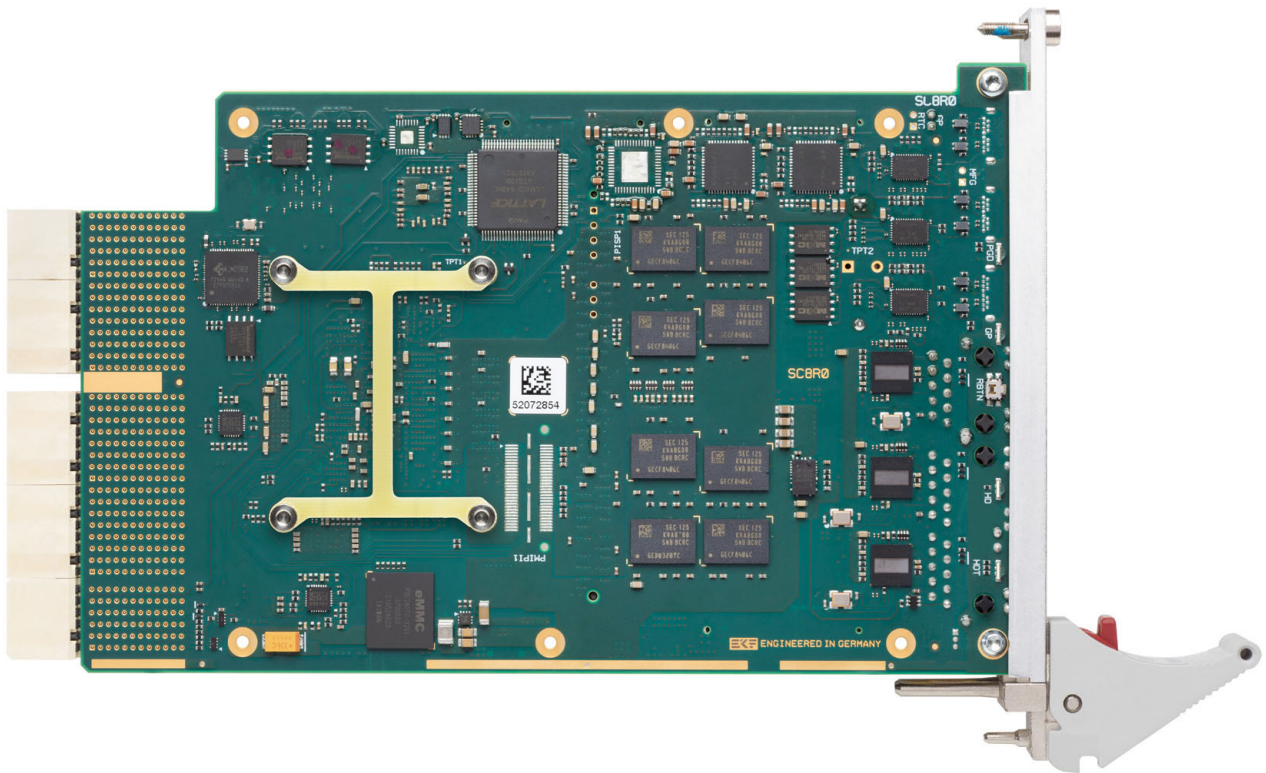


Component Placement

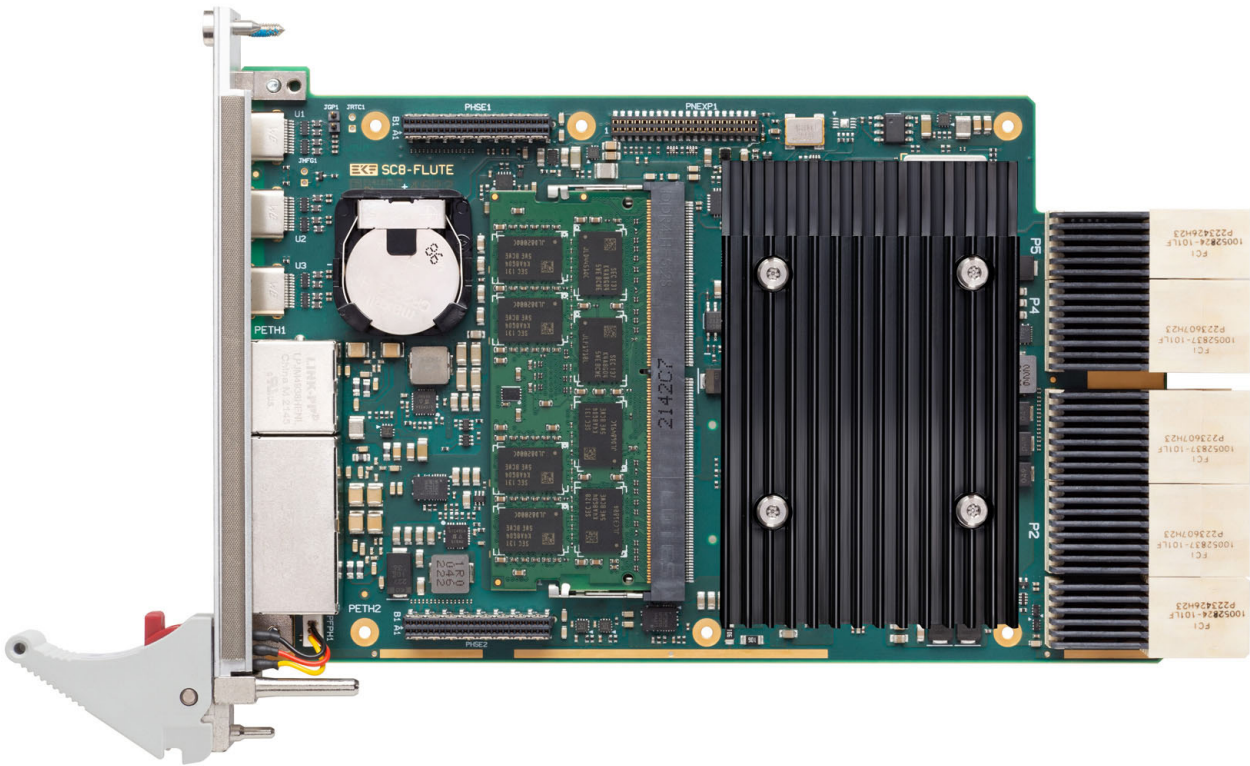




PCB Top View

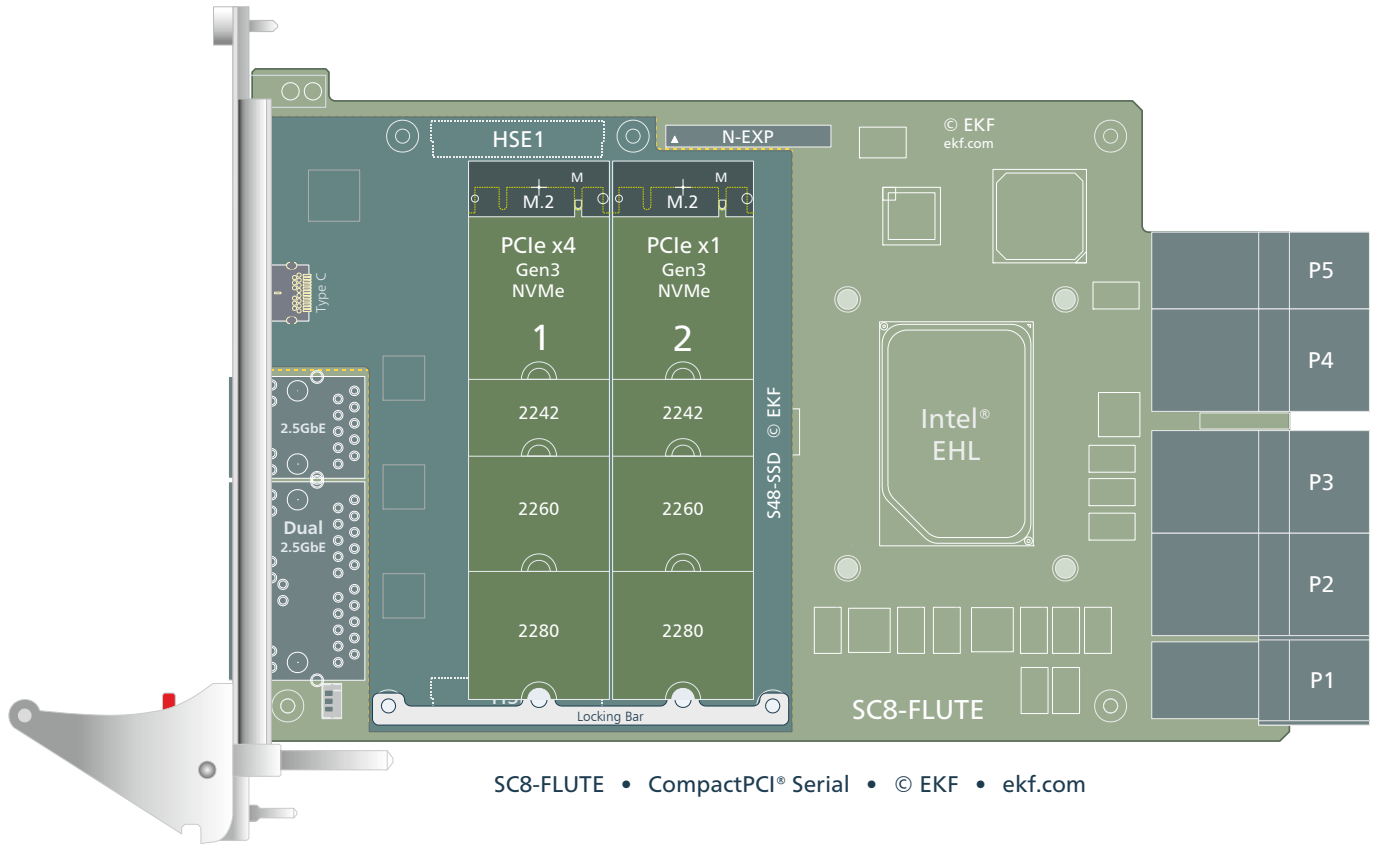


PCB Bottom View



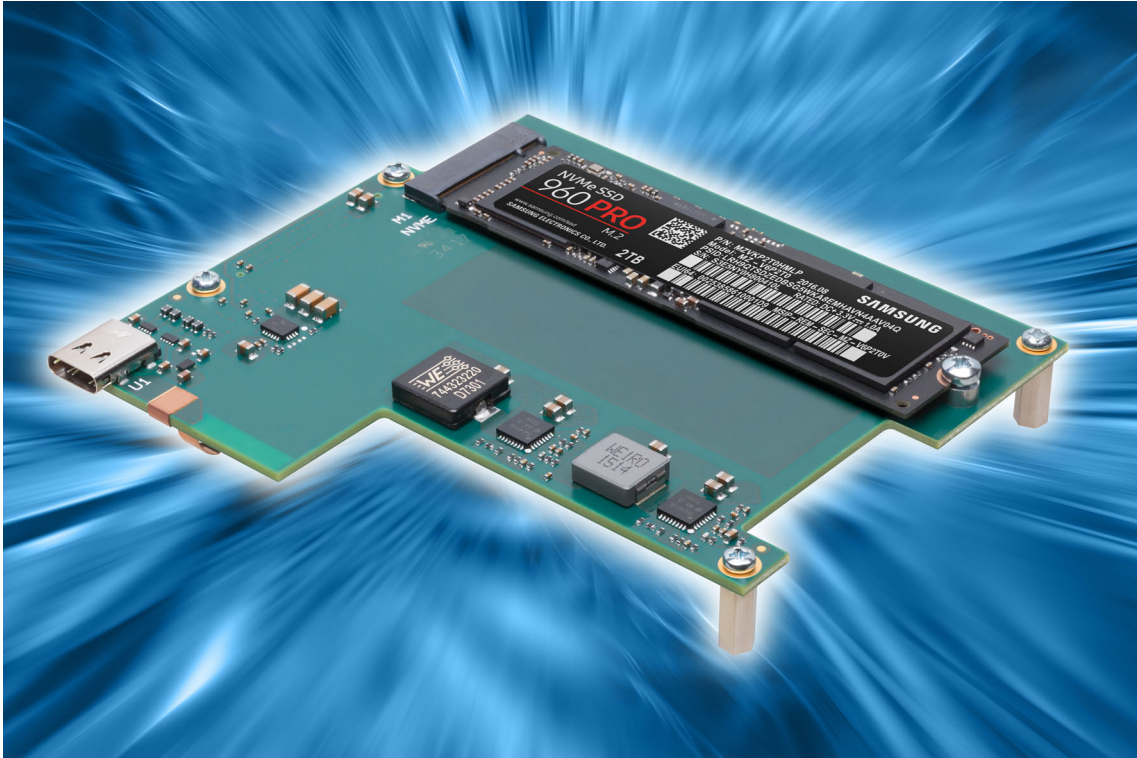
Top View - Heatsink & SODIMM Mounted

Sample Low Profile Mezzanine 4HP Assembly



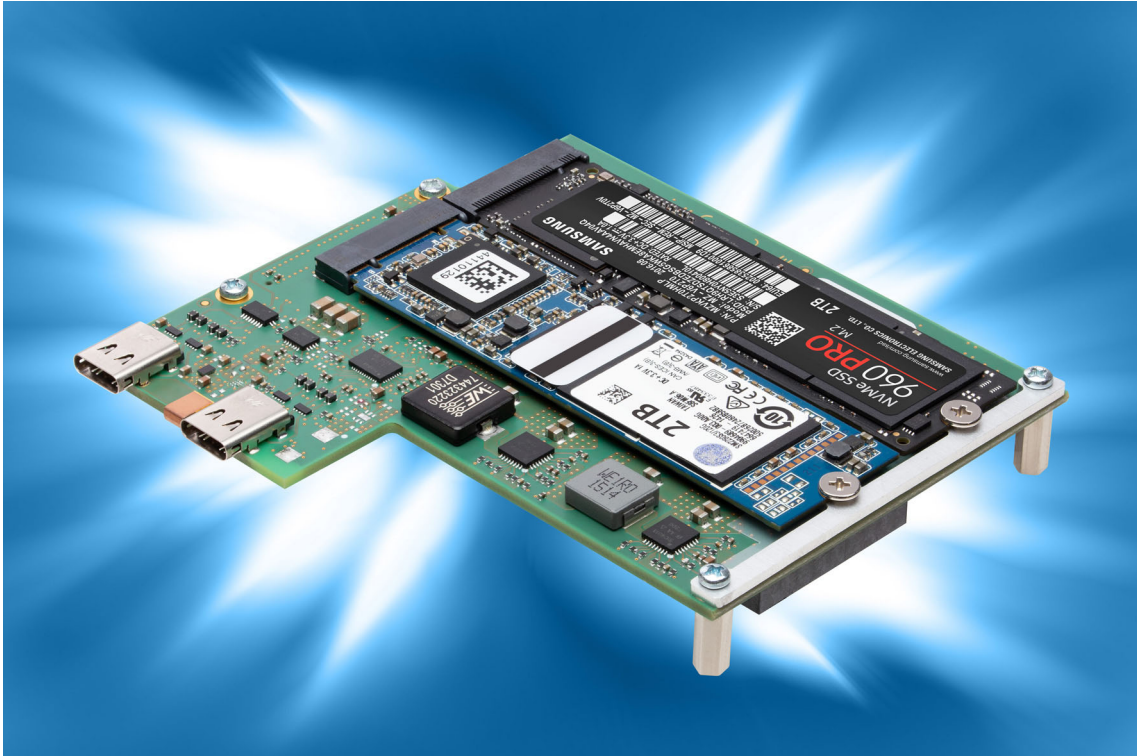
SC8-FLUTE • CompactPCI® Serial • © EKF • ekf.com

Sample Low Profile Mezzanine Mass Storage Solutions



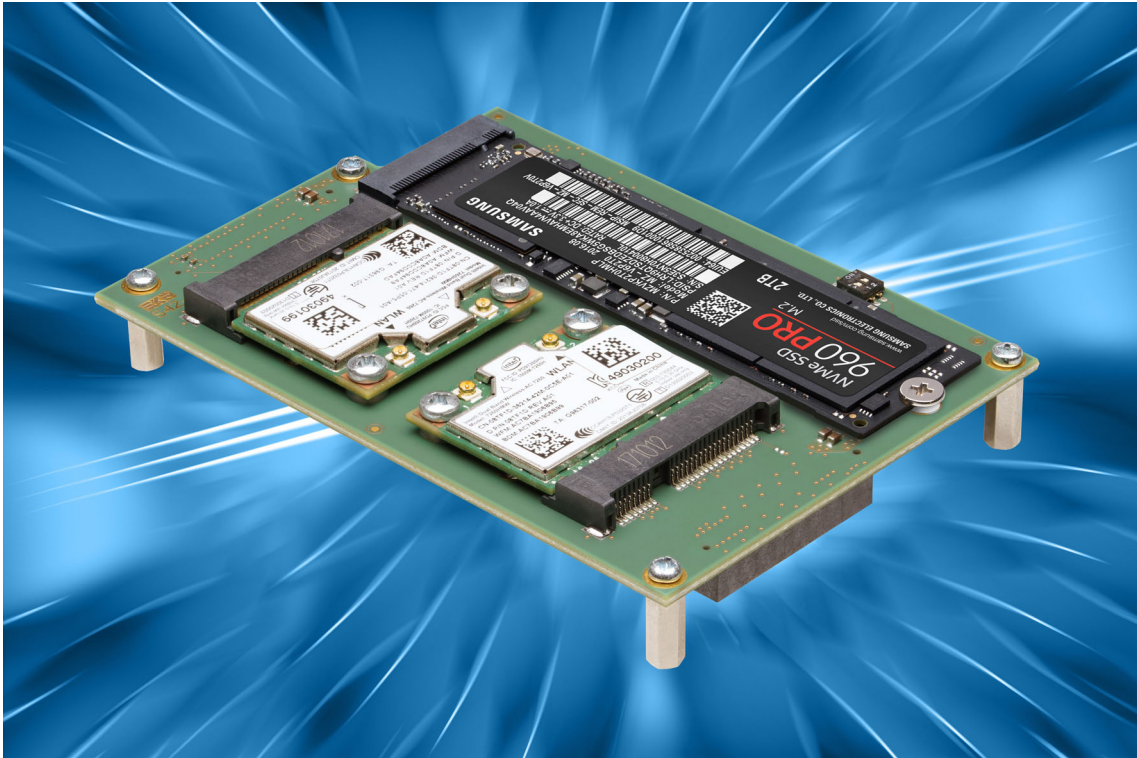
S20-NVME • Low Profile Mezzanine M.2 NVMe SSD





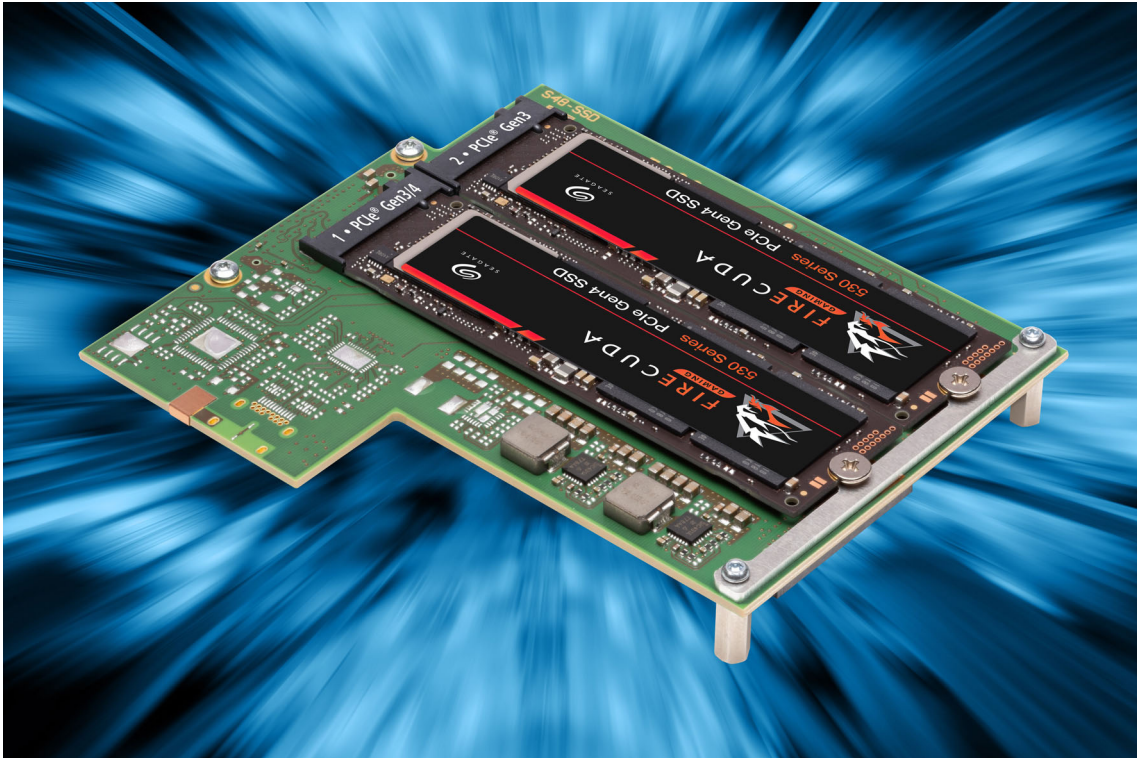
S40-NVME Low Profile Mezzanine Module





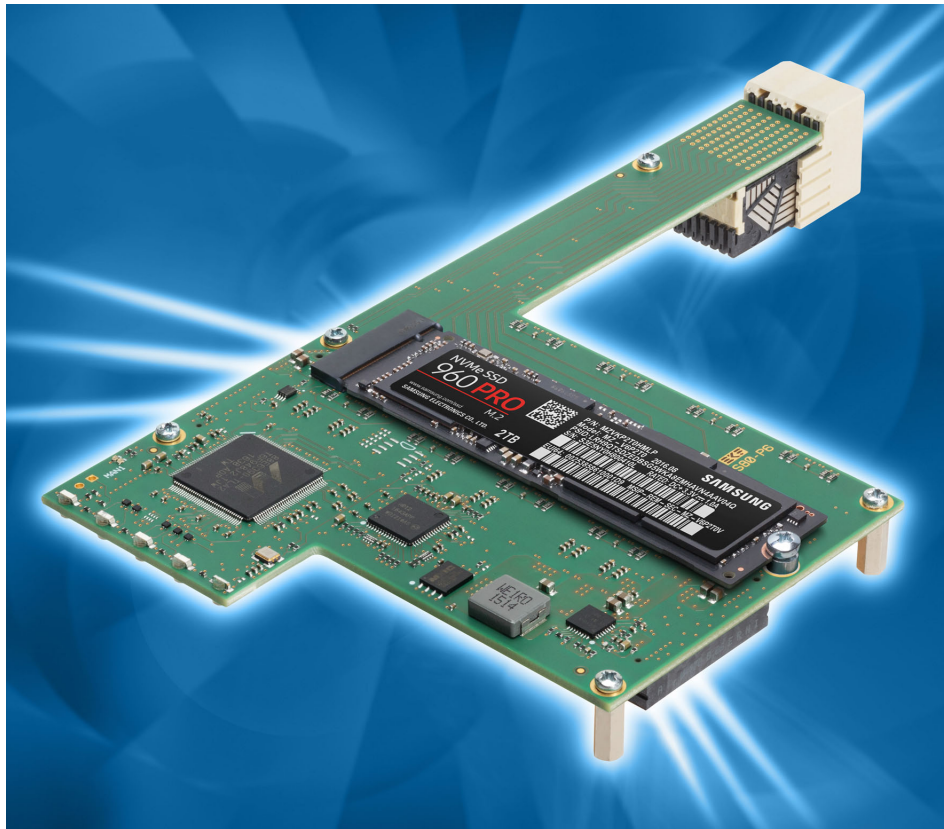
S42-MC Low Profile Mezzanine Module





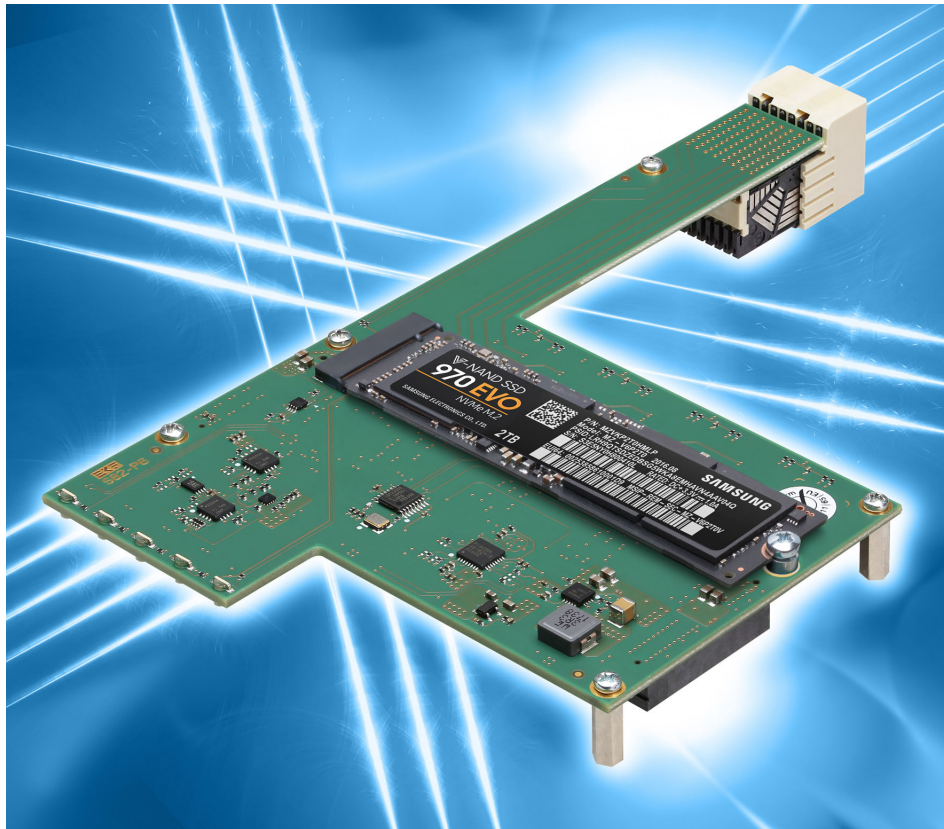
S48-SSD Low Profile Mezzanine Module





S80-P6 Low Profile Mezzanine Module





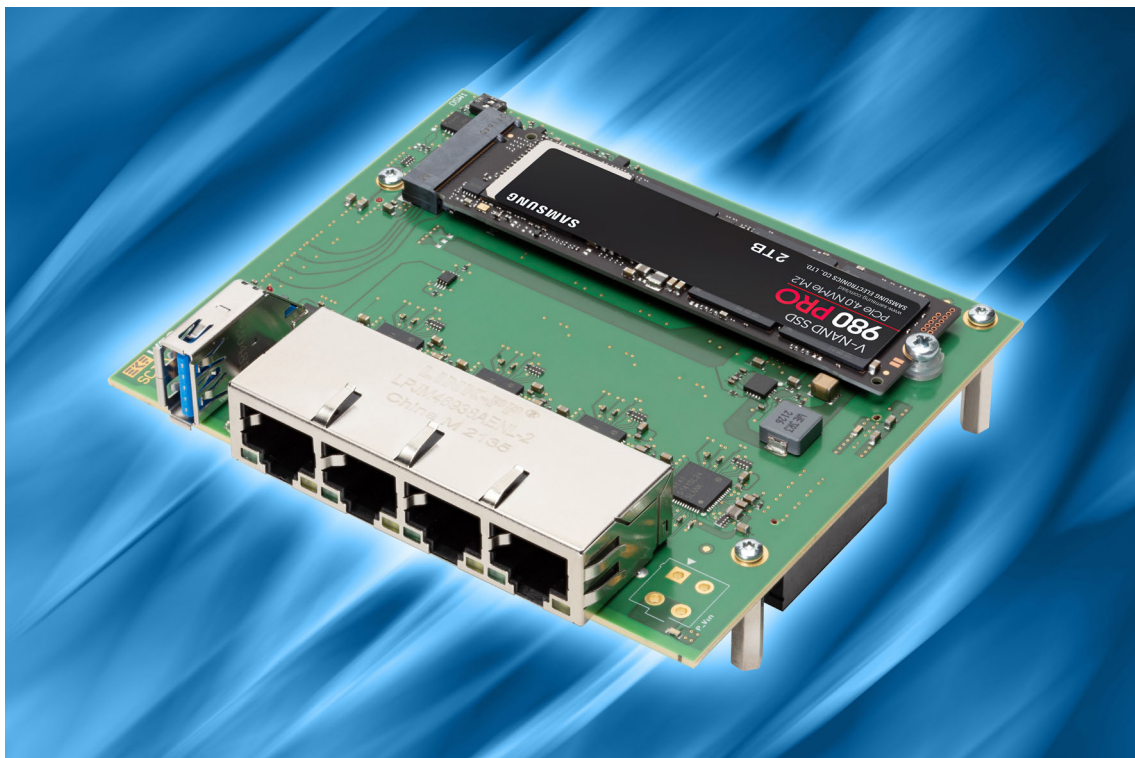
S82-P6 Low Profile Mezzanine Module



Sample 8HP/12HP Side Card Assemblies



SCJ-VEENA 8HP Assembly



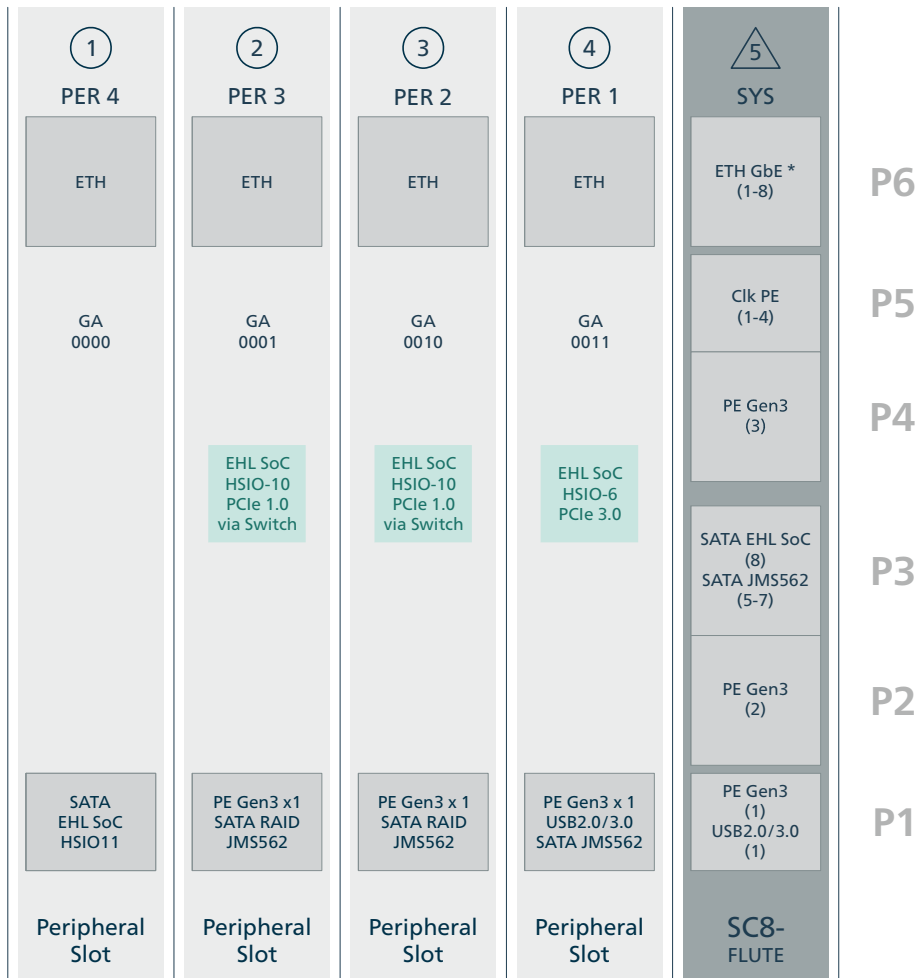


SCZ-NVM 8HP Assembly



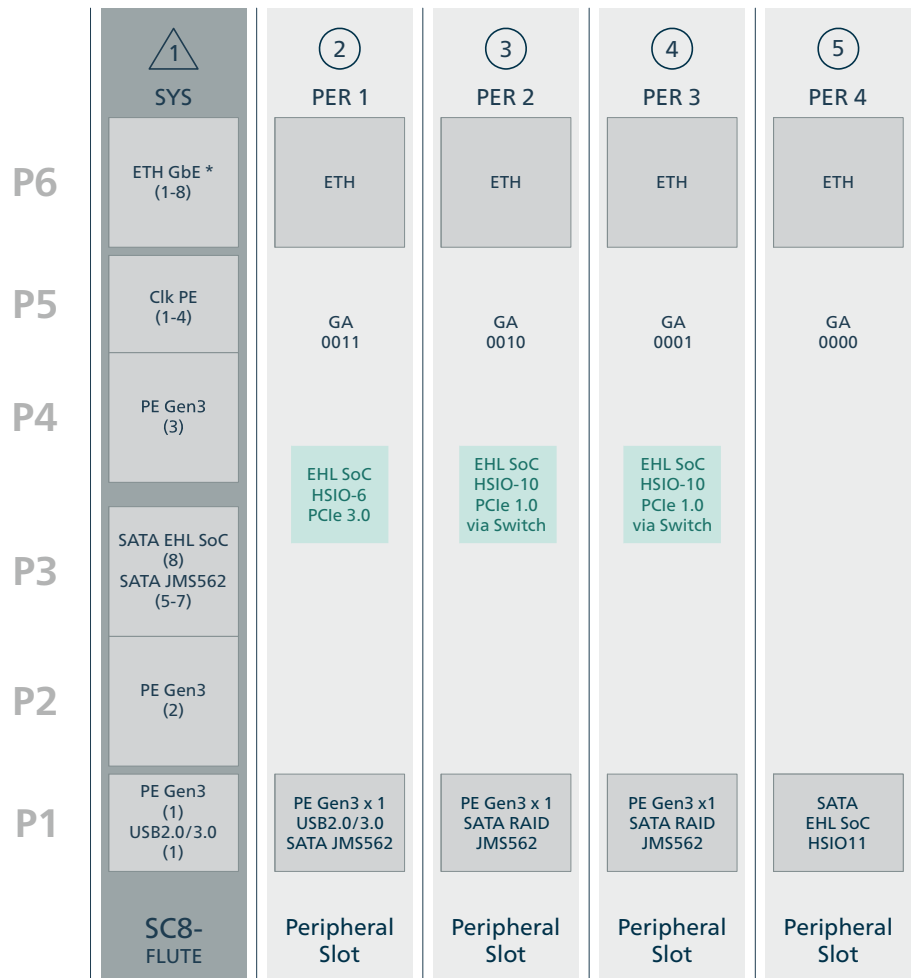
SCZ-NVM 8HP/12HP Assembly

Backplane Resources



1+4 Slots backplane resources (system slot right)

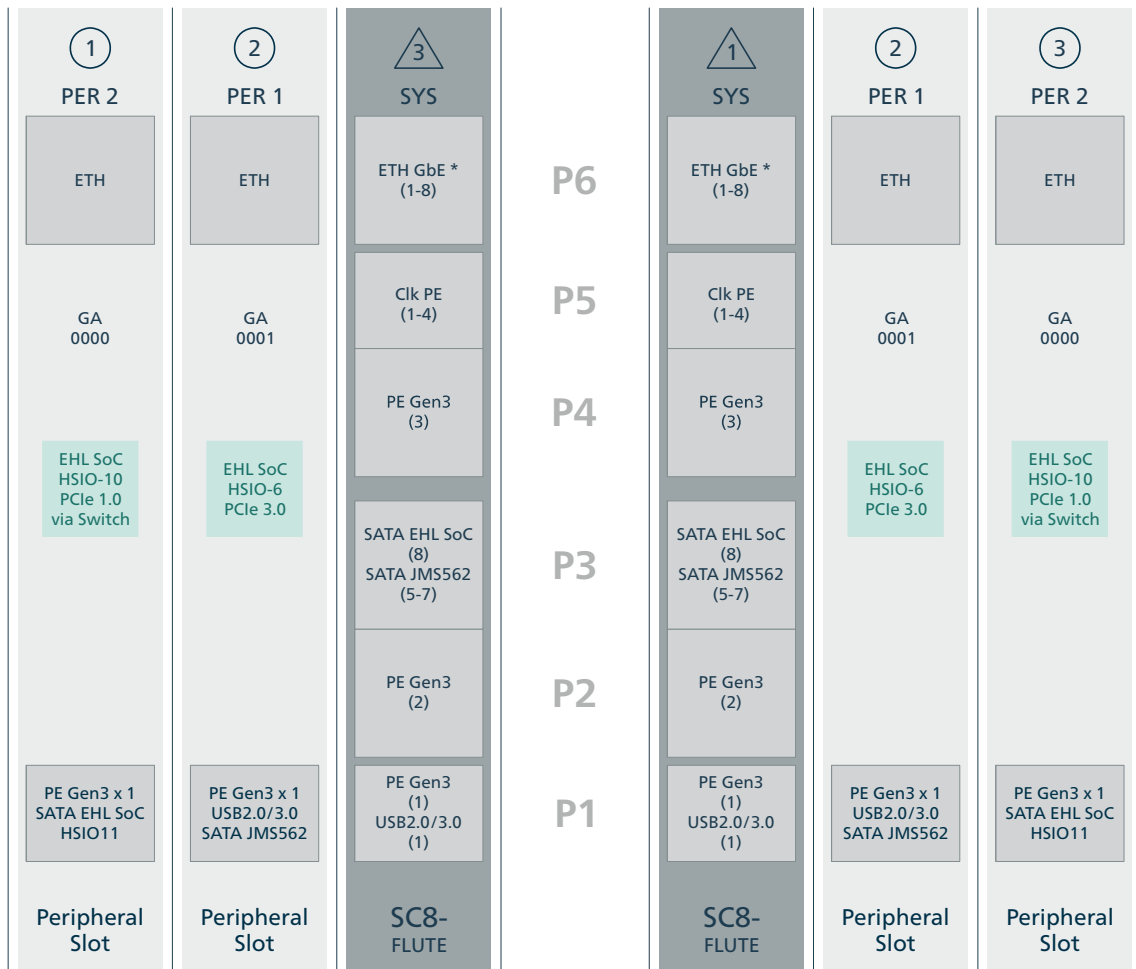
* Ethernet via P6 requires low profile mezzanine module S80 or S82



1+4 Slots backplane resources (system slot left)

* Ethernet via P6 requires low profile mezzanine module S80 or S82

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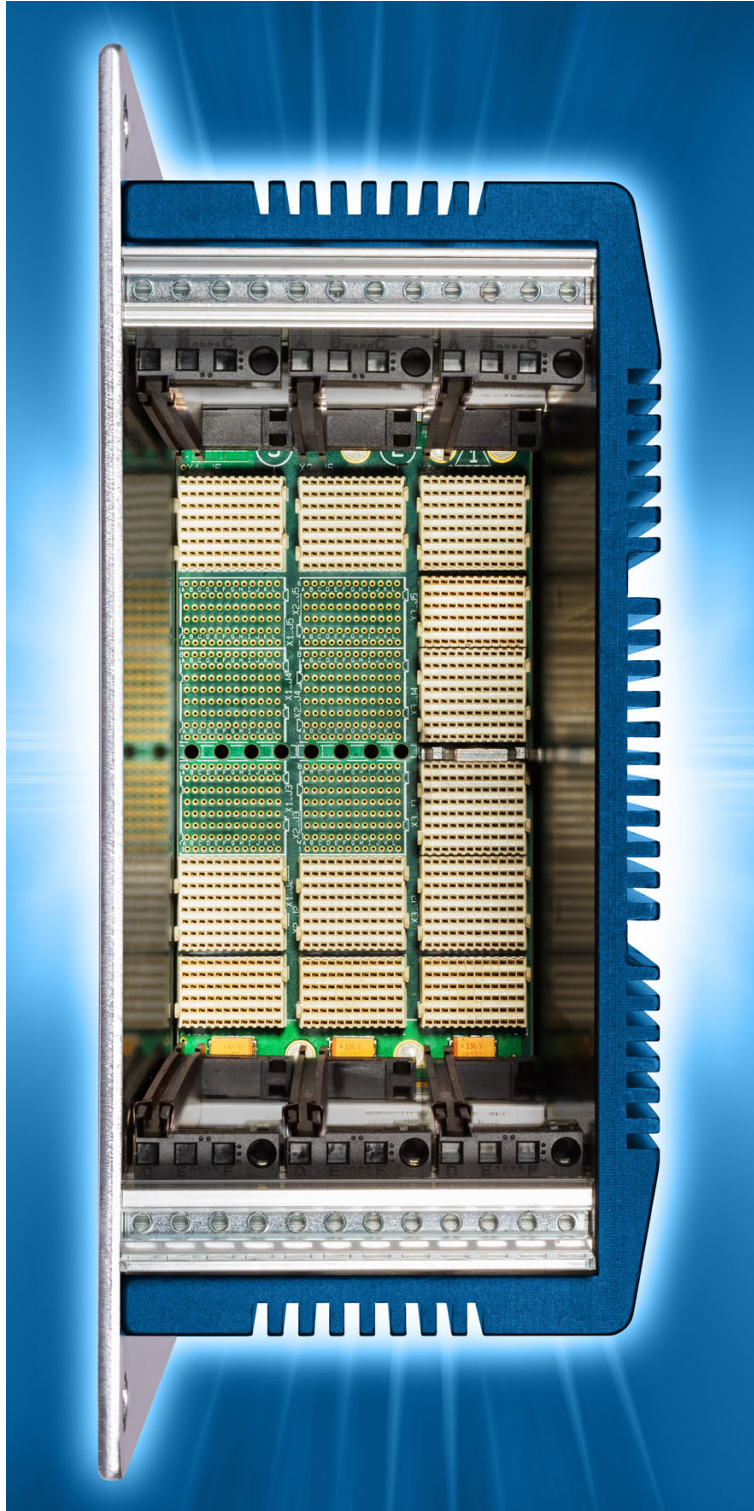


1+2 Slots backplane resources (system slot right)

1+2 Slots backplane resources (system slot left)

* Ethernet via P6 requires low profile mezzanine module S80 or S82

Recommended System Solutions



SRS-1201-BLUBRICK





SRS-3201-BLUBOXX



Industrial Computers Made in Germany
boards. systems. solutions.



Beyond All Limits:
EKF High Performance Embedded

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