4th Generation Intel® Core™ Processor Dual XMC/PMC Embedded Controller

VPX)
VPX REDI
OpenVPX)
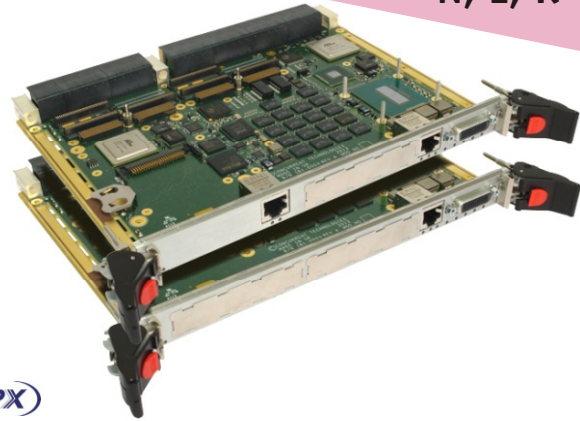
APPLICATIONS

The VR E1x/msd is a PC-compatible, high performance, high functionality 6U VPX air-cooled processor board supporting the 4th generation Intel® Core™ processor (2-core or 4-core) and the Intel® QM87 PCH with up to 32 Gbytes of DDR3L-1600 ECC DRAM. This single slot board features two XMC/PMC sites and a variety of interfaces including an option for an on-board 2.5-inch storage drive and CompactFlash®. The VR E1x/msd is suitable for a range of applications within industrial control, transport, aerospace, security and defense applications. For harsher environments extended temperature versions are supported. For rugged applications two VPX-REDI versions are catered for: VPX-REDI Type 1 and Type 2 conduction-cooled boards. For all board versions, to simplify integration, many operating systems are supported.

HIGHLIGHTS

- 6U VPX (VITA 46.0) single board computer:
  - air-cooled
  - use in commercial (non-rugged) applications
  - 6U VPX 0.8-inch slot or 1.0-inch slot
  - optional rear transition module available
- Compatible with several OpenVPX™ profiles
- 4th generation Intel® Core™ processor:
  - option for 2-core or 4-core processor
  - includes Intel® Advanced Vector Extensions 2 (AVX2)
  - includes Intel® AES New Instructions (AES-NI)
- 16 or 32 Gbytes soldered DDR3L-1600 DRAM with ECC
- Rear plug compatible with the popular VR 737/x8x SBC
- Configurable PCI Express® (PCIe) data plane fabric interface (VITA 46.4) supports:
  - four x8 or eight x4 PCI Express ports with DMA
  - support for Gen1, Gen2 and Gen3
  - supports up to four non-transparent links
- Control plane interface (VITA 46.6) supports:
  - 2 x Gigabit Ethernet and 2 x 1000Base-BX interfaces
- Up to 2 x Gigabit Ethernet ports via front panel:
  - alternatively one port via front and one via rear
- Up to 4 x SATA600 interfaces including optional on-board SATA600 2.5-inch HDD/SDD site

- Onboard CompactFlash® socket
- Up to 2 x XMC/PMC module interfaces:
  - 32/64-bit, 33/66/100 MHz PCI/PCI-X™
  - 2 x XMC module interfaces (x8 PCI Express®)
  - front and rear I/O options
- 8 x GPIO, 8 x GPI, 6 x serial interfaces
- Up to 5 x USB 2.0 and 3 x USB 3.0/2.0 ports
- 3 x independent digital and analog graphics interfaces
- High definition stereo audio
- Optional support for:
  - compatible I/O with legacy VR 737/x8x VPX SBC
  - single or dual XMC/PMC sites
  - Built-In Test (BIT) firmware and software
  - board-level security package
  - Trusted Platform Module (TPM)
- Optional Rear Transition Modules
- Extended temperature versions (E-Series, K-Series)
- Ruggedized conduction-cooled versions (RCx-Series):
  - rear plug compatible with the air-cooled versions
- Watchdog and long duration timers
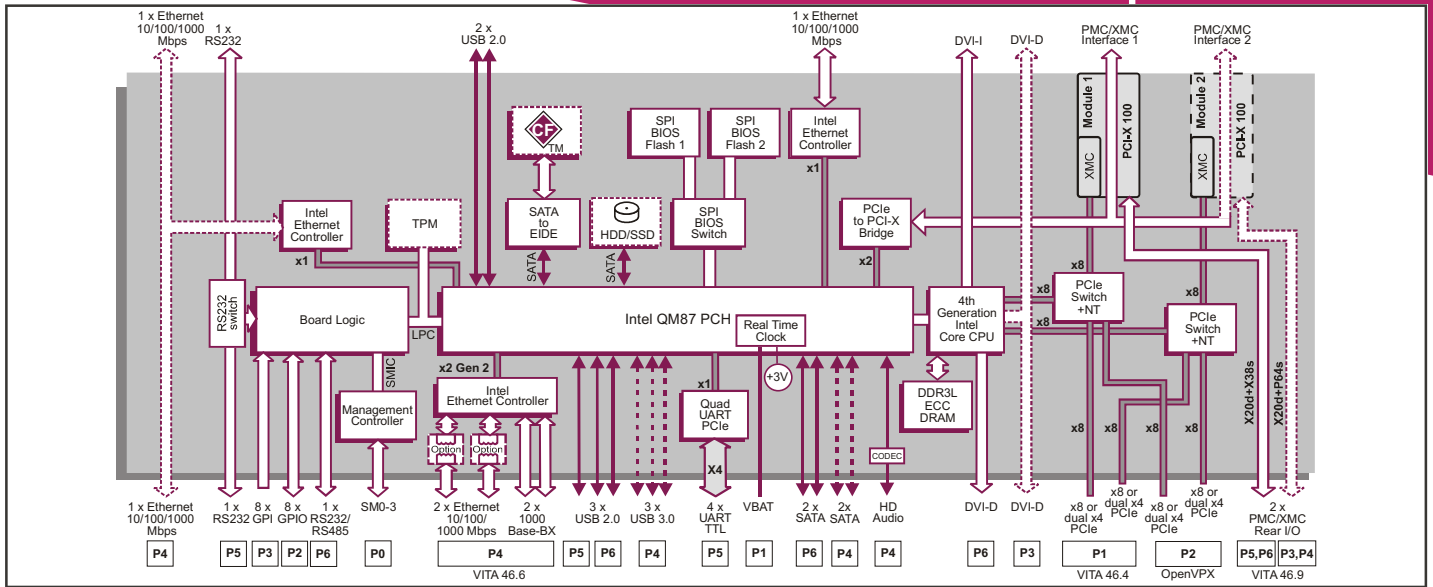- Support for Linux®, Windows® and VxWorks®

Diagram labels (top block diagram):

1 x Ethernet 10/100/1000 Mbps · 1 x RS232 · 2 x USB 2.0 · 1 x Ethernet 10/100/1000 Mbps · DVI-I · DVI-D · PMC/XMC Interface 1 · PMC/XMC Interface 2

Intel Ethernet Controller x1 · TPM · CF™ · SATA to EIDE · HDD/SSD · SPI BIOS Flash 1 · SPI BIOS Flash 2 · Intel Ethernet Controller x1 · SPI BIOS Switch · PCIe to PCI-X Bridge · Module 1 XMC · PCI-X 100 · Module 2 XMC · PCI-X 100

RS232 switch · Board Logic · LPC · Intel QM87 PCH · Real Time Clock · 4th Generation Intel Core CPU · SATA · SATA · +3V · x2 · PCIe Switch +NT x8 · PCIe Switch +NT x8

SMIC · Management Controller · x2 Gen 2 · Intel Ethernet Controller · Option · Option · Quad UART PCIe x1 · CODEC · X4 · DDR3L ECC DRAM · X20d+X38s · X20d+P64s · x8

1 x Ethernet 10/100/1000 Mbps [P4] · 1 x RS232 GPI [P5] · 8 x GPIO [P3] · 8 x GPIO [P2] · 1 x RS232/RS485 [P6] · SM0-3 [P0] · 2 x Ethernet 10/100/1000 Mbps [P4] · 2 x 1000 Base-BX [P4] · 3 x USB 2.0 [P5] · 3 x USB 3.0 [P6] · 4 x UART TTL [P5] · VBAT [P1] · 2x SATA [P6] · 2x SATA [P4] · HD Audio [P4] · DVI-D [P6] · DVI-D [P3] · x8 or dual x4 PCIe [P1] · x8 or dual x4 PCIe · x8 or dual x4 PCIe [P2] · x8 or dual x4 PCIe · 2 x PMC/XMC Rear I/O [P5,P6][P3,P4]

VITA 46.6 · VITA 46.4 · OpenVPX · VITA 46.9

VPX Single Board Computer

- 6U VPX air-cooled SBC utilizing the 4th generation Intel® Core™ processor
- three front/rear I/O factory build options:
  → option 1 - legacy VR 737/x8x compatible I/O
  → option 2 - dual XMC/PMC sites plus extra I/O
  → option 3 - single XMC/PMC site plus extra I/O
- compatible with several OpenVPX module profiles
- ruggedized conduction-cooled (VITA 48.2) VPX-REDI (RCx-Series) versions:
  → see VR E1x/msd-RCx datasheet

Central Processor

- 4th generation Intel® Core™ processor:
  → 2-core 2.7 GHz (37W) Intel® Core™ i5-4400E
  → 4-core 1.7 GHz (35W) Intel® Core™ i7-4700EQ
  → 4-core 2.4 GHz (47W) Intel® Core™ i7-4700EQ
  → Intel® Advanced Vector Extensions 2 (AVX2)
  → Intel® AES New Instructions (AES-NI)
- utilizes the Intel® QM87 Platform Controller Hub
- 16 or 32 Gbytes soldered DDR3L-1600 ECC DRAM:
  → single bit error correction, dual channel memory
  → accessible from processor or VPX fabric
  → 2-core supports 16 Gbytes only
  → 4-core supports 16 or 32 Gbytes

XMC/PMC Interfaces (build options)

- both XMC/PMC sites commonly support:
  → front panel I/O aperture
  → PMC - 32/64-bit, shared 33/66/100MHz PCI/PCI-X bus (3.3V PCI signaling, 5V tolerant)
  → PMC VIO from 3.3V or 5V (user selectable switch)
  → XMC - x8 PCI Express® Gen2 link per site
  → XMC VPWR from 5V or 12V (factory build option)
- build option 1 - dual sites, VR 737/x8x compatible:
  → site 1 XMC P16, 20 differential-pairs plus 38 single-ended, P6w1-X20d+P5w3-X38s
  → site 2 XMC P26 + PMC P24, 20 differential-pairs plus 64 single-ended, P4w1-X20d+P3w1-P64s
- build option 2 - dual sites, site 1 has rear I/O:
  → XMC P16, 20 differential-pairs plus 38 single-ended, P5w3-X38s+P6w1-X20d
- build option 3 - single site, site 1 has rear I/O:
  → XMC P16, 20 differential-pairs plus 38 single-ended, P5w3-X38s+P6w1-X20d

Graphics Interfaces

- build options 1, 2 and 3 - a DVI-I interface via a front panel 60-way High Density (HD) connector:
  → DVI-D up to 1600 x 1200 @ 16M colors
  → DVI-A up to 1920 x 1200 @ 16M colors
- build option 1 - additional DVI-D interface via a front panel 60-way HD connector
- build options 2 and 3 - additional DVI-D via P6
- additional DVI-D, up to 1600 x 1200 @ 16M colors

Mass Storage Interfaces

- for all build options (unless otherwise stated)
- support for on-board CompactFlash® socket
- optional on-board 2.5-inch SATA600 drive
- 2 x SATA600 interfaces via P6
- build options 2 and 3 - additionally includes 2 x SATA600 interfaces via P4

Serial Interfaces

- for all build options
- 1 x RS232 channel via a front panel 60-way HD connector, can be switched by user via P5
- 1 x RS232/422/485 channel via P6:
  → supporting full modem in RS232 only
  → supporting Transmit Control in RS485 mode
- 4 x UART serial TTL interfaces via P5
- 16550 compatible UARTs

Other Peripheral Devices

- for all build options (unless otherwise stated)
- PC Real Time Clock
- long duration and watchdog timer
- CPU board temperature and voltage sensors accessed via System Management interface
- 8 x GPIO signals via P2, 8 x GPI signals via P3
- stereo audio including onboard codec via P4
- 3 x USB 2.0 ports, two via P6 and one via P5
- 2 x USB 2.0 ports via 60-way HD connector
- build options 2 and 3 - additionally includes 3 x USB 3.0/2.0 interfaces via P4

VPX Data Plane PCI Express Interface

- configurable PCI Express® (PCIe) fabric:
  → four x8 or eight x4 PCIe (Gen1, Gen2, and Gen3)
  → compatible with OpenVPX™ module profiles
- supports up to four non-transparent links with DMA for multi-processing applications
- PCIe ports can be configured by the VPX switch configuration tool
- supported by Fabric Interconnect Networking software (FIN-S), see SW FNS/nnn datasheet

VPX Control Plane Ethernet Interfaces

- 2 x 10/100/1000 Mbps Ethernet interfaces and 2 x 1000Base-BX interfaces via P4 (VITA 46.6):
  → with or without magnetics (factory build option)

Additional Ethernet Port (build option)

- build option 2 - additional 1 x 10/100/1000 Mbps Ethernet port via P4
- build option 3 - additional 1 x 10/100/1000 Mbps Ethernet port via a front panel RJ45 connector

Non-Volatile Memory

- dual 8 Mbytes of BIOS SPI Flash EPROM
- 8 Kbytes User EEPROM

Software Support

- support for Linux®, Windows® and VxWorks®

Firmware Support

- Insyde Software InsydeH20™ BIOS
- optional Fastboot solution using Intel Firmware Support Package (Intel® FSP)
- Intel® Platform Innovation Framework for EFI
- LAN boot firmware included

Optional Built-In Test (BIT) Support

- Power-on BIT (PBIT), Initiated BIT (IBIT), Continuous BIT (CBIT)

Optional Board Security Packages

- Trusted Platform Module (TPM)
- proprietary board-level security features

Safety

- PCB (PWB) manufactured with flammability rating of 94V-0

System Management

- System Management interface:
  → implements SM0-1 and SM2-3 hardware
- on-board System Management Controller

Electrical Specification

- typical current figures (2.4 GHz, 8 Gbytes):
  → VS3, +5V@ 10A, voltage +5% / -2.5%
  → AUX, +3.3V@ < 300mA, voltage +5% / -2%

Environmental Specification

- operating temperatures:
  → 0°C to +55°C (N-Series: up to 2.4 GHz)
  → -25°C to +70°C (E-Series: 2.7 GHz only)
  → -40°C to +70°C (K-Series: 2.7 GHz only)
  → air-cooled
- storage temperature:
  → VITA 47 Class C1, -40°C to +85°C
- operating altitude: 0 to 15,000 feet (0 to 4,572 meters)
- 5% to 95% Relative Humidity, non condensing:
  → K-Series includes humidity sealant

Mechanical Specification

- 6U VPX form-factor (VITA 46.0) 9.2 inches x 6.3 inches (233mm x 160mm)
- optional slot widths:
  → 0.8-inch (VITA 46.0)
  → 1.0-inch (VITA 48.0 as per VITA 65)
- connectors to VITA 46.0, P0 through to P6
- operating mechanical:
  → shock - VITA 47 Class OS1, 20g
  → vibration - 0.002g²/Hz

ORDERING INFORMATION

Order Number   Product Description (Hardware)

VR E1x/msd-yz   4th generation Intel Core processor, N, E and K-Series
where m = front panel width style, where s = processor speed

For the order number suffix (d-yz) options please contact your local sales office:
where d = DRAM size   where yz = I/O Configuration
d = up to 32 Gbytes DRAM   yz = rear I/O configuration

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Specification subject to change; E and OE.