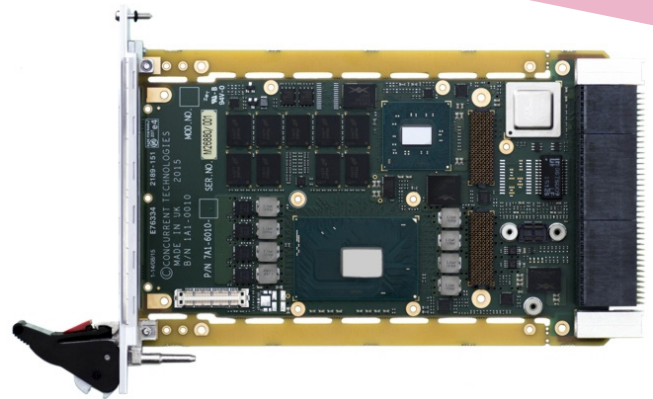


## Intel® Xeon® Processor E3-1500 v5 Family Single Board Computer



### APPLICATIONS

TR E5x/msd is a 3U VPX™ single board computer based on the Intel® Xeon® processor E3-1500 v5 family, providing enhanced processing performance within the same Size, Weight and Power (SWaP) envelope compared to the successful TR B1x/msd board. A range of standard I/O interfaces are provided with an XMC expansion slot to add application specific I/O and an optional front panel module with DisplayPort,

Ethernet, USB and serial connections. TR E5x/msd supports a wide range of backplane profiles based on a PCI Express® (PCIe®) data plane fabric and optional PCIe expansion plane for flexible multi-board configurations. It is compliant with the recently ratified VITA 46.11 system management specification and is particularly suited for command, control, communicate and compute applications.

### HIGHLIGHTS

- 3U VPX (VITA 46.0) single board computer:
  - 3U VPX 1.0-inch air-cooled slot
  - use in commercial (non-rugged) applications
  - optional rear transition module available
- I/O interfaces compatible with several OpenVPX™ profiles
- Intel® Xeon® processor E3-1500 v5 family
- Up to 16 Gbytes soldered DDR4 DRAM with ECC
- Configurable Control Plane interface (VITA 46.6):
  - 2 x SerDes (1000BASE-BX) ports or
  - 2 x Gigabit Ethernet ports
- Configurable PCI Express® (PCIe®) Data Plane fabric interface (VITA 46.4):
  - 2 x4 or 4 x2 or 1 x8 or 1 x4 PCIe ports
  - support for Gen 1, Gen 2 and Gen 3
- Configurable PCI Express Expansion Plane fabric interface (VITA 65) as a build option:
  - 2 x4 or 4 x2 or 1 x4 PCIe ports
  - support for Gen 1, Gen 2 and Gen 3
- PCIe switch supports two non-transparent ports
- Compatible with the FR 331/x06 VPX PCIe Switch
- Up to 3 x SATA600 rear ports for external mass storage plus an optional onboard Flash Drive Module
- Up to 2 x serial ports and up to 4 x USB ports via rear
- DisplayPort with audio interface via rear
- Optional front panel module provides I/O interfaces:
  - 1 x USB 3.0, 3 x RS232, 1 x Gigabit Ethernet,
  - 1 x DisplayPort
- Optional XMC module interface (with front and rear I/O):
  - XMC module interface (1 x8 or 2 x4 PCI Express Gen 2)
- IPMI (Intelligent Platform Management Interface)
- Optional support for:
  - Built-In Test (BIT) firmware and software
  - board-level security package
  - Trusted Platform Module (TPM)
  - software tools to configure the PCIe fabric interfaces
- Commercial versions (N-Series, E-Series):
  - N: 0°C to +55°C
  - E: -25°C to +70°C
- Rugged conduction-cooled VPX-REDI versions (RCx-Series)
- Support for Linux®, Windows® and VxWorks®



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## VPX Single Board Computer

- air-cooled 3U VPX SBC utilizing Intel® Xeon® processor E3-1500 v5 family
  - optional Rear Transition Module (RTM)
- compatible with several OpenVPX™ module profiles:
  - MOD3-PAY-2F2U-16.2.3-3
  - MOD3-PAY-2F1F2U-16.2.1-4
  - MOD3-PAY-1F2F2U-16.2.2-4

## Central Processor

- Intel Xeon processors supported:
  - 4-core Intel® Xeon® E3-1505M v5 (45W)
  - 4-core Intel® Xeon® E3-1505L v5 (25W)
- utilizes the Intel® CM236 Platform Controller Hub

## DRAM

- up to 16 Gbytes soldered DDR4 ECC DRAM:
  - single bit error correction
  - dual channel architecture
  - accessible from processor or VPX fabric

## XMC Interface (Build Option)

- 1 x XMC site, in a single VPX slot (VITA 42.0):
  - front panel I/O and build options for P2 rear I/O
  - 1 x8 or 2 x4 PCI Express® Gen 2 (VITA 42.3) XMC (Switched Mezzanine Card) interface
  - +5V or +12V powered (build option)
- XMC site is void with the optional Front I/O Module

## XMC P2 I/O plus Additional P2 I/O Options

- P2 factory build options, option 1 (full rear XMC I/O) or option 2 (reduced XMC I/O plus additional P2 I/O)
- P2 build option 1 supports the following:
  - full rear XMC I/O providing P2w1-X24s+X8d+X12d
- P2 build option 2 supports the following:
  - reduced rear XMC I/O providing P2w7-X8d+X12d
  - 1 x USB 2.0 port and 1 x USB 3.0 port
  - 1 x SATA600 interface
  - 1 x DisplayPort interface
- XMC rear I/O supports VITA 46.9 pin-mapping

## Graphics Interfaces

- 2 x independent graphics interfaces supported:
  - DisplayPort interface, supporting audio and video, via the Front I/O Module
  - DisplayPort interface, supporting audio and video, via P2 (XMC build option 2)
  - resolution is dependent on the device driver
- support for Microsoft® DirectX 12 and 11.x
- support for OpenGL 4.x and 5.x under Windows® and Linux®
- support for OpenCL 2.1

## Serial Ports

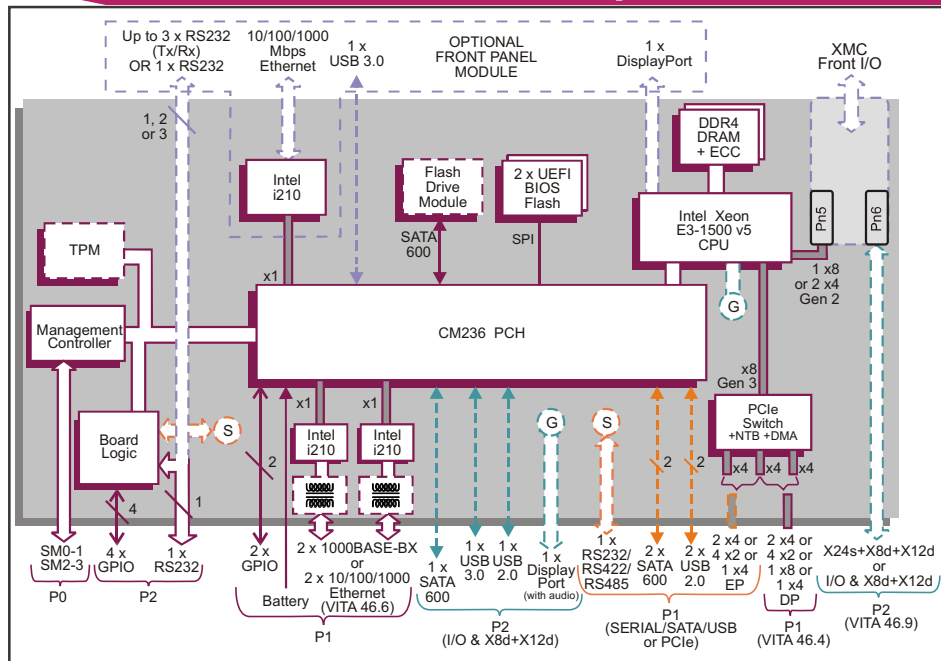
- 1 x RS232/422/485 port accessed via P1 (voids VPX Expansion Plane PCI Express interface):
  - supporting Tx, Rx, RTS and CTS in RS232 only
- 1 x RS232 port accessed via P2:
  - supporting Tx, Rx, RTS and CTS
- 1 x RS232 (full modem) or 3 x RS232 (Tx/Rx) ports via the Front I/O Module:
  - the RS232 port's type/routing is user selectable
  - 16550 compatible UARTs

## Other Peripheral Interfaces

- PC RTC, long duration timer, watchdog timer
- up to 4 x USB ports via the rear:
  - option for 2 x USB 2.0 ports via P1 (voids VPX Expansion Plane PCI Express interface)
  - option for 1 x USB 2.0 port and 1 x USB 3.0 port via P2 (XMC build option 2)
- 1 x USB 3.0 port via the Front I/O Module
- 2 x GPIO signals via P1
- 4 x GPIO signals via P2

## Optional Front I/O Module (Build Option)

- front panel I/O build option (no XMC site) supports:
  - 10/100/1000 Mbps Ethernet port via RJ45
  - 1 x USB 3.0 port
  - up to 3 x RS232 (Tx/Rx) ports via an RJ45 or 1 x RS232 full modem via RJ45, user selectable
  - 1 x DisplayPort interface (resolution dependent on device drivers)
- the module is only available with the air-cooled boards



## Mass Storage Interfaces

- 2 x SATA600 interfaces via P1 (voids VPX Expansion Plane PCI Express fabric interface)
- 1 x SATA600 interface via P2 (XMC build option 2)
- 1 x SATA600 interface for an optional on-board Flash Drive Module

## VPX Control Plane, Ethernet

- configurable Control Plane (VITA 46.6)
- P1 factory build option for 2 x SerDes 1000BASE-BX ports (IEEE802.3z)
- alternative P1 factory build option for 2 x 10/100/1000 Mbps Ethernet ports:
  - with or without magnetics
  - optional Rear Transition Module available

## VPX Data/Expansion Planes, PCI Express

- P0, P1 and P2 support OpenVPX configuration
- configurable PCI Express (PCIe®) VPX Data Plane fabric interface (VITA 46.4) supports:
  - 2 x4 or 4 x2 or 1 x8 or 1 x4 PCIe ports
- configurable PCIe VPX Expansion Plane interface (VITA 65) supports:
  - 2 x4 or 4 x2 or 1 x4 PCIe ports
  - interface configured as a build option via P1 (voids 1 x Serial, 2 x SATA600 and 2 x USB 2.0 interfaces)
- PCIe interface supports Gen 1, Gen 2 and Gen 3
- PCIe switch supports two non-transparent ports for multi-processing configurations
- 4 channel DMA engine for fast data block moves
- switch ports can be configured by the VPX switch configuration tool, see datasheet
- switch supported by Fabric Interconnect Networking software (FIN-S), see datasheet
- support for PCIe backplane common clock options REFCLK (VITA 65-R2012)

## System Management

- IPMI via SM0-3, accessing:
  - voltages monitor, CPU temperature monitor and board temperature monitor
- Baseboard Management Controller (BMC)

## Optional Built-In Test (BIT) Support

- Power-on BIT, Initiated BIT, Continuous BIT

## Optional Board Security Packages

- Trusted Platform Module (TPM)
- proprietary hardware/software board security

## Software Support

- supports Linux®, Windows® and VxWorks®

## Firmware Support

- UEFI boot firmware (BIOS):
  - UEFI 2.4 support
  - EDK II support
  - includes Compatibility Support Module
- LAN boot firmware included

## Non-Volatile Memory

- 8 Mbytes of BIOS Flash EPROM, dual devices

## Safety

- PCB (PWB) manufactured with flammability rating of UL94V-0

## Electrical Specification (Estimated)

- approximate typical current consumption for 4-core Intel Xeon processor (45W) with 16 Gbytes DRAM:
  - +5V @ 7A
  - +3.3V @ 2.5A; +3.3V AUX @ 0.4A
- +12V AUX and -12V AUX routed to XMC site

## Environmental Specification

- operating temperature (all CPU processors):
  - VITA 47 Class AC1, 0°C to +55°C (N-Series)
- extended operating temperature (selected CPU):
  - 25°C to +70°C (E-Series)
- non-operating temperature:
  - VITA 47 Class C1, -40°C to +85°C
- operating altitude:
  - 0 to 15,000 feet (0 to 4,572 meters)
- relative humidity:
  - 5% to 95%, non condensing
- rugged conduction-cooled (VITA 48.2) VPX-REDI (RCx-Series) version (contact sales office)

## Mechanical Specification

- 3U VPX form-factor (VITA 46.0, VITA 48.0)
- 3.9 inches x 6.3 inches (100mm x 160mm)
- slot width 1.0-inch air cooled:
  - IEEE 1101.10 as per VITA 46.0
  - or VITA 48.0 as per VITA 65
- connectors to VITA 46.0 for P0, P1 and P2
- operating mechanical:
  - shock - VITA 47 Class OS1, 20g
  - random vibration - 0.002g<sup>2</sup>/Hz

## Optional VPX Fabric Switch

- SBC is compatible with FR 331/x06 VPX Switch

For further information on the VPX (N-Series, E-Series) and VPX-REDI (RCx-Series) boards please contact your local sales office.