Intel® Core™ 2 Duo Processor Single Board Computer

VPX⟩
VPX REDI⟩
OpenVPX⟩

APPLICATIONS

The TR 501/x6x is a PC-compatible high performance 3U VPX processor board supporting the 1.86 GHz Intel® Core™ 2 processor, and the Intel® GS45 mobile class chipset with up to 8 Gbytes of DDR3-1066 DRAM. The TR 501/x6x features an XMC site and a range of I/O interfaces including two SATA300 channels, dual 1000 Base-BX, RS-232/422/485 and USB interfaces. The board provides a flexible PCI Express® (PCIe) backplane fabric interface that can be configured in several ways from 8 x1 PCIe ports to a 1 x8 PCIe port making it suitable for use in both distributed systems and centralized switching systems as defined in OpenVPX (VITA 65). For rugged applications two VPX-REDI conduction-cooled versions are available, the TR 501/36x-RCS is a VPX-REDI Type 1 Two-Level Maintenance conduction-cooled board and the TR 501/36x-RCT is VPX-REDI Type 2. The board is suitable for a range of applications within industrial control, transport, aerospace, security and defense applications. To simplify integration many standard operating systems are supported.

HIGHLIGHTS

- 3U VPX (VITA 46.0) N-Series single board computer:
  - rear plug compatible with the VPX-REDI RCx-Series
  - air-cooled
  - 0°C to +55°C operating temperature
  - use in commercial (non-rugged) applications
  - 3U VPX 0.8-inch slot or 1.0-inch slot
  - optional front panel console module available
  - optional rear transition module available
- I/O interfaces compatible with several OpenVPX profiles
- 1.86 GHz Intel® Core™ 2 Duo processor:
  - dual-core processor
  - 1066MHz DRAM Bus
  - 6 Mbytes last-level cache shared between cores
- Up to 8 Gbytes DDR3-1066 DRAM
- Configurable PCI Express® (PCIe) fabric interface supports:
  - 8 x1 PCIe ports, 2 x4 PCIe ports, 1 x4 + 4 x1 PCIe ports or a 1 x8 PCIe port
  - compatible with OpenVPX module profiles
  - option for non-transparent link 1

- XMC module interface with rear I/O:
  - XMC module interface (x4 PCI Express®)
  - XMC rear I/O P2w1-X24s+X8d+X12d
- 2 x SERDES (1000 Base-BX) ports, or 2 x Gigabit Ethernet ports, or 1 x SERDES plus 1 x Gigabit Ethernet ports
- 2 x SATA300, 1 x RS-232/422/485 and 2 x USB 2.0 interfaces
- Analog graphics interface
- Watchdog and long duration timers
- Optional Built-In Test (BIT) supports:
  - Power-on BIT, Initiated BIT, Continuous BIT
- Optional N-Series front panel console module allows for extra I/O:
  - 1 x USB 2.0, 1 x RS232, 1 x 10/100Mbps Ethernet and 1 x VGA
- Compatible with the FR 331/306 VPX Switch
- Support for Linux®, Windows® 7, Windows® Embedded Standard 7, Windows® XP, Windows® XP Embedded, QNX® and VxWorks®

CONCURRENT TECHNOLOGIES

VPX Single Board Computer

- 3U VPX SBC (N-Series) utilizing Intel® Core™ 2 Duo processor:
  - air-cooled
  - optional front panel console module via Console Interface Connector on the SBC
  - optional rear panel transition module
- compatible with several OpenVPX (VITA 65) module profiles
- for ruggedized VPX-REDI (RCx-Series) version:
  - conduction-cooled to VITA 48.2
  - -40°C to +85°C at card edge
  - conformally coated
  - see TR 501/36x-RCx datasheet

Central Processor

- 1.86 GHz Intel® Core™ 2 Duo SL9400:
  - 45nm process technology
  - 1066 MHz DRAM Bus
  - 6 Mbytes of shared Last-Level on-die cache
  - Intel 64 technology (64-bit computing)
- utlizes Intel® GS45 mobile class chipset with Intel ICH9M-E I/O Controller Hub

DRAM

- supports up to 8 Gbytes DDR3-1066 DRAM:
  - up to 8 Gbytes soldered
  - peak bandwidth of 16 Gbytes/s
  - dual channel architecture
- accessible from processor or VPX fabric

XMC Interface

- 1 x XMC site, in a single VPX slot (VITA 42.0):
  - XMC (Switched Mezzanine Card) interface supported via a x4 PCI Express® (VITA 42.3)
  - rear I/O P2w1-X24s+X8d+X12d (VITA 46.9)
  - +5V powered

Mass Storage Interfaces

- 2 x SATA300 interface via P1 connector:
  - transfer rate up to 300 Mbytes/s
- optional on-board EIDE NAND Flash Disk Module

Ethernet Interfaces

- factory build option for 2 x 1000Mbps IEEE802.3z SERDES (1000 Base-BX) ports via P1:
  - with software switchable option for 1 x 10/100/1000Mbps Ethernet port (with magnetics) plus 1 x SERDES port
- alternative factory build option for 2 x 10/100/1000Mbps Ethernet ports (one with magnetics and one without magnetics)
- implemented by Intel® 82571
- optional 10 Base-T, 100 Base-TX Ethernet:
  - implemented using MAC within the ICH9M-E and via an Intel 82567 PHY
  - signals via Console Interface Connector
  - magnetics and RJ45 connector on front panel console module

Graphics Interface

- implemented by Intel GS45
- analog VGA accessed via P2 rear I/O:
  - resolutions up to 2048 x 1536 @ 16M colors
  - signals also via Console Interface Connector
- support for Microsoft® DirectX 10
- support for OpenGL 2.0 under Windows® and Linux®

Serial Interfaces

- 1 x RS-232/422/485 channel accessed via P1:
  - supporting Tx/Rx. CTS/RTS in RS-232 only
  - support Transmit Control in RS-485 mode
- optional 1 x RS-232 channel:
  - signals via Console Interface Connector
- 16550 compatible UARTs
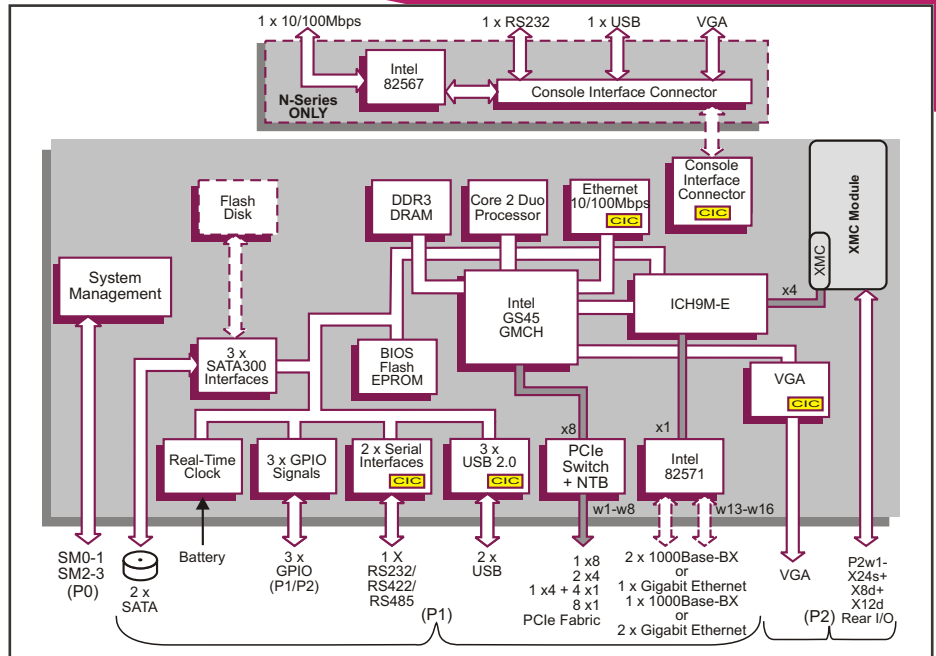
VPX Backplane Interface

- P0, P1 and P2 support OpenVPX configuration
- configurable PCI Express® (PCIe) fabric interface supports:
  - 8 x1 PCIe ports, 2 x4 PCIe ports, 1 x4 + 4 x1 PCIe ports, or a 1 x8 PCIe port
  - compatible with OpenVPX module profiles
  - PCI Express Gen 1 and Gen 2
- optional non-transparent link 1 to support multi-processing configuration
- 4 channel DMA engine for fast data block moves

Optional VPX Switch Support

- SBC compatible with the FR 331/306 VPX Switch

Other Peripheral Interfaces

- PC Real Time Clock (Year 2000 compliant)
- long duration timer; watchdog timer
- CPU temperature monitor; voltages monitor; accessed via System Management interface
- 2 x USB 2.0 interfaces accessed via P1
- optional 1 x USB 2.0 interface:
  - signals via Console Interface Connector
- 3 x GPIO signals via P1 and P2

Software Support

- support for Linux®, Windows® 7, Windows® Embedded Standard 7, Windows® XP, Windows® XP Embedded, Windows® Server 2003, Windows® Server 2008, QNX®, Solaris® and VxWorks®

Optional Built-In Test (BIT) Support

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

Firmware Support

- Phoenix™ TrustedCore BIOS
- comprehensive Power-On Self-Test (POST)
- LAN boot firmware included

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
- supports 8 Kbytes of non-volatile memory

Flash EPROM

- 4 Mbytes of BIOS SPI Flash EPROM

Electrical Specification

- typical current figures (4 Gbytes DRAM)
- +5V@ 4.8A, voltage +5% / -2.5%
- +3.3V@ 1.6A, voltage +5% / -2%
- +12V AUX and -12V AUX routed to the XMC site

Environmental Specification

- operating temperature:
  - VITA 47 Class AC1, 0°C to +55°C
  - 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 (operating/storage)

Mechanical Specification

- 3U VPX form-factor (VITA 46.0, VITA 48.0):
- 3.9 inches x 6.3 inches (100mm x 160mm)
- optional slot widths :
  - 0.8-inch (VITA 46.0)
  - 1.0-inch (IEEE 1101.10 as per VITA 46.0)
  - 1.0-inch (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 - 0.002g²/Hz

ORDERING INFORMATION

Order Number	Product Description (Hardware)
TR 501/x62-xy	1.86 GHz Core 2 Duo processor SL9400, 3U VPX, N-Series

For the order number suffix (xy) options please contact your local sales office:

where x = Ethernet I/O	where y = DRAM size
x - rear Ethernet configuration	y - up to 8 Gbytes DRAM

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