

NM-TRF-7001

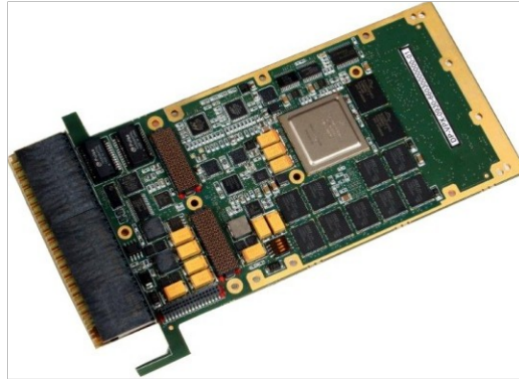
3U VPX T2080 Quad Core Single Board Computer

KEY FEATURES AND BENEFITS

- Freescale Q or IQ Quad core dual threaded T2080 processor upto 1.5GHz speed
- 4x dual threaded e6500 processor cores
- Each core has Altivec engine vector processor
- 64KB L1 cache per core
- 2MB L2 cache for four cores
- One DDR3 64bit memory controller with 512KB L3 cache
- 2x Gigabit Ethernet (GbE) controllers
- 2x I²C channels
- Integrated DMA controllers
- Upto 4GB (8GB Optional) of DDR3 SDRAM with ECC
- x4 fabric ports on the VPX P1 connector mapped as per VITA 46.9 that can be configured as:
 - Two x4 PCIe Gen 2 ports (or)
 - One x4, One x2 PCIe Gen 2 ports
- 512MB Flash
- One XMC (VITA 42.0) site
 - x4 lane PCIe Gen 2 interface as per VITA 42.3
 - JN6 pinned out to backplane P2 following VITA 46.9 X24s+X20d
- Two Gbe interfaces on P1 connector
- Two Rs232 / Rs422 ports
- Two USB 2.0 ports
- Avionics-style watchdog timers
- Six general purpose timers

APPLICATIONS

- Signal processing applications
- Mission control computers
- Data communications
- Waveform generators
- Data acquisition
- RADAR



DESCRIPTION

Versatile Performance Switching (VPX) based Quad Core Signal Processing Module (NM-TRF-7001) is the latest VPX™ compliant 3U processor that combines the high performance and the advanced I/O capabilities of Freescale's Power Architecture® Quad-core Altivec™ enabled T2080 processor with an extensive I/O complement to provide the best performance for a Quad Core processor at low power. Designed for space constrained applications, the TRF-7001 represents rugged high-performance, highly integrated small form factor SBCs. In conjunction with its processing power, the VPX-0930 easily meets challenge by offering an impressive variant of I/O capability in order to satisfy the most demanding application needs.

The VPX module format, governed by the VITA 46 specifications and the associated VITA 48 Ruggedized Enhanced Design Implementation (REDI) was established to address the fundamental requirement to provide open-architecture modules that incorporate the high-speed serial interconnect technology that is becoming pervasive in high performance computing. The VPX standard was developed by the leading providers of military commercial-off-the-shelf (COTS) modules to address the major issue of high-speed serial interconnect. The VPX module format provides many benefits to integrators of high performance multi-processor systems for radar, mission computers, and other applications.

BLOCK LEVEL EXPLANATION

FREE SCALE QorIQ PROCESSOR

The NM-TRF-7001 supports Freescale's latest generation of QorIQ highly integrated system on chip processors, the quad core, 64-bit Dual threaded T2080. The T2080 provides an extensive amount of I/O capability and processing power in a low power footprint, making it ideal for SWaP sensitive applications.

MEMORY

Dual Data Rate (DDR3) SDRAM

The T2080 provides a single memory controller supporting DDR3 SDRAM which the NM-TRF-7001 uses to provide up to 4GB (8GB optional) DDR3 SDRAM. The DDR3 interface operates at a rate up to 1600 MHz resulting in a peak bandwidth of 5GB/s. To preserve data integrity, the VPX-0930 utilizes the processor's memory controller's ECC circuitry to correct single-bit errors and detect double-bit errors. The DDR is accessible from the processor as well as the Ethernet and PCIe interfaces.

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NOR FLASH

The NM-TRF-7001 is configured with 256MB of NOR Flash Memory. The Flash will retain data for 20 years. For absolute security against inadvertent Flash programming or corruption, a hardware write protection strapping is provided to disable writing to Flash.

NAND FLASH

For applications requiring more non-volatile memory storage than can be supported by the NOR Flash memory, the NM-TRF-7001 provides optional NAND memory of upto 8GB.

MRAM

Magneto resistive Random Access Memory (MRAM) provides 512KB fast, non-volatile storage of mission data that must not be lost when power is removed. Data retention is greater than 20 years, with unlimited write endurance. Automatic data protection is provided on power loss.

INTERFACE

SATA

The NM-TRF-7001 provides two SATA ports on VPX P1 connector. It will support SATA 2.0.

Gigabit Ethernet Interfaces

The NM-TRF-7001 provides two 10/100/1000Base-T Ethernet interfaces, both implemented within the processor with an external phy and transformers. Both ports are routed to the P1 backplane connector and follow the pinout as defined by VITA 65.9. The Ethernet controllers integrate a number of features designed to minimize processor loading due to Ethernet traffic. These include dedicated DMA engines, support for jumbo packets, efficient buffer management schemes, TCP, and UDP, and interrupt coalescence.

LVTTTL Discrete Digital I/O

The NM-TRF-7001 provides 5 nos. of LVTTTL compatible discrete digital I/O. The 5GPIOs are configured as 3 outputs and 2 inputs.

I/O PORTS

Fabric Ports

The NM-TRF-7001 supports PCIe fabric ports to the backplane on P1 as per VITA 46 and VITA 65.9. The ports can be selected as:

- Two x4 Gen2 PCIe ports.
- One x4, One x2 Gen2 PCIe ports.

Note that a PCIe Gen 2 port is also has backward capable of running at Gen 1 speeds, hence these ports can be used to connect to other cards that are only Gen 1 capable.

EIA232 Serial Ports

The NM-TRF-7001 provides two EIA-232 serial channels. The EIA-232 serial ports support asynchronous communications with one transmit and one receive signal. Both ports utilize the processor's DUARTs. The Baud rate of both ports can be set independently from 300 to 115200KBaud. The ports are configurable as RS422.

USB 2.0 Ports

The NM-TRF-7001 provides two USB 2.0 ports from the processor. Each port can handle high-speed (480MB/s), full-speed (12MB/s), and low-speed (1.5MB/s) operation. The NM-TRF-7001 provides a current limited +5V output to power external USB devices.

AVIONICS WATCHDOG TIMERS

The NM-TRF-7001 provides watchdog timer implemented in the Core Functions FPGA. Watchdog timer is a pre-settable down-counter with a resolution of 1µsec. Time-out periods from 1msec to 32 seconds can be programmed. Initialization software can select whether a watchdog exception event causes a software interrupt, a processor reset, a card reset or a system reset. The watchdog timer can be used in two ways:

- 1) As a standard watchdog timer, a single time period is programmed which defines a maximum interval between writes to the watchdog register.
- 2) For increased system integrity, the watchdog can optionally be configured to operate in "Avionics" mode whereby a minimum interval between writes to the watchdog register is also enforced.

TIMERS

Six 32bit timers with 20ns resolution. Timers capable of configuring presentable, readable down counter with interrupt on terminal count.

GENERAL PURPOSE DMA CONTROLLERS

The processor provides four DMA channels that are available for general purpose use. The DMA subsystem can be used for transferring blocks of data between the SDRAM, Flash memory, device bus peripherals, Gigabit Ethernet and the PCI bus. The DMA controllers support direct and descriptor-driven chained operation. The DMA controllers can support source and destination striding. The DMA controllers also feature a bandwidth management feature to allow the user to control the distribution of bandwidth between the DMA channels.

XMC SITE

The NM-TRF-7001 is equipped with one mezzanine site, capable of supporting VITA 42.0 XMC modules. The XMC site supports the VITA 46.9. The XMC interface is a x4 lane PCIe Gen 2 connection direct to the processor following the VITA 42.3 pinout.

XMC POWER ROUTING

The XMC site is provided with VPWR (5V), 3.3V, +12V, and -12V .

TEMPERATURE SENSORS

The NM-TRF-7001 provides temperature sensors to measure board and processor temperatures. There are two sensors to measure temperature on the card and one sensor to directly measure the die temperature of the processor using its thermal diode feature. The sensors can be read by software and may be configured to generate an interrupt in case of an over temperature condition.

SOFTWARE SUPPORT

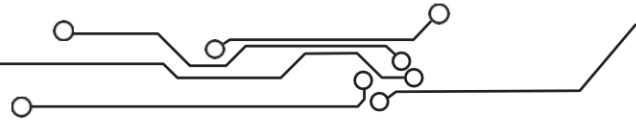
Operating System Software

The TRF-7001 is supported with an extensive array of software items, which cover all faces of developing application code for the board. Users have the option of choosing to develop with a variety of operating systems and development tools. The following operating systems are supported or planned for the TRF-7001

- Uboot
- VxWorks.
- Linux BSP

Rear Transition Module

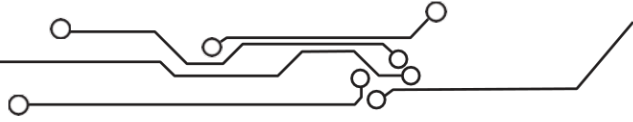
To gain access to the backplane I/O signals of the NM-TRF-7001, rear transition module (RTM) is available to access to the I/O in a lab environment. There are several configurations of the RTM dependent on the NM-TRF-7001 variant. Please contact factory for more information.



NM-TRF-7001

SPECIFICATIONS

TYPE		3U VPX	COMMUNICATION	
POWER REQUIREMENTS		Voltage 5V, 3.3V, 3.3V_AUX, +12_AUX, -12_AUX (optional)	PCle	
		Power 36W Typ.	<ul style="list-style-type: none"> One x4 PCIe from processor to XMC primary connector VPXP1 connector PCIe can be configured as below two options <ol style="list-style-type: none"> Two x4 PCIe from processor to VPX P1 connector (No SATA option) One x4 PCIe, One x2 PCIe and Two x1 SATA ports from processor to VPX P1 connector. 	
SOFTWARE SUPPORT		Uboot Built in test (BIT) OS-Linux, VxWorks	MECHANICAL	
CONNECTORS		Ethernet 2 Nos of 10/100/1000 Mbps Ethernet ports SATA Two x1 SATA from processor to VPX P1 connector USB Two USB 2.0 Ports available at the VPX P1 connector IPMI Interface Micro-controller based IPMI interface supporting VPX system management interface RTC Interface On board RTC with external battery backup through VBAT pin of P1 connector XMC One XMC Slot complied with VITA 42.0 standard VPX connector VPX P0: <ul style="list-style-type: none"> VPX power connector VS3=5V, VS2=3.3V, 3.3V_AUX, VS1=12V (optional) VPX P1: <ul style="list-style-type: none"> VPX Differential I/O connect Two x4 gen2 PCIe lane for Processor communication Two x1 SATA Port Two Gigabit Ethernet ports Two USB-2.0 ports VPX P2: <ul style="list-style-type: none"> VPX Differential I/O connector 20 Differential and 24 single ended IO from XMC secondary connector 	Dimension (LxBxW)in mm 160 x 100 x 20.32 Weight in grams 550 Slot width 0.85" and 1"	
PROCESSOR		Freescale's Qor IQ T2080 Quad core processor operating upto 1.5GHz FPGA Spartan-6 FPGA	ENVIRONMENT	
MEMORY		DDR memory 4GB/8GB* DDR3 SDRAM with ECC Nor flash memory 512MB flash for boot memory NAND flash memory 8GB* NAND flash MRAM 4Mbit of magnetic RAM	Operating temperature -40°C to +71°C	
			ORDERING INFORMATION	
			NM-TRF-7001-663330 	
			Note : 1. Not all combinations of an orderable variant are available as standard product. Variants in red are standard product. 2. Please consult factory for further help in selecting the appropriate variant. * Contact factory for configuration details	



BLOCK DIAGRAM OF NM-TRF-7001

