

FEATURES

- TI TMS320C645x DSP
 - 720 MHz, 1 GHz, & 1.2 GHz options
 - 1 MB cache or 2 MB cache options
 - Integrated 10/100/1000 EMAC
 - 2 Integrated McBSPs
 - JTAG Emulation/Debug
- On-Board Xilinx Spartan3 FPGA
 - XC3S2000 & XC3S4000 options
 - 300 MHz Clock Logic
 - JTAG Interface/Debug
- On-Board 10/100 Ethernet PHY connected to DSP's EMAC
- 128 MB CPU DDR2 SDRAM
- 64 MB FPGA DDR1 SDRAM
- 16 MB NOR FLASH
- SO-DIMM-200 Interface
 - 140 FPGA User I/O Pins
 - 2 McBSP Interfaces
 - I2C Interface
 - 10/100 Ethernet Interface
 - 3.3V Power Interface
- Expansion I/O Connector
 - DSP Rapid IO Interface
 - DSP PCI I/O Interface
 - DSP Gigabit Ethernet Interface (RGMII) to an external PHY

APPLICATIONS

- Embedded Instrumentation
- Rapid Development / Deployment
- Embedded Digital Signal Processing
- Real-time Audio / Video Processing



(3.25" x 2.7" - actual size)

DESCRIPTION

The MityDSP-Pro is a highly configurable, high performance, small form-factor processor card that features a Texas Instruments TMS320C645x Digital Signal Processor (DSP) tightly integrated with a Xilinx Spartan3 Field Programmable Gate Array (FPGA), FLASH and DDR1/DDR2 SDRAM memory subsystems. Both the DSP and the FGPA are capable of loading/executing programs and logic images developed by end users. The MityDSP-Pro provides a complete digital processing infrastructure necessary for embedded applications development.

Users of the MityDSP-Pro are encouraged to develop applications and FPGA firmware using the MityDSP hardware and software development kit provided by Critical Link. The development kit includes API libraries compatible with the TI Code Composer Studio compiler as well as FPGA netlist components compatible with the Xilinx ISE FPGA synthesis/implementation tools. The libraries provide the necessary functions needed to configure the MityDSP-Pro, program standalone MityDSP embedded applications, and interface with the various hardware components on the board. In addition, the libraries include several interface “cores” – FPGA and DSP software

modules designed to interface with various data converter modules (ADCs, DACs, LCD interfaces, etc) – as well as bootloading and FLASH programming utilities.

Figure 1 provides a top-level block diagram of the MityDSP-Pro processor card. As shown in the figure, the primary interface to the MityDSP-Pro is through a standard SO-DIMM-200 card edge interface. The interface provides 3.3V power, configuration control, Ethernet connectivity, inter-integrated circuit (I2C) connectivity, synchronous serial connectivity, and 140 pins of configurable FPGA I/O for application-defined interfacing. Details of the SO-DIMM connector interface are included in the SO-DIMM-200 Interface Description, below.

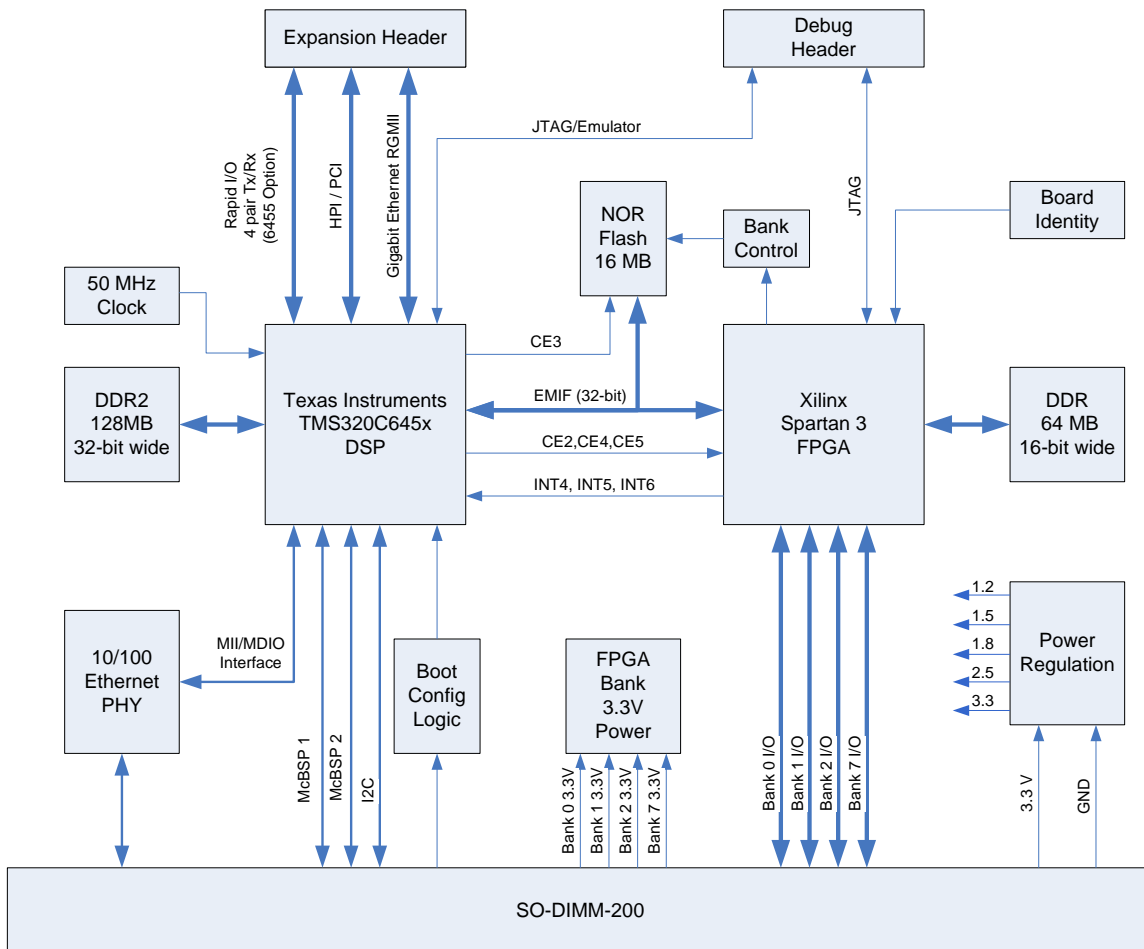


Figure 1: MityDSP-Pro Block Diagram

FPGA Bank I/O

The MityDSP-Pro provides 140 lines of FPGA I/O directly to the SO-DIMM-200 card edge interface. The 140 lines of FPGA I/O are distributed across 4 banks of the FPGA. These I/O lines and their associated logic are completely configurable within the FPGA.

With the Xilinx Spartan3 family of FPGA, each bank may be configured to operate on a different electrical interface standard based on input voltage and termination configurations. The MityDSP-Pro provides, for each of the four externally accessible FPGA banks, a power supply pin (VCCO_N) to allow the bank to be powered to 2.5V or 3.3V. The following table outlines the various electrical interface standards that are possible on the MityDSP-Pro:

Table 1: MityDSP-Pro FPGA Available I/O Standards

| I/O Standard | Bank Voltage | VCCO_N pin |
|--|--------------|---------------------|
| 2.5V LVDS with 100 ohm DCI termination | 2.5V | Open or 2.5V supply |
| 2.5V LVDS without DCI termination | 2.5V | Open or 2.5V supply |
| 2.5V CMOS (pull-up/down options in FPGA) | 2.5V | Open or 2.5V supply |
| 3.3V CMOS (pull-up/down options in FPGA) | 3.3V | 3.3V supply |

For complete details regarding hardware bank voltage configuration please refer to the SO-DIMM-200 Interface description and the appropriate Spartan3 manuals from Xilinx.

Integrated DSP Communications Modules

The C6454 processor includes several on-chip communications modules. The MityDSP-Pro design provides access to the several of the modules through the SO-DIMM-200 card edge interface.

The Ethernet MAC MII/MDIO interface on the DSP has been integrated with an on-board Ethernet PHY device. The Tx/Rx line-level signals of the PHY device are brought to the SO-DIMM-200 connector. In order to leverage the Ethernet interface, application boards need only supply appropriate Ethernet magnetics, and the RJ-45 Ethernet connector, which are often available as a single component. The MityDSP software developer's kit includes a software driver and port of the LwIP TCP/IP protocol stack for use with the Ethernet interface.

The DSP's Gigabit Ethernet capability is accessible via the expansion I/O connector on the bottom side of the MityDSP-Pro module. The EMAC's Reduced Gigabit Medium Independent Interface (RGMI) is available on this connector for connection to a PHY device on the end application board. The signals are separate from the MII signals routed to the on-board 10/100 PHY. Although the same EMAC module within the DSP services both sets of signals, only one Ethernet interface can be used at a time.

The inter-integrated circuit (I2C) signals have been routed between the DSP, FPGA, and the SO-DIMM-200 interface. Communication is allowed between any combination of DSP, FPGA, and user board devices. TI provides several I2C interface libraries for

integration with various data acquisition modules. The MityDSP development kit also contains modules for implementing I2C communication using the FPGA connection. In addition, the I2C interface may be used to boot the DSP processor (see the SO-DIMM-200 interface description for details on MityDSP-Pro boot configuration).

The DSP also includes two multi-channel buffered serial ports (McBSPs) which have been routed directly to the SO-DIMM-200 interface. Both Critical Link (as part of the MityDSP development kit) and TI provide several McBSP interface libraries for integration with various data acquisition modules.

EMIF Interface

The C645x DSP and the Spartan3 FPGA are connected using the DSP External Memory Interface (EMIFA). The EMIFA interface includes 4 chip-select spaces. The EMIFA interface supports multiple data width transfers and bus wait state configurations based on chip select space. 8, 16, 32, and 64 bit data word sizes may be used. Three of the four chip-select lines are reserved for the FPGA interface. The MityDSP-Pro also includes lines between the FPGA and the DSP for the purposes of generating interrupts.

In addition to the FPGA, 16 MB of on-board NOR FLASH memory is also connected to the DSP using the EMIF. The FLASH memory is connected to fourth chip-select line of the EMIF (CE3). The FLASH memory is typically used to store the following types of data:

- secondary bootloader DSP software
- secondary bootloader FPGA image
- application DSP software
- application FPGA images
- application data (non-volatile storage)

The DSP EMIF interface is only capable of addressing 4 MB of data on the EMIF interface. In order to provide access to the remaining 12 MB of FLASH memory, the upper address lines of the FLASH are controlled by Bank Control logic. Upon reset the Bank Control Logic defaults to bank zero for bootloading support. Following bootloading, the bank control logic is controlled by the FPGA. Refer to the MityDSP User's Guide for more information on bank control logic.

System Memory

The C6454 includes a 32 KB level-1 program (L1P) cache/SRAM, a 32 KB level-1 data (L1D) cache/SRAM, and a 1 MB level-2 (L2) cache/SRAM. The C6455 doubles the L2 cache/SRAM to 2MB. All types of cache/SRAM may be split into various amounts of cache and SRAM. Refer to TI's datasheets for specific details on configuring the cache/SRAM memory blocks.

For main DSP software program and runtime data storage, a dedicated 128 MB of DDR2 memory is available via the DDR2 control interface on the DSP. The memory is 32 bits

wide and is capable of running at 250 MHz providing a burst throughput of 2 GB per second to the processor.

For the FPGA, a separate 64 MB of DDR1 memory is provided. The memory interface is 16 bits wide and is capable of running at 125 MHz providing a burst throughput of 500 MB per second to the FPGA. Common uses for the FPGA memory include custom data collection systems, video frame buffers, and MicroBlaze program storage.

Debug Interface

Both the JTAG interface signals for the FPGA and the JTAG and emulator signals for the C645x processor have been brought out to a connector/header for use with in-circuit debugging. The JTAG chains are separate on the interface. With an appropriate breakout cable, the interface will support the use of standard Xilinx Platform JTAG cable programming and the Spectrum Digital processor emulator (or equivalent). Details of the pin-outs for the debug header are included in the Debug Interface Description below.

Expansion Interface

For system expansion, the MityDSP-Pro also provides a low profile Hirose FX8-100S-SV connector interface that may be used to access the Host-Port-Interface (HPI), Peripheral-Component-Interconnect (PCI), and Gigabit Ethernet MAC ports of the C645x bus. In addition, four lanes of transmit and receive Rapid I/O data lines (and associated clocks) are also provided with the C6455 processor option.

Note that the Gigabit Ethernet interface utilizes the RGMII specification and is designed to operate at 1.5V. If a 1.8V interface voltage is required please contact your Critical Link representative for further information on this option.

Module Options

The MityDSP-Pro has been designed to support several upgrade options. These include a selection of 3 CPU speeds with a combination of 2 FPGA types. If you do not see a combination in Table 6 that meets your needs please contact a Critical Link sales representative.

Example Application

The figure below illustrates an example application utilizing the MityDSP-Pro processor card. The example application is a 6-way signal beamformer for use in a radar system. The card is required to capture 6 channels of IF signal data, downconvert the data to baseband, sum the signals together with the input channels and data provided from upstream processors, and send the results to downstream processing.

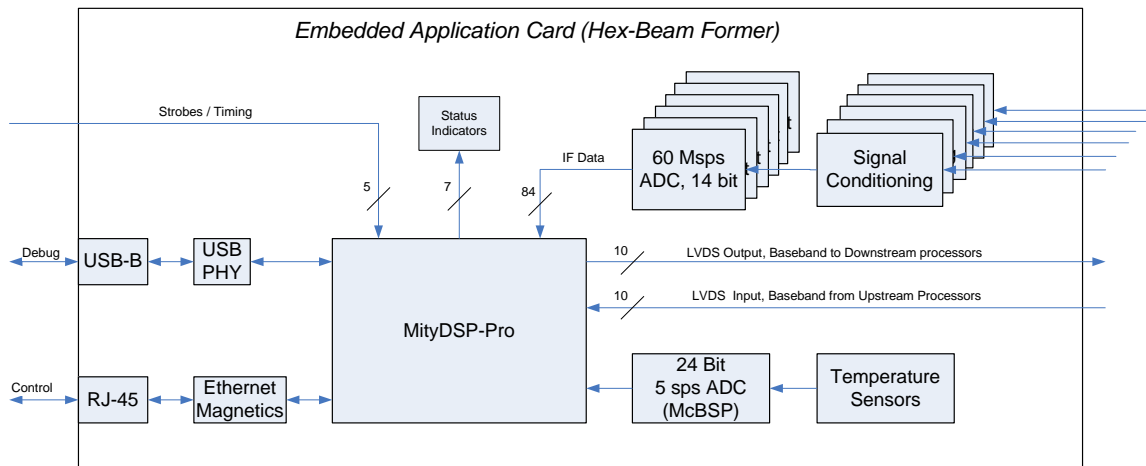


Figure 2: Typical MityDSP-Pro Application

In the example application, a designer leverages three of the four FPGA I/O banks as 3.3V CMOS interface and is able to integrate 6 14-bit ADC circuits directly to the MityDSP-Pro FPGA as well as various strobe signals and status indicators. The fourth bank is reserved for LVDS signaling and is used to receive and transmit data from upstream and downstream processors.

The user is able to utilize the McBSP interface of the MityDSP-Pro to capture on-board temperature data for health monitoring. In addition, an Ethernet interface and a USB interface are added to provide debug and status and control information to external control units.

Within the MityDSP-Pro, the user is able to utilize the FPGA multiply accumulator engines and programmable logic to capture, baseband, and integrate each of the ADC channels on the main board. The TI processor can be used to compute complex coefficients used in the beamforming process and provide the command and control interface for the entire card.

With the application, the user needs only focus on the details of the application specific problems at hand: e.g., developing the appropriate signal conditioning and application software and firmware. The framework for the processing and interconnects is completely designed with the integration of the MityDSP-Pro.

ABSOLUTE MAXIMUM RATINGS

If Military/Aerospace specified cards are required, please contact the Critical Link Sales Office or unit Distributors for availability and specifications.

Maximum Supply Voltage, Vcc 3.4 V

Storage Temperature Range -65 to 80C

Shock, Z-Axis ±10 g

Shock, X/Y-Axis ±10 g

OPERATING CONDITIONS

Commercial Temperature Range 0 to 70C

Industrial Temperature Range -40 to +85C

ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|--|--|------------|-----|------|-----------|-------|
| Vcc | Voltage supply, 3.3 volt input. | | | 3.3 | 3.4 | Volts |
| Icc | Quiescent Current draw, 3.3 volt input | | | 1.5 | 3 | Amps |
| Icc-max | Max current draw, positive 3.3 volt input. | | | 1.7 | 3.5 | Amps |
| | | | | 10 | - | KHz |
| | | | | 0 | TBD | Volts |
| | Clock Frequency, Digital Inputs | | | 25 | 25 | MHz |
| | Update period, digital inputs | | | 1280 | 1280 | ns |
| | Clock Frequency, Digital Output LVDS clk entering deserializer | | | 50 | 20 / 68 | MHz |
| | Update period, digital outputs | | | 20 | 14.7 / 50 | ns |
| <p>1. Power utilization of the MityDSP-Pro is heavily dependant on end-user application. Major factors include: CPU PLL configuration, FPGA utilization, and external SDRAM utilization.</p> | | | | | | |

SO-DIMM-200 Interface Description

The primary interface connector for the MityDSP-Pro is the SO-DIMM-200 card edge interface. Table 2 lists every pin on the SO-DIMM-200 main interface connector. Table 3 describes the function of each group of signals on the main interface connector.

Table 2: SO-DIMM-200 Pin-Out

| Pin | Signal | FPGA Bank | Signal | Pin |
|-----|-------------|-----------|-------------|-----|
| 1 | 3.3 V | - | 3.3 V | 2 |
| 3 | 3.3 V | - | 3.3 V | 4 |
| 5 | 3.3 V | - | 3.3 V | 6 |
| 7 | GND | - | GND | 8 |
| 9 | GND | - | GND | 10 |
| 11 | MRESET# | - | BOOT_MODE | 12 |
| 13 | ETH_TD_P | - | RS232_TXD | 14 |
| 15 | ETH_TD_N | - | RS232_RXD | 16 |
| 17 | ETH_RD_P | - | RS232_RTS | 18 |
| 19 | ETH_RD_N | - | RS232_CTS | 20 |
| 21 | FPGA_RSV1 | - | SCL | 22 |
| 23 | FPGA_RSV2 | - | SDA | 24 |
| 25 | CLKR0 | - | CLKR1 | 26 |
| 27 | CLKX0 | - | CLKX1 | 28 |
| 29 | DR0 | - | DR1 | 30 |
| 31 | DX0 | - | DX1 | 32 |
| 33 | FSR0 | - | FSR1 | 34 |
| 35 | FSX0 | - | FSX1 | 36 |
| 37 | VCCO_2 | - | VCCO_1 | 38 |
| 39 | VCCO_0 | - | VCCO_7 | 40 |
| 41 | GND | - | GND | 42 |
| 43 | ODD1_P.N26 | 2 | EVN1_P.N22 | 44 |
| 45 | ODD1_N.N25 | 2 | EVN1_N.N21 | 46 |
| 47 | ODD2_P.M26 | 2 | EVN2_P.N24 | 48 |
| 49 | ODD2_N.M25 | 2 | EVN2_N.N23 | 50 |
| 51 | ODD3_P.M22 | 2 | EVN3_P.M24 | 52 |
| 53 | ODD3_N.M21 | 2 | EVN3_N.L23 | 54 |
| 55 | ODD4_P.L26 | 2 | EVN4_P.K24 | 56 |
| 57 | ODD4_N.L25 | 2 | EVN4_N.K23 | 58 |
| 59 | ODD5_P.K26 | 2 | EVN5_P.J25 | 60 |
| 61 | ODD5_N.K25 | 2 | EVN5_N.J24 | 62 |
| 63 | GND | - | GND | 64 |
| 65 | ODD6_P.K22 | 2 | EVN6_P.H24 | 66 |
| 67 | ODD6_N.K21 | 2 | EVN6_N.H23 | 68 |
| 69 | ODD7_P.H26 | 2 | EVN7_P.J23 | 70 |
| 71 | ODD7_N.H25 | 2 | EVN7_N.J22 | 72 |
| 73 | ODD8_P.J21 | 2 | EVN8_P.H21 | 74 |
| 75 | ODD8_N.H22 | 2 | EVN8_N.H20 | 76 |
| 77 | ODD9_P.D26 | 2 | EVN9_P.E24 | 78 |
| 79 | ODD9_N.D25 | 2 | EVN9_N.E23 | 80 |
| 81 | ODD10_P.F21 | 1 | EVN10_P.C23 | 82 |
| 83 | ODD10_N.E21 | 1 | EVN10_N.B23 | 84 |
| 85 | GND | - | GND | 86 |
| 87 | ODD11_P.E20 | 1 | EVN11_P.C22 | 88 |
| 89 | ODD11_N.D20 | 1 | EVN11_N.B22 | 90 |
| 91 | ODD12_P.B21 | 1 | EVN12_P.D21 | 92 |
| 93 | ODD12_N.A21 | 1 | EVN12_N.C21 | 94 |
| 95 | ODD13_P.B20 | 1 | EVN13_P.G18 | 96 |
| 97 | ODD13_N.A20 | 1 | EVN13_N.F18 | 98 |
| 99 | ODD14_P.B19 | 1 | EVN14_P.G17 | 100 |

| Pin | Signal | FPGA Bank | Signal | Pin |
|-----|-------------|-----------|-------------|-----|
| 101 | ODD14_N.A19 | 1 | EVN14_N.F17 | 102 |
| 103 | ODD15_P.F16 | 1 | EVN15_P.E17 | 104 |
| 105 | ODD15_N.E16 | 1 | EVN15_N.D17 | 106 |
| 107 | GND | - | GND | 108 |
| 109 | ODD16_P.B15 | 1 | EVN16_P.F15 | 110 |
| 111 | ODD16_N.A15 | 1 | EVN16_N.E15 | 112 |
| 113 | ODD17_P.C14 | 1 | EVN17_P.E14 | 114 |
| 115 | ODD17_N.B14 | 1 | EVN17_N.D14 | 116 |
| 117 | ODD18_P.A13 | 0 | EVN18_P.F13 | 118 |
| 119 | ODD18_N.B13 | 0 | EVN18_N.G13 | 120 |
| 121 | ODD19_P.A12 | 0 | EVN19_P.C13 | 122 |
| 123 | ODD19_N.B12 | 0 | EVN19_N.D13 | 124 |
| 125 | ODD20_P.H13 | 0 | EVN20_P.E12 | 126 |
| 127 | ODD20_N.G12 | 0 | EVN20_N.F12 | 128 |
| 129 | GND | - | GND | 130 |
| 131 | ODD21_P.F11 | 0 | EVN21_P.D11 | 132 |
| 133 | ODD21_N.G11 | 0 | EVN21_N.E11 | 134 |
| 135 | ODD22_P.A8 | 0 | EVN22_P.C10 | 136 |
| 137 | ODD22_N.B8 | 0 | EVN22_N.D10 | 138 |
| 139 | ODD23_P.A7 | 0 | EVN23_P.E10 | 140 |
| 141 | ODD23_N.B7 | 0 | EVN23_N.F10 | 142 |
| 143 | ODD24_P.D7 | 0 | EVN24_P.F9 | 144 |
| 145 | ODD24_N.E7 | 0 | EVN24_N.G9 | 146 |
| 147 | ODD25_P.D6 | 0 | EVN25_P.B6 | 148 |
| 149 | ODD25_N.E6 | 0 | EVN25_N.C6 | 150 |
| 151 | GND | - | GND | 152 |
| 153 | ODD26_P.A4 | 0 | EVN26_P.B5 | 154 |
| 155 | ODD26_N.B4 | 0 | EVN26_N.C5 | 156 |
| 157 | ODD27_P.D2 | 7 | EVN27_P.J5 | 158 |
| 159 | ODD27_N.D1 | 7 | EVN27_N.J4 | 160 |
| 161 | ODD28_P.H5 | 7 | EVN28_P.H4 | 162 |
| 163 | ODD28_N.J6 | 7 | EVN28_N.H3 | 164 |
| 165 | ODD29_P.K6 | 7 | EVN29_P.J3 | 166 |
| 167 | ODD29_N.K5 | 7 | EVN29_N.J2 | 168 |
| 169 | ODD30_P.G2 | 7 | EVN30_P.K4 | 170 |
| 171 | ODD30_N.G1 | 7 | EVN30_N.K3 | 172 |
| 173 | GND | - | GND | 174 |
| 175 | ODD31_P.H2 | 7 | EVN31_P.L6 | 176 |
| 177 | ODD31_N.H1 | 7 | EVN31_N.L5 | 178 |
| 179 | ODD32_P.K2 | 7 | EVN32_P.M5 | 180 |
| 181 | ODD32_N.K1 | 7 | EVN32_N.M6 | 182 |
| 183 | ODD33_P.L2 | 7 | EVN33_P.L4 | 184 |
| 185 | ODD33_N.L1 | 7 | EVN33_N.M3 | 186 |
| 187 | ODD34_P.M2 | 7 | EVN34_P.N4 | 188 |
| 189 | ODD34_N.M1 | 7 | EVN34_N.N3 | 190 |
| 191 | ODD35_P.N2 | 7 | EVN35_P.N6 | 192 |
| 193 | ODD35_N.N1 | 7 | EVN35_N.N5 | 194 |
| 195 | GND | - | GND | 196 |
| 197 | 3.3V | - | 3.3V | 198 |
| 199 | 3.3V | - | 3.3V | 200 |

Table 3: Signal Group Description

| Signal / Group | I/O | Description |
|--|------------|---|
| 3.3 V | N/A | 3.3 volt reference input power referenced to GND. |
| MRESET# | I | Manual Reset. Pulled-up on the MityDSP-Pro module. When driven to GND for a minimum of 1 us, a module-wide reset is triggered. Can be tied into system system-wide reset and power monitoring circuitry. |
| ETH_TD_P / N ETH_RD_P / N | O I | Ethernet Transmit Data & Receive Data link lines. These pairs of signals are connected to the onboard 10/100 Ethernet PHY connected to the DSP EMAC. These pairs should be routed through appropriate 1:1 magnetics prior to exposure to an RJ-45 type connector interface. |
| FPGA_RSV1 / 2 | IO | Reserved for Ethernet RJ45 Link & Activity LED signals, driven by the on-board 10/100 PHY. Can also be used as general purpose FPGA I/O. |
| CLKR0 / 1 CLKX0 / 1 DR0 / 1 DX0 / 1 FSR0 / 1 | IO | These pins are direct connects to the corresponding McBSP port-0 / port-1 pins on the C645x DSP. For further interface information, please refer to the TMS645x McBSP Users Guide and Data Sheets. |
| BOOT_MODE | I | Boot Mode Selection. Reserved for future use. Do not connect. |
| SCL, SDA | I/O | These pins are connected to the I2C interface on the C645x DSP, and also to FPGA pins. For further interface information, please refer to the TMS320C645x I2C Users Guide and Data Sheets. |
| GND | N/A | System Digital Ground. |
| ODDXX_P/N.YYY EVNXX_P/N.YYY | IO | FPGA General Purpose I/O pin. FPGA I/O pins have been routed to the MityDSP connector in pairs denoted ODDXX (odd pin side of connector) or EVNXX (even pin side of connector). When configured for differential termination the pairs should be used according to the _P (positive) or _N (negative) extension. The YYY portion of the name corresponds to the FPGA pin location mapped to the signal. |
| VCCO_N | N/A | FPGA Banks 0, 1, 2, and 7 Voltage configuration. Leave disconnected for 2.5V bank logic (LVCMOS25 or LVDS25). Connect to 3.3V power supply for 3.3V bank logic (LVCMOS33 or LVTTL). PCB trace must be capable of providing a minimum of 200 mA. |

Debug Interface Description

The debug interface connector pin-out is specified in the table below.

Table 4: Debug Connector Pin-Out

| Pin | Signal | Signal | Pin |
|-----|----------|-----------|-----|
| 1 | DSP_EMU0 | DSP_TMS | 2 |
| 3 | DSP_EMU1 | DSP_TDI | 4 |
| 5 | 3.3V | DSP_TDO | 6 |
| 7 | GND | DSP_TCK | 8 |
| 9 | GND | DSP_TRST# | 10 |
| 11 | FPGA_TDI | FPGA_TMS | 12 |
| 13 | FPGA_TCK | FPGA_TDO | 14 |
| 15 | GND | 2.5V | 16 |

Expansion Interface Description

The Expansion Interface pin-out is described in the table below.

Table 5: Expansion Interface Pin-Out

| Pin | Signal | Signal | Pin |
|-----|----------|-----------|-----|
| 1 | GND | GND | 2 |
| 3 | RIORX0_N | RIOTX0_P | 4 |
| 5 | RIORX0_P | RIOTX0_N | 6 |
| 7 | RIORX1_P | RIOTX1_P | 8 |
| 9 | RIORX1_N | RIOTX1_N | 10 |
| 11 | RIORX2_N | RIOTX2_N | 12 |
| 13 | RIORX2_P | RIOTX2_P | 14 |
| 15 | RIORX3_P | RIOTX3_N | 16 |
| 17 | RIORX3_N | RIOTX3_P | 18 |
| 19 | RIOCLK_N | GND | 20 |
| 21 | RIOCLK_P | HPI_WIDTH | 22 |
| 23 | GND | PCI_AD27 | 24 |
| 25 | PCI_EEAI | PCI_AD1 | 26 |
| 27 | PCI166 | PCI_AD30 | 28 |
| 29 | PCI_EN | PCI_AD0 | 30 |
| 31 | PCI_AD11 | PCI_AD4 | 32 |
| 33 | PCI_AD10 | PCI_AD22 | 34 |
| 35 | PCI_AD3 | PCI_AD25 | 36 |
| 37 | PCI_AD5 | PCI_AD8 | 38 |
| 39 | PCI_AD29 | PCI_AD21 | 40 |
| 41 | PCI_AD23 | PCI_AD13 | 42 |
| 43 | PCI_AD7 | PCI_AD2 | 44 |
| 45 | PCI_AD9 | PCI_AD19 | 46 |
| 47 | PCI_AD28 | PCI_AD15 | 48 |
| 49 | PCI_AD31 | PCI_ERR# | 50 |
| 51 | PCI_AD16 | PCI_AD17 | 52 |
| 53 | PCI_AD6 | PCI_AD18 | 54 |
| 55 | PCI_AD14 | PCI_STOP# | 56 |
| 57 | GND | PCI_AD26 | 58 |
| 59 | PCI_CLK | PCI_AD20 | 60 |
| 61 | GND | PCI_CBE2# | 62 |

| Pin | Signal | Signal | Pin |
|-----|-------------|------------|-----|
| 63 | PCI_AD12 | PCI_AD24 | 64 |
| 65 | PCI_FRAME# | PCI_SERR# | 66 |
| 67 | PCI_DEVSEL# | PCI_RST# | 68 |
| 69 | PCI_PAR | PCI_CBE1# | 70 |
| 71 | PCI_IDSEL | PCI_CBE0# | 72 |
| 73 | PCI_IRDY# | PCI_CBE3# | 74 |
| 75 | PCI_GNT# | PCI_REQ# | 76 |
| 77 | PCI_INTA# | MAC_SEL | 78 |
| 79 | PCI_TRDY# | RGMII_VREF | 80 |
| 81 | GND | GND | 82 |
| 83 | RGMDCLK | RGREFCLK | 84 |
| 85 | RGMDIO | GND | 86 |
| 87 | RGRXD3 | RGTXD3 | 88 |
| 89 | RGRXD2 | RGTXD2 | 90 |
| 91 | RGRXD1 | RGTXD1 | 92 |
| 93 | RGRXD0 | RGTXD0 | 94 |
| 95 | RGRXCTL | RGTXCTL | 96 |
| 97 | RGRXC | RGTXC | 98 |
| 99 | GND | GND | 100 |

Note that the RGMII Ethernet interface pins are configured for 1.5V operation. If a 1.8V interface voltage is required please contact your Critical Link representative for further information on this option.

THERMAL MANAGEMENT

The MityDSP-Pro module does require some amount of thermal management even at room temperatures depending on processor load. The primary concern is with the DSP device, which does generate quite a bit of heat, even when idle. Of course more processing activity will mean more power draw and more heat dissipation. Critical Link has operated the MityDSP-Pro module without heat sinking or air flow on bench tops at room temperatures for long periods of time without failure.

However, using the module inside an enclosure is cause for concern, as the heat will most likely build up inside and eventually cause the DSP or other components to malfunction. Existing customers have successfully used small fans to move air across the surface of the MityDSP-Pro module to keep the DSP temperature within operating range. However, every end product is different, and it is advisable to do plenty of testing to ensure that the product will meet desired performance specifications.

ORDERING INFORMATION

The following table lists the orderable module configurations. For shipping status, availability, and lead time of these or other configurations please contact your Critical Link representative.

Table 6: Orderable Model Numbers

| Model | CPU Speed | FPGA | L2 CPU Cache | NOR Flash | CPU DDR2 RAM | FPGA DDR1 RAM | Operating Temp |
|----------------|-----------|----------|--------------|-----------|--------------|---------------|----------------|
| 6455-JE-3X5-RC | 1.2 GHz | XC3S4000 | 2 MB | 16MB | 128MB | 64MB | 0°C to 70°C |
| 6455-IE-3X5-RI | 1.0 GHz | XC3S4000 | 2 MB | 16MB | 128MB | 64MB | -40°C to 85°C |
| 6454-GD-3X5-RC | 720 MHz | XC3S2000 | 1 MB | 16MB | 128MB | 64MB | 0°C to 70°C |
| 6454-ID-3X5-RI | 1.0 GHz | XC3S2000 | 1 MB | 16MB | 128MB | 64MB | -40°C to 85°C |

MECHANICAL INTERFACE

A mechanical outline of the MityDSP-Pro is illustrated below.

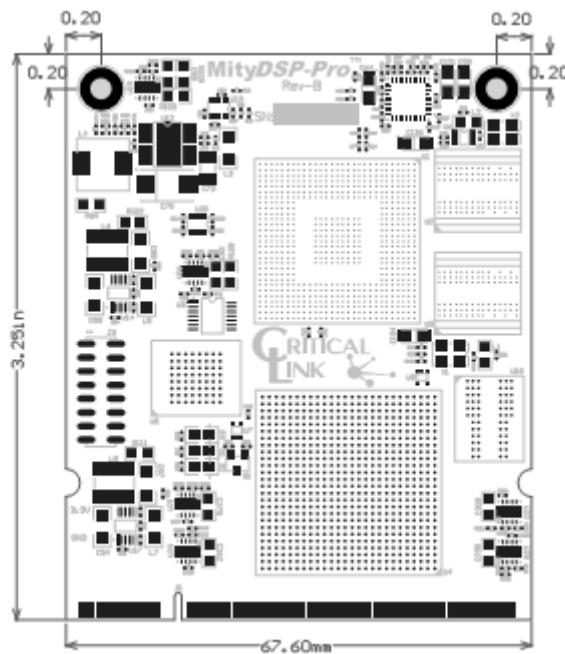


Figure 3: Dimensions 3.25" x 2.7"

DESIGN GUIDE

Critical Link provides a comprehensive “Carrier Board Design Guide” for the MityDSP-Pro system on module. It documents further details when creating a custom carrier board that interfaces with this module. It can be found at the following website location:

<http://www.mitydsp.com/products-services/cpu-engines/design-guides/>

REVISION HISTORY

| Date | Change Description |
|-------------|---|
| 13-MAR-2012 | Update available model numbers and add rev history |
| 27-MAR-2013 | Add note about RGMII voltage level for expansion header |
| 12-JUL-2013 | Add design guide and thermal management sections |
| | |

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