

ML628

Virtex-6 FPGA

GTX and GTH Transceiver

Characterization Board

User Guide

UG771 (v1.1) February 19, 2014



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Revision History

The following table shows the revision history for this document.

Date	Version	Revision
03/23/2011	1.0	Initial Xilinx release.
07/06/2011	1.0.1	Revised link in Appendix D , on page 71 to point to the version of UG806 supporting ISE software version 13.2.
02/19/2014	1.1	Updated disclaimer and copyright. Added callouts 2, 3, and 10 to Figure 1-2 .

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About This Guide

This document describes the basic setup, features, and operation of the ML628 Virtex®-6 FPGA GTX and GTH transceiver characterization board. The ML628 board provides the hardware environment for characterizing and evaluating the GTX and GTH transceivers available on the Virtex-6 XC6VHX380T-2C FFG1923 FPGA. The latest revision of this document is available online at:

http://www.xilinx.com/products/boards/ml628/reference_designs.htm

Guide Contents

This user guide contains the following chapters and appendices:

- [Chapter 1, ML628 Board Features and Operation](#), describes the components, features, and operation of the ML628 Virtex-6 FPGA GTX and GTH transceiver characterization board.
- [Appendix A, Default Jumper Positions](#), lists the jumpers that must be installed on the board for proper operation.
- [Appendix B, VITA 57.1 FMC HPC Connector Pinout](#), provides a pinout reference for the FPGA mezzanine card (FMC) connector.
- [Appendix C, ML628 Master UCF Listing](#), provides a listing of the ML628 master user constraints file (UCF).
- [Appendix D, References](#), provides a list of references and links to related documentation.

To find additional documentation, see the Xilinx website at:

<http://www.xilinx.com/support/documentation/index.htm>.

To search the Answer Database of silicon, software, and IP questions and answers, see the Xilinx website at:

<http://www.xilinx.com/support>.

Conventions

This document uses the following conventions. An example illustrates each convention.

Typographical

The following typographical conventions are used in this document:

Convention	Meaning or Use	Example
Courier font	Messages, prompts, and program files that the system displays	speed grade: - 100
Courier bold	Literal commands that you enter in a syntactical statement	ngdbuild <i>design_name</i>
Helvetica bold	Commands that you select from a menu	File → Open
	Keyboard shortcuts	Ctrl+C
<i>Italic font</i>	Variables in a syntax statement for which you must supply values	ngdbuild <i>design_name</i>
	References to other manuals	See the <i>Command Line Tools User Guide</i> for more information.
	Emphasis in text	If a wire is drawn so that it overlaps the pin of a symbol, the two nets are <i>not</i> connected.

Online Document

The following conventions are used in this document:

Convention	Meaning or Use	Example
Blue text	Cross-reference link to a location in the current document	See the section “ Additional Resources ” for details. Refer to “ Title Formats ” in Chapter 1 for details.
Blue, underlined text	Hyperlink to a website (URL)	Go to http://www.xilinx.com for the latest speed files.

ML628 Board Features and Operation

This chapter describes the components, features, and operation of the ML628 Virtex®-6 FPGA GTX and GTH transceiver characterization board. The ML628 board provides the hardware environment for characterizing and evaluating the GTX and GTH transceivers available on the Virtex-6 XC6VHX380T-2C FFG1923 FPGA. ML628 schematics, bill-of-material (BOM), layout files and reference designs are available online at:

http://www.xilinx.com/products/boards/ml628/reference_designs.htm

ML628 Board Features

- Virtex-6 XC6VHX380T-2C FFG1923 FPGA
- On-board power supplies for all necessary voltages
- Power supply jacks for optional use of external power supplies
- JTAG configuration port for use with Platform Cable USB or Parallel Cable III/IV cables
- System ACE™ controller
- Separate power modules supporting all Virtex-6 FPGA GTX and GTH transceiver power requirements
- A fixed, 200 MHz 2.5V LVDS oscillator wired to global clock inputs
- Two single-ended global clock inputs with SMA connectors
- Two pairs of differential global clock inputs with SMA connectors
- SuperClock-2 module supporting multiple frequencies
- Six Samtec BullsEye connector pads for the GTH transceivers and reference clocks
- Ten Samtec BullsEye connector pads for the GTX transceivers and reference clocks
- Power status LEDs
- General purpose DIP switches, LEDs, push buttons, and test I/O
- Two VITA 57.1 FMC HPC connectors
- USB to UART bridge
- I²C bus
- PMBus connectivity to on-board digital power supplies
- Active cooling for the FPGA

The ML628 board block diagram is shown in [Figure 1-1](#).

Caution! The ML628 board can be damaged by electrostatic discharge (ESD). Follow standard ESD prevention measures when handling the board.

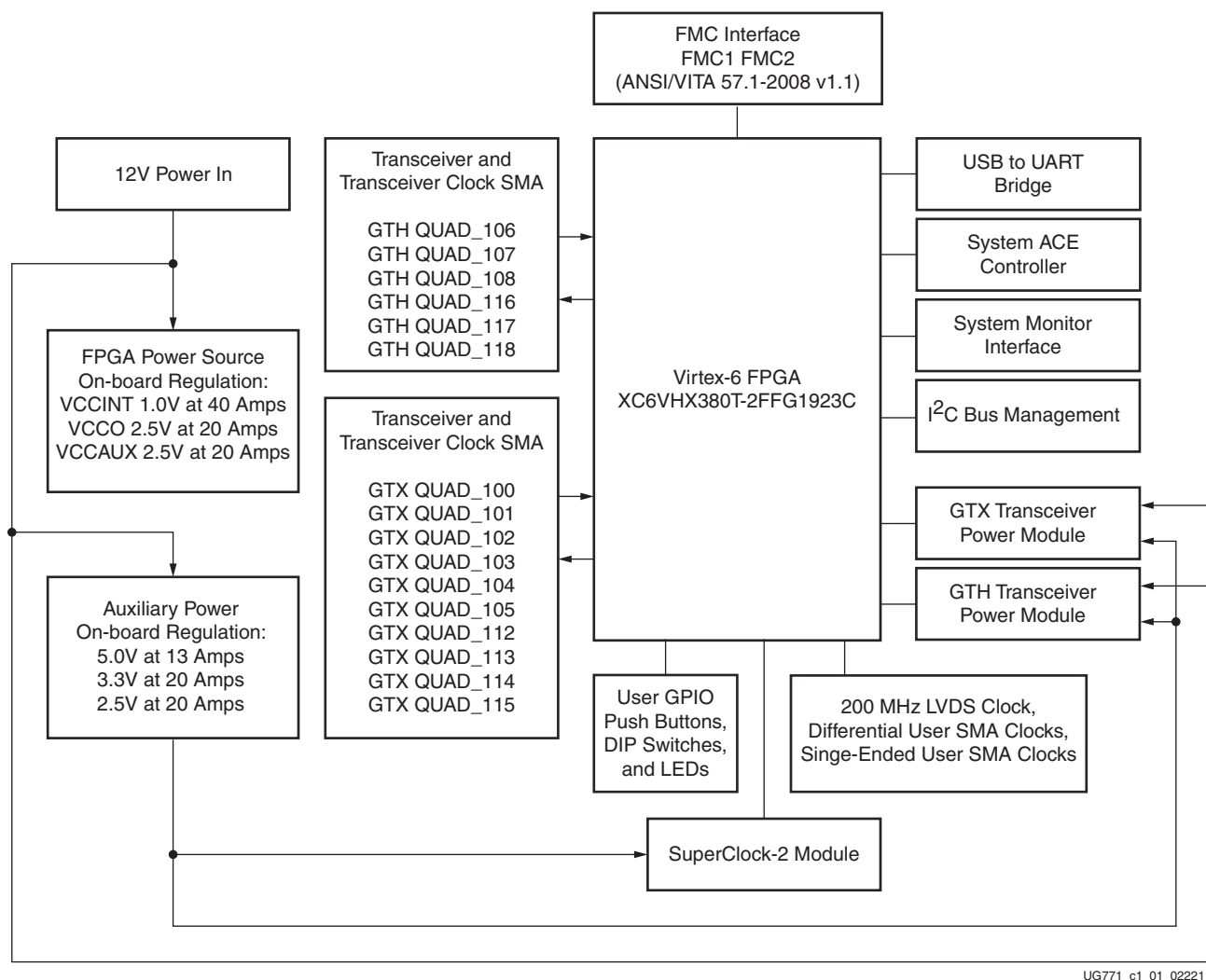
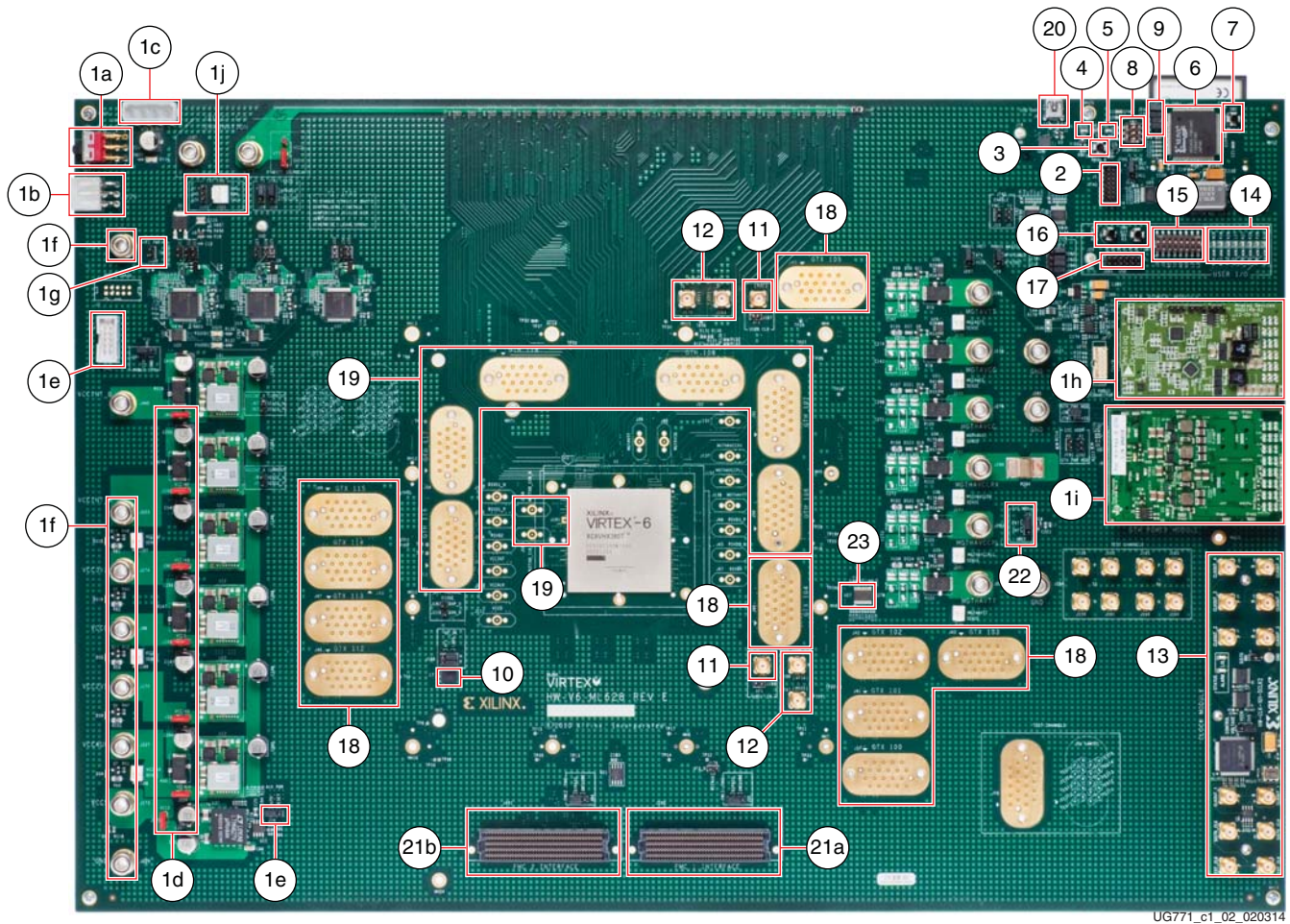


Figure 1-1: ML628 Board Block Diagram

Detailed Description

[Figure 1-2](#) shows the ML628 board described in this user guide. Each numbered feature that is referenced in [Figure 1-2](#) is described in the sections that follow.

Note: [Figure 1-2](#) is for reference only and might not reflect the current revision of the board.



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- | | |
|---|---|
| 1a Main power switch (SW1) | 9 JTAG isolation jumpers (J22, J23, J195, J196) |
| 1b 12V Mini-Fit connector (J122) | 10 200 MHz 2.5V LVDS oscillator (U7) |
| 1c 12V ATX connector (J141) | 11 Single-ended SMA global clock input (J171, J172) |
| 1d Power regulation jumpers (J30, J32, J61, J102, J104, J105, J129) | 12 Differential SMA global clock inputs (J167 - J170) |
| 1e Regulation inhibit (J289) | 13 SuperClock-2 module |
| 1f External power supply jacks | 14 User LEDs, active High (DS10 - DS17) |
| 1g TI PMBus connector (J14) | 15 User DIP switches, active High (SW7) |
| 1h GTX transceiver power supply module | 16 User push buttons, active High (SW4, SW6) |
| 1i GTH transceiver power supply module | 17 User test I/O (J285) |
| 1j Active cooling power connector (J221) | 18 GTX transceiver Connector Pad |
| 2 FPGA configuration connector (J1) | 19 GTH transceiver Connector Pad |
| 3 PROG_B push button, active Low (SW5) | 20 USB to UART bridge (J9 and U26) |
| 4 DONE LED (DS6) | 21a FMC1 connector (J290) |
| 5 INIT LED (DS20) | 21b FMC2 connector (J441) |
| 6 System ACE controller (U25) | 22 System Monitor |
| 7 System ACE reset, active Low (SW2) | 23 I ² C bus management (U27) |
| 8 Configuration address DIP switch (SW3) | |

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Figure 1-2: ML628 Board Features

Power Management

Numbers 1a through 1j refer to the callouts in [Figure 1-2](#):

- 1a: Main power switch (SW1)
- 1b: 12V Mini-Fit connector (J122)
- 1c: 12V ATX connector (J141)
- 1d: Power regulation jumpers (J30, J32, J61, J102, J104, J105, J129)
- 1e: Regulation inhibit (J289)
- 1f: External power supply jacks (J234, J440, J223, J174, J98, J175, J227, J173, J220)
- 1g: TI PMBus cable connector (J14)
- 1h: GTX transceiver power supply module
- 1i: GTH transceiver power supply module
- 1j: Active heatsink power connector

Board Power and Switch

The ML628 board is powered through J122 using the 12V AC adapter included with the board. J122 is a 6-pin (2 x 3) right angle Mini-Fit type connector.

Caution! Do **NOT** plug a PC ATX power supply 6-pin connector into J122 on the ML628 board. The ATX 6-pin connector has a different pinout than J122. Connecting an ATX 6-pin connector into J122 will damage the ML628 board and void the board warranty.

Power can also be provided through:

- Connector J141 which accepts an ATX hard disk 4-pin power plug
- Jack J234 which can be used to connect to a bench-top power supply

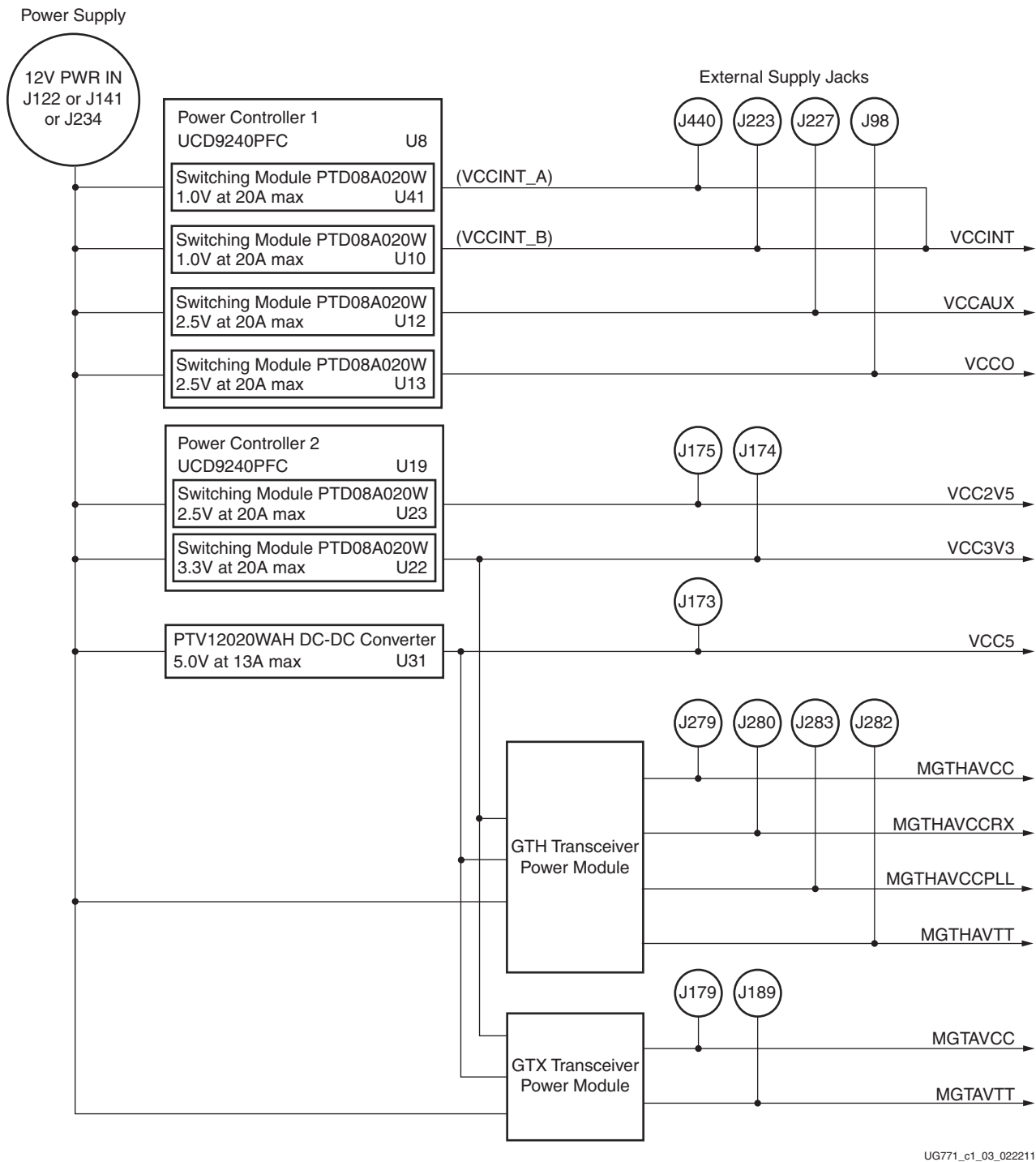
Caution! Do **NOT** apply power to J122 and connectors J141 and/or J234 at the same time. Doing so will damage the ML628 board.

The ML628 board power is turned on or off by switch SW1. When the switch is in the ON position, power is applied to the board and a green LED (DS36) illuminates.

Onboard Power Regulation

Figure 1-3 shows the onboard power supply architecture.

Note: Power regulation jumpers are not shown in Figure 1-3.



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Figure 1-3: ML628 Board Power Supply Block Diagram

The ML628 board uses power regulators and PMBus compliant digital PWM system controllers from Texas Instruments to supply the core and auxiliary voltages listed in [Table 1-1](#). The board can also be configured to use external bench power supply for each voltage. See [Using External Power Sources](#).

Table 1-1: Onboard Power System Devices

Device	Reference Designator	Description	Power Rail Net Name	Typical Voltage	Power Regulation Jumper	External Supply Jack
Core voltage controller and regulators						
UCD9240PFC	U8	PMBus compliant digital PWM system controller (address = 52)				
PTD08A020W	U10	Adjustable switching regulator 20A, 0.6V to 3.6V	VCCINT ¹	1.0V	J102	J223
PTD08A020W	U41	Adjustable switching regulator 20A, 0.6V to 3.6V	VCCINT (VCCINT_B)	1.0V	J61	J440
PTD08A020W	U12	Adjustable switching regulator 20A, 0.6V to 3.6V	VCCAUX	2.5V	J104	J227
PTD08A020W	U13	Adjustable switching regulator 20A, 0.6V to 3.6V	VCCO	2.5V	J105	J98
Auxiliary voltage controller and regulators						
UCD9240PFC	U19	PMBus compliant digital PWM system controller (address = 53)				
PTD08A020W	U23	Adjustable switching regulator 20A, 0.6V to 3.6V	VCC2V5	2.5V	J31	J175
PTD08A020W	U22	Adjustable switching regulator 20A, 0.6V to 3.6V	VCC3V3	3.3V	J30	J174
5V auxiliary power						
PTV12020WAH	U31	Switching regulator 13A, 5.0V	VCC5	5.0V	J129	J173
Notes:						
1. The UCD9240PCF (U8) synchronizes the PTD power stages (U10 and U41) so that a maximum of 40A can be supplied to the VCCINT rail						

Using External Power Sources

The maximum output current rating for each power regulator is listed in [Table 1-1](#). If a design exceeds this value on any power rail, power for that rail must be supplied through the external power jack using a supply capable of providing the required current.

Each power rail has a corresponding jack and jumper that is used to supply voltage to the rail using an external power supply. The jack, jumper, and regulator for each power rail is listed in [Table 1-1](#).

Caution! The power regulation jumper (see [Power Regulation Jumper](#) column in [Table 1-1](#)) must be removed before applying external power to the power rail through its corresponding supply jack.

Caution! The external power supply jacks have a maximum current rating of 15A.

Disabling Onboard Power

Voltage regulators U10, U12, U13, U22, U23, and U41 are disabled by installing a jumper at J289 (TI PWR INHIBIT). Voltage regulator U31 is disabled by installing a jumper across pins 2–3 of header J24 (AUX POR - RESET).

Default Jumper Positions

A list of shunts and shorting plugs and their required positions for normal board operation is provided in [Appendix A, Default Jumper Positions](#).

Monitoring Voltage and Current

Voltage and current monitoring and control are available for selected power rails through Texas Instruments' Fusion Digital Power graphical user interface (GUI). The three onboard TI power controllers (U8 at PMBUS address 52, U19 at PMBUS address 53, and U32 at PMBUS address 54) are wired to the same PMBus. The PMBus connector, J14, is provided for use with the TI USB Interface Adapter PMBus pod and associated TI GUI.

References

More information about the power system components used by the ML628 board are available from the Texas Instruments digital power website at:

<http://www.ti.com/ww/en/analog/digital-power/index.html>

GTH Transceiver Power Module

The GTH transceiver power module supplies MGTHAVCC, MGTHAVCCR_X, MGTHAVTT and MGTHAVCCPLL voltages to the FPGA GTH transceivers. Two GTH power modules are provided with the ML628 board for evaluation. Either of the modules can be plugged into the connectors J6 and J197 in the outlined and labeled power module location shown in [Figure 1-4](#).

Note: The GTH and GTX power modules have different connectors and form factors to prevent GTH modules from being connected to the GTX headers and vice versa.

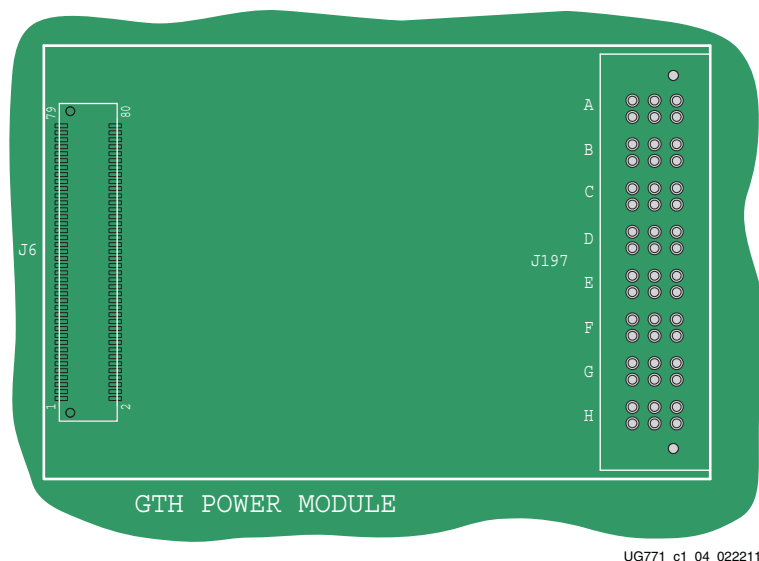


Figure 1-4: Mounting Location, GTH Transceiver Power Module

Table 1-2 describes the nominal voltage values for the MGTHAVCC, MGTHAVCCR_X, MGTHAVTT and MGTHAVCCPLL power rails. The table also lists the maximum current ratings for each rail supplied by either module.

Table 1-2: GTH Transceiver Power Module

Power Supply Rail Net Name	Nominal Voltage	Maximum Current Rating
MGTHAVCC	1.1V	5.10A
MGTHAVCCR _X	1.1V	3.45A
MGTHAVTT	1.2V	1.50A
MGTHAVCCPLL	1.8V	2.60A

The GTH transceiver power rails also have corresponding input voltage jacks to supply each voltage independently from a bench-top power supply. The external jacks are indicated in Table 1-3.

Caution! The GTH module **MUST** be removed when providing external power to the GTH transceiver rails.

Table 1-3: GTH External Supply Jacks

Power Supply Rail Net Name	External Supply Jack
MGTHAVCC	J279
MGTHAVCCR _X	J280
MGTHAVTT	J282
MGTHAVCCPLL	J283

GTX Transceiver Power Module

The GTX transceiver power module supplies MGTAVCC and MGTAVTT voltages to the FPGA GTX transceivers. Three GTX power modules are provided with the ML628 board for evaluation. Any one of the three modules can be plugged into connectors J34 and J179 in the outlined and labeled power module location shown in Figure 1-5.

Note: The GTX and GTH power modules have different connectors and form factors to prevent GTX modules from being connected to the GTH headers and vice versa.

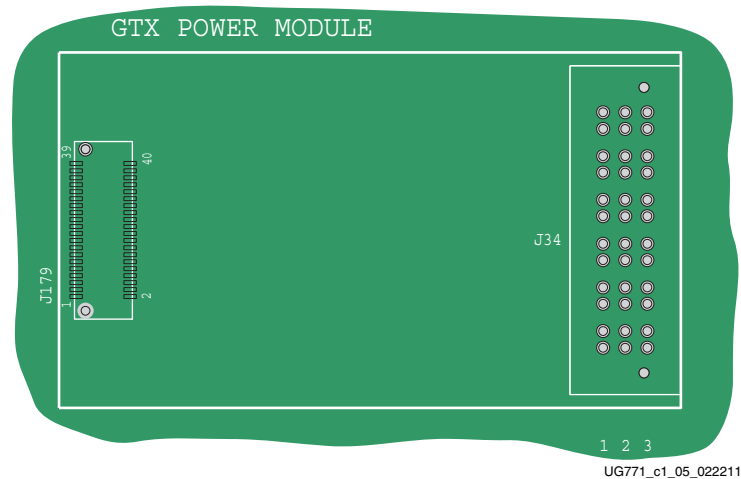


Figure 1-5: Mounting Location, GTX Transceiver Power Module

Table 1-4 describes the nominal voltage values for the MGTAVCC and MGTAVTT power rails. It also lists the maximum current ratings for each rail supplied by GTX modules included with the ML628 board.

Caution! The Intersil module features an MGTAVCC voltage adjust header, J1. Make sure to **REMOVE** any jumper across J1 before powering the board with the Intersil module installed. Failure to do so may damage the FPGA.

Table 1-4: GTX Transceiver Power Module

Power Supply Rail Net Name	Nominal Voltage	Maximum Current Rating
MGTAVCC	1.025V	10A
MGTAVTT	1.2V	6A

The GTX transceiver power rails also have corresponding input voltage jacks to supply each voltage independently from a bench-top power supply (The external jacks are shown in Table 1-4).

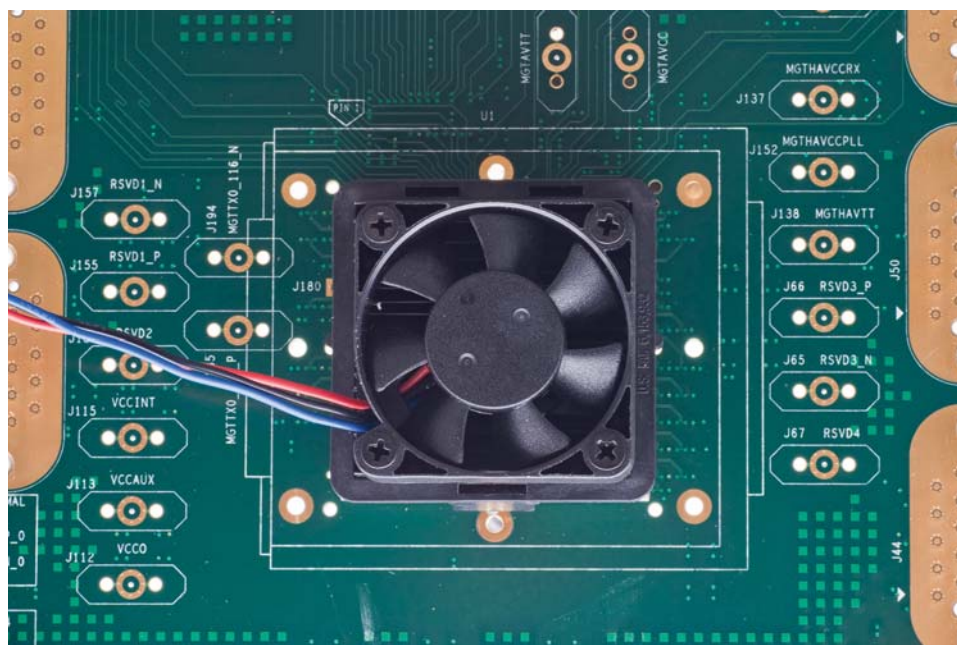
Caution! The GTX module **MUST** be removed when providing external power to the GTX transceiver rails.

Table 1-5: GTX External Supply Jacks

Power Supply Rail Net Name	External Supply Jack
MGTHAVCC	J279
MGTHAVCCR	J280
MGTHAVTT	J282
MGTHAVCCPLL	J283

Active Heatsink Power Connector

An active heatsink is provided for the FPGA (Figure 1-6). A 12V fan is affixed to the heatsink and is powered from the 3-pin header J101.



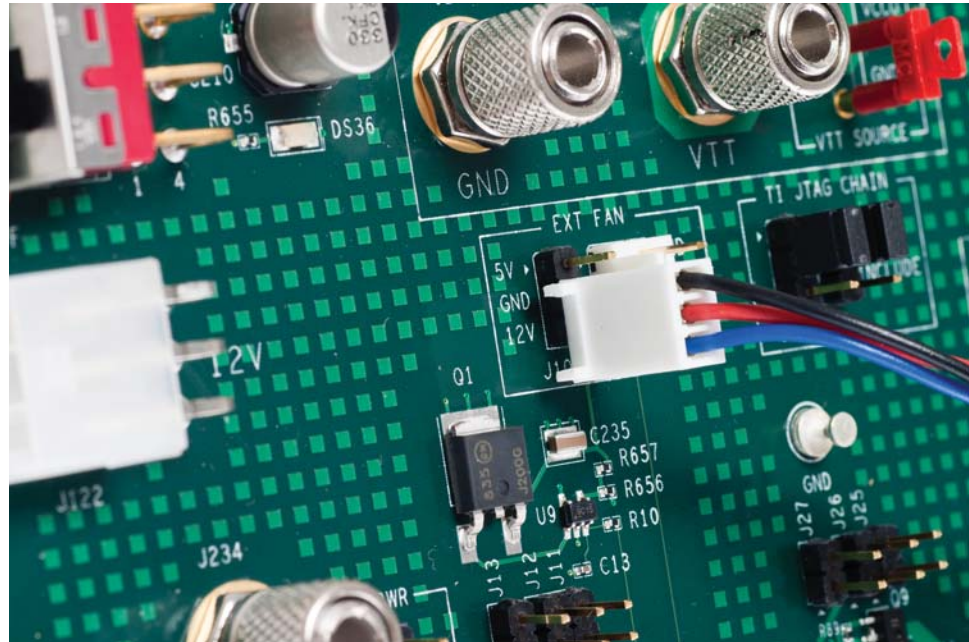
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Figure 1-6: Active Heatsink

The fan power connections are detailed in [Table 1-6](#) and shown in [Figure 1-7](#).

Table 1-6: Fan Power Connections

Fan Wire	Header
Black	J101 - GND
Red	J101 - 12V
Blue	Not Connected



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Figure 1-7: Fan Power Connector (J101)

FPGA Configuration

[Figure 1-2, callout 2]

The FPGA is configured in JTAG mode only using one of the following options:

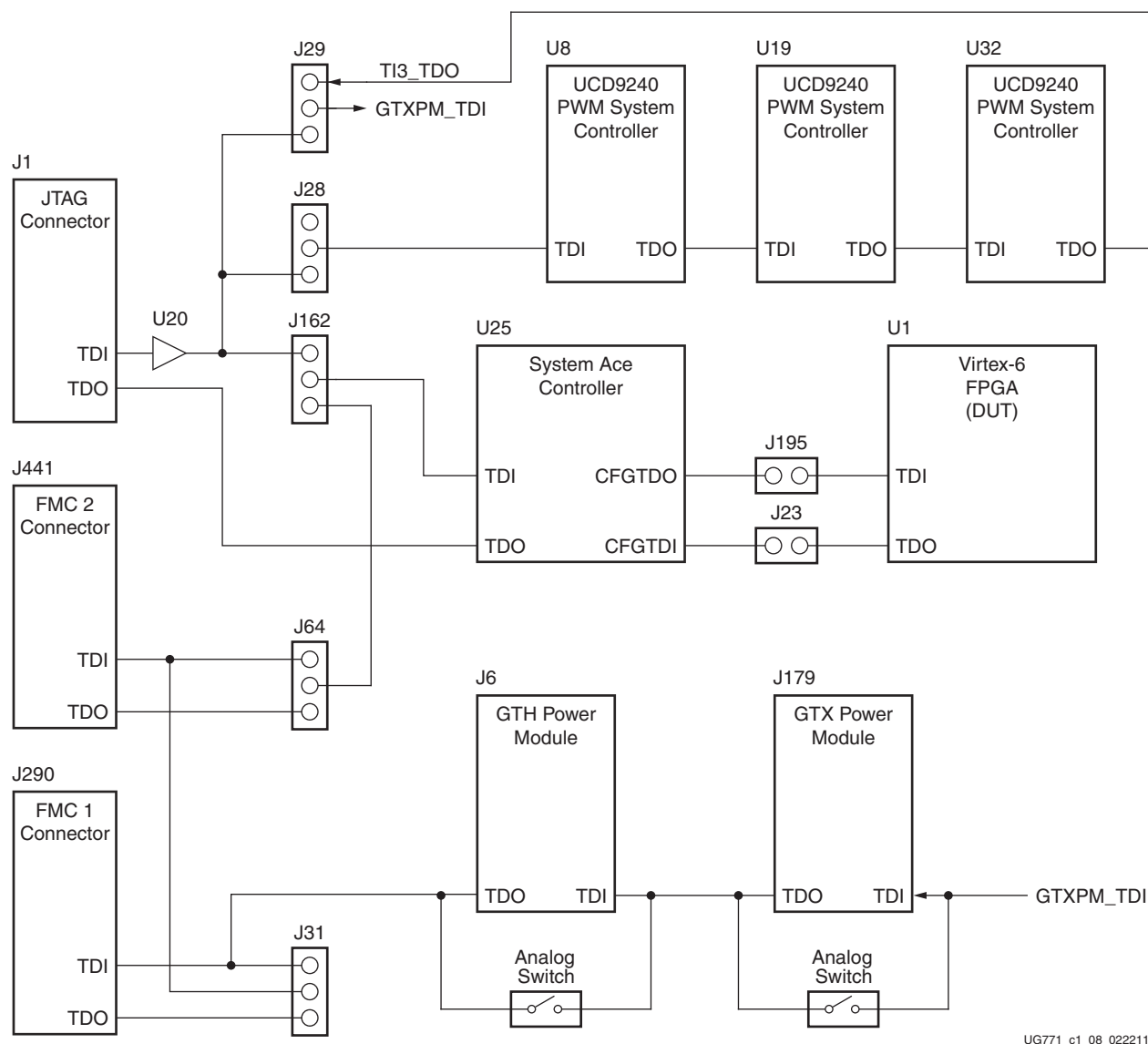
- Platform Cable USB
- Parallel Cable IV
- Parallel Cable III
- System ACE controller

Detailed information on the System ACE controller is available in [DS080](#), *System ACE CompactFlash Solution*.

The FPGA is configured through one of the aforementioned cables by connecting the cable to the JTAG cable connector, J1.

The FPGA is configured through the System ACE controller by setting the 3-bit configuration address DIP switches (SW3) to select one of eight bitstreams stored on a CompactFlash memory card (see [Configuration Address DIP Switches](#), page 19).

The JTAG chain of the board is illustrated in [Figure 1-8](#) (the four System ACE interface isolation jumpers described in [JTAG Isolation Jumpers](#) are not shown). Shorting pins 1–2 on header J162 automatically bypasses the FMC modules, GTH transceiver power supply module and GTX transceiver power supply module in the chain.



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Figure 1-8: JTAG Chain

PROG_B Push Button

[Figure 1-2, callout 3]

Pressing the PROG push button (SW5) grounds the active-Low program pin of the FPGA.

DONE LED

[Figure 1-2, callout 4]

The DONE LED (DS6) indicates the state of the DONE pin of the FPGA. When the DONE pin is High, DS6 lights indicating the FPGA is successfully configured.

INIT LED

[Figure 1-2, callout 5]

The INIT LED (DS20) lights during FPGA initialization.

System ACE Controller

[Figure 1-2, callout 6]

The onboard System ACE controller (U25) allows storage of multiple configuration files on a CompactFlash card. These configuration files can be used to program the FPGA. The CompactFlash card connects to the CompactFlash card connector (U24) located directly below the System ACE controller on the back side of the board.

System ACE Controller Reset

[Figure 1-2, callout 7]

Pressing push button SW2 (RESET) resets the System ACE controller. Reset is an active-Low input.

Configuration Address DIP Switches

[Figure 1-2, callout 8]

DIP switch SW3 selects one of the eight configuration bitstream addresses in the CompactFlash memory card. The switch settings for selecting each address are shown in Table 1-7.

Table 1-7: SW3 DIP Switch Configuration

Address	ADR2	ADR1	ADR0
0	O ⁽¹⁾	O	O
1	O	O	C ⁽²⁾
2	O	C	O
3	O	C	C
4	C	O	O
5	C	O	C
6	C	C	O
7	C	C	C

Notes:

1. O indicates the open switch position (logic 0).
2. C indicates the closed switch position (logic 1).

JTAG Isolation Jumpers

[Figure 1-2, callout 9]

The group of four 2-pin headers shown in Figure 1-9 provide the option to isolate the FPGA JTAG interface from the System ACE controller by removing the shunts from all

four headers. The FPGA JTAG interface can also be driven directly from these headers by attaching the flying wire JTAG cable to pin 2 of each header. Figure 1-9 shows a more detailed representation of the isolation jumpers as part of the broader JTAG chain in Figure 1-8.

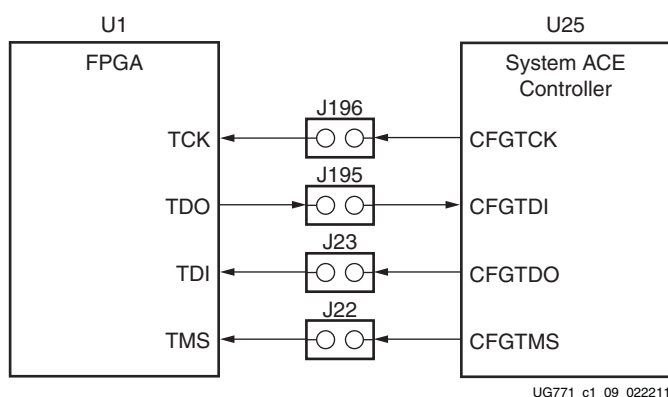


Figure 1-9: JTAG Isolation Jumpers

Table 1-8 indicates the FPGA pin name associated with each jumper.

Table 1-8: JTAG Isolation Jumpers

Reference Designator	FPGA Pin Name
J22	TMS
J23	TDI
J195	TDO
J196	TCK

200 MHz 2.5V LVDS Oscillator

[Figure 1-2, callout 10]

The ML628 board has one 2.5V LVDS differential 200 MHz oscillator (U7) connected to the FPGA global clock inputs. Table 1-9 lists the FPGA pin connections to the LVDS oscillator. The 200 MHz differential clock is enabled by placing two shunts (P, N) across J188 header pins 1–3 and 2–4 (LVDS).

Table 1-9: LVDS Oscillator Global Clock Connections

FPGA Pin	Net Name	U7 Pin
AK13	IIO_LVDS_GC_34_P	4
AK12	IO_LVDS_GC_34_N	5

Single-Ended SMA Global Clock Inputs

[Figure 1-2, callout 11]

The ML628 board provides two single-ended clock input SMA connectors that can be used for connecting to an external function generator. The FPGA clock pins are connected to the SMA connectors as shown in Table 1-10.

To use these clock inputs, remove jumpers across AFX SEL headers J186 and J187.

Table 1-10: Single-Ended SMA Clock Connections

FPGA Pin	Net Name	SMA Connector
AP33	CLK_1	J171
R31	CLK_2	J172

Differential SMA Global Clock Inputs

[Figure 1-2, callout 12]

The ML628 board provides two pairs of differential SMA transceiver clock inputs that can be used for connecting to an external function generator. The FPGA clock pins are connected to the SMA connectors as shown in Table 1-11.

Table 1-11: Differential SMA Clock Connections

FPGA Pin	Net Name	SMA Connector
AN33	CLK_DIFF_1_P	J167
AP33	CLK_DIFF_1_N	J168
J33	CLK_DIFF_2_P	J169
H33	CLK_DIFF_2_N	J170

SuperClock-2 Module

[Figure 1-2, callout 13]

The SuperClock-2 module connects to the clock module interface connector (J32) and provides a programmable, low-noise and low-jitter clock source for the ML628 board. The clock module maps to FPGA I/O by way of 24 control pins, 3 LVDS pairs, 1 regional clock pair, and 1 reset pin. Table 1-12 shows the FPGA I/O mapping for the SuperClock-2 module interface. The ML628 board also supplies 5V, 3.3V, and 2.5V input power to the clock module interface.

Table 1-12: SuperClock-2 FPGA I/O Mapping

FPGA Pin	Net Name	J32 Pin
B35	CM_LVDS1_P	1
B36	CM_LVDS1_N	3
C12	CM_LVDS2_P	9
C11	CM_LVDS2_N	11
BC33	CM_LVDS3_P	17
BD33	CM_LVDS3_N	19
A23	CM_GCLK_P	25
A24	CM_GCLK_N	27
G26	CM_CTRL_0	61

Table 1-12: SuperClock-2 FPGA I/O Mapping (Cont'd)

FPGA Pin	Net Name	J32 Pin
G25	CM_CTRL_1	63
H23	CM_CTRL_2	65
J23	CM_CTRL_3	67
J25	CM_CTRL_4	69
K25	CM_CTRL_5	71
D26	CM_CTRL_6	73
E26	CM_CTRL_7	75
D25	CM_CTRL_8	77
E25	CM_CTRL_9	79
M25	CM_CTRL_10	81
M24	CM_CTRL_11	83
A25	CM_CTRL_12	85
B25	CM_CTRL_13	87
L25	CM_CTRL_14	89
L24	CM_CTRL_15	91
B24	CM_CTRL_16	93
C23	CM_CTRL_17	95
C24	CM_CTRL_18	97
D23	CM_CTRL_19	99
K23	CM_CTRL_20	101
L23	CM_CTRL_21	103
B26	CM_CTRL_22	105
C26	CM_CTRL_23	107
D24	CM_RST	66

User LEDs (Active High)

[Figure 1-2, callout 14]

DS10 through DS17 are eight active-High LEDs that are connected to user I/O pins on the FPGA as shown in Table 1-13. These LEDs can be used to indicate status or any other purpose determined by the user.

Table 1-13: User LEDs

FPGA Pin	Net Name	Reference Designator
N28	APP_LED1	DS17
P28	APP_LED2	DS16
K28	APP_LED3	DS15
L27	APP_LED4	DS14
K27	APP_LED5	DS13
K26	APP_LED6	DS12
P26	APP_LED7	DS11
R26	APP_LED8	DS10

User DIP Switches (Active High)

[Figure 1-2, callout 15]

The DIP switch SW7 provides a set of eight active-High switches that are connected to user I/O pins on the FPGA as shown in Table 1-14. These pins can be used to set control pins or any other purpose determined by the user.

Table 1-14: User DIP Switches

FPGA Pin	Net Name	Reference Designator
J29	USER_SW1	SW7
J28	USER_SW2	
R27	USER_SW3	
T27	USER_SW4	
H29	USER_SW5	
H28	USER_SW6	
L29	USER_SW7	
L28	USER_SW8	

User Push Buttons (Active High)

[Figure 1-2, callout 16]

SW5 and SW6 are active-High user push buttons that are connected to user I/O pins on the FPGA as shown in Table 1-15. These switches can be used for any purpose determined by the user.

Table 1-15: User Push Buttons

FPGA Pin	Net Name	Reference Designator
A27	USER_PB1	SW6
B27	USER_PB2	SW4

User Test I/O

[Figure 1-2, callout 17]

A standard 2 x 6, 100-mil pitch header (J285) brings out 6 FPGA I/O for test purposes.

Table 1-16 lists these pins.

Table 1-16: User Test I/O

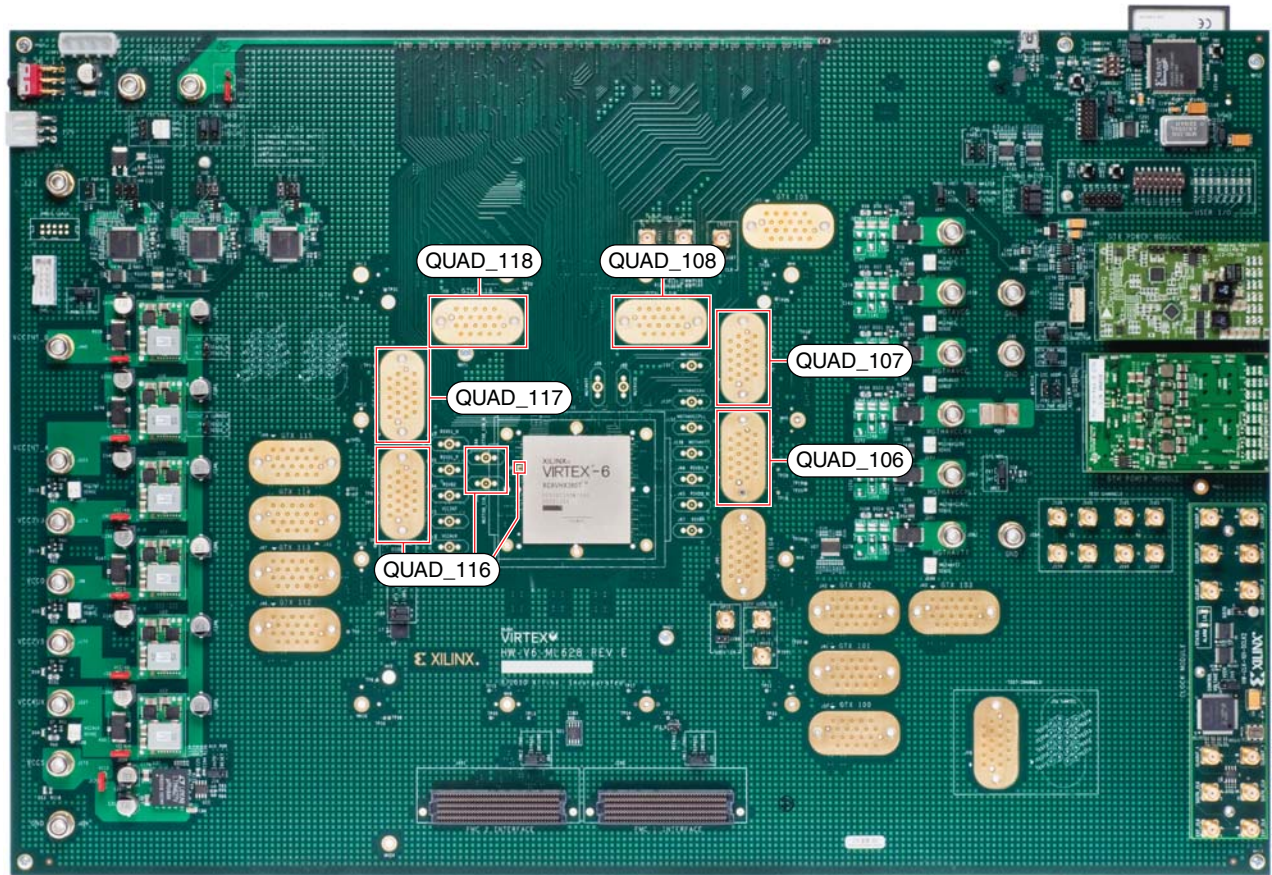
FPGA Pin	Net Name	J285 Pin
M26	USER_I0_1	2
N26	USER_I0_2	4
C28	USER_I0_3	6
C27	USER_I0_4	8
A29	USER_I0_5	10
A28	USER_I0_6	12

GTH Transceivers and Reference Clocks

[Figure 1-2, callout 19]

The ML628 board provides access to all GTH transceiver and reference clock pins on the FPGA as shown in Figure 1-10. The GTH transceivers are grouped into six sets of four RX-TX “lanes.” Four lanes are referred to as a “Quad.”

Note: Figure 1-10 is for reference only and might not reflect the current revision of the board.



UG771_c1_10_030111

Figure 1-10: GTH Quad Locations

Each GTH Quad and its associated reference clock (CLK0) are routed from the FPGA to a connector pad which is designed to interface with Samtec BullsEye connectors such as the Samtec HDR-155805-01-BEYE cable assembly. Contact Samtec, Inc. for other cable assemblies. Figure 1-11 “A” shows the connector pad. Figure 1-11 “B” shows the connector pinout.

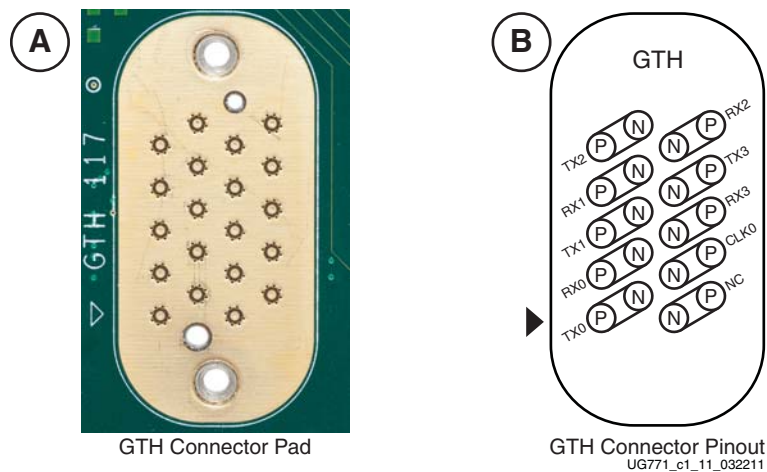


Figure 1-11: A – GTH BullsEye Connector Pad. B – GTH BullsEye Connector Pad

Two GTH transmitters are *not* connected to a BullsEye connector pad. These are transmitter pairs MGTTX0_116_P / MGTTX0_116_N and MGTTX1_116_P / MGTTX1_116_N. To provide optimum test conditions for these transmitters, both pairs are routed on very short traces (less than 1-inch) to separate connectors located near the perimeter of the FPGA.

MGTTX0_116_P and MGTTX0_116_N are terminated to removable SMA connectors (Molex part number 73251-1851) J185 and J194, respectively. MGTTX1_116_P and MGTTX1_116_N are terminated to probe pad J180 (Figure 1-12).

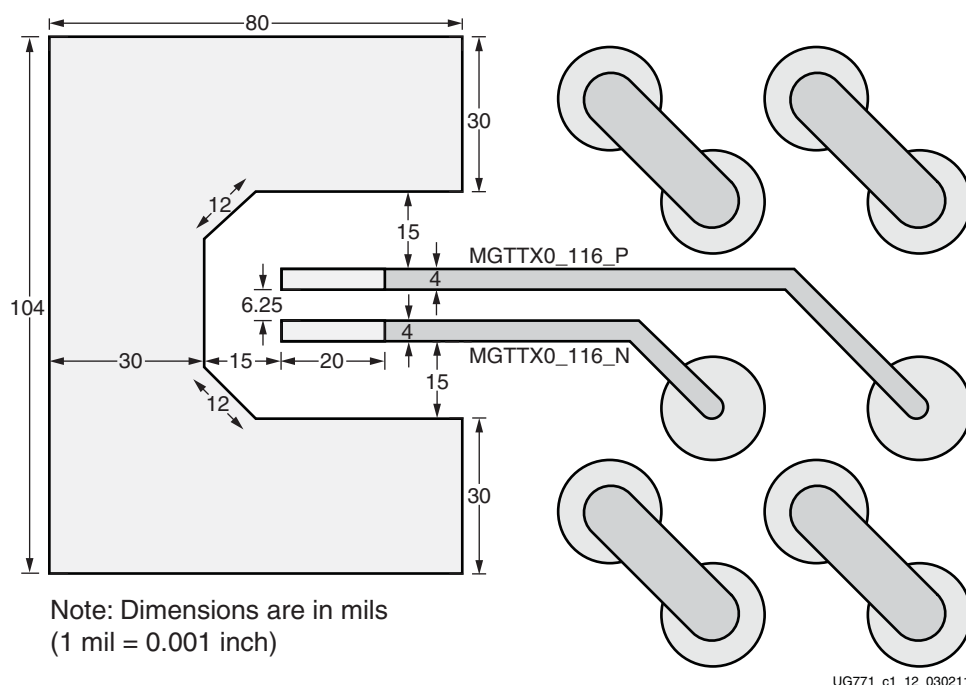


Figure 1-12: Microprobe Test Pad Dimensions (J180)

Information for each GTH transceiver pin is shown in Table 1-17.

Table 1-17: GTH Transceiver Pins

FPGA Pin	Net Name	Quad	Connector	Trace Length (Mils)
T43	MGTTX0_106_P	106	J50	3,025
T44	MGTTX0_106_N	106	J50	3,025
U41	MGTRX0_106_P	106	J50	2,135
U42	MGTRX0_106_N	106	J50	2,135
P43	MGTTX1_106_P	106	J50	3,337
P44	MGTTX1_106_N	106	J50	3,337
T39	MGTRX1_106_P	106	J50	2,250
T40	MGTRX1_106_N	106	J50	2,250
M43	MGTTX2_106_P	106	J50	2,793

Table 1-17: GTH Transceiver Pins (Cont'd)

FPGA Pin	Net Name	Quad	Connector	Trace Length (Mils)
M44	MGTTX2_106_N	106	J50	2,793
N37	MGTRX2_106_P	106	J50	2,192
N38	MGTRX2_106_N	106	J50	2,192
N41	MGTTX3_106_P	106	J50	2,800
N42	MGTTX3_106_N	106	J50	2,799
M39	MGTRX3_106_P	106	J50	2,711
M40	MGTRX3_106_N	106	J50	2,710
L41	MGTTX0_107_P	107	J51	3,050
L42	MGTTX0_107_N	107	J51	3,049
K39	MGTRX0_107_P	107	J51	2,919
K40	MGTRX0_107_N	107	J51	2,920
K43	MGTTX1_107_P	107	J51	3,890
K44	MGTTX1_107_N	107	J51	3,890
L37	MGTRX1_107_P	107	J51	3,184
L38	MGTRX1_107_N	107	J51	3,184
G41	MGTTX2_107_P	107	J51	3,905
G42	MGTTX2_107_N	107	J51	3,906
H39	MGTRX2_107_P	107	J51	3,407
H40	MGTRX2_107_N	107	J51	3,406
H43	MGTTX3_107_P	107	J51	3,865
H44	MGTTX3_107_N	107	J51	3,864
J37	MGTRX3_107_P	107	J51	3,525
J38	MGTRX3_107_N	107	J51	3,525
F43	MGTTX0_108_P	108	J52	3,644
F44	MGTTX0_108_N	108	J52	3,645
G37	MGTRX0_108_P	108	J52	2,791
G38	MGTRX0_108_N	108	J52	2,791
D43	MGTTX1_108_P	108	J52	2,677
D44	MGTTX1_108_N	108	J52	2,678
F39	MGTRX1_108_P	108	J52	2,528
F40	MGTRX1_108_N	108	J52	2,528
A41	MGTTX2_108_P	108	J52	2,349

Table 1-17: GTH Transceiver Pins (Cont'd)

FPGA Pin	Net Name	Quad	Connector	Trace Length (Mils)
A42	MGTTX2_108_N	108	J52	2,349
B39	MGTRX2_108_P	108	J52	2,207
B40	MGTRX2_108_N	108	J52	2,207
C41	MGTTX3_108_P	108	J52	2,874
C42	MGTTX3_108_N	108	J52	2,874
D39	MGTRX3_108_P	108	J52	2,564
D40	MGTRX3_108_N	108	J52	2,563
T2	MGTTX0_116_P	116	J185	3,565
T1	MGTTX0_116_N	116	J194	3,565
U4	MGTRX0_116_P	116	J53	967
U3	MGTRX0_116_N	116	J53	967
P2	MGTTX1_116_P	116	J180	3,704
P1	MGTTX1_116_N	116	J180	3,704
T6	MGTRX1_116_P	116	J53	132
T5	MGTRX1_116_N	116	J53	89
M2	MGTTX2_116_P	116	J53	2,766
M1	MGTTX2_116_N	116	J53	2,767
N8	MGTRX2_116_P	116	J53	3,214
N7	MGTRX2_116_N	116	J53	3,214
N4	MGTTX3_116_P	116	J53	2,911
N3	MGTTX3_116_N	116	J53	2,912
M6	MGTRX3_116_P	116	J53	3,052
M5	MGTRX3_116_N	116	J53	3,051
L4	MGTTX0_117_P	117	J54	2,898
L3	MGTTX0_117_N	117	J54	2,899
K6	MGTRX0_117_P	117	J54	3,144
K5	MGTRX0_117_N	117	J54	3,145
K2	MGTTX1_117_P	117	J54	3,926
K1	MGTTX1_117_N	117	J54	3,927
L8	MGTRX1_117_P	117	J54	3,156
L7	MGTRX1_117_N	117	J54	3,156
G4	MGTTX2_117_P	117	J54	3,269

Table 1-17: GTH Transceiver Pins (Cont'd)

FPGA Pin	Net Name	Quad	Connector	Trace Length (Mils)
G3	MGTTX2_117_N	117	J54	3,268
H6	MGTRX2_117_P	117	J54	3,475
H5	MGTRX2_117_N	117	J54	3,474
H2	MGTTX3_117_P	117	J54	2,717
H1	MGTTX3_117_N	117	J54	2,717
J8	MGTRX3_117_P	117	J54	2,902
J7	MGTRX3_117_N	117	J54	2,901
F2	MGTTX0_118_P	118	J55	3,492
F1	MGTTX0_118_N	118	J55	3,492
G8	MGTRX0_118_P	118	J55	3,433
G7	MGTRX0_118_N	118	J55	3,434
D2	MGTTX1_118_P	118	J55	2,864
D1	MGTTX1_118_N	118	J55	2,865
F6	MGTRX1_118_P	118	J55	3,151
F5	MGTRX1_118_N	118	J55	3,152
A4	MGTTX2_118_P	118	J55	2,271
A3	MGTTX2_118_N	118	J55	2,271
B6	MGTRX2_118_P	118	J55	2,518
B5	MGTRX2_118_N	118	J55	2,518
C4	MGTTX3_118_P	118	J55	2,560
C3	MGTTX3_118_N	118	J55	2,561
D6	MGTRX3_118_P	118	J55	2,426
D5	MGTRX3_118_N	118	J55	2,426

Information for each GTH transceiver clock input is shown in [Table 1-18](#).

Table 1-18: GTH Transceiver Clock Inputs to the FPGA

FPGA Pin	Net Name	Quad	Connector
R41	MGTREFCLK_106_P	106	J50
R42	MGTREFCLK_106_N	106	J50
J41	MGTREFCLK_107_P	107	J51
J42	MGTREFCLK_107_N	107	J51
E41	MGTREFCLK_108_P	108	J52
E42	MGTREFCLK_108_N	108	J52

Table 1-18: GTH Transceiver Clock Inputs to the FPGA (Cont'd)

FPGA Pin	Net Name	Quad	Connector
R4	MGTREFCLK_116_P	116	J53
R3	MGTREFCLK_116_N	116	J53
J4	MGTREFCLK_117_P	117	J54
J3	MGTREFCLK_117_N	117	J54
E4	MGTREFCLK_118_P	118	J55
E3	MGTREFCLK_118_N	118	J55

GTX Transceivers and Reference Clocks

[Figure 1-2, callout 18]

The ML628 board provides access to all GTX transceiver and reference clock pins on the FPGA as shown in Figure 1-13. The GTX transceivers are grouped into six sets of four RX-TX “lanes.” Four lanes are referred to as a “Quad.”

Note: Figure 1-13 is for reference only and might not reflect the current revision of the board.

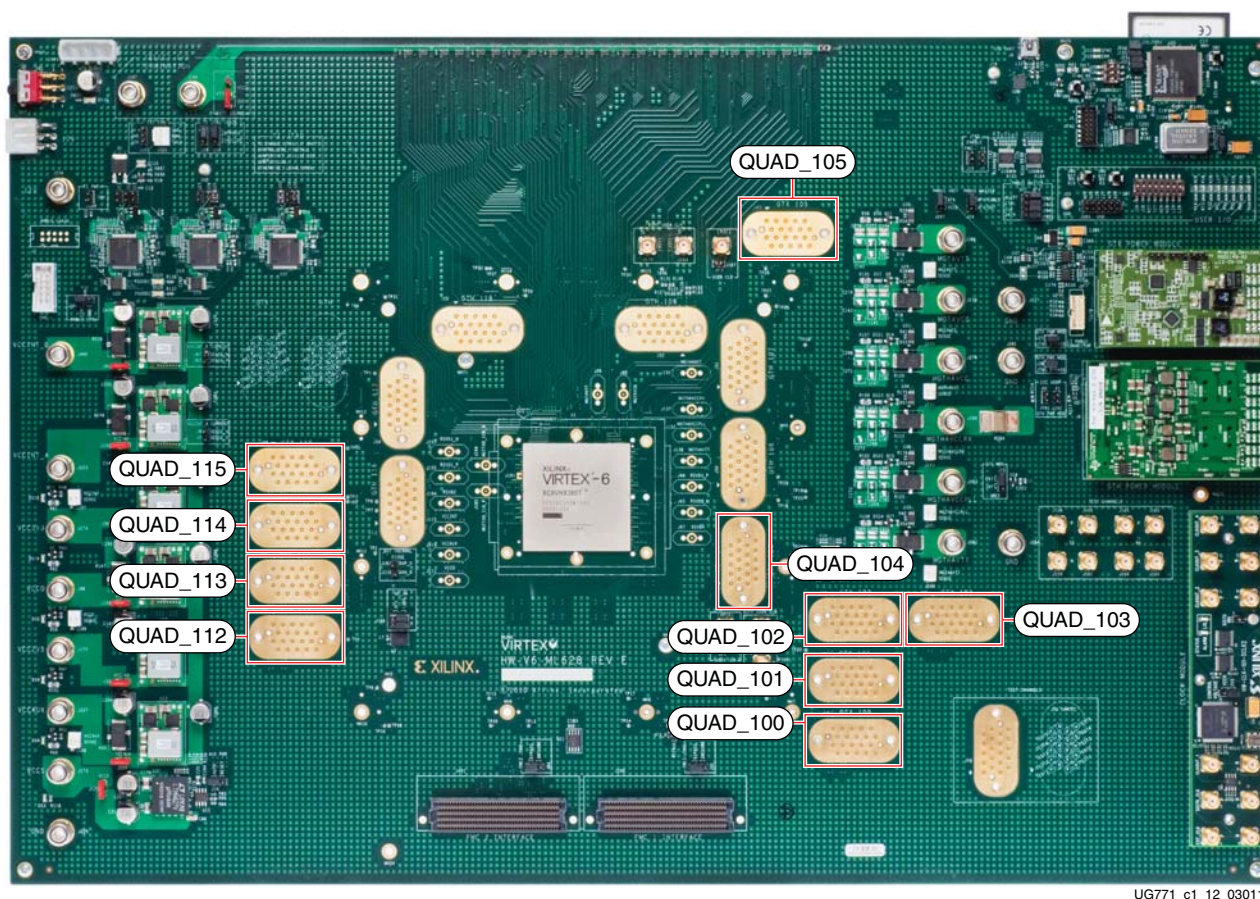


Figure 1-13: GTX Transceiver and Reference Clock SMA Locations

Each GTX Quad and its associated reference clocks (CLK0 and CLK1) are brought out to a connector pad which is designed to interface with Samtec BullsEye connectors such as the Samtec HDR-155805-01-BEYE cable assembly. Contact Samtec, Inc. for information about other cable assemblies. [Figure 1-14 “A”](#) shows the connector pad. [Figure 1-14 “B”](#) shows the connector pinout.

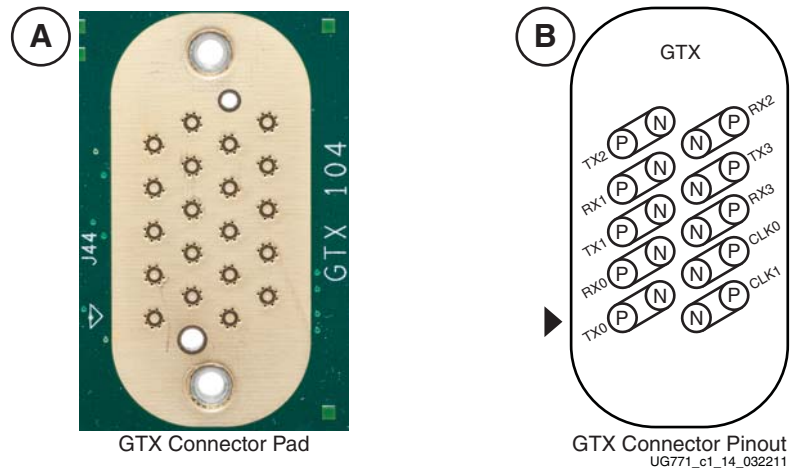


Figure 1-14: A – GTX BullsEye Connector Pad. B – GTX BullsEye Connector Pad

Information for each GTX transceiver pin is shown in [Table 1-19](#).

Table 1-19: GTX Transceiver Pins

FPGA Pin	Net Name	Quad	Connector	Trace Length (Mils)
BB44	MGTTX0_100_P	100	J37	5,825
BB43	MGTTX0_100_N	100	J37	5,825
BD40	MGTRX0_100_P	100	J37	5,316
BD39	MGTRX0_100_N	100	J37	5,316
AY44	MGTTX1_100_P	100	J37	6,178
AY43	MGTTX1_100_N	100	J37	6,178
BC42	MGTRX1_100_P	100	J37	5,702
BC41	MGTRX1_100_N	100	J37	5,701
AW42	MGTTX2_100_P	100	J37	7,107
AW41	MGTTX2_100_N	100	J37	7,107
BB40	MGTRX2_100_P	100	J37	6,653
BB39	MGTRX2_100_N	100	J37	6,652
AV44	MGTTX3_100_P	100	J37	6,662
AV43	MGTTX3_100_N	100	J37	6,662
BA42	MGTRX3_100_P	100	J37	6,158
BA41	MGTRX3_100_N	100	J37	6,157

Table 1-19: GTX Transceiver Pins (Cont'd)

FPGA Pin	Net Name	Quad	Connector	Trace Length (Mils)
AU42	MGTTX0_101_P	101	J41	5,335
AU41	MGTTX0_101_N	101	J41	5,335
AY40	MGTRX0_101_P	101	J41	4,955
AY39	MGTRX0_101_N	101	J41	4,955
AT44	MGTTX1_101_P	101	J41	5,647
AT43	MGTTX1_101_N	101	J41	5,647
AV40	MGTRX1_101_P	101	J41	5,347
AV39	MGTRX1_101_N	101	J41	5,347
AR42	MGTTX2_101_P	101	J41	5,990
AR41	MGTTX2_101_N	101	J41	5,990
AT40	MGTRX2_101_P	101	J41	5,586
AT39	MGTRX2_101_N	101	J41	5,586
AP44	MGTTX3_101_P	101	J41	6,987
AP43	MGTTX3_101_N	101	J41	6,988
AP40	MGTRX3_101_P	101	J41	5,677
AP39	MGTRX3_101_N	101	J41	5,678
AN42	MGTTX0_102_P	102	J42	5,056
AN41	MGTTX0_102_N	102	J42	5,055
AL38	MGTRX0_102_P	102	J42	4,603
AL37	MGTRX0_102_N	102	J42	4,603
AM44	MGTTX1_102_P	102	J42	5,241
AM43	MGTTX1_102_N	102	J42	5,241
AM40	MGTRX1_102_P	102	J42	5,029
AM39	MGTRX1_102_N	102	J42	5,028
AL42	MGTTX2_102_P	102	J42	5,883
AL41	MGTTX2_102_N	102	J42	5,883
AJ38	MGTRX2_102_P	102	J42	5,468
AJ37	MGTRX2_102_N	102	J42	5,469
AK44	MGTTX3_102_P	102	J42	5,806
AK43	MGTTX3_102_N	102	J42	5,806
AK40	MGTRX3_102_P	102	J42	5,383
AK39	MGTRX3_102_N	102	J42	5,382

Table 1-19: GTX Transceiver Pins (Cont'd)

FPGA Pin	Net Name	Quad	Connector	Trace Length (Mils)
AJ42	MGTTX0_103_P	103	J43	6,626
AJ41	MGTTX0_103_N	103	J43	6,627
AH40	MGTRX0_103_P	103	J43	6,500
AH39	MGTRX0_103_N	103	J43	6,500
AH44	MGTTX1_103_P	103	J43	7,261
AH43	MGTTX1_103_N	103	J43	7,261
AG38	MGTRX1_103_P	103	J43	7,179
AG37	MGTRX1_103_N	103	J43	7,180
AG42	MGTTX2_103_P	103	J43	7,333
AG41	MGTTX2_103_N	103	J43	7,333
AF40	MGTRX2_103_P	103	J43	7,092
AF39	MGTRX2_103_N	103	J43	7,091
AF44	MGTTX3_103_P	103	J43	8,388
AF43	MGTTX3_103_N	103	J43	8,388
AE38	MGTRX3_103_P	103	J43	7,453
AE37	MGTRX3_103_N	103	J43	7,454
AE42	MGTTX0_104_P	104	J44	2,665
AE41	MGTTX0_104_N	104	J44	2,666
AD40	MGTRX0_104_P	104	J44	2,994
AD39	MGTRX0_104_N	104	J44	2,994
AD44	MGTTX1_104_P	104	J44	2,696
AD43	MGTTX1_104_N	104	J44	2,696
AC38	MGTRX1_104_P	104	J44	2,786
AC37	MGTRX1_104_N	104	J44	2,786
AC42	MGTTX2_104_P	104	J44	3,091
AC41	MGTTX2_104_N	104	J44	3,092
AB40	MGTRX2_104_P	104	J44	2,435
AB39	MGTRX2_104_N	104	J44	2,436
AB44	MGTTX3_104_P	104	J44	3,846
AB43	MGTTX3_104_N	104	J44	3,847
AA38	MGTRX3_104_P	104	J44	3,139
AA37	MGTRX3_104_N	104	J44	3,140

Table 1-19: GTX Transceiver Pins (Cont'd)

FPGA Pin	Net Name	Quad	Connector	Trace Length (Mils)
AA42	MGTTX0_105_P	105	J45	8,305
AA41	MGTTX0_105_N	105	J45	8,305
Y40	MGTRX0_105_P	105	J45	7,237
Y39	MGTRX0_105_N	105	J45	7,236
Y44	MGTTX1_105_P	105	J45	7,068
Y43	MGTTX1_105_N	105	J45	7,068
W38	MGTRX1_105_P	105	J45	7,455
W37	MGTRX1_105_N	105	J45	7,456
W42	MGTTX2_105_P	105	J45	6,717
W41	MGTTX2_105_N	105	J45	6,717
V40	MGTRX2_105_P	105	J45	8,331
V39	MGTRX2_105_N	105	J45	8,331
V44	MGTTX3_105_P	105	J45	6,213
V43	MGTTX3_105_N	105	J45	6,212
U38	MGTRX3_105_P	105	J45	7,386
U37	MGTRX3_105_N	105	J45	7,385
AN3	MGTTX0_112_P	112	J46	6,021
AN4	MGTTX0_112_N	112	J46	6,020
AL7	MGTRX0_112_P	112	J46	5,915
AL8	MGTRX0_112_N	112	J46	5,914
AM1	MGTTX1_112_P	112	J46	5,559
AM2	MGTTX1_112_N	112	J46	5,560
AM5	MGTRX1_112_P	112	J46	5,708
AM6	MGTRX1_112_N	112	J46	5,707
AL3	MGTTX2_112_P	112	J46	5,395
AL4	MGTTX2_112_N	112	J46	5,396
AJ7	MGTRX2_112_P	112	J46	4,506
AJ8	MGTRX2_112_N	112	J46	4,506
AK1	MGTTX3_112_P	112	J46	5,986
AK2	MGTTX3_112_N	112	J46	5,985
AK5	MGTRX3_112_P	112	J46	5,094
AK6	MGTRX3_112_N	112	J46	5,094

Table 1-19: GTX Transceiver Pins (Cont'd)

FPGA Pin	Net Name	Quad	Connector	Trace Length (Mils)
AJ3	MGTTX0_113_P	113	J47	5,669
AJ4	MGTTX0_113_N	113	J47	5,668
AH5	MGTRX0_113_P	113	J47	5,878
AH6	MGTRX0_113_N	113	J47	5,878
AH1	MGTTX1_113_P	113	J47	5,020
AH2	MGTTX1_113_N	113	J47	5,020
AG7	MGTRX1_113_P	113	J47	5,715
AG8	MGTRX1_113_N	113	J47	5,715
AG3	MGTTX2_113_P	113	J47	5,026
AG4	MGTTX2_113_N	113	J47	5,025
AF5	MGTRX2_113_P	113	J47	4,225
AF6	MGTRX2_113_N	113	J47	4,224
AF1	MGTTX3_113_P	113	J47	5,457
AF2	MGTTX3_113_N	113	J47	5,456
AE7	MGTRX3_113_P	113	J47	5,135
AE8	MGTRX3_113_N	113	J47	5,135
AE3	MGTTX0_114_P	114	J48	4,623
AE4	MGTTX0_114_N	114	J48	4,623
AD5	MGTRX0_114_P	114	J48	4,150
AD6	MGTRX0_114_N	114	J48	4,150
AD1	MGTTX1_114_P	114	J48	5,211
AD2	MGTTX1_114_N	114	J48	5,211
AC7	MGTRX1_114_P	114	J48	4,693
AC8	MGTRX1_114_N	114	J48	4,693
AC3	MGTTX2_114_P	114	J48	5,330
AC4	MGTTX2_114_N	114	J48	5,330
AB5	MGTRX2_114_P	114	J48	5,465
AB6	MGTRX2_114_N	114	J48	5,465
AB1	MGTTX3_114_P	114	J48	5,542
AB2	MGTTX3_114_N	114	J48	5,541
AA7	MGTRX3_114_P	114	J48	4,896
AA8	MGTRX3_114_N	114	J48	4,897

Table 1-19: GTX Transceiver Pins (Cont'd)

FPGA Pin	Net Name	Quad	Connector	Trace Length (Mils)
AA3	MGTTX0_115_P	115	J49	5,020
AA4	MGTTX0_115_N	115	J49	5,020
Y5	MGTRX0_115_P	115	J49	5,269
Y6	MGTRX0_115_N	115	J49	5,269
Y1	MGTTX1_115_P	115	J49	4,563
Y2	MGTTX1_115_N	115	J49	4,562
W7	MGTRX1_115_P	115	J49	5,134
W8	MGTRX1_115_N	115	J49	5,134
W3	MGTTX2_115_P	115	J49	4,238
W4	MGTTX2_115_N	115	J49	4,238
V5	MGTRX2_115_P	115	J49	4,534
V6	MGTRX2_115_N	115	J49	4,533
V1	MGTTX3_115_P	115	J49	4,941
V2	MGTTX3_115_N	115	J49	4,941
U7	MGTRX3_115_P	115	J49	4,698
U8	MGTRX3_115_N	115	J49	4,698

Information for each GTX transceiver clock input is shown in [Table 1-20](#).

Table 1-20: GTX Transceiver Clock Inputs to the FPGA

FPGA Pin	Net Name	Quad	Connector
BA37	MGTREFCLK0_100_P	100	J37
BA38	MGTREFCLK0_100_N	100	J37
AW37	MGTREFCLK1_100_P	100	J37
AW38	MGTREFCLK1_100_N	100	J37
AU37	MGTREFCLK0_101_P	101	J41
AU38	MGTREFCLK0_101_N	101	J41
AR37	MGTREFCLK1_101_P	101	J41
AR38	MGTREFCLK1_101_N	101	J41
AN37	MGTREFCLK0_102_P	102	J42
AN38	MGTREFCLK0_102_N	102	J42
AH35	MGTREFCLK1_102_P	102	J42
AH36	MGTREFCLK1_102_N	102	J42
AF35	MGTREFCLK0_103_P	103	J43

Table 1-20: GTX Transceiver Clock Inputs to the FPGA (Cont'd)

FPGA Pin	Net Name	Quad	Connector
AF36	MGTREFCLK0_103_N	103	J43
AD35	MGTREFCLK1_103_P	103	J43
AD36	MGTREFCLK1_103_N	103	J43
AB35	MGTREFCLK0_104_P	104	J44
AB36	MGTREFCLK0_104_N	104	J44
Y35	MGTREFCLK1_104_P	104	J44
Y36	MGTREFCLK1_104_N	104	J44
V35	MGTREFCLK0_105_P	105	J45
V36	MGTREFCLK0_105_N	105	J45
T35	MGTREFCLK1_105_P	105	J45
T36	MGTREFCLK1_105_N	105	J45
AN8	MGTREFCLK0_112_P	112	J46
AN7	MGTREFCLK0_112_N	112	J46
AH10	MGTREFCLK1_112_P	112	J46
AH9	MGTREFCLK1_112_N	112	J46
AF10	MGTREFCLK0_113_P	113	J47
AF9	MGTREFCLK0_113_N	113	J47
AD10	MGTREFCLK1_113_P	113	J47
AD9	MGTREFCLK1_113_N	113	J47
AB10	MGTREFCLK0_114_P	114	J48
AB9	MGTREFCLK0_114_N	114	J48
Y10	MGTREFCLK1_114_P	114	J48
Y9	MGTREFCLK1_114_N	114	J48
V10	MGTREFCLK0_115_P	115	J49
V9	MGTREFCLK0_115_N	115	J49
T10	MGTREFCLK1_115_P	115	J49
T9	MGTREFCLK1_115_N	115	J49

USB to UART Bridge

[Figure 1-2, callout 20]

Communications between the ML628 board and a host computer are through a USB cable connected to J9. Control is provided by U26, a USB to UART bridge (Silicon Laboratories CP2103). Table 1-21 lists the pin assignments and signals for the USB connector J9.

Table 1-21: USB Type B Connector Pin Assignments and Signals

J9 Pin	Signal Name	Description
1	VBUS	+5V into the CP2103 USB to UART bridge at U26. Used to sense USB network connection.
2	USB_DATA_N	Bidirectional differential serial data (N-side)
3	USB_DATA_P	Bidirectional differential serial data (P-side)
4	GROUND	Signal ground

The CP2103 supports an IO voltage range of 1.8V to 2.5V on the ML628 board. The connections between the FPGA and CP2103 should use the LVCMOS25 IO standard. UART IP (for example, Xilinx® XPS UART Lite) must be implemented in the FPGA fabric. The FPGA supports the USB to UART bridge using four signal pins:

- Transmit (TX)
- Receive (RX)
- Request to Send (RTS)
- Clear to Send (CTS)

Connections of these signals between the FPGA and the CP2103 at U26 are listed in Table 1-22.

Table 1-22: FPGA to U26 (CP2103 USB to UART Bridge) Connections

FPGA Pin	FPGA Function	Net Name	U26 Pin	U26 Function
E27	RTS, output	USB_CTS	22	CTS, input
F27	CTS, input	USB_RTS	23	RTS, output
B29	TX, data out	USB_RX	24	RXD, data in
C29	RX, data in	USB_TX	25	TXD, data out

The bridge device also provides as many as 4 GPIO signals that can be defined by the user for status and control information (Table 1-23).

Table 1-23: CP2103 USB to UART Bridge User GPIO

FPGA Pin	Net Name	U26 Pin
E28	USB_GPIO0	19
F28	USB_GPIO1	18
M27	USB_GPIO2	17
N27	USB_GPIO3	16

A royalty-free software driver named Virtual COM Port (VCP) is available from Silicon Laboratories. This driver permits the CP2103 USB to UART bridge to appear as a COM

port to the host computer communications application software (for example, HyperTerminal or TeraTerm). The VCP driver must be installed on the host computer prior to establishing communications with the ML628 board.

FMC HPC Connectors

[Figure 1-2, callouts 21a and 21b]

The ML628 board features two high pin count (HPC) connectors as defined by the VITA 57.1.1 FMC specification. The FMC HPC connector is a 10 x 40 position socket. See [Appendix B, VITA 57.1 FMC HPC Connector Pinout](#), for a cross-reference of signal names to pin coordinates.

FMC1 HPC connector (J290) provides connectivity for:

- 80 differential user defined pairs:
 - 34 LA pairs
 - 24 HA pairs
 - 22 HB pairs
- 4 differential clocks

FMC2 HPC connector (J441) provides connectivity for:

- 76 differential user defined pairs:
 - 34 LA pairs
 - 24 HA pairs
 - 18 HB pairs
- 4 differential clocks

Note: The V_{ADJ} voltage for the FMC HPC connectors on the ML628 board is fixed at 2.5V (non-adjustable). The 2.5V rail cannot be turned off. The VITA 57.1 FMC interfaces on the ML628 board are compatible with 2.5V mezzanine cards capable of supporting 2.5V V_{ADJ} .

The FMC HPC connectors on the ML628 board are identified as: FMC1 at J290 and FMC2 at J441. The connections for each of these connectors are listed in [Table 1-24](#) and [Table 1-25](#) respectively.

Table 1-24: VITA 57.1 FMC1 HPC Connections at J290

FPGA Pin	Net Name	FMC Pin
AL22	FMC1_CLK0_M2C_P	H4
AM22	FMC1_CLK0_M2C_N	H5
N12	FMC1_CLK1_M2C_P	G2
M12	FMC1_CLK1_M2C_N	G3
AJ26	FMC1_CLK2_M2C_P	K4
AK27	FMC1_CLK2_M2C_N	K5
BB22	FMC1_CLK3_M2C_P	J2
BC22	FMC1_CLK3_M2C_N	J3
AY22	FMC1_HA00_CC_P	F4
BA22	FMC1_HA00_CC_N	F5

Table 1-24: VITA 57.1 FMC1 HPC Connections at J290 (Cont'd)

FPGA Pin	Net Name	FMC Pin
BA20	FMC1_HA01_CC_P	E2
BB20	FMC1_HA01_CC_N	E3
AU21	FMC1_HA02_P	K7
AV21	FMC1_HA02_N	K8
AN23	FMC1_HA03_P	J6
AN22	FMC1_HA03_N	J7
AW21	FMC1_HA04_P	F7
AY21	FMC1_HA04_N	F8
AV23	FMC1_HA05_P	E6
AW23	FMC1_HA05_N	E7
AP23	FMC1_HA06_P	K10
AR23	FMC1_HA06_N	K11
AY23	FMC1_HA07_P	J9
BA23	FMC1_HA07_N	J10
AW20	FMC1_HA08_P	F10
AY20	FMC1_HA08_N	F11
AT20	FMC1_HA09_P	E9
AU20	FMC1_HA09_N	E10
AV19	FMC1_HA10_P	K13
AW19	FMC1_HA10_N	K14
AU22	FMC1_HA11_P	J12
AV22	FMC1_HA11_N	J13
BA19	FMC1_HA12_P	F13
BB19	FMC1_HA12_N	F14
BC23	FMC1_HA13_P	E12
BD23	FMC1_HA13_N	E13
AT23	FMC1_HA14_P	J15
AT22	FMC1_HA14_N	J16
BB21	FMC1_HA15_P	F16
BC21	FMC1_HA15_N	F17
BC19	FMC1_HA16_P	E15
BD19	FMC1_HA16_N	E16
AR22	FMC1_HA17_CC_P	K16

Table 1-24: VITA 57.1 FMC1 HPC Connections at J290 (Cont'd)

FPGA Pin	Net Name	FMC Pin
AR21	FMC1_HA17_CC_N	K17
BD21	FMC1_HA18_P	J18
BD20	FMC1_HA18_N	J19
BA24	FMC1_HA19_P	F19
BB24	FMC1_HA19_N	F20
AN24	FMC1_HA20_P	E18
AP24	FMC1_HA20_N	E19
AT24	FMC1_HA21_P	K19
AU24	FMC1_HA21_N	K20
BC24	FMC1_HA22_P	J21
BD24	FMC1_HA22_N	J22
AL24	FMC1_HA23_P	K22
AM24	FMC1_HA23_N	K23
BA30	FMC1_HB00_CC_P	K25
BB30	FMC1_HB00_CC_N	K26
AW30	FMC1_HB01_P	J24
AY30	FMC1_HB01_N	J25
BD30	FMC1_HB02_P	F22
BD31	FMC1_HB02_N	F23
AL30	FMC1_HB03_P	E21
AM30	FMC1_HB03_N	E22
BB32	FMC1_HB04_P	F25
BC32	FMC1_HB04_N	F26
AY32	FMC1_HB05_P	E24
BA32	FMC1_HB05_N	E25
AU31	FMC1_HB06_CC_P	K28
AV31	FMC1_HB06_CC_N	K29
AM31	FMC1_HB07_P	J27
AM32	FMC1_HB07_N	J28
AW31	FMC1_HB08_P	F28
AY31	FMC1_HB08_N	F29
AR31	FMC1_HB09_P	E27
AT32	FMC1_HB09_N	E28

Table 1-24: VITA 57.1 FMC1 HPC Connections at J290 (Cont'd)

FPGA Pin	Net Name	FMC Pin
AK31	FMC1_HB10_P	K31
AL32	FMC1_HB10_N	K32
AP30	FMC1_HB11_P	J30
AR30	FMC1_HB11_N	J31
AT30	FMC1_HB12_P	F31
AU30	FMC1_HB12_N	F32
AJ30	FMC1_HB13_P	E30
AJ31	FMC1_HB13_N	E31
AU32	FMC1_HB14_P	K34
AV32	FMC1_HB14_N	K35
AP31	FMC1_HB15_P	J33
AR32	FMC1_HB15_N	J34
AN31	FMC1_HB16_P	F34
AN32	FMC1_HB16_N	F35
AJ29	FMC1_HB17_CC_P	K37
AK30	FMC1_HB17_CC_N	K38
AK32	FMC1_HB18_P	J36
AL33	FMC1_HB18_N	J37
BA33	FMC1_HB19_P	E33
BA34	FMC1_HB19_N	E34
AW35	FMC1_HB20_P	F37
AY35	FMC1_HB20_N	F38
AW33	FMC1_HB21_P	E36
AY33	FMC1_HB21_N	E37
C31	FMC1_I2C_SDA	U27.10
C30	FMC1_I2C_SCL	U27.11
AV24	FMC1_LA00_CC_P	G6
AW24	FMC1_LA00_CC_N	G7
BB26	FMC1_LA01_CC_P	D8
BC26	FMC1_LA01_CC_N	D9
AL25	FMC1_LA02_P	H7
AM25	FMC1_LA02_N	H8
AP25	FMC1_LA03_P	G9

Table 1-24: VITA 57.1 FMC1 HPC Connections at J290 (Cont'd)

FPGA Pin	Net Name	FMC Pin
AR25	FMC1_LA03_N	G10
AP26	FMC1_LA04_P	H10
AR26	FMC1_LA04_N	H11
AW25	FMC1_LA05_P	D11
AY25	FMC1_LA05_N	D12
AK22	FMC1_LA06_P	C10
AL23	FMC1_LA06_N	C11
AU26	FMC1_LA07_P	H13
AV26	FMC1_LA07_N	H14
BA25	FMC1_LA08_P	G12
BB25	FMC1_LA08_N	G13
AJ23	FMC1_LA09_P	D14
AK23	FMC1_LA09_N	D15
AW26	FMC1_LA10_P	C14
AY26	FMC1_LA10_N	C15
AM26	FMC1_LA11_P	H16
AN26	FMC1_LA11_N	H17
AT25	FMC1_LA12_P	G15
AU25	FMC1_LA12_N	G16
BC28	FMC1_LA13_P	D17
BD28	FMC1_LA13_N	D18
AJ24	FMC1_LA14_P	C18
AK25	FMC1_LA14_N	C19
AY27	FMC1_LA15_P	H19
BA27	FMC1_LA15_N	H20
BB27	FMC1_LA16_P	G18
BC27	FMC1_LA16_N	G19
AU27	FMC1_LA17_CC_P	D20
AV27	FMC1_LA17_CC_N	D21
AV28	FMC1_LA18_CC_P	C22
AW28	FMC1_LA18_CC_N	C23
AM27	FMC1_LA19_P	H22
AN27	FMC1_LA19_N	H23

Table 1-24: VITA 57.1 FMC1 HPC Connections at J290 (Cont'd)

FPGA Pin	Net Name	FMC Pin
BC29	FMC1_LA20_P	G21
BD29	FMC1_LA20_N	G22
BA29	FMC1_LA21_P	H25
BB29	FMC1_LA21_N	H26
AJ25	FMC1_LA22_P	G24
AK26	FMC1_LA22_N	G25
AY28	FMC1_LA23_P	D23
BA28	FMC1_LA23_N	D24
AR27	FMC1_LA24_P	H28
AT27	FMC1_LA24_N	H29
AL27	FMC1_LA25_P	G27
AL28	FMC1_LA25_N	G28
AT29	FMC1_LA26_P	D26
AU29	FMC1_LA26_N	D27
AR28	FMC1_LA27_P	C26
AT28	FMC1_LA27_N	C27
AJ28	FMC1_LA28_P	H31
AK28	FMC1_LA28_N	H32
AV29	FMC1_LA29_P	G30
AW29	FMC1_LA29_N	G31
AN28	FMC1_LA30_P	H34
AP28	FMC1_LA30_N	H35
AN29	FMC1_LA31_P	G33
AP29	FMC1_LA31_N	G34
BB31	FMC1_LA32_P	H37
BC31	FMC1_LA32_N	H38
AL29	FMC1_LA33_P	G36
AM29	FMC1_LA33_N	G37
BD25	FMC1_PRSNT_M2C_L	H2
U38.16	FMC1_TCK	D29
J31.1 / U5.2 / J6.61	FMC1_TDI	D30

Table 1-24: VITA 57.1 FMC1 HPC Connections at J290 (Cont'd)

FPGA Pin	Net Name	FMC Pin
U38.18	FMC1_TMS	D33

Notes:

1. This signal is not directly connected to the FPGA. The value in the leftmost column represents the device and pin the signal is connected to. For example, U27.9 = U27 pin 9.

Table 1-25: VITA 57.1 FMC2 HPC Connections at J441

FPGA Pin	Net Name	FMC Pin
BC6	FMC2_CLK0_M2C_P	H4
BD6	FMC2_CLK0_M2C_N	H5
AL13	FMC2_CLK1_M2C_P	G2
AL12	FMC2_CLK1_M2C_N	G3
AJ20	FMC2_CLK2_M2C_P	K4
AJ19	FMC2_CLK2_M2C_N	K5
BB5	FMC2_CLK3_M2C_P	J2
BB4	FMC2_CLK3_M2C_N	J3
AU11	FMC2_HA00_CC_P	F4
AU10	FMC2_HA00_CC_N	F5
AV9	FMC2_HA01_CC_P	E2
AW8	FMC2_HA01_CC_N	E3
AT12	FMC2_HA02_P	K7
AU12	FMC2_HA02_N	K8
AV12	FMC2_HA03_P	J6
AW11	FMC2_HA03_N	J7
AY7	FMC2_HA04_P	F7
AY6	FMC2_HA04_N	F8
AL17	FMC2_HA05_P	E6
AM16	FMC2_HA05_N	E7
AU7	FMC2_HA06_P	K10
AV6	FMC2_HA06_N	K11
AV11	FMC2_HA07_P	J9
AW10	FMC2_HA07_N	J10
AW9	FMC2_HA08_P	F10
AY8	FMC2_HA08_N	F11
AP14	FMC2_HA09_P	E9

Table 1-25: VITA 57.1 FMC2 HPC Connections at J441 (Cont'd)

FPGA Pin	Net Name	FMC Pin
AR13	FMC2_HA09_N	E10
AV7	FMC2_HA10_P	K13
AW6	FMC2_HA10_N	K14
AP11	FMC2_HA11_P	J12
AR11	FMC2_HA11_N	J13
AM15	FMC2_HA12_P	F13
AN14	FMC2_HA12_N	F14
AN13	FMC2_HA13_P	E12
AN12	FMC2_HA13_N	E13
AU9	FMC2_HA14_P	J15
AV8	FMC2_HA14_N	J16
AJ16	FMC2_HA15_P	F16
AJ15	FMC2_HA15_N	F17
AK17	FMC2_HA16_P	E15
AK16	FMC2_HA16_N	E16
AP13	FMC2_HA17_CC_P	K16
AR12	FMC2_HA17_CC_N	K17
AK15	FMC2_HA18_P	J18
AL15	FMC2_HA18_N	J19
AL14	FMC2_HA19_P	F19
AM14	FMC2_HA19_N	F20
AW1	FMC2_HA20_P	E18
AY1	FMC2_HA20_N	E19
BD5	FMC2_HA21_P	K19
BD4	FMC2_HA21_N	K20
AY2	FMC2_HA22_P	J21
BA2	FMC2_HA22_N	J22
BB2	FMC2_HA23_P	K22
BB1	FMC2_HA23_N	K23
BC13	FMC2_HB00_CC_P	K25
BC12	FMC2_HB00_CC_N	K26
BC16	FMC2_HB01_P	J24
BD15	FMC2_HB01_N	J25

Table 1-25: VITA 57.1 FMC2 HPC Connections at J441 (Cont'd)

FPGA Pin	Net Name	FMC Pin
BC17	FMC2_HB02_P	F22
BD16	FMC2_HB02_N	F23
AY17	FMC2_HB03_P	E21
AY16	FMC2_HB03_N	E22
BD14	FMC2_HB04_P	F25
BD13	FMC2_HB04_N	F26
BD11	FMC2_HB05_P	E24
BD10	FMC2_HB05_N	E25
BB16	FMC2_HB06_CC_P	K28
BB15	FMC2_HB06_CC_N	K29
AV16	FMC2_HB07_P	J27
AW16	FMC2_HB07_N	J28
BB12	FMC2_HB08_P	F28
BC11	FMC2_HB08_N	F29
AY18	FMC2_HB09_P	E27
BA18	FMC2_HB09_N	E28
AP21	FMC2_HB10_P	K31
AR20	FMC2_HB10_N	K32
AV18	FMC2_HB11_P	J30
AW18	FMC2_HB11_N	J31
BA17	FMC2_HB12_P	F31
BB17	FMC2_HB12_N	F32
AP20	FMC2_HB13_P	E30
AP19	FMC2_HB13_N	E31
AU17	FMC2_HB14_P	K34
AV17	FMC2_HB14_N	K35
AT19	FMC2_HB15_P	J33
AU19	FMC2_HB15_N	J34
AR18	FMC2_HB16_P	F34
AT18	FMC2_HB16_N	F35
AT17	FMC2_HB17_CC_P	K37
AU16	FMC2_HB17_CC_N	K38
U27.13	FMC2_I2C_SDA(1)	C31

Table 1-25: VITA 57.1 FMC2 HPC Connections at J441 (Cont'd)

FPGA Pin	Net Name	FMC Pin
U27.14	FMC2_I2C_SCL(1)	C30
BC8	FMC2_LA00_CC_P	G6
BC7	FMC2_LA00_CC_N	G7
BA5	FMC2_LA01_CC_P	D8
BA4	FMC2_LA01_CC_N	D9
BC3	FMC2_LA02_P	H7
BC2	FMC2_LA02_N	H8
AY3	FMC2_LA03_P	G9
BA3	FMC2_LA03_N	G10
BD9	FMC2_LA04_P	H10
BD8	FMC2_LA04_N	H11
AW5	FMC2_LA05_P	D11
AY5	FMC2_LA05_N	D12
BA12	FMC2_LA06_P	C10
BB11	FMC2_LA06_N	C11
BA8	FMC2_LA07_P	H13
BA7	FMC2_LA07_N	H14
AY12	FMC2_LA08_P	G12
AY11	FMC2_LA08_N	G13
BB10	FMC2_LA09_P	D14
BC9	FMC2_LA09_N	D15
BB7	FMC2_LA10_P	C14
BB6	FMC2_LA10_N	C15
AY10	FMC2_LA11_P	H16
BA9	FMC2_LA11_N	H17
BA10	FMC2_LA12_P	G15
BB9	FMC2_LA12_N	G16
AY15	FMC2_LA13_P	D17
BA15	FMC2_LA13_N	D18
AM21	FMC2_LA14_P	C18
AN21	FMC2_LA14_N	C19
BA14	FMC2_LA15_P	H19
BA13	FMC2_LA15_N	H20

Table 1-25: VITA 57.1 FMC2 HPC Connections at J441 (Cont'd)

FPGA Pin	Net Name	FMC Pin
AW13	FMC2_LA16_P	G18
AY13	FMC2_LA16_N	G19
AT14	FMC2_LA17_CC_P	D20
AT13	FMC2_LA17_CC_N	D21
AU15	FMC2_LA18_CC_P	C22
AV14	FMC2_LA18_CC_N	C23
AL20	FMC2_LA19_P	H22
AM20	FMC2_LA19_N	H23
AU14	FMC2_LA20_P	G21
AV13	FMC2_LA20_N	G22
AW15	FMC2_LA21_P	H25
AW14	FMC2_LA21_N	H26
AK20	FMC2_LA22_P	G24
AL19	FMC2_LA22_N	G25
AR15	FMC2_LA23_P	D23
AT15	FMC2_LA23_N	D24
AP18	FMC2_LA24_P	H28
AR17	FMC2_LA24_N	H29
AJ18	FMC2_LA25_P	G27
AK18	FMC2_LA25_N	G28
AM19	FMC2_LA26_P	D26
AN19	FMC2_LA26_N	D27
AN18	FMC2_LA27_P	C26
AN17	FMC2_LA27_N	C27
AJ21	FMC2_LA28_P	H31
AK21	FMC2_LA28_N	H32
AP16	FMC2_LA29_P	G30
AR16	FMC2_LA29_N	G31
AL18	FMC2_LA30_P	H34
AM17	FMC2_LA30_N	H35
AN16	FMC2_LA31_P	G33
AP15	FMC2_LA31_N	G34
BC18	FMC2_LA32_P	H37

Table 1-25: VITA 57.1 FMC2 HPC Connections at J441 (Cont'd)

FPGA Pin	Net Name	FMC Pin
BD18	FMC2_LA32_N	H38
BB14	FMC2_LA33_P	G36
BC14	FMC2_LA33_N	G37
BC4	FMC2_PRSENT_M2C_L	H2
U38.15	FMC2_TCK(1)	D29
J31.2 / J64.1	FMC2_TDI(1)	D30
J162.3 / J64.2	FMC2_TDO(1)	D31
U38.17	FMC2_TMS(1)	D33

Notes:

1. This signal is not directly connected to the FPGA. The value in the leftmost column represents the device and pin the signal is connected to. For example, U27.9 = U27 pin 9.

Table 1-26: Power Supply Voltages for the HPC Connector

Voltage Supply	Allowable Voltage Range	Number of Pins	Maximum Amps	Tolerance	Maximum Capacitive Load
V _{ADJ}	Fixed 2.5V	4	4	±5%	1,000 µF
3P3V _{AUX}	3.3V	1	0.020	±5%	150 µF
3P3V	3.3V	4	3	±5%	1,000 µF
12P0V	12V	2	1	±5%	1,000 µF

System Monitor

[Figure 1-2, callout 22]

System Monitor measurements can be monitored using the ChipScope™ Pro tool. The ML628 board provides two ways of setting the System Monitor reference voltage:

- **Jumper pins 1-2 (EXT) on J15:** In this configuration, an on-board, low temperature coefficient, 1.25V reference (U14, Texas Instruments part number REF3012AIDBZT) is connected to System Monitor VREFP.
- **Jumper pins 2-3 (INT) on J15:** In this configuration, the FPGA's System Monitor uses an internal reference circuit.

Note: A jumper should be installed in one of the two positions during normal operation.

I²C Bus Management

[Figure 1-2, callout 23]

The I²C bus is controlled through U27, an 8-channel I²C-bus multiplexer (NXP Semiconductor PCA9547). The FPGA communicates with the multiplexer through I²C data and clock signals mapped to FPGA pins H34 and H33, respectively. The I²C idcode for the PCA9547 device is 0x70. The bus hosts five components:

- SuperClock-2 module
- GTH transceiver power supply module
- GTX transceiver power supply module
- FMC1
- FMC2

An I²C component can be accessed by selecting the appropriate channel through the control register of the MUX as shown in [Table 1-27](#).

Table 1-27: I²C Channel Assignments

U27 Channel	I ² C Component
0	SuperClock-2 module
1	GTX transceiver power supply module
2	GTH transceiver power supply module
3	FMC1
4	FMC2

Default Jumper Positions

Table A-1 shows the standard (black) shunts that must be installed on the board for proper operation. Table A-2 shows the high current (red) shunts that must be installed to enable the on-board power supplies. These jumpers must always be installed except where specifically noted in this user guide. Refer to PCB Assembly Drawing 0431587 for the default placement of all on-board jumpers and their respective connectors as they are located on the board.

Note: Any connector not shown in Table A-1 should be left open for normal operation.

Table A-1: Standard Shunts

Connector	Name	Shunt Position	Quantity	Pins (Jumper Label)
J286	PMBUS CTRL	Installed	1	1-2 (GND)
J24	AUX POR	Installed	1	1-2 (AUTO)
J176	VFS_0	Installed	1	1-2 (VCCAUX)
J188	SYSTEM CLOCK ⁽¹⁾	Installed Horizontally	2	1-3, 2-4 (LVDS)
J292	PMBUS ALERT	Installed	1	2-3 (AFX)
J293	PMBUS CTRL	Installed	1	2-3 (AFX)
J294	PMBUS CLK	Installed	1	2-3 (AFX)
J295	PMBUS DATA	Installed	1	2-3 (AFX)
J19	PMBUS LEVEL TRANSLATION ⁽¹⁾	Installed	1	1-2 (AFX/CABLE)
J287	PMBUS LEVEL TRANSLATION ⁽¹⁾	Installed	1	1-2 (AFX)
J162	JTAG CHAIN	Installed	1	1-2 (DUT ONLY)
J4	SYSTEM ACE CLK	Installed	1	1-2 (ON)
J22	SYSACE JTAG ENABLE	Installed	1	1-2
J23	SYSACE JTAG ENABLE	Installed	1	1-2
J195	SYSACE JTAG ENABLE	Installed	1	1-2
J196	SYSACE JTAG ENABLE	Installed	1	1-2
J15	SYS MON	Installed	1	1-2 (EXT)
J31	FMC1 JTAG	Installed	1	1-2 (BYPASS)
J64	FMC2 JTAG	Installed	1	1-2 (BYPASS)

Notes:

1. Italicized entries in the Name column are not visible in the PCB silkscreen labels.

Table A-2: Digital Power Shorting Plugs

Connector	Name	Shorting Plug Position
J30	VCC3V3	Installed
J32	VCC2V5	Installed
J102	VCCINT_A	Installed
J61	VCCINT_B	Installed
J104	VCCAUX	Installed
J105	VCCO	Installed
J129	VCC5	Installed

VITA 57.1 FMC HPC Connector Pinout

Table B-1 provides a cross-reference of signal names to pin coordinates for the VITA 57.1 FMC HPC connector.

	K	J	H	G	F	E	D	C	B	A
1	VREF_B_M2C	GND	VREF_A_M2C	GND	PG_M2C	GND	PG_C2M	GND	RES1	GND
2	GND	CLK3_M2C_P	PRSN_T_M2C_L	CLK1_M2C_P	GND	HA01_P_CC	GND	DP0_C2M_P	GND	DP1_M2C_P
3	GND	CLK3_M2C_N	GND	CLK1_M2C_N	GND	HA01_N_CC	GND	DP0_C2M_N	GND	DP1_M2C_N
4	CLK2_M2C_P	GND	CLK0_M2C_P	GND	HA00_P_CC	GND	GBCLK0_M2C_P	GND	DP9_M2C_P	GND
5	CLK2_M2C_N	GND	CLK0_M2C_N	GND	HA00_N_CC	GND	GBCLK0_M2C_N	GND	DP9_M2C_N	GND
6	GND	HA03_P	GND	LA00_P_CC	GND	HA05_P	GND	DP0_M2C_P	GND	DP2_M2C_P
7	HA02_P	HA03_N	LA02_P	LA00_N_CC	HA04_P	HA05_N	GND	DP0_M2C_N	GND	DP2_M2C_N
8	HA02_N	GND	LA02_N	GND	HA04_N	GND	LA01_P_CC	GND	DP8_M2C_P	GND
9	GND	HA07_P	GND	LA03_P	GND	HA09_P	GND	LA01_N_CC	GND	DP8_M2C_N
10	HA06_P	HA07_N	LA04_P	LA03_N	HA08_P	HA09_N	GND	LA06_P	GND	DP3_M2C_P
11	HA06_N	GND	LA04_N	GND	HA08_N	GND	LA05_P	LA06_N	GND	DP3_M2C_N
12	GND	HA11_P	GND	LA08_P	GND	HA13_P	LA05_N	GND	DP7_M2C_P	GND
13	HA10_P	HA11_N	LA07_P	LA08_N	HA12_P	HA13_N	GND	GND	DP7_M2C_N	GND
14	HA10_N	GND	LA07_N	GND	HA12_N	GND	LA09_P	LA10_P	GND	DP4_M2C_P
15	GND	HA14_P	GND	LA12_P	GND	HA16_P	LA09_N	LA10_N	GND	DP4_M2C_N
16	HA17_P_CC	HA14_N	LA11_P	LA12_N	HA15_P	HA16_N	GND	GND	DP6_M2C_P	GND
17	HA17_N_CC	GND	LA11_N	GND	HA15_N	GND	LA13_P	GND	DP6_M2C_N	GND
18	GND	HA18_P	GND	LA16_P	GND	HA20_P	LA13_N	LA14_P	GND	DP5_M2C_P
19	HA21_P	HA18_N	LA15_P	LA16_N	HA19_P	HA20_N	GND	LA14_N	GND	DP5_M2C_N
20	HA21_N	GND	LA15_N	GND	HA19_N	GND	LA17_P_CC	GND	GBCLK1_M2C_P	GND
21	GND	HA22_P	GND	LA20_P	GND	HB03_P	LA17_N_CC	GND	GBCLK1_M2C_N	GND
22	HA23_P	HA22_N	LA19_P	LA20_N	HB02_P	HB03_N	GND	LA18_P_CC	GND	DP1_C2M_P
23	HA23_N	GND	LA19_N	GND	HB02_N	GND	LA23_P	LA18_N_CC	GND	DP1_C2M_N
24	GND	HB01_P	GND	LA22_P	GND	HB05_P	LA23_N	GND	DP9_C2M_P	GND
25	HB00_P_CC	HB01_N	LA21_P	LA22_N	HB04_P	HB05_N	GND	GND	DP9_C2M_N	GND
26	HB00_N_CC	GND	LA21_N	GND	HB04_N	GND	LA26_P	LA27_P	GND	DP2_C2M_P
27	GND	HB07_P	GND	LA25_P	GND	HB09_P	LA26_N	LA27_N	GND	DP2_C2M_N
28	HB06_P_CC	HB07_N	LA24_P	LA25_N	HB08_P	HB09_N	GND	GND	DP8_C2M_P	GND
29	HB06_N_CC	GND	LA24_N	GND	HB08_N	GND	TCK	GND	DP8_C2M_N	GND
30	GND	HB11_P	GND	LA29_P	GND	HB13_P	TDI	SCL	GND	DP3_C2M_P
31	HB10_P	HB11_N	LA28_P	LA29_N	HB12_P	HB13_N	TDO	SDA	GND	DP3_C2M_N
32	HB10_N	GND	LA28_N	GND	HB12_N	GND	3P3VAUX	GND	DP7_C2M_P	GND
33	GND	HB15_P	GND	LA31_P	GND	HB19_P	TMS	GND	DP7_C2M_N	GND
34	HB14_P	HB15_N	LA30_P	LA31_N	HB16_P	HB19_N	TRST_L	GA0	GND	DP4_C2M_P
35	HB14_N	GND	LA30_N	GND	HB16_N	GND	GA1	12P0V	GND	DP4_C2M_N
36	GND	HB18_P	GND	LA33_P	GND	HB21_P	3P3V	GND	DP6_C2M_P	GND
37	HB17_P_CC	HB18_N	LA32_P	LA33_N	HB20_P	HB21_N	GND	12P0V	DP6_C2M_N	GND
38	HB17_N_CC	GND	LA32_N	GND	HB20_N	GND	3P3V	GND	GND	DP5_C2M_P
39	GND	VIO_B_M2C	GND	VADJ	GND	VADJ	GND	3P3V	GND	DP5_C2M_N
40	VIO_B_M2C	GND	VADJ	GND	VADJ	GND	3P3V	GND	RES0	GND

UG771_aB_01_100710

Figure B-1: FMC HPC Connector Pinout

ML628 Master UCF Listing

The ML628 master user constraints file (UCF) template provides for designs targeting the ML628 Virtex-6 FPGA GTX and GTH transceiver characterization board. Net names in the constraints listed below correlate with net names on the ML628 board schematic. Users must identify the appropriate pins and replace the net names below with net names in the user RTL. See the [Constraints Guide](#) for more information.

Users can refer to the UCF files generated by tools such as Memory Interface Generator (MIG) for memory interfaces and Base System Builder (BSB) for more detailed I/O standards information required for each particular interface. The FMC connectors J290 and J441 are connected to 2.5V V_{CC0} banks. Because each user's FMC card implements customer-specific circuitry, the FMC bank I/O standards must be uniquely defined by each customer.

ML628 Master UCF Listing:

NET "APP_LED1"	LOC = "U1.N28";
NET "APP_LED2"	LOC = "U1.P28";
NET "APP_LED3"	LOC = "U1.K28";
NET "APP_LED4"	LOC = "U1.L27";
NET "APP_LED5"	LOC = "U1.K27";
NET "APP_LED6"	LOC = "U1.K26";
NET "APP_LED7"	LOC = "U1.P26";
NET "APP_LED8"	LOC = "U1.R26";
NET "CCLK_0"	LOC = "U1.AC33";
NET "CLK_1"	LOC = "U1.AP33";
NET "CLK_2"	LOC = "U1.R31";
NET "CLK_DIFF_1_N"	LOC = "U1.AP34";
NET "CLK_DIFF_1_P"	LOC = "U1.AN33";
NET "CLK_DIFF_2_N"	LOC = "U1.H33";
NET "CLK_DIFF_2_P"	LOC = "U1.J33";
NET "CM_CTRL_0"	LOC = "U1.G26";
NET "CM_CTRL_1"	LOC = "U1.G25";
NET "CM_CTRL_2"	LOC = "U1.H23";
NET "CM_CTRL_3"	LOC = "U1.J23";
NET "CM_CTRL_4"	LOC = "U1.J25";
NET "CM_CTRL_5"	LOC = "U1.K25";
NET "CM_CTRL_6"	LOC = "U1.D26";
NET "CM_CTRL_7"	LOC = "U1.E26";
NET "CM_CTRL_8"	LOC = "U1.D25";
NET "CM_CTRL_9"	LOC = "U1.E25";
NET "CM_CTRL_10"	LOC = "U1.M25";
NET "CM_CTRL_11"	LOC = "U1.M24";
NET "CM_CTRL_12"	LOC = "U1.A25";
NET "CM_CTRL_13"	LOC = "U1.B25";
NET "CM_CTRL_14"	LOC = "U1.L25";

NET "CM_CTRL_15"	LOC = "U1.L24";
NET "CM_CTRL_16"	LOC = "U1.B24";
NET "CM_CTRL_17"	LOC = "U1.C23";
NET "CM_CTRL_18"	LOC = "U1.C24";
NET "CM_CTRL_19"	LOC = "U1.D23";
NET "CM_CTRL_20"	LOC = "U1.K23";
NET "CM_CTRL_21"	LOC = "U1.L23";
NET "CM_CTRL_22"	LOC = "U1.B26";
NET "CM_CTRL_23"	LOC = "U1.C26";
NET "CM_GCLK_N"	LOC = "U1.A24";
NET "CM_GCLK_P"	LOC = "U1.A23";
NET "CM_LVDS1_N"	LOC = "U1.B36";
NET "CM_LVDS1_P"	LOC = "U1.B35";
NET "CM_LVDS2_N"	LOC = "U1.C11";
NET "CM_LVDS2_P"	LOC = "U1.C12";
NET "CM_LVDS3_N"	LOC = "U1.BD33";
NET "CM_LVDS3_P"	LOC = "U1.BC33";
NET "CM_RST"	LOC = "U1.D24";
NET "DUT_I2C_SCL"	LOC = "U1.R25";
NET "DUT_I2C_SDA"	LOC = "U1.P25";
NET "DUT_PMB_ALERT"	LOC = "U1.G27";
NET "DUT_PMB_CLK"	LOC = "U1.F29";
NET "DUT_PMB_CTRL"	LOC = "U1.H27";
NET "DUT_PMB_DATA"	LOC = "U1.G29";
NET "FMC1_CLK0_M2C_N"	LOC = "U1.AM22";
NET "FMC1_CLK0_M2C_P"	LOC = "U1.AL22";
NET "FMC1_CLK1_M2C_N"	LOC = "U1.M12";
NET "FMC1_CLK1_M2C_P"	LOC = "U1.N12";
NET "FMC1_CLK2_M2C_N"	LOC = "U1.AK27";
NET "FMC1_CLK2_M2C_P"	LOC = "U1.AJ26";
NET "FMC1_CLK3_M2C_N"	LOC = "U1.BC22";
NET "FMC1_CLK3_M2C_P"	LOC = "U1.BB22";
NET "FMC1_HA00_CC_N"	LOC = "U1.BA22";
NET "FMC1_HA00_CC_P"	LOC = "U1.AY22";
NET "FMC1_HA01_CC_N"	LOC = "U1.BB20";
NET "FMC1_HA01_CC_P"	LOC = "U1.BA20";
NET "FMC1_HA02_N"	LOC = "U1.AV21";
NET "FMC1_HA02_P"	LOC = "U1.AU21";
NET "FMC1_HA03_N"	LOC = "U1.AN22";
NET "FMC1_HA03_P"	LOC = "U1.AN23";
NET "FMC1_HA04_N"	LOC = "U1.AY21";
NET "FMC1_HA04_P"	LOC = "U1.AW21";
NET "FMC1_HA05_N"	LOC = "U1.AW23";
NET "FMC1_HA05_P"	LOC = "U1.AV23";
NET "FMC1_HA06_N"	LOC = "U1.AR23";
NET "FMC1_HA06_P"	LOC = "U1.AP23";
NET "FMC1_HA07_N"	LOC = "U1.BA23";
NET "FMC1_HA07_P"	LOC = "U1.AY23";
NET "FMC1_HA08_N"	LOC = "U1.AY20";
NET "FMC1_HA08_P"	LOC = "U1.AW20";
NET "FMC1_HA09_N"	LOC = "U1.AU20";
NET "FMC1_HA09_P"	LOC = "U1.AT20";
NET "FMC1_HA10_N"	LOC = "U1.AW19";
NET "FMC1_HA10_P"	LOC = "U1.AV19";
NET "FMC1_HA11_N"	LOC = "U1.AV22";
NET "FMC1_HA11_P"	LOC = "U1.AU22";
NET "FMC1_HA12_N"	LOC = "U1.BB19";
NET "FMC1_HA12_P"	LOC = "U1.BA19";
NET "FMC1_HA13_N"	LOC = "U1.BD23";

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NET "FMC1_HA13_P"          LOC = "U1.BC23";
NET "FMC1_HA14_N"          LOC = "U1.AT22";
NET "FMC1_HA14_P"          LOC = "U1.AT23";
NET "FMC1_HA15_N"          LOC = "U1.BC21";
NET "FMC1_HA15_P"          LOC = "U1.BB21";
NET "FMC1_HA16_N"          LOC = "U1.BD19";
NET "FMC1_HA16_P"          LOC = "U1.BC19";
NET "FMC1_HA17_CC_N"       LOC = "U1.AR21";
NET "FMC1_HA17_CC_P"       LOC = "U1.AR22";
NET "FMC1_HA18_N"          LOC = "U1.BD20";
NET "FMC1_HA18_P"          LOC = "U1.BD21";
NET "FMC1_HA19_N"          LOC = "U1.BB24";
NET "FMC1_HA19_P"          LOC = "U1.BA24";
NET "FMC1_HA20_N"          LOC = "U1.AP24";
NET "FMC1_HA20_P"          LOC = "U1.AN24";
NET "FMC1_HA21_N"          LOC = "U1.AU24";
NET "FMC1_HA21_P"          LOC = "U1.AT24";
NET "FMC1_HA22_N"          LOC = "U1.BD24";
NET "FMC1_HA22_P"          LOC = "U1.BC24";
NET "FMC1_HA23_N"          LOC = "U1.AM24";
NET "FMC1_HA23_P"          LOC = "U1.AL24";
NET "FMC1_HB00_CC_N"       LOC = "U1.BB30";
NET "FMC1_HB00_CC_P"       LOC = "U1.BA30";
NET "FMC1_HB01_N"          LOC = "U1.AY30";
NET "FMC1_HB01_P"          LOC = "U1.AW30";
NET "FMC1_HB02_N"          LOC = "U1.BD31";
NET "FMC1_HB02_P"          LOC = "U1.BD30";
NET "FMC1_HB03_N"          LOC = "U1.AM30";
NET "FMC1_HB03_P"          LOC = "U1.AL30";
NET "FMC1_HB04_N"          LOC = "U1.BC32";
NET "FMC1_HB04_P"          LOC = "U1.BB32";
NET "FMC1_HB05_N"          LOC = "U1.BA32";
NET "FMC1_HB05_P"          LOC = "U1.AY32";
NET "FMC1_HB06_CC_N"       LOC = "U1.AV31";
NET "FMC1_HB06_CC_P"       LOC = "U1.AU31";
NET "FMC1_HB07_N"          LOC = "U1.AM32";
NET "FMC1_HB07_P"          LOC = "U1.AM31";
NET "FMC1_HB08_N"          LOC = "U1.AY31";
NET "FMC1_HB08_P"          LOC = "U1.AW31";
NET "FMC1_HB09_N"          LOC = "U1.AT32";
NET "FMC1_HB09_P"          LOC = "U1.AR31";
NET "FMC1_HB10_N"          LOC = "U1.AL32";
NET "FMC1_HB10_P"          LOC = "U1.AK31";
NET "FMC1_HB11_N"          LOC = "U1.AR30";
NET "FMC1_HB11_P"          LOC = "U1.AP30";
NET "FMC1_HB12_N"          LOC = "U1.AU30";
NET "FMC1_HB12_P"          LOC = "U1.AT30";
NET "FMC1_HB13_N"          LOC = "U1.AJ31";
NET "FMC1_HB13_P"          LOC = "U1.AJ30";
NET "FMC1_HB14_N"          LOC = "U1.AV32";
NET "FMC1_HB14_P"          LOC = "U1.AU32";
NET "FMC1_HB15_N"          LOC = "U1.AR32";
NET "FMC1_HB15_P"          LOC = "U1.AP31";
NET "FMC1_HB16_N"          LOC = "U1.AN32";
NET "FMC1_HB16_P"          LOC = "U1.AN31";
NET "FMC1_HB17_CC_N"       LOC = "U1.AK30";
NET "FMC1_HB17_CC_P"       LOC = "U1.AJ29";
NET "FMC1_HB18_N"          LOC = "U1.AL33";
NET "FMC1_HB18_P"          LOC = "U1.AK32";

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NET "FMC1_HB19_N"      LOC = "U1.BA34";
NET "FMC1_HB19_P"      LOC = "U1.BA33";
NET "FMC1_HB20_N"      LOC = "U1.AY35";
NET "FMC1_HB20_P"      LOC = "U1.AW35";
NET "FMC1_HB21_N"      LOC = "U1.AY33";
NET "FMC1_HB21_P"      LOC = "U1.AW33";
NET "FMC1_LA00_CC_N"    LOC = "U1.AW24";
NET "FMC1_LA00_CC_P"    LOC = "U1.AV24";
NET "FMC1_LA01_CC_N"    LOC = "U1.BC26";
NET "FMC1_LA01_CC_P"    LOC = "U1.BB26";
NET "FMC1_LA02_N"      LOC = "U1.AM25";
NET "FMC1_LA02_P"      LOC = "U1.AL25";
NET "FMC1_LA03_N"      LOC = "U1.AR25";
NET "FMC1_LA03_P"      LOC = "U1.AP25";
NET "FMC1_LA04_N"      LOC = "U1.AR26";
NET "FMC1_LA04_P"      LOC = "U1.AP26";
NET "FMC1_LA05_N"      LOC = "U1.AY25";
NET "FMC1_LA05_P"      LOC = "U1.AW25";
NET "FMC1_LA06_N"      LOC = "U1.AL23";
NET "FMC1_LA06_P"      LOC = "U1.AK22";
NET "FMC1_LA07_N"      LOC = "U1.AV26";
NET "FMC1_LA07_P"      LOC = "U1.AU26";
NET "FMC1_LA08_N"      LOC = "U1.BB25";
NET "FMC1_LA08_P"      LOC = "U1.BA25";
NET "FMC1_LA09_N"      LOC = "U1.AK23";
NET "FMC1_LA09_P"      LOC = "U1.AJ23";
NET "FMC1_LA10_N"      LOC = "U1.AY26";
NET "FMC1_LA10_P"      LOC = "U1.AW26";
NET "FMC1_LA11_N"      LOC = "U1.AN26";
NET "FMC1_LA11_P"      LOC = "U1.AM26";
NET "FMC1_LA12_N"      LOC = "U1.AU25";
NET "FMC1_LA12_P"      LOC = "U1.AT25";
NET "FMC1_LA13_N"      LOC = "U1.BD28";
NET "FMC1_LA13_P"      LOC = "U1.BC28";
NET "FMC1_LA14_N"      LOC = "U1.AK25";
NET "FMC1_LA14_P"      LOC = "U1.AJ24";
NET "FMC1_LA15_N"      LOC = "U1.BA27";
NET "FMC1_LA15_P"      LOC = "U1.AY27";
NET "FMC1_LA16_N"      LOC = "U1.BC27";
NET "FMC1_LA16_P"      LOC = "U1.BB27";
NET "FMC1_LA17_CC_N"    LOC = "U1.AV27";
NET "FMC1_LA17_CC_P"    LOC = "U1.AU27";
NET "FMC1_LA18_CC_N"    LOC = "U1.AW28";
NET "FMC1_LA18_CC_P"    LOC = "U1.AV28";
NET "FMC1_LA19_N"      LOC = "U1.AN27";
NET "FMC1_LA19_P"      LOC = "U1.AM27";
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NET "FMC1_LA20_P"      LOC = "U1.BC29";
NET "FMC1_LA21_N"      LOC = "U1.BB29";
NET "FMC1_LA21_P"      LOC = "U1.BA29";
NET "FMC1_LA22_N"      LOC = "U1.AK26";
NET "FMC1_LA22_P"      LOC = "U1.AJ25";
NET "FMC1_LA23_N"      LOC = "U1.BA28";
NET "FMC1_LA23_P"      LOC = "U1.AY28";
NET "FMC1_LA24_N"      LOC = "U1.AT27";
NET "FMC1_LA24_P"      LOC = "U1.AR27";
NET "FMC1_LA25_N"      LOC = "U1.AL28";
NET "FMC1_LA25_P"      LOC = "U1.AL27";
NET "FMC1_LA26_N"      LOC = "U1.AU29";

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NET "FMC1_LA26_P"	LOC = "U1.AT29";
NET "FMC1_LA27_N"	LOC = "U1.AT28";
NET "FMC1_LA27_P"	LOC = "U1.AR28";
NET "FMC1_LA28_N"	LOC = "U1.AK28";
NET "FMC1_LA28_P"	LOC = "U1.AJ28";
NET "FMC1_LA29_N"	LOC = "U1.AW29";
NET "FMC1_LA29_P"	LOC = "U1.AV29";
NET "FMC1_LA30_N"	LOC = "U1.AP28";
NET "FMC1_LA30_P"	LOC = "U1.AN28";
NET "FMC1_LA31_N"	LOC = "U1.AP29";
NET "FMC1_LA31_P"	LOC = "U1.AN29";
NET "FMC1_LA32_N"	LOC = "U1.BC31";
NET "FMC1_LA32_P"	LOC = "U1.BB31";
NET "FMC1_LA33_N"	LOC = "U1.AM29";
NET "FMC1_LA33_P"	LOC = "U1.AL29";
NET "FMC1_PRSNT_M2C_L"	LOC = "U1.BD25";
NET "FMC2_CLK0_M2C_N"	LOC = "U1.BD6";
NET "FMC2_CLK0_M2C_P"	LOC = "U1.BC6";
NET "FMC2_CLK1_M2C_N"	LOC = "U1.AL12";
NET "FMC2_CLK1_M2C_P"	LOC = "U1.AL13";
NET "FMC2_CLK2_M2C_N"	LOC = "U1.AJ19";
NET "FMC2_CLK2_M2C_P"	LOC = "U1.AJ20";
NET "FMC2_CLK3_M2C_N"	LOC = "U1.BB4";
NET "FMC2_CLK3_M2C_P"	LOC = "U1.BB5";
NET "FMC2_HA00_CC_N"	LOC = "U1.AU10";
NET "FMC2_HA00_CC_P"	LOC = "U1.AU11";
NET "FMC2_HA01_CC_N"	LOC = "U1.AW8";
NET "FMC2_HA01_CC_P"	LOC = "U1.AV9";
NET "FMC2_HA02_N"	LOC = "U1.AU12";
NET "FMC2_HA02_P"	LOC = "U1.AT12";
NET "FMC2_HA03_N"	LOC = "U1.AW11";
NET "FMC2_HA03_P"	LOC = "U1.AV12";
NET "FMC2_HA04_N"	LOC = "U1.AY6";
NET "FMC2_HA04_P"	LOC = "U1.AY7";
NET "FMC2_HA05_N"	LOC = "U1.AM16";
NET "FMC2_HA05_P"	LOC = "U1.AL17";
NET "FMC2_HA06_N"	LOC = "U1.AV6";
NET "FMC2_HA06_P"	LOC = "U1.AU7";
NET "FMC2_HA07_N"	LOC = "U1.AW10";
NET "FMC2_HA07_P"	LOC = "U1.AV11";
NET "FMC2_HA08_N"	LOC = "U1.AY8";
NET "FMC2_HA08_P"	LOC = "U1.AW9";
NET "FMC2_HA09_N"	LOC = "U1.AR13";
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NET "FMC2_HA10_N"	LOC = "U1.AW6";
NET "FMC2_HA10_P"	LOC = "U1.AV7";
NET "FMC2_HA11_N"	LOC = "U1.AR11";
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NET "FMC2_HA12_N"	LOC = "U1.AN14";
NET "FMC2_HA12_P"	LOC = "U1.AM15";
NET "FMC2_HA13_N"	LOC = "U1.AN12";
NET "FMC2_HA13_P"	LOC = "U1.AN13";
NET "FMC2_HA14_N"	LOC = "U1.AV8";
NET "FMC2_HA14_P"	LOC = "U1.AU9";
NET "FMC2_HA15_N"	LOC = "U1.AJ15";
NET "FMC2_HA15_P"	LOC = "U1.AJ16";
NET "FMC2_HA16_N"	LOC = "U1.AK16";
NET "FMC2_HA16_P"	LOC = "U1.AK17";
NET "FMC2_HA17_CC_N"	LOC = "U1.AR12";

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NET "FMC2_HA20_P"        LOC = "U1.AW1";
NET "FMC2_HA21_N"        LOC = "U1.BD4";
NET "FMC2_HA21_P"        LOC = "U1.BD5";
NET "FMC2_HA22_N"        LOC = "U1.BA2";
NET "FMC2_HA22_P"        LOC = "U1.AY2";
NET "FMC2_HA23_N"        LOC = "U1.BB1";
NET "FMC2_HA23_P"        LOC = "U1.BB2";
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NET "FMC2_HB00_CC_P"     LOC = "U1.BC13";
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NET "FMC2_HB02_N"        LOC = "U1.BD16";
NET "FMC2_HB02_P"        LOC = "U1.BC17";
NET "FMC2_HB03_N"        LOC = "U1.AY16";
NET "FMC2_HB03_P"        LOC = "U1.AY17";
NET "FMC2_HB04_N"        LOC = "U1.BD13";
NET "FMC2_HB04_P"        LOC = "U1.BD14";
NET "FMC2_HB05_N"        LOC = "U1.BD10";
NET "FMC2_HB05_P"        LOC = "U1.BD11";
NET "FMC2_HB06_CC_N"     LOC = "U1.BB15";
NET "FMC2_HB06_CC_P"     LOC = "U1.BB16";
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NET "FMC2_HB07_P"        LOC = "U1.AV16";
NET "FMC2_HB08_N"        LOC = "U1.BC11";
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NET "FMC2_HB11_P"        LOC = "U1.AV18";
NET "FMC2_HB12_N"        LOC = "U1.BB17";
NET "FMC2_HB12_P"        LOC = "U1.BA17";
NET "FMC2_HB13_N"        LOC = "U1.AP19";
NET "FMC2_HB13_P"        LOC = "U1.AP20";
NET "FMC2_HB14_N"        LOC = "U1.AV17";
NET "FMC2_HB14_P"        LOC = "U1.AU17";
NET "FMC2_HB15_N"        LOC = "U1.AU19";
NET "FMC2_HB15_P"        LOC = "U1.AT19";
NET "FMC2_HB16_N"        LOC = "U1.AT18";
NET "FMC2_HB16_P"        LOC = "U1.AR18";
NET "FMC2_HB17_CC_N"     LOC = "U1.AU16";
NET "FMC2_HB17_CC_P"     LOC = "U1.AT17";
NET "FMC2_LA00_CC_N"     LOC = "U1.BC7";
NET "FMC2_LA00_CC_P"     LOC = "U1.BC8";
NET "FMC2_LA01_CC_N"     LOC = "U1.BA4";
NET "FMC2_LA01_CC_P"     LOC = "U1.BA5";
NET "FMC2_LA02_N"        LOC = "U1.BC2";
NET "FMC2_LA02_P"        LOC = "U1.BC3";
NET "FMC2_LA03_N"        LOC = "U1.BA3";
NET "FMC2_LA03_P"        LOC = "U1.AY3";
NET "FMC2_LA04_N"        LOC = "U1.BD8";
NET "FMC2_LA04_P"        LOC = "U1.BD9";

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NET "FMC2_LA07_P"	LOC = "U1.BA8";
NET "FMC2_LA08_N"	LOC = "U1.AY11";
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NET "FMC2_LA09_P"	LOC = "U1.BB10";
NET "FMC2_LA10_N"	LOC = "U1.BB6";
NET "FMC2_LA10_P"	LOC = "U1.BB7";
NET "FMC2_LA11_N"	LOC = "U1.BA9";
NET "FMC2_LA11_P"	LOC = "U1.AY10";
NET "FMC2_LA12_N"	LOC = "U1.BB9";
NET "FMC2_LA12_P"	LOC = "U1.BA10";
NET "FMC2_LA13_N"	LOC = "U1.BA15";
NET "FMC2_LA13_P"	LOC = "U1.AY15";
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NET "FMC2_LA16_P"	LOC = "U1.AW13";
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NET "FMC2_LA17_CC_P"	LOC = "U1.AT14";
NET "FMC2_LA18_CC_N"	LOC = "U1.AV14";
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NET "FMC2_LA21_P"	LOC = "U1.AW15";
NET "FMC2_LA22_N"	LOC = "U1.AL19";
NET "FMC2_LA22_P"	LOC = "U1.AK20";
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NET "FMC2_LA23_P"	LOC = "U1.AR15";
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NET "FMC2_LA24_P"	LOC = "U1.AP18";
NET "FMC2_LA25_N"	LOC = "U1.AK18";
NET "FMC2_LA25_P"	LOC = "U1.AJ18";
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NET "FMC2_LA26_P"	LOC = "U1.AM19";
NET "FMC2_LA27_N"	LOC = "U1.AN17";
NET "FMC2_LA27_P"	LOC = "U1.AN18";
NET "FMC2_LA28_N"	LOC = "U1.AK21";
NET "FMC2_LA28_P"	LOC = "U1.AJ21";
NET "FMC2_LA29_N"	LOC = "U1.AR16";
NET "FMC2_LA29_P"	LOC = "U1.AP16";
NET "FMC2_LA30_N"	LOC = "U1.AM17";
NET "FMC2_LA30_P"	LOC = "U1.AL18";
NET "FMC2_LA31_N"	LOC = "U1.AP15";
NET "FMC2_LA31_P"	LOC = "U1.AN16";
NET "FMC2_LA32_N"	LOC = "U1.BD18";
NET "FMC2_LA32_P"	LOC = "U1.BC18";
NET "FMC2_LA33_N"	LOC = "U1.BC14";
NET "FMC2_LA33_P"	LOC = "U1.BB14";
NET "FMC2_PRSENT_M2C_L"	LOC = "U1.BC4";

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NET "MGTREFCLK0_100_P"    LOC = "U1.BA37";
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NET "MGTREFCLK0_101_P"    LOC = "U1.AU37";
NET "MGTREFCLK0_102_N"    LOC = "U1.AN38";
NET "MGTREFCLK0_102_P"    LOC = "U1.AN37";
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NET "MGTREFCLK0_104_P"    LOC = "U1.AB35";
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NET "MGTREFCLK0_114_P"    LOC = "U1.AB10";
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NET "MGTREFCLK1_105_P"    LOC = "U1.T35";
NET "MGTREFCLK1_112_N"    LOC = "U1.AH9";
NET "MGTREFCLK1_112_P"    LOC = "U1.AH10";
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NET "MGTREFCLK_108_P"     LOC = "U1.E41";
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NET "MGTREFCLK_116_P"     LOC = "U1.R4";
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NET "MGTRX0_102_N"        LOC = "U1.AL37";

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NET "MGTRX1_114_P"	LOC = "U1.AC7";
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NET "MGTRX1_118_P"	LOC = "U1.F6";

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NET "MGTRX2_116_P"	LOC = "U1.N8";
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NET "MGTRX2_117_P"	LOC = "U1.H6";
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NET "MGTRX3_102_P"	LOC = "U1.AK40";
NET "MGTRX3_103_N"	LOC = "U1.AE37";
NET "MGTRX3_103_P"	LOC = "U1.AE38";
NET "MGTRX3_104_N"	LOC = "U1.AA37";
NET "MGTRX3_104_P"	LOC = "U1.AA38";
NET "MGTRX3_105_N"	LOC = "U1.U37";
NET "MGTRX3_105_P"	LOC = "U1.U38";
NET "MGTRX3_106_N"	LOC = "U1.M40";
NET "MGTRX3_106_P"	LOC = "U1.M39";
NET "MGTRX3_107_N"	LOC = "U1.J38";
NET "MGTRX3_107_P"	LOC = "U1.J37";
NET "MGTRX3_108_N"	LOC = "U1.D40";
NET "MGTRX3_108_P"	LOC = "U1.D39";
NET "MGTRX3_112_N"	LOC = "U1.AK6";
NET "MGTRX3_112_P"	LOC = "U1.AK5";
NET "MGTRX3_113_N"	LOC = "U1.AE8";
NET "MGTRX3_113_P"	LOC = "U1.AE7";
NET "MGTRX3_114_N"	LOC = "U1.AA8";
NET "MGTRX3_114_P"	LOC = "U1.AA7";
NET "MGTRX3_115_N"	LOC = "U1.U8";
NET "MGTRX3_115_P"	LOC = "U1.U7";
NET "MGTRX3_116_N"	LOC = "U1.M5";

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NET "MGTRX3_116_P"      LOC = "U1.M6" ;
NET "MGTRX3_117_N"      LOC = "U1.J7" ;
NET "MGTRX3_117_P"      LOC = "U1.J8" ;
NET "MGTRX3_118_N"      LOC = "U1.D5" ;
NET "MGTRX3_118_P"      LOC = "U1.D6" ;
NET "MGTTX0_100_N"      LOC = "U1.BB43" ;
NET "MGTTX0_100_P"      LOC = "U1.BB44" ;
NET "MGTTX0_101_N"      LOC = "U1.AU41" ;
NET "MGTTX0_101_P"      LOC = "U1.AU42" ;
NET "MGTTX0_102_N"      LOC = "U1.AN41" ;
NET "MGTTX0_102_P"      LOC = "U1.AN42" ;
NET "MGTTX0_103_N"      LOC = "U1.AJ41" ;
NET "MGTTX0_103_P"      LOC = "U1.AJ42" ;
NET "MGTTX0_104_N"      LOC = "U1.AE41" ;
NET "MGTTX0_104_P"      LOC = "U1.AE42" ;
NET "MGTTX0_105_N"      LOC = "U1.AA41" ;
NET "MGTTX0_105_P"      LOC = "U1.AA42" ;
NET "MGTTX0_106_N"      LOC = "U1.T44" ;
NET "MGTTX0_106_P"      LOC = "U1.T43" ;
NET "MGTTX0_107_N"      LOC = "U1.L42" ;
NET "MGTTX0_107_P"      LOC = "U1.L41" ;
NET "MGTTX0_108_N"      LOC = "U1.F44" ;
NET "MGTTX0_108_P"      LOC = "U1.F43" ;
NET "MGTTX0_112_N"      LOC = "U1.AN4" ;
NET "MGTTX0_112_P"      LOC = "U1.AN3" ;
NET "MGTTX0_113_N"      LOC = "U1.AJ4" ;
NET "MGTTX0_113_P"      LOC = "U1.AJ3" ;
NET "MGTTX0_114_N"      LOC = "U1.AE4" ;
NET "MGTTX0_114_P"      LOC = "U1.AE3" ;
NET "MGTTX0_115_N"      LOC = "U1.AA4" ;
NET "MGTTX0_115_P"      LOC = "U1.AA3" ;
NET "MGTTX0_116_N"      LOC = "U1.T1" ;
NET "MGTTX0_116_P"      LOC = "U1.T2" ;
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NET "MGTTX1_100_P"      LOC = "U1.AY44" ;
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NET "MGTTX1_112_P"      LOC = "U1.AM1" ;
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NET "MGTTX1_118_N"	LOC = "U1.D1";
NET "MGTTX1_118_P"	LOC = "U1.D2";
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NET "MGTTX2_100_P"	LOC = "U1.AW42";
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NET "MGTTX2_101_P"	LOC = "U1.AR42";
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NET "MGTTX2_108_P"	LOC = "U1.A41";
NET "MGTTX2_112_N"	LOC = "U1.AL4";
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NET "MGTTX2_113_P"	LOC = "U1.AG3";
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NET "MGTTX2_114_P"	LOC = "U1.AC3";
NET "MGTTX2_115_N"	LOC = "U1.W4";
NET "MGTTX2_115_P"	LOC = "U1.W3";
NET "MGTTX2_116_N"	LOC = "U1.M1";
NET "MGTTX2_116_P"	LOC = "U1.M2";
NET "MGTTX2_117_N"	LOC = "U1.G3";
NET "MGTTX2_117_P"	LOC = "U1.G4";
NET "MGTTX2_118_N"	LOC = "U1.A3";
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NET "MGTTX3_100_N"	LOC = "U1.AV43";
NET "MGTTX3_100_P"	LOC = "U1.AV44";
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NET "MGTTX3_101_P"	LOC = "U1.AP44";
NET "MGTTX3_102_N"	LOC = "U1.AK43";
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NET "MGTTX3_103_P"	LOC = "U1.AF44";
NET "MGTTX3_104_N"	LOC = "U1.AB43";
NET "MGTTX3_104_P"	LOC = "U1.AB44";
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NET "MGTTX3_106_N"	LOC = "U1.N42";
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NET "MGTTX3_107_N"	LOC = "U1.H44";
NET "MGTTX3_107_P"	LOC = "U1.H43";
NET "MGTTX3_108_N"	LOC = "U1.C42";

NET "MGTTX3_108_P"	LOC = "U1.C41";
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NET "MGTTX3_115_N"	LOC = "U1.V2";
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NET "MGTTX3_116_N"	LOC = "U1.N3";
NET "MGTTX3_116_P"	LOC = "U1.N4";
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NET "MGTTX3_118_N"	LOC = "U1.C3";
NET "MGTTX3_118_P"	LOC = "U1.C4";
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NET "MGT_MOD_SPI_Q"	LOC = "U1.N24";
NET "MGT_MOD_SPI_SCK"	LOC = "U1.H26";
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NET "USB_GPIO_2"	LOC = "U1.M27";
NET "USB_GPIO_3"	LOC = "U1.N27";
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NET "USB_RXD_I"	LOC = "U1.C29";
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NET "USER_IO_3"	LOC = "U1.C28";
NET "USER_IO_4"	LOC = "U1.C27";
NET "USER_IO_5"	LOC = "U1.A29";
NET "USER_IO_6"	LOC = "U1.A28";
NET "USER_PB1"	LOC = "U1.A27";
NET "USER_PB2"	LOC = "U1.B27";
NET "USER_SW1"	LOC = "U1.J29";
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NET "USER_SW3"	LOC = "U1.R27";
NET "USER_SW4"	LOC = "U1.T27";
NET "USER_SW5"	LOC = "U1.H29";
NET "USER_SW6"	LOC = "U1.H28";
NET "USER_SW7"	LOC = "U1.L29";
NET "USER_SW8"	LOC = "U1.L28";

References

Additional information relevant to Virtex®-6 devices, the ML628 Virtex-6 FPGA GTX and GTH transceiver characterization board, and intellectual property is available in the documents listed here:

- [UG806](#), *ML628 IBERT Getting Started Guide*
- [DS150](#), *Virtex-6 Family Overview*
- [DS152](#), *Virtex-6 FPGA Data Sheet: DC and Switching Characteristics*
- [UG360](#), *Virtex-6 FPGA Configuration User Guide*
- [UG361](#), *Virtex-6 FPGA SelectIO Resources User Guide*
- [UG362](#), *Virtex-6 FPGA User Guide: Clocking Resources*
- [UG364](#), *Virtex-6 FPGA Configurable Logic Block User Guide*
- [UG365](#), *Virtex-6 FPGA Packaging and Pinout Specifications*
- [UG366](#), *Virtex-6 FPGA GTX Transceivers User Guide*
- [UG370](#), *Virtex-6 FPGA System Monitor User Guide*
- [UG371](#), *Virtex-6 FPGA GTH Transceivers User Guide*
- [DS581](#), *XPS External Peripheral Controller (EPC) Data Sheet*
- [DS606](#), *XPS IIC Bus Interface (v2.00a) Data Sheet*
- [UG770](#), *HW-CLK-101-SCLK2 SuperClock-2 Module User Guide*

To find additional documentation, see the Xilinx website at:

<http://www.xilinx.com/support/documentation/index.htm>.

