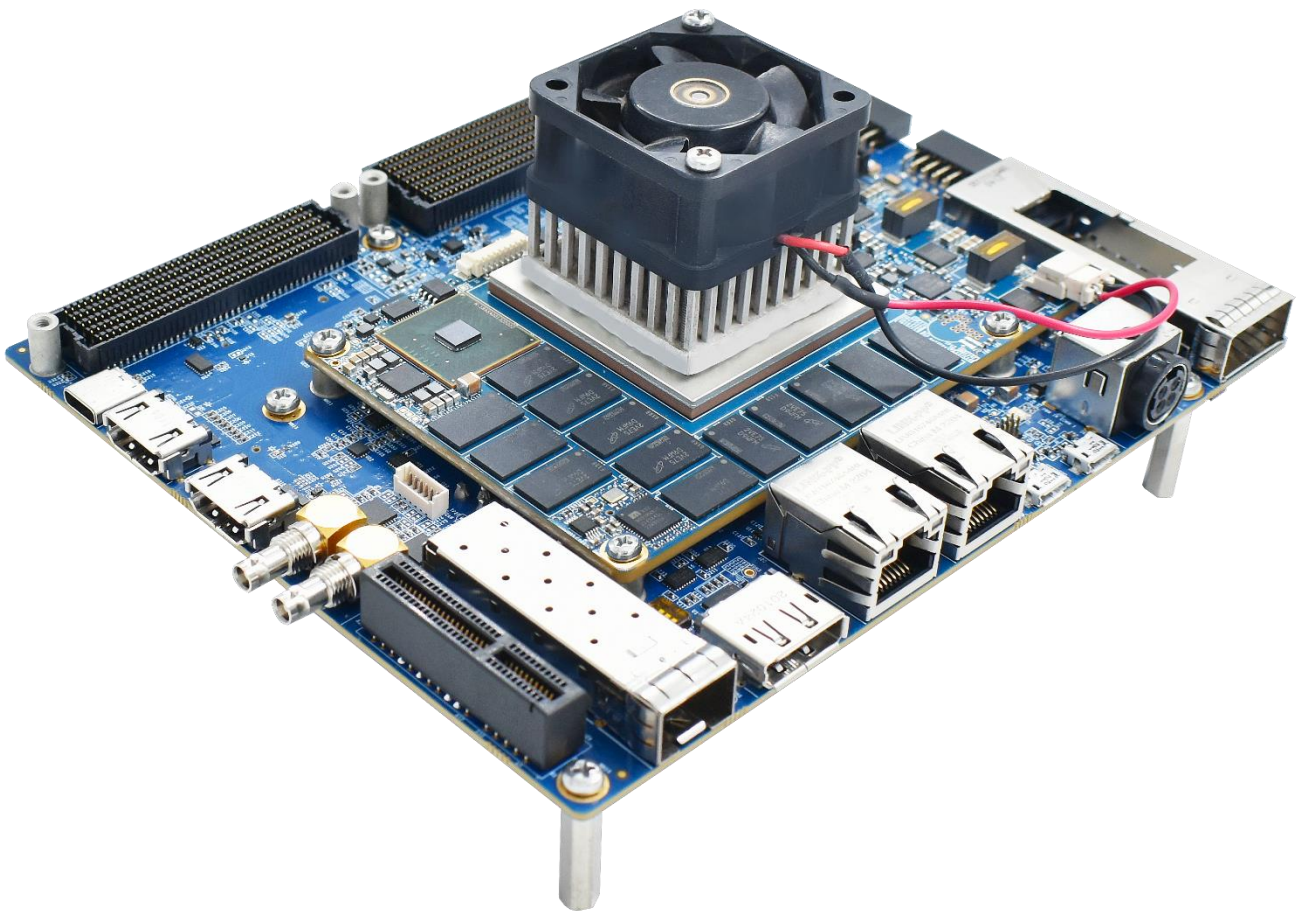


# iW-RainboW-G47D

## Kintex UltraScale+ FPGA SOM Development Platform Datasheet



# Kintex UltraScale+ FPGA SOM DevKit Datasheet

## Document Revision History

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## Table of Contents

|   |           |
|---|-----------|
| <b>1. INTRODUCTION .....</b>                                      | <b>8</b>  |
| 1.1 PURPOSE .....   | 8         |
| 1.2 OVERVIEW .....  | 8         |
| 1.3 LIST OF ACRONYMS .....  | 8         |
| 1.4 TERMINOLOGY DESCRIPTION .....                                 | 9         |
| 1.5 REFERENCES .....  | 10        |
| <b>2. ARCHITECTURE AND DESIGN .....</b>                           | <b>11</b> |
| 2.1 KINTEX ULTRASCALE+ FPGA SOM CARRIER BOARD BLOCK DIAGRAM ..... | 11        |
| 2.2 KINTEX ULTRASCALE+ FPGA SOM CARRIER BOARD FEATURES .....      | 12        |
| 2.3 BOARD TO BOARD CONNECTORS.....                                | 14        |
| 2.3.1 Board to Board Connector1 .....                             | 14        |
| 2.3.2 Board to Board Connector2 .....                             | 15        |
| 2.3.3 Board to Board Connector3 .....                             | 16        |
| 2.3.4 Board to Board Connector4 .....                             | 17        |
| 2.4 CPU INTERFACE FEATURES .....                                  | 18        |
| 2.4.1 High-speed Serial Interfaces (SerDes).....                  | 18        |
| 2.4.2 Gigabit Ethernet Port1 .....                                | 26        |
| 2.4.3 USB2.0 OTG Port.....  | 27        |
| 2.4.4 USB 3.0 Type-C Port .....                                   | 28        |
| 2.4.5 Debug UART .....  | 29        |
| 2.5 FPGA INTERFACE FEATURES.....                                  | 31        |
| 2.5.1 GTY High Speed Transceivers .....                           | 31        |
| 2.5.2 FMC HPC Connector.....                                      | 38        |
| 2.5.3 FMC+ HPC Connector.....                                     | 54        |
| 2.6 ADDITIONAL FEATURES .....                                     | 77        |
| 2.6.1 Clock Synthesizers.....                                     | 77        |
| 2.6.2 JTAG Connector .....  | 80        |
| 2.6.3 Pmod Host Port Connectors .....                             | 83        |
| 2.6.4 IO Expanders.....   | 85        |
| 2.6.5 I2C Tree .....  | 88        |
| 2.6.6 GPIO Header.....  | 89        |
| 2.6.7 Power ON/OFF Switch.....                                    | 91        |
| 2.6.8 Reset Switch .....  | 92        |
| 2.6.9 RTC Coin Cell Holder .....                                  | 93        |
| 2.6.10 12V Fan Header .....                                       | 94        |
| <b>3. TECHNICAL SPECIFICATION .....</b>                           | <b>95</b> |
| 3.1 POWER INPUT REQUIREMENT .....                                 | 95        |
| 3.2 POWER OUTPUT SPECIFICATION .....                              | 96        |
| 3.3 ENVIRONMENTAL CHARACTERISTICS.....                            | 97        |
| 3.3.1 Environmental Specification.....                            | 97        |

|       |   |            |
|-------|---|------------|
| 3.3.2 | RoHS Compliance.....  | 97         |
| 3.3.3 | Electrostatic Discharge.....  | 97         |
| 3.4   | MECHANICAL CHARACTERISTICS.....   | 98         |
| 3.4.1 | Carrier Board Mechanical Dimensions.....                                    | 98         |
| 3.4.2 | Guidelines to insert the Kintex UltraScale+ SoC SOM into Carrier Board..... | 100        |
| 3.4.3 | FAN Sink Fixing procedure on SOM with Carrier Board.....                    | 101        |
| 4.    | <b>ORDERING INFORMATION.....</b>  | <b>102</b> |

## List of Figures

|   |     |
|---|-----|
| FIGURE 1: KINTEX ULTRASCALE+ FPGA SOM CARRIER BOARD BLOCK DIAGRAM ..... | 11  |
| FIGURE 2: BOARD TO BOARD CONNECTOR1.....                                | 14  |
| FIGURE 3: BOARD TO BOARD CONNECTOR2.....                                | 15  |
| FIGURE 4: BOARD TO BOARD CONNECTOR3.....                                | 16  |
| FIGURE 5: BOARD TO BOARD CONNECTOR4.....                                | 17  |
| FIGURE 6: LANE SELECTION SWITCH.....                                    | 19  |
| FIGURE 7: PCIE X4 CONNECTOR.....  | 20  |
| FIGURE 8: M.2 SATA CONNECTOR (KEY M).....                               | 23  |
| FIGURE 9: GIGABIT ETHERNET CONNECTOR1 .....                             | 26  |
| FIGURE 10: USB OTG CONNECTOR.....                                       | 28  |
| FIGURE 11: USB 3.0 TYPE-C CONNECTOR .....                               | 29  |
| FIGURE 12: DEBUG UART CONNECTOR.....                                    | 30  |
| FIGURE 13: QSFP28/QSFP+/QSFP+ CONNECTOR WITH CAGE .....                 | 32  |
| FIGURE 14: FIREFLY CONNECTOR .....                                      | 35  |
| FIGURE 15: FMC CONNECTOR.....   | 38  |
| FIGURE 16: FMC HPC CONNECTOR PIN OUT .....                              | 39  |
| FIGURE 17: FMC BOARD TO BOARD CONNECTOR BLOCK DIAGRAM .....             | 39  |
| FIGURE 18: FMC+ CONNECTOR.....  | 54  |
| FIGURE 19: FMC+ HPC CONNECTOR PIN OUT .....                             | 55  |
| FIGURE 20: FMC+ AND BOARD-TO-BOARD CONNECTOR BLOCK DIAGRAM .....        | 56  |
| FIGURE 21: CLOCK TREE.....  | 79  |
| FIGURE 22: JTAG CONNECTOR.....  | 81  |
| FIGURE 23: PMOD HOST PORT CONNECTORS.....                               | 83  |
| FIGURE 24: I2C TREE.....  | 88  |
| FIGURE 25: GPIO HEADER.....   | 89  |
| FIGURE 26: POWER ON/OFF SWITCH.....                                     | 91  |
| FIGURE 27: RESET SWITCH.....  | 92  |
| FIGURE 28: RTC COIN CELL HOLDER.....                                    | 93  |
| FIGURE 29: 12V-FAN HEADER.....  | 94  |
| FIGURE 30: POWER JACK.....  | 95  |
| FIGURE 31: CARRIER BOARD MECHANICAL DIMENSION – TOP VIEW.....           | 98  |
| FIGURE 32: CARRIER BOARD MECHANICAL DIMENSION – SIDE VIEW .....         | 99  |
| FIGURE 33: KINTEX ULTRASCALE+ FPGA SOM INSERTING AND REMOVING.....      | 100 |
| FIGURE 34: KINTEX ULTRASCALE+ SOM WITH FAN SINK FIXING PROCEDURE .....  | 101 |

## List of Tables

|  |     |
|--|-----|
| TABLE 1: ACRONYMS & ABBREVIATIONS .....            | 8   |
| TABLE 2: TERMINOLOGY .....                         | 9   |
| TABLE 3: SWITCH SELECTION SETTING .....            | 18  |
| TABLE 4: PCIe x4 CONNECTOR PIN ASSIGNMENT.....     | 21  |
| TABLE 5: M.2 SATA CONNECTOR PIN ASSIGNMENT .....   | 23  |
| TABLE 6: QSFP28/QSFP+/QSFP CONNECTOR PIN OUT ..... | 33  |
| TABLE 7: FIREFLY DATA CONNECTOR PIN OUT .....      | 36  |
| TABLE 8: FIREFLY POWER CONNECTOR PIN OUT.....      | 37  |
| TABLE 9: FMC HPC CONNECTOR PIN ASSIGNMENT .....    | 41  |
| TABLE 10: FMC+ HPC CONNECTOR PIN ASSIGNMENT .....  | 57  |
| TABLE 11: CLOCK SYNTHESIZER 1 OUTPUT CLOCKS.....   | 77  |
| TABLE 12: CLOCK SYNTHESIZER 2 OUTPUT CLOCKS.....   | 78  |
| TABLE 13: JTAG SELECTION SWITCH .....              | 80  |
| TABLE 14: JTAG HEADER PIN ASSIGNMENT .....         | 82  |
| TABLE 15: PMOD CONNECTOR1 PIN ASSIGNMENT.....      | 84  |
| TABLE 16: PMOD CONNECTOR2 PIN ASSIGNMENT.....      | 84  |
| TABLE 17: IO EXPANDER 1 OUTPUT .....               | 85  |
| TABLE 18: IO EXPANDER 2 OUTPUT .....               | 86  |
| TABLE 19: IO EXPANDER 3 OUTPUT .....               | 87  |
| TABLE 20: GPIO HEADER PIN ASSIGNMENT .....         | 89  |
| TABLE 21: 12V FAN HEADER PINOUT.....               | 94  |
| TABLE 22: POWER INPUT REQUIREMENT .....            | 95  |
| TABLE 23: POWER OUTPUT SPECIFICATION .....         | 96  |
| TABLE 24: ENVIRONMENTAL SPECIFICATION .....        | 97  |
| TABLE 25: ORDERABLE PRODUCT PART NUMBERS .....     | 102 |

## 1. INTRODUCTION

### 1.1 Purpose

The Kintex UltraScale+ FPGA SOM Development platform incorporates Kintex UltraScale+ FPGA based SOM and Ultra-High-Performance Carrier board for complete validation of Kintex UltraScale+ FPGA and LS1021A Layerscape processor functionality. This document is the Hardware Datasheet for the Kintex UltraScale+ FPGA Carrier Board and provides detailed information on the overall design & usage of the Carrier Board from a Hardware Systems perspective. The details about the Kintex UltraScale+ FPGA SOM hardware is explained in another document “iW-RainboW-G47M-Kintex-UltraScale+ FPGA-SOM-Datasheet”.

### 1.2 Overview

iWave's Kintex UltraScale+ FPGA Development platform comes with Kintex UltraScale+ FPGA SOM and the Ultra-High-Performance Carrier Board. The development board can be used for quick prototyping of various applications targeted by the Kintex UltraScale+ FPGA. With the 140mmx170mm size, carrier board is packed with all the necessary on-board connectors to validate the features of Kintex UltraScale+ FPGA SOM.

### 1.3 List of Acronyms

The following acronyms will be used throughout this document.

**Table 1: Acronyms & Abbreviations**

| Acronyms | Abbreviations                                       |
|----------|---|
| B2B      | Board To Board Connector                            |
| CPU      | Central Processing Unit                             |
| DDR4     | Double Data Rate fourth-generation                  |
| EEPROM   | Electrically Erasable Programmable Read-only Memory |
| FMC      | FPGA Mezzanine Card                                 |
| FMC+     | FPGA Mezzanine Card+                                |
| FPGA     | Field Programmable Gate Array                       |
| GB       | Giga Byte   |
| Gbps     | Gigabits per sec                                    |
| GHz      | Giga Hertz  |
| GPIO     | General Purpose Input Output                        |
| HPC      | High Performance Computing                          |
| I2C      | Inter-Integrated Circuit                            |
| IC       | Integrated Circuit                                  |
| JTAG     | Joint Test Action Group                             |
| LED      | Light-Emitting Diode                                |
| MB       | Mega Byte   |
| Mbps     | Megabits per sec                                    |



# Kintex UltraScale+ FPGA SOM DevKit Datasheet

| Acronyms | Abbreviations                               |
|----------|---|
| MDI      | Medium-dependent interface                  |
| MHz      | Mega Hertz                                  |
| MRAM     | Magneto-resistive Random Access Memory      |
| OTG      | On-The-Go                                   |
| PCB      | Printed Circuit Board                       |
| PCIe     | Peripheral Component Interconnect Express   |
| PMIC     | Power Management Integrated Circuit         |
| PMOD     | Peripheral Module Interface                 |
| QSFP     | Quad Small Form-factor Pluggable            |
| RGMI     | Reduced Gigabit Media Independent Interface |
| RTC      | Real Time Clock                             |
| SerDes   | Serializer/Deserializer                     |
| SOM      | System On Module                            |
| SRAM     | Static Random Access Memory                 |
| TPM      | Trusted Platform Module                     |
| UART     | Universal Asynchronous Receiver/Transmitter |
| USB      | Universal Serial Bus                        |

## 1.4 Terminology Description

In this document, wherever Signal Type is mentioned, below terminology is used.

**Table 2: Terminology**

| Terminology | Description  |
|-------------|--|
| I           | Input Signal   |
| O           | Output Signal  |
| IO          | Bidirectional Input/output Signal                                    |
| CMOS        | Complementary Metal Oxide Semiconductor Signal                       |
| LVDS        | Low Voltage Differential Signal                                      |
| GBE         | Gigabit Ethernet Media Dependent Interface differential pair signals |
| USB         | Universal Serial Bus differential pair signals                       |
| OD          | Open Drain Signal  |
| OC          | Open Collector Signal  |
| Power       | Power Pin  |
| PU          | Pull Up  |
| PD          | Pull Down  |
| NA          | Not Applicable   |
| NC          | Not Connected  |

*Note: Signal Type does not include internal pull-ups or pull-downs implemented by the chip vendors and only includes the pull-ups or pull-downs implemented on board.*

## 1.5 References

- Kintex UltraScale+ FPGA Datasheet & Reference Manual.
- QorIQ LS1021A Data Sheet & Reference Manual.
- Kintex UltraScale+ FPGA SOM Datasheet.

## 2. ARCHITECTURE AND DESIGN

This section provides detailed information about the Kintex UltraScale+ FPGA Development platform carrier board features with high level block diagram and detailed information about each block.

### 2.1 Kintex UltraScale+ FPGA SOM Carrier Board Block Diagram

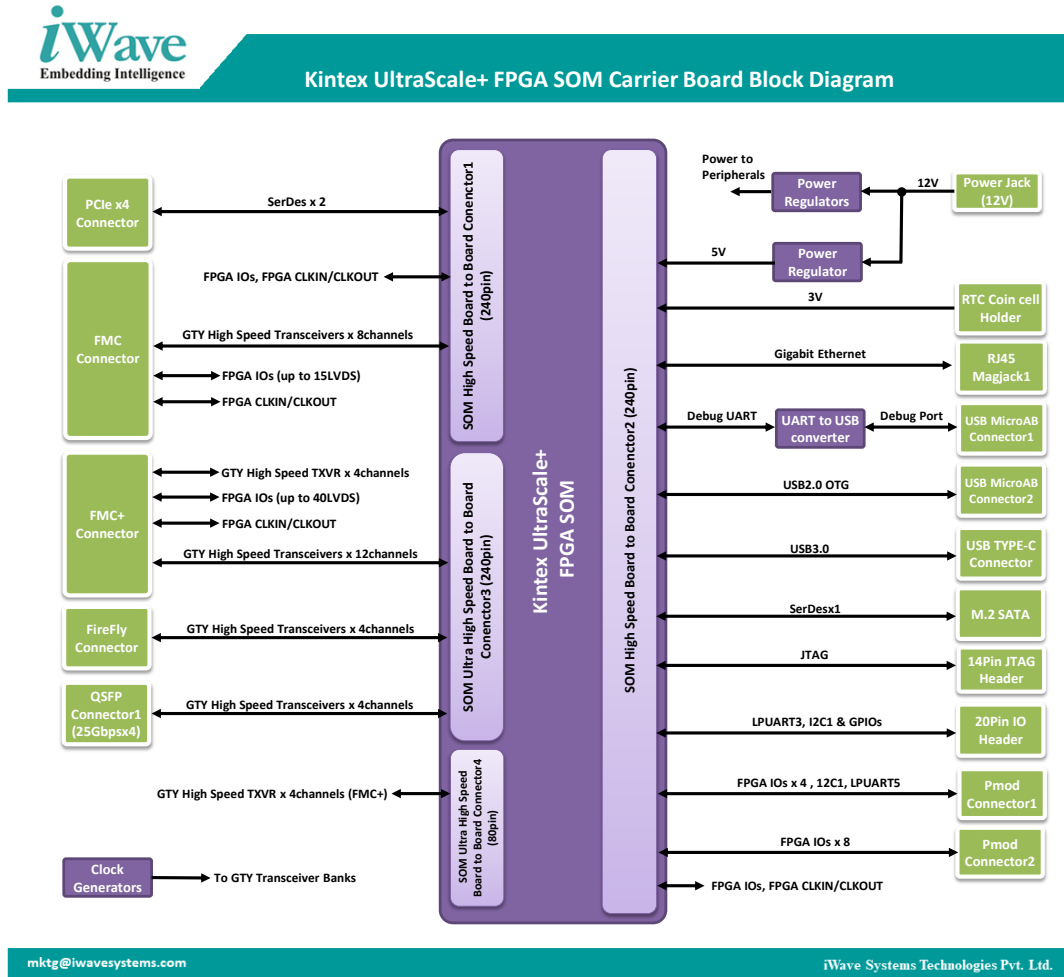


Figure 1: Kintex UltraScale+ FPGA SOM Carrier Board Block Diagram

## 2.2 Kintex UltraScale+ FPGA SOM Carrier Board Features

The Kintex UltraScale+ FPGA Carrier board supports the following features to validate the Kintex UltraScale+ FPGA SOM supported interfaces.

### CPU Interface Features

- PCIe x4 Connector x 1
- M.2 SATA Connector x1
- Gigabit Ethernet through RJ45MagJack x 1
- USB2.0 OTG through Micro AB Connector x 1
- USB 3.0 through Type-C Connector x 1
- Debug UART through USB Micro AB Connector x 1

### FPGA Interface Features

- QSFP28/QSFP+/QSFP Connector x 1
- FireFly Connector x 1
- FMC High Pin Count (HPC) Connector
  - 8 GTY High Speed Transceivers
  - 2 GTY Reference Clock
  - Up to 9 LVDS IOs/19 Single ended (SE) IOs from HP Bank
  - Up to 6 DIFF IOs/12 Single ended (SE) IOs from HD Bank
  - 2 Clock Input Capable LVDS/SE pins from HP Bank
  - 1 Clock Output Capable LVDS/SE pins from HP Bank
  - 3 Clock Output Capable DIFF/SE pins from HD Bank
- FMC+ High Pin Count (HPC) Connector
  - 16 GTY High Speed Transceivers
  - 4 GTY Reference Clock
  - Up to 24 LVDS IOs/48 Single ended (SE) IOs from HP Bank
  - Up to 16 DIFF IOs/40 Single ended (SE) IOs from HD Bank
  - 2 Clock Input Capable LVDS/SE pins from HP Bank
  - 2 Clock Input Capable DIFF/SE pins from HD Bank
  - 2 Clock Output Capable LVDS/SE pins from HP Bank
  - Up to 6 SE IOs from CPU

## Additional Features

- Clock Synthesizers/Generators x2
- JTAG Connector x 1
- PMOD Connector x 2
- 16-Bit IO Expanders x 3
- I2C Bus Switch x 1
- 20 Pin GPIO Header x 1
- Power ON/OFF Switch x 1
- Reset Push Button Switch x 1
- RTC Coin Cell Holder x 1
- 12V Fan Header x 1

## General Specification

- Power Supply : DC 12V, 14A Power Input Jack
- Form Factor : 140mm X 170mm

## 2.3 Board to Board Connectors

The Kintex UltraScale+ FPGA Carrier board supports four Board to Board mating connectors for Kintex UltraScale+ FPGA SOM attachment. This Board-to-Board connector are capable of handling high-speed serialized signals and can be used for size constrained embedded applications.

### 2.3.1 Board to Board Connector1

Board to Board Connector1 (J18) is physically located at the top of the board as shown below.

*Note: For the Board-to-Board Connector1 pinout, refer the Kintex UltraScale+ FPGA SOM Datasheet.*

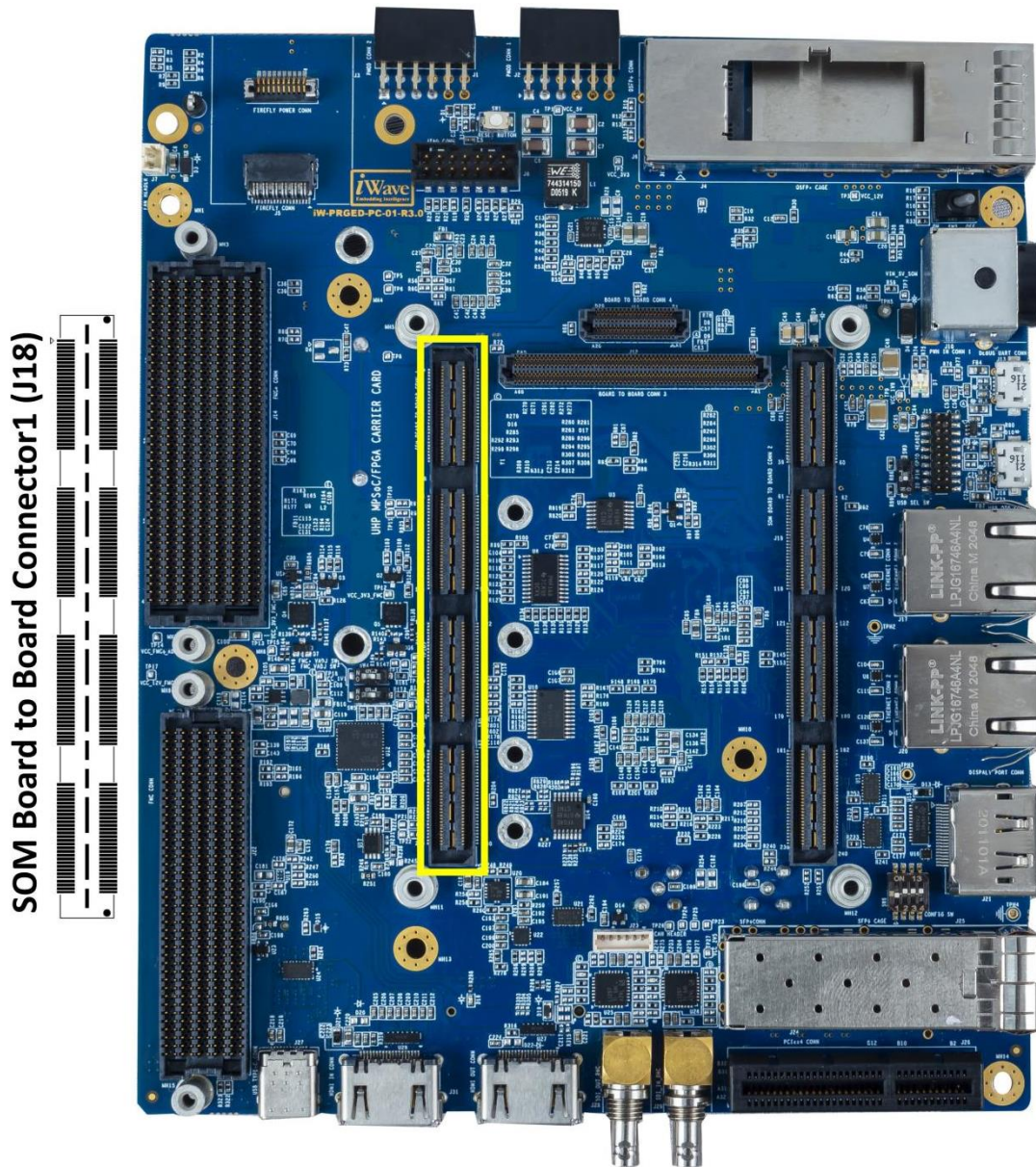


Figure 2: Board to Board Connector1



## 2.3.2 Board to Board Connector2

Board to Board Connector2 (J19) is physically located at the top of the board as shown below.

*Note: For the Board-to-Board Connector2 pinout, refer the Kintex UltraScale+ FPGA SOM Datasheet.*

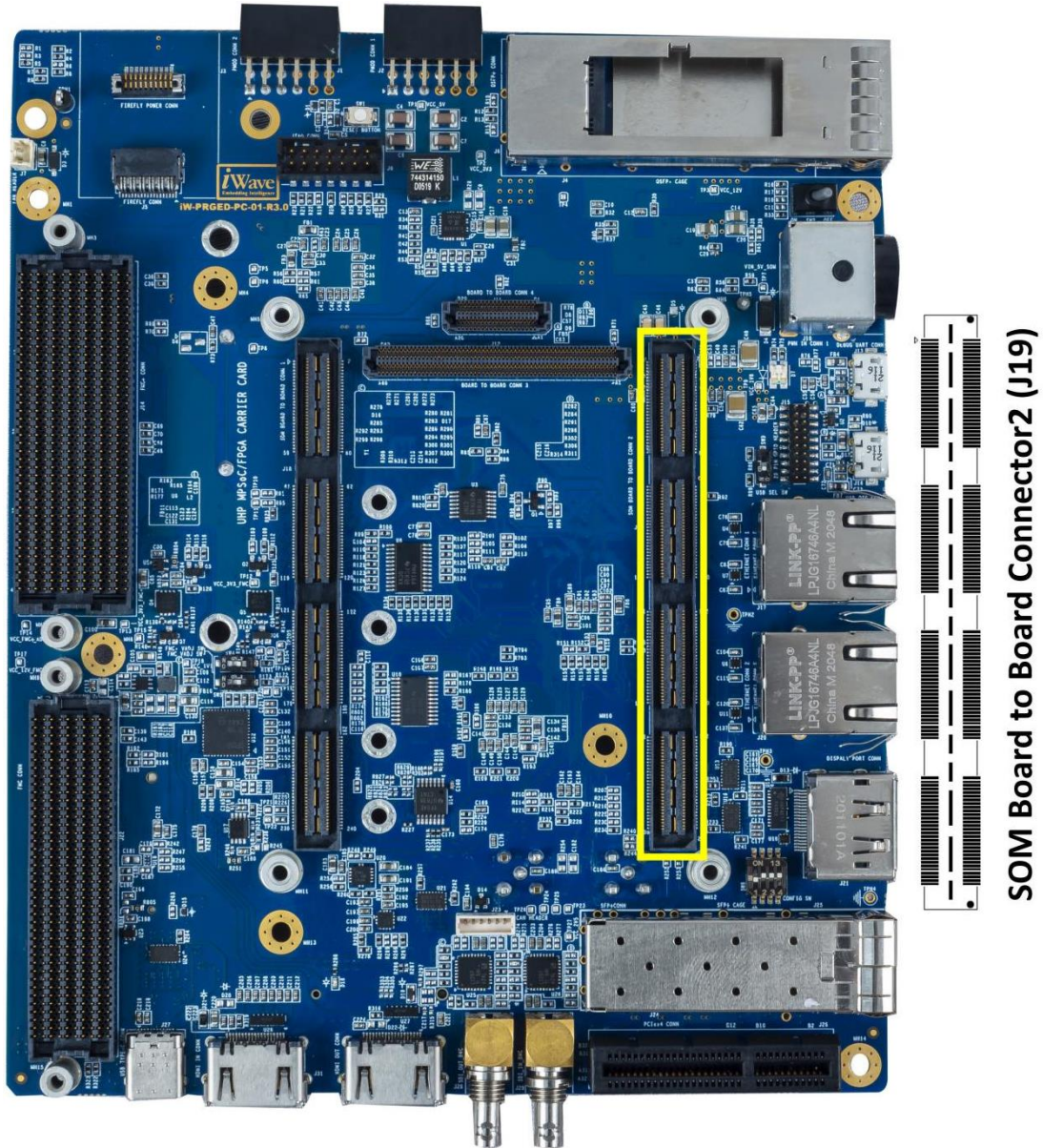


Figure 3: Board to Board Connector2



## 2.3.3 Board to Board Connector3

Board to Board Connector3 (J12) is physically located at the top of the board as shown below.

*Note: For the Board-to-Board Connector3 pinout, refer the Kintex UltraScale+ FPGA SOM Datasheet.*

### SOM Board to Board Connector3 (J12)

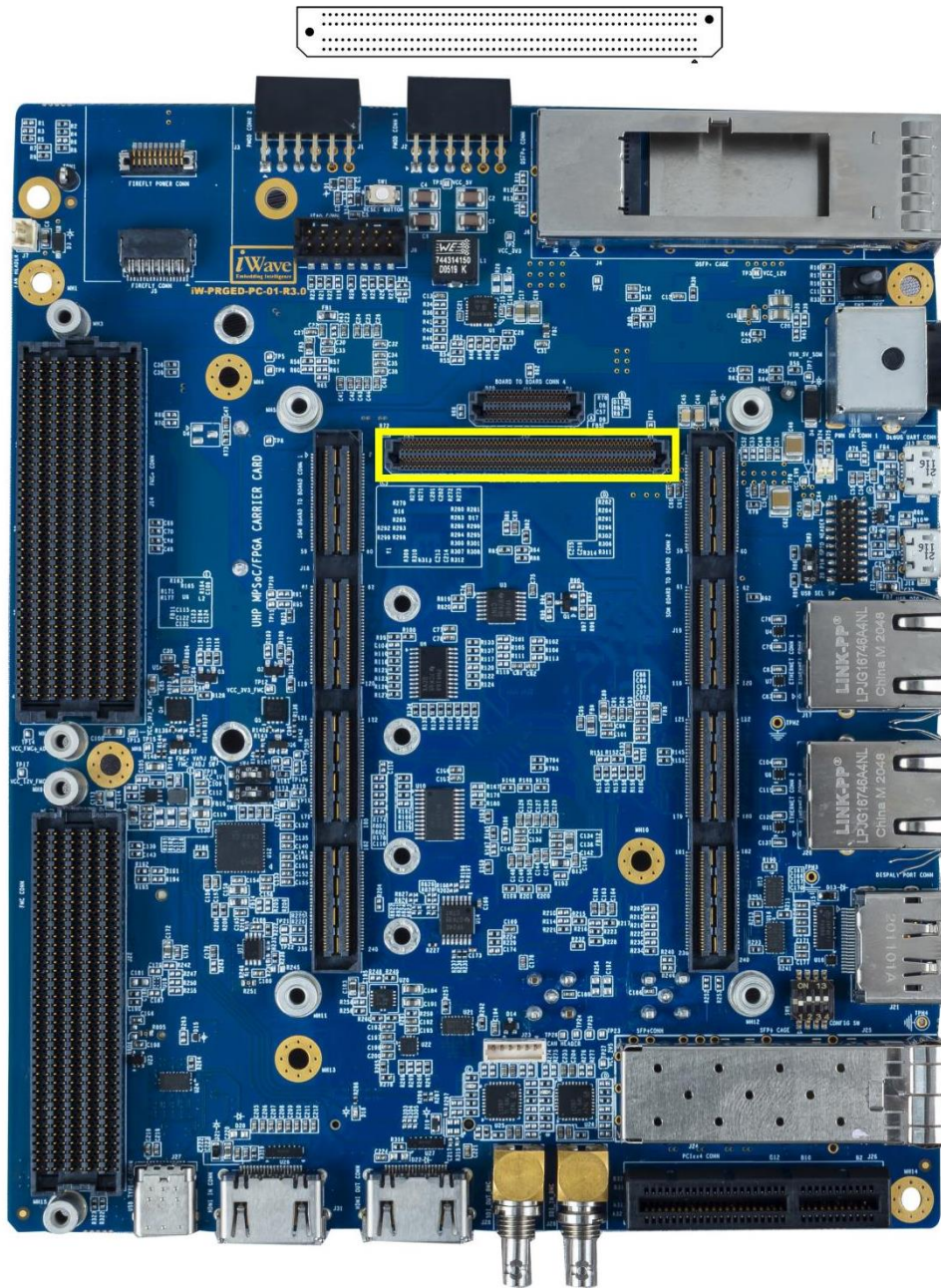


Figure 4: Board to Board Connector3



## 2.3.4 Board to Board Connector4

Board to Board Connector4 (J11) is physically located at the top of the board as shown below.

*Note: For the Board-to-Board Connector4 pinout, refer the Kintex UltraScale+ FPGA SOM Datasheet.*

### SOM Board to Board Connector4 (J11)

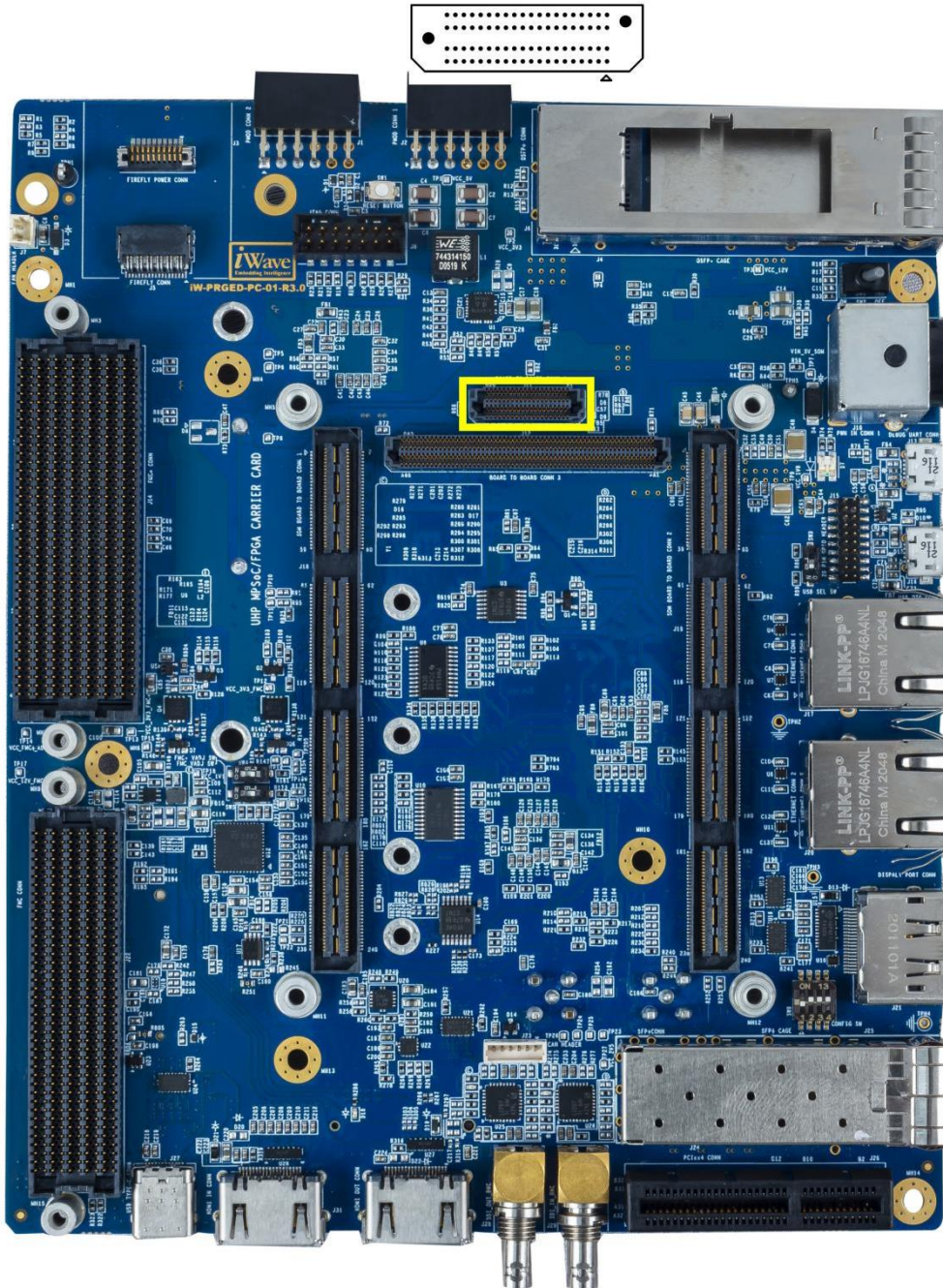


Figure 5: Board to Board Connector4

## 2.4 CPU Interface Features

The features which are supported from LS1021A Layerscape processor is explained in the following section.

### 2.4.1 High-speed Serial Interfaces (SerDes)

The Kintex UltraScale+ SOM Carrier board supports a high-speed serial interconnect application through Serializer/Deserializer (SerDes) Lanes of CPU. The SerDes lanes can be used for PCI Express, SGMII, and serial ATA (SATA) data transfers.

Each SerDes lane is connected to High-speed MUX/DEMUX IC to support different high-speed interfaces. High speed MUX/DEMUX is switching is controlled by 4-bit DIP Switch (SW6). The Switch selection details are explained below.

**Table 3: Switch Selection Setting**

| Switch6 Bit Number | Functionality   |   |
|--------------------|---|---|
|                    | OFF   | ON  |
| <b>Bit1</b>        | SerDes Lane2 is connected to Lane0 of PCIe x4 connector (Default)                                     | Not Applicable                                    |
| <b>Bit2</b>        | SerDes Lane3 is connected to Lane1 of PCIe x4 connector /JTAG pin of FPGA to JTAG connector (Default) | JTAG pin of CPU to JTAG connector                 |
| <b>Bit3</b>        | Not Applicable  | USB3.0 is connected to TypeC port (Default)       |
| <b>Bit4</b>        | Not Applicable  | SerDes Lane1 is connected to TypeC port (Default) |

*Note: Make sure SW6 selection is done properly before power on.*

SW6 in Kintex UltraScale+ Devkit is available on top side of board as shown below.

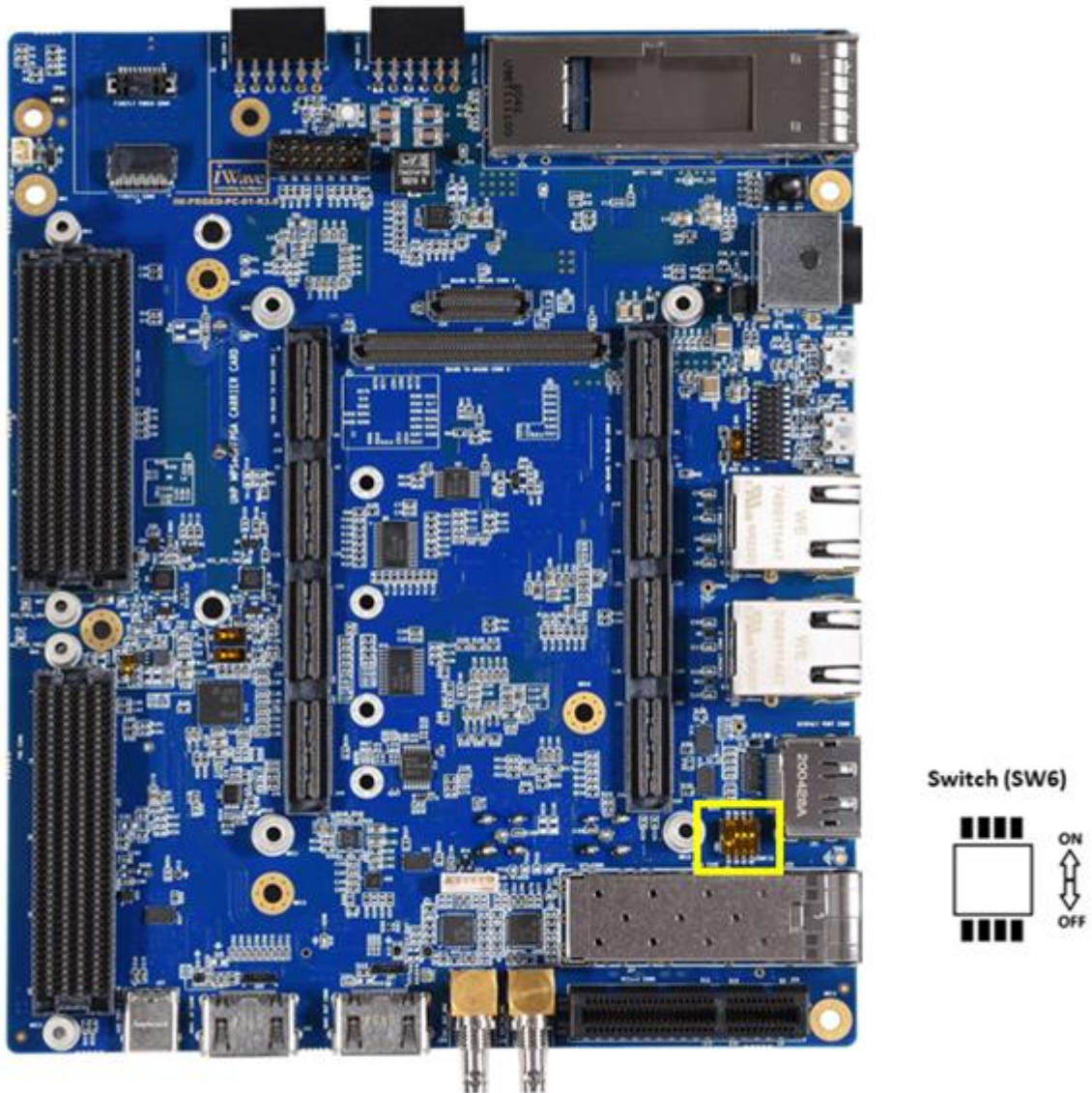


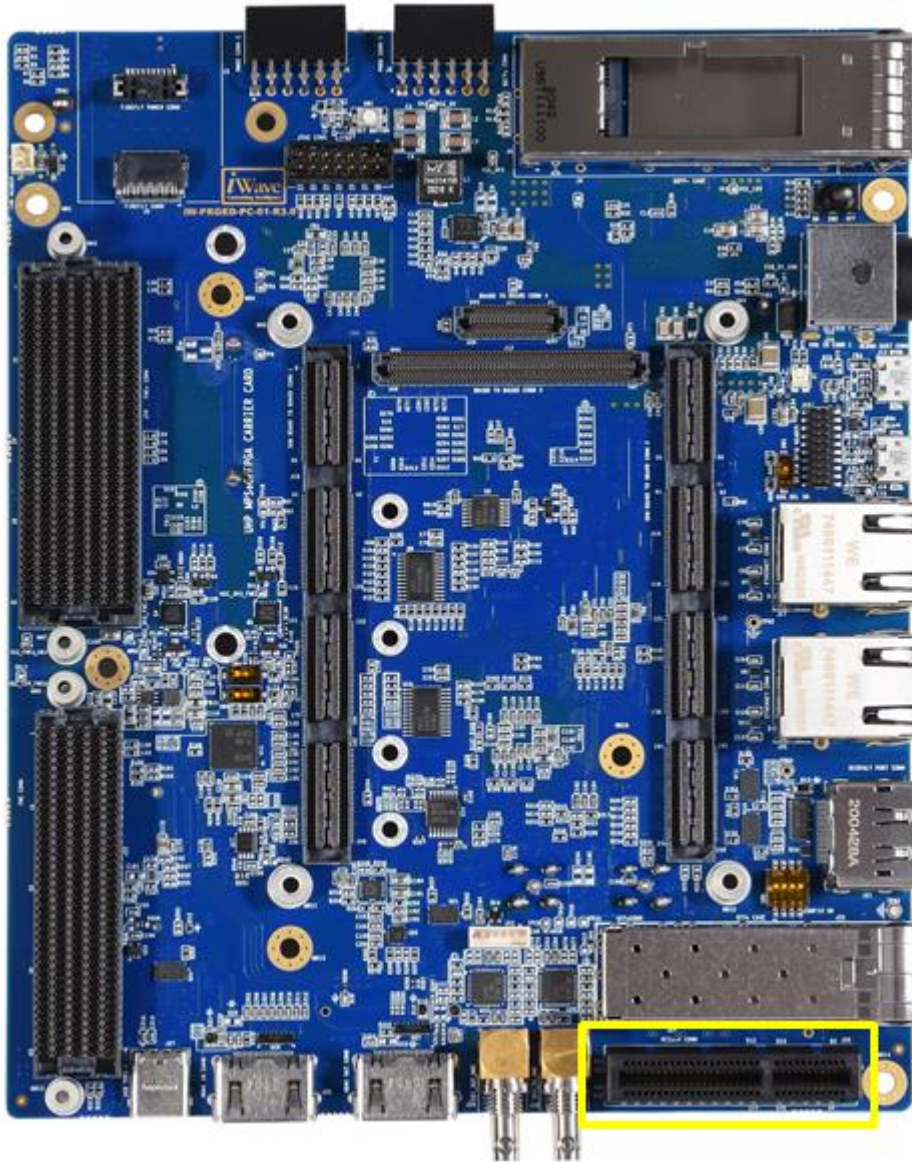
Figure 6: Lane Selection Switch

### 2.4.1.1 PCIe X4 Connector

The Kintex UltraScale+ FPGA Carrier board supports PCIe Gen2 Interface through Serdes Lanes of LS1021A Processor. The SerDes lane2 and Lane3 from Board-to-Board Connector1 is connected to PCIe x4 connector to support PCIe x1 or PCIe x2 Interface. The SerDes Lane selection to PCIe connector is done through Selection Switch (SW6), refer Table 3 for proper Lane selection.

This PCIe x4 connector (J26) is physically located at the top of the board as shown below.





PCIe x4 connector (J26)

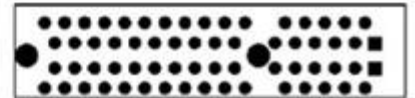


Figure 7: PCIe x4 Connector

# Kintex UltraScale+ FPGA SOM DevKit Datasheet

**Table 4: PCIe x4 Connector Pin Assignment**

| Pin No | Pin Name | Signal Name        | Signal Type/<br>Termination | Description                           |
|--------|----------|--------------------|-----------------------------|---------------------------------------|
| A1     | PRSNT1#  | PRSNT1#            | O, 3.3V CMOS                | Present pin, default Grounded.        |
| A2     | +12V_3   | VCC_12V            | O, 12V Power                | 12V Supply Voltage.                   |
| A3     | +12V_4   | VCC_12V            | O, 12V Power                | 12V Supply Voltage.                   |
| A4     | GND      | GND                | Power                       | Ground.                               |
| A5     | TCK      | NA                 | NA                          | NC.                                   |
| A6     | TDI      | NA                 | NA                          | NC.                                   |
| A7     | TDO      | NA                 | NA                          | NC.                                   |
| A8     | TMS      | NA                 | NA                          | NC.                                   |
| A9     | +3V3_2   | VCC_3V3            | O, 3.3V Power               | 3.3V Supply Voltage.                  |
| A10    | +3V3_3   | VCC_3V3            | O, 3.3V Power               | 3.3V Supply Voltage.                  |
| A11    | PERST#   | PL_AV23_LVDS92_L1P | O, 3.3V CMOS                | PCIe Reset through FPGA Bank IO.      |
| A12    | GND      | GND                | Power                       | Ground.                               |
| A13    | REFCLK+  | PClEX4_REFCLKP     | O, DIFF                     | 100MHz PCIe Reference Clock positive. |
| A14    | REFCLK-  | PClEX4_REFCLKN     | O, DIFF                     | 100MHz PCIe Reference Clock negative. |
| A15    | GND      | GND                | Power                       | Ground.                               |
| A16    | PERp0    | LS_SD1_RX2_P       | I, DIFF                     | PCIe Lane0 Receive pair positive.     |
| A17    | PERn0    | LS_SD1_RX2_N       | I, DIFF                     | PCIe Lane0 Receive pair negative.     |
| A18    | GND      | GND                | Power                       | Ground.                               |
| A19    | RSVD4    | NA                 | NA                          | NC.                                   |
| A20    | GND      | GND                | Power                       | Ground.                               |
| A21    | PERp1    | LS_SD1_RX3_P       | I, DIFF                     | PCIe Lane1 Receive pair positive.     |
| A22    | PERn1    | LS_SD1_RX3_N       | I, DIFF                     | PCIe Lane1 Receive pair negative.     |
| A23    | GND      | GND                | Power                       | Ground.                               |
| A24    | GND      | GND                | Power                       | Ground.                               |
| A25    | PERp2    | NA                 | NA                          | NA                                    |
| A26    | PERn2    | NA                 | NA                          | NA                                    |
| A27    | GND      | GND                | Power                       | Ground.                               |
| A28    | GND      | GND                | Power                       | Ground.                               |
| A29    | PERp3    | NA                 | NA                          | NA                                    |
| A30    | PERn3    | NA                 | NA                          | NA                                    |
| A31    | GND      | GND                | Power                       | Ground.                               |
| A32    | RSVD5    | NA                 | NA                          | NC.                                   |
| B1     | +12V_1   | VCC_12V            | O, 12V Power                | 12V Supply Voltage.                   |
| B2     | +12V_2   | VCC_12V            | O, 12V Power                | 12V Supply Voltage.                   |
| B3     | RSVD1    | NA                 | NA                          | NC.                                   |
| B4     | GND      | GND                | Power                       | Ground.                               |
| B5     | SMCLK    | I2C0_SD1_SCL       | O, 3.3V CMOS                | SMB Clock.                            |
| B6     | SMDAT    | I2C0_SD1_SDA       | IO, 3.3V CMOS               | SMB DATA.                             |
| B7     | GND      | GND                | Power                       | Ground.                               |

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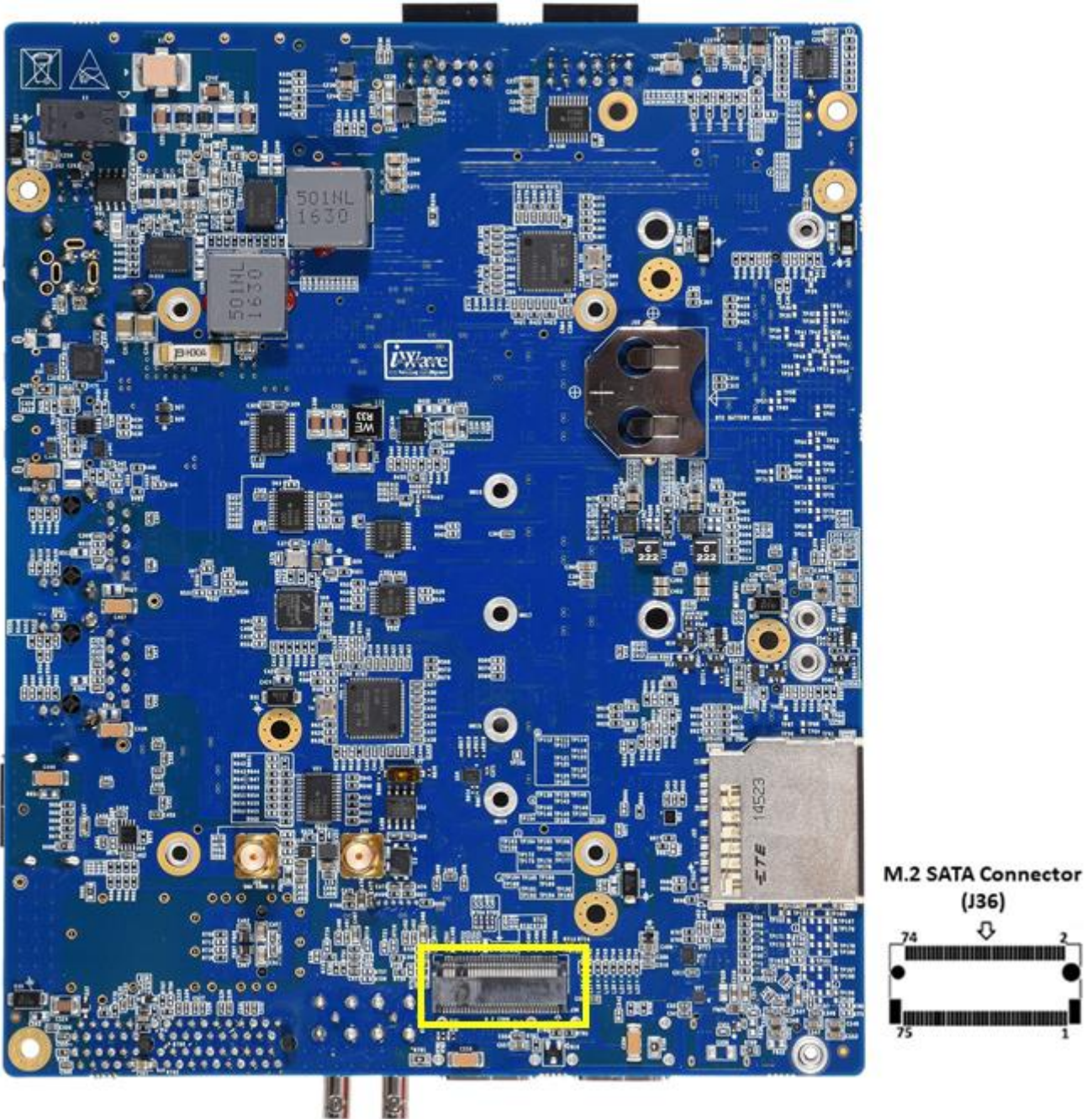
| Pin No | Pin Name  | Signal Name        | Signal Type/<br>Termination | Description                        |
|--------|-----------|--------------------|-----------------------------|------------------------------------|
| B8     | +3V3_1    | VCC_3V3            | O, 3.3V Power               | 3.3V Supply Voltage.               |
| B9     | TRST#     | NA                 | NA                          | NC.                                |
| B10    | 3V3AUX    | VCC_3V3            | O, 3.3V Power               | 3.3V Supply Voltage                |
| B11    | WAKE#     | PL_AW23_LVDS92_L1N | O, 3.3V CMOS                | PCIe Wake through FPGA Bank IO.    |
| B12    | RSVD2     | NA                 | NA                          | NC.                                |
| B13    | GND       | GND                | Power                       | Ground.                            |
| B14    | PETp0     | LS_SD1_TX2_P       | O, DIFF                     | PCIe Lane0 Transmit pair positive. |
| B15    | PETn0     | LS_SD1_TX2_N       | O, DIFF                     | PCIe Lane0 Transmit pair negative. |
| B16    | GND       | GND                | Power                       | Ground.                            |
| B17    | PRSNT2#_1 | NA                 | NA                          | NC.                                |
| B18    | GND       | GND                | Power                       | Ground.                            |
| B19    | PETp1     | LS_SD1_TX3_P       | O, DIFF                     | PCIe Lane1 Transmit pair positive. |
| B20    | PETn1     | LS_SD1_TX3_N       | O, DIFF                     | PCIe Lane1 Transmit pair negative. |
| B21    | GND       | GND                | Power                       | Ground.                            |
| B22    | GND       | GND                | Power                       | Ground.                            |
| B23    | PETp2     | NA                 | NA                          | NA                                 |
| B24    | PETn2     | NA                 | NA                          | NA                                 |
| B25    | GND       | GND                | Power                       | Ground.                            |
| B26    | GND       | GND                | Power                       | Ground.                            |
| B27    | PETp3     | NA                 | NA                          | NA                                 |
| B28    | PETn3     | NA                 | NA                          | NA                                 |
| B29    | GND       | GND                | Power                       | Ground.                            |
| B30    | RSVD3     | NA                 | NA                          | NC.                                |
| B31    | PRSNT#2_2 | NA                 | NA                          | NC.                                |
| B32    | GND       | GND                | Power                       | Ground.                            |

### 2.4.1.2 M.2 SATA Connector

The Kintex Ultrascale+ Carrier board supports one SATA interface through M.2 (Key M) SATA connector. SerDes Lane1 of LS1021A CPU is used for SATA interface. Speeds of 1.5 Gbps (first-generation SATA), 3 Gbps (second generation SATA), and 6 Gb/s (third-generation SATA). The SerDes Lane selection to M.2 SATA connector is done through Selection Switch (SW6), refer Table 3 for proper Lane selection.

This M.2 SATA connector (J36) is physically located at the bottom of the board as shown below.





**Figure 8: M.2 SATA Connector (Key M)**

**Table 5: M.2 SATA Connector Pin Assignment**

| Pin No | Pin Name | Signal Name | Signal Type/<br>Termination | Description     |
|--------|----------|-------------|-----------------------------|-----------------|
| 1      | CONFIG_3 | NA          | NA                          | NC              |
| 2      | 3.3V     | VCC_3V3     | O, 3.3V Power               | Supply Voltage. |
| 3      | GND      | GND         | Power                       | Ground.         |
| 4      | 3.3V     | VCC_3V3     | O, 3.3V Power               | Supply Voltage. |
| 5      | PERn3    | NA          | NA                          | NC.             |
| 6      | N/A1     | NA          | NA                          | NC.             |
| 7      | PERp3    | NA          | NA                          | NC.             |
| 8      | N/A2     | NA          | NA                          | NC.             |

## Kintex UltraScale+ FPGA SOM DevKit Datasheet

| Pin No | Pin Name      | Signal Name  | Signal Type/<br>Termination | Description                                      |
|--------|---------------|--------------|-----------------------------|--|
| 9      | GND           | GND          | Power                       | Ground.  |
| 10     | DAS/DSS       | DAS          | IO, 3.3V CMOS               | Connected to LED D20 for the activity indication |
| 11     | PETn3         | NA           | NA                          | NC.  |
| 12     | 3.3V          | VCC_3V3      | O, 3.3V Power               | Supply Voltage.                                  |
| 13     | PETp3         | NA           | NA                          | NC.  |
| 14     | 3.3V          | VCC_3V3      | O, 3.3V Power               | Supply Voltage.                                  |
| 15     | GND           | GND          | Power                       | Ground.  |
| 16     | 3.3V          | VCC_3V3      | O, 3.3V Power               | Supply Voltage.                                  |
| 17     | PERn2         | NA           | NA                          | NC.  |
| 18     | 3.3V          | VCC_3V3      | O, 3.3V Power               | Supply Voltage.                                  |
| 19     | PERp2         | NA           | NA                          | NC.  |
| 20     | N/A3          | NA           | NA                          | NC.  |
| 21     | CONFIG_0      | NA           | NA                          | NC   |
| 22     | N/A4          | NA           | NA                          | NC.  |
| 23     | PETn2         | NA           | NA                          | NC.  |
| 24     | N/A5          | NA           | NA                          | NC.  |
| 25     | PETp2         | NA           | NA                          | NC.  |
| 26     | N/A6          | NA           | NA                          | NC.  |
| 27     | GND           | GND          | Power                       | Ground.  |
| 28     | N/A7          | NA           | NA                          | NC.  |
| 29     | PERn1         | NA           | NA                          | NC.  |
| 30     | N/A8          | NA           | NA                          | NC.  |
| 31     | PERp1         | NA           | NA                          | NC.  |
| 32     | N/A9          | NA           | NA                          | NC.  |
| 33     | GND           | GND          | Power                       | Ground.  |
| 34     | N/A10         | NA           | NA                          | NC.  |
| 35     | PETn1         | NA           | NA                          | NC.  |
| 36     | N/A11         | NA           | NA                          | NC.  |
| 37     | PETp1         | NA           | NA                          | NC.  |
| 38     | DEVSLP        | NA           | NA                          | NC.  |
| 39     | GND           | GND          | Power                       | Ground.  |
| 40     | SMB_CLK       | NA           | NA                          | NC.  |
| 41     | SATA-B+/PERn0 | LS_SD1_RX1_P | I, DIFF                     | SATA Receive pair positive.                      |
| 42     | SMB_DATA      | NA           | NA                          | NC.  |
| 43     | SATA-B-/PERp0 | LS_SD1_RX1_N | I, DIFF                     | SATA Receive pair negative.                      |
| 44     | N/A14         | NA           | NA                          | NC.  |
| 45     | GND           | GND          | Power                       | Ground.  |
| 46     | N/A15         | NA           | NA                          | NC.  |
| 47     | SATA-A-/PETn0 | LS_SD1_TX1_N | O, DIFF                     | SATA Transmit pair negative.                     |
| 48     | N/A16         | NA           | NA                          | NC.  |
| 49     | SATA-A+/PETp0 | LS_SD1_TX1_P | O, DIFF                     | SATA Transmit pair positive.                     |



## Kintex UltraScale+ FPGA SOM DevKit Datasheet

| Pin No | Pin Name | Signal Name     | Signal Type/<br>Termination | Description                                  |
|--------|----------|-----------------|-----------------------------|--|
| 50     | PERST#   | B_M2_PCI_RST#   | O, 3.3V CMOS                | This pin is connected to IO Expander port 14 |
| 51     | GND      | GND             | Power                       | Ground.                                      |
| 52     | CLKREQ#  | B_PCI_CLKREQ#   | O, 3.3V CMOS                | This pin is connected to IO Expander port 16 |
| 53     | REFCLKN  | NA              | NA                          | NC.  |
| 54     | PEWAKE#  | B_M2_PCI_WAK#   | I, 3.3V CMOS                | This pin is connected to IO Expander port 15 |
| 55     | REFCLKP  | NA              | NA                          | NC.  |
| 56     | MFG1     | NA              | NA                          | NC.  |
| 57     | GND      | GND             | Power                       | Ground.                                      |
| 58     | MFG2     | NA              | NA                          | NC.  |
| 59     | M1       | NA              | NA                          | NC.  |
| 60     | M2       | NA              | NA                          | NC.  |
| 61     | M3       | NA              | NA                          | NC.  |
| 62     | M4       | NA              | NA                          | NC.  |
| 63     | M5       | NA              | NA                          | NC.  |
| 64     | M6       | NA              | NA                          | NC.  |
| 65     | M7       | NA              | NA                          | NC.  |
| 66     | M8       | NA              | NA                          | NC.  |
| 67     | N/A17    | NA              | NA                          | NC.  |
| 68     | SUSCLK   | NA              | NA                          | NC.  |
| 69     | CONFIG_1 | PCI/SATA_CONFIG | Power, 10K PU               | This pin is connected to VCC_3V3             |
| 70     | 3.3V     | VCC_3V3         | O, 3.3V Power               | Supply Voltage.                              |
| 71     | GND      | GND             | Power                       | Ground.                                      |
| 72     | 3.3V     | VCC_3V3         | O, 3.3V Power               | Supply Voltage.                              |
| 73     | GND      | GND             | Power                       | Ground.                                      |
| 74     | 3.3V     | VCC_3V3         | O, 3.3V Power               | Supply Voltage.                              |
| 75     | CONFIG_2 | NA              | NA                          | NC   |

## 2.4.2 Gigabit Ethernet Port1

The Kintex UltraScale+ FPGA SOM Carrier board supports one 10/100/1000Mbps Ethernet port. This port is supported through Ethernet Controller1 interface of L1021A processor in the Kintex UltraScale+ FPGA SOM. The Interface is supported through on SOM Ethernet PHY. MDI signals from Board-to-Board connector2 is directly connected to RJ45 MagJack (J17). The Ethernet supports Speed (Yellow) and Link/Activity (Green) LED indications on RJ45 MagJack connector. This RJ45 MagJack connector(J17) is physically located at the top of the board as shown below.

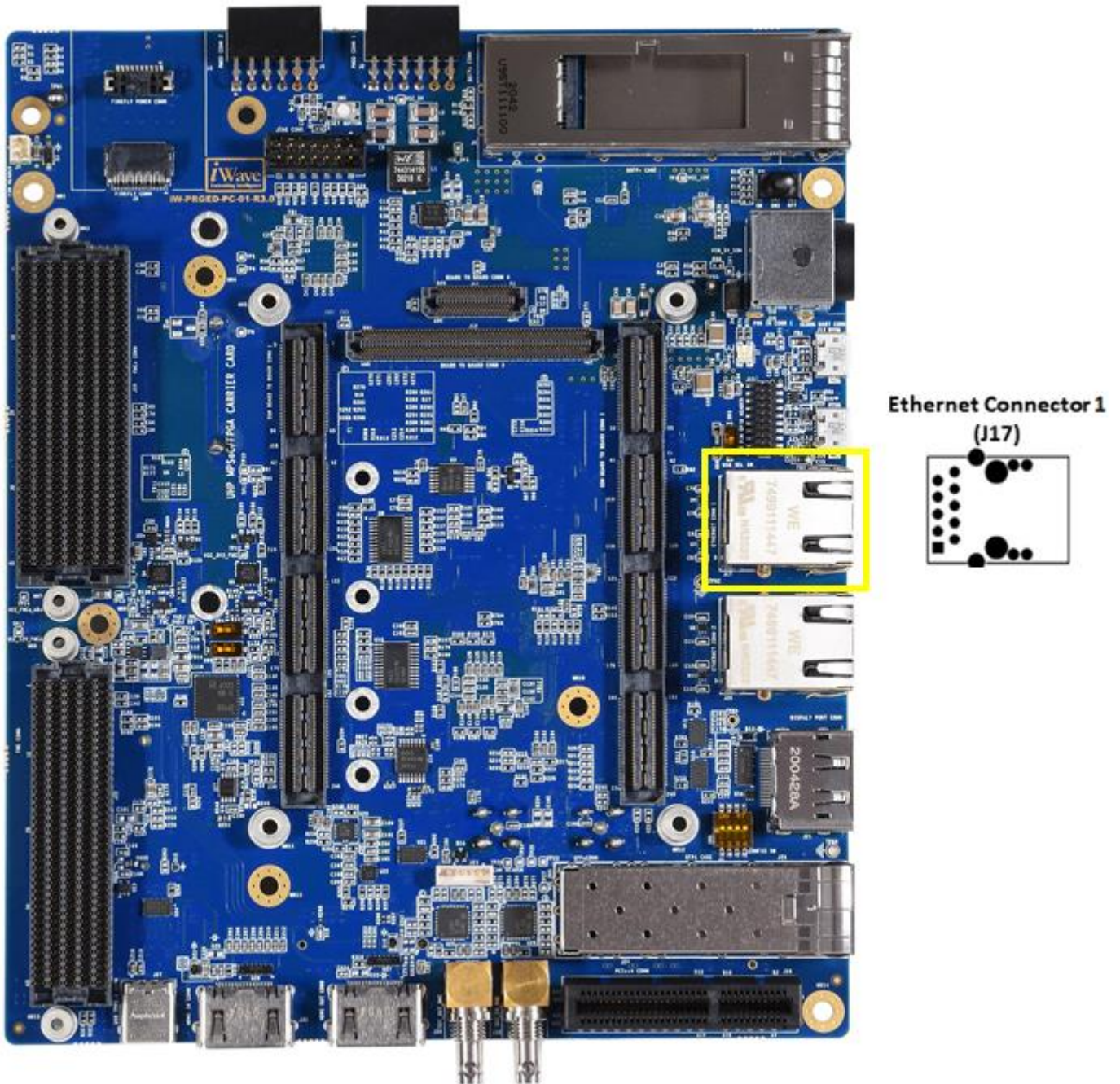


Figure 9: Gigabit Ethernet Connector1

### 2.4.3 USB2.0 OTG Port

The Kintex UltraScale+ FPGA Carrier Board supports USB2.0 High Speed OTG interface through USB1 Controller of LS1021A processor. This USB2.0 OTG interface is supported through USB2.0 MicroAB connector (J16). The USB output signals from Board-to-Board connector2 is connected to “FUSB340” USB Switch for selecting the USB2.0 OTG connection between USB2.0 MicroAB connector (J16) and USB3.0 TypeC connector (J27). The selection can be done by changing the Single bit DIP switch (SW3). If the switch (SW3) is set to OFF, USB2.0 OTG is connected to MicroAB connector (J16) and if the switch (SW3) is set to ON, USB2.0 OTG is connected to USB3.0 TypeC connector (J27).

The USB2.0 OTG port can be used as full functional OTG functionality which supports USB2.0 host and USB2.0 device based on USB ID pin status. The VBUS power of this USB2.0 MicroAB connector is connected through current limit power switch which can be used to switch On/Off the power based on the device or Host and also limits the current above 500mA in host mode. The USB PHY transceiver in LS1021A detects the USB functionality through USB ID pin (34<sup>th</sup> pin of B2B-2) and controls the power using the GPIO pin (32<sup>nd</sup> pin of B2B-2). This USB2.0 OTG connector (J16) is physically located at the top of the board as shown below.

*Note: Connect the USB2.0 pendrive/mouse to the microAB to Host connector first, then connect the connector to the board connector(J16).*



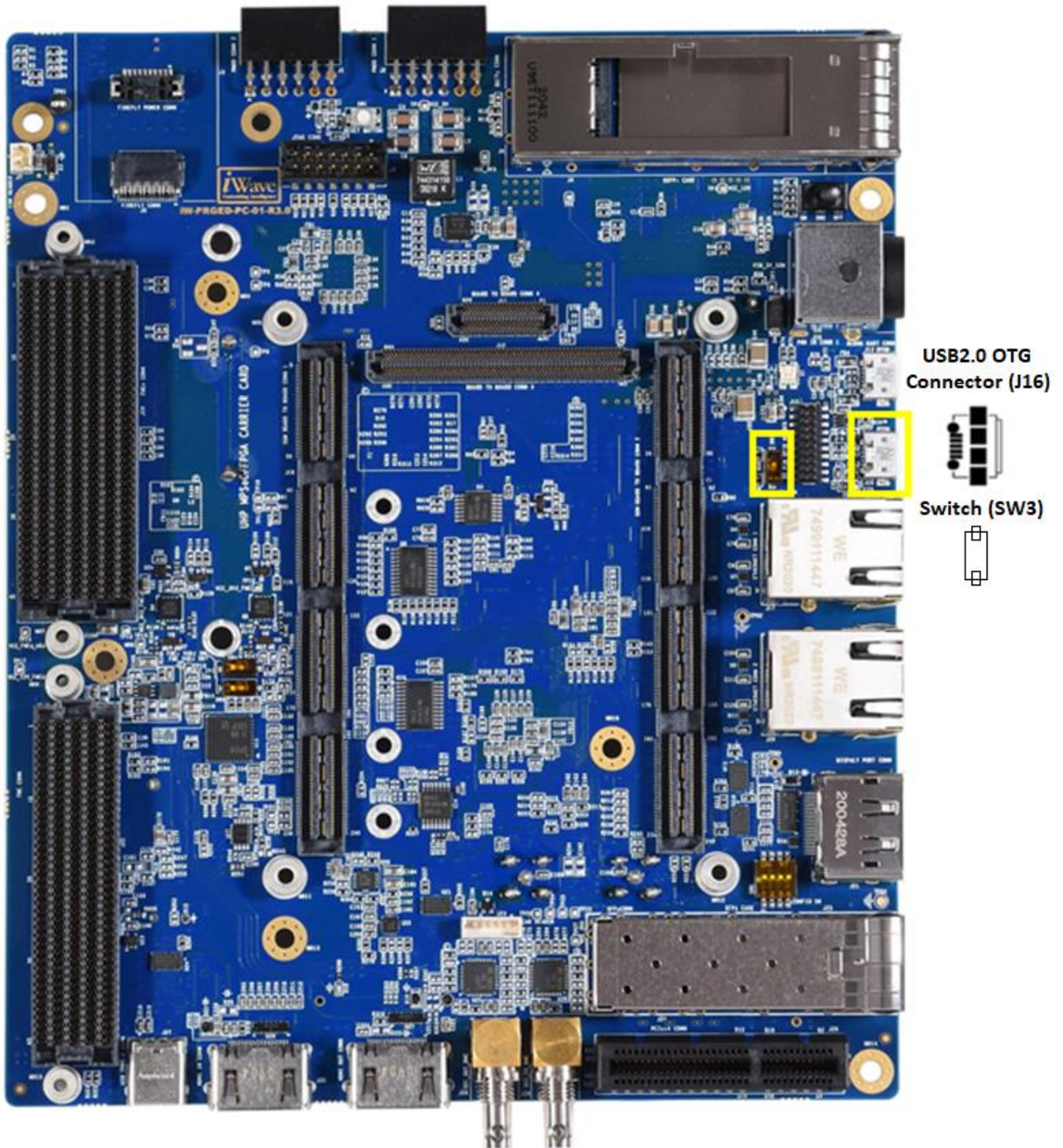


Figure 10: USB OTG Connector

## 2.4.4 USB 3.0 Type-C Port

The Kintex UltraScale+ FPGA Carrier Board supports one Super Speed USB3.0 OTG through USB Type-C connector. The USB1 Controller of LS1021A processor from Board-to-Board Connector2 is used for USB3.0 OTG interface. The USB signal from Board-to-Board connector is through High-Speed MUX/DEMUX switch. Refer Table 3 for proper lane selection through Switch SW6.



# Kintex UltraScale+ FPGA SOM DevKit Datasheet

The Kintex UltraScale+ FPGA Carrier board supports “FUSB302” USB Type-C controller for port detection & cable orientation and controlled through I2C0 interface of LS1021A processor. To support double-way plug in on USB Type-C connector, USB1 Controller Lane is connected to “FUSB340” 2:1 data Switch and then connected to USB Type-C connector. The lane selection to Type-C connector is controlled through FPGA Bank IO “PL\_AL21\_LVDS92\_L12P” from Board-to-Board Connector1 pin70. This USB Type-C connector (J27) is physically located at the top of the board as shown below.

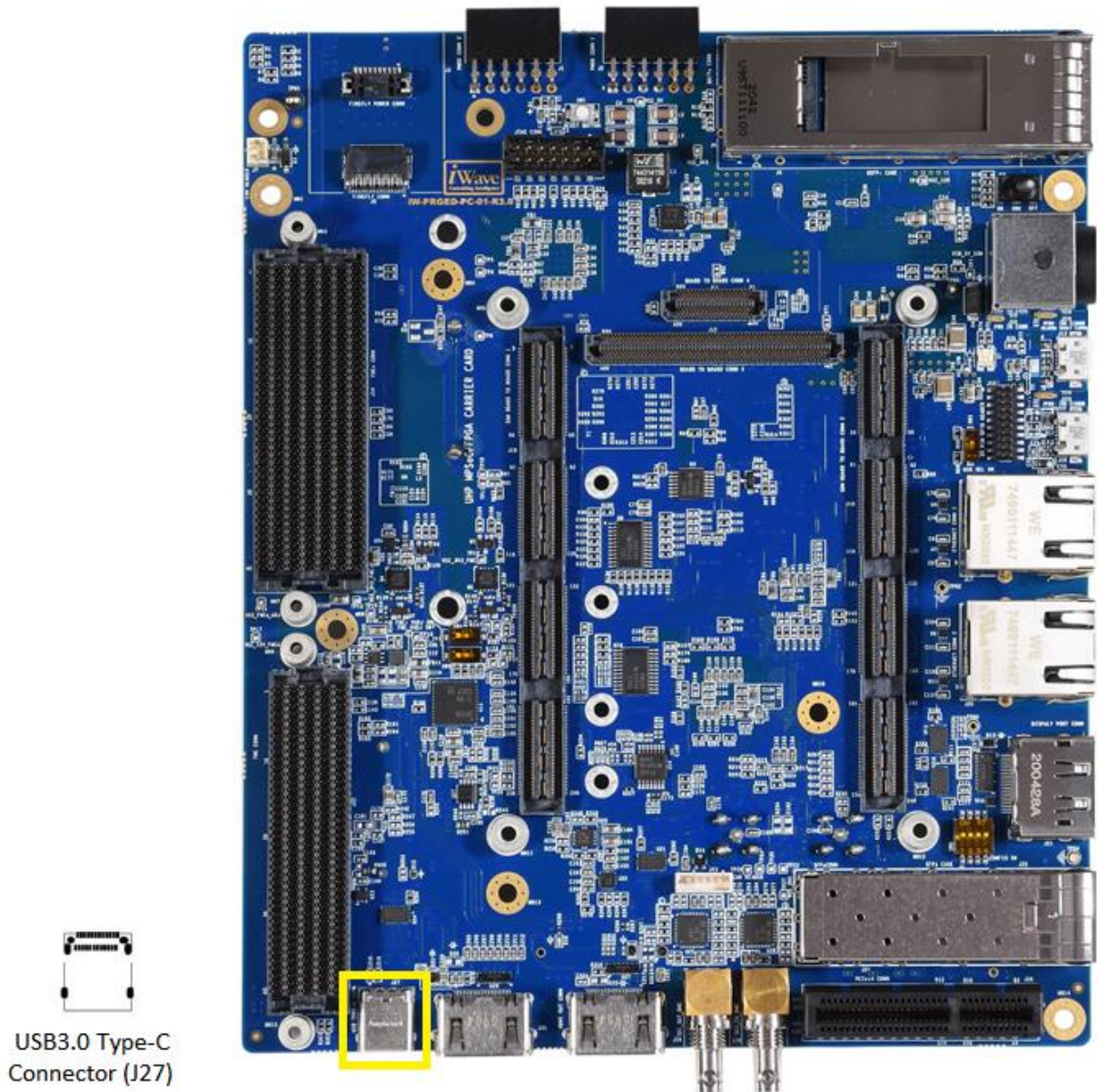


Figure 11: USB 3.0 Type-C Connector

## 2.4.5 Debug UART

The Kintex UltraScale+ FPGA Carrier Board supports debug interface through UART1 of LS1021A. The DUART controller of LS1021A is used for Debug UART interface. This UART1 signals from Board-to-Board Connector2 is connected to



# Kintex UltraScale+ FPGA SOM DevKit Datasheet

UART to USB Converter “FT232RQ”. The output of the USB converter is connected to USB MicroAB Connector (J13). This USB MicroAB Connector can be used for Debug purpose which is physically located at the top of the board as shown below.

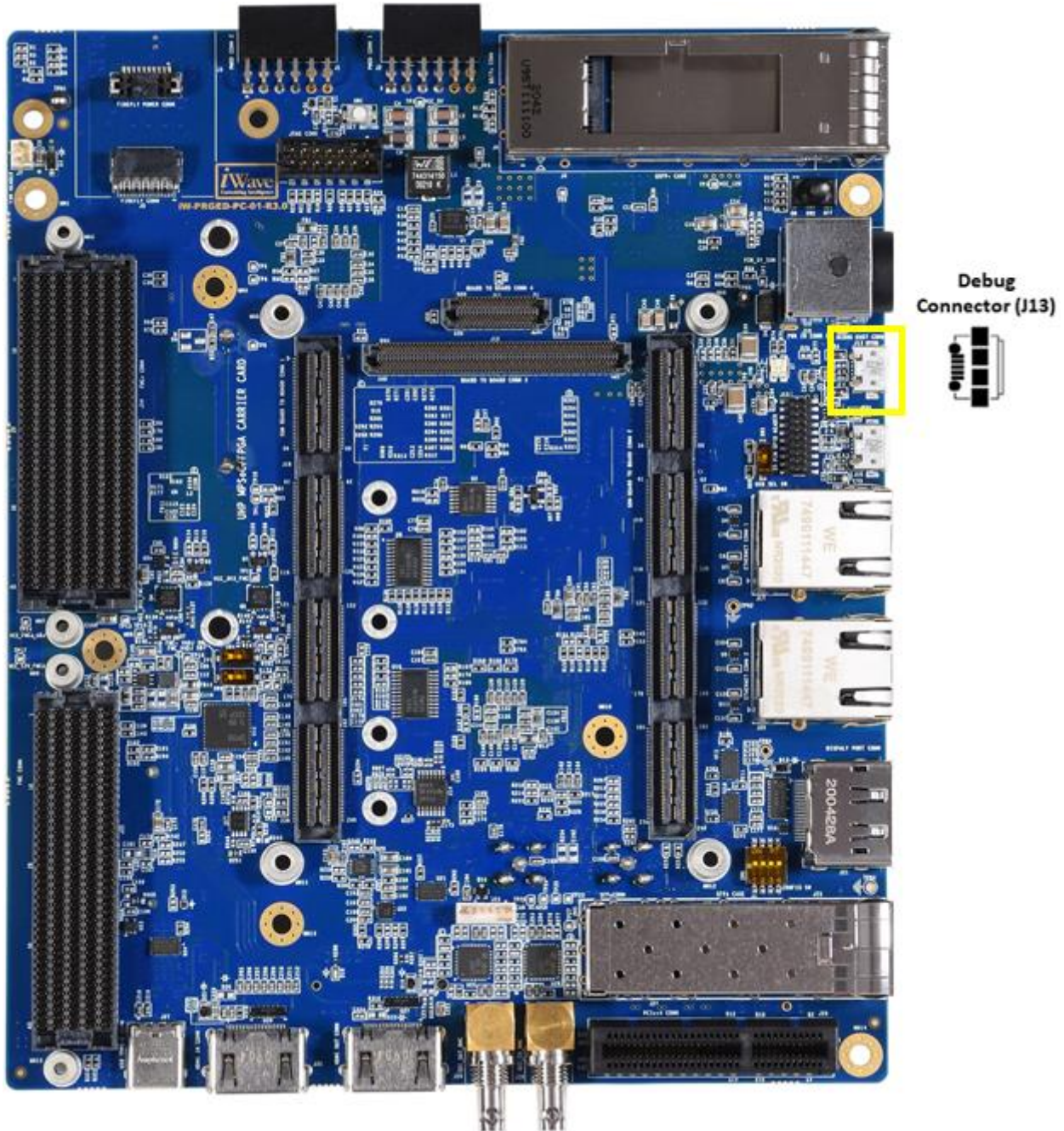


Figure 12: Debug UART Connector

## 2.5 FPGA Interface Features

The features which are supported from Kintex UltraScale+ FPGA FPGA is explained in the following section.

### 2.5.1 GTY High Speed Transceivers

The Kintex UltraScale+ FPGA Carrier board supports different highspeed interfaces through 32 GTY Transceivers as mentioned below.

- QSFP28/QSFP+/QSFP Connector (4 GTY Transceivers)
- FireFly Connector (4 GTY Transceivers)
- FMC HPC Connector (8 GTY Transceivers)
- FMC+ HPC Connector (16 GTY Transceivers)

## 2.5.1.1 QSFP28/QSFP+/QSFP Connector

The Kintex UltraScale+ FPGA Carrier board supports one QSFP28/QSFP+/QSFP Connector through GTY transceiver of Kintex UltraScale+ FPGA. GTY transceiver of FPGA Bank230 Channel0 to Channel3 from Board-to-Board Connector3 is connected to QSFP+ connector. Also, I2C0 through I2C bus switch0 is connected to this connector for control and configuration. All other control signals of QSFP+ connector is connected from IO Expander2 (U6). This QSFP+ connector with dust case (J4) is physically located at the top of the board as shown below.

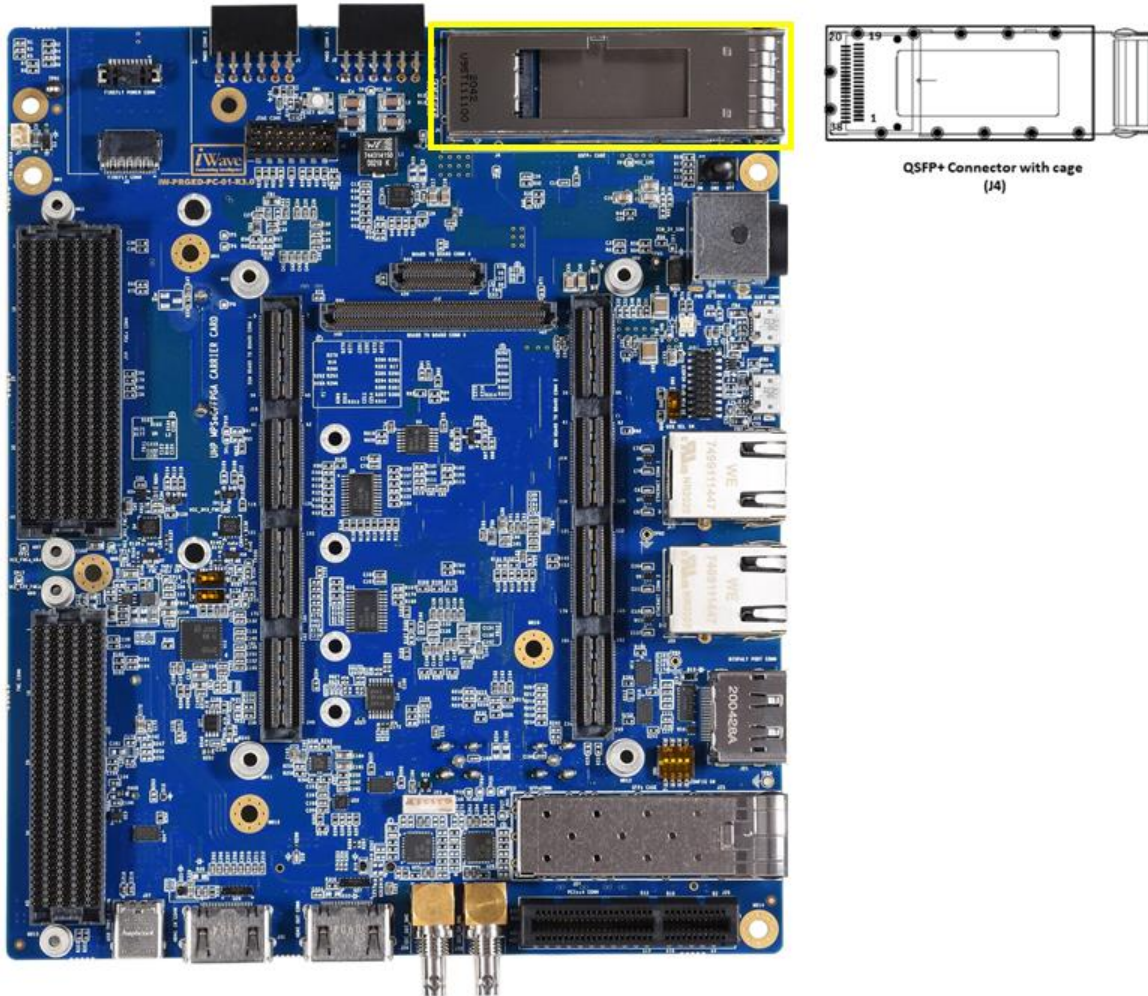


Figure 13: QSFP28/QSFP+/QSFP+ Connector with Cage



# Kintex UltraScale+ FPGA SOM DevKit Datasheet

**Table 6: QSFP28/QSFP+/QSFP Connector Pin Out**

| Pin No | Pin Name | Signal Name         | Signal Type / Termination | Description   |
|--------|----------|---------------------|---------------------------|---|
| 1      | GND1     | GND                 | Power                     | Ground.   |
| 2      | Tx2n     | GTYTXN1_230         | O, DIFF                   | QSFP+ Transmit2 Data Negative   |
| 3      | Tx2p     | GTYTXP1_230         | O, DIFF                   | QSFP+ Transmit2 Data Positive.  |
| 4      | GND2     | GND                 | Power                     | Ground.   |
| 5      | Tx4n     | GTYTXN3_230         | O, DIFF                   | QSFP+ Transmit4 Data Negative   |
| 6      | Tx4p     | GTYTXP3_230         | O, DIFF                   | QSFP+ Transmit4 Data Positive.  |
| 7      | GND3     | GND                 | Power                     | Ground.   |
| 8      | ModSelL  | IOEXP_P00_Q_MODESEL | O, 3.3V CMOS/<br>4.7K PD  | Module Select.<br>This Pin is connected to IO Expander2 Port 0 for software access if required    |
| 9      | ResetL   | IOEXP_P01_Q_RESETL  | O, 3.3V CMOS/<br>4.7K PU  | Module reset.<br>This Pin is connected to IO Expander2 Port 1 for software access if required     |
| 10     | VccRx    | VCCRX_3V3           | O, 3.3V Power             | 3.3V Receiver Supply Voltage  |
| 11     | SCL      | I2C0_SD0_SCL        | O, 3.3V CMOS              | I2C Clock.<br>This Pin is connected from 5th pin of I2C Bus switch (U29).                         |
| 12     | SDA      | I2C0_SD0_SDA        | IO, 3.3V CMOS             | I2C Data.<br>This Pin is connected from 4th pin of I2C Bus switch (U29).                          |
| 13     | GND4     | GND                 | Power                     | Ground.   |
| 14     | Rx3p     | GTYRXP2_230         | I, DIFF                   | QSFP+ Receiver3 Data Positive   |
| 15     | Rx3n     | GTYRXN2_230         | I, DIFF                   | QSFP+ Receiver3 Data Negative   |
| 16     | GND5     | GND                 | Power                     | Ground.   |
| 17     | Rx1p     | GTYRXP0_230         | I, DIFF                   | QSFP+ Receiver1 Data Positive   |
| 18     | Rx1n     | GTYRXN0_230         | I, DIFF                   | QSFP+ Receiver1 Data Negative   |
| 19     | GND6     | GND                 | Power                     | Ground.   |
| 20     | GND7     | GND                 | Power                     | Ground.   |
| 21     | Rx2n     | GTYRXN1_230         | I, DIFF                   | QSFP+ Receiver2 Data Negative   |
| 22     | Rx2p     | GTYRXP1_230         | I, DIFF                   | QSFP+ Receiver2 Data Positive   |
| 23     | GND8     | GND                 | Power                     | Ground.   |
| 24     | Rx4n     | GTYRXN3_230         | I, DIFF                   | QSFP+ Receiver4 Data Negative   |
| 25     | Rx4p     | GTYRXP3_230         | I, DIFF                   | QSFP+ Receiver4 Data Positive   |
| 26     | GND9     | GND                 | Power                     | Ground.   |
| 27     | ModPrsL  | IOEXP_P04_Q_MODPRSL | I, 3.3V CMOS/<br>4.7K PU  | Module present.<br>This Pin is connected to IO Expander2 Port 4 for software access if required   |
| 28     | IntL     | IOEXP_P03_Q_INTL    | I, 3.3V CMOS/<br>4.7K PU  | Module Interrupt.<br>This Pin is connected to IO Expander2 Port 3 for software access if required |

## Kintex UltraScale+ FPGA SOM DevKit Datasheet

| Pin No | Pin Name | Signal Name        | Signal Type / Termination | Description  |
|--------|----------|--------------------|---------------------------|--|
| 29     | VccTx    | VCCTX_3V3          | O, 3.3V Power             | 3.3V Transmit Supply Voltage   |
| 30     | Vcc1     | VCC1_3V3           | O, 3.3V Power             | 3.3V Supply Voltage  |
| 31     | LPMODE   | IOEXP_P02_Q_LPMODE | O, 3.3V CMOS/<br>4.7K PD  | Module Low power mode.<br>This Pin is connected to IO Expander2 Port 2 for software access if required |
| 32     | GND10    | GND                | Power                     | Ground.  |
| 33     | Tx3p     | GTYTXP2_230        | O, DIFF                   | QSFP+ Transmit3 Data Positive.   |
| 34     | Tx3n     | GTYTXN2_230        | O, DIFF                   | QSFP+ Transmit3 Data Negative.   |
| 35     | GND11    | GND                | Power                     | Ground.  |
| 36     | Tx1p     | GTYTXP0_230        | O, DIFF                   | QSFP+ Transmit1 Data Positive  |
| 37     | Tx1n     | GTYTXN0_230        | O, DIFF                   | QSFP+ Transmit1 Data Negative.   |
| 38     | GND12    | GND                | Power                     | Ground.  |

## 2.5.1.2 FireFly Connector

The Kintex UltraScale+ FPGA Carrier board supports one FireFly Connector through GTY transceiver of Kintex UltraScale+ FPGA which can support FireFly x4 devices. GTY transceiver of FPGA Bank228 Channel0 to Channel3 from Board-to-Board Connector3 is connected to FireFly data connector(J5). Also, I2C0 through I2C bus switch1 is connected to this connector for control and configuration. All other control signals of FireFly connector are connected from IO Expander. And FireFly module power is supplied from FireFly power connector (J3). This FireFly data with power connector (J5) is physically located at the top of the board as shown below.

*Note: Transceiver Lane3 is muxed with between LS1021A processor and Kintex UltraScale+ FPGA.*

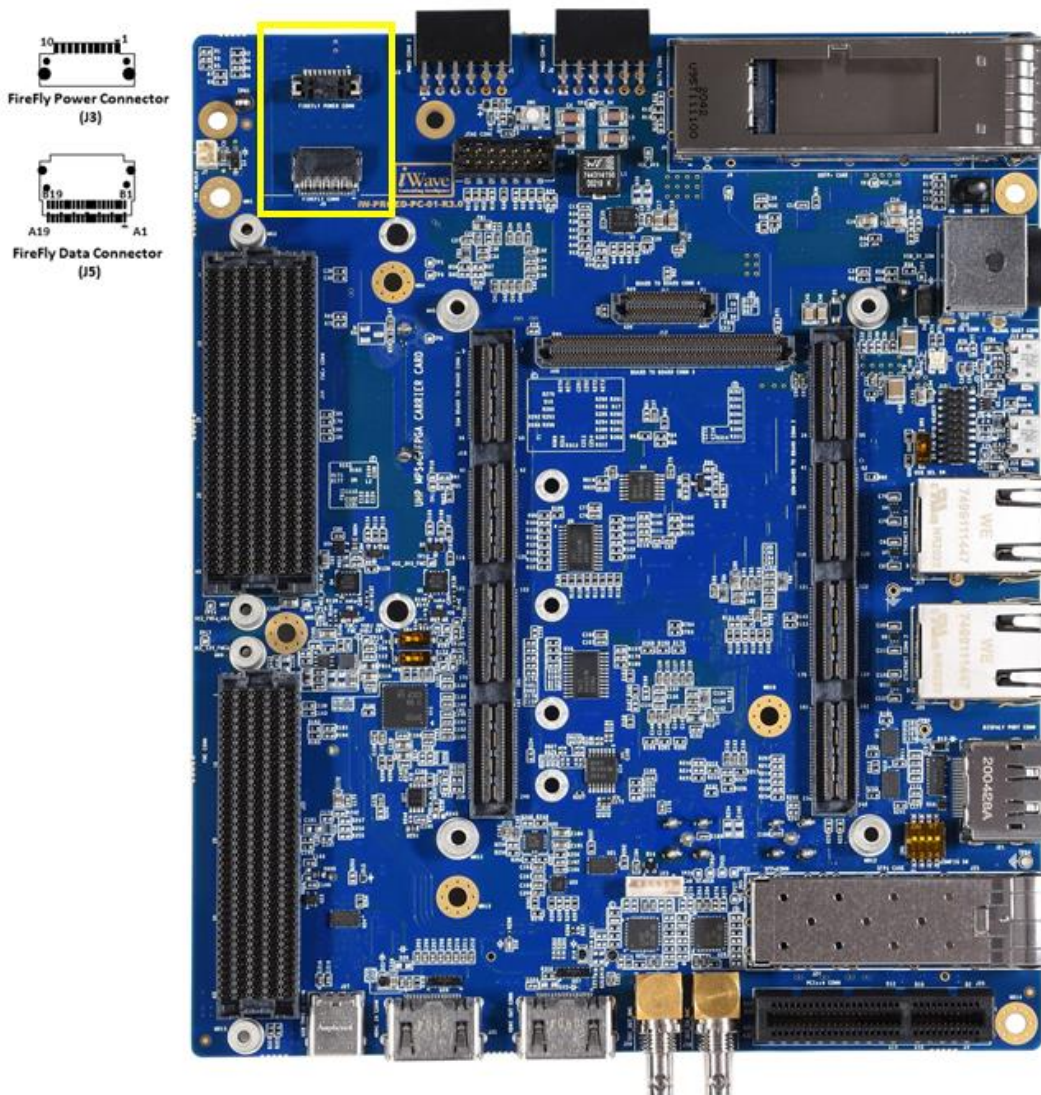


Figure 14: FireFly Connector

# Kintex UltraScale+ FPGA SOM DevKit Datasheet

**Table 7: FireFly Data Connector Pin Out**

| Pin No | Pin Name | Signal Name | Signal Type / Termination | Description                      |
|--------|----------|-------------|---------------------------|----------------------------------|
| A1     | GND_1    | GND         | Power                     | Ground.                          |
| A2     | TX1N     | GTYTXN0_228 | O, DIFF                   | FireFly Transmit0 Data Negative  |
| A3     | TX1P     | GTYTXP0_228 | O, DIFF                   | FireFly Transmit0 Data Positive. |
| A4     | GND_2    | GND         | Power                     | Ground.                          |
| A5     | TX3N     | GTYTXN1_228 | O, DIFF                   | FireFly Transmit1 Data Negative  |
| A6     | TX3P     | GTYTXP1_228 | O, DIFF                   | FireFly Transmit1 Data Positive. |
| A7     | GND_3    | GND         | Power                     | Ground.                          |
| A8     | RSVD_1   | NA          | NA                        | NC                               |
| A9     | RSVD_2   | NA          | NA                        | NC                               |
| A10    | RSVD_3   | NA          | NA                        | NC                               |
| A11    | RSVD_4   | NA          | NA                        | NC                               |
| A12    | RSVD_5   | NA          | NA                        | NC                               |
| A13    | GND_4    | GND         | Power                     | Ground.                          |
| A14    | RX4P     | GTYRXP3_228 | I, DIFF                   | FireFly Receiver3 Data Positive  |
| A15    | RX4N     | GTYRXN3_228 | I, DIFF                   | FireFly Receiver3 Data Negative  |
| A16    | GND_5    | GND         | Power                     | Ground.                          |
| A17    | RX2P     | GTYRXP2_228 | I, DIFF                   | FireFly Receiver2 Data Positive  |
| A18    | RX2N     | GTYRXN2_228 | I, DIFF                   | FireFly Receiver2 Data Negative  |
| A19    | GND_6    | GND         | Power                     | Ground.                          |
| B1     | GND_7    | GND         | Power                     | Ground.                          |
| B2     | TX2N     | GTYTXN2_228 | O, DIFF                   | FireFly Transmit2 Data Negative  |
| B3     | TX2P     | GTYTXP2_228 | O, DIFF                   | FireFly Transmit2 Data Positive. |
| B4     | GND_8    | GND         | Power                     | Ground.                          |
| B5     | TX4N     | GTYTXN3_228 | O, DIFF                   | FireFly Transmit3 Data Negative  |
| B6     | TX4P     | GTYTXP3_228 | O, DIFF                   | FireFly Transmit3 Data Positive. |
| B7     | GND_9    | GND         | Power                     | Ground.                          |
| B8     | RSVD_6   | NA          | NA                        | NC                               |
| B9     | RSVD_7   | NA          | NA                        | NC                               |
| B10    | RSVD_8   | NA          | NA                        | NC                               |
| B11    | RSVD_9   | NA          | NA                        | NC                               |
| B12    | RSVD_10  | NA          | NA                        | NC                               |
| B13    | GND_10   | GND         | Power                     | Ground.                          |
| B14    | RX3P     | GTYRXP1_228 | I, DIFF                   | FireFly Receiver1 Data Positive  |
| B15    | RX3N     | GTYRXN1_228 | I, DIFF                   | FireFly Receiver1 Data Negative  |
| B16    | GND_11   | GND         | Power                     | Ground.                          |
| B17    | RX1P     | GTYRXPO_228 | I, DIFF                   | FireFly Receiver0 Data Positive  |
| B18    | RX1N     | GTYRXNO_228 | I, DIFF                   | FireFly Receiver0 Data Negative  |
| B19    | GND_12   | GND         | Power                     | Ground.                          |

**Table 8: FireFly Power Connector Pin Out**

| Pin No | Pin Name | Signal Name        | Signal Type / Termination | Description   |
|--------|----------|--------------------|---------------------------|---|
| 1      | VCC_TX   | VCCTX_F_3V3        | O, 3.3V Power             | 3.3V Transmit Supply Voltage  |
| 2      | GND_14   | GND                | Power                     | Ground  |
| 3      | MODPRS   | IOEXP_P10_F_MODPRS | I, 3.3V CMOS/<br>4.7K PU  | FireFly Module Present.<br>This Pin is connected to IO Expander2 Port 10 for software access if required  |
| 4      | MODSEL   | IOEXP_P06_F_MODSEL | O, 3.3V CMOS/<br>4.7K PU  | FireFly Module Select.<br>This Pin is connected to IO Expander2 Port 6 for software access if required    |
| 5      | INTL     | IOEXP_P07_F_INTL   | I, 3.3V CMOS/<br>4.7K PU  | FireFly Module Interrupt.<br>This Pin is connected to IO Expander2 Port 7 for software access if required |
| 6      | RESETL   | IOEXP_P05_F_RESETL | O, 3.3V CMOS/<br>4.7K PU  | FireFly Module Reset.<br>This Pin is connected to IO Expander2 Port 5 for software access if required     |
| 7      | SDA      | I2C0_SD1_SDA       | IO, 3.3V CMOS             | I2C1 Data.<br>This Pin is connected from 6th pin of I2C Bus switch (U29).                                 |
| 8      | SCL      | I2C0_SD1_SCL       | O, 3.3V CMOS              | I2C1 Clock.<br>This Pin is connected from 7th pin of I2C Bus switch (U29).                                |
| 9      | RSVD_14  | VCC_F_1V8          | O, 1.8V Power             | 1.8 V supply  |
| 10     | VCC_RX   | VCCR_X_F_3V3       | O, 3.3V Power             | 3.3V Receive Supply Voltage   |



## 2.5.2 FMC HPC Connector

The Kintex UltraScale+ FPGA Carrier board supports one 400Pin Standard FMC HPC connector to support standard ANSI/VITA 57.1 FMC modules.

The FMC HPC Connector (J22) supports the below mentioned interface from Kintex UltraScale+ FPGA.

- 8 GTY High Speed Transceivers
- 2 GTY Reference Clock
- Up to 9 LVDS IOs/19 Single ended (SE) IOs from HP Bank
- 2 Clock Input Capable LVDS/SE pins from HP Bank
- 1 Clock Output Capable LVDS/SE pins from HP Bank
- Up to 6 DIFF IOs/12 Single ended (SE) IOs from HD Bank
- 3 Clock Output Capable DIFF/SE pins from HD Bank

This 400Pin FMC HPC connector (J22) is physically located at the top of the board as shown below.

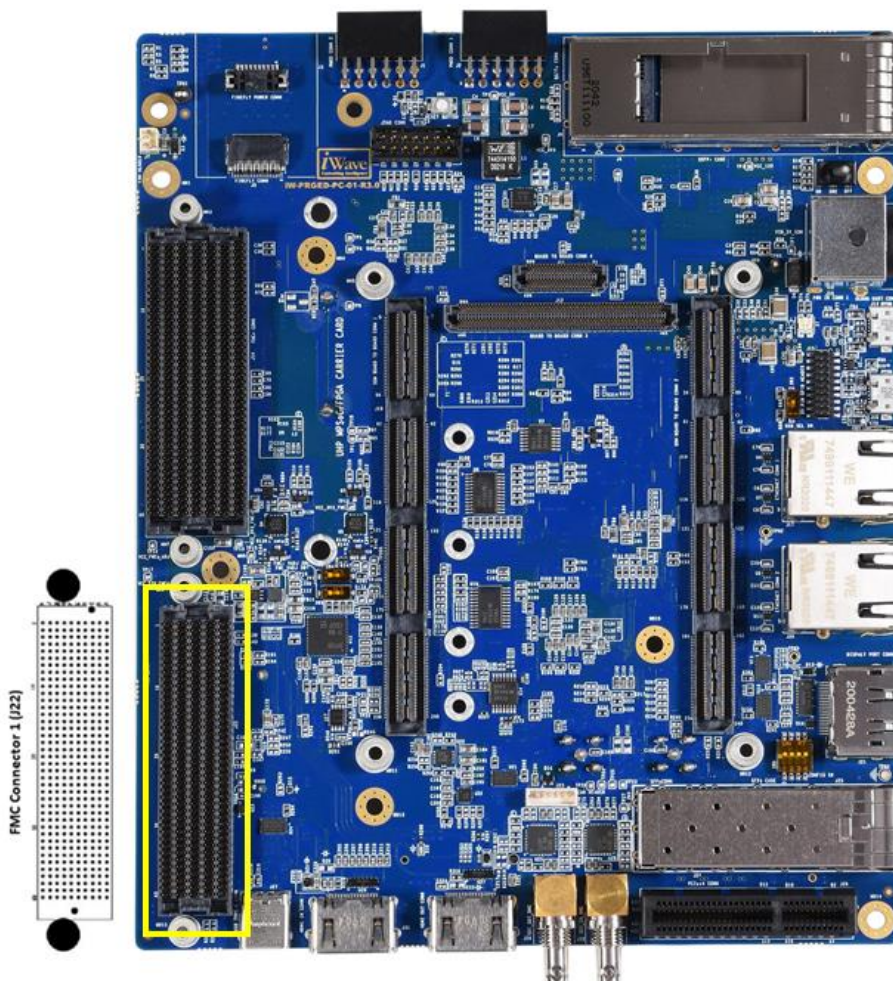


Figure 15: FMC Connector

# Kintex UltraScale+ FPGA SOM DevKit Datasheet

This 400Pin FMC HPC connector (J22) pin mapping is shown below.

|    | K   | J   | H            | G          | F      | E    | D             | C         | B             | A         |
|----|-----|-----|--------------|------------|--------|------|---------------|-----------|---------------|-----------|
| 1  | NC  | GND | NC           | GND        | PG_M2C | GND  | PG_C2M        | GND       | CLK_DIR       | GND       |
| 2  | GND | NC  | PRSN_T_M2C_L | CLK1_M2C_P | GND    | NC   | GND           | DP0_C2M_P | GND           | DP1_M2C_P |
| 3  | GND | NC  | GND          | CLK1_M2C_N | GND    | NC   | GND           | DP0_C2M_N | GND           | DP1_M2C_N |
| 4  | NC  | GND | NC           | GND        | NC     | GND  | GBTCLK0_M2C_P | GND       | NC            | GND       |
| 5  | NC  | GND | NC           | GND        | NC     | GND  | GBTCLK0_M2C_N | GND       | NC            | GND       |
| 6  | GND | NC  | GND          | LA00_P_CC  | GND    | NC   | GND           | DP0_M2C_P | GND           | DP2_M2C_P |
| 7  | NC  | NC  | LA02_P       | LA00_N_CC  | NC     | NC   | GND           | DP0_M2C_N | GND           | DP2_M2C_N |
| 8  | NC  | GND | LA02_N       | GND        | NC     | GND  | LA01_P_CC     | GND       | NC            | GND       |
| 9  | GND | NC  | GND          | LA03_P     | GND    | NC   | LA01_N_CC     | GND       | NC            | GND       |
| 10 | NC  | NC  | LA04_P       | LA03_N     | NC     | NC   | GND           | LA06_P    | GND           | DP3_M2C_P |
| 11 | NC  | GND | LA04_N       | GND        | NC     | GND  | LA05_P        | LA06_N    | GND           | DP3_M2C_N |
| 12 | GND | NC  | GND          | LA08_P     | GND    | NC   | LA05_N        | GND       | DP7_M2C_P     | GND       |
| 13 | NC  | NC  | LA07_P       | LA08_N     | NC     | NC   | GND           | GND       | DP7_M2C_N     | GND       |
| 14 | NC  | GND | LA07_N       | GND        | NC     | GND  | LA09_P        | LA10_P    | GND           | DP4_M2C_P |
| 15 | GND | NC  | GND          | LA12_P     | GND    | NC   | LA09_N        | LA10_N    | GND           | DP4_M2C_N |
| 16 | NC  | NC  | LA11_P       | LA12_N     | NC     | NC   | GND           | GND       | DP6_M2C_P     | GND       |
| 17 | NC  | GND | LA11_N       | GND        | NC     | GND  | LA13_P        | GND       | DP6_M2C_N     | GND       |
| 18 | GND | NC  | GND          | NC         | GND    | NC   | LA13_N        | NC        | GND           | DP5_M2C_P |
| 19 | NC  | NC  | NC           | LA16_N     | NC     | NC   | GND           | NC        | GND           | DP5_M2C_N |
| 20 | NC  | GND | NC           | GND        | NC     | GND  | NC            | GND       | GBTCLK1_M2C_P | GND       |
| 21 | GND | NC  | GND          | NC         | GND    | NC   | NC            | GND       | GBTCLK1_M2C_N | GND       |
| 22 | NC  | NC  | NC           | NC         | NC     | NC   | GND           | NC        | GND           | DP1_C2M_P |
| 23 | NC  | GND | NC           | GND        | NC     | GND  | NC            | NC        | GND           | DP1_C2M_N |
| 24 | GND | NC  | GND          | NC         | GND    | NC   | NC            | GND       | NC            | GND       |
| 25 | NC  | NC  | NC           | NC         | NC     | NC   | GND           | GND       | NC            | GND       |
| 26 | NC  | GND | NC           | GND        | NC     | GND  | NC            | NC        | GND           | DP2_C2M_P |
| 27 | GND | NC  | GND          | NC         | GND    | NC   | NC            | NC        | GND           | DP2_C2M_N |
| 28 | NC  | NC  | NC           | NC         | NC     | NC   | GND           | GND       | NC            | GND       |
| 29 | NC  | GND | NC           | GND        | NC     | GND  | TCK           | GND       | NC            | GND       |
| 30 | GND | NC  | GND          | NC         | GND    | NC   | TDI           | SCL       | GND           | DP3_C2M_P |
| 31 | NC  | NC  | NC           | NC         | NC     | NC   | TDO           | SDA       | GND           | DP3_C2M_N |
| 32 | NC  | GND | NC           | GND        | NC     | GND  | 3P3VAUX       | GND       | DP7_C2M_P     | GND       |
| 33 | GND | NC  | GND          | NC         | GND    | NC   | TMS           | GND       | DP7_C2M_N     | GND       |
| 34 | NC  | NC  | NC           | NC         | NC     | NC   | TRST_L        | GA0       | GND           | DP4_C2M_P |
| 35 | NC  | GND | NC           | GND        | NC     | GND  | GA1           | 12P0V     | GND           | DP4_C2M_N |
| 36 | GND | NC  | GND          | NC         | GND    | NC   | 3P3V          | GND       | DP6_C2M_P     | GND       |
| 37 | NC  | NC  | NC           | NC         | NC     | NC   | GND           | 12P0V     | DP6_C2M_N     | GND       |
| 38 | NC  | GND | NC           | GND        | NC     | GND  | 3P3V          | GND       | GND           | DP5_C2M_P |
| 39 | GND | NC  | GND          | VADJ       | GND    | VADJ | GND           | 3P3V      | GND           | DP5_C2M_N |
| 40 | NC  | GND | VADJ         | GND        | VADJ   | GND  | 3P3V          | GND       | NC            | GND       |

Figure 16: FMC HPC Connector Pin Out

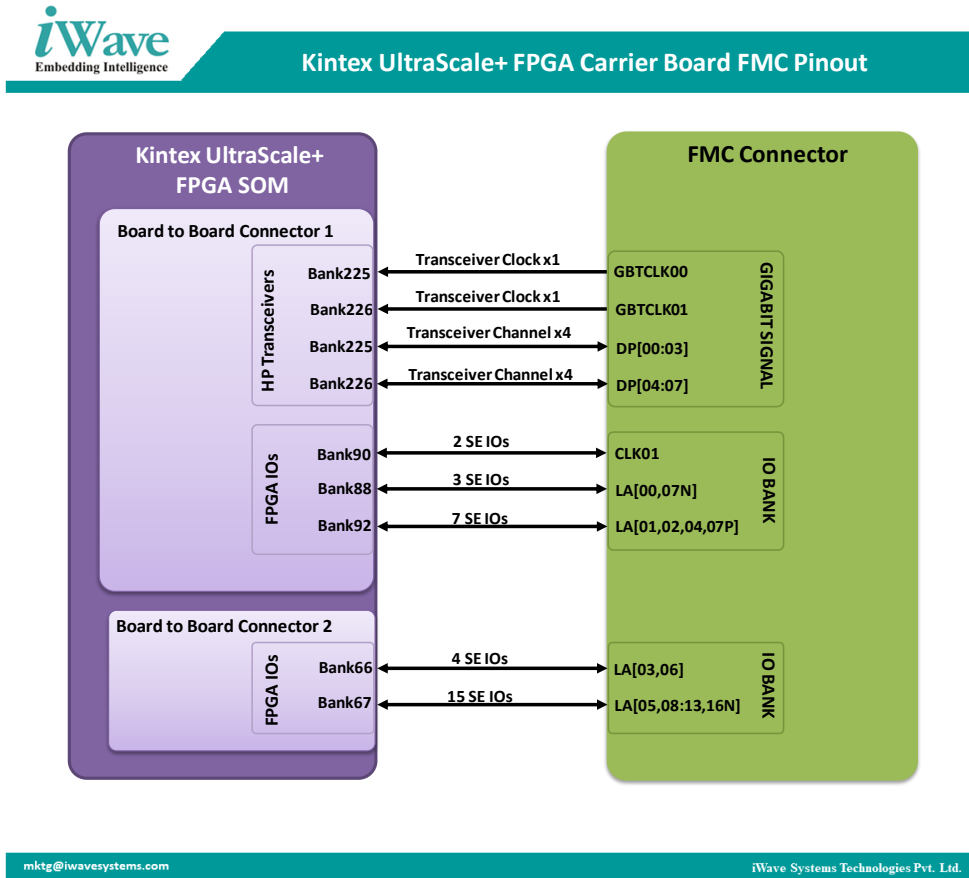


Figure 17: FMC Board to Board Connector Block Diagram

Number of Pins - 400

Connector Part Number - ASP-134486-01

Mating Connector - ASP-134488-01 from Samtec

Staking Height - 10mm

*Note:*

*\* By default, FMC connector power is disabled as per Vita Specification. While booting the FMC Module EEPROM is read and enabling the FMC connector power.*

*\* If FMC modules EEPROM is not programmed, then FMC connector power is not enabled.*



## Kintex UltraScale+ FPGA SOM DevKit Datasheet

**Table 9: FMC HPC Connector Pin Assignment**

| Sl.no | FMC Connector VITA   |                        | Board to Board Connectors       |                                     |  | Kintex UltraScale+ FPGA (FFVB2104) |             |                          | Description  |
|-------|----------------------|------------------------|---------------------------------|-------------------------------------|--|------------------------------------|-------------|--------------------------|--|
|       | FMC Connector Pin No | FMC Connector Pin Name | Board to Board Connector Number | Board to Board Connector Pin Number | Board to Board Connector Signal Name (SOM) | FPGA Bank                          | FPGA Pin No | Signal Type/Termination* |  |
| 1     | A1                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 2     | A2                   | DP1_M2C_P              | Board to Board Connector 1      | 17                                  | GTYRXP1_225                                | 225                                | BA2         | I, DIFF                  | GTY Bank225 channel1 High speed differential receiver positive.    |
| 3     | A3                   | DP1_M2C_N              | Board to Board Connector 1      | 15                                  | GTYRXN1_225                                | 225                                | BA1         | I, DIFF                  | GTY Bank225 channel1 High speed differential receiver Negative.    |
| 4     | A4                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 5     | A5                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 6     | A6                   | DP2_M2C_P              | Board to Board Connector 1      | 57                                  | GTYRXP2_225                                | 225                                | AW4         | I, DIFF                  | GTY Bank225 channel2 High speed differential receiver positive.    |
| 7     | A7                   | DP2_M2C_N              | Board to Board Connector 1      | 55                                  | GTYRXN2_225                                | 225                                | AW3         | I, DIFF                  | GTY Bank225 channel2 High speed differential receiver Negative.    |
| 8     | A8                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 9     | A9                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 10    | A10                  | DP3_M2C_P              | Board to Board Connector 1      | 51                                  | GTYRXP3_225                                | 225                                | AV2         | I, DIFF                  | GTY Bank225 channel3 High speed differential receiver positive.    |
| 11    | A11                  | DP3_M2C_N              | Board to Board Connector 1      | 49                                  | GTYRXN3_225                                | 225                                | AV1         | I, DIFF                  | GTY Bank225 channel3 High speed differential receiver Negative.    |
| 12    | A12                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 13    | A13                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 14    | A14                  | DP4_M2C_P              | Board to Board Connector 1      | 117                                 | GTYRXP0_226                                | 226                                | AU4         | I, DIFF                  | GTY Bank226 channel0 High speed differential receiver positive.    |
| 15    | A15                  | DP4_M2C_N              | Board to Board Connector 1      | 115                                 | GTYRXN0_226                                | 226                                | AU3         | I, DIFF                  | GTY Bank226 channel0 High speed differential receiver Negative.    |
| 16    | A16                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 17    | A17                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 18    | A18                  | DP5_M2C_P              | Board to Board Connector 1      | 111                                 | GTYRXP1_226                                | 226                                | AT2         | I, DIFF                  | GTY Bank226 channel1 High speed differential receiver positive.    |
| 19    | A19                  | DP5_M2C_N              | Board to Board Connector 1      | 109                                 | GTYRXN1_226                                | 226                                | AT1         | I, DIFF                  | GTY Bank226 channel1 High speed differential receiver Negative.    |
| 20    | A20                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 21    | A21                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 22    | A22                  | DP1_C2M_P              | Board to Board Connector 1      | 9                                   | GTYTXP1_225                                | 225                                | BD5         | O, DIFF                  | GTY Bank225 channel1 High speed differential transmitter positive. |
| 23    | A23                  | DP1_C2M_N              | Board to Board Connector 1      | 11                                  | GTYTXN1_225                                | 225                                | BD4         | O, DIFF                  | GTY Bank225 channel1 High speed differential transmitter Negative. |
| 24    | A24                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 25    | A25                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 26    | A26                  | DP2_C2M_P              | Board to Board Connector 1      | 37                                  | GTYTXP2_225                                | 225                                | BB5         | O, DIFF                  | GTY Bank225 channel2 High speed differential transmitter positive. |

## Kintex UltraScale+ FPGA SOM DevKit Datasheet

| Sl.no | FMC Connector VITA   |                        | Board to Board Connectors       |                                     |  | Kintex UltraScale+ FPGA (FFVB2104) |             |                          | Description  |
|-------|----------------------|------------------------|---------------------------------|-------------------------------------|--|------------------------------------|-------------|--------------------------|--|
|       | FMC Connector Pin No | FMC Connector Pin Name | Board to Board Connector Number | Board to Board Connector Pin Number | Board to Board Connector Signal Name (SOM) | FPGA Bank                          | FPGA Pin No | Signal Type/Termination* |  |
| 27    | A27                  | DP2_C2M_N              | Board to Board Connector 1      | 39                                  | GTYTXN2_225                                | 225                                | BB4         | O, DIFF                  | GTY Bank225 channel2 High speed differential transmitter Negative.                       |
| 28    | A28                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 29    | A29                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 30    | A30                  | DP3_C2M_P              | Board to Board Connector 1      | 43                                  | GTYTXP3_225                                | 225                                | AV7         | O, DIFF                  | GTY Bank225 channel3 High speed differential transmitter positive.                       |
| 31    | A31                  | DP3_C2M_N              | Board to Board Connector 1      | 45                                  | GTYTXN3_225                                | 225                                | AV6         | O, DIFF                  | GTY Bank225 channel3 High speed differential transmitter Negative.                       |
| 32    | A32                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 33    | A33                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 34    | A34                  | DP4_C2M_P              | Board to Board Connector 1      | 97                                  | GTYTXP0_226                                | 226                                | AU9         | O, DIFF                  | GTY Bank226 channel0 High speed differential transmitter positive.                       |
| 35    | A35                  | DP4_C2M_N              | Board to Board Connector 1      | 99                                  | GTYTXN0_226                                | 226                                | AU8         | O, DIFF                  | GTY Bank226 channel0 High speed differential transmitter Negative.                       |
| 36    | A36                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 37    | A37                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 38    | A38                  | DP5_C2M_P              | Board to Board Connector 1      | 103                                 | GTYTXP1_226                                | 226                                | AT7         | O, DIFF                  | GTY Bank226 channel1 High speed differential transmitter positive.                       |
| 39    | A39                  | DP5_C2M_N              | Board to Board Connector 1      | 105                                 | GTYTXN1_226                                | 226                                | AT6         | O, DIFF                  | GTY Bank226 channel1 High speed differential transmitter Negative.                       |
| 40    | A40                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 41    | B1                   | CLK_DIR                | NA                              | NA                                  | NA   | NA                                 | NA          | O, 3.3V                  | Pin determines the clock source. This Pin is connected to 15th pin of IO Expander (U10). |
| 42    | B2                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 43    | B3                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 44    | B4                   | DP9_M2C_P              | NA                              | NA                                  | NC   | NA                                 | NA          | NA                       | NA   |
| 45    | B5                   | DP9_M2C_N              | NA                              | NA                                  | NC   | NA                                 | NA          | NA                       | NA   |
| 46    | B6                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 47    | B7                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 48    | B8                   | DP8_M2C_P              | NA                              | NA                                  | NC   | NA                                 | NA          | NA                       | NA   |
| 49    | B9                   | DP8_M2C_N              | NA                              | NA                                  | NC   | NA                                 | NA          | NA                       | NA   |
| 50    | B10                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 51    | B11                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 52    | B12                  | DP7_M2C_P              | Board to Board Connector 1      | 137                                 | GTYRXP3_226                                | 226                                | AP2         | I, DIFF                  | GTY Bank226 channel3 High speed differential receiver positive.                          |
| 53    | B13                  | DP7_M2C_N              | Board to Board Connector 1      | 135                                 | GTYRXN3_226                                | 226                                | AP1         | I, DIFF                  | GTY Bank226 channel3 High speed differential receiver Negative.                          |
| 54    | B14                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 55    | B15                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |

## Kintex UltraScale+ FPGA SOM DevKit Datasheet

| Sl.no | FMC Connector VITA   |                        | Board to Board Connectors       |                                     |  | Kintex UltraScale+ FPGA (FFVB2104) |             |                          | Description  |
|-------|----------------------|------------------------|---------------------------------|-------------------------------------|--|------------------------------------|-------------|--------------------------|--|
|       | FMC Connector Pin No | FMC Connector Pin Name | Board to Board Connector Number | Board to Board Connector Pin Number | Board to Board Connector Signal Name (SOM) | FPGA Bank                          | FPGA Pin No | Signal Type/Termination* |  |
| 56    | B16                  | DP6_M2C_P              | Board to Board Connector 1      | 143                                 | GTYRXP2_226                                | 226                                | AR4         | I, DIFF                  | GTY Bank226 channel2 High speed differential receiver positive.    |
| 57    | B17                  | DP6_M2C_N              | Board to Board Connector 1      | 141                                 | GTYRXN2_226                                | 226                                | AR3         | I, DIFF                  | GTY Bank226 channel2 High speed differential receiver Negative.    |
| 58    | B18                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 59    | B19                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 60    | B20                  | GBTCLK1_M2C_P          | Board to Board Connector 1      | 98                                  | GTREFCLKOP_226                             | 226                                | AT11        | I, DIFF                  | GTY Bank226 differential reference clock0 positive.                |
| 61    | B21                  | GBTCLK1_M2C_N          | Board to Board Connector 1      | 100                                 | GTREFCLKON_226                             | 226                                | AT10        | I, DIFF                  | GTY Bank226 differential reference clock0 negative.                |
| 62    | B22                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 63    | B23                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 64    | B24                  | DP9_C2M_P              | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NA   |
| 65    | B25                  | DP9_C2M_N              | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NA   |
| 66    | B26                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 67    | B27                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 68    | B28                  | DP8_C2M_P              | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NA   |
| 69    | B29                  | DP8_C2M_N              | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NA   |
| 70    | B30                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 71    | B31                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 72    | B32                  | DP7_C2M_P              | Board to Board Connector 1      | 129                                 | GTYTXP3_226                                | 226                                | AP7         | O, DIFF                  | GTY Bank226 channel3 High speed differential transmitter positive. |
| 73    | B33                  | DP7_C2M_N              | Board to Board Connector 1      | 131                                 | GTYTXN3_226                                | 226                                | AP6         | O, DIFF                  | GTY Bank226 channel3 High speed differential transmitter Negative. |
| 74    | B34                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 75    | B35                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 76    | B36                  | DP6_C2M_P              | Board to Board Connector 1      | 123                                 | GTYTXP2_226                                | 226                                | AR9         | O, DIFF                  | GTY Bank226 channel2 High speed differential transmitter positive. |
| 77    | B37                  | DP6_C2M_N              | Board to Board Connector 1      | 125                                 | GTYTXN2_226                                | 226                                | AR8         | O, DIFF                  | GTY Bank226 channel2 High speed differential transmitter Negative. |
| 78    | B38                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 79    | B39                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 80    | B40                  | RES0                   | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.  |
| 81    | C1                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 82    | C2                   | DP0_C2M_P              | Board to Board Connector 1      | 3                                   | GTYTXP0_225                                | 225                                | BF5         | O, DIFF                  | GTY Bank225 channel0 High speed differential transmitter positive. |
| 83    | C3                   | DP0_C2M_N              | Board to Board Connector 1      | 5                                   | GTYTXN0_225                                | 225                                | BF4         | O, DIFF                  | GTY Bank225 channel0 High speed differential transmitter Negative. |
| 84    | C4                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 85    | C5                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |

## Kintex UltraScale+ FPGA SOM DevKit Datasheet

| Sl.no | FMC Connector VITA   |                        | Board to Board Connectors       |                                     |  | Kintex UltraScale+ FPGA (FFVB2104) |             |                          | Description  |
|-------|----------------------|------------------------|---------------------------------|-------------------------------------|--|------------------------------------|-------------|--------------------------|--|
|       | FMC Connector Pin No | FMC Connector Pin Name | Board to Board Connector Number | Board to Board Connector Pin Number | Board to Board Connector Signal Name (SOM) | FPGA Bank                          | FPGA Pin No | Signal Type/Termination* |  |
| 86    | C6                   | DPO_M2C_P              | Board to Board Connector 1      | 23                                  | GTYRXPO_225                                | 225                                | BC2         | I, DIFF                  | GTY Bank225 channel0 High speed differential receiver positive.                        |
| 87    | C7                   | DPO_M2C_N              | Board to Board Connector 1      | 21                                  | GTYRXNO_225                                | 225                                | BC1         | I, DIFF                  | GTY Bank225 channel0 High speed differential receiver Negative.                        |
| 88    | C8                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 89    | C9                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 90    | C10                  | LA06_P                 | Board to Board Connector 2      | 122                                 | PL_AN18_LVDS66_L19P_DBC                    | 66                                 | AN18        | IO, 1.8V                 | PL Bank66 IO19 differential positive.  |
| 91    | C11                  | LA06_N                 | Board to Board Connector 2      | 124                                 | PL_AN17_LVDS66_L19N_DBC                    | 66                                 | AN17        | IO, 1.8V                 | PL Bank66 IO19 differential negative   |
| 92    | C12                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 93    | C13                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 94    | C14                  | LA10_P                 | Board to Board Connector 2      | 115                                 | PL_AY13_LVDS67_L12P_GC                     | 67                                 | AY13        | IO, 1.8V                 | PL Bank67 IO12 differential positive.  |
| 95    | C15                  | LA10_N                 | Board to Board Connector 2      | 117                                 | PL_BA13_LVDS67_L12N_GC                     | 67                                 | BA13        | IO, 1.8V                 | PL Bank67 IO12 differential negative.  |
| 96    | C16                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 97    | C17                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 98    | C18                  | LA14_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.  |
| 99    | C19                  | LA14_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.  |
| 100   | C20                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 101   | C21                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 102   | C22                  | LA18_P_CC              | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.  |
| 103   | C23                  | LA18_N_CC              | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.  |
| 104   | C24                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 105   | C25                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 106   | C26                  | LA27_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.  |
| 107   | C27                  | LA27_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.  |
| 108   | C28                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 109   | C29                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 110   | C30                  | SCL                    | NA                              | NA                                  | NA   | NA                                 | NA          | O, 3.3V LVCMOS           | FMC+ I2C Clock Signal.<br>This Pin is connected from 12th pin of I2C Bus switch (U29). |
| 111   | C31                  | SDA                    | NA                              | NA                                  | NA   | NA                                 | NA          | IO, 3.3V LVCMOS          | FMC+ I2C Data Signal.<br>This Pin is connected from 11th pin of I2C Bus switch (U29).  |
| 112   | C32                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 113   | C33                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 114   | C34                  | GA0                    | NA                              | NA                                  | NA   | NA                                 | NA          | 1K, PU                   | Geographical address 0   |
| 115   | C35                  | 12POV                  | NA                              | NA                                  | VCC_12V_FMC                                | NA                                 | NA          | O, 12V Power             | Carrier Board Supply Voltage.  |
| 116   | C36                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |



## Kintex UltraScale+ FPGA SOM DevKit Datasheet

| Sl.no | FMC Connector VITA   |                        | Board to Board Connectors       |                                     |  | Kintex UltraScale+ FPGA (FFVB2104) |             |                          | Description  |
|-------|----------------------|------------------------|---------------------------------|-------------------------------------|--|------------------------------------|-------------|--------------------------|--|
|       | FMC Connector Pin No | FMC Connector Pin Name | Board to Board Connector Number | Board to Board Connector Pin Number | Board to Board Connector Signal Name (SOM) | FPGA Bank                          | FPGA Pin No | Signal Type/Termination* |  |
| 117   | C37                  | 12P0V                  | NA                              | NA                                  | VCC_12V_FMC                                | NA                                 | NA          | O, 12V Power             | Carrier Board Supply Voltage.  |
| 118   | C38                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 119   | C39                  | 3P3V                   | NA                              | NA                                  | VCC_3V3_FMC                                | NA                                 | NA          | O, 3.3V Power            | Carrier Board Supply Voltage.  |
| 120   | C40                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 121   | D1                   | PG_C2M                 | NA                              | NA                                  | NA   | NA                                 | NA          | O, 3.3V                  | Power Good Signal from Carrier to FMC Module.<br>This Pin is connected to 17th pin of IO Expander (U10). |
| 122   | D2                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 123   | D3                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 124   | D4                   | GBTCLK0_M2C_P          | Board to Board Connector 1      | 4                                   | GTREFCLK0P_225                             | 225                                | AW9         | I, DIFF                  | GT Bank225 differential reference clock0 positive.   |
| 125   | D5                   | GBTCLK0_M2C_N          | Board to Board Connector 1      | 6                                   | GTREFCLK0N_225                             | 225                                | AW8         | I, DIFF                  | GT Bank225 differential reference clock0 Negative.   |
| 126   | D6                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 127   | D7                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 128   | D8                   | LA01_P_CC              | Board to Board Connector 1      | 87                                  | PL_AT24_LVDS92_L6P_HDGC                    | 92                                 | AT24        | IO, 1.8V                 | PL Bank92 IO6 differential positive.   |
| 129   | D9                   | LA01_N_CC              | Board to Board Connector 1      | 89                                  | PL_AU24_LVDS92_L6N_HDGC                    | 92                                 | AU24        | IO, 1.8V                 | PL Bank92 IO6 differential negative.   |
| 130   | D10                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 131   | D11                  | LA05_P                 | Board to Board Connector 2      | 123                                 | PL_AY16_LVDS67_L9P                         | 67                                 | AY16        | IO, 1.8V                 | PL Bank67 IO9 differential positive.   |
| 132   | D12                  | LA05_N                 | Board to Board Connector 2      | 121                                 | PL_AY15_LVDS67_L9N                         | 67                                 | AY15        | IO, 1.8V                 | PL Bank67 IO9 differential negative  |
| 133   | D13                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 134   | D14                  | LA09_P                 | Board to Board Connector 2      | 116                                 | PL_BA15_LVDS67_L11P_GC                     | 67                                 | BA15        | IO, 1.8V                 | PL Bank67 IO11 differential positive.  |
| 135   | D15                  | LA09_N                 | Board to Board Connector 2      | 118                                 | PL_BA14_LVDS67_L11N_GC                     | 67                                 | BA14        | IO, 1.8V                 | PL Bank67 IO11 differential negative.  |
| 136   | D16                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 137   | D17                  | LA13_P                 | Board to Board Connector 2      | 103                                 | PL_AP15_LVDS67_L20P                        | 67                                 | AP15        | IO, 1.8V                 | PL Bank67 IO20 differential positive.  |
| 138   | D18                  | LA13_N                 | Board to Board Connector 2      | 105                                 | PL_AP14_LVDS67_L20N                        | 67                                 | AP14        | IO, 1.8V                 | PL Bank67 IO20 differential negative.  |
| 139   | D19                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 140   | D20                  | LA17_P_CC              | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.  |
| 141   | D21                  | LA17_N_CC              | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.  |
| 142   | D22                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |
| 143   | D23                  | LA23_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.  |
| 144   | D24                  | LA23_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.  |
| 145   | D25                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.  |

## Kintex UltraScale+ FPGA SOM DevKit Datasheet

| Sl.no | FMC Connector VITA   |                        | Board to Board Connectors       |                                     |  | Kintex UltraScale+ FPGA (FFVB2104) |             |                           | Description  |
|-------|----------------------|------------------------|---------------------------------|-------------------------------------|--|------------------------------------|-------------|---------------------------|--|
|       | FMC Connector Pin No | FMC Connector Pin Name | Board to Board Connector Number | Board to Board Connector Pin Number | Board to Board Connector Signal Name (SOM) | FPGA Bank                          | FPGA Pin No | Signal Type/Termination*  |  |
| 146   | D26                  | LA26_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                        | NC.  |
| 147   | D27                  | LA26_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                        | NC.  |
| 148   | D28                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                     | Ground.  |
| 149   | D29                  | TCK                    | Board to Board Connector 2      | 31                                  | JTAG_TCK                                   | 0                                  | AE13        | I, 3.3V CMOS/<br>49.9K PU | JTAG Test Clock<br>This Pin is connected to 31st pin of Board-to-Board Connector2 (J19).       |
| 150   | D30                  | TDI                    | NA                              | NA                                  | NA   | NA                                 | NA          | O, 3.3V CMOS              | NC.<br>This pin is connected from D31st pin of FMC+ Connector(J14)                             |
| 151   | D31                  | TDO                    | NA                              | NA                                  | FMC2_JTAG_TDO                              | NA                                 | NA          | O, 3.3V CMOS              | NC   |
| 152   | D32                  | 3P3VAUX                | NA                              | NA                                  | VCC_3V3                                    | NA                                 | NA          | O, 3.3V Power             | Carrier Board Supply Voltage.  |
| 153   | D33                  | TMS                    | Board to Board Connector 2      | 29                                  | JTAG_TMS                                   | 0                                  | AG15        | I, 3.3V CMOS/<br>49.9K PU | JTAG Test Mode Select<br>This Pin is connected to 29th pin of Board-to-Board Connector2 (J19). |
| 154   | D34                  | TRST_L                 | Board to Board Connector 2      | 25                                  | NC   | NC                                 | NC          | NA                        | NC.<br>This Pin is connected to 25th pin of Board-to-Board Connector2 (J19).                   |
| 155   | D35                  | GA1                    | NA                              | NA                                  | NA   | NA                                 | NA          | 1K, PD                    | Geographical address 1   |
| 156   | D36                  | 3P3V                   | NA                              | NA                                  | VCC_3V3_FMC                                | NA                                 | NA          | O, 3.3V Power             | Carrier Board Supply Voltage.  |
| 157   | D37                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                     | Ground.  |
| 158   | D38                  | 3P3V                   | NA                              | NA                                  | VCC_3V3_FMC                                | NA                                 | NA          | O, 3.3V Power             | Carrier Board Supply Voltage.  |
| 159   | D39                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                     | Ground.  |
| 160   | D40                  | 3P3V                   | NA                              | NA                                  | VCC_3V3_FMC                                | NA                                 | NA          | O, 3.3V Power             | Carrier Board Supply Voltage.  |
| 161   | E1                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                     | Ground.  |
| 162   | E2                   | HA01_P_CC              | NA                              | NA                                  | NA   | NA                                 | NA          | NA                        | NC.  |
| 163   | E3                   | HA01_N_CC              | NA                              | NA                                  | NA   | NA                                 | NA          | NA                        | NC.  |
| 164   | E4                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                     | Ground.  |
| 165   | E5                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                     | Ground.  |
| 166   | E6                   | HA05_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                        | NC.  |
| 167   | E7                   | HA05_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                        | NC.  |
| 168   | E8                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                     | Ground.  |
| 169   | E9                   | HA09_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                        | NC.  |
| 170   | E10                  | HA09_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                        | NC.  |
| 171   | E11                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                     | Ground.  |
| 172   | E12                  | HA13_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                        | NC.  |
| 173   | E13                  | HA13_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                        | NC.  |
| 174   | E14                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                     | Ground.  |
| 175   | E15                  | HA16_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                        | NC.  |
| 176   | E16                  | HA16_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                        | NC.  |

## Kintex UltraScale+ FPGA SOM DevKit Datasheet

| Sl.no | FMC Connector VITA   |                        | Board to Board Connectors       |                                     |  | Kintex UltraScale+ FPGA (FFVB2104) |             |                          | Description                                   |
|-------|----------------------|------------------------|---------------------------------|-------------------------------------|--|------------------------------------|-------------|--------------------------|---|
|       | FMC Connector Pin No | FMC Connector Pin Name | Board to Board Connector Number | Board to Board Connector Pin Number | Board to Board Connector Signal Name (SOM) | FPGA Bank                          | FPGA Pin No | Signal Type/Termination* |   |
| 177   | E17                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                                       |
| 178   | E18                  | HA20_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.   |
| 179   | E19                  | HA20_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.   |
| 180   | E20                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                                       |
| 181   | E21                  | HB03_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.   |
| 182   | E22                  | HB03_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.   |
| 183   | E23                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                                       |
| 184   | E24                  | HB05_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.   |
| 185   | E25                  | HB05_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.   |
| 186   | E26                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                                       |
| 187   | E27                  | HB09_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.   |
| 188   | E28                  | HB09_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.   |
| 189   | E29                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                                       |
| 190   | E30                  | HB13_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.   |
| 191   | E31                  | HB13_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.   |
| 192   | E32                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                                       |
| 193   | E33                  | HB19_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.   |
| 194   | E34                  | HB19_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.   |
| 195   | E35                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                                       |
| 196   | E36                  | HB21_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.   |
| 197   | E37                  | HB21_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.   |
| 198   | E38                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                                       |
| 199   | E39                  | VADJ                   | NA                              | NA                                  | VCC_FMC_ADJ                                | NA                                 | NA          | O, 1.8V Power            | Carrier Board Supply Voltage.                 |
| 200   | E40                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                                       |
| 201   | F1                   | PG_M2C                 | NA                              | NA                                  | NA   | NA                                 | NA          | I, 3.3V CMOS/<br>10K PU  | Power Good Signal from FMC Module to Carrier. |
| 202   | F2                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                                       |
| 203   | F3                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                                       |
| 204   | F4                   | HA00_P_CC              | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.   |
| 205   | F5                   | HA00_N_CC              | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.   |
| 206   | F6                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                                       |
| 207   | F7                   | HA04_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.   |
| 208   | F8                   | HA04_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.   |
| 209   | F9                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                                       |
| 210   | F10                  | HA08_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.   |
| 211   | F11                  | HA08_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.   |
| 212   | F12                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                                       |
| 213   | F13                  | HA12_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.   |
| 214   | F14                  | HA12_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.   |

## Kintex UltraScale+ FPGA SOM DevKit Datasheet

| Sl.no | FMC Connector VITA   |                        | Board to Board Connectors       |                                     |  | Kintex UltraScale+ FPGA (FFVB2104) |             |                          | Description                           |
|-------|----------------------|------------------------|---------------------------------|-------------------------------------|--|------------------------------------|-------------|--------------------------|---------------------------------------|
|       | FMC Connector Pin No | FMC Connector Pin Name | Board to Board Connector Number | Board to Board Connector Pin Number | Board to Board Connector Signal Name (SOM) | FPGA Bank                          | FPGA Pin No | Signal Type/Termination* |                                       |
| 215   | F15                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                               |
| 216   | F16                  | HA15_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                                   |
| 217   | F17                  | HA15_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                                   |
| 218   | F18                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                               |
| 219   | F19                  | HA19_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                                   |
| 220   | F20                  | HA19_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                                   |
| 221   | F21                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                               |
| 222   | F22                  | HB02_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                                   |
| 223   | F23                  | HB02_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                                   |
| 224   | F24                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                               |
| 225   | F25                  | HB04_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                                   |
| 226   | F26                  | HB04_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                                   |
| 227   | F27                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                               |
| 228   | F28                  | HB08_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                                   |
| 229   | F29                  | HB08_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                                   |
| 230   | F30                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                               |
| 231   | F31                  | HB12_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                                   |
| 232   | F32                  | HB12_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                                   |
| 233   | F33                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                               |
| 234   | F34                  | HB16_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                                   |
| 235   | F35                  | HB16_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                                   |
| 236   | F36                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                               |
| 237   | F37                  | HB20_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                                   |
| 238   | F38                  | HB20_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                                   |
| 239   | F39                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                               |
| 240   | F40                  | VADJ                   | NA                              | NA                                  | VCC_FMC_ADJ                                | NA                                 | NA          | O, 1.8V Power            | Carrier Board Supply Voltage.         |
| 241   | G1                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                               |
| 242   | G2                   | CLK1_M2C_P             | Board to Board connector 1      | 144                                 | PL_AY22_LVDS90_L11P                        | 90                                 | AY22        | IO, DIFF                 | PL Bank90 IO11 differential positive. |
| 243   | G3                   | CLK1_M2C_N             | Board to Board connector 1      | 142                                 | PL_BA22_LVDS90_L11N                        | 90                                 | BA22        | IO, DIFF                 | PL Bank90 IO11 differential negative. |
| 244   | G4                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                               |
| 245   | G5                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                               |
| 246   | G6                   | LA00_P_CC              | Board to Board connector 1      | 118                                 | PL_BE12_LVDS88_L5P_HDGC                    | 88                                 | BE12        | IO, 1.8V                 | PL Bank88 IO5 differential positive.  |
| 247   | G7                   | LA00_N_CC              | Board to Board connector 1      | 116                                 | PL_BF12_LVDS88_L5N_HDGC                    | 88                                 | BF12        | IO, 1.8V                 | PL Bank88 IO5 differential negative.  |
| 248   | G8                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                               |
| 249   | G9                   | LA03_P                 | Board to Board connector 2      | 126                                 | PL_AW20_LVDS66_L9P                         | 66                                 | AW20        | IO, 1.8V                 | PL Bank66 IO9 differential positive.  |



## Kintex UltraScale+ FPGA SOM DevKit Datasheet

| Sl.no | FMC Connector VITA   |                        | Board to Board Connectors       |                                     |  | Kintex UltraScale+ FPGA (FFVB2104) |             |                          | Description   |
|-------|----------------------|------------------------|---------------------------------|-------------------------------------|--|------------------------------------|-------------|--------------------------|---|
|       | FMC Connector Pin No | FMC Connector Pin Name | Board to Board Connector Number | Board to Board Connector Pin Number | Board to Board Connector Signal Name (SOM) | FPGA Bank                          | FPGA Pin No | Signal Type/Termination* |   |
| 250   | G10                  | LA03_N                 | Board to Board connector 2      | 128                                 | PL_AY20_LVDS66_L9N                         | 66                                 | AY20        | IO, 1.8V                 | PL Bank66 IO9 differential negative.  |
| 251   | G11                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.   |
| 252   | G12                  | LA08_P                 | Board to Board connector 2      | 127                                 | PL_BD16_LVDS67_L3P                         | 67                                 | BD16        | IO, 1.8V                 | PL Bank67 IO3 differential positive.  |
| 253   | G13                  | LA08_N                 | Board to Board connector 2      | 125                                 | PL_BE16_LVDS67_L3N                         | 67                                 | BE16        | IO, 1.8V                 | PL Bank67 IO3 differential negative.  |
| 254   | G14                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.   |
| 255   | G15                  | LA12_P                 | Board to Board connector 2      | 109                                 | PL_AW16_LVDS67_L14P_GC                     | 67                                 | AW16        | IO, 1.8V                 | PL Bank67 IO14 differential positive.   |
| 256   | G16                  | LA12_N                 | Board to Board connector 2      | 111                                 | PL_AW15_LVDS67_L14N_GC                     | 67                                 | AW15        | IO, 1.8V                 | PL Bank67 IO14 differential negative.   |
| 257   | G17                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.   |
| 258   | G18                  | LA16_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | IO expander U51   |
| 259   | G19                  | LA16_N                 | Board to Board connector 2      | 112                                 | PL_AW13_LVDS67_L13N_GC                     | 67                                 | AW13        | IO, 1.8V                 | PL Bank67 IO13 differential negative.   |
| 260   | G20                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.   |
| 261   | G21                  | LA20_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.   |
| 262   | G22                  | LA20_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.   |
| 263   | G23                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.   |
| 264   | G24                  | LA22_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.   |
| 265   | G25                  | LA22_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.   |
| 266   | G26                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.   |
| 267   | G27                  | LA25_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.   |
| 268   | G28                  | LA25_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.   |
| 269   | G29                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.   |
| 270   | G30                  | LA29_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.   |
| 271   | G31                  | LA29_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.   |
| 272   | G32                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.   |
| 273   | G33                  | LA31_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.   |
| 274   | G34                  | LA31_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.   |
| 275   | G35                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.   |
| 276   | G36                  | LA33_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.   |
| 277   | G37                  | LA33_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.   |
| 278   | G38                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.   |
| 279   | G39                  | VADJ                   | NA                              | NA                                  | VCC_FMC_ADJ                                | NA                                 | NA          | O, 1.8V Power            | Carrier Board Supply Voltage.   |
| 280   | G40                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.   |
| 281   | H1                   | VREF_A_M2C             | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.   |
| 282   | H2                   | PRSNT_M2C_L            | NA                              | NA                                  | NA   | NA                                 | NA          | I, 3.3V CMOS/<br>10K PU  | Module Preset Signal.<br>This Pin is connected to 4th pin of IO Expander (U10). |

## Kintex UltraScale+ FPGA SOM DevKit Datasheet

| Sl.no | FMC Connector VITA   |                        | Board to Board Connectors       |                                     |  | Kintex UltraScale+ FPGA (FFVB2104) |             |                          | Description                          |
|-------|----------------------|------------------------|---------------------------------|-------------------------------------|--|------------------------------------|-------------|--------------------------|--------------------------------------|
|       | FMC Connector Pin No | FMC Connector Pin Name | Board to Board Connector Number | Board to Board Connector Pin Number | Board to Board Connector Signal Name (SOM) | FPGA Bank                          | FPGA Pin No | Signal Type/Termination* |                                      |
| 283   | H3                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                              |
| 284   | H4                   | CLK0_M2C_P             | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                                  |
| 285   | H5                   | CLK0_M2C_N             | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                                  |
| 286   | H6                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                              |
| 287   | H7                   | LA02_P                 | Board to Board connector 1      | 46                                  | PL_AR22_LVDS92_L4P                         | 92                                 | AR22        | IO, 1.8V                 | PL Bank92 IO4 differential positive. |
| 288   | H8                   | LA02_N                 | Board to Board connector 1      | 48                                  | PL_AT22_LVDS92_L4N                         | 92                                 | AT22        | IO, 1.8V                 | PL Bank92 IO4 differential negative. |
| 289   | H9                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                              |
| 290   | H10                  | LA04_P                 | Board to Board connector 1      | 24                                  | PL_AN23_LVDS92_L8P_HDGC                    | 92                                 | AN23        | IO, 1.8V                 | PL Bank92 IO8 differential positive. |
| 291   | H11                  | LA04_N                 | Board to Board connector 1      | 22                                  | PL_AP23_LVDS92_L8N_HDGC                    | 92                                 | AP23        | IO, 1.8V                 | PL Bank92 IO8 differential negative. |
| 292   | H12                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                              |
| 293   | H13                  | LA07_P                 | Board to Board connector 1      | 50                                  | PL_AV22_LVDS92_L3N                         | 92                                 | AV22        | IO, 1.8V                 | PL Bank92 IO3 differential positive. |
| 294   | H14                  | LA07_N                 | Board to Board connector 1      | 52                                  | PL_BF9_LVDS88_L3N                          | 88                                 | BF9         | IO, 1.8V                 | PL Bank88 IO3 differential negative. |
| 295   | H15                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                              |
| 296   | H16                  | LA11_P                 | Board to Board connector 2      | 95                                  | PL_BD13_LVDS67_L4P_DBC                     | 67                                 | BD13        | IO, 1.8V                 | PL Bank67 IO4 differential positive. |
| 297   | H17                  | LA11_N                 | Board to Board connector 2      | 97                                  | PL_BE13_LVDS67_L4N_DBC                     | 67                                 | BE13        | IO, 1.8V                 | PL Bank67 IO4 differential negative. |
| 298   | H18                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                              |
| 299   | H19                  | LA15_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                                  |
| 300   | H20                  | LA15_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                                  |
| 301   | H21                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                              |
| 302   | H22                  | LA19_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                                  |
| 303   | H23                  | LA19_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                                  |
| 304   | H24                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                              |
| 305   | H25                  | LA21_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                                  |
| 306   | H26                  | LA21_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                                  |
| 307   | H27                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                              |
| 308   | H28                  | LA24_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                                  |
| 309   | H29                  | LA24_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                                  |
| 310   | H30                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                              |
| 311   | H31                  | LA28_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                                  |
| 312   | H32                  | LA28_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                                  |
| 313   | H33                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                              |
| 314   | H34                  | LA30_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                                  |
| 315   | H35                  | LA30_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                                  |

## Kintex UltraScale+ FPGA SOM DevKit Datasheet

| Sl.no | FMC Connector VITA   |                        | Board to Board Connectors       |                                     |  | Kintex UltraScale+ FPGA (FFVB2104) |             |                          | Description                   |
|-------|----------------------|------------------------|---------------------------------|-------------------------------------|--|------------------------------------|-------------|--------------------------|-------------------------------|
|       | FMC Connector Pin No | FMC Connector Pin Name | Board to Board Connector Number | Board to Board Connector Pin Number | Board to Board Connector Signal Name (SOM) | FPGA Bank                          | FPGA Pin No | Signal Type/Termination* |                               |
| 316   | H36                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                       |
| 317   | H37                  | LA32_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                           |
| 318   | H38                  | LA32_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                           |
| 319   | H39                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                       |
| 320   | H40                  | VADJ                   | NA                              | NA                                  | VCC_FMC_ADJ                                | NA                                 | NA          | O, 1.8V Power            | Carrier Board Supply Voltage. |
| 321   | J1                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                       |
| 322   | J2                   | CLK3_BIDIR_P           | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                           |
| 323   | J3                   | CLK3_BIDIR_N           | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                           |
| 324   | J4                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                       |
| 325   | J5                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                       |
| 326   | J6                   | HA03_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                           |
| 327   | J7                   | HA03_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                           |
| 328   | J8                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                       |
| 329   | J9                   | HA07_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                           |
| 330   | J10                  | HA07_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                           |
| 331   | J11                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                       |
| 332   | J12                  | HA11_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                           |
| 333   | J13                  | HA11_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                           |
| 334   | J14                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                       |
| 335   | J15                  | HA14_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                           |
| 336   | J16                  | HA14_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                           |
| 337   | J17                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                       |
| 338   | J18                  | HA18_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                           |
| 339   | J19                  | HA18_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                           |
| 340   | J20                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                       |
| 341   | J21                  | HA22_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                           |
| 342   | J22                  | HA22_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                           |
| 343   | J23                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                       |
| 344   | J24                  | HB01_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                           |
| 345   | J25                  | HB01_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                           |
| 346   | J26                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                       |
| 347   | J27                  | HB07_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                           |
| 348   | J28                  | HB07_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                           |
| 349   | J29                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                       |
| 350   | J30                  | HB11_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                           |
| 351   | J31                  | HB11_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                           |
| 352   | J32                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.                       |
| 353   | J33                  | HB15_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.                           |

## Kintex UltraScale+ FPGA SOM DevKit Datasheet

| Sl.no | FMC Connector VITA   |                        | Board to Board Connectors       |                                     |  | Kintex UltraScale+ FPGA (FFVB2104) |             |                          | Description |
|-------|----------------------|------------------------|---------------------------------|-------------------------------------|--|------------------------------------|-------------|--------------------------|-------------|
|       | FMC Connector Pin No | FMC Connector Pin Name | Board to Board Connector Number | Board to Board Connector Pin Number | Board to Board Connector Signal Name (SOM) | FPGA Bank                          | FPGA Pin No | Signal Type/Termination* |             |
| 354   | J34                  | HB15_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.         |
| 355   | J35                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.     |
| 356   | J36                  | HB18_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.         |
| 357   | J37                  | HB18_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.         |
| 358   | J38                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.     |
| 359   | J39                  | VIO_B_M2C              | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.         |
| 360   | J40                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.     |
| 361   | K1                   | VREF_B_M2C             | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.         |
| 362   | K2                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.     |
| 363   | K3                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.     |
| 364   | K4                   | CLK2_BIDIR_P           | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.         |
| 365   | K5                   | CLK2_BIDIR_N           | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.         |
| 366   | K6                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.     |
| 367   | K7                   | HA02_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.         |
| 368   | K8                   | HA02_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.         |
| 369   | K9                   | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.     |
| 370   | K10                  | HA06_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.         |
| 371   | K11                  | HA06_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.         |
| 372   | K12                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.     |
| 373   | K13                  | HA10_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.         |
| 374   | K14                  | HA10_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.         |
| 375   | K15                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.     |
| 376   | K16                  | HA17_P_CC              | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.         |
| 377   | K17                  | HA17_N_CC              | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.         |
| 378   | K18                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.     |
| 379   | K19                  | HA21_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.         |
| 380   | K20                  | HA21_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.         |
| 381   | K21                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.     |
| 382   | K22                  | HA23_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.         |
| 383   | K23                  | HA23_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.         |
| 384   | K24                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.     |
| 385   | K25                  | HB00_P_CC              | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.         |
| 386   | K26                  | HB00_N_CC              | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.         |
| 387   | K27                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.     |
| 388   | K28                  | HB06_P_CC              | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.         |
| 389   | K29                  | HB06_N_CC              | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.         |
| 390   | K30                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.     |
| 391   | K31                  | HB10_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.         |
| 392   | K32                  | HB10_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.         |



## Kintex UltraScale+ FPGA SOM DevKit Datasheet

| Sl.no | FMC Connector VITA   |                        | Board to Board Connectors       |                                     |  | Kintex UltraScale+ FPGA (FFVB2104) |             |                          | Description |
|-------|----------------------|------------------------|---------------------------------|-------------------------------------|--|------------------------------------|-------------|--------------------------|-------------|
|       | FMC Connector Pin No | FMC Connector Pin Name | Board to Board Connector Number | Board to Board Connector Pin Number | Board to Board Connector Signal Name (SOM) | FPGA Bank                          | FPGA Pin No | Signal Type/Termination* |             |
| 393   | K33                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.     |
| 394   | K34                  | HB14_P                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.         |
| 395   | K35                  | HB14_N                 | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.         |
| 396   | K36                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.     |
| 397   | K37                  | HB17_P_CC              | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.         |
| 398   | K38                  | HB17_N_CC              | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.         |
| 399   | K39                  | GND                    | NA                              | NA                                  | GND  | NA                                 | NA          | Power                    | Ground.     |
| 400   | K40                  | VIO_B_M2C              | NA                              | NA                                  | NA   | NA                                 | NA          | NA                       | NC.         |

Note:

\*FMC connector supports VADJ 1.8V and 1.2V. By default, VADJ is set to 1.8V. Contact iWave for further details.

\* If VCC\_FMC\_ADJ voltage changed from default value 1.8 to 1.2V, please make sure that SOM concern IO voltage also to be modified to avoid IO conflict.

\*IO Type of IOs originating from Kintex UltraScale+ FPGA is configurable. Hence for exact IO type configuration options, refer Xilinx Kintex UltraScale+ FPGA datasheet.

## 2.5.3 FMC+ HPC Connector

The Kintex UltraScale+ FPGA Carrier board supports one 560Pin FMC+ HPC connector to support standard ANSI/VITA 57.4 FMC modules.

The FMC+ HPC Connector (J14) supports the below mentioned interface from Kintex UltraScale+ FPGA SOM module.

- 16 GTY High Speed Transceivers
- 4 GTY Reference Clock
- Up to 24 LVDS IOs/48 Single ended (SE) IOs from HP Bank
- 2 Clock Input Capable LVDS/SE pins from HP Bank
- 2 Clock Output Capable LVDS/SE pins from HP Bank
- Up to 16 DIFF IOs/40 Single ended (SE) IOs from HD Bank
- 2 Clock Input Capable DIFF IOs/SE pins from HD Bank
- Up to 6 SE pins from CPU

This 560Pin FMC+ HPC connector (J14) is physically located at the top of the board as shown below.

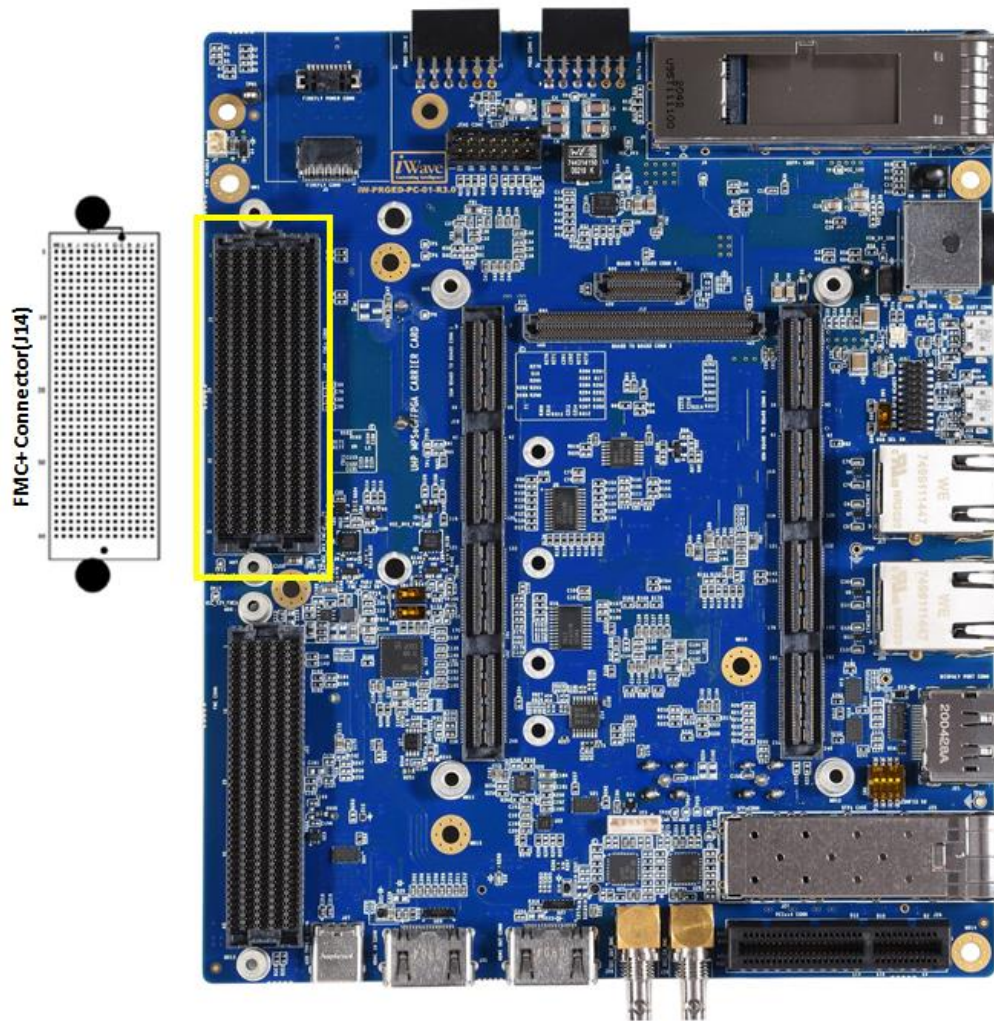


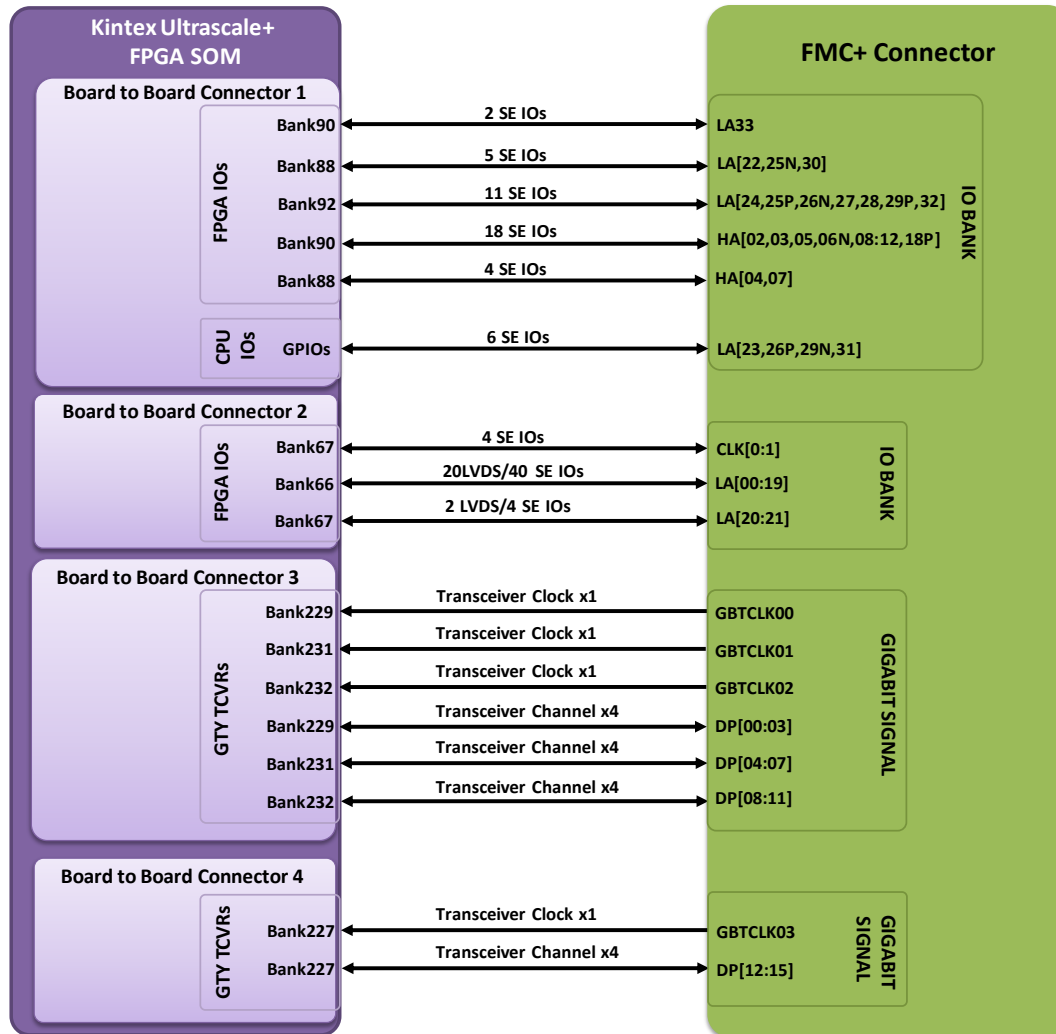
Figure 18: FMC+ Connector

# Kintex UltraScale+ FPGA SOM DevKit Datasheet

This 560Pin FMC HPC connector (J14) pin mapping is shown below.

|    | M          | L             | K      | J      | H           | G          | F      | E      | D             | C         | B             | A         | Z                | Y          |
|----|------------|---------------|--------|--------|-------------|------------|--------|--------|---------------|-----------|---------------|-----------|------------------|------------|
| 1  | GND        | NC            | NC     | GND    | NC          | GND        | PG M2C | GND    | PG C2M        | GND       | CLK DIR       | GND       | HSPC_PRSNT_M2C_L | GND        |
| 2  | NC         | GND           | GND    | NC     | PRSNT_M2C_L | CLK1_M2C_P | GND    | NC     | GND           | DP0_C2M_P | GND           | DP1_M2C_P | GND              | NC         |
| 3  | NC         | GND           | GND    | NC     | GND         | CLK1_M2C_N | GND    | NC     | GND           | DP0_C2M_N | GND           | DP1_M2C_N | GND              | NC         |
| 4  | GND        | NC            | NC     | GND    | CLK0_M2C_P  | GND        | NC     | GND    | GBTCLK0_M2C_P | GND       | DP9_M2C_P     | GND       | NC               | GND        |
| 5  | GND        | NC            | NC     | GND    | CLK0_M2C_N  | GND        | NC     | GND    | GBTCLK0_M2C_N | GND       | DP9_M2C_N     | GND       | NC               | GND        |
| 6  | NC         | GND           | GND    | HA03_P | GND         | LA00_P_CC  | GND    | HA05_P | GND           | DP0_M2C_P | GND           | DP2_M2C_P | GND              | NC         |
| 7  | NC         | GND           | HA02_P | HA03_N | LA02_P      | LA00_N_CC  | HA04_P | HA05_N | GND           | DP0_M2C_N | GND           | DP2_M2C_N | GND              | NC         |
| 8  | GND        | GBTCLK3_M2C_P | HA02_N | GND    | LA02_N      | GND        | HA04_N | GND    | LA01_P_CC     | GND       | DP8_M2C_P     | GND       | NC               | GND        |
| 9  | GND        | GBTCLK3_M2C_N | GND    | HA07_P | GND         | LA03_P     | GND    | HA09_P | LA01_N_CC     | GND       | DP8_M2C_N     | GND       | NC               | GND        |
| 10 | NC         | GND           | NC     | HA07_N | LA04_P      | LA03_N     | HA08_P | HA09_N | GND           | LA06_P    | GND           | DP3_M2C_P | GND              | DP10_M2C_P |
| 11 | NC         | GND           | HA06_N | GND    | LA04_N      | GND        | HA08_N | GND    | LA05_P        | LA06_N    | GND           | DP3_M2C_N | GND              | DP10_M2C_N |
| 12 | GND        | GBTCLK2_M2C_P | GND    | HA11_P | GND         | LA08_P     | GND    | NC     | LA05_N        | GND       | DP7_M2C_P     | GND       | DP11_M2C_P       | GND        |
| 13 | GND        | GBTCLK2_M2C_N | HA10_P | HA11_N | LA07_P      | LA08_N     | HA12_P | NC     | GND           | GND       | DP7_M2C_N     | GND       | DP11_M2C_N       | GND        |
| 14 | NC         | GND           | HA10_N | GND    | LA07_N      | GND        | HA12_N | GND    | LA09_P        | LA10_P    | GND           | DP4_M2C_P | GND              | DP12_M2C_P |
| 15 | NC         | GND           | GND    | NC     | GND         | LA12_P     | GND    | NC     | LA09_N        | LA10_N    | GND           | DP4_M2C_N | GND              | DP12_M2C_N |
| 16 | GND        | NC            | NC     | NC     | LA11_P      | LA12_N     | NC     | NC     | GND           | GND       | DP6_M2C_P     | GND       | DP13_M2C_P       | GND        |
| 17 | GND        | NC            | NC     | GND    | LA11_N      | GND        | NC     | GND    | LA13_P        | GND       | DP6_M2C_N     | GND       | DP13_M2C_N       | GND        |
| 18 | DP14_C2M_P | GND           | GND    | HA18_P | GND         | LA16_P     | GND    | NC     | LA13_N        | LA14_P    | GND           | DP5_M2C_P | GND              | DP14_M2C_P |
| 19 | DP14_C2M_N | GND           | NC     | NC     | LA15_P      | LA16_N     | NC     | NC     | GND           | LA14_N    | GND           | DP5_M2C_N | GND              | DP14_M2C_N |
| 20 | GND        | NC            | NC     | GND    | LA15_N      | GND        | NC     | GND    | LA17_P_CC     | GND       | GBTCLK1_M2C_P | GND       | NC               | GND        |
| 21 | GND        | NC            | GND    | NC     | GND         | LA20_P     | GND    | NC     | LA17_N_CC     | GND       | GBTCLK1_M2C_N | GND       | NC               | GND        |
| 22 | DP15_C2M_P | GND           | NC     | NC     | LA19_P      | LA20_N     | NC     | NC     | GND           | LA18_P_CC | GND           | DP1_C2M_P | GND              | DP15_M2C_P |
| 23 | DP15_C2M_N | GND           | NC     | GND    | LA19_N      | GND        | NC     | GND    | LA23_P        | LA18_N_CC | GND           | DP1_C2M_N | GND              | DP15_M2C_N |
| 24 | GND        | NC            | GND    | NC     | GND         | LA22_P     | GND    | NC     | LA23_N        | GND       | DP9_C2M_P     | GND       | DP10_C2M_P       | GND        |
| 25 | GND        | NC            | NC     | NC     | LA21_P      | LA22_N     | NC     | NC     | GND           | GND       | DP9_C2M_N     | GND       | DP10_C2M_N       | GND        |
| 26 | NC         | GND           | NC     | GND    | LA21_N      | GND        | NC     | GND    | LA26_P        | LA27_P    | GND           | DP2_C2M_P | GND              | DP11_C2M_P |
| 27 | NC         | GND           | GND    | NC     | GND         | LA25_P     | GND    | NC     | LA26_N        | LA27_N    | GND           | DP2_C2M_N | GND              | DP11_C2M_N |
| 28 | GND        | NC            | NC     | NC     | LA24_P      | LA25_N     | NC     | NC     | GND           | GND       | DP8_C2M_P     | GND       | DP12_C2M_P       | GND        |
| 29 | GND        | NC            | NC     | GND    | LA24_N      | GND        | NC     | GND    | TCK           | GND       | DP8_C2M_N     | GND       | DP12_C2M_N       | GND        |
| 30 | NC         | GND           | GND    | NC     | GND         | LA29_P     | GND    | NC     | TDI           | SCL       | GND           | DP3_C2M_P | GND              | DP13_C2M_P |
| 31 | NC         | GND           | NC     | NC     | LA28_P      | LA29_N     | NC     | NC     | TDO           | SDA       | GND           | DP3_C2M_N | GND              | DP13_C2M_N |
| 32 | GND        | NC            | NC     | GND    | LA28_N      | GND        | NC     | GND    | 3P3VAUX       | GND       | DP7_C2M_P     | GND       | NC               | GND        |
| 33 | GND        | NC            | GND    | NC     | GND         | LA31_P     | GND    | NC     | TMS           | GND       | DP7_C2M_N     | GND       | NC               | GND        |
| 34 | NC         | GND           | NC     | NC     | LA30_P      | LA31_N     | NC     | NC     | TRST_L        | GA0       | GND           | DP4_C2M_P | GND              | NC         |
| 35 | NC         | GND           | NC     | GND    | LA30_N      | GND        | NC     | GND    | GA1           | 12P0V     | GND           | DP4_C2M_N | GND              | NC         |
| 36 | GND        | 12P0V         | GND    | NC     | GND         | LA33_P     | GND    | NC     | 3P3V          | GND       | DP6_C2M_P     | GND       | NC               | GND        |
| 37 | GND        | 12P0V         | NC     | NC     | LA32_P      | LA33_N     | NC     | NC     | GND           | 12P0V     | DP6_C2M_N     | GND       | NC               | GND        |
| 38 | NC         | GND           | NC     | GND    | LA32_N      | GND        | NC     | GND    | 3P3V          | GND       | GND           | DP5_C2M_P | GND              | NC         |
| 39 | NC         | GND           | GND    | NC     | GND         | VADJ       | GND    | VADJ   | GND           | 3P3V      | GND           | DP5_C2M_N | GND              | NC         |
| 40 | GND        | 12P0V         | NC     | GND    | VADJ        | GND        | VADJ   | GND    | 3P3V          | GND       | NC            | GND       | 3P3V             | GND        |

Figure 19: FMC+ HPC Connector Pin Out



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**Figure 20: FMC+ and Board-to-Board Connector Block Diagram**

Number of Pins - 560

Connector Part Number - ASP-184329-01 from Samtec

Mating Connector - ASP-184330-01 from Samtec

Staking Height - 10mm

*Note:*

*\* By default, FMC+ connector power is disabled as per Vita Specification. While booting the FMC or FMC+ Modules EEPROM is read and enabling the FMC+ connector power.*

*\* If FMC & FMC+ modules EEPROM is not programmed, then FMC+ connector power is not enabled.*



**Table 10: FMC+ HPC Connector Pin Assignment**

| Sl.no | FMC+ Connector VITA   |                         | Board to Board Connectors       |                                     |  | Kintex UltraScale+ FPGA(FFVB2104) |             |                |                           | Description  |
|-------|-----------------------|-------------------------|---------------------------------|-------------------------------------|--|-----------------------------------|-------------|----------------|---------------------------|--|
|       | FMC+ Connector Pin No | FMC+ Connector Pin Name | Board to Board Connector Number | Board to Board Connector Pin Number | Board to Board Connector Signal Name (SOM) | FPGA Bank                         | FPGA Pin No | LS1021A Pin No | Signal Type/ Termination* |  |
| 1     | A1                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 2     | A2                    | DP1_M2C_P               | Board to Board Connector 3      | A36                                 | GTYRXP1_229                                | 229                               | Y2          | NA             | I, DIFF                   | GTY Bank229 channel1 High speed differential receiver positive.    |
| 3     | A3                    | DP1_M2C_N               | Board to Board Connector 3      | A37                                 | GTYRXN1_229                                | 229                               | Y1          | NA             | I, DIFF                   | GTY Bank229 channel1 High speed differential receiver negative.    |
| 4     | A4                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 5     | A5                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 6     | A6                    | DP2_M2C_P               | Board to Board Connector 3      | A25                                 | GTYRXP2_229                                | 229                               | W4          | NA             | I, DIFF                   | GTY Bank229 channel2 High speed differential receiver positive.    |
| 7     | A7                    | DP2_M2C_N               | Board to Board Connector 3      | A24                                 | GTYRXN2_229                                | 229                               | W3          | NA             | I, DIFF                   | GTY Bank229 channel2 High speed differential receiver negative.    |
| 8     | A8                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 9     | A9                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 10    | A10                   | DP3_M2C_P               | Board to Board Connector 3      | B23                                 | GTYRXP3_229                                | 229                               | V2          | NA             | I, DIFF                   | GTY Bank229 channel3 High speed differential receiver positive.    |
| 11    | A11                   | DP3_M2C_N               | Board to Board Connector 3      | B22                                 | GTYRXN3_229                                | 229                               | V1          | NA             | I, DIFF                   | GTY Bank229 channel3 High speed differential receiver negative.    |
| 12    | A12                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 13    | A13                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 14    | A14                   | DP4_M2C_P               | Board to Board Connector 3      | C9                                  | GTYRXP0_231                                | 231                               | N4          | NA             | I, DIFF                   | GTY Bank231 channel0 High speed differential receiver positive.    |
| 15    | A15                   | DP4_M2C_N               | Board to Board Connector 3      | C8                                  | GTYRXN0_231                                | 231                               | N3          | NA             | I, DIFF                   | GTY Bank231 channel0 High speed differential receiver negative.    |
| 16    | A16                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 17    | A17                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 18    | A18                   | DP5_M2C_P               | Board to Board Connector 3      | C29                                 | GTYRXP1_231                                | 231                               | M2          | NA             | I, DIFF                   | GTY Bank231 channel1 High speed differential receiver positive.    |
| 19    | A19                   | DP5_M2C_N               | Board to Board Connector 3      | C28                                 | GTYRXN1_231                                | 231                               | M1          | NA             | I, DIFF                   | GTY Bank231 channel1 High speed differential receiver negative.    |
| 20    | A20                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 21    | A21                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 22    | A22                   | DP1_C2M_P               | Board to Board Connector 3      | B30                                 | GTYTXP1_229                                | 229                               | Y7          | NA             | O, DIFF                   | GTY Bank229 channel1 High speed differential transmitter positive. |
| 23    | A23                   | DP1_C2M_N               | Board to Board Connector 3      | B31                                 | GTYTXN1_229                                | 229                               | Y6          | NA             | O, DIFF                   | GTY Bank229 channel1 High speed differential transmitter negative. |
| 24    | A24                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 25    | A25                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |

## Kintex UltraScale+ FPGA SOM DevKit Datasheet

| Sl.no | FMC+ Connector VITA   |                         | Board to Board Connectors       |                                     |  | Kintex UltraScale+ FPGA(FFVB2104) |             |                |                           | Description  |
|-------|-----------------------|-------------------------|---------------------------------|-------------------------------------|--|-----------------------------------|-------------|----------------|---------------------------|--|
|       | FMC+ Connector Pin No | FMC+ Connector Pin Name | Board to Board Connector Number | Board to Board Connector Pin Number | Board to Board Connector Signal Name (SOM) | FPGA Bank                         | FPGA Pin No | LS1021A Pin No | Signal Type/ Termination* |  |
| 26    | A26                   | DP2_C2M_P               | Board to Board Connector 3      | A28                                 | GTYTXP2_229                                | 229                               | W9          | NA             | O, DIFF                   | GTY Bank229 channel2 High speed differential transmitter positive.                       |
| 27    | A27                   | DP2_C2M_N               | Board to Board Connector 3      | A29                                 | GTYTXN2_229                                | 229                               | W8          | NA             | O, DIFF                   | GTY Bank229 channel2 High speed differential transmitter negative.                       |
| 28    | A28                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 29    | A29                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 30    | A30                   | DP3_C2M_P               | Board to Board Connector 3      | B26                                 | GTYTXP3_229                                | 229                               | V7          | NA             | O, DIFF                   | GTY Bank229 channel3 High speed differential transmitter positive.                       |
| 31    | A31                   | DP3_C2M_N               | Board to Board Connector 3      | B27                                 | GTYTXN3_229                                | 229                               | V6          | NA             | O, DIFF                   | GTY Bank229 channel3 High speed differential transmitter negative.                       |
| 32    | A32                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 33    | A33                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 34    | A34                   | DP4_C2M_P               | Board to Board Connector 3      | C41                                 | GTYTXP0_231                                | 231                               | N9          | NA             | O, DIFF                   | GTY Bank231 channel0 High speed differential transmitter positive.                       |
| 35    | A35                   | DP4_C2M_N               | Board to Board Connector 3      | C40                                 | GTYTXN0_231                                | 231                               | N8          | NA             | O, DIFF                   | GTY Bank231 channel0 High speed differential transmitter negative.                       |
| 36    | A36                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 37    | A37                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 38    | A38                   | DP5_C2M_P               | Board to Board Connector 3      | C13                                 | GTYTXP1_231                                | 231                               | M7          | NA             | O, DIFF                   | GTY Bank231 channel1 High speed differential transmitter positive.                       |
| 39    | A39                   | DP5_C2M_N               | Board to Board Connector 3      | C12                                 | GTYTXN1_231                                | 231                               | M6          | NA             | O, DIFF                   | GTY Bank231 channel1 High speed differential transmitter negative.                       |
| 40    | A40                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 41    | B1                    | CLK_DIR                 | NA                              | NA                                  | NA   | NA                                | NA          | NA             | O, 3.3V                   | Pin determines the clock source. This Pin is connected to 16th pin of IO Expander (U10). |
| 42    | B2                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 43    | B3                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 44    | B4                    | DP9_M2C_P               | Board to Board Connector 3      | D43                                 | GTYRXP1_232                                | 232                               | H2          | NA             | I, DIFF                   | GTH Bank232 channel1 High speed differential receiver positive.                          |
| 45    | B5                    | DP9_M2C_N               | Board to Board Connector 3      | D42                                 | GTYRXN1_232                                | 232                               | H1          | NA             | I, DIFF                   | GTH Bank232 channel1 High speed differential receiver Negative.                          |
| 46    | B6                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 47    | B7                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 48    | B8                    | DP8_M2C_P               | Board to Board Connector 3      | D51                                 | GTYRXP0_232                                | 232                               | J4          | NA             | I, DIFF                   | GTH Bank232 channel0 High speed differential receiver positive.                          |
| 49    | B9                    | DP8_M2C_N               | Board to Board Connector 3      | D50                                 | GTYRXN0_232                                | 232                               | J3          | NA             | I, DIFF                   | GTH Bank232 channel0 High speed differential receiver negative.                          |

## Kintex UltraScale+ FPGA SOM DevKit Datasheet

| Sl.no | FMC+ Connector VITA   |                         | Board to Board Connectors       |                                     |  | Kintex UltraScale+ FPGA(FFVB2104) |             |                |                           | Description  |
|-------|-----------------------|-------------------------|---------------------------------|-------------------------------------|--|-----------------------------------|-------------|----------------|---------------------------|--|
|       | FMC+ Connector Pin No | FMC+ Connector Pin Name | Board to Board Connector Number | Board to Board Connector Pin Number | Board to Board Connector Signal Name (SOM) | FPGA Bank                         | FPGA Pin No | LS1021A Pin No | Signal Type/ Termination* |  |
| 50    | B10                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 51    | B11                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 52    | B12                   | DP7_M2C_P               | Board to Board Connector 3      | C25                                 | GTYRXP3_231                                | 231                               | K2          | NA             | I, DIFF                   | GTY Bank231 channel3 High speed differential receiver positive.    |
| 53    | B13                   | DP7_M2C_N               | Board to Board Connector 3      | C24                                 | GTYRXN3_231                                | 231                               | K1          | NA             | I, DIFF                   | GTY Bank231 channel3 High speed differential receiver negative.    |
| 54    | B14                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 55    | B15                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 56    | B16                   | DP6_M2C_P               | Board to Board Connector 3      | C4                                  | GTYRXP2_231                                | 231                               | L4          | NA             | I, DIFF                   | GTY Bank231 channel2 High speed differential receiver positive.    |
| 57    | B17                   | DP6_M2C_N               | Board to Board Connector 3      | C5                                  | GTYRXN2_231                                | 231                               | L3          | NA             | I, DIFF                   | GTY Bank231 channel2 High speed differential receiver negative.    |
| 58    | B18                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 59    | B19                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 60    | B20                   | GBTCLK1_M2C_P           | Board to Board Connector 3      | C20                                 | GTREFCLKOP_231                             | 231                               | M11         | NA             | I, DIFF                   | GTY Bank231 differential reference clock0 positive.                |
| 61    | B21                   | GBTCLK1_M2C_N           | Board to Board Connector 3      | C21                                 | GTREFCLKON_231                             | 231                               | M10         | NA             | I, DIFF                   | GTY Bank231 differential reference clock0 negative.                |
| 62    | B22                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 63    | B23                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 64    | B24                   | DP9_C2M_P               | Board to Board Connector 3      | C57                                 | GTYTXP1_232                                | 232                               | H7          | NA             | O, DIFF                   | GTH Bank232 channel1 High speed differential Transmitter positive. |
| 65    | B25                   | DP9_C2M_N               | Board to Board Connector 3      | C56                                 | GTYTXN1_232                                | 232                               | H6          | NA             | O, DIFF                   | GTH Bank232 channel1 High speed differential Transmitter Negative. |
| 66    | B26                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 67    | B27                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 68    | B28                   | DP8_C2M_P               | Board to Board Connector 3      | C52                                 | GTYTXP0_232                                | 232                               | J9          | NA             | O, DIFF                   | GTH Bank232 channel0 High speed differential transmitter positive. |
| 69    | B29                   | DP8_C2M_N               | Board to Board Connector 3      | C53                                 | GTYTXN0_232                                | 232                               | J8          | NA             | O, DIFF                   | GTH Bank232 channel0 High speed differential transmitter negative. |
| 70    | B30                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 71    | B31                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 72    | B32                   | DP7_C2M_P               | Board to Board Connector 3      | C33                                 | GTYTXP3_231                                | 231                               | K7          | NA             | O, DIFF                   | GTY Bank231 channel3 High speed differential transmitter positive. |
| 73    | B33                   | DP7_C2M_N               | Board to Board Connector 3      | C32                                 | GTYTXN3_231                                | 231                               | K6          | NA             | O, DIFF                   | GTY Bank231 channel3 High speed differential transmitter negative. |
| 74    | B34                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 75    | B35                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |

## Kintex UltraScale+ FPGA SOM DevKit Datasheet

| Sl.no | FMC+ Connector VITA   |                         | Board to Board Connectors       |                                     |  | Kintex UltraScale+ FPGA(FFVB2104) |             |                |                           | Description  |
|-------|-----------------------|-------------------------|---------------------------------|-------------------------------------|--|-----------------------------------|-------------|----------------|---------------------------|--|
|       | FMC+ Connector Pin No | FMC+ Connector Pin Name | Board to Board Connector Number | Board to Board Connector Pin Number | Board to Board Connector Signal Name (SOM) | FPGA Bank                         | FPGA Pin No | LS1021A Pin No | Signal Type/ Termination* |  |
| 76    | B36                   | DP6_C2M_P               | Board to Board Connector 3      | C37                                 | GTYTXP2_231                                | 231                               | L9          | NA             | O, DIFF                   | GTY Bank231 channel2 High speed differential transmitter positive. |
| 77    | B37                   | DP6_C2M_N               | Board to Board Connector 3      | C36                                 | GTYTXN2_231                                | 231                               | L8          | NA             | O, DIFF                   | GTY Bank231 channel2 High speed differential transmitter negative. |
| 78    | B38                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 79    | B39                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 80    | B40                   | RES0                    | NA                              | NA                                  | NA   | NA                                | NA          | NA             | NA                        | NC.  |
| 81    | C1                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 82    | C2                    | DPO_C2M_P               | Board to Board Connector 3      | A32                                 | GTYTXP0_229                                | 229                               | AA9         | NA             | O, DIFF                   | GTY Bank229 channel0 High speed differential transmitter positive. |
| 83    | C3                    | DPO_C2M_N               | Board to Board Connector 3      | A33                                 | GTYTXN0_229                                | 229                               | AA8         | NA             | O, DIFF                   | GTY Bank229 channel0 High speed differential transmitter negative. |
| 84    | C4                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 85    | C5                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 86    | C6                    | DPO_M2C_P               | Board to Board Connector 3      | A40                                 | GTYRXPO_229                                | 229                               | AA4         | NA             | I, DIFF                   | GTY Bank229 channel0 High speed differential receiver positive.    |
| 87    | C7                    | DPO_M2C_N               | Board to Board Connector 3      | A41                                 | GTYRXN0_229                                | 229                               | AA3         | NA             | I, DIFF                   | GTY Bank229 channel0 High speed differential receiver negative.    |
| 88    | C8                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 89    | C9                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 90    | C10                   | LA06_P                  | Board to Board Connector 2      | 183                                 | PL_BB17_LVDS66_L5P                         | 66                                | BB17        | NA             | IO, 1.8V                  | PL Bank66 IO5 differential positive.                               |
| 91    | C11                   | LA06_N                  | Board to Board Connector 2      | 181                                 | PL_BC17_LVDS66_L5N                         | 66                                | BC17        | NA             | IO, 1.8V                  | PL Bank66 IO5 differential negative.                               |
| 92    | C12                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 93    | C13                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 94    | C14                   | LA10_P                  | Board to Board Connector 2      | 176                                 | PL_AV18_LVDS66_L11P_GC                     | 66                                | AV18        | NA             | IO, 1.8V                  | PL Bank66 IO11 differential positive.                              |
| 95    | C15                   | LA10_N                  | Board to Board Connector 2      | 178                                 | PL_AW18_LVDS66_L11N_GC                     | 66                                | AW18        | NA             | IO, 1.8V                  | PL Bank66 IO11 differential negative.                              |
| 96    | C16                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 97    | C17                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 98    | C18                   | LA14_P                  | Board to Board Connector 2      | 147                                 | PL_AP20_LVDS66_L18P                        | 66                                | AP20        | NA             | IO, 1.8V                  | PL Bank66 IO18 differential positive.                              |
| 99    | C19                   | LA14_N                  | Board to Board Connector 2      | 149                                 | PL_AR20_LVDS66_L18N                        | 66                                | AR20        | NA             | IO, 1.8V                  | PL Bank66 IO18 differential negative.                              |
| 100   | C20                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 101   | C21                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 102   | C22                   | LA18_P_CC               | Board to Board Connector 2      | 152                                 | PL_BE17_LVDS66_L1P_DBC                     | 66                                | BE17        | NA             | IO, 1.8V                  | PL Bank66 IO1 differential positive.                               |



## Kintex UltraScale+ FPGA SOM DevKit Datasheet

| Sl.no | FMC+ Connector VITA   |                         | Board to Board Connectors       |                                     |  | Kintex UltraScale+ FPGA(FFVB2104) |             |                |                           | Description  |
|-------|-----------------------|-------------------------|---------------------------------|-------------------------------------|--|-----------------------------------|-------------|----------------|---------------------------|--|
|       | FMC+ Connector Pin No | FMC+ Connector Pin Name | Board to Board Connector Number | Board to Board Connector Pin Number | Board to Board Connector Signal Name (SOM) | FPGA Bank                         | FPGA Pin No | LS1021A Pin No | Signal Type/ Termination* |  |
| 103   | C23                   | LA18_N_CC               | Board to Board Connector 2      | 154                                 | PL_BF17_LVDS66_L1N_DBC                     | 66                                | BF17        | NA             | IO, 1.8V                  | PL Bank66 IO1 differential negative.   |
| 104   | C24                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 105   | C25                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 106   | C26                   | LA27_P                  | Board to Board Connector 1      | 27                                  | PL_AV24_LVDS92_L2P                         | 92                                | AV24        | NA             | IO, 1.8V                  | PL Bank92 IO2 differential positive.   |
| 107   | C27                   | LA27_N                  | Board to Board Connector 1      | 29                                  | PL_AW24_LVDS92_L2N                         | 92                                | AW24        | NA             | IO, 1.8V                  | PL Bank92 IO2 differential negative.   |
| 108   | C28                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 109   | C29                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 110   | C30                   | SCL                     | NA                              | NA                                  | NA   | NA                                | NA          | NA             | O, 3.3V LVC MOS           | FMC+ I2C Clock Signal.<br>This Pin is connected from 12th pin of I2C Bus switch (U29).                   |
| 111   | C31                   | SDA                     | NA                              | NA                                  | NA   | NA                                | NA          | NA             | IO, 3.3V LVC MOS          | FMC+ I2C Data Signal.<br>This Pin is connected from 11th pin of I2C Bus switch (U29).                    |
| 112   | C32                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 113   | C33                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 114   | C34                   | GA0                     | NA                              | NA                                  | NA   | NA                                | NA          | NA             | 1K, PU                    | Geographical address 0   |
| 115   | C35                   | 12P0V                   | NA                              | NA                                  | VCC_12V_FMC+                               | NA                                | NA          | NA             | O, 12V Power              | Carrier Board Supply Voltage.  |
| 116   | C36                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 117   | C37                   | 12P0V                   | NA                              | NA                                  | VCC_12V_FMC+                               | NA                                | NA          | NA             | O, 12V Power              | Carrier Board Supply Voltage.  |
| 118   | C38                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 119   | C39                   | 3P3V                    | NA                              | NA                                  | VCC_3V3_FMC+                               | NA                                | NA          | NA             | O, 3.3V Power             | Carrier Board Supply Voltage.  |
| 120   | C40                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 121   | D1                    | PG_C2M                  | NA                              | NA                                  | NA   | NA                                | NA          | NA             | O, 3.3V                   | Power Good Signal from Carrier to FMC Module.<br>This Pin is connected to 18th pin of IO Expander (U10). |
| 122   | D2                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 123   | D3                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 124   | D4                    | GBTCLK0_M2C_P           | Board to Board Connector 3      | B38                                 | GTREFCLK0P_229                             | 229                               | Y11         | NA             | I, DIFF                   | GTY Bank229 differential reference clock0 positive.  |
| 125   | D5                    | GBTCLK0_M2C_N           | Board to Board Connector 3      | B39                                 | GTREFCLK0N_229                             | 229                               | Y10         | NA             | I, DIFF                   | GTY Bank229 differential reference clock0 negative.  |
| 126   | D6                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 127   | D7                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 128   | D8                    | LA01_P_CC               | Board to Board Connector 2      | 132                                 | PL_AL17_LVDS66_L22P_DBC                    | 66                                | AL17        | NA             | IO, 1.8V                  | PL Bank66 IO22 differential positive.  |

## Kintex UltraScale+ FPGA SOM DevKit Datasheet

| Sl.no | FMC+ Connector VITA   |                         | Board to Board Connectors       |                                     |  | Kintex UltraScale+ FPGA(FFVB2104) |             |                |                           | Description  |
|-------|-----------------------|-------------------------|---------------------------------|-------------------------------------|--|-----------------------------------|-------------|----------------|---------------------------|--|
|       | FMC+ Connector Pin No | FMC+ Connector Pin Name | Board to Board Connector Number | Board to Board Connector Pin Number | Board to Board Connector Signal Name (SOM) | FPGA Bank                         | FPGA Pin No | LS1021A Pin No | Signal Type/Termination*  |  |
| 129   | D9                    | LA01_N_CC               | Board to Board Connector 2      | 134                                 | PL_AM17_LVDS66_L22N_DBC                    | 66                                | AM17        | NA             | IO, 1.8V                  | PL Bank66 IO22 differential negative.  |
| 130   | D10                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 131   | D11                   | LA05_P                  | Board to Board Connector 2      | 148                                 | PL_BD18_LVDS66_L3P                         | 66                                | BD18        | NA             | IO, 1.8V                  | PL Bank66 IO3 differential positive.   |
| 132   | D12                   | LA05_N                  | Board to Board Connector 2      | 150                                 | PL_BE18_LVDS66_L3N                         | 66                                | BE18        | NA             | IO, 1.8V                  | PL Bank66 IO3 differential negative.   |
| 133   | D13                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 134   | D14                   | LA09_P                  | Board to Board Connector 2      | 164                                 | PL_AT18_LVDS66_L15P                        | 66                                | AT18        | NA             | IO, 1.8V                  | PL Bank66 IO15 differential positive.  |
| 135   | D15                   | LA09_N                  | Board to Board Connector 2      | 166                                 | PL_AU17_LVDS66_L15N                        | 66                                | AU17        | NA             | IO, 1.8V                  | PL Bank66 IO15 differential negative.  |
| 136   | D16                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 137   | D17                   | LA13_P                  | Board to Board Connector 2      | 169                                 | PL_AT20_LVDS66_L14P_GC                     | 66                                | AT20        | NA             | IO, 1.8V                  | PL Bank66 IO14 differential positive.  |
| 138   | D18                   | LA13_N                  | Board to Board Connector 2      | 171                                 | PL_AU20_LVDS66_L14N_GC                     | 66                                | AU20        | NA             | IO, 1.8V                  | PL Bank66 IO14 differential negative.  |
| 139   | D19                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 140   | D20                   | LA17_P_CC               | Board to Board Connector 2      | 144                                 | PL_AP18_LVDS66_L17P                        | 66                                | AP18        | NA             | IO, 1.8V                  | PL Bank66 IO17 differential positive.  |
| 141   | D21                   | LA17_N_CC               | Board to Board Connector 2      | 146                                 | PL_AR18_LVDS66_L17N                        | 66                                | AR18        | NA             | IO, 1.8V                  | PL Bank66 IO17 differential negative.  |
| 142   | D22                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 143   | D23                   | LA23_P                  | Board to Board Connector 1      | 32                                  | GPIO3_24(EC2_RXD1)                         | NA                                | NA          | U1             | IO, 1.8V                  | GPIO3_24 from CPU  |
| 144   | D24                   | LA23_N                  | Board to Board Connector 1      | 34                                  | GPIO4_09(TDMA_RXD)                         | NA                                | NA          | H3             | IO, 1.8V                  | GPIO4_09 from CPU  |
| 145   | D25                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          |                | Power                     | Ground.  |
| 146   | D26                   | LA26_P                  | Board to Board Connector 1      | 38                                  | GPIO3_19(EC2_TXEN)                         | NA                                | NA          | T5             | IO, 1.8V                  | GPIO3_19 from CPU  |
| 147   | D27                   | LA26_N                  | Board to Board Connector 1      | 40                                  | PL_AP24_LVDS92_L9N                         | 92                                | AP24        | NA             | IO, DIFF                  | PL Bank92 IO9 differential negative.   |
| 148   | D28                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 149   | D29                   | TCK                     | Board to Board Connector 2      | 31                                  | JTAG_TCK                                   | 0                                 | AE13        | NA             | I, 3.3V CMOS/<br>49.9K PU | JTAG Test Clock.<br>This Pin is connected to 31st pin of Board-to-Board Connector2 (J19) through Voltage level translator.       |
| 150   | D30                   | TDI                     | Board to Board Connector 2      | 33                                  | NA   | NA                                | NA          | NA             | O, 3.3V CMOS              | JTAG Test Data Output.<br>This Pin is connected to 33rd pin of Board-to-Board Connector2 (J19) through Voltage level translator. |
| 151   | D31                   | TDO                     | NA                              | NA                                  | NA   | NA                                | NA          | NA             | O, 3.3V CMOS              | FMC+ Test Data Output.   |

## Kintex UltraScale+ FPGA SOM DevKit Datasheet

| Sl.no | FMC+ Connector VITA   |                         | Board to Board Connectors       |                                     |  | Kintex UltraScale+ FPGA(FFVB2104) |             |                |                           | Description  |
|-------|-----------------------|-------------------------|---------------------------------|-------------------------------------|--|-----------------------------------|-------------|----------------|---------------------------|--|
|       | FMC+ Connector Pin No | FMC+ Connector Pin Name | Board to Board Connector Number | Board to Board Connector Pin Number | Board to Board Connector Signal Name (SOM) | FPGA Bank                         | FPGA Pin No | LS1021A Pin No | Signal Type/ Termination* |  |
|       |                       |                         |                                 |                                     |  |                                   |             |                |                           | This pin is connected to D30th pin of FMC Connector(J22)   |
| 152   | D32                   | 3P3VAUX                 | NA                              | NA                                  | VCC_3V3                                    | NA                                | NA          | NA             | O, 3.3V Power             | Carrier Board Supply Voltage.  |
| 153   | D33                   | TMS                     | Board to Board Connector 2      | 29                                  | JTAG_TMS                                   | 0                                 | AG15        | NA             | I, 3.3V CMOS/ 49.9K PU    | JTAG Test Mode Select.<br>This Pin is connected to 29th pin of Board-to-Board Connector2 (J19) through Voltage level translator. |
| 154   | D34                   | TRST_L                  | Board to Board Connector 2      | 25                                  | NC   | NA                                | NA          | NA             | NA                        | NC.<br>This Pin is connected to 25th pin of Board-to-Board Connector2 (J8) through Voltage level translator.                     |
| 155   | D35                   | GA1                     | NA                              | NA                                  | NA   | NA                                | NA          | NA             | 1K, PU                    | Geographical address 1   |
| 156   | D36                   | 3P3V                    | NA                              | NA                                  | VCC_3V3_FMC+                               | NA                                | NA          | NA             | O, 3.3V Power             | Carrier Board Supply Voltage.  |
| 157   | D37                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 158   | D38                   | 3P3V                    | NA                              | NA                                  | VCC_3V3_FMC+                               | NA                                | NA          | NA             | O, 3.3V Power             | Carrier Board Supply Voltage.  |
| 159   | D39                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 160   | D40                   | 3P3V                    | NA                              | NA                                  | VCC_3V3_FMC+                               | NA                                | NA          | NA             | O, 3.3V Power             | Carrier Board Supply Voltage.  |
| 161   | E1                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 162   | E2                    | HA01_P_CC               | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.  |
| 163   | E3                    | HA01_N_CC               | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.  |
| 164   | E4                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 165   | E5                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 166   | E6                    | HA05_P                  | Board to Board connector 1      | 128                                 | PL_BE22_LVDS90_L4P                         | 90                                | BE22        | NA             | IO, 1.8V                  | PL Bank90 IO4 differential positive.   |
| 167   | E7                    | HA05_N                  | Board to Board connector 1      | 134                                 | PL_BD24_LVDS90_L3N                         | 90                                | BD24        | NA             | IO, 1.8V                  | PL Bank90 IO3 differential negative.   |
| 168   | E8                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 169   | E9                    | HA09_P                  | Board to Board connector 1      | 112                                 | PL_BD21_LVDS90_L5P_HDGC                    | 90                                | BD21        | NA             | IO, 1.8V                  | PL Bank90 IO5 differential positive.   |
| 170   | E10                   | HA09_N                  | Board to Board connector 1      | 110                                 | PL_BE21_LVDS90_L5N_HDGC                    | 90                                | BE21        | NA             | IO, 1.8V                  | PL Bank90 IO5 differential negative.   |
| 171   | E11                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 172   | E12                   | HA13_P                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.  |
| 173   | E13                   | HA13_N                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.  |
| 174   | E14                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 175   | E15                   | HA16_P                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.  |
| 176   | E16                   | HA16_N                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.  |
| 177   | E17                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 178   | E18                   | HA20_P                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.  |

## Kintex UltraScale+ FPGA SOM DevKit Datasheet

| Sl.no | FMC+ Connector VITA   |                         | Board to Board Connectors       |                                     |  | Kintex UltraScale+ FPGA(FFVB2104) |             |                |                           | Description  |
|-------|-----------------------|-------------------------|---------------------------------|-------------------------------------|--|-----------------------------------|-------------|----------------|---------------------------|--|
|       | FMC+ Connector Pin No | FMC+ Connector Pin Name | Board to Board Connector Number | Board to Board Connector Pin Number | Board to Board Connector Signal Name (SOM) | FPGA Bank                         | FPGA Pin No | LS1021A Pin No | Signal Type/ Termination* |  |
| 179   | E19                   | HA20_N                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.  |
| 180   | E20                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 181   | E21                   | HB03_P                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.  |
| 182   | E22                   | HB03_N                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.  |
| 183   | E23                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 184   | E24                   | HB05_P                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.  |
| 185   | E25                   | HB05_N                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.  |
| 186   | E26                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 187   | E27                   | HB09_P                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.  |
| 188   | E28                   | HB09_N                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.  |
| 189   | E29                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 190   | E30                   | HB13_P                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.  |
| 191   | E31                   | HB13_N                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.  |
| 192   | E32                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 193   | E33                   | HB19_P                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.  |
| 194   | E34                   | HB19_N                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.  |
| 195   | E35                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 196   | E36                   | HB21_P                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.  |
| 197   | E37                   | HB21_N                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.  |
| 198   | E38                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 199   | E39                   | VADJ                    | NA                              | NA                                  | VCC_FMC+_ADJ                               | NA                                | NA          | NA             | O, 1.8V Power             | Carrier Board Supply Voltage.  |
| 200   | E40                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 201   | F1                    | PG_M2C                  | NA                              | NA                                  | NA   | NA                                | NA          | NA             | I, 3.3V CMOS/<br>10K PU   | Power Good Signal from FMC Module to Carrier.<br>This Pin is connected to 20th pin of IO Expander (U10). |
| 202   | F2                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 203   | F3                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 204   | F4                    | HA00_P_CC               | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.  |
| 205   | F5                    | HA00_N_CC               | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.  |
| 206   | F6                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 207   | F7                    | HA04_P                  | Board to Board Connector 1      | 204                                 | PL_BE8_LVDS88_L2P                          | 88                                | BE8         | NA             | IO, 1.8V                  | PL Bank88 IO2 differential positive.   |
| 208   | F8                    | HA04_N                  | Board to Board Connector 1      | 202                                 | PL_BF8_LVDS88_L2N                          | 88                                | BF8         | NA             | IO, 1.8V                  | PL Bank88 IO2 differential negative.   |
| 209   | F9                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 210   | F10                   | HA08_P                  | Board to Board Connector 1      | 153                                 | PL_BD23_LVDS90_L2P                         | 90                                | BD23        | NA             | IO, 1.8V                  | PL Bank90 IO2 differential positive.   |



## Kintex UltraScale+ FPGA SOM DevKit Datasheet

| Sl.no | FMC+ Connector VITA   |                         | Board to Board Connectors       |                                     |  | Kintex UltraScale+ FPGA(FFVB2104) |             |                |                          | Description                           |
|-------|-----------------------|-------------------------|---------------------------------|-------------------------------------|--|-----------------------------------|-------------|----------------|--------------------------|---------------------------------------|
|       | FMC+ Connector Pin No | FMC+ Connector Pin Name | Board to Board Connector Number | Board to Board Connector Pin Number | Board to Board Connector Signal Name (SOM) | FPGA Bank                         | FPGA Pin No | LS1021A Pin No | Signal Type/Termination* |                                       |
| 211   | F11                   | HA08_N                  | Board to Board Connector 1      | 151                                 | PL_BE23_LVDS90_L2N                         | 90                                | BE23        | NA             | IO, 1.8V                 | PL Bank90 IO2 differential negative.  |
| 212   | F12                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                               |
| 213   | F13                   | HA12_P                  | Board to Board Connector 1      | 150                                 | PL_BA24_LVDS90_L10P                        | 90                                | BA24        | NA             | NA                       | PL Bank90 IO10 differential positive. |
| 214   | F14                   | HA12_N                  | Board to Board Connector 1      | 148                                 | PL_BB24_LVDS90_L10N                        | 90                                | BB24        | NA             | NA                       | PL Bank90 IO10 differential negative. |
| 215   | F15                   | GND                     | NA                              | NA                                  | NC   | NA                                | NA          | NA             | Power                    | Ground.                               |
| 216   | F16                   | HA15_P                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                   |
| 217   | F17                   | HA15_N                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                   |
| 218   | F18                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                               |
| 219   | F19                   | HA19_P                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                   |
| 220   | F20                   | HA19_N                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                   |
| 221   | F21                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                               |
| 222   | F22                   | HB02_P                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                   |
| 223   | F23                   | HB02_N                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                   |
| 224   | F24                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                               |
| 225   | F25                   | HB04_P                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                   |
| 226   | F26                   | HB04_N                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                   |
| 227   | F27                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                               |
| 228   | F28                   | HB08_P                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                   |
| 229   | F29                   | HB08_N                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                   |
| 230   | F30                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                               |
| 231   | F31                   | HB12_P                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                   |
| 232   | F32                   | HB12_N                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                   |
| 233   | F33                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                               |
| 234   | F34                   | HB16_P                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                   |
| 235   | F35                   | HB16_N                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                   |
| 236   | F36                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                               |
| 237   | F37                   | HB20_P                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                   |
| 238   | F38                   | HB20_N                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                   |
| 239   | F39                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                               |
| 240   | F40                   | VADJ                    | NA                              | NA                                  | VCC_FMC+_ADJ                               | NA                                | NA          | NA             | O, 1.8V Power            | Carrier Board Supply Voltage.         |
| 241   | G1                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                               |
| 242   | G2                    | CLK1_M2C_P              | Board to Board Connector 2      | 92                                  | PL_AU13_LVDS67_L15P                        | 67                                | AU13        | NA             | IO, 1.8V                 | PL Bank67 IO15 differential positive. |
| 243   | G3                    | CLK1_M2C_N              | Board to Board Connector 2      | 94                                  | PL_AV13_LVDS67_L15N                        | 67                                | AV13        | NA             | IO, 1.8V                 | PL Bank67 IO15 differential negative. |
| 244   | G4                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                               |

## Kintex UltraScale+ FPGA SOM DevKit Datasheet

| Sl.no | FMC+ Connector VITA   |                         | Board to Board Connectors       |                                     |  | Kintex UltraScale+ FPGA(FFVB2104) |             |                |                           | Description                           |
|-------|-----------------------|-------------------------|---------------------------------|-------------------------------------|--|-----------------------------------|-------------|----------------|---------------------------|---------------------------------------|
|       | FMC+ Connector Pin No | FMC+ Connector Pin Name | Board to Board Connector Number | Board to Board Connector Pin Number | Board to Board Connector Signal Name (SOM) | FPGA Bank                         | FPGA Pin No | LS1021A Pin No | Signal Type/ Termination* |                                       |
| 245   | G5                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.                               |
| 246   | G6                    | LA00_P_CC               | Board to Board Connector 2      | 159                                 | PL_BC19_LVDS66_L4P_DBC                     | 66                                | BC19        | NA             | IO, 1.8V                  | PL Bank66 IO4 differential positive.  |
| 247   | G7                    | LA00_N_CC               | Board to Board Connector 2      | 161                                 | PL_BD19_LVDS66_L4N_DBC                     | 66                                | BD19        | NA             | IO, 1.8V                  | PL Bank66 IO4 differential negative.  |
| 248   | G8                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.                               |
| 249   | G9                    | LA03_P                  | Board to Board Connector 2      | 163                                 | PL_BB19_LVDS66_L6P                         | 66                                | BB19        | NA             | IO, 1.8V                  | PL Bank66 IO6 differential positive.  |
| 250   | G10                   | LA03_N                  | Board to Board Connector 2      | 165                                 | PL_BC18_LVDS66_L6N                         | 66                                | BC18        | NA             | IO, 1.8V                  | PL Bank66 IO6 differential negative.  |
| 251   | G11                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.                               |
| 252   | G12                   | LA08_P                  | Board to Board Connector 2      | 155                                 | PL_AV21_LVDS66_L10P_QBC                    | 66                                | AV21        | NA             | IO, 1.8V                  | PL Bank66 IO10 differential positive. |
| 253   | G13                   | LA08_N                  | Board to Board Connector 2      | 157                                 | PL_AW21_LVDS66_L10N_QBC                    | 66                                | AW21        | NA             | IO, 1.8V                  | PL Bank66 IO10 differential negative. |
| 254   | G14                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.                               |
| 255   | G15                   | LA12_P                  | Board to Board Connector 2      | 175                                 | PL_AT19_LVDS66_L13P_GC                     | 66                                | AT19        | NA             | IO, 1.8V                  | PL Bank66 IO13 differential positive. |
| 256   | G16                   | LA12_N                  | Board to Board Connector 2      | 177                                 | PL_AU19_LVDS66_L13N_GC                     | 66                                | AU19        | NA             | IO, 1.8V                  | PL Bank66 IO13 differential negative. |
| 257   | G17                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.                               |
| 258   | G18                   | LA16_P                  | Board to Board Connector 2      | 131                                 | PL_AL20_LVDS66_L24P                        | 66                                | AL20        | NA             | IO, 1.8V                  | PL Bank66 IO24 differential positive. |
| 259   | G19                   | LA16_N                  | Board to Board Connector 2      | 133                                 | PL_AM20_LVDS66_L24N                        | 66                                | AM20        | NA             | IO, 1.8V                  | PL Bank66 IO24 differential negative. |
| 260   | G20                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.                               |
| 261   | G21                   | LA20_P                  | Board to Board Connector 2      | 145                                 | PL_BE15_LVDS67_L2P                         | 67                                | BE15        | NA             | IO, 1.8V                  | PL Bank67 IO2 differential positive.  |
| 262   | G22                   | LA20_N                  | Board to Board Connector 2      | 143                                 | PL_BF15_LVDS67_L2N                         | 67                                | BF15        | NA             | IO, 1.8V                  | PL Bank67 IO2 differential negative.  |
| 263   | G23                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.                               |
| 264   | G24                   | LA22_P                  | Board to Board Connector 1      | 84                                  | PL_BC12_LVDS88_L7P_HDGC                    | 88                                | BC12        | NA             | IO, 1.8V                  | PL Bank88 IO7 differential positive.  |
| 265   | G25                   | LA22_N                  | Board to Board Connector 1      | 82                                  | PL_BC11_LVDS88_L7N_HDGC                    | 88                                | BC11        | NA             | IO, 1.8V                  | PL Bank88 IO7 differential negative.  |
| 266   | G26                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.                               |
| 267   | G27                   | LA25_P                  | Board to Board Connector 1      | 44                                  | PL_AN24_LVDS92_L9P                         | 92                                | AN24        | NA             | IO, 1.8V                  | PL Bank92 IO9 differential positive.  |
| 268   | G28                   | LA25_N                  | Board to Board Connector 1      | 42                                  | PL_BF10_LVDS88_L3P                         | 88                                | BF10        | NA             | IO, 1.8V                  | PL Bank88 IO3 differential positive.  |
| 269   | G29                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.                               |
| 270   | G30                   | LA29_P                  | Board to Board Connector 1      | 16                                  | PL_AU22_LVDS92_L3P                         | 92                                | AU22        | NA             | IO, 1.8V                  | PL Bank92 IO3 differential positive.  |

## Kintex UltraScale+ FPGA SOM DevKit Datasheet

| Sl.no | FMC+ Connector VITA   |                         | Board to Board Connectors       |                                     |  | Kintex UltraScale+ FPGA(FFVB2104) |             |                |                          | Description  |
|-------|-----------------------|-------------------------|---------------------------------|-------------------------------------|--|-----------------------------------|-------------|----------------|--------------------------|--|
|       | FMC+ Connector Pin No | FMC+ Connector Pin Name | Board to Board Connector Number | Board to Board Connector Pin Number | Board to Board Connector Signal Name (SOM) | FPGA Bank                         | FPGA Pin No | LS1021A Pin No | Signal Type/Termination* |  |
| 271   | G31                   | LA29_N                  | Board to Board Connector 1      | 18                                  | GPIO3_22(EC2_RXD3)                         | NA                                | NA          | R2             | NA                       | GPIO3_22 from CPU  |
| 272   | G32                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.  |
| 273   | G33                   | LA31_P                  | Board to Board Connector 1      | 30                                  | GPIO3_18(EC2_TXD0)                         | NA                                | NA          | T3             | NA                       | GPIO3_18 from CPU  |
| 274   | G34                   | LA31_N                  | Board to Board Connector 1      | 28                                  | GPIO3_17(EC2_TXD1)                         | NA                                | NA          | T4             | NA                       | GPIO3_17 from CPU  |
| 275   | G35                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.  |
| 276   | G36                   | LA33_P                  | Board to Board Connector 1      | 130                                 | PL_BF24_LVDS90_L1P                         | 90                                | BF24        | NA             | IO, 1.8V                 | PL Bank90 IO1 differential positive.   |
| 277   | G37                   | LA33_N                  | Board to Board Connector 1      | 132                                 | PL_BF23_LVDS90_L1N                         | 90                                | BF23        | NA             | IO, 1.8V                 | PL Bank90 IO1 differential negative.   |
| 278   | G38                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.  |
| 279   | G39                   | VADJ                    | NA                              | NA                                  | VCC_FMC+_ADJ                               | NA                                | NA          | NA             | O, 1.8V Power            | Carrier Board Supply Voltage.  |
| 280   | G40                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.  |
| 281   | H1                    | VREF_A_M2C              | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.  |
| 282   | H2                    | PRSNT_M2C_L             | NA                              | NA                                  | NA   | NA                                | NA          | NA             | I,3.3V/10K PU            | Module Present Signal.<br>This Pin is connected to 5th pin of IO Expander (U10). |
| 283   | H3                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.  |
| 284   | H4                    | CLK0_M2C_P              | Board To Board Connector 2      | 104                                 | PL_BA12_LVDS67_L7P_QBC                     | 67                                | BA12        | NA             | IO, 1.8V                 | PL Bank67 IO7 differential positive.   |
| 285   | H5                    | CLK0_M2C_N              | Board To Board Connector 2      | 106                                 | PL_BB12_LVDS67_L7N_QBC                     | 67                                | BB12        | NA             | IO, 1.8V                 | PL Bank67 IO7 differential negative.   |
| 286   | H6                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.  |
| 287   | H7                    | LA02_P                  | Board to Board Connector 2      | 156                                 | PL_AR17_LVDS66_L16P_QBC                    | 66                                | AR17        | NA             | IO, 1.8V                 | PL Bank66 IO16 differential positive.  |
| 288   | H8                    | LA02_N                  | Board to Board Connector 2      | 158                                 | PL_AT17_LVDS66_L16N_QBC                    | 66                                | AT17        | NA             | IO, 1.8V                 | PL Bank66 IO16 differential negative.  |
| 289   | H9                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.  |
| 290   | H10                   | LA04_P                  | Board to Board Connector 2      | 162                                 | PL_BF19_LVDS66_L2P                         | 66                                | BF19        | NA             | IO, 1.8V                 | PL Bank66 IO2 differential positive.   |
| 291   | H11                   | LA04_N                  | Board to Board Connector 2      | 160                                 | PL_BF18_LVDS66_L2N                         | 66                                | BF18        | NA             | IO, 1.8V                 | PL Bank66 IO2 differential negative.   |
| 292   | H12                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.  |
| 293   | H13                   | LA07_P                  | Board to Board Connector 2      | 151                                 | PL_AY18_LVDS66_L8P                         | 66                                | AY18        | NA             | IO, 1.8V                 | PL Bank66 IO8 differential positive.   |
| 294   | H14                   | LA07_N                  | Board to Board Connector 2      | 153                                 | PL_BA18_LVDS66_L8N                         | 66                                | BA18        | NA             | IO, 1.8V                 | PL Bank66 IO8 differential negative.   |
| 295   | H15                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.  |

## Kintex UltraScale+ FPGA SOM DevKit Datasheet

| Sl.no | FMC+ Connector VITA   |                         | Board to Board Connectors       |                                     |  | Kintex UltraScale+ FPGA(FFVB2104) |             |                |                           | Description                           |
|-------|-----------------------|-------------------------|---------------------------------|-------------------------------------|--|-----------------------------------|-------------|----------------|---------------------------|---------------------------------------|
|       | FMC+ Connector Pin No | FMC+ Connector Pin Name | Board to Board Connector Number | Board to Board Connector Pin Number | Board to Board Connector Signal Name (SOM) | FPGA Bank                         | FPGA Pin No | LS1021A Pin No | Signal Type/ Termination* |                                       |
| 296   | H16                   | LA11_P                  | Board to Board Connector 2      | 170                                 | PL_AV19_LVDS66_L12P_GC                     | 66                                | AV19        | NA             | IO, 1.8V                  | PL Bank66 IO12 differential positive. |
| 297   | H17                   | LA11_N                  | Board to Board Connector 2      | 172                                 | PL_AW19_LVDS66_L12N_GC                     | 66                                | AW19        | NA             | IO, 1.8V                  | PL Bank66 IO12 differential negative. |
| 298   | H18                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.                               |
| 299   | H19                   | LA15_P                  | Board to Board Connector 2      | 182                                 | PL_AY17_LVDS66_L7P_QBC                     | 66                                | AY17        | NA             | IO, 1.8V                  | PL Bank66 IO7 differential positive.  |
| 300   | H20                   | LA15_N                  | Board to Board Connector 2      | 184                                 | PL_BA17_LVDS66_L7N_QBC                     | 66                                | BA17        | NA             | IO, 1.8V                  | PL Bank66 IO7 differential negative.  |
| 301   | H21                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.                               |
| 302   | H22                   | LA19_P                  | Board to Board Connector 2      | 140                                 | PL_AL19_LVDS66_L23P                        | 66                                | AL19        | NA             | IO, 1.8V                  | PL Bank66 IO23 differential positive. |
| 303   | H23                   | LA19_N                  | Board to Board Connector 2      | 142                                 | PL_AM19_LVDS66_L23N                        | 66                                | AM19        | NA             | IO, 1.8V                  | PL Bank66 IO23 differential negative. |
| 304   | H24                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.                               |
| 305   | H25                   | LA21_P                  | Board to Board Connector 2      | 139                                 | PL_BD15_LVDS67_L5P                         | 67                                | BD15        | NA             | IO, 1.8V                  | PL Bank67 IO5 differential positive.  |
| 306   | H26                   | LA21_N                  | Board to Board Connector 2      | 141                                 | PL_BD14_LVDS67_L5N                         | 67                                | BD14        | NA             | IO, 1.8V                  | PL Bank67 IO5 differential negative.  |
| 307   | H27                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.                               |
| 308   | H28                   | LA24_P                  | Board to Board Connector 1      | 12                                  | PL_AL22_LVDS92_L11P                        | 92                                | AL22        | NA             | IO, 1.8V                  | PL Bank92 IO11 differential positive. |
| 309   | H29                   | LA24_N                  | Board to Board Connector 1      | 14                                  | PL_AM22_LVDS92_L11N                        | 92                                | AM22        | NA             | IO, 1.8V                  | PL Bank92 IO11 differential negative. |
| 310   | H30                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.                               |
| 311   | H31                   | LA28_P                  | Board to Board Connector 1      | 31                                  | PL_AL24_LVDS92_L10P                        | 92                                | AL24        | NA             | IO, 1.8V                  | PL Bank92 IO10 differential positive. |
| 312   | H32                   | LA28_N                  | Board to Board Connector 1      | 33                                  | PL_AM24_LVDS92_L10N                        | 92                                | AM24        | NA             | IO, 1.8V                  | PL Bank92 IO10 differential negative. |
| 313   | H33                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.                               |
| 314   | H34                   | LA30_P                  | Board to Board Connector 1      | 58                                  | PL_BB11_LVDS88_L8P_HDGC                    | 88                                | BB11        | NA             | IO, 1.8V                  | PL Bank88 IO8 differential positive.  |
| 315   | H35                   | LA30_N                  | Board to Board Connector 1      | 56                                  | PL_BB10_LVDS88_L8N_HDGC                    | 88                                | BB10        | NA             | IO, 1.8V                  | PL Bank88 IO8 differential negative.  |
| 316   | H36                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.                               |
| 317   | H37                   | LA32_P                  | Board to Board Connector 1      | 91                                  | PL_AR23_LVDS92_L5P_HDGC                    | 92                                | AR23        | NA             | IO, 1.8V                  | PL Bank92 IO5 differential positive.  |
| 318   | H38                   | LA32_N                  | Board to Board Connector 1      | 93                                  | PL_AT23_LVDS92_L5N_HDGC                    | 92                                | AT23        | NA             | IO, 1.8V                  | PL Bank92 IO5 differential negative.  |
| 319   | H39                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.                               |
| 320   | H40                   | VADJ                    | NA                              | NA                                  | VCC_FMC+_ADJ                               | NA                                | NA          | NA             | O, 1.8V Power             | Carrier Board Supply Voltage.         |
| 321   | J1                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.                               |



## Kintex UltraScale+ FPGA SOM DevKit Datasheet

| Sl.no | FMC+ Connector VITA   |                         | Board to Board Connectors       |                                     |  | Kintex UltraScale+ FPGA(FFVB2104) |             |                |                          | Description                           |
|-------|-----------------------|-------------------------|---------------------------------|-------------------------------------|--|-----------------------------------|-------------|----------------|--------------------------|---------------------------------------|
|       | FMC+ Connector Pin No | FMC+ Connector Pin Name | Board to Board Connector Number | Board to Board Connector Pin Number | Board to Board Connector Signal Name (SOM) | FPGA Bank                         | FPGA Pin No | LS1021A Pin No | Signal Type/Termination* |                                       |
| 322   | J2                    | CLK3_BIDIR_P            | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                   |
| 323   | J3                    | CLK3_BIDIR_N            | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                   |
| 324   | J4                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                               |
| 325   | J5                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                               |
| 326   | J6                    | HA03_P                  | Board to Board Connector 1      | 238                                 | PL_AY23_LVDS90_L12P                        | 90                                | AY23        | NA             | IO, 1.8V                 | PL Bank90 IO12 differential positive. |
| 327   | J7                    | HA03_N                  | Board to Board Connector 1      | 236                                 | PL_BA23_LVDS90_L12N                        | 90                                | BA23        | NA             | IO, 1.8V                 | PL Bank90 IO12 differential negative. |
| 328   | J8                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                               |
| 329   | J9                    | HA07_P                  | Board to Board Connector 1      | 147                                 | PL_BE7_LVDS88_L1P                          | 88                                | BE7         | NA             | IO, 1.8V                 | PL Bank88 IO1 differential positive.  |
| 330   | J10                   | HA07_N                  | Board to Board Connector 1      | 149                                 | PL_BF7_LVDS88_L1N                          | 88                                | BF7         | NA             | IO, 1.8V                 | PL Bank88 IO1 differential negative.  |
| 331   | J11                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                               |
| 332   | J12                   | HA11_P                  | Board to Board Connector 1      | 154                                 | PL_BB22_LVDS90_L9P                         | 90                                | BB22        | NA             | IO, 1.8V                 | PL Bank90 IO9 differential positive.  |
| 333   | J13                   | HA11_N                  | Board to Board Connector 1      | 152                                 | PL_BC22_LVDS90_L9N                         | 90                                | BC22        | NA             | IO, 1.8V                 | PL Bank90 IO9 differential negative.  |
| 334   | J14                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                               |
| 335   | J15                   | HA14_P                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                   |
| 336   | J16                   | HA14_N                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                   |
| 337   | J17                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                               |
| 338   | J18                   | HA18_P                  | Board to Board Connector 1      | 172                                 | PL_BC24_LVDS90_L3P                         | 90                                | BC24        | NA             | IO, 1.8V                 | PL Bank90 IO3 differential positive.  |
| 339   | J19                   | HA18_N                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                   |
| 340   | J20                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                               |
| 341   | J21                   | HA22_P                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                   |
| 342   | J22                   | HA22_N                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                   |
| 343   | J23                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                               |
| 344   | J24                   | HB01_P                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                   |
| 345   | J25                   | HB01_N                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                   |
| 346   | J26                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                               |
| 347   | J27                   | HB07_P                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                   |
| 348   | J28                   | HB07_N                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                   |
| 349   | J29                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                               |
| 350   | J30                   | HB11_P                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                   |
| 351   | J31                   | HB11_N                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                   |
| 352   | J32                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                               |
| 353   | J33                   | HB15_P                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                   |
| 354   | J34                   | HB15_N                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                   |

## Kintex UltraScale+ FPGA SOM DevKit Datasheet

| Sl.no | FMC+ Connector VITA   |                         | Board to Board Connectors       |                                     |  | Kintex UltraScale+ FPGA(FFVB2104) |             |                |                          | Description                          |
|-------|-----------------------|-------------------------|---------------------------------|-------------------------------------|--|-----------------------------------|-------------|----------------|--------------------------|--------------------------------------|
|       | FMC+ Connector Pin No | FMC+ Connector Pin Name | Board to Board Connector Number | Board to Board Connector Pin Number | Board to Board Connector Signal Name (SOM) | FPGA Bank                         | FPGA Pin No | LS1021A Pin No | Signal Type/Termination* |                                      |
| 355   | J35                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                              |
| 356   | J36                   | HB18_P                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                  |
| 357   | J37                   | HB18_N                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                  |
| 358   | J38                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                              |
| 359   | J39                   | VIO_B_M2C               | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                  |
| 360   | J40                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                              |
| 361   | K1                    | VREF_B_M2C              | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                  |
| 362   | K2                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                              |
| 363   | K3                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                              |
| 364   | K4                    | CLK2_BIDIR_P            | NA                              | NA                                  | NA   | NA                                | NA          | NA             | NA                       | NA                                   |
| 365   | K5                    | CLK2_BIDIR_N            | NA                              | NA                                  | NA   | NA                                | NA          | NA             | NA                       | NA                                   |
| 366   | K6                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                              |
| 367   | K7                    | HA02_P                  | Board to Board Connector 1      | 108                                 | PL_BD20_LVDS90_L6P_HDGC                    | 90                                | BD20        | NA             | IO, 1.8V                 | PL Bank90 IO6 differential positive. |
| 368   | K8                    | HA02_N                  | Board to Board Connector 1      | 106                                 | PL_BE20_LVDS90_L6N_HDGC                    | 90                                | BE20        | NA             | IO, 1.8V                 | PL Bank90 IO6 differential negative. |
| 369   | K9                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                              |
| 370   | K10                   | HA06_P                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                  |
| 371   | K11                   | HA06_N                  | Board to Board Connector 1      | 104                                 | PL_BF22_LVDS90_L4N                         | 90                                | BF22        | NA             | IO, 1.8V                 | PL Bank90 IO4 differential negative. |
| 372   | K12                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                              |
| 373   | K13                   | HA10_P                  | Board to Board Connector 1      | 136                                 | PL_BA20_LVDS90_L7P_HDGC                    | 90                                | BA20        | NA             | IO, 1.8V                 | PL Bank90 IO7 differential positive. |
| 374   | K14                   | HA10_N                  | Board to Board Connector 1      | 138                                 | PL_BB20_LVDS90_L7N_HDGC                    | 90                                | BB20        | NA             | IO, 1.8V                 | PL Bank90 IO7 differential negative. |
| 375   | K15                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                              |
| 376   | K16                   | HA17_P_CC               | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                  |
| 377   | K17                   | HA17_N_CC               | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                  |
| 378   | K18                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                              |
| 379   | K19                   | HA21_P                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                  |
| 380   | K20                   | HA21_N                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                  |
| 381   | K21                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                              |
| 382   | K22                   | HA23_P                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                  |
| 383   | K23                   | HA23_N                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                  |
| 384   | K24                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                              |
| 385   | K25                   | HB00_P_CC               | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                  |
| 386   | K26                   | HB00_N_CC               | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                  |
| 387   | K27                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                              |
| 388   | K28                   | HB06_P_CC               | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NC.                                  |

## Kintex UltraScale+ FPGA SOM DevKit Datasheet

| Sl.no | FMC+ Connector VITA   |                         | Board to Board Connectors       |                                     |  | Kintex UltraScale+ FPGA(FFVB2104) |             |                |                           | Description   |
|-------|-----------------------|-------------------------|---------------------------------|-------------------------------------|--|-----------------------------------|-------------|----------------|---------------------------|---|
|       | FMC+ Connector Pin No | FMC+ Connector Pin Name | Board to Board Connector Number | Board to Board Connector Pin Number | Board to Board Connector Signal Name (SOM) | FPGA Bank                         | FPGA Pin No | LS1021A Pin No | Signal Type/ Termination* |   |
| 389   | K29                   | HB06_N_CC               | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.   |
| 390   | K30                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.   |
| 391   | K31                   | HB10_P                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.   |
| 392   | K32                   | HB10_N                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.   |
| 393   | K33                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.   |
| 394   | K34                   | HB14_P                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.   |
| 395   | K35                   | HB14_N                  | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.   |
| 396   | K36                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.   |
| 397   | K37                   | HB17_P_CC               | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.   |
| 398   | K38                   | HB17_N_CC               | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.   |
| 399   | K39                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.   |
| 400   | K40                   | VIO_B_M2C               | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.   |
| 401   | L1                    | RES1                    | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.   |
| 402   | L2                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.   |
| 403   | L3                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.   |
| 404   | L4                    | GBTCLK4_M2C_P           | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NA  |
| 405   | L5                    | GBTCLK4_M2C_N           | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NA  |
| 406   | L6                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.   |
| 407   | L7                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.   |
| 408   | L8                    | GBTCLK3_M2C_P           | Board to Board Connector 4      | A6                                  | GTREFCLK0P_227                             | 227                               | AM11        | NA             | I, DIFF                   | GTU Bank227 differential reference clock0 positive. |
| 409   | L9                    | GBTCLK3_M2C_N           | Board to Board Connector 4      | A7                                  | GTREFCLK0N_227                             | 227                               | AM10        | NA             | I, DIFF                   | GTU Bank227 differential reference clock0 negative. |
| 410   | L10                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.   |
| 411   | L11                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.   |
| 412   | L12                   | GBTCLK2_M2C_P           | Board to Board Connector 3      | C48                                 | GTREFCLK0P_232                             | 232                               | H11         | NA             | I, DIFF                   | GTU Bank232 differential reference clock0 positive. |
| 413   | L13                   | GBTCLK2_M2C_N           | Board to Board Connector 3      | C49                                 | GTREFCLK0N_232                             | 232                               | H10         | NA             | I, DIFF                   | GTU Bank232 differential reference clock0 Negative. |
| 414   | L14                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.   |
| 415   | L15                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.   |
| 416   | L16                   | SYNC_C2M_P              | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.   |
| 417   | L17                   | SYNC_C2M_N              | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.   |
| 418   | L18                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.   |
| 419   | L19                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.   |
| 420   | L20                   | REFCLK_C2M_P            | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.   |
| 421   | L21                   | REFCLK_C2M_N            | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.   |
| 422   | L22                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.   |

## Kintex UltraScale+ FPGA SOM DevKit Datasheet

| Sl.no | FMC+ Connector VITA   |                         | Board to Board Connectors       |                                     |  | Kintex UltraScale+ FPGA(FFVB2104) |             |                |                           | Description  |
|-------|-----------------------|-------------------------|---------------------------------|-------------------------------------|--|-----------------------------------|-------------|----------------|---------------------------|--|
|       | FMC+ Connector Pin No | FMC+ Connector Pin Name | Board to Board Connector Number | Board to Board Connector Pin Number | Board to Board Connector Signal Name (SOM) | FPGA Bank                         | FPGA Pin No | LS1021A Pin No | Signal Type/ Termination* |  |
| 423   | L23                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 424   | L24                   | REFCLK_M2C_P            | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.  |
| 425   | L25                   | REFCLK_M2C_N            | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.  |
| 426   | L26                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 427   | L27                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 428   | L28                   | SYNC_M2C_P              | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.  |
| 429   | L29                   | SYNC_M2C_N              | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.  |
| 430   | L30                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 431   | L31                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 432   | L32                   | RES2                    | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.  |
| 433   | L33                   | RES3                    | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NC.  |
| 434   | L34                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 435   | L35                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 436   | L36                   | 12P0V                   | NA                              | NA                                  | VCC_12V_FMC+                               | NA                                | NA          | NA             | O, 12V Power              | Carrier Board Supply Voltage.                                      |
| 437   | L37                   | 12P0V                   | NA                              | NA                                  | VCC_12V_FMC+                               | NA                                | NA          | NA             | O, 12V Power              | Carrier Board Supply Voltage.                                      |
| 438   | L38                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 439   | L39                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 440   | L40                   | 12P0V                   | NA                              | NA                                  | VCC_12V_FMC+                               | NA                                | NA          | NA             | O, 12V Power              | Carrier Board Supply Voltage.                                      |
| 441   | M1                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 442   | M2                    | DP23_M2C_P              | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NA   |
| 443   | M3                    | DP23_M2C_N              | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NA   |
| 444   | M4                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 445   | M5                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 446   | M6                    | DP22_M2C_P              | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NA   |
| 447   | M7                    | DP22_M2C_N              | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NA   |
| 448   | M8                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 449   | M9                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 450   | M10                   | DP21_M2C_P              | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NA   |
| 451   | M11                   | DP21_M2C_N              | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NA   |
| 452   | M12                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 453   | M13                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 454   | M14                   | DP20_M2C_P              | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NA   |
| 455   | M15                   | DP20_M2C_N              | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NA   |
| 456   | M16                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 457   | M17                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 458   | M18                   | DP14_C2M_P              | Board to Board Connector 4      | A18                                 | GTYTXP2_227                                | 227                               | AL9         | NA             | O, DIFF                   | GTY Bank227 channel2 High speed differential transmitter positive. |



## Kintex UltraScale+ FPGA SOM DevKit Datasheet

| Sl.no | FMC+ Connector VITA   |                         | Board to Board Connectors       |                                     |  | Kintex UltraScale+ FPGA(FFVB2104) |             |                |                           | Description  |
|-------|-----------------------|-------------------------|---------------------------------|-------------------------------------|--|-----------------------------------|-------------|----------------|---------------------------|--|
|       | FMC+ Connector Pin No | FMC+ Connector Pin Name | Board to Board Connector Number | Board to Board Connector Pin Number | Board to Board Connector Signal Name (SOM) | FPGA Bank                         | FPGA Pin No | LS1021A Pin No | Signal Type/ Termination* |  |
| 459   | M19                   | DP14_C2M_N              | Board to Board Connector 4      | A19                                 | GTYTXN2_227                                | 227                               | AL8         | NA             | O, DIFF                   | GTY Bank227 channel2 High speed differential transmitter negative. |
| 460   | M20                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 461   | M21                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 462   | M22                   | DP15_C2M_P              | Board to Board Connector 4      | B12                                 | GTYTXP3_227                                | 227                               | AK7         | NA             | O, DIFF                   | GTY Bank227 channel3 High speed differential transmitter positive. |
| 463   | M23                   | DP15_C2M_N              | Board to Board Connector 4      | B13                                 | GTYTXN3_227                                | 227                               | AK6         | NA             | O, DIFF                   | GTY Bank227 channel3 High speed differential transmitter negative. |
| 464   | M24                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 465   | M25                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 466   | M26                   | NA                      | NA                              | A44                                 | NC   | NA                                | NA          | NA             | NA                        | NA   |
| 467   | M27                   | NA                      | NA                              | A45                                 | NC   | NA                                | NA          | NA             | NA                        | NA   |
| 468   | M28                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 469   | M29                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 470   | M30                   | NA                      | NA                              | B46                                 | NC   | NA                                | NA          | NA             | NA                        | NA   |
| 471   | M31                   | NA                      | NA                              | B47                                 | NC   | NA                                | NA          | NA             | NA                        | NA   |
| 472   | M32                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 473   | M33                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 474   | M34                   | NA                      | NA                              | A52                                 | NC   | NA                                | NA          | NA             | NA                        | NA   |
| 475   | M35                   | NA                      | NA                              | A53                                 | NC   | NA                                | NA          | NA             | NA                        | NA   |
| 476   | M36                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 477   | M37                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 478   | M38                   | NA                      | NA                              | A48                                 | NC   | NA                                | NA          | NA             | NA                        | NA   |
| 479   | M39                   | NA                      | NA                              | A49                                 | NC   | NA                                | NA          | NA             | NA                        | NA   |
| 480   | M40                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 481   | Y1                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 482   | Y2                    | NA                      | NA                              | C6                                  | NC   | NA                                | NA          | NA             | NA                        | NA   |
| 483   | Y3                    | NA                      | NA                              | C7                                  | NC   | NA                                | NA          | NA             | NA                        | NA   |
| 484   | Y4                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 485   | Y5                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 486   | Y6                    | NA                      | NA                              | D4                                  | NC   | NA                                | NA          | NA             | NA                        | NA   |
| 487   | Y7                    | NA                      | NA                              | D5                                  | NC   | NA                                | NA          | NA             | NA                        | NA   |
| 488   | Y8                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 489   | Y9                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 490   | Y10                   | DP10_M2C_P              | Board to Board Connector 3      | C45                                 | GTYRXP2_232                                | 232                               | G4          | NA             | I, DIFF                   | GTY Bank232 channel2 High speed differential receiver positive.    |
| 491   | Y11                   | DP10_M2C_N              | Board to Board Connector 3      | C44                                 | GTYRXN2_232                                | 232                               | G3          | NA             | I, DIFF                   | GTY Bank232 channel2 High speed differential receiver Negative.    |
| 492   | Y12                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |

## Kintex UltraScale+ FPGA SOM DevKit Datasheet

| Sl.no | FMC+ Connector VITA   |                         | Board to Board Connectors       |                                     |  | Kintex UltraScale+ FPGA(FFVB2104) |             |                |                           | Description  |
|-------|-----------------------|-------------------------|---------------------------------|-------------------------------------|--|-----------------------------------|-------------|----------------|---------------------------|--|
|       | FMC+ Connector Pin No | FMC+ Connector Pin Name | Board to Board Connector Number | Board to Board Connector Pin Number | Board to Board Connector Signal Name (SOM) | FPGA Bank                         | FPGA Pin No | LS1021A Pin No | Signal Type/ Termination* |  |
| 493   | Y13                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 494   | Y14                   | DP12_M2C_P              | Board to Board Connector 4      | B17                                 | GTYRXP0_227                                | 227                               | AN4         | NA             | I, DIFF                   | GTY Bank227 channel0 High speed differential receiver positive.    |
| 495   | Y15                   | DP12_M2C_N              | Board to Board Connector 4      | B16                                 | GTYRXN0_227                                | 227                               | AN3         | NA             | I, DIFF                   | GTY Bank227 channel0 High speed differential receiver negative.    |
| 496   | Y16                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 497   | Y17                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 498   | Y18                   | DP14_M2C_P              | Board to Board Connector 4      | B9                                  | GTYRXP2_227                                | 227                               | AL4         | NA             | I, DIFF                   | GTY Bank227 channel2 High speed differential receiver positive.    |
| 499   | Y19                   | DP14_M2C_N              | Board to Board Connector 4      | B8                                  | GTYRXN2_227                                | 227                               | AL3         | NA             | I, DIFF                   | GTY Bank227 channel2 High speed differential receiver negative.    |
| 500   | Y20                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 501   | Y21                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 502   | Y22                   | DP15_M2C_P              | Board to Board Connector 4      | B5                                  | GTYRXP3_227                                | 227                               | AK2         | NA             | I, DIFF                   | GTY Bank227 channel3 High speed differential receiver positive.    |
| 503   | Y23                   | DP15_M2C_N              | Board to Board Connector 4      | B4                                  | GTYRXN3_227                                | 227                               | AK1         | NA             | I, DIFF                   | GTY Bank227 channel3 High speed differential receiver negative.    |
| 504   | Y24                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 505   | Y25                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 506   | Y26                   | DP11_C2M_P              | Board to Board Connector 3      | D58                                 | GTYTXP3_232                                | 232                               | F7          | NA             | O, DIFF                   | GTY Bank232 channel3 High speed differential Transmitter positive. |
| 507   | Y27                   | DP11_C2M_N              | Board to Board Connector 3      | D59                                 | GTYTXN3_232                                | 232                               | F6          | NA             | O, DIFF                   | GTY Bank232 channel3 High speed differential Transmitter Negative. |
| 508   | Y28                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 509   | Y29                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 510   | Y30                   | DP13_C2M_P              | Board to Board Connector 4      | A14                                 | GTYTXP1_227                                | 227                               | AM7         | NA             | O, DIFF                   | GTY Bank227 channel1 High speed differential transmitter positive. |
| 511   | Y31                   | DP13_C2M_N              | Board to Board Connector 4      | A15                                 | GTYTXN1_227                                | 227                               | AM6         | NA             | O, DIFF                   | GTY Bank227 channel1 High speed differential transmitter negative. |
| 512   | Y32                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 513   | Y33                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 514   | Y34                   | DP17_M2C_P              | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NA   |
| 515   | Y35                   | DP17_M2C_N              | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NA   |
| 516   | Y36                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 517   | Y37                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |
| 518   | Y38                   | DP19_M2C_P              | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NA   |
| 519   | Y39                   | DP19_M2C_N              | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                        | NA   |
| 520   | Y40                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                     | Ground.  |

## Kintex UltraScale+ FPGA SOM DevKit Datasheet

| Sl.no | FMC+ Connector VITA   |                         | Board to Board Connectors       |                                     |  | Kintex UltraScale+ FPGA(FFVB2104) |             |                |                          | Description   |
|-------|-----------------------|-------------------------|---------------------------------|-------------------------------------|--|-----------------------------------|-------------|----------------|--------------------------|---|
|       | FMC+ Connector Pin No | FMC+ Connector Pin Name | Board to Board Connector Number | Board to Board Connector Pin Number | Board to Board Connector Signal Name (SOM) | FPGA Bank                         | FPGA Pin No | LS1021A Pin No | Signal Type/Termination* |   |
| 521   | Z1                    | HSPC_PRSENT_M2C_L       | NA                              | NA                                  | NA   | NA                                | NA          | NA             | I,3.3V/10K PU            | FMC+ Module Present Signal.<br>This Pin is connected to 6th pin of IO Expander (U10). |
| 522   | Z2                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.   |
| 523   | Z3                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.   |
| 524   | Z4                    | DP22_C2M_P              | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NA  |
| 525   | Z5                    | DP22_C2M_N              | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NA  |
| 526   | Z6                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.   |
| 527   | Z7                    | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.   |
| 528   | Z8                    | DP20_C2M_P              | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NA  |
| 529   | Z9                    | DP20_C2M_N              | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NA  |
| 530   | Z10                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.   |
| 531   | Z11                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.   |
| 532   | Z12                   | DP11_M2C_P              | Board to Board Connector 3      | D47                                 | GTYRXP3_232                                | 232                               | F2          | NA             | I, DIFF                  | GTY Bank232 channel3 High speed differential receiver positive.                       |
| 533   | Z13                   | DP11_M2C_N              | Board to Board Connector 3      | D46                                 | GTYRXN3_232                                | 232                               | F1          | NA             | I, DIFF                  | GTY Bank232 channel3 High speed differential receiver Negative.                       |
| 534   | Z14                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.   |
| 535   | Z15                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.   |
| 536   | Z16                   | DP13_M2C_P              | Board to Board Connector 4      | A3                                  | GTYRXP1_227                                | 227                               | AM2         | NA             | I, DIFF                  | GTY Bank227 channel1 High speed differential receiver positive.                       |
| 537   | Z17                   | DP13_M2C_N              | Board to Board Connector 4      | A2                                  | GTYRXN1_227                                | 227                               | AM1         | NA             | I, DIFF                  | GTY Bank227 channel1 High speed differential receiver negative.                       |
| 538   | Z18                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.   |
| 539   | Z19                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.   |
| 540   | Z20                   | GBTCLK5_M2C_P           | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NA  |
| 541   | Z21                   | GBTCLK5_M2C_N           | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NA  |
| 542   | Z22                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.   |
| 543   | Z23                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.   |
| 544   | Z24                   | DP10_C2M_P              | Board to Board Connector 3      | D54                                 | GTYTXP2_232                                | 232                               | G9          | NA             | O, DIFF                  | GTY Bank232 channel2 High speed differential Transmitter positive.                    |
| 545   | Z25                   | DP10_C2M_N              | Board to Board Connector 3      | D55                                 | GTYTXN2_232                                | 232                               | G8          | NA             | O, DIFF                  | GTY Bank232 channel2 High speed differential Transmitter Negative.                    |
| 546   | Z26                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.   |
| 547   | Z27                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.   |
| 548   | Z28                   | DP12_C2M_P              | Board to Board Connector 4      | A10                                 | GTYTXP0_227                                | 227                               | AN9         | NA             | O, DIFF                  | GTY Bank227 channel0 High speed differential transmitter positive.                    |
| 549   | Z29                   | DP12_C2M_N              | Board to Board Connector 4      | A11                                 | GTYTXN0_227                                | 227                               | AN8         | NA             | O, DIFF                  | GTY Bank227 channel0 High speed differential transmitter negative.                    |

## Kintex UltraScale+ FPGA SOM DevKit Datasheet

| Sl.no | FMC+ Connector VITA   |                         | Board to Board Connectors       |                                     |  | Kintex UltraScale+ FPGA(FFVB2104) |             |                |                          | Description                   |
|-------|-----------------------|-------------------------|---------------------------------|-------------------------------------|--|-----------------------------------|-------------|----------------|--------------------------|-------------------------------|
|       | FMC+ Connector Pin No | FMC+ Connector Pin Name | Board to Board Connector Number | Board to Board Connector Pin Number | Board to Board Connector Signal Name (SOM) | FPGA Bank                         | FPGA Pin No | LS1021A Pin No | Signal Type/Termination* |                               |
| 550   | Z30                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                       |
| 551   | Z31                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                       |
| 552   | Z32                   | DP16_M2C_P              | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NA                            |
| 553   | Z33                   | DP16_M2C_N              | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NA                            |
| 554   | Z34                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                       |
| 555   | Z35                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                       |
| 556   | Z36                   | DP18_M2C_P              | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NA                            |
| 557   | Z37                   | DP18_M2C_N              | NA                              | NA                                  | NC   | NA                                | NA          | NA             | NA                       | NA                            |
| 558   | Z38                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                       |
| 559   | Z39                   | GND                     | NA                              | NA                                  | GND  | NA                                | NA          | NA             | Power                    | Ground.                       |
| 560   | Z40                   | 3P3V                    | NA                              | NA                                  | VCC_3V3_FMC+                               | NA                                | NA          | NA             | O, 3.3V Power            | Carrier Board Supply Voltage. |

Note:

\* FMC+ connector supports VADJ 1.8V and 1.2V. By default, VADJ is set to 1.8V. Contact iWave for further details.

\* If VCC\_FMC+\_ADJ voltage changed from default value 1.8 to 1.2V, please make sure that SOM concern IO voltage also to be modified to avoid IO conflict.

\*IO Type of IOs originating from Kintex UltraScale+ FPGA is configurable. Hence for exact IO type configuration options, refer Xilinx Kintex UltraScale+ FPGA datasheet.

## 2.6 Additional Features

### 2.6.1 Clock Synthesizers

The Kintex UltraScale+ FPGA Carrier board supports two 10-output Clock Synthesizer “SI5341B-D-GM” for on board clock distribution. This Clock Generator outputs are connected to FPGA-GTY, SerDes Reference clock on Board-to-Board Connectors through 0.01uF AC coupling capacitors. An external 48MHz crystal is connected to this Clock Synthesizer for reference. This Clock Synthesizer supports from 100 Hz to 1028 MHz clock output and configurable through I2C0.

**Table 11: Clock Synthesizer 1 Output Clocks**

| Pin No | Pin Name | Signal Name       | Programmed Frequency | Connected To                             |
|--------|----------|-------------------|----------------------|--|
| 23     | OUT0     | NC                | -                    | NA                                       |
| 24     | OUT0b    | NC                |                      | NA                                       |
| 27     | OUT1     | NC                | -                    | NA                                       |
| 28     | OUT1b    | NC                |                      | NA                                       |
| 30     | OUT2     | HS_TXVR2_RX_CH5p  | -                    | B2B-1 171 <sup>st</sup> pin.             |
| 31     | OUT2b    | HS_TXVR2_RX_CH5n  |                      | B2B-1 169 <sup>th</sup> pin.             |
| 34     | OUT3     | NC                | -                    | NA                                       |
| 35     | OUT3b    | NC                |                      | NA                                       |
| 37     | OUT4     | PClex4_REFCLKP    | 100MHz               | PCIe x4 connector A13 <sup>th</sup> pin. |
| 38     | OUT4b    | PClex4_REFCLKN    |                      | PCIe x4 connector A14 <sup>th</sup> pin. |
| 41     | OUT5     | LS_SD1_REF_CLK2_P | 100MHz               | B2B-1 77 <sup>th</sup> pin.              |
| 42     | OUT5b    | LS_SD1_REF_CLK2_N |                      | B2B-1 75 <sup>th</sup> pin.              |
| 44     | OUT6     | GTREFCLK1P_225    | 156.25MHz            | B2B-1 64 <sup>th</sup> pin.              |
| 45     | OUT6b    | GTREFCLK1N_225    |                      | B2B-1 66 <sup>th</sup> pin.              |
| 50     | OUT7     | GTREFCLK1P_226    | 156.25MHz            | B2B-1 158 <sup>th</sup> pin.             |
| 51     | OUT7b    | GTREFCLK1N_226    |                      | B2B-1 160 <sup>th</sup> pin.             |
| 53     | OUT8     | NC                | -                    | NA                                       |
| 54     | OUT8b    | NC                |                      | NA                                       |
| 58     | OUT9     | NC                | -                    | NA                                       |
| 59     | OUT9b    | NC                |                      | NA                                       |



**Table 12: Clock Synthesizer 2 Output Clocks**

| Pin No | Pin Name | Signal Name        | Programmed Frequency | Connected To                 |
|--------|----------|--------------------|----------------------|------------------------------|
| 23     | OUT0     | GTREFCLK1P_232     | 156.25MHz            | B2B-3 A2 <sup>nd</sup> pin.  |
| 24     | OUT0b    | GTREFCLK1N_232     |                      | B2B-3 A1 <sup>st</sup> pin.  |
| 27     | OUT1     | GTREFCLK1P_230     | 156.25MHz            | B2B-3 A21 <sup>st</sup> pin. |
| 28     | OUT1b    | GTREFCLK1N_230     |                      | B2B-3 A20 <sup>th</sup> pin. |
| 30     | OUT2     | GTREFCLK1P_231     | 156.25MHz            | B2B-3 C17 <sup>th</sup> pin. |
| 31     | OUT2b    | GTREFCLK1N_231     |                      | B2B-3 C16 <sup>th</sup> pin. |
| 34     | OUT3     | GTREFCLK1P_227     | 156.25MHz            | B2B-4 B2 <sup>nd</sup> pin.  |
| 35     | OUT3b    | GTREFCLK1N_227     |                      | B2B-4 B1 <sup>st</sup> pin.  |
| 37     | OUT4     | GTREFCLK0P_230     | 100MHz               | B2B-3 B19 <sup>th</sup> pin. |
| 38     | OUT4b    | GTREFCLK0N_230     |                      | B2B-3 B18 <sup>th</sup> pin. |
| 41     | OUT5     | NC                 | -                    | NA                           |
| 42     | OUT5b    | NC                 |                      | NA                           |
| 44     | OUT6     | GTREFCLK1P_228     | 156.25MHz            | B2B-3 D39 <sup>th</sup> pin. |
| 45     | OUT6b    | GTREFCLK1N_228     |                      | B2B-3 D38 <sup>th</sup> pin. |
| 50     | OUT7     | GTREFCLK1P_229     | 156.25MHz            | B2B-3 B34 <sup>th</sup> pin. |
| 51     | OUT7b    | GTREFCLK1N_229     |                      | B2B-3 B35 <sup>th</sup> pin. |
| 53     | OUT8     | NC                 | -                    | NA                           |
| 54     | OUT8b    | NC                 |                      | NA                           |
| 58     | OUT9     | B2B_GTREFCLK0P_228 | 100MHz               | B2B-3 D2 <sup>nd</sup> pin.  |
| 59     | OUT9b    | B2B_GTREFCLK0N_228 |                      | B2B-3 D3 <sup>rd</sup> pin.  |

# Kintex UltraScale+ FPGA SOM DevKit Datasheet



## iW-RainboW-G47D-KintexUltraScale+FPGA SOM DevKit Clock Tree



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iWave Systems Technologies Pvt. Ltd.



Figure 21: Clock Tree

## 2.6.2 JTAG Connector

A Standard Xilinx 14-pin JTAG Header is available in Kintex UltraScale+ FPGA Carrier board for debug purpose. Kintex UltraScale+ SOM share a common pinout for both FPGA and CPU JTAG signals on board-to-board connector. The JTAG signals are muxed to board-to-board connector using mux/demux switch in SOM. The logic level on JTAG\_SEL signal of 224<sup>th</sup> pin on board-to-board connector2 selects the JTAG chain on JTAG Header (J8) and same JTAG signals are also connected to FMC+ & FMC connector. JTAG-HS2/ JTAG-HS3 programming cable can be plugged to this JTAG Header for programming and debugging purpose of FPGA and for LS1021A CodeWarrior TAP is connected.

Kintex UltraScale+ Carrier board supports JTAG selection using Bit2 of SW6. Refer the below table for JTAG selection details.

**Table 13: JTAG Selection switch**

| JTAG Device | SW6 (4 Position Switch) |   |
|-------------|-------------------------|---|
|             | SW6.2                   | Switch Position Image   |
| FPGA        | OFF                     |   |
| LS1021A     | ON                      |  |

This JTAG Header (J8) is physically located at the top of the board as shown below.

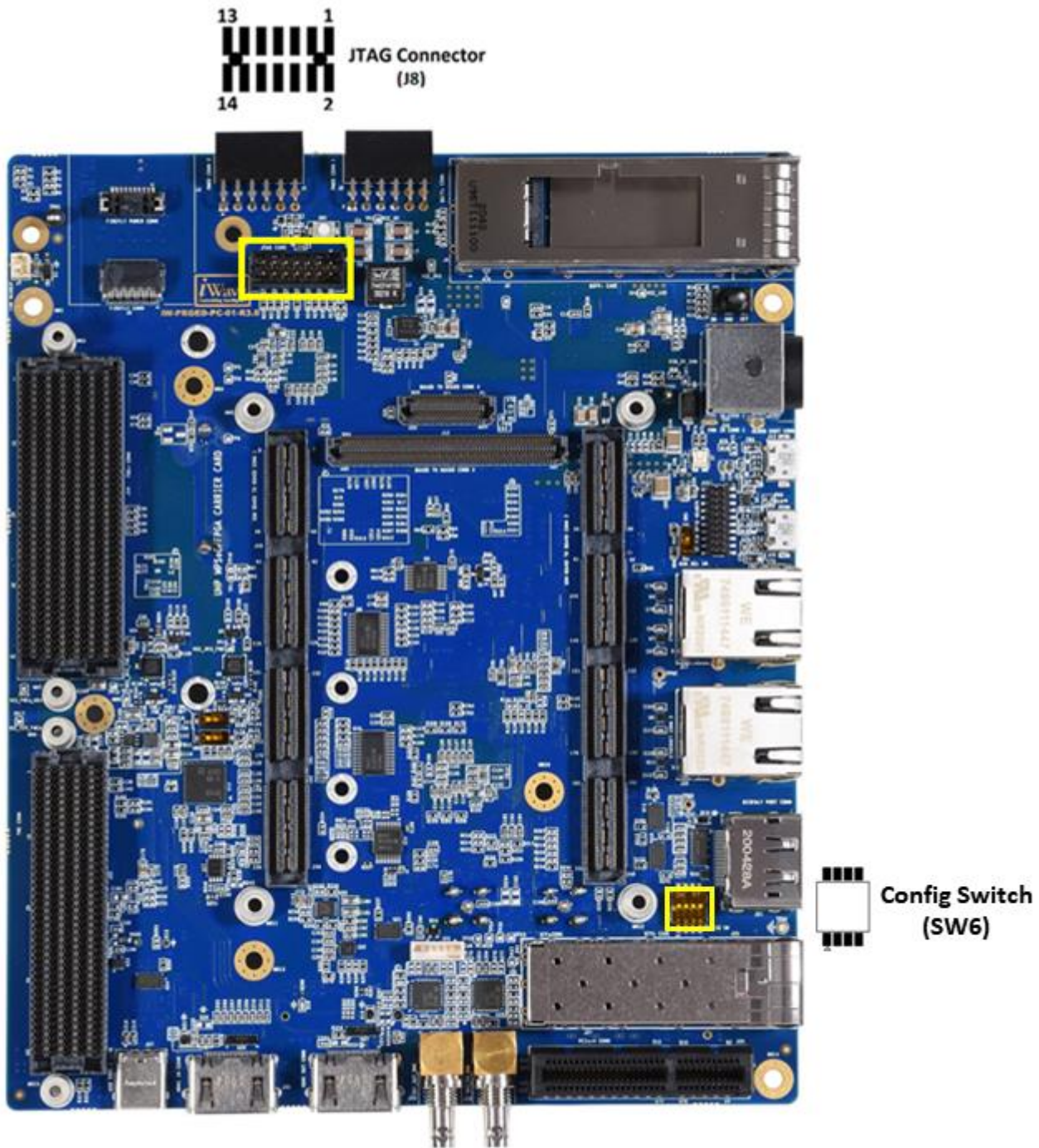


Figure 22: JTAG Connector

**Table 14: JTAG Header Pin Assignment**

| Pin No | Signal Name | Signal Type/<br>Termination | Description            |
|--------|-------------|-----------------------------|------------------------|
| 1      | NC          | -                           | Not Connected          |
| 2      | VCC_3V3     | O, 3.3V Power               | 3V3 Supply Voltage.    |
| 3      | GND         | Power                       | Ground                 |
| 4      | JTAG_TMS    | I, 3V3 LVCMOS               | JTAG test mode select. |
| 5      | GND         | Power                       | Ground                 |
| 6      | JTAG_TCK    | I, 3V3 LVCMOS/ 3K PU        | JTAG test Clock        |
| 7      | GND         | Power                       | Ground                 |
| 8      | JTAG_TDO    | O,3V3 LVCMOS                | JTAG test data output. |
| 9      | GND         | Power                       | Ground                 |
| 10     | JTAG_TDI    | I, 3V3 LVCMOS               | JTAG test data input   |
| 11     | GND         | Power                       | Ground                 |
| 12     | NC          | -                           | Not Connected          |
| 13     | GND         | Power                       | Ground                 |
| 14     | JTAG_TRSTB  | I, 3V3 LVCMOS/ 1K PU        | Not Connected          |



## 2.6.3 Pmod Host Port Connectors

Pmod interface or Peripheral Module interface is a standard defined by Digilent Inc. The Pmod interface is used to connect low frequency, low I/O pin count peripheral modules to host controller boards. There are twelve-pin of the interface defined, encompassing I<sup>2</sup>C1, LPUART and GPIO protocols.

The Kintex UltraScale+ FPGA Carrier board supports two 12pin Pmod host port connector for plugging Pmod modules. Since Pmod interface specification requires 3.3V IO level, the signals from Board-to-Board connector are connected to Pmod Connectors through Voltage level translator. Pmod Host port connector1 (J2) and Connector2 (J1) are physically located at the top of the board as shown below.

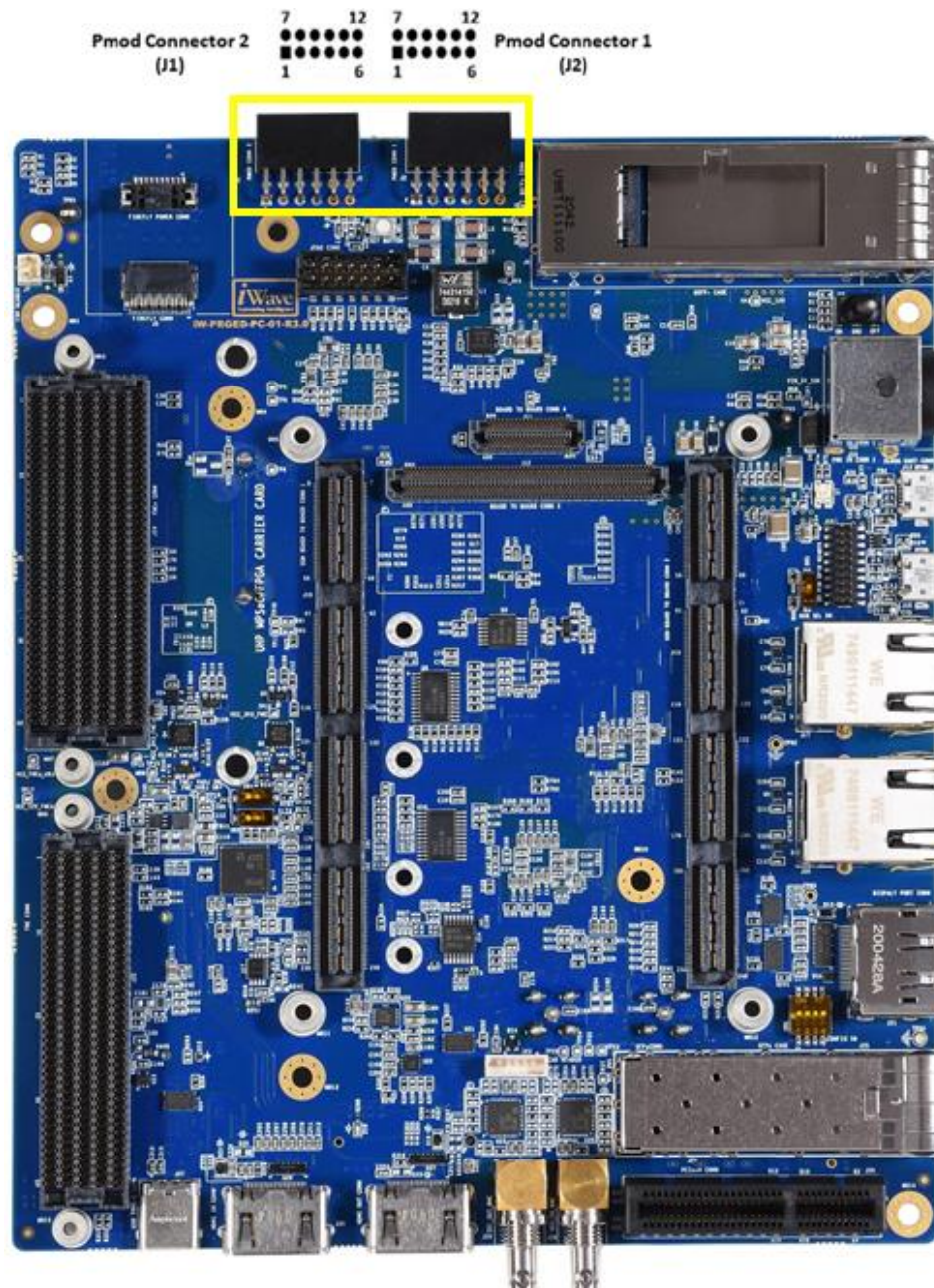


Figure 23: Pmod Host Port Connectors

**Table 15: Pmod Connector1 Pin Assignment**

| Pin No | Signal Name         | Signal Type/<br>Termination | Description                   |
|--------|---------------------|-----------------------------|-------------------------------|
| 1      | PL_AY11_LVDS67_L8N  | IO, 3V3 LVCMOS              | General purpose Input Output. |
| 2      | LS_LPUART5_SIN      | IO, 3V3 LVCMOS              | General purpose Input Output. |
| 3      | LS_IIC2_SDA         | IO, 3V3 LVCMOS              | General purpose Input Output. |
| 4      | PL_AV16_LVDS67_L18N | IO, 3V3 LVCMOS              | General purpose Input Output. |
| 5      | GND                 | Power                       | Ground.                       |
| 6      | VCC_3V3             | O, 3.3V Power               | 3V3 Supply Voltage.           |
| 7      | PL_AY12_LVDS67_L8P  | IO, 3V3 LVCMOS              | General purpose Input Output. |
| 8      | LS_LPUART5_SOUT     | IO, 3V3 LVCMOS              | General purpose Input Output. |
| 9      | LS_IIC2_SCL         | IO, 3V3 LVCMOS              | General purpose Input Output. |
| 10     | PL_AU16_LVDS67_L18P | IO, 3V3 LVCMOS              | General purpose Input Output. |
| 11     | GND                 | Power                       | Ground.                       |
| 12     | VCC_3V3             | O, 3.3V Power               | 3V3 Supply Voltage.           |

**Table 16: Pmod Connector2 Pin Assignment**

| Pin No | Signal Name             | Signal Type/<br>Termination | Description                   |
|--------|-------------------------|-----------------------------|-------------------------------|
| 1      | PL_AR15_LVDS67_L19N_DBC | IO, 3V3 LVCMOS              | General purpose Input Output. |
| 2      | PL_BC13_LVDS67_L6N      | IO, 3V3 LVCMOS              | General purpose Input Output. |
| 3      | PL_BF13_LVDS67_L1N      | IO, 3V3 LVCMOS              | General purpose Input Output. |
| 4      | PL_AR13_LVDS67_L22N_DBC | IO, 3V3 LVCMOS              | General purpose Input Output. |
| 5      | GND                     | Power                       | Ground.                       |
| 6      | VCC_3V3                 | O, 3.3V Power               | 3V3 Supply Voltage.           |
| 7      | PL_BC14_LVDS67_L6P      | IO, 3V3 LVCMOS              | General purpose Input Output. |
| 8      | PL_AR16_LVDS67_L19P_DBC | IO, 3V3 LVCMOS              | General purpose Input Output. |
| 9      | PL_BF14_LVDS67_L1P      | IO, 3V3 LVCMOS              | General purpose Input Output. |
| 10     | PL_AP13_LVDS67_L22P_DBC | IO, 3V3 LVCMOS              | General purpose Input Output. |
| 11     | GND                     | Power                       | Ground.                       |
| 12     | VCC_3V3                 | O, 3.3V Power               | 3V3 Supply Voltage.           |

## 2.6.4 IO Expanders

The Kintex UltraScale+ FPGA Carrier board supports three GPIO 16-Bit port Expander. Refer below table for IO Expander pin mapping.

**Table 17: IO EXPANDER 1 Output**

| Pin No  | Pin Name | Signal Name        | Signal Type / Termination | Description                          |
|---|----------|--------------------|---------------------------|--------------------------------------|
| IO EXPANDER 1 (TCA6416APWR) - I2C address: 0x20 |          |                    |                           |                                      |
| 4   | P00      | NC                 | NA                        | NA                                   |
| 5   | P01      | NC                 | NA                        | NA                                   |
| 6   | P02      | NC                 | NA                        | NA                                   |
| 7   | P03      | NC                 | NA                        | NA                                   |
| 8   | P04      | NC                 | NA                        | NA                                   |
| 9   | P05      | NC                 | NA                        | NA                                   |
| 10  | P06      | NC                 | NA                        | NA                                   |
| 11  | P07      | NC                 | NA                        | NA                                   |
| 13  | P10      | IOEXP_P11_MUX_SEL1 | O, 3.3V CMOS              | Connected to MUX Selection Switch    |
| 14  | P11      | NC                 | NA                        | NA                                   |
| 15  | P12      | IOEXP_P13_MUX_SEL3 | O, 3.3V CMOS              | Connected to MUX Selection Switch    |
| 16  | P13      | NC                 | NA                        | NA                                   |
| 17  | P14      | B_IO_EXP_INT2      | I, 3.3V CMOS/4.7K PU      | Connected to IO EXPANDER 2           |
| 18  | P15      | B_IO_EXP_INT3      | I, 3.3V CMOS/4.7K PU      | Connected to IO EXPANDER 3           |
| 19  | P16      | IOEXP_FMC_LA16P    | IO, 1.8V CMOS             | Connected to FMC connector G18th pin |
| 20  | P17      | NC                 | NA                        | NA                                   |

**Table 18: IO EXPANDER 2 Output**

| Pin No   | Pin Name | Signal Name         | Signal Type / Termination | Description                          |
|--|----------|---------------------|---------------------------|--------------------------------------|
| IO EXPANDER 2 (TCA6416APWR)- I2C address: 0x21 |          |                     |                           |                                      |
| 4  | P00      | IOEXP_P00_Q_MODESEL | O, 3.3V CMOS/4.7K PD      | Connected to QSFP28 Connector        |
| 5  | P01      | IOEXP_P01_Q_RESETL  | O, 3.3V CMOS/4.7K PU      | Connected to QSFP28 Connector        |
| 6  | P02      | IOEXP_P02_Q_LPMODE  | O, 3.3V CMOS/4.7K PD      | Connected to QSFP28 Connector        |
| 7  | P03      | IOEXP_P03_Q_INTL    | I, 3.3V CMOS/4.7K PU      | Connected to QSFP28 Connector        |
| 8  | P04      | IOEXP_P04_Q_MODPRSL | I, 3.3V CMOS/4.7K PU      | Connected to QSFP28 Connector        |
| 9  | P05      | IOEXP_P05_F_RESETL  | O, 3.3V CMOS/4.7K PU      | Connected to FireFly Power Connector |
| 10   | P06      | IOEXP_P06_F_MODESEL | O, 3.3V CMOS/4.7K PU      | Connected to FireFly Power Connector |
| 11   | P07      | IOEXP_P07_F_INTL    | O, 3.3V CMOS/4.7K PU      | Connected to FireFly Power Connector |
| 13   | P10      | IOEXP_P10_F_MODPRS  | I, 3.3V CMOS/4.7K PU      | Connected to FireFly Power Connector |
| 14   | P11      | NC                  | NA                        | NA                                   |
| 15   | P12      | NC                  | NA                        | NA                                   |
| 16   | P13      | NC                  | NA                        | NA                                   |
| 17   | P14      | NC                  | NA                        | NA                                   |
| 18   | P15      | NC                  | NA                        | NA                                   |
| 19   | P16      | NC                  | NA                        | NA                                   |
| 20   | P17      | NC                  | NA                        | NA                                   |

**Table 19: IO EXPANDER 3 Output**

| Pin No  | Pin Name | Signal Name         | Signal Type / Termination | Description                 |
|---|----------|---------------------|---------------------------|-----------------------------|
| IO EXPANDER 3 (TCA9535PWR)- I2C address: 0x23 |          |                     |                           |                             |
| 4   | P00      | B_FMC_PR_M2C_L      | I, 3.3V CMOS/10K PU       | Connected to FMC connector  |
| 5   | P01      | B_FMC+_PR_M2C_L     | I, 3.3V CMOS/10K PU       | Connected to FMC+ connector |
| 6   | P02      | B_HSPC_PR_SNT_M2C_L | I, 3.3V CMOS/10K PU       | Connected to FMC+ connector |
| 7   | P03      | EN_VCC_12V_FMC      | O, 3.3V CMOS/10K PD       | Connected to FMC Power      |
| 8   | P04      | EN_VCC_3V3_FMC      | O, 3.3V CMOS/1K PD        | Connected to FMC Power      |
| 9   | P05      | EN_VCC_FMC_ADJ      | O, 3.3V CMOS/10K PD       | Connected to FMC Power      |
| 10  | P06      | EN_VCC_FMC+_ADJ     | O, 3.3V CMOS/10K PD       | Connected to FMC+ Power     |
| 11  | P07      | NC                  | NA                        | NA                          |
| 13  | P10      | EN_VCC_12V_FMC+     | O, 3.3V CMOS/10K PD       | Connected to FMC+ Power     |
| 14  | P11      | EN_VCC_3V3_FMC+     | O, 3.3V CMOS/1K PD        | Connected to FMC+ Power     |
| 15  | P12      | B_FMC_CLK_DIR       | I, 3.3V CMOS              | Connected to FMC connector  |
| 16  | P13      | B_FMC+_CLK_DIR      | I, 3.3V CMOS              | Connected to FMC+ connector |
| 17  | P14      | B_FMC_PG_C2M        | O, 3.3V CMOS/10K PD       | Connected to FMC control    |
| 18  | P15      | B_FMC+_PG_C2M       | O, 3.3V CMOS/10K PD       | Connected to FMC+ connector |
| 19  | P16      | NC                  | NA                        | NA                          |
| 20  | P17      | NC                  | NA                        | NA                          |



## 2.6.5 I2C Tree

The Kintex UltraScale+ FPGA Carrier board supports one 4 channel I2C Bus Switch (PI4MSD5V9546ALEX). I2C tree shown below.

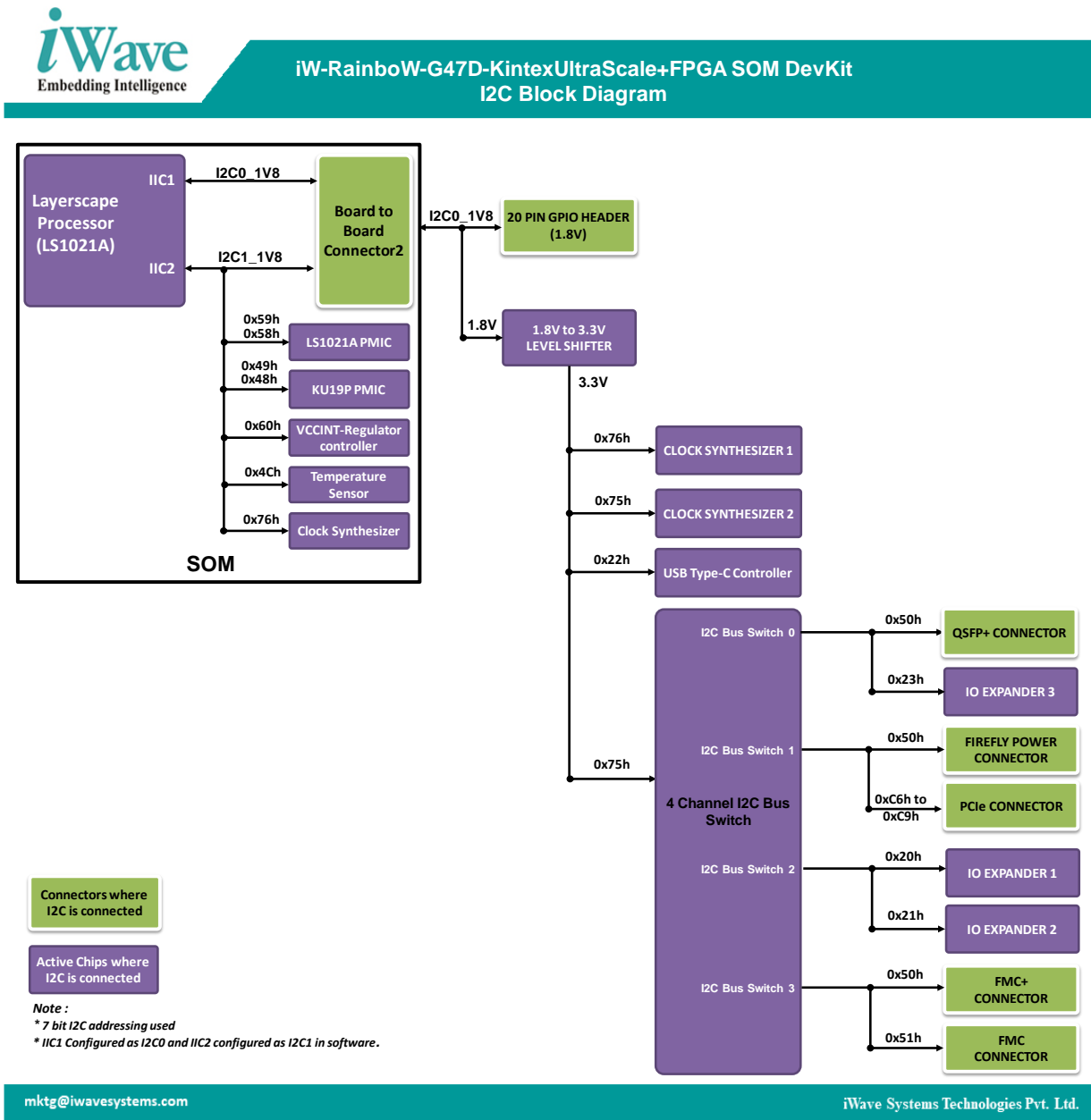


Figure 24: I2C Tree

## 2.6.6 GPIO Header

The Kintex UltraScale+ FPGA Carrier board supports GPIO Header (J15) for General Purpose. This Header signals are directly connected from Board to Board 1 & 2 connectors. This header supports I2C0, LPUART1 and FPGA GPIOs. This GPIO Header (J15) is physically located at the top of the board as shown below.

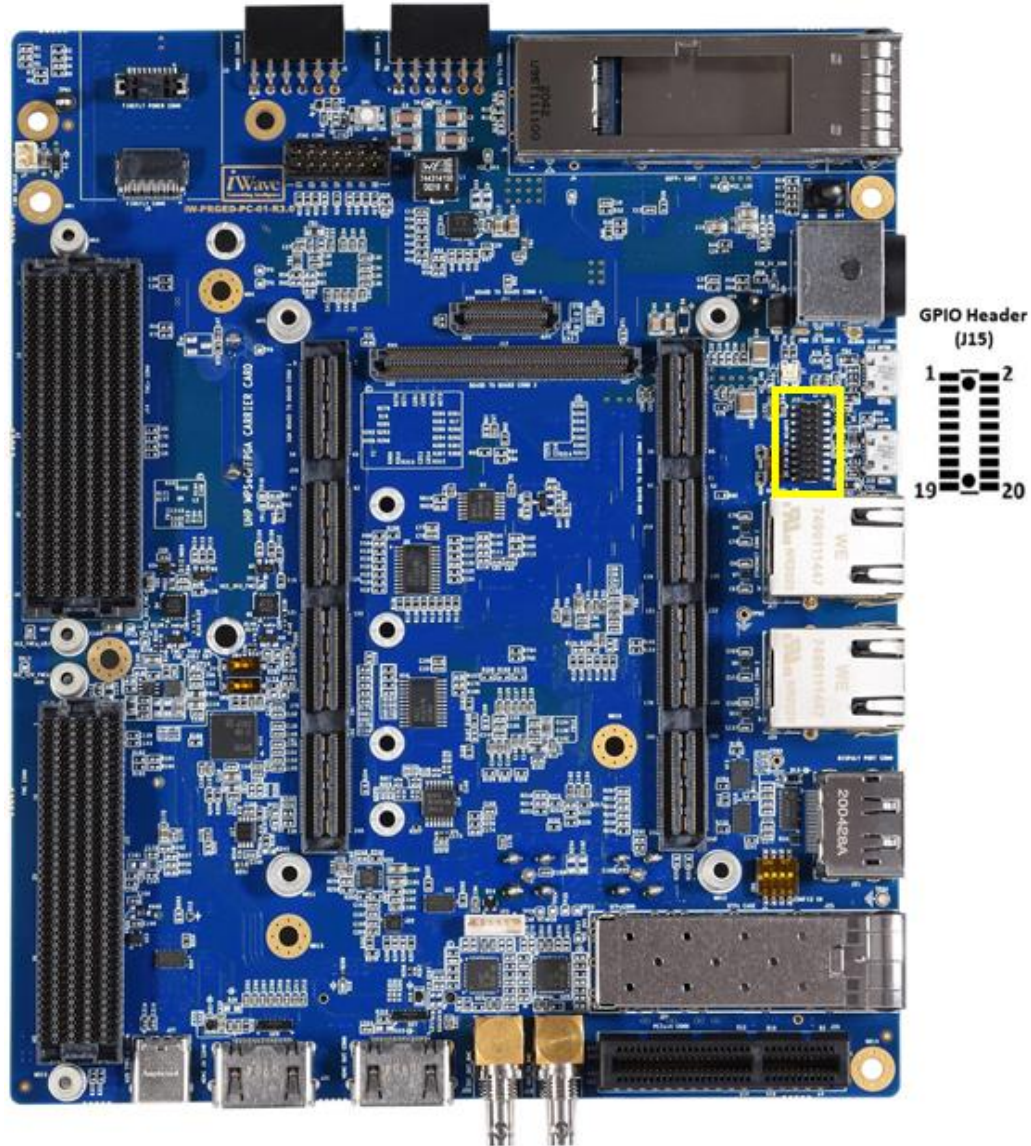


Figure 25: GPIO Header

Table 20: GPIO Header Pin Assignment

| Pin No | Signal Name        | Signal Type/ Termination | Description   |
|--------|--------------------|--------------------------|---|
| 1      | VCC_1V8            | O, 1.8V Power            | 1V8 Supply Voltage.   |
| 2      | VCC_5V             | O, 5V Power              | 5V Supply Voltage.  |
| 3      | PL_BB9_LVDS88_L11P | IO, 1.8V LVCMOS          | PL Bank88 IO11 Differential positive. Same pin can be used as Single ended I/O.<br>This Pin is connected to 211th pin of Board-to-Board Connector1 (J18). |

## Kintex UltraScale+ FPGA SOM DevKit Datasheet

| Pin No | Signal Name             | Signal Type/<br>Termination | Description  |
|--------|-------------------------|-----------------------------|--|
| 4      | LS_IIC1_SDA             | IO, 1.8V OD                 | I2C1 data.<br>This Pin is connected to 46th pin of Board-to-Board Connector2 (J19).  |
| 5      | PL_BC9_LVDS88_L11N      | IO, 1.8V LVCMOS             | PL Bank88 IO11 Differential Negative. Same pin can be used as Single ended I/O.<br>This Pin is connected to 213th pin of Board-to-Board Connector1 (J18).                    |
| 6      | LS_IIC1_SCL             | O, 1.8V OD                  | I2C1 Clock.<br>This Pin is connected to 48th pin of Board-to-Board Connector2 (J19).   |
| 7      | NC                      | NA                          | NC.  |
| 8      | LS_LPUART3_SOUT         | O, 1.8V LVCMOS              | LPUART3 Transmit data line. Same pin can be configured as General-Purpose Input/Output if required.<br>This Pin is connected to 50th pin of Board-to-Board Connector2 (J19). |
| 9      | PL_BE10_LVDS88_L4N      | IO, 1.8V LVCMOS             | PL Bank88 IO4 Differential Negative. Same pin can be used as Single ended I/O.<br>This Pin is connected to 176th pin of Board-to-Board Connector1 (J18).                     |
| 10     | LS_LPUART3_SIN          | I, 1.8V LVCMOS              | LPUART3 Receive data line. Same pin can be configured as General-Purpose Input/Output if required.<br>This Pin is connected to 52nd pin of Board-to-Board Connector2 (J19).  |
| 11     | GND                     | Power                       | Ground   |
| 12     | GND                     | Power                       | Ground   |
| 13     | GPIO3_15(EC2_TXD3)      | IO, 1.8V                    | General Purpose I/O from LS1021A processor.<br>This Pin is connected to 61st pin of Board-to-Board Connector2 (J19).   |
| 14     | NC                      | NA                          | NC.  |
| 15     | PL_AN28_LVDS65_L20P_D08 | IO, 1.8V                    | PL Bank65 IO20 Differential positive. Same pin can be used as Single ended I/O.<br>This Pin is connected to 63rd pin of Board-to-Board Connector2 (J19).                     |
| 16     | NC                      | NA                          | NC.  |
| 17     | GPIO4_25(SDHC_DAT6)     | IO, 1.8V                    | General Purpose I/O from LS1021A processor.<br>This Pin is connected to 65th pin of Board-to-Board Connector2 (J19).   |
| 18     | PL_AV17_T1U_N12_66      | IO, 1.8V                    | I/O from FPGA.<br>This Pin is connected to 67th pin of Board-to-Board Connector2 (J19).  |
| 19     | GND                     | Power                       | Ground   |
| 20     | GND                     | Power                       | Ground   |



## 2.6.7 Power ON/OFF Switch

The Kintex UltraScale+ FPGA Carrier board has power ON/OFF switch (SW2) to control the Main power Input ON/OFF functionality. This power switch is physically located at the top of the board as shown below.

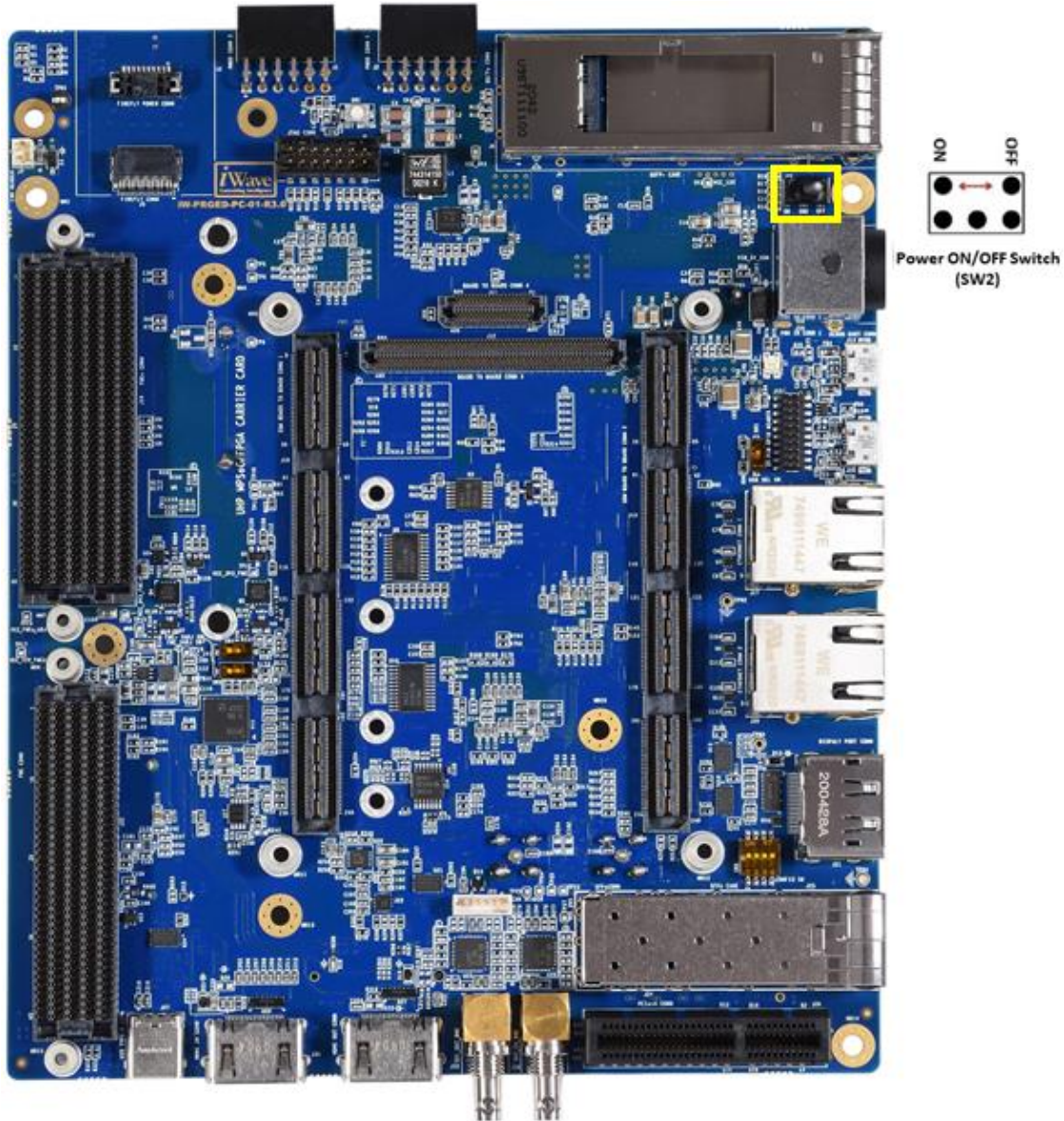


Figure 26: Power On/Off Switch

## 2.6.8 Reset Switch

The Kintex UltraScale+ FPGA Carrier board supports Push button switch (SW1) to reset the Kintex UltraScale+ SOMs CPU. Reset signal of Board-to-Board connector2 Pin 35 is directly connected from Reset Push button switch. This Reset Push button switch (SW1) is physically located at the top of the board as shown below.

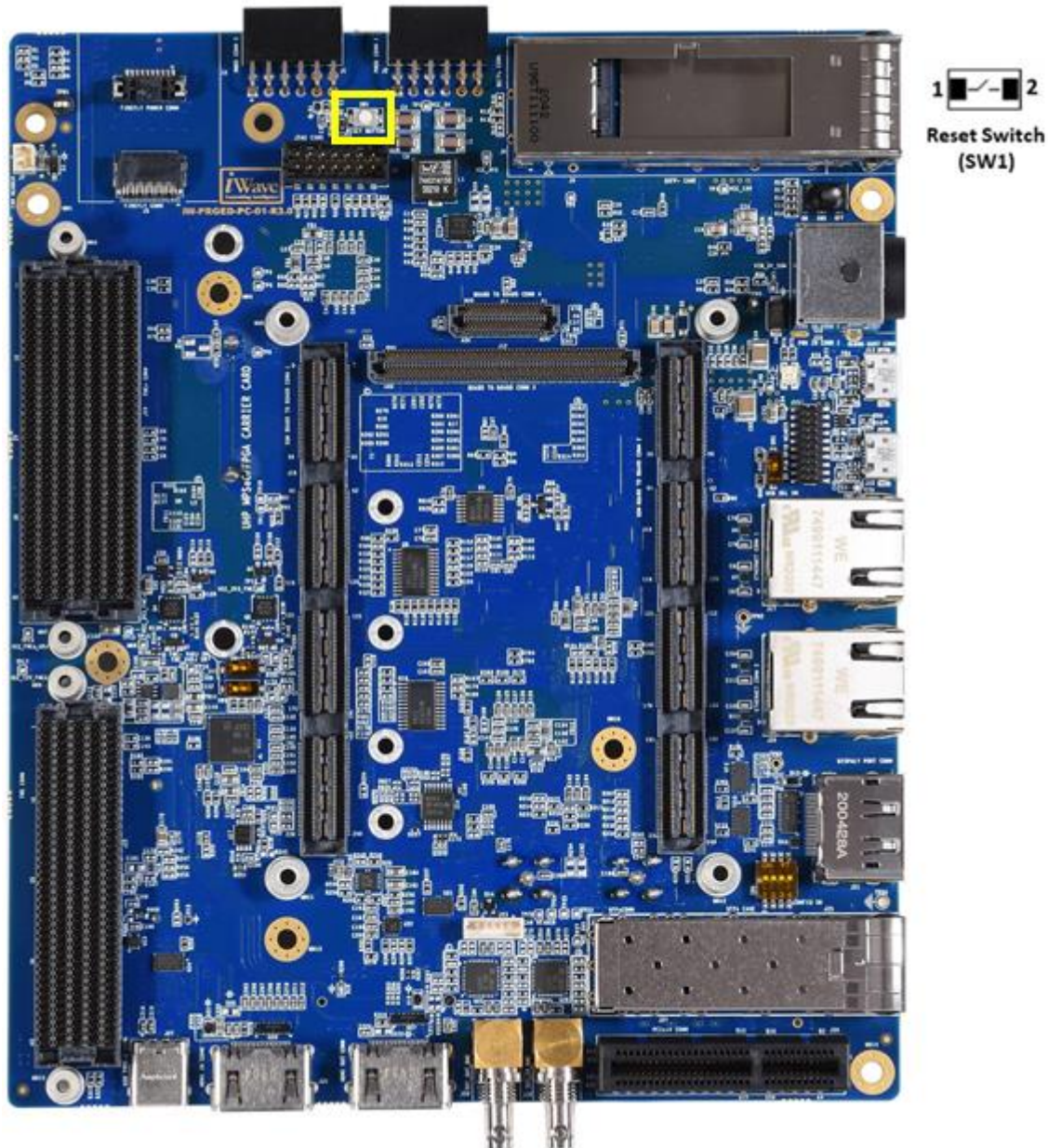


Figure 27: Reset Switch



## 2.6.9 RTC Coin Cell Holder

The Kintex UltraScale+ FPGA Carrier board supports Coin Cell Holder to connect “2032” series 3V coin cell. This coin cell voltage is connected to Kintex UltraScale+ FPGA SOM for RTC back up voltage when VCC main power is off. This Coin Cell Holder (J32) is physically located at the bottom of the board as shown below.

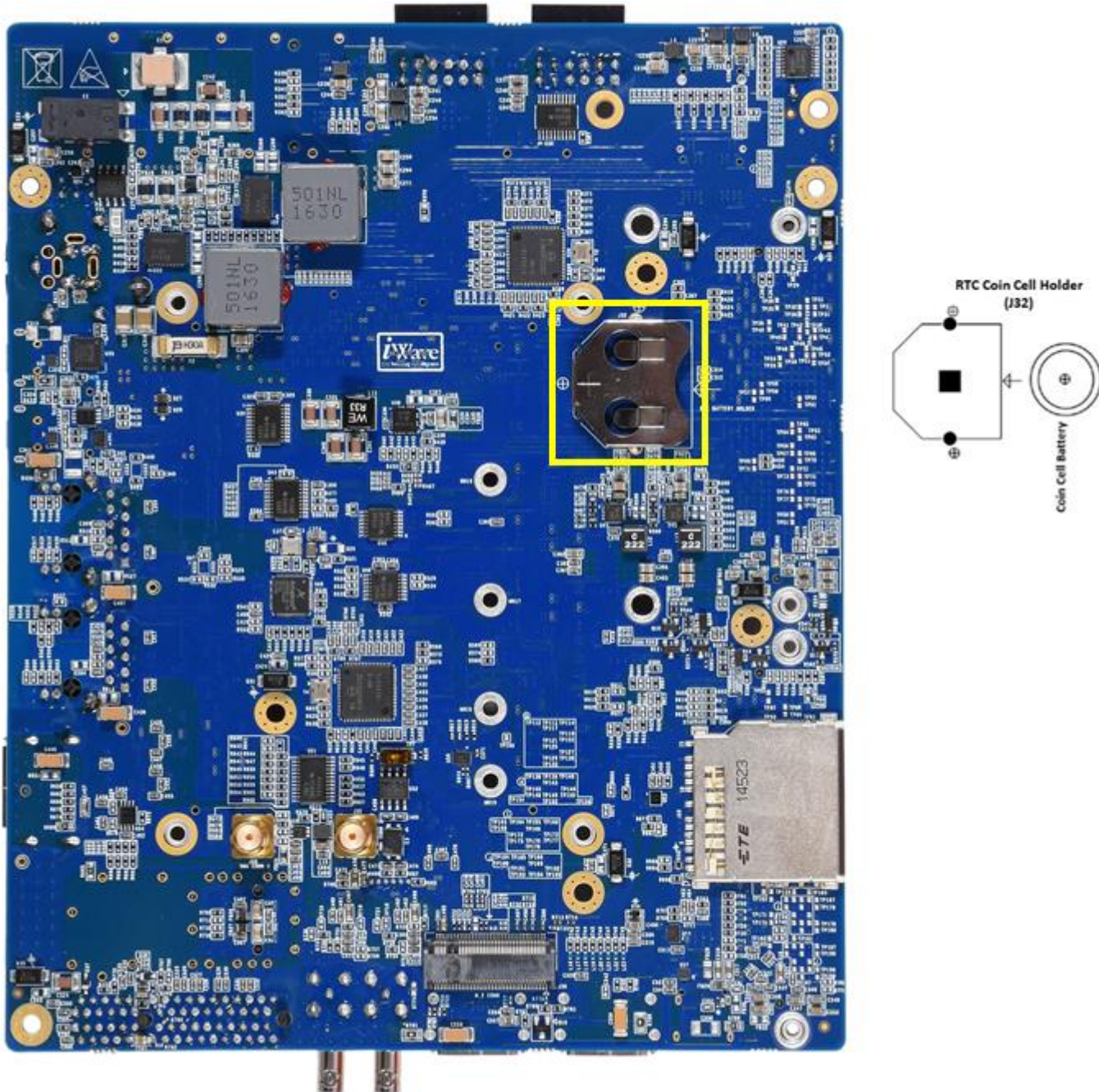


Figure 28: RTC Coin Cell Holder



## 2.6.10 12V Fan Header

The Kintex UltraScale+ FPGA Carrier Board supports a 12V Fan Header (J7) to connect cooling Fan if required. The Fan Header (J7) is physically located on top side of the carrier board as shown below.

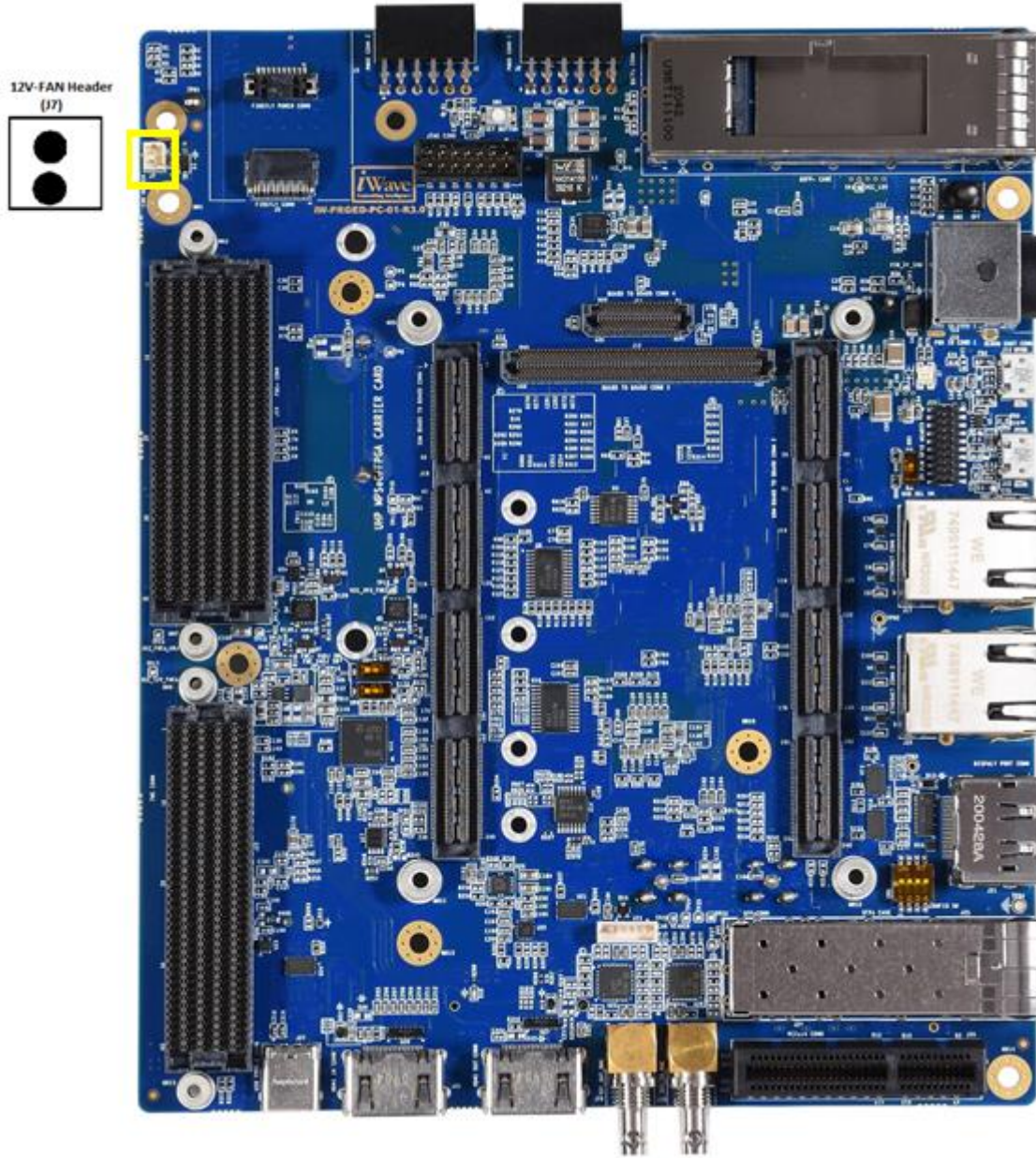


Figure 29: 12V-Fan Header

Table 21: 12V Fan Header Pinout

| Sl. No. | Power Rail           | Signal Type/ Termination | Description     |
|---------|----------------------|--------------------------|-----------------|
| 1       | VCC_12V <sup>1</sup> | O, 12V Power             | Supply Voltage. |
| 2       | GND                  | Power                    | Ground.         |

<sup>1</sup> Do not connect the SOM Heat Sink Fan to 12V FAN Connector in Carrier board. By Default, iW-RainboW-G47D Kintex UltraScale+ FPGA SOM Development platform comes with Heat Sink + Fan mounted on SOM itself.

## 3. TECHNICAL SPECIFICATION

This section provides detailed information about the Kintex UltraScale+ FPGA Carrier Board technical specification with Electrical, Environmental and Mechanical characteristics.

### 3.1 Power Input Requirement

The Kintex UltraScale+ FPGA Carrier Board is designed to work with 12V external power and uses on board voltage regulators for internal power management. 12V power input from an external power supply is connected to the Kintex UltraScale+ FPGA Carrier Board through Power Jack (J10). This connector is physically placed at the top of the board as shown below.

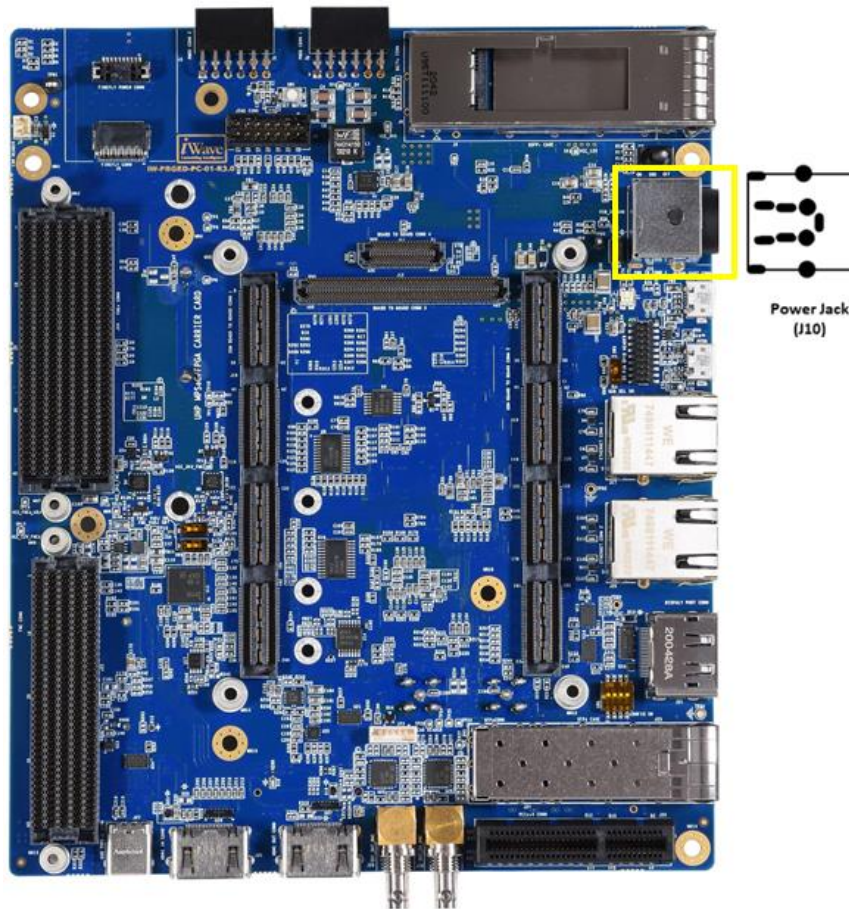


Figure 30: Power Jack

The below table provides the Power Input Requirement Kintex UltraScale+ FPGA Carrier Board.

Table 22: Power Input Requirement

| Sl. No. | Power Rail            | Min (V) | Typical (V) | Max(V) | Max Input Ripple |
|---------|-----------------------|---------|-------------|--------|------------------|
| 1       | VCC_12V               | 11.75V  | 12V         | 12.25V | ±50mV            |
| 2       | VRTC_3V0 <sup>1</sup> | 0       | 3V          | 3.15V  | ±20mV            |

<sup>1</sup> The Kintex UltraScale+ FPGA Devkit uses this voltage as backup power source to On-SOM PMIC RTC controller when VCC is off.

## 3.2 Power Output Specification

The Kintex UltraScale+ FPGA SOM Carrier Board has dedicated power regulator to provide +5V power to SOM for VCC power supply. Also +3V RTC power from coin cell holder is provided for Real time clock support.

The Kintex UltraScale+ FPGA SOM Carrier Board also shares different on-board power to FMC connectors, Pmod connectors and GPIO Header for its Add-On Module power.

**Table 23: Power Output Specification**

| Sl. No.   | Power Rail  | Min (V) | Typical (V) | Max(V) | Max Output Current |
|---|-------------|---------|-------------|--------|--------------------|
| <b>To Board-to-Board Connector2 (for Kintex UltraScale+ FPGA SOM)</b> |             |         |             |        |                    |
| 1   | VCC_5V      | 4.85V   | 5V          | 5.15V  | 40A                |
| 2   | VRTC_3V0    | 0V      | 3V          | 3.15V  | -                  |
| <b>To FMC Connector</b>   |             |         |             |        |                    |
| 1   | VCC_FMC_ADJ | 1.75    | 1.8         | 1.85   | 4A                 |
| 2   | VCC_3V3     | 3.15    | 3.3         | 3.45   | 3A                 |
| 3   | 3P3VAUX     | 3.15    | 3.3         | 3.45   | 100mA              |
| 4   | VCC_12V     | 11.75V  | 12V         | 12.25V | 1A                 |
| <b>To FMC+ Connector</b>  |             |         |             |        |                    |
| 1   | VCC_FMC_ADJ | 1.75    | 1.8         | 1.85   | 4A                 |
| 2   | VCC_3V3     | 3.15    | 3.3         | 3.45   | 3A                 |
| 3   | 3P3VAUX     | 3.15    | 3.3         | 3.45   | 100mA              |
| 4   | VCC_12V     | 11.75V  | 12V         | 12.25V | 1A                 |
| <b>To Pmod Connector1</b>   |             |         |             |        |                    |
| 1   | VCC_3V3     | 3.15    | 3.3         | 3.45   | 500mA              |
| <b>To Pmod Connector2</b>   |             |         |             |        |                    |
| 1   | VCC_3V3     | 3.15    | 3.3         | 3.45   | 500mA              |
| <b>To GPIO Header</b>   |             |         |             |        |                    |
| 1   | VCC_5V      | 4.85V   | 5V          | 5.15V  | 500mA              |
| 2   | VCC_1V8     | 1.75    | 1.8         | 1.85   | 200mA              |

## 3.3 Environmental Characteristics

### 3.3.1 Environmental Specification

The below table provides the Environment specification of Kintex UltraScale+ FPGA SOM Development platform.

**Table 24: Environmental Specification**

| Parameters                               | Min | Max  |
|--|-----|------|
| Operating temperature range <sup>1</sup> | 0°C | 70°C |

<sup>1</sup> iWave only guarantees the component selection for the given operating temperature.

### 3.3.2 RoHS Compliance

iWave's Kintex UltraScale+ FPGA SOM Development platform is designed by using RoHS compliant components and manufactured on lead free production process.

### 3.3.3 Electrostatic Discharge

iWave's Kintex UltraScale+ FPGA SOM Development platform is sensitive to electrostatic discharge and so high voltages caused by static electricity could damage some of the devices on board. It is packed with necessary protection while shipping. Do not open or use board except at an electrostatic free workstation.



## 3.4 Mechanical Characteristics

### 3.4.1 Carrier Board Mechanical Dimensions

The Ultra-High-Performance Carrier board PCB form factor is 140mm x 170mm and Board mechanical dimension is shown below.

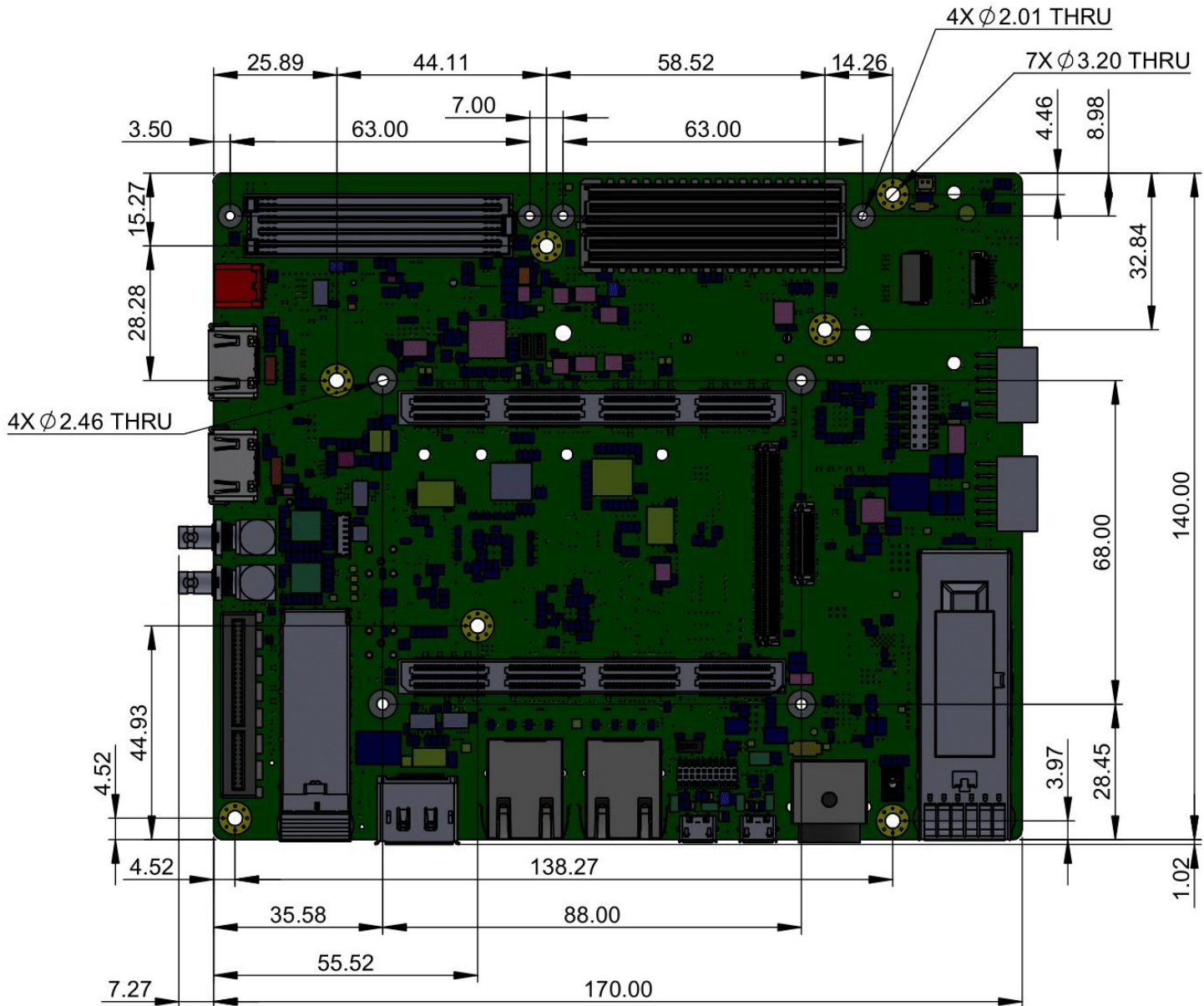


Figure 31: Carrier board Mechanical dimension – Top View

## Kintex UltraScale+ FPGA SOM DevKit Datasheet

The Ultra-High-Performance Carrier board PCB thickness is  $1.55\text{mm} \pm 0.1\text{mm}$ , top side maximum height component is Ethernet Magjack Connector ( $15.00\text{mm}$ ) and bottom side maximum height component is SMA Connector ( $9.55\text{mm}$ ). Please refer the below figure for height details of the Kintex UltraScale+ FPGA SOM Carrier board.

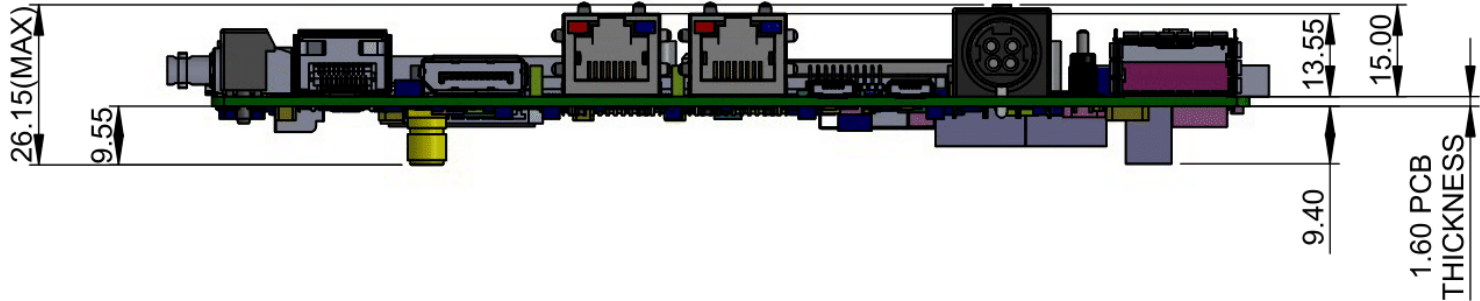


Figure 32: Carrier board Mechanical dimension – Side View

### 3.4.2 Guidelines to insert the Kintex UltraScale+ SoC SOM into Carrier Board

- Make sure the power is not provided to the carrier Board
- Insert the Kintex UltraScale+ SOM in to the Board-to-Board (B2B) as shown below in the first photo
- Check the position of B2B1, B2B2, B2B3 and B2B4 of Kintex UltraScale+ SOM is proper while inserting
- Press the SOM in to B2B connectors as shown below in the first photo such that the board is fixed firmly into the B2B connectors
- To remove the SOM from carrier board, Lift the SOM as shown in the second photo

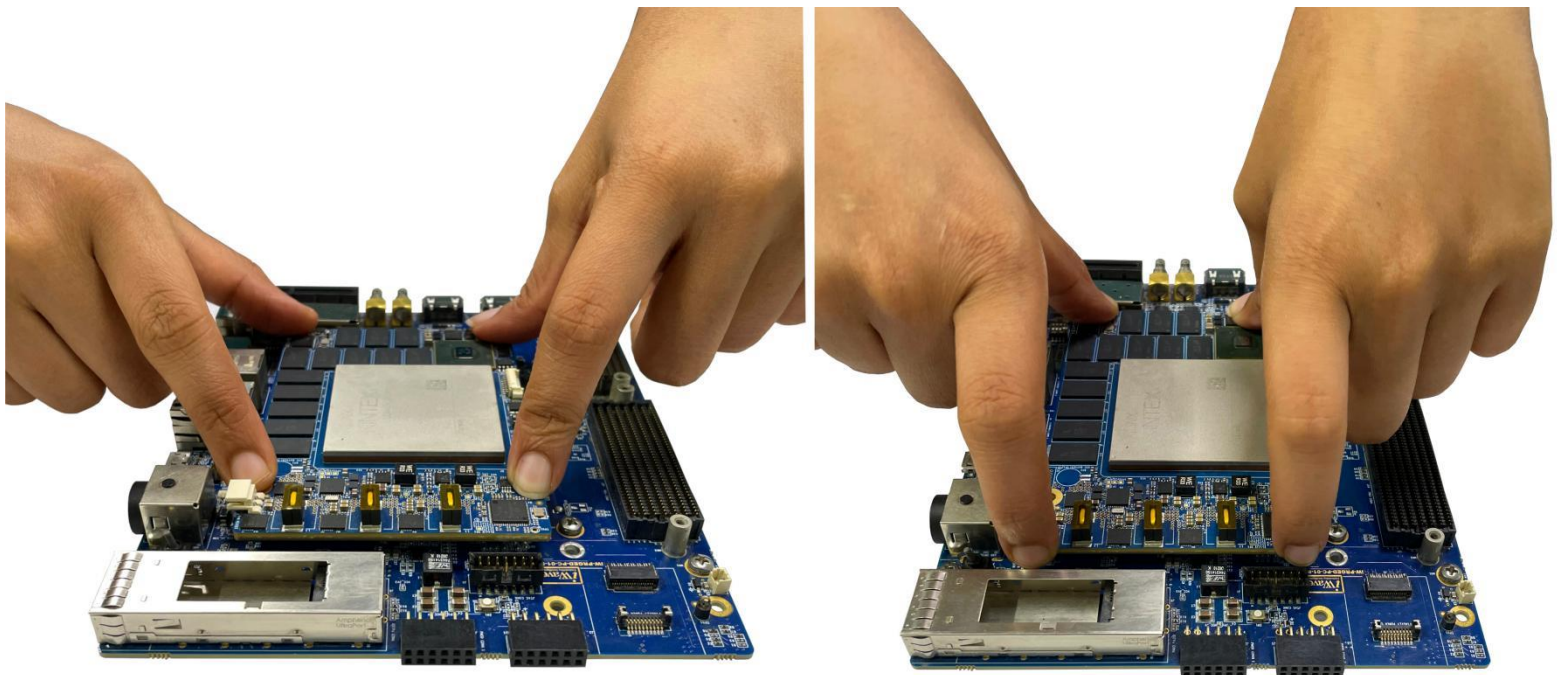


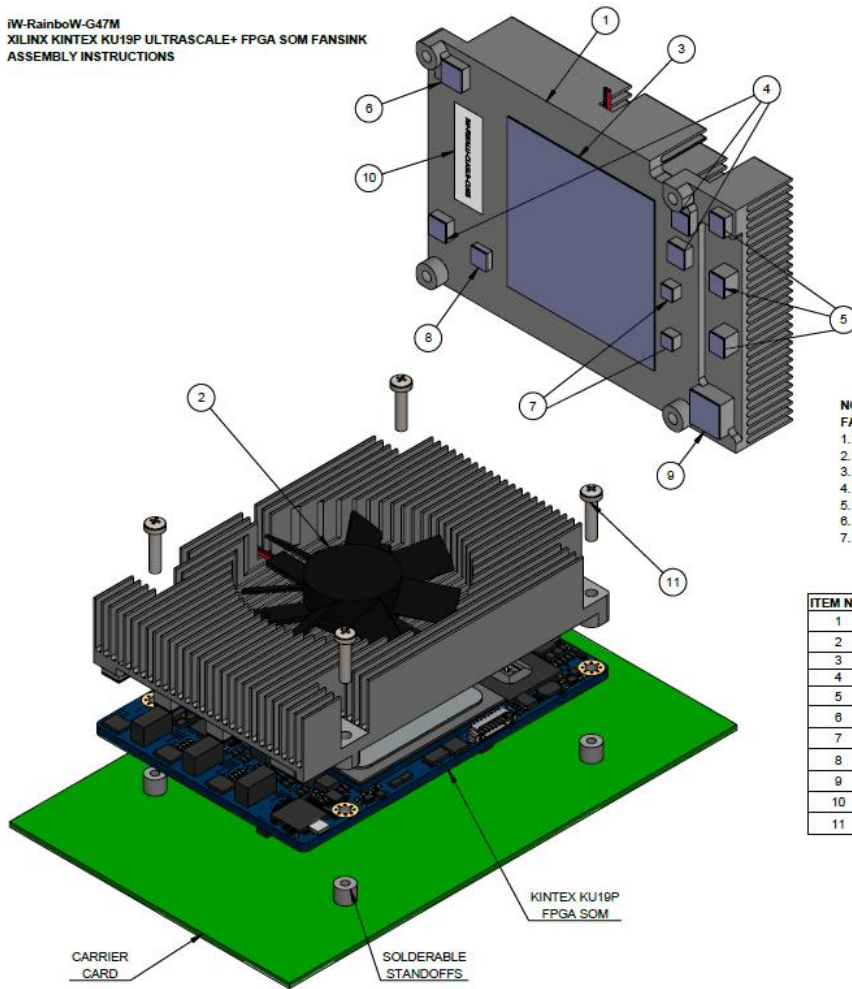
Figure 33: Kintex UltraScale+ FPGA SOM inserting and removing

# Kintex UltraScale+ FPGA SOM DevKit Datasheet

## 3.4.3 FAN Sink Fixing procedure on SOM with Carrier Board

The Kintex UltraScale+ Carrier board and Kintex UltraScale+ SOM with Fan sink fixing procedure is shown below.

iW-RainboW-G47M  
XILINX KINTEX KU19P ULTRASCALE+ FPGA SOM FANSINK  
ASSEMBLY INSTRUCTIONS



**NOTE 1.1:**

**CAUTION:-**

1. ASSEMBLY MUST BE DONE VERY CAREFULLY SINCE PUTTING THE FAN SINK IN A WRONG WAY AND OVER TIGHTENING OF SCREWS WILL DAMAGE THE SOM MODULE OR PREVENT THE SYSTEM FROM WORKING PROPERLY.
2. FOLLOW THE ASSEMBLY INSTRUCTIONS (NOTE 1.2) CAREFULLY TO ENSURE THAT THE MODULE DOES NOT GET DAMAGED.
3. NECESSARY PRECAUTIONS SHOULD BE TAKEN CARE TO AVOID THE ELECTROSTATIC CHARGES.

**NOTE 1.2:**

**FAN SINK ASSEMBLY INSTRUCTIONS: -**

1. CLEAN THE PROCESSOR SURFACE.
2. PEEL OFF THE LINER PRESENT ON THE THERMAL PAD.
3. GENTLY PLACE THE FAN SINK ON SOM MODULE.
4. MAKE SURE THAT SOM MODULE AND FAN SINK MOUNTING HOLES ARE ALIGNED.
5. MOUNT THE ASSEMBLED FAN SINK AND SOM ON THE CARRIER CARD SPACERS.
6. AFTER ASSEMBLING MAKE SURE ALL THE SOM MOUNTING HOLES ARE ALIGNED WITH CARRIER CARD SPACERS.
7. PUT THE SCREWS FROM TOP OF THE FAN SINK AND TIGHTEN THEM TO HAND TIGHT(REFER Fig1.1).

| ITEM NO. | PART NUMBER                      | DESCRIPTION                             | MATERIAL              | QTY. |
|----------|----------------------------------|---|-----------------------|------|
| 1        | iW-PRHBZ-MP-D1-R1.0-REL1.0-FSK01 | FAN SINK FOR FPGA/SoC SOM               | AL 8063-T5 ALLOY      | 1    |
| 2        | T056010BHZC0U3aR                 | 80mm FAN (COMES ASSEMBLED WITH FANSINK) | PBT(BLACK) PLASTIC    | 1    |
| 3        | TIF540-52-5-52-5-1.0             | 1mm THICK THERMAL PAD                   | SILICONE RUBBER (SIR) | 1    |
| 4        | TIF540-06-06-1.0                 | 1mm THICK THERMAL PAD                   | SILICONE RUBBER (SIR) | 3    |
| 5        | TIF540-06-05-1.0                 | 1mm THICK THERMAL PAD                   | SILICONE RUBBER (SIR) | 3    |
| 6        | TIF540-07-07-1.0                 | 1mm THICK THERMAL PAD                   | SILICONE RUBBER (SIR) | 1    |
| 7        | TIF540-04-04-1.0                 | 1mm THICK THERMAL PAD                   | SILICONE RUBBER (SIR) | 2    |
| 8        | TIF540-5.5-5.5-1.0               | 1mm THICK THERMAL PAD                   | SILICONE RUBBER (SIR) | 1    |
| 9        | TIF540-10.5-10.5-1.0             | 1mm THICK THERMAL PAD                   | SILICONE RUBBER (SIR) | 1    |
| 10       | LABEL-30X10                      | LABEL FOR PRODUCTION LOT PART NUMBER    | STICKER               | 1    |
| 11       | M3X16 PAN PHILLIPS DIN 7985      | SCREW                                   | SS 304                | 4    |

Figure 34: Kintex UltraScale+ SOM with Fan sink fixing procedure

## 4. ORDERING INFORMATION

The below table provides the standard orderable part numbers for Kintex UltraScale+ FPGA Development platform which includes Kintex UltraScale+ FPGA SOM and Carrier Board.

**Table 25: Orderable Product Part Numbers**

| Product Part Number           | Description  | Temperature |
|-------------------------------|--|-------------|
| <b>KU19P FPGA Based SOM</b>   |  |             |
| iW-G47D-K19P-4E008G-Q128M-LIB | Kintex UltraScale+ KU19P(-2) FPGA with Dual 4GB FPGA DDR4,128MB QSPI Flash and LS1021A CPU with 2GB DDR4, 256MB NOR Flash - Development kit with Linux | Commercial  |

*Note: For Development platform identification purpose, Product part number is pasted as Label with Barcode readable format.*



