Squid PCI Express Gen 3 Carrier board for six MiniPCIe modules

Hardware Manual

April 27, 2020

Revision 1.1

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1 About this Document

1.1 Purpose

This document describes hardware installation, features, specification and operation of the *Squid* PCI Express Gen 3 Carrier board for six MiniPCIe modules from AMFELTEC Corporation.

1.2 Feedback

AMFELTEC Corp. makes every effort to ensure that the information contained in this document is accurate and complete at time of release. Please contact AMFELTEC Corp. if you find any errors, inconsistence or have trouble understanding any part of this document.

To provide your feedback, please send an email to support@amfeltec.com

Your comments or corrections are greatly valued in our effort for excellence and continued improvement.

1.3 Revision History

Rev. No.	Description	Rev. Date
1.0	Initial Release.	August 23, 2019
1.1	Minor correction	April 27, 2020

2 General Description

2.1 Introduction

Squid PCI Express family is a series of PCI Express Carrier Boards designed for expansion of any desktop computer or embedded appliance. *Squid* family expands a motherboard's PCI Express or USB slot with multiple full/half size MiniPCI Express or M.2 modules.

PCI Express Gen 3 Carrier board for six MiniPCI Express modules occupies the space equal to standard one-slot wide PCI Express board defined by PCI Express Specification. Carrier board is located in the middle of the PCI Express slot and connects to the motherboard PCI Express connector via exchangeable x1 or x4 PCI Express adapters. This unique PCI Express structure (US Pat. #9,996,494) allows allocating up to six MiniPCIe modules on the top and bottom sides of the 2U, half-length carrier board, and not violating PCI Express Specification.

MiniPCIe circuits located on the Carrier board support any MiniPCI Express add-in modules (full and half-size) and supports PCI Express, USB and SIM card interfaces.

2.2 Package Contents

PCI Express Carrier Board for MiniPCIe modules package (depending on the SKU part number) includes the following parts:

1. PCI Express Carrier Board for MiniPCIe modules (Figure 1, Figure 2 and Figure 3)
2. x1 or x4 PCI Express Adapters (Figure 1)
3. Full or half size PCI Express bracket
4. MiniPCIe disable control cable (optional)

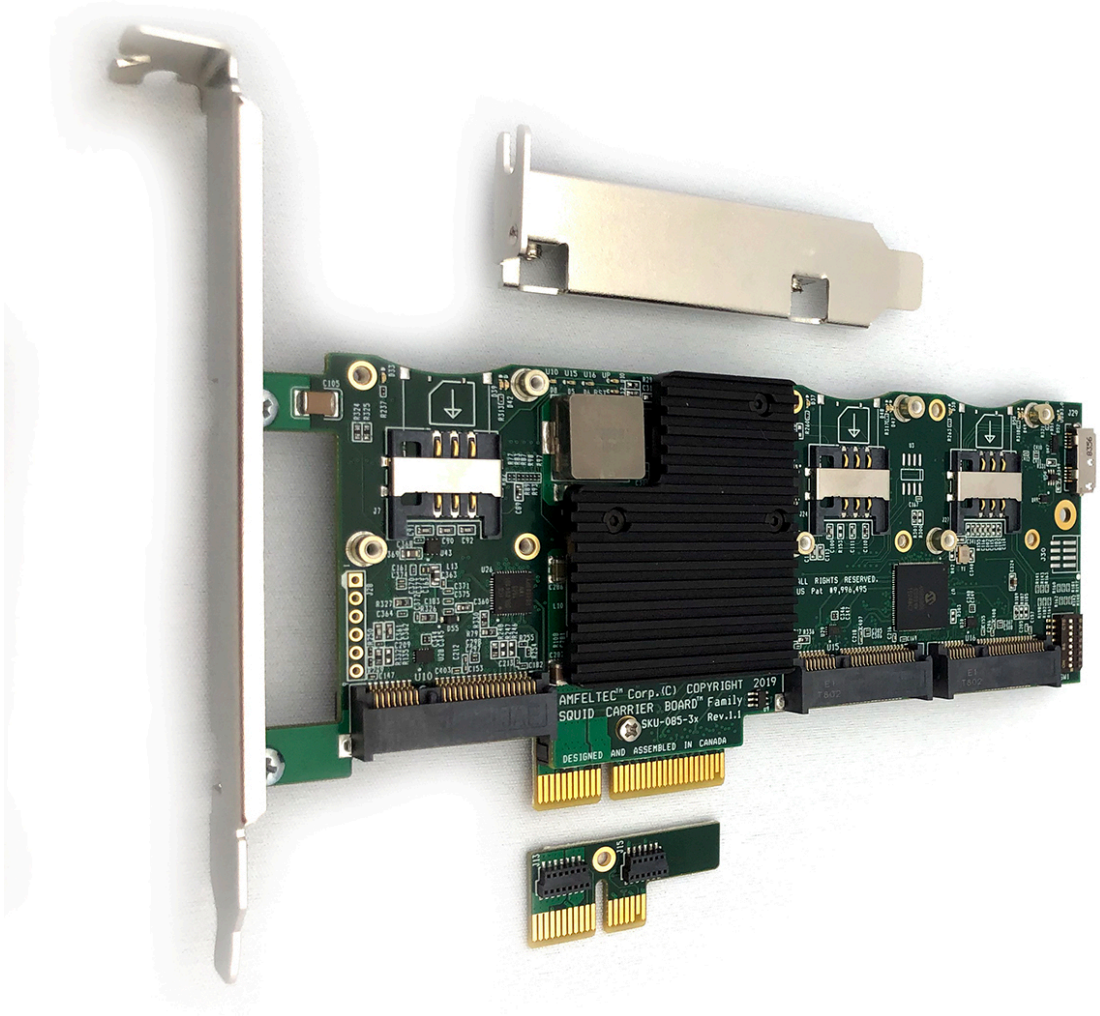

Figure 1: PCI Express Gen 3 Carrier Board for six MiniPCIe modules (with x4 PCIe upstream Adapter)

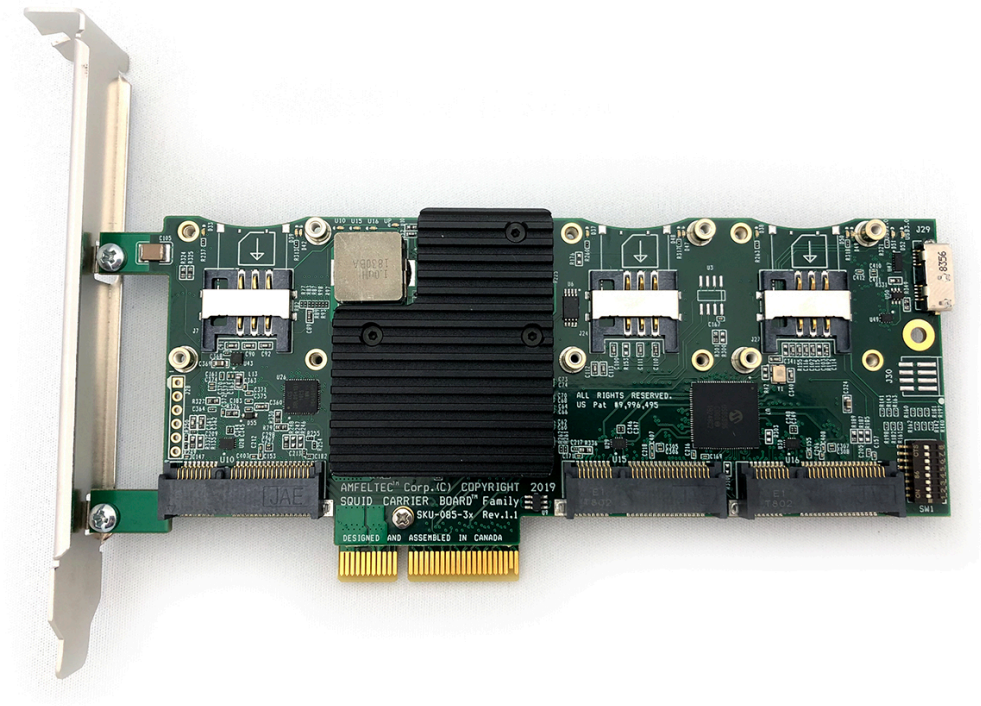

Figure 2: PCI Express Gen 3 Carrier board for six MiniPCIe modules (component side).

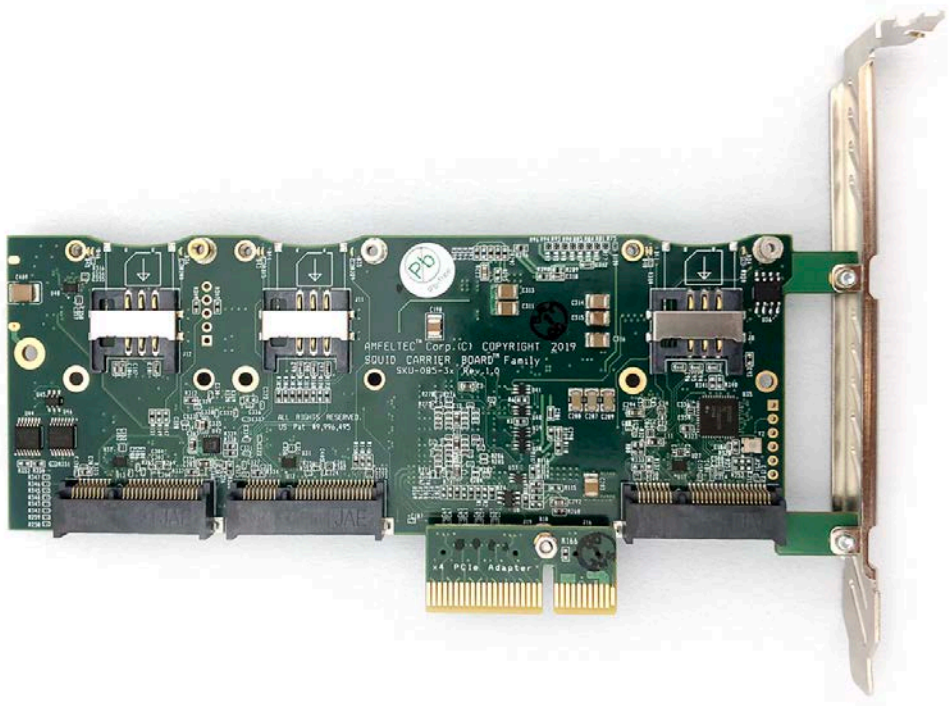

Figure 3: PCI Express Gen 3 Carrier board for six MiniPCIe modules (soldering side)

3 Features

3.1 Features

- Easy ‘Plug and Play” installation; no drivers needed
- Supports up to 6 MiniPCI Express add-in modules
  (3 modules on the board component side and 3 modules on the soldering side)
- Standard on-slot-wide, half-height (2U), half-length PCI express Gen 3 board
- Supports half and full-size MiniPCI Express modules
- PCI express Gen 2 (5 Gb/s), USB 2.0, USB 3.0 and SIM card interfaces provided for each of 6 MiniPCI Express circuit
- Supports x1 or x4 upstream PCI Express Gen 3 (8 Gb/s) connection to motherboard
- Compliant with PCI Express 3.0, MiniPCI Express 2.1 and USB 3.0 Specifications
- Dimensions: 160 mm x 68 mm
- RoHS compliant

Carrier board has PCI express Gen 3 switch for splitting upstream PCI express interface from a motherboard between 6 independent MiniPCIe circuits. USB 2.0 and USB 3.0 connection to all MiniPCIe circuits is done via SuperSpeed USB 3.1 SmartHub controller. Hub upstream port can be connected or via on-board USB 3.0 Micro-AB (Amphenol: GSB343K33HR) connector and standard USB 3.0 cable to on-motherboard USB connector or to onboard USB 3.0 PCI express Host controller. Type of the upstream connection is defined by onboard switch.

3.2 PCI Express Gen 3 Carrier board for six MiniPCIe modules interfaces connection.

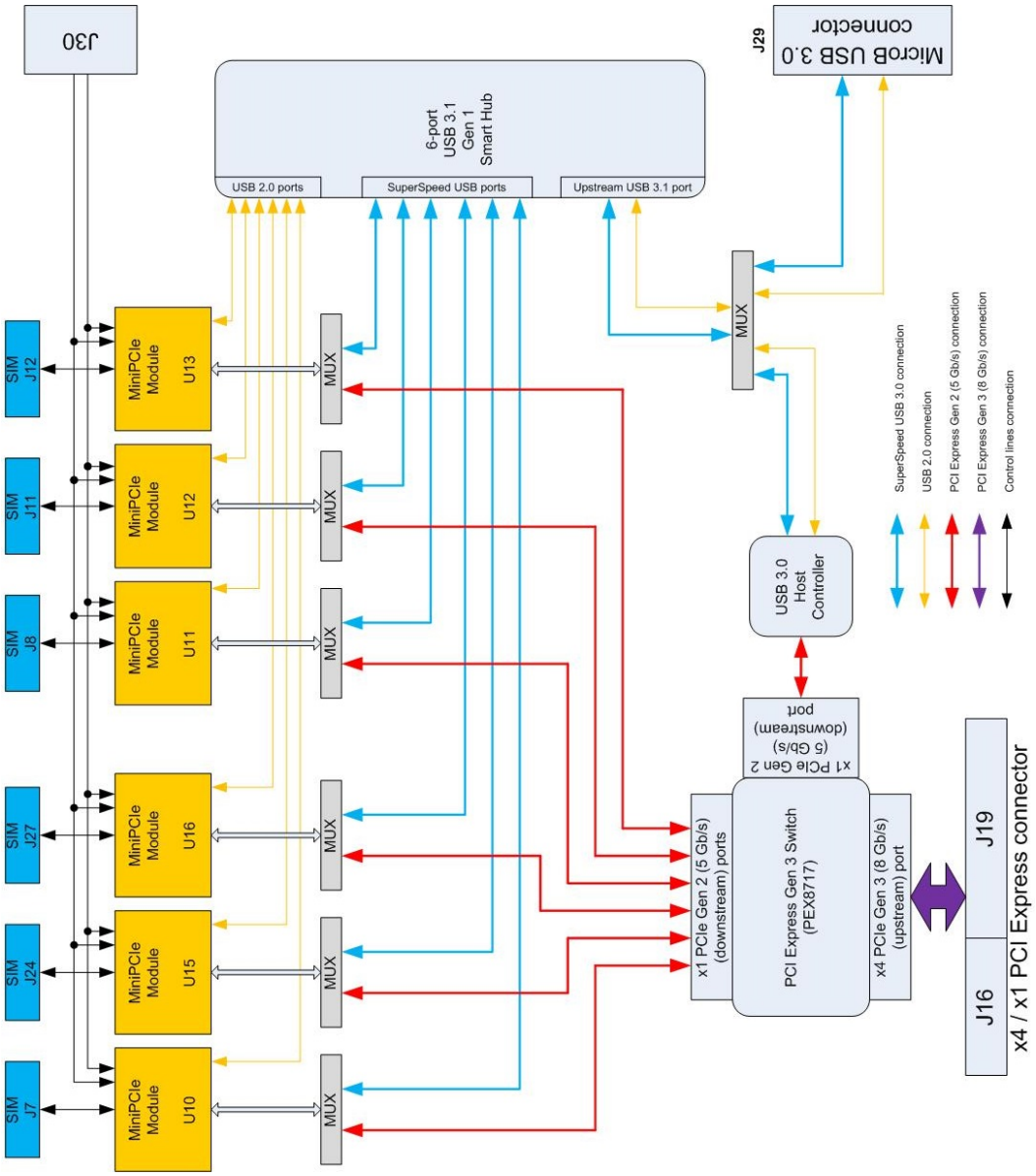

Figure 4: Carrier board interface connection

4 Installation

Following steps provide the exact sequence that needs to be followed in order to properly install the Amfeltec PCI Express Expansion Carrier Board:

- Turn OFF computer before installation
- Remove the chassis cover from the computer
- Locate an unused PCI express slot and remove the corresponding slot cover from computer chassis
- Plug-in Carrier board to PCI express slot and attach its bracket to the computer chassis with a screw
- Connect Carrier Board USB connectors to the motherboard USB 3.0 header (optional)
- Put the chassis cover back on the computer
- Turn ON computer

5 Hardware Description

5.1 Board Layout

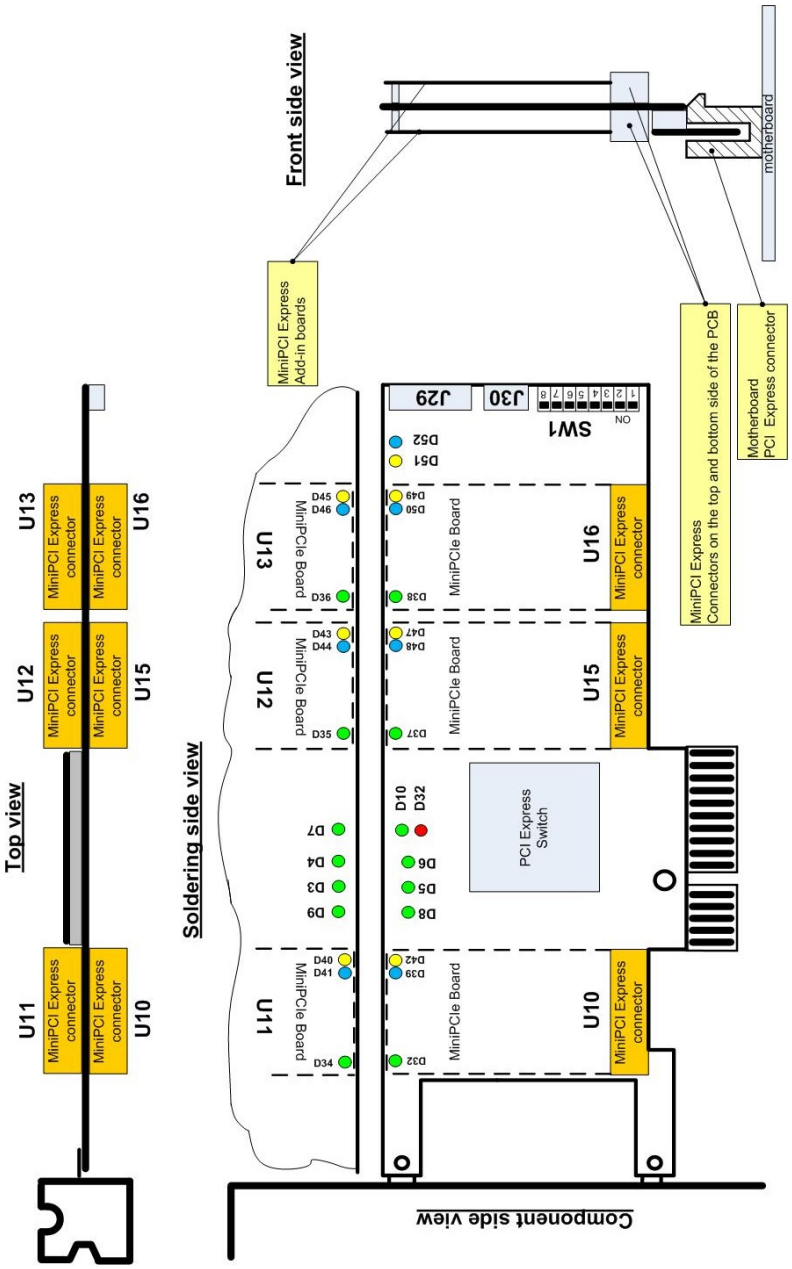

Figure 5: PCI Express Carrier Board for MiniPCIe modules layout

5.2 LEDs

Name	Ref. Des.	Color	Usage
RESET	D23	RED	Global PCI Express RESET signal from
UPSTREAM	D10	GREEN	Upstream PCIe Link status.
USB_LINK	D7	GREEN	USB Host controller downstream PCIe Link status
LINK1	D8	GREEN	Status of the downstream PCIe Link to U10
LINK2	D5	GREEN	Status of the downstream PCIe Link to U15
LINK3	D6	GREEN	Status of the downstream PCIe Link to U16
LINK4	D9	GREEN	Status of the downstream PCIe Link to U11
LINK5	D3	GREEN	Status of the downstream PCIe Link to U12
LINK6	D4	GREEN	Status of the downstream PCIe Link to U13
USB_UPSTR	D52 D51	Blue Yellow	Upstream USB connection speed: (Blue – USB 3.0/ Yellow – USB 2.0)
USB_U10	D39 D42	Blue Yellow	USB connection speed: (Blue – USB 3.0/ Yellow – USB 2.0)
USB_U15	D48 D47	Blue Yellow	USB connection speed: (Blue – USB 3.0/ Yellow – USB 2.0)
USB_U16	D50 D49	Blue Yellow	USB connection speed: (Blue – USB 3.0/ Yellow – USB 2.0)
USB_U11	D41 D40	Blue Yellow	USB connection speed: (Blue – USB 3.0/ Yellow – USB 2.0)
USB_U12	D44 D43	Blue Yellow	USB connection speed: (Blue – USB 3.0/ Yellow – USB 2.0)
USB_U13	D46 D45	Blue Yellow	USB connection speed: (Blue – USB 3.0/ Yellow – USB 2.0)
MiniPCIe_U10	D33	GREEN	LED connects to MiniPCIe circuit U10 pin 42 (optionally can be change to pin 44 or pin 46)
MiniPCIe_U15	D37	GREEN	LED connects to MiniPCIe circuit U15 pin 42 (optionally can be change to pin 44 or pin 46)

MiniPCIe_U16	D38	GREEN	LED connects to MiniPCIe circuit U16 pin 42 (optionally can be change to pin 44 or pin 46)
MiniPCIe_U11	D34	GREEN	LED connects to MiniPCIe circuit U11 pin 42 (optionally can be change to pin 44 or pin 46)
MiniPCIe_U12	D35	GREEN	LED connects to MiniPCIe circuit U12 pin 42 (optionally can be change to pin 44 or pin 46)
MiniPCIe_U13	D36	GREEN	LED connects to MiniPCIe circuit U13 pin 42 (optionally can be change to pin 44 or pin 46)

Table 1: PCI Express Gen 3 Carrier board for six MiniPCIe modules LEDs

5.3 Connectors

Ref. Des.	Type	Usage
J16, J19	connectors	Connection to the x1 or x4 PCI Express Adapter
J30	connector	MiniPCI express circuits disable signals: Pins 20(WDSBL1#) and 51(WDSBL2#) Molex P/N: 87438-0443
U10, U15, U16	MiniPCI Express connector	MiniPCI Express add-in modules connection (component side)
U11, U12, U13	MiniPCI Express connector	MiniPCI Express add-in modules connection (soldering side)
J7, J24, J27	SIM connector	For MiniPCIe circuits on the component side
J8, J11, J12	SIM connector	For MiniPCIe circuits on the soldering side
J29	USB 3.0 Micro-AB connector	Amphenol P/N: GSB343K33HR

Table 2: Connectors

Pin	Name	Function
1	VBUS	Power
2	DM	USB 2.0 differential pair
3	DP	
4	ID (Not used)	OTG identification
5	Ground	Ground for power return
6	SSTXM (output from Carrier board)	SuperSpeed transmitter differential pair
7	SSTXP (output from Carrier board)	
8	Ground	Ground for SuperSpeed signal return
9	SSRXM (input to Carrier board)	SuperSpeed receiver differential pair
10	SSRXP (input to Carrier board)	
Shell	Shell	Connector metal shell

Table 3: USB 3.0 Micro-AB connector J29 (receptacle)

Pin	Name/Function
1	Pins 20 from all MiniPCIe circuits (W_DISABL1#) (3.3V; TTL)
2	Not used
3	Pins 51 from all MiniPCIe circuits (W_DISABL2#) (3.3V; TTL)
4	Ground

Table 4: MiniPCI express circuits disable connector J30

Pin	Name	Pin	Name
51	W_DISABLE2#	52	+3.3V (power)
49	Reserved	50	Ground
47	ANTCNTRL3 (not implemented)	48	+1.5V (power)
45	ANTCNTRL2 (not implemented)	46	LED_WPAN# (LED) (optional)
43	Ground	44	LED_WLAN# (LED) (optional)
41	+3.3V (power)	42	LED_WWAN# (connects to LED)
39	+3.3V (power)	40	Ground
37	Ground	38	USB_D+
35	Ground	36	USB_D-
33	PETp0 or SSTX+	34	Ground
31	PETn0 or SSTX-	32	SMB_DATA (not implemented)
29	Ground	30	SMB_CLK (not implemented)
27	Ground	28	+1.5V (power)
25	PERp0 or SSRX+	26	Ground
23	PERn0 or SSRX-	24	+3.3V (power)
21	Ground	22	PERST#
19	UIM_IC_DP (not implemented)	20	W_DISABLE1#
17	UIM_IC_DM (not implemented)	18	Ground
Mechanical Key			

15	Ground	16	UIM_SPU
13	REFCLK+	14	UIM_RESET
11	REFCLK-	12	UIM_CLK
9	Ground	10	UIM_DATA
7	CLKREQ# (not implemented)	8	UIM_PWR (not implemented)
5	COEX2 (not implemented)	6	+1.5V (power)
3	COEX1 (not implemented)	4	Ground
1	WAKE# (not implemented)	2	+3.3V (power)

Table 5: MiniPCI express connectors (U10, U11, U12, U13, U15 and U16) pinout

5.4 Switch

Switch number	Function
SW1	"ON" – PCI express interface connect to U10 MiniPCIe circuit (default) "OFF" – SuperSpeed USB 3.0 interface connect to U10 MiniPCIe circuit
SW2	"ON" – PCI express interface connect to U11 MiniPCIe circuit (default) "OFF" – SuperSpeed USB 3.0 interface connect to U11 MiniPCIe circuit
SW3	"ON" – PCI express interface connect to U12 MiniPCIe circuit (default) "OFF" – SuperSpeed USB 3.0 interface connect to U12 MiniPCIe circuit
SW4	"ON" – PCI express interface connect to U13 MiniPCIe circuit (default) "OFF" – SuperSpeed USB 3.0 interface connect to U13 MiniPCIe circuit
SW5	"ON" – PCI express interface connect to U15 MiniPCIe circuit (default) "OFF" – SuperSpeed USB 3.0 interface connect to U15 MiniPCIe circuit
SW6	"ON" – PCI express interface connect to U16 MiniPCIe circuit (default) "OFF" – SuperSpeed USB 3.0 interface connect to U16 MiniPCIe circuit
SW7	"ON" – USB HUB upstream USB 3.0 connection to J29 connector (Internal USB Host controller disconnected) "OFF" – USB HUB upstream USB 3.0 connection to internal USB Host controller (default) (J29 connector disconnected)
SW8	"ON" – PCI express connection at Gen 3 speed (8 Gb/s) (default) "OFF" – PCI express connection at Gen 2 speed (5 Gb/s)

Table 6: Switch SW1

6 Appendix A:

7 Appendix B: Limited warranty

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