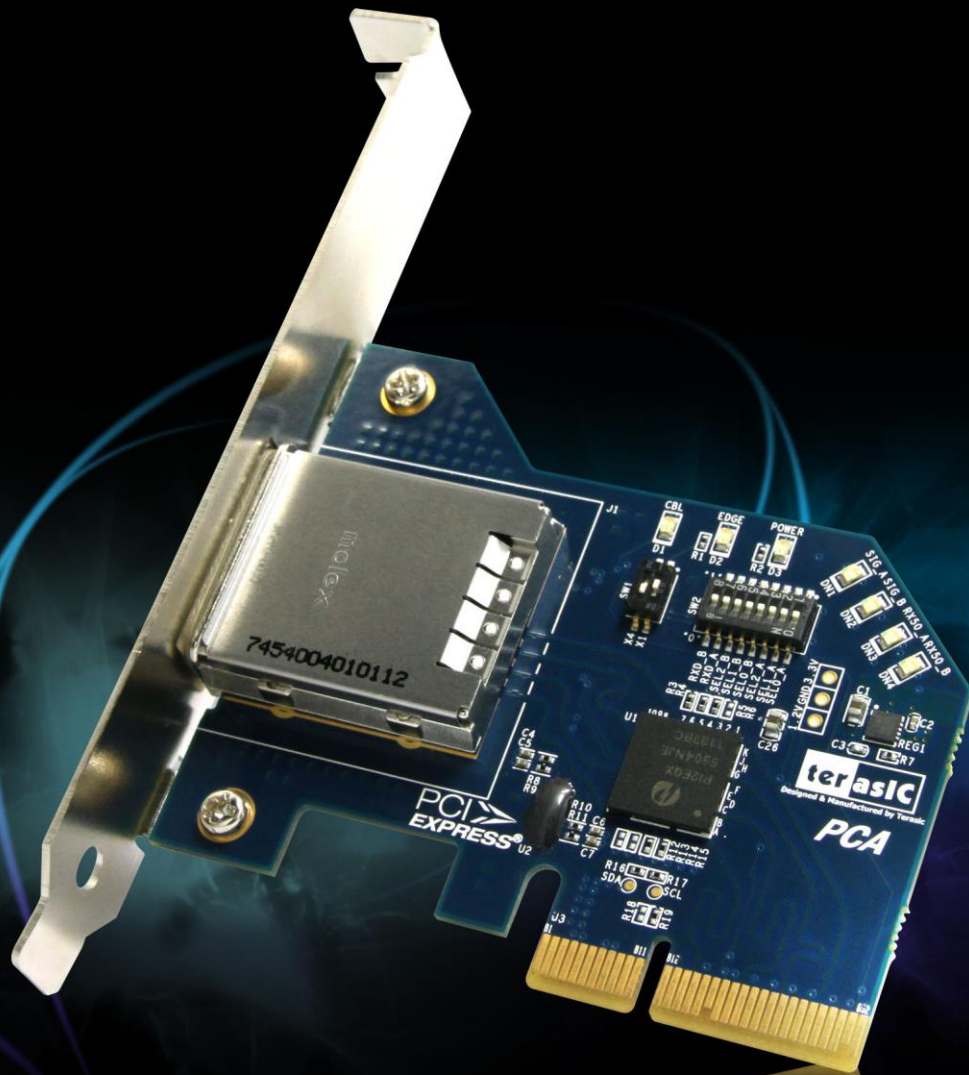


# PCA

## User Manual

### Terasic PCIe Cable Adapter Daughter Card



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# Chapter 1

## *Introduction*

The Terasic PCIe x4 Cable Adapter (PCA) is used to connect a PCIe upstream slot with downstream target board via PCIe x4 cable, supporting PCIe x4 & x1 lanes. The PCA can provide programmable equalization, amplification, and de-emphasis for PCIe transceiver signal by using 8 select bits. It is also available to optimize performance over a variety of physical mediums by reducing Inter-symbol interference.

### 1.1 Features

Figure 1-1 shows a photograph of the PCA.



Figure 1-1 Exterior View

The key features of the card are listed below:

- Up to 5.0Gbps PCIe 2.0 Serial Re-Driver
- PCIe x4 Gen 2
- Adjustable receiver equalization
- Adjustable transmitter amplitude and de-emphasis

## 1.2 Getting Help

Here is information of how to get help if you encounter any problem:

Terasic Technologies

- Tel: +886-3-550-8800
- Email: [support@terasic.com](mailto:support@terasic.com)

# Chapter 2

## Architecture

This chapter provides information about architecture and block diagram of the PCA board.

### 2.1 Layout and Components

The picture of the Terasic PCIe x4 Cable Adapter (PCA) is shown in **Figure 2-1** and **Figure 2-2**. It depicts the layout of the board and indicates the locations of the connectors and key components.

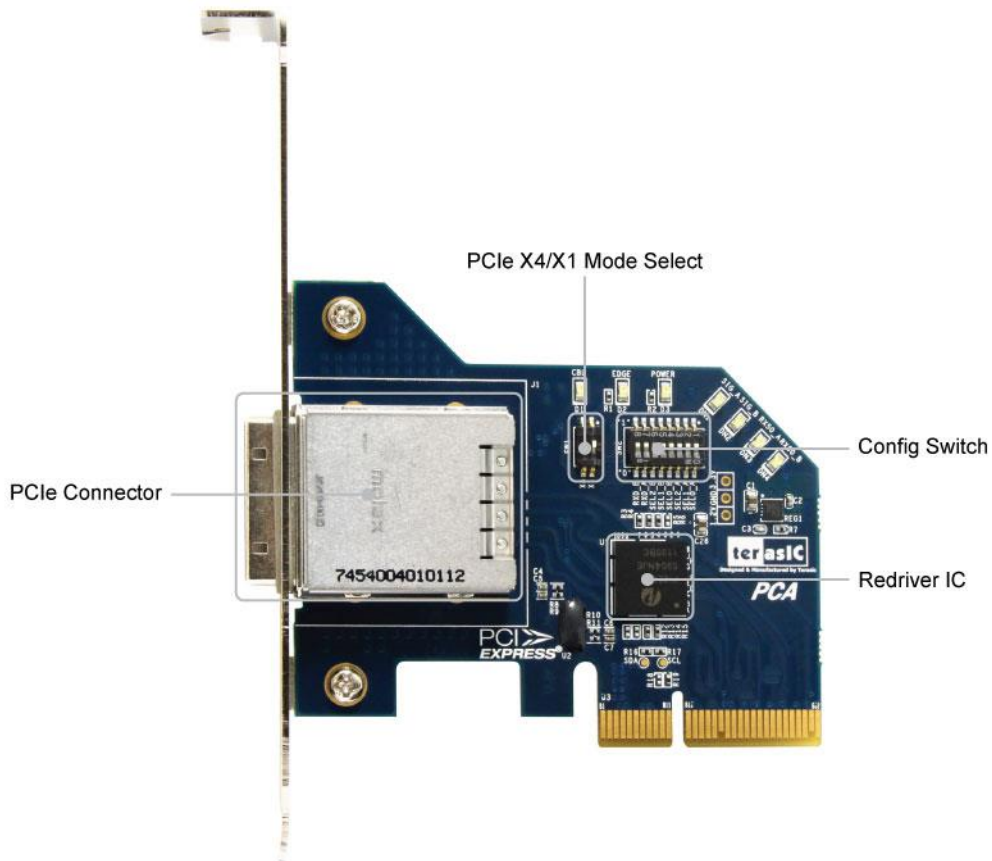


Figure 2-1 The PCA Card PCB and Component Diagram (top view)



Figure 2-2 The PCA Card PCB and Component Diagram (bottom view)

## 2.2 Block Diagram of the PCA Board

Figure 2-3 shows the block diagram of the PCA card.

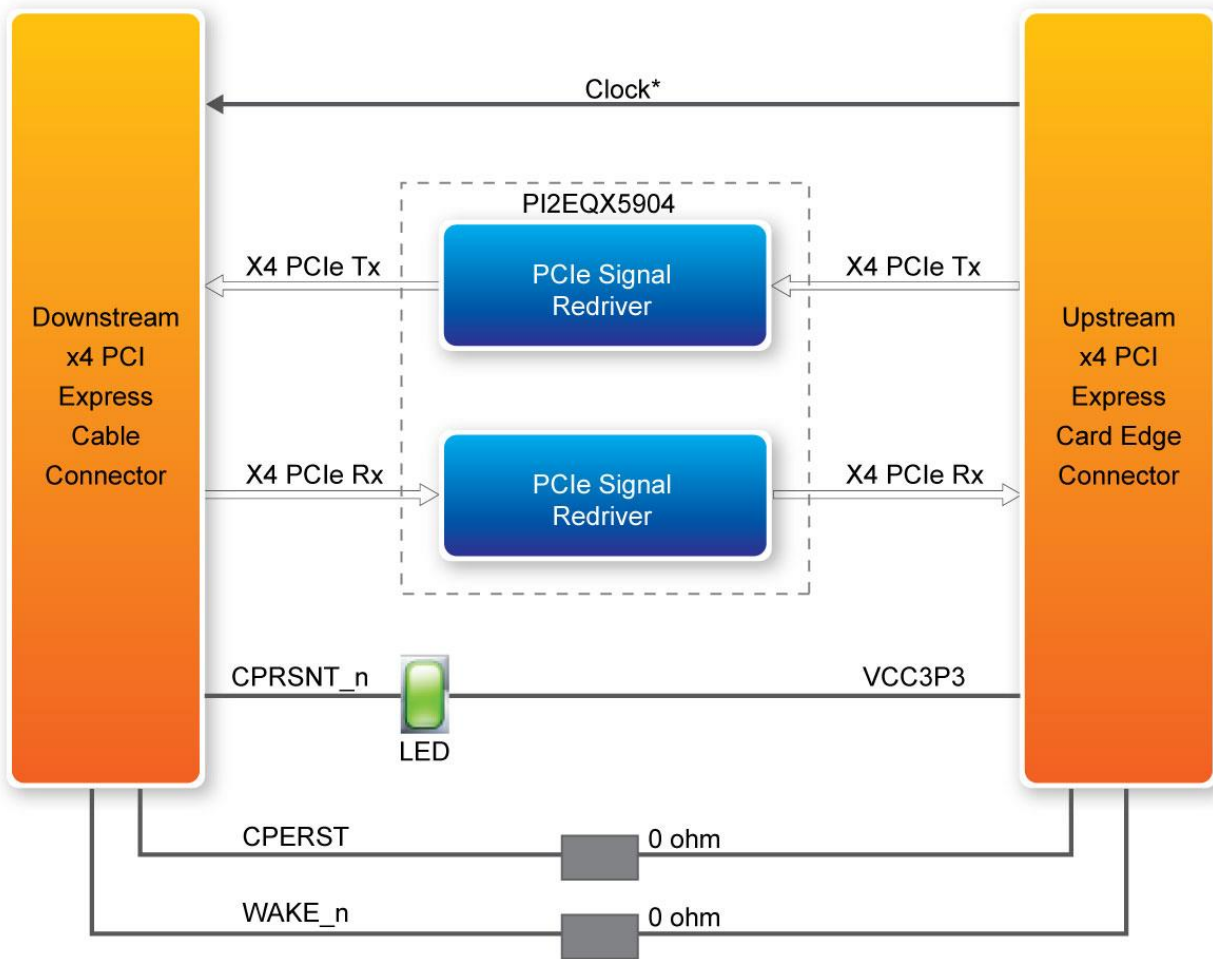


Figure 2-3 Block Diagram of PCA

# Chapter 3

## Board Components

This chapter describes the specifications of the on board components.

### 3.1 PCIe Edge Connector

This PCIe edge connector is used to connect the PCA with PC motherboard PCIe slot, as show **Figure 3-1** and **Figure 3-2**.

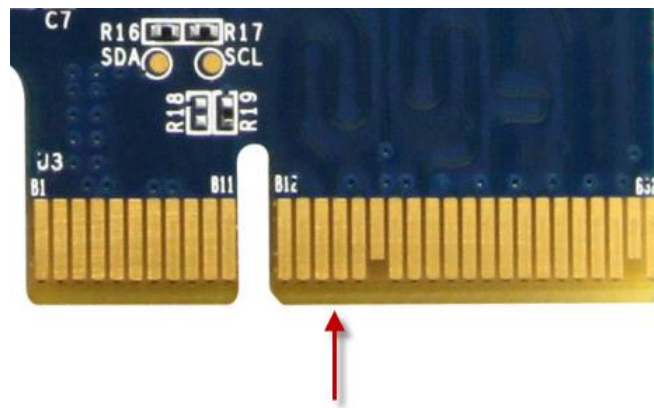


Figure 3-1 PCA Edge Connector

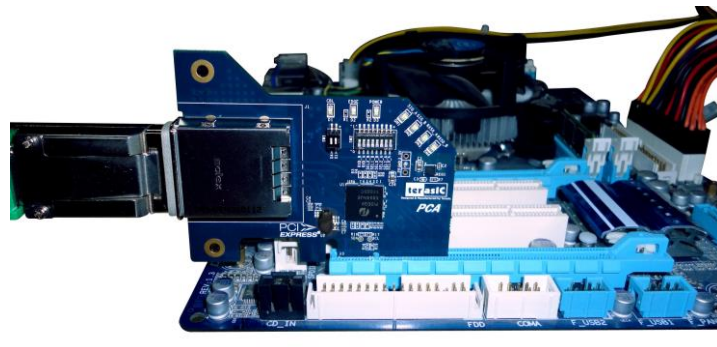


Figure 3-2 Plug the PCA into the PCIe slot of the Motherboard

The pins are numbered as shown in Table 3-1 with side A on the top of the center-line on the solder side of the board and side B on the bottom of the centerline on the component side of the board.



The PCIe interface pins PETpx, PETnx, PERpx, and PERnx are named with the following convention: “PE” stands for PCIe high speed, “T” for Transmitter, “R” for Receiver, “p” for positive (+), and “n” for negative (-).

Note that adjacent differential pairs are separated by two ground pins to manage the connector crosstalk.

**Table 3-1** gives the wiring information of the PCIe Edge connector.

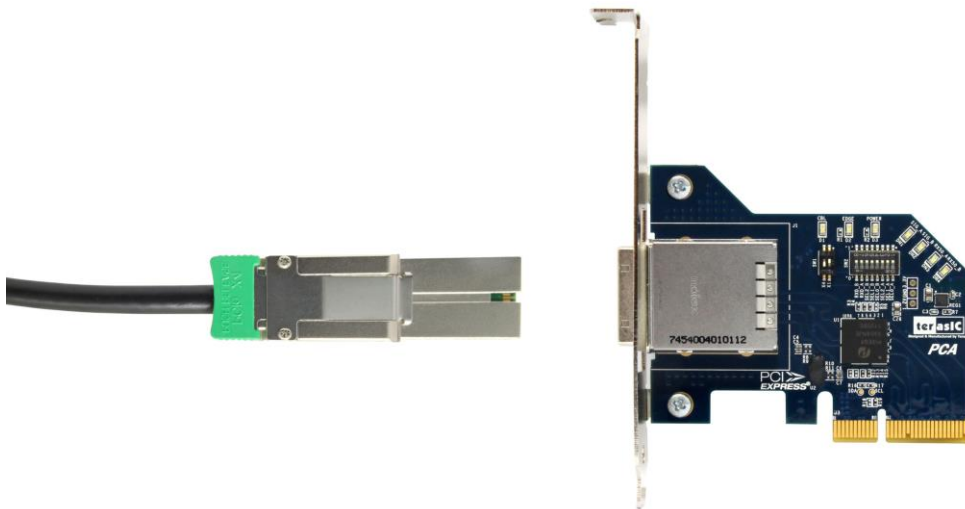
**Table 3-1** Pin assignments and descriptions on PCIe Edge connector

Pin Numbers	Side B		Side A	
	Name	Description	Name	Description
1	NC	NC	PRSNT1n	Hot-Plug presence detect
2	NC	NC	NC	NC
3	NC	NC	NC	NC
4	GND	Ground	GND	Ground
5	NC	NC	NC	NC
6	NC	NC	NC	NC
7	GND	Ground	NC	NC
8	VCC3P3	3.3V Power	NC	NC
9	NC	NC	VCC3P3	3.3V Power
10	3.3VAUX	3.3 V Auxiliary Power	VCC3P3	3.3V Power
11	WAKE	NC	PERSTn	Fundamental Reset
<b>Mechanical Key</b>				
12	RSVD	Reserved	GND	Ground
13	GND	Ground	REFCLK+	Reference clock (differential pair)
14	PETp0	Transmitter differential pair, Lane 0	REFCLK-	
15	PETn0	Lane 0	GND	Ground
16	GND	Ground	PERp0	Receiver differential pair, Lane 0
17	PRSNT2n	Hot-Plug presence detect	PERn0	
18	GND	Ground	GND	Ground
19	PETp1	Transmitter differential pair, Lane 1		
20	PETn1		GND	Ground
21	GND	Ground	PERp1	Receiver differential pair, Lane 1
22	GND	Ground	PERn1	
23	PETp2	Transmitter differential pair,	GND	Ground
24	PETn2		GND	Ground

		Lane 2		
25	GND	Ground	PERp2	Receiver differential pair, Lane 2
26	GND	Ground	PERn2	
27	PETp3	Transmitter differential pair, Lane 3	GND	Ground
28	PETn3		GND	Ground
29	GND	Ground	PERp3	Receiver differential pair, Lane 3
30	RSVD	Reserved	PERn3	
31	PRSNT2n	Hot-Plug presence detect	GND	Ground
32	GND	Ground	RSVD	Reserved

### 3.2 PCIe Cable Connector

A PCIe cable connector is used to connect the PCIe x4 Cable and PCA cable connector, Connect the adapter by using a PCIe x4 Cable, as show **Figure 3-3**.



**Figure 3-3 PCIe x4 Cable and PCA**

To purchase the PCIe x4 Cable, please refer the url: [PCIe.Cable.terasic.com](http://PCIe.Cable.terasic.com).

**Figure 3-4** as show the PCIe Cable connects PCA connector

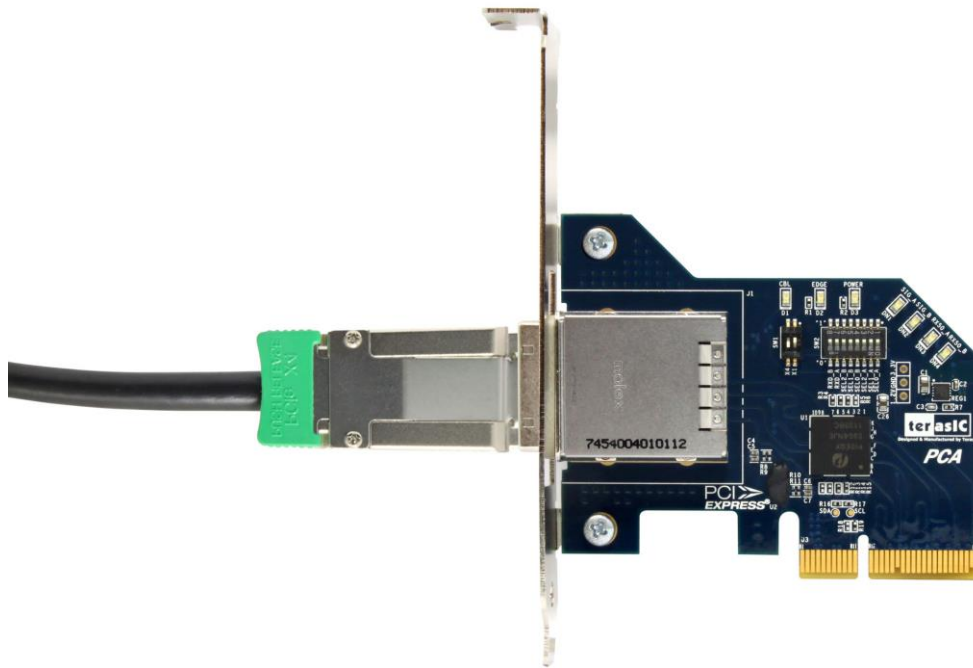


Figure 3-4 PCIe Cable and PCA connector Connected

Table 3-2 gives the wiring information of the PCIe Cable connector.

<i>Pin Numbers</i>	<i>Name</i>	<i>Description</i>
A1	GND	Ground reference for PCI Express transmitter Lanes
A2	PETp0	Differential PCI Express transmitter Lane 0
A3	PETn0	Differential PCI Express transmitter Lane 0
A4	GND	Ground reference for PCI Express transmitter Lanes
A5	PETp1	Differential PCI Express transmitter Lane 1
A6	PETn1	Differential PCI Express transmitter Lane 1
A7	GND	Ground reference for PCI Express transmitter Lanes
A8	PETp2	Differential PCI Express transmitter Lane 2
A9	PETn2	Differential PCI Express transmitter Lane 2
A10	GND	Ground reference for PCI Express transmitter Lanes

A11	PETp3	Differential PCI Express transmitter Lane 3
A12	PETn3	Differential PCI Express transmitter Lane 3
A13	GND	Ground reference for PCI Express transmitter Lanes
A14	CREFLK+	Differential 100MHz cable reference clock
A15	CREFLK-	Differential 100MHz cable reference clock
A16	GND	Ground reference for PCI Express transmitter Lanes
A17	SB_RTN	Signal return for single ended sideband signals
A18	CPRSNTn	Used for detection of whether a cable is installed and the downstream subsystem is powered
A19	CPWRON	Turns power on / off to slavetype downstream subsystems
B1	GND	Ground reference for PCI Express transmitter Lanes
B2	PERp0	Differential PCI Express receiver Lane 0
B3	PERn0	Differential PCI Express receiver Lane 0
B4	GND	Ground reference for PCI Express transmitter Lanes
B5	PERp1	Differential PCI Express receiver Lane 1
B6	PERn1	Differential PCI Express receiver Lane 1
B7	GND	Ground reference for PCI Express transmitter Lanes
B8	PERp2	Differential PCI Express receiver Lane 2
B9	PERn2	Differential PCI Express receiver Lane 2
B10	GND	Ground reference for PCI Express transmitter Lanes
B11	PERp3	Differential PCI Express receiver Lane 3
B12	PERn3	Differential PCI Express receiver Lane 3
B13	GND	Ground reference for PCI Express transmitter Lanes

B14	PWR	+3.3V Cable power
B15	PWR	+3.3V Cable power
B16	PWR RTN	Cable power return
B17	PWR RTN	Cable power return
B18	CWAKEn	Power management signal for wakeup events (optional)
B19	CPERSTn	Cable PERSTn

### 3.3 Switches

The PCA contains x2 and x8 switches that allow configuration of the PCA PCIe mode (SW1), equalization and de-emphasis (SW2). The two switches, SW1 and SW2, are located on top of the front side of the PCA card. **Figure 3-5** show the location of the board.

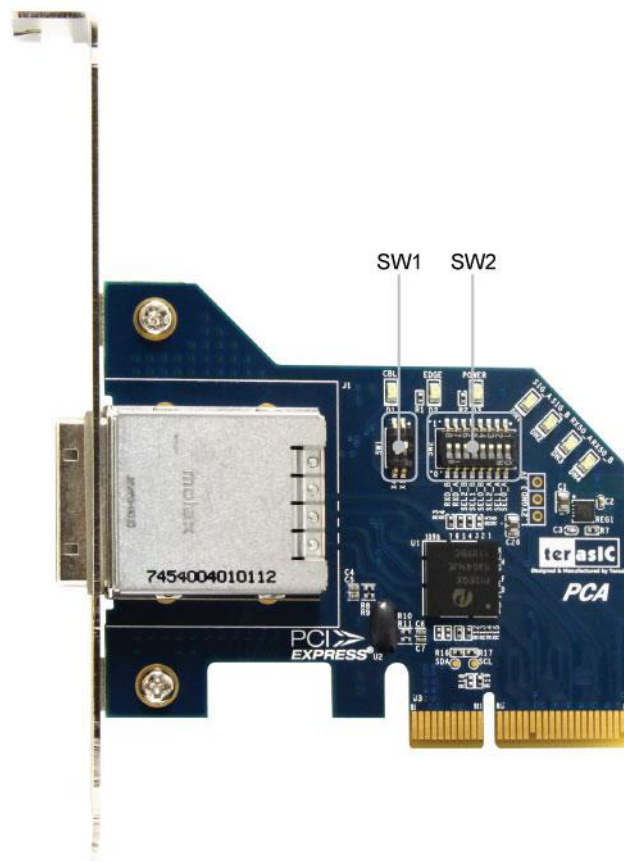


Figure 3-5 Switches

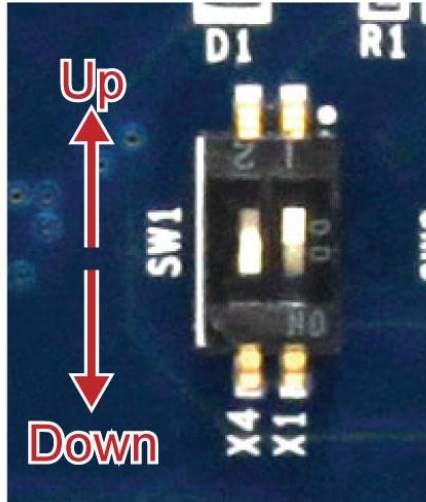


Figure 3-6 show the SW1 settings

Table 3-3 SW1 Settings

Pin 2	Pin 1	PCIe Mode (x1/x4)
UP	UP	NULL
UP	Down	x1
Down	UP	x4(Default mode)
Down	Down	NULL

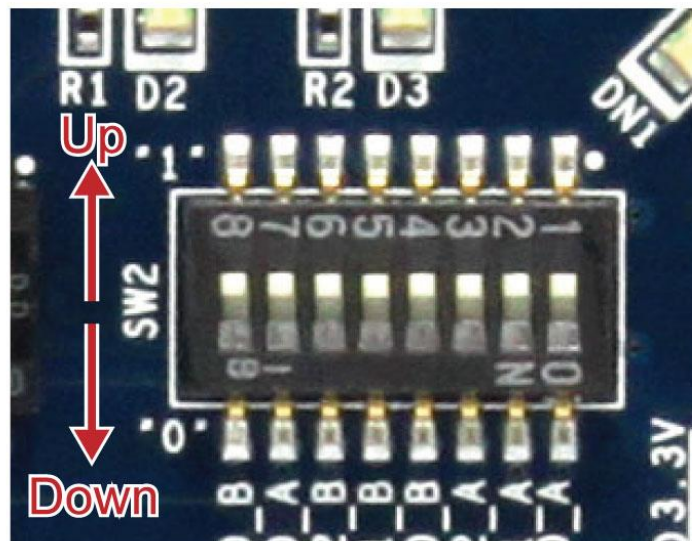


Figure 3-7 Show the SW2 Settings

The PI2EQX5904 chip located on the PCA has two channels, A and B, which are separately equalization controlled. **Figure 3-8** shows the block diagram of the channel A and B. Table 3-4 & Table 3-5 list the SW2 pins settings on Equalizer Configuration for channel A or channel B.

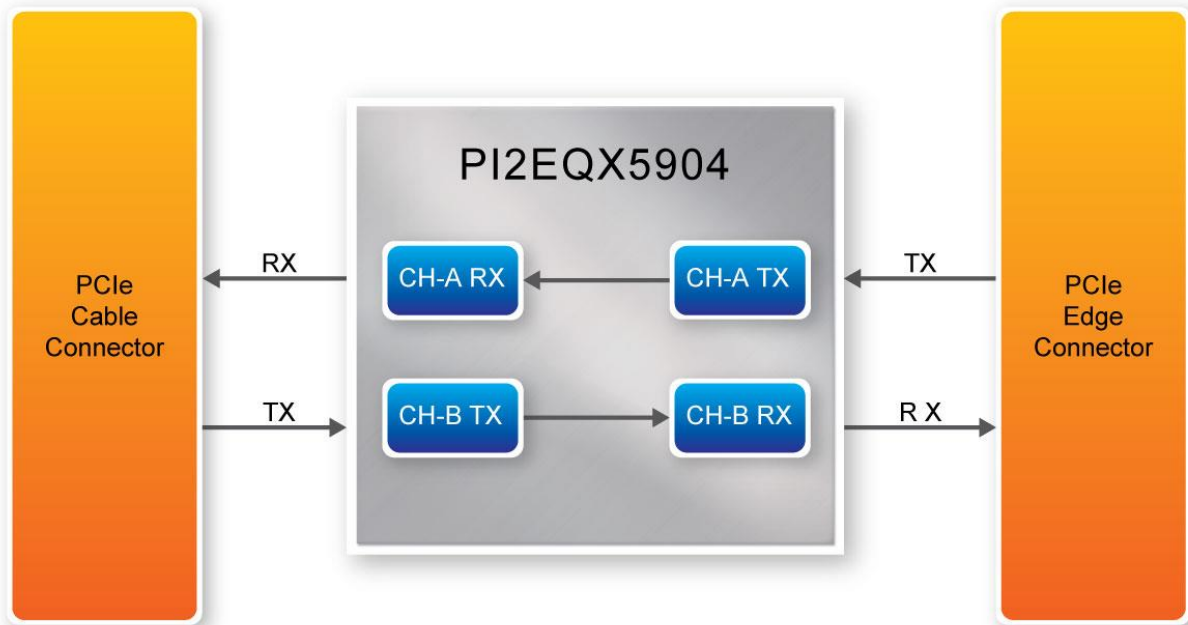


Figure 3-8 CH\_A and CH\_B of PI2EQX5904

Table 3-4 SW2 Settings (Input Equalizer Configuration for Channel A)

Pin 1	SEL0_A	Pin 2	SEL1_A	Pin 3	SEL2_A	@1.25GHz	@2.5GHz
0		0		0		0.5dB	1.2 dB
0		0		1		0.6dB	1.5 dB
0		1		0		1.0 dB	2.6 dB
0		1		1		1.9 dB	4.3 dB
1		0		0		2.8 dB	5.8 dB
1		0		1		3.6 dB	7.1 dB
1		1		0		5.0 dB	9.0 dB
1		1		1		7.7 dB(Default Setting)	12.3 dB(Default Setting)

**Table 3-5 SW2 Settings (Input Equalizer Configuration for Channel B)**

<i>Pin 4 SEL0_B</i>	<i>Pin 5 SEL1_B</i>	<i>Pin 6 SEL2_B</i>	<i>@1.25GHz</i>	<i>@2.5GHz</i>
0	0	0	0.5dB	1.2 dB
0	0	1	0.6dB	1.5 dB
0	1	0	1.0 dB	2.6 dB
0	1	1	1.9 dB	4.3 dB
1	0	0	2.8 dB	5.8 dB
1	0	1	3.6 dB	7.1 dB
1	1	0	5.0 dB	9.0 dB
1	1	1	7.7 dB(Default Setting)	12.3 dB(Default Setting)

The SW2 pin 7 connects to the PI2EQX5904 RXD\_A pin, while SW2 pin 8 connects to PI2EQX5904 RXD\_B pin. These 2 pins are used to control channel A & B Receiver Detect Enable function. Automatic Receiver Detection is a feature that can set the number of active channels. By sensing the presence of a load device on the output, the channel can be automatically enabled to operate.

When setting the RXD\_A or RXD\_B to a high level, Automatic Receiver Detection will be enabled. Please refer the datasheet of PI2EQX5904 for more settings.

**Table 3-6 SW2 Settings (Receiver Detect Function Enable for CH\_A & CH\_B)**

<i>Pin 7 RXD_A</i>	<i>Pin 8 RXD_B</i>	<i>Receiver Detect Function Enable</i>
1	1	CH_A & CH_B Receiver Detect Enable (Default Setting)
1	0	CH_A Receiver Detect Enable CH_B Receiver Detect Disable
0	1	CH_A Receiver Detect Disable CH_B Receiver Detect Enable
0	0	CH_A & CH_B Receiver Detect Disable

### 3.4 LEDs

The PCA includes status LEDs, Please refer **Table 3-7** for the status of the LED indicator.

<i>Board Reference</i>	<i>LED name</i>	<i>Description</i>
D1	CBL	Cable PRSNT1n



<b>D2</b>	<b>EDGE</b>	<b>Edge PRSNT1n</b>
<b>D3</b>	<b>POWER</b>	<b>Power LED</b>
<b>DN1</b>	<b>SIG_A</b>	<b>Signal detect output for CH_A</b>
<b>DN2</b>	<b>SIG_B</b>	<b>Signal detect output for CH_B</b>
<b>DN3</b>	<b>RX50_A</b>	<b>Receiver Detect Output for CH_A0</b>
<b>DN4</b>	<b>RX50_B</b>	<b>Receiver Detect Output for CH_B0</b>

# Chapter 4 *Appendix*

## 4.1 Revision History

<i>Version</i>	<i>Change Log</i>
V1.0	Initial Version (Preliminary)
V1.1	Delete the chapter of TR4 demo

## 4.2 Copyright Statement

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