

Table of Contents

1	Introduction	2
2	Overview	2
3	Quick Start.....	3
4	Circuit Description.....	4
4.1	Mode Selection.....	4
4.2	I2C Address and I2C Bus	4
4.3	DP/HDMI Selection.....	4
4.4	Port Selection.....	4
4.5	Priority Order.....	5
4.6	Equalization Setting.....	6
4.7	Swing and Pre-emphasis Settings	6
4.8	Source Termination Setting	7
4.9	5V/3.3V Power Supply	7
4.10	Power Saving Mode	7
5	References.....	8
6	Appendix A: Demo Board Schematic.....	8

1 Introduction

PI3WVR31313A DP/HDMI1.3 de-multiplexer switch can be employed in source as well as sink applications. It carries two passive output ports for DP1.2 or HDMI1.4, and one active output port for DP-to-HDMI1.4 level shifter and re-driver. This user manual describes the components and the usage of PI3WVR31313A Demo Board Rev.A.

2 Overview

Figure 1 is the block diagram of Pericom PI3WVR31313A demo board and figure 2 shows the demo board layout. One DP plug connector (J1) on PI3WVR31313A demo board is used for plugging a source device, such as a motherboard. A DP cable can be connected between a DP receptacle connector (J2/3) on the demo board and a sink device, such as a DP monitor. An HDMI sink device, such as an HDTV, can be connected to an HDMI receptacle connector (J4) via an HDMI cable. A slide switch at reference SW1 is used to control the output configurations of PI3WVR31313A.

+5V can be employed to the demo board via a mini USB female connector (J5). This +5V power is to pull the pull-up resistors of DDC paths to 5V. It is also converted to +3.3V for the entire demo board through a regulator PT7M8206 at reference U2. Alternatively, the +3.3V can be employed by the DP source device if header pin JP1 is shorted.

PI3USB103 at reference U3 is added to the demo board to automatically select whether transmitting AUX or DDC between the input DP connector and PI3WVR31313A.

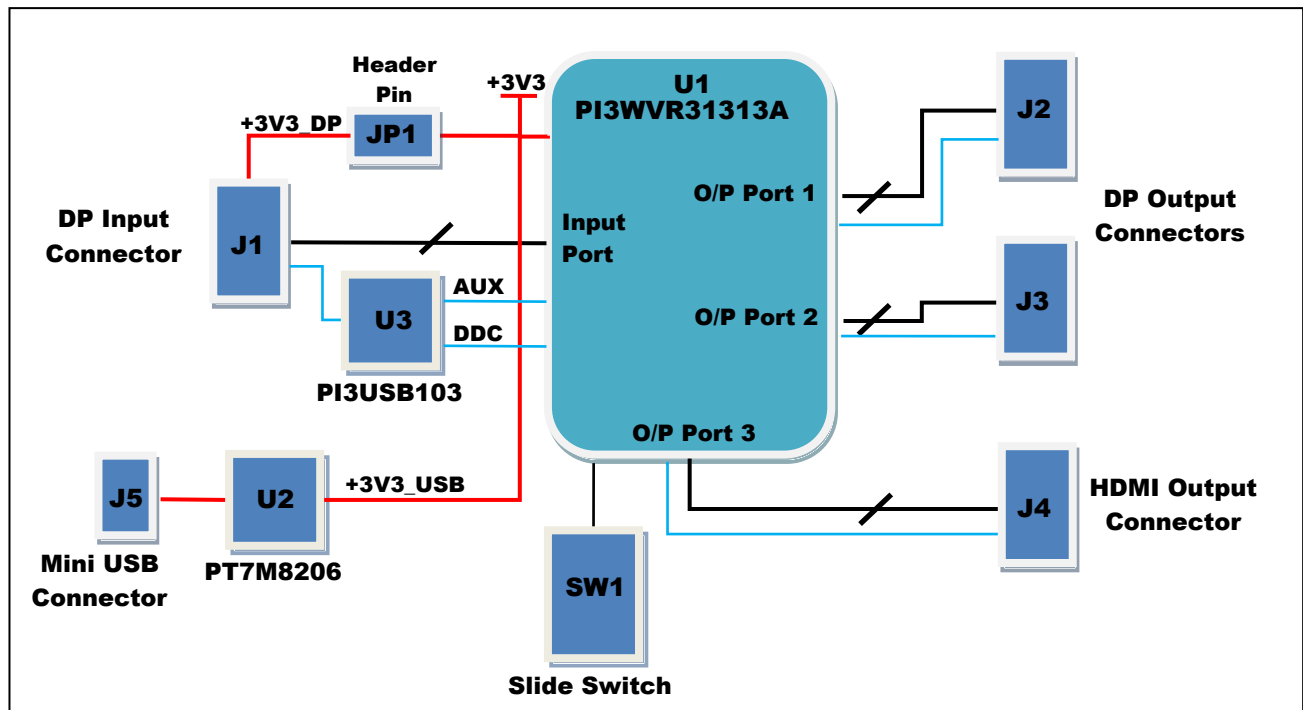


Figure 1: Block Diagram of PI3WVR31313A Demo Board Rev.A

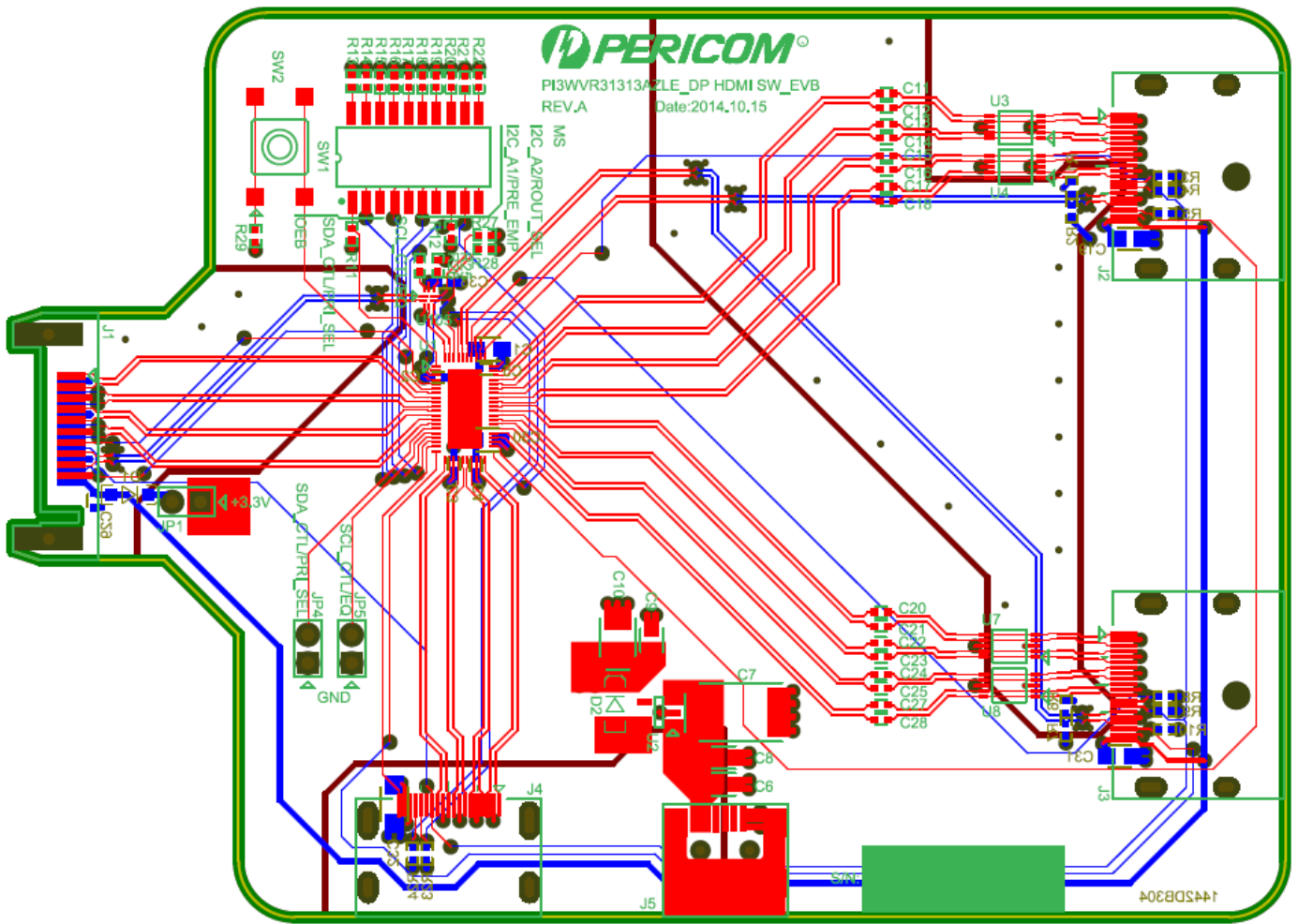


Figure 2: Layout of PI3WVR31313A Demo Board Rev.A

3 Quick Start

To start-up the PI3WVR31313A demo board rev.A, complete the following steps:

1. Short header pins JP1 to allow 3.3V from the source device employing to the demo board;
2. Short pins 1 and 20 of switch SW1 to enable PI3WVR31313A;
3. Short pins 3 and 18 of switch SW1 to set priority order to port 1, then port 2 and then port 3;
4. Leave pins 4, 5, 6 and 7 of switch SW1 open to set equalization and pre-emphasis to 4dB and 1.5dB, respectively;
5. Leave pins 8 of SW1 open to enable source termination;
6. Short pins 10 and 11 of switch SW1 to select pin control mode;
7. Connect a USB adaptor to J5 to supply 5V to the demo board;
8. Connect a source device, e.g. motherboard, to the DP input connector at J1;
9. Connect DP sink device(s), e.g. DP monitor, to the DP output connector(s) at J2-3;
10. Connect an HDMI sink device, e.g. HDTV, to the HDMI connector at J4.

4 Circuit Description

4.1 Mode Selection

Output configurations of PI3WVR31313A can be set via I2C or pin control mode. MS pin is used to select among these three modes.

MS	Control Mode
0	Pin Control Mode for Type2 ID
M(0.5*Vdd)	Pin Control Mode for Type1 ID
1	I2C Control Mode

Table 1: Mode Selection of PI3WVR31313A Demo Board Rev.A

4.2 I2C Address and I2C Bus

If I2C control mode is selected via MS pin, pins 17-8 of PI3WVR31313A are used as I2C address bits. The I2C address bits[3:2] can be set via pins 6-8 of the slide switch SW1 on the demo board. Pins 16 and 15 of PI3WVR31313A are used for transmitting I2C SCL and SDA, respectively. External pull-ups may be required for SCL_CTL and SDA_CTL pins when reading/writing I2C. Alternatively, pull-ups for SCL_CTL and SDA_CTL can be enabled by leaving pins 3-5 of the slide switch SW1 open, and short pin 2-4.

4.3 DP/HDMI Selection

If PI3WVR31313A demo board is connected to a dual-mode DP source device, DP as well as HDMI protocols can be transmitted depending on the type of a sink device attached to an output port of PI3WVR31313A. When the sink device is HDMI, DDC path instead of AUX path should be selected to transmit the EDID content. In I2C mode, the device must be defined as DP or HDMI in I2C control mode via Byte 0 bit 1.

I2C B0b1	Description
0	DP input
1	HDMI input

Table 2: DP/HDMI Selection of PI3WVR31313A Demo Board Rev.A in I2C Control Mode

In pin control mode, CAD_SRC is used to determine whether AUX or DDC is transmitted through pins 52-3 and 55-6 for ports 1 and 2 of PI3WVR31313A. For port 3, DDC is always transmitted. As AUX and DDC signals from pins 59-60 and pins 2-3 of PI3WVR31313A are merged to the AUX pins on the input DP connector on the demo board, PI3USB103 is added in between to select from AUX and DDC.

4.4 Port Selection

Output ports can be selected through byte 0 in I2C control mode. Pin control mode does not offer this selection.

I2C Byte 0	Description
bit[6:5]	Port SEL1/SEL0 selection control 00 port 1 01 port 2 10 port 3 11 depends on priority selection

Table 3: Port Selection of PI3WVR31313A Demo Board Rev.A in I2C Control Mode

4.5 Priority Order

On top of dedicating an output port in I2C control mode, output ports can be prioritized via I2C or pin control mode. The priority is controlled by I2C byte 0 bit[4:2] in I2C control mode or PRI_SEL pin in pin control mode.

I2C Byte 0	Description
Bit[4:2]	PRI_SEL priority selection control by HPDx 000 port1/port2/port3 001 port1/port3/port2 010 port2/port1/port3s 011 port2/port3/port1 1x0 port3/port1/port2 1x1 port3/port2/port1

Table 4: Priority Selection of PI3WVR31313A Demo Board Rev.A in I2C Control Mode

PRI_SEL	HPD1	HPD2	HPD3	HPD_SRC	CAB_SRC	AUXP/AUXN	SDA/SCL
0	0	0	0	0	Hi-Z	Hi-Z	Hi-Z
0	1	x	x	HPD1	CAB1=0	AUX1P/AUX1N	Hi-Z
					CAB1=1	Hi-Z	SDA1/SCL1
0	0	1	x	HPD2	CAB2=0	AUX2P/AUX2N	Hi-Z
					CAB2=1	Hi-Z	SDA2/SCL2
0	0	0	1	HPD3	High	Hi-Z	SDA3/SCL3
M	0	0	0	0	Hi-Z	Hi-Z	Hi-Z
M	1	x	0	HPD1	CAB1=0	AUX1P/AUX1N	Hi-Z
					CAB1=1	Hi-Z	SDA1/SCL1
M	0	1	0	HPD2	CAB2=0	AUX2P/AUX2N	Hi-Z
					CAB2=1	Hi-Z	SDA2/SCL2
M	x	x	1	HPD3	High	Hi-Z	SDA3/SCL3
1	0	0	0	0	Hi-Z	Hi-Z	Hi-Z
1	1	x	x	HPD1	CAB1=0	AUX1P/AUX1N	Hi-Z
					CAB1=1	Hi-Z	SDA1/SCL1
1	0	1	0	HPD2	CAB2=0	AUX2P/AUX2N	Hi-Z
					CAB2=1	Hi-Z	SDA2/SCL2
1	0	x	1	HPD3	High	Hi-Z	SDA3/SCL3

Table 5: Priority Selection of PI3WVR31313A Demo Board Rev.A in Pin Control Mode

4.6 Equalization Setting

PI3WVR31313A offers various equalization settings from 1.5dB up to 19dB for serving both source and sink HDMI applications. Settings in pin control mode and I2C control mode are summarized as below. The slide switch SW1 and header pin JP5 on the demo board can be used to pin strap EQ pin or I2C byte 1 bits[7:5] can be used to set a desired equalization value.

Pin Control EQ	I2C Control B1b[7:5]	Equalization	Input FR4 Trace	Input HDMI Cable
0	000	1.5 dB	2 – 8"	0 – 7m
Open	001	4 dB		
1	010	6.5 dB	5 – 40"	5 – 15m
-	011	9 dB		
-	100	11.5 dB		
-	101	14 dB	30" or above	10m or above
-	110	16.5 dB		
-	111	19 dB		
-				

Table 6: EQ Setting of PI3WVR31313A Demo Board Rev.A

4.7 Swing and Pre-emphasis Settings

Swing and pre-emphasis settings of PI3WVR31313A are designated for fulfilling source eye diagram requirement specified in HDMI specification as well as for transmitting long output trace in sink application. The settings can be selected via the slide switch SW1 on the demo board or configured via I2C byte 2.

Pin Control PRE-EMP	I2C Control B2b[3:2]	I2C Control B2b[6:4]	Swing	Pre-emphasis
0	00	000	500 mV	0 dB
Open		001		1.5 dB
1		010		2.5 dB
-		011		3.5 dB
-		100		6 dB
-	01	000	450 mV	0 dB
-		001		1.5 dB
-		010		2.5 dB
-		011		3.5 dB
-		100		6 dB
-	10	000	550 mV	0 dB
-		001		1.5 dB
-		010		2.5 dB
-		011		3.5 dB
-		100		6 dB
-	11	000	600 mV	0 dB
-		001		1.5 dB
-		010		2.5 dB
-		011		3.5 dB
-		100		6 dB

Table 7: Swing and Pre-emphasis Settings of PI3WVR31313A Demo Board Rev.A

4.8 Source Termination Setting

Source termination embedded in PI3WVR31313A is used to minimize the reflection due to any impedance mismatch before PI3WVR31313A. It can be enabled by the slide switch SW1. For any transmission higher than 2.2Gbps, source termination is highly recommended.

ROUT_SEL	Source Termination
0	Disabled
1	Enabled

Table 8: Source Termination Setting of PI3WVR31313A Demo Board Rev.A

4.9 5V/3.3V Power Supply

5V power is required by the DDC pull-ups at the HDMI connector. The +5V coming from the mini USB2.0 connector at reference J104 is converted to +3V3 power via PT7M8206 for the entire PI3WVR31313A demo board.

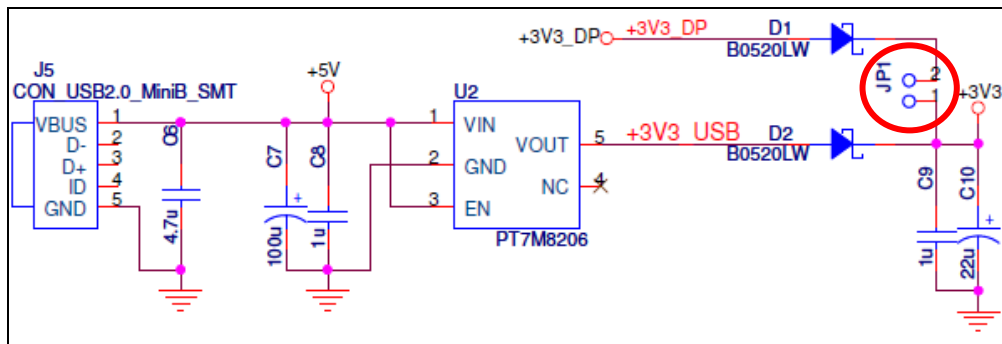


Figure 3: Power Supply of PI3WVR31313A Demo Board Rev.A

The 3.3V coming from input DP connector can be employed to the +3V3 power plane on the demo board via shorting the header pin JP1.

4.10 Power Saving Mode

PI3WVR31313A can enter power saving mode by setting OEB pin to a high voltage level.

OEB	Output TMDS of PI3WVR31313A
1	Power Saving Mode
0	Normal Mode

Table 9: OEB Setting of PI3WVR31313A Demo Board Rev.A

5 References

- (1) High-Definition Multimedia Interface Specification Version 1.4b, HDMI Licensing, LLC, October 11, 2011
- (2) High-Definition Multimedia Interface Specification Version 2.0, HDMI Licensing, LLC, 2013
- (3) High-Definition Multimedia Interface Compliance Test Specification Version 1.4a, HDMI Licensing, LLC, March 4, 2010

6 Appendix A: Demo Board Schematic

For clearer view of schematic diagram, please click the PDF file icon on the right.

