



USB3-GbE VIP IO Board

Evaluation Board User Guide

FPGA-EB-02016-1.0

May 2018

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Acronyms in This Document

A list of acronyms used in this document.

Acronym	Definition
USB	Universal Serial Bus
GbE	Gigabit Ethernet
I ² C	Inter-Integrated Circuit
LDO	Low Dropout
LED	Light-emitting Diode
LVDS	Low-Voltage Differential Signaling
SPI	Serial Peripheral Interface
VIP	Video Interface Platform

1. Introduction

This document describes the Lattice Semiconductor USB3-GbE VIP IO Board. This board is designed to work with the Lattice Video Interface Platform (VIP) board interconnect system.

This user guide includes descriptions of board components, schematics, and bill of materials.

Key features of the USB3-GbE VIP IO Board include:

- Onboard industrial grade TI DP83867IR Gigabit Ethernet PHY with support 10/100/1000 Ethernet
- Onboard Cypress FX3 USB3.1 controller
- Two 60-pin Rugged High-Speed Headers

Figure 1.1 shows the top view of the USB3-GbE VIP IO Board and its key components. Figure 1.2 shows the bottom view of the board.

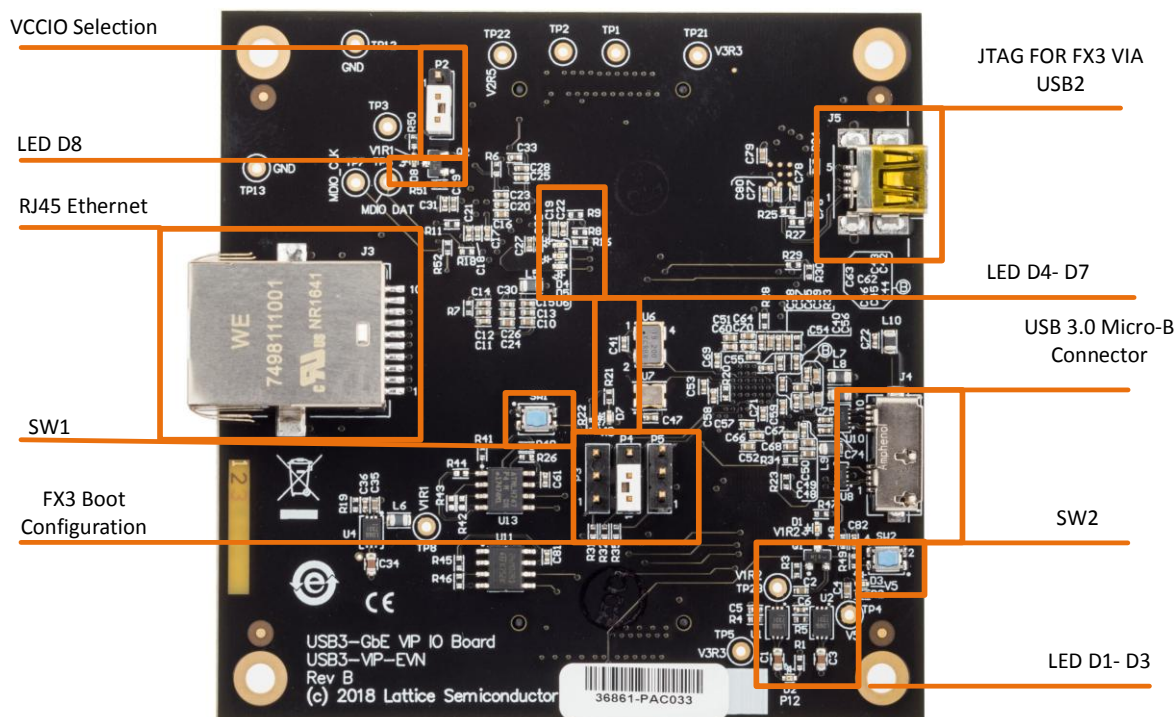


Figure 1.1. Top View of USB3-GbE VIP IO Board

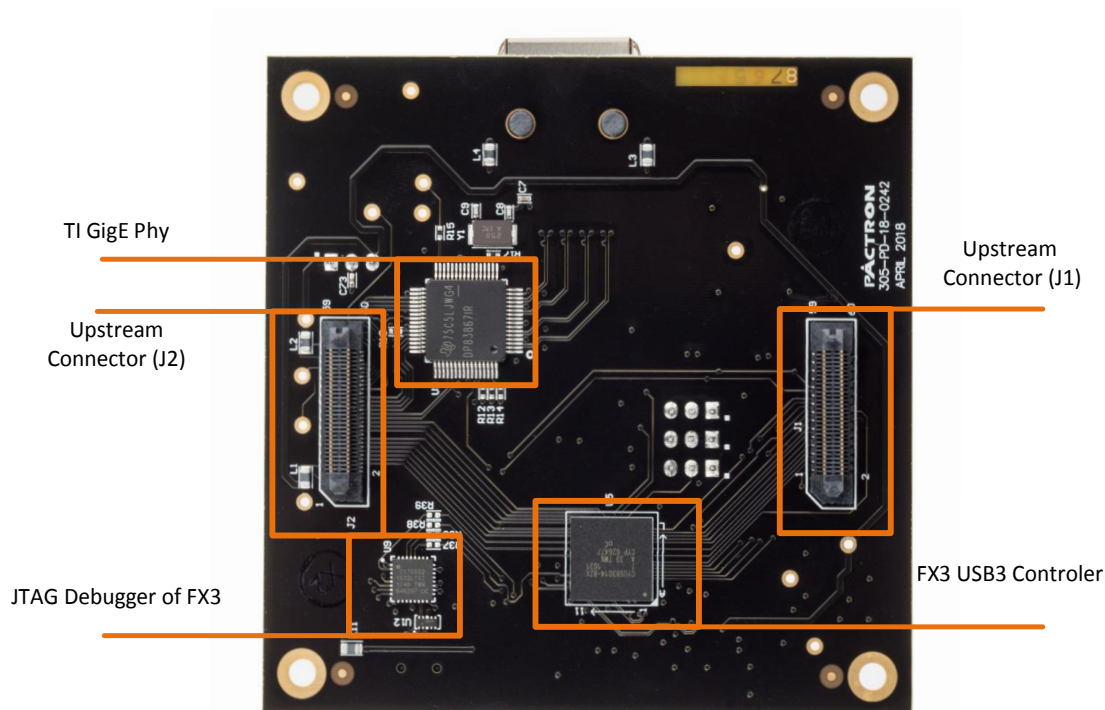


Figure 1.2. Bottom View of USB3-GbE VIP IO Board

1.1. Further Information

The following references provide detailed information on the USB3-GbE VIP IO Board:

- [Appendix A. USB3-GbE VIP IO Board Schematics](#)
- [Appendix B. USB3-GbE VIP IO Board Bill of Materials](#)
- For more information on boards and kits available for the VIP (Video Interface Platform) system visit www.latticesemi.com/vip.
- For details on the Texas Instruments DP83867IR Gigabit Ethernet PHY, visit the Texas Instruments website at www.ti.com.
- For details on the Cypress FX3 USB3.1 controller, visit the Cypress website at www.cypress.com.

2. Functional Description

The USB3-GbE VIP IO Board provides USB3 and Gigabit Ethernet connectivity for the ECP5 VIP Processor Board. The Gigabit Ethernet Phy and the USB3 controller work independently.

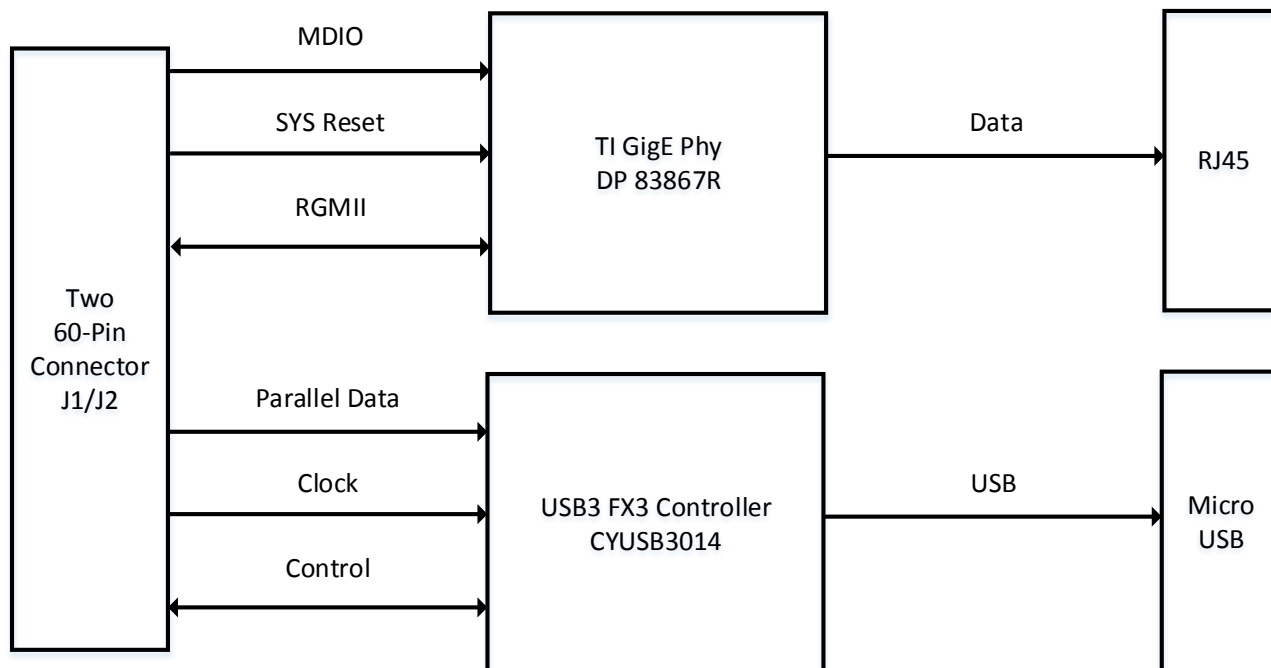


Figure 2.1. Functional Block Diagram

2.1. Switches and Buttons

The push button switch, SW1, is connected to the CTL10_GPIO signal of the FX3 USB Controller. The push button switch, SW2, is connected to the System Reset of the board. Pressing SW2 provides logic 0 to the TI DP83687 and CYUSB3014 Reset pin. The RESET signal is also connected to GSRN on connector J1, allowing SW2 to control the reset signal for other connected boards.

2.2. Gigabit Ethernet Interface

The RJ45 connector, J3, provides Gigabit Ethernet connectivity via a standard Cat6 Ethernet cable.

2.3. USB3 Interface

The USB 3.0 Micro-B connector, J4, provides USB connectivity via a Micro USB 3.0 cable.

3. High-Speed Connectors

The two 60-pin high-speed headers, connectors J1 and J2, are used to connect ECP5 VIP Processor Board.

Table 3.1. Connector J1

J1 Connector Pin	Signal Name	Device - pin	Description
1	GND	—	—
2	P12	—	—
3	CLK_OUT	—	—
4	P12	—	—
5	FX3_D24	FX3 - DQ24	—
6	P12	—	—
7	GND	—	—
8	P12	—	—
9	FX3_D27	FX3 - DQ27	—
10	FX3_D31	FX3 - DQ31	—
11	FX3_D25	FX3 - DQ25	—
12	FX3_D28	FX3 - DQ28	—
13	GND	—	—
14	GND	—	—
15	FX3_D22	FX3 - DQ22	—
16	FX3_SYNC	FX3 - CTL8_GPIO	—
17	FX3_D21	FX3 - DQ21	—
18	FX3_D26	FX3 - DQ26	—
19	GND	—	—
20	GND	—	—
21	FX3_D19	FX3 - DQ19	—
22	FX3_D16	FX3 - DQ16	—
23	FX3_D18	FX3 - DQ18	—
24	MDIO_DATA	DP - MDIO—	MANAGEMENT DATA I/O
26	GND	—	—
27	FX3_SPI_SCK	SPISCK_UARTRTS_GPIO	—
28	SYS_RST_N		Global System Reset
29	FX3_SPI_MOSI	FX3- GPIO_I2SWS	—
30	MDIO_CLK	DP - MDC	MANAGEMENT DATA CLOCK
31	FX3_SPI_MISO	GPIO_I2SMCLK	—
32	FX3_D29	FX3 - DQ29	—
33	FX3_SPI_CS_N	SPISSN_UARTCTS_GPIO	—
34	GND	—	—
35	FX3_FPGA_DONE	FX3 - GPIO_I2SCLK	—
37	FX3_FPGA_INIT_N	FX3 - GPIO_I2SSD	—
40	GND	—	—
41	FX3_I2C_SCL	FX3 - I2C_SCL	I ² C Interface Clock
43	FX3_I2C_SDA	FX3 - I2C_SDA	I ² C Interface Data
46	GND	—	—
52	GND	—	—
55	GND	—	—
25, 36, 38, 39, 42, 44, 45, 47, 48, 49, 50, 51, 53, 54, 56, 57, 59,60	Not Connected	—	—

Table 3.2. Connector J2

J1 Connector Pin	Signal Name	Device - pin	Description
1, 2, 3, 4	3.3V	—	—
5	FX3_D0	FX3 - DQ0	—
6	FX3_D3	FX3 - DQ3	—
7	FX3_D4	FX3 - DQ4	—
8	FX3_D6	FX3 - DQ6	—
9	FX3_D15	FX3 - DQ15	—
10	FX3_D8	FX3 - DQ8	—
11	FX3_D7	FX3 - DQ7	—
12	FX3_D10	FX3 - DQ10	—
13	FX3_PCKTEND_N	FX3 - CTL7_PKTEND	—
14	FX3_D12	FX3 - DQ12	—
15	FX3_SLRD_N	FX3 - CTL3_SLRD	—
16	FX3_D11	FX3 - DQ11	—
17	FX3_D14	FX3 - DQ14	—
18	FX3_D13	FX3 - DQ13	—
19	FX3_PCLK	FX3 - PCLK_CLK—	—
20, 21	GND	—	—
22	FX3_D9	FX3 - DQ9	—
23	FX3_A1	FX3 - CTL11_A1	—
24	FX3_SLCS_N	FX3 - CTL0_SLCS	—
25	FX3_A0	FX3 - CTL12_A0	—
26	FX3_SLWR_N	FX3 - CTL1_SLWR	—
27	FX3_D17	FX3 - DQ12	—
28	RGMII_RXCTRL	DP -RX_DV/RX_CTRL	RECEIVE DATA VALID or RECEIVE CONTROL
29	FX3_D20	FX3 - DQ20	—
30	RGMII_TXCTRL	DP -TX_EN/TX_CTRL	TRANSMIT ENABLE or TRANSMIT CONTROL
31	FX3_D23	FX3 - DQ23	—
32	RGMII_RXD3	DP -RX_D3	RECEIVE DATA Bit 3
33	FX3_D5	FX3 - DQ5	—
35	FX3_D1	FX3 - DQ1	—
36	RGMII_RXD1	DP -RX_D1	RECEIVE DATA Bit 1
37	FX3_D2	FX3 - DQ2	—
38	RGMII_RXD0	DP -RX_D0	RECEIVE DATA Bit 0
39, 40	GND	—	—
41	FX3_FLAG_A	FX3 - CTL4_FLAGA	—
42	RGMII_TXCLK	DP -GTX_CLK	GMII and RGMII TRANSMIT CLOCK
43	FX3_SLOE_N	FX3 - CTL2_SLOE	—
44	RGMII_TXD0	DP -TX_D0	GMII TRANSMIT DATA Bit 0
45	FX3_FLAG_B	FX3 - CTL5_FLAGB—	—
46	RGMII_TXD1	DP -TX_D1	GMII TRANSMIT DATA Bit 1
47	FX3_D30	FX3 - DQ30	—
48	RGMII_TXD2	TX_D2	GMII TRANSMIT DATA Bit 2
49	TP1	—	—
50	RGMII_TXD3	TX_D3	GMII TRANSMIT DATA Bit 3
51	TP2	—	—
52	RGMII_RXCLK	DP -RX_CLK	RECEIVE CLOCK
54	TP3	—	—
53, 55, 56	GND	—	—
57, 58, 59, 60	2.5V	—	—

4. Power Supply

Board power is supplied through connectors J1 and J2. Figure 4.1 shows the power distribution scheme. Header P2 is used to select VCCIO for FX3 and GbE PHY.

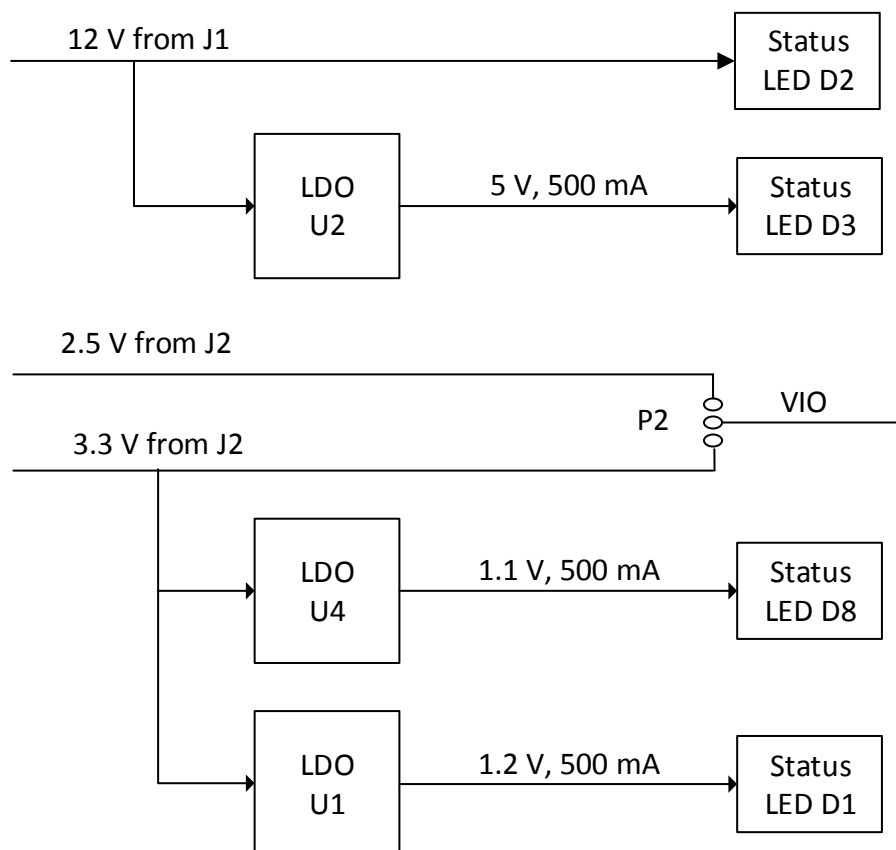


Figure 4.1. Power Distribution Scheme

5. User LEDs and Headers

Eight discrete LEDs (light-emitting diodes) are available to the user.

Table 5.1. User LEDs

Signal	LED #	Source	Color
LED1	D1	1.2 V LDO	Green
LED2	D2	12 V	Green
LED3	D3	5.0 V	Green
LED4	D4	Activity	Yellow
LED5	D5	Speed 1000	Green
LED6	D6	Link up	Blue
LED7	D7	1.1 V LDO	Green
LED8	D8	FX3 user LED	Blue

The USB3-GbE VIP IO Board has four 3-pin configuration headers. Header J2 allows to configure the applied voltage to the board. The user can select either 3.3 V or 2.5 V. Header J3, J4, and J5 provide the bootstrapping options for the Boot selection of the FX3 USB controller.

Table 5.2. Header J2

Description	Header J2 Pin 1	Header J2 Pin2	Header J2 Pin 3
VCCIO	V2R5	VIO	V3R3

Table 5.3. Header J3

Description	Header J3 Pin 1	Header J3 Pin2	Header J3 Pin 3
FX3 Boot Selection	VIO	PMODE0	GND

Table 5.4. Header J4

Description	Header J4 Pin 1	Header J4 Pin2	Header J4 Pin 3
FX3 Boot Selection	VIO	PMODE1	GND

Table 5.5. Header J5

Description	Header J5 Pin 1	Header J5 Pin2	Header J5 Pin 3
FX3 Boot Selection	VIO	PMODE2	GND

6. Ordering Information

Please visit www.latticesemi.com/boards for the latest ordering information.

Table 6.1. Reference Part Number

Description	Ordering Part Number
USB3-GbE VIP IO Board	USB3-VIP-EVN

References

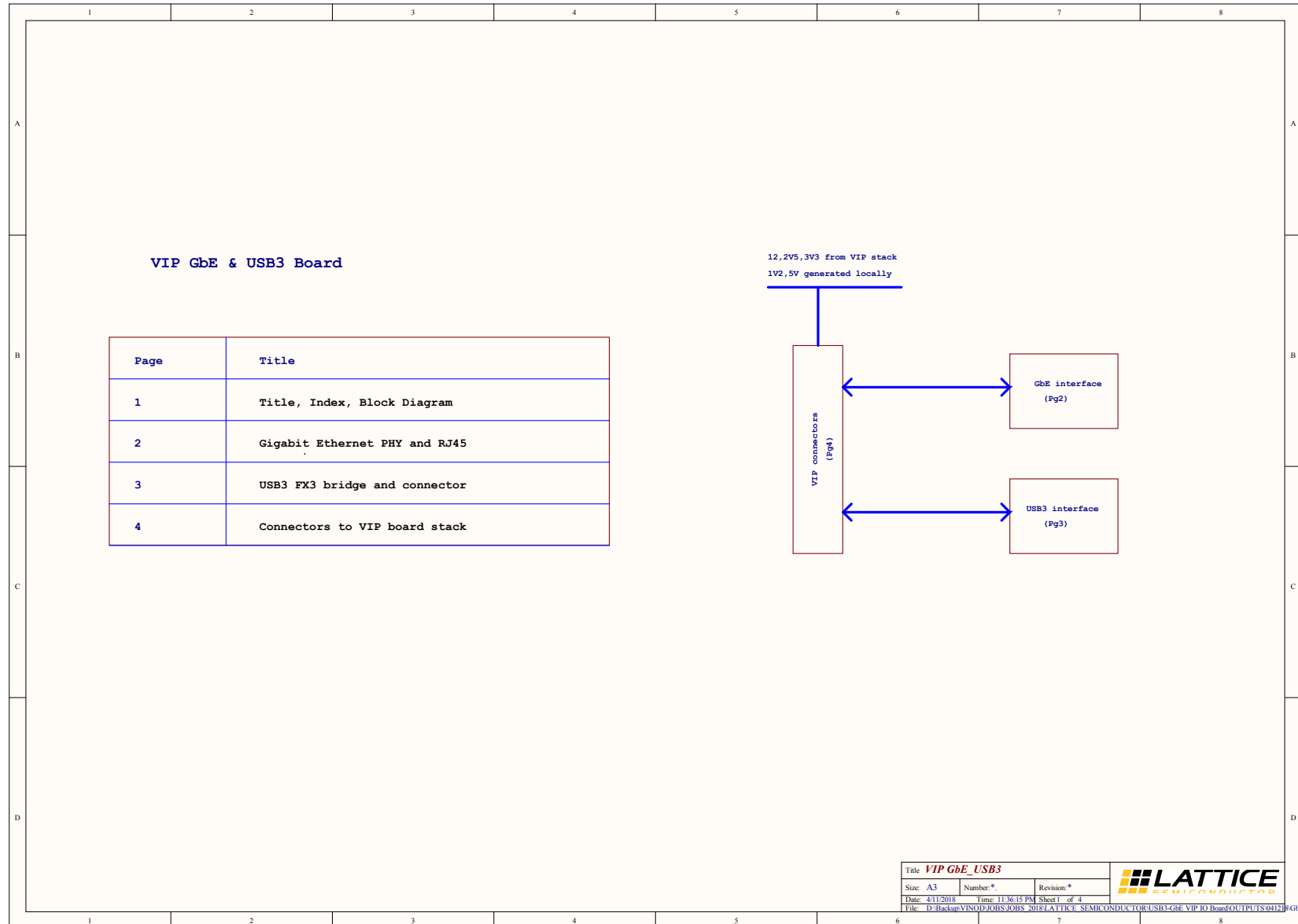
For more information, refer to the following documents:

- [Lattice Embedded Vision Development Kit User Guide \(FPGA-UG-02015\)](#)
- [ECP5 VIP Processing Board \(FPGA-EB-02001\)](#)

Technical Support Assistance

Submit a technical support case through www.latticesemi.com/techsupport.

Appendix A. USB3-GbE VIP I/O Board DisplayPort Schematics





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Appendix B. USB3-GbE VIP IO Board Bill of Materials

Item	Reference	Qty	Value	Comments	Part Number	Manufacturer	Description
1	C1,C3,C34	3	1uF	—	CGA3E3X5R1E105M080 AB	TDK Corporation	Cap 1uF 25V ±20% 0603 (1608 Metric) Thickness 1mm SMD
2	C2,C4,C10,C16,C24,C35,C44,C45,C48,C49,C51,C52,C62,C64,C68	15	10uF	—	GRJ155R60J106ME11D	Murata	Cap 10uF 6.3V ±20% 0402 (1005 Metric) Thickness 0.6mm SMD
3	C5,C6,C14,C15,C21,C22,C23,C30,C31,C32,C33,C36,C38,C40,C41,C43,C46,C47,C50,C53,C54,C55,C56,C61,C63,C65,C69,C71,C72,C73,C74,C75,C78,C80,C81	35	100nF	—	C0402C104M9PACTU	Kemet	Cap 100nF 6.3V ±20% 0402 (1005 Metric) Thickness 0.6mm SMD
4	C7,C12,C13,C18,C19,C20,C26,C27,C28,C29,C76,C82	12	1uF	—	GRM152R60J105ME15 D	Murata	CAP 1uF 6.3V ±20% 0402 (1005 Metric) Thickness 0.6mm SMD
5	C8,C9	2	27pF	—	GRM1555C1H270GA01 D	Murata	Cap 27pF 10V ±2% 0402 (1005 Metric) Thickness 0.6mm SMD
6	C11,C17,C25,C57,C58,C59,C60,C66,C67,C70	10	10nF	—	GRM155R60J103KA01D	Murata	Cap 10nF 6.3V ±10% 0402 (1005 Metric) Thickness 0.6mm SMD
7	C37,C39,C42,C77,C79	5	4.7uF	—	GRM153R60J475ME15 D	Murata	Cap 4.7uF 6.3V ±20% 0402 (1005 Metric) Thickness 0.6mm SMD
8	D1,D2,D3,D5,D8	5	APG1005CGC-T	—	APG1005CGC-T	Kingbright	LED GREEN CLEAR 0402 SMD
9	D4	1	APHHS1005SYCK	—	APHHS1005SYCK	Kingbright	LED YELLOW CLEAR 0402 SMD
10	D6,D7	2	APHHS1005LQBC/D-V	—	APHHS1005LQBC/D-V	Kingbright	LED BLUE CLEAR SMD
11	H1,H2,H3,H4	4	M HOLE	DNL	—	—	Hole M3 -No component mounted
12	J1,J2	2	ERM5-030-050-L-DV-K-TR	—	ERM5-030-05.0-L-DV-K-TR	Samtec Inc	Conn High Speed Edge Rate Terminal Strip HDR 60 POS 0.5mm Solder ST SMD T/R -
13	J3	1	7498111001	—	7498111001	Wurth	CONN MAGJACK 1PORT 1000 BASE-T
14	J4	1	GSB443133HR	—	GSB443133HR	Amphenol	USB3.1 MICRO B R/A SMT 30U

Item	Reference	Qty	Value	Comments	Part Number	Manufacturer	Description
15	J5	1	67503-1020	—	67503-1020	Molex	CONN RECEPT MINIUSB R/A 5POS SMD
16	L1,L2,L3,L4,L5,L6,L7,L8,L9,L10,L11	11	MPZ2012S601AT000	—	MPZ2012S601AT000	TDK	FERRITE BEAD 600 OHM 0805 1LN
17	M1,M2,M3,M4	4	MIRE	DNL	—	—	Assembly target -No component mounted
18	P2,P3,P4,P5	4	HDR1X3	Regular 100 Mil Header	—	—	Header, 3-Pin
19	Q1,Q2	2	MMBT2222LT1G	—	MMBT2222LT1G	ON Semiconductor	TRANS NPN 30V 0.6A SOT23
20	R1	1	2K Ohm	—	RC0402FR-072KL	Yageo	2K 0.063W 1% 0402 (1005 Metric) SMD
21	R2	1	1k Ohm	—	RC0402FR-071KL	Yageo	1K 0.063W 1% 0402 (1005 Metric) SMD
22	R3,R22,R31,R32,R35,R51	6	10K Ohm	—	RC0402JR-0710KL	Yageo	10K 0.063W 5% 0402 (1005 Metric) SMD
23	R4	1	120K Ohm	—	RC0402FR-07120KL	Yageo	120K 0.063W 1% 0402 (1005 Metric) SMD
24	R5	1	499K Ohm	—	RC0402FR-07499KL	Yageo	499K 0.063W 1% 0402 (1005 Metric) SMD
25	R6,R15,R20,R28	4	402 Ohm	—	RC0402FR-07402RL	Yageo	402R 0.063W 1% 0402 (1005 Metric) SMD
26	R7	1	11K Ohm	—	RC0402FR-0711KL	Yageo	11K 0.063W 1% 0402 (1005 Metric) SMD
27	R8	1	5.76K Ohm	—	RC0402FR-075K76L	Yageo	5.76K 0.063W 1% 0402 (1005 Metric) SMD
28	R9	1	2.49K Ohm	—	RC0402FR-072K49L	Yageo	2.49K 0.063W 1% 0402 (1005 Metric) SMD
29	R10,R52	2	22 Ohm	—	RC0402FR-0722RL	Yageo	22R 0.063W 1% 0402 (1005 Metric) SMD
30	R11,R16,R23,R24,R26,R29,R30,R40,R41,R45,R48	11	4.7K Ohm	—	RC0402FR-074K7L	Yageo	4K7 0.063W 1% 0402 (1005 Metric) SMD
31	R12,R13,R14,R21	4	560 Ohm	—	RC0402FR-07560RL	Yageo	560R 0.063W 1% 0402 (1005 Metric) SMD

Item	Reference	Qty	Value	Comments	Part Number	Manufacturer	Description
32	R17	1	1M Ohm	—	RC0402FR-071ML	Yageo	1M 0.063W 1% 0402 (1005 Metric) SMD
33	R18	1	2.2K Ohm	—	RC0402FR-072K2L	Yageo	2.2K 0.063W 1% 0402 (1005 Metric) SMD
34	R19	1	110K Ohm	—	RC0402FR-07110KL	Yageo	110K 0.063W 1% 0402 (1005 Metric) SMD
35	R25	1	4.7K Ohm	DNL	RC0402FR-074K7L	Yageo	4K7 0.063W 1% 0402 (1005 Metric) SMD
36	R27	1	10K Ohm	DNL	RC0402JR-0710KL	Yageo	10K 0.063W 5% 0402 (1005 Metric) SMD
37	R33	1	6.04K Ohm	—	RC0402FR-076K04L	Yageo	6.04K 0.063W 1% 0402 (1005 Metric) SMD
38	R34	1	200 Ohm	—	RC0402JR-07200RL	Yageo	200R 0.063W 5% 0402 (1005 Metric) SMD
39	R36,R37,R38,R39,R42,R43,R44	7	0 Ohm	DNL	RC0402JR-070RP	Yageo	0 0.063W 1% 0402 (1005 Metric) SMD
40	R46	1	0 Ohm	—	RC0402JR-070RP	Yageo	0 0.063W 1% 0402 (1005 Metric) SMD
41	R47,R50	2	470	—	ERJ-2RKF4700X	Panasonic	RES SMD 470 OHM 1% 1/10W 0402
42	R49	1	100	—	CRCW0402100RFKED	Vishay-Dale	RES, 100, 1%, 0.063 W, 0402
43	SW1,SW2	2	SWPB	—	434153017835	Wurth	Switch PB SPST-NO 0.05A 12V
44	TP1,TP2,TP3,TP4,TP5,TP6,TP7,TP8,TP12,TP13,TP21,TP22,TP23	13	TP	DNL	5003	Keystone	Test Point, Orange, 1-Pin THD, RoHS
45	U1,U2,U4	3	LT3085	—	LT3085EDCB#TRMPBF	Linear Technology	IC REG LDO ADJ 0.5A 6DFN
46	U3	1	DP83867	—	DP83867IRPAPR	Texas Instruments	IC ETHERNET PHY 64HTQFP
47	U5	1	CYUSB3014	—	CYUSB3014-BZXI	Cypress	IC ARM9 USB CONTROLLER 121FBGA
48	U6	1	OSC_19M2	—	KC5032A19.2000CM0E00	Kyocera	Oscillator 19.2MHz - 5x3.2mm package
49	U7	1	OSC_32768	—	ECS-327KE-TR	ECS	Oscillator 32.768KHz - 3.2x2.5mm package

Item	Reference	Qty	Value	Comments	Part Number	Manufacturer	Description
50	U8,U10,U12	3	SP3010-04UTG	—	SP3010-04UTG	Littelfuse	TVS DIODE 6V 12.3V 10UDFN
51	U9	1	CY7C65215	—	CY7C65215-32LTXI	Cypress	IC USB TO SERIAL BRIDGE 32QFN
52	U11	1	M24M02	—	M24M02-DRMN6TP	STMicroelectronics	IC EEPROM 2MBIT 1MHZ 8SO
53	U13	1	AT24MAC402	—	AT24MAC402-SSHM	Microchip	IC EEPROM 2KBIT 1MHZ 8SOIC
54	Y1	1	ABM3-25	—	ABM3-25.000MHZ-D2Y-T	Abracon	CRYSTAL 25.0000MHZ 18PF SMD
55	USB3-GbE VIP IO BOARD REVB PCB	1	—	—	305-PD-18-0242	PACTRON	—

Revision History

Date	Version	Change Summary
May 2018	1.0	Initial release.



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