



ECP5 VIP Processor Board

Evaluation Board User Guide

FPGA-EB-02001 Version 1.2

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Acronyms in This Document

A list of acronyms used in this document.

Acronym	Definition
CMOS	Complementary Metal-Oxide Semiconductor
CSI-2	Camera Serial Interface
DDR	Double Data Rate
DSI	Display Serial Interface
FTDI	Future Technology Devices International
GPIO	General Purpose Input/Output
I ² C	Inter-Integrated Circuit
LVDS	Low-Voltage Differential Signaling
SPI	Serial Peripheral Interface
VIP	Video Interface Platform
VTT	Tracking Termination Voltage

1. Introduction

This document describes the Lattice Semiconductor ECP5 VIP Processor Board which is a key component of Lattice's Video Interface Platform (VIP) board interconnect. Lattice VIP boards can be interconnected to create solutions for MIPI® CSI-2/DSI, SERDES, LVDS and more.

The content of this user guide includes descriptions of onboard jumper settings, programming circuit, a complete set of schematics, and bill of materials for ECP5 VIP processor board.

Key features of the ECP5 VIP processor board include:

- ECP5/5G
 - SERDES interface
 - Dual DDR3 interface
 - LVDS/MIPI Transmitter/Receiver interface
 - SPI flash configuration
 - General Purpose Input/Output
- Programming Circuit
 - Mini-B USB connector to FTDI
 - FTDI to ECP5 using JTAG
 - FTDI to ispClock using JTAG
- ispClock
 - SERDES reference clock generation interface

Figure 1.1 on the next page shows the top view of the ECP5 VIP processor board and its key components. Figure 1.2 shows the bottom view of the board.

1.1. Further Information

- For more information on boards and kits available for the VIP system, visit www.latticesemi.com/boards
- The board's key component is the ECP5™ FPGA. For details about ECP5, refer to FPGA-DS-02012, [ECP5 and ECP5-5G Family Data Sheet](#).
- For the latest information about this board, demo files, further documentation and more, visit www.latticesemi.com/Products/FPGAandCPLD/ECP5.aspx
- Refer to [Appendix A](#) and [Appendix B](#) for the schematics and BOM of the ECP5 VIP processor board.

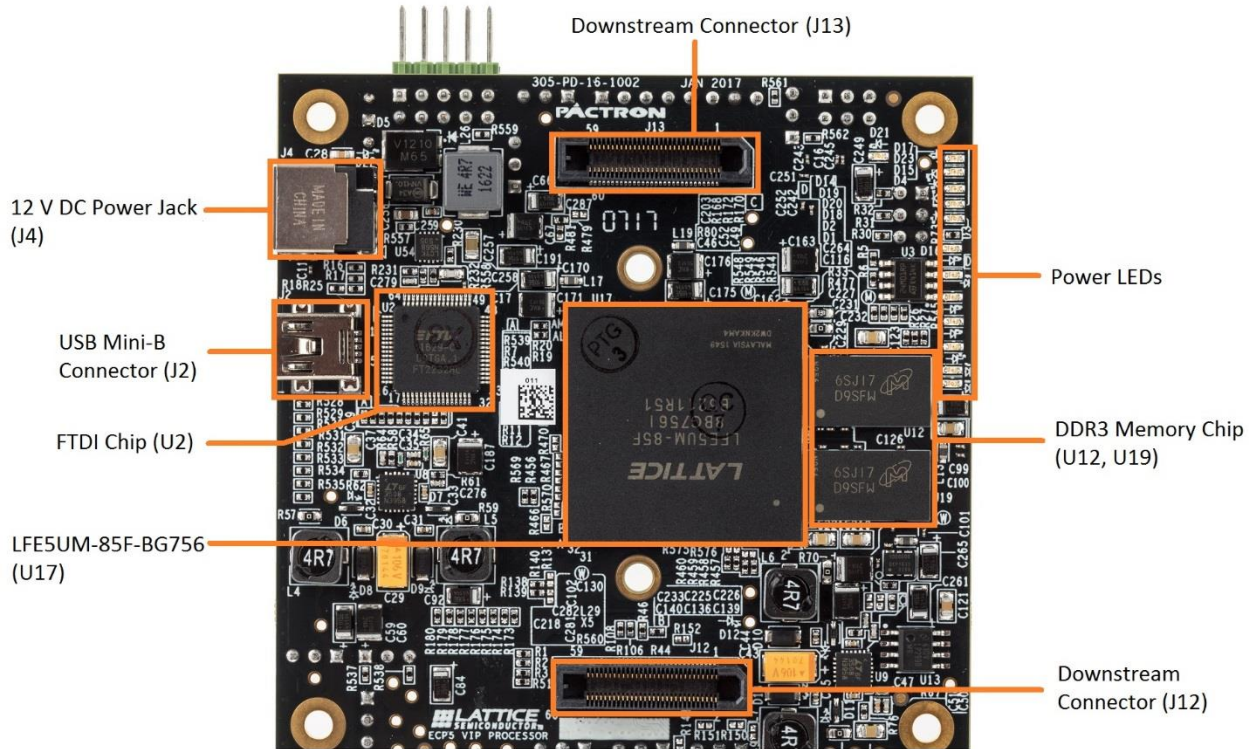


Figure 1.1. Top View of ECP5 VIP Processor Board and its Key Components

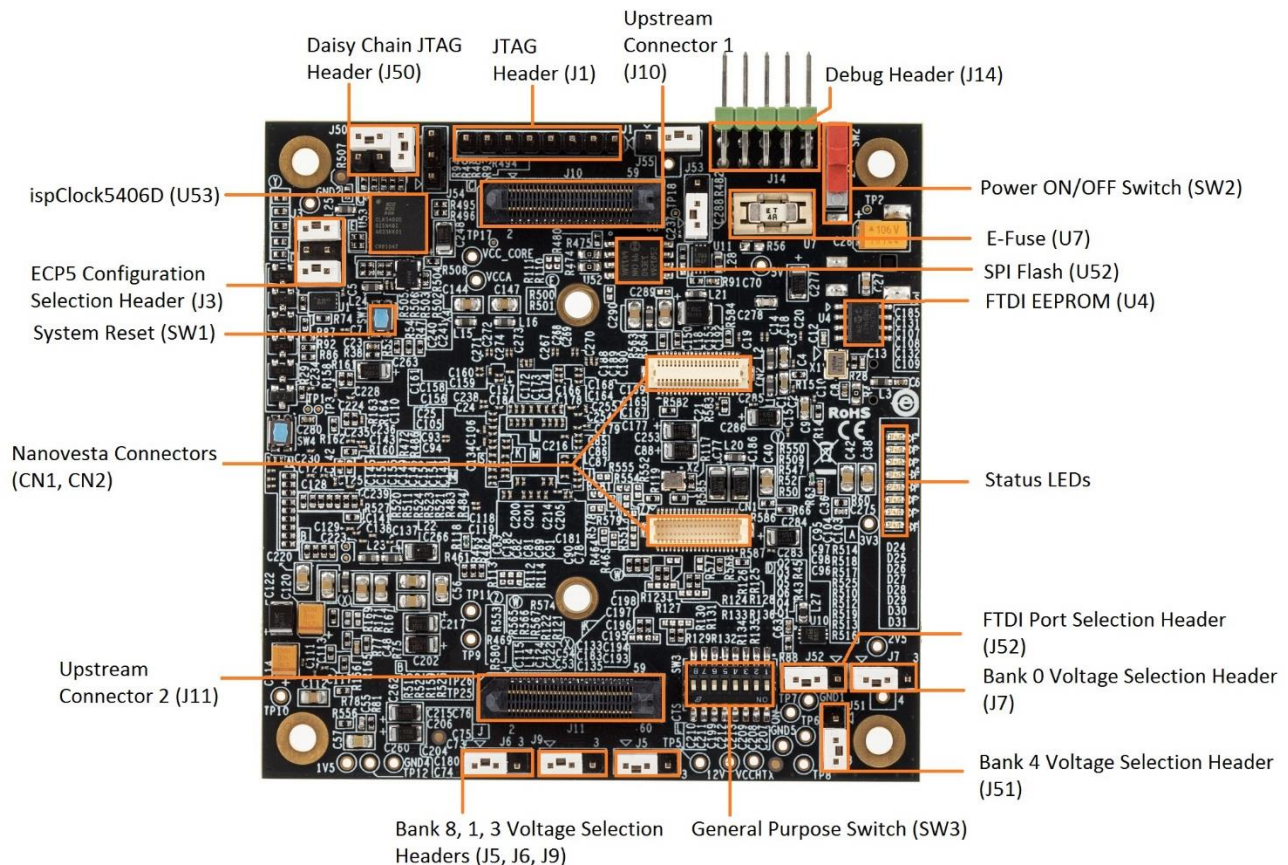


Figure 1.2. Bottom View of ECP5 VIP Processor Board

2. Headers and Test Connections

Figure 1.1 shows the top view of the ECP5 VIP processor board. The headers and test connections on the board provide access to ECP5 VIP processor board circuits. Table 2.1 lists the headers and test connectors.

Table 2.1. Headers and Test Connectors

Part	Description	Setting
J1	External JTAG interface	—
J2	Mini-B USB connector for programming	—
J52	JTAG/SPI Selection header	1–2 (SPI), 2–3 (JTAG)
J50	JTAG Daisy Chain connector	Refer to Schematic note in Appendix A
J3	ECP5 Configuration mode selection header	Refer to Schematic note in Appendix A
J53	FTDI Mode selection	1–2 (Normal), 2–3 (Reset)
J4	12 V DC power jack	—
J5, J6, J51, J9	ECP5 Banks 8, 1, 3, 4 voltage selection	1–2 (3V3), 2–3 (2V5)
J7, J55	ECP5 Banks 0, 2 voltage selection	1–2 (3V3), 2–3 (2V5), 2–4 (CN1/CN2_VCC)
J14	Debug Header	—
SW1	Global reset	—
SW4	Program reset for reprogram	—
SW3	General purpose DIP switches	—
SW2	Power on switch	—
J54	ispClock 5406 reference clock selector	1–2 (External), 2–3 (Internal)
CN2	Nanovesta serial interface connector	—
CN1	Nanovesta parallel interface connector	—
J10, J11	General purpose upstream connector	—
J12, J13	General purpose downstream connector	—

3. Programming Circuit

The Mini-B USB connector is used for programming the board by using Lattice Diamond® Programmer software. [Figure 3.1](#) shows the programming block of ECP5 VIP processor board.

The Mini-B USB connector interfaces to the FTDI FT2232H IC. The FTDI IC works with Diamond programmer software to provide interfaces for:

- JTAG – to program LFE5UM-85F and its SPI Flash and ispClock
- SPI – to program external devices connected to the ECP5 VIP processor board

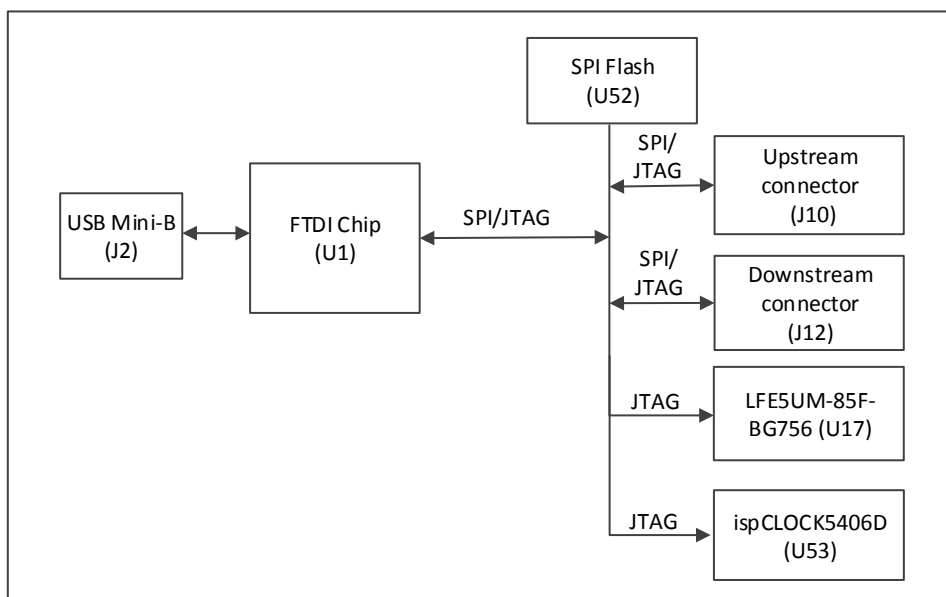


Figure 3.1. Programming Block using USB Interface

4. ECP5 Interface Support

The ECP5 VIP processor board supports various onboard interfaces and external interfaces through board-to-board connectors. The sections below describe key onboard interfaces supported on ECP5 VIP processor board.

4.1. Clock Interface

Clocking for the ECP5 device on the ECP5 VIP processor board can be done through onboard fixed frequency crystal oscillators, and also internal OSC built inside the ECP5 device. The board has 100 MHz fixed frequency OSC to support DDR3 Memory controller, and 27 MHz to support MIPI/LVDS related interfaces.

4.2. DDR3 Interface

Figure 4.1 shows the block diagram of the DDR3 Interface. The LFE5UM-85F-BG756 (U17) device DDR3 memory controller is used to interface with onboard DDR3 memory device and it supports a single rank and multiple memory devices connected on the board.

Each memory device supports 16-bit parallel data with 1 Gb memory capacity. The combined capacity supported is 2 Gb. The DDR3 memory controller can be configured to support either 32-bit or 16-bit wide memory interface by enabling the chip select signals for both memory devices.

This board is designed to support both on board VTT termination as well as on-die termination and can be configured by memory controller.

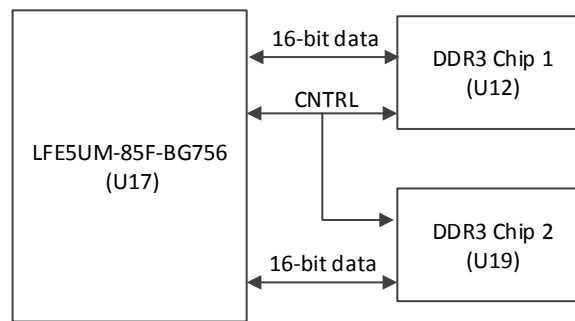


Figure 4.1. DDR3 Interface

4.3. Nanovesta Interface

Figure 4.2 shows the block diagram of the Nanovesta connector interface. The LFE5UM-85F-BG756 (U17) device receives camera input from the Nanovesta connectors. Pin mapping of the Nanovesta connector interface is designed such that the legacy Lattice Nanovesta camera sensor boards can be interfaced with ECP5 VIP processor board. It supports both parallel and SLVS interface for receiving camera input from sensor module.

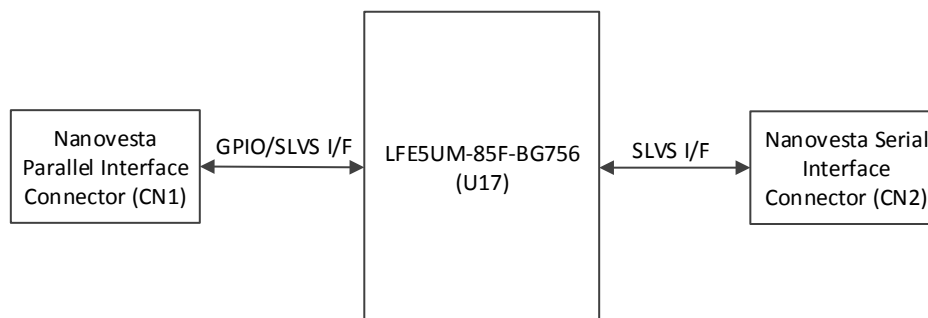


Figure 4.2. Nanovesta Connector Interface

4.4. Upstream and Downstream interface

Figure 4.3 shows the block diagram of the Upstream and Downstream connector. Upstream and Downstream connectors act as board to board connector and are used to interface the ECP5 VIP processor board to any other external boards for bridging applications. These connectors support interfaces, such as LVDS, MIPI, SPI, JTAG, SERDES and general purpose interface.

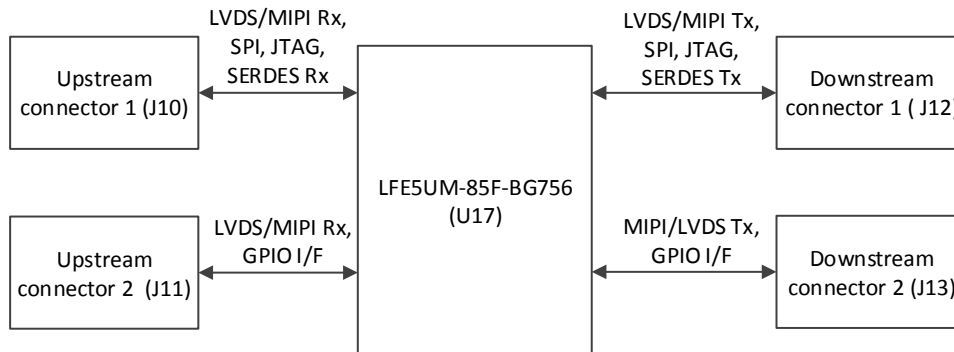


Figure 4.3. Upstream and Downstream Connector

4.5. ispClock5406D Interface

Figure 4.4 shows the block diagram of the ispClock5406D interface. For more information on Lattice ispClock, visit www.latticesemi.com/ispclock.

The ispClock5406D device can be programmed using JTAG through FTDI interface. This circuitry is used as a reference clock generation circuit for the ECP5 SERDES interface. The input clock source for the reference clock generation circuit can be onboard oscillator or the PLL output from ECP5 FPGA which can be selected by the ref_sel input of the ispClock5406D.

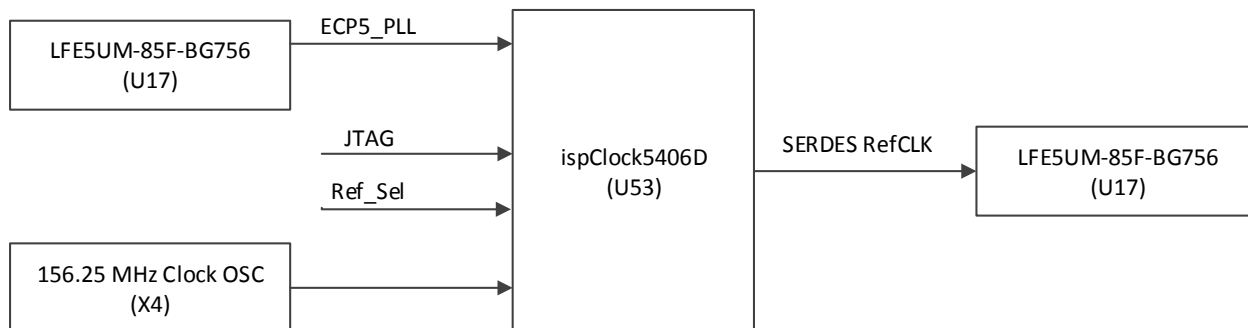


Figure 4.4. ispClock5406D Interface

4.6. Debugging Interface

The ECP5 VIP processor board supports onboard debugging in the form of JTAG, GPIO Headers and onboard DIP switches. Table 4.1–Table 4.3 list the ECP5 ball mapping for the debugging interfaces.

Table 4.1. Header (J14)

Header (J14) Pin Number	Net Name	ECP5 Ball number
4	Header1	AK32
6	Header2	AJ32
8	Header3	AM30
10	Header4	AL30
1	Header5	AQK31
3	Header6	AJ31
5	Header7	AM31
7	Header8	AL32
2	VCCIO2	—
9	GND	—

Table 4.2. Switch (SW3)

Switch (SW3) Pin Number	Net Name	ECP5 Ball Number
1	SW1	B26
2	SW2	C26
3	SW3	D26
4	SW4	A28
5	SW5	A29
6	SW6	A30
7	SW7	A31
8	SW8	B28

Table 4.3. JTAG Connector (J1)

JTAG Connector (J1) Pin Number	Net Name
1	3V3
2	FTDI_TDO
3	FTDI_TDI
4	NC
5	NC
6	FTDI_TMS
7	GND
8	FTDI_TCK

5. Power Supply

The power supply to the development kit is provided from an external 12 V DC adaptor.

Figure 5.1 shows the power supply block of the ECP5 VIP processor board. The Mini-B USB connector is used only for programming and the external power adaptor must be connected to source power for the on board regulators for the normal operation and successful programming.

The external adaptor provides 12 V power source through voltage regulators on the board as well as to the external boards connected to Nanovesta, upstream and downstream connectors. Each I/O bank voltage can be selected by putting jumpers on J5, J6, J7, J9, J51, J55. See Table 5.1 for the voltage selection. All voltage generation from the onboard regulator can be measured by a respective test point on the board.

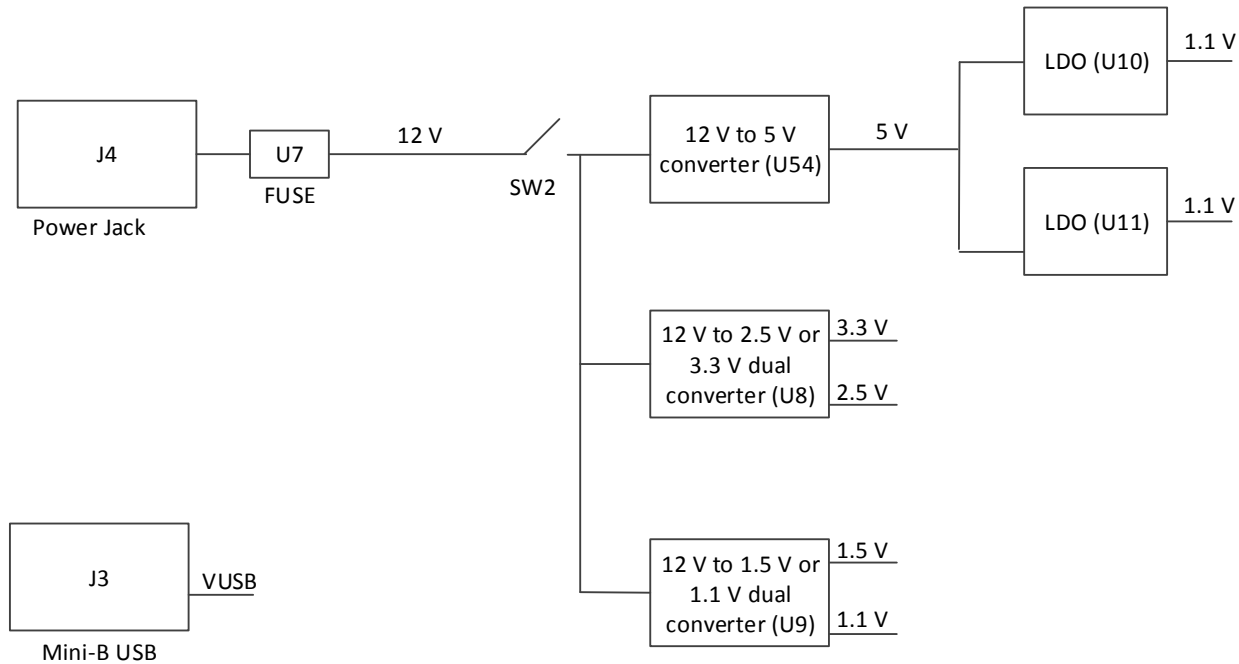


Figure 5.1. Power Supply Block

Table 5.1 lists the device power rails. There are five voltage regulators on the board used to supply the 5 V, 3.3 V, 2.5 V, 1.5 V, and 1.1 V rails. The input to these regulators is either the external 12 V adaptor or on board regulators that is connected to the board. Switch SW2 is used to connect or disconnect the external adaptor power to the board.

Table 5.1. Power LEDs

Voltage Rail	LEDs	Colour
12	D15	Green
5	D23	Green
3.3	D17	Green
2.5	D14	Green
1.5	D16	Green
VCC_CORE	D18	Green
VCCA	D19	Green
VCCTX	D20	Green

Table 5.2 lists the board voltage rails, including the rail source voltage, test point number, and voltage on net.

Table 5.2. Device Power Rail Summary and Test Points

Net Name	Source Rail	Test Points	Voltage on Net (V)
12 V	12_Ext	—	12
5 V	12 V	5V	5
3V3	12 V	3V3	3.3
2V5	12 V	2V5	2.5
1V5	12 V	1V5	1.5
VCC_CORE	12 V	VCC_CORE	1.1
VCCHTX	5 V	VCCHTX	1.1
VCCA	5 V	VCCA	1.1

6. ECP5 I/O Ball Mapping to Connectors

Table 6.1. Upstream Connector Mapping

J10			J11		
Pin number on Connector	Net Name	ECP5 Ball	Pin Number on Connector	Net Name	ECP5 Ball
1	3V3	—	1	3V3	—
2	5V	—	2	3V3	—
3	3V3	—	3	3V3	—
4	5V	—	4	3V3	—
5	GND	—	5	UP_GPIO9	F29
6	5V	—	6	UP_GPIO17	A13
7	LVDS_CP	P27	7	UP_GPIO10	F28
8	GND	—	8	UP_GPIO18	A8
9	LVDS_CN	P26	9	UP_GPIO1	C29
10	LVDS_D2P	J30	10	UP_GPIO19	F9
11	GND	—	11	UP_GPIO2	C30
12	LVDS_D2N	K30	12	UP_GPIO20	D9
13	LVDS_D0P	D30	13	LDI_RX_D3_P	F32
14	GND	—	14	UP_GPIO21	C9
15	LVDS_D0N	D31	15	LDI_RX_D3_N	H32
16	LVDS_D3P	L31	16	UP_GPIO22	A9
17	GND	—	17	GND	—
18	LVDS_D3N	L30	18	GND	—
19	LVDS_D1P	K32	19	GND	—
20	GND	—	20	GND	—
21	LVDS_D1N	L32	21	LDI_RX_D2_P	J29
22	2V5	—	22	GND	—
23	GND	—	23	LDI_RX_D2_N	K29
24	2V5	—	24	UP_GPIO25	C10
25	DIR_GPIO3	—	25	UP_GPIO33	D13
26	GND	—	26	UP_GPIO26	B10
27	UP_MCLK	—	27	UP_GPIO34	C13
28	GSRN	AH1	28	UP_GPIO27	A10
29	UP_SISPI	—	29	LDI_RX_D0_P	K27
30	UP_GPIO48	C16	30	UP_GPIO28	E11
31	UP_SPI50	—	31	LDI_RX_D0_N	K26
32	UP_GPIO49	B16	32	UP_GPIO29	D11
33	UP_CSSPIN	—	33	GND	—
34	GND	—	34	UP_GPIO30	C11
35	UP_CDONE	—	35	GND	—
36	HDRXP0_D1CH0	AM17	36	GND	—
37	UP_CRESETB	—	37	LDI_RX_D1_P	J26
38	HDRXN0_D1CH0	AM18	38	GND	—
39	DIR_GPIO4	—	39	LDI_RX_D1_N	J27
40	GND	—	40	GND	—
41	SCL	AG1	41	UP_GPIO31	B11
42	HDRXP0_D1CH1	AM20	42	UP_GPIO39	B14

Table 6.1. Upstream Connector Mapping (Continued)

J10			J11		
Pin number on Connector	Net Name	ECP5 Ball	Pin Number on Connector	Net Name	ECP5 Ball
43	SDA	AJ1	43	UP_GPIO32	F13
44	HDRXNO_D1CH1	AM21	44	UP_GPIO40	A14
45	FTDI_TCK	AK5	45	UP_GPIO37	D14
46	GND	—	46	UP_GPIO41	B4
47	FTDI_TDO	—	47	UP_GPIO38	C14
48	HDRXP0_D0CH0	AM8	48	UP_GPIO42	F15
49	FTDI_TDI	—	49	UP_GPIO45	A15
50	HDRXNO_D0CH0	AM9	50	UP_GPIO43	D15
51	FTDI_TMS	AM5	51	UP_GPIO50	D17
52	GND	—	52	UP_GPIO44	C15
53	DIR_GPIO5	—	53	GND	—
54	HDRXP0_D0CH1	AM11	54	GND	—
55	GND	—	55	GND	—
56	HDRXNO_D0CH1	AM12	56	GND	—
57	GND	—	57	2V5	—
58	GND	—	58	2V5	—
59	GND	—	59	2V5	—
60	DIR_GPIO1	—	60	2V5	—

Table 6.2. Downstream Connector Pin Mapping

J12			J13		
Pin number on Connector	Net Name	ECP5 Ball	Pin number on Connector	Net Name	ECP5 Ball
1	GND	—	1	3V3	—
2	12V	—	2	3V3	—
3	MIPITX_CLKP	A18	3	3V3	—
4	12V	—	4	3V3	—
5	MIPITX_CLKN	C18	5	LDI_TX_D0_P	W31
6	12V	—	6	LDI_TX_D1_P	AB30
7	GND	—	7	LDI_TX_D0_N	Y32
8	12V	—	8	LDI_TX_D1_N	AB29
9	MIPITX_DATA0P	F18, R27	9	LDI_TX_D3_P	R32
10	MIPITX_DATA2P	D19, U29	10	LDI_TX_D2_P	AD27
11	MIPITX_DATA0N	A19, T27	11	LDI_TX_D3_N	T31
12	MIPITX_DATA2N	E19, V29	12	LDI_TX_D2_N	AE27
13	GND	—	13	DW_GPIO5	T29
14	GND	—	14	DW_GPIO27	AB28
15	MIPITX_DATA1P	B19, R29	15	DW_GPIO6	U28
16	MIPITX_DATA3P	F19, P31	16	DW_GPIO28	AB27
17	MIPITX_DATA1N	C19, T28	17	DW_GPIO7	V27
18	MIPITX_DATA3N	P30, A20	18	DW_GPIO29	AC26
19	GND	—	19	DW_GPIO8	V26
20	GND	—	20	GND	—
21	DW_GPIO46	A25	21	GND	—

Table 6.2. Downstream Connector Pin Mapping (Continued)

J12			J13		
Pin number on Connector	Net Name	ECP5 Ball	Pin number on Connector	Net Name	ECP5 Ball
22	DW_GPIO48	D25	22	DW_GPIO30	AD26
23	DW_GPIO47	C25	23	DW_GPIO44	C24
24	DW_GPIO49	E25	24	DW_GPIO23	Y27
25	DIR_GPIO3	—	25	DW_GPIO45	D24
26	GND	—	26	DW_GPIO24	W28
27	ECP_SCLK	AM3	27	DW_GPIO11	P32
28	GSRN	AH1	28	DW_GPIO33	AE29
29	ECP_MOSI	AK2	29	DW_GPIO12	U31
30	DW_GPIO50	F25	30	DW_GPIO25	Y29
31	ECP_MISO	AJ2	31	DW_GPIO3	U27
32	DW_GPIO51	F17	32	DW_GPIO26	W29
33	FPGA_CSN	AG3	33	DW_GPIO4	U26
34	GND	—	34	DW_GPIO36	AC28
35	DW_DONE	AJ4	35	DW_GPIO15	W30
36	HDTXP0_D0CH0	AK9	36	DW_GPIO1	T30
37	DW_INITN	AG4	37	DW_GPIO16	Y30
38	HDTXN0_D0CH0	AK10	38	DW_GPIO2	N32
39	DIR_GPIO4	—	39	GND	—
40	GND	—	40	GND	—
41	SCL	AG1	41	DW_GPIO17	T32
42	HDTXP0_D0CH1	AK12	42	DW_GPIO39	AC31
43	SDA	AJ1	43	DW_GPIO18	AC30
44	HDTXN0_D0CH1	AK13	44	DW_GPIO40	AB32
45	FTDI_TCK	AK5	45	DW_GPIO19	AB31
46	GND	—	46	DW_GPIO41	AC32
47	FTDI_TDO	—	47	DW_GPIO20	V32
48	HDTXP0_D1CH0	AK18	48	DW_GPIO42	AD32
49	FTDI_TDI	—	49	DW_GPIO21	W32
50	HDTXN0_D1CH0	AK19	50	DW_GPIO43	A24
51	FTDI_TMS	AM5	51	DW_GPIO22	Y26
52	GND	—	52	LDI_TX_CK_P	R26
53	DIR_GPIO5	—	53	GND	—
54	HDTXP0_D1CH1	AK21	54	LDI_TX_CK_N	T26
55	GND	—	55	GND	—
56	HDTXN0_D1CH1	AK22	56	GND	—
57	VCCHTX	—	57	2V5	—
58	GND	—	58	2V5	—
59	VCCHTX	—	59	2V5	—
60	DIR_GPIO1	—	60	2V5	—

Table 6.3. Nanovesta Connector Pin Mapping

Connector 1 (CN2) Top - High SPI to Sensor			Connector 1 (CN1) Top - Parallel up to Sensor1		
Pin number on Connector	Net Name	ECP5 Ball	Pin number on Connector	Net Name	ECP5 Ball
1	5V	—	1	5V	—
2	5V	—	2	5V	—
3	CN2_VCC	—	3	CN1_VCC	—
4	VDDIO_RP	—	4	VDDIO_RH	A16
5	GND	—	5	GND	—
6	GND	—	6	GND	—
7	GND	—	7	GND	—
8	GND	—	8	GND	—
9	—	—	9	EXTCLK_FPGA	B17
10	HISPI_RESETN	C8	10	PIXCLK	C17
11	SLVS_3N	E30	11	LINE_VALID	A4
12	SLVS_5N	N29	12	FRAME_VALID	A5
13	SLVS_3P	F30	13	DOUT6	F11
14	SLVS_5P	N30	14	DOUT4	E10
15	PANASONIC_B1N	H30	15	SLVS_6N	D32
16	SLVS_CN	N26	16	SLVS_8N	H28
17	PANASONIC_B1P	H31	17	SLVS_6P	C32
18	SLVS_CP	N27	18	SLVS_8P	H27
19	SLVS_2N	C31	19	SLVS_7N	L29
20	PANASONIC_B0N	J32	20	SLVS_9N	L27
21	SLVS_2P	B32	21	SLVS_7P	K28
22	PANASONIC_B0P	K31	22	SLVS_9P	L26
23	SLVS_4N	E32	23	DOUT11	F14
24	SLVS_0N	D28	24	DOUT9	A11
25	SLVS_4P	F31	25	SIGNAL_TRIGGER	D7
26	SLVS_0P	C28	26	SADDR	F8
27	SLVS_1N	E29	27	RESET_BAR	C7
28	RESERVED	B8	28	SDCLK	E8
29	SLVS_1P	D29	29	OUTPUT_EN_BAR	B7
30	HISPI_SDA	A2	30	SDATA	D8
31	—	—	31	STANDBY	A7
32	HISPI_SCLK	A3	32	OSC_EN	B3
33	GND	—	33	GND	—
34	GND	—	34	GND	—
35	GND	—	35	GND	—
36	GND	—	36	GND	—
37	CN2_VCC	—	37	CN1_VCC	—
38	CN2_VCC	—	38	CN1_VCC	—
39	5V	—	39	5V	—
40	5V	—	40	5V	—
SHIELD1	5V	—	SHIELD1	5V	—
SHIELD2	5V	—	SHIELD2	5V	—

7. Status Indicators

The LED status indicators on the board show power, configuration, and application status. [Table 7.1](#) lists the status LED I/O map.

Table 7.1. Status LED I/O Map

Device	LED	Net Name	Colour
LFE5UM-85F-BG756	D24	LED1	Green
LFE5UM-85F-BG756	D25	LED2	Green
LFE5UM-85F-BG756	D26	LED3	Green
LFE5UM-85F-BG756	D27	LED4	Green
LFE5UM-85F-BG756	D28	LED5	Green
LFE5UM-85F-BG756	D29	LED6	Green
LFE5UM-85F-BG756	D30	LED7	Green
LFE5UM-85F-BG756	D31	LED8	Green
ispClock5406D	D21	—	Blue
LFE5UM-85F-BG756	D3	FPGA_CSN	Blue
LFE5UM-85F-BG756	D4	FPGA_CSN1	Blue
LFE5UM-85F-BG756	D1	DW_INITN	Blue
LFE5UM-85F-BG756	D2	DW_DONE	Green

8. Ordering Information

This board is included as part of a kit, and not available as a separate item. The below part number is for reference only, so it is clear which board is described in this document. Please visit www.latticesemi.com/boards for the latest ordering information.

Table 8.1. Reference Part Number

Description	Ordering Part Number
ECP5 VIP Processor Board	LFE5-VIP-P-EVN

References

For more information, refer to:

- FPGA-DS-02012 (previously DS1044), [ECP5 and ECP5-5G Family Data Sheet](#)
- FPGA-UG-02015, [Lattice Embedded Vision Development Kit User Guide](#)
- FPGA-EB-02002, [CrossLink VIP Input Bridge Board](#)
- FPGA-EB-02003, [HDMI VIP Output Bridge Board](#)

For more information on ispClock, visit

www.latticesemi.com/ispclock

Technical Support Assistance

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

Appendix A. ECP5 VIP Processor Board Schematics

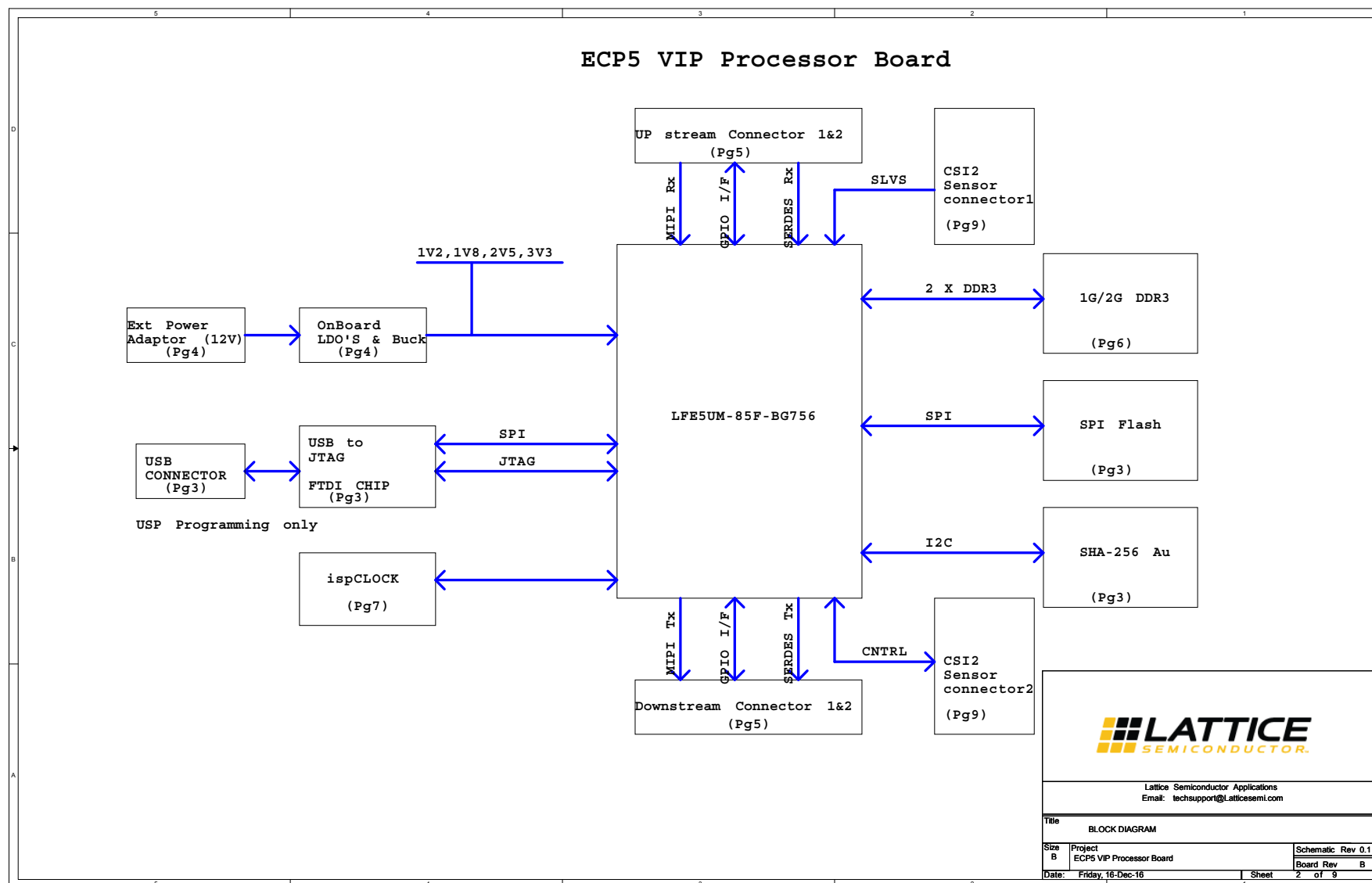


Figure A.1. Block Diagram

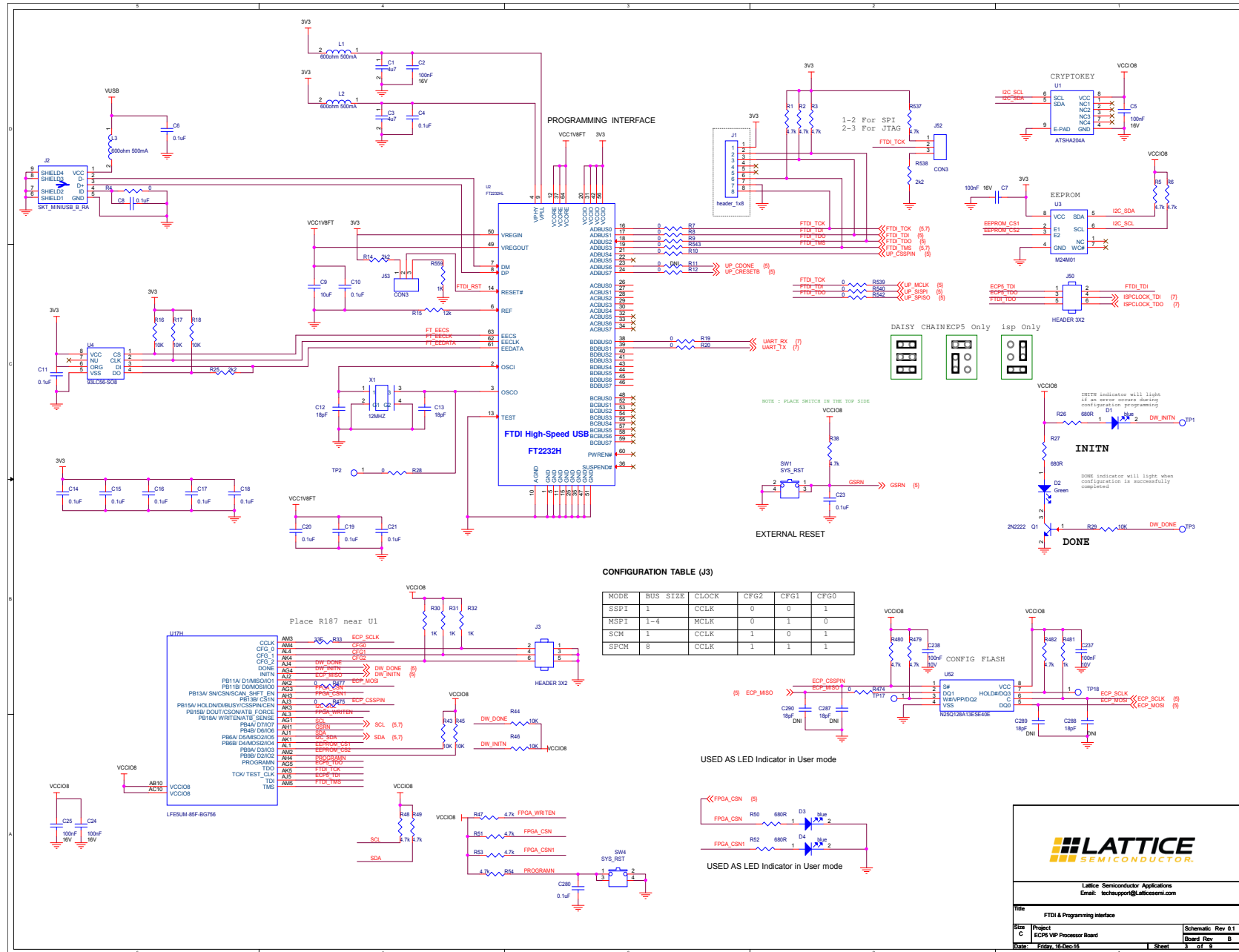


Figure A.2. FTDI and Programming Interface

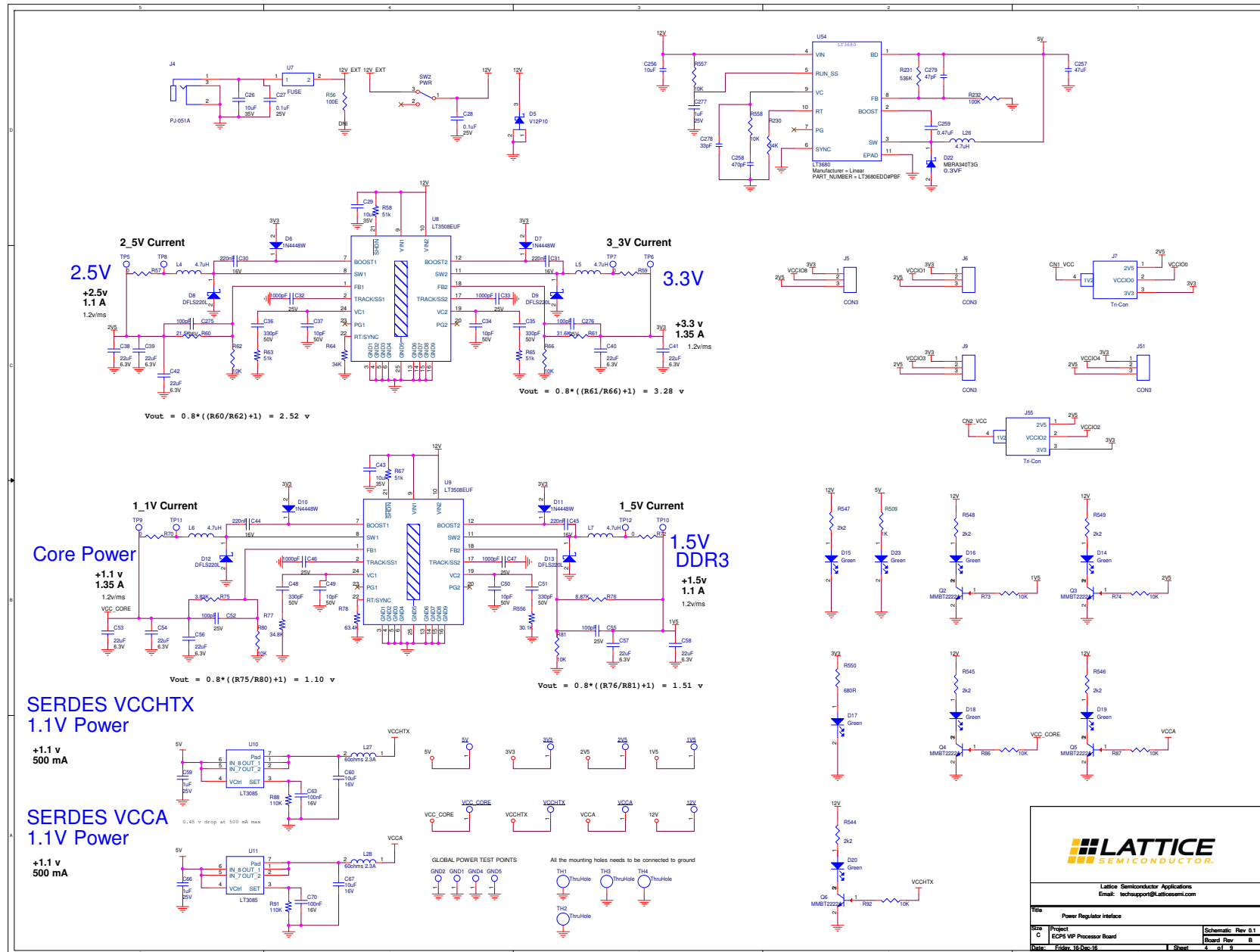
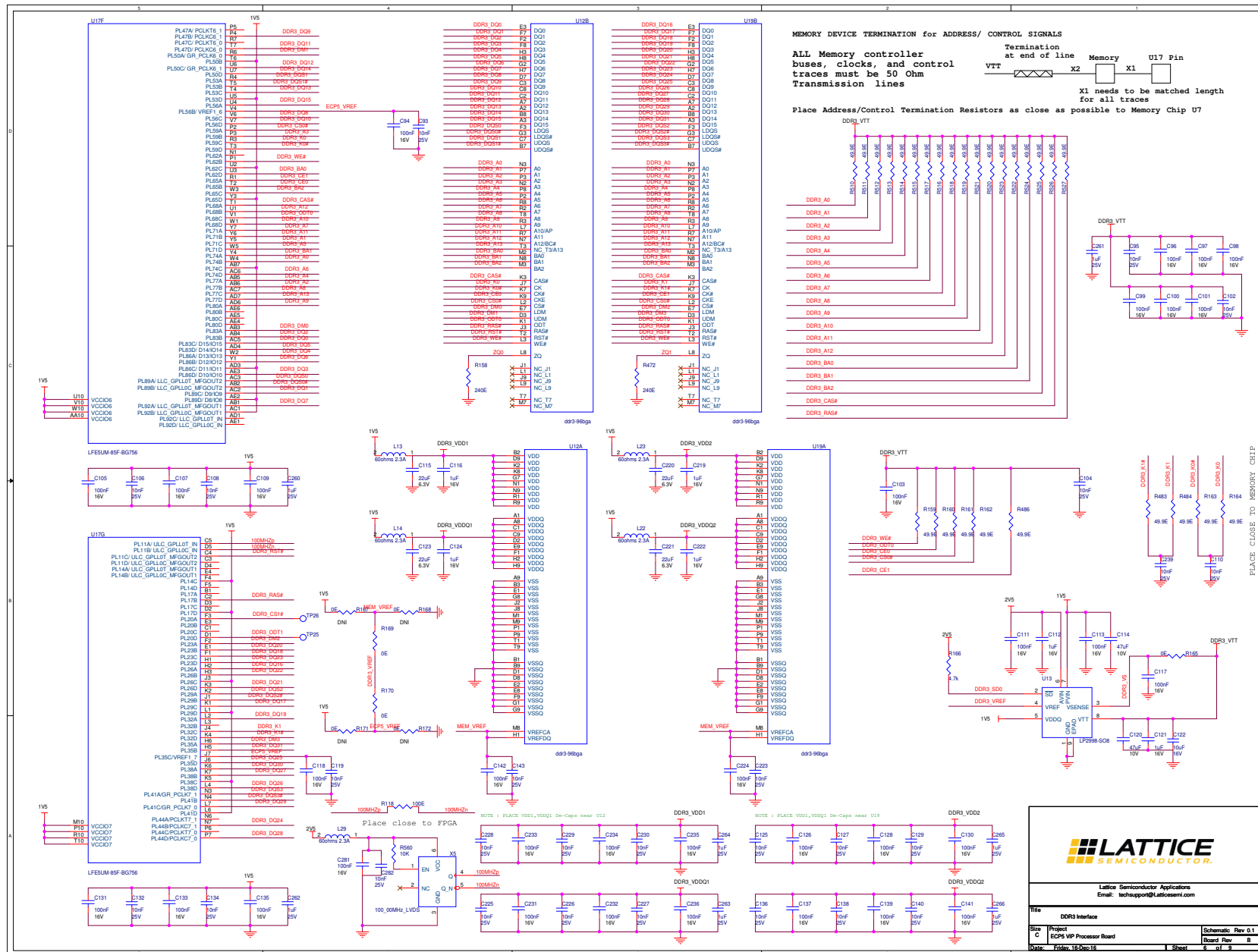
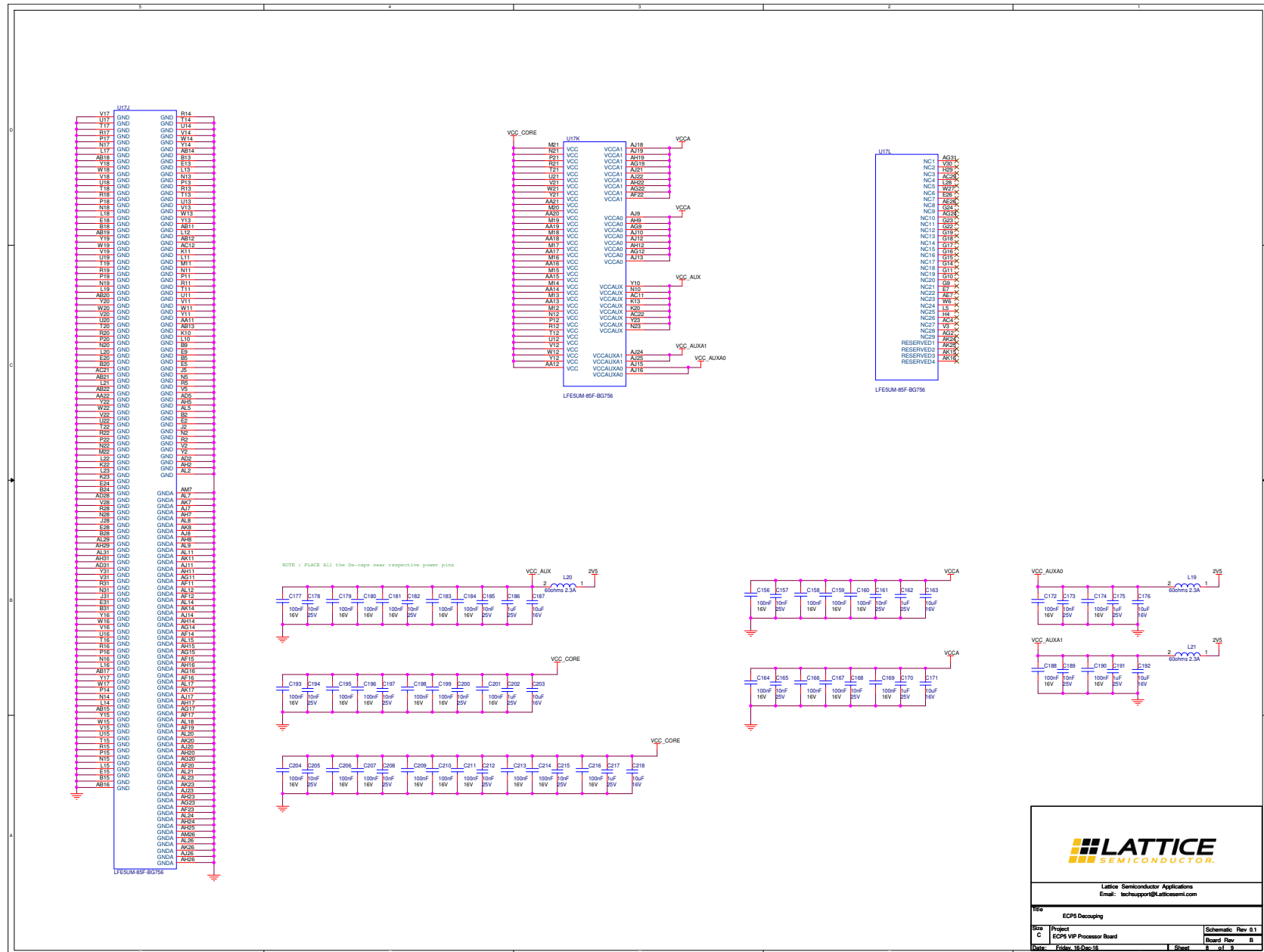


Figure A.3. Power Regulator Interface









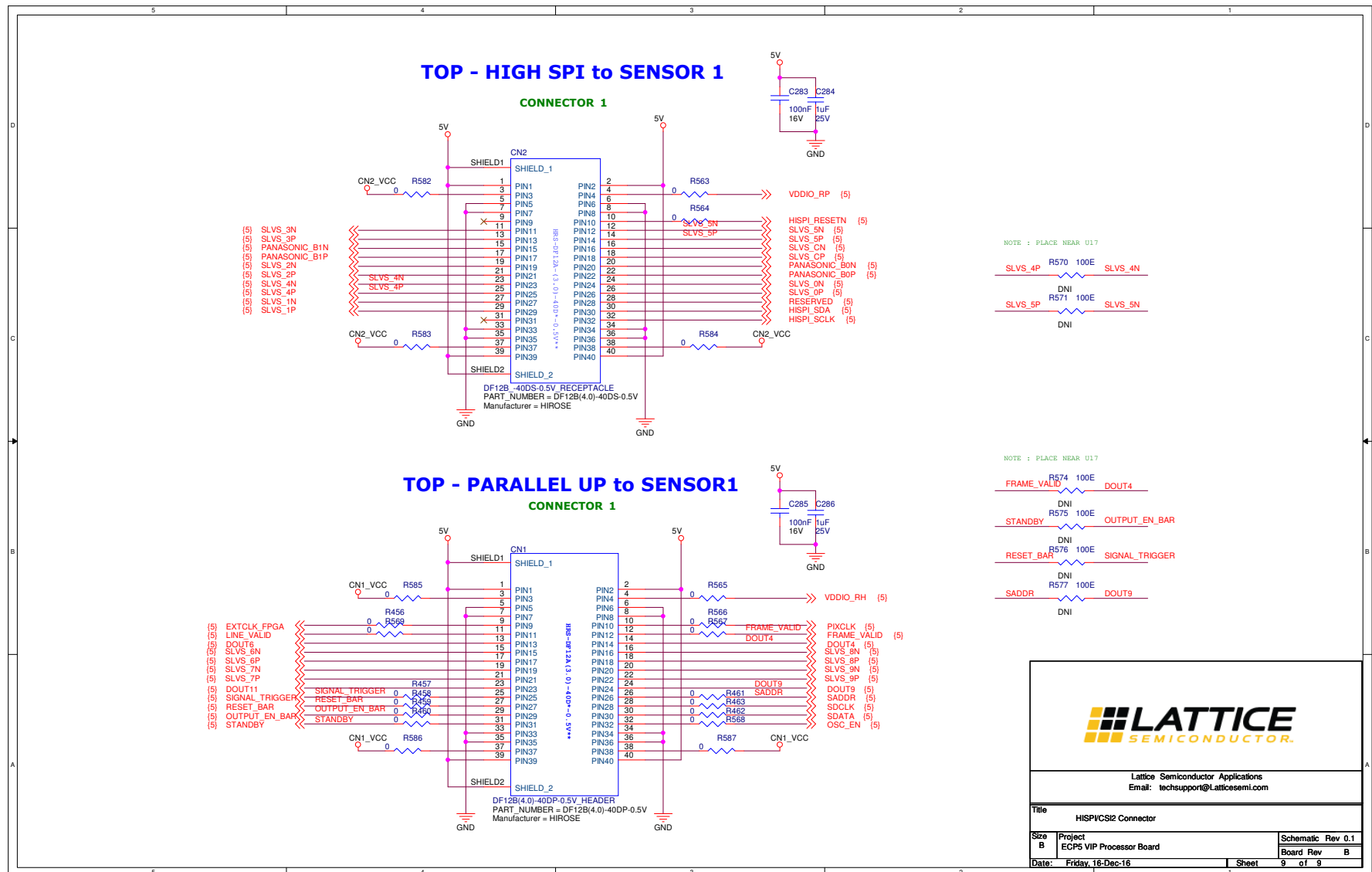


Figure A.8. HISPI/CSI2 Connector

Appendix B. ECP5 VIP Processor Board Bill of Materials

Item	Reference	Qty	Part	PCB Footprint	Comments	Part Number	Manufacturer	Description
1	CN1	1	DF12B(4.0)-40DP-0.5V_HEADER	HRS-DF12B-HEADER	—	DF12B(4.0)-40DP-0.5V	Hirose	CONN HEADER 40POS 4 mm SMD 0.5 mm
2	CN2	1	DF12B_-40DS-0.5V_RECEPTACLE	HRS-DF12B-RECEPTACLE-CENTER	—	DF12B(4.0)-40DS-0.5V	Hirose	CONN RECEPT 40POS 0.5 mm GOLD SMD
3	C1, C3	2	4u7	C0603	—	885012106005	Würth	CAP CER 4.7 μ F 6.3 V X5R 0603
4	C2, C5, C7, C24, C25, C73, C74, C75, C76, C78, C81, C82, C83, C85, C86, C87, C89, C90, C91, C94, C96, C97, C98, C99, C100, C101, C103, C105, C107, C109, C111, C113, C117, C118, C126, C128, C130, C131, C133, C135, C137, C139, C141, C142, C145, C148, C151, C154, C156, C158, C159, C160, C164, C166, C167, C169, C172, C174, C177, C179, C180, C181, C183, C184, C188, C190, C193, C195, C196, C198, C199, C201, C204, C206, C207, C209, C210, C211, C213, C214, C216, C224, C231, C232, C233, C234, C235, C236, C237, C238, C240, C242, C243, C245, C251, C254, C281, C283, C285	99	100nF	C0201	—	CC0201KRX5R7BB104	Yageo	CAP CER 0.1 μ F 16 V X5R 0201
5	C4, C10, C11, C14, C15, C16, C17, C18, C19, C20, C21	11	0.1uF	C0201	—	CC0201KRX5R7BB104	Yageo	CAP CER 0.1 μ F 16 V X5R 0201
6	C6, C8, C23, C280	4	0.1uF	C0402	—	885012205037	Würth	CAP CER 0.1 μ F 16 V X7R 0402
7	C9	1	10uF	C0603	—	LMK107BJ106MALTD	Taiyo Yuden	CAP CER 10 μ F 10 V X5R 20% 0603
8	C12, C13	2	18pF	C0402	—	C0402C180K3GACTU	Kemet	CAP CER 18 pF 25 V C0G 0402
9	C26, C29, C43	3	10uF	C6032	—	TRJC106K035RRJ	AVX	Tantalum Capacitors - Solid SMD 10 μ F \pm 10% 35V

Item	Reference	Qty	Part	PCB Footprint	Comments	Part Number	Manufacturer	Description
10	C27, C28	2	0.1uF	C0603	—	885012206071	Würth	CAP CER 0.1 µF 25 V X7R 0603
11	C30, C31, C44, C45	4	220nF	C0402	—	885012105017	Würth	CAP CER 0.22 µF 16 V X5R 0402
12	C32, C33, C46, C47	4	1000pF	C0402	—	885012205044	Würth	CAP CER 1000 pF 25 V X7R 0402
13	C34, C37, C49, C50	4	10pF	C0402	—	885012005055	Würth	CAP CER 10 pF 50 V NPO 0402
14	C35, C36, C48, C51	4	330pF	C0402	—	885012205058	Würth	CAP CER 330 pF 50 V X7R 0402
15	C38, C39, C40, C41, C42, C53, C54, C56, C57, C58, C115, C123, C220, C221	14	22uF	C0805	—	885012107005	Würth	CAP CER 22 µF 6.3 V X5R 0805
16	C52, C55, C275, C276	4	100pF	C0402	—	885012005046	Würth	CAP CER 100 pF 25 V NPO 0402
17	C59, C66, C77, C84, C88, C92, C162, C170, C175, C186, C191, C202, C217, C248, C249, C253, C260, C261, C262, C263, C264, C265, C266, C277, C284, C286	26	1uF	C1206	—	THJA105K025RJN	AVX	Tantalum Capacitors - Solid SMD 25 V 1 µF 10%
18	C60, C67, C122, C163, C171, C176, C187, C192, C203, C218	10	10uF	C1210	—	THJB106K016SJN	AVX	Tantalum Capacitors - Solid SMD 16 V 10 µF 10%
19	C63, C70	2	100nF	C0402	—	885012205037	Würth	CAP CER 0.1 µF 16 V X7R 0402
20	C93, C95, C102, C104, C106, C108, C110, C119, C125, C127, C129, C132, C134, C136, C138, C140, C143, C146, C149, C152, C155, C157, C161, C165, C168, C173, C178, C182, C185, C189, C194, C197, C200, C205, C208, C212, C215, C223, C225, C226, C227, C228, C229, C230, C239, C241, C252, C255, C282	49	10nF	C0201	—	GRM033R61E103KA12D	Murata	CAP CER 10000 pF 25 V X5R 0201
21	C112, C116, C121, C124, C144, C147, C150, C153, C219, C222	10	1uF	C0805	—	885012207051	Würth	CAP CER 1 µF 16 V X7R 0805
22	C114, C120	2	47uF	CASEB	—	T491B476K010AT	KEMET	CAP TANT 47 µF 10 V 10% 1411
23	C256	1	10uF	C0603	—	CL10A106M A8NRNC	Samsung	CAP CER 10 µF 25 V 20% X5R 0603

Item	Reference	Qty	Part	PCB Footprint	Comments	Part Number	Manufacturer	Description
24	C257	1	47uF	C0805	—	C2012X5R1A476M125A C	TDK	CAP CER 47 μ F 10 V 20% X5R 0805
25	C258	1	470pF	C0603	—	885012006042	Würth Electronics	Multilayer Ceramic Capacitors MLCC - SMD/SMT WCAP-CSGP 470 pF 0603 5% 25 V MLCC
26	C259	1	0.47uF	C0402	—	CL05A474KA5NNNC	Samsung	CAP CER 0.47 μ F 25 V 10% X5R 0402
27	C267, C268, C269, C270, C271, C272, C273, C274	8	100nF	C0201	—	CC0201KRX5R7BB104	Yageo	0.10 μ F 16 V Ceramic Capacitor X5R 0201 (0603 Metric) 0.024" L x 0.012" W (0.60 mm x 0.30 mm)
28	C278	1	33pF	C0603	—	885012006054	Würth Electronics	Multilayer Ceramic Capacitors MLCC - SMD/SMT WCAP-CSGP 33 pF 0603 5% 50 V MLCC
29	C279	1	47pF	C0402	—	885012005059	Würth Electronics	Multilayer Ceramic Capacitors MLCC - SMD/SMT WCAP-CSGP 47 pF 0402 5% 50 V MLCC
30	C287, C288, C289, C290	4	18pF	C0402	DNL	C0402C180K3GACTU	Kemet	CAP CER 18 pF 25 V C0G 0402
31	D1, D3, D4, D21	4	blue	led_0603	—	150060BS75000	Würth	LED BLUE CLEAR 0603 SMD
32	D2, D14, D15, D16, D17, D18, D19, D20, D23, D24, D25, D26, D27, D28, D29, D30, D31	17	Green	led_0603	—	150060VS75000	Würth	LED GREEN CLEAR 0603 SMD
33	D5	1	V12P10	V12P10	—	V12P10-M3/86A	Vishay Intertechnologies	Diode Schottky 100 V 12A 3-Pin(2+Tab) SMPC T/R
34	D6, D7, D10, D11	4	1N4448W	1N4448W	—	1N4448WT	Fairchild Semiconductor	Diode Small Signal Switching 75 V 2-Pin SOD-523F T/R
35	D8, D9, D12, D13	4	DFLS220L	DFLS220L	—	DFLS220L-7	Diodes Incorporated	Diode Schottky 20 V 2 A POWERDI123

Item	Reference	Qty	Part	PCB Footprint	Comments	Part Number	Manufacturer	Description
36	D22	1	0.3VF	MBRA340T 3G	—	MBRA340T3 G	On Semiconductor	Diode Schottky 40 V 3 A SMA
37	GND1, GND2, GND4, GND5, 5V, 12V, 1V5, 2V5, 3V3, VCC_CORE, VCCHTX, VCCA	12	TP_S_40_63	tp_s_40_63	DNL	—	—	Square test point, 40 mil inner diameter, 63 mil outer diameter
38	J1	1	header_1x8	hdr_amp_8 7220_8_1x 8_100	—	6130081112 1	Würth	8 Positions Header, Unshrouded Connector 0.100" (2.54 mm) Through Hole Gold
39	J2	1	SKT_MINIUSB _B_RA	skt_minius b_b_ra	—	6510051612 1	Würth	CONN COM Type-B Mini USB SMD 5P
40	J3	1	HEADER 3X2	HDR3X2	—	6130062112 1	Würth	6 Positions Header, Unshrouded Connector 0.100" (2.54 mm) Through Hole Gold
41	J4	1	PJ-051A	PJ_051A	—	PJ-051A	CUI Inc.	DC Power Connectors Power Jacks
42	J5, J6, J9, J51	4	CON3	HDR1X3	—	6130031112 1	Würth	3 Positions Header, Unshrouded Connector 0.100" (2.54 mm) Through Hole Gold
43	J7, J55	2	Tri-Con	TriCon	Regular 100mil header	—	—	General 100 mils header
44	J10, J11	2	CONN RCPT 30x2	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 0.5 mm Solder ST SMD T/R -
45	J12, J13	2	CONN RCPT 30x2	ERF5-030- 070-L-DV- K-TR	—	ERF5-030- 07.0-L-DV-K- TR	Samtec Inc.	Conn High Speed Edge Rate Terminal Strip HDR 60 POS 0.5 mm Solder ST SMD T/R -
46	J14	1	RightAngle 5X2	90122- 0925	—	90122-0925	Molex	10 Positions Header, Unshrouded, Breakaway Connector 0.100" (2.54 mm) Through Hole, Right Angle Gold

Item	Reference	Qty	Part	PCB Footprint	Comments	Part Number	Manufacturer	Description
47	J50	1	HEADER 3X2	HDR-3X2	—	6130062112 1	Würth	6 Positions Header, Unshrouded Connector 0.100" (2.54 mm) Through Hole Gold
48	J52, J53, J54	3	CON3	HDR_1X3_100MIL	—	6130031112 1	Würth	3 Positions Header, Unshrouded Connector 0.100" (2.54 mm) Through Hole Gold
49	L1, L2, L3	3	600ohm 500mA	FB0603	—	742792651	Würth	FERRITE BEAD 600 Ω 0603 1LN
50	L4, L5, L6, L7	4	4.7uH	SPD62R	—	SPD62R-472M	API Delevan Inc.	FIXED IND 4.7 μ H 2 A 150 M Ω SMD
51	L13, L14, L15, L16, L17, L18, L19, L20, L21, L22, L23, L24, L25, L29	14	60ohms 2.3A	FB0603	—	742792602	Würth	FERRITE BEAD 60 Ω 0603 1LN
52	L26	1	4.7uH	74437346047	—	74437346047	Würth	FIXED IND 4.7 μ H 3.8 A 40 M Ω SMD
53	L27, L28	2	60ohms 2.3A	FB0603	—	MPZ1608Y600B	TDK	EMI Filter Beads, Chips & Arrays 60 Ω Power
54	Q1	1	2N2222	MMBT2222 ALT-1	—	MMBT2222 ALT1G	On Semiconductor	Trans GP BJT NPN 40 V 0.6 A Automotive 3-Pin SOT-23 T/R
55	Q2, Q3, Q4, Q5, Q6	5	MMBT2222A	SM_SOT23-3	—	MMBT2222 A,215	NXP USA Inc.	TRANS NPN 40 V 0.6 A SOT23
56	R1, R2, R3, R5, R6, R38, R47, R48, R49, R51, R53, R54, R166, R173, R174, R175, R176, R177, R178, R179, R180, R479, R480, R482, R494, R537, R562	27	4.7k	R0402	—	ERJ-2RKF4701X	Panasonic	RES SMD 4.7K Ω 1% 1/10 W 0402
57	R4, R57, R59, R70, R72	5	0	R0603	—	RC0603JR-070RL	Yageo	Res 1/10 W 0.0 Ω 5% 0603
58	R7, R8, R9, R10, R12, R19, R20, R28, R93, R94, R106, R108, R119, R456, R457, R458, R459, R460, R461, R462, R463, R495, R496, R500, R501, R539, R540, R542, R543, R563, R564, R565, R566, R567, R568, R569, R582, R583, R584, R585, R586, R587	42	0	R0402	—	ERJ-2GE0R00X	Panasonic	RES SMD 0.0 Ω JUMPER 1/10 W 0402
59	R11	1	0	R0402	DNL	ERJ-2GE0R00X	Panasonic	RES SMD 0.0 Ω JUMPER 1/10 W 0402

Item	Reference	Qty	Part	PCB Footprint	Comments	Part Number	Manufacturer	Description
60	R14, R25, R538, R544, R545, R546, R547, R548, R549	9	2k2	R0402	—	ERJ-2RKF2201X	Panasonic	RES SMD 2.2K Ω 1% 1/10 W 0402
61	R15	1	12k	R0402	—	ERJ-2RKF1202X	Panasonic	RES SMD 12K Ω 1% 1/10 W 0402
62	R16, R17, R18, R29, R43, R44, R45, R46, R62, R66, R80, R81, R504, R557, R558, R560	16	10K	R0402	—	ERJ-2GEJ103X	Panasonic	RES SMD 10K Ω 5% 1/10 W 0402
63	R26, R27, R50, R52, R507, R528, R529, R530, R531, R532, R533, R534, R535, R550	14	680R	R0402	—	RMCF0402J T680R	Stackpole Electronics Inc.	RES 680 Ω 1/16 W 5% 0402
64	R30, R31, R32, R509, R559, R561	6	1K	R0402	—	RMCF0402J T1K00	Stackpole Electronics Inc.	RES 1K Ω 1/16 W 5% 0402
65	R33	1	33E	R0603	—	ERJ-3GEYJ330V	Panasonic	Thick Film Resistors 0603 33 Ω 5% AEC-Q200
66	R56	1	100E	R0603	DNL	CRCW06031 00RFKEAHP	Vishay/Dale	Thick Film Resistors - SMD 1/4 W 100 Ω 1% 100 ppm High Power
67	R58, R63, R65, R67	4	51k	RLP-100	—	TNPW04025 1K0BEED	Vishay/Dale	Thin Film Resistors 51K Ω 0.1% 25 ppm
68	R60	1	21.5K	R0402	—	ERJ-2RKF2152X	Panasonic	RES SMD 21.5K Ω 1% 1/10 W 0402
69	R61	1	31.6K	R0402	—	ERJ-2RKF3162X	Panasonic	RES SMD 31.6K Ω 1% 1/10 W 0402
70	R64	1	34K	R0402	—	ERJ-2RKF3402X	Panasonic	RES SMD 34K Ω 1% 1/10 W 0402
71	R73, R74, R86, R87, R92	5	10K	R0402	—	ERJ-2GEJ103X	Panasonic	RES SMD 10K Ω 5% 1/10 W 0402
72	R75	1	3.83K	R0402	—	ERJ-2RKF3831X	Panasonic	RES SMD 3.83K Ω 1% 1/10 W 0402
73	R76	1	8.87K	R0402	—	ERJ-2RKF8871X	Panasonic	RES SMD 8.87K Ω 1% 1/10 W 0402
74	R77	1	34.8K	R0402	—	ERJ-2RKF3482X	Panasonic	RES 34.8K Ω 1/10 W 1% 0402 SMD
75	R78	1	63.4K	R0402	—	ERJ-2RKF6342X	Panasonic	RES 63.4K Ω 1/10 W 1% 0402 SMD
76	R88, R91	2	110K	R0402	—	ERJ-2RKF1103X	Panasonic	RES SMD 110K Ω 0.1% 1/10 W 0402

Item	Reference	Qty	Part	PCB Footprint	Comments	Part Number	Manufacturer	Description
77	R110, R111, R112, R113, R114, R148, R149, R150, R151, R152	10	4.7k	R0402	DNL	ERJ-2RKF4701X	Panasonic	RES SMD 4.7K Ω 1% 1/10 W 0402
78	R117	1	100K	R0402	—	RMCF0402J T100K	Stackpole Electronics Inc.	RES 100K Ω 1/16 W 5% 0402
79	R118	1	100E	R0402	—	TNPW04021 00RBEED	Vishay	Thin Film Resistors - SMD 100 Ω .1% 25ppm
80	R121, R122	2	0E	R0402	—	ERJ-2GE0R00X	Panasonic	RES SMD 0.0 Ω JUMPER 1/10 W 0402
81	R123, R124, R127, R128, R129, R132, R133, R136, R137, R140	10	49.9E	R0402	DNL	CRCW04024 9R9FKED	Vishay Dale	Thick Film Resistors - SMD 1/16 W 49.9 Ω 1%
82	R125, R126, R130, R131, R134, R135, R138, R139	8	0E	R0402	—	ERJ-2GE0R00X	Panasonic	RES SMD 0.0 Ω Jumper 1/10 W 0402
83	R158, R472	2	240E	R0402	—	ERJ-2RKF2400X	Panasonic	RES SMD 240 Ω 1% 1/10 W 0402
84	R159, R160, R161, R162, R163, R164, R483, R484, R486, R510, R511, R512, R513, R514, R515, R516, R517, R518, R519, R520, R521, R522, R523, R524, R525, R526, R527	27	49.9E	R0402	—	CRCW04024 9R9FKED	Vishay Dale	Thick Film Resistors - SMD 1/16 W 49.9 Ω 1%
85	R165, R169, R170	3	0E	R0402	—	ERJ-2GE0R00X	Panasonic	RES SMD 0.0 Ω Jumper 1/10 W 0402
86	R167, R168, R171, R172	4	0E	R0402	DNL	ERJ-2GE0R00X	Panasonic	RES SMD 0.0 Ω Jumper 1/10 W 0402
87	R230	1	34K	R0402	—	ERJ-2RKF3402X	Panasonic	RES 34K Ω 1/10 W 1% 0402 SMD
88	R231	1	536K	R0402	—	ERJ-2RKF5363X	Panasonic Electronic Components	RES 536K Ω 1/10 W 1% 0402 SMD
89	R232	1	100K	R0402	—	ERJ-2RKF1003X	Panasonic Electronic Components	RES 100K Ω 1/10 W 1% 0402 SMD
90	R464, R465, R466, R467, R469, R470, R471, R551, R552, R553, R554, R555, R570, R571, R574, R575, R576, R577, R578, R579, R580, R581	22	100E	R0402	DNL	TNPW04021 00RBEED	Vishay	Thin Film Resistors - SMD 100 Ω 0.1% 25 ppm
91	R474, R475, R477	3	0	R0603	—	ERJ-3GEY0R00V	Panasonic	Thick Film Resistors - SMD 0603 Zero Ω

Item	Reference	Qty	Part	PCB Footprint	Comments	Part Number	Manufacturer	Description
92	R481	1	1k	R0402	—	RMCF0402J T1K00	Stackpole Electronics Inc.	RES SMD 1K Ω 5% 1/16 W 0402
93	R502, R503, R505, R506	4	220E	R0402	—	ERJ-2RKf2200X	Panasonic	RES SMD 220 Ω 1% 1/10 W 0402
94	R508	1	470E	R0402	—	CRCW04024 70RFKED	Vishay	Thick Film Resistors - SMD 1/16 W 470 Ω 1% 100 ppm
95	R556	1	30.1K	R0402	—	ERJ-2RKf3012X	Panasonic	RES 30.1K Ω 1/10 W 1% 0402 SMD
96	SW1, SW4	2	SYS_RST	4psmd_switch	—	4341530178 35	Würth	SWITCH TACTILE SPST-NO 0.05 A 12 V
97	SW2	1	PWR	450301014 042_switch	—	4503010140 42	Würth	Slide Switch SPDT Through Hole
98	SW3	1	SW DIP-8	CTS_218-8	Alternate PN : 218-8LPST	97C08SRT	Grayhill Inc.	Dip Switch SPST 8 Position Surface Mount Slide (Standard) Actuator 25 mA 24 VDC
99	TH1, TH2, TH3, TH4	4	ThruHole	MTG125	DNL	—	—	—
100	TP1, TP2, TP3, TP17, TP18, TP25, TP26	7	20mil_SMD	20mil_SMD	DNL	—	—	—
101	TP5, TP6, TP7, TP8, TP9, TP10, TP11, TP12	8	TestPoint	TP50	DNL	—	—	—
102	U1	1	ATSHA204A	ATSHA204 A	—	ATSHA204A-MAHDA-T	Atmel Corporation	IC CRYPTO 4.5 KB I2C 8UDFN
103	U2	1	FT2232HL	tqfp64_0p5_12p2x12p2_h1p6	—	FT2232HL	FTDI	USB to UART / FIFO
104	U3	1	M24M01	M24M01	—	M24M01-RMN6P	STMicroelectronics	EEPROM Serial-I2C 1 Mbit 128K x 8 2.5 V/3.3 V/5 V 8-Pin SO N
105	U4	1	93LC56-SO8	so8_50_244	—	93LC56C-I/SN	Microchip	IC EEPROM 2 KBIT 3 MHz 8SOIC
106	U7	1	FUSE	0154004DR T	—	0154004.DR T	Littelfuse	Surface Mount Fuses Fuseblock with fuse 4 A OMNI BLOK 154T
107	U8, U9	2	LT3508EUF	LT3508EUF	—	LT3508EUF# PBF	Linear Technology	IC REG BUCK ADJ 1.4 A DL 24QFN

Item	Reference	Qty	Part	PCB Footprint	Comments	Part Number	Manufacturer	Description
108	U10, U11	2	LT3085	LT3085E_6 DFN	—	LT3085EDCB #PBF	Linear Technology	IC REG LDO ADJ 0.5 A 6DFN
109	U12, U19	2	ddr3-96bga	MT41J64M1 16TW-093	—	MT41J64M1 6TW-093	Micron	IC DDR3 SDRAM 1 Gbit FBGA
110	U13	1	LP2998-SO8	RLP-300	—	LP2998MR/ NOPB	Texas Instruments	Termination Regulator 2.2 V to 5.5 V 8-Pin HSOP EP Tube
111	U17	1	ECP5UM-85F-BG756	LFE5UM-85F-7BG756I	—	LFE5UM-85F-7BG756I	Lattice Semiconductor Corporation	IC FPGA 84K LUT 1.1 V 756CABGA IND
112	U52	1	N25Q128A13E SE40E	N25Q128_ SO8W	Assembly Option A	S25FL132K0 XMF1011	Cypress	IC FLASH 32 Mbit 108 MHz 8SOIC
					Assembly Option B	N25Q128A1 3ESE40E	Micron	IC FLASH 128 Mbit 108 MHz 8SO
113	U53	1	ispCLOCK5406 D	ISPCLOCK5 406D	—	ispCLOCK54 06D	Lattice Semiconductor Corporation	ispClock Manager
114	U54	1	LT3680	LT3680_10 QFN	—	LT3680EDD# PBF	Linear	5 V Step down converter
115	X1	1	12MHZ	crystal_4p_ 3p2x2p5	—	7M-12.000MAAJ -T	TXC	CRYSTAL 12.0000 MHz 18 pF SMD
116	X2	1	KC2520B27.00 00C2GE00	27MHZ_OS C	—	KC2520B27. 0000C2GE0 0	AVX/Kyocera	Standard Clock Oscillators 27 MHz 2.5 V 2.5x2.0 mm SMD
117	X4	1	156.25MHz_L VCMOS	SiT8256AC	—	SiT8256AC- 23-33E - 156.250000 Y	SiTime	125 MHz CMOS MEMS (Silicon) Oscillator Surface Mount 2.25 V ~ 3.6 V 35 mA Enable/Disable
118	X5	1	100_00MHz_L VDS	DSC1123CI 5	—	DSC1123CI5 -100.0000	Microchip Technology/ Micrel	100 MHz LVDS MEMS (Silicon) Oscillator Surface Mount 2.25 V ~ 3.6 V 32 mA Enable/Disable
119	ECP5 Video Processor Board REV B PCB	1	—	—	—	305-PD-16-1002	Pactron	—

Revision History

Date	Version	Change Summary
June 2017	1.2	Updated Ordering Information section.
May 2017	1.1	Updated board pictures to Rev B: <ul style="list-style-type: none">• Figure 1.1. Top View of ECP5 VIP Processor Board and its Key Components• Figure 1.2. Bottom View of ECP5 VIP Processor Board
April 2017	1.0	Initial release.



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