CrossLinkU-NX Evaluation Board

User Guide

FPGA-EB-02072-1.0

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Abbreviations in This Document

A list of abbreviations used in this document.

Abbreviation	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
I2C	Inter-Integrated Circuit
I2S	Inter-IC Sound
JTAG	Joint Test Action Group
LDO	Low Dropout
LED	Light Emitting Diode
LVDS	Low-Voltage Differential Signaling
MIPI	Mobile Industry Processor Interface
ML	Machine Learning
MSPI	Master SPI
PMOD	Peripheral Module
SMA	SubMiniature version A
SPI	Serial Peripheral Interface
SSPI	Slave SPI
VIP	Video Interface Platform
VTT	Tracking Termination Voltage

1. Introduction

This document describes the Lattice Semiconductor CrossLinkU™-NX Evaluation Board. The board's key component is the CrossLinkU-NX FPGA (from here on referred as LIFCL-33U), which can receive input from a camera and sends video output over LIFCL-33U's USB 3.0 interface through the USB Type-C connector.

This board also features two PMOD (Peripheral Module) connectors through a daughter board for off board support.

The content of this user guide includes descriptions of onboard settings, connectors, programming circuit, a complete set of schematics, and bill of materials for the CrossLinkU-NX Evaluation Board.

The key features of the CrossLinkU-NX Evaluation Board include:

- LIFCL-33U FPGA (LIFCL-33U-CTG104)
  - MIPI CSI-2 receiver (Soft D-PHY) interface for camera data
  - SPI flash configuration
  - Hardened USB 2.0 / USB 3.2 Gen 1 support
- Board Resources
  - Two PMOD expansion headers available through daughter board
  - Micro-USB connector for power and FPGA configuration
  - USB Type-C connector for power and data transfer
- FPGA Programming Circuits
  - Radiant Programmer through USB/FTDI interface (JTAG or SPI)
  - Boot from onboard flash
  - External SPI programming through header

The Lattice CrossLinkU-NX Evaluation Board Kit contains the following:

- CrossLinkU-NX Evaluation Board
- USB Cable for programming via FTDI chip (USB-A to USB 2.0 micro-B)
- USB Cable (USB Type-C to USB Type-C)
- Quick Start Guide

Figure 1.1 and Figure 1.2 show the top and bottom views of the CrossLinkU-NX Evaluation Board and its key components.

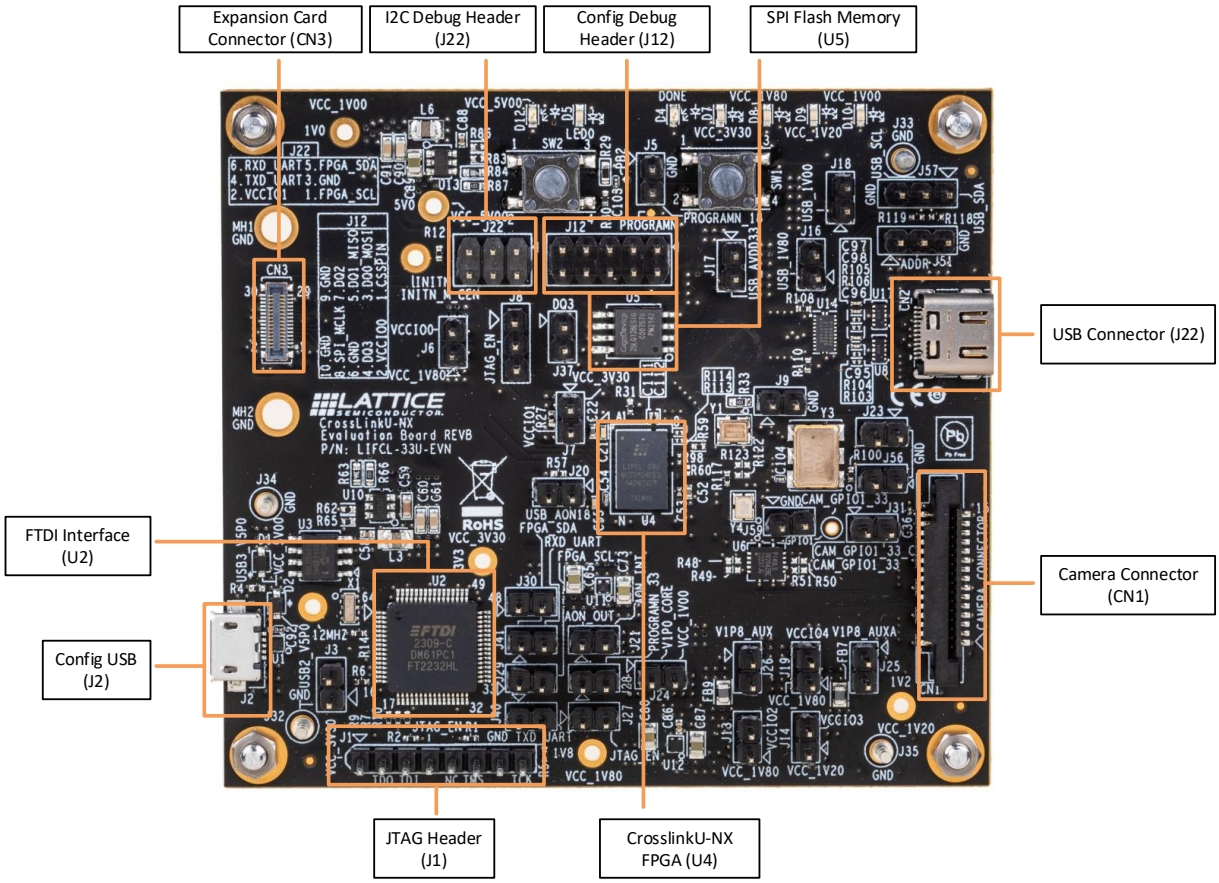

Figure 1.1. Top View of CrossLinkU-NX Evaluation Board

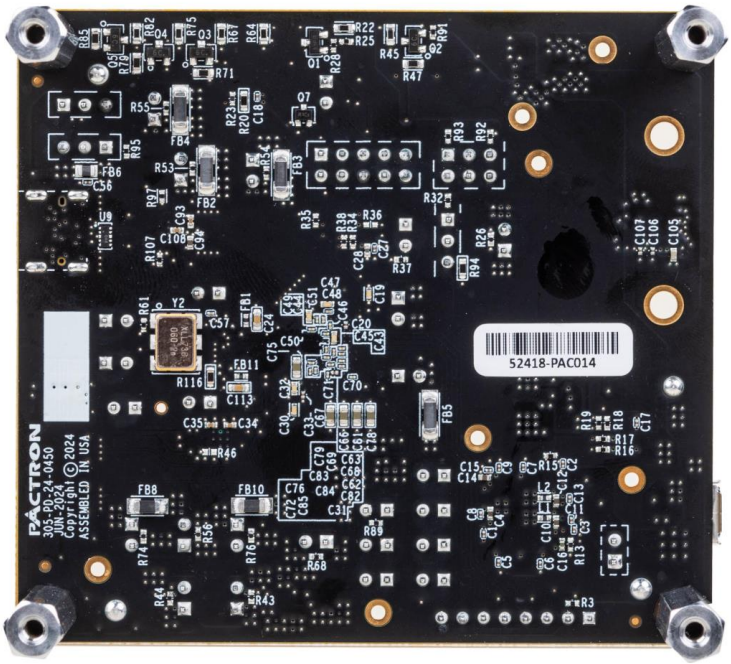

Figure 1.2. Bottom View of CrossLinkU-NX Evaluation Board

1.1. Further Information

The following references provide detailed information on the CrossLinkU-NX Evaluation Board and the LIFCL-33U FPGA device:

- Appendix A. CrossLinkU-NX Evaluation Board Schematics
- Appendix B. CrossLinkU-NX Evaluation Board Bill of Materials
- Appendix C. CrossLinkU-NX I/O Daughter Board Schematics
- Appendix D CrossLinkU-NX I/O Daughter Board Bill of Materials
- Development Boards and Kits for CrossLink-NX
- CrossLink-NX-33 and CrossLinkU-NX Data Sheet (FPGA-DS-02104) for details on the LIFCL-33U FPGA.

2. Headers and Jumpers

Table 2.1 presents the headers and jumpers illustrated in Figure 1.1 and Figure 1.2.

Table 2.1. Headers and Test Connectors

Part	Description	Settings (Default Listed 1st)
J1	JTAG Header	—
J3	FTDI Reset Jumper	Open – Active FTDI Closed – Holds FTDI in reset
J5	PROGRAMN Pull-down Jumper	Open – MSPI Boot Mode Closed – Secondary Configuration Mode
J6	Power Measurement Header for V_{VCIO0}	Open
J7	Power Measurement Header for V_{VCIO1}	Open
J8	JTAG_EN - LIFCL-33U (U4)	1-2 – JTAG is Enabled 2-3 – JTAG is Disabled
J9	25 MHz OSC (Y1) Standby	Open – Y1 Output Active Closed – Y1 in Standby
J12	Configuration Debug Header	—
J13	Power Measurement Header for V_{VCIO2}	Open
J14	Power Measurement Header for V_{VCIO3}	Open
J16	Power Measurement Header for AVDD18, AVDD18_TX & AVDD18_COM	Open
J17	Power Measurement Header for AVDD33	Open
J18	Power Measurement Header for AVDD & AVDD_TX	Open
J19	Power Measurement Header for VCCIO4	Open
J20	Power Measurement Header for VCCAUX_AON	Open
J21	AON Header	Open
J22	I2C and UART Debug Header	—
J23	60 MHz OSC (Y2) Enable/Disable	Open – Enable Closed - Disable
J24	Power Measurement Header for V_{CC}	Open
J25	Power Measurement Header for V_{CCAUX} (H7)	Open
J26	Power Measurement Header for V_{CCAUX} (Other Balls)	Open
J27	FTDI JTAG_EN Connection Header	Open – JTAG_EN not connected to FTDI Closed – JTAG_EN connected to FTDI
J28	FTDI PROGRAMN Connection Header	Open – PROGRAMN not connected to FTDI Closed – PROGRAMN connected to FTDI
J29	FTDI SCL Connection Header	Open – SCL not connected to FTDI Closed – SCL connected to FTDI
J30	FTDI SDA Connection Header	Open – SDA not connected to FTDI Closed – SDA connected to FTDI
J31	Connection to Test Point GPIO1	Open – Ball L6 connected to CN1 Connector Closed – Ball L6 connected to TP GPIO1
J37	Pull-Up Resistor Option for Flash (U5) RESET# Signal	Closed – Connect Pull-Up Resistor Open – Disconnect Pull-Up Resistor
J40	FTDI UART TX Connection Header	Open – UART TX not connected to FTDI Closed – UART TX connected to FTDI
J41	FTDI UART RX Connection Header	Open – UART RX not connected to FTDI Closed – UART RX connected to FTDI

Part	Description	Settings (Default Listed 1st)
J51	USB Switch (U14) I2C Address Control	Open – Pin Control Mode 1-2 – I2C Enable, ADDR Bit 6 = 1 2-3 – I2C Enable, ADDR Bit 6 = 0
J56	60 MHz OSC (Y3) Enable/Disable	Closed – Disable Open – Enable
J57	USB Switch (U14) I2C Debug Header	—
J59	60 MHz OSC (Y4) Enable/Disable	Open - Enable Closed – Disable

3. Board Programming

3.1. Programming Circuit

The LIFCL-33U can be programmed with USB through the FTDI/JTAG interface using Lattice Radiant™ Programmer Software or by an external programmer connected to Header J9.

Figure 3.1 shows the programming block of the CrossLinkU-NX Evaluation Board.

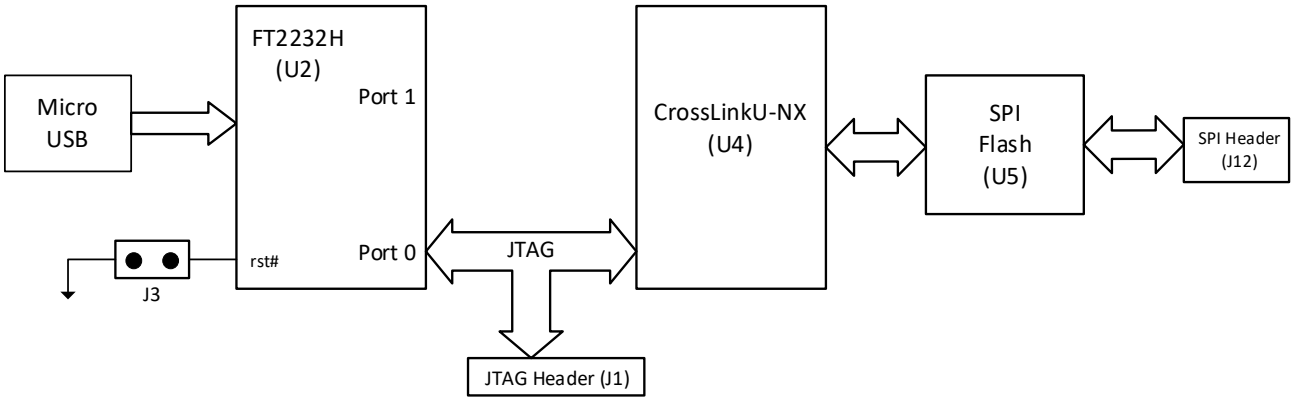

Figure 3.1. Programming Block

The FTDI/JTAG interface is used to program both LIFCL-33U and SPI Flash Memory (GigaDevice GD25Q128E 128 MB flash or Winbond W25Q512NWEIM 512 MB flash).

Lattice Radiant Software can be used to modify the board's demo design or create a new design for the board.

3.2. Programming the Board - SRAM

This section describes the procedure for programming a pattern to the SRAM (volatile) configuration memory of LIFCL-33U. The LIFCL-33U can be programmed through the JTAG, I2C, I3C, or SPI interfaces. This section focuses on JTAG programming through the USB/FTDI interface. For details on the other configuration modes, refer to the sysCONFIG Usage Guide for Nexus Platform (FPGA-TN-02099).

The board is programmed using the Lattice Radiant Programmer software, which can be started as a stand-alone tool or from a Lattice Radiant project.

To program the board:

1. Power ON the board by connecting the USB cable to J2 of the CrossLinkU-NX Evaluation Board.
2. Start a programming project by launching the tool and initiating a board scan, as shown in Figure 3.2.

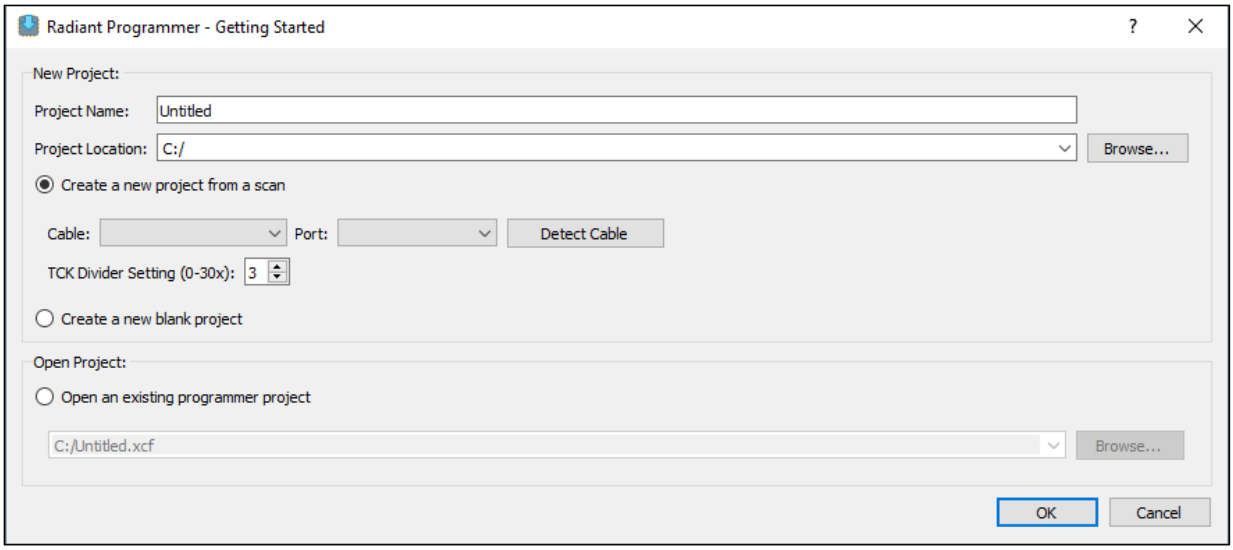

Figure 3.2. Starting Programmer

3. Once the board is successfully scanned, the window shown in Figure 3.3 opens. This interface allows you to enter a file name.

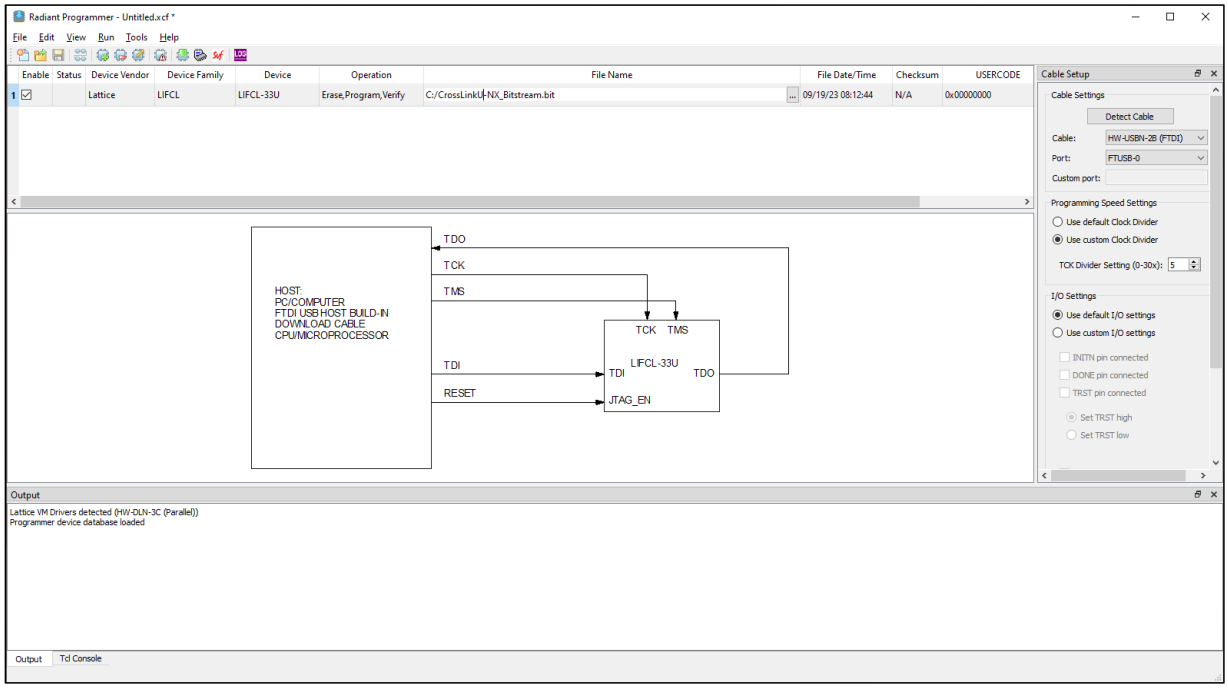

Figure 3.3. Lattice Radiant Programmer – Fast Configuration

4. Double-click on the **Operation** field and select the appropriate programming mode. In this example, **Fast Configuration** of the SRAM array through JTAG is selected.

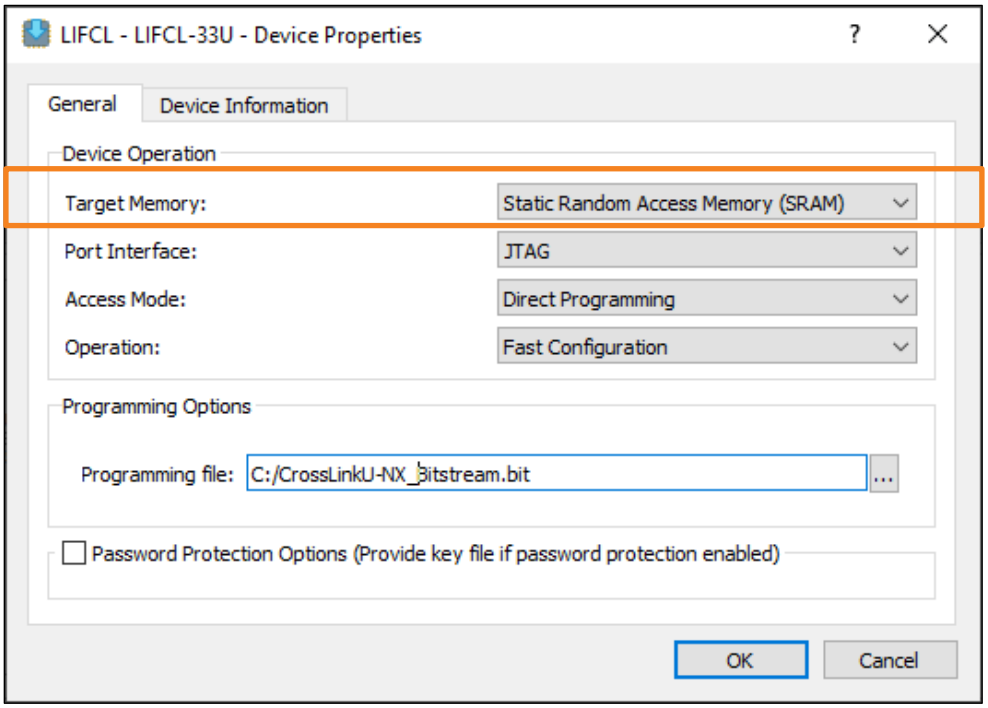

Figure 3.4. Entering Programming Mode

5. After setting all the fields and selecting the bitstream file in the **Device Properties** Window, click the **OK** button.
6. In the main Lattice Radiant Programmer window, click the **Program** button to configure the LIFCL-33U located on the board.
7. Check the **Output** Console at the bottom of Lattice Radiant Programmer for the programming results. You should see **Operation: Successful** as shown in Figure 3.5.

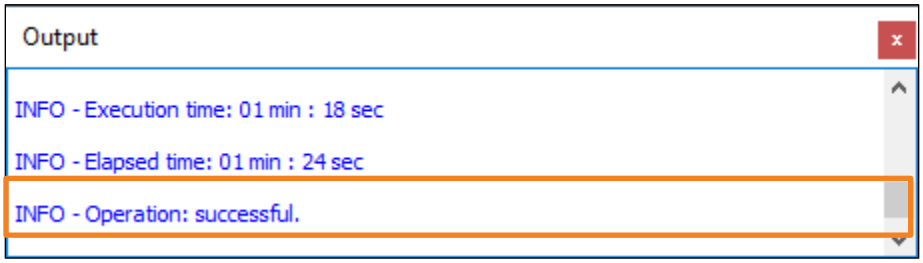

Figure 3.5. Lattice Radiant Programmer Output Window

3.3. Programming the Board – External Flash

To program the external Flash:

1. Power ON the board by connecting the USB cable to J2 of the LIFCL-33U-EVN Board.
2. Start a programming project by launching the tool and initiating a board scan, as shown in Figure 3.6.

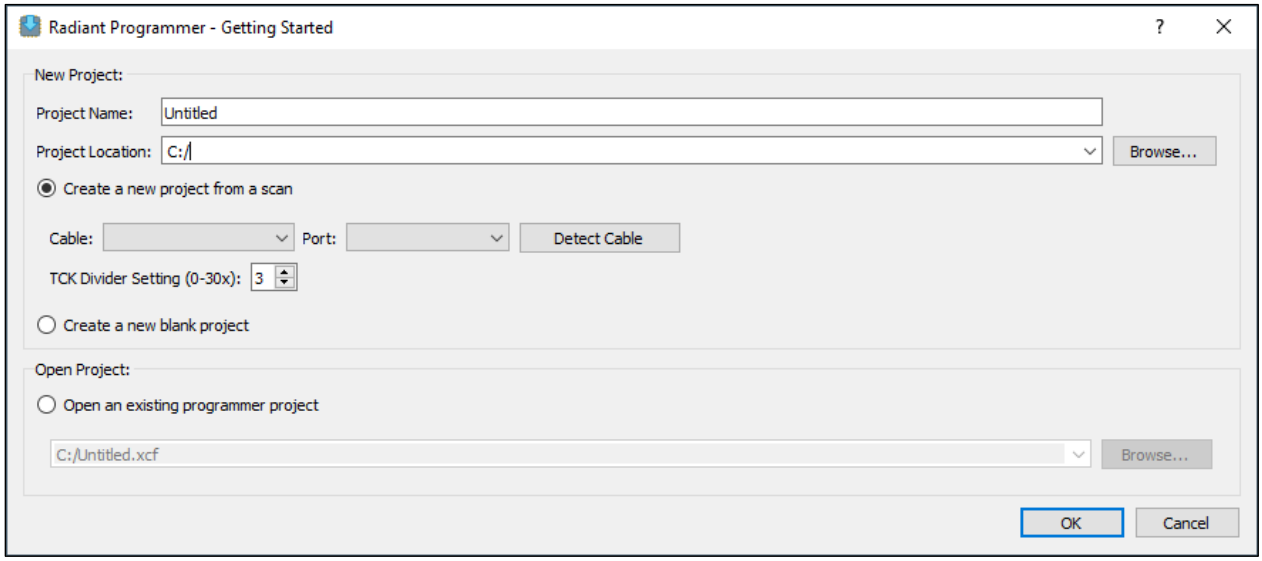

Figure 3.6. Starting Programmer

3. Once the board is successfully scanned, the window shown in Figure 3.7 opens. This interface allows you to enter a file name.

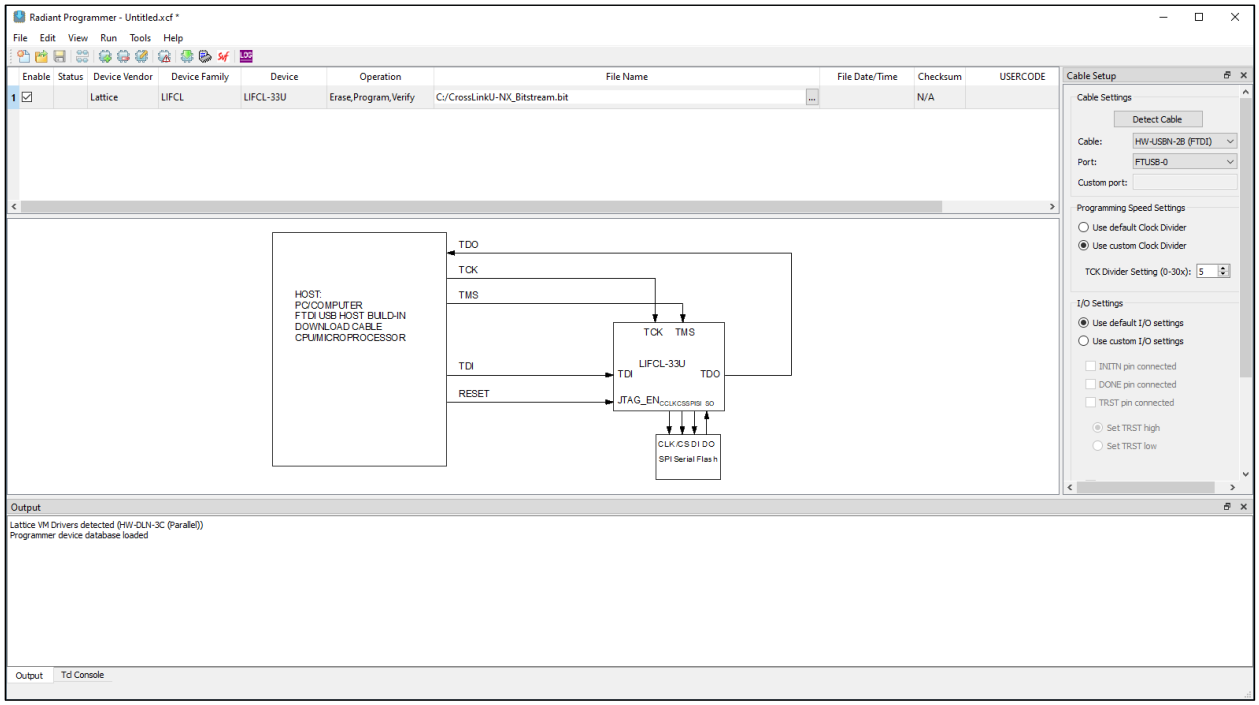

Figure 3.7. Lattice Radiant Programmer – External SPI Flash Memory

4. Double-click on the **Operation** field and select the appropriate programming mode. In this example, **External SPI Flash Memory (SPI FLASH)**.

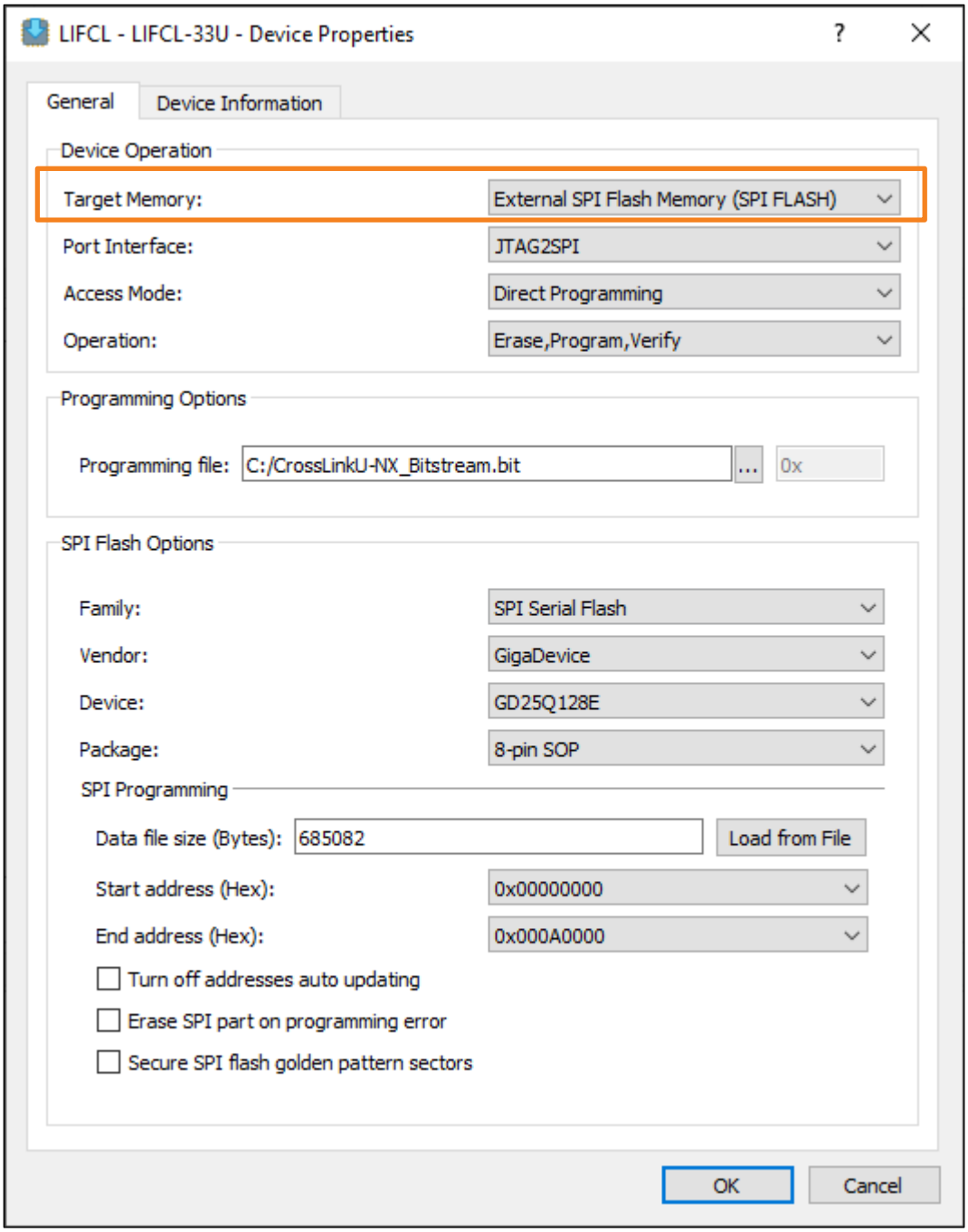

Figure 3.8. Entering Programming Mode

5. Click the **OK** button in the **Device Properties** window after setting the appropriate fields and selecting the bitstream file.
6. Click the **Program** button to configure the flash device on the board.

7. Check the **Output** Console at the bottom of Lattice Radiant Programmer for the programming results. You should see **Operation: Successful** as shown in Figure 3.9.

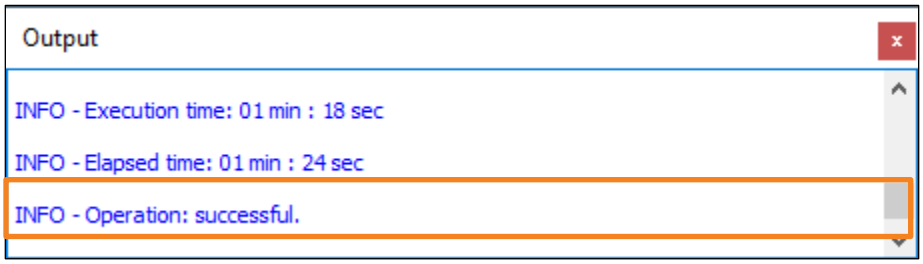

Figure 3.9. Lattice Radiant Programmer Output Window

4. CrossLinkU-NX Interface Support

The CrossLinkU-NX Evaluation Board supports various onboard interfaces and external interfaces. This section describes the key onboard interfaces supported on the CrossLinkU-NX Evaluation Board.

4.1. Camera Sensor Interface

Figure 4.1 shows the block diagram of the camera sensor interface. The CN1 connector supports up to two MIPI data lanes. The camera sensor can be configured using the I2C interface from the LIFCL-33U. The CN1 connector is compatible with Raspberry Pi camera modules.

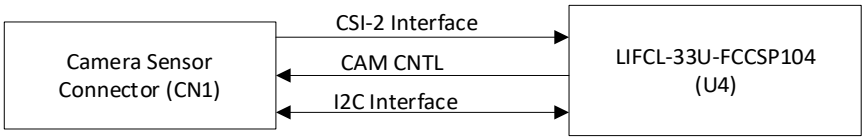

Figure 4.1. Camera Sensor Interface

4.2. Daughter Board Interface

Figure 4.2 shows the block diagram of the daughter board interface (CN3). The LIFCL-33U is connected to the 30-pin CN3 connector. The CrossLinkU-NX I/O Daughter Board (LIFCL-33U-IO-DB-EVN) can be connected to this connector to break out the LIFCL-33U GPIOs to two PMOD connectors. See the CrossLinkU-NX I/O Daughter Board section for details.

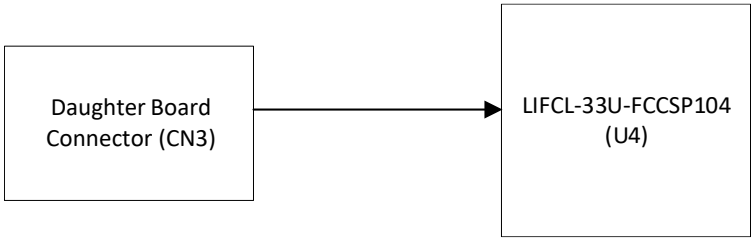

Figure 4.2. Daughter Board Interface

4.3. USB Interface

Figure 4.3 shows the block diagram of the USB interface. The USB signals from the LIFCL-33U go to a USB Type-C connector through Diode Inc. USB3 Switch (P/N: PI5USB30213A).

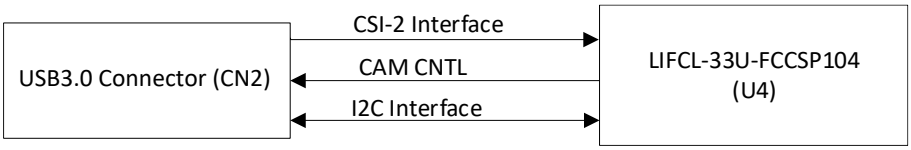

Figure 4.3. USB Interface

5. Power Supplies

The CrossLinkU-NX Evaluation Board receives power through the J2 or the CN2 USB connectors. If one or both USB ports are connected to a power source, the board will power up.

As shown in Figure 5.1, the Power Supply Blocks of the CrossLinkU-NX Evaluation Board can accept 5 V supply from either of the USB connectors. The board's internal converters then generate the necessary 3.3 V, 1.8 V, 1.2 V, and 1.0 V power supplies required for the various board components.

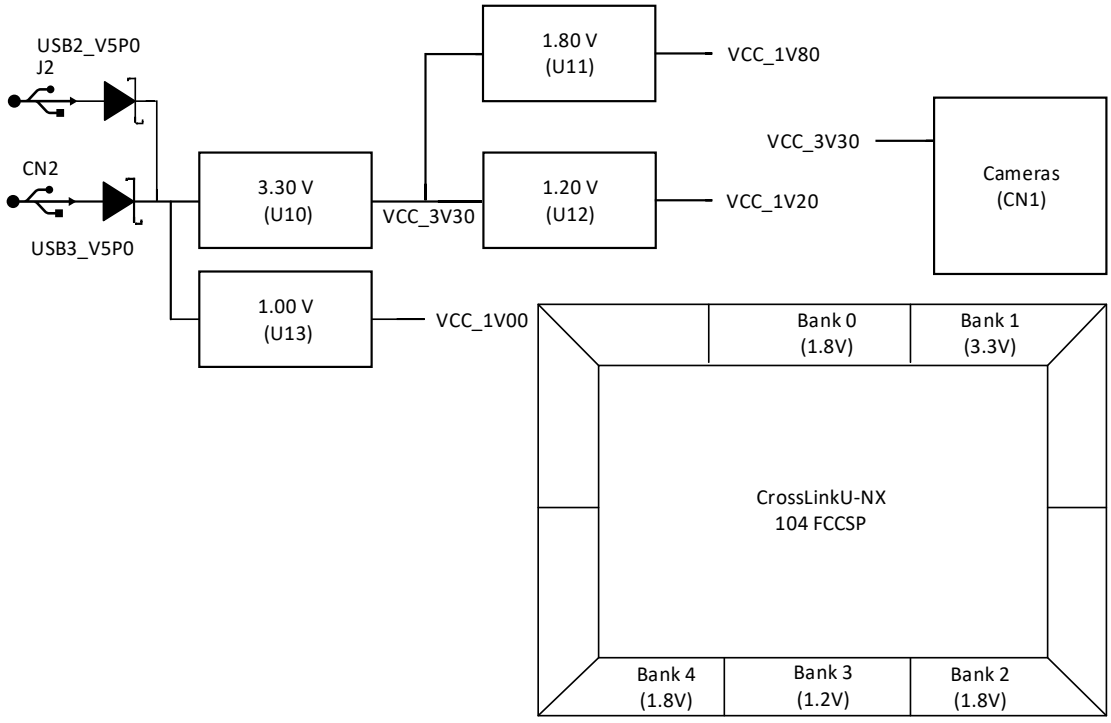

Figure 5.1. Power Supply Blocks

Table 5.1 lists the board voltage rails, including rail source voltage, voltage on net, LED, and LED color.

Table 5.1. Device Power Rail Summary

Voltage Rail	Source Rail	Voltage on Net (V)	Status LED	LED Color
VCC_5V00	USB	5.00	D12	Green
VCC_3V30	VCC_5V00	3.30	D7	Green
VCC_1V80	VCC_3V30	1.80	D8	Green
VCC_1V20	VCC_3V30	1.20	D9	Green
VCC_1V00	VCC_5V00	1.00	D10	Green

Table 5.2. Power Regulators

Voltage Rail	Regulator P/N	Description	Output Current
1.00 V	AP62201WU-7	Adjustable Buck Switching Regulator	2.0 A
1.20 V	NCP145CMX120TCG	Fixed Linear Voltage Regulator	500 mA
1.80 V	NCP177BMX180TCG	Fixed Linear Voltage Regulator	500 mA
3.30 V	AP62201WU-7	Adjustable Buck Switching Regulator	2.0 A

6. CrossLinkU-NX I/O Ball Mapping to Connectors

Table 6.1. Camera Sensor Connector Pin Mapping

CN1		
Pin Num	**Net/Test Point Name**	**Ball Num**
1	GND	—
2	CAM_D0_N	M6
3	CAM_D0_P	M7
4	GND	—
5	CAM_D1_N	N6
6	CAM_D1_P	N7
7	GND	—
8	CAM_CK_N	E6
9	CAM_CK_P	F7
10	GND	—
11	CAM_GPIO0_33	F7
12	CAM_GPIO1_33_C	L6
13	CAM_SCL_33	J6
14	CAM_SDA_33	H6
15	VCC_3V30	—

Table 6.2. JTAG Connector Pin Mapping

J1		
Pin Num	**Net/Test Point Name**	**Ball Num**
1	VCC_3V30	—
2	FTDI_TDO	D1
3	FTDI_TDI	D2
4	JTAG_EN	A2
5	NC	—
6	FTDI_TMS	B2
7	GND	—
8	FTDI_TCK	F2

Table 6.3. Daughter Board Connector Pin Mapping

CN3		
Pin Number	**Net Name**	**Ball Number**
1	VCC_3V30	—
2	VCC_3V30	—
3	VCC_3V30	—
4	M_DQS/DM0	A3
5	M_ADQ0_PMA1	N5
6	M_ADQ1_PMA2	N4
7	M_ADQ2_PMA3	M5
8	M_ADQ3_PMA4	M4
9	M_ADQ4_PMA7	L4
10	M_ADQ5_PMA8	L3
11	M_ADQ6_PMA9	N3
12	M_ADQ7_PMA10	N2

CN3		
Pin Number	**Net Name**	**Ball Number**
13	M_DQS/DM1	M8
14	M_DQ8_PMB1	M3
15	M_DQ9_PMB2	M2
16	M_DQ10_PMB3	K3
17	M_DQ11_PMB4	K2
18	M_DQ12_PMB7	J2
19	M_DQ13_PMB8	H2
20	GND	—
21	M_CLK_PMB9	J1
22	GND	—
23	M_DQ14_PMB10	H1
24	GND	—
25	M_DQ15	N8
26	INITN_M_CEN	A1
27	GND	—
28	GND	—
29	GND	—
30	GND	—

Table 6.4. Flash Debug Connector Pin Mapping

J12		
Pin Number	**Net Name**	**Ball Number**
1	CSSPIN	B3
2	VCCIO0	—
3	DQ0_MOSI	D4
4	DQ3	E3
5	DQ1_MISO	D3
6	GND	—
7	DQ2	E4
8	SPI_MCLK	B4
9	GND	—
10	GND	—

Table 6.5. I2C Debug Connector Pin Mapping

J22		
Pin Number	**Net Name**	**Ball Number**
1	FPGA_SCL	E1
2	VCCIO1	—
3	GND	—
4	TXD_UART	F1
5	FPGA_SDA	E2
6	RXD_UART	G1

7. Status Indicators

The LED status indicators on the board show the application status. Table 7.1 lists the status LED I/O map.

Table 7.1. Status LED I/O Map

Net Name	LED	Bank / Pin	Color	Note
DONE	D4	1 / G2	Green	Configuration done indicator
LED0	D5	3 / G6	Green	Programmable User LED

8. Pushbuttons

Table 8.1 lists all the pushbuttons. This board has two pushbuttons.

Table 8.1 Switch and Pushbutton I/O Map

Net Name	Component	Bank / Pin
PROGRAMN	SW1	0 / A4
PUSHBUTTON2	SW2	1 / B1

9. Clocks

Table 9.1 lists all the clocks available on the board.

Table 9.1. Clocks I/O Map

Clock	Component	Description
12 MHz	X1	Ceramic resonator reference clock for FT2232H (U2) pins 2 and 3
25 MHz	Y1	OSC single ended reference clock to LIFCL-33U (U4) ball G7
60 MHz	Y3	NOT POPULATED
60 MHz	Y2	LVDS OSC to LIFCL-33U (U4) balls G8 and H8. This OSC is disable by default through jumper J23.
60 MHz	Y4	OSC single ended reference clock to LIFCL-33U (U4) ball H8

10. Test Points

Table 10.1 lists the test points available on the board.

Table 10.1. Test Points

Test Point	Description
12 MHz	Test point on X1 output
1V0	Test point for 1.0 V from U13 regulator
1V2	Test point for 1.2 V from U12 regulator
1V8	Test point for 1.8 V from U11 regulator
3V3	Test point for 3.3 V from U10 regulator
5V0	Test point for 5.0 V from either USB connector
GPIO1	Test point for camera interface (CN1) GPIO1 state
INITN	Test point for INITN state
J32	GND Turret
J33	GND Turret
J34	GND Turret
J35	GND Turret
PB2	Test point for SW2 (push button) state
PROGRAMN	Test point for PROGRAMN state

11. CrossLinkU-NX I/O Daughter Board

The CrossLinkU-NX I/O Daughter Board (LIFCL-33U-IO-DB-EVN) connects to the CrossLinkU-NX Evaluation Board through the 30-pin connectors, the CN1 on the daughter board, and the CN3 on the evaluation board. This daughter board takes the CrossLinkU-NX GPIOs and breaks them out into two PMOD connectors.

Table 11.1. Daughter Board Connector Pin Mapping

CN1			
Pin Number	**Net Name**	**DB Connection**	**DB Reference**
1	VCC_3V30	—	—
2	VCC_3V30	—	—
3	VCC_3V30	—	—
4	DB_LED1	LED1	D4
5	PMOD_A1_18	PMOD A	J1.1
6	PMOD_A2_18	PMOD A	J1.2
7	PMOD_A3_18	PMOD A	J1.3
8	PMOD_A4_18	PMOD A	J1.4
9	PMOD_A7_18	PMOD A	J1.7
10	PMOD_A8_18	PMOD A	J1.8
11	PMOD_A9_18	PMOD A	J1.9
12	PMOD_A10_18	PMOD A	J1.10
13	DB_LED2	LED2	D3
14	PMOD_B1_18	PMOD B	J2.1
15	PMOD_B2_18	PMOD B	J2.2
16	PMOD_B3_18	PMOD B	J2.3
17	PMOD_B4_18	PMOD B	J2.4
18	PMOD_B7_18	PMOD B	J2.7
19	PMOD_B8_18	PMOD B	J2.8
20	GND	—	—
21	PMOD_B9_18	PMOD B	J2.9
22	GND	—	—
23	PMOD_B10_18	PMOD B	J2.10
24	GND	—	—
25	DB_LED3	LED3	D2
26	DB_LED4	LED4	Not Populated
27	GND	—	—
28	GND	—	—
29	GND	—	—
30	GND	—	—

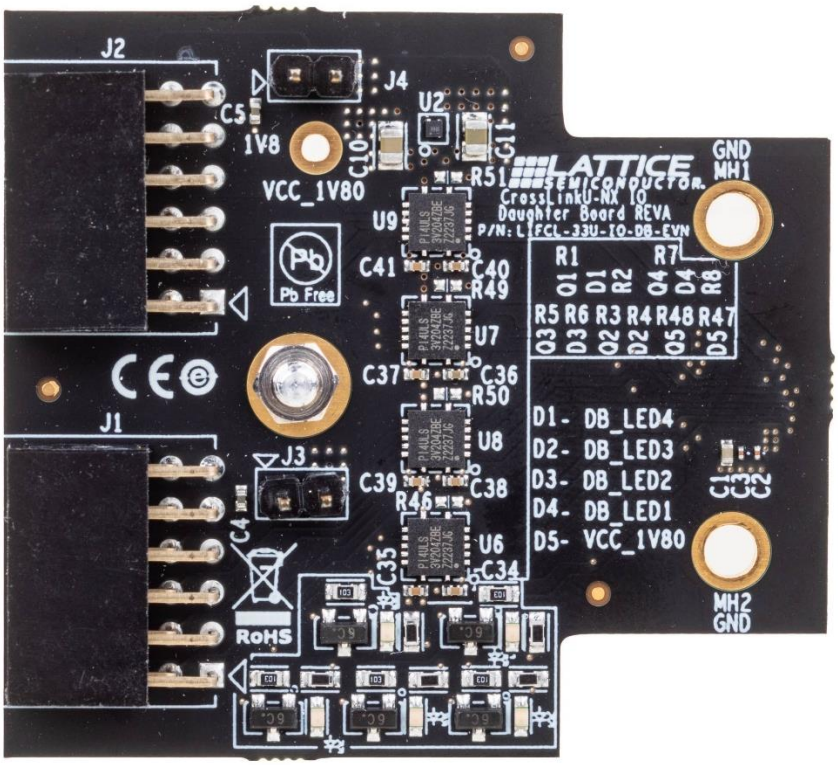

Figure 11.1. Top View of CrossLinkU-NX I/O Daughter Board

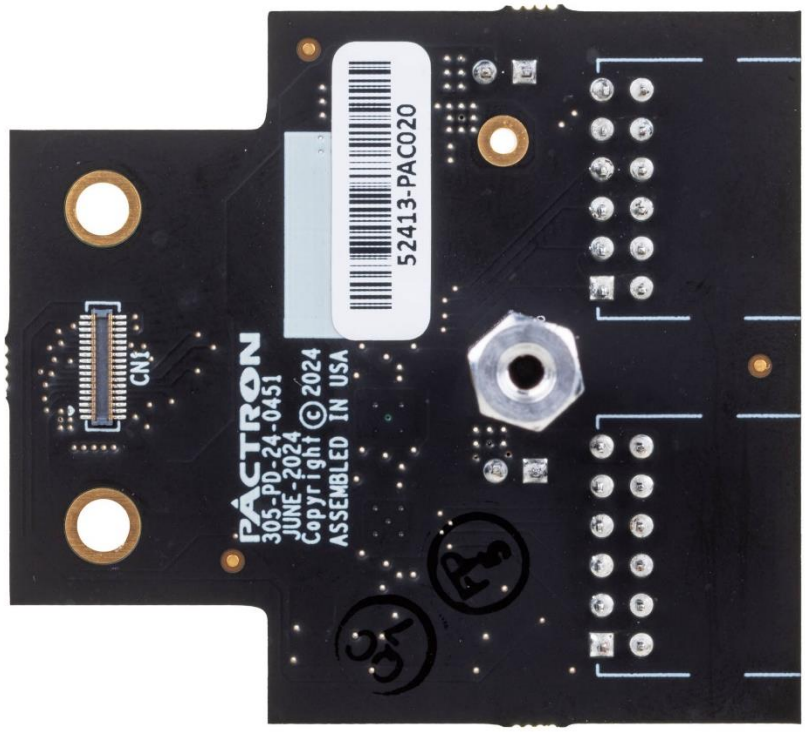

Figure 11.2. Bottom View of CrossLinkU-NX I/O Daughter Board

12. Ordering Information

This board is part of a kit and not available for purchase as a separate item. The part number listed in Table 9.1 is provided for reference purposes only, to help identify the board described in this document. For the most up-to-date ordering information, please visit www.latticesemi.com/boards.

Table 12.1. Reference Part Number

Description	Ordering Part Number
CrossLinkU-NX Evaluation Board	LIFCL-33U-EVN
CrossLinkU-NX I/O Daughter Board	LIFCL-33U-IO-DB-EVN

Appendix A. CrossLinkU-NX Evaluation Board Schematics

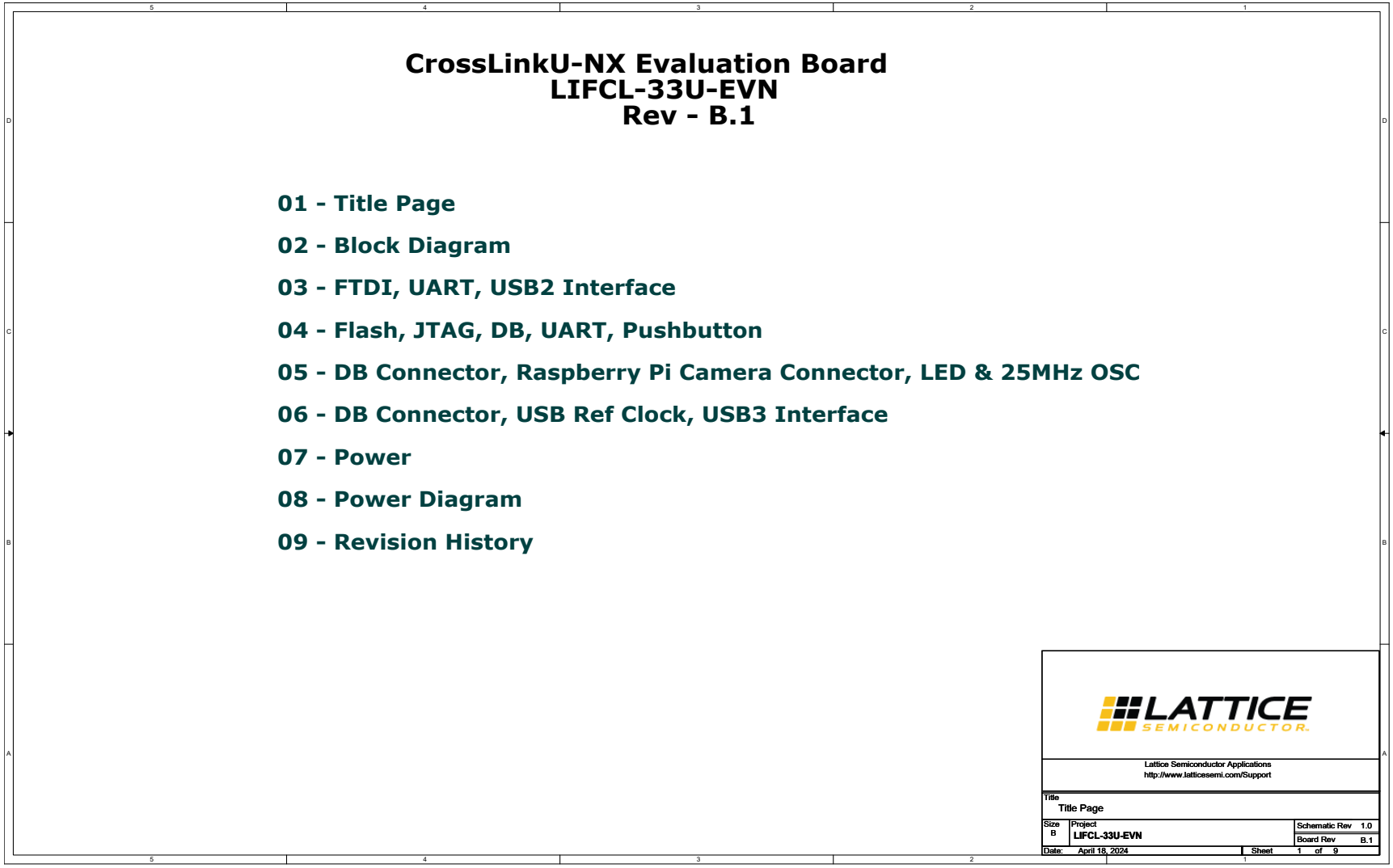

Figure A.1. Title Page

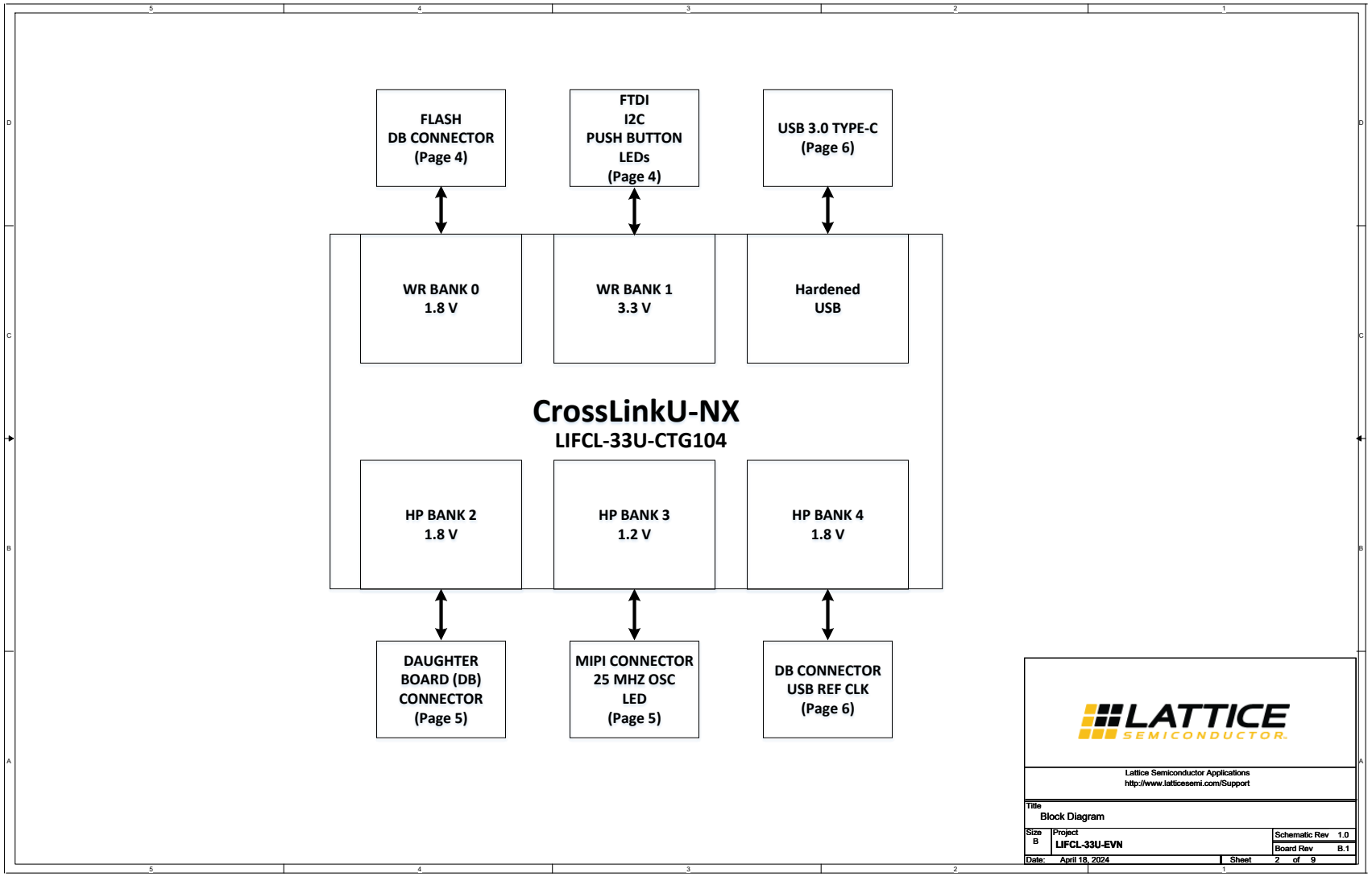

Figure A.2. Block Diagram

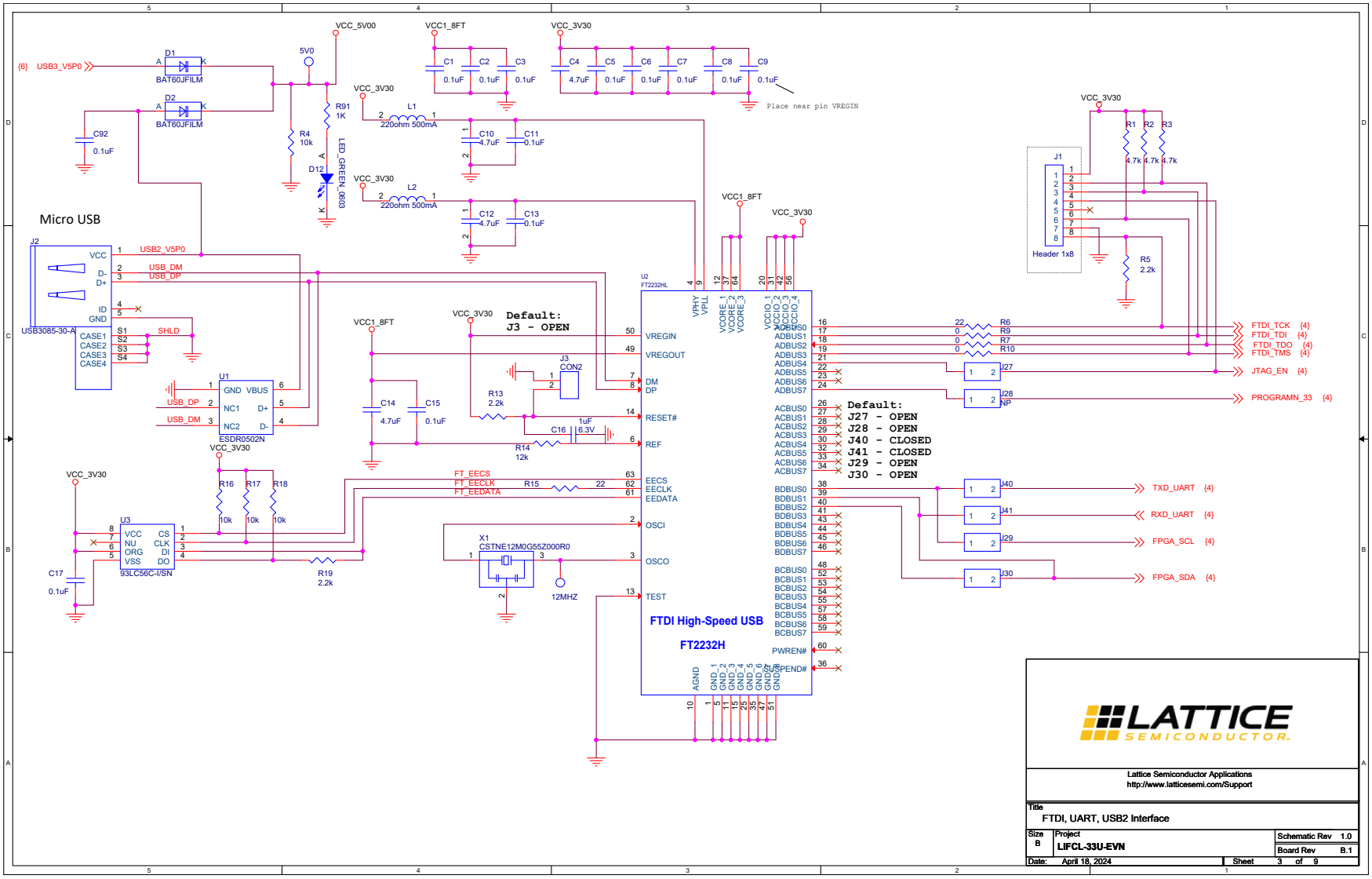

Figure A.3. FTDI, USB2 Interface

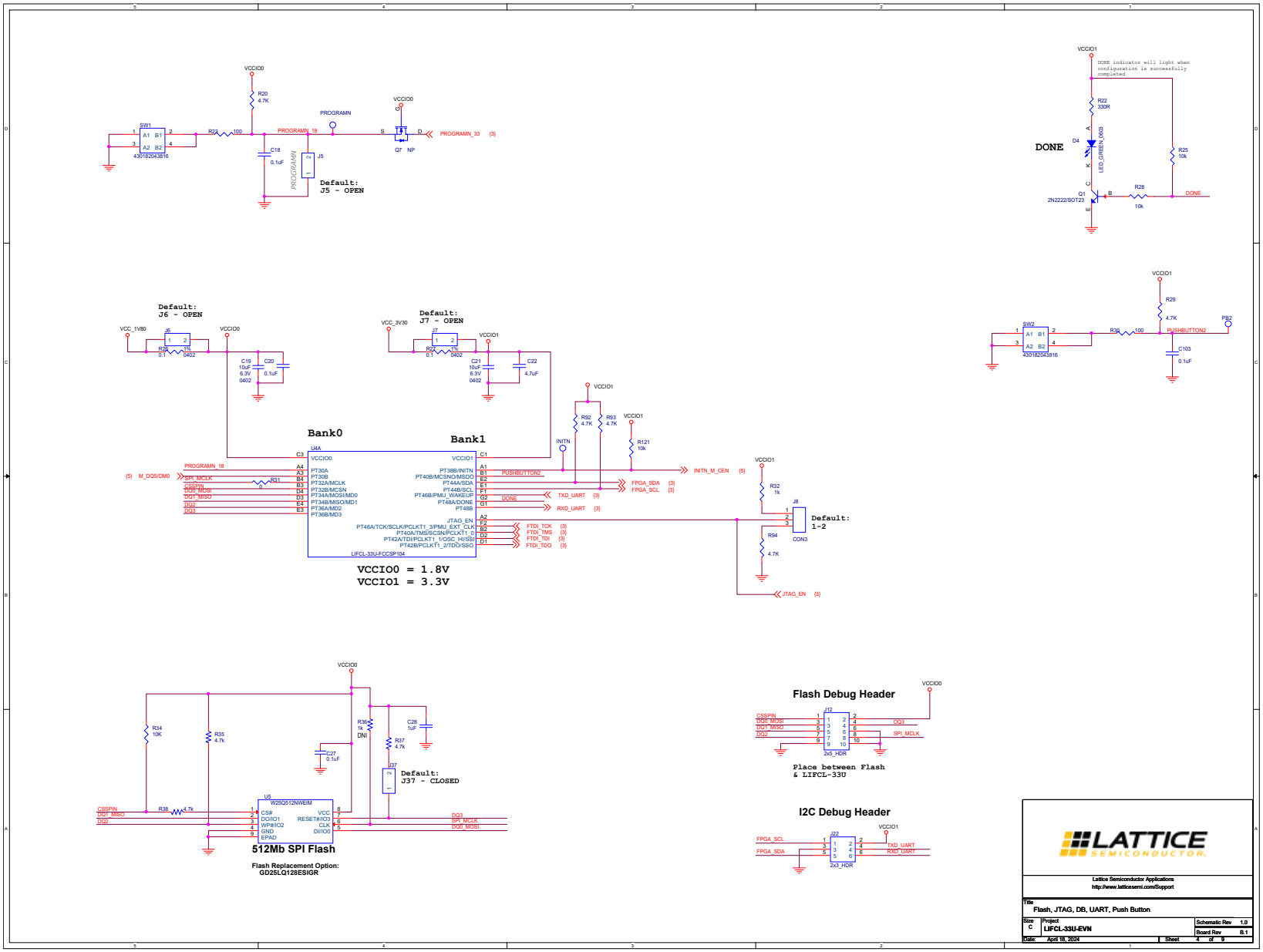

Figure A.4. Flash, PMOD Connectors, JTAG

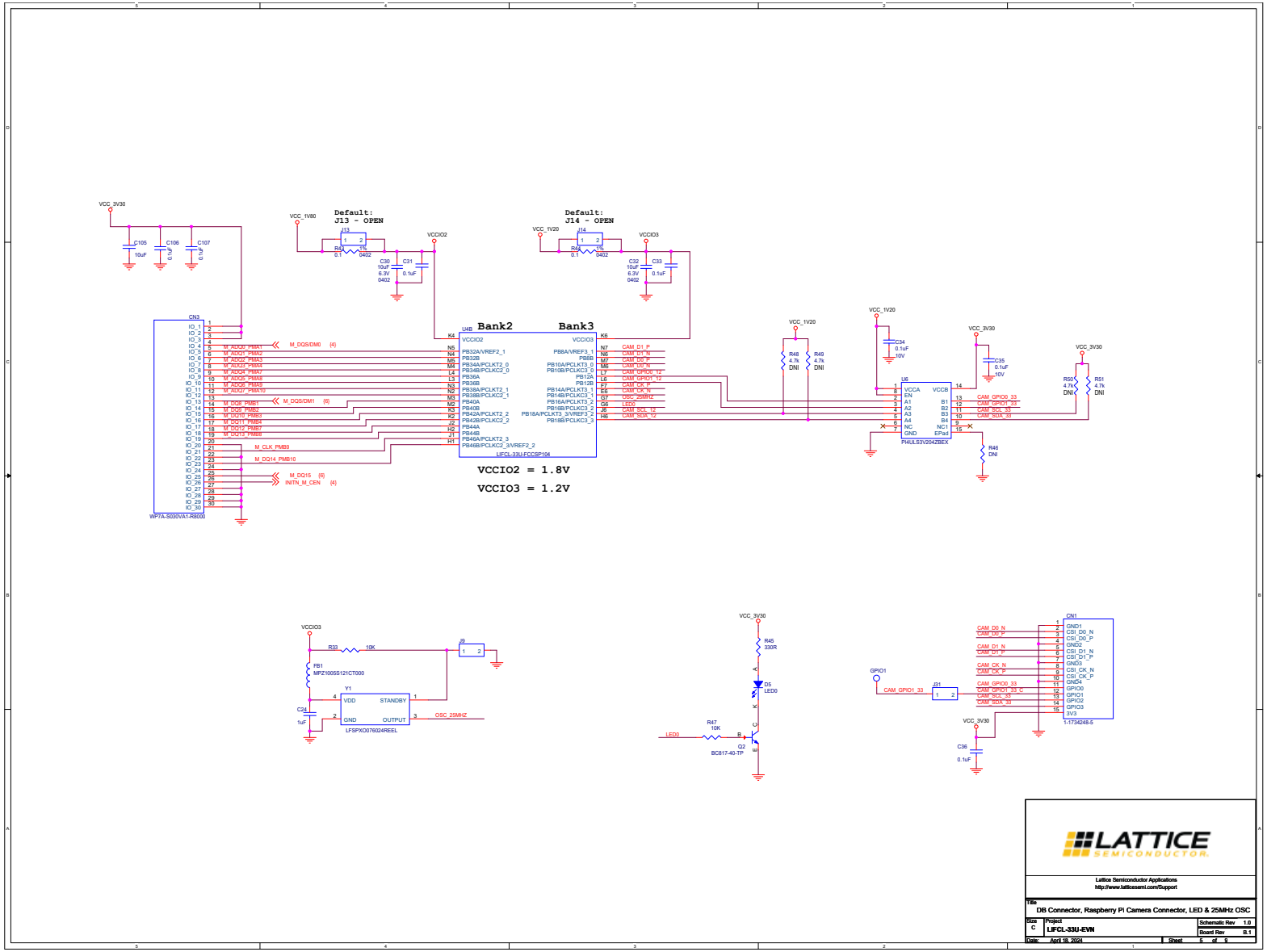

Figure A.5. PSRAM Memory Interface, Raspberry Pi Camera Connector

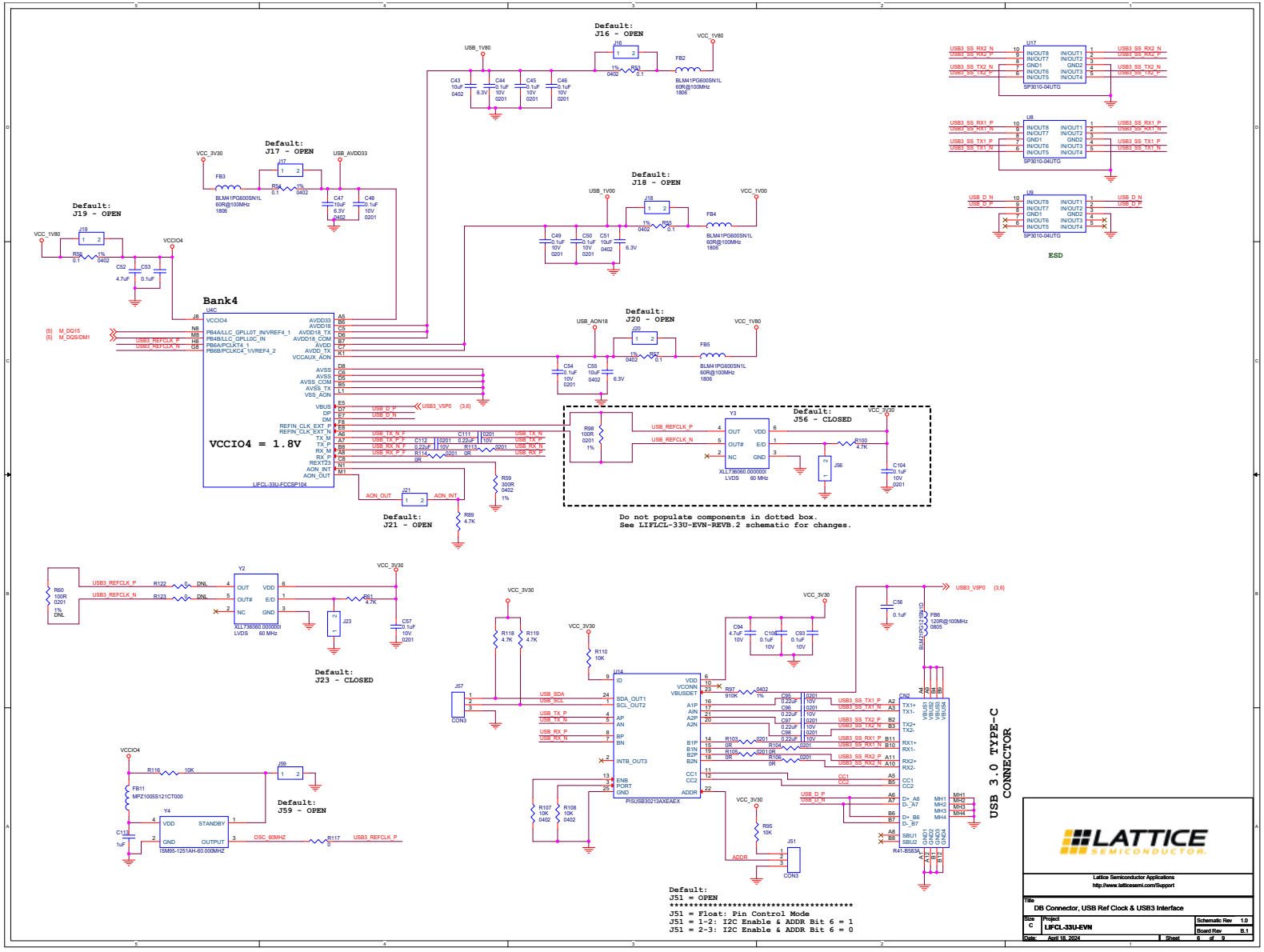

Figure A.6. PSRAM Memory Interface, USB 3 Interface

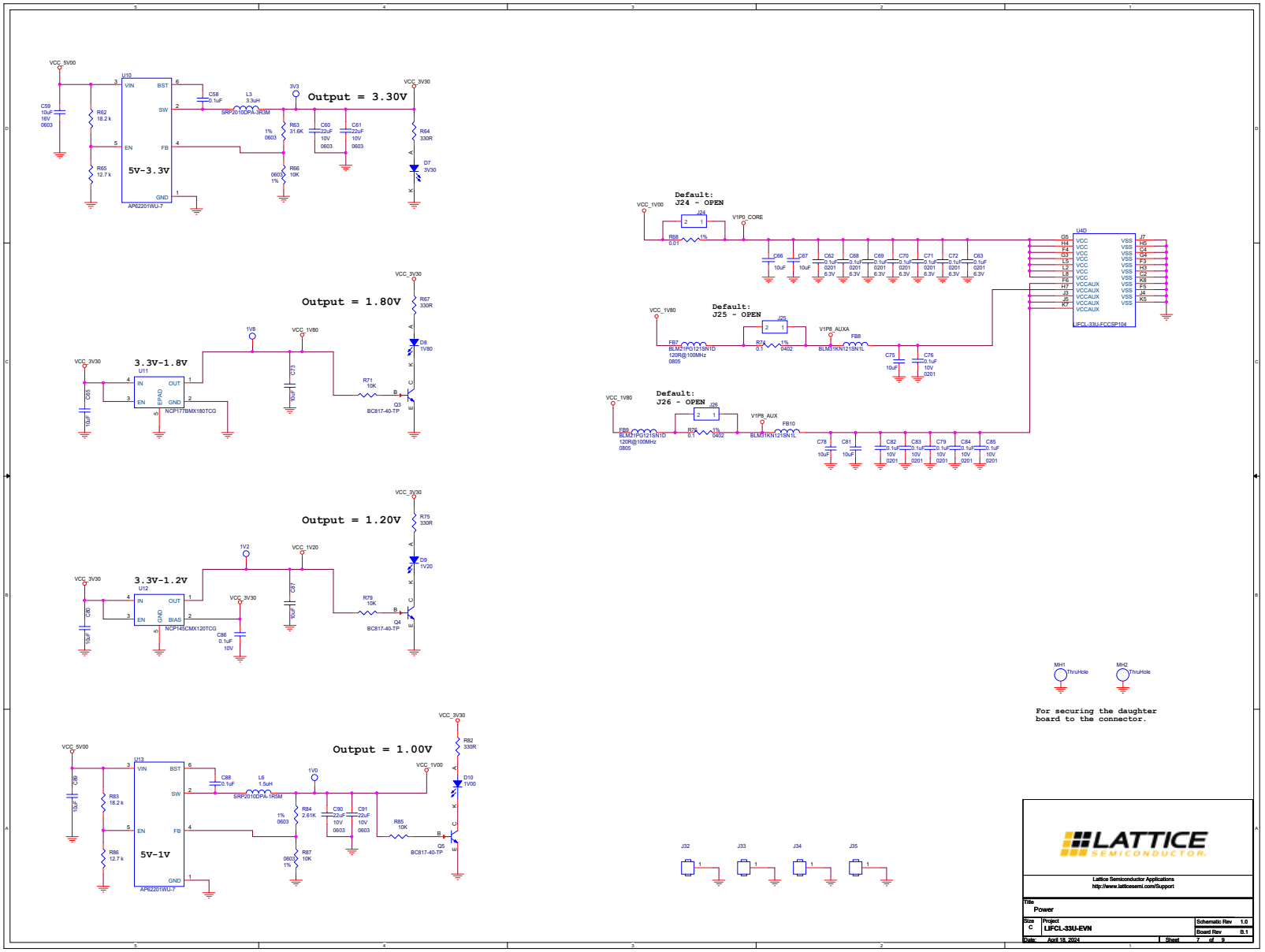

Figure A.7. Power

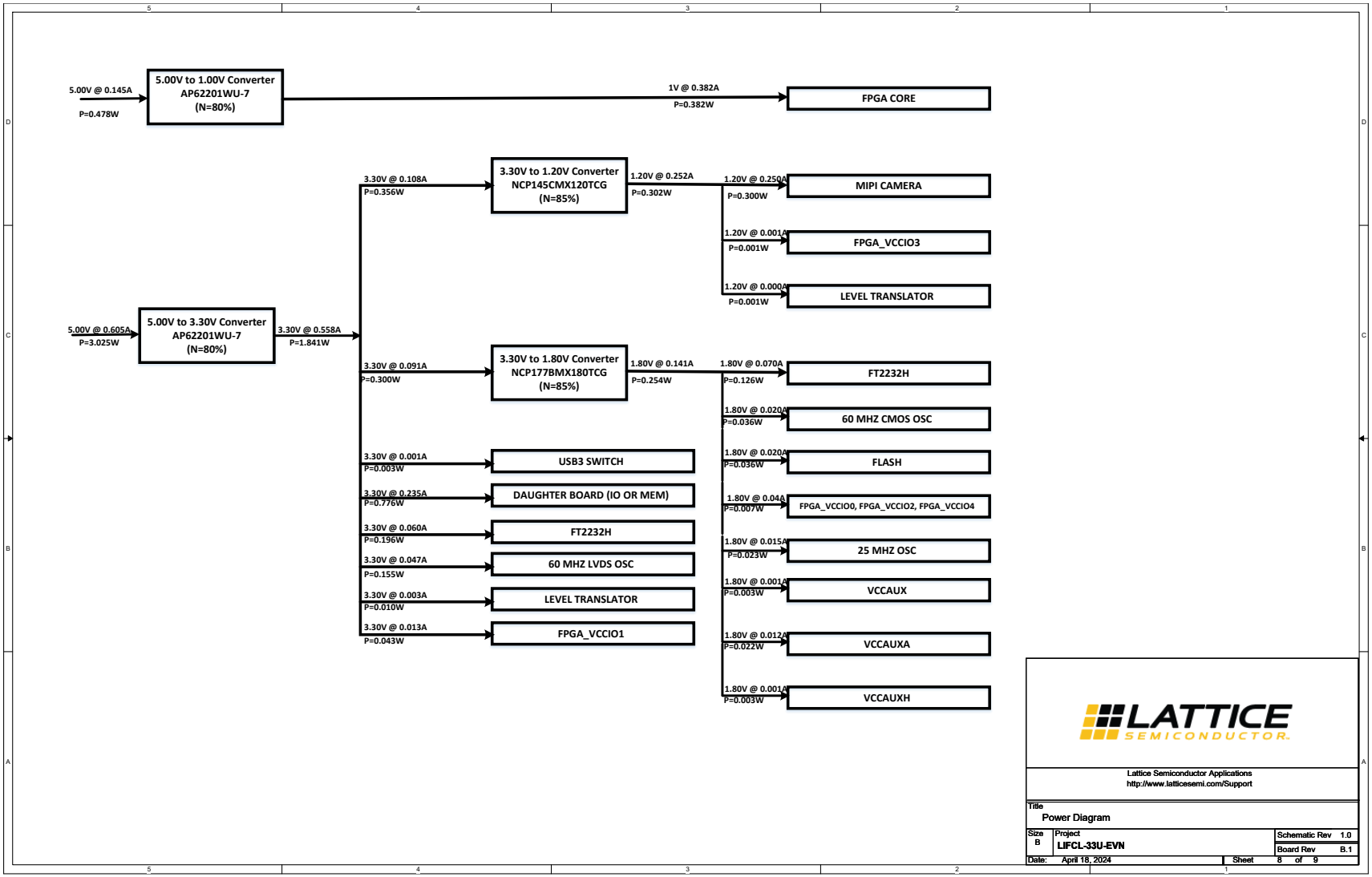

Figure A.8. Power Diagram

Appendix B. CrossLinkU-NX Evaluation Board Bill of Materials

Item	Reference	Qty	Value	PCB Footprint	Comments	Manufacturer Part Number	Manufacturer	Description
1	CN1	1	1-1734248-5	15P_Connector	—	1-1734248-5	TE Connectivity AMP Connectors	CONN FPC VERT 15POS 1MM SMD
2	CN2	1	USB Type-C Receptacle	usb_type_c	—	R41-B583A	Mitsumi Electric Company Ltd	USB TYPE-C CONNECTOR, ONBOARD SM
3	CN3	1	WP7A-S030VA1-R8000	WP7A-S030VA1-R8000	—	WP7A-S030VA1-R8000	JAE Electronics	CONN RCPT 30POS SMD GOLD
4	C1,C2,C3,C5,C6,C7,C8,C9,C11,C13,C15,C17,C27	13	0.1 µF	C0201	—	C0603X5R1C104K030BC	TDK	CAP CER 0.1UF 16V X5R 0201
5	C4,C10,C12,C14,C22,C52,C94	7	4.7 µF	C0402	—	C1005X5R1A475K050BC	TDK	CAP CER 4.7UF 10V X5R 0402
6	C16,C28	2	1 µF	C0402	—	EMK105BJ105KVHF	Taiyo Yuden	CAP CER 1UF 16V X5R 0402
7	C18,C103	2	0.1 µF	C0201	—	C0603X5R1C104K030BC	TDK	CAP CER 0.1UF 16V X5R 0201
8	C19,C21,C30,C32	4	10 µF	402	—	GRM155R60J106ME15D	Murata Electronics	CAP CER 10UF 6.3V X5R 0402
9	C20,C31,C33,C36,C53,C106,C107	7	0.1 µF	c0201_chamfer	—	C0603X5R1C104K030BC	TDK	CAP CER 0.1UF 16V X5R 0201
10	C24,C113	2	1 µF	C0603	—	CL10B105KP8NNNC	Samsung Electro-Mechanics	CAP CER 1UF 10V X7R 0603
11	C34,C35,C86,C93,C108	5	0.1 µF	C0402	—	GRM155R61A104KA01J	Murata Electronics	CAP CER 0.1UF 10V X5R 0402
12	C43,C47,C51,C55	4	10 µF	C0402	—	GRM155R60J106ME15D	Murata Electronics	CAP CER 10UF 6.3V X5R 0402
13	C44,C45,C46,C48,C49,C50,C54,C57,C76,C79,C82,C83,C84,C85	14	0.1 µF	C0201	—	GRM033R61A104ME15D	Murata	0.1uF Ceramic Chip Capacitor, X5R, 10V
14	C104	1	0.1 µF	C0201	DNL	GRM033R61A104ME15D	Murata	0.1uF Ceramic Chip Capacitor, X5R, 10V
15	C56,C92	2	0.1 µF	C0201	—	GRM033R61E104KE14J	Murata	CAP CER 0.1UF 25V 10% X5R 0201
16	C58,C88	2	0.1 µF	cap0402	—	GRM155R71H104KE14J	Murata Electronics	CAP CER 0.1UF 50V X7R 0402
17	C59	1	10 µF	C0603	—	EMK107BBJ106MA-T	Taiyo Yuden	CAP CER 10UF 16V X5R 0603
18	C60,C61,C90,C91	4	22 µF	C0603	—	CL10A226MP8NUNE	Samsung Electro-Mechanics	CAP CER 22UF 10V X5R 0603

Item	Reference	Qty	Value	PCB Footprint	Comments	Manufacturer Part Number	Manufacturer	Description
19	C62,C63	2	0.1 µF	C0201	—	GRM033R60J104KE19D	Murata	0.1uF Ceramic Chip Capacitor, X5R, 6.3V
20	C65,C73,C80,C87,C89	5	10 µF	cap0805	—	C2012X5R1E106M085AC	TDK Corporation	CAP CER 10UF 25V X5R 0805
21	C66,C67,C75,C78,C81	5	10 µF	C0603	—	C1608X5R1C106M080AB	TDK Corporation	CAP CER 10UF 16V X5R 0603
22	C68,C69,C70,C71,C72	5	0.1 µF	C0201	—	GRM033R60J104KE19D	Murata Electronics	0.1uF Ceramic Chip Capacitor, X5R, 6.3V
23	C95,C96,C97,C98,C111,C112	6	0.22 µF	201	—	GRM033R61A224KE90D	Murata Electronics	CAP CER 0.22UF 10V X5R 0201
24	C105	1	10 µF	C0402	—	CL05A106MP5NUNC	Samsung	CAP CER 10UF 10V X5R 0402
25	D1,D2	2	BAT60JFILM	SOD-323	—	BAT60JFILM	STMicroelectronics	DIODE SCHOTTKY 10V 3A SOD323
26	D4,D12	2	LED_GREEN_0603	APT1608	—	APT1608CGCK	Kingbright	LED GREEN CLEAR CHIP SMD
27	D5	1	LED0	led_0603	—	SML-D12M8WT86	Rohm Semiconductor	LED GREEN DIFFUSED 0603 SMD
28	D7	1	3V30	led_0603	—	SML-D12M8WT86	Rohm Semiconductor	LED GREEN DIFFUSED 0603 SMD
29	D8	1	1V80	led_0603	—	SML-D12M8WT86	Rohm Semiconductor	LED GREEN DIFFUSED 0603 SMD
30	D9	1	1V20	led_0603	—	SML-D12M8WT86	Rohm Semiconductor	LED GREEN DIFFUSED 0603 SMD
31	D10	1	1V00	led_0603	—	SML-D12M8WT86	Rohm Semiconductor	LED GREEN DIFFUSED 0603 SMD
32	FB1,FB11	2	MPZ1005S121CT000	FB0402	—	MPZ1005S121CT000	TDK Corporation	FERRITE BEAD 120 OHM 0402 1LN
33	FB2,FB3,FB4,FB5	4	60R@100 MHz	1806	—	BLM41PG600SN1L	Murata Electronics	FERRITE BEAD 60 OHM 1806 1LN
34	FB6,FB7,FB9	3	120R@100 MHz	805	—	BLM21PG121SN1D	Murata Electronics	FERRITE BEAD 120 OHM 0805 1LN
35	FB8,FB10	2	BLM31KN121SN1L	BLM41P	—	BLM31KN121SN1L	Murata Electronics	FERRITE BEAD 120 OHM 1206 1LN
36	GPIO1	1	TestPoint	TP50	DNL	—	—	—
37	1V0,1V2,12MHZ,1V8,3V3,5V0,INITN	7	T POINT R	TP	DNL	—	—	—
38	J1	1	Header 1x8	hdr_amp_87220_8_1x8_100	—	22284081	Molex	CONN HEADER 8POS .100 VERT TIN

Item	Reference	Qty	Value	PCB Footprint	Comments	Manufacturer Part Number	Manufacturer	Description
39	J2	1	USB3085-30-A	MICRO_AB_USB3085_30_A	—	USB3085-30-A	GCT	USB - micro AB USB 2.0 Receptacle Connector 5 Position Surface Mount, Right Angle
40	J3	1	CON2	CON2	—	61300211121	Würth Elektronik	CONN HEADER VERT 2POS 2.54MM
41	J5,J6,J7,J9,J13,J14,J16,J17,J18,J19,J20,J21,J24,J25,J26,J27,J29,J30,J31,J59	20	Header	Header_2X1_100MIL	—	—	—	Regular 100Mil Header
42	J28	1	Header	Header_2X1_100MIL	DNL	—	—	Regular 100Mil Header
43	J8	1	CON3	HDR1X3	DEFAULT : PIN 1 & 2	—	—	Regular 100Mil Header
44	J51,J57	2	CON3	HDR1X3	—	—	—	Regular 100Mil Header
45	J12	1	2x5_HDR	2X5_HDR	—	—	—	Regular 100Mil Header
46	J22	1	2x3_HDR	2X3_HDR	—	—	—	Regular 100Mil Header
47	J23,J37,J40,J41	4	Header	Header_2X1_100MIL	DEFAULT : PIN 1 & 2	—	—	Regular 100Mil Header
48	J56	1	Header	Header_2X1_100MIL	DEFAULT : PIN 1 & 2/DNL	—	—	Regular 100Mil Header
49	J32,J33,J34,J35	4	J-Turret	TUR_TH	—	1573-2	Keystone Electronics	TERM TURRET SINGLE L=4.72MM TIN
50	L1,L2	2	220 Ω 500 mA	FB0402	—	MPZ1005S221ET000	TDK Corporation	FERRITE BEAD 220 OHM 0402 1LN
51	L3	1	3.3 µH	806	—	SRP2010DPA-3R3M	Bourns Inc.	IND,2X1.6X1MM,3.3UH20%,1.4A,SHD
52	L6	1	1.5 µH	806	—	SRP2010DPA-1R5M	Bourns Inc.	IND,2X1.6X1MM,1.5UH20%,2.1A,SHD
53	MH1,MH2	2	ThruHole	MTG125	DNL	—	—	—
54	PB2,PROGRAMN	2	TestPoint_SMT	TPC32	DNL	—	—	—
55	Q1	1	2N2222/SOT23	MMBT2222ALT-1	—	MMBT2222ALT1HTSA1	Infineon Technologies	TRANS NPN 40V 0.6A SOT-23
56	Q2,Q3,Q4,Q5	4	BC817-40-TP	SOT23-3	—	BC817-40-TP	Micro Commercial Co	TRANS NPN 45V 0.8A SOT-23
57	Q7	1	BSS816NW	SOT-323	DNL	BSS816NWH6327XTSA1	Infineon Technologies	MOSFET N-CH 20V 1.4A SOT323-3
58	R1,R2,R3,R35,R37,R38	6	4.7 kΩ	R0402	—	RC0402FR-074K7L	Yageo	RES SMD 4.7K OHM 1% 1/16W 0402

Item	Reference	Qty	Value	PCB Footprint	Comments	Manufacturer Part Number	Manufacturer	Description
59	R4,R16,R17,R18,R25,R28,R121	7	10 kΩ	R0402	—	RC0402FR-0710KL	Yageo	RES SMD 10K OHM 1% 1/16W 0402
60	R5,R13,R19	3	2.2 kΩ	R0402	—	RC0402FR-072K2L	Yageo	RES SMD 2.2K OHM 1% 1/16W 0402
61	R6	1	22 Ω	R0402	—	RC0402FR-0722RL	Yageo	RES SMD 22 OHM 1% 1/16W 0402
62	R7,R9,R10	3	0	R0402	—	RC0402JR-070RL	Yageo	RES SMD 0 OHM JUMPER 1/16W 0402
63	R14	1	12 kΩ	R0402	—	RC0402FR-0712KL	Yageo	RES SMD 12K OHM 1% 1/16W 0402
64	R15	1	22 Ω	R0402	—	RC0402FR-0722RL	Yageo	RES SMD 22 OHM 1% 1/16W 0402
65	R20,R29,R94	3	4.7 kΩ	R0603	—	CRCW06034K70FKEA	Vishay	RES 4.70K OHM 1/10W 1% 0603 SMD
66	R22,R45,R64,R67,R75,R82	6	330 Ω	res0603	—	ERJ-3EKF3300V	Panasonic Electronic Components	RES SMD 330 OHM 1% 1/10W 0603
67	R23,R30	2	100 Ω	R0402	—	ERJ-2RKF1000X	Panasonic	RES SMD 100 OHM 1% 1/10W 0402
68	R26,R27,R43,R44,R53,R54,R55, R56,R57,R74,R76	11	0.1 Ω	R0402	—	RL0402FR-070R1L	Yageo	RES 0.1 OHM 1% 1/16W 0402
69	R31,R117	2	0	R0402	—	RC0402JR-070RL	Yageo	RES SMD 0 OHM JUMPER 1/16W 0402
70	R32	1	1 kΩ	R0402	—	RC0402FR-071KL	Yageo	RES SMD 1K OHM 1% 1/16W 0402
71	R33,R116	2	10 kΩ	R0603	—	CRCW060310K0FKEA	Vishay Dale	RES SMD 10K OHM 1% 1/10W 0603
72	R34,R95,R110	3	10 kΩ	R0402	—	CRCW040210K0JNED	Vishay Dale	RES SMD 10K OHM 5% 1/16W 0402
73	R36	1	1 kΩ	R0402	DNL	RC0402FR-071KL	Yageo	RES SMD 1K OHM 1% 1/16W 0402
74	R46	1	DNI	R0402	DNL	ERJ-2GE0R00X	Panasonic Electronic Components	RES SMD 0 OHM JUMPER 1/10W 0402
75	R47,R71,R79,R85	4	10 kΩ	res0603	—	RC1608F103CS	Samsung Electro-Mechanics	RES SMD 10K OHM 1% 1/10W 0603

Item	Reference	Qty	Value	PCB Footprint	Comments	Manufacturer Part Number	Manufacturer	Description
76	R48,R49,R50,R51	4	4.7 kΩ	R0402	DNL	RC0402FR-074K7L	Yageo	RES SMD 4.7K OHM 1% 1/16W 0402
77	R59	1	300 Ω	402	—	RC0402FR-07300RL	Yageo	RES 300 OHM 1% 1/16W 0402
78	R60	1	100 Ω	201	DNL	RC0201FR-07100RL	Yageo	RES 100 OHM 1% 1/20W 0201
79	R61,R89,R118,R119	4	4.7 kΩ	R0402	—	CRCW04024K70JNED	Vishay	RES SMD 4.7K OHM 5% 1/16W 0402
80	R100	1	4.7 kΩ	R0402	DNL	CRCW04024K70JNED	Vishay	RES SMD 4.7K OHM 5% 1/16W 0402
81	R62,R83	2	18.2 kΩ	res0402	—	RT0402BRD0718K2L	YAGEO	RES SMD 18.2KOHM 0.1% 1/16W 0402
82	R63	1	31.6 kΩ	603	—	RC0603FR-0731K6L	Yageo	RES 31.6K OHM 1% 1/10W 0603
83	R65,R86	2	12.7 kΩ	res0402	—	ERJ-2RKF1272X	Panasonic Electronic Components	RES SMD 12.7K OHM 1% 1/10W 0402
84	R66,R87	2	10 kΩ	603	—	RC0603FR-0710KL	Yageo	RES SMD 10K OHM 1% 1/10W 0603
85	R68	1	0.01 Ω	R0402	—	PE0402FRF070R01L	Yageo	RES 0.01 OHM 1% 1/16W 0402
86	R84	1	2.61 kΩ	603	—	RC0603FR-072K61L	Yageo	RES 2.61K OHM 1% 1/10W 0603
87	R91	1	1 kΩ	R0402	—	CRCW04021K00JNED	Vishay	RES SMD 1K OHM 5% 1/16W 0402
88	R92,R93	2	4.7 kΩ	R0402	—	RC0402JR-074K7L	YAGEO	RES 4.7K OHM 5% 1/16W 0402
89	R97	1	910 kΩ	402	—	RC0402FR-07910KL	YAGEO	RES 910K OHM 1% 1/16W 0402
90	R98	1	100 Ω	201	DNL	RC0201FR-07100RL	Yageo	RES 100 OHM 1% 1/20W 0201
91	R103,R104,R105,R106,R113,R114	6	0	R0201	—	RC0201JR-070RL	Yageo	RES 0 OHM JUMPER 1/20W 0201
92	R107,R108	2	10 kΩ	R0402	—	RC0402JR-0710KL	YAGEO	RES 10K OHM 5% 1/16W 0402
93	R122,R123	2	0	R0402	DNL	RC0402JR-070RL	Yageo	RES SMD 0 OHM JUMPER 1/16W 0402

Item	Reference	Qty	Value	PCB Footprint	Comments	Manufacturer Part Number	Manufacturer	Description
94	SW1,SW2	2	430182043816	430182043816	—	430182043816	Würth Elektronik	SWITCH TACTILE SPST-NO 0.05A 12V
95	U1	1	ESDR0502N	ESDR0502N	—	ESDR0502NMUTBG	ON Semiconductor	TVS DIODE 5.5VWM 6UDFN
96	U2	1	FT2232HL	tqfp64_0p5_12p2x12p2_h1p6	—	FT2232HL	FTDI	IC USB HS DUAL UART/FIFO 64-LQFP
97	U3	1	93LC56C-I/SN	so8_50_244	—	93LC56C-I/SN	Microchip	IC EEPROM 2KBIT SPI 3MHZ 8SOIC
98	U4	1	LIFCL-33U-FCCSP104	FCCSP104	Customer Supplied	—	—	—
99	U5	1	W25Q512NWEIM	8-WSON	—	W25Q512NWEIM	Winbond Electronics	IC FLASH 512MBIT SPI/QUAD 8WSON
100	U6	1	PI4ULS3V204ZBEX	TQFN-14	—	PI4ULS3V204ZBEX	Diodes Inc.	8-bit bi-directional Level Shifter
101	U8,U9,U17	3	SP3010-04UTG	UDFN10_SP3010-04UTG	—	SP3010-04UTG	Littelfuse Inc.	TVS DIODE 6V 12.3V 10UDFN
102	U10,U13	2	AP62201WU-7	TSOT26_AP62201WU-7	—	AP62201WU-7	Diodes Incorporated	DCDC CONV HV BUCK TSOT26 T&R 3K
103	U11	1	NCP177BMX180TCG	XDFN4	—	NCP177BMX180TCG	onsemi	IC REG LINEAR 1.8V 500MA 4XDFN
104	U12	1	NCP145CMX120TCG	XDFN4	—	NCP145CMX120TCG	onsemi	IC REG LINEAR 1.2V 500MA 4XDFN
105	U14	1	PI5USB30213AXEAEX	QFN40P400X200X50-25N	—	PI5USB30213AXEAEX	Diodes Incorporated	USB3 SWITCH,X1-QFN2040-24,T&R,3.
106	X1	1	CSTNE12M0G55Z000R0	OSC_CSTNE12M0G55Z000R0	—	CSTNE12M0G55Z000R0	Murata Electronics	CERAMIC RES 12.0000MHZ 33PF SMD
107	Y1	1	LFSPXO076024REEL	4-SMD_25MHz	—	LFSPXO076024REEL	IQD Frequency Products	XTAL OSC XO 25.0000MHZ CMOS SMD
108	Y2	1	60 MHz	6SMD	—	XLL736060.000000I	Renesas Electronics America Inc	XTAL OSC XO 60.0000MHZ LVDS SMD
109	Y3	1	60 MHz	6SMD	DNL	XLL736060.000000I	Renesas Electronics America Inc	XTAL OSC XO 60.0000MHZ LVDS SMD
110	Y4	1	ISM95-1251AH-60.000 MHz	4-SMD_60MHz	—	ISM95-1251AH-60.000MHZ	ILSI	OSC XO 60MHZ 1.8V CMOS SMD

Item	Reference	Qty	Value	PCB Footprint	Comments	Manufacturer Part Number	Manufacturer	Description
111	Shunt for headers	30	SPC02SYAN	—	Load the shunts mentioned in the BoM & the remaining are Bag & Tag	SPC02SYAN	Sullins Connector Solutions	CONN JUMPER SHORTING GOLD FLASH
112	Nuts	4	91834A102	—	—	91834A102	McMaster Carr	18-8 Stainless Steel Narrow Hex Nut 4-40
113	Standoffs	4	93505A435	—	—	93505A435	McMaster Carr	Aluminum, 1/4" Hex Size, 7/8" Long, 4-40 Thread Size
114	LIFCL-33U-EVN BOARD REVB.1 PCB	1		—	—	305-PD-24-0940	PACTRON	—

Note:

1. For the initial build of 25 boards, please use the 15 units of APS512XXN-OBX9-BG and 10 units of APS256XXN-OB9-BG at location U7.

Appendix C. CrossLinkU-NX I/O Daughter Board Schematics

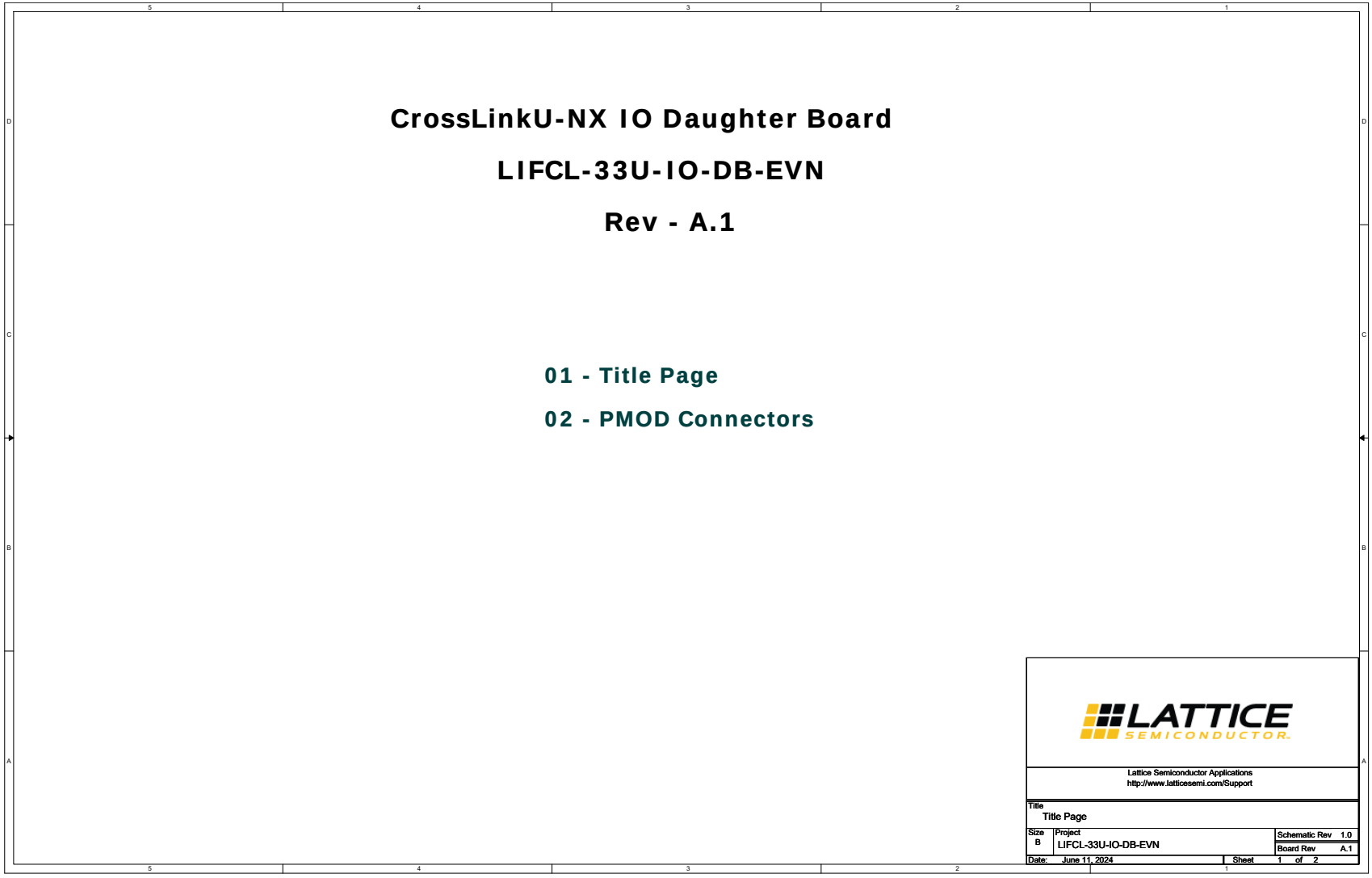

Figure C.1. Title Page

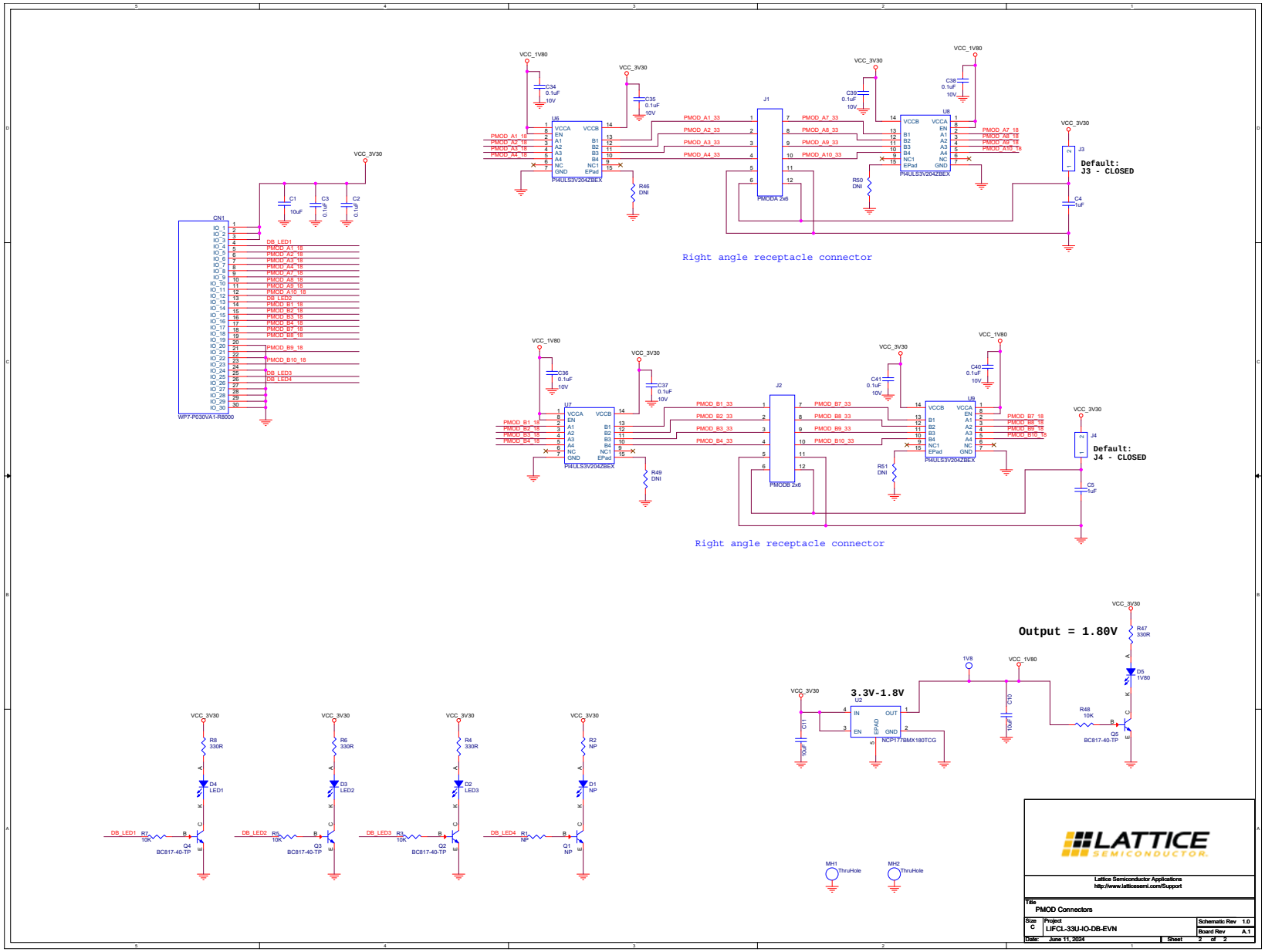

Figure C.2. PMOD Connectors

Appendix D. CrossLinkU-NX I/O Daughter Board Bill of Materials

Item	Reference	Qty	Value	PCB Footprint	Comments	Manufacturer Part Number	Manufacturer	Description
1	CN1	1	WP7-P030VA1-R8000	WP7-P030VA1-R8000	—	WP7-P030VA1-R8000	JAE Electronics	CONN PLUG 30POS SMD GOLD
2	C1	1	10 µF	C0402	—	CL05A106MP5NUNC	Samsung	CAP CER 10UF 10V X5R 0402
3	C2,C3	2	0.1 µF	c0201_chamfer	—	C0603X5R1C104K030BC	TDK	CAP CER 0.1UF 16V X5R 0201
4	C4,C5	2	1 µF	C0402	—	EMK105BJ105KVHF	Taiyo Yuden	CAP CER 1UF 16V X5R 0402
5	C10,C11	2	10 µF	cap0805	—	C2012X5R1E106M085AC	TDK Corporation	CAP CER 10UF 25V X5R 0805
6	C34,C35,C36,C37, C38,C39,C40,C41	8	0.1 µF	C0402	—	GRM155R61A104KA01J	Murata Electronics	0.10µF ±10% 10V X5R Ceramic Capacitor -55°C ~ 85°C Surface Mount, MLCC 0402 (1005 Metric) 0.039" L x 0.020" W (1.00mm x 0.50mm)
7	D1	1	GREEN	LED0603	DNL	SML-D12M8WT86	Rohm Semiconductor	LED GREEN DIFFUSED 0603 SMD
8	D2	1	LED3	led_0603	—	SML-D12M8WT86	Rohm Semiconductor	LED GREEN DIFFUSED 0603 SMD
9	D3	1	LED2	led_0603	—	SML-D12M8WT86	Rohm Semiconductor	LED GREEN DIFFUSED 0603 SMD
10	D4	1	LED1	led_0603	—	SML-D12M8WT86	Rohm Semiconductor	LED GREEN DIFFUSED 0603 SMD
11	D5	1	1V80	led_0603	—	SML-D12M8WT86	Rohm Semiconductor	LED GREEN DIFFUSED 0603 SMD
12	J1	1	PMODA 2x6	skt_sullins_PPPC062LJBN-RC	—	PPPC062LJBN-RC	Sullins	CONN HDR 12POS 0.1 GOLD PCB R/A
13	J2	1	PMODB 2x6	skt_sullins_PPPC062LJBN-RC	—	PPPC062LJBN-RC	Sullins	CONN HDR 12POS 0.1 GOLD PCB R/A
14	J3,J4	2	Header	Header_2X1_100MIL	DEFAULT : PIN 1 & 2	—	—	Regular 100 MIL header
15	MH1,MH2	2	ThruHole	MTG125	DNL	—	—	—
16	Q1	1	BC817-40-TP	SOT23-3	DNL	BC817-40-TP	Micro Commercial Co	TRANS NPN 45V 0.8A SOT-23
17	Q2,Q3,Q4,Q5	4	BC817-40-TP	SOT23-3	—	BC817-40-TP	Micro Commercial Co	TRANS NPN 45V 0.8A SOT-23
18	R1	1	10 kΩ	res0603	DNL	RC1608F103CS	Samsung Electro-Mechanics	RES SMD 10K OHM 1% 1/10W 0603

Item	Reference	Qty	Value	PCB Footprint	Comments	Manufacturer Part Number	Manufacturer	Description
19	R2	1	330 Ω	res0603	DNL	ERJ-3EKF3300V	Panasonic Electronic Components	RES SMD 330 OHM 1% 1/10W 0603
20	R3,R5,R7,R48	4	10 kΩ	res0603	—	RC1608F103CS	Samsung Electro-Mechanics	RES SMD 10K OHM 1% 1/10W 0603
21	R4,R6,R8,R47	4	330 Ω	res0603	—	ERJ-3EKF3300V	Panasonic Electronic Components	RES SMD 330 OHM 1% 1/10W 0603
22	R46,R49,R50,R51	4	DNI	R0402	DNL	ERJ-2GE0R00X	Panasonic Electronic Components	RES SMD 0 OHM JUMPER 1/10W 0402
23	U2	1	NCP177BMX180TCG	XDFN4	—	NCP177BMX180TCG	onsemi	IC REG LINEAR 1.8V 500MA 4XDFN
24	U6,U7,U8,U9	4	PI4ULS3V204ZBEX	TQFN-14	—	PI4ULS3V204ZBEX	Diodes Inc.	8-bit bi-directional Level Shifter
25	1V8	1	T POINT R	TP	DNL	—	—	—
26	Screws	2	91613A432	—	—	91613A432	McMaster Carr	316 Stainless Steel Slotted Screws, 4-40 Thread Size, 1/4" Long
27	Nuts	3	91834A102	—	—	91834A102	McMaster Carr	18-8 Stainless Steel Narrow Hex Nut 4-40
28	Standoffs	1	93505A436	—	—	93505A436	McMaster Carr	Aluminum, 1/4" Hex Size, 1" Long, 4-40 Thread Size
29	Shunts	2	—	—	—	SPC02SYAN	Sullins Connector Solutions	CONN JUMPER SHORTING GOLD FLASH
30	CrossLinkU-NX IO Daughter Board RevA.1 PCB	1	—	—	—	305-PD-24-0941	PACTRON	—

References

- CrossLinkU-NX web page
- CrossLink-NX-33 and CrossLinkU-NX Data Sheet (FPGA-DS-02104)
- sysCONFIG Usage Guide for Nexus Platform (FPGA-TN-02099)
- Lattice Radiant FPGA design software
- Development Boards and Kits for CrossLink-NX
- Lattice Insights for Lattice Semiconductor training courses and learning plans

Technical Support Assistance

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

For frequently asked questions, refer to the Lattice Answer Database at www.latticesemi.com/en/Support/AnswerDatabase.

Revision History

Revision 1.0, January 2025

Section	Change Summary
All	Initial release.

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