Mach-N2 Evaluation Board

Preliminary User Guide

FPGA-EB-02078-0.81

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Abbreviations in This Document

A list of abbreviations used in this document.

Abbreviation	Definition
AC/DC	Alternating Current and Direct Current
ADC	Analog-to-digital Converter
DIP	Dual Inline Package
ESD	Electrostatic Discharge
FMC	FPGA Mezzanine Card
FPGA	Field Programmable Gate Array
FTDI	Future Technology Devices International
GPIO	General Purpose Input/Output
HCSL	High-Speed Current Steering Logic
HPC	High Pin Count
I2C	Inter-Integrated Circuit
I/O	Input/Output
JTAG	Joint Test Action Group
LED	Light Emitting Diode
LPC	Low Pin Count
LVDS	Low-Voltage Differential Signaling
OSC	Oscillator
PC	Personal Computer
PMOD	Peripheral Module
POT	Potentiometer
SERDES	Serializer/Deserializer
SMA	Subminiature Version A
SPI	Serial Peripheral Interface
UART	Universal Asynchronous Receiver Transmitter
USB	Universal Serial Bus

1. Introduction

The Lattice Mach™-N2 Evaluation Board enables investigation and experimentation with the Mach-N2 device features. It supports rapid prototyping and design testing. The board is part of the Mach-N2 Evaluation Kit. This user guide demonstrates the Mach-N2 device and provides an overview of board resources.

Mach-N2 Evaluation Kit contents:

- Mach-N2 Evaluation Board with LN2-MH-20-CBG484 device
- USB-A to USB-B (mini) cable for FPGA SRAM programming by means of a PC
- 12 V AC/DC power adapter with international plug adapters
- Lattice Radiant™ software download information

Guide Contents:

This user guide includes:

- Functional descriptions of major board sections
- Details of on-board headers, status indicators, push buttons, and switches
- Complete schematics of the Mach-N2 Evaluation Board

1.1. Mach-N2 Evaluation Board

The Mach-N2 Evaluation Board features the Mach-N2 device in CBG484 package. It provides expansion options through FMC HPC and LPC connectors, PCIe Gen 4x4 edge finger, 1G Ethernet, and Raspberry Pi Camera connectors. User-friendly resources, such as jumpers, LED indicators, push buttons, and switches, are available for custom applications.

Figure 1.1 shows the top view of the Mach-N2 Evaluation Board, and Figure 1.2 shows the bottom view.

1.2. Features

The Mach-N2 Evaluation Board includes:

- General-purpose input/output (GPIO) breakout with two FMC connectors, Ethernet and Raspberry Pi MIPI Camera connectors
- 94 wide-range I/O pins and 153 high-speed differential I/O pairs
- USB-B (mini) connection for device programming
- Eight DIP switches, three push buttons, eight green LEDs and three seven-segment LEDs for designer configuration
- Two FMC connectors (FMC-1 and FMC-2)
- PCIe Gen4 x4 finger edge
- Lattice Radiant software programming support
- Reference clock sources

Caution: The Mach-N2 Evaluation Board contains ESD-sensitive components. Always follow ESD-safe practices when handling and operating the board.

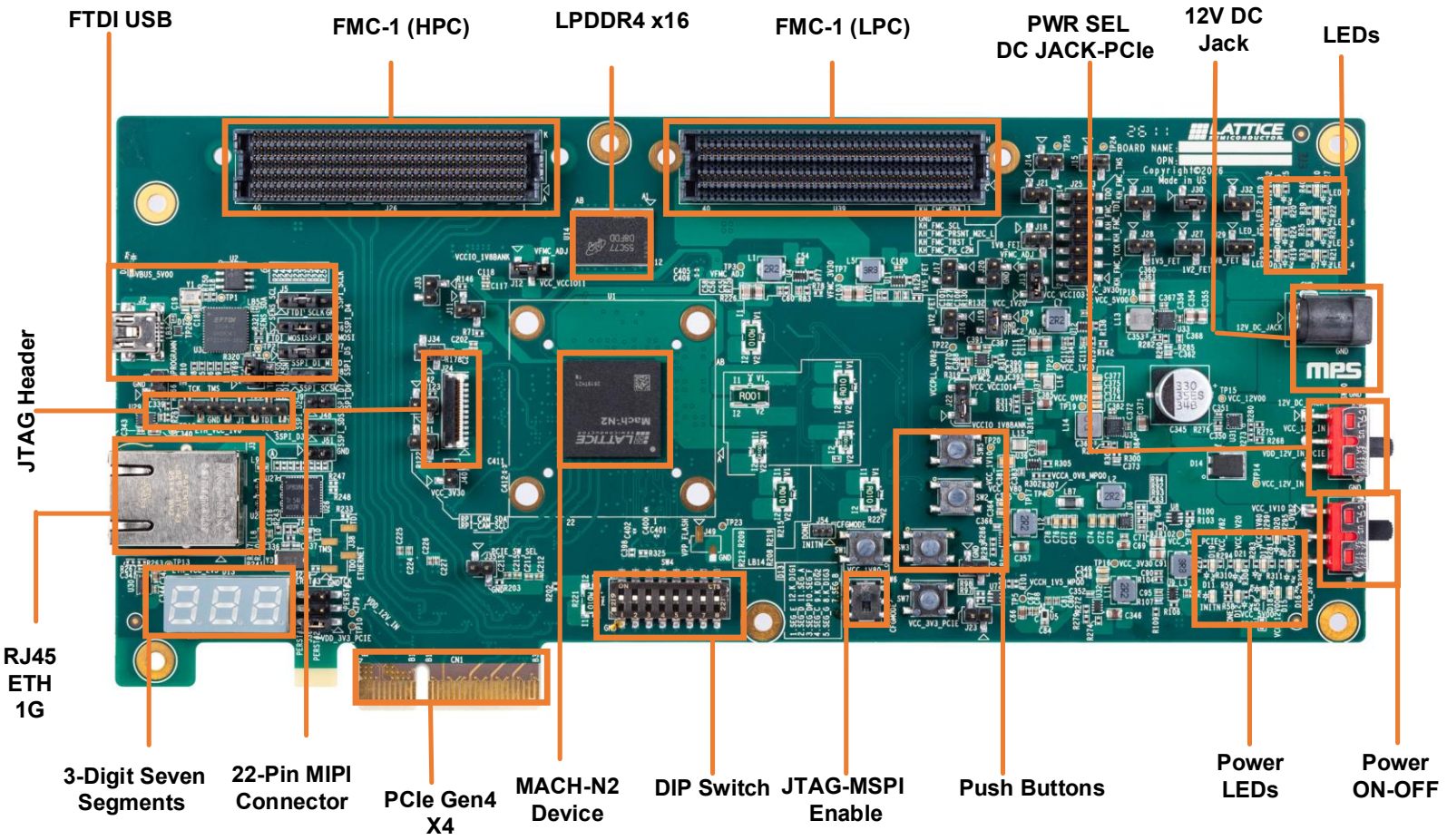

Figure 1.1. Mach-N2 Evaluation Board – Top view

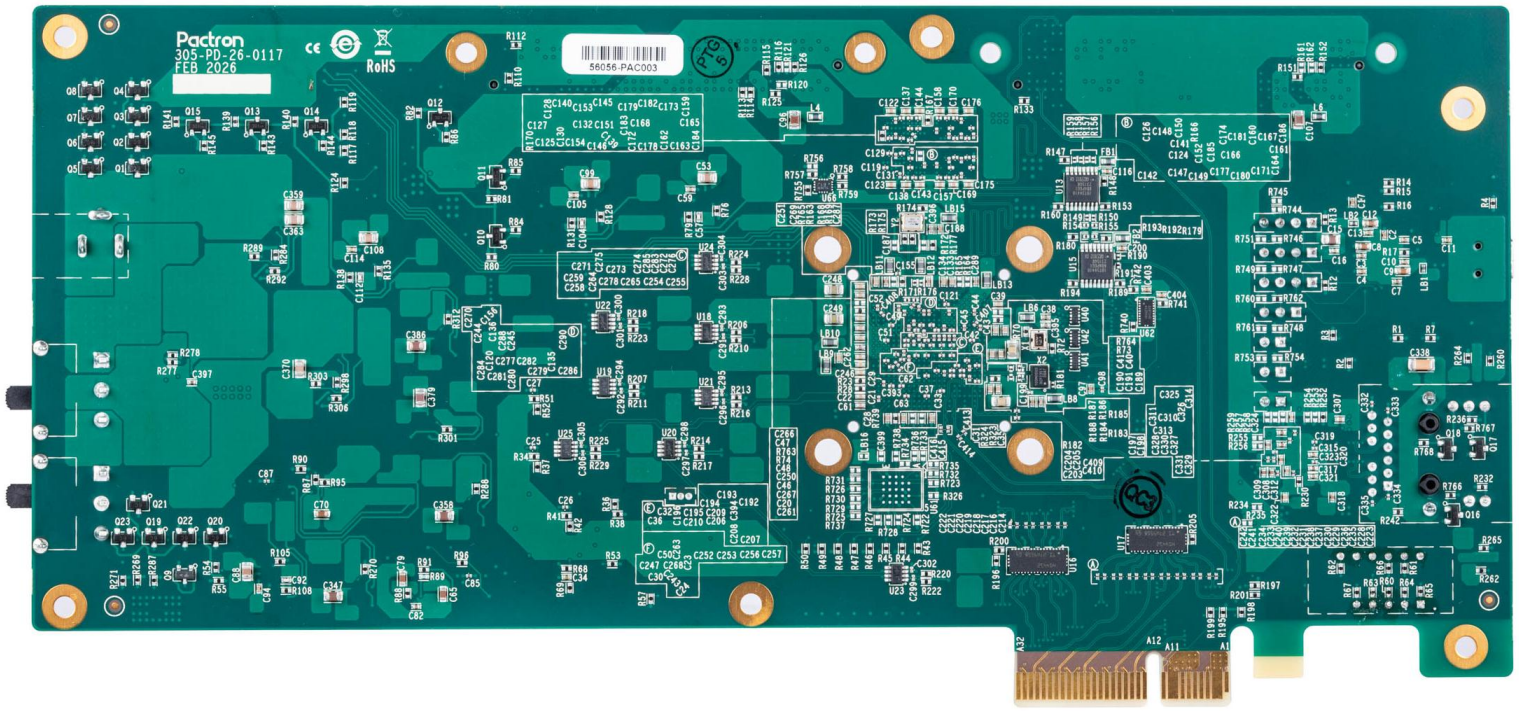

Figure 1.2. Mach-N2 Evaluation Board – Bottom view

1.3. Mach-N2 FPGA

The Mach-N2 Evaluation Board features the Mach-N2 device in the CBG484 package (LN2-MH-20-CBG484). This low-power, general-purpose FPGA supports diverse applications across multiple markets and is optimized for bridging and processing in edge environments.

For detailed device capabilities, refer to:

- Lattice Nexus™ 2 Platform - Overview Data Sheet (FPGA-DS-02122)
- Lattice Nexus 2 Platform Data Sheet - Specifications (FPGA-DS-02121)

1.4. Applying Power to the Board

The Mach-N2 Evaluation Board can be powered using the 12 V AC/DC adapter included in the kit or by means of PCIe Edge Finger power. Connect the adapter to power input jack J39, which is linked to slider switch SW10; for power input selection (see Figure 1.3). After connecting the 12 V DC power and toggling SW8 to the ON position, the power LEDs illuminate to confirm that the board is receiving the correct voltages.

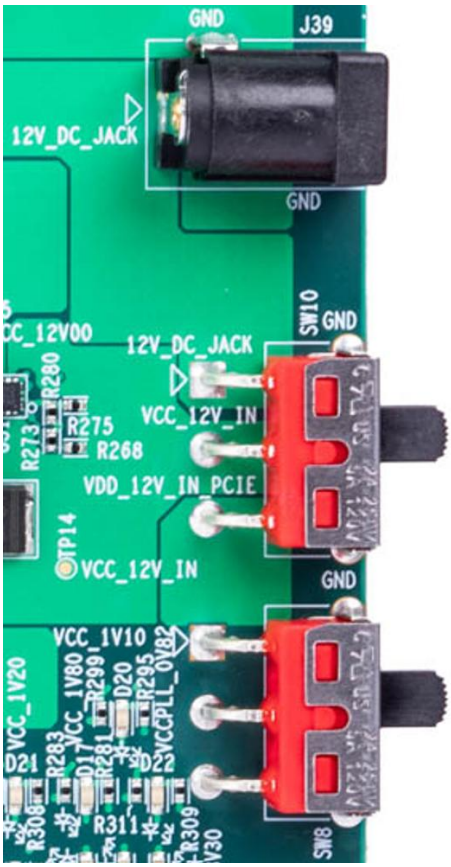

Figure 1.3. 12 V DC Power Supply

Table 1.1. Board Power Supply

Part Designator	Description
J39	12 V DC Input Supply Jack
SW10	12 V DC Input Supply Selection between DC Jack and PCIe edge finger
SW8	ON/OFF Switch

Table 1.2. Jumper Setting

Part Designator	Description	Setting	Default
J3	FTDI Reset	Open – FTDI active Close – Holds FTDI in reset	Open
J5, J6, J7	FTDI I2C	J5 (1-2), J6 (1-2), J7 (1-2) for SENS_SCL and SENS SDA Open – I2C bus unconnected Close – I2C bus connected	Open
J5, J6, J7, J8	FTDI to SSPI x1	J5 (2-3), J6 (2-3), J7 (2-3), J8 (1-2) for SSPI x1 with FTDI Interface Connected – closed for FTDI to SSPI x1 Disconnected – open for FTDI to SSPI x1	Open
J12	Bank 11 voltage settings	J12.1 and J12.2 – short to set Bank 11 for 1.8 V. J12.2 and J12.3 – short to configure VFMC_ADJ	Short J12.1 and J12.2
J13	Bank 3 voltage settings	J13.1 and J13.2 – short to set Bank 3 for 1.2 V J13.2 and J13.3 – short to configure VFMC_ADJ	Short J13.1 and J13.2
J22	Bank 14 voltage settings	J22(1-2) short for 1.8V and J22(2-3) short for VFMC2_ADJ	J22 (1-2) Short
J11	125 MHz OSC (x1); standby	Open – OSC enabled Close – OSC in standby	Open
J10	PROGRAMN pull-down jumper	Open – MSPI boot mode Close – Secondary configuration mode	Open
J4	FTDI PROGRAMN control	J4.1 and J4.2	Open
J49	VPP Flash selection for U61 IC	J49.1 and J49.2 – short to configure VPP Flash	Open
J35	SERDES line select between FMC2 and the PCIe edge finger is controlled by U16 and U17 ICs	J35.1 and J35.2 -short to enable SERDES over PCIe edge finger J35.1 and J35.2 – open to select FMC2	Open
J34	Reference clock selection for SERDES line operation	J34.1 and J34.2 – short to select reference clock from the FMC2 J34.1 and J34.2 – open to select the reference clock from PCIe Edge Finger	Open
J33	Reference clock selection from FMC2	J33.1 and J33.2 – short to select GBTCLK1 J33.1 and J33.2 – open to select GBTCLK0	Open
J27, J28, J29, J30, J31, J32	U12 voltage selection for FMC2	J27, J28, J29, J30, J31, J32 select the voltage for VFMC2. Only one of these jumpers should be installed. J27, J28, and J29 are used to connect to FPGA GPIOs to select respective voltage for VFMC2_ADJ J30 – short to set 1.2 V J31 – short to set 1.5 V J32 – short to set 1.8 V	Short J30

Part Designator	Description	Setting	Default
J16, J17, J18, J19, J20, J21	U4 voltage selection for FMC1 (VFMC_ADJ)	J16, J17, J18, J19, J20, and J21 select the voltage for VFMC2. Only one of these jumpers should be installed. J16, J17, and J18 are used to select the default voltage supplied by the FPGA . J19 – short to set 1.2 V J20 – short to set 1.5 V J21 – short to set 1.8 V	Short J19
J14	Bank 11 Vref11 control pin	J14 – short to enable TP25	Open
J15	Bank 11 Vref3 control pin	J15 – short to enable TP24	Open
J23	SERDES voltage selection	Choose one of the following voltage pairs: (OPEN) 0.8 V and 1.5 V (CLOSE) 0.9 V and 1.8V	Open

2. Power Scheme

2.1. Power Architecture

The Mach-N2 Evaluation Board uses on-board regulators powered by 12 V DC. For details on power supply options, refer to Appendix A. Mach-N2 Evaluation Board Schematics.
Figure 2.1 and Figure 2.2 illustrates the high-level power supply architecture of the board. Table 2.1 lists the voltage options available for various V_{CCIO} supplies.

2.2. FMC Power Configuration

The board includes two FMC connectors, designated as FMC1 and FMC2. The VFMC1_ADJ and VFMC2_ADJ power supplies are required for these connectors per the FMC standard. Set the power output level by adjusting the jumpers as follows:

- FMC1: J19, J16, J17, J18, J20, and J21
- FMC2: J30, J31, J32, J27, J28, and J29

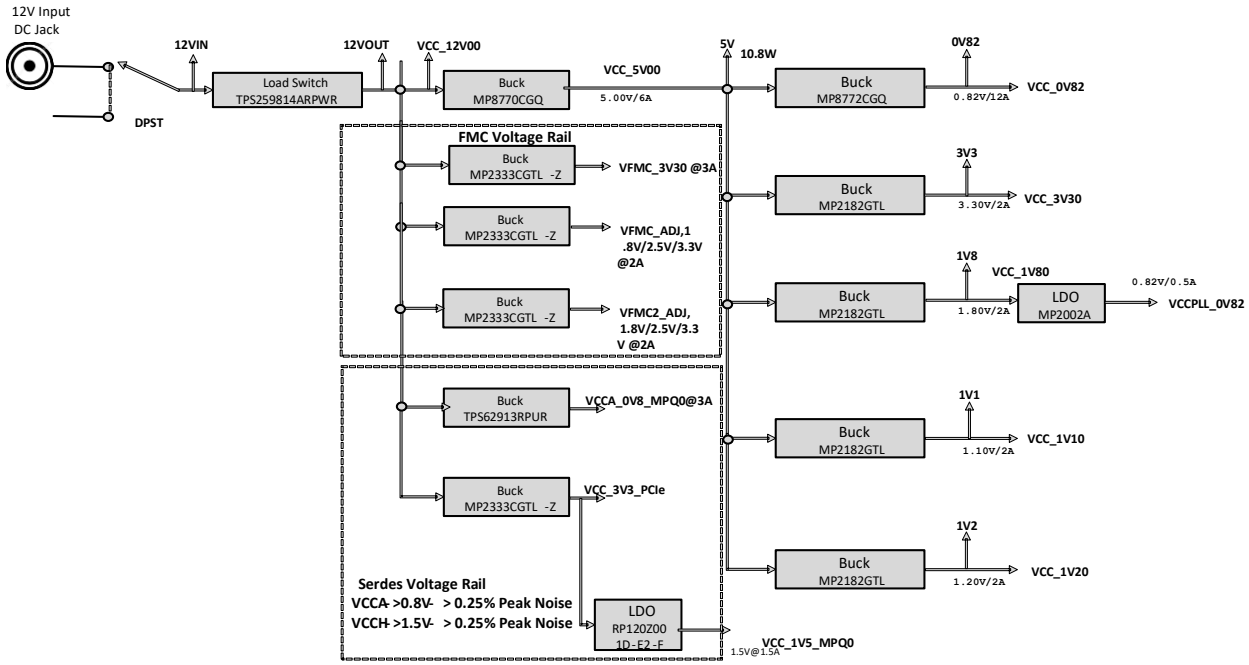

Figure 2.1. Board Power Scheme (1)

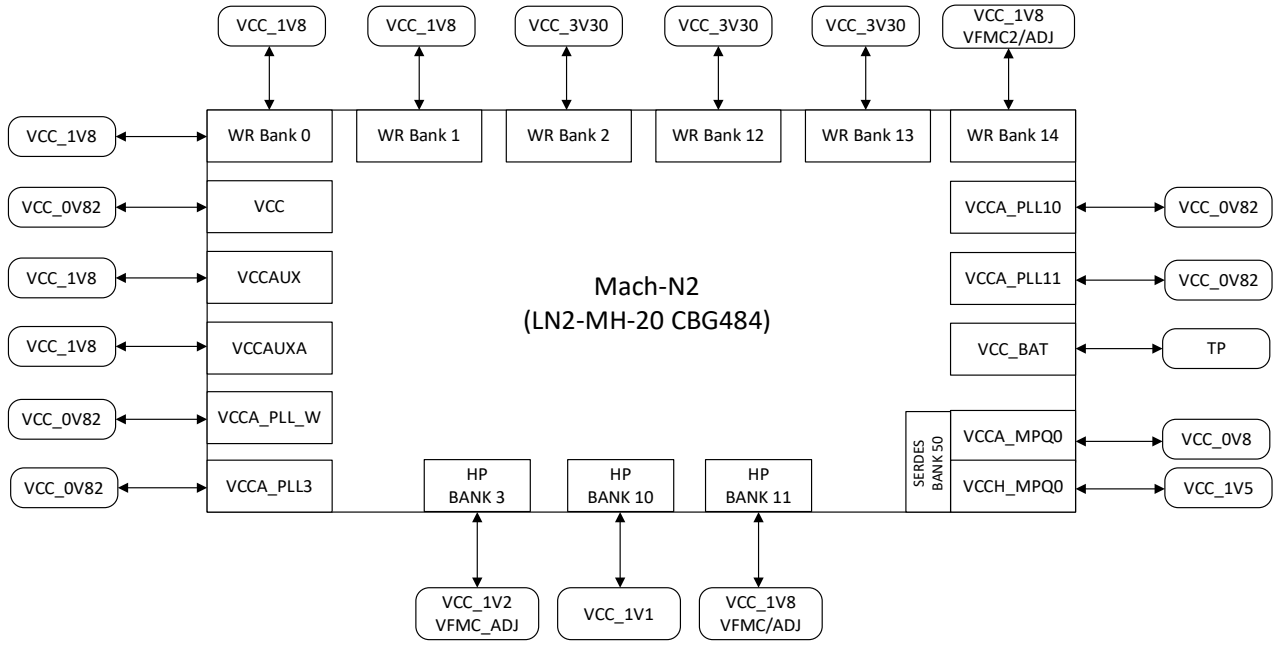

Figure 2.2. Board Power Scheme (2)

Table 2.1. V_{CCIO} Supply Options

V_{CCIO} Bank	3.30 V	1.80 V	1.20 V	1.10 V	FMC_ADJ
V_{CCIO0}	—	Fixed	—	—	–
V_{CCIO1}	—	Fixed	—	—	–
V_{CCIO2}	Fixed	—	—	—	–
V_{CCIO3}	—	—	Default	—	VFMC_ADJ
V_{CCIO10}	—	—	—	Fixed	VFMC_ADJ
V_{CCIO11}	—	Default	—	—	–
V_{CCIO12}	Fixed	—	—	—	–
V_{CCIO13}	Fixed	—	—	—	–
V_{CCIO14}	Default	—	—	—	VFMC2_ADJ

The Mach-N2 Evaluation Board uses LEDs to provide a visual indication of power status. See Table 2.2 for details.

Table 2.2. Status LED Definition

LED Designator	Color	Description
D2	Green	J2 USB connector
D16	Green	3.30 V power on
D20	Green	1.10 V power on
D17	Green	1.80 V power on
D21	Green	1.20 V power on
D19	Green	0.82 V power on
D18	Green	5.00 V power on
D15	Green	12.00 V from external power source, J39
D22	Green	0.82 V to Mach-N2 VCCHP and VCCA_PLLx power rails

3. Mach-N2 Evaluation Board Programming

The JTAG/SPI programming architecture of the Mach-N2 Evaluation Board is shown in Figure 3.1.

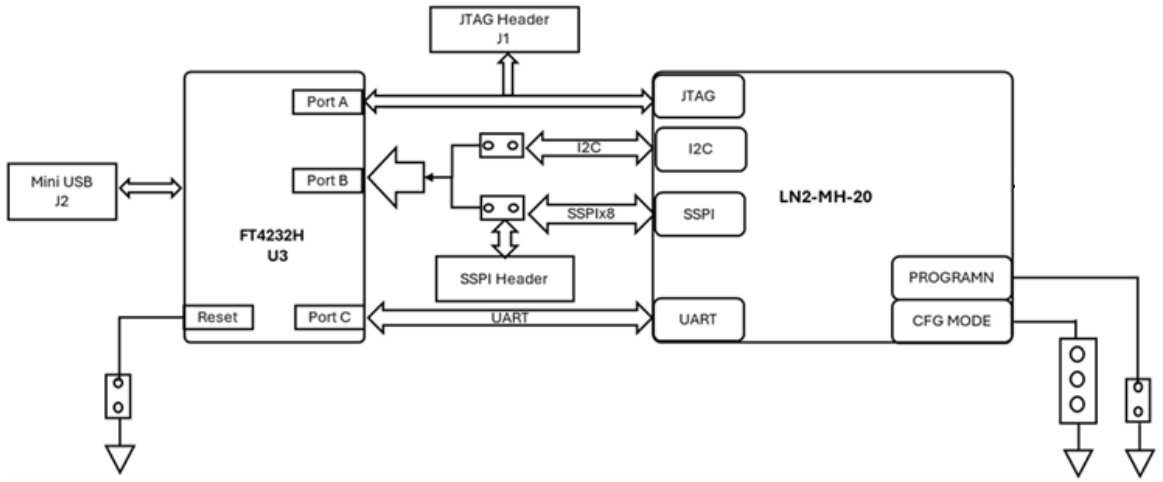

Figure 3.1. Programming Architecture

Note: The Revision B board uses the FT2232H device, which limits the I2C and SSPI interfaces with FTDI.

3.1. JTAG Download Interface

The Mach-N2 Evaluation Board includes an integrated download controller for programming the Mach-N2 device. It uses the FT4232H chip from Future Technology Devices International Ltd. (FTDI) to convert USB signals to JTAG. To use the built-in download cable, connect a USB-A to mini-USB cable from a PC running Lattice Radiant Programmer to the mini-USB connector (J2) on the board. This cable is provided in the Mach-N2 Evaluation Board Kit. When connected, the PC's USB hub detects the device on Port A, enabling the built-in cable for use with the Radiant programming software.

3.2. Alternate JTAG Download Interface

J1 is an eight-pin JTAG header compatible with an external Lattice Programming Cable, which is sold separately. To use the J1 pin, disable the FTDI chip from the JTAG chain by installing the J3 jumper. Connect the USB-A to mini-USB Cable to J1 to interface with the Mach-N2 device. J1 can also serve as a test point when the USB-to-JTAG configuration is active. For detailed connection instructions, see the Programming Cables User Guide (FPGA-UG-02042).

Table 3.1 lists the JTAG pin assignments.

Table 3.1. JTAG Connections

J1 Pin Number	JTAG Signal Name	Mach-N2 Bank	Mach-N2 Ball Location for JTAG
1	VCC_3V30	—	—
2	TDO	2	J2
3	TDI	2	J1
4	—	—	—
5	—	—	—
6	TMS	2	E1
7	GND	—	—
8	TCK	2	D1

3.3. Additional Pin Configurations

The Mach-N2 Evaluation Board provides test points for additional pin configurations, as shown in Table 3.2.

Table 3.2. Other Signal Configurations

Signal Name	Mach-N2 Bank	Mach-N2 Ball Location	Header	Button/Jumper
PROGRAMN	2	G2	J10.2 & J4.2	SW7/J10
INITN	2	H3	J54.2	—
DONE	2	G1	J54.3	—
CFGMODE	2	F2	J54.1	SW6

INITN: Open drain pin. This signal asserts LOW when the configuration sequence begins, indicating the device is in an initialization state. At this time, LED D11 illuminates red. This signal deasserts after initialization completes and configuration download starts.

DONE: Open drain pin. This signal asserts LOW during configuration. When the signal deasserts, the device has completed configuration; at this time, LED D12 illuminates green.

For more information on Nexus-2 JTAG and SPI programming, refer to the Lattice Nexus 2 sysCONFIG User Guide (FPGA-TN-02370).

3.4. Mach-N2 Device SRAM Programming

The Radiant Programmer programs the **.bit** file into the Mach-N2 device SRAM. It is integrated into the Radiant Software and is also available as a stand-alone application.

To program the Mach-N2 SRAM follow these steps:

1. Connect the PC to the Mach-N2 Evaluation Board (J2) using the USB cable.
2. Set SW6 to JTAG mode.
3. In In the Lattice Radiant software, click **Tools > Programmer,** or in Windows, go to **Start > Lattice Radiant Software 2026.1.1 > Radiant Programmer.**
4. Double-click the **Operation** field when the Radiant Programmer interface opens (see Figure 3.2).
5. Enter a **Project Name** and select a **Project Location** path to save it.
6. Click **Create a new blank project,** then click **OK** .

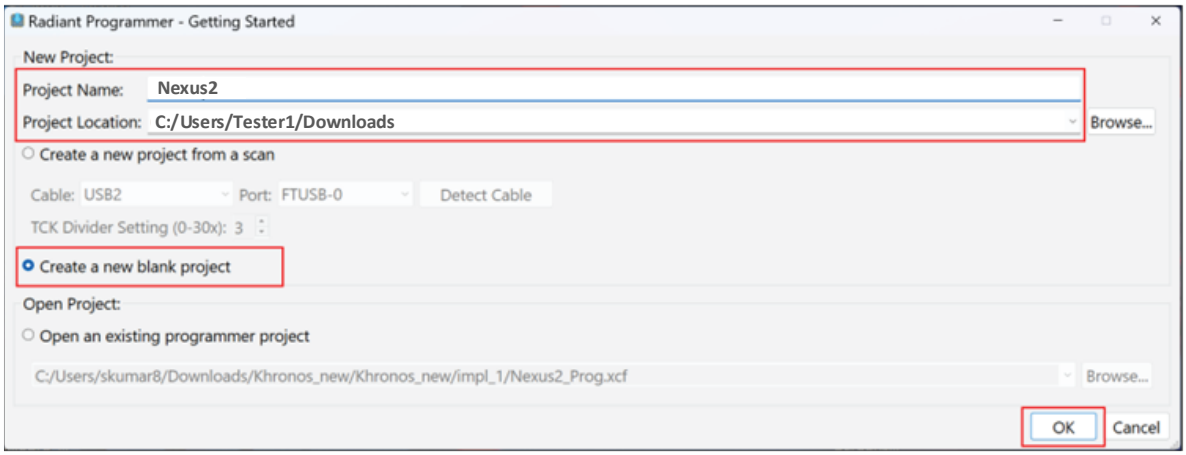

Figure 3.2. Radiant Programmer Interface – Getting Started

7. Click **Detect Cable**. In the pop-up window, select **FTUSB-0 (Quad RS232-HS A Location 0251)** for JTAG programming, then click **OK**.

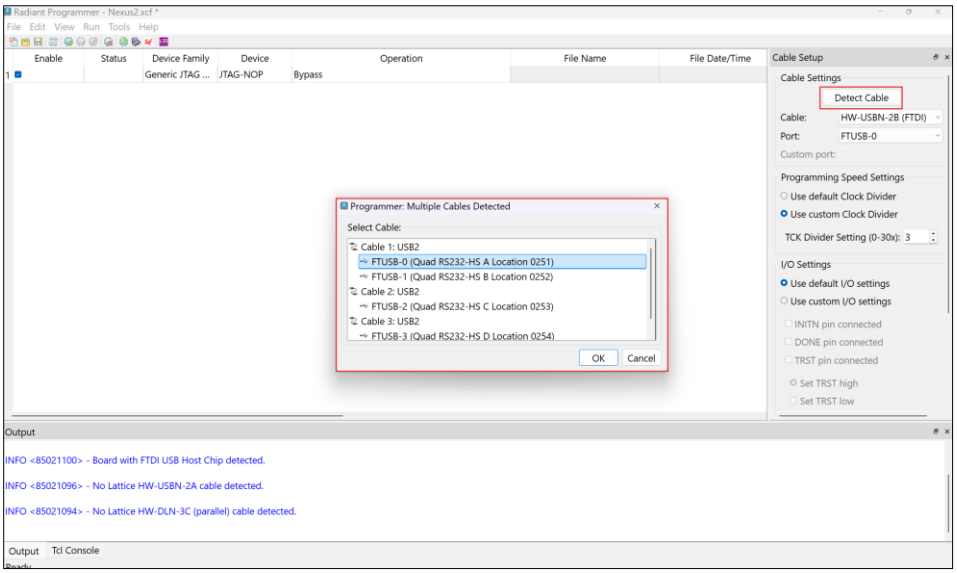

Figure 3.3. Cable Settings

8. Click **Scan** to detect the device.
9. Double-click **Fast Configuration**. The **Device Properties** dialog box opens (see Figure 3.4), select the following:
   - **Target Memory – Compressed Random Access Memory (CRAM)**
   - **Port Interface – JTAG**
   - **Access Mode – Direct Programming**
   - **Operation – Fast Configuration**
   - **Programming file –** Select the **.bit** file to be program

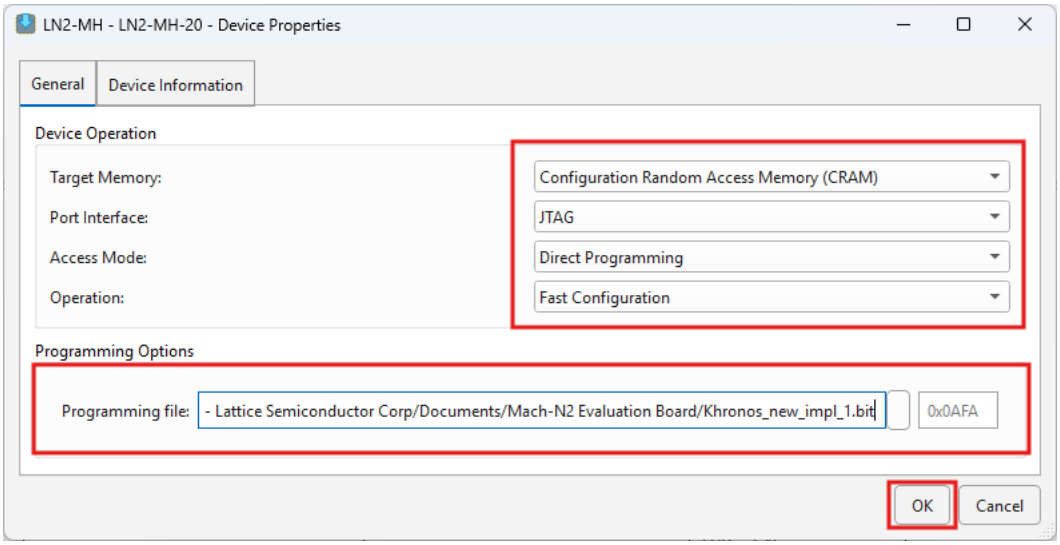

Figure 3.4. Radiant Programmer – Device Properties

10. Click **OK**.

11. Click **Program Device** or select **Run** > **Program Device** to start programming the **.bit** file. If successful, the **Status** column displays **PASS** and the **Output** pane shows **INFO – Operation: successful**.

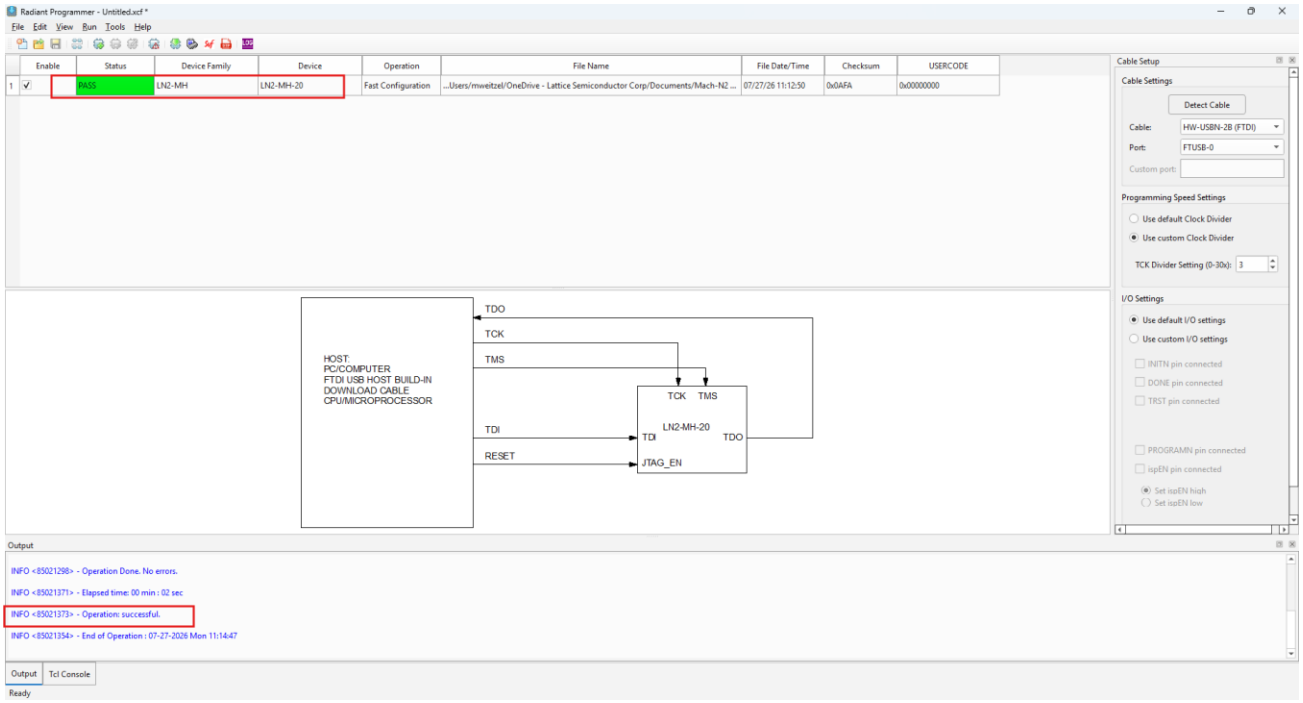

Figure 3.5. Output Pane – SRAM Programming

3.5. Mach-N2 Internal Flash Programming

The Mach-N2 device includes internal flash memory that can be programmed using the Radiant Programmer through the J2 USB connector. The Radiant Programmer is integrated into the Lattice Radiant software and is also available as a stand-alone application.

To program the Mach-N2 internal flash, follow these steps:

1. Connect the PC to the Mach-N2 Evaluation Board (J2) using the USB cable.
2. In the Lattice Radiant software, click **Tools > Programmer**, or in Windows, go to **Start > Lattice Radiant Software 2026.1.1 > Radiant Programmer**.
3. Double-click **Fast Configuration**.
4. Select **FLASH Configuration Memory** in Target Memory
5. Select **Flash Header**, then browse to the **.mcs** file.
6. Select **cfg0/UFM0**, then browse to the **.jed** file, and click **OK**.
7. Click **Program**, to program the **.bit** file. Click **Program Device** or select **Run > Program Device**. If successful, the status column displays **PASS**, and the Output pane shows **INFO – Operation: successful**.
8. Restart the board.

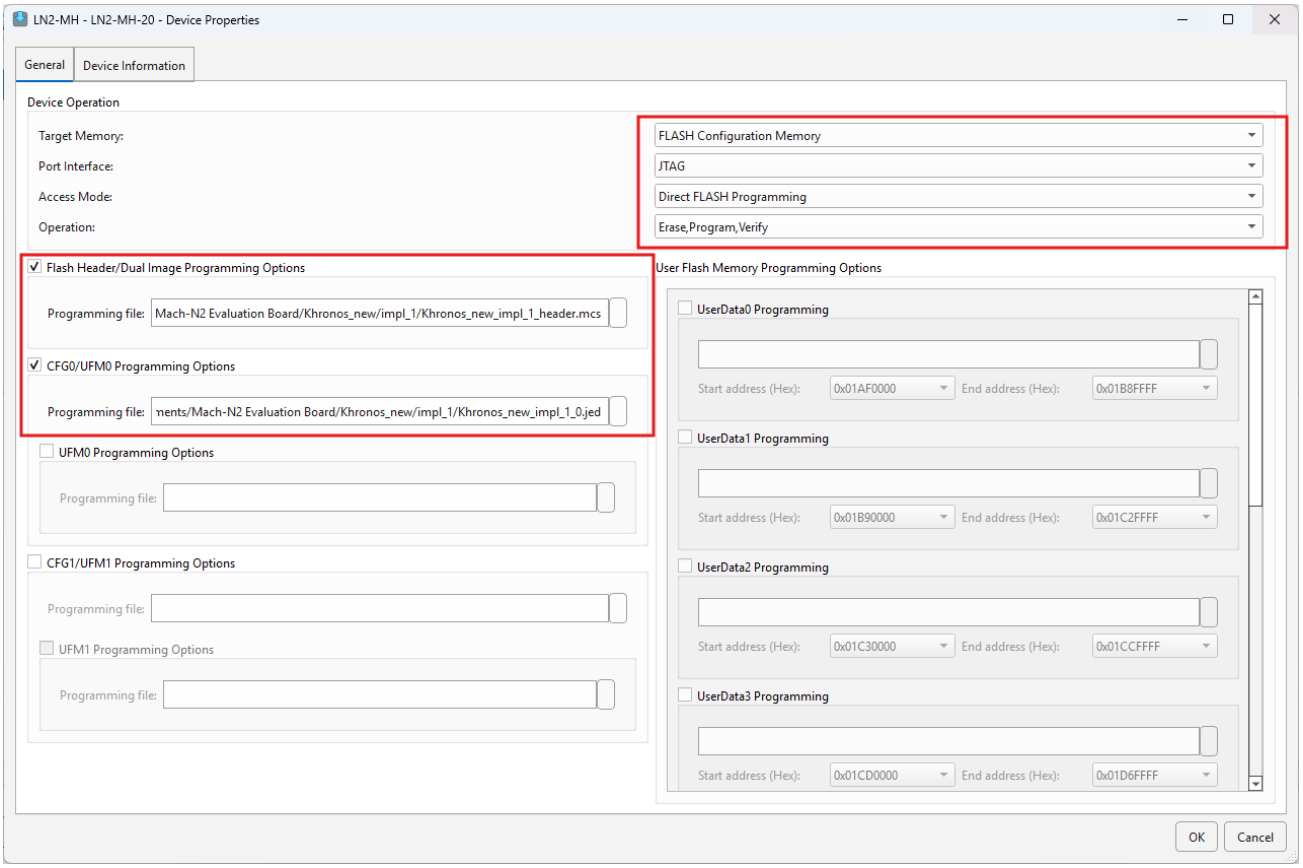

Figure 3.6. Output Pane – Internal Flash Programming

3.6. Boot from Flash

1. Power off the board using SW8.
2. Set SW6 to MSPI mode.
3. Power on the board using SW7.
4. When the boot process completes, LED D12 (**DONE**) illuminates.

4. Mach-N2 Clock Sources

The Mach-N2 Evaluation Board offers two clock sources options, as shown in Table 4.1.

Table 4.1. Clock Sources

Clock Frequency (MHz)	Signal Name	Mach-N2 Bank	Mach-N2 Ball Location	Clock Source	Comments
100	F_DDR_100MHz_P/N	10	AA8/ AA9	Y2	HCSL differential output
125	125_MHz	12	E14	X1	LVCMOS = 3.3 V

5. Memory Interface

This section describes external memory interface support on the Mach-N2 Evaluation Board, including signal names, types, and connectivity for Mach-N2 devices. The board supports an LPDDR4 x16 memory interface.

Table 5.1. LPDDR4 Pin Details

Signal Name	Mach-N2 Bank	Mach-N2 Ball	Comments
—	10	W9	240 Ω pull up to VCCIO11 (1.1 V)
F_DDR_100MHz_P	10	AA8	100 MHz reference clock
F_DDR_100MHz_N	10	AA9	
LPDDR4_CLK_P	10	U16	LPDDR4 clock
LPDDR4_CLK_N	10	V16	
LPDDR4_RESET	10	AB17	LPDDR4 reset
LPDDR4_A0	10	V14	LPDDR4 command/address inputs
LPDDR4_A1	10	V12	
LPDDR4_A2	10	U12	
LPDDR4_A3	10	V8	
LPDDR4_A4	10	U8	
LPDDR4_A5	10	Y8	
LPDDR4_CKE	10	U14	LPDDR4 clock enable
LPDDR4_CS	10	AB19	LPDDR4 chip select
LPDDR4_LDQS_P	10	U13	LPDDR4 data strobe
LPDDR4_LDQS_N	10	T13	
LPDDR4_UDQS_P	10	AB9	
LPDDR4_UDQS_N	10	AB8	
LPDDR4_LDM	10	Y13	LPDDR4 data mask/data bus inversion
LPDDR4_UDM	10	AB16	
LPDDR4_DQ0	10	V13	LPDDR4 data input/output
LPDDR4_DQ1	10	W13	
LPDDR4_DQ2	10	T15	
LPDDR4_DQ3	10	U15	
LPDDR4_DQ4	10	AA18	
LPDDR4_DQ5	10	AA17	
LPDDR4_DQ6	10	V9	
LPDDR4_DQ7	10	V10	
LPDDR4_DQ8	10	AB10	
LPDDR4_DQ9	10	AB11	
LPDDR4_DQ10	10	AB14	
LPDDR4_DQ11	10	AB15	
LPDDR4_DQ12	10	AB12	
LPDDR4_DQ13	10	AB13	
LPDDR4_DQ14	10	AA14	
LPDDR4_DQ15	10	AA13	

6. Control Buses – I2C, UART, and SPI

This section describes the architecture of configuration and communication buses.

6.1. I2C Architecture

The Mach-N2 Evaluation Board includes three I2C buses.

- The first bus connects through output port B on the FTDI chip.
- The second bus routes from Bank 13 by means of the Raspberry PI MIPI connector.
- The third bus is shared by the FMC1 and FMC2 connectors.

The I2C connections are listed in Table 6.1.

Table 6.1. I2C Bus Connections

Signal Name	Mach-N2 Bank	Mach-N2 Ball Location	Other Connection	Comments
SENS_SCL	13	B11	J5.1	Mount R323 for the FPGA I2C interface. Short J5.1 and J5.2 to enable FTDI access.
SENS_SDA	13	B10	J5.2	Mount R324 for the FPGA I2C interface. Short J6.1 and J6.2 to enable FTDI access.
RPI_CAM_SCL	13	B11	J24.3	Raspberry Pi MIPI connector.
RPI_CAM_SDA	13	B10	J24.2	Raspberry Pi MIPI connector.
KH_FMC_SDA	13	F12	J26.C31, U39.C31, and J25.10	FMC1 and FMC2 debug header.
KH_FMC_SCL	13	E12	J26.C30, U39.C31, and J25.14	FMC1 and FMC2 debug header.

6.2. UART Architecture

The board provides a single UART interface, enabling a flexible connection between the Mach-N2 device and the FTDI chip. Two general-purpose I/Os in Bank 13 are used for the UART interface, as shown in Table 6.2. The UART connection links the FTDI chip and the Mach-N2 device.

Table 6.2. UART Bus Connections

Signal Name	Mach-N2 Bank	Mach-N2 Ball Location	FTDI Chip Ball Location	Comment
TXD_UART	13	D10	32	Assign RX on FPGA
RXD_UART	13	C10	33	Assign TX on FPGA

6.3. SPI Architecture

The SSPI connections on the board support the Mach-N2 device configuration from the SSPI flash, as shown in Table 6.3.

Table 6.3. SSPI Bus Connections

Signal Name	Mach-N2 Bank	Mach-N2 Ball	Parallel Configuration Header Pin
SSPI_SCLK	2	H1	J5.3
SSPI_D0_MOSI	2	F5	J6.4
SSPI_D1_MISO	2	F4	J7.3
SSPI_D2	2	D2	J9.1
SSPI_D3	2	D3	J48.1
SSPI_D4	2	G4	J6.4
SSPI_D5	2	G3	J7.4
SSPI_D6	2	F1	J8.3
SSPI_D7	2	E2	J9.2
SSPI_SCSN	2	G5	J8.2
SSPI_SDS	2	H5	J48.2

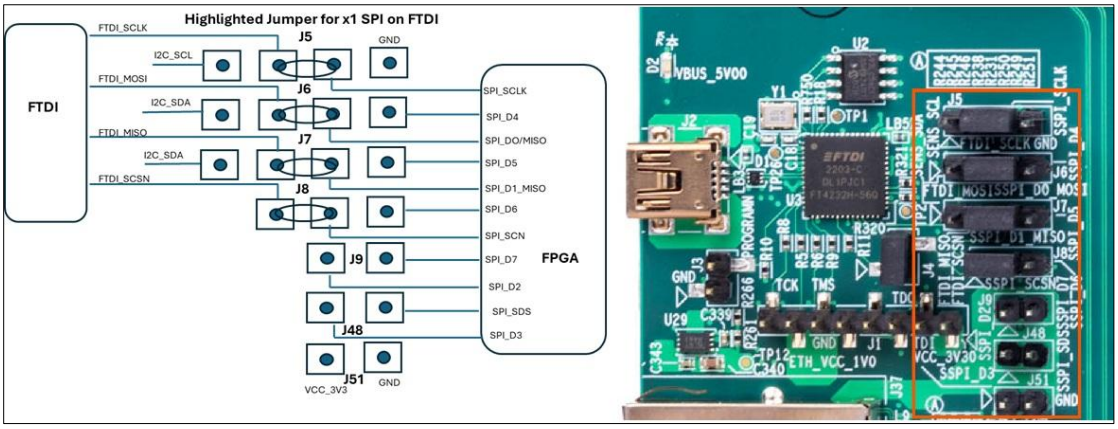

Figure 6.1. FTDI chip to SSPI x1 Interface Jumper

7. LEDs, Switches and Seven-Segment Displays

This section describes the LEDs, switches, and seven-segment displays on the Mach-N2 Evaluation Board, which can be used in demonstration and customer designs.

7.1. DIP Switch

Eight Mach-N2 device pins connect to the DIP switch (SW4) to allow manual input to the FPGA. One side of each switch connects to GPIOs in Bank 11 and is pulled up through a 4.7 kΩ resistor; the other side is connected to ground. The designated pins are listed in Table 7.1.

Table 7.1. DIP Switch Signals

Signal Name	Mach-N2 Ball Location	Mach-N2 Bank
KH_DIP_0	L21	11
KH_DIP_1	M21	11
KH_DIP_2	P19	11
KH_DIP_3	R19	11
KH_DIP_4	L22	11
KH_DIP_5	M22	11
KH_DIP_6	U19	11
KH_DIP_7	T19	11

7.2. General Purpose Push Buttons

The Mach-N2 Evaluation Board provides four push-button switches (SW7, SW2, SW3, and SW5) for demonstration and user applications. One switch (SW7) is a predefined functional pin; the other three are generic pins (SW2, SW3, and SW5). Pressing the push-button switch drives logic level 0 to the corresponding I/O pin. The designated pins are listed in Table 7.2. For more information on PROGRAMN, refer to the Lattice Nexus 2 sysCONFIG User Guide (FPGA-TN-02370).

Table 7.2. Push Button Switch Signals

Signal Name	Mach-N2 Bank	Mach-N2 Ball Location	Switch Reference	Logic Level
PROGRAMN	2	G2	SW7	0
PB_1	11	V21	SW2	0
PB_2	11	U21	SW3	0
PB_3	11	U18	SW5	0

7.3. General Purpose LEDs

The Mach-N2 Evaluation Board provides eight LEDs connected to I/O in Bank 1. The LEDs are green or red, as listed in Table 7.3.

Table 7.3. General Purpose LED Signals

Signal Name	Mach-N2 Ball Location	Mach-N2 Bank	LED	Color
KH_LED_0	T1	3	D3	Green
KH_LED_1	T2	3	D4	Green
KH_LED_2	R6	3	D5	Green
KH_LED_3	P6	3	D6	Green
KH_LED_4	AB2	3	D7	Green
KH_LED_5	AB3	3	D8	Green
KH_LED_6	W3	3	D9	Green
KH_LED_7	Y3	3	D10	Green

7.4. Seven-Segment Displays

The Mach-N2 Evaluation Board provides a three-character, seven-segment LED display (D13) connected to I/O in Bank 12. The designated pins are listed in Table 7.4.

Table 7.4. Segment Display

Signal Name	Mach-N2 Ball Location	Mach-N2 Bank	Segment Display
SEG_A	C13	12	A
SEG_B	A13	12	B
SEG_C	E14	12	C
SEG_D	A12	12	D
SEG_E	B12	12	E
SEG_F	F13	12	F
SEG_G	B13	12	G
SEG_DP	C14	12	DP
K_DIG1	J14	12	K_DIG1
K_DIG2	K14	12	K_DIG2
K_DIG3	E13	12	K_DIG3

7.5. Level Translator for GPIOs

Signal Name	Mach-N2 Ball Location	Mach-N2 Bank	Level Translator	Comment
VCCH_SEL_IN	M19	11	U62.2	SERDES voltage change from 0.8 V to 0.9 V and 1.5 V to 1.8 V by assigning 0.
125MHZ_DISABLE_IN	L19	11	U62.3	125 MHz clock disable by assigning 0.
PCIe_SW_PD_IN	U22	11	U62.4	Disable power-down by driving low.
KH_PCIe_SW_SEL_IN	V22	11	U62.5	SERDES switch channel selection of U16 and U17.
PCIe_CLK_SEL_IN	V18	11	U62.6	PCIe to FMC input clock selection of U15.
1V2_FET_IN	Y19	11	U62.7	FMC2 voltage selection.
PCIe_100MHZ_EN_IN	Y20	11	U62.8	PCIe 100 MHz clock disable by driving low.
LPDDR_CLK_EN_IN	AB18	10	U66.1	LPDDR 100 MHz clock disable by driving low.
KH_PCIe_WAKE#_IN	W8	10	U66.2	PCIe finger edge wake-up signal GPIO.
FMC2_CLK_SEL_IN	Y14	10	U66.3	FMC2 GBT_CLK0 and GBT_CLK1 clock selection.

8. Headers, Connectors and Mach-N2 Device Ball Mapping

This section describes the headers, connectors, and ball mapping for the Mach-N2 Evaluation Board. Bank 3 and Bank 11 share signals with FMC1 (LPC), and Bank 14 and the SERDES bank share signals with FMC2 (HPC). If both FMC connectors are used, ensure that the voltage-level jumper settings for Bank 3, Bank 11, and Bank 14 match the requirements of the daughter card installed on the board. Bank 13 shares signals between FMC1 and FMC2.

8.1. FMC1 (LPC) Connector

Table 8.1. FMC1 Pin Connections

Pin Name (U39A)	Signal Name	Mach-N2 Bank	Mach-N2 Ball Location
C10	KH_FMC_LA06_P	3	K2
C11	KH_FMC_LA06_N	3	L2
C14	KH_FMC_LA10_P	3	W19
C15	KH_FMC_LA10_N	3	V19
C18	KH_FMC_LA14_P	3	U1
C19	KH_FMC_LA14_N	3	U2
C22	KH_FMC_LA18_P_CC	11	U17
C23	KH_FMC_LA18_N_CC	11	V17
C26	KH_FMC_LA27_P	3	R7
C27	KH_FMC_LA27_N	3	P7
C30	KH_FMC_SCL	13	E12
C31	KH_FMC_SDA	13	F12
C34	KH_FMC_GA0	—	—
D1	KH_FMC_PG_C2M	13	D12
D8	KH_FMC_LA01_P_CC	11	P17
D9	KH_FMC_LA01_N_CC	11	N17
D11	KH_FMC_LA05_P	11	W22
D12	KH_FMC_LA05_N	11	W21
D14	KH_FMC_LA09_P	3	M4
D15	KH_FMC_LA09_N	3	L4
D17	KH_FMC_LA13_P	3	T3
D18	KH_FMC_LA13_N	3	U3
D20	KH_FMC_LA17_P_CC	11	W17
D21	KH_FMC_LA17_N_CC	11	W18
D23	KH_FMC_LA23_P	3	N6
D24	KH_FMC_LA23_N	3	N5
D26	KH_FMC_LA26_P	3	R2
D27	KH_FMC_LA26_N	3	P2
D29	KH_FMC_TCK	13	A10
D30	KH_FMC_TDI	13	H12
D31	KH_FMC_TDO	13	H11
D33	KH_FMC_TMS	13	A11
D34	KH_FMC_TRST_L	—	—
D35	KH_FMC_GA1	—	—
G2	KH_FMC_CLK1_M2C_P	11	Y22
G3	KH_FMC_CLK1_M2C_N	11	Y21
G6	KH_FMC_LA00_P_CC	11	N18
G7	KH_FMC_LA00_N_CC	11	P18
G9	KH_FMC_LA03_P	11	L18

Pin Name (U39A)	Signal Name	Mach-N2 Bank	Mach-N2 Ball Location
G10	KH_FMC_LA03_N	11	M18
G12	KH_FMC_LA08_P	3	K1
G13	KH_FMC_LA08_N	3	L1
G15	KH_FMC_LA12_P	3	M5
G16	KH_FMC_LA12_N	3	M6
G18	KH_FMC_LA16_P	3	L3
G19	KH_FMC_LA16_N	3	M3
G21	KH_FMC_LA20_P	11	R17
G22	KH_FMC_LA20_N	11	T17
G24	KH_FMC_LA22_P	3	U4
G25	KH_FMC_LA22_N	3	U5
G27	KH_FMC_LA25_P	11	N21
G28	KH_FMC_LA25_N	11	P21
G30	KH_FMC_LA29_P	3	V1
G31	KH_FMC_LA29_N	3	W1
G33	KH_FMC_LA31_P	3	AA1
G34	KH_FMC_LA31_N	3	Y1
G37	KH_FMC_LA33_P	3	P5
G38	KH_FMC_LA33_N	3	R5
H2	KH_FMC_PRSNT_M2C_L	13	D11
H4	KH_FMC_CLK0_M2C_P	11	T22
H5	KH_FMC_CLK0_M2C_N	11	R22
H7	KH_FMC_LA02_P	11	L17
H8	KH_FMC_LA02_N	11	M17
H10	KH_FMC_LA04_P	11	Y17
H11	KH_FMC_LA04_N	11	Y18
H13	KH_FMC_LA07_P	3	N2
H14	KH_FMC_LA07_N	3	M2
H16	KH_FMC_LA11_P	3	P1
H17	KH_FMC_LA11_N	3	R1
H19	KH_FMC_LA15_P	3	M1
H20	KH_FMC_LA15_N	3	N1
H22	KH_FMC_LA19_P	11	P20
H23	KH_FMC_LA19_N	11	R20
H25	KH_FMC_LA21_P	3	U6
H26	KH_FMC_LA21_N	3	T6
H28	KH_FMC_LA24_P	11	P22
H29	KH_FMC_LA24_N	11	N22
H31	KH_FMC_LA28_P	11	M20
H31	KH_FMC_LA28_N	11	L20
H34	KH_FMC_LA30_P	3	P3
H35	KH_FMC_LA30_N	3	R3
H37	KH_FMC_LA32_P	3	P4
H38	KH_FMC_LA32_N	3	R4

8.2. FMC2 (HPC) Connector

Table 8.2. FMC2 Pin Connections

J26 Pin Name	Signal Name	Switch	Mach-N2 Bank	Mach-N2 Ball Location
A2	FMC2_KH_SERDES_RX1_P	U16.32	SERDES	B19
A3	FMC2_KH_SERDES_RX1_N	U16.31	SERDES	A19
A6	FMC2_KH_SERDES_RX2_P	U16.27	SERDES	A17
A7	FMC2_KH_SERDES_RX2_N	U16.26	SERDES	B17
A10	FMC2_KH_SERDES_RX3_P	U16.23	SERDES	A15
A11	FMC2_KH_SERDES_RX3_N	U16.22	SERDES	B15
A22	FMC2_KH_SERDES_TX1_P	U17.32	SERDES	E22
A23	FMC2_KH_SERDES_TX1_N	U17.31	SERDES	D22
A26	FMC2_KH_SERDES_TX2_P	U17.27	SERDES	E16
A27	FMC2_KH_SERDES_TX2_N	U17.26	SERDES	D16
A30	FMC2_KH_SERDES_TX3_P	U17.23	SERDES	D18
A31	FMC2_KH_SERDES_TX3_N	U17.22	SERDES	E18
B20	FMC2_GBTCLK1_P	U13.5	SERDES	H22
B21	FMC2_GBTCLK1_N	U13.6	SERDES	G22
C2	FMC2_KH_SERDES_TX0_P	U17.36	SERDES	A21
C3	FMC2_KH_SERDES_TX0_N	U17.35	SERDES	B21
C6	FMC2_KH_SERDES_RX0_P	U16.36	SERDES	D20
C7	FMC2_KH_SERDES_RX0_N	U16.35	SERDES	E20
C10	FMC2_LA06_P	—	14	E9
C11	FMC2_LA06_N	—	14	E8
C30	KH_FMC_SCL	—	13	E12
C31	KH_FMC_SDA	—	13	F12
C34	FMC2_GA0	—	—	—
D1	FMC2_PG_C2M	—	13	J11
D4	FMC2_GBTCLK0_P	U13.2	SERDES	H22
D5	FMC2_GBTCLK0_N	U13.3	SERDES	G22
D8	FMC2_LA01_P	—	14	F9
D9	FMC2_LA01_N	—	14	F8
D11	FMC2_LA05_P	—	14	D9
D12	FMC2_LA05_N	—	14	C9
D14	FMC2_LA09_P	—	14	A7
D15	FMC2_LA09_N	—	14	B7
D29	KH_FMC_TCK	—	13	A10
D30	KH_FMC_TDI	—	13	H12
D31	KH_FMC_TDO	—	13	H11
D33	KH_FMC_TMS	—	13	A11
D35	FMC2_GA1	—	—	—
F1	FMC2_PG_M2C	—	13	J12
K4	FMC2_CLK2_M2C_P	—	10	AA16
K5	FMC2_CLK2_M2C_N	—	10	AA15
G6	FMC2_LA00_P	—	14	G9
G7	FMC2_LA00_N	—	14	G10
G9	FMC2_LA03_P	—	14	A9
G10	FMC2_LA03_N	—	14	B9
G12	FMC2_LA08_P	—	14	D8
G13	FMC2_LA08_N	—	14	D7

J26 Pin Name	Signal Name	Switch	Mach-N2 Bank	Mach-N2 Ball Location
H2	FMC2_PRSTN_L	—	12	G14
H7	FMC2_LA02_P	—	14	F10
H8	FMC2_LA02_N	—	14	E10
H10	FMC2_LA04_P	—	14	B8
H11	FMC2_LA04_N	—	14	E8
H13	FMC2_LA07_P	—	14	C6
H14	FMC2_LA07_N	—	14	D6

8.3. Parallel FMC1 Configuration Header

Table 8.3. Parallel FMC1 Configuration Header Pin Connections

J10 Pin Name	Signal Name	Mach-N2 Bank	Mach-N2 Ball Location
1	VCC_3V30	—	—
2	VCC_3V30	—	—
3	KH_FMC_TCK	13	A10
4	KH_FMC_PG_C2M	13	D12
5	—	—	—
6	KH_FMC_TRST_L	—	—
7	KH_FMC_TDI	13	H12
8	KH_FMC_PRSNT_M2C_L	13	D11
9	KH_FMC_TDO		H11
10	KH_FMC_SCL	13	E12
11	GND	—	—
12	GND	—	—
13	KH_FMC_TMS	13	A11
14	KH_FMC_SDA	13	F12

8.4. Raspberry Pi MIPI Camera Connector

The Mach-N2 Evaluation Board provides a 22-pin FPC connector compatible with the Raspberry Pi Camera Module V2.

Table 8.4. Raspberry Pi FPC Pin Connections

JP24 Pin Name	Signal Name	Mach-N2 Bank	Mach-N2 Ball Location
1	VCC_3V30	—	—
2	RPI_CAM_SDA	13	B10
3	RPI_CAM_SCL	13	B11
4	GND	—	—
5	RPI_CAM_GPIO1	13	E11
6	RPI_CAM_GPIO0	13	F11
7	GND	—	—
8	DPHY1_DP3	10	AB21
9	DPHY1_DN3	10	AB20
10	GND	—	—
11	DPHY1_DP2	10	AA22
12	DPHY1_DN2	10	AA21
13	GND	—	—
14	DPHY1_CKP	10	U10
15	DPHY1_CKN	10	U11

JP24 Pin Name	Signal Name	Mach-N2 Bank	Mach-N2 Ball Location
16	GND	—	—
17	DPHY1_DP1	10	AA12
18	DPHY1_DN1	10	AA11
19	GND	—	—
20	DPHY1_DP0	10	AA19
21	DPHY1_DN0	10	AA20
22	GND	—	—

8.5. SERDES/PCIe Interface

The Mach-N2 device, packaged in the CBG484 package, includes one quad SERDES lane. This lane is divided into two paths through a 1:2 MUX switch. The block diagram below illustrates the configuration. Table 8.2 lists the FMC2 pin connections. The J35 header is used to select the output of the 1:2 MUX switch. Shorting J35 (1-2) selects the PCIe edge finger, and opening J35 (1-2) selects FMC2 SERDES. Refer Table 8.5 for the PCIe Finger Edge Connector.

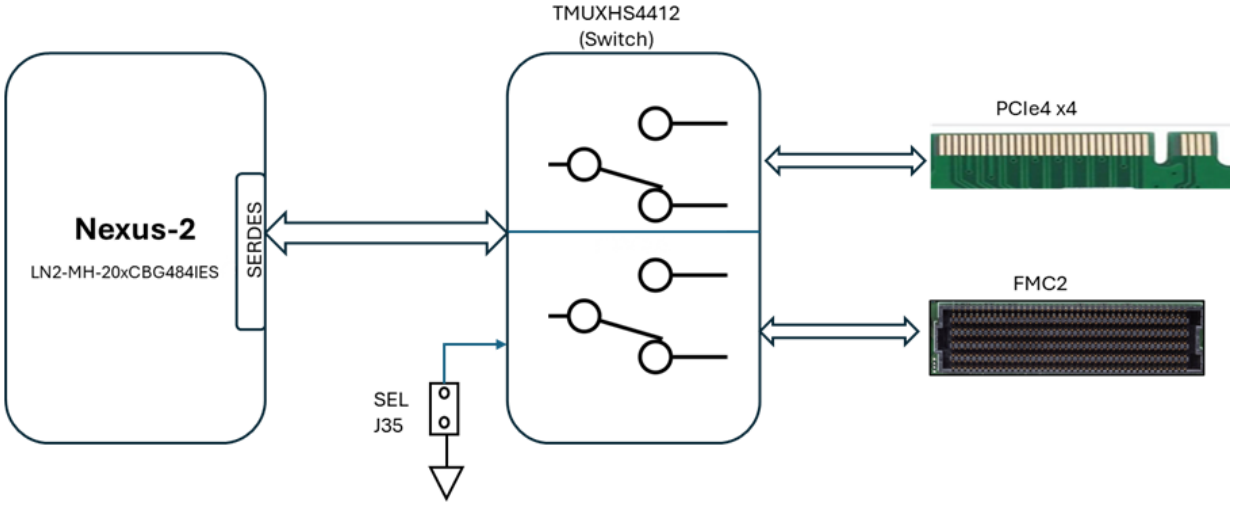

Figure 8.1. SERDES Interface

8.6. PCIe Finger Edge Connector

Table 8.5. PCIe Finger Edge Connector Pin Details

CN1 Pin Name	Signal Name	Switch	Mach-N2 Ball	CN1 Pin Name	Signal Name	Switch	Mach-N2 Ball
A1	KH_PCIe_PERST#1	—	—	B1	VDD_12V_IN_PCIE	—	—
A2	VDD_12V_IN_PCIE	—	—	B2	VDD_12V_IN_PCIE	—	—
A3	VDD_12V_IN_PCIE	—	—	B3	VDD_12V_IN_PCIE	—	—
A4	GND	—	—	B4	GND	—	—
A5	No connection	—	—	B5	KH_PCIe_SMCLK	—	F14
A6	No connection	—	—	B6	KH_PCIe_SMDAT	—	G13
A7	No connection	—	—	B7	GND	—	—
A8	No connection	—	—	B8	VDD_3V3_PCIe	—	—
A9	VDD_3V3_PCIe	—	—	B9	KH_PCIe_TRST#	—	H2
A10	VDD_3V3_PCIe	—	—	B10	No connection	—	—
A11	KH_PCIe_PERST#	—	J13	B11	KH_PCIe_WAKE#	U66.11	W8

CN1 Pin Name	Signal Name	Switch	Mach-N2 Ball	CN1 Pin Name	Signal Name	Switch	Mach-N2 Ball
A12	GND	—	—	B12	No connection	—	—
A13	FG_KH_PCIe_REFCLK_P	U15.2	H22	B13	GND	—	—
A14	FG_KH_PCIe_REFCLK_N	U15.3	G22	B14	FG_KH_PCIe_RX0_P	U16.38	A21
A15	GND	—	—	B15	FG_KH_PCIe_RX0_N	U16.37	B21
A16	FG_KH_PCIe_TX0_P	U17.38	D20	B16	GND	—	—
A17	FG_KH_PCIe_TX0_N	U17.37	E20	B17	KH_PCIe_PERST#2	—	—
A18	GND	—	—	B18	GND	—	—
A19	No connection	—	—	B19	FG_KH_PCIe_RX1_P	U16.34	B19
A20	GND	—	—	B20	FG_KH_PCIe_RX1_N	U16.33	A19
A21	FG_KH_PCIe_TX1_P	U17.34	E22	B21	GND	—	—
A22	FG_KH_PCIe_TX1_N	U17.33	D22	B22	GND	—	—
A23	GND	—	—	B23	FG_KH_PCIe_RX2_P	U16.29	A17
A24	GND	—	—	B24	FG_KH_PCIe_RX2_N	U16.28	B17
A25	FG_KH_PCIe_TX2_P	U17.29	E16	B25	GND	—	—
A26	FG_KH_PCIe_TX2_N	U17.28	D16	B26	GND	—	—
A27	GND	—	—	B27	FG_KH_PCIe_RX3_P	U16.25	A15
A28	GND	—	—	B28	FG_KH_PCIe_RX3_N	U16.24	B15
A29	FG_KH_PCIe_TX3_P	U17.25	D18	B29	GND	—	—
A30	FG_KH_PCIe_TX3_N	U17.24	E18	B30	No connection	—	—
A31	GND	—	—	B31	KH_PCIe_PERST#3	—	—
A32	No connection	—	—	B32	GND	—	—

9. Software Requirements

The following software versions are required to develop designs for the Mach-N2 Evaluation Board:

- Lattice Radiant Software 2026.1.1 or later
- Lattice Radiant Programmer 2026.1.1 or later
- Lattice Propel™ Software 2026.1.1 or later

10. Storage and Handling

Static electricity can reduce the lifespan of electronic components. Follow these guidelines to prevent electrostatic discharge (ESD) damage:

- Use antistatic measures, such as working on an antistatic mat and wearing an antistatic wrist strap.
- Store the development board in its original packaging.
- Touch a metal USB housing to equalize the voltage potential between yourself and the board.

11. Ordering Information

Table 11.1. Ordering Information

Description	Ordering Part Number	China RoHS Environment-Friendly Use Period (EFUP)
Mach-N2 Evaluation Board	LN2-MH-20-EVN	

Appendix A. Mach-N2 Evaluation Board Schematics

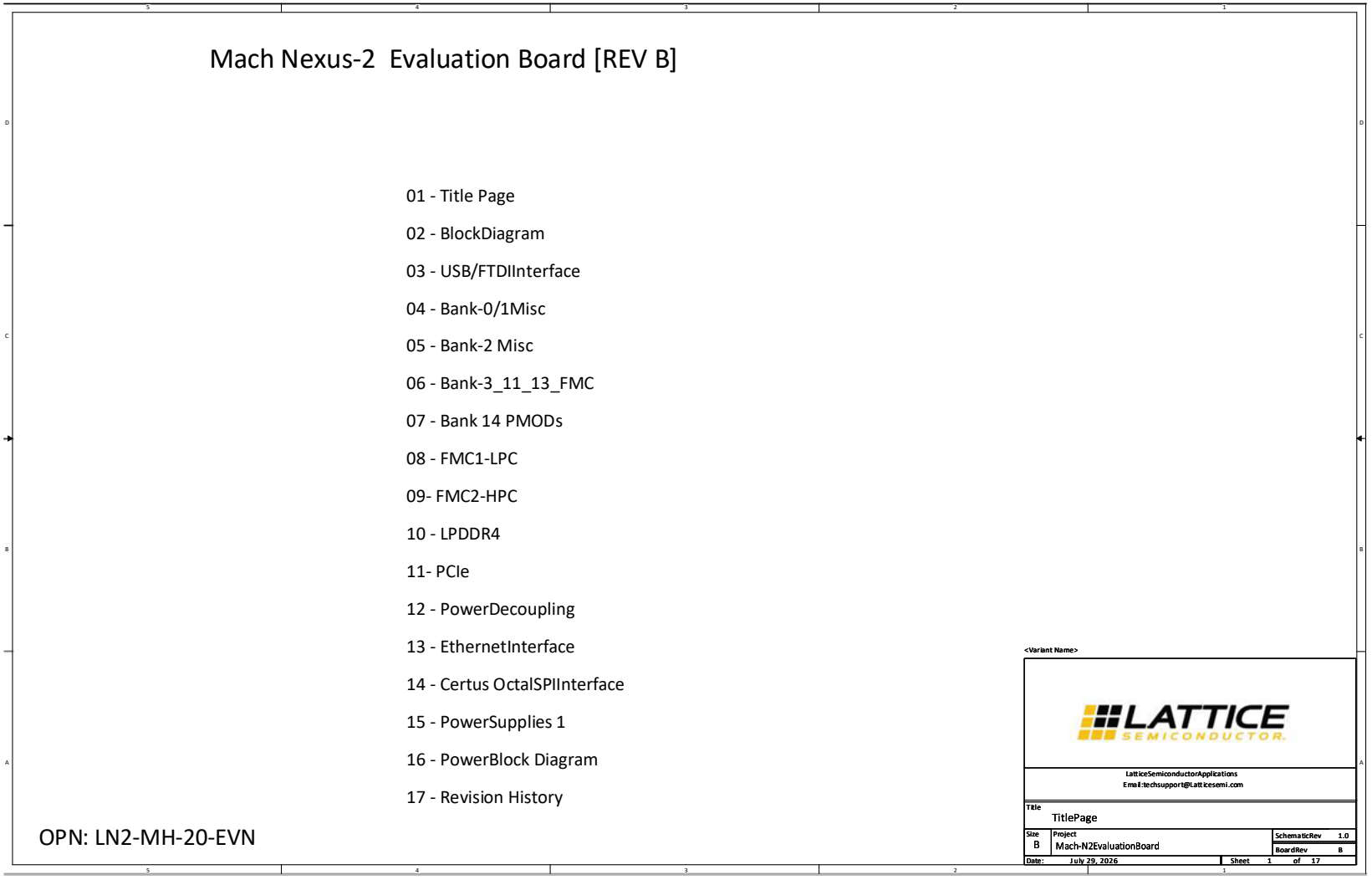

Figure A.1. Title Page

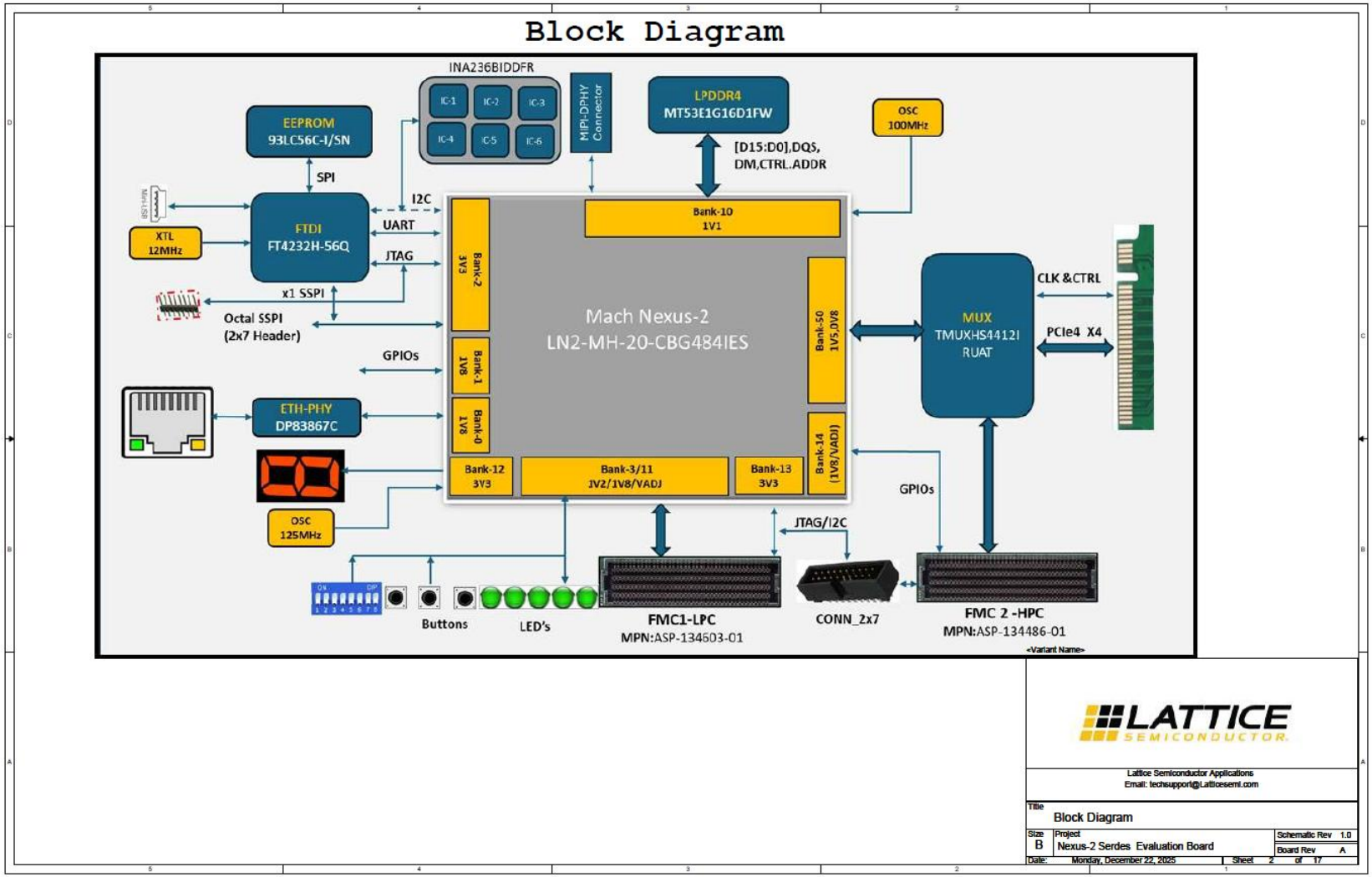

Figure A.2. Block Diagram

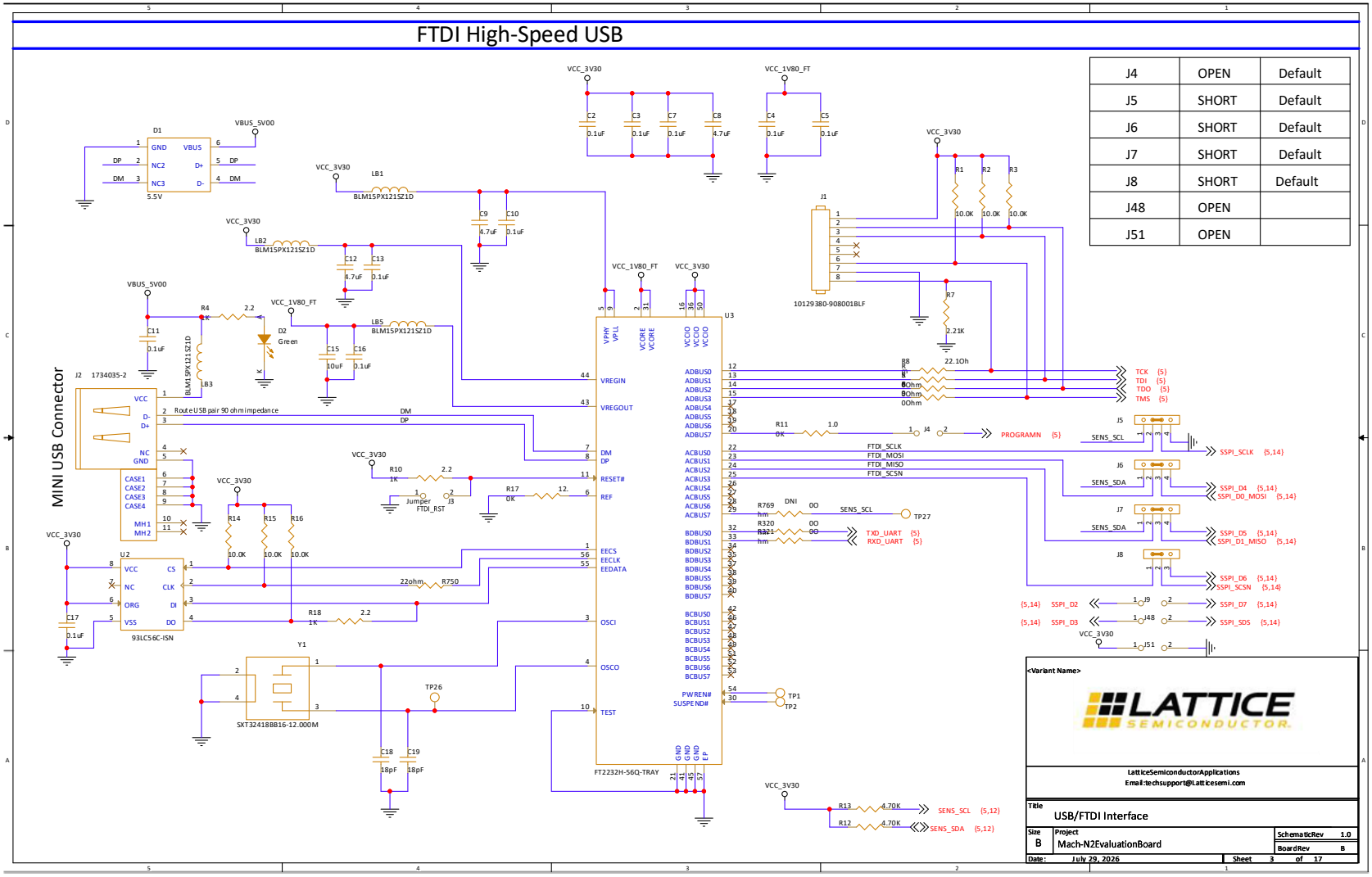

Figure A.3. USB/FTDI Interface

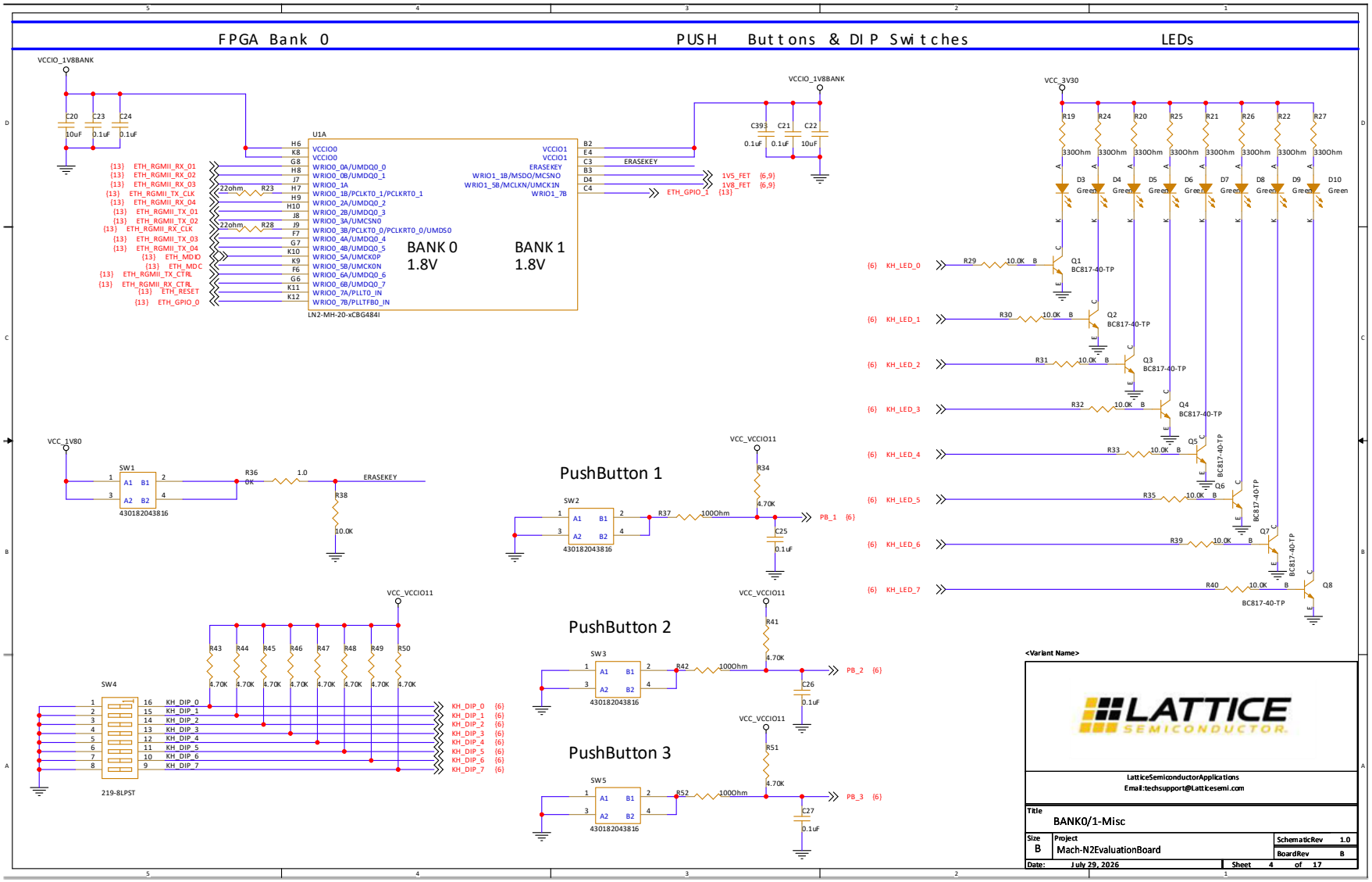

Figure A.4. Banks 0, 1 – Miscellaneous

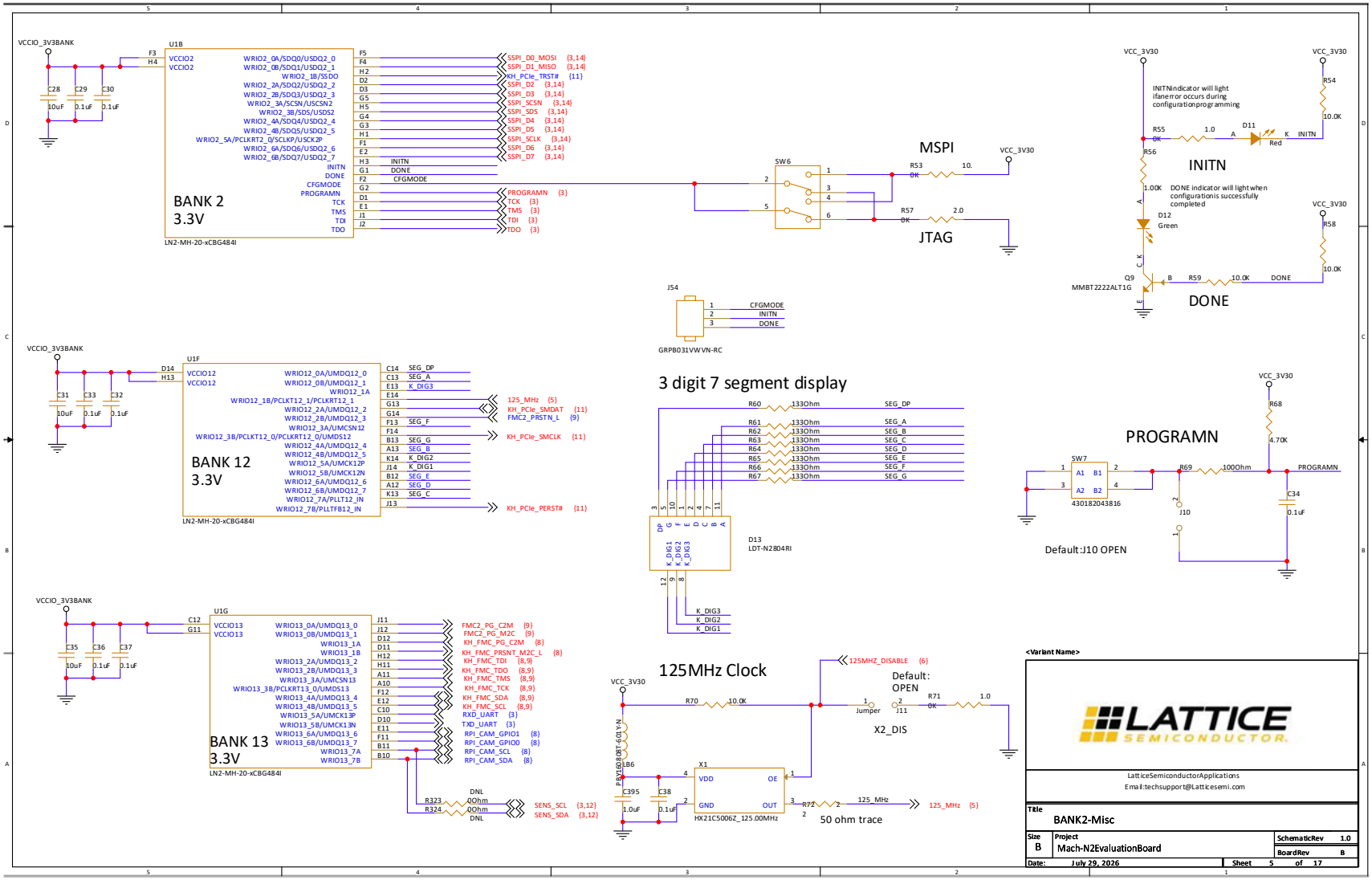

Figure A.5. Bank 2 – Miscellaneous

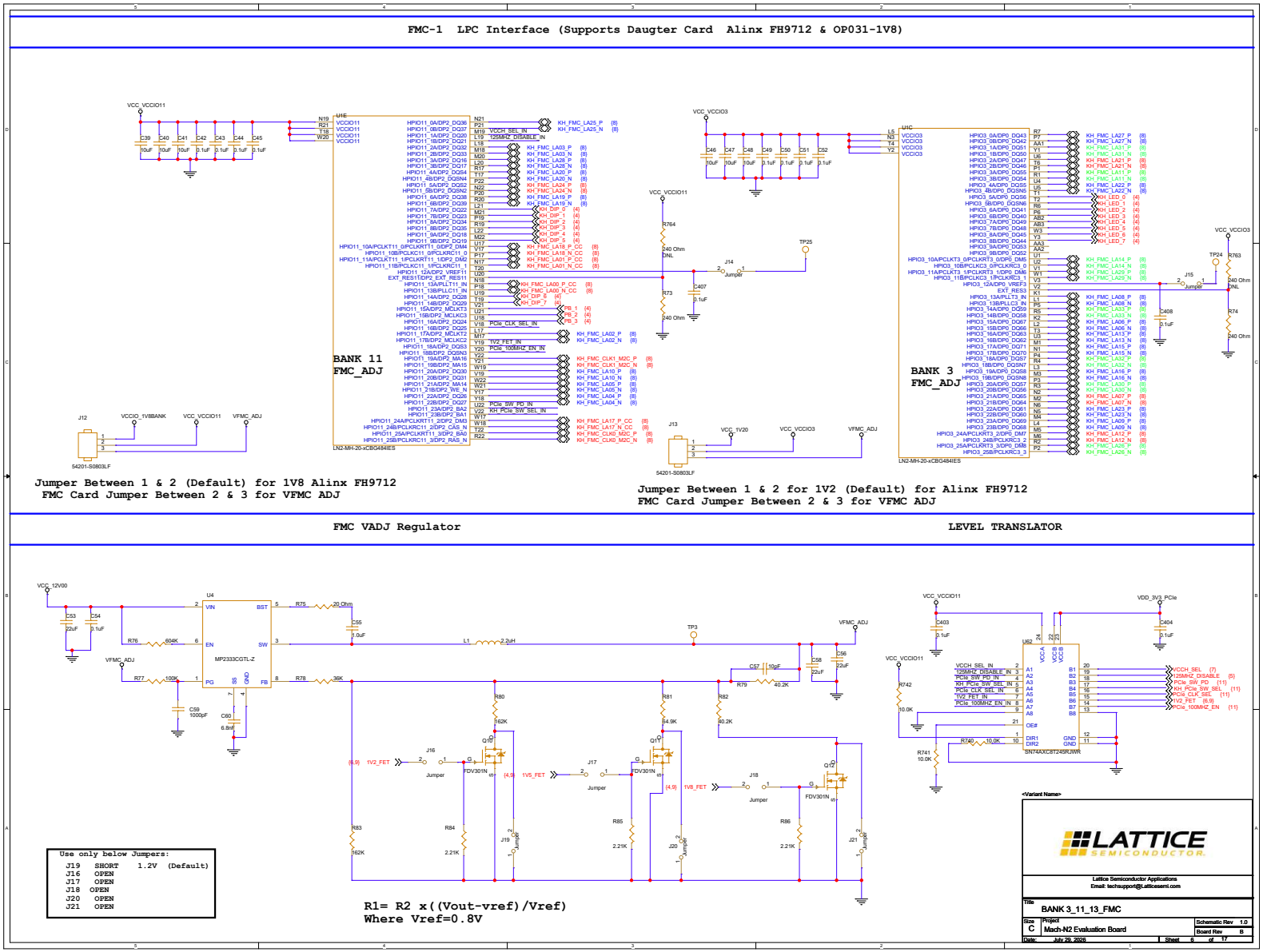

Figure A.6. Banks 3, 11, and 13 – FMC

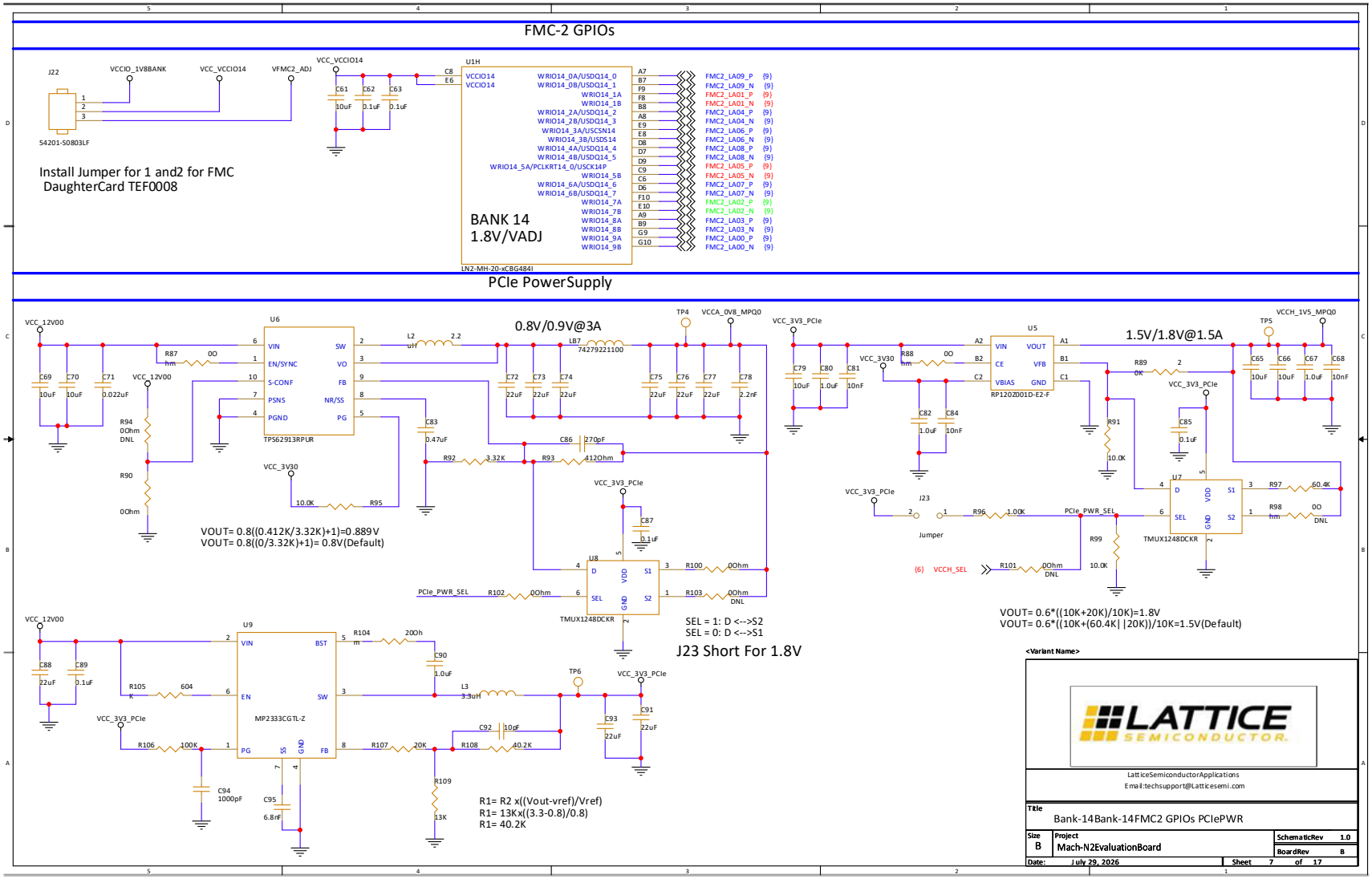

Figure A.7. Bank 14 – FMC2 GPIOs PCIe Power

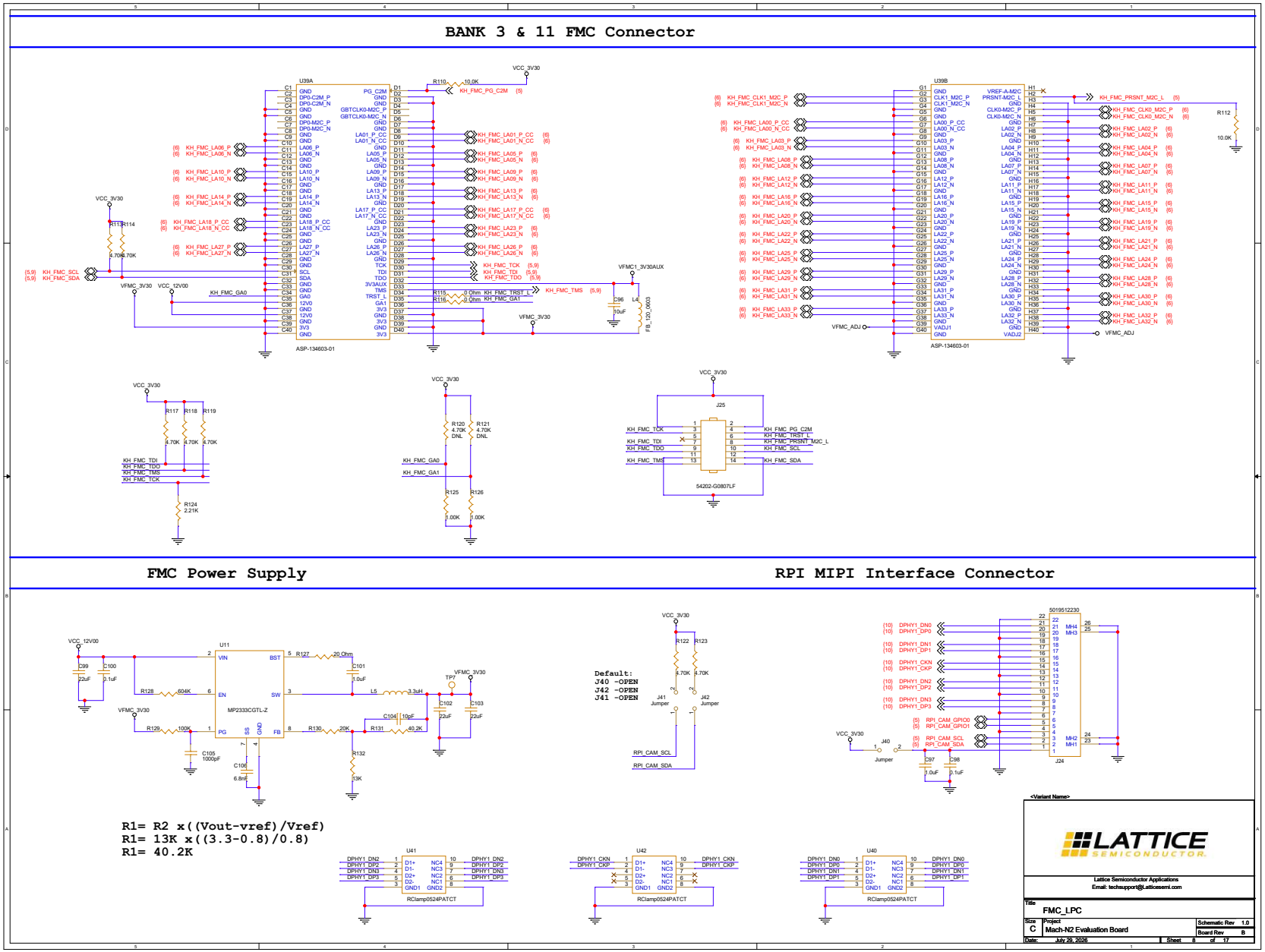

Figure A.8. FMC LPC Interface

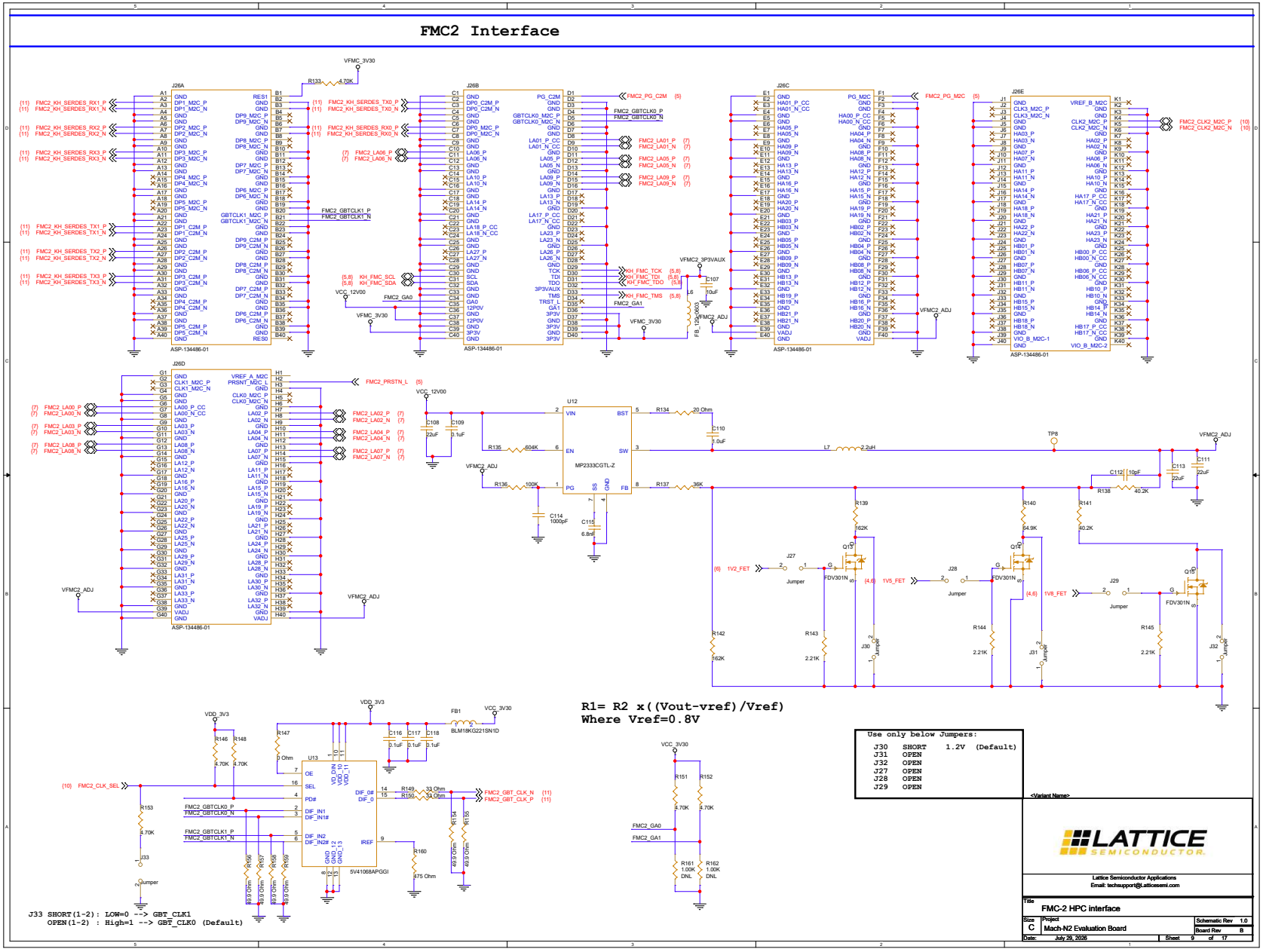

Figure A.9. FMC2 HPC Interface

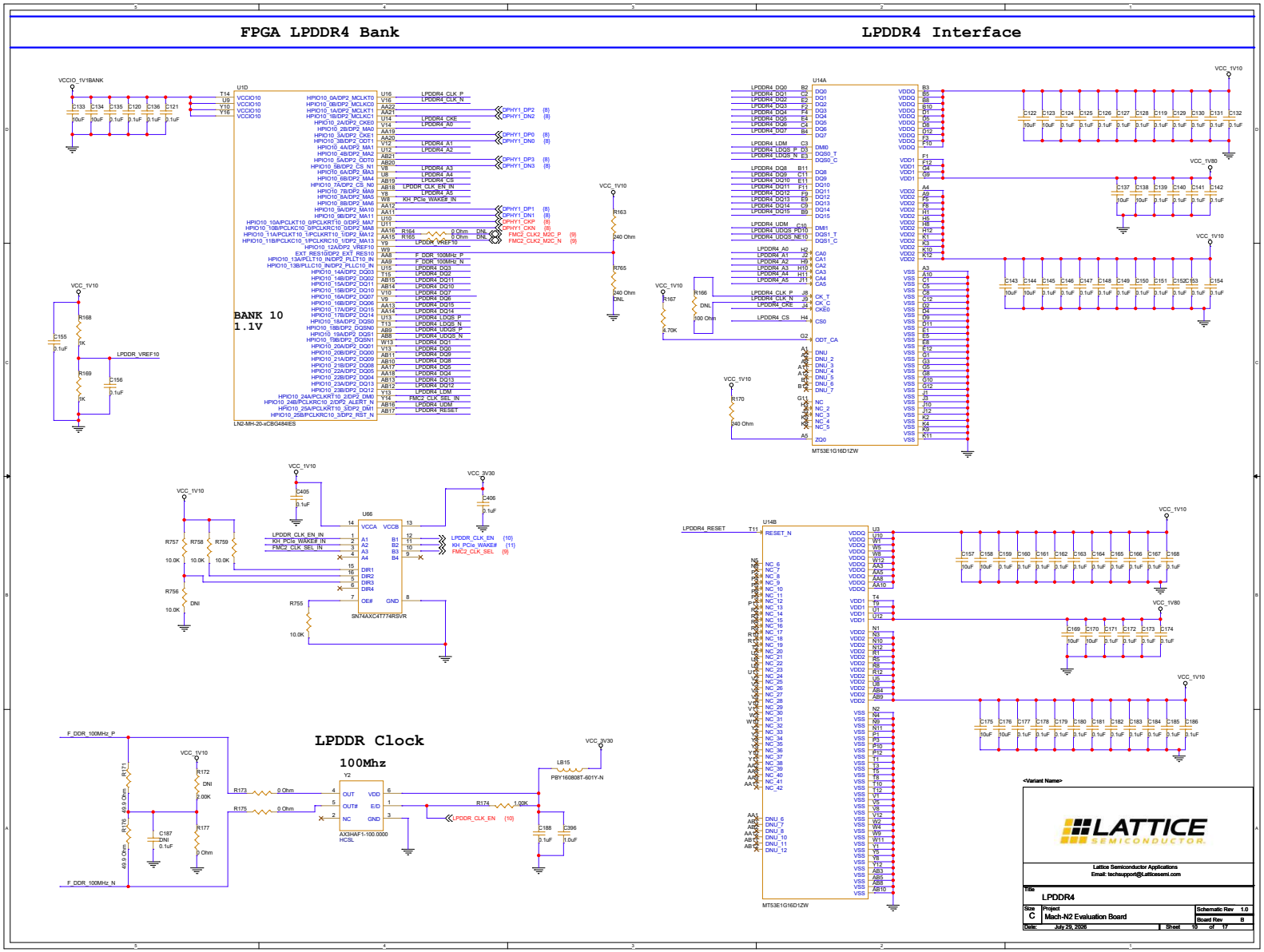

Figure A.10. LPDDR4

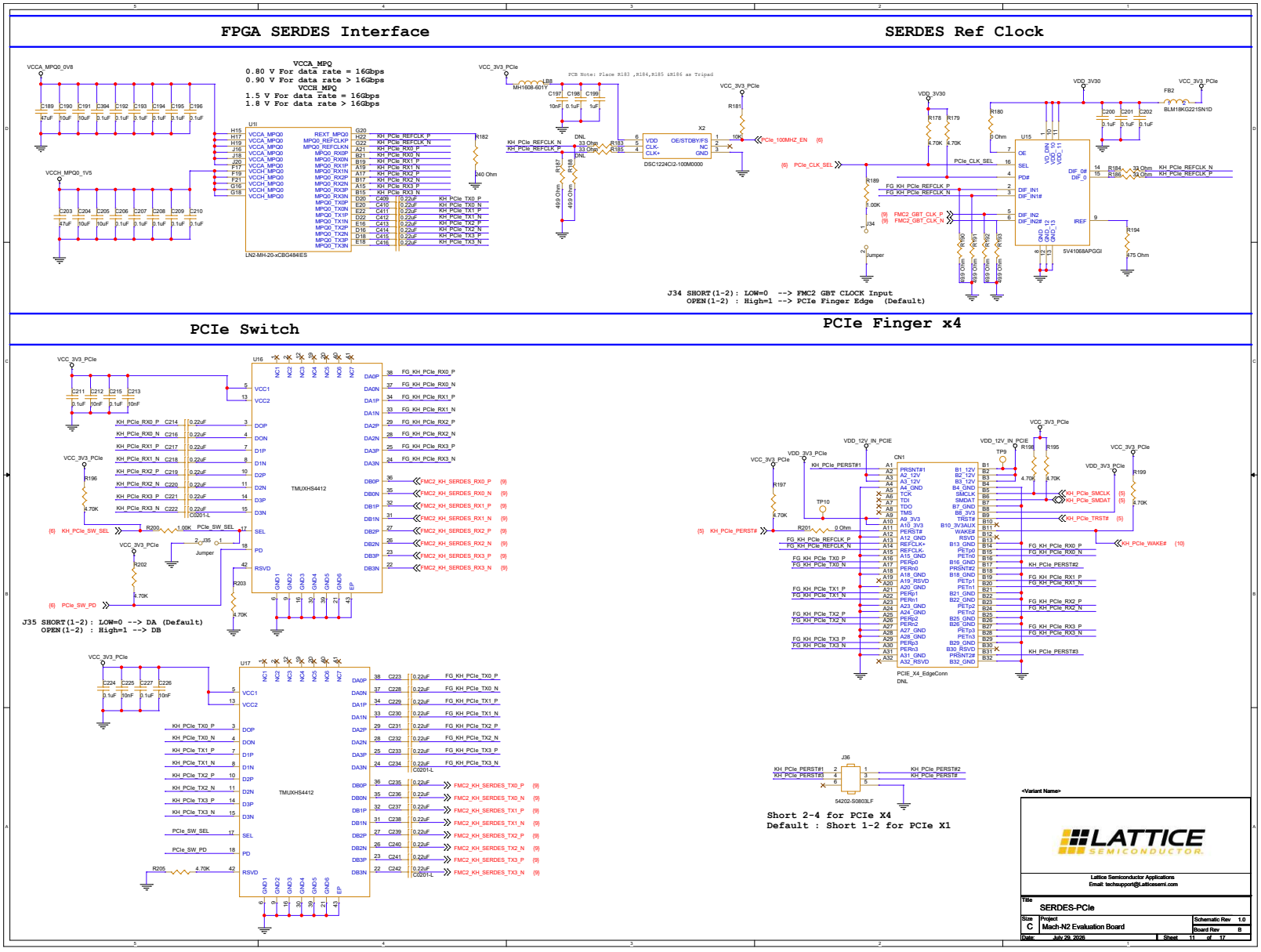

Figure A.11. SERDES PCIe

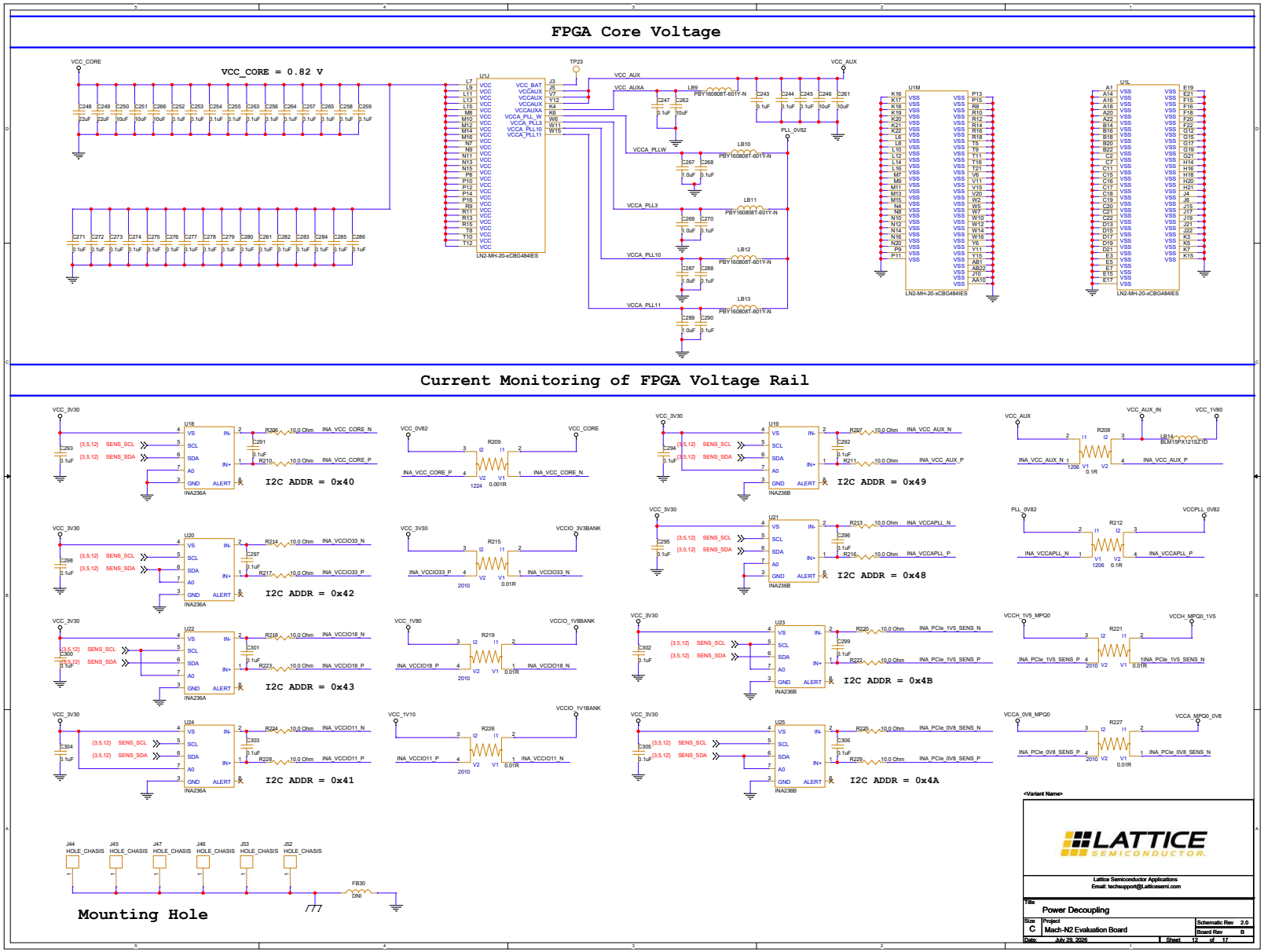

Figure A.12. Power Decoupling

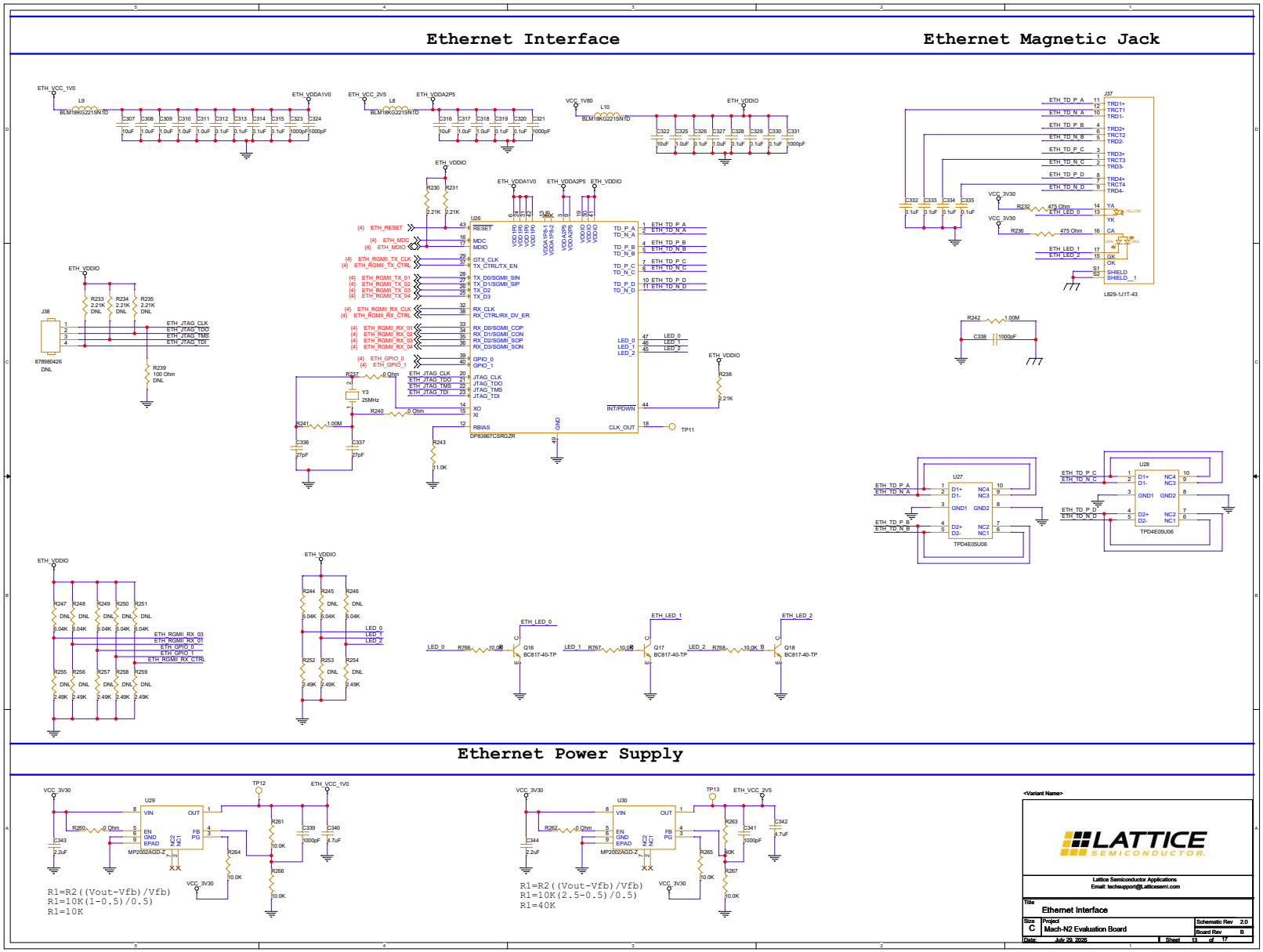

Figure A.13. Ethernet Interface

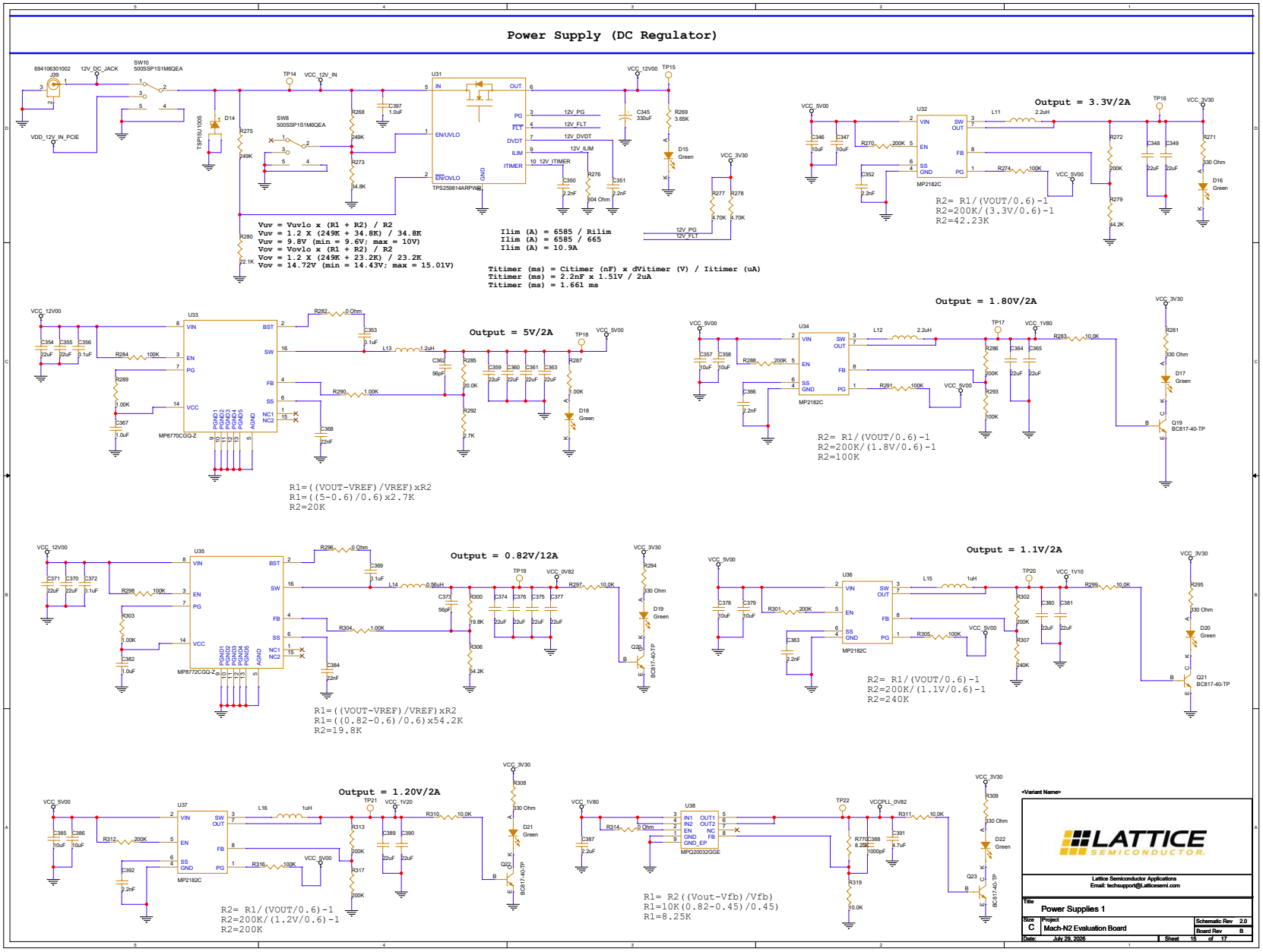

Figure A.14. Power Supply 1

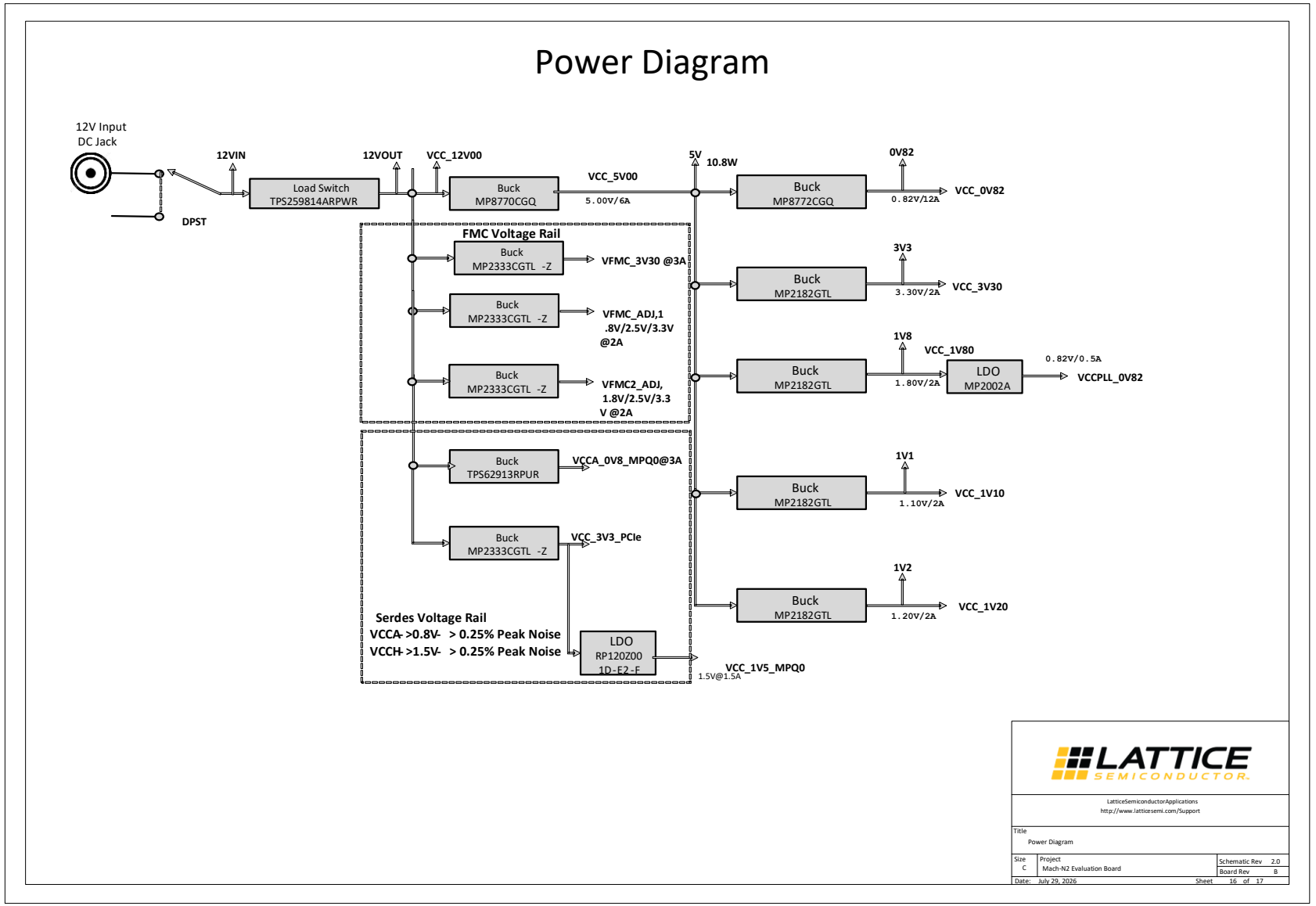

Figure A.15. Power Block Diagram

Appendix B. Mach-N2 Evaluation Board Bill of Materials

Item	Reference	Qty	Value	PCB Footprint	Comments	Part Number	Manufacturer	Description
1	CN1	1	PCIE_X4_EdgeConn	pcie_64_pin	DNL	-	-	-
2	C2,C3,C4,C5,C7,C10,C11,C13,C16,C17,C34,C38,C54,C89,C100,C109,C116,C117,C118,C188,C200,C201,C202,C211,C215,C224,C227,C356,C372,C403,C404	31	0.1uF	C0402-L	-	GRM155R71H104KE14J	Murata	0.1 µF ±10% 50V Ceramic Capacitor X7R 0402 (1005 Metric)
3	C8,C9,C12,C340,C342,C391	6	4.7uF	C0603-L	-	C1608X5R1E475K080AC	TDK	4.7 µF ±10% 25V Ceramic Capacitor X5R 0603 (1608 Metric)
4	C15,C96,C107,C346,C347,C357,C358,C378,C379,C385,C386	11	10uF	C0805	-	C2012X7S1E106K125AC	TDK	10 µF ±10% 25V Ceramic Capacitor X7S 0805 (2012 Metric)
5	C18,C19	2	18pF	C0402-L	-	CC0402JRNPO9BN180	Yageo	18 pF ±5% 50V Ceramic Capacitor C0G, NP0 0402 (1005 Metric)
6	C20,C22,C28,C31,C35,C39,C40,C41,C46,C47,C48,C61,C122,C123,C133,C134,C137,C138,C143,C144,C157,C158,C169,C170,C175,C176,C190,C191,C204,C205,C246,C250,C251,C261,C262,C266,C307,C316,C322	39	10uF	C0402-L	-	CC0402MRX5R6BB106	Yageo	CAP CER 10UF 10V X5R 0402
7	C21,C23,C24,C25,C26,C27,C29,C30,C32,C33,C36,C37,C42,C43,C44,C45,C49,C50,C51,C52,C62,C63,C85,C87,C98,C119,C120,C121,C124,C125,C126,C127,C128,C129,C130,C131,C132,C135,C136,C139,C140,C141,C142,C145,C146,C147,C148,C149,C150,C151,C152,C153,C154,C155,C156,C159,C160,C161,C162,C163,C164,C165,C166,C167,C168,C171,C172,C173,C174,C177,C178,C179,C180,C181,C182,C183,C184,C185,C186,C192,C193,C194,C195,C196,C206,C207,C208,C209,C210,C243,C244,C245,C247,C252,C253,C254,C255,C256,C257,C258,C259,C263,C264,C265,C268,C270,C271,C272,C273,C274,C275,C276,C277,C278,C279,C280,C281,C282,C283,C284,C285,C286,C288,C290,C312,C313,C314,C315,C319,C320,C326,C328,C329,C330,C332,C333,C334,C335,C393,C394,C405,C406,C407,C408	144	0.1uF	C0201	-	GRM033Z71C104KE14D	Murata	CAP CER 0.1UF 16V X7R 0201

Item	Reference	Qty	Value	PCB Footprint	Comments	Part Number	Manufacturer	Description
8	C53,C56,C58,C88,C91,C93,C99,C102,C103,C108,C111,C113,C354,C355,C359,C360,C361,C363,C370,C371	20	22uF	C0805	-	GRM21BR61E226ME44K	Murata	22 µF ±20% 25V Ceramic Capacitor X5R 0805 (2012 Metric)
9	C55,C90,C101,C110,C397	5	1.0uF	C0402-L	-	C1005X5R1V105K050BC	TDK	1 µF ±10% 35V Ceramic Capacitor X5R 0402 (1005 Metric)
10	C57,C92,C104,C112	4	10pF	C0402-L	-	CC0402JRNPO8BN100	Yageo	CAP CER 10PF 25V C0G/NPO 0402
11	C59,C94,C105,C114,C321,C323,C324,C331,C339,C341,C388	11	1000pF	C0402-L	-	GRM155R72A102KA01D	Murata	1000 pF ±10% 100V Ceramic Capacitor X7R 0402 (1005 Metric)
12	C60,C95,C106,C115	4	6.8nF	C0402-L	-	C0402C682J3REC7411	KEMET	CAP CER 0402 6.8NF 25V X7R 5%
13	C65,C66,C69,C70,C79	5	10uF	C0603-L	-	GRM188R61E106KA73J	Murata	10 µF ±10% 25V Ceramic Capacitor X5R 0603 (1608 Metric)
14	C67,C80,C82,C97,C267,C269,C287,C289,C308,C309,C310,C311,C317,C318,C325,C327,C367,C382,C395,C396	20	1.0uF	C0402-L	-	GRM155R61E105KA12D	Murata	1 µF ±10% 25V Ceramic Capacitor X5R 0402 (1005 Metric)
15	C68,C81,C84,C197,C212,C213,C225,C226	8	10nF	C0402-L	-	GRM155R71H103KA88D	Murata	10000 pF ±10% 50V Ceramic Capacitor X7R 0402 (1005 Metric)
16	C71	1	0.022uF	C0402-L	-	GRM155R71H223KA12D	Murata	0.022 µF ±10% 50V Ceramic Capacitor X7R 0402 (1005 Metric)
17	C72,C73,C74,C75,C76,C77,C348,C349,C364,C365,C374,C375,C376,C377,C380,C381,C389,C390	18	22uF	C0603-L	-	GRM188R61A226ME15D	Murata	22 µF ±20% 10V Ceramic Capacitor X5R 0603 (1608 Metric)
18	C78,C350,C351,C352,C366,C383,C392	7	2.2nF	C0402-L	-	GRM1555C1H222JA01D	Murata	2200 pF ±5% 50V Ceramic Capacitor C0G, NP0 0402 (1005 Metric)
19	C83	1	0.47uF	C0402-L	-	GRM155R61A474KE15D	Murata	0.47 µF ±10% 10V Ceramic Capacitor X5R 0402 (1005 Metric)
20	C86	1	270pF	C0402-L	-	C0402C271J5GACTU	KEMET	270 pF ±5% 50V Ceramic Capacitor C0G, NP0 0402 (1005 Metric)

Item	Reference	Qty	Value	PCB Footprint	Comments	Part Number	Manufacturer	Description
21	C187,C398	2	0.1uF	C0402-L	DNL	GRM155R71H104KE14J	Murata	0.1 µF ±10% 50V Ceramic Capacitor X7R 0402 (1005 Metric)
22	C189,C203	2	47uF	C0805	-	C2012X5R1A476M125AC	TDK	47 µF ±20% 10V Ceramic Capacitor X5R 0805 (2012 Metric)
23	C198	1	0.1uF	C0402-L	-	CC0402KRX7R7BB104	Yageo	0.1 µF ±10% 16V Ceramic Capacitor X7R 0402 (1005 Metric)
24	C199	1	1uF	C0201-L	-	GRM033R61A105ME15D	Murata Electronics	1 µF ±20% 10V Ceramic Capacitor X5R 0201 (0603 Metric)
25	C214,C216,C217,C218,C219,C220,C221,C222,C223,C228,C229,C230,C231,C232,C233,C234,C235,C236,C237,C238,C239,C240,C241,C242,C409,C410,C411,C412,C413,C414,C415,C416	32	0.22uF	C0201-L	-	GRM033R61E224ME01D	Murata	CAP CER 0.22UF 25V X5R 0201
26	C248,C249	2	22uF	C0805	-	CC0805MKX5R5BB226	Yageo Corporation	CAP NCS X5R 0805 22uF +/-20% 6.3V
27	C291,C292,C293,C294,C295,C296,C297,C298,C299,C300,C301,C302,C303,C304,C305,C306,C353,C369	18	0.1uF	C0201-L	-	GRM033R61A104KE15D	Murata Electronics	CAP CER 0.1UF 10V X5R 0201
28	C336,C337	2	27pF	C0402-L	-	GRM1555C1H270FA01D	Murata Electronics	CAP CER 27PF 50V C0G/NP0 0402
29	C338	1	1000pF	C1206	-	CC1206KKX7RDBB102	Yageo	1000 pF ±10% 2000V (2kV) Ceramic Capacitor X7R 1206 (3216 Metric)
30	C343,C344,C387	3	2.2uF	C0402-L	-	GRM155R60J225ME01D	Murata	2.2 µF ±20% 6.3V Ceramic Capacitor X5R 0402 (1005 Metric)
31	C345	1	330uF	EXV-9P_KEM	-	EEV337M035S9PAA	Kemet	330 µF 35 V Aluminum Electrolytic Capacitors Radial, Can - SMD 2000 Hrs @ 105°C
32	C362,C373	2	56pF	C0402-L	-	CBR04C560F5GAC	KEMET	CAP CER 56PF 50V C0G/NP0 0402
33	C368,C384	2	22nF	C0402-L	-	C0402C223K3RAC	KEMET Corporation	CAP X7R 0402 22nF +/-10% 25V

Item	Reference	Qty	Value	PCB Footprint	Comments	Part Number	Manufacturer	Description
34	C399	1	10uF	C0402-L	DNL	CC0402MRX5R6BB106	Yageo	CAP CER 10UF 10V X5R 0402
35	C400,C401,C402	3	0.1uF	C0201	DNL	GRM033Z71C104KE14D	Murata	CAP CER 0.1UF 16V X7R 0201
36	D1	1	5.5V	UDFN6_1P2X1	-	ESDR0502NMUTAG	ONSEMI	Clamp Ipp Tvs Diode Surface Mount 6-UDFN (1.2x1)
37	D2,D3,D4,D5,D6,D7,D8,D9,D10,D12,D15,D16,D17,D18,D19,D20,D21,D22	18	Green	LED0603	-	SML-D12M8WT86	Rohm Semiconductor	Green 572nm LED indication - Discrete 2.2V 0603
38	D11	1	Red	LED0603	-	SML-D12U1WT86	Rohm Semiconductor	Red 620nm LED Indication - Discrete 2.2V 0603 (1608 Metric)
39	D13	1	LDT-N2804RI	LDT-N2804RI_LUM	-	LDT-N2804RI	Lumex	Display Modules - LED Character and Numeric Red 7-Segment 3 Character Common Cathode 2V 10mA 0.394" H x 0.887" W x 0.240" D (10.00mm x 22.53mm x 6.10mm) 12-DIP (0.300", 7.62mm), 1
40	D14	1	TSP15U100S	TO-227A_TS	Alternate PN : TSUP15102	TSP15U100S	Taiwan Semiconductor	Diode Schottky 100 V 15A Surface Mount TO-277A (SMPC)
41	FB1,FB2	2	BLM18KG221SN1D	FB0603	-	BLM18KG221SN1D	Murata Electronics	220 Ohms @ 100 MHz 1 Power Line Ferrite Bead 0603 (1608 Metric) 2.2A 50mOhm
42	FB30	1	DNI	FB0603	DNL	BLM18SP221SZ1D	Murata Electronics	FERRITE BEAD 220 OHM 0603 1LN
43	J1	1	10129380-908001BLF	HDR_1X8_SMD	-	10129380-908001BLF	Amphenol	CONN HEADER SMD 8POS 2.54MM
44	J2	1	1734035-2	CONN5_USB1734035_TEC	-	1734035-2	TE Connectivity	USB - mini B USB 2.0 Receptacle Connector 5 Position Surface Mount, Right Angle

Item	Reference	Qty	Value	PCB Footprint	Comments	Part Number	Manufacturer	Description
45	J3,J10,J11,J14,J15,J16,J17,J18,J20,J21,J27,J28,J29,J31,J32,J40,J41,J42,J4,J33,J34	21	Jumper	HDR_1X2_100MIL_SMD	-	878980204	Molex	CONN HEADER SMD 2POS 2.54MM
46	J19,J30,J35	3	Jumper	HDR_1X2_100MIL_SMD	Default : Pin 1 & 2	878980204	Molex	CONN HEADER SMD 2POS 2.54MM
47	J5,J6,J7	3	Jumper	HDR_1X4_100MIL_TH	Default : Pin 2 & 3	929400-01-14-RK	3M	Connector Header Through Hole 14 position 0.100" (2.54mm)
48	J8	1	Jumper	HDR_1X3_100MIL_TH	Default : Pin 1 & 2	929400-01-14-RK	3M	Connector Header Through Hole 14 position 0.100" (2.54mm)
49	J9,J48,J51	3	Jumper	HDR_1X2_100MIL	Regular 100 Mil Header	-	-	-
50	J12,J13,J22	3	54201-S0803LF	HDR_1X3_100MIL_SMD	Default : Pin 1 & 2	54201-S0803LF	Amphenol ICC (FCI)	CONN HEADER SMD 3POS 2.54MM
51	J23	1	Jumper	HDR_1X2_100MIL_SMD	-	878980204	Molex	CONN HEADER SMD 2POS 2.54MM
52	J24	1	5019512230	501951-2230	-	5019512230	Molex	CONN FFC VERT 22POS 0.5MM SMD
53	J25	1	54202-G0807LF	HDR_2x7_SMD	-	54202-G0807LF	Amphenol ICC (FCI)	CONN HEADER SMD 14POS 2.54MM
54	J26	1	ASP-134486-01	CONN_ASP-134486-01_SAI	-	ASP-134486-01	Samtec	400 Position Connector Array, Female Sockets Surface Mount Gold
55	J36	1	54202-S0803LF	HDR_3X2_SMD	Default : Pin 1 & 2	54202-S0803LF	Amphenol ICC (FCI)	CONN HEADER SMD 6POS 2.54MM
56	J37	1	L829-1J1T-43	BEL_L829-1J1T-43	-	L829-1J1T-43	Bel Fuse	1 Port RJ45Through Hole 10/100/1000 Base-T, AutoMDIX
57	J38	1	878980426	HDR_1X4_SMD	DNL	878980426	Molex	CONN HEADER SMD 4POS 2.54MM
58	J39	1	694106301002	CONN3_01002_WRE	-	694106301002	Wurth	Power Barrel Connector Jack

Item	Reference	Qty	Value	PCB Footprint	Comments	Part Number	Manufacturer	Description
								2.10mm ID (0.083"), 5.50mm OD (0.217") Through Hole, Right Angle
59	J44,J45,J46,J47,J52,J53	6	HOLE_CHASIS	hole35mm header	DNL	-	-	-
60	J49	1	Jumper	HDR_1X2_100MIL_SMD	DNL	878980204	Molex	CONN HEADER SMD 2POS 2.54MM
61	J54	1	GRPB031VWVN-RC	CONN_GRPB031VWVN-RC_SUL	-	GRPB031VWVN-RC	Sullins	Connector Header Through Hole 3 position 0.050" (1.27mm)
62	LB1,LB2,LB3,LB5,LB14	5	BLM15PX121SZ1D	FB0402	-	BLM15PX121SZ1D	Murata	FERRITE BEAD BEAD_0402 Ferrite 120ohm 55mohm 2A
63	LB6,LB9,LB10,LB11,LB12,LB13,LB15	7	PBY160808T-601Y-N	FB0603	-	PBY160808T-601Y-N	Pulse Electronics	FERRITE BEAD BEAD_0603 Ferrite 600ohm 25% 200mohm 0.8A
64	LB7	1	74279221100	FB1206	-	74279221100	Würth Elektronik	10 Ohms @ 100 MHz 1 Ferrite Bead 1206 (3216 Metric) 10.5A 3mOhm
65	LB8	1	MH1608-601Y	FB0603	-	MH1608-601Y	Bourns, Inc.	FERRITE BEAD BEAD_0603 Ferrite 600ohm 25% 200mohm 0.8A
66	LB16	1	BLM15PX121SZ1D	FB0402	DNL	BLM15PX121SZ1D	Murata	FERRITE BEAD BEAD_0402 Ferrite 120ohm 55mohm 2A
67	L1,L2,L7,L11,L12	5	2.2uH	IND_SRP4020TA_BRN-L	-	SRP4020TA-2R2M	Bourns	2.2 µH Shielded Drum Core, Wirewound Inductor 4 A 61mOhm Max 2-SMD
68	L3,L5	2	3.3uH	IND_SRP4020TA_BRN-L	-	SRP4020TA-3R3M	Bourns	3.3 µH Shielded Drum Core, Wirewound Inductor 3.5 A 76mOhm Max 2-SMD

Item	Reference	Qty	Value	PCB Footprint	Comments	Part Number	Manufacturer	Description
69	L4,L6	2	FB_120_0603	IND_1608_TDK	-	MPZ1608S121ATAH0	TDK	120 Ohms @ 100 MHz
70	L8,L9,L10	3	BLM18KG221SN1D	IND_1608_TDK	-	BLM18KG221SN1D	Murata Electronics	220 Ohms @ 100 MHz 1 Power Line Ferrite Bead 0603 (1608 Metric) 2.2A 50mOhm
71	L13	1	1.2uH	MWSA0402S_1R2MT	-	MWSA0402S-1R2MT	Shenzhen Sunlord Electronics Co., Ltd.	1.2 µH Shielded Drum Core, Wirewound Inductor 6 A 27mOhm Max Nonstandard
72	L14	1	0.56uH	EXLA1V0402_R56_R	-	EXLA1V0402-R56-R	Eaton - Electronics Division	560 nH Shielded Molded Inductor 12.6 A 7.8mOhm Max Nonstandard
73	L15,L16	2	1uH	IND_1239AS_2520	-	1239AS-H-1R0M=P2	Murata Electronics	1 µH Shielded Drum Core, Wirewound Inductor 3 A 59mOhm Max 1008 (2520 Metric)
74	Q1,Q2,Q3,Q4,Q5,Q6,Q7,Q8,Q16,Q17,Q18,Q19,Q20,Q21,Q22,Q23	16	BC817-40-TP	SOT-23-3	-	BC817-40-TP	Micro Commercial	Bipolar (BJT) Transistor NPN 45 V 800 mA 100MHz 310 mW Surface Mount SOT-23
75	Q9	1	MMBT2222ALT1G	MMBT2222ALT-1	-	MMBT2222ALT1G	onsemi	TRANS NPN 40V 0.6A SOT23-3
76	Q10,Q11,Q12,Q13,Q14,Q15	6	FDV301N	SOT23_NCH_FDV301N	-	FDV301N	ON Semiconductor Corporation	MOSFET N-CH 25V 220MA SOT23
77	R1,R2,R3,R14,R15,R16,R29,R30,R31,R32,R33,R35,R38,R39,R40,R53,R54,R58,R59,R70,R91,R95,R99,R110,R112,R261,R264,R265,R266,R267,R283,R297,R299,R310,R311,R740,R741,R742,R755,R757,R758,R759,R762,R766,R767,R768	46	10.0K	R0402-L	-	RC0402FR-0710KP	Yageo	10 kOhms ±1% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Thick Film
78	R4,R7,R10,R18,R84,R85,R86,R124,R143,R144,R145,R230,R231,R238	14	2.21K	R0402-L	-	RC0402FR-072K21L	Yageo	2.21 kOhms ±1% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Thick Film

Item	Reference	Qty	Value	PCB Footprint	Comments	Part Number	Manufacturer	Description
79	R5,R6,R9,R87,R88,R90,R100,R102,R115,R116,R147,R173,R175,R177,R180,R201,R237,R240,R260,R262,R282,R296,R314,R320,R321	25	0 Ohm	R0402-L	-	RC0402FR-070RL	Yageo	0 Ohms Jumper Chip Resistor 0402 (1005 Metric) Moisture Resistant Thick Film
80	R8	1	22.1 Ohm	R0402-L	-	RC0402FR-0722R1L	Yageo	22.1 Ohms ±1% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Moisture Resistant Thick Film
81	R11,R36,R55,R56,R71,R96,R125,R126,R174,R189,R200,R287,R289,R290,R303,R304	16	1.00K	R0402-L	-	RC0402FR-071KP	Yageo	1 kOhms ±1% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Thick Film
82	R12,R13,R34,R41,R43,R44,R45,R46,R47,R48,R49,R50,R51,R68,R113,R114,R117,R118,R119,R122,R123,R133,R146,R148,R151,R152,R153,R167,R178,R179,R195,R196,R197,R198,R199,R202,R203,R205,R277,R278	40	4.70K	R0402-L	-	RC0402FR-074K7P	Yageo	4.7 kOhms ±1% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Thick Film
83	R17	1	12.0K	R0402-L	-	RC0402FR-0712KL	Yageo	12 kOhms ±1% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Moisture Resistant Thick Film
84	R19,R20,R21,R22,R24,R25,R26,R27,R271,R281,R294,R295,R308,R309	14	330 Ohm	R0402-L	-	RC0402FR-07330RL	Yageo	330 Ohms ±1% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Moisture Resistant Thick Film
85	R23,R28,R739,R750	4	22ohm	R0402	-	RC0402FR-0722RL	Yageo	SMD 22 Ohms 62.5mW 0402 1%
86	R37,R42,R52,R69	4	100 Ohm	R0402-L	-	RC0402FR-07100RL	Yageo	100 Ohms ±1% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Moisture Resistant Thick Film
87	R57	1	2.00K	R0402-L	-	RC0402FR-072KL	Yageo	2 kOhms ±1% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Moisture Resistant Thick Film

Item	Reference	Qty	Value	PCB Footprint	Comments	Part Number	Manufacturer	Description
88	R60,R61,R62,R63,R64,R65,R66,R67	8	133 Ohm	R0402-L	-	RC1005F1330CS	SAMSUNG ELECTRONICS CO., LTD.	RES 0402 133ohm 1% 62.5mW
89	R72	1	22	R0402	-	RC0402FR-0722RL	Yageo	SMD 22 Ohms 62.5mW 0402 1%
90	R73,R74,R163,R170,R182	5	240 Ohm	R0402-L	-	RC0402FR-07240RL	Yageo	240 Ohms ±1% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Moisture Resistant Thick Film
91	R75,R104,R127,R134	4	20 Ohm	R0402-L	-	CRCW040220R0FKED C	Vishay Dale	RES 20 OHM 1% 1/16W 0402
92	R76,R105,R128,R135	4	604K	R0402-L	-	RC0402FR-07604KL	Yageo	RES 604K OHM 1% 1/16W 0402
93	R77,R106,R129,R136	4	100K	R0402-L	-	RC0402FR-07100KL	Yageo	100 kOhms ±1% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Moisture Resistant Thick Film
94	R78,R137	2	36K	R0402-L	-	RC0402FR-0736KL	YAGEO	RES 36K OHM 1% 1/16W 0402
95	R79,R108,R131,R138	4	40.2K	R0402-L	-	RC0402FR-0740K2L	Yageo	40.2 kOhms ±1% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Moisture Resistant Thick Film
96	R80,R83,R139,R142	4	162K	R0402-L	-	ERJ-2RKF1623X	Panasonic Electronic Components	RES SMD 162K OHM 1% 1/10W 0402
97	R81,R140	2	64.9K	R0402-L	-	RMCF0402FT64K9	Stackpole Electronics Inc	RES 64.9K OHM 1% 1/16W 0402
98	R82,R141	2	40.2K	R0402-L	-	ERJ-2RKF4022X	Panasonic Electronic Components	RES SMD 40.2K OHM 1% 1/10W 0402
99	R89,R107,R130	3	20K	R0402-L	-	RK73H1ETTP2002F	KOA Speer Electronics, Inc.	RES 0402 20kohm 1% 62.5mW
100	R92	1	3.32K	R0402-L	-	RC0402FR-073K32L	YAGEO	RES 3.32K OHM 1% 1/16W 0402

Item	Reference	Qty	Value	PCB Footprint	Comments	Part Number	Manufacturer	Description
101	R93	1	412 Ohm	R0402-L	-	RC0402FR-07412RL	Yageo	RES 412 OHM 1% 1/16W 0402
102	R94,R98,R101,R103,R164,R165,R323,R324,R325,R737	10	0 Ohm	R0402-L	**DNL**	RC0402FR-070RL	Yageo	0 Ohms Jumper Chip Resistor 0402 (1005 Metric) Moisture Resistant Thick Film
103	R97	1	60.4K	R0402-L	-	RC0402FR-0760K4L	Yageo	60.4 kOhms ±1% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Moisture Resistant Thick Film
104	R109,R132	2	13K	R0402-L	-	RC0402FR-0713KL	Yageo	RES 13K OHM 1% 1/16W 0402
105	R120,R121,R326,R722,R723	5	4.70K	R0402-L	**DNL**	RC0402FR-074K7P	Yageo	4.7 kOhms ±1% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Thick Film
106	R149,R150,R184,R186	4	33 Ohm	R0201	-	RC0201FR-0733RL	Yageo	RES 33 OHM 1% 1/20W 0201
107	R154,R155,R156,R157,R158,R159,R171,R176,R187,R188,R190,R191,R192,R193	14	49.9 Ohm	R0201	-	RC0201DR-0749R9L	Yageo	RES 49.9 OHM 0.5% 1/20W 0201
108	R160,R194,R232,R236	4	475 Ohm	R0402-L	-	RC0402FR-07475RL	Yageo	RES 475 OHM 1% 1/16W 0402
109	R161,R162,R732,R735,R744,R745	6	1.00K	R0402-L	**DNL**	RC0402FR-071KP	Yageo	1 kOhms ±1% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Thick Film
110	R166,R239	2	100 Ohm	R0402-L	**DNL**	RK73H1ETTP1000F	KOA Speer Electronics, Inc.	RES 0402 100ohm 1% 62.5mW
111	R168,R169	2	1K	R0201-L	-	CRCW02011K00FKED	Vishay Dale	RES SMD 1K OHM 1% 1/20W 0201
112	R172	1	2.00K	R0402-L	**DNL**	RC0402FR-072KL	Yageo	2 kOhms ±1% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Moisture Resistant Thick Film
113	R181	1	10K	R0201-L	-	RC0201FR-0710KL	YAGEO	RES 10K OHM 1% 1/20W 0201

Item	Reference	Qty	Value	PCB Footprint	Comments	Part Number	Manufacturer	Description
114	R183,R185	2	33 Ohm	R0201	**DNL**	RC0201FR-0733RL	Yageo	RES 33 OHM 1% 1/20W 0201
115	R206,R207,R210,R211,R213,R214,R216,R217,R218,R220,R222,R223,R224,R225,R228,R229	16	10.0 Ohm	R0402-L	-	RC0402FR-7W10RL	Yageo	10 Ohms ±1% 0.125W, 1/8W Chip Resistor 0402 (1005 Metric) Moisture Resistant Thick Film
116	R208,R212	2	0.1R	1206	-	LVK12R100CER	Ohmite	0.5W 0.100 OHMS 0.25% LVK (1206)
117	R209	1	0.001R	1224	-	LVK25R001DER	Ohmite	RES 0.001 OHM 2W 2512 WIDE
118	R215,R219,R221,R226,R227	5	0.01R	2010	-	LVK20R010CER	Ohmite	0.75W 0.010 OHM 0.25% LVK(2010)
119	R233,R234,R235	3	2.21K	R0402-L	**DNL**	RC0402FR-072K21L	Yageo	2.21 kOhms ±1% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Thick Film
120	R241,R242	2	1.00M	R0402-L	-	ERJ-2RKF1004X	Panasonic	1 MOhms ±1% 0.1W, 1/10W Chip Resistor 0402 (1005 Metric) Automotive AEC-Q200 Thick Film
121	R243	1	11.0K	R0402-L	-	RC0402FR-0711KL	Yageo	11 kOhms ±1% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Moisture Resistant Thick Film
122	R244	1	6.04K	R0402-L	-	RC0402FR-076K04L	Yageo	6.04 kOhms ±1% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Moisture Resistant Thick Film
123	R245,R246,R247,R248,R249,R250,R251	7	6.04K	R0402-L	**DNL**	RC0402FR-076K04L	Yageo	6.04 kOhms ±1% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Moisture Resistant Thick Film

Item	Reference	Qty	Value	PCB Footprint	Comments	Part Number	Manufacturer	Description
124	R252	1	2.49K	R0402-L	-	ERA-2AEB2491X	Panasonic Electronic Components	RES SMD 2.49KOHM 0.1% 1/16W 0402
125	R253,R254,R255,R256,R257,R258,R259	7	2.49K	R0402-L	**DNL**	ERA-2AEB2491X	Panasonic Electronic Components	RES SMD 2.49KOHM 0.1% 1/16W 0402
126	R263	1	40K	R0402-L	-	RNCF0402BTE40K0	Stackpole Electronics Inc	RES SMD 40K OHM 0.1% 1/10W 0402
127	R268,R275	2	249K	R0402-L	-	RC0402FR-07249KL	Yageo	249 kOhms ±1% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Moisture Resistant Thick Film
128	R269	1	3.65K	R0402-L	-	RC0402FR-073K65L	Yageo	3.65 kOhms ±1% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Moisture Resistant Thick Film
129	R270,R272,R286,R288,R301,R302,R312,R313,R317	9	200K	R0402-L	-	CRCW0402200KFKED	Vishay Americas Inc.	RES 0402 200kohm 1% 62.5mW
130	R273	1	34.8K	R0402-L	-	RC0402FR-0734K8L	Yageo	34.8 kOhms ±1% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Moisture Resistant Thick Film
131	R274,R284,R291,R293,R298,R305,R316	7	100K	R0402-L	-	ERJ-2RKF1003X	Panasonic Electronic Components	RES 100K OHM 1% 1/10W 0402
132	R276	1	604 Ohm	R0402-L	-	RC0402FR-07604RL	Yageo	604 Ohms ±1% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Moisture Resistant Thick Film
133	R279	1	44.2K	R0402-L	-	RC0402FR-0744K2L	YAGEO	RES 44.2K OHM 1% 1/16W 0402
134	R280	1	22.1K	R0402-L	-	RC0402FR-0722K1L	Yageo	22.1 kOhms ±1% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Thick Film

Item	Reference	Qty	Value	PCB Footprint	Comments	Part Number	Manufacturer	Description
135	R285	1	20.0K	R0402-L	-	RC0402FR-0720KL	Yageo	20 kOhms ±1% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Moisture Resistant Thick Film
136	R292	1	2.7K	R0402-L	-	RC0402FR-072K7L	YAGEO	RES 2.7K OHM 1% 1/16W 0402
137	R300	1	19.8K	R0402-L	-	RN73R1ETTP1982B25	KOA Speer Electronics, Inc.	RES 19.8K OHM 0.1% 1/16W 0402
138	R306	1	54.2K	R0402-L	-	RT0402BRD0754K2L	YAGEO	RES 54.2K OHM 0.1% 1/16W 0402
139	R307	1	240K	R0402-L	-	RC0402FR-07240KL	Yageo	RES 240K OHM 1% 1/16W 0402
140	R319	1	10.0K	R0402-L	-	ERA-2AEB103X	Panasonic Electronic Components	RES SMD 10K OHM 0.1% 1/16W 0402
141	R724,R725,R726,R727,R728,R729,R730,R731,R733,R734,R746,R747,R748,R749,R751,R753,R754,R760,R761	19	10.0K	R0402-L	**DNL**	RC0402FR-0710KP	Yageo	10 kOhms ±1% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Thick Film
142	R736	1	22ohm	R0402	**DNL**	RC0402FR-0722RL	Yageo	SMD 22 Ohms 62.5mW 0402 1%
143	R738	1	0	R0402	**DNL**	CRCW04020000ZSTD	Vishay / Dale	Thick Film Resistors - SMD 0402 Zero Ohms
144	R756	1	10.0K	R0402-L	**DNL**	RC0402FR-0710KP	Yageo	10 kOhms ±1% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Thick Film
145	R763,R764,R765	3	240 Ohm	R0402-L	**DNL**	RC0402FR-07240RL	Yageo	240 Ohms ±1% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Moisture Resistant Thick Film
146	R769	1	0 Ohm	R0402-L	**DNL**	RC0402FR-070RL	Yageo	0 Ohms Jumper Chip Resistor 0402 (1005 Metric) Moisture Resistant Thick Film

Item	Reference	Qty	Value	PCB Footprint	Comments	Part Number	Manufacturer	Description
147	R770	1	8.25K	R0402	-	RC0402FR-078K25L	Yageo	8.25 kOhms ±1% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Moisture Resistant Thick Film
148	SW1,SW2,SW3,SW5,SW7	5	430182043816	SOIC_8204 3816_WRE	-	430182043816	Wurth	Tactile Switch SPST-NO Top Actuated Surface Mount
149	SW4	1	219-8LPST	219-8LPST_CTS	-	219-8LPST	CTS	Dip Switch SPST 8 Position Surface Mount Slide (Standard) Actuator 100mA 20VDC
150	SW6	1	SW-Wurth_452 403012014	452403012 014	-	452403012014	Wurth	SWITCH SLIDE DPDT 300MA 6V
151	SW8,SW10	2	500SSP1S1 M6QEA	SW_500SS P1S1M6QE A	-	500SSP1S1M6QEA	E-Switch	Slide Switch SPDT Through Hole, Right Angle
152	TP1,TP2,TP3,TP4,TP5,TP6,TP7,TP8,TP9,TP10,TP 11,TP12,TP13,TP14,TP15,TP16,TP17,TP18,TP19 ,TP20,TP21,TP22,TP23,TP24,TP25,TP26,TP27	27	Test Point	TP_SM_32	DNL	TP_SM	NA	Test point 0.32" surface mount
153	U1	1	LN2-MH-20-xCBG484IE S	LN2-MH-20-xCBG484IE S	Customer Supplied	LN2-MH-20-xCBG484IES	-	-
154	U2	1	93LC56C-ISN	SOIC8-N	-	93LC56C-ISN	Microchip	EEPROM Memory IC 2Kbit Microwire 3 MHz 8-SOIC
155	U3	1	FT2232H-56Q-TRAY	QFN_H-56Q-TRAY_FTD	-	FT2232H-56Q-TRAY	FTDI, Future Technology Devices International Ltd	USB Bridge, USB to UART,FIFO USB 2.0 UART, FIFO Interface 56-VQFN (8x8)
156	U4,U9,U11,U12	4	MP2333CG TL-Z	SOT583_M P2333CGTL -Z	Customer Supplied	MP2333CGTL-Z	Monolithic Power Systems Inc.	IC REG BUCK Vin 4.2-18V ADJ 3A SOT583

Item	Reference	Qty	Value	PCB Footprint	Comments	Part Number	Manufacturer	Description
157	U5	1	RP120Z001D-E2-F	WLCSP-6-P11	-	RP120Z001D-E2-F	Nisshinbo Micro Devices Inc.	IC REG LIN POS ADJ 1.5A WLCSP-6
158	U6	1	TPS62913RPUR	QFN10-2mmx2mm	-	TPS62913RPUR	Texas Instruments	IC REG BUCK ADJ 3A 10VQFN
159	U7,U8	2	TMUX1248DCKR	SC70-6_TMUX1248	-	TMUX1248DCKR	Texas Instruments	1 Circuit IC Switch 2:1 3Ohm (Typ) SC-70-6
160	U13,U15	2	5V41068APGGI	SOP65P640X120-16N	-	5V41068APGGI	Renesas Electronics America Inc.	IC CLK MUX 2:1 16TSSOP
161	U14	1	MT53E1G16D1ZW	TFBGA200_MT53E1G16D1ZW	-	MT53E1G16D1ZW-046 AIT:C	Micron	IC DRAM 16GBIT PAR 200TFBGA
162	U16,U17	2	TMUXHS4412	WQFN42_TMUXHS4412	-	TMUXHS4412IRUAT	Texas Instruments	4 Circuit 20Gbps IC Switch 1:2, 2:1 8Ohm 42-WQFN (3.5x9)
163	U18,U20,U22,U24	4	INA236A	SOT23-8_DDF_TEX	-	INA236AIDDFR	Texas Instruments	Current Monitor Regulator High/Low-Side TSOT-23-8
164	U19,U21,U23,U25	4	INA236B	SOT23-8_DDF_TEX	-	INA236BIDDFR	Texas Instruments	Current Monitor Regulator High/Low-Side TSOT-23-8
165	U26	1	DP83867CSRGZR	RGZ0048B_NV	-	DP83867CSRGZR	Texas Instruments	Ethernet Physical Layer Controller 10/100/1000 Base-TX PHY Serial Interface 48-VQFN (7x7)
166	U27,U28	2	TPD4E05U06	USON10_TPD4E05U06	-	TPD4E05U06DQAR	Texas Instruments	14V Clamp 2.5A (8/20µs) Ipp Tvs Diode Surface Mount 10-USON (2.5x1)
167	U29,U30	2	MP2002AGD-Z	QFN8_MP2002AGD	Customer Supplied	MP2002AGD-Z	Monolithic Power Systems Inc.	IC REG LIN POS ADJ 500MA 8-QFN
168	U31	1	TPS259814ARPWR	VQFN10_RPW_TEX	-	TPS259814ARPWR	Texas Instruments	Electronic Fuse Regulator High-Side 10A 10-VQFN-HR (2x2)

Item	Reference	Qty	Value	PCB Footprint	Comments	Part Number	Manufacturer	Description
169	U32,U34,U36,U37	4	MP2182C	SOT583_MP2182	Customer Supplied	MP2182CGTL-Z	Monolithic Power Systems Inc.	Buck Switching Regulator IC Positive Adjustable 0.6V 1 Output 2A SOT-583
170	U33	1	MP8770CGQ-Z	QFN16_MP8770	Customer Supplied	MP8770CGQ-Z	Monolithic Power Systems Inc.	IC REG BUCK ADJ 8A 16QFN
171	U35	1	MP8772CGQ-Z	QFN16_MP8772	Customer Supplied	MP8772CGQ-Z	Monolithic Power Systems Inc.	IC REG BUCK Vin 3-17V ADJ 12A QFN-16
172	U38	1	MPQ20032GGE	QFN-8	Customer Supplied	MPQ20032GGE	Monolithic Power Systems Inc.	5.5V,0.5A HIGH ACCURACY LOW IQ LDO WITH POWER GOOD,AEC-Q100
173	U39	1	ASP-134603-01	CONN160_134603-01_SAI	-	ASP-134603-01	Samtec	160 Position Connector Array, Female Sockets Surface Mount Gold
174	U40,U41,U42	3	RClamp0524PATCT	10-UFDFN	-	RClamp0524PATCT	Semtech Corporation	15V Clamp 5A (8/20µs) Ipp Tvs Diode Surface Mount SLP2510P8
175	U61	1	W35T51NW	W35T51NW	DNL	W35T51NWTBIE	Winbond	512M-bit Octal NOR Flash Memory with uniform 4KB sectors
176	U62	1	SN74AXC8T245RJWR	UQFN24_SN74AXC8T245	-	SN74AXC8T245RJWR	Texas Instruments	Translation Transceiver 1 Element 8 Bit per Element Tri-State, Non-Inverted Output 24-UQFN (4x2)
177	U66	1	SN74AXC4T774RSVR	16-UFQFN	-	SN74AXC4T774RSVR	Texas Instruments	Voltage Level Translator Bidirectional 1 Circuit 4 Channel 310Mbps 16-UQFN (2.6x1.8)

Item	Reference	Qty	Value	PCB Footprint	Comments	Part Number	Manufacturer	Description
178	X1	1	HX21C5006Z_125.00MHz	4-SMD	-	HX21C5006Z	Diodes Incorporated	125 MHz XO (Standard) LVCMOS Oscillator 3.3V Enable/Disable 4-SMD, No Lead
179	X2	1	DSC1224CI2-100M0000	VDFN6_DSC1224CI2	-	DSC1224CI2-100M0000	Microchip	MEMS OSC XO 100.0000MHZ HCSL SMD
180	Y1	1	SXT32418BB16-12.000M	XTAL_12MHz_SXT32418	-	SXT32418BB16-12.000M	Suntsu Electronics, Inc	12 MHz ±30ppm Crystal 18pF 100 Ohms 4-SMD, No Lead
181	Y2	1	AX3HAF1-100.0000	OSC_100MHz_AX3HAF1	-	AX3HAF1-100.0000	Abracon LLC	XTAL OSC XO 100MHZ 3.3V HCSL
182	Y3	1	25MHz	XTAL_25MHz_ABM3	-	ABM3-25.000MHZ-D2Y-T	Abracon LLC	25 MHz ±20ppm Crystal 18pF 30 Ohms 2-SMD, No Lead
183	Shunt for headers	39	-	-	Load the shunts mentioned in the BoM & the remaining are Bag & Tag	SNT-100-BK-T	Samtec Inc.	2 (1 x 2) Position Shunt Connector Black Open Top 0.100" (2.54mm) Tin
184	Mach-N2 SERDES Evaluation Board RevB PCB	1			-	305-PD-26-0117	PACTRON	-

Appendix C. Known Limitations

The PCIe Gen4 x4 edge connector (CN21) is not supported in the design because of PCB limitations.

References

- Lattice Nexus 2 Platform web page
- Mach-N2 web page
- Lattice Nexus 2 Platform – Overview Data Sheet (FPGA-DS-02122)
- Lattice Nexus 2 Platform Data Sheet – Specifications (FPGA-DS-02121)
- Programming Cables User Guide (FPGA-UG-02042)
- Lattice Nexus 2 sysCONFIG User Guide (FPGA-TN-02370)
- Lattice Radiant FPGA design software
- Lattice Radiant Software User Guide
- 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, please refer to the Lattice Answer Database at www.latticesemi.com/Support/AnswerDatabase.

Revision History

Revision 0.81, September 2026

Section	Change Summary
All	• Minor editorial fixes. • Removed *ES* from OPN globally.
Abbreviations in This Document	• Added *HCSL* and *LPC* on the list. • Updated the meaning of HPC to *High Pin Count*.

Introduction	• Updated the board image of Figure 1.1. Mach-N2 Evaluation Board – Top view and Figure 1.2. Mach-N2 Evaluation Board – Bottom view
	• Updated Table 1.2. Jumper Setting.
	  • Updated the settings of jumpers J5, J6, and J7 (FTDI I2C).
	  • Updated the settings of jumpers J5, J6, J7, and J8 (FTDI to SSPI x1).
	  • Removed *short* from the settings of jumper J4 (FTDI program control).
	  • Updated the settings of jumper J23 (SERDES voltage selection).

Mach-N2 Evaluation Board Programming	Added a note that board revision B uses FT2232H device.
Control Buses – I2C, UART, and SPI	Replaced the Mach-N2 ball location of the SSPI_D4 signal from *L9* to *G4* in Table 6.3. SSPI Bus Connections.
Headers, Connectors, and Mach-N2 Device Ball Mapping	Added the PCIe Finger Edge Connector section.
Software Requirements	Updated the Lattice Radiant Software version from *2025.2* to *2026.1.1*.
Appendix A. Mach-N2 Evaluation Board-Schematics	Updated the board schematics.
Appendix B. Mach-N2 Evaluation Board Bill of Materials	Updated the bill of materials.
References	Added the Mach-N2 web page in this section.

Revision 0.80, January 2026

Section	Change Summary
All	Preliminary release.

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