NVIDIA Jetson Xavier NX Developer Kit Carrier Board P3509_A01

Specification

SP-09765-001_v1.0 | May 2020

Document History

SP-09765-001_v1.0

Version	Date	Description of Change
1.0	May 4, 2020	Initial Release

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Chapter 1. Introduction

This specification contains recommendations and guidelines for engineers to follow to create modules for the expansion connectors on the NVIDIA® Jetson Xavier™ NX carrier board as well as understand the capabilities of the other dedicated interface connectors and associated power solutions on the platform.

> **!** **CAUTION**: ALWAYS CONNECT JETSON XAVIER NX and ALL EXTERNAL PERIPHERAL DEVICES BEFORE CONNECTING THE POWER SUPPLY TO THE AC POWER JACK. Connecting a device while powered on may damage the developer kit carrier board, Jetson Xavier NX, or peripheral device. In addition, the carrier board should be powered down and the power removed before plugging or unplugging devices or add-on modules into the headers. Wait for the red power VDD_IN LED to turn off or wait for 5 minutes if your system does not have a power LED. This includes the Jetson Xavier NX module, the camera connector, the M.2 connector, and the other expansion headers.
>
> The Jetson Xavier NX developer board contains ESD-sensitive parts. Always use appropriate anti-static and grounding techniques when working with the system. Failure to do so can result in ESD discharge to sensitive pins, and irreparably damage your Jetson Xavier NX board. NVIDIA will not replace units that have been damaged due to ESD discharge.

The Jetson Xavier NX carrier board is ideal for software development within the Linux environment. Standard connectors are used to access Jetson Xavier NX features and interfaces, enabling a highly flexible and extensible development platform. Go to https://developer.nvidia.com/embedded/develop or contact your NVIDIA representative for access to software updates and the developer SDK supporting the OS image and host development platform that you want to use. The developer SDK includes an OS image that you will load onto your Jetson Xavier NX device, supporting documentation, and code samples to help you get started.

1.1 Jetson Xavier NX Feature List

- Applications processor
  - NVIDIA® Xavier™
- Memory
  - 8 GB 128-bit wide LPDDR4x DRAM (1600 MHz)
  - Micro SD card socket (UHS-1)
- Network
  - 10/100/1000 BASE-T Ethernet
- Advanced power management
  - Dynamic voltage and frequency scaling
  - Multiple clock and power domains

1.2 Carrier Board Feature List

- Connection to Jetson Xavier NX
  - 260-pin SO-DIMM connector
- USB
  - USB 2.0 Micro B (device only)
  - USB 3.1 (Gen2) Hub to 4x Type A (host only)
- Wired Network
  - Gigabit Ethernet (RJ45 connector with PoE and LEDs)
- Display
  - Stacked connector
    - HDMI™ Type A (v2.0a/b)
    - VESA® DisplayPort™ (v1.4)
- Camera Connectors
  - 2x 15-position flex connectors
  - CSI (2.5 Gbps per pair): 1, x2 (each connector)
  - Camera CLK, I2C, and control
- M.2 Key E Connector
  - PCIe (Gen3) x1 Lane, USB 2.0
  - I2S, UART, I2C
  - Control
- M.2 Key M connector
  - PCIe (Gen4) x4 lane, control

- Expansion header
  - 40-pin (2x20) header
  - I2C (x2), SPI (x2), UART
  - I2S, audio clock, GPIOs, PWMs
- UI and indicators
  - Button header: power, reset, and force recovery
  - LEDs: Power
- Debug/Serial
  - Serial port signals (on button header)
- Miscellaneous
  - Fan connector: 5V, PWM and tach
  - Optional RTC back-up coin-cell retainer
  - Optional CAN header (5 Mhz)
- Power
  - DC Jack: 9-20V (19V supply provided)
  - Optional Ehternet PoE and backpower headers
  - Main 5.0V supply: TPS53015
  - Main 3.3V supply: TPS53015J
  - Main 1.8V supply: TLV70018
  - 3.3V AO (always on) supply: GS7116S5
  - USB VBUS supplies: AP22811AW5-7 (x2)
  - HDMI 5V power switch: APL3552ABI-TRG
  - HDMI 3.3V supply: GS7616CS-R
  - DP 3.3V power switch: APL3552ABI-TRG
- Developer kit operating temperature range
  - 0 ^{0}C to 35 ^{0}C

1.3 Jetson Xavier NX Carrier Board Block Diagram

Figure 1-1 through Figure 1-5 show the block diagram and various placement views for Jetson Xavier NX and the carrier board.

Figure 1-1. Jetson Xavier NX Block Diagram

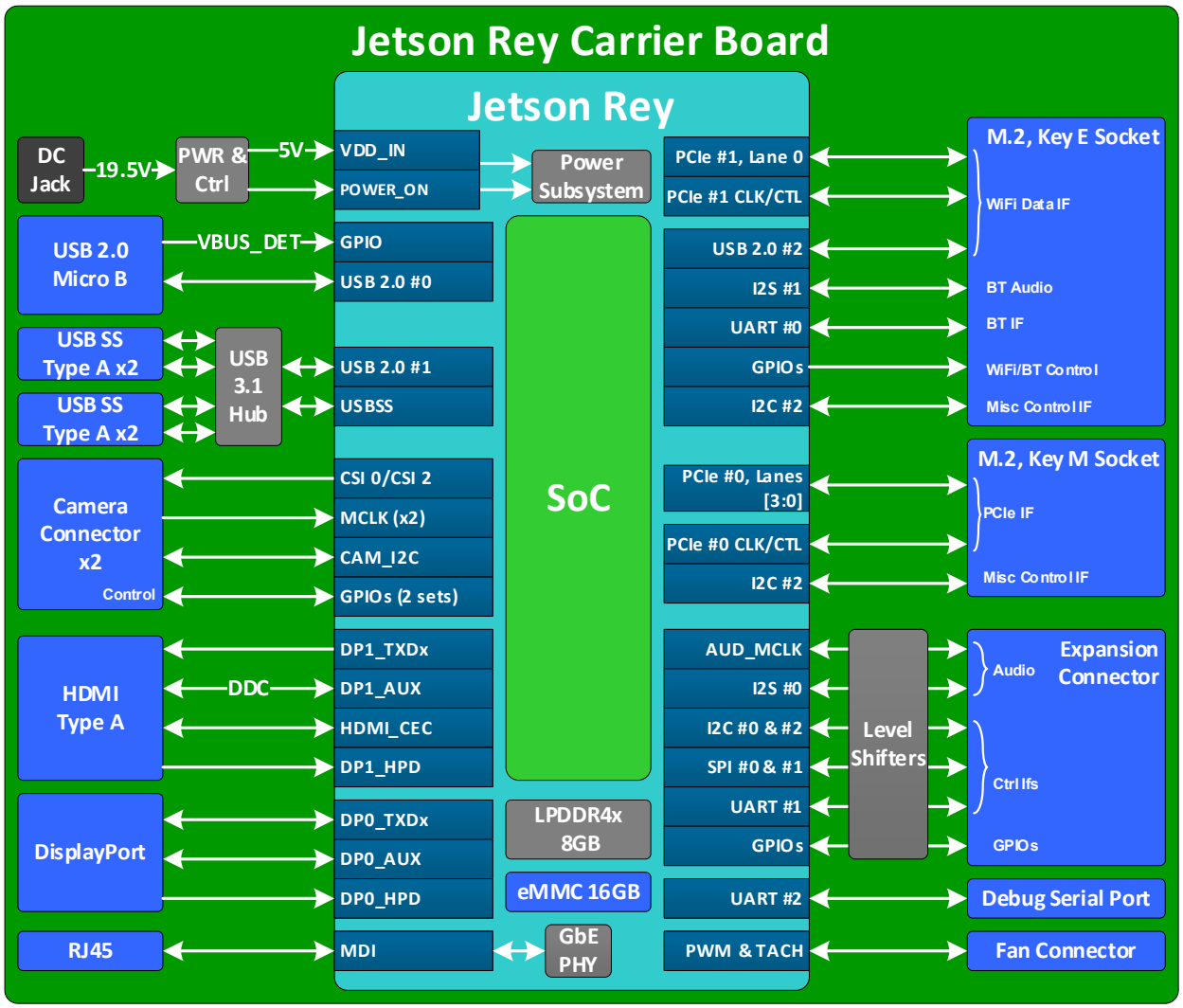


Figure 1-2. Jetson Xavier NX Placement – Top View

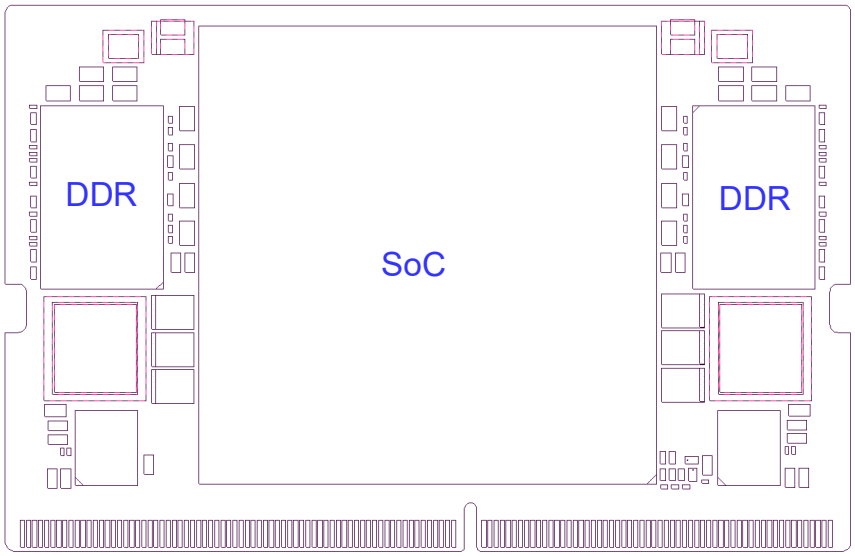


Figure 1-3. Jetson Xavier NX Placement – Bottom View

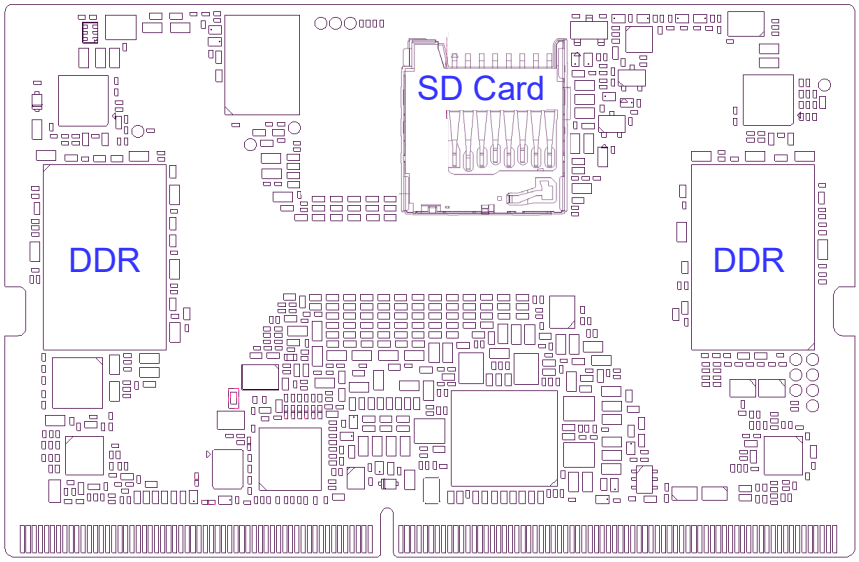
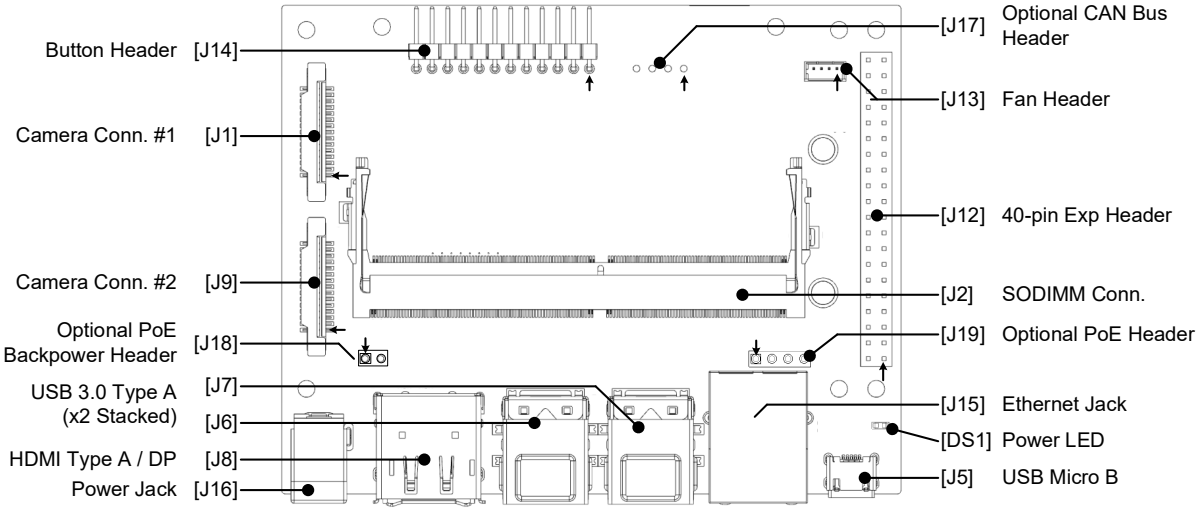
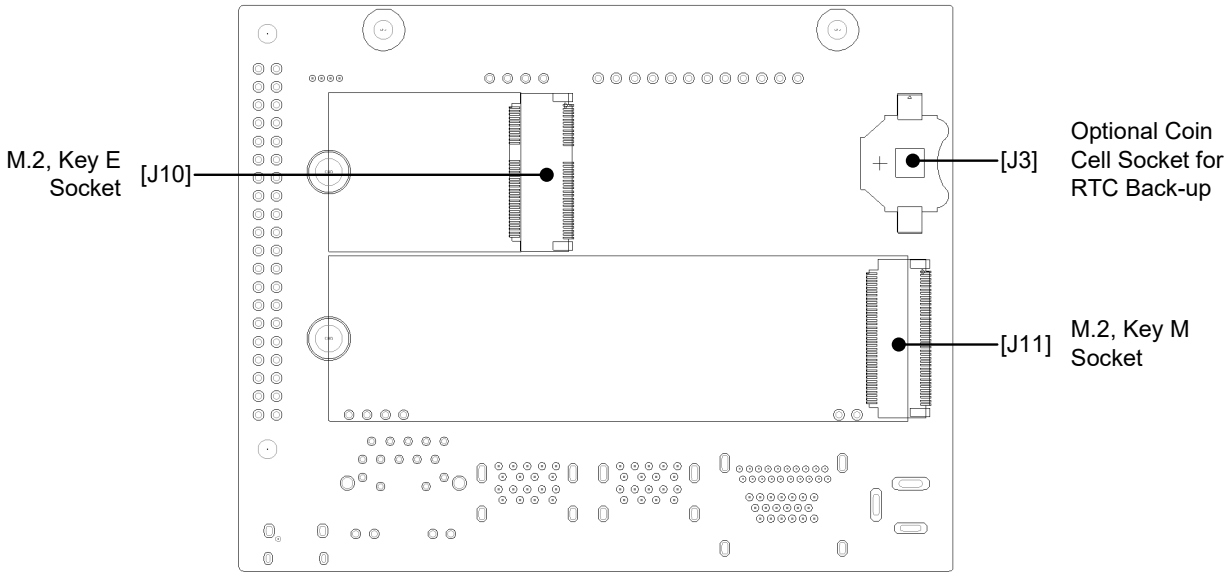


Figure 1-4. Jetson Xavier NX Carrier Board Placement – Top View



J1	Camera (#1) Connector (15 pos, 1mm pitch)	J13	Fan Header (4-pin, 1.25mm pitch)
J2	Jetson Xavier NX Conn. (SODIMM, 260-pin)	J14	Button Header (1x12, 2.54mm pitch, RA)
J5	USB Micro B, RA Female	J15	RJ45 Ethernet Socket, 18-pins, RA, Female
J6	USB Type A Dual Stacked Connector	J16	Power Jack
J7	USB Type A Dual Stacked Connector	J17	Optional: CAN Bus Header (1x4, 2.54mm pitch, RA)
J8	HDMI Type A & DisplayPort Stacked Conn.	J18	Optional: PoE Backpower Header (1x2, 2.54mm pitch)
J9	Camera (#2) Connector (15 pos, 1mm pitch)	J19	Optional: PoE Header (1x4, 2.54mm pitch)
J12	40-pin Expansion Header (2x20, 2.54mm pitch)	DS1	Power LED (Green)

Figure 1-5. Jetson Xavier NX Carrier Board Placement – Bottom View



J3	Optional: RTC Back-up Coin Cell Socket (CR1225)
J10	M.2 Key E Connectivity Slot (75-pin)
J11	M.2 Key M Slot (75-pin)

Chapter 2. Jetson Xavier NX Carrier Board Standard Connectors

The Jetson Xavier NX carrier board provides several connectors with industry standard pinouts to support additional functionality beyond what is integrated on the main platform board. This includes:

- USB 2.0: Micro B Connector
- USB 3.1: 2 x Type A Stacked Connectors
- Gigabit Ethernet: RJ45 Connector
- HDMI / DP: HDMI Type A and DisplayPort Stacked Connector
- M.2, Key E Socket
- M.2, Key M Socket

2.1 USB Ports

The carrier board supports two USB Connectors. One is a USB 2.0 Micro B connector (J5) supporting Device mode only (including USB Recovery). There are two, dual stacked USB 3.0 Type A connectors (J6 and J7). Each connector supports Host mode only. A single load switch supplies VBUS to all four USB 3.0 ports and is limited to 2A of output current.

Table 2-1. USB 2.0 Micro B Connector Pin Description – J5

Pin #	Module Pin Name	Module Pin #	Usage and Description	Type/Dir
1	–	–	VBUS Supply	Power
2	USB0_D_N	115	USB 2.0 #0 Data	Bidir
3	USB0_D_P	117		
4	–	–	Unused	Unused
5	–	–	Ground	Ground

Note: In the Type/Dir column, Output I s to USB connector. Input is form USB connector. Bidir is for bidirectional signals.

Legend	Ground	Power	Reserved

Table 2-2. USB 3.0 Type A Connector Pin Descriptions - J6

Pin #	Module Pin Name[1]	Module Pin #	Usage/Description	Type/Dir[2]
USB 3.0 Type A (2)				
1	–	–	VBUS Supply	Power
2	USB1_D_N		USB 2.0 #2 Data from hub	Bidir
3	USB1_D_P			
4	–	–	Ground	Ground
5	USBSS_RX_N	161	USB 3.1 Receive #2 Data from hub	Input
6	USBSS_RX_P	163		
7	–	–	Ground	Ground
8	USBSS_TX_N	166	USB 3.1 Transmit #2 Data from hub	Output
9	USBSS_TX_P	168		
USB 3.0 Type A (1)				
10	–	–	VBUS Supply	Power
11	USB1_D_N	115	USB 2.0 Data #1 Data from hub	Bidir
12	USB1_D_P	117		
13	–	–	Ground	Ground
14	USBSS_RX_N	161	USB 3.1 Receive #1 Data from hub	Input
15	USBSS_RX_P	163		
16	–	–	Ground	Ground
17	USBSS_TX_N	166	USB 3.1 Transmit #1 Data from hub	Output
18	USBSS_TX_P	168		

Notes:

[1]The module pin names not directly connected to the USB connector pins but are routed to the input of the USB hub.

[2]In the Type/Dir column, Output is to USB connectors. Input is from USB connectors. Bidir is for bidirectional signals.

Legend	Ground	Power	Reserved

Table 2-3. USB 3.0 Type A Connector Pin Descriptions - J7

Pin #	Module Pin Name[1]	Module Pin #	Usage/Description	Type/Dir[2]
USB 3.0 Type A (2)				
1	–	–	VBUS Supply	Power
2	USB1_D_N	115	USB 2.0 #4 Data from hub	Bidir
3	USB1_D_P	117		
4	–	–	Ground	Ground
5	USBSS_RX_N	161	USB 3.1 Receive #4 Data from hub	Input
6	USBSS_RX_P	163		
7	–	–	Ground	Ground
8	USBSS_TX_N	166	USB 3.1 Transmit #4 Data from hub	Output
9	USBSS_TX_P	168		
USB 3.0 Type A (1)				
10	–	–	VBUS Supply	Power
11	USB1_D_N	115	USB 2.0 Data #3 Data from hub	Bidir
12	USB1_D_P	117		
13	–	–	Ground	Ground
14	USBSS_RX_N	161	USB 3.1 Receive #3 Data from hub	Input
15	USBSS_RX_P	163		
16	–	–	Ground	Ground
17	USBSS_TX_N	166	USB 3.1 Transmit #3 Data from hub	Output
18	USBSS_TX_P	168		

Notes:

[1]The module pin names not directly connected to the USB connector pins but are routed to the input of the USB hub.

[2]In the Type/Dir column, Output is to USB connectors. Input is from USB connectors. Bidir is for bidirectional signals.

Legend	Ground	Power	Reserved

2.2 Gigabit Ethernet

The carrier board implements an RJ45 connector (J15) along with the necessary magnetics device.

Table 2-4. Ethernet RJ45 Connector Pin Description - J15

Pin #	Module Pin Name	Module Pin #	Usage/Description	Type/Dir
1	GPE_MDI0_P	186	Gigabit Ethernet MDI 0+	Bidir
2	GPE_MDI0_N	184	Gigabit Ethernet MDI 0–	Bidir
3	GPE_MDI1_P	192	Gigabit Ethernet MDI 1+	Bidir
4	–	–	MCT	–
5	–	–	MCT	–
6	GPE_MDI1_N	190	Gigabit Ethernet MDI 1–	Bidir
7	GPE_MDI2_P	198	Gigabit Ethernet MDI 2+	Bidir
8	GPE_MDI2_N	196	Gigabit Ethernet MDI 2–	Bidir
9	GPE_MDI3_P	204	Gigabit Ethernet MDI 3+	Bidir
10	GPE_MDI3_N	202	Gigabit Ethernet MDI 3–	Bidir
11	–	–	Power-Over-Ethernet	Power
12				
13				
14				
15	–	–	Green LED Anode	Input
16	GBE_LED_LINK	188	Green LED Cathode. On for 1000Mbps link. Off for 10/100Mbps.	Output
17	–	–	Yellow LED Anode	Input
18	GBE_LED_ACT	194	Yellow LED Cathode. On indicates activity.	Output
19	–	–	Shield Ground	Ground
20				

Note: In the Type/Dir column, Output is to RJ45 connector. Input is from RJ45 connector. Bidir is for bidirectional signals.

Legend	Ground	Power	Reserved

2.3 HDMI and DisplayPort

A stacked DisplayPort (DP) and HDMI Type A connector (J8) is supported.

Table 2-5. HDMI Connector Pin Description – J8

Pin #	Module Pin Name	Module Pin #	Usage/Description	Type/Dir
1	DP1_TXD0_P	65	HDMI Transmit Data 2+	Output
2	–	–	Ground	Ground
3	DP1_TXD0_N	63	HDMI Transmit Data 2–	Output
4	DP1_TXD1_P	71	HDMI Transmit Data 1+	Output
5	–	–	Ground	Ground
6	DP1_TXD1_N	69	HDMI Transmit Data 1–	Output
7	DP1_TXD2_P	77	HDMI Transmit Data 0+	Output
8	–	–	Ground	Ground
9	DP1_TXD2_N	75	HDMI Transmit Data 0–	Output
10	DP1_TXD3_P	83	HDMI Transmit Clock+	Output
11	–	–	Ground	Ground
12	DP1_TXD3_N	81	HDMI Transmit Clock–	Output
13	HDMI_CEC	94	HDMI CEC	Bidir
14	–	–	Unused	Unused
15	DP1_AUX_P	100	HDMI DDC Clock	Output /OD
16	DP1_AUX_N	98	HDMI DDC Data	Bidir/OD
17	–	–	Ground	Ground
18	–	–	HDMI 5V Power	Power
19	DP1_HPD	96	HDMI Hot Plug Detect	Input

Note: In the Type/Dir column, Output is to HDMI connector. Input is from HDMI connector. Birdir is for bidirectional signals.

Legend	Ground	Power	Reserved

Table 2-6. DP Connector Pin Description – J8

Pin #	Module Pin Name	Module Pin #	Usage/Description	Type/Dir
1	DP0_TXD0_P	41	DP Lane 0+	Output
2	–	–	Ground	Ground
3	DP0_TXD0_N	39	DP Lane 0–	Output
4	DP0_TXD1_P	47	DP Lane 1+	Output
5	–	–	Ground	Ground
6	DP0_TXD1_N	45	DP Lane 1–	Output
7	DP0_TXD2_P	53	DP Lane 2+	Output
8	–	–	Ground	Ground
9	DP0_TXD2_N	51	DP Lane 2–	Output
10	DP0_TXD3_P	59	DP Lane 3+	Output
11	–	–	Ground	Ground
12	DP0_TXD3_N	57	DP Lane 3–	Output
13	–	–	MODE: Selects between DP and TMDS (DVI/HDMI) signaling.	Unused
14	–	–	CEC_DP: Not used – pulled to GND through 1Mohm resistor	Unused
15	DP0_AUX_N	90	DisplayPort Auxiliary Channel 0-	Bidir
16	–	–	Ground	Ground
17	DP0_AUX_P	92	DisplayPort Auxiliary Channel 0+	Bidir
18	DP0_HPD	88	HDMI Hot Plug Detect	Input
19	–	–	Power Return (Ground)	Ground
20	–	–	+3.3V	Power

Note: In the Type/Dir column, Output is to DP connector. Input is from DP connector. Bidir is for bidirectional signals.

Legend	Ground	Power	Reserved

2.4 M.2 Key E Expansion Slot

The Jetson Xavier NX carrier board includes a M.2, Key E Slot Mini-PCIe Expansion slot (J10). This includes interface options for WiFi/BT including PCIe (x1), USB 2.0, UART, I2S, and I2C optional.

Notes:

- The Jetson Xavier NX Developer Kit carrier board will only support single sided M.2 Key E modules.
- Stuffing resistors for connecting I2C2 to pins 58 and 60 of the M.2 Key E connector are not installed by default. If I2C is required, 0Ω resistors can be installed at locations R106 and R107. Care should be taken as some M.2 cards can cause conflicts with other devices connected to the I2C interface.

Table 2-7. M.2, Key E Expansion Slot Pin Description – J10

Pin #	Module Pin Name	Module Pin #	Usage/Description	Type/Dir	Pin #	Module Pin Name	Module Pin #	Usage/Description	Type/Dir
1	–		Ground	Ground		–	–	–	–
3	USB2_D_P	123	USB 2.0 Data	Bidir	2	–	–	Main 3.3V Supply	Power
5	USB2_D_N	121			4				
7	–		Ground	Ground	6	–	–	Unused	Unused
9	–	–	Unused	Unused	8	I2S1_CLK	226	I2S #1 Clock	Bidir, 1.8V
11					10	I2S1_FS	224	I2S #1 Left/Right Clock	Bidir, 1.8V
13					12	I2S1_DIN	222	I2S #1 Data In	Input, 1.8V
15					14	I2S1_DOUT	220	I2S #1 Data Out	Bidir, 1.8V
17					16	–	–	Unused	Unused
19					18	–	–	Ground	Ground
21					20	GPIO02	124	Bluetooth #2 Wake AP	Input, 3.3V
23					22	UART0_RXD	101	UART #0 Receive	Input, 1.8V
25	–	–	Key	Unused	24	–	–	Key	Unused
27					26				
29					28				
31					30				
33	–	–	Ground	Ground	32	UART0_TXD	99	UART #0 Transmit	Output, 1.8V
35	PEX1_TX0_P	174	PCIe #1 Transmit Lane 0	Output	34	UART0_CTS*	105	UART #0 Clear to Send	Input, 1.8V
37	PEX1_TX0_N	172			36	UART0_RTS*	103	UART #0 Request to Send	Output, 1.8V

Pin #	Module Pin Name	Module Pin #	Usage/Description	Type/Dir	Pin #	Module Pin Name	Module Pin #	Usage/Description	Type/Dir
39	–	–	Ground	Ground	38	–	–	Unused	Unused
41	PEX1_RX0_P	169	PCIe #1 Receive Lane 0	Input	40				
43	PEX1_RX0_N	167			42				
45	–	–	Ground	Ground	44				
47	PEX1_CLK_P	175	PCIe #1 Reference clock	Output	46				
49	PEX1_CLK_N	173			48				
51	–	–	Ground	Ground	50	CLK_32K_OUT	210	Suspend Clock (32KHz)	Output, 3.3V
53	PEX1_ CLKREQ*	182	PCIe #1 Clock Request	Bidir, 3.3V	52	PEX0_RST*	183	PCIe #0 Reset	Output, 3.3V
55	PEX_WAKE*	179	PCIe Wake	Input, 3.3V	54	–	–	Unused	Unused
57	–	–	Ground	Ground	56				
59	–	–	Unused	Unused	58	I2C2_SDA	234	General I2C #2 (optional)	Bidir/OD, 1.8V
61					60	I2C2_SCL	232		
63	–	–	Ground	Ground	62	GPIO10	212	M.2, Key E Connector Alert	Input, 1.8V
65	–	–	Unused	Unused	64	–	–	Unused	Unused
67					66				
69	–	–	Ground	Ground	68				
71	–	–	Unused	Unused	70				
73					72	–	–	Main 3.3V Supply	Power
75	–	–	Ground	Ground	74				

Note: In the Type/Dir column, Output is to M.2 module. Input is from M.2 module. Bidir is for bidirectional signals.

Legend	Ground	Power	Reserved

2.5 M.2 Key M Expansion Slot

The carrier board includes an M.2, Key M Slot NVMe Expansion slot (J11). This includes PCIe (x4) and I2C (optional).

Notes:

- The Jetson Xavier NX Developer Kit carrier board will only support single sided M.2 Key M modules.
- Stuffing resistors for connecting I2C2 to pins 40 and 42 of the M.2 Key M socket are not installed by default. If I2C is required, 0Ω resistors can be installed at locations R110 and R111. Care should be taken as some M.2 cards can cause conflicts with other devices connected to the I2C interface.

Table 2-8. M.2 Key M Expansion Slot Pin Description – J11

Pin #	Module Pin Name	Module Pin #	Usage/Description	Type/Dir Default	Pin #	Module Pin Name	Module Pin #	Usage/Description	Type/Dir Default
1	–	–	Ground	Ground	2	–	–	Main 3.3V Supply	Power
3					4				
5	PCIE0_RX3_N	155	PCIe IF #0 Lane 3 Receive	Input	6	–	–	Unused	Unused
7	PCIE0_RX3_P	157			8				
9	–	–	Ground	Ground	10				
11	PCIE0_TX3_N	154	PCIe IF #0 Lane 3 Transmit	Output	12	–	–	Main 3.3V Supply	Power
13	PCIE0_TX3_P	156			14				
15	–	–	Ground	Ground	16				
17	PCIE0_RX2_N	149	PCIe IF #0 Lane 2 Receive	Input	18	–	–	Unused	Unused
19	PCIE0_RX2_P	151			20				
21	–	–	Ground	Ground	22				
23	PCIE0_TX2_N	148	PCIe IF #0 Lane 2 Transmit	Output	24				
25	PCIE0_TX2_P	150			26				
27	–	–	Ground	Ground	28				
29	PCIE0_RX1_N	137	PCIe IF #0 Lane 1 Receive	Input	30				
31	PCIE0_RX1_P	139			32				
33	–	–	Ground	Ground	34				
35	PCIE0_TX1_N	140	PCIe IF #0 Lane 1 Transmit	Output	36				
37	PCIE0_TX1_P	142			38				
39	–	–	Ground	Ground	40	I2C2_SCL	232	General I2C #2 (optional)	Bidir/OD, 1.8V
41	PCIE0_RX0_N	131	PCIe IF #0 Lane 0 Receive	Input	42	I2C2_SDA	234		
43	PCIE0_RX0_P	133			44	SDMMC_DAT1	221	M.2 Key M Alert	Output, 1.8V
45	–	–	Ground	Ground	46	–	–	Unused	Unused
47	PCIE0_TX0_N	134	PCIe IF #0 Lane 0 Transmit	Output	48				
49	PCIE0_TX0_P	136			50	PEX0_RST*	181	PCIe IF #0 Reset	Output, 3.3V
51	–	–	Ground	Ground	52	PEX0_ CLKREQ*	180	PCIe IF #0 Clock Request	Input, 3.3V
53	PCIE0_CLK_N	160	PCIe IF #0 Reference Clock	Output	54	PEX_WAKE*	179	PCIe Wake (Level Shifted from 3.3V to 1.8V)	Input, 3.3V
55	PCIE0_CLK_P	162			56	–	–	Unused	Unused
57	–	–	Ground	Ground	58				
59	–	–	Unused (Key)	Unused	60	–	–	Unused (Key)	Unused

Pin #	Module Pin Name	Module Pin #	Usage/Description	Type/Dir Default	Pin #	Module Pin Name	Module Pin #	Usage/Description	Type/Dir Default
61					62				
63					64				
65					66				
67	–	–	Unused	Unused	68	–	–	32KHz Suspend Clock	Output, 3.3V
69					70				
71					72	–	–	Main 3.3V Supply	Power
73	–	–	Ground	Ground	74				
75							–	–	–

Note: In the Type/Dir column, Output is to M.2 module. Input is from M.2 Module. Bidir is for bidirectional signals.

Legend	Ground	Power	Reserved

Chapter 3. Carrier Board Custom Expansion IF Connections

The Jetson Xavier NX carrier board supports several expansion headers and connectors that have custom pinouts. The following lists the headers and connectors that have custom pinouts.

- Jetson Xavier NX Module Connector, 260-pin, SO-DIMM, 1.27 mm pitch
- Camera Connectors (x2), 15 position, Flex Connector, 1.0 mm pitch
- 40-Pin Expansion Header, 2x20, 2.54 mm pitch
- Button Header, 2x4, 2.54 mm pitch
- Optional CAN Bus header
- Fan Connector, 4-pin, 1.25 mm pitch
- Optional real-time-clock back-up coin cell socket
- DC Power Jack
- Power-over Ethernet (PoE) header, 1x4, 2.54 mm pitch
- PoE backpower header, 1x, 2.54 mm pitch

3.1 Jetson Xavier NX Module Connector

The carrier board interfaces to the Jetson Xavier NX module using a 260-pin SODIMM connector (J2). The carrier board has a TE Connectivity 2309413-1 connector. This interfaces with the Jetson Xavier NX edge fingers. The connector pinout can be found in the *Jetson Xavier NX Product Design Guide*.

3.2 Camera Connector

The Jetson Xavier NX carrier board includes two 15-position flex (1.0 mm pitch) camera connectors (J1 and J9). The connector used on the carrier board is a TE Connectivity Part #1-1734248-5. Each connector includes the following.

- CSI 1 x2 lane
- CAM_I2C, Clock and Control GPIOs for the camera
- 3.3V Supply

Note: The position of camera connectors #1 (Connected to CSI0) and #2 (connected to CSI2) are swapped compared to the Jetson Nano DevKit (B01).

Table 3-1. Camera #1 Connector Pin Description – J1

Pin #	Module Pin Name	Module Pin #	Usage/Description	Type/Dir	Pin #	Module Pin Name	Usage/Description	Type/Dir
1	–	–	Ground	Ground	2	–	Not Used	–
3	CSI0_D0_N	4	CSI 0 Data 0	Input	4	–		
5	CSI0_D0_P	6			6	–		
7	–	–	Ground	Ground	8	–		
9	CSI0_D1_N	16	CSI 0 Data 1	Input	10	–		
11	CSI0_D1_P	18			12	–		
13	–	–	Ground	Ground	14	–		
15	CSI0_CLK_N	10	CSI 0 Clock	Input	16	–		
17	CSI0_CLK_P	12			18	–		
19	–	–	Ground	Ground	20	–		
21	CAM0_PWDN	114	Camera #0 Power-down	Output, 1.8V	22	–		
23	CAM0_MCLK	116	Camera #0 Master Clock	Output, 1.8V	24	–		
25	CAM_I2C_SCL	213	Camera I2C. 2.2kΩ pull-ups on module. 1.6kΩ pull-ups on the carrier board. The module CAM_I2C pins connect to an I2C mux. The camera connector #1 receives the I2C from the mux (1st output). The I2C signals on the camera side of the mux have 47kΩ pull-ups.	Output, 3.3V	26	–		
27	CAM_I2C_SDA	215		Bidir, 3.3V	28	–		
29	–	–	+3.3V	Power	30	–		

Note: In the Type/Dir column, Output is to camera module. Input is from camera module. Bidir is for bidirectional signals.

Legend	Ground	Power	Reserved

Table 3-2. Camera #2 Connector Pin Description – J9

Pin #	Module Pin Name	Module Pin #	Usage/Description	Type/Dir	Pin #	Module Pin Name	Usage/Description	Type/Dir
1	–	–	Ground	Ground	2	–	Not Used	–
3	CSI2_D0_N	22	CSI 2 Data 0	Input	4	–		
5	CSI2_D0_P	24			6	–		
7	–	–	Ground	Ground	8	–		
9	CSI2_D1_N	34	CSI 2 Data 1	Input	10	–		
11	CSI2_D1_P	36			12	–		
13	–	–	Ground	Ground	14	–		
15	CSI2_CLK_N	28	CSI 2 Clock	Input	16	–		
17	CSI2_CLK_P	30			18	–		
19	–	–	Ground	Ground	20	–		
21	CAM1_PWDN	120	Camera #1 Power-down	Output, 1.8V	22	–		
23	CAM1_MCLK	122	Camera #1 Master Clock	Output, 1.8V	24	–		
25	CAM_I2C_SCL	213	Camera I2C. 2.2kΩ pull-ups on module. 1.6kΩ pull-ups on the carrier board. The module CAM_I2C pins connect to an I2C mux. The camera connector #2 receives the I2C from the mux (2nd output). The I2C signals on the camera side of the mux have 47kΩ pull-ups.	Output, 3.3V	26	–		
27	CAM_I2C_SDA	215		Bidir, 3.3V	28	–		
29	–	–	+3.3V	Power	30	–		

Note: In the Type/Dir column, Output is to camera module. Input is from camera module. Bidir is for bidirectional signals.

Legend	Ground	Power	Reserved

3.3 40-Pin Expansion Header

The Jetson Xavier NX carrier board includes a 40-pin (2x20, 2.54 mm pitch) Expansion Header (J12). The connector used on the carrier board is an Astron Technology (Part # 27-0169H-220-1G-H). The expansion connector includes various audio and control interfaces including:

- I2S
- Audio Clock
- I2C (x2)
- SPI (x2)
- UART
- GPIOs (x3 – See Note)

Notes:

- All the signals on the Expansion Header use 3.3V levels.
- All the interface signal pins (I2S, I2C, SPI, UART and Audio clock) can also be configured as GPIOs
- Any pull-up or pull-down resistors on the signals (except I2C) must be weak (limited to >50kΩ).

Figure 3-1. Expansion Header Connections

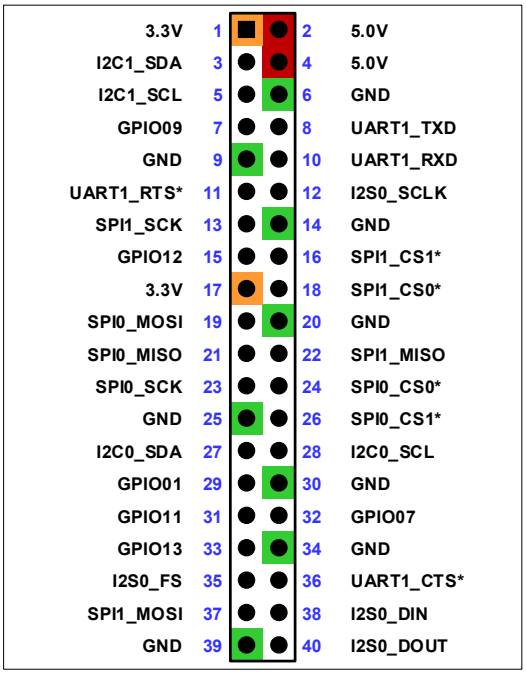


Table 3-3. Expansion Header Pin Description – J12

Header Pin #	Module Pin Name	Module Pin #	SoC Pin name	Default Usage / Description	Alternate Functionality	Type/ Dir	Pin Drive or Power Pin Max Current	SoC GPIO Port #	Power-on Default	PU/PD on Module	Notes
1	–	–	–	Main 3.3V Supply	–	Power (input)	1A	–	–	–	1
2	–	–	–	Main 5.0V Supply	–	Power (input/output_	1A	–	–	–	1
3	I2C1_SDA	191	DP_AUX_CH3_N	I2C #1 Data	–	Bidir OD	±2mA	–	z	2.2KΩ PU	2
4	–	–	–	Main 5.0V Supply	–	Power	1A	–	–	–	–
5	I2C1_SCL	189	DP_AUX_CH3_P	I2C #1 Clock	–	Bidir OD	±2mA	–	z	2.2KΩ PU	2
6	–	–	–	Ground	–	Ground	–	–	–	–	–
7	GPIO09	211	AUD_MCLK	GPIO	Audio Master Clock	Bidir/Output	±20uA	PS.04	pd		3
8	UART1_TXD	203	UART1_TX	UART #1 Transmit	GPIO	Output/Bidir	±20uA	PR.02	pd		3
9	–	–	–	Ground	–	Ground	–	–	–	–	–
10	UART1_RXD	205	UART1_RX	UART #1 Receive	GPIO	Input/Bidir	±20uA	PR.03	pu		3
11	UART1_RTS*	207	UART1_RTS	GPIO	UART #2 Request to Send	Bidir/Output	±20uA	PR.04	pd		3
12	I2S0_SCLK	199	DAP5_SCLK	GPIO	Audio I2S #0 Clock	Bidir	±20uA	PT.05	pd		3
13	SPI1_SCK	106	SPI3_SCK	GPIO	SPI #1 Shift Clock	Bidir/Output	±20uA	PY.00	pd		3
14	–	–	–	Ground	–	Ground	–	–	–	–	–
15	GPIO12	218	TOUCH_CLK	GPIO	–	Bidir	±20uA	PCC.04	pd		3
16	SPI1_CSI1*	112	SPI3_CS1	GPIO	SPI #1 Chip Select #1	Bidir/Output	±20uA	PY.04	pu		3
17	–	–	–	Main 3.3V Supply	–	Power	1A	–	–	–	1
18	SPI1_CSI0*	110	SPI3_CS0	GPIO	SPI #0 Chip Select #0	Bidir/Output	±20uA	PY.03	pu		3
19	SPI0_MOSI	89	SPI1_MOSI	GPIO	SPI #0 Master Out/Slave In	Bidir/Output	±20uA	PZ.05	pd		3
20	–	–	–	Ground	–	Ground	–	–	–	–	–
21	SPI0_MISO	93	SPI1_MISO	GPIO	SPI #0 Master In/Slave Out	Bidir/Input	±20uA	PZ.04	pd		3
22	SPI1_MISO	108	SPI3_MISO	GPIO	SPI #1 Master In/Slave Out	Bidir/Input	±20uA	PY.01	pd		3
23	SPI0_SCK	91	SPI1_SCK	GPIO	SPI #0 Shift Clock	Bidir/Output	±20uA	PZ.03	pd		3
24	SPI0_CS0*	95	SPI1_CS0	GPIO	SPI #0 Chip Select #0	Bidir/Output	±20uA	PZ.06	pu		3
25	–	–	–	Ground	–	Ground	–	–	–	–	–
26	SPI0_CS1*	97	SPI1_CS1	GPIO	SPI #0 Chip Select #1	Bidir/Output	±20uA	PZ.07	pu		3
27	I2C0_SDA	187	GEN2_I2C_SDA	I2C #0 Data	GPIO	Bidir OD/Bidir	±2mA	PDD.00	z	2.2KΩ PU	2
28	I2C0_SCL	185	GEN2_I2C_SCL	I2C #0 Clock	GPIO	Bidir OD/Bidir	±2mA	PCC.07	z	2.2KΩ PU	2

Header Pin #	Module Pin Name	Module Pin #	SoC Pin name	Default Usage / Description	Alternate Functionality	Type/ Dir	Pin Drive or Power Pin Max Current	SoC GPIO Port #	Power-on Default	PU/PD on Module	Notes
29	GPIO01	118	SOC_GPIO41	GPIO	General Purpose Clock #0	Bidir/Output	±20uA	PQ.05	pd		3
30	–	–	–	Ground	–	Ground	–	–	–	–	–
31	GPIO11	216	SOC_GPIO42	GPIO	General Purpose Clock #1	Bidir/Output	±20uA	PQ.06	pd		3
32	GPIO07	206	SOC_GPIO44	GPIO	PWM	Bidir/Output	±20uA	PR.00	pd		3
33	GPIO13	228	SOC_GPIO54	GPIO	PWM	Bidir/Output	±20uA	PN.01	pd		3
34	–	–	–	Ground	–	Ground	–	–	–	–	–
35	I2S0_FS	197	DAP5_FS	GPIO	Audio I2S #0 Field Select	Bidir	±20uA	PU.00	pd		3
36	UART1_CTS*	209	UART1_CTS	GPIO	UART #1 Clear to Send	Bidir/Input	±20uA	PR.05	pd		3
37	SPI1_MOSI	104	SPI3_MOSI	GPIO	SPI #1 Master Out/Slave In	Bidir/Output	±20uA	PY.02	pd		3
38	I2S0_DIN	195	DAP5_DIN	GPIO	Audio I2S #0 Data in	Bidir/Input	±20uA	PT.07	pd		3
39	–	–	–	Ground	–	Ground	–	–	–	–	–
40	I2S0_DOUT	193	DAP5_DOUT	GPIO	Audio I2S #0 Data Out	Bidir/Output	±20uA	PT.06	pd		3

Notes:

1. This is current capability per power pin.

2. These pins are connected to the SoC directly. They are open-drain (either pulled up or driven low by the SoC when configured as outputs). The max drive that meets the data sheet VOL is ±2mA.

3. These pins connect to TI TXB0108 level translators. Due to the design of these devices, the output drivers are very weak, so they can be overdriven by another connected device output for bidirectional support.

4. In the Type/Dir column, output is to expansion header. Input is from expansion header. Bidir is for bidirectional signals. Where two directions are shown, the first is for the primary function (mostly GPIOs) and the second is for the alternate function.

5. Where the signal direction is input or output in this table (Table 3-3), this matches the typical special function usage (e.g. SPI, I2S, etc.). The direction is bidirectional if these are configured as GPIOs.

6. All signals on the 40-pin header are 3.3V levels.

Legend	Ground	Power	Reserved

3.4 Button Header

The Jetson Xavier NX carrier board brings several system signals (power, reset, and force recovery), UART and Sleep/Wake LED related signals to a pair of standard 0.254 mm pitch header. The button header is J14.

Table 3-4. Button Header Description – J14

Pin #	Module Pin Name	Module Pin #	Usage/Description	Type/Dir Default
1	–	–	PC_LED-: Connects to LED Cathode to indicate System Sleep/Wake (Off when system in sleep mode)	Input, 5V
2	–	–	PC_LED+: Connects to LED Anode (see above)	Output
3	UART2_RXD (DEBUG)	238	UART #2 Receive	Input, 3.3V
4	UART2_TXD (DEBUG)	236	UART #2 Transmit	Output, 3.3V
5	–	–	AC OK: Connect pins 5 and 6 to disable Auto-Power-On and require power button press.	Input, 3.3V
6	–	–	Auto Power-on disable: Pulled to GND. See Pin 5.	na
7	–	–	Ground	Ground
8	SYS_RESET*	239	Temporarily connect pins 7 and 8 to reset system	Input, 1.8V
9	–	–	Ground	Ground
10	FORCE_RECOVERY*	214	Connect pins 9 and 10 during power-on to put system in USB Force Recovery mode.	Input, 1.8V
11	–	–	Ground	Ground
12	SLEEP/WAKE*	240	Connect pins 11 and 12 to initiate power-on if Auto-Power-On disabled (Pins 5 and 6 connected).	Input, 5V

Note: In the Type/Dir column, Output is to button header. Input is from button header. Bidir is for bidirectional signals.

Legend	Ground	Power	Reserved

3.5 Optional CAN Bus Header

The Jetson Xavier NX carrier board includes the footprint for a 4-pin, 2.45 mm pitch header (J17) which supports a CAN Bus interface.

Table 3-5. Optional CAN Header Pin Description – J17

Pin #	Module Pin Name	Module Pin #	Usage/Description	Type/Dir Default
1	CAN_TX	145	CAN Bus transmit	Output, 3.3V
2	CAN_RX	143	CAN Bus receive	Input, 3.3V
3	–	–	Ground	Ground
4	–	–	Main 3.3V Supply	Power

Note: In the Type/Dir column, Output is to CAN connector. Input is from CAN connector. Bidir is for bidirectional signals.

3.6 Fan Connector

The Jetson Xavier NX carrier board includes a 4-pin Fan Header (J13). The connector used is a Singatron Enterprise Co., Ltd., Part # 2WBA2542WVC-F-04PNLBT1N00G.

Table 3-6. Fan Connector Pin Description – J13

Pin #	Module Pin Name	Module Pin #	Usage/Description	Type/Dir Default
1	–	–	Ground	Ground
2	–	–	Main 5.0V Supply	Power
3	GPIO08	208	Fan Tachometer signal	Input, 5V
4	GPIO14	230	Fan Pulse Width Modulation signal	Output, 5V

Note: In the Type/Dir column, Output is to fan connector. Input is from fan connector. Bidir is for bidirectional signals.

Legend	Ground	Power	Reserved

3.7 Optional Battery Back-up Coin Cell Holder

The Jetson Xavier NX carrier board includes an option to mount a coin cell holder (J3) for real-time clock back-up. One battery holder that works with the carrier board is from Kensington Electronics – Part # 3000TR.

Table 3-7. Coin Cell Batter Holder Pin Description – J3

Pin #	Module Pin Name	Module Pin #	Usage/Description	Type/Dir
1	PMIC_BBAT	235	Power Management IC (PMIC) real-time clock battery back-up. Optionally used to provide back-up power for the Real-Time-Clock (RTC). Connects to coin cell (lithium or other). PMIC is supply when charging rechargeable cells. Coin cell is source when system is disconnected from power. Charging is enabled by default in software. If non-rechargeable battery is to be used, charging should be disabled.	Power (Bidir)
2	–	–	Ground	Ground
3	PMIC_BBAT	235	Same as pin #1	Power (Bidir)

Legend	Ground	Power	Reserved

3.8 DC Power Jack

The Jetson Xavier NX carrier board uses a DC power jack (J16) to bring in the power from the included DC power supply. The jack used on the carrier board is a Singatron Enterprise part (part #: 2DC-0005D206F). The mating barrel jack connector dimensions are:

- Barrel length: 9.5 mm
- Barrel diameter:5.5 mm
- Pin receptacle: Accepts 2.5 mm jack pin
- The center pin is positive (+V)
- Max current supported is 3.5A

Figure 3-2. Jack Connector

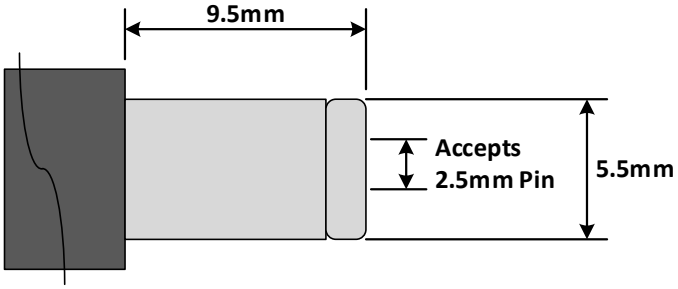


Table 3-8. DC Jack Pin Description – J16

Pin #	Module Pin Name	Module Pin #	Usage/Description	Type/Dir Default
1	–	–	Main DC input supplying DC jack input (9-20V)	Power
2	–	–	Ground	Ground
3	–	–	Ground	Ground

Legend	Ground	Power	Reserved

3.9 Optional Power-Over Ethernet and Backpower Headers

The Jetson Xavier NX carrier board provides an option for an alternate main power input (besides the DC power jack). A 4-pin Power over Ethernet (PoE) header (J19 – 1x4 male, 2.54 mm pitch) brings out the VC power pins of the Ethernet connector. In addition, a 2-pin Backpower header (J18 – 1x2 male, 2.54 mm pitch) provides an alternate path for the input voltage (3A max). In order to use this alternate PoE power mechanism, the design will require

a power converter to take the high voltage PoE supply (38V-60V) and convert it to the 9V-20V input the carrier board requires.

Figure 3-3. PoE Alternative Power Input

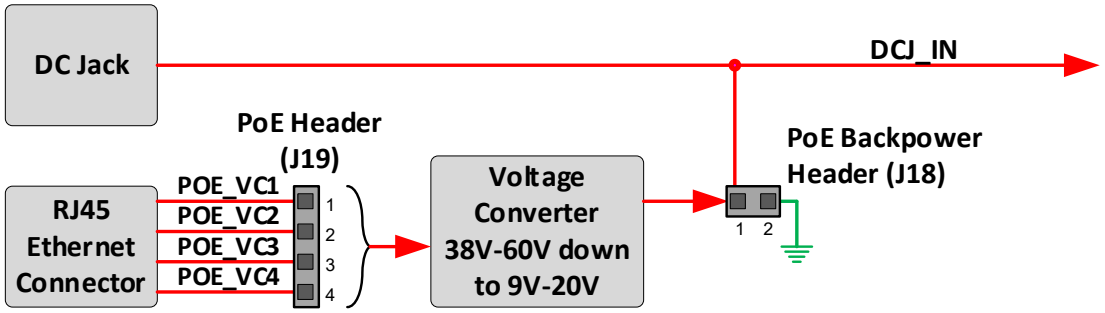


Table 3-9. PoE Header – J19

Pin #	Module Pin Name	Module Pin #	Usage/Description	Type/Dir Default
1	–	–	Ethernet RG45 connector PoE VC1 power	Power
2	–	–	Ethernet RG45 connector PoE VC2 power	Power
3	–	–	Ethernet RG45 connector PoE VC3 power	Power
4	–	–	Ethernet RG45 connector PoE VC4 power	Power

Table 3-10. PoE Backpower Header – J18

Pin #	Module Pin Name	Module Pin #	Usage/Description	Type/Dir Default
1	–	–	Main DC input supplying DC jack input (9V-20V). 3A max.	Power
2	–	–	Ground	Ground

Legend	Ground	Power	Reserved

Chapter 4. Mechanicals

Figure 4-1 and Figure 4-2 show the mechanical dimensions for the carrier board and the developer kit.

Figure 4-1. Developer Kit Carrier Board Mechanical Dimensions

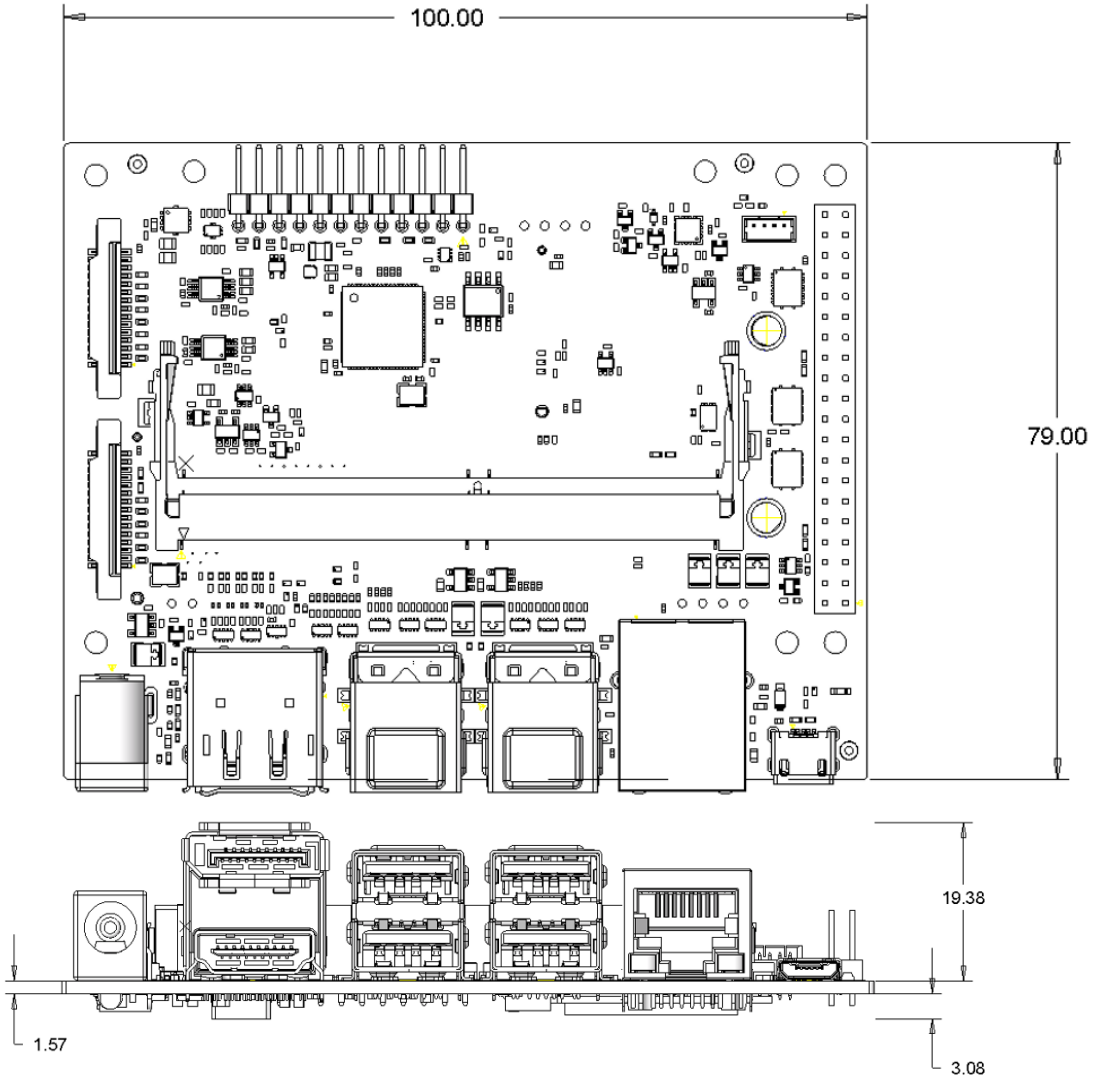
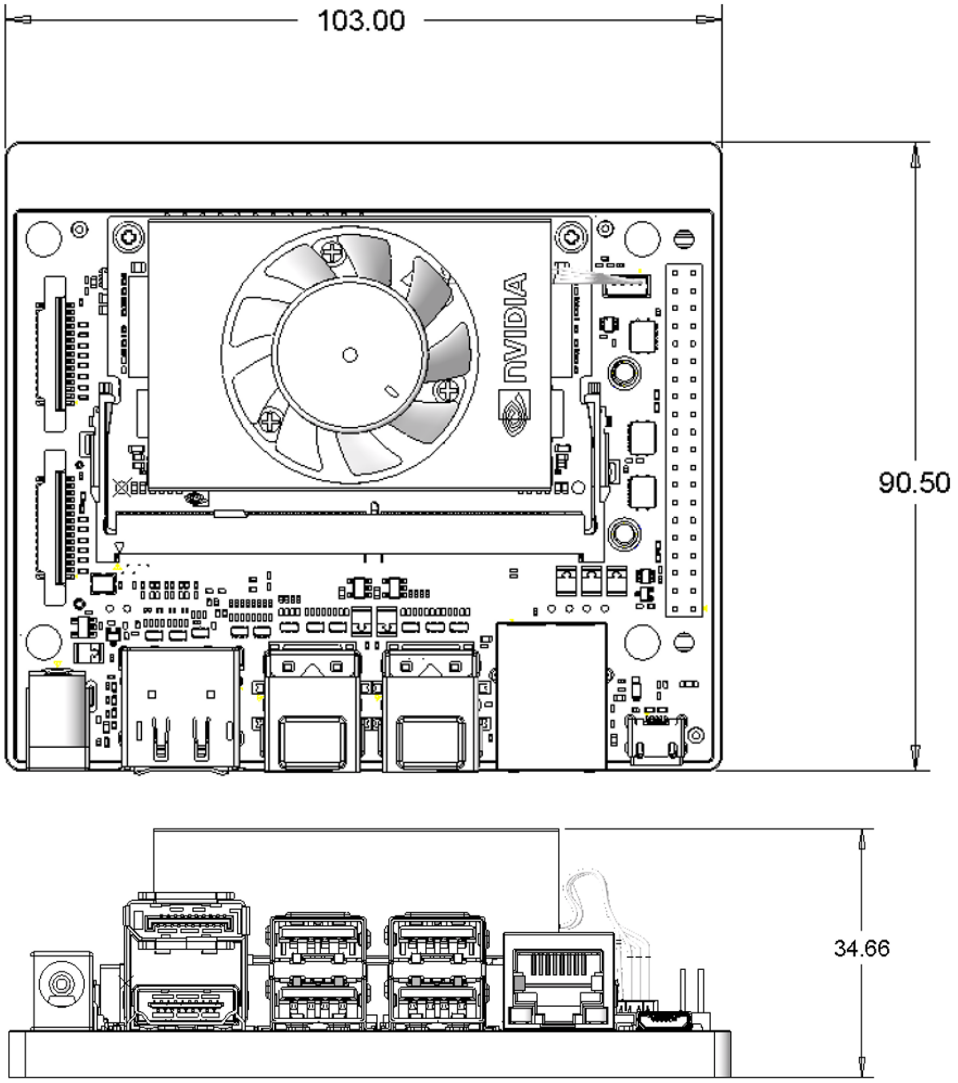


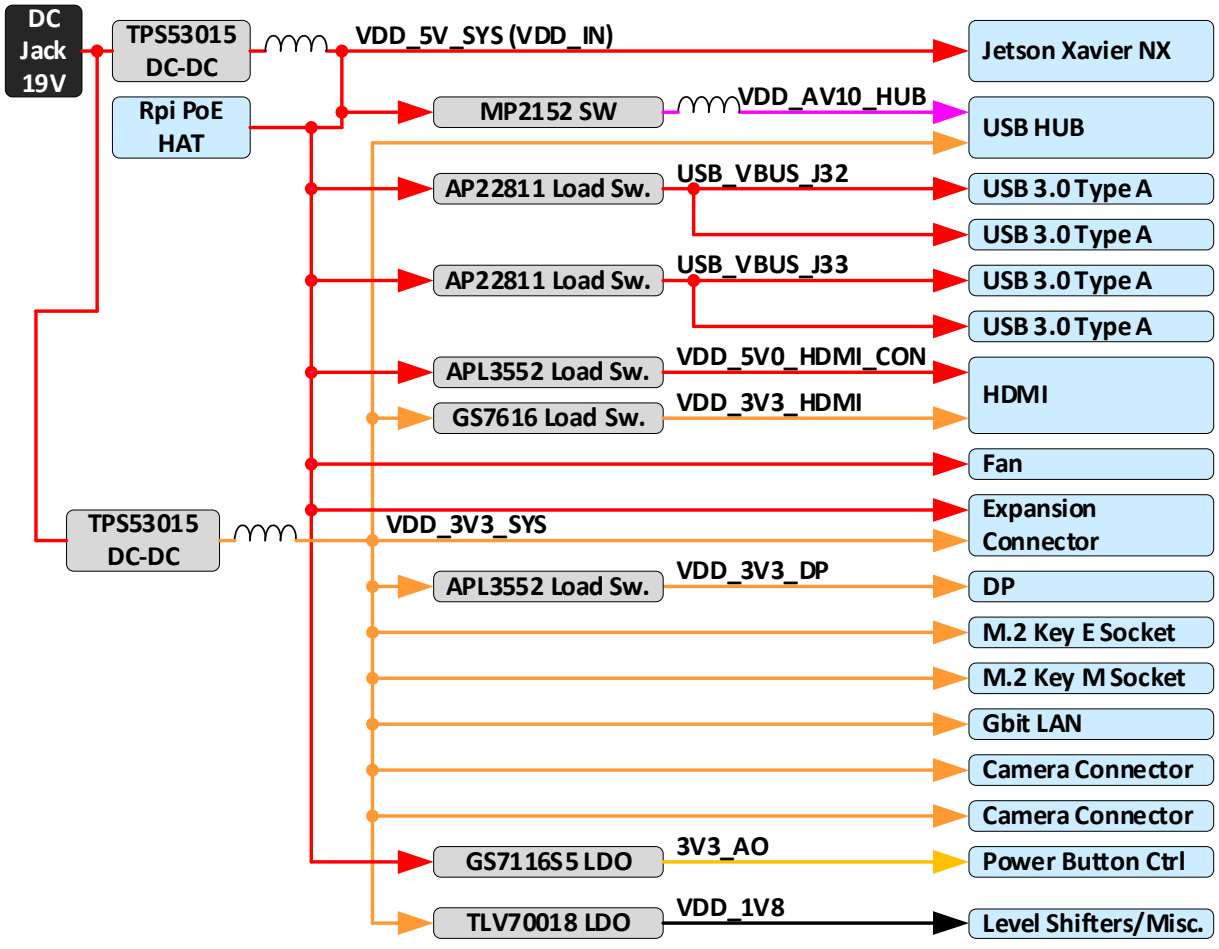
Figure 4-2. Developer Kit Mechanical Dimensions



Chapter 5. Interface Power

Figure 5-1 shows the interface connector power diagram.

Figure 5-1. Interface Connector Power Diagram



The following tables show the allocation of supplies to the connectors on the Jetson Xavier NX carrier board and current capabilities.

Table 5-1. Interface Power Supply Allocation

Power Rails	Usage	(V)	Power Supply or Gate	Source	Enable
DC_IN	Main power input from DC Adapter	19.5	AONR21357025 Power Mux	DC Adapter	
VDD_5V_SYS	Main 5.0V supply	5.0			
VDD_3V3_SYS	Main 3.3V supply	3.3	MP1475	VDD_5V_IN	SYS_RESET_IN*
VDD_1V8	Main 1.8V supply	1.8	TVL70018 LDO	VDD_3V3_SYS	3.3V_IO_PG
USB_VBUS_J32	5V VBUS for dual stacked 3.0 Type A connector	5.0	TPS259530 Load Switch	VDD_5V_IN	From USB Hub
USB_VBUS_J33	5V VBUS for dual stacked 3.0 Type A connector	5.0	TPS259530 Load Switch	VDD_5V_IN	From USB Hub
VDD_5V0_HDMI_CON	5V rail for HDMI connector	5.0	APL3552 Load Switch	VDD_5V_IN	VDD_3V3_SYS

Table 5-2. Interface Supply Current Capabilities

Power Rails	Usage	(V)	Max Current (mA)
DCJ_IN	Main power input from DC Adapter	19.5	3500
VDD_5V_SYS	Main 5.0V supply	5.0	8000
VDD_3V3_SYS	Main 3.3V supply	3.3	6000
VDD_1V8	Main 1.8V supply	1.8	300
3V3_AO	3.3V Always-on supply	3.3	500

Table 5-3. Supply Current Capabilities Per Connector Per Supply

Power Rails	Connector	(V)	Max Current (A)
VDD_5V_SYS (VDD_IN)	SO-DIMM	5.0	4.0
	40-pin header		0.5
	Fan connector		0.15
VDD_5V0_HDMI_CON	HDMI connector		0.55
USB_VBUS_J32	USB 3.1 type A (x2)		3.0
USB_VBUS_J33	USB 3.1 type A (x2)		3.0
VDD_3V3_SYS	40-pin header	3.3	0.1
	M.2 Key E socket		0.8
	M.2 Key M socket		0.8
	Camera connector #1		0.26
	Camera connector #2		0.26

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