Jetson Orin Series Carrier Board

Specification

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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 Orin Series carrier board. As well as understand the capabilities of the other dedicated interface connectors and associated power solutions on the platform.

The Jetson Orin Series carrier board is ideal for software development within the Linux environment. Standard connectors are used to access Jetson Orin Series features and interfaces, enabling a highly flexible and extensible development platform.

The Jetson Orin Series carrier board supports all the Jetson Orin Series Series and Jetson Orin NX Series modules.

Caution: ALWAYS CONNECT JETSON ORIN SERIES 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 Orin Series, 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 Orin Series module, the camera connector, the M.2 connector, and the other expansion headers.

The Jetson Orin Series 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 Orin Series board. NVIDIA will not replace units that have been damaged due to ESD discharge.

1.1 Jetson Orin Series Module Feature List

The following is a list of features for the Jetson Orin Series module.

- Applications processor (AP)
  - NVIDIA Orin™
- Memory
  - 8 GB 128-bit wide LPDDR5 DRAM (68 GB/s)
  - Micro SD card socket (UHS-1)
- Networking
  - 10/100/1000 BASE-T Ethernet
- Advanced power management (APM)
- Dynamic voltage and frequency scaling
- Multiple clock and power domains

1.2 Carrier Board Feature List

The following is a list of features for the carrier board.

- Connection to Jetson Orin Series
  - 260-pin SO-DIMM connector
- USB
  - USBC: Supports Recovery Mode
  - USB 3.2 (Gen2x1) Hub to 4x Type A (host only)
- Wired network
  - Gigabit Ethernet (RJ45 connector with LEDs and optional PoE header)
- Display
  - VESA® DisplayPort™ (DP v1.2 (+MST) and eDP v1.4)
- Camera connectors
  - 2x 22-position flex connectors
  - CSI (2.5 Gbps per pair): 1, x2 or x4 and 1, x2
  - 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 (x2)
  - #1) PCIe (Gen3) x4 lane, control

- #2) PCIe (Gen3) x2 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, force recovery, debug UART, Auto-Power-On disable
- LEDs: Power

> Miscellaneous
- Fan connector: 5V, PWM, and tach
- Optional RTC back-up connector
- Optional CAN header

> Power
- DC Jack: 9-20 V (19V supply provided)
- Optional Ethernet PoE and back power headers
- Main 5.0 V Pre-regulator: GS9230 (or A0Z2264)
  - Provides VDD_IN to module
- Main 3.3V supply: GS9230 (or A0Z2264)
- Main 1.8V supply: GS7116S5
- 3.3V AO (always on) supply: GS7116S5
- USB VBUS load switches: AP22811AW5-7 (x2)
- DP 3.3V power switch: APL3552ABI-TRG

> Developer kit operating temperature range
- 0ºC to 35ºC

1.3 Jetson Orin Series Carrier Board Block Diagram

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

Figure 1-1. Jetson Orin Series Block Diagram

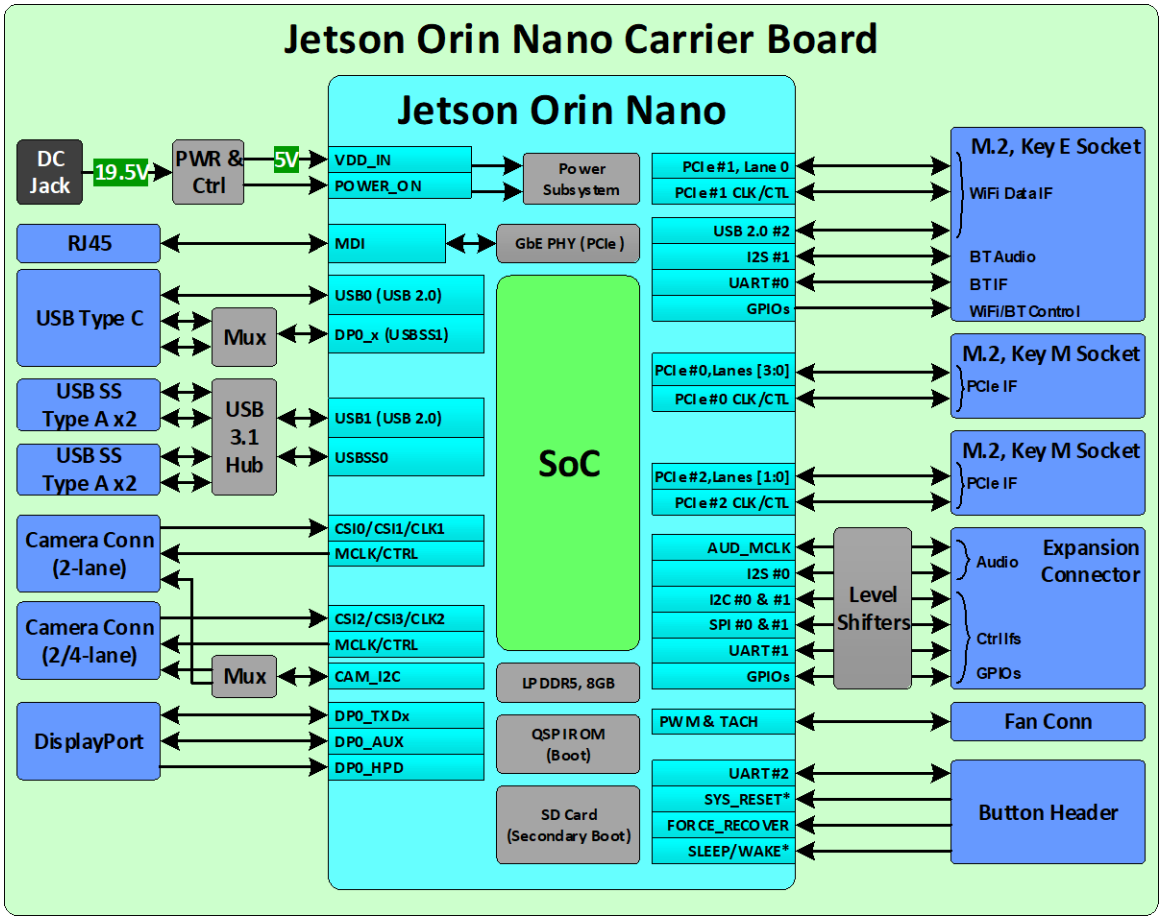


Figure 1-2. Jetson Orin Series – Top View (Envelope)

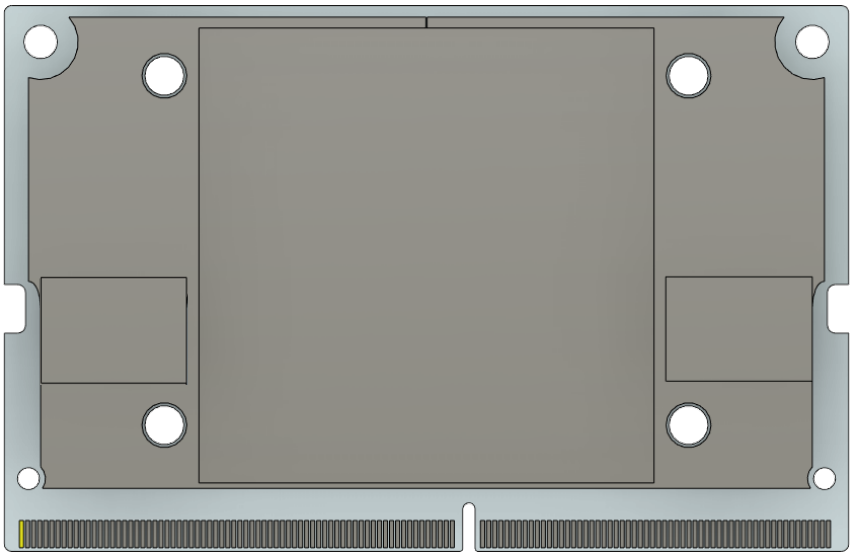


Figure 1-3. Jetson Orin Series – Bottom View (Envelope)

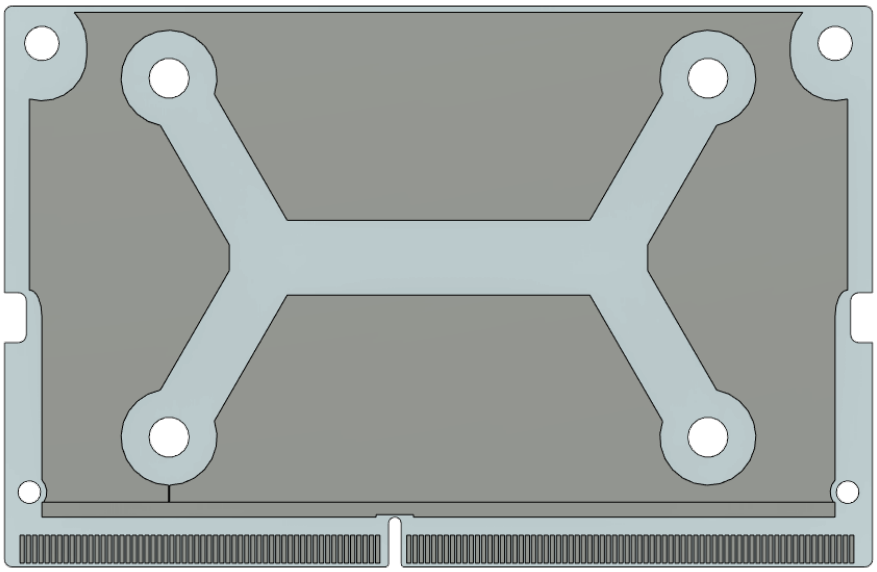
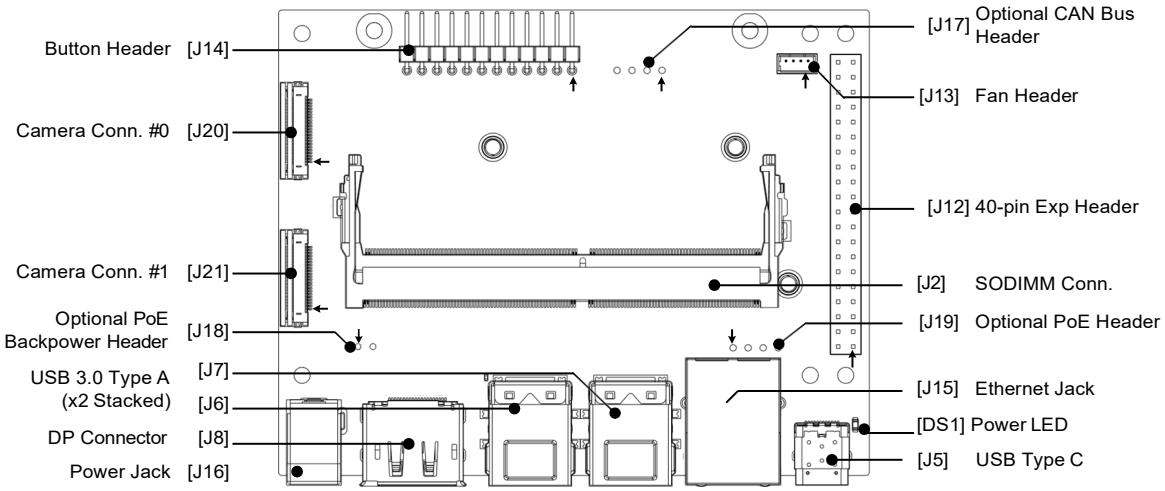
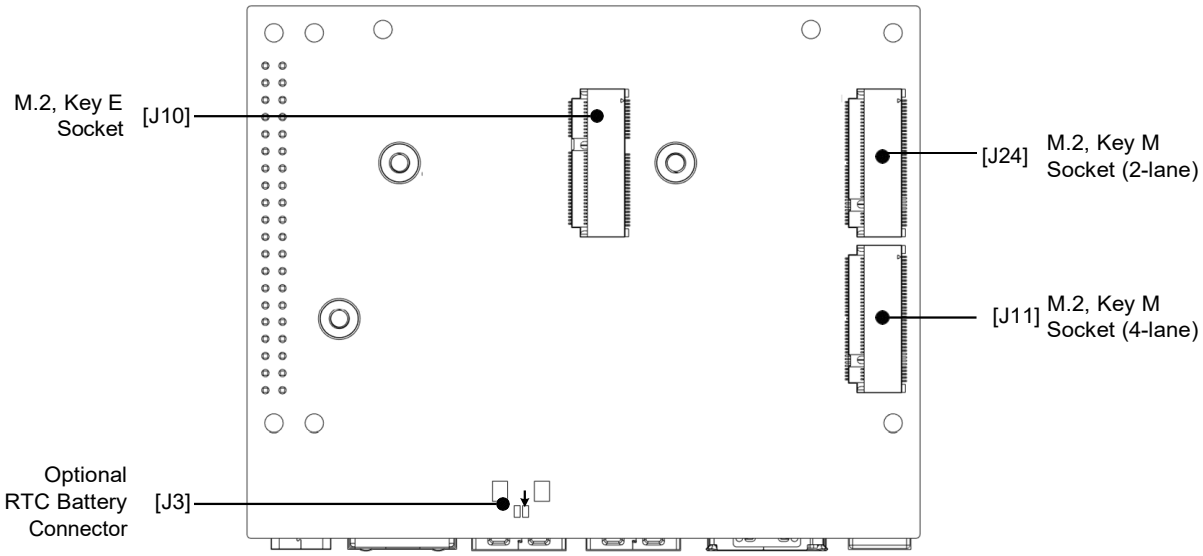


Figure 1-4. Jetson Orin Series Carrier Board Placement – Top View



J2	Jetson Orin Nano Conn. (SODIMM, 260-pin)	**J15**	RJ45 Ethernet Socket, 18-pins, RA, Female
J5	USB Type C	**J16**	Power Jack
J6	USB Type A Dual Stacked Connector	**J17**	Optional: CAN Bus Header (1x4, 2.54 mm pitch, RA)
J7	USB Type A Dual Stacked Connector	**J18**	Optional: PoE Backpower Header (1x2, 2.54 mm pitch)
J8	DisplayPort Connector	**J19**	Optional: PoE Header (1x4, 2.54 mm pitch)
J12	40-pin Expansion Header (2x20, 2.54 mm pitch)	**J20**	Camera (#0) Connector (22 pos, 0.5 mm pitch)
J13	Fan Header (4-pin, 1.25 mm pitch)	**J21**	Camera (#1) Connector (22 pos, 0.5 mm pitch)
J14	Button Header (1x12, 2.54 mm pitch, RA)	**DS1**	Power LED (Green)

Figure 1-5. Jetson Orin Series Carrier Board Placement – Bottom View



J3	Optional: RTC Back-up Coin Cell Socket (CR1225)	**J11**	M.2 Key M Slot (75-pin)
J10	M.2 Key E Connectivity Slot (75-pin)	**J24**	M.2 Key M Slot (75-pin)

Chapter 2. Jetson Series Carrier Board Standard Connectors

The Jetson Orin Series 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 3.2: Type C connector
- USB 3.2: 2 x Type A stacked connectors
- Gigabit Ethernet: RJ45 connector
- DisplayPort connector
- M.2, Key E socket
- M.2, Key M socket (4-lane PCIe)
- M.2, Key M socket (2-lane PCIe)

2.1 USB Ports

The carrier board supports five USB connectors. One is a USB 3.2 Type C connector (J5) supporting host, device, and USB Recovery. In addition, there are two, dual stacked USB 3.2 Type A connectors (J6 and J7). Each connector supports host mode only. A load switch supplying VBUS is provided for each of the USB 3.2 ports per stack and is limited to 3A of output current.

Table 2-1. USB 3.2 Type C Connector Pin Description – J5

Pin #	Connector Pin Name	Associated Module Pin Name (See Note 1 and 2)	Module Pin #	Usage/Description	Type/Dir
A1	GND_A	–	–	Ground	Ground
A2	TX1_P	USBSS1_TX_P	G23	USB 3.2 #1 Transmit 1 from mux	Output
A3	TX1_N	USBSS1_TX_N	G22		
A4	–	–	–	USB VBUS_A Power	Power
A5	CC1	–	–	CC 1 from CC Controller	Output
A6	D1_P	USB0_D_P	F12	USB 2.0 #0 Data 1	Bidir

Pin #	Connector Pin Name	Associated Module Pin Name (See Note 1 and 2)	Module Pin #	Usage/Description	Type/Dir
A7	D1_N	USB0_D_N	F13		
A8	SBU1	–	–	Unconnected	–
A9	–	–	–	USB VBUS_A Power	Power
A10	RX2_N	USBSS1_RX_P	C22	USB 3.2 #1 Receive 2 from mux	Input
A11	RX2_P	USBSS1_RX_N	C23		
A12	GND_A	–	–	Ground	Ground
B1	GND_B	–	–	Ground	Ground
B2	TX2_P	USBSS1_TX_P	G23	USB 3.2 #1 Transmit 2 from mux	Output
B3	TX2_N	USBSS1_TX_N	G22		
B4	–	–	–	USB VBUS_A Power	Power
B5	CC2	–	–	CC 2 from CC Controller	Output
B6	D2_P	USB0_D_P	F12	USB 2.0 #0 Data 2	Bidir
B7	D2_N	USB0_D_N	F13		
B8	SBU2	–	–	Unconnected	–
B9	–	–	–	USB VBUS_A Power	Power
B10	RX1_N	USBSS1_RX_P	C22	USB 3.2 #1 Receive 1 from mux	Input
B11	RX1_P	USBSS1_RX_N	C23		
B12	GND_B	–	–	Ground	Ground

Notes:

1. USB 3.2 module pin names are using the Orin NX and Orin Series function names.
2. The module pins for the USB 3.2 ports are not directly connected to the USB connector pins but are routed through a multiplexer.
3. 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 2-2. USB 3.2 Type A Connector Pin Descriptions – J6

Pin #	Module Pin Name (see Note 1 and 2)	Module Pin #	Usage/Description	Type/Dir
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	USBSS0_RX_N	161	USB 3.1 Receive #2 Data from hub	Input

Pin #	Module Pin Name (see Note 1 and 2)	Module Pin #	Usage/Description	Type/Dir
6	USBSS0_RX_P	163		
7	–	–	Ground	Ground
8	USBSS0_TX_N	166	USB 3.1 Transmit #2 Data from hub	Output
9	USBSS0_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	USBSS0_RX_N	161	USB 3.1 Receive #1 Data from hub	Input
15	USBSS0_RX_P	163		
16	–	–	Ground	Ground
17	USBSS0_TX_N	166	USB 3.1 Transmit #1 Data from hub	Output
18	USBSS0_TX_P	168		

Notes:

1. USB 3.2 module pin names are using the Orin NX and Orin Series function names.
2. The module pin names not directly connected to the USB connector pins but are routed to the input of the USB hub.
3. 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 3.2 Type A Connector Pin Description – J7

Pin #	Module Pin Name (see Note 1 and 2)	Module Pin #	Usage/Description	Type/Dir
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	USBSS0_RX_N	161	USB 3.1 Receive #4 Data from hub	Input
6	USBSS0_RX_P	163		
7	–	–	Ground	Ground
8	USBSS0_TX_N	166	USB 3.1 Transmit #4 Data from hub	Output
9	USBSS0_TX_P	168		

Pin #	Module Pin Name (see Note 1 and 2)	Module Pin #	Usage/Description	Type/Dir
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	USBSS0_RX_N	161	USB 3.1 Receive #3 Data from hub	Input
15	USBSS0_RX_P	163		
16	–	–	Ground	Ground
17	USBSS0_TX_N	166	USB 3.1 Transmit #3 Data from hub	Output
18	USBSS0_TX_P	168		

Notes:

1. USB 3.2 module pin names are using the Orin NX and Orin Series function names.
2. The module pin names not directly connected to the USB connector pins but are routed to the input of the USB hub.
3. 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

Pin #	Module Pin Name	Module Pin #	Usage/Description	Type/Dir
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 1,000 Mbps 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 DisplayPort

A DisplayPort (DP) connector (J8) is provided. Dual mode is supported.

Table 2-5. DisplayPort 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

Pin #	Module Pin Name	Module Pin #	Usage/Description	Type/Dir
13	–	–	MODE to support Dual-role mode.	Unused
14	–	–	CEC_DP: Not used – pulled to GND through 1 Mohm 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	–	–	+3.3 V	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 Orin Series 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 Orin Nano 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 2-6. 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		–	–	No Pin	–
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

Pin #	Module Pin Name	Module Pin #	Usage/Description	Type/Dir	Pin #	Module Pin Name	Module Pin #	Usage/Description	Type/Dir
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
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 (32 KHz)	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				

Pin #	Module Pin Name	Module Pin #	Usage/Description	Type/Dir	Pin #	Module Pin Name	Module Pin #	Usage/Description	Type/Dir
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 two M.2, Key M Slots for NVMe storage (J11 and J24). The M.2, Key M slot J11 supports PCIe (x4), Gen4. The M.2, Key M slot J24 supports PCIe (x2), Gen4.

Notes:

> Jetson Orin Nano modules supports only up to Gen3 PCIe, and Jetson Orin NX modules support up to Gen4 PCIe

> The Jetson Orin Nano Developer Kit carrier board will only support single sided M.2 Key M modules.

Table 2-7. M.2 Key M Expansion Slot Pin Description – J11 (x4 PCIe)

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		Output	24				

Pin #	Module Pin Name	Module Pin #	Usage/Description	Type/Dir Default	Pin #	Module Pin Name	Module Pin #	Usage/Description	Type/Dir Default
25	PCIE0_TX2_P	150	PCIe IF #0 Lane 2 Transmit		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	–	–	Unused	Unused
41	PCIE0_RX0_N	131	PCIe IF #0 Lane 0 Receive	Input	42				
43	PCIE0_RX0_P	133			44	GPIO10	212	M.2 Key M Alert	Input, 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
61					62				
63					64				
65					66				
67	–	–	Unused	Unused	68	–	–	32 KHz Suspend Clock	Output, 3.3V
69					70	–	–	Main 3.3V Supply	Power
71	–	–	Ground	Ground	72				
73					74				
75							–	No Pin	–

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

Table 2-8. M.2 Key M Expansion Slot Pin Description – J24 (x2 PCIe)

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	–	–	Unused	Unused	6	–	–	Unused	Unused
7					8				
9	–	–	Ground	Ground	10				
11	–	–	Unused	Unused	12	–	–	Main 3.3V Supply	Power
13					14				
15	–	–	Ground	Ground	16				
17	–	–	Unused	Unused	18				
19					20	–	–	Unused	Unused
21	–	–	Ground	Ground	22				
23	–	–	Unused	Unused	24				
25					26				
27	–	–	Ground	Ground	28				
29	PCIE2_RX1_N	58	PCIe IF #2 Lane 1 Receive	Input	30				
31	PCIE2_RX1_P	60			32				
33	–	–	Ground	Ground	34				
35	PCIE2_TX1_N	64	PCIe IF #2 Lane 1 Transmit	Output	36				
37	PCIE2_TX1_P	66			38				
39	–	–	Ground	Ground	40				
41	PCIE2_RX0_N	40	PCIe IF #2 Lane 0 Receive	Input	42				
43	PCIE2_RX0_P	42			44	GPIO10	212	M.2 Key M Alert	Input, 1.8V
45	–	–	Ground	Ground	46	–	–	Unused	Unused
47	PCIE2_TX0_N	46	PCIe IF #2 Lane 0 Transmit	Output	48				
49	PCIE2_TX0_P	48			50	PEX2_RST*	219	PCIe IF #0 Reset	Output, 3.3V
51	–	–	Ground	Ground	52	PEX2_CLKREQ*	221	PCIe IF #0 Clock Request	Input, 3.3V
53	PCIE2_CLK_N	52	PCIe IF #2 Reference Clock	Output	54	PEX_WAKE*	179	PCIe Wake (Level Shifted from 3.3V to 1.8V)	Input, 3.3V
55	PCIE2_CLK_P	54			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	–	–	32 KHz Suspend Clock	Output, 3.3V
69					70				
71					72	–	–	Main 3.3V Supply	Power
73	–	–	Ground	Ground	74				
75							–	–No Pin	–

Notes:

1. PCIe 2 module pin names are using the Orin NX and Orin Series function names.
2. 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 Orin Series carrier board supports several expansion headers and connectors that have custom pinouts. The following lists the headers and connectors that have custom pinouts.

- Jetson Orin Series Module Connector, 260-pin, SO-DIMM, 1.27 mm pitch
- Camera Connectors (x2), 22 position, Flex Connector, 0.5 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 (RTC) back-up connector
- DC Power Jack
- Optional Power-over Ethernet (PoE) header, 1x4, 2.54 mm pitch
- Optional PoE backpower header, 1x, 2.54 mm pitch

3.1 Jetson Orin Series Module Connector

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

3.2 Camera Connector

The Jetson Orin Series carrier board includes two 22-position flex (0.5 mm pitch) camera connectors (J20 and J219). The connector used on the carrier board is a Molex Japan Part #54548-2272.

The connectors support the following.

> J20: CSI 1 x2 lane

> J21: CSI 1 x2 lane or 1 x4 lane

> Both J20/J21: C

- CAM_I2C, clock, and control GPIOs for the camera
- 3.3V Supply

Table 3-1. Camera #0 Connector Pin Description –J20

Pin #	Module Pin Name	Module Pin #	Usage/Description	Type/Dir
1	–	–	+3.3V	Power
2	CAM_I2C_SDA	215	Camera I2C. 2.2 kΩ pull-ups on module. The module CAM_I2C pins connect to an I2C mux. The camera connector #0 (J20) receives the I2C from the mux (first output). The I2C signals on the camera side of the mux have 1 kΩ pull-ups.	Bidir, 3.3V
3	CAM_I2C_SCL	213		Output, 3.3V
4	–	–	Ground	Ground
5	CAM0_MCLK	116	Camera #0 Primary Clock	Output, 1.8V
6	CAM0_PWDN	114	Camera #0 Power-down	Output, 1.8V
7	–	–	Ground	Ground
8	CSI0_D1_P	18	CSI 0 Data 1	Input
9	CSI0_D1_N	16		
10	–	–	Ground	Ground
11	CSI0_D0_P	6	CSI 0 Data 0	Input
12	CSI0_D0_N	4		
13	–	–	Ground	Ground
14	CSI1_CLK_P	11	CSI 0 Clock	Input
15	CSI1_CLK_N	9		
16	–	–	Ground	Ground
17	CSI1_D1_P	17	CSI 1 Data 1	Input
18	CSI1_D1_N	15		
19	–	–	Ground	Ground
20	CSI1_D0_P	5	CSI 1 Data 0	Input
21	CSI1_D0_N	3		
22	–	–	Ground	Ground

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 #1 Connector Pin Description – J21

Pin #	Module Pin Name	Module Pin #	Usage/Description	Type/Dir
1	–	–	+3.3V	Power
2	CAM_I2C_SDA	215	Camera I2C. 2.2 kΩ pull-ups on module. The module CAM_I2C pins connect to an I2C mux. The camera connector #1 (J21) receives the I2C from the mux (second output). The I2C signals on the camera side of the mux have 1 kΩ pull-ups.	Bidir, 3.3V
3	CAM_I2C_SCL	213		Output, 3.3V
4	–	–	Ground	Ground
5	CAM1_MCLK	122	Camera #0 Primary Clock	Output, 1.8V
6	CAM1_PWDN	120	Camera #0 Power-down	Output, 1.8V
7	–	–	Ground	Ground
8	CSI3_D1_P	35	CSI 3 Data 1	Input
9	CSI3_D1_N	33		
10	–	–	Ground	Ground
11	CSI3_D0_P	23	CSI 3 Data 0	Input
12	CSI3_D0_N	21		
13	–	–	Ground	Ground
14	CSI2_CLK_P	30	CSI 2 Clock	Input
15	CSI2_CLK_N	28		
16	–	–	Ground	Ground
17	CSI2_D1_P	36	CSI 2 Data 1	Input
18	CSI2_D1_N	34		
19	–	–	Ground	Ground
20	CSI2_D0_P	24	CSI 2 Data 0	Input
21	CSI2_D0_N	22		
22	–	–	Ground	Ground

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 Orin Series 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 (AU) clock
- I2C (x2)
- SPI (x2)
- UART
- GPIOs (x3 – See notes)

Notes:

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

Figure 3-1. Expansion Header Connections

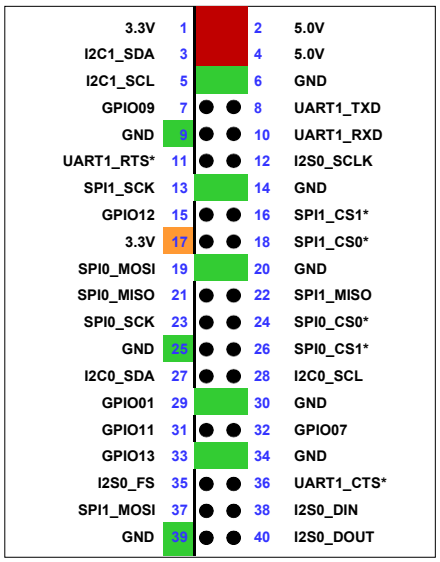


Table 3-3. Expansion Header Pin Description – J12

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

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
2	–	–	–	Main 5.0V Supply	–	Power (input/output_	1A	–	–	–	1
3	I2C1_SDA	191	GP16_I2C8_DAT	I2C #1 Data	–	Bidir OD	±2 mA	PDD.02	z	2.2KΩ PU	2
4	–	–	–	Main 5.0V Supply	–	Power	1A	–	–	–	–
5	I2C1_SCL	189	GP15_I2C8_CLK	I2C #1 Clock	–	Bidir OD	±2 mA	PDD.01	z	2.2KΩ PU	2
6	–	–	–	Ground	–	Ground	–	–	–	–	–
7	GPIO09	211	GP167	GPIO	Audio Primary Clock	Bidir/Output	±20uA	PAC.06	pd		3
8	UART1_TXD	203	GP70_UART1_TXD_BOOT2_STRAP	UART #1 Transmit	GPIO	Output/Bidir	±20uA	PR.02	pd		3
9	–	–	–	Ground	–	Ground	–	–	–	–	–
10	UART1_RXD	205	GP71_UART1_RXD	UART #1 Receive	GPIO	Input/Bidir	±20uA	PR.03	pd		3
11	UART1_RTS*	207	GP72_UART1_RTS_N	GPIO	UART #2 Request to Send	Bidir/Output	±20uA	PR.04	pd		3
12	I2S0_SCLK	199	GP122	GPIO	Audio I2S #0 Clock	Bidir	±20uA	PH.07	pd		3
13	SPI1_SCK	106	GP36_SPI3_CLK	GPIO	SPI #1 Shift Clock	Bidir/Output	±20uA	PY.00	pd		3
14	–	–	–	Ground	–	Ground	–	–	–	–	–
15	GPIO12	218	GP88_PWM1	GPIO	–	Bidir	±20uA	PN.01	z		3
16	SPI1_CSI1*	112	GP40_SPI3_CS1_N	GPIO	SPI #1 Chip Select #1	Bidir/Output	±20uA	PY.04	z		3
17	–	–	–	Main 3.3V Supply	–	Power	1A	–	–	–	1
18	SPI1_CSI0*	110	GP39_SPI3_CS0_N	GPIO	SPI #0 Chip Select #0	Bidir/Output	±20uA	PZ.06	z		3
19	SPI0_MOSI	89	GP49_SPI1_MOSI	GPIO	SPI #0 Primary Out/Secondary In	Bidir/Output	±20uA	PZ.05	pd		3
20	–	–	–	Ground	–	Ground	–	–	–	–	–
21	SPI0_MISO	93	GP48_SPI1_MISO	GPIO	SPI #0 Primary In/Secondary Out	Bidir/Input	±20uA	PZ.04	pd		3
22	SPI1_MISO	108	GP37_SPI3_MISO	GPIO	SPI #1 Primary In/Secondary Out	Bidir/Input	±20uA	PY.01	pd		3
23	SPI0_SCK	91	GP47_SPI1_CLK	GPIO	SPI #0 Shift Clock	Bidir/Output	±20uA	PZ.03	pd		3
24	SPI0_CS0*	95	GP50_SPI1_CS0_N	GPIO	SPI #0 Chip Select #0	Bidir/Output	±20uA	PZ.06	z		3
25	–	–	–	Ground	–	Ground	–	–	–	–	–

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
26	SPI0_CS1*	97	GP51_SPI1_CS1_N	GPIO	SPI #0 Chip Select #1	Bidir/Output	±20uA	PZ.07	pu		3
27	I2C0_SDA	187	GP14_I2C2_DAT	I2C #0 Data	GPIO	Bidir OD/Bidir	±2 mA	PDD.00	z	1.5KΩ PU	2
28	I2C0_SCL	185	GP13_I2C2_CLK	I2C #0 Clock	GPIO	Bidir OD/Bidir	±2 mA	PCC.07	z	1.5KΩ PU	2
29	GPIO01	118	GP65	GPIO	General Purpose Clock #0	Bidir/Output	±20uA	PQ.05	pd		3
30	–	–	–	Ground	–	Ground	–	–	–	–	–
31	GPIO11	216	GP66	GPIO	General Purpose Clock #1	Bidir/Output	±20uA	PQ.06	pd		3
32	GPIO07	206	GP113_PWM7	GPIO	PWM	Bidir/Output	±20uA	PG.06	z		3
33	GPIO13	228	GP115	GPIO	PWM	Bidir/Output	±20uA	PH.00	z		3
34	–	–	–	Ground	–	Ground	–	–	–	–	–
35	I2S0_FS	197	GP125	GPIO	Audio I2S #0 Field Select	Bidir	±20uA	PI.02	pd		3
36	UART1_CTS*	209	GP73_UART1_CTS_N	GPIO	UART #1 Clear to Send	Bidir/Input	±20uA	PR.05	pd		3
37	SPI1_MOSI	104	GP38_SPI3_MOSI	GPIO	SPI #1 Primary Out/Secondary In	Bidir/Output	±20uA	PY.02	pd		3
38	I2S0_DIN	195	GP124	GPIO	Audio I2S #0 Data in	Bidir/Input	±20uA	PI.01	pd		3
39	–	–	–	Ground	–	Ground	–	–	–	–	–
40	I2S0_DOUT	193	GP123	GPIO	Audio I2S #0 Data Out	Bidir/Output	±20uA	PI.00	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 ±2 mA.
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 (for example, SPI, I2S, and so on). 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 Orin Series 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 Pin 1)	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.	Not applicable
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 Orin Series 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.

Legend	Ground	Power	Reserved

3.6 Fan Connector

The Jetson Orin Series 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 carrier board has a connector where an RTC backup battery can be connected. This connector (J3) is commonly used on laptop designs. The connector used is a Wieson Technologies AC2651-0011-003-HH, 2-pin, 1.25 mm pitch connector.

Table 3-7. RTC Backup Batter Connector Pin Description – J3

Pin #	Associated Module Pin Name	Module Pin #	Usage/Description	Type/Dir
1	PM IC_BBAT	235	RTC backup battery supply	Power
2	–	–	Ground	Ground

Legend	Ground	Power	Reserved

3.8 DC Power Jack

The Jetson Orin Series 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 3.5 A

Figure 3-2. Jack Connector

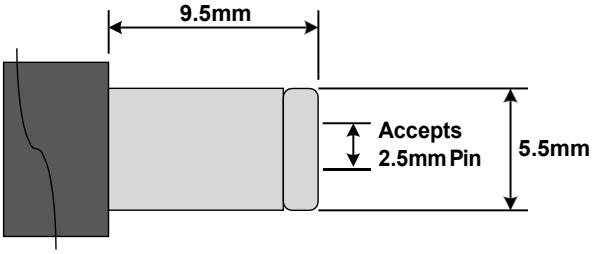


Table 3-8. DC Jack Pin Description – J16

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

Legend	Ground	Power	Reserved

3.9 Optional Power-Over Ethernet and Backpower Headers

The Jetson Orin Series 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 (3 A max). To use this alternate PoE power mechanism, the design will require a power converter to take the high-voltage PoE supply (38 V-60 V) and convert it to the 5 V-20 V input the carrier board requires.

Figure 3-3. PoE Alternative Power Input

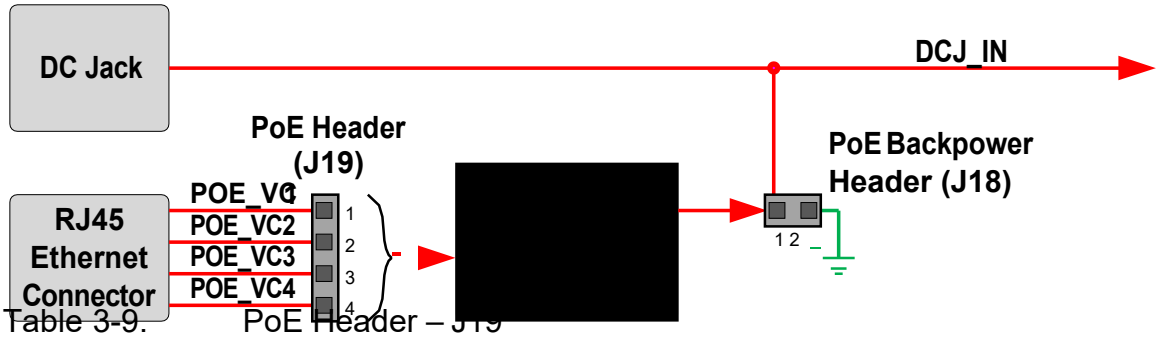


Table 3-9. PoE Header – J19

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

Legend	Ground	Power	Reserved

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 (9 V-20 V). 3 A max.	Power
2	–	–	Ground	Ground

Legend	Ground	Power	Reserved

Chapter 4. Mechanical Specification

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

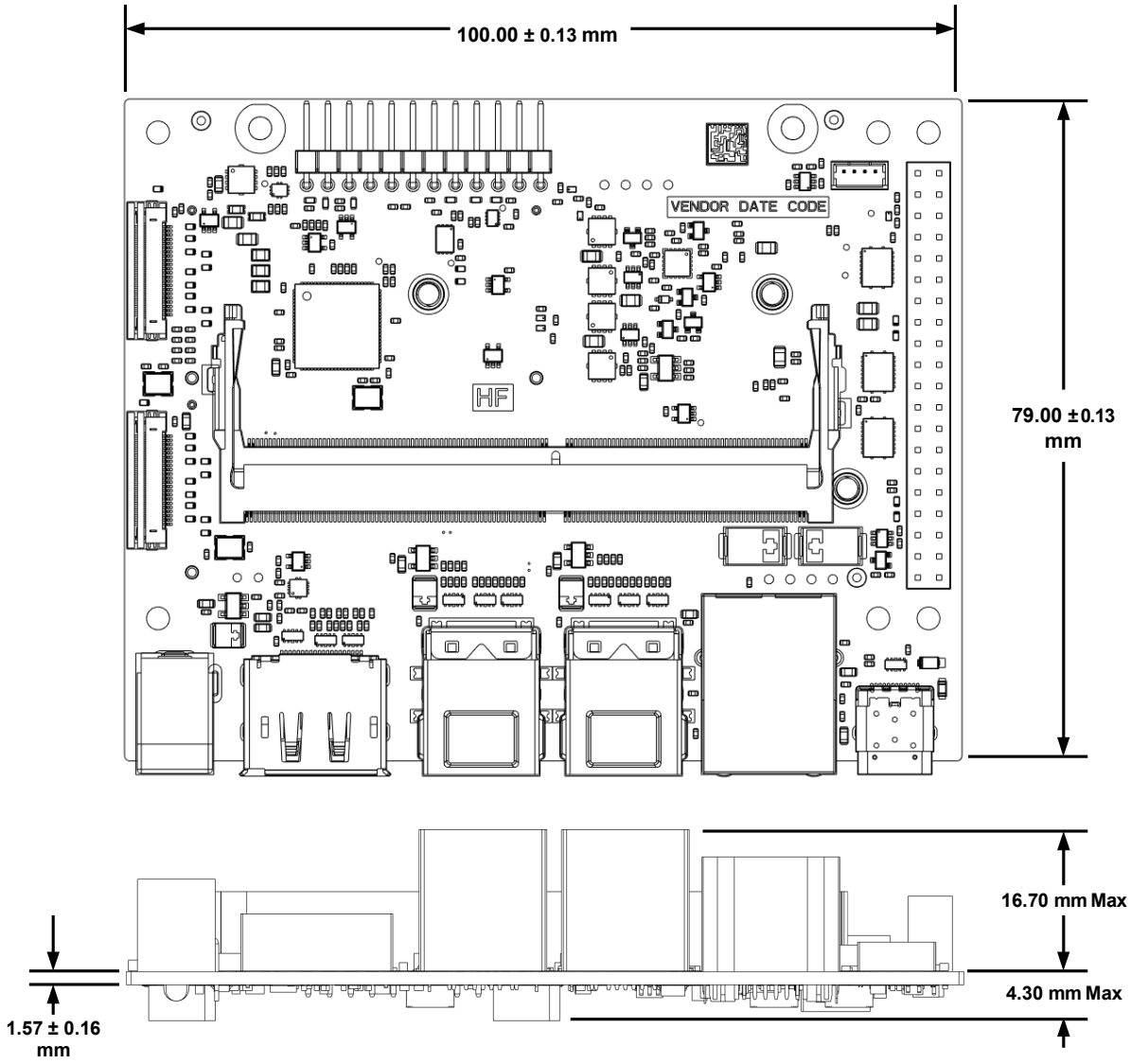
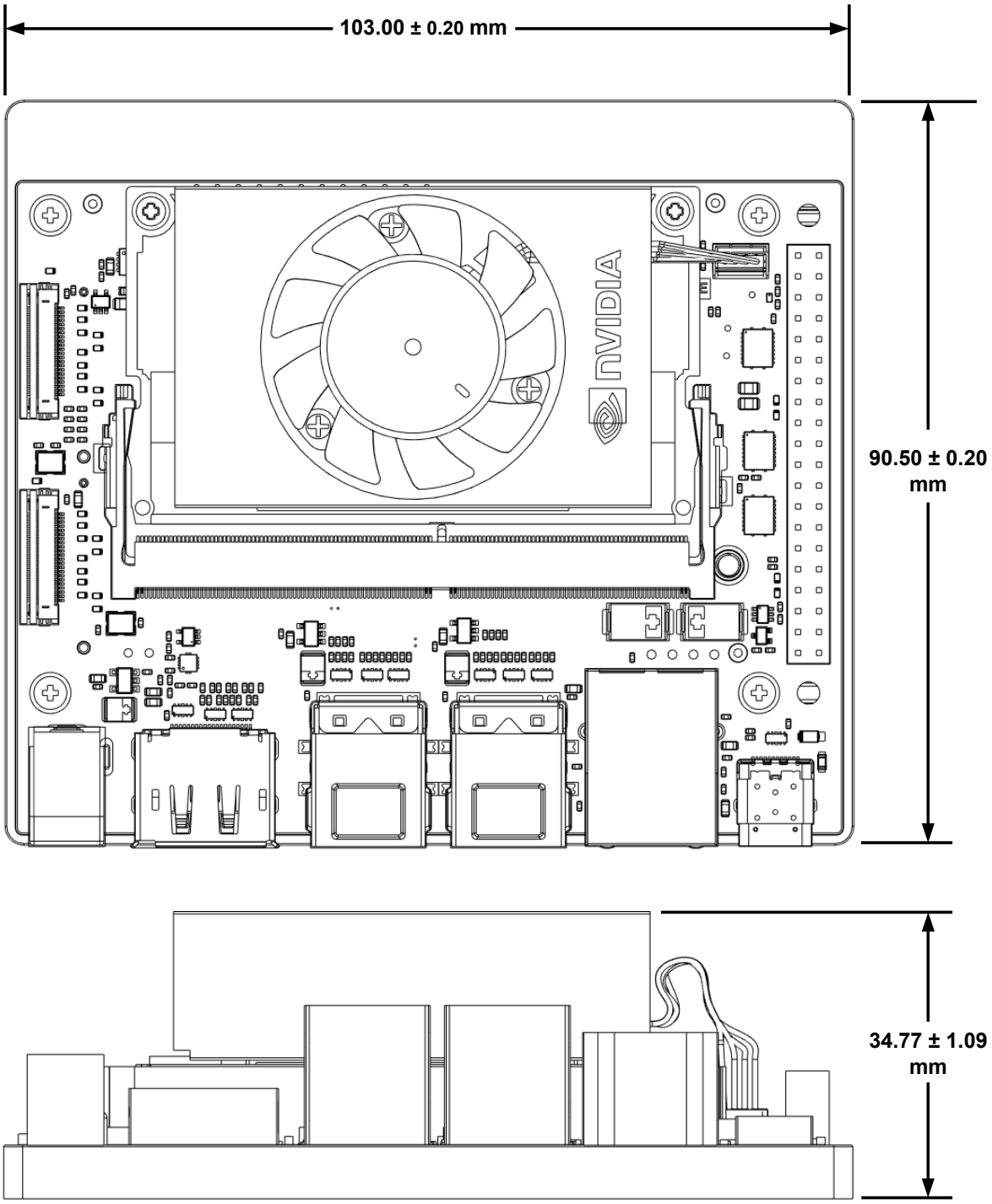


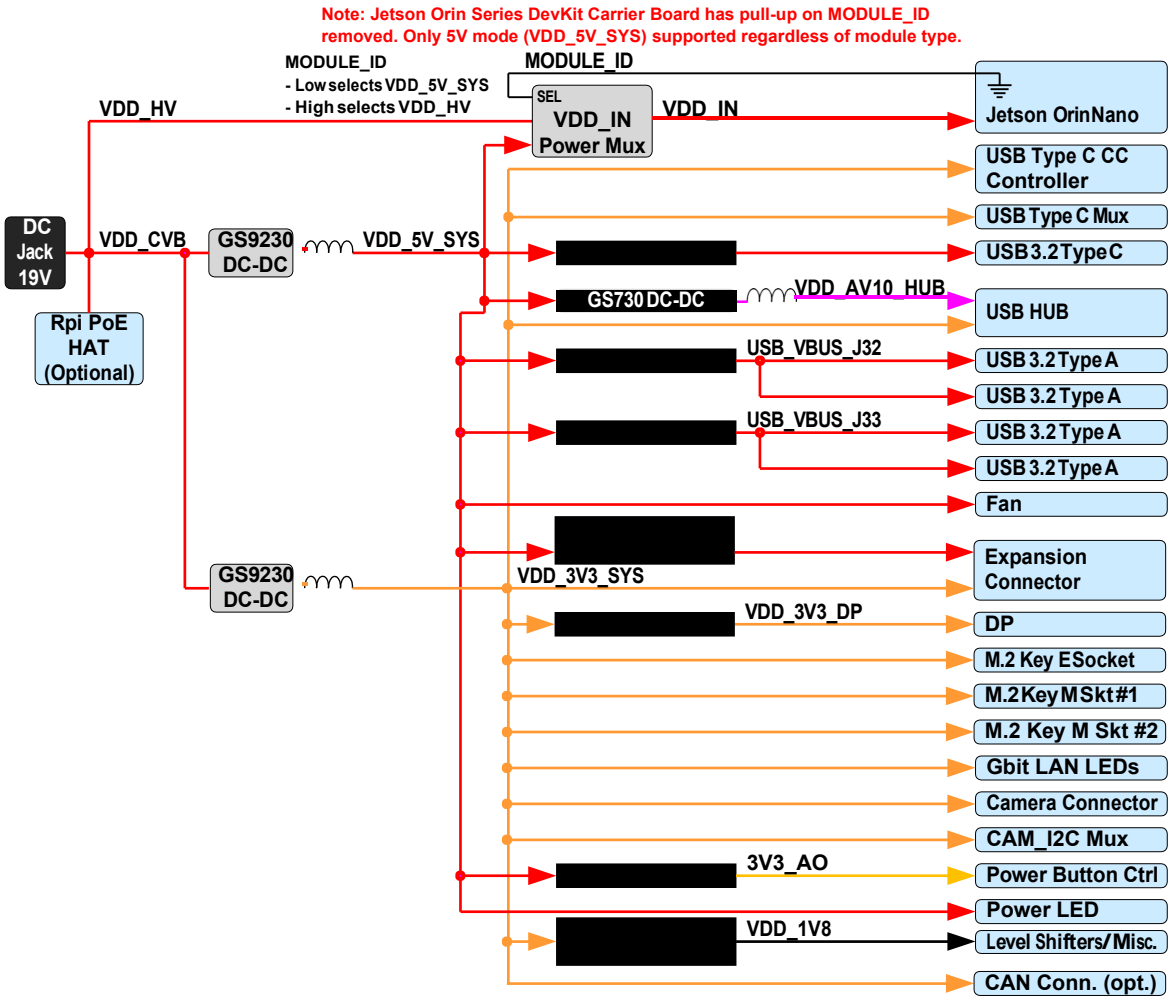
Figure 4-2. Developer Kit Mechanical Dimensions



Chapter 5. Interface Power

Figure 5 1 shows the power diagram.

Figure 5-1. Power Diagram



The following tables show the allocation of supplies to the connectors on the Jetson Orin Series 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	GS9230NVTQ-R	VDD_CVB (DC_IN after Power FET)	VDD_CVB
VDD_3V3_SYS	Main 3.3V supply	3.3	GS9230NVTQ-R	VDD_CVB	SYS_RESET_IN*
3V3_AO	Button MCU	3.3	GS7116S5-ADJ-R LDO	VDD_5V_SYS	VDD_5V_SYS regulator power good
VDD_1V8	Main 1.8V supply	1.8	AP2127K-1.8TRG1	VDD_3V3_SYS	3.3V_IO_PG
VDD_AV10_HUB	USB hub	1.1	GS7303ACTD-R	VDD_5V_SYS	VDD_3V3_SYS regulator power good
USBC_VBUS	5V VBUS for USB Type C connector	5.0	AP22811AW5-7	VDD_5V_SYS	ID from USB Type C CC controller
USB_VBUS_A	5V VBUS for dual stacked 3.0 Type A connector	5.0	AP22811AW5-7 Load Switch	VDD_5V_SYS	From USB Hub
USB_VBUS_B	5V VBUS for dual stacked 3.0 Type A connector	5.0	AP22811AW5-7 Load Switch	VDD_5V_SYS	From USB Hub
VDD_3V3_DP	3.3V rail for DP connector	5.0	GS7612S5MC-R Load Switch	VDD_3V3_SYS	VDD_3V3_SYS regulator power good

Table 5-2. Interface Supply Current Capabilities

Power Rails	Usage	(V)	Max Current (A)
DCJ_IN	Main power input from DC Adapter	19.0	4.2
VDD_5V_SYS	Main 5.0V supply	5.0	2.78
VDD_3V3_SYS	Main 3.3V supply	3.3	5.4
VDD_1V8	Main 1.8V supply	1.8	0.0002
3V3_AO	3.3V Always-on supply	3.3	0.200

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	2.12
	40-pin header		0.5
	Fan connector		0.15
VDD_3V3_DP	DP connector		0.5
USBC_VBUS	USB Type C		0.5
USB_VBUS_A/B	USB 3.2 type A (x4)		0.5
VDD_3V3_SYS	40-pin header	3.3	0.1
	M.2 Key E socket		0.8
	M.2 Key M sockets (x2)		2.1
	Camera connectors (x2)		0.26

FCC Warnning:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection againstharmful interference in a residential installation. This equipment generates, uses and can radiateradio frequency energy and, if not installed and used in accordance with the instructions, maycause harmful interference to radio communications. However, there is no guarantee thatinterference will not occur in a particular installation. If this equipment does cause harmfulinterference to radio or television reception, which can be determined by turning the equipmentoff and on, the user is encouraged to try to correct the interference by one or more of thefollowing measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Caution: Any changes or modifications to this device not explicitly approved by manufacturer could void your authority to operate this equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1)This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.