



NVIDIA Jetson Xavier NX and Jetson Nano Interface Comparison and Migration

Application Note

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Table of Contents

Introduction	1
Jetson Xavier NX vs. Jetson Nano	2
Module Interface Comparisons.....	4
Function and Interface Difference Details	6
Mechanical Differences	6
USB 3.x and PCI Express Mapping.....	7
PCI Express	8
Display.....	8
DSI	8
eDP, DP, and HDMI.....	9
CAN	9
Camera	10
Debug.....	11

List of Figures

Figure 1.	Jetson Nano Block Diagram	2
Figure 2.	Jetson Xavier NX Block Diagram	3
Figure 3.	Jetson Nano vs. Jetson Xavier NX Module Top	6
Figure 4.	Jetson Nano vs. Jetson Xavier NX Module Bottom	7
Figure 5.	Jetson Xavier NX and Jetson Nano PCIe Block Diagram	8
Figure 6.	Jetson Nano DSI Block Diagram	9
Figure 7.	Jetson Xavier NX CAN Block Diagram	9
Figure 8.	Jetson Xavier NX and Jetson Nano CSI Block Diagrams	10

List of Tables

Table 1.	Jetson Xavier and Jetson Nano Feature Comparison	4
Table 2.	Mechanical Differences	6
Table 3.	Jetson Xavier NX USB 3.1 and PCIe Lane Mapping Configurations	7
Table 4.	Jetson Nano USB 3.0 and PCIe Lane Mapping Configurations	7
Table 5.	eDP, DP, and HDMI Display Support	9

Introduction

This application note compares the features and interfaces supported on the NVIDIA® Jetson Xavier™ NX and Jetson Nano™ modules. This application note also describes the migration path for designers familiar with Jetson Nano to design a carrier board for Jetson Xavier NX that will support the features available on Jetson Xavier NX.

Jetson Xavier NX vs. Jetson Nano

The Jetson Xavier NX and Jetson Nano modules are pin compatible with a few exceptions. This application note describes the differences to allow users familiar with Jetson Nano to design a similar carrier board for Jetson Xavier NX.

The following figures show the Jetson Xavier NX and Jetson Nano block diagrams. The interfaces or blocks that are supported only by one of the modules are highlighted in red. The interface types that are supported on both modules but where the number of lanes/instances, voltage level, or access is different are highlighted in magenta.

Figure 1. Jetson Nano Block Diagram

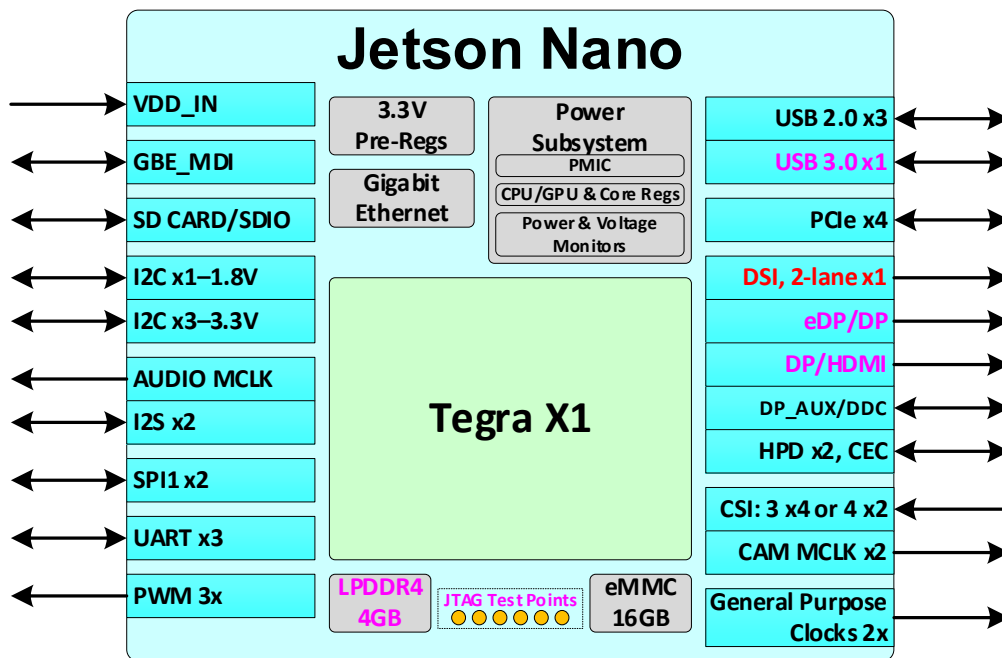
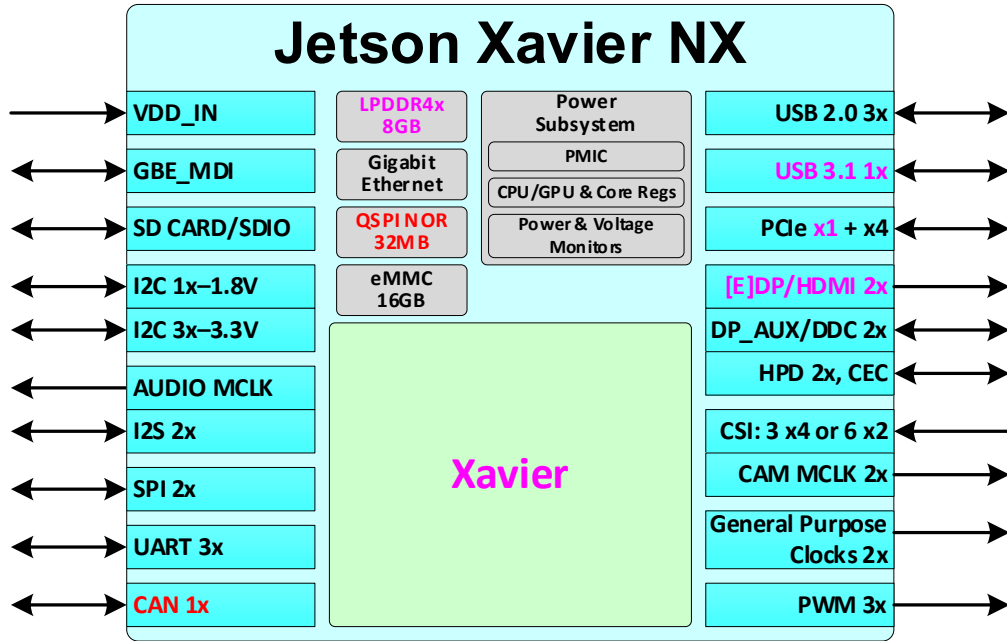


Figure 2. Jetson Xavier NX Block Diagram



Module Interface Comparisons

Table 1 lists the key system specifications, devices and interfaces that are supported on either the Jetson Xavier NX or the Jetson Nano module.

Table 1. Jetson Xavier and Jetson Nano Feature Comparison

Feature	Jetson Xavier NX	Jetson Nano
System Specifications and Device on the Module		
GPU	NVIDIA Volta™ architecture with 384 NVIDIA® CUDA® cores and 48 Tensor cores	NVIDIA Maxwell™ architecture with 128 CUDA cores
CPU	6-core NVIDIA Carmel Armv8.2 64-bit CPU	Quad-core ARM Cortex-A57 MPCore processor
Memory	8 GB 128-bit LPDDR4x	4 GB 64-bit LPDDR4
Storage	16 GB eMMC	
Networking	10/100/1000 Mbit	
Video Encode	2x464 MP/sec 2x 4K @ 30 (HEVC) 6x 1080p @ 60 (HEVC) 14x 1080p @ 30 (HEVC)	250MP/sec 1x 4K @ 30 (HEVC) 2x 1080p @ 60 (HEVC) 4x 1080p @ 30 (HEVC) 4x 720p @ 60 (HEVC) 9x 720p @ 30 (HEVC)
Video Decode	2x690MP/sec 2x 4K @ 60 (HEVC) 4x 4K @ 30 (HEVC) 12x 1080p @ 60 (HEVC) 32x 1080p @ 30 (HEVC) 16x 1080p @ 30 (H.264)	500MP/sec 1x 4K @ 60 (HEVC) 2x 4K @ 30 (HEVC) 4x 1080p @ 60 (HEVC) 8x 1080p @ 30 (HEVC) 9x 720p @ 60 (HEVC)
Camera	12 lanes (3x4 or 6x2) MIPI CSI-2 D-PHY 1.2 (2.5 Gb/s per pair)	12 lanes (3x4 or 4x2) MIPI CSI-2 D-PHY 1.1 (1.5 Gb/s per pair)
Mechanical	69.6 mm x 45 mm 260-pin edge connector	

Feature	Jetson Xavier NX	Jetson Nano
System Specifications and Device on the Module		
Input Voltage	5V (nominal)	
Interfaces		
USB 2.0	3x	
USB 3.x	1x (3.1 GEN2)	1x (3.0 GEN1)
PCIe	1 x1+ 1 x4 (Gen3). x1 is Root Port only. x4 has both Root Port and Endpoint support	1 x4 (Gen2), Root Port only.
Display	Two multi-mode (e)DP 1.4/HDMI™ 2.0a	HDMI 2.0 or DP1.2, eDP 1.4 DSI (1 x2)
Audio (I2S)	2x	
SDIO/SD Card	1x SD Card/SDIO	
I2C	4x	
CAN	1x	Not supported
UART	3x	
SPI	2x	
JTAG	Not supported	Brought to on-module test points only
Fan	PWM and Tach Input	

Function and Interface Difference Details

Mechanical Differences

Table 2 lists the mechanical differences.

Table 2. Mechanical Differences

Feature	Jetson Xavier NX	Jetson Nano
Size	69.5 mm x 45 mm	
Built-in thermal solution	None	
Thermal solution mounting	4 holes in PCB for mounting thermal solution to Jetson Xavier NX.	Same approach as Jetson Xavier NX except that the thermal solution mounting hole locations are different.

Figure 3. Jetson Nano vs. Jetson Xavier NX Module Top

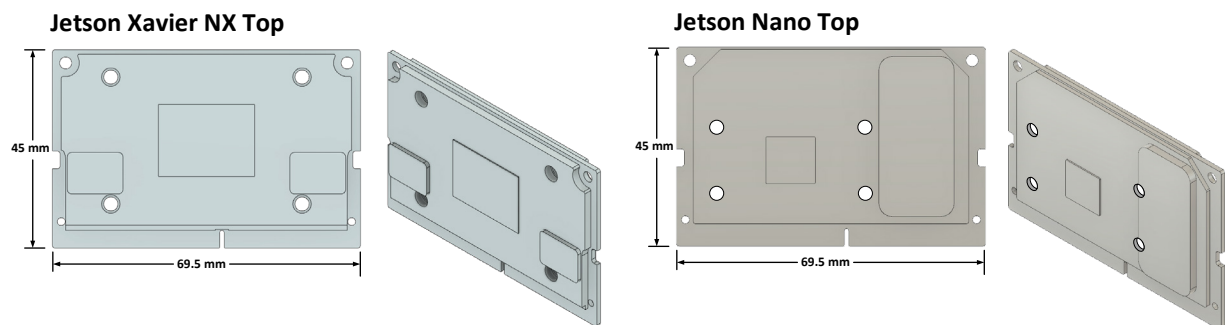
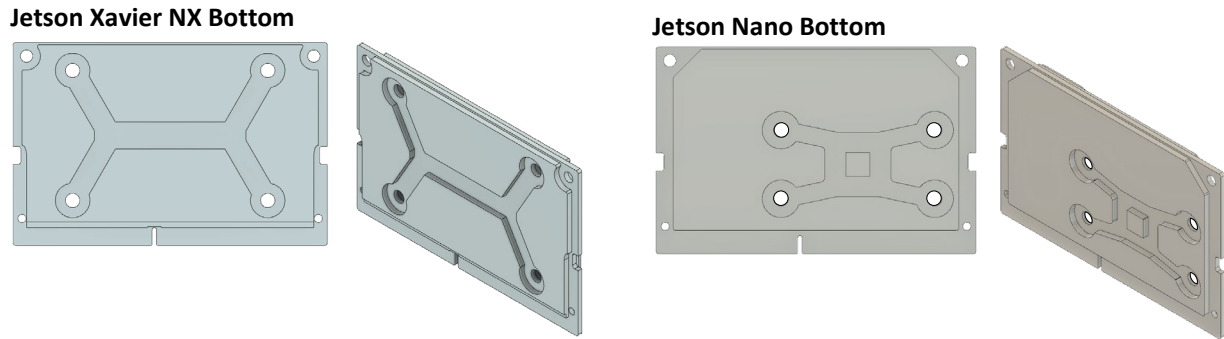


Figure 4. Jetson Nano vs. Jetson Xavier NX Module Bottom



USB 3.x and PCI Express Mapping

The following tables show the different options for mapping USB 3.x and PCIe to the common set of interface pins.

Table 3. Jetson Xavier NX USB 3.1 and PCIe Lane Mapping Configurations

Jetson Xavier NX Pin Names		PCIE0_RX3 PCIE0_TX3	PCIE0_RX2 PCIE0_TX2	PCIE0_RX1 PCIE0_TX1	PCIE1_RX0 PCIE1_TX0	PCIE1_RX0 PCIE1_TX0	USBSS_RX USBSS_TX
Xavier Lanes		Lane 5	Lane 4	Lane 3	Lane 2	Lane 11	Lane 1
USB 3.1	PCIe						
1	1x4 + 1x1	PCle 0 lane 3 [Ctrl #5]	PCle 0 lane 2 [Ctrl #5]	PCle 0 lane 1 [Ctrl #5]	PCle 0 lane 0 [Ctrl #5]	PCle 1 lane 0 [Ctrl #4]	USB_SS Port #2
Recommended Usage		PCIe x4 connector or device (i.e. M.2 Key M)				PCIe x1 conn. or device (i.e. M.2 Key E)	USB 3.1 connector, device or hub

Table 4. Jetson Nano USB 3.0 and PCIe Lane Mapping Configurations

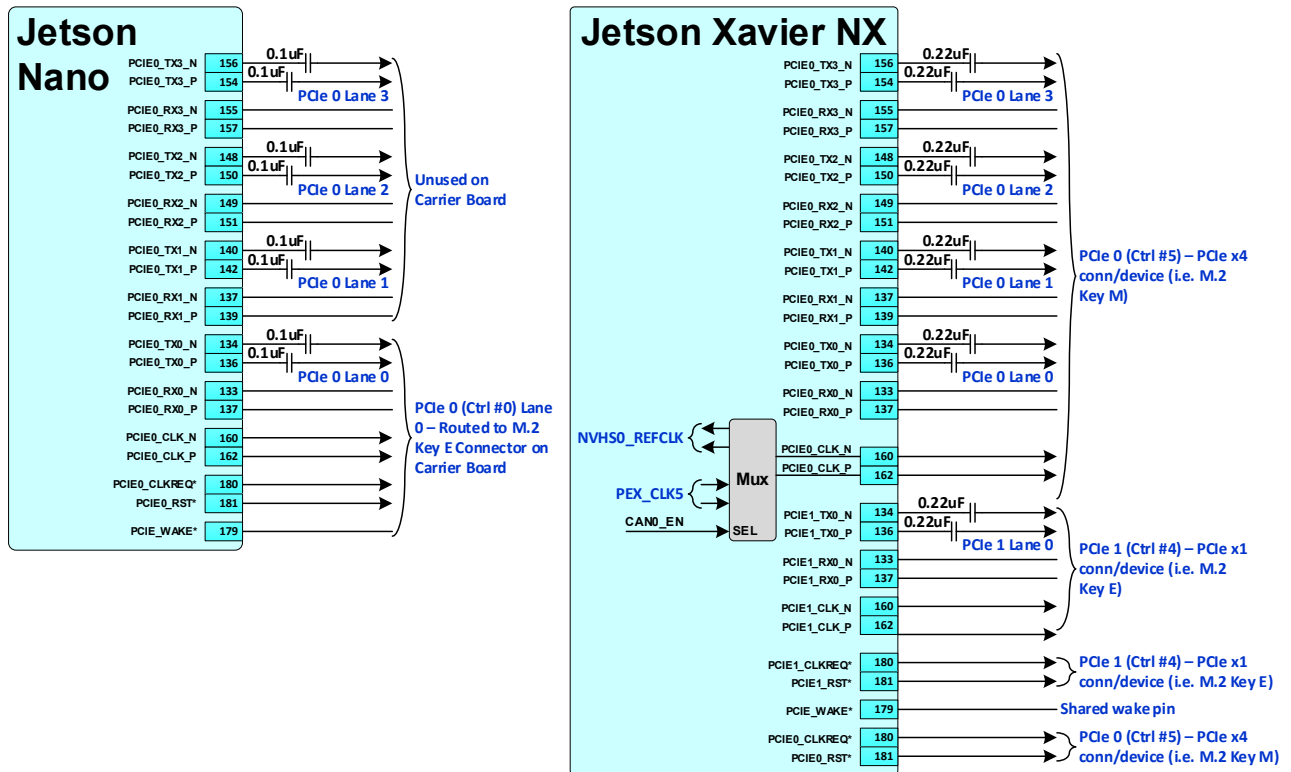
Jetson Nano Pin Names		na	PCIE0_RX3 PCIE0_TX3	PCIE0_RX2 PCIE0_TX2	PCIE0_RX1 PCIE0_TX1	PCIE1_RX0 PCIE1_TX0	USBSS_RX USBSS_TX
NVIDIA Tegra X1 Lanes		Lane 0	Lane 1	Lane 2	Lane 3	Lane 4	Lane 6
USB 3.0	PCIe						
1	1 x4	PCle 1 lane 0 – Used on- module for Ethernet	PCle 0 lane 3 [Ctrl #0]	PCle 0 lane 2 [Ctrl #0]	PCle 0 lane 1 [Ctrl #0]	PCle 0 lane 0 [Ctrl #0]	USB_SS Port #0
Usage on NVIDIA DevKit Carrier Board		Ethernet	Unused			M.2 Key E	USB 3.0 Type A

PRELIMINARY INFORMATION

PCI Express

Jetson Xavier NX supports two PCIe interfaces: A x1 lane interface and a x4 lane interface (can be x2 or x1 instead) at the module pins. Jetson Nano supports only the x4 lane interface (can be x2 or x1 instead).at the module pins. Jetson Xavier NX supports both Root Port and Endpoint operation on the x4 interface (only Root Port on the x1) where Jetson Nano only supports Root Port operation.

Figure 5. Jetson Xavier NX and Jetson Nano PCIe Block Diagram



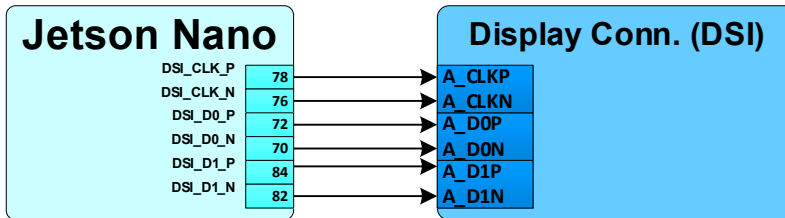
Display

Jetson Nano supports DSI, Vesa® DisplayPort™ [DP], embedded DisplayPort (eDP), and HDMI as described in this section. Jetson Xavier NX does not support DSI but does support DisplayPort (DP), embedded DisplayPort (eDP), and HDMI with some differences.

DSI

Jetson Xavier NX does not support DSI. Jetson Nano supports a single 2-lane DSI interface.

Figure 6. Jetson Nano DSI Block Diagram



eDP, DP, and HDMI

Both Jetson Xavier NX and Jetson Nano can support eDP, DP, and HDMI displays. Jetson Xavier NX can support any of these displays on either of the two interfaces. Jetson Nano has one interface that supports only eDP (or DP display only) while the other supports HDMI, eDP, and DP.

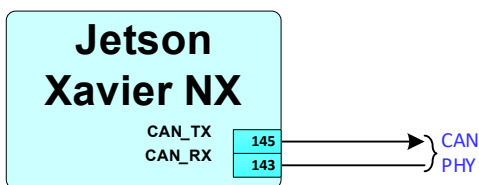
Table 5. eDP, DP, and HDMI Display Support

Feature	Jetson Xavier NX	Jetson Nano
eDP/DP	DP[1:0]_TXD[3:0]_P/N, DP[1:0]_AUX_P/N, DP[1:0]_HPD	DP0_TXD[3:0]_P/N, DP0_AUX_P/N, DP0_HPDP
HDMI/DP		DP1_TXD[3:0]_P/N, DP1_AUX_P/N, DP1_HPDP, HDMI_CEC

CAN

Jetson Xavier NX supports a single CAN interface. Jetson Nano does not support CAN.

Figure 7. Jetson Xavier NX CAN Block Diagram

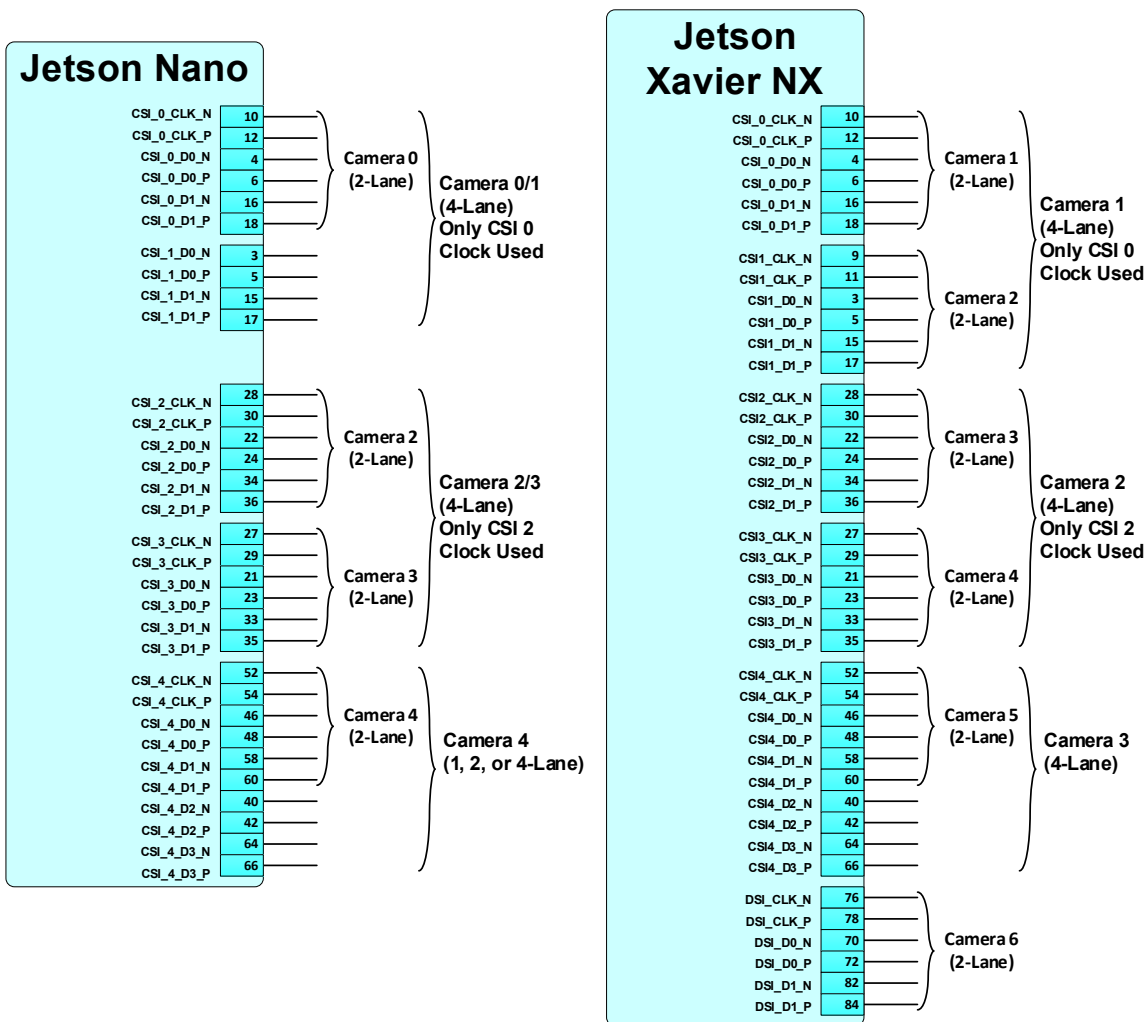


Camera

Both Jetson Xavier NX and Jetson Nano support up to 12 CSI data lanes and can support the following configurations to cameras or serializers:

- ▶ Jetson Xavier NX
 - 3 x4, 2 x4 + 2 x2, 1 x4 + 4 x2, or 6 x2
- ▶ Jetson Nano
 - 3 x4, 2 x4 + 2 x2, 1 x4 + 3 x2, or 4 x2

Figure 8. Jetson Xavier NX and Jetson Nano CSI Block Diagrams



Debug

Jetson Nano brings the JTAG interface to test points on the module only. Jetson Xavier NX does not support JTAG. Both Jetson Nano and Jetson Xavier NX provide UART2 for debug purposes.

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