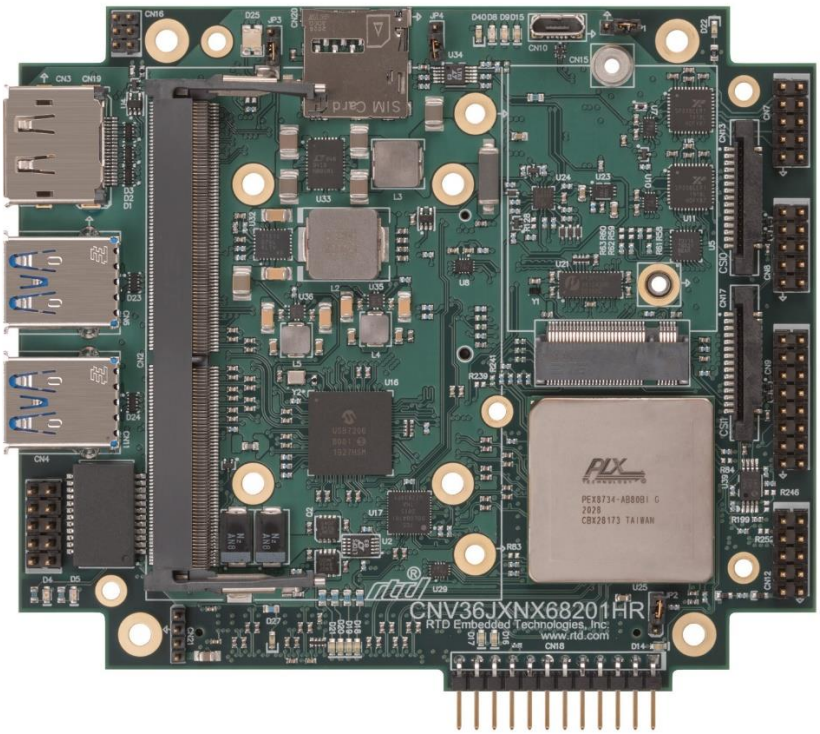
CNV36JXNX cpu/gpuModules™



User's Manual

BDM-610000090 Revision A

PC/104

www.rtd.com

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"Accessing the Analog World"®

CNV36JXNX cpu/gpuModules™ User's Manual

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Revision History

Revision	Date	Reason for Change
A	9/7/2021	Initial release

CNV36JXNX cpu/gpuModules™

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Chapter 1 Introduction

This manual provides comprehensive hardware and software information for users developing with the CNV36JXNX PCIe/104 cpu/gpuModule.

Note *Read the specifications beginning on page 13 prior to designing with the cpu/gpuModule.*

This manual is organized as follows:

Chapter 1 ***Introduction***
introduces main features and specifications

Chapter 2 ***Getting Started***
provides abbreviated instructions to get started quickly

Chapter 3 ***Connecting the cpu/gpuModule***
provides information on connecting the cpu/gpuModule to peripherals

Chapter 4 ***Using the cpu/gpuModule***
provides information to develop applications for the cpu/gpuModule, including general cpu/gpuModule information, detailed information on storing both applications and system functions, and using utility programs

Appendix A ***Hardware Reference***
lists jumper locations and settings, physical dimensions, and processor thermal management

Appendix B ***Troubleshooting***
offers advice on debugging problems with your system

Appendix C ***IDAN™ Dimensions and Pinout***
provides connector pinouts for the cpu/gpuModule installed in an RTD Intelligent Data Acquisition Node (IDAN) frame

Appendix D ***Additional Information***
lists sources and websites to support the cpu/gpuModule installation and configuration

Appendix E ***Limited Warranty***

CNV36JXNX cpu/gpuModule

RTD's CNV36JXNX cpu/gpuModule represents the latest in high performance PCIe/104 embedded controllers with a Type 2 bus. This design is based on the NVIDIA® Jetson Xavier NX system-on-module.

The type 2 PCIe bus connector supports Gen 3.0 PCIe for four PCIe x1 lanes and two PCIe x4 lanes. A M.2 E-key socket is available on the bottom side of the board for wireless modules and a M.2 B-key socket is available on the top side for WWAN modules or SSDs. Both slots utilize PCI-Express and USB connectivity.

Jetson Xavier NX Onboard memory consists of **8 GB** of embedded 128-bit LPDDR4 DRAM with a speed of 57.9GB/s.

The cpu/gpuModule's DisplayPort video interface supports audio and a maximum resolution of 4096 x 2304.

The Jetson Xavier NX has a 16GB eMMC 5.1 Flash storage device, a microSD socket is also available on the CNV36JXNX carrier for expansion. M.2 NVMe/PCIe based SSDs can also be used with the board either by means of the M.2 B-key socket or by using additional carrier board (SSD34200/SSD34100). The onboard M.2 B-key socket only has USB3.1 and PCIe X1 interfaces. M.2 B+M-key SATA based SSDs will **NOT** work in this socket as the NVIDIA Xavier NX does not support SATA peripherals. Because the M.2 NVMe/PCIe socket only has a PCIe x1 interface connected rather than the typical PCIe x2 interface some NVMe/PCIe based SSDs may experience slower read and write speeds than advertised.

A xHCI controller supplies five USB 3.1 connections, with up to 10Gb/s data throughput each. Two connections are routed to the bottom PCIe connector and two connections are available at USB A connectors. One additional USB 2.0 port is utilized in the Utility port for the use of a keyboard and mouse.

Network connectivity is provided by a 10/100/1000 Mbps on-board Ethernet controller.

Other features include two RS-232/422/485 configurable serial ports, one of which (CN7) has a CAN bus mode. The board also features two MIPI CSI-2 ports which can be used for connecting cameras. These ports are 15-pin FFC

The CNV36JXNX is also made available in a rugged passively cooled IDAN enclosure.

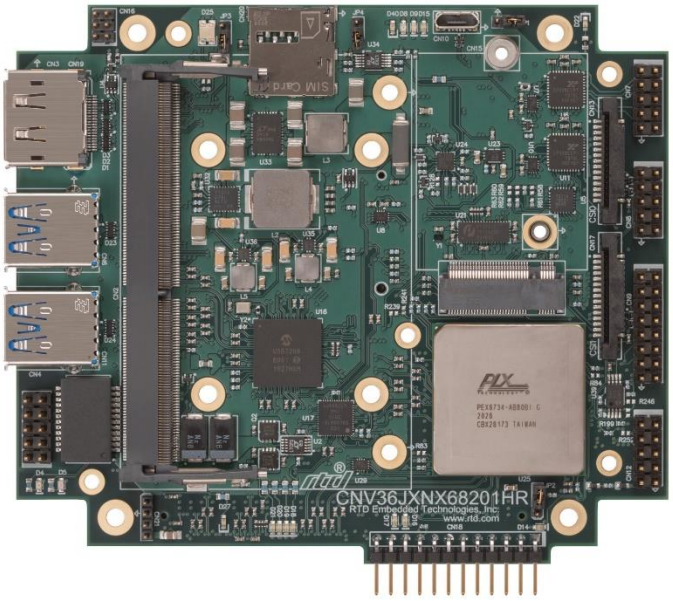

Figure 1 CNV36JXNX cpu/gpuModule (top view)

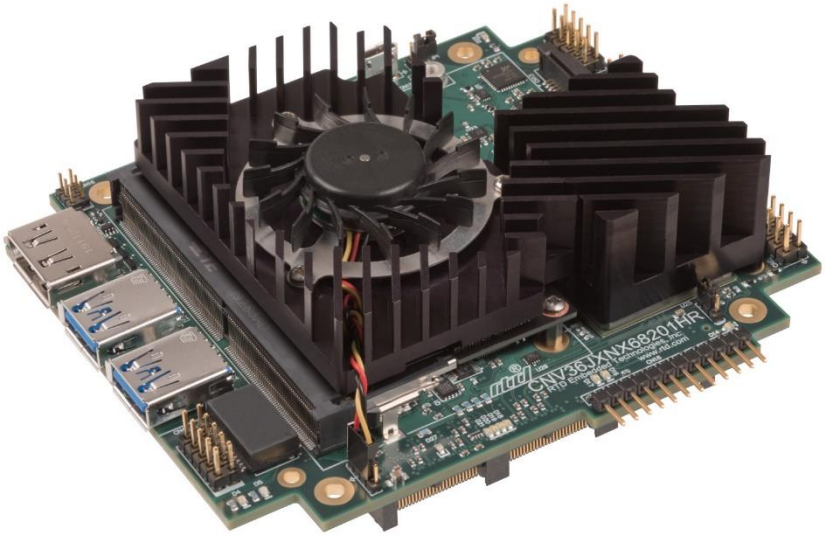

Figure 2 CNV36JXNX cpu/gpuModule (With NX and standard heatsink)

You can easily customize the cpu/gpuModule by stacking PCI/104-Express or PCIe/104 modules such as video controllers, Digital Signal Processors, drive carriers, LAN controllers, or analog and digital data acquisition modules. Stacking modules onto the cpu/gpuModule avoids expensive installations of backplanes and card cages and preserves the module's compactness.

The cpu/gpuModule is verified with Linux for Tegra operating system. Ordering Information

The CNV36JXNX cpu/gpuModule is available with one type of system-on-module and heatsink. The cpu/gpuModule can also be purchased as part of an Intelligent Data Acquisition Node (IDAN™) building block, which consists of the cpu/gpuModule and a milled aluminum IDAN frame. The IDAN building block can be used in just about any combination with other IDAN building blocks to create a simple but rugged PC/104 stack.

Refer to Appendix C *IDAN™ Dimensions and Pinout*, for more information. The CNV36JXNX cpu/gpuModule can also be purchased as part of a custom-built RTD HiDAN™ or HiDAN*plus* High Reliability Intelligent Data Acquisition Node. Contact RTD for more information on its high reliability PC/104 systems.

CNV36JXNX Model Options

The basic cpu/gpuModule model options are shown below. Refer to the RTD website (www.rtd.com) for moredetailed ordering information and any new variations that may be available.

Table 1 CNV36JXNX cpu/gpuModule Model Options

Part Number	Description
CNV36JXNX68201HR	NVIDIA® Jetson Xavier NX CPU module with standard heat sink
CNV36JXNX68201HRF	NVIDIA® Jetson Xavier NX CPU module with flat heat spreader
IDAN-CNV36JXNX68201HR	NVIDIA® Jetson Xavier NX CPU module in an IDAN frame

Cable Kits and Accessories

For maximum flexibility, RTD does not provide cables with the cpu/gpuModule. You may wish to purchase theCNV36JXNX cpu/gpuModule cable kit (XK-CM124), which contains:

- Utility Port 2.0 multi-function cable
    - (2x USB 2.0 ports, battery, reset button, power button,speaker)
- DIO cable (DIL-16 to DSUB-25)
- Two serial port cables (DIL-10 to DSUB-9)
- One Ethernet cable (DIL-10 to RJ-45)

For additional accessories, refer to the RTD website.

Board Features

- NVIDIA® Jetson Xavier NX system-on-module

Part Number	Cores	Core Frequency	L1 Cache	L2 Cache	L3 Cache	Stack Height
CNV36JXNX68201HR	3x 2	1.4 GHz - 1.9 GHz	128 KB Instruction 64 KB Data	2 MB per 2-core cluster	4MB shared	Any (stack down only)

- Volta GPU
  - 384 NVIDIA® CUDA® cores
  - 48 Tensor cores
  - End-to-end lossless compression, Tile Caching, OpenGL® 4.6, OpenGL ES 3.2, Vulkan™ 1.10, CUDA 10
  - Maximum Operating Frequency: 1100MHz
- Carmel CPU
  - ARMv8.2 (64-bit) heterogeneous multi-processing (HMP) CPU architecture
  - 3x dual-core CPU clusters (six NVIDIA® Carmel processor cores) connected by a high-performance system coherency interconnect fabric
  - L3 Cache: 4 MB (shared across all clusters)
  - NVIDIA® Carmel (Dual-Core) Processor: L1 Cache: 128 KB L1 instruction cache (I-cache) per core; 64 KB L1 data cache (Dcache) per core, L2 Unified Cache: 2 MB per cluster
  - Maximum Operating Frequency: 1900 MHz
- Memory
  - 8 GB 128-bit LPDDR4x DRAM
  - Secure External Memory Access
  - Using TrustZone® Technology
  - System MMU
  - Maximum Operating Frequency: 1600 MHz
- Storage
  - 16 GB eMMC 5.1 Flash Storage
  - Bus Width: 8-bit, Maximum Bus Frequency: 200 MHz (HS400)
  - micro-SD card slot
  - M.2 B-key slot
- Stackable 156-pin PCIe/104 Type 2 bus on bottom
  - Two PCI Express x4 Links. Gen 3, 8 GT/s
  - Four PCI Express x1 Links. Gen 3, 8 GT/s
  - Two USB 2.0
  - ATX Power Supply Signaling
  - RTC Battery
- Advanced Thermal Management
  - Thermal Monitor throttles processor and memory to prevent thermal runaway
  - Modified heatsinks and flat heat spreaders are available
  - Mini Fan Heatsink with Auto Fan control
  - Passive Structural Heatsink & Heatpipes in IDAN and HiDAN System Configurations
- Real-Time Clock (external battery required to maintain time only)
- Complete Single Board Computer

I/O

- Networking
  - 10/100/1000 Gigabit Ethernet
- Imaging
  - 4 lanes (2x2 lane) MIPI CSI-2 D-PHY 1.2 (2.5 Gb/s per pair, total up to 10 Gbps)
- Display Controller
  - One DisplayPort 1.4
  - Maximum Resolution 3840x2160 at 60 Hz (up to 36 bpp)
- Software-configurable RS-232/422/485 serial ports, CAN port
  - 120 Ohm Termination resistors for RS-422/485 through software Configuration
  - Fully jumper-less configuration
  - One port can be changed to a CAN bus
- Digital I/O (DIO)
  - 14-bit programmable GPIO
- Four USB 3.1 (Universal Serial Bus) Ports
  - Supports 10Gbit/s (Super Speed)
  - Two ports on the bottom PCIe connector (CN1)
  - Two ports, one on CN11 and one on CN21, USB A connectors
    - Automatic resettable over-current protection (1A @ 5 Vdc)
- M.2 expansion slots
  - E-key slot for Wi-Fi/Bluetooth connectivity with PCIe, USB2.0 and I2S interfaces (supported card sizes 3030 or 2230)
  - B-key slot for WWAN connectivity or SSD with PCIe, USB3.1, and micro-SIM interfaces (supported card sizes 3042 or 2242)
- Utility Port 2.0 Connector
  - 1x USB 2.0 (Universal Serial Bus) Port with 500 mA over-current protection
  - Hardware Reset input
  - Soft Power Button input
  - Battery input for Real Time Clock
- Power Management
  - ATX support for “Soft Off”
  - ATX Power signals

Block Diagram

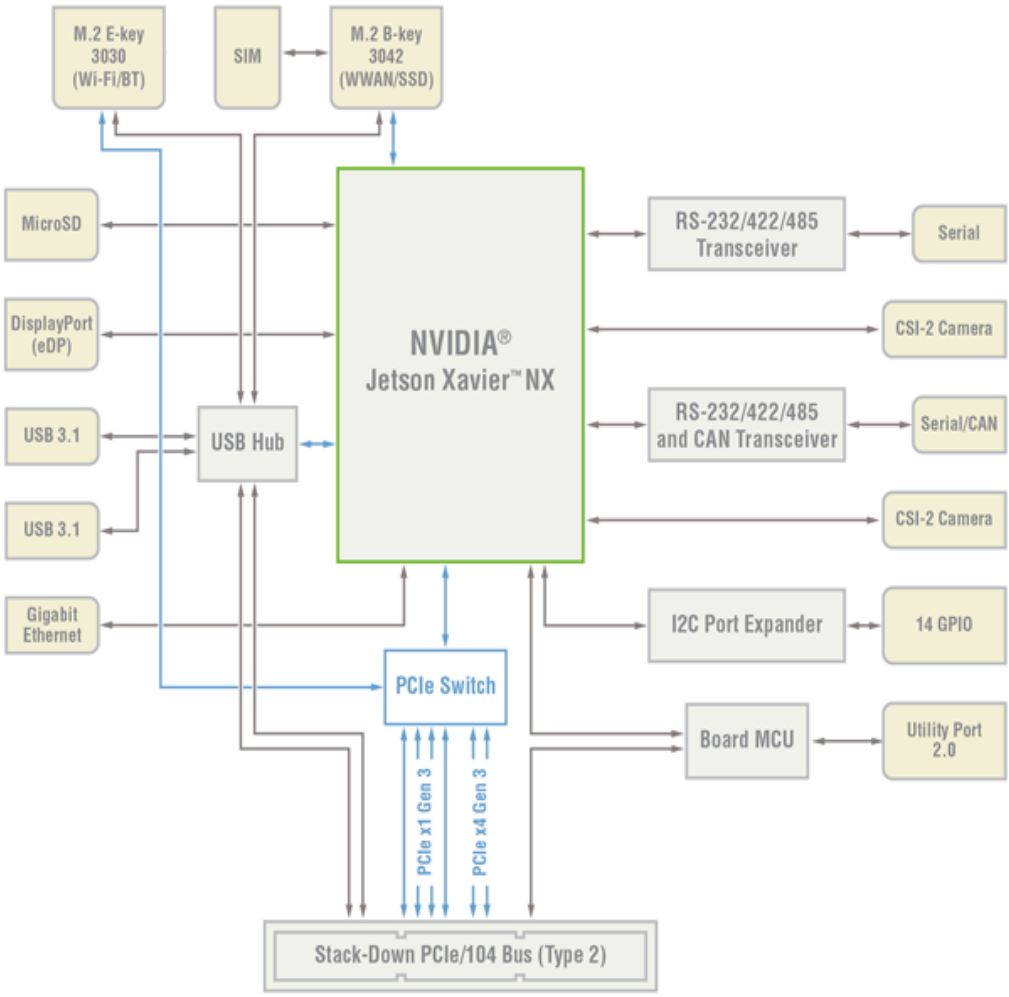

Figure 3 CNV36JXNX cpu/gpuModule Simplified Block Diagram

Specifications

Physical Characteristics

Basic dimensions and the weight of the CNV36JXNX are listed below. For a more detailed dimensional drawing, refer to the *Physical Dimensions* section.

- Dimensions
  - Board Size (connectors not included)
    - Length (L): 99.06 mm L (3.900")
    - Width (W): 115.57 mm W (4.550")
  - Stack-down Only Design
  - Stand-off Height Below the CPU:
    - All versions: 15.240mm (0.600")
- Weight: Approximately 0.248 Kg (0.547 lbs.) with fan Heatsink
- Weight: Approximately 0.210 Kg (0.463 lbs.) with flat Heat spreader
- Weight: Approximately 0.123 Kg (0.271 lbs.) without Heatsink
- IDAN Weight: Approximately TBD Kg (TBD lbs.)

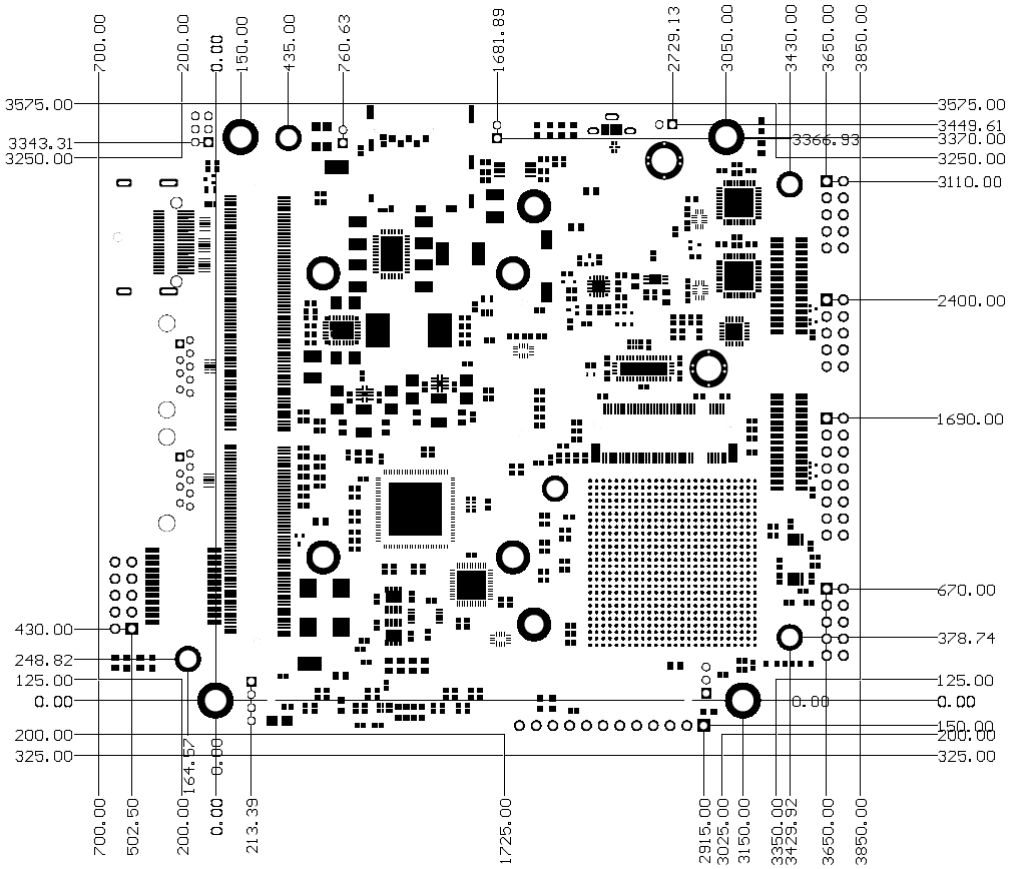

Figure 4 Dimensioned Drawing

Power Consumption

Exact power consumption depends on the actual application. Typical power consumption of the CNV36JXNX is listed in Table 2.

Table 2 Typical Power Consumption

Part Number	Typical PowerConsumption
CNV36JXNX68201HR	TBD W

Note *The measurements listed above are intended to represent common usage scenarios. The cpu/gpuModule's power consumption is heavily influenced by the running software and system activity.*

Operating Conditions

Table 3 Operating Conditions

Symbol	Parameter	Test Condition	Min.	Max.
V_{CC5}	5V Supply Voltage		4.75V	5.25V
V_{CC12}	12V Supply Voltage		NU	NU
V_{CCSTBY}	5V Standby Voltage[1]		4.75V	5.25V
I_{CCSTBY}	5V Standby Current[1]		-	800mA
Ta	Ambient Operating Temperature[2]		-40	+70C
Ts	Storage Temperature		-40	+70C
Rh	Humidity	Non-Condensing	0	90%
MTBF	Mean Time Before Failure (hours)	CNV36JXNX68201HR	TBD	

1. With supplied heat sink solution. Depending on the CPU usage, performance may degrade as the ambient temperature approaches the maximum. Contact RTD Tech Support for more information.
2. Calculation Model: Telcordia Issue 2; Calculation Method: Method 1 Case 3; Temperature: +30C; Environment: Ground Benign, Controlled

Electrical Characteristics

The table below lists the Electrical Characteristics of the CNV36JXNX. Operating outside of these parameters may cause permanent damage to the cpu/gpuModule.

Table 4 Electrical Characteristics

Symbol	Parameter	Test Condition	Min.	Max.
		USB Ports		
Ioc	Overcurrent Limit	Each Port USB2.0	500 mA	750 mA
Ioc	Overcurrent Limit	Each Port USB3.0	1.0 A	1.3 A
		Serial Ports - RS-232		
V_{IN}	Input Voltage Range	—	-15 V	+15V
V_{OH}	Output Voltage Swing	R_L = 3k	±-5.0 V	±7.0 V
V_{IH}	Input Voltage High	—	1.5 V	2.0 V
V_{IL}	Input Voltage Low	—	0.6 V	1.2 V
		Serial Ports - RS-422/485		
V_{OD1}	Differential Output	R_L = 100 Ohm	2.0 V	—
V_{OD2}	Differential Output	R_L = 54 Ohm	1.5 V	—
V_{OC}	Common Mode Output	R_L = 54 or 100 Ohm	—	3.0 V
V_{TH}	Differential Input Threshold	—	-200 mV	-50 mV
V_I	Absolute Max Input Voltage	—	-12 V	-12 V
		CAN Bus		
$V_{O(D)H}$	Bus Output Voltage Dominant CANH	R_L=60Ω	2.45 V	3.3V
$V_{O(D)L}$	Bus Output Voltage Dominant CANL	R_L=60Ω	0.5 V	1.25V
$V_{O(R)}$	Bus Output Voltage Recessive	R_L=60Ω	—	1.85 V
$V_{OD(D)}$	Differential Output Voltage Dominant	R_L=50-65Ω	1.6 V	3V
$V_{OD(R)}$	Differential Output Voltage Dominant	R_L=60Ω	-120 mV	12 mV
$I_{OS(D)}$	Output Short Circuit Current Dominant	V_{CANH}=-12V	-200 mA	—
$I_{OS(D)}$	Output Short Circuit Current Dominant	V_{CANL}=12V	—	200mA
$I_{OS(R)}$	Output Short Circuit Current Recessive	$V_{CANH,CANL}$=-12V…+12V	-5 mA	5 mA
V_{TH}	Differential Input Threshold		500 mV	900 mV
V_{CM}	Common Mode Range		-12 V	-12 V

Table 4 Electrical Characteristics

Symbol	Parameter	Test Condition	Min.	Max.
		DIO		
$\mathbf{I_{OH}}$	Output Current Source	V_{OH} = 2.4 V	29 mA	
$\mathbf{I_{OL}}$	Output Current Sink	V_{OL} = 0.5 V	17 mA	
$\mathbf{V_{IH}}$	Input Voltage High	—	1.8 V	6 V
$\mathbf{V_{IL}}$	Input Voltage Low	—	-0.3 V	0.8 V
$\mathbf{I_{DIOvcc}}$	Supply current	—		1 A
$\mathbf{T_{MIN}}$	Update Interval	—	TBD ms	
		Utility Port 2.0 Connector (CN5)		
$\mathbf{V_{RTC}}$	Input RTC Voltage[1]	—	2.5 V	3.6 V
$\mathbf{I_{RTC}}$	RTC Battery Current	—		2.2 uA
$\mathbf{I_{UTILvcc}}$	Utility Supply Current	—		1 A

1. Date and time lost when power is completely removed from the system including the CMOS battery. Date and time are not required for board operation. BIOS will set default values on the next power cycle.

Migrating to RTD's NVIDIA® Jetson Series cpu/gpuModule

When migrating to RTD's NVIDIA® Jetson Series cpu/gpuModule, there are several differences from preceding RTD cpu/gpuModule product families of which the customer should be aware.

Connector Pinout & Function Differences

The CNV36JXNX cpu/gpuModule have several connector-related differences from a standard RTD CPU, which are summarized below. Complete information about the connectors on the CNV36JXNX can be found in Chapter 3, *Connecting the cpu/gpuModule*.

New I/O Connectors

The CNV36JXNX cpu/gpuModule introduces new I/O connectors that were not present on some previous RTD cpuModules:

- **USB 3.1 Connectors (CN11 and CN21)**
  - Provide USB 3.0 connections via a Type A receptacle.
- **MIPI CSI-2 Connectors (CN13 and CN23)**
  - Provide camera connectivity using MIPI CSI-2 interface and Flexible Flat Cables

Connector Differences

While some connectors on the CNV36JXNX have identical pinouts as on previous RTD cpuModule generations, the features of the connectors are sometimes different. Other connectors have entirely different pinouts than those found on previous cpuModule generations. Connectors with pinout and feature differences include:

- **Auxiliary Power Connector (CN3)**
  - RTD NVIDIA® Jetson Xavier NX Series CPU requires 5V only. Power may be connected to CN3.
  - 12 pins (unlike the 10-pin connector on RTD Montevina cpuModules)
  - +5V and +12V inputs (unlike +5V only auxiliary power connectors found on Montevina cpuModule).
  - The Auxiliary Power Connector excludes ATX power signaling. The ATX power signals are present on the PCIe/104 Type 2 connector.
- **DIO Connector (CN6)**
  - RTD NVIDIA® Jetson Xavier NX Series CPU provide only one port of 14 IO. Previous cpuModules provide two ports.
- **COM Ports (CN7 and CN8)**
  - Does not support dual mode like previous cpuModules
  - CN7 has the ability to be switched into a CAN bus mode

Software Differences

The CNV36JXNX cpu/gpuModule have several software-related differences, which are summarized below. Complete information about these CNV36JXNX features can be found in Chapter 4, *Using the cpu/gpuModule*.

DIO

While other RTD cpuModules (such as the CMA34CR-series) feature an aDIO, CNV36JXNX only supports a 14-bit programmable GPIO. Since the CNV36JXNX doesn't support aDIO, it will not be possible to migrate any legacy software based on RTD's Advanced Digital I/O.

Linux for Tegra

Previous generation of RTD cpuModules contained a Fail-safe Boot ROM image or UEFI shell, which permitted the cpuModule to boot to a prompt even when no disk drives were connected to the system. Since the CNV36JXNX is only a carrier module for the NVIDIA® Jetson Xavier NX, this product can only run operating systems with support packages provided by NVIDIA. RTD will ship CNV36JXNX cpu/gpuModule with pre-loaded version of Linux for Tegra.

Contact Information

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Chapter 2 Getting Started

For many users, the factory configuration of the CNV36JXNX cpu/gpuModule can be used to get a PC/104 system operational. You can get your system up and running quickly by following the simple steps described in this chapter, which are:

Proper Grounding Techniques

Before removing the CNV36JXNX from its static bag, proper grounding techniques must be used to prevent electrostatic discharge (ESD) damage to the cpu/gpuModule. Common grounding procedures include an anti-static mat on a workbench, which may connect to an anti-static wrist strap (also known as an ESD wrist strap) on the wrist of the technician or engineer.

1. Before connecting the cpu/gpuModule, the user must be properly grounded to prevent electrostaticdischarge (ESD).
2. Connect the Utility Port 2.0 cable to CN5.
3. Connect a USB keyboard and mouse.
4. Connect a monitor to the DisplayPort connector CN4.
5. Connect power.
6. Boot

Refer to the remainder of this chapter for details on each of these steps.

Selecting the Stack Order for the CNV36JXNX

There are several things to consider when selecting the order of boards in the stack. Before selecting the order, be sure to determine which bus connector on each board is the “Active” bus. Typically, if a peripheral module has both PCIe and PCI bus connectors, only the PCIe is active, and the PCI is pass-through. The following is a list of rules to use to determine the stack order:

1. The PCIe connector is on the bottom of the cpu/gpuModule, therefore it must be the uppermost card in the stack.
2. The CPU module has no direct SATA links. Any added SATA functionality will consume PCIe resources.
3. Generally, keep higher speed boards closer to the CPU.
4. If using lane repopulation, consume all lanes before making the last lane repopulate, to preserve bandwidth.
5. Keep the power supply as close as possible to the CPU due to the high instantaneous current demands of the CPU.

Connecting to the Stack

The bus connectors of the cpu/gpuModule are simply plugged onto a PC/104 stack to connect to other devices.Follow the procedure below to ensure that stacking of the modules does not damage connectors or electronics.

WARNING *Do not force the module onto the stack! Wiggling the module or applying toomuch pressure may damage it. If the module does not readily press into place, remove it, check for bent pins or out-of-place keying pins, and try again.*

For mechanical dimensions, including board-to-board spacing, see *Physical Dimensions*.

1. Turn off power to the PC/104 system or stack.
2. Always work at an ESD protected workstation and wear a grounded wrist-strap.
3. Select and install stand-offs to properly position the cpu/gpuModule on the stack.
4. Remove the cpu/gpuModule from its anti-static bag.
5. Check that pins of the bus connector are properly positioned.
6. Check the stacking order; make sure all the busses used by the peripheral cards are connected to the cpu/gpuModule.
7. Hold the cpu/gpuModule by its edges and orient it so the bus connector pins line up with the matchingconnector on the stack.
8. Gently and evenly press the cpu/gpuModule onto the PC/104 stack.

Power Input Connections

Power to the board must come from the bottom PCIe/104 Type 2 bus connector (**CN1**), or the auxiliary power connector (**CN3**). These connectors provide the required +5V DC voltage rail input to the cpu/gpuModule.

Booting the CNV36JXNX cpu/gpuModule for the First Time

You can now apply power to the cpu/gpuModule. The CNV36JXNX will be shipped with pre-loaded image of Linux for Tegra (L4T) based on Ubuntu 18.04 LTS. Upon first boot, the cpu/gpuModule will boot to the Ubuntu software license agreement page. After agreeing to the software license, the user will be prompted to assign a username and password. This will be the root username and password for the system.

Chapter 3 Connecting the cpu/gpuModule

This chapter provides information on all CNV36JXNX cpu/gpuModule connectors.

Connector Locations – page 23

Auxiliary Power (CN3) – page 26

Utility Port 2.0 Connector (CN5) – page 28

DisplayPort Connector (CN4) – page 30

Serial Port 1 (CN7) and Serial Port 2 (CN8) – page 32

Ethernet (10/100/1000Base-T and -TX) Connector (CN20) – page 37

PCIe/104 Type 2 Bus (CN1 - Bottom) – page 39

Reserved (CN16 and CN12) – page 42

Connector Locations

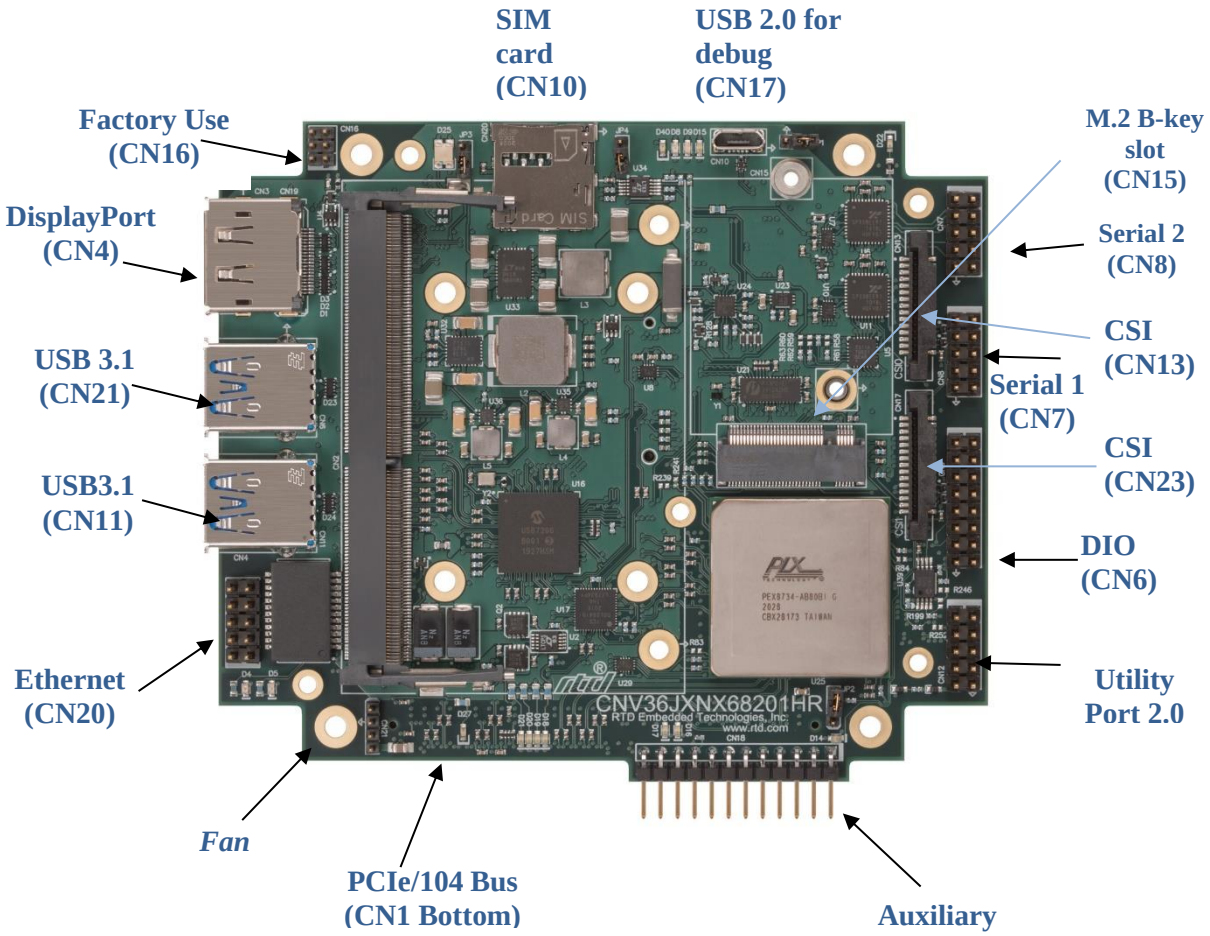


Figure 5 CNV36JXNX cpu/gpuModule (top view)

Note *Pin 1 of each connector is indicated by a white silk-screened square on the top side ofthe board and a square solder pad on the bottom side of the board. Pin 1 of the bus connectors match when stacking PC/104 modules.*

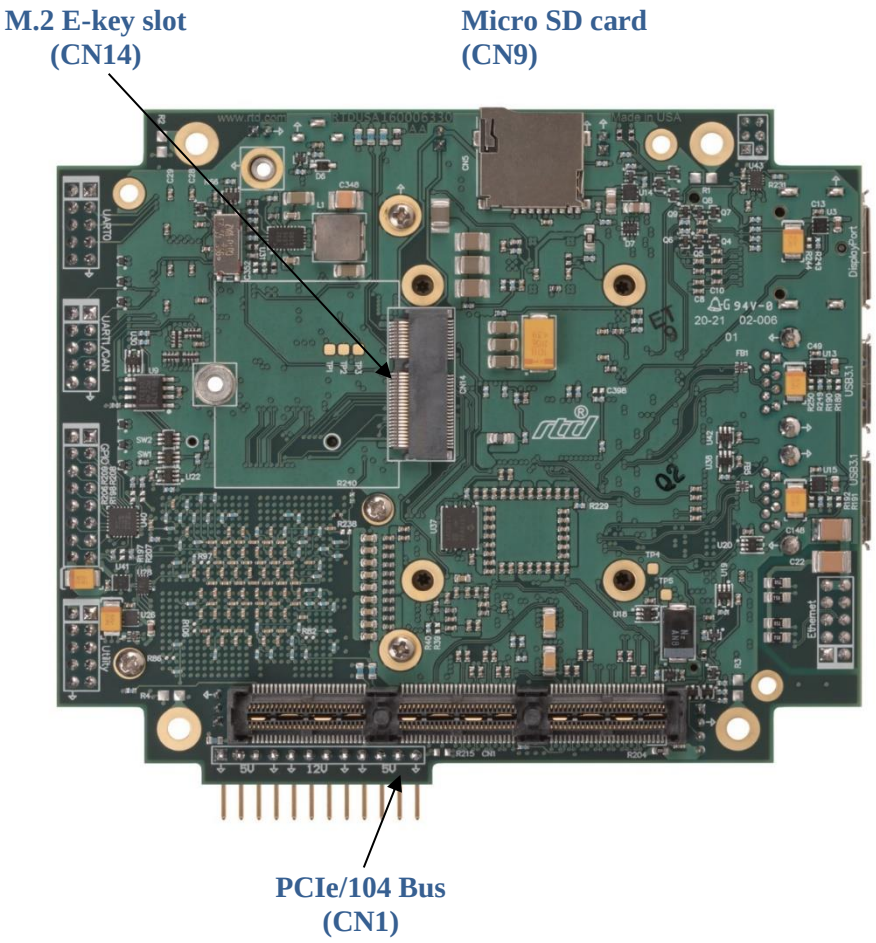


Figure 6 CNV36JXNX cpu/gpuModule (bottom view)

Table 5 CNV36JXNX Basic Connectors

Connector	Function	Size and Pitch	Mating Connector
CN1	PCIe/104 Type 2 Bus (Bottom)	156-pin, 0.635mm	Samtec ASP-129637-03
CN3	Auxiliary Power	1x12, 0.1”	FCI 65039-025LF (housing model number only)
CN4	DisplayPort	Molex P/N Series 47272-xxxx	Molex P/N Series68783-xxxx
CN5	Utility Port 2.0	2x5, 0.1”	3M 89110-0001
CN6	DIO	2x8, 0.1”	3M 89116-0001
CN7	Serial Port 1	2x5, 0.1”	3M 89110-0001
CN8	Serial Port 2	2x5, 0.1”	3M 89110-0001
CN11	USB 3.1	Samtec USB Series USB3-A	Samtec USB3-A-S-S-TH
CN21	USB 3.1	Samtec USB Series USB3-A	Samtec USB3-A-S-S-TH
CN12	*Fan (reserved)*	1x4, 2mm	FCI 69305-004LF
CN20	Ethernet	2x5, 0.1”	3M 89110-0001
CN10	SIM Card Slot for M.2 Cellular Peripherals	N/A	Nano (with adapter) or Micro SIM Card
CN9	Micro SD Card Slot for Memory Expansion	N/A	Micro SD Card
CN14	M.2 E-Key Peripheral Expansion	75pin, 0.5mm	M.2 E-Key 3030 or 2030
CN15	M.2 B-Key Peripheral Expansion	75pin, 0.5mm	M.2 B-Key 3042 or 2042
CN17	USB Debug Port		Micro USB 2.0

Auxiliary Power (CN3)

The Auxiliary Power connector (**CN3**) can be used to supply power to devices that are attached to the cpu/gpuModule. These devices include hard drive, front-end boards for data acquisition systems, and other devices.

Power can also be conveyed to the module through the Auxiliary Power connector (**CN3**). The CNV36JXNX cpu/gpuModule requires +5 VDC and ground for operation.

Note *Although it is possible to power the cpu/gpuModule through the Auxiliary Power connector,the preferred method is to power it through the bus connector from a power supply in the stack. The cpu/gpuModule can have large current transients during operation, which make powering it through wires difficult. Powering through the bus eliminates problems such as resistive voltage drop and lead inductance transients.*

WARNING *There is no reverse voltage protection on CN3. Reverse connecting CN3 will void the warranty. Always check polarity before applying power.*

If using the Auxiliary Power connector to power the system, care must be taken to ensure good power connections. The power and ground leads must be twisted together, or as close together as possible to reduce lead inductance. A separate lead must be used for each of the power pins. All 5V pins and all ground pins must be connected. Do not use wire smaller than 20 gauge. The power supply solution must be verified by measuring voltage at the Auxiliary Power Connector and verifying that it meets the input voltage specifications. The voltage at the connector should be checked with an oscilloscope while the system is operational.

WARNING *This 12-pin power connector is* ***not*** *compatible with some older generations of RTD cpuModules.*

WARNING *If you connect power incorrectly, the module will almost certainly be destroyed. Please verify power connections to the module before applying power.*

Table 6 Auxiliary Power Connector (CN3)

Pin	Signal	Function
1	GND	Ground
2	+5 V	+5 Volts DC
3	+5 V	+5 Volts DC
4	GND	Ground
5	GND	Ground
6	+12 V	+12 Volts DC
7	+12 V	+12 Volts DC
8	GND	Ground
9	GND	Ground
10	+5 V	+5 Volts DC
11	+5V	+5 Volts DC
12	GND	Ground

WARNING *The user is responsible for any over-voltage and reverse voltage protection that would be necessary to power through CN3. Over-voltage damage at CN3 is not covered under warranty.*

Figure 7 Power Connector (CN3)

Utility Port 2.0 Connector (CN5)

The Utility Port 2.0 connector implements the following functions:

- 1x USB 2.0 (Universal Serial Bus) Port
- Hardware Reset input
- Soft Power Button input
- Battery input for Real Time Clock

The NVIDIA® Jetson series cpu/gpuModule does not provide speaker functionality, therefore pin 1 is not connected. It is safe to use any device that has speaker connected to pin 1 (eg. ADP076 utility module).

Table 7 provides the pinout of the Utility Port 2.0 connector.

Table 7 Utility Port 2.0 Connector (CN5)

Pin	Signal	Function	In/Out
1	NC	Not Connected	
2	PWR	+5 V	out
3	RESET#	Manual Push-Button Reset	in
4	DATA–	Bidirectional data line for USB1	in/out
5	PWRSW#	Soft Power Button	in
6	DATA+	Bidirectional data line for USB1	in/out
7	GND	Ground	out
8	GND	Ground	out
9	BAT	RTC Battery Input	in
10	Shield GND	Shield Ground	out

***WARNING** The pinout of the Utility Port 2.0 connector is **not** compatible with some older generations of RTD cpuModules. Attaching a legacy Utility Port harness to the Utility Port 2.0 connector may damage or destroy the cpu/gpuModule.*

Facing the connector pins, the pinout is: (pin one is indicated by a square solder pad and white silk screen)

9	7	5	3	1
BAT	**GND**	**PWRSW#**	**RESET#**	**NC**
Shield GND	**GND**	**DATA+**	**DATA-**	**PWR**
10	**8**	**6**	**4**	**2**

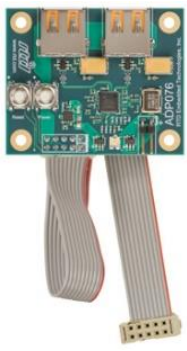


Figure 8. Utility Port 2.0 Accessory Cable

USB 2.0 Connection

One USB 2.0 compliant connector is available on connector **CN5**. Table 8 provides the pinout of the USB connector.

System Reset

Pin 3 of the Utility Port 2.0 connector allows connection of an external push-button to manually reset the system. The push-button is normally open and connected to ground when pushed. The reset button can be used to enter into *recovery mode*. When the cpu/gpuModule is turned off and power button is pressed while pressing reset button, the system will enter recovery mode. Details of recovery mode can be found in the *Force Recovery Mode* section on page 44

Soft Power Button

Pin 5 of the Utility Port 2.0 connector allows connection of an external push-button to send a soft power signal to the system. The push-button is normally open and connected to ground when pushed. For more information on the modes of the Soft Power Button, refer to the *Power Management* section in Chapter 4, *Using the cpu/gpuModule*

Battery

Pin 9 of the Utility Port 2.0 connector is the connection for an external backup battery. This battery is used by the cpu/gpuModule when system power is removed to preserve the date and time of the real time clock (RTC).

Connecting a battery is only required to maintain time when power is completely removed from the cpu/gpuModule. A battery is not required for board operation.

DisplayPort Connector (CN4)

The DisplayPort connector on the CNV36JXNX cpu/gpuModule is a standard PC DisplayPort connector completed with latch holes to provide a rugged connecting solution for latching DisplayPort cables.

The DisplayPort supports all mandatory features of the VESA DisplayPort (DP) 1.4 standard and supports audio over the connection. Full bandwidth transmission is supported over a 2-meter cable, with reduced bandwidth transmission supported up to a length of 15 meters.

The connection can directly output single-link HDMI and DVI signals by using active converter cables. Simple passive cables are not supported.

Table 8 provides the pinout of the DisplayPort connector.

Table 8 DisplayPort Connector (CN4)

Pin	Signal	Standard Function	DVI / HDMI mode[1]	In/Out
1	LN0+	Main Link, Lane 0 (positive)	TMDS Channel 2 (positive)	out
2	GND	Ground	Ground	out
3	LN0-	Main Link, Lane 0 (negative)	TMDS Channel 2 (negative)	out
4	LN1+	Main Link, Lane 1 (positive)	TMDS Channel 1 (positive)	out
5	GND	Ground	Ground	out
6	LN1-	Main Link, Lane 1 (negative)	TMDS Channel 1 (negative)	out
7	LN2+	Main Link, Lane 2 (positive)	TMDS Channel 0 (positive)	out
8	GND	Ground	Ground	out
9	LN2-	Main Link, Lane 2 (negative)	TMDS Channel 0 (negative)	out
10	LN3+	Main Link, Lane 3 (positive)	TMDS Clock (positive)	out
11	GND	Ground	Ground	out
12	LN3-	Main Link, Lane 3 (negative)	TMDS Clock (negative)	out
13	CFG1	Configuration Pin 1	Cable Adapter Detect	out
14	CFG2	Configuration Pin 2	Consumer Electronics Control[2]	out
15	AUX+	Auxiliary Channel (positive)	DDC Clock	in/out
16	GND	Ground	Ground	out
17	AUX-	Auxiliary Channel (negative)	DDC Data	in/out
18	HPD	Hot Plug Detect	Hot Plug Detect	in
19	DPG	Return for DPV	Return for DPV	out
20	DPV	+3.3V DC Power	+3.3V DC Power	out

1. Requires special passive adapter
2. HDMI mode only

Facing the connector pins of the DisplayPort connector (**CN4**), the pinout is:

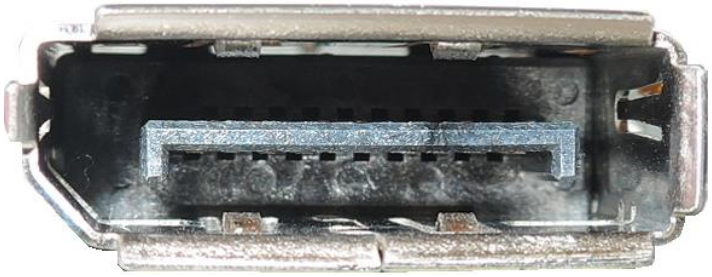


Figure 9 DisplayPort Connector CN4

19	**17**	**15**	**13**	**11**	**9**	**7**	**5**	**3**	**1**
DPG	AUX-	AUX+	CFG1	GND	LN2-	LN2+	GND	LN0-	LN0+
DPV	HPD	GND	CFG2	LN3-	LN3+	GND	LN1-	LN1+	GND
20	**18**	**16**	**14**	**12**	**10**	**8**	**6**	**4**	**2**

Serial Port 1 (CN7) and Serial Port 2 (CN8)

The serial ports can be configured using the setup shell script *cvn36jxnx_serial.sh* found in SWP-700020067. The serial ports are not set to any mode by default. The setup script, *cvn36jxnx_serial.sh*, must be used to set a mode.

Serial Port 1 (COM1) is implemented on connector **CN7**, and Serial Port 2 (COM2) is implemented on connector **CN8**. The serial ports are normally configured as PC compatible full-duplex RS-232 ports, but you may reconfigure these ports as half-duplex RS-422 or full-duplex RS-422 or RS-485. Serial ports can be accessed from Linux according to Table 9.

Table 9 Linux Device Serial Ports

Connector	Device file
CN7	/dev/ttyTHS0
CN8	/dev/ttyTHS1

Serial Port UART

The serial ports are implemented with a 16550/16450-compatible UART (Universal Asynchronous Receiver/ Transmitter). This UART is capable of baud rates up to 1 Mbps in RS232. RS422/RS485 mode can use faster rates. The default mode is 16450.

It is possible to change the slew rate for the UARTs of the cpu/gpuModule to allow the serial ports to operate at higher speeds than 115200 bps.

RS-232 Serial Port (Default)

Table 10 provides the serial port connector pinout and shows how to connect to an external DB-25 or DB-9 compatible serial connector. DCD, DSR, DTR, and RI pins are connected to the transceiver, but are not functional. The NX module does not implement these signals.

Table 10 Serial Port in RS-232 Mode

Pin	Signal	Function	In/Out	DB-25	DB-9
1	-	N/C	-	8	1
2	-	N/C	-	6	6
3	RXD	Receive Data	in	3	2
4	RTS	Request To Send	out	4	7
5	TXD	Transmit Data	out	2	3
6	CTS	Clear To Send	in	5	8
7	-	N/C	-	20	4
8	-	N/C	-	22	9
9	GND	Signal Ground	—	7	5
10	GND	Signal Ground	—	—	—

Facing the serial port’s connector pins, the pinout is:

9	**7**	**5**	**3**	**1**
GND	N/C	**TXD**	**RXD**	N/C
GND	N/C	**CTS**	**RTS**	N/C
10	**8**	**6**	**4**	**2**

RS-422 or RS-485 Serial Port

You may use *cvn36jxnx_serial.sh* setup shell script to configure the serial ports as RS-422 or RS-485. In this case, you must connect the serial port to an RS-422 or RS-485 compatible device.

When using RS-422 mode, you can use the serial ports in either half-duplex (two-wire) or full-duplex (four-wire) configurations.

Note *The cpu/gpuModule incorporates a software 120 Ohm termination resistor. Termination is usually necessaryon all RS-422 receivers and at the ends of the RS-485 bus. Termination resistors can be enabled using the cvn36jxnx_serial.sh setup shell script.*

When using full-duplex in RS-422 mode, connect the ports as shown in Table 11.

Table 11 Full-Duplex Connections

Port 1	Port 2
RXD+	TXD+
TXD+	RXD+
RXD–	TXD–
TXD–	RXD–

In RS-485 mode, the connection of the ports is always half-duplex, as the transceivers' transmitters are connected to the receivers internally.

RS-422 Mode Pinout

Table 12 provides the serial port connector pinout when RS-422 mode is enabled.

Table 12 Serial Port in RS-422 Mode

Pin	Signal	Function	In/Out	DB-9
1	TXD–	Transmit Data (–)	out	1
2	—	Reserved	—	6
3	TXD+	Transmit Data (+)	out	2
4	—	Reserved	—	7
5	RXD+	Receive Data (+)	in	3
6	—	Reserved	—	8
7	RXD–	Receive Data (–)	in	4
8	—	Reserved	—	9
9	GND	Signal Ground	—	5
10	GND	Signal Ground	—	—

Facing the serial port connector, the pinout is:

9	7	5	3	1
GND	RXD-	RXD+	TXD+	TXD-
GND	Rsvd	Rsvd	Rsvd	Rsvd
10	8	6	4	2

WARNING *The pinout of the COM ports in RS-422 mode is* ***not*** *compatible with some oldergenerations of RTD cpuModules.*

RS-485 Mode Pinout

Table 13 provides the serial port connector pinout when RS-485 mode is enabled

Table 13 Serial Port in RS-485 Mode

Pin	Signal	Function	In/Out	DB-9
1	D–	Data (–)	in/out	1
2	—	Reserved	—	6
3	D+	Data (+)	in/out	2
4	—	Reserved	—	7
5	—	Reserved	—	3
6	—	Reserved	—	8
7	—	Reserved	—	4
8	—	Reserved	—	9
9	GND	Signal Ground	—	5
10	GND	Signal Ground	—	—

Facing the serial port connector, the pinout is:

9	7	5	3	1
GND	**Rsvd**	**Rsvd**	**D+**	**D-**
GND	**Rsvd**	**Rsvd**	**Rsvd**	**Rsvd**
10	**8**	**6**	**4**	**2**

WARNING *The pinout of the COM ports in RS-422 mode is* ***not*** *compatible with some oldergenerations of RTD cpuModules.*

Note *When using the serial port in RS-485 mode, the serial transmitters are enabled and disabled under software control. The transmitters can be enabled by manipulating the RequestTo Send (RTS*) signal of the serial port controller.*

- RTS* = 0, and serial transmitters are disabled
- RTS* = 1, and serial transmitters are enabled

CAN Bus

You may use *cvn36jxnx_serial.sh* setup shell script to configure the CN7 for CAN Bus. The CAN transceiver on the CNV36JXNX can support data rates up to 5 Mbps.

Table 13 provides the CN7 connector pinout when CAN Bus is enabled

Table 14 CN7 in CAN Bus Mode

Pin	Signal	Function	In/Out	DB-9
1	—	Reserved	—	1
2	—	Reserved	—	6
3	CANL	Data Low	in/out	2
4	CANH	Data High	in/out	7
5	—	Reserved	—	3
6	—	Reserved	—	8
7	—	Reserved	—	4
8	—	Reserved	—	9
9	GND	Signal Ground	—	5
10	GND	Signal Ground	—	—

Facing the serial port connector, the pinout is:

9	7	5	3	1
GND	**Rsvd**	**Rsvd**	**CANL**	**Rsvd**
GND	**Rsvd**	**Rsvd**	**CANH**	**Rsvd**
10	**8**	**6**	**4**	**2**

Note *When using the serial port in CAN Bus mode, you must load the kernel modules. Below are the commands needed to load the kernel modules*

modprobe can
modprobe can-raw
modprobe mttcan

You can use the Ubuntu network interface to setup the can network Below is the following command to setup a network with bitrate at 500kbps

ip link set can0 up type can bitrate 500000

Digital I/O Port (CN6)

Connector **CN6** is configured as a DIO port. DIO is 14 digital bits configured as an 8-bit programmable and 6-bit programmable I/O, providing any combination of inputs and outputs. Refer to *Digital I/O* — page *44* for informationon programming the DIO.

Table 15 DIO Pinout (CN6)

CN6 Pin	Function	CN6 Pin	Function
1	I/0-00	2	I/0-01
3	I/0-02	4	I/0-03
5	I/0-04	6	I/0-05
7	I/0-06	8	I/0-07
9	I/0-12	10	I/0-13
11	I/0-08	12	I/0-09
13	I0-10	14	I/0-11
15	GND	16	+5 V[1]

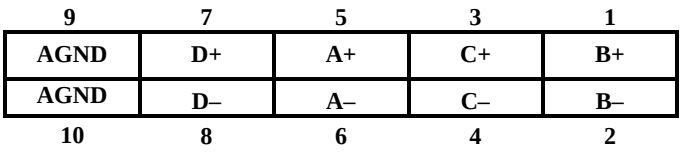
Ethernet (10/100/1000Base-T and -TX) Connector (CN20)

This connector provides a 10/100/1000Base-T Ethernet connection. **Table 16** provides the pinout of the Ethernet connector. For 1000Base-T, all four pairs are used for transmit and receive.

The LED D4 (green LED) indicates the state of the link and D5 (yellow LED) blinks when there is activity on the link.

Table 16 Ethernet Connector (CN20)

RJ-45 Pin	10-Pin DIL Pin	Signal	Function
3	1	B+ (RX+)	Receive+ (10/100)
6	2	B- (RX–)	Receive– (10/100)
4	3	C+	
5	4	C-	
1	5	A+ (TX+)	Transmit+ (10/100)
2	6	A- (TX–)	Transmit– (10/100)
7	7	D+	
8	8	D-	
—	9	AGND	Ethernet Ground
—	10	AGND	Ethernet Ground



MIPI CSI-2 Camera Connectors (CN13, CN23)

CN13 and CN23 are FFC (Flexible Flat Cable) connectors which can be used to interface cameras to the Jetson Xavier NX CPU. This interface is designed for internal connectivity so the maximum signal length can be approximately 1.5 ft.

Table 17 MIPI CSI-2 Camera Connector Pinout

Pin	Name	Description
1	GND	Ground
2	D0-	Data lane 0
3	D0+	
4	GND	Ground
5	D1-	Data lane 1
6	D1+	
7	GND	Ground
8	CLK-	Clock
9	CLK+	
10	GND	Ground
11	PWDN	Power Down
12	MCLK	Master Clock
13	SCL	I^2C interface for control
14	SDA	
15	3.3V	3.3V power for camera

PCIe/104 Type 2 Bus (CN1 - Bottom)

Connector **CN1** carries the signals of the PCIe/104 PCIe bus. These signals match definitionsfound in the **PCI/104-Express & PCIe/104 Specification Version 3.1** from the PC/104 Embedded Consortium. Table 17 lists the pinouts of the PC/104-Express bus connector.

WARNING *Not all PCIe cards are compatible with the PCIe/104 Type 2 connector. Be surethat all boards attached to this bus are compatible before powering the system.*

Table 18 PCIe/104 Type 2 Bus Signal Assignments [1]

Pin	Signal		Signal	Pin
1	USB_OC#		PE_RST#	2
3	+3.3V[2]		+3.3V[2]	4
5	USB_1p		USB_0p	6
7	USB_1n		USB_0n	8
9	GND		GND	10
11	PEx1_1Tp		PEx1_0Tp	12
13	PEx1_1Tn		PEx1_0Tn	14
15	GND		GND	16
17	PEx1_2Tp		PEx1_3Tp	18
19	PEx1_2Tn		PEx1_3Tn	20
21	GND		GND	22
23	PEx1_1Rp		PEx1_0Rp	24
25	PEx1_1Rn		PEx1_0Rn	26
27	GND	+5 Volts	GND	28
29	PEx1_2Rp		PEx1_3Rp	30
31	PEx1_2Rn		PEx1_3Rn	32
33	GND		GND	34
35	PEx1_1Clkp		PEx1_0Clkp	36
37	PEx1_1Clkn		PEx1_0Clkn	38
39	+5V_STBY		+5V_STBY	40
41	PEx1_2Clkp		PEx1_3Clkp	42
43	PEx1_2Clkn		PEx1_3Clkn	44
45	CPU_DIR		PWRGOOD	46
47	Reserved		Reserved	48
49	Reserved		Reserved	50
51	Reserved		PSON#	52

Table 18 PCIe/104 Type 2 Bus Signal Assignments [1]

Pin	Signal		Signal	Pin
53	WAKE#		STK1	54
55	GND		GND	56
57	PEx4_1T(0)P		PEx4_0T(0)P	58
59	PEx4_1T(0)N		PEx4_0T(0)N	60
61	GND		GND	62
63	PEx4_1T(1)P		PEx4_0T(1)P	64
65	PEx4_1T(1)N		PEx4_0T(1)N	66
67	GND		GND	68
69	PEx4_1T(2)P		PEx4_0T(2)P	70
71	PEx4_1T(2)N		PEx4_0T(2)N	72
73	GND		GND	74
75	PEx4_1T(3)P	+5 Volts	PEx4_0T(3)P	76
77	PEx4_1T(3)N		PEx4_0T(3)N	78
79	GND		GND	80
81	NC (SATA_T1_P)		NC (SATA_T0_P)	82
83	NC (SATA_T1_N)		NC (SATA_T0_N)	84
85	GND		GND	86
87	USB3_T1_P		USB3_T0_P	88
89	USB3_T1_N		USB3_T0_N	90
91	GND		GND	92
93	Reserved		Reserved	94
95	Reserved		Reserved	96
97	GND		GND	98
99	Reserved		Reserved	100
101	Reserved		Reserved	102
103	GND		GND	104

Table 18 PCIe/104 Type 2 Bus Signal Assignments [1]

Pin	Signal		Signal	Pin
105	STK2		Reserved	106
107	GND		GND	108
109	Reserved		Reserved	110
111	Reserved		Reserved	112
113	GND		GND	114
115	Reserved		Reserved	116
117	Reserved		Reserved	118
119	GND		GND	120
121	Reserved		Reserved	122
123	Reserved		Reserved	124
125	GND		GND	126
127	Reserved		Reserved	128
129	Reserved	+12 Volts	Reserved	130
131	GND		GND	132
133	Reserved		NC (SATA_0Rp)9	134
135	Reserved		NC (SATA_0Rn	136
137	GND		GND	138
139	Reserved		Reserved	140
141	Reserved		Reserved	142
143	GND		GND	144
145	Reserved		Reserved	146
147	Reserved		Reserved	148
149	GND		GND	150
151	Reserved		Reserved	152
153	Reserved		Reserved	154
155	GND		GND	156

1. Signals marked with (#) are active low.
2. +3.3V is not required for board operation.

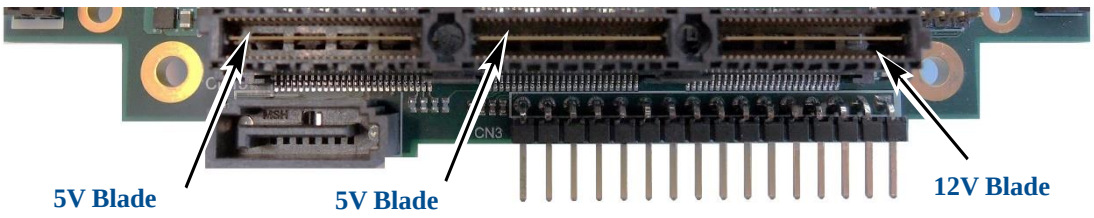


Figure 10 Locations of 5V and 12V Power Blades

PCIe/104 Type 2 Compatibility

The PCIe/104 Type 2 connector is compatible with any PCI/104-Express or PCIe/104 peripheral module that does not use the x16 Link. This includes any card that uses the PCIe x1 or x4 links, USB, or a power supply.

If a card is installed that is not compatible with the Type 2 connector, the CPU will keep the system in soft-off, and the LED D27 will be lit to indicate that there is a Bus Stacking Error.

PCIe Link Configuration

This cpu/gpuModule supports a total of four PCIe x1 links and two PCIe x4 links for system expansion. The PCIe links are routed to CN1

Reserved (CN16 and CN12)

CN16 is reserved for factory use and should be left unconnected.

CN12 is the fan connector and is for factory use only.

Chapter 4 Using the cpu/gpuModule

This chapter provides information for users who wish to develop their own applications programs for the CNV36JXNX cpu/gpuModule.

This chapter includes information on the following topics:

Operating System Specific Usage – page 44

Digital I/O – page 44

Power Management – page 45

Thermal Management – page 46

Operating System Specific Usage

Flashing the OS onto the NVIDIA eMMC

Force Recovery Mode

NVIDIA® Jetson Xavier™ NX must be in Force Recovery Mode to flash the onboard eMMC. To place the NX in Force Recovery Mode, follow the steps below using the power and reset buttons on the Utility Port (CN5).

1. Connect a micro USB cable to the debug port (CN17).
2. Power on the board.
3. Place the board into soft off by holding the power button for five seconds.
4. While holding the power button, press the reset button.
5. Release the power button.
6. Release the reset button.

If the process was successful, the attached host CPU will show a new USB device.

Linux for Tegra®

The CNV36JXNX is fully supported with Linux for Tegra kernel version 4.9. Earlier versions of the kernel may not contain drivers for all devices and may not work as expected.

At the time of publication, RTD has validated Linux for Tegra 4.9.

See https://developer.nvidia.com/embedded/jetson-linux-r341 for NVIDIA® Jetson™ Linux Driver Package.

Digital I/O

This board supports 14 bits of 5V tolerant TTL/CMOS compatible digital I/O (TTL signaling).

When the CPU powers on, all digital I/O lines are programmed as inputs, with 100K pull ups on each line. Meaning that all inputs are known to be logic high at power on or when left floating and set as inputs.

Power Management

The CNV36JXNX cpu/gpuModule supports powering mechanisms which allow the cpu/gpuModule to change power consumption and temperature and achieve minimal power consumption states. These features include thermal throttling, as well as low power modes. Various wake options are also available to resume normal system power.

Power Management

The cpu/gpuModule supports several different low power modes, including the S3 and S5 sleeping states. These suspend modes are described below:

- **S3 (Suspend to RAM):** When the system wakes from this mode, operating systems allow applications to resume where they left off, as the state of the application is preserved in memory.
- **S5 (Soft-Off):** The system is in a soft off state and must be rebooted when it wakes.

Power Button Modes

The soft power button input of the Utility Port 2.0 connector (**CN5**) can be configured by the operating system as a suspend button (transition to S3) or as soft power button (transition to S5). Consult your operating system documentation for information on how to configure it. The power button will always cause a transition to S5 if pressed for 4 seconds or longer, without interaction from the operating system.

The soft power button of the Utility Port 2.0 connector (**CN5**) is the only mechanism to wake the system from S5.

Low-Power Wake Options

The cpu/gpuModule supports several methods of waking from a low power state.

- **Resume from USB:** Operating systems that support S3 permit waking the system from the USB interfaces. Common USB wake methods include insertion of a USB device, a USB keyboard stroke, or movement from another USB device, such as mouse.

AT vs. ATX Power Supplies

Both AT and ATX power supplies may be used with the CNV36JXNX cpu/gpuModule, however AT power supplies do not provide any standby power to the cpu/gpuModule.

ATX power supplies do provide a standby power, thus allowing the system to utilize all low power modes supported by the hardware. When an ATX supply is used to power the cpu/gpuModule, lower power modes can be achieved. During these low power modes, the standby power from the ATX power supply provides power to a small circuit on the CPU, which is used to watch for a system wake event.

ATX Power Supply Signals

The PCIe/104 Type 2 Bus connector (**CN1**) provides two ATX style signals., +5V Standby and PSON#. The +5V Standby rail is used to power certain parts of the cpu/gpuModule when the main power supply is turned off, i.e., during Suspend-to-RAM (S3) or Soft-Off (S5) power modes. The PSON# signal is an active low open-drain output that signals the power supply to turn on.

Thermal Management

The CNV36JXNX has an Operating Temperature Range of -40℃ to +70℃. Environmental testing was performed using RTD active solution using an environmental chamber. RTD evaluated the functionality of the NX module by running Jetson Benchmarks provided by NVIDIA. All parts, on the CNV36JXNX carrier module, are rated for -40℃ to +85℃ temperature range. It is important to note that the NVIDIA Jetson module has its own temperature ratings separate from the RTD carrier.

For a proper thermal solution, it is the customer's responsibility to maintain the NVIDIA core junctions below the specified temperatures, shown in the table below.

Table 19 NVIDIA® Jetson™ Xavier NX Operating Junction Temperatures

Parameter	Temperature
Maximum Xavier NX SOC Operating Temperature	CPU = 90.5℃
	GPU = 91.5℃
	AUX = 90.0℃
Xavier NX SOC Shutdown Temperature	CPU = 96.0℃
	GPU = 97.0℃
	AUX = 95.5℃

Appendix A Hardware Reference

This appendix provides information on CNV36JXNX cpu/gpuModule hardware, including:

Jumper Settings and Locations – page 48

Onboard PCI/PCIe Devices – page 49

Physical Dimensions – page 50

Heatsink Dimensions – page 51

Flat-Heat Spreader Dimensions – page 51

Jumper Settings and Locations

Some cpu/gpuModule configuration options are configured by jumpers. Jumpers are labeled on the board as **JP** followed by a number.

Figure 11 shows the jumper locations that are used to configure the cpu/gpuModule. **Table 20** lists the jumpers and their settings.

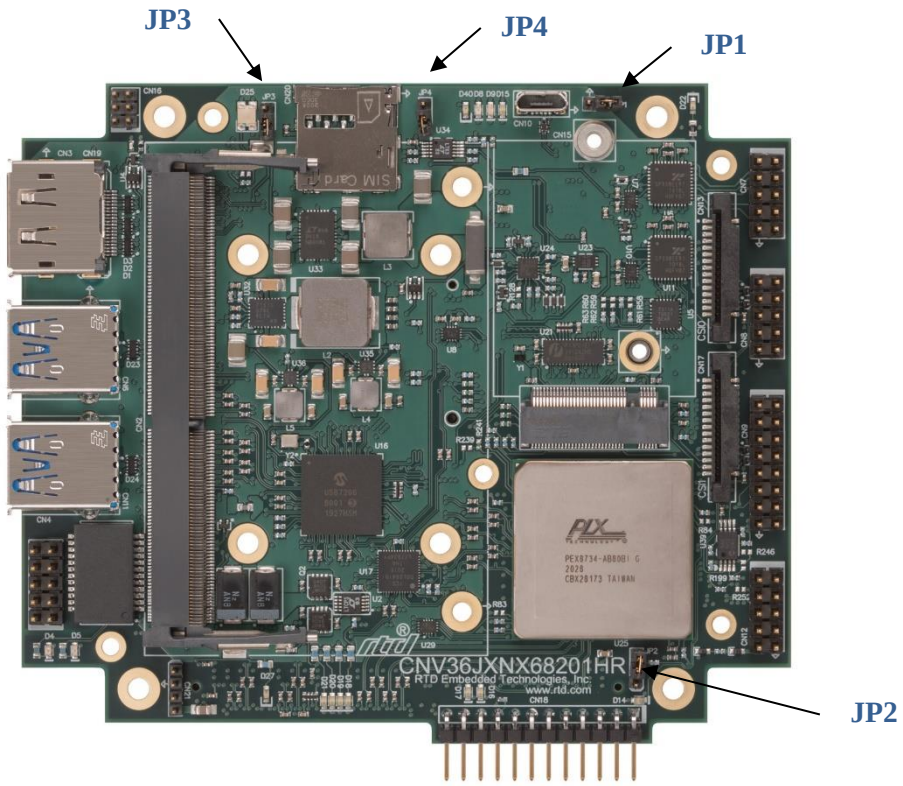


Figure 11 CNV36JXNX Jumper Locations (top side)

Table 20 CNV36JXNX Jumpers

Jumper	Pins	Function	Default
JP1	2	W_DISABLE1 signal of the M.2 sockets. Used to disable all wireless connection. Short to disable. Open for enable	open
JP2	3	PCI Express switch maximum link speed configuration. Pin 1-2 shorted: Gen 3 (maximum) speed Pins open: Gen 2 speed Pin 2-3 shorted: Gen 1 speed This setting affects all ports and sets the maximum speed that links can use. The actual link speed is always determined by link partners and channel quality (auto negotiated).	1-2 shorted
JP3	2	Stacking error detection is bypassed if this jumper is shorted	open
JP4	2	M.2 E-key slot SIM card power bypass. Install this jumper if there is no board in the E-key slot. For details refer PCI Express M.2 Specification section 3.1.11.4.	open

Onboard PCI/PCIe Devices

The CNV36JXNX cpu/gpuModule has several onboard PCIe devices, they are listed in the table below.

Table 21 Onboard PCI/PCIe Devices

Device ID	Vendor ID	Description
8734	10B5	PEX 8-Port PCI Express Switch [1]
1AD0	10DE	NVIDIA Xavier NX

1. This device will appear eight times in PCI configuration space.

Physical Dimensions

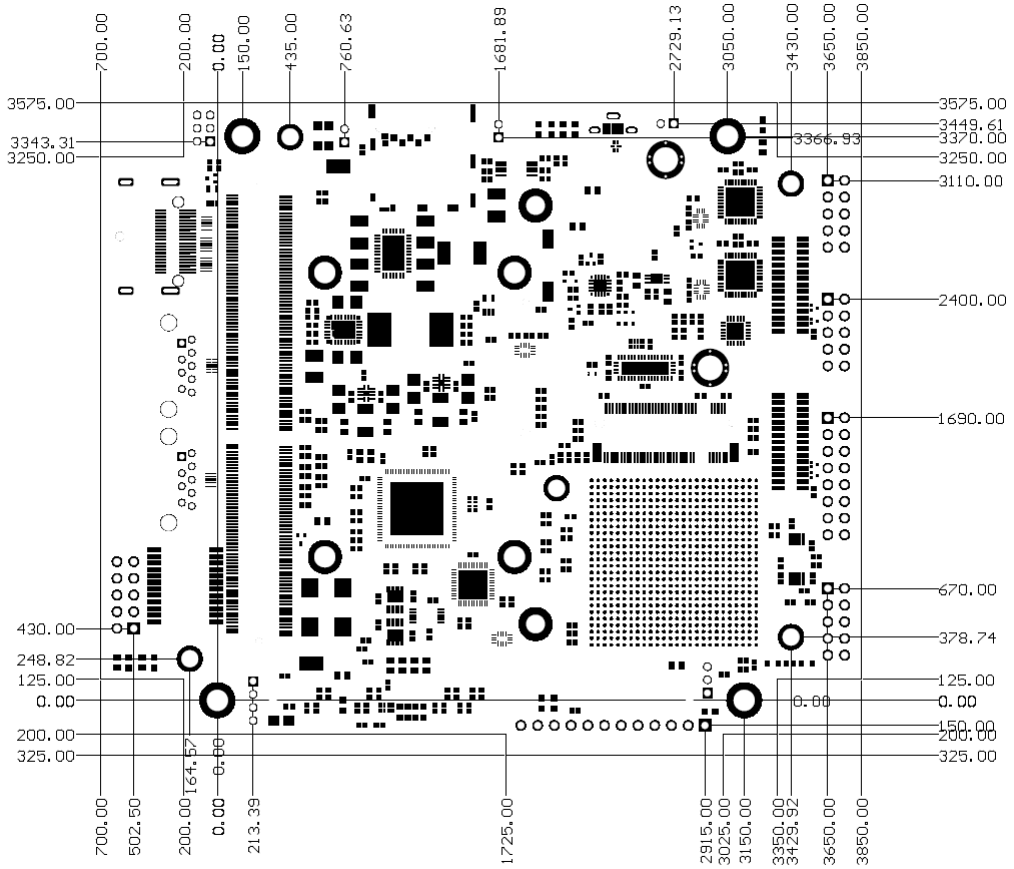


Figure 12 CNV36JXNX Physical Dimensions (±0.005 inches)

Heatsink Dimensions

To maximize the thermal performance of the cpu/gpuModule while keeping the total board weight to a minimum, various heatsinks are offered with each ordering part number. Use the table below to correlate the heatsink figure to each ordering part number.

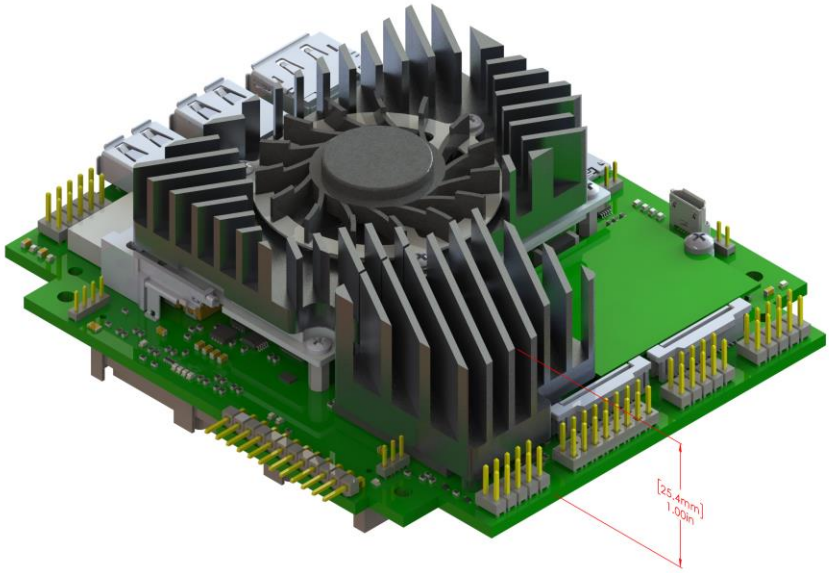


Figure 13 CNV36JXNXD Heatsink with Height from Board

Flat-Heat Spreader Dimensions

For cooling solutions where it is desirable to mount the cpu/gpuModule to a flat surface, the CNV36JXNX may be ordered with a flat heat spreader instead of the standard passive heatsink. Each flat heat spreader has ten mounting locations which use 6-32 UNC x 0.138” long threaded insert.

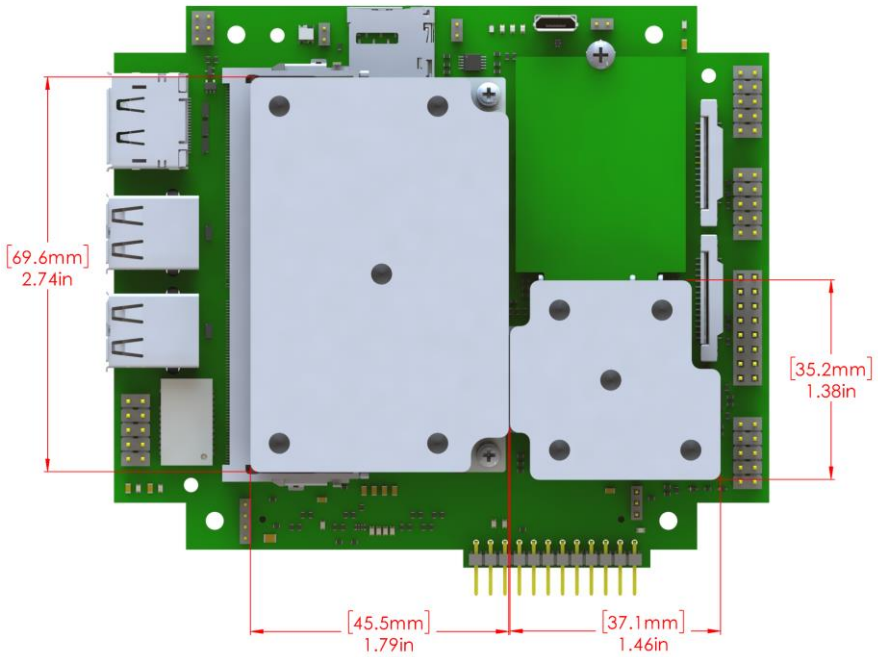


Figure 14 Flat-Heat Spreader Outside Dimensions

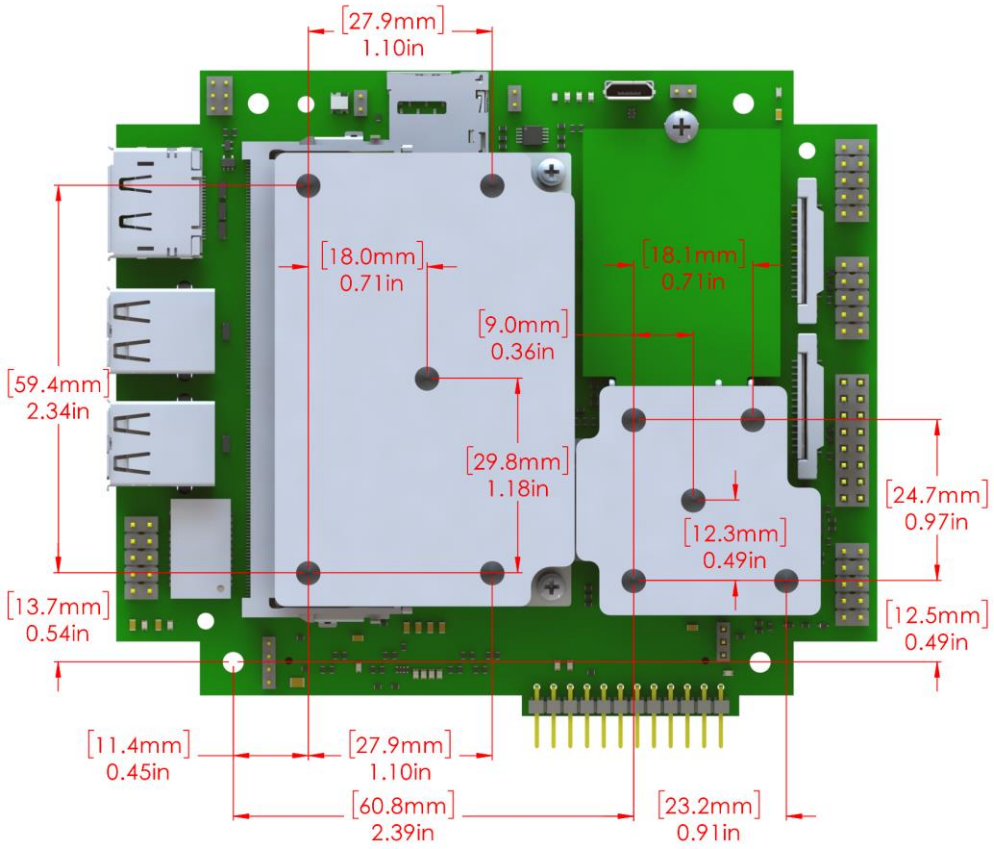


Figure 15 Flat Heat Spreader Hole Placement

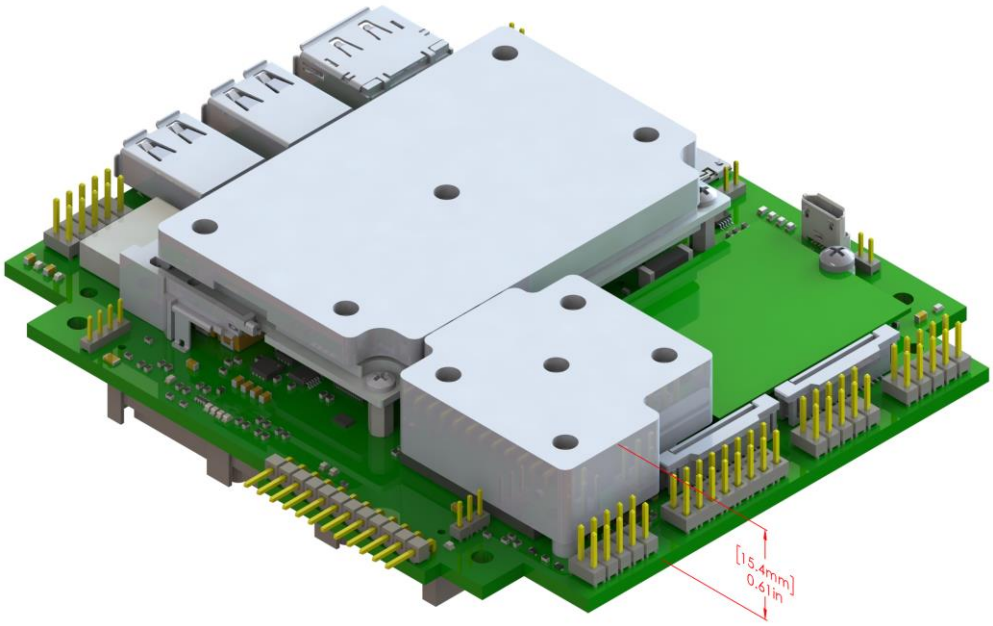


Figure 16 Flat Heat Spreader Height from Board

Appendix B Troubleshooting

Many problems you may encounter with operation of your CNV36JXNX cpu/gpuModule are due to common errors. This appendix includes the following sections to help you get your system operating properly.

Common Problems and Solutions – page 54

Troubleshooting a PC/104 System – page 55

How to Obtain Technical Support – page 55

Common Problems and Solutions

Table 21 lists some of the common problems you may encounter while using your CNV36JXNX cpu/gpuModule and suggests possible solutions.

If you are having problems with your cpu/gpuModule, review this table before contacting RTD Technical Support.

Table 22 Troubleshooting

Problem	Additional Symptoms	Possible Cause(s)
cpu/gpuModule does not boot (no video output)		Input power is inadequate. Refer to *Electrical Characteristics*. Verify input voltages are correct. If power is supplied via **CN3**, check for cabling issues.
		Malfunctioning peripheral card. Remove all peripheral cards from the system.
		cpu/gpuModule is in "Soft Off" due to operating system shutdown. Press power button to wake.
		ATX power supply is not turning on. Check jumpers on power supply. Verify PSON# signal.
		cpu/gpuModule may be booted, but video is not connected properly. Attach a keyboard and verify the operation of the Num Lock and Caps Lock LEDs. If they respond as expected, the cpu/gpuModule is booted. Check the video cable connections.
cpu/gpuModule reboots unexpectedly	cpu/gpuModule is powered via Auxiliary Power Connector (**CN3**)	Power cabling issues. Verify all pins on **CN3** are reliably connected with proper gauge wires.
		Power supply noise or current limiting. Check power pins with an oscilloscope and verify they remain in range.
		Power supply may not respond quickly enough to changes in power consumption. Switch to a different power supply (a PCI Express power supply is recommended)
	Peripheral card(s) installed	Peripheral card(s) may be overloading the power supply. Reduce the system to just the cpu/gpuModule and power supply and see if the problem re-appears. (Note that **CN3** is intended for powering the cpu/gpuModule only.)
Date/time not saved when system is off	No RTC battery	A battery must be attached to the Utility Port 2.0 connector (**CN5**) to maintain date/time when main power is removed.

Troubleshooting a PC/104 System

If you have reviewed the preceding table and still cannot isolate the problem with your CNV36JXNX cpu/gpuModule, please try the following troubleshooting steps. Even if the resulting information does not helpyou find the problem, it will be very helpful if you need to contact technical support.

1. **Simplify the system**. Remove items one at a time and see if one particular item seems to cause the problem.
2. **Swap components**. Try replacing items in the system one-at-a-time with similar items.

How to Obtain Technical Support

If after following the above steps, you still cannot resolve a problem with your CNV36JXNX cpu/gpuModule,please gather the following information:

- cpu/gpuModule model, and serial number
- List of all boards in system
- Description of problem
- Circumstances under which problem occurs

Then contact RTD Technical Support:

Phone: 814-234-8087

Fax: 814-234-5218

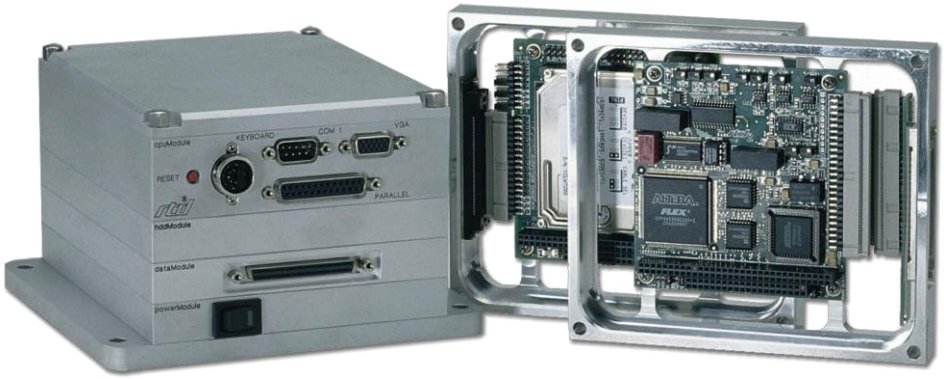
E-mail: techsupport@rtd.com

Appendix C IDAN™ Dimensions and Pinout

Like all other PCIe/104 modules, cpu/gpuModules can be packaged in Intelligent Data Acquisition Node (IDAN) frames, which are milled 6061 aluminum frames with integrated heat sinks and heatpipes for fan-less operation. RTD modules installed in IDAN frames are called building blocks. IDAN building blocks maintain the simple but rugged stacking concept of and PCIe/104. Each RTD module is mounted in its own IDAN frame and all I/O connections are brought to the walls of each frame using standard PC connectors.

On the CNV36JXNX, no connections are made from module to module internal to the system other than through the PCIe/104 Type 2 bus, enabling quick interchangeability and system expansion without hours of rewiring and board redesign.

This appendix provides the dimensions and pinouts of the CNV36JXNX installed in an IDAN frame. Contact RTD for more information on high reliability IDAN systems.



IDAN—Adhering to the PC/PCI-104 and PCIe/104 stacking concept, IDAN allows you to build a customized system with any combination of RTD modules.

IDAN Heat Pipes—Advanced heat pipe technology maximizes heat transfer to heat fins.

HiDAN*plus*—Integrating the modularity of IDAN with the ruggedization of HiDAN, HiDAN*plus* enables connectors on all system frames, with signals running between frames

IDAN Contents

The IDAN-CNV36JXNX contains both a CNV36JXNX cpu/gpuModule and an ATX3510HR-190W power supply.

Also, inside the IDAN-CNV36JXNX unit is a CMOS battery which is connected to the battery input connection of the cpu/gpuModule's Utility Port 2.0 connector. The frame of the IDAN-CNV36JXNX brings out the cpu/gpuModule's multi-color LED as well as the cpu/gpuModule's reset button.

For additional flexibility, the 25-pin "D" connector which provides connections to the cpu/gpuModule's DIOconnector (**CN6**) includes connections to several pins on the Utility Port 2.0 connector, which include thereset button input, power button input, and RTC battery input.

For more information on cpu/gpuModule's battery input and reset button input on the Utility Port 2.0 connector,refer to the *Utility Port 2.0 Connector (CN5)* on page 28.

IDAN Dimensions

The IDAN frame for the CNV36JXNX is shown in the figure below:

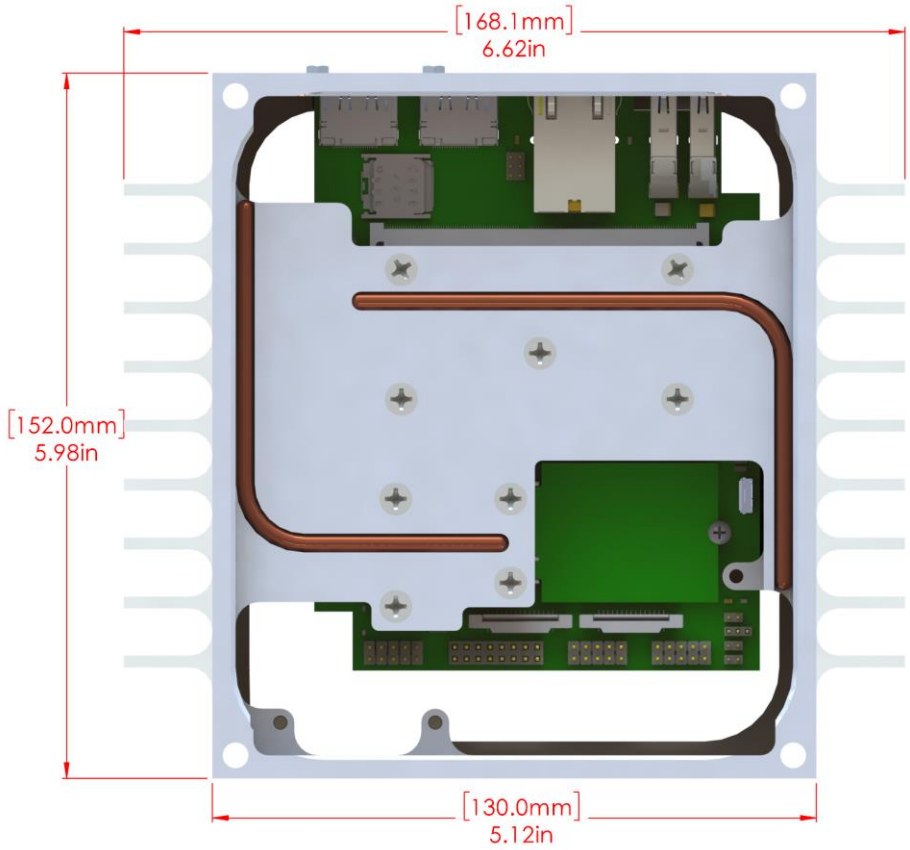


Figure 17 IDAN Frame Outside Dimensions

IDAN Connectors

The figures below show the connector locations for the CNV36JXNX as they are brought out on the front and back panels of the IDAN-CNV36JXNX. For a full description of each connector on the CNV36JXNX, refer to *Connecting to the Stack page 21*.

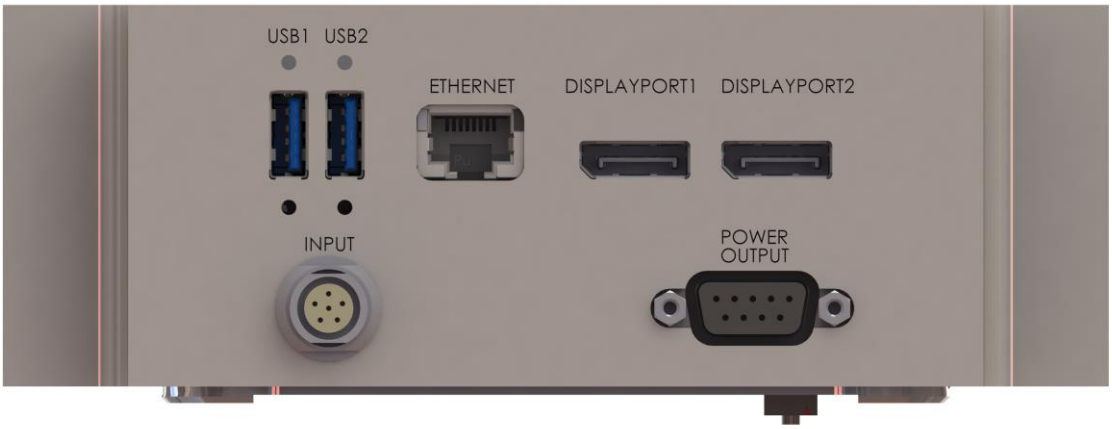


Figure 18 IDAN-CNV36JXNX Rear Panel

Figure 19 IDAN-CNV36JXNX Front Panel with Height

Table 23 IDAN- CNV36JXNX Connectors

Board Designator	Function	Connector Description	IDAN Panel Connector	Mating Connector
CN3, CN18	DisplayPort	DisplayPort (female)	Molex 47272 series	Molex 68783 series
CN12	USB Port (Utility Port2.0)	USB Type A Receptacle	Samtec USBR-A-S-S-O-TH	USB Type A Plug
CN9	DIO	25-pin D (female)	Adam Tech DB25SD	Adam Tech DB25PD
CN7	Serial Port 1	9-pin D (male)	Adam Tech DE09PD COM1	Adam Tech DE09SD
CN8	Serial Port 2	9-pin D (male)	Adam Tech DE09PD COM2	Adam Tech DE09SD
CN6	USB 3.0	USB Type A Receptacle	Stewart SS-52000-002	USB Type A Plug
CN11	USB 3.0	USB Type A Receptacle	Stewart SS-52000-002	USB Type A Plug
CN4	Ethernet	RJ45	Pulse JT4-1108HL	RJ45 cable
TB1	Power	Power Input	Souriau JBXEP2G06FSSDS INPUT	Souriau JBXFD2G06MSSDS MR
TB2	Power	Power Output	Norcomp 171-009-202L-021 POWER OUTPUT	Norcomp 171-009-103L021

External I/O Connections

Table 24 COM1/COM2 9-Pin D Connector (male)

CPU Pin	IDAN Pin (DB-9)	Single RS-232	Single RS-422	Single RS-485
1	1	—	TXD–	D–
2	6	—	—	—
3	2	RXD	TXD+	D+
4	7	RTS	—	—
5	3	TXD	RXD+	—
6	8	CTS	—	—
7	4	—	RXD–	—
8	9	—	—	—
9	5	GND	GND	GND

Table 25 DIO — 25-Pin D Connector (female)

IDAN Pin #	DIO Port	CPU Pin # (CN9)
1	I/0-00	1
2	I/0-02	3
3	I/0-04	5
4	I/0-06	7
5	I/0-12	9
6	I/0-08	11
7	I/0-10	13
8	GND	15
9	N/C	—
10	N/C	—
11	N/C	—
12	N/C	—
13	N/C	—
14	I/0-01	2
15	I/0-03	4
16	I/0-05	6
17	I/0-07	8
18	I/0-13	10
19	I/0-09	12
20	I/0-11	14
21	+5 V	16
22	N/C	—
23	N/C	—
24	N/C	—
25	N/C	—

Table 26 DisplayPort Connector

Pin	Signal	Standard Function	DVI / HDMI mode[1]	In/Out
1	LN0+	Main Link, Lane 0 (positive)	TMDS Channel 2 (positive)	out
2	GND	Ground	Ground	out
3	LN0-	Main Link, Lane 0 (negative)	TMDS Channel 2 (negative)	out
4	LN1+	Main Link, Lane 1 (positive)	TMDS Channel 1 (positive)	out
5	GND	Ground	Ground	out
6	LN1-	Main Link, Lane 1 (negative)	TMDS Channel 1 (negative)	out
7	LN2+	Main Link, Lane 2 (positive)	TMDS Channel 0 (positive)	out
8	GND	Ground	Ground	out
9	LN2-	Main Link, Lane 2 (negative)	TMDS Channel 0 (negative)	out
10	LN3+	Main Link, Lane 3 (positive)	TMDS Clock (positive)	out
11	GND	Ground	Ground	out
12	LN3-	Main Link, Lane 3 (negative)	TMDS Clock (negative)	out
13	CFG1	Configuration Pin 1	Cable Adapter Detect	out
14	CFG2	Configuration Pin 2	Consumer Electronics Control[2]	out
15	AUX+	Auxiliary Channel (positive)	DDC Clock	in/out
16	GND	Ground	Ground	out
17	AUX-	Auxiliary Channel (negative)	DDC Data	in/out
18	HPD	Hot Plug Detect	Hot Plug Detect	in
19	DPG	Return for DPV	Return for DPV	out
20	DPV	+3.3V DC Power	+3.3V DC Power	out

1. Requires special passive adapter
2. HDMI mode only

Facing DisplayPort connector, the pinout is:

19	17	15	13	11	9	7	5	3	1
DPG	AUX-	AUX+	CFG1	GND	LN2-	LN2+	GND	LN0-	LN0+
DPV	HPD	GND	CFG2	LN3-	LN3+	GND	LN1-	LN1+	GND
20	**18**	**16**	**14**	**12**	**10**	**8**	**6**	**4**	**2**

Table 27 Ethernet RJ45 Connector T568A Color Code

IDAN Pin #	RJ-45 Pin	Signal[1]	CPU Pin #
1	1	A+ (TX+)	1
2	2	**A- (TX–)**	2
3	3	**B+ (RX+)**	3
4	4	C+	4
5	5	C-	5
6	6	B- (RX–)	6
7	7	D+	7
8	8	D-	8

Note 1: White stripe indicated in cell fill color.

Appendix D Additional Information

NVIDIA Driver Information:

https://developer.nvidia.com/embedded/jetson-linux-r341

PC/104 Specifications

A copy of the latest PC/104 specifications can be found on the webpage for the PC/104 Embedded Consortium:

http://www.pc104.org

Appendix E Limited Warranty

RTD Embedded Technologies, Inc. warrants the hardware and software products it manufactures and produces to be free from defects in materials and workmanship for one year following the date of shipment from RTD Embedded Technologies, Inc. This warranty is limited to the original purchaser of product and is not transferable.

During the one-year warranty period, RTD Embedded Technologies will repair or replace, at its option, any defective products, or parts at no additional charge, provided that the product is returned, shipping prepaid, to RTD Embedded Technologies. All replaced parts and products become the property of RTD Embedded Technologies. Before returning any product for repair, customers are required to contact the factory for a Return Material Authorization number.

This limited warranty does not extend to any products which have been damaged as a result of accident, misuse, abuse (such as: use of incorrect input voltages, improper or insufficient ventilation, failure to follow the operating instructions that are provided by RTD Embedded Technologies, “acts of god” or other contingencies beyond the control of RTD Embedded Technologies), or as a result of service or modification by anyone other than RTD Embedded Technologies. Except as expressly set forth above, no other warranties are expressed or implied, including, but not limited to, any implied warranties of merchantability and fitness for a particular purpose, and RTD Embedded Technologies expressly disclaims all warranties not stated herein. All implied warranties, including implied warranties for merchantability and fitness for a particular purpose, are limited to the duration of this warranty. In the event the product is not free from defects as warranted above, the purchaser's sole remedy shall be repair or replacement as provided above. Under no circumstances will RTD Embedded Technologies be liable to the purchaser or any user for any damages, including any incidental or consequential damages, expenses, lost profits, lost savings, or other damages arising out of the use or inability to use the product.

Some states do not allow the exclusion or limitation of incidental or consequential damages for consumer products, and some states do not allow limitations on how long an implied warranty lasts, so the above limitations or exclusions may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

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PC/104

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