

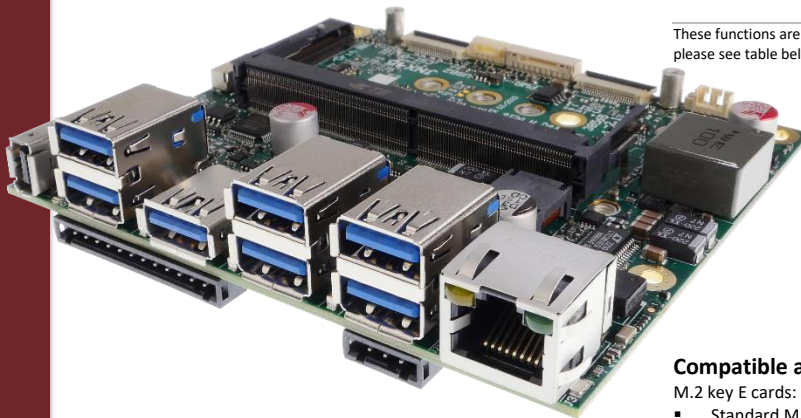
## USB 3.2 centric for Orin Nano and Orin NX

### Overview

The JNX45 is specifically designed for the new Jetson Orin compute modules with a focus on remote serviceability and debugging. The Orin supports 3 native USB 3.2 (10Gbit/s) ports and 3 PCIe busses. At your choice these systems can be equipped with the entire family of NVIDIA compute modules in the SO-DIMM form factor from the traditional Nano to the new Orin NX16.

### Features

- remote low level system management (MCU communicates via LTE)
- automatic system recovery or factory reset
- primary boot SSD (PCIe x4)
- recovery or backup boot SSD (PCIe x1)
- M.2 key E for Wifi, LoRaWAN, GPS and more
- M.2 key B for LTE and 5G
- industrial strength design
- power monitoring of Jetson and USB ports



### System Management

On board MCU for watchdog and low level system management functions (via LTE). The MCU can receive text messages via an UART connection to compatible LTE M.2 cards (e.g. Simcom SIM7600). With these messages low level system management can be performed. Please note that this requires optional MCU firmware. The source code to this firmware may be licensed.

- power cycle or reset
- change of boot order
- activate secondary boot device (power controlled by MCU)
- control power to M.2 key B and E slots
- debug console of Jetson
- user UART to Jetson
- capture and store multiple boot logs
- watchdog function for Jetson
- optional: hardware watchdog for MCU

### Resources

Description	Link
3D Model	<a href="https://auvideo.eu/step/">https://auvideo.eu/step/</a>
Auvideo BSP package	<a href="https://auvideo.eu/firmware/">https://auvideo.eu/firmware/</a>

### Technical Specification

Feature	JNX45
supported modules	Nano/ TX2 NX/ Xavier NX/ Orin Nano/NX
monitor	HDMI 2.0 (4kp60)
UART	1x
SPI	1x (1.8V)
I2C	3x (3.3V)
I2S	1x (1.8V)
CAN	1x (with TJA1051 CAN transceiver)
MIPI CSI-2	2x CSI-2 (22 pin with 4 lanes)
Ethernet	Gigabit RJ45
MCU	yes
USB 2.0	1x internal (J28)
USB 3.2	2x native 5x shared with 10Gbit/s USB hub
M.2 key B	for LTE (with dual nano SIM) (3042/3052)
M.2 key E	PCIe x1 & USB 2.0 (2230)
M.2 key M	PCIe x4 for NVME SSDs (2280) – bottom side
M.2 key M	PCIe x1 for NVME SSDs (2280) – top side
fan connector	5V for NVIDIA/Auvideo heatsink/fan
power in	12V & 24V battery systems or DC sources (max. 30V)
power monitoring	12 channels (CM & USB ports)
CM power	5V (8A max)
size	80x104.6mm 80x112.6mm (with side wings) for slide-in enclosure

These functions are available with the Orin NX, other modules may not support all features, please see table below.

### Compatible addons:

#### M.2 key E cards:

- Standard M.2 Wifi cards (PCIe+USB) like Intel AX200 (Orin only)
- USB only M.2 Wifi cards like Laird ST60-2230C-UU (Xavier and Orin)
- W200 RTL8111 (in development)
- W210 Ublox Lily (in development)
- W220 Ublox NEO-M8N GNSS module

#### USB addon modules (for J28):

- U100 USB 2.0 to 2x M.2 adapter (key E and key B)
- U110 Quad USB 2.0 to 100bT Ethernet (PoE+)
- U115 Quad USB 2.0 to 100bT Ethernet (PoE+) with 48V pushup PS
- U120 USB 2.0 to 4x USB 2.0 type A module

#### PCIe x1 addon modules:

- 38456 i210 + 4 port GbE Ethernet switch (PoE-PSE) with 48V pushup PS
- 38456-2 RTL8111 + 4 port GbE Ethernet switch (PoE-PSE) with 48V pushup PS (RJ45 or M12 X-Code)
- P101 (38551) FPC to PCIe x1 slot adapter (to use standard PCIe cards)

Please check the Auvideo website for further options.

### Carrier Board Variations

SKU	Part
70785	JNX45



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# JNX45 USBeast

## Power monitoring (U & I)

This carrier board features 12 channel voltage and current monitoring on specific power rails.

Channel	Rail
1	Jetson power rail (5VCM)
2	5.0V rail
3	3.3V rail
4-10	USB type A ports
11	USB2 (J28)
12	5Vout (J37)

With four INA3221 power monitoring chips.

## MCU

The integrated MCU can fulfill several functions like:

- carrier board power management
- Jetson control (reset, force recovery)
- watchdog for the Jetson
- low level system management
- reset to factory default
- store 1 or more Jetson console boot logs

With custom MCU code those functions can be triggered using the service port, Jetson, LTE functionality or optional watchdog. The MCU source code (STM32L071) may be licensed to add custom features.

The MCU features 5 UARTs in total:

- Jetson debug console (UART2)
- Jetson user UART (UART1)
- M.2 LTE slot (requires LTE card with UART support)
- M.2 Wifi slot (requires Wifi card with UART support)
- MCU console UART (service port)



Top side

## Service port

The JNX45 has a special service port to simplify in field services with the following functionality:

- flashing port (USB 2.0 OTG)
- Jetson debug console (UART2)
- MCU UART console: to control Jetson operation (reset, force recovery, and more)
- optional 12V to 24V power supply to power the JNX45 while flashing

To use the service port the 38563 adapter is needed.

## Build to order embedded systems

On request the Auvideo carrier boards can be integrated to build to order embedded systems. Normally these are passively cooled systems with standard or Auvideo custom extrusions. The extrusion is very compact and offers excellent thermal characteristics. For ease of mounting the carrier board can just slide into this enclosure. Optionally embedded systems can be populated with IP67 rated connectors.

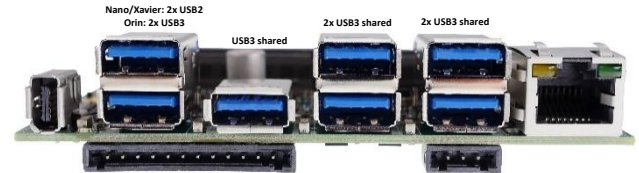
All Auvideo carrier boards and embedded systems are **Made in Germany**. They are produced in-house (CO<sub>2</sub> neutral) with fully automated SMT equipment.

## Connections table

Different modules feature different functionalities as described in this table.

Function	Nano	TX2 NX/ Xavier NX	Orin Nano/NX
Dual USB type A (J6)	USB 2.0	USB 2.0	USB 3.2
M.2 key E	USB 2.0	USB 2.0	PCIe & USB 2.0
M.2 key M (PCIe x1) top	-	yes	yes

The M.2 key E slot is full featured with the Orin and supports any standard M.2 Wifi card (e.g. Intel AX200).



The USB 2.0 type A port is optional. The default configuration is with this connector removed and the USB 2.0 bus routed to the J28 internal port.

## Remote maintenance and service (beta)

The JNX45 is especially designed with full remote system monitoring and recovering options in mind. It offers several hardware implementations to offer a great platform for different remote maintenance and service functionalities. As every project is different Auvideo offers extended workbench software services to fit your needs. Please contact us to discuss your project.

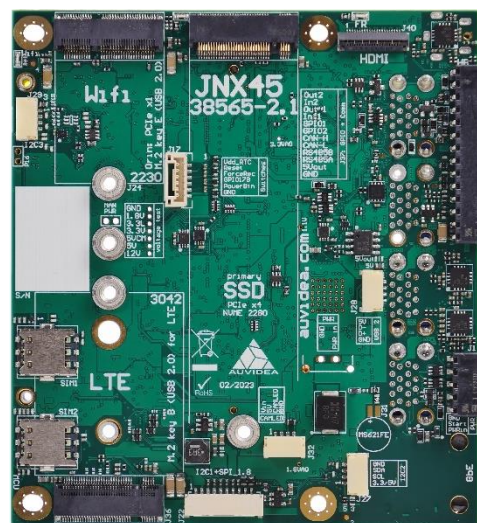
## remote power cycle and more

The JNX45 carrier board features an M.2 LTE slot. The SIMCOM LTE cards support 2 communication interfaces. USB is routed to the Jetson and UART to the MCU. In this manner the MCU can receive text messages independent of the Jetson. So low level system management functions can be integrated. An example is a power cycle message. The MCU can reset the Jetson or enter the boot manager to change boot settings. In this manner it can perform cold reboots (power cycle) or warm reboots (reset).

## Safe boot and remote factory reset

The new JNX45 offers the features of the JNX42 and adds some new features:

- it supports two M.2 SSD slots. One is reserved for the boot SSD of the Orin. The second is reserved for a special safe boot SSD, to be able to perform a full factory reset, when the primary SSD has failed and the Jetson does not boot anymore. This second SSD is activated by the MCU if a factory reset should be executed
- the MCU can store the complete log of the debug console. Via LTE this boot log can then be analyzed to determine why the Jetson is not booting anymore
- with access to the Jetson console port the MCU can optionally perform software watchdog functions to supervise the Jetson



Bottom side

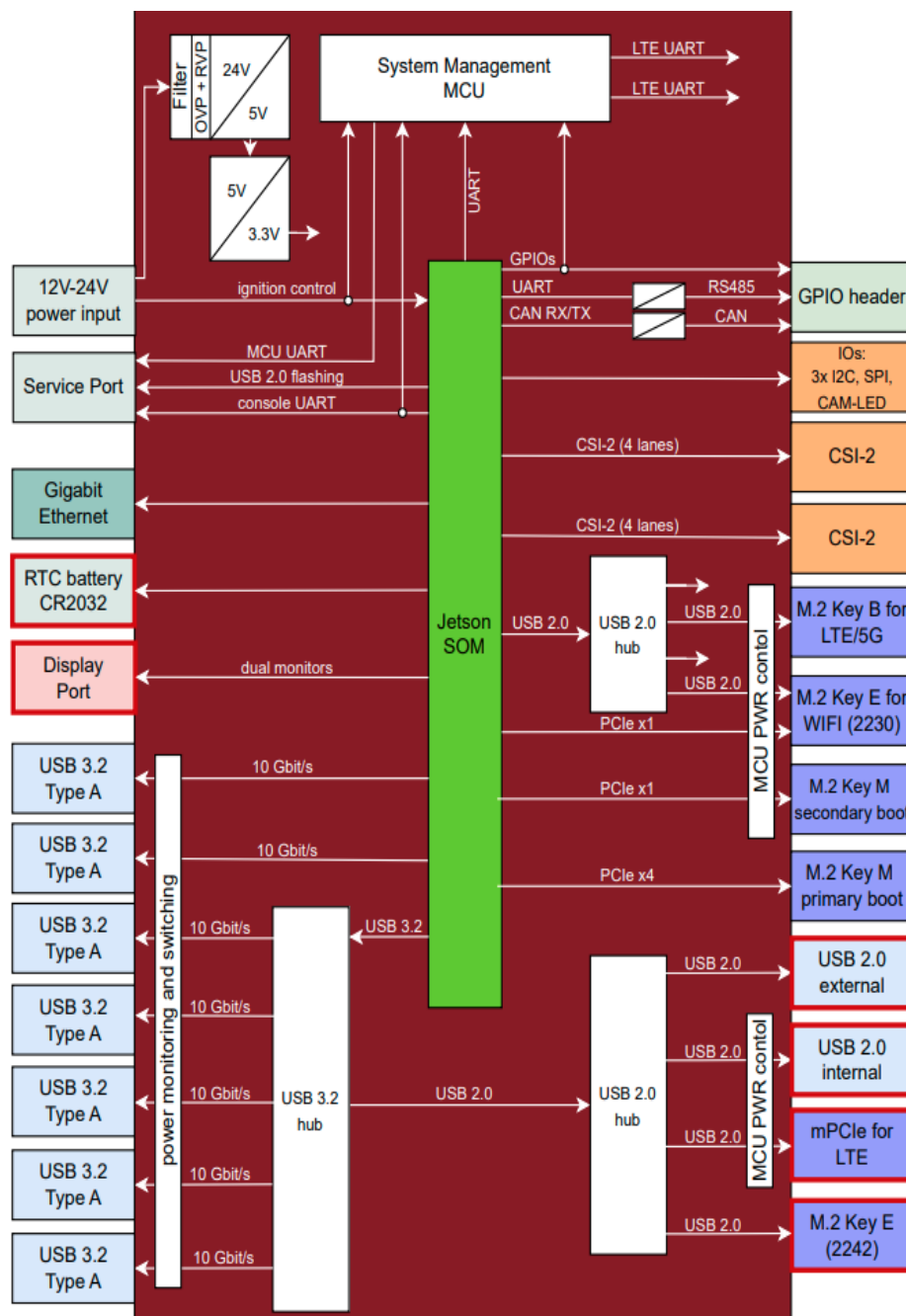
## Internal USB

J28 is located on the bottom side. This JST-GH (1.25mm pitch) port may connect to any of the Auvideo internal USB add-on boards such as the U100, U110, etc.

# JNX45 Carrier Board

## JNX45 USBeast

### Block diagram



History:

☐ JNX46 only