

# NRU-51V Series

Rugged NVIDIA® Jetson Xavier™ NX GMSL2 Camera Sensor Hub for Autonomous Vehicles and Teleoperation

## Preliminary



CE FC

### Key Features

- Powered by NVIDIA® Jetson Xavier™ NX SOM bundled with JetPack 4.6.1
- Rugged -25°C to 60°C fanless operation
- Support 4x GMSL2 automotive cameras via FAKRA Z connectors
- 1x 10GBASE-T 10Gb and 1x 1GBASE-T 1Gb Ethernet port
- 2x mini-PCIe sockets for WiFi/ GNSS/ NVMe/ CAN modules
- 1x M.2 3042/ 3052 B key socket for 4G/ 5G mobile communication
- 1x isolated CAN, 1x configurable RS232/ 422/ 485 port, and 1x GPS PPS input
- 8V to 35V wide-range DC input with built-in ignition power control

## Introduction

NRU-51V is a rugged Jetson Xavier™ NX computer supporting GMSL2 cameras that can act either as a sensor hub or a perception unit for ADAS, teleoperation, autonomous mobile robots, and autonomous vehicles.

By supporting GMSL2 automotive cameras, they enable NRU-51V with greater vision capability by taking advantage of advanced features such as IP67 waterproof, high dynamic range (>120dB 120dB HDR), auto white balance (AWB), and LED flicker mitigation (LFM). NRU-51V can obtain high-quality images with minimal latency regardless of lighting conditions, from bright sunny days to pitch-black nights. Moreover, it has a unique synchronization mechanism capable of acquiring images from four GMSL2 cameras simultaneously within microseconds channel-to-channel skew. It can further accept GPS PPS signal to align image data with LIDAR or synchronize cameras on other systems.

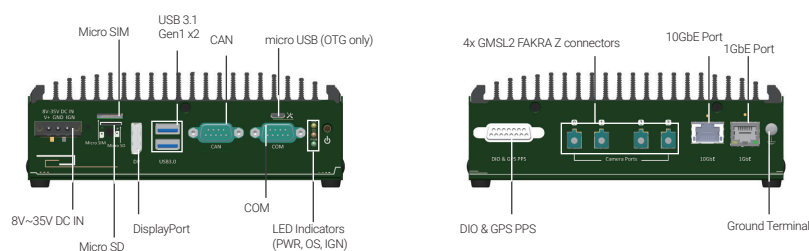
Thanks to the great power efficiency of NVIDIA® Jetson Xavier™ NX SOM, NRU-51V delivers 21 TOPS inference performance in its 15W power package. Users can transfer raw camera images through its built-in 10GBASE-T Ethernet to another GPU server for perception processing, but also leverage its significant TOPS for real-time object or ROI detection. For teleoperation applications, users can utilize its hardware H.264/265 video codec, to encode video streams from four GMSL2 cameras in real-time and transmit the live video feed to a driver at a remote location via 5G telecommunication with minimum latency.

The combination of GMSL2 interface and Jetson Xavier™ NX makes NRU-51V much more than just a simple edge AI computer. With greater vision brought by automotive cameras plus I/O interfaces such as 10GbE, CAN 2.0, and M.2 for 5G broadband, NRU-51V plays a central role in a moving platform, as a sensor hub for ADAS, a perception unit for AGV/ AMR, or a teleoperation controller for off-highway vehicles.

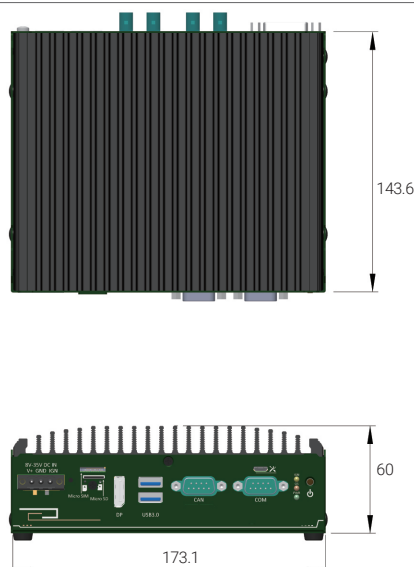
## Specifications

| System Core                   |  | Power Supply   |   |
|-------------------------------|--|--|---|
| Processor                     | NVIDIA® Jetson Xavier™ NX system-on-module (SOM), comprising NVIDIA® Volta GPU and Carmel CPU  | DC Input   | 1x 3-pin pluggable terminal block for 8V to 35V DC input and ignition power control (V+/ GND/ IGN)          |
| Memory                        | 8GB/ 16GB LPDDR4x (Xavier NX 8GB/ 16GB) @ 1600/ 1866 MHz on SOM (15W/ 20W TDP mode)  | <b>Mechanical</b>  |   |
| eMMC                          | 16GB eMMC 5.1 on SOM   | Dimension  | 173 mm (W) x 144 mm (D) x 60 mm (H)   |
| <b>Panel I/O Interface</b>    |  | Weight   | 1.4 kg  |
| GMSL2 Camera                  | 4x GMSL2 FAKRA Z connectors, supporting 4x 1920x1080 @ 30 FPS camera input   | Mounting   | Wall-mount bracket (optional)   |
| Ethernet Port                 | 1x 10GBASE-T 10GbE port with screw-lock<br>1x 1GBASE-T 1GbE port with screw-lock   | <b>Environmental</b>   |   |
| USB                           | 2x USB 3.1 Gen1 ports (total 5 Gbps shared with M.2 B key)<br>1x micro USB (OTG only)  | Operating Temperature  | -25°C to 60°C with passive cooling (15W TDP mode) *<br>-25°C to 70°C with optional fan kit (15W TDP mode) * |
| Video Port                    | 1x DisplayPort, supporting 3840x2160 at 60Hz   | Storage Temperature  | -40°C ~ 85°C  |
| Serial Port                   | 1x hardware configurable RS-232/ 422/ 485 port   | Humidity   | 10% ~ 90%, non-condensing   |
| CAN Bus                       | 1x isolated CAN 2.0 port   | Vibration  | Operating, MIL-STD-810G, Method 514.7, Category 4 (pending)   |
| Isolated DIO                  | 1x GPS PPS input, 3-CH isolated DI and 4-CH isolated DO  | Shock  | Operating, MIL-STD-810G, Method 516.7, Procedure I (pending)  |
| Micro SD                      | 1x front-accessible microSD card slot  | EMC  | CE/FCC Class A, according to EN 55032 & EN 55035 (pending)  |
| Ground Terminal               | 1x M4 ground terminal for chassis ESD shielding  | * For sub-zero and over 60°C operating temperature, a wide temperature SD card / NVMe is required. |   |
| <b>Internal I/O Interface</b> |  |  |   |
| Mini PCI Express              | 1x full-size mini PCI Express socket (PCIe + USB 2.0) for WIFI, NVMe storage<br>1x full-size mini PCI Express socket (USB 2.0) for GNSS, V2X, or CAN |  |   |
| M.2                           | 1x M.2 3042/ 3052 B key (USB 3.1 Gen 1 + USB 2.0) for 4G/5G module with dual SIM support (1x front-accessible, 1x internal)                          |  |   |

## Appearance



## Dimensions



Unit : mm

## Ordering Information

| Model No.           | Product Description   |
|---------------------|---|
| <b>NRU-51V-8GB</b>  | Rugged NVIDIA® Jetson Xavier™ NX (8GB) GMSL2 Camera Sensor Hub  |
| <b>NRU-51V-16GB</b> | Rugged NVIDIA® Jetson Xavier™ NX (16GB) GMSL2 Camera Sensor Hub |

## Optional Accessories

|                            |  |                             |  |
|----------------------------|--|-----------------------------|--|
| <b>AC-IMX390-H60</b>       | Sony IMX390 CMOS sensor camera; 1920x1080 @ 30fps; LFM; HFOV 63.9°; IP67+IP69K; -40°C to 85°C operating temperature; male FAKRA connector; active alignment; without lens cap  | <b>AC-AR0233-H120-60FPS</b> | Onsemi AR0233 CMOS sensor camera; 1920x1080 @ 60fps; LFM; HFOV 118°; IP67; -40°C to 70°C operating temperature; male FAKRA connector   |
| <b>AC-IMX390-H120</b>      | Sony IMX390 CMOS sensor camera; 1920x1080 @ 30fps; LFM; HFOV 120.6°; IP67+IP69K; -40°C to 85°C operating temperature; male FAKRA connector; active alignment; without lens cap | <b>AC-AR0233-H190-60FPS</b> | Onsemi AR0233 CMOS sensor camera; 1920x1080 @ 60fps; LFM; HFOV 196°; IP67; -40°C to 70°C operating temperature; male FAKRA connector; without lens cap                                   |
| <b>AC-IMX390-H190</b>      | Sony IMX390 CMOS sensor camera; 1920x1080 @ 30fps; LFM; HFOV 186°; IP67+IP69K; -40°C to 85°C operating temperature; male FAKRA connector; active alignment; without lens cap   | <b>PA-60W-OW</b>            | 60W AC/ DC power adapter 12V/ 5A; cord end terminals for terminal block, operating temperature: -30 to 60°C  |
| <b>AC-AR0233-H60</b>       | Onsemi AR0233 CMOS sensor camera; 1920x1080 @ 30fps; LFM; HFOV 60°; IP67; -40°C to 85°C operating temperature; male FAKRA connector  | <b>PA-120W-OW</b>           | 120W AC/ DC power adapter 20V/ 6A; 18AWG/ 120cm; cord end terminals for terminal block, operating temperature: -30 to 70°C   |
| <b>AC-AR0233-H120</b>      | Onsemi AR0233 CMOS sensor camera; 1920x1080 @ 30fps; LFM; HFOV 118°; IP67; -40°C to 85°C operating temperature; male FAKRA connector   | <b>Risr-M2M-mPCIe</b>       | NGFF M.2 2242 key M to mini-PCIe adapter   |
| <b>AC-AR0233-H190</b>      | Onsemi AR0233 CMOS sensor camera; 1920x1080 @ 30fps; LFM; HFOV 196°; IP67; -40°C to 85°C operating temperature; male FAKRA connector; without lens cap                         | <b>Wmkit-NRU-50</b>         | Wall mount kit for NRU-50 series, including wall mount brackets and screws   |
| <b>AC-AR0233-H60-60FPS</b> | Onsemi AR0233 CMOS sensor camera; 1920x1080 @ 60fps; LFM; HFOV 60°; IP67; -40°C to 70°C operating temperature; male FAKRA connector  | <b>Tpkkit-NRU-50</b>        | 3 pcs of 30x30x2 mm thermal pad for mPCIe modules with the max component height between 1.3 mm and 2.4 mm, and M.2 B key modules with the max component height between 0.7 mm and 2.0 mm |
|                            |  | <b>FK-FF-CABLE-7M</b>       | 7M FAKRA cable for cameras with male FAKRA connector; the waterproof end is black  |
|                            |  | <b>FK-FF-CABLE-15M</b>      | 15M FAKRA cable for cameras with male FAKRA connector; the waterproof end has heat shrink tube   |