NRU-51V Series
Rugged NVIDIA® Jetson Xavier™ NX GMSL2 Camera Sensor Hub for Autonomous Vehicles and Teleoperation

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 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

Processor
NVIDIA® Jetson Xavier™ NX system-on-module (SOM), comprising NVIDIA® Volta GPU and Carmel CPU

Memory
8GB/ 16GB LPDDR4x (Xavier NX 8GB/ 16GB) @ 1600/ 1866 MHz on SOM (15W/ 20W TDP mode)

eMMC
16GB eMMC 5.1 on SOM

Panel I/O Interface

GMSL2 Camera
4x GMSL2 FAKRA Z connectors, supporting 4x 1920x1080 @ 30 FPS camera input

Ethernet Port
1x 10GBASE-T 10GbE port with screw-lock
1x 1GBASE-T 1GbE port with screw-lock

USB
2x USB 3.1 Gen1 ports (total 5 Gbps shared with M.2 B key)
1x micro USB (OTG only)

Video Port
1x DisplayPort, supporting 3840x2160 at 60Hz

Serial Port
1x hardware configurable RS-232/ 422/ 485 port
1x isolated CAN 2.0 port

CAN Bus
1x isolated CAN 2.0 port

Isolated DIO
1x GPS PPS input, 3-CH isolated DI and 4-CH isolated DO

Micro SD
1x front-accessible microSD card slot

Ground Terminal
1x M4 ground terminal for chassis ESD shielding

Mini PCI Express
1x full-size mini PCI Express socket (PCIe + USB 2.0) for WiFi, NVMe storage
1x full-size mini PCI Express socket (USB 2.0) for GNSS, V2X, or CAN

M.2
1x 3042/ 3052 M.2 B key (USB 3.1 Gen 1 + USB 2.0) for 4G/5G module with dual SIM support (1x front-accessible, 1x internal)

Power Supply

DC Input
1x 3-pin pluggable terminal block for 8V to 35V DC input and ignition power control (4V GND/ IGN)

Mechanical

Dimension
173 mm (W) x 144 mm (D) x 60 mm (H)

Weight
1.4 kg

Mounting
Wall-mount bracket (optional)

Environmental

Operating Temperature
-25°C ~ 70°C with passive cooling (15W TDP mode) *

Storage Temperature
-40°C ~ 85°C

Humidity
10% ~ 90%, non-condensing

Vibration
Operating, MIL-STD-810G, Method 514.7, Category 4 (pending)

Shock
Operating, MIL-STD-810G, Method 516.7, Procedure I (pending)

EMC
CE/ FCC Class A, according to EN 55032 & EN 55035 (pending)

* For sub-zero and over 60°C operating temperature, a wide temperature SD card / NVMe is required.
NRU-51V Series

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

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**Optional Accessories**

<table>
<thead>
<tr>
<th>AC-IMX390-H60</th>
<th>Sony IMX390 CMOS sensor camera; 1920x1080 @ 30fps; LFM; HFOV 63.9°; IP67; -40°C to 85°C operating temperature; male FAKRA connector; active alignment; without lens cap</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC-IMX390-H120</td>
<td>Sony IMX390 CMOS sensor camera; 1920x1080 @ 30fps; LFM; HFOV 120.6°; IP67; -40°C to 85°C operating temperature; male FAKRA connector; active alignment; without lens cap</td>
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<tr>
<td>AC-IMX390-H190</td>
<td>Sony IMX390 CMOS sensor camera; 1920x1080 @ 30fps; LFM; HFOV 186°; IP67; -40°C to 85°C operating temperature; male FAKRA connector; active alignment; without lens cap</td>
</tr>
<tr>
<td>AC-AR0233-H60</td>
<td>Onsemi AR0233 CMOS sensor camera; 1920x1080 @ 30fps; LFM; HFOV 60°; IP67; -40°C to 85°C operating temperature; male FAKRA connector</td>
</tr>
<tr>
<td>AC-AR0233-H120</td>
<td>Onsemi AR0233 CMOS sensor camera; 1920x1080 @ 30fps; LFM; HFOV 118°; IP67; -40°C to 85°C operating temperature; male FAKRA connector</td>
</tr>
<tr>
<td>AC-AR0233-H190</td>
<td>Onsemi AR0233 CMOS sensor camera; 1920x1080 @ 30fps; LFM; HFOV 196°; IP67; -40°C to 85°C operating temperature; male FAKRA connector</td>
</tr>
<tr>
<td>AC-AR0233-H60-60FPS</td>
<td>Onsemi AR0233 CMOS sensor camera; 1920x1080 @ 60fps; LFM; HFOV 60°; IP67; -40°C to 70°C operating temperature; male FAKRA connector</td>
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<tr>
<td>AC-AR0233-H120-60FPS</td>
<td>Onsemi AR0233 CMOS sensor camera; 1920x1080 @ 60fps; LFM; HFOV 118°; IP67; -40°C to 70°C operating temperature; male FAKRA connector</td>
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**Micro SD** | Micro SIM

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**DisplayPort** | **4x GMSL2 FAKRA Z connectors**

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**Power Adapters**

| PA-60W-OW | 60W AC/DC power adapter 12V/ 5A; cord end terminals for terminal block, operating temperature: -30 to 60°C |
| PA-120W-OW | 120W AC/DC power adapter 20V/ 6A; 18AWG/ 120cm; cord end terminals for terminal block, operating temperature: -30 to 70°C |

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**Miscellaneous**

| Tptk-NRU-50 | 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 |
| FK-FF-CABLE-7M | 7M FAKRA cable for cameras with male FAKRA connector; the waterproof end is black |
| FK-FF-CABLE-15M | 15M FAKRA cable for cameras with male FAKRA connector; the waterproof end has heat shrink tube |

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All specifications and photos are subject to change without prior notice.