AUVIDEA
JNX30-LC
TECHNICAL REFERENCE MANUAL

SCOPE OF WORK
Providing technical information and documentation to the product line JNX30-LC for NVIDIA Jetson Nano, TX2 NX & Xavier NX

PCB NUMBER
38401

ISSUE DATE
DEC.2021

[REVISED DATE]
[DEC.2021]

Version
1.2

PAGES
28

CONTENTS

SECTION 1 Document revisions and changes

Document version	Changes
V1.0	initial document, internal verification process
V1.1	internal verification process
V1.2	first release version

SECTION 2 Product revisions and changes

2.1 Product versions

Product version	Changes
38401-2	▪ added 5V 8A power supply ▪ added PCIe connector (rotate it compared to rev 1) ▪ added CAN connector (requires external CAN transceiver module - 38163-3)
38401-3	▪ changed MCU footprint from TSSOP-20 to UFQFN-28 ▪ supports STM32F042G6U6 and STM32L031G6U6 - dual rail power ▪ added support for MCU flashing from Jetson via UART ▪ changed R110 to 3.01k for maximum input current of 6A ▪ changed main power supply from LT8646 to MIC28514 ▪ extended e-fuse support for TPS26630/1 type ▪ added 2nd FAN connector
38401-4	▪ internal release
38401-5	▪ changed 3.3V power supply and power it by 12V ▪ changed MCU LDO (absolute max. input voltage 26V) ▪ added discrete components for power up (no MCU) ▪ moved FAN connector, so that it can be directly plugged ▪ changed over current protection from chip to fuse

2.2 Design and manufacturing

Flexible design and manufacturing
designed and manufactured in Germany
in-house fully automated production line with 3D AOI
special configuration possible with minimum purchase of 25 pcs (display port, M.2, PoE, 48V power in, super cap option, 2 RPi camera module connectors, SPI, I2C, switches, etc.)
design services: you architect your custom carrier board and Auvidea designs and produces it - please ask for a quote.

SECTION 3 Overview

3.1 Jetson compute module

This new JNX30-LC carrier board has been designed for the Jetson Xavier NX primarily, but it also supports the TX2 NX and Nano compute modules. A 5V 8A on-board power converter supports the high-power modes of the NX.

3.2 JNX30-LC

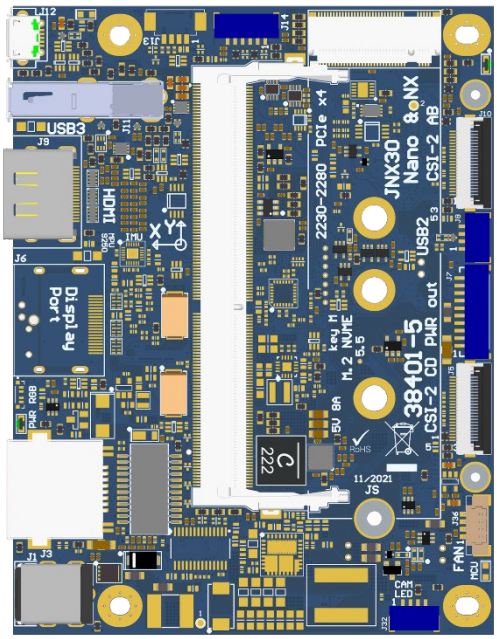
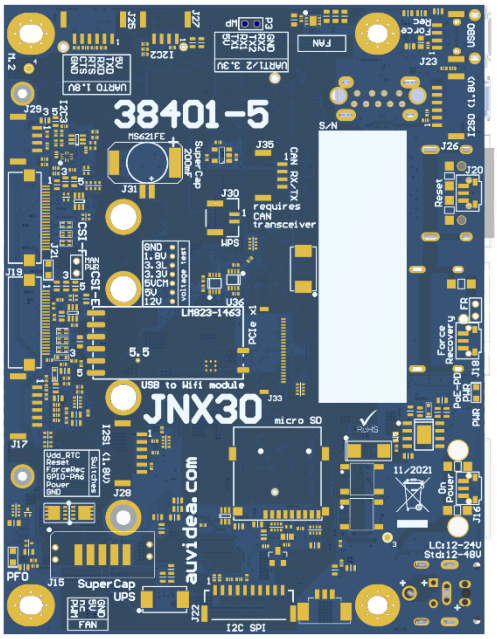
Easy integration into passively cooled systems

- Easy flashing: just connect a USB OTG cable (AutoFlash)
- High performance storage: M.2 NVME PCIe x4

Applications

- Industrial AI computers
- Digital signage systems

3.3 Model pictures

	Top side	Bottom side
JNX30-LC		

3.4 JNX30-LC features and comparison

Description	JNX30-LC	NVIDIA Devkit
Power	6V - 19V (barrel connector)	5V – 19V
NX powering	5V 8A power supply	?
DP	no (optional with some JNX30-LC versions)	yes
HDMI	yes	yes
Fan connector	yes	yes
M.2 NVME Key M	yes	yes
Micro SD card	no (optional with other models)	no
M.2 Key E	only with external module (using internal USB - J8)	yes
CAN RX / TX	no (optional with other models)	yes
USB 3	1x USB 3.1 (native - full performance)	4x USB 3.1 (via USB hub - shared)
Micro USB	1x Micro USB (device mode only)	1x Micro USB (device mode only)
Auto Flashing	yes (plug in host cable and flash)	no
USB 2.0	1x USB 2.0 (JST-GH, J8)	no
Ethernet	Gigabit RJ45 (2 LEDs)	Gigabit RJ45 (2 LEDs)
PoE option	no	yes - J19
CSI	2x CSI-2 (4 lanes) plus camera LED (hardware sync available)	2x CSI-2
UART	2x (J14)	2x (40 pin header, P12)
I2C	no (2x optional with some JNX versions)	2x (40 pin header, P12)
I2S	no (2x optional with some JNX versions)	1x (40 pin header, P12)
SPI	no (optional with some JNX30 versions)	2x (40 pin header)
Additional features		
Protection	overvoltage protection (TVS diode)	?
Level shifters	unidirectional level shifters (work better)	bi-directional (sometimes cause problems)
Buttons	no	12 pin header
Expandability	1. Fully populated variants available	no
	2. Add-on boards for more USB and Ethernet	
	3. IMU	
	4. board EEPROM and crypto chip (for SW copy protection)	
	5. PCIe x1 connector	
	6. LM823 WIFI module	
	7. 2 more CSI-2 interfaces (2 lanes each)	
	8. Micro SD card	
	9. RTC battery (rechargeable)	
	10. Over current fuse (product safety)	
	11. UPS option for graceful power down	
	12. On board MCU for watchdog and remote power cycle (LTE)	

3.5 Technical specifications

Description		Note
HDMI	standard HDMI connector (2.0)	
USB 3.0/3.1	5Gb/s (dependent on compute module)	
Physical size	80 x 104.6mm	
Mounting holes	4x M3	
Temperature range	0 to 70°C (extended temperature range optional)	
Humidity	noncondensing	
Longevity	Very long as no temperature sensitive components are used (like electrolytic capacitors)	

3.6 Power consumption

Description	JNX30-LC
Carrier board logic	< 1 watt
3.3/5V power converter efficiency	> 90%
Power in converter efficiency	n.a.

SECTION 4 Features

4.1 Booting via SSD

Auvidea ships some development systems with a pre-configured SSD. This contains a bootable partition which can be larger than the storage capacity of the integrated eMMC flash memory on the compute module. This allows the installation of all tools and supporting applications in the boot partition:

- Linux
- Jetpack 4.x
- A large selection of SDKs like listed in appendix D (CUDA, VisionWorks, DeepStream and more)
- 3rd party applications and demo programs
- Sample video files to immediately try out the AI models

The SSD typically included is a 128GB NVME SSD by Transcend (model: TS128GMTE110S). It offers very high performance as it connects to the compute module with 4 PCIe Gen2 lanes (5 Gbit/s).

Installation:
Full length 2280 SSDs must be inserted carefully as the SO-DIMM socket of the compute module blocks tilting. Please slide the SSD in carefully from the side and ensure, that it is seated properly before applying power. Secure the SSD with a M3 (nylon) screw. Metal screws must be treated with care, so that the head of the screw is small enough that it does not touch any traces or components on the compute module

High power SSDs may require extra cooling by installing a thermal pad between the SSD and the compute module or the carrier board.

4.2 Crypto chip

The crypto chip has been added to support software licensing and copy protection. Please check the data sheet of the manufacturer for details.
Model: ATSHA204A-MAHCZ-T
https://ww1.microchip.com/downloads/en/DeviceDoc/ATSHA204A-Data-Sheet-40002025A.pdf

4.3 MCU

A MCU for additional power management and watchdog functions is optional. It is standard on some of the extended versions of the JNX30. The MCU can provide features like:

- Powering control (up and down) of the compute module
- Brown out protection
- Clean boot after short power interruptions
- Watchdog support: it can connect to the debug console of the compute module
- Remote power cycle via LTE (requires LTE module with UART interface – like SIMCOM modules)

SECTION 5 Pinout description

Please note that the software GPIO number differs from the socket pin number. This software GPIO number must be computed with a special formula and differs between the various compute modules. Please see appendix B for details.

5.1 J1 - Power input jack

Nexus

Pin	Description	Note
1	12V	12V nominal (absolute max. 20V) recommend power supply 12V 36W (or higher) Reverse voltage protection over voltage protection (SMA6J18CA) with max 20V peak
2	GND	

5.2 J3 - Ethernet (GbE)

Standard RJ45 pinout with PoE capable magnetics class 3 and 4 (PD or PSE). Connected to the Ethernet controller on the compute module. PoE-PD and PoE-PSE are supported with the corresponding variants of the JNX30. Also, there is the new JNX30 PDiso (38481) with isolated PoE-PD.

5.3 J4 - M.2 PCIEx4 NVME SSDs

Please note that only NVME SSDs are supported. SATA SSDs are not supported. We recommend the 128GB Transcend SSDs (TS128GMTE110S). This SSD is standard in some of the Auvidea dev kit offerings.

5.4 J5 - CSI-2 CD

22 pin 0.5mm pitch FPC connector

Pin	Description	Socket pin	Note
1	3.3V		Power: connected with bead to 3.3V (5V optional if bead is moved)
2	GEN1_I2C_SDA	187	
3	GEN1_I2C_SCL	185	
4	GND		
5	CAM2-MCLK		IN: Input - connect to 1.8V or 3.3V output of the camera to drive the CAM LED. 1: enable CAM LED 0: disable CAM LED
6	CAM2_PWDN	206	OUT: Output (open drain with 2.2k pullup to 3.3V) - connect to power enable of camera. The control signal is connected via level shifting inverter to pin 152 of the compute modules.
7	GND		
8	CSI_D_D1_P	66	
9	CSI_D_D1_N	64	
10	GND		
11	CSI_D_D0_P	42	
12	CSI_D_D0_N	40	
13	GND		
14	CSI_C_CLK_P	54	
15	CSI_C_CLK_N	52	
16	GND		
17	CSI_C_D1_P	60	
18	CSI_C_D1_N	58	
19	GND		
20	CSI_C_D0_P	48	
21	CSI_C_D0_N	46	
22	GND		

Please note that on the JNX30-LC each camera connector uses its own I2C bus. This setup is different from the NVIDIA dev kit. If you like to use CSI-2 cameras, please install the Auvidea BSP (firmware).

This CSI-2 connector has the same 22 pin pinout as the 22-pin connector on the Raspberry Pi Zero and Raspberry Pi compute module dev kit board. With adapter cable it may connect to Raspberry Pi camera 2.1 and Vision Component camera modules. Alvium cameras require the Alvium adapter.

Pin 6: by default, the device tree puts a PWM signal on pin 206 (LCD_BL_PWM - GPIO_07). For most cameras (like Raspberry Pi camera with iMX219 sensor) this needs to be changed to a constant low output to send a high to the camera for power enable. This is part of the device tree changes.

Some Vision Component camera modules use this pin to synchronise multiple cameras. The pin 5s of all CSI-2 connectors are OR ‘red together and drive the CAM LED output.

5.5 J7 – Power out

SM10B-GHS-TB

Pin	Description	Socket pin	Note
1	V_IN		
2	V_IN		
3	12V		
4	12V		
5	12V		
6	12V		
7	GND		
8	GND		
9	GND		
10	GND		

5.6 J8 - USB 2.0

JST-GH 1.25mm

Pin	Description	Socket pin	Note
1	5V		
2	USB2_D_N	121	
3	USB2_D_P	123	
4	GND		

Internal USB 2.0 JST-GH connector to connect to internal USB 2.0 add-on modules (like U100, U110, U120, etc).

5.7 J9 - HDMI

Standard pinout
CEC is not supported (pin 13 of HDMI connector)
Power pin 18 is current limited by PTC fuse (5V 50mA)

5.8 J10 - CSI-2 AB

22 pin 0.5mm pitch FPC connector

Pin	Description	Socket pin	Note
1	3.3V		Power: connected with bead to 3.3V (5V optional if bead is moved)
2	CAM-I2C_SDA	215	
3	CAM-I2C_SCL	213	
4	GND		
5	CAM1-MCLK		IN: Input - connect to 1.8V or 3.3V output of the camera to drive the CAM LED. 1: enable CAM LED 0: disable CAM LED
6	CAM1_PWDN	206	OUT: Output (open drain with 2.2k pullup to 3.3V) - connect to power enable of camera. The control signal is connected via level shifting inverter to pin 152 of the compute modules.
7	GND		
8	CSI_B_D1_P	17	
9	CSI_B_D1_N	15	
10	GND		
11	CSI_B_D0_P	5	
12	CSI_B_D0_N	3	
13	GND		
14	CSI_A_CLK_P	12	
15	CSI_A_CLK_N	10	
16	GND		
17	CSI_A_D1_P	18	
18	CSI_A_D1_N	16	
19	GND		
20	CSI_A_D0_P	6	
21	CSI_A_D0_N	4	
22	GND		

See further details in the J5 description.

5.9 J11 - USB 3.0 – 3.1

USB 3.0 Type A standard pinout
In Rev 1: power control is always on (5V 1A)
In Rev 2 and up: Controllable with GPIO_03 (socket pin 126) power on[0]/off[1], default on[0], 5V 1A
See Appendix B for documentation on how to configure and use GPIOs.

5.10 J12 - Micro USB

Standard pinout
OTG support (to flash the compute module)
See Appendix B for documentation on how to configure and use GPIOs.

5.11 J14 - UART connector

JST-GH 1.25mm

Pin	Description	Socket pin	Note
1	5V		
2	UART0_TXD	99	OUT (3.3V)
3	UART0_RXD	101	IN (3.3V)
4	UART2_TXD	236	OUT, Debug port (3.3V)
5	UART2_RXD	238	IN, Debug port (3.3V)
6	GND		

Unidirectional directional 1.8V to 3.3V level shifters and 10 Ohm series resistance (plus ESD protection).

5.12 J32 – CAM LED

Pin	Description	Socket pin	Note
1	12V		
2	12V		
3	CAM_LED		OUT: open drain (3.3V to 12V)
4	CAM_LED		OUT: open drain (3.3V to 12V)

CAM_LED: open drain output to drive cathode of camera LED.
Controlled by 3 signals which are OR ‘red together:
J5 pin 5 (CSI CD camera)
J10 pin 5 (CSI AB camera)
Compute module GPIO_12: (socket pin 218) 0: LED off, 1: LED on, float: LED on

CAM_LED flash signal can be used to control external camera LED. When using external LED please limit current with external resistor. Connect cathode to CAM_LED pin and anode to 3.3V to 12V power. Maximum current: 2A.

5.13 J36 - Fan connector

Pico blade 1.5mm

Pin	Description	Socket pin	Note
1	GND		
2	5V		Max. 1A
3	TACH	-	Not connected
4	PWM	230	Open drain output with 10k pullup to 5V

5.14 U1 - Crypto chip

Model: ATSHA204A

Pin	Description	Socket pin	Note
1	NC		
2	NC		
3	NC		
4	GND		
5	GEN2_I2C_SDA		
6	GEN2_I2C_SCL		
7	NC		
8	3.3V		

Integrated for software protection and licensing.
Datasheet Link:
https://ww1.microchip.com/downloads/en/DeviceDoc/ATSHA204A-Data-Sheet-40002025A.pdf

5.15 LED - PWR

Controlled by GPIO_PA6 (socket pin 178): on[1]/off[0], default: off[0].

SECTION 6 FAQ

To be added.

SECTION 7 Disclaimer

Thank you for reading this manual. If you have found any typos or errors in this document, please let us know.
This is the preliminary version of this data sheet. Please treat all specifications with caution as there may be any typos or errors.

The Auvidea Team

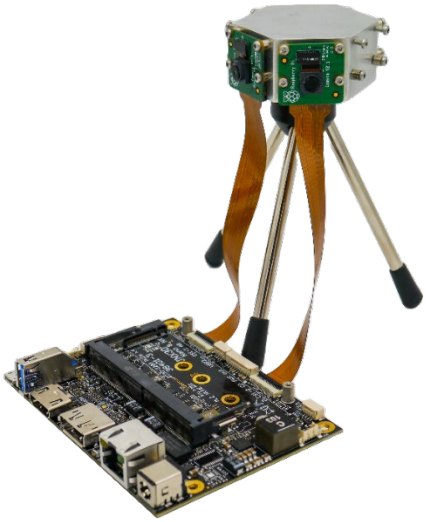
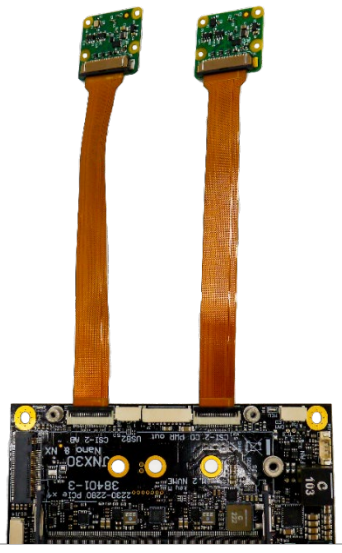
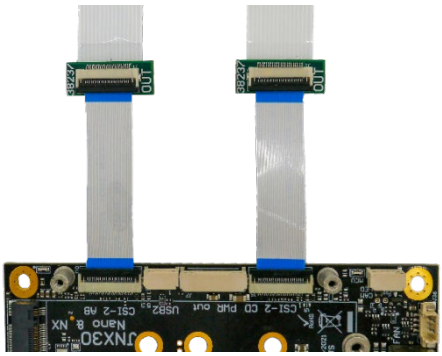
SECTION 8 Copyright notice

Trademarks
NVIDIA, the NVIDIA logo, CUDA, Jetson, Maxwell, Tegra, Nano and VisionWorks are registered trademarks and/or trademarks of NVIDIA Corporation in the United States and other countries. Other company and product names may be trademarks of the respective companies with which they are associated.

SECTION 9 Appendix A [CSI-Cameras]

9.1 Connection examples

CSI cameras can connect to J19-CSI-2-AB and J5–CSI-2-CD connector as shown below.
Connectors are the same as on Pi Zero.
Driver for the Raspberry Pi camera v2.1 (iMX219 sensor) is included din the NVIDIA Jetpacks.
More compatible camera modules are provided by vision-components.com.
Some vision-component cameras support camera and LED lighting synchronisation.
Auvidea can also provide an adapter to the Alvium cameras manufactured by alliedvision.com (38424)

Using 38426 flex cable (60-120mm)	Using 38237 adapter
▪ 22pole to 15 pole flex cable specifical designed to connect JNX30 series to raspberry Pi cameras (38426)	▪ 50mm 22pole FFC cable with contacts on the same side (42101) ▪ Adapter (38237) ▪ 100mm 15pol FFC cable contacts on oposite side (shipped with Pi camera)
	
	

SECTION 10 Appendix B [GPIO]

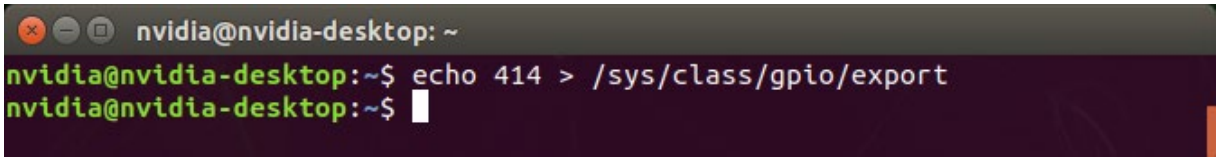
10.1 Calculate GPIO pins

This will be added in a future version

10.2 GPIO control

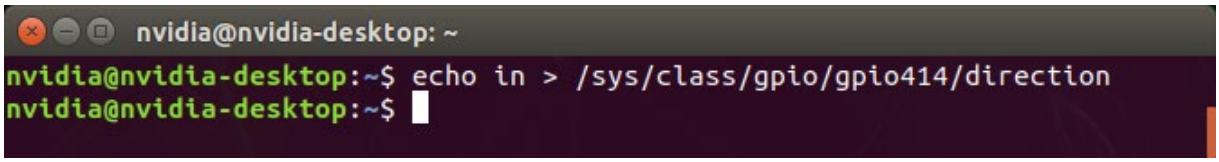
This example shows how to set and readout GPIO 414.
For different GPIO numbers replace 414 accordingly.

10.2.1 Export GPIO



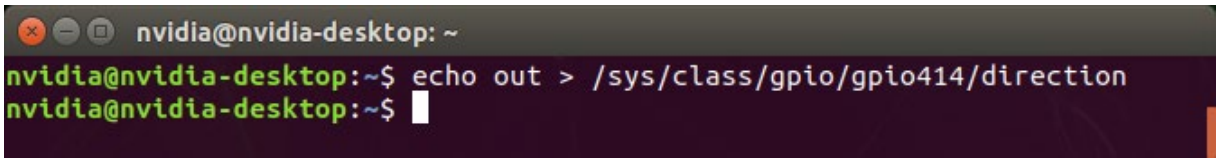
echo 414 > /sys/class/gpio/export

10.2.2 Change direction to in



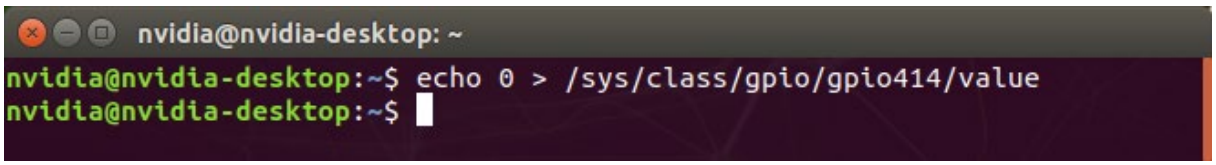
echo in > /sys/class/gpio/gpio414/direction

10.2.3 Change direction to out



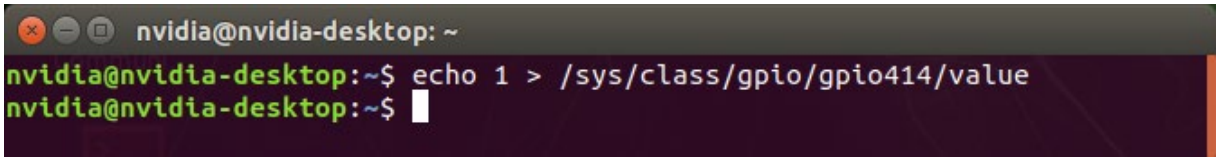
echo out > /sys/class/gpio/gpio414/direction

10.2.4 Set GPIO low



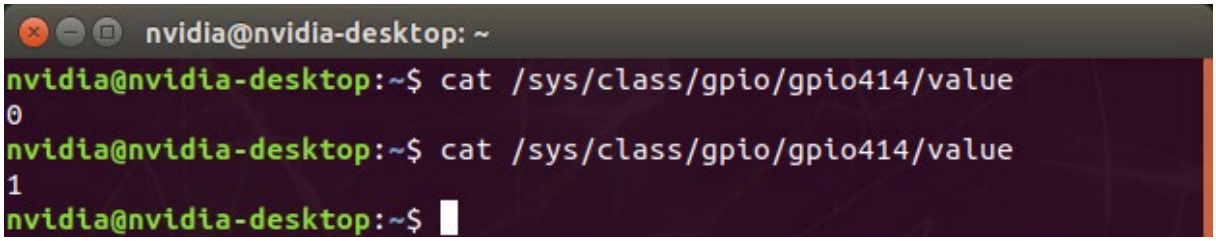
echo 0 > /sys/class/gpio/gpio414/value

10.2.5 Set GPIO high



echo 1 > /sys/class/gpio/gpio414/value

10.2.6 Readout GPIO value



cat /sys/class/gpio/gpio414/value

SECTION 11 Appendix C [I2C]

11.1 I2C Examples of configurations and how to use

This will be added in a future version

SECTION 12 Appendix D [Install Jetpack]

12.1 Installed Packages

When choosing the pre-configured version with SSD from AUVIDEA the following packages are already installed for easy setup.

These packages have been installed with the following commands:
apt install nvidia-jetpack
apt install deepstream-6.0.1

autopoint
cmake
cmake-data
cuda-command-line-tools-10-2
cuda-compiler-10-2
cuda-cudart-10-2
cuda-cudart-dev-10-2
cuda-cuobjdump-10-2
cuda-cupti-10-2
cuda-cupti-dev-10-2
cuda-documentation-10-2
cuda-driver-dev-10-2
cuda-gdb-10-2
cuda-libraries-10-2
cuda-libraries-dev-10-2
cuda-memcheck-10-2
cuda-nvcc-10-2
cuda-nvdisasm-10-2
cuda-nvgraph-10-2
cuda-nvgraph-dev-10-2
cuda-nvml-dev-10-2
cuda-nvprof-10-2
cuda-nvprune-10-2
cuda-nvrtc-10-2
cuda-nvrtc-dev-10-2
cuda-nvtx-10-2
cuda-samples-10-2
cuda-toolkit-10-2
cuda-tools-10-2
cuda-visual-tools-10-2
debhelper
dh-autoreconf
dh-strip-nondeterminism
graphsurgeon-tf
libarchive-cpio-perl
libcublas-dev
libcublas10
libcudnn8
libcudnn8-dev

libcudnn8-samples
libcufft-10-2
libcufft-dev-10-2
libcurand-10-2
libcurand-dev-10-2
libcurl4
libcusolver-10-2
libcusolver-dev-10-2
libcusparse-10-2
libcusparse-dev-10-2
libegl1-mesa-dev
libeigen3-dev
libfile-stripnondeterminism-perl
libfltk-gl1.3
libfltk-images1.3
libfltk1.3
libgles2-mesa-dev
libgstreamer-plugins-base1.0-dev
libgstreamer1.0-dev
libjsoncpp1
libmail-sendmail-perl
libnpp-10-2
libnpp-dev-10-2
libNVIDIA-container-tools
libNVIDIA-container0
libnvinfer-bin
libnvinfer-dev
libnvinfer-doc
libnvinfer-plugin-dev
libnvinfer-plugin8
libnvinfer-samples
libnvinfer8
libnvonnxparsers-dev
libnvonnxparsers8
libnvparsers-dev
libnvparsers8
libnvvpi1
libopencv
libopencv-dev
libopencv-python
libopencv-samples
liborc-0.4-dev
liborc-0.4-dev-bin
librhash0
libsys-hostname-long-perl
libtbb2
libuv1
libvisionworks
libvisionworks-dev
libvisionworks-samples
libvisionworks-sfm
libvisionworks-sfm-dev

libvisionworks-tracking
libvisionworks-tracking-dev
libwayland-bin
libwayland-dev
libxi-dev
libxmu-dev
libxmu-headers
libxrandr-dev
libxrender-dev
NVIDIA-container
NVIDIA-container-csv-cuda
NVIDIA-container-csv-cudnn
NVIDIA-container-csv-tensorrt
NVIDIA-container-csv-visionworks
NVIDIA-container-runtime
NVIDIA-container-toolkit
NVIDIA-cuda
NVIDIA-cudnn8
NVIDIA-docker2
NVIDIA-l4t-3d-core
NVIDIA-l4t-camera
NVIDIA-l4t-cuda
NVIDIA-l4t-firmware
NVIDIA-l4t-graphics-demos
NVIDIA-l4t-gstreamer
NVIDIA-l4t-init
NVIDIA-l4t-jetson-multimedia-api
NVIDIA-l4t-libvulkan
NVIDIA-l4t-multimedia
NVIDIA-l4t-multimedia-utils
NVIDIA-l4t-wayland
NVIDIA-l4t-weston
NVIDIA-l4t-x11
NVIDIA-opencv
NVIDIA-tensorrt
NVIDIA-visionworks
NVIDIA-vpi
opencv-licenses
po-debconf
python-numpy
python-olefile
python-pil
python-vpi1
python3-libnvinfer
python3-libnvinfer-dev
python3-vpi1
tensorrt
uff-converter-tf
vpi1-demos
vpi1-dev
vpi1-samples
x11proto-input-dev

x11proto-randr-dev NVIDIA-jetpack deepstream-6.0 libgstrtspserver-1.0-0

SECTION 13 End of document

End of document