

User manual SG4A-ORIN-GMSL2



Version 1.0

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Catalogue

Docume	nt revision history	2
Safety w	arnings and precautions for use	3
Explanat	ion of nouns	4
Chapter	1 Introduction to the SG4A-ORIN-GMSL2 adapter plate	6
1.1	SG4A-ORIN-GMSL2 adapter board function	6
1.	2SG4A-ORIN-GMSL2 adapter plate specification	7
Chapter	2 SG4A-ORIN-GMSL2 adapter plate operating instructions	11
2.1	Setting up the environment	11
2.2	Driver installation and camera lighting	

1



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Rev	Date	Description	Author
Document	Date of	Description	Author
version	revision		
number			
V1.0	2023/03/28	Initial release	Resear
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			Developm
			ent



Safety warnings and precautions for use

• Safety instructions

Before using this product, you must first consult this document to gain an initial understanding of the product and follow the safety instructions in the product's user manual to ensure your personal safety and to avoid damage to the equipment. The manufacturer is not responsible for any problems with the equipment or the safety of your life and property caused by its incorrect operation.

• Supply voltage

12V DC input power to the adapter; current: 3A or more

• Environmental requirements:

Operating temperature: -20°C - 85°C

Ventilation requirements: The area around the installation of the calculation platform must be well ventilated.

• Grounding requirements

The power supply of the power adapter must be well earthed, in special scenarios it is necessary to install an earth screw to earth.

• Static Protection

Electronic components and circuits are sensitive to electrostatic discharge. Although we design our circuit board card products with anti-static protection for the main



interfaces on the board, it is difficult to achieve anti-static safety protection for all components and circuits. It is therefore advisable to observe anti-static safety measures when handling any circuit board components. ESD safety measures include, but are not limited to, the following:

- The box should be placed in an anti-static bag during transport and storage until the installation is deployed before taking this adapter board;
- The static electricity stored in the body should be discharged before the body comes into contact with the box: wear a discharge grounding wristband;
- Operate the box only within the safe area of the static discharge point;
- Avoid moving boxes in carpeted areas.

Explanation of nouns

POC	Power Over Coax
GMSL	Gigabit Multimedia Serial Links
FPDLINK	Flat Panel Display Link
SerDes	Serializer and Deserializer
D-PHY	The original version of the MIPI D-PHY was designed for



	500Mbits/s, while D is 500 in Roman numerals (Latin		
	numerals), and C and M are 100 and 1000 in Roman		
	numerals respectively, i.e. C and M in C-PHY and M-PHY.		
C-PHY	C-PHYs may be used in channel-limited applications,		
	hence the use of the character "C", 3-Phase symbol		
	encoding technology, which allows each symbol to		
	2.28bits of data per symbol, 2.27 times more efficient		
	than D-PHY using a 5-input transmission		



Chapter 1 Introduction to the SG4A-ORIN-GMSL2 adapter board

The SG4A-ORIN-GMSL2 adapter board, which allows up to 16 cameras to be connected to the Jetson AGX Orin/Xavier module, is fully compatible with the NVIDIA Jetson AGX Orin/Xavier Development Kit. As there are many different types of GMSL cameras available, the adapter board can be adaptively operated at different frequencies i.e. it is compatible with both GMSL1 and GMSL2 protocol interfaces through software configuration. The GMSL camera is powered by PoC (Power over Coax), so all data, control signals and power are sent over a 50 Ohm coaxial cable, making the camera's cable routing flexible and easy to install in automotive applications. As the 120Pin connector on the NVIDIA Jetson AGX Orin/Xavier development kit does not provide the required voltage for the camera, the adapter board has a hot-swappable 12V power external connector.

1.1 SG4A-ORIN-GMSL2 Adapter plate function

- Compatible with official kits
 Support for NVIDIA Jetson AGX Orin/Xavier Development Kit
- Compatible with different versions of NVIDIA JetPack SDK
 Jetpack 5.0.1, L4T r34.1.1 and above
- Supports up to 16 GMSL cameras



Each SG4A-ORIN-GMSL2 single board has a built-in Maxim MAX96712, which supports 4*GMSL2 cameras and can be connected to a total of 4 SG4A-ORIN-GMSL2s, expanding to a maximum of 16 channels

- Support for synchronous triggering
 Support for external trigger signals for camera synchronisation
- Cameras can transmit up to 15 metres

By using the GMSL protocol for cameras, you can support stable and reliable transmission of cameras over long distances, with a maximum distance support of 15 metres. The use of Moriyun repeaters allows for the extension of: https://www.sensing-world.com/gmslzjg

1.2 SG4A-ORIN-GMSL2 Adapter Plate Specification

Model / Model	SG4A-ORIN-GMSL2
Dimension	73.66mm*53.34mm
Weight	<50g
Connectors / Connector	MIPI CSI-2
Camera input / Camera input	Camera*4(GMSL2/GMSL1)
Trigger In / Trigger In	3Pin Sync In
Deserializer / Deserializer	MAX96712GTB
Camera Connector / Camera	Fakra Z Code

7



Connector	
POC Power Supply / POC Power	DC 8-16V
Supply	
DC Power Supply / DC Power	DC 12V
Supply	
Operating Temperature /	-20°C to +85°C
Operating Conditions	
Adaptation kit	Jetson AGX Orin/Xavier
with adapter plate / collocation	SG4A-NVKit-MIPI Adapter board





• SG4A-ORIN-GMSL2 Interface diagram of the adapter board

• SG4A-NVKit-MIPI adapter board interface diagram









Chapter 2 SG4A-ORIN-GMSL2 Instructions for using the adapter

plate

2.1 Setting up the environment

Reference link to Nvidia's official website:

Software Setup

https://developer.nvidia.com/embedded/learn/jetson-agx-orin-devkit-user-guid

e/two_ways_to_set_up_software.html

To Flash the Jetson Developer Kit Operating Software

https://docs.nvidia.com/jetson/archives/r35.1/DeveloperGuide/text/IN/QuickSta rt.html#to-flash-the-jetson-developer-kit-operating- software

The driver package for the SG4A-ORIN-GMSL2 adapter board is developed on a specific Jetson Linux version and you need to make sure the Jetson Linux version matches before installing the driver. If it does not match, you need to re-flash the system, otherwise the system will not boot after installing the driver. NVIDIA Jetson AGX Orin/Xavier supports two types of flashes using SDK Manager and Flash.sh script.

Preparation required:

- NVIDIA Jetson AGX Orin/Xavier Development Kit
- Computer with Ubuntu 18.04/20.04s 1



• USB TYPE-C data cable 1pc

2.1.1 Set RECOVERY download mode

The Nvidia Jetson platform software is upgraded via the USB interface and the Jetson device needs to be put into Recovery mode before the upgrade can take place, which includes the Kernel Kernel, the file system RootFS, the JetPack SDK and more.

To enter Recovery download mode in the off state, proceed as follows:

(1) Connecting a USB TYPE-C cable

Use a USB TYPE-C cable to connect the Jetson device to the Ubuntu Host, one end to the TYPE-C port of the Jetson device[®] and the other end to the USB port of the Ubuntu Host



(2) Press and hold the Force Recovery button at 2 and do not release it yet





(3) Access to power

Can be connected to the power supply using the Type-C connector @



Can also be connected to the power supply using the DC interface (5)





(4) If the white LED[®] does not light up, press and hold the power on button[®] to

switch on







(5) Wait for more than 5s and release all buttons to enter Recovery download mode

You can run the command Isusb on the Ubuntu Host to check for NVIDIA Corp.

APX devices to confirm that the Jetson device has successfully entered Recovery

download mode.

sens	sing(ubuntu	-\$ ls	ust		
Bus	004	Device	001:	ID	1d6b:0003	Linux Foundation 3.0 root hub
Bus	003	Device	004:	ID	0e0f:0002	VMware, Inc. Virtual USB Hub
Bus	003	Device	003:	ID	0e0f:0002	VMware, Inc. Virtual USB Hub
Bus	003	Device	005:	ID	0955:7023	NVIDIA Corp. APX
Bus	003	Device	002:	ID	0e0f:0003	VMware, Inc. Virtual Mouse
Bus	003	Device	001:	ID	1d6b:0002	Linux Foundation 2.0 root hub
Bus	001	Device	001:	ID	1d6b:0002	Linux Foundation 2.0 root hub
Bus	002	Device	003:	ID	0e0f:0002	VMware, Inc. Virtual USB Hub
Bus	002	Device	002:	ID	0e0f:0008	VMware, Inc. Virtual Bluetooth Adapter
Bus	002	Device	001:	ID	1d6b:0001	Linux Foundation 1.1 root hub
sens	sing	ubuntu	-\$			

2.1.2 Use the SDK Manager to brush your phone

(1) Download SDK Manager



Download the latest SDK Manager from the official website and select the .deb

format for Ubuntu.

https://developer.nvidia.com/nvidia-sdk-manager

Once downloaded, copy it to the working directory of your Ubuntu Host and install it.

\$ sudo apt install . /sdkmanager_1.9.2-10884_amd64.deb

(2) Run SDK Manager

Before running the SDK Manager, please refer to section 2.1.1 Setting up

RECOVERY download mode to put the Jetson device into Recovery download mode.

Find and click on the "SDKManager" icon in the application to run the SDK Manager,

or run it from the terminal with the following command.

\$ sdkmanager

Once launched, you will need to log in with your account, if you don't already

have one, you can register for a developer account.



SDK Marager 1:0:210865 x80,84 NVIDIA SDK MANAGER	
NYDIA DEVELOPER developer.nvidia.com NUCKLINE from local.tolder	4
NVIDLA Developer LOGIN Circle LOGN to industria layor process in your default browser. SDK	
LOGIN	
Stay lagged in Convoltage	

(3) Refresh

STEP 01: Automatically identify the Jetson device, select the JetPack version to match the Jetson Linux version required by the driver package, here JetPack 5.0.2 (Jetson Linux 35.1) is used as an example. Note that if there is no matching version, you need to use the Flash.sh script brushing method instead.

				R Hello Norman ∨
STEP 01 DEVELOPMENT ENVIRONMENT	PRODUCT CATEGORY	Jetson		0
STEP 02 DETAILS AND LIDENSE	HARDWARE CONFIGURATION	Host Machine 🥑	Target Hardware Jetson AGX Orin modules Original States AGX Orin (3208 dev kit version)	eloper
	TARGET OPERATING SYSTEM	Linux JetPack 5.0.2 (rev. 2) See what is new		.
	ADDITIONAL SDKS	DeepStream DeepStream 6.1.1		
Repair / Uninstall			CONT TO STEP	INUE >



STEP 02: Select the components to be installed according to your needs

DK Manager				A Hello Norman →
	STEP 01			Expand all
	DEVELOPMENT			STATUS
		> NvSci		
	STEP 02	Computer Vision	83.7 MB	
	DETAILS AND LICENSE	> Developer Tools	1,124 MB	
				STATUS
		V V Jetson Linux		
		> Jetson Linux image		
		> Flash Jetson Linux	0 MB	
		✓		
		> CUDA	1,430 MB	
		> CUDA-X AI	1,634 MB	
		> Computer Vision	110.5 MB	
		System requires up to 39GB (host) and 14GB (target) of available d	isk space during setup.	0.0117111115
				in star de
		I accent the terms and conditions of the license agreements	5. Download now. Install later.	< BACK TO STEP 01

STEP 03: Download and Installation

SDK Manager 1.9.2.10884 x86_64				
			A Hello	Norman 🗸 🚦
OTED OA	DETAILS TERMINAL			
STEP 01				
ENVIRONMENT	JETPACK 5.0.2 (REV. 2) LINUX FOR JETSON A			
No. of Concession, Name			Downloading - 14%	
STEP 02	> NvSci	0.4 MB	Install Pending	
DETAILS AND LICENSE	 Computer Vision 	83.7 MB	Install Pending	
and an and a second	 Developer Tools 	1,124 MB	Downloading - 76%	
STEP 03	✓ TARGET COMPONENTS	DOWNLOAD SIZE		
SETUP	✓ Jetson Linux			
PROCESS	Jetson Linux Image	1,775 MB	Downloading - 5%	
	7 Plash Jetson Linux	U MB	1 lost rending	
CTED 0/				
STEP U4				
FINALIZATION				
	Downloading: 23.62% (10.53MB/s)			
	Installing: 0.00%		PAUSE	
	Download folder: /home/sensing/Downloads/nvidia/s	ikm downloads	FOR A BIT	1.00
WIDIA. Copyright © 2023, NVIDIA (ORPORATION, All rights reserved. NVIDIA Developer			

As the Jetson device is already in Recovery mode, here select Manual Setup, and set a new username and password.



SDK Manager 1.9.2.10884 x86_64			
	SDK Manager	× A Hello	
STEP 01 DEVELOPMENT DIVERDIMENT	Jetson ACK Orin (b2008 developer kit version) [1-2] ● (refresh) Connect and set your Jetson ACM Orin module as follows: (connect and set your Jetson ACM Orin Staße developer kit version) into Force Recovery Mode via Manual Setup or Automatic Setup. Choose Automatic Setup only if the device has already been flashed and is currently running. Manual Setup - Artistin AGK Orin B308 developer kit version] • 2 Make sum the dires is concerted to the source addater to discovered off •	Expand. US stailed stailed	
STEP 03 SFUP PROCESS	a. Science and the back comparison of the form (LBS Proc. Connector on the device. 4. Pross and hold the middle Force Recovery) button. 5. Press and hold the left (Power) button. 6. Release both mutters. 7. QEM Configuration. Proc.Config 0 • Now (Learname) - mode	stalled stalled 'US S image ready	
STEP 04	New Posterialities, Investe New Posterialities, Investe 8. Storage Device: EMMC (default) V Role: Voir magnined to manuality change the device boot order after flashing when there are multiple choices on your device. When ready, click: Flash to continue.	tash Pending	
	Rush Ske	FOR A BIT	

SDK Manager 1.9.2.10884 x86_64				_ ×
			🞗 Hello Norman 🗸	
STEP 01 DEVELOPMENT ENVIRONMENT	DETAILS TERMINAL JETPACK 5.0.2 (REV. 2) LINUX FOR JETSON AG			
		DOWNLOAD SIZE		
CTED 00	> CUDA	3,241 MB	Installed	
STEP UZ	> NvSci	0.4 MB	installed	
AND LICENSE	> Computer Vision	83.7 MB	Installed	
A CONTRACTOR OF A	> Developer Tools	1,124 MB	Instanted	
STEP 03	TARGET COMPONENTS Jetson Linux			
PROCESS	 Jetson Linux image 	1,995 MB	OS image ready	
	 Flash Jetson Linux 	0 MB	Elashing - 49%	
STEP 04 SUMMARY FINAL (ZATION				
l.	Download completed successfully Installing, 91,57% Download folder: /home/sensing/Downloads/nvidia/sdl	km_downloads	PAUSE	
🐵 NVIDIA. Copyright © 2023, NVIDIA CC	REPORATION, All rights reserved. I NVIDIA Developer			

STEP 04: Installation complete



SDK Manager 1.9.2.10884 x86_64			· · · · · · · · · · · · · · · · · · ·
			🕆 Hello Norman 🗸
STEP 01	OETAILS TERMINAL JETPACK 50.2 IREV, 21 LINUX FOR JETSON A ~ HOST COMPONENTS > CUDA ~ No.C-:	AGK ORIN MODULES DOWNLOAD SIZE 3,341 MB 0.4 MP	Espandiall STATUS @ Installed @ percenter
DETAILS AND LICENSE	Computer Vision Developer Tools	83.7 MB 1,124 MB	Installed Installed
STEP 03	TARGET COMPONENTS Jetson Linux Jetson Linux image Flash Jetson Linux	DOWNLOAD SIZE 1,995 MB 0 MB	STATUS © DS image ready © Success
STEP 04			
	INSTALLATION CO	MPLETED SUCCESSFULLY.	
💿 TVIDIA. Copyright © 2023, WIDIA CORPO	ORATION. All rights reserved. I NVIDIA Developer		< BACK TO STEP 01

Once the swipe is complete, the Jetson device automatically boots into the Linux

desktop.



2.1.3 Use the flash.sh script to flush the machine

(1) Download the brush package

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

Depending on the driver version, select the corresponding Jetson Linux version,

here JetPack 5.0.2 (Jetson Linux 35.1) is used as an example.

Downloads and Links

	Jetson Orin modules and developer kit	Jetson Xavier modules and developer kits
DRIVERS	Drive	r Package (BSP)
	Sample	e Root Filesystem
SOURCES	Driver Pa	ckage (BSP) Sources
	Sample Ro	ot Filesystem Sources
	Sensor Proc	essing Engine Sources
DOCS	Jetson AGX Orin Developer Kit User Guide	Jetson AGX Xavier Developer Kit User Guide Jetson AGX Xavier Platform Adaptation Guide
	R	elease Notes
	Jetson Linux Dev	veloper Guide (online version)
	Jetson Linux Develop	ber Guide (downloadable version)
	Software	License Agreement
	Jetson Linux API Reference (fo	ormerly named Multimedia API Reference)
	nvbuf_utils to	NvUtils Migration Guide

Click on Driver Package to download to get Jetson Linux R35.1.0 aarch64.tbz2

Click on Sample Root Filesystem to download

Tegra_Linux_Sample-Root-Filesystem_R35.1.0_aarch64. tbz2 and copy it to the working directory of your Ubuntu Host.



sensing@ubuntu:~/nvidia\$ ls
Jetson_Linux_R35.1.0_aarch64.tbz2
Tegra_Linux_Sample-Root-Filesystem_R35.1.0_aarch64.tbz2
sensing@ubuntu:~/nvidia\$

(2) Unzip and install the brush package

Unzip the package, note that the filesystem needs to be extracted to the

Linux_for_Tegr a/rootfs directory via sudo.

\$ tar -jxvf Jetson_Linux_R35.1.0_aarch64.tbz2

\$ sudo tar -jxvf Tegra_Linux_Sample-Root-Filesystem_R35.1.0_aarch64.tbz2 -C Linux_for_Tegr

a/rootfs/

Execute the apply_binaries.sh script

\$ cd Linux_for_Tegra/

\$ sudo . /apply_binaries.sh

```
Setting up nvidia-l4t-initrd (35.1.0-20220810203728) ...
Pre-installing initrd package, skip flashing
Setting up nvidia-l4t-jetson-io (35.1.0-20220810203728) ...
Setting up nvidia-l4t-multimedia (35.1.0-20220810203728) ...
Setting up nvidia-l4t-pva (35.1.0-20220810203728) ...
Setting up nvidia-l4t-vulkan-sc-samples (35.1.0-20220810203728) ...
Setting up nvidia-l4t-weston (35.1.0-20220810203728) ...
Setting up nvidia-l4t-display-kernel (5.10.104-tegra-35.1.0-20220810203728) ...
Setting up nvidia-l4t-camera (35.1.0-20220810203728) ...
Setting up nvidia-14t-graphics-demos (35.1.0-20220810203728) ...
Setting up nvidia-l4t-gstreamer (35.1.0-20220810203728) ...
Processing triggers for nvidia-l4t-kernel (5.10.104-tegra-35.1.0-20220810203728)
 . . .
Processing triggers for libc-bin (2.31-Oubuntu9.9) ...
/home/sensing/nvidia/Linux_for_Tegra
Removing QEMU binary from rootfs
Removing stashed Debian packages from rootfs
L4T BSP package installation completed!
Disabling NetworkManager-wait-online.service
Disable the ondemand service by changing the runlevels to 'K'
Success!
```

Note: If an error is reported during the execution of this script, follow the prompts to

install the appropriate dependency package.



(3) Refresh

Refer to section "2.1.1 Setting up Recovery Download Mode" to put the Jetson

device into Recovery download mode. After confirming that the device is recognized

with the lsusb command, execute the following command to refresh the device.

\$ sudo . /flash.sh jetson-agx-orin-devkit mmcblk0p1
<pre>[688.5490] Bootloader version 01.00.0000 [688.5808] Writing partition A_MEM_BCT with mem_coldboot_sigheader.bct.encry [243712 bytes] [688.5826] [] 100% [691.6344] tegradevflash_v2write B_MEM_BCT mem_coldboot_sigheader.bct.enc pt [691.6494] Bootloader version 01.00.0000 [691.6854] Writing partition B_MEM_BCT with mem_coldboot_sigheader.bct.encry [243712 bytes] [691.6886] [] 100% [694.7130] Flashing completed</pre>
<pre>[694.7228] Coldbooting the device [694.7371] tegrarcm_v2chip 0x23 0ismb2 [694.7568] MB2 version 01.00.0000 [694.7947] Coldbooting the device [694.7960] tegrarcm_v2chip 0x23 0reboot coldboot [694.8031] MB2 version 01.00.0000 *** The target t186ref has been flashed successfully. *** Reset the board to boot from internal eMMC.</pre>

After brushing, the Jetson device automatically reboots into the Linux system and

follows the wizard to complete the configuration to access the desktop.



2.2 Driver installation and camera lighting

For a list of supported cameras and driver installation spotlights, please contact sales for a copy.





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