

文件編號		版本
生效日期	2026/1/29	
制定部門	System-SW	V2.10

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	1 of 64
------	--	-----	---------

Confidential  
 Non-Confidential

使用說明  需求手冊  設計文件  測試報告

分發：

文件編號		生效日期	1 月 29 日 2026 年
------	--	------	-----------------

文件名稱： oToCAM\_NvidiaDriver\_UserGuide.docx

#### 歷史資料

版本	制修訂人/核准人	生效日期	變更項目
0.1	YukiChen	2021/01/11	Initial Version
0.5	PierreHsieh	2021/05/06	Modify for Maxim SerDes.
0.8	GoldenLin	2021/09/06	Add ISP type camera full-size preview command.
0.9	GoldenLin	2022/12/02	Modify for JetPack 5.0 changes.
1.0	GoldenLin	2023/7/31	Add DTS description, Linux Kernel Patch
1.1	GoldenLin	2024/08/30	Add DTS new config: MIPI datarate Add JetPack6.0 support
2.0	JohnTu	2025/06/20	Modify for new camera driver
2.1	JohnTu	2025/06/25	Fine tune string
2.2	JohnTu	2025/06/30	Add for device tree programming
2.3	JohnTu	2025/09/26	Add for device tree programming Dynamic device tree example
2.4	JohnTu	2025/09/26	Fix for otocam driver VER_1.04.04/VER_1.03.03
2.5	JohnTu	2025/11/06	Add for dynamic dts generator tool Add for JP7.0
2.6	JohnTu	2025/11/13	Add oToAdapter for dynamic dts generator tool

文件編號		版本
生效日期	2026/1/29	
制定部門	System-SW	V2.10

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	2 of 64
------	--	-----	---------

			Add for static device tree & tools  Add for oToCAM274isp
2.7	JohnTu	2025/11/25	Remove session of “Configure Camera Nodes and Properties for dynamic-overlay device tree creation”  Add installation of device tree  For driver v1.5.3(JP7.x) v1.4.9(JP6.x)v1.3.8(JP5.x)
2.8	JohnTu	2025/12/10	For driver v2.5.0(JP7.x) v2.4.0(JP6.x)v2.3.0(JP5.x)  oToAdapter OrinNX/Nano new HW fix
2.9	JohnTu	2026/1/22	For driver v2.5.2(JP7.x) v2.4.3(JP6.x)v2.3.2(JP5.x)  For Frame sync (section 2.1.7 & 2.1.2)
2.10	JohnTu	2026/1/22	For driver v2.6.0(JP7.1) v2.5.3(JP7.0) v2.4.4(JP6.x)v2.3.3(JP5.x)  Fix For Frame sync (section 2.1.7 & 2.1.2)

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	3 of 64
------	--	-----	---------

## 目錄

<b>1. INTRODUCTION .....</b>	<b>4</b>
1.1. FEATURES .....	4
1.2. BLOCK DIAGRAM .....	5
1.3. DRIVER PACKAGE .....	8
<b>2. INSTALLATION AND INTEGRATION .....</b>	<b>10</b>
2.1. INTEGRATE DEVICE-TREE (DTS).....	10
2.2. RECONFIGURE AND PATCH LINUX KERNEL.....	44
2.3. UPDATE KERNEL IMAGE AND DTB .....	45
<b>3. DRIVER TESTING .....</b>	<b>46</b>
3.1. LOAD KERNEL MODULE .....	46
3.2. RUN GSTREAMER TO DISPLAY .....	46
3.3. RUN V4L2-UTILS OR OTHER TOOL.....	47
<b>4. FEEDBACK.....</b>	<b>49</b>
<b>5. REFERENCE .....</b>	<b>50</b>
5.1. NVIDIA DEVELOPMENT DOCUMENTS.....	50
5.2. NVIDIA CARRIER BOARD SPECIFICATION.....	50
5.3. NVIDIA XAVIER PINMUX TABLE .....	50
<b>APPENDIX A. DEVICE TREE PROGRAMMING .....</b>	<b>51</b>

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	4 of 64
------	--	-----	---------

# 1. Introduction

oToCAM Nvidia Driver package supports oToBrite's oToCAM series cameras on Jetson Linux platform. This User Guide documents the package contents, and driver installation/integration/testing procedures.

## 1.1. Features

Catalog	Feature
Platform	<ul style="list-style-type: none"> <li>➤ Supported Jetson DevKits: AGX-Orin, Orin NX(Nano), AGX-Xavier, Xavier NX</li> <li>➤ Supported Cameras: ar0823atisp(oToCAM276isp), imx728isp(oToCAM271isp), imx623isp(oToCAM274isp), imx390isp(oToCAM264isp), imx490isp(oToCAM260isp), imx290isp, isx021/031, ar0144/233, svb56g, and more.</li> </ul>
MIPI CSI-2	<ul style="list-style-type: none"> <li>➤ MIPI CSI-2: 1.5Gbps (1.0~2.5Gbps), x2/4 lanes per port</li> <li>➤ GMSL SerDes: Maxim MAX9296/96712/96724/96714, MAX9295/96717 <ul style="list-style-type: none"> <li>■ Each Dser can connect 1/2/4 cameras. Max. <b>4</b> Dsers on a system.</li> </ul> </li> <li>➤ FPDL SerDes: TI UB954/960, UB953/933/913 <ul style="list-style-type: none"> <li>■ Each Dser can connect 2/4 cameras. Max. <b>4</b> Dsers on a system.</li> </ul> </li> </ul>
JetPack SDK	<ul style="list-style-type: none"> <li>➤ JetPack-7.0/L4T-38.2 (oToCAM Driver V2.05.XX) (oToCAM.ko...)</li> <li>➤ JetPack-6.2.1/L4T-36.4.4 (oToCAM Driver V2.04.XX) (oToCAM.ko...)</li> <li>➤ JetPack-6.2/L4T-36.4.3 (oToCAM Driver V2.04.XX) (oToCAM.ko...)</li> <li>➤ JetPack-5.1/L4T-35.6 (oToCAM Driver V2.03.XX) (oToCAM.ko...)</li> <li>➤ JetPack-7.0/L4T-38.2 (oToCAM Driver V1.05.XX) (oToCAM.ko...)</li> <li>➤ JetPack-6.2.1/L4T-36.4.4 (oToCAM Driver V1.04.XX) (oToCAM.ko...)</li> <li>➤ JetPack-6.2/L4T-36.4.3 (oToCAM Driver V1.04.XX) (oToCAM.ko...)</li> <li>➤ JetPack-5.1/L4T-35.6 (oToCAM Driver V1.03.XX) (oToCAM.ko...)</li> <li>➤ JetPack-6.1/L4T-36.4 (oToCAM Driver V0.04.XX)</li> <li>➤ JetPack-5.1/L4T-35.6 (oToCAM Driver V0.03.XX)</li> <li>➤ JetPack-4.6/L4T-32.6 (oToCAM Driver V0.02.XX)</li> <li>➤ JetPack-4.5/L4T-32.5 (oToCAM Driver V0.01.XX)</li> </ul>

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	
文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數

文件名稱 oToCAM\_nVidiaDriver\_UserGuide-v2.10.docx

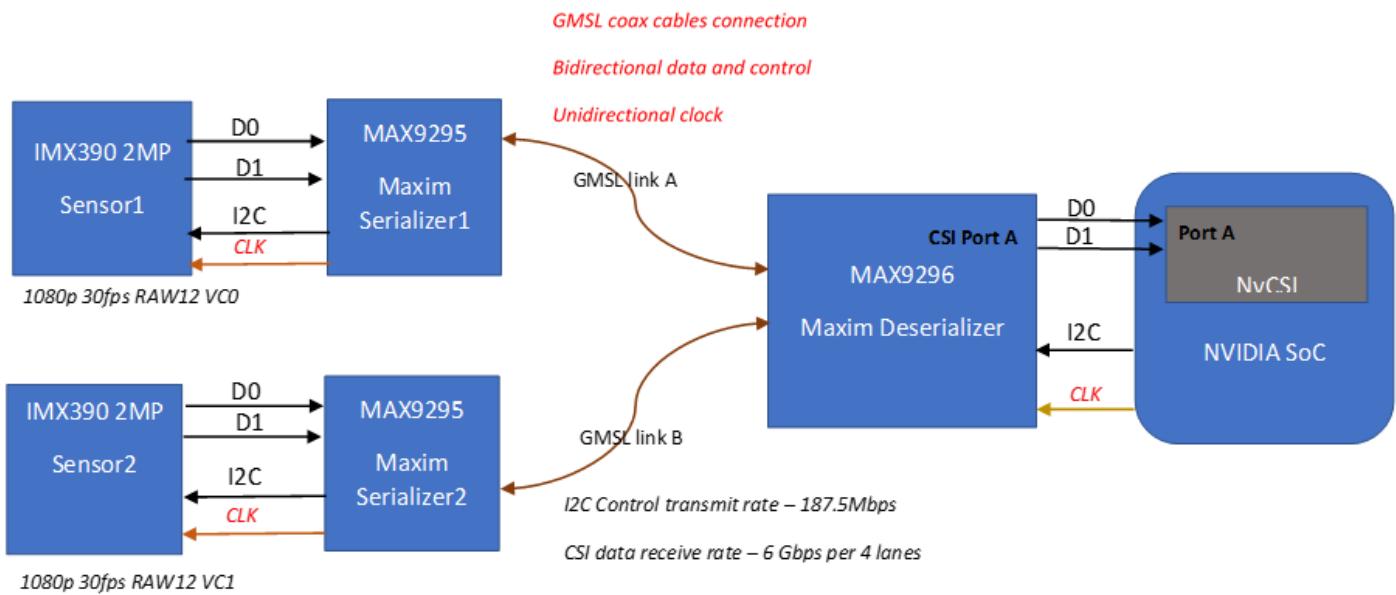
頁 數 5 of 64

## 1.2. Block Diagram

The following diagram shows a GMSL connection with 1:2 Deserializer, which can link two Serializer-Sensor devices. (Ref:

<https://docs.nvidia.com/jetson/archives/r35.4.1/DeveloperGuide/text/SD/CameraDevelopment/JetsonVirtualChannelWithGmslCameraFramework.html>)

Reference GMSL setup with 2x aggregator

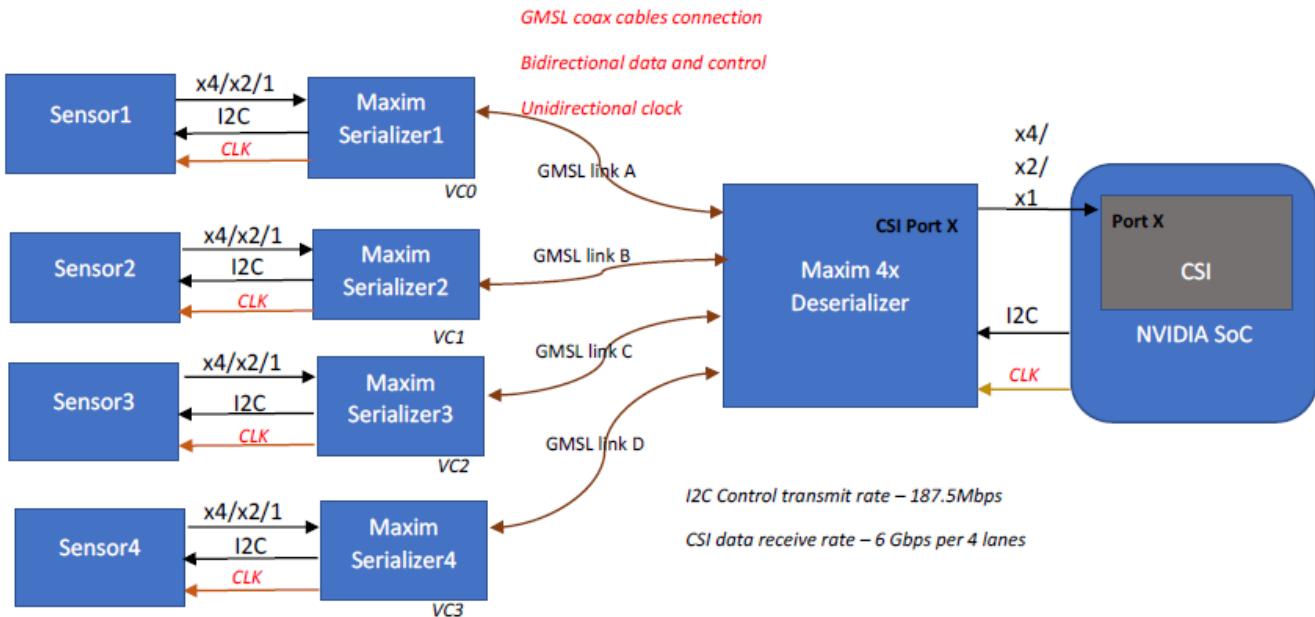


The following diagram shows a GMSL connection with 1:4 Deserializer, which can link four Serializer-Sensor devices.

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	6 of 64
------	--	-----	---------

### Proposed GMSL setup with 4x aggregator

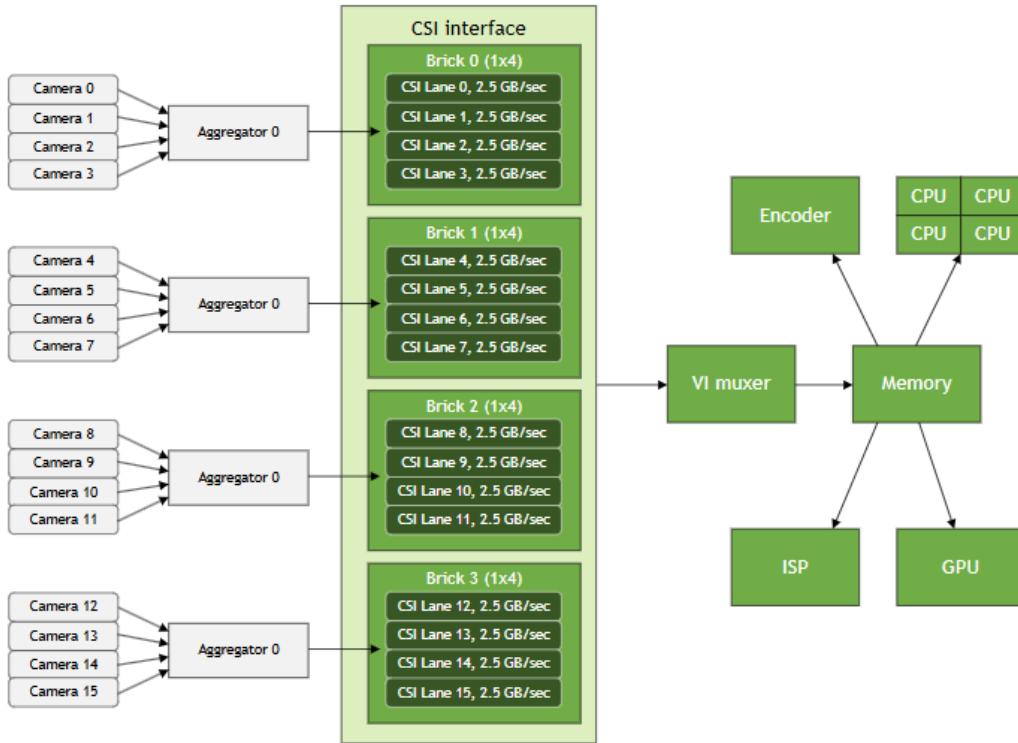


文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	7 of 64
------	--	-----	---------

## Jetson AGX Orin Series

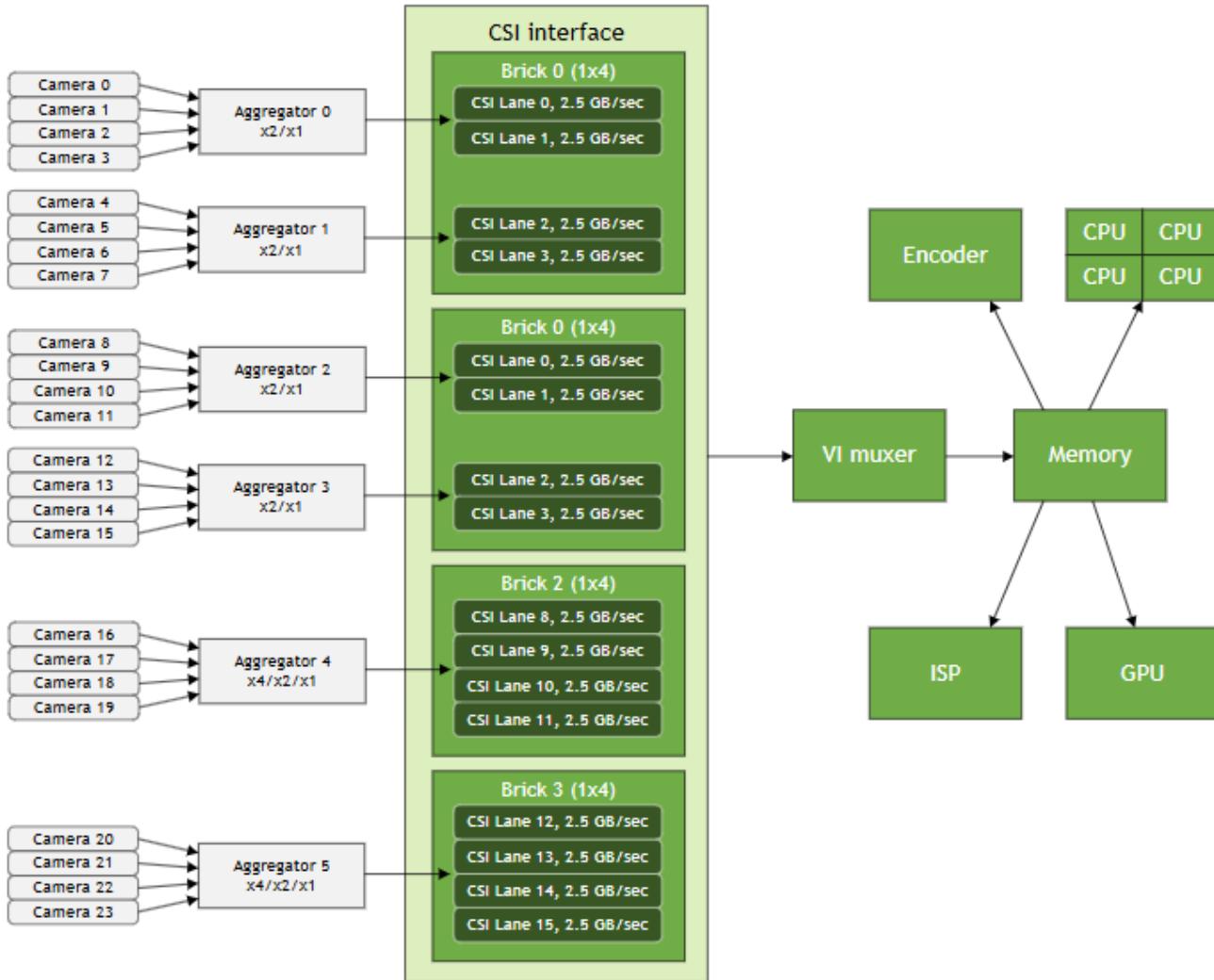
Jetson AGX Orin series supports a maximum of 16 virtual channels with ISP, or 24 virtual channels without ISP.



The diagram above shows sensor connections to each of the NVIDIA® Orin™ CSI bricks (a total of 4 CSI bricks) in x4 or /x2 or /x1 possible lane configuration.

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	8 of 64
------	--	-----	---------



The diagram above shows four sensors connected to each port of CSI bricks AB and CD in x2 or x1 lane configuration, and four sensors connected to each of the remaining CSI bricks EF and GH in x4, x2, or x1 lane configuration.

### 1.3. Driver Package

The driver package can be extracted as follows:

```
$ unzip otocam-driver.zip
```

It has two folders inside:

- bin/: contains kernel modules (oToSerDes.ko, oToCAM.ko).
- dts/: contains sample device-tree source files.

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	9 of 64
------	--	-----	---------

Kernel modules are built for specific JetPack/Linux version. Use below command to check module's **vermagic**, and see whether it can match the JetPack/Linux version on your Jetson DevKit.

modinfo oToCAM.ko

```
version:      1.04.02
license:      Dual BSD/GPL
author:       oToBrite Corporation
description: Media Controller driver for oToCAM
description: support oToCAM222/oToCAM223/oToCAM264ISP/oToCAM260ISP/oToCAM271ISP/oToCAM272ISP/oToCAM251
srcversion:   5E00BEC365CF244A377DF11
alias:        of:N*T*Cotobrite,otocamC*
alias:        of:N*T*Cotobrite,otocam
alias:        i2c:otocam
depends:     oToSerDes
name:        oToCAM
vermagic:    5.15.148-tegra SMP preempt mod_unload modversions aarch64
parm:        sensor_model:array of charp
parm:        test_mode:int
parm:        deser_notset_poweroff:int
```

modinfo oToSerDes.ko

```
version:      1.04.02
license:      Dual BSD/GPL
author:       oToBrite Corporation
description: GMSL/FPD-Link Serializer/Deserializer driver for oToCAM
description: support max9295/max96717/TI-UB953
description: support max96724/max96712/max9296/TI-UB960
srcversion:   E23FD517D6575FAF750D862
alias:        i2c:deserializer
alias:        of:N*T*Cti,ub953C*
alias:        of:N*T*Cti,ub953
alias:        of:N*T*Cotobrite,serializerC*
alias:        of:N*T*Cotobrite,serializer
alias:        of:N*T*Cti,ub960C*
alias:        of:N*T*Cti,ub960
alias:        of:N*T*Cotobrite,deserializerC*
alias:        of:N*T*Cotobrite,deserializer
alias:        i2c:serializer
depends:    
name:        oToSerDes
vermagic:    5.15.148-tegra SMP preempt mod_unload modversions aarch64
parm:        test_mode:int
parm:        clk_en:int
parm:        prdbg:int
```

文件編號		版本
生效日期	2026/1/29	
制定部門	System-SW	V2.10
文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數 10 of 64

## 2. Installation and Integration

### 2.1. Integrate Device-Tree (DTS)

Driver package provides the following sample DTS files:

- (1) Dynamic (for make device tree include camera module)
- (2) Dynamic by dts generator tool
- (3) Dynamic\_overlay (for make device tree overlay)
- (4) Static (for overlay example of Orin-NX evk)

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	11 of 64
------	--	-----	----------

```

dts
└── dynamic
    ├── agx
    │   └── aeax-orin
    │       └── JP6_example
    │           ├── device-tree-out
    │           │   └── AGXOrin_EVK
    │           └── OrinNX_EVK
    ├── nx
    ├── nx-orin
    ├── otocam
    ├── readme.txt
    └── t23x
        ├── tegra234-camera-config.h
        ├── tegra234-p3737-0000+p3701-0004-nv-otocam.dts
        ├── tegra234-p3737-camera-imx390-overlay-otocam.dts
        ├── tegra234-p3737-camera-modules-otocam.dtsi
        ├── tegra234-p3767-camera-imx390-overlay-otocam.dts
        ├── tegra234-p3768-0000+p3767-0000-nv-otocam.dts
        └── tegra234-p3768-camera-modules-otocam.dtsi
    └── dynamic_dts_generator
        ├── linux 22.04
        │   └── make_overlay_dts_orin-devkit-r36
        └── windows10
            ├── make_overlay_dts_orin-devkit-r36.exe
            └── oToBriteEVK DTS Gen.xlsx
                └── nvthon310.dll
    └── dynamic_overlay
    └── static
        ├── connection-example.jpg
        ├── JP514-EVK-orin-nx
        ├── JP61-EVK-orin-nx
        ├── JP62-EVK-orin-agx
        ├── JP62-EVK-orin-nx
        ├── overlay-note.txt
        └── README.docx
    └── tools
        ├── check_IQ
            ├── example.png
            ├── exp_time_float_to_hex.py
            ├── oToCAM-gw5300-IQ.sh
            ├── readme.txt
            └── sensor_gain_float_to_hex.py
        ├── gst-showall2.sh
        ├── gst-showall.sh
        ├── insmod-otocam-rename.sh
        ├── rmmod-rename.sh
        ├── run_replace.sh
        ├── set-dtb-to-dts.sh
        ├── set-dts-to-dtb.sh
        ├── show-debug.sh
        ├── show-parse-tree.sh
        ├── test-nv16.sh
        └── test-otocam276isp.sh

```

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	12 of 64
------	--	-----	----------

## 2.1.1 Configure Camera Nodes and Properties for dynamic device tree creation

(JetPack 6.x)

```
dynamic/
└── t23x/
    ├── tegra234-camera-config.h
    ├── tegra234-p3737-0000+p3701-0004-nv-otocam.dts (AGX-Orin)
    ├── tegra234-p3737-camera-modules-otocam.dtsi (AGX-Orin)
    ├── tegra234-p3768-0000+p3767-0000-nv-otocam.dts (NX-Orin)
    └── tegra234-p3768-camera-modules-otocam.dtsi (NX-Orin)

otocam/
    ├── tegra234-camera-imx390-i2c.dtsi
    ├── tegra234-camera-imx390-a00.dtsi
    ├── tegra194-camera-all-mode.dtsi
    ├── tegra194-camera-imx390isp-mode.dtsi
    ├── tegra194-camera-imx490isp-mode.dtsi
    ├── tegra194-camera-isx021-mode.dtsi
    ├── tegra194-camera-isx031-mode.dtsi
    └── etc.
```

(JetPack 5.x)

```
dynamic/
└── agx-orin/
    ├── tegra234-camera-config.h
    ├── tegra234-p3701-0004-p3737-0000-otocam.dts
    └── tegra234-p3737-camera-modules.dtsi

└── nx-orin/
    ├── tegra234-camera-config.h
    ├── tegra234-p3767-0000-p3768-0000-otocam.dts
    └── tegra234-camera-modules.dtsi

otocam/
    ├── tegra194-p2822-0000-camera-imx390-a00.dtsi
    ├── tegra194-camera-imx390-a00.dtsi
    ├── tegra194-camera-all-mode.dtsi
    ├── tegra194-camera-imx390isp-mode.dtsi
    ├── tegra194-camera-imx490isp-mode.dtsi
    ├── tegra194-camera-isx021-mode.dtsi
    ├── tegra194-camera-isx031-mode.dtsi
    └── etc.
```

These files are modified/extended from Jetson Linux SDK below files:

(JetPack 6.x, in **hardware/nvidia/t23x/nv-public/**)

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	13 of 64
------	--	-----	----------

```

nv-platform/
├── tegra234-p3737-0000+p3701-0004-nv.dts
├── tegra234-p3768-0000+p3767-0000-nv.dts
└── ...
overlay/
├── tegra234-p3737-camera-modules.dtsi
├── tegra234-p3737-camera-imx390-overlay.dts
└── tegra234-camera-imx390-a00.dtsi
...

```

(JetPack 5.x, in **hardware/nvidia/platform/**)

```

t23x/concord/kernel-dts/ (AGX-Orin)
├── tegra234-p3701-0004-p3737-0000.dts
├── (tegra234-p3737-camera-imx390-overlay.dts)
└── cvb/
    ├── tegra234-p3737-camera-modules.dtsi
    └── tegra234-p3737-0000-camera-imx390-a00.dtsi
t23x/common/kernel-dts/
└── t234-common-modules/
    └── tegra234-camera-imx390-a00.dtsi

t19x/galen/kernel-dts/ (AGX-Xavier)
├── tegra194-p2888-0001-p2822-0000.dts
├── (tegra194-p2822-camera-imx390-overlay.dts)
└── common/
    ├── tegra194-p2822-camera-modules.dtsi
    └── tegra194-p2822-0000-camera-imx390-a00.dtsi
t19x/common/kernel-dts/
└── t19x-common-modules/
    └── tegra194-camera-imx390-a00.dtsi

```

To integrate, place Driver package's DTS files into Jetson Linux SDK source tree as below, and modify Makefile accordingly.

(JetPack 6.x)

```

hardware/nvidia/t23x/nv-public/
├── nv-platform/ (<= t23x/*)
└── otocam/*
...

```

(JetPack 5.x)

```

hardware/nvidia/platform/
├── t23x/concord/kernel-dts/ (<= agx-orin/*)
├── t23x/3768/kernel-dts/     (<= nx-orin/*)
└── tegra/common/kernel-dts/ otocam/*

```

If your board has its own main .dts, modify it to include Driver package's .dtsi files as below:

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	14 of 64
------	--	-----	----------

```
//#include "cvb/tegra234-p3737-camera-modules.dtsi" // -
#include "otocam/tegra194-camera-common.h" // +
#include "tegra234-camera-config.h" // +
#include "tegra234-p3737-camera-modules.dtsi" // +
```

### 2.1.1.1 Configure Camera Nodes and Properties

DTS camera nodes and properties can be configured via the parameters defined in **tegra234-camera-config.h**:

I2C_BUS, I2C_MUX, I2C_MUX_TCA9546	Used in <b>otocam/tegra234-camera-imx390-i2c.dtsi</b> , to configure the path of dser/ser/sensor I2C device nodes
I2C_BUS_CAM0-7	Used in <b>otocam/tegra234-camera-imx390-a00.dtsi</b> , to compose tegra-camera-platform's sysfs-device-tree property
CSI_NUM_CHANS	Maximum number of cameras can be connected, eg. 2 4 8
CSI_NUM_PORTS	Number of (aggregated) ports on CSI Host Controller
CSI_PORT_LANES	Bus-width of each CSI Port, eg. 2 4
CSI_SERDES_TYPE CSI_SERDES, CSI_SERDES_GMSL FPDL	0:m9296, 1:m96712, 2:m96724, 3:m96714 define the maximum number of ser devices that can be linked to a dser, eg. 1 2 4 (Ref: 1.2 Block Diagram)
CAM_MODE	Used in <b>otocam/tegra194-camera-all-mode.dtsi</b> , to select a camera-mode .dtsi file, eg. imx390isp isx021 .. (Ref: 1.1 Features)

Beside modifying **tegra234-camera-config.h**, check **otocam/tegra234-camera-imx390-i2c.dtsi** for configured I2C bus/address, dser reset-gpios, etc. If they still can't match your board design, please directly modify the nodes and properties.

**NOTE:** If user want to assign different camera models for each SerDes port, modify in **otocam/tegra234-camera-imx390-a00.dtsi** to directly include a specific camera-mode .dtsi (instead of **otocam/tegra194-camera-all-mode.dtsi**). As below example:

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	15 of 64
------	--	-----	----------

```
&cam_0 {
    //#include "otocam/tegra194-camera-all-mode.dtsi"      // -
    #include "otocam/tegra194-camera-imx390isp-mode.dtsi" // +
mode0 {
    ...
}
...
}
```

**NOTE:** If user want to provide an external FSYNC signal to fsync-mode enabled cameras, assign Dser's GPIO/MFP pin number via `fsync-gpio` property in `otocam/tegra234-camera-imx390-i2c.dtsi`. As below example:

```
dser_a: max9296@48 {
    compatible = "maxim,max9296";
    ...
    fsync-gpio = <0>;      // +
}
```

- For MAX9296, MFP0/7-10 pins are suitable for FSYNC signal input, because they are in GPI mode by default.
- For pulse-fsync enabled cameras (eg. imx, isx series), driver will provide initial FSYNC pulse to start streaming. External FSYNC signal can be provided optionally.
- For trigger-fsync enabled cameras (eg. isx series), frames are output only when External FSYNC signal are provided.

**NOTE:** Dser's MIPI bus data rate can be configured by property `max_lane_speed`, as below:

```
tegra-camera-platform {
    ...
    max_lane_speed = <1500000>;      // in unit of 1Kbps
    ...
}
```

Camera property `pix_clk_hz` (in camera-mode .dtsi) is calculated based on MIPI bus data rate. Therefore, it should be updated according to modified MIPI bus speed.

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	16 of 64
------	--	-----	----------

(<https://docs.nvidia.com/jetson/archives/r36.4.3/DeveloperGuide/SD/CameraDevelopment/SensorSoftwareDriverProgramming.html#sensor-pixel-clock>)

## 2.1.1.2 FPD-Link SerDes Support

TI SerDes devices can be declared in the same way as Maxim SerDes. Below is the comparison between them.

GMSL/Maxim SerDes	FPD-Link/TI SerDes
<pre>dser_a: max9296@48 {     compatible = "maxim,max9296";     reg = &lt;0x48&gt;;     csi-mode = "2x4";     max-src = &lt;2&gt;;     reset-gpios = &lt;&amp;tegra_main_gpio CAM0_RST_L ...&gt;; };  ser_a: max9295_a@40 {     compatible = "maxim,max9295";     reg = &lt;0x40&gt;;     nvidia,gmsl-dser-device = &lt;&amp;dser_a&gt;; };</pre>	<pre>dser_a: ub960@30 {     compatible = "ti,ub960";     reg = &lt;0x30&gt;;     csi-mode = "2x4";     max-src = &lt;4&gt;;     reset-gpios = &lt;&amp;tegra_main_gpio CAM0_RST_L ...&gt;; };  ser_a: ub953@18 {     compatible = "ti,ub953";     reg = &lt;0x18&gt;;     nvidia,gmsl-dser-device = &lt;&amp;dser_a&gt;; };</pre>

Camera nodes use same properties to describe SerDes link, regardless of GMSL or FPD-Link. Like below:

tegra234-camera-imx390-i2c.dtsi	tegra234-camera-imx390-a00.dtsi
<pre>cam_0: imx390@10 {     reg = &lt;0x10&gt;;     ...     nvidia,gmsl-ser-device = &lt;&amp;ser_a&gt;;     nvidia,gmsl-dser-device = &lt;&amp;dser_a&gt;; };</pre>	<pre>&amp;cam_0 {     ...     gmsl-link {         src-csi-port = "b";         dst-csi-port = "a";         serdes-csi-link = "a";         csi-mode = "1x4";         st-vc = &lt;0&gt;;         vc-id = &lt;0&gt;;         num-lanes = &lt;2&gt;;     }; };</pre>

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱 oToCAM\_nVidiaDriver\_UserGuide-v2.10.docx

頁 數 17 of 64

### 2.1.1.3 JP6.2 dynamic dts example

```
JP6_example
└── device-tree-out
    ├── AGXOrin_EVK
    │   └── OrinNX_EVK
    └── hardware
        └── nvidia
            └── t23x
                └── nv-public
                    └── nv-platform
                        └── Makefile
                            └── tegra234-camera-config.h
                            └── tegra234-p3737-0000+p3701-0004-nv-otocam.dts
                            └── tegra234-p3737-camera-imx390-overlay-otocam.dts
                            └── tegra234-p3737-camera-modules-otocam.dtsi
                            └── tegra234-p3767-camera-imx390-overlay-otocam.dts
                            └── tegra234-p3768-0000+p3767-0000-nv-otocam.dts
                            └── tegra234-p3768-camera-modules-otocam.dtsi
                └── otocam
                    └── tegra194-camera-all-mode.dtsi
                    └── tegra194-camera-ar0823isp-mode.dtsi
                    └── tegra194-camera-common.h
                    └── tegra194-camera-imx390isp-mode.dtsi
                    └── tegra194-camera-imx490isp-mode.dtsi
                    └── tegra194-camera-imx490isp-mode.dtsi
                    └── tegra194-camera-imx728isp-mode.dtsi
                    └── tegra194-camera-isx019-mode.dtsi
                    └── tegra194-camera-isx021-mode.dtsi
                    └── tegra194-camera-isx031-mode.dtsi
                    └── tegra194-camera-svb56g-mode.dtsi
                    └── tegra234-camera-imx390-a00.dtsi
                    └── tegra234-camera-imx390-i2c.dtsi
```

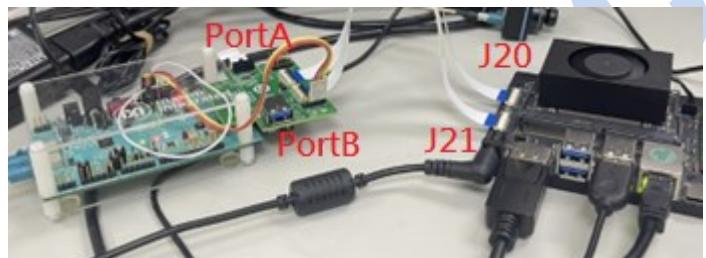


```
#include "otocam/tegra194-camera-common.h"
#include "tegra234-camera-config.h"
#include "tegra234-p3737-camera-modules-otocam.dtsi"
```

```
#define DTS OVERLAY
#include "otocam/tegra234-camera-imx390-i2c.dtsi"
```

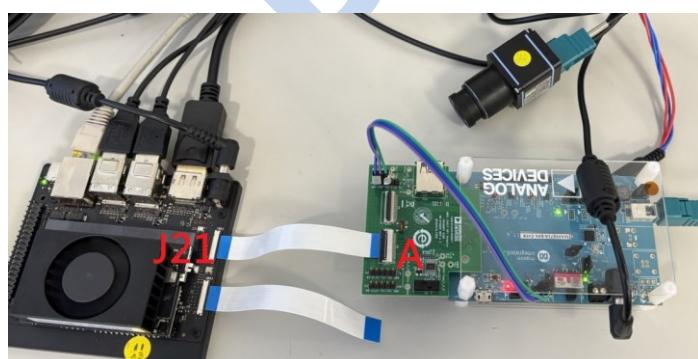
```
#include "otocam/tegra194-camera-all-mode.dtsi"
#include "otocam/tegra234-camera-imx390-a00.dtsi"
```

Example :



Orin NX(Nano) :

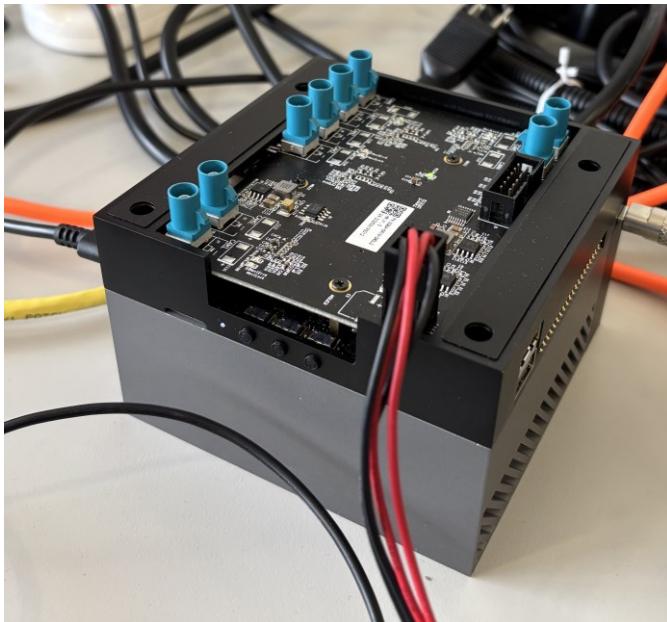
Orin NX(Nano) A port-> J21 only :



AGX Orin :

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	18 of 64
------	--	-----	----------



Confidential

[tegra234-camera-config.h](#)  
[tegra234-camera-config-m9296-2lane\\_2otocam222.h](#)  
[tegra234-camera-config-m9296-2lane\\_8otocam222.h \(AGX Orin\)](#)  
[tegra234-camera-config-m9296-4lane\\_2otocam222.h](#)  
[tegra234-camera-config-m9296-4lane\\_8otocam222.h \(AGX Orin\)](#)  
[tegra234-camera-config-m96712-2lane\\_4otocam222.h](#)  
[tegra234-camera-config-m96712-4lane\\_4otocam222.h](#)  
[tegra234-camera-config-m96714-2lane\\_1otocam222.h](#)  
[tegra234-camera-config-m96714-4lane\\_i2cmux\\_1otocam222.h \(A port-> J21\)](#)  
[tegra234-camera-config-m96724-2lane\\_4otocam222.h](#)  
[tegra234-camera-config-m96724-4lane\\_4otocam222.h](#)

oToAdapter for Orin NX/Nano & AGX Orin :

- [tegra234-camera-config-otoadapter-2lane\\_4otocam222.h](#)
- [tegra234-camera-config-otoadapter-4lane\\_4otocam222.h](#)
- [tegra234-camera-config-otoadapter-4lane\\_8otocam222.h](#)

tegra234-camera-config-m9296-2lane\_2otocam222.h :

OTO

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	19 of 64
------	--	-----	----------

```
#define I2C_BUS»i2c@3180000 // cam_i2c
//#define I2C_BUS»cam_i2cmux
#if 0
#define I2C_MUX»/tca9546@70
//#define I2C_MUX_TCA9546
#define I2C_BUS_CAM0»/bus@0/I2C_BUS/i2c@0
#define I2C_BUS_CAM1»/bus@0/I2C_BUS/i2c@0
#define I2C_BUS_CAM2»/bus@0/I2C_BUS/i2c@1
#define I2C_BUS_CAM3»/bus@0/I2C_BUS/i2c@1
#define I2C_BUS_CAM4»/bus@0/I2C_BUS/i2c@1
#define I2C_BUS_CAM5»/bus@0/I2C_BUS/i2c@1
#define I2C_BUS_CAM6»/bus@0/I2C_BUS/i2c@1
#define I2C_BUS_CAM7»/bus@0/I2C_BUS/i2c@1
#else
#define I2C_BUS_CAM0»/bus@0/I2C_BUS
#define I2C_BUS_CAM1»/bus@0/I2C_BUS
#define I2C_BUS_CAM2»/bus@0/I2C_BUS
#define I2C_BUS_CAM3»/bus@0/I2C_BUS
#define I2C_BUS_CAM4»/bus@0/I2C_BUS
#define I2C_BUS_CAM5»/bus@0/I2C_BUS
#define I2C_BUS_CAM6»/bus@0/I2C_BUS
#define I2C_BUS_CAM7»/bus@0/I2C_BUS
#endif

#define CSI_NUM_CHANS»2 //support max cams
#define CSI_NUM_PORTS»1 //Number of aggregated ports
#define CSI_PORT_LANES»2 //4lane or 2lane
#define CSI_SERDES_TYPE 0 //0:m9296, 1:m96712, 2:m96724
#if (CSI_SERDES_TYPE==0)
#define CSI_SERDES»2 // max cams connected to a dser
#elif (CSI_SERDES_TYPE==1)
#define CSI_SERDES»4 // max cams connected to a dser
#elif (CSI_SERDES_TYPE==2)
#define CSI_SERDES»4 // max cams connected to a dser
#else
#define CSI_SERDES»2 // max cams connected to a dser
#endif
#define CSI_SERDES_GMSL

#define CAM_MODE»isx021 //isx021, isx031, imx390isp, imx490isp, imx728isp, ar0823isp
```

M9296 2lane (2\*otocam -> a -> J20) v.s. 4lane (2\*otocam -> b -> J21) :

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱 oToCAM\_nVidiaDriver\_UserGuide-v2.10.docx 頁 數 20 of 64

```
1 #define I2C_BUS i2c@3180000 // cam_i2c
2 // #define I2C_BUS cam_i2cmux
3 #if 0
4 #define I2C_MUX //tca9546@70
5 // #define I2C_MUX_TCA9546
6 #define I2C_BUS_CAM0 /bus@0/I2C_BUS/i2c@0
7 #define I2C_BUS_CAM1 /bus@0/I2C_BUS/i2c@0
8 #define I2C_BUS_CAM2 /bus@0/I2C_BUS/i2c@1
9 #define I2C_BUS_CAM3 /bus@0/I2C_BUS/i2c@1
10 #define I2C_BUS_CAM4 /bus@0/I2C_BUS/i2c@1
11 #define I2C_BUS_CAM5 /bus@0/I2C_BUS/i2c@1
12 #define I2C_BUS_CAM6 /bus@0/I2C_BUS/i2c@1
13 #define I2C_BUS_CAM7 /bus@0/I2C_BUS/i2c@1
14 #else
15 #define I2C_BUS_CAM0 /bus@0/I2C_BUS
16 #define I2C_BUS_CAM1 /bus@0/I2C_BUS
17 #define I2C_BUS_CAM2 /bus@0/I2C_BUS
18 #define I2C_BUS_CAM3 /bus@0/I2C_BUS
19 #define I2C_BUS_CAM4 /bus@0/I2C_BUS
20 #define I2C_BUS_CAM5 /bus@0/I2C_BUS
21 #define I2C_BUS_CAM6 /bus@0/I2C_BUS
22 #define I2C_BUS_CAM7 /bus@0/I2C_BUS
23 #endif
24
25 #define CSI_NUM_CHANS 2 //support max cams
26 #define CSI_NUM_PORTS 1 //Number of aggregated ports
27 #define CSI_PORT_LANES 2 //4lane or 2lane
28 #define CSI_SERDES_TYPE 0 //0:im9296, 1:im9612, 2:im96724
29 #if (CSI_SERDES_TYPE==0)
30 #define CSI_SERDES 2 // max cams connected to a dser
31 #elif (CSI_SERDES_TYPE==1)
32 #define CSI_SERDES 4 // max cams connected to a dser
33 #elif (CSI_SERDES_TYPE==2)
34 #define CSI_SERDES 4 // max cams connected to a dser
35 #else
36 #define CSI_SERDES 2 // max cams connected to a dser
37 #endif
38 #define CSI_SERDES_GMSL
39
40 #define CAM_MODE isx021 //isx021, isx031, imx390isp-2
```

```
 tegra234-camera-config-m9296-4lane_zotocam222.h

1 #define I2C_BUS i2c@3180000 // cam_i2c
2 /*#define I2C_BUS cam_i2cmux
3 #if 0
4 #define I2C_MUX //tca9546@70
5 /*#define I2C_MUX_TCA9546
6 #define I2C_BUS_CAM0 /bus@0/I2C_BUS/i2c@0
7 #define I2C_BUS_CAM1 /bus@0/I2C_BUS/i2c@0
8 #define I2C_BUS_CAM2 /bus@0/I2C_BUS/i2c@1
9 #define I2C_BUS_CAM3 /bus@0/I2C_BUS/i2c@1
10 #define I2C_BUS_CAM4 /bus@0/I2C_BUS/i2c@1
11 #define I2C_BUS_CAM5 /bus@0/I2C_BUS/i2c@1
12 #define I2C_BUS_CAM6 /bus@0/I2C_BUS/i2c@1
13 #define I2C_BUS_CAM7 /bus@0/I2C_BUS/i2c@1
14 #else
15 #define I2C_BUS_CAM0 /bus@0/I2C_BUS
16 #define I2C_BUS_CAM1 /bus@0/I2C_BUS
17 #define I2C_BUS_CAM2 /bus@0/I2C_BUS
18 #define I2C_BUS_CAM3 /bus@0/I2C_BUS
19 #define I2C_BUS_CAM4 /bus@0/I2C_BUS
20 #define I2C_BUS_CAM5 /bus@0/I2C_BUS
21 #define I2C_BUS_CAM6 /bus@0/I2C_BUS
22 #define I2C_BUS_CAM7 /bus@0/I2C_BUS
23 #endif
24
25 #define CSI_NUM_CHANS 2 //support max cams
26 #define CSI_NUM_PORTS 1 //Number of aggregated ports
27 #define CSI_PORT_LANES 4 //4lane or 2lane
28 /*#define CSI_SERDES_TYPE 0 //m9296, 1:m9672, 2:m96724
29 #if (CSI_SERDES_TYPE==0)
30 #define CSI_SERDES 2 // max cams connected to a dser
31 #elif (CSI_SERDES_TYPE==1)
32 #define CSI_SERDES 4 // max cams connected to a dser
33 #elif (CSI_SERDES_TYPE==2)
34 #define CSI_SERDES 4 // max cams connected to a dser
35 #else
36 #define CSI_SERDES 2 // max cams connected to a dser
37 #endif
38 #define CSI_SERDES_GMSL
39
40 #define CAM_MODE isx021 //isx021, isx031, imx390isp,
```

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	21 of 64
------	--	-----	----------

```

tegra234-camera-config-m96724-4lane_4otocam222.h          tegra234-camera-config-m9296-4lane_2otocam222.h
-----          -----
1 #define I2C_BUS i2c@3180000 // cam_i2c          1 #define I2C_BUS i2c@3180000 // cam_i2c
2 /*#define I2C_BUS cam_i2cmux          2 /*#define I2C_BUS cam_i2cmux
3 #if 0          3 #if 0
4 #define I2C_MUX //tca9546@70          4 #define I2C_MUX //tca9546@70
5 /*#define I2C_MUX_TCA9546          5 /*#define I2C_MUX_TCA9546
6 #define I2C_BUS_CAM0 /bus@0/I2C_BUS/i2c@0          6 #define I2C_BUS_CAM0 /bus@0/I2C_BUS/i2c@0
7 #define I2C_BUS_CAM1 /bus@0/I2C_BUS/i2c@0          7 #define I2C_BUS_CAM1 /bus@0/I2C_BUS/i2c@0
8 #define I2C_BUS_CAM2 /bus@0/I2C_BUS/i2c@1          8 #define I2C_BUS_CAM2 /bus@0/I2C_BUS/i2c@1
9 #define I2C_BUS_CAM3 /bus@0/I2C_BUS/i2c@1          9 #define I2C_BUS_CAM3 /bus@0/I2C_BUS/i2c@1
10 #define I2C_BUS_CAM4 /bus@0/I2C_BUS/i2c@1          10 #define I2C_BUS_CAM4 /bus@0/I2C_BUS/i2c@1
11 #define I2C_BUS_CAM5 /bus@0/I2C_BUS/i2c@1          11 #define I2C_BUS_CAM5 /bus@0/I2C_BUS/i2c@1
12 #define I2C_BUS_CAM6 /bus@0/I2C_BUS/i2c@1          12 #define I2C_BUS_CAM6 /bus@0/I2C_BUS/i2c@1
13 #define I2C_BUS_CAM7 /bus@0/I2C_BUS/i2c@1          13 #define I2C_BUS_CAM7 /bus@0/I2C_BUS/i2c@1
14 #else          14 #else
15 #define I2C_BUS_CAM0 /bus@0/I2C_BUS          15 #define I2C_BUS_CAM0 /bus@0/I2C_BUS
16 #define I2C_BUS_CAM1 /bus@0/I2C_BUS          16 #define I2C_BUS_CAM1 /bus@0/I2C_BUS
17 #define I2C_BUS_CAM2 /bus@0/I2C_BUS          17 #define I2C_BUS_CAM2 /bus@0/I2C_BUS
18 #define I2C_BUS_CAM3 /bus@0/I2C_BUS          18 #define I2C_BUS_CAM3 /bus@0/I2C_BUS
19 #define I2C_BUS_CAM4 /bus@0/I2C_BUS          19 #define I2C_BUS_CAM4 /bus@0/I2C_BUS
20 #define I2C_BUS_CAM5 /bus@0/I2C_BUS          20 #define I2C_BUS_CAM5 /bus@0/I2C_BUS
21 #define I2C_BUS_CAM6 /bus@0/I2C_BUS          21 #define I2C_BUS_CAM6 /bus@0/I2C_BUS
22 #define I2C_BUS_CAM7 /bus@0/I2C_BUS          22 #define I2C_BUS_CAM7 /bus@0/I2C_BUS
23 #endif          23 #endif
24
25 #define CSI_NUM_CHANS 4 //support max cams          25 #define CSI_NUM_CHANS 2 //support max cams
26 #define CSI_NUM_PORTS 1 //Number of aggregated ports          26 #define CSI_NUM_PORTS 1 //Number of aggregated ports
27 #define CST_PORT_LANES 4 //4lane or 2lane          27 #define CST_PORT_LANES 4 //4lane or 2lane
28 #define CSI_SERDES_TYPE 2 //0:m9296, 1:m96712, 2:m96724          28 #define CSI_SERDES_TYPE 0 //0:m9296, 1:m96712, 2:m96724
29 #if (CSI_SERDES_TYPE==0)          29 #if (CSI_SERDES_TYPE==0)
30 #define CSI_SERDES 2 // max cams connected to a dser          30 #define CSI_SERDES 2 // max cams connected to a dser
31 #elif (CSI_SERDES_TYPE==1)          31 #elif (CSI_SERDES_TYPE==1)
32 #define CSI_SERDES 4 // max cams connected to a dser          32 #define CSI_SERDES 4 // max cams connected to a dser
33 #elif (CSI_SERDES_TYPE==2)          33 #elif (CSI_SERDES_TYPE==2)
34 #define CSI_SERDES 4 // max cams connected to a dser          34 #define CSI_SERDES 4 // max cams connected to a dser
35 #else          35 #else
36 #define CSI_SERDES 2 // max cams connected to a dser          36 #define CSI_SERDES 2 // max cams connected to a dser
37 #endif          37 #endif
38 #define CSI_SERDES_GMSL          38 #define CSI_SERDES_GMSL
39          39
40 #define CAM_MODE isx021 //isx021, isx031, imx390isp-          40 #define CAM_MODE isx021 //isx021, isx031, imx390isp,

```

M96724 2lane (2\*otocam -> a -> J20 + 2\*otocam -> b -> J21) v.s. 4lane (4\*otocam -> b -> J21) :

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	22 of 64
------	--	-----	----------

```
tegra234-camera-config-m96724-2lane_4otocam222.h ... ▾
1 #define I2C_BUS i2c@3180000 // cam_i2c
2 //define I2C_BUS cam_i2cmux
3 #if 0
4 #define I2C_MUX //tca9546@70
5 //define I2C_MUX_TCA9546
6 #define I2C_BUS_CAM0 /bus@0/I2C_BUS/i2c@0
7 #define I2C_BUS_CAM1 /bus@0/I2C_BUS/i2c@0
8 #define I2C_BUS_CAM2 /bus@0/I2C_BUS/i2c@1
9 #define I2C_BUS_CAM3 /bus@0/I2C_BUS/i2c@1
10 #define I2C_BUS_CAM4 /bus@0/I2C_BUS/i2c@1
11 #define I2C_BUS_CAM5 /bus@0/I2C_BUS/i2c@1
12 #define I2C_BUS_CAM6 /bus@0/I2C_BUS/i2c@1
13 #define I2C_BUS_CAM7 /bus@0/I2C_BUS/i2c@1
14 #else
15 #define I2C_BUS_CAM0 /bus@0/I2C_BUS
16 #define I2C_BUS_CAM1 /bus@0/I2C_BUS
17 #define I2C_BUS_CAM2 /bus@0/I2C_BUS
18 #define I2C_BUS_CAM3 /bus@0/I2C_BUS
19 #define I2C_BUS_CAM4 /bus@0/I2C_BUS
20 #define I2C_BUS_CAM5 /bus@0/I2C_BUS
21 #define I2C_BUS_CAM6 /bus@0/I2C_BUS
22 #define I2C_BUS_CAM7 /bus@0/I2C_BUS
23 #endif
24
25 #define CST_NUM_CHANS 4 //support max cams
26 #define CSI_NUM_PORTS 2 //Number of aggregated ports
27 #define CSI_PORT_LANES 2 //4lane or 2lane
28 #define CSI_SERDES_TYPE 2 //0:m9296, 1:m96/12, 2:m96/24
29 #if (CSI_SERDES_TYPE==0)
30 #define CSI_SERDES 2 // max cams connected to a dser
31 #elif (CSI_SERDES_TYPE==1)
32 #define CSI_SERDES 4 // max cams connected to a dser
33 #elif (CSI_SERDES_TYPE==2)
34 #define CSI_SERDES 4 // max cams connected to a dser
35 #else
36 #define CSI_SERDES 2 // max cams connected to a dser
37 #endif
38 #define CSI_SERDES_GMSL
39
40 #define CAM_MODE isx021 //isx021, isx031, imx390isp-r
... ▾
tegra234-camera-config-m96724-4lane_4otocam222.h ...
1 #define I2C_BUS i2c@3180000 // cam_i2c
2 //define I2C_BUS cam_i2cmux
3 #if 0
4 #define I2C_MUX //tca9546@70
5 //define I2C_MUX_TCA9546
6 #define I2C_BUS_CAM0 /bus@0/I2C_BUS/i2c@0
7 #define I2C_BUS_CAM1 /bus@0/I2C_BUS/i2c@0
8 #define I2C_BUS_CAM2 /bus@0/I2C_BUS/i2c@1
9 #define I2C_BUS_CAM3 /bus@0/I2C_BUS/i2c@1
10 #define I2C_BUS_CAM4 /bus@0/I2C_BUS/i2c@1
11 #define I2C_BUS_CAM5 /bus@0/I2C_BUS/i2c@1
12 #define I2C_BUS_CAM6 /bus@0/I2C_BUS/i2c@1
13 #define I2C_BUS_CAM7 /bus@0/I2C_BUS/i2c@1
14 #else
15 #define I2C_BUS_CAM0 /bus@0/I2C_BUS
16 #define I2C_BUS_CAM1 /bus@0/I2C_BUS
17 #define I2C_BUS_CAM2 /bus@0/I2C_BUS
18 #define I2C_BUS_CAM3 /bus@0/I2C_BUS
19 #define I2C_BUS_CAM4 /bus@0/I2C_BUS
20 #define I2C_BUS_CAM5 /bus@0/I2C_BUS
21 #define I2C_BUS_CAM6 /bus@0/I2C_BUS
22 #define I2C_BUS_CAM7 /bus@0/I2C_BUS
23 #endif
24
25 #define CST_NUM_CHANS 4 //support max cams
26 #define CSI_NUM_PORTS 1 //Number of aggregated ports
27 #define CSI_PORT_LANES 4 //4lane or 2lane
28 #define CSI_SERDES_TYPE 2 //0:m9296, 1:m96/12, 2:m96/24
29 #if (CSI_SERDES_TYPE==0)
30 #define CSI_SERDES 2 // max cams connected to a dser
31 #elif (CSI_SERDES_TYPE==1)
32 #define CSI_SERDES 4 // max cams connected to a dser
33 #elif (CSI_SERDES_TYPE==2)
34 #define CSI_SERDES 4 // max cams connected to a dser
35 #else
36 #define CSI_SERDES 2 // max cams connected to a dser
37 #endif
38 #define CSI_SERDES_GMSL
39
40 #define CAM_MODE isx021 //isx021, isx031, imx390isp, imx
```

M96712 v.s. M96724 :

OTOBRITE

文件編號		版本
生效日期	2026/1/29	
制定部門	System-SW	V2.10

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	23 of 64
------	--	-----	----------

```

tegra234-camera-config-m96712-4lane_4otocam222.h ... ▾
1 #define I2C_BUS i2c@3180000 // cam_i2c
2 // #define I2C_BUS cam_i2cmux
3 #if 0
4 #define I2C_MUX //tca9546@70
5 // #define I2C_MUX_TCA9546
6 #define I2C_BUS_CAM0 /bus@0/I2C_BUS/i2c@0
7 #define I2C_BUS_CAM1 /bus@0/I2C_BUS/i2c@0
8 #define I2C_BUS_CAM2 /bus@0/I2C_BUS/i2c@1
9 #define I2C_BUS_CAM3 /bus@0/I2C_BUS/i2c@1
10 #define I2C_BUS_CAM4 /bus@0/I2C_BUS/i2c@1
11 #define I2C_BUS_CAM5 /bus@0/I2C_BUS/i2c@1
12 #define I2C_BUS_CAM6 /bus@0/I2C_BUS/i2c@1
13 #define I2C_BUS_CAM7 /bus@0/I2C_BUS/i2c@1
14 #else
15 #define I2C_BUS_CAM0 /bus@0/I2C_BUS
16 #define I2C_BUS_CAM1 /bus@0/I2C_BUS
17 #define I2C_BUS_CAM2 /bus@0/I2C_BUS
18 #define I2C_BUS_CAM3 /bus@0/I2C_BUS
19 #define I2C_BUS_CAM4 /bus@0/I2C_BUS
20 #define I2C_BUS_CAM5 /bus@0/I2C_BUS
21 #define I2C_BUS_CAM6 /bus@0/I2C_BUS
22 #define I2C_BUS_CAM7 /bus@0/I2C_BUS
23 #endif
24
25 #define CSI_NUM_CHANS 4 //support max cams
26 #define CSI_NUM_PORTS 1 //Number of aggregated ports
27 #define CSI_PORT_LANES 4 //4lane or 2lane
28 #define CSI_SERDES_TYPE 1 //0:m9296, 1:m96712, 2:m96724
29 #if (CSI_SERDES_TYPE==0)
30 #define CSI_SERDES 2 // max cams connected to a dser
31 #elif (CSI_SERDES_TYPE==1)
32 #define CSI_SERDES 4 // max cams connected to a dser
33 #elif (CSI_SERDES_TYPE==2)
34 #define CSI_SERDES 4 // max cams connected to a dser
35 #else
36 #define CSI_SERDES 2 // max cams connected to a dser
37 #endif
38 #define CSI_SERDES_GMSL
39
40 #define CAM_MODE isx021 //isx021, isx031, imx390isp-
... ▾
tegra234-camera-config-m96724-4lane_4otocam222.h
1 #define I2C_BUS i2c@3180000 // cam_i2c
2 // #define I2C_BUS cam_i2cmux
3 #if 0
4 #define I2C_MUX //tca9546@70
5 // #define I2C_MUX_TCA9546
6 #define I2C_BUS_CAM0 /bus@0/I2C_BUS/i2c@0
7 #define I2C_BUS_CAM1 /bus@0/I2C_BUS/i2c@0
8 #define I2C_BUS_CAM2 /bus@0/I2C_BUS/i2c@1
9 #define I2C_BUS_CAM3 /bus@0/I2C_BUS/i2c@1
10 #define I2C_BUS_CAM4 /bus@0/I2C_BUS/i2c@1
11 #define I2C_BUS_CAM5 /bus@0/I2C_BUS/i2c@1
12 #define I2C_BUS_CAM6 /bus@0/I2C_BUS/i2c@1
13 #define I2C_BUS_CAM7 /bus@0/I2C_BUS/i2c@1
14 #else
15 #define I2C_BUS_CAM0 /bus@0/I2C_BUS
16 #define I2C_BUS_CAM1 /bus@0/I2C_BUS
17 #define I2C_BUS_CAM2 /bus@0/I2C_BUS
18 #define I2C_BUS_CAM3 /bus@0/I2C_BUS
19 #define I2C_BUS_CAM4 /bus@0/I2C_BUS
20 #define I2C_BUS_CAM5 /bus@0/I2C_BUS
21 #define I2C_BUS_CAM6 /bus@0/I2C_BUS
22 #define I2C_BUS_CAM7 /bus@0/I2C_BUS
23 #endif
24
25 #define CSI_NUM_CHANS 4 //support max cams
26 #define CSI_NUM_PORTS 1 //Number of aggregated ports
27 #define CSI_PORT_LANES 4 //4lane or 2lane
28 #define CSI_SERDES_TYPE 2 //0:m9296, 1:m96712, 2:m96724
29 #if (CSI_SERDES_TYPE==0)
30 #define CSI_SERDES 2 // max cams connected to a dser
31 #elif (CSI_SERDES_TYPE==1)
32 #define CSI_SERDES 4 // max cams connected to a dser
33 #elif (CSI_SERDES_TYPE==2)
34 #define CSI_SERDES 4 // max cams connected to a dser
35 #else
36 #define CSI_SERDES 2 // max cams connected to a dser
37 #endif
38 #define CSI_SERDES_GMSL
39
40 #define CAM_MODE isx021 //isx021, isx031, imx390isp-

```

M9296 2lane (2\*otocam -> a -> J20) v.s. M96714 2lane (1\*otocam -> a -> J20):

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱 oToCAM\_nVidiaDriver\_UserGuide-v2.10.docx 頁 數 24 of 64

## M96724 v.s. oToAdapter :

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	25 of 64
------	--	-----	----------

```

tegra234-camera-config-m96724-4lane_4otocam222.h
...
12 #define I2C_BUS_CHAN0 /bus@0/I2C_BUS/i2c@1
13 #define I2C_BUS_CAM7 /bus@0/I2C_BUS/i2c@1
14 #else
15 #define I2C_BUS_CAM0 /bus@0/I2C_BUS
16 #define I2C_BUS_CAM1 /bus@0/I2C_BUS
17 #define I2C_BUS_CAM2 /bus@0/I2C_BUS
18 #define I2C_BUS_CAM3 /bus@0/I2C_BUS
19 #define I2C_BUS_CAM4 /bus@0/I2C_BUS
20 #define I2C_BUS_CAM5 /bus@0/I2C_BUS
21 #define I2C_BUS_CAM6 /bus@0/I2C_BUS
22 #define I2C_BUS_CAM7 /bus@0/I2C_BUS
23 #endif
24
25 #define CSI_NUM_CHANS 4 //support max cams
26 #define CSI_NUM_PORTS 1 //Number of aggregated ports
27 #define CSI_PORT_LANES 4 //4lane or 2lane
28 #define CSI_SERDES_TYPE 2 //0:m9296, 1:m96712, 2:m96724
29 #if (CSI_SERDES_TYPE==0)
30 #define CSI_SERDES 2 // max cams connected to a dser
31 #elif (CSI_SERDES_TYPE==1)
32 #define CSI_SERDES 4 // max cams connected to a dser
33 #elif (CSI_SERDES_TYPE==2)
34 #define CSI_SERDES 4 // max cams connected to a dser
35 #else
36 #define CSI_SERDES 2 // max cams connected to a dser
37 #endif
38 #define CSI_SERDES_GMSL
39
40 #define CAM_MODE isx021 //isx021, isx031, imx390isp, imx490isp, imx728isp, imx623isp, ar0823isp
41
42 #define CAM_MODE isx021 //isx021, isx031,
43

```

```

tegra234-camera-config-otoadapter-4lane_4otocam222.h
...
12 #define I2C_BUS_CHAN0 /bus@0/I2C_BUS/i2c@1
13 #else
14 #define I2C_BUS_CAM0 /bus@0/I2C_BUS
15 #define I2C_BUS_CAM1 /bus@0/I2C_BUS
16 #define I2C_BUS_CAM2 /bus@0/I2C_BUS
17 #define I2C_BUS_CAM3 /bus@0/I2C_BUS
18 #define I2C_BUS_CAM4 /bus@0/I2C_BUS
19 #define I2C_BUS_CAM5 /bus@0/I2C_BUS
20 #define I2C_BUS_CAM6 /bus@0/I2C_BUS
21 #define I2C_BUS_CAM7 /bus@0/I2C_BUS
22 #endif
23
24
25 #define CSI_NUM_CHANS 4 //support max cams
26 #define CSI_NUM_PORTS 1 //Number of aggregated ports
27 #define CSI_PORT_LANES 4 //4lane or 2lane
28 #define CSI_SERDES_TYPE 2 //0:m9296, 1:m96712, 2:m96724
29 #if (CSI_SERDES_TYPE==0)
30 #define CSI_SERDES 2 // max cams connected to a dser
31 #elif (CSI_SERDES_TYPE==1)
32 #define CSI_SERDES 4 // max cams connected to a dser
33 #elif (CSI_SERDES_TYPE==2)
34 #define CSI_SERDES 4 // max cams connected to a dser
35 #else
36 #define CSI_SERDES 2 // max cams connected to a dser
37 #endif
38 #define CSI_SERDES_GMSL
39
40 #define ORIN_NX_OTOADAPTER
41
42 #define CAM_MODE isx021 //isx021, isx031,
43

```

M96714 2lane (1\*otocam -> a -> J20) v.s. 4lane (1\*otocam -> a -> J21, i2cmux) :



文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	26 of 64
------	--	-----	----------

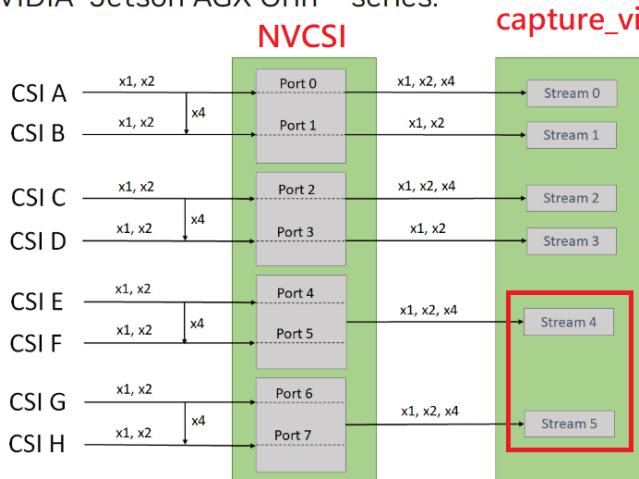
```

tegra234-camera-config-m96714-4lane_i2cmux_1otocam222.h ... tegra234-camera-config-m96714-2lane_1otocam222.h
1 //define I2C_BUS i2c@3180000 // cam_i2c
2 #define I2C_BUS cam_i2cmux
3 #if 1
4 #define I2C_MUX //tca9546@0
5 //#define I2C_MUX_TCA9546
6 #define I2C_BUS_CAM0 /bus@0/I2C_BUS/i2c@0
7 #define I2C_BUS_CAM1 /bus@0/I2C_BUS/i2c@0
8 #define I2C_BUS_CAM2 /bus@0/I2C_BUS/i2c@1
9 #define I2C_BUS_CAM3 /bus@0/I2C_BUS/i2c@1
10 #define I2C_BUS_CAM4 /bus@0/I2C_BUS/i2c@1
11 #define I2C_BUS_CAM5 /bus@0/I2C_BUS/i2c@1
12 #define I2C_BUS_CAM6 /bus@0/I2C_BUS/i2c@1
13 #define I2C_BUS_CAM7 /bus@0/I2C_BUS/i2c@1
14 #else
15 #define I2C_BUS_CAM0 /bus@0/I2C_BUS
16 #define I2C_BUS_CAM1 /bus@0/I2C_BUS
17 #define I2C_BUS_CAM2 /bus@0/I2C_BUS
18 #define I2C_BUS_CAM3 /bus@0/I2C_BUS
19 #define I2C_BUS_CAM4 /bus@0/I2C_BUS
20 #define I2C_BUS_CAM5 /bus@0/I2C_BUS
21 #define I2C_BUS_CAM6 /bus@0/I2C_BUS
22 #define I2C_BUS_CAM7 /bus@0/I2C_BUS
23 #endif
24
25 #define CSI_NUM_CHANS 1 //support max cams
26 #define CSI_NUM_PORTS 1 //Number of aggregated ports
27 #define CSI_PORT_LANES 4 //4lane or 2lane
28 #define CSI_SERDES_TYPE 3 //0:m9296, 1:m96712, 2:m96724, 3:m96714
29 #if (CSI_SERDES_TYPE==0)
30 #define CSI_SERDES 2 // max cams connected to a dser
31 #elif (CSI_SERDES_TYPE==1)
32 #define CSI_SERDES 4 // max cams connected to a dser
33 #elif (CSI_SERDES_TYPE==2)
34 #define CSI_SERDES 4 // max cams connected to a dser
35 #elif (CSI_SERDES_TYPE==3)
36 #define CSI_SERDES 1 // max cams connected to a dser
37 #else
38 #define CSI_SERDES 2 // max cams connected to a dser
39 #endif
40 #define CSI_SERDES_GMSL
41
42 #define CAM_MODE isx021 //isx021, isx031, imx390isp, i
43

```

## M9296 4lane AGX Orin (8\*otocam v.s. Orin NX(Nano)) :

➢ NVIDIA® Jetson AGX Orin™ series:



文件編號		版本
生效日期	2026/1/29	
制定部門	System-SW	V2.10

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	27 of 64
------	--	-----	----------

```

tegra234-camera-config-m9296-4lane_8otocam222.h
...
1 #define I2C_BUS i2c@3180000 // cam_i2c
2 #define I2C_MUX tca9546@70
3 #if 1
4 #define I2C_MUX //tca9546@70
5 ///#define I2C_MUX TCA9546
6 #define I2C_BUS_CAM0 /bus@0/I2C_BUS/i2c@0
7 #define I2C_BUS_CAM1 /bus@0/I2C_BUS/i2c@0
8 #define I2C_BUS_CAM2 /bus@0/I2C_BUS/i2c@1
9 #define I2C_BUS_CAM3 /bus@0/I2C_BUS/i2c@1
10 #define I2C_BUS_CAM4 /bus@0/I2C_BUS/i2c@1
11 #define I2C_BUS_CAM5 /bus@0/I2C_BUS/i2c@1
12 #define I2C_BUS_CAM6 /bus@0/I2C_BUS/i2c@1
13 #define I2C_BUS_CAM7 /bus@0/I2C_BUS/i2c@1
14 #else
15 #define I2C_BUS_CAM0 /bus@0/I2C_BUS
16 #define I2C_BUS_CAM1 /bus@0/I2C_BUS
17 #define I2C_BUS_CAM2 /bus@0/I2C_BUS
18 #define I2C_BUS_CAM3 /bus@0/I2C_BUS
19 #define I2C_BUS_CAM4 /bus@0/I2C_BUS
20 #define I2C_BUS_CAM5 /bus@0/I2C_BUS
21 #define I2C_BUS_CAM6 /bus@0/I2C_BUS
22 #define I2C_BUS_CAM7 /bus@0/I2C_BUS
23 #endif
24
25 #define CSI_NUM_CHANS 8 //support max cams
26 #define CSI_NUM_PORTS 4 //Number of aggregated ports
27 #define CSI_PORT_LANES 4 //4lane or 2lane
28 #define CSI_SERDES_TYPE 0 //0:m9296, 1:m96712, 2:m96724
29 #if (CSI_SERDES_TYPE==0)
30 #define CSI_SERDES 2 // max cams connected to a dser
31 #elif (CSI_SERDES_TYPE==1)
32 #define CSI_SERDES 4 // max cams connected to a dser
33 #elif (CSI_SERDES_TYPE==2)
34 #define CSI_SERDES 4 // max cams connected to a dser
35 #else
36 #define CSI_SERDES 2 // max cams connected to a dser
37 #endif
38 #define CST_SERDES_GMSL
39 #define AGX_ORIN_M9296SENSING
40 #define CAM_MODE isx021 //isx021, isx031, imx390isp-
41 #define CAM_MODE isx021 //isx021, isx031, imx390isp-

```

```

tegra234-camera-config-m9296-4lane_2otocam222.h
...
1 #define I2C_BUS i2c@3180000 // cam_i2c
2 #define I2C_MUX tca9546@70
3 #if 0
4 #define I2C_MUX //tca9546@70
5 ///#define I2C_MUX TCA9546
6 #define I2C_BUS_CAM0 /bus@0/I2C_BUS/i2c@0
7 #define I2C_BUS_CAM1 /bus@0/I2C_BUS/i2c@0
8 #define I2C_BUS_CAM2 /bus@0/I2C_BUS/i2c@1
9 #define I2C_BUS_CAM3 /bus@0/I2C_BUS/i2c@1
10 #define I2C_BUS_CAM4 /bus@0/I2C_BUS/i2c@1
11 #define I2C_BUS_CAM5 /bus@0/I2C_BUS/i2c@1
12 #define I2C_BUS_CAM6 /bus@0/I2C_BUS/i2c@1
13 #define I2C_BUS_CAM7 /bus@0/I2C_BUS/i2c@1
14 #else
15 #define I2C_BUS_CAM0 /bus@0/I2C_BUS
16 #define I2C_BUS_CAM1 /bus@0/I2C_BUS
17 #define I2C_BUS_CAM2 /bus@0/I2C_BUS
18 #define I2C_BUS_CAM3 /bus@0/I2C_BUS
19 #define I2C_BUS_CAM4 /bus@0/I2C_BUS
20 #define I2C_BUS_CAM5 /bus@0/I2C_BUS
21 #define I2C_BUS_CAM6 /bus@0/I2C_BUS
22 #define I2C_BUS_CAM7 /bus@0/I2C_BUS
23 #endif
24
25 #define CSI_NUM_CHANS 2 //support max cams
26 #define CSI_NUM_PORTS 1 //Number of aggregated ports
27 #define CSI_PORT_LANES 4 //4lane or 2lane
28 #define CSI_SERDES_TYPE 0 //0:m9296, 1:m96712, 2:m96724
29 #if (CSI_SERDES_TYPE==0)
30 #define CSI_SERDES 2 // max cams connected to a dser
31 #elif (CSI_SERDES_TYPE==1)
32 #define CSI_SERDES 4 // max cams connected to a dser
33 #elif (CSI_SERDES_TYPE==2)
34 #define CSI_SERDES 4 // max cams connected to a dser
35 #else
36 #define CSI_SERDES 2 // max cams connected to a dser
37 #endif
38 #define CST_SERDES_GMSL
39
40 #define CAM_MODE isx021 //isx021, isx031, imx390isp-
41

```

## 2.1.2 Dynamic by dts generator tool

The .dts of dynamic\_dts\_generator is generated using a tool ([Excel on Windows/Linux](#)). Currently it's designed for NVIDIA Orin NX(Nano) EVK + Maxim EVK or [OrinNX\(AGX Orin\) EVK + oToAdapter](#).

Excel: Each yellow cell below contains a list of options. After selecting, press the "Generate DTS" button to generate the device tree. Insufficient bandwidth may occur with certain option combinations, resulting in a warning message, then please refer section 2.1.4 for the device tree installation.

There are three sheets : OrinNX(for OrinNX EVK+Maxim EVK), [oToAdapterNX\(for OrinNX EVK+oToAdapter\)](#), [oToAdapterAGX\(for AGX Orin EVK+oToAdapter\)](#)

**CSI\_Mode** : 2x4 for 4lane, 4x2 for 2lane

**oToCam** :

otocam222/otocam223/otocam260isp/otocam264isp/otocam271isp/otocam274isp/otocam276isp

Deserializer : 9296/96712/96714/[96724](#)

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

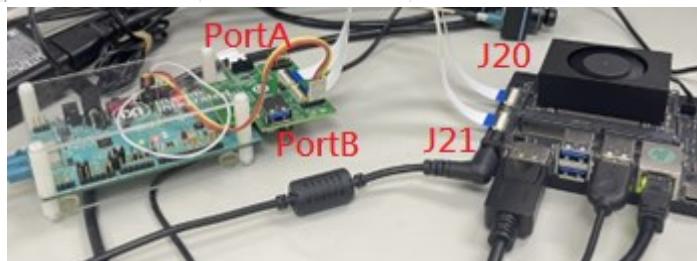
文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	28 of 64
------	--	-----	----------

max lane speed : low / high

OrinNX EVK+Maxim EVK :

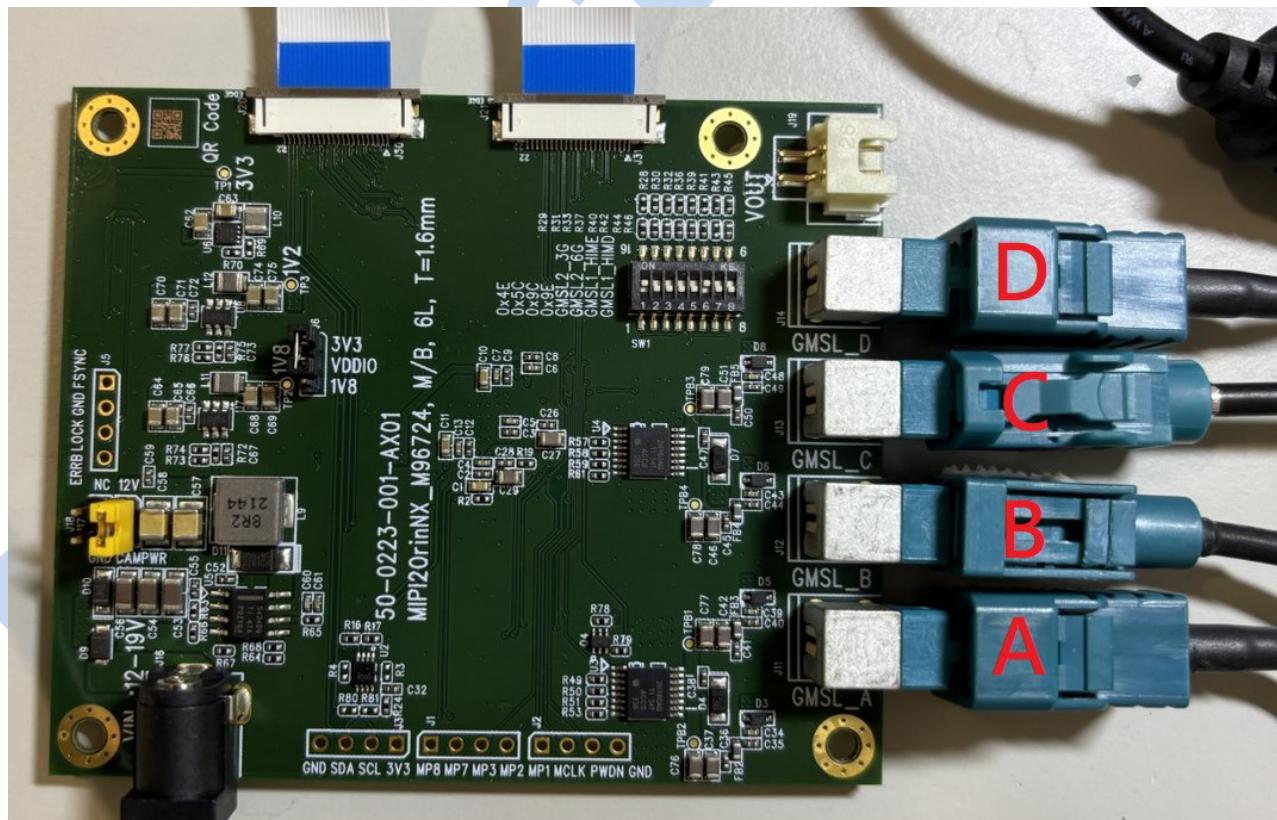
OrinNX	CSI_Mode	oToCam	Deserializer	lane speed
Setting	2x4	otocam222	9296	high
		otocam222		
		otocam222		
		otocam222		

Generate DTS



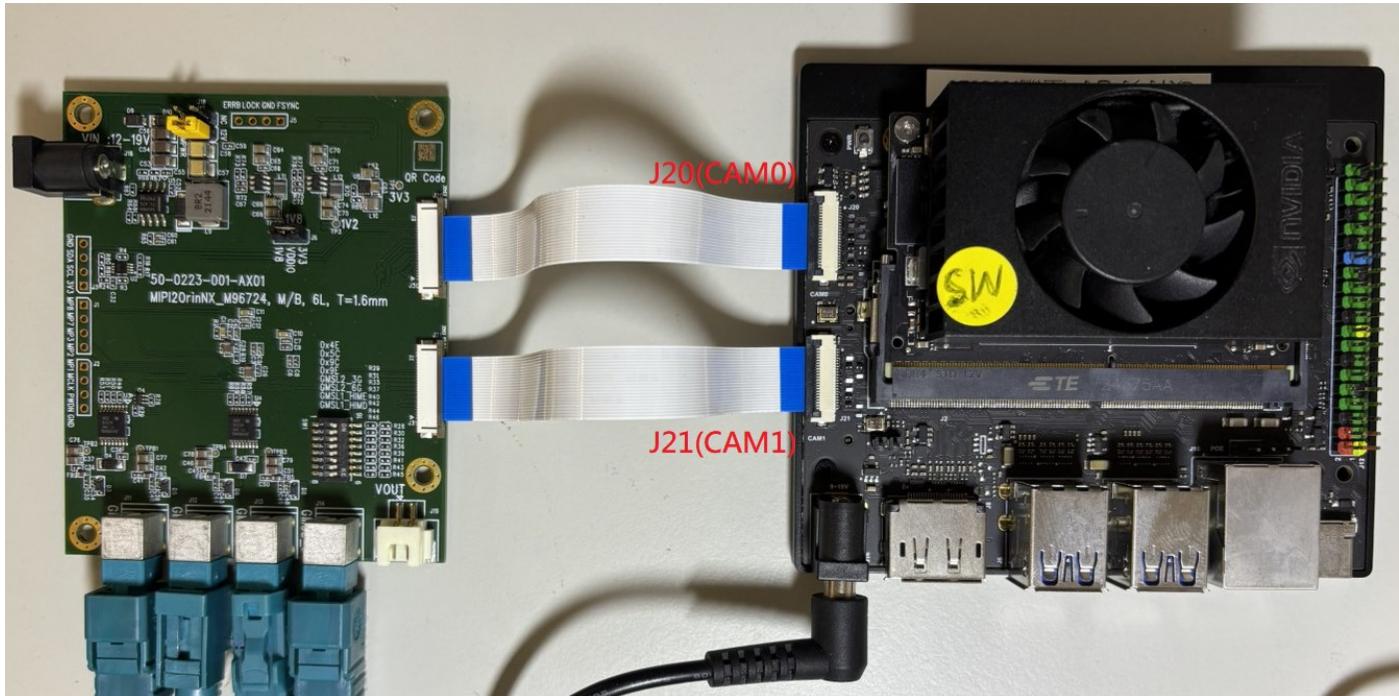
OrinNX EVK+oToAdapter :

OrinNX	CSI_Mode	oToCam	Deserializer	lane speed
Setting	2x4	otocam222 A	96724	high
		otocam222 B		
		otocam222 C		
		otocam222 D		



文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	29 of 64
------	--	-----	----------



Frame sync Setting : (see section 2.1.7 for detail)

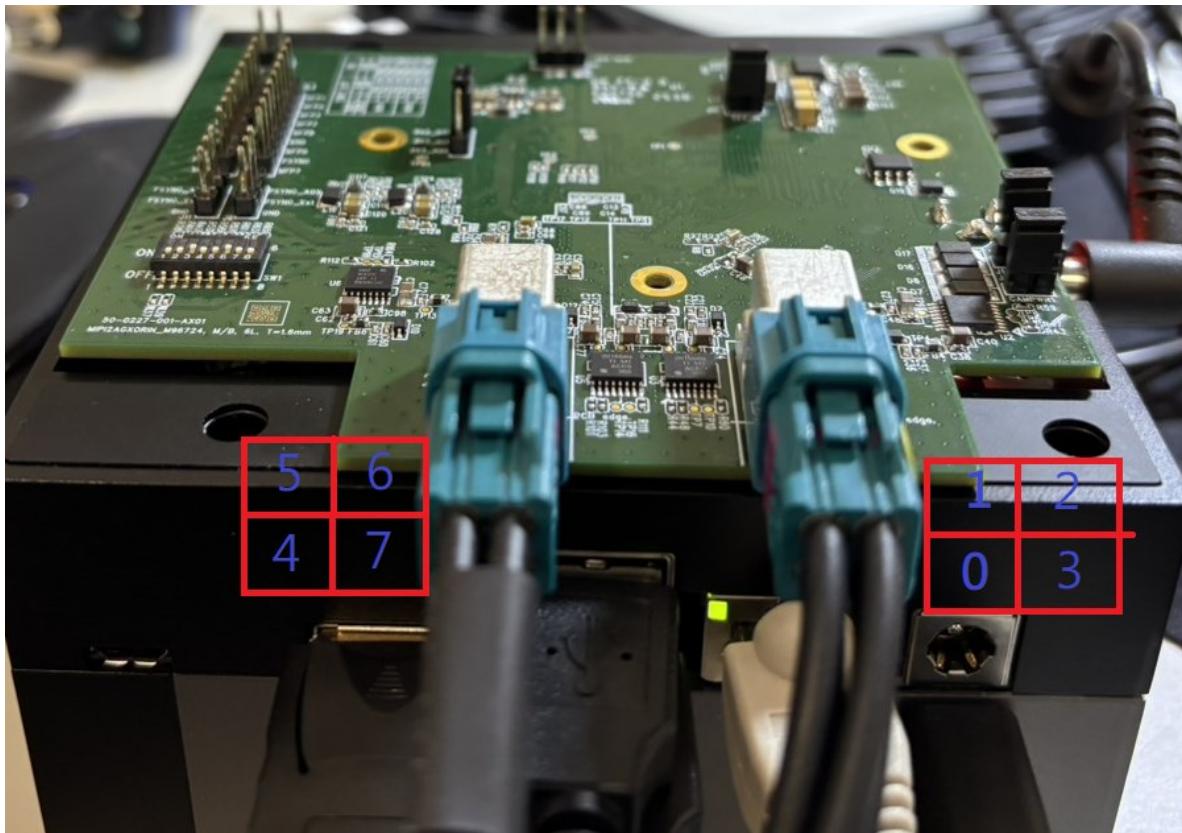
fsync_setting	internal fsync
Deserializer1	on
<hr/>	
fsync_setting	external fsync
Deserializer1	off

AGX Orin EVK+oToAdapter :

oToAdapterAGX	CSI_Mode	oToCam	Deserializer	lane speed
Setting	2x4	otocam271isp 0	96724	low
		otocam271isp 1	96724	
		otocam271isp 2		
		otocam271isp 3		
		otocam271isp 4		
		otocam271isp 5		
		otocam271isp 6		
		otocam271isp 7		

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

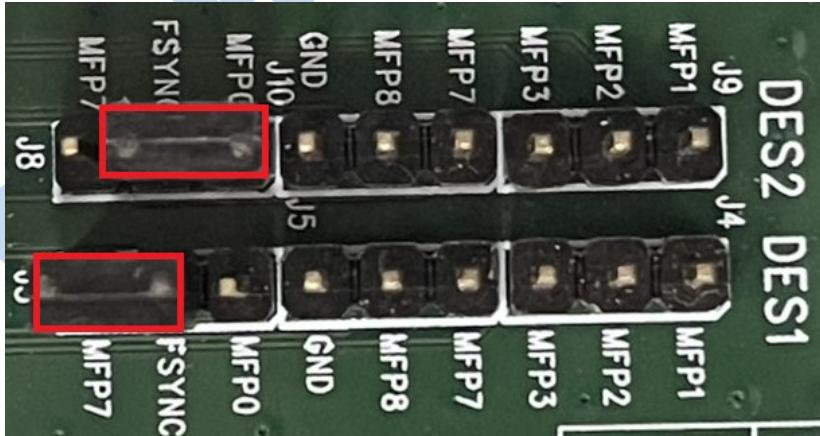
文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	30 of 64
------	--	-----	----------



Frame sync Setting : (see section 2.1.7 for detail)

fsync_setting	internal fsync
Deserializer1	off
Deserializer2	on

fsync_setting	external fsync
Deserializer1	on
Deserializer2	off

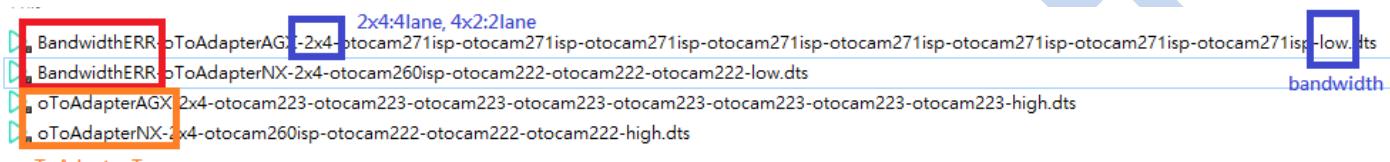


文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

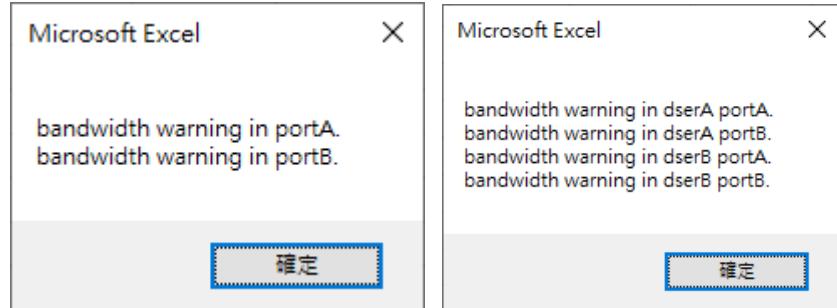
文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	31 of 64
------	--	-----	----------

p.s.

1. lane speed: **high(2.5gb)/low(1.5gb)**. Generally, high is selected. However, if there are issues with board design or cable quality, low should be selected. In this case, the amount of data that can be transmitted will be smaller, and fewer cameras will be supported.
2. If the selected combination bandwidth is insufficient, a warning message like the one shown below will appear, and the generated .dts file will contain the "**BandwidthERR**" error message. The .dts file is still usable in this case, but you should reduce the number of connected cameras.



**oToAdapter Type**

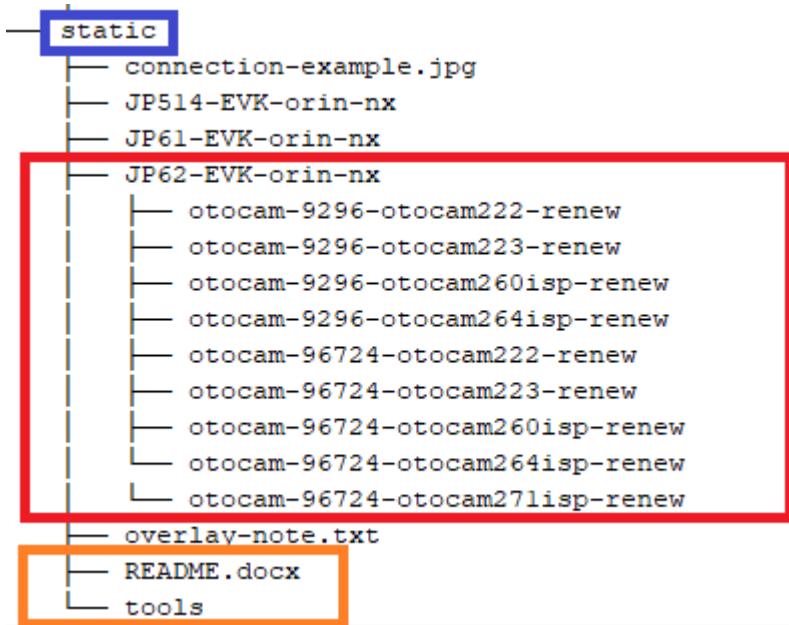


3. Bandwidth calculation :  $\text{Max\_cam} * \text{cam\_w} * \text{cam\_h} * 8 * 2 * 1.25 * 30(\text{fps}) > \text{max\_lane} * \text{lane\_speed}$ (high:2.5g, low 1.5g) -> BandwidthERR, for example:  
 bw\_low (4lane) :  $4 * 1920 * 1536 * 8 * 2 * 1.25 * 30 = 7g > 4 * 1.5 = 6g$  -> BandwidthERR, in this case, if the connected cameras are 3, then 5.3g is ok.  
 bw\_high (4lane) :  $4 * 1920 * 1536 * 8 * 2 * 1.25 * 30 = 7g < 4 * 2.5 = 10g$  -> 4 of the connected cameras is ok.

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	32 of 64
------	--	-----	----------

## 2.1.3 The static device tree example



## 2.1.4 The installation of device tree

Please refer to the file README.docx of static folder, and the related tools are on the tools folder.

Step1. [copy driver, tree file to tools folder.](#)

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	33 of 64
------	--	-----	----------

```
nvidia@ubuntu:~/tools_20260105$ ls
check_IQ
'GetVoltage&Tempture'
gst-showall2.sh
gst-showall_repeat.sh
gst-showall.sh
insmod-otocam.sh
oToAdapterAGX-2x4-2x4-otocam223-otocam223-otocam223-otocam223-otocam223-otocam2
23-otocam223-otocam223-high.dts
oToAdapterAGX-2x4-2x4-otocam260isp-otocam260isp-otocam260isp-otocam260isp-otoca
m260isp-otocam260isp-otocam260isp-otocam260isp-high.dts
oToAdapterNX-2x4-otocam223-otocam223-otocam223-otocam223-high.dts
oToCAM.ko
oToSerDes.ko
rmmod.sh
run_replace-v2.sh
set-dtb-to-dts.sh
set-dts-to-dtb.sh
show-debug.sh
show-fps.sh
show-parse-tree.sh
test-nv16.sh
test-otocam276isp.sh
nvidia@ubuntu:~/tools_20260105$ ./run_replace-v2.sh
ls: cannot access '*.dtbo': No such file or directory
1: oToAdapterAGX-2x4-2x4-otocam223-otocam223-otocam223-otocam223-otoca
m223-otocam223-otocam223-high.dts
2: oToAdapterAGX-2x4-2x4-otocam260isp-otocam260isp-otocam260isp-otocam260isp-oto
cam260isp-otocam260isp-otocam260isp-otocam260isp-high.dts
3: oToAdapterNX-2x4-otocam223-otocam223-otocam223-otocam223-high.dts
Enter dts file index to apply: □
```

Step2. Run “sh run\_replace-v2.sh”, then select the target .dts or .dtbo (this step will auto reboot the system). If you want to apply run\_replace-v2.sh to the dynamic overlay .dts, please change the content of xxx.dts “overlay-name = "Jetson Camera IMX390"; “ to “overlay-name = "Camera xxx”; “

Step3. Run “sh insmod-otocam.sh”, then use “ls /dev/video\*” to check video node.

Step4. Run “sh gst-showall.sh” or “gst-showall\_repeat.sh” in GUI mode or Run “show-fps.sh” in console mode to show frame rate.

4-1. gst-showall2.sh for otocam276isp

gst-showall2.sh 0 -> for 3840x2160

gst-showall2.sh 1 -> for 512x288

4-2. test-otocam276isp.sh

test-otocam276isp.sh 0 -> save for 3840x2160 yuv file

test-otocam276isp.sh 1 -> save for 512x288 yuv file

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	34 of 64
------	--	-----	----------

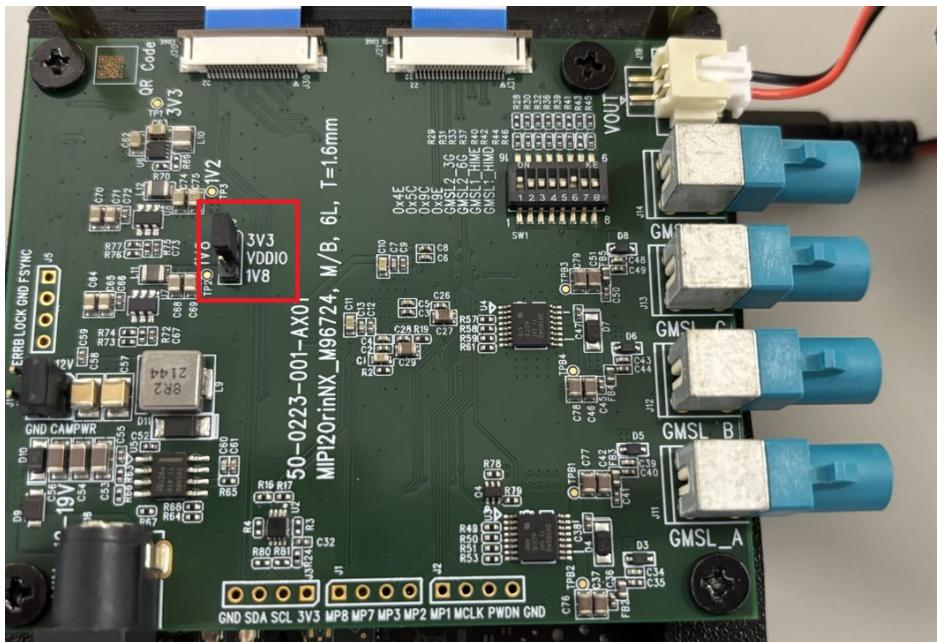
4-3. gnome-test-nv16-multi.sh for frame rate monitoring(output log to videoN.txt).

Step5. Check result

## 2.1.4.1 The device tree installation of oToAdapter

Orin Nano+oToAdapter :

- (1) Set to 3.3v for Old HW, New HW : no need to set



- (2) Insert a **sd card** (>= 64GB) and flash Jetson Linux bsp image

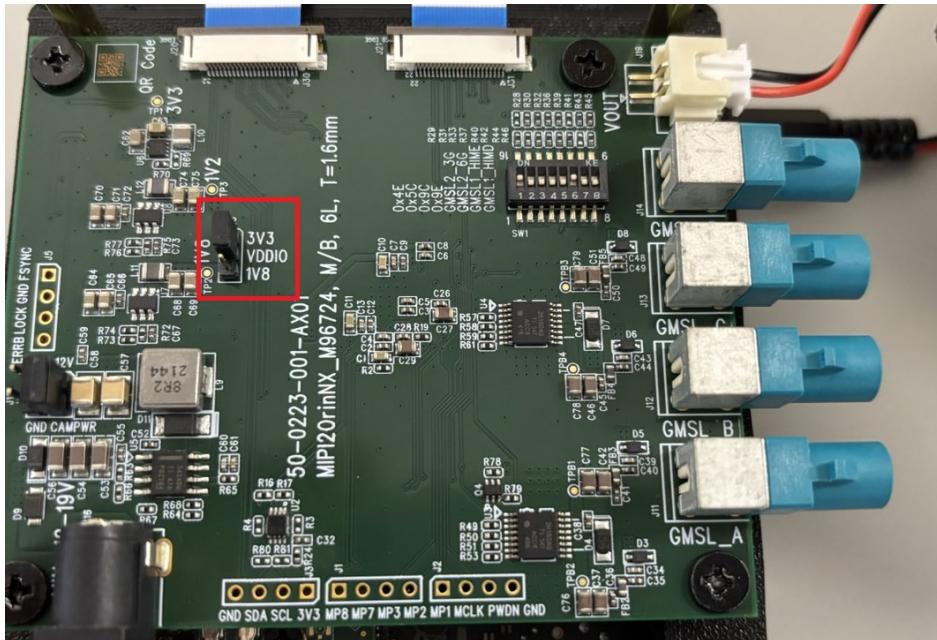
- (3) Install device tree & display camera image by 2.1.4

Orin NX+oToAdapter :

- (1) Set to 3.3v for Old HW, New HW : no need to set

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

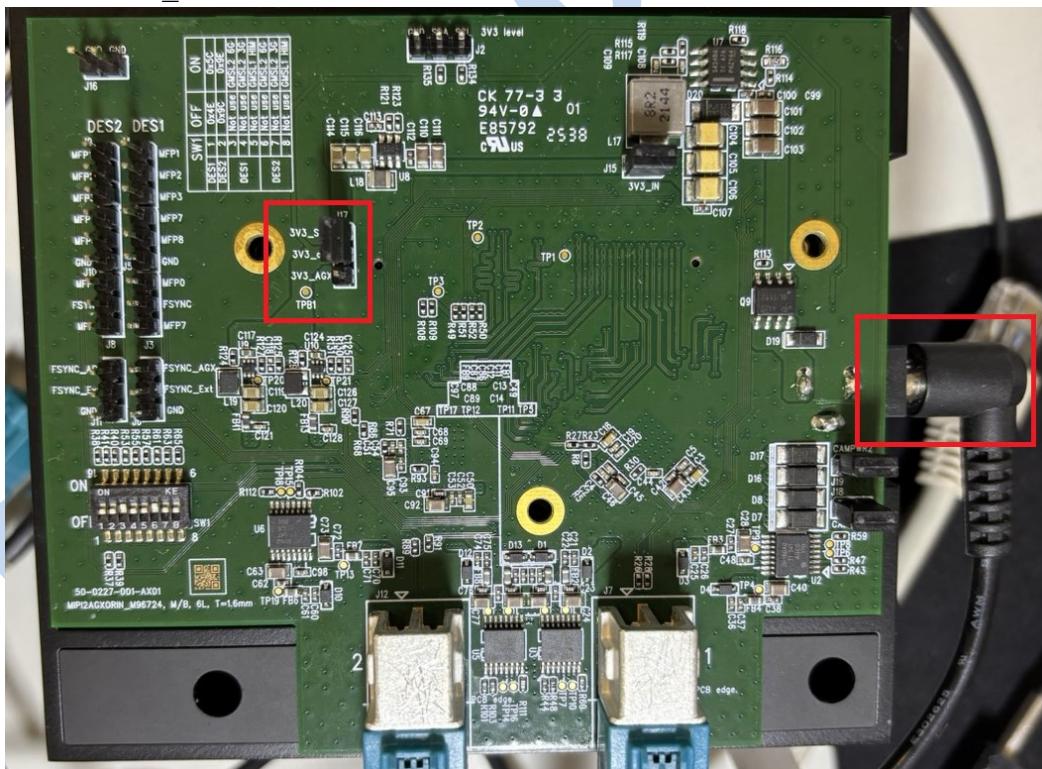
文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	35 of 64
------	--	-----	----------



- (2) Insert a SSD(>=128GB) and flash Jetson Linux bsp image
- (3) Install device tree & display camera image by 2.1.4

#### AGX Orin +oToAdapter :

- (1) Please use an external power supply(12V~19V), the jumper is configured to connect to 3V3\_Sys and 3V3\_out



文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

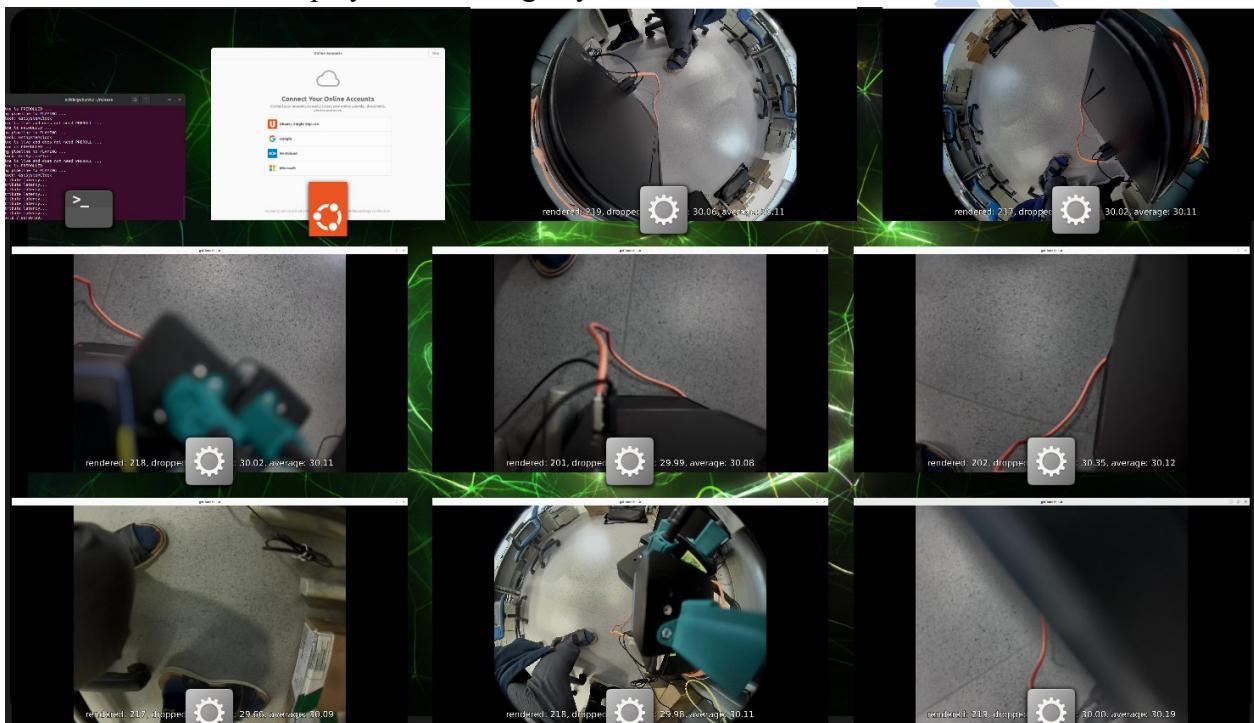
文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	36 of 64
------	--	-----	----------

## (2) flash Jetson Linux bsp image by Nvidia SDK Manager

The original Jetson Linux is R35 with Ubuntu v20.04. Please install JP6.2 (Ubuntu v22.04).

```
nvidia@ubuntu:~$ more /etc/nv_tegra_release
# R36 (release), Revision: 4.3, GCID: 38968081, BOARD: generic, EABI: aarch64, D
DATE: Wed Jan  8 01:49:37 UTC 2025
# KERNEL_VARIANT: oot
TARGET_USERSPACE_LIB_DIR=nvidia
TARGET_USERSPACE_LIB_PATH=usr/lib/aarch64-linux-gnu/nvidia
nvidia@ubuntu:~$ more /etc/os-release
PRETTY_NAME="Ubuntu 22.04.5 LTS"
NAME="Ubuntu"
VERSION_ID="22.04"
VERSION="22.04.5 LTS (Jammy Jellyfish)"
```

## (3) Install device tree & display camera image by session 2.1.4



### 2.1.5 Device tree update for oToCAM.ko & oToSerDes.ko

device tree update for oToCAM.ko & oToSerDes.ko is as the following, please search “compatible” string and update the related string(red box) .

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	37 of 64
------	--	-----	----------

```

O:\nvidia\test\device_tree\vecow\device-tree_fix.dts
241      };
242
243      i2c@1 {
244          reg = <0x01>;
245          i2c-mux,deselect-on-exit;
246          i2c-mux,idle-disconnect;
247          #address-cells = <0x01>;
248          #size-cells = <0x00>;
249
250          max9296_c#0A8 {
251              compatible = "maxim,max9296";
252              reg = <0x48>;
253              csi-mux = <0x4>;
254              max-rcr = <0x02>;
255              reset-gpios = <0xffffffff 0xa0 0x00>;
256              fsync-gpio = <0x06>;
257              phandle = <0x06>;
258          };
259
260          max9295_prime#02 {
261              compatible = "maxim,max9295";
262              reg = <0x62>;
263              is-prime-ser;
264          };
265
266          max9295_c#0A0 {
267              compatible = "maxim,max9295";
268              reg = <0x40>;
269              nvidia,gm1-dser-device = <0x06>;
270              phandle = <0x07>;
271          };
272
273          max9295_d#0A0 {
274              compatible = "maxim,max9295";
275              reg = <0x60>;
276              nvidia,gm1-dser-device = <0x06>;
277              phandle = <0x09>;
278          };
279
280          otocomisp_c@1b {
281              status = "okay";
282              reg = <0x1b>;
283              dev-addrs = <0x00>;
284              clock = <0xffffffff 0x24 0xffffffff 0x24>;
285              clock-names = "experiph1@0@lp_grtbw";
286              mclk = "experiph1";
287              nvidia,gm1-ser-device = <0x07>;
288              nvidia,gm1-dser-device = <0x06>;
289              devnode = "video2";
290              compatible = "qcom,lmx390";
291              physical-u = "15.0";
292          };
293
294          max9296_c#0A8 {
295              compatible = "otobrite,deserializer";
296              reg = <0x48>;
297              csi-mux = <0x4>;
298              max-rcr = <0x03>;
299              reset-gpios = <0xffffffff 0xa0 0x00>;
300              fsync-gpio = <0x06>;
301              phandle = <0x06>;
302          };
303
304          max9295_nc#0C2 {
305              compatible = "otobrite,serializer";
306              reg = <0x62>;
307              is-prime-ser;
308          };
309
310          max9295_c#0A0 {
311              compatible = "otobrite,serializer";
312              reg = <0x40>;
313              nvidia,gm1-dser-device = <0x06>;
314              phandle = <0x07>;
315          };
316
317          max9295_d#0A0 {
318              compatible = "otobrite,serializer";
319              reg = <0x60>;
320              nvidia,gm1-dser-device = <0x06>;
321              phandle = <0x09>;
322          };
323
324          otocomisp_c@1b {
325              status = "okay";
326              reg = <0x1b>;
327              dev-addrs = <0x00>;
328              clock = <0xffffffff 0x24 0xffffffff 0x24>;
329              clock-names = "experiph1@0@lp_grtbw";
330              mclk = "experiph1";
331              nvidia,gm1-ser-device = <0x07>;
332              nvidia,gm1-dser-device = <0x06>;
333              compatible = "otobrite,otocam";
334              physical-u = "15.0",
335          };
336

```

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx
頁 數	38 of 64

## 2.1.6 Device tree update for sensor model

- This is the setting of otocam222.

```
mode0 {
    mclk_khz = "24000";
    num_lanes = "4";
    tegra_sinterface = "serial_a";
    vc_id = "0";
    discontinuous_clk = "no";
    dpcm_enable = "false";
    cil_settletime = "0";
    mode_type = "yuv";
    pixel_phase = "uyvy";
    csi_pixel_bit_depth = "16";
    dynamic_pixel_bit_depth = "16";
    active_w = "1920";
    active_h = "1280";
    readout_orientation = "0";
    line_length = "2200";
    inherent_gain = "1";
    pix_clk_hz = "375000000";
    gain_factor = "10";
    min_gain_val = "0";
    max_gain_val = "300";
    step_gain_val = "3";
    default_gain = "0";
    min_hdr_ratio = "1";
    max_hdr_ratio = "1";
    framerate_factor = "1000000";
    min_framerate = "30000000";
    max_framerate = "30000000";
    step_framerate = "1";
    default_framerate = "30000000";
    exposure_factor = "1000000";
    min_exp_time = "59";
    max_exp_time = "33333";
    step_exp_time = "1";
    default_exp_time = "33333";
    embedded_metadata_height = "0";
};
```

- Differences between otocam222 & otocam223/otocam274isp

文件編號	版本
生效日期	2026/1/29
制定部門	System-SW

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	39 of 64
------	--	-----	----------

```

O:\nvidia\oto_src\nvidia\kernel_drivers_media\i2c\dt\static\JP61-EVK-orin-nx\otocam-929\otoCam222\new\device-tree.dts
O:\nvidia\oto_src\nvidia\kernel_drivers_media\i2c\dt\static\JP61-EVK-orin-nx\otocam-929\otoCam260isp\new\device-tree.dts

```

The screenshot shows a side-by-side comparison of two device tree files. The left column contains the code for the otoCam222 device, and the right column contains the code for the otoCam260isp device. The code is color-coded by line number, and specific sections are highlighted with blue boxes to indicate differences. The highlighted sections include sensor model definitions, clock settings, and various configuration parameters like pixel phase and gain factors.

## ● Differences between otocam222 & otocam260isp

```

R:\Release\Nvidia_Release\fix\static\JP62-EVK-orin-nx\otocam-929\otocam222\new\device-tree.dts
R:\Release\Nvidia_Release\fix\static\JP62-EVK-orin-nx\otocam-929\otocam264isp\new\device-tree.dts

```

This screenshot compares the otocam222 and otocam264isp device trees. Similar to the previous comparison, it highlights differences in sensor model definitions, clock configurations, and other hardware parameters. The blue boxes are placed over the sections that change between the two models.

## ● Differences between otocam222 & otocam264isp

```

O:\nvidia\oto_src\nvidia\kernel_drivers_media\i2c\dt\static\JP61-EVK-orin-nx\otocam-929\otocam222\new\device-tree.dts
O:\nvidia\oto_src\nvidia\kernel_drivers_media\i2c\dt\static\JP61-EVK-orin-nx\otocam-929\otocam264isp\new\device-tree.dts

```

This final screenshot shows the comparison between otocam222 and otocam264isp. It focuses on the device tree definitions, highlighting the changes made to support the newer otocam264isp model. The blue boxes are used to mark the specific lines where the two versions diverge.

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	40 of 64
------	--	-----	----------

## ● Differences between otocam222 & otocam271isp/otocam276isp(max\_lane\_speed = 2.5G)

```
R:\Release\Nvidia_Release\fix\static\JP62-EVK-orin-nx\otocam-9296\otocam222\new\device-tree.dts
R:\Release\Nvidia_Release\fix\static\JP62-EVK-orin-nx\otocam-9296\otocam271isp\new\device-tree.dts
```

Differences in device-tree.dts between otocam222 and otocam271isp:

- otocam271isp has a higher pixel clock (mclk\_khz = "24000") compared to otocam222 (mclk\_khz = "22000").
- otocam271isp has a higher active width (active\_w = "1920") compared to otocam222 (active\_w = "1280").
- otocam271isp has a higher line length (line\_length = "2208") compared to otocam222 (line\_length = "1208").
- otocam271isp has a higher inherent gain (inherent\_gain = "1") compared to otocam222 (inherent\_gain = "0").
- otocam271isp has a higher pixel clock hz (pix\_clk\_hz = "375000000") compared to otocam222 (pix\_clk\_hz = "357000000").
- otocam271isp has a higher gain factor (gain\_factor = "10") compared to otocam222 (gain\_factor = "8").
- otocam271isp has a higher min\_gain\_val (min\_gain\_val = "0") compared to otocam222 (min\_gain\_val = "1").
- otocam271isp has a higher max\_gain\_val (max\_gain\_val = "300") compared to otocam222 (max\_gain\_val = "200").
- otocam271isp has a higher step\_gain\_val (step\_gain\_val = "3") compared to otocam222 (step\_gain\_val = "2").
- otocam271isp has a higher default\_gain (default\_gain = "0") compared to otocam222 (default\_gain = "1").
- otocam271isp has a higher min\_hdr\_ratio (min\_hdr\_ratio = "1") compared to otocam222 (min\_hdr\_ratio = "0").
- otocam271isp has a higher max\_hdr\_ratio (max\_hdr\_ratio = "1") compared to otocam222 (max\_hdr\_ratio = "0").
- otocam271isp has a higher framerate\_factor (framerate\_factor = "1000000") compared to otocam222 (framerate\_factor = "10000000").
- otocam271isp has a higher min\_framerate (min\_framerate = "30000000") compared to otocam222 (min\_framerate = "10000000").
- otocam271isp has a higher max\_framerate (max\_framerate = "30000000") compared to otocam222 (max\_framerate = "10000000").
- otocam271isp has a higher step\_framerate (step\_framerate = "1") compared to otocam222 (step\_framerate = "0").
- otocam271isp has a higher default\_framerate (default\_framerate = "30000000") compared to otocam222 (default\_framerate = "10000000").
- otocam271isp has a higher exposure\_factor (exposure\_factor = "1000000") compared to otocam222 (exposure\_factor = "10000000").
- otocam271isp has a higher min\_exp\_time (min\_exp\_time = "59") compared to otocam222 (min\_exp\_time = "3333").
- otocam271isp has a higher max\_exp\_time (max\_exp\_time = "33333") compared to otocam222 (max\_exp\_time = "10000").
- otocam271isp has a higher step\_exp\_time (step\_exp\_time = "1") compared to otocam222 (step\_exp\_time = "0").
- otocam271isp has a higher default\_exp\_time (default\_exp\_time = "33333") compared to otocam222 (default\_exp\_time = "59").
- otocam271isp has a higher embedded\_metadata\_height (embedded\_metadata\_height = "0") compared to otocam222 (embedded\_metadata\_height = "1").
- otocam271isp has a higher lane\_polarity (lane\_polarity = "6") compared to otocam222 (lane\_polarity = "5").

```
R:\Release\Nvidia_Release\fix\static\JP62-EVK-orin-nx\otocam-9296\otocam222\new\device-tree.dts
R:\Release\Nvidia_Release\fix\static\JP62-EVK-orin-nx\otocam-9296\otocam271isp\new\device-tree.dts
```

Differences in device-tree.dts between otocam222 and otocam271isp:

- otocam271isp has a higher max\_lane\_speed (max\_lane\_speed = "0x262540") compared to otocam222 (max\_lane\_speed = "0x1e3630").
- otocam271isp has a higher min\_bits\_per\_pixel (min\_bits\_per\_pixel = "<0x0a>") compared to otocam222 (min\_bits\_per\_pixel = "<0x08>").
- otocam271isp has a higher v1\_peak\_byte\_per\_pixel (v1\_peak\_byte\_per\_pixel = "<0x02>") compared to otocam222 (v1\_peak\_byte\_per\_pixel = "<0x01>").
- otocam271isp has a higher v1\_bw\_margin\_pct (v1\_bw\_margin\_pct = "<0x19>") compared to otocam222 (v1\_bw\_margin\_pct = "<0x18>").
- otocam271isp has a higher isp\_peak\_byte\_per\_pixel (isp\_peak\_byte\_per\_pixel = "<0x05>") compared to otocam222 (isp\_peak\_byte\_per\_pixel = "<0x04>").
- otocam271isp has a higher isp\_bw\_margin\_pct (isp\_bw\_margin\_pct = "<0x19>") compared to otocam222 (isp\_bw\_margin\_pct = "<0x18>").
- otocam271isp has a higher phandle (phandle = "<0x31>") compared to otocam222 (phandle = "<0x30>").

## ● Differences between otocam222 & otocam264raw

```
O:\nvidia\test\device_tree\avermedia\device-tree\otocam222.dts
O:\nvidia\test\device_tree\avermedia\device-tree\otocam264raw.dts
```

Differences in device-tree.dts between otocam222 and otocam264raw:

- otocam264raw has a higher physical\_h (physical\_h = "12.5") compared to otocam222 (physical\_h = "12.5").
- otocam264raw has a higher sensor\_model (sensor\_model = "imx390") compared to otocam222 (sensor\_model = "imx21").
- otocam264raw has a higher post\_crop\_frame\_drop (post\_crop\_frame\_drop = "0") compared to otocam222 (post\_crop\_frame\_drop = "1").
- otocam264raw has a higher use\_decibel\_gain (use\_decibel\_gain = "true") compared to otocam222 (use\_decibel\_gain = "false").
- otocam264raw has a higher use\_sensor\_mode\_id (use\_sensor\_mode\_id = "true") compared to otocam222 (use\_sensor\_mode\_id = "false").
- otocam264raw has a higher phandle (phandle = "<0x24f>") compared to otocam222 (phandle = "<0x24f>").
- otocam264raw has a higher mode0 (mode0) block compared to otocam222.
- otocam264raw has a higher mode0 (mode\_type = "bayen") compared to otocam222 (mode\_type = "uyvy").
- otocam264raw has a higher pixel\_phase (pixel\_phase = "rggb") compared to otocam222 (pixel\_phase = "uyvy").
- otocam264raw has a higher csi\_pixel\_bit\_depth (csi\_pixel\_bit\_depth = "12") compared to otocam222 (csi\_pixel\_bit\_depth = "16").
- otocam264raw has a higher dynamic\_pixel\_bit\_depth (dynamic\_pixel\_bit\_depth = "12") compared to otocam222 (dynamic\_pixel\_bit\_depth = "16").
- otocam264raw has a higher active\_w (active\_w = "1920") compared to otocam222 (active\_w = "1280").
- otocam264raw has a higher active\_h (active\_h = "1280") compared to otocam222 (active\_h = "1208").
- otocam264raw has a higher readout\_orientation (readout\_orientation = "0") compared to otocam222 (readout\_orientation = "1").
- otocam264raw has a higher line\_length (line\_length = "2208") compared to otocam222 (line\_length = "1208").
- otocam264raw has a higher inherent\_gain (inherent\_gain = "1") compared to otocam222 (inherent\_gain = "0").
- otocam264raw has a higher pix\_clk\_hz (pix\_clk\_hz = "625000000") compared to otocam222 (pix\_clk\_hz = "375000000").
- otocam264raw has a higher gain\_factor (gain\_factor = "10") compared to otocam222 (gain\_factor = "8").
- otocam264raw has a higher min\_gain\_val (min\_gain\_val = "0") compared to otocam222 (min\_gain\_val = "1").
- otocam264raw has a higher max\_gain\_val (max\_gain\_val = "300") compared to otocam222 (max\_gain\_val = "200").
- otocam264raw has a higher step\_gain\_val (step\_gain\_val = "3") compared to otocam222 (step\_gain\_val = "2").
- otocam264raw has a higher default\_gain (default\_gain = "0") compared to otocam222 (default\_gain = "1").
- otocam264raw has a higher min\_hdr\_ratio (min\_hdr\_ratio = "1") compared to otocam222 (min\_hdr\_ratio = "0").
- otocam264raw has a higher max\_hdr\_ratio (max\_hdr\_ratio = "1") compared to otocam222 (max\_hdr\_ratio = "0").
- otocam264raw has a higher framerate\_factor (framerate\_factor = "1000000") compared to otocam222 (framerate\_factor = "10000000").
- otocam264raw has a higher min\_framerate (min\_framerate = "30000000") compared to otocam222 (min\_framerate = "10000000").
- otocam264raw has a higher max\_framerate (max\_framerate = "30000000") compared to otocam222 (max\_framerate = "10000000").
- otocam264raw has a higher step\_framerate (step\_framerate = "1") compared to otocam222 (step\_framerate = "0").
- otocam264raw has a higher default\_framerate (default\_framerate = "30000000") compared to otocam222 (default\_framerate = "10000000").
- otocam264raw has a higher exposure\_factor (exposure\_factor = "1000000") compared to otocam222 (exposure\_factor = "10000000").
- otocam264raw has a higher min\_exp\_time (min\_exp\_time = "59") compared to otocam222 (min\_exp\_time = "3333").
- otocam264raw has a higher max\_exp\_time (max\_exp\_time = "33333") compared to otocam222 (max\_exp\_time = "10000").
- otocam264raw has a higher step\_exp\_time (step\_exp\_time = "1") compared to otocam222 (step\_exp\_time = "0").
- otocam264raw has a higher default\_exp\_time (default\_exp\_time = "33333") compared to otocam222 (default\_exp\_time = "59").
- otocam264raw has a higher embedded\_metadata\_height (embedded\_metadata\_height = "0") compared to otocam222 (embedded\_metadata\_height = "1").
- otocam264raw has a higher lane\_polarity (lane\_polarity = "6") compared to otocam222 (lane\_polarity = "5").
- otocam264raw has a higher gmsl-link (gmsl-link) block compared to otocam222.
- otocam264raw has a higher gmsl-link (streams = "raw1@0ued-ul") compared to otocam222 (streams = "yuv@0ued-ul").
- otocam264raw has a higher gmsl-link (src\_csi\_port = "b") compared to otocam222 (src\_csi\_port = "a").
- otocam264raw has a higher gmsl-link (dst\_csi\_port = "a") compared to otocam222 (dst\_csi\_port = "b").
- otocam264raw has a higher gmsl-link (serdes\_csi\_link = "a") compared to otocam222 (serdes\_csi\_link = "b").

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	41 of 64
------	--	-----	----------

- Driver rename (nv\_imx390.ko -> oToCAM.ko, max9296.ko -> oToSerDes.ko)

```

O:\nvidia\test\device_tree\vecow\device-tree_ori.dts
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272
273
274
275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291

O:\nvidia\test\device_tree\vecow\device-tree_fix.dts
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272
273
274
275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291

```

## 2.1.7 Frame sync

Internal Frame sync : The fsync signal is generated internally by deserializer. The red box below indicates that the 10Hz signal is generated internally by the deserializer.

```

dserb: max96724@4e {
    status = "okay";
    compatible = "otobrite,deserializer";
    reg = <0x4e>;
    force-clock = <0x1>;
    csi-mode = "2x4";
    max-src = <4>;
    fsync-inter-hz = <0x0a>;
};

otocamisp_@1b {
    status = "okay";
    reg = <0x1b>;
    def-addr = <0x0>;
    clock = <0xffffffff 0x24 0xffffffff 0x24>;
    clock-names = "extperiph1\0pllp_grtba";
    mclk = "extperiph1";
    nvidia,gm1-ser-device = <0x07>;
    nvidia,gm1-ser-ctrl = <0x00>;
    devnode = "video2";
    compatible = "sony,imx390";
    physical-w = "15.0";
};

otocamisp_@1b {
    status = "okay";
    reg = <0x1b>;
    def-addr = <0x0>;
    clock = <0xffffffff 0x24 0xffffffff 0x24>;
    clock-names = "extperiph1\0pllp_grtba";
    mclk = "extperiph1";
    nvidia,gm1-ser-device = <0x07>;
    nvidia,gm1-ser-ctrl = <0x00>;
    devnode = "video2";
    compatible = "otobrite,otocam";
    physical-w = "15.0";
};

```

External Frame sync : The fsync signal is generated externally, such as PWM. We need to configure the external signal and specify which GPIO input to use. The red box below indicates that the signal is input via gpio1.

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

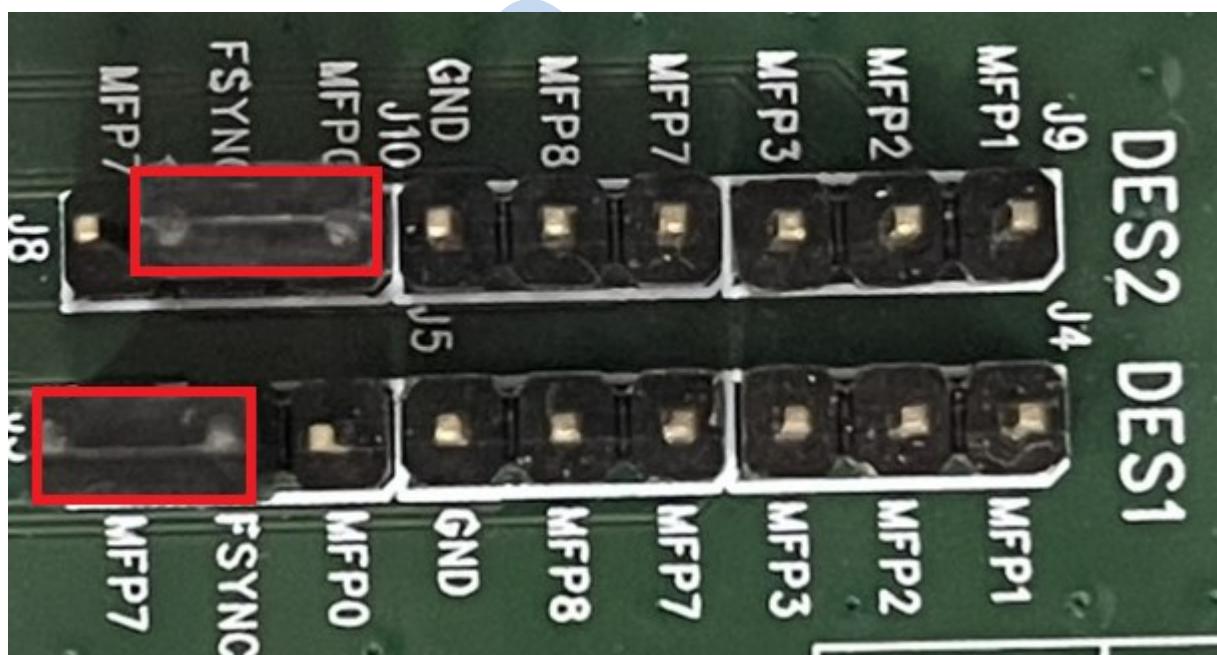
文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	42 of 64
------	--	-----	----------

```
dsera: max96724@27 {
    status = "okay";
    compatible = "otobrite,deserializer";
    reg = <0x27>;
    force-clock = <0x1>;
    csi-mode = "2x4";
    max-src = <4>;
    fsync-gpio = <0x01>;
};
```

The available GPIOs for each deserializer can be found in the table below.

	internal	external
max96712 evk	2,5	0,2,4,5
max96724 evk	0	0,1,2,3,7,8
max96714 evk	0	0,1,2,3,4,6,7
max9296 evk	0	0,7,8
otoadapter NX	0	0,1,2,3
otoadapter AGX	0	0,1,2,3,7,8
TI interposer	3	1

The example of AGX Orin+oToAdapter :



DES2 is configured with internal fsync. The signal is generated from MFP0 and transmitted to FSYNC. The

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	43 of 64
------	--	-----	----------

DES2 internal line FSYNC of oToAdapter(m96724\*2) is connected to DES1 FSYNC. Therefore, the fsync signal generated from DES2 will be transmitted to DES1's FSYNC, and then to DES1's MFP7 (gpio7). In the device tree, DES1 must be configured as external fsync (from gpio7), and DES2 as internal fsync, with a frequency of 30Hz.

```

dsera: max96724@27 {
    status = "okay";
    compatible = "otobrite,deserializer";
    reg = <0x27>;
    fsync-gpio = <0x7>;
    force-clock = <0x1>;
    csi-mode = "2x4";
    max-src = <4>;
};

dserb: max96724@4e {
    status = "okay";
    compatible = "otobrite,deserializer";
    reg = <0x4e>;
    fsync-gpio = <0xd>; 0xd=disable
    force-clock = <0x1>;
    csi-mode = "2x4";
    max-src = <4>;
    fsync-inter-hz = <0x1e>;
};

```

Fsync Start :

About deserializer m96724(oToAdapter)/m96712 , after capturing frames using gstreamer(gst-showall\_xxx.sh) or v4l2-ctl(gnome-test-nv16-multi.sh), use “oToAdapter-fsync-internal-start.sh” to start fsync.

Check fsync by “gnome-test-nv16-multi.sh” :

If fsync start, the time stamp of video0.txt ~ videoN.txt will be < 1ms.

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	44 of 64
------	--	-----	----------

```
D:\projects\nvidia\1\video1.txt D:\projects\nvidia\1\video1.dat
[...]
294 cap dbuf: 0 seq: 268 bytesused: 5898240 ts: 480.73905 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
295 cap dbuf: 1 seq: 269 bytesused: 5898240 ts: 480.77963 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
296 cap dbuf: 2 seq: 270 bytesused: 5898240 ts: 481.00953 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
297 cap dbuf: 3 seq: 271 bytesused: 5898240 ts: 481.04944 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
298 cap dbuf: 0 seq: 272 bytesused: 5898240 ts: 481.07637 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
299 cap dbuf: 1 seq: 273 bytesused: 5898240 ts: 481.10628 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
300 cap dbuf: 2 seq: 274 bytesused: 5898240 ts: 481.14624 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
301 cap dbuf: 3 seq: 275 bytesused: 5898240 ts: 481.17637 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
302 cap dbuf: 0 seq: 276 bytesused: 5898240 ts: 481.20629 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
303 cap dbuf: 1 seq: 277 bytesused: 5898240 ts: 481.24623 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
304 cap dbuf: 2 seq: 278 bytesused: 5898240 ts: 481.27637 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
305 cap dbuf: 3 seq: 279 bytesused: 5898240 ts: 481.30628 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
306 cap dbuf: 0 seq: 280 bytesused: 5898240 ts: 481.34623 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
307 cap dbuf: 1 seq: 281 bytesused: 5898240 ts: 481.37637 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
308 cap dbuf: 2 seq: 282 bytesused: 5898240 ts: 481.40628 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
309 cap dbuf: 3 seq: 283 bytesused: 5898240 ts: 481.44623 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
310 cap dbuf: 0 seq: 284 bytesused: 5898240 ts: 481.47637 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
311 cap dbuf: 1 seq: 285 bytesused: 5898240 ts: 481.50628 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
312 cap dbuf: 2 seq: 286 bytesused: 5898240 ts: 481.54623 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
313 cap dbuf: 3 seq: 287 bytesused: 5898240 ts: 481.57637 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
314 cap dbuf: 0 seq: 288 bytesused: 5898240 ts: 481.60628 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
315 cap dbuf: 1 seq: 289 bytesused: 5898240 ts: 481.64623 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
316 cap dbuf: 2 seq: 290 bytesused: 5898240 ts: 481.67637 delta: 33.34 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
317 cap dbuf: 3 seq: 291 bytesused: 5898240 ts: 481.70628 delta: 33.34 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
318 cap dbuf: 0 seq: 292 bytesused: 5898240 ts: 481.74623 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
319 cap dbuf: 1 seq: 293 bytesused: 5898240 ts: 481.77637 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
320 cap dbuf: 2 seq: 294 bytesused: 5898240 ts: 481.80628 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
321 cap dbuf: 3 seq: 295 bytesused: 5898240 ts: 481.83623 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
322 cap dbuf: 0 seq: 296 bytesused: 5898240 ts: 481.86628 delta: 33.34 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
323 cap dbuf: 1 seq: 297 bytesused: 5898240 ts: 481.89623 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
324 cap dbuf: 2 seq: 298 bytesused: 5898240 ts: 481.92628 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
325 cap dbuf: 3 seq: 299 bytesused: 5898240 ts: 481.95623 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
326 cap dbuf: 0 seq: 300 bytesused: 5898240 ts: 481.98628 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
327 cap dbuf: 1 seq: 301 bytesused: 5898240 ts: 482.01623 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
328 cap dbuf: 2 seq: 302 bytesused: 5898240 ts: 482.04628 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
329 cap dbuf: 3 seq: 303 bytesused: 5898240 ts: 482.07637 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
330 cap dbuf: 0 seq: 304 bytesused: 5898240 ts: 482.10628 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
331 cap dbuf: 1 seq: 305 bytesused: 5898240 ts: 482.13623 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
332 cap dbuf: 2 seq: 306 bytesused: 5898240 ts: 482.16628 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
333 cap dbuf: 3 seq: 307 bytesused: 5898240 ts: 482.19623 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
334 cap dbuf: 0 seq: 308 bytesused: 5898240 ts: 482.22628 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
335 cap dbuf: 1 seq: 309 bytesused: 5898240 ts: 482.25623 delta: 33.33 ms fsp: 30.00 (ts-monotonic, ts-src-eof)
336 cap dbuf: 2 seq: 310 bytesused: 5898240 ts: 482.286647 delta: 33.33 ms fsp: 29.93 (ts-monotonic, ts-src-eof)
337 cap dbuf: 3 seq: 311 bytesused: 5898240 ts: 482.316647 delta: 33.33 ms fsp: 29.93 (ts-monotonic, ts-src-eof)

[...] 同步訊號開始 [...]
[...] 同步完成 [...]
```

## 2.2. Reconfigure and Patch Linux Kernel

For JetPack 6.x, there's no need to modify kernel config since max9296, max9295, nv\_imx390 are not built into the kernel. Simply replace max9296.ko, max9295.ko, nv\_imx390.ko with oToBrite's version.

(JetPack 5.x) First, remove Jetson Linux's built-in Maxim SerDes module and IMX390 camera module from kernel config file as below:

```
kernel/kernel-5.10/arch/arm64/configs/tegra_defconfig
CONFIG_VIDEO_IMX219=n
CONFIG_I2C_IOEXPANDER_SER_MAX9295=n
CONFIG_I2C_IOEXPANDER_DESER_MAX9296=n
CONFIG_VIDEO_IMX390=n
```

Next, patch tegra-camera driver to support additional pixel formats required for certain sensors (ST-VB56G, AR0144, etc.)

```
kernel/nvidia/drivers/media/platform/tegra/camera/
camera_common.c

static const struct camera_common_colorfmt[] = {
    ...
    { // +
        MEDIA_BUS_FMT_Y16_1X16,
        V4L2_COLORSPACE_SRGB,
        V4L2_PIX_FMT_Y16,
    },
    ...
sensor_common.c

static int extract_pixel_format(...) {
    ...
    else if (strncmp(pixel_t, "gray_y16", size) == 0) // +
        *format = V4L2_PIX_FMT_Y16;
```

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	45 of 64
------	--	-----	----------

```
else if (strncmp(pixel_t, "bayer_rggb8", size) == 0) // +
    *format = V4L2_PIX_FMT_SRGGB8;
```

...

#### vi/vi5\_formats.h

```
static const struct tegra_video_format vi5_video_formats[] = {
    ...
    TEGRA_VIDEO_FORMAT(RAW10, 10, Y16_1X16, 2, 1, T_R16,
                        RAW10, Y16, "GRAY16"), // for ST-VB56G
    /*TEGRA_VIDEO_FORMAT(RAW12, 12, Y16_1X16, 2, 1, T_R16,
                        RAW12, Y16, "GRAY16"),*/ // else for AR0144
    ...
}
```

#### kernel/kernel-5.10/include/uapi/linux/media-bus-format.h

```
...
#define MEDIA_BUS_FMT_UYYVYY16_0_5X48      0x202b
#define MEDIA_BUS_FMT_Y16_1X16               0x202f // +
...
```

Finally, rebuild kernel image and DTB.

### 2.3. Update Kernel Image and DTB

Install the rebuilt kernel image and DTB to target Jetson DevKit. Below are relevant path and files:

```
/boot/
└── Image
    ├── tegra234-p3737-0000+p3701-0004-nv.dtb  (JetPack6.0 AGX-Orin)
    ├── tegra234-p3701-0004-p3737-0000.dtb    (JetPack5.x AGX-Orin)
    └── tegra194-p2888-0001-p2822-0000.dtb    (JetPack5.x AGX-Xavier)
    └── extlinux/
        └── extlinux.conf
```

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx
------	--

頁 數	46 of 64
-----	----------

## 3. Driver Testing

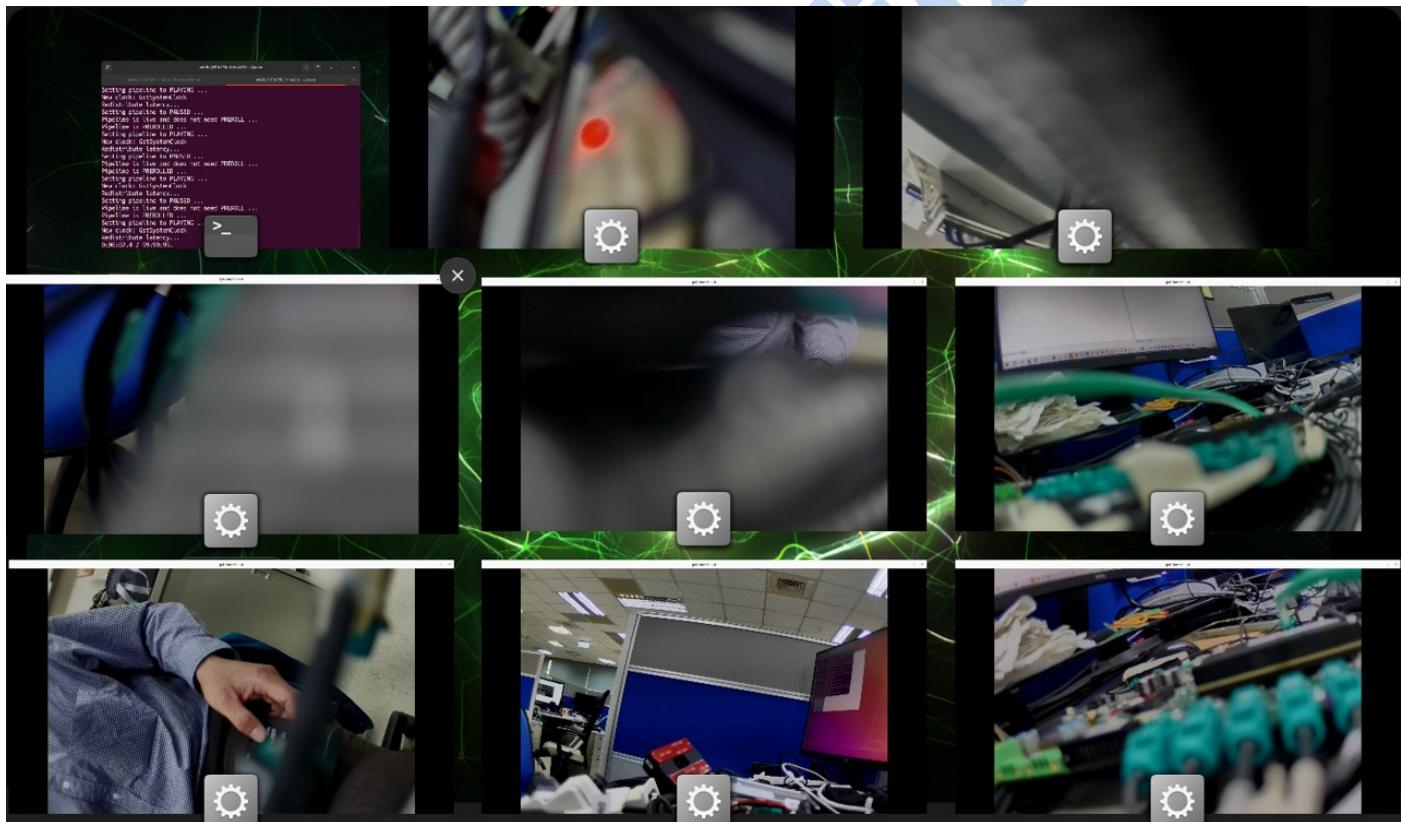
### 3.1. Load Kernel Module

Kernel modules can be manually loaded as below:

```
$ sudo insmod oToSerDes.ko
$ sudo insmod oToCAM.ko
```

### 3.2. Run GStreamer to display

```
gst-launch-1.0 v4l2src device=/dev/video$1 ! videoconvert ! xvimagesink
gst-launch-1.0 -e v4l2src device=/dev/video$1 ! fpsdisplaysink
```



文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	47 of 64
------	--	-----	----------

### 3.3. Run V4L2-utils or other tool

v4l2-ctl command can activate video streaming, but don't display video on screen. Below is command example:

check frame rate :

```
v4l2-ctl -d /dev/video0 --set-fmt-video=pixelformat=NV16 --stream-mmap --stream-count=300
```

```
v4l2-ctl -d /dev/video0 --set-fmt-video=pixelformat=UYVY --stream-mmap --stream-count=300
```

get image/raw data:

```
v4l2-ctl -d /dev/video0 --set-fmt-video=pixelformat=NV16 --stream-mmap --stream-count=1 --stream-to=nv16-video0.raw
```

```
v4l2-ctl -d /dev/video0 --set-fmt-video=pixelformat=UYVY --stream-mmap --stream-count=1 --stream-to=uyvy-video0.raw
```

```
v4l2-ctl -d /dev/video0 --set-fmt-video=pixelformat=RG12 --stream-mmap --stream-count=1 --stream-to=rg12-video0.raw
```

```
$ v4l2-ctl -d /dev/video0 --set-fmt-video=pixelformat=NV16 --stream-mmap --stream-count=300
<<<<<<<<<<<<<<<<<<<<<< 30.00 fps
<<<<<<<<<<<<<<<<<<<<<<< 29.80 fps
<<<<<<<
```

gnome-test-nv16-multi.sh on tool folder for frame rate monitor (output log to videoN.txt).

文件編號		版本
生效日期	2026/1/29	
制定部門	System-SW	V2.10

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	48 of 64
------	--	-----	----------



```

video0 : 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 1 seq: 1017 bytesused: 5898240 ts: 7993.432446 delta: 33.332 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 2 seq: 1018 bytesused: 5898240 ts: 7993.465778 delta: 33.332 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 3 seq: 1019 bytesused: 5898240 ts: 7993.499111 delta: 33.333 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 0 seq: 1020 bytesused: 5898240 ts: 7993.532443 delta: 33.332 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 1 seq: 1021 bytesused: 5898240 ts: 7993.565776 delta: 33.333 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 2 seq: 1022 bytesused: 5898240 ts: 7993.599108 delta: 33.332 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 3 seq: 1023 bytesused: 5898240 ts: 7993.632440 delta: 33.332 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 0 seq: 1024 bytesused: 5898240 ts: 7993.665773 delta: 33.333 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 1 seq: 1025 bytesused: 5898240 ts: 7993.699105 delta: 33.332 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 2 seq: 1026 bytesused: 5898240 ts: 7993.732437 delta: 33.332 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 3 seq: 1027 bytesused: 5898240 ts: 7993.765770 delta: 33.333 ms fps
: 30.00 (ts-monotonic, ts-src-eof)

video1 : 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 2 seq: 1006 bytesused: 5898240 ts: 7993.391156 delta: 33.333 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 3 seq: 1007 bytesused: 5898240 ts: 7993.424488 delta: 33.332 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 0 seq: 1008 bytesused: 5898240 ts: 7993.457820 delta: 33.332 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 1 seq: 1009 bytesused: 5898240 ts: 7993.491153 delta: 33.333 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 2 seq: 1010 bytesused: 5898240 ts: 7993.524485 delta: 33.332 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 3 seq: 1011 bytesused: 5898240 ts: 7993.557817 delta: 33.332 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 0 seq: 1012 bytesused: 5898240 ts: 7993.591150 delta: 33.333 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 1 seq: 1013 bytesused: 5898240 ts: 7993.624482 delta: 33.332 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 2 seq: 1014 bytesused: 5898240 ts: 7993.657815 delta: 33.333 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 3 seq: 1015 bytesused: 5898240 ts: 7993.691147 delta: 33.332 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 0 seq: 1016 bytesused: 5898240 ts: 7993.724479 delta: 33.332 ms fps
: 30.00 (ts-monotonic, ts-src-eof)

video2 : 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 3 seq: 999 bytesused: 5898240 ts: 7993.451660 delta: 33.333 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 0 seq: 1000 bytesused: 5898240 ts: 7993.484992 delta: 33.332 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 1 seq: 1001 bytesused: 5898240 ts: 7993.518324 delta: 33.332 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 2 seq: 1002 bytesused: 5898240 ts: 7993.551657 delta: 33.333 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 3 seq: 1003 bytesused: 5898240 ts: 7993.584989 delta: 33.332 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 0 seq: 1004 bytesused: 5898240 ts: 7993.618322 delta: 33.333 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 1 seq: 1005 bytesused: 5898240 ts: 7993.651654 delta: 33.332 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 2 seq: 1006 bytesused: 5898240 ts: 7993.684986 delta: 33.332 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 3 seq: 1007 bytesused: 5898240 ts: 7993.718319 delta: 33.333 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 0 seq: 1008 bytesused: 5898240 ts: 7993.751651 delta: 33.332 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 1 seq: 1009 bytesused: 5898240 ts: 7993.784983 delta: 33.332 ms fps
: 30.00 (ts-monotonic, ts-src-eof)

video3 : 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 2 seq: 986 bytesused: 5898240 ts: 7993.393441 delta: 33.332 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 3 seq: 987 bytesused: 5898240 ts: 7993.426774 delta: 33.333 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 0 seq: 988 bytesused: 5898240 ts: 7993.460106 delta: 33.332 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 1 seq: 989 bytesused: 5898240 ts: 7993.493438 delta: 33.332 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 2 seq: 990 bytesused: 5898240 ts: 7993.526771 delta: 33.333 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 3 seq: 991 bytesused: 5898240 ts: 7993.560103 delta: 33.332 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 0 seq: 992 bytesused: 5898240 ts: 7993.593436 delta: 33.333 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 1 seq: 993 bytesused: 5898240 ts: 7993.626768 delta: 33.332 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 2 seq: 994 bytesused: 5898240 ts: 7993.660100 delta: 33.332 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 3 seq: 995 bytesused: 5898240 ts: 7993.693433 delta: 33.333 ms fps
: 30.00 (ts-monotonic, ts-src-eof)
cap ddbuf: 0 seq: 996 bytesused: 5898240 ts: 7993.726765 delta: 33.332 ms fps
: 30.00 (ts-monotonic, ts-src-eof)

```

文件編號		版本
生效日期	2026/1/29	
制定部門	System-SW	V2.10
文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數 49 of 64

## 4. Feedback

When issues arise during integration and testing, please feedback oToBrite with below information:

- dmesg logs for module insertion, and video streaming.
- check camera PoC/power supply, FAKRA/SerDes cable connection.
- check whether video nodes exist:  
    \$ ls /dev/video\*
- check v4l2 sub-device nodes binding:  
    \$ media-ctl -p -d /dev/media0
- check video settings:  
    \$ gst-device-monitor-1.0 /dev/videoN

文件編號		版本
生效日期	2026/1/29	
制定部門	System-SW	V2.10
文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數 50 of 64

## 5. Reference

### 5.1. Nvidia Development Documents

<https://developer.nvidia.com/embedded/jetson-linux> Jetson Linux Driver Package

<https://docs.nvidia.com/jetson/archives/r35.4.1/DeveloperGuide/index.html> Camera Development

### 5.2. Nvidia Carrier Board Specification

[https://developer.nvidia.com/embedded/dlc/Jetson\\_AGX\\_Xavier\\_Developer\\_Kit\\_Carrier\\_Board\\_Specification](https://developer.nvidia.com/embedded/dlc/Jetson_AGX_Xavier_Developer_Kit_Carrier_Board_Specification)

### 5.3. Nvidia Xavier PinMux Table

<https://developer.nvidia.com/jetson-xavier-nx-pinmux-configuration-template-v106>

文件編號		版本
生效日期	2026/1/29	
制定部門	System-SW	V2.10
文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數 51 of 64

## Appendix A. Device tree programing

**device tree programing example (AGX Orin):**

driver version: 0.04.05。

Dser use 2x4 config。

Sensor is otocam222。

Step 1. Dser : check i2c address to fill the following block.

```
bus@0 {
    i2c@3180000 {
        max9296_a@48 {
            status = "okay";
            compatible = "maxim,max9296";
            reg = <0x6b>;
            csi-mode = "2x4";
            max-src = <0x04>;
            reset-gpios = <0xffffffff 0x3b 0x00>;
            fsync-gpio = <0x00>;
            phandle = <0x01>;
        };
    };
}
```

- two Dser, one for 3180000 , another for 31e0000 。
- “reg” : Dser i2c address 。
- “csi-mode” 、 ” max-src” : set Dser config , it is 2x4 。
- “fsync-gpio” : for fsync , not used 。

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	52 of 64
------	--	-----	----------

Step 2. Ser : write to the same area with Dser.

```
max9295_a@40 {
    status = "okay";
    compatible = "maxim,max9295";
    reg = <0x18>;
    nvidia,gmsl-dser-device = <0x01>;
    phandle = <0x02>;
};
```

- The default i2c address of 9295A is 0x62 , after insert driver, it will be remapped to the assigned address of reg .
- The tree will describe which Dser the Ser is connected to. The value of "nvidia,gmsl-dser-device" is a pointer to the "phandle" of the Dser. .

Step 3. Cam : Usually written in the same section as the corresponding Ser and Dser.

```
imx390@10 {
    status = "okay";
    reg = <0x10>;
    def-addr = <0x1a>;
    clocks = <0xffffffff 0x24 0xffffffff 0x24>;
    clock-names = "extperiph1\0pll_p_grtba";
    mclk = "extperiph1";
    nvidia,gmsl-ser-device = <0x02>;
    nvidia,gmsl-dser-device = <0x01>;
    devnode = "video0";
    compatible = "sony,imx390";
    physical_w = "15.0";
    physical_h = "12.5";
    sensor_model = "isx021";
    post_crop_frame_drop = "0";
    use_decibel_gain = "true";
    use_sensor_mode_id = "true";
    phandle = <0x2b>;
```

- The default i2c address of Isx021 is 0x1a, and it will be remapped to the address specified by "reg" after the driver is installed. .
- The tree will describe which Ser and Dser the Cam is connected to, "nvidia,gmsl-ser-device", "nvidia,gmsl-dser-device".
- "Sensor\_model" refers to the sensor model used.

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	53 of 64
------	--	-----	----------

- Basic information of Cam, which is used by the mainboard program (v4l2, gstreamer) to parse the received data.
- This is the setting of otocam222.

```
mode0 {  
    mclk_khz = "24000";  
    num_lanes = "4";  
    tegra_sinterface = "serial_a";  
    vc_id = "0";  
    discontinuous_clk = "no";  
    dpcm_enable = "false";  
    cil_settletime = "0";  
    mode_type = "yuv";  
    pixel_phase = "uyvy";  
    csi_pixel_bit_depth = "16";  
    dynamic_pixel_bit_depth = "16";  
    active_w = "1920";  
    active_h = "1280";  
    readout_orientation = "0";  
    line_length = "2200";  
    inherent_gain = "1";  
    pix_clk_hz = "375000000";  
    gain_factor = "10";  
    min_gain_val = "0";  
    max_gain_val = "300";  
    step_gain_val = "3";  
    default_gain = "0";  
    min_hdr_ratio = "1";  
    max_hdr_ratio = "1";  
    framerate_factor = "1000000";  
    min_framerate = "3000000";  
    max_framerate = "3000000";  
    step_framerate = "1";  
    default_framerate = "3000000";  
    exposure_factor = "1000000";  
    min_exp_time = "59";  
    max_exp_time = "33333";  
    step_exp_time = "1";  
    default_exp_time = "33333";  
    embedded_metadata_height = "0";  
};
```

- Differences between otocam222 & otocam223

文件編號	版本
生效日期	2026/1/29
制定部門	System-SW

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	54 of 64
------	--	-----	----------

```

diff --git a/O:\nvidia\oto_src\nvidia\kernel_drivers_media\i2c\dt\static\JP61-EVK-orin-nx\otocam-929\otocam222\new\device-tree.dts b/O:\nvidia\oto_src\nvidia\kernel_drivers_media\i2c\dt\static\JP61-EVK-orin-nx\otocam-929\otocam260isp\new\device-tree.dts
--- a/O:\nvidia\oto_src\nvidia\kernel_drivers_media\i2c\dt\static\JP61-EVK-orin-nx\otocam-929\otocam222\new\device-tree.dts
+++ b/O:\nvidia\oto_src\nvidia\kernel_drivers_media\i2c\dt\static\JP61-EVK-orin-nx\otocam-929\otocam260isp\new\device-tree.dts
@@ -48,62 +48,62 @@ 
        clock_name = "experiph1@0x100_0rta";
        mclk = "experiph1";
        nvidia,gmsl-ser-device = <0x02>;
        nvidia,gmsl-dsr-device = <0x01>;
        devnode = "video0";
        compatible = "otobrite,otocam";
        physical_w = "15.0";
        physical_h = "12.5";
        sensor_model = "isx021";
        post_crop_frame_drop = "0";
        use_decibel_gain = "true";
        use_sensor_mode_id = "true";
        phandle = <0x2b>;
    mode0 {
        mclk_khz = "24000";
        num_lanes = "4";
        tegra_sinterface = "serial_a";
        vc_id = "0";
        discontinuous_clk = "no";
        dpcm_enable = "false";
        cil_settletime = "0";
        mode_type = "yuuv";
        pixel_phase = "uyvy";
        csi_pixel_bit_depth = "16";
        dynamic_csi_pixel_bit_depth = "16";
        active_w = "1920";
        active_h = "1280";
        readout_orientation = "0";
        line_length = "2200";
        inherent_gain = "1";
        pix_clk_hz = "375000000";
        gain_factor = "10";
        min_gain_val = "0";
        max_gain_val = "300";
        step_gain_val = "3";
        default_gain = "0";
        min_hdr_ratio = "1";
    }
    mode0 {
        mclk_khz = "24000";
        num_lanes = "4";
        tegra_sinterface = "serial_a";
        vc_id = "0";
        discontinuous_clk = "no";
        dpcm_enable = "false";
        cil_settletime = "0";
        mode_type = "yuuv";
        pixel_phase = "uyvy";
        csi_pixel_bit_depth = "16";
        dynamic_csi_pixel_bit_depth = "16";
        active_w = "1920";
        active_h = "1280";
        readout_orientation = "0";
        line_length = "2200";
        inherent_gain = "1";
        pix_clk_hz = "375000000";
        gain_factor = "10";
        min_gain_val = "0";
        max_gain_val = "300";
        step_gain_val = "3";
        default_gain = "0";
        min_hdr_ratio = "1";
    }

```

## ● Differences between otocam222 & otocam260isp

```

diff --git a/R\Release\Nvidia_Release\fix\static\JP62-EVK-orin-nx\otocam-929\otocam222\new\device-tree.dts b/R\Release\Nvidia_Release\fix\static\JP62-EVK-orin-nx\otocam-929\otocam264isp\new\device-tree.dts
--- a/R\Release\Nvidia_Release\fix\static\JP62-EVK-orin-nx\otocam-929\otocam222\new\device-tree.dts
+++ b/R\Release\Nvidia_Release\fix\static\JP62-EVK-orin-nx\otocam-929\otocam264isp\new\device-tree.dts
@@ -50,62 +50,62 @@ 
        mclk = "experiph1";
        nvidia,gmsl-ser-device = <0x02>;
        nvidia,gmsl-dsr-device = <0x01>;
        devmode = "video0";
        compatible = "otobrite,otocam";
        physical_w = "15.0";
        physical_h = "12.5";
        sensor_model = "isx021";
        post_crop_frame_drop = "0";
        use_decibel_gain = "true";
        use_sensor_mode_id = "true";
        phandle = <0x2b>;
    mode0 {
        mclk_khz = "24000";
        num_lanes = "4";
        tegra_sinterface = "serial_a";
        vc_id = "0";
        discontinuous_clk = "no";
        dpcm_enable = "false";
        cil_settletime = "0";
        mode_type = "yuuv";
        pixel_phase = "uyvy";
        csi_pixel_bit_depth = "16";
        dynamic_csi_pixel_bit_depth = "16";
        active_w = "1920";
        active_h = "1280";
        readout_orientation = "0";
        line_length = "2200";
        inherent_gain = "1";
        pix_clk_hz = "375000000";
        gain_factor = "10";
        min_gain_val = "0";
        max_gain_val = "300";
        step_gain_val = "3";
        default_gain = "0";
        min_hdr_ratio = "1";
    }
    mode0 {
        mclk_khz = "24000";
        num_lanes = "4";
        tegra_sinterface = "serial_a";
        vc_id = "0";
        discontinuous_clk = "no";
        dpcm_enable = "false";
        cil_settletime = "0";
        mode_type = "yuuv";
        pixel_phase = "uyvy";
        csi_pixel_bit_depth = "16";
        dynamic_csi_pixel_bit_depth = "16";
        active_w = "2880";
        active_h = "1664";
        readout_orientation = "0";
        line_length = "3200";
        inherent_gain = "1";
        pix_clk_hz = "375000000";
        gain_factor = "10";
        min_gain_val = "0";
        max_gain_val = "300";
        step_gain_val = "3";
        default_gain = "0";
        min_hdr_ratio = "1";
    }

```

## ● Differences between otocam222 & otocam264isp

```

diff --git a/O:\nvidia\oto_src\nvidia\kernel_drivers_media\i2c\dt\static\JP61-EVK-orin-nx\otocam-929\otocam222\new\device-tree.dts b/O:\nvidia\oto_src\nvidia\kernel_drivers_media\i2c\dt\static\JP61-EVK-orin-nx\otocam-929\otocam264isp\new\device-tree.dts
--- a/O:\nvidia\oto_src\nvidia\kernel_drivers_media\i2c\dt\static\JP61-EVK-orin-nx\otocam-929\otocam222\new\device-tree.dts
+++ b/O:\nvidia\oto_src\nvidia\kernel_drivers_media\i2c\dt\static\JP61-EVK-orin-nx\otocam-929\otocam264isp\new\device-tree.dts
@@ -53,62 +53,62 @@ 
        devnode = "video0";
        compatible = "otobrite,otocam";
        physical_w = "15.0";
        physical_h = "12.5";
        sensor_model = "isx021";
        post_crop_frame_drop = "0";
        use_decibel_gain = "true";
        use_sensor_mode_id = "true";
        phandle = <0x2b>;
    mode0 {
        mclk_khz = "24000";
        num_lanes = "4";
        tegra_sinterface = "serial_a";
        vc_id = "0";
        discontinuous_clk = "no";
        dpcm_enable = "false";
        cil_settletime = "0";
        mode_type = "yuuv";
        pixel_phase = "uyvy";
        csi_pixel_bit_depth = "16";
        dynamic_csi_pixel_bit_depth = "16";
        active_w = "1920";
        active_h = "1280";
        readout_orientation = "0";
        line_length = "2200";
        inherent_gain = "1";
        pix_clk_hz = "375000000";
        gain_factor = "10";
        min_gain_val = "0";
        max_gain_val = "300";
        step_gain_val = "3";
        default_gain = "0";
        min_hdr_ratio = "1";
    }
    mode0 {
        mclk_khz = "24000";
        num_lanes = "4";
        tegra_sinterface = "serial_a";
        vc_id = "0";
        discontinuous_clk = "no";
        dpcm_enable = "false";
        cil_settletime = "0";
        mode_type = "yuuv";
        pixel_phase = "uyvy";
        csi_pixel_bit_depth = "16";
        dynamic_csi_pixel_bit_depth = "16";
        active_w = "1920";
        active_h = "1280";
        readout_orientation = "0";
        line_length = "2200";
        inherent_gain = "1";
        pix_clk_hz = "375000000";
        gain_factor = "10";
        min_gain_val = "0";
        max_gain_val = "300";
        step_gain_val = "3";
        default_gain = "0";
        min_hdr_ratio = "1";
    }

```

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	55 of 64
------	--	-----	----------

## ● Differences between otocam222 & otocam271isp(max\_lane\_speed = 2.5G)

```

R:\Release\Nvidia_Release\fix\static\JP62-EVK-orin-nx\otocam-9296\otocam222\new\device-tree.dts
R:\Release\Nvidia_Release\fix\static\JP62-EVK-orin-nx\otocam-9296\otocam271isp\new\device-tree.dts

```

```

model@ {
    mclk_khz = "24000";
    num_lanes = "4";
    tegra_sinterface = "serial_a";
    vc_id = "0";
    discontinuous_clk = "no";
    dpcm_enable = "false";
    csi_settletime = "0";
    mode_type = "yuv";
    pixel_phase = "uyvy";
    csi_pixel_bit_depth = "16";
    dynamic_pixel_bit_depth = "16";
    active_w = "1920";
    active_h = "1280";
    readout_orientation = "0";
    line_length = "2200";
    inherent_gain = "1";
    pix_clk_hz = "37500000";
    gain_factor = "10";
    min_gain_val = "0";
}

```

```

R:\Release\Nvidia_Release\fix\static\JP62-EVK-orin-nx\otocam-9296\otocam222\new\device-tree.dts
R:\Release\Nvidia_Release\fix\static\JP62-EVK-orin-nx\otocam-9296\otocam271isp\new\device-tree.dts

```

```

fragment-camera@13 {
    target-path = "/";
    _overlay__ {
        tegra-camera-platform {
            compatible = "nvidia, tegra-camera-platform";
            num_csi_lanes = <0x04>;
            max_lane_speed = <0x1e360>;
            min_bits_per_pixel = <0x0a>;
            v1_peak_byte_per_pixel = <0x02>;
            v1_bw_margin_pct = <0x19>;
            isp_peak_byte_per_pixel = <0x05>;
            isp_bw_margin_pct = <0x19>;
            phandle = <0x31>;
        }
    }
}

```

## ● Differences between otocam222 & otocam264raw

```

O:\nvidia\test\device_tree\avmedia\device-tree\otocam222.dts
O:\nvidia\test\device_tree\avmedia\device-tree\otocam264raw.dts

```

```

physical_h = "12.5";
sensor_model = "imx221";
post_crop_frame_drop = "0";
use_decibel_gain = "true";
use_sensor_mode_id = "true";
phandle = <0x24f>;
mode0 {
    mclk_khz = "24000";
    num_lanes = "4";
    tegra_sinterface = "serial_a";
    vc_id = "0";
    discontinuous_clk = "no";
    dpcm_enable = "false";
    csi_settletime = "0";
    mode_type = "yuv";
    pixel_phase = "uyvy";
    csi_pixel_bit_depth = "16";
    dynamic_pixel_bit_depth = "16";
    active_w = "1920";
    active_h = "1280";
    readout_orientation = "0";
    line_length = "2200";
    inherent_gain = "1";
    pix_clk_hz = "37500000";
    gain_factor = "10";
    min_gain_val = "0";
    max_gain_val = "300";
    step_gain_val = "3";
    default_gain = "0";
    min_hdr_ratio = "1";
    max_hdr_ratio = "1";
    framerate_factor = "1000000";
    min_framerate = "30000000";
    max_framerate = "30000000";
    step_framerate = "1";
    default_framerate = "30000000";
    exposure_factor = "1000000";
    min_exp_time = "59";
    max_exp_time = "33333";
    step_exp_time = "1";
    default_exp_time = "33333";
    embedded_metadata_height = "0";
    lane_polarity = "6";
};
gmsl-link {
    streams = "uyv@0ued-u1";
    src-csi-port = "b";
    dst-csi-port = "a";
    serdes-csi-link = "a";
}

```

```

physical_h = "12.5";
sensor_model = "imx390";
post_crop_frame_drop = "0";
use_decibel_gain = "true";
use_sensor_mode_id = "true";
phandle = <0x24f>;
mode0 {
    mclk_khz = "24000";
    num_lanes = "4";
    tegra_sinterface = "serial_a";
    vc_id = "0";
    discontinuous_clk = "no";
    dpcm_enable = "false";
    csi_settletime = "0";
    mode_type = "bayer";
    pixel_phase = "rgb";
    csi_pixel_bit_depth = "12";
    dynamic_pixel_bit_depth = "12";
    active_w = "1920";
    active_h = "1080";
    readout_orientation = "0";
    line_length = "2200";
    inherent_gain = "1";
    pix_clk_hz = "62500000";
    gain_factor = "10";
    min_gain_val = "0";
    max_gain_val = "300";
    step_gain_val = "3";
    default_gain = "0";
    min_hdr_ratio = "1";
    max_hdr_ratio = "1";
    framerate_factor = "1000000";
    min_framerate = "30000000";
    max_framerate = "30000000";
    step_framerate = "1";
    default_framerate = "30000000";
    exposure_factor = "1000000";
    min_exp_time = "59";
    max_exp_time = "33333";
    step_exp_time = "1";
    default_exp_time = "33333";
    embedded_metadata_height = "0";
    lane_polarity = "6";
};
gmsl-link {
    streams = "nwrd2@0ued-u1";
    src-csi-port = "b";
    dst-csi-port = "a";
    serdes-csi-link = "a";
}

```

## Step4. Gmsl-link

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	56 of 64
------	--	-----	----------

gmsl-link describes that Cam enters Ser through port B (src-csi-port) in csi-lane 1x4 (csi-mode), and Ser then enters Dser through gmsl LinkA (serdes-csi-link), the packet format (streams), Virtual-channel (st-vc, vc-id) along the way, and then goes out from Port A (dst-csi-port) of Dser to the main board.

```
gmsl-link {  
    streams = "yuv8\0ued-u1";  
    src-csi-port = "b";  
    dst-csi-port = "a";  
    serdes-csi-link = "a";  
    csi-mode = "1x4";  
    st-vc = <0x00>;  
    vc-id = <0x00>;  
    num-lanes = <0x04>;  
};
```

文件編號		版本
生效日期	2026/1/29	
制定部門	System-SW	V2.10

文件名稱 | oToCAM\_nVidiaDriver\_UserGuide-v2.10.docx

頁 數 | 57 of 64

```
ports {
    #address-cells = <0x01>;           1
    #size-cells = <0x00>;
    port@0 {
        reg = <0x00>;
        endpoint {
            vc-id = <0x00>;
            port-index = <0x04>;
            bus-width = <0x04>;
            remote-endpoint = <0x03>;
            phandle = <0x0e>;
        };
    };
};
```

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	58 of 64
------	--	-----	----------

```
bus@0 {  
    host1x@13e00000 {  
        nvc_si@15a00000 {  
            num-channels = <0x08>;  
            #address-cells = <0x01>;  
            #size-cells = <0x00>;  
            num-tpg-channels = <0x24>;  
            phandle = <0x34>;  
  
            channel@0 {  
                reg = <0x00>;  
                status = "okay";  
                phandle = <0x35>;  
  
                ports {  
                    #address-cells = <0x01>;  
                    #size-cells = <0x00>;  
  
                    port@0 {  
                        reg = <0x00>;  
                        status = "okay";  
                        phandle = <0x36>;  
  
                        endpoint@0 {  
                            port-index = <0x04>;  
                            bus-width = <0x04>;  
                            remote-endpoint = <0x0e>;  
                            status = "okay";  
                            phandle = <0x03>;  
                        };  
                    };  
                };  
            };  
        };  
    };  
};
```

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx
------	--

```

tegra-capture-vi {
    num-channels = <0x08>;
    phandle = <0x2f>;

    ports {
        #address-cells = <0x01>;
        #size-cells = <0x00>;

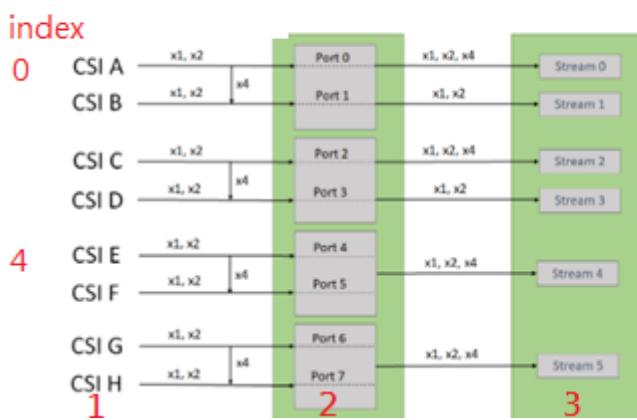
        port@0 {
            reg = <0x00>;
            status = "okay";
            phandle = <0x30>;

            endpoint {
                vc-id = <0x00>;
                port-index = <0x04>;
                bus-width = <0x04>;
                remote-endpoint = <0x0a>;
                status = "okay";
                phandle = <0x0f>;
            };
        };
    };
}

```

The following graphic illustrates the port index mapping for different Jetson platforms.

› NVIDIA® Jetson AGX Orin™ series:



- The ports of Cam, NVCSI, and capture-vi describe together where Linux will receive the data. The Dser setting is 4 lines and both are output from port A. The circuit diagram shows that they are connected to the CSI (A/B) and CSI (E/F) of the motherboard respectively, so the port-index is 0

文件編號		版本
生效日期	2026/1/29	
制定部門	System-SW	V2.10
文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數 60 of 64

and 4 respectively.

oToBrite Confidential

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	61 of 64
------	--	-----	----------

```
tegra-camera-platform {
    compatible = "nvidia, tegra-camera-platform";
    num_csi_lanes = <0x08>;
    max_lane_speed = <0x16E360>;
    min_bits_per_pixel = <0x0a>;
    vi_peak_byte_per_pixel = <0x02>;
    vi_bw_margin_pct = <0x19>;
    isp_peak_byte_per_pixel = <0x05>;
    isp_bw_margin_pct = <0x19>;
    tpg_max_iso = <0x3bc400>;
    phandle = <0x41>;

    modules {

        module0 {
            badge = "imx390_rear";
            position = "rear";
            orientation = "1";
            status = "okay";
            phandle = <0x42>;

            drivernode0 {
                pcl_id = "v4l2_sensor";
                sysfs-device-tree = "/sys/firmware/devicetree/base/bus@0/i2c@3180000/imx390@10";
                status = "okay";
                phandle = <0x43>;
            };

            drivernode1 {
                status = "disabled";
                pcl_id = "v4l2_lens";
                phandle = <0x44>;
            };
        };
    };
}
```

- When installing the driver, the main board will search for the camera data in the "sysfs-device-tree" to match.
- max\_lane\_speed will affect the output frequency of Dser.

p.s. 1. Driver rename (nv\_imx390.ko -> oToCAM.ko, max9296.ko -> oToSerDes.ko)

```
O:\nvidia\test\device_tree\vecow\device-tree_fix.dts
```

```
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272
273
274
275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291
```

```
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272
273
274
275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291
```

文件編號		版本
生效日期	2026/1/29	
制定部門	System-SW	V2.10

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	62 of 64
------	--	-----	----------

## 2. i2c mux: 2-channel i2c-mux(nxp,pca9543), 4-channel i2c-mux(nxp,pca9546)

```

fragment@10 {
    target-path = "/";
    _overlay__ {
        bus@0 {
            i2c@3180000 {
                tca9546@70 {
                    status = "okay";
                    compatible = "nxp,pca9546";
                    reg = <0x70>;
                    #address-cells = <0x01>;
                    #size-cells = <0x00>;
                    skip_mux_detect = "yes";
                i2c@0 {
                    reg = <0x00>;
                    i2c-mux,deselect-on-exit;
                    #address-cells = <0x01>;
                    #size-cells = <0x00>;
                    status = "okay";
                };
                max9296_a@48 {
                    status = "okay";
                    compatible = "maxim,max9296";
                    reg = <0x48>;
                    csi-mode = "2x4";
                    max-src = <0x02>;
                    reset-gpios = <0xffffffff 0x3b 0x00>;
                    fsync-gpio = <0x00>;
                    phandle = <0x01>;
                };
            };
        };
    };
};

fragment@10 {
    target-path = "/";
    _overlay__ {
        bus@0 {
            i2c@3180000 {
                max9296_a@48 {
                    status = "okay";
                    compatible = "maxim,max9296";
                    reg = <0x48>;
                    csi-mode = "2x4";
                    max-src = <0x04>;
                    reset-gpios = <0xffffffff 0x3b 0x00>;
                    fsync-gpio = <0x00>;
                    phandle = <0x01>;
                };
                max9295_a@40 {
                    status = "okay";
                    compatible = "maxim,max9295";
                    reg = <0x10>;
                    nvidia,gml1-dser-device = <0x01>;
                    phandle = <0x02>;
                };
                max9295_b@60 {
                    status = "okay";
                    compatible = "maxim,max9295";
                    reg = <0x10>;
                    nvidia,gml1-dser-device = <0x01>;
                    phandle = <0x04>;
                };
            };
        };
    };
};

```

Ser i2c remap addr:

文件編號		版本
生效日期	2026/1/29	V2.10
制定部門	System-SW	

文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數	63 of 64
------	--	-----	----------

```
max9295_a@40 {
    status = "okay";
    compatible = "maxim,max9295";
    reg = <0x18>;
    nvidia,gmsl-dser-device = <0x01>;
    phandle = <0x02>;
};

max9295_b@60 {
    status = "okay";
    compatible = "maxim,max9295";
    reg = <0x19>;
    nvidia,gmsl-dser-device = <0x01>;
    phandle = <0x04>;
};

max9295_c@40 {
    compatible = "maxim,max9295";
    reg = <0x1a>;
    nvidia,gmsl-dser-device = <0x01>;
    phandle = <0x06>;
};

max9295_d@60 {
    compatible = "maxim,max9295";
    reg = <0x1b>;
    nvidia,gmsl-dser-device = <0x01>;
    phandle = <0x08>;
};

max9295_e@40 {
    status = "okay";
    compatible = "maxim,max9295";
    reg = <0x1c>;
    nvidia,gmsl-dser-device = <0x16>;
    phandle = <0x17>;
};

max9295_f@60 {
    status = "okay";
    compatible = "maxim,max9295";
    reg = <0x1d>;
    nvidia,gmsl-dser-device = <0x16>;
    phandle = <0x19>;
};

max9295_g@40 {
    compatible = "maxim,max9295";
    reg = <0x1e>;
    nvidia,gmsl-dser-device = <0x16>;
    phandle = <0x1b>;
};

max9295_h@60 {
    compatible = "maxim,max9295";
    reg = <0x1f>;
    nvidia,gmsl-dser-device = <0x16>;
    phandle = <0x1d>;
};
```

文件編號		版本
生效日期	2026/1/29	
制定部門	System-SW	V2.10
文件名稱	oToCAM_nVidiaDriver_UserGuide-v2.10.docx	頁 數 64 of 64

oToBrite Confidential