

目录

MAX9296/MAX96712 6-Channel GMSL1/2 expansion card	3
Features	3
Structure [3D Rendering]	3
Images	4
Description	7
User Notes	7
Installation and Power On	8
Installation	8
Wiring	8
Power on	8
Test	8
Driver of GMSL Camera	9
Test Applications	9
注意事项	10
参考信息	10
问题排查 Q&A	10
1. 检测不到解串器	10
2. 检测不到串化器	10
3. 检测不到相机模组的 CMOS或EEPROM	11
3. 配置都正常，不出图	11

MAX9296/MAX96712 6-Channel GMSL1/2 expansion card

Features

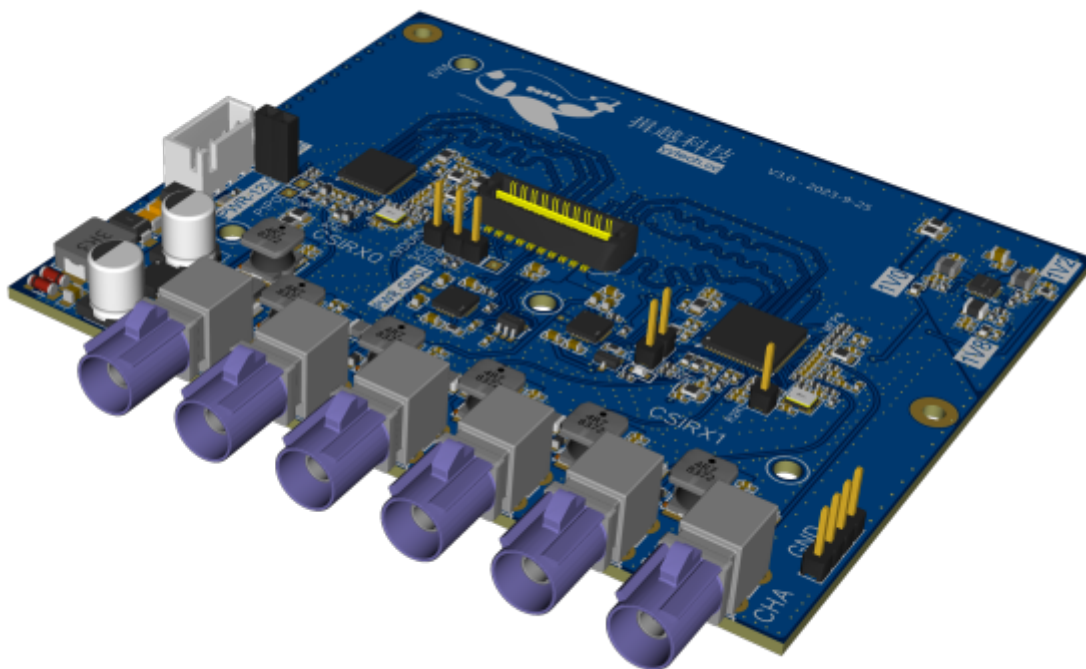
The expansion card is based [Dual-channel max9296 expansion card](#), capable of connecting 6 cameras:

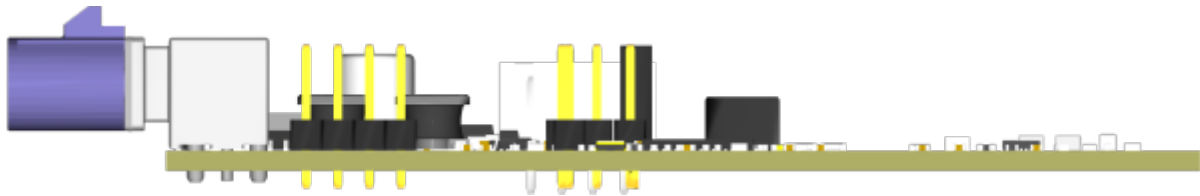
- Work with TI DEV boards□EVM and Starter-kit□SK□□
- MAX 6 cameras□Max9296: 2 cameras□ MAX96712:4 cameras□
- Use Max20087 to provide POC control, over voltage and current protection
- Reserve fsync input

Other

- Power supply: 12-16V
- GMSL camera (POC) 9.6- 10V
- GMSL link indication LED□

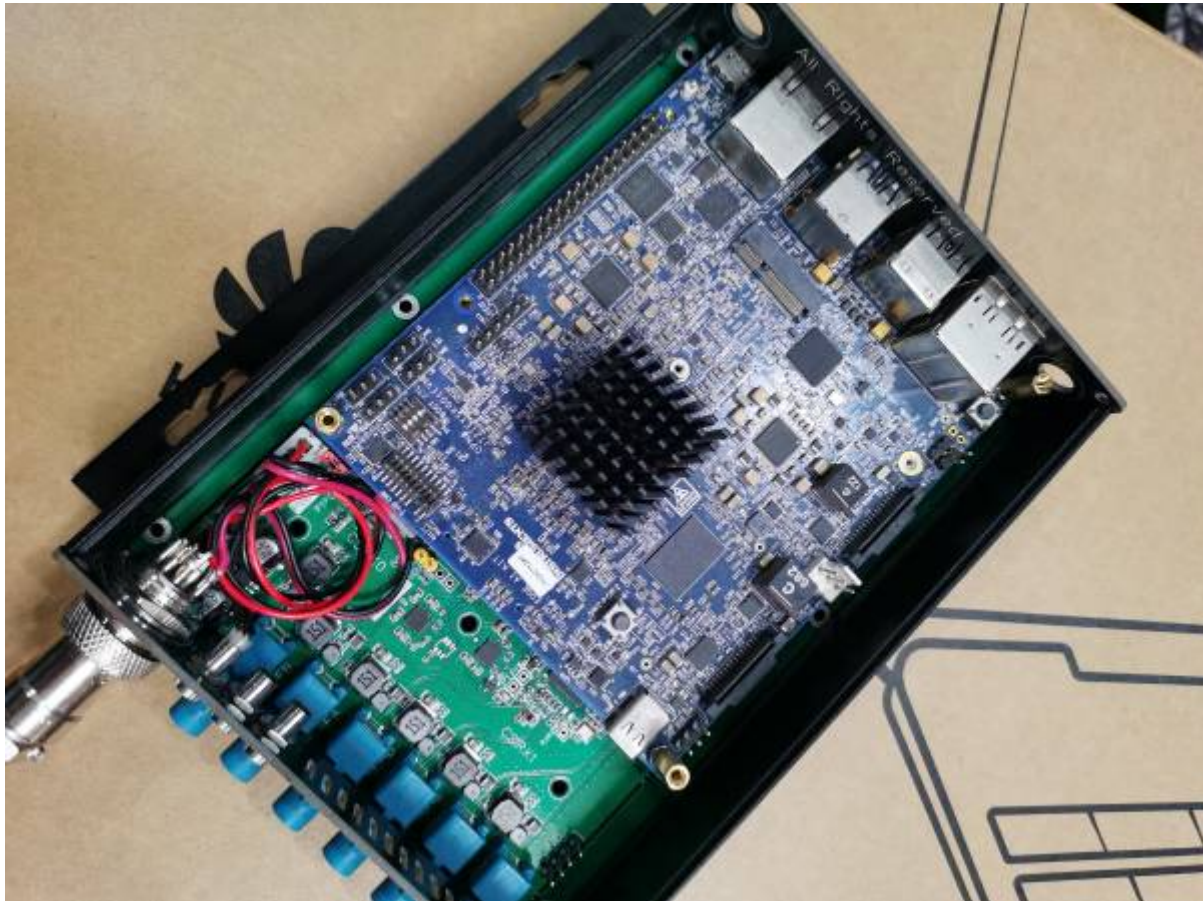
Structure [3D Rendering]

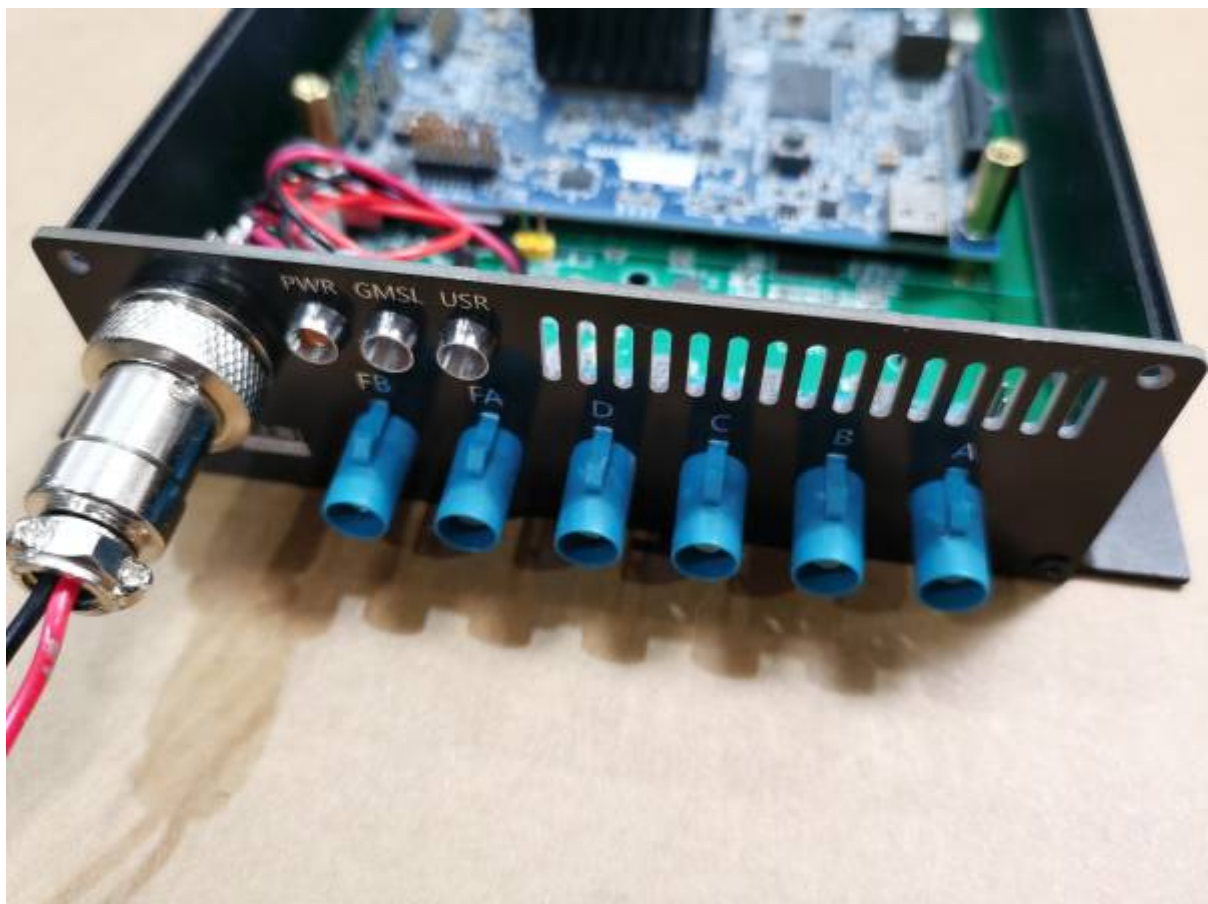




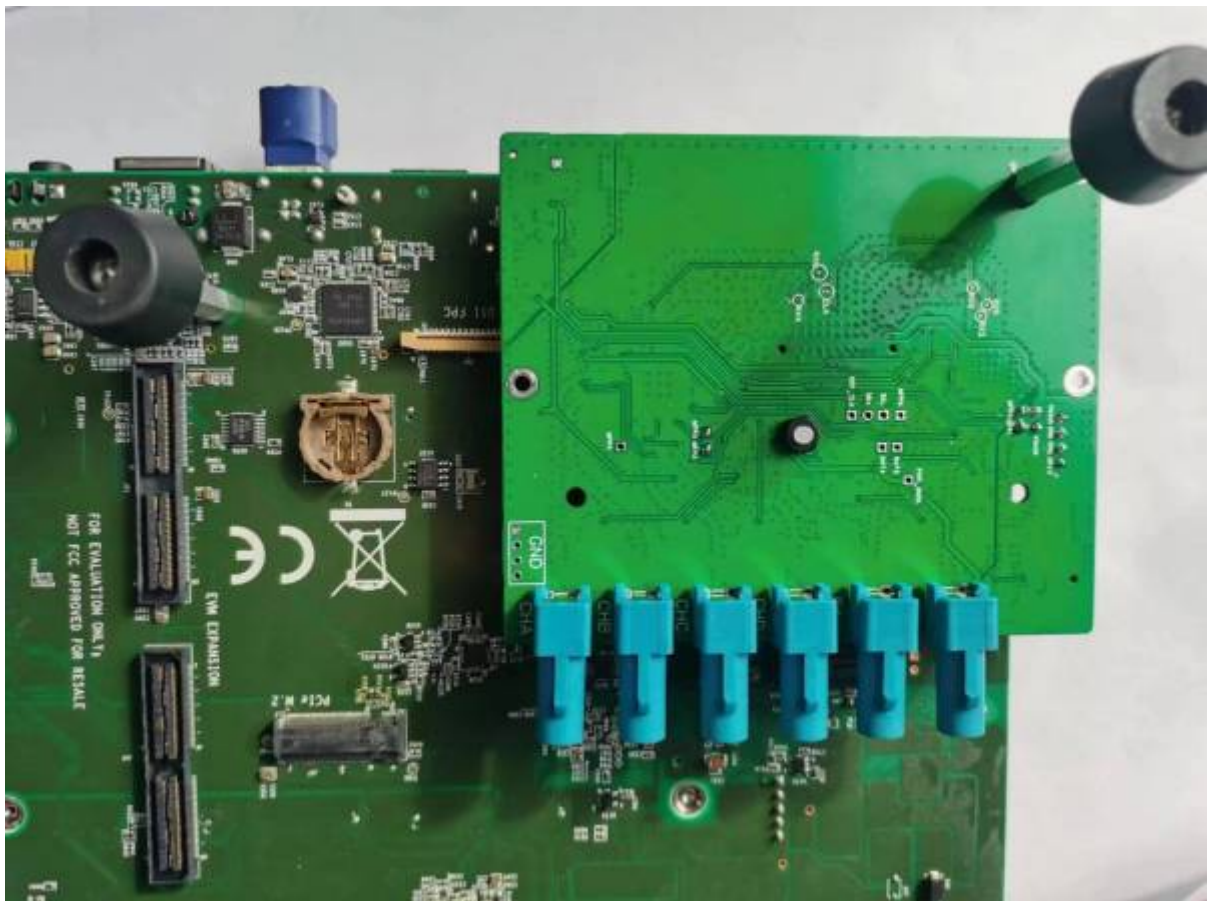
Images

□Expansion card with SK board, installed in case□



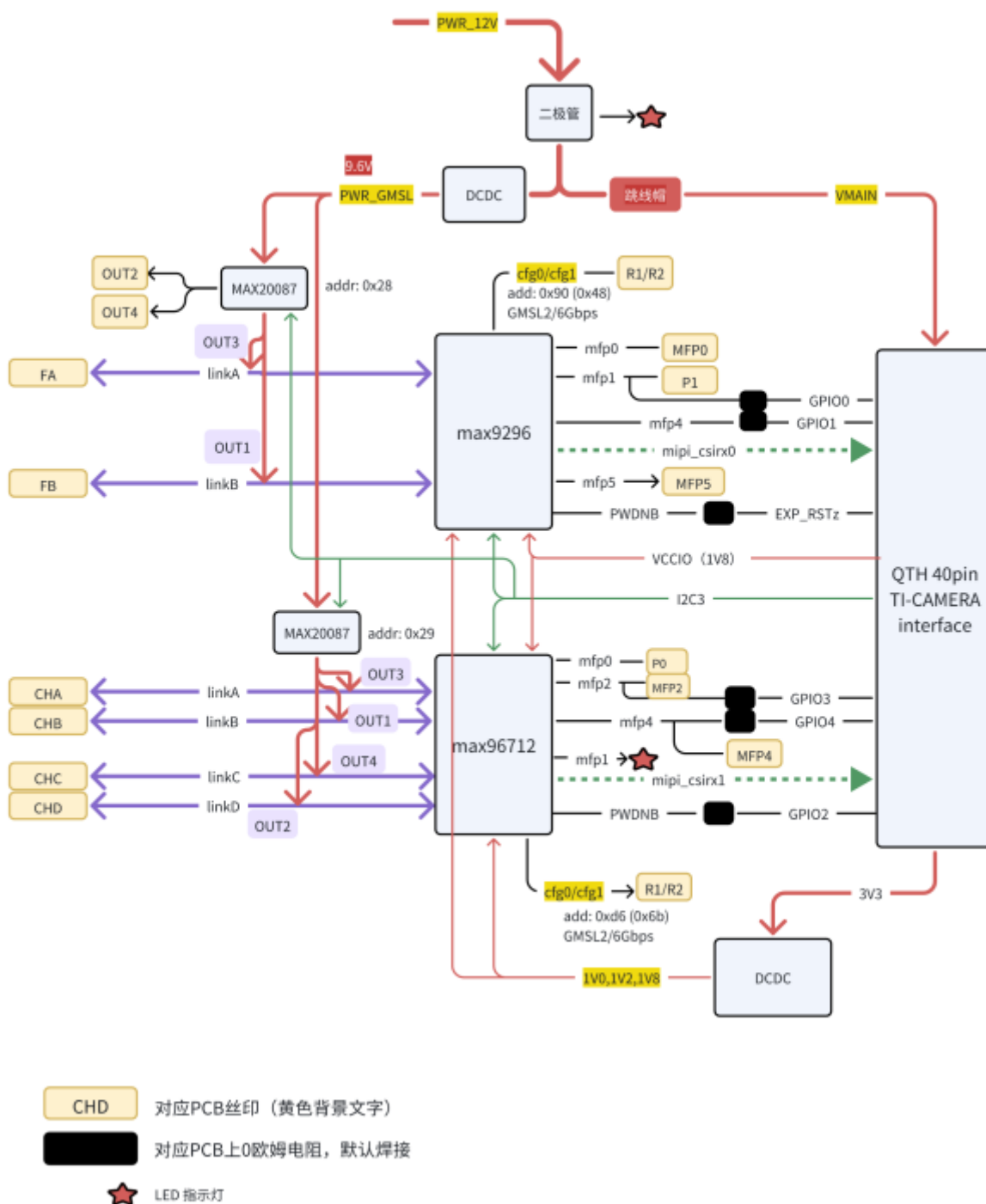


(Work with EVM)



Description

6通道GMSL1/2扩展板结构说明V1.0



User Notes

- Power supply (Recommend): 12-16V□ Maximum:20V, Minimum: 11V□
- GMSL POC voltage: 9.6V.
- Current limit setting resistor for max20087 is 82K□

Attention□external power and mainboard power can not be connected simutanously

Installation and Power On

Install the expansion card to EVM/SK board with screw and nuts we provided. The silk print test "evm", "sk" indicate which holes to use.

□Description based on SK board□

Installation

- The distance between mainboard and expansion board is 5mm. place use copper spacers we provide (5mm length, M2.5)
- Align QTH/QSH 40PIN B2B connector, press.
- Align fixing holes.
- Fasten screws.

Status of boards after installation, please refer:

dual9296_sk_stack_v5_1.png

Wiring

The expansion board can be power with two methods:

- Use mainboard TYPE-C port. □Use qualified power supply, QC standard, the output voltage should be 20V or 12V□
- Use external power supply port□4pin XH2.54 wire to board connect□
- Do not connect camera before you confirm the power supply is normal.

Whichever method you choose, you need to short VMAIN jumper.

Power on

Connect camera Fakra cable, turn power supply on□

Test

Connect 4 cameras to max96712(1080p30, YUV422):

```

App Run Graph Done!
Capture delete done!
VSS delete done!
AEB delete done!
LC delete done!
img Mosaic delete done!
Display delete done!
MCU2_0: 8406.812681 s: =====
MCU2_0: 8406.812778 s: Capture Status: Instance11
MCU2_0: 8406.812819 s: =====
MCU2_0: 8406.812866 s: overflowCount: 0
MCU2_0: 8406.812896 s: spuriousDeintrCount: 0
MCU2_0: 8406.812934 s: frontFIFOvflCount: 0
MCU2_0: 8406.812964 s: crcCount: 0
MCU2_0: 8406.813001 s: eccCount: 0
MCU2_0: 8406.813030 s: correctedEccCount: 0
MCU2_0: 8406.813061 s: dataIdErrorCount: 0
MCU2_0: 8406.813083 s: invalidAccessCount: 0
MCU2_0: 8406.813115 s: invalidSpCount: 0
MCU2_0: 8406.813150 s: strmfIFOvflCount[0]: 0
MCU2_0: 8406.813180 s: Channel Num | Frame Queue Count | Frame De-queue Count | Frame Drop Count | Error Frame Count |
MCU2_0: 8406.813224 s: 0 | 214538 | 214538 | 0 | 0 |
MCU2_0: 8406.813267 s: 1 | 214538 | 214538 | 0 | 0 |
MCU2_0: 8406.813358 s: 214538 | 214538 | 214538 | 0 | 0 |
MCU2_0: 8406.813470 s: 214538 | 214538 | 214538 | 0 | 0 |
Graph delete done!
App Delete Graph Done!
8406.825395 s: ISS: De-initializing sensor [S_IMX390_9296_96712] ... !!!
8406.825702 s: ISS: De-initializing sensor [S_IMX390_9296_96712] ... Done !!!
Sensor deinit done!
Capture deinit done!
8406.826061 s: VX_ZONE_ERROR:[ownReleaseReferenceInt:307] Invalid reference
8406.826071 s: VX_ZONE_ERROR:[ownReleaseReferenceInt:307] Invalid reference
LC deinit done!
img Mosaic deinit done!

```

Connect 2 camera to max9296 4 cameras to max96712 (6 in total)

```

LC delete done!
img Mosaic delete done!
MCU2_0: 4011.222337 s: =====
MCU2_0: 4011.222129 s: Capture Status: Instance0
MCU2_0: 4011.222119 s: =====
MCU2_0: 4011.222119 s: overflowCount: 0
MCU2_0: 4011.222256 s: spuriousDeintrCount: 0
MCU2_0: 4011.222300 s: frontFIFOvflCount: 0
MCU2_0: 4011.222370 s: crcCount: 0
MCU2_0: 4011.222406 s: eccCount: 0
MCU2_0: 4011.222444 s: correctedEccCount: 0
MCU2_0: 4011.222482 s: dataIdErrorCount: 0
MCU2_0: 4011.222523 s: invalidAccessCount: 0
MCU2_0: 4011.222563 s: invalidSpCount: 0
MCU2_0: 4011.222603 s: strmfIFOvflCount[0]: 0
MCU2_0: 4011.222675 s: Channel Num | Frame Queue Count | Frame De-queue Count | Frame Drop Count | Error Frame Count |
MCU2_0: 4011.222730 s: 0 | 897 | 897 | 4 | 0 |
MCU2_0: 4011.222761 s: =====
MCU2_0: 4011.222761 s: Capture Status: Instance11
MCU2_0: 4011.222761 s: =====
MCU2_0: 4011.222761 s: overflowCount: 0
MCU2_0: 4011.222761 s: spuriousDeintrCount: 0
MCU2_0: 4011.222761 s: frontFIFOvflCount: 0
MCU2_0: 4011.222761 s: crcCount: 0
MCU2_0: 4011.222761 s: eccCount: 0
MCU2_0: 4011.222761 s: correctedEccCount: 0
MCU2_0: 4011.222761 s: dataIdErrorCount: 0
MCU2_0: 4011.222761 s: invalidAccessCount: 0
MCU2_0: 4011.222761 s: invalidSpCount: 0
MCU2_0: 4011.222761 s: strmfIFOvflCount[0]: 0
MCU2_0: 4011.222761 s: Channel Num | Frame Queue Count | Frame De-queue Count | Frame Drop Count | Error Frame Count |
MCU2_0: 4011.222761 s: 0 | 897 | 897 | 0 | 0 |
MCU2_0: 4011.222761 s: 1 | 897 | 897 | 0 | 0 |
MCU2_0: 4011.222761 s: 897 | 897 | 897 | 0 | 0 |
MCU2_0: 4011.222761 s: 897 | 897 | 897 | 0 | 0 |
Graph delete done!
App Delete Graph Done!
4011.222804 s: ISS: De-initializing sensor [ALI-ISX081_96712_96717_6CHCHB-1] ... !!!
4011.222804 s: ISS: De-initializing sensor [ALI-ISX081_96712_96717_6CHCHB-1] ... Done !!!
Sensor deinit done!
Capture deinit done!
4011.293206 s: VX_ZONE_ERROR:[ownReleaseReferenceInt:307] Invalid reference
LC deinit done!
img Mosaic deinit done!

```

wechat_20231117181934.mp4

Driver of GMSL Camera

See document: [GMSL Camera driver: compile and update.](#)

Test Applications

Together with the hardware, we provide a list of test application/drivers

- camera driver
- application of preview camera video
- rtos application

Attention All applications provided are for test only

When running the application, please be noted

- MAX96712 use internal fsync will output fsync signal as a fsync master.

- The MAX9296 GPIO0/MFP0 receives fsync signal and send to camera.
- You will need to short MAX96712/MFP2 and MAX9296/MFP0, or will not be able to get video on HDMI display.

采购后，请与技术联系获取相关源代码。

注意事项

- 连接相机之前，请先确认相机的供电电压□GMSL电源最大负载能力为 2A/9.6V□
- 使用外接电源（通过4PIN端子）时，请注意电源的正负极。
- 推荐使用使用主板供电，即QTH/QSH端子的供电引脚
 - 对于TDA4VM starter kit, 使用标准笔记本Type-C供电时，电压为20V左右
 - 对于TDA4VM, TDA4VH 的 EVM □TI标准开发板），电压一般为 12V□
- 相机保护芯片MAX20087的电流设置电阻□PCB标注 RI□默认为82K□
- max9296/max96712的IO电压为QSH的VCCIO□可以通过主板拨码开关，或者GPIO控制，可以为1.8V或3.3V□外接同步触发脉冲时注意输入电平。
- 拆装扩展板时，注意不要侧向用力，以免损坏QTH/QSH连接器。
- 编程时，注意控制GPIO的输入/输出。 需要将GPIO设置为合适状态，使得MAX9296/MAX96712处于非reset状态。

参考信息

更多信息，请参考：

- [dual-max9296扩展卡](#)
- [摄像头驱动的编译与更新](#)

问题排查 Q&A

1. 检测不到解串器

- I2C是否畅通，可以用示波器检测波形确认。
- 解串器是否置于reset状态：检查reset/gpio的电平。
- 供电是否正常

2. 检测不到串化器

- 串化器供电是否正常
- 串化器与解串器的模式□GMSL1/GMSL2□,速率□3G/6Gbps□是否匹配。

3. 检测不到相机模组的CMOS或EEPROM

- 多数CMOS有reset/pwdn由串化器的gpio控制，需进行相应的配置，才能使得CMOS工作正常。

3. 配置都正常，不出图

- 确认解串器是否有输出，可用示波器测量mipi信号clk不容易测量，请测量csirx0-3
- 如设置同步，相机是否都已连接，同步是否正常配置。
- CMOS的 fsync (如有) 是否给定了合适的信号

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