AN13712

8MP ISP OS08A20传感器

第2版 — 2023年9月4日 **应用笔记**

文档信息

信息	内容
关键词	AN13712、8MP ISP OS08A20传感器、i.MX Yocto SDK
摘要	本文介绍了i.MX 8M Plus ISP上的OS08a20传感器。OS08A20传感器的图像尺寸为4K、2K、1080p和720p。

1 介绍

本文介绍i.MX 8M Plus ISP上的OS08a20传感器。OS08A20传感器的图像尺寸为4K、2K、1080p和720p。输出格式为12位/10位RAW RGB。该传感器具有2次曝光交错式HDR功能，并支持帧起始输入。i.MX 8M Plus ISP有一个用于原始数据的去马赛克传感器，并输出YUV格式。ISP还具有去噪、锐化和伽玛模块，可提高传感器图像质量。

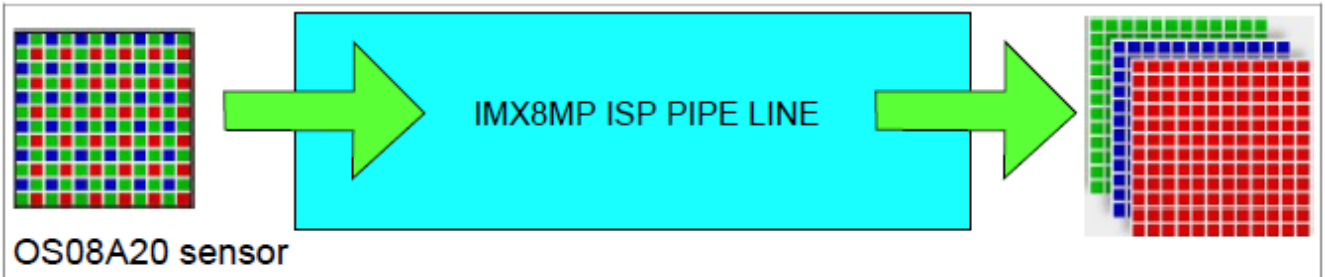

图1. OS08A20传感器

以下是OS08a20传感器的特点：

- 支持双Os08a20模块
- 支持3种ISP输出格式：
  - YUV422
  - NV16
  - NV12
- 支持4种传感器模式：
  - 1920x1080 10位线性模式
  - 1920x1080 10位HDR模式
  - 3820x2160 12位线性模式
  - 3820x2160 10位HDR模式

2 模块和电路板

本节介绍模块和电路板。

2.1 i.MX 8M Plus EVK

图2显示i.MX 8M Plus EVK板。

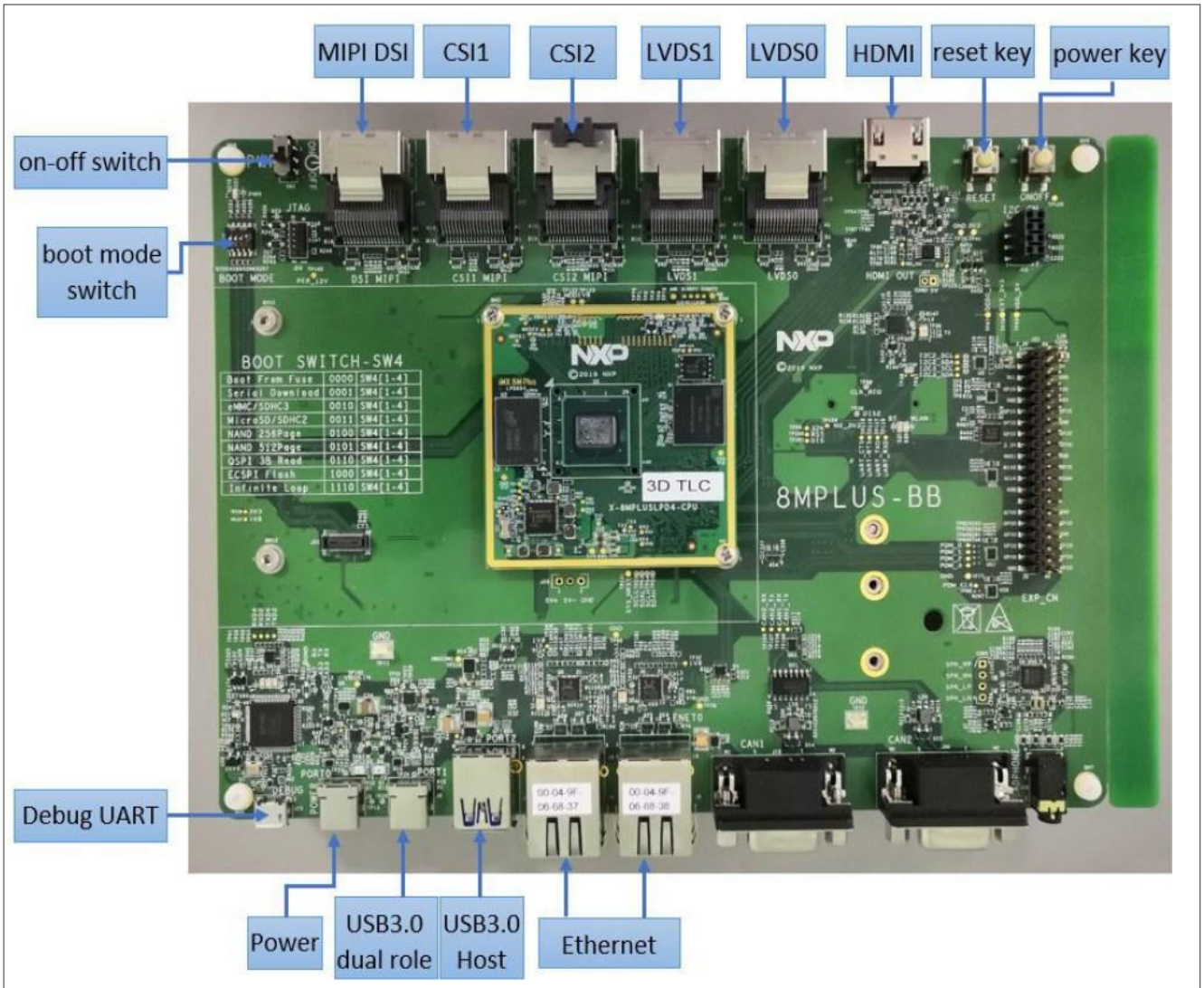

图2. i.MX 8M Plus EVK板

2.2 OS08A20传感器模块

图3显示了OS08A20传感器模块。

图3. OS08A20传感器模块

2.3 硬件连接

传感器连接到转接板，转接板使用MiniSas电缆连接CSI1或CSI2。

3 配置软件

本节介绍如何配置软件。

3.1 OS08A20 SDK HAL源代码

```
├── OS08a20
│   ├── calib
│   │   ├── OS08a20_8M_10_1080p_linear.xml
│   │   ├── OS08a20_8M_10_1080p_hdr.xml
│   │   ├── OS08a20_8M_10_4k_linear.xml
│   │   └── OS08a20_8M_10_4k_hdr.xml
│   ├── source
│   │   └── OS08a20.c
│   ├── dewarp
│   │   ├── sensor_dwe_os08a20_1080P_config.json
│   │   └── sensor_dwe_os08a20_4K_config.json
```

3.2 OS08A20内核驱动源码

OS08A20内核驱动源码如下:

```
├── os08a20
│   ├── os08a20_mipi_v3.c
│   ├── os08a20_regs_1080p.h
│   ├── os08a20_regs_1080p_hdr.h
│   ├── os08a20_regs_4k.h
│   └── os08a20_regs_4k_hdr.h
```

3.3 传感器模式表

表1列出了传感器模式。

表1. 传感器模式表

Mode模式	Index编号	数据格式
1080P_linear	0	RAW10
1080P_hdr0	1	RAW10
4K_linear	2	RAW12
4K_hdr	3	RAW10

“/opt/imx8-isp/bin/start_isp.sh”文件中有一个模式选择参数。

4 构建和测试

本节介绍构建和测试。

4.1 创建i.MX Yocto SDK并安装工具链

本节介绍如何创建i.MX Yocto SDK并安装工具链。

4.1.1 下载存储库（如有需要）

```
$ mkdir ~/bin (this step may not be needed if the bin folder already exists)
$ curl https://storage.googleapis.com/git-repo-downloads/repo > ~/bin/repo
$ chmod a+x ~/bin/repo
$ export PATH=~/bin:$PATH
```

4.1.2 设置Git（如有需要）

```
$ git config --global user.name "Your Name"
$ git config --global user.email "Your Email"
$ git config –list
```

4.1.3 创建Yocto构建环境

```
$ mkdir imx-yocto-bsp
$ cd imx-yocto-bsp
$ repo init -u https://github.com/nxp-imx/imx-manifest -b imx-linux-mickledore -
m imx-6.1.22-2.0.0.xml
$ repo sync
$ DISTRO=fsl-imx-xwayland MACHINE=imx8mp-lpddr4-evk source imx-setup-release.sh
 -b build
```

4.1.4 安装工具链

要安装工具链，请执行以下步骤：

1. 运行“build”文件夹中的“./tmp/deploy/sdk/fsl-imx-xwayland-glibc-x86_64-imx-image-full-armv8a-imx8mp-lpddr4-evk-toolchain-6.1-mickledore.sh”文件。
2. 工具链的默认目录是“/opt/fsl-imx-xwayland/6.1-mickledore”。如果将工具链安装在其他位置，请将后续会话中的默认路径替换为您自己的路径。

4.2 构建恩智浦内核

本节介绍如何构建恩智浦内核。

4.2.1 下载最新版本的恩智浦内核

```
$ git clone https://github.com/nxp-imx/linux-imx.git  -b lf-6.1.22-2.0.0
```

4.2.2 构建内核

```
$ source /opt/ 6.1-mickledore/environment-setup-armv8a-poky-linux
$ make mrproper
$ make ARCH=arm64 imx_v8_defconfig O=./build_v8
$ cd build_v8/
$ make ARCH=arm64 -j8
```

4.3 构建isp-imx

本节介绍如何构建isp-imx。

4.3.1 下载最新版本的isp-imx

```
$ wget https://www.nxp.com/lgfiles/NMG/MAD/YOCTO/isp-imx-4.2.2.22.0.bin
$ chmod +x isp-imx-4.2.2.22.0.bin
$ ./isp-imx-4.2.2.22.0.bin
```

在Yocto中，“isp-imx”位于“tmp/work/aarch64-mx8mp-poky-linux/isp-imx”。

4.3.2 构建SDK

```
$ source /opt/ 6.1-mickledore/environment-setup-armv8a-poky-linux
$ ./build-all-isp.sh release partial
```

4.4 构建isp-vvcam

本节介绍如何构建isp-vvcam。

4.4.1 下载最新版本的isp-vvcam

```
$ git clone https://github.com/nxp-imx/isp-vvcam.git -b lf-6.1.22-2.0.0
```

在Yocto中，“isp-vvcam”位于“build-wayland-8mp/tmp/work/imx8mpevk-poky-linux/kernel-module-isp-vvcam”。

4.4.2 构建vvcam

```
$ source /opt/ 6.1-mickledore/environment-setup-armv8a-poky-linux
$ export KERNEL_SOURCE_DIR = [the build path of the NXP kernel]
$ ./build-all-vvcam.sh
```

4.5 存储有用的文件

本节介绍如何存储有用文件。

4.5.1 将有用文件复制到输出目录

执行以下步骤将有用文件复制到输出目录：

1. 将内核文件复制到构建输出目录：

```
$ cp linux-imx/build_v8/arch/arm64/boot/dts/freescale/imx8mp-evk-*.dtb [your
 build-out directory]/boot
$ cp linux-imx/build_v8/arch/arm64/boot/Image [the build-out directory]/boot
$ cp linux-imx/build_v8/drivers/staging/media/imx/imx8-media-dev.ko [the
 build-out directory]/sdk
```

2. 将isp-imx文件复制到构建输出目录：

```
$ cp -r ./isp-imx-4.2.2.22.0/build_output_release_partial/blob/* [the build-
out directory]/sdk
```

3. 将isp-vvcam文件复制到构建输出目录：

```
$ cp ./isp-vvcam/modules/* [the build-out directory]/sdk
```

4.5.2 将文件发送到电路板

```
$ scp -r [the build out directory]/sdk/* root@$EVK_IP_Address:/home/root/[your
 test directory in root]
$ scp [the build out directory]/boot/* root@$EVK_IP_Address:/run/media/boot-
mmcblk1p1/
```

输出目录应包含以下文件：

图4. 输出目录

4.6 选择设备树

要选择设备树，请执行以下步骤：

1. "imx8mp-evk-os08a20.dtb" - #单个os08a20，连接到CSI1
2. "imx8mp-evk-dual-os08a20.dtb" - #双OS08a20，连接到CSI1和CSI2
3. "imx8mp-evk-os08a20-ov5640.dtb" - #ov5640和os08a20 (os08a20 -> CSI1, ov5640 -> CSI2)

4.7 编辑传感器配置文件并选择正确的模式

Sensor0_Entry.cfg（示例）：

```
name="os08a20" drv = "os08a20.drv"
mode= 2
[mode.0]
xml = "OS08a20_8M_10_1080p_linear.xml"
dwe = "dewarp_config/sensor_dwe_os08a20_1080P_config.json"
[mode.1]
xml = "OS08a20_8M_10_1080p_hdr.xml"
dwe = "dewarp_config/sensor_dwe_os08a20_1080P_config.json"
[mode.2]
xml = " OS08a20_8M_10_4k_linear.xml"
dwe = "dewarp_config/sensor_dwe_os08a20_4K_config.json"
[mode.3]
xml = " OS08a20_8M_10_4k_hdr.xml"
dwe = "dewarp_config/sensor_dwe_os08a20_4K_config.json""
```

4.8 启用电路板上的ISP和摄像头

本节介绍如何启用电路板上的ISP和摄像头。

4.8.1 添加到路径

```
$ export LD_LIBRARY_PATH=$pwd:$LD_LIBRARY_PATH
```

4.8.2 停止默认ISP

```
$ systemctl stop imx8-isp.service
```

4.8.3 删除现有模块

```
$ rmmod vvcam-dwe
$ rmmod vvcam-isp
$ rmmod vvcam-video
$ rmmod imx8-media-dev.ko
$ rmmod os08a20.ko
```

4.8.4 安装模块

```
$ insmod vvcam-dwe
$ insmod vvcam-isp
$ insmod vvcam-video
$ insmod imx8-media-dev.ko
$ insmod os08a20.ko
```

4.8.5 启动ISP媒体服务器

单传感器：

```
$ ./isp_media_server CAMERA0&
```

双传感器：

```
$ ./isp_media_server DUAL_CAMERA&
```

4.9 OS08A20测试用例

模式0：1080p线性：

- 将“Sensor0_Entry.cfg”更改为模式0：

```
$ gst-launch-1.0 -v v4l2src device=/dev/video2 ! "video/x-
raw,format=YUY2,width=1920,height=1080" ! queue ! waylandsink
```

模式1：1080p HDR：

- 将“Sensor0_Entry.cfg”更改为模式1：

```
$ gst-launch-1.0 -v v4l2src device=/dev/video2 ! "video/x-
raw,format=YUY2,width=1920,height=1080" ! queue ! waylandsink
```

模式2：4K线性：

- 将“Sensor0_Entry.cfg”更改为模式2：

```
$ gst-launch-1.0 -v v4l2src device=/dev/video2 ! "video/x-
raw,format=YUY2,width=3820,height=2160" ! queue ! waylandsink
```

模式3：4K线性：

- 将“Sensor0_Entry.cfg”更改为模式3：

```
$ gst-launch-1.0 -v v4l2src device=/dev/video2 ! "video/x-
raw,format=YUY2,width=3820,height=2160" ! queue ! waylandsink
```

4.10 禁用或绕过dewarp功能

如果要绕过dewarp配置，可以将dewarp配置文件中的“dewarp bypass”参数设置为true。

```
{
        "dewarpConfigArray" :[
                {
                        "source_image":{
                                "width"  : 1920,
                                "height" : 1080
                        },

                        "?dewarpType": "LENS_CORRECTION, FISHEYE_EXPAND, SPLIT_SCREEN",
                        "dewarpType": "FISHEYE_DEWARP",

                        "scale": {
                                "roix"   : 0,
                                "roiy"   : 0,
                                "factor" : 1.0
                        },

                        "split": {
                                "horizon_line"      : 540,
                                "vertical_line_up"  : 960,
                                "vertical_line_down": 960
                        },

                        "bypass" : true,
                        "hflip"  : false,
                        "vflip"  : false,

                        "camera_matrix"   : [1.9584556270377586e+003,0.0, 9.6819933899253533e+00
                        "distortion_coeff": [-1.2839656060464022e-001, 1.4121087523973114e-001,
```

图5. 禁用或绕过dewarp功能

如果要禁用dewarp功能，在启动“isp_media_server”后，你可以运行以下命令，然后再运行“gstream”命令：

```
$ v4l2-ctl -d 2 -c viv_ext_ctrl='{<id>:<pipeline.s.dwe.onoff>;<enable>:false}'
```

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6 修订历史

表2总结了对本文所做的修订。

表2. 修订历史

版本号	发布日期	说明
第2版	2023年9月4日	更新Linux内核6.1.22版本。
第1版	2022年11月29日	更新了第1章。
第0版	2022年8月24日	初版发布。

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