GPIO??

GPIO GPIO General-purpose input/output
GPI GPO GPIO

Jetson Orin Nano□□□　40PIN GPIO□□□□□□

Sysfs GPIO	Name	Pin	Pin	Name	Sysfs GPI
	3.3 VDC *Power*	1	2	**5.0 VDC** *Power*	
	I2C1_SDA *I2C Bus 7*	3	4	**5.0 VDC** *Power*	
	I2C1_SCL *I2C Bus 7*	5	6	**GND**	
144 gpio492	**GPIO9** *AUDIO_MCLK*	7	8	**UART1_TX** */dev/ttyTHS0*	
	GND	9	10	**UART1_RX** */dev/ttyTHS0*	
112 gpio460	**UART1_RTS**	11	12	**I2S0_SCLK**	*50* gpio398
122 gpio470	**SPI1_SCK**	13	14	**GND**	
85 gpio433	**GPIO12** *Alt: PWM*	15	16	**SPI1_CS1**	*126* gpio474
	3.3 VDC *Power*	17	18	**SPI1_CS0**	*125* gpio473
135 gpio483	**SPI0_MOSI**	19	20	**GND**	
134 gpio482	**SPI0_MISO**	21	22	**SPI1_MISO**	*123* gpio471
133 gpio481	**SPI0_SCK**	23	24	**SPI0_CS0**	*136* gpio484
	GND	25	26	**SPI0_CS1**	*137* gpio485

1 ?JetPack 5?????GPIO

1.1 ???????GPIO

??GPIO?????????

以 31号引脚为例， 454为 GPIO口编号， PQ.06为引脚名称

- 提升至 root权限，启用 GPIO□

```
sudo bash


echo 454 > /sys/class/gpio/export
```

- 设置 GPIO为输入模式

```
echo in > /sys/class/gpio/PQ.06/direction
```

- 获取 GPIO当前状态，返回值 1为高电平， 0为低电平

```
cat /sys/class/gpio/PQ.06/value
```

- 设置 GPIO为输出模式

```
echo out > /sys/class/gpio/PQ.06/direction
```

- 设置 GPIO输出， 1为高电平， 0为低电平

```
echo 1 > /sys/class/gpio/PQ.06/value
```

您也可以使用以下脚本进行测试

```
#!/bin/bash
trap 'echo PQ.06 > /sys/class/gpio/unexport; echo "GPIO PQ.06 is released"' EXIT

echo "setting GPIO PQ.06"
echo PQ.06 > /sys/class/gpio/export 2>/dev/null

# set Pin output mode
echo out > /sys/class/gpio/PQ.06/direction
```

```
# blink
while true
do
    echo 0 > /sys/class/gpio/PQ.06/value
    sleep 0.5
    cat /sys/class/gpio/PQ.06/value
    sleep 0.5
    echo 1 > /sys/class/gpio/PQ.06/value
    sleep 0.5
    cat /sys/class/gpio/PQ.06/value
    sleep 0.5
done
```

1.2 ??python??GPIO

1.2.1 ??JETSON.GPIO?

- 如果您不确定您的环境是否正常，或者您尝试使用 **conda**环境运行脚本请执行以下指令安装 Jetson 官方的 GPIO库

```
pip install JETSON.GPIO
```

Jetson GPIO库提供了四种给 I / O引脚编号的方法。

- **BOARD**: 物理引脚编号（ 40针接口顺序）。
- **BCM**: Broadcom SoC 的 GPIO 编号（ 常用）。
- **CVM**: CVM/CVB 连接器的信号名称。
- **TEGRA_SOC**: Tegra SoC 信号名称。

```
import time
import RPi.GPIO as GPIO

# define pin number
output_pin = 31

# set pin as BOARD mode
GPIO.setmode(GPIO.BOARD)

# set pin mode
GPIO.setup(output_pin, GPIO.OUT)

print("Press CTRL+C to exit")
```

```
curr_value = GPIO.HIGH
try:
    while True:
        time.sleep(1)
        print("pin {} now is {}".format(output_pin, curr_value))
        GPIO.output(output_pin, curr_value)
        # blink
        curr_value ^= GPIO.HIGH
finally:
    GPIO.cleanup()
```

其他具体用法和例程可参考 项目官网_____

1.3??C/C++??GPIO

- 安装 libgpio-dev

```
sudo apt install libgpio-dev
```

参考例程:

```
/**
 * License - MIT.
*/
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <gpiod.h>

#define GPIO_CHIP       "/dev/gpiochip0"
#define GPIO_LED        3

int main()
{
    int ret = 0;
    struct gpiod_chip *gpiochip;
    struct gpiod_line *gpioline;

    // Open driver.
    gpiochip = gpiod_chip_open(GPIO_CHIP);
```

```
    if (NULL == gpiochip) {
        printf("Error in gpiod_chip_open.\n");
        ret = -1;
        goto out1;
    }

    // Get gpio.
    gpioline = gpiod_chip_get_line(gpiochip, GPIO_LED);

    if (NULL == gpioline) {
        printf("Error in gpiod_chip_get_line.\n");
        ret = -1;
        goto out2;
    }

    // Set gpio direction.
    ret = gpiod_line_request_output(gpioline, "gpio", 0);

    if (ret != 0) {
        printf("Error in gpiod_line_request_output.\n");
        ret = -1;
        goto out2;
    }

    // Blink.
    for (int i = 0; i < 10; i++) {
        printf("%d times.\n", i);

        gpiod_line_set_value(gpioline, 1);
        sleep(1);

        gpiod_line_set_value(gpioline, 0);
        sleep(1);
    }

    // Release.
    gpiod_line_release(gpioline);

out2:
    gpiod_chip_close(gpiochip);
```

```
out1:
    return ret;
}
```

- 编译源文件

```
g++ test_gpio.cc -o test_gpio -lgpiod
```

- 执行测试程序

```
./test_gpio
```

2 ?JetPack 6?????GPIO

2.1??libgpiod??GPIO

在 **JetPack 6.2/r36.4.3** 中， NVIDIA已经移除了传统的 sysfs GPIO 接口（ /sys/class/gpio）不建议再使用 sysfs 来控制 GPIO。推荐使用 Linux统一的 **libgpiod** 管理 GPIO

- 安装前置软件包

```
sudo apt-get install busybox automake autoconf libtool
```

- 验证安装是否成功

```
jetson@jetson-desktop:~$ gpioinfo
gpiochip0 - 164 lines:
□line   0:      "PA.00" "regulator-vdd-3v3-sd" output active-high [used]
□line   1:      "PA.01"       unused   input  active-high
□line   2:      "PA.02"       unused   input  active-high
□line   3:      "PA.03"       unused   input  active-high
□line   4:      "PA.04"       unused   input  active-high
□line   5:      "PA.05"       unused   input  active-high
□line   6:      "PA.06"       unused   input  active-high
□line   7:      "PA.07"       unused   input  active-high
□line   8:      "PB.00"       unused   input  active-high
□line   9:      "PC.00"       unused   input  active-high
...........
```

- 读取 GPIO 状态

```
gpioget $(gpiofind "PQ.06")
```

- 将 GPIO 设置为输出模式

```
sudo busybox devmem 0x2430070 w 0x004
```

各个引脚对应的寄存器地址从官方文档中可以查询到

- 保持高电平：

```
gpioset --mode=wait `gpiofind "PQ.06"`=1
```

- 保持低电平：

```
gpioset --mode=wait `gpiofind "PQ.06"`=0
```

2.2 ??python??GPIO

> 在 JetPack6 系统中仍需要修改寄存器内容来更改引脚 GPIO模式以使用高级语言控制 GPIO

- 将 PQ.06 引脚设置为输出模式

```
sudo busybox devmem 0x2430070 w 0x004
```

- 如果您尝试使用 conda 环境运行脚本请执行以下指令安装 Jetson 官方的 GPIO 库

```
pip install JETSON.GPIO
```

- 建议执行以下指令，重新安装系统自带的 JETSON.GPIO 库

```
sudo rm -rf /usr/lib/python3*/dist-packages/Jetson
sudo rm -rf /usr/local/lib/python3*/dist-packages/Jetson
git clone https://github.com/NVIDIA/jetson-gpio.git
cd jetson-gpio
sudo pip3 install .
```

Jetson GPIO 库提供了四种给 I / O引脚编号的方法。

- **BOARD**：物理引脚编号（40针接口顺序）。
- **BCM**：Broadcom SoC 的 GPIO 编号（常用）。

- **CVM**: CVM/CVB 连接器的信号名称。
- **TEGRA_SOC**: Tegra SoC 信号名称。

```
import time
import RPi.GPIO as GPIO

# define pin number PQ.06
output_pin = 31

# set pin as BOARD mode
GPIO.setmode(GPIO.BOARD)

# set pin mode
GPIO.setup(output_pin, GPIO.OUT)

print("Press CTRL+C to exit")
curr_value = GPIO.HIGH
try:
    while True:
        time.sleep(1)
        print("pin {} now is {}".format(output_pin, curr_value))
        GPIO.output(output_pin, curr_value)
        # blink
        curr_value ^= GPIO.HIGH
finally:
    GPIO.cleanup()
```

其他具体用法和例程可参考 项目官网_____

2.3??C/C++??GPIO

> 在 JetPack6 系统中仍需要修改寄存器内容来更改引脚 GPIO模式以使用高级语言控制 GPIO

- 将 PQ.06 引脚设置为输出模式

```
sudo busybox devmem 0x2430070 w 0x004
```

- 安装 libgpio-dev

```
sudo apt install libgpiod-dev
```

□□□□□

```
/**
 * License - MIT.
*/
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <gpiod.h>

#define GPIO_CHIP       "/dev/gpiochip0"
#define GPIO_LED        106

int main()
{
    int ret = 0;
    struct gpiod_chip *gpiochip;
    struct gpiod_line *gpioline;

    // Open driver.
    gpiochip = gpiod_chip_open(GPIO_CHIP);

    if (NULL == gpiochip) {
        printf("Error in gpiod_chip_open.\n");
        ret = -1;
        goto out1;
    }

    // Get gpio.
    gpioline = gpiod_chip_get_line(gpiochip, GPIO_LED);

    if (NULL == gpioline) {
        printf("Error in gpiod_chip_get_line.\n");
        ret = -1;
        goto out2;
    }

    // Set gpio direction.
    ret = gpiod_line_request_output(gpioline, "gpio", 0);
```

```
    if (ret != 0) {
        printf("Error in gpiod_line_request_output.\n");
        ret = -1;
        goto out2;
    }

    // Blink PQ.06
    for (int i = 0; i < 30; i++) {
        printf("%d times.\n", i);

        gpiod_line_set_value(gpioline, 1);
        sleep(1);

        gpiod_line_set_value(gpioline, 0);
        sleep(1);
    }

    // Release.
    gpiod_line_release(gpioline);

out2:
    gpiod_chip_close(gpiochip);

out1:
    return ret;
}
```

- 编译源文件

```
g++ test_gpio.cc -o test_gpio -lgpiod
```

- 执行测试程序

```
./test_gpio
```

PADCTL????GPIO????

> 我们从官方文档中查找摘取了以下信息供您参考，您也可以自行查阅官方文档。
>
> Pinmux和 TRM

PADCTL_A0(PADCTL_G3) 0x02430000
PADCTL_A4(PADCTL_G4) 0x02434000
PADCTL_A16(PADCTL_EDP) 0x02440000
PADCTL_A24(PADCTL_G7) 0x02448000

7□ GPIO09 PADCTL_G7_SOC_GPIO59_0 0x30 gpio-492 PAC.06 0x02448030
15□ GPIO12 PADCTL_EDP_SOC_GPIO39_0 0x20 gpio-433 PN.01 0x02440020
29□ GPIO01 PADCTL_G3_SOC_GPIO32_0 0x68 gpio-453 PQ.05 0x02430068
31□ GPIO11 PADCTL_G3_SOC_GPIO33_0 0x70 gpio-454 PQ.06 0x02430070
32□ GPIO07 PADCTL_G4_SOC_GPIO19_0 0x80 gpio-389 PG.06 0x02434080
33□ GPIO13 PADCTL_G4_SOC_GPIO21_0 0x40 gpio-391 PH.00 0x02434040

3 ???GPIO??

□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□ Pinmux□□□□□□

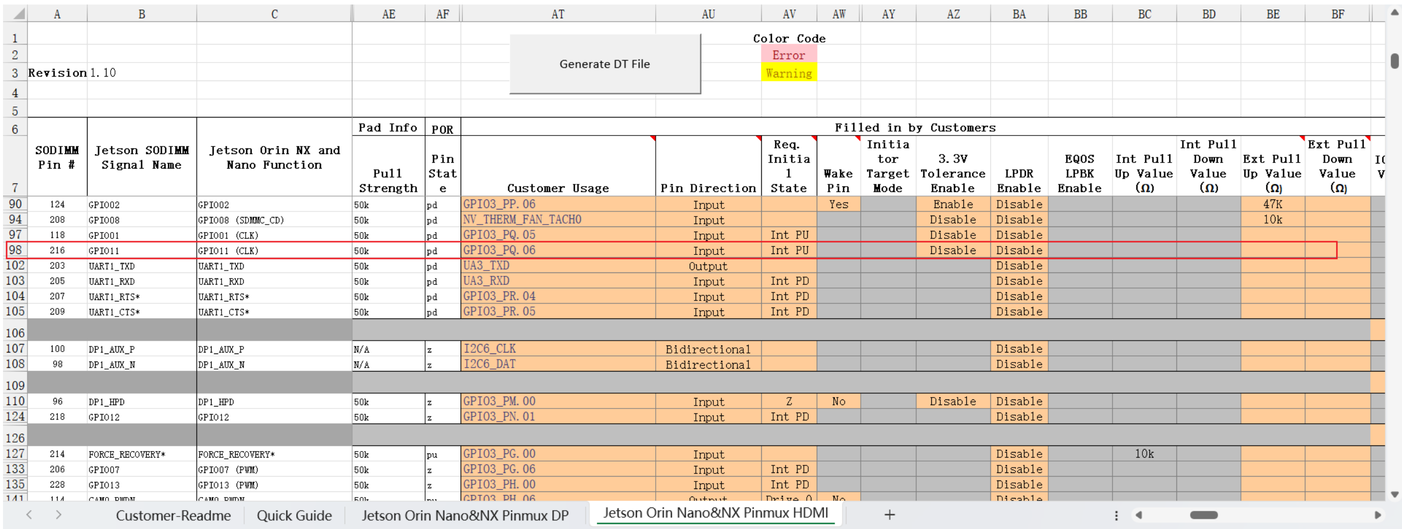
3.1 ??Pinmux???????

□□□ Jetson Download Center □□ `Jetson Orin NX Series and Jetson Orin Nano Series Pinmux`

□□□□□□□□ □□□ □□

3.2 ??Pinmux???????????

□ GPIO11(PQ.06)□□□□□□□□□□□□□□□□□□□□□□□□



Row	A: SODIMM Pin #	B: Jetson SODIMM Signal Name	C: Jetson Orin NX and Nano Function	AE: Pad Info – Pull Strength	AF: POR – Pin State	AT: Customer Usage	AU: Pin Direction	AV: Req. Initial State	AW: Wake Pin	AY: Initiator Target Mode	AZ: 3.3V Tolerance Enable	BA: LPDR Enable	BB: EQOS LPBK Enable	BC: Int Pull Up Value (Ω)	BD: Int Pull Down Value (Ω)	BE: Ext Pull Up Value (Ω)	BF: Ext Pull Down Value (Ω)
3	Revision	1.10															
90	124	GPIO02	GPIO02	50k	pd	GPIO3_PP.06	Input		Yes		Enable	Disable				47K	
94	208	GPIO08	GPIO08 (SDMMC_CD)	50k	pd	NV_THERM_FAN_TACHO	Input				Disable	Disable				10k	
97	118	GPIO01	GPIO01 (CLK)	50k	pd	GPIO3_PQ.05	Input	Int PU			Disable	Disable					
98	216	GPIO11	GPIO11 (CLK)	50k	pd	GPIO3_PQ.06	Input	Int PU			Disable	Disable					
102	203	UART1_TXD	UART1_TXD	50k	pd	UA3_TXD	Output					Disable					
103	205	UART1_RXD	UART1_RXD	50k	pd	UA3_RXD	Input	Int PD				Disable					
104	207	UART1_RTS*	UART1_RTS*	50k	pd	GPIO3_PR.04	Input	Int PD				Disable					
105	209	UART1_CTS*	UART1_CTS*	50k	pd	GPIO3_PR.05	Input	Int PD				Disable					
106																	
107	100	DP1_AUX_P	DP1_AUX_P	N/A	z	I2C6_CLK	Bidirectional					Disable					
108	98	DP1_AUX_N	DP1_AUX_N	N/A	z	I2C6_DAT	Bidirectional					Disable					
109																	
110	96	DP1_HPD	DP1_HPD	50k	z	GPIO3_PM.00	Input	Z	No		Disable	Disable					
124	218	GPIO12	GPIO12	50k	z	GPIO3_PN.01	Input	Int PD				Disable					
126																	
127	214	FORCE_RECOVERY*	FORCE_RECOVERY*	50k	pu	GPIO3_PG.00	Input					Disable		10k			
133	206	GPIO07	GPIO07 (PWM)	50k	z	GPIO3_PG.06	Input	Int PD				Disable					
135	228	GPIO13	GPIO13 (PWM)	50k	z	GPIO3_PH.00	Input	Int PD				Disable					

□□□□

Revision 1.10

Generate DT File

Color Code: Error / Warning

Row	SODIMM Pin #	Jetson SODIMM Signal Name	Jetson Orin NX and Nano Function	Pad Info: Pull Strength	POR: Pin State	Customer Usage	Pin Direction	Req. Initial State	Wake Pin	Initiator Target Mode	3.3V Tolerance Enable	LPDR Enable	EQOS LPBK Enable	Int Pull Up Value (Ω)	Int Pull Down Value (Ω)	Ext Pull Up Value (Ω)	Ext Pull Down Value (Ω)
90	124	GPIO02	GPIO02	50k	pd	GPIO3_PP.06	Input		Yes		Enable	Disable				47K	
94	208	GPIO08	GPIO08 (SDMMC_CD)	50k	pd	NV_THERM_FAN_TACHO	Input				Disable	Disable				10k	
97	118	GPIO01	GPIO01 (CLK)	50k	pd	GPIO3_PQ.05	Input	Int PU			Disable	Disable					
98	216	GPIO11	GPIO11 (CLK)	50k	pd	GPIO3_PQ.06	Output	Drive 1			Disable	Disable					
102	203	UART1_TXD	UART1_TXD	50k	pd	UA3_TXD	Output					Disable					
103	205	UART1_RXD	UART1_RXD	50k	pd	UA3_RXD	Input	Int PD				Disable					
104	207	UART1_RTS*	UART1_RTS*	50k	pd	GPIO3_PR.04	Input	Int PD				Disable					
105	209	UART1_CTS*	UART1_CTS*	50k	pd	GPIO3_PR.05	Input	Int PD				Disable					
106																	
107	100	DP1_AUX_P	DP1_AUX_P	N/A	z	I2C6_CLK	Bidirectional					Disable					
108	98	DP1_AUX_N	DP1_AUX_N	N/A	z	I2C6_DAT	Bidirectional					Disable					
109																	
110	96	DP1_HPD	DP1_HPD	50k	z	GPIO3_PM.00	Input	Z	No		Disable	Disable					
124	218	GPIO12	GPIO12	50k	z	GPIO3_PN.01	Input	Int PD				Disable					
126																	
127	214	FORCE_RECOVERY*	FORCE_RECOVERY*	50k	pu	GPIO3_PG.00	Input					Disable		10k			
133	206	GPIO07	GPIO07 (PWM)	50k	z	GPIO3_PG.06	Input	Int PD				Disable					
135	228	GPIO13	GPIO13 (PWM)	50k	z	GPIO3_PH.00	Input	Int PD				Disable					
141	114	CAM0_PWDN	CAM0_PWDN	50k	pu	GPIO3_PH.06	Output	Drive 0	No			Disable					

Customer-Readme | Quick Guide | Jetson Orin Nano&NX Pinmux DP | Jetson Orin Nano&NX Pinmux HDMI

□□□□□□□ Generate DT File□ excel

□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

3.3 ???????

□□□□ `Orin-jetson orin nano&nx pinmux hdmi-padvoltage-default.dtsi` □□□□□□□□□□

`tegra234-mb1-bct-pinmux-p3767-dp-a03.dtsi`

`tegra234-mb1-bct-pinmux-p3767-hdmi-a03.dts`

□ `Orin-jetson orin nano&nx pinmux hdmi-pinmux.dtsi` □□□□□□□□□□

`tegra234-mb1-bct-padvoltage-p3767-hdmi-a03.dtsi`

`tegra234-mb1-bct-padvoltage-p3767-pd-a03.dtsi`

□□□□ `Orin-jetson orin nano&nx pinmux hdmi-gpio-default.dtsi` □□□□□□□□ `./Linux_for_Tegra/bootloader/t186ref/BCT` □□□

3.4 ????Pinmux??????

□□□□□□□□□□□□□□□□□□□□ pinmux

```
sudo ./flash.sh -c bootloader/t186ref/cfg/flash_t234_qspi.xml --no-systemimg -k A_MB1_BCT
jetson-orin-nano-devkit nvme0n1p1
```

□□□□□□ 31□□□□□□□□□□□□□□□□□

```
gpioget $(gpiofind "PQ.06")
```

---

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