

# How to add more SPI slave devices with SS and IRQ

This wiki describes how to use more SS(Chip-select) and IRQ pins for more SPI slave devices.

If you want to add slave devices you should consider which pins to use as SS(Chip-select) or IRQ pins. You can choose any GPIO on external 40pin except you're using. You should check the available pins and then edit the device tree blob file.

## SS(Chip-Select)

First of all, you can check whether GPIO is in use or not with “cat /sys/kernel/debug/gpio” command.

```
root@odroid:~# cat /sys/kernel/debug/gpio
GPIOs 0-138:
gpio-3   (amlsd           ) out lo
gpio-5   (DWC_OTG            ) in  lo
gpio-13  (blue:heartbeat     ) out hi
gpio-49  (amlsd             ) in  hi
root@odroid:~#
```

## ODROID-N2

You can find the number of gpio-<nr> [this Expansion Connector](#) in a column named “GPIO & Export No”.

And then, modify the num\_chipselect and cs\_gpios properties.

[https://github.com/hardkernel/linux/blob/odroidn2-4.9.y/arch/arm64/boot/dts/amlogic/meson64\\_odroidn2.dts#L451-L454](https://github.com/hardkernel/linux/blob/odroidn2-4.9.y/arch/arm64/boot/dts/amlogic/meson64_odroidn2.dts#L451-L454)

## ODROID-C2

You can find the number of gpio-<nr> [this Expansion Connector](#) in a column named “GPIO”.

And then, modify the num\_chipselect and cs\_gpios properties.

[https://github.com/hardkernel/linux/blob/odroidc2-v3.16.y/arch/arm64/boot/dts/meson64\\_odroidc2.dts#L819-L821](https://github.com/hardkernel/linux/blob/odroidc2-v3.16.y/arch/arm64/boot/dts/meson64_odroidc2.dts#L819-L821)

## ODROID-C1/C1+

You can find the number of gpio-<nr> [this Expansion Connector](#) in a column named "GPIO".

And then, modify the num\_chipselect and cs\_gpios properties.

[https://github.com/hardkernel/linux/blob/odroidc-3.10.y/arch/arm/boot/dts/meson8b\\_odroidc.dts#L584-L585](https://github.com/hardkernel/linux/blob/odroidc-3.10.y/arch/arm/boot/dts/meson8b_odroidc.dts#L584-L585)

## IRQ(Interrupt)

## ODROID-N2

Some of SPI slave devices require interrupts like touch LCD, CAN or etc. You can choose GPIO on external 40pin as interrupt pin except you're using.

**But the important fact is that you can only use 8 interrupts on ODROID-N2.**

Refer to the [ODROID-N2 datasheet](#) Page 226.

**If you use the edge trigger as both(falling and rising) it is consumed two GPIO IRQs. So you can only four GPIO IRQs if you set all the GPIO as both edges.**

If you want to test GPIO IRQs with CLI, please refer to this link.

[IRQ test on terminal](#)

You can check whether IRQ is in use or not with "cat /proc/interrupts".

you can see the example dts that the ads7846 use GPIO as pendown interrupt.

[https://github.com/hardkernel/linux/blob/odroidn2-4.9.y/arch/arm64/boot/dts/amlogic/meson64\\_odroidn2.dts#L476](https://github.com/hardkernel/linux/blob/odroidn2-4.9.y/arch/arm64/boot/dts/amlogic/meson64_odroidn2.dts#L476)

## ODROID-C2

Some of SPI slave devices require interrupts like touch LCD, CAN or etc. You can choose GPIO on external 40pin as interrupt pin except you're using.

**But the important fact is that you can only use 6 interrupts on ODROID-C2. There are a total of 8 GPIO-IRQs but it is using the four IRQ to notice the SD\_EMMC IN/OUT on ODROID-C2.**

Refer to the [ODROID-C2 datasheet](#) Page 86.

**If you try to use the edge trigger as both(falling and rising) it is consumed three GPIO IRQs. So you can only three GPIO IRQs if you set all the GPIO as both edges.**

If you want to test GPIO IRQs with CLI, please refer to this link.

[IRQ test on terminal](#)

You can check whether IRQ is in use or not with “cat /proc/interrupts”.  
The GPIO IRQ numbers are assigned 96 ~ 103.

The picture shows you that it is using two IRQs, 99 and 101.

```

root@odroid:~#
root@odroid:~#
root@odroid:~# cat /proc/interrupts

```

	CPU0	CPU1	CPU2	CPU3	
25:	0	0	0	0	GIC 25 vgic
35:	1145	0	0	0	GIC 35 osd_vsync, vsync
38:	1813	0	0	0	GIC 38 timerC
58:	0	0	0	0	GIC 58 meson_uart
62:	0	0	0	0	GIC 62 dwc_otg, dwc_otg_hcd:usb2, dwc_otg_pcd
63:	143533	0	0	0	GIC 63 dwc_otg, dwc_otg_hcd:usb1
78:	0	0	0	0	GIC 78 deinterlace
89:	0	0	0	0	GIC 89 hdmitx
92:	2507	0	0	0	GIC 92 MESON TIMER-F
93:	0	2962	0	0	GIC 93 MESON TIMER-G
94:	0	0	1681	0	GIC 94 MESON TIMER-H
95:	0	0	0	1733	GIC 95 MESON TIMER-I
99:	1	0	0	0	GIC 99 sd_emmc_mmc_in
101:	1	0	0	0	GIC 101 sd_emmc_mmc_out
121:	1144	0	0	0	GIC 121 rdma, osd_rdma
182:	0	0	0	0	GIC 182 ge2d
192:	0	0	0	0	GIC 192 Mali_GP
193:	0	0	0	0	GIC 193 Mali_GP_MMU

You can see the C1 dts example that the ads7846 use GPIO as pendown interrupt.

[https://github.com/hardkernel/linux/blob/odroidc-3.10.y/arch/arm/boot/dts/meson8b\\_odroidc.dts#L636](https://github.com/hardkernel/linux/blob/odroidc-3.10.y/arch/arm/boot/dts/meson8b_odroidc.dts#L636)

## ODROID-C1/C1+

Some of SPI slave devices require interrupts like touch LCD, CAN or etc. You can choose GPIO on external 40pin as interrupt pin except you're using.

**But the important fact is that you can only use 8 interrupts on ODROID-C1.**

Refer to the [ODROID-C1 datasheet](#) Page 45.

**If you use the edge trigger as both(falling and rising) it is consumed two GPIO IRQs. So you can only four GPIO IRQs if you set all the GPIO as both edges.**

If you want to test GPIO IRQs with CLI, please refer to this link.

[IRQ test on terminal](#)

You can check whether IRQ is in use or not with “cat /proc/interrupts”.

According to the [ODROID-C1 datasheet](#) page 52, the GPIO IRQ numbers are assigned 96 ~ 103.

The picture below is when I assigned the IRQ with ads7846 modules.

```
root@odroid:~# cat /proc/interrupts
          CPU0           CPU1           CPU2           CPU3
35:         133038             0             0             0      GIC  am_osd_vsync, vsync
38:         221690             0             0             0      GIC  timerC
40:             0           446             0             0      GIC  eth0
60:             2             0             0             0      GIC  sdio
62:             0             0             0             0      GIC  dwc_otg, dwc_otg_hcd
63:             0             0             0      17721940      GIC  dwc_otg, dwc_otg_hcd
78:             0             0             0             0      GIC  deinterlace
89:             0             0             0             0      GIC  amhdmitx
92:        437000             0             0             0      GIC  MESON TIMER-F
93:             0           64331             0             0      GIC  MESON TIMER-G
94:             0             0           65353             0      GIC  MESON TIMER-H
95:             0             0             0           37928      GIC  MESON TIMER-I
96:             1             0             0             0      GIC  ads7846
97:             1             0             0             0      GIC  ads7846
98:             1             0             0             0      GIC  ads7846
99:             1             0             0             0      GIC  ads7846
100:            1             0             0             0      GIC  ads7846
101:            1             0             0             0      GIC  ads7846
102:            1             0             0             0      GIC  ads7846
103:            1             0             0             0      GIC  ads7846
107:            0             0             0             0      GIC  uart_b_ttyS2:
```

you can see the example dts that the ads7846 use GPIO as pendown interrupt.  
[https://github.com/hardkernel/linux/blob/odroidc-3.10.y/arch/arm/boot/dts/meson8b\\_odroidc.dts#L636](https://github.com/hardkernel/linux/blob/odroidc-3.10.y/arch/arm/boot/dts/meson8b_odroidc.dts#L636)

## Update your DTB without building kernel source

# ODROID-N2

If don't have a build system, you can use the dtc(device-tree-compiler) on terminal.

### Install device-tree-compiler on your ODROID-N2

```
sudo apt update
sudo apt install device-tree-compiler
```

### Backup your dtb file

**If you have a problem while modifying the dtb file and cannot boot, overwrite the it with this backup file.**

```
sudo cp /media/boot/meson64_odroidn2.dtb
/media/boot/meson64_odroidn2.dtb.old
```

### Disassemble from dtb to dts

```
sudo dtc -I dtb -O dts /media/boot/meson64_odroidn2.dtb >
/media/boot/meson64_odroidn2_my.dts
```

## Edit the dts

In the [spi node](#), modify to the settings you want, adding slave devices, adding SS/IRQ pins and etc.

## Compile from dts to dtb

```
sudo dtc -I dts -O dtb /media/boot/meson64_odroidn2_my.dts >
/media/boot/meson64_odroidn2.dtb
sync
sudo reboot
```

**If you have a problem while modifying the dtb file and cannot boot, overwrite with the file you backed up.**

# ODROID-C2

If don't have a build system, you can use the dtc(device-tree-compiler) on terminal.

## Install device-tree-compiler on your ODROID-C2

```
sudo apt update
sudo apt install device-tree-compiler
```

## Backup your dtb file

**If you have a problem while modifying the dtb file and cannot boot, overwrite the it with this backup file.**

```
sudo cp /media/boot/meson64_odroidc2.dtb
/media/boot/meson64_odroidc2.dtb.old
```

## Disassemble from dtb to dts

```
sudo dtc -I dtb -O dts /media/boot/meson64_odroidc2.dtb >
/media/boot/meson64_odroidc2_my.dts
```

## Edit the dts

In the [spi node](#), modify to the settings you want, adding slave devices, adding SS/IRQ pins and etc.

## Compile from dts to dtb

```
sudo dtc -I dts -O dtb /media/boot/meson64_odroidc2_my.dts >
/media/boot/meson64_odroidc2.dtb
sync
sudo reboot
```

**If you have a problem while modifying the dtb file and cannot boot, overwrite with the file**

**you backed up.**

## ODROID-C1/C1+

If don't have a build system, you can use the dtc(device-tree-compiler) on terminal.

### Install device-tree-compiler on your ODROID-C1

```
sudo apt update
sudo apt install device-tree-compiler
```

### Backup your dtb file

**If you have a problem while modifying the dtb file and cannot boot, overwrite the it with this backup file.**

```
sudo cp /media/boot/meson8b_odroidc.dtb /media/boot/meson8b_odroidc.dtb.old
```

### Disassemble from dtb to dts

```
sudo dtc -I dtb -O dts /media/boot/meson8b_odroidc.dtb >
/media/boot/meson8b_odroidc_my.dts
```

### Edit the dts

In the [spi node](#), modify to the settings you want, adding slave devices, adding SS/IRQ pins and etc.

### Compile from dts to dtb

```
sudo dtc -I dts -O dtb /media/boot/meson8b_odroidc_my.dts >
/media/boot/meson8b_odroidc.dtb
sync
sudo reboot
```

**If you have a problem while modifying the dtb file and cannot boot, overwrite with the file you backed up.**

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