

# Fintek

# Linux API Guide

v1.40

Aug 15, 2024



## Datasheet Revision History

Date	Version	Revision History
2014/9/22	V1.00	1. Initial version.
2014/9/24	V1.01	1. SuperIO detection function modified. 2. Function SetWdtConfiguration parameter modified. Sample code & Library version: 854091fe7
2015/6/9	V1.02	1. Add support for F81768 SuperIO. 2. Static Library released with x86/x86_64. Sample code & Library version: 38a40dea5e
2015/8/10	V1.03	1. Add support GPIO for F81504/508/512 PCIE to UARTs. 2. Fix F81866 GPIO 0x/1x/2x/8x setting loss. 3. Add demo app compile & operate section. Sample code & Library version: 1088a3cc9d
2015/8/19	V1.04	1. Add support EEPROM modification for F81504/508/512 PCIE to UARTs. Sample code & Library version: 7c55f05304
2015/8/25	V1.05	1. Add support for F71808A Watchdog. Sample code & Library version: f28939d0f6
2015/8/26	V1.06	1. Fix detecting multi-SuperIO Issue. Sample code & Library version: f1a336a001
2015/9/10	V1.07	1. Add support for F71869A SuperIO with WDT function. Sample code & Library version: 9dffe67749
2015/10/13	V1.08	1. Add support for F81866 SuperIO with I2C function. Sample code & Library version: eb4ee4f830
2015/12/25	V1.09	1. Add support for F71869A SuperIO with GPIO function. Sample code & Library version: 8005078325
2015/12/28	V1.10	1. Fix for init_fintek_sio() error when multiple SuperIO exist. 2. Add more debug message option. Sample code & Library version: f216964384
2016/9/22	V1.11	1. Fix GPIO mapping for F81803 & F81768. Sample code & Library version: 97527cc592



2016/10/11	V1.12	Increase F81886 GPIO read/write performance with 3.7us pulse width. Sample code & Library version: 6627a95cb9
2017/3/16	V1.13	1. Add support for F75113 GPIO & WatchDog function. Sample code & Library version: 7cce21887d
2017/5/16	V1.14	1. Fix for F75113 GPIO4x. Sample code & Library version: fa0b58cd29
2017/5/24	V1.15	1. Add multi-WDT support. (F75113). Sample code & Library version: 5f26f0e4fe
2017/6/6	V1.16	1. Fix for newer GCC build failed issue. Sample code & Library version: ef7eba4668
2017/10/2	V1.17	1. Add support for F75114 GPIO function. Sample code & Library version: d609ca08ff
2017/12/5	V1.18	1. Add support for F81801 GPIO/WDT function. Sample code & Library version: 9f90d44fa9
2017/12/5	V1.19	1. Fix support for F81801 GPIO/WDT function. Sample code & Library version: 1d4dd6b7be
2017/12/28	V1.20	1. Add support for F81804/F81966 GPIO/WDT function. 2. Fix API for demo code "demo_list_device.c" crash on non-HID device. Sample code & Library version: e2476b4759
2018/4/17	V1.21	1. Add demo code "demo_id.c" for separate from F75114 with ID (GPIO03/04) Sample code & Library version: 6684982276
2018/8/20	V1.22	1. Add demo code "demo_spi.c" to demonstrate SPI API usage. 2. Add support for F81532A/F81534A/F81535/F81536 (driver needed) 3. Using older GCC to make library for older system compatibility Sample code & Library version: 6fe4d90695
2018/10/24	V1.23	1. Add support for F75113 (I2C/SMBUS protocol) Sample code & Library version: 3c609b4a57
2018/10/26	V1.24	1. Fix F75113 (I2C/SMBUS protocol) for only 2 sets WDT. Sample code & Library version: c85c4b9308
2018/12/24	V1.25	1. Add armv7l arch for RK3388 Android Sample code & Library version: cd690cbcf2

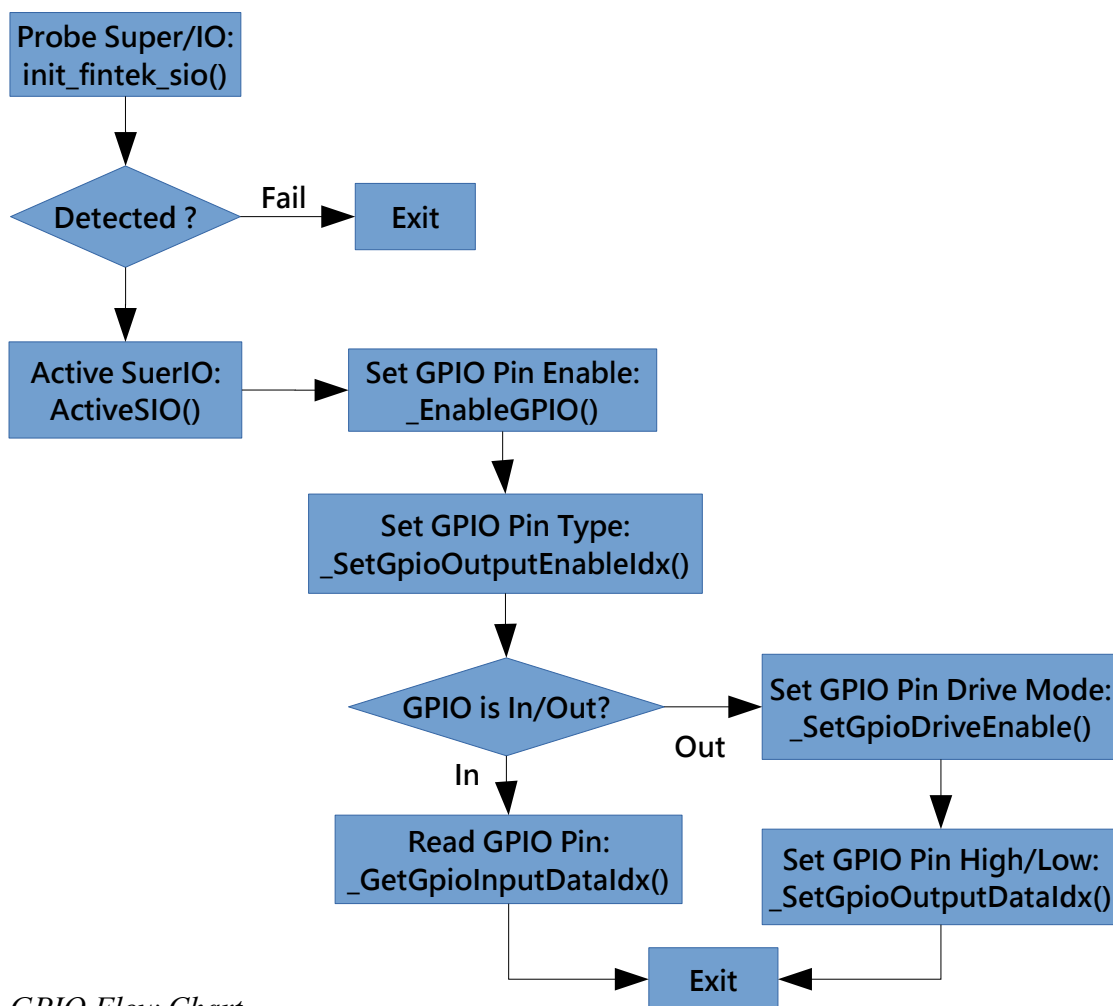


2019/1/17	V1.26	1. Add GPIO interrupt mode for F81866 2. Fix GPIO support and check for F81532A/534A/535/536 3. Improve performance for F75114 GPIO operation Sample code & Library version: a3f9c2db8a
2019/3/13	V1.27	1. Support F81216/AD/H watchdog 2. Support F75115 GPIO 3. Fix some IC lack GetoutputEnable/GetDriveEnable() Sample code & Library version: 28b1ea5bff
2019/9/17	V1.28	1. Add demo_gpio_int.c to handle GPIO interrupt (need driver) 2. Add case open support for F81866 3. Support F81866/966 GPIO interrupt mode Sample code & Library version: c285953950
2020/2/10	V1.29	1. Improve F75115 GPIO set/get speed & group control 2. Add GPIO performance measure function "gpio_performance_demo()" in demo_gpio.c 3. Implement F81216E WDT/GPIO API. 4. Fix demo_gpio.c for interrupt handling issue. 5. Implement F75113 GPIO group read/write mode. 6. Force enable GPIO config by "_EnableGPIO()" on F81504/508/512 Sample code & Library version: 5aa89c2774
2020/6/24	V1.30	1. Add F75115 I2C 2. Add F81966 GPIO interrupt trigger type (Rising/Falling Edge selector) 3. Add arm64 AARCH64 library Sample code & Library version: 4ee1af2d10
2021/2/5	V1.31	1. Add F81968 GPIO/WDT 2. Add F81866 PWM Sample code & Library version: 3d4c1d3e40
2021/10/29	V1.32	1. Add F75115 UART/PWM/Multi-functions switch. Sample code & Library version: 4a8bc87e0d
2022/12/13	V1.33	1. Add F81504/508/512 GPIO group set/get mode. Sample code & Library version: 4a8bc87e0d
2023/10/23	V1.34	1. Add support for F81866 Fan Control function. Sample code & Library version: 6375031c28

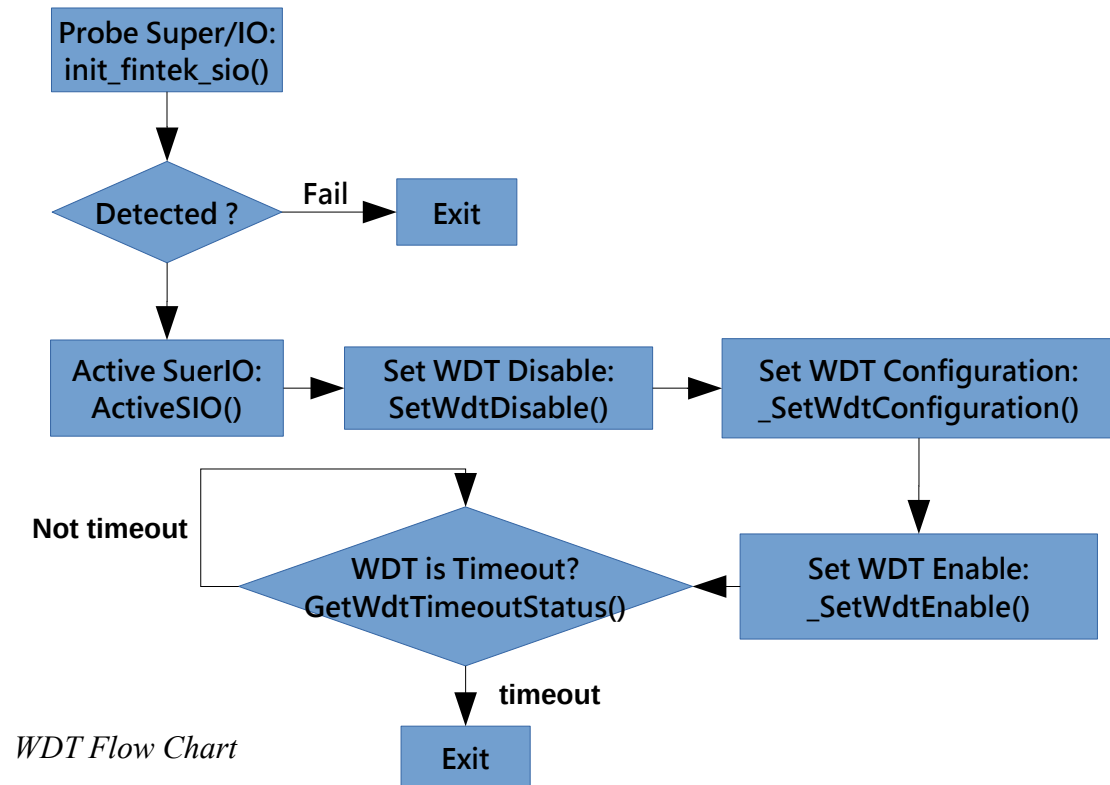


2024/1/29	V1.35	1. Add force mode to support USB HID device. Sample code & Library version: a6fb252b88
2024/3/6	V1.36	1. Fix warning . Sample code & Library version: f323ac7441
2024/5/17	V1.37	1. add F81966, F81866 Fan Control function(set Fan Mode). 2. add F81966, F81866 Temperature function. 3. add F75114 GPIO group mode. Sample code & Library version: 7f4463579a38
2024/7/26	V1.38	1. Add driver mode for support protection for Secure Boot. Please review Driver Installation section for future information. Sample code & Library version: 22b4b1d7ddfb
2024/8/5	V1.39	1. Add PECL temperature access for F81866/966. 2. Change GetTemperature() function type. 3. Change Driver for auto active device. Sample code & Library version: 987940e87421
2024/8/15	V1.40	1. Fix F81214/216/218E watchdog not working issue. 2. Add F81214/216/218E GPIO group mode. Sample code & Library version: 1162b3da45a2

# Flow Control



GPIO Flow Chart



## 1.1 Demo API Function

This documents contains GPIO / WDT / EEPROM / I2C/SPI configuration API for Fintek IC. The support list is below:

- GPIO
  - F81866/F81803/F81768/F71869A/F81504/F81508/F81512/F75113(LPC,I2C)\*/  
F75114/F75115/F81801/F81804/F81966/F81532A/F81534A/F81535/F81536/  
F81214E/F81216E/F81218E/F75111/F81968
- Watch Dog
  - F81866/F81803/F81768/F71808A/F71869A/F75113/F81801/F81804/F81966/  
F81216/F81216AD/F81216H/F81214E/F81216E/F81218E/F75111/F81968
- EEPROM
  - F81504/F81508/F81512
- I2C
  - F81866 / F75115
- SPI
  - F75115
- UART
  - F75115
- PWM
  - F75115 / F81866
- Fan
  - F81866

Some chip likes F75113 should refer ch4.2.6 section “I2C/SMBUS bus driver” for more help.



## 1.2 Driver Installation

The following example and command are based on Ubuntu 22.04.

1. `sudo su`
2. `unzip gpio_interrupt_driver.zip`
3. `apt-get update`
4. `apt-get install build-essential sbsigntool openssl`
5. `cd gpio_interrupt_driver`
6. `make clean ; make`
7. If you want to using GPIO with interrupt, Please refer section 4.2.4. GPIO Interrupt handle with `demo_gpio`. Otherwise we can load driver directly via “`insmod fintek_gpio_int.ko`”.

Sign driver for SecureBoot:

<https://ubuntu.com/blog/how-to-sign-things-for-secure-boot>

## 2.1 GPIO Function:

### 2.1.1 Function List

- `int _EnableGPIO(unsigned int uldx, eGPIO_Mode eMode)`
- `int _SetGpioOutputDataIdx(unsigned int uldx, unsigned int uValue)`
- `int _GetGpioOutputDataIdx(unsigned int uldx, unsigned int *uValue)`
- `int _GetGpioInputDataIdx(unsigned int uldx, unsigned int *uValue)`
- `int _SetGpioDriveEnable(unsigned int uldx, eGPIO_Drive_Mode eMode)`
- `int _SetGpioOutputEnableIdx(unsigned long uldx, eGPIO_Direction eMode)`
- `int _SetGpioPullMode(unsigned int uldx, eGPIO_Pull_Mode eMode)`
- `int _GetGpioPullMode(unsigned int uldx, eGPIO_Pull_Mode *eMode)`
- `int _SetGpioGroupOutputDataIdx(unsigned int uldx, unsigned int uValue)`
- `int _GetGpioGroupInputDataIdx(unsigned int uldx, unsigned int *uValue)`
- `int _EnableGpioInt(unsigned int set, unsigned int en_bit, unsigned int irq)`
- `int _DisableGpioInt(unsigned int set, unsigned int dis_bit)`
- `int _GetGpioIntStatus(unsigned int set, unsigned int *bit_status)`
- `int _ClearGpioIntStatus(unsigned int set, unsigned int clear_bit_status)`

### 2.1.2 Value Description

Define	Value	Description
<code>_EnableGPIO</code>	uldx	GPIO Index (ex. GPIO16 => uldx=0x16)
	eMode	Enum eGPIO_Mode {eGPIO_Mode_Disable, eGPIO_Mode_Enable}
<code>_SetGpioOutputDataIdx</code>	uldx	GPIO Index (ex. GPIO16 => uldx=0x16)
	uValue	Set GPIO Output value: 0: Low 1:High
<code>_SetGpioGroupOutputDataIdx</code>	set	GPIO set (ex. GPIO3x => set=0x3)
	uValue	Set max to 8 pin data
<code>_GetGpioOutputDataIdx</code>	uldx	GPIO Index (ex. GPIO16 => uldx=0x16)
	*uValue	Read GPIO Current Output value: 0: Low 1:High
<code>_GetGpioInputDataIdx</code>	uldx	GPIO Index (ex. GPIO16 => uldx=0x16)
	*uValue	Read GPIO Current Input value: 0: Low 1:High
<code>_GetGpioGroupInputDataIdx</code>	set	GPIO set (ex. GPIO3x => set=0x3)
	*uValue	Get max to 8 pin data
<code>_SetGpioDriveEnable</code>	uldx	GPIO Index (ex. GPIO16 => uldx=0x16)

	eMode	Enum eGPIO_Drive_Mode {eGPIO_Drive_Mode_OpenDrain, eGPIO_Drive_Mode_Pushpull}
_GetGpioDriveEnable	uldx	GPIO Index (ex. GPIO16 => uldx=0x16)
	*eMode	EEnum eGPIO_Drive_Mode {eGPIO_Drive_Mode_OpenDrain, eGPIO_Drive_Mode_Pushpull}
_SetGpioOutputEnableIdx	uldx	GPIO Index (ex. GPIO16 => uldx=0x16)
	eMode	Enum eGPIO_Direction {eGPIO_Direction_In, eGPIO_Direction_Out}
_GetGpioOutputEnableIdx	uldx	GPIO Index (ex. GPIO16 => uldx=0x16)
	*eMode	Enum eGPIO_Direction {eGPIO_Direction_In, eGPIO_Direction_Out}
_SetGpioPullMode	uldx	GPIO Index (ex. GPIO16 => uldx=0x16)
	eMode	Enum eGPIO_Pull_Mode {eGPIO_Pull_Low, eGPIO_Pull_High, eGPIO_Pull_Disable}
_GetGpioPullMode	uldx	GPIO Index (ex. GPIO16 => uldx=0x16)
	*eMode	Enum eGPIO_Pull_Mode {eGPIO_Pull_Low, eGPIO_Pull_High, eGPIO_Pull_Disable}
_EnableGpioInt	set	Enable GPIO interrupt with special set
	en_bit	Enable GPIO interrupt with special set & bit
	irq	IRQ channel
_DisableGpioInt	set	Disable GPIO interrupt with special set
	dis_bit	Disable GPIO interrupt with special set & bit
_GetGpioIntStatus	set	Get GPIO interrupt status with special set
	*status	Get pins status
_ClearGpioIntStatus	set	Clear GPIO interrupt status with special set
	status	Clear pins status

## 2.2 WDT Function:

### 2.2.1 Function List

- 1<sup>st</sup> WDT control
  - int SetWdtDisable()
  - int SetWdtEnable()
  - int SetWdtConfiguration(int iTimerCnt, int iClkSel, int iPulseMode, int iUnit, int iActive, int iPulseWidth)
  - int GetWdtTimeoutStatus(int \*Status, int\* RemainTime)

- Other WDT control (by index, 1<sup>st</sup> WDT = 0)
  - int SetWdtIdxConfiguration(int idx, int iTimerCnt, int iClkSel, int iPulseMode, int iUnit, int iActive, int iPulseWidth)
  - int SetWdtIdxEnable(int idx)
  - int SetWdtIdxDisable(int idx)
  - int GetWdtIdxTimeoutStatus(int idx, int \*Status, int \*RemainTime)

## 2.2.2 Value Description

Define	Value	Description
SetWdtConfiguration	iTimerCnt	0-255 (second or minute program by "iUnit")
	iClkSel	Watchdog timer clock. -1: Remain default value setting by BIOS (recommend) 0: 10Hz clock divided by CLKIN. 1: Internal 10Hz clock.
	iPulseMode	Watchdog output mode. -1: Remain default value setting by BIOS (recommend) 0: Select level output mode. 1: Select pulse output mode.
	iUnit	Watchdog unit select. -1: Remain default value setting by BIOS (recommend) 0: Select second. 1: Select minute.
	iActive	Watchdog output polarity of WDTRST -1: Remain default value setting by BIOS (recommend) 0: low active. 1: high active.
	iPulseWidth	Watchdog output pulse width -1: Remain default value setting by BIOS (recommend) 0: Select pulse width of 1 ms. 1: Select pulse width of 25 ms. 2: Select pulse width of 125 ms. 3: Select pulse width of 5 sec.
SetWdtDisable		Disable WDT & clear WDTMOUT_STS

SetWdtEnable		Enable WDT & WDTMOUT_STS
GetWdtTimeoutStatus	*Status	0: Timeout event is not occurred 1: Timeout event is occurred
	* RemainTime	Remain time of WDT

## 2.3 I2C function:

### 2.3.1 Function List

- int SelectI2CChannel(unsigned int ch)
- int WriteI2CData(unsigned int addr, unsigned int data)
- int ReadI2CData(unsigned int addr, unsigned int \*data)
- int I2C\_Start(int idx)
- int I2C\_Write\_Data(int idx, uint8\_t data)
- int I2C\_Read\_Data(int idx, uint8\_t \*data, int nack)
- int I2C\_Stop(int idx)

### 2.3.2 Value Description

Define	Value	Description
SelectI2CChannel	ch	Target channel
WriteI2CData	dev	Set slave address
	addr	Set slave register/command
	data	Set write data to slave
ReadI2CData	dev	Set slave address
	addr	Set slave register/command
	*data	Read data from slave
I2C_Start	idx	Target channel
I2C_Write_Data	idx	Target channel
	data	Write data
I2C_Read_Data	idx	Target channel
	*data	Read data
	nack	Reply ack / nack to device
I2C_Stop	idx	Target channel

## 2.4 PWM function:

### 2.4.1 Function List

- int GetPWMCount()
- int SetPWMSioRawConfig(int idx, uint32\_t val)
- int GetPWMSioRawConfig(int idx, uint32\_t \*val)
- int GetPWMFreqSupport\_Size(int idx)
- int GetPWMFreqSupport\_List(int idx, uint32\_t \* data, int in\_size)
- int SetPWM\_Freq\_Div\_Percentage(int idx, int freq, int div, int percentage)
- int GetPWM\_Freq\_Div\_Percentage(int idx, int \*freq, int \*div, int \*percentage)
- int GetPWMMaxDivider(int idx, int \*max\_div)

### 2.4.2 Value Description

Define	Value	Description
GetPWMCount		Get max PWM sets for target IC
SetPWMSioRawConfig		
	idx	Target PWM index
	val	Set raw value
GetPWMSioRawConfig		
	idx	Target PWM index
	*val	Get raw value
GetPWMFreqSupport_Size		Get PWM support base frequency list count
	idx	Target PWM index
GetPWMFreqSupport_List		Get PWM support base frequency list table
	idx	Target PWM index
	*data	Frequency table
	in_size	Pass size to SDK (size divided by int)
SetPWM_Freq_Div_Percentage		Set PWM Freq/Div/Duty
	idx	Target PWM index
	freq	Set PWM Frequency
	div	Set Frequency divider
	percentage	Set PWM Duty percentage
GetPWM_Freq_Div_Percentage		Get PWM Freq/Div/Duty
	idx	Target PWM index
	*freq	Get PWM Frequency

	*div	Get Frequency divider
	*percentage	Get PWM Duty percentage
GetPWMMaxDivider		Get PWM max divider
	idx	Target PWM index
	*max_div	Get PWM max divider



## 2.5 SPI function:

### 2.5.1 Function List

- int SetSpiCsEn(int idx, int en)
- int ReadSpiData(int idx, unsigned char \*data)
- int WriteSpiData(int idx, unsigned char data)

### 2.5.2 Value Description

Define	Value	Description
SetSpiCsEn	idx	SPI index
	en	0: Chip select low, 1: Chip select high
ReadSpiData	idx	SPI index
	*data	Read 1 byte data from device (MISO)
WriteSpiData	idx	SPI index
	data	Write 1 byte data to device (MOSI)

## 2.6 UART function:

### 2.6.1 Function List

- int UART\_GetMaxChannel()
- int UART\_SetBaudRate(uint32\_t idx, uint32\_t baudrate)
- int UART\_SetDTR(uint32\_t idx, uint32\_t en)
- int UART\_SetRTS(uint32\_t idx, uint32\_t en)
- int UART\_GetDCD(uint32\_t idx, uint32\_t \* status)
- int UART\_GetDSR(uint32\_t idx, uint32\_t \* status)
- int UART\_GetCTS(uint32\_t idx, uint32\_t \* status)
- int UART\_GetRI(uint32\_t idx, uint32\_t \* status)
- int UART\_TX(uint32\_t idx, uint8\_t \* data, uint8\_t len)
- int UART\_RX(uint32\_t idx, uint8\_t \* data, uint8\_t data\_len, uint8\_t \* read\_len, uint32\_t timeout)

### 2.6.2 Value Description

Define	Value	Description
UART_GetMaxChannel		Get max UART count of target IC
UART_SetBaudRate	idx	UART index
	baudrate	Set desired baudrate
UART_SetDTR	idx	UART index
	en	Set DTR enable (Active Low)
UART_SetRTS	idx	UART index
	en	Set DTR enable (Active Low)
UART_GetDCD	idx	UART index
	*status	Get DCD status (Active Low)
UART_GetDSR	idx	UART index
	*status	Get DSR status (Active Low)
UART_GetCTS	idx	UART index
	*status	Get CTS status (Active Low)
UART_GetRI	idx	UART index
	*status	Get Ring-In status (Active Low)
UART_TX	idx	UART index
	*data	UART TX data array
	len	UART TX data array size

UART_RX	idx	UART index
	*data	UART RX data array
	data_len	UART RX data array size
	*read_len	UART current read data size
	timeout	RX max timeout (ms)

## 2.7 Fan function:

### 2.7.1 Function List

- int SetPWMSioRawConfig(int idx, uint32\_t val)
- int GetPWMSioRawConfig(int idx, uint32\_t \*val)
- int GetFanPWMSioRPMConfig(int idx, unsigned int \*val)
- int GetPWMCount()
- int GetFanMode(int idx, ePWM\_Fan\_Mode\* eMode)

### 2.7.2 Value Description

Define	Value	Description
SetPWMSioRawConfig		
	idx	Target Fan index
	val	Set raw value
GetPWMSioRawConfig		
	idx	Target Fan index
	*val	Get raw value
GetFanPWMSioRPMConfig		
	idx	Target Fan index
	*val	Get RPM value
GetFanMode		
	idx	Target Fan index
	eMode	Get Fan mode

## 2.8 Temperature function:

### 2.7.1 Function List

- int GetTemperatureCount()
- int GetTemperature(int idx, int \*temp)
- int GetTemperature\_PECI(int \*temp)

### 2.7.2 Value Description

Define	Value	Description
GetTemperatureCount		Get max normal temperature count.
GetTemperature		
	idx	Target temperature index
	*temp	Get temperature value
GetTemperature_PECI		
	*temp	Get Peci temperature value

## Linux Demo code Guide :

### 3.1 Files Description

We provide x86, x86\_64 & Android SDK. It's named with:

- fintek\_demo\_release\_i686-<ver>.tar.gz
- fintek\_demo\_release\_x86\_64-<ver>.tar.gz
- fintek\_demo\_release-<ver>-armv7l.tar.gz

It contained:

- libfintek\_api.a
- demo\_spi.c
- demo\_wdt.c
- demo\_gpio.c
- demo\_raspberry.c
- demo\_id.c
- demo\_eeprom.c
- demo\_i2c.c
- demo\_i2c\_protocol.c
- demo\_pwm.c
- demo\_uart.c
- demo\_fan.c
- demo\_temperature.c
- fintek\_api.h
- Makefile

## Example :

### 4.1 Decompress & compile demo app

Decompress `fintek_demo_release_<arch>-<version>.tar.gz` to your working directory.

For examples, We'll decompress to `"/home/code/demo"` with arch:x86 version:4a8bc87e0d

1. `mkdir /home/code/demo`
2. `cd /home/code/demo`
3. `cp <somewhere>/fintek_demo_release-4a8bc87e0d-i686.tar.gz .`
4. `tar xf fintek_demo_release-4a8bc87e0d-i686.tar.gz`
5. `make`
6. use demo code to test on your platform.
  - 4.2.3 for simple command to control GPIO
  - 4.3.2 for simple command to control WDT
  - 4.4.2 for simple command to control PWM
  - 4.5.2 for simple command to Read/Write I2C
  - 4.6.2 for simple command to Read/Write SPI Flash
  - 4.7.2 for simple command to Case-open demo
  - 4.8.2 for simple command to UART demo
  - 4.9.2 for simple command to FAN demo
  - 4.11.2 for simple command to Temperature demo

If the demo application show the message **"Cant Found any Fintek SIO Product"**. We should change the first parameter in demo source code with `init_fintek_sio()`. It can be referenced from file `"fintek_api.h"`.

```
typedef enum {
    eSIO_TYPE_SIO = 0,
    eSIO_TYPE_F71808A = eSIO_TYPE_SIO,
    eSIO_TYPE_F81866,
    eSIO_TYPE_F81803,
    eSIO_TYPE_F81768,

    eSIO_TYPE_PCI,
    eSIO_TYPE_PCI_F81504 = eSIO_TYPE_PCI,
    eSIO_TYPE_PCI_F81508,
    eSIO_TYPE_PCI_F81512,

    eSIO_TYPE_UNKNOWN,
    eSIO_TYPE_INVALID,
} eSIO_TYPE;
```

## 4.2 GPIO Read/Write/Interrupt

- Please reference the function gpio\_demo() within demo code “demo\_gpio.c” for the detail.
- The following demo code should run with privileged user (root).

### 4.2.1. GPIO Read Example with API (Read from GPIO06):

```
init_fintek_sio(eSIO_TYPE_F81866, 0, &sio_data)
ActiveSIO(sio_data.ic_port, sio_data.key);
CHECK_RET(_EnableGPIO(0x06, eGPIO_Mode_Enable));
CHECK_RET(_SetGpioOutputEnableIdx( 0x06, eGPIO_Direction_In));
CHECK_RET(_GetGpioInputDataIdx( 0x06, &data));
DeactiveSIO(sio_data.ic_port);
```

### 4.2.2. GPIO Write Example with API (Write to GPIO06 with High):

```
init_fintek_sio(eSIO_TYPE_F81866, 0, &sio_data)
ActiveSIO(sio_data.ic_port, sio_data.key);
CHECK_RET(_EnableGPIO(0x06, eGPIO_Mode_Enable));
CHECK_RET(_SetGpioOutputEnableIdx( 0x06, eGPIO_Direction_Out));
```

```
CHECK_RET(_SetGpioDriveEnable( 0x06 , eGPIO_Drive_Mode_OpenDrain));  
CHECK_RET(_SetGpioOutputDataIdx( 0x06 , 1));  
DeactiveSIO(sio_data.ic_port);
```

#### 4.2.3. GPIO Write with demo\_gpio (Write to GPIO80 with High / Read GPIO81):

The command line format of demo\_gpio:

```
./demo_gpio <idx> <dir> <mode> <value>
```

<idx>: index of gpio, e.g., 0x80.

<dir>: 0 for input. 1 for output

<mode>: 0 for open-drain. 1 for Push-pull

<value>: 0 for output low. 1 for output high

We'll use following command to control GPIO80 with Push-Pull & High Level

```
./demo_gpio 0x80 1 1 1
```

And read GPIO81 with

```
./demo_gpio 0x81 0 0 0
```

#### 4.2.4. GPIO Interrupt handle with demo\_gpio (GPIO86):

1. Install driver in gpio\_interrupt\_driver folder.

##### **Parameter settings :**

**Port :** Setting IC Entry Key Port according to SIO.(ex : 0x2e, 0x4e)

**Key :** Setting IC Entry Key according to SIO. (ex : 0x67, 0x77 , 0x87, 0xa0)

**Irq :** Configure system available idle IRQ channels for interrupt monitoring. The following command can be used to query :

```
$ cat /proc/interrupts
```

( Serial IRQ are typically allocated within the range of 0 to 15. )



```

root@user:/mnt/VMServer/gpio_interrupt_driver_v1.1# cat /proc/interrupts

```

	CPU0	CPU1	CPU2	CPU3	
1:	0	0	4	0	IO-APIC 1-edge i8042
7:	0	0	0	0	IO-APIC 7-edge parport0
8:	0	0	0	0	IO-APIC 8-fasteoi rtc0
9:	0	0	0	0	IO-APIC 9-fasteoi acpi
12:	0	6	0	0	IO-APIC 12-edge i8042
18:	2	0	0	0	IO-APIC 18-fasteoi i801_smbus
86:	0	0	0	0	IO-APIC 86-fasteoi soc_dts
91:	0	276	18	0	PCI-MSI 327680-edge xhci_hcd
92:	0	0	19675	0	PCI-MSI 311296-edge ahci[0000:00:13.0]
93:	0	688	0	53877	PCI-MSI 1048576-edge enp2s0
94:	0	0	0	0	PCI-MSI 2097152-edge xhci_hcd
95:	0	0	0	0	PCI-MSI 2097153-edge xhci_hcd
96:	0	0	0	0	PCI-MSI 2097154-edge xhci_hcd
97:	0	0	0	0	PCI-MSI 2097155-edge xhci_hcd
98:	0	0	0	0	PCI-MSI 2097156-edge xhci_hcd
99:	0	22	0	0	PCI-MSI 425984-edge mei_txe
100:	0	1134	2624	0	PCI-MSI 32768-edge i915
101:	0	0	0	1809	PCI-MSI 442368-edge snd_hda_intel:card0
NMI:	3	3	3	4	Non-maskable interrupts
LOC:	51800	42481	43006	165895	Local timer interrupts
SPU:	0	0	0	0	Spurious interrupts
PMI:	3	3	3	4	Performance monitoring interrupts
IWI:	34798	25748	42989	71567	IRQ work interrupts
RTR:	0	0	0	0	APIC ICR read retries
RES:	1449	1151	1740	1826	Rescheduling interrupts
CAL:	14736	10666	10886	11757	Function call interrupts
TLB:	388	379	647	437	TLB shootdowns
TRM:	0	0	0	0	Thermal event interrupts
THR:	0	0	0	0	Threshold APIC interrupts
DFR:	0	0	0	0	Deferred Error APIC interrupts
MCE:	0	0	0	0	Machine check exceptions
MCP:	10	10	10	10	Machine check polls
ERR:	0				
MIS:	0				
PIN:	0	0	0	0	Posted-interrupt notification event
NPI:	0	0	0	0	Nested posted-interrupt event
PIW:	0	0	0	0	Posted-interrupt wakeup event

### Compile & Install Demo Driver :

1. Decompress gpio\_interrupt\_driver\_<version>.zip to your working directory.
2. Run 'make' to compile Driver.
3. Run 'insmod' to install Driver.

**Please note** to include the parameters mentioned in the previous section when entering 'insmod' to install driver.

### Example : insmod fintek\_gpio\_int.ko irq=5

**Note** : The maximum number of IRQs available here is four sets. (ex : irq=5,11,12,13)

```

root@arbor-sw:/home/jeff/ddd/old/hpeter/fintek/docker/fintek_api/fintek_api/driver# insmod fintek_gpio_int.ko irq=5
root@arbor-sw:/home/jeff/ddd/old/hpeter/fintek/docker/fintek_api/fintek_api/driver#

```

```

2024-07-26T08:09:16.976201+00:00 arbor-sw kernel: [ 5133.742757] Fintek GPIO interrupt handler v1.2-20240717
2024-07-26T08:09:16.976217+00:00 arbor-sw kernel: [ 5133.742763] handled irq : 5

```

**Compile demo\_gpio\_int :**

Run 'make demo\_gpio\_int'

**Run demo\_gpio\_int :**

Ex : './demo\_gpio\_int 0x85,5 0x86,5'

**Warning :**

**The GPIO settings must be in sets when multiple GPIOs correspond to a single IRQ, for example, all should be 5x, or 8x.**

**Furthermore, the maximum number of GPIO sets allowed is 8.**

2. We can refer gpio\_int\_demo() in demo\_gpio.c or demo\_gpio\_int.c

#### 4.2.5. GPIO with demo\_raspberry (PIN40 → GPIO27):

The command line format of demo\_raspberry, it's most same with demo\_gpio:

`./demo_raspberry <pin> <dir> <mode> <value>`

<pin>: pin of F75115 (using raspberry index)

```

root@code-desktop: /home/code [114x23]
連線(C) 編輯(E) 檢視(V) 視窗(W) 選項(O) 說明(H)
^C
root@code-desktop:/home/code/ddd/old/hpeter/fintek/fintek_api# ./demo_gpio 0x86 5
FINTEK Lib Version: 557ec5be85
idx: 0x86 => set:8, count:6, irq: 5
Dir: 0x0 => IN
cnt: 0, data: 0
cnt: 1, data: 1
cnt: 2, data: 0
cnt: 3, data: 0
cnt: 4, data: 0
cnt: 5, data: 1
cnt: 6, data: 0
cnt: 7, data: 0
cnt: 8, data: 0

-----
5:      1      0      66207      0      IO-APIC      5-edge      fintek-gpio-int
root@code-desktop:/home/code# cat /proc/interrupts | grep fintek
5:      1      0      66208      0      IO-APIC      5-edge      fintek-gpio-int
root@code-desktop:/home/code# cat /proc/interrupts | grep fintek
5:      1      0      66216      0      IO-APIC      5-edge      fintek-gpio-int
root@code-desktop:/home/code#
[0] 0:bash- 1:bash 2:bash* 3:bash "code-desktop" 17:18 17- -- -19

```

#### 4.2.6. Notice

##### I2C/SMBUS bus driver:

All I2C/SMBUS device must dependent on i2c bus driver. For example, we need modprobe “i2c\_i801” for bus driver in Intel platform before using any demo code.

The F75113 support LPC/I2C protocol. We can choose protocol type when calling “init\_fintek\_sio”, passing “eSIO\_TYPE\_F75113” with LPC mode and “eSIO\_TYPE\_F75113\_I2C” with I2C mode.

## 4.3 WDT Set and Monitor

- Please reference the function watchdog\_demo() within demo code "demo\_wdt.c" for the detail.
- The following demo code should run with privileged user (root).

### 4.3.1. WDT Set and Monitor Example (Count down for 10 second)

```
init_fintek_sio(eSIO_TYPE_F81866, 0 ,&sio_data)
ActiveSIO(sio_data.ic_port, sio_data.key);
SetWdtDisable();
// countdown 10s, other parameter using original value
SetWdtConfiguration(10, -1, -1, 0, -1, -1);
DeactiveSIO(sio_data.ic_port);

while( !GetWdtTimeoutStatus(&status, &timer) ) {
    static int old_timer = 0;

    if(old_timer != timer) {
        fprintf(stderr, "status:%d, timer:%d\n", status, timer);
        old_timer = timer;
    }

    if(status) {
        fprintf(stderr, "status:%d, timer:%d\n", status, timer);
        break;
    }

    usleep(10000);
}

DeactiveSIO(sio_data.ic_port);
```

### 4.3.2. WDT Set and Monitor Example with demo\_wdt

./demo\_wdt

### 4.3.3. Multi-WDT control

If can be referenced by function “watchdog2\_demo()” in demo\_wdt.c

## 4.4 PWM control

- Please reference the function pwm\_demo() within demo code “demo\_pwm.c” for the detail.
- The following demo code should run with privileged user (root).

### 4.4.1. PWM API example

See demo code “demo\_pwm.c”

### 4.4.2. PWM example with demo\_pwm on F75115

Example1. Set PWM1 with frequency 23.437KHz(approx.), duty 50%

$$(24\text{MHz} / (1023+1) = 23.437\text{KHz})$$

./demo\_pwm 1 1 24000000 1023 50

Example2. Set PWM1 with frequency 1.2MHz(approx.), duty 80%

$$(12\text{MHz} / (9+1) = 1.2\text{MHz})$$

./demo\_pwm 1 1 12000000 9 80

## 4.5 I2C

- Please reference the function `i2c_demo()` within demo code “demo\_i2c.c” for the detail.
- We provide customize I2C command in `i2c_demo()` with demo code “demo\_i2c\_protocol\_.c”.
- The following demo code should run with privileged user (root).

### 4.5.1. I2C Read & Write Example (Read from slave 0x20 & Write 0xaa to slave from ch 0)

```
unsigned int tmp;
```

```
init_fintek_sio(eSIO_TYPE_F75115_HID, 0, &sio_data)
```

```
ActiveSIO(sio_data.ic_port, sio_data.key);
```

```
status = SelectI2CChannel(0); // success with status=0, others are failed.
```

```
status = ReadI2CData(0x20, 0x10, &tmp); // read from slave 0x20 with reg 0x10
```

```
status = WriteI2CData(0x20, 0x10, 0xaa); // write 0xaa to slave 0x20 with reg 0x10
```

```
DeactiveSIO(sio_data.ic_port);
```

### 4.5.2. I2C Read & Write Example with demo\_i2c

Example1. Read from slave 0xa0 by channel 0 with reg 0x10

```
./demo_i2c r 0x00 0xa0 0x10
```

Example2. Write to slave 0xa0 with data 0xaa by channel 0 with reg 0x10

```
./demo_i2c w 0x00 0xa0 0x10 0xaa
```

Example3. Dump EEPROM by channel 0

```
./demo_i2c d 0x00 0xa0
```

## 4.6 SPI

- Please reference the function spi\_flash\_demo() within demo code “demo\_spi.c” for the detail.
- The following demo code should run with privileged user (root).

### 4.6.1. Read / Write SPI with SPI channel 0

```
unsigned char tmp;
sFintek_sio_data sio_data;

init_fintek_sio(eSIO_TYPE_F75115_HID, 0, &sio_data)
ActiveSIO(sio_data.ic_port, sio_data.key);

SetSpiCsEn(0, 1); // force CS high
SetSpiCsEn(0, 0); // set CS low

WriteSpiData(0, 0x03); // write 0x03 to MOSI
ReadSpiData(0, &tmp); // read data from MISO

SetSpiCsEn(0, 1); // set CS high

DeactiveSIO(sio_data.ic_port);
```

### 4.6.2. SPI Flash Read & Write Example with demo\_spi

Example1. Read SPI Flash addr = 0x1000  
./demo\_spi r 0 0x1000

Example2. Write String “abcde” to SPI Flash addr = 0x1000  
./demo\_spi w 0 0x1000 abcde

## 4.7 Case open detect

- Please reference the function `demo_caseopen()` within demo code “demo\_caseopen.c” for the detail.
- The following demo code should run with privileged user (root).

### 4.7.1. Read case open status

```
./demo_caseopen
```

### 4.7.2. Read and clear case open status

```
./demo_caseopen 1
```



## 4.8 UART control

- Please reference the function `uart_demo()` within demo code “demo\_uart.c” for the detail.
- The following demo code should run with privileged user (root).

### 4.4.1. UART API example

See demo code “demo\_uart.c”

### 4.4.2. UART example with demo\_uart on F75115

Example. Use UART channel 0 to do self test. Please connect TX/RX, RTS/CTS, DTR/DSR.  
./demo\_uart 0

```
root@code-ms7c82:/home/code/ddd/old/hpeter/fintek/docker/fintek_api/fintek_api# ./demo_uart 0
FINTEK Lib Version: b1f9034262
Please connect TX/RX, DTR/DSR, RTS/CTS for loopback test
set baudrate 115200 ok
TX ok
RX ok, read_len: 32
TX:
19 BC 6A 8C 86 93 FD 86 4B 99 25 15 70 0B 2E 51 BC 5F 71 98 E3 7F 82 BC 07 CA EF BF BE DB 73 D7
RX:
19 BC 6A 8C 86 93 FD 86 4B 99 25 15 70 0B 2E 51 BC 5F 71 98 E3 7F 82 BC 07 CA EF BF BE DB 73 D7
Set RTS disable, check CTS: 0 ok
Set RTS enable, check CTS: 1 ok
Set DTR disable, check DSR: 0 ok
Set DTR enable, check DSR: 1 ok
read DCD: 0, ok
read DSR: 1, ok
read CTS: 1, ok
read RI: 0, ok
root@code-ms7c82:/home/code/ddd/old/hpeter/fintek/docker/fintek_api/fintek_api#
```

## 4.9 FAN control

- Please reference the function Fan\_demo() within demo code “demo\_fan.c” for the detail.
- The following demo code should run with privileged user (root).
- The fan is divided into "auto fan" and "manual." Please confirm that the mode is **switched to "manual"** in order to control the fan using Raw values.

### 4.9.1. FAN API example

See demo code “demo\_fan.c”

### 4.9.2. FAN example with demo\_fan on F81866

Example1. Get Fan0 RPM value

```
./demo_fan 0 0 0
```

Example2. Get F81866 max fan count

```
./demo_fan 0 1 0
```

Example3. Get Fan0 Raw value

```
./demo_fan 1 0 0
```

Example4. Set Fan0 with Raw value 100

```
./demo_fan 2 0 0 100
```

Example5. Get Fan0 fan mode

```
./demo_fan 3 0 0
```

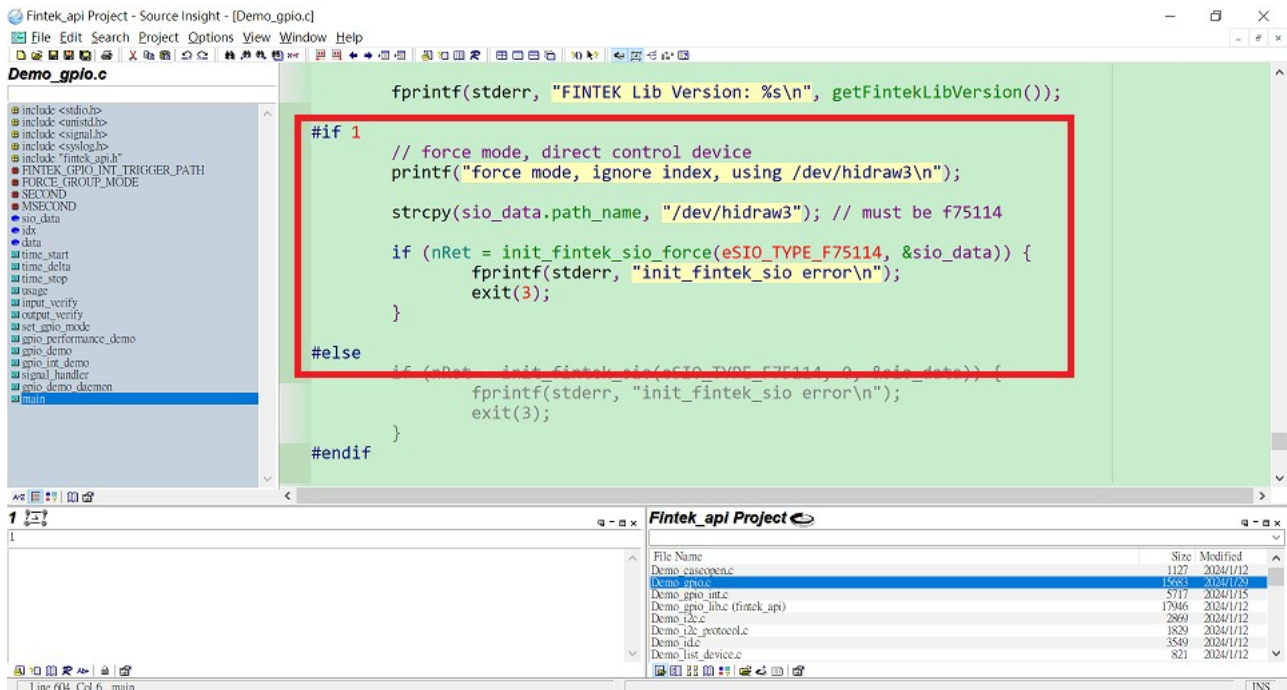
Example6. Set Fan0 fan mode to Auto RPM mode

```
./demo_fan 4 0 0 0
```

## 4.10 Directly control device via init\_fintek\_sio\_force()

In some situations, we need to control device directly likes in “Docker” or some limited containers. We can use `init_fintek_sio_force()` instead of `init_fintek_sio()` to control physic device like `/dev/hidraw3` and export the device node to container. The following example will use F75114 (`/dev/hidraw3`) & `demo_gpio.c` with Docker.

1. Modify `demo_gpio.c` to change enumeration to force mode.\



```

Fintek_api Project - Source Insight - [Demo_gpio.c]
File Edit Search Project Options View Window Help

Demo_gpio.c
include <stdio.h>
include <unistd.h>
include <signal.h>
include <syslog.h>
include "fintek_api.h"
Fintek_GPIO_INT_TRIGGER_PATH
FORCE_GROUP_MODE
SECOND
MSECOND
sio_data
idx
data
time_start
time_delta
time_stop
usage
input_verify
output_verify
set_gpio_mode
gpio_performance_demo
gpio_demo
gpio_int_demo
signal_handler
gpio_demo_daemon
main

fprintf(stderr, "FINTEK Lib Version: %s\n", getFintekLibVersion());

#if 1
// force mode, direct control device
printf("force mode, ignore index, using /dev/hidraw3\n");

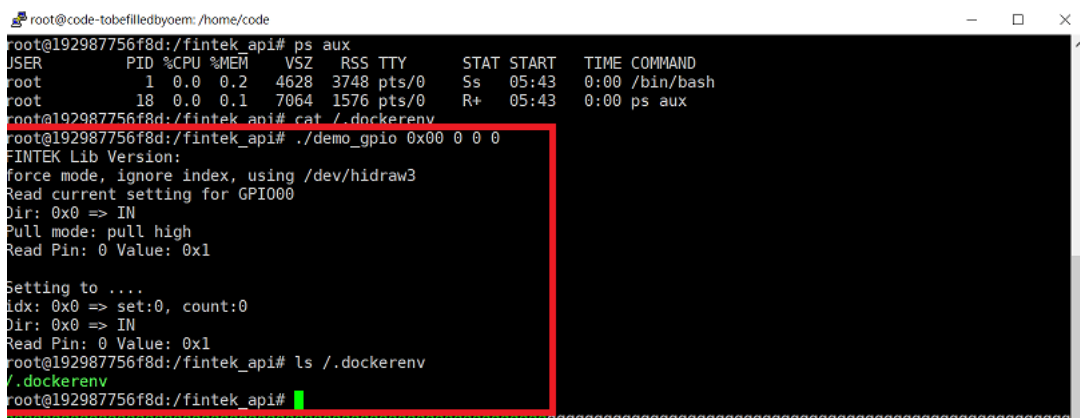
strcpy(sio_data.path_name, "/dev/hidraw3"); // must be f75114

if (nRet = init_fintek_sio_force(eSIO_TYPE_F75114, &sio_data)) {
    fprintf(stderr, "init_fintek_sio error\n");
    exit(3);
}

#else
// (Not) init_fintek_sio(eSIO_TYPE_F75114, 0, &sio_data) {
    fprintf(stderr, "init_fintek_sio error\n");
    exit(3);
}

#endif
    
```

2. rebuild the `demo_gpio.c` with “make”.
3. `docker pull ubuntu:22.04`
4. `docker run -it --device=/dev/hidraw3 -v <dir_to_fintek_lib>:/fintek_api ubuntu:22.04 /bin/bash`
5. run `“/fintek_api/demo_gpio 0x00 0 0 0”` to get gpio mode.



```

root@code-tobefilledbyoem:/home/code
root@192987756f8d:/fintek_api# ps aux
USER      PID %CPU %MEM    VSZ   RSS TTY      STAT START   TIME COMMAND
root         1  0.0  0.2  4628  3748 pts/0    Ss   05:43   0:00 /bin/bash
root       18  0.0  0.1  7064  1576 pts/0    R+   05:43   0:00 ps aux
root@192987756f8d:/fintek_api# cat /.dockerenv
root@192987756f8d:/fintek_api# ./demo_gpio 0x00 0 0 0
FINTEK Lib Version:
force mode, ignore index, using /dev/hidraw3
Read current setting for GPIO00
Dir: 0x0 => IN
Pull mode: pull high
Read Pin: 0 Value: 0x1

Setting to ....
idx: 0x0 => set:0, count:0
Dir: 0x0 => IN
Read Pin: 0 Value: 0x1
root@192987756f8d:/fintek_api# ls /.dockerenv
/.dockerenv
root@192987756f8d:/fintek_api#
    
```

## 4.11 Temperature

- Please reference the function `Temperature_demo()` within demo code “demo\_temperature.c” for the detail.
- The following demo code should run with privileged user (root).
- The current support includes reading the temperature from index 0, index 1, and index 2.

### 4.11.1. Temperature API example

See demo code “demo\_temperature.c”

### 4.11.2. FAN example with demo\_fan on F81866

Example1. Get Temperature index 0 value

```
./demo_temperature 0
```