ILITEK
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Linux I²C
Touch Device Driver

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1. Introduction

This document introduces how the touch panel driver with i2c works on different platforms, the guide of porting, and some configurations may be set up before users porting it on its own device. This version of driver integrates the supports on several platforms such as Qualcomm, MTK, Rockchip, which are all defined on the header file ***ilitek_ts.h***. Users can choose one of them by replacing the macro's name depending on their platform, as figer 1. Note that users should be aware of the differences in their Makefile while they are modifying the define.

```
00065: #define ILITEK_PLAT_QCOM                1
00066: #define ILITEK_PLAT_MTK                 2
00067: #define ILITEK_PLAT_ROCKCHIP            3
00068: #define ILITEK_PLAT_ALLWIN              4
00069: #define ILITEK_PLAT_AMLOGIC             5
00070:
00071: #define ILITEK_PLAT                     ILITEK_PLAT_QCOM
00072:
```

Figer 1. The definiation of platform in ***ilitek_ts.h***

The type of support Touch IC	ILI231X、ILI251X、Lego series
I2C Slave address (7 bits)	0x41
Upgrade firmware automatically at boot stage	It shoule be included the header file named "ilitek_fw.h", or used bin file
Support platforms	Qualcomm, Rockchip, MTK (with DTS), Allwinner, Amlogic. (without the list, users might port the driver with the define of QCOM on their platforms.)

2. File description

This section describes the purpose of each files in the driver.

2.1 ilitek_ts.h

Provide customer modifications . It includes common definations, declation, and macros for each C files. Most of macros used to enable some functions or features are located on the header file.

2.2 ilitek_common.h

It includes common definations, declation, and macros for each C files. Most of macros used to enable some functions or features are located on the header file.

2.3 ilitek_platform_init.c

It places board information, registering i2c device driver with kernel and callback probe function once i2c device been detected.

2.4 ilitek_main.c

Most of main features with Touch IC and other settings related to the input events and suspend/resume are implmeneted in this C file.

2.5 ilitek_update.c

The C file deals with the process of upgrade firmware.

2.6 ilitek_tool.c

It is mainly used to communicate with user space by its device nodes for debugging, commanding, or looking up information from touch ICs.

2.7 ilitek_protocol.c

It is extern functions and ilitek protocol.

3. Porting Guide

This section guides users how they use the driver poring on their own platforms. Note that the scenarios described on below might be different based on kernel version, board configurations or other specific requirements. The following is just common steps which are all verified.

1. Copy the directory of this driver into the path ***kernel/drivers/input/touchscreen/.*** It might be different based on platform's request.Normally we move the driver into the above folder.
2. Add the path of our driver into kernel Makefile, which locates as follows:

kernel/drivers/input/touchscreen/Makefile.

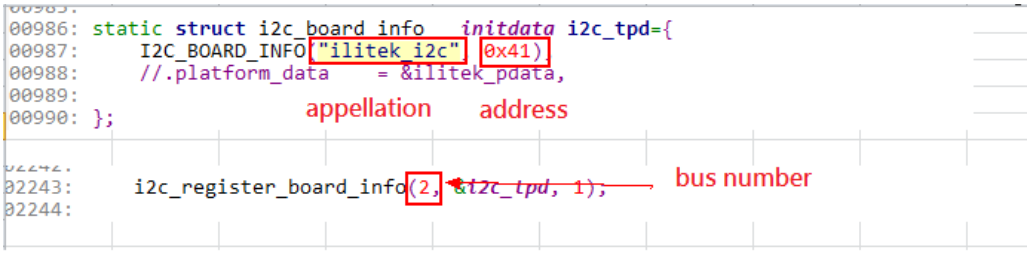
```
obj-$(CONFIG_TOUCHSCREEN_TPS6507X)  += tps6507x-ts.o
obj-$(CONFIG_TOUCHSCREEN_VTL_CT36X) += vtl_ts/
obj-y += ilitek_lim/
```

Once it has been done, the driver will be compiled by kernel as built-in. It can also be defined in Kconfig configured by menuconfig if users prefer to do it.

3. According to the different platform that should select the corresponding compiler as below:

```
obj-y += ilitek_main.o \
 ilitek_platform_init.o \
 ilitek_update.o \
 ilitek_tool.o \
 ilitek_protocol.o
```

4. The next following step is the most important when it comes to port our driver on a platform. The first thing users should make sure is what the method is used to configure I2C bus and gpios on their platform certainly. In general, there are divided into two ways where allow users to modifiy several hardware settings. If users's platform is set up by board configuration, the borad file is then nomally placed on the path *"linux/arch/arm/mach-xxx/board-xxx.c".* The following figure, for example, shows that how we did configuration with i2c bus in kernel on customer's platform:



On the other hand, if users's platform is configrued by DTS, they may then find the dts file that is normally located at *"linux/arch/arm/boot/dts/xxx-xxx.dts"* to write ther own settings. More importantly, Users must know which of I2C buses number appied on and INT/Reset pin used on TP device on their platform before adding the information in .dts.

```
ilitek@41 {
    compatible = "tchip,ilitek";
    reg = <0x41>;
    interrupt-parent = <&msm_gpio>;
    interrupts = <13 0x0>;
    vdd-supply = <&pm8916_l17>;
    vcc_i2c-supply = <&pm8916_l6>;
    ilitek,irq-gpio = <&msm_gpio 13 0x0>;
    ilitek,reset-gpio = <&msm_gpio 12 0x0>;
    ilitek,vbus = "vcc_i2c";
    ilitek,vdd = "vdd";
    ilitek,name = "ilitek_i2c";
};
```

4. Description of macros and defines in head file

4.0 Driver version information

It doesn't need to revise the first code(DERVER_VERSION_MAJOR)

#define DERVER_VERSION_MAJOR	5
#define DERVER_VERSION_MINOR	8
#define CUSTOMER_ID	0
#define MODULE_ID	0
#define PLATFORM_ID	0
#define PLATFORM_MODULE	0
#define ENGINEER_ID	0

4.1 Support which of platforms

#define ILITEK_PLAT_QCOM	1
#define ILITEK_PLAT_MTK	2
#define ILITEK_PLAT_ROCKCHIP	3
#define ILITEK_PLAT_ALLWIN	4
#define ILITEK_PLAT_AMLOGIC	5
#define ILITEK_PLAT	ILITEK_PLAT_QCOM

As said before, these macros are confirmed to the driver which of probe functions it should run on. If users could not find their platform on the list, they may then define ILITEK_PLAT_QCOM as alternative.

4.2 Tool with debug

```
#define ILITEK_TOOL
```

It is enabled for the tool with debug.

4.3 Firmware tunning message

```
#define ILITEK_TUNING_MESSAGE
```

It is enabled for the firmware dumping its debug messeages.

4.4 ESD protection

```
#define ILITEK_ESD_PROTECTION
```

It is used to protect ESD happening if it's enabled.

4.5 Mutiple-touch protocol in Linux

```
#define ILITEK_TOUCH_PROTOCOL_B
```

It tells Linux kernel to either use protocol B, or protocol A to interpret the packet of finger report from firmware.

4.6 Register the switch of input device pressure

```
//#define ILITEK_REPORT_PRESSURE
```

It's defined is off.

4.7 LCM resolution

```
#define ILITEK_USE_LCM_RESOLUTION
```

It tells driver whether to use LCM resolution while registering input subsystem.

4.8 MTK config

```
//define MTK_UNDTS
```

If use MTK platform no use dts and for mtk old version.

4.9 Rotate axises

```
#define ILITEK_ROTATE_FLAG      0
```

It will rotate the axis of X and Y with finger report, just setting it as non-zero it would be enabled.

4.10 Revert axis of X

```
#define ILITEK_REVERT_X         0
```

If it is set as non-zero, the value of axis of X will be changed from maximum to minimum, or from minimum to maximum.

4.11 Revert axis of Y

```
#define ILITEK_REVERT_Y         0
```

If it is set as non-zero, the value of axis of Y will be changed from maximum to minimum, or from minimum to maximum.

4.12 The width of the touch screen

```
#define TOUCH_SCREEN_X_MAX   (1080)
```

This is the resolution setting, this setting must be set correctly when ILITEK_USE_MTK_INPUT_DEV or ILITEK_USE_LCM_RESOLUTION is activated in MTK platform.

4.13 The height of the touch screen

```
#define TOUCH_SCREEN_Y_MAX      (1920)
```

This is the resolution setting, this setting must be set correctly when ILITEK_USE_MTK_INPUT_DEV or ILITEK_USE_LCM_RESOLUTION is activated in MTK platform.

4.14 Regulator power

#define ILITEK_ENABLE_REGULATOR_POWER_ON

If it is enabled, the driver uses the function of regulator provided by kernel to control TP's voltage.

4.15 GPIO numbers

#define ILITEK_GET_GPIO_NUM

Enabling the macros the driver calls kerne's macro (of_get_named_gpio) to get GPIO numbers defined on .dts and apply them to the two variables (ILITEK_RESET_GPIO, ILITEK_IRQ_GPIO) as correct gpio number. If it is disabled, users should then fill the gpio number in the variables by themselves.

4.16 The behavior of gesture wake up

#define ILITEK_CLICK_WAKEUP	0
#define ILITEK_DOUBLE_CLICK_WAKEUP	1
#define ILITEK_GESTURE_WAKEUP	2
#define ILITEK_GESTURE	ILITEK_CLICK_WAKEUP

1. Sing-click wake up (by driver), which is mainly used to SA Large.
2. Double-click wake up (by drive), which is mainly used to SA Large
3. Gesture wake up (by firmware), which is mainly used to SA Small
4. Acoording to the above define, it tells driver that which of behaviors should react when it comes to gesture wake up.

4.17 The distance of double click

#define DOUBLE_CLICK_DISTANCE	1000

The distance setting between two points of double click.

4.18 The intervals of double click

#define DOUBLE_CLICK_ONE_CLICK_USED_TIME	800

To set the intervals between the first and second click.

4.19 Power saving mode

#define DOUBLE_CLICK_NO_TOUCH_TIME	1000
#define DOUBLE_CLICK_TOTAL_USED_TIME (DOUBLE_CLICK_NO_TOUCH_TIME + (DOUBLE_CLICK_ONE_CLICK_USED_TIME * 2))	
#define ILITEK_SLEEP	0
#define ILITEK_POWEROFF	1
#define ILITEK_LOW_POWER	ILITEK_SLEEP

The power saving mode when system sleeping. Please set ILITEK_LOW_POWER to ILITEK_SLEEP if using ILITEK power saving mode; set ILITEK_LOW_POWER to ILITEK_POWEROFF if system sleeping uses power off mode.

4.20 Upgrade firmware at boot stage

#define ILITEK_UPDATE_FW

The process of upgrade firmware will run on booting time if it is enabled. Since the function requires a particular header file to be included, it might be disabled before every thing has been tuned in priority.

4.21 The length setting of raw data

#define RAW_DATA_TRANSGER_LENGTH	1024

The length setting of raw data that Lego serials read, if you use ILI213X, please set this value as 256.

4.22 The length setting of upgrading firmware

#define UPGRADE_LENGTH_BLV1_8	2048

The length setting that Lego serials upgrade the firmware. It's default value is 2048.

4.23 Chrome OS

#define CHROME_OS

Update setting for Chrome OS, the default setting is enable.

4.24 Check INT status

#define ILI_UPDATE_BY_CHECK_INT

Some of specific Touch ICs (Ex. ILI2302/ILI2312) have the ability to speed up the process of upgrade firmware. Enabling the macro the driver will check the status of INT and sending next data if INT is being polled low or high (means that touch IC is ready or not).

4.25 Upgrade firmware with bin file

#define ILITEK_UPGRADE_WITH_BIN	0

The file we use to upgrade firmware has two formats, .hex and .bin. Once users enable the macros, they should specify the name and the path where locates the .bin file.

4.26 LCM reslution

#define TOUCH_SCREEN_X_MAX	(1080)	//LCD_WIDTH
#define TOUCH_SCREEN_Y_MAX	(1920)	//LCD_HEIGHT

If users have enabled the macro *ILITEK_USE_LCM_RESOLUTION* on their system, or enabled *ILITEK_USE_MTK_INPUT_DEV* on MTK platform , those two macros should be enabled and set them correctly.

4.27 Input device for MTK

#define ILITEK_USE_MTK_INPUT_DEV

Since on MTK platforms they usually use its own input structure to regitster with kernel, it will use *tpd->dev* to register input subsystem in kernel.

4.28 The level of debug message

#define ILITEK_ERR_LOG_LEVEL	(1)
#define ILITEK_INFO_LOG_LEVEL	(3)
#define ILITEK_DEBUG_LOG_LEVEL	(4)
#define ILITEK_DEFAULT_LOG_LEVEL	(3)

For the MTK platform that doesn't need to analysis the **reset** and the **irq** corresponding pin would disable the ILITEK_GET_GPIO_NUM.Notice that both of the ILITEK_RESET_GPIO and ILITEK_IRQ_GPIO are corresponding values.

The level represents the number as ERR, INFOR and DEBUG, respectively. Users can adjust the number to see the corresponding debug message.

```
#define debug_level(level, fmt, arg...) do {\
        if (level <= ilitek_log_level_value) {\
                if (level == ILITEK_ERR_LOG_LEVEL) {\
                        printk(" %s ERR   line = %d %s : "fmt, "ILITEK", __LINE__, __func__, ##arg);\
                }\
                else if (level == ILITEK_INFO_LOG_LEVEL) {\
                        printk(" %s INFO line = %d %s : "fmt, "ILITEK", __LINE__, __func__, ##arg);\
                }\
                else if (level == ILITEK_DEBUG_LOG_LEVEL) {\
                        printk(" %s DEBUG line = %d %s : "fmt, "ILITEK", __LINE__, __func__, ##arg);\
                }\
        }\
} while (0)

#define tp_log_err(fmt, arg...) debug_level(ILITEK_ERR_LOG_LEVEL, fmt, ##arg)
#define tp_log_info(fmt, arg...) debug_level(ILITEK_INFO_LOG_LEVEL, fmt, ##arg)
#define tp_log_debug(fmt, arg...) debug_level(ILITEK_DEBUG_LOG_LEVEL, fmt, ##arg)
```

The log could print the related documents, the Level setting and tp_log_err, tp_log_info, tp_log_debug which were corresponded. ILITEK_DEFAULT_LOG_LEVEL had preset the printing level, if the level which less than or equal to the preset level, then it will print. The key word of the logs is "ILITEK".

5. Description of main functions

This section introduces important functions related to platform's settings and some tips are also included.

#define ILITEK_CLICK_WAKEUP

5.1 ilitek_power_on

This function will be called when ILITEK_ENABLE_REGULATOR_POWER_ON is enabled. Note that the member *vdd* and *vdd_i2c* of structure *ilitek_data* should be set according to the requirement of platform.

5.2 ilitek_get_gpio_num

This function gets the gpio of INT and RESET from the two macros, ILITEK_IRQ_GPIO and ILITEK_RESET_GPIO, which will be appied automatically if platforms use .dts as configuration.

5.3 ilitek_request_gpio

This function requests gpio number that users have been set on kernel. The output of reset will be highe and irq as input when the request is accepted. The operations of gpio might be different with platforms. It had found the tpd_gpio_ouput in MTK platform couldn't pull high and pull low normally. Then it could change to use the gpio_direction_output.

```
void ilitek_reset(int delay) {
    tp_log_info("delay = %d\n", delay);
    if (ilitek_data->reset_gpio > 0) {
    #if ILITEK_PLAT != ILITEK_PLAT_MTK
        gpio_direction_output(ilitek_data->reset_gpio,1);
        mdelay(10);
        gpio_direction_output(ilitek_data->reset_gpio,0);
        mdelay(10);
        gpio_direction_output(ilitek_data->reset_gpio,1);
        mdelay(delay);
    #else
        tpd_gpio_output(ilitek_data->reset_gpio, 1);
        mdelay(10);
        tpd_gpio_output(ilitek_data->reset_gpio, 0);
        mdelay(10);
        tpd_gpio_output(ilitek_data->reset_gpio, 1);
        mdelay(delay);
    #endif
    }
    else {
        tp_log_err("reset pin is invalid\n");
    }
    return;
}
```

5.4 ilitek_reset

The duration of delay of polling reset pin from low to high needs larger than the initial time of touch IC. The

function of *tpd_gpio_output (or other customered function)* may cause this action unexpection, so users should ensure that the haward reset works correctly.

5.5 ilitek_read_tp_info

1. Set ilitek_repeat_start to false when it is judged that the IC is ILI2511.

2. For large-size ICs, when the 0xC0 command reads 0x55 (that is, BL mode), the flag of the forced upgrade will be set, forcing the upgrade flag:ilitek_data->force_update.

3. The keyinfo of the button information is set to a size of 10, and when the number of keys is greater than 10, the size of the member keyinfo needs to be modified in the struct ilitek_ts_data structure.

```
static int ilitek_request_irq(void)
#if ILITEK_PLAT != ILITEK_PLAT_MTK
        ilitek_data->client->irq    = gpio_to_irq(ilitek_data->irq_gpio);
#else
        node = of_find_matching_node(NULL, touch_of_match);
        if (node) {
                ilitek_data->client->irq = irq_of_parse_and_map(node, 0);
        }
#endif
```

Notice the irq number,if the number has the special setting in the platform.Note the interrupt number which is got by modified the structure.

5.6 ilitek_request_irq(void)

Users should be aware of the correction of irq gpio number given by kernel.

6. Function description

Power on upgrade function

1. **Turn on the ILITEK_UPDATE_FW macro control**
2. **If you use ili file, you need to provide ili file to use this function.**
3. **Whether to upgrade the judgment method**

```
tp_log_info("ilitek df_startaddr=0x%X, df_endaddr=0x%X, df_checksum=0x%X, df_len = 0x%d\n", df_startaddr, df_endaddr, df_checksum, df_l
if (!(ilitek_data->force_update)) {
    for (i = 0; i < 8; i++) {
        tp_log_info("ilitek_data.firmware_ver[%d] = %d, firmware_ver[%d] = %d\n", i, ilitek_data->firmware_ver[i], i, firmware_ver[i]);
        if (firmware_ver[i] < ilitek_data->firmware_ver[i]) {
            i = 8;
            break;
        }
        if (firmware_ver[i] > ilitek_data->firmware_ver[i]) {
            break;
        }
    }
    if (i >= 8) {
        if (!ilitek_data->ic_2120) {
            tp_log_info("firmware version is older so not upgrade\n");
        }
        else {
            tp_log_info("firmware version is same so not upgrade\n");
            if (ILITEK_UPGRADE_WITH_BIN) {
                if (CTPM_FW_BIN) {
                    vfree(CTPM_FW_BIN);
                    CTPM_FW_BIN = NULL;
                }
            }
        }
        return 1;
    }
} ? end if !(ilitek_data->force_... ?
```

4. Upgrade flow selection

```
if ((ilitek_data->mcu_ver[0] == 0x11 || ilitek_data->mcu_ver[0] == 0x10) && ilitek_data->mcu_ver[1] == 0x25) {
    df_startaddr = 0xF000;
    ret = ilitek_upgrade_2511(df_startaddr, df_endaddr, ap_startaddr, ap_endaddr, CTPM_FW);
    if (ret < 0) {
        tp_log_err("ilitek_upgrade_2511 err ret = %d\n", ret);
        //goto Retry;
    }
} else {
    df_startaddr = 0x1F000;
    if (df_startaddr < df_endaddr) {
        ilitek_data->has_df = true;
    } else {
        ilitek_data->has_df = false;
    }
    ret = ilitek_upgrade_2302or2312(df_startaddr, df_endaddr, df_checksum, ap_startaddr, ap_endaddr, ap_checksum, CTPM_FW);
    if (ret < 0) {
        tp_log_err("ilitek_upgrade_2302or2312 err ret = %d\n", ret);
        //goto Retry;
    }
}
```

5. Gesture function

#define ILITEK_CLICK_WAKEUP 0 // Single touch on wake up

#define ILITEK_DOUBLE_CLICK_WAKEUP 1 //Double clock on wake up

#define ILITEK_GESTURE_WAKEUP 2 //It FW set wake up

Turn on this feature to ensure that the TP is not powered off during sleep.

For large inch size used double click to wake up the parameter description:

#define ILITEK_GESTURE ILITEK_CLICK_WAKEUP//Click to wake up

#define ILITEK_GESTURE ILITEK_DOUBLE_CLICK_WAKEUP//Double click to wake up

#define DOUBLE_CLICK_DISTANCE 1000 // Maximum distance of double click coordinates.

#define DOUBLE_CLICK_ONE_CLICK_USED_TIME 800 // The longest time spent on frist click

#define DOUBLE_CLICK_NO_TOUCH_TIME 1000 // Interval between the second click.

#define DOUBLE_CLICK_TOTAL_USED_TIME (DOUBLE_CLICK_NO_TOUCH_TIME + (DOUBLE_CLICK_ONE_CLICK_USED_TIME * 2)) // Double click total time

For the upper layer system carry on setting the gesture in the path of /sys/touchscreen/gesture whether it enable or not. The implementation as below:

```
00191: #ifdef ILITEK_GESTURE
00192: static ssize_t ilitek_gesture_show(struct device *dev,
00193:     struct device_attribute *attr, char *buf) {
00194:     if (ilitek_data->enbale_gesture) {
00195:         return sprintf(buf, "gesture: on\n");
00196:     }
00197:     else {
00198:         return sprintf(buf, "gesture: off\n");
00199:     }
00200: }
00201: static ssize_t ilitek_gesture_store(struct device *dev,
00202:     struct device_attribute *attr, const char *buf, size_t size) {
00203:     if (buf[0]) {
00204:         ilitek_data->enbale_gesture = true;
00205:     }
00206:     else {
00207:         ilitek_data->enbale_gesture = false;
00208:     }
00209:     return size;
00210: }
00211: static DEVICE_ATTR(gesture, S_IRWXUGO, ilitek_gesture_show, ilitek_gesture_store);
00212: #endif
```

※if you want to read the status of gesture ,could read from /sys/touchscreen/gesture

※ set the first byte which is 0 means disable otherwise is enable the gesture function in /sys/touchscreen/gesture

6. **Using the command line to swich mode**,just support the protocol version upper than 3.4.0..

   1.1 cat /proc/ilitek/ setmode_0

   Switch mode 0.

   1.2 cat /proc/ilitek/ setmode_1

   Switch mode 1.

   1.3 cat /proc/ilitek/ setmode_2

   Switch mode 2.

7. **ESD Detection**

   The macro control as below:

   #define ILITEK_ESD_PROTECTION //Default diable

   If you enable the macro then it will create the work column that will detect whether the IC work normally or not at time intervals. If the Touch controller work abnormally then that do the reset(or add the turn on and turn off), it could modify the time intervals by the ilitek_data->esd_delay.

   Preset the detection method: command to read data (preset is 0x42 then it will get the protocol) that will retry three times.If it fail thrice then it will be reset by the follow:

```
00375: static void ilitek_esd_check(struct work_struct *work) {
00376:     int i = 0;
00377:     unsigned char buf[4]={0};
00378:     tp_log_info("enter.......\n");
00379:     if(ilitek_data->operation_protection){
00380:         tp_log_info("ilitek esd ilitek_data->operation_protection is true SO not check\n");
00381:         goto ↓ilitek_esd_check_out;
00382:     }
00383:     ilitek_data->operation_protection = true;
00384:     buf[0] = ILITEK_TP_CMD_GET_PROTOCOL_VERSION;
00385:     if(ilitek_data->esd_check){
00386:         for (i = 0; i < 3; i++) {
00387:             if(ilitek_i2c_write_and_read(buf, 1, 0, buf, 2) < 0){
00388:                 tp_log_err("ilitek esd  i2c communication error \n");
00389:                 if ( i == 2) {
00390:                     tp_log_err("esd i2c communication failed three times reset now\n");
00391:                     break;
00392:                 }
00393:             }
00394:             else {
00395:                 if (buf[0] == 0x03) {
00396:                     tp_log_info("esd ilitek_ts_send_cmd successful, response ok\n");
00397:                         goto ↓ilitek_esd_check_out;
00398:                 }
00399:                 else {
00400:                     tp_log_err("esd ilitek_ts_send_cmd successful, response failed\n");
00401:                     if ( i == 2) {
00402:                         tp_log_err("esd ilitek_ts_send_cmd successful, response failed three times reset now\n");
00403:                         break;
00404:                     }
00405:                 }
00406:             }
00407:         } ? end for i=0;i<3;i++ ?
00408:     } ? end if ilitek_data->esd_check ?
```

8. Upgrade FW by command line

1. Set the FW path,refer to the following operation:

   echo “/data/local/tmp/2511dftest.hex” > /proc/ilitek/update_firmware

   “/data/local/tmp/2511dftest/hex” is corresponding path and file name. The recommend path is /data/local/tmp/ there are often have many rights to operate. In here, we use the hex file to upgrade.

2. cat/proc/ilitek/update_firmware

   If it upgrade successfully that will show the message as below:

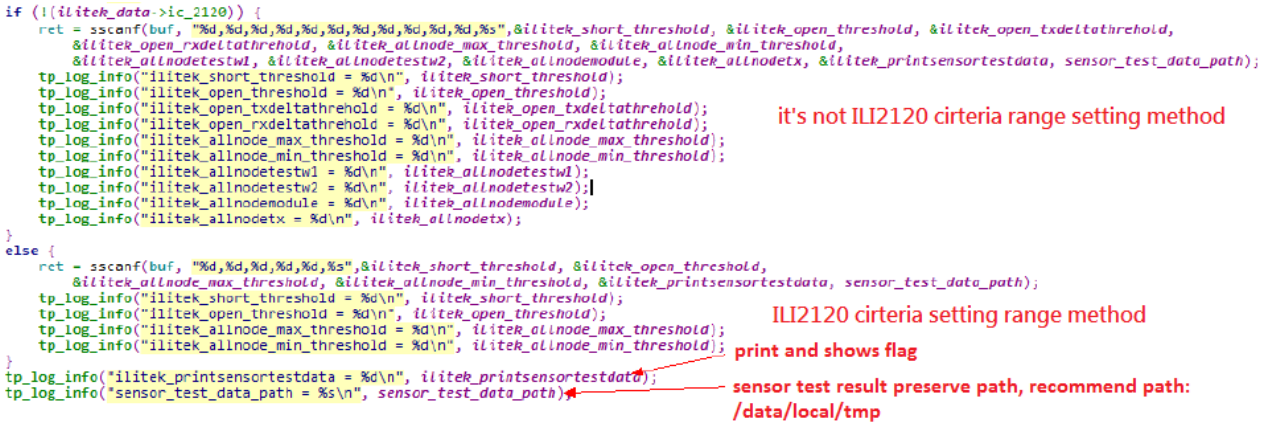
   Upgrade successful ilitek firmware versiom is 6.0.0.0.1.2.255.255

9. Sensor Test by command line

1. Operate the read command in cat/proc/ilitej/sensor_test_data or upper layer path directly then that can do the sensor test(used the default criteria) after that. It will send the message as following:

It will preserve the data in the “/data/local/tmp/” at the same time. Then it named after “ilitek_sensortest”.

2. Setting the cirteria range, preserving path and data shows flag



Reference:

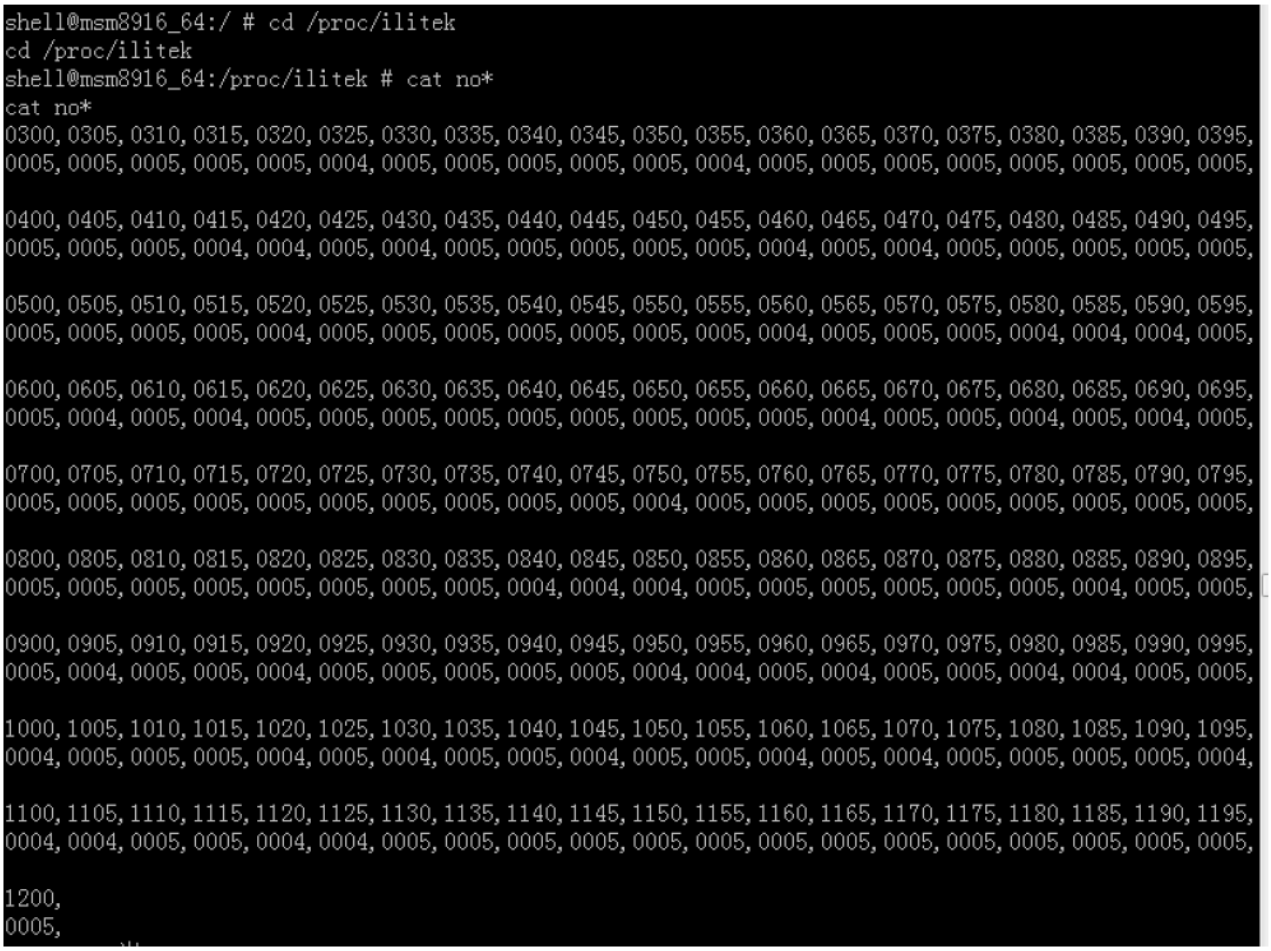
```
echo 7,400,120,120,4800,3700,120,120,20,20,1,/data/local/tmp/ > /proc/ilitek/sensor_test_data
```

3. For the method which been used in upper layer, it could read only 5 bytes context in upper layer. That can determine the testing is pass or fail by the context which had been read.

```
if (short_test_result == 0 && open_test_result == 0 && allnode_test_result ==0) {
        seq_printf(m, "pass\n");
}
else {
        seq_printf(m, "fail\n");
}
```

10.NoiseFre function

1. Excute the Operate the read command in cat/proc/ilitek/noisefre_data directly(Use the default parameters).It will sent the message as below:



2. Revise the starting and ending frequency and hopping step, please follow the procedures below:

```
echo 30,120,5,/data/local/tmp/ > /proc/ilitek/noisefre_data
```

30,120,5,/data/local/tmp/ ➔ **Starting , Ending frequency, step and result preserved path**

11.For the Medium and Larg inch size debug message method is ACII code and check the debug message directly.

1. **echo dbg_flag>/proc/ilitek_debug** //this command used to enable or disable the function flag
2. **cat/proc/ilitek_debug** //if it be excuted, then the debug message will be printed.
3. If you don't want to see the debug message, don't forget to command the**"echo dbg_flag>/proc/ilitek_debug"** again.

12.Get the firmware version

Command the cat/proc/ilitek/firmware_version directly, then it will sent the message as below:

ilitek firmware version is 6.0.0.0.1.2.255.255

For the demand which get the FW version in the upper layer application that could execute by the command line or **/sys/touchscreen/firmware_version.**

7. Troubleshooting

7.1 Probe function will not be called by kernel

Users should look up the board configuration (located at under *match-xxx/* or *dts/*) to ensure that the settings of I2C Bus number and gpio and their name are correct. For example, on board file, users might check the name of *ILITEK_TS_NAME* that is the same as the name of I2C device registered on kernel. On the other hand, users might also check whether the name of **comptiable** in structure *ilitek_touch_match_table* is the same as the name of **compatiable** in .dts, both of them must be matched.

7.2 I2C communication does not work

First of all, users have to make sure that the I2C bus name and slave address are all correct. Secondly, providing voltage to Touch IC in correct is also a main point to be checked. Finally, if it does not still work, users could use LA to catch the wave of I2C to see what happends on it during ommunication with touch IC.

7.3 Report problems

1. It could touch but the coordinate mapping has some problems.
   i. X、Y should swap -> set the ILITEK_ROTATE_FLAG from 0 to 1 or from 1 to 0.
   ii. X、Y value should mirror change means max change to min ->set the ILITEK_REVERT_X or ILITEK_REVERT_Y from 0 to 1 or from 1 to 0.
   iii.If it need to show the solution, then enable the #define ILITEK_USE_LCM_RESOLUTION this macro, set the TOUCH_SCREEN_X_MAX and TOUCH_SCREEN_Y_MAX correctly at same time.
2. No touch response
   i. Check the interrupt had registered or not, then check the interrupt signal correctly at the same time.
   ii. Check the interrupt response by the log, if it has interrupt response that can print the data which was received in **ilitek_read_data_and_report_3XX** to check whether it is correct or not.
   iii. To capture the active of the INT signal pull high or pull low when we touch, then check it work normally or not.

Revision History

Version No.	Date	Page	Description
0.0.1	2011/03/07	All	Firstly release
0.0.2	2011/05/12	3	Modified driver file name.
0.0.3	2011/09/30	3	Modified version id
0.0.4	2012/11/26	3	Method of adding idc files
0.0.5	2017/07/14	15	Modified driver structure
0.0.0.6	2017/9/12	13	1.support the dts on MTK platform. 2.For the medium and large inch add debug message command. 3.Check the hex file before upgrading the FW. 4.add the mach function for Intel platform
0.0.0.7	2019/5/7	14	Remove ILI2120 function add glove mode control.
0.0.0.8	2019/08/22	19	Remove glove mode control. Add switch modes function
0.0.0.9	2020/5/8	19	1. Added the chrome os define 2. Added the support for the Lego series IC description 3. Added V6 upgrade
0**.0.1.0**	2020/10/15	20	1. Added the setting of low power 2. Added the length setting of raw data 3. Added the length setting for firmware upgrade.