

**ILITek TP IC
Programming Guide
For ILI2520, ILI2521,
ILI2322, ILI2323, ILI2316, ILI2326,
ILI2130, ILI2131, ILI2132**

Version: V1.50

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FW UPGRADE FLOW	錯誤! 尚未定義書籤。
USB FW UPGRADE COMMAND FLOW	錯誤! 尚未定義書籤。
USB FW UPGRADE FLOW CHART	錯誤! 尚未定義書籤。
I2C FW UPGRADE COMMAND FLOW	錯誤! 尚未定義書籤。
I2C FW UPGRADE FLOW CHART	錯誤! 尚未定義書籤。

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1. Introduction

This document describes how to communicate with ILITEK USB or I2C touch solution.

The Human Interface Device (HID) class specification allows designers to create USB-based devices and applications without the need for custom driver development. ILITEK USB Touch Device supports the HID class specification version 1.1. ILITEK USB Touch Device also supports Digitizer drivers for Windows® Touch and pen-based computers for the Windows family of operating systems.

1.1. About this document

It is intended to be used by software engineers to port the I2C driver when using touch modules with ILITEK TP IC.

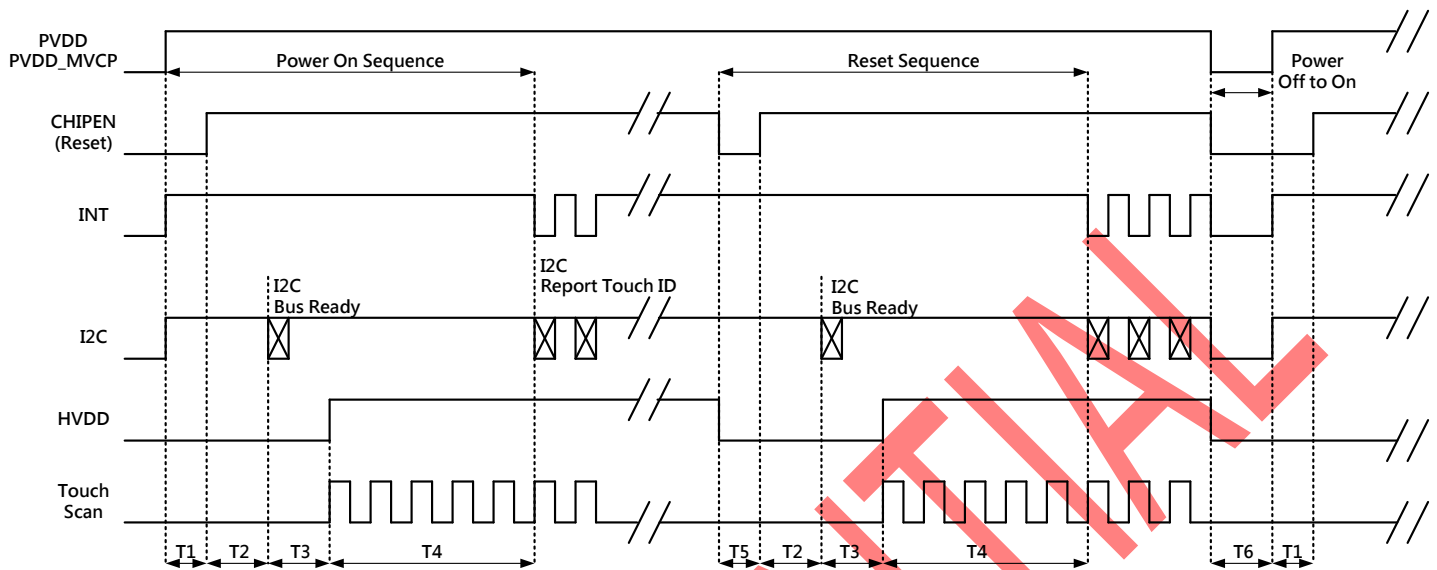
This document assumes that the reader has a basic understanding of the USB specification (including some knowledge of endpoints, descriptors, and transfer protocols) and windows programming.

This document includes the following:

- ◆ Power Sequence
- ◆ I2C Timing
- ◆ Report Format
- ◆ General Command
- ◆ Read CDC Data Flow
- ◆ FW Programming Flow
- ◆ USB Protocol (Descriptors)

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2. Power Sequence

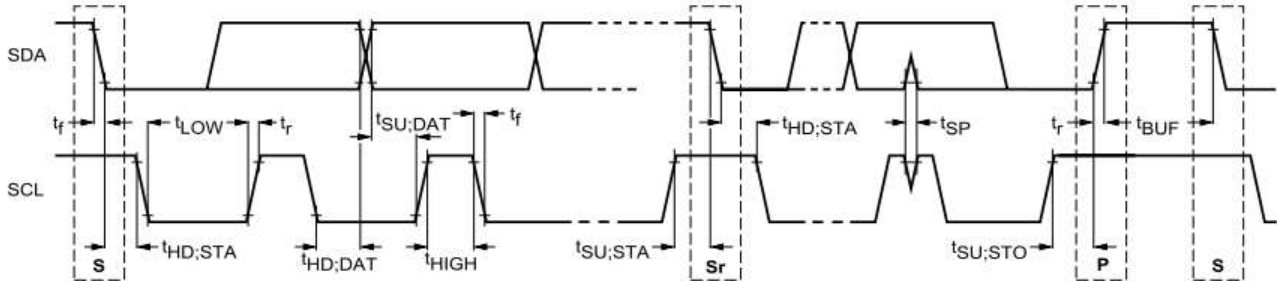


Symbol	Description	Min.	Max.	Unit.
T1	Input Power Supply PVDD, PVDD_MVCP, Power on Reset time. Host need to control Reset time to be larger than 10ms.	10	--	ms
T2	Chip initial time		400	ms
T3	HVDD start up time		300	ms
T4	Chip report Touch ID preparation time		400	ms
T5	Chip Reset and HVDD discharge time. Host need to control Reset time to be larger than 10ms.	10		ms
T6	Input Power Supply PVDD, PVDD_MVCP, and HVDD Power off discharge time. Host need to control discharge time to be larger than 100ms.	100		ms

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3. I2C Timing Specifications

3.1. I2C Timing



The timing of I2C Interface

Characteristics of the SDA and SCL bus lines

Symbol	Parameter	Standard mode			Fast Mode		
		Min	Max	Unit	Min	Max	Unit
f_{SCL}	SCL clock frequency	0	100	kHz	0	400	kHz
$t_{HD,STA}$	Hold time (repeated) START condition. After this period, the first clock pulse is generated	4.0	–	μs	0.6	–	μs
t_{LOW}	LOW period of the SCL clock	4.7	–	μs	1.3	–	μs
t_{HIGH}	HIGH period of the SCL clock	4.0	–	μs	0.6	–	μs
$t_{SU,STA}$	Set-up time for a repeated START condition	4.7	–	μs	0.6	–	μs
$t_{HD,DAT}$	Data hold time	50	–	ns	50	–	ns
$t_{SU,DAT}$	Data set-up time	250	–	ns	100	–	ns
t_r	Rise time of both SDA and SCL signals	–	1000	ns	–	300	ns
t_f	Fall time of both SDA and SCL signals	–	300	ns	–	300	ns
$t_{SU,STO}$	Set-up time for STOP condition	4.0	–	μs	0.6	–	μs
t_{BUF}	Bus free time between a STOP and START condition	4.7	–	μs	1.3	–	μs

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3.2. I2C Interface Data Structure

3.2.1. Device Address

The device addresses are 7-binary bits long and are conventionally expressed as 4 bits followed by 3 bits followed by the letter 'b', 1000 001b. These addresses occupy the high seven bits of an eight-bit field on the bus.

MSB							LSB
1	0	0	0	0	0	1	0/1
Device Address							R/W

7-bit Device Address:
0x41

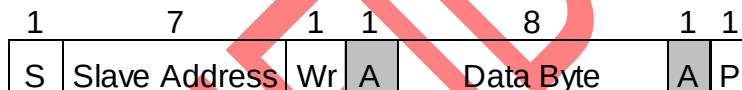
8-bit Device Read
Address: 0x83

8-bit Device Write
Address: 0x82

I2C Device Address

3.2.2. Data Transfer

Data is transferred over the I²C bus with 8-bit address and 8-bit data. The related protocol and timing diagrams are shown as below.



S Start Condition

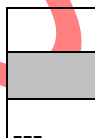
Sr Repeated Start Condition

Rd Read (bit value of 1)

Wr Write (bit value of 0)

A Acknowledge (this bit position may be '0' for an ACK or '1' for a NACK)

P Stop Condition



Master-to-Slave

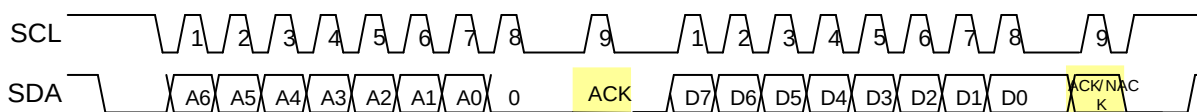
Slave-to-Master

Continue

Generic Transaction Diagram

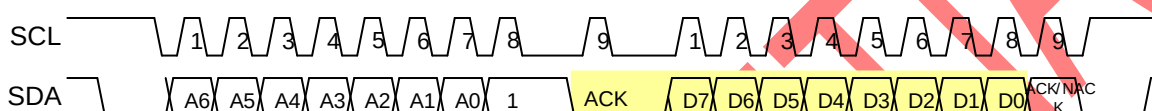
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I2C Write timing



 => slave to master

I2C Read timing



 => slave to master

Byte Write



Byte Write

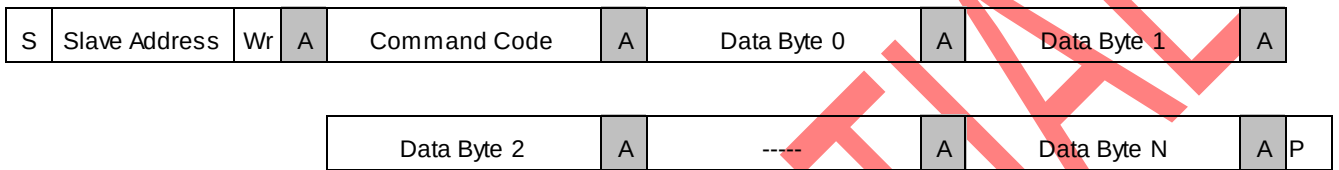
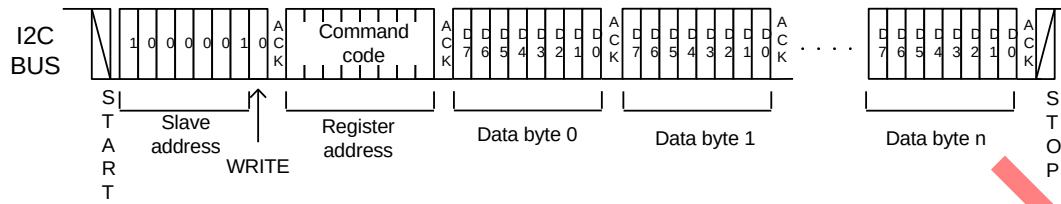
Byte Read



Byte Read

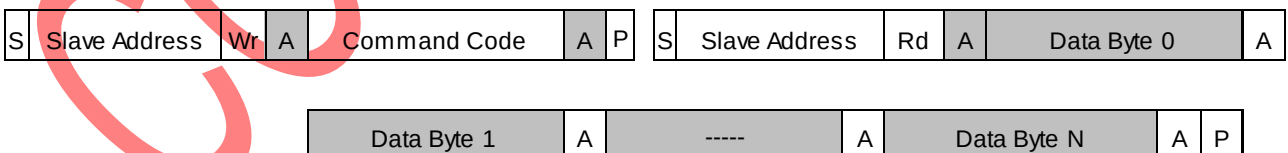
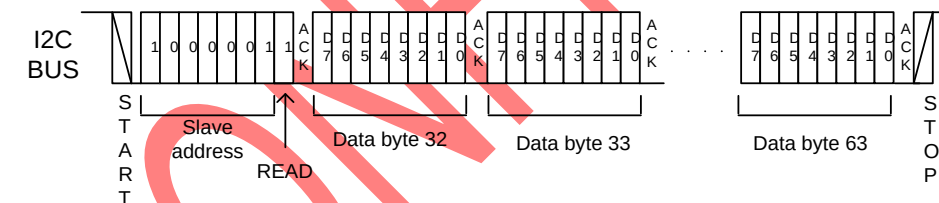
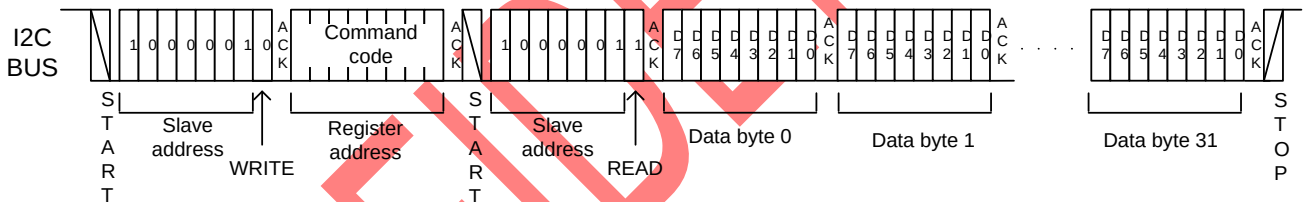
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Multi-Byte Write



Multi-Byte Write

Multi-Byte Read



Multi-Byte Read

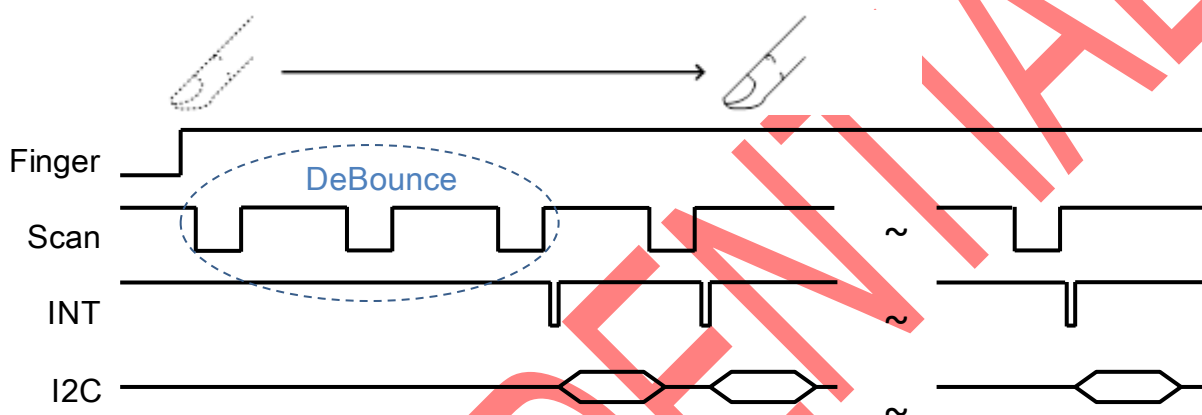
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4. Reports Format

4.1. I2C Report Communication

ILI Touch device use interrupt pin to signal the host when detecting touch events on the sensor. **When a finger touches on the touch sensor surface, the INT pin will be low active.** The Host I2C “Multi-Byte Read” after touch device issues INT to read touch reported data.

Touch device normally take 3 scan frames as DeBounce time.



INT Pin Control Diagram (Finger)

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4.2. USB/I2C Report ID Format

Report ID Format									
Name of Bytes	Description	Bit							
		7	6	5	4	3	2	1	0
1	Tip Switch and Point ID	0	Tip	Point ID					
2	X direction coordinate	X Position (LSB)							
3		X Position (MSB)							
4	Y direction coordinate	Y Position (LSB)							
5		Y Position (MSB)							

4.3. USB/I2C Packet Format

Packet Format		
Name of Bytes	Description	Notes
0	Report ID	I2C=0x48, USB=0x04
1~5	Point_1	Please refer 3.2 Report ID Format
6~10	Point_2	Please refer 3.2 Report ID Format
11~15	Point_3	Please refer 3.2 Report ID Format
16~20	Point_4	Please refer 3.2 Report ID Format
21~25	Point_5	Please refer 3.2 Report ID Format
26~30	Point_6	Please refer 3.2 Report ID Format
31~35	Point_7	Please refer 3.2 Report ID Format
36~40	Point_8	Please refer 3.2 Report ID Format
41~45	Point_9	Please refer 3.2 Report ID Format
46~50	Point_10	Please refer 3.2 Report ID Format
51~60	Reserve	
61	Contact Count	
62	Reserve	
63	Check Sum	

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5. General Command

This chapter defines the command format.

5.1. Definition of Terms

“Host” means the device which is connected with ILITek TP Device. A host is usually a personal computer.

“IN” means ILITek TP Device transfers data to Host.

“OUT” means Host send data to ILITek TP Device.

5.2. Protocol Header for USB Interface

OUT Data Header of USB			
Byte	Name of Bytes	Description	Bit [7:0]
0	Report_ID	USB Report ID	0x03
1	Header	USB Header	0xA3
2	Write_Length	USB Write Data Length	
3	Return_Length	USB Return Data Length	

IN Data Header of USB			
Byte	Name of Bytes	Description	Bit [7:0]
0	Report_ID	USB Report ID	0x03
1	Header	USB Header	0xA3
2	CMD_Code_1	Command Code 1	
3	Return_Length	USB Return_Length	

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5.3. I2C Write Command (USB OUT Report)

USB Host transmitted to the ILITEK TP Device by EP0 Control OUT transfer.

5.3.1.Command List

CMD	Name	Set/Get	Description	Return Data
0x20	Get_Panel_Information	Get	The maximum report value and channel number.	IN_Panel_Information
0x40	Get_Firmware_Version	Get	Firmware version	IN_Firmware_Version
0x61	Get_Kernel_Version	Get	Kernel version	IN_Kernel_Version
0xF0	Mode_Control	Set	Enabled/Disable Test Mode	None
0xF1	Set_CDC_Initial	Set	Initial command for Read all node data.	None
0xF2	Get_CDC_Data	Get	Read data	IN_CDC_Data
0x80	Get_System_Status	Get	Read system busy status	IN_System_Status
0x60	Reset	Set	Whole chip reset	None
0xC0	Get_Mode_Check	Get	Read FW current mode	IN_Mode_Check
0xC1	Set_AP_Mode	Set	Switch FW into AP mode	None
0xC2	Set_BL_Mode	Set	Switch FW into BL mode	None
0xC3	Set_ROM_Code	Set	Write data into ROM	None
0xCC	Set_Flash_Enabled	Set	Unlock and set address of Flash	None
0xC7	Get_AP_CRC	Get	Read AP code CRC	IN_AP_CRC
0xCD	Get_Block_CRC	Get	Read Block code CRC	IN_Block_CRC
0x30	Set_Sleep	Set	Into Sleep Mode	None
0x31	Set_Wakeup	Set	Touch Device Wakeup	None

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5.3.2.Get_Panel_Information

The Host sends “**Get_Panel_Information**” to touch device.

After the touch device receives this command, the touch device responds data with the “IN_Panel_Information” data format.

Direction: OUT

Return Data: [IN_Panel_Information](#)

Byte 0~3 for USB interface only. You should send the command start from byte 4 if you are using I2C interface.

Get Panel Information Command Data Format			
Byte	Name of Bytes	Description	Bit [7:0]
0	Report_ID	USB Report ID	0x03
1	Header	USB Header	0xA3
2	Write_Length	USB Write Data Length	0x01
3	Return_Length	USB Return Data Length	0x0F
4	CMD_Code_1	Command Code 1	0x20
5~63	Reserve	Reserve	N.A

USB Example:

Index	Phase	Data	Description
1	OUT	03 a3 01 0F 20	Get Panel Information
2	IN	03 a3 20 0F 00 40 00 40 43 00 2B 00 0A 00 01 01 00 01 03	interrupt IN to return data

I2C Example:

Index	7-bits Addr	Phase	Data	Description
1	0x41	Write	20	Get Panel Information
2	0x41	Read	00 40 00 40 43 00 2B 00 0A 00 01 01 00 01 03	Host read 15 bytes

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5.3.3.Get_Firmware_Version

The Host sends “**Get_Firmware_Version Command**” to touch device.

After the touch device receives this command, the touch device responds data with the “IN_Firmware_Version” data format.

Direction: OUT

Return Data: [IN_Firmware_Version](#)

Byte 0~3 for USB interface only. You should send the command start from byte 4 if you are using I2C interface.

Get Firmware Version Command Data Format			
Byte	Name of Bytes	Description	Bit [7:0]
0	Report_ID	USB Report ID	0x03
1	Header	USB Header	0xA3
2	Write_Length	USB Write Data Length	0x01
3	Return_Length	USB Return Data Length	0x08
4	CMD_Code_1	Command Code 1	0x40
5~63	Reserve	Reserve	N.A

USB Example:

Index	Phase	Data	Description
1	OUT	03 a3 01 08 40	Get FW Version
2	IN	03 a3 40 08 07 00 00 00 00 00 00 00	interrupt IN to return data

I2C Example:

Index	7-bits Addr	Phase	Data	Description
1	0x41	Write	40	Get FW Version
2	0x41	Read	07 00 00 00 00 00 00 00	Host read 8 bytes

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5.3.4.Get_Kernel_Version

The Host sends “**Get_Kernel_Version Command**” to touch device.

After the touch device receives this command, the touch device responds data with the “IN_Kernel_Version” data format.

Direction: OUT

Return Data: [IN_Kernel_Version](#)

Byte 0~3 for USB interface only. You should send the command start from byte 4 if you are using I2C interface.

Kernel Version Command Data Format			
Byte	Name of Bytes	Description	Bit [7:0]
0	Report_ID	USB Report ID	0x03
1	Header	USB Header	0xA3
2	Write_Length	USB Write Data Length	0x01
3	Return_Length	USB Return Data Length	0x20
4	CMD_Code_1	Command Code 1	0x61
5~63	Reserve	Reserve	N.A

USB Example:

Index	Phase	Data	Description
1	OUT	03 a3 01 20 61	Get FW Version
2	IN	03 a3 61 20 21 25 00 C0 03 02 49 4C 49 32 35 32 31 30 30 31 32 31 35 41 30 30 00 00 00 00 00 00 00 00 00 00 00	interrupt IN to return data

I2C Example:

Index	7-bits Addr	Phase	Data	Description
1	0x41	Write	61	Get FW Version
2	0x41	Read	21 25 00 C0 03 02 49 4C 49 32 35 32 31 30 30 31 32 31 35 41 30 30 00 00 00 00 00 00 00 00 00 00	Host read 32 bytes

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5.3.5.Mode_Control

The Host sends “**Mode_Control Command**” to ILITEK Touch Device.

Direction: OUT, Return Data: None

Byte 0~3 for USB interface only. You should send the command start from byte 4 if you are using I2C interface.

Mode Control Command Data Format			
Byte	Name of Bytes	Description	Bit [7:0]
0	Report_ID	USB Report ID	0x03
1	Header	USB Header	0xA3
2	Write_Length	USB Write Data Length	0x03
3	Return_Length	USB Return Data Length	0x00
4	CMD_Code_1	Command Code 1	0xF0
5	Operation Mode	Operation Mode	0: normal mode, 1: test mode, 2: debug mode, 3: suspend mode
6	Engineer Mode	Touch panel report touch information under USB report Id 0x03 or 0x04.	0: Engineer Mode off, 1: Engineer Mode on
7~63	Reserve	Reserve	N.A

USB Example:

Index	Phase	Data	Description
1	OUT	03 a3 03 00 F0 03 00	Enter suspend mode

I2C Example:

Index	7-bits Addr	Phase	Data	Description
1	0x41	Write	F0 03 00	Enter suspend mode

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5.3.6.Set_CDC_Initial

The Host sends “**Set_CDC_Initial**” to touch device.

The device will initial and prepare return data. After that, the touch device responds an ack. USB interface return command “[IN Ack](#)” and I2C interface trigger an INT pulse. That is to notify host that the touch device is done to prepare return data.

Direction: OUT

Return Data: None

Byte 0~3 for USB interface only. You should send the command start from byte 4 if you are using I2C interface.

Set CDC Initial Command Data Format			
Byte	Name of Bytes	Description	Bit [7:0]
0	Report_ID	USB Report ID	0x03
1	Header	USB Header	0xA3
2	Write_Length	USB Write Data Length	0x02
3	Return_Length	USB Return Data Length	0x00
4	CMD_Code_1	Command Code 1	0xF1
5	CMD_Code_2	CDC Data Format This command is used to inform TP IC which data shall be transferred to host.	TEST_MODE: 01: Mutual Raw Data with BK 02: Mutual Raw Data without BK 03: Mutual BG Data with BK 04: Mutual (BG – Raw) with BK 05: Calibration Data (DAC_P, Mutual SWCap) 06: Calibration Data(DAC_N, Mutual SWCap) 07: Reserve 08: Reserve 09: Self Raw Data with BK 0A: Self Raw Data without BK 0B: Self BG Data with BK

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			0C: Self (BG – Raw) with BK 0D: Calibration Data(DAC_P, Self) 0E: Calibration Data(DAC_N, Self) 0F: Reserve 10: Reserve 11: ICON Raw Data with BK 12: ICON Raw Data without BK 13: ICON BG Data with BK 14: ICON (BG – Raw) with BK 15: Reserve 16: Reserve 17: Reserve 18: Reserve 19: Mutual Open Data 1A: Sensor pin short data(RX) 1B: Sensor pin short data(TX)
6~63	Reserve	Reserve	N.A

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5.3.7. Get_CDC_Data

The Host sends “**Get_CDC_Data Command**” to touch device.

After the touch device receives this command, the touch device responds an ack. USB interface return command “[IN_Ack](#)” and I2C interface trigger an INT pulse. And then the host can send a USB Control IN to get “IN_CDC_Data” data format.

Direction: OUT

Return Data: [IN_CDC_Data](#)

Byte 0~3 for USB interface only. You should send the command start from byte 4 if you are using I2C interface.

Get CDC Data Command Data Format			
Byte	Name of Bytes	Description	Bit [7:0]
0	Report_ID	USB Report ID	0x03
1	Header	USB Header	0xA3
2	Write_Length	USB Write Data Length	0x01
3	Return_Length	USB Return Data Length	0x00
4	CMD_Code_1	Command Code 1	0xF2
5~63	Reserve	Reserve	N.A

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5.3.8.Get_System_Status

The Host sends “**Get_System_Status**” to touch device.

After the touch device receives this command, the touch device responds data with the “IN_System_Status” data format.

Direction: OUT

Return Data: [IN System Status](#)

Byte 0~3 for USB interface only. You should send the command start from byte 4 if you are using I2C interface.

Get System Status Command Data Format			
Byte	Name of Bytes	Description	Bit [7:0]
0	Report_ID	USB Report ID	0x03
1	Header	USB Header	0xA3
2	Write_Length	USB Write Data Length	0x01
3	Return_Length	USB Return Data Length	0x01
4	CMD_Code_1	Command Code 1	0x80
5 ~ 63	Reserve	Reserve	N.A

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5.3.9.Reset

The Host sends “**Reset**” to touch device.

After the touch device receives this command, the touch panel will do whole chip reset.

Direction: OUT

Return Data: None

Byte 0~3 for USB interface only. You should send the command start from byte 4 if you are using I2C interface.

Reset Command Data Format			
Byte	Name of Bytes	Description	Bit [7:0]
0	Report_ID	USB Report ID	0x03
1	Header	USB Header	0xA3
2	Write_Length	USB Write Data Length	0x01
3	Return_Length	USB Return Data Length	0x00
4	CMD_Code_1	Command Code 1	0x60
5 ~ 63	Reserve	Reserve	N.A

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5.3.10. Get_Mode_Check

The Host sends “**Get_Mode_Check**” to touch device.

After the touch device receives this command, the touch device responds operation mode with the “IN_Mode_Check” data format.

Direction: OUT

Return Data: [IN_Mode_Check](#)

Byte 0~3 for USB interface only. You should send the command start from byte 4 if you are using I2C interface.

Get Mode Check Command Data Format			
Byte	Name of Bytes	Description	Bit [7:0]
0	Report_ID	USB Report ID	0x03
1	Header	USB Header	0xA3
2	Write_Length	USB Write Data Length	0x01
3	Return_Length	USB Return Data Length	0x01
4	CMD_Code_1	Command Code 1	0xC0
5~63	Reserved	Reserved	N.A

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5.3.11. Set_AP_Mode

The Host sends “**Set_AP_Mode**” to touch device.

After the touch device receives this command, the touch device switch mode into AP mode.

Direction: OUT

Return Data: None

Byte 0~3 for USB interface only. You should send the command start from byte 4 if you are using I2C interface.

Set AP Mode Command Data Format			
Byte	Name of Bytes	Description	Bit [7:0]
0	Report_ID	USB Report ID	0x03
1	Header	USB Header	0xA3
2	Write_Length	USB Write Data Length	0x01
3	Return_Length	USB Return Data Length	0x00
4	CMD_Code_1	Command Code 1	0xC1
5~63	Reserved	Reserved	N.A

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5.3.12. Set_BL_Mode

The Host sends “**Set_BL_Mode**” to touch device.

After the touch device receives this command, the touch device switch mode into BL mode.

Direction: OUT

Return Data: None

Byte 0~3 for USB interface only. You should send the command start from byte 4 if you are using I2C interface.

Set BL Mode Command Data Format			
Byte	Name of Bytes	Description	Bit [7:0]
0	Report_ID	USB Report ID	0x03
1	Header	USB Header	0xA3
2	Write_Length	USB Write Data Length	0x01
3	Return_Length	USB Return Data Length	0x00
4	CMD_Code_1	Command Code 1	0xC2
5~63	Reserved	Reserved	N.A

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5.3.13. Set_ROM_Code

The Host sends “**Set_ROM_Code**” to touch device.

After the touch device receives this command, the touch device write code into ROM.

USB Report ID: 0x07, 0x08, 0x09 (please check usb vendor descriptor)

Direction: OUT

Return Data: None

Byte 0~3 for USB interface only. You should send the command start from byte 4 if you are using I2C interface.

Set ROM Code Command Data Format			
Byte	Name of Bytes	Description	Bit [7:0]
0	Report_ID	USB Report ID	0x07 or 0x08 or 0x09
1	Header	USB Header	0xA3
2~3	Write_Length	USB Write Data Length	0x21
4~5	Return_Length	USB Return Data Length	0x00
6	CMD_Code_1	Command Code 1	0xC3
7	Data_0	Code Byte 0	Programming code byte 0
~			
N-1	Data_N	Code Byte N-1	Programming code byte N-1

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5.3.14. Set_Flash_Enabled

The Host sends “**Set_Flash_Enabled**” to touch device.

After the touch device receives this command, the touch device unlocks the mode switch lock.

Direction: OUT

Return Data: None

Byte 0~3 for USB interface only. You should send the command start from byte 4 if you are using I2C interface.

Set Enabled Lite Command Data Format			
Byte	Name of Bytes	Description	Bit [7:0]
0	Report_ID	USB Report ID	0x03
1	Header	USB Header	0xA3
2	Write_Length	USB Write Data Length	0x09
3	Return_Length	USB Return Data Length	0x00
4	CMD_Code_1	Command Code 1	0xCC
5	CMD_Code_2	Command Code 2	0x5A
6	CMD_Code_3	Command Code 3	0xA5
7~9	Start Address	Flash Start Address	byte[7] byte [8]<<8 byte [9]<<16
10~12	End Address	Flash End Address	byte[10] byte [11]<<8 byte [12]<<16
13~63	Reserved	Reserved	N.A

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5.3.15. Get_AP_CRC

The Host sends “Get_AP_CRC” to touch device.

After the touch device receives this command, the touch return CRC value with the “IN_CRC” data format.

Direction: OUT

Return Data: [IN AP_CRC](#)

Byte 0~3 for USB interface only. You should send the command start from byte 4 if you are using I2C interface.

Get CRC Command Data Format			
Byte	Name of Bytes	Description	Bit [7:0]
0	Report_ID	USB Report ID	0x03
1	Header	USB Header	0xA3
2	Write_Length	USB Write Data Length	0x01
3	Return_Length	USB Return Data Length	(IN_Panel_Information Byte14) * 2
4	CMD_Code_1	Command Code 1	0xC7
5~63	Reserved	Reserved	N.A

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5.3.15.1. Calculate Programing Code CRC Value

Example:

```
int i = 0;
for(i = start_addr; i < end_addr; i++)
{
    CRC16 = UpdateCRC(CRC16, pbuff[i]);
}

unsigned int UpdateCRC(unsigned int crc, char newbyte)
{
    crc = crc ^ newbyte;
    for (i = 0; i < 8; i++)
    {
        if (crc & 0x01)
        {
            crc = crc >> 1;
            crc ^= 0x8408;    // CRC16-CCITT FCS (X^16+X^12+X^5+1)
        }
        else
        {
            crc = crc >> 1;
        }
    }
    return crc;
}
```

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5.3.16. Get_Block_CRC

The Host sends “Get_Block_CRC” to touch device.

After the touch device receives this command, the touch return CRC value with the “IN_CRC” data format.

Direction: OUT

Return Data: [IN_Block_CRC](#)

Byte 0~3 for USB interface only. You should send the command start from byte 4 if you are using I2C interface.

Get CRC Command Data Format			
Byte	Name of Bytes	Description	Bit [7:0]
0	Report_ID	USB Report ID	0x03
1	Header	USB Header	0xA3
2	Write_Length	USB Write Data Length	0x01
3	Return_Length	USB Return Data Length	0x04
4	CMD_Code_1	Command Code 1	0xCD
5~63	Reserved	Reserved	N.A

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5.3.17. Set_Sleep

The Host sends “Set_Sleep” to touch device.

After the touch device receives this command, the touch device will into sleep mode.

Direction: OUT

Return Data: None

Byte 0~3 for USB interface only. You should send the command start from byte 4 if you are using I2C interface.

Get CRC Command Data Format			
Byte	Name of Bytes	Description	Bit [7:0]
0	Report_ID	USB Report ID	0x03
1	Header	USB Header	0xA3
2	Write_Length	USB Write Data Length	0x01
3	Return_Length	USB Return Data Length	0x04
4	CMD_Code_1	Command Code 1	0x30
5~63	Reserved	Reserved	N.A

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5.3.18. Set_Wakeup

The Host sends “Set_Wakeup” to touch device.

After the touch device receives this command, the touch device will exit sleep mode.

Direction: OUT

Return Data: None

Byte 0~3 for USB interface only. You should send the command start from byte 4 if you are using I2C interface.

Get CRC Command Data Format			
Byte	Name of Bytes	Description	Bit [7:0]
0	Report_ID	USB Report ID	0x03
1	Header	USB Header	0xA3
2	Write_Length	USB Write Data Length	0x01
3	Return_Length	USB Return Data Length	0x04
4	CMD_Code_1	Command Code 1	0x31
5~63	Reserved	Reserved	N.A

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5.4. I2C Read (Host IN Report)

The ILITEK TP Device transmitted data to the host in IN reports across the Interrupt IN endpoint

5.4.1.Return Data List

Name	Description
IN_Panel_Information	Touch panel information report including X/Y maximum report value and X/Y channel numbers.
IN_Firmware_Version	Firmware Version V X.X.X
IN_Kernel_Version	Kernel Version
IN_CDC_Data	CDC data
IN_System_Status	System Status
IN_Ack	Ack to Set CDC Initial and Get CDC Data command.
IN_Mode_Check	FW current mode
IN_AP_CRC	Return FW CRC
IN_Block_CRC	Return Block CRC

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5.4.2.IN_Panel_Information

Direction: IN

Byte 0~3 for USB interface only. You should get the data start from byte 4 if you are using I2C interface.

Panel Information Data Format			
Byte	Name of Bytes	Description	Bit [7:0]
0	Report_ID	USB Report ID	0x03
1	Header	USB Header	0xA3
2	CMD_Code_1	Command Code 1	0x20
3	Return_Length	USB Return_Length	0x0F
4	Xmax_Low	The maximum report value	The maximum X coordinate (bit 7:0)
5	Xmax_High		The maximum X coordinate (bit 15:8)
6	Ymax_Low	The maximum report value of Y coordinate	The maximum Y coordinate (bit 7:0)
7	Ymax_High		The maximum Y coordinate (bit 15:8)
8	Rx Channel_Low	Rx Channel numbers	The channel numbers of Rx(bit 7:0)
9	Rx Channel_High		The channel numbers of Rx (bit 15:8)
10	Tx Channel_Low	Tx Channel numbers	The channel numbers of Tx (bit 7:0)
11	Tx Channel_High		The channel numbers of Tx (bit 15:8)
12	Touch number	Support touch number	Support touch number
13	Key number	Support key number	Support key number
14	Total IC Number	Total IC Number on PCB	Total IC Number
15	Mode Number	Support Mode Number	Return FW support mode
16	Report Format	Report Format	Report Format
17	Die Num	Die Number	Total die number
18	Flash Block Num	Flash Block Number	Flash Block Num
18~63	Reserve	Reserve	N.A

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5.4.3.IN_Firmware_Version

Direction: IN

Byte 0~3 for USB interface only. You should get the data start from byte 4 if you are using I2C interface.

Firmware Version Data Format			
Byte	Name of Bytes	Description	Bit [7:0]
0	Report_ID	USB Report ID	0x03
1	Header	USB Header	0xA3
2	CMD_Code_1	Command Code 1	0x40
3	Return_Length	USB Return_Length	0x08
4	FW_Ver_0	Internal Firmware Version V X.X.X.X	Chip ID Code
5	FW_Ver_1		Major firmware version
6	FW_Ver_2		Minor firmware version
7	FW_Ver_3		Minor firmware version
8	Customer	Customer Firmware Version V X.X.X.X	Customer Firmware Version
9	Customer		
10	Customer		
11	Customer		
12~63	Reserve	Reserve	N.A

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5.4.4.IN_Kernel_Version

Direction: IN

Byte 0~3 for USB interface only. You should get the data start from byte 4 if you are using I2C interface.

Kernel Version Data Format			
Byte	Name of Bytes	Description	Bit [7:0]
0	Report_ID	USB Report ID	0x03
1	Header	USB Header	0xA3
2	CMD_Code_1	Command Code 1	0x61
3	Return_Length	USB Return_Length	0x20
4	Kernel_Ver_0	Kernel version 0	Kernel version 0
5	Kernel_Ver_1	Kernel version 1	Kernel version 1
6	Data Flash Start Address	Data Flash Start Address	bit 7:0
7			bit 15:8
8			bit 23:16
9	Flash Size	Flash Size	0:64k, 1:128k, 2:256k
10~25	Model Name	Model Name	Model Name
26~63	Reserve	Reserve	N.A

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5.4.5.IN_CDC_Data

Size: Depend on report ID

Direction: Control IN

Byte 0~3 for USB interface only. You should get the data start from byte 2 if you are using I2C interface.

CDC Data Format			
Byte	Name of Bytes	Description	Bit [7:0]
0	Report_ID	USB Report ID	0x07 or 0x08 or 0x09
1	CMD_Code_1	Command Code 1	0xF2
2	RX_Data_Offset_Low	RX offset	RX offset channel (bit 7:0)
3	RX_Data_Offset_High	RX offset	RX offset channel (bit 15:8)
4	TX_Data_Offset_Low	TX offset	TX offset channel (bit 7:0)
5	TX_Data_Offset_High	TX offset	TX offset channel (bit 15:8)
6~Control_IN_Length	CDC_Data	CDC data	CDC data

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5.4.6.IN_System_Status

Direction: IN

Byte 0~3 for USB interface only. You should get the data start from byte 4 if you are using I2C interface.

Y All node Data Format			
Byte	Name of Bytes	Description	Bit [7:0]
0	Report_ID	USB Report ID	0x03
1	Header	USB Header	0xA3
2	CMD_Code_1	Command Code 1	0x80
3	Return_Length	USB Return_Length	0x01
4	System_Status	System_Status	0x50: System is not busy
5~63	Reserve	Reserve	N.A

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5.4.7.IN_Ack

Direction: IN

Byte 0~3 for USB interface only. You should get the data start from byte 4 if you are using I2C interface.

Y All node Data Format			
Byte	Name of Bytes	Description	Bit [7:0]
0	Report_ID	USB Report ID	0x03
1	CMD_Code_1	Command Code 1	0xA3
2	Ack_CMD	Ack command which depend on host command	Ack command
3	Return_Length	USB Return_Length	0x01
4	Ack code	Ack code	0xAC
5~63	Reserve	Reserve	N.A

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5.4.8.IN_Mode_Check

Direction: IN

Byte 0~3 for USB interface only. You should get the data start from byte 4 if you are using I2C interface.

Mode Check Data Format			
Byte	Name of Bytes	Description	Bit [7:0]
0	Report_ID	USB Report ID	0x03
1	Header	USB Header	0xA3
2	CMD_Code_1	Command Code 1	0xC0
3	Return_Length	USB return_Length	0x01
4	Mode_Check	Mode Check Byte	0x5A: AP mode
12	Reserve	Reserve	N.A

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5.4.9.IN_AP_CRC

Direction: IN

Byte 0~3 for USB interface only. You should get the data start from byte 4 if you are using I2C interface.

CRC Data Format			
Byte	Name of Bytes	Description	Bit [7:0]
0	Report_ID	USB Report ID	0x03
1	Header	USB Header	0xA3
2	CMD_Code_1	Command Code 1	0xC7
3	Return_Length	USB Return_Length	(IN_Panel_Information_Byte14) * 2
4	CRC_L	1st IC Master CRC(b7~b0)	CRC = (CRC_H <<8) + CRC_L
5	CRC_H	1st IC Master CRC(b15~b8)	
6	CRC_L	2nd IC Slave CRC(b7~b0)	CRC = (CRC_H <<8) + CRC_L
7	CRC_H	2nd IC Slave CRC(b15~b8)	
8	CRC_L	3rd IC Slave CRC(b7~b0)	CRC = (CRC_H <<8) + CRC_L
9	CRC_H	3rd IC Slave CRC(b15~b8)	
10	Reserve	Reserve	N.A

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5.4.10. IN_Block_CRC

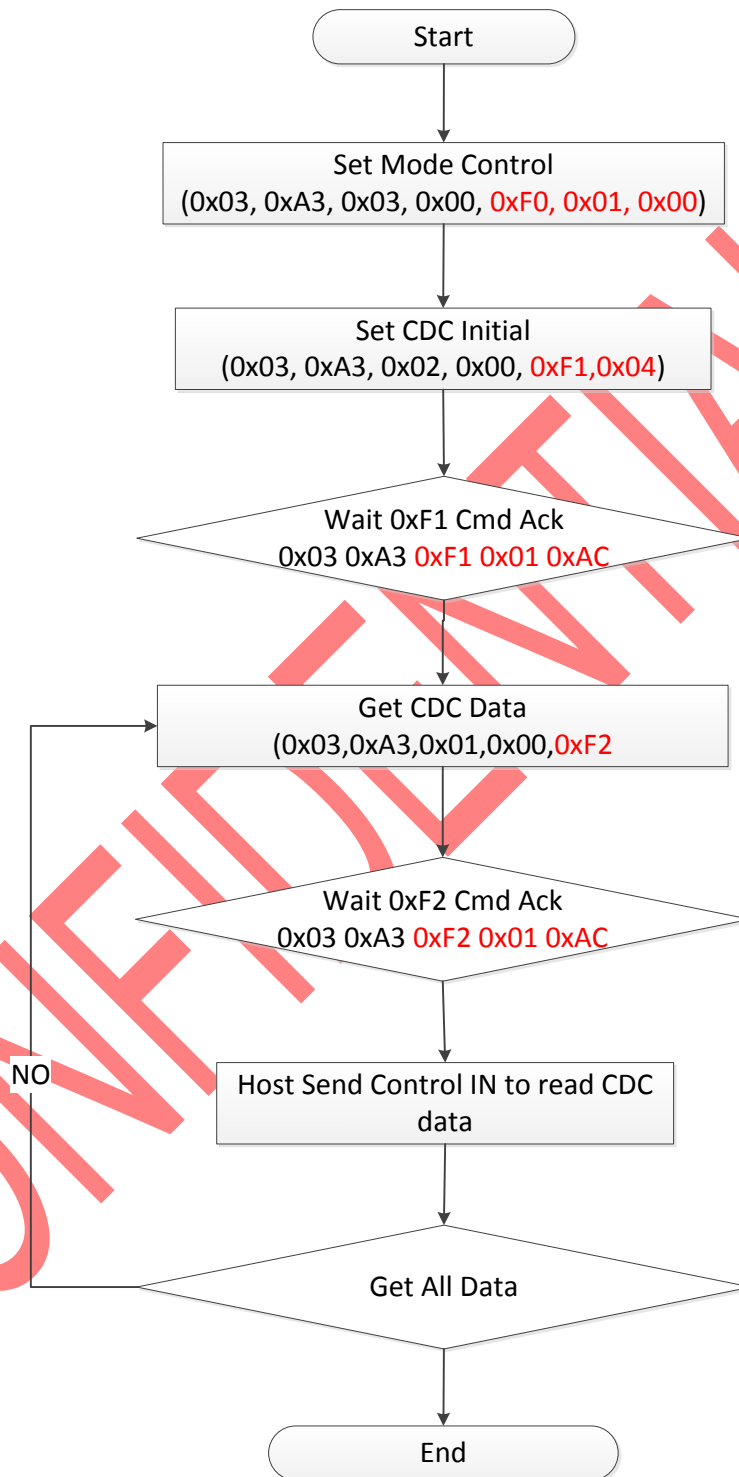
Direction: IN

Byte 0~3 for USB interface only. You should get the data start from byte 4 if you are using I2C interface.

CRC Data Format			
Byte	Name of Bytes	Description	Bit [7:0]
0	Report_ID	USB Report ID	0x03
1	Header	USB Header	0xA3
2	CMD_Code_1	Command Code 1	0xCD
3	Return_Length	USB Return_Length	0x02
4	CRC_L	CRC_Low_Byte	CRC = (CRC_H <<8) + CRC_L
5	CRC_H	CRC_High_Byte	
6	Reserve	Reserve	N.A

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6. Read CDC Data Flow (Protocol V6.x.x)



Read CDC Data Flow

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6.1. USB Read BG-Raw Command Flow

Index	Phase	Data	Description	Delta Time
1	CTL	21 09 03 02 00 00 40 00	SET REPORT	1.3sc
	OUT	03 a3 03 00 f0 01 00	Enter Test Mode	1.3ms
2	CTL	21 09 03 02 00 00 40 00	SET REPORT	357ms
	OUT	03 a3 02 00 f1 04	Get Mutual BG-Raw data	210us
3	IN	03 a3 f1 01 ac	Touch Ack to Host	9.2ms
4	CTL	21 09 03 02 00 00 40 00	SET REPORT	8.3ms
	OUT	03 a3 01 00 f2	Prepare Data	214us
5	IN	03 a3 f2 01 ac	Touch Ack to Host	1.4ms
6	CTL	a1 01 08 03 00 00 07 04	GET REPORT	11ms
	IN	08 f2 00 00 00 00 e2 ff d3 ff ce ff e3 ff 08 00 09 00 07 00 05 0a ..	Read Raw Data	1.3ms
7	CTL	21 09 03 02 00 00 40 00	SET REPORT	3.2ms
	OUT	03 a3 01 00 f2	Prepare Data	263us
8	IN	03 a3 f2 01 ac	Touch Ack to Host	859us
9	CTL	a1 01 08 03 00 00 07 04	GET REPORT	379us
	IN	08 f2 00 00 04 00 03 00 0a 00 0c 00 08 00 01 00 fc ff fe ff fd ff fc ..	Read Raw Data	1.3ms
10	Repeat 7~9 till Self data finish, Mutual Size = 2*TX*RX channel			
11	CTL	21 09 03 02 00 00 40 00	SET REPORT	1.3ms
	OUT	03 a3 02 00 f1 0c	Get Self BG-Raw data	500us
12	IN	03 a3 f1 01 ac	Touch Ack to Host	1.1ms
13	CTL	21 09 03 02 00 00 40 00	SET REPORT	5.1ms
	OUT	03 a3 01 00 f2	Prepare Data	203us
14	IN	03 a3 f2 01 ac	Touch Ack to Host	603us
15	CTL	a1 01 08 03 00 00 07 04	GET REPORT	896us
	IN	08 f2 00 00 00 00 fb ff ff ff fc ff fb ff fe ff ff ff fa ff ff ff fc ff ff 01 00 ..	Read Raw Data	1.2ms
16	Repeat 13~15 till Self data finish, Self Size = 2*(TX+RX) channel			
17	CTL	21 09 03 02 00 00 40 00	SET REPORT	1.3ms
	OUT	03 a3 03 00 f0 00 00		1.3ms

* Data record by Bus Hound

USB Read BG-Raw Command Flow

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6.2. I2C Read BG-Raw Command Flow

Index	Addr	Phase	Data	Description	Delta
1	0x41	Write	f0 01 00	Enter Test Mode	
2	0x41	Write	f1 04	Get Mutual BG-Raw data	1ms
3		INT	N/A	Touch Device Ack Signal to Host	10ms~20ms
4	0x41	Write	f2	Prepare Data	1ms
5		INT	N/A	Touch Device Ack Signal to Host	2ms
6	0x41	Read	f2 00 00 00 00 e2 ff d3 ff ce ff e3 ff 08 00 09 00 07 00 05 00 09 00 07 00 0a 00 06 00 07 00 0a 00 08 00 0c 00 07 00 ..	Read Raw Data Read Length = $1024/(2 \times \text{RX Channel}) + 5$ Mutual data start from 6th byte	1ms
7	0x41	Write	f2	Prepare Data	1ms
8		INT	N/A	Touch Device Ack Signal to Host	1ms
9	0x41	Read	f2 00 00 04 00 03 00 0a 00 0c 00 08 00 01 00 fc ff fe ff fd ff fe ff ff fd ff fc ff fe ff fc ff fe ff ff fe ff ..	Read Raw Data Read Length = $1024/(2 \times \text{RX Channel}) + 5$ Mutual data start from 6th byte	1ms
10				Repeat 7~9 till Mutual data finish Mutual Size = $2 \times \text{TX} \times \text{RX channel}$	
11	0x41	Write	f1 0c	Get Self BG-Raw data	1ms
12		INT	N/A	Touch Device Ack Signal to Host	1ms
13	0x41	Write	f2	Prepare Data	1ms
14		INT	N/A	Touch Device Ack Signal to Host	1ms
15	0x41	Read	f2 00 00 00 00 fb ff ff ff fc ff fb ff fe ff ff ff fa ff ff ff fc ff 03 00 fe ff 01 00 02 00 fa ff fd ff fe ff fe ff ..	Read Raw Data Read Length = $1024/(2 \times \text{RX Channel}) + 5$ Self data start from 6th byte	1ms
16				Repeat 13~15 till Self data finish Self Size = $2 \times (\text{TX} + \text{RX}) \text{ channel}$	
17	0x41	Write	f0 00 00	Exit Test Mode	1ms

* Data record by Logical Analyzer

I2C Read BG-Raw Command Flow

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6.3. USB Read Short Test Command Flow

Index	Phase	Data	Description	Delta Time
1	CTL	21 09 03 02 00 00 40 00	SET REPORT	1.3sc
	OUT	03 a3 03 00 f0 01 00	Enter Test Mode	1.3ms
2	CTL	21 09 03 02 00 00 40 00	SET REPORT	357ms
	OUT	03 a3 02 00 f1 1A	Get RX Channel Short Data	210us
3	IN	03 a3 f1 01 ac	Touch Ack Signal to Host	113ms
4	CTL	21 09 03 02 00 00 40 00	SET REPORT	6.3ms
	OUT	03 a3 01 00 f2	Prepare Data	214us
5	IN	03 a3 f2 01 ac	Touch Ack Signal to Host	1.4ms
6	CTL	a1 01 08 03 00 00 07 04	GET REPORT	1.1ms
	IN	08 f2 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .. Read Length = 2*RX Channel + 6 Short data start from 7th byte	Read RX Channel Short Data	33ms
7	CTL	21 09 03 02 00 00 40 00	SET REPORT	1.3ms
	OUT	03 a3 02 00 f1 1B	Get TX Channel Short Data	210us
8	IN	03 a3 f1 01 ac	Touch Ack Signal to Host	1.2ms
9	CTL	21 09 03 02 00 00 40 00	SET REPORT	1.3ms
	OUT	03 a3 01 00 f2	Prepare Data	214us
10	IN	03 a3 f2 01 ac	Touch Ack Signal to Host	1.4ms
11	CTL	a1 01 08 03 00 00 07 04	GET REPORT	1.1ms
	IN	08 f2 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .. Read Length = 2*TX Channel + 6 Short data start from 7th byte	Read TX Channel Short Data	1.3ms
12	CTL	21 09 03 02 00 00 40 00	SET REPORT	1.3ms
	OUT	03 a3 03 00 f0 00 00	Exit Test Mode	1.3ms

* Data record by Bus Hound

USB Read Short Test Command Flow

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6.4. I2CRead Short Test Command Flow

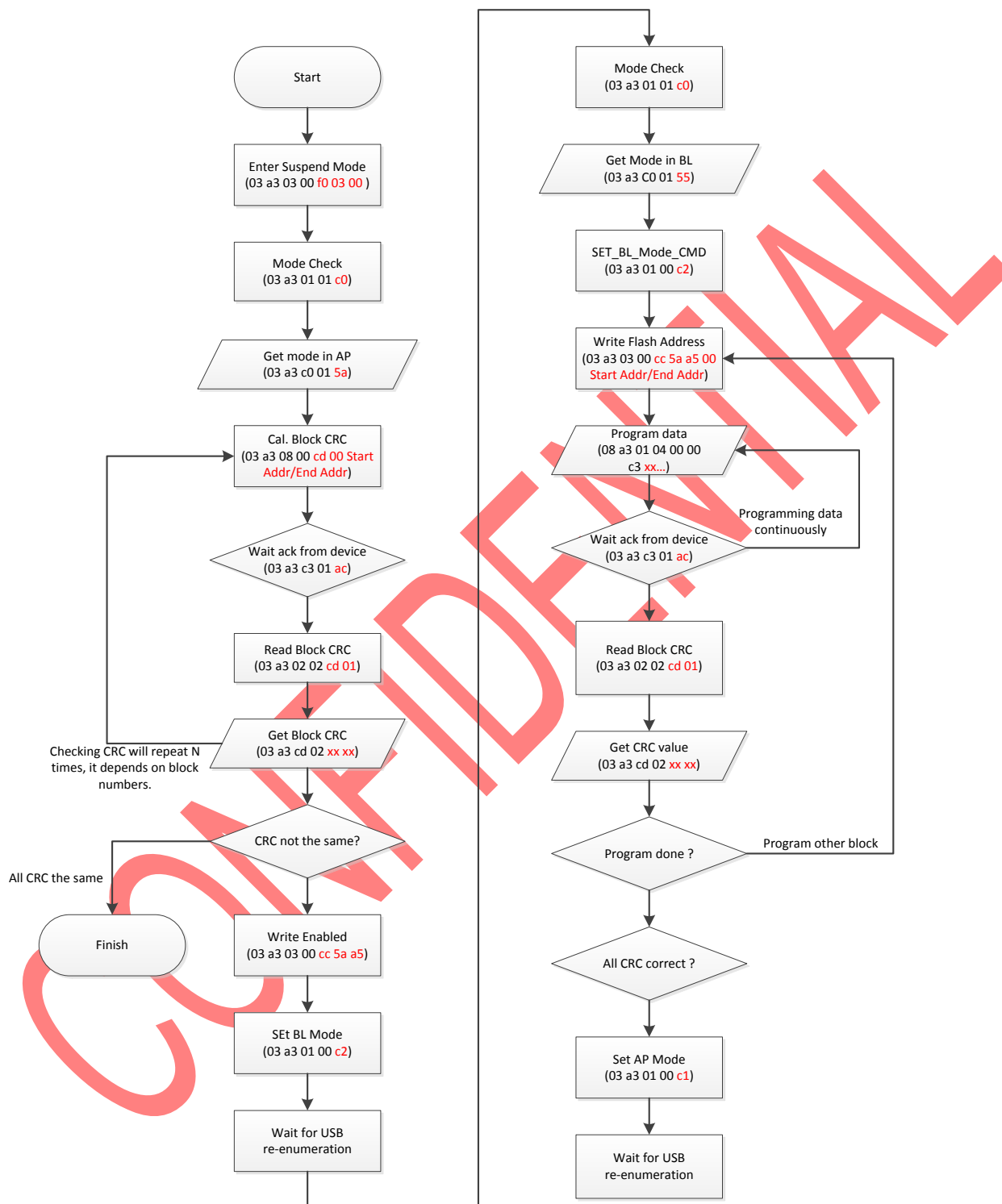
Index	Addr	Phase	Data	Description	Delta
1	0x41	Write	f0 01 00	Enter Test Mode	
2	0x41	Write	f1 1A	Get RX Channel Short Data	1ms
3		INT	N/A	Touch Ack Signal to Host	20ms
4	0x41	Write	f2	Prepare Data	1ms
5		INT	N/A	Touch Ack Signal to Host	2ms
6	0x41	Read	f2 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ..	Read RX Channel Short Data Read Length = 2*RX Channel + 5 Short data start from 6th byte	1ms
7	0x41	Write	f1 1B	Get TX Channel Short Data	1ms
8		INT	N/A	Touch Ack Signal to Host	20ms
9	0x41	Write	f2	Prepare Data	1ms
10		INT	N/A	Touch Ack Signal to Host	
11	0x41	Read	f2 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ..	Read RX Channel Short Data Read Length = 2*TX Channel + 5 Short data start from 6th byte	1ms
12	0x41	Write	f0 00 00	Exit Test Mode	1ms

* Data record by Logical Analyzer

I2C Read Short Test Command Flow

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7. FW Programming Flow



USB FW upgrade flow chart

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7.1. USB Programming Command Flow

Index	Phase	Data	Description	Delta Time
1	CTL	21 09 03 02 00 00 40 00	SET REPORT	2.3sc
	OUT	03 a3 03 00 f0 03 00	Enter Suspend Mode	1.2ms
2	CTL	21 09 03 02 00 00 40 00	SET REPORT	100ms
	OUT	03 a3 01 01 c0	BL_AP_ModeCheck_CMD	263us
3	IN	03 a3 c0 01 5a	AP mode	678us
4	CTL	21 09 03 02 00 00 40 00	SET REPORT	1.1ms
	OUT	03 a3 08 00 cd 00 00 30 00 c1 af 01	Calculate Block CRC CMD Block Start Address=0x3000 Block End Address=0x01afc1	229us
5	IN	03 a3 cd 01 ac	Calculation CRC ACK	1.0sc
6	CTL	21 09 03 02 00 00 40 00	SET REPORT	667us
	OUT	03 a3 02 02 cd 01	Read Block CRC	287us
7	IN	03 a3 cd 02 23 77	Get Block CRC (2 bytes) Index 4~7 will repeat N times, it depends on block numbers.	6us
8	CTL	21 09 03 02 00 00 40 00	SET REPORT	8.5ms
	OUT	03 a3 03 00 cc 5a a5	Write Flash Enable	195us
9	CTL	21 09 03 02 00 00 40 00	SET REPORT	100ms
	OUT	03 a3 01 00 c2	SET_BL_Mode_CMD	166us
10	Wait for USB re-enumeration			
11	CTL	21 09 03 02 00 00 40 00	SET REPORT	100ms
	OUT	03 a3 01 01 c0	BL_AP_ModeCheck_CMD	263us
12	IN	03 a3 c0 01 55	BL mode	678us
13	CTL	21 09 03 02 00 00 40 00	SET REPORT	2.8ms
	OUT	03 a3 03 00 c9 00 04	Write Transfer Length = 1024 bytes	159us
14	CTL	21 09 03 02 00 00 40 00	SET REPORT	2.8ms
	OUT	03 a3 03 00 cc 5a a5 00 30 00 c1 af 01	Write Flash Enable 00 30 00 => Block Start Address c1 af 01 => Block End Address	159us
15	CTL	21 09 08 03 00 00 07 04	SET REPORT	1.4ms
	OUT	08 a3 01 04 00 00 c3 48 ...	Program Data (1024+7 bytes)	1.3ms
16	IN	03 a3 c3 01 ac	Wait for ACK (Ack data = 0xAC)	23ms

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17	CTL	21 09 03 02 00 00 40 00	SET REPORT	438us
	OUT	03 a3 02 02 cd 01	Read Block CRC	225us
18	IN	03 a3 cd 02 c5 12	Get Block CRC value=0xc512	327us
19	index 14~18 will repeat N times. N = Block number If read CRC all correct then switch mode back to AP.			
20	CTL	21 09 03 02 00 00 40 00	SET REPORT	100ms
	OUT	03 a3 01 00 c1 00 00 00	Set AP Mode	166us
21	Wait for USB re-enumeration			
22	CTL	21 09 03 02 00 00 40 00	SET REPORT	4.9ms
	OUT	03 a3 01 01 c0 00 00 00	BL_AP_ModeCheck_CMD	234us
23	IN	03 a3 c0 01 5a	AP mode	321us

7.2. I2C Programming Command Flow

Index	Addr	Phase	Data	Description	Delta
1	0x41	Write	F0 03 00	Enter Suspend Mode	-1.3us
2	0x41	Write	C0	BL_AP_ModeCheck_CMD	100.5250ms
3	0x41	Read	5A	AP mode	101.5896ms
4	0x41	Write	CD 00 00 30 00 C1 81 01	Calculate Block CRC CMD Block Start address:0x300, Block End address: 0x0181C1	103.591ms
5				Waiting for INT	1.134417s
6	0x41	Write	CD 01	Read Block CRC, wait for INT	1.135743s
7	0x41	Read	76 58	Get Block CRC value=0x5876 Index 4~7 will repeat N times, it depends on block numbers.	1.136826s
8	0x41	Write	CC 5A A5	Write Flash Enable	2.138424s
9	0x41	Write	C2	SET_BL_Mode_CMD	2.238627s
10	0x41	Write	C0	BL_AP_ModeCheck_CMD	3.239197s
11	0x41	Read	55	BL Mode	3.240361s
12	0x41	Write	C9 00 04	Write Transfer Length = 1024 bytes	3.24486s
13	0x41	Write	CC 5A A5 00 30 00 C1 81 01	Write Flash Enable 00 30 00 => Block Start Address c1 81 01 => Bolck End Address	3.245272s
14	0x41	Write	C3	Write Data	3.250866s

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15				Waiting for INT	3.430688s
16	0x41	Write	C3	Write Data	3.441664s
17	0x41	Write	CD 01	Get CRC	44.761935s
18	0x41	Read	1F 31	Get CRC value Index 13~18 will repeat N times N = Block number	44.763015s
19	0x41	Write	CC 5A A5	Write Flash Enable	44.768732s
20	0x41	Write	C1	Set AP Mode	44.869058s
21	0x41	Write	C0	BL_AP_ModeCheck_CMD	45.86948s
22	0x41	Read	5A	AP mode	45.87055s

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8. USB Protocol (Descriptors)

Under Windows 2000, XP, Vista, 7, 8, 10, ILITEK touch device is HID compliant it can utilize the HID driver supplied with the operating system to control 'Human Interface Devices' as long as the HID descriptors and generated data confirm to the HID requirements.

8.1. Application Code Descriptor

8.1.1. Device Descriptor

Offset	Field	Size	Value	Description
0	bLength	1	12h	Size of descriptor in byte
1	bDescriptorType	1	01h	Descriptor type (DEVICE = 1)
2	bcdUSB	2	0110h	USB specification release (Ver 2.0 = 0x0200) USB specification release (Ver 1.1 = 0x0110) (Depend on Selective Suspend Protocol)
4	bDeviceClass	1	00h	Class info in Ifc Descriptors
5	bDeviceSubClass	1	00h	Subclass code
6	bDeviceProtocol	1	00h	Protocol code
7	bMaxPacketSize0	1	40h	Maximum packet size
8	idVendor	2	222Ah	Vendor ID
10	idProduct	2	xxxxh	Product ID (Depend on Project)
12	bcdDevice	2	xxxxh	Device release number (Depend on project)
14	iManufacturer	1	01h	Index of string descriptor describing manufacturer ("ILITEK")
15	iProduct	1	02h	Index of string descriptor describing product ("ILITEK-TP")
16	iSerialNumber	1	00h	Index of string descriptor describing the serial number
17	bNumConfigurations	1	01h	Number of possible configuration

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8.1.2.Configuration Descriptor

Offset	Field	Size	Value	Description
0	bLength	1	09h	Size of descriptor in byte
1	bDescriptorType	1	02h	Descriptor type (CONFIGURATION = 2)
2	wTotalLength	2	xxxxh	Total length of data returned for this configuration (Depend on project)
4	bNumInterfaces	1	01h	Number of interfaces supported by this configuration (2 interface for option which depends on application)
5	bConfigurationValue	1	01h	Value to use as an argument to the Set Configuration() request to select this configuration
6	iConfiguration	1	00h	Index of string descriptor describing this configuration
7	bmAttributes	1	A0h	Configuration characteristic (Bus Powered, Remote Wakeup)
	4..0: Reserved		...00000	
	5: Remote Wakeup		..1.....	Yes
	6: Self Powered		.0.....	No, Bus Powered
	7: (set to one)		1.....	
8	bMaxPower	1	C8h	Maximum power consumption (200 mA)

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8.1.3.Interface 0 Descriptor

Interface Descriptor

Offset	Field	Size	Value	Description
0	bLength	1	09h	Size of descriptor in byte
1	bDescriptorType	1	04h	Descriptor type (INTERFACE = 4)
2	bInterfaceNumber	1	00h	Number of this interface
3	bAlternateSetting	1	00h	Value used to select this alternate setting for the interface identified in the prior field
4	bNumEndpoints	1	01h	Number of endpoints used by this interface
5	bInterfaceClass	1	03h	Class code (HID)
6	bInterfaceSubClass	1	00h	Subclass code (No Subclass)
7	bInterfaceProtocol	1	00h	Protocol code (None)
8	iInterface	1	00h	Index of string descriptor describing this interface

HID Descriptor

Offset	Field	Size	Value	Description
0	bLength	1	09h	Size of descriptor in byte
1	bDescriptorType	1	21h	Descriptor type (HID)
2	bcdHID	2	0110h	HID class specification release (1.1)
4	bCountryCode	1	00h	Country code of localized hardware
5	bNumDescriptors	1	01h	Number of HID class descriptors
6	bDescriptorType	1	22h	Type of class descriptor (Report)
7	wDescriptorLength	2	xxxxh	Total size of report descriptor (Depend on project)

Endpoint1 Descriptor

Offset	Field	Size	Value	Description
0	bLength	1	07h	Size of descriptor in byte
1	bDescriptorType	1	05h	Descriptor type (Endpoint)
2	bEndpointAddress	1	81h	1 In
3	bmAttributes	1	03h	Interrupt
	1..0: Transfer Type		11	Interrupt
	7..2: Reserved		000000..	
4	wMaxPacketSize	2	0040h	64 bytes
6	bInterval	1	01h	1 ms

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8.1.4.Interface1 Descriptor (Option)

Interface Descriptor

Offset	Field	Size	Value	Description
0	bLength	1	09h	Size of descriptor in byte
1	bDescriptorType	1	04h	Descriptor type (INTERFACE = 4)
2	bInterfaceNumber	1	01h	Number of this interface
3	bAlternateSetting	1	00h	Value used to select this alternate setting for the interface identified in the prior field
4	bNumEndpoints	1	01h	Number of endpoints used by this interface
5	bInterfaceClass	1	03h	Class code (HID)
6	bInterfaceSubClass	1	00h	Subclass code (No Subclass)
7	bInterfaceProtocol	1	00h	Protocol code (None)
8	iInterface	1	00h	Index of string descriptor describing this interface

HID Descriptor

Offset	Field	Size	Value	Description
0	bLength	1	09h	Size of descriptor in byte
1	bDescriptorType	1	21h	Descriptor type (HID)
2	bcdHID	2	0110h	HID class specification release (1.1)
4	bCountryCode	1	00h	Country code of localized hardware
5	bNumDescriptors	1	01h	Number of HID class descriptors
6	bDescriptorType	1	22h	Type of class descriptor (Report)
7	wDescriptorLength	2	xxxxh	Total size of report descriptor (Depend on project)

Endpoint1 Descriptor

Offset	Field	Size	Value	Description
0	bLength	1	07h	Size of descriptor in byte
1	bDescriptorType	1	05h	Descriptor type (Endpoint)
2	bEndpointAddress	1	82h	2 In
3	bmAttributes	1	03h	Interrupt
	1..0: Transfer Type		11	Interrupt
	7..2: Reserved		000000..	
4	wMaxPacketSize	2	0040h	64 bytes
6	bInterval	1	01h	1 ms

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8.1.5.Report Descriptor

Item Tag (Value)	Raw Data
Usage Page (Digitizer)	05 0D
Usage (Touch Screen)	09 04
Collection (Application)	A1 01
Report ID (4)	85 04
Usage (Finger)	09 22
Collection (Logical)	A1 02
Usage Page (Digitizer)	05 0D
Report Count (1)	95 01
Report Size (6)	75 06
Usage	09 51
Logical Minimum (0)	15 00
Logical Maximum (63)	25 3F
Input (Data,Var,Abs,NWrp,Lin,Pref,NNul,Bit)	81 02
Usage (Tip Switch)	09 42
Logical Maximum (1)	25 01
Report Size (1)	75 01
Report Count (1)	95 01
Input (Data,Var,Abs,NWrp,Lin,Pref,NNul,Bit)	81 02
Report Size (1)	75 01
Report Count (1)	95 01
Input (Cnst,Var,Abs,NWrp,Lin,Pref,NNul,Bit)	81 03
Usage Page (Generic Desktop)	05 01
Report Size (16)	75 10
Unit Exponent (-2)	55 0E
Unit (SI Lin: Length (cm))	65 11
Usage (X)	09 30
Logical Maximum (16384) (Depend on project)	26 00 40
Physical Minimum (0)	35 00
Physical Maximum (5212) (Depend on project)	46 5C 14
Input (Data,Var,Abs,NWrp,Lin,Pref,Null,Bit)	81 42
Usage (Y)	09 31
Logical Maximum (9600) (Depend on project)	26 80 25
Physical Maximum (2932) (Depend on project)	46 74 0B

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Input (Data,Var,Abs,NWrp,Lin,Pref,Null,Bit)	81 42
End Collection	C0
Usage Page (Digitizer)	05 0D
Usage (Finger)	09 22
Collection (Logical)	A1 02
Usage Page (Digitizer)	05 0D
Report Count (1)	95 01
Report Size (6)	75 06
Usage	09 51
Logical Minimum (0)	15 00
Logical Maximum (63)	25 3F
Input (Data,Var,Abs,NWrp,Lin,Pref,NNul,Bit)	81 02
Usage (Tip Switch)	09 42
Logical Maximum (1)	25 01
Report Size (1)	75 01
Report Count (1)	95 01
Input (Data,Var,Abs,NWrp,Lin,Pref,NNul,Bit)	81 02
Report Size (1)	75 01
Report Count (1)	95 01
Input (Cnst,Var,Abs,NWrp,Lin,Pref,NNul,Bit)	81 03
Usage Page (Generic Desktop)	05 01
Report Size (16)	75 10
Unit Exponent (-2)	55 0E
Unit (SI Lin: Length (cm))	65 11
Usage (X)	09 30
Logical Maximum (16384) (Depend on project)	26 00 40
Physical Minimum (0)	35 00
Physical Maximum (5212) (Depend on project)	46 5C 14
Input (Data,Var,Abs,NWrp,Lin,Pref,Null,Bit)	81 42
Usage (Y)	09 31
Logical Maximum (9600) (Depend on project)	26 80 25
Physical Maximum (2932) (Depend on project)	46 74 0B
Input (Data,Var,Abs,NWrp,Lin,Pref,Null,Bit)	81 42
End Collection	C0
Usage Page (Digitizer)	05 0D

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Usage (Finger)	09 22
Collection (Logical)	A1 02
Usage Page (Digitizer)	05 0D
Report Count (1)	95 01
Report Size (6)	75 06
Usage	09 51
Logical Minimum (0)	15 00
Logical Maximum (63)	25 3F
Input (Data,Var,Abs,NWrp,Lin,Pref,NNul,Bit)	81 02
Usage (Tip Switch)	09 42
Logical Maximum (1)	25 01
Report Size (1)	75 01
Report Count (1)	95 01
Input (Data,Var,Abs,NWrp,Lin,Pref,NNul,Bit)	81 02
Report Size (1)	75 01
Report Count (1)	95 01
Input (Cnst,Var,Abs,NWrp,Lin,Pref,NNul,Bit)	81 03
Usage Page (Generic Desktop)	05 01
Report Size (16)	75 10
Unit Exponent (-2)	55 0E
Unit (SI Lin: Length (cm))	65 11
Usage (X)	09 30
Logical Maximum (16384) (Depend on project)	26 00 40
Physical Minimum (0)	35 00
Physical Maximum (5212) (Depend on project)	46 5C 14
Input (Data,Var,Abs,NWrp,Lin,Pref,Null,Bit)	81 42
Usage (Y)	09 31
Logical Maximum (9600) (Depend on project)	26 80 25
Physical Maximum (2932) (Depend on project)	46 74 0B
Input (Data,Var,Abs,NWrp,Lin,Pref,Null,Bit)	81 42
End Collection	C0
Usage Page (Digitizer)	05 0D
Usage (Finger)	09 22
Collection (Logical)	A1 02
Usage Page (Digitizer)	05 0D

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Report Count (1)	95 01
Report Size (6)	75 06
Usage	09 51
Logical Minimum (0)	15 00
Logical Maximum (63)	25 3F
Input (Data,Var,Abs,NWrp,Lin,Pref,NNul,Bit)	81 02
Usage (Tip Switch)	09 42
Logical Maximum (1)	25 01
Report Size (1)	75 01
Report Count (1)	95 01
Input (Data,Var,Abs,NWrp,Lin,Pref,NNul,Bit)	81 02
Report Size (1)	75 01
Report Count (1)	95 01
Input (Cnst,Var,Abs,NWrp,Lin,Pref,NNul,Bit)	81 03
Usage Page (Generic Desktop)	05 01
Report Size (16)	75 10
Unit Exponent (-2)	55 0E
Unit (SI Lin: Length (cm))	65 11
Usage (X)	09 30
Logical Maximum (16384) (Depend on project)	26 00 40
Physical Minimum (0)	35 00
Physical Maximum (5212) (Depend on project)	46 5C 14
Input (Data,Var,Abs,NWrp,Lin,Pref,Null,Bit)	81 42
Usage (Y)	09 31
Logical Maximum (9600) (Depend on project)	26 80 25
Physical Maximum (2932) (Depend on project)	46 74 0B
Input (Data,Var,Abs,NWrp,Lin,Pref,Null,Bit)	81 42
End Collection	C0
Usage Page (Digitizer)	05 0D
Usage (Finger)	09 22
Collection (Logical)	A1 02
Usage Page (Digitizer)	05 0D
Report Count (1)	95 01
Report Size (6)	75 06
Usage	09 51

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Logical Minimum (0)	15 00
Logical Maximum (63)	25 3F
Input (Data,Var,Abs,NWrp,Lin,Pref,NNul,Bit)	81 02
Usage (Tip Switch)	09 42
Logical Maximum (1)	25 01
Report Size (1)	75 01
Report Count (1)	95 01
Input (Data,Var,Abs,NWrp,Lin,Pref,NNul,Bit)	81 02
Report Size (1)	75 01
Report Count (1)	95 01
Input (Cnst,Var,Abs,NWrp,Lin,Pref,NNul,Bit)	81 03
Usage Page (Generic Desktop)	05 01
Report Size (16)	75 10
Unit Exponent (-2)	55 0E
Unit (SI Lin: Length (cm))	65 11
Usage (X)	09 30
Logical Maximum (16384) (Depend on project)	26 00 40
Physical Minimum (0)	35 00
Physical Maximum (5212) (Depend on project)	46 5C 14
Input (Data,Var,Abs,NWrp,Lin,Pref,Null,Bit)	81 42
Usage (Y)	09 31
Logical Maximum (9600) (Depend on project)	26 80 25
Physical Maximum (2932) (Depend on project)	46 74 0B
Input (Data,Var,Abs,NWrp,Lin,Pref,Null,Bit)	81 42
End Collection	C0
Usage Page (Digitizer)	05 0D
Usage (Finger)	09 22
Collection (Logical)	A1 02
Usage Page (Digitizer)	05 0D
Report Count (1)	95 01
Report Size (6)	75 06
Usage	09 51
Logical Minimum (0)	15 00
Logical Maximum (63)	25 3F
Input (Data,Var,Abs,NWrp,Lin,Pref,NNul,Bit)	81 02

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Usage (Tip Switch)	09 42
Logical Maximum (1)	25 01
Report Size (1)	75 01
Report Count (1)	95 01
Input (Data,Var,Abs,NWrp,Lin,Pref,NNul,Bit)	81 02
Report Size (1)	75 01
Report Count (1)	95 01
Input (Cnst,Var,Abs,NWrp,Lin,Pref,NNul,Bit)	81 03
Usage Page (Generic Desktop)	05 01
Report Size (16)	75 10
Unit Exponent (-2)	55 0E
Unit (SI Lin: Length (cm))	65 11
Usage (X)	09 30
Logical Maximum (16384) (Depend on project)	26 00 40
Physical Minimum (0)	35 00
Physical Maximum (5212) (Depend on project)	46 5C 14
Input (Data,Var,Abs,NWrp,Lin,Pref,Null,Bit)	81 42
Usage (Y)	09 31
Logical Maximum (9600) (Depend on project)	26 80 25
Physical Maximum (2932) (Depend on project)	46 74 0B
Input (Data,Var,Abs,NWrp,Lin,Pref,Null,Bit)	81 42
End Collection	C0
Usage Page (Digitizer)	05 0D
Usage (Finger)	09 22
Collection (Logical)	A1 02
Usage Page (Digitizer)	05 0D
Report Count (1)	95 01
Report Size (6)	75 06
Usage	09 51
Logical Minimum (0)	15 00
Logical Maximum (63)	25 3F
Input (Data,Var,Abs,NWrp,Lin,Pref,NNul,Bit)	81 02
Usage (Tip Switch)	09 42
Logical Maximum (1)	25 01
Report Size (1)	75 01

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Report Count (1)	95 01
Input (Data,Var,Abs,NWrp,Lin,Pref,NNul,Bit)	81 02
Report Size (1)	75 01
Report Count (1)	95 01
Input (Cnst,Var,Abs,NWrp,Lin,Pref,NNul,Bit)	81 03
Usage Page (Generic Desktop)	05 01
Report Size (16)	75 10
Unit Exponent (-2)	55 0E
Unit (SI Lin: Length (cm))	65 11
Usage (X)	09 30
Logical Maximum (16384) (Depend on project)	26 00 40
Physical Minimum (0)	35 00
Physical Maximum (5212) (Depend on project)	46 5C 14
Input (Data,Var,Abs,NWrp,Lin,Pref,Null,Bit)	81 42
Usage (Y)	09 31
Logical Maximum (9600) (Depend on project)	26 80 25
Physical Maximum (2932) (Depend on project)	46 74 0B
Input (Data,Var,Abs,NWrp,Lin,Pref,Null,Bit)	81 42
End Collection	C0
Usage Page (Digitizer)	05 0D
Usage (Finger)	09 22
Collection (Logical)	A1 02
Usage Page (Digitizer)	05 0D
Report Count (1)	95 01
Report Size (6)	75 06
Usage	09 51
Logical Minimum (0)	15 00
Logical Maximum (63)	25 3F
Input (Data,Var,Abs,NWrp,Lin,Pref,NNul,Bit)	81 02
Usage (Tip Switch)	09 42
Logical Maximum (1)	25 01
Report Size (1)	75 01
Report Count (1)	95 01
Input (Data,Var,Abs,NWrp,Lin,Pref,NNul,Bit)	81 02
Report Size (1)	75 01

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Report Count (1)	95 01
Input (Cnst,Var,Abs,NWrp,Lin,Pref,NNul,Bit)	81 03
Usage Page (Generic Desktop)	05 01
Report Size (16)	75 10
Unit Exponent (-2)	55 0E
Unit (SI Lin: Length (cm))	65 11
Usage (X)	09 30
Logical Maximum (16384) (Depend on project)	26 00 40
Physical Minimum (0)	35 00
Physical Maximum (5212) (Depend on project)	46 5C 14
Input (Data,Var,Abs,NWrp,Lin,Pref,Null,Bit)	81 42
Usage (Y)	09 31
Logical Maximum (9600) (Depend on project)	26 80 25
Physical Maximum (2932) (Depend on project)	46 74 0B
Input (Data,Var,Abs,NWrp,Lin,Pref,Null,Bit)	81 42
End Collection	C0
Usage Page (Digitizer)	05 0D
Usage (Finger)	09 22
Collection (Logical)	A1 02
Usage Page (Digitizer)	05 0D
Report Count (1)	95 01
Report Size (6)	75 06
Usage	09 51
Logical Minimum (0)	15 00
Logical Maximum (63)	25 3F
Input (Data,Var,Abs,NWrp,Lin,Pref,NNul,Bit)	81 02
Usage (Tip Switch)	09 42
Logical Maximum (1)	25 01
Report Size (1)	75 01
Report Count (1)	95 01
Input (Data,Var,Abs,NWrp,Lin,Pref,NNul,Bit)	81 02
Report Size (1)	75 01
Report Count (1)	95 01
Input (Cnst,Var,Abs,NWrp,Lin,Pref,NNul,Bit)	81 03
Usage Page (Generic Desktop)	05 01

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Report Size (16)	75 10
Unit Exponent (-2)	55 0E
Unit (SI Lin: Length (cm))	65 11
Usage (X)	09 30
Logical Maximum (16384) (Depend on project)	26 00 40
Physical Minimum (0)	35 00
Physical Maximum (5212) (Depend on project)	46 5C 14
Input (Data,Var,Abs,NWrp,Lin,Pref,Null,Bit)	81 42
Usage (Y)	09 31
Logical Maximum (9600) (Depend on project)	26 80 25
Physical Maximum (2932) (Depend on project)	46 74 0B
Input (Data,Var,Abs,NWrp,Lin,Pref,Null,Bit)	81 42
End Collection	C0
Usage Page (Digitizer)	05 0D
Usage (Finger)	09 22
Collection (Logical)	A1 02
Usage Page (Digitizer)	05 0D
Report Count (1)	95 01
Report Size (6)	75 06
Usage	09 51
Logical Minimum (0)	15 00
Logical Maximum (63)	25 3F
Input (Data,Var,Abs,NWrp,Lin,Pref,NNul,Bit)	81 02
Usage (Tip Switch)	09 42
Logical Maximum (1)	25 01
Report Size (1)	75 01
Report Count (1)	95 01
Input (Data,Var,Abs,NWrp,Lin,Pref,NNul,Bit)	81 02
Report Size (1)	75 01
Report Count (1)	95 01
Input (Cnst,Var,Abs,NWrp,Lin,Pref,NNul,Bit)	81 03
Usage Page (Generic Desktop)	05 01
Report Size (16)	75 10
Unit Exponent (-2)	55 0E
Unit (SI Lin: Length (cm))	65 11

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Usage (X)	09 30
Logical Maximum (16384) (Depend on project)	26 00 40
Physical Minimum (0)	35 00
Physical Maximum (5212) (Depend on project)	46 5C 14
Input (Data,Var,Abs,NWrp,Lin,Pref,Null,Bit)	81 42
Usage (Y)	09 31
Logical Maximum (9600) (Depend on project)	26 80 25
Physical Maximum (2932) (Depend on project)	46 74 0B
Input (Data,Var,Abs,NWrp,Lin,Pref,Null,Bit)	81 42
End Collection	C0
Usage Page (Digitizer)	05 0D
Usage (Scan Time)	09 56
UNIT()	55 00
UNIT()	65 00
Logical Maximum (65535)	27 FF FF FF 7F
Report Count (1)	95 01
Report Size (32)	75 20
Input (Data,Var,Abs,NWrp,Lin,Pref,NNul,Bit)	81 02
Usage (Contact Count Maximum)	09 54
Logical Maximum(7f)	25 7F
Report Count (1)	95 01
Report Size (8)	75 08
Input (Data,Var,Abs,NWrp,Lin,Pref,NNul,Bit)	81 02
Report Size (8)	75 08
Report Count (8)	95 08
Input (Cnst,Var,Abs,NWrp,Lin,Pref,NNul,Bit)	81 03
Report ID (2)	85 02
Usage (Contact Count Maximum)	09 55
Logical Maximum (10)	25 0A
Report Size (8)	75 08
Report Count (1)	95 01
Feature (Data,Var,Abs,NWrp,Lin,Pref,NNul,NVol,Bit)	B1 02
Usage Page (Vendor)	06 00 FF
Usage (Vendor)	09 C5
Report ID (6)	85 06

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Logical Minimum (0)	15 00
Logical Maximum (255)	26 FF 00
Report Size (8)	75 08
Report Count (256)	96 00 01
Feature (Data,Var,Abs,NWrp,Lin,Pref,NNul,NVol,Bit)	B1 02
End Collection	C0
Usage Page (Vendor-Defined)	06 00 FF
Usage (Vendor-Defined 1)	09 01
Collection (Application)	A1 01
Usage (Vendor-Defined 1)	09 01
Report ID (3)	85 03
Logical Minimum (0)	15 00
Logical Maximum (255)	26 FF 00
Report Size (8)	75 08
Report Count (63)	95 3F
Input (Data,Var,Abs,NWrp,Lin,Pref,NNul,Bit)	81 02
Usage Page (Vendor-Defined)	06 00 FF
Usage (Vendor-Defined 1)	09 01
Logical Minimum (0)	15 00
Logical Maximum (255)	26 FF 00
Report Size (8)	75 08
Report Count (63)	95 3F
Output (Data,Var,Abs,NWrp,Lin,Pref,NNul,NVol,Bit)	91 02
End Collection	C0
Below descriptor is optional (Depend on project)	
Usage Page (Generic Desktop)	05 01
Usage (Mouse)	09 02
Collection (Application)	A1 01
Report ID (4)	85 04
Usage (Pointer)	09 01
Collection (Linked)	A1 00
Usage Page (Button)	05 09
Usage Min (1)	19 01
Usage Max (5)	29 05

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Logical Minimum (0)	15 00
Logical Maximum (1)	25 01
Report Count (5)	95 05
Report Size (1)	75 01
Input (Data, Variable, Absolute)	81 02
Report Count (1)	95 01
Report Size (3)	75 03
Input (Constant)	81 01
Usage Page (Generic Desktop)	05 01
Report Size (16)	75 10
Report Count (1)	95 01
Unit Exponent (-2)	55 0E
Unit (SI Lin: Length (cm))	65 11
Usage (X)	09 30
Logical Maximum (16384)	26 00 40
Physical Minimum (0)	35 00
Physical Maximum (5212)	46 5C 14
Input (Data,Var,Abs,NWrP,Lin,Pref,NNul,Bit)	81 42
Usage (Y)	09 31
Logical Maximum (9600)	26 80 25
Physical Maximum (2932)	46 74 0B
Input (Data,Var,Abs,NWrP,Lin,Pref,NNul,Bit)	81 42
End Collection	C0
End Collection	C0

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8.2. BootLoader Code Descriptor

8.2.1. Device Descriptor

Offset	Field	Size	Value	Description
0	bLength	1	12h	Size of descriptor in byte
1	bDescriptorType	1	01h	Descriptor type (DEVICE = 1)
2	bcdUSB	2	0200h	USB specification release (Ver 2.0 = 0x0200)
4	bDeviceClass	1	00h	Class info in Ifc Descriptors
5	bDeviceSubClass	1	00h	Subclass code
6	bDeviceProtocol	1	00h	Protocol code
7	bMaxPacketSize0	1	40h	Maximum packet size
8	idVendor	2	222Ah	Vendor ID
10	idProduct	2	xxxxh	Product ID (Depend on Solution) ILI2316 = FF16 ILI2326 = FF17 ILI2520 = FF18 ILI2521 = FF19 ILIM3A = FF1C ILI2322 = FF1D ILI2323 = FF1E ILI2130 = FF1F ILI2131 = FF20 ILI2132 = FF21
12	bcdDevice	2	0000h	Device release number
14	iManufacturer	1	01h	Index of string descriptor describing manufacturer ("ILITEK.")
15	iProduct	1	00h	Index of string descriptor describing product
16	iSerialNumber	1	00h	Index of string descriptor describing the serial number
17	bNumConfigurations	1	01h	Number of possible configuration

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8.2.2.Configuration Descriptor

Offset	Field	Size	Value	Description
0	bLength	1	09h	Size of descriptor in byte
1	bDescriptorType	1	02h	Descriptor type (CONFIGURATION = 2)
2	wTotalLength	2	xxxxh	Total length of data returned for this configuration (Depend on project)
4	bNumInterfaces	1	01h	Number of interfaces supported by this configuration
5	bConfigurationValue	1	01h	Value to use as an argument to the Set Configuration() request to select this configuration
6	iConfiguration	1	00h	Index of string descriptor describing this configuration
7	bmAttributes	1	A0h	Configuration characteristic (Bus Powered, Remote Wakeup)
	4..0: Reserved		...00000	
	5: Remote Wakeup		..1.....	Yes
	6: Self Powered		.0.....	No, Bus Powered
	7: (set to one)		1.....	
8	bMaxPower	1	C8h	Maximum power consumption (200 mA)

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8.2.3.Interface 0 Descriptor

Interface Descriptor

Offset	Field	Size	Value	Description
0	bLength	1	09h	Size of descriptor in byte
1	bDescriptorType	1	04h	Descriptor type (INTERFACE = 4)
2	bInterfaceNumber	1	00h	Number of this interface
3	bAlternateSetting	1	00h	Value used to select this alternate setting for the interface identified in the prior field
4	bNumEndpoints	1	01h	Number of endpoints used by this interface
5	bInterfaceClass	1	03h	Class code (HID)
6	bInterfaceSubClass	1	00h	Subclass code (No Subclass)
7	bInterfaceProtocol	1	00h	Protocol code (None)
8	iInterface	1	00h	Index of string descriptor describing this interface

HID Descriptor

Offset	Field	Size	Value	Description
0	bLength	1	09h	Size of descriptor in byte
1	bDescriptorType	1	21h	Descriptor type (HID)
2	bcdHID	2	0110h	HID class specification release (1.1)
4	bCountryCode	1	00h	Country code of localized hardware
5	bNumDescriptors	1	01h	Number of HID class descriptors
6	bDescriptorType	1	22h	Type of class descriptor (Report)
7	wDescriptorLength	2	xxxxh	Total size of report descriptor (Depend on project)

Endpoint1 Descriptor

Offset	Field	Size	Value	Description
0	bLength	1	07h	Size of descriptor in byte
1	bDescriptorType	1	05h	Descriptor type (Endpoint)
2	bEndpointAddress	1	81h	1 In
3	bmAttributes	1	03h	Interrupt
	1..0: Transfer Type		11	Interrupt
	7..2: Reserved		000000..	
4	wMaxPacketSize	2	0040h	64 bytes
6	bInterval	1	01h	1 ms

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8.2.4. Report Descriptor

Item Tag (Value)	Raw Data
Usage Page (Vendor-Defined)	06 00 FF
Usage (Vendor-Defined 1)	09 01
Collection (Application)	A1 01
Usage (Vendor-Defined 1)	09 01
Report ID (3)	85 03
Logical Minimum (0)	15 00
Logical Maximum (255)	26 FF 00
Report Size (8)	75 08
Report Count (63)	95 3F
Input (Data,Var,Abs,NWrp,Lin,Pref,NNul,Bit)	81 02
Usage Page (Vendor-Defined)	06 00 FF
Usage (Vendor-Defined 1)	09 01
Logical Minimum (0)	15 00
Logical Maximum (255)	26 FF 00
Report Size (8)	75 08
Report Count (63)	95 3F
Output (Data,Var,Abs,NWrp,Lin,Pref,NNul,NVol,Bit)	91 02
Report ID (7)	85 07
Report Count (262)	96 06 01
Usage (Vendor-Defined 1)	09 01
Feature (Data,Var,Abs,NWrp,Lin,Pref,NNul,NVol,Bit)	B1 02
Report ID (8)	85 08
Report Count (262)	96 06 04
Usage (Vendor-Defined 1)	09 01
Feature (Data,Var,Abs,NWrp,Lin,Pref,NNul,NVol,Bit)	B1 02
Report ID (9)	85 09
Report Count (262)	96 06 08
Usage (Vendor-Defined 1)	09 01
Feature (Data,Var,Abs,NWrp,Lin,Pref,NNul,NVol,Bit)	B1 02
Report ID (10)	85 0A
Report Count (262)	96 06 10
Usage (Vendor-Defined 1)	09 01
Feature (Data,Var,Abs,NWrp,Lin,Pref,NNul,NVol,Bit)	B1 02
End Collection	C0

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