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Projected Capacitance Touch Panel Specification

Model: HT704F

Revision Date : 2010/12/08

PLACE OF SEAL	CUSTOMER APPROVED	CUSTOMER CHECKED

Please sign to confirm your acceptance and return a copy for our record filling.

Approved By	Checked By	Edited By

REVISION STATUS

Version	Content	page	Modified By	Revise Date
A/00	First Issued	--	Tracy	2010-12-08

Table of Contents

1. Function

Touch Panel Module is a capacitive-type which for the consumer to use compliance with flat panel display like TFT-LCD. Once the consumer touched it by finger, the circuitry for this Touch Panel indicates the coordinate point to the relative products at the contact point.

2. Features

Item	Description	Unit
Touch Panel Size	7”	Inch
Outer Dimension	164.00*98.70	mm
View Area	155.08*87.64	mm
Active Area	154.08*86.64	mm
Touch Module Resolution (Trace: Tx x Ty)	12*21	CH
Touch Module Resolution	2048 x 2048	dots
Input Type	Multi-Touch(Real 2 Point)	
Output Type	I2C interface	

3.Characteristics

3.1 Surface hardness&strength

Item	spec
Pencil surface hardness	Loading force≥500g Pencil movement angle:45° Pencil hardness:≥6H
Ball-falling Test	Steel ball dianeter: 32mm Steel ball weight:～132g Ball-falling height≥35cm

3.2 Optical Characteristics

Test by the lighting measure device and the transparency should be87% minimum.

4.Reliability

No.	Item	Test Condition	Note
1	High Temperature Operating	after exposing at 60°C for 240 hours and at normal temperature and humidity for 24 hours	
2	Low Temperature Operating	after exposing at -20°C for 240 hours and at normal temperature and humidity for 24 hours (except for dew gathering)	
3	High Temperature High Humidity Operating	after exposing at 40°C, 80%RH for 240 hours (after dehumidifying in the chamber 60°C and 50% max.) and at normal temperature and humidity for 24 hours (except for dew gathering)	
4	High Temperature Storage	after exposing at 60°C for 240 hours and at normal temperature and humidity for 24 hours	
5	Low Temperature Storage	after exposing at -30°C for 240 hours and at normal temperature and humidity for 24 hours (except for dew gathering)	
6	High Temperature High Humidity Storage	after exposing at 60°C ,90%RH for 240 hours (after dehumidifying in the chamber 60°C and 50% max.) and at normal temperature and humidity for 24 hours (except for dew gathering)	
7	Thermal Shock (Non Operating)	after exposing under the conditions between -30°C (30min) and 70°C (30 min) by 50 cycles (taking out at 70°C) and at normal temperature and humidity for 24 hours (except for dew gathering) Test sample: 4pcs.	
8	FPC Bending test	Condition: Connector side: bending angle will be decided per different project. Touch Panel Side: bending angle will be decided per different project. Minimum 10 cycles for each side. Criterion: Normal performance after bending test. There shall be no damage on FPC	
9	FPC connection Insert / Remove test	Condition: Insert / Remove Touch panel FPC for 10 cycles. Criterion: Normal performance after FPC connection Insert / Remove test	
10	Touch panel Surface Hardness test	Condition: Pencil hardness = 5H, Loading = 475g, to stroke on touch panel surface. Criterion: Normal performance after surface hardness test. There shall be no scratch on touch panel surface	

5. Appearance Inspection Standard

Unveil product appearance inspection standard and assurance product quality level.

5.1 Limit Sample

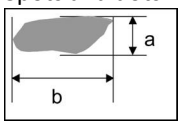
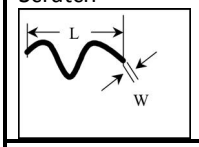
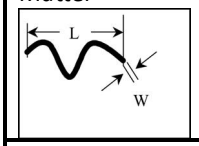
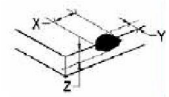
If the definition of appearance inspection was out of the description mentioned in this specification, we should base on the both parties agreed limit sample. Both parties should have the same standard limit sample and the appearance will base on the limit sample.

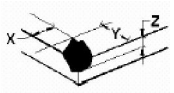
5.2 Inspection Conditions

1. The brightness in test site: 500 Lux.
2. Inspection distance: 30 cm (take PANEL under Transmit Light)
3. Viewing Angle: >60°
4. Light Source: 40W natural light

5.3 Criteria

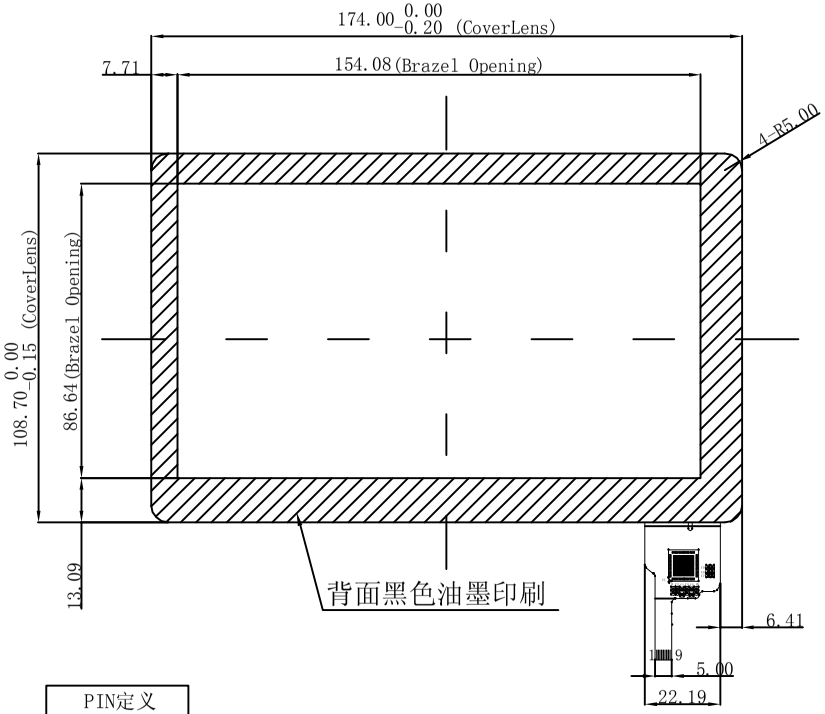
Based on above inspection condition, the defect can be found within 3 to 5 seconds is major defect.

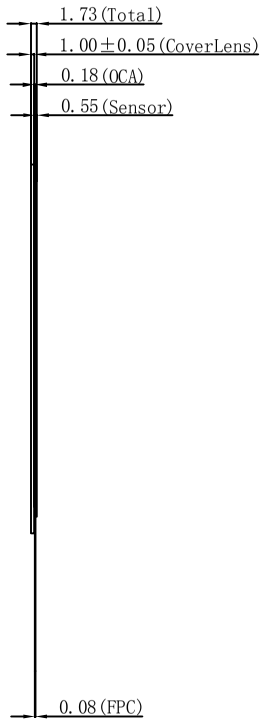
Item	Description		Criteria
Spots and dots  D=(a+b)/2	D ≤ 0.15 mm		Ignore
	0.15< D ≤ 0.2 mm		2 or less (distance 5mm over)
	0.2 mm < D ≤ 0.3 mm		1 or less (distance 5mm over)
	0.3 mm < D		Not allowed
Scratch 	W ≤ 0.02mm	--	Ignore
	0.02 mm < W ≤ 0.03mm	L ≤ 5 mm	3or less (distance 5mm over)
	0.03 mm < W ≤ 0.05 mm	L ≤ 5 mm	2 or less (distance 5mm over)
	0.05 mm < W	--	Not allowed
Linear Foreign Matter 	W ≤ 0.02 mm	--	Ignore
	0.02 mm < W ≤ 0.03mm	L ≤ 2 mm	2or less (distance 5mm over)
	0.03 mm < W ≤ 0.05 mm	L ≤ 2 mm	1 or less
	0.05 mm < W	--	Not allowed
General Crack 	Y ≤ 0.5mm, X(Ignore), Z ≤ t		5 or less
	Y > 0.5 mm		Not allowed

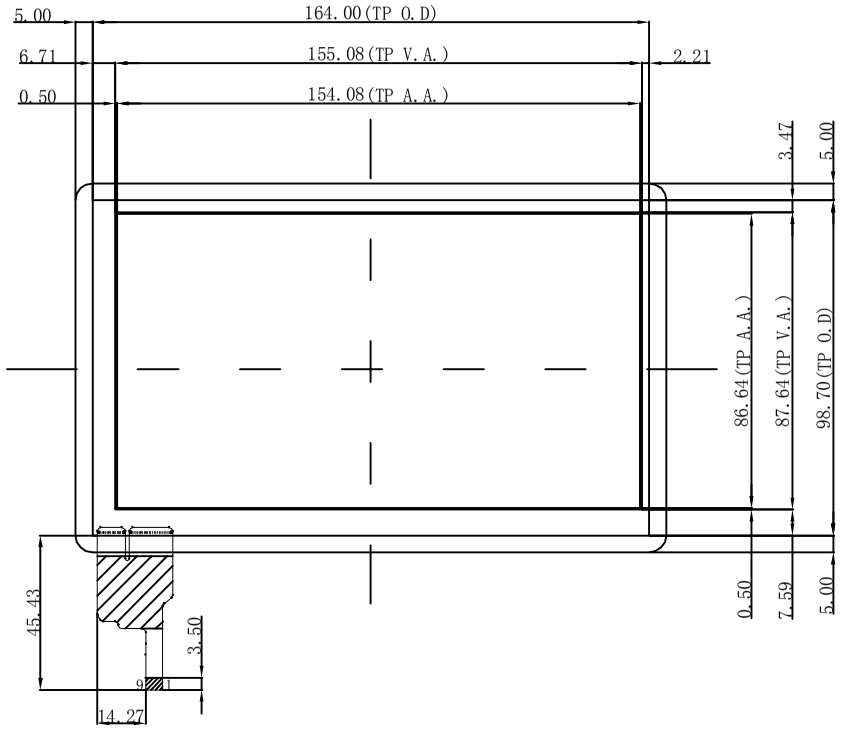
Corner crack 	X ≤ 0.5mm, Y ≤ 0.5mm, Z ≤ t		2 or less
Bad crack 	All shall be rejected.		NG
Masking line (V. A.)		Limit sample agreed by both party	
FPC appearance inspection standard	Terminal	No cracking, corrosion and distortion. No plating defect cause copper exposed and burr on the contact area. No contamination, impurity or dirt on the contact area. Conductive burr is not allowed. However, non-conductive burr allowed to peeled off as: 3 cycle: press 5 times ←→ clean 5 times. Clean with dry cloth for each cycle. It's not allowed the terminal peeled off. No bump and copper chip allowed. However, even it is in the tolerance, it is still defect if its failure will affect the reliability and electrical characteristics.	
	Pattern printed circuit	Concerning about the bump & chip copper: Bump： should be less than 1/3 of pitch. Chip copper： should be less than 1/3 of pitch.	
	Resist (or cover layer)	Concerning about Pin hole, cut, air bubble. Circuit part: no cut, no air bubble. Other than the circuit part： no cut, no air bubble is allowed to cross the circuit.	
	Stiffener	No cracking allowed	
	Cover layer	No peeling, no warp, no broken	
	Impression bent mark	Limit sample agreed by both party	

5.4 Sampling Plan/ Quality Level

Rank	AQL	Inspection Item
Unacceptable defect	Ac=0/Re=1 judgment	The defect will cause the function or operating failure as unacceptable Defect.
Major Defect	0.65	Concerning about the electrical characteristics
Minor Defect	0.65	Concerning about the mechanical, optical characteristics and the dimensions requirement







PIN定义	
1	NC
2	RST
3	INT
4	VDD
5	GND
6	SCK
7	NC
8	NC
9	SDA

Front view

Side view

Back view

REV	日期	變更內容	ECN NO.

未註明角度公差±0.1°		
	A	B
~30	±0.10	±0.15
30~60	±0.15	±0.20
60~150	±0.20	±0.25
150~300	±0.25	±0.30
300~630	±0.30	±0.35
630~1000	±0.35	±0.40

Super-Union Optical Co. Ltd.

APPROVED	JOUST	DATE	2010-12-02	DWG NO.:	HT704F 规格图		
CHECKED	CP	DATE	2010-12-02	REV: 1.0	UNIT: mm SIZE: A3	SCALE:	SHEET: 1:1
DESIGNED	ZJ	DATE	2010-12-02	PART NO.:			
DRAWER	LM	DATE	2010-12-02	TITLE:			

7. Pin Definitions

Pin	Signal	I/O	Description
1	NC	I/O	No connection
2	RST	I/O	RESET active high: min 10us(high remain time)
3	INT	I/O	External interrupt INT
4	VDD	I/O	Supply voltage 3.3V
5	GND	I/O	Ground
5	GND	I/O	Ground
6	SCK	I/O	I2C Serial Clock(SCK)
7	NC	I/O	No connection
8	NC	I/O	No connection
9	SDA	I/O	I2C Serial Data(SDA)

8. Command Description

8.1 System Block Diagram (Fig. 3)

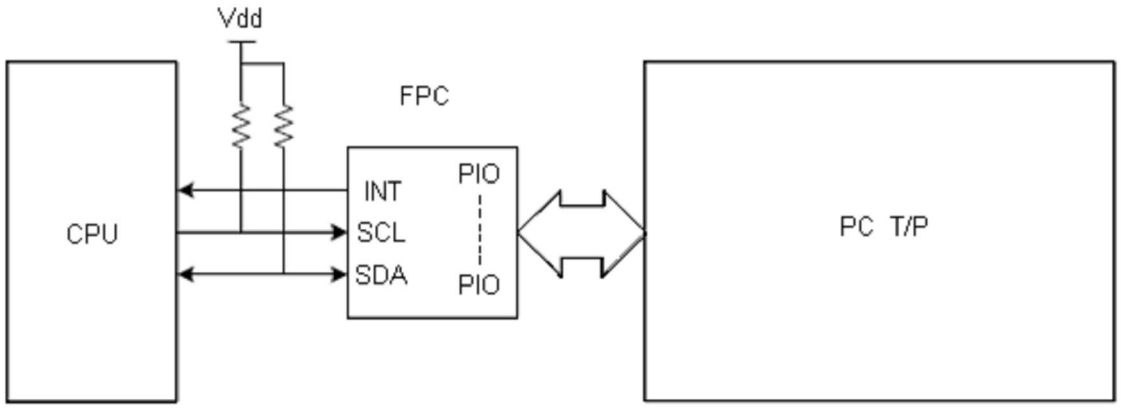


Fig. 3

8.2 Touch Panel Specifications Table 1.

Interface	I2C Slave
Slave address	0Ah
Translate rate	Up to 400 Kbit/s
Resolution	480x800
Report Rate	(25-200)points/sec.
Gesture	Provide (X,Y) coordinates and number of touch points with force index and speed index (Max 4 points)
Power Voltage	3.3V DC
Current Consumption	7.5~12 / 0.03~0.05 mA (work / sleep)
Operating Temperature	-20 C to 70 C

8.3 I2C Timing

Slave Address = 0b0101110x

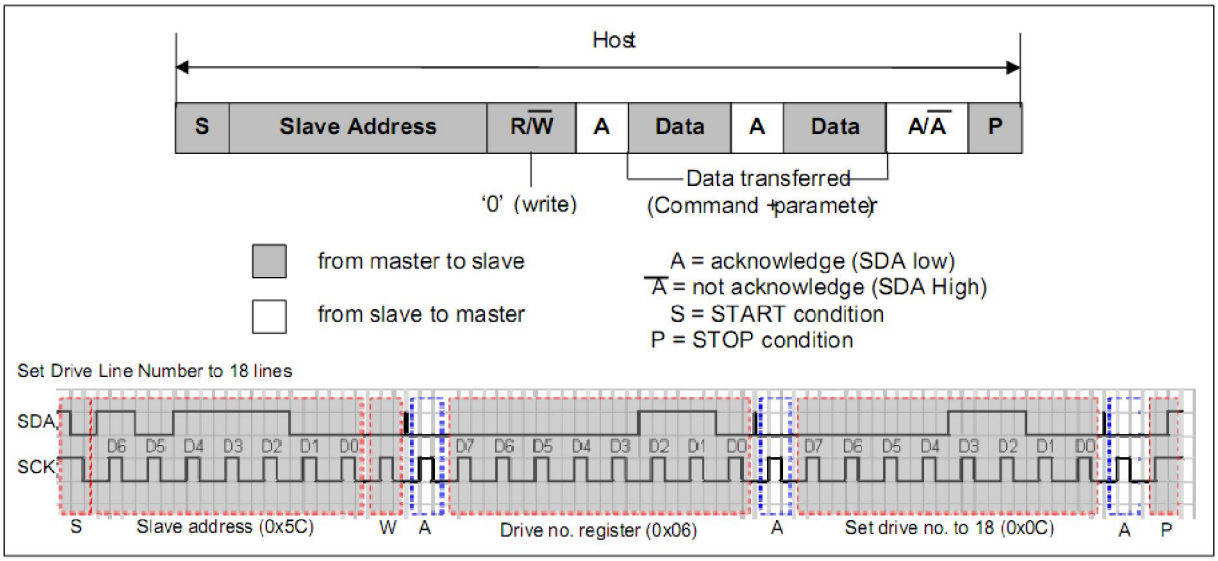


Fig.4 IIC Command Write Example

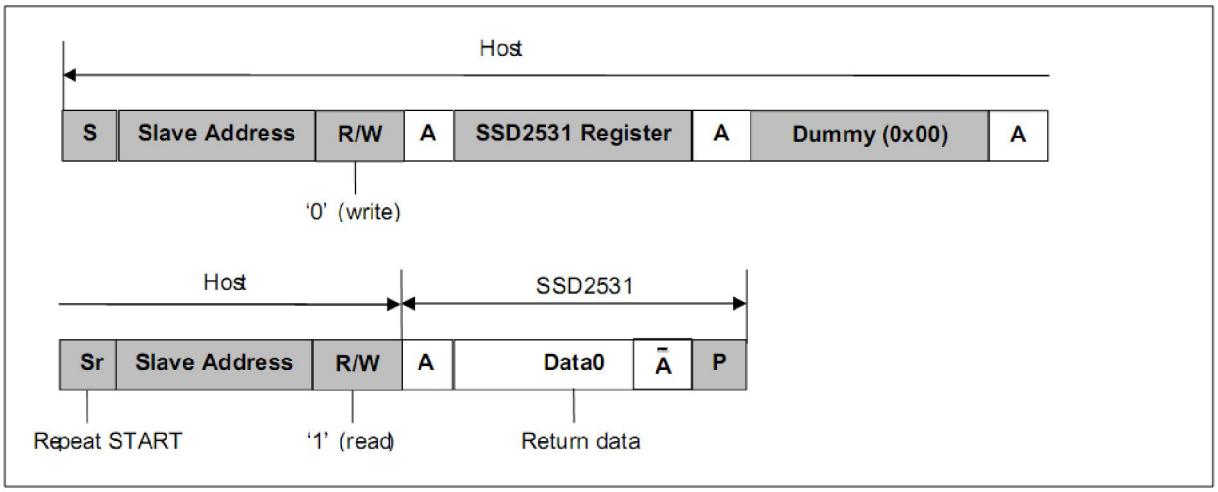


Fig.5 IIC Command Read (Single-Byte Data) Example

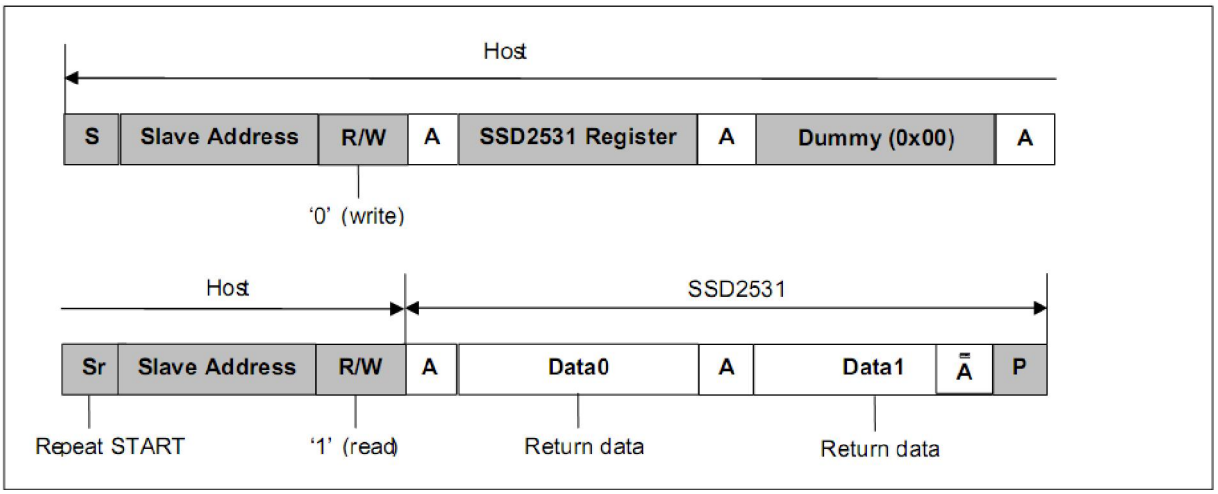


Fig.6 IIC Command Read (Double-Byte Data) Example

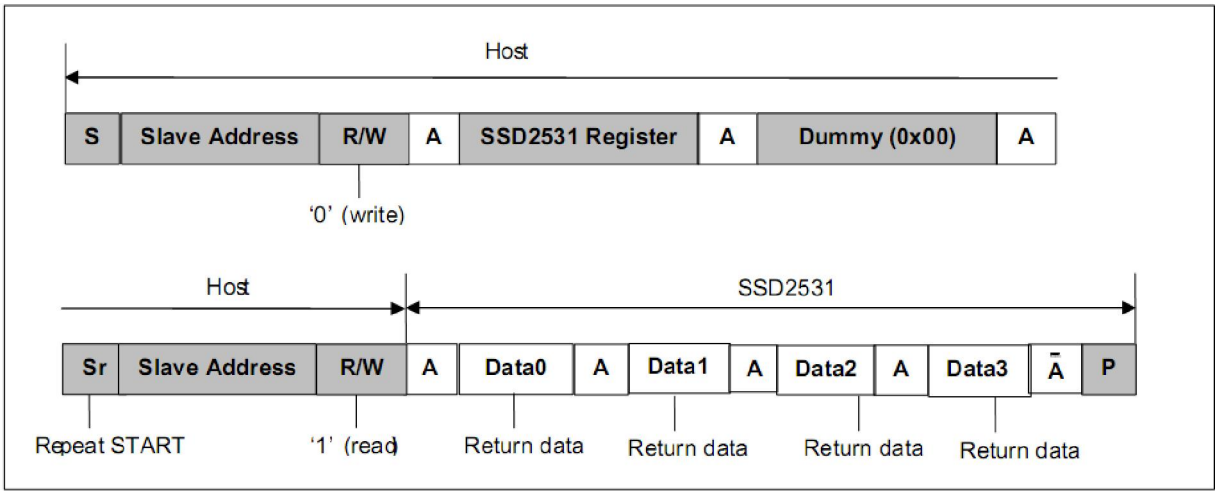


Fig.7 IIC Command Read (Four-Byte Data) Example

8.4 Finger coordinate

Detected finger touch coordinates are stored on registers R7Ch~R7Fh. Host processor can read the finger coordinate data directly from these registers. When there has no finger touch, the register will return 0xFFFFFFh.

In normal operation, SSD2531 will pull low IRQ pin to interrupt Host process whenever detected finger touch or happened a touch event.

The IRQ has a latency of not more than 10ms when the SSD2531 senses an event. The following diagram illustrated the latency of event triggered IRQ

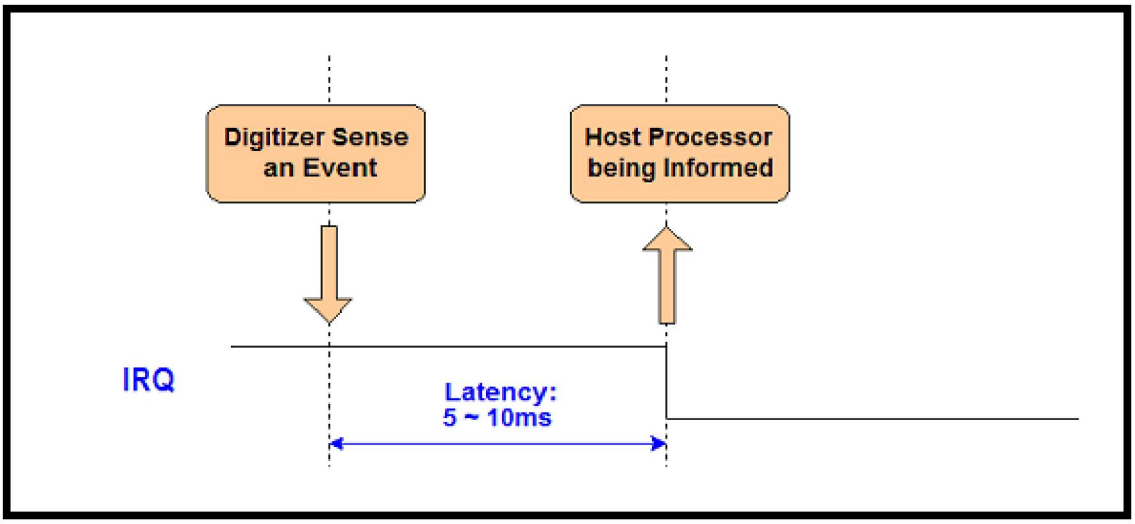


Fig.8 Latency of Event Triggered IRQ

When IRQ goes low, Host processor can read the event status register R79h to check what information is ready to be read. This can help to shorten the system process time especially for multi touch application.

Event Status (R79h)

R/W	Parameter	IB7	IB6	IB5	IB4	IB3	IB2	IB1	IB0
R	1	--	LO	OF	NE	F3	F2	F1	F0
POR		0	0	0	0	0	0	0	0

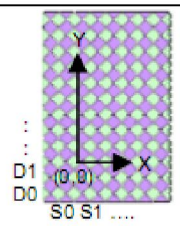
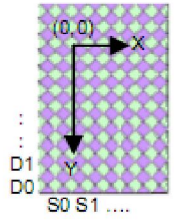
This register showed the status of the touch detection. When a touch event is detected, the IRQ signal will set to low and at least one bit on this register will set to “1” to indicate the touch status. This register is “0” if the IRQ signal is high.

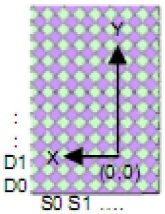
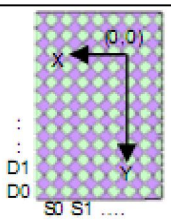
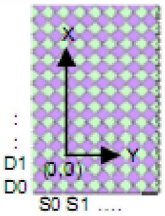
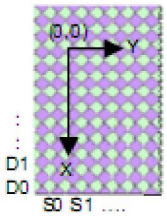
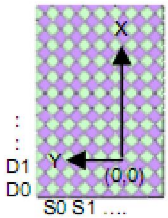
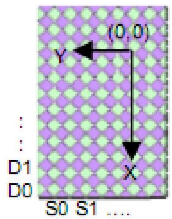
Register	Name	Function
LO	Large Object	If a touch detected with touch area over Max Finger Area (R16h), this bit will set to "1"
OF	FIFO Overflow	This bit will set to "1" if Touch Event Stack has over 8 events stored
NE	FIFO Not Empty	This bit will set to "1" if Touch Event Stack is not empty
F3	Finger3 Detected	If more than 1 finger were detected. This bit will set to "1" indicating the present of 4th finger
F2	Finger2 Detected	If more than 1 finger were detected. This bit will set to "1" indicating the present of 3rd finger
F1	Finger1 Detected	If more than 1 finger were detected. This bit will set to "1" indicating the present of 2nd finger
F0	Finger0 Detected	This bit will set to "1" when 1st finger touch detected

8.5 Touch Coordinate Mapping

SSD2531 provides 12 sensing pins and 21 driving pins for connect to touch panel to form a 12x21 touch matrix or a 352x640 touch resolution. By default setting, x-axis is mapped to sensing pins and y-axis is mapped to driving pins while point 0 is start from pin SENSE00 and the first scan line of R08h.

User can remap the coordinate by command R65h and mapping the following table illustrated the mapping setting of command R65h.

Data	Mapping Setting	Example
000	Normal	
001	Y-Invert	

010	X-Invert	
011	X&Y-Invert	
100	Transpose	
101	Transpose + X-Invert	
110	Transpose + Y-Invert	
111	Transpose + X&Y-Invert	

8.6 Touch Panel Config Setting

1、Connect with power。

2、Give a pulse to Reset pin, (low level active and low level >=10us)

3、Control host to write congfiguration information to touch panel(Use I2C),as follows:

```
delay 100
 0x23, 0x00,          // Exit sleep mode
 delay 100
 0x2B, 0x02,          // Enable DSP clock
 0xd4, 0x08,          // Clk speed
 0xd7, 0x04,          // ADC range

// Touch panel configuration
 0x06, 0x0f,          // Set drive lines
 0x07, 0x06,          // Set sense lines

 0x08, 0x09,          // Set 1st drive line reg
 0x09, 0x08,          // Set 2nd drive line reg
 0x0A, 0x07,          // Set 3rd drive line reg
 0x0B, 0x06,          // Set 4th drive line reg
 0x0C, 0x05,          // Set 5th drive line reg
 0x0D, 0x04,          // Set 6th drive line reg
 0x0E, 0x03,          // Set 7th drive line reg
 0x0F, 0x02,          // Set 8th drive line reg
 0x10, 0x01           // Set 9th drive line reg
 0x11, 0x00,          // Set 10th drive line reg
 0x12, 0x14,          // Set 11th drive line reg
 0x13, 0x13,          // Set 12th drive line reg
 0x14, 0x12,          // Set 13th drive line reg
 0x15, 0x11,          // Set 14th drive line reg
 0x16, 0x10,          // Set 15th drive line reg
 0x17, 0x0f,          // Set 16th drive line reg
 0x18, 0x0e,          // Set 17th drive line reg
 0x19, 0x0d,          // Set 18th drive line reg
 0x1a, 0x0c,          // Set 19th drive line reg
 0x1b, 0x0b,          // Set 20th drive line reg
 0x1c, 0x0a,          // Set 21th drive line reg
// Touch detection setting
 0x2A, 0x03,          // Set sub-frames
 0x8d, 0x01,
 0x8e, 0x02,
 0x94, 0x00, 0x00,
 0x8d, 0x00,
 0x25, 0x02,          // Set scan mode (200hz)
```

```
delay 100

0xc1, 0x02,          // charge pump 2nd booster (?)
0xd5, 0x0f,          // driving voltage (15.5V)

delay 100
delay 100
delay 100

0xd9, 0x01,          // enable sense filter
0x59, 0,           //ENABLE_MOVE_TOLERANCE,
0x5b, 1,           //MOVE_TOLERANCE,
0x5a, 0x00,          // maximum missed frames
0x2c, 0x02,          // median filter parameter (2 tap)
0x3d, 0x01
0x38, 0x00,          // delta data range
0x33, 0x01,          // minimum finger area
0x34, 0x40,          // minimum finger level
0x35, 0x00, 0x00,        // Finger weight threshold
0x36, 0x1e,          // Set Max. Finger area
0x37, 0x03,          // Set Segmentation depth
0x39, 0x01,          // Finger tracking mode
0x56, 0x01,          // Moving average
0x51, 0x00, 0x00,        // single click timing (disabled)
0x52, 0x00, 0x00,        // double click timing (disabled)
0x53, 0x10,          // CG tolerance
0x54, 0x30,          // X tracking tolerance
0x55, 0x30,          // Y tracking tolerance
0x65, 0x02,
0x66, 0x40,          // scale X [xx.xxxxxx]
0x67, 0x40,          // scale Y [xx.xxxxxx]
0xa2, 0x00,          // Reset Init Reference
0x7a, 0xff, 0xbf,        // mask all events but finger leave
0x7b, 0xe0           // mask IRQ: fifo overflow, large object.
```

8.7 Reading coordinate

In normal operation, the INT pin will be pulled low to interrupt Host process whenever detected finger touch or happened touch event. Host can read coordinate as follows:

1、Send start singal a communication。

3、After getting ACK singal,the Host must send 0x79、0x00 to touch panel to check interrupt event。

4、If touch panel has interrupt event，Host can send 0x7C,0x00 to read coordinate。The date's defination as follows：nd address（0x5C）。

5、if touch panel dose not give ACK,Host give a stop singal to finish

Reg#	Function	R/W/C	No. of	Parameter	Default
R79h	Event Status	R	1	[7]: Reserved [6]: Large Object detected [5]: FIFO overflow [4]: FIFO not empty [3]: Finger 3 detected [2]: Finger 2 detected [1]: Finger 1 detected [0]: Finger 0 detected	N/A
R7Ch	Finger01 (X,Y) coordinates, speed index and press weight index.	R	4	[31:24]: x-coordinate[7:0] [23:16]: y-coordinate[7:0] [15:12]: x-coordinate [11:8] [11:08]: y-coordinate [11:8] [07:04]: press weight index[3:0] [03:00]: speed index [3:0]	0xFF 0xFF 0xFF 0x00
R7Dh	Finger02 (X,Y) coordinates, speed index and press weight index.	R	4	[31:24]: x-coordinate[7:0] [23:16]: y-coordinate[7:0] [15:12]: x-coordinate [11:8] [11:08]: y-coordinate [11:8] [07:04]: press weight index[3:0] [03:00]: speed index [3:0]	0xFF 0xFF 0xFF 0x00
R7Eh	Finger03 (X,Y) coordinates, speed index and press weight index.	R	4	[31:24]: x-coordinate[7:0] [23:16]: y-coordinate[7:0] [15:12]: x-coordinate [11:8] [11:08]: y-coordinate [11:8] [07:04]: press weight index[3:0] [03:00]: speed index [3:0]	0xFF 0xFF 0xFF 0x00
R7Fh	Finger04 (X,Y) coordinates, speed index and press weight index.	R	4	[31:24]: x-coordinate[7:0] [23:16]: y-coordinate[7:0] [15:12]: x-coordinate [11:8] [11:08]: y-coordinate [11:8] [07:04]: press weight index[3:0] [03:00]: speed index [3:0]	0xFF 0xFF 0xFF 0x00

8.8 Sleep in, Sleep out initialization

Below software code can be improved the stability of the sleep in/out function. Below is initialization for sleep in /out procedure at the first time:

Step 1: Reset

Step 2: Initialization

Step 3: Sleep in (set idle mode " 0x25, 0x00"; read mode "0x26" to be 0x00; sleep in "0x24, 0x00")

Step 4: Sleep out (sleep out "0x23, 0x00"; set operation mode "0x25, 0x02";)

The sleep in/sleep out only generates the clock pulse to the system, so we need to set the operation mode for panel activities