DOCUMENT NUMBER AND REVISION

FS-J070WVTC0211 REV. A

(7.0"TFT+7.0"CTP)

DOCUMENT TITLE:

SPECIFICATION
OF
LCD MODULE TYPE

CUSTOMER	
MODEL NUMBER	**J070WVTC0211**
SAMPLE LOT NO.	
CUSTOMER APPROVAL	
DATE	

DEPARTMENT	NAME	SIGNATURE	DATE
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☐ **PRELIMINARY SPECIFICATION**

☑ **FINAL SPECIFICATION AND SAMPLE**

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DOCUMENT REVISION HISTORY 1:

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A	2018.09.25	First Release	CHEN HUAIJUN	LIHUAMING

CONTENTS

Specification of LCD Module Type
Item No.: J070WVTC0211

1 General Description

J070WVTC0211 is a color active matrix LCD module incorporating amorphous silicon TFT (Thin Film Transistor). It is composed of a TFT module, capacitor touch panel, and backlight driver. The module display area contains 800 (RGB) ×480 pixels. This product accords with RoHS environmental criterion.
TFT:

Table 1

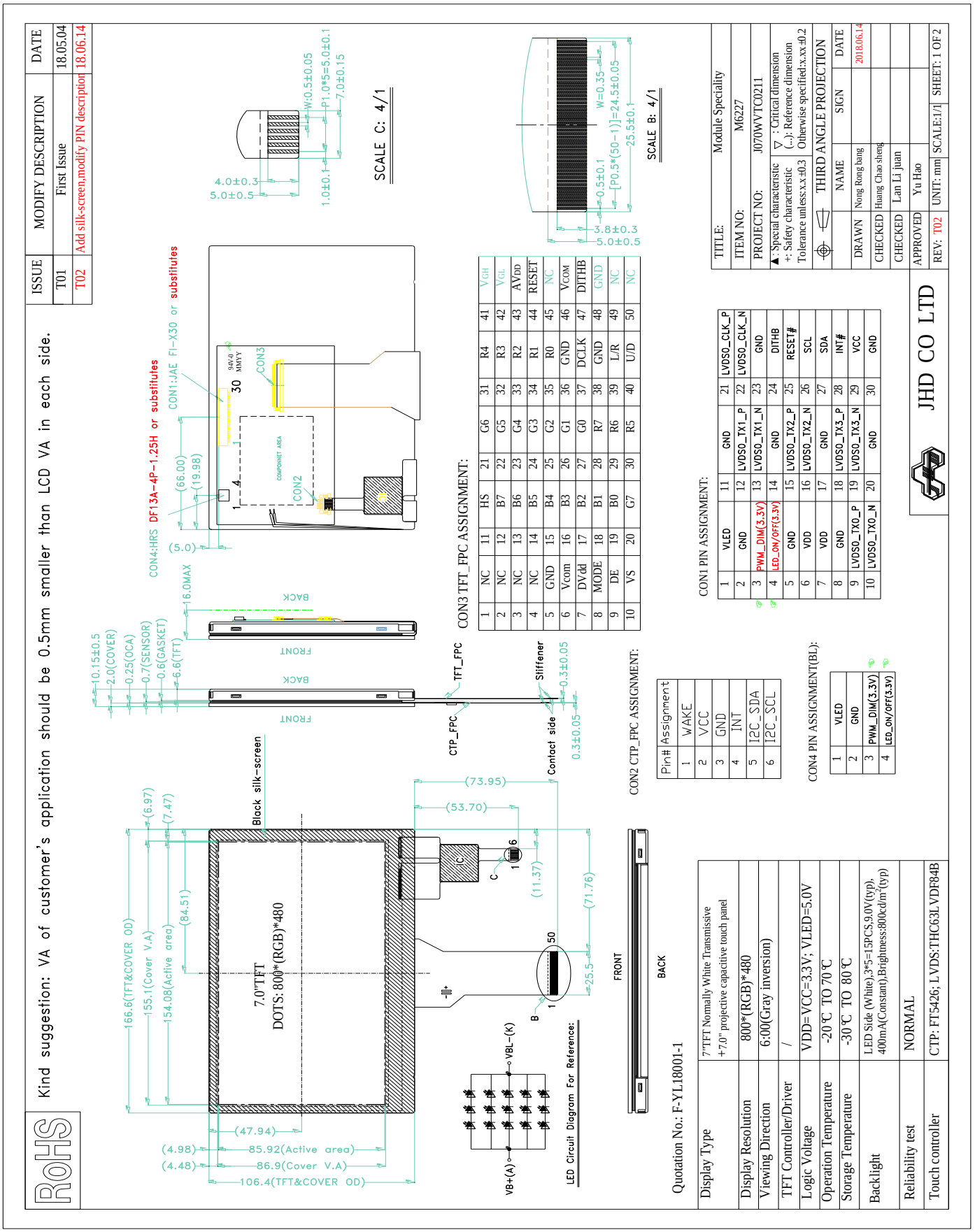
Item	Specification	Unit
Screen Size	7.0 inches	Diagonal
Display Resolution	800 (H)(RGB) x 480 (V)	Pixel
Active Area (LCD)	154.08(H) x 85.92 (V)	mm
Outline Dimension	166.6 (H) x 106.4(V) x 16MAX (T)	mm
Display Mode	Normally white mode/ Transmissive anti-glare	--
Pixel Arrangement	R,G,B Vertical Stripe	--
Pixel Size	0.1905x0.1905	mm
Display Color	16.7M	--
Viewing Direction	6 o'clock	--
Input Interface	LVDS Data Transfer	--

TP:

Table 2

Item	Specification	Unit
Touch panel Size	7.0 inches	
Active Area (Sensor)	154.08 (H) x 85.92 (V)	mm
Input type	Multi touch	
Interface mode	I^2C	

Note (1): Optical measurement should be executed after panel is secured. Measurement process should be executed in a stable, windless, and dark room. Optical specifications should be measured by spectrophotometer.



Quotation No.: F-YL18001-1	
Display Type	7"TFT Normally White Transmissive +7.0" projective capacitive touch panel
Display Resolution	800*(RGB)*480
Viewing Direction	6:00(Gray inversion)
TFT Controller/Driver	/
Logic Voltage	VDD=VCC=3.3V; VLED=5.0V
Operation Temperature	-20℃ TO 70℃
Storage Temperature	-30℃ TO 80℃
Backlight	LED Side (White),3*5=15PCS,9.0V(typ), 400mA(Constant),Brightness:800cd/m^2(typ)
Reliability test	NORMAL
Touch controller	CTP: FT5426; LVDS:THC63LVDF84B

Fig 1. (A): Module Specification

ISSUE	MODIFY DESCRIPTION	DATE
T01	First Issue	18.05.04
T02	Add silk-screen,modify PIN description	18.06.14

1. 晶华公司的环保标志:
   JHD Environment Sign(green shading):

RoHS

2. 晶华所执行的标准如下:
   JHD perform Environment Standard as follows :

有害物质十种含量(ppm)---ICP 测试方式
Ten Injurant Contents (ppm)---ICP Test Style

镉及镉化合物 Cadmium and Cadmium ncompounds	铅及铅化合物 Lead and lead compounds	汞及汞化合物 Mercury and mercury compounds	6价铬化合物 Hexavalent chromium compounds	多溴联苯 Polybrominated biphenyls (PBB)	多溴二苯醚 Polybrominated diphenylethers (PBDE)	邻苯二甲酸丁基苄酯 Butyl benzyl phthalate (BBP)	邻苯二甲酸二正丁酯 Dibutyl phthalate (DBP)	邻苯二甲酸二异丁酯 Diisobutyl phthalates (DIBP)	邻苯二甲酸二(2-乙基己基)酯 Bis(2-ethylhexyl) phthalate (DEBP)
<100	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000

3. 如有客户环保协议,按客户环保协议执行.
   We Could Execute According To Customer's Environment Standard If Customer Requires.

TITLE:	Module Speciality		
ITEM NO:	M6227		
PROJECT NO:	J070WVTC0211		
▲: Special characteristic +: Safety characteristic Tolerance unless:x.x ±0.3	▽: Critical dimension (...): Reference dimension Otherwise specified:x.xx ±0.2		
THIRD ANGLE PROJECTION			
	NAME	SIGN	DATE
DRAWN	Nong Rong bang		2018.06.14
CHECKED	Huang Chao sheng		
CHECKED	Lan Li juan		
APPROVED	Yu Hao		
REV: T02	UNIT: mm	SCALE:1/1	SHEET: 2 OF 2

JHD CO LTD

Fig 1. (B): Module Specification

深圳晶华显示器材有限公司
SHENZHEN JINGHUA DISPLAYS CO.,LTD

FS-J070WVTC0211 REV.A
(7.0"TFT+7.0"CTP)
SEP/2018

2 Interface signals

Table 3

Pin No.	Symbol	I/O	Function	Remark
1	VLED(5V)	P	Power supply for BL driver	
2	GND	P	Power ground	
3	PWM_DIM(3.3V)	I	BL Luminance adjusting input	
4	LED_ON/OFF(3.3V)	I	BL controller enable signal input	
5	GND	P	Power ground	
6	VDD	P	Power supply for logic	
7	VDD	P	Power supply for logic	
8	GND	P	Power ground	
9	LVDS0_TX0_P	I	Positive LVDS Data inputs	
10	LVDS0_TX0_N	I	Negative LVDS Data inputs	
11	GND	P	Power ground	
12	LVDS0_TX1_P	I	Positive LVDS Data inputs	
13	LVDS0_TX1_N	I	Negative LVDS Data inputs	
14	GND	P	Power ground	
15	LVDS0_TX2_P	I	Positive LVDS Data inputs	
16	LVDS0_TX2_N	I	Negative LVDS Data inputs	
17	GND	P	Power ground	
18	LVDS0_TX3_P	I	Positive LVDS Data inputs	
19	LVDS0_TX3_N	I	Negative LVDS Data inputs	
20	GND	P	Power ground	
21	LVDS0_CLK_P	I	LVDS Clock input	
22	LVDS0_CLK_N	I	LVDS Clock input	
23	GND	P	Power ground.	
24	DITHB	I	Dithering function input	
25	RESET#	I	Interrupt signal for the host to change F5426 from Hibernate to Active mode	TP
26	SCL	I	I2C clock input.	TP
27	SDA	I/O	I2C data input and output. (SPI Data Out)	TP
28	INT#	O	The interrupt request signal from CTPM to Host	TP
29	VCC	P	Power supply for logic(tp)	TP
30	GND	P	Power ground(tp)	TP

I: input, O: output, P: Power

3. Electrical Specifications

3.1 Absolute Ratings of Environment

If the operating condition exceeds the following absolute maximum ratings, the TFT LCD module may be damaged permanently.

Table 4

Item	Symbol	Min.	Max.	Unit	Note
Storage temperature	TSTG	-30	80	℃	(1)
Operating temperature	TOPR	-20	70	℃	(1)

Note (1) Only operation is guaranteed at operating temperature. Contrast, response time, another display quality are evaluated at +25 ℃.

3.2 Electrical Absolute Maximum Ratings

Table 5

Parameter	Min	Max	Unit
Supply Voltage (VCC)	-0.3	+4.0	V
LVCMOS Input Voltage	-0.3	VCC + 0.3	V
LVCMOS Output Voltage	-0.3	VCC + 0.3	V
LVDS Input Pin	-0.3	VCC + 0.3	V
Junction Temperature	-	+125	°C
Storage Temperature	-55	+150	°C
Reflow Peak Temperature	-	+260	°C
Reflow Peak Temperature Time	-	10	sec
Maximum Power Dissipation @+25°C	-	1.9	W

3.3 LVDS Recommended Operating conditions

Table 6

Symbol	Parameter		Min	Typ	Max	Unit
-	All Supply Voltage		2.5	-	3.6	V
Ta	Operating Ambient Temperature		-10	+25	+70	°C
-	Clock Frequency	VCC = 2.5V to 2.7V	20	-	70	MHz
		VCC = 2.7V to 3.0V	15	-	70	MHz
		VCC = 3.0V to 3.6V	15	-	85	MHz

3.4 LVCMOS DC Specifications

Table 7

Over recommended operating supply and temperature range unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ*	Max	Unit
V_{IH}	High Level Input Voltage	-	2.0	-	VCC	V
V_{IL}	Low Level Input Voltage	-	GND	-	0.8	V
V_{OH1}	High Level Output Voltage	VCC = 3.0V to 3.6V I_{OH} = -4mA	2.4	-	-	V
V_{OL1}	Low Level Output Voltage	VCC = 3.0V to 3.6V I_{OL} = 4mA	-	-	0.4	V
V_{OH2}	High Level Output Voltage	VCC = 2.5V to 3.0V I_{OH} = -2mA	2.1	-	-	V
V_{OL2}	Low Level Output Voltage	VCC = 2.5V to 3.0V I_{OL} = 2mA	-	-	0.4	V
I_{IN}	Input Current	GND ≤ V_{IN} ≤ VCC	-	-	±10	μA

3.5 LVDS Receiver DC Specifications

Table 8

Over recommended operating supply and temperature range unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ*	Max	Unit
V_{TH}	Differential Input High Threshold	RL=100Ω, VIC=+1.2V	-	-	100	mV
V_{TL}	Differential Input Low Threshold		-100	-	-	mV
I_{IN}	Input Current	V_{IN} = +2.4 / 0V VCC = 3.6V	-	-	±10	μA

3.6 DC Electrical Characteristics of the TFT LCD

Table 9

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
Power supply		VDD	3.0	3.3	3.6	V	
Input Voltage for logic	H Level	VIH	0.7VDD	-	VDD	V	
	L Level	VIL	0	-	0.3VDD	V	

3.7 Backlight Unit

The Back-light system is an edge-lighting type with 21 white LED (Light Emitting Diode)s. The characteristics of 21 white LEDs are shown in the following tables.

Table 10

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Note
Forward Voltage	Vf	8.2	8.75	9.3	V	
Forward Current	If	-	310	-	mA	(1)
Power Consumption	PBL	-	2712.5	-	mW	(2)
LED Life time	-	20000	-		hr	(3)

Note (1) LEDs in 3 series x 5 parallel type.

(2) Where If = 310mA, Vf =8.72V, PBL = VF × If

(3) The environmental conducted under ambient air flow, at Ta=25±2℃, 60%RH±5%

4. Timing Specifications

4.1 BL Specifications

Pin No.	Symbol	I/O	Function	Remark
1	VLED(5V)	P	Power supply for BL driver	
2	GND	P	Power ground	
3	PWM_DIM(3.3V)	I	BL Luminance adjusting input	
4	LED_ON/OFF	I	BL controller enable signal input	

LED_ON/OFF: En Control Input. Forcing this pin above 1.5V enables the part. Forcing this pin below 0.4V, shuts down the device. In shutdown, all functions are disabled drawing <1uA supply current. Do not leave EN floating.

PWM_DIM: using a filtered PWM signal as an adjustable DC voltage for LED dimming control. A filtered PWM signal acts as the DC voltage to regulate the output current. In this circuit, the output ripple depends on the frequency of PWM signal. For smaller output voltage ripple (<100mV), the recommended frequency of 3.3V PWM signal should be above 2kHz. To fix the frequency of PWM signal and change the duty cycle of PWM signal can get different output current.

4.2 LVDS AC Specifications

4.2.1 LVCMOS & LVDS Receiver AC Specifications

Table 11

Over recommended operating supply and temperature range unless otherwise specified

Symbol	Parameter		Min	Typ	Max	Unit
t_{RCP}	CLKOUT Transition Time	VCC = 2.5V to 2.7V	14.3	T	50.0	ns
		VCC = 2.7V to 3.0V	14.3	T	66.6	
		VCC = 3.0V to 3.6V	11.8	T	66.6	
t_{RCH}	CLKOUT High Time		-	4T/7	-	ns
t_{RCL}	CLKOUT Low Time		-	3T/7	-	ns
t_{RCD}	RCLK IN to CLKOUT +/- Delay		-	5T/7	-	ns
t_{RS}	LVCMOS Data Setup to CLKOUT		0.35T - 0.3	-	-	ns
t_{RH}	LVCMOS Data Hold from CLKOUT		0.45T – 1.6	-	-	ns
t_{TLH}	LVCMOS Low to High Transition Time		-	2.0	3.0	ns
t_{THL}	LVCMOS High to Low Transition Time		-	1.8	3.0	ns
t_{RIP1}	Input Data Position0 (T=11.76ns)		-0.4	0.0	+0.4	ns
t_{RIP0}	Input Data Position1 (T=11.76ns)		T/7-0.4	T/7	T/7+0.4	ns
t_{RIP6}	Input Data Position2 (T=11.76ns)		2T/7-0.4	2T/7	2T/7+0.4	ns
t_{RIP5}	Input Data Position3 (T=11.76ns)		3T/7-0.4	3T/7	3T/7+0.4	ns
t_{RIP4}	Input Data Position4 (T=11.76ns)		4T/7-0.4	4T/7	4T/7+0.4	ns
t_{RIP3}	Input Data Position5 (T=11.76ns)		5T/7-0.4	5T/7	5T/7+0.4	ns
t_{RIP2}	Input Data Position6 (T=11.76ns)		6T/7-0.4	6T/7	6T/7+0.4	ns
t_{RPLL}	Phase Lock Loop Set		-	-	10.0	ms

*Typ values are at the conditions of VCC=3.3V and Ta = +25ºC

4.2.2 LVCMOS Output

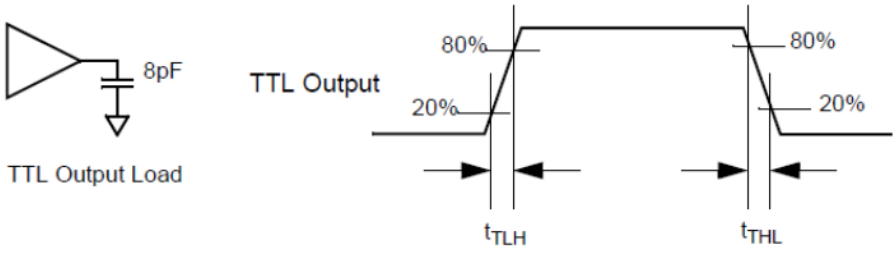


Fig2 .CLKOUT Transmission time

4.2.3 LVDS input data position

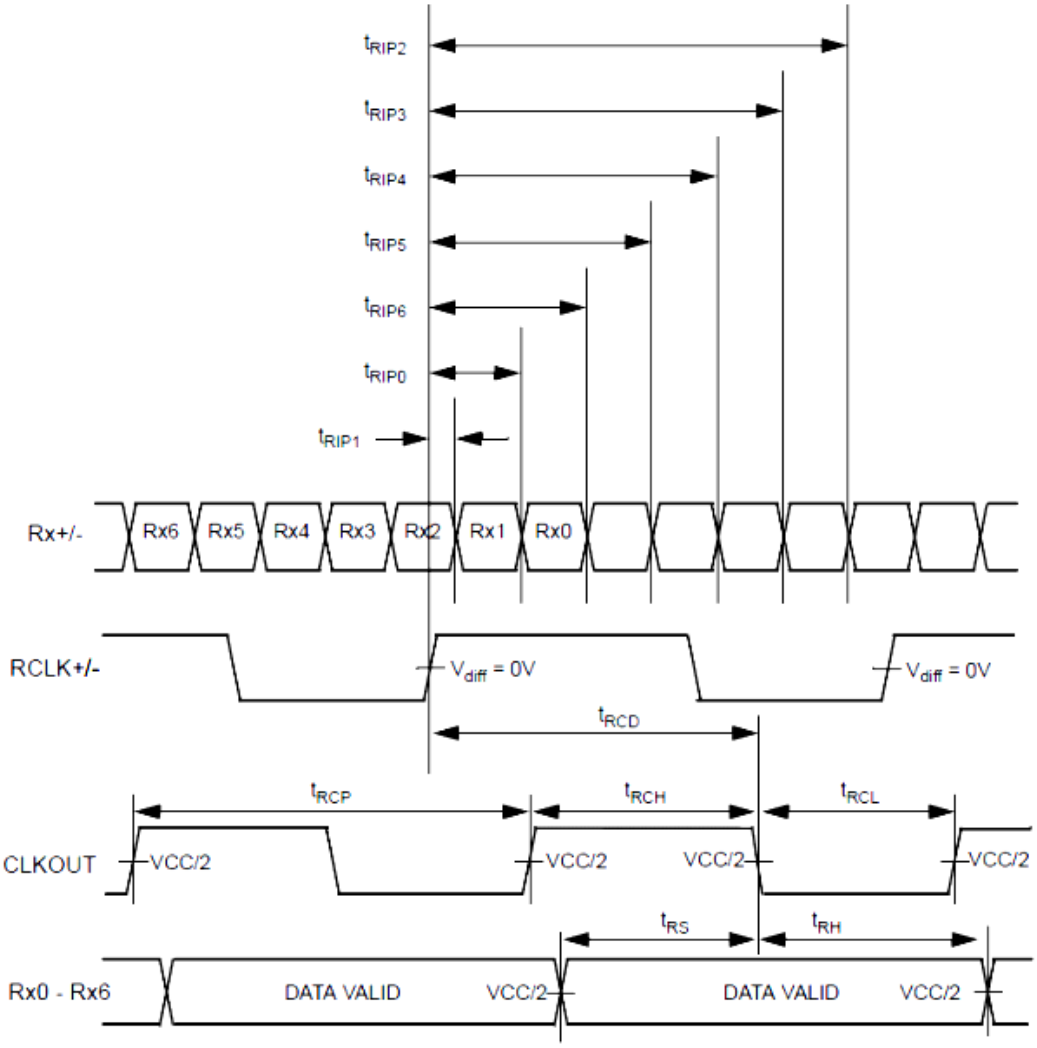


Fig 3. LVDS input data position

4.2.4 Phase lock loop set time

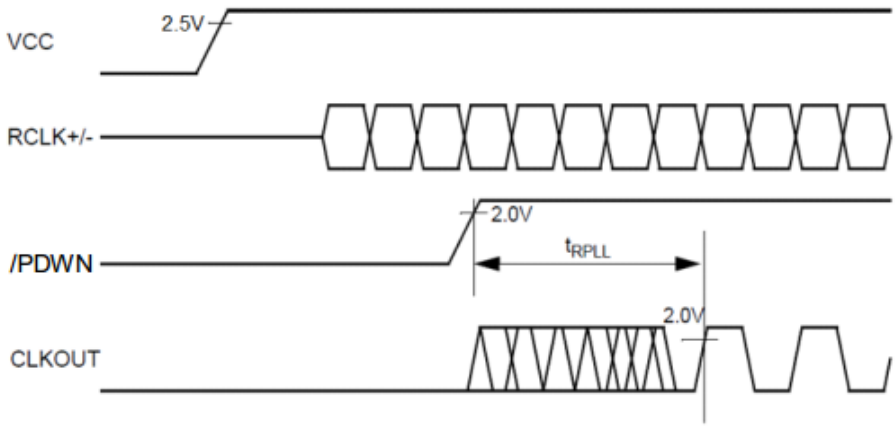


Fig 4. Phase lock loop set time

4.2.5 LVDS Data Timing Diagram

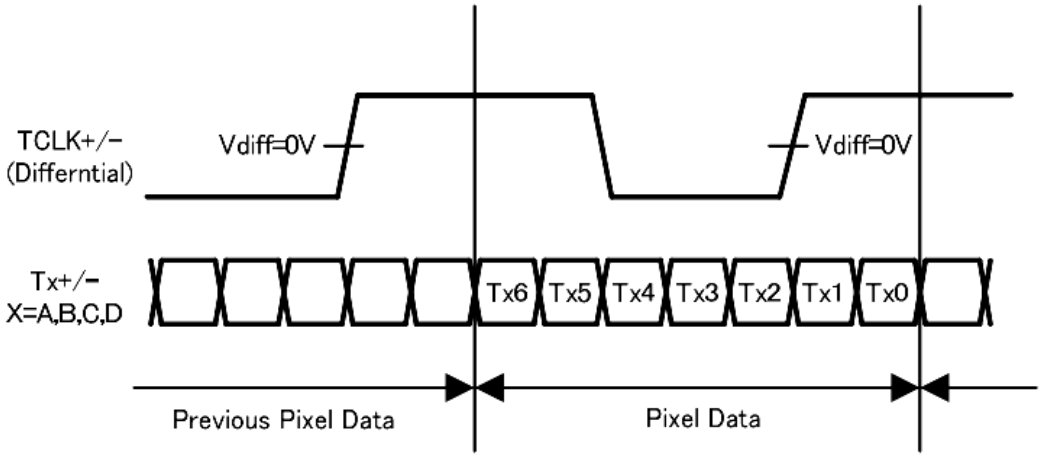


Fig 5.LVDS Data Timing Diagram

4.3 Timing Specifications for CTP:

4.3.1 CTP interface to Host

Fig 7 shows how CTPM communicates with host device. I2C interface supported by FT5426 that is two-wire serial bus consisting of data line SDA and clock line SCL, used for serial data transferring between host and slave device.

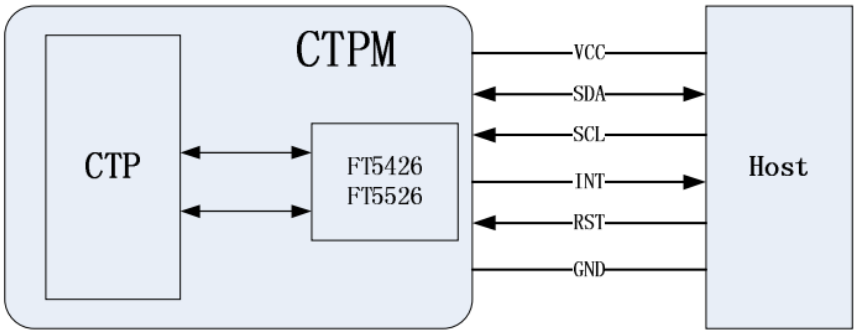


Fig 6. CTP and Host connection

There are Control Interface and Data Interface. As table 11 demonstrates, Serial interface is the data interface, /INT and /WAKE are the control interface. For the detail, please refer to table 11.

Table 12 Description for TP module and Host interface

Port Name	Description
VCC	CTPM power supply, ranges from 2.8V to 3.6V.
SDA	I^2C data input and output.
SCL	I^2C clock input.
INT	The interrupt request signal from CTPM to Host.
RST	The reset signal from host to CTPM, active low, and the low pulse width should be more than 1ms.
GND	Power ground.

4.3.2 I2C Read/Write Interface description

Write N bytes to I2C slave

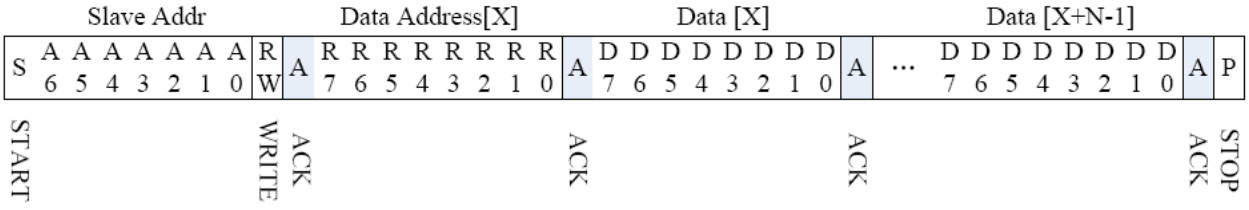


Fig 8. Write N bytes to I2C slave

Set Data Address

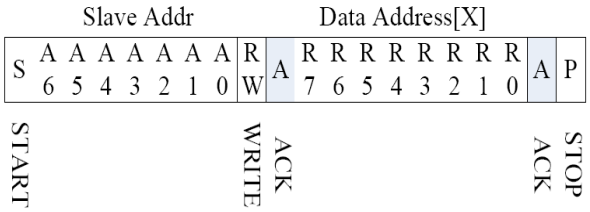


Fig 9. Set data address

Read X bytes from I²C Slave

Fig 7. Read X bytes from I2C slave

4.3.3 Interrupt signal from CTP to Host

As for standard CTPM, host needs to use both interrupt signal and I2C interface to get the touch data. CTPM will output an interrupt request signal to the host when there is a valid touch. Then host can get the touch data via I2C interface. If there is no valid touch detected, the INT will output high level, and the host does not need to read the touch data. There are two kinds of method to use interrupt: interrupt trigger and interrupt polling.

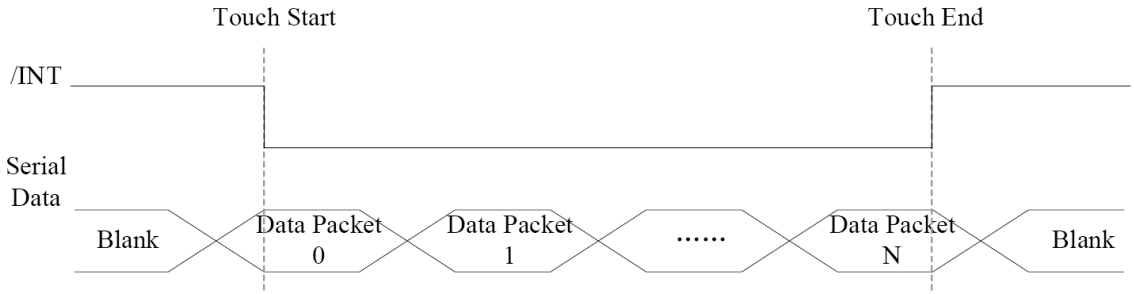


Fig 8. Interrupt polling mode

As for interrupt polling mode, INT will always be pulled to low level when there is a valid touch point, and be high level when a touch finished.

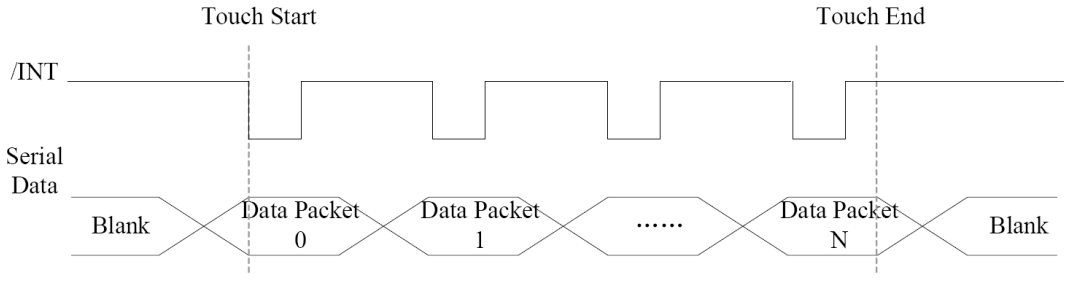


Fig 9. Interrupt trigger mode

While for interrupt trigger mode, INT signal will be set to low if there is a touch detected. But whenever an update of valid touch data, CTPM will produce a valid pulse on INT port for INT signal, and host can read the touch data periodically according to the frequency of this pulse. In this mode, the pulse frequency is the touch data updating rate

4.3.4 Reset signal from Host to CTPM.

Host can send the reset signal via RST port to reset FT5426-5526. The reset signal should not be set to low while in normal working mode. The RST port can also be used to active the CTPM in hibernate mode. Note that the reset pulse width should be more than 1ms.

4.3.5 CTP Register Mapping

This chapter describes the standard FTS Capacitive Touch Panel products communication registers in address order for each device mode. The most detailed descriptions of the Standard Products communication registers are in the Register Definitions section of each chapter. The device modes are listed in the table below, along with each mode's register prefix.

4.3.6 CTP Working Mode

In this mode the CTP is fully functional as a touch screen controller in working mode. The access address to read and write is just logical address which is not enforced by hardware, Here is the operating mode register map.

4.3.7 Working Mode Register Map

Table 13(a)

ADDR	RW	Name	b7	b6	b5	b4	b3	b2	b1	b0
0x00	RW	Mode_Switch		Device Mode[2:0]						
0x01	R0	Guesture	Gesture ID [7:0]							
0x02	R0	Cur Point	Number of touch points[7:0]							
0x03	R0	TOUCH1_XH	1st Event Flag				1st Touch X Position[11:8]			
0x04	R0	TOUCH1_XL	1st Touch X Position[7:0]							
0x05	R0	TOUCH1_YH	1st Touch ID[3:0]				1st Touch Y Position[11:8]			
0x06	R0	TOUCH1_YL	1st Touch Y Position[7:0]							
0x07	R0	TOUCH1_WEIGHT	1st Touch Weight[7:0]							
0x08	R0	TOUCH1_MISC	1st Touch Area[3:0]							
0x09	R0	TOUCH2_XH	2nd Event Flag				2nd Touch X Position[11:8]			
0x0A	R0	TOUCH2_XL	2nd Touch X Position[7:0]							
0x0B	R0	TOUCH2_YH	2nd Touch ID[3:0]				2nd Touch Y Position[11:8]			
0x0C	R0	TOUCH2_YL	2nd Touch Y Position[7:0]							
0x0D	R0	TOUCH2_WEIGHT	2nd Touch Weight[7:0]							
0x0E	R0	TOUCH2_MISC	2nd Touch Area[3:0]							

Table 13(b)

0x0F	R0	TOUCH3_XH	3rd Event Flag		3rd Touch X Position[11:8]
0x10	R0	TOUCH3_XL	3rd Touch X Position[7:0]		
0x11	R0	TOUCH3_YH	3rd Touch ID[3:0]		3rd Touch Y Position[11:8]
0x12	R0	TOUCH3_YL	3rd Touch Y Position[7:0]		
0x13	R0	TOUCH3_WEIGHT	3rd Touch Weight[7:0]		
0x14	R0	TOUCH3_MISC	3rd Touch Area[3:0]		
0x15	R0	TOUCH4_XH	4th Event Flag		4th Touch X Position[11:8]
0x16	R0	TOUCH4_XL	4th Touch X Position[7:0]		
0x17	R0	TOUCH4_YH	4th Touch ID[3:0]		4th Touch Y Position[11:8]
0x18	R0	TOUCH4_YL	4th Touch Y Position[7:0]		
0x19	R0	TOUCH4_WEIGHT	4th Touch Weight[7:0]		
0x1A	R0	TOUCH4_MISC	4th Touch Area[3:0]		

Table 13(c)

0x1B	R0	TOUCH5_XH	5th Event Flag		5th Touch X Position[11:8]
0x1C	R0	TOUCH5_XL	5th Touch X Position[7:0]		
0x1D	R0	TOUCH5_YH	5th Touch ID[3:0]		5th Touch Y Position[11:8]
0x1E	R0	TOUCH5_YL	5th Touch Y Position[7:0]		
0x1F	R0	TOUCH5_WEIGHT	5th Touch Weight[7:0]		
0x20	R0	TOUCH5_MISC	5th Touch Area[3:0]		
0x21	R0	TOUCH6_XH	6th Event Flag		6th Touch X Position[11:8]
0x22	R0	TOUCH6_XL	6st Touch X Position[7:0]		
0x23	R0	TOUCH6_YH	6st Touch ID[3:0]		6st Touch Y Position[11:8]
0x24	R0	TOUCH6_YL	6st Touch Y Position[7:0]		
0x25	R0	TOUCH6_WEIGHT	6st Touch Weight[7:0]		
0x26	R0	TOUCH6_MISC	6st Touch Area[3:0]		
0x27	R0	TOUCH7_XH	7th Event Flag		7th Touch X Position[11:8]
0x28	R0	TOUCH7_XL	7st Touch X Position[7:0]		
0x29	R0	TOUCH7_YH	7st Touch ID[3:0]		7st Touch Y Position[11:8]
0x2A	R0	TOUCH7_YL	7st Touch Y Position[7:0]		
0x2B	R0	TOUCH7_WEIGHT	7st Touch Weight[7:0]		

Table 13(d)

0x2B	R0	TOUCH7_WEIGHT	7st Touch Weight[7:0]		
0x2C	R0	TOUCH7_MISC	7st Touch Area[3:0]		
0x2D	R0	TOUCH8_XH	8th Event Flag		8st Touch X Position[11:8]
0x2E	R0	TOUCH8_XL	8st Touch X Position[7:0]		
0x2F	R0	TOUCH8_YH	8st Touch ID[3:0]	8st Touch Y Position[11:8]	
0x30	R0	TOUCH8_YL	8st Touch Y Position[7:0]		
0x31	R0	TOUCH8_WEIGHT	8st Touch Weight[7:0]		
0x32	R0	TOUCH8_MISC	8st Touch Area[3:0]		
0x33	R0	TOUCH9_XH	9th Event Flag		9st Touch X Position[11:8]
0x34	R0	TOUCH9_XL	9st Touch X Position[7:0]		
0x35	R0	TOUCH9_YH	9st Touch ID[3:0]	9st Touch Y Position[11:8]	
0x36	R0	TOUCH9_YL	9st Touch Y Position[7:0]		
0x37	R0	TOUCH9_WEIGHT	9st Touch Weight[7:0]		
0x38	R0	TOUCH9_MISC	9st Touch Area[3:0]		
0x39	R0	TOUCH10_XH	10th Event Flag		10st Touch X Position[11:8]
0x3A	R0	TOUCH10_XL	10st Touch X Position[7:0]		
0x3B	R0	TOUCH10_YH	10st Touch ID[3:0]	10st Touch Y Position[11:8]	

Table 13(e)

0x3C	R0	TOUCH10_YL	10st Touch Y Position[7:0]		
0x3D	R0	TOUCH10_WEIGHT	10st Touch Weight[7:0]		
0x3E	R0	TOUCH10_MISC	10st Touch Area[3:0]		

4.3.8 Device Mode

This is the device mode register, which is configured to determine the current mode of the chip.

Table 14

Address	Bit Address	Register Name	Description
0x00	6:4	[2:0]Device Mode	000b WORKING Mode 100b TEST Mode

4.3.9 Gest ID

This register describes the gesture of a valid touch.

Table 15

Address	Bit Address	Register Name	Description
0x01	7:0	Gesture ID[7:0]	Gesture ID 0x10 Move Up 0x14 Move Right 0x18 Move Down 0x1C Move Left 0x48 Zoom In 0x49 Zoom Out 0x00 No Gesture

4.3.10 TD Status

This register is the touch data status register.

Table 16

Address	Bit Address	Register Name	Description
0x02	7:0	Number of touch points [7:0]	The detected point number, max. 10

4.3.11 Pn_XH(n:1-5)

This register describes MSB of the X coordinate of the nth touch point and the corresponding event flag.

Table 17

Address	Bit Address	Register Name	Description
0x03 0x09 0x0F 0x15 0x1B 0x21 0x27 0x2D 0x33 0x39	7:6	Event Flag	00b: Press Down 01b: Lift Up 10b: Contact 11b: No event
	5:4	Reserved	
	3:0	Touch X Position [11:8]	MSB of Touch X Position in pixels

4.3.12 Pn_XL(n:1-5)

This register describes LSB of the X coordinate of the nth touch point.

Table 18

Address	Bit Address	Register Name	Description
0x04 0x0A 0x10 0x16 0x1C 0x22 0x28 0x2E 0x34 0x3A	7:0	Touch X Position [7:0]	LSB of the Touch X Position in pixels

4.3.13Pn_YH(n:1-5)

This register describes MSB of the Y coordinate of the nth touch point and corresponding touch ID

Table 19

Address	Bit Address	Register Name	Description
0x05 0x0B	7:4	Touch ID[3:0]	Touch ID of Touch Point, this value is 0x0F when the ID is invalid
0x11 0x17 0x1D 0x23 0x29 0x2F 0x35 0x3B	3:0	Touch Y Position [11:8]	MSB of Touch Y Position in pixels

4.3.14 Pn_YL(n:1-2)

This register describes LSB of the Y coordinate of the nth touch point.

Table 20

Address	Bit Address	Register Name	Description
0x06 0x0C 0x12 0x18 0x1E 0x24 0x2A 0x30 0x36 0x3C	7:0	Touch Y Position [7:0]	LSB of the Touch Y Position in pixels

4.3.15 Pn_WEIGHT(n:1-5)

This register describes weight of the nth touch point.

Table 21(a)

Address	Bit Address	Register Name	Description
0x07 0x0D 0x13	7:0	Touch Weight[7:0]	Touch pressure value

Table 21(b)

0x19 0x1F 0x25 0x2B 0x31 0x37 0x3D			

4.3.16 Pn_MISC(n:1-5)

This register describes the miscellaneous information of the nth touch point.

Table 22

Address	Bit Address	Register Name	Description
0x08 0x0E 0x14 0x1A 0x20	7:4	Touch Area[3:0]	Touch area value
0x26 0x2C 0x32 0x38 0x3E	3:0	Reserved	

5. Optical Characteristics

5.1 Optical characteristic of the LCD

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state with the methods. Measuring equipment: BM-7A

Table 23

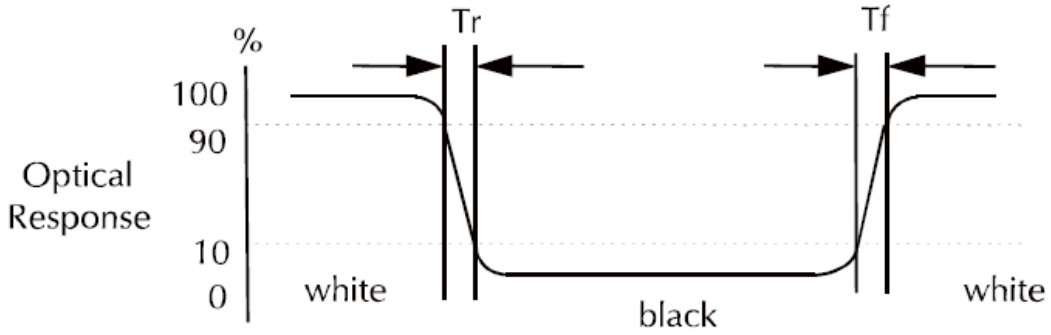
Item		Symbol	Condition	Min	Type	Max	Unit	Note
Brightness (Module)		B		650	800	--	cd/m2	
Response time		Tr	θ=0°	-	10	20	ms	.
		Tf		--	15	30	ms	
Contrast ratio		CR	At optimized viewing angle	400	500	--	--	
Luminance Uniformity		ΔL		70	80		%	
Color Chromaticity (CIE 1931)	White	Wx	θ=0° Normal Viewing Angle	0.26	0.31	0.36	--	BM-7A
		Wy		0.28	0.33	0.38		
Viewing Angle (6H)	Hor.	θR	CR≥10	60	70	--	Degree	
		θL		60	70	--		
	Ver.	θU		40	50	--		
		θD		60	70	--		

a. Test equipment setup

After stabilizing and leaving the panel alone shall be warmed up for the stable operation of LCM, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7(fast) with a viewing angle of 2° at a distance of 50cm and normal direction.

b. Definition of response time: Tr and Tf

The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".

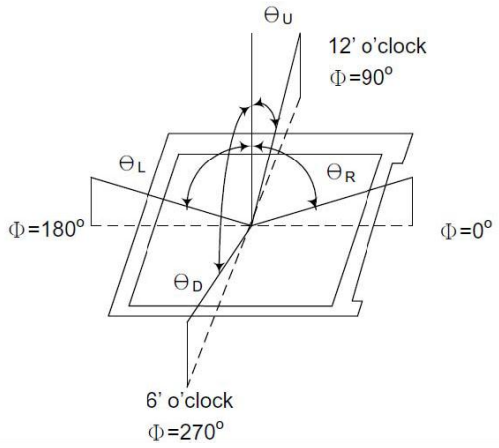


c. Definition of contrast ratio:

$$\text{Contrast Ratio (CR)} = \frac{\text{Brightness measured when LCD is at "white state"}}{\text{Brightness measured when LCD is at "black state"}}$$

d. Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

e. View Angle



f. Definition of Luminance of White: Luminance of white at the center points

Light Source of Back-Light Unit	LED Type

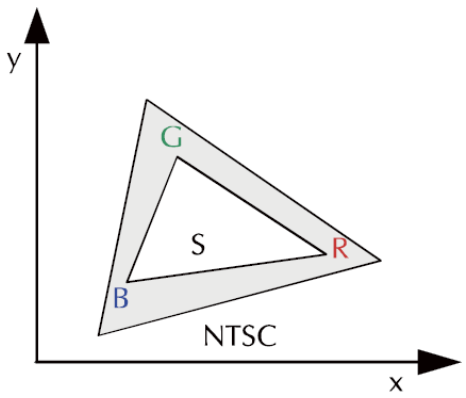
g. Definition of White Uniformity

$$\text{White Uniformity} = \frac{\text{Min. luminance of white among 9-points}}{\text{Max. luminance of white among 9-points}} \times 100\%$$

h. The definition of Color Gamut -Color Chromaticity CIE 1931

Color coordinate of white & red, green, blue at center point.

Color Gamut: NTSC (%) = (RGB Triangle Area / NTSC Triangle Area) x 100



6. Reliability Condition

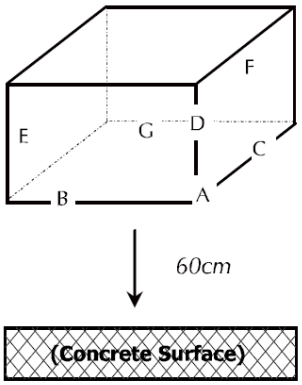
No change on display and in operation under the following test condition.

Condition: Unless otherwise specified, tests will be conducted under the following condition.

Temperature: 20±5°C.

Humidity: 65±5 RH%.

Tests will be not conducted under functioning state.

No.	Parameter	Condition	Notes
1	High Temperature Operating	70°C±2°C, 240hrs (Operation state).	
2	Low Temperature Operating	-20°C±2°C, 240hrs (Operation state).	1
3	High Temperature Storage	80°C±2°C, 240hrs.	2
4	Low Temperature Storage	-30°C±2°C, 240hrs.	1,2
5	High Temperature and High Humidity Operation Test	60°C±2°C, 90 %, 240hrs.	1,2
6	Vibration Test	Total fixed amplitude: 1.5mm. Vibration Frequency: 10~55Hz. One cycle 60 seconds to 3 direction of X, Y, Z each 15 minutes.	3
7	Drop Test	To be measured after dropping from 60cm high on the concrete surface in packing state.  *Dropping method corner dropping:* *A corner: Once edge dropping.* *B, C, D edge: Once face dropping.* *E, F, G face: Once.*	

Notes: 1. No dew condensation to be observed.

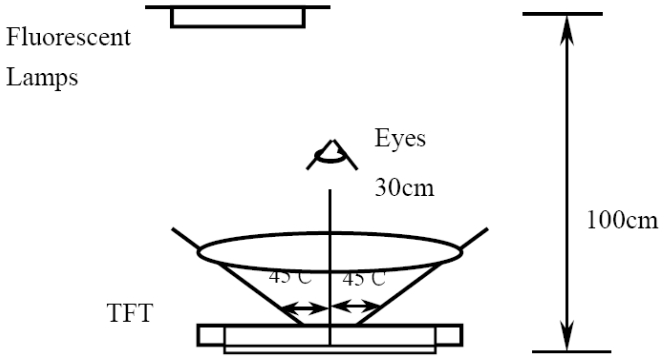
2. The function test shall be conducted after 4 hours storage at the normal temperature and humidity after removed from the test chamber.

3. Vibration test will be conducted to the product itself without putting I in a container.

7. Quality Units

1. Inspection method

An appearance test should be conducted by human sight at approximately 30 cm distance from the LCD module under fluorescent light. Distance between LCD and fluorescent lamps should be 100 cm or more. Viewing direction for inspection is 45° from vertical against LCD.

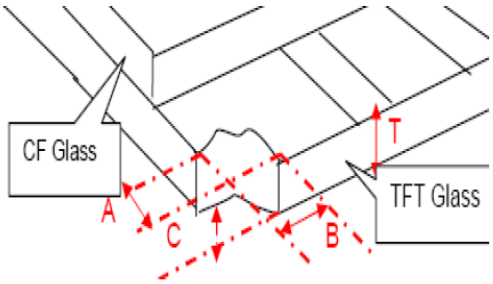
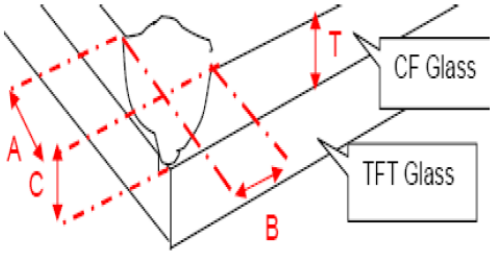
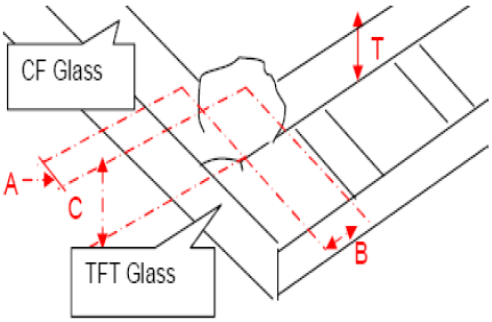
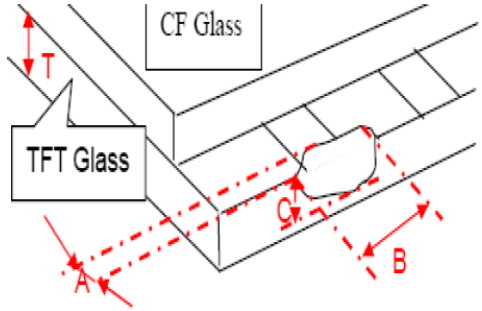


2. Quality Level

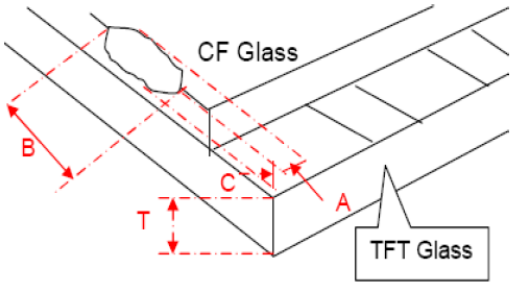
The AQL for major and minor defects is defined as follows:

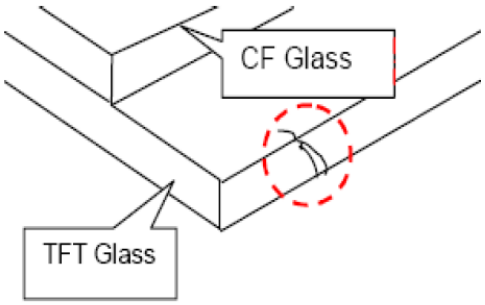
Partition	Definition	AQL
Major defect	Functional defective as product.	0.1
Minor defect	Satisfy all functions as product but not satisfy cosmetic standard.	0.25

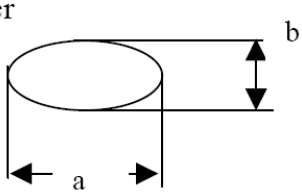
3. Visual Inspection Standard

Defect	Inspection	Criteria
1 Corner Broken (Minor)		1. A≤2.0 mm , B≤2.0 mm ,C≤T Ignore 2. A＞2.0 mm ,or B＞2.0 mm Not allowed
2 Corner Broken (Minor)		1. A≤1.5 mm , B≤1.5 mm , C≤T Ignore 2. A＞1.5 mm, or B＞1.5 mm Not allowed 3. To be applied to both CF and TFT glass
3 Corner Broken (Minor)		1. A≤1.5 mm , B≤1.5 mm , C≤T Ignore 2. A＞1.5 mm, or B＞1.5 mm Not allowed 3. To be applied to both CF and TFT glass
4 Pad Broken (Minor)		1. A≤0.8 mm, C≤T Ignore B Length Ignore 2. A＞0.8 mm, Not allowed

<table>
<tr><th>DEFECT</th><th>INSPECTION</th><th>CRITERIA</th></tr>
<tr><td>5

Side Broken
（Minor）</td><td> 
</td><td>1. A≤0.8 mm, C≤T Ignore
B Length Ignore
2. A＞0.8 mm, Not allowed</td></tr>
<tr><td>6

Glass crack
（Major）</td><td> 
</td><td>Not allowed</td></tr>
<tr><td>7

（Minor）</td><td>Spots on polarizer
 

Φ= (a+b)/2</td><td><table>
<tr><th>Dimension</th><th>Acceptable Numbers</th></tr>
<tr><td>Φ≤0.1mm</td><td>Ignore ： *1</td></tr>
<tr><td>0.1mm＜Φ≤0.20mm</td><td>2</td></tr>
<tr><td>Φ＞ 0.20mm</td><td>0</td></tr>
</table>
* 1: The distance between dot defects should be more 5MM apart</td></tr>
<tr><td>8
（Minor）</td><td>Scratched on polarizer</td><td><table>
<tr><th>Dimension</th><th>Acceptable Numbers</th></tr>
<tr><td>W≤0.03mm</td><td>Ignore</td></tr>
<tr><td>L≤2.5 mm
0.03mm＜W≤0.05mm</td><td>2</td></tr>
<tr><td>L≥2.5 mm or W≥0.05 mm</td><td>0</td></tr>
</table></td></tr>
</table>

DEFECT	INSPECTION	CRITERIA
9 （Major）	Envelop silicon on glass	1、 ITO non envelop silicon reject 2、 Silicon area not match with document request reject 3、 Silicon not cover with all ITO reject 4、 Glue wet to the LCD upper POL or the bottom POL. And the connector over the LCD PIN. (Include FFC、FPC…etc) reject
10 （Major）	Keep out light cover/ protection cover	1、 Miss the cover reject
11 （Major）	TCP IC/ FPC	1、Scratch、the line broken off reject 2、The PIN oxidation、broken off、dirty、bend、distortion reject 3、FPC protection cover fix no good or deflection over the drawing request . reject
12 （Major）	Backlight	1、The size don't match with the drawing . reject 2、Dirty、finger mark reject 3、Scald reject

4. Electronic Inspection Standard:

<table>
<tr><th>Defect</th><th>Inspection</th><th>Criteria</th></tr>
<tr><td>1
（Minor）</td><td>Black/White spot</td><td>
<table>
<tr><td>Dimension</td><td>Acceptable Numbers</td></tr>
<tr><td>Φ≤0.1mm</td><td>Ignore ： *1</td></tr>
<tr><td>0.1mm＜Φ≤0.20mm</td><td>2</td></tr>
<tr><td>Φ＞ 0.20mm</td><td>0</td></tr>
</table>
*1: The distance between dot defects should be more 5MM apart
</td></tr>
<tr><td>2
（Minor）</td><td>Black/White line</td><td>
<table>
<tr><td>Dimension</td><td>Acceptable Numbers</td></tr>
<tr><td>W≤0.03mm</td><td>Ignore ：</td></tr>
<tr><td>L≤2.5mm
0.03mm＜ W ≤0.05mm</td><td>2</td></tr>
<tr><td>L≥2.5mm or W ≥0.05mm</td><td>0</td></tr>
</table>
</td></tr>
<tr><td>3
（Minor）</td><td>Light spot (The sub-pixel always light)</td><td>Acceptable Numbers : ≤1</td></tr>
<tr><td>4
（Major）</td><td>Display</td><td>1、Missing segment、missing word reject
2、Display abnormal、 no display reject
3、Viewing angle not right reject
4、Display odds reject</td></tr>
<tr><td>5
（Major）</td><td>Electricity parameter（V0P/Current）</td><td>Over the production SPEC reject</td></tr>
<tr><td>6
（Major）</td><td>Backlight</td><td>1、 No backlight、 the LED died off reject
2、 The light odds(Follow the limit sample) reject</td></tr>
</table>