DOCUMENT NUMBER AND REVISION

FS-J050WVCN0205 REV.A

DOCUMENT TITLE:

SPECIFICATION

OF

LCD MODULE TYPE

CUSTOMER	
MODEL NUMBER	**J050WVCN0205**
CUSTOMER APPROVAL	
DATE	

DEPARTMENT	NAME	SIGNATURE	DATE
PREPARED BY	Yang Zelin		2016.12.05
CHECKED BY	NRB/LLJ		2016.12.05
APPROVED BY	Chen Shiming		2016.12.05

SHENZHEN JINGHUA DISPLAYS CO., LTD.

4th floor, 2nd building, Pengji Industrial Park, No.3 Liuhe Road, Liuyue Community, Henggang Street, Longgang District, Shenzhen China

Tel: 86-755-82442519, 82487795

86-755-82441596, 82448287

Fax: 86-755-82262610

URL: www.china-lcd.com

DOCUMENT REVISION HISTORY 1:

DOCUMENT REVISION FROM TO	DATE	DESCRIPTION	CHANGED BY	CHECKED BY
A	2016.12.05	First Release.	Yang Zelin	Chen Shiming

CONTENTS

Specification of LCD Module Type
Item No.: J050WVCN0205

1. General Description

- Display type: 800x 480(RGB) dots, TFT-LCD Module
- LCD size: 5.0 inch
- View Direction: 6 O'clock(grey scale inversion)
- Backlight: 12 LED B/L White
- Capacitive touch panel.

2. Mechanical Specifications

The mechanical detail is shown in Fig. 1 and summarized in Table 1 below.

Table 1

Item	Contents	Unit
LCD Type	TFT TRANSMISSIVE, Normally white	/
Viewing direction	6:00(grey scale inversion)	O' Clock
Module outline (W x HxD)	134.5 x100.7 x 4.925(NOT INCLUDE FPC)	mm
Active area (WxH) (TFT)	108.0x64.8	mm
View area (WxH) (Cover)	109.0x65.8	mm
Number of Pixel	800(RGB) x480	Pixel
Driver IC	Source: ILI6122 Gate: ILI5960 Ctp：FT5426	/
Backlight Type	12 white LEDS	/
Interface Type	Parallel RGB 24-bit	/
Input voltage	3.3	V

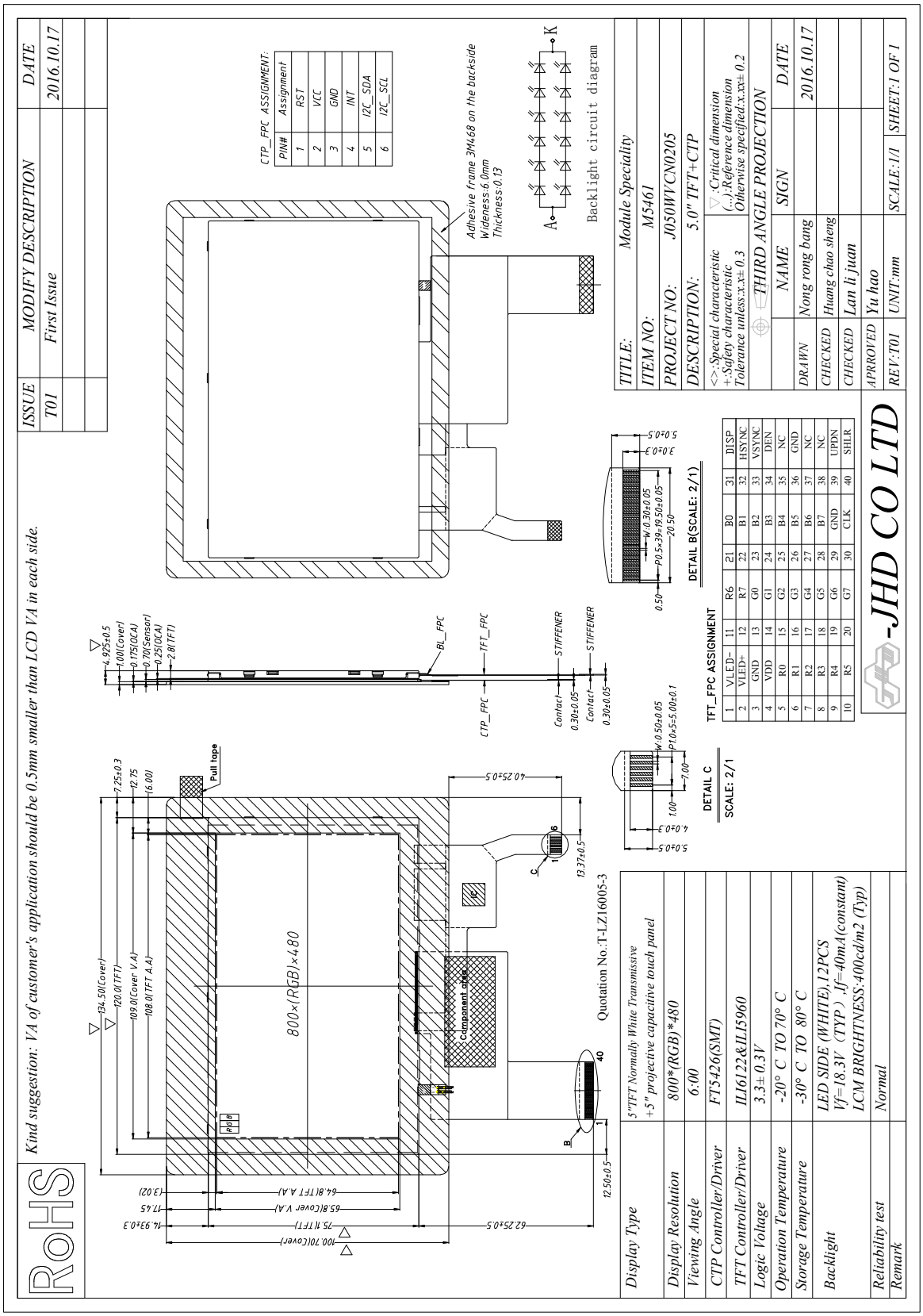


Figure 1a: Module Specification

ISSUE	MODIFY DESCRIPTION	DATE
T01	First Issue	2016.10.17

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 :

有害物质六种含量(ppm)---ICP 测试方式 Six Injurant Contents（ppm)---ICP Test Style					
镉及镉化合物 Cadmium and Cadmium compounds	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)
<100	<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:	M5461		
PROJECT NO:	J050WVCN0205		
DESCRIPTION:	5.0" TFT+CTP		
<>: 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		2016.10.17
CHECKED	Huang chao sheng		
CHECKED	Lan li juan		
APPROVED	Yu hao		
REV: T01	UNIT: mm	SCALE:1/1	SHEET: 2 OF 2

— JHD CO LTD

Figure 1b: Module Specification

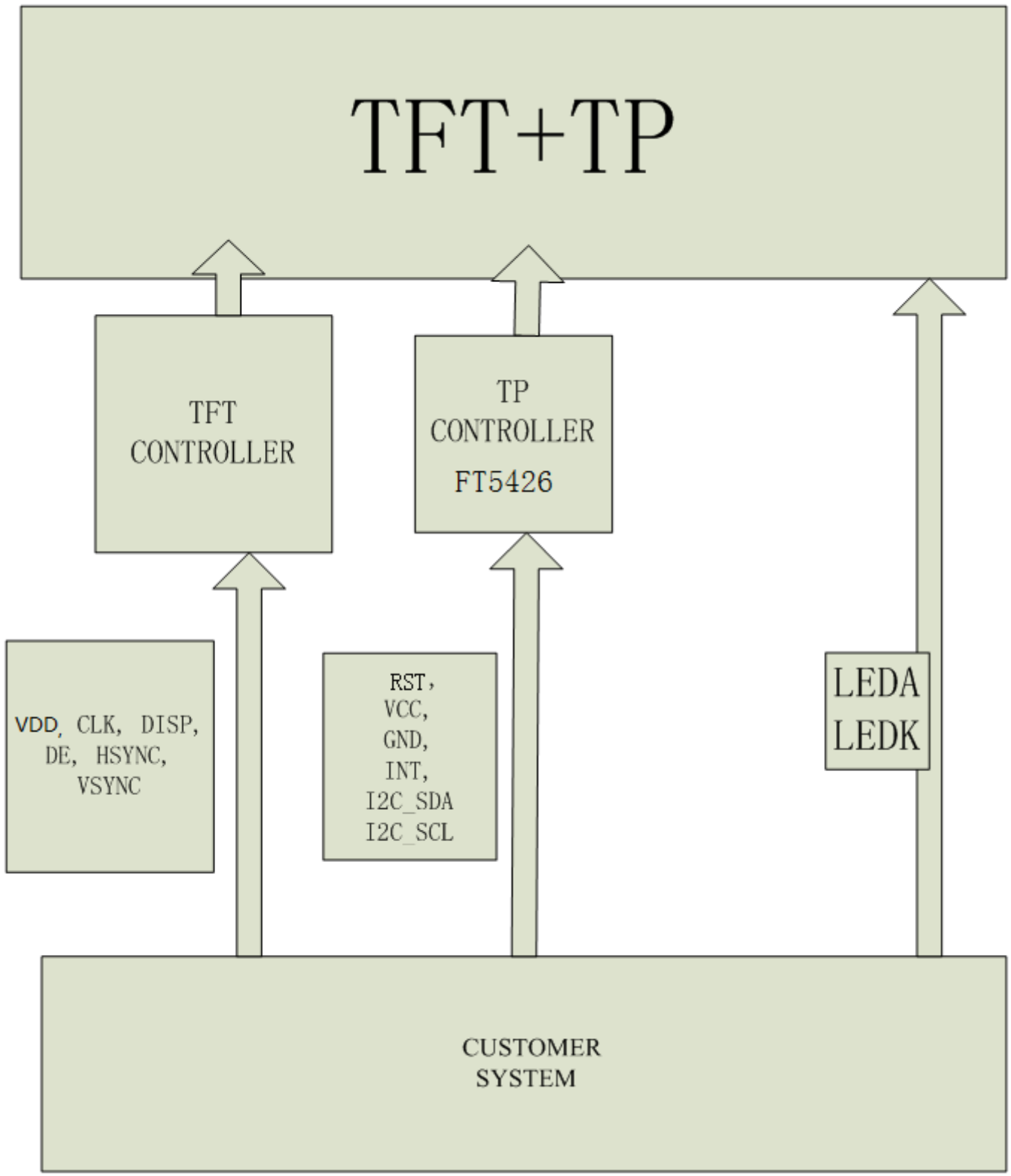


Figure 3: block diagram

3. Interface signals

Table 2a: CON-TFT

Pin No	Symbol	Function
1	LEDK	Cathode of Back Light
2	LEDA	Anode of Back Light
3,29,36	GND	Ground
4	VDD	Power supply
5~12	R0~R7	Data bus (red)
13~20	G0~G7	Data bus (green)
21~28	B0~B7	Data bus (blue)
29	GND	Ground
30	CLK	Pixel clock signal
31	DISP	Display on/off control
32	HSYNC	Horizontal sync signal
33	VSYNC	Vertical sync signal
34	DEN	Data enable
35	NC	No connection
36	GND	Ground
37、38	NC	No connection
39	UPDN	Gate scan direction control
40	SHLR	Source shift direction control

Table 2b: CON-CTP

Pin No	Pin Name	Description
1	RST	The reset signal from host to CTPM, active low, and the low pulse width should be more than 1ms.
2	VCC	Power supply for logic.
3	GND	Power ground.
4	INT	External interrupt to the host.
5	I^2C_SDA	I^2C data input and output.
6	I^2C_SCL	I^2C clock input.

4. Maximum absolute values

ITEM	SYMBOL	STANDARD	UNITS
Supply Voltage for Logic	VCC	2.7 to 3.6	V
Operating temperature	TOP	-20 to +70	℃
Storage temperature	TST	-30 to +80	

5. Electrical Specifications

5.1 TFT-LCD Module Characteristics

ITEM	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Power-supply Voltage	VDD	Ta = 25 ℃	3.0	3.3	3.6	V
Input Voltage	VIH	H level	0.7 ×VDD	—	VDD	
	VIL	L level	VSS	—	0.3 × VDD	
Supply Current For Logic	IDD	VDD=3.3V	—	----	—	mA

Note: The supply voltage for V_{LCD} has to be adjusted by VR or Software.

5.2 Back-Light Unit

Item	Symbol	Min	Typ	Max	Unit	Condition
Forward voltage	Vf	17.4	18.3	19.8	V	If=40mA
Luminance (only backlight)	Lv	6500	8500	-	cd/m2	If=40mA
Number of LED	--	12			Piece	--
Connection mode	P	Parallel			--	--
Luminance uniformity	Avg		80		%	

5.3 CTP Characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Current consumption （Normal operation mode）	Iopr	VDD3 = 2.8V Ta=25℃ MCLK=24MHz	--	12.76	--	mA
Current consumption （Monitor mode）	Imon	VDD3 = 2.8V Ta=25℃ MCLK=24MHz	--	0.43	--	mA
Current consumption （Sleep mode）	Islp	VDD3 = 2.8V Ta=25℃ MCLK=24MHz	--	42	--	uA

5.4 Estimated Luminance Lifetime

The luminance lifetime is the time from initial luminance to half-luminance.

This lifetime is the estimated value, and is not guarantee value.

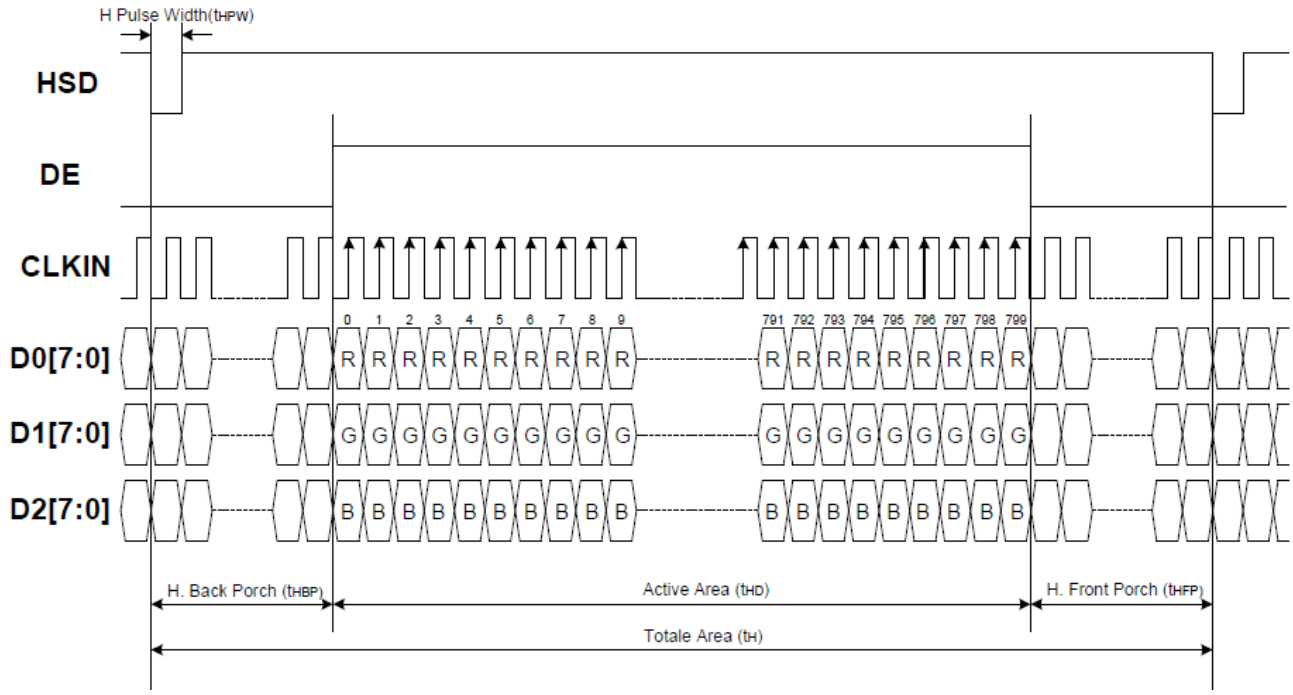
Condition		Estimated luminance lifetime (Life time expectancy) Note1, Note2	Unit
LED elementary substance	25°C (Ambient temperature of the product) Continuous operation, IL= 20mA/One circuit	20,000	h

Note1: Estimated luminance lifetime is not the value for an LCD module but the value for LED elementary substance.

Note2: By ambient temperature, the lifetime changes particularly. Especially, in case the product works under high temperature environment, the lifetime becomes short.

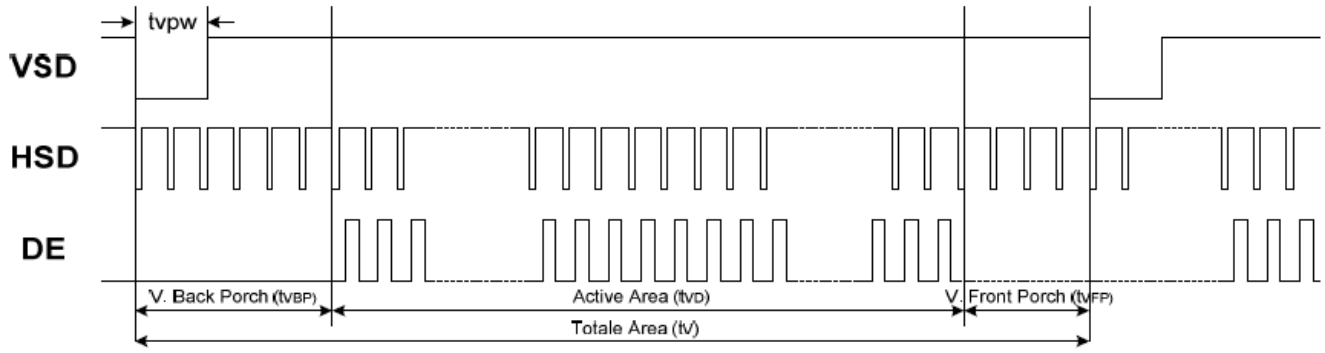
6. AC Characteristics

6.1 24-BIT RGB Interface



Horizontal Input Timing						
Parameter		Symbol	Value			Unit
			Min.	Typ.	Max.	
Horizontal display area		t_{HD}	--	800	--	CLKIN
CLKIN frequency		f_{CLK}	--	33.3	50	MHz
1 Horizontal line period		t_H	862	1056	1200	CLKIN
HSD pulse width	Min.	t_{HPW}	--	1	--	CLKIN
	Typ.		--	--	--	CLKIN
	Max.		--	40	--	CLKIN
HSD back porch	SYNC	t_{HBP}	46	46	46	CLKIN
HSD front porch	SYNC	t_{HFP}	16	210	354	CLKIN

Horizontal Input Timing

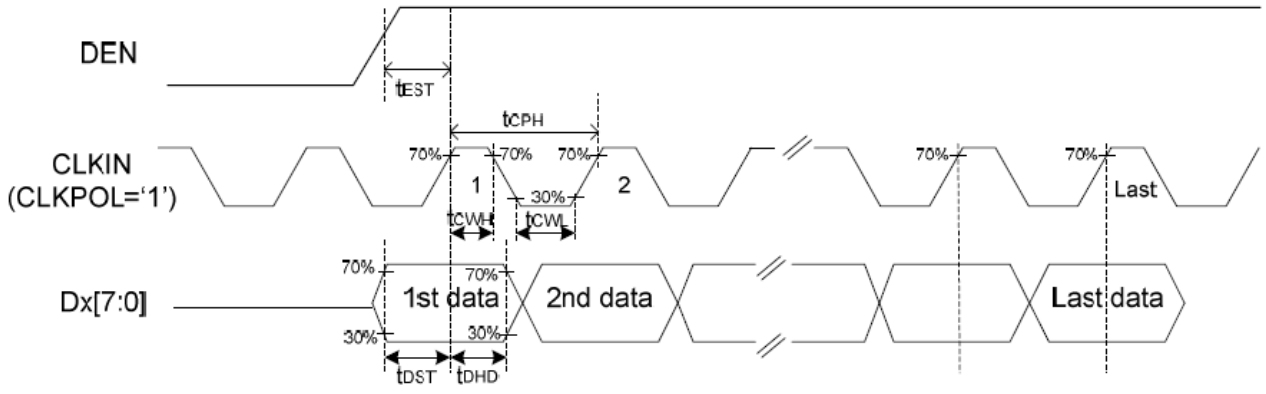


Vertical Input Timing					
Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
Vertical display area	t_{VD}	--	480	--	HSD
VSD period time	t_V	510	525	650	HSD
VSD pulse width	t_{VPW}	1	--	20	HSD
VSD back porch	t_{VBP}	23	23	23	HSD
VSD front porch	t_{VFP}	7	22	147	HSD

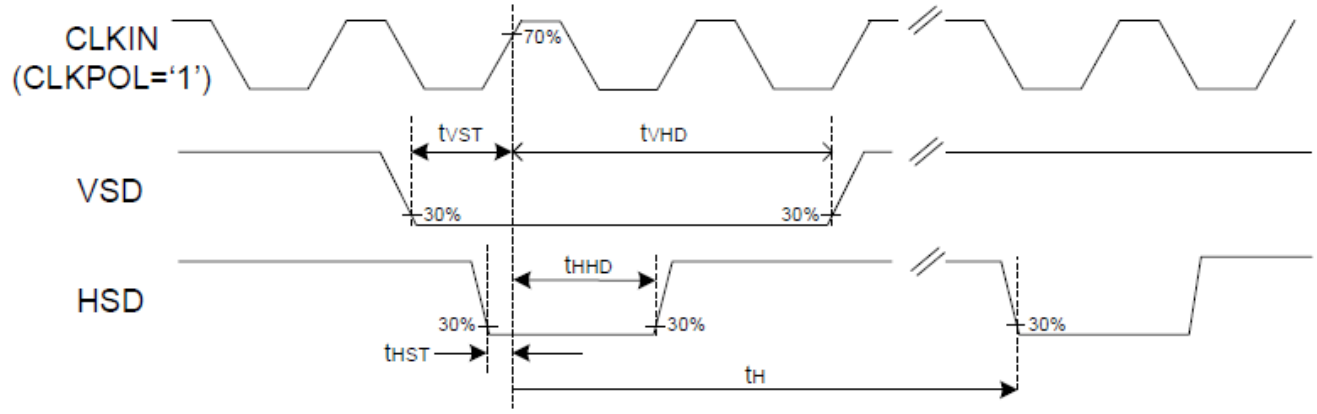
Vertical Input Timing

6.2 SYNC-DE mode timing diagram

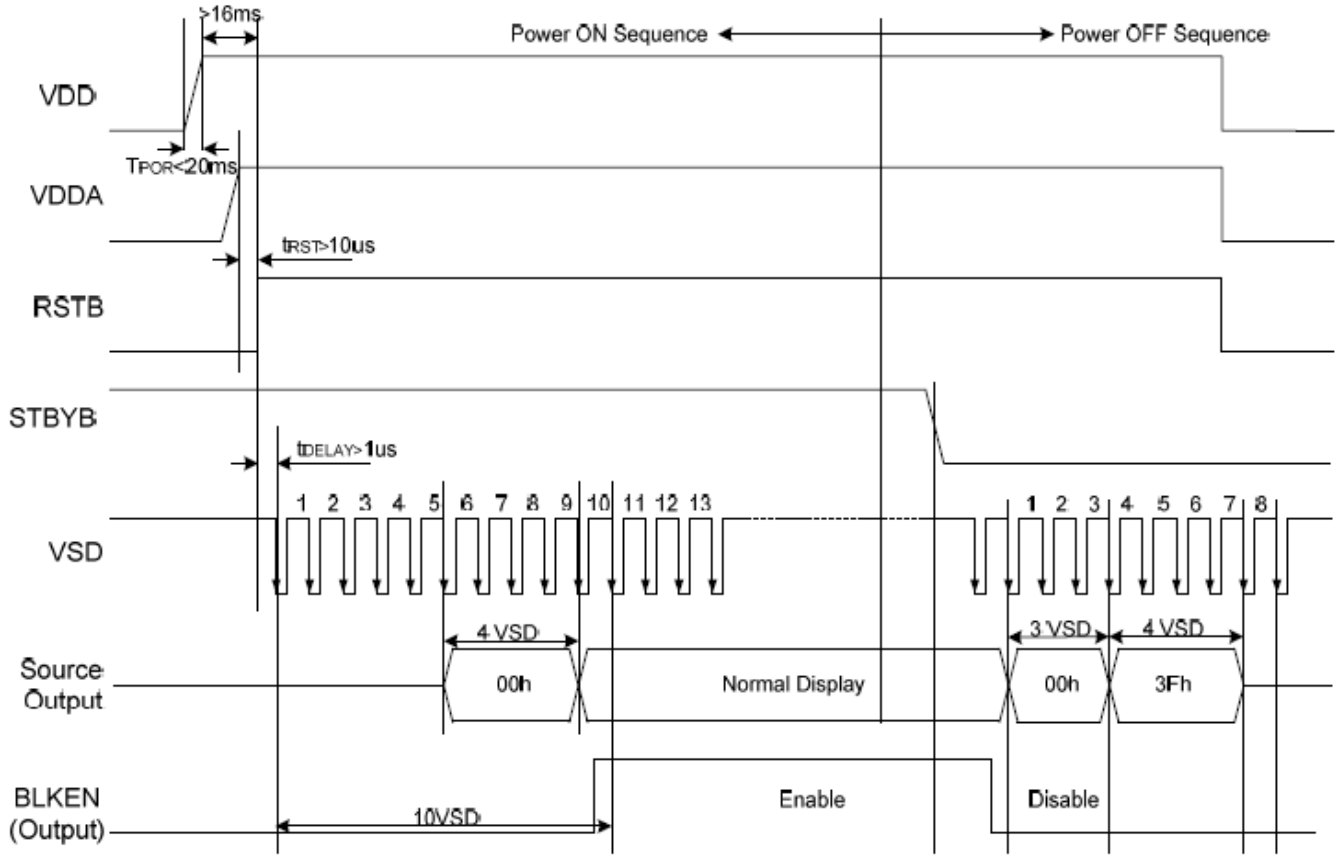
DE Mode (MODE='1')



SYNC Mode (MODE='0')



6.3 Power ON/OFF sequence



Note: For prevent anormal operation, t_{RST} must be longer than 10us during Power ON sequence.

6.5 I2C Interface

6.5.1 CTPM interface to Host

Figure 5 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. INT port and RST port form the control interface. The INT port is controlled by FT5426, it will send out an interrupt request signal to the host when there is a valid touch on CTPM. Host can send the reset signal to CTPM via RST port to reset the FT5426 if needed.

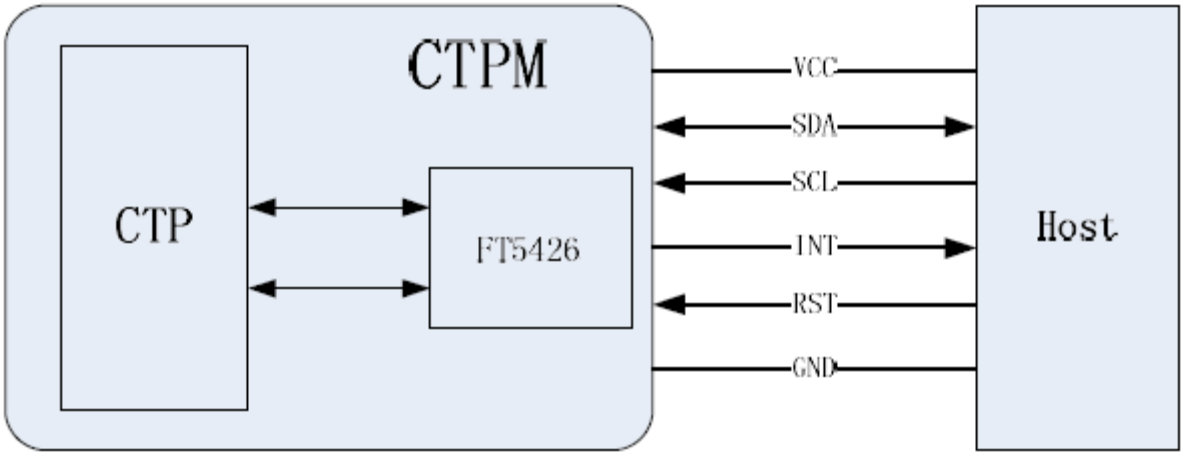


Figure 5: CTPM and Host connection

6.5.2 I²C Read/Write Interface description

It is important to note that the SDA and SCL must connect with a pull-high resistor respectively before you read/write I2C data. The I2C is always configured in the Slave mode. The data transfer format is shown in Figure 2-4.

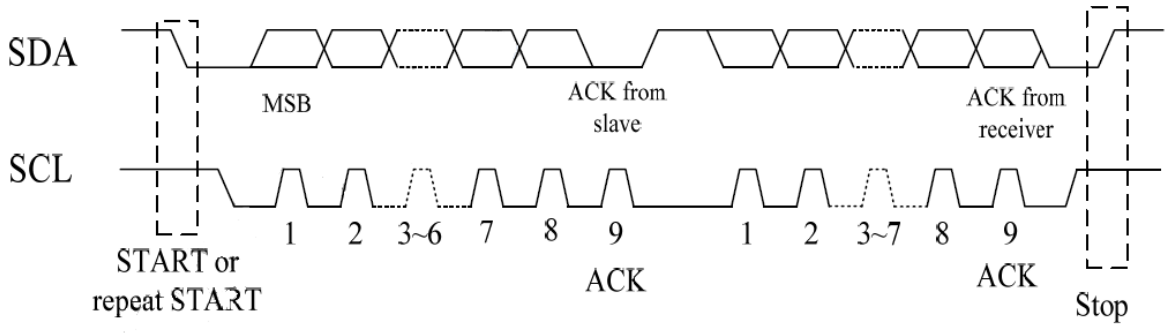


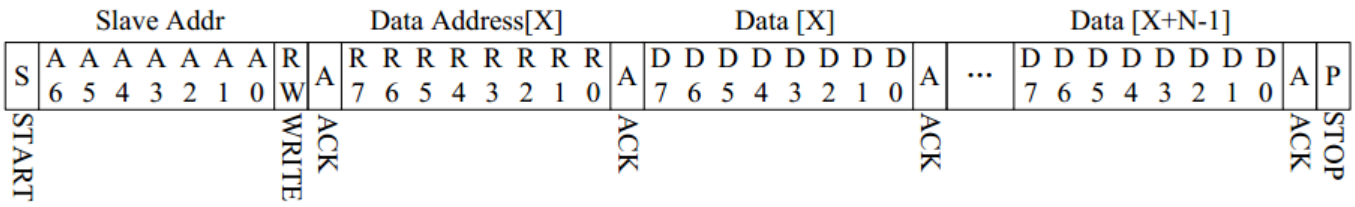
Figure 6: I2C Serial Data Transfer Format

Table 3 lists the meanings of the mnemonics used in the above figures.

Table 3: Mnemonics Description

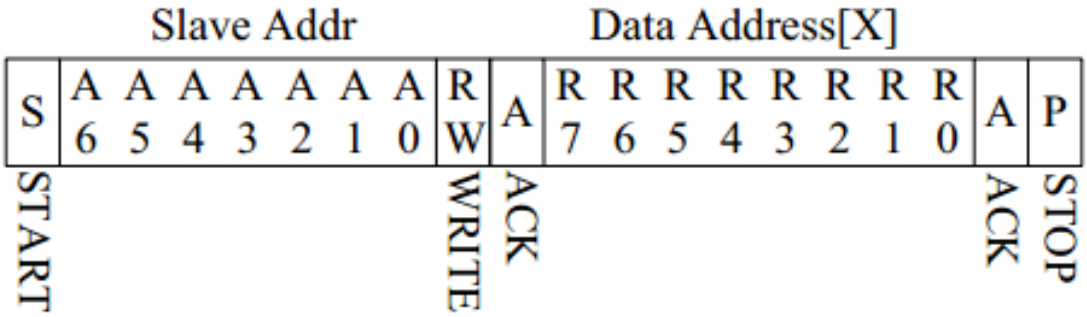
Mnemonics	Description
S	I2C Start or I2C Restart
A[6:0]	Slave address ,**7bits(011 1000)**
R/ W	READ/WRITE bit, '1' for read, '0'for write
A(N)	ACK(NACK) bit
P	STOP: the indication of the end of a packet (if this bit is missing, S will indicate the end of the current packet and the beginning of the next packet)

◆ Host write data to slave

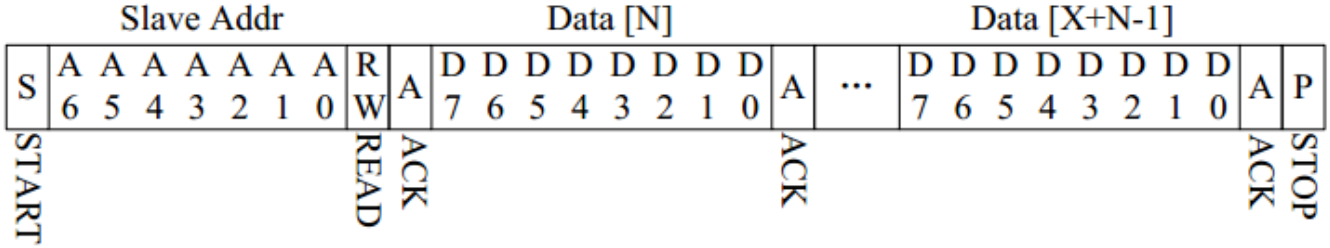


◆ Host read data from slave

Step1: write data address



Step2: read data



6.5.3 Interrupt signal from CTPM 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.

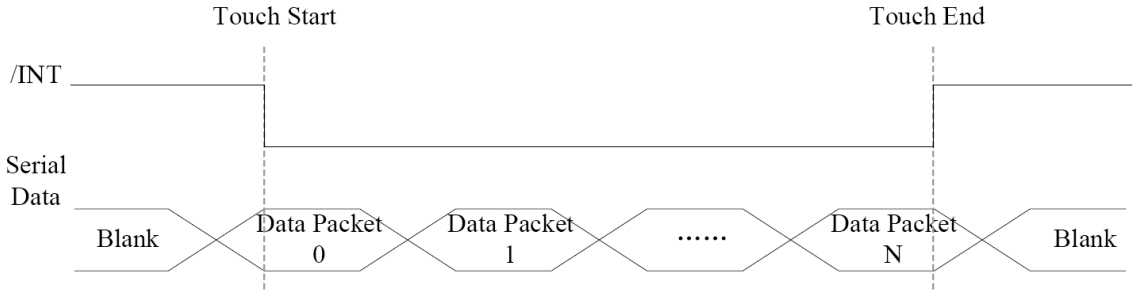


Figure 7: Interrupt query mode

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.

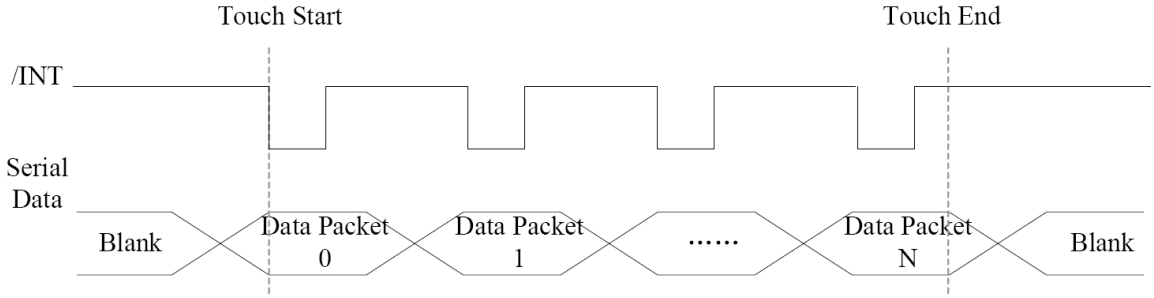


Figure 8: Interrupt trigger mode

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

6.5.4 Reset Signal from Host to CTPM

Host can send the reset signal via RST port to reset CTPM. 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.

7 CTP Register Mapping

This chapter describes the standard CTPM communication registers in address order for working mode.

7.1 Working Mode

The CTPM 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 working mode register map.

Register Map [Working Mode]

ADDR	RW	Name	b7	b6	b5	b4	b3	b2	b1	b0
0x00	RW	Mode_Switch		Device Mode[2:0]						
0x01	RO	Guesture	Gesture ID [7:0]							
0x02	RO	Cur Point	Number of touch points[7:0]							
0x03	RO	TOUCH1_XH	1st Event Flag				1st Touch X Position[11:8]			
0x04	RO	TOUCH1_XL	1st Touch X Position[7:0]							
0x05	RO	TOUCH1_YH	1st Touch ID[3:0]				1st Touch Y Position[11:8]			
0x06	RO	TOUCH1_YL	1st Touch Y Position[7:0]							
0x07	RO	TOUCH1_WEIGHT	1st Touch Weight[7:0]							
0x08	RO	TOUCH1_MISC	1st Touch Area[3:0]							
0x09	RO	TOUCH2_XH	2nd Event Flag				2nd Touch X Position[11:8]			
0x0A	RO	TOUCH2_XL	2nd Touch X Position[7:0]							
0x0B	RO	TOUCH2_YH	2nd Touch ID[3:0]				2nd Touch Y Position[11:8]			
0x0C	RO	TOUCH2_YL	2nd Touch Y Position[7:0]							
0x0D	RO	TOUCH2_WEIGHT	2nd Touch Weight[7:0]							
0x0E	RO	TOUCH2_MISC	2nd Touch Area[3:0]							
0x0F	RO	TOUCH3_XH	3rd Event Flag				3rd Touch X Position[11:8]			
0x10	RO	TOUCH3_XL	3rd Touch X Position[7:0]							
0x11	RO	TOUCH3_YH	3rd Touch ID[3:0]				3rd Touch Y Position[11:8]			
0x12	RO	TOUCH3_YL	3rd Touch Y Position[7:0]							
0x13	RO	TOUCH3_WEIGHT	3rd Touch Weight[7:0]							
0x14	RO	TOUCH3_MISC	3rd Touch Area[3:0]							
0x15	RO	TOUCH4_XH	4th Event Flag				4th Touch X Position[11:8]			
0x16	RO	TOUCH4_XL	4th Touch X Position[7:0]							
0x17	RO	TOUCH4_YH	4th Touch ID[3:0]				4th Touch Y Position[11:8]			
0x18	RO	TOUCH4_YL	4th Touch Y Position[7:0]							
0x19	RO	TOUCH4_WEIGHT	4th Touch Weight[7:0]							
0x1A	RO	TOUCH4_MISC	4th Touch Area[3:0]							

0x1B	RO	TOUCH5_XH	5th Event Flag		5th Touch X Position[11:8]		
0x1C	RO	TOUCH5_XL	5th Touch X Position[7:0]				
0x1D	RO	TOUCH5_YH	5th Touch ID[3:0]		5th Touch Y Position[11:8]		
0x1E	RO	TOUCH5_YL	5th Touch Y Position[7:0]				
0x1F	RO	TOUCH5_WEIGHT	5th Touch Weight[7:0]				
0x20	RO	TOUCH5_MISC	5th Touch Area[3:0]				
0x21	RO	TOUCH6_XH	6th Event Flag		6th Touch X Position[11:8]		
0x22	RO	TOUCH6_XL	6st Touch X Position[7:0]				
0x23	RO	TOUCH6_YH	6st Touch ID[3:0]		6st Touch Y Position[11:8]		
0x24	RO	TOUCH6_YL	6st Touch Y Position[7:0]				
0x25	RO	TOUCH6_WEIGHT	6st Touch Weight[7:0]				
0x26	RO	TOUCH6_MISC	6st Touch Area[3:0]				
0x27	RO	TOUCH7_XH	7th Event Flag		7th Touch X Position[11:8]		
0x28	RO	TOUCH7_XL	7st Touch X Position[7:0]				
0x29	RO	TOUCH7_YH	7st Touch ID[3:0]		7st Touch Y Position[11:8]		
0x2A	RO	TOUCH7_YL	7st Touch Y Position[7:0]				
0x2B	RO	TOUCH7_WEIGHT	7st Touch Weight[7:0]				
0x2C	RO	TOUCH7_MISC	7st Touch Area[3:0]				
0x2D	RO	TOUCH8_XH	8th Event Flag		8st Touch X Position[11:8]		
0x2E	RO	TOUCH8_XL	8st Touch X Position[7:0]				
0x2F	RO	TOUCH8_YH	8st Touch ID[3:0]		8st Touch Y Position[11:8]		
0x30	RO	TOUCH8_YL	8st Touch Y Position[7:0]				
0x31	RO	TOUCH8_WEIGHT	8st Touch Weight[7:0]				
0x32	RO	TOUCH8_MISC	8st Touch Area[3:0]				
0x33	RO	TOUCH9_XH	9th Event Flag		9st Touch X Position[11:8]		
0x34	RO	TOUCH9_XL	9st Touch X Position[7:0]				
0x35	RO	TOUCH9_YH	9st Touch ID[3:0]		9st Touch Y Position[11:8]		
0x36	RO	TOUCH9_YL	9st Touch Y Position[7:0]				
0x37	RO	TOUCH9_WEIGHT	9st Touch Weight[7:0]				
0x38	RO	TOUCH9_MISC	9st Touch Area[3:0]				
0x39	RO	TOUCH10_XH	10th Event Flag		10st Touch X Position[11:8]		
0x3A	RO	TOUCH10_XL	10st Touch X Position[7:0]				
0x3B	RO	TOUCH10_YH	10st Touch ID[3:0]		10st Touch Y Position[11:8]		

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

Register Description

- DEVICE_MODE

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

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

- GEST_ID

  This register describes the gesture of a valid touch.

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

- TD_STATUS

  This register is the Touch Data status register.

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

- Pn_XH (n:1-5)

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

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

- Pn_XL (n:1-5)

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

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

- Pn_YH (n:1-5)

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

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

- Pn_YL (n:1-2)

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

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

- Pn_WEIGHT (n:1-5)

  This register describes weight of the nth touch point.

Address	Bit Address	Register Name	Description
0x07 0x0D 0x13 0x19 0x1F 0x25 0x2B 0x31 0x37 0x3D	7:0	Touch Weight[7:0]	Touch pressure value

- Pn_MISC (n:1-5)

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

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	

8. Optical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Viewing angle	θ	Top	CR≥7	40	50	-	deg.	(1), (4), (5)
		Bottom		60	70	-	deg.	
		Left		60	70	-	deg.	
		Right		60	70	-	deg.	
Contrast Ratio		CR	θ =0° 25℃	400	500	-	-	(2), (4), (5)
Response time		Rising: Tr	θ =0°	-	10	20	ms	(3), (4), (5)
		Falling: Td		-	15	30	ms	
Color chromaticity (CIE1931)	White	Wx	θ =0° Normal viewing angle	0.26	0.31	0.36		(1), (4)
		Wy		0.28	0.33	0.38		
	Red	Rx		0.50	0.55	0.60		
		Ry		0.29	0.34	0.39		
	Green	Gx		0.31	0.36	0.41		
		Gy		0.54	0.59	0.64		
	Blue	Bx		0.10	0.15	0.20		
		By		0.04	0.09	0.14		
Luminance (across the LCD)		Lv		-	250	-	cd/m^2	

Note: Above characteristics are taken using SHARP corresponding materials and module components.

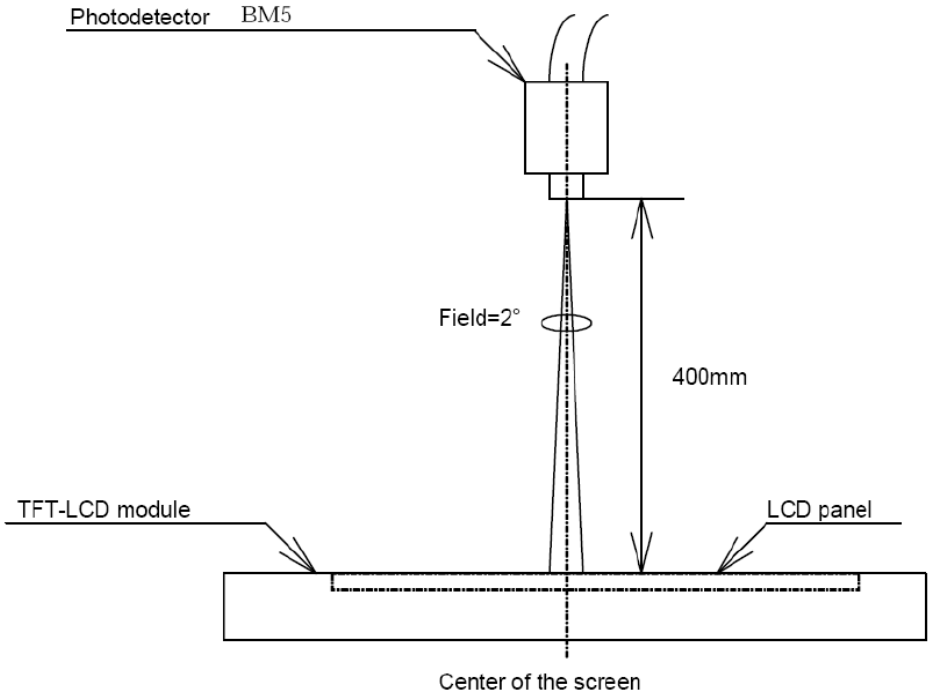
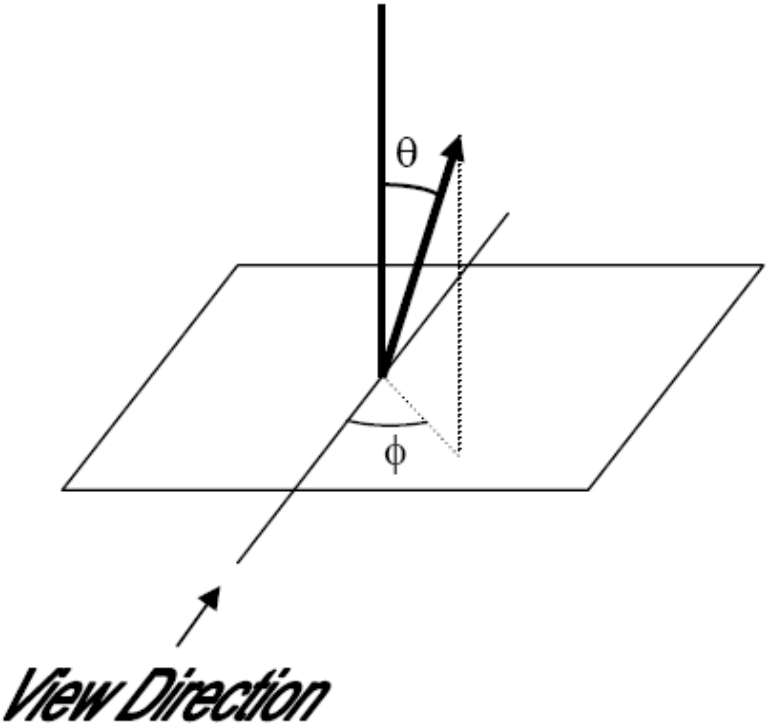


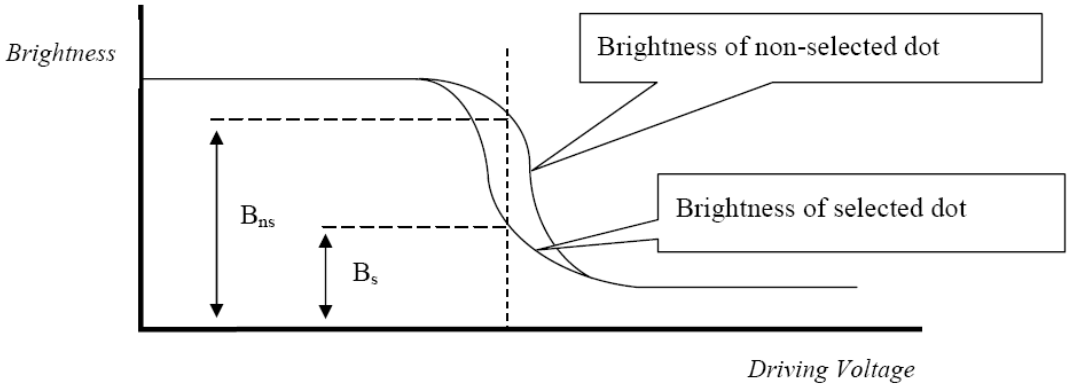
Fig. Optical characteristics measurement method

8.1 θ and ϕ



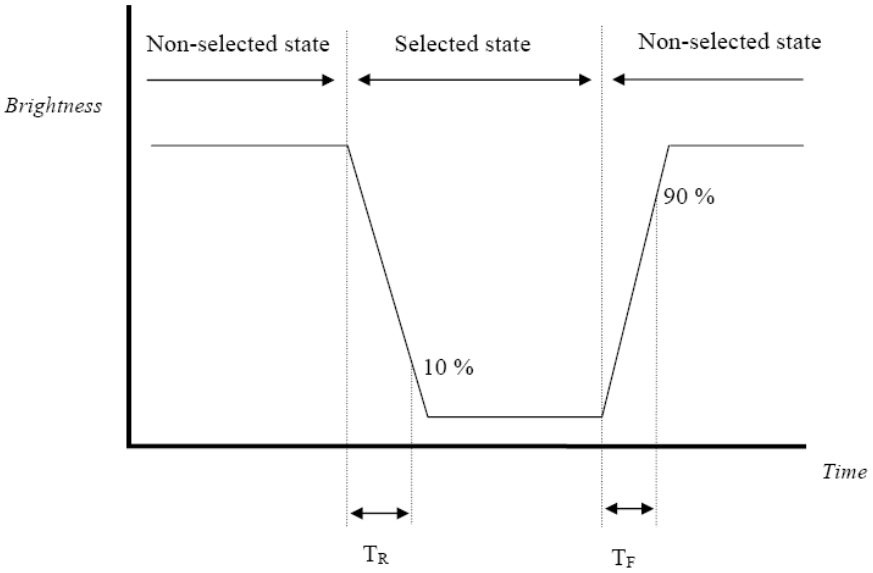
- The contrast of the display is optimal when viewed in the "View Direction" (ϕ = 0°).
- 0° ≦ θ ＜90°, 0° ≦ ϕ ＜360°

8.2 Contrast ratio Cr

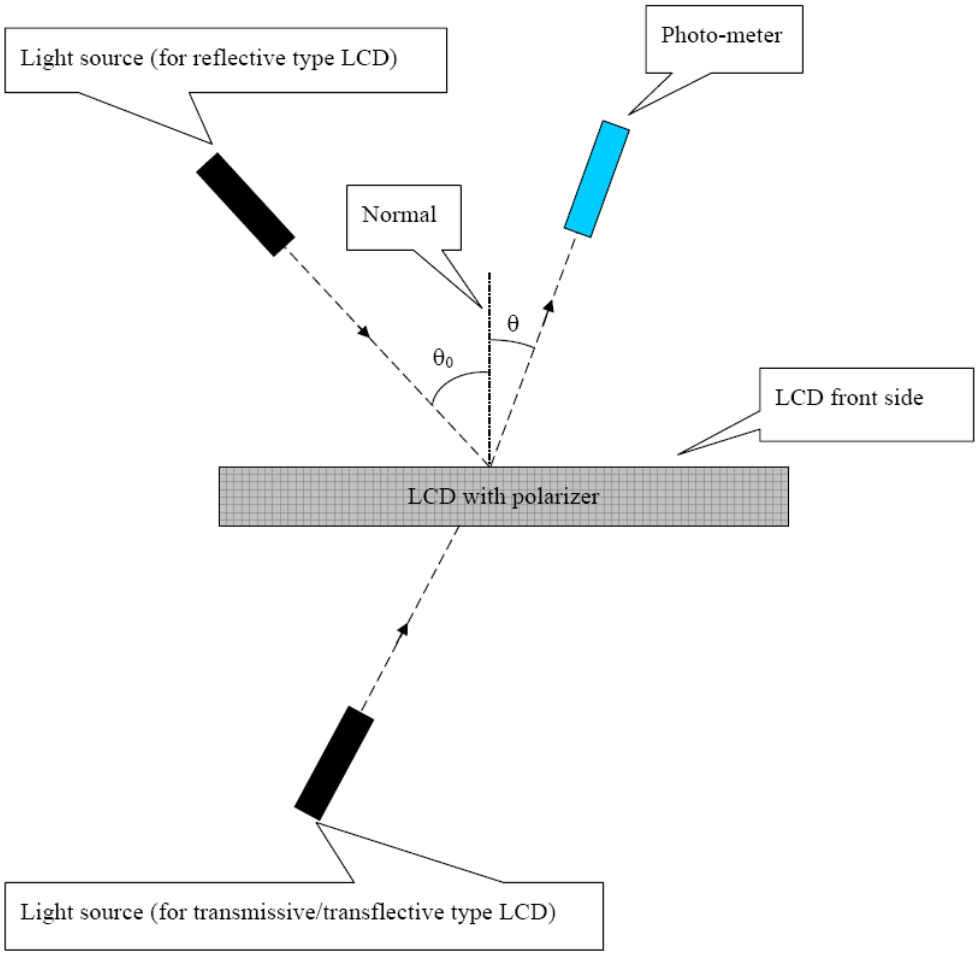


Contrast Ratio: $C_r = B_{ns} / B_s$

8.3 Response times TR and TF



8.4 Optical measurement system



8.6 Transparency & Hardness

8.6.1 Transparency

ITEM	CONDITION	MIN.	TYP.	MAX.	UNIT
TRANSPARENCY NOTE (1)	Ta = 25°C	85	—	—	%

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

8.6.2 Hardness

ITEM	DESCRIPTION
SURFACE HARDNESS	7H (MIN.)

9. Quality Units

9.1 Reliability

No.	Test Items	Test Condition	REMARK
1	High Temperature Storage Test	Ta=+80℃ Dry 120h	
2	Low Temperature Storage Test	Ta=-30℃ Dry 120h	
3	High Temperature Operation Test	Ta=70℃ Dry 120h	
4	Low Temperature Operation Test	Ta=-20℃ Dry 120h	
5	High Temperature and High Humidity Operation Test	Ta=40℃ 90%RH 240h	
6	Electro Static Discharge Test	Panel surface / top case. Contact / Air：±6KV / ±8KV，150pF，330Ω	Non-operating
7	Shock Test (non-operating)	Shock Level: 100G Waveform: Half Sinusoidal Wave Shock Time: 6ms Number of Shocks: 3 times for each ±X, ±Y, ±Z direction	
8	Vibration Test (non-operating)	Frequency range: 10Hz ~ 550Hz Stoke: 1.3mm Sweep: 1.5G, 33.3~400Hz Vibration: Sinusoidal Wave, 1Hrs for X,YZ direction.	
9	Thermal Shock Test	-30℃(0.5h) ~ 80℃(0.5h) / 100 cycles	

* Ta= Ambient Temperature

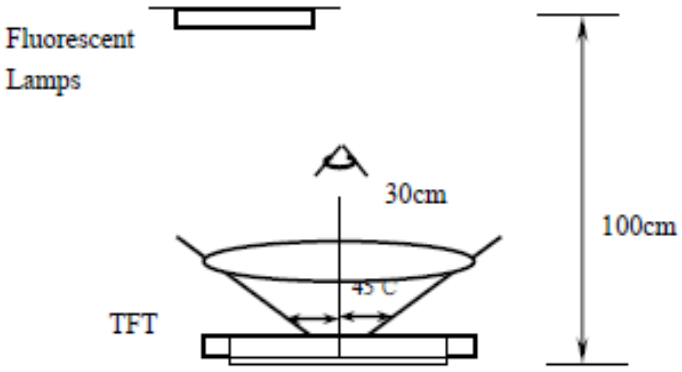
Note:

1. The test samples have recovery time for 2 hours at room temperature before the function check. In the standard conditions, there is no display function NG issue occurred.
2. All the cosmetic specifications are judged before the reliability stress.

9.2 Inspection quality criterion

1. Inspection method

An appearance inspection should be conducted at 30 cm or more distance/height from the inspector's eye sight to the LCD module surface under fluorescent light. The distance between LCD and fluorescent lamps should be 100 cm or more. Viewing angle 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 in product.	0.1
Minor defect	Meet all functions of product but have some cosmetic defective	0.25

3. Definition

3.1The environmental condition of inspection

1）Ambient temperature ：22℃±5℃，65±20%RH

2）Function inspection：less than 300Lux

3）Visual inspection：750±150Lux

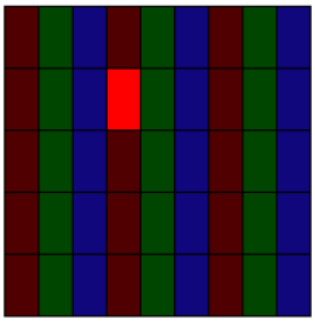
3.2Definition of dot defect

The size of a defective dot over 1/2 of whole dot，and all of bright dot or dark dot defect must be visible through ND 5% filter.

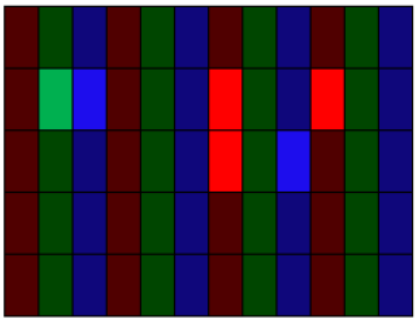
3.2.1 Bright dot

Dots appear bright and unchanged in size in which LCD Cell is displaying under black pattern.

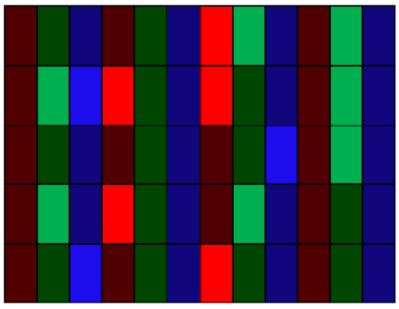
single dot



two adjacent dots



three adjacent dots



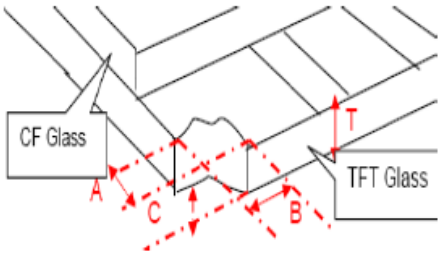
3.2.2 Dark dot

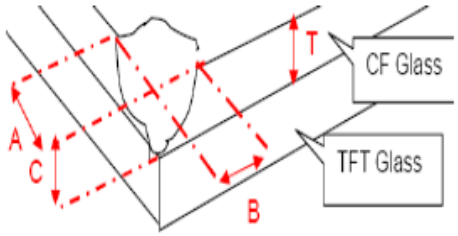
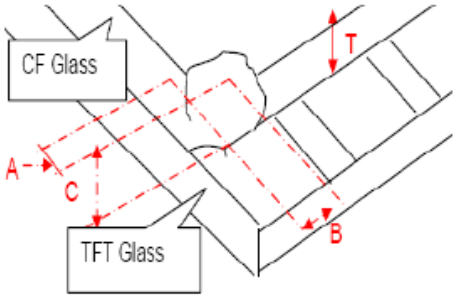
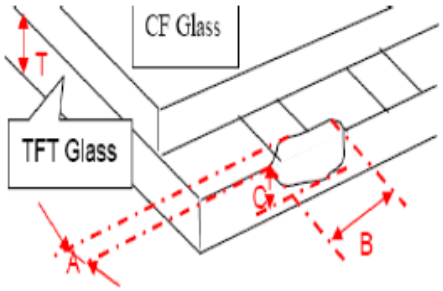
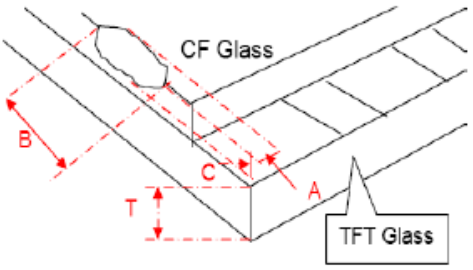
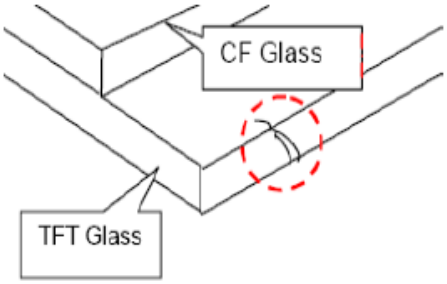
The same definition of bright dot, but always display dark in white pattern

3.2.3 The usage of ND 5%

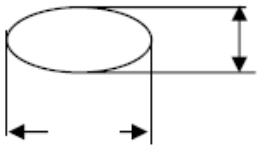
Use the ND 5% to cover bright/dark dot within 2s,it should be judged OK if it's invisible.

4. 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**
5 Side Broken **（Minor）**		1. A≤0.8 mm, C≤T **Ignore** B Length Ignore 2. A＞0.8 mm, **Not allowed**
6 Glass crack **（Major）**		**Not allowed**

<table>
<tr>
<td>7

（Minor）</td>
<td>Spots on polarizer
 
Φ= (a+b)/2</td>
<td>
<table>
<tr><th>Dimensions</th><th>Acceptable Numbers</th></tr>
<tr><td>Φ≤0.1mm</td><td>Ignore ,*1</td></tr>
<tr><td>0.1mm＜Φ≤0.30mm</td><td>2</td></tr>
<tr><td>Φ＞ 0.30mm</td><td>0</td></tr>
</table>
1:The distance between dot defects should be more 5MM apart
2:Judge by negative-film card
</td>
</tr>
<tr>
<td>8
（Minor）</td>
<td>Scratched on polarizer</td>
<td>
<table>
<tr><th>Dimensions</th><th>Acceptable Numbers</th></tr>
<tr><td>W≤0.03mm</td><td>Ignore</td></tr>
<tr><td>L≤3 mm
0.03mm＜W≤0.05mm</td><td>3</td></tr>
<tr><td>L≤3 mm
0.05mm＜W≤0.1mm</td><td>1</td></tr>
<tr><td>L≥3 mm or W≥0.1 mm</td><td>0</td></tr>
</table>
1:The distance between dot defects should be more 5MM apart
2:Judge by negative-film card
</td>
</tr>
<tr>
<td>9

（Major）</td>
<td>Envelop silicon on glass</td>
<td>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</td>
</tr>
<tr>
<td>10
（Major）</td>
<td>Keep out light cover/ protection cover</td>
<td>1. Miss the cover reject</td>
</tr>
<tr>
<td>11
（Major）</td>
<td>TCP IC/ FPC</td>
<td>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</td>
</tr>
</table>

		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**
13 (Major)	Weld	1.tack weld **reject** 2.welding shifting less than 1/3 FPC pin 3.welding short out **reject** 4.very little or too much tin **reject** 5.tin seat ≤0.13mm 6.FPC cock **reject**
13 (Minor)	LCD rainbow	1.area＞1/4 LCD display area **reject** 2.visible at display **reject**

5. 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><th>Dimensions</th><th>Acceptable Numbers</th></tr>
<tr><td>Φ≤0.1mm</td><td>Ignore</td></tr>
<tr><td>0.1mm＜Φ≤0.30mm</td><td>2</td></tr>
<tr><td>Φ＞ 0.30mm</td><td>0</td></tr>
</table>
1:The distance between dot defects should be more 5MM apart
2:Judge by negative-film card
</td></tr>
<tr><td>2
(Minor)</td><td>Black/White line</td><td>
<table>
<tr><th>Dimensions</th><th>Acceptable Numbers</th></tr>
<tr><td>W≤0.03mm</td><td>Ignore</td></tr>
<tr><td>L≤3 mm
0.03mm＜W≤0.05mm</td><td>3</td></tr>
<tr><td>L≤3 mm
0.05mm＜W≤0.1mm</td><td>1</td></tr>
<tr><td>L≥3 mm or W≥0.1 mm</td><td>0</td></tr>
</table>
1:The distance between dot defects should be more 5MM apart
2:Judge by negative-film card
</td></tr>
</table>

<table>
<tr><td>3
（Minor）</td><td>Bright/dark dot</td><td>
<table>
<tr><th>Dimensions</th><th>Acceptable Numbers</th></tr>
<tr><td>Single bright dot</td><td>≤1</td></tr>
<tr><td>Two adjacent bright dots</td><td>reject</td></tr>
<tr><td>Three adjacent bright dots</td><td>reject</td></tr>
<tr><td>Single dark dot</td><td>≤2</td></tr>
<tr><td>Two adjacent dark dots</td><td>≤1</td></tr>
<tr><td>Three adjacent dark dots</td><td>reject</td></tr>
</table>
1:The distance between dot defects should be more 5MM apart
2:Total dot≤2</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>Mura</td><td>judge by ND5% filter or limit sample</td></tr>
<tr><td>6
（Major）</td><td>flicker</td><td>judge by ND 5% filter in grey pattern or limit sample</td></tr>
<tr><td>7
（Major）</td><td>Electricity parameter
（V0P/Current）</td><td>Over the production SPEC reject</td></tr>
<tr><td>8
（Major）</td><td>Backlight</td><td>1.No backlight, the LED died off reject
2. The light odds(Follow the limit sample) reject
3. light leak reject</td></tr>
<tr><td>9
（Major）</td><td>Cross talk</td><td>Limit sample</td></tr>
<tr><td>10
（Major）</td><td>Touch defect</td><td>Reject</td></tr>
</table>

9.3 Precautions For Using Lcd Module

9.3.1 Mounting Precautions

(1) You must mount a module using arranged in four corners or four sides.
(2) You should consider the mounting structure so that uneven force (ex. Twisted stress) is not applied to the module. And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.
(3) Please attach a transparent protective plate to the surface in order to protect the polarizer. Transparent protective plate should have sufficient strength in order to the resist external force.
(4) You should adopt radiation structure to satisfy the temperature specification.
(5) Acetic acid type and chlorine type materials for the cover case are not describe because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.
(6) Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment. Do not touch the surface of polarizer for bare hand or greasy cloth. (Some cosmetics are determined to the polarizer)
(7) When the surface becomes dusty, please wipe gently with adsorbent cotton or other soft materials like chamois soaks with petroleum benzene. Normal-hexane is recommended for cleaning the adhesives used to attach front / rear polarizers. Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer.
(8) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
(9) Do not open the case because inside circuits do not have sufficient strength.

9.3.2 Operating Precautions

(1) The spike noise causes the mis-operation of circuits. It should be lower than following voltage：
V=±200mV(Over and under shoot voltage)
(2) Response time depends on the temperature. (In lower temperature, it becomes longer.)
(3) Brightness depends on the temperature. (In lower temperature, it becomes lower) And in lower temperature, response time (required time that brightness is stable after turned on) becomes longer.
(4) Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
(5) When fixed patterns are displayed for a long time, remnant image is likely to occur.
(6) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.

9.3.3 Electrostatic Discharge Control

Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wristband etc. And don't touch interface pin directly.

9.4 Precautions For Strong Light Exposure

Strong light exposure causes degradation of polarizer and color filter.

9.5 Storage

When storing modules as spares for a long time, the following precautions are necessary.

(1) Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5℃ and 35℃ at normal humidity.

(2) The polarizer surface should not come in contact with any other object. It is recommended that they be stored in the container in which they were shipped.

9.6 Handling Precautions For Protection Film

(1) When the protection film is peeled off, static electricity is generated between the film and polarizer. This should be peeled off slowly and carefully by people who are electrically grounded and with well ion-blown equipment or in such a condition, etc.

(2) The protection film is attached to the polarizer with a small amount of glue. Is apt to remain on the polarizer.Please carefully peel off the protection film without rubbing it against the polarizer.

(3) When the module with protection film attached is stored for a long time, sometimes there remains a very small amount of glue still on the polarizer after the protection film is peeled off.

(4) You can remove the glue easily. When the glue remains on the polarizer surface or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with normal-hexane.

"Shenzhen Jinghua Displays CO., LTD. reserves the right to change this specification"

- END -