Thin-Film-Transistor LCD Module
Model: XTPW70NP01-03

Acceptance

Approved and Checked by

Approved by	Checked by		Made by

Revise Records

Rev.	Date	Contents	Written	Approved
A	2017/01/13	Preliminary Specification	LUO	JACK
B	2017/05/05	Add the timing data,LED half life	LUO	JACK

Special Notes

Note1.	
Note2.	
Note3.	
Note4.	
Note5.	

1.General Description and Features

XTPW70NP01-03 is a TM (Transmissive) type color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT-LCD module, a driver circuit and a back-light unit . The resolution of a 7.0" contains 800RGBx480 dots and can display up to 16.7M colors. The following table described the features of XTPW70NP01-03

LCD Module

Item	Specification	Unit
Screen Size	7.0inches	Diagonal
Display Resolution	800RGB(H)x480(V)	Dot
Active Area	154.08 (H) x 85.92 (V)	mm
Outline Dimension	170.08(W) x 103.92(H) x5.525 (D)	mm
Display Mode	Normally white/Transmissive	--
Pixel Arrangement	RGB-Vertical Stripe	--
Display Color	16.7M	--
Gray scale inversion Direction	6 o'clock	
Viewing Direction	12 o'clock	--
Drive IC	HX8264*1 HX8664*1 or Compatible	--
Surface luminance	300 cd/㎡	
TP	6WIRE -CTP	

2.Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	--	170.08	--	mm	--
	Vertical (V)	--	103.92	--	mm	(1)
	Thickness (T)	--	5.525	--	mm	(2)
Weight		--	N/A	--	g	--

Note (1) Not include FPC.
Refer to the Outline Dimension for further information.
(2) Back-light unit are included.

3.Electrical Specifications

3.1 Absolute Max. Ratings

3.1.1 Absolute Ratings of Environment

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

(Ta=25±2°C, V_{SS}=GND=0)

Item	Symbol	Min.	Max.	Unit	Note
Storage temperature	T_{STG}	-30	80	°C	(1)
Operating temperature	T_{OPR}	-20	70	°C	(1,2,3)

Note (1) 95 % RH Max. (40 °C ≥ Ta). Maximum wet-bulb temperature at 39 °C or less. (Ta > 40 °C)
No condensation.

Note (2) In case of below 0°, the response time of liquid crystal (LC) becomes slower and the color of panel becomes darker than normal one. Level of retardation depends on temperature, because of LC's character

Note (3) Only operation is guarantied at operating temperature. Contrast, response time, another display quality are evaluated at +25°C.

3.2 Electrical Absolute Rating

3.2.1 TFT-LCD Module

(Voltage Referenced to VSS)

Item	Symbol	Value		Unit	Condition
		Min.	Max.		
Digital Power Supply Voltage	VDD	VSS-0.3	5.0	V	--

3.2.2 Back-Light Unit

(Ta=25±2°C)

Item	Symbol	Min.	Max.	Unit	Note
current	I_f	--	30	mA	(1)
voltage	V_R	--	5.0	V	(1)

Note (1) Permanent damage to the device may occur if maximum values are exceeded or reverse voltage is loaded. Functional operation should be restricted to the conditions described under normal operating conditions.

4 Electrical Characteristics

4.1 TFT-LCD Module (DC Characteristics)

Item	Symbol	Min.	Typ.	Max.	Unit.	Note.
Digital Supply Voltage	VDD	3	3.3	3.6	V	
Analog Supply Voltage	VDDA	9.4.	9.6	9.8	V	
Gate On Voltage	VGH	17	18	19	V	
Gate Off Voltage	VGL	-6.6	-6	-5.4	V	
Common Voltage	VCOM	3.5	4	4.5	V	Note1
Logic Input Voltage	VIH	0.7VDD	-	VDD	V	
	VIL	GND	-	0.3VDD	V	

Note1：Please adjust VCOM to make the flicker level be minimum.

4.2 Backlight Unit

The back-light system is an edge-lighting type with twenty-one white LEDs (Light Emitting Diode).

Item	Symbol	Value			Unit	Condition
		Min.	Typ.	Max.		
LED Voltage	VF	8	9.0	11	V	
LED Current	IF	-	140	-	mA	
Power Consumption	P_{BL}	-	-	-	mW	

Note (1) Where I_F = 140MA, The LED lifetime 40000 hours

Note (2) Where I_F = 180MA, The LED lifetime 25000 hours(According to the calculated)

5 Input Terminal Pin Assignment

Display			
1	LED+ / A+	**26**	G1
2	LED+ / A+	**27**	G0
3	LED- / K-	**28**	R7
4	LED- / K-	**29**	R6
5	GND	**30**	R5
6	VCOM (4V)	**31**	R4
7	DVDD (3.3V)	**32**	R3
8	MODE	**33**	R2
9	DE	**34**	R1
10	LCD_VSYNC	**35**	R0
11	LCD_HSYNC	**36**	GND
12	B7	**37**	LCD_PCLK
13	B6	**38**	GND
14	B5	**39**	SHLR
15	B4	**40**	UPDN
16	B3	**41**	VDDG (18V)
17	B2	**42**	VEEG (-6V)
18	B1	**43**	AVDD (9.6V)
19	B0	**44**	/RST
20	G7	**45**	NC
21	G6	**46**	VCOM (4V)
22	G5	**47**	DITH
23	G4	**48**	GND
24	G3	**49**	NC
25	G2	**50**	NC

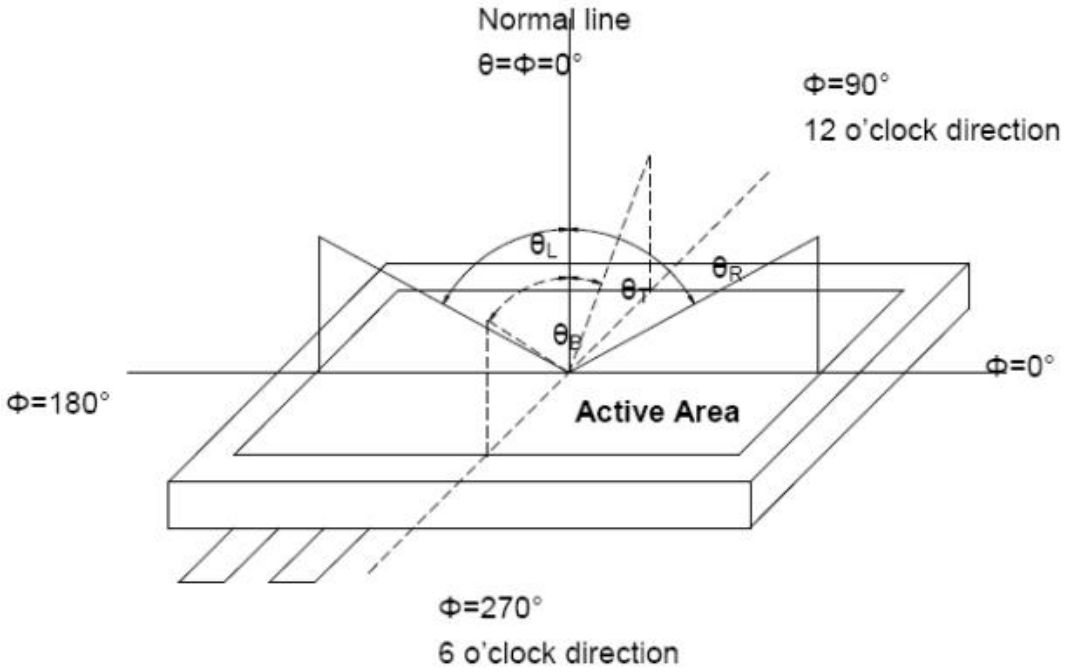
MODE: H = DE mode (default)
L = HSD/VSD mode
DITH: H = 6bit resolution (last 2 bit of input data truncated)
L = 8bit resolution (default setting)
L/R: 0 = right to left scan direction
1= left to right scan direction
U/D: 0 = top to bottom scan direction
1 = bottom to top scan direction

Capacitive Touch Panel			
1	DVDD (3.3V)	**4**	/INTR
2	SCL	**5**	/RESET
3	SDA	**6**	DGND

6 Optical Characteristics

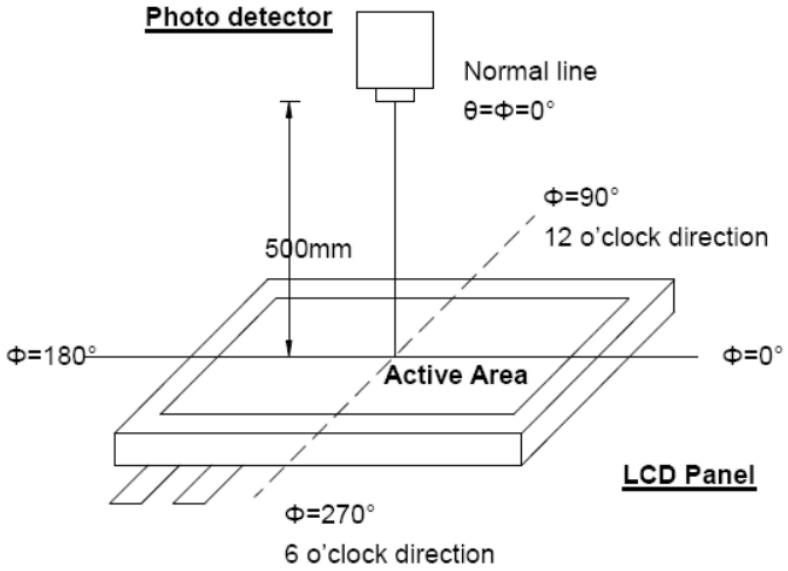
ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Transmittance		T	----	4.8	5.1	-	%
Contrast Ratio		CR	θ=ϕ= 0°	320	400	-	--
Response Time		Tr+ Tf	θ=ϕ= 0°	-	25	40	ms
Cross Talk		CT	θ=ψ= 0°	--	--	2.0	%
Viewing Angle	Vertical	θ	CR≧10	120	140	-	°
	Horizontal	ψ		100	120	-	°
Color Filter Chromaticity	White	x	θ=ϕ= 0°	0.282	0.302	0.322	
		y		0.318	0.338	0.358	
		Y		31.3	34.3	37.3	
	Red	x	θ=ϕ= 0°	0.586	0.606	0.626	
		y		0.305	0.325	0.345	
		Y		18.8	21.8	24.8	
	Green	x	θ=ϕ= 0°	0.283	0.303	0.323	
		y		0.547	0.567	0.587	
		Y		55.7	59.7	63.7	
	Blue	x	θ=ϕ= 0°	0.127	0.147	0.167	
		y		0.141	0.161	0.181	
		Y		18.3	21.3	24.3	
	NTSC			45	50	-	%

Note 1: Definition of viewing angle range



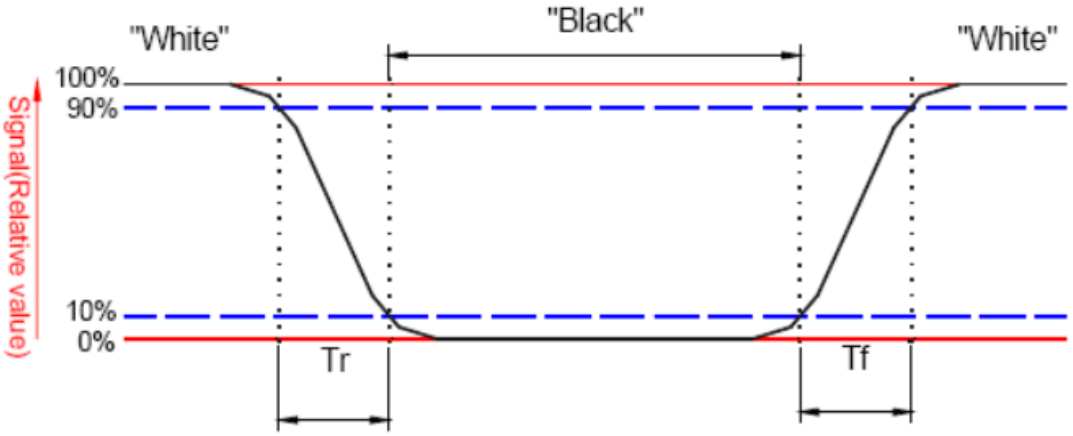
Note 2: Definition of optical measurement system.

The optical characteristics should be measured in dark room. The optical properties are measured at the center point of the LCD screen,(Response time is measured by Photo detector TRD_100, other items are measured by BM-5A/Field of view :1°/Height 500mm.)



Note 3: Definition of response time:

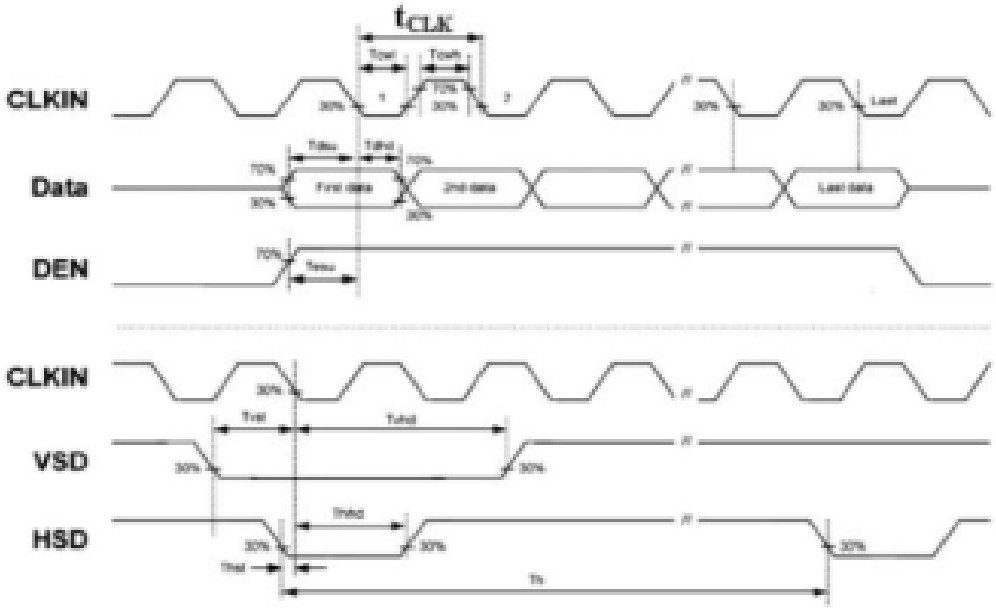
The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time (TON) is the time between photo detector output intensity changed from 90% to 10%. And fall time (TOFF) is the time between photo detector output intensity changed from 10% to 90%.



7 Interface Timing

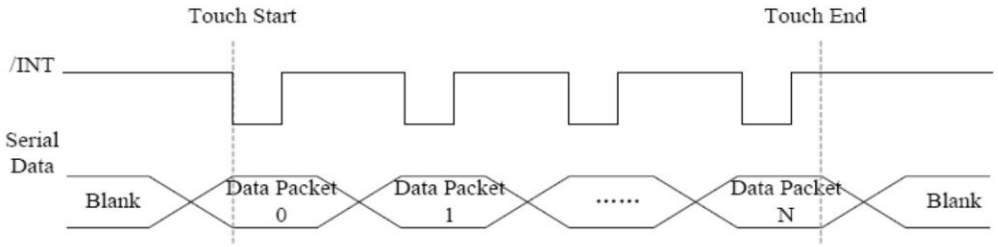
DISPLAY TIMING AND DATA INPUT FORMAT

Item	Symbol	Min	Typ	Max	Unit
Clock Frequency	1/tclk	-	33	-	MHz
Horizontal Display Area	tHA		800		tclk
HS Period	tH	-	1056	-	tclk
HS Blanking	tHB	-	256	-	tclk
Vertical Display Area	tVA		480		tH
VS Period	tV	-	525	-	tH
VS Blanking	tVB	-	45	-	tH

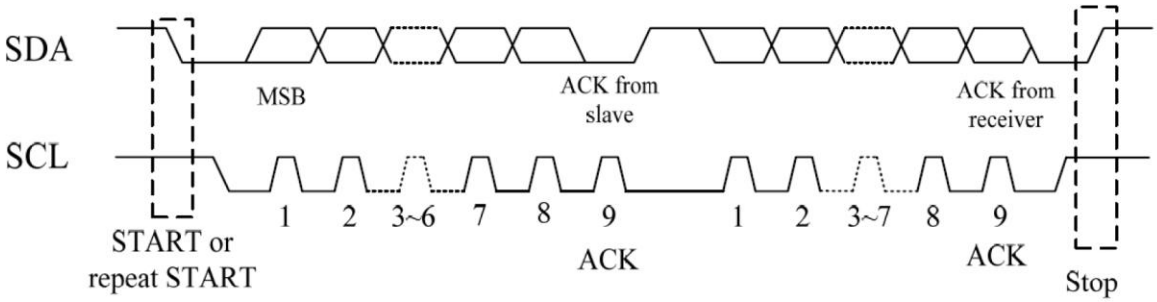


TOUCHPANEL TIMING AND DATA INPUT FORMAT

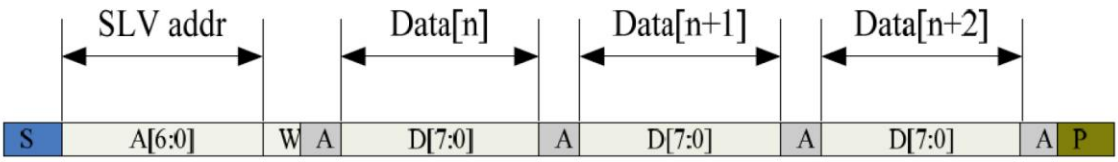
Parameter	Unit	Min	Max
SCL frequency	KHz	0	400
Bus free time between a STOP and START condition	us	4.7	\
Hold time (repeated) START condition	us	4.0	\
Data setup time	ns	250	\
Setup time for a repeated START condition	us	4.7	\
Setup Time for STOP condition	us	4.0	\



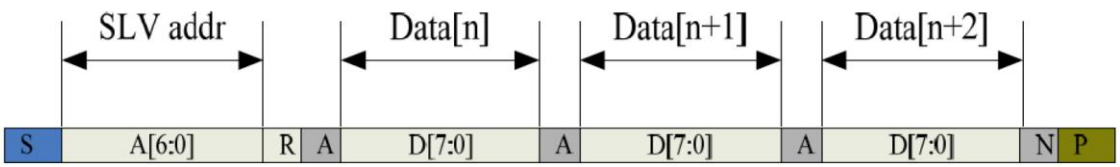
Interrupt trigger mode



I2C Serial Data Transfer Format



I2C master write, slave read



I2C master read, slave write

Touch Controller:	FT5426
Touch Panel Vendor ID:	Address: 0xA8 Data:0X03
Firmware version number:	Address: 0xA6 Data:0x01

8 Reliability Condition for LCD

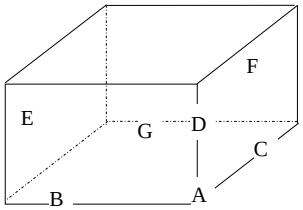
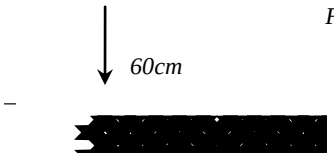
No change on display and in operation under the following test condition.

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)	--
3	High Temperature Storage	80°C±2°C, 240hrs	--
4	Low Temperature Storage	-30°C±2°C, 240hrs	--
5	High Temperature and High Humidity Operation Test	60°C±2°C, 90%, 240hrs	--
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.	--

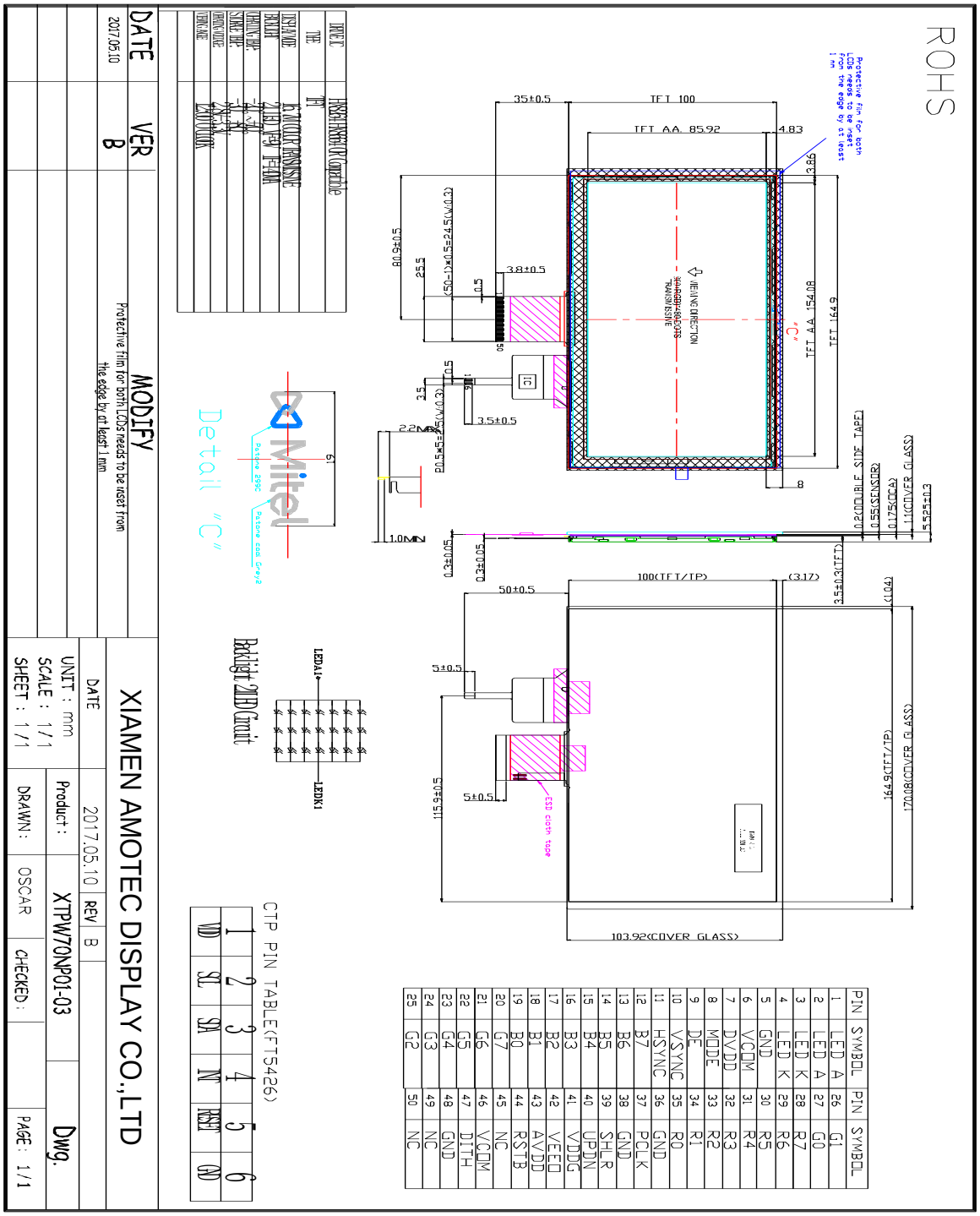
7.	Drop Test	To be measured after dropping from 60cm high on the concrete surface in packing state.  *Dropping method corner dropping* *A corner: once* *Edge dropping* *B, C, D edge: once* *Face dropping* *E, F, G face: once*  ***Concrete Surface***	--

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.

9 Dimensional outlines



10 Incoming Inspection Standards

11.1 VISUAL & FUNCTION INSPECTION STANDARD

11.1.1 Inspection conditions

Inspection performed under the following conditions is recommended.

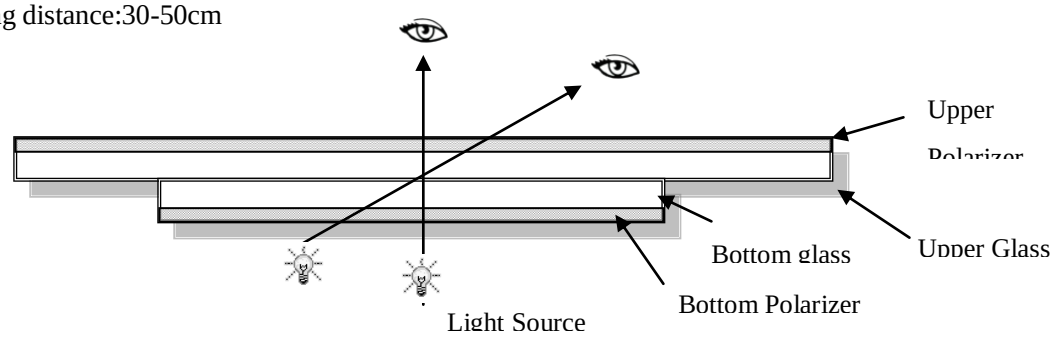
Temperature : 25±5℃

Humidity : 65%±10%RH

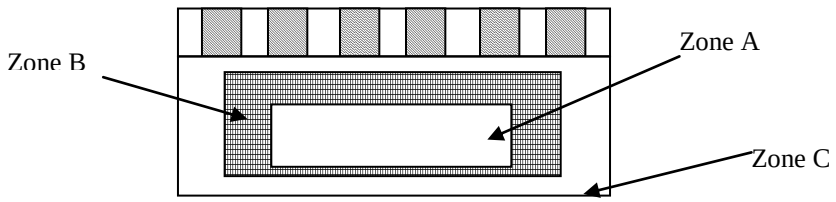
Viewing Angle : Normal viewing Angle.

Illumination: Single fluorescent lamp (300 to 700Lux)

Viewing distance:30-50cm



11.1.2 Definition



Zone A : Effective Viewing Area(Character or Digit can be seen)

Zone B : Viewing Area except Zone A

Zone C : Outside (Zone A+Zone B) which can not be seen after assembly by customer .)

Note:

As a general rule ,visual defects in Zone C can be ignored when it doesn't effect product function or appearance after assembly by customer.

11.1.3 Sampling Plan

According to GB/T 2828-2003 ; , normal inspection, Class Ⅱ

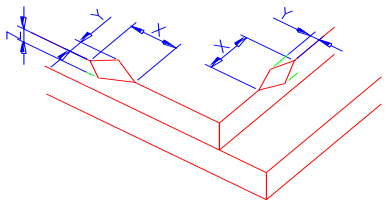
AQL:

Major defect	Minor defect
0.65	1.5

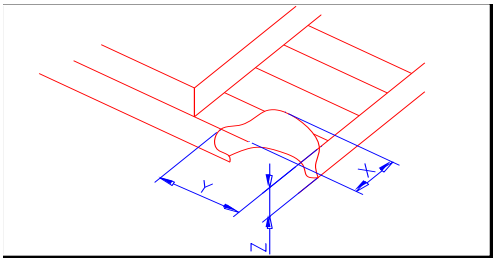
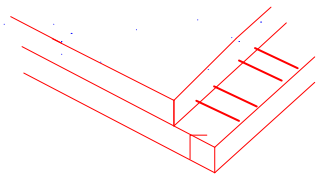
LCD: Liquid Crystal Display , TP: Touch Panel , LCM: Liquid Crystal Module

No	Items to be inspected	Criteria	Classification of defects
1	Functional defects	1) No display, Open or miss line 2) Display abnormally, Short 3) Backlight no lighting, abnormal lighting. 4) TP no function	Major
2	Missing	Missing component	
3	Outline dimension	Overall outline dimension beyond the drawing is not allowed	
4	Color tone	Color unevenness, refer to limited sample	Minor
5	Soldering appearance	Good soldering , Peeling off is not allowed.	
6	LCD/Polarizer/TP	Black/White spot/line, scratch, crack, etc.	

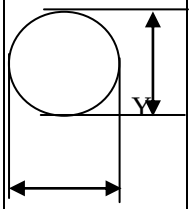
11.1.4 Criteria (Visual)

Number	Items	Criteria(mm)
1.0 LCD Crack/Broken NOTE: X: Length Y: Width	(1) The edge of LCD broken	

X	Y	Z
≤3.0mm	<Inner border line of the seal	≤T

Z: Height L: Length of ITO, T: Height of LCD	(2)LCD corner broken	 <table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>≤3.0mm</td><td>≤L</td><td>≤T</td></tr></table>
	(3) LCD crack	 Crack Not allowed

Number	Items	Criteria (mm)
2.0	Spot defect	① light dot（LCD/TP/Polarizer black/white spot , light dot, pinhole, dent, stain）



X

Φ=(X+Y)/2

Zone / Size (mm)	Acceptable Qty A	B	C
Φ≤0.10	Ignore		
0.10<Φ≤0.15	3(distance≧10mm)		Ignore
0.15<Φ≤0.2	1		
0.2<Φ	0		

②Dim spot（LCD/TP/Polarizer dim dot, light leakage、 dark spot）

Zone / Size (mm)	Acceptable Qty A	B	C
Φ≤0.1	Ignore		
0.1<Φ≤0.2	2(distance≧10mm)		Ignore
0.2<Φ≤0.3	1		
Φ＞0.3	0		

③ Polarizer accidented spot

Zone / Size (mm)	Acceptable Qty A	B	C
Φ≤0.2	Ignore		
0.2<Φ≤0.5	2(distance≧10mm)		Ignore
Φ>0.5	0		

<table>
<tr>
<td></td>
<td>Line defect (LCD/TP /Polarizer black/white line, scratch, stain)</td>
<td>
<table>
<tr><td rowspan="2">Width(mm)</td><td rowspan="2">Length(mm)</td><td colspan="3">Acceptable Qty</td></tr>
<tr><td>A</td><td>B</td><td>C</td></tr>
<tr><td>Φ≤0.03</td><td>Ignore</td><td colspan="2">Ignore</td><td rowspan="3">Ignore</td></tr>
<tr><td>0.03<W≤0.05</td><td>L≤3.0</td><td colspan="2">N≤2</td></tr>
<tr><td>0.05<W≤0.08</td><td>L≤2.0</td><td colspan="2">N≤2</td></tr>
<tr><td>0.08<W</td><td colspan="4">Define as spot defect</td></tr>
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</tr>
<tr>
<td>3.0</td>
<td>Polarizer Bubble</td>
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<tr><td rowspan="2">Zone
Size (mm)</td><td colspan="3">Acceptable Qty</td></tr>
<tr><td>A</td><td>B</td><td>C</td></tr>
<tr><td>Φ<0.2</td><td colspan="2">Ignore</td><td rowspan="3">Ignore</td></tr>
<tr><td>0.2<Φ<0.4</td><td colspan="2">2(distance≧10mm)</td></tr>
<tr><td>0.4<Φ≤0.6</td><td colspan="2">1</td></tr>
<tr><td>0.6<Φ</td><td colspan="2">0</td><td></td></tr>
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<tr>
<td>4.0</td>
<td>SMT</td>
<td>According to IPC-A-610C class Ⅱ standard . Function defect and missing part are major defect ,the others are minor defect.</td>
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