Thin-Film-Transistor LCD Module
Model:XTPY43SN03-11

Acceptance

Approved and Checked by

Approved by	Checked by		Made by

Revise Records

Rev.	Date	Contents	Written	Approved
A	2018/04/19	Preliminary Specification	LUO	JACK
B	2018/05/02	Add TAPE	LUO	JACK

Special Notes

Note1.	
Note2.	
Note3.	
Note4.	
Note5.	

1.General Description and Features

XTPY43SN03-11 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 4.3" contains 480RGBx272 dots and can display up to 16.7M colors. The following table described the features of XTPY43SN03-11.

LCD Module

Item	Specification	Unit
Screen Size	4.3inches	Diagona
Display Resolution	480RGB(H)x272(V)	Dot
Active Area	95.04(H) x 53.86 (V)	mm
Outline Dimension	114.2(W) x 73.2(H) x 4.68(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	HX8257A-C FT5336	

2.Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	--	114.2	--	mm	--
	Vertical (V)	--	93.2	--	mm	(1)
	Thickness (T)	--	4.68	--	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
Operating temperature	T_{OPR}	-20	70	°C	(1)
Storage temperature	T_{STG}	-30	80	°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	4.6	V	--

3.2.2 Back-Light Unit

(Ta=25±2°C)

Item	Symbol	Min.	Max.	Unit	Note
Current(1LED)	I_f	--	30	mA	(1)
Reverse voltage	V_R	--	5	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 DRIVING TFT LCD PANEL

Item		Sym.	Min	Typ.	Max	Unit	Note
Power for Circuit Driving		VDD	3.0	3.3	3.6	V	
Logic Input Voltage	Low Voltage	V_{IL}	0	-	0.3Vdd	V	
	High Voltage	V_{IH}	0.7Vdd	-	Vdd	V	
Logic Output Voltage	Low Voltage	V_{OL}	0	-	0.2Vdd	V	
	High Voltage	V_{OH}	0.8Vdd	-	-	V	
Power Consumption	Black Mode	P_b	T.B.D	T.B.D	T.B.D	mW	
	Standby Mode	P_w	T.B.D	T.B.D	T.B.D	mW	

4.2 Driving Backlight Unit

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

(Ta=25±2°C)

Item	Symbol	Value			Unit	Condition
		Min.	Typ.	Max.		
LED Voltage	VF	14	16	18	V	
LED Current	IF	-	40	-	mA	
Power Consumption	P_{BL}	-	-	-	mW	

Note (1) Where I_F = 40mA, V_F = 14-16.5V $P_{BL} = V_F \times I_F$

4.3 Driving CTP

Item	Value
Working Voltage	DC 2.8-3.3V
Interface	I2C
Support Touch	5 points

5 Input Terminal Pin Assignment

LCD PIN ASSAGEMENT

Pin No.	Symbol	Description
1	VLED-	Cathode of LED backlight
2	VLED+	Anode of LED backlight
3	GND	Power ground
4	VDD	Power voltage
5	R0	Red data (LSB)
6	R1	Red data
7	R2	Red data
8	R3	Red data
9	R4	Red data
10	R5	Red data
11	R6	Red data
12	R7	Red data (MSB)
13	G0	Green data (LSB)
14	G1	Green data
15	G2	Green data
16	G3	Green data
17	G4	Green data
18	G5	Green data
19	G6	Green data
20	G7	Green data(MSB)
21	B0	Blue data(LSB)
22	B1	Blue data
23	B2	Blue data
24	B3	Blue data
25	B4	Blue data
26	B5	Blue data
27	B6	Blue data
28	B7	Blue data(MSB)
29	GND	Power ground
30	DCLK	Pixel clock
31	DISP	Display on/off
32	HSYN	Horizontal sync signal
33	VSYNC	Vertical sync signal
34	DE	Data enable
35	NC	NO connect
36	GND	Power ground

37	NC(XR)	NO CONNECT
38	NC(YD)	NO CONNECT
39	NC(XL)	NO CONNECT
40	NC(YU)	NO CONNECT

TOUCH PANEL ASSAGEMENT

NO.	Symbol	Description
1	VDD	Power supply for touch panel(2.8~3.3V)
2	RESET	Reset the device
3	INT	interrupt
4	SCL	I2C CLOCK
5	SDA	12C DATA
6	GND	GROUND

6 Optical Characteristics

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state with the methods shown in Note (1).
Measuring equipment: BM-7,

(Ta=25±2°C)

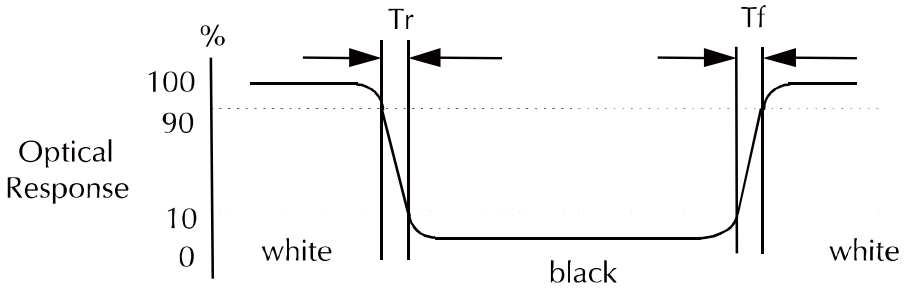
Item		Symbol	Condition	Min	Type	Max	Unit	Note
Brightness		--	θ=0° Normal Viewing Angle	--	400	--	cd/m^2	--
Response time		$T_{R+}T_F$		--	20	--	ms	--
Contrast ratio		CR		400	500	--	--	--
Color Chromaticity (CIE1931)	Red	R_X					--	--
		R_Y						
	Green	G_X					--	
		G_Y						
	Blue	B_X					--	
		B_Y						
	White	Wx		0.278	0.318	0.358	--	
		Wy		0.291	0.331	0.371		
Viewing Angle	Hor.	θ_R	CR≥10	60	70	--	Degree	--
		θ_L		60	70	--		
	Ver.	ϕ_T		60	70	--		
		ϕ_B		50	60	--		

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".

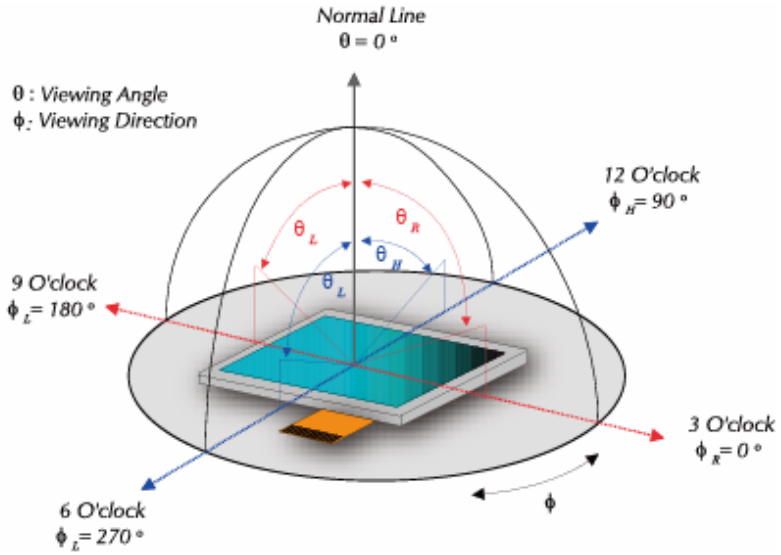


c. Definition of contrast ratio:

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

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

e. View Angle



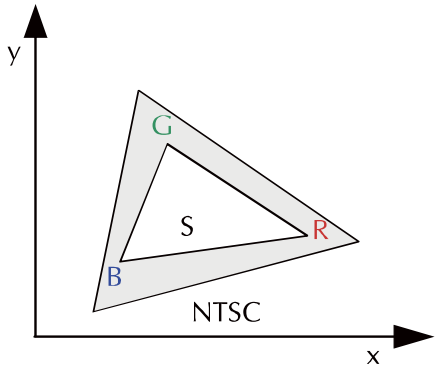
f. Definition of Luminance of White: Luminance of white at the center points

Light Source of Back-Light Unit	LED Type

g. Definition of White Uniformity

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

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



7 Interface Timing

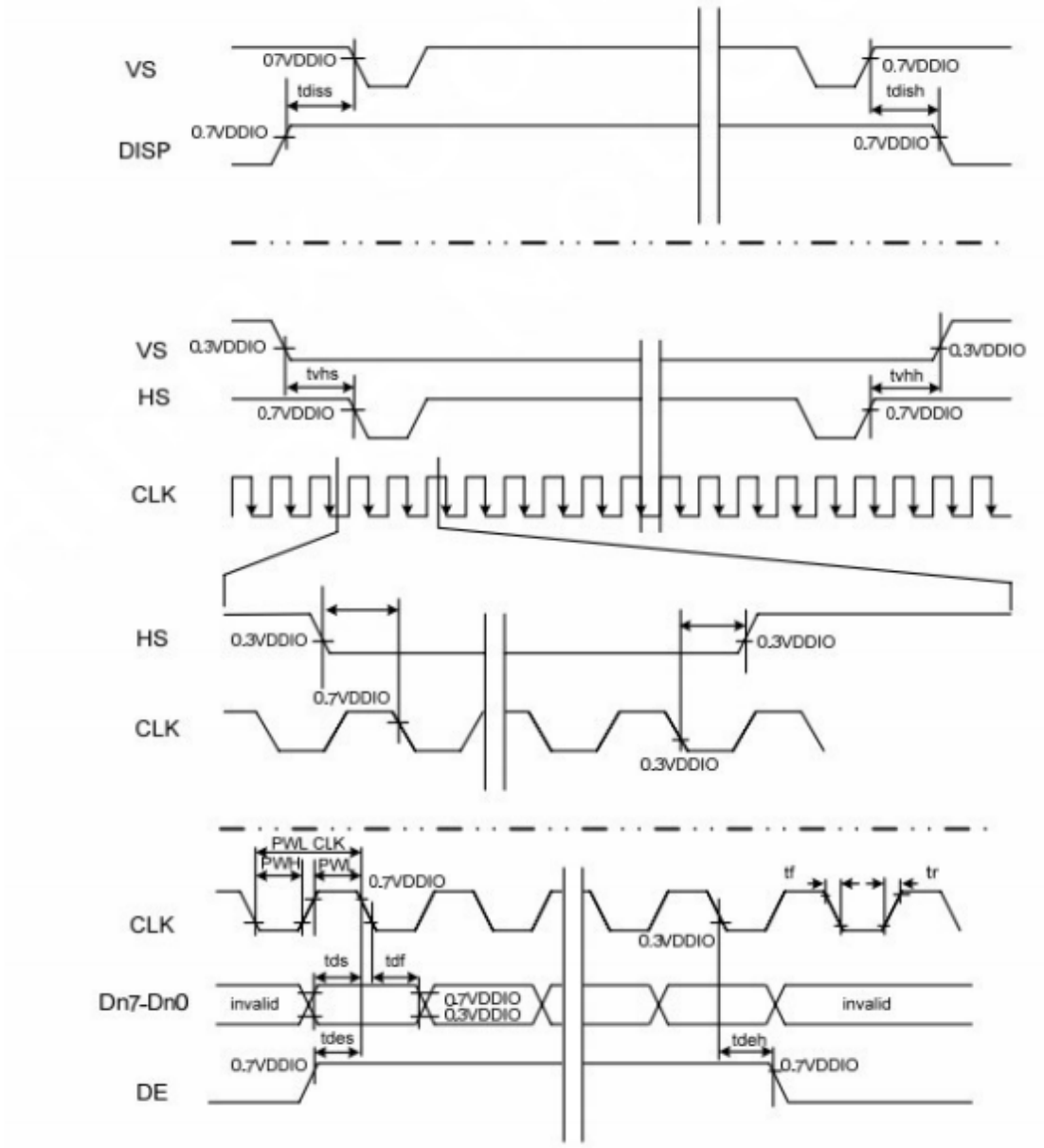
7.1.1 Input Setup Timing setting

(T_A=25°C, VDDIO=1.8V to 3.6V, DVSS= 0V, tr [1]=tf [1]=2ns)

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DISP setup time	t_{diss}	10	-	-	ns
DISP hold time	t_{dish}	10	-	-	ns
Clock period	PW_{CLK} [2]	66.7	-	-	ns
Clock pulse high period	PWH [2]	26.7	-	-	ns
Clock pulse low period	PWL [2]	26.7	-	-	ns
Hsync setup time	t_{hs}	10	-	-	ns
Hsync hold time	t_{hh}	10	-	-	ns
Data setup time	t_{ds}	10	-	-	ns
Data hold time	t_{dh}	10	-	-	ns
DE setup time	t_{des}	10	-	-	ns
DE hold time	t_{deh}	10	-	-	ns
Vsync setup time	t_{vhs}	10	-	-	ns
Vsync hold time	t_{vhh}	10	-	-	ns

Note: (1) tr, tf is defined 10% to 90% of signal amplitude.
(2) For parallel interface, maximum clock frequency is 15MHz.

7.1.2 Input setup Timing Diagram



7.2 Data Input Format

7.2.1 Data Input Timing Parameter Setting

(480RGBx272, T_A=25ºC, VDDIO=1.8V to 3.6V, DVSS= 0V)

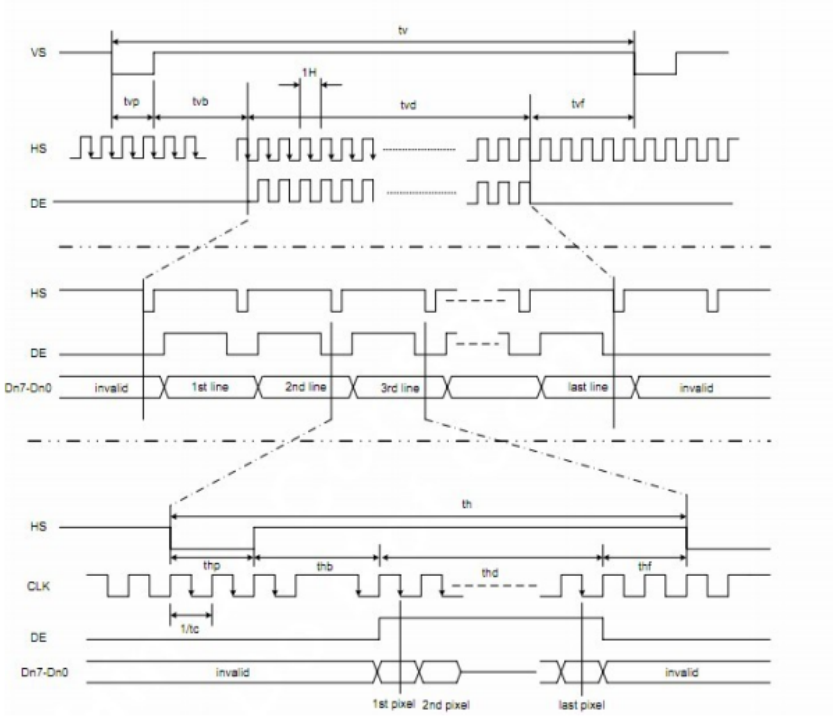
Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Clock cycle	f_{CLK} (1)	-	9	15	MHz
Hsync cycle	1/th	-	17.14	-	KHz
Vsync cycle	1/tv	-	59.94	-	Hz
Horizontal Signal					
Horizontal cycle	th	525	525	605	CLK
Horizontal display period	thd	480	480	480	CLK
Horizontal front porch	thf	2	2	82	CLK
Horizontal pulse width	thp (2)	2	41	41	CLK
Horizontal back porch	thb (2)	2	2	41	CLK
Vertical Signal					
Vertical cycle	tv	285	286	399	H (1)
Vertical display period	tvd	272	272	272	H (1)
Vertical front porch	tvf	1	2	227	H (1)
Vertical pulse width	tvp (2)	1	10	11	H (1)
Vertical back porch	tvb (2)	1	2	11	H (1)

Note: (1) Unit: CLK=1/ f_{CLK} , H= th,

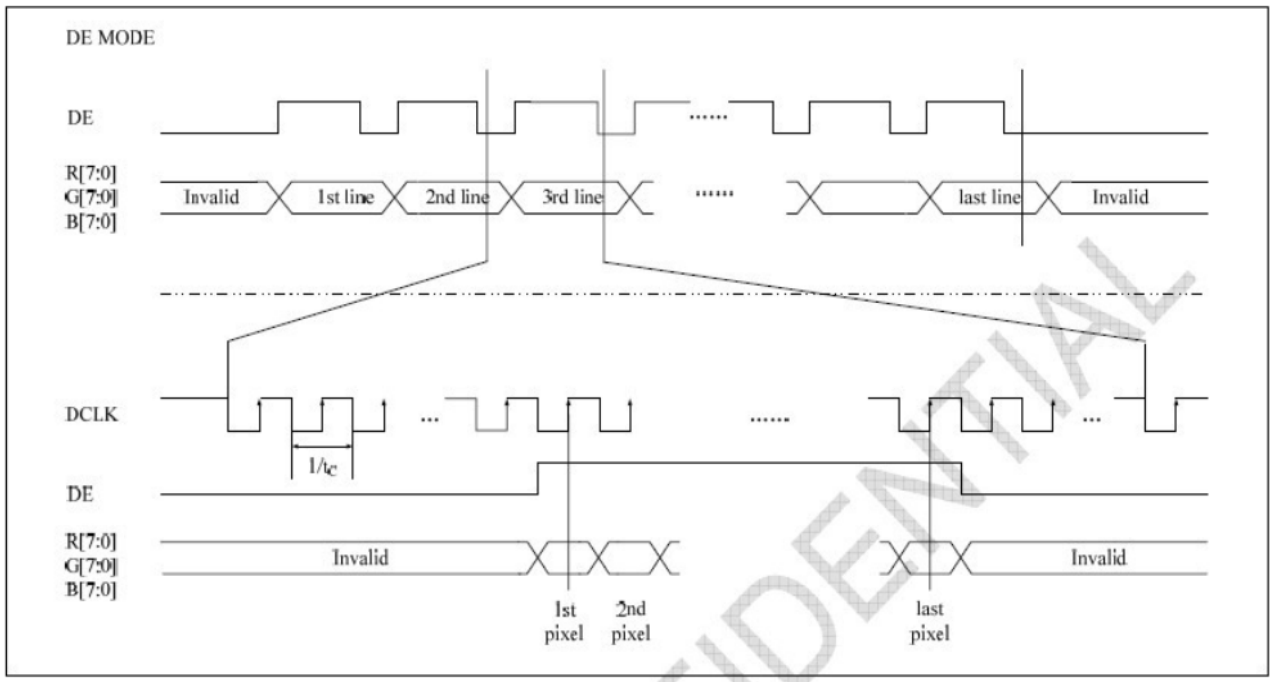
(2) It is necessary to keep tvp+tvb=12 and thp+thb=43 in sync mode. DE mode is unnecessary to keep it.

7.2.2 Data Input Timing Diagram

7.2.2.1 Data Input Timing Diagram under SYNC Mode

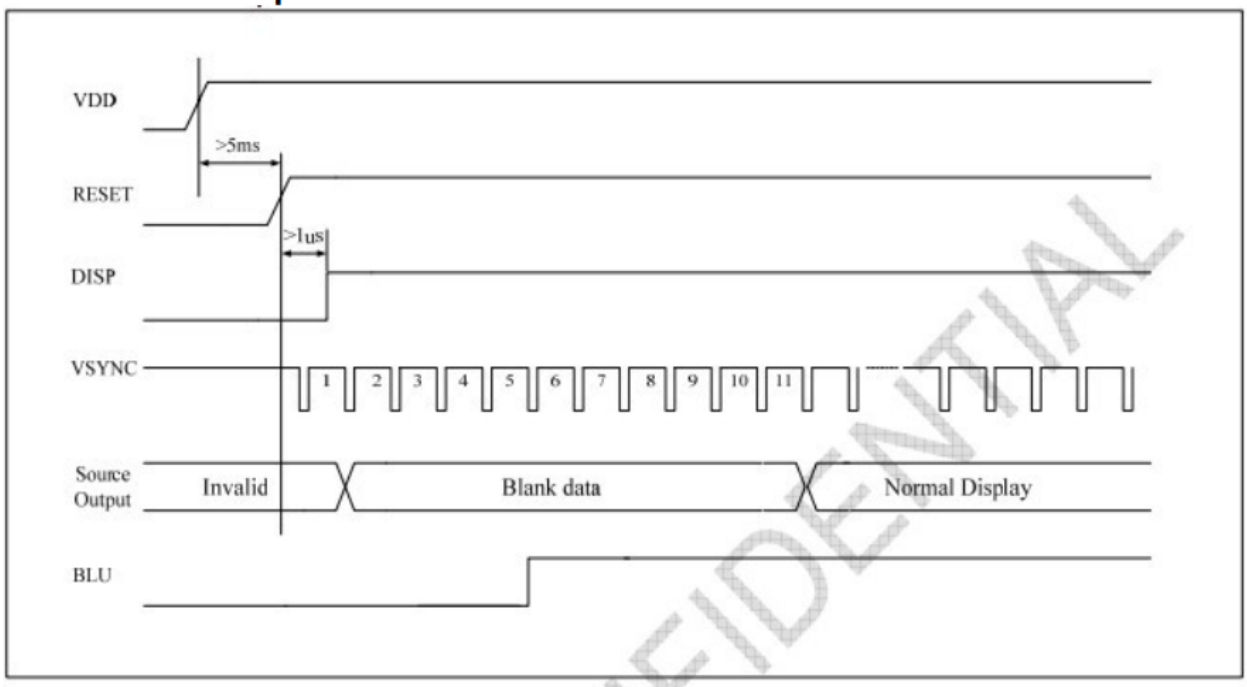


7.2.2.2 Data Input Timing Diagram under DE Mode

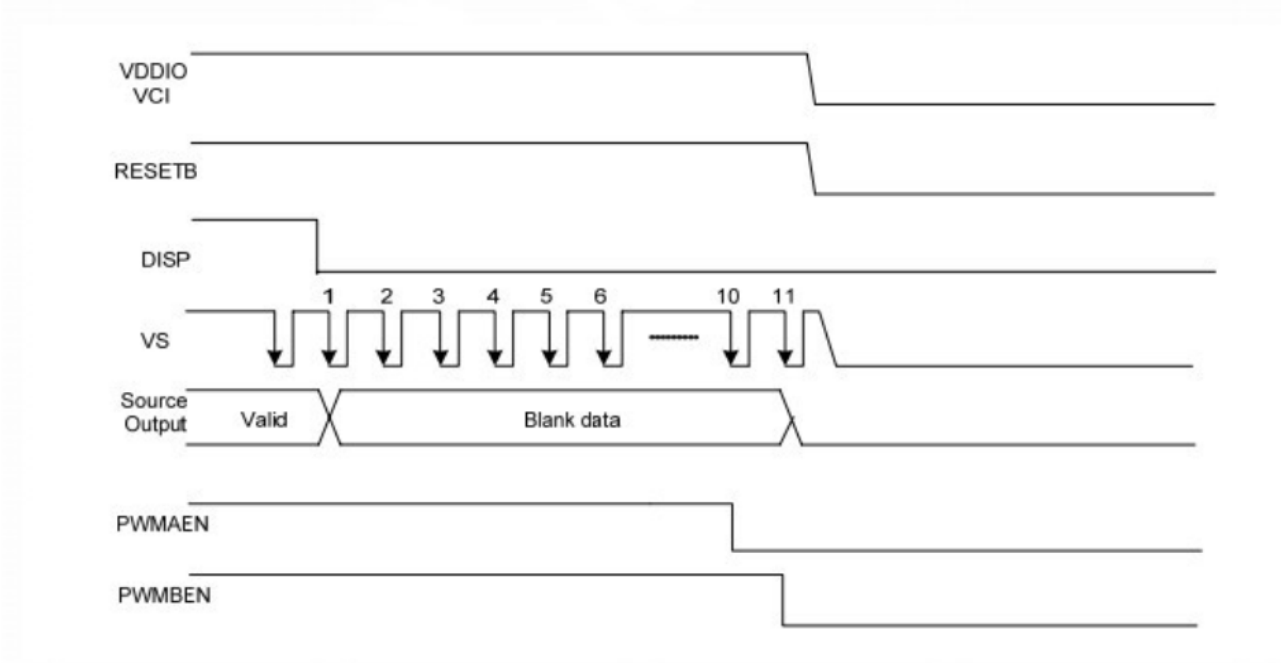


7.3 Power on/off Sequence

7.3.1 Power On Sequence



7.3.2 Power Off Sequence



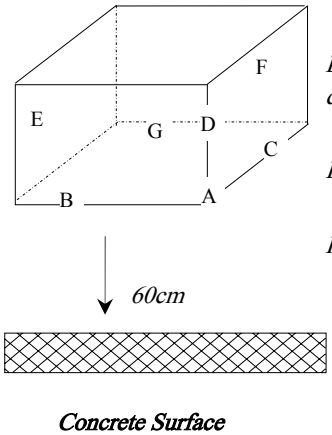
8 Reliability Condition for LCD

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.

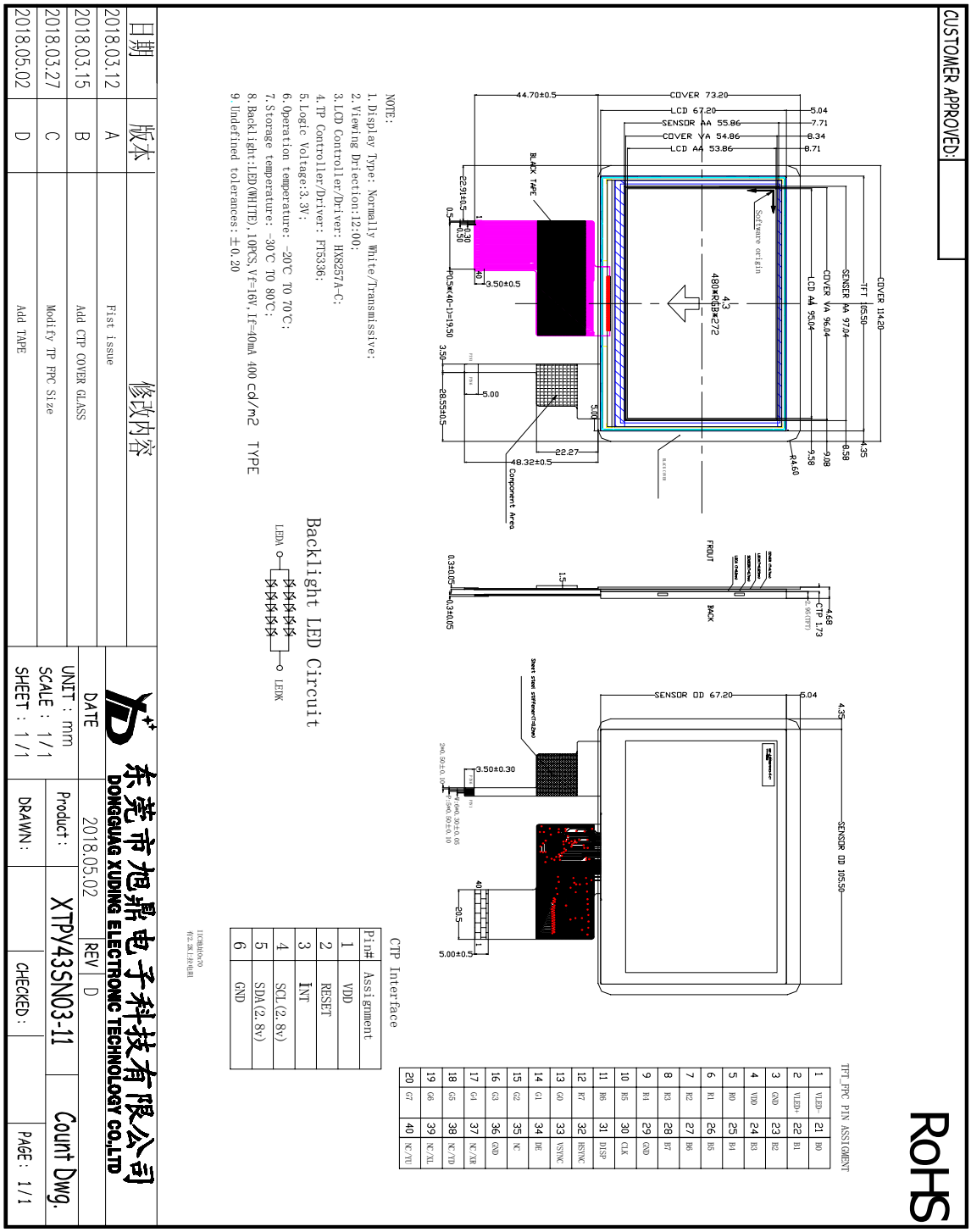
No.	Parameter	Condition	Notes
1	High Temperature Operating	70° C±2° C, 240hrs (Operation state)	--
2	Low Temperature Operating	-20° C±2° C, 240hrs (Operation state)	--
3	High Temperature Storage	80° C±2° C, 240hrs	--
4	Low Temperature Storage	-30° C±2° C, 240hrs	--
5	High Temperature and High Humidity 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*	--

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

10.1 VISUAL & FUNCTION INSPECTION STANDARD

10.1.1 Inspection conditions

Inspection performed under the following conditions is recommended.

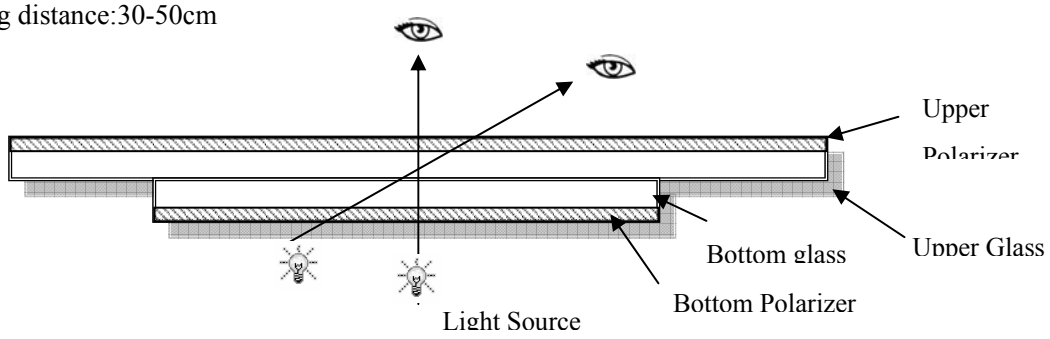
Temperature : 25±5℃

Humidity : 65%±10%RH

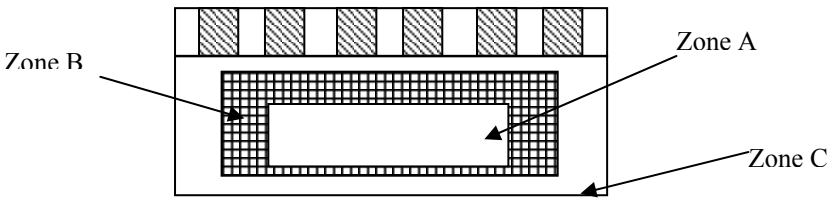
Viewing Angle : Normal viewing Angle.

Illumination: Single fluorescent lamp (300 to 700Lux)

Viewing distance:30-50cm



10.1.2 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.

10.1.3 Sampling Plan

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

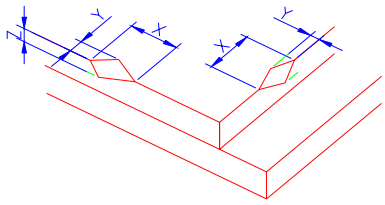
AQL:

Major defect	Minor defect
0.65	1.5

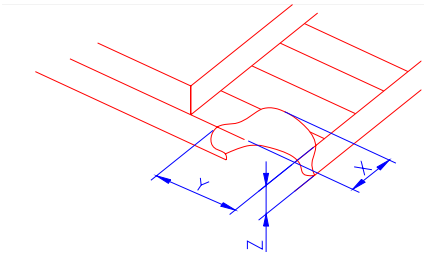
LCD: Liquid Crystal Display , TP: Touch Panel , LCM: Liquid Crystal Module

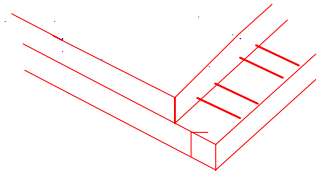
No	Items to be inspected	Criteria	Classification of defects
1	Functional defects	1) No display, Open or miss line 2) Display abnormally, Short 3) Backlight no lighting, abnormal lighting. 4) TP no function	Major
2	Missing	Missing component	
3	Outline dimension	Overall outline dimension beyond the drawing 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.	

10.1.4 Criteria (Visual)

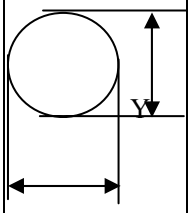
Number	Items	Criteria(mm)
1.0 LCD Crack/Broken NOTE: X: Length Y: Width	(1) The edge of LCD broken	

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

<table>
<tr><td rowspan="2">Z: Height
L: Length of ITO,
T: Height of LCD</td><td>(2)LCD corner broken</td><td> 

<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></td></tr>
<tr><td>(3) LCD crack</td><td> 
Crack
Not allowed</td></tr>
</table>

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>
</table>
</td>
</tr>
<tr>
<td>3.0</td>
<td>Polarizer Bubble</td>
<td>
<table>
<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="4">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></tr>
</table>
</td>
</tr>
<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>
</tr>
</table>