Thin-Film-Transistor LCD Module
Model: XTPW70NP03-05

Acceptance

Approved and Checked by

Approved by	Checked by		Made by

Revise Records

Rev.	Date	Contents	Written	Approved
A	2015/07/15	Preliminary Specification	OSCAR	JACK

Special Notes

Note1.	
Note2.	
Note3.	
Note4.	
Note5.	

1. General Description and Features

XTPW70NP03-05 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" contains 1024RGBx600 dots The following table described the features of XTPW70NP03-05.

1.1 Features

- 1024 x 600 pixels resolution.

1.2 LCD Module

Item	Specification	Unit
Screen Size	7.0 inches	Diagonal
Display Resolution	1024 x RGB x 600	Dot
Pixel Pitch	0.15 (H) x 0.15 (V)	mm
Active Area	153.6 (H) x 90 (V)	mm
Outline Dimension	165.75(W) x 105.39(H) x 3.3 (D)	mm
Display Mode	Normally white/Transmissive	--
Pixel Arrangement	RGB-Stripe	--
Surface Treatment	Anti-glare (AG)	--
Viewing Direction	12 o'clock	--
Input Interface	Digital	--

2. Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	--	165.75	--	mm	--
	Vertical (V)	--	105.39	--	mm	(1)
	Thickness (T)	--	3.3	--	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
Forward current	I_f	--	30	mA	(1)
Reverse 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

(GND=AV_{SS}=0V, Note 1)

Item	Symbol	Values			Unit	Remark
		Min	Type.	Max		
Input signal voltage	VCOM	3.56	3.76	3.96	V	Note 1
Power voltage	DVDD	3	3.3	3.6	V	Note 2
	AVDD	10.8	11	11.2	V	
	VGL	-10	-7	-4	V	
	VGH	16	20	24	V	
Low level input voltage	VIL	0	-	0.3xVDD	V	
High level input voltage	VIH	0.7xVDD	-	VDD	V	

Note 1:

1）Vcom value is available in the condition:
The ambient temperature is 25℃.
The operation frequency is 60Hz

2）The gate IC is the NT52002H-D,the source IC is the NT51008CH-D.

Note 2:

1）Be sure to apply V_{CC} and V_{GL} to the LCD first, and then apply V_{GH}

2）Be sure contrast ratio is 90% at least when V_{GL} drifts 3v and V_{GH} drifts 4v. Operation Frequency is @ 60Hz.

Backlight Unit

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

(Ta=25±2°C)

Item	Symbol	Value			Unit	Condition
		Min.	Typ.	Max.		
LED Voltage	VF	9.0	(9.6)	12.9	V	
LED Current	IF	-	(160)		mA	
Power Consumption	P_{BL}	-	(1536)	-	mW	

Note (1) Where I_F = 160mA, V_F = 9.6, P_{BL} = V_F ×

5 Input Terminal Pin Assignment

5.1 Pin Assignment

Pin No.	Symbol	I/O	Functi	Remark
1	VCOM	P	Common Voltage	
2	VDD	P	Power Voltage for digital circuit	
3	VDD	P	Power Voltage for digital circuit	
4	NC	---	No connection	
5	Reset	I	Global reset pin	
6	STBYB	I	Standby mode, Normally pulled high STBYB = "1", normal operation STBYB = "0", timing controller, source driver will turn off, all output are High-Z	
7	GND	P	Ground	
8	RXIN0-	I	-LVDS differential data input	
9	RXIN0+	I	+ LVDS differential data input	
10	GND	P	Ground	
11	RXIN1-	I	-LVDS differential data input	
12	RXIN1+	I	+ LVDS differential data input	
13	GND	P	Ground	
14	RXIN2-	I	-LVDS differential data input	
15	RXIN2+	I	+ LVDS differential data input	
16	GND	P	Ground	
17	RXCLKIN-	I	-LVDS differential clock input	
18	RXCLKIN+	I	+ LVDS differential clock input	
19	GND	P	Ground	
20	RXIN3-	I	-LVDS differential data input	
21	RXIN3+	I	+ LVDS differential data input	
22	GND	P	Ground	

23	NC	---	No connection	
24	NC	---	No connection	
25	GND	P	Ground	
26	NC	---	No connection	
27	DIMO	O	Backlight CABC controller signal output	
28	SELB	I	6bit/8bit mode select	Note1
29	AVDD	P	Power for Analog Circuit	
30	GND	P	Ground	
31	LED-	P	LED Cathode	
32	LED-	P	LED Cathode	
33	L/R	I	Horizontal inversion	Note3
34	U/D	I	Vertical inversion	Note3
35	VGL	P	Gate OFF Voltage	
36	CABCEN1	I	CABC H/W enable	Note2
37	CABCEN0	I	CABC H/W enable	Note2
38	VGH	P	Gate ON Voltage	
39	LED+	P	LED Anode	
40	LED+	P	LED Anode	

I: input, O: output, P: Power
Note1: If LVDS input data is 6 bits ,SELB must be set to High;
If LVDS input data is 8 bits ,SELB must be set to Low.
Note2: When CABC_EN="00", CABC OFF.
When CABC_EN="01", user interface image.
When CABC_EN="10", still picture.
When CABC_EN="11", moving image.
When CABC off, don't connect DIMO, else connect it to backlight.
Note3: When L/R="0", set right to left scan direction.
When L/R="1", set left to right scan direction.
When U/D="0", set top to bottom scan direction.
When U/D="1", set bottom to top scan direction.

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-5A, BM-7,

Item	Symbol	Condition	Specification			Unit	Remark
			Min.	Typ.	Max.		
Response time	Tr	θ= 0°	-	10	20	ms	Note 3
	Tf		-	15	30		
Contrast ratio	CR	θ= 0°	500	700	-	-	Note 4
Viewing angle	Top	CR≧10	40	50	-	deg.	Note 1
	Bottom	CR≧10	60	70	-		
	Left	CR≧10	60	70	-		
	Right	CR≧10	60	70	-		
Color chromaticity(CIE) （CF only with ITO）	Wx	θ= 0°	-0.015	0.309	+0.015	-	Note 2 Note 5
	Wy			0.327			
	Rx			0.649			
	Ry			0.331			
	Gx			0.288			
	Gy			0.585			
	Bx			0.140			
	By			0.089			
Cross talk	Ct	-	-	-	2	%	Note 7
Transmittance	Trans	-	3.2	3.5	-	%	Note 6

Test conditions:

1. The ambient temperature is 25℃.
2. The test systems refer to Note 2.
3. All the pertinent Module data measured based on Novatek IC
   (Source IC: NT51008CH-D/4EA COG; Gate IC: NT52002H-D/4EA COG Novatek)

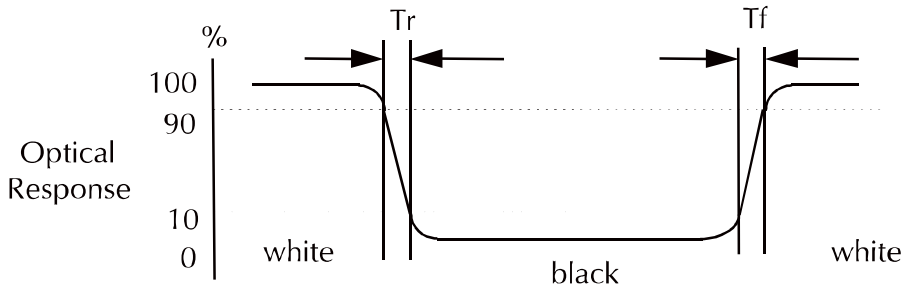
Note 1: Definition of viewing angle range

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".



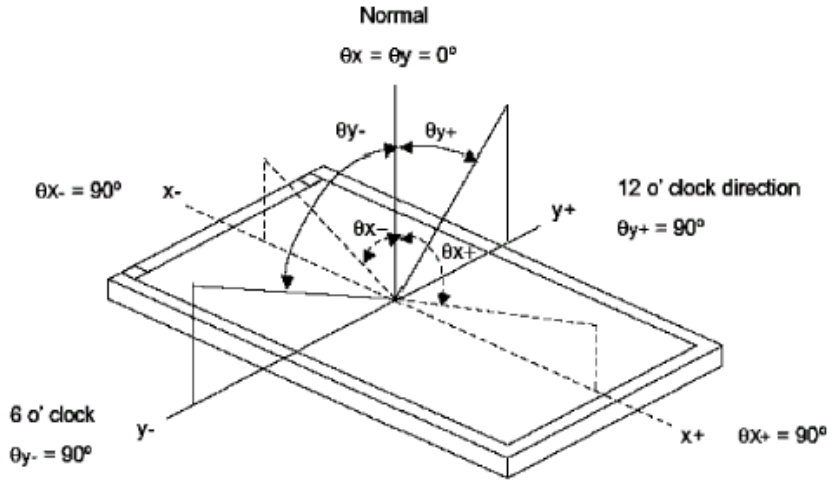
c. Definition of contrast ratio:

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

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

e. View Angle

Note 1 : Definition of Viewing Angle θ_x and θ_y :



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

Light Source of Back-Light Unit	LED Type

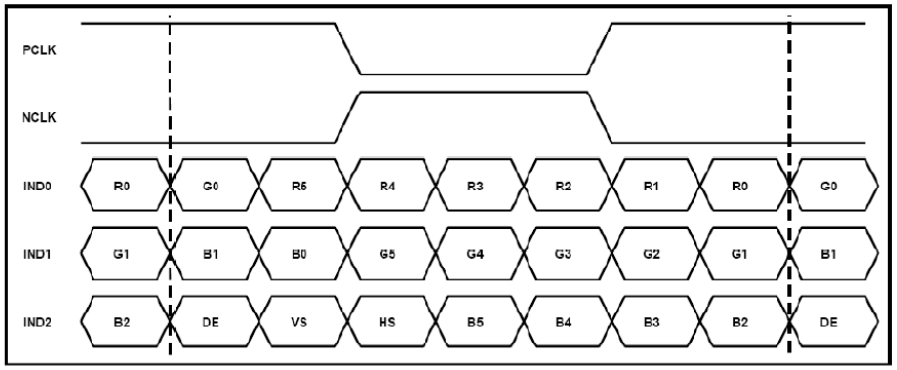
g. Definition of White Uniformity

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

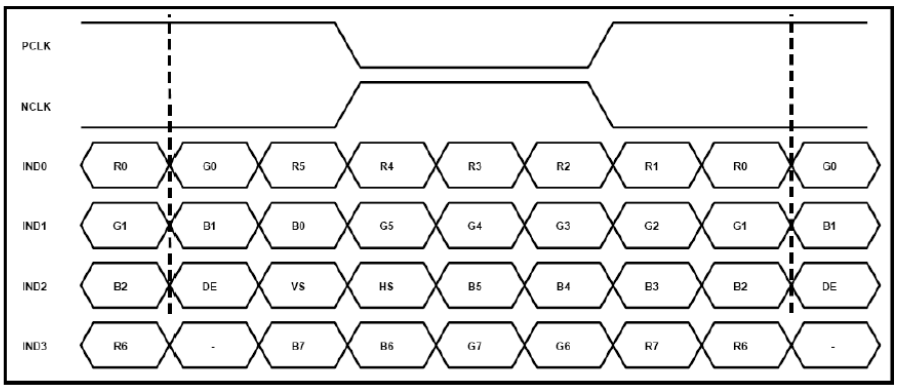
h. The definition of Color Gamut -Color Chromaticity CIE 1931
Color coordinate of white & red, green, blue at center point.
Color Gamut : NTSC(%) = (RGB Triangle Area / NTSC Triangle Area) x 100

7 Interface Timing

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Clock Frequency	fclk	40.8	51.2	67.2	MHz	Frame rate =60Hz
Horizontal display area	thd		1024		DCLK	
HS period time	th	1114	1344	1400	DCLK	
HS Blanking	thb	90	320	376	DCLK	
Vertical display area	tvd		600		H	
VS period time	tv	610	635	800	H	
VS Blanking	thb	10	35	200	H	



6-bit LVDS input



8-bit LVDS input

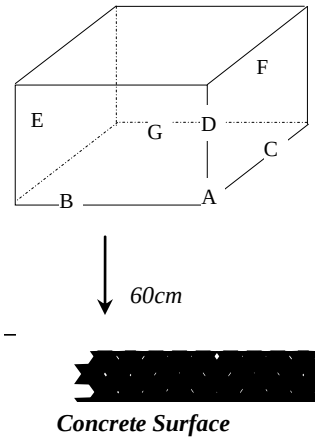
8 Reliability Condition for LCD

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 Incoming Inspection Standards

10.1 VISUAL & FUNCTION INSPECTION STANDARD

Inspection performed under the following conditions is recommended.

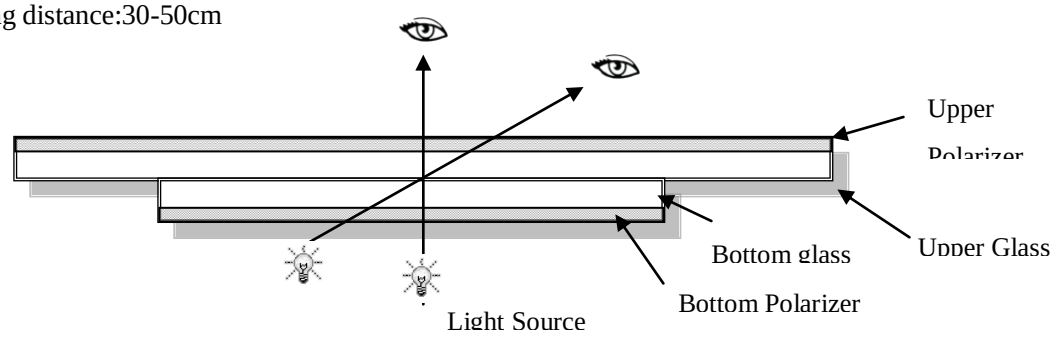
Temperature : 25±5℃

Humidity : 65%±10%RH

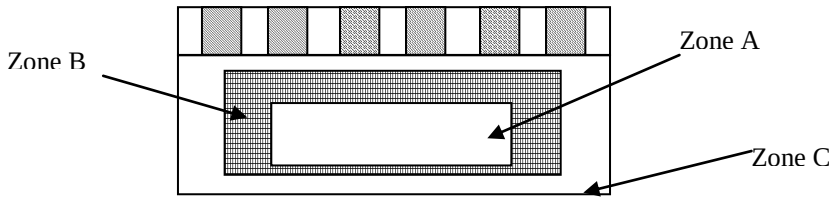
Viewing Angle : Normal viewing Angle.

Illumination: Single fluorescent lamp (300 to 700Lux)

Viewing distance:30-50cm



10.2 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.

10.3 Sampling Plan

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

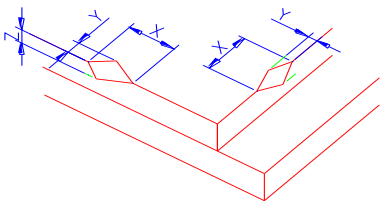
AQL:

Major defect	Minor defect
0.65	1.5

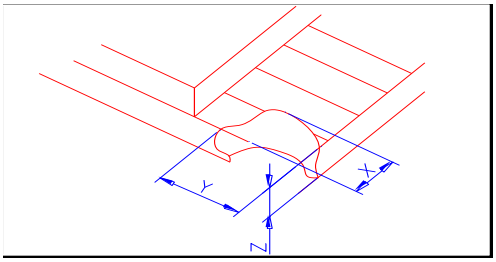
LCD: Liquid Crystal Display , TP: Touch Panel , LCM: Liquid Crystal Module

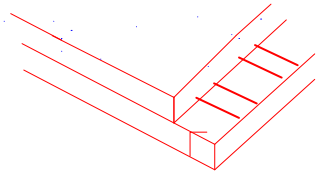
No	Items to be inspected	Criteria	Classification of defects
1	Functional defects	1) No display, Open or miss line 2) Display abnormally, Short 3) Backlight no lighting, abnormal lighting. 4) TP no function	Major
2	Missing	Missing component	
3	Outline dimension	Overall outline dimension beyond the drawing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

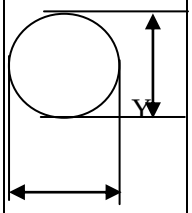
10.4 Criteria (Visual)

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

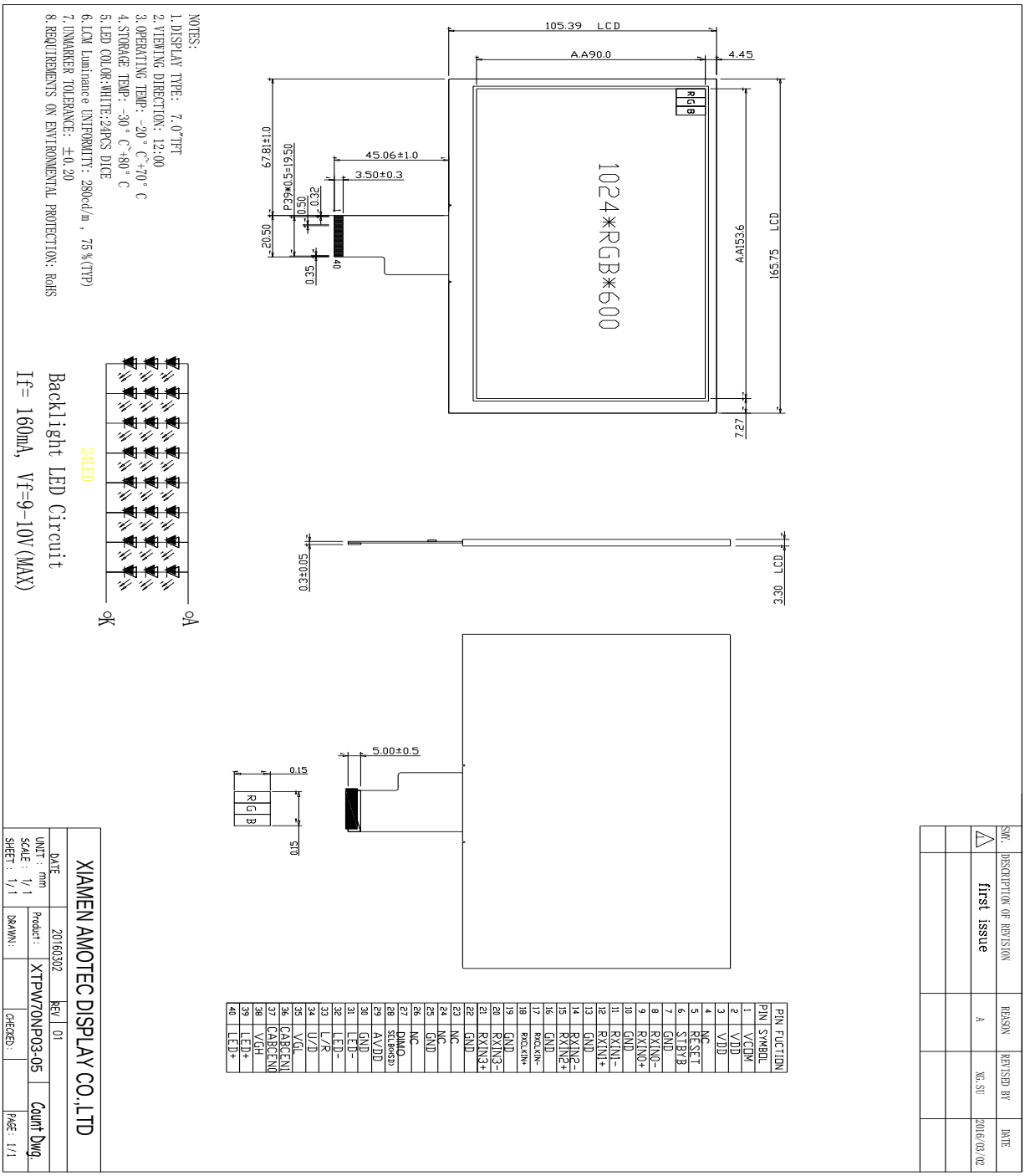
<table>
<tr>
<td rowspan="2">Z: Height
L: Length of ITO,
T: Height of LCD</td>
<td>(2)LCD corner broken</td>
<td> 

<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>

<table>
<tr><th>Number</th><th>Items</th><th>Criteria (mm)</th></tr>
<tr><td>2.0</td><td>Spot defect
 

X
Φ=(X+Y)/2</td><td>① light dot（LCD/TP/Polarizer black/white spot , light dot, pinhole, dent, stain）
<table>
<tr><th rowspan="2">Zone
Size (mm)</th><th colspan="3">Acceptable Qty</th></tr>
<tr><th>A</th><th>B</th><th>C</th></tr>
<tr><td>Φ≤0.10</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr>
<tr><td>0.10<Φ≤0.15</td><td colspan="2">3(distance≧10mm)</td></tr>
<tr><td>0.15<Φ≤0.2</td><td colspan="2">1</td></tr>
<tr><td>0.2<Φ</td><td colspan="2">0</td></tr>
</table>
②Dim spot（LCD/TP/Polarizer dim dot, light leakage、dark spot）
<table>
<tr><th rowspan="2">Zone
Size (mm)</th><th colspan="3">Acceptable Qty</th></tr>
<tr><th>A</th><th>B</th><th>C</th></tr>
<tr><td>Φ≤0.1</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr>
<tr><td>0.1<Φ≤0.2</td><td colspan="2">2(distance≧10mm)</td></tr>
<tr><td>0.2<Φ≤0.3</td><td colspan="2">1</td></tr>
<tr><td>Φ＞0.3</td><td colspan="2">0</td></tr>
</table>
③ Polarizer accidented spot
<table>
<tr><th rowspan="2">Zone
Size (mm)</th><th colspan="3">Acceptable Qty</th></tr>
<tr><th>A</th><th>B</th><th>C</th></tr>
<tr><td>Φ≤0.2</td><td colspan="2">Ignore</td><td rowspan="3">Ignore</td></tr>
<tr><td>0.2<Φ≤0.5</td><td colspan="2">2(distance≧10mm)</td></tr>
<tr><td>Φ>0.5</td><td colspan="2">0</td></tr>
</table></td></tr>
</table>

<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>



NOTES:
1.DISPLAY TYPE: 7.0"TFT
2.VIEWING DIRECTION: 12:00
3.OPERATING TEMP: -20°C~+70°C
4.STORAGE TEMP: -30°C~+80°C
5.LED COLOR:WHITE;24PCS DICE
6.LCM Luminance UNIFORMITY: 280cd/m , 75%(TYP)
7.UNMARKER TOLERANCE: ±0.20
8.REQUIREMENTS ON ENVIRONMENTAL PROTECTION: RoHS
105.39 LCD
A.A90.0
4.45
1024*RGB*600
45.06±1.0
3.50±0.3
67.81±1.0
P39*0.5=19.50
0.50
0.32
20.50
0.35
40
A.A153.6
165.75 LCD
7.27
0.3±0.05
3.30 LCD
5.00±0.5
0.15
0.15
24LED
Backlight LED Circuit
If= 160mA, Vf=9-10V(MAX)
XIAMEN AMOTEC DISPLAY CO.,LTD
DATE 20160302 REV 01
UNIT: mm
SCALE: 1/1
SHEET: 1/1
Product: XTPW70NP03-05
Count Dwg.
DRAWN:
CHECKED:
PAGE: 1/1
SMV. DESCRIPTION OF REVISION REASON REVISED BY DATE
first issue A XG.SU 2016/03/02
PIN FUCTION
PIN SYMBOL
1 VCOM
2 VDD
3 VDD
4 NC
5 RESET
6 STBYB
7 GND
8 RXIN0-
9 RXIN0+
10 GND
11 RXIN1-
12 RXIN1+
13 GND
14 RXIN2-
15 RXIN2+
16 GND
17 RXCLKIN-
18 RXCLKIN+
19 GND
20 RXIN3-
21 RXIN3+
22 GND
23 NC
24 NC
25 GND
26 NC
27 DIMO
28 SCL(RMSD)
29 AVDD
30 GND
31 LED-
32 LED-
33 L/R
34 U/D
35 VGL
36 CABCEN1
37 CABCEN0
38 VGH
39 LED+
40 LED+