Product Specification				
	Model: XTPQ35SN08-03	Rev. No.	Issued Date.	Page.
		A	2017,08,31	1 / 19

Thin-Film-Transistor LCD Module
Model:XTPQ35SN08-03

Acceptance

Approved and Checked by

Approved by	Checked by		Made by

Revise Records

Rev.	Date	Contents	Written	Approved
A	2017/08/31	Preliminary Specification	GAO	JACK

Special Notes

Note1.	
Note2.	
Note3.	
Note4.	
Note5.	

1.General Description and Features

XTPQ35SN08-03 is a TM (Transmissive) type color active matrix TFT (Thin Film Transis tor) 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 3.5" contains 320RGBx240 dots and can display up to 262K color s. The following table described the features of XTPQ35SN08-03.

LCD Module

Item	Specification	Unit
Screen Size	3.5inches	Diagona
Display Resolution	320RGB(H)x240(V)	Dot
Active Area	70.08(H) x52.56 (V)	mm
Outline Dimension	76.9(W) x 63.9 (H) x 3.3 (D)	mm
Display Mode	Normally white/Transmissive	--
Pixel Arrangement	RGB-Vertical Stripe	--
Display Color	262K	--
Gray scale inversion Direction	12 o'clock	
Viewing Direction	6 o'clock	--
Drive IC	SSD2119	--
Brightness	300 cd/m2	

2.Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	--	76.9	--	mm	--
	Vertical (V)	--	63.9	--	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	4.0	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

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
Power supply voltage	VLOGIC	2.5	3.0	3.6	V
Input voltage'H'level	VIH	0.8*VLOGIC	-	VLOGIC	V
Input voltage'L'level	VIL	0	-	0.2*VLOGIC	V

4.2 Backlight Unit

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

(Ta=25±2°C)

Item	Symbol	Value			Unit	Condition
		Min.	Typ.	Max.		
LED Voltage	VF	16.8		19.8	V	
LED Current	IF	-	20	-	mA	
Power Consumption	P_{BL}	-	--	-	mW	

5 Input Terminal Pin Assignment

NO	SYMBOL	I/O/P	FUNCTI	MEMARK
1	VCI	P	Booster input voltage pin. - Connect to voltage source between 2.5V to 3.6V	
2	VCI	P	Booster input voltage pin. - Connect to voltage source between 2.5V to 3.6V	
3	VSS	P	GROUND	
4	VSSIO	P	Grounding for gamma circuit	
5	VSS	P	GROUND	
6	RESET	I	System reset pin. - An active low pulse at this pin will reset the IC, Connect to V_{DDIO} in normal operation	
7	DC/SDC(RS)	I	Data or command **DC** : Parallel Interface **SDC** : Serial Interface	
8	E/RD	I	6800-system : **E** (enable signal) 8080-system : **RD** (read strobe signal) Serial mode : Not used and should be connected to V_{DDIO} or V_{ss}	
9	WR	I	6800-system : **RW** (indicates read cycle when High, write cycle when Low) 8080-system : **WR** (write strobe signal)	
10	CS	I	**CS** : Chip select pin for 6800/8080 Parallel Interface **SCS** : Chip Select pin for Serial Mode Interface	
11	SCL	I	Serial clock input	
12	SDO	O	Data output pin in serial interface	
13	SDI	I	Data input pin in serial interface	
14	WSYNC(NC)	O	Ram Write Synchronization output	
15-32	D17-D0	I/O	For parallel mode, 8/9/16/18 bit interface. Please refer to Section 15 Interface Mapping Section for definition. Unused pins should connect to V_{SS}.	
33	VSS	P	GROUND	
34	DOTCLK	I	Dot-clock signal and oscillator source. A non-stop external clock must be provided to that pin even at front or black porch non-display period.	
35	HSYNC	I	Line Synchronization input	
36	VSYNC	I	Frame/Ram Write Synchronization input	

<table>
<tr><td>37</td><td>OE</td><td>I</td><td>Display enable pin from controller.</td><td></td></tr>
<tr><td>38</td><td>VSS</td><td>P</td><td colspan="2">GROUND</td></tr>
<tr><td>39</td><td>PS0</td><td rowspan="4">I</td><td rowspan="4">
<table>
<tr><th>PS3</th><th>PS2</th><th>PS1</th><th>PS0</th><th>Interface Mode</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>0</td><td>16-bit 6800 parallel interface</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>1</td><td>8-bit 6800 parallel interface</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>0</td><td>16-bit 8080 parallel interface</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>1</td><td>8-bit 8080 parallel interface</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>0</td><td>9-bit generic D[9:16] (262k colour) + 3-wire SPI If 65K color, D12 shorts to D17 internally</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>1</td><td>16-bit generic (262k colour) + 3-wire SPI</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>0</td><td>18-bit generic (262k colour) + 3-wire SPI</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>1</td><td>6-bit generic D[8:3] (262k colour) + 3-wire SPI</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>0</td><td>18-bits 6800 parallel interface</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>1</td><td>9-bits 6800 parallel interface</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>0</td><td>18-bit 8080 parallel interface</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>1</td><td>9-bit 8080 parallel interface</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>0</td><td>3-wire SPI</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>1</td><td>4-wire SPI</td></tr>
</table>
</td><td></td></tr>
<tr><td>40</td><td>PS1</td><td></td></tr>
<tr><td>41</td><td>PS2</td><td></td></tr>
<tr><td>42</td><td>PS3</td><td></td></tr>
<tr><td>43</td><td>VSS</td><td>P</td><td colspan="2">GROUND</td></tr>
<tr><td>44</td><td>NC</td><td>-</td><td colspan="2"></td></tr>
<tr><td>45</td><td>NC</td><td>-</td><td colspan="2"></td></tr>
<tr><td>46</td><td>NC</td><td>-</td><td colspan="2"></td></tr>
<tr><td>47</td><td>NC</td><td>-</td><td colspan="2"></td></tr>
<tr><td>48</td><td>VSS</td><td>P</td><td colspan="2">GROUND</td></tr>
<tr><td>49</td><td>LED K</td><td>P</td><td colspan="2">POWER FOR BACKLIGHT (GROUND)</td></tr>
<tr><td>50</td><td>LED A</td><td>P</td><td colspan="2">POWER FOR BACKLIGHT(ANODE)</td></tr>
</table>

6 LCD Optical Characteristics

Item		Symbol	Specifications			Unit	Note
			Min.	Typ.	Max.		
Transmittance（Without Polarizer）		T%	-	14	-	%	[1]Here the transmittance and response time are design value. [2]Chromaticity measuring machine: CFT-01. **Reference Only**
Contrast ratio		Cr (Θ=0°)	150	300	-		
Response time (25℃)		$T_{r+}T_f$	-	35	50	ms	
Viewing angle (Cr≥ 10)		Θ21	15	25	-	deg	
		Θ22	35	45	-		
		Θ12	35	45	-		
		Θ11	35	45	-		
Chromaticity of CF	Red	x	0.604	0.624	0.644		
		y	0.302	0.322	0.342		
		Y	15.6	20.6	25.6		
	Green	x	0.268	0.288	0.308		
		y	0.54	0.56	0.58		
		Y	53.6	58.6	63.6		
	Blue	x	0.127	0.147	0.167		
		y	0.097	0.117	0.137		
		Y	8.3	13.3	18.3		
	White	x		0.307			
		y		0.328			
		Y		30.8			
Color gamut of CF (NTSC%)		S		58		%	

FIG. 1 The definition of Response Time

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

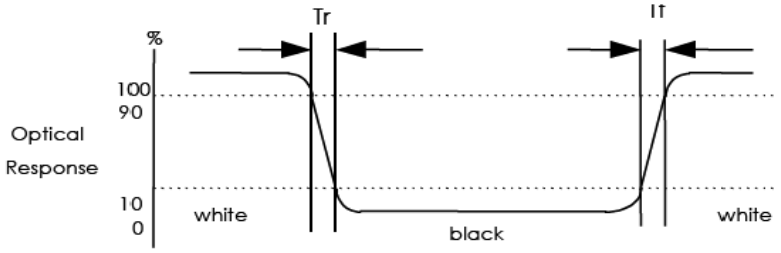
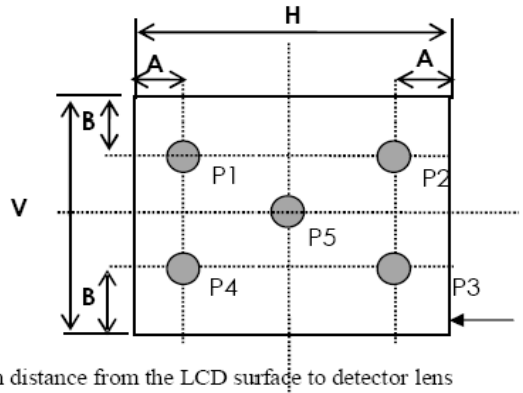
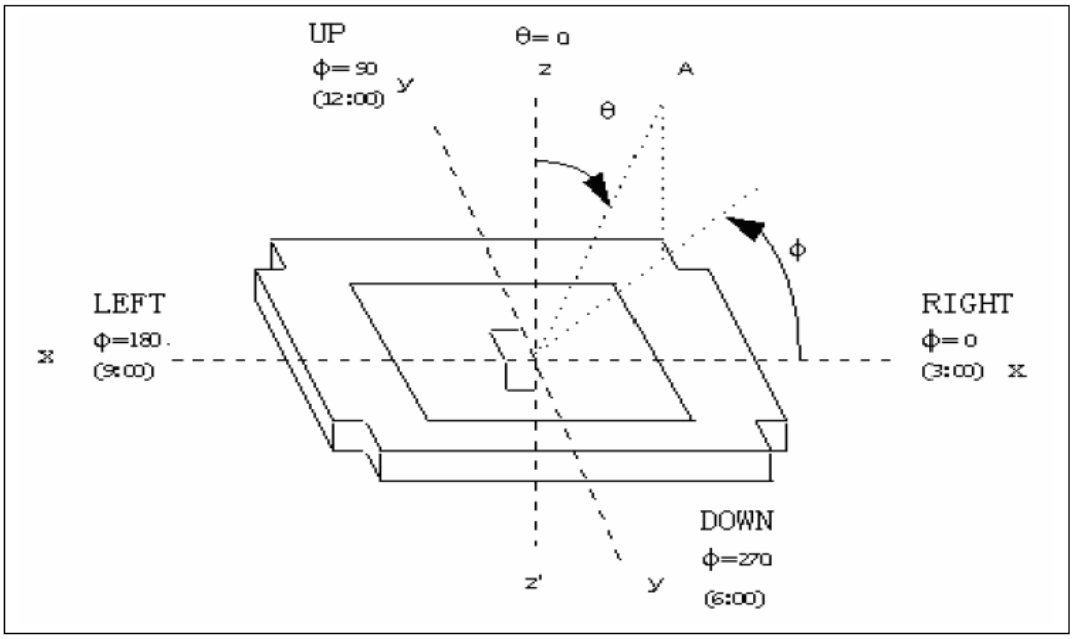


FIG. 2 Measuring method for Contrast ratio, surface luminance, Luminance uniformity , CIE (x, y) chromaticity

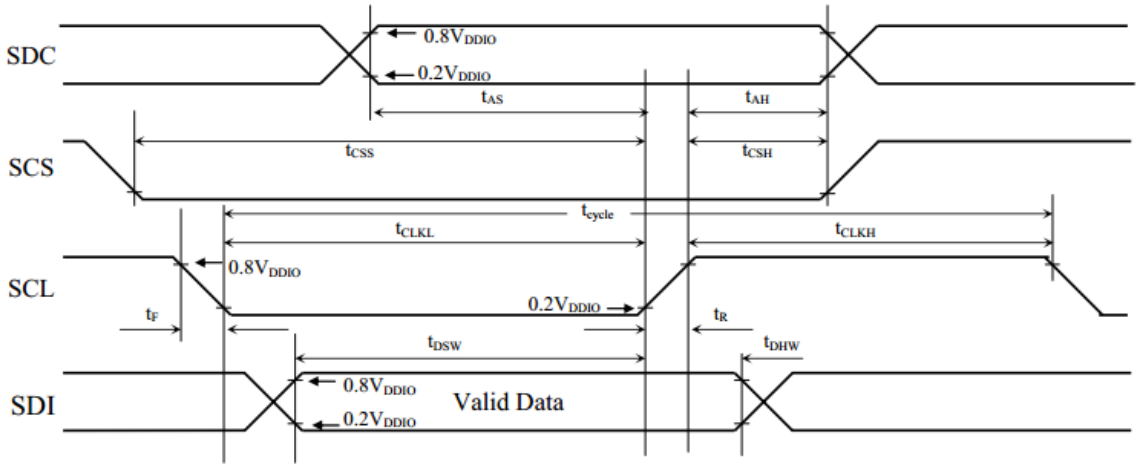


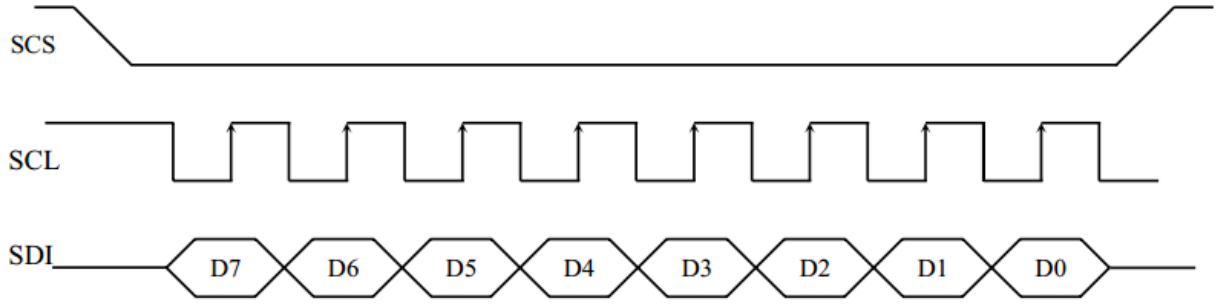
A : 5 mm
B : 5 mm
H,V : Active Area
Light spot size ∅=7mm, 500mm distance from the LCD surface to detector lens
measurement instrument is TOPCON's luminance meter BM-5

FIG. 3 The definition of viewing angle



7 Interface Timing

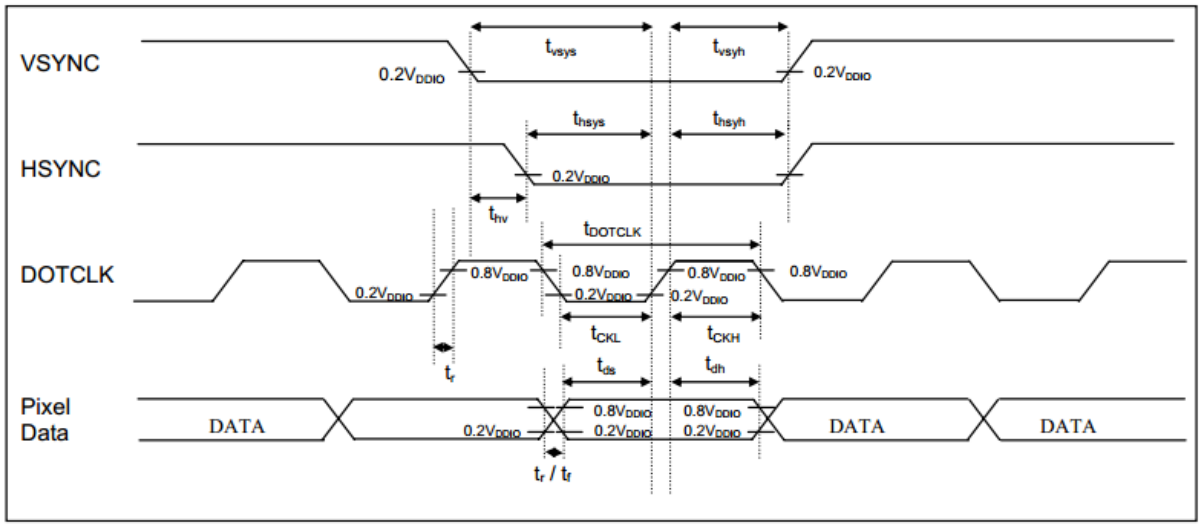




(T_A = -40 to 85°C, V_{DDIO} = 1.4V to 3.6V)

Symbol	Parameter	Min	Typ	Max	Unit
f_{DOTCLK}	DOTCLK Frequency (70Hz frame rate)	1	5.5	8.2	MHz
t_{DOTCLK}	DOTCLK Period	122	182	1000	us
t_{VSYS}	Vertical Sync Setup Time	20	-	-	ns
t_{VSYH}	Vertical Sync Hold Time	20	-	-	ns
t_{HSYS}	Horizontal Sync Setup Time	20	-	-	ns
t_{HSYH}	Horizontal Sync Hold Time	20	-	-	ns
t_{HV}	Phase difference of Sync Signal Falling Edge	0	-	320	t_{DOTCLK}
t_{CLK}	DOTCLK Low Period	61	-	-	ns
t_{CKH}	DOTCLK High Period	61	-	-	ns
t_{DS}	Data Setup Time	25	-	-	ns
t_{DH}	Data hold Time	25	-	-	ns
t_{RES}	Reset pulse width	8			ns

Note: External clock source must be provided to DOTCLK pin of SSD2119. The driver will not operate in absence of the clocking signal.


VSYNC
HSYNC
DOTCLK
Pixel Data
DATA
DATA
DATA
t_{vsys}
t_{vsyh}
t_{hsys}
t_{hsyh}
t_{hv}
t_{DOTCLK}
t_{CKL}
t_{CKH}
t_r
t_{ds}
t_{dh}
t_r / t_f
$0.2V_{DDIO}$
$0.8V_{DDIO}$

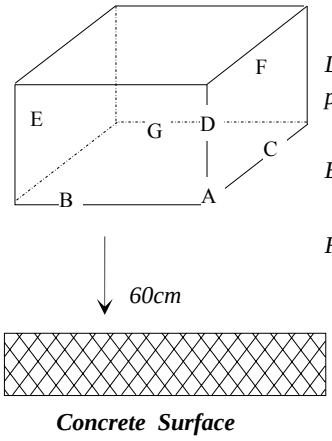
8 Reliability Condition for LCD

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.

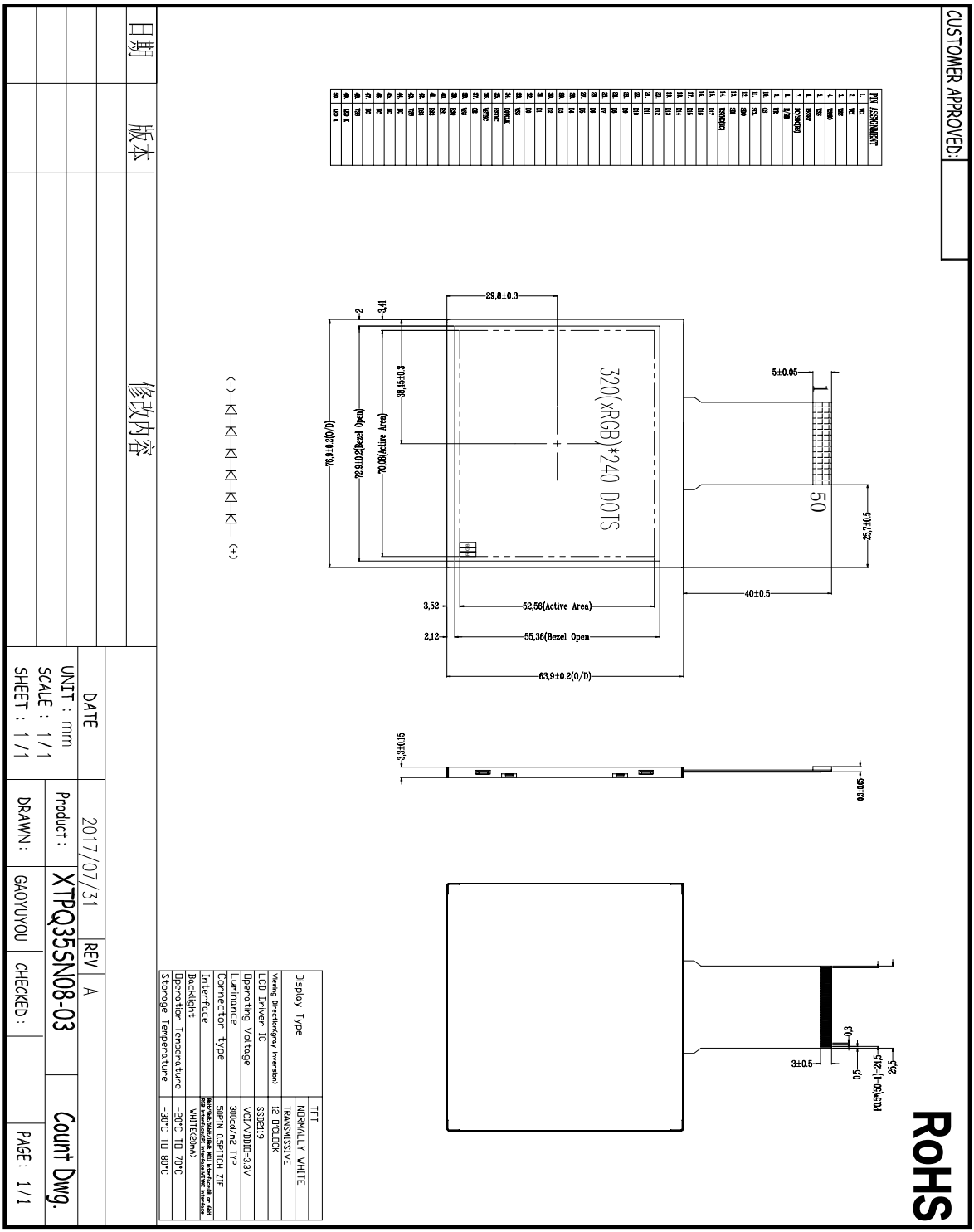
No.	Parameter	Condition	Notes
1	High Temperature Operating	70°C±2°C, 240hrs (Operation state)	--
2	Low Temperature Operating	-20°C±2°C, 240hrs (Operation state)	--
3	High Temperature Storage	80°C±2°C, 240hrs	--
4	Low Temperature Storage	-30°C±2°C, 240hrs	--
5	High Temperature and High Humidity Operation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

11.1 VISUAL & FUNCTION INSPECTION STANDARD

11.1.1 Inspection conditions

Inspection performed under the following conditions is recommended.

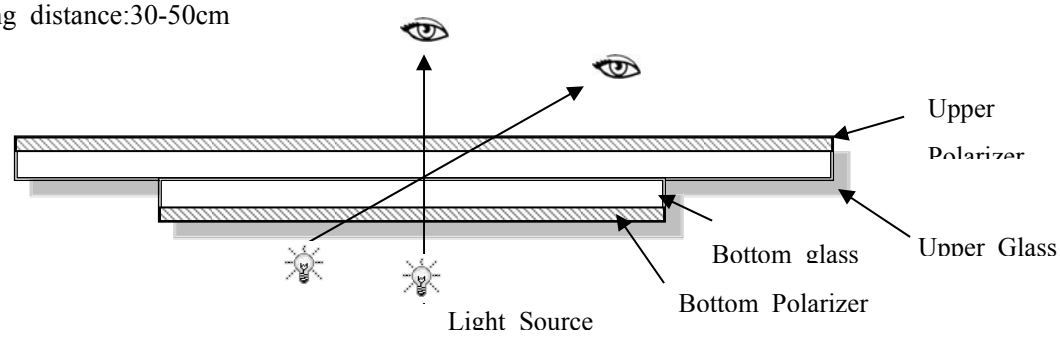
Temperature : 25±5℃

Humidity : 65%±10%RH

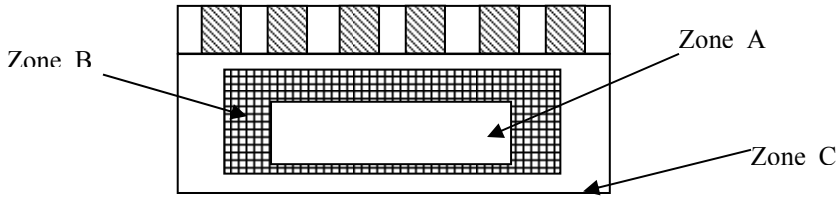
Viewing Angle : Normal viewing Angle.

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

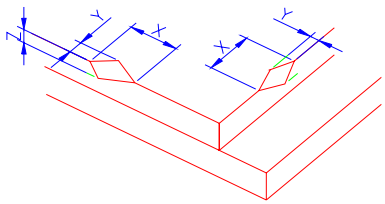
AQL:

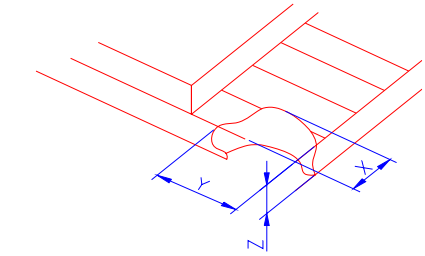
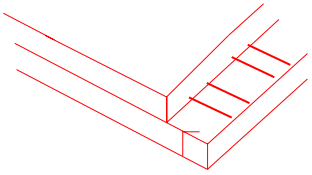
Major defect	Minor defect
0.65	1.5

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

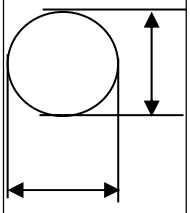
No	Items to be inspected	Criteria	Classification of defects
1	Functional defects	1) No display, Open or miss line 2) Display abnormally, Short 3) Backlight no lighting, abnormal lighting. 4) TP no function	Major
2	Missing	Missing component	
3	Outline dimension	Overall outline dimension beyond the drawing 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: ≤3.0mm; Y: <Inner border line of the seal; Z: ≤T

Z: Height L: Length of ITO, T: Height of LCD	(2)LCD corner broken	 X: ≤3.0mm; Y: ≤L; Z: ≤T
	(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）



Y

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>