

**Product Specification**

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Thin-Film-Transistor LCD Module  
Model:XTPJ17SN01-01

Acceptance

Approved and Checked by

Approved by	Checked by		Made by



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### 1. General Description and Features

XTPJ17SN01-01 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 1.77" contains 128RGBx160dots and can display up to 262K colors. The following table described the features of XTPJ17SN01-01.

#### LCD Module

Item	Specification	Unit
Screen Size	1.77inches	Diagona
Display Resolution	128RGB(H)x160(V)	Dot
Active Area	28.03 (H) x 35.04(V)	mm
Outline Dimension	33.83 (W) x 43.42(H) x 2.6 (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	ILI9163V	--

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## 2.Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	--	33.83	--	mm	--
	Vertical (V)	--	43.42	--	mm	(1)
	Thickness (T)	--	2.6	--	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<sub>SS</sub>=GND=0)

Item	Symbol	Min.	Max.	Unit	Note
Operating temperature	T <sub>OPR</sub>	-20	70	°C	(1)
Storage temperature	T <sub>STG</sub>	-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 guaranteed at operating temperature. Contrast, response time, another display quality are evaluated at +25°C.

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### 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(1LED)	I <sub>f</sub>	--	30	mA	(1)
voltage	V <sub>R</sub>	--	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.

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#### 4 Electrical Characteristics

##### 4.1 Backlight Unit

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

(Ta=25±2°C)

Item	Symbol	Value			Unit	Condition
		Min.	Typ.	Max.		
LED Voltage	V <sub>F</sub>	2.7	3.0	3.3	V	If=80mA
LED Current	I <sub>F</sub>	-	80	-	mA	
Power Consumption	P <sub>BL</sub>	-	-	-	mW	
Brightness through TFT	L <sub>v</sub>	-	250	300	nit	If=80mA
Color coordinate(TFT Surface)	Y	0.25<x<0.29				
	X	0.25<x<0.29				
Uniformity(TFT Surface)		>=80%				

Note (1)  $P_{BL} = V_F \times I_F$

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### 5 Input Terminal Pin Assignment

PIN.NO	SYMBOL	I/O /P	FUNCTI	MEMA RK
1	XL	-	-	
2	YU	-	-	
3	XR	-	-	
4	YD	-	-	
5	GND	P	<b>POWER GROUND</b>	
6	<b>IOVCC(1.8/ 2.8V)</b>	P	Power supply for interface logic circuits (1.65 ~ 3.3 V)	
7	<b>VCI(2.8V)</b>	P	Power supply for analog circuit. Could connect to external power supply (VCI=2.5~4.0V).	
8	TE	O	Tearing effect output pin to synchronies MCU to frame writing, activated by S/W command. When this pin is not activated, this pin is low. If not used, please open this pin.	
9	<b>CS/SPI CS</b>	I	Chip select input pin ("Low" enable). This pin can be permanently fixed "Low" in MCU interface mode only.	
10	<b>DC/SPI SDL</b>	I	Display data / Command selection pin in parallel and SCL in 3-pin SPI interface. D/CX='1': Display data. D/CX='0': Command data. If not used, please connect this pin to GND.	
11	<b>WR(R/W)SP I DC</b>	I	Write enable in parallel interface. WRX: for 8080 MCU R/WX: for 6800 MCU D/CX: for 4-wire SPI If not used, please connect this pin to VDDI or GND.	
12	<b>RD/E</b>	I	Read enable in 8080-parallel interface and Read/ Write operation enable pin in 6800-parallel interface. In 8080-parallel interface, if not used, please connect this pin to VDDI. In 6800-parallel interface, if not used, please connect this pin to VDDI or GND.	
13	GND	P	<b>POWER GROUND</b>	

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<b>14</b>	<b>P68</b>	<b>I</b>	<p>8080/6800 MCU Interface mode selection.</p> <p>P68='1': select 6800-MCU parallel interface</p> <p>P68='0': select 8080-MCU parallel interface</p> <p>If not used, please fix this pin at GND level.</p>																
<b>15</b>	<b>RESET</b>	<b>I</b>	<p>Chip reset pin ("Low Active").</p> <p>This signal low will reset the device and must be applied to properly initialize the chip.</p>																
<b>16</b>	<b>GND</b>	<b>P</b>	<b>POWER GROUND</b>																
<b>17-34</b>	<b>DB0-DB17</b>	<b>I/O</b>	<p>When RCM1='0' (MCU I/F), D[17:0] are used to MCU parallel interface data bus, and D0 is also the serial input/ output signal in SPI interface mode. In serial interface, D[17:1] are not used and should be connected to ground.</p> <p>When RCM1='1' (RGB I/F), D[17:0] are used to RGB interface data bus.</p>																
<b>35</b>	<b>A</b>	<b>P</b>	<b>POWER FOR BACKLIHT(ANODE)</b>																
<b>36</b>	<b>K</b>	<b>P</b>	<b>POWER FOR BACKLIHT(CATHODE)</b>																
<b>37</b>	<b>SPI4W</b>	<b>I</b>	<p>SPI interface selection pin</p> <p>SPI4W='0': 3-wire SPI. (default)</p> <p>SPI4W='1': 4-wire SPI.</p> <p>This pin is internal pull low.</p>																
<b>38</b>	<b>IM0</b>	<b>I</b>	<p>MCU parallel interface type selection</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">IM1</th> <th style="text-align: center;">IM0</th> <th style="text-align: center;">Parallel interface</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">MCU 8-bit Parallel</td> </tr> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td style="text-align: center;">MCU 16-bit Parallel</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td style="text-align: center;">MCU 9-bit Parallel</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td style="text-align: center;">MCU 18-bit Parallel</td> </tr> </tbody> </table>	IM1	IM0	Parallel interface	0	0	MCU 8-bit Parallel	0	1	MCU 16-bit Parallel	1	0	MCU 9-bit Parallel	1	1	MCU 18-bit Parallel	
IM1	IM0			Parallel interface															
0	0	MCU 8-bit Parallel																	
0	1	MCU 16-bit Parallel																	
1	0	MCU 9-bit Parallel																	
1	1	MCU 18-bit Parallel																	
<b>39</b>	<b>IM1</b>																		
<b>40</b>	<b>IM2</b>	<b>I</b>	<p>MCU Parallel interface bus and Serial interface select</p> <ul style="list-style-type: none"> <li>- IM2='1';Parallel Interface</li> <li>- IM2='0';Serial Interface</li> </ul>																

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### 6 LCD Optical Characteristics

Item	Symbol	Condition	Specification			Unit	Remark
			Min.	Typ.	Max.		
Response time	Tr+Tf	$\theta = 0^\circ$	-	30	60	ms	Note 6
Contrast ratio	CR	$\theta = 0^\circ$	200	300	-		Note 3,7
Viewing angle	Top	$CR \cong 10$	40	45	-	deg.	Note 3,7,8
	Bottom	$CR \cong 10$	15	20	-		
	Left	$CR \cong 10$	40	45	-		
	Right	$CR \cong 10$	40	45	-		
CF Color chromaticity(CIE)	Wx	$\theta = 0^\circ$	-0.02	0.308	+0.02		Note 4
	Wy			0.327			
	Rx			0.610			
	Ry			0.329			
	Gx			0.299			
	Gy			0.567			
	Bx			0.143			
	By			0.111			
Cross talk	ct				2%		Note 10
Transmittance	Trans		6.21%	6.9%	-		Note 5

Note 1: Ambient temperature = 25°C.

Note 2: To be measured in dark room after LED backlight warm up 5 minutes.

Note 3: To be measured with a viewing cone of 2° by Topcon luminance meter BM-5A.

Note 4: To be measured with Otsuta chromaticity meter LCF-2100M, CF only measure with C light

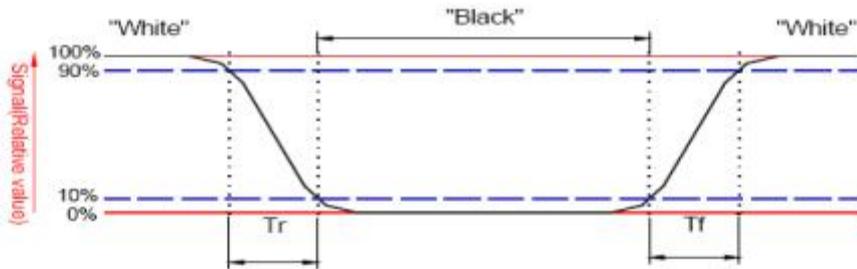
Note 5: CDY shipping status is cell without polarizer. Transmittance of Specification is cell with polarizer

Note 6: Definition of response time:

The output signals of TRD-100 are measured when the input signals are changed to "White" (falling time) and from "White" to "Black" (rising time), respectively. The interval is between the 10% and 90% of amplitudes. Refer to figure as below.

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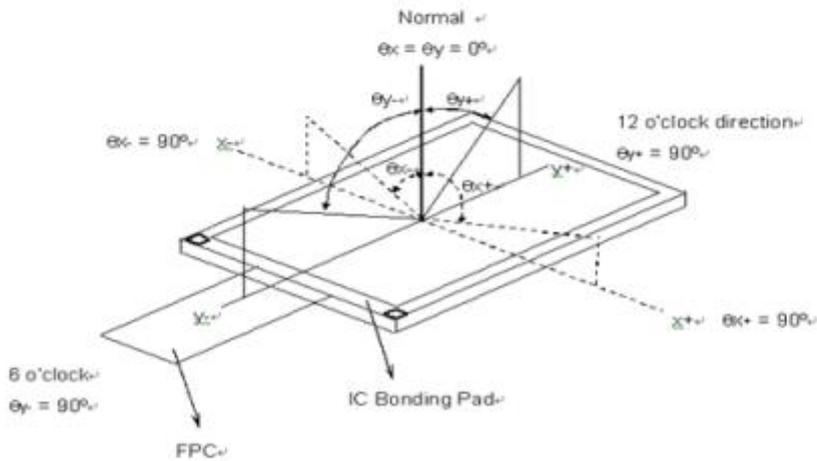


Note 7: Definition of contrast ratio:

Contrast ratio is calculated by the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "white" state}}{\text{Brightness on the "black" state}}$$

Note 8: Definition of viewing angle



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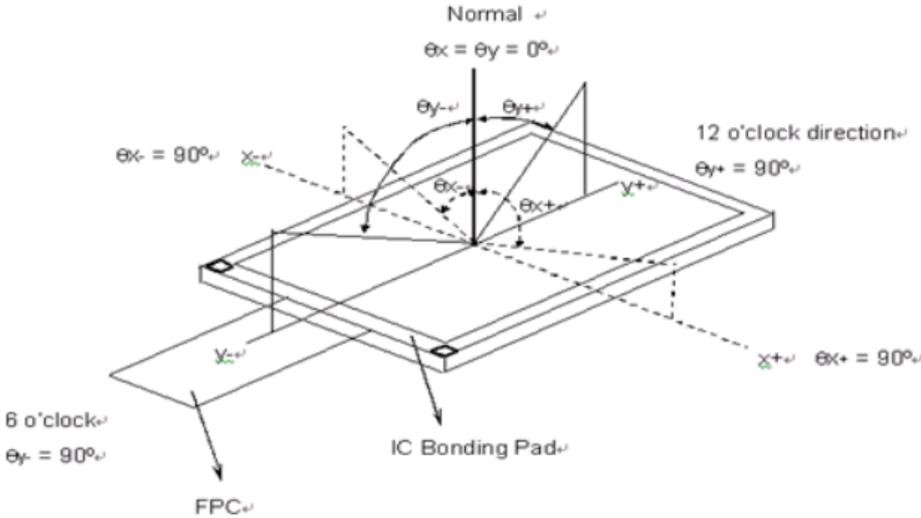
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Note 7: Definition of contrast ratio:

Contrast ratio is calculated by the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "white" state}}{\text{Brightness on the "black" state}}$$

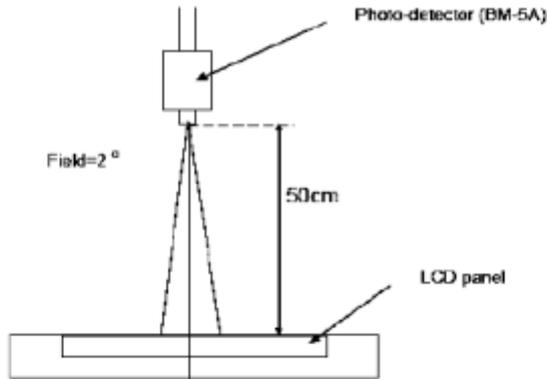
Note 8: Definition of viewing angle



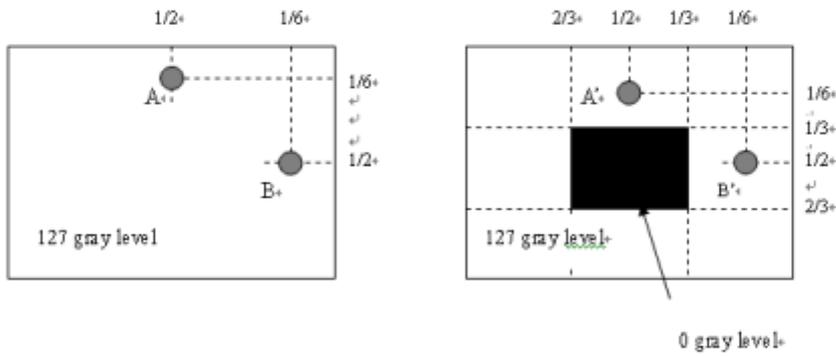
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Note 9: Optical characteristic measurement setup.



Note 10:



$|LA-LA'|/LA \times 100\% = 2\% \text{ max.}$ , LA and LA' are brightness at location A and A'  
 $|LB-LB'|/LB \times 100\% = 2\% \text{ max.}$ , LB and LB' are brightness at location B and B'

## E. Electronic Specification

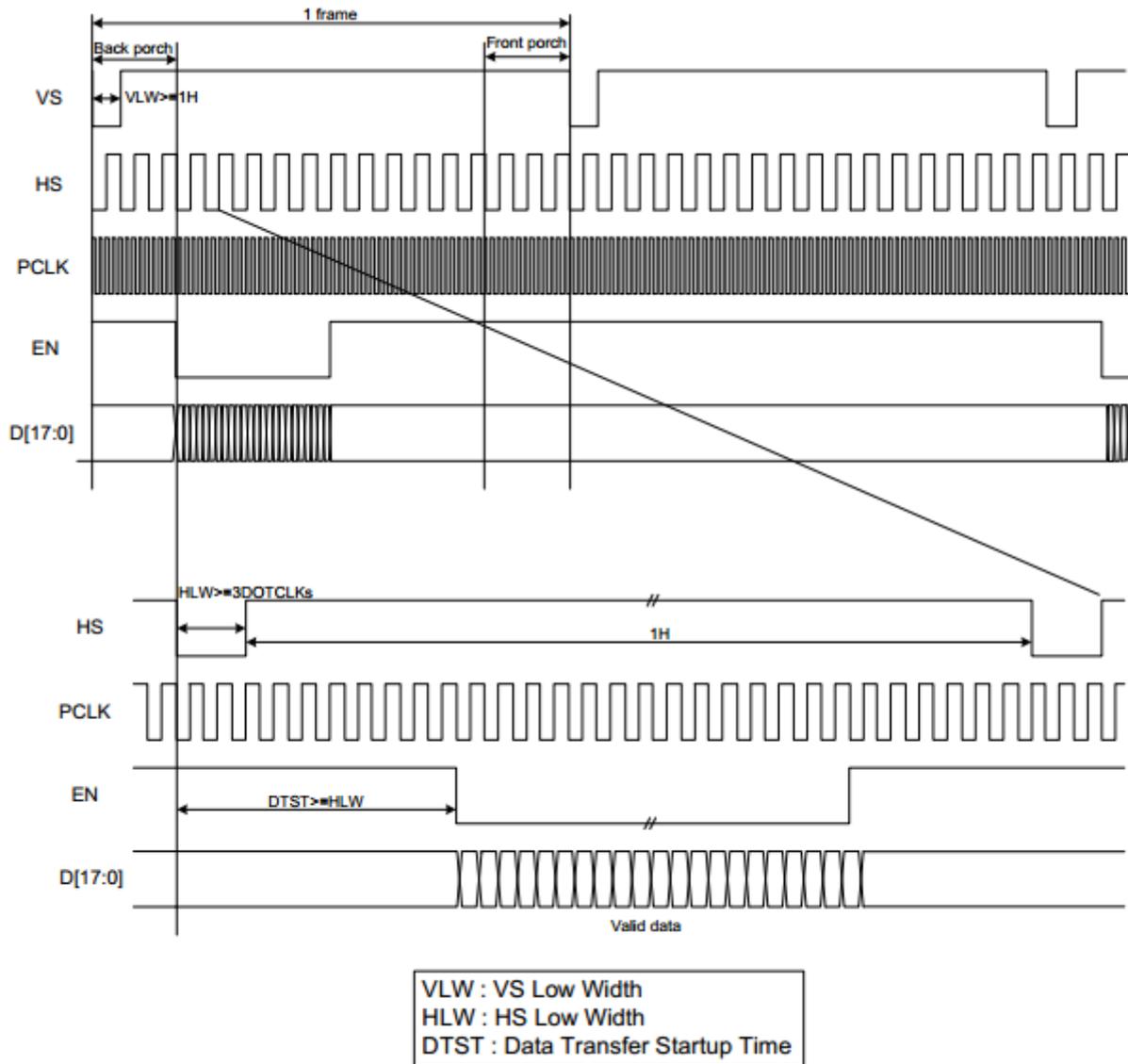
Item	Symbol	Values			Unit	Remark
		Min	Type.	Max		
TFT Operation Frame rate	Hz	45	60	85	Hz	
TFT common electrode voltage	V <sub>COMH</sub>	2.5	--	4.5	V	
	V <sub>COML</sub>	-2.0	--	0	V	
TFT gate on voltage	V <sub>GH</sub>	13	15	17	V	
TFT gate off voltage	V <sub>GL</sub>	-12	-10	-7	V	

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## 7 Interface Timing

The timing chart of 18-/16-bit RGB interface mode is shown as below.



**Figure24: Timing Chart of Signals in 18-/16-bit RGB Interface Mode**

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### 8 Reliability Condition for LCD

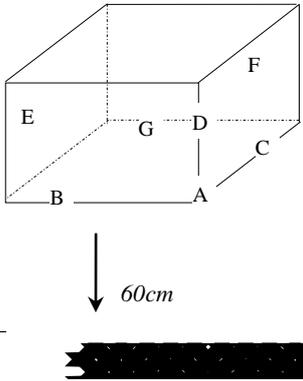
No change on display and in operation under the following test condition.

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	<p>To be measured after dropping from 60cm high on the concrete surface in packing state.</p> <div style="display: flex; align-items: center;">  <div style="margin-left: 20px;"> <p><i>Dropping method corner dropping</i></p> <p><i>A corner: once</i></p> <p><i>Edge dropping</i></p> <p><i>B, C, D edge: once</i></p> <p><i>Face dropping</i></p> <p><i>E, F, G face: once</i></p> </div> </div> <p style="text-align: center;"><i>Concrete Surface</i></p>	--
----	-----------	--	----

- 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.



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### 10 Incoming Inspection Standards

#### 11.1 VISUAL & FUNCTION INSPECTION STANDARD

##### 11.1.1 Inspection conditions

Inspection performed under the following conditions is recommended.

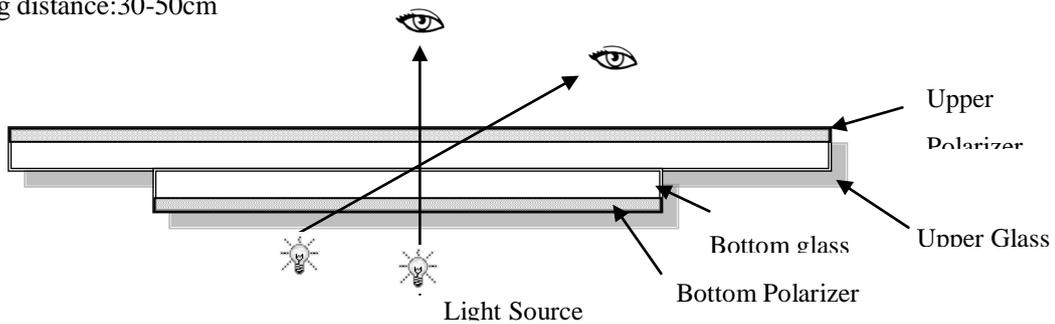
Temperature :  $25 \pm 5^{\circ}\text{C}$

Humidity :  $65\% \pm 10\% \text{RH}$

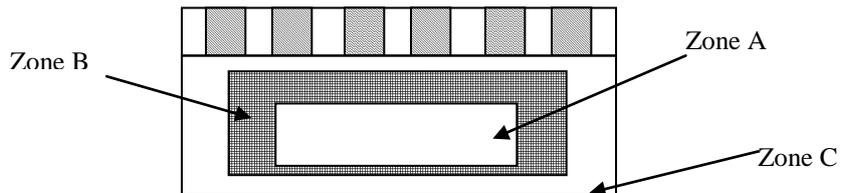
Viewing Angle : Normal viewing Angle.

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
--------------	--------------

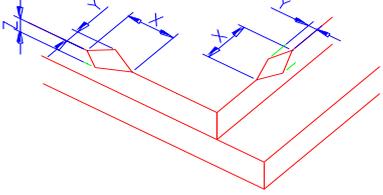
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0.65	1.5
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LCD: Liquid Crystal Display , TP: Touch Panel , LCM: Liquid Crystal Module

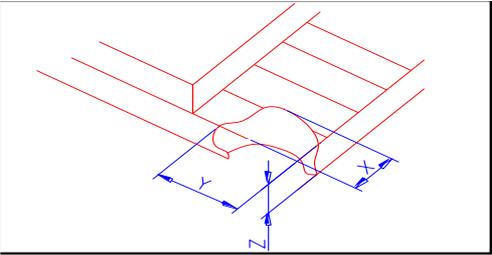
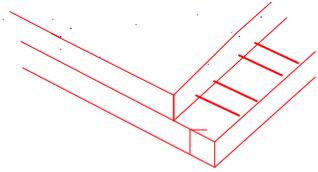
No	Items to be inspected	Criteria	Classification of defects
1	Functional defects	1) No display, Open or miss line 2) Display abnormally, Short 3) Backlight no lighting, abnormal lighting. 4) TP no function	Major
2	Missing	Missing component	
3	Outline dimension	Overall outline dimension beyond the drawing 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	(1) The edge of LCD broken	 <table border="1" data-bbox="847 1480 1393 1635"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>≤3.0mm</td> <td>&lt;Inner border line of the seal</td> <td>≤T</td> </tr> </tbody> </table>	X	Y	Z	≤3.0mm	<Inner border line of the seal	≤T
X	Y	Z						
≤3.0mm	<Inner border line of the seal	≤T						
NOTE: X: Length Y: Width								

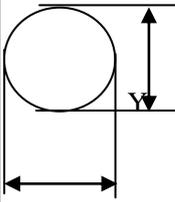
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<p>Z: Height L: Length of ITO, T: Height of LCD</p>	<p>(2) LCD corner broken</p>	 <table border="1" style="margin: 10px auto; border-collapse: collapse;"> <thead> <tr> <th style="padding: 5px;">X</th> <th style="padding: 5px;">Y</th> <th style="padding: 5px;">Z</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;"><math>\leq 3.0\text{mm}</math></td> <td style="padding: 5px;"><math>\leq L</math></td> <td style="padding: 5px;"><math>\leq T</math></td> </tr> </tbody> </table>	X	Y	Z	$\leq 3.0\text{mm}$	$\leq L$	$\leq T$
	X	Y	Z					
$\leq 3.0\text{mm}$	$\leq L$	$\leq T$						
<p>(3) LCD crack</p>	 <p style="text-align: center;">Crack Not allowed</p>							

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Number	Items	Criteria (mm)																																																									
2.0	Spot defect  $\Phi = (X+Y)/2$	① light dot (LCD/TP/Polarizer black/white spot , light dot, pinhole, dent, stain) <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2" style="text-align: center;">Zone Size (mm)</th> <th colspan="3" style="text-align: center;">Acceptable Qty</th> </tr> <tr> <th style="text-align: center;">A</th> <th style="text-align: center;">B</th> <th style="text-align: center;">C</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"><math>\Phi \leq 0.10</math></td> <td colspan="2" style="text-align: center;">Ignore</td> <td rowspan="4" style="text-align: center; vertical-align: middle;">Ignore</td> </tr> <tr> <td style="text-align: center;"><math>0.10 &lt; \Phi \leq 0.15</math></td> <td colspan="2" style="text-align: center;">3( distance <math>\geq 10</math>mm)</td> </tr> <tr> <td style="text-align: center;"><math>0.15 &lt; \Phi \leq 0.2</math></td> <td colspan="2" style="text-align: center;">1</td> </tr> <tr> <td style="text-align: center;"><math>0.2 &lt; \Phi</math></td> <td colspan="2" style="text-align: center;">0</td> </tr> </tbody> </table> ② Dim spot (LCD/TP/Polarizer dim dot, light leakage、 dark spot) <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2" style="text-align: center;">Zone Size (mm)</th> <th colspan="3" style="text-align: center;">Acceptable Qty</th> </tr> <tr> <th style="text-align: center;">A</th> <th style="text-align: center;">B</th> <th style="text-align: center;">C</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"><math>\Phi \leq 0.1</math></td> <td colspan="2" style="text-align: center;">Ignore</td> <td rowspan="4" style="text-align: center; vertical-align: middle;">Ignore</td> </tr> <tr> <td style="text-align: center;"><math>0.1 &lt; \Phi \leq 0.2</math></td> <td colspan="2" style="text-align: center;">2( distance <math>\geq 10</math>mm)</td> </tr> <tr> <td style="text-align: center;"><math>0.2 &lt; \Phi \leq 0.3</math></td> <td colspan="2" style="text-align: center;">1</td> </tr> <tr> <td style="text-align: center;"><math>\Phi &gt; 0.3</math></td> <td colspan="2" style="text-align: center;">0</td> </tr> </tbody> </table> ③ Polarizer accidented spot <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2" style="text-align: center;">Zone Size (mm)</th> <th colspan="3" style="text-align: center;">Acceptable Qty</th> </tr> <tr> <th style="text-align: center;">A</th> <th style="text-align: center;">B</th> <th style="text-align: center;">C</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"><math>\Phi \leq 0.2</math></td> <td colspan="2" style="text-align: center;">Ignore</td> <td rowspan="3" style="text-align: center; vertical-align: middle;">Ignore</td> </tr> <tr> <td style="text-align: center;"><math>0.2 &lt; \Phi \leq 0.5</math></td> <td colspan="2" style="text-align: center;">2( distance <math>\geq 10</math>mm)</td> </tr> <tr> <td style="text-align: center;"><math>\Phi &gt; 0.5</math></td> <td colspan="2" style="text-align: center;">0</td> </tr> </tbody> </table>	Zone Size (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.10$	Ignore		Ignore	$0.10 < \Phi \leq 0.15$	3( distance $\geq 10$ mm)		$0.15 < \Phi \leq 0.2$	1		$0.2 < \Phi$	0		Zone Size (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.1$	Ignore		Ignore	$0.1 < \Phi \leq 0.2$	2( distance $\geq 10$ mm)		$0.2 < \Phi \leq 0.3$	1		$\Phi > 0.3$	0		Zone Size (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.2$	Ignore		Ignore	$0.2 < \Phi \leq 0.5$	2( distance $\geq 10$ mm)		$\Phi > 0.5$	0	
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## Product Specification

AMOTEC	Model: XTPJ17SN01-01	Rev. No.	Issued Date.	Page.
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	Line defect (LCD/TP /Polarizer black/white line, scratch, stain)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2" style="text-align: center;">Width(mm)</th> <th rowspan="2" style="text-align: center;">Length(mm)</th> <th colspan="3" style="text-align: center;">Acceptable Qty</th> </tr> <tr> <th style="text-align: center;">A</th> <th style="text-align: center;">B</th> <th style="text-align: center;">C</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"><math>\Phi \leq 0.03</math></td> <td style="text-align: center;">Ignore</td> <td colspan="3" style="text-align: center;">Ignore</td> </tr> <tr> <td style="text-align: center;"><math>0.03 &lt; W \leq 0.05</math></td> <td style="text-align: center;"><math>L \leq 3.0</math></td> <td colspan="3" style="text-align: center;">N<math>\leq</math>2</td> </tr> <tr> <td style="text-align: center;"><math>0.05 &lt; W \leq 0.08</math></td> <td style="text-align: center;"><math>L \leq 2.0</math></td> <td colspan="3" style="text-align: center;">N<math>\leq</math>2</td> </tr> <tr> <td style="text-align: center;"><math>0.08 &lt; W</math></td> <td colspan="4" style="text-align: center;">Define as spot defect</td> </tr> </tbody> </table>			Width(mm)	Length(mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.03$	Ignore	Ignore			$0.03 < W \leq 0.05$	$L \leq 3.0$	N $\leq$ 2			$0.05 < W \leq 0.08$	$L \leq 2.0$	N $\leq$ 2			$0.08 < W$	Define as spot defect			
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