

# PRODUCT SPECIFICATION

## 8.8" TFT LCD MODULE

MODEL: T088480192-A0WMN-001 Ver:1.2

**ROHS**

< ◇ > Preliminary Specification

< ◆ > Finally Specification

<b>CUSTOMER'S APPROVAL</b>	
<b>CUSTOMER :</b>	
<b>SIGNATURE:</b>	<b>DATE:</b>

<b>APPROVED BY</b>	<b>PM REVIEWED</b>	<b>PD REVIEWED</b>	<b>PREPARED BY</b>

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### Revision History

Revision	Date	Originator	Detail	Remarks
1.0	2017.06.23	ZFY	Initial Release	
1.1	2018.01.22	ZFY	Modify outline drawing (B)	P24
1.2	2018.04.23	ZFY	Modify many details	P21/P22

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## 1. General Description

The specification is a transmissive type color active matrix liquid crystal display (LCD) which uses amorphous thin film transistor (TFT) as switching devices. This product is composed of a TFT-LCD panel, driver lcs and a backlight unit.

## 2. Module Parameter

Features	Details	Unit
Display Size(Diagonal)	8.8"	
LCD type	IPS TFT	
Display Mode	Transmissive /normaliy black/glare	
Resolution	480 RGB x 1920	Pixels
View Direction	FULL VIEW	Best Image
Module Outline	64.3 (H) x 231.3 (V) x 6.1 (T) (Note1 )	mm
Active Area	54.72 (H) x 218.88 (V)	mm
Pixel Size	114 (H) x 114 (V)	um
Pixel Arrangement	RGB vertical Stripe	
Color	16.7M	
Interface	MIPI	
With or Without Touch Panel	Without	
Operating Temperature	<b>-20~70</b>	°C
Storage Temperature	<b>-30~80</b>	°C
Weight	TBD	g

Note 1: Exclusive hooks, posts , FFC/FPC tail etc.

## 3. Absolute Maximum Ratings

V<sub>SS</sub>=0V, Ta=25°C

Item	Symbol	Min.	Max.	Unit
Supply Voltage	VDD	-0.5	4.0	V
	AVDD	7	12.5	V
	VGH	15	26	V
	VGL	-11.5	-4	V
Storage temperature	T <sub>stg</sub>	-30	+80	°C
Operating temperature	T <sub>op</sub>	-20	+70	°C

Note 1: If Ta below 50°C, the maximal humidity is 90%RH, if Ta over 50°C, absolute humidity should be less than 60%RH.

Note 2: The response time will be extremely slow when the operating temperature is around -10°C, and the back ground will become darker at high temperature operating.

#### 4. DC Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage	VDD	3.0	3.3	3.6	V
	AVDD	11.8	12	12.2	V
	VGH	17	18	19	V
	VGL	-11	-10	-9	V
	VCOM	3.66	4.16	4.66	V
Logic Low input voltage	V <sub>IL</sub>	0	-	0.3*VDD	V
Logic High input voltage	V <sub>IH</sub>	0.7VDD	-	VDD	V
Current Consumption	I <sub>VDD</sub>	-	TBD	-	mA

Note: Typ. VCOM is only a reference value, it must be optimized according to each LCM. Be sure to use VR

#### 5. Backlight Characteristic

##### 5.1. Backlight Characteristic

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	V <sub>F</sub>	Ta=25 °C, I <sub>F</sub> =20mA/LED		<b>17</b>	<b>20.4</b>	V
Forward Current	I <sub>F</sub>	Ta=25 °C	-	<b>160</b>	-	mA
Power dissipation	P <sub>d</sub>		-	2720	-	mW
Uniformity	Avg		70	80	-	%
Drive method	<b>Constant current</b>					
LED Configuration	TBD					

##### 5.2. Backlighting circuit

TBD

## 6. Optical Characteristics

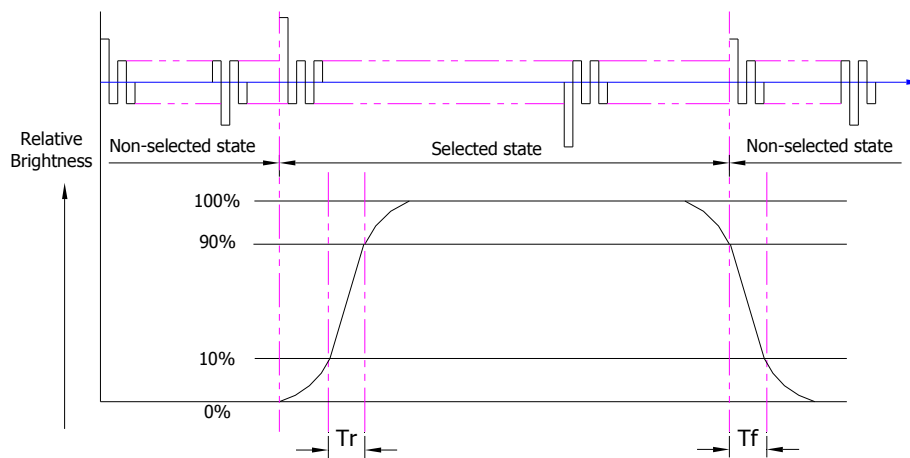
### 6.1. Optical Characteristics

Ta=25°C, VDD=3.3V

	Item	Symbol	Condition	Specification			Unit	
				Min.	Typ.	Max.		
Backlight On (Transmissive Mode)	Luminance on TFT( $I_f = 20\text{mA/LED}$ )	Lv	Normally viewing angle $\theta_X = \varphi_Y = 0^\circ$	480	600	-	cd/m <sup>2</sup>	
	Contrast ratio(See 6.3)	CR		600	800	-		
	Response time (See 6.2)	TR+TF		-	40	-	ms	
	Chromaticity Transmissive (See 6.5)	Red	X <sub>R</sub>	Center CR≥10		TBD		
			Y <sub>R</sub>			TBD		
		Green	X <sub>G</sub>			TBD		
			Y <sub>G</sub>			TBD		
		Blue	X <sub>B</sub>			TBD		
			Y <sub>B</sub>			TBD		
	White	X <sub>W</sub>		TBD				
		Y <sub>W</sub>		TBD				
	Viewing Angle (See 6.4)	Horizontal	θ <sub>X+</sub>	Center CR≥10	75	85	-	Deg.
			θ <sub>X-</sub>		75	85	-	
		Vertical	φ <sub>Y+</sub>		75	85	-	
φ <sub>Y-</sub>			75		85	-		
	NTSC				50		%	

### 6.2. Definition of Response Time

#### 6.2.1. Normally Black Type (Negative)

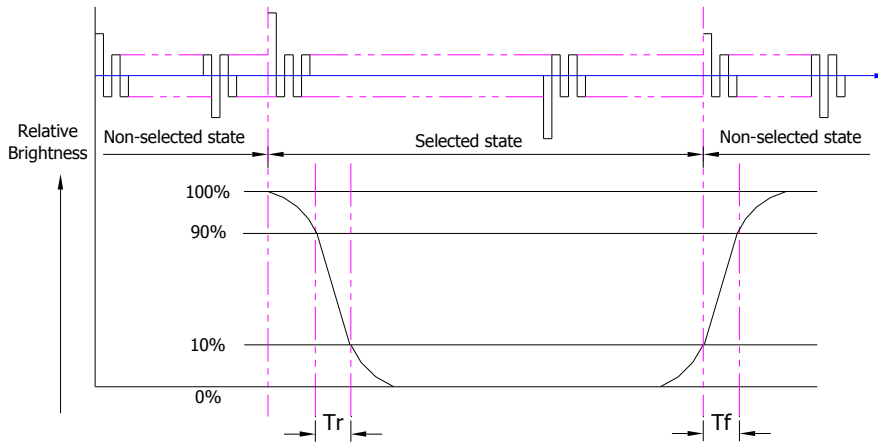


Tr is the time it takes to change from non-selected state with relative luminance 10% to selected state with relative luminance 90%;

Tf is the time it takes to change from selected state with relative luminance 90% to non-selected state with relative luminance 10%.

Note : Measuring machine: LCD-5100

6.2.2. Normally White Type (Positive)



Tr is the time it takes to change from non-selected stage with relative luminance 90% to selected state with relative luminance 10%;

Tf is the time it takes to change from selected state with relative luminance 10% to non-selected state with relative luminance 90%;

Note : Measuring machine: LCD-5100 or EQUI

6.3 Definition of Contrast Ratio

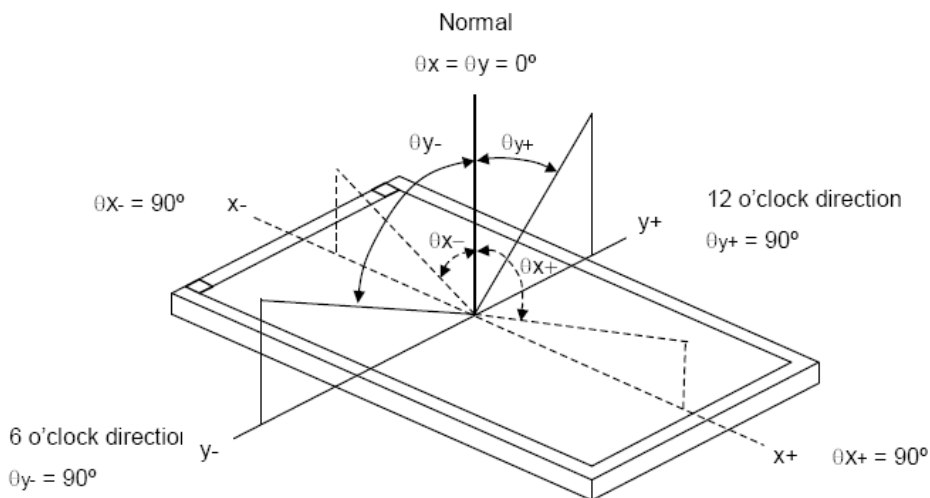
Contrast is measured perpendicular to display surface in reflective and transmissive mode.

The measurement condition is:

Measuring Equipment	Eldim or Equivalent
Measuring Point Diameter	3mm//1mm
Measuring Point Location	Active Area centre point
Test pattern	A: All Pixels white
	B: All Pixel black
Contrast setting	Maximum

Definitions: CR (Contrast) = Luminance of White Pixel / Luminance of Black Pixel

6.4 Definition of Viewing Angles



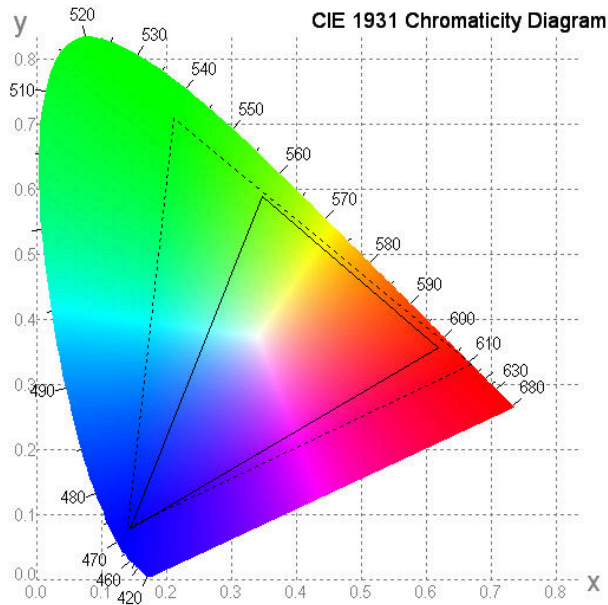
Measuring machine: LCD-5100 or EQUI

### 6.5 Definition of Color Appearance

R,G,B and W are defined by (x, y) on the IE chromaticity diagram

NTSC=area of RGB triangle/area of NTSC triangleX100%

Measuring picture: Red, Green, Blue and White (Measuring machine: BM-7)

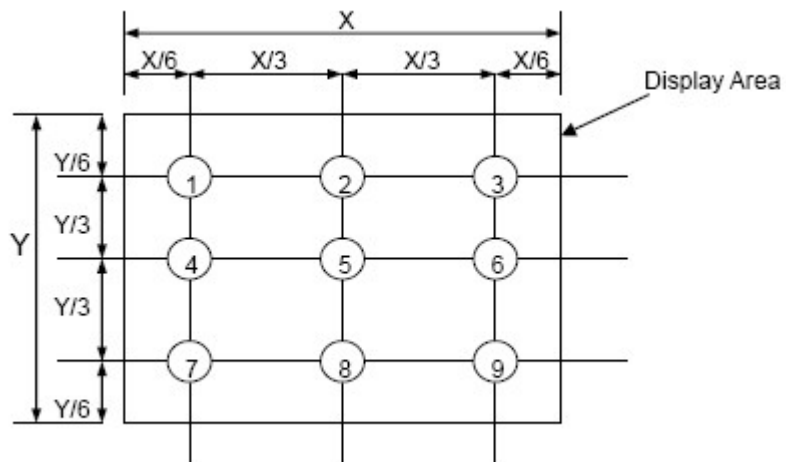


### 6.6 Definition of Surface Luminance, Uniformity and Transmittance

Using the transmissive mode measurement approach, measure the white screen luminance of the display panel and backlight.

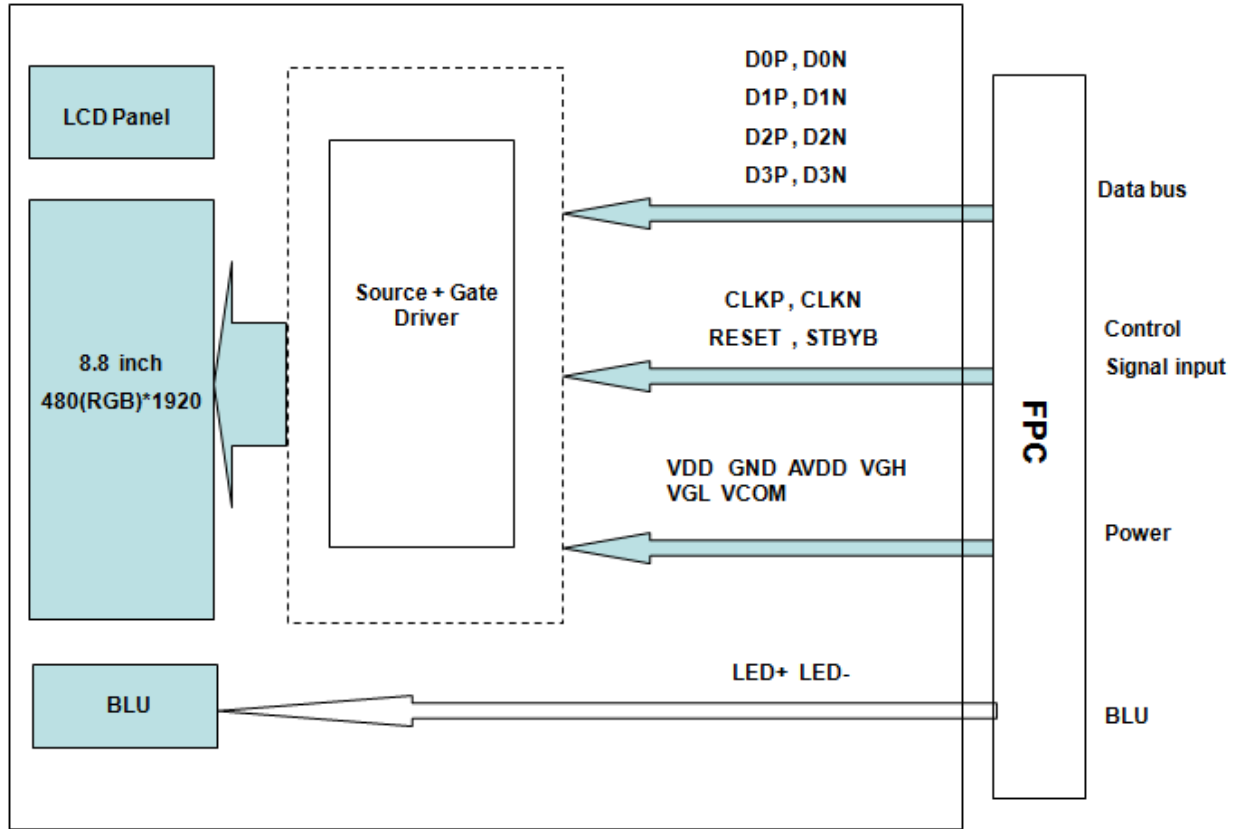
- 6.6.1 Surface Luminance:  $L_V = \text{average} (L_{P1}:L_{P9})$
- 6.6.2 Uniformity =  $\text{Minimal} (L_{P1}:L_{P9}) / \text{Maximal} (L_{P1}:L_{P9}) * 100\%$
- 6.6.3 Transmittance =  $L_V \text{ on LCD} / L_V \text{ on Backlight} * 100\%$

Note : Measuring machine: BM-7





## 7. Block Diagram and Power Supply



## 8. Interface Pins Definition

No.	Symbol	Function	Remark
1	GND	Power ground	
2	NC	No connection	
3	LED+	Power for LED backlight anode	
4	LED+	Power for LED backlight anode	
5	NC	No connection	
6	LED-	Power for LED backlight cathode	
7	LED-	Power for LED backlight cathode	
8	NC	No connection	
9	GND	Power ground	
10	NC	No connection	
11	AVDD	Power supply for analog circuit	
12	NC	No connection	
13	VGH	Power supply for analog circuit	
14	NC	No connection	
15	VGL	Power supply for analog circuit	
16	NC	No connection	
17	GND	Power ground	
18	VCOM	Power supply for common voltage	
19	GND	Power ground	
20	GND	Power ground	
21	RESET	Global reset	
22	VDD	Power supply for digital circuits	
23	STBYB	Standby mode	
24	TP_SYNC	Sync signal for touch panel	OUT
25	GND	Power ground	
26	D0P	MIPI Data Input Lane0 positive-end	
27	D0N	MIPI Data Input Lane0 negative-end	
28	GND	Power ground	
29	D1P	MIPI Data Input Lane1 positive-end	
30	D1N	MIPI Data Input Lane1 negative-end	
31	GND	Power ground	
32	CLKP	MIPI Clock Input positive-end	
33	CLKN	MIPI Clock Input negative-end	
34	GND	Power ground	
35	D2P	MIPI Data Input Lane2 positive-end	
36	D2N	MIPI Data Input Lane2 negative-end	
37	GND	Power ground	
38	D3P	MIPI Data Input Lane3 positive-end	
39	D3N	MIPI Data Input Lane3 negative-end	
40	GND	Power ground	

## 9. AC Characteristics

### 1) HS receiver DC specification

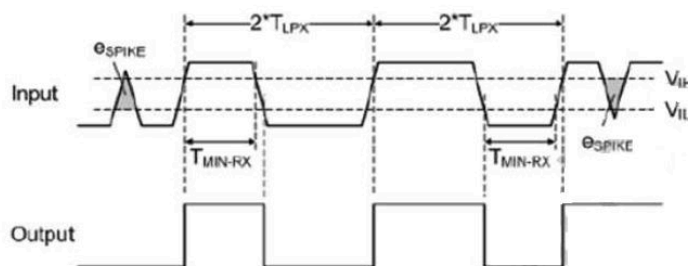
Parameter	Symbol	Rating			Unit	Note
		Min	Typ	Max		
Operation Voltage	VDD	1.5-10%	1.5	1.5+10%	mV	
Differential Input Voltage	VID	70	200	260	mV	
Common Mode Voltage	V <sub>CMRX(DC)</sub>	70	-	330	mV	
Differential Input High Threshold Voltage	V <sub>TH</sub>	-	-	70	mV	
Differential Input Low Threshold Voltage	V <sub>TL</sub>	-70	-	-	mV	
Singled-ended input high voltage	V <sub>IHHS</sub>	-	-	460	mV	
Singled-ended input low voltage	V <sub>ILHS</sub>	-40	-	-	mV	
Singled-ended threshold for HS termination enable	V <sub>TERM-EN</sub>	-	-	450	mV	
Differential input impedance	Z <sub>ID</sub>	80	100	125	ohm	
Pin leakage current	I <sub>LEAK</sub>	-10	-	10	uA	
Common-mode interference beyond 450MHz	ΔV <sub>CMRX(HF)</sub>	-	-	100	mV	
Common-mode interference 50MHz - 450MHz	ΔV <sub>CMRX(LF)</sub>	-50	-	50	mV	
Common-mode termination	C <sub>CM</sub>	-	-	60	pF	
Embedded Termination	R <sub>T</sub>	90	100	110	ohm	2bits RT_SEL[1: 0] for termination resistor selection 00 → 200ohm 10 , 01 → 150ohm 11 → 100ohm (default)  1bit ERMEN for termination resistor enable TERMR_EN=0, termr disable R=(OPEN) TERMR_EN=1, termr enable

Note:

- (1) Excluding possible additional RF interference of 100mV peak sine wave beyond 450MHz.
- (2) This table value includes a ground difference of 50mV between the transmitter and the receiver, the static common-mode level tolerance and variations below 450MHz.

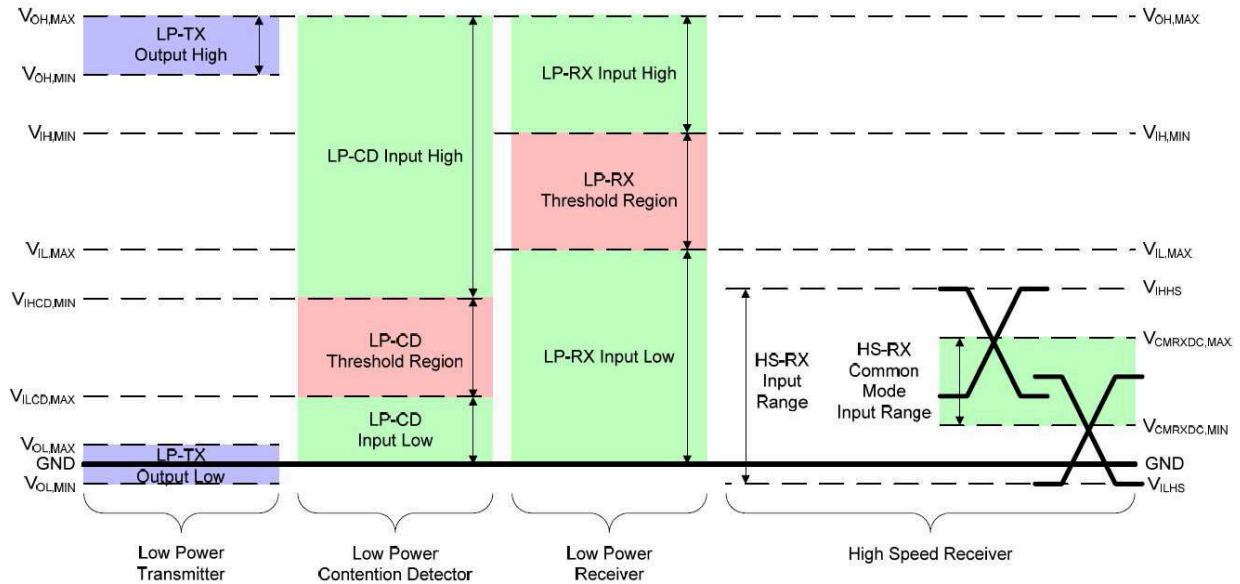
### 2) LP receiver DC specification

Parameter	Symbol	Rating			Unit	Note
		Min	Typ	Max		
Logic 1 input voltage	V <sub>IH</sub>	880	-	-	mV	
Logic 0 input voltage, not in ULP State	V <sub>IL</sub>	-	-	550	mV	
Input hysteresis	V <sub>HYST</sub>	25	-	-	mV	



### 3) Line contention detection

Parameter	Symbol	Rating			Unit	Note
		Min	Typ	Max		
Logic 1 contention threshold	$V_{IHCD}$	450	-	-	mV	
Logic 0 contention threshold	$V_{ILCD}$	-	-	200	mV	

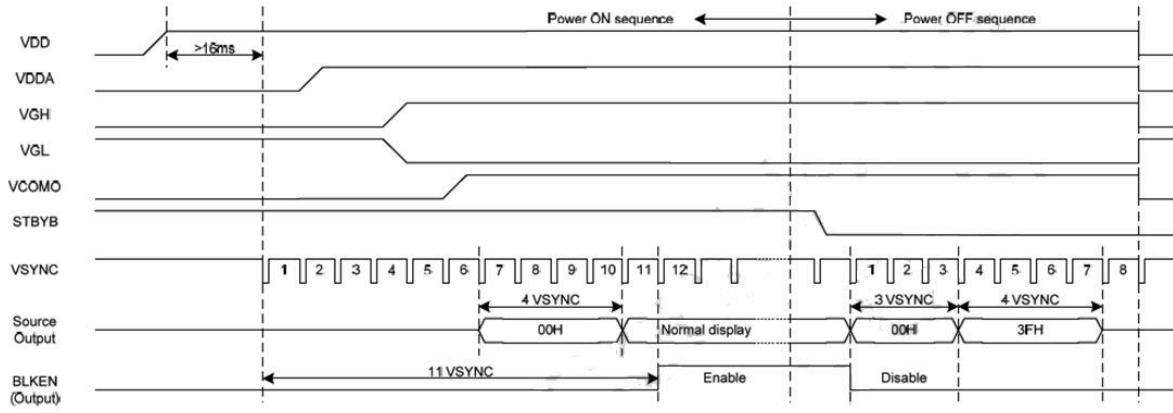


### 4) Interface Timing

Item	Symbol	Min.	Typ.	Max.	Unit
MIPI Video data rate(4 lane)	-	-	397.7	-	Mbps
PCLK Frequency	FPCLK	-	66.3	-	MHz
Horizontal Synchronization	Hsync	-	30	-	PCLK
Horizontal Back Porch	HBP	-	30	-	PCLK
Horizontal Front Porch	HFP	-	30	-	PCLK
Hsync+HBP+HFP	-	75	90	-	PCLK
HorizontalAddress(Display Area)	Hadr	-	480	-	PCLK
Horizontal cycle	-	555	570	-	PCLK
Vertical Synchronization	Vsync	-	6	-	Line
Vertical Back Porch	VBP	-	6	-	Line
Vertical Front Porch	VFP	-	6	-	Line
Vsync+VBP+VFP	-	15	18	-	Line
Vertical Address(Display Area)	Vadr	-	1920	-	Line
Vertical cycle	-	1935	1938	-	Line
Frame Rate	-	-	60	-	Hz

5) Power ON/OFF sequence

Power-On/Off Timing Sequence:



## 10. Quality Assurance

### 10.1 Purpose

This standard for Quality Assurance assures the quality of LCD module products supplied to customer.

### 10.2 Standard for Quality Test

#### 10.2.1 Sampling Plan:

GB2828.1-2012

Single sampling, general inspection level II

#### 10.2.2 Sampling Criteria:

Visual inspection: AQL 1.5%

Electrical functional: AQL 0.65%.

#### 10.2.3 Reliability Test:

Detailed requirement refer to Reliability Test Specification.

### 10.3 Nonconforming Analysis & Disposition

#### 10.3.1 Nonconforming analysis:

10.3.1.1 Customer should provide overall information of non-conforming sample for their complaints.

10.3.1.2 After receipt of detailed information from customer, the analysis of nonconforming parts usually should be finished in one week.

10.3.1.3 If cannot finish the analysis on time, customer will be notified with the progress status.

#### 10.3.2 Disposition of nonconforming:

10.3.2.1 Non-conforming product over PPM level will be replaced.

10.3.2.2 The cause of non-conformance will be analyzed. Corrective action will be discussed and implemented.

### 10.4 Agreement Items

Shall negotiate with customer if the following situation occurs:

10.4.1 There is any discrepancy in standard of quality assurance.

10.4.2 Additional requirement to be added in product specification.

10.4.3 Any other special problem.

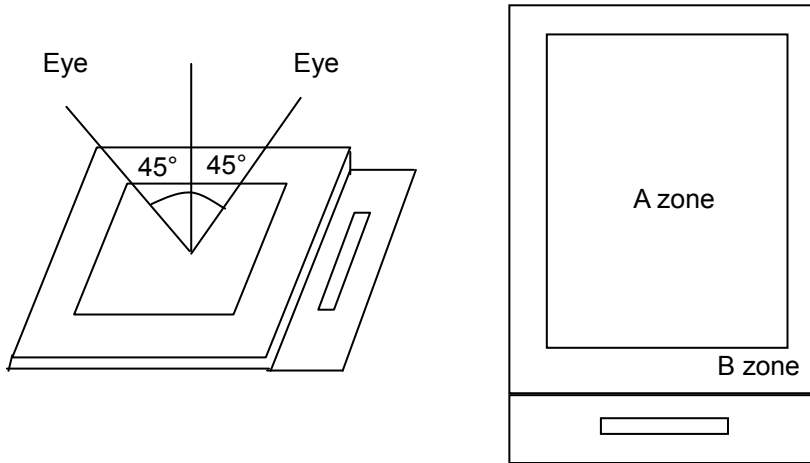
### 10.5 Standard of the Product Visual Inspection

#### 10.5.1 Appearance inspection:

10.5.1.1 The inspection must be under illumination about 1000 – 1500 lx, and the distance of view must be at 30cm ± 2cm.

10.5.1.2 The viewing angle should be 45° from the vertical line without reflection light or follows customer's viewing angle specifications.

10.5.1.3 Definition of area: A Zone: Active Area, B Zone: Viewing Area,

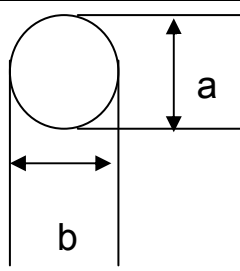


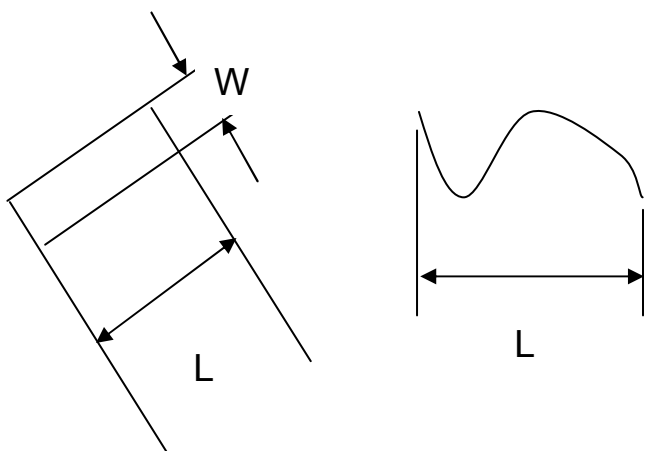
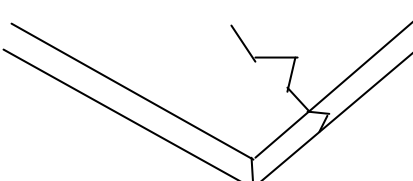
10.5.2 Basic principle:

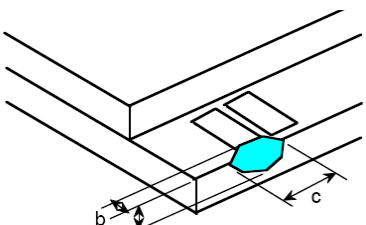
10.5.2.1 A set of sample to indicate the limit of acceptable quality level must be discussed by both us and customer when there is any dispute happened.

10.5.2.2 New item must be added on time when it is necessary.

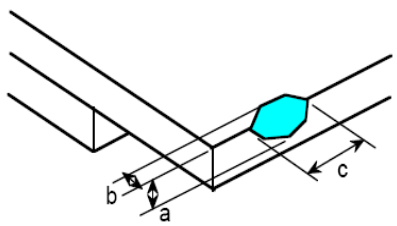
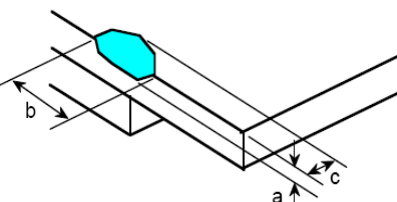
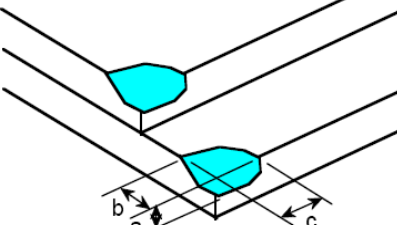
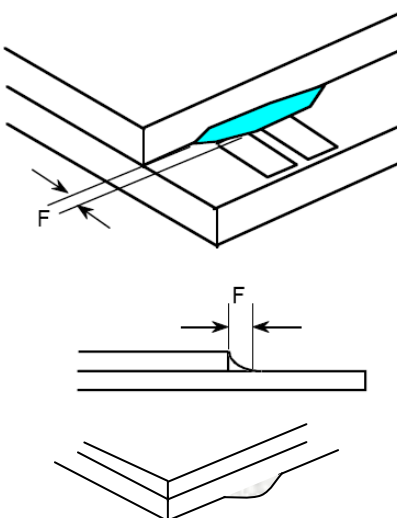
10.6 Inspection Specification

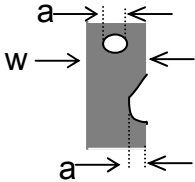
No.	Item	Criteria (Unit: mm)																
01	Black / White spot Foreign material (Round type) Pinholes Stain Particles inside cell. (Minor defect)	 <table border="1" data-bbox="909 1030 1412 1243"> <thead> <tr> <th>Size</th> <th>Area</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td><math>\phi \leq 0.20</math></td> <td></td> <td>Ignore</td> </tr> <tr> <td><math>0.20 &lt; \phi \leq 0.50</math></td> <td></td> <td><math>N \leq 3</math></td> </tr> <tr> <td><math>0.50 &lt; \phi</math></td> <td></td> <td>0</td> </tr> </tbody> </table> <p><math>\phi = (a + b) / 2</math> Distance between 2 defects should more than 5mm apart.</p>	Size	Area	Acc. Qty	$\phi \leq 0.20$		Ignore	$0.20 < \phi \leq 0.50$		$N \leq 3$	$0.50 < \phi$		0				
Size	Area	Acc. Qty																
$\phi \leq 0.20$		Ignore																
$0.20 < \phi \leq 0.50$		$N \leq 3$																
$0.50 < \phi$		0																
02	Electrical Defect (Minor defect)	<table border="1" data-bbox="502 1422 1412 1635"> <thead> <tr> <th rowspan="2">Bright dot</th> <th>Display Area</th> <th>Total</th> <th rowspan="3">Note1</th> </tr> </thead> <tbody> <tr> <td><math>N \leq 2</math></td> <td><math>N \leq 2</math></td> </tr> <tr> <th>Dark dot</th> <td><math>N \leq 4</math></td> <td><math>N \leq 4</math></td> </tr> <tr> <th>Total dot</th> <td><math>N \leq 4</math></td> <td><math>N \leq 4</math></td> </tr> <tr> <th>Mura</th> <td colspan="2">Not visible through 5% ND filters.</td> <td>Note 2</td> </tr> </tbody> </table> <p>Remark: 1. Bright dot caused by scratch and foreign object accords to item 1.</p>	Bright dot	Display Area	Total	Note1	$N \leq 2$	$N \leq 2$	Dark dot	$N \leq 4$	$N \leq 4$	Total dot	$N \leq 4$	$N \leq 4$	Mura	Not visible through 5% ND filters.		Note 2
Bright dot	Display Area	Total		Note1														
	$N \leq 2$	$N \leq 2$																
Dark dot	$N \leq 4$	$N \leq 4$																
Total dot	$N \leq 4$	$N \leq 4$																
Mura	Not visible through 5% ND filters.		Note 2															

03	<p>Black and White line Scratch Foreign material (Line type) (Minor defect)</p>	 <table border="1" data-bbox="558 739 1181 1008"> <thead> <tr> <th>Length</th> <th>Width</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td>/</td> <td><math>W \leq 0.1</math></td> <td>Ignore</td> </tr> <tr> <td><math>L \leq 2.5</math></td> <td><math>0.1 &lt; W \leq 0.2</math></td> <td>3</td> </tr> <tr> <td><math>L &gt; 2.5</math></td> <td><math>0.2 &lt; W</math></td> <td>0</td> </tr> <tr> <td colspan="2">Total</td> <td>3</td> </tr> </tbody> </table> <p>Distance between 2 defects should more than 3mm apart. Scratches not viewable through the back of the display are acceptable.</p>	Length	Width	Acc. Qty	/	$W \leq 0.1$	Ignore	$L \leq 2.5$	$0.1 < W \leq 0.2$	3	$L > 2.5$	$0.2 < W$	0	Total		3
Length	Width	Acc. Qty															
/	$W \leq 0.1$	Ignore															
$L \leq 2.5$	$0.1 < W \leq 0.2$	3															
$L > 2.5$	$0.2 < W$	0															
Total		3															
04	<p>Glass Crack (Minor defect)</p>	 <p>Crack is potential to enlarge, any type is not allowed.</p>															

05	<p>Glass Chipping Pad Area: (Minor defect)</p> 	<table border="1" data-bbox="861 1747 1340 1926"> <thead> <tr> <th>Length and Width</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td><math>c &gt; 3.0, b &lt; 1.0</math></td> <td>1</td> </tr> <tr> <td><math>c &lt; 3.0, b &lt; 1.0</math></td> <td>3</td> </tr> <tr> <td colspan="2"><math>a &lt; \text{Glass Thickness}</math></td> </tr> </tbody> </table>	Length and Width	Acc. Qty	$c > 3.0, b < 1.0$	1	$c < 3.0, b < 1.0$	3	$a < \text{Glass Thickness}$	
Length and Width	Acc. Qty									
$c > 3.0, b < 1.0$	1									
$c < 3.0, b < 1.0$	3									
$a < \text{Glass Thickness}$										



<p>06</p>	<p>Glass Chipping Rear of Pad Area: (Minor defect)</p> 	<table border="1"> <thead> <tr> <th>Length and Width</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td><math>c &gt; 3.0, b &lt; 1.0</math></td> <td>1</td> </tr> <tr> <td><math>c &lt; 3.0, b &lt; 1.0</math></td> <td>2</td> </tr> <tr> <td><math>c &lt; 3.0, b &lt; 0.5</math></td> <td>4</td> </tr> <tr> <td colspan="2" style="text-align: center;"><math>a &lt; \text{Glass Thickness}</math></td> </tr> </tbody> </table>	Length and Width	Acc. Qty	$c > 3.0, b < 1.0$	1	$c < 3.0, b < 1.0$	2	$c < 3.0, b < 0.5$	4	$a < \text{Glass Thickness}$	
Length and Width	Acc. Qty											
$c > 3.0, b < 1.0$	1											
$c < 3.0, b < 1.0$	2											
$c < 3.0, b < 0.5$	4											
$a < \text{Glass Thickness}$												
<p>07</p>	<p>Glass Chipping Except Pad Area: (Minor defect)</p> 	<table border="1"> <thead> <tr> <th>Length and Width</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td><math>c &gt; 3.0, b &lt; 1.0</math></td> <td>1</td> </tr> <tr> <td><math>c &lt; 3.0, b &lt; 1.0</math></td> <td>2</td> </tr> <tr> <td><math>c &lt; 3.0, b &lt; 0.5</math></td> <td>4</td> </tr> <tr> <td colspan="2" style="text-align: center;"><math>a &lt; \text{Glass Thickness}</math></td> </tr> </tbody> </table>	Length and Width	Acc. Qty	$c > 3.0, b < 1.0$	1	$c < 3.0, b < 1.0$	2	$c < 3.0, b < 0.5$	4	$a < \text{Glass Thickness}$	
Length and Width	Acc. Qty											
$c > 3.0, b < 1.0$	1											
$c < 3.0, b < 1.0$	2											
$c < 3.0, b < 0.5$	4											
$a < \text{Glass Thickness}$												
<p>08</p>	<p>Glass Corner Chipping: (Minor defect)</p> 	<table border="1"> <thead> <tr> <th>Length and Width</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td><math>c &lt; 3.0, b &lt; 3.0</math></td> <td>Ignore</td> </tr> <tr> <td colspan="2" style="text-align: center;"><math>a &lt; \text{Glass Thickness}</math></td> </tr> </tbody> </table>	Length and Width	Acc. Qty	$c < 3.0, b < 3.0$	Ignore	$a < \text{Glass Thickness}$					
Length and Width	Acc. Qty											
$c < 3.0, b < 3.0$	Ignore											
$a < \text{Glass Thickness}$												
<p>09</p>	<p>Glass Burr: (Minor defect)</p> 	<table border="1"> <thead> <tr> <th>Length</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td><math>F &lt; 1.0</math></td> <td>Ignore</td> </tr> </tbody> </table> <p>Glass burr don't affect assemble and module dimension.</p>	Length	Acc. Qty	$F < 1.0$	Ignore						
Length	Acc. Qty											
$F < 1.0$	Ignore											

<p>10</p>	<p>FPC Defect: (Minor defect)</p> 	<p>10.1 Dent, pinhole width <math>a &lt; w/3</math>. (w: circuitry width.) 10.2 Open circuit is unacceptable. 10.3 No oxidation, contamination and distortion.</p>								
<p>11</p>	<p>Bubble on Polarizer (Minor defect)</p>	<table border="1"> <thead> <tr> <th>Diameter</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td><math>\phi \leq 0.30</math></td> <td>Ignore</td> </tr> <tr> <td><math>0.30 &lt; \phi \leq 0.50</math></td> <td><math>N \leq 2</math></td> </tr> <tr> <td><math>0.50 &lt; \phi</math></td> <td><math>N = 0</math></td> </tr> </tbody> </table>	Diameter	Acc. Qty	$\phi \leq 0.30$	Ignore	$0.30 < \phi \leq 0.50$	$N \leq 2$	$0.50 < \phi$	$N = 0$
Diameter	Acc. Qty									
$\phi \leq 0.30$	Ignore									
$0.30 < \phi \leq 0.50$	$N \leq 2$									
$0.50 < \phi$	$N = 0$									
<p>12</p>	<p>Dent on Polarizer (Minor defect)</p>	<table border="1"> <thead> <tr> <th>Diameter</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td><math>\phi \leq 0.25</math></td> <td>Ignore</td> </tr> <tr> <td><math>0.25 &lt; \phi \leq 0.50</math></td> <td><math>N \leq 4</math></td> </tr> <tr> <td><math>0.50 &lt; \phi</math></td> <td>None</td> </tr> </tbody> </table>	Diameter	Acc. Qty	$\phi \leq 0.25$	Ignore	$0.25 < \phi \leq 0.50$	$N \leq 4$	$0.50 < \phi$	None
Diameter	Acc. Qty									
$\phi \leq 0.25$	Ignore									
$0.25 < \phi \leq 0.50$	$N \leq 4$									
$0.50 < \phi$	None									
<p>13</p>	<p>Bezel</p>	<p>13.1 No rust, distortion on the Bezel. 13.2 No visible fingerprints, stains or other contamination.</p>								
<p>14</p>	<p>Touch Panel</p>	<p>D: Diameter W: width L: length 14.1 Spot: <math>D &lt; 0.25</math> is acceptable <math>0.25 \leq D \leq 0.4</math> 2dots are acceptable and the distance between defects should more than 10 mm. <math>D &gt; 0.4</math> is unacceptable 14.2 Dent: <math>D &gt; 0.40</math> is unacceptable 14.3 Scratch: <math>W \leq 0.03</math>, <math>L \leq 10</math> is acceptable, <math>0.03 &lt; W \leq 0.10</math>, <math>L \leq 10</math> is acceptable Distance between 2 defects should more than 10 mm. <math>W &gt; 0.10</math> is unacceptable.</p>								
<p>15</p>	<p>PCB</p>	<p>15.1 No distortion or contamination on PCB terminals. 15.2 All components on PCB must same as documented on the BOM/component layout. 15.3 Follow IPC-A-600F.</p>								
<p>16</p>	<p>Soldering</p>	<p>Follow IPC-A-610C standard</p>								

17	Electrical Defect (Major defect)	<p>The below defects must be rejected.</p> <p>17.1 Missing vertical / horizontal segment, 17.2 Abnormal Display. 17.3 No function or no display. 17.4 Current exceeds product specifications. 17.5 LCD viewing angle defect. 17.6 No Backlight. 17.7 Dark Backlight. 17.8 Touch Panel no function.</p>
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Remark: LCD Panel Broken shall be rejected. Defect out of LCD viewing area is acceptable.

**10.7 Classification of Defects**

10.7.1 Visual defects (Except no / wrong label) are treated as minor defect and electrical defect is major.

10.7.2 Two minor defects are equal to one major in lot sampling inspection.

**10.8 Identification/marketing criteria**

Any unit with illegible / wrong /double or no marking/ label shall be rejected.

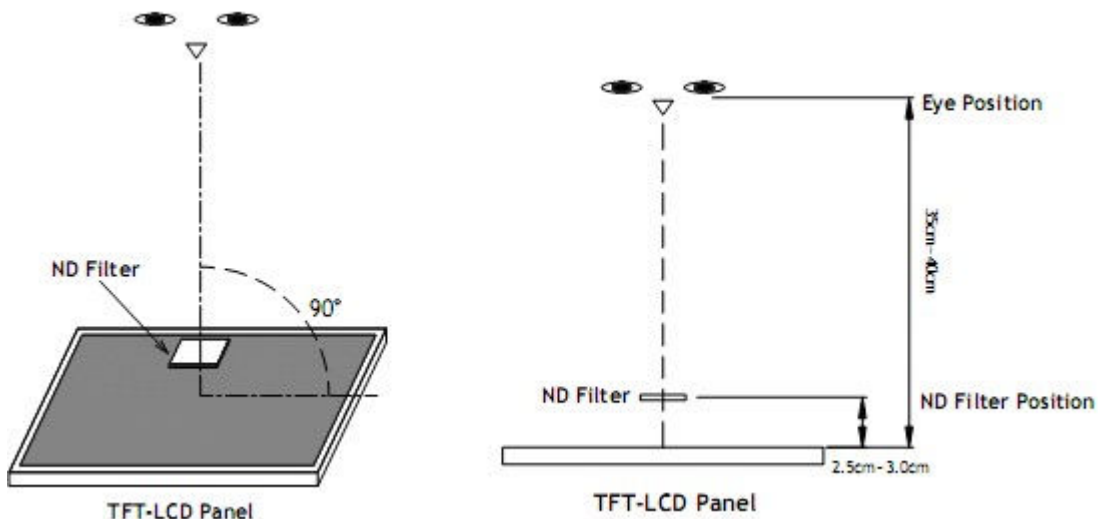
**10.9 Packaging**

10.9.1 There should be no damage of the outside carton box, each packaging box should have one identical label.

10.9.2 Modules inside package box should have compliant mark.

10.9.3 All direct package materials shall offer ESD protection

**Note1:** Bright dot is defined as the defective area of the dot is larger than 50% of one sub-pixel area.



Bright dot: The bright dot size defect at black display pattern. It can be recognized by 2% transparency of filter when the distance between eyes and panel is 350mm ± 50mm.

Dark dot: Cyan, Magenta or Yellow dot size defect at white display pattern. It can be recognized by 5% transparency of filter when the distance between eyes and panel is 350mm ± 50mm.

**Note2:** Mura on display which appears darker / brighter against background brightness on parts of display area.

## 11. Reliability Specification

No	Item	Condition	Quantity	Criteria
1	High Temperature Operating	<b>70°C, 96Hrs</b>	2	GB/T2423.2-2008
2	Low Temperature Operating	<b>-20°C, 96Hrs</b>	2	GB/T2423.1-2008
3	High Humidity	<b>50°C, 90%RH, 96Hrs</b>	2	GB/T2423.3-2006
4	High Temperature Storage	<b>80°C, 96Hrs</b>	2	GB/T2423.2-2008
5	Low Temperature Storage	<b>-30°C, 96Hrs</b>	2	GB/T2423.1-2008
6	Thermal Cycling Test	-20°C, 60min~70°C, 60min, 20 cycles.	2	GB/T2423.22-2012
7	Packing vibration	Frequency range:10Hz~50Hz Acceleration of gravity:5G X, Y, Z 30 min for each direction.	2	GB/T5170.14-2009
8	Drop Test (Packaged)	Height:80 cm,1 corner, 3 edges, 6 surfaces.	2	GB/T2423.8-1995

Note1. No deflection cosmetic and operational function allowable.

Note2. Total current Consumption should be below double of initial value

## 12. Precautions and Warranty

### 12.1. Safety

12.1.1 The liquid crystal in the LCD is poisonous. Do not put it in your mouth. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and water.

12.1.2 Since the liquid crystal cells are made of glass, do not apply strong impact on them.  
Handle with care.

### 12.2. Handling

12.2.1 Reverse and use within ratings in order to keep performance and prevent damage.

12.2.2 Do not wipe the polarizer with dry cloth, as it might cause scratch. If the surface of the LCD needs to be cleaned, wipe it swiftly with cotton or other soft cloth soaked with petroleum IPA, do not use other chemicals.

### 12.3. Storage

12.3.1. Do not store the LCD module beyond the specified temperature ranges.

12.3.2. Strong light exposure causes degradation of polarizer and color filter

### 12.4. Metal Pin (Apply to Products with Metal Pins)

#### 12.4.1 Pins of LCD and Backlight

12.4.1.1 Solder tip can touch and press on the tip of Pin LEAD during the soldering

12.4.1.2 Recommended Soldering Conditions

Solder Type: Sn96.3~94-Ag3.3~4.3-Cu0.4~1.1

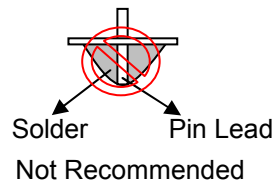
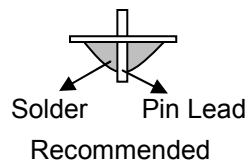
Maximum Solder Temperature: 370℃

Maximum Solder Time: 3s at the maximum temperature

Recommended Soldering Temp: 350±20℃

Typical Soldering Time: ≤3s

12.4.1.3 Solder Wetting



#### 12.4.2 Pins of EL

12.4.2.1 Solder tip can touch and press on the tip of EL leads during soldering.

12.4.2.2 No Solder Paste on the soldering pad on the motherboard is recommended.

12.4.2.3 Recommended Soldering Conditions

Solder type: Nippon Alimit Leadfree SR-34, size 0.5mm

Recommended Solder Temperature: 270~290℃

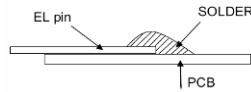
Typical Soldering Time: ≤2s

Minimum solder distance from EL lamp (body):2.0mm

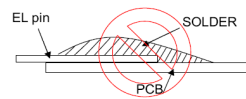
12.4.2.4 No horizontal press on the EL leads during soldering.

12.4.2.5 180° bend EL leads three times is not allowed.

#### 12.4.2.6 Solder Wetting

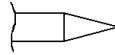


Recommended

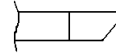


Not Recommended

#### 12.4.2.7 The type of the solder iron:

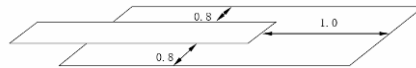


Recommended



Not Recommended

#### 12.4.2.8 Solder Pad



### 12.5. Operation

- 12.5.1. Do not drive LCD with DC voltage
- 12.5.2. Response time will increase below lower temperature
- 12.5.3. Display may change color with different temperature
- 12.5.4. Mechanical disturbance during operation, such as pressing on the display area, may cause the segments to appear “fractured”.
- 12.5.5. Do not connect or disconnect the LCM to or from the system when power is on.
- 12.5.6. Never use the LCM under abnormal condition of high temperature and high humidity.
- 12.5.7. Module has high frequency circuits. Sufficient suppression to the electromagnetic interface shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.
- 12.5.8. Do not display the fixed pattern for long time (we suggest the time not longer than one hour) because it may develop image sticking due to the TFT structure.

### 12.6. Static Electricity

- 12.6.1. CMOS LSIs are equipped in this unit, so care must be taken to avoid the electro-static charge, by ground human body, etc.
- 12.6.2. The normal static prevention measures should be observed for work clothes and benches.
- 12.6.3. The module should be kept into anti-static bags or other containers resistant to static for storage.

### 12.7. Limited Warranty

- 12.7.1. Our warranty liability is limited to repair and/or replacement. We will not be responsible for any consequential loss.
- 12.7.2. If possible, we suggest customer to use up all modules in six months. If the module storage time over twelve months, we suggest that recheck it before the module be used.
- 12.7.3. After the product shipped, any product quality issues must be feedback within three months, otherwise, we will not be responsible for the subsequent or consequential events.

## 13 Packaging

TBD

14. Outline Drawing

