

PRODUCT SPECIFICATION

3.5" TFT LCD MODULE

MODEL: T035640480-A0WMN-002 Ver:1.2



< ◇ > Preliminary Specification

< ◆ > Finally Specification

CUSTOMER'S APPROVAL	
CUSTOMER :	
SIGNATURE:	DATE:

APPROVED BY	PM REVIEWED	PD REVIEWED	PREPARED BY

Revision History

Revision	Date	Originator	Detail	Remarks
Ver 1.0	2018.02.28	ZFY	Initial Release	
1.1	2018.03.02	ZFY	Modify outline drawing (B)	P24
1.2	2018.04.27	ZDT	Modify Polarizer Surface Treatment Modify outline drawing (C) Modify many details	P4 P24 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 ICs and a backlight unit.

2. Module Parameter

Features	Details	Unit
Display Size(Diagonal)	3.5"	
LCD type	IPS TFT	
Display Mode	Transmissive /Normally black	
Resolution	640 RGB x 480	Pixels
View Direction	Full viewing	Best Image
Module Outline	78.15(H) x 65(V) x 2.7(T) (Note1)	mm
Active Area	70.656(H) x 52.992(V)	mm
Pixel Pich	110.4(H) x 110.4(V)	um
Pixel Arrangement	RGB Stripe	
Polarizer Surface Treatment	Anti-Glare	
Display Colors	16M	
Interface	24-bit RGB interface	
Driver IC	HX8664B + HX8264D	-
With or Without Touch Panel	Without	
Operating Temperature	-20~70	°C
Storage Temperature	-30~80	°C
Weight	TBD	g

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

3. Absolute Maximum Ratings

V_{SS}=0V, Ta=25°C

Item	Symbol	Min.	Max.	Unit
Supply Voltage	DVDD	-0.5	3.96	V
	AVDD	-0.5	14.85	V
	VGH	-0.3	42	V
	VGL	VGH-42	0.3	V
Storage temperature	T _{STG}	-30	+80	°C
Operating temperature	T _{OP}	-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	DVDD	2.7	3.3	3.6	V
	AVDD	-	TBD	-	V
	VGH	-	TBD	-	V
	VGL	-	TBD	-	V
	VCOM	-	TBD	-	V
Low input voltage	V_{IL}	0	-	$0.3 \cdot DVDD$	V
High input voltage	V_{IH}	$0.7 \cdot DVDD$	-	DVDD	V
Low output voltage	V_{OL}	0	-	VSS+0.4	V
High output voltage	V_{OH}	$DVDD-0.4$	-	-	V

Note: VCOM is only a reference value. It must be optimized according to each LCM. Please use VR.

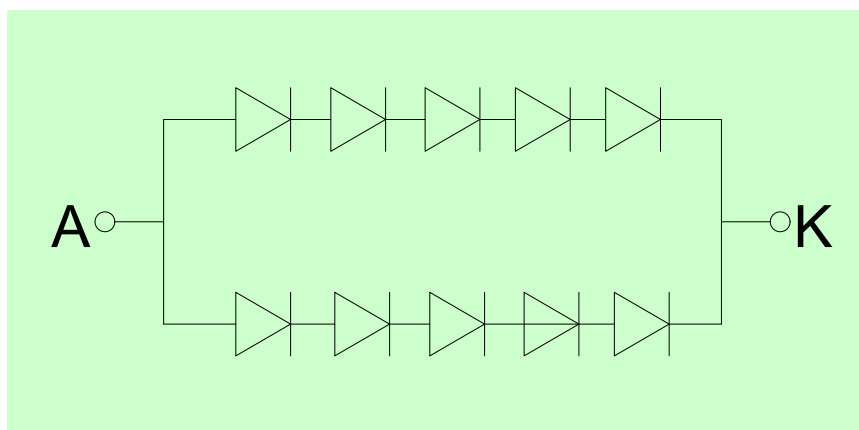
5. Backlight Characteristic

5.1. Backlight Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
Forward Voltage	V_F	$T_a=25\text{ }^\circ\text{C}$, $I_F=20\text{mA/LED}$	14	16	17	V
Forward Current	I_F	$T_a=25\text{ }^\circ\text{C}$, $V_F=3.2\text{V/LED}$	-	40	-	mA
Power dissipation	P_D		-	640	-	mW
Uniformity	Avg		-	80	-	%
LED working life($25\text{ }^\circ\text{C}$)	-		-	30000	-	Hrs
Drive method	Constant current					
LED Configuration	10 White LEDs (5 LEDs in string and 2 groups in parallel)					

Note1: LED life time defined as follows: The final brightness is at 50% of original brightness.
The environmental conducted under ambient air flow, at $T_a=25 \pm 2\text{ }^\circ\text{C}$, $60\%RH \pm 5\%$, $I_F=20\text{mA}$

5.2. Backlighting circuit



6. Optical Characteristics

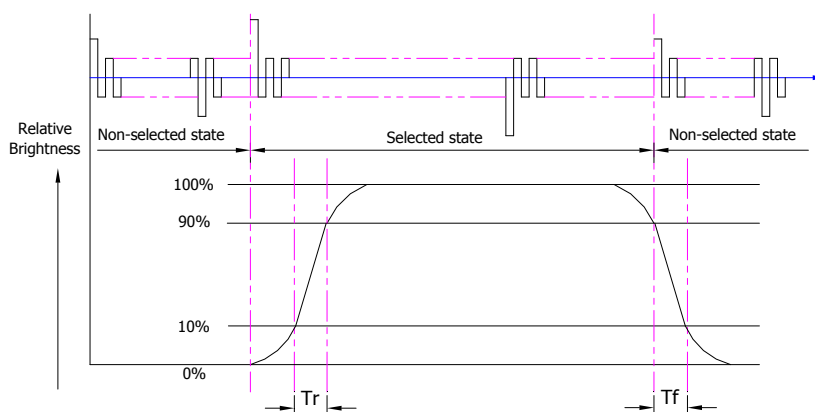
6.1. Optical Characteristics

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 $\theta_x = \phi_y = 0^\circ$	400	500	-	cd/m ²
	Contrast ratio(See 6.3)	CR		500	700	-	
	Response time (See 6.2)	T _R T _F		-	25	35	ms
	Chromaticity Transmissive (See 6.5)	Red	X _R	(0.585)	(0.635)	(0.685)	
			Y _R	(0.308)	(0.358)	(0.408)	
		Green	X _G	(0.249)	(0.299)	(0.349)	
			Y _G	(0.561)	(0.611)	(0.661)	
		Blue	X _B	(0.098)	(0.148)	(0.198)	
			Y _B	(0.025)	(0.075)	(0.125)	
	White	X _W	(0.268)	(0.318)	(0.368)		
Y _W		(0.320)	(0.370)	(0.420)			
Viewing Angle (See 6.4)	Horizontal	θ_{x+}	Center CR \geq 10	65	80	-	Deg.
		θ_{x-}		65	80	-	
	Vertical	ϕ_{y+}		65	80	-	
		ϕ_{y-}		65	80	-	
NTSC Ratio(Gamut)				-	66	-	%

6.2. Definition of Response Time

6.2.1. Normally Black Type (Negative)

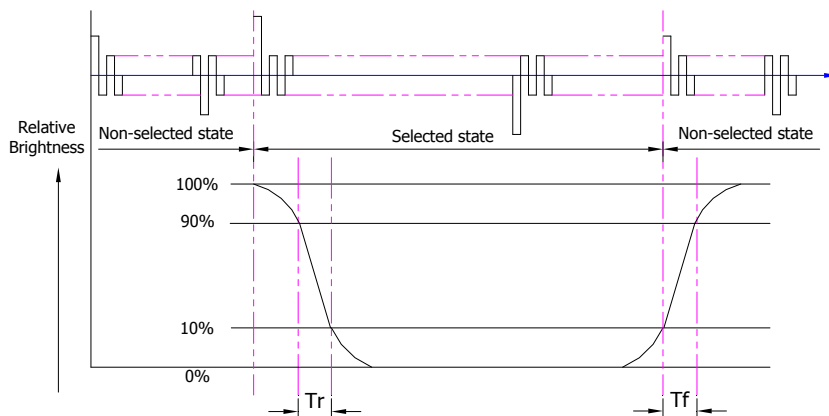


T_r is the time it takes to change from non-selected stage with relative luminance 10% to selected state with relative luminance 90%;

T_f 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

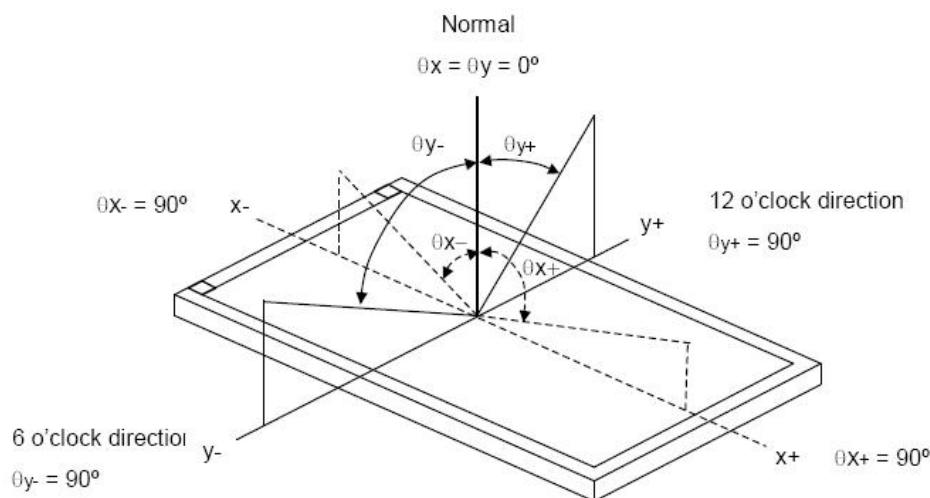
Contrast is measured perpendicular to display surface in reflective and transmissive mode.

The measurement condition is:

Measuring Equipment	Eldim or Euivelent
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



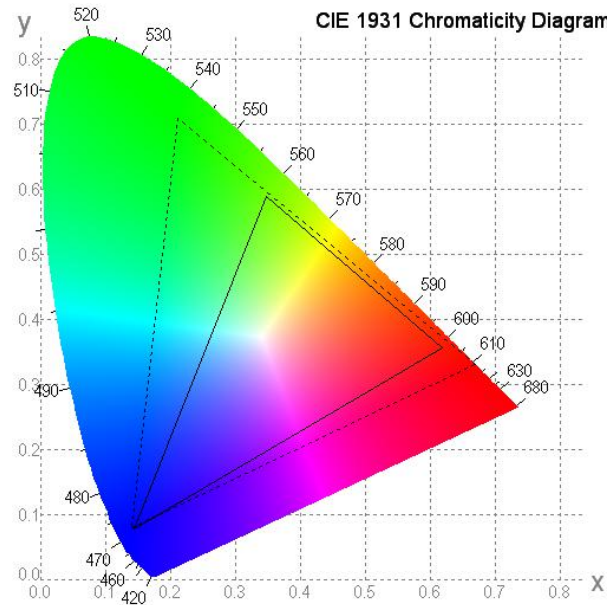
Measuring machine: LCD-5100 or EQUI

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

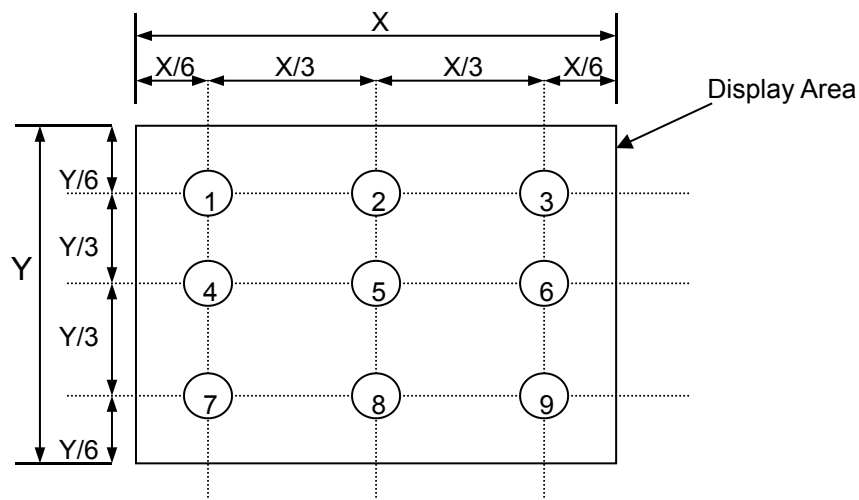
Using the transmissive mode measurement approach, measure the white screen luminance of the display panel and backlight.

6.6.1. Surface Luminance: $L_V = \text{average} (L_{P1}:L_{P9})$

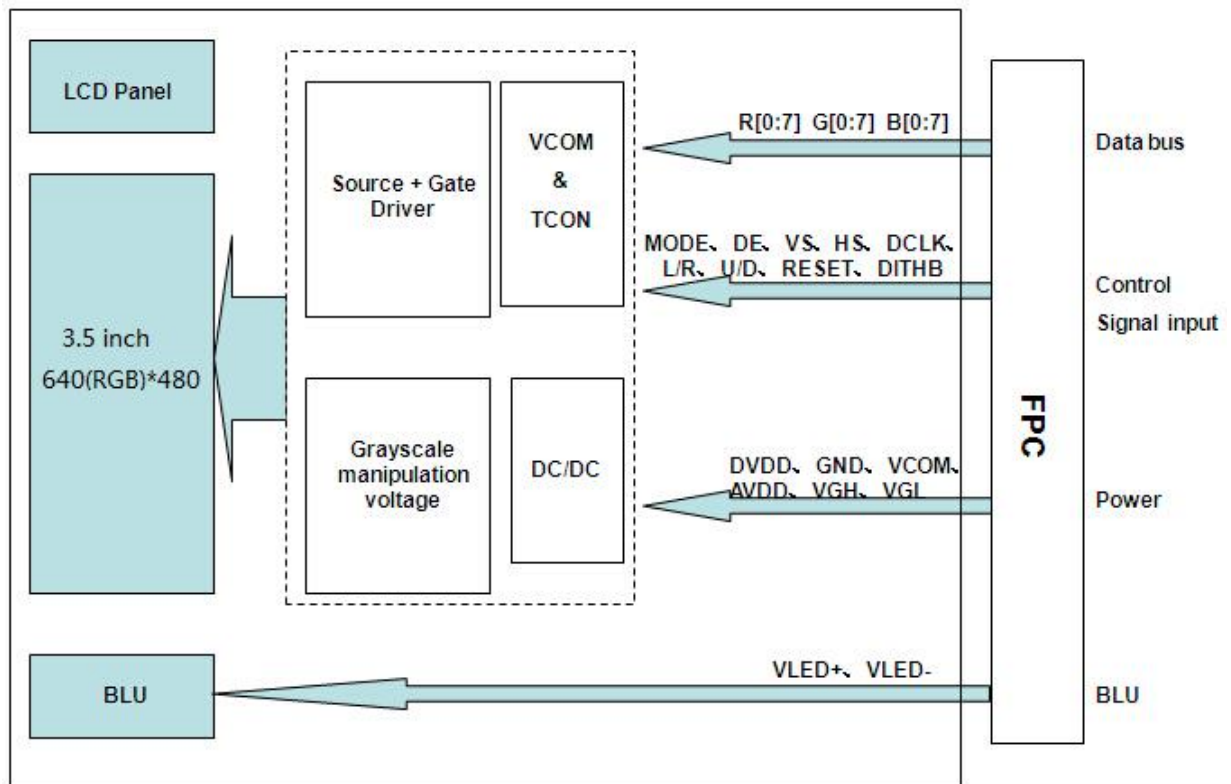
6.6.2. Uniformity = $\text{Minimal} (L_{P1}:L_{P9}) / \text{Maximal} (L_{P1}:L_{P9}) * 100\%$

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	LED-A	Backlight Anode	
2	LED-A	Backlight Anode	
3	LED-K	Backlight Cathode	
4	LEA-K	Backlight Cathode	
5	GND	Ground	
6	VCOM	Common voltage.	
7	DVDD	Power source	
8	MODE	DE/SYNC mode select. Normally pull high. MODE="1": DE mode. (Default) MODE="0": HSD/VSD mode.	
9	DE	Input data enable control.	
10	VS	Vertical synchronizing signal	
11	HS	Horizontal synchronizing signal	
12	B7	Blue data signal	
13	B6	Blue data signal	
14	B5	Blue data signal	
15	B4	Blue data signal	
16	B3	Blue data signal	
17	B2	Blue data signal	
18	B1	Blue data signal	
19	B0	Blue data signal	
20	G7	Green data signal	
21	G6	Green data signal	
22	G5	Green data signal	
23	G4	Green data signal	
24	G3	Green data signal	
25	G2	Green data signal	
26	G1	Green data signal	
27	G0	Green data signal	
28	R7	Red data signal	
29	R6	Red data signal	
30	R5	Red data signal	
31	R4	Red data signal	
32	R3	Red data signal	
33	R2	Red data signal	
34	R1	Red data signal	
35	R0	Red data signal	
36	GND	Ground	
37	DCLK	Clock signal to sample each data	
38	GND	Ground	

39	L/R	Source Right or Left sequence control. Normally pulled high. "0": Shift left: last data=S1 S2 S3.....S1200=first data. "1": Shift right: first data=S1 S2 S3.....S1200=last data.	
40	U/D	Gate up or down scan control. Normally pulled low. "0": STV2 output vertical start pulse and UD pin output logical "0" to gate driver. (Default) "1": STV1 output vertical start pulse and UD pin output logical "1" to gate driver.	
41	VGH	Gate ON Voltage.	
42	VGL	Gate OFF Voltage.	
43	AVDD	Power supply for analog circuits	
44	RESET	Reset	
45	NC	No connection	
46	VCOM	Common voltage.	
47	DITHB	Dithering function enable control. Normally pull high. DITHB="1": Disable internal dithering function. (Default) DITHB="0": Enable internal dithering function.	
48	GND	Ground	
49	NC	No connection	
50	NC	No connection	

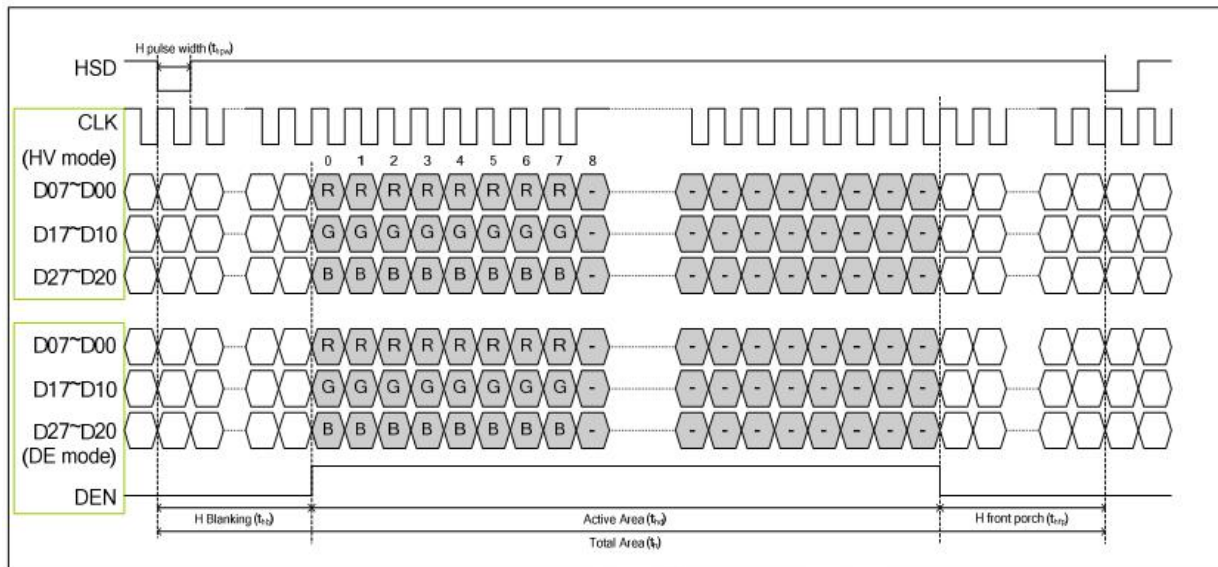
9. AC Characteristics and RGB Input Timing

1) AC Characteristics

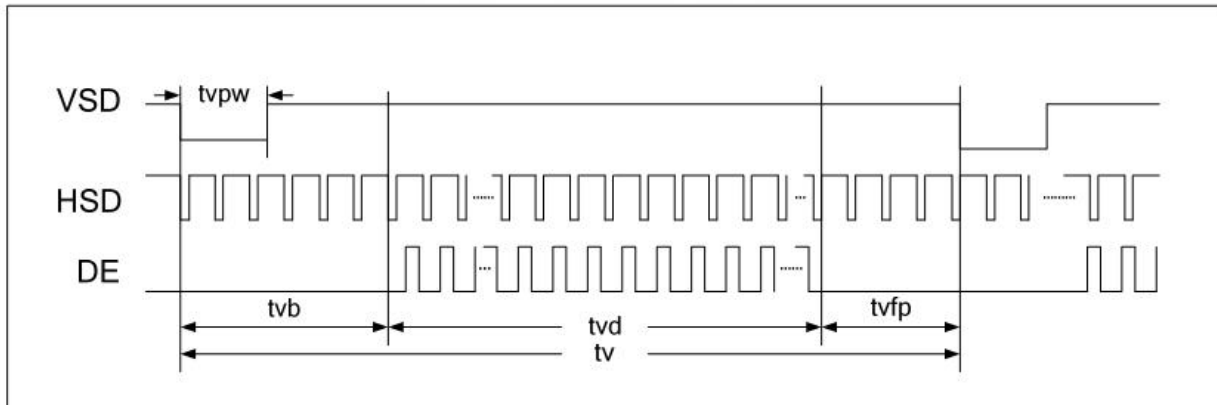
Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
HS setup time	T_{hst}	8	-	-	ns
HS hold time	T_{hhd}	8	-	-	ns
VS setup time	T_{vst}	8	-	-	ns
VS hold time	T_{vhd}	8	-	-	ns
Data setup time	T_{dsu}	8	-	-	ns
Data hold time	T_{dhd}	8	-	-	ns
DE setup time	T_{esu}	8	-	-	ns
DE hold time	T_{ehd}	8	-	-	ns
VDD Power On Slew rate	T_{POR}	-	-	20	ms
RSTB pulse width	T_{Rst}	10	-	-	us
CLKIN cycle time	T_{cph}	20	-	-	ns
CLKIN pulse duty	T_{cwh}	40	50	60	%
Output stable time	T_{sst}	-	-	6	us

2) Data input format

- Horizontal timing



- Vertical timing



Horizontal timing

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Horizontal Display Area	thd	640			DCLK
DCLK frequency	fclk	-	24	50	MHz
One Horizontal Line	th	760			DCLK
HS pulse width	thpw	1	48	255	DCLK
HS Back Porch (Blanking)	thb	88			DCLK
HS Front Porch	thfp	1	32	255	DCLK
DE mode Blanking	th-thd	85	120	512	DCLK

Vertical timing

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Vertical Display Area	tvd	480			T_H
VS period time	tv	513	525	767	T_H
VS pulse width	tvpw	3	3	255	T_H
VS Back Porch (Blanking)	tvb	32			T_H
VS Front Porch	tvfp	1	13	255	T_H
DE mode Blanking	tv-tvd	4	45	255	T_H

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 can not 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.

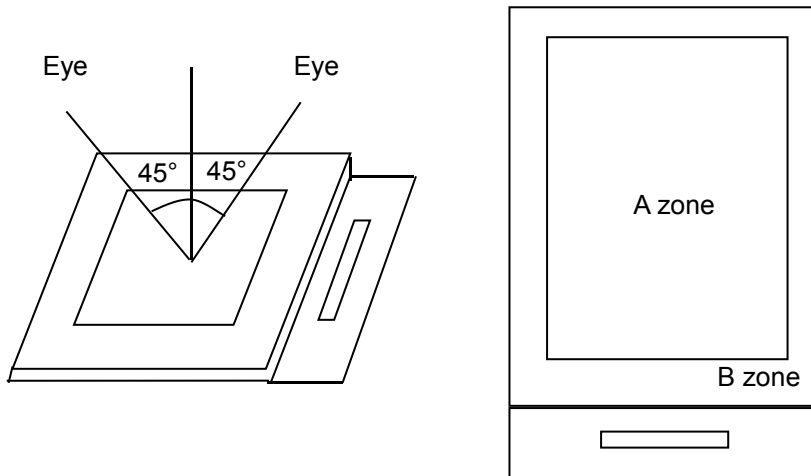
10.5.Standard of the Product Visual Inspection

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,

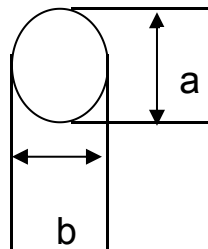


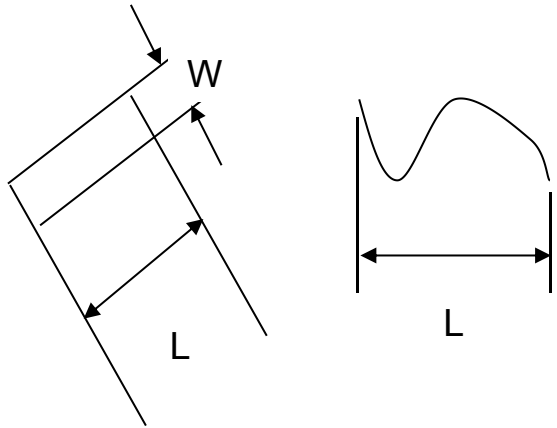
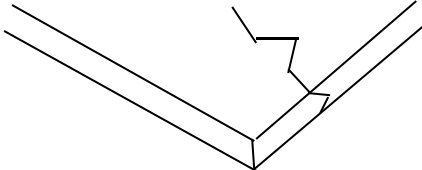
10.5.2. Basic principle:

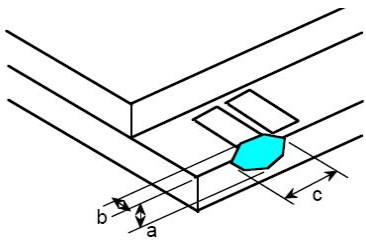
10.5.2.1. A set of sample to indicate the limit of acceptable quality level must be discussed by both us and customer when there is any dispute happened.

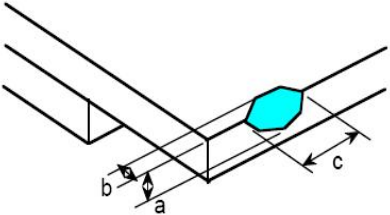
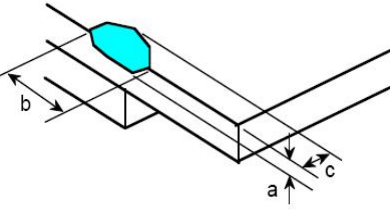
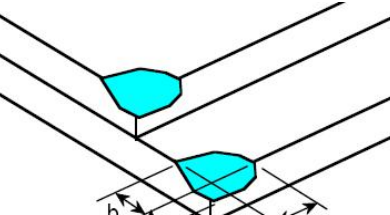
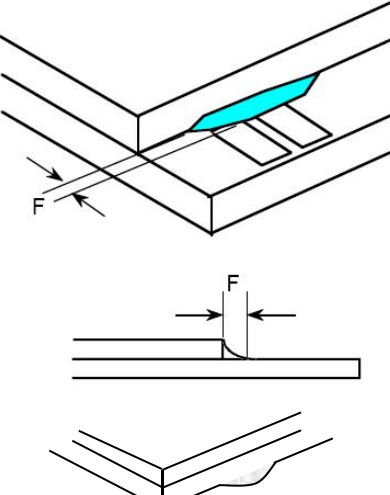
10.5.2.2. New item must be added on time when it is necessary.

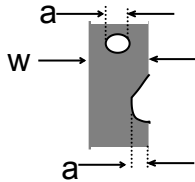
10.6. Inspection Specification

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="893 1209 1404 1545"> <thead> <tr> <th>Size</th> <th>Area</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td>$\varphi \leq 0.10$</td> <td></td> <td>Ignore</td> </tr> <tr> <td>$0.10 < \varphi \leq 0.15$</td> <td></td> <td>2</td> </tr> <tr> <td>$0.15 < \varphi \leq 0.25$</td> <td></td> <td>1</td> </tr> <tr> <td>$0.25 < \varphi$</td> <td></td> <td>0</td> </tr> <tr> <td>Total</td> <td></td> <td>2 no include $\varphi \leq 0.10$</td> </tr> </tbody> </table> <p>$\varphi = (a + b) / 2$ Distance between 2 defects should more than 3mm apart.</p>	Size	Area	Acc. Qty	$\varphi \leq 0.10$		Ignore	$0.10 < \varphi \leq 0.15$		2	$0.15 < \varphi \leq 0.25$		1	$0.25 < \varphi$		0	Total		2 no include $\varphi \leq 0.10$
Size	Area	Acc. Qty																		
$\varphi \leq 0.10$		Ignore																		
$0.10 < \varphi \leq 0.15$		2																		
$0.15 < \varphi \leq 0.25$		1																		
$0.25 < \varphi$		0																		
Total		2 no include $\varphi \leq 0.10$																		
02	Electrical Defect (Minor defect)	<table border="1" data-bbox="542 1657 1372 1881"> <thead> <tr> <th></th> <th>Display Area</th> <th>Total</th> <th rowspan="3">Note1</th> </tr> </thead> <tbody> <tr> <td>Bright dot</td> <td>0</td> <td>0</td> </tr> <tr> <td>Dark dot</td> <td>N ≤ 3</td> <td>N ≤ 3</td> </tr> <tr> <td>Total dot</td> <td>N ≤ 3</td> <td>N ≤ 3</td> <td></td> </tr> <tr> <td>Mura</td> <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>		Display Area	Total	Note1	Bright dot	0	0	Dark dot	N ≤ 3	N ≤ 3	Total dot	N ≤ 3	N ≤ 3		Mura	Not visible through 5% ND filters.		Note 2
	Display Area	Total	Note1																	
Bright dot	0	0																		
Dark dot	N ≤ 3	N ≤ 3																		
Total dot	N ≤ 3	N ≤ 3																		
Mura	Not visible through 5% ND filters.		Note 2																	

03	Black and White line Scratch Foreign material (Line type) (Minor defect)	 <table border="1" data-bbox="614 705 1236 1019"> <thead> <tr> <th>Length</th> <th>Width</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td>/</td> <td>$W \leq 0.03$</td> <td>Ignore</td> </tr> <tr> <td>$L \leq 2.5$</td> <td>$0.03 < W \leq 0.05$</td> <td>3</td> </tr> <tr> <td>$L \leq 2.5$</td> <td>$0.05 < W \leq 0.10$</td> <td>2</td> </tr> <tr> <td>/</td> <td>$0.1 < W$</td> <td>0</td> </tr> <tr> <td colspan="2">Total</td> <td>3</td> </tr> </tbody> </table> <p data-bbox="550 1064 1404 1131">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	/	$W \leq 0.03$	Ignore	$L \leq 2.5$	$0.03 < W \leq 0.05$	3	$L \leq 2.5$	$0.05 < W \leq 0.10$	2	/	$0.1 < W$	0	Total		3
Length	Width	Acc. Qty																		
/	$W \leq 0.03$	Ignore																		
$L \leq 2.5$	$0.03 < W \leq 0.05$	3																		
$L \leq 2.5$	$0.05 < W \leq 0.10$	2																		
/	$0.1 < W$	0																		
Total		3																		
04	Glass Crack (Minor defect)	 <p data-bbox="550 1400 1181 1433">Crack is potential to enlarge, any type is not allowed.</p>																		

05	Glass Chipping Pad Area: (Minor defect)	 <table border="1" data-bbox="869 1601 1340 1769"> <thead> <tr> <th>Length and Width</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td>$c > 3.0, b < 1.0$</td> <td>1</td> </tr> <tr> <td>$c < 3.0, b < 1.0$</td> <td>3</td> </tr> <tr> <td colspan="2">$a < \text{Glass Thickness}$</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>$c > 3.0, b < 1.0$</td> <td>1</td> </tr> <tr> <td>$c < 3.0, b < 1.0$</td> <td>2</td> </tr> <tr> <td>$c < 3.0, b < 0.5$</td> <td>4</td> </tr> <tr> <td colspan="2" style="text-align: center;">$a < \text{Glass Thickness}$</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>$c > 3.0, b < 1.0$</td> <td>1</td> </tr> <tr> <td>$c < 3.0, b < 1.0$</td> <td>2</td> </tr> <tr> <td>$c < 3.0, b < 0.5$</td> <td>4</td> </tr> <tr> <td colspan="2" style="text-align: center;">$a < \text{Glass Thickness}$</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>$c < 3.0, b < 3.0$</td> <td>Ignore</td> </tr> <tr> <td colspan="2" style="text-align: center;">$a < \text{Glass Thickness}$</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>$F < 1.0$</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											

10	<p>FPC Defect:(Minor defect)</p> 	<p>9.1 Dent, pinhole width $a < w/3$. (w: circuitry width.) 9.2 Open circuit is unacceptable. 9.3 No oxidation, contamination and distortion.</p>								
11	<p>Bubble on Polarizer (Minor defect)</p>	<table border="1"> <thead> <tr> <th>Diameter</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td>$\varphi \leq 0.20$</td> <td>Ignore</td> </tr> <tr> <td>$0.20 < \varphi \leq 0.30$</td> <td>4</td> </tr> <tr> <td>$0.30 < \varphi$</td> <td>None</td> </tr> </tbody> </table>	Diameter	Acc. Qty	$\varphi \leq 0.20$	Ignore	$0.20 < \varphi \leq 0.30$	4	$0.30 < \varphi$	None
Diameter	Acc. Qty									
$\varphi \leq 0.20$	Ignore									
$0.20 < \varphi \leq 0.30$	4									
$0.30 < \varphi$	None									
12	<p>Dent on Polarizer (Minor defect)</p>	<table border="1"> <thead> <tr> <th>Diameter</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td>$\varphi \leq 0.20$</td> <td>Ignore</td> </tr> <tr> <td>$0.20 < \varphi \leq 0.30$</td> <td>4</td> </tr> <tr> <td>$0.30 < \varphi$</td> <td>None</td> </tr> </tbody> </table>	Diameter	Acc. Qty	$\varphi \leq 0.20$	Ignore	$0.20 < \varphi \leq 0.30$	4	$0.30 < \varphi$	None
Diameter	Acc. Qty									
$\varphi \leq 0.20$	Ignore									
$0.20 < \varphi \leq 0.30$	4									
$0.30 < \varphi$	None									
13	<p>Bezel</p>	<p>12.1 No rust, distortion on the Bezel. 12.2 No visible fingerprints, stains or other contamination.</p>								
14	<p>Touch Panel</p>	<p>D: Diameter W: width L: length 13.1 Spot: $D < 0.25$ is acceptable $0.25 \leq D \leq 0.4$ 2dots are acceptable and the distance between defects should more than 10 mm. $D > 0.4$ is unacceptable 13.2 Dent: $D > 0.40$ is unacceptable 13.3 Scratch: $W \leq 0.03$, $L \leq 10$ is acceptable, $0.03 < W \leq 0.10$, $L \leq 10$ is acceptable Distance between 2 defects should more than 10 mm. $W > 0.10$ is unacceptable.</p>								
15	<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>								
16	<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.

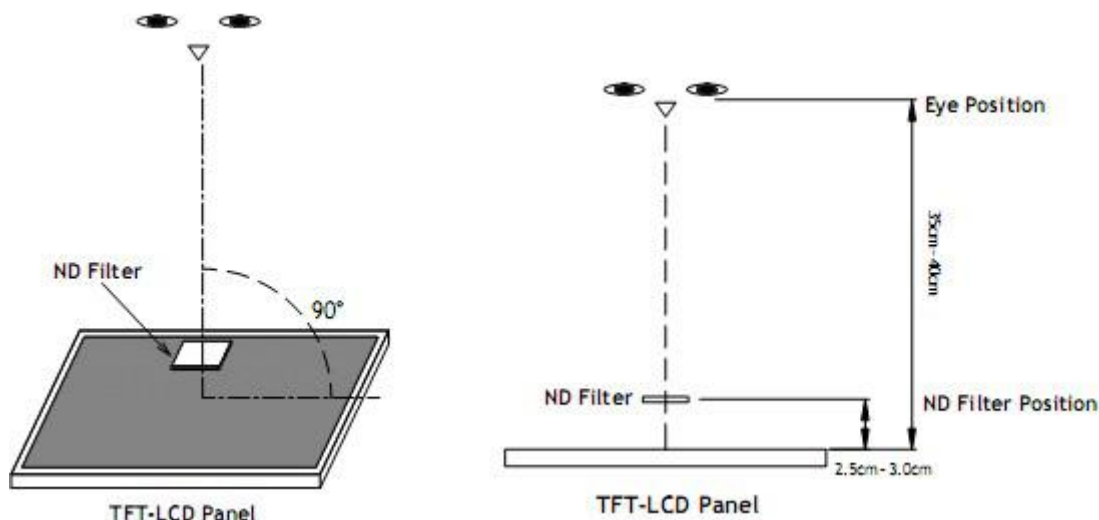
10.9. Packing

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 $350\text{mm} \pm 50\text{mm}$.

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 $350\text{mm} \pm 50\text{mm}$.

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	70°C, 96Hrs	2	GB/T2423.2-2008
2	Low Temperature Operating	-20°C, 96Hrs	2	GB/T2423.1-2008
3	High Humidity	50°C, 90%RH, 96Hrs	2	GB/T2423.3-2006
4	High Temperature Storage	80°C, 96Hrs	2	GB/T2423.2-2008
5	Low Temperature Storage	-30°C, 96Hrs	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	Electrical Static Discharge	Air: ±4KV 150pF/330 Ω 5 times Contact: ±2KV 150pF/330 Ω 5 times	2	GB/T17626.2-2006
9	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

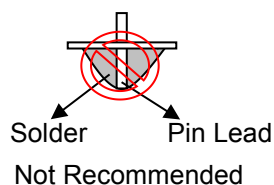
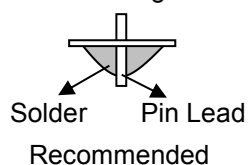
Maximum Solder Temperature: 370°C

Maximum Solder Time: 3s at the maximum temperature

Recommended Soldering Temp: 350±20°C

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

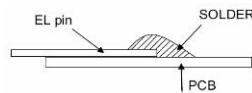
Recommended Solder Temperature: 270~290°C

Typical Soldering Time: ≤2s

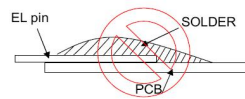
Minimum solder distance from EL lamp (body): 2.0mm

12.4.2.4. No horizontal press on the EL leads during soldering.

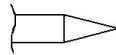
12.4.2.5. 180° bend EL leads three times is not allowed.

12.4.2.6. Solder Wetting

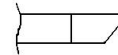
Recommended



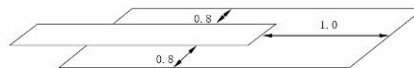
Not Recommended

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

