

PRODUCT SPECIFICATION

3.9” TFT LCD MODULE
MODEL: YDP LCD I 390 R



- < ◇ > Preliminary Specification
- < ◆ > Finally Specification

CUSTOMER’S APPROVAL	
CUSTOMER :	
SIGNATURE:	DATE:

APPROVED BY	PM REVIEWED	PD REVIEWED	PREPARED BY
—	TFT S. G. H 20240328	TFT 周福云 20240328	TFT L. Q 20240328

knitter-switch

Revision History

Revision	Date	Originator	Detail	Remarks
1.0	2024.03.28	LQ	Initial Release	

Table of Contents

No.	Item	Page
1.	General Description	4
2.	Module Parameter	4
3.	Absolute Maximum Ratings	4
4.	DC Characteristics	5
5.	Backlight Characteristic	5
5.1.	Backlight Characteristics	5
5.2.	Backlighting circuit	5
6.	Optical Characteristics	6
6.1.	Optical Characteristics	6
6.2.	Definition of Response Time	6
6.3.	Definition of Contrast Ratio	7
6.4.	Definition of Viewing Angles	7
6.5.	Definition of Color Appearance	8
6.6.	Definition of Surface Luminance, Uniformity and Transmittance	8
7.	Block Diagram and Power Supply	9
8.	Interface Pins Definition	10
9.	AC Characteristics	11
9.1.	Clock and Data Input Timing Diagram	11
9.2.	Parallel 24-bit RGB Timing Table	12
10.	Quality Assurance	14
10.1.	Purpose	14
10.2.	Standard for Quality Test	14
10.3.	Nonconforming Analysis & Disposition	14
10.4.	Agreement Items	14
10.5.	Standard of the Product Visual Inspection	14
10.6.	Inspection Specification	15
10.7.	Classification of Defects	19
10.8.	Identification/marketing criteria	19
10.9.	Packing	19
11.	Reliability Specification	20
12.	Precautions and Warranty	21
12.1.	Safety	21
12.2.	Handling	21
12.3.	Storage	21
12.4.	Metal Pin (Apply to Products with Metal Pins)	21
12.5.	Operation	22
12.6.	Static Electricity	22
12.7.	Limited Warranty	22
13.	Packaging	23
14.	Outline Drawing	24

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)	3.9"	
LCD type	IPS TFT	
Display Mode	Transmissive /Normally Black	
Resolution	480 RGB x 128	Pixels
View Direction	Full viewing	Best Image
Module Outline	105.5(H) x 40.64(V) x 2.95(T) (Note1)	mm
Active Area	95.04(H) x 25.34(V)	mm
Pixel Size	198.00(H) x198.00(V)	um
Pixel Arrangement	RGB Vertical stripe	
Polarizer Surface Treatment	Anti-Glare	
Display Colors	16.7M	
Interface	24-bit RGB interface	
Driver IC	NV3047E	-
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

GND=0V, Ta=25°C

Item	Symbol	Min.	Max.	Unit
Supply Voltage	VCC	-0.3	4.6	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
Analog Operating voltage	VCC	3.0	3.3	3.6	V
Logic Low input voltage	V _{IL}	GND	-	0.3*VCC	V
Logic High input voltage	V _{IH}	0.7*VCC	-	VCC	V
Logic Low output voltage	V _{OL}	GND	-	GND+0.4	V
Logic High output voltage	V _{OH}	VCC-0.4	-	VCC	V
Current Consumption All White	I _{CC}	-	TBD	-	mA

5. Backlight Characteristic

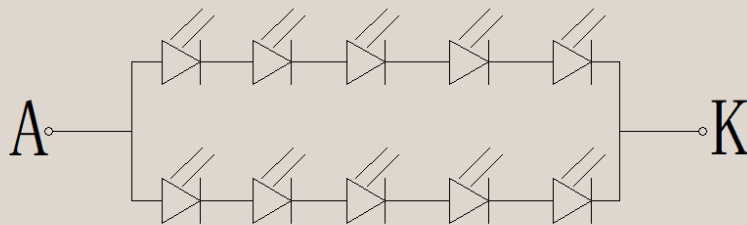
5.1. Backlight Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	V _F	Ta=25 °C, I _F =20mA/LED	13.5	14.8	16.0	V
Forward Current	I _F	Ta=25 °C, V _F =2.9V/LED	-	40	-	mA
Power dissipation	P _d		-	592	-	mW
Uniformity	Avg		-	80	-	%
LED working life(25°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 Ta=25±2 °C,60%RH±5%, I_F=20mA/LED.

5.2. Backlighting circuit



Backlight LED Circuit: $2 \times 5 = 10$ (LED)

$I_f = 40\text{mA}$; $V_f = 13.5\text{V} \sim 16.0\text{V}$

6. Optical Characteristics

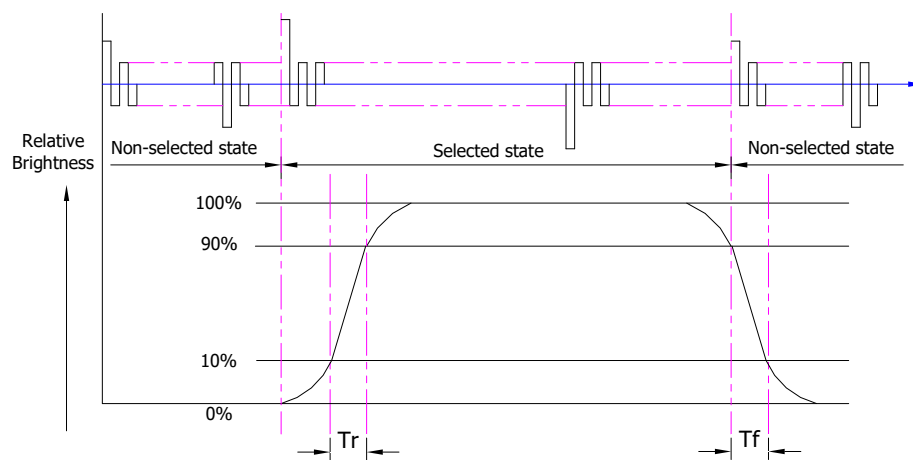
6.1. Optical Characteristics

Ta=25°C, VCC=3.3V

Backlight On (Transmissive Mode)	Item		Symbol	Condition	Specification			Unit
					Min.	Typ.	Max.	
	Luminance on TFT(I_f =20mA/LED)		Lv	Normally viewing angle $\theta_x = \phi_y = 0^\circ$	280	350	-	cd/m ²
	Contrast ratio(See 6.3)		CR		1000	1200	-	
	Response time (See 6.2)		T _R +T _F		-	30	35	ms
	Chromaticity Transmissive (See 6.5)	Red	X _R		-	TBD	-	
			Y _R		-	TBD	-	
		Green	X _G		-	TBD	-	
			Y _G		-	TBD	-	
		Blue	X _B		-	TBD	-	
			Y _B		-	TBD	-	
		White	X _W		-	TBD	-	
			Y _W		-	TBD	-	
	Viewing Angle (See 6.4)	Horizontal	θ _{x+}	Center CR≥10	80	85	-	Deg.
			θ _{x-}		80	85	-	
		Vertical	φ _{y+}		80	85	-	
			φ _{y-}		80	85	-	
NTSC Ratio(Gamut)					45	50	-	%

6.2. Definition of Response Time

6.2.1. Normally Black Type (Negative)



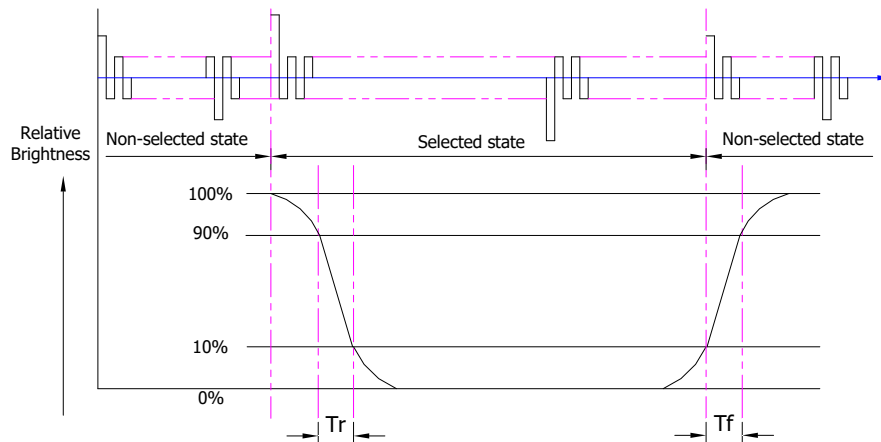
T_r is the time it takes to change from non-selected state with relative luminance 10% to selected state with relative luminance 90%;

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)



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

T_f 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

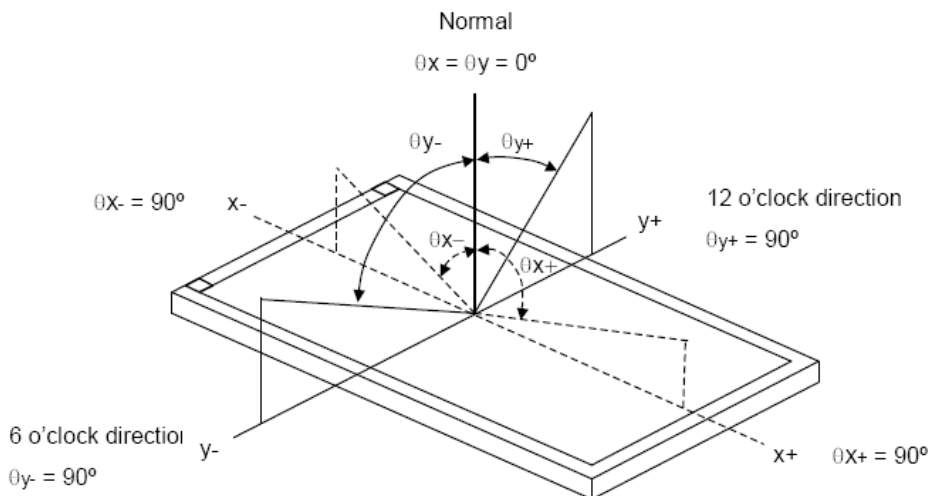
Contrast is measured perpendicular to display surface in reflective and transmissive mode.

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



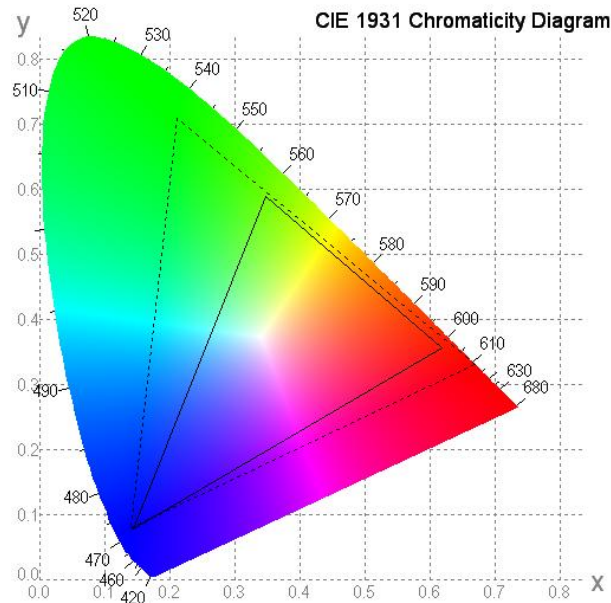
Measuring machine: LCD-5100 or EQUI

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

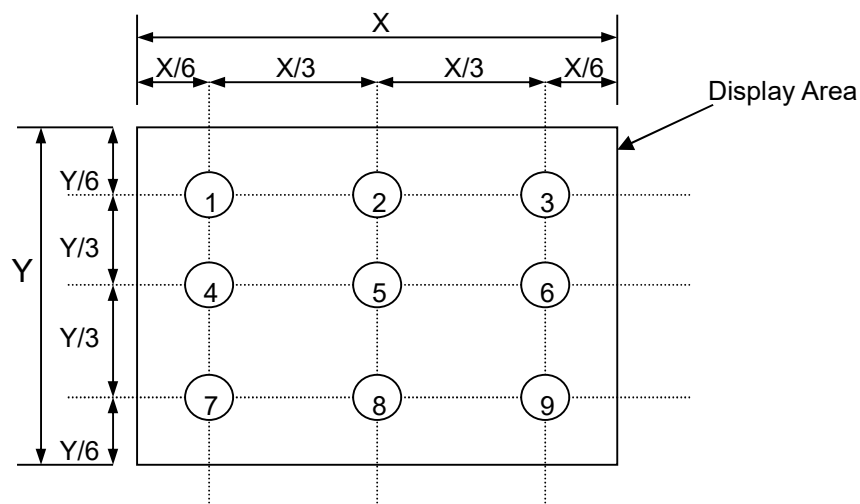
Using the transmissive mode measurement approach, measure the white screen luminance of the display panel and backlight.

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

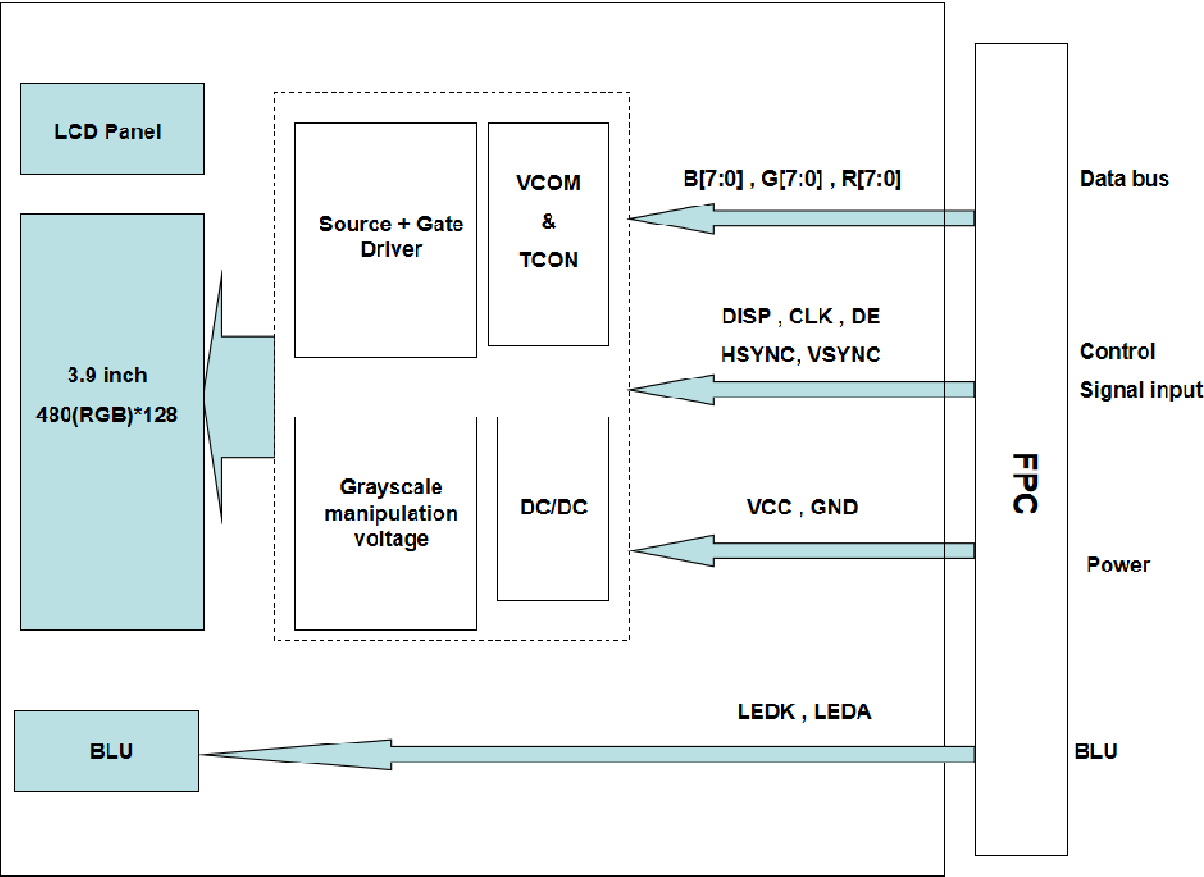
6.6.2. Uniformity = Minimal ($L_{P1}:L_{P9}$) / Maximal ($L_{P1}:L_{P9}$) * 100%

6.6.3. Transmittance = L_V on LCD / L_V on Backlight * 100%

Note: Measuring machine: BM-7



7. Block Diagram and Power Supply

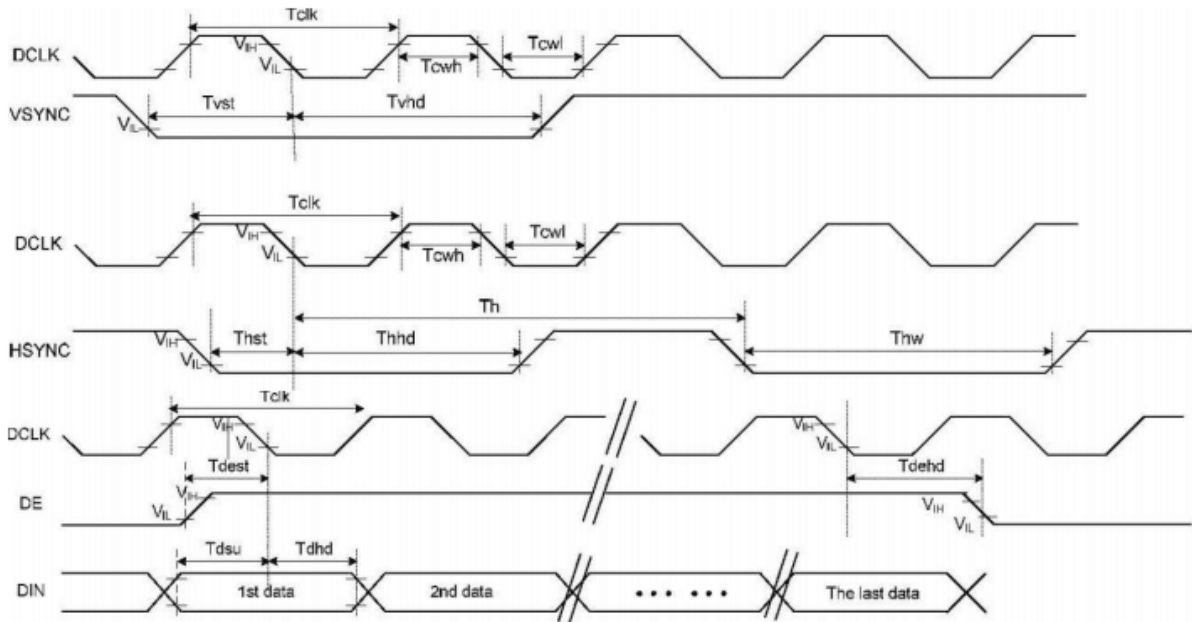


8. Interface Pins Definition

No.	Symbol	Function	Remark
1	LEDK	Backlight Cathode	
2	LEDA	Backlight Anode	
3	GND	Ground	
4	VCC	Power source	
5	R0	Red data signal	
6	R1	Red data signal	
7	R2	Red data signal	
8	R3	Red data signal	
9	R4	Red data signal	
10	R5	Red data signal	
11	R6	Red data signal	
12	R7	Red data signal	
13	G0	Green data signal	
14	G1	Green data signal	
15	G2	Green data signal	
16	G3	Green data signal	
17	G4	Green data signal	
18	G5	Green data signal	
19	G6	Green data signal	
20	G7	Green data signal	
21	B0	Blue data signal	
22	B1	Blue data signal	
23	B2	Blue data signal	
24	B3	Blue data signal	
25	B4	Blue data signal	
26	B5	Blue data signal	
27	B6	Blue data signal	
28	B7	Blue data signal	
29	GND	Ground	
30	CLK	Clock signal.	
31	DISP	Display on/off signal.DISP="H" Display on; DISP="L" Display off	
32	HSYNC	Horizontal synchronizing signal.	
33	VSYNC	Vertical synchronizing signal.	
34	DE	Input data enable control.	
35	NC	No connection	
36	GND	Ground	
37	GND	Ground	
38	GND	Ground	
39	NC	No connection	
40	NC	No connection	

9. AC Characteristics

9.1. Clock and Data Input Timing Diagram



VDD=VDDI= 3.3V, AGND= 0V

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
System operation timing						
VDD power source slew time	TPOR			20	ms	From 0V to 99% VDD
GRB pulse width	tRSTW	10	50		us	R=10Kohm, C=1uF
Input/ Output timing						
CLK pulse duty	Tcw	40	50	60	%	
Hsync width	Thw	1			DCLK	
Hsync period	Th	55	60	65	us	
Vsync setup time	Tvst	12			ns	
Vsync hold time	Tvhd	12			ns	
Hsync setup time	Thst	12			ns	
Hsync hold time	Thhd	12			ns	
Data setup time	Tdsu	12			ns	
Data hold time	Tdhd	12			ns	
DE setup time	Tdest	12			ns	
DE setup time	Tdehd	12			ns	
SD output stable time	Tst			12	us	Output settled within +20Mv Loading =6.8k+28.2pF
GD output rise and fall time	Tgst			6	us	Output settled (5%~95%), Loading = 4.7k+29.8pF

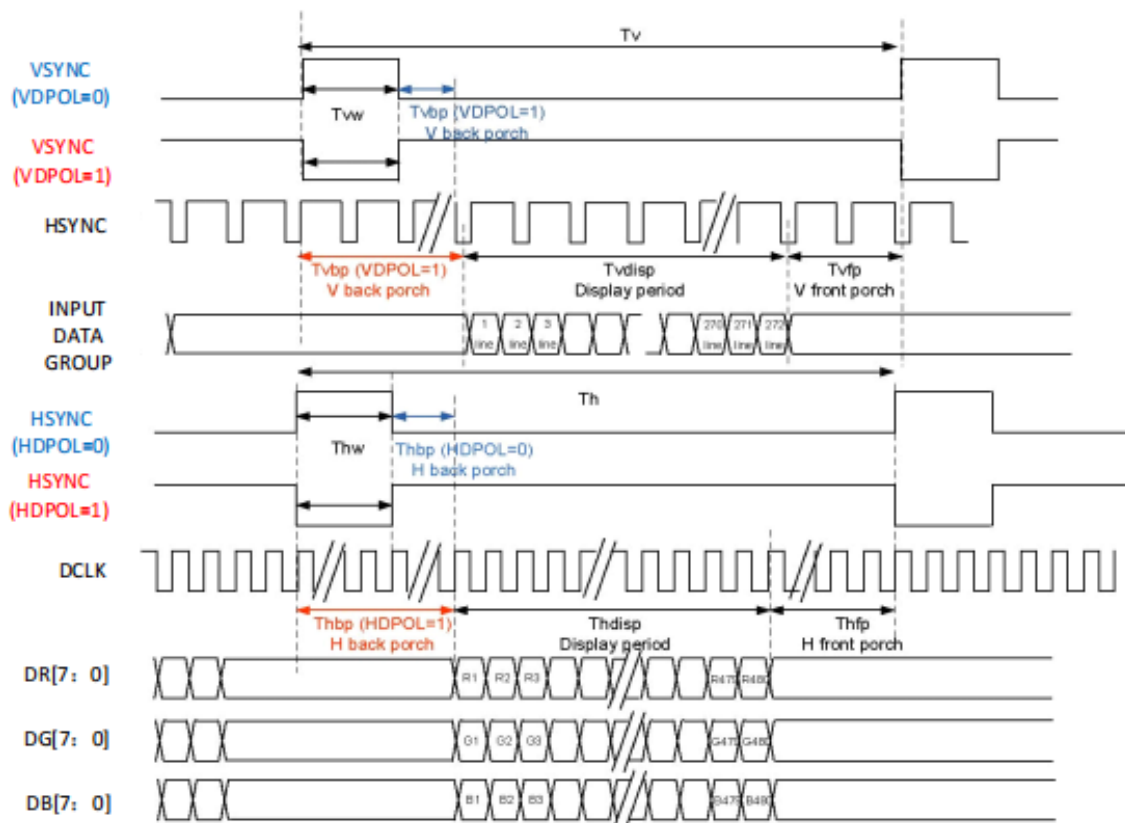
9.2. Parallel 24-bit RGB Timing Table

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK Frequency		Fclk	8	9	12	MHz	
DCLK Period		Tclk	83	111	125	ns	
Frame Rate		FR			75	Hz	
Line Period		Tlp	24			us	
HSYNC	Period Time	Th		531		DCLK	
	Display Period	Thdisp		480		DCLK	
	Back Porch	Thbp		43		DCLK	By H_Blanking setting
	Front Porch	Thfp		8		DCLK	
	Pulse Width	Thw		4		DCLK	
VSYNC	Period Time	Tv		-		H	
	Display Period	Tvdisp		128		H	
	Back Porch	Tvbp		-		H	By V_Blanking setting
	Front Porch	Tvfp		-		H	
	Pulse Width	Tvw		-		H	

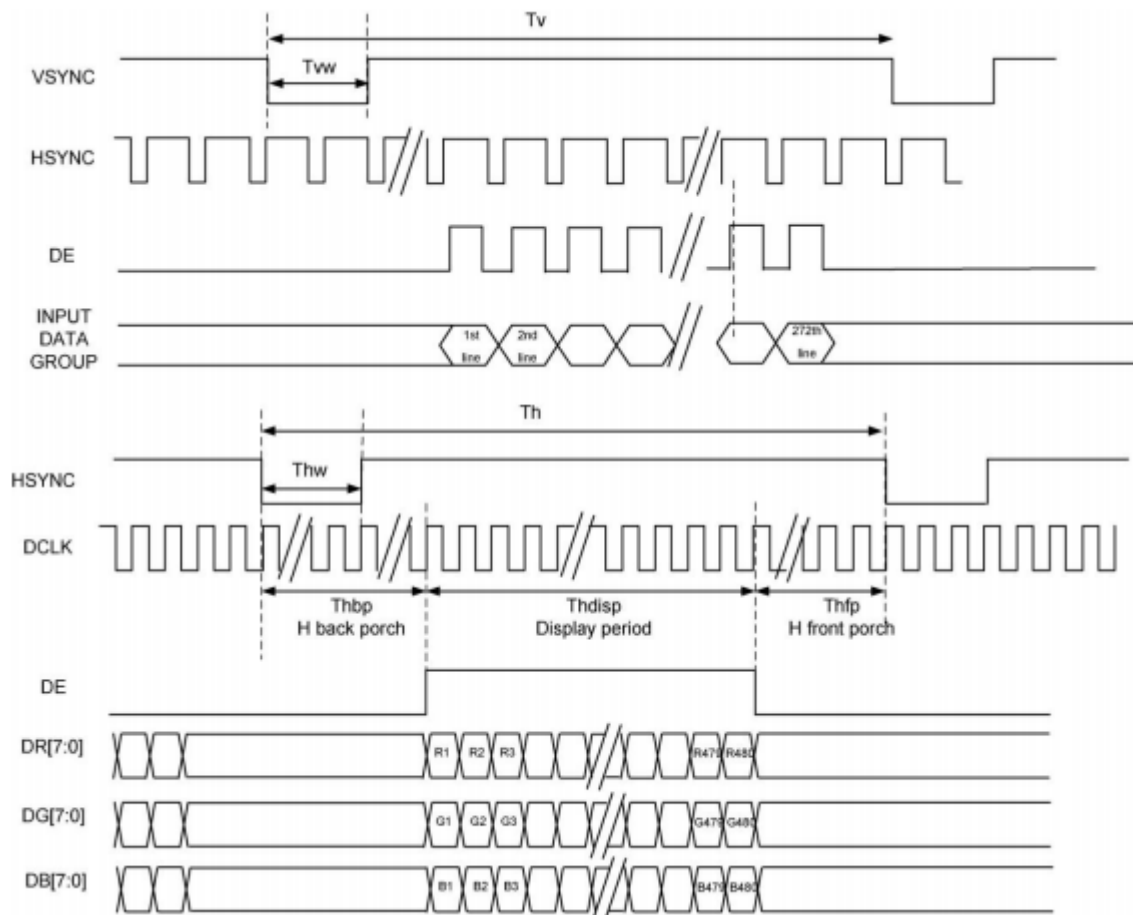
Note:

1. It is necessary to keep Tvbp=12, Tvfp=8, Twv=4 and Thbp=43, Thfp=8 Thw=4 in sync mode.
2. The Max Value and Min Value of porch must satisfy the range of Frame Rate and Line Period
3. It is necessary to keep Thbp>10, Tvbp+Tvfp<128

1) SYNC Mode Timing Diagram



2) SYNC-DE Mode Timing Diagram



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.

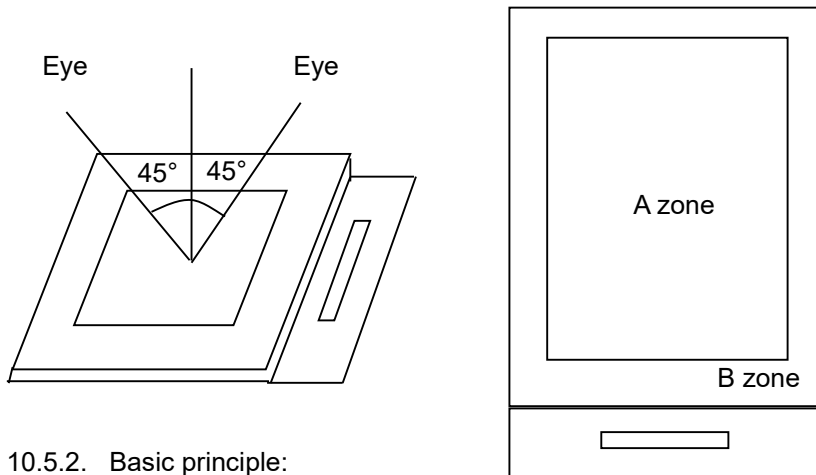
10.5.Standard of the Product Visual Inspection

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,

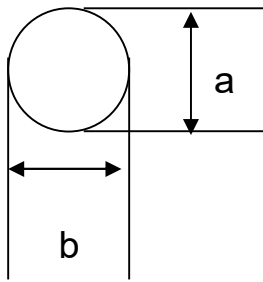


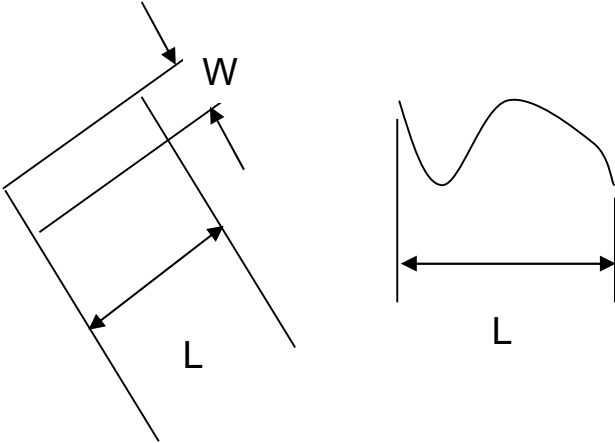
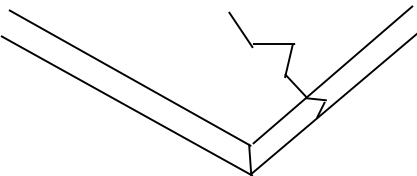
10.5.2. Basic principle:

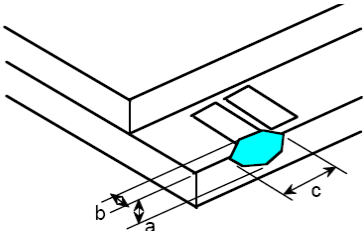
10.5.2.1. A set of sample to indicate the limit of acceptable quality level must be discussed by both us and customer when there is any dispute happened.

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

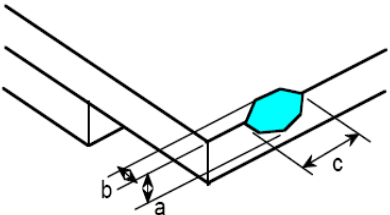
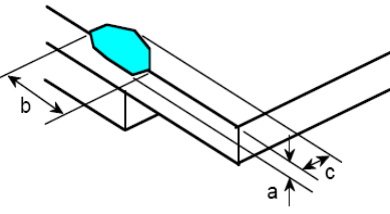
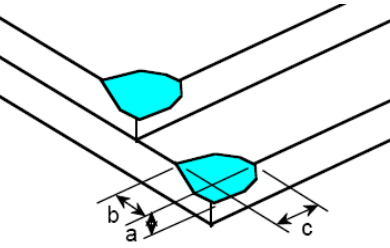
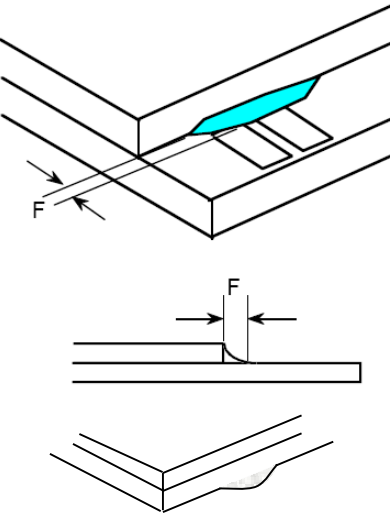
10.6. Inspection Specification

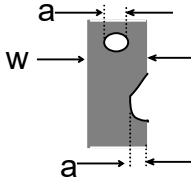
No.	Item	Criteria (Unit: mm)																		
01	Black / White spot Foreign material (Round type) Pinholes Stain Particles inside cell. (Minor defect)	 $\varphi = (a + b) / 2$	<table><tr><th>Size \ Area</th><th>Acc. Qty</th></tr><tr><td>$\varphi \leq 0.10$</td><td>Ignore</td></tr><tr><td>$0.10 < \varphi \leq 0.15$</td><td>2</td></tr><tr><td>$0.15 < \varphi \leq 0.25$</td><td>1</td></tr><tr><td>$0.25 < \varphi$</td><td>0</td></tr><tr><td>Total</td><td>2 no include $\varphi \leq 0.10$</td></tr></table>	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 $\varphi \leq 0.10$																			
		Distance between 2 defects should more than 3mm apart.																		
02	Electrical Defect (Minor defect)	<table><tr><td></td><td>Display Area</td><td>Total</td><td rowspan="4">Note1</td></tr><tr><td>Bright dot</td><td>0</td><td>0</td></tr><tr><td>Dark dot</td><td>$N \leq 2$</td><td>$N \leq 2$</td></tr><tr><td>Total dot</td><td>$N \leq 2$</td><td>$N \leq 2$</td></tr><tr><td>Mura</td><td colspan="2">Not visible through 5% ND filters.</td><td>Note2</td></tr></table>			Display Area	Total	Note1	Bright dot	0	0	Dark dot	$N \leq 2$	$N \leq 2$	Total dot	$N \leq 2$	$N \leq 2$	Mura	Not visible through 5% ND filters.		Note2
			Display Area	Total	Note1															
Bright dot	0	0																		
Dark dot	$N \leq 2$	$N \leq 2$																		
Total dot	$N \leq 2$	$N \leq 2$																		
Mura	Not visible through 5% ND filters.		Note2																	
		Remark: 1. Bright dot caused by scratch and foreign object accords to item 1.																		

03	Black and White line Scratch Foreign material (Line type) (Minor defect)	 <table border="1"> <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> Distance between 2 defects should more than 3mm apart. Scratches not viewable through the back of the display are acceptable.	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)	 Crack is potential to enlarge, any type is not allowed.																		

05	Glass Chipping Pad Area: (Minor defect)	
		

Length and Width	Acc. Qty
$c > 3.0, b < 1.0$	1
$c < 3.0, b < 1.0$	3
$a < \text{Glass Thickness}$	

06	Glass Chipping Rear of Pad Area: (Minor defect) 	<table><tr><th>Length and Width</th><th>Acc. Qty</th></tr><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">$a < \text{Glass Thickness}$</td></tr></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											
$a < \text{Glass Thickness}$												
07	Glass Chipping Except Pad Area: (Minor defect) 	<table><tr><th>Length and Width</th><th>Acc. Qty</th></tr><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">$a < \text{Glass Thickness}$</td></tr></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											
$a < \text{Glass Thickness}$												
08	Glass Corner Chipping: (Minor defect) 	<table><tr><th>Length and Width</th><th>Acc. Qty</th></tr><tr><td>$c < 3.0, b < 3.0$</td><td>Ignore</td></tr><tr><td colspan="2">$a < \text{Glass Thickness}$</td></tr></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											
$a < \text{Glass Thickness}$												
09	Glass Burr: (Minor defect) 	<table><tr><th>Length</th><th>Acc. Qty</th></tr><tr><td>$F < 1.0$</td><td>Ignore</td></tr></table> Glass burr don't affect assemble and module dimension.	Length	Acc. Qty	$F < 1.0$	Ignore						
Length	Acc. Qty											
$F < 1.0$	Ignore											

10	FPC Defect: (Minor defect) 	10.1 Dent, pinhole width $a < w/3$. (w: circuitry width.) 10.2 Open circuit is unacceptable. 10.3 No oxidation, contamination and distortion.										
11	Bubble on Polarizer (Minor defect)	<table><tr><th>Diameter</th><th>Acc. Qty</th></tr><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>$0.30 < \varphi \leq 0.50$</td><td>1</td></tr><tr><td>$0.50 < \varphi$</td><td>None</td></tr></table>	Diameter	Acc. Qty	$\varphi \leq 0.20$	Ignore	$0.20 < \varphi \leq 0.30$	4	$0.30 < \varphi \leq 0.50$	1	$0.50 < \varphi$	None
Diameter	Acc. Qty											
$\varphi \leq 0.20$	Ignore											
$0.20 < \varphi \leq 0.30$	4											
$0.30 < \varphi \leq 0.50$	1											
$0.50 < \varphi$	None											
12	Dent on Polarizer (Minor defect)	<table><tr><th>Diameter</th><th>Acc. Qty</th></tr><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>$0.30 < \varphi \leq 0.50$</td><td>1</td></tr><tr><td>$0.50 < \varphi$</td><td>None</td></tr></table>	Diameter	Acc. Qty	$\varphi \leq 0.20$	Ignore	$0.20 < \varphi \leq 0.30$	4	$0.30 < \varphi \leq 0.50$	1	$0.50 < \varphi$	None
Diameter	Acc. Qty											
$\varphi \leq 0.20$	Ignore											
$0.20 < \varphi \leq 0.30$	4											
$0.30 < \varphi \leq 0.50$	1											
$0.50 < \varphi$	None											
13	Bezel	13.1 No rust, distortion on the Bezel. 13.2 No visible fingerprints, stains or other contamination.										
14	PCB	14.1 No distortion or contamination on PCB terminals. 14.2 All components on PCB must same as documented on the BOM/component layout. 14.3 Follow IPC-A-600F.										
15	Soldering	Follow IPC-A-610C standard										
16	Electrical Defect (Major defect)	The below defects must be rejected. 16.1 Missing vertical / horizontal segment, 16.2 Abnormal Display. 16.3 No function or no display. 16.4 Current exceeds product specifications. 16.5 LCD viewing angle defect. 16.6 No Backlight. 16.7 Dark Backlight. 16.8 Touch Panel no function.										

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.

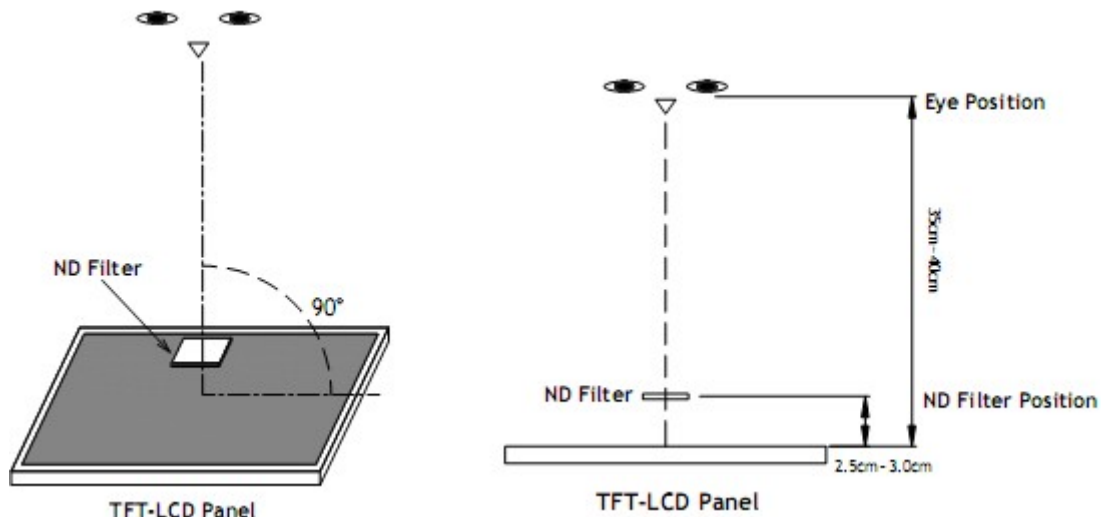
10.9. Packing

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℃, 96Hrs	2	GB/T2423.2-2008
2	Low Temperature Operating	-20℃, 96Hrs	2	GB/T2423.1-2008
3	High Humidity Storage	50℃, 90%RH, 96Hrs	2	GB/T2423.3-2016
4	High Temperature Storage	80℃, 96Hrs	2	GB/T2423.2-2008
5	Low Temperature Storage	-30℃, 96Hrs	2	GB/T2423.1-2008
6	Thermal Cycling Test Storage	-20℃, 60min~70℃, 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.	-	GB/T5170.14-2009
8	Electrical Static Discharge	Air: $\pm 4\text{KV}$ 150pF/330 Ω 5 times Contact: $\pm 2\text{KV}$ 150pF/330 Ω 5 times	2	GB/T17626.2-2018
9	Drop Test (Packaged)	Height:80 cm,1 corner, 3 edges, 6 surfaces.	-	GB/T2423.7-2018

Note1. No defection 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

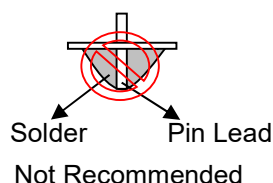
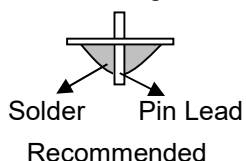
Maximum Solder Temperature: 370°C

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

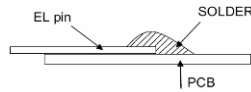
Typical Soldering Time: ≤2s

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

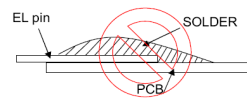
- 12.4.2.4. No horizontal press on the EL leads during soldering.

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

12.4.2.6. Solder Wetting

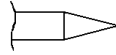


Recommended

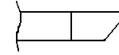


Not Recommended

12.4.2.7. The type of the solder iron:

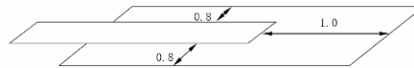


Recommended



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 will 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

