PRODUCT SPECIFICATION

■ Tentative Specification
□ Preliminary Specification
□ Approval Specification

MODELNAME:X056TN53V.1

Version:R02

Customer: Common

APPROVED BY **SIGNATURE**

Name / Title
Note

Please return 1 copy for your confirmation with your signature and comments.

Approved By	Checked By	Prepared By

Revision History

Revision	Date	Originator	Detail	Remarks
1.0	2024-7-8		Initial Release	

Table of Contents

1. General Description

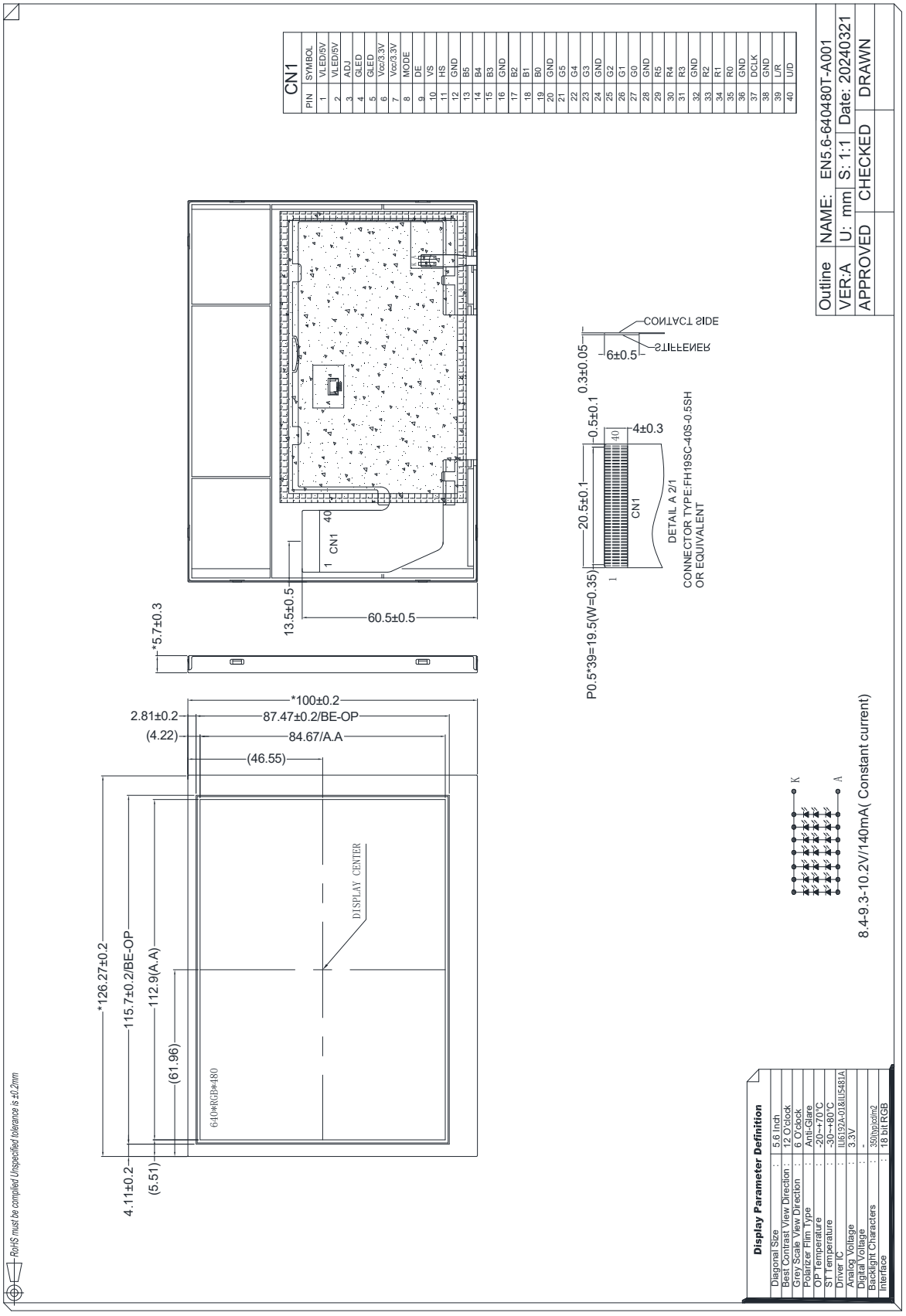
The specification is a transmissive type color active matrix liquid crystal display (LCD) which uses amorphous thin film transistor (TFT) as switching devices. This product is composed of a TFT-LCD panel, driver Ics and a backlight unit.

2. Module Parameter

Features	Details	Unit
Display Size(Diagonal)	5.6”	
LCD type	TN TFT	
Display Mode	Transmissive / Normally White	
Resolution	640 RGB x 480	Pixels
View Direction	12 O’CLOCK	Best Image
Gray Scale Inversion Direction	6 O’CLOCK	
Module Outline	126.5(H) x 100(V) x 5.7(T) (Note1)	mm
Active Area	112.896(H) x84.672(V)	mm
Pixel Size	58.8*3 x 176.4	um
Pixel Arrangement	RGB	
Polarizer Surface Treatment	Anti-glare	
Driver IC	ILI6192A-01&ILI5481A	
Display Colors	16.7M	
Interface	18 Bits-RGB Interface	
With or Without Touch Panel	Without	-
Operating Temperature	**-20～70**	ºC
Storage Temperature	**-30～80**	ºC
Weight	100	g

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

2.1. Outline Drawing



3. Absolute Maximum Ratings

GND=0V, Ta=25ºC

Item	Symbol	Min.	Max.	Unit
Supply Voltage	DVDD	-0.3	5.0	V
Storage temperature	T_{STG}	**-30**	**+80**	ºC
Operating temperature	T_{OP}	**-20**	**+70**	ºC

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

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

4. DC Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage	VGH	14.5	15	15.5	V
	VGL	-12.5	-12	-11.5	V
Common Electrode Driving Signal	VCOM	-0.77	-0.74	-0.71	V
Logic Low input voltage	V_{IL}	GND	-	0.3*DVDD	V
Logic High input voltage	V_{IH}	0.7*DVDD	-	DVDD	V

5. Backlight Characteristics

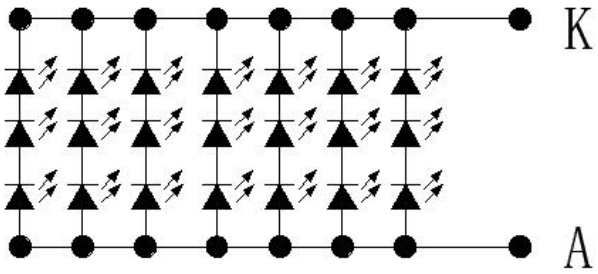
5.1. Backlight Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Backlight Voltage	V_{LEDA}	Ta=25 ºC, I_F=20mA/LED	-	**9.3**	-	V
Backlight Current	I_{LED}	Ta=25 ºC, V_F=3.1V/LED	-	**140**	-	mA
Power dissipation	P_D		-	**1302**	-	mW
VLED For LED driver	V_{LED}	Ta=25 ºC, I_F=20mA/LED		**5V**		V
Uniformity	Avg		75	80	-	%
LED working life(25℃)	-		20000	30000	-	Hrs
Drive method	Constant current					
LED Configuration	21 White LEDs(3 LEDs in one string and 7 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 ºC,60%RH±5%, I_F=20mA/LED.

Note7：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 ºC,60%RH±5%, I_F=40mA/LED.

5.2. Backlighting circuit



6. Optical Characteristics

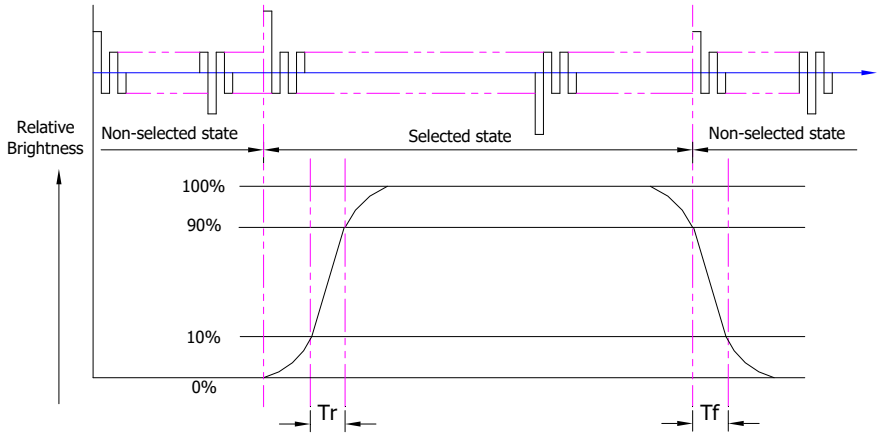
6.1. Optical Characteristics

Ta=25ºC, DVDD=3.3V

	Item		Symbol	Condition	Specification			Unit
					Min.	Typ.	Max.	
Backlight On (Transmissive Mode)	Luminance on TFT(I_f =20mA/LED)		Lv	Normally viewing angle θX = φY =0º	**300**	**350**	-	cd/m²
	Contrast ratio(See 6.3)		CR		600	1000	-	
	Response time (See 6.2)		TR+TF		-	25	50	ms
		White	Xw			-		
			Yw			-		
	Viewing Angle (See 6.4)	Horizontal	θX+	Center CR≥10	**60**	**70**	-	Deg.
			θX-		**60**	**70**	-	
		Vertical	φY+		**40**	**50**	-	
			φY-		**60**	**70**	-	
	NTSC Ratio(Gamut)				-	51.2	-	%

6.2. Definition of Response Time

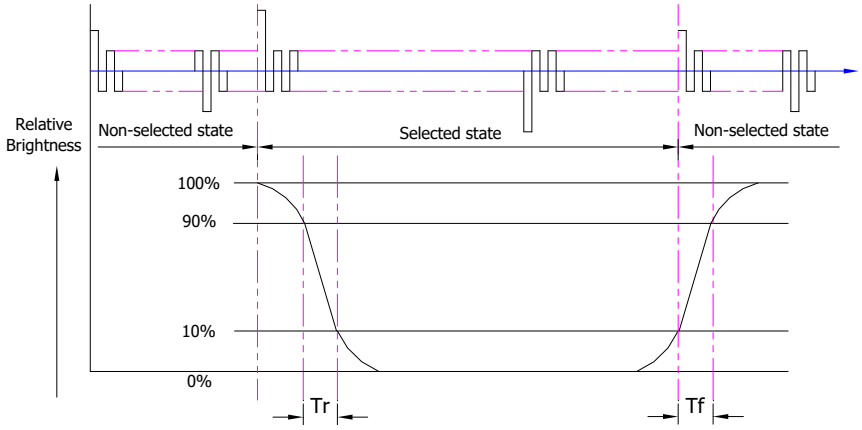
6.2.1. Normally Black Type (Negative)



Tr is the time it takes to change form non-selected stage 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 form 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

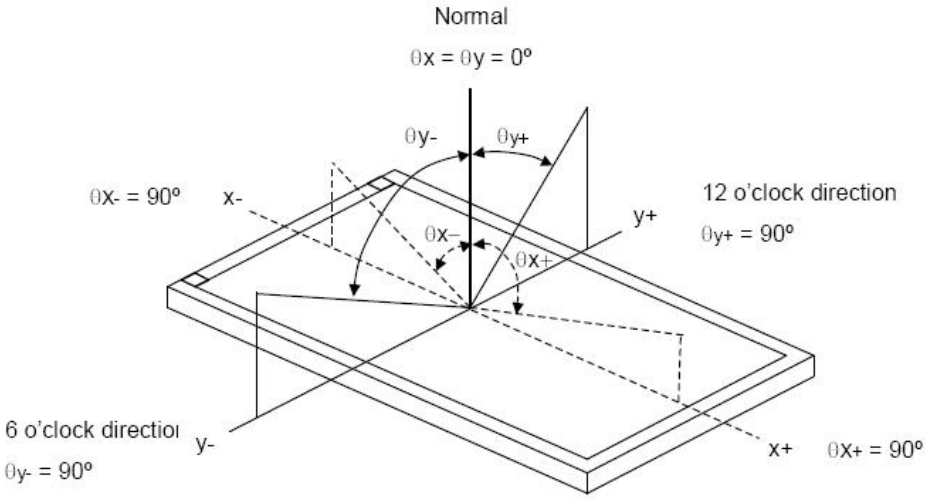
6.3. Definition of Contrast Ratio

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



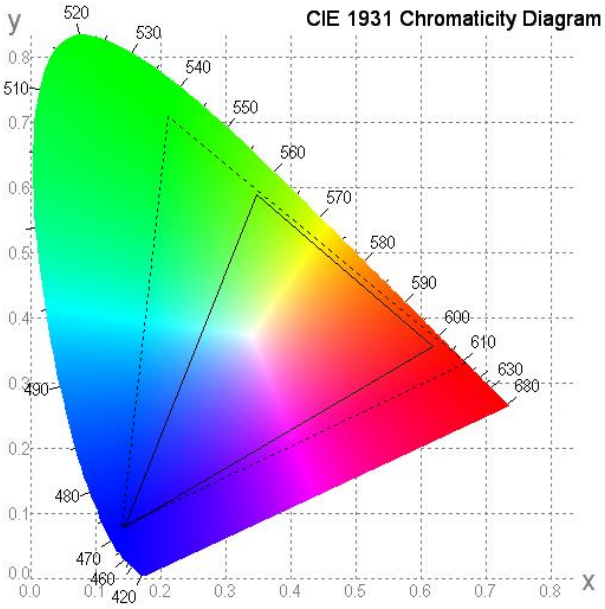
Measuring machine: LCD-5100 or EQUI

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

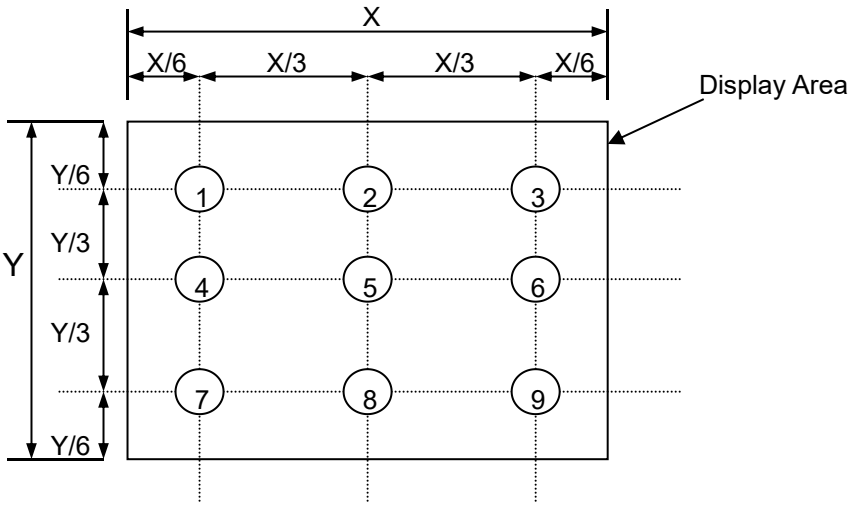
Using the transmissive mode measurement approach, measure the white screen luminance of the display panel and backlight.

6.6.1. Surface Luminance: L_V = 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



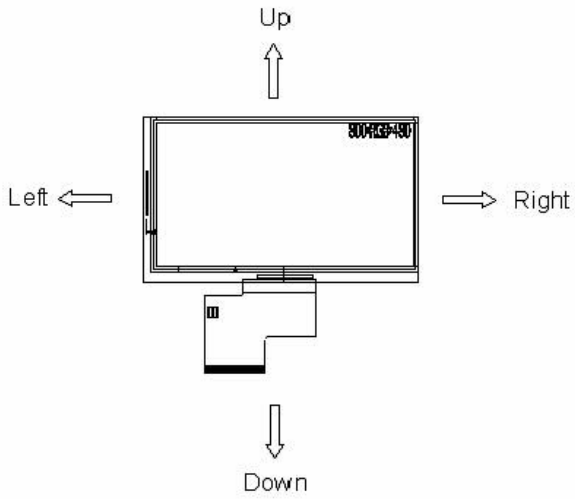
7. Interface Pins Definition

No.	Symbol	Function	Remark
1	VLED	Power Voltage for LED circuit /5V	
2	VLED	Power Voltage for LED circuit/5V	
3	ADJ	Adjust the LED brightness with PWM Pulse	
4	GLED	Ground for LED circuit	
5	GLED	Ground for LED circuit	
6	VCC	Power Voltage for digital circuit/3.3V	
7	VCC	Power Voltage for digital circuit/3.3V	
8	MODE	DE or HV mode control	
9	DE	Data enable	
10	VS	Vsync signal input	
11	HS	Hsync signal input	
12	GND	Power ground	
13	B5	Blue data input (MSB)	
14	B4	Blue data input	
15	B3	Blue data input	
16	GND	Power ground	
17	B2	Blue data input	
18	B1	Blue data input	
19	B0	Blue data input(LSB)	
20	GND	Power ground	
21	G5	Green data input(MSB)	
22	G4	Green data input	
23	G3	Green data input	
24	GND	Power ground	
25	G2	Green data input	
26	G1	Green data input	
27	G0	Green data input(LSB)	
28	GND	Power ground	
29	R5	Red data input(MSB)	
30	R4	Red data input	
31	R3	Red data input	
32	GND	Power ground	
33	R2	Red data input	
34	R1	Red data input	
35	R0	Red data input(LSB)	
36	GND	Power ground	
37	DCLK	Sample clock	
38	GND	Power ground	
39	L/R	Select left to right scanning direction	
40	U/D	Select up or down scanning direction	

Setting of scan control input		Scanning direction
U/D	L/R	
DVDD	DVDD	Up to down, left to right
GND	GND	Down to up, right to left
DVDD	GND	Up to down, right to left
GND	DVDD	Down to up, left to right

Note 1: Definition of scanning direction.

Refer to the figure as follow:



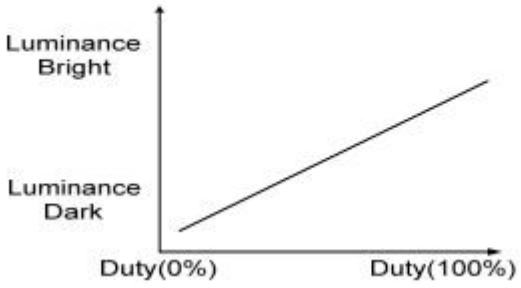
Note 2: Global reset pin. Active low to enter reset state. Suggest to connect with and RC reset circuit for stability. Normally pull high.

Note 3:

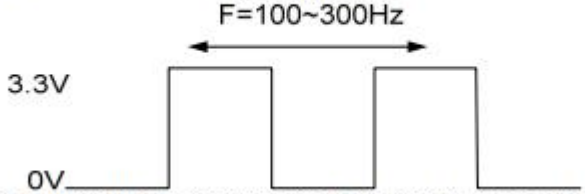
HV Mode, Mode="H", DE floating

DE Mode. Mode="L" and HS floating and VS floating

Note1: Pin.3 is used to adjust brightness.



Note 2:ADJ signal=0~3.3V,operation frequency:100~300Hz



8. AC Characteristics

8.1. Timing Characteristics of input signals

Horizontal input timing diagram

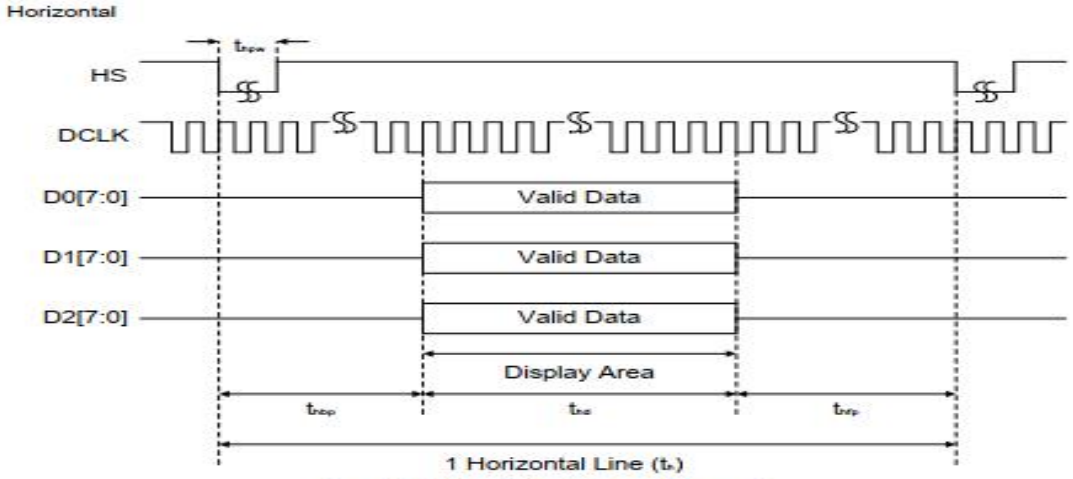


Figure 42 Horizontal input timing at sync mode.

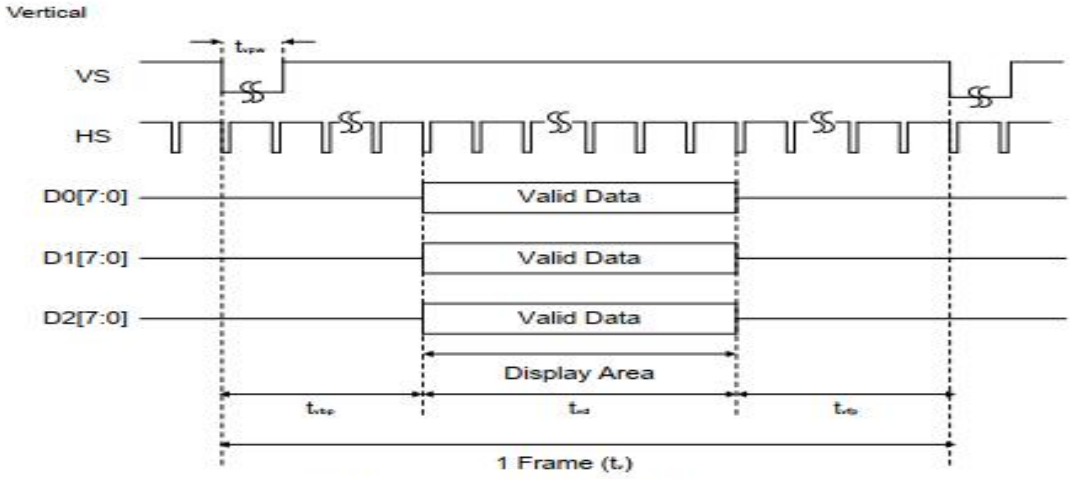


Figure 43 Vertical input timing at sync mode.

640RGB X 480 Resolution Timing Table

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK Frequency		Fclk	18.4	20	23.4	MHz	
DCLK Period		Tclk	55	50	42	ns	
HSYNC	Period Time	Th	486	680	598	DCLK	
	Display Period	Thdisp	-	640	-	DCLK	
	Back Porch	Thbp	3	4	5	DCLK	By H_BLANKING setting
	Front Porch	Thfp	20	24	30	DCLK	
	Pulse Width	Thw	10	12	13	DCLK	
VSYNC	Period Time	Tv	133	493	321	HSYNC	
	Display Period	Tvdisp	-	480	-	HSYNC	
	Back Porch	Tvbp	2	2	2	HSYNC	By V_BLANKING setting
	Front Porch	Tvfp	7	8	10	HSYNC	
	Pulse Width	Tvw	3	3	3	HSYNC	

8.1.5 Parallel RGB at DE only mode

It just needs DE signal only, when DE only mode enable.

Horizontal

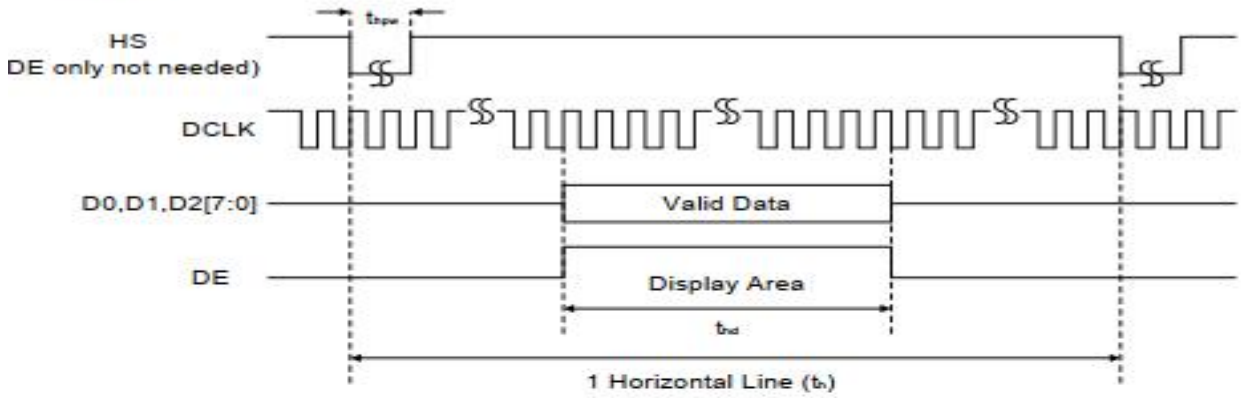


Figure 44 Horizontal input timing at DE mode.

Vertical

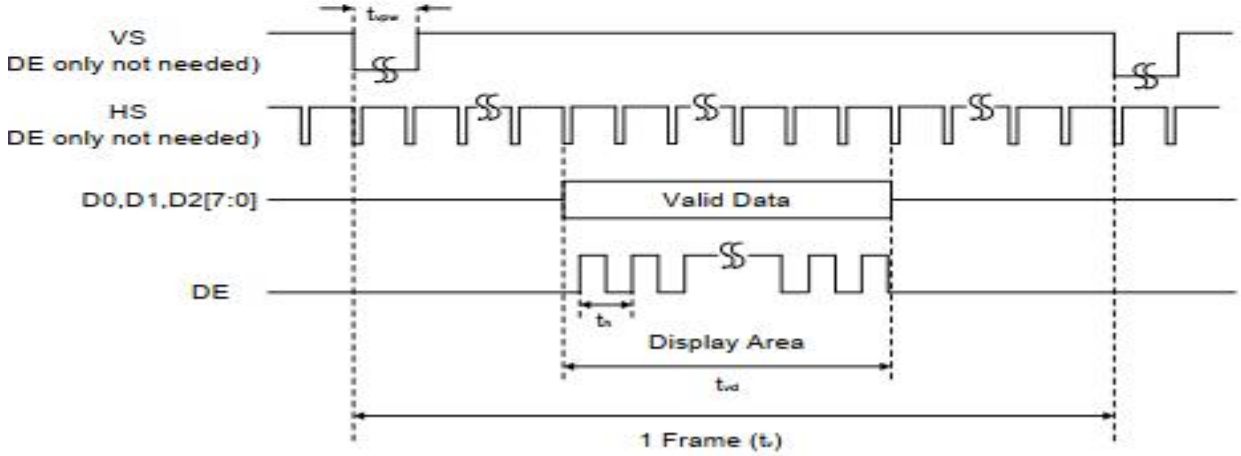


Figure 45 Vertical input timing at DE mode.

640RGB X 480 Resolution Timing Table

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK Frequency		Fclk	18.4	20	23.4	MHz	
DCLK Period		Tclk	55	50	42	ns	
HSYNC	Period Time	Th	486	680	598	DCLK	
	Display Period	Thdisp	-	640	-	DCLK	
	Back Porch	Thbp	3	4	5	DCLK	By H_BLANKING setting
	Front Porch	Thfp	20	24	30	DCLK	
	Pulse Width	Thw	10	12	13	DCLK	
VSYNC	Period Time	Tv	133	493	321	HSYNC	
	Display Period	Tvdisp	-	480	-	HSYNC	
	Back Porch	Tvbp	2	2	2	HSYNC	By V_BLANKING setting
	Front Porch	Tvfp	7	8	10	HSYNC	
	Pulse Width	Tvw	3	3	3	HSYNC	

8.2. POWER ON/OFF SEQUENCE

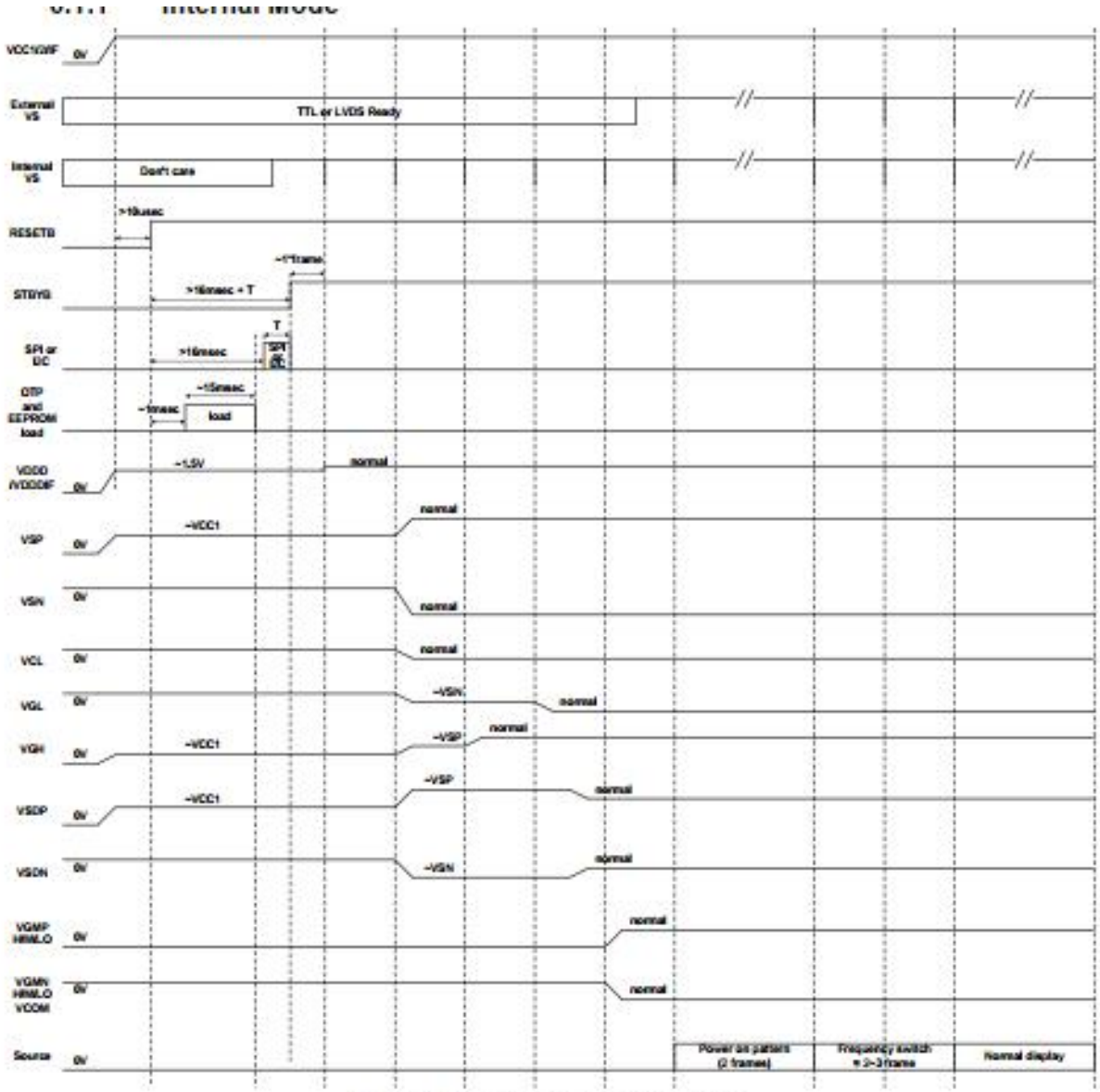


Figure 22 Power on sequence Internal mode.

Note: If VSP and VSN are generated by PFM circuits.

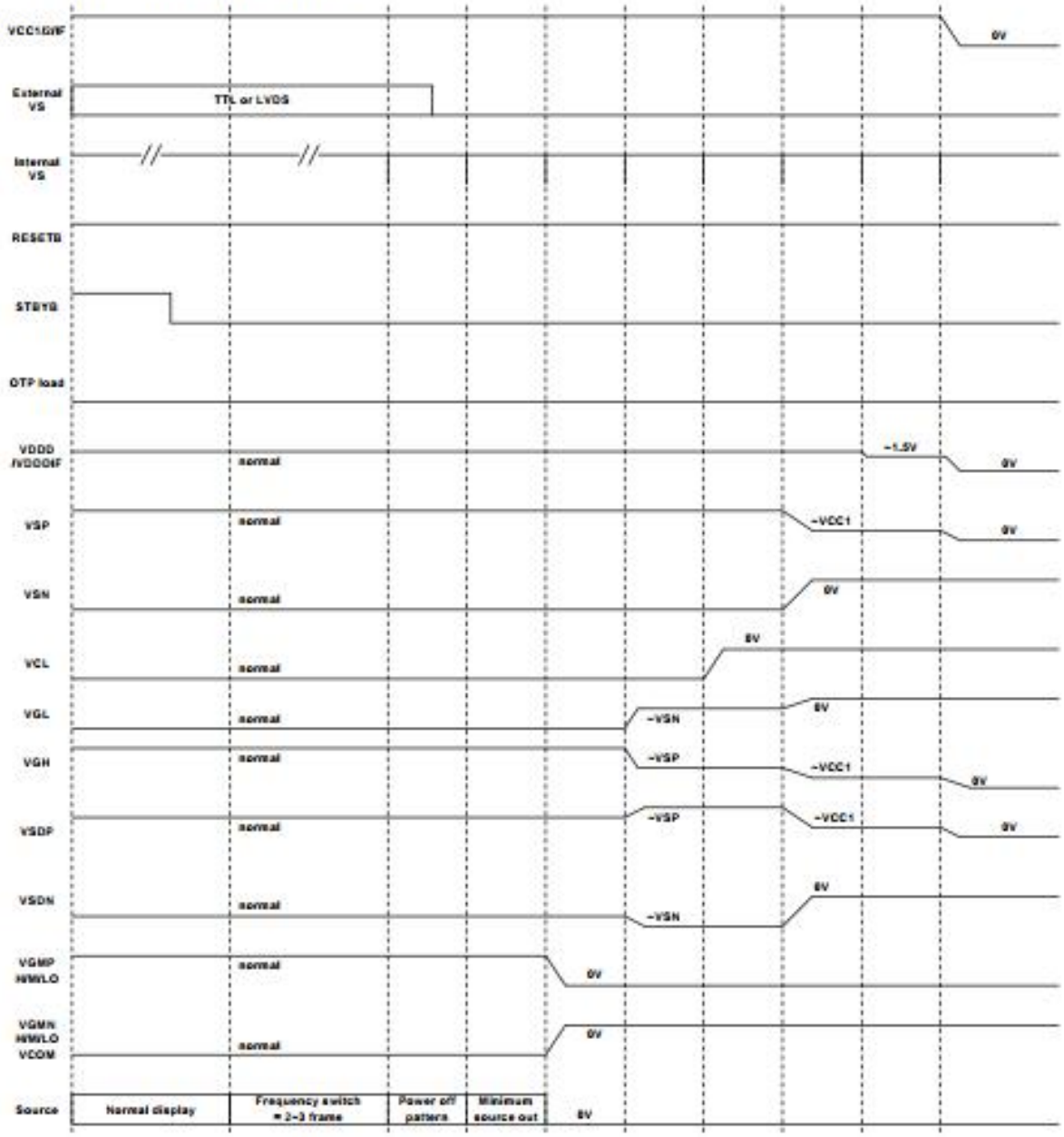


Figure 24 Power off sequence Internal mode.

Note: If VSP and VSN are generated by PFM circuits.

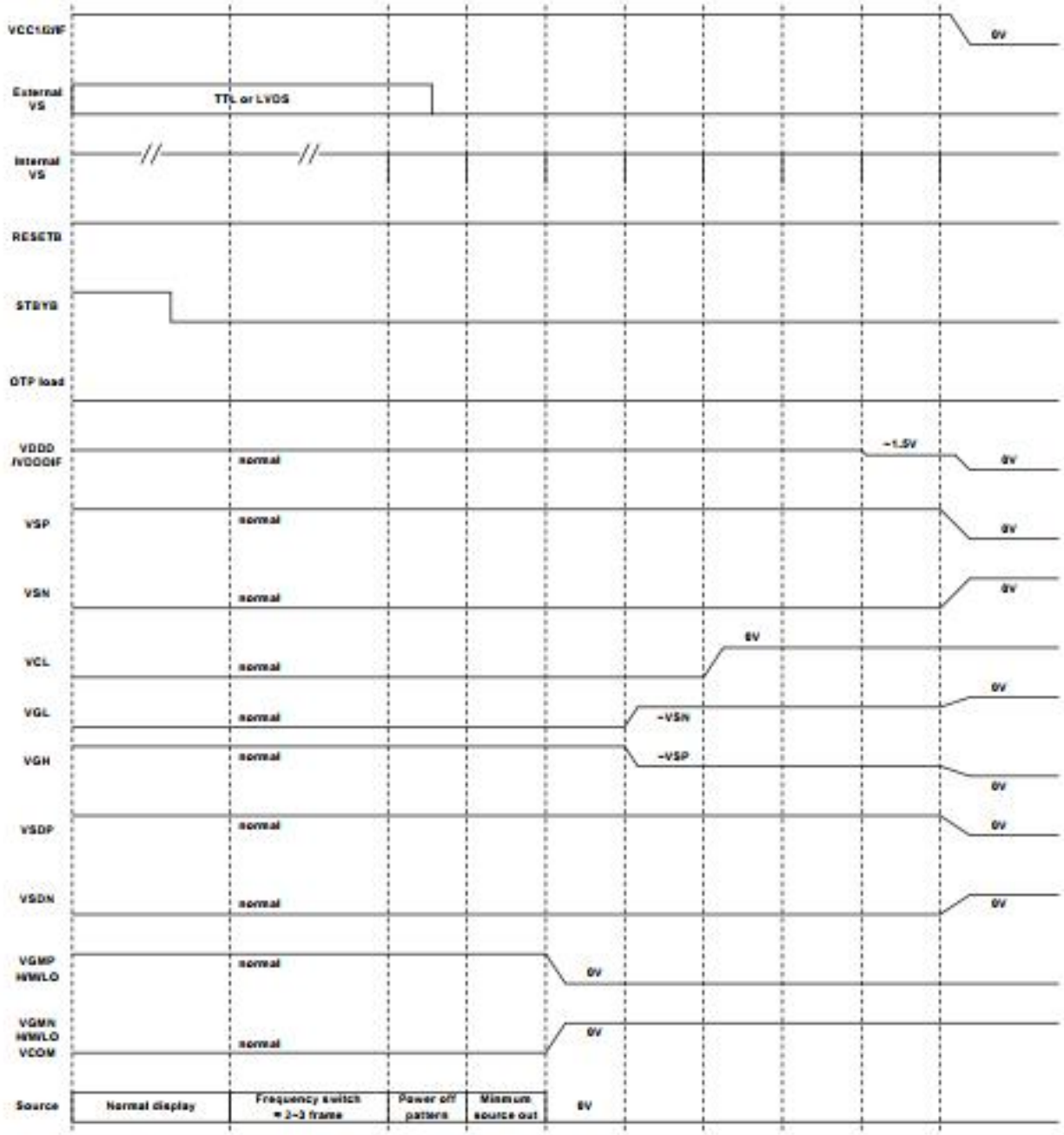


Figure 25 Power off sequence external mode.

Note: If VSP=VSDP and VSN=VSDN by external power supply, VGH and VGL generated by internal charge pump circuits.

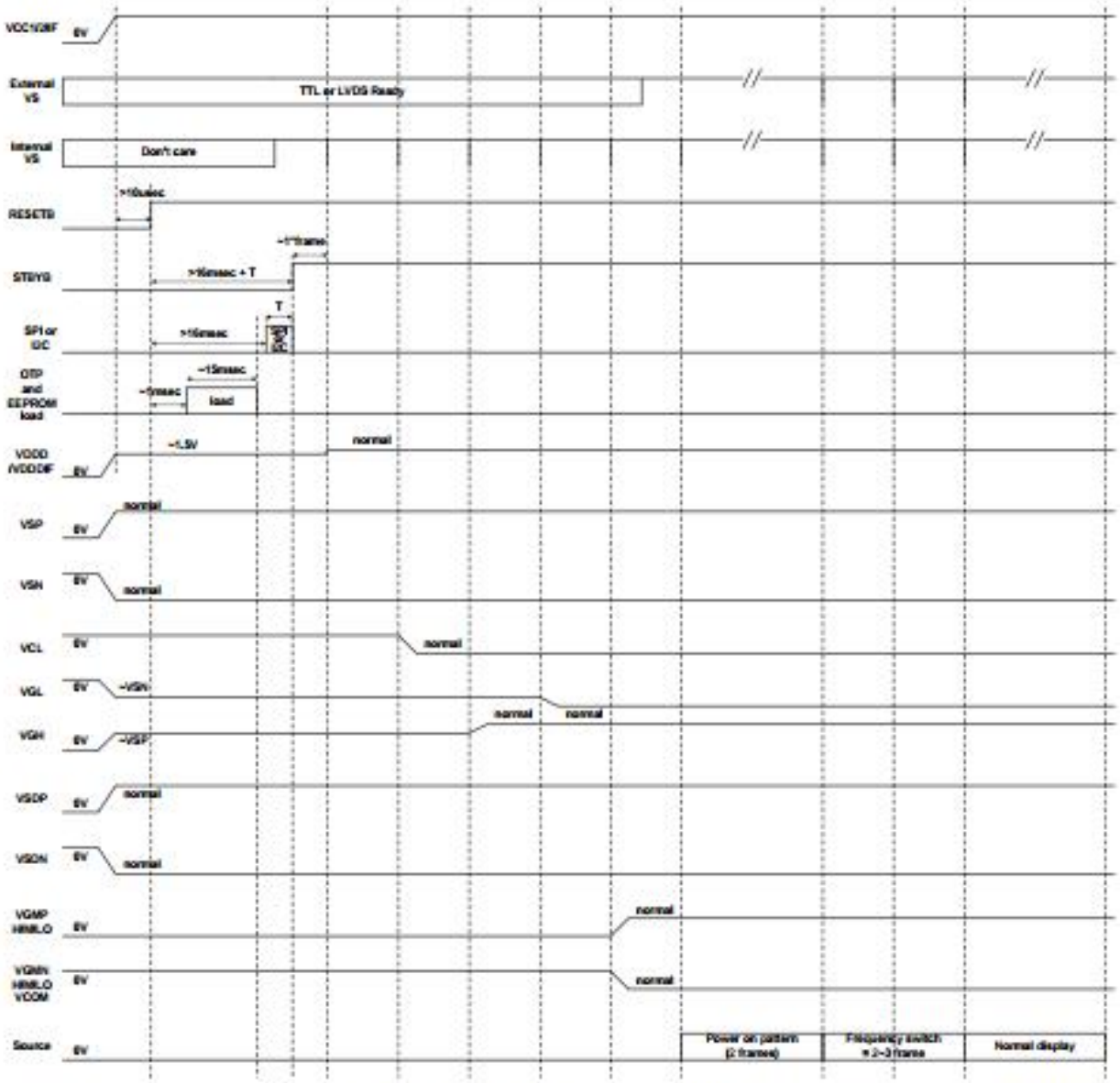


Figure 23 Power on sequence external mode.

Note: If VSP=VSDP and VSN=VSDN by external power supply, VGH and VGL generated by internal charge pump circuits.

9. Quality Assurance

9.1. Purpose

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

9.2. Standard for Quality Test

9.2.1. Sampling Plan:

GB2828.1-2012

Single sampling, general inspection level II

9.2.2. Sampling Criteria:

Visual inspection: AQL 1.5

Electrical functional: AQL 0.65.

9.2.3. Reliability Test:

Detailed requirement refer to Reliability Test Specification.

9.3. Nonconforming Analysis & Disposition

9.3.1. Nonconforming analysis:

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

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

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

9.3.2. Disposition of nonconforming:

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

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

9.4. Agreement Items

Shall negotiate with customer if the following situation occurs:

9.4.1. There is any discrepancy in standard of quality assurance.

9.4.2. Additional requirement to be added in product specification.

9.4.3. Any other special problem.

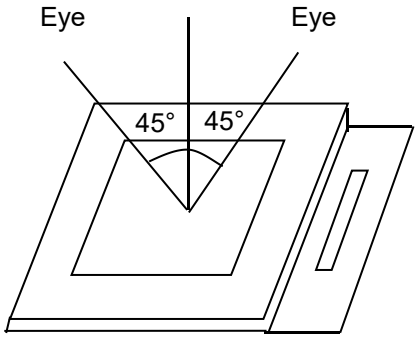
9.5. Standard of the Product Visual Inspection

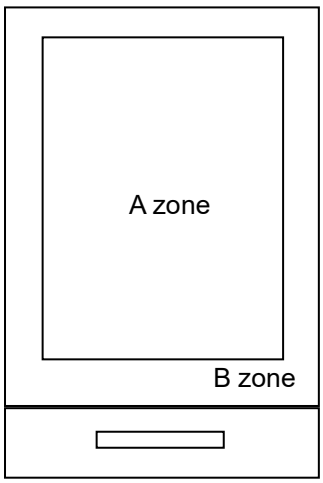
9.5.1. Appearance inspection:

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

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

9.5.1.3. Definition of area: A Zone: Active Area, B Zone: Viewing Area,





9.5.2. Basic principle:

9.5.2.1. 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.

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

9.6. Inspection Specification

Inspection Specification These inspection standards shall be applied to LCD Module supplied by INNOLUX Optoelectronics Corporation. This model is only used in CE product, if it is used in other product applications; it still adopts this copy of specification. If there are any other product applications such as handwriting recognition, Industrial use, Medical use, Aerospace usage and so on, the specifications should be negotiated separately.

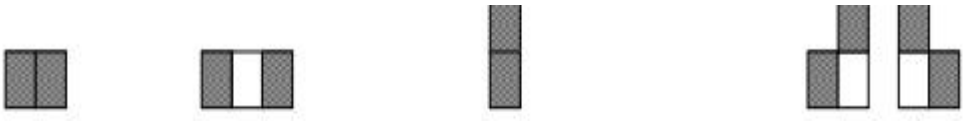
01 Definition of dot defect induced from the panel inside

a) Bright dot：Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern.

b) Dark dot：Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green, blue picture.

c) 2 dot adjacent = 1 pair = 2 dots

Picture:



2 dot adjacent　2 dot adjacent　2 dot adjacent (vertical)　2 dot adjacent(slant)

No.	Display Inspection		
02	Items		Criteria (Unit: mm)
	Bright dot	Random	N ≦3
		2 dots adjacent	N ≦ 0
		3 dots adjacent	N ≦ 0
	Dark dot	Random	N ≦ 4
		2 dots adjacent	N ≦ 0
		3 dots adjacent	N ≦ 0
	Total bright dot and dark dot		N ≦ 4

	Distance	Minimum Distance Between dark dots Minimum Distance Between dark and bright dots	5mm
Tiny bright dot			visible through 6% ND filter D≦0.3mm，Ignore 0.3mm＜D≦0.5mm，N≦34 Distance≧5mmm
Display failure（V-line/Cross line etc)			
Mura/Waving/Hot spot		Not visible through 5% ND filter in 50% gray or judge by limit sample if necessary	

*Note: Defect which is on the Black Matrix (outside of Active Area) are not considered as a defect.

No.	Appearance & Display inspection	
03	**Items**	**Criteria (Unit: mm)**
	Foreign Black/White/Bright Spot (Display & Appearance)	D≦0.3mm，Ignore, 0.25mm＜D≦0.5mm，N≦4 Distance≧5mm,It is shown in Fig. 2.
	Foreign Black/White/Bright Line (Display & Appearance)	W≦0.05 mm，Ignore 0.05＜W≦0.1mm　L≦5.0 mm，N≦4 It is shown in Fig. 3.
	Polarizer Dent/Air Bubble	D≦0.3mm，Ignore 0.3mm＜D≦0.5mm，N≦4 Distance≧5mm
	Polarizer Scratches	W≦0.07mm，Ignore 0.07＜W≦0.1mm L≦5.0 mm，N≦4

Notes: If any specific defect is not included in the above defect table, this defect should be judged by INX/ODM/Brand customer discussion.

1. W：Width　　3. D：Average Diameter
2. L：Length　　4. N：Count

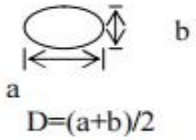
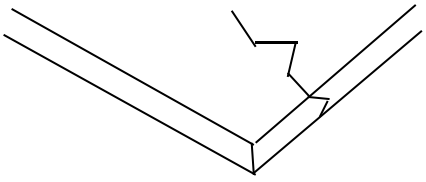
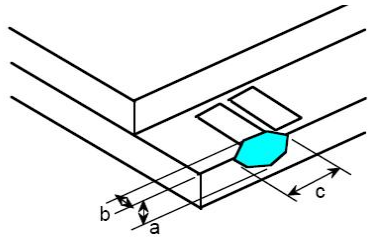
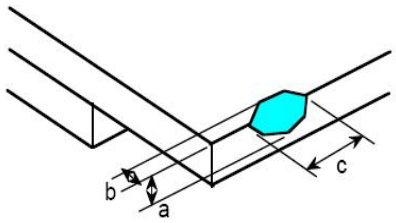
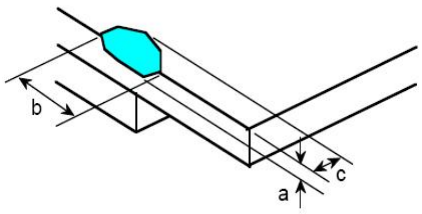
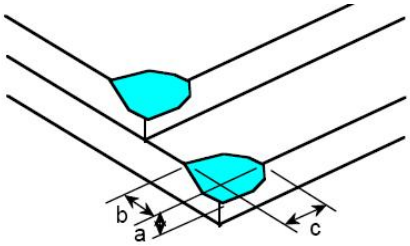
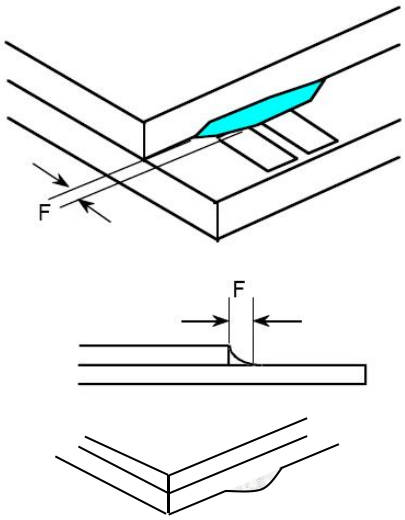


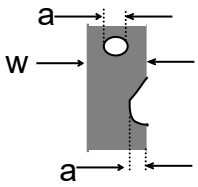
Fig. 2

Fig. 3

No.	Item	Criteria (Unit: mm)
04	Glass Crack (Minor defect)	 Crack is potential to enlarge, any type is not allowed.

<table>
<tr><td></td><td></td><td></td></tr>
<tr><td>05</td><td>Glass Chipping Pad Area:
(Minor defect)
 
</td><td><table><tr><td>Length and Width</td><td>Acc. Qty</td></tr><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<Glass Thickness</td></tr></table></td></tr>
<tr><td>06</td><td>Glass Chipping Rear of Pad Area:
(Minor defect)
 
</td><td><table><tr><td>Length and Width</td><td>Acc. Qty</td></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<Glass Thickness</td></tr></table></td></tr>
<tr><td>07</td><td>Glass Chipping Except Pad Area:
(Minor defect)
 
</td><td><table><tr><td>Length and Width</td><td>Acc. Qty</td></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<Glass Thickness</td></tr></table></td></tr>
<tr><td>08</td><td>Glass Corner Chipping:
(Minor defect)
 
</td><td><table><tr><td>Length and Width</td><td>Acc. Qty</td></tr><tr><td>c < 3.0, b< 3.0</td><td>Ignore</td></tr><tr><td colspan="2">a<Glass Thickness</td></tr></table></td></tr>
</table>

<table>
<tr>
<td>09</td>
<td>Glass Burr:
(Minor defect)
 

</td>
<td><table><tr><td>Length</td><td>Acc. Qty</td></tr><tr><td>F < 1.0</td><td>Ignore</td></tr></table>
Glass burr don’t affect assemble and module dimension.</td>
</tr>
<tr>
<td>10</td>
<td>FPC Defect:
(Minor defect)
 
</td>
<td>10.1 Dent, pinhole width a<w/3.
(w: circuitry width.)
10.2 Open circuit is unacceptable.
10.3 No oxidation, contamination and distortion.</td>
</tr>
<tr>
<td>11</td>
<td>Bezel</td>
<td>13.1 No rust, distortion on the Bezel.
13.2 No visible fingerprints, stains or other contamination.</td>
</tr>
<tr>
<td>12</td>
<td>Touch Panel</td>
<td>D: Diameter W: width L: length
14.1 Spot: D<0.25 is acceptable
0.25≤D≤0.4
2dots are acceptable and the distance between defects should more than 10 mm.
D>0.4 is unacceptable
14.2 Dent: D>0.40 is unacceptable
14.3 Scratch: W≤0.03, L≤10 is acceptable,
0.03<W≤0.10, L≤10 is acceptable
Distance between 2 defects should more than 10 mm.
W>0.10 is unacceptable.</td>
</tr>
<tr>
<td>13</td>
<td>LCD Ripple</td>
<td>Touch the touch panel, cannot see the LCD ripple.
Pen: R 0.8mm silicon rubber.
Operation Force:120g</td>
</tr>
</table>

14	PCB	16.1 No distortion or contamination on PCB terminals. 16.2 All components on PCB must same as documented on the BOM/component layout. 16.3 Follow IPC-A-600F.
15	Soldering	Follow IPC-A-610C standard
16	Electrical Defect (Major defect)	The below defects must be rejected. 18.1 Missing vertical / horizontal segment, 18.2 Abnormal Display. 18.3 No function or no display. 18.4 Current exceeds product specifications. 18.5 LCD viewing angle defect. 18.6 No Backlight. 18.7 Dark Backlight. 18.8 Touch Panel no function.

Remark: LCD Panel Broken shall be rejected. Defect out of LCD viewing area is acceptable.

9.7. Classification of Defects

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

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

9.8. Identification/marking criteria

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

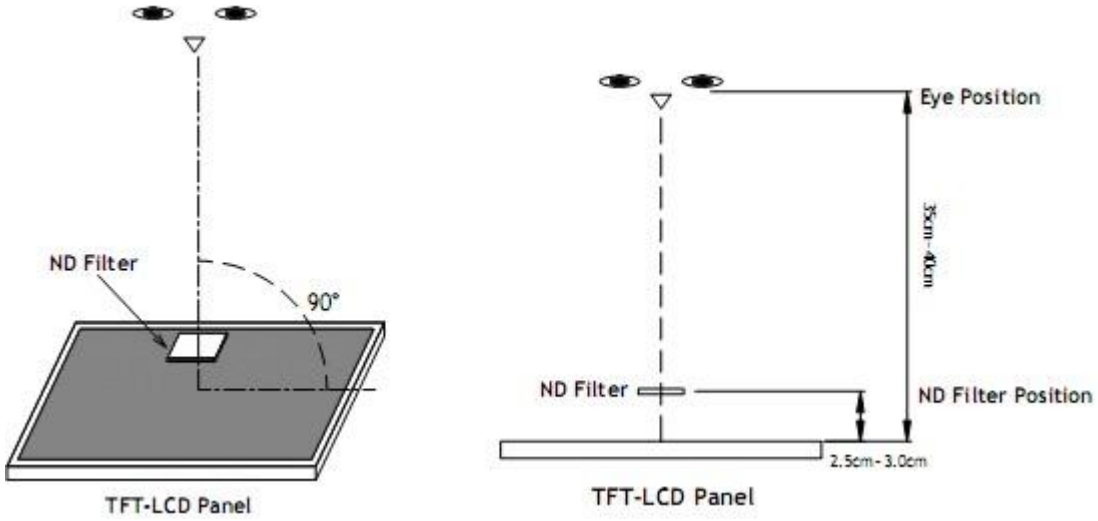
9.9. Packing

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

9.9.2. Modules inside package box should have compliant mark.

9.9.3. 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.

10. 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	**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	**-30℃, 60min~80℃, 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:±8KV 150pF/330Ω 5 times	2	GB/T17626.2 -2018
		Contact:±4KV 150pF/330Ω 5 times		
9	Drop Test (Packaged)	Height:80 cm,1 corner, 3 edges, 6 surfaces.	2	GB/T2423.8 -1995

Note 1: Ta is the ambient temperature of samples.

Note 2: Ts is the temperature of panel's surface.

Note 3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but doesn't guarantee all the cosmetic specification.

Note 4: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

Note 5: One product only can use to conduct one Item test

11. Precautions and Warranty

11.1. Safety

11.1.1. 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.

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

11.2. Handling

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

11.2.2. 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.

11.3. Storage

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

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

11.4. Metal Pin (Apply to Products with Metal Pins)

11.4.1. Pins of LCD and Backlight

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

11.4.1.2. Recommended Soldering Conditions

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

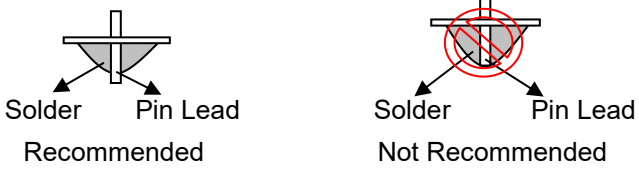
Maximum Solder Temperature: 370℃

Maximum Solder Time: 3s at the maximum temperature

Recommended Soldering Temp: 350±20℃

Typical Soldering Time: ≤3s

11.4.1.3. Solder Wetting



11.4.2. Pins of EL

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

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

11.4.2.3. Recommended Soldering Conditions

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

Recommended Solder Temperature: 270～290℃

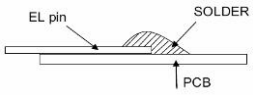
Typical Soldering Time: ≤2s

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

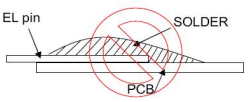
11.4.2.4. No horizontal press on the EL leads during soldering.

11.4.2.5. 180° bend EL leads three times is not allowed.

11.4.2.6. Solder Wetting

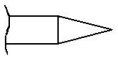


Recommended

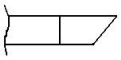


Not Recommended

11.4.2.7. The type of the solder iron:

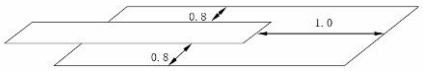


Recommended



Not Recommended

11.4.2.8. Solder Pad



11.5. Operation

11.5.1. Do not drive LCD with DC voltage

11.5.2. Response time will increase below lower temperature

11.5.3. Display may change color with different temperature

11.5.4. Mechanical disturbance during operation, such as pressing on the display area, may cause the segments to appear “fractured”.

11.5.5. Do not connect or disconnect the LCM to or from the system when power is on.

11.5.6. Never use the LCM under abnormal condition of high temperature and high humidity.

11.5.7. 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.

11.5.8. Do not display the fixed pattern for long time（we suggest the time not longer than half of one hour）because it may develop image sticking due to the TFT structure.

11.6. Static Electricity

11.6.1. CMOS LSIs are equipped in this unit, so care must be taken to avoid the electro-static charge, by ground human body, etc.

11.6.2. The normal static prevention measures should be observed for work clothes and benches.

11.6.3. The module should be kept into anti-static bags or other containers resistant to static for storage.

11.7. Limited Warranty

11.7.1. Our warranty liability is limited to repair and/or replacement. We will not be responsible for any consequential loss.

11.7.2. 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.

11.7.3. 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.

12. Packaging

TBD