

Display Elektronik GmbH

# DATA SHEET

TFT MODULE

DEM 1280800D VMH-PW-N

10,1“ TFT

Product Specification

Version: 0

13.12.2024



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**\* Description**

This is a color active matrix TFT (Thin Film Transistor) LCD (liquid crystal display) that uses amorphous silicon TFT as a switching device. This module is composed of a Transmissive type TFT-LCD Panel, driver circuit, back-light unit. The resolution of a 10.1 " TFT-LCD contains 1280x800 pixels, and can display up to 16.7M colors.

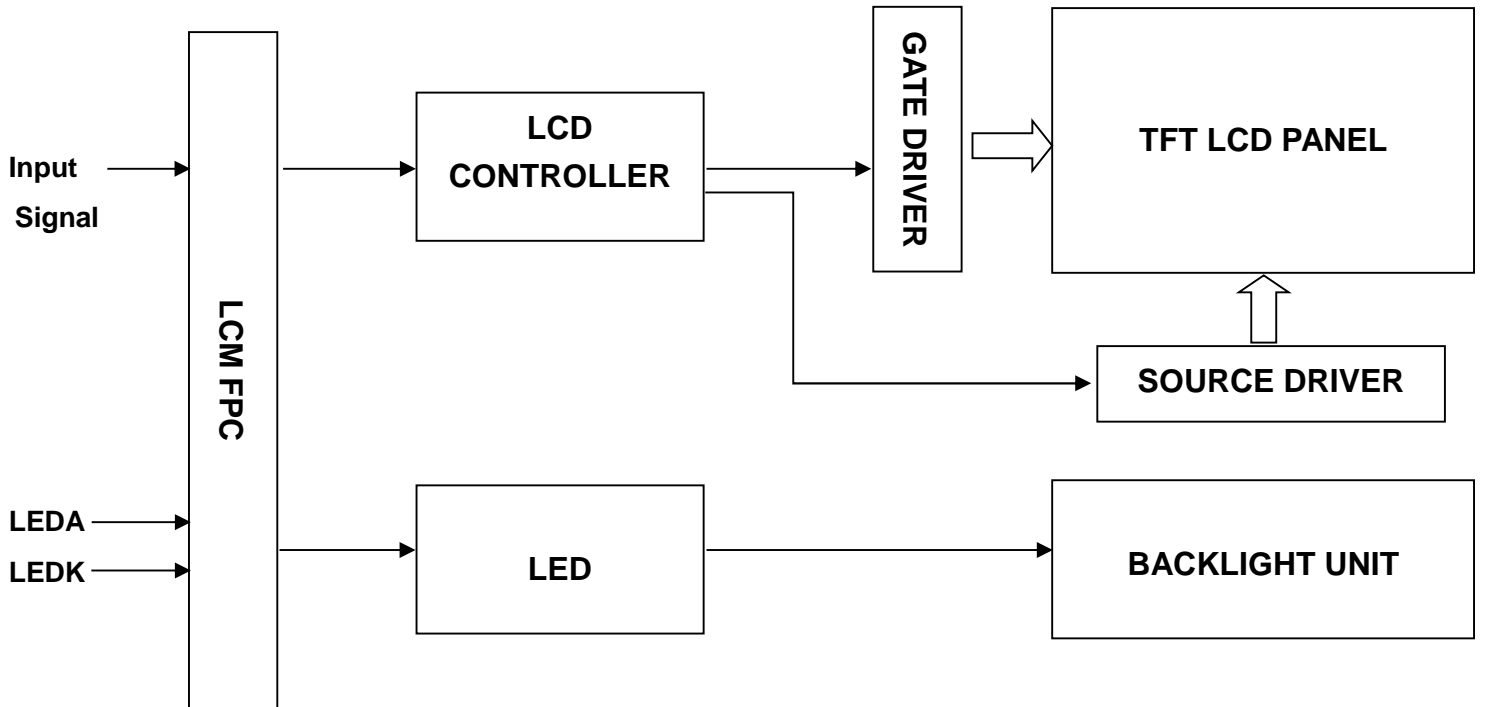
**\* Features**

General Information Items	Specification	Unit	Note
	Main Panel		
Display area(AA)	216.96(H)*135.6(V) (10.1 inch)	mm	
Driver element	TFT active matrix	-	
Display colors	16.7M	colors	
Number of pixels	1280(RGB)*800	dots	
Pixel arrangement	RGB vertical stripe	-	
Pixel pitch	0.1692(H)*0.1692(V)	mm	
Viewing angle	ALL	o'clock	
LCM Interface	8BIT LVDS	-	
Display mode	Transmissive /Normally Black	-	
Operating temperature	-20~+70	°C	
Storage temperature	-30~+85	°C	

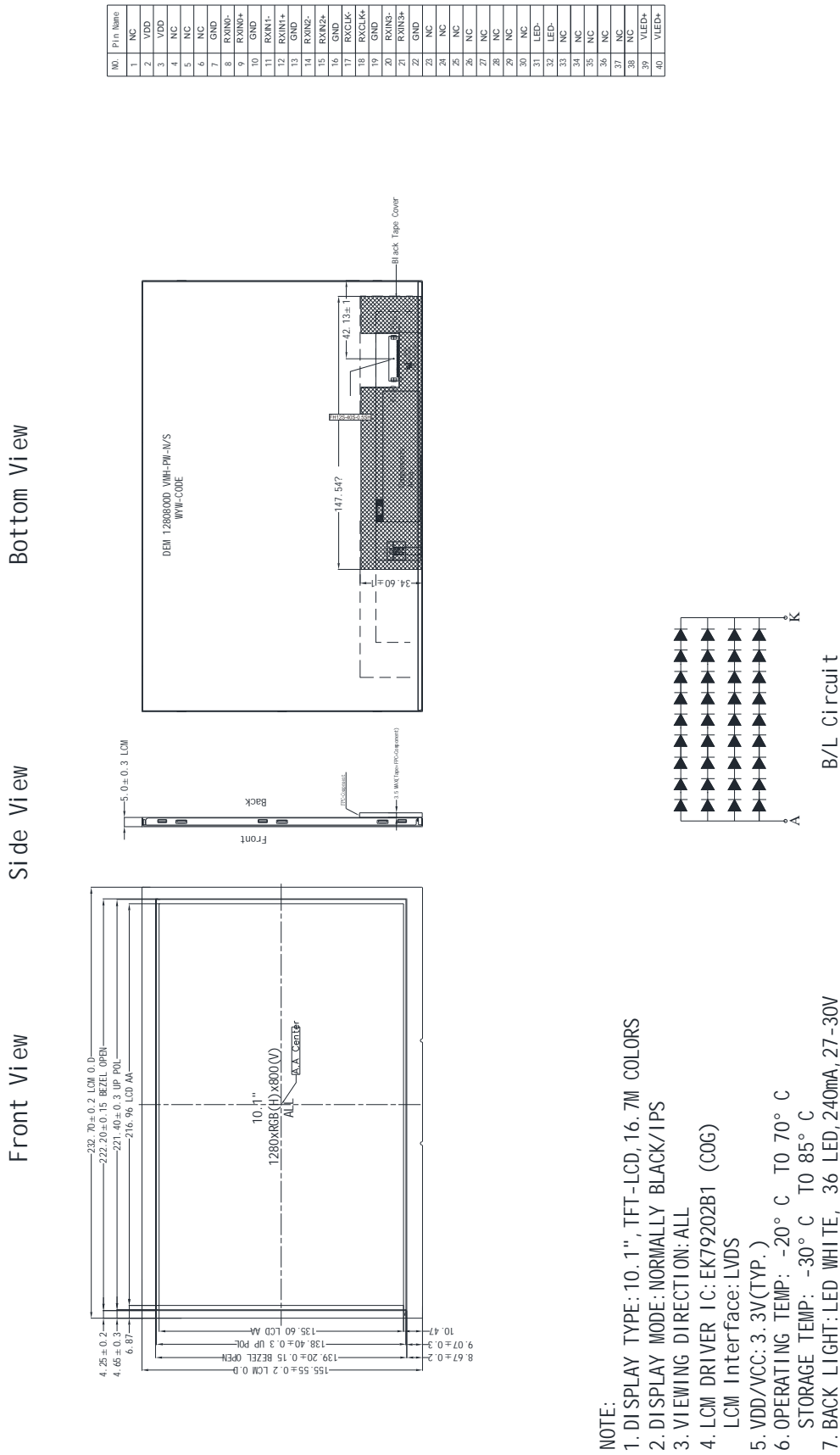
**\* Mechanical Information**

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal(H)	-	232.70	-	mm	
	Vertical(V)	-	155.55	-	mm	
	Depth(D)	-	5.0	-	mm	
Weight		-	290	-	g	

1. Block Diagram



2. Outline dimension



- NOTE:
1. DISPLAY TYPE: 10.1", TFT-LCD, 16.7M COLORS
  2. DISPLAY MODE: NORMALLY BLACK/IPS
  3. VIEWING DIRECTION: ALL
  4. LCM DRIVER IC: EK79202B1 (COG)  
LCM Interface: LVDS
  5. VDD/VCC: 3.3V(TYP.)
  6. OPERATING TEMP: -20° C TO 70° C  
STORAGE TEMP: -30° C TO 85° C
  7. BACK LIGHT: LED WHITE, 36 LED, 240mA, 27-30V
  8. RoHS COMPLIANT.

**3. Input terminal Pin Assignment**

NO.	SYMBOL	DISCRIPTION	I/O
1	NC	Not Connect	
2	VDD	A power supply for analog circuit. VDD=3.3V;	P
3	VDD		
4	NC	Not Connect	
5	NC	Not Connect	
6	NC	Not Connect	
7	GND	Ground	P
8	RXIN0-	LVDS data Input.	I
9	RXIN0+		I
10	GND	Ground	P
11	RXIN1-	LVDS data Input.	I
12	RXIN1+		I
13	GND	Ground	P
14	RXIN2-	LVDS data Input.	I
15	RXIN2+		I
16	GND	Ground	P
17	RXCLK-	LVDS clock Input.	I
18	RXCLK+		I
19	GND	Ground	P
20	RXIN3-	LVDS data Input.	I
21	RXIN3+		I
22	GND	Ground	P
23	NC	Not Connect	
24	NC	Not Connect	
25	NC	Not Connect	
26	NC	Not Connect	
27	NC	Not Connect	
28	NC	Not Connect	
29	NC	Not Connect	
30	NC	Not Connect	
31	LED-	LED Cathode	P
32	LED-	LED Cathode	P
33	NC	Not Connect	
34	NC	Not Connect	
35	NC	Not Connect	

36	NC	Not Connect	
37	NC	Not Connect	
38	NC	Not Connect	
39	LED+	LED Anode	P
40	LED+	LED Anode	P



## 4. LCD Optical Characteristics

### 4.1 Optical specification

Item	Symbol	Condition	Min.	Typ.	Max.	Unit.	Note	
Contrast Ratio	CR	$\Theta=0$	800	1000	--		CA-310	
Response time	Rising	$T_{R+T_F}$	Normal viewing angle	--	25	35	msec	*
	Falling							*
Color gamut	S(%)		45	50	--	%	*	
Color Filter Chromaticity (CIE 1931))	White	$W_X$	-0.04	0.317	+0.04		CA-310	
		$W_Y$						
	Red	$R_X$						0.599
		$R_Y$						0.353
	Green	$G_X$						0.355
		$G_Y$						0.550
	Blue	$B_X$						0.147
		$B_Y$						0.114
Viewing angle	Hor.	$\Theta_L$	CR>10	70	80	--		
		$\Theta_R$		70	80	--		
	Ver.	$\Theta_U$		70	80	--		
		$\Theta_D$		70	80	--		
Option View Direction	ALL							

\* The data comes from the LCD specification.

#### Measuring Condition

Measuring surrounding : dark room

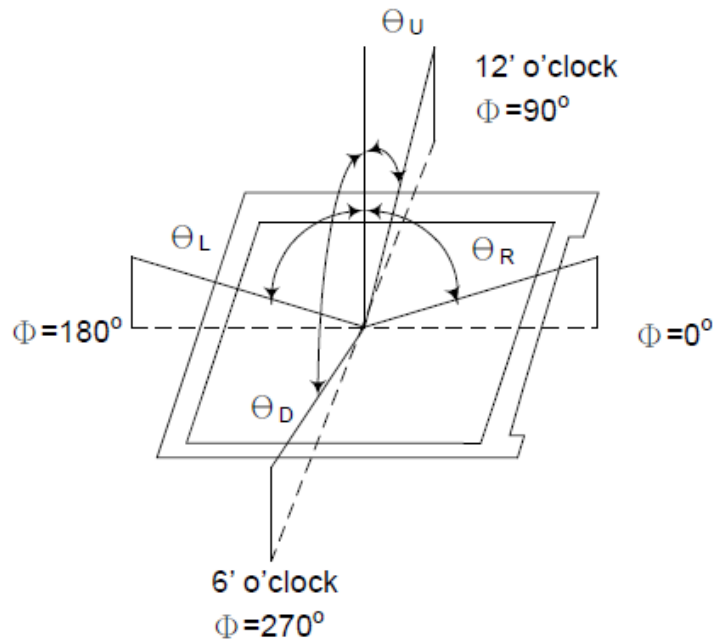
Ambient temperature : 25±2°C

15min. warm-up time.

#### Measuring Equipment

FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.

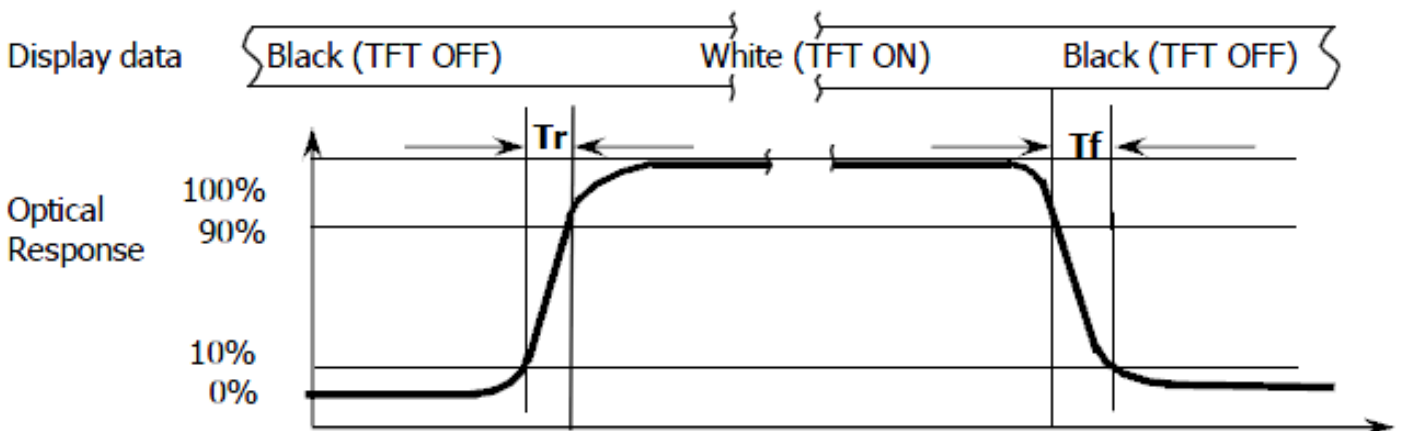
**Note (1):** Definition of Viewing Angle :



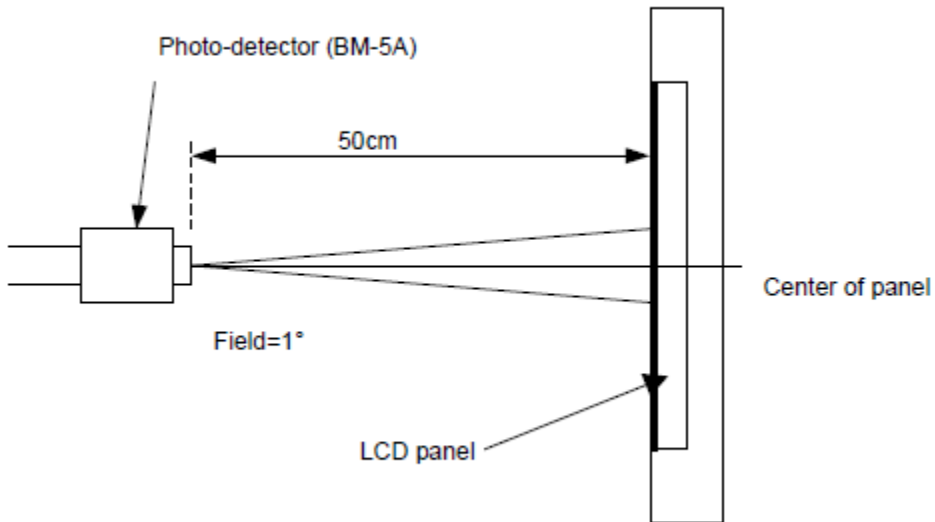
**Note (2):** Definition of Contrast Ratio(CR) :measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

**Note (3):** Response Time



**Note (4):** Definition of optical measurement setup



## 5. Electrical Characteristics

### 5.1 Absolute Maximum Rating

Characteristics	Symbol	Min.	Max.	Unit	Note
Digital Supply Voltage	VDD	-0.5	4	V	Note1
Operating temperature	T <sub>OP</sub>	-20	+70	°C	
Storage temperature	T <sub>ST</sub>	-30	+85	°C	

NOTE1: If the absolute maximum rating of even is one of the above parameters is exceeded even momentarily, the quality of the product may be degraded. Absolute maximum ratings, therefore, specify the values exceeding which the product may be physically damaged. Be sure to use the product within the range of the absolute maximum ratings.

### 5.2 DC Electrical Characteristics

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Note
Digital Supply Voltage	VDD	-	3.3	-	V	
Normal mode Current	IDD	--	173	--	mA	
Level input voltage	V <sub>IH</sub>	0.8*VDD	--	VDD	V	
	V <sub>IL</sub>	GND	--	0.2*VDD	V	

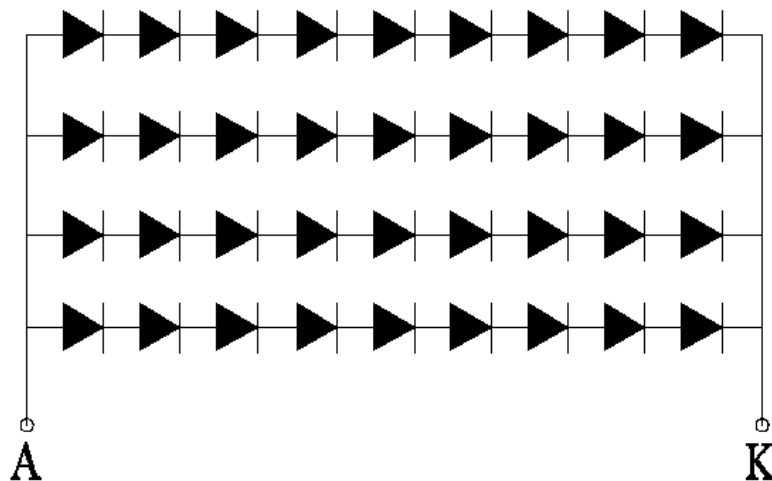
5.3 LED Backlight Characteristics

The back-light system is edge-lighting type with 36 chips LED

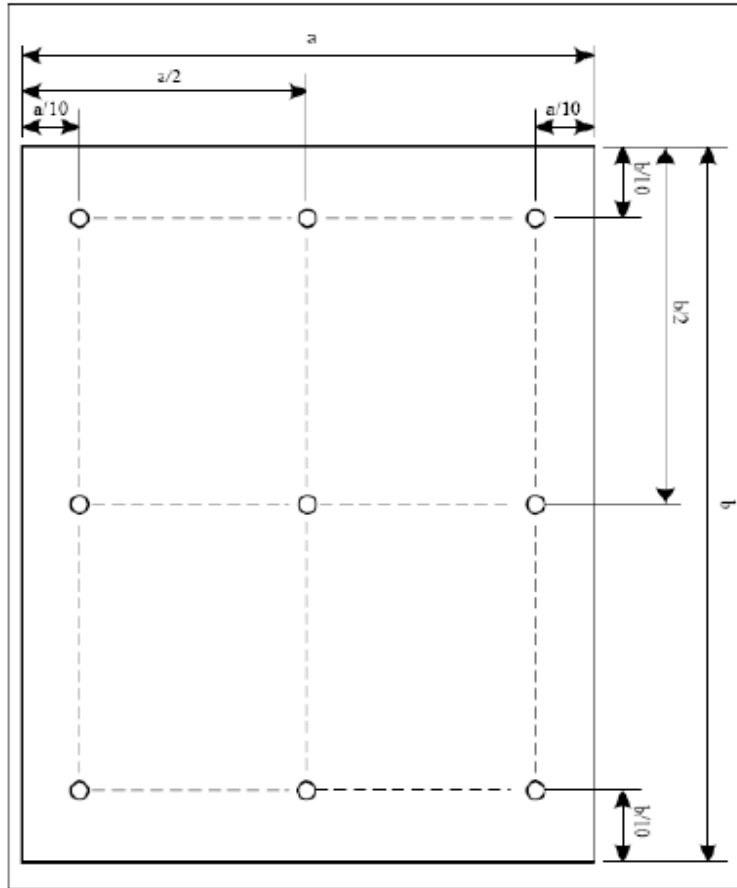
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Forward Current	I <sub>F</sub>	--	240	--	mA	
Forward Voltage	V <sub>F</sub>	--	27	30	V	
LCM Luminance	LV	950	1000	--	cd/m <sup>2</sup>	Note3
LED life time	Hr	50000	--	--	Hour	Note1,2
Uniformity	Avg	70	80	--	%	Note3

Note1: LED life time (Hr) can be defined as the time in which it continues to operate under the condition:  
 Ta=25±3 °C, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note 2: The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25°C and IL=240mA. The LED lifetime could be decreased if operating IL is larger than 240mA. The constant current driving method is suggested.



Note (3) Luminance Uniformity of these 9 points is defined as below:



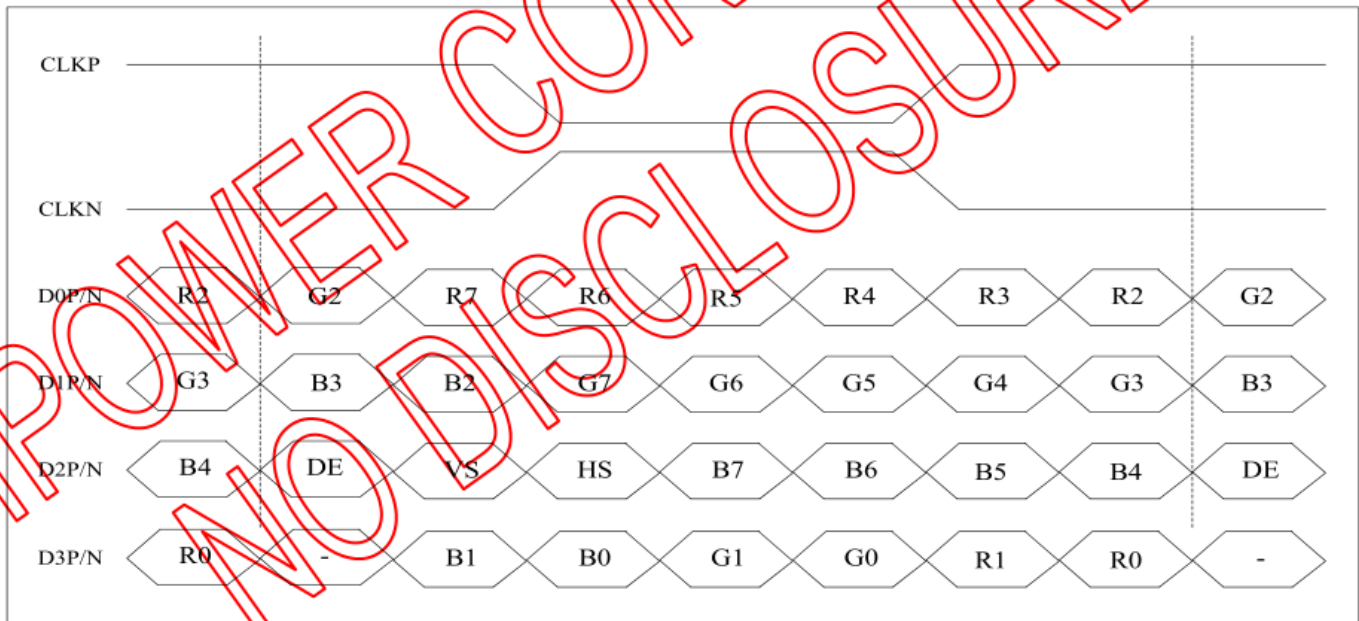
$$\text{Uniformity} = \frac{\text{minimum luminance in 9 points (1-9)}}{\text{maximum luminance in 9 points (1-9)}}$$

$$\text{Luminance} = \frac{\text{Total Luminance of 9 points}}{9}$$

6. Video Interface and Timing Table

6.1 LVDS interface

6.1.1 Data input format for LVDS



8-bit LVDS input (LVBIT=H, LVFMT=L)

## 6.1.2 LVDS Input Timing Table

## For 1280RGBx800

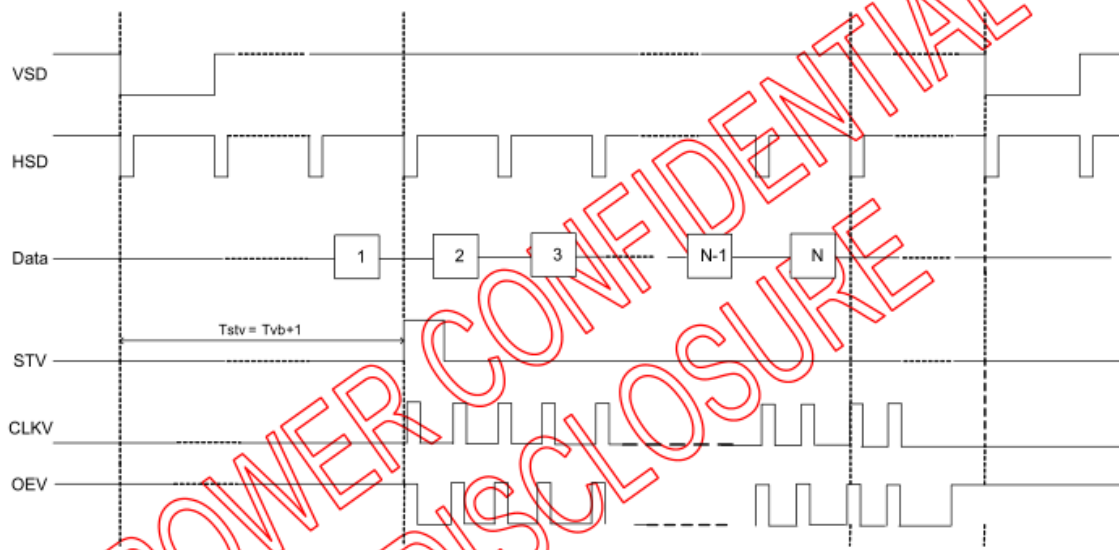
Parameter		Symbol	Value			Unit
			Min.	Typ.	Max.	
DCLK frequency @Frame rate=60Hz (LVDS)		F <sub>DCLK</sub>	66.3	72.4	78.9	MHz
HSYNC period time		T <sub>H</sub>	1380	1440	1500	DCLK
Horizontal display area		T <sub>HD</sub>	1280			DCLK
HSYNC pulse width	Min.	T <sub>HPW</sub>	2			
	Typ.		-			
	Max.		40			
HSYNC back porch(with pulse width)		T <sub>HBP</sub>	88	88	88	DCLK
HSYNC front porch		T <sub>HFP</sub>	12	72	132	DCLK
VSYNC period time		T <sub>V</sub>	824	838	872	H
Vertical display area		T <sub>VD</sub>	800			H
VSYNC pulse width	Min.	T <sub>VPW</sub>	2			H
	Typ.		-			
	Max.		20			
VSYNC back porch(with pulse width)		T <sub>VBP</sub>	23	23	23	H
VSYNC front porch		T <sub>VFP</sub>	1	15	49	H



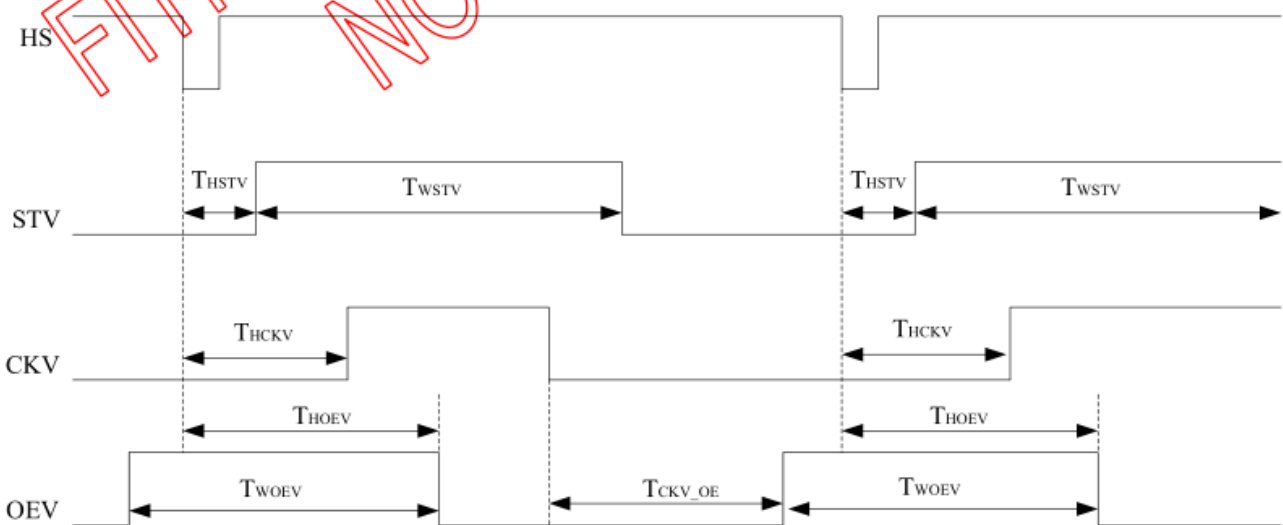
### 6.1.3 Gate Output Timing Table

(VDD=2.3 to 3.6V, VSS=VSSA=VSS\_IF=0V, TA=-20 to +85°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit
STV Pulse Width	$T_{WSTV}$	-	1	-	H
Time from HSD to STV	$T_{HSTV}$	-	2	-	DCLK
Time from HSD to CKV	$T_{HCKV}$	-	25	-	DCLK
Time from HSD to OEV	$T_{HOEV}$	-	35	-	DCLK
Time from CKV to OEV	$T_{CKV\_OE}$	-	168	-	DCLK
OEV Pulse Width	$T_{WOEV}$	-	188	-	DCLK



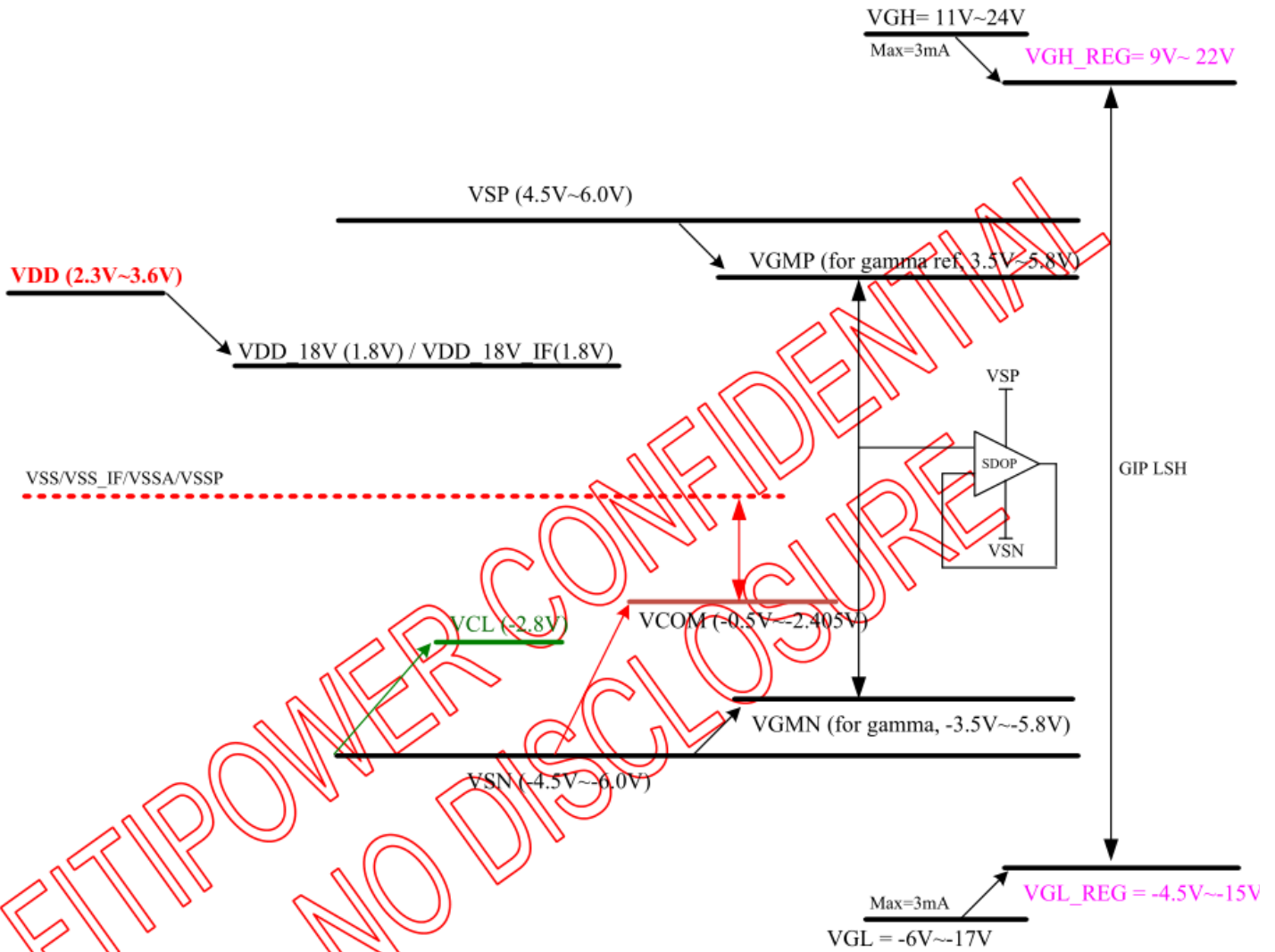
Vertical output timing



Gate output timing

7. Power Sequence and External Power Circuit

7.1 Power Generation

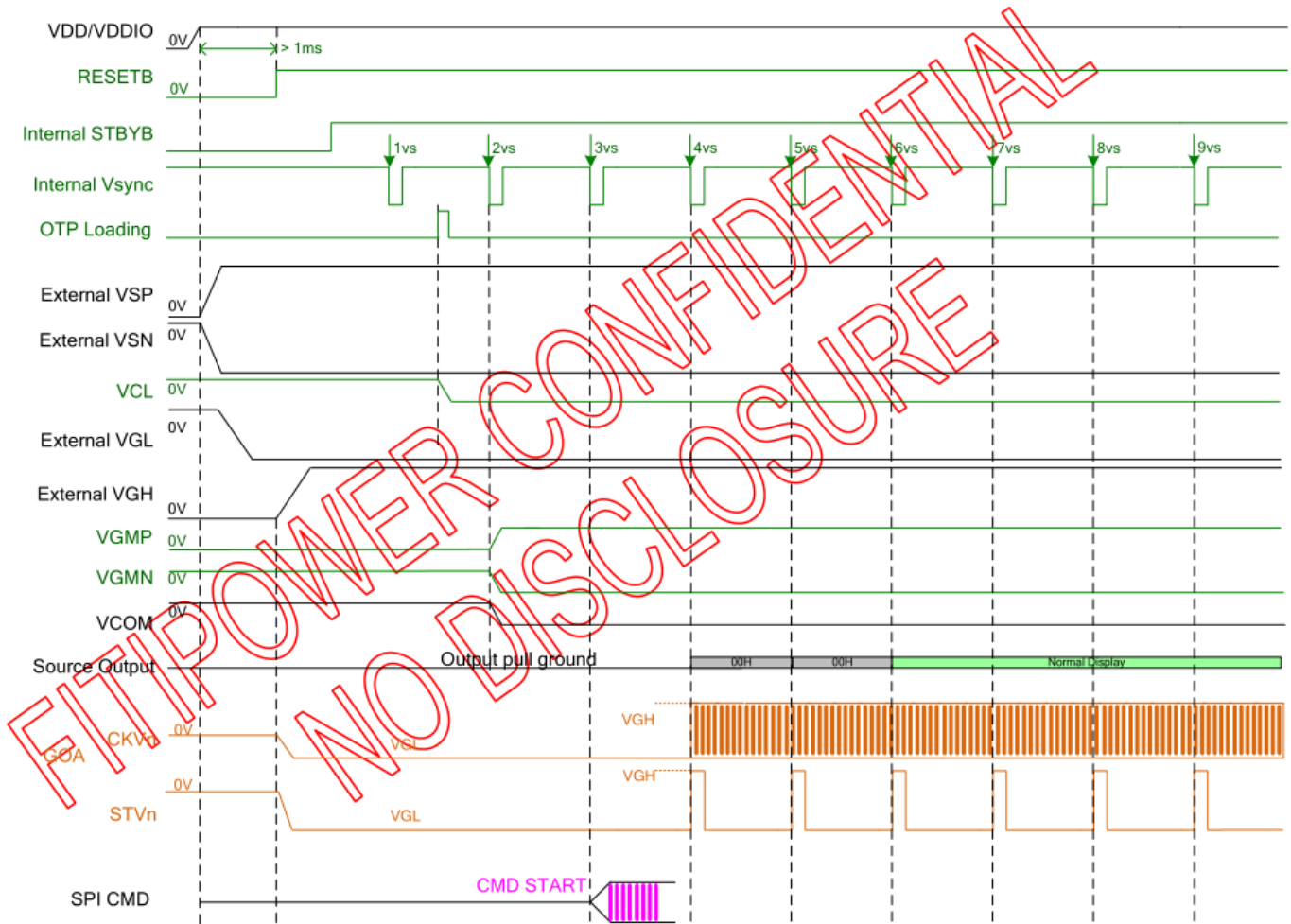


power generation

## 7.2 Power on sequence

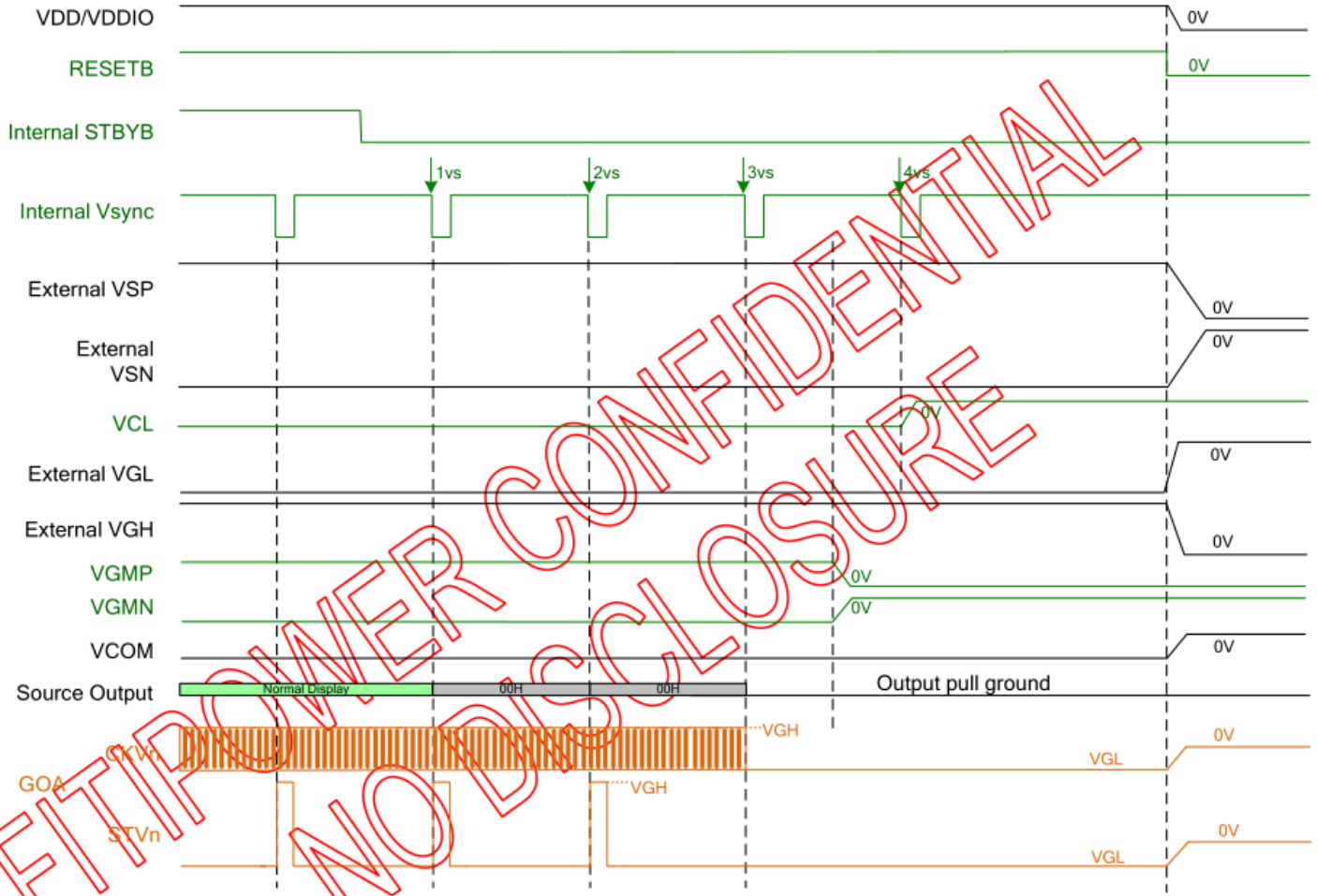
### 7.2.1 Power on sequence

External VSP/VSN  
External VGH/VGL



7.2.2 Power off sequence

External VSP/VSN  
External VGH/VGL



## 8. LCD Module Out-Going Quality Level

### 8.1 VISUAL & FUNCTION INSPECTION STANDARD

#### 8.1.1 Inspection conditions

Inspection performed under the following conditions is recommended.

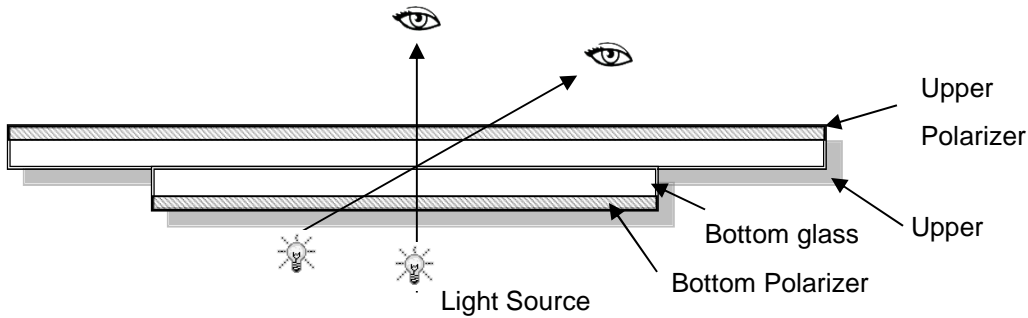
Temperature :  $25\pm 5^{\circ}\text{C}$

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

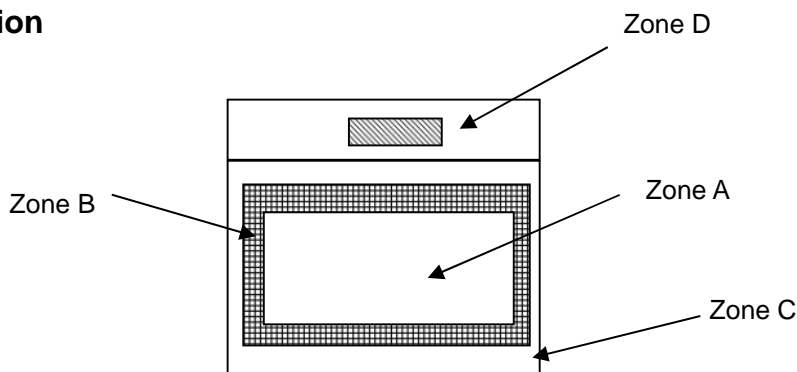
Viewing Angle : Normal viewing Angle.

Illumination: Single fluorescent lamp (300 to 700Lux)

Viewing distance:30-50cm



#### 8.1.2 Definition



Zone A : Effective Viewing Area(Character or Digit can be seen)

Zone B : Viewing Area except Zone A

Zone C : Outside (Zone A+Zone B) which can not be seen after assembly by customer .)

Zone D : IC Bonding Area

Note:As a general rule ,visual defects in Zone C can be ignored when it doesn't effect product function or appearance after assembly by customer

**8.1.3 Sampling Plan**

According to GB/T 2828-2003 ; , normal inspection, Class II

AQL:

Major defect	Minor defect
0.65	1.5

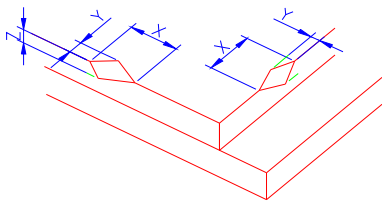
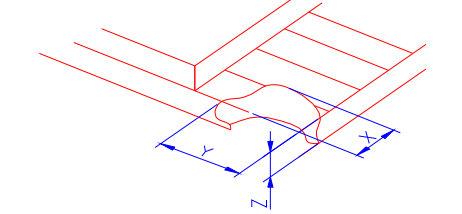
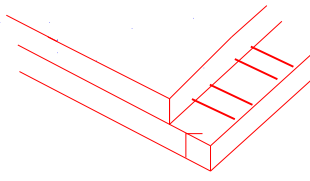
LCD: Liquid Crystal Display , LCM: Liquid Crystal Module

No	Items to be inspected	Criteria	Classification of defects
1	Functional defects	1) No display, Open or miss line 2) Display abnormally, Short 3) Backlight no lighting, abnormal lighting. etc...	Major
2	Missing	Missing components and etc...	
3	Outline dimension	Overall outline dimension beyond the drawing is not allowed, deformation and etc...	
4	Color tone	Color unevenness, refer to limited sample	Minor
5	Spot/Line defect	Light dot, Dim spot, (Note1) Polarizer Air Bubble, Polarizer accidented spot and etc...	
6	Soldering appearance	Good soldering , Peeling off is not allowed and etc...	
7	LCD/Polarizer	Black/White spot/line, scratch, crack, etc.	

**Note1:** a) Light dot: Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern.

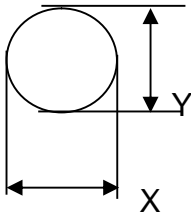
b) Dim dot: Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green, blue picture.

8.1.4 Criteria (Visual)

Number	Items	Criteria(mm)						
1.0 LCD Crack/Broken NOTE: X: Length Y: Width Z: Height L: Length of ITO, T: Height of LCD	(1) The edge of LCD broken	 <table border="1" data-bbox="746 611 1445 759"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>≤3.0mm</td> <td>&lt;Inner border line of the seal</td> <td>≤T</td> </tr> </tbody> </table>	X	Y	Z	≤3.0mm	<Inner border line of the seal	≤T
X	Y	Z						
≤3.0mm	<Inner border line of the seal	≤T						
	(2) LCD corner broken	 <table border="1" data-bbox="825 1068 1364 1167"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>≤3.0mm</td> <td>≤L</td> <td>≤T</td> </tr> </tbody> </table>	X	Y	Z	≤3.0mm	≤L	≤T
X	Y	Z						
≤3.0mm	≤L	≤T						
	(3) LCD crack	 <p style="text-align: center;">Crack Not allowed</p>						

2.0

Spot defect



$$\Phi = (X + Y) / 2$$

① light dot ( black/white spot , pinhole, stain, etc. )

Zone Size (mm)	Acceptable Qty		
	A	B	C
$\Phi \leq 0.15$	Ignore		
$0.15 < \Phi \leq 0.25$	Ignore		
$0.25 < \Phi \leq 0.4$			
$\Phi > 0.4$	0		

② Dim spot ( light leakage, dent, dark spot, etc )

Zone Size (mm)	Acceptable Qty		
	A	B	C
$\Phi \leq 0.15$	Ignore		
$0.15 < \Phi \leq 0.25$	Ignore		
$0.25 < \Phi \leq 0.4$			
$\Phi > 0.4$	0		


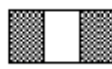
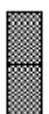
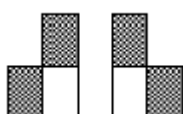
③ Polarizer accidented spot


Zone Size (mm)	Acceptable Qty		
	A	B	C
$\Phi \leq 0.2$	Ignore		
$0.2 < \Phi \leq 0.5$	Ignore		
$\Phi > 0.5$			

④ Polarizer Bubble

Zone Size (mm)	Acceptable Qty		
	A	B	C
$\Phi \leq 0.2$	Ignore		
$0.2 < \Phi \leq 0.4$	Ignore		
$0.4 < \Phi \leq 0.5$			
$\Phi > 0.5$	0		



3.0	LCD Pixel defect	<p>Pixel bad points</p> <table border="1"> <thead> <tr> <th data-bbox="534 257 726 302">Item</th> <th data-bbox="726 257 1236 302">Zone A</th> <th data-bbox="1236 257 1476 302">Acceptable Qty</th> </tr> </thead> <tbody> <tr> <td data-bbox="534 302 726 459" rowspan="3">Bright dot</td> <td data-bbox="726 302 1236 358">Random</td> <td data-bbox="1236 302 1476 358">N≤2</td> </tr> <tr> <td data-bbox="726 358 1236 414">2 dots adjacent</td> <td data-bbox="1236 358 1476 414">N≤0</td> </tr> <tr> <td data-bbox="726 414 1236 459">3 dots adjacent</td> <td data-bbox="1236 414 1476 459">N≤0</td> </tr> <tr> <td data-bbox="534 459 726 627" rowspan="3">Dark dot</td> <td data-bbox="726 459 1236 515">Random</td> <td data-bbox="1236 459 1476 515">N≤3</td> </tr> <tr> <td data-bbox="726 515 1236 571">2 dots adjacent</td> <td data-bbox="1236 515 1476 571">N≤0</td> </tr> <tr> <td data-bbox="726 571 1236 627">3 dots adjacent</td> <td data-bbox="1236 571 1476 627">N≤0</td> </tr> <tr> <td data-bbox="534 627 726 940">Distance</td> <td data-bbox="726 627 1236 940">                     1. Minimum Distance Between Bright dots.                      2. Minimum Distance Between dark dots                      3. Minimum Distance Between dark and bright dot.                 </td> <td data-bbox="1236 627 1476 940">5mm</td> </tr> <tr> <td colspan="2" data-bbox="534 940 1236 996">Total bright and dark dot</td> <td data-bbox="1236 940 1476 996">N≤4</td> </tr> </tbody> </table> <p>Note:</p> <p>A) Bright dot: Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern.</p> <p>B) Dark dot: Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green, blue picture.</p> <p>C) 2 dot adjacent = 1 pair = 2 dots</p> <p>Picture:</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;">  <p>2 dot adjacent</p> </div> <div style="text-align: center;">  <p>2 dot adjacent</p> </div> <div style="text-align: center;">  <p>2 dot adjacent (vertical)</p> </div> <div style="text-align: center;">  <p>2 dot adjacent (slant)</p> </div> </div>	Item	Zone A	Acceptable Qty	Bright dot	Random	N≤2	2 dots adjacent	N≤0	3 dots adjacent	N≤0	Dark dot	Random	N≤3	2 dots adjacent	N≤0	3 dots adjacent	N≤0	Distance	1. Minimum Distance Between Bright dots. 2. Minimum Distance Between dark dots 3. Minimum Distance Between dark and bright dot.	5mm	Total bright and dark dot		N≤4
Item	Zone A	Acceptable Qty																							
Bright dot	Random	N≤2																							
	2 dots adjacent	N≤0																							
	3 dots adjacent	N≤0																							
Dark dot	Random	N≤3																							
	2 dots adjacent	N≤0																							
	3 dots adjacent	N≤0																							
Distance	1. Minimum Distance Between Bright dots. 2. Minimum Distance Between dark dots 3. Minimum Distance Between dark and bright dot.	5mm																							
Total bright and dark dot		N≤4																							

4.0	Line defect (LCD /Polarizer backlight black/white line, scratch, stain)  W: width, L : length  N : Count	<table border="1"> <thead> <tr> <th rowspan="2">Width(mm)</th> <th rowspan="2">Length(m)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td><math>\Phi \leq 0.05</math></td> <td>Ignore</td> <td colspan="2">Ignore</td> <td rowspan="3">Ignore</td> </tr> <tr> <td><math>0.05 &lt; W \leq 0.06</math></td> <td><math>L \leq 5.0</math></td> <td colspan="2"><math>N \leq 3</math></td> </tr> <tr> <td><math>0.06 &lt; W \leq 0.08</math></td> <td><math>L \leq 4.0</math></td> <td colspan="2"><math>N \leq 2</math></td> </tr> <tr> <td><math>W &gt; 0.08</math></td> <td colspan="3">Define as spot defect</td> <td></td> </tr> </tbody> </table>	Width(mm)	Length(m)	Acceptable Qty			A	B	C	$\Phi \leq 0.05$	Ignore	Ignore		Ignore	$0.05 < W \leq 0.06$	$L \leq 5.0$	$N \leq 3$		$0.06 < W \leq 0.08$	$L \leq 4.0$	$N \leq 2$		$W > 0.08$	Define as spot defect			
		Width(mm)			Length(m)	Acceptable Qty																						
			A	B		C																						
		$\Phi \leq 0.05$	Ignore	Ignore		Ignore																						
		$0.05 < W \leq 0.06$	$L \leq 5.0$	$N \leq 3$																								
$0.06 < W \leq 0.08$	$L \leq 4.0$	$N \leq 2$																										
$W > 0.08$	Define as spot defect																											
5.0	Electronic Components SMT.	Not allow missing parts, solderless connection, cold solder joint, mismatch, The positive and negative polarity opposite																										
6.0	Display color & Brightness.	1. Color: Measuring the color coordinates, The measurement standard according to the datasheet or samples. 2. Brightness: Measuring the brightness of White screen, The measurement standard according to the datasheet or Samples.																										
7.0	LCD Mura/Waving/ Hot spot	Not visible through 5% ND filter in 50% gray or judge by limit sample if necessary.																										

Criteria ( functional items)

Number	Items	Criteria (mm)
1	No display	Not allowed
2	Missing segment	Not allowed
3	Short	Not allowed
4	Backlight no lighting	Not allowed

**9. Reliability Test Result**

Remark:

Item	Condition	Inspection after test
High Temperature Operating	70°C,96H	Inspection after 2~4hours storage at room temperature, the sample shall be free from defects: 1.Air bubble in the LCD; 2.Non-display; 3.Missing segments/line; 4.Glass crack; 5.Current IDD is twice higher than initial value.
Low Temperature Operating	-20°C, 96HR	
High Temperature Storage	85°C, 96HR	
Low Temperature Storage	-30°C, 96HR	
High Temperature & High	+60°C, 90% RH ,96 hours.	
Thermal Shock (Non-operation)	-10°C,30 min ↔ +60°C,30 min, Change time:5min 20CYC.	
ESD test	C=150pF, R=330,5points/panel Air:±6KV, 5times; Contact:±4KV, 5 times; (Environment: 15°C~35°C. 30%~60%).	
Vibration (Non-operation)	Frequency range:10~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z. (6 hours for total) (Package condition).	
Box Drop Test	1 Corner 3 Edges 6 faces,80cm(MEDIUM BOX)	

- 1.The test samples should be applied to only one test item.
- 2.Sample size for each test item is 5~10pcs.
- 3.For Damp Proof Test, Pure water(Resistance > 10MΩ) should be used.
- 4.In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.
- 5.Failure Judgment Criterion: Basic Specification, Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

**10. Cautions and Handling Precautions**

**10.1 Handling and Operating the Module**

(1) When the module is assembled, it should be attached to the system firmly.

Do not warp or twist the module during assembly work.

(2) Protect the module from physical shock or any force. In addition to damage, this may cause improper operation or damage to the module and back-light unit.

(3) Note that polarizer is very fragile and could be easily damaged. Do not press or scratch the surface.

(4) Do not allow drops of water or chemicals to remain on the display surface.

If you have the droplets for a long time, staining and discoloration may occur.

(5) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.

(6) The desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane.

Do not use ketene type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.

(7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs, or clothes, it must be washed away thoroughly with soap.

(8) Protect the module from static; it may cause damage to the CMOS ICs.

(9) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.

(10) Do not disassemble the module.

(11) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.

(12) Pins of I/F connector shall not be touched directly with bare hands.

(13) Do not connect, disconnect the module in the "Power ON" condition.

(14) Power supply should always be turned on/off by the item 6.1 Power On Sequence & 6.2 Power Off Sequence

## **10.2 Storage and Transportation.**

(1) Do not leave the panel in high temperature, and high humidity for a long time.

It is highly recommended to store the module with temperature from 0 to 35 °C and relative humidity of less than 70%

(2) Do not store the TFT-LCD module in direct sunlight.

(3) The module shall be stored in a dark place. When storing the modules for a long time, be sure to adopt effective measures for protecting the modules from strong ultraviolet radiation, sunlight, or fluorescent light.

(4) It is recommended that the modules should be stored under a condition where no condensation is allowed. Formation of dewdrops may cause an abnormal operation or a failure of the module.

In particular, the greatest possible care should be taken to prevent any module from being operated where condensation has occurred inside.

(5) This panel has its circuitry FPC on the bottom side and should be handled carefully in order not to be stressed.