LCD Mall Limited

Product Specification

Model Name	**LM070BWX10EN**
Description	Standard LCD Module 7.0" WXGA /IPS 1280x(RGB)x768 Dots
Date	2019/06/12
Version	1.0

■ **Preliminary Specification**

☐ **Final Product Specification**

Prepared by	Checked by	Approved by
YJL 2019/06/12	YJL 2019/06/12	LX 2019/06/12

For Customer Approval

Approved By	Comment

Records of Revision

DATE	REF.PAGE PARAGRAPH DRAWING No.	REVISED No.	SUMMARY	REMARK
2019/06/12		V01	First Issue	

LCD Mall Limited

CONTENTS

1. General Description

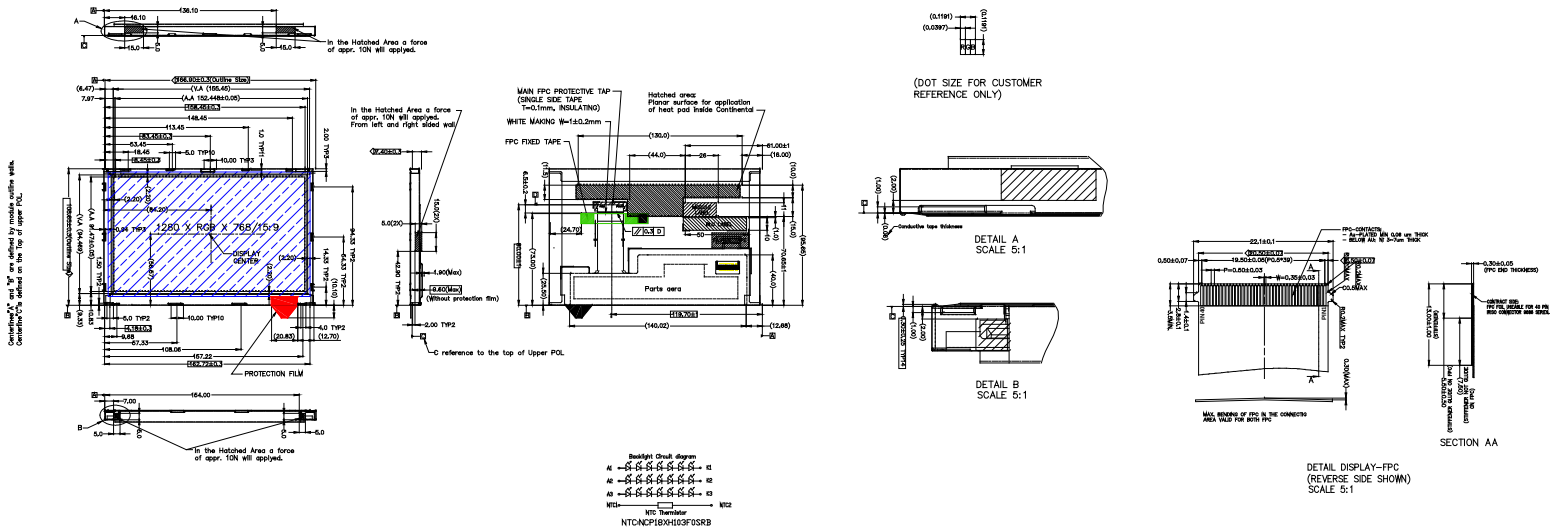
- 7", Landscape, normally black, ADS type, transmissive, amorphous silicon TFT LCD module with 3 source driver IC (COG) + 1 gate driver IC(COG)
- Display Resolution: 1280 x RGB x 768.
- Viewing angle (U/D/L/R): 80/80/80/80
- “Himax” HX8298-A x 3 +HX8695E x 1
- Display up to 16.7M colors.
- 1-port LVDS.
- Backlight with 21 LEDs.
- HC front polarizer.
- “RoHS” Compliance.

2. Mechanical Specifications

The mechanical detail is shown in Fig. 1 and summarized in Table 1 below.

Table 1

Parameters		Specifications	Unit
Outline dimensions		166.90(H) x 108.65 (V) x 7.4 (D)	mm
Color TFT 1280 x RGB x768	VA area	155.45 (W) x 94.469(H)	mm
	Active area	152.448 (W) x 91.4688 (H)	mm
	Display format	1280 x RGB x 768	dots
	Color configuration	RGB stripes	-
	Dot pitch	0.1191 (W) x 0.1191(H)	mm
Backlight		White LED	-
Weight		Typ. 180	g



PIN	SYMBOL
1	NC
2	CS
3	SCL
4	SDA
5	VCC
6	VCC
7	GND
8	GND
9	D0_N
10	D0_P
11	GND
12	D1_N
13	D1_P
14	GND
15	D2_N
16	D2_P
17	GND
18	CLK_N
19	CLK_P
20	GND
21	D3_N
22	D3_P
23	GND
24	VSFB
25	DISP_ON
26	HVR
27	NTC2
28	NTC1
29	C3
30	C3
31	A3
32	A3
33	C2
34	C2
35	A2
36	A2
37	C1
38	C1
39	A1
40	A1

REV.	DATE	MODIFICATION
1.0	2019.06.09	First Issue

TP NOTES:
1. LCD Mall has standard RTP and CTP for this display.
2. LCD Mall can do customer design for RTP or CTP
3. If take RTP, the luminance will reduce 20%
4. If take CTP, the luminance will reduce 10~15%
5. LCD Mall can support optical bonding touch and display.
6. Special CTP solution need R&D evaluation.
7. General Tolerance: +/-0.2mm
   "( )"reference dimension. "*"critical dimension
8. RoHS Compliant

LCM NOTES:
1. Display Type: 7.0 inch TFT /Transmissive
2. Viewing Direction: ALL 1280*RGB*768
3. Backlight: 21 chip white LED, 7S3P
   VF =19~23V; IF = 240mA
4. Surface Luminance: 1000cd/m2 (TYP)
5. Driver IC: --
6. Operating Temp.: -40° C~+85° C
7. Storage Temp.: -40° C~+90° C
8. Top Polarizer Surface Treatment: Anti-Glare
9. General Tolerance: +/-0.2mm
   "( )"reference dimension. "*"critical dimension
10. RoHS Compliant

INTERFACE	MIPI Interface / FPC Connector
VIEWING DIRECTION	ALL
Gray DIRECTION	

LCD Mall Limited

File NO: DWG-LM070BWX10EN		PART NO. LM070BWX10EN	
DWN YJL 2019.06.09		REV. 1.0	SHEET OF 1/1
CHKD YJL 2019.06.09		TOLERANCE UNLESS SPECIFIED	±0.2
PROJECTION 3rd ANGLE		UNIT mm	SCALE 1:1

3. Interface Signals

Table 2(a): Pin assignment 1

Pin No.	Symbol	Description
1	N/C	Reserved for supplier test, NC for customer
2	CS	SPI interface for supplier online test and programming use (Pull high for customer)
3	SCL	SPI interface for supplier online test and programming use (NC for customer)
4	SDA	SPI interface for supplier online test and programming use (NC for customer)
5	VCC	Power supply (3.3V)
6	VCC	Power supply (3.3V)
7	GND	Ground
8	GND	Ground
9	D0_N	LVDS data 0-
10	D0_P	LVDS data 0+
11	GND	Ground
12	D1_N	LVDS data 1-
13	D1_P	LVDS data 1+
14	GND	Ground
15	D2_N	LVDS data 2-
16	D2_P	LVDS data 2+
17	GND	Ground
18	CLK_N	LVDS clock-
19	CLK_P	LVDS clock +
20	GND	Ground
21	D3_N	LVDS data 3-
22	D3_P	LVDS data 3+
23	GND	Ground
24	VSFB	VSYNC waveform feedback
25	DISP_ON	Display on/off (black display),
26	HVR	Horizontally and Vertically Inverted
27	NTC2	Temperature Sensor Pin2

Table 2(b): Pin assignment 2

Pin No.	Symbol	Description
28	NTC1	Temperature Sensor Pin1
29	C3	Backlight Cathode 3
30	C3	Backlight Cathode 3
31	A3	Backlight Anode 3
32	A3	Backlight Anode 3
33	C2	Backlight Cathode 2
34	C2	Backlight Cathode 2
35	A2	Backlight Anode 2
36	A2	Backlight Anode 2
37	C1	Backlight Cathode 1
38	C1	Backlight Cathode 1
39	A1	Backlight Anode 1
40	A1	Backlight Anode 1

4. Absolute Maximum Ratings

The product or it's functions may subject to permanent damage if it's stressed beyond those absolute maximum ratings listed below. Exposure to absolute maximum rating conditions for extended periods may affect display module reliability.

Table 3: Absolute Maximum Ratings & Environmental Conditions

Item	Symbol	Min.	Max.	Unit
Digital supply voltage	VDD	-0.3	+3.96	V
Digital I/O input signals	VIO	-0.3	VDD+0.3	V
Single LED forward current	IF	-	85	mA
Total LED forward current	IF(Total)	-	255	mA
Relative Humidity (at 60 C, Note 4)	RH	-	90	%
Operating Temperature (Note 3)	Topr	-30	+85	C
Storage Temperature	Tstg	-40	+90	C

Note 1:Note 1: GND=VSS=0V.
Note 2:For LED backlight driving limit at other ambient temperature, please follow recommended derating profile in Section 5.3
Note 3:No condensation allowed under any condition.
Note 4: No performance guarantee below -30 °C.

[Caution]

Do not display fixed pattern for prolonged hours because it may develop image sticking on the display.

5. Electrical Specifications

5.1 Block Diagram

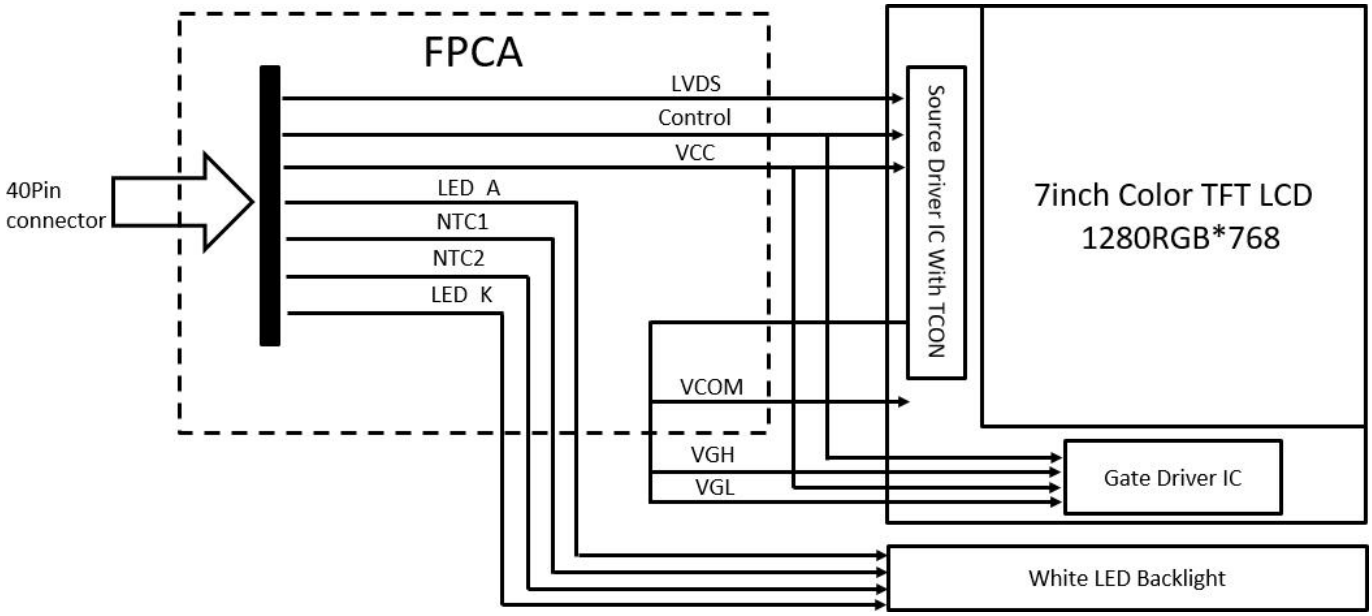


Figure 2: Block Diagram of module

5.2 Typical Electrical Characteristics

GND=0V, VCC= 3.3V.

Table 4

Parameter	Symbol	Min.	Typ.	Max.	Unit
Power supply	VCC	3.0	3.3	3.6	V
Current supply	Ivcc(Note2)	-		480	mA
Driver input high signal voltage	VIH	0.7*VCC	-	VCC	V
Driver input low signal voltage	VIL	GND	-	0.3*VCC	V
LED Life Time (50%)	(Note3)	30000	-	-	hrs

Note 1: There is tolerance in optimum LCD driving voltage during production and it will be within the specified range.

Note 2: All white pattern.

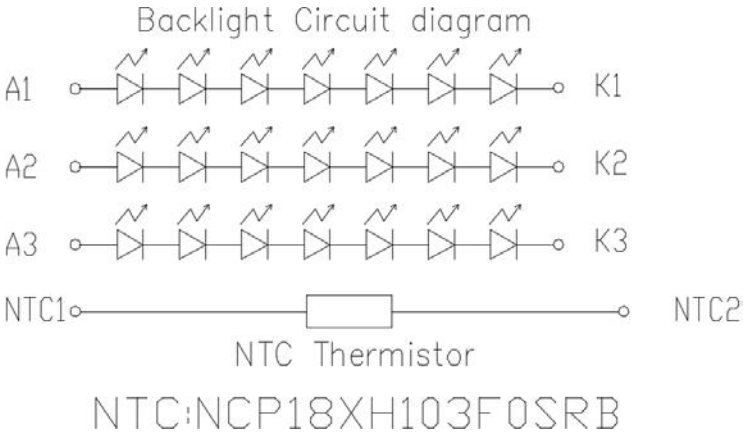
Note 3: The “LED Life Time” is defined as the time period when the brightness decrease to 50% of the initial value under continuous lighting at 25°C (dry condition) with the recommended driving current

5.3 Recommended Driving Condition For LED Backlight

Table 5 (Ta = 25°C)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Supply voltage of LED02 backlight	V_{LED}	Backlight current= 240mA Number of LED dies= 7x3pcs	18.9	21	23.8	V	Note 1
Supply current of single Backlight LED02 string	$I_{LED1..2}$	Per LED string	-	80	-	mA	Note 2, 4
Total Supply current of LED02 Backlight	I_{LED} (Total)	-	-	240	-	mA	Note 2.4
Backlight Power Consumption	P_{LED}	-	-	5.04	-	W	Note 3

Note 1: Backlight Circuit Diagram



Note 2: The LED driving condition is defined for each LED module.

Input current = 80mA x 3 = 240mA

Note 3: Backlight power consumption is calculated by $I_{LED} \times V_{LED}$

Note 4: Backlight driving current best at 240mA or below, and should not significantly exceed 240mA at all temperature; otherwise, overheating may happen and may damage the backlight.

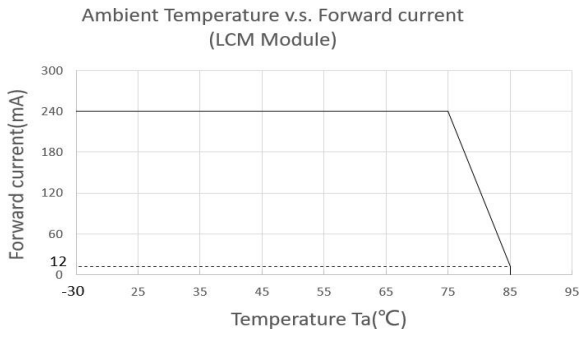


Figure 3: Recommended Backlight Derating Curve

5.4 Timing Characteristics

5.4.1 LVDS mode AC electrical characteristics

Table 6

Parameter	Symbol	Min	Typ	Max	Unit
Clock frequency	F_{LVCYC}	61.6	66.4	74.6	MHz
Clock period	T_{LVCYC}	13.4	-	16.2	ns
1 data bit time	UI	-	1/7	-	T_{LVCYC}
Clock high time	T_{LVCH}	2.45	4	4.55	UI
Clock low time	T_{LVCL}	2.45	3	4.55	UI
Position 1	T_{POS1}	-0.2	0	0.2	UI
Position 0	T_{POS0}	0.8	1	1.2	UI
Position 6	T_{POS6}	1.8	2	2.2	UI
Position 5	T_{POS5}	2.8	3	3.2	UI
Position 4	T_{POS4}	3.8	4	4.2	UI
Position 3	T_{POS3}	4.8	5	5.2	UI
Position 2	T_{POS2}	5.8	6	6.2	UI
Input eye width	T_{EYEW}	0.6	-	-	UI
Input eye border	T_{EX}	-	-	0.2	UI
LVDS wake up time	T_{ENLVDS}	-	-	150	us
Differential input common Mode voltage	VCM	1	1.2	1.7-|Vid|/2	V
Differential input high Threshold voltage	Vth	-	-	+0.1	V
Differential input low threshold voltage	Vtl	-0.1	-	-	V
Differential input voltage	|Vid|	0.2		0.6	V

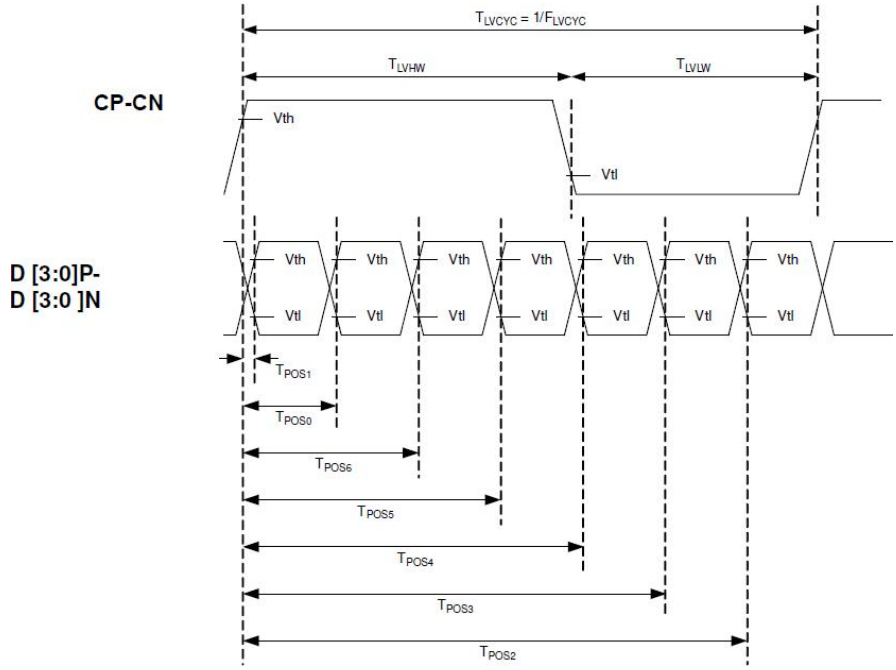
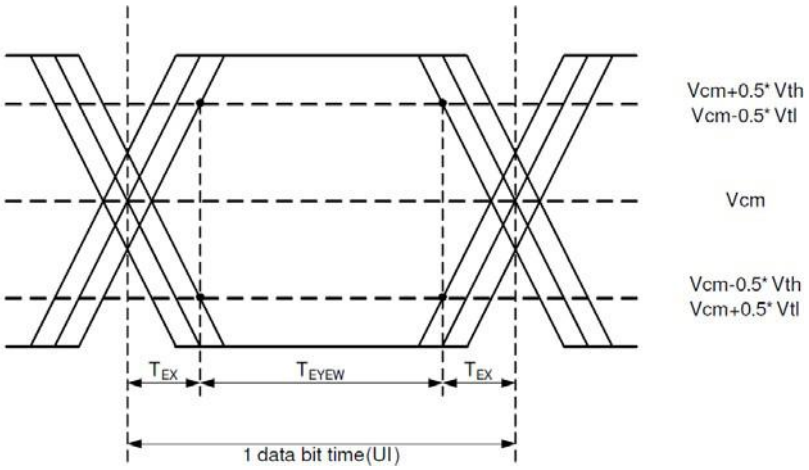


Figure4.1:LVDS input timing

Single-ended:
D[3 :0]P,
D[3 :0]N



Differential:
D[3 :0]P-D[3:0]N

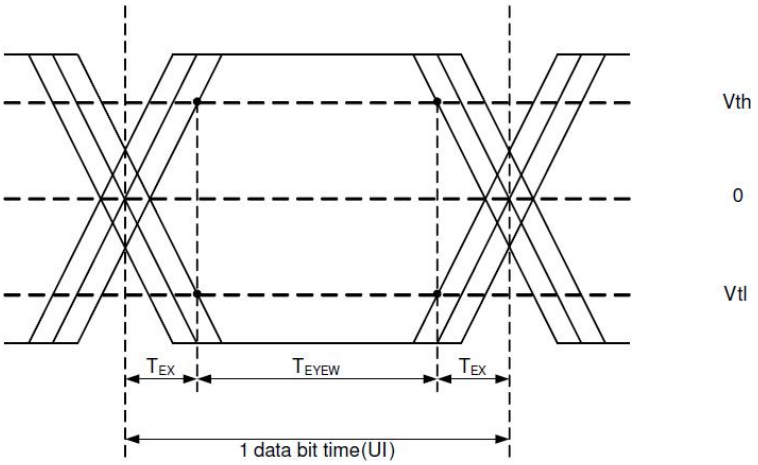


Figure 4.2: LVDS input eye diagram

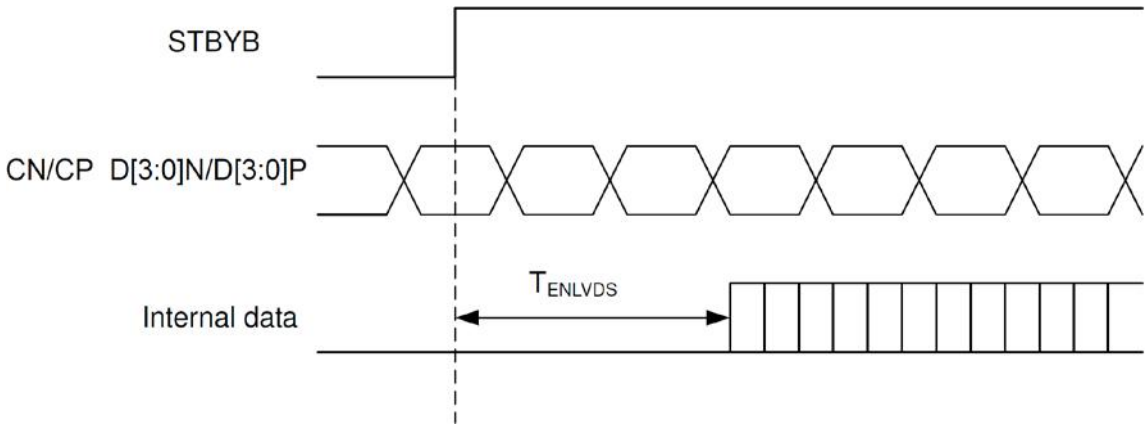


Figure 4.3:LVDS wake up time

5.4.2 LVDS signal timing

Table 7

Parameter	Symbol	Value			Unit
		Min	Typ	Max	
DCLK frequency	Fdclk	61.6	66.4	74.6	MHz
Horizontal valid area	thd		1280		DCLK
1 horizontal line	th	1320	1364	1458	DCLK
Vertical valid area	tvd		768		H
1 vertical field	tv	778	811	853	H
Frame rate	FR		60		Hz

DE Mode

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

- **Horizontal**

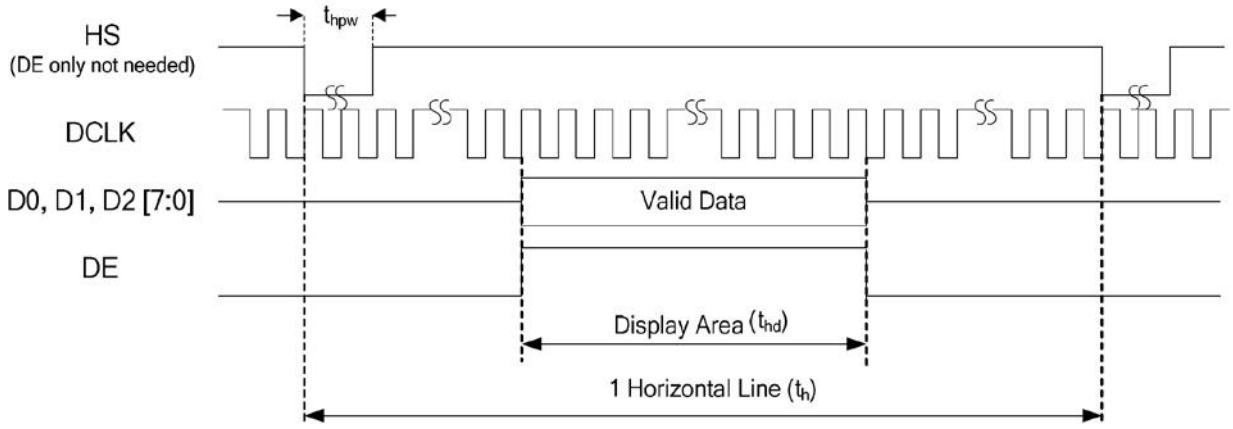


Figure 5.1: Horizontal input timing at DE only mode

- **Vertical**

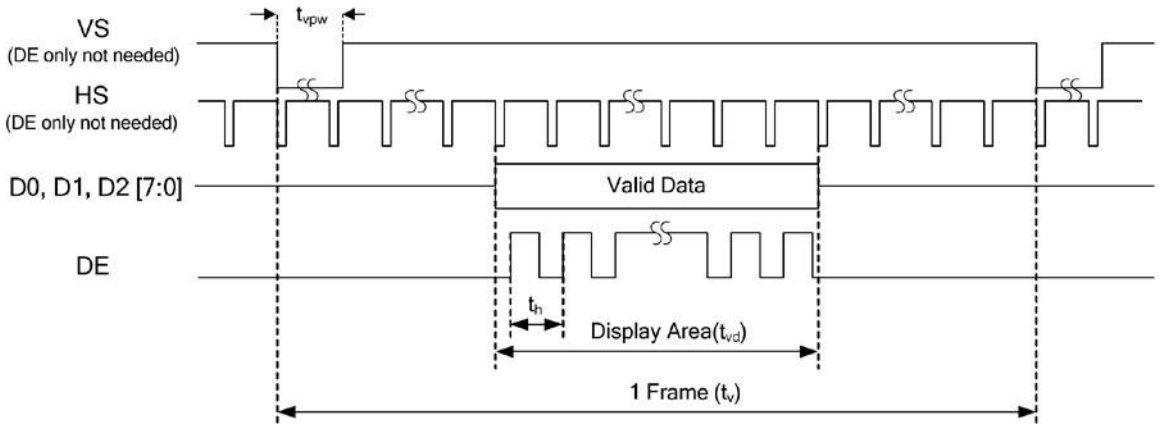


Figure 5.2 Vertical input timing at DE only mode

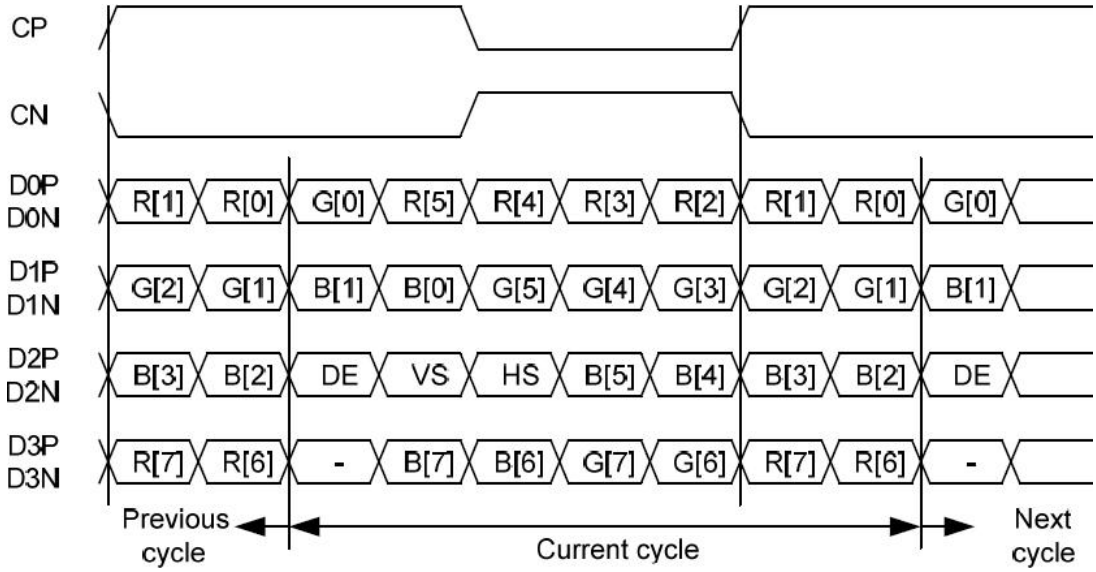
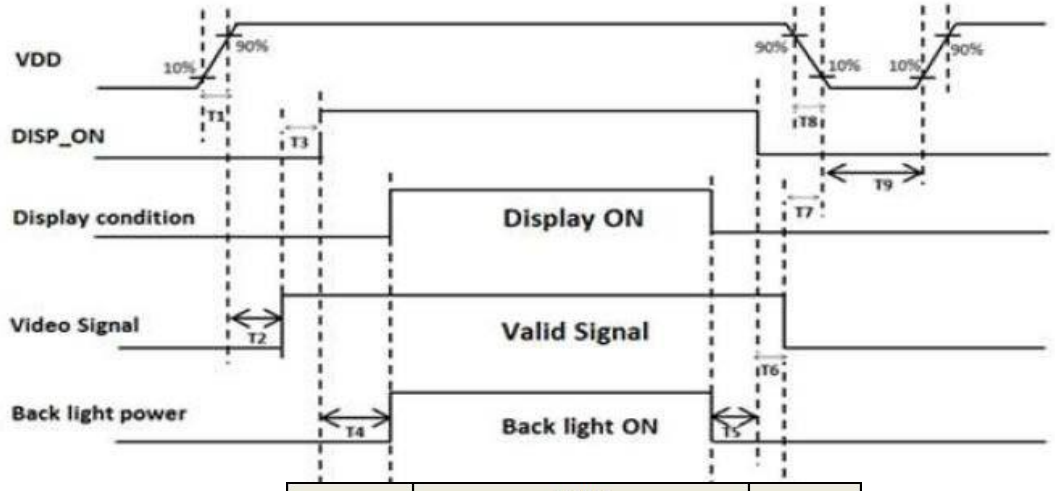


Figure 5.3:LVDS Input signal VESA format:

5.4.3 Power on sequence



Parameter	Value			Unit
	Min.	Typ.	Max.	
T1	0.5	-	10	ms
T2	0	-	-	ms
T3	100	-	-	ms
T4	150	-	-	ms
T5	200	-	-	ms
T6	200	-	-	ms
T7	0	-	-	ms
T8	0	-	10	ms
T9	400	-	-	ms

DISP_ON is an active high signal.When this signal is low,the display will be in standby mode and nothing displayed on the screen.

6. Optical Characteristics

Conditions unless specified otherwise:

- Ta = 25°C
- Supply voltage = 3.3 volts
- Elapsed time from switch on is greater than 30 minutes
- RGB, white and black test patterns only
- Factory settings
- Brightness = 100% unless specified
- Measurements are conducted at ambient temperature and perpendicular unless specified Table 8

Items		Symbol	Condition		Min.	Typ.	Max.	Unit	Note
Response Time		T_R+T_F	Ta=-20°C	Viewing normal angle = = 0°	-	-	250	ms	(Note 1)
			Ta=25°C		-	-	40		
Viewing angle	12’	2	Ta=25°C	Center CR>10	-	80	-	deg.	(Note 2)
	6’	1			-	80	-		
	9’	2			-	80	-		
	3’	1			-	80	-		
Contrast Ratio		CR	Ta=25°C	Viewing normal angle = = 0°	700	900	-	-	(Note 3)
Brightness		Br	Ta=25°C		870	1000	-	cd/m^2	
Chromaticity	White	x_W	Ta=25°C	Viewing normal angle = = 0°	0.270	0.300	0.330	-	(Note 4)
		y_W			0.290	0.320	0.350	-	
	Red	x_R			0.610	0.640	0.670	-	
		y_R			0.312	0.342	0.372	-	
	Green	x_G			0.293	0.323	0.353	-	
		y_G			0.596	0.626	0.656	-	
	Blue	x_B			0.116	0.146	0.176	-	
		y_B			0.046	0.076	0.106	-	

Note 1: The electro-optical response time measurements shall be made as Figure 6 by switching the “data” input signal OFF and ON. The times needed for the luminance to change from 10% to 90% s T_r, and 90% to 10% is T_f.

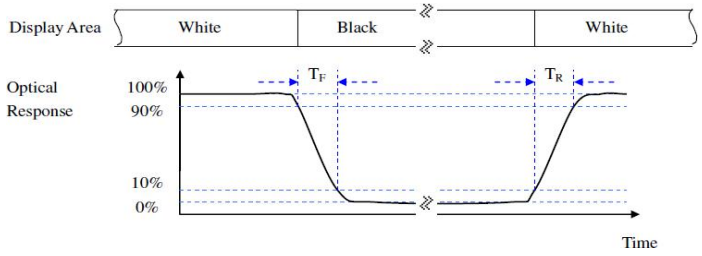


Figure 6: Response Time Testing

Note 2: The definitions of viewing angle.

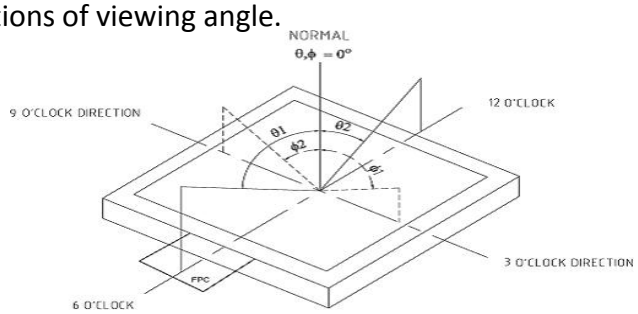


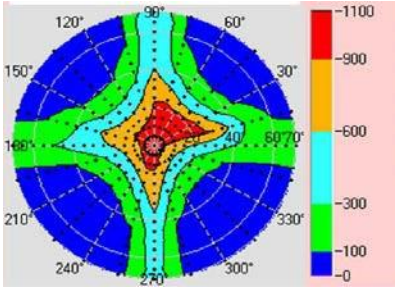
Figure 7

Note 3: Contrast measurements shall be made at viewing angle of θ=0° and at the center of the LCD surface by using DMS. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state. (See figure 7)

Luminace Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

Note 4: The color chromaticity coordinates specified in Table 8 shall be measured at the center of the panel.



ISO-Contrast Plot (for reference) (Ta=25°C)

Note 5: The White luminance uniformity on LCD surface is measured per VESA standard over 9 points and is then expressed as

$$\text{Uniformity } \Delta Y = \frac{\text{Minimum Luminance of 9 points}}{\text{Maximum Luminance of 9 points}} \times 100\ (\%)$$

7. Reliability Tests / Environmental

7.1 Reliability Conditions

Table 9: List of Reliability Tests

Test		Symbol	Condition	Reference	Sample Qty
1	High Temperature Storage	HST	+90°C / 240 hrs	IEC60068-2-2 Bb	4pcs
2	Low Temperature Storage	LST	-40°C / 240 hrs	IEC60068-2-1 Ab	4pcs
3	High Temperature Operating (Note 1)	HOT	+85°C / 240 hrs	IEC60068-2-2 Bb	4pcs
4	Low Temperature Operating	LOT	-30°C / 240 hrs	IEC60068-2-1 Ab	4pcs
5	Accelerated Humidity Test Operating	AHTO	+60°C / 90% RH / 240 hrs	IEC60068-2-78Cab	4pcs
6	Temperature Shock Test	TST	-30°C <> +80°C, 30min/5min/30min,200cycles Non-Operating	IEC60068-2-14Na	4pcs
7	UV exposure resistance	UV	1KW Xenon/ 100 hrs Power off.	IEC 60068-2-5 Sa	2pcs
8	Mechanical Shock (Note 2)	-	3 directions: X,Y,Z axes Repeats:6 Peak acc.:100 G Pulse duration: 6 ms (half sine wave) Non-Operating	IEC 60068-2-27Ea	2pcs
9	Mechanical Vibration (Note 2)	-	3 directions: X,Y,Z axes Sweep time: 10 (1Oct/ min) Frequency: 10 -> 150->10 Hz 10-58 Hz: constant amplitude 0.75mm peak. 58-150Hz: constant acceleration 10g peak Sinusoidal, Non-Operating	IEC 60068-2-6Fc	2pcs

Note 1: LCD panel surface temperature should not exceed 85ºC.

Note 2: For module internal structure robustness test purpose only. Customer application cluster design should take care of overall mounting robustness with display module.

7.2 Electrostatic Discharge (ESD)

Table 10: ESD Test Conditions

Test	Condition	Method	Remark	Sample Qty
Human body model	R = 330 , C = 150pF, • Air discharge: 15 KV to display surface • Contact discharge: 8 KV to metal frame	IEC61000-4-2	Not operating	2pcs
Machine model	R = 0 , C = 200pF, 200V to I/O pins	MIL-STD-883, method 3015	Not operating	

Note 1: The TFT-LCD panel and IC on module are sensitive to electrostatic discharge; please make sure equipments and operators are properly ground before and during handling

Note 2: As different customer application have different interfacing designs and assembly processes, the display module has no ESD protection circuitry. Customer is required to take special care on ESD level control in the assembly and test processes.

8. Handling Cautions

8.1 Mounting of module

- Please power off the display module before it is disconnected or connected to the application.
- If the connection to the application is not good, following problems may result.
  1. Significant noise on signals between display module and application
  2. Unstable display performance
  3. Parts on the module will be heat up or damaged
- The polarizer is made of soft material and is susceptible to flaw. The display must be handled with care.
- Protective film (Laminator) is applied on surface for protection against scratches and dirts. Please avoid electrostatic charge build-up when peeling off the laminator.

8.2 Precautions in Mounting

- When metal part of the TFT-LCD module (shielding lid and rear case) is soiled, wipe it with soft dry cloth.
- Wipe off water drops or finger grease immediately when found. Prolonged contact with water may cause discoloration or spots.
- The TFT-LCD panel module contains glass which breaks or cracks easily if dropped or bumped on hard surface. Please handle with care.
- The TFT-LCD panel and IC on module are sensitive to electrostatic discharge; please make sure equipments and operators are properly ground before and during handling.

8.3 Adjusting module

- Adjusting volumes on the rear face of the module have been set to its optimal before shipment. Therefore, do not change any adjusted values. If adjusted values are changed, the display may not perform to specification.

8.4 Others

- Do not expose the module to direct sunlight or intensive ultraviolet rays for prolonged hours
- Store the module at room temperature condition.
- If LCD panel breaks, liquid crystal may escape from the panel. Avoid bringing it to eyes or mouth contact. When liquid crystal sticks on hands, clothes or feet, wash it out immediately with soap.
- Observe all other precautionary requirements as in handling general electronic components.
- Please adjust the voltage of common electrode as materials of attachment by 1 module.
- Do not expose the display module to harmful gases such as acid and alkali gasses, which will corrode electronic components.
- Do not disassemble the display module because it can cause permanent damage and will void the warranty agreement.

9. Definitions

Data sheet status	
Objective Specification	This data sheet contains target or goal specifications for product development.
Preliminary Specification	This data sheet contains preliminary data; supplementary data may be published later.
Product Specification	This data sheet contains final product specification.
Limiting values	
Limiting values given are in accordance with the Absolute Maximum Rating. Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operating of the device at these or any other conditions above those given in the Characteristics sections of the specification is not implied. Expose to limiting values for extended periods may affect device reliability. Device is functional within the limiting conditions doesn't imply the same performance over the covered conditions, customer is required to decide the best range for the final applications.	

10. Life Support Applications

These products are not designed for use in life saving appliances, devices or systems where malfunctioning of these products can reasonably be expected to result in personal injury. Customers using or selling these products for use in such applications do so at their own risk and agree full non liability of L C D M a l l Limited for any damages or losses