LCM Specification

Preliminary Specification【 √ 】
Final Specification 【 】

PRODUCT TYPE: TFT MODULE

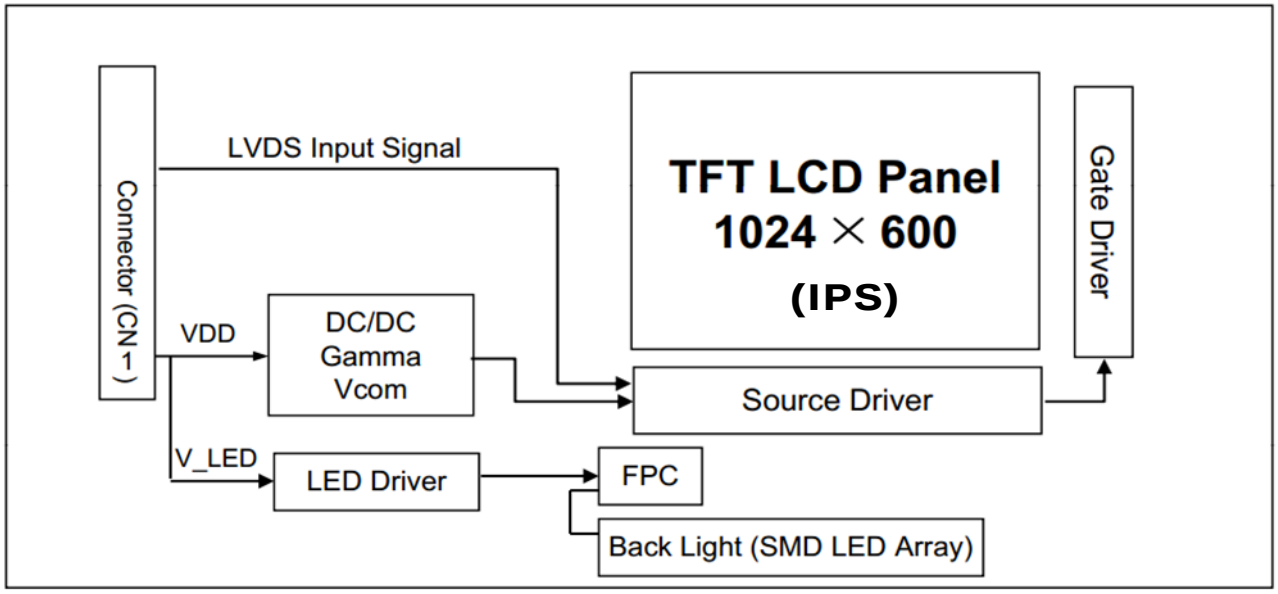
PRODUCT P/N: EH07023C

DESIGNEDBY	
CHECKEDBY	
APPROVED BY	

INSPECTION RESULT	
TESTED BY	
APPROVED BY	

1. OVERVIEW

EH07023C is a color active matrix TFT LCD module using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This module has a 7.0 inch diagonally measured active area with WSVGA resolutions (1024horizontal by 600 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this module can display 16.7M colors. The TFT LCD panel used for this module is adapted for a low reflection and higher color type.



1.1 Features

1 Channel LVDS Interface with 1 pixel / clock

Thin and light weight

Display 16.7M colors (Hi FRC)

High luminance and contrast ratio, low reflection and wide viewing angle

DE (Data Enable) signal mode

3.7V for Logic Power and LED Back Light Power

RoHS Compliant

1.2 General Specification

Parameter	Specification	Unit	Remarks
Lcd size	7.0 (Diagonal)	inch	
Active area	153.6(H) × 90(V)	mm	
Number of pixels	1024(H) ×600(V)	pixels	
Pixel pitch	50(H) ×150(V)×RGB	㎛	
Pixel arrangement	Pixels RGB stripe arrangement		
Display colors	16.7M(6bits + H-FRC)	colors	
Display mode	Transmission mode, Normally Black		
Outline Dimension	164.05(H) × 100.86(V) × 2.35(D) typ.	mm	
Weight	120 (max)	g	
Surface Treatment	Hard Coating, 3H, Low Reflection (Front Polarizer)		
Back-light	Bottom edge side, 1-LED Lighting Bar Type		
Gamut	45%(Min)/50%(Typ)		
Response Time	20 (Typ)/40(Max)	ms	
Viewing Angle	178° (Typ.)		

2. Pin Assignment

FPC Connector is used for the module electronics interface.

PinNo.	Symbol	I/O	Function	Remark
1	VCOM	P	CommonVoltage	
2	VDD	P	PowerVoltagefordigitalcircuit	
3	VDD	P	PowerVoltagefordigitalcircuit	
4	NC	---	Noconnection	
5	Reset	I	Globalresetpin	
6	STBYB	I	Standbymode,Normallypulledhigh STBYB= “1” ,normaloperation STBYB= “0” ,timingcontroller,source driverwillturnoff,alloutputareHigh-Z	
7	GND	P	Ground	
8	RXIN0-	I	-LVDSdifferentialdatainput	
9	RXIN0+	I	+LVDSdifferentialdatainput	
10	GND	P	Ground	
11	RXIN1-	I	-LVDSdifferentialdatainput	
12	RXIN1+	I	+LVDSdifferentialdatainput	
13	GND	P	Ground	
14	RXIN2-	I	-LVDSdifferentialdatainput	
15	RXIN2+	I	+LVDSdifferentialdatainput	
16	GND	P	Ground	
17	RXCLKIN-	I	-LVDSdifferentialclockinput	
18	RXCLKIN+	I	+LVDSdifferentialclockinput	
19	GND	P	Ground	
20	RXIN3-	I	-LVDSdifferentialdatainput	
21	RXIN3+	I	+LVDSdifferentialdatainput	
22	GND	P	Ground	
23	NC	---	Noconnection	
24	NC	---	Noconnection	
25	GND	P	Ground	

26	NC	---	Noconnection	
27	DIMO	O	BacklightCABCcontrollersignaloutput	
28	SELB	I	6bit/8bitmodeselect	Note1
29	AVDD	P	PowerforAnalogCircuit	
30	GND	P	Ground	
31	LED-	P	LEDCathode	
32	LED-	P	LEDCathode	
33	L/R	I	Horizontalinversion	Note3
34	U/D	I	Verticalinversion	Note3
35	VGL	P	GateOFFVoltage	
36	CABCEN1	I	CABCH/Wenable	Note2
37	CABCEN0	I	CABCH/Wenable	Note2
38	VGH	P	GateONVoltage	
39	LED+	P	LEDAnode	
40	LED+	P	LEDAnode	

I: input, O: output, P: Power

Note1: If LVDS input data is 6 bits ,SELB must be set to High;
If LVDS input data is 8 bits ,SELB must be set to Low.

Note2: When CABC_EN=”00”, CABC OFF.
When CABC_EN=”01”, user interface image.
When CABC_EN=”10”, still picture.
When CABC_EN=”11”, moving image.
When CABC off, don’t connect DIMO, else connect it to backlight.

Note3: When L/R=”0”, set right to left scan dirction.
When L/R=”1”, set left to right scan dirction.
When U/D=”0”, set top to bottom scan dirction.
When U/D=”1”, set bottom to top scan diction.

3. Operation Specifications

3.1 Absolute Maximum Ratings

3.1.1. Typical Operation Conditions

Item	Symbol	Values					Unit
		Min.	Typ.	Max.	Example		
Powervoltage	DVDD	3.00	3.30	3.50	3.20	3.20	V
	AVDD	10.00	10.50	11.00	11.09	10.32	V
	VCOM	3.40	3.60	3.70	3.68	3.67	V
	VGH	19.00	19.50	20.50	20.10	19.22	V
	VGL	-6.00	-6.50	-7.00	-6.75	-6.51	V
OperationTemperature	TOP	-20.00		60.00			℃
StorageTemperature	TST	-30.00		70.00			℃
LEDReverseVoltage	VR			5.00			V
LEDForwardCurrent	IF			35.00			mA

Note 1: The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

3.1.2 Current Consumption

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
CurrentforDriver	I_{GH}	-	0.2	1.0	mA	V_{GH}=20V
	I_{GL}	-	0.2	1.0	mA	V_{GL}=-6.5V
	IDV_{DD}	-	50	60	mA	DV_{DD}=3.3V
	IAV_{DD}	-	25	30	mA	AV_{DD}=11V

3.1.3 Backlight Driving Conditions

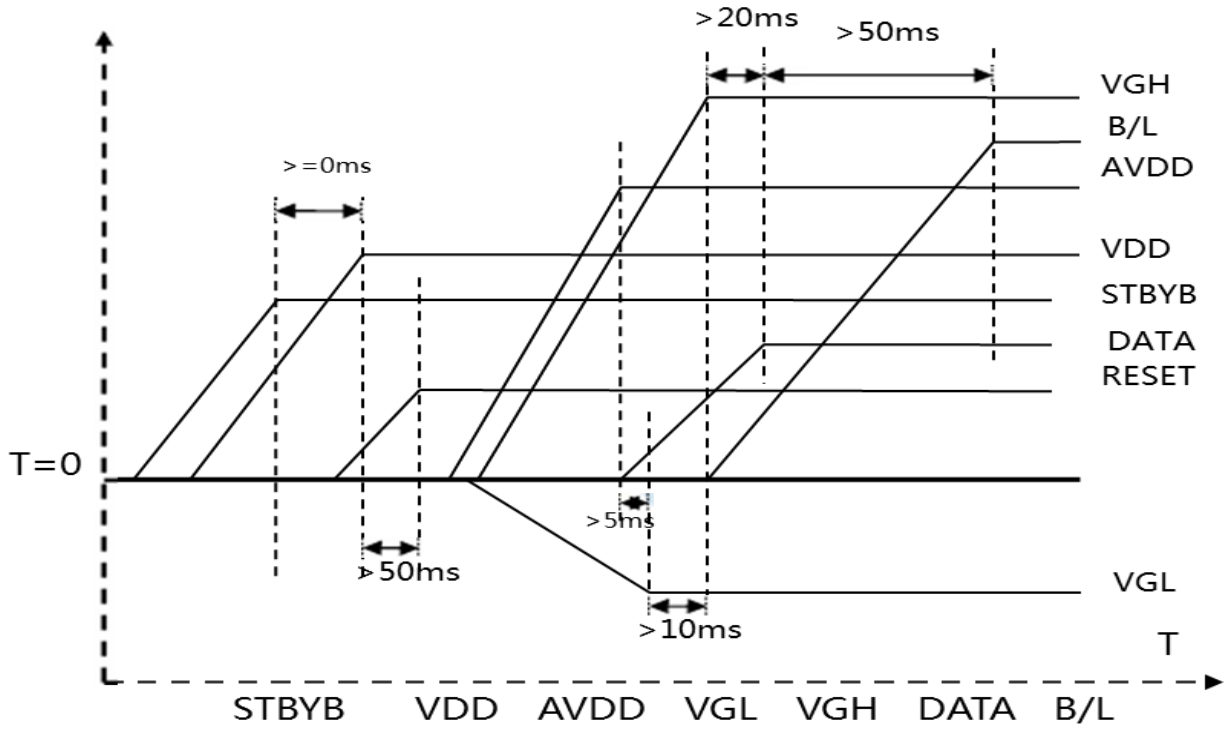
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Voltage for LED backlight	V_L	--	9.3	10.2	V	Note1
Current for LED backlight	I_L	--	120	130	mA	
LED life time	-	-	20,000	-	Hr	Note2

Note 1: The LED Supply Voltage is defined by the number of LED at Ta=25℃ and IL =120mA.

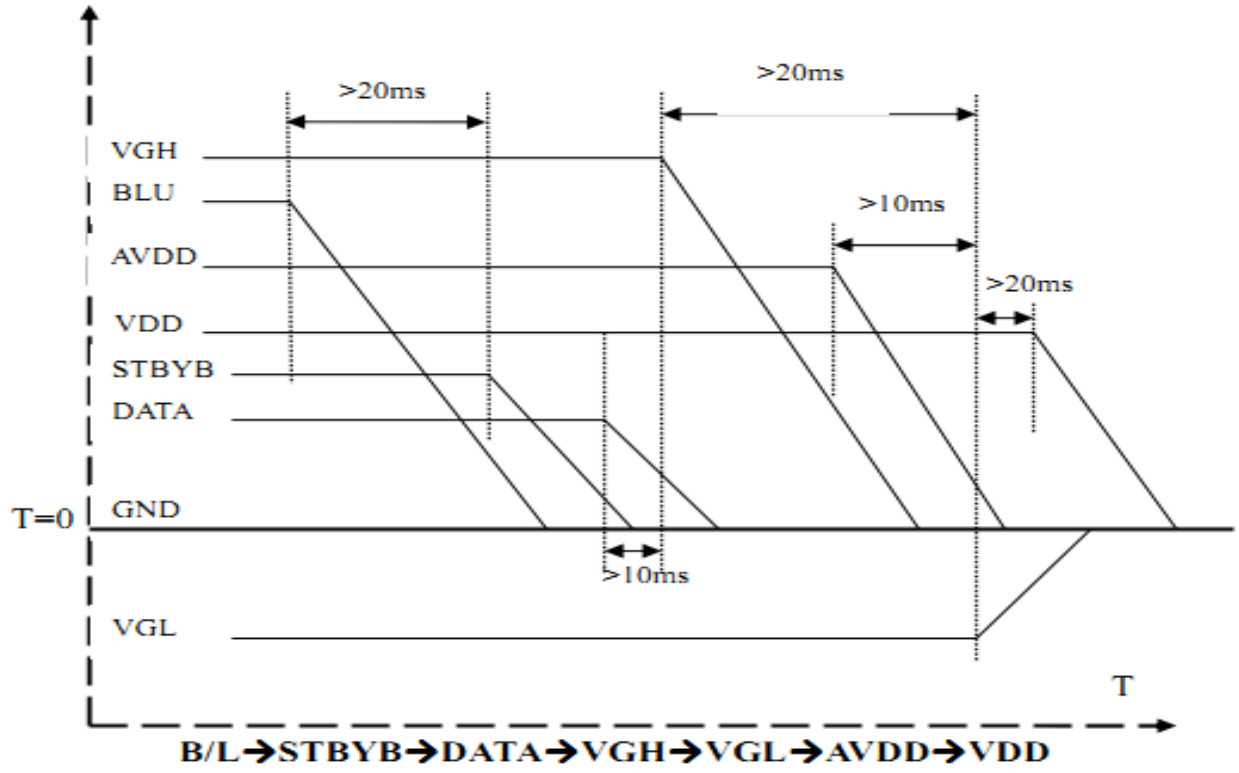
Note 2: The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25℃ and IL =120mA. The LED lifetime could be decreased if operating ILis lager than 120mA.

3.2 Power Sequence

a. Power on:



b. Power off:

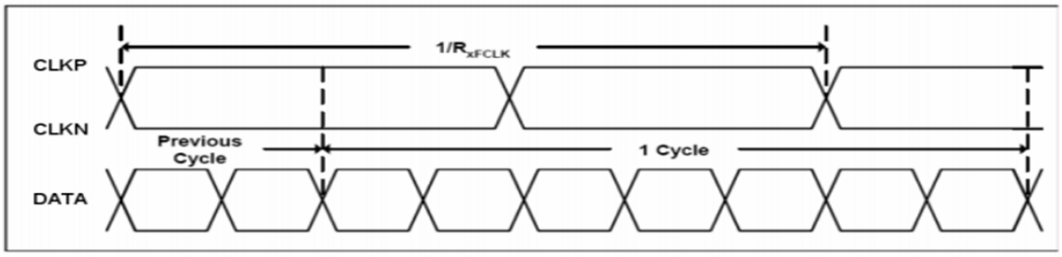


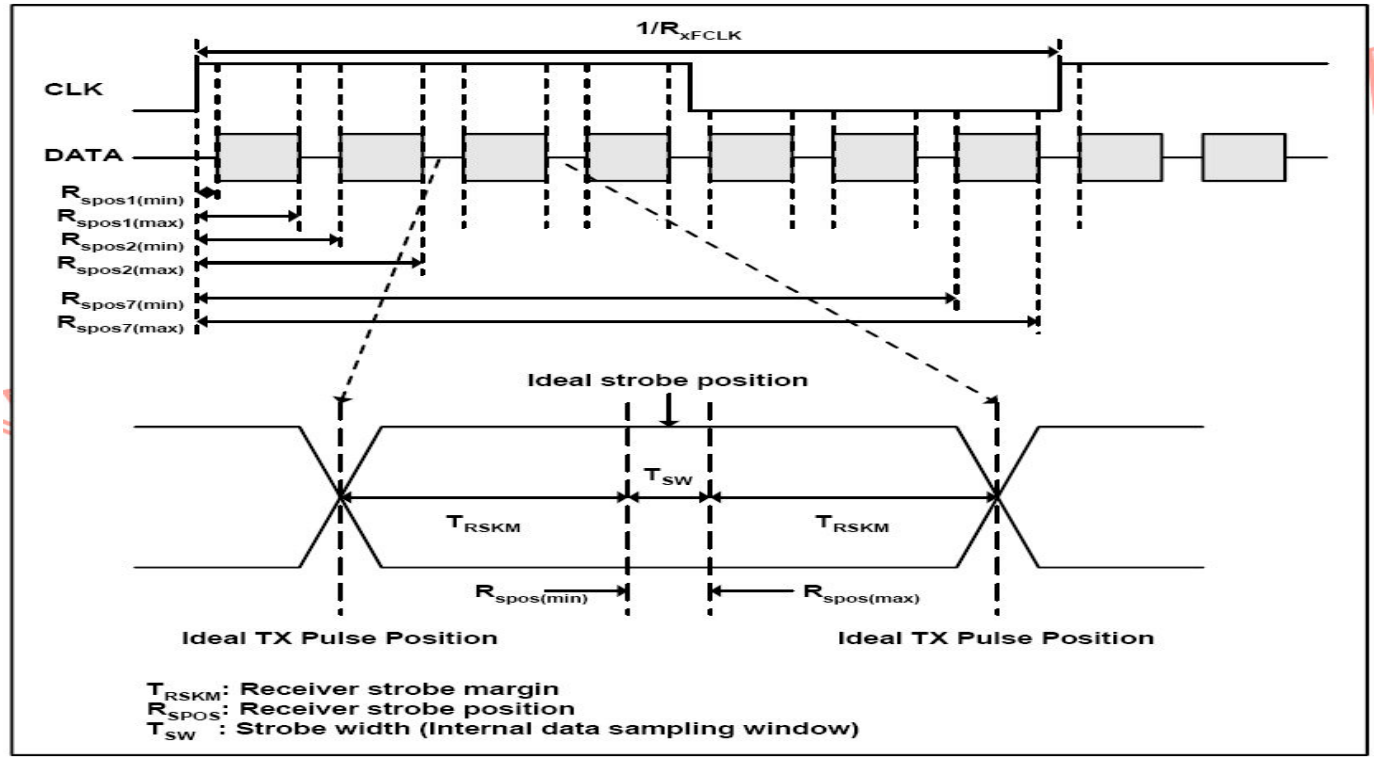
3.3 Timing Characteristics

3.3.1 AC Electrical Characteristics

Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Clock frequency	R_{xFCLK}	40.8	51.2	71	MHz	
Input data skew margin	T_{RSKM}	500	-	-	ps	
Clock high time	T_{LVCH}	-	$4/(7*R_{xFCLK})$	-	ns	
Clock low time	T_{LVCL}	-	$3/(7*R_{xFCLK})$	-	ns	

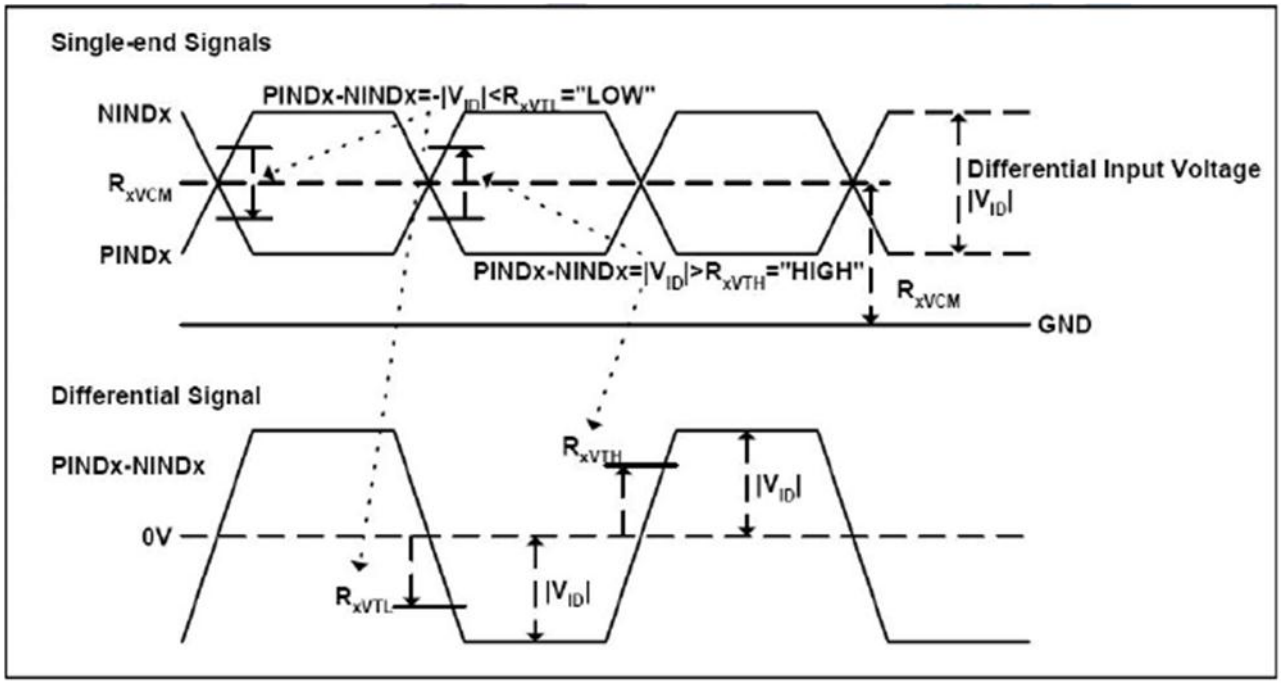
3.3.2. Input Clock and Data Timing Diagram





3.3.3. DC Electrical Characteristics

Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Differentialinputhigh Thresholdvoltage	R_{xVTH}	-	-	+0.1	V	R_{XVCM}= 1.2V
Differentialinputlow Thresholdvoltage	R_{xVTH}	-0.1	-	-	V	
Inputvoltagerange (singled-end)	R_{xVIN}	0	-	2.4	V	
Differentialinputcommonmode voltage	R_{xVCM}	$\|V_{ID}\|$/ 2	-	2.4- $\|V_{ID}\|$/ 2	V	
Differentialvoltage	$\|V_{ID}\|$	0.2	-	0.6	V	
Differentialinputleakagecurrent	RV_{xliz}	-10	-	+10	uA	

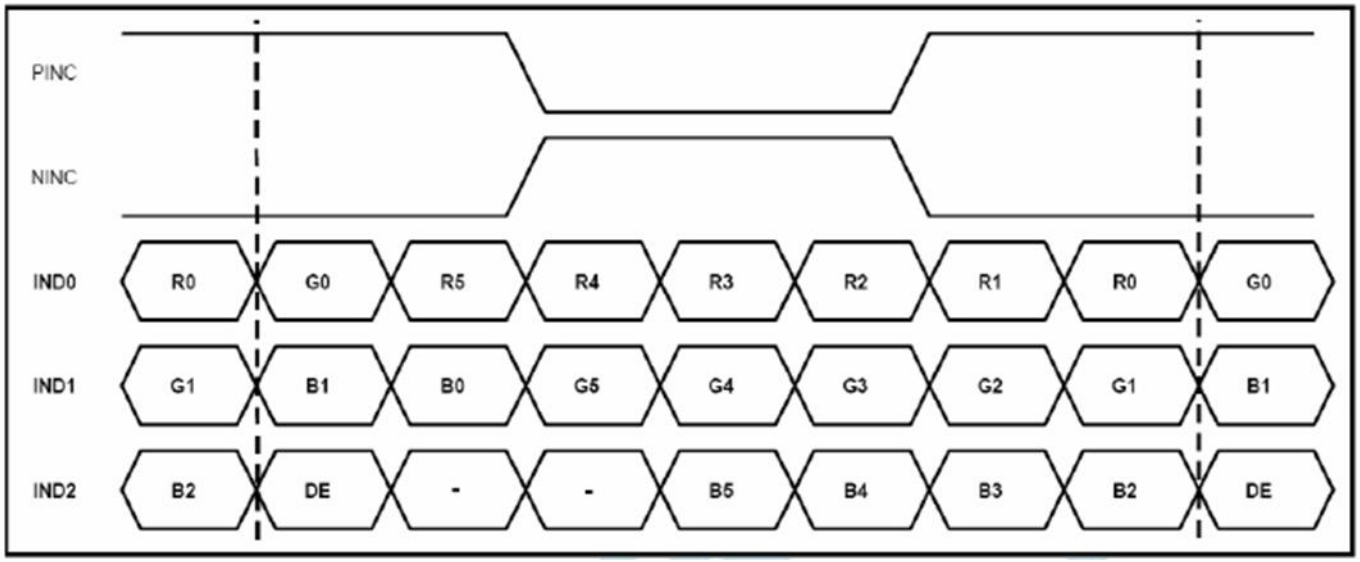


3.3.4. Timing

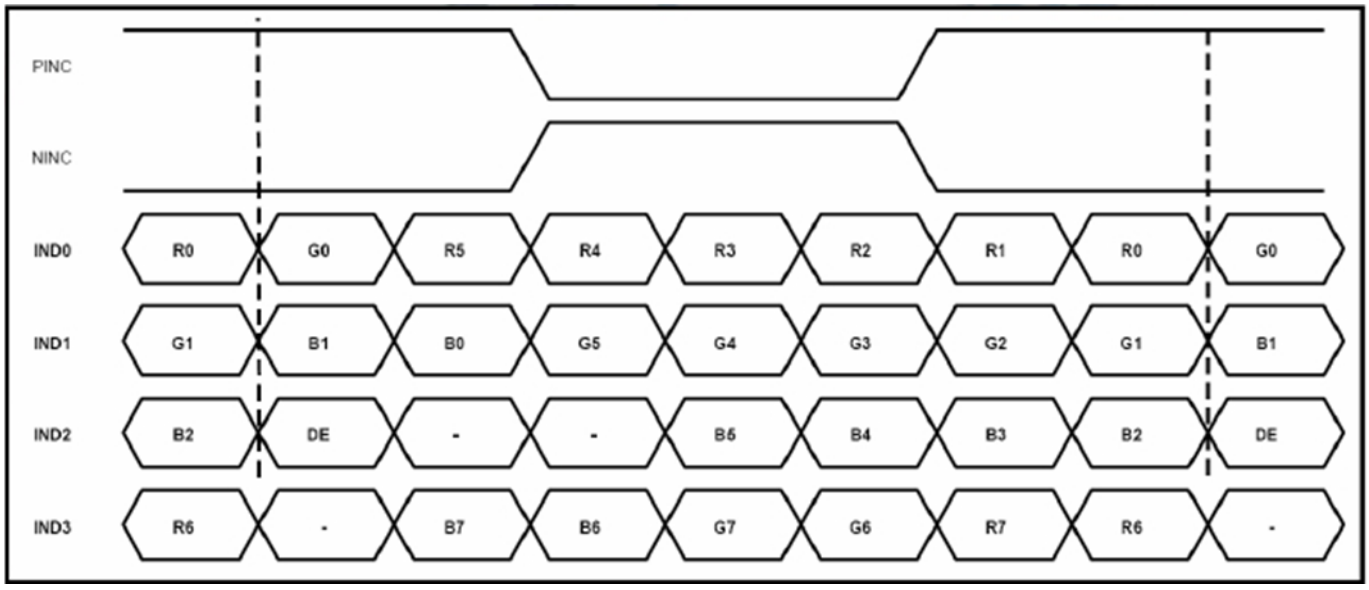
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
ClockFrequency	fclk	40.8	51.2	67.2	MHz	Framerate =60Hz
Horizontaldisplayarea	thd	1024			DCLK	
HSperiodtime	th	1114	1344	1400	DCLK	
HSBlanking	thb	90	320	376	DCLK	
Verticaldisplayarea	tvd	600			H	
VSperiodtime	tv	610	635	800	H	
VSBlanking	thb	10	35	200	H	

3.3.5. Data Input Format

6bit LVDS input



8bit LVDS input



4. Optical Specifications

Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Viewing angle (CR≥10)	θ_L	Φ=180° (9o' clock)	-	85	-	degree	Note1
	θ_R	Φ=0° (3o' clock)	-	85	-		
	θ_T	Φ=90° (12o' clock)	-	85	-		
	θ_B	Φ=270° (6o' clock)	-	85	-		
Responsetime	T_{ON}	Normal θ=Φ=0°	-	20	40	msec	Note3
	T_{OFF}		-	20	40	msec	Note3
Contrast ratio	CR		700	800	-	-	Note4
Color chromaticity	W_X		0.26	0.31	0.36	-	Note2 Note5 Note6
	W_Y		0.28	0.33	0.38	-	
Luminance	L		200	250	-	cd/m²	Note6
Luminance uniformity	Y_U		70	75	-	%	Note7

Test Conditions:

1. DVDD=3.3V, IL=120mA (Backlight current), the ambient temperature is 25℃.
2. 2. The test systems refer to Note 2.

Note 1: Definition of viewing angle range

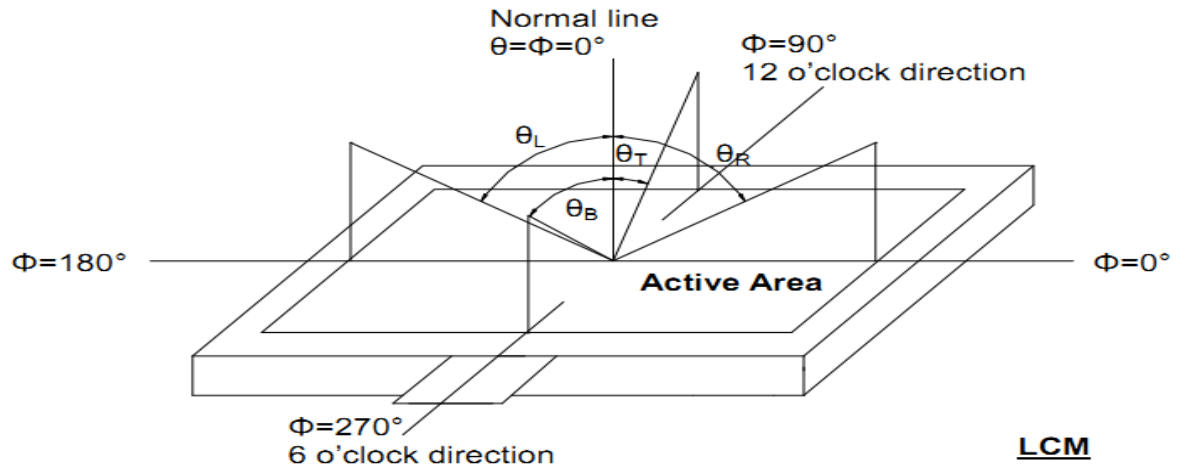


Fig. 4-1 Definition of viewing angle

Note 2: Definition of optical measurement system . The optical characteristics should be measured in dark room. After 30 minutes operation, the optical properties are measured at the center point of the LCD screen. (Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/Field of view: 1° /Height: 500mm.)

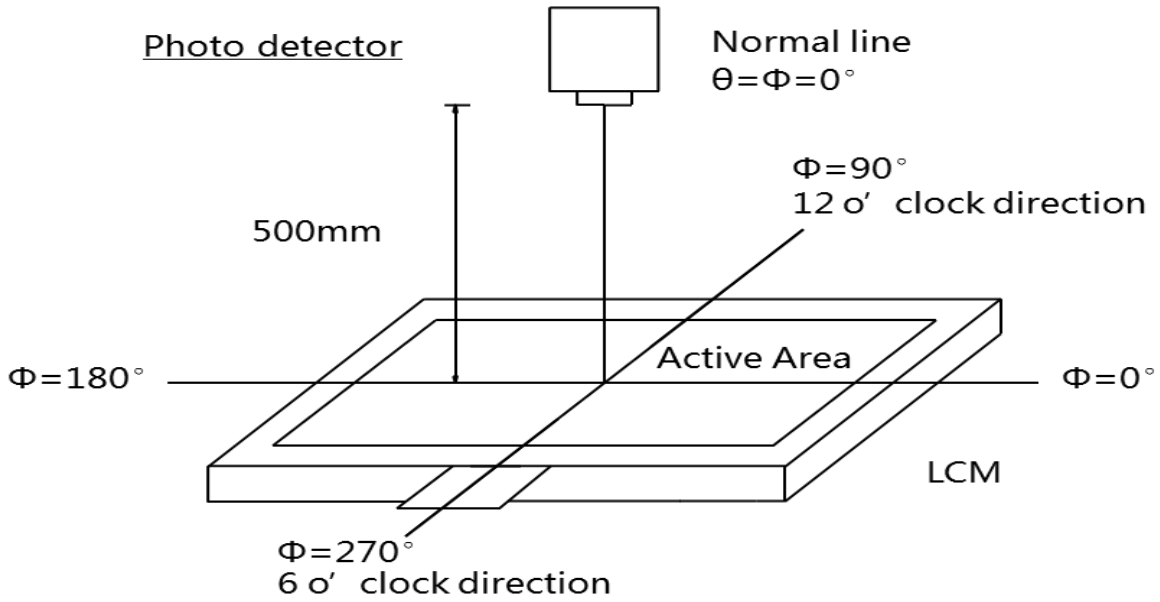


Fig. 4-2 Optical measurement system setup

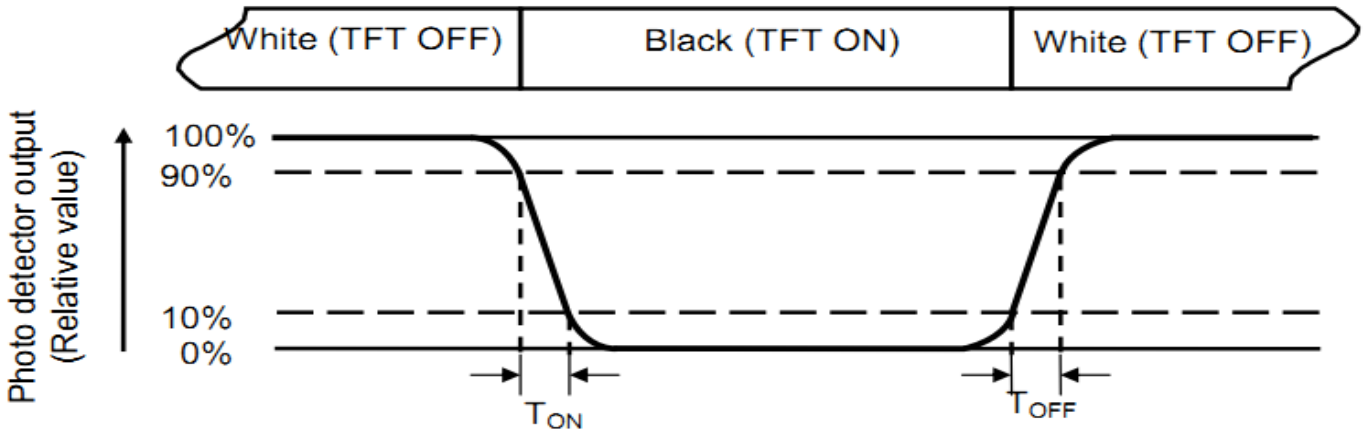


Fig. 4-3 Definition of response time

Note 3: Definition of Response time The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time (TON) is the time between photo detector output intensity changed from 90% to 10%. And fall time (TOFF) is the time between photo detector output intensity changed from 10% to 90%.

Note 4: Definition of contrast ratio

$$\text{Contrast ratio(CR)} = \frac{\text{Luminance measured when LCD on the " White" state}}{\text{Luminance measured whenLCDon the "Black" state}}$$

Note 5: Definition of color chromaticity (CIE1931) Color coordinates measured at center point of LCD.

Note 6: All input terminals LCD panel must be ground while measuring the center area of the panel. The LED driving condition is IL=120mA .

Note 7: Definition of Luminance Uniformity. Active area is divided into 9 measuring areas (Refer to Fig. 4-4).Every measuring point is placed at the center of each measuring area.

$$Luminance\ \ Uniformity\ (Yu) = \frac{B_{min}}{B_{max}}$$

L-------Active area length W----- Active area width

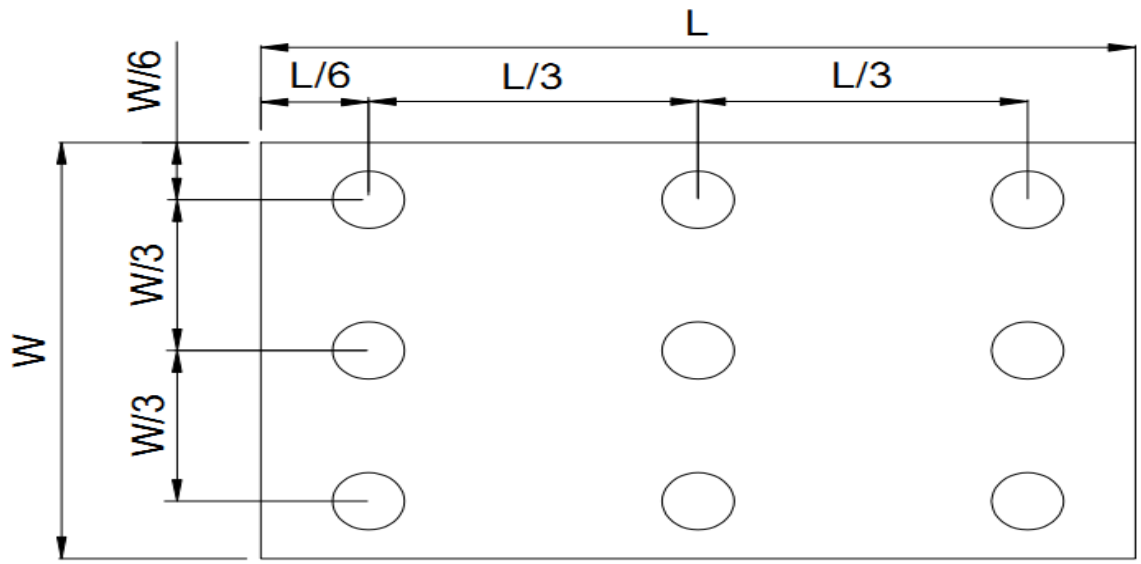


Fig. 4-4 Definition of measuring points

Bmax: The measured maximum luminance of all measurement position.
Bmin: The measured minimum luminance of all measurement position.

5. Reliability Test Items

Item	TestConditions	Remark
HighTemperatureStorage	Ta=70℃240hrs	Note1，Note4
LowTemperatureStorage	Ta=-30℃240hrs	Note1，Note4
High Temperature Operation	Ts=60℃240hrs	Note2，Note4
Low Temperature Operation	Ta=-20℃240hrs	Note1，Note4
Operate at High Temperature and Humidity	+40℃,90%RH240hrs	Note4
Thermal Shock	-30℃/30min~+70℃/30minforatotal100 Cycles , Start with cold temperature and end With high temperature.	Note4
VibrationTest	Frequencyrange:10~55Hz Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2hoursforeachdirectionofX.Y.Z. (6hoursfortotal)	
MechanicalShock	100G6ms,±X,±Y,±Z3timesforeach direction	
Package Vibration Test	RandomVibration: 0.015G*G/Hzfrom5-200HZ,-6dB/Octave from200-500HZ 2hoursforeachdirectionofX.Y.Z. (6hoursfortotal)	
Package DropTest	Height:60cm 1corner,3edges,6surfaces	
Electro Static Discharge	±2KV,HumanBodyMode,100pF/1500Ω	

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 don't guarantee all of the cosmetic specification.
Note 4: Before cosmetic and function test, the product must have enough recovery time , at least 2 hours at room temperature.

6.1. Safety

Liquid crystal is poisonous. Do not put it in your mouth. If liquid crystal touches your skin or clothes, wash it off immediately by using soap and water.

6.2. Handling

1. The LCD panel is plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.
2. The polarizer attached to the display is easily damaged. Please handle it carefully to avoid scratch or other damages.
3. To avoid contamination on the display surface, do not touch the module surface with bare hands.
4. Keep a space so that the LCD panels do not touch other components.
5. Put cover board such as acrylic board on the surface of LCD panel to protect panel from damages.
6. Transparent electrodes may be disconnected if you use the LCD panel under environmental conditions where the condensation of dew occurs.
7. Do not leave module in direct sunlight to avoid malfunction of the ICs.

6.3. Static Electricity

1. Be sure to ground module before turning on power or operating module.
2. Do not apply voltage which exceeds the absolute maximum rating value.

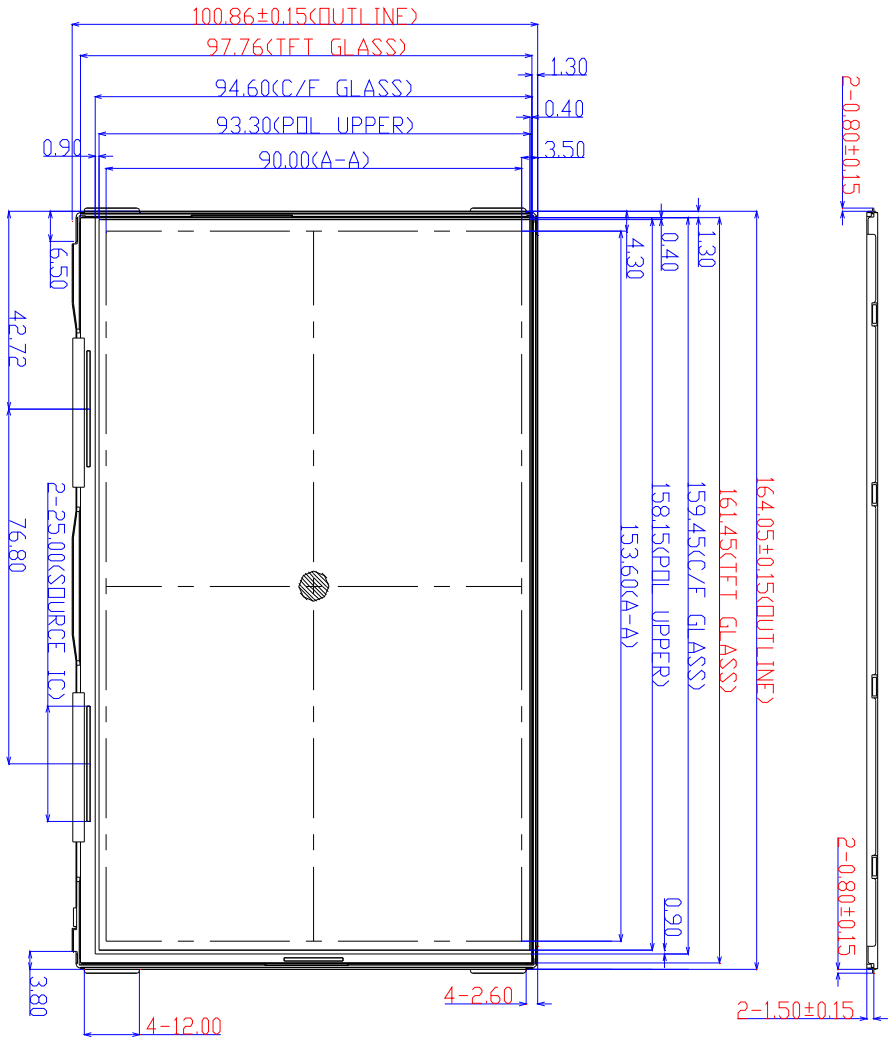
6.4. Storage

1. Store the module in a dark room where must keep at 25±10℃ and 65%RH or less.
2. Do not store the module in surroundings containing organic solvent or corrosive gas.
3. Store the module in an anti-electrostatic container or bag.

6.5. Cleaning

1. Do not wipe the polarizer with dry cloth. It might cause scratch.
2. Only use a soft sloth with IPA to wipe the polarizer, other chemicals might permanent damage to the polarizer.

7. Mechanical Drawing



7. Mechanical Drawing