



PHOENIX DISPLAY INTERNATIONAL, INC.

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SPECIFICATION FOR LCD MODULE

CUSTOMER	
PART NUMBER	PDI070WXBE-05
DESCRIPTION	7.0" 1024 x 600
VERSION	V1.0
ISSUE DATE	12-Dec-16

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Contents

1. General Specifications.....	4
2. Pin Assignment	5
3. Operation Specifications.....	8
3.1. Absolute Maximum Rating.....	8
3.1.1. Typical Operation Conditions.....	8
3.1.2. Current Consumption	9
3.1.3. Backlight Driving Conditions.....	9
3.2. Power Sequence	10
3.3. Timing Characteristics	11
3.3.1. AC Electrical Characteristics	11
3.3.2. Data Input Format.....	12
3.3.3. Timing.....	13
4. Optical Specifications.....	15
5. Reliability Test Items.....	19
6. General Precautions.....	20
6.1. Safety	20
6.2. Handling	20
6.3. Static Electricity	20
6.4. Storage	20
6.5. Cleaning	20
7. Mechanical Drawing	21

1. General Specification

No.	Item	Specification	Remark
1	LCD size	7.0 inch(Diagonal)	
2	Driver element	a-Si TFT active matrix	
3	Resolution	1024 × 3(RGB) × 600	
4	Display mode	Normally White, Transmissive	
5	Dot pitch	0.0502(H) × 0.1432(V) mm	
6	Active area	154.21(W)X85.92(H)mm	
7	Module size	164(W)X103(H)mm	Note 1
8	Surface treatment	Hard Coating Glare	
9	Color arrangement	RGB-stripe	
11	Interface	LVDS	
12	View direction(gray inversion)	6 O'clock	
13	Panel power consumption	0.45W	
14	Weight	TBD	

Note 1: Refer to Mechanical Drawing.

2. Pin Assignment

TFT LCD Panel Driving Section

FPC Connector is used for the module electronics interface. The recommended model is FH12A-40S-0.5SH manufactured by Hirose.

Pin No.	Symbol	I/O	Function	Remark
1	VCOM	P	Common Voltage	
2	VDD	P	Power Voltage for digital circuit	
3	VDD	P	Power Voltage for digital circuit	
4	NC	---	No connection	
5	Reset	I	Global reset pin	
6	STBYB	I	Standby mode, Normally pulled high STBYB = "1", normal operation STBYB = "0", timing controller, source driver will turn off, all output are High-Z	
7	GND	P	Ground	
8	RXIN0-	I	-LVDS differential data input	
9	RXIN0+	I	+ LVDS differential data input	
10	GND	P	Ground	
11	RXIN1-	I	-LVDS differential data input	
12	RXIN1+	I	+ LVDS differential data input	
13	GND	P	Ground	
14	RXIN2-	I	-LVDS differential data input	
15	RXIN2+	I	+ LVDS differential data input	
16	GND	P	Ground	
17	RXCLKIN-	I	-LVDS differential clock input	
18	RXCLKIN+	I	+ LVDS differential clock input	
19	GND	P	Ground	
20	RXIN3-	I	-LVDS differential data input	
21	RXIN3+	I	+ LVDS differential data input	
22	GND	P	Ground	

23	NC	---	No connection	
24	NC	---	No connection	
25	GND	P	Ground	
26	NC	---	No connection	
27	DIMO	O	Backlight CABC controller signal output	
28	SELB	I	6bit/8bit mode select	Note1
29	AVDD	P	Power for Analog Circuit	
30	GND	P	Ground	
31	LED-	P	LED Cathode	
32	LED-	P	LED Cathode	
33	L/R	I	Horizontal inversion	Note3
34	U/D	I	Vertical inversion	Note3
35	VGL	P	Gate OFF Voltage	
36	CABCEN1	I	CABC H/W enable	Note2
37	CABCEN0	I	CABC H/W enable	Note2
38	VGH	P	Gate ON Voltage	
39	LED+	P	LED Anode	
40	LED+	P	LED Anode	

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.

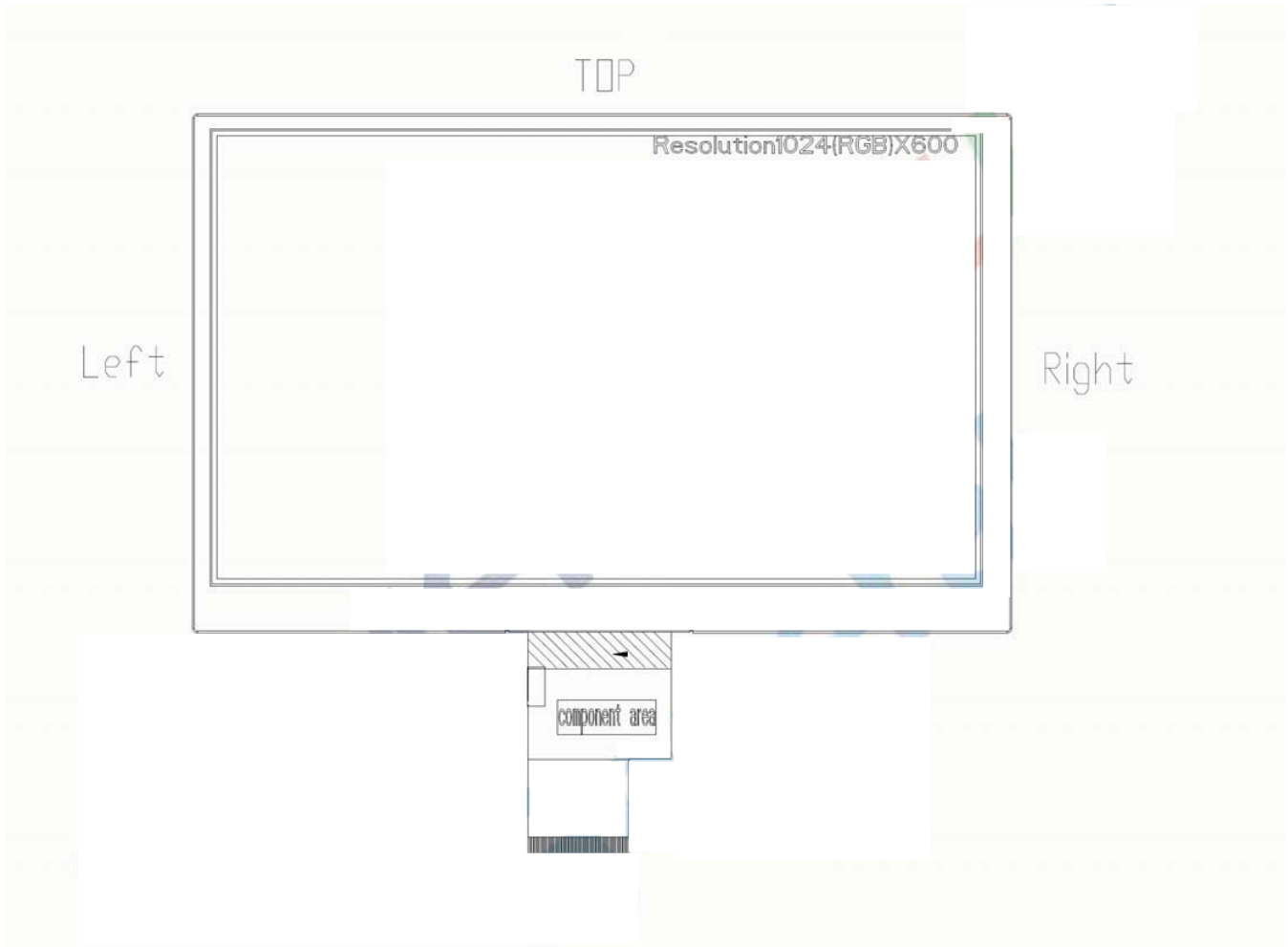
Note3: When L/R="0", set right to left scan direction.

When L/R="1", set left to right scan direction.

When U/D="0", set top to bottom scan direction.

When U/D="1", set bottom to top scan direction.

Note : Definition of scanning direction.
Refer to the figure as below:



3. Operation Specifications

3.1. Absolute Maximum Ratings (Note 1)

Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Power voltage	DVDD	-0.3	5.0	V	
	AVDD	6.5	13.5	V	
	VGH	-0.3	42.0	V	
	VGL	-20.0	0.3	V	
	VGH-VGL		40.0	V	
Operation Temperature	TOP	-20	60	°C	
Storage Temperature	TST	-30	70	°C	

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.

Note 2: VR Conditions: Zener Diode 20mA

3.1.1. Typical Operation Conditions (NOTE1)

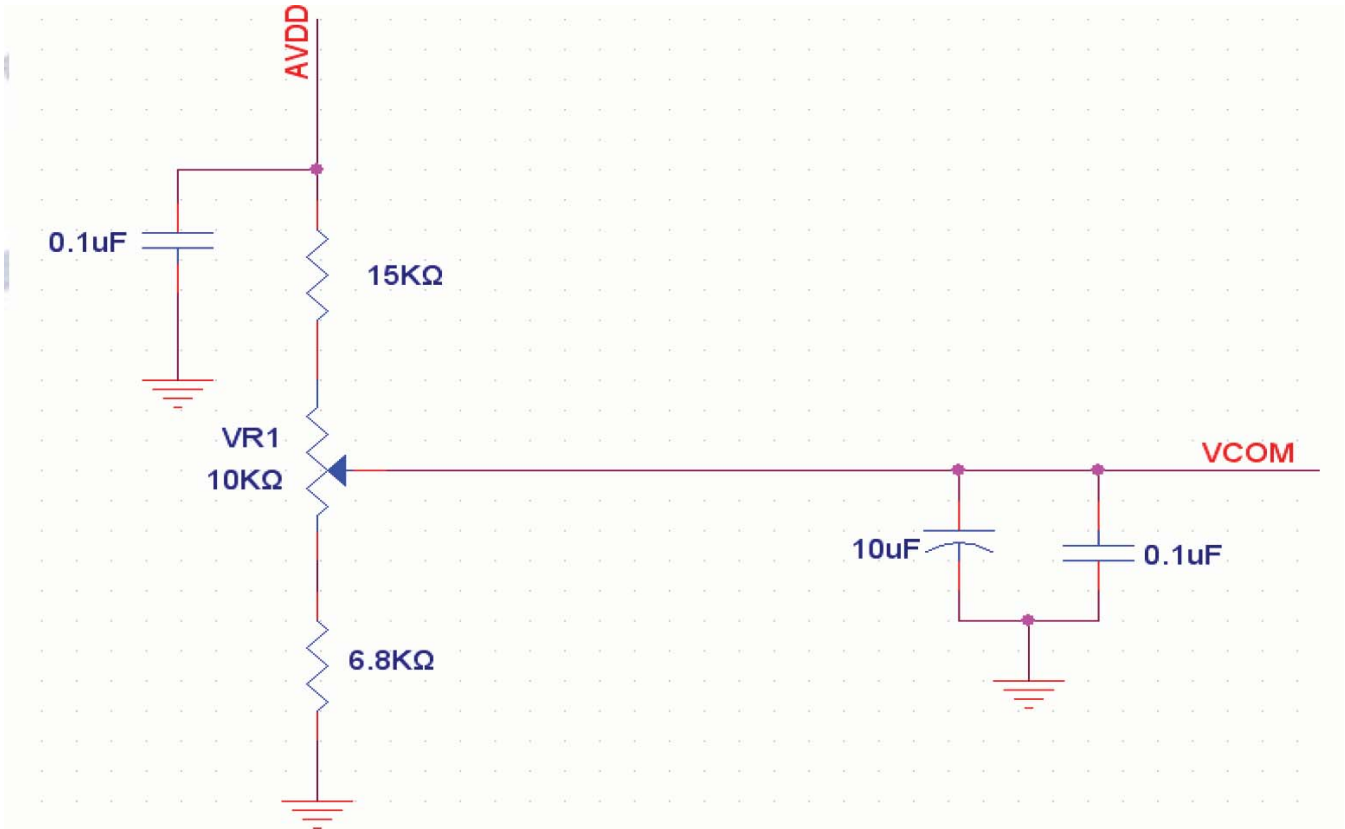
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	DVDD	3.0	3.3	3.6	V	Note 2
	AVDD	10.8	11	11.2	V	
	VGH	16	18	20	V	
	VGL	-5.0	-6.0	-7.0	V	
Input signal voltage	VCOM	2.8	(3.8)	4.8	V	
Input logic high voltage	VIH	0.7 DVDD	-	DVDD	V	Note 3
Input logic low voltage	VIL	0	-	0.3 DVDD	V	

Note 1: Be sure to apply DVDD and VGL to the LCD first, and then apply VGH.

Note 2: DVDD setting should match the signals output voltage (refer to Note 3) of Customer's system board.

Note 3: DCLK,HS,VS,RESET,U/D, L/R,DE,R0~R7,G0~G7,B0~B7,MODE,DITHB.

Note 4: Typ. VCOM is only a reference value, it must be optimized according to each LCM.
 Be sure to use VR;



3.1.2. Current Consumption (Note3)

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Current for Driver	I _{GH}	-	0.2	1	mA	V _{GH} =18.0V
	I _{GL}	-	0.2	1	mA	V _{GL} = -6.0V
	ID _{VDD}	-	50	60	mA	DV _{DD} =3.3V
	IA _{VDD}	-	25	30	mA	AV _{DD} =9.6V

3.1.3. Backlight Driving Conditions

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Voltage for LED backlight	V_L	--			V	Note 1
Current for LED backlight	I_L	--	180	200	mA	
LED life time	-	20,000	-	-	Hr	Note 2

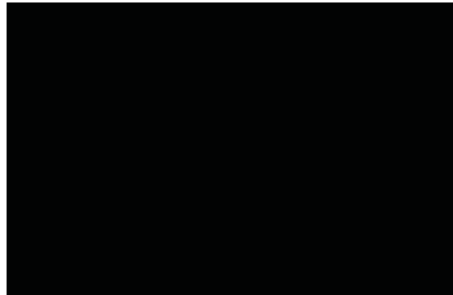
Note 1: The LED Supply Voltage is defined by the number of LED at $T_a=25^{\circ}\text{C}$ and $I_L=160\text{mA}$.

Note 2: The "LED life time" is defined as the module brightness decrease to 50% original brightness at $T_a=25^{\circ}\text{C}$ and $I_L=160\text{mA}$. The LED lifetime could be decreased if operating I_L is larger than 160 mA.

Note 3: Typ.specification:Gray-level test pattern; Max.specification:Black-level test pattern.



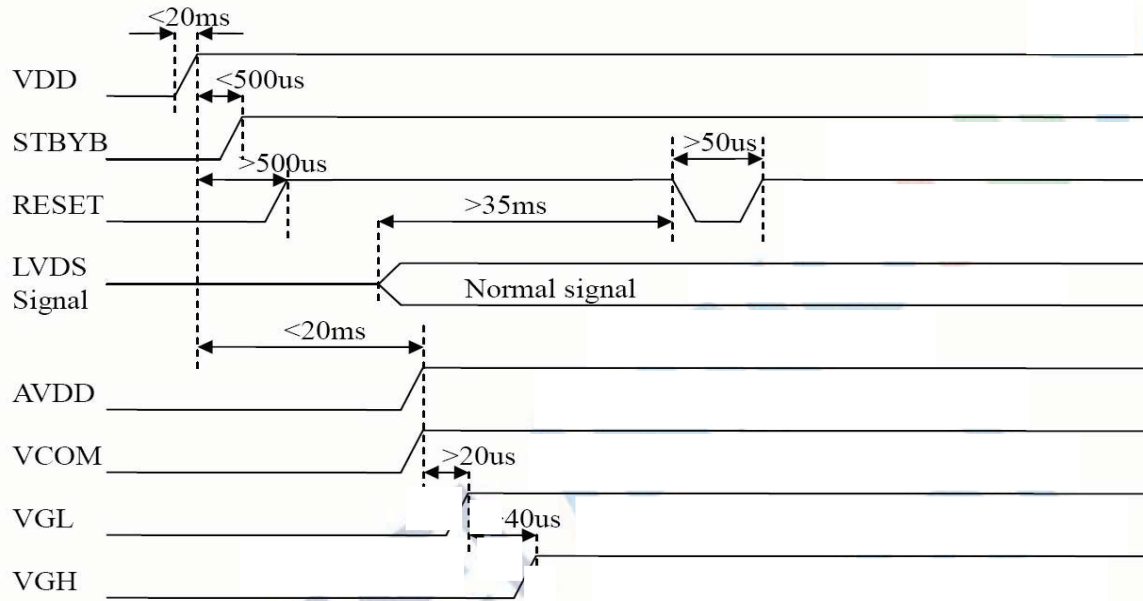
(a) Gray-level test pattern



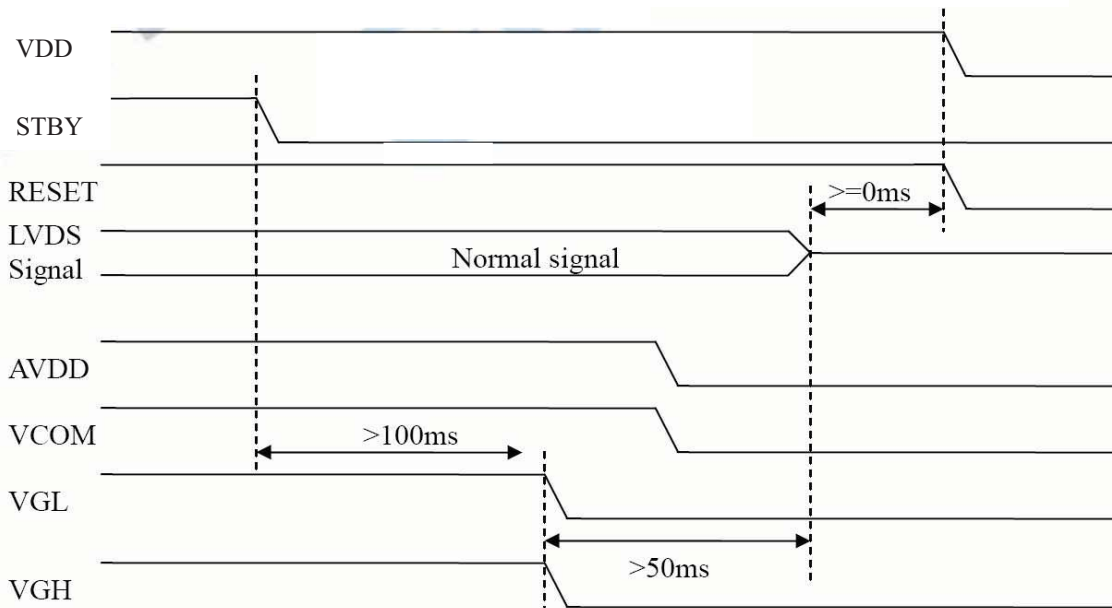
(b) Black-level test pattern

3.2. Power Sequence

a. Power on:



b. Power off:

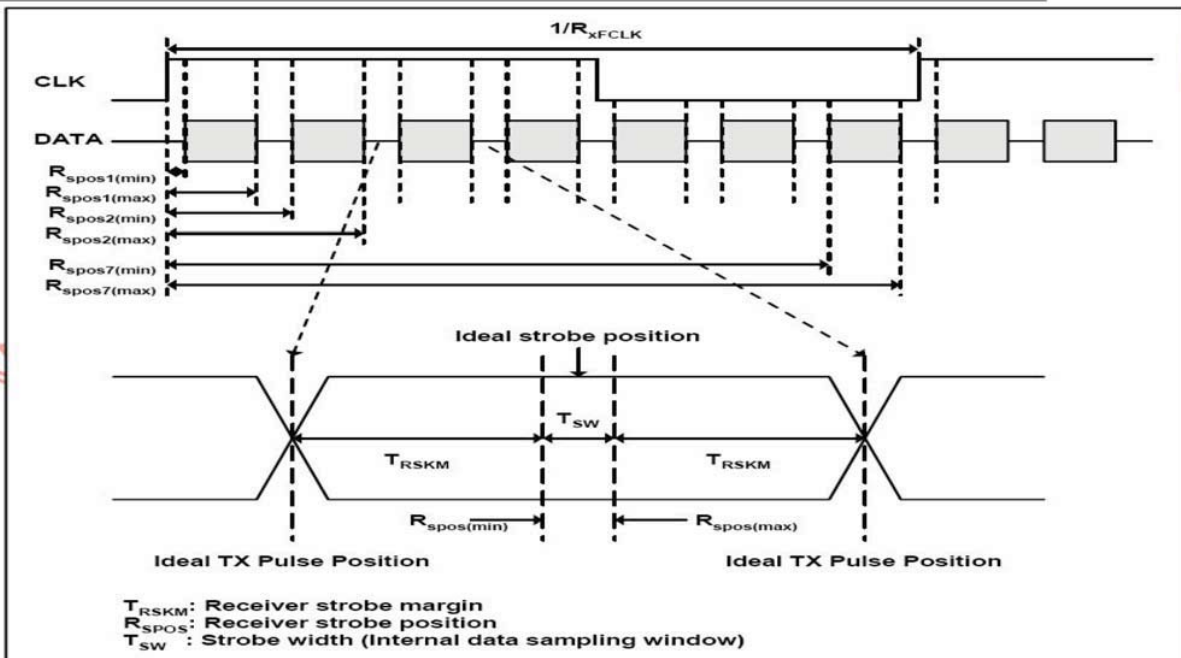
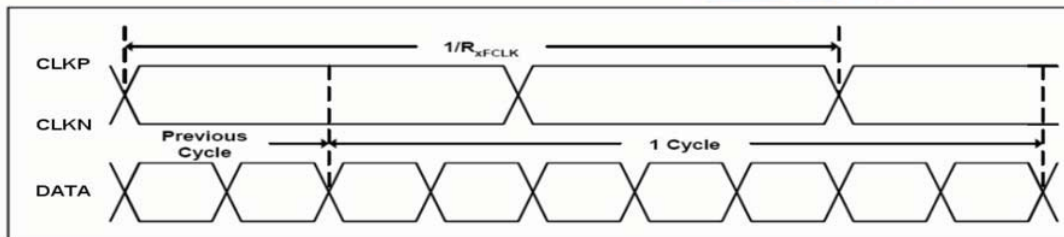


3.3. Timing Characteristics

3.3.1. AC Electrical Characteristics

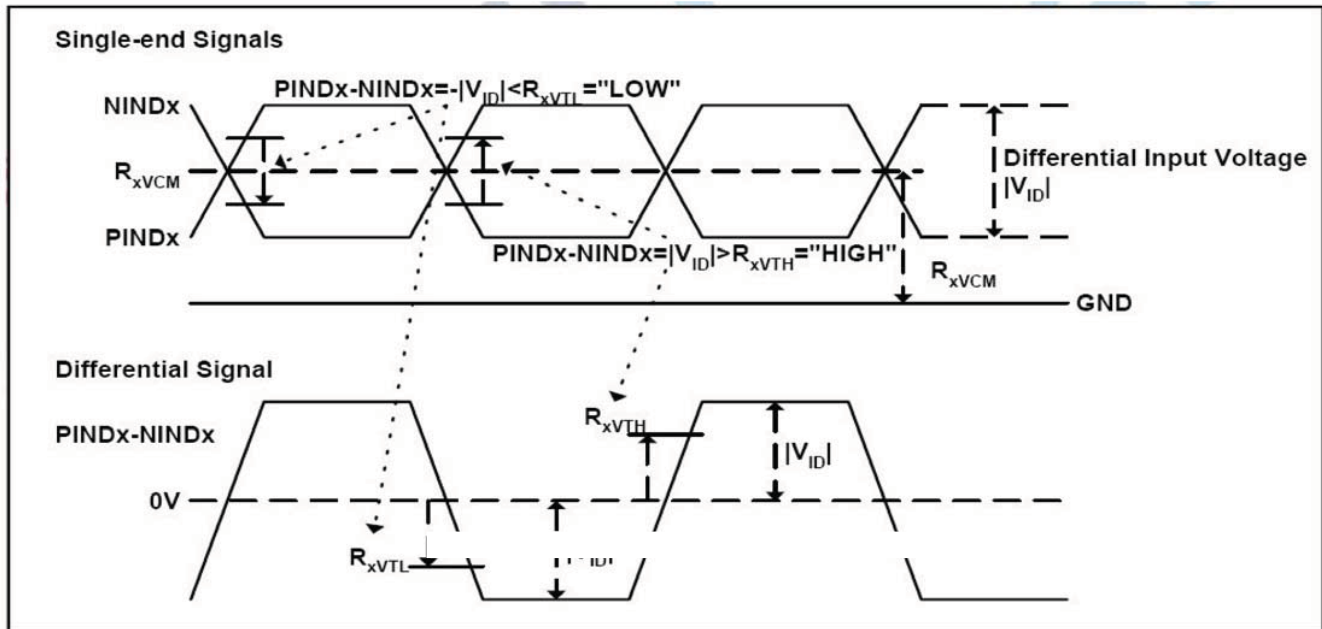
Item	Symbol	values			Unit	Remark
		Min	Typ	Ma x		
Clock frequency	Rxfclk	40.8	51.2	71	MHz	
Input data skew margin	Trskm	500		-	ps	
Clock high time	Tlvch	-	$4/(7 * R_{XFCLK})$	-	ns	
Clock low time	Tlvcl	-	$3/(7 * R_{XFCLK})$	-	ns	

3.3.2. Input clock and data timing diagram



3.3.3. DC Electrical Characteristics

Parameter	Symbol	Values			Unit	Remark
		Min	Typ	Max		
Differential input high Threshold voltage	R_{xVTH}	-	-	+0.1	V	$R_{xVCM}=1.2V$
Differential input low Threshold voltage	R_{xVTH}	-0.1	-	-	V	
Input voltage range (singled-end)	R_{xVIN}	0	-	2.4	V	
Differential input common mode voltage	R_{xVCM}	$ V_{ID} /2$	-	$2.4- V_{ID} /2$	V	
Differential voltage	$ V_{ID} $	0.2	-	0.6	V	
Differential input leakage current	R_{Vxliz}	-10	-	+10	μA	

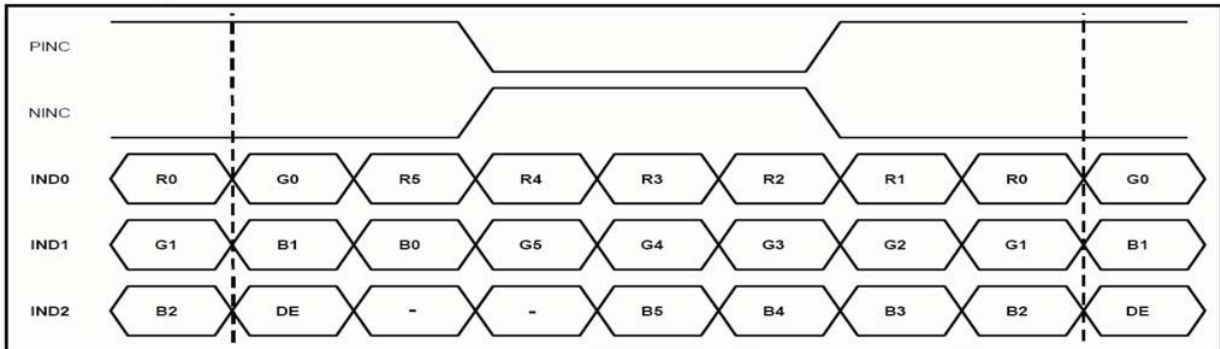


3.3.4 Timing characteristics

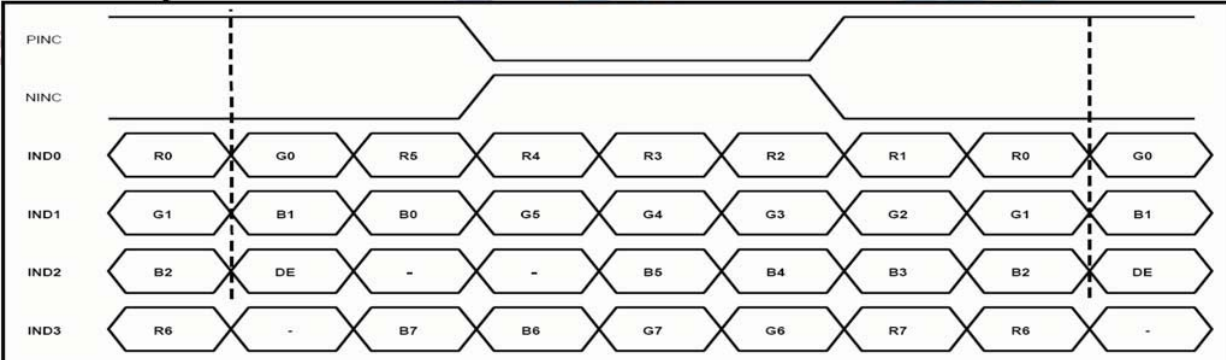
Item	Symbol	Values			Unit	Remark
		Min	Typ	Max		
Clock frequency	Fclk	40.8	51.2	67.2	MHz	Frame rate=60Hz
Horizontal display area	Thd	1024			DCLK	
HS period time	Th	1114	1344	1400	DCLK	
HS Blanking	Thb	90	320	376	DCLK	
Vertical display area	Tvd	600			H	
VS period time	Tv	610	635	800	H	
VS blanking	Thb	10	35	200	H	

3.3.5 Data input format

6bit LVDS input



8bit LVDS input



Note: Support DE timing mode only, SYNC mode not supported.

4. Optical Specifications

Item	Symbol	Condition	Values			Unit	Remark	
			Min.	Typ.	Max.			
Viewing angle (CR \geq 10)	θ_L	$\Phi=180^\circ$ (9 o'clock)	65	80	-	degree	Note 1	
	θ_R	$\Phi=0^\circ$ (3 o'clock)	65	80	-			
	θ_T	$\Phi=90^\circ$ (12 o'clock)	60	65	-			
	θ_B	$\Phi=270^\circ$ (6 o'clock)	65	70	-			
Response time	TON	Normal $\theta=\Phi=0^\circ$	-	10	20	msec	Note 3	
	TOFF		-	15	30	msec	Note 3	
Contrast ratio	CR		600	800	-	-	Note 4	
Luminance			500	550				
	WX					-		
	WY					-		
Transmittance	YU			-	4.2	-	%	

Test conditions:

1. $DV_{DD}=3.3V$, $I_L=180mA$ (Backlight current), the ambient temperature is $25^\circ C$
2. The test systems refer to Note 2.

Note 1: Definition of viewing angle range

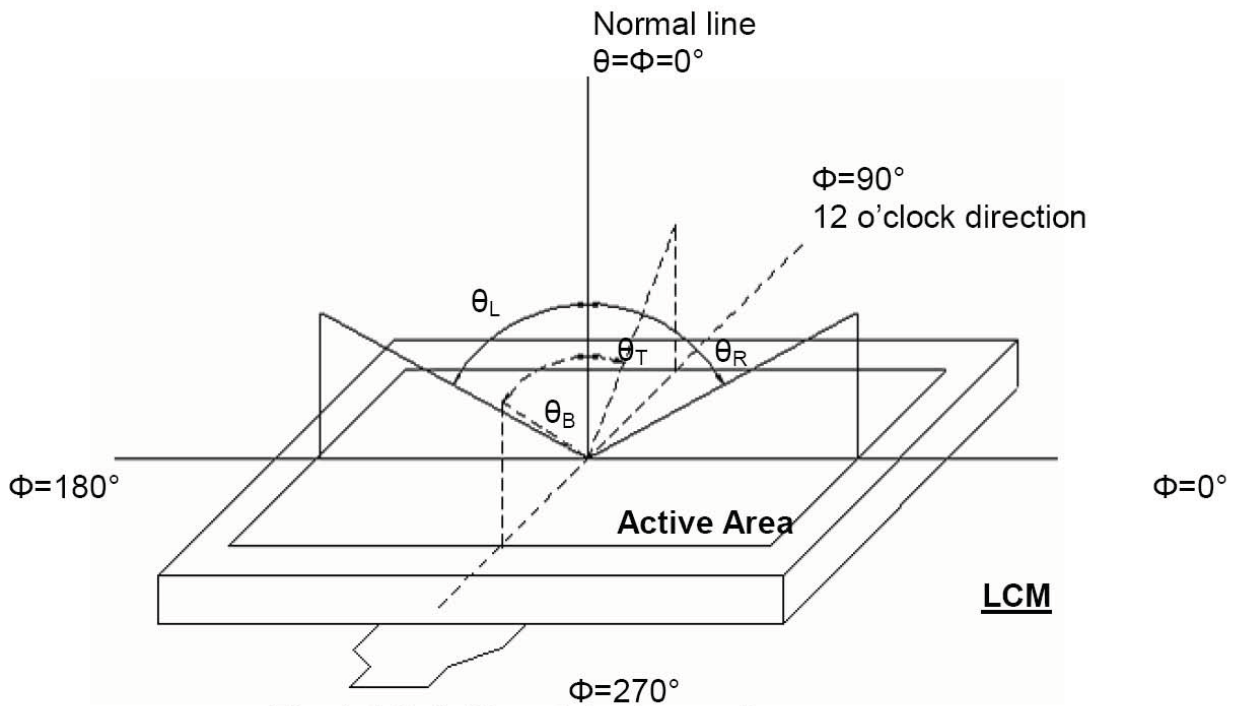


Fig. 4-1 Definition of viewing angle

Note 2: Definition of optical measurement sy

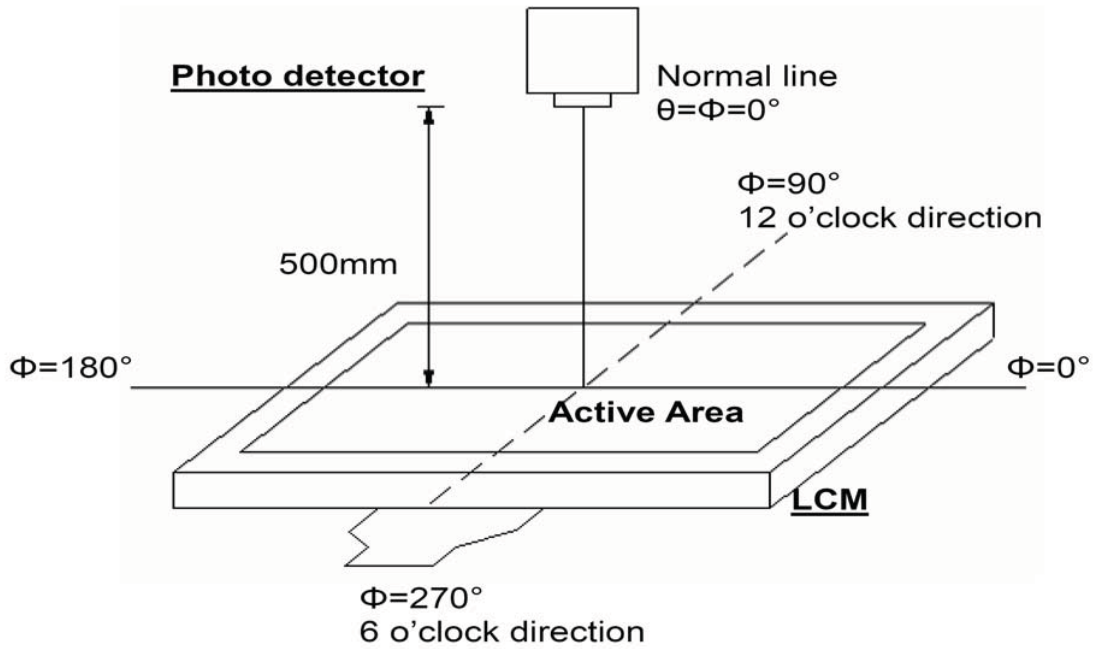


Figure 4-2 Optical measurement system setup

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 (T_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.

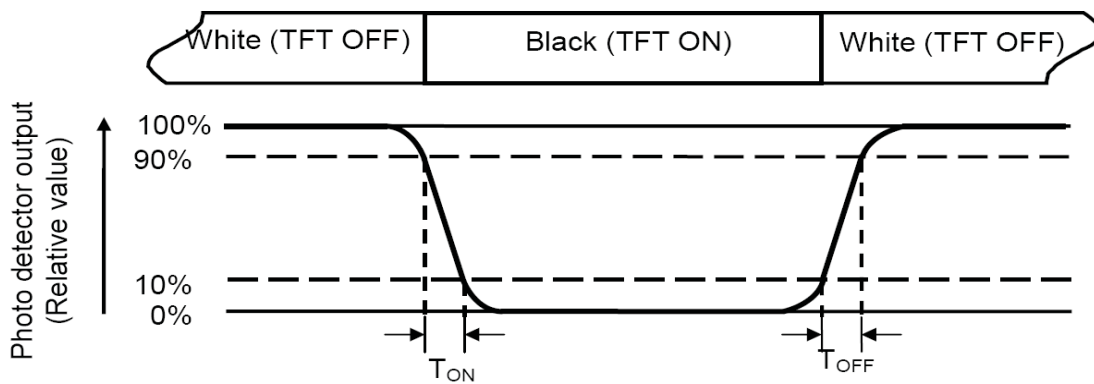


Figure 4-3 Definition of response time

Note 4: Definition of contrast ratio

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

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=180mA .

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.

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

L=Active area length W=Active area width

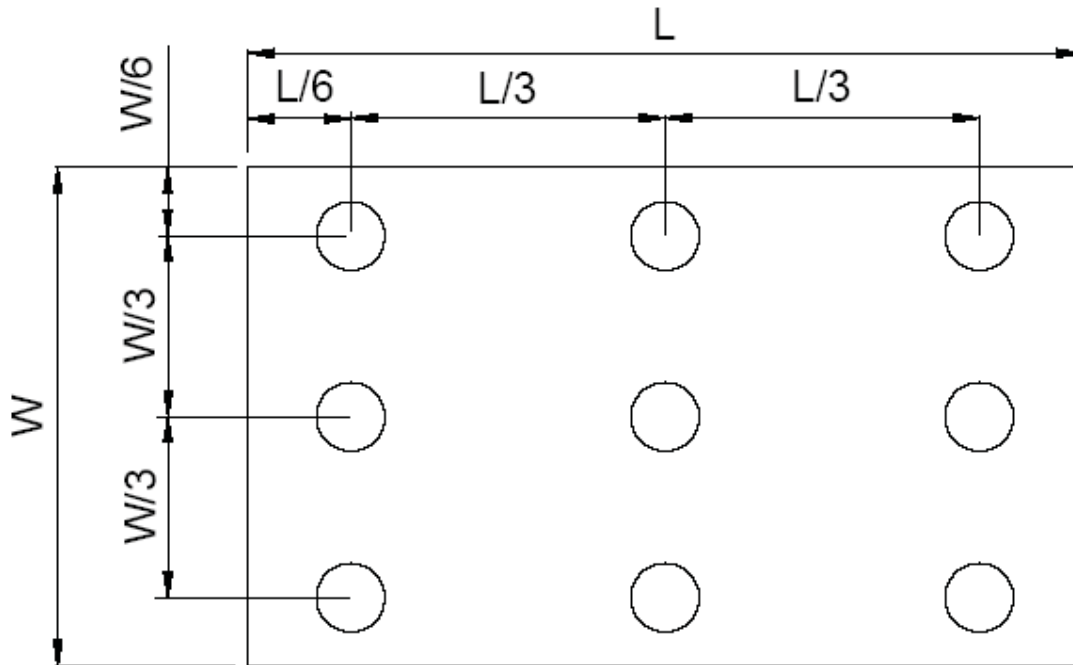


Fig. 4-4 Definition of measuring points

B_{\max} : The measured maximum luminance of all measurement position.

B_{\min}

5. Reliability Test Items

(NOTE 3)

Item	Test Conditions	Remark
High temperature storage	Ta=80°C 240hrs	NOTE1 , NOTE4
Low temperature storage	Ta=-30°C 240hrs	NOTE1 , NOTE4
High temperature operation	Ta=70°C 240hrs	NOTE2 , NOTE4
Low temperature operation	Ta=-20°C 240hrs	NOTE2 , NOTE4
Operate at high temperature and humidity	+60°C, 90%RH 240hrs	NOTE4
Thermal Shock	-30°C/30min~+80°C/30min for a total 100 cycles ,start with cold temperature and end with high temperature .	NOTE4
Vibration Test	Frequency range:10~55HZ Stroke:1.5mm Swap:10HZ~55HZ~10HZ 2 hours of each direction of X.Y. Z (6 hours for total)	
Mechanical shock	100G 6ms, ± X, ± Y, ± Z 3 times for each direction	
Package vibration test	Random vibration :0.15G*G/HZ from 5-200 HZ,-6dB/Octave from 200-500HZ of each direction of X.Y. Z (6 hours for total)	
Dropping test	Height:60cm 1 corner ,3 edges ,6 surfaces	
ESD test	± 2KV ,Human Body Mode, 100pF/1500 Ω	

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. General Precautions

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 $25\pm 10^{\circ}\text{C}$ 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 .

Packing

PARAMETER	Specification	Unit
Outside box	390(L) x 350(W) x 480(H)	mm
Inside box	373(L) x 333(W) x 220(H)	mm
Product quantity of Inside box	40	pcs
Total product quantity	$40*2=80$	pcs
Total weight	8.5 ± 0.5	KG

7. Mechanical Drawing

