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on-site service

Optical Bonding

In-house Manufacturing

Cover glass

System solutions

OEM Solutions

Custom Display

Production Custom designs Installation

Mechanical design



LCD MODULE SPECIFICATION

Customer:

ModelName:

ET070SQ03-KN

Date:

2024/08/01

Version:

00

For Customer's Acceptance

Approved by	Comment

Approved By	Checked By	Prepared By
JIAN	XIE	CoCo



[illegible]

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1. General Specifications

No.	Item	Specification	Remark
1	LCD size	7.0 inch	
2	Driver element	a-Si TFT active matrix	
3	Resolution	6 0 0 × (RGB) × 600	
4	Display mode	Normally BLACK	
5	Dot pitch	0.1917(H) x 0.1896(V) mm	
6	Active area	130(W) × 113.78(H) mm	
7	Module size	144(W) × 124(H) × 5.3(D) mm	Note 1
8	View direction	ALL	O'Clock
9	Surface treatment	Anti-Glare	
10	Color arrangement	lvds-stripe	
11	Interface	lvds	
12	Lcm power consumption	1.8W	TYP
13	Drive IC	HX8282A11+HX8696A01	

Note 1: Refer to Mechanical Drawing.



2. Pin Assignment

FPC Connector is used for the module electronics interface. The recommended model is FH12A-50S-0.5SH manufactured by Hirose.

Pin. No	Symbol	I/O	Function	Remark
1-3	VCCS		Power Supply (3.3V typ.)	
4	VED1D		DDC 3.3V power	
5-7	NC		No Connection (Reserved for INX test)	
8	Rxin0-		LVDS differential data input	R0-R5, G0
9	Rxin0+		LVDS differential data input	
10	VSS		Ground	
11	Rxin1-		LVDS differential data input	G1-G5, B0, B1
12	Rxin1+		LVDS differential data input	
13	VSS		Ground	
14	Rxin2-		LVDS Differential Data Input	B2-B5, HS, VS, DE
15	Rxin2+		LVDS Differential Data Input	
16	VSS		Ground	
17	RxCLK-		LVDS differential clock input	LVDS CLK
18	RxCLK+		LVDS differential clock input	
19	VSS		Ground	
20-21	NC		No Connection (Reserve)	
22	VSS		Ground	
23-24	NC		No Connection (Reserve)	
25	VSS		Ground	
26-27	NC		No Connection (Reserve)	
28	VSS		Ground	
29-34	LED GND		LED Ground	
35	LED_PWM		PWM Control Signal of LED Converter	
36	LED_EN		Enable Control Signal of LED Converter	
37	LED_GND		LED Ground	0 ohm to GND
38-40	LED_VCCS		LED Power Supply	

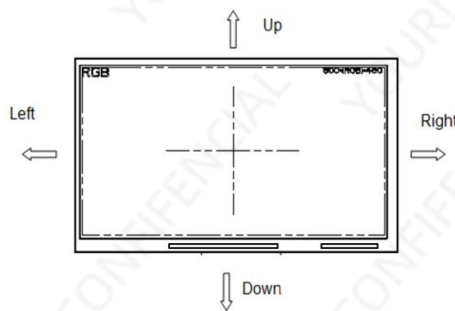
I: input; 0: output; P: Power or Ground(0V).



Note : Selection of scanning mode

Setting of scan control input		Scanning direction
UPDN	SHLR	
GND	VDD	Up to down, left to right
VDD	GND	Down to up, right to left
GND	GND	Up to down, right to left
VDD	VDD	Down to up, left to right

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	VDD	3.0	3.6	V	VSS=0V, TA=25℃
Operation Temperature	T _{OP}	-30	70	℃	
Storage Temperature	T _{ST}	-40	80	℃	

Note1 : 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.



Test condition: GND=0V, TA=25 °C

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	VDD	3.0	3.3	3.6	V	
	VGH	19.5	20	20.5	V	
	VGL	-6.5	-6	-5.5	V	
	AVDD	9.6	10.2	13.5	V	
	VCOM	4.5	5	5.5	V	
Input logic high voltage	V _{IH}	0.8 V _{DD}	-	V _{DD}	V	
Input logic low voltage	V _{IL}	0		0.2 V _{DD}	V	



3.3. Current Consumption

Current for LED Driver

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Voltage for LED Backlight	V_L	20	21	21.5	V	Note 1
Current for LED Backlight	I_L	-	80	-	mA	
LED life time	-	20,000	-	-	Hr	Note 2

Note1: $V_L=21V$, $I_L=80mA$ (Backlight circuit: 3 series connection, 9 parallel connection), the ambient temperature is $25^{\circ}C$.

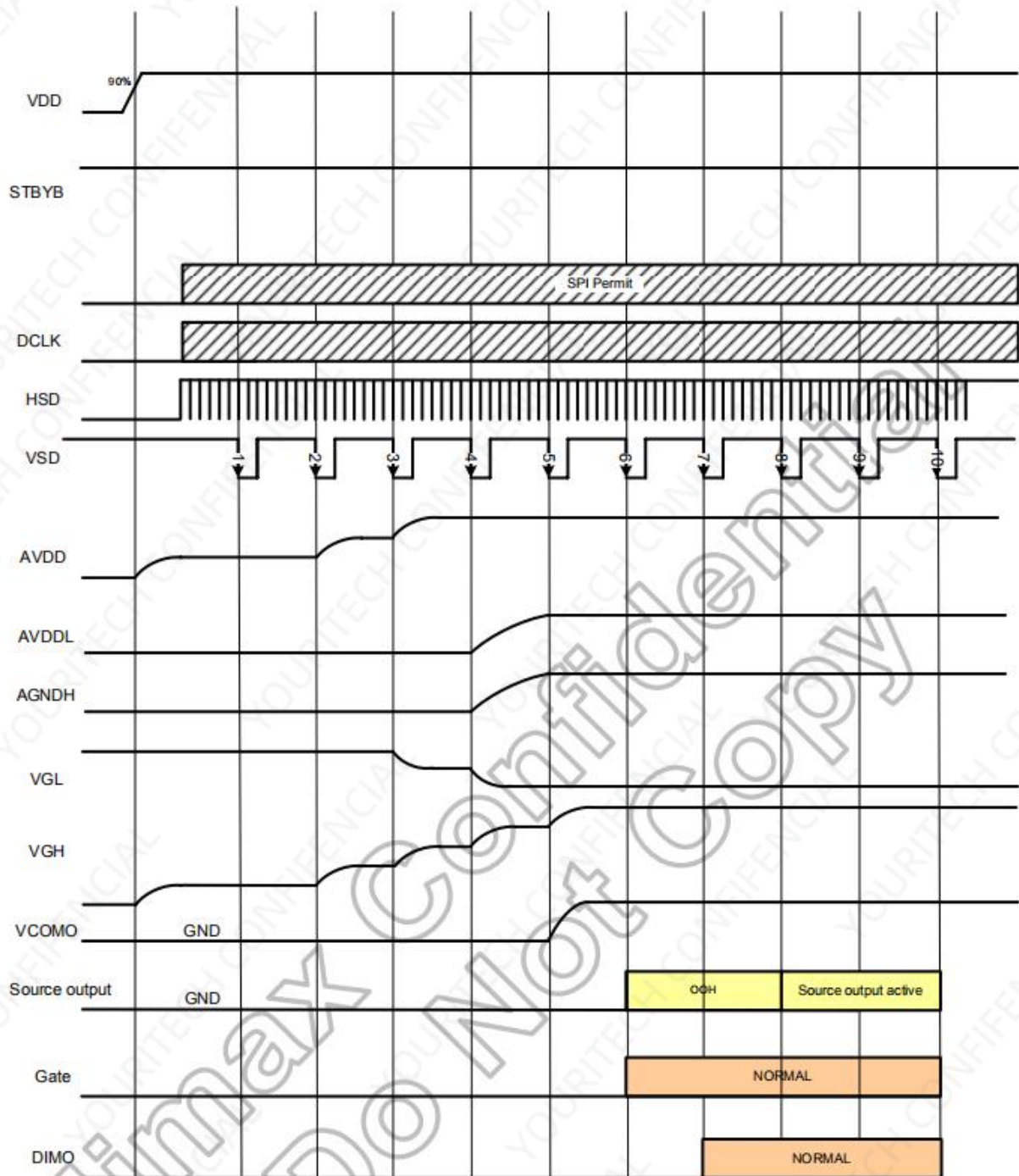
Fig. 3-1 LED test circuit diagram

Note 2: The "LED life time" is defined as the module brightness decrease to 50% original brightness at $T_a=25^{\circ}C$ and 1/2 rated current. The LED lifetime could be decreased if operating I_L is larger than 180 mA.

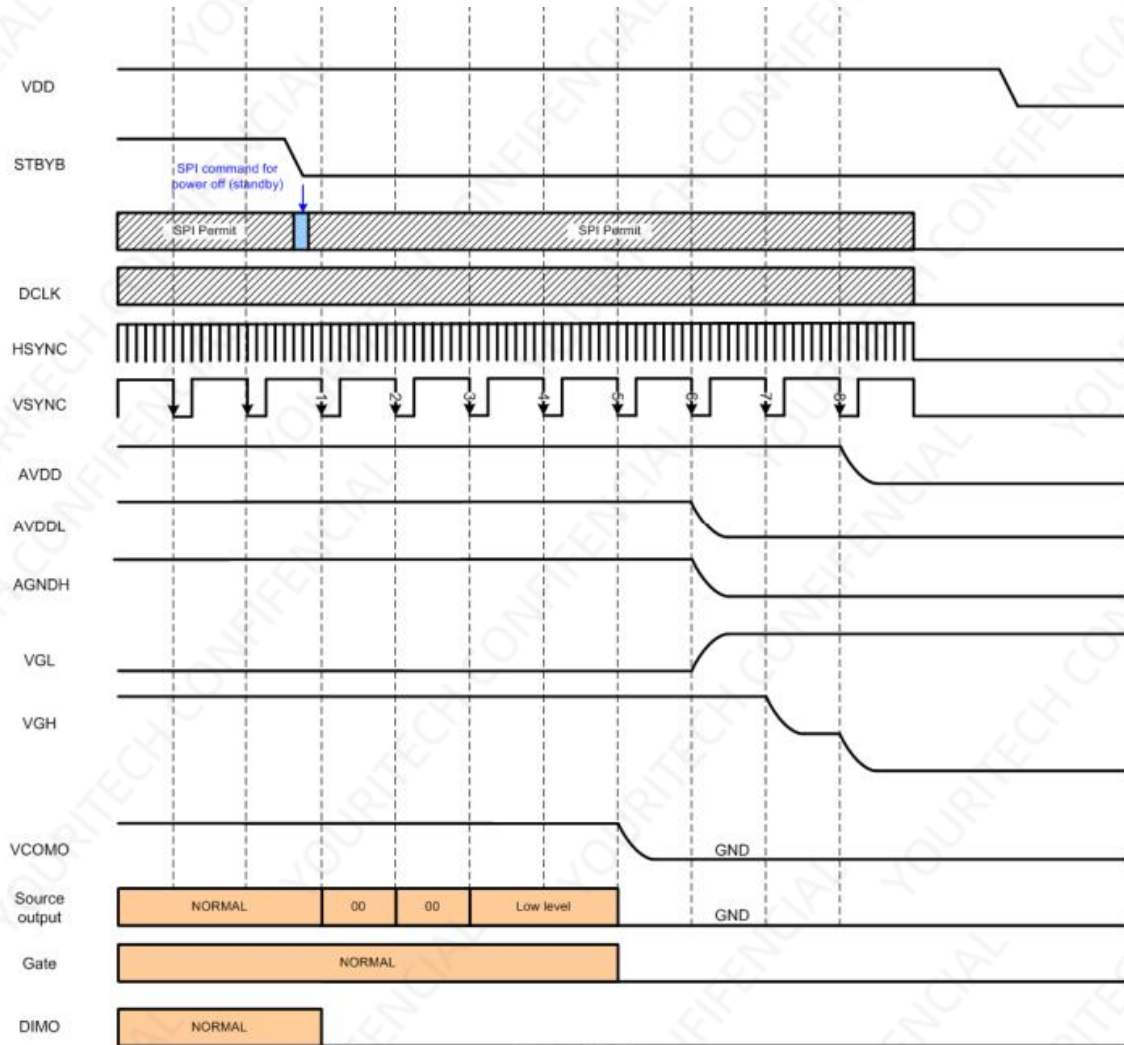


3.4. PowerSequence

Power on:

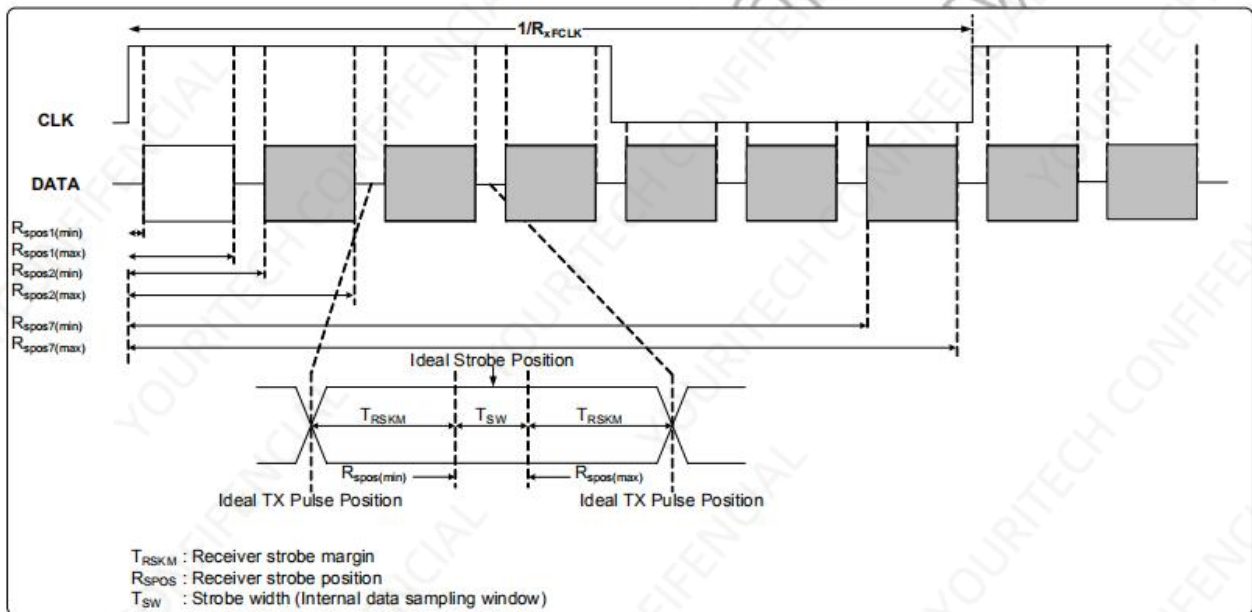
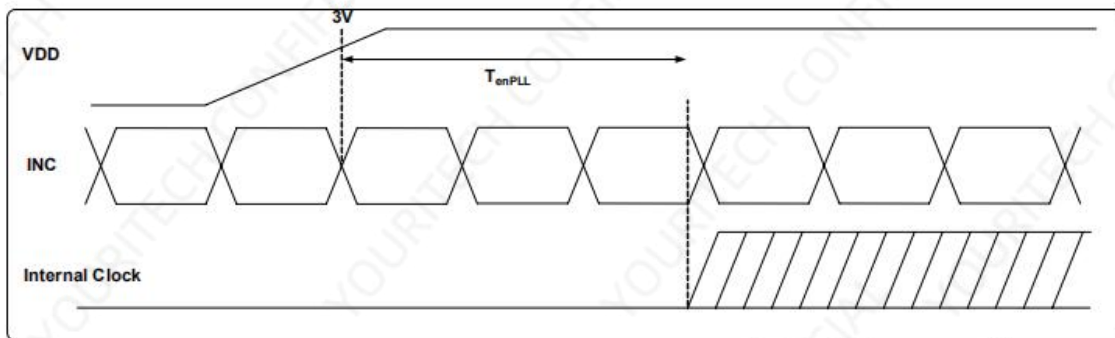
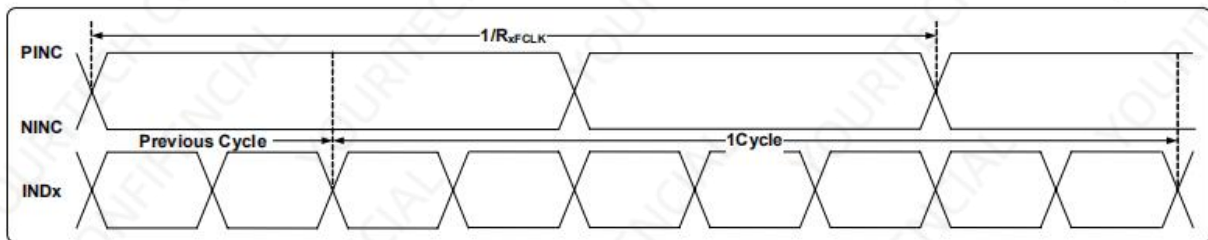


Power off:



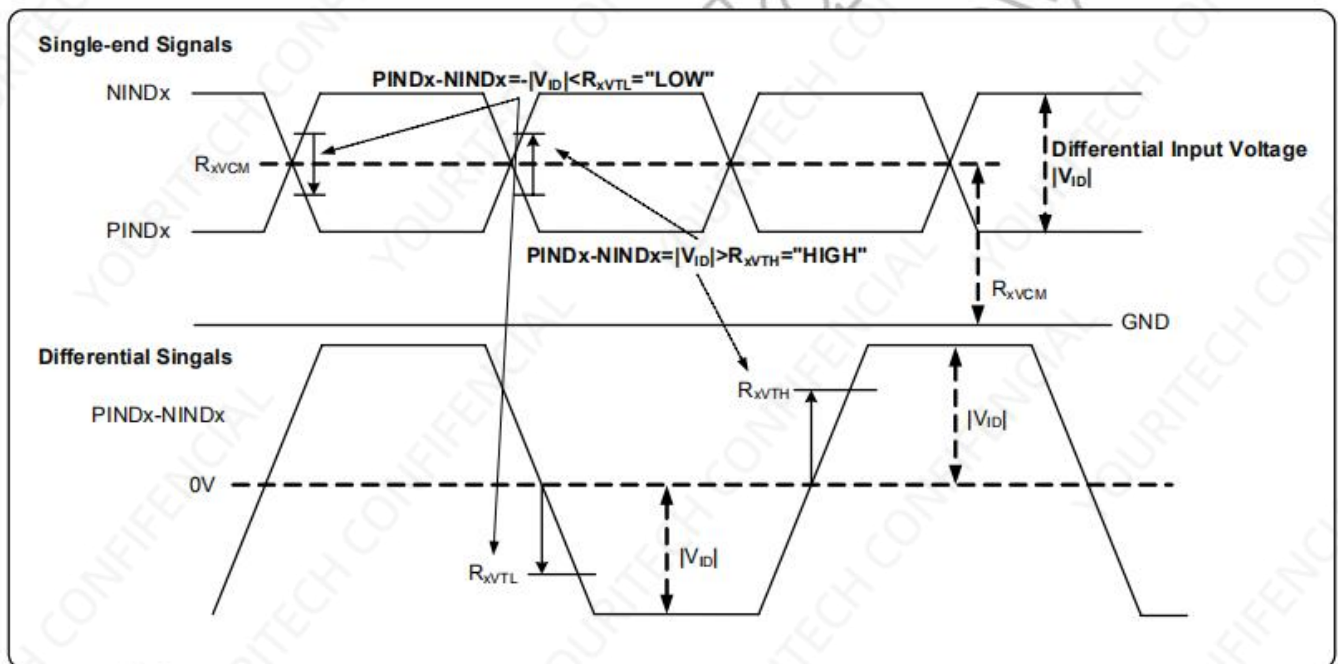
3.5.1. AC Electrical Characteristics

Parameter	Symbol	Spec.			Unit	Condition
		Min.	Typ.	Max.		
Clock frequency	R_{XFCLK}	20	-	71	MHz	-
Input data skew margin	T_{RSKM}	500	-	-	pS	$ V_{ID} =400mV$ $R_{XVCM}=1.2V$ $R_{XFCLK}=71MHz$
Clock high time	T_{LVCH}	-	$4/(7 \cdot R_{XFCLK})$	-	ns	-
Clock low time	T_{LVCL}	-	$3/(7 \cdot R_{XFCLK})$	-	ns	-
PLL wake-up time	T_{enPLL}	-	-	150	μs	-



3.5.2. DC Electrical Characteristics

Parameter	Symbol	Spec.			Unit	Condition
		Min.	Typ.	Max.		
Differential input high Threshold voltage	R_{XVTH}	-	-	+0.1	V	$R_{XVCM}=1.2V$
Differential input low threshold voltage	R_{XVTL}	-0.1	-	-	V	
Input voltage range (singled-end)	R_{XVIN}	0	-	$VDD-1.2+ V_{ID} /2$	V	-
Differential input common Mode voltage	R_{XVCM}	$ V_{ID} /2$	-	$VDD-1.2$	V	-
Differential input voltage	$ V_{ID} $	0.2	-	0.6	V	-
Differential input leakage Current	RV_{XlIZ}	-10	-	+10	μA	-
LVDS Digital Operating Current	I_{ddlvds}	-	15	30	mA	Fclk=65MHz, VDD=3.3V
LVDS Digital Stand-by Current	I_{stlvds}	-	10	50	μA	Clock & all Functions are stopped



3.5.3. Data Input Format

- DE mode

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK Frequency	fclk	40.8	51.2	67.2	MHz
Horizontal Display Area	thd	1024			DCLK
HSD Period	th	1114	1344	1400	DCLK
HSD Blanking	thb+ thfp	90	320	376	DCLK
Vertical Display Area	tv	600			T _H
VSD Period	tv	610	635	800	T _H
VSD Blanking	tvbp+ tvfp	10	35	200	T _H

Table 10.4: DE mode (1024x600)

- HV mode

Horizontal timing

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK Frequency	fclk	44.9	51.2	63	MHz
Horizontal Display Area	thd	1024			DCLK
HSD Period	th	1200	1344	1400	DCLK
HSD Pulse Width	thpw	1	-	140	DCLK
HSD Back Porch	thbp	160			DCLK
HSD Front Porch	thfp	16	160	216	DCLK

Table 10.5: HV mode horizontal timing (1024x600)

Vertical Timing

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Vertical Display Area	tv	600			T _H
VSD Period	tv	624	635	750	T _H
VSD Pulse Width	tvpw	1	-	20	T _H
VSD Back Porch	tvbp	23			T _H
VSD Front Porch	tvfp	1	12	127	T _H

Table 10.6: HV Mode Vertical Timing (1024x600)



Vertical timing

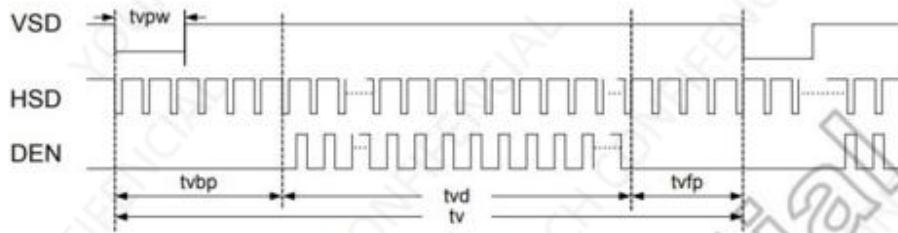


Figure 10.2: Vertical input timing diagram

Horizontal timing

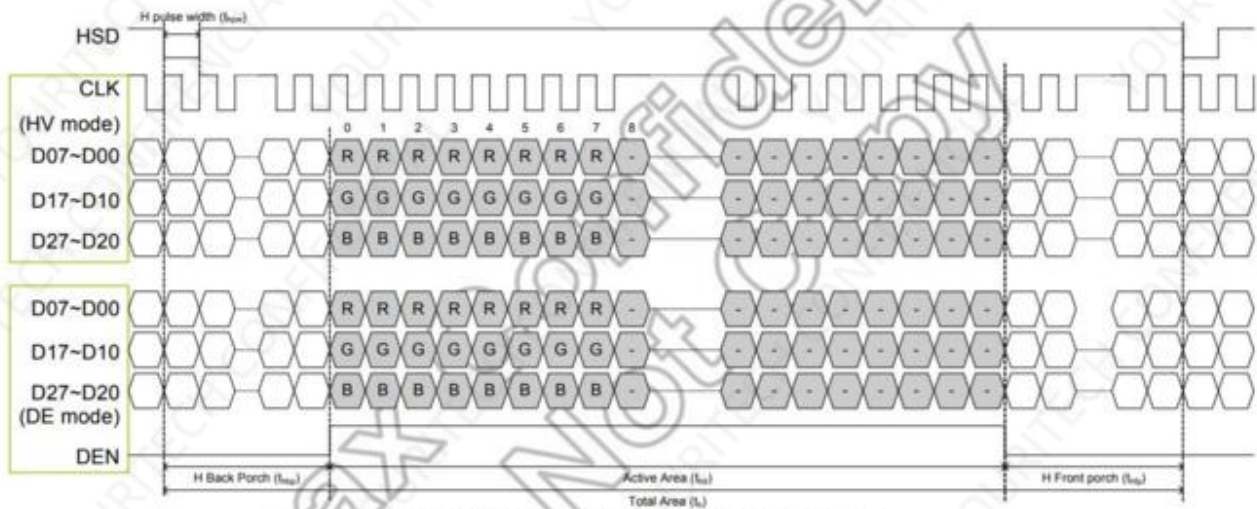


Figure 10.3: Horizontal input timing diagram



4. Optical Specifications

Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Viewing angle (CR≥ 10)	θ_L	$\Phi=180^\circ$ (9 o'clock)	-	85	-	degree	Note 1
	θ_R	$\Phi=0^\circ$ (3 o'clock)	-	85	-		
	θ_T	$\Phi=90^\circ$ (12 o'clock)	-	85	-		
	θ_B	$\Phi=270^\circ$ (6 o'clock)	-	85	-		
Response time	T_{ON}	Normal $\theta=\Phi=0^\circ$	-	15	15	msec	Note 3
	T_{OFF}		-	15	25	msec	Note 3
Contrast ratio	CR		-	800	-	-	Note 4
Color chromaticity	W_X		-	0.30	-	-	Note 2 Note 5 Note 6
	W_Y		-	0.34	-	-	
NTSC				50		%	
Luminance	L		410	430	-	cd/m ²	Note 6
Luminance uniformity	Y_U		80	88	-		Note 7

The test systems refer to Note 2.



Note 1: Definition of viewing angle range

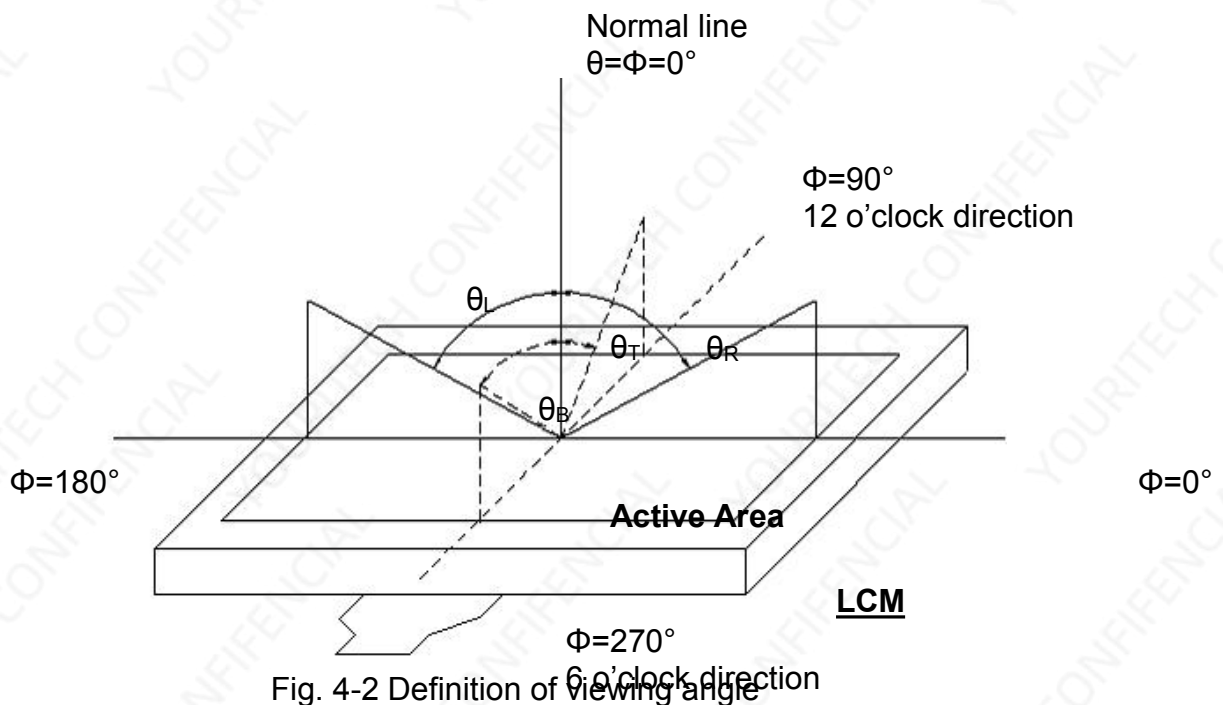


Fig. 4-2 Definition of viewing angle

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. (Viewing angle is measured by ELDIM-EZ contrast/Height :1.2mm, Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/ Field of view: 1° /Height: 500mm.) or CA-210.

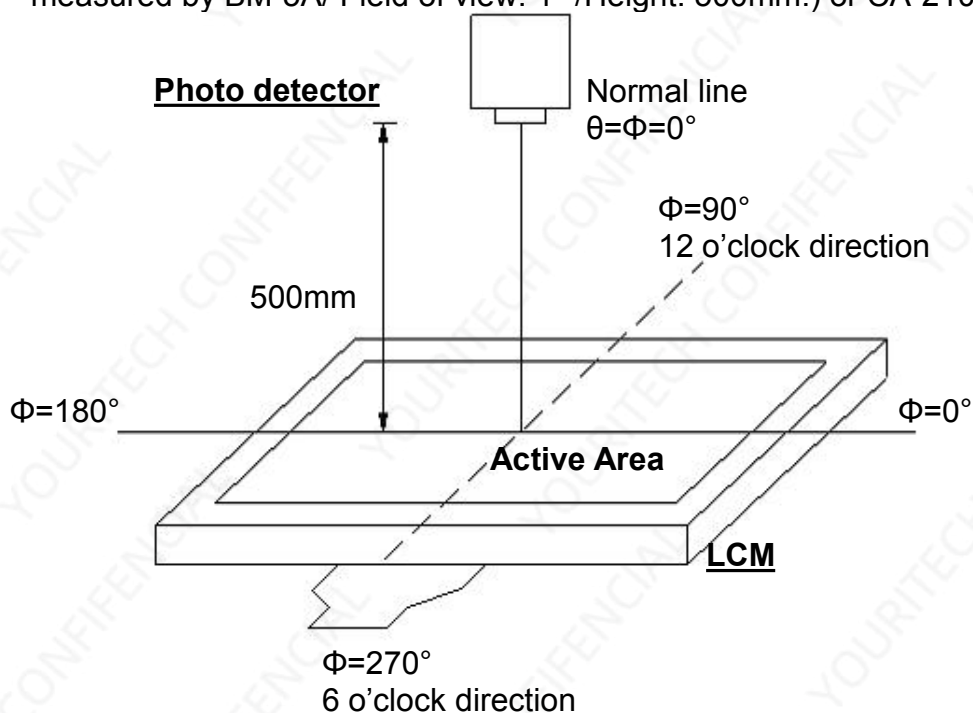


Fig. 4-3 Optical measurement system setup



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%.

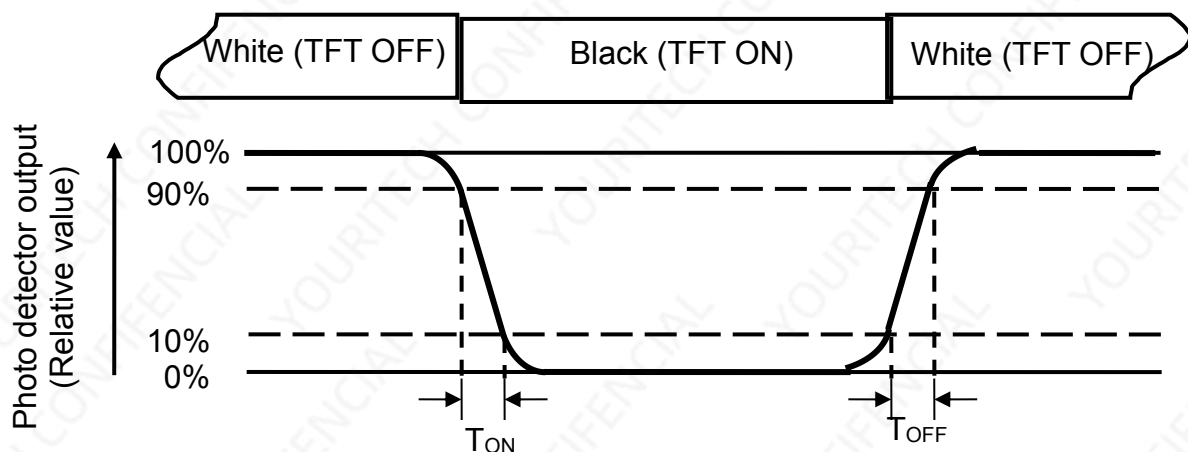


Fig. 4- 4 Definition of response time

Note 4: Definition of contrast ratio

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

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 $I_L=180 \text{ mA}$.



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

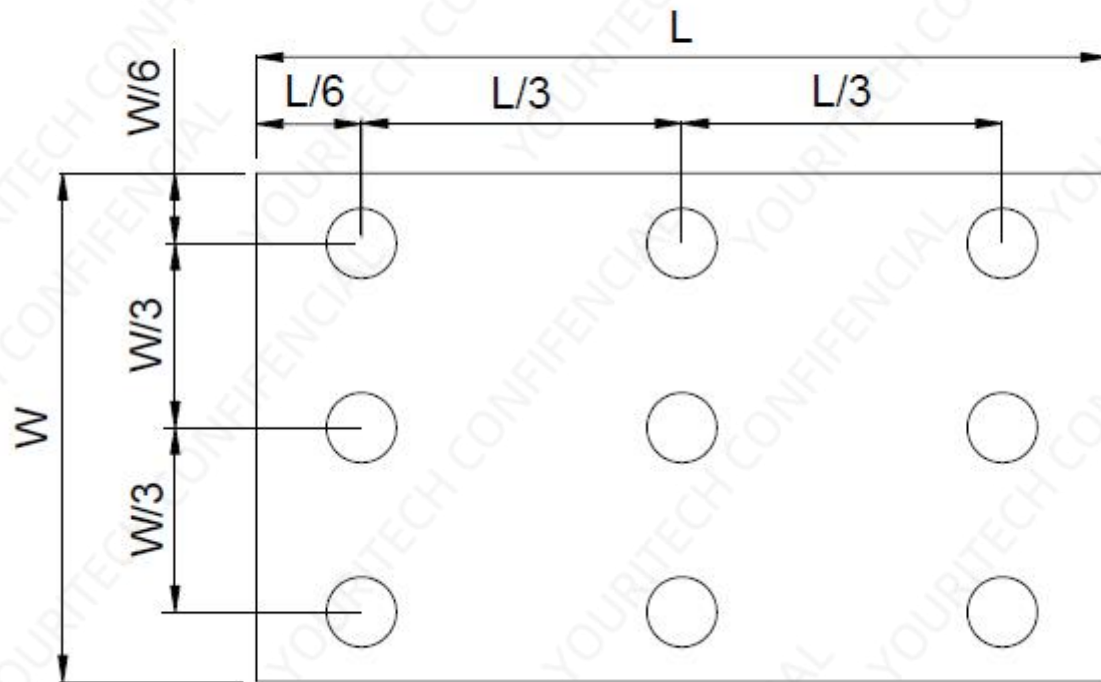


Fig. 4-4 Definition of measuring points

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

$B_{\min}$: The measured minimum luminance of all measurement position.



5. Reliability Test Items

Item	Test Conditions		Criterion
High Temperature Storage	Ta = 80℃	96hrs	A,B,C,D,E
Low Temperature Storage	Ta = -30℃	96hrs	A,B,C,D,E
High Temperature Operation	Ts = 70℃	96hrs	A,B,C,D,E
Low Temperature Operation	Ta = -20℃	96hrs	A,B,C,D,E
Operate at High Temperature and Humidity	+60℃, 90%RH	96hrs	A,B,C,D,E
Thermal Shock(non operation)	-20℃/30 min ~ +60℃/30 min for a total 30 cycles, Start with cold temperature and end with high temperature.		A,B,C,D,E
Vibration Test	Sweep:10Hz~55Hz~10Hz 2G 2 hours for each direction of X. Y. Z. (6 hours for total)		A,B,C,D,E
Package Vibration Test	Random Vibration : 0.015G*G/Hz from 5-200HZ, -6dB/Octave from 200-500HZ 2 hours for each direction of X. Y. Z. (6 hours for total)		A,B,C,D,E
Package Drop Test	Height:60 cm 1 corner, 3 edges, 6 surfaces		A,B,C,D,E
Electro Static Discharge	Contact=+/-4KV, Air=+/-8KV,(R=330R,C=150pF), 1 sec,5point,10times/point;		A,B,C,D,E

※Criterion:

A.LCM each function is OK,.

B.LCM appearance inspection without abnormalities (Including scratch, damage, corrosion and serious deformation)

C.LCM brightness above the Min. value of Spec.

D. Luminance uniformity above the Min. value of Spec.

E. Color chromaticity within tolerance range



MECHANICAL OUTLINE, UNIT:mm
(Unspecified Tolerances is: ±0.3 mm)

REV

DESCRIPTION:

DATE

V0

???

2024.10.15

RoHS

确认排线弯折后结构

ELECTRICAL-OPTICAL CHARACTERISTICS
(Ta=25° C. The Ambient temperature Ta=25° C)

Item	Symbol	Condition	min.	typ.	max.	Unit
Forward Current	U	If= 80 mA	18.9	21	23.8	V
Reverse Current	Ir	Vi= 5 V			10	μA
Power dissipation	Pd	If= 120 mA			2.9	W
Colour Coordinates						
Bl. Lumiance (center area)	Lv	If= 80 mA	--	--	--	cd/m²
	Lv	If= 80 mA	70	75		%
	Lv	If= 80 mA	TBD	TBD		cd/m²
LCM Lumiance (reference参考值)						
Operating Temperature Range	Topr	normal use	-10		+60	°C
Storage Temperature Range	Tstg	normal use	-20		+70	°C

电路原理图: 7 X 4 ? = 28

PRODUCT NAME	CUST NUMBER	PROJECTION	SHEET: 1 of 1	SCALE: 比例 1:1
产品名称	客户型号	三角法	页次	日期
BOE7D IPS			设计	日期
			签字	日期
			检查	日期
			批准	日期

REV	DESCRIPTION:	DATE
V0	???	2024.10.15

7 . General Precautions

8.1. 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.

8.2. 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.

8.3. 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.

8.4. 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.

8.5. 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.