

PRODUCT SPECIFICATION

5.0" TN TFT LCD MODULE

MODEL: NTFT5s800480

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1. General Description

The specification is a transmissive type color active matrix liquid crystal display (LCD) which uses amorphous thin film transistor (TFT) as switching devices. This product is composed of a TFT-LCD panel, driver Ics and a backlight unit.

2. Module Parameter

Features	Details	Unit
Display Size(Diagonal)	5.0"	
LCD type	TN TFT	

Display Mode	Normally White/Transmissive	
Resolution	800 RGB x 480	Pixels
View Direction	12 O'clock	Best Image
Gray Scale Inversion Direction	6 O'clock	
Module Outline	120.7 (H) x 75.8 (V) x 3.1(T) (Note1)	mm
Active Area	108 (H) x 64.8(V)	mm
Pixel Size	135 (H) x 135(V)	um
Pixel Arrangement	R.G.B Vertical Stripe	
Polarizer Surface Treatment	Anti-Glare	
Display Colors	16.7M	
Interface	24-bit RGB interface	
With or Without Touch Panel	Without	
Operating Temperature	-20~70	°C
Storage Temperature	-30~80	°C
Weight	TBD	g

Note 1: Exclusive hooks, posts , FFC/FPC tail etc.

3. Absolute Maximum Ratings

$V_{SS}=0V$, $T_a=25^{\circ}C$

Item	Symbol	Min.	Max.	Unit
Supply Voltage	VDD	-0.5	5.0	V
Storage temperature	T _{STG}	-30	+80	°C
Operating temperature	T _{OP}	-20	+70	°C

Note 1: If T_a below $50^{\circ}C$, the maximal humidity is 90%RH, if T_a over $50^{\circ}C$, absolute humidity should be less than 60%RH.

Note 2: The response time will be extremely slow when the operating temperature is around $-10^{\circ}C$, and the back ground will become darker at high temperature operating.

4. DC Characteristics

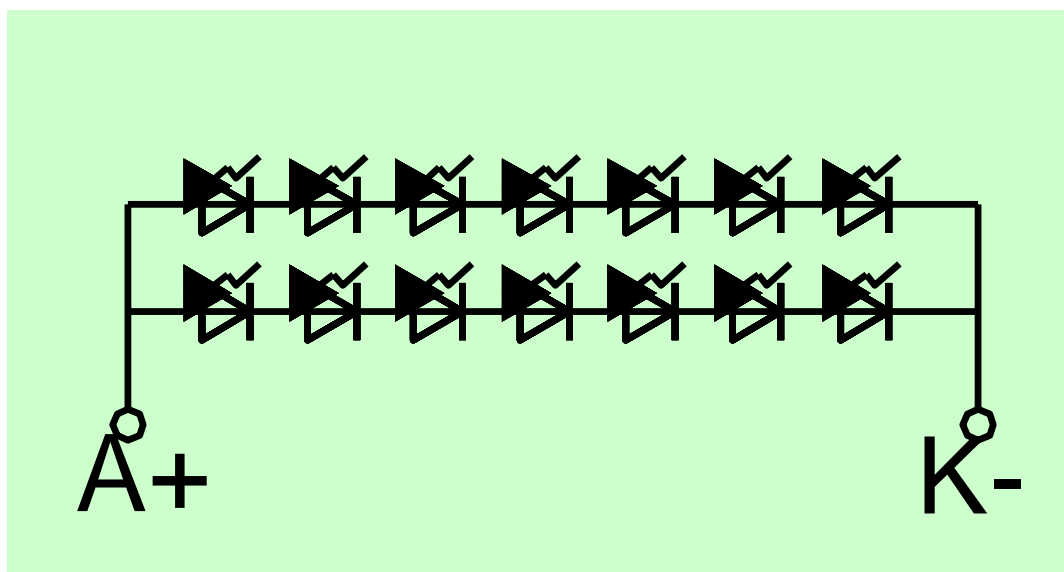
Item	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage	VDD	3.0	3.3	3.6	V
Logic Low input voltage	V _{IL}	0	-	0.3*VDD	V
Logic High input voltage	V _{IH}	0.7*VDD	-	VDD	V
Logic Low output voltage	V _{OL}	-	-	VSS+0.4	V
Logic High output voltage	V _{OH}	VDD-0.4	-	-	V
Current Consumption	I _{CC+ I_{IN}}	90	135	170	mA
All Black					
	Analog				

5. Backlight Characteristic

5.1. Backlight Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Backlight Voltage	V _{LED}	T _a =25 °C, I _f =20mA/LED	3.0*7	3.2*7	3.4*7	V
Backlight Current	I _{LED}	T _a =25 °C, V _F =3.2V/LED	15*2	20*2	25*2	mA
Power dissipation	P _D		630	896	1190	mW
Uniformity	Avg		75	80	-	%
Drive method	Constant current					
LED Configuration	14 White LEDs(7 LEDs in one string and 2 groups in parallel)					

5.2. Backlighting circuit



6. Optical Characteristics

6.1. Optical Characteristics

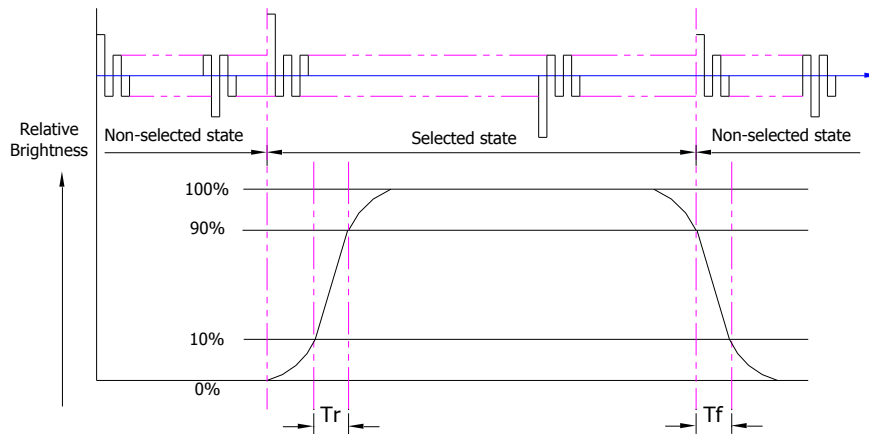
T_a=25°C, V_{DD}=3.3V, TN LC+ Polarizer

Backlight On	Item	Symbol	Condition	Specification			Unit
				Min.	Typ.	Max.	
	Luminance on TFT(I _f =20mA/LED)	L _v	Normally viewing angle θ _x = φ _y = 0°	240	300	-	cd/m ²
	Contrast ratio(See 6.3)	CR		-	350	-	

Response time (See 6.2)		T_R+T_F		-	20	-	ms
Chromaticity Transmissive (See 6.5)	Red	X_R	Center $CR \geq 10$	0.565	0.615	0.665	
		Y_R		0.302	0.352	0.402	
	Green	X_G		0.284	0.334	0.384	
		Y_G		0.548	0.598	0.648	
	Blue	X_B		0.100	0.150	0.200	
		Y_B		0.050	0.100	0.150	
	White	X_W		0.248	0.298	0.348	
Y_W		0.274	0.324	0.374			
Viewing Angle (See 6.4)	Horizontal	θ_{X+}	Center $CR \geq 10$	60	70	-	Deg.
		θ_{X-}		60	70	-	
	Vertical	ϕ_{Y+}		45	50	-	
		ϕ_{Y-}		60	70	-	
NTSC Ratio(Gamut)				-	50	-	%

6.2. Definition of Response Time

6.2.1. Normally Black Type (Negative)

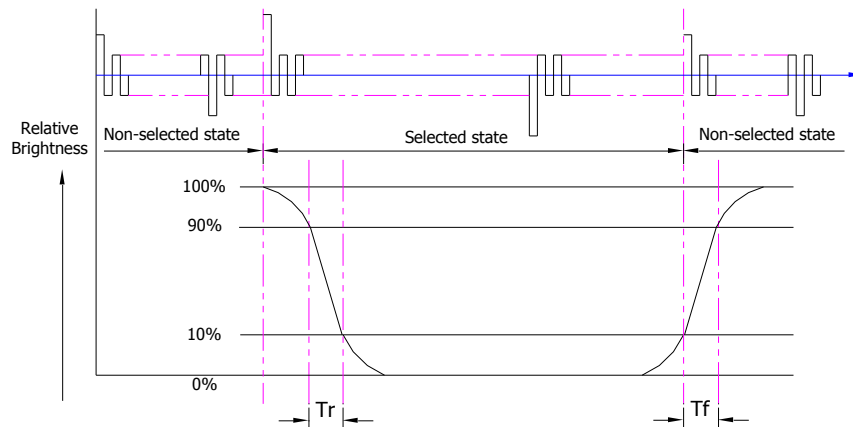


T_r is the time it takes to change from non-selected stage with relative luminance 10% to selected state with relative luminance 90%;

T_f is the time it takes to change from selected state with relative luminance 90% to non-selected state with relative luminance 10%

Note : Measuring machine: LCD-5100

6.2.2. Normally White Type (Positive)



Tr is the time it takes to change from non-selected state with relative luminance 90% to selected state with relative luminance 10%;

Tf is the time it takes to change from selected state with relative luminance 10% to non-selected state with relative luminance 90%;

Note : Measuring machine: LCD-5100 or EQUI

6.3. Definition of Contrast Ratio

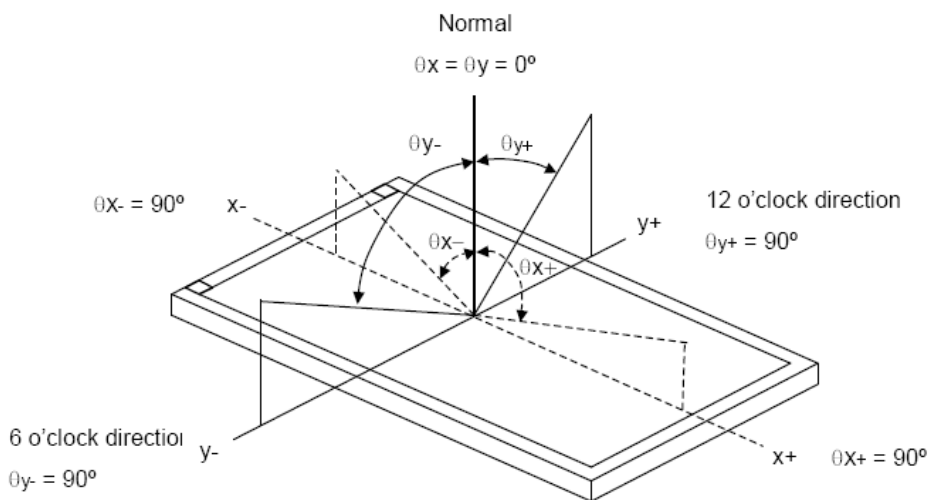
Contrast is measured perpendicular to display surface in reflective and transmissive mode.

The measurement condition is:

Measuring Equipment	Eldim or Equivalent
Measuring Point Diameter	3mm//1 mm
Measuring Point Location	Active Area centre point
Test pattern	A: All Pixels white
	B: All Pixel black
Contrast setting	Maximum

Definitions: CR (Contrast) = Luminance of White Pixel / Luminance of Black Pixel

6.4. Definition of Viewing Angles



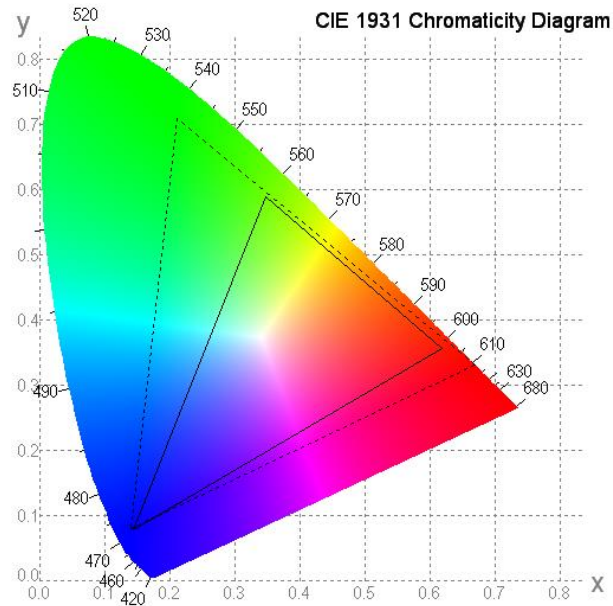
Measuring machine: LCD-5100 or EQUI

6.5. Definition of Color Appearance

R,G,B and W are defined by (x, y) on the IE chromaticity diagram

NTSC=area of RGB triangle/area of NTSC triangleX100%

Measuring picture: Red, Green, Blue and White (Measuring machine: BM-7)



6.6. Definition of Surface Luminance, Uniformity and Transmittance

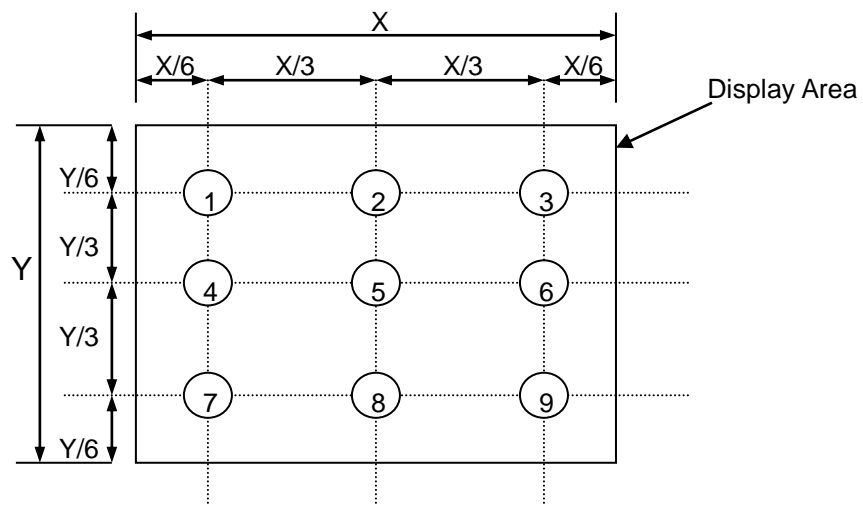
Using the transmissive mode measurement approach, measure the white screen luminance of the display panel and backlight.

6.6.1. Surface Luminance: $L_V = \text{average} (L_{P1}:L_{P9})$

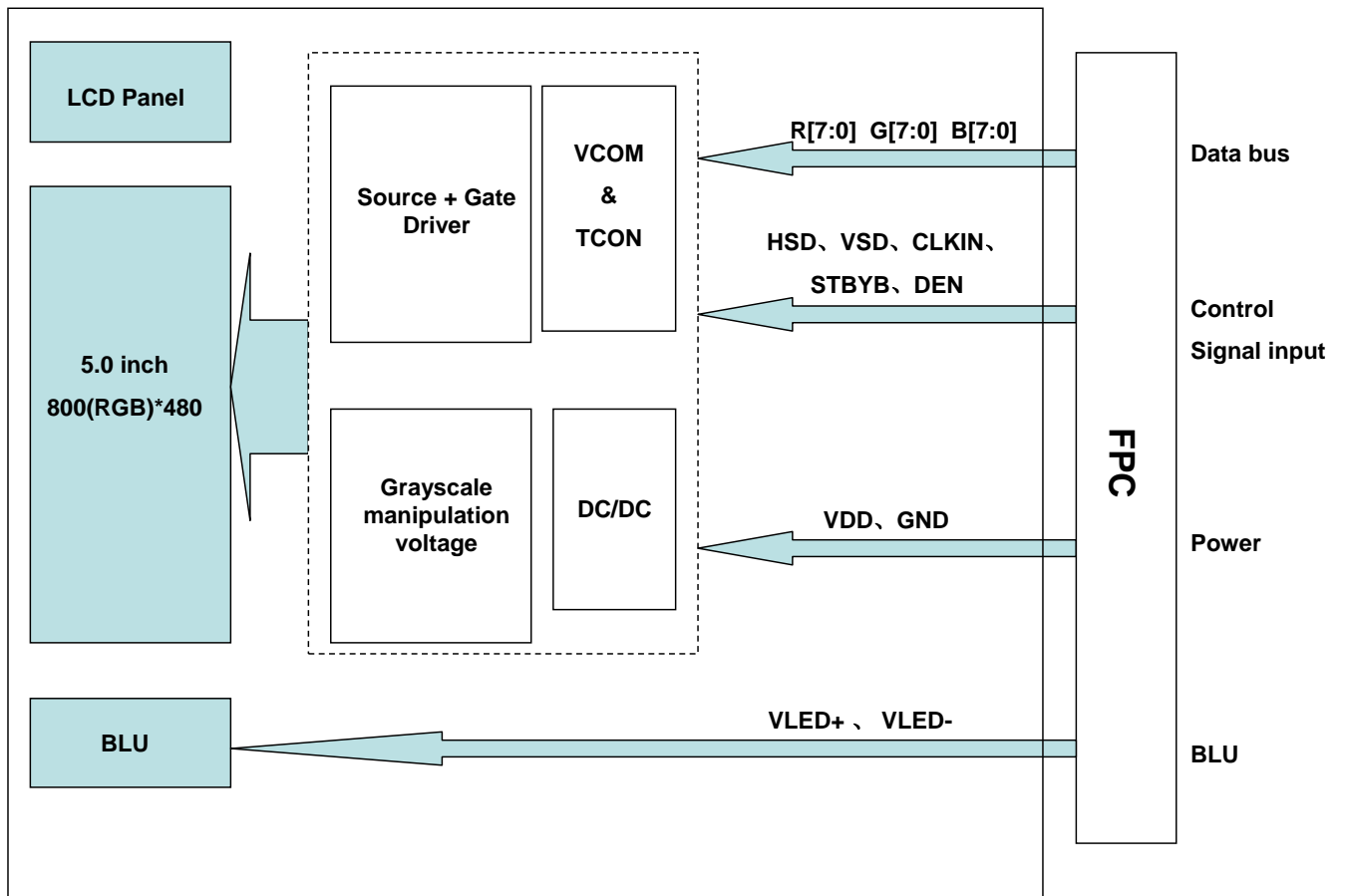
6.6.2. Uniformity = Minimal ($L_{P1}:L_{P9}$) / Maximal ($L_{P1}:L_{P9}$) * 100%

6.6.3. Transmittance = L_V on LCD / L_V on Backlight * 100%

Note : Measuring machine: BM-7



7. Block Diagram and Power Supply



8. Interface Pins Definition

No.	Symbol	Function	Remark
1	VLED-	Ground (Cathode).	
2	VLED+	LED Input Terminal I(Anode).	
3	GND	Power voltage.	
4	VDD	Power voltage	
5	R0	Red data (LSB).	
6	R1	Red data.	
7	R2	Red data.	
8	R3	Red data.	
9	R4	Red data.	
10	R5	Red data.	
11	R6	Red data.	
12	R7	Red data (MSB).	
13	G0	Green data (LSB).	
14	G1	Green data.	
15	G2	Green data.	
16	G3	Green data.	
17	G4	Green data.	
18	G5	Green data.	
19	G6	Green data.	
20	G7	Green data (MSB).	
21	B0	Blue data (LSB).	
22	B1	Blue data.	
23	B2	Blue data.	
24	B3	Blue data.	
25	B4	Blue data.	
26	B5	Blue data.	
27	B6	Blue data.	
28	B7	Blue data (MSB).	
29	GND	Ground.	
30	CLKIN	Clock for input data. Data latched at falling edge of this signal.	
31	STBYB	Display on/off.	
32	HSD	Horizontal sync signal.	
33	VSD	Vertical sync signal.	
34	DEN	Data enable.	
35	NC	No connection.	
36	GND	Ground.	
37	NC(XR)	No connection.	
38	NC(YD)	No connection.	
39	NC(XL)	No connection.	
40	NC(YU)	No connection.	

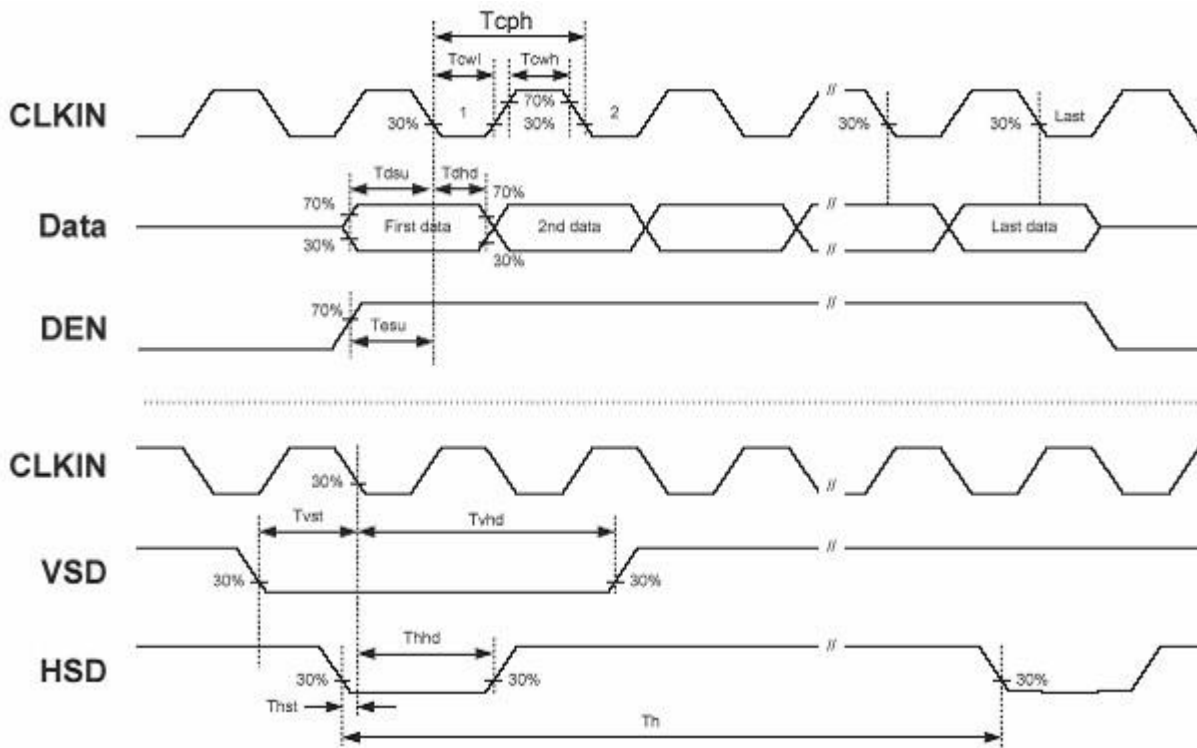
9. Timing Chart

9.1. Parallel RGB AC Characteristics

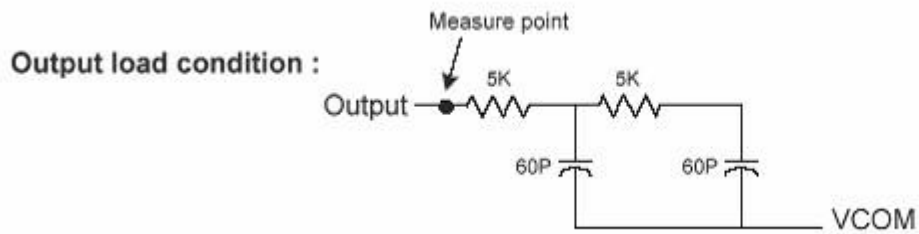
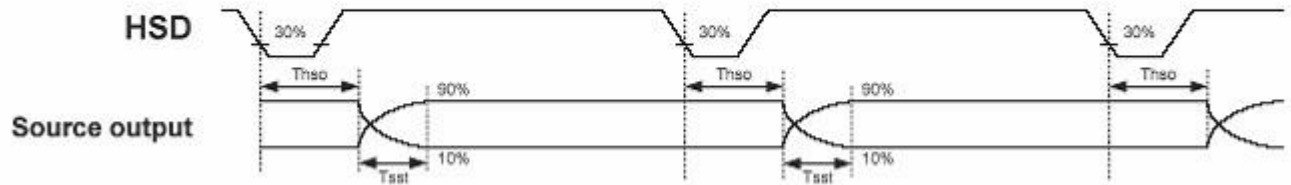
(VDDD=2.3 to 3.6V,AVDD=6.5 to 13.5V, GND=AGND=0V,TA=-20 to +85°C)

Parameter	Symbol	MIN.	Typ.	MAX.	UNIT	Conditions
CLKIN Frequency	Fclk	-	33	50	MHz	VDDD = 2.3V ~ 3.6V
CLKIN Cycle Time	Tclk	20	30	-	ns	
CLKIN Pulse Duty	Tcwh	40	50	60	%	Tclk
Time from HSD to Source Output	Thso	-	Tld		CLKIN	
Time from HSD to LD	Thld	-	Tld		CLKIN	
Time from HSD to STV	Thstv	-	2		CLKIN	
Time from HSD to CKV	Thckv	-	20		CLKIN	
Time from HSD to OEV	Thoev	-	4		CLKIN	
LD Pulse	Twld	-	10		CLKIN	
CKV Pulse Width	Twckv	-	66		CLKIN	
OEV Pulse Width	Twoev	-	Tld+10		CLKIN	

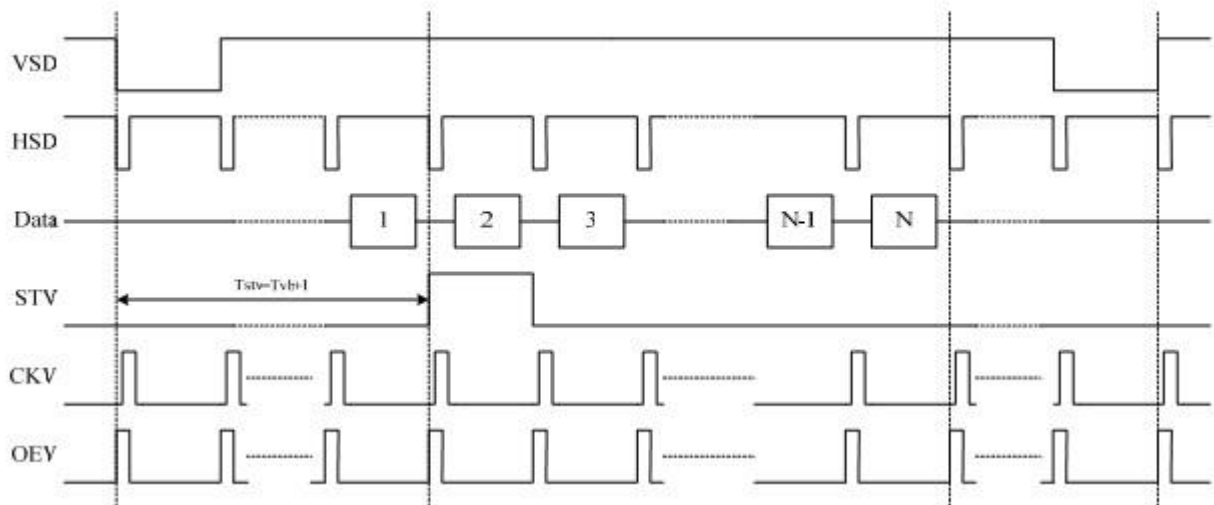
9.2. Input Clock and Data Timing Diagram



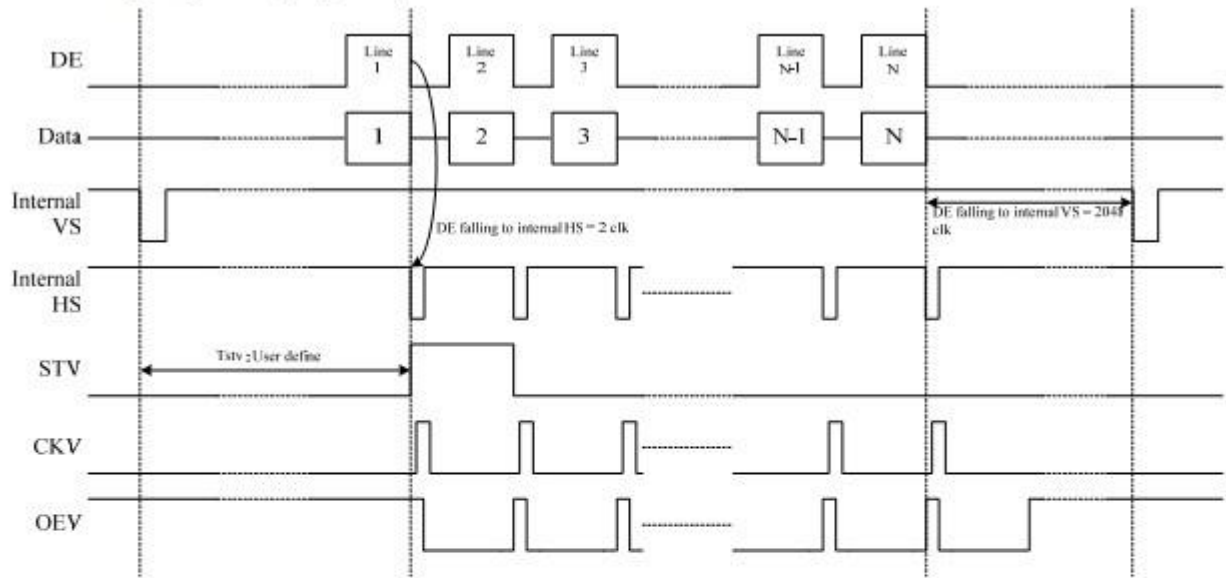
Source Output Timing Diagram (Single Gate)



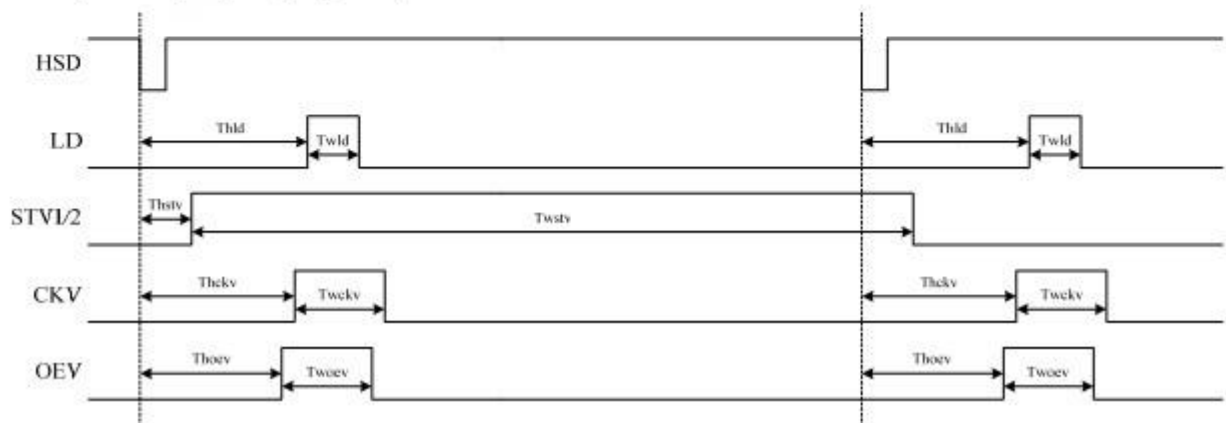
Vertical Timing Diagram HV (Single Gate)



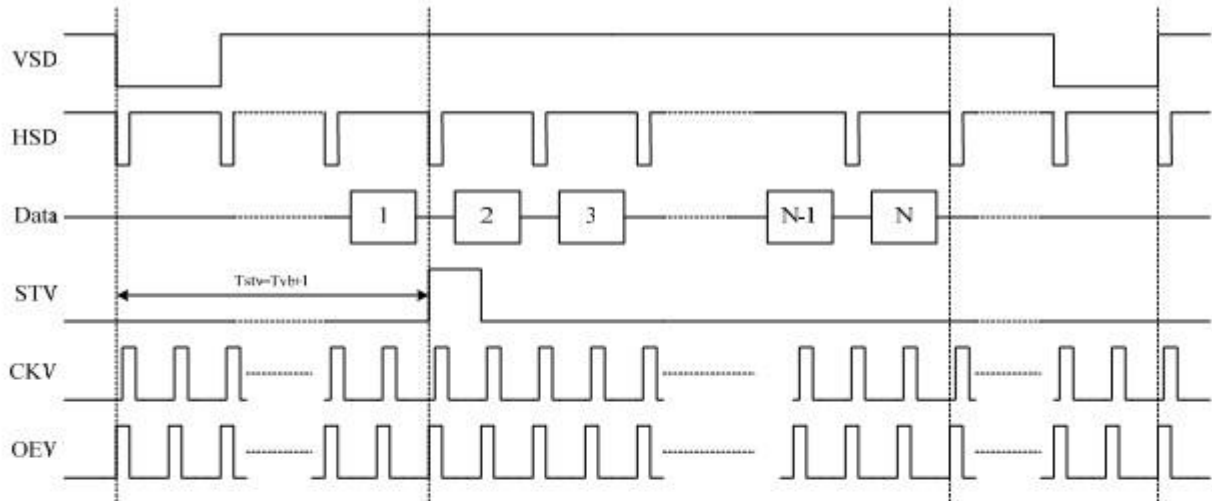
Vertical Timing Diagram DE (Single Gate)



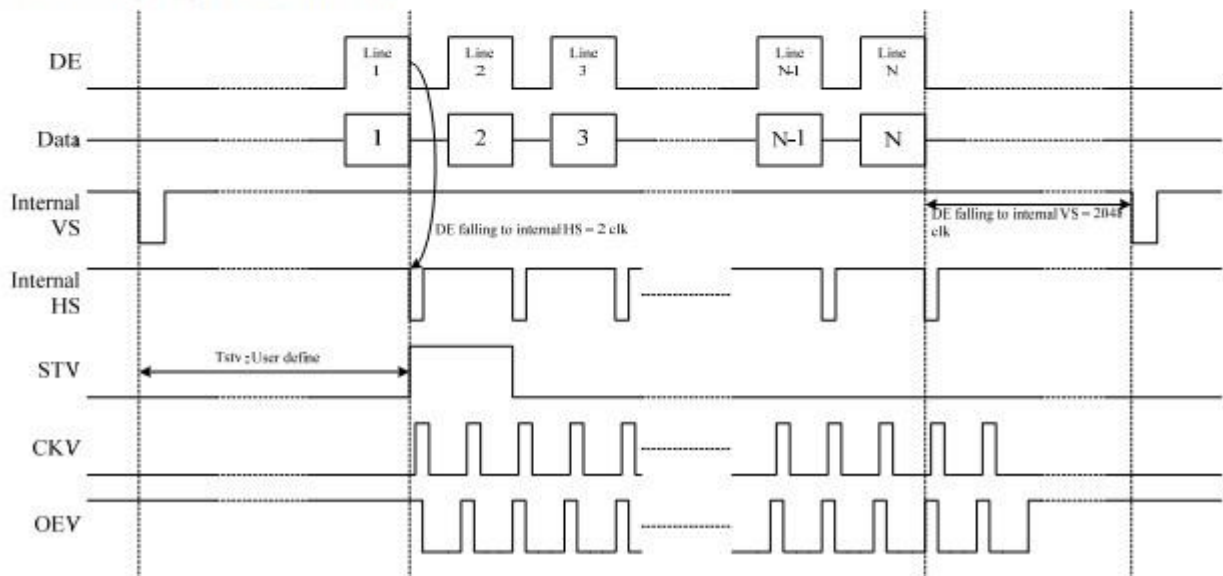
Gate output timing diagram (Single Gate)



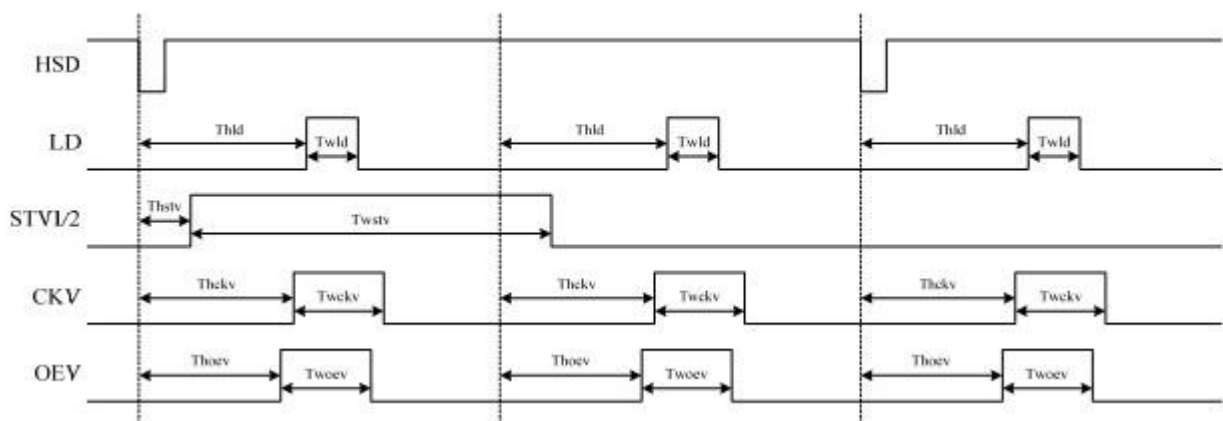
Vertical Timing Diagram HV (Dual Gate)



Vertical Timing Diagram DE (Dual Gate)

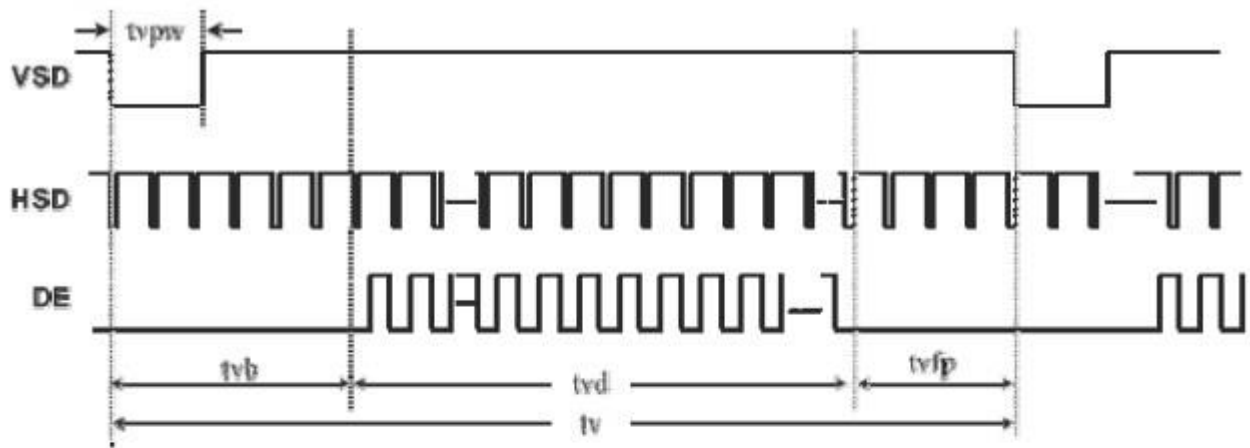


Gate output timing diagram (Dual Gate)

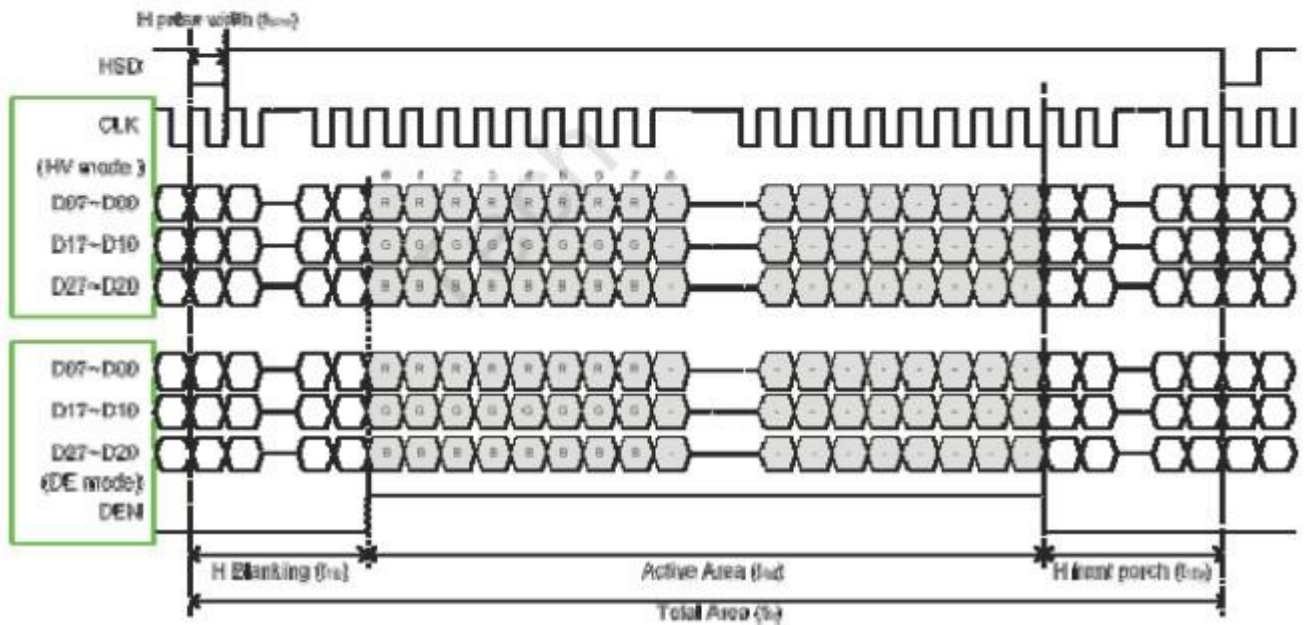


9.3. Data Input Format

Vertical input timing



Horizontal input timing



Timing Characteristics

For 800x480 panel

Horizontal input timing

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
Horizontal display area	thd	800			DCLK
DCLK frequency	fclk	-	30	50	MHz
1 Horizontal Line	th	928			DCLK
HSD pulse width	thpw	Min.	1		
		Typ.	48		
		Max.	-		
HSD Back Porch (Blanking)	thb	-	88	-	
HSD Front Porch	thfp	-	40	-	

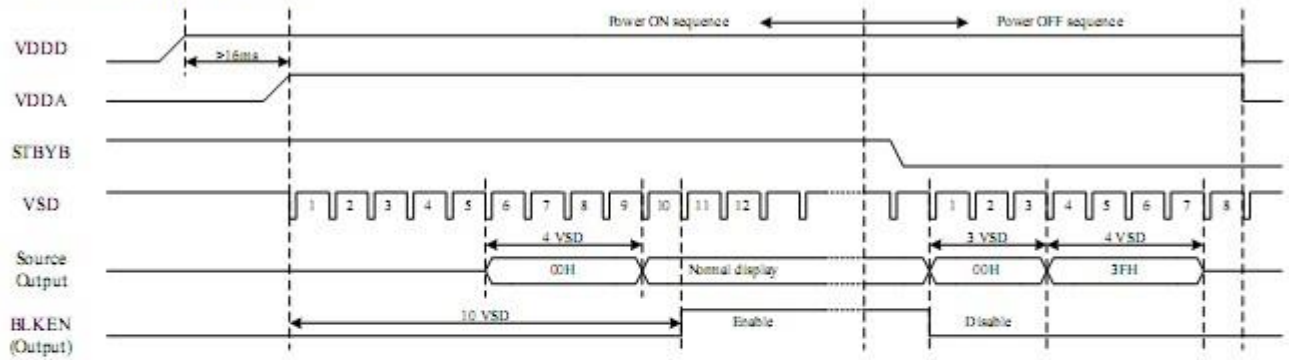
Vertical input timing

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
Vertical display area	tvd	480			H
VSD period time	tv	-	525	-	H
VSD pulse width	tvpw	-	3	-	H
VSD Back Porch (Blanking)	tvb	-	32	-	H
VSD Front Porch	tvfp	-	13	-	H

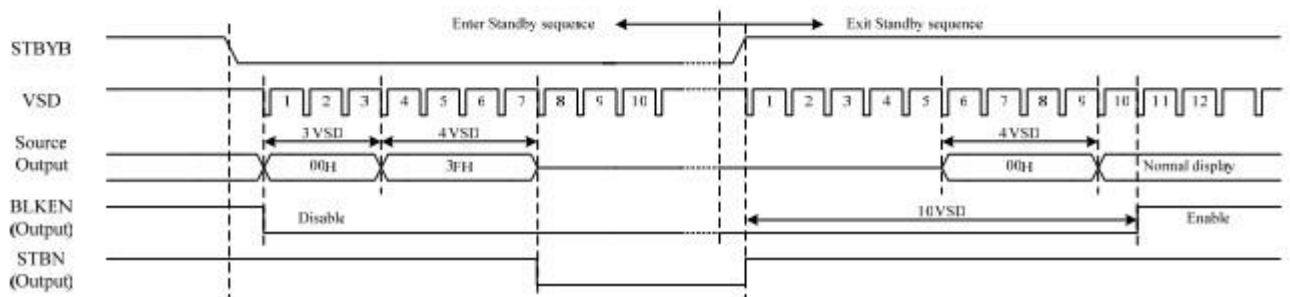
9.4. Power ON/Off Sequence

In order to prevent IC from power on reset fail, the rising time (T_{POR}) of the digital power supply VDD should be maintained within the given specifications. Refer to "AC Characteristics" for more detail on timing.

Power-On/Off Timing Sequence:



Enter and Exit Standby Mode Sequence:



10. Precautions

12.1 Safety

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

12.1.2 Since the liquid crystal cells are made of glass, do not apply strong impact on them. Handle with care.

12.2 Handling

12.2.1 Reverse and use within ratings in order to keep performance and prevent damage.

12.2.2 Do not wipe the polarizer with dry cloth, as it might cause scratch. If the surface of the LCD needs to be cleaned, wipe it swiftly with cotton or other soft cloth soaked with petroleum IPA, do not use other chemicals.

12.3 Storage

12.3.1 Do not store the LCD module beyond the specified temperature ranges.

12.4 Metal Pin (Apply to Products with Metal Pins)

12.4.1 Pins of LCD and Backlight

12.4.1.1 Solder tip can touch and press on the tip of Pin LEAD during the soldering

12.4.1.2 Recommended Soldering Conditions

Solder Type: Sn96.3~94-Ag3.3~4.3-Cu0.4~1.1

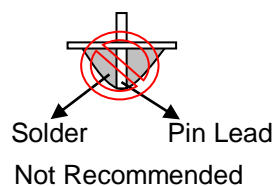
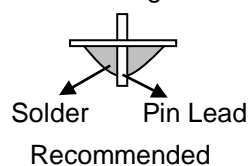
Maximum Solder Temperature: 370°C

Maximum Solder Time: 3s at the maximum temperature

Recommended Soldering Temp: 350±20°C

Typical Soldering Time: ≤3s

12.4.1.3 Solder Wetting



12.4.2 Pins of EL

12.4.2.1 Solder tip can touch and press on the tip of EL leads during soldering.

12.4.2.2 No Solder Paste on the soldering pad on the motherboard is recommended.

12.4.2.3 Recommended Soldering Conditions

Solder type: Nippon Alimit Leadfree SR-34, size 0.5mm

Recommended Solder Temperature: 270~290°C

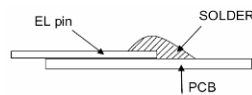
Typical Soldering Time: ≤2s

Minimum solder distance from EL lamp (body):2.0mm

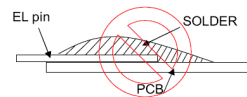
12.4.2.4 No horizontal press on the EL leads during soldering.

12.4.2.5 180° bend EL leads three times is not allowed.

12.4.2.6 Solder Wetting

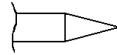


Recommended

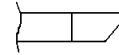


Not Recommended

12.4.2.7 The type of the solder iron:

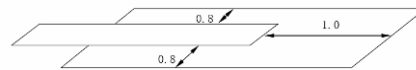


Recommended



Not Recommended

12.4.2.8 Solder Pad



12.5 Operation

- 12.5.1 Do not drive LCD with DC voltage
- 12.5.2 Response time will increase below lower temperature
- 12.5.3 Display may change color with different temperature
- 12.5.4 Mechanical disturbance during operation, such as pressing on the display area, may cause the segments to appear "fractured".

12.6 Static Electricity

- 12.6.1 CMOS LSIs are equipped in this unit, so care must be taken to avoid the electro-static charge, by ground human body, etc.
- 12.6.2 The normal static prevention measures should be observed for work clothes and benches.
- 12.6.3 The module should be kept into anti-static bags or other containers resistant to static for storage.

12.7 Limited Warranty

- 12.7.1 Our warranty liability is limited to repair and/or replacement. We will not be responsible for any consequential loss.
- 12.7.2 If possible, we suggest customer to use up all modules in six months. If the module storage time over twelve months, we suggest that recheck it before the module be used.
- 12.7.3 After the product shipped, any product quality issues must be feedback within three months, otherwise, we will not be responsible for the subsequent or consequential events.

11. Outline Drawing

