INNOLUX DISPLAY CORPORATION

LCD MODULE

SPECIFICATION

Customer: _____

Model Name: AT080TN64

Date: 2023/12/04

Version: V1.0

☐ Preliminary Specification

■ Final Specification

For Customer's Acceptance

Approved by	Comment

Approved by	Reviewed by	Prepared by
Joko.Wang 2023/12/04	Menghsuan.Lu 2023/12/04	KC.Chang 2023/12/04

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Record of Revision

Version	Revise Date	Page	Content
V1.0	2023/12/04		GZ0800NA0035S Final SPEC initial version V1.0

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1 Purpose

The specification AT080TN64 is a 8 ”(800x480) TFT Liquid Crystal Display module with LED Backlight unit , 50 pin TTL interface, normally white trans-missive display mode. This module will be applied to Consumer Electronics.

1.1 General Specifications

No.	Item	Specification	Remark
1	LCD size	8.0 inch(Diagonal)	
2	Driver element	a-Si TFT active matrix	
3	Resolution	800 X 3(RGB) X 480	
4	Display mode	Normally White, Transmissive	
5	Dot pitch	0.0736(W) X 0.2070(H) mm	
6	Active area	176.64(W) X 99.36(H) mm	
7	Module size	192.8(W) X 116.9(H) X 6.4(D) mm	Note 1
8	Surface treatment	Anti-Glare	
9	Color arrangement	RGB-stripe	
10	Interface	Digital	
11	Backlight Power consumption	2.232 W (Typ)	
12	Panel Power consumption	0.226 W (Typ)	
13	Weight	245g(Typ.)	
14	Source-IC Gate-IC	EK79713 EK73202	
15	Driving methods	1+2 dot	

Note 1: Refer to Mechanical Drawing.

2 Pin Assignment

2.1 TFT LCD Panel Driving Section

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	V_{LED+}	P	Power for LED backlight (Anode)	
2	V_{LED+}	P	Power for LED backlight (Anode)	
3	V_{LED-}	P	Power for LED backlight (Cathode)	
4	V_{LED-}	P	Power for LED backlight (Cathode)	
5	GND	P	Power ground	
6	V_{COM}	I	Common voltage	
7	DV_{DD}	P	Power for Digital Circuit	
8	MODE	I	DE/SYNC mode select	Note 1
9	DE	I	Data Input Enable	
10	VS	I	Vertical Sync Input	
11	HS	I	Horizontal Sync Input	
12	B7	I	Blue data(MSB)	
13	B6	I	Blue data	
14	B5	I	Blue data	
15	B4	I	Blue data	
16	B3	I	Blue data	
17	B2	I	Blue data	
18	B1	I	Blue data	Note 2
19	B0	I	Blue data(LSB)	Note 2
20	G7	I	Green data(MSB)	
21	G6	I	Green data	
22	G5	I	Green data	
23	G4	I	Green data	
24	G3	I	Green data	

25	G2	I	Green data	
26	G1	I	Green data	Note 2
27	G0	I	Green data(LSB)	Note 2
28	R7	I	Red data(MSB)	
29	R6	I	Red data	
30	R5	I	Red data	
31	R4	I	Red data	
32	R3	I	Red data	
33	R2	I	Red data	
34	R1	I	Red data	Note 2
35	R0	I	Red data(LSB)	Note 2
36	GND	P	Power Ground	
37	DCLK	I	Sample clock	Note 3
38	GND	P	Power Ground	
39	L/R	I	Left / right selection	Note 4,5
40	U/D	I	Up/down selection	Note 4,5
41	V_{GH}	P	Gate ON Voltage	
42	V_{GL}	P	Gate OFF Voltage	
43	AV_{DD}	P	Power for Analog Circuit	
44	RESET	I	Global reset pin.	Note 6
45	NC	-	No connection	
46	V_{COM}	I	Common Voltage	
47	DITHB	I	Dithering function	Note 7
48	GND	P	Power Ground	
49	NC	-	No connection	
50	NC	-	No connection	

I: input, O: output, P: Power

Note 1: DE/SYNC mode select. Normally pull high.
When select DE mode, MODE="1", VS and HS must pull high.
When select SYNC mode, MODE= "0", DE must be grounded.

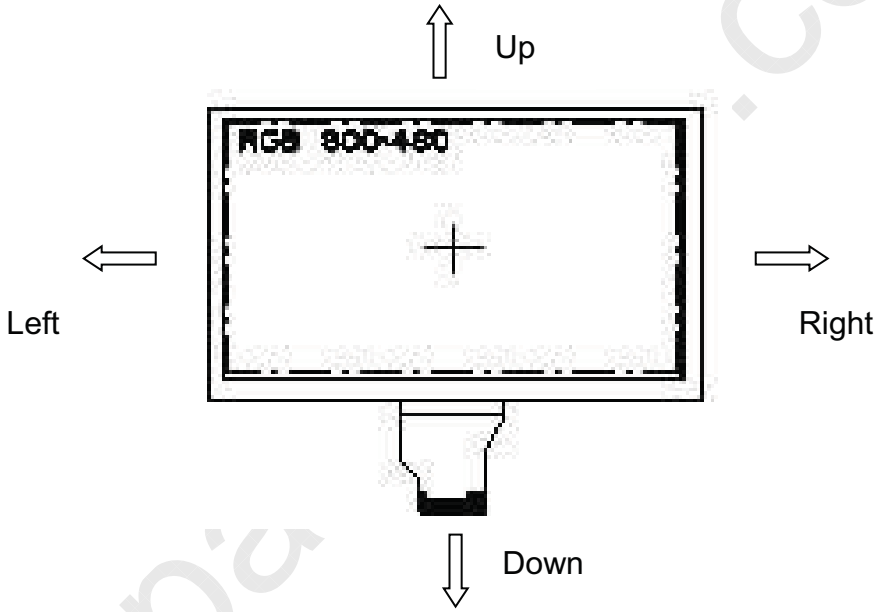
Note 2: When input 18 bits RGB data, the two low bits of R,G and B data must be grounded.

Note 3: Data shall be latched at the falling edge of DCLK.

Note 4: Selection of scanning mode

Setting of scan control input		Scanning direction
U/D	L/R	
GND	DV_{DD}	Up to down, left to right
DV_{DD}	GND	Down to up, right to left
GND	GND	Up to down, right to left
DV_{DD}	DV_{DD}	Down to up, left to right

Note 5: Definition of scanning direction.
Refer to the figure as below:



Note 6: Global reset pin. Active low to enter reset state. Suggest to connect with an RC reset circuit for stability. Normally pull high.

Note 7: Dithering function enable control, normally pull high.
When DITHB="1",Disable internal dithering function,
When DITHB="0",Enable internal dithering function,

3 Operation Specifications

3.1 Absolute Maximum Rating

(GND=AV_{SS}=0V, Note 1)

Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Power voltage	V_{CC}	-0.3	5.0	V	
	AV_{DD}	6.5	13.5	V	
	V_{GH}	-0.3	40.0	V	
	V_{GL}	-20.0	0.3	V	
	V_{GH}-V_{GL}	20	40.0	V	
Operation Temperature	T_{OP}	-30	85	℃	
Storage Temperature	T_{ST}	-30	85	℃	
LED Reverse Voltage	Vr	-	1.2	V	Each LED Note 2
LED Forward Current	I_f	-	25	mA	Each LED

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.

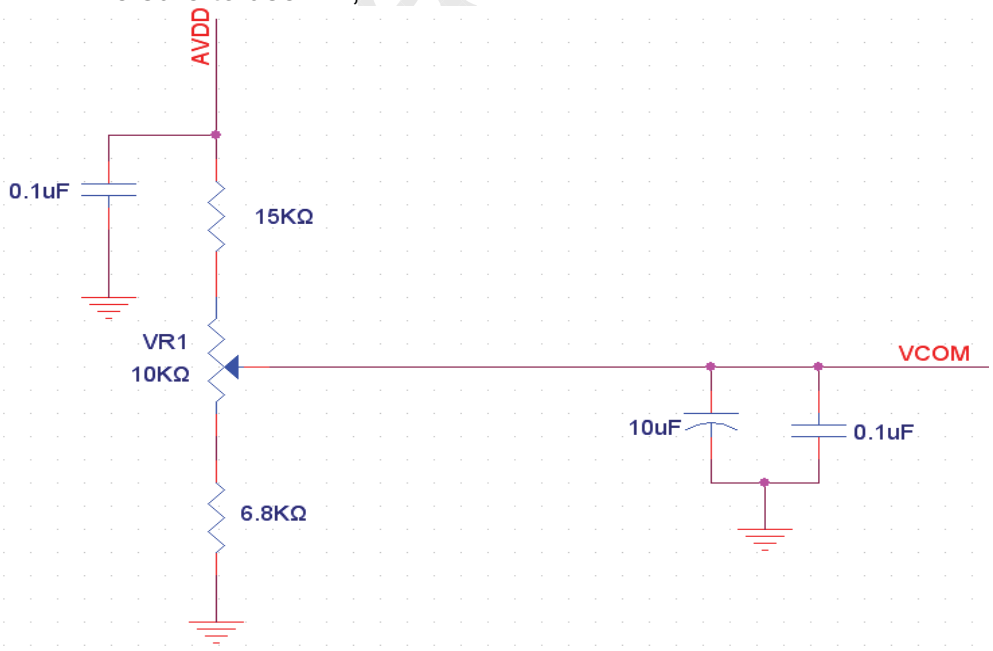
Note 2: V_R Conditions: Zener Diode 20mA

3.1.1 Typical Operation Conditions

(Note 1)

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	DV_{DD}	3.0	3.3	3.6	V	Note 2
	AV_{DD}	10.2	10.4	10.6	V	
	V_{GH}	15.3	16.0	16.7	V	
	V_{GL}	-7.7	-7.0	-6.3	V	
Input signal voltage	V_{COM}	3.4	4.4	5.4	V	Note 4
Input logic high voltage	V_{IH}	0.7 DV_{DD}	0.9 DV_{DD}	DV_{DD}	V	Note 3
Input logic low voltage	V_{IL}	0	0.1 DV_{DD}	0.3 DV_{DD}	V	

Note 1: Be sure to apply DV_{DD} and V_{GL} to the LCD first, and then apply V_{GH}.
Note 2: DV_{DD} 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

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Current for Driver	I_{GH}	0.05	0.2	1	mA	
	I_{GL}	0.05	0.2	1	mA	
	IDV_{DD}	1	4	10	mA	
	IAV_{DD}	5	20	50	mA	

3.1.3 Backlight Driving Conditions

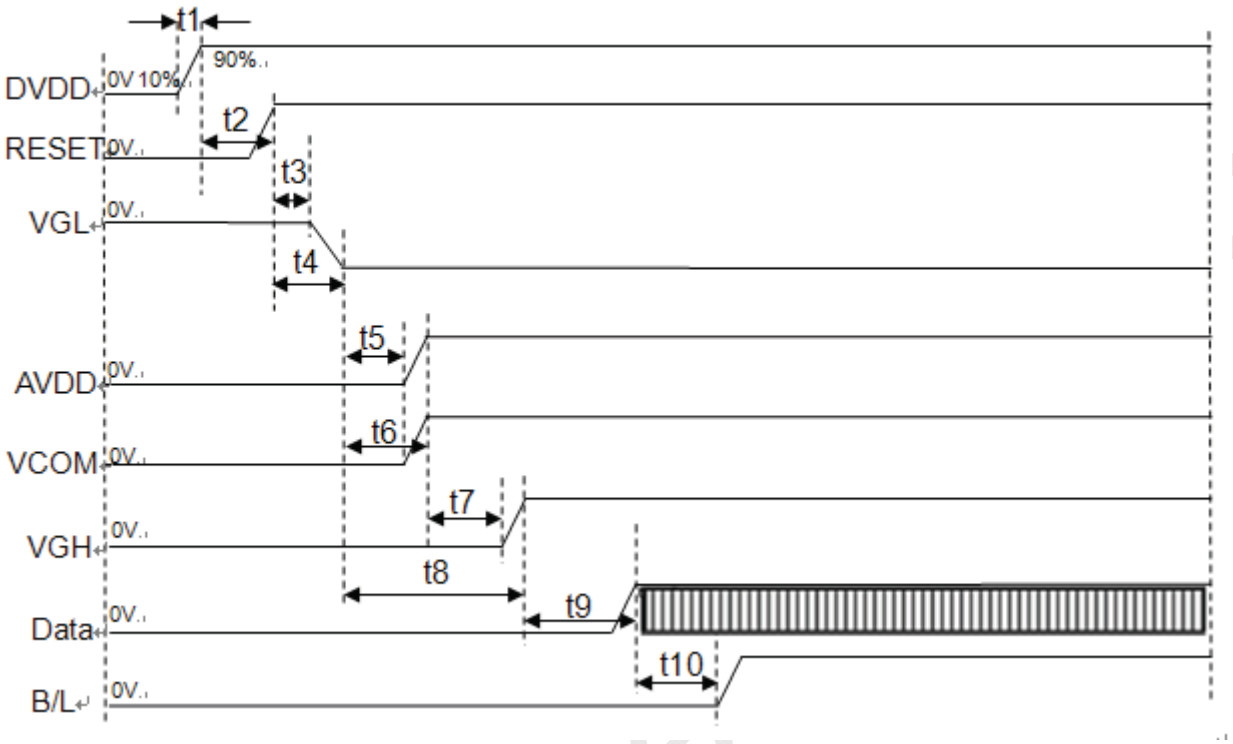
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Voltage for LED backlight	VL	8.4	9.3	10.2	V	Note 1
Current for LED backlight	I_L	216	240	264	mA	
LED life time	-	20,000	-	-	Hr	Note 2

Note 1: The LED Supply Voltage is defined by the number of LED at Ta=25℃ and I_L =240mA.

Note 2: The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25℃ and I_L =240mA. The LED lifetime could be decreased if operating I_L is lager than 240 mA.

3.2 Power Sequence

3.2.1 Power on:

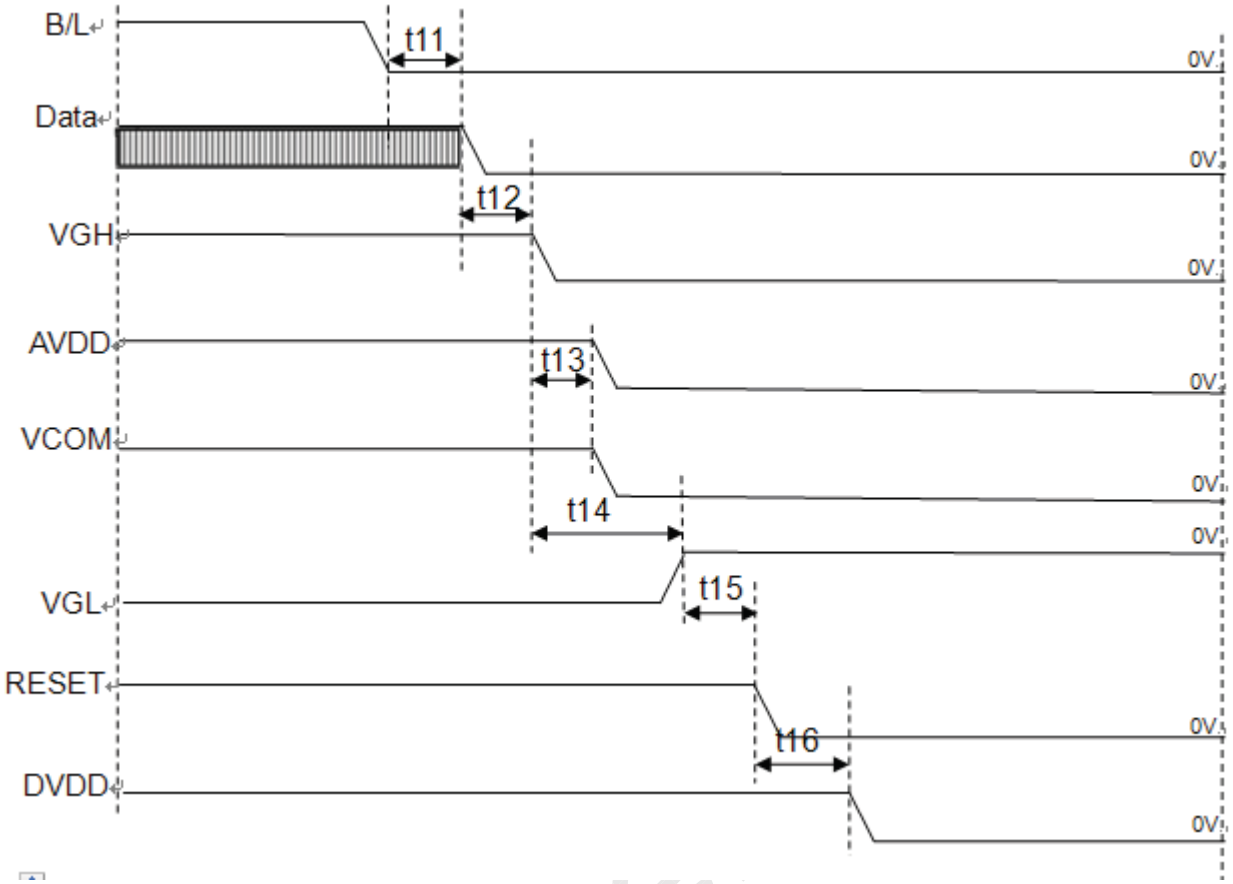


DV_{DD}→RESET→VGL→AVDD→VGH→Data→B/L

Symbol	SPEC			Unit
	Min.	Typ.	Max.	
t1	0.5	5	20	ms
t2	1	1	1.5	ms
t3	10	15	20	ms
t4	20	22	24	ms
t5	1	2	3	ms
t6	5	6	7	ms
t7	1.5	2	4	ms
t8	10	12	15	ms
t9	150	-	500	ms
t10	180	190	200	ms

Note: Data include R0~R7, B0~B7, GO~G7, U/D, L/R, DCLK, HS, VS, DE.
Note: Be sure to apply DV_{DD} and V_{GL} to the LCD first, and then apply V_{GH}.

3.2.2 Power off:



B/L→Data→VGH→AVDD→VGL→RESET→DV_{DD}

Symbol	SPEC			Unit
	Min.	Typ.	Max.	
t11	180	190	200	ms
t12	10	15	20	ms
t13	5	6	7	ms
t14	10	12	15	ms
t15	20	22	24	ms
t16	1	1.5	3	ms

Note: Data include R0~R7, B0~B7, GO~G7, U/D, L/R, DCLK, HS, VS, DE.

3.3 Timing Characteristics

3.3.1 AC Electrical Characteristics

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
HS setup time	T_{hst}	8	10	12	ns	
HS hold time	T_{hhd}	8	10	12	ns	Associated with Hsync width, refer to Hsync width=1 clk
VS setup time	T_{vst}	8	10	12	ns	
VS hold time	T_{vhd}	8	10	12	ns	Associated with Vsync width, refer to Vsync width=1 clk
Data setup time	T_{dsu}	8	10	12	ns	
Data hold time	T_{dhd}	8	10	12	ns	
DE setup time	T_{esu}	8	10	12	ns	
DE hold time	T_{ehd}	8	10	12	ns	Associated with DE width, refer to DE width=1 clk
DV_{DD} Power On Slew rate	T_{POR}	0.5	5	20	ms	From 0 to 90% DV_{DD}
RESET pulse width	T_{Rst}	1	2	5	ms	
DCLK cycle time	T_{coh}	20	30	33	ns	
DCLK pulse duty	T_{cwh}	40	50	60	%	

3.3.2 Data Input Format

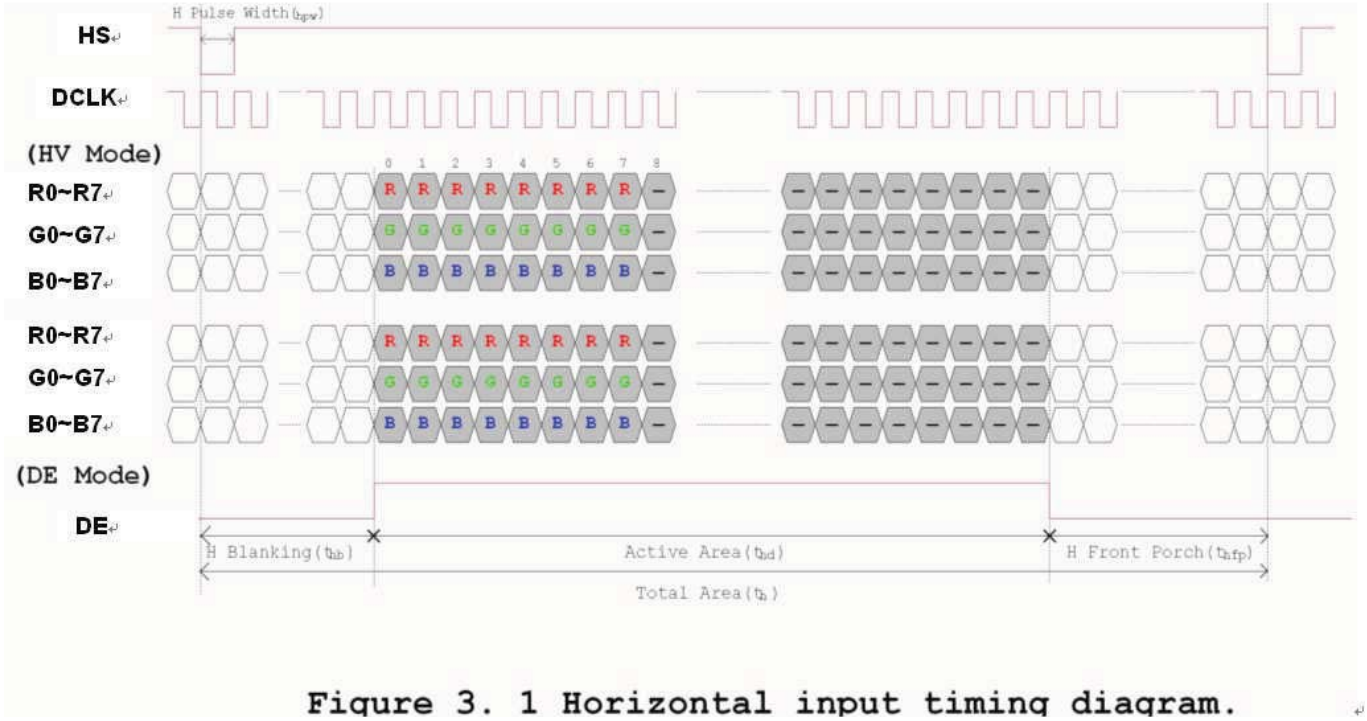


Figure 3. 1 Horizontal input timing diagram.

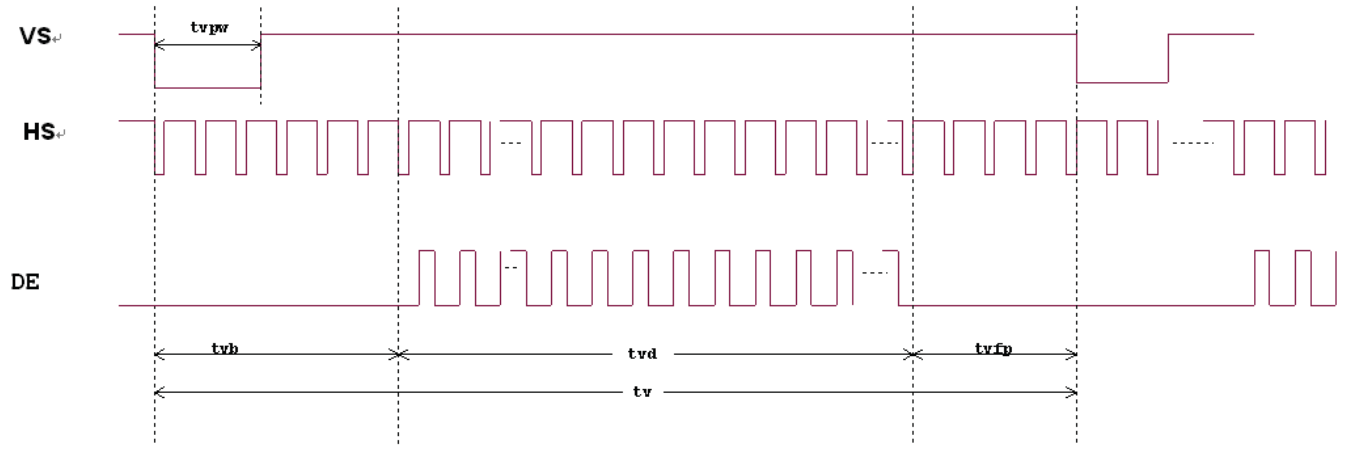


Figure 3. 2 Vertical input timing diagram.

3.3.3 Timing

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Horizontal Display Area	thd		800		DCLK	
DCLK Frequency	fclk	26.4	33.3	46.8	MHz	
One Horizontal Line	th	862	1056	1200	DCLK	
HS pulse width	thpw	1	6	40	DCLK	Note1
HS Blanking	thb		46		DCLK	Note1
HS Front Porch	thfp	16	210	354	DCLK	

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Vertical Display Area	tvd		480		TH	
VS period time	tv	510	525	650	TH	
VS pulse width	tvpw	1	3	20	TH	Note2
VS Blanking	tvb		23		TH	Note2
VS Front Porch	tvfp	7	22	147	TH	

Note1: HS Blanking has included HS pulse width
Note2: VS Blanking has included VS pulse width
Note: Frame rate 60±5Hz

4 Optical Specifications

Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Viewing angle (CR≥10)	θ_L	Φ=180°(9 o'clock)	60	70	-	degree	Note 1
	θ_R	Φ=0°(3 o'clock)	60	70	-		
	θ_T	Φ=90°(12 o'clock)	40	50	-		
	θ_B	Φ=270°(6 o'clock)	60	70	-		
Response time	T_{ON}	Normal θ=Φ=0°	-	10	20	msec	Note 3
	T_{OFF}		-	15	30	msec	Note 3
Contrast ratio	CR		600	800	-	-	Note 4
Color chromaticity	W_X		0.26	0.31	0.36	-	Note 2 Note 5 Note 6
	W_Y		0.28	0.33	0.38	-	
Luminance	L		400	500	-	cd/m²	Note 6
Luminance uniformity	Y_U		70	75	-	%	Note 7

Test Conditions:
1. V_{CC}=3.3V, AV_{DD}=10V, I_L=240mA (Backlight current), the ambient temperature is 25℃.
2. The test systems refer to Note 2.

Note 1: Definition of viewing angle range

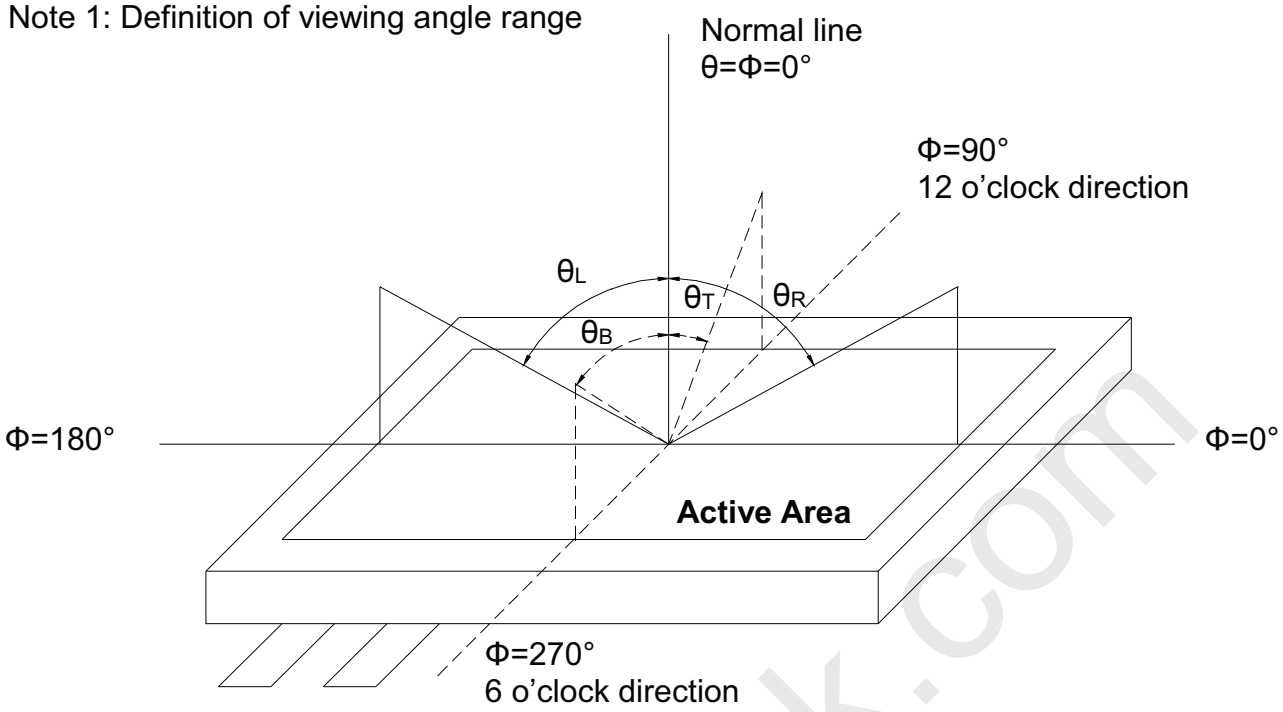


Fig. 4-1 Definition of viewing angle

Note 2: Definition of optical measurement system.

The optical characteristics should be measured in dark room. 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.)

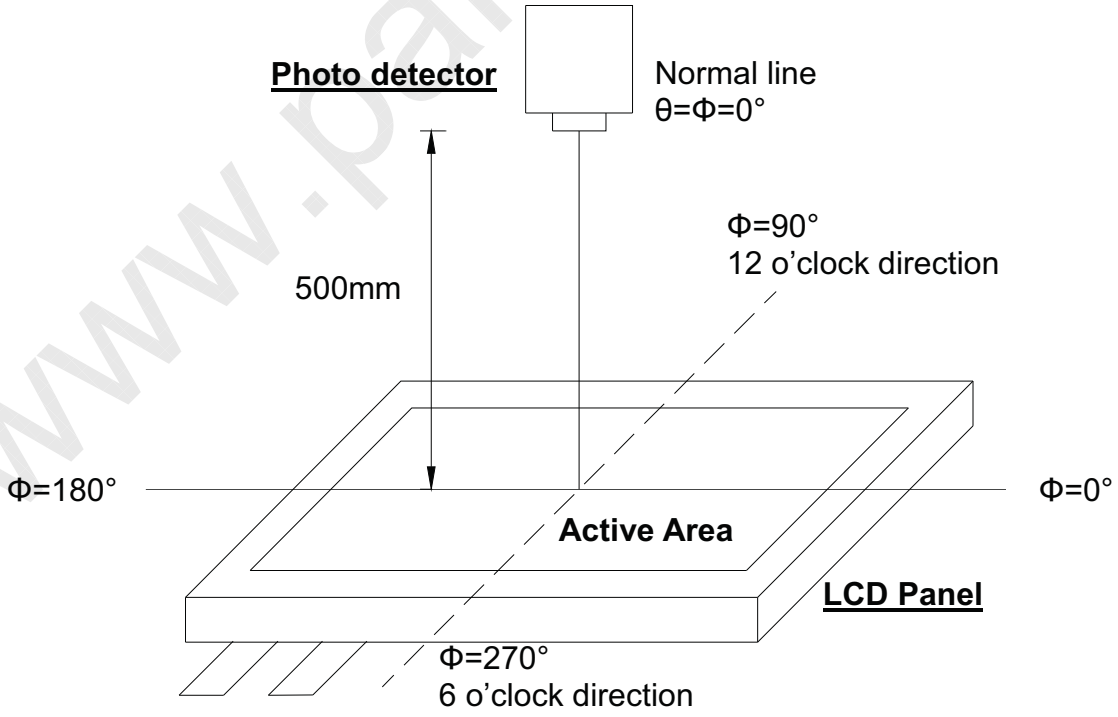


Fig. 4-2 Optical measurement system setup

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%.

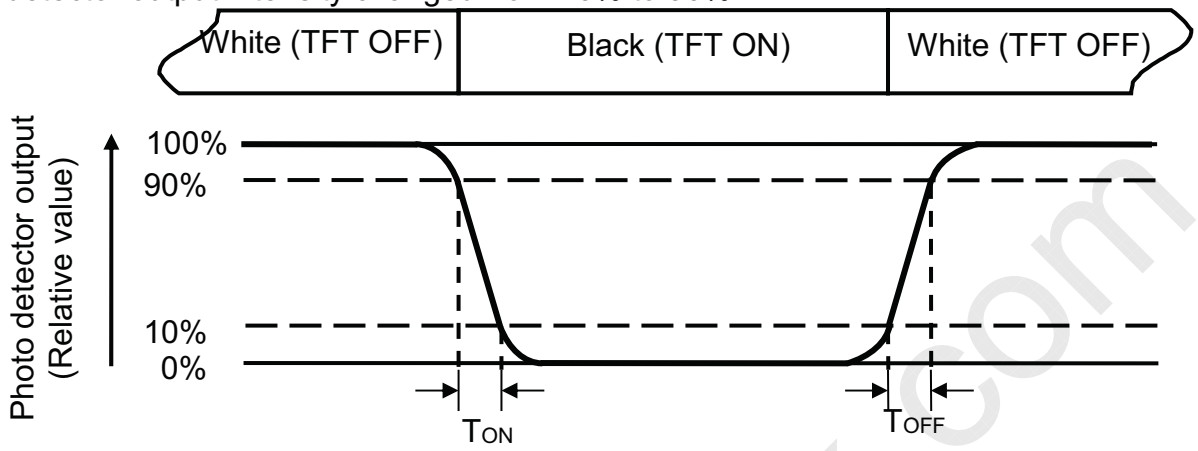


Fig. 4-3 Definition of response time

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=240mA.

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

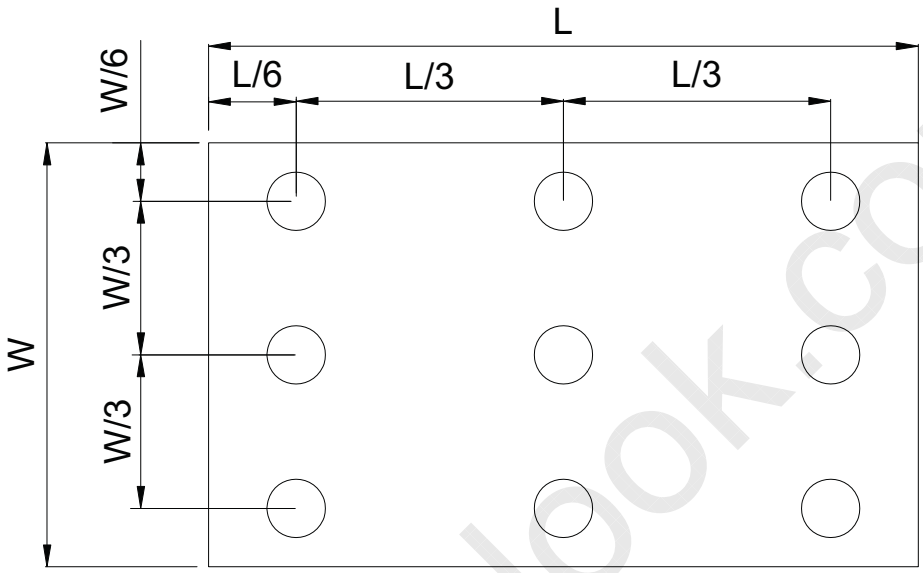


Fig. 4-4 Definition of measuring points

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	Remark
High Temperature Storage	Ta = 85℃ 240 hrs	Note 1, Note3, Note 4, Note5
Low Temperature Storage	Ta = -30℃ 240hrs	Note 1, Note3, Note 4
High Temperature Operation	Ts = 85℃ 240hrs	Note 2, Note3, Note 4, Note5
Low Temperature Operation	Ta = -30℃ 240hrs	Note 1, Note3, Note 4
Operate at High Temperature and Humidity	+60℃, 90%RH 240 hrs	Note 3, Note4, Note5
Thermal Shock	-30℃/30 min ~ +85℃/30 min for a total 100 cycles, Start with cold temperature and end with high temperature	Note 3, Note4, Note5
Vibration Test	Frequency: 10 ~55~10Hz; Sweep Mode: Log SweepSweep time: 1Oct/min; Acceleration: 1.5G; Test time: 2hrs for each direction of X, Y, Z.	
Mechanical Shock	100G 6ms,±X, ±Y, ±Z 3 times for each direction	
Package Vibration Test	1.47Grms X, Y, Z three axis (30min /axis) [Spectrum：5Hz(0.015G2/Hz)，100Hz(0.015G2/Hz)，200Hz(0.0037G2/Hz)]	
Package Drop Test	Height:60 cm 1 corner, 3 edges, 6 surfaces	
Electro Static Discharge	± 2KV, Human Body Mode, 100pF/1500Ω ± 2KV, Surface Contact Mode, 150pF/330Ω ± 2KV, Surface Air Mode, 150pF/330Ω	

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 tests, the product must have enough recovery time, at least 2 hours at room temperature.

Note 5: A certain level of Mura (non-uniformity) of dark / black image will happen several days after high temperature testing (H.T.T.). There is a slowly part recovery over a long time (several months). Such a long exposure time like in H.T.T. will normally not happen in a real application. Therefore the test H.T.T. was introduced to simulate cycles with normal conditions in-between but with the same total exposure time what show a significant reduced Mura.
The root cause is related to tension generated due to different amount of shrinking in the stack of layers in the polarizer sheet. The effect is more significant on larger displays like this size. An investigation into alternative polarizer material showed that there is no better alternative currently available.

6 General Precautions

6.1 Safety

1.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.

2.The temperature for using is no more than this product SPEC, otherwise, only promise the function is OK, but the quality may be changed.

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.

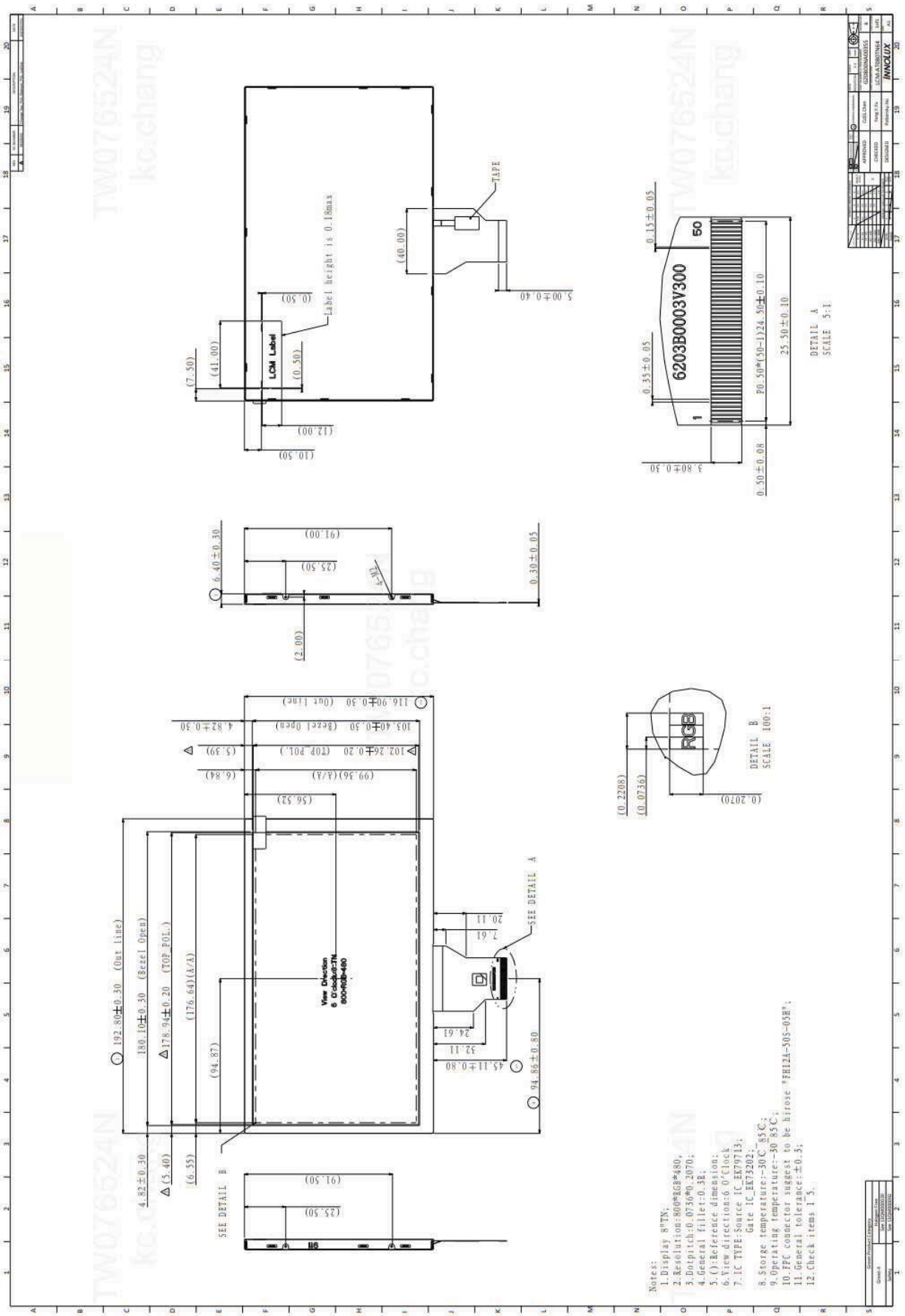
6.4 Storage

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



8 Package Drawing

8.1 Packaging Drawing