PRODUCT SPECIFICATION

Doc. Number:

□ Tentative Specification

■ Preliminary Specification

□ Approval Specification

MODEL NO.: JJ123IA
SUFFIX: 01J

Customer:

APPROVED BY **SIGNATURE**

Name / Title

Note :

Please return 1 copy for your confirmation with your signature and comments.

Approved By	Checked By	Prepared By
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REVISION HISTORY

Version	Date	Page	Description
V0.1	2018/01/23		New release
V0.2	2018/04/16	1	Modify General Specifications
		2,3	Modify Pin Assignment
		6,7,9~13	Modify Operation Specifications
		15	Modify Optical Specifications
		19	Modify Reliability Test Items
		22	Modify Mechanical Drawing
		23	Add Packing Drawing

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1. General Specifications

No.	Item	Specification	Remark
1	LCD size	12.3 inch (Diagonal)	
2	Driver element	a-Si TFT active matrix	
3	Resolution	1920 × 3(RGB) × 720	
4	Display mode	Normally Black, Transmissive	
5	Dot pitch	0.0508(W) × 0.1524(H) mm	
6	Active area	292.608(W) × 109.728(H) mm	
7	Module size	309.0(W) × 128.0(H) ×6.5(D) mm	Note 1
8	Surface treatment	AG	
9	Color arrangement	RGB-stripe	
10	Interface	2 Port LVDS (DE Only)	Note 2
11	Backlight power consumption	8.2 W (typ.)	
12	Panel power consumption	TBD	
13	Weight	TBD g (Typ.)	
14	NTSC	76%	

Note 1: Refer to Mechanical Drawing.
Note 2: VESA format

2. Pin Assignment

PCBa connector is used for the module electronics interface. The recommended model is 12003S-50Y900 manufactured by IRISO.

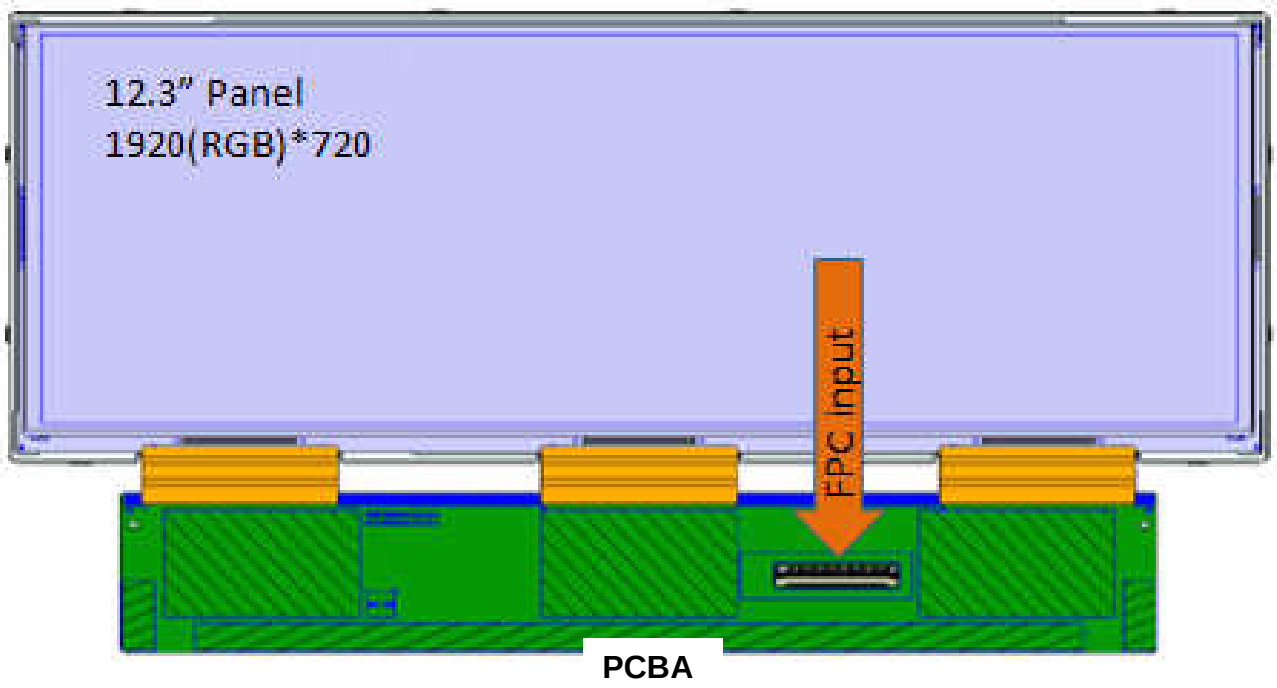
Pin	Input signal name	I/O pin (I:input, O:output, P:power)	Typical voltage (Volt)		description
1	GND	P	0V	power supply	Ground
2	VDD	P	3.3 V	power supply	External main and I/O power supply ; Power3V3
3	VDD	P	3.3 V	power supply	External main and I/O power supply : Power3V3
4	NC				Keep floating
5	RESET	I		Function	Global reset pin, set logic High for normal display operation
6	STBYB	I		Function	Standby mode setting pin, set logic High for normal display operation
7	GND	P	0V	power supply	Ground
8	OLV0N	I		LVDS signal	LVDS odd data 0-
9	OLV0P	I		LVDS signal	LVDS odd data 0+
10	GND	P	0V	power supply	Ground
11	OLV1N	I		LVDS signal	LVDS odd data 1-
12	OLV1P	I		LVDS signal	LVDS odd data 1+
13	GND	P	0V	power supply	Ground
14	OLV2N	I		LVDS signal	LVDS odd data 2-
15	OLV2P	I		LVDS signal	LVDS odd data 2+
16	GND	P	0V	power supply	Ground
17	OLVCLKN	I		LVDS signal	LVDS odd clk -
18	OLVCLKP	I		LVDS signal	LVDS odd clk +
19	GND	P	0V	power supply	Ground
20	OLV3N	I		LVDS signal	LVDS odd data 3-
21	OLV3P	I		LVDS signal	LVDS odd data 3+
22	GND	P	0 V	power supply	Ground
23	ELV0N	I		LVDS signal	LVDS even data 0-
24	ELV0P	I		LVDS signal	LVDS even data 0+
25	GND	P	0V	power supply	Ground

26	ELV1N	I		LVDS signal	LVDS even data 1-
27	ELV1P	I		LVDS signal	LVDS even data 1+
28	GND	P	0.00 V	power supply	Ground
29	ELV2N	I		LVDS signal	LVDS even data 2-
30	ELV2P	I		LVDS signal	LVDS even data 2+
31	GND	P	0V	power supply	Ground
32	ELVCLKN	I		LVDS signal	LVDS even clk -
33	ELVCLKP	I		LVDS signal	LVDS even clk +
34	GND	P	0V	power supply	Ground
35	ELV3N	I		LVDS signal	LVDS even data 3-
36	ELV3P	I		LVDS signal	LVDS even data 3+
37	GND	P	0V	power supply	Ground
38	BISTEN	I	0V	Function	Normal Operation/BIST pattern select, set logic Low for normal display operation.
39	RL	I	3.3V	Function	Horizontal shift direction (source output) selection. L/R = 1: Left -> Right L/R = 0: Right -> Left
40	TB	I	3.3V	Function	Vertical shift direction (gate output) selection. U/D = 1: Top ->Bottom U/D = 0: Bottom->Top
41	CSB	I	3.3V		LCD Maker Internal Use, Keep connecting 3.3V
42	SCL	I	3.3V		LCD Maker Internal Use, Keep connecting 3.3V
43	SDI	I	3.3V		LCD Maker Internal Use, Keep connecting 3.3V
44	PINCTL	I	3.3V	Function	Select Pin/Register control. (default: Customer to Pull high for Pin Control only) PINCTL = 1: Pin/Register control function controlled by Pin. PINCTL = 0: Pin/Register control function controlled by Register.
45	NC				Keep floating
46	NC				Keep floating
47	NC				Keep floating
48	NC				Keep floating
49	SDO	O			LCD Maker Internal Use,Keep floating
50	NC				Keep floating

The recommended model of FPC Connector is 12001S-10Y901 manufactured by IRISO

PIN No.	Symbol	I/O	Function
1	PLED	Power	LED anode power supply
2	PLED	Power	LED anode power supply
3	PLED	Power	LED anode power supply
4	NC		Keep floating
5	NTC1		heat sensor
6	NTC2(GND)		heat sensor
7	NLED	Power	LED cathode power supply
8	NLED	Power	LED cathode power supply
9	NLED	Power	LED cathode power supply
10	NLED	Power	LED cathode power supply

Note 1: Definition of scanning direction. Refer to the figure as below:



FPC Input direction
The contacts of FPC are face-down

3. Operation Specifications

3.1. Absolute Maximum Ratings

(GND=0V)

Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Power voltage	V_{DD}	-0.5	5	V	Note 1
Operation Temperature	T_{OP}	-30	85	℃	Note2, 3, 4
Storage Temperature	T_{ST}	-40	90	℃	Note2, 3, 4
LED Forward Current	I_F	-	250	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 : This rating applies to all parts of the module and should not be exceeded.

Note 3 : Maximum wet-bulb temperature is 58℃. Condensation of dew must be avoided as electrical current leaks will occur, causing a degradation of performance specifications.

Note 4 : The operating temperature only guarantees operation of the LCM and doesn't guarantee all the contents of Electro-optical specification.

3.1.1Typical Operation Conditions

(GND =0V)

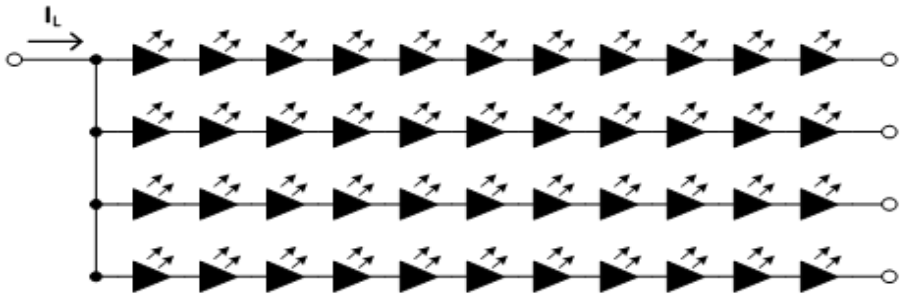
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	V_{DD}	3.1	3.3	3.5	V	Note 1,2
Power Supply Input Current	I_{DD}		TBD	TBD	mA	Note 3
Input logic high voltage	V_{IH}	0.7 V_{DD}	-	V_{DD}	V	Note 4
Input logic low voltage	V_{IL}	GND	-	0.3 V_{DD}	V	

Note 1: V_{DD} setting should match the signals output voltage of customer's system board.
Note 2: The ripple voltage should be controlled under 5% of V_{DD}
Note 3: Full white pattern.
Note 4: RESET, STBYB , RL, TB, BIST, PINCTL, SDI, SCL, CSB

3.1.2 Backlight Driving Conditions

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Voltage for LED backlight	V_L	30.8	-	36.3	V	Note 1
Current for LED backlight	I_L		240		mA	(4P11S)
LED life time	-	20000			Hr	Note 2

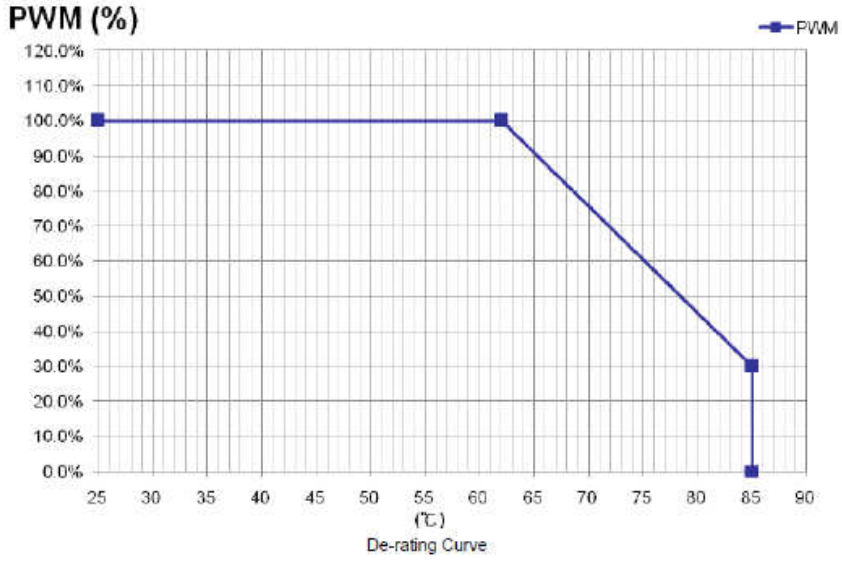
Note 1: The LED Supply Voltage is defined by the number of LED at Ta=25℃ and I_F =150 mA
Note 2: The "LED life time" is defined as the module brightness decrease to 50% original brightness at Ta=25℃ and I_L = 240 mA. The LED lifetime could be decreased if operating I_L is larger than 240mA.



3.1.3 PWM.

The LED string has a NTC(Negative Temperature Coefficient) to detect the ambient temperature of LED string.

LED power de-rating has to start at 62℃ linear dow n to PWM 30% at 85℃ before switching off, see graph as below.

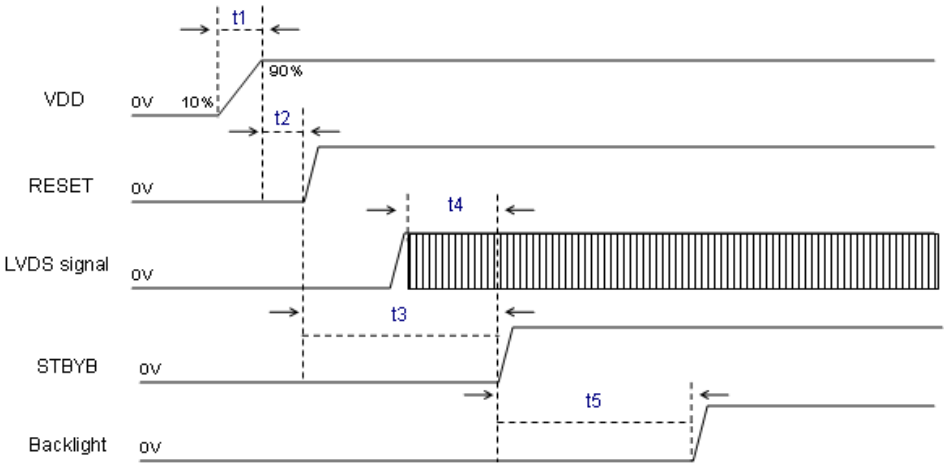


De-rating Curve

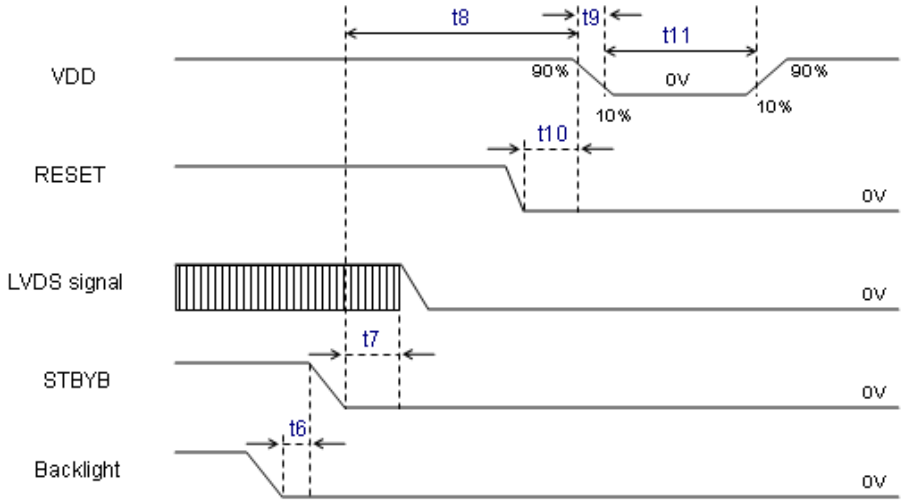
3.2 Power Sequence

VDD = 3.1~3.5V

a. Power on:



b. Power off:



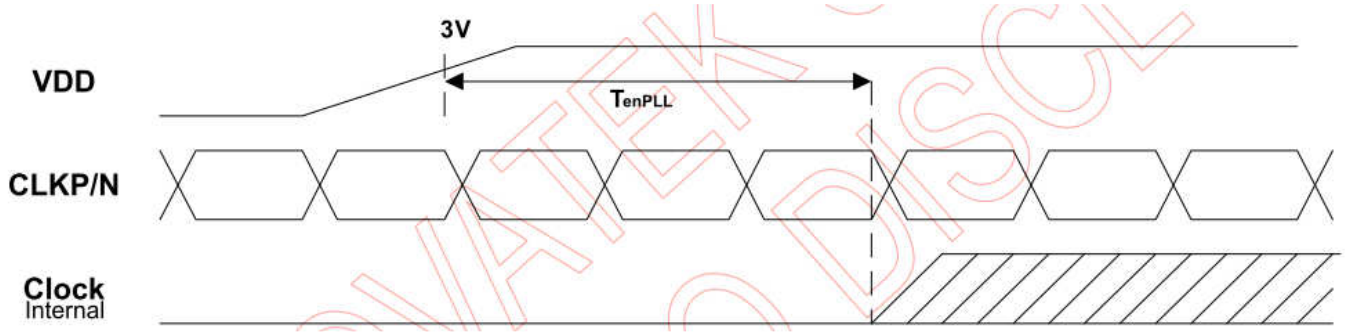
Symbol	Spec.			Unit
	Min.	Typ.	Max.	
t1	0.5	10	20	ms
t2	1	1.2	1.5	ms
t3	10	15	20	ms
t4	1	10	20	ms
t5	180	190	200	ms
t6	0	10	20	ms
t7	150	155	160	ms
t8	160	180	200	ms
t9	0.5	5	10	ms
t10	0	5	10	ms
t11	500	650	800	ms

3.3Timing Characteristics

3.3.1 LVDS AC Electrical Characteristics

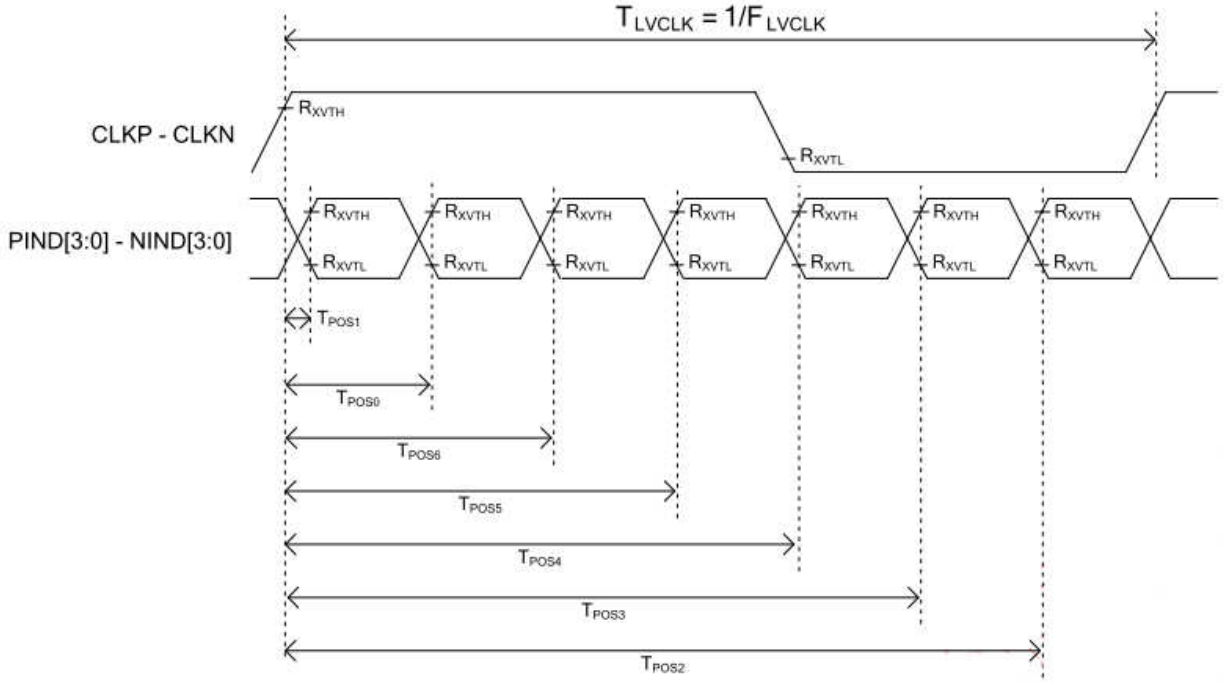
Parameter	Symbol	Spec.			Unit	Remark
		Min.	Typ.	Max.		
Clock frequency	FLVCLK	25		85	MHz	Frame rate=60Hz
Clock Period	TLVCLK	40		11.76	ns	Frame rate=60Hz
1 data bit time	UI	-	1/7	-	TLVCLK	
Position 1	TPOS1	-0.25	0	0.25	UI	Note9
Position 0	TPOS0	0.75	1	1.25	UI	
Position 6	TPOS6	1.75	2	2.25	UI	
Position 5	TPOS5	2.75	3	3.25	UI	
Position 4	TPOS4	3.75	4	4.25	UI	
Position 3	TPOS3	4.75	5	5.25	UI	
Position 2	TPOS2	5.75	6	6.25	UI	
PLL wake-up time	TenPLL	-	-	150	us	

Note9 : Please refer to “Input Clock and Data Timing Diagram”

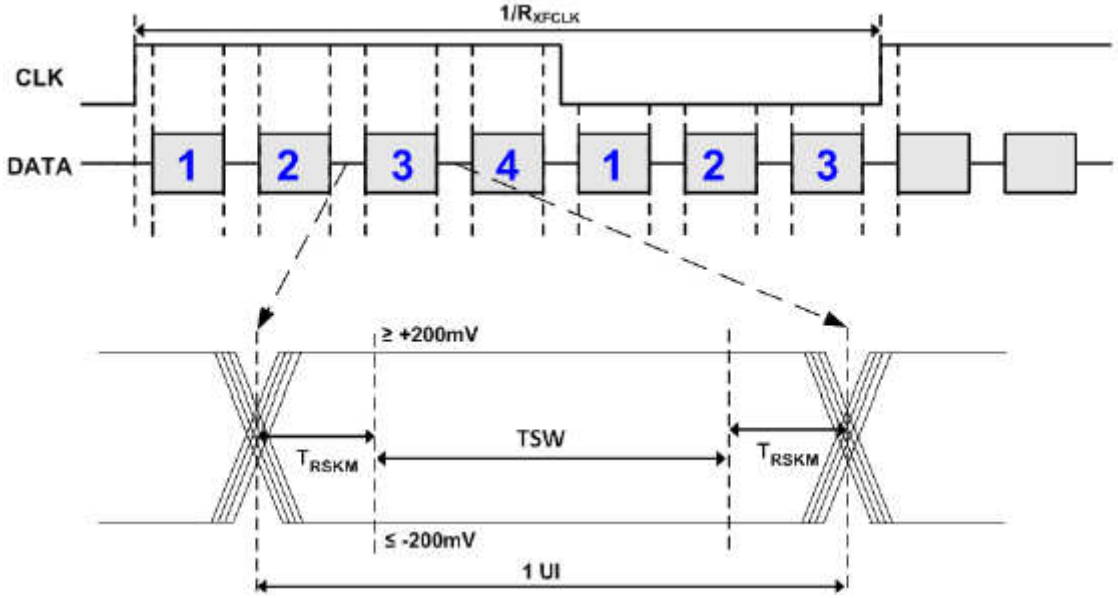


3.3.2. Input Clock and Data Timing Diagram

LVDS input timing:



Differential:

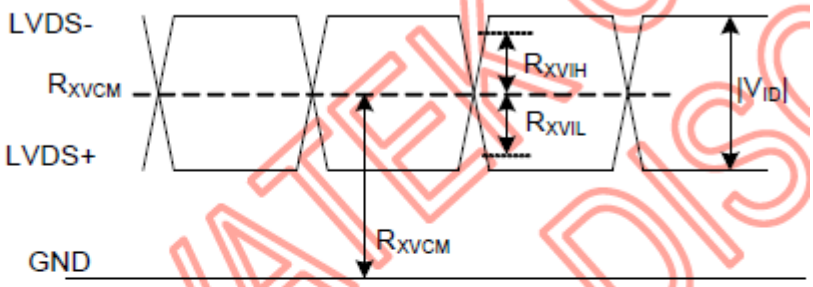


LVDS Data Skew

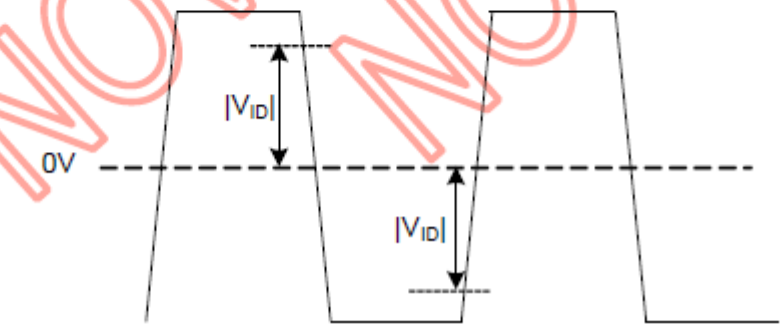
3.3.3. LVDS DC Electrical Characteristics

Parameter	Symbol	Spec.			Unit	Remark
		Min.	Typ.	Max.		
Differential input high Threshold voltage	Vth	+0.1	-	+0.3	V	
Differential input low Threshold voltage	Vtl	-0.3	-	-0.1	V	
Differential input common Mode voltage	Vcm	1	1.2	1.7-$\|V_{id}\|/2$	V	-
Differential input voltage	|Vid|	0.2	-	0.6	V	-
Differential input leakage Current	Vleak	-10	-	+10	μA	VCC_IF=1.8V, CLKP/N, DxP/N

Single-end Signal



Differential Signal

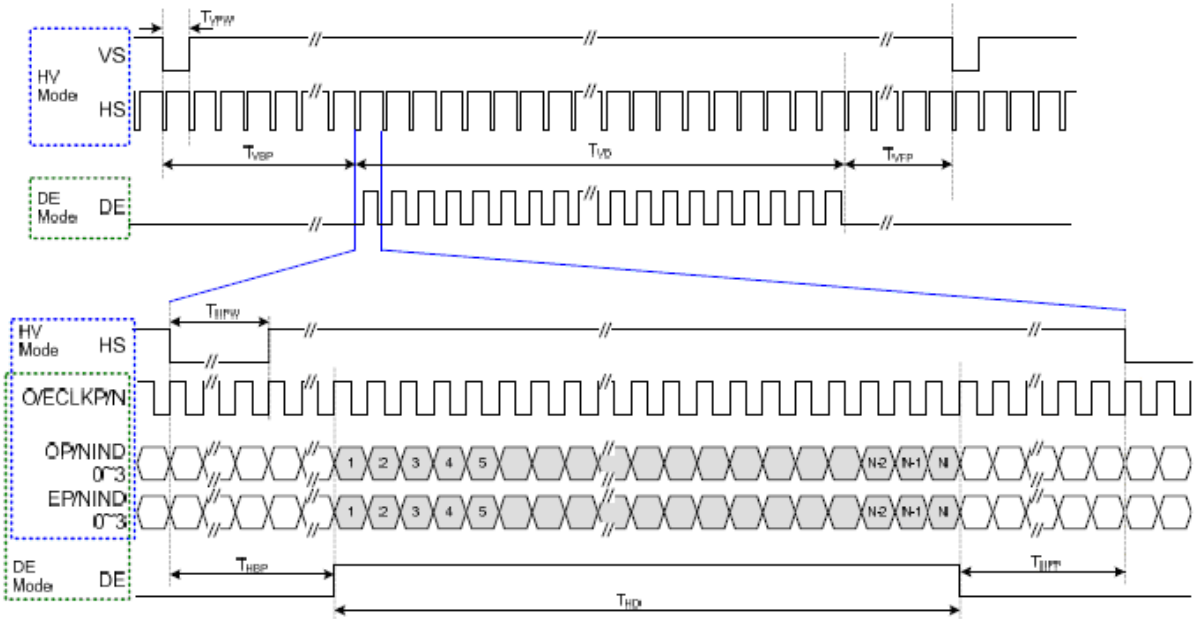


3.3.4. Timing

Parameter	Symbol	1920xRGBx720 (Two Port LVDS)			Unit
		Min.	Typ.	Max.	
CLK frequency	F_{CLK}	44.6	44.7	50.2	MHz
Horizontal display area	T_{HD}		960		CLK
HS period time	T_H	1020	1024	1150	CLK
Vertical display area	T_{VD}		720		H
VS period time	T_V	726	728	849	H
Frame rate	FR	-	60	-	Hz

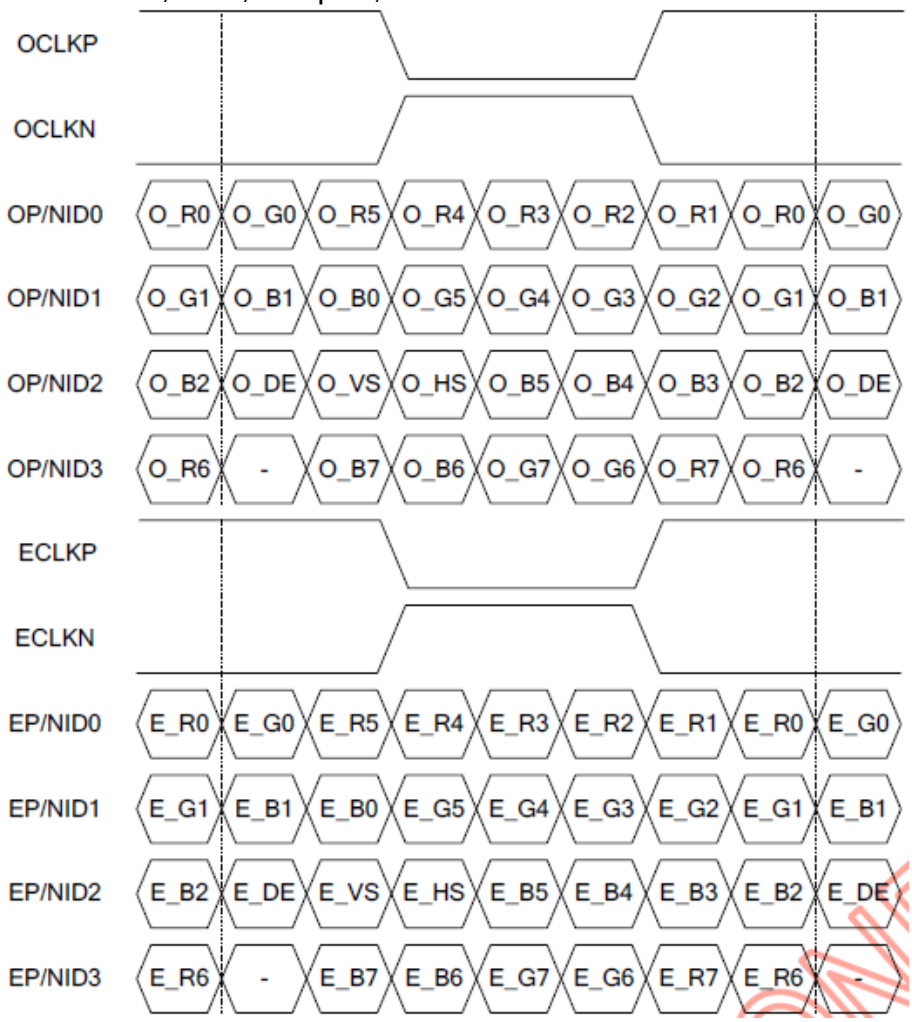
Note : DE mode only.

Please refer the waveform of green rectangle. (DE Mode)



3.3.4. Data Input Format

LVDS, 8-bit, two port, VESA format:



4 Optical Specifications

Remark: All exception items are marked by ( ) and INX reserves the right to update after amount of measured data.

Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Viewing angle (CR≥ 10)	θ_L	Φ=180℃(9 o'clock)	80	85	-	degree	Note 1, 2
	θ_R	Φ=0℃(3 o'clock)	80	85	-		
	θ_T	Φ=90℃(12 o'clock)	80	85	-		
	θ_B	Φ=270℃(6 o'clock)	80	85	-		
Response time	T_{ON}	Normal θ=Φ=0°	-	15	20	msec	Note 2,3
	T_{OFF}		-	10	15	msec	
Contrast ratio	CR		(700)	1000	-	-	Note 2,4
Color chromaticity	W_X		(0.273)	(0.313)	(0.353)	-	Note 2,5
	W_Y		(0.289)	(0.329)	(0.369)	-	
NTSC			-	76	-	%	Note 2,5
Gamma			1.9	2.2	2.5		Note 2
Luminance	L		(600)	750	-	cd/m²	Note 2
Luminance uniformity	UL		75	80	-	%	Note 2,6

Test Conditions:
1. V_{DD}=3.3V, 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.

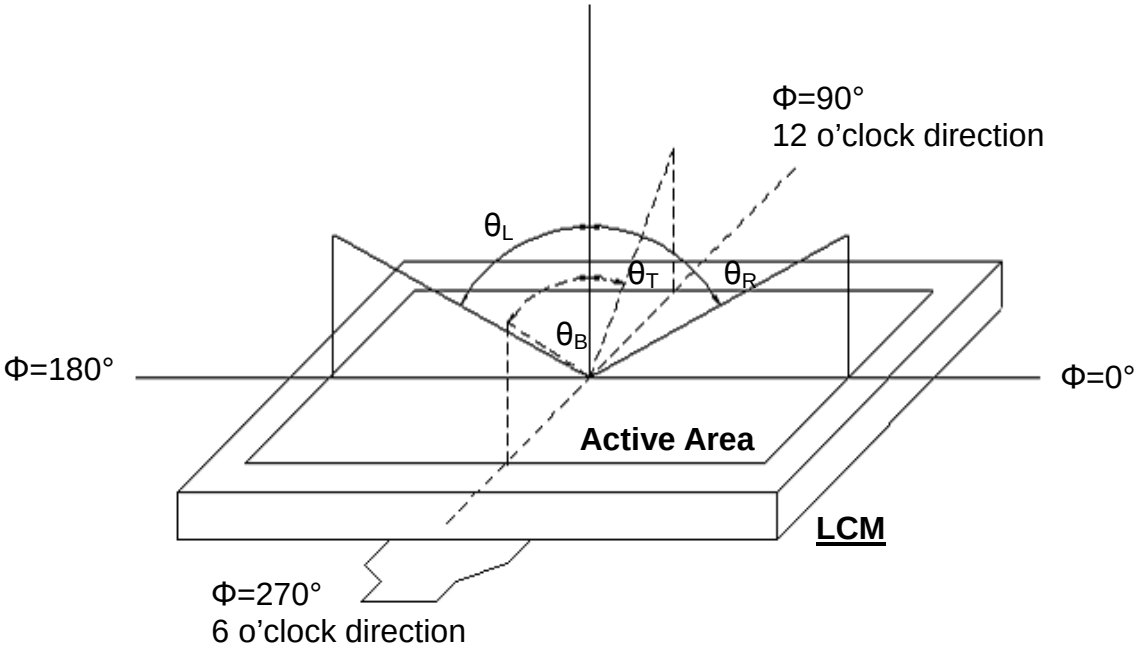


Fig. 4-1 Definition of viewing angle

Note 2: Definition of optical measurement system.
The backlight has been light on for 30 minutes then measured the optical properties at the center point of the LCD screen in dark room. The optical performance are measured by DMS. .

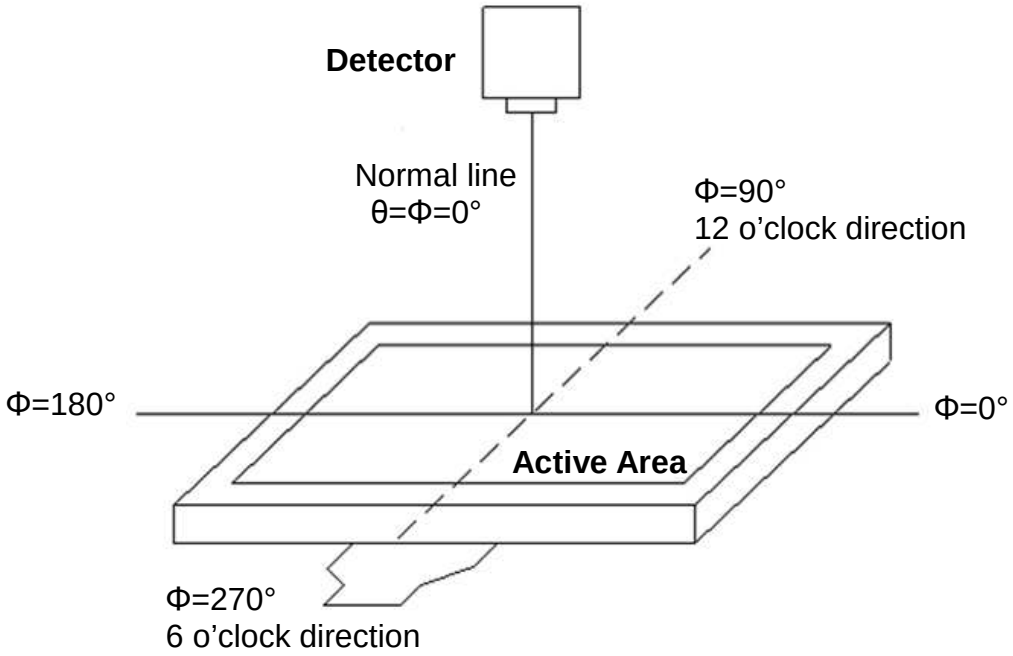


Fig. 4-2 Optical measurement system setup

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 (Ton) is the time between photo detector output intensity changed from 10% to 90%, and fall time (Toff) is the time between photo detector output intensity changed from 90% to 10%.

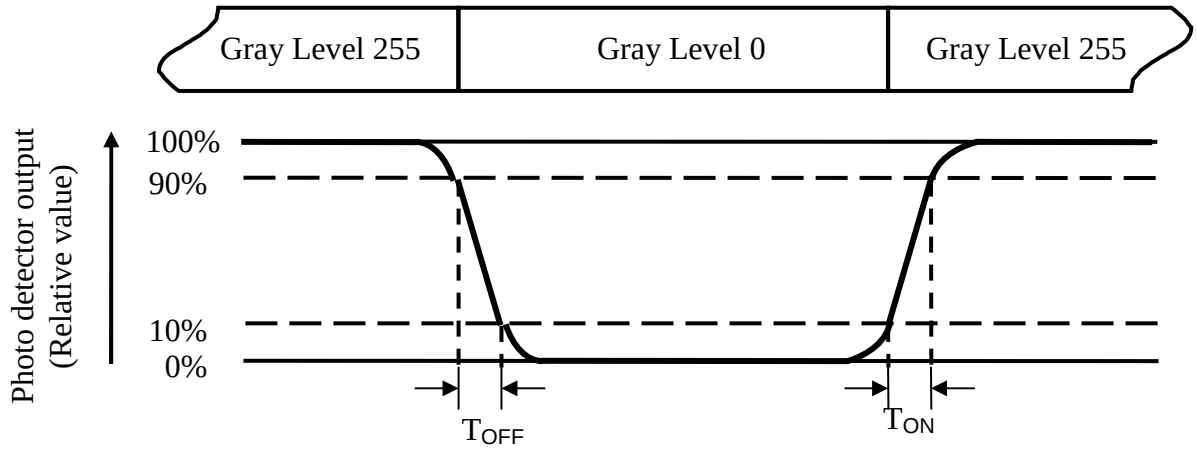


Fig. 4-3 Definition of response time

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 the center point of LCD when panel is driven at “White”, “Red”, “Green” and “Blue” state respectively.

Note 6: Definition of luminance uniformity

To test for uniformity, the tested area is divided into 3 rows and 3 columns. The measurement spot is placed at the center of each circle as below.

$$\text{Luminance Uniformity (UL)} = \frac{L_{min}}{L_{max}}$$

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

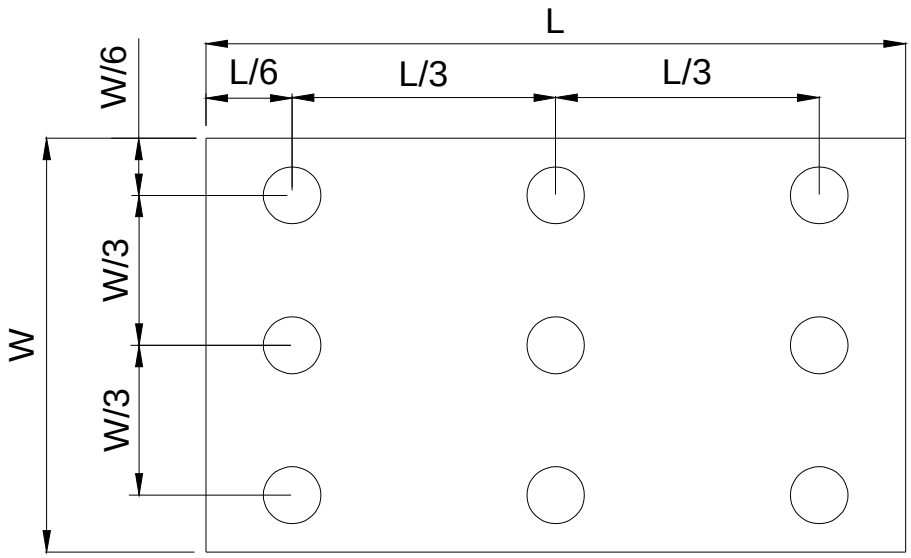


Fig. 4-4 Definition of measuring points

5 Reliability Test Items

Item	Test Conditions	Remark
High Temperature Storage Test	Ta=90ºC, 504 hours	Note 1 Note 2 Note 3 Note 5
Low Temperature Storage Test	Ta=-40ºC, 504 hours	
High Temperature Operation Test	Tp=85ºC, 504 hours	
Low Temperature Operation Test	Ta=-30ºC, 504 hours	
High Temperature & High Humidity Operation Test	Ta=60ºC, RH 90%, 504hours	
Thermal Shock	[(Ta=-30℃ 30min)→(Ta=85℃ 30min)]/cycle , 100cycles	
ESD Test	Condition 1 : C = 150pF, R = 330Ω Contact Discharge, ± 8KV (Class B) Condition 2 : C = 150pF, R = 330Ω, Air Discharge, ± 15KV(Class B)	Note 2 Note 6
Mechanical Shock	100G, 6ms, half sine wave, 3 times for each direction of ±X, ±Y, ±Z	Note 2 Note 4
Mechanical Vibration	10Hz, 10(m/s2)2/Hz55Hz, 3.25(m/s2)2/Hz 180Hz, 0.125(m/s2)2/Hz 300Hz, 0.125(m/s2)2/Hz 360Hz, 0.07(m/s2)2/Hz 1000Hz, 0.07(m/s2)2/Hz Total acceleration : 2.0Grms Test time : 8hrs for each direction of X, Y, Z.	Note 2 Note 4
Packaging Vibration Test	1.14Grms X, Y, Z three axis (30min /axis) [Spectrum：5Hz(0.015G2/Hz)，100Hz(0.015G2/Hz)，200Hz(0.0037G2/Hz)]	
Packaging Drop Test	1corner, 3edges, 6faces (1 time/direction) <follow ISTA(1A) Height> 0kg≦W <10kg：76cm, 10kg≦W <19kg：61cm, 19kg≦W <28kg：46cm, 28kg≦W <45kg：31cm, 45kg≦W ≦68kg：20cm	

Note 1: Ta = Ambient Temperature, Tp = Panel Surface Temperature. The polarizer can only accept the highest temperature 85℃ storage and operation test.

Note 2: Criteria: Normal display image with no Function NG, or line defects.

Note 3: Evaluation should be tested after storage at room temperature for more than two hour

Note 4: At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.

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.

Note 6: Criteria Class B: Some performance degradation allowed. No data loss. Self - recoverable No hardware failures

6 General Precautions

6.1Safety

Liquid crystal is poisonous. Do not put it in your mouth. If liquid crystal touches your skin or cloths, 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.

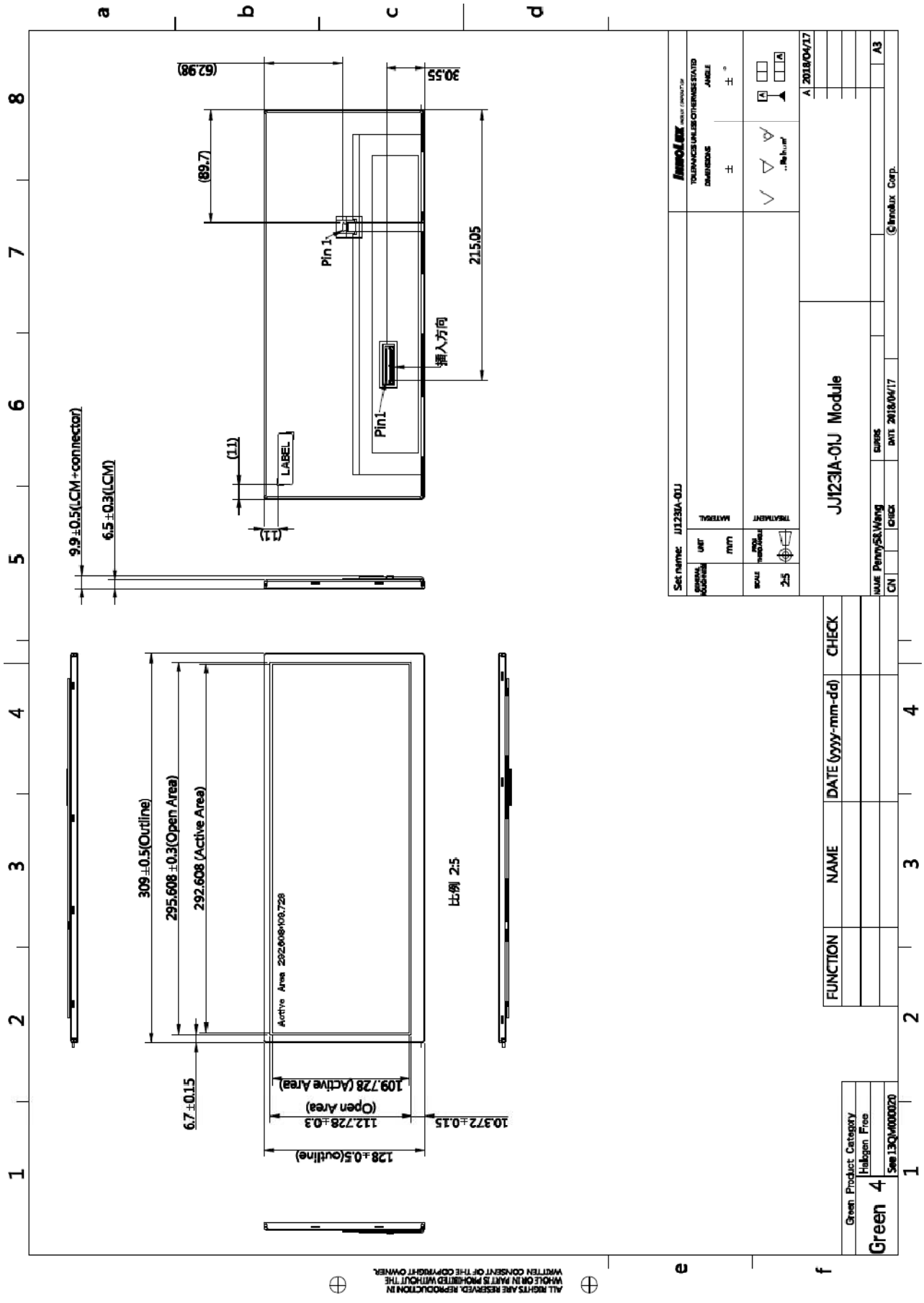
6.4 Storage

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



8 Packing Drawing