

# AMOLED

## Product Specification

Model Name: PO070FMTO

Description: 7" FHD AMOLED

Doc. Version: 01

Customer:

- Approved for Preliminary Specification
- Approved for Final Specification
- Approved for Final Specification & Sample

Prepared by	Checked by	Approved by

Customer's Approval



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## 1.Scope

This specification define OLED manufactured by Panox Display. In any unspecified case, it may be necessary for Panox Display and the department to design this module into their products in order to obtain a solution.

## 2. Features

### 1.1 Product Applications

Mobile phone, portable GPS, handheld game console...

### 1.2 Product Features

1.2.1 Display color: 1.07 billion colors (RGB x 10bits)

1.2.2 Frame rate: Support max 165HZ

1.2.2 Display format: 7" FHD(1080RGBx1920)

1.2.3 Pixel Configuration: V-style4

1.2.4 Interface: MIPI 4 lanes

1.2.5 Driver IC: SH8804B

1.2.6 Touch IC: FT3519T

1.2.7 Touch screen: On-Cell

## 3. Mechanical Specifications

Item	Specification	unit
Dimension outline	89.1344*160.9056*1.095	mm
Resolution	1080 RGB x 1920 ( Rendering )	dots
Active area	87.1344 (H) x 154.9056 (V)	mm
Diagonal size	7	inch
PPI	315	μm
Glass thickness (LTPS/encapsulation glass)	0.50 / 0.255	mm
Weight	( TBD )	g

## 4. Maximum Rating

Parameter	Symbol	Spec			Unit	Note
		Min.	Typ.	Max.		
Analog/boost power voltage	VCI	-0.3	-	5.5	V	-
I/O voltage	VDDIO	-0.3	-	5.5	V	-
Power IC Input Voltage	VBAT	-0.3	-	6	V	-
Operating temperature	Top	-40		70	°C	
Storage temperature	Tstg	-45		80	°C	

## 5. Electrical Specifications

### 5.1 Electrical Characteristics

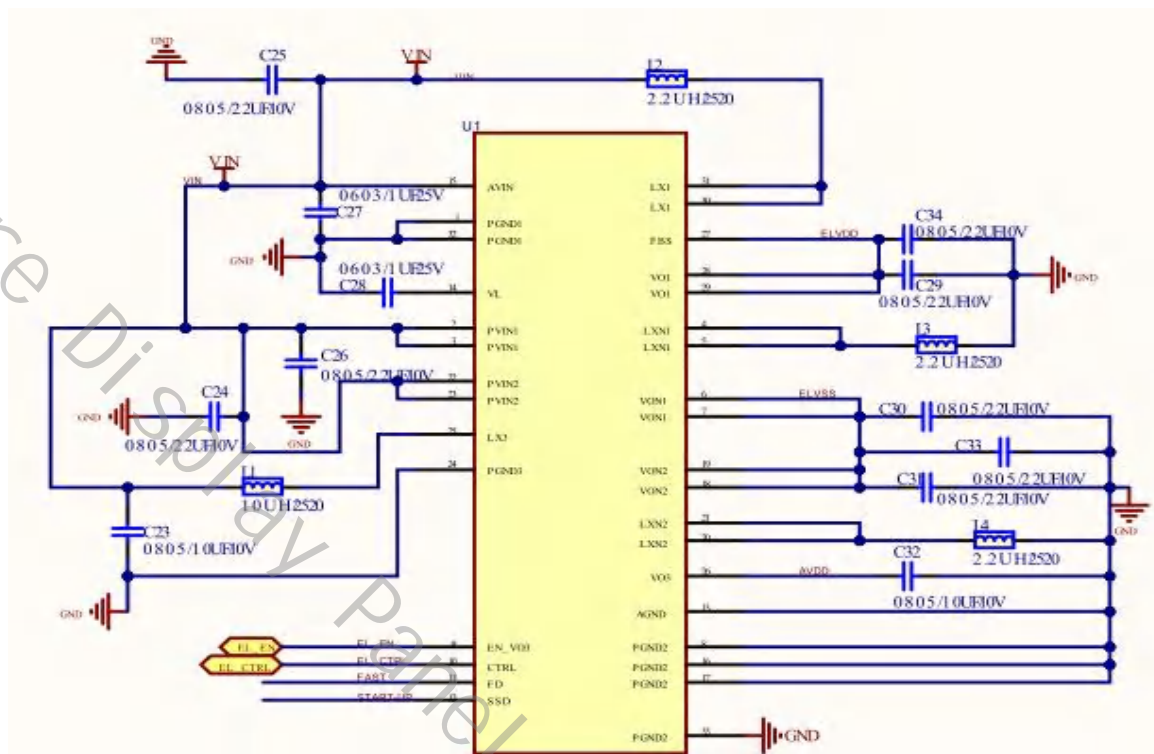
#### 5.1.1 Current Characteristic

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Power IC Input Voltage	VBAT	3.3	-	4.5	V	Ref
Digital Power supply	VDDI	1.65	1.8	1.95	V	Ref
Analog Power supply	VCI	2.7	2.8	3.6	V	Ref
TP Power Supply voltage	AVDD	2.7	-	3.6	V	-
TP I/O Digital Voltage	Iovcc	1.65	-	3.6	V	

## 5.1.2 Application circuit

Mode	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Full White @800 Nits	I <sub>BAT</sub>	I <sub>BAT</sub> =4.2V V <sub>CI</sub> =3.3V	-	750	800	mA	-
	I <sub>CI</sub>	V <sub>DDIO</sub> =1.8V	-	15	20	mA	-
	I <sub>DDIO</sub>	@ Full white 800 nits	-	50	65	mA	-
TP Normal Operation	I <sub>opr</sub>	AVDD=3.3V I <sub>ovcc</sub> = 1.8V		26		mA	-
TP Monitor	I <sub>mon</sub>			0.6		mA	-
TP Sleep	I <sub>slp</sub>			80		uA	-

## 5.2 I/O Connection and Block Diagrams



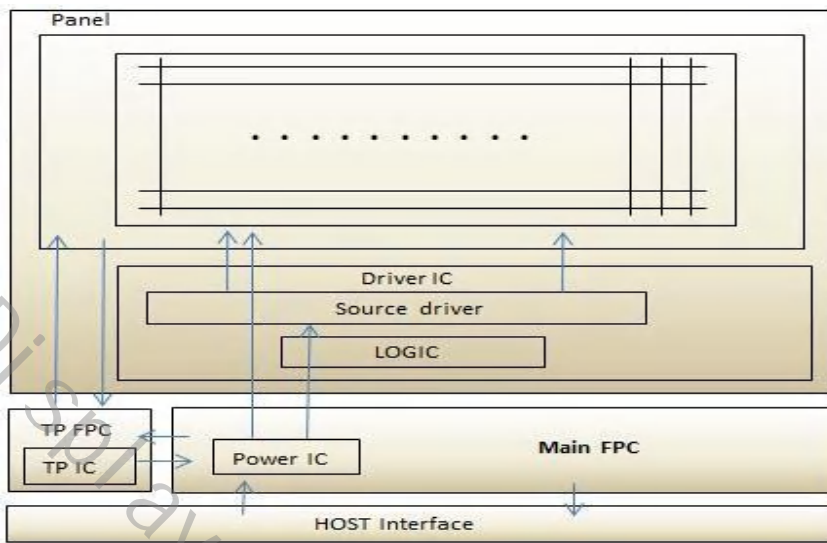
### 5.2.1 I/O Connection

#	Pin_name	I/O	Description
1	GND	Power	The power ground
2	GND	Power	The power ground
3	GND	Power	The power ground
4	VBAT	Power	Power IC Input Voltage
5	VBAT	Power	Power IC Input Voltage
6	VBAT	Power	Power IC Input Voltage
7	VBAT	Power	Power IC Input Voltage
8	VBAT	Power	Power IC Input Voltage
9	GND	Power	The power ground
10	VPP	Power	Power supply for OTP. Leave the pin to open when not in use.
11	NC	-	No connection
12	GND	Power	The power ground
13	D3P	I	MIPI DSI data3+

14	D3N	I/O	MIPI DSI data3-
15	GND	Power	The power ground
16	D0P	I/O	MIPI DSI data0+
17	D0N	I/O	MIPI DSI data0-
18	GND	Power	The power ground
19	CLKP	I	MIPI DSI clock+
20	CLKN	I	MIPI DSI clock-
21	GND	Power	The power ground
22	D1P	I/O	MIPI DSI data1+
23	D1N	I/O	MIPI DSI data1-
24	GND	Power	The power ground
25	D2P	I/O	MIPI DSI data2+
26	D2N	I/O	MIPI DSI data2-
27	GND	Power	The power ground
28	RESX	I	This signal will reset the device and must be applied to properly initialize the chip. Active low.
29	VDDIO	Power	Driver IC digital I/O supply
30	VCI	Power	Driver IC analog supply
31	TE	O	Tear effect output
32	GND	Power	The power ground
33	TSP_AVDD	Power	TP IC digital power supply
34	TSP_DVDD	Power	TP IC digital I/O supply
35	TSP_SDA	I/O	I2C Data Input & Output
36	TSP_SCL	I/O	I2C Clock Input
37	TSP_RESET	I	External Reset, Low is Active
38	TSP_ATTN	I	Interrupt request to the host, or Wakeup request from the host.
39	ID	O	Panel ID



### 5.2.2 Display Module Block Diagram



### 5.3 Recommended Operating Sequence

#### 5.3.1 Power on/off sequence

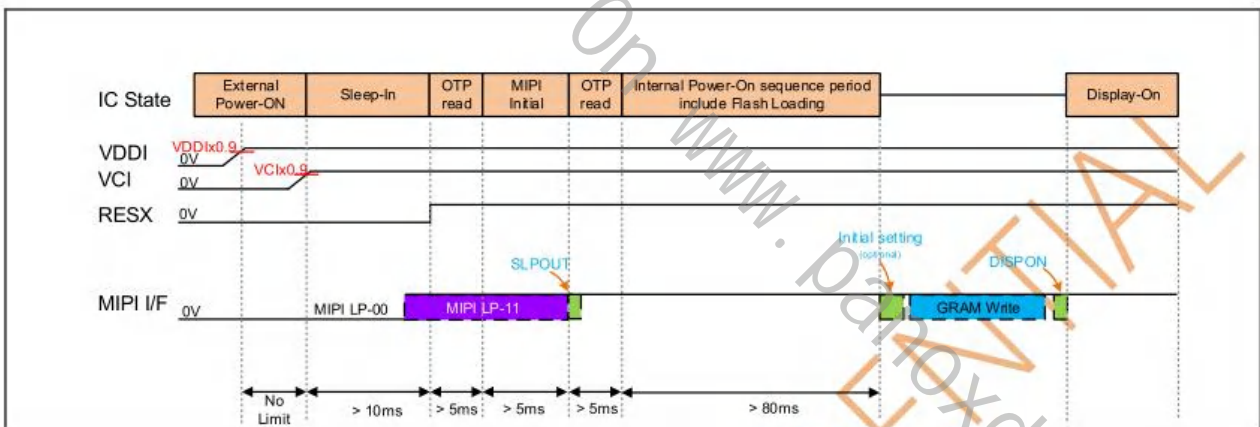


Figure 16 Power-On Sequence

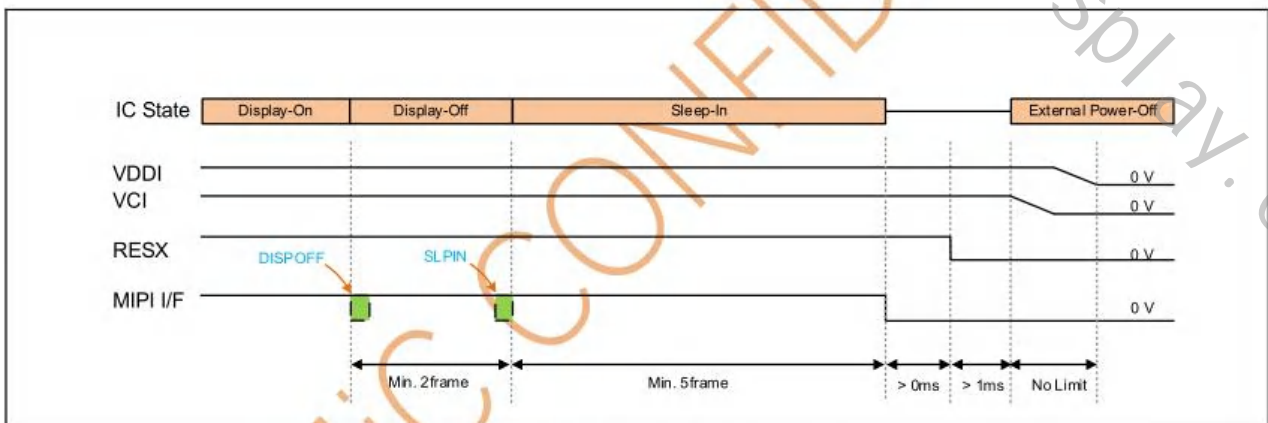


Figure 17 Power-Off Sequence

### 5.3.2 Power On to Display On&Display Off to Power Off Sequence

The power on to display-on sequence & display-off to power-off sequence are illustrated in the following figures.

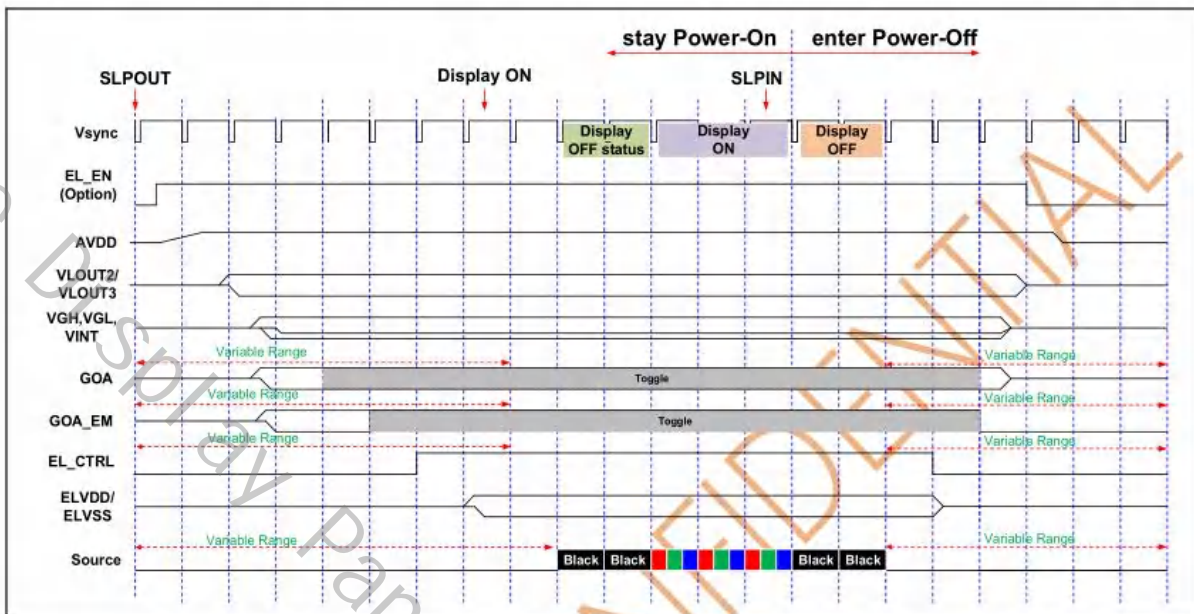


Figure 18 Power-On to Display-On & Display-Off to Power-Off Sequence

### 5.3.3 Power Ramp Up/Down

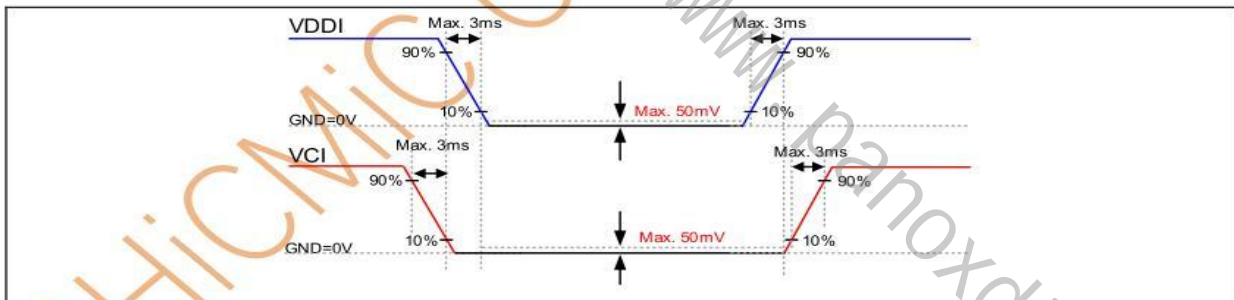


Figure 19 Power Ramp Up/Down

### 5.4 Reset Input Timing

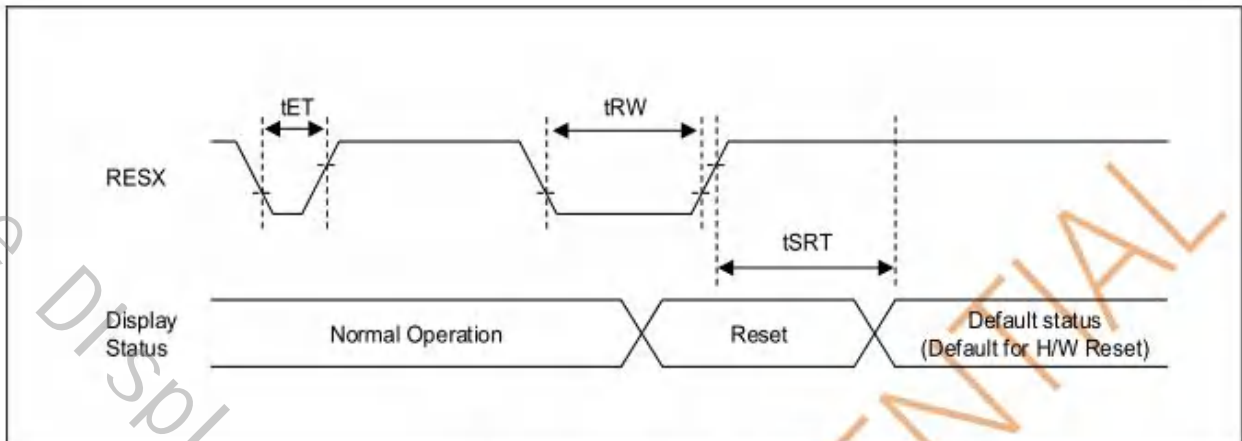


Figure 3 Reset Input Timing

Table 12 Reset Input Timing

Parameter	Symbol	Pad	Min.	Typ.	Max.	Unit	Note
Reset low pulse width	tRW	RESX	30	-	-	μs	-
Secure reset completion time	tSRT	RESX	-	-	5	ms	Reset during Sleep In mode
		RESX	-	-	150		Reset during Sleep Out mode
Reset un-reacted pulse width	tET	RESX			5	μs	-

**NOTE:**

1. Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below.

Table 13 RESX Pulse

RESX Pulse	Action
Shorter than 5 μs	Reset rejected
Longer than 30 μs	Reset
Between 5 μs and 30 μs	Reset start ( It depends on voltage and temperature condition )

2. During the reset period, the display will be blanked (The display is entering blanking sequence, for which the maximum time is 150ms, when Reset starts in Sleep Out-mode. The display remains in the blank state in Sleep In-mode) and then return to Default condition for H/W reset.
3. During Reset Completion Time, ID bytes (or similar) value in OTP will be latched to the internal register during this period. This loading is done every time when there is H/W reset complete time (tSRT) within 5ms after a rising edge of RESX.

## 6. Electro-Optical Specification

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angle	$\theta T$	CR $\geq$ 10	80			Degree	Note 2 Test Equipment: CS2000A
	$\theta B$		80				
	$\theta L$		80				
	$\theta R$		80				
Contrast Ratio	CR	$\theta=0^\circ$	100,000				Note1 Note3 Test Equipment: CS2000A
Chromaticity	White	x	(0.280)	(0.300)	(0.320)		Note 4 Test Equipment: CS2000A Note: Chromaticity can be modified according to customer demand
		y	(0.290)	(0.310)	(0.330)		
	Red	x	(0.652)	(0.682)	(0.712)		
		y	(0.285)	(0.315)	(0.345)		
	Green	x	(0.200)	(0.240)	(0.280)		
		y	(0.676)	(0.716)	(0.756)		
	Blue	x	(0.108)	(0.138)	(0.168)		
		y	(0.016)	(0.046)	(0.076)		
Uniformity	U		75	80		%	Note1 Note5 Test Equipment: CS2000A
NTSC				100		%	Note4
Normal-Luminance	L		720	800	880	Cd/m <sup>2</sup>	Note1 Note6 Test Equipment: CS2000A
HBM-Luminance	L		900	1000	1100	Cd/m <sup>2</sup>	Note1 Note6 Test Equipment: CS2000A
Flicker					-40	dB	Note8 Test Equipment: CA310 (Green 127 60HZ)
Cross-talk					2	%	Note7

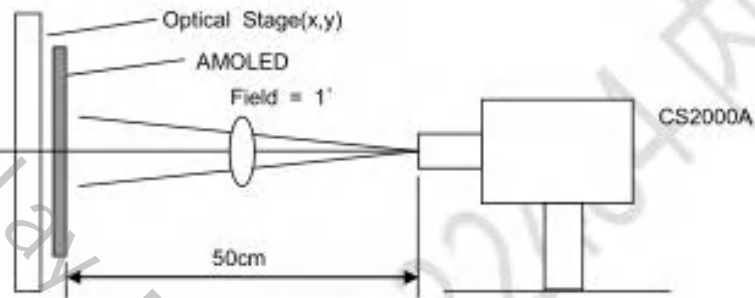
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Test Conditions:

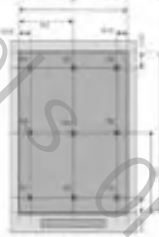
1. the ambient temperature is 25°C.
2. The test systems refer to Note1 and Note2.

Note 1: 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 AMOLED screen. All input terminals AMOLED panel must be ground when measuring the center area of the panel.

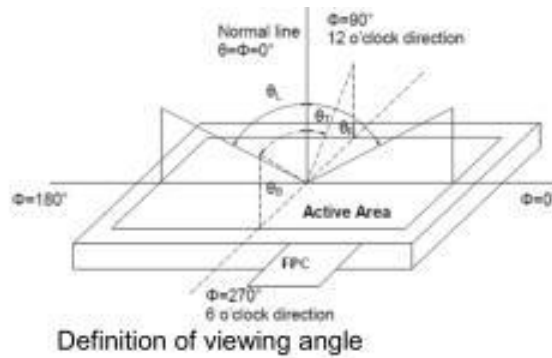


Optical Characteristic Measurement Equipment and Method



Measuring point for surface luminance

Note 2: Definition of viewing angle range and measurement system.



Note 3: Definition of contrast ratio

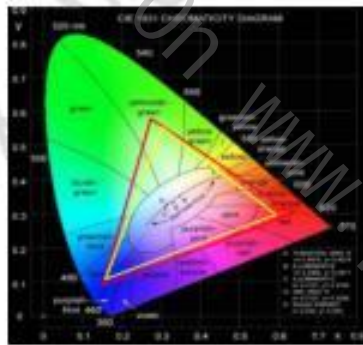
$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when AMOLED is on the "white" state}}{\text{Luminance measured when AMOLED is on the "Black" state}}$$

"White state": A state where the AMOLED should be driven by  $V_{\text{white}}$ .

"Black state": A state where the AMOLED should be driven by  $V_{\text{black}}$ .

Note 4 Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of AMOLED.

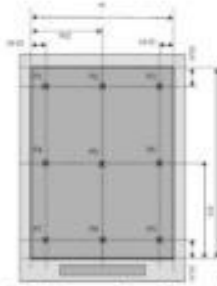


Note 5: Definition of luminance uniformity

Active area is divided into 9 measuring areas. Every measuring point is placed at the center of each measuring area.

Luminance Uniformity(U) = Lmin/ Lmax

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



Definition of uniformity

Lmax: The measured maximum luminance of all measurement position.

Lmin: The measured minimum luminance of all measurement position.

Note 6: Definition of luminance:

Measure the luminance of white state at center point.

Note 7: Cross Talk

A. Measure luminance at the position, P0.

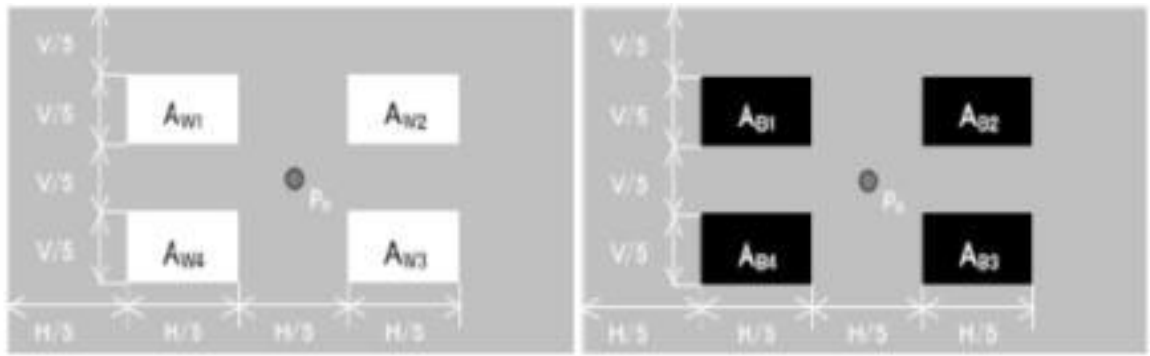
B. Calculate cross talk as below equation.

$$L_{W\_OFF} = \frac{L_{W1} + L_{W2} + L_{W3} + L_{W4}}{4}$$

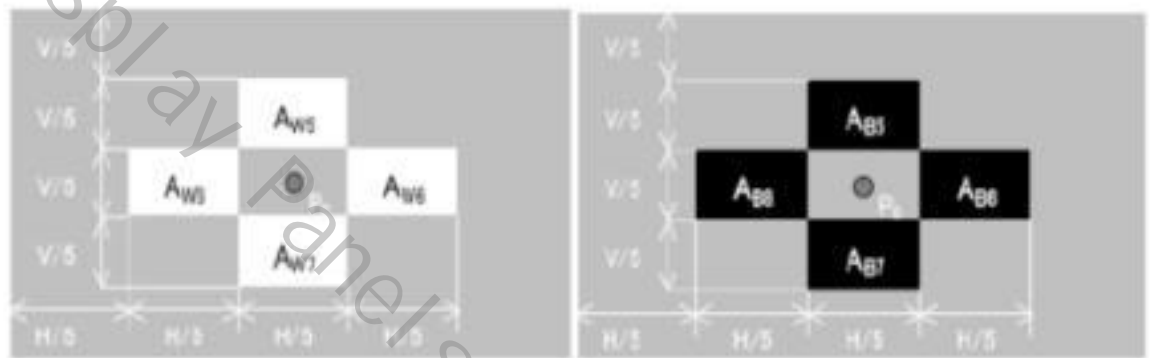
$$L_{B\_OFF} = \frac{L_{B1} + L_{B2} + L_{B3} + L_{B4}}{4}$$

$$\text{crosstalk} = \frac{|L_{Wi\_ON} - L_{W\_OFF}|}{L_{W\_OFF}} \times 100\% \quad (i = 5 \text{ to } 8)$$

$$\text{crosstalk} = \frac{|L_{Bi\_ON} - L_{B\_OFF}|}{L_{B\_OFF}} \times 100\% \quad (i = 5 \text{ to } 8)$$



(a)  $L_{W\_OFF}$ ,  $L_{B\_OFF}$  measuring pattern



(b)  $L_{W\_ON}$ ,  $L_{B\_ON}$  measuring pattern

Note 8: Flicker

Adjust the sample to Green127 at 60Hz @800nit, measure Flicker value by JEITA with CA310.



## 7. Reliability

### 7.1 Environmental Test

No	Item	Conditions	Quantity	Note
1	High Temperature Operating (HTO)	70°C/48hrs	5pcs	After testing - No clearly visible defects or remarkable deterioration of display quality. However, any polarizer's deteriorations by the high temperature/ High humidity test are permitted. - No function-related abnormalities.
2	Low Temperature Operating (LTO)	-40°C/48hrs	5pcs	
3	High Temperature Storage (HTS)	80°C/48hrs	5pcs	
4	Low Temperature Storage (LTS)	-45°C/48hrs	5pcs	
5	High Temperature / High Humidity Operating (HTHHO)	60°C /93%R.H./96hrs	5pcs	
6	High Temperature/High Humidity Storage (HTHHS)	60°C /93%R.H./96hrs	5pcs	

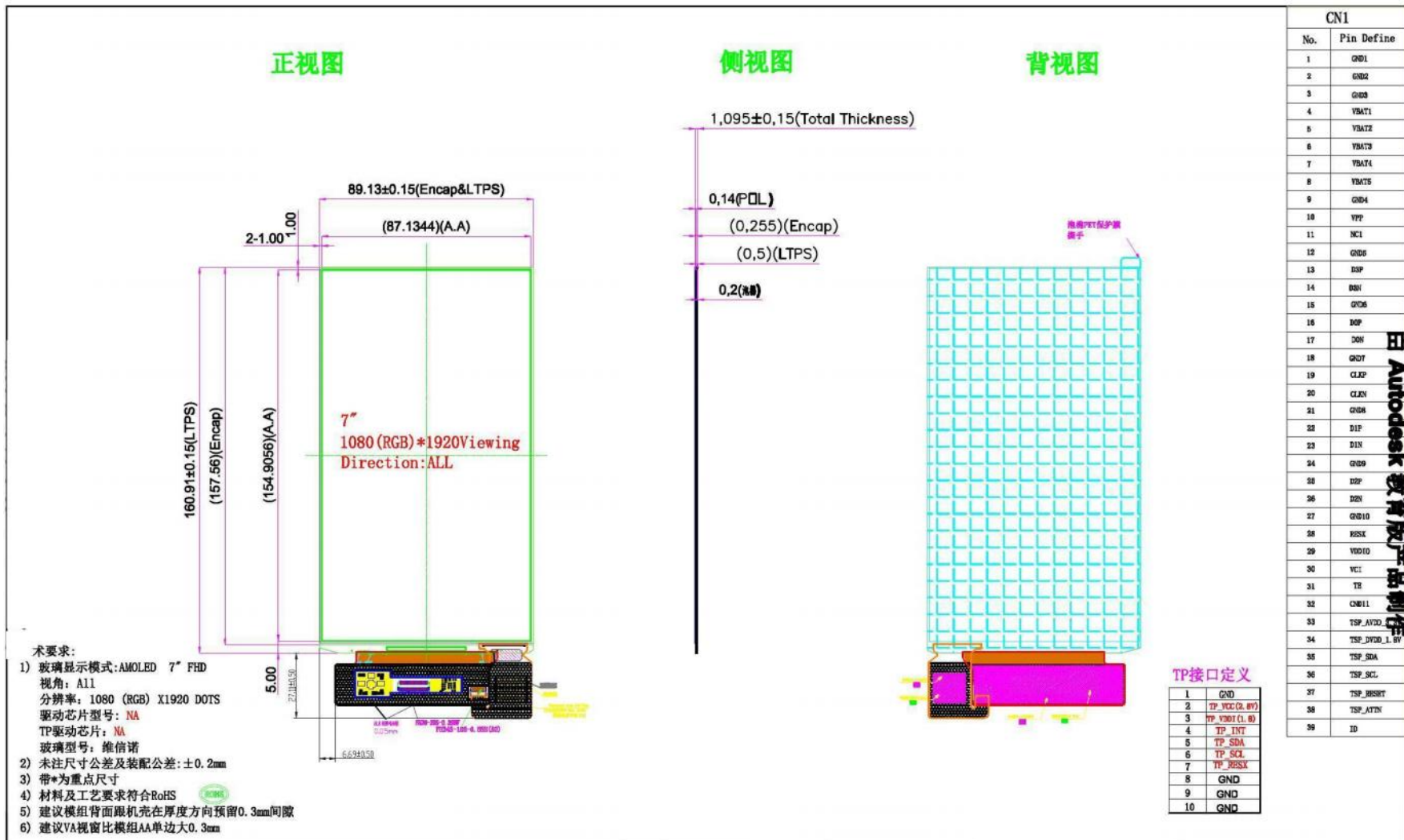
### 7.2 Electrical Test

No	Item	Conditions	Note
1	Air discharged Criteria C	±8kV	After testing - Hard defect should not happen. - If it would be recovered to normal state after resetting, it would be judged as a good state. ( Class C )
2	Contact discharged Criteria C	±4kV	

## 8. Handling Precautions

- 8.1 When cleaning ITO pad, avoid using hard and abrasive material or corrosive solution
- 8.2 Keep module away from direct sunlight or fluorescent light, and keep it at room temperature and humidity
- 8.3 Strong impact & pressure on module and packing is prohibited
- 8.4 Following normal power on/off sequence is necessary for preventing normal display or permanent damage to display
- 8.5 Optimal contrast ratio under ideal voltage is AMOLED module's characteristic, hence it is recommended a voltage control function available
- 8.6 Image sticking may occur if an image displays for an extended period of time
- 8.7 When interfered by system's overall mechanical design, an abnormal display may occur
- 8.8 After considering emitting energy, you should plan your design to satisfy EMI standards.
- 8.9 Host side should place a surge-prevent circuit at power trace ( VCI, VDDI) to protect AMOLED module.

9, Outline Dimension Drawing



- 术要求:
- 1) 玻璃显示模式: AMOLED 7" FHD  
 视角: All  
 分辨率: 1080 (RGB) X1920 DOTS  
 驱动芯片型号: NA  
 TP驱动芯片: NA  
 玻璃型号: 维信诺
  - 2) 未注尺寸公差及装配公差: ±0.2mm
  - 3) 带\*为重点尺寸
  - 4) 材料及工艺要求符合RoHS
  - 5) 建议模组背面跟机壳在厚度方向预留0.3mm间隙
  - 6) 建议VA视窗比模组AA单边大0.3mm

CN1	
No.	Pin Define
1	GND1
2	GND2
3	GND3
4	VBAT1
5	VBAT2
6	VBAT3
7	VBAT4
8	VBAT5
9	GND4
10	VPP
11	NC1
12	GND5
13	DSP
14	DBN
15	GND6
16	DOP
17	DON
18	GND7
19	CLEP
20	CLEN
21	GND8
22	DIP
23	DIN
24	GND9
25	DSP
26	D2N
27	GND10
28	KESX
29	VIDEO
30	VCI
31	TE
32	CND11
33	TSP_AVDD
34	TSP_DVDD_1.8V
35	TSP_SDA
36	TSP_SCL
37	TSP_RESET
38	TSP_ATN
39	ID

No.	Pin Define
1	GND
2	TP_PCC(O. #0)
3	TP_VDD1(L. #)
4	TP_INT
5	TP_SDA
6	TP_SCL
7	TP_RESET
8	GND
9	GND
10	GND

VI.2			设计	YY	2024.3.14	图纸名称	PO070FMTO								
VI.1			检查			模组图纸									
VI.0	初始图纸	YY	批准	2024.3.14											
版本	变更履历	签名	日期	其他			<table border="1"> <tr> <td>单位</td> <td>mm</td> <td>比例</td> <td>1:1</td> </tr> <tr> <td>第三视角</td> <td></td> <td>表</td> <td>1/1</td> </tr> </table>	单位	mm	比例	1:1	第三视角		表	1/1
单位	mm	比例	1:1												
第三视角		表	1/1												

## 10. Packing Specification

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