PRODUCT SPECIFICATION
产品规格书

PRODUCT **产品名称:**	**AMOLED MODULE**
MODEL NO. **模块型号：**	**U3A 2.06inch**
REVISON **文件版本:**	**1.0**
CUSTOMER **客户：**	
DATE **日期：**	**2024-05-11**

Proposed by			**Customer's Approval**
Designed	**Checked**	**Approved**	

■ REVISION RECORD
修改记录

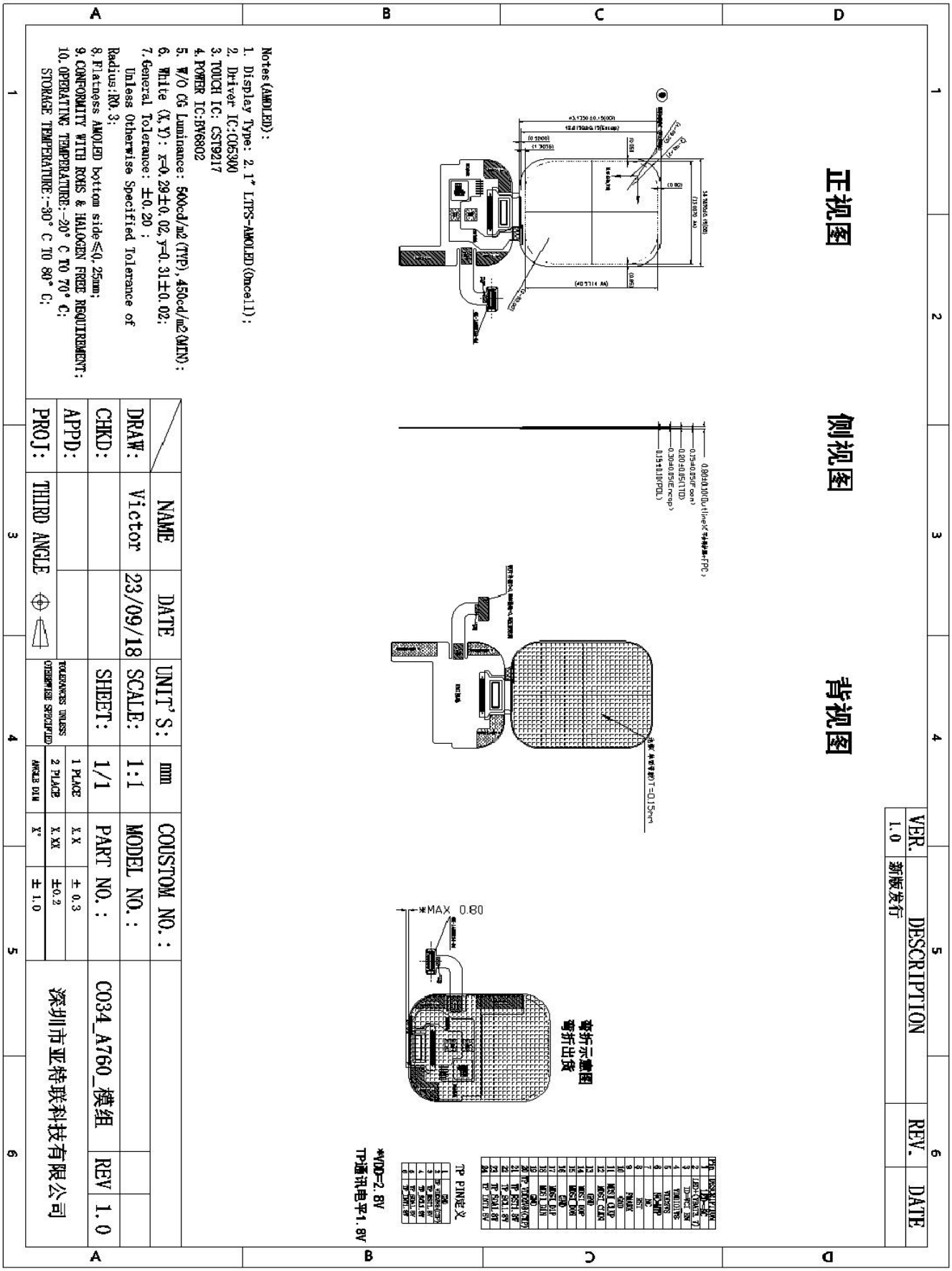
REV NO. 版本号	REV DATE 修改日期	CONTENTS 内容	REMARKS 注释
1.0	2024-05-11	First release	

CONTENTS

1. GENERAL INFORMATION

Item	Contents	Unit
Display Mode	AMOLED	/
LTPS Glass Outline (W·H)	34.79 × 43.14	mm
Active area	33.09 (W)× 40.51(H)	mm
Number of Dots	410×502	/
Diagonal Inch	2.06	inch
Pixel pitch (W·H)	76.5 × 76.5	um
Module Thickness(with LENS)	1.68	mm

2. Outline Dimension Drawing



3. Maximum Ratings

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	-
Operating temperature	Top	-20	-	70	℃	-
Storage temperature	Tstg	-40	-	80	℃	-

4. Electrical Specification

4.1 Electrical Characteristics

Power Characteristic： Normal mode

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
AMOLED Power Positive	ELVDD	3.25	3.3	3.35	V	Ref
AMOLED power Negative	ELVSS	-3.35	-3.3	-3.25	V	Ref
Panel GEOA Power	VDD	5.8	6	6.2	V	Ref
Panel GEOA Power	VEE	-6.2	-6	-5.8	V	Ref
Panel reference Power	VINT	-	-3	-	V	Ref
Vdata voltage	VGMP	-	4.4	-	V	Ref
	VGSP	-	1.2	-	V	Ref
Digital Power supply	VDDIO	3.25	3.3	3.35	V	Ref
Analog Power supply	VCI	3.25	3.3	3.35	V	Ref

Power Characteristic： HBM mode

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
AMOLED Power Positive	ELVDD	TBD	TBD	TBD	V	-
AMOLED power Negative	ELVSS	TBD	TBD	TBD	V	Ref
Panel GEOA Power	VDD	5.8	6	6.2	V	Ref
Panel GEOA Power	VEE	-6.2	-6	-5.8	V	Ref
Panel reference Power	VINT	-	-3	-	V	Ref
Vdata voltage	VGMP	-	4.4	-	V	Ref
	VGSP	-	0.8	-	V	Ref
Digital Power supply	VDDIO	3.25	3.3	3.35	V	Ref
Analog Power supply	VCI	3.25	3.3	3.35	V	Ref

1) Normal Mode

Power Supply: VDDIO =1.8V VCI=3.3V ELVSS= -3.3V ELVDD=3.3V

Frame Frequency: Fframe =60HZ @ 25degC, Brightness 600 nits, Command Mode,

Display Condition	Symbol	Min.	Typ.	Max.	Unit	Remark
100% Pixel On 600nits	IELVDD /ELVSS	-	39.47	45.39	mA	Ref
	IVCI	-	5.8	6.5	mA	Ref
	IVDDIO	-	5.5	5.8	mA	Ref

2) HBM Mode

Power Supply: VDDIO =1.8V VCI=3.3V ELVDD-ELVSS=7.2V （TBD）

Frame Frequency: Fframe =60HZ @ 25degC, Brightness 1000 nits, Command Mode,

Display Condition	Symbol	Min.	Typ.	Max.	Unit	Remark
100% Pixel On 1000nits	IELVDD /ELVSS	-	69.43	79.84	mA	Ref
	IVCI	-	5.8	6.5	mA	Ref
	IVDDIO	-	5.5	5.8	mA	Ref

3) Idle Mode

Power Supply: VDDIO=1.8V VCI=3.3V

Frame Frequency: Fframe =15HZ @ 25degC, Brightness 50 nits,

Display Condition	Symbol	Min.	Typ.	Max.	Unit	Remark
10% Pixel On 50 nits	IELVDD /ELVSS	-	-	-	mA	Supplied by Driver IC
	IVCI	-	TBD	-	mA	Ref
	IVDDIO	-	0.8	1	mA	Ref

4) Deep Standby Mode

Display Condition	Symbol	Min.	Typ.	Max.	Unit	Remark
Deep Standby	IVCI	-	-	3	uA	-
	IVDDIO	-	-	3	uA	-

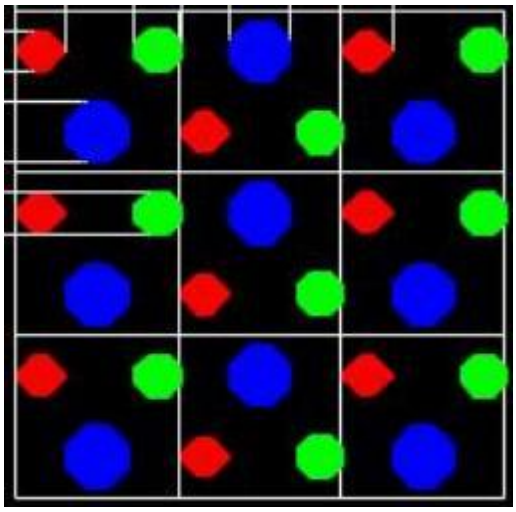
Driver IC: CO5300 (refer to the datasheet).

Touch IC: CST9217 (refer to the datasheet)

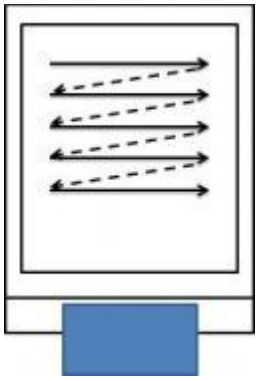
4.2 Interface Description

N0.	Symbol	Description
1	LED_NC	NC
2	VBAT	PMIC Power supply
3	VCI_EN	Power supply for Analog circuit
4	IOVDD	Power supply for interface system
5	VDD2V8	Power supply for interface system.2V8
6	MTP	MTP programming power supply pin.
7	NC	NC
8	LCD_RST	This signal will reset the device and must be applied to properly initialize the chip
9	FMAPK	Tearing effect output pin to synchronize MCU to frame writing,activated by S/W command.
10	GND	Ground
11	MDSI_CLKP	DSI-CLK+ differential clock signals
12	MDSI_CLKN	DSI-CLK- differential clock signals
13	GND	Ground
14	MDSI_DOP	DSI-D0+ differential data signals
15	MDSI_DON	DSI-D0- differential data signals
16	GND	Ground
17	MDSI_D1P	DSI-D1+ differential data signals
18	MDSI_D1N	DSI-D1- differential data signals
19	GND	Ground
20	VDD	Touch IC Power supply
21	TP_RST	This signal will reset the device and must be applied to properly initialize the chip.Signal is active low
22	TP_SCL	Touch I2C clock
23	TP_SDA	Touch I2C data
24	TP_INT	Touch State change interupt

4.3 Pixel arrangement

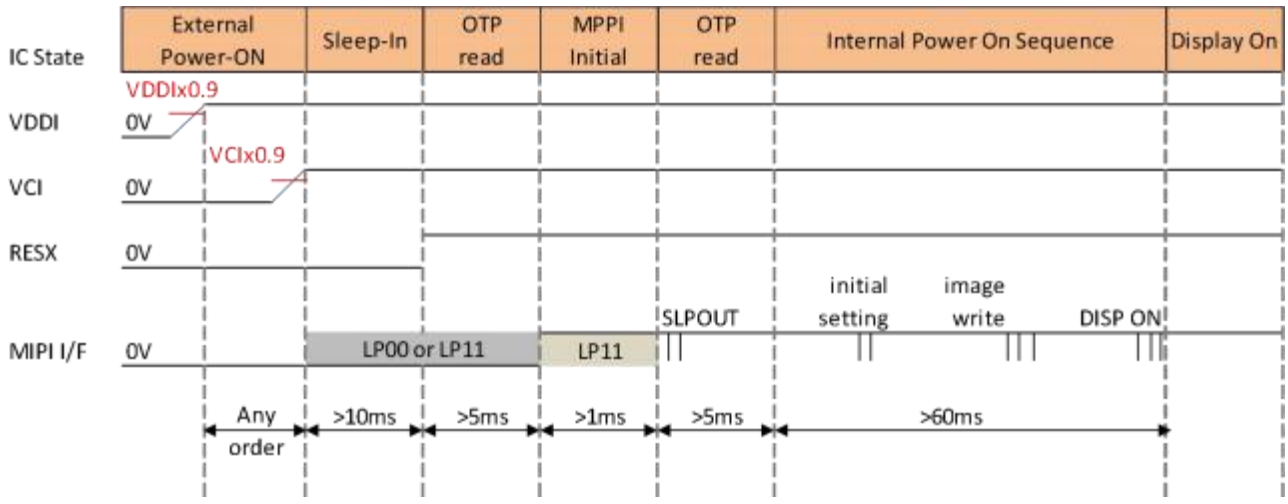


4.4 Graphic memory writing direction

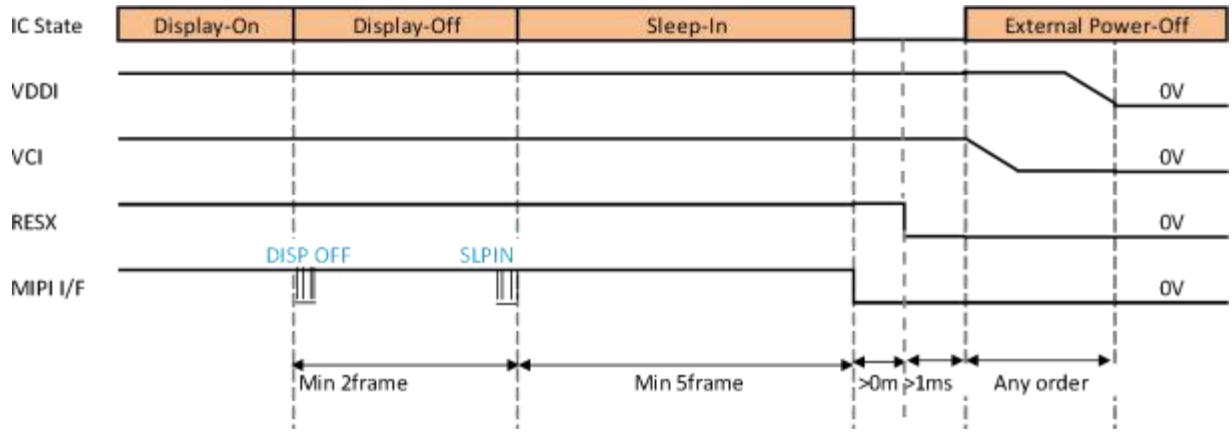


4.5 Recommended Operating Sequence

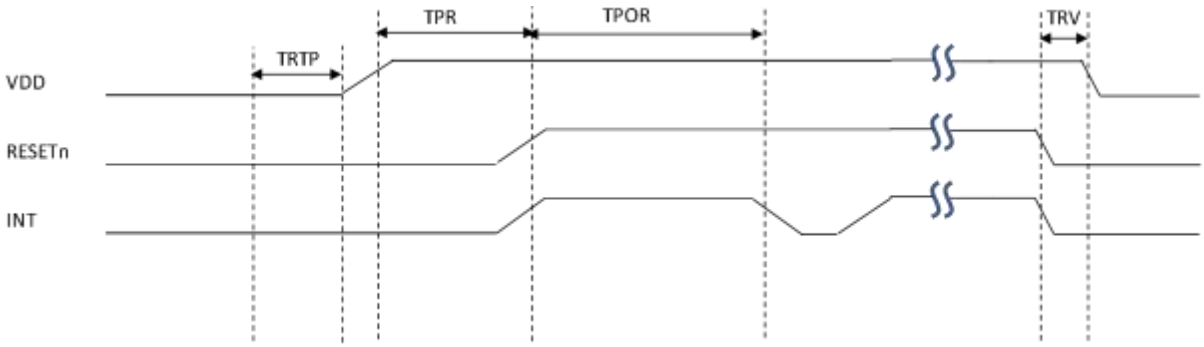
4.5.1 Power On Sequence



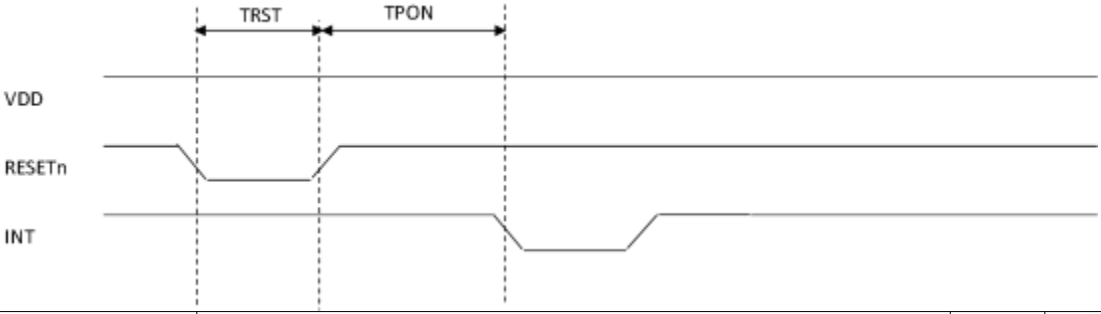
4.5.2 Power Off Sequence



4.5.3 Power on/off sequence(Touch IC)



External reset timing



Parameter	Description	Min	Max	Units
TRTP	Time of resetting to be low before powering on	100		us
TPR	Reset time after 0.9VDD powering on	1		ms
TPOR	Time of starting to report point after powering on		200	ms
TPON	Chip reinitialization time after reset		200	ms
TRST	Reset time		1	ms
TRV	Time of VDD Discharge after reset	0		ms

4.5.4 Timing requirements for RESETB

When RESETB of the reset pin equals to Low, it will be in the condition of reset.When it is in the condition of reset, it will make the device recover the initial set.However, in order to avoid the reset noise cause reset, there is a mechanism to judge about whether the reset is needed or not.The closed interval of Low can be shown as the following.

(Test condition: VDDIO=1.65V~3.6V, VSS=0V, TA=-20℃~+70℃)

Table: Reset timing

Parameter	Symbol	Pad	Min.	Typ.	Max.	Unit	Note
Reset low pulse width	tRW	RESX	10	-	-	us	-
Secure reeset completion	tSRT	RESX	-	-	5	ms	Reset during Sleep In mode
		RESX	-	-	150		Reset during Sleep Out mode
Reset un-reacted pulse width	tET	RESX			5	us	-

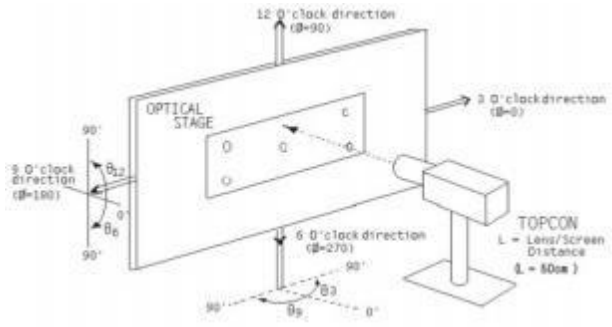
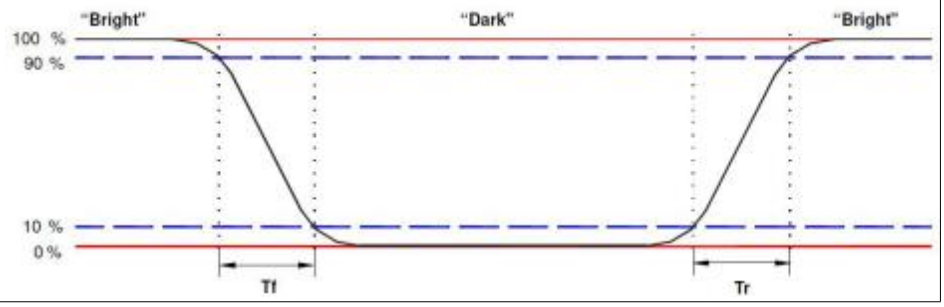
5. Electro-Optical Specification

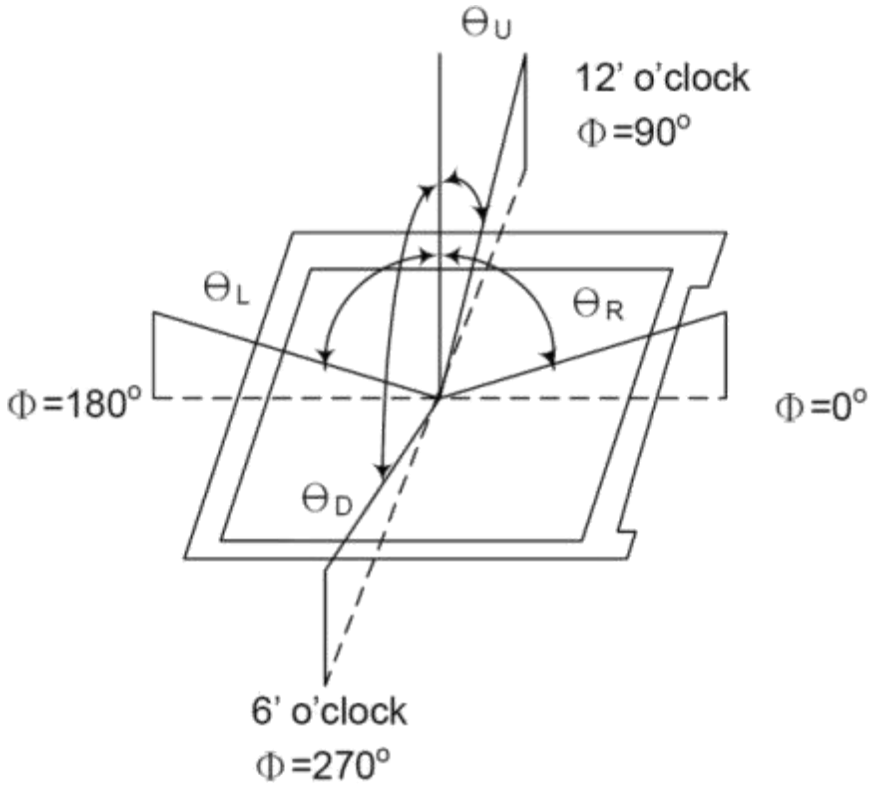
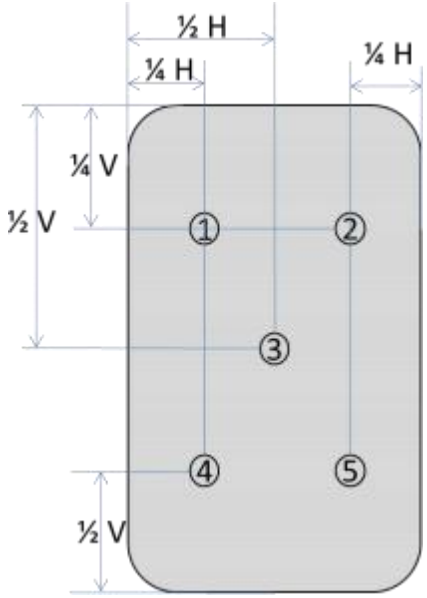
Test condition：25℃±3℃， 65±20%RH，darkroom。

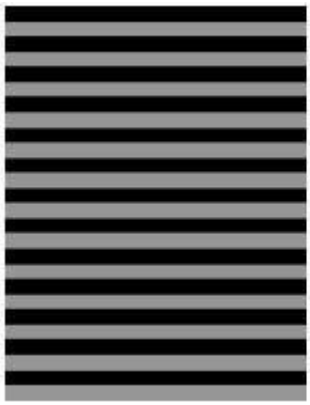
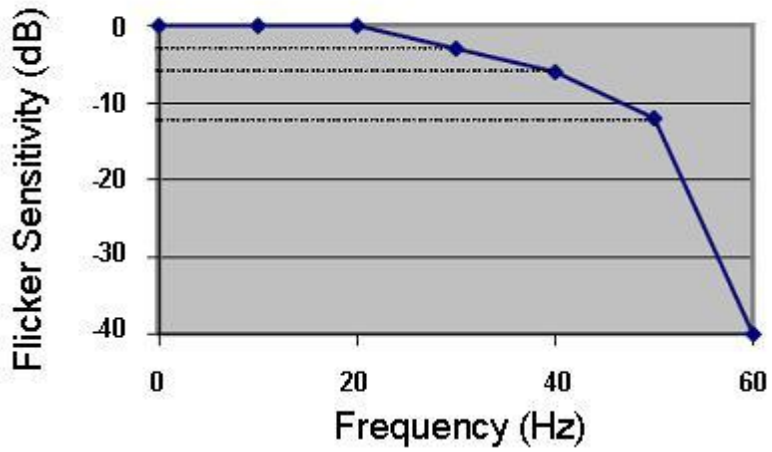
No	Item		Symbol	Condition	Value			Unit	Remark
					Min.	Typ.	Max.		
1	Brightness		L	Full white Without CG	750	800	850	cd/m^2	Note1
			Boost		**900**	**1000**		cd/m^2	
2	Brightness Uniformity		UL	Full white	85			%	Note4
3	Contrast Ratio		CR	Normal Θ=Φ=0°	10000			-	Note3.
4	Response time		Ton+ Toff	Normal Θ=Φ=0°		2	3	ms	Note2.
5	Color Coordinate of CIE1931	White	X	Normal Θ=Φ=0°	0.270	0.300	0.330	-	Note1.
			Y		0.280	0.310	0.340		
		Red	X		0.656	0.686	0.716		
			Y		0.280	0.310	0.340		
		Green	X		0.185	0.235	0.285		
			Y		0.670	0.720	0.770		
		Blue	X		0.108	0.143	0.178		
			Y		0.009	0.044	0.079		
6	Color Gamut		NTSC	CIE1931	97	108		%	
7	Viewing			Top/Botton/Right/Left	85			°	Note3.

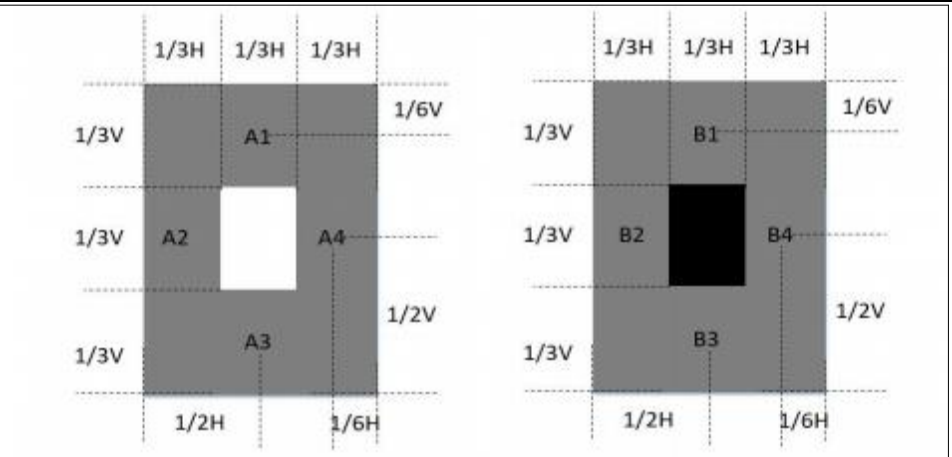
	Angle	CR ratio ≥10					
8	Gamma	Log(Lv-Lb)=log(V)+log(a) V(Gray)= 48,72,104,132, 164,192,224 Lum(gray255)=600nit	1.9	2.2	2.5	-	
9	Flicker	Normal Θ=Φ=0°			-30	dB	Note6.
10	Crosstalk				1.1	%	Note7.
11	Color shift	θL=30°		3.5	6	JNCD	
12	OLED Life Time(At 25℃,with white color pattern)	600nits	200			hrs	Note8.
		1000nits	TBD	TBD		hrs	Note8.

See the note in the table below:

No	Item	Details
Note1	Brightness	
Note 2	Response time	

Note 3	Viewing Angle	 Contrast Ratio Dark Room C.R= LW/LB LW: full white brightness of display center P0; LB: full black brightness of display center P0.
Note 4	Brightness Uniformity	• The test condition is at 25℃ and measured on the surface of display module. • Measurement equipment: CS2000 or similar equipments. • The luminance uniformity is calculated by using following formula: • △Bp = Bp (Min.) / Bp (Max.)×100 (%) • Bp (Max.) = Maximum brightness in 5 measured spots • Bp (Min.) = Minimum brightness in 5 measured spots. 
Note 5	Luminance decrease	Definition of Luminance decrease ratio Test pattern : Full White

	ration	The luminance decrease ratio is calculated by using following formula: $\text{Luminance decrease ration} = 1 - \frac{\text{Luminance test at left, right, top, bottom} = 30°}{\text{Luminance test at left, right, top, bottom} = 0°}$
Note 6	**Flicker**	Suggested Instruments: **Konica Minolta CA-310** or **Klein Instruments K-8**  **Odd** row : **L0** Black **Even** row : **L186** gray level **Flicker Test Pattern** The flicker level is defined by **Fast Fourier Transformation (FTT)** as follows: $Flicker = 20\log_{10}\left(2\frac{f_{FFTC}(n)}{f_{FFTC}(0)}\right) + FS(Hz)$ (dB) Where **fFFTC(n)** is the n-th FFT coefficient. **fFFTC(0)** is the 0-th FFT coefficient which is DC component. **FS(Hz)** is the flicker sensitivity as a function of frequency. The peak flicker level shall be reported based on the calculation using above formula in which FS(Hz) is determined by the flicker weighing factor shown below. **Flicker Weighing Factor** 
Note 7	**Crosstalk**	There should be no visible cross-talk in normal direction of the display when the two “Cross-talk Test Patterns” below are loaded. △Bp (Max.) = Maximum value in △Bp1~△Bp4. △Bp (Min.) = Minimum value in △Bp1~△Bp4. △CT=△Bp (Max.)/ △Bp(Min.). △CT must be less than 1.10

		
Note 8	**Life Time**	OLED life time is defined by the **Minimum Duration Time** that the luminance is decayed to a specific ratio (ex. **95%**) of initial state. Test Pattern under duration period: **L255** White

6. Reliability

6.1 Environmental Test

Item	Main spec	No. of failures / No. of examinations
High Temperature Operation	70℃/ 240hrs	0/10
Low Temperature Operation	-20℃/ 240hrs	0/10
High Temperature Storage	80℃/ 240hrs	0/10
Low Temperature Storage	-40℃/ 240hrs	0/10
High Temperature Humidity Operation	60℃/93%RH/ 240hrs	0/10
Thermal Shock	-40℃~85℃ dwell time=0.5hr, 100 cycles.	0/10

6.2 Electrical Test

Item	Main spec	Note
Air Discharge	±4/±6/±8kV 150pF/330Ω (Module level; without CG)	5Points, Each 10times. After one time discharge, panel and gun touch the ground, through the whole test, turn on ion fan. No degradation of OLED performance after this test.
Contact Discharge	±1/±2kV, 150pF/330Ω (Module level; without CG)	

6.3 Mechanical Test

Test item	Test condition	Note
Packing vibration-proof test	2g, f=10->55->10Hz apply in each of X, Y, and Z direction for 30 min	Package
Packing Drop test	Drop the packing from 60cm height, 6-faces, 3-edges and 1-corner(one time for each)	Package

7. Packing Specification

	包装作业规范 Packaging Operation Procedure	编 号：3MT-EN-POP 版 本： 01 页 数： 1 OF 1 发行日期：23-05-10

一、基本信息

客户：	模组规格：
品名：AMOLED MODULE	包装方式：真空包装

二、作业规范

1、包装数量

☑ 吸塑盒，每盒 25 pcs；真空袋，每包 12 盒； 纸箱，每箱 2 包，每箱600PCS

☐ 其他

2、真空袋规格 单位：**MM**

☑ 455*515 ☐ 400*450 ☐ 120*160

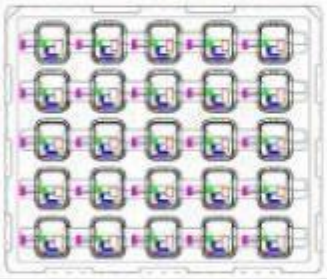
3、纸箱规格

☑ 415mm*320mm*250mm ☐ 270mm*270mm*350mm ☐ 290mm*265mm*125mm ☐ 300mm*300mm*250mm

4、标签

☑ 合格标签 ☑ RoHS标签 ☑ 月份标签 ☐ 产品标签

三、作业步骤

作业示意图	说明和注意事项
	1、按产品形状，盖板面向下摆放在吸塑盒定位形状槽内 2、每盘摆放25个 3、注意摆放方向一致 4、注意排线放入对应槽内，不可再弯折
	1、12盘一扎，最上面放一个空盘 2、用胶带十字交叉固定好 3、贴上RoHS、合格、月份标签 4、按每袋一扎，放入真空袋，真空包装
	1、每箱两包 2、在纸箱空隙放气泡袋防护 3、胶带固定好 4、注意纸箱不可有破损、脏污

编制/日期：Victor/23.05.10　　核准/日期：

8. Precautions For Use of OLED Modules

Handling Precautions

The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

If the display panel is damaged and the Organic Light- Emitting Diode inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

The polarizer covering the display surface of the OLED module is soft and easily scratched. Handle this polarizer carefully.

If the display surface is contaMinated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

- Isopropyl alcohol
- Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

- Water
- Ketone
- Aromatic solvents

Do not attempt to disassemble the OLED Module .

If the logic circuit power is off, do not apply the input signals.

To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

Be sure to ground the body when handling the OLED Modules.

Tools required for assembly, such as soldering irons, must be properly ground.

To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

The OLED Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

Storage precautions

When storing the OLED modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

The OLED modules should be stored under the storage temperature range. If the OLED modules will be stored for a long time, the recommend condition is:

Temperature : 0C ~ 40C Relatively humidity: ≤80%

The OLED modules should be stored in the room without acid, alkali and harmful gas.

Transportation Precautions

The OLED modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.