

Product Specification (Preliminary)

Part Name: OEL Display Module
Customer Part ID:
Zhong Jing Yuan Part ID: ZJY192I0400WG01
Doc No.: SAS1-090BS-B

Customer:
Approved by

From: Zhongjingyuan Electronic Technology Co., LTD
Approved by

Notes:

1. Please contact Zhongjingyuan Semiconductor Inc. before assigning your product based on this module specification
2. The information contained herein is presented merely to indicate the characteristics and performance of our products. No responsibility is assumed by Zhongjingyuan Semiconductor Inc. for any intellectual property claims or other problems that may result from application based on the module described herein.

CONTENTS

ITEM	PAGE
1. SCOPE	4
2. WARRANTY	4
3. FEATURES	4
4. MECHANICAL DATA	5
5. MAXIMUM RATINGS	6
6. ELECTRICAL CHARACTERISTICS	6
6.1 D.C ELECTRICAL CHARACTERISTICS	
6.2 ELECTRO-OPTICAL CHARACTERISTICS	
7. LIFETIME SPECIFICATION	8
8. INTERFACE	9
8.1 FUNCTION BLOCK DIAGRAM	
8.2 PANEL LAYOUT DIAGRAM	
8.3 PIN ASSIGNMENTS	
8.4 GRAPHIC DISPLAY DATA RAM ADDRESS MAP	
8.5 INTERFACE TIMING CHART	
9. POWER ON / OFF SEQUENCE & APPLICATION CIRCUIT	16
9.1 POWER ON / OFF SEQUENCE	
9.2 APPLICATION CIRCUIT	
9.3 COMMAND TABLE	
10. RELIABILITY TEST CONDITIONS	19
11. EXTERNAL DIMENSION	20
12. PACKING SPECIFICATION	21
13. OUTGOING INSPECTION PROVISION	22
14. APPENDIXES	28



1. SCOPE

The purpose of this specification is to define the general provisions and quality requirements that apply to the supply of display cells manufactured by Zhongjingyuan. This document, together with the Module Assembly Drawing, is the highest-level specification for this product. It describes the product, identifies supporting documents and contains specifications.

2. WARRANTY

Zhongjingyuan warrants that the products delivered pursuant to this specification (or order) will conform to the agreed specifications for twelve (12) months from the shipping date ("Warranty Period"). Zhongjingyuan is obligated to repair or replace the products which are found to be defective or inconsistent with the specifications during the Warranty Period without charge, on condition that the products are stored in the original packages at $25^{\circ}\text{C}\pm 5^{\circ}\text{C}$, $55\%\pm 10\%\text{RH}$ or used as the conditions specified in the specifications.

Nevertheless, Zhongjingyuan is not obligated to repair or replace the products without charge if the defects or inconsistency are caused by the force majeure or the reckless behaviors of the customer.

After the Warranty Period, all repairs or replacements of the products are subject to charge.

3. FEATURES

- Small molecular organic light emitting diode.
- Color : White
- Panel resolution : 128x160
- Driver IC : SH1108
- Excellent quick response time.
- Extremely thin thickness for best mechanism design : 5.1 mm
- High contrast : 2,000:1
- Wide viewing angle : 160°
- Strong environmental resistance.
- and 3-wire & 4-wire serial peripheral interface, I2C bus interface.
Default 4-wire serial peripheral interface
- Wide range of operating temperature : -40 to 70°C
- Anti-glare polarizer.



4. MECHANICAL DATA

NO	ITEM	SPECIFICATION	UNIT
1	Dot Matrix	128 x 160	dot
2	Dot Size	0.206 (W) x 0.226 (H)	mm ²
3	Dot Pitch	0.226 (W) x 0.246 (H)	mm ²
4	Aperture Rate	84	%
5	Active Area	28.908 (W) x 39.34 (H)	mm ²
6	Panel Size	32.9 (W) x 46.55 (H)	mm ²
7*	Panel Thickness	1.47 ± 0.15	mm
8	Module Size	37 (W) x 60 (H) x 5.1 (T)	mm ³
9	Diagonal A/A size	1.92	inch
10	Module Weight	TBD	gram

* Panel thickness includes substrate glass, cover glass and UV glue thickness.

5. MAXIMUM RATINGS

ITEM	MIN	MAX	UNIT	Condition	Remark
Supply Voltage (V_{DD})	3.0	3.6	V	$T_a = 25^{\circ}\text{C}$	IC maximum rating
Operating Temp.	-40	70	$^{\circ}\text{C}$	-	-
Storage Temp	-40	85	$^{\circ}\text{C}$	-	Note (2)

Note:

- (1) Maximum ratings are those values beyond which damages to the OLED module may occur. The OLED functional operation should be restricted to the limits in the section 6. Electrical Characteristics tables.
- (2) The defined temperature ranges do not include the polarizer. The maximum withstood temperature of the polarizer should be 80°C .

6. ELECTRICAL CHARACTERISTICS

6.1 D.C ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETERS	TEST CONDITION	MIN	TYP	MAX	UNIT
V_{DD}	Digital power supply	$T_a 25^{\circ}\text{C}$	3.0	3.3	3.6	V
V_{IH}	High logic input level		$0.8^* V_{DD}$	-	V_{DD}	V
V_{IL}	Low logic input level		V_{SS}	-	$0.2^* V_{DD}$	V
V_{OH}	High logic output level	$I_{OH} = -0.5\text{mA}$	$0.8^* V_{DD}$	-	V_{DD}	V
V_{OL}	Low logic output level	$I_{OL} = 0.5\text{mA}$	V_{SS}	-	$0.2^* V_{DD}$	V

Note: The V_{PP} input must keep in a stable value; ripple and noise are not allowed.



6.2 ELECTRO-OPTICAL CHARACTERISTICS

PANEL ELECTRICAL SPECIFICATIONS

PARAMETER	MIN	TYP	MAX	UNITS	COMMENTS
Normal mode current (IPP)	-	240	300	mA	All pixels on (1)
	-	16	17	mA	20% pixels on (1)
Standby mode current (IPP)	-	5	6	mA	Standby mode 10% pixels on (2)
Normal mode power consumption	-	891	918	mW	All pixels on (1)
	-	216	229.5	mW	20% pixels on (1)
Standby mode power consumption	-	67.5	81	mW	Standby mode 10% pixels on (2)
IDD sleep mode current	-	-	5	uA	Sleep mode Current (3)
IPP sleep mode current	-	-	5	uA	Sleep mode Current (3)
Normal mode Luminance	115	145		cd/m ²	Display Average
Standby Luminance		65		cd/m ²	
CIE _x (White)	0.32	0.36	0.40		CIE1931
CIE _y (White)	0.34	0.38	0.42		CIE1931
Dark Room Contrast	2000:1				
Viewing Angle	160			degree	
Response Time		10		μs	

(1) Normal mode condition :

- Driving Voltage : 13.5V
- Contrast setting : 0xd0
- Frame rate : 105Hz
- Duty setting : 1/128

(2) Standby mode condition :

- Driving Voltage : 13.5V
- Contrast setting : 0x00
- Frame rate : 105Hz
- Duty setting : 1/128

(3) Sleep mode condition :

When send 0xae command OLED display off and memory data will be maintained.

(4) Wake up condition :

When send 0xaf command OLED will be turned on.



7. LIFETIME SPECIFICATION

ITEM	MIN	UNIT	Condition	Remark
Life Time	10,000	Hrs	145 cd/m ² , 50% checkerboard	Note (1)
Life Time	13,000	Hrs	115 cd/m ² , 50% checkerboard	Note (2)

Note:

(A) Under VPP = 13.5V, Ta = 25°C, 50% RH.

(B) Life time is defined the amount of time when the luminance has decayed to less than 50% of the initial measured luminance.

(1) Setting of 145 cd/m² :

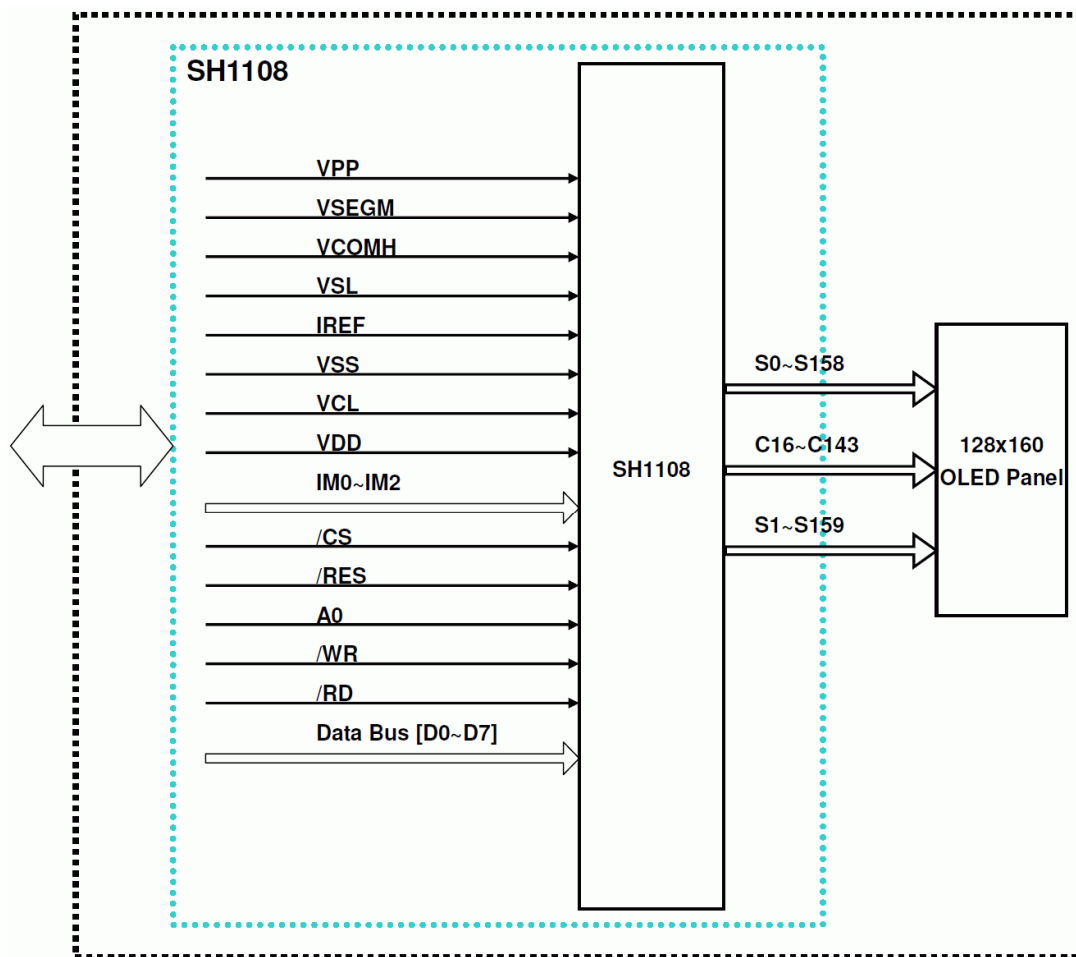
- Contrast setting : 0xd0
- Frame rate : 105Hz
- Duty setting : 1/128

(2) Setting of 115 cd/m² :

- Contrast setting : 0x80
- Frame rate : 105Hz
- Duty setting : 1/128

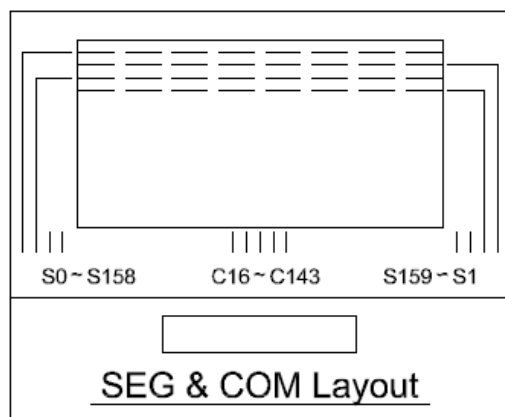
8. INTERFACE

8.1 FUNCTION BLOCK DIAGRAM



RiTdisplay 128x160 OLED Module

8.2 PANEL LAYOUT DIAGRAM





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8.3 PIN ASSIGNMENTS

Pin No.	Pin Name	Description			
1	GND	Ground pin.			
2	VCC	Power supply for logic and input/output.			
3	SCL	The serial clock input pad (SCL)			
4	SDA	The serial data input pad (SDA).			
5	RES	This is a reset signal input pin. When RES is set to "L", the settings are initialized.	Reset pins can be disconnected by default		

8.4 GRAPHIC DISPLAY DATA RAM ADDRESS MAP



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RAM map example: ADC=1(Seg remap)

8.5 INTERFACE TIMING CHART

I²C-bus Interface

The SH1108 can transfer data via a standard I²C-bus and has slave mode only in communication. The command or RAM data can be written into the chip and the status and RAM data can be read out of the chip.

Table 7

IM0	IM1	IM2	Type	CS [—]	A0	RD [—]	WR [—]	D0	D1	D2 to D7
0	1	0	I ² C Interface	Pull Low	SA0	-	-	SCL	SDA	(Hz)

Note: “-” pin must always be HIGH or LOW. D7~ D2 is recommended to connect the V_{DD} or GND. It is also allowed to leave D7~ D2 unconnected.

CS Signal could always pull low in I²C-bus application.

Characteristics of the I²C-bus

The I²C-bus is for bi-directional, two-line communication between different ICs or modules. The two lines are a serial data line (SDA) and a serial clock line (SCL). Both lines must be connected to a positive supply via a pull-up resistor. Data transfer may be initiated only when the bus is not busy.

Note: The positive supply of pull-up resistor must equal to the value of V_{DD}.

Bit Transfer

One data bit is transferred during each clock pulse. The data on the SDA line must remain stable during the HIGH period of the clock pulse as changes in the data line at this time will be interpreted as a control signal.

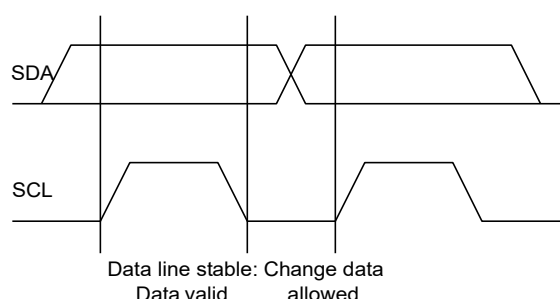


Figure 5 Bit Transfer

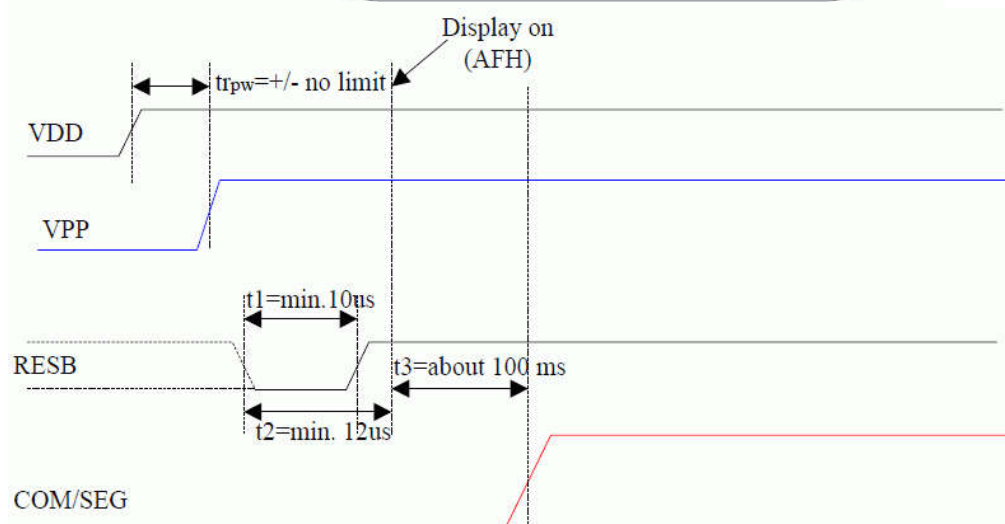
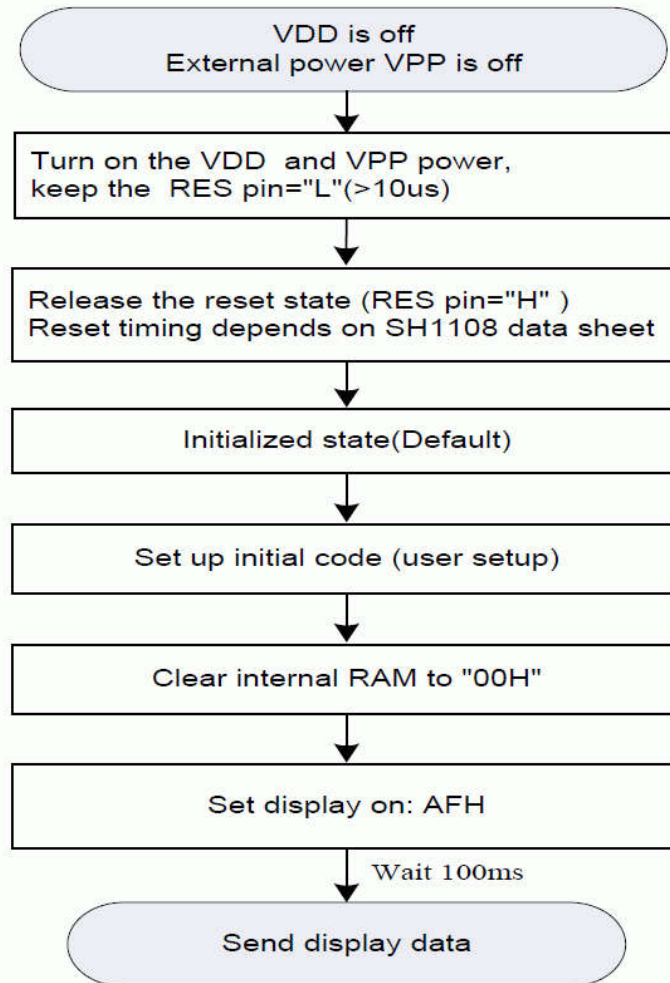


9. POWER ON / OFF SEQUENCE & APPLICATION CIRCUIT

9.1 POWER ON / OFF SEQUENCE

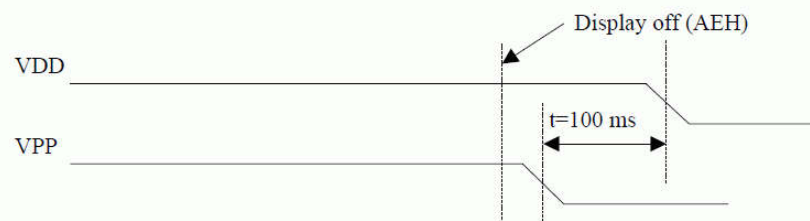
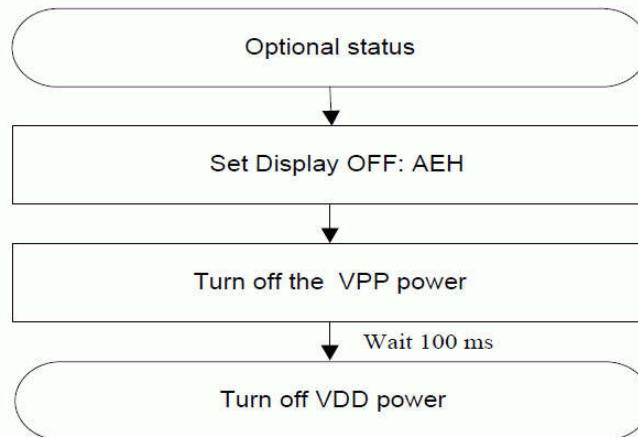
Power on sequence:

External power is being used immediately after turning on the power:





Power off sequence:



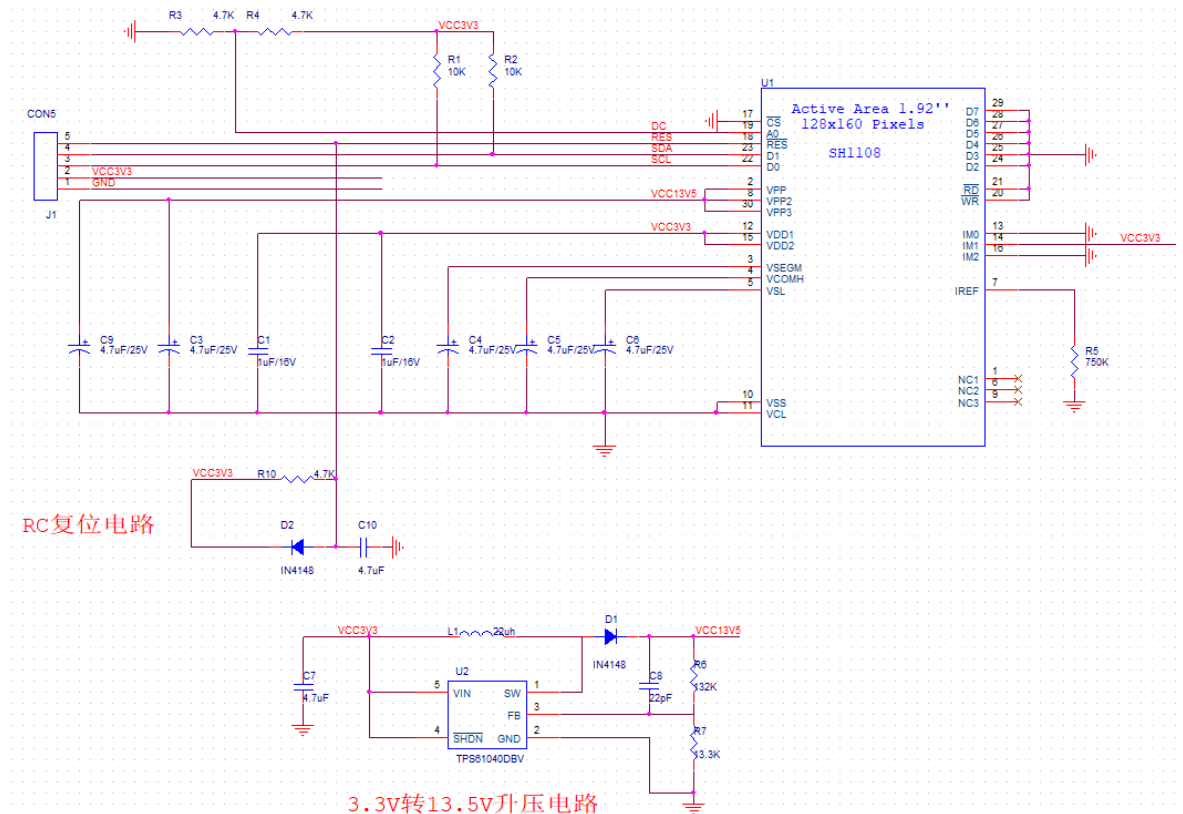


9.2 APPLICATION CIRCUIT

IIC设备地址控制:

0X3C:R3焊接R4不焊接

0X3D:3不焊接4焊接



IIC设备地址控制:

0X3C:R3焊接R4不焊接

0X3D:3不焊接4焊接

9.3 COMMAND TABLE

Refer to IC Spec.: SH1108G

Application Initial Setting

/* 128 x 160 OLED driver program */

/* The more detail of SPI sequence please refer the SH1108 datasheet */

```
void initial(void)
```

```
{
```

```
comm_out(0xae);//Display OFF(sleep mode)
```



```
comm_out(0x81);//Set Contrast Control
comm_out(0xd0);

comm_out(0xa0);//Set Segment Re-map

comm_out(0xa4);//Set Entire Display OFF/ON

comm_out(0xa6);//Set Normal/Reverse Display

comm_out(0xa9);//Display Resolution Control
comm_out(0x02);

comm_out(0xad);//DC-DC Control Mode Set
comm_out(0x80);

comm_out(0xc0);//Set COM Output Scan Direction

comm_out(0xd5);//Set Display Clock Divide Ratio/Oscillator Frequency
comm_out(0x40);

comm_out(0xd9);//Dis-charge/Pre-charge Period Mode Set
comm_out(0x2f);

comm_out(0xdb);//Set VCOMH Deselect Level
comm_out(0x3f);

comm_out(0x20);//Page addressing mode

comm_out(0xdc);//VSEGM Deselect Level Mode Set
comm_out(0x35);

comm_out(0x30);//Set Discharge VSL Level

CleanDDR ();

comm_out(0xaf);//Set Display ON

}
void CleanDDR(void)
{
    unsigned int i,j;
    for(i=0;i<20;i++)
    {
        comm_out(0xb0);
        comm_out(i);
    }
}
```




```
comm_out(0x00);
comm_out(0x10);

for(j=0;j<160;j++)
{
    data_out(0x00);
}
}
```

After initial the driver IC, user can display all pixels on.

```
void show_data(void)
{
    unsigned int i,j;
    for(i=0;i<20;i++)
    {
        comm_out(0xb0);
        comm_out(i);

        comm_out(0x00);
        comm_out(0x11);

        for(j=0;j<128;j++)
        {
            data_out(0xff);
        }
    }
}
```



10. RELIABILITY TEST CONDITIONS

No.	Items	Specification	Quantity
1	High temp. (Non-operation)	85°C, 240hrs	5
2	High temp. (Operation)	70°C, 120hrs	5
3	Low temp. (Operation)	-40°C, 120hrs	5
4	High temp. / High humidity (Operation)	65°C, 90%RH, 120hrs	5
5	Thermal shock (Non-operation)	-40°C ~85°C (-40°C /30min; transit /3min; 85°C /30min; transit /3min) 1cycle: 66min, 100 cycles	5
6	Vibration	Frequency : 5~50HZ, 0.5G Scan rate : 1 oct/min Time : 2 hrs/axis Test axis : X, Y, Z	1 Carton
7	Drop	Height: 120cm Sequence : 1 angle、3 edges and 6 faces Cycles: 1	1 Carton
8	ESD (Non-operation)	Air discharge model, ±8kV, 10 times	5

Test and measurement conditions

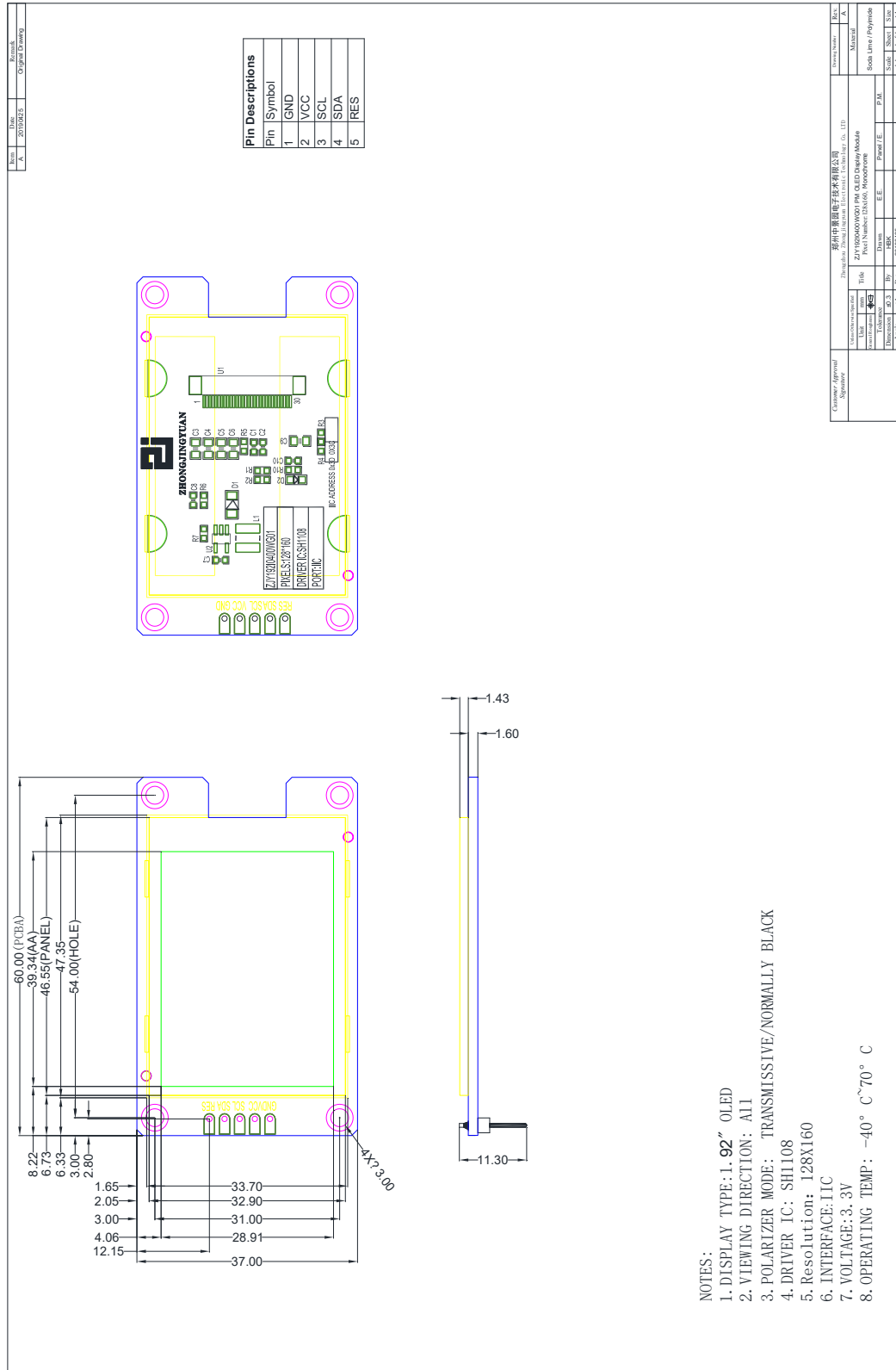
1. All measurements shall not be started until the specimens attain to temperature stability.
2. The degradation of Polarizer are ignored for item 1, 4 & 5.

Evaluation criteria

1. The function test is OK.
2. No observable defects.
3. Luminance: > 50% of initial value.
4. Current consumption: within $\pm 50\%$ of initial value.



11. EXTERNAL DIMENSION





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12. PACKING SPECIFICATION

TBD

13. OUTGOING INSPECTION PROVISION

1. 抽樣方法 / SAMPLING METHOD

- (1) MIL-STD-1916 / 驗證水準 level III / 正常檢驗 / 單次樣品檢驗
MIL-STD-1916 / inspection level III / normal inspection / single sample inspection
- (2) 主要缺陷 Level III ; 次要缺陷 Level II
Major Level III ; Minor Level II

MIL-STD-1916 樣本代字對照表							
批量	驗證水準 (VL)						
	VII	VI	V	IV	III	II	I
2 ~ 170	A	A	A	A	A	A	A
171 ~ 288	A	A	A	A	A	A	B
289 ~ 544	A	A	A	A	A	B	C
545 ~ 960	A	A	A	A	B	C	D
961 ~ 1632	A	A	A	B	C	D	E
1633 ~ 3072	A	A	B	C	D	E	E
3073 ~ 5440	A	B	C	D	E	E	E
5441 ~ 9216	B	C	D	E	E	E	E
9217 ~ 17408	C	D	E	E	E	E	E
17409 ~ 30720	D	E	E	E	E	E	E
≥ 30721	E	E	E	E	E	E	E

2. 檢驗條件 / INSPECTION CONDITION

檢查和測量在下列條件下進行的，除非另有規定。

The inspection and measurement are performed under the following conditions, unless otherwise specified.

溫度 / Temperature: 25±5°C

濕度 / Humidity: 50±10%R.H.

壓力 / Pressure: 860~1060hPa (mbar)

檢驗員拿的面板和眼睛之間的距離 / Distance between the panel and eyes of the inspector ≥ 30cm




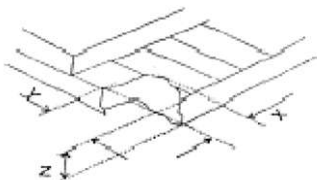
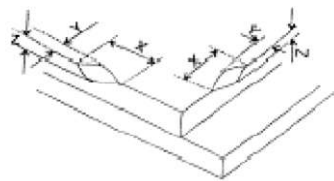
3. 品質檢驗規格 / SPECIFICATION FOR QUALITY CHECK

3.1 缺陷分類 / DEFECT CLASSIFICATION

嚴重度 Severity	檢驗項目 Inspection Item	缺陷 Defect	備註 Remark
主要缺陷 Major Defect	1. 面板 Panel	(1) 無顯示 Non-displaying	
		(2) 線缺陷 Line defects	
		(3) 故障 Malfunction	
		(4) 玻璃破損 Glass cracked	
	2. 軟板 Film	(1) 軟板尺寸超規 Film dimension out of specification	不能組裝 Can not be assembled
次要缺陷 Minor Defect	3. 尺寸 Dimension	(1) 外形尺寸超規 Outline dimension out of specification	外觀缺陷 Appearance defect
	1. 面板 Panel	(1) 玻璃刮傷 Glass scratch	
		(2) 玻璃切割異常 Glass cutting NG	
		(3) 玻璃崩邊、崩角 Glass chip	
	2. 偏光板 Polarizer	(1) 偏光板刮傷 Polarizer scratch	
		(2) 表面汙漬 Stains on surface	
		(3) 偏光板氣泡 Polarizer bubbles	
	3. 顯示 Displaying	(1) 暗點、亮點、髒污 Dim spot、Bright spot、dust	
	4. 軟板 Film	(1) 損傷 Damage	
		(2) 異物 Foreign material	



3.2 出貨規格 / OUTGOING SPECIFICATION

項目 Item	描述 Description	標準 Criterion	允收 水準 AQL															
I. 面板 Panel	1. 玻璃刮傷 Glass scratch	<table><tr><th>寬 / Width (mm) W</th><th>長 / Length (mm) L</th><th>容許個數 number of pieces permitted</th></tr><tr><td>$W \leq 0.03$</td><td>忽略 Ignore</td><td>忽略 Ignore</td></tr><tr><td>$0.03 < W$</td><td>$L \leq 1$</td><td>1</td></tr><tr><td>$0.05 < W$</td><td>-----</td><td>無 None</td></tr><tr><td>顯示區外 beyond A.A.</td><td>-----</td><td>忽略 Ignore</td></tr></table>	寬 / Width (mm) W	長 / Length (mm) L	容許個數 number of pieces permitted	$W \leq 0.03$	忽略 Ignore	忽略 Ignore	$0.03 < W$	$L \leq 1$	1	$0.05 < W$	-----	無 None	顯示區外 beyond A.A.	-----	忽略 Ignore	次要 Minor
	寬 / Width (mm) W	長 / Length (mm) L	容許個數 number of pieces permitted															
	$W \leq 0.03$	忽略 Ignore	忽略 Ignore															
$0.03 < W$	$L \leq 1$	1																
$0.05 < W$	-----	無 None																
顯示區外 beyond A.A.	-----	忽略 Ignore																
	2. 玻璃破損 Glass crack	(1) 裂紋 / Crack 擴展裂紋是不能接受的。 Propagation crack is not acceptable. 	主要 Major															
	3. 玻璃崩邊、崩角 Glass chip	 (2) 崩邊 / Chip on edge 	次要 Minor															



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項目 Item	描述 Description	標準				允收 水準 AQL									
		崩角 Chip on corner	Size (mm)	崩邊 Chip on edge	Size (mm)										
I. 面板 Panel	3. 玻璃崩邊、崩角 Glass chip					次要 Minor									
		X	≤ 1.5	X	≤ 3.0										
		Y	≤ 2.0	Y	≤ 1.0										
		Z	≤ t	Z	≤ t										
	備註 / Note: 1. t = 玻璃厚度 t = glass thickness 2. 崩邊或崩角延伸到 ITO 導線是不能接受的。 Chip on the corner extending into the ITO contact is not acceptable.														
4. 尺寸 Dimension	請參閱圖紙的規範。 Refer to the drawing of the spec				主要 Major										
II. 偏光板 Polarizer	1. 刮傷 Scratch	點狀按照“項目 II-3 偏光板氣泡”的標準。 Spot type in accordance with the criteria of “Item II-3. Polarizer bubble”. 線狀按照“項目 I-1 玻璃刮傷”的標準。				次要 Minor									
	2. 表面汙漬 Stains on surface	表面汙漬無法用軟布或類似的清潔物輕輕擦拭去除。 Stains cannot be removed even when wiped lightly with a soft cloth or similar cleaning.				次要 Minor									
	3. 偏光板氣泡 Polarizer bubble	<table><tr><td>尺寸 Size</td><td>容許個數 number of pieces (per mm)</td></tr><tr><td>Φ ≤ 0.2</td><td>忽略 Ignore</td></tr><tr><td>0.2 < Φ ≤ 0.5</td><td>2</td></tr><tr><td>0.5 < Φ</td><td>0</td></tr><tr><td>顯示區外 beyond A.A.</td><td>忽略 Ignore</td></tr></table>				尺寸 Size	容許個數 number of pieces (per mm)	Φ ≤ 0.2	忽略 Ignore	0.2 < Φ ≤ 0.5	2	0.5 < Φ	0	顯示區外 beyond A.A.	忽略 Ignore
尺寸 Size	容許個數 number of pieces (per mm)														
Φ ≤ 0.2	忽略 Ignore														
0.2 < Φ ≤ 0.5	2														
0.5 < Φ	0														
顯示區外 beyond A.A.	忽略 Ignore														



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項目 Item	描述 Description	標準 Criterion			允收 水準 AQL
III. 顯示 Displaying	1. 耗電 Power consumption	該模組的工作電流消耗不應超出產品規格書的規範。 The module operating current consumption should not go beyond the standard indicated in Product Specification			主要 Major
	2. 像素尺寸 Pixel size	顯示像素的尺寸的公差應規格的±25%之內。 The tolerance of display pixel dimension should be within ±25% of specification.			次要 Minor
	3. 顏色 Color	依據產品規格。 Refer to the product specification.			主要 Major
	4. 亮度 Luminance	依據產品規格。 Refer to the product specification.			主要 Major
	5. 暗點、亮點、 髒污 Dimming spot、Lighting spot、Dust	1.	平均直徑 Average diameter	容許個數 number of pieces permitted	次要 Minor
		D:(mm)			
		D ≤ 0.1	忽略 Ignore		
		0.1 < D ≤	1		
		0.15< D ≤	1		
		0.2 < D	0		
		顯示區外 beyond A.A.	忽略 Ignore		
		D=(長邊直徑 + 短邊直徑)/2 D=(long diameter + short diameter)/2 像素暗點是不允許。 Pixel off is not allowed.			



郑州中景园电子技术有限公司

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ZHONGJINGYUAN

商城地址: <https://oled-zjy.taobao.com>

TEL: 18639000975

項目 Item	描述 Description	標準 寬 長 width(mm) Criterion length(mm)			容許個數 number of	允收 水準 AQL
		寬 width(mm)	標準 長 Criterion length(mm)	容許個數 number of		
III. 顯示 Displaying	5. 暗點、亮點、 髒污 Dimming spot、Lighting spot、Dust	2. W	L	pieces permitted	次要 Minor	
		$W \leq 0.03$	忽略 Ignore	忽略 Ignore		
		$0.03 < W$	$L \leq 1$	3		
		$0.05 < W$	-----	無 None		
		顯示區外 beyond A.A.	-----	忽略 Ignore		
IV. 軟板 Film	1. 尺寸 Dimension	軟板尺寸超規。 Film dimension out of Spec.			主要 Major	
	2. 損傷 Damage	破損；深刮傷；深摺痕；深壓痕或其他損害是不能接受的。 Crack; deep scratch; deep fold; deep pressure mark or other damage is not acceptable.			次要 Minor	
	3. 異物 Foreign material	導電異物附著在導線，軟板和玻璃之間的異物是不能接受的。 Conductive foreign material sticking to the leads, foreign material between film and glass are not acceptable.			次要 Minor	

14. APPENDIXES

APPENDIX 1: DEFINITIONS

A. DEFINITION OF CHROMATICITY COORDINATE

The chromaticity coordinate is defined as the coordinate value on the CIE 1931 color chart for R, G, B, W.

B. DEFINITION OF CONTRAST RATIO

The contrast ratio is defined as the following formula:

$$\text{Contrast Ratio} = \frac{\text{Luminance of all pixels on measurement}}{\text{Luminance of all pixels off measurement}}$$

C. DEFINITION OF RESPONSE TIME

The definition of turn-on response time T_r is the time interval between a pixel reaching 10% of steady state luminance and 90% of steady state luminance. The definition of turn-off response time T_f is the time interval between a pixel reaching 90% of steady state luminance and 10% of steady state luminance. It is shown in Figure 2.

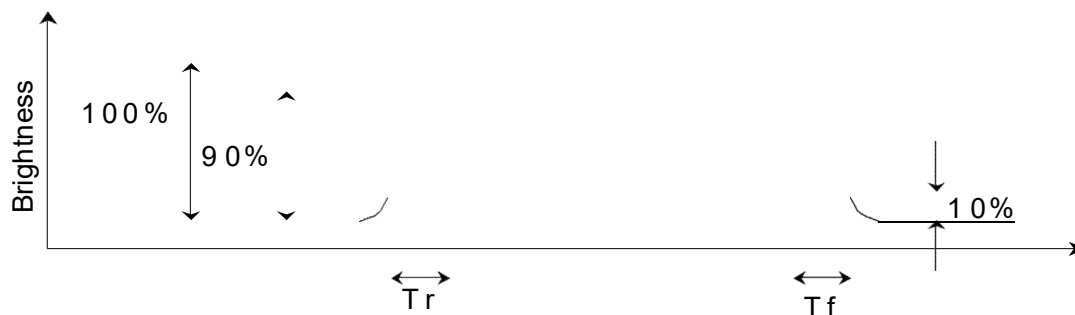


Figure 2 Response time

D. DEFINITION OF VIEWING ANGLE

The viewing angle is defined as Figure 3. Horizontal and vertical (H & V) angles are determined for viewing directions where luminance varies by 50% of the perpendicular value.

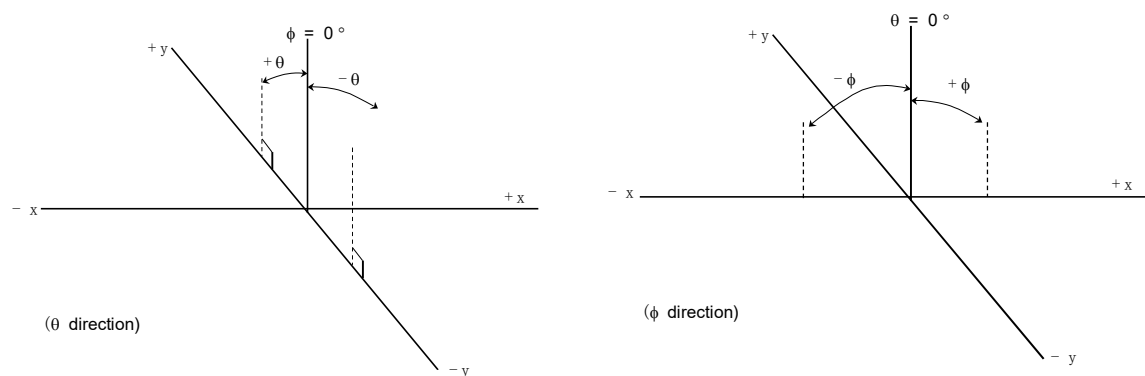
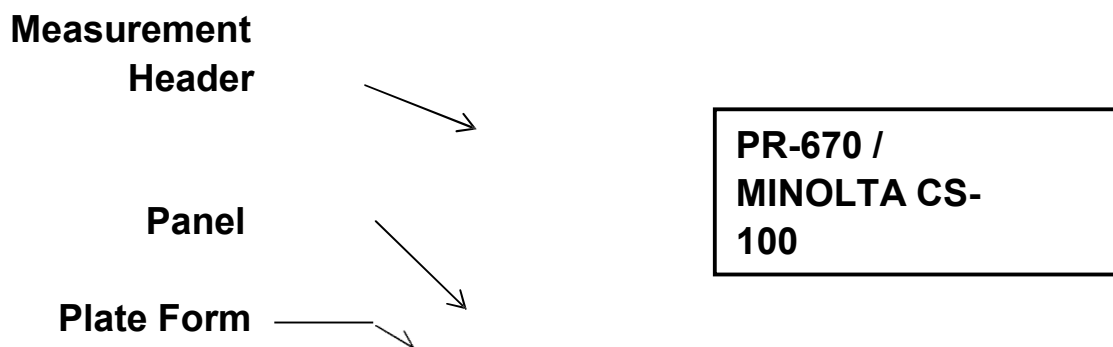


Figure 3 Viewing angle

APPENDIX 2: MEASUREMENT APPARATUS

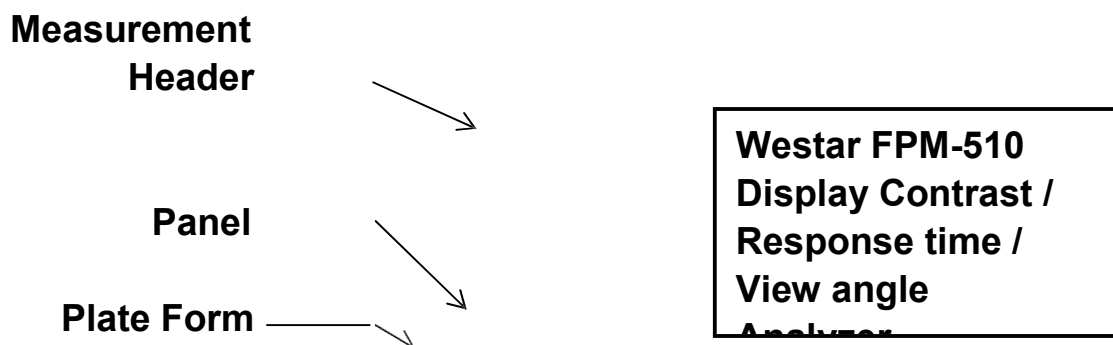
A. LUMINANCE/COLOR COORDINATE

PHOTO RESEARCH PR-670, MINOLTA CS-100



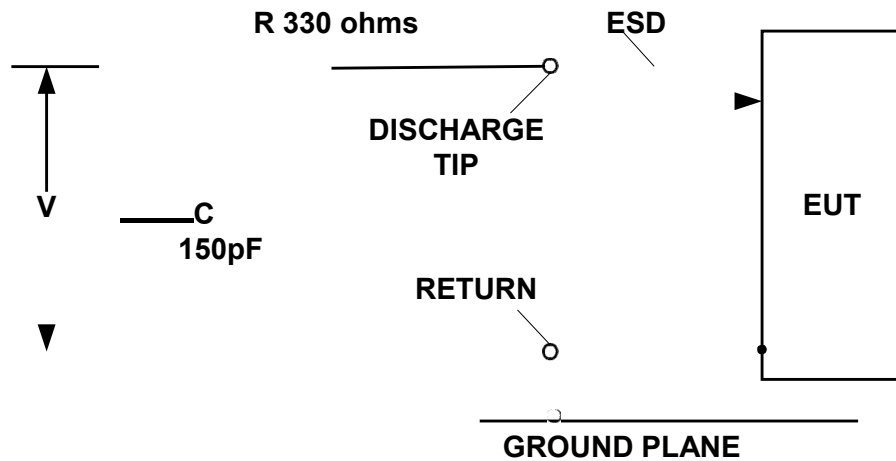
B. CONTRAST / RESPONSE TIME / VIEWING ANGLE

WESTAR CORPORATION FPM-510





C. ESD ON AIR DISCHARGE MODE



APPENDIX 3: PRECAUTIONS FOR USING THE OLED MODULE

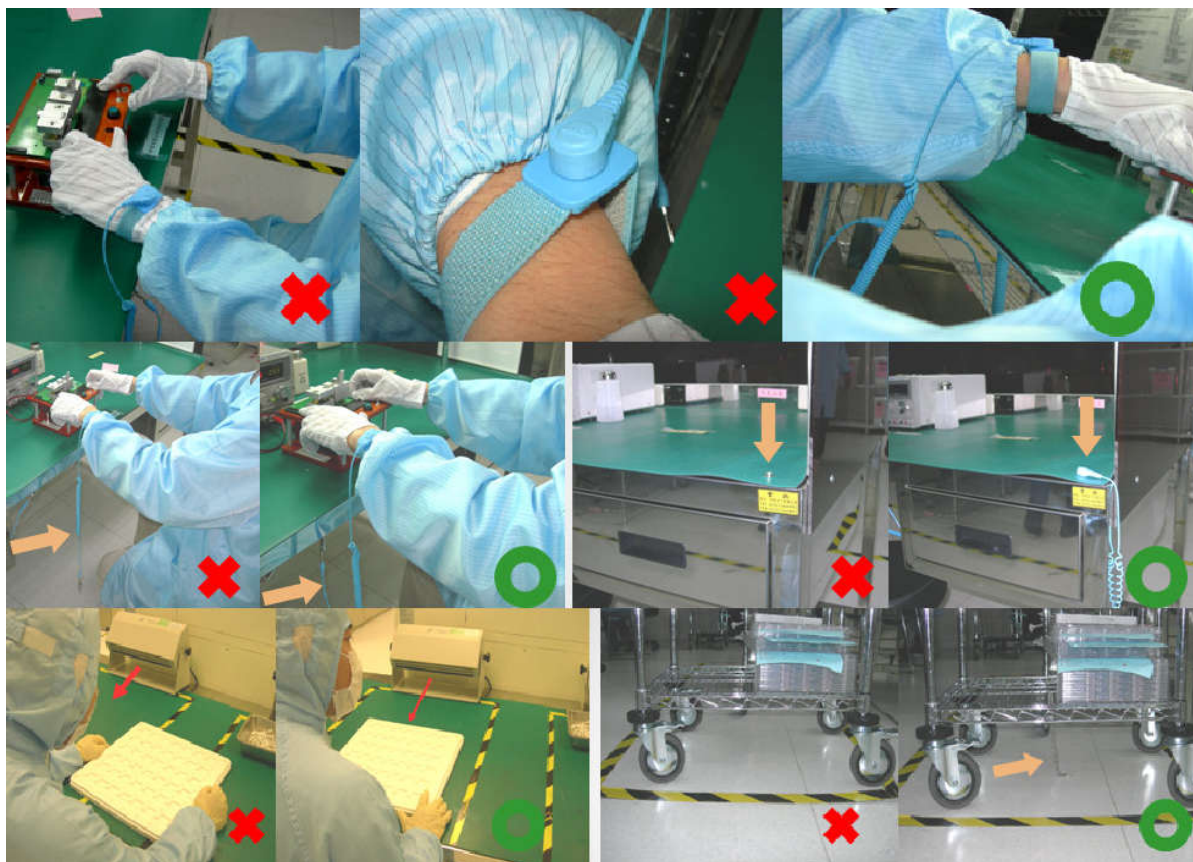
Precautions for Handling

1. When handling the module, wear powder-free anti static rubber finger cots/ anti-static clothing, anti-static gloves ,antistatic wrist strap and anti-static shoes

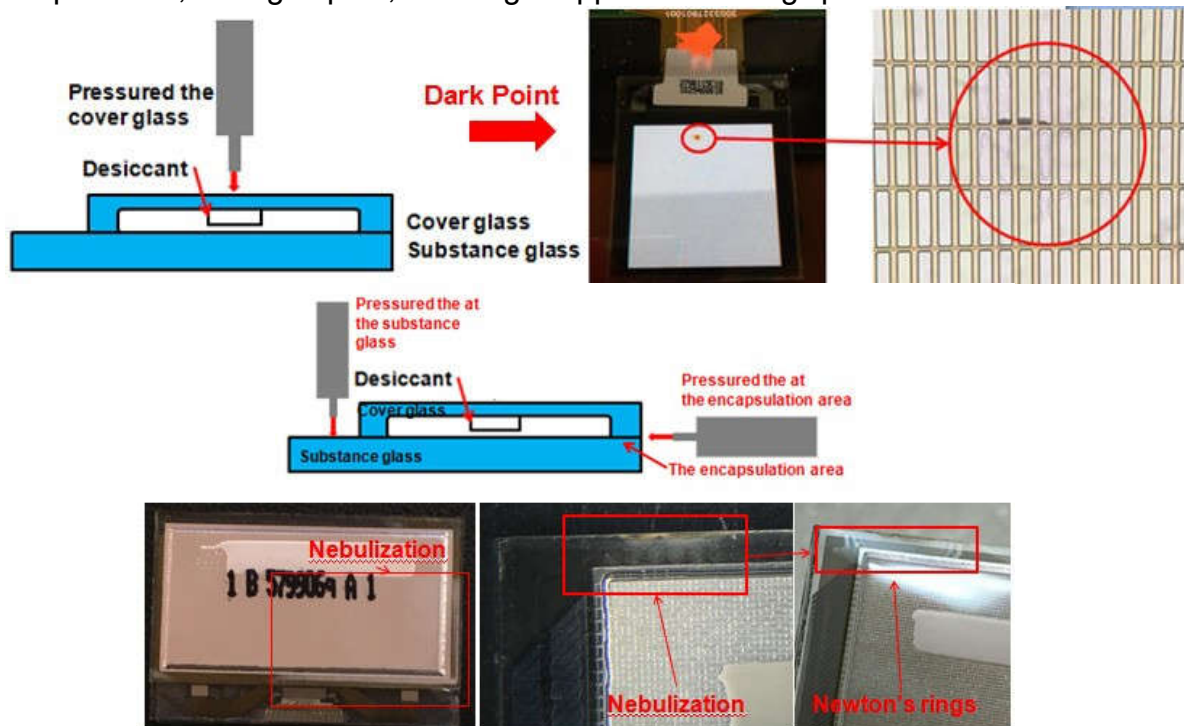
The environment should dispose the static elimination blower, anti-static pad, anti-static chair, and anti-static floor. The humidity maintains usually more than 40%



2. The OLED module is an electronic component and is subject to damage caused by Electro Static Discharge (ESD). And hence normal ESD precautions must be taken when handling it. Also, appropriate ESD protective environment must be administered and maintained in the production line. When handling and assembling the panel, wear an antistatic wrist strap with the alligator clip attached to the ground to prevent ESD damage on the panel. Antistatic wrist strap should touch human body directly instead of gloves. (See below photos).



3. The OLED module is consisted of glass and film, and it should avoid pressure, strong impact, or being dropped from a high position.

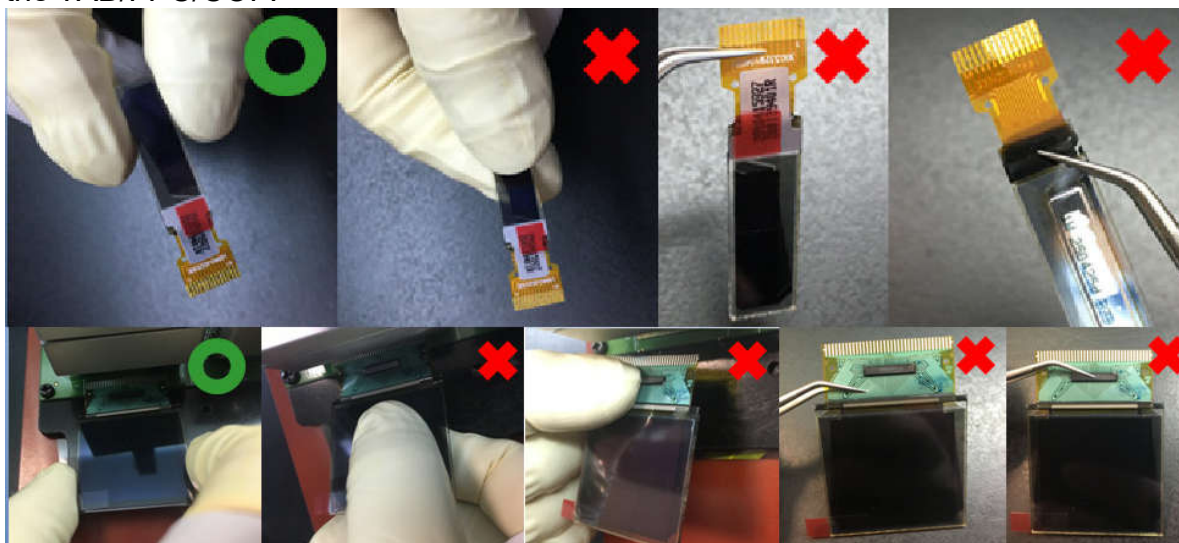


4. Take out the panel one by one from the holding trays for assembly, and never put the panel on top of another one to avoid the scratch.



5. Avoid jerk and excessive bend on TAB/FPC/COF, and be careful not to let foreign matter or bezel damage the film.

6. When handling and assembling the module (panel + IC), grab the panel, not the TAB/FPC/COF.

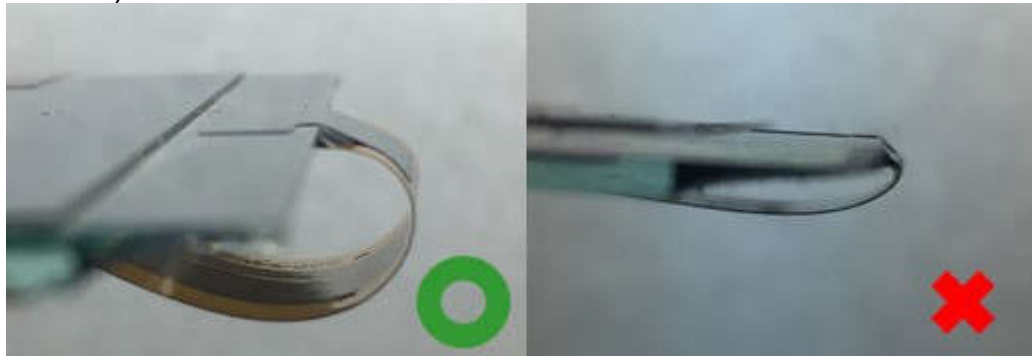


7. Use the tweezers to open the clicks on the connector of PCB before the insertion of FPC/COF, and click them back in. Once the FPC/COF sits properly in the connector, use the tweezers to avoid the damages.

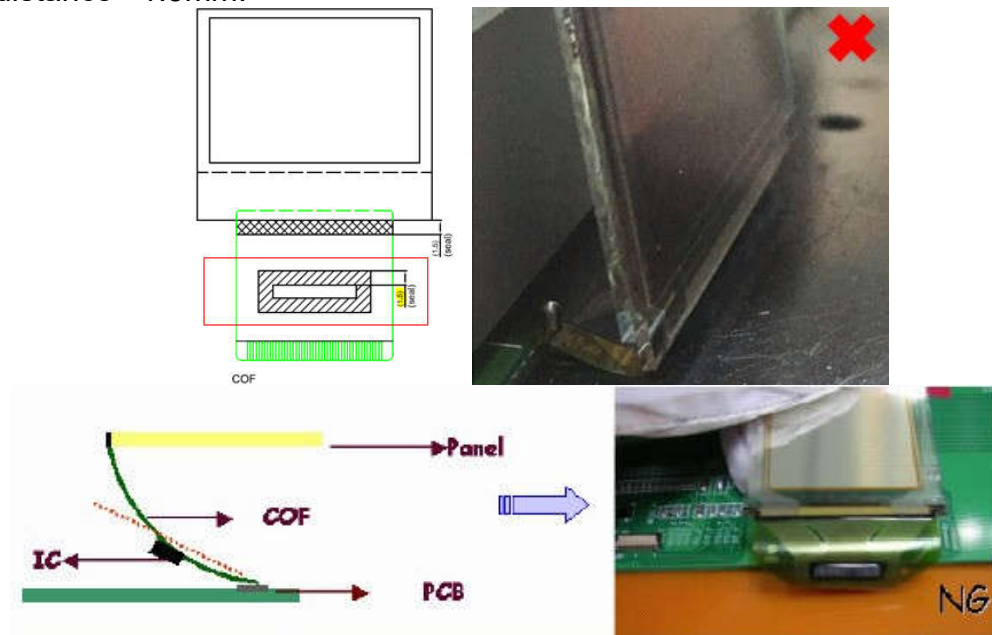




8. Please do not bend the film near the substrate glass. It could cause film peeling and TAB/FPC/COF damage. For TAB, It should bend the slit area as actual OLED it is. For FPC or COF, it is suggested to follow below pictures for instruction (distance between substrate glass and bending area $>1.5\text{mm}$; $R>0.5\text{mm}$).



9. Avoid bending the film at IC bonding area. It could damage the IC ILB bonding. It should avoid bending the IC seal area. Please keep the bending distance $>1.5\text{mm}$.

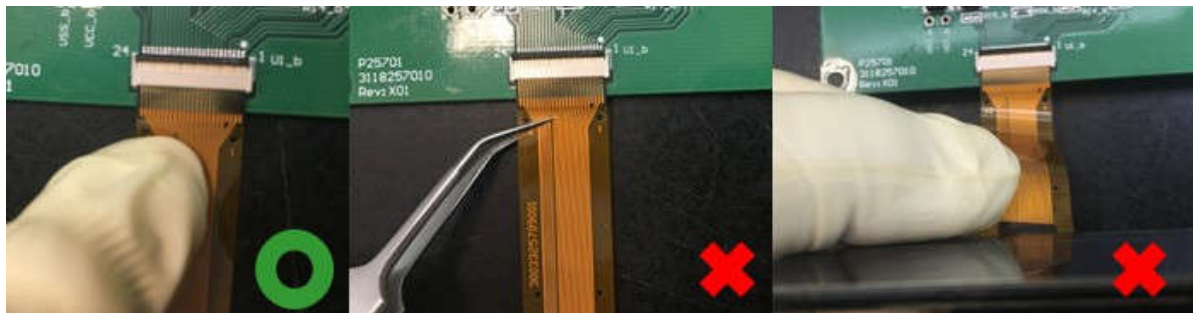




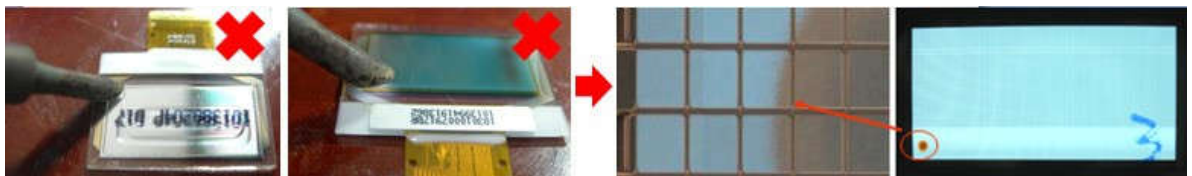
Use finger to insert COF /FPC into the connector when assembling the panel.
Please refer to the photo.



COF: Use both thumbs

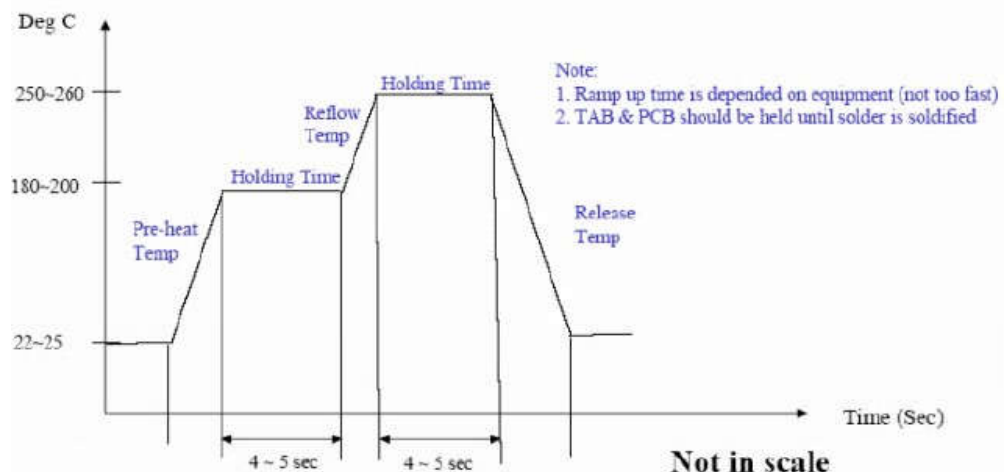


10. Do not wipe the pin of film and polarizer with the dry or hard materials that will damage the surface. When cleaning the display surface, use the soft cloth with solvent, IPA or alcohol, to clean.
11. Protection film is applied to the surface of OLED panel to avoid the scratch. Please remove the protective film before assembling it. If the OLED panel has been stored for a long time, the residue adhesive material of the protective film may remain on the display surface after remove the protective film. Please use the soft cloth with solvent, IPA or alcohol, to clean.
12. When hand or hot-bar soldering TAB/FPC onto PCB, make sure the temperature and timing profiles to meet the requirements of soldering specification (the specification depends on the application or optimized by customer) to prevent the damage of IC pins by inappropriate soldering, and also avoid the high temperature to damage the Organic light-emitting materials.





13. Solder residues arise from soldering process have to be cleaned up thoroughly before the module assembly.
14. Use the voltage and current settings listed in the specification to do the function test after the module assembly.
15. Suggestion for soldering process:
 - i. TAB Lead- free soldering hot bar process
 1. Use pulse heated bonding tool equipment
 2. Material: Sn/Ag/Cu lead-free solder paste with typical 25um thickness on PCB pad. The TAB pin size and shape may be different, please base on the production line to adjust the thickness of PCB pad and temperature.S
 3. Bonding Force:--4kg per centimeter square as the starting point.
 4. Suggested bonding tool temperature & time profile is as below for reference. Since there are differences in TAB soldering pins, soldering technicians' skills, mechanism...etc., the soldering conditions must be adequately tuned.



- ii. TAB Lead- free soldering wire process
In case of manual soldering (Lead- free solder wire)
 1. Solder wire contact iron directly: $280 \pm 5^{\circ}\text{C}$ at 3-5secs
 2. Solder wire contact TAB lead directly (near iron but not contact): $380 \pm 5^{\circ}\text{C}$, 3-5secs
 3. Since there are differences in TAB soldering pins, soldering technicians' skills, mechanism...etc., the soldering conditions must be adequately tuned.
- iii. High temperature will result in rapid heat conduction to IC and might cause damage to IC, so please keep the temperature below 380°C . Also, avoid damaging the polyimide and solder resist which might take place at high temperatures. Refold cycles base on the de-soldering status, if the plating of pin was damaged, it can not be used again.

Precautions for Electrical

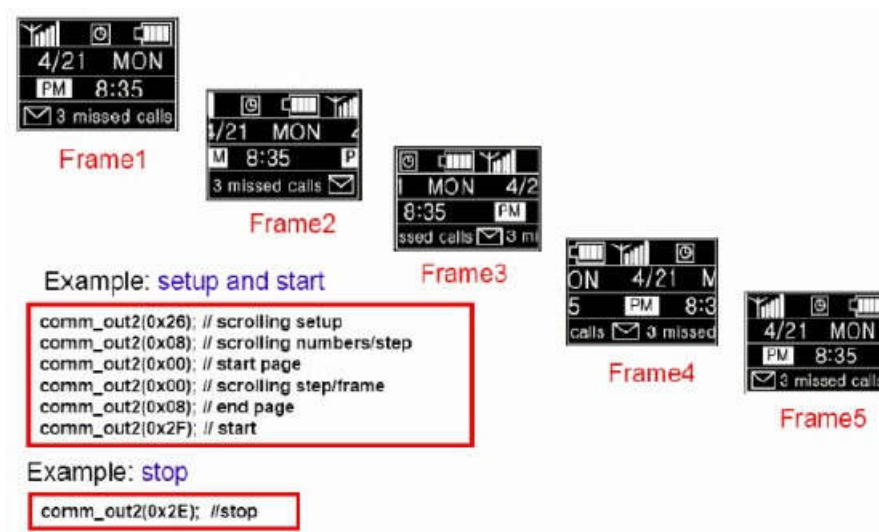
1. Residual Image (Image Sticking)

The OLED is a self-emissive device. As with other self-emissive device or displays consisting of self-emissive pixels, when a static image frozen for a long period of time is changed to another one with all-pixels-on background, residual image or image sticking is noticed by the human eye. Image sticking is due to the luminance difference or contrast between the pixels that were previously turned on and the pixels that are newly turned on. Image sticking depends on the luminance decay curve of the display. The slower the decay, the less prominent the image sticking is. It is strongly recommended that the user employ the following four strategies to minimize image sticking.

1. Employ image scrolling or animation to even out the lit-on time of each and every pixel on the display, also could use sleeping mode for reduced the residual image and extend the power capacity.
2. Minimize the use of all-pixels-on or full white background in their application because when the panel is turned on full white, the image sticking from previously shown patterns is the most revealing. Black background is the best for power savings, greatest visibility, eye appealing, and dazzling displays.
3. Avoid displaying the characters or menu with high brightness level in a fix position for a long time or repeatedly. If necessary, using the auto fadeout technology.
4. If a static logo is used in the reliability test, change the pattern into its inverse (i.e., turn off the while pixels and turn on the previously unlit pixels) and freeze the inverse pattern as long as the original logo is used, so every pixel on the panel can be lit on for about the same time to minimize image sticking, caused by the differential turn-on time between the original and its reverse patterns.



Scrolling example



Frame1

Frame2

Frame3

Frame4

Frame5

Example: setup and start

```
comm_out2(0x26); // scrolling setup
comm_out2(0x08); // scrolling numbers/step
comm_out2(0x00); // start page
comm_out2(0x00); // scrolling step/frame
comm_out2(0x08); // end page
comm_out2(0x2F); // start
```

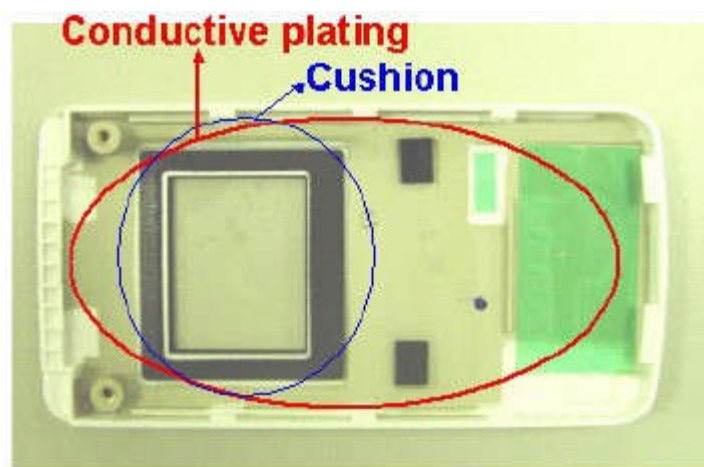
Example: stop

```
comm_out2(0x2E); //stop
```

Precautions for Mechanical

1. Cushion or Buffer tape on the cover glass

It is strongly recommended to have a cushion or buffer tape to apply on the panel backside and front side when assembling OLED panel into module to protect it from damage due to excessive extraneous forces.



It is recommended that a plating conductive layer be used in the housing for EMI/EMC protection. And, the enough space should be reserved for the IC placement if the IC thickness is thicker than the TAB film when customer design the PCB.

2. Avoid excessive bending of film when handling or designing the panel into the product

The bending of TAB/COF/FPC has to follow the precautions indicated in the specification, extra bending or excessive extraneous forces should be avoided to minimize the chances of film damage. If bending the film is necessary, please bend the designated bending area only. Please refer to items 8 and 9 of Precautions for Handling for more information.

Precautions for Storage and Reliability Test

1. Storage

Store the packed cartons or packages at $25^{\circ}\text{C}\pm 5^{\circ}\text{C}$, $55\%\pm 10\%\text{RH}$. Do not store the OLED module under direct sunlight or UV light. For best panel performance, unpack the cartons and start the production of the panels within six months after the reception of them.

2. Reliability Test

Zhongjingyuan only guarantees the reliability of the OLEDs under the test conditions and durations listed in the specification.