

Specification for Approval

PRODUCT NUMBER: Z J Y M 1 3 0 - C H 1 1 1 5
PRODUCT DESCRIPTION: Z J Y M 1 3 0 - C H 1 1 1 5

CUSTOMER
APPROVED BY
DATE:
中景园电子技术有限公司

中景园电子技术有限公司

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REVISION RECORD

REV.	REVISION DESCRIPTION	REV. DATE	REMARK
A01	INITIAL RELEASE	2020. 10. 26	

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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 RiTdisplay. 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, which are either not addressed, or are exceptions to the supporting documents.

2. WARRANTY

RiTdisplay 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"). RiTdisplay 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°C±5°C, 55%±10%RH or used as the conditions specified in the specifications.

Nevertheless, RiTdisplay 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 matrix : 64x128
- Driver IC : CH1115
- Excellent quick response time.
- Extremely thin thickness for best mechanism design : 1.427 mm
- High contrast : 10,000:1
- Wide viewing angle : 160°
- Interface: SPI interface and I²C interface.
- Strong environmental resistance.
- Wide range of operating temperature : -40 to 70 °C.
- Anti-glare polarizer.

4. MECHANICAL DATA

NO	ITEM	SPECIFICATION	UNIT
1	Dot Matrix	64 (W) x 128 (H)	dot
2	Dot Size	0.21 (W) x 0.21 (H)	mm ²
3	Dot Pitch	0.23 (W) x 0.23 (H)	mm ²
4	Aperture Rate	83	%
5	Active Area	14.7 (W) x 29.42 (H)	mm ²
6	Panel Size	17.1 (W) x 35.8 (H)	mm ²
7*	Panel Thickness	1.22 ± 0.1	mm
8	Module Size	17.1 (W) x 51.6 (H) x 1.427 (D)	mm ³
9	Diagonal A/A size	1.29	inch
10	Module Weight	1.70 ± 10%	gram

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

5. MAXIMUM RATINGS

ITEM	MIN	MAX	UNIT	Condition	Remark
Supply Voltage (V_{DD1})	-0.3	3.6	V	$T_a = 25^{\circ}\text{C}$	IC maximum rating
Supply Voltage (V_{PP})	8	14.5	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	PARAMETER	TEST CONDITION	MIN	TYP	MAX	UNIT
V_{DD1}	Logic Supply Voltage	$T_a = 25^{\circ}\text{C}$	1.65	-	3.5	V
V_{PP}	Operating Voltage (for OLED panel)	$T_a = 25^{\circ}\text{C}$	9.5	-	10.5	V
V_{OH}	High Logic Output Level	$I_{OH} = -0.5\text{mA}$	$0.8 \cdot V_{DD1}$	-	V_{DD1}	V
V_{OL}	Low Logic Output Level	$I_{OL} = 0.5\text{mA}$	V_{SS}	-	$0.2 \cdot V_{DD1}$	V
V_{IH}	High Logic Input Level	-	$0.8 \cdot V_{DD1}$	-	V_{DD1}	V
V_{IL}	Low Logic Input Level	-	V_{SS}	-	$0.2 \cdot V_{DD1}$	V

6.2 ELECTRO-OPTICAL CHARACTERISTICS

PANEL ELECTRICAL SPECIFICATIONS

PARAMETER	MIN	TYP.	MAX	UNITS	COMMENTS
Normal mode current (IPP)	-	17.5	19.5	mA	All pixels on (1)
		15	16.5	mA	50% pixels on (1)
	-	4.6	5.6	mA	20% pixels on (1)
Standby mode current(IPP)	-	1.5	2	mA	Standby mode 10% pixels on (2)
Normal mode power consumption		175	195	mW	All pixels on (1)
		150	165	mW	50% pixels on (1)
		46	56	mW	20% pixels on (1)
Standby mode power consumption		15	20	mW	Standby mode 10% pixels on (2)
IDD1 sleep mode current	-	-	5	uA	Sleep mode Current (3)
IPP sleep mode current	-	-	5	uA	Sleep mode Current (3)
Normal Luminance	105	125	-	cd/m ²	Display Average
Standby Luminance	-	75	-	cd/m ²	Display Average
CIE _x (White)	0.26	0.30	0.34		x, y (CIE 1931)
CIE _y (White)	0.29	0.33	0.37		
Dark Room Contrast	10,000:1				
Viewing Angle	160			degree	
Response Time		10		μs	

(1) Normal mode condition :

- $V_{PP} = 10V$
- Contrast setting : 0x80
- Frame rate : 159Hz
- Duty setting : 1/64

(2) Standby mode condition :

- $V_{PP} = 10V$
- Contrast setting : 0x01
- Frame rate : 159Hz
- Duty setting : 1/64

(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	13,000	Hrs	125 cd/m ² , alternating checkerboard	Note (1)
Life Time	20,000	Hrs	105 cd/m ² , alternating checkerboard	Note (2)

Note:

(A) Under $V_{PP} = 10V$, $T_a = 25^{\circ}C$, 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 125 cd/m² :

- Contrast setting : 0x80
- Frame rate : 105Hz
- Duty setting : 1/64

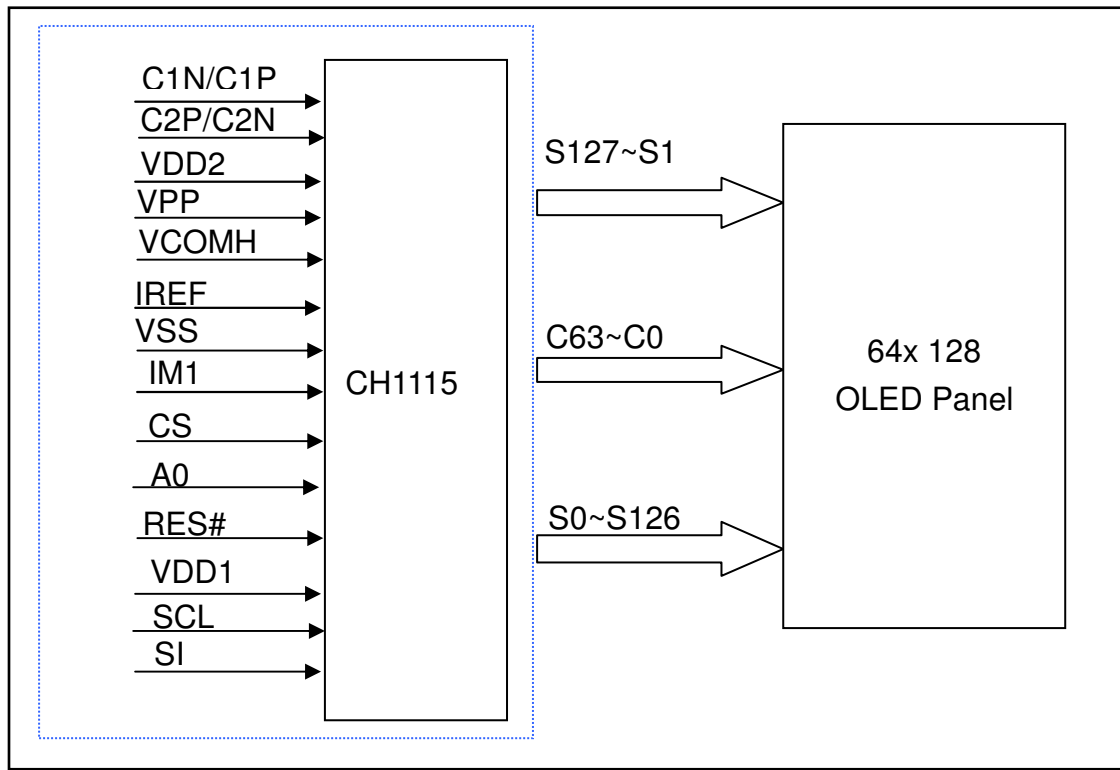
(2) Setting of 105 cd/m² :

- Contrast setting : 0x58
- Frame rate : 105Hz
- Duty setting : 1/64

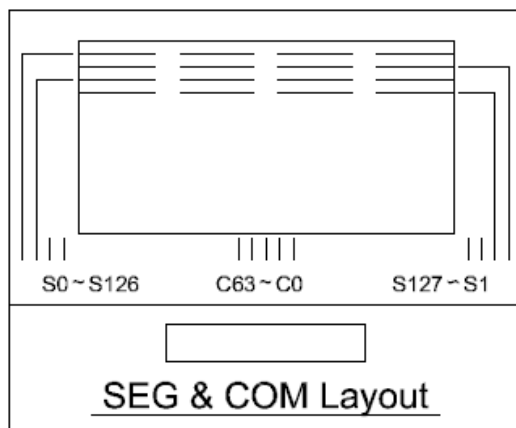
Note: More setting refer to P39405 application note.

8. INTERFACE

8.1 FUNCTION BLOCK DIAGRAM



8.2 PANEL LAYOUT DIAGRAM



8.3 PIN ASSIGNMENTS

Pin No.	Pin Name	Description	Setting at each interface		
			8080	SPI	IIC
1	C1N	Connect to charge pump capacitor.			
2	C1P	Connect to charge pump capacitor.			
3.	C2P	Connect to charge pump capacitor.			
4	C2N	Connect to charge pump capacitor.			
5	VDD2	Power supply for charge pump circuit.			
6	VPP	OLED panel power supply			
7.	VCOMH	A capacitor should be connected between this pin and VSS.			
8	IREF	This is a segment current reference pad.			
9	VSS	Ground.			
10	IM1	I MCU bus interface selection pins.	NA	Low	High
11	CS	This pad is the chip select input.	NA	CS#	Low
12	A0	This is the Data/Command control pad.	NA	A0	Low
13	RES	This is a reset signal input pad	NA	Reset	Reset
14	VDD1	Power supply pin for core logic operation.			
15	SCL	When the serial interface is selected, then D0 serves as the serial clock input pad (SCL) and D1 serves as the serial data input pad (SI).	NA	SCL	SCL
16	SI	When the I2C interface is selected, then D0 serves as the serial clock input pad (SCL) and D1 serves as the serial data input pad (SDA).	NA	SDA	SI

Note

(1) Low is connected to VSS

(2) High is connected to VDD1

8.4 GRAPHIC DISPLAY DATA RAM ADDRESS MAP

Page Address				Data								Line Address						
D3	D2	D1	D0	D0												00H	PAGE 0	
				D1												01H		
				D2												02H		
				D3												03H		
				D4												04H		
				D5												05H		
				D6												06H		
				D7												07H		
D3	D2	D1	D0	D0												08H	PAGE1	
				D1												09H		
				D2												0AH		
				D3												0BH		
				D4												0CH		
				D5												0DH		
				D6												0EH		
				D7												0FH		
D3	D2	D1	D0	D0												10H	PAGE2	
				D1												11H		
				D2												12H		
				D3												13H		
				D4												14H		
				D5												15H		
				D6												16H		
				D7												17H		
D3	D2	D1	D0	D0												18H	PAGE3	
				D1												19H		
				D2												1AH		
				D3												1BH		
				D4												1CH		
				D5												1DH		
				D6												1EH		
				D7												1FH		
D3	D2	D1	D0	D0												20H	PAGE4	
				D1												21H		
				D2												22H		
				D3												23H		
				D4												24H		
				D5												25H		
				D6												26H		
				D7												27H		
D3	D2	D1	D0	D0												28H	PAGE5	
				D1												29H		
				D2												2AH		
				D3												2BH		
				D4												2CH		
				D5												2DH		
				D6												2EH		
				D7												2FH		
D3	D2	D1	D0	D0												30H	PAGE6	
				D1												31H		
				D2												32H		
				D3												33H		
				D4												34H		
				D5												35H		
				D6												36H		
				D7												37H		
D3	D2	D1	D0	D0												38H	PAGE7	
				D1												39H		
				D2												3AH		
				D3												3BH		
				D4												3CH		
				D5												3DH		
				D6												3EH		
				D7												3FH		

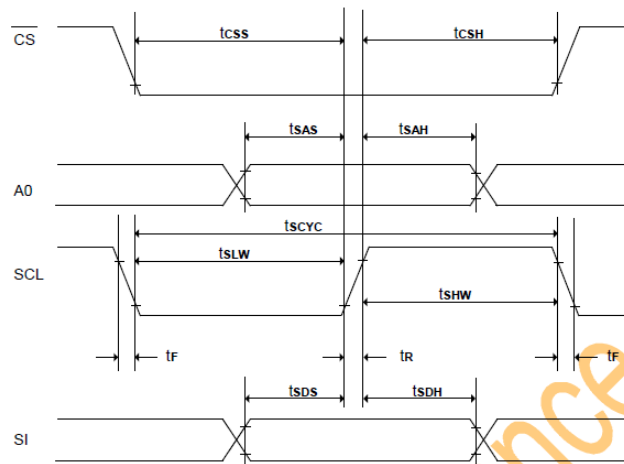
<

OUTPUT

COM0
COM1
COM2
COM3
COM4
COM5
COM6
COM7
COM8
COM9
COM10
COM11
COM12
COM13
COM14
COM15
COM16
COM17
COM18
COM19
COM20
COM21
COM22
COM23
COM24
COM25
COM26
COM27
COM28
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COM44
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COM46
COM47
COM48
COM49
COM50
COM51
COM52
COM53
COM54
COM55
COM56
COM57
COM58
COM59
COM60
COM61
COM62
COM63

8.5 INTERFACE TIMING CHART

System buses Write characteristics 3 (For 4 wire SPI)



(V_{DD1} = 1.65 - 2.4V, T_A = +25°C)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
tscyc	Serial clock cycle	500	-	-	ns	
tsas	Address setup time	300	-	-	ns	
tsah	Address hold time	300	-	-	ns	
tsds	Data setup time	200	-	-	ns	
tsdh	Data hold time	200	-	-	ns	
tcss	CS setup time	240	-	-	ns	
tcsH	CS hold time time	120	-	-	ns	
tshw	Serial clock H pulse width	200	-	-	ns	
tslw	Serial clock L pulse width	200	-	-	ns	
tr	Rise time	-	-	30	ns	
tf	Fall time	-	-	30	ns	

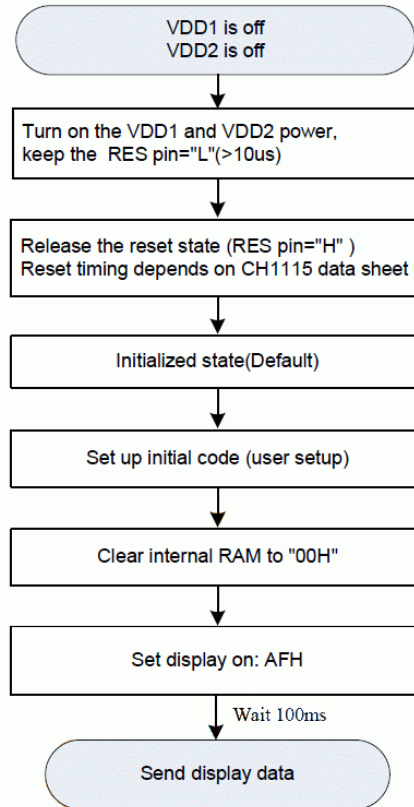
(V_{DD1} = 2.4 - 3.5V, T_A = +25°C)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
tscyc	Serial clock cycle	250	-	-	ns	
tsas	Address setup time	150	-	-	ns	
tsah	Address hold time	150	-	-	ns	
tsds	Data setup time	100	-	-	ns	
tsdh	Data hold time	100	-	-	ns	
tcss	CS setup time	120	-	-	ns	
tcsH	CS hold time time	60	-	-	ns	
tshw	Serial clock H pulse width	100	-	-	ns	
tslw	Serial clock L pulse width	100	-	-	ns	
tr	Rise time	-	-	15	ns	
tf	Fall time	-	-	15	ns	

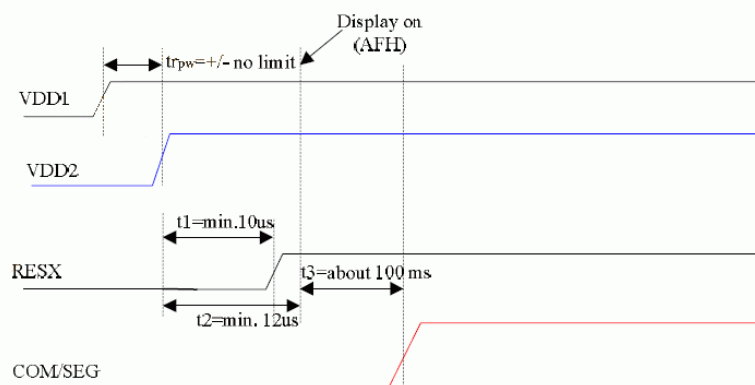
9. POWER ON / OFF SEQUENCE & APPLICATION CIRCUIT

9.1 POWER ON / OFF SEQUENCE

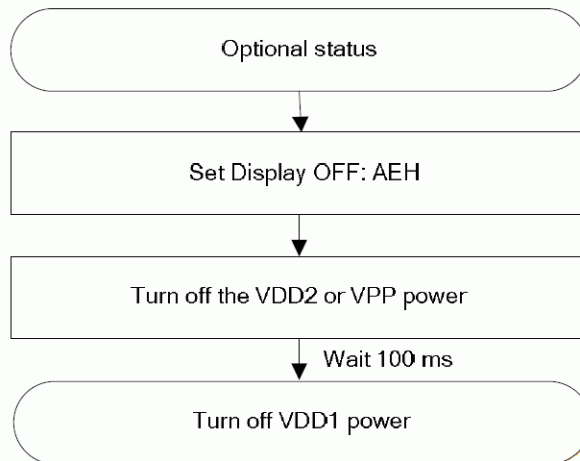
Built-in DC-DC pump power is being used immediately after turning on the power:



Power on sequence:



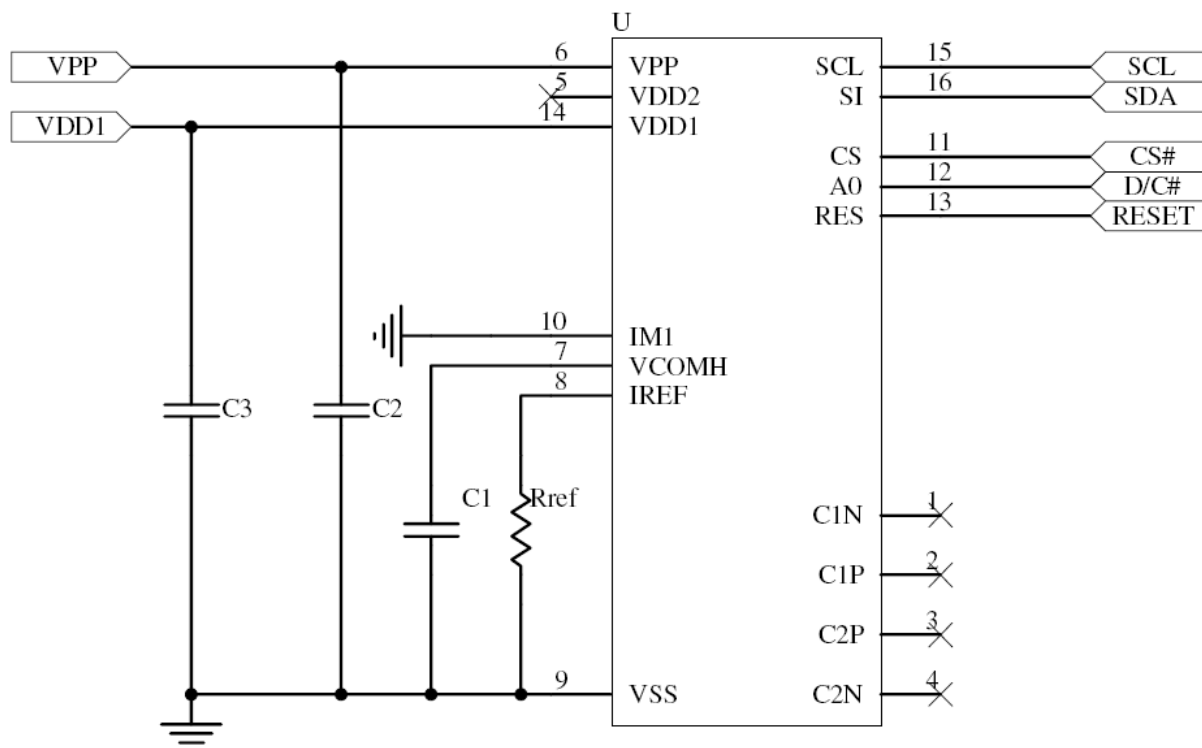
Power Off



Power off sequence:



9.2 APPLICATION CIRCUIT



Recommend components :

U : P39403

C1,C2 : 1nF/50V

C3 : 100nF/50V

Rref : 390K ohm 1% (0603)

Note:

1. The circuit is designed for SPI interface.
2. If need the IIC interface, Please refer the P39403 IIC application note.

9.3 COMMAND TABLE

Refer to CH1115 IC Spec.

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.

[illegible]

12. PACKING SPECIFICATION

Revision	Date	Note
/01	2020/10/26	Packing Instruction

④ 7003010001001
5G 乾燥劑

② RTD3003000010
ANTI-STATIC BAG 80x90x0.07mm

③ RTD3002000006
EPE盒 238*116*35mm, SMALL SIZE

⑦ 7003000001101
單色 CARTON 385x305x203mm, AB浪, ROHS-H'2

⑤ 7003003001011
真空包裝袋, 285x90x480mm ANTI-S

⑥ 7003001001101
PIZZA BOX 345x285x88mm, B浪, ROHS-H'2

Vacuum packing .4 sec

⑧ RTD3208000125
封箱膠帶, W=48mm, L=910cm

⑦ 7003000001101
單色 CARTON 385x305x203mm, AB浪, ROHS-H'2

x2 pcs

x1 pcs

ITEM	PART No.	DESC	QTY	General Tolerance		CONFIDENTIAL	Scale	Unit	Sheet	PROJECT CODE	P39405	
				Length (mm)	Tolerance (mm)							
1	90L9839405000	MODULE ASSY FOR P39405 WHITE	30	0 ~ 8	±0.1	 Third Angle Projection	x	mm	1/1	Packing Instruction	REVISION 01	
2	80L9839405000	ANTI-STATIC BAG 80x90x0.07mm	30	8 ~ 25	±0.2		M.E.	Module	Spec.		Approved	REVISION 01
3	RTD3003000010	ANTI-STATIC BAG 80x90x0.07mm	10	25 ~ 50	±0.3		Kelly Hsu	Valerie Lo	Kelly Hsu		Johnson Hsu	90L9839405000

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

樣本代字 (CL)	驗證水準(VL)							
	T	VII	VI	V	IV	III	II	I
	樣本大小							
A	3072	1280	512	192	80	32	12	5
B	4096	1536	640	256	96	40	16	6
C	5120	2048	768	320	128	48	20	8
D	6144	2560	1024	384	160	64	24	10
E	8192	3072	1280	512	192	80	32	12

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: $25\pm 5^{\circ}\text{C}$

濕度 / Humidity: $50\pm 10\%\text{R.H.}$

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 $\geq 30\text{cm}$

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


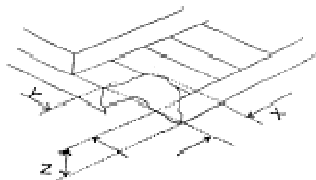
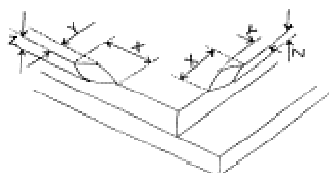
3.1 缺陷分類 / DEFECT CLASSIFICATION

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	

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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>$0.03 < W \leq 0.05$</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	$0.03 < W \leq 0.05$	$L \leq 1$	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																
$0.03 < W \leq 0.05$	$L \leq 1$	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	(1) 崩角 / Chip on corner  (2) 崩邊 / Chip on edge 	次要 Minor															

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項目 Item	描述 Description	標準 Criterion	允收 水準 AQL																
I. 面板 Panel	3. 玻璃崩邊、崩角 Glass chip	<table><tr><td>崩角 Chip on corner</td><td>Size (mm)</td><td>崩邊 Chip on edge</td><td>Size (mm)</td></tr><tr><td>X</td><td>≤1.5</td><td>X</td><td>≤3.0</td></tr><tr><td>Y</td><td>≤2.0</td><td>Y</td><td>≤1.0</td></tr><tr><td>Z</td><td>≤t</td><td>Z</td><td>≤t</td></tr></table> <p>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.</p>	崩角 Chip on corner	Size (mm)	崩邊 Chip on edge	Size (mm)	X	≤1.5	X	≤3.0	Y	≤2.0	Y	≤1.0	Z	≤t	Z	≤t	次要 Minor
	崩角 Chip on corner	Size (mm)	崩邊 Chip on edge	Size (mm)															
X	≤1.5	X	≤3.0																
Y	≤2.0	Y	≤1.0																
Z	≤t	Z	≤t																
	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。 Line type in accordance with the criteria of “Item I-1. Glass scratch”.	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	<div>(mm)</div> <table><tr><td>尺寸 Size</td><td>容許個數 number of pieces permitted</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 permitted	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	次要 Minor						
尺寸 Size	容許個數 number of pieces permitted																		
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. <table border="1"><thead><tr><th>平均直徑 Average diameter D:(mm)</th><th>容許個數 number of pieces permitted</th></tr></thead><tbody><tr><td>D ≤0.1</td><td>忽略 Ignore</td></tr><tr><td>0.1 < D ≤0.15</td><td>1</td></tr><tr><td>0.15< D ≤0.2</td><td>1</td></tr><tr><td>0.2 < D</td><td>0</td></tr><tr><td>顯示區外 beyond A.A.</td><td>忽略 Ignore</td></tr></tbody></table> 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.	平均直徑 Average diameter D:(mm)	容許個數 number of pieces permitted	D ≤0.1	忽略 Ignore	0.1 < D ≤0.15	1	0.15< D ≤0.2	1	0.2 < D	0	顯示區外 beyond A.A.	忽略 Ignore
平均直徑 Average diameter D:(mm)	容許個數 number of pieces permitted													
D ≤0.1	忽略 Ignore													
0.1 < D ≤0.15	1													
0.15< D ≤0.2	1													
0.2 < D	0													
顯示區外 beyond A.A.	忽略 Ignore													

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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.

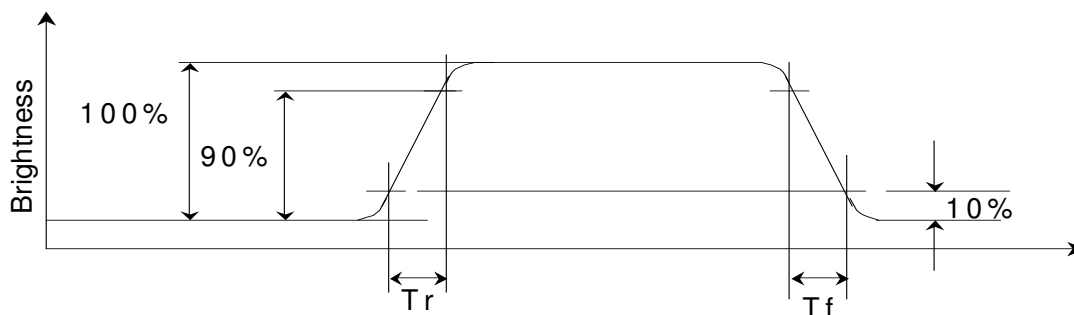


Figure 2 Response time

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.

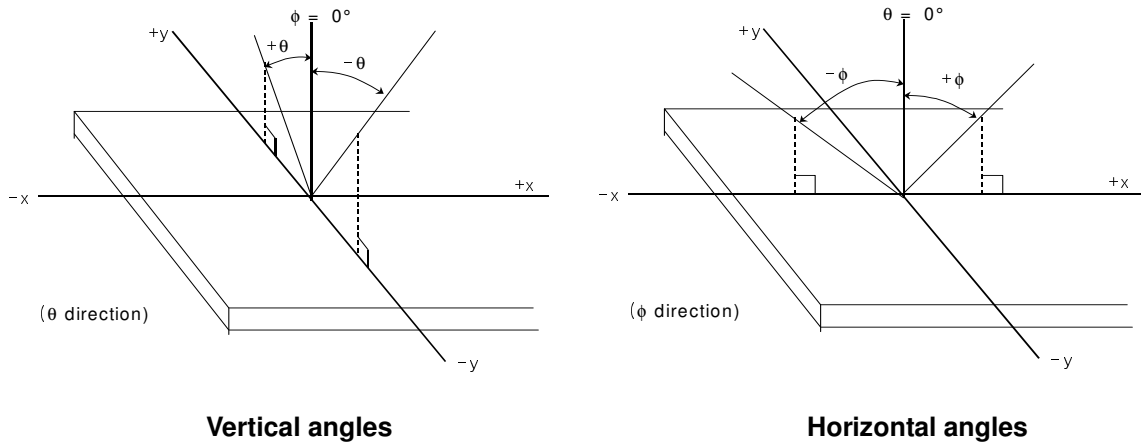
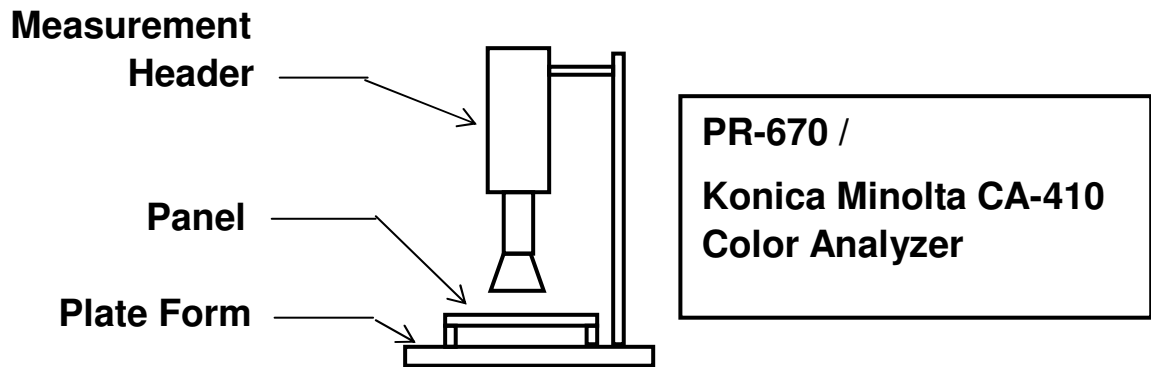


Figure 3 Viewing Angle

APPENDIX 2: MEASUREMENT APPARATUS

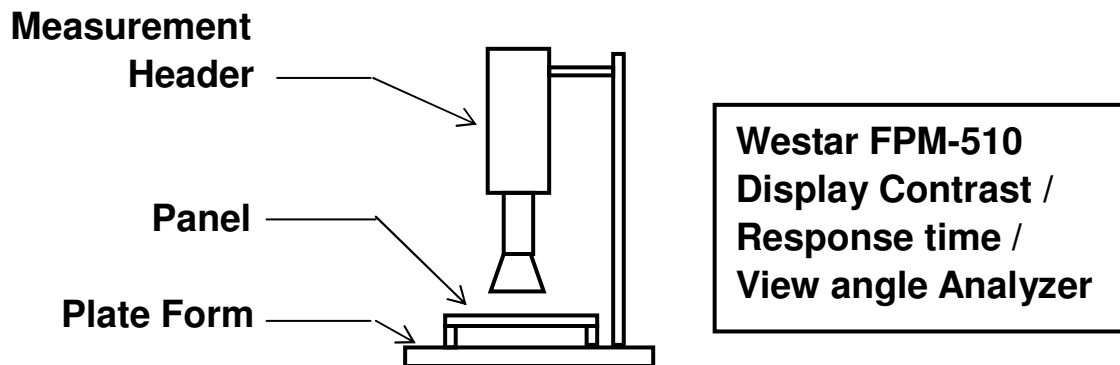
A. LUMINANCE/COLOR COORDINATE

PHOTO RESEARCH PR-670, Konica Minolta CA-410

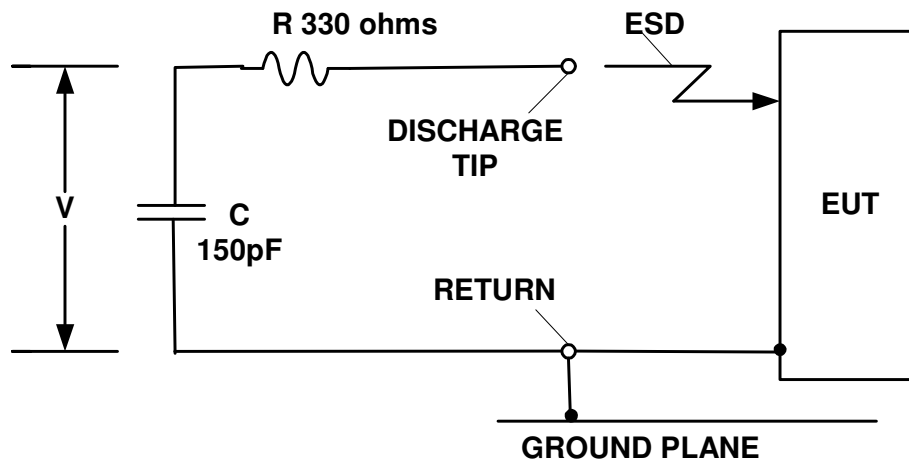


B. CONTRAST / RESPONSE TIME / VIEWING ANGLE

WESTAR CORPORATION FPM-510



C. ESD ON AIR DISCHARGE MODE



APPENDIX 3: PRECAUTIONS FOR USING THE OLED MODULE

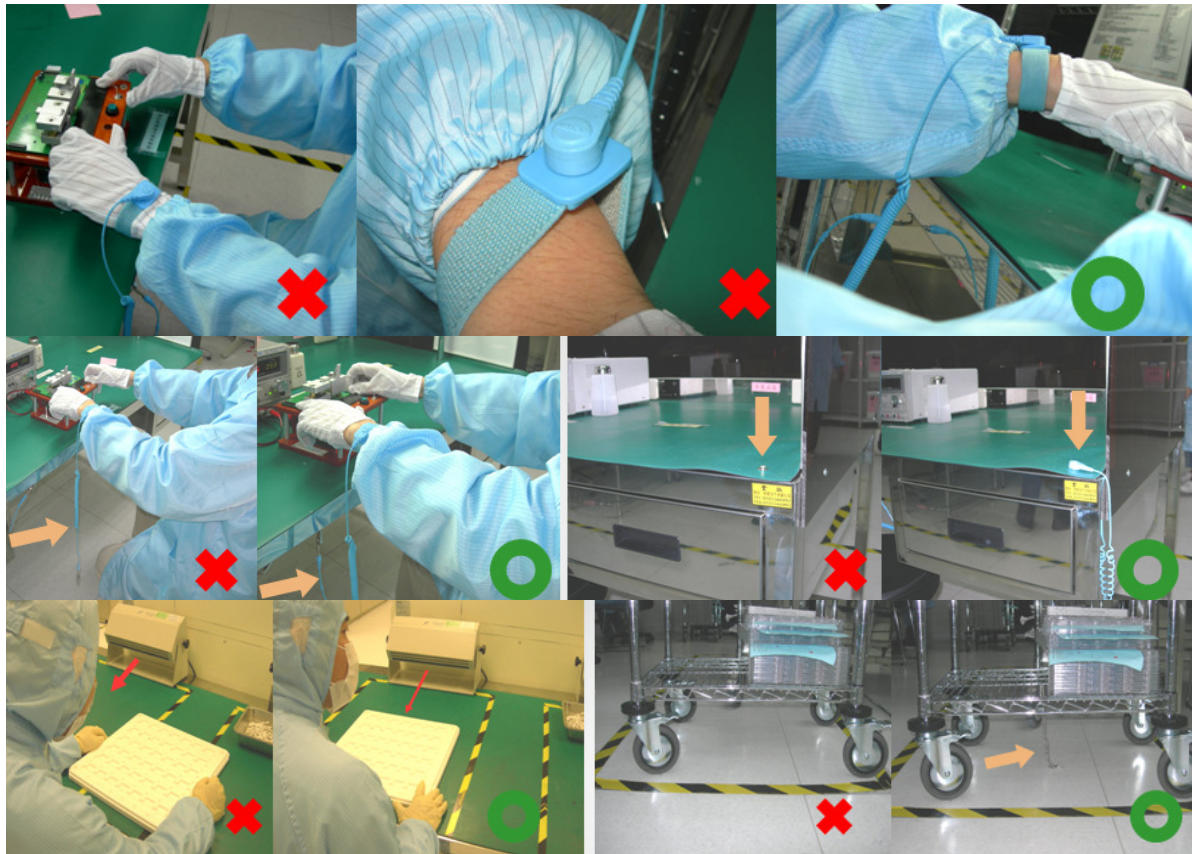
Precautions for Handling

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

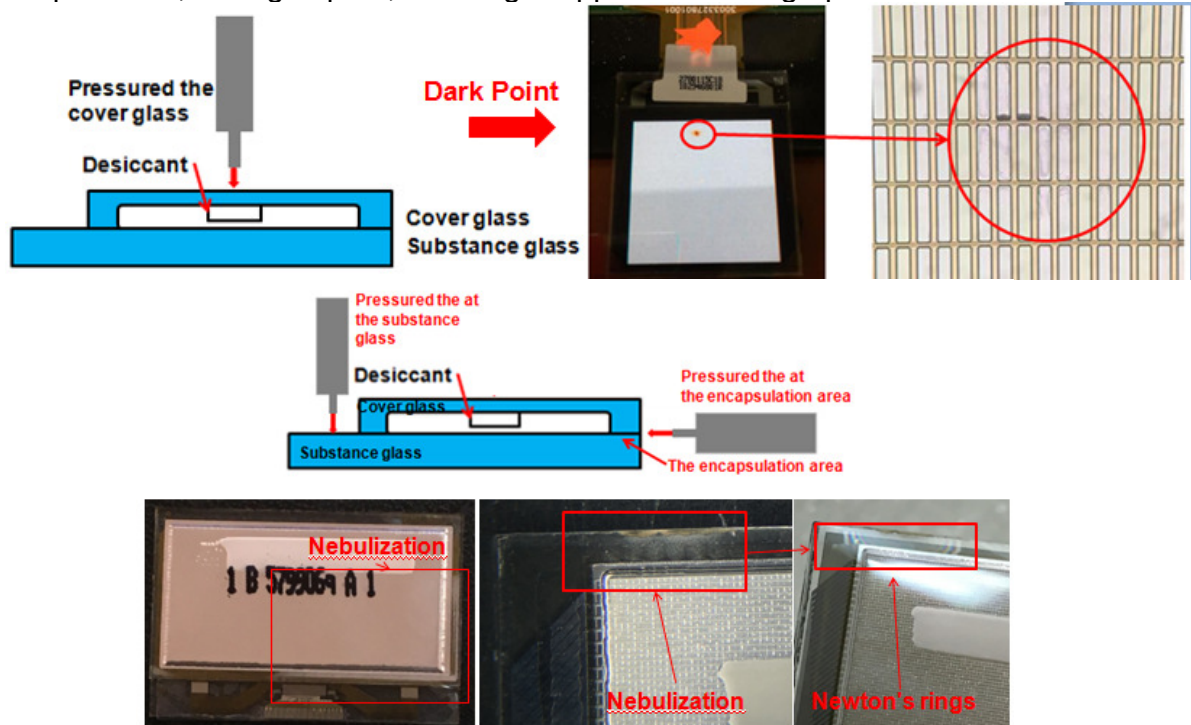
The environment should dispose the static elimination blower, anti-static pad, anti-static chair, and anti-static floor. The humidity maintains usually more than 40%



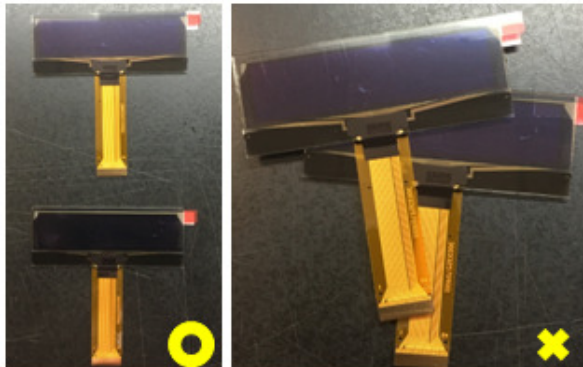
2. The OLED module is an electronic component and is subject to damage caused by Electro Static Discharge (ESD). And hence normal ESD precautions must be taken when handling it. Also, appropriate ESD protective environment must be administered and maintained in the production line. When handling and 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).



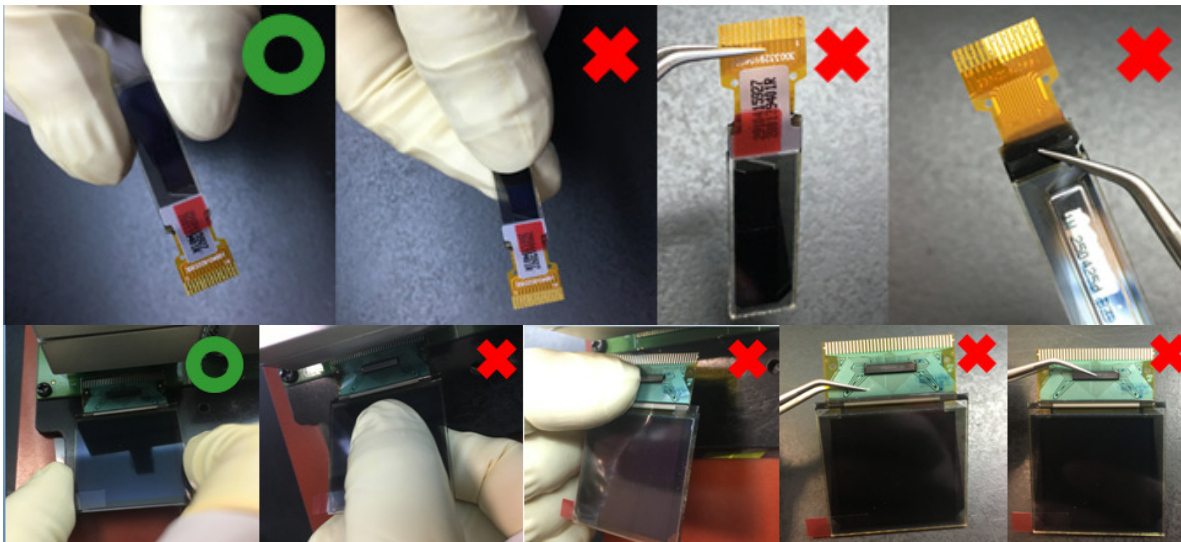
3. The OLED module is consisted of glass and film, and it should avoid pressure, strong impact, or being dropped from a high position.



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.



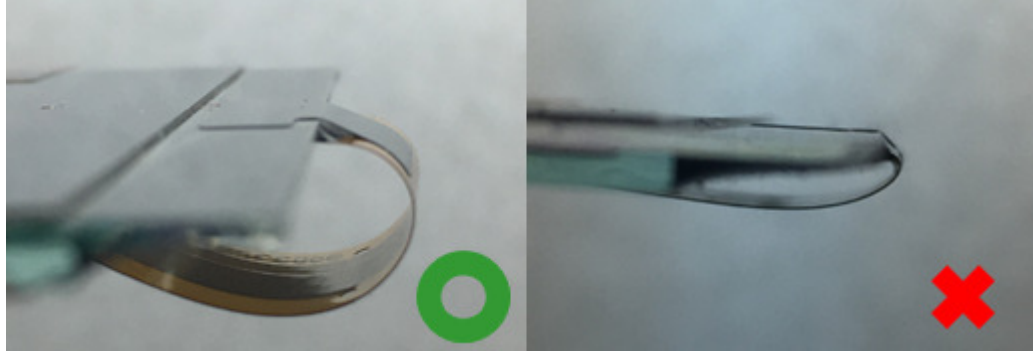
5. Avoid jerk and excessive bend on TAB/FPC/COF, and be careful not to let foreign matter or bezel damage the film.
6. When handling and assembling the module (panel + IC), grab the panel, not the TAB/FPC/COF.



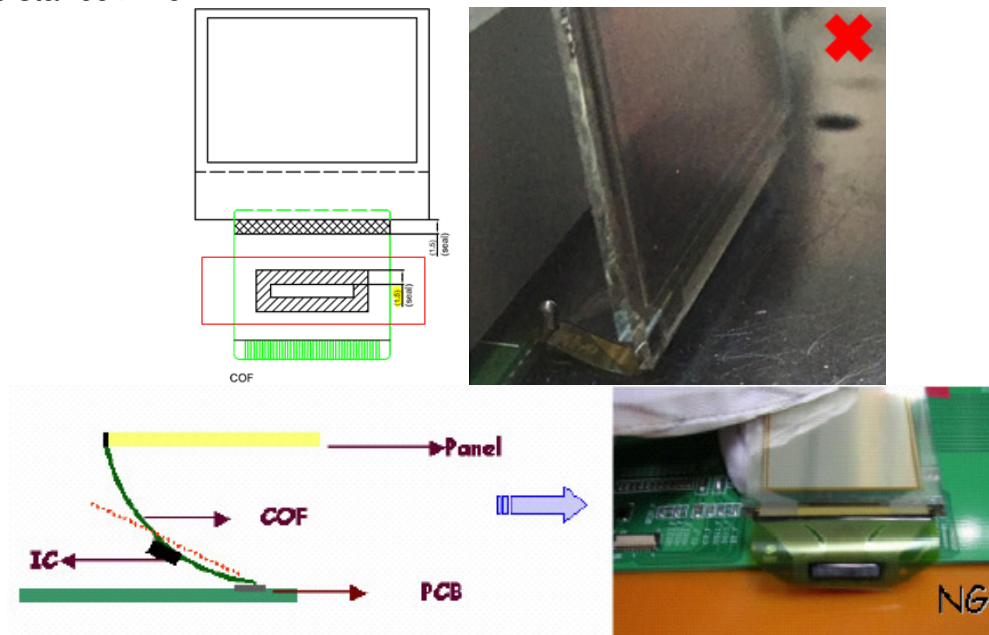
7. Use the tweezers to open the clicks on the connector of PCB before the insertion of FPC/COF, and click them back in. Once the FPC/COF sits properly in the connector, use the tweezers to avoid the damages.



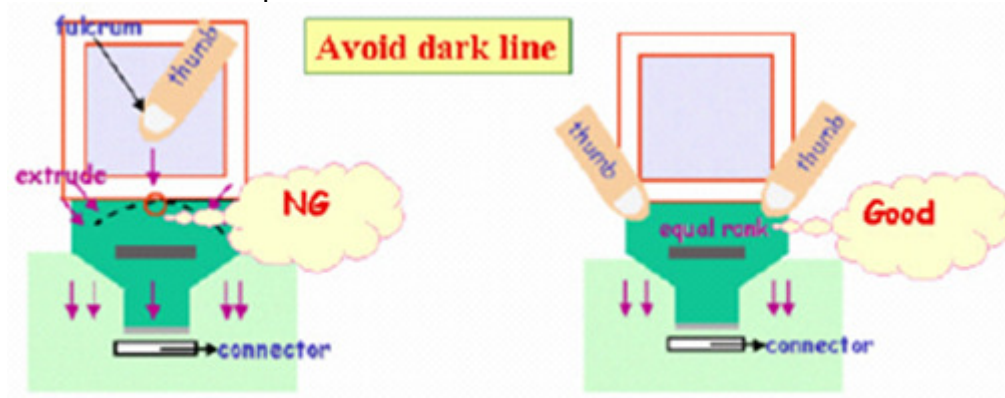
8. Please do not bend the film near the substrate glass. It could cause film peeling and TAB/FPC/COF damage. For TAB, It should bend the slit area as actual OLED it is. For FPC or COF, it is suggested to follow below pictures for instruction (distance between substrate glass and bending area $>1.5\text{mm}$;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



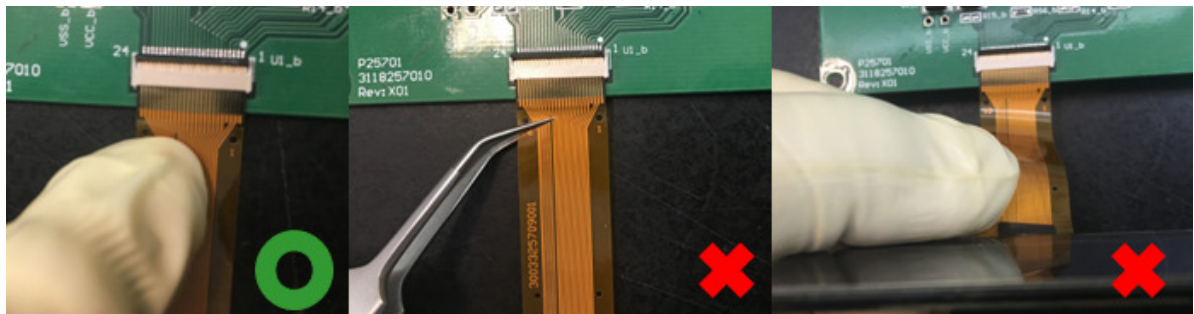
9. Avoid bending the film at IC bonding area. It could damage the IC ILB bonding. It should avoid bending the IC seal area. Please keep the bending distance $>1.5\text{mm}$.



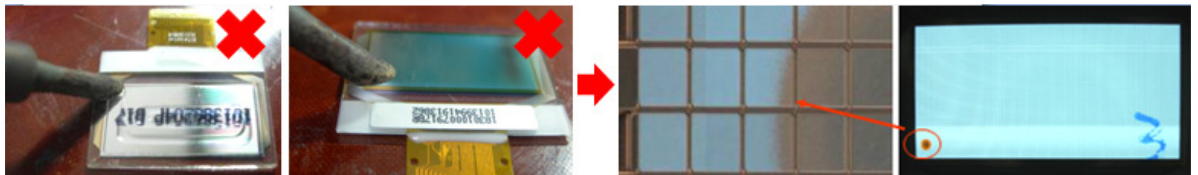
Use finger to insert COF /FPC into the connector when assembling the panel.
Please refer to the photo.



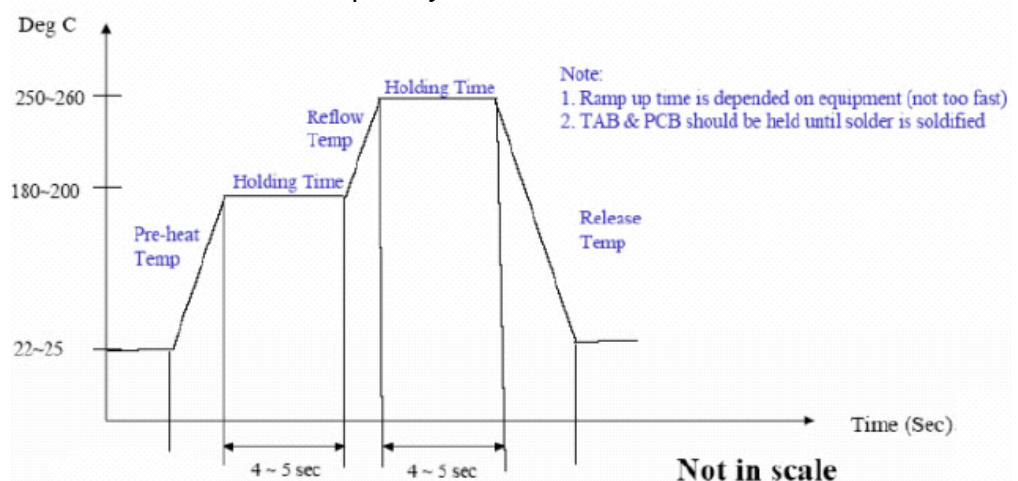
COF: Use both thumbs



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)

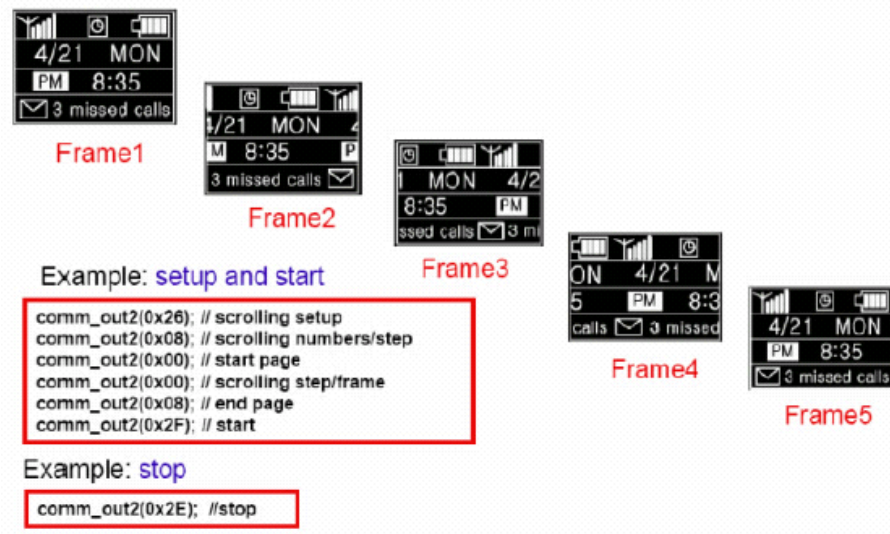
The OLED is a self-emissive device. As with other self-emissive device or displays consisting of self-emissive pixels, when a static image frozen for a long period of time is changed to another one with all-pixels-on background, residual image or image sticking is noticed by the human eye. Image sticking 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.

Black Background



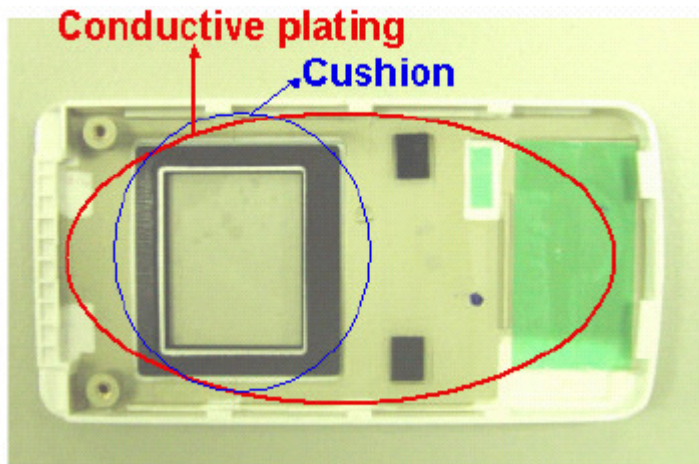
Scrolling example



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

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