

SPECIFICATION FOR AMOLED Module

MODULE No:	ID-156UHOEN018
CUSTOMER:	

I-DISPLAY	INITIAL	DATE
PREPARED BY		
CHECKED BY		
APPROVED BY		

CUSTOMER	INITIAL	DATE
APPROVED BY		

Revision History

[illegible]

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*** Description**

This is a color active matrix AMOLED module using Low Temperature Poly-silicon Thin Film Transistors as active switching devices. This module has a 15.6 inch diagonally measured active area with 3840horizontal by 2160vertical pixel arrays. Each pixel is divided into RED and GREEN dots, or BLUE and GREEN dots, and two pixels share RED or BLUE dots which are arranged in vertical stripe and this module can display 1.07B colors.

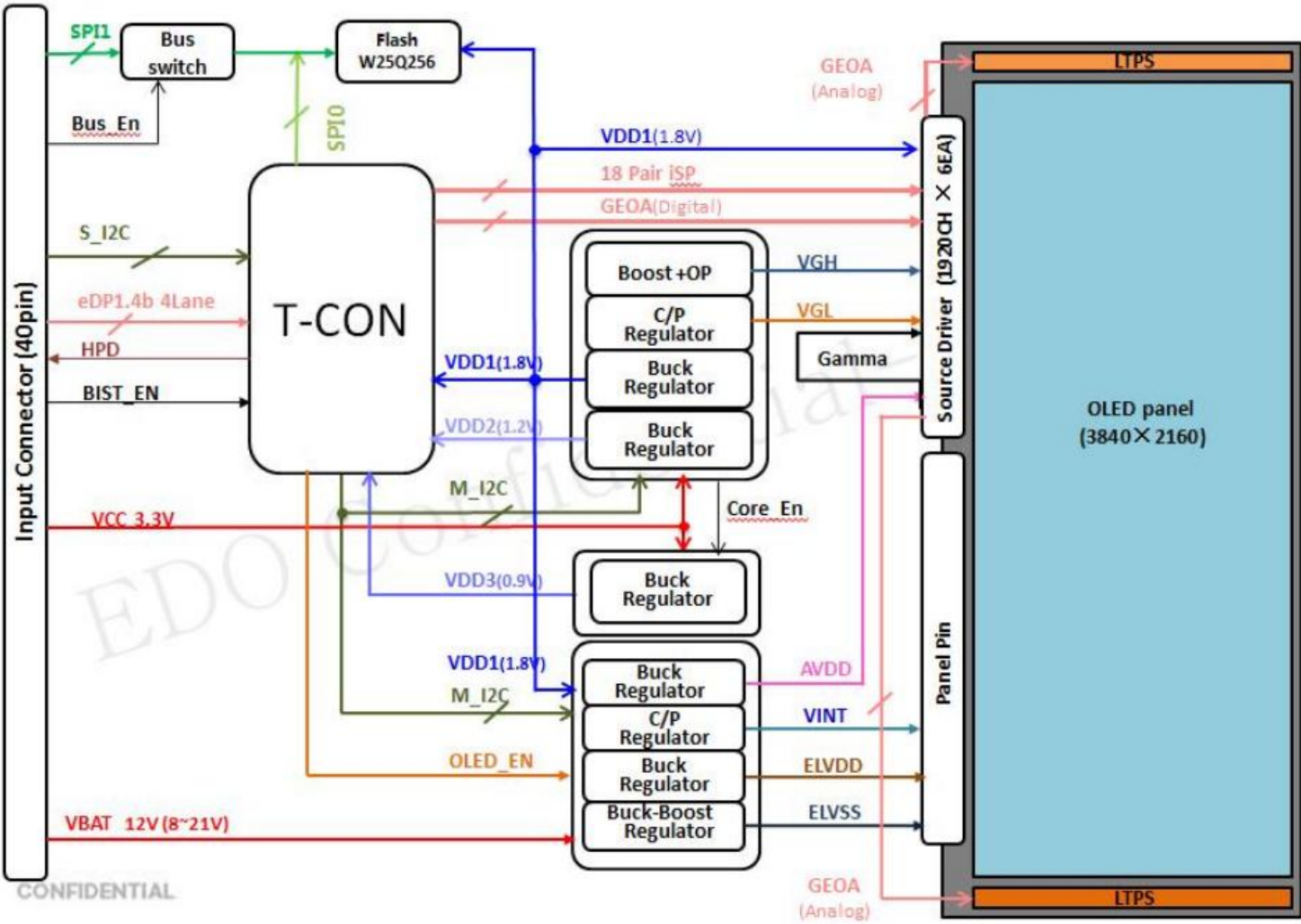
*** Features**

General Information Items	Specification	Unit	Note
	Main Panel		
Display area(AA)	344.2176(H)*193.6224 (V) (15.6 inch)	mm	
Driver element	LTPS TFT active matrix	-	
Display colors	1.07B	colors	
Number of pixels	3840(RGB)*2160	dots	
Pixel arrangement	RGB vertical stripe	-	
Pixel pitch	0.08964(H)*0.08964(V)	mm	
Viewing angle	ALL	o'clock	
Controller IC	RM98110	-	
LCM Interface	EDP 1.4b	-	
Display mode	Transmissive /Normally Black	-	
Operating temperature	-20~+70	℃	
Storage temperature	-40~+85	℃	

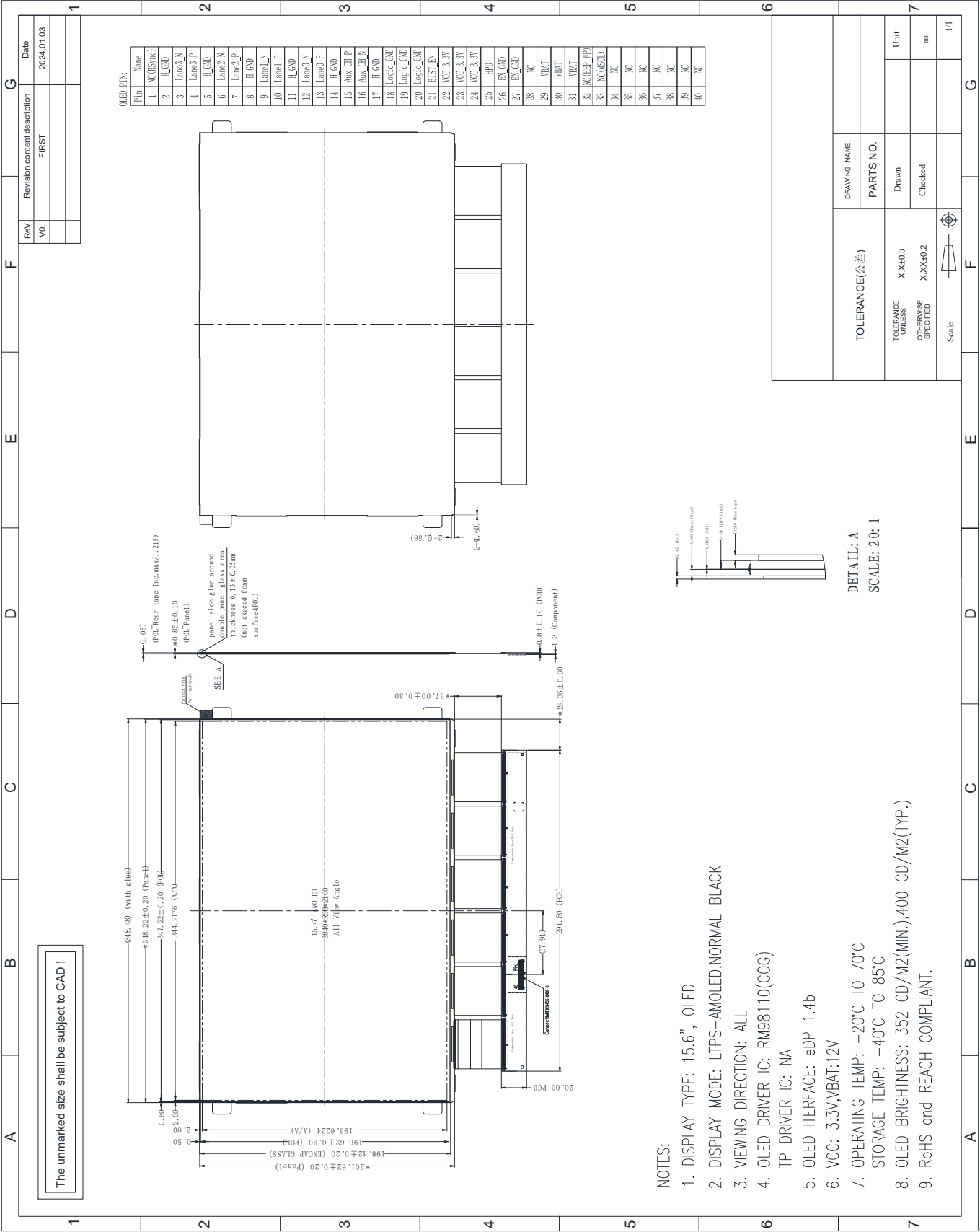
*** Mechanical Information**

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal(H)		348.48		mm	-
	Vertical(V)		201.62		mm	-
	Depth(D)		1.05		mm	-
Weight			TBD		g	-

1. Block Diagram



2. Outline dimension



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3. Input terminal Pin Assignment

3.1 TFT(Connector:IPEX 20849-040E-01)

NO.	SYMBOL	DISCRIPTION	I/O
1	NC(HSync)	Do not used. Test pin for display	--
2	GND	Hight Speed Ground	P
3	LANE3N	Complement Signal Link Lane 3	I
4	LANE3P	True Signal Link Lane 3	I
5	GND	Hight Speed Ground	P
6	LANE2N	Complement Signal Link Lane 2	I
7	LANE2P	True Signal Link Lane 2	I
8	GND	Hight Speed Ground	P
9	LANE1N	Complement Signal Link Lane 1	I
10	LANE1P	True Signal Link Lane 1	I
11	GND	Hight Speed Ground	P
12	LANE0N	Complement Signal Link Lane 0	I
13	LANE0P	True Signal Link Lane 0	I
14	GND	Hight Speed Ground	P
15	AUXP_CH_P	True Signal Auxiliary Channel	I
16	AUXN_CH_N	Complement Signal Auxiliary Channel	I
17	GND	Hight Speed Ground	P
18	Logic_GND	Logic and driver ground	P
19	Logic_GND	Logic and driver ground	P
20	Logic_GND	Logic and driver ground	P
21	BIST_EN	BIST enable signal	I
22	VCC_3.3V	Logic and driver power	P
23	VCC_3.3V	Logic and driver power	P
24	VCC_3.3V	Logic and driver power	P
25	HPD	HPD Signal	I
26	EN_GND	Ground for EL PMIC	P

27	EN_GND	Ground for EL PMIC	P
28	NC	--	--
29	VBAT	Power for EL PMIC	P
30	VBAT	Power for EL PMIC	P
31	VBAT	Power for EL PMIC	P
32	NC(EEP_WP)	Do not used. Test pin for display	--
33	NC(MSCL)	Do not used. Test pin for display	--
34	NC	Do not used. Test pin for display	--
35	NC	Do not used. Test pin for display	--
36	NC	Do not used. Test pin for display	--
37	NC	Do not used. Test pin for display	--
38	NC	Do not used. Test pin for display	--
39	NC	Do not used. Test pin for display	--
40	NC	Do not used. Test pin for display	--

4. OLED Optical Characteristics

4.1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Brightness			Normal (White mode)	352	400	448	cd/m ²	(1)
Peak Luminance(10% Box)			VESA HDR		520	-	cd/m ²	500TB
Brightness Uniformity			Full white		-	1.4		(2)
Contrast Ratio			Normal Θ=Φ=0°	-	100,000	-	-	(3)
Color of CIE Coordinate	White	x	Normal Θ=Φ=0°	0.293	0.313	0.333	-	
		y		0.309	0.329	0.349	-	
	Red	x		0.663	0.683	0.703	-	
		y		0.297	0.317	0.337	-	
	Green	x		0.195	0.235	0.275	-	
		y		0.694	0.734	0.774	-	
	Blue	x		0.117	0.137	0.157	-	
		y		0.024	0.044	0.064	-	
Color Gamut			DCI-P3	98	-100	--	%	(4)
			Adobe	95			%	
			sRGB	100	-	-	%	
White Temperature°K			Normal Θ=Φ=0°	6000	6500	7000	K	
Gamma			Normal Θ=Φ=0°	2.0	2.2	2.4	-	(5)
Response time			On/Off	-	1	2	ms	(6)
Viewing Angle			Top/Bottom/Right/ Left CR>10	85		-	°	(7)
Color Shift		Δuv	Θ=Φ=45°	-	-	0.025	-	(8)
Image Sticking		ΔL	Macbeth pattern, Max Lum, 3000h, Ambient : ~25℃, Panel : ~45℃	-	-	3.5	%	
Flicker			Normal Θ=Φ=0°	-	-	-35	dB	
Crosstalk			Normal Θ=Φ=0°	-	-	1.5	%	(9)
TUV blue ray certification			415-455nm/400-500nm			50	%	(10)
OLED Life Time			T50 @ 25℃	15,000	-	-	Hrs	(11)

Note 1: Brightness follows MicroSoft brightness3 (Based on OPR 50%).

The Brightness of full white pattern (OPR 100%) is the same as that of OPR 50%.



Note 2: Brightness uniformity

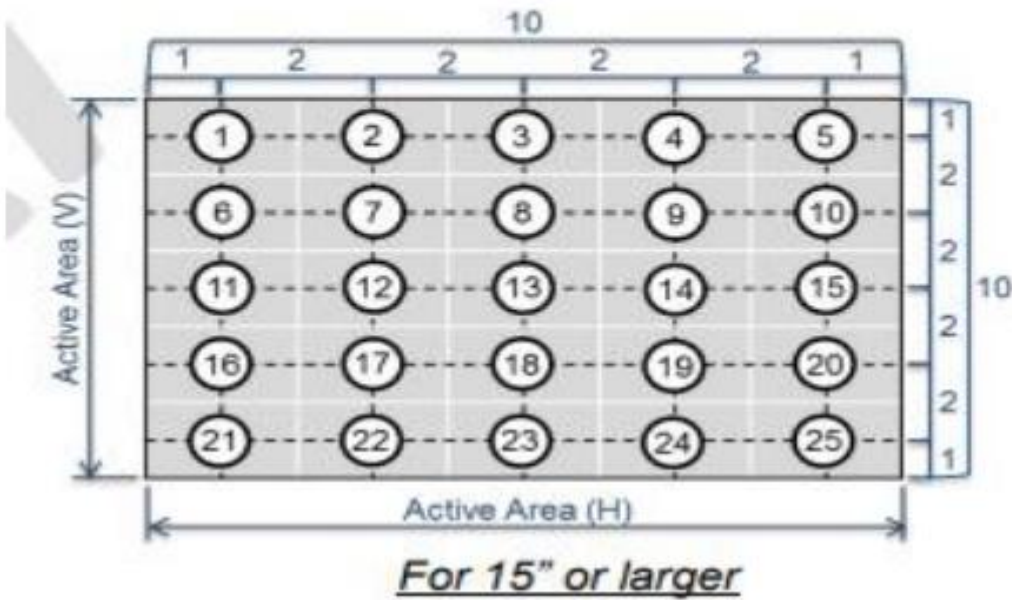
For brightness uniformity measure, EDO's request as below:

- 1. The test condition is at 25℃ and measured on the surface of Display panel module.
- 2. Measurement equipment: CA310 or similar equipment.
- 3. The brightness uniformity is calculated by using following formula:

Brightness Uniformity = Bp (Max.) / Bp (Min.)

Bp (Max.) = Maximum brightness in 25 measured spots

Bp (Min.) = Minimum brightness in 25 measured spots.



Note 3: 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: Color Gamut

For brightness uniformity measure, EDO's request as below:

- 1. Measurement equipment: CS2000A or similar equipment.
- 2. DCI-P3 & Adobe color data:

CIE1976	R	G	B
DCI-P3	(0.496,0.526)	(0.099,0.578)	(0.175,0.158)
Adobe	(0.451,0.523)	(0.076,0.576)	(0.175,0.158)
sRGB	(0.451,0.523)	(0.125,0.563)	(0.175,0.158)

- 3. The color gamut is calculated by using following formula:

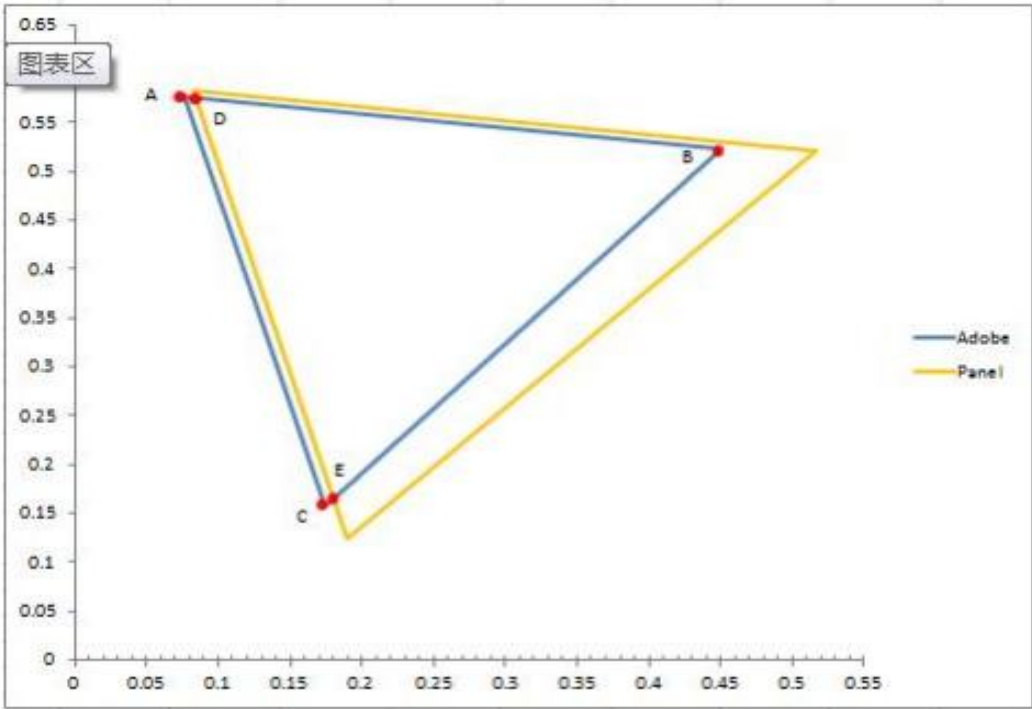
Color Gamut % = $S_{\text{coverage}} / S_{\text{original color gamut}}$

S_{coverage} : The area covered by panel color gamut

$S_{\text{original color gamut}}$: The triangle area of Adobe or DCI-P3 color gamut

For example:

Color Gamut % = $S_{\text{DEB}} / S_{\text{ABC}}$ %



Note 5: Gamma

For gamma curve control, EDO's request as below:

1. Calibration the test instrument. Set the screen size parameters, and measure the center point.
2. EDO will test the gray scale below, if possible also can use the patterns of gray 0 to 255 to test:
for example:

16, 17, 18, 19, ... , 237, 238, 239, 240. Total 225pcs patterns.

3. Output the measure data. Data number normalization and draw the chart.
4. The whole screen should be complied with the gamma curve of gamma 2.0 or 2.4, it means ± 0.2 error is allowed. But if there are special requirements for the special project, its required specifications can be used as a standard value, please refer the project spec.

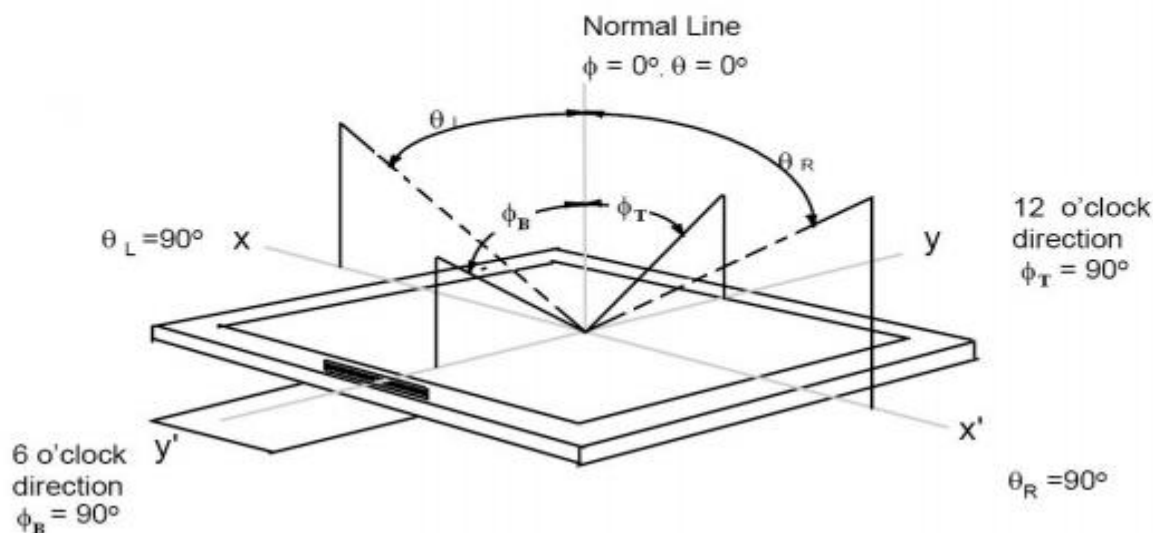
Note 6: Response Time

Response time=Pixel turn on and turn off time (White $\rightleftharpoons$ Black).

It is measuring transition time from 10% to 90% of luminance.

Note 7: The definition of Viewing Angle

Refer to the graph below marked by θ and ϕ



Note8: Color Shift

For color shift measure:

Fix on white pattern,

On the condition $\theta=0^\circ$ $F=0^\circ$, we can get the color coordinate (u_1', v_1') and on $\theta=45^\circ$ $F=45^\circ$ we can get another color coordinate (u_2', v_2')

$$\Delta = \text{Square Root}((u_2' - u_1')^2 + (v_2' - v_1')^2)$$

JNCD stands for "Just Noticeable Color Difference"

For the (u', v') color space 1 JNCD=0.0040

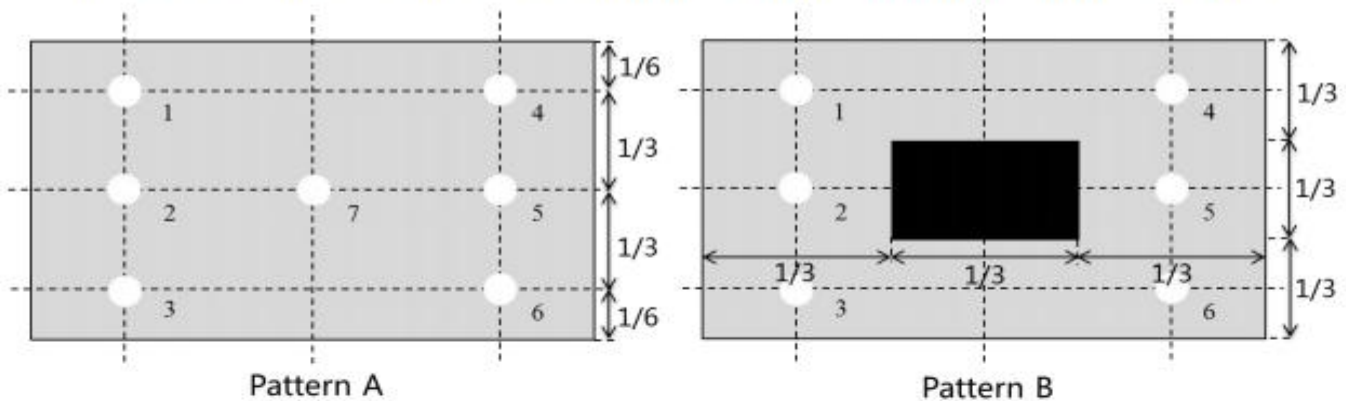
6.25 JNCD means $\Delta u'v' < 0.0250$.

This Requirement is from our customer and we have test some of our phone display and the result is OK.

Note9: Crosstalk

For crosstalk measure, EDO's request as below:

1. Pattern A and B are of 127 gray, the only difference is that black patch in the middle of pattern B.



2. Calibrate the test instrument.
3. Point 7 in pattern A is used as brightness calibration for each panel. Then measure the brightness of points 1 to 6 in pattern A and B.
4. Calculate the value of crosstalk according to the formula:
$$\text{Crosstalk} = \max\{ \{(B_2 - A_2) - [(B_1 - A_1) + (B_3 - A_3)]/2\}/A_2; \{(B_5 - A_5) - [(B_4 - A_4) + (B_6 - A_6)]/2\}/A_5 \}.$$

Note10: TUV blue ray certification

Under full white mode, test the spectra of center point, and then calculate the intensity in the range 415nm - 455nm and 400nm - 500nm. The ratio of intensity from 415nm - 455nm compared to 400nm - 500nm should be less than 50%.

Note11: OLED Life Time

The test procedure is as follows:

At room temperature(25 °C), light the module with typical value brightness(Full white). After that, record the brightness of center point every 24 hours. Then test 600 hours or more to collect the raw data. Finally, use the raw data and the specific formulas to calculate and estimate the T50.

5. TFT Electrical Characteristics

5.1 Absolute Maximum Rating (Ta=25 VSS=0V)

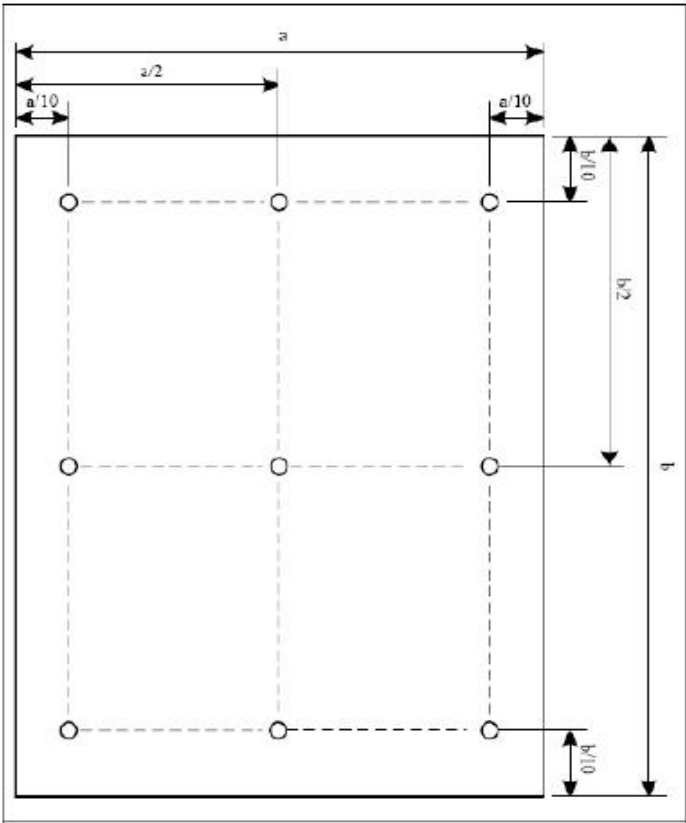
Characteristics	Symbol	Min.	Max.	Unit
System Supply Voltage	VCC_3.3V	-0.3	4.6	V
EL Power Supply Voltage	VBAT	-0.3	24	V
Operating temperature	T _{OP}	-20	+70	°C
Storage temperature	T _{ST}	-40	+85	°C

NOTE: If the absolute maximum rating of even is one of the above parameters is exceeded even momentarily, the quality of the product may be degraded. Absolute maximum ratings, therefore, specify the values exceeding which the product may be physically damaged. Be sure to use the product within the range of the absolute maximum ratings.

5.2 DC Electrical Characteristics

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Note
System Supply Voltage	VCC_3.3V	3.0	3.3	3.6	V	--
EL Power Supply Voltage	VBAT	8.0	12.0	21.0	V	--
Current Logic	I _{VCC_3.3V}	--	--	640	mA	--
Current Panel	I _{VBAT}	--	1033	1370	mA	--
Level input voltage	V _{IH}	0.7V _{CC}	--	I _{OVCC}	V	--
	V _{IL}	-0.3	--	0.3 V _{CC}	V	--
Level output voltage	V _{OH}	0.8V _{CC}	--	V _{CC}	V	--
	V _{OL}	GND	--	0.2V _{CC}	V	--

NOTE 3: Luminance Uniformity of these 9 points is defined as below:



$$\text{Uniformity} = \frac{\text{minimum luminance in 9 points (1-9)}}{\text{maximum luminance in 9 points (1-9)}}$$

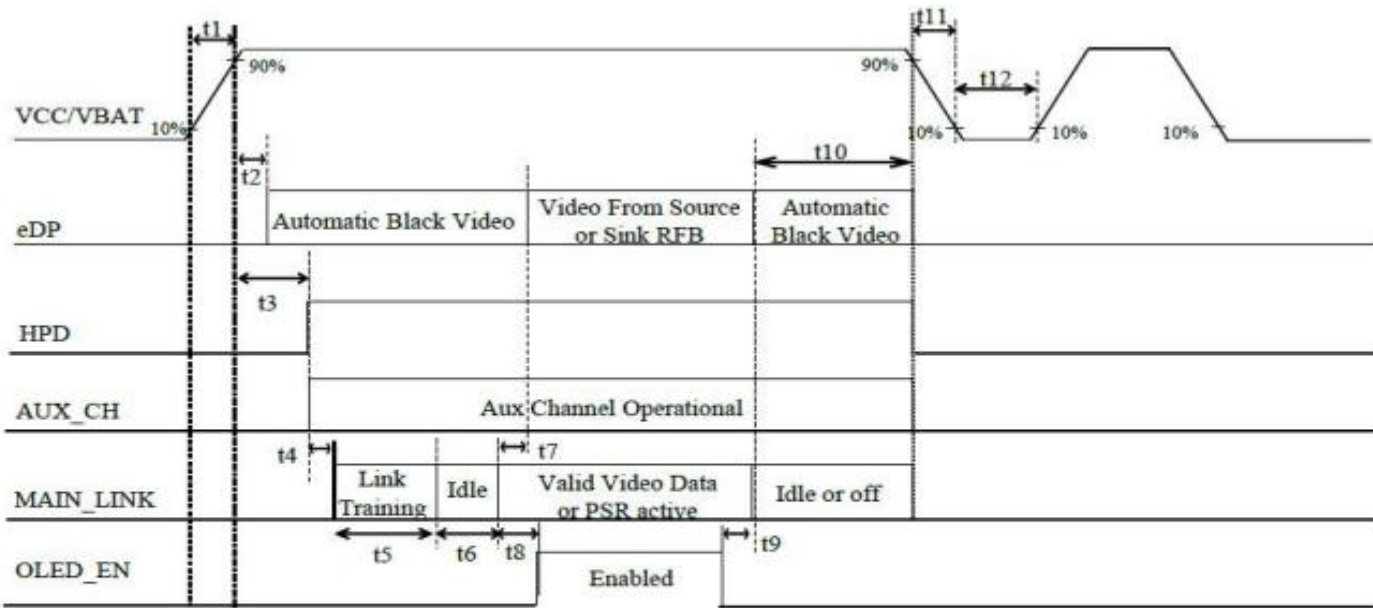
$$\text{Luminance} = \frac{\text{Total Luminance of 9 points}}{9}$$

6. TFT AC Characteristic

6.1 Interface

Resolution	3840(H) × 2160(V)	
eDP Speed	Typ	5.4 Gbps
Frame Freq.	Typ	60 Hz
Porch	HFP + HBP (with HS)	160
	VFP + VBP (with VS)	48

6.2 Recommended Operating Sequence



- ◆ It needs minimum 1200ms HPD~Valid Video Data(T4-T6). During the period display back data and valid video data before 1200ms can be lost.
- ◆ Do not keep the interface signal high-impedance or unusual signal when power is on.

Symbol	Min	Max	Unit	Description
t1	0.5	10	ms	Power rail rise time, 10 to 90%
t2	0	200	ms	Delay from VCC/VBAT to automatic Black Video
t3	0	200	ms	Delay from VCC/VBAT to HPD high
t4	-	-	ms	Allows for the Source device to read Link capability
t5	-	-	ms	Link Training duration
t6	-	-	ms	Link idle
t7	0	50	ms	Delay from valid video data from Source to video on display
t8	20	-	ms	Delay from valid video data from Source device to OLED_EN
t9	0	-	ms	Delay from OLED disable to end of valid video data
t10	0	500	ms	Delay from end of valid video data from the Source to power-off
t11	-	10	ms	Power rail fall time, 90 to 10%
t12	500	-	ms	Note

[Note] As for the power off-on sequence for VCC(t12), be sure to keep above mentioned timing. If the VCC power off-on sequence timing is other than shown above, Panel may cause permanent damage.

VCC-dip Condition

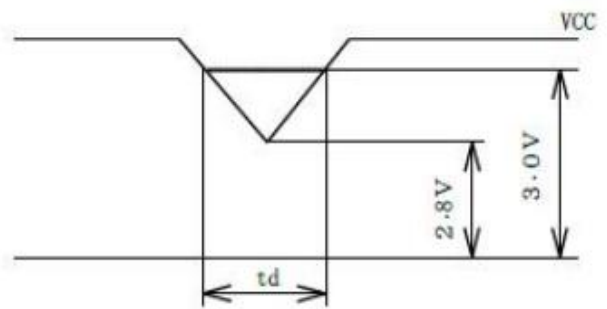
- 1) $2.8\text{ V} \leq V_{CC} < 3.0\text{ V}$

$$t_d \leq 10\text{ ms}$$

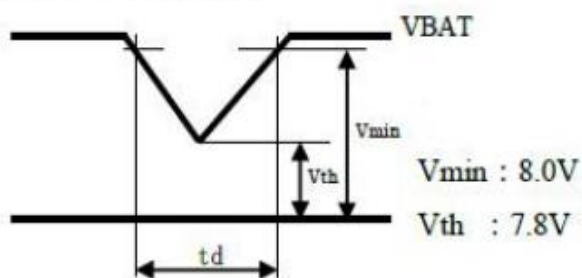
Under above condition, the display image should return to an appropriate figure after VCC voltage recovers.

- 2) $V_{CC} < 2.8\text{ V}$

VCC-dip conditions should also follow the ON-OFF conditions for supply voltage



VBAT-dip Condition



- 1) $V_{th} \leq V_{BAT} < V_{min} : t_d \leq 20\text{ms}$

- 2) $V_{BAT} < V_{th}$: The condition of instantaneous voltage drop is apply to display exception

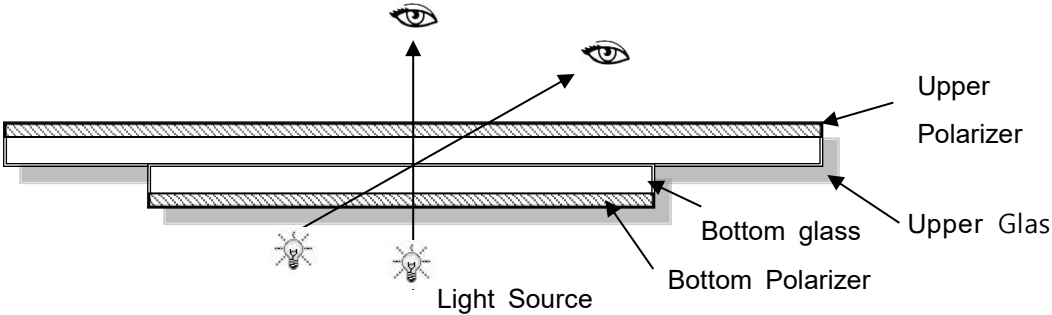
7. OLED Module Out-Going Quality Level

7.1 VISUAL & FUNCTION INSPECTION STANDARD

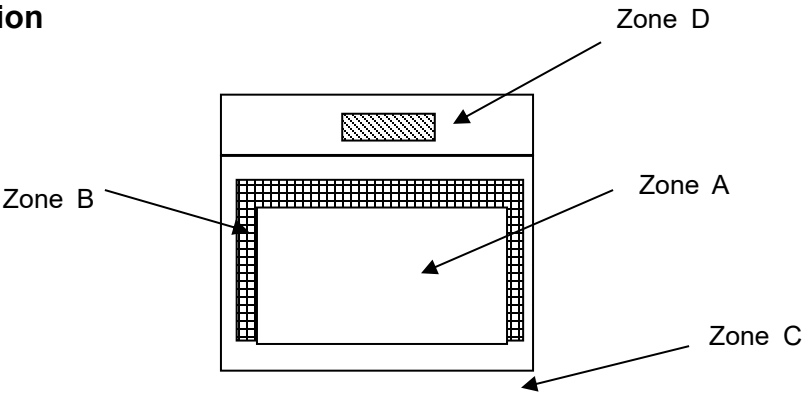
7.1.1 Inspection conditions

Inspection performed under the following conditions is recommended.

- Temperature : 25±5°C
- Humidity : 65%±10%RH
- Viewing Angle : Normal viewing Angle.
- Illumination: Single fluorescent lamp (300 to 700Lux)
- Viewing distance:30-50cm



7.1.2 Definition



- Zone A : Effective Viewing Area(Character or Digit can be seen)
- Zone B : Viewing Area except Zone A
- Zone C Cover (Zone A+Zone B) which can not be seen after assembly by customer .)
- Zone D : IC Bonding Area

Note:
As a general rule ,visual defects in Zone C can be ignored when it doesn't effect product function or appearance after assembly by customer

7.1.3 Sampling Plan

According to GB/T 2828-2012 ; , normal inspection, Class II

AQL:

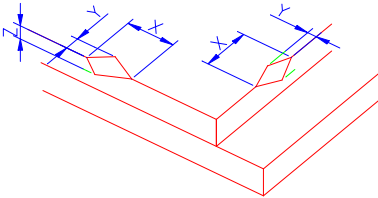
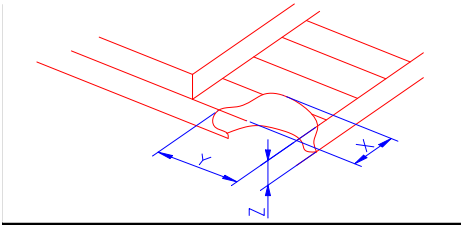
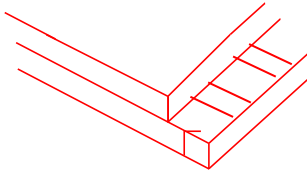
Major defect	Minor defect
0.65	1.5

OLED: Liquid Crystal Display , LCM: Liquid Crystal Module

No	Items to be inspected	Criteria	Classification of defects
1	Functional defects	1) No display, Open or miss line 2) Display abnormally, Short 3) Backlight no lighting, abnormal lighting. etc	Major
2	Missing	Missing components and etc	
3	Outline dimension	Overall outline dimension beyond the drawing is not allowed, deformation and etc	
4	Color tone	Color unevenness, refer to limited sample	Minor
5	Spot/Line defect	Light dot, Dim spot, (Note1) Polarizer Air Bubble, Polarizer accidented spot and etc	
6	Soldering appearance	Good soldering , Peeling off is not allowed and etc	
7	OLED/Polarizer	Black/White spot/line, scratch, crack, etc.	

Note1: a) Light dot: Dots appear bright and unchanged in size in which OLED panel is displaying under black pattern.
b) Dim dot: Dots appear dark and unchanged in size in which OLED panel is displaying under pure red, green, blue picture.

7.1.4 Criteria (Visual)

Number	Items	Criteria(mm)						
1.0 OLED Crack/Broken NOTE: X: Length Y: Width Z: Height L: Length of IT O, T: Height of OLE D	(1) The edge of OLE D broken	 <table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>≤3.0mm</td><td><Inner border line of the seal</td><td>≤T</td></tr></table>	X	Y	Z	≤3.0mm	<Inner border line of the seal	≤T
	X	Y	Z					
	≤3.0mm	<Inner border line of the seal	≤T					
(2)OLED corner broken	 <table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>≤3.0mm</td><td>≤L</td><td>≤T</td></tr></table>	X	Y	Z	≤3.0mm	≤L	≤T	
X	Y	Z						
≤3.0mm	≤L	≤T						
(3) OLED crack	 Crack Not allowed							

Spot defect

2.0

Y

X

$\Phi=(X+Y)/2$

① light dot (black/white spot , pinhole, stain, etc.)

Zone Size (mm)	Acceptable Qty		
	A	B	C
$\Phi \leq 0.15$	Ignore	Ignore	
$0.15 < \Phi \leq 0.25$	3(distance $\geq 10\text{mm}$)		
$0.25 < \Phi \leq 0.4$	2(distance $\geq 10\text{mm}$)		
$\Phi > 0.4$	0		

② Dim spot (light leakage、dent、dark spot, etc)

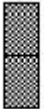
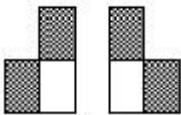
Zone Size (mm)	Acceptable Qty		
	A	B	C
$\Phi \leq 0.15$	Ignore	Ignore	
$0.15 < \Phi \leq 0.25$	3(distance $\geq 10\text{mm}$)		
$0.25 < \Phi \leq 0.4$	2(distance $\geq 10\text{mm}$)		
$\Phi > 0.4$	0		

③ Polarizer accidented spot

Zone Size (mm)	Acceptable Qty		
	A	B	C
$\Phi \leq 0.2$	Ignore		Ignore
$0.2 < \Phi \leq 0.5$	2(distance $\geq 10\text{mm}$)		
$\Phi > 0.5$	0		

④Polarizer Bubble

Zone Size (mm)	Acceptable Qty		
	A	B	C
$\Phi \leq 0.2$	Ignore		Ignore
$0.2 < \Phi \leq 0.4$	2(distance $\geq 10\text{mm}$)		
$\Phi > 0.4$	0		

3.0	OLED Pixel defect	Pixel bad points <table> <tr> <th>Item</th><th>Zone A</th><th>Acceptable Qt</th></tr> <tr> <td rowspan="3">Bright dot</td><td>Random</td><td>$N \leq 2$</td></tr> <tr> <td>2 dots adjacent</td><td>$N \leq 0$</td></tr> <tr> <td>3 dots adjacent</td><td>$N \leq 0$</td></tr> <tr> <td rowspan="3">Dark dot</td><td>Random</td><td>$N \leq 3$</td></tr> <tr> <td>2 dots adjacent</td><td>$N \leq 0$</td></tr> <tr> <td>3 dots adjacent</td><td>$N \leq 0$</td></tr> <tr> <td>Distance</td><td> 1. Minimum Distance Between Bright dots. 2. Minimum Distance Between dark dots 3. Minimum Distance Between dark and bright dot. </td><td>5mm</td></tr> <tr> <td colspan="2">Total bright and dark dot</td><td>$N \leq 4$</td></tr> </table> Note: A) Bright dot: Dots appear bright and unchanged in size in which OLED panel is displaying under black pattern. B) Dark dot: Dots appear dark and unchanged in size in which OLED panel is displaying under pure red, green, blue picture. C) 2 dot adjacent = 1 pair = 2 dots Picture:   2 dot adjacent 2 dot adjacent (vertical)   2 dot adjacent 2 dot adjacent (slant)	Item	Zone A	Acceptable Qt	Bright dot	Random	$N \leq 2$	2 dots adjacent	$N \leq 0$	3 dots adjacent	$N \leq 0$	Dark dot	Random	$N \leq 3$	2 dots adjacent	$N \leq 0$	3 dots adjacent	$N \leq 0$	Distance	1. Minimum Distance Between Bright dots. 2. Minimum Distance Between dark dots 3. Minimum Distance Between dark and bright dot.	5mm	Total bright and dark dot		$N \leq 4$
Item	Zone A	Acceptable Qt																							
Bright dot	Random	$N \leq 2$																							
	2 dots adjacent	$N \leq 0$																							
	3 dots adjacent	$N \leq 0$																							
Dark dot	Random	$N \leq 3$																							
	2 dots adjacent	$N \leq 0$																							
	3 dots adjacent	$N \leq 0$																							
Distance	1. Minimum Distance Between Bright dots. 2. Minimum Distance Between dark dots 3. Minimum Distance Between dark and bright dot.	5mm																							
Total bright and dark dot		$N \leq 4$																							

4.0	Line defect (OLED /Polarizer backlight black/white line, scratch, stain)  W: width, L : length N : Count	Width(mm)	Length(m)	Acceptable Qty		
				A	B	C
		$\Phi \leq 0.05$	Ignore	Ignore		Ignore
		$0.05 < W \leq 0.06$	$L \leq 5.0$	$N \leq 3$		
		$0.06 < W \leq 0.08$	$L \leq 4.0$	$N \leq 2$		
$W > 0.08$	Define as spot defect					
5.0	Electronic Components SMT.	Not allow missing parts, solderless connection, cold solder joint, mismatch, The positive and negative polarity opposite				
6.0	Display color& Brightness.	1. Color: Measuring the color coordinates, The measurement standard according to the datasheet or samples. 2. Brightness: Measuring the brightness of White screen, The measurement standard according to the datasheet or Samples.				
7.0	OLED Mura/Waving/Hot spot	Not visible through 5% ND filter in 50% gray or judge by limit sample if necessary.				

Criteria (functional items)

Number	Items	Criteria (mm)
1	No display	Not allowed
2	Missing segment	Not allowed
3	Short	Not allowed
4	Backlight no lighting	Not allowed
5	CTP no function	Not allowed

8. Reliability Test Result

Item	Condition	Inspection after test
High Temperature Operating	70°C,96H	Inspection after 2~4hours storage at room temperature, the sample shall be free from defects: 1.Air bubble in the OLED; 2.Non-display; 3.Missing segments/line; 4.Glass crack; 5.Current IDD is twice higher than initial value.
Low Temperature Operating	-20°C, 96HR	
High Temperature Storage	85°C, 96HR	
Low Temperature Storage	-40°C, 96HR	
High Temperature & High Humidity Storage	+60°C, 90% RH ,96 hours.	
Thermal Shock (Non-operation)	-20°C,30 min ↔ 70°C,30 min, Change time:5min 20CYC.	
ESD test	C=150pF, R=330,5points/panel Air:±8~15KV, 5times; Contact:±6~8KV, 5 times; (Environment: 15°C~35°C, 30%~60%).	
Vibration (Non-operation)	Frequency range:10~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z. (6 hours for total) (Package condition).	
Box Drop Test	1 Corner 3 Edges 6 faces,80cm(MEDIUM BOX)	

- Remark:
- 1.The test samples should be applied to only one test item.
 - 2.Sample size for each test item is 5~10pcs.
 - 3.For Damp Proof Test, Pure water(Resistance > 10MΩ) should be used.
 - 4.In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.
 - 5.Failure Judgment Criterion: Basic Specification, Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.
 - 6. The color fading mura of polarizing filter should not care.

9. Cautions and Handling Precautions

9.1 Handling and Operating the Module

- (1) When the module is assembled, it should be attached to the system firmly.
Do not warp or twist the module during assembly work.
- (2) Protect the module from physical shock or any force. In addition to damage, this may cause improper operation or damage to the module and back-light unit.
- (3) Note that polarizer is very fragile and could be easily damaged. Do not press or scratch the surface.
- (4) Do not allow drops of water or chemicals to remain on the display surface.
If you have the droplets for a long time, staining and discoloration may occur.
- (5) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.
- (6) The desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane.
Do not use ketene type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.
- (7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs, or clothes, it must be washed away thoroughly with soap.
- (8) Protect the module from static; it may cause damage to the CMOS ICs.
- (9) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
- (10) Do not disassemble the module.
- (11) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.
- (12) Pins of I/F connector shall not be touched directly with bare hands.
- (13) Do not connect, disconnect the module in the “Power ON” condition.
- (14) Power supply should always be turned on/off by the item 6.1 Power On Sequence &6.2 Power Off Sequence

9.2 Storage and Transportation.

- (1) Do not leave the panel in high temperature, and high humidity for a long time.
It is highly recommended to store the module with temperature from 0 to 35 °C and relative humidity of less than 70%
- (2) Do not store the TFT-OLED module in direct sunlight.
- (3) The module shall be stored in a dark place. When storing the modules for a long time, be sure to adopt effective measures for protecting the modules from strong ultraviolet radiation, sunlight, or fluorescent light.
- (4) It is recommended that the modules should be stored under a condition where no condensation is allowed. Formation of dewdrops may cause an abnormal operation or a failure of the module.
In particular, the greatest possible care should be taken to prevent any module from being operated where condensation has occurred inside.
- (5) This panel has its circuitry FPC on the bottom side and should be handled carefully in order not to be stressed.

10. Packing

----TBD-----