Densitron EUROPE OLED

June 10

2013

An overview of OLED Technology and Sales Critical Information.

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OLED Technology Overview

What is OLED?

Organic Light-Emitting Diode (OLED) Display Panel, or Organic Electroluminescence (OEL), utilizes new generation technologies and is capable of delivering visual performance which is superior to that of other flat displays – brighter and clearer full-colour images with more agile responding speed.

How does OLED emit light?

The basic structure of OLED is a sandwich formed with a thin and transparent semi-conducting anode of Indium Tin Oxide (ITO) and a metal cathode on both sides of an organic substrate. The organic material comprises hole transmission layer (HTL), emitting layer (EL) and electronic transmission layer (ETL).

When a proper voltage provided by the battery (low voltage property) is applied, holes injected in the anode and electric charges from the cathode meet and combine at the illuminating layer and excite electroluminescence; structure of the organic layer and design and choice of the anode and cathode are key factors to the light emitting efficiency of the OLED device.

The advantages of using OLED:

Visibility: Good visibility from long distance; wide viewing angle

Small Size: Thickness down to 1.6 mm; Pitch size smaller than that of any other display technology

Image Quality: High speed, contrast and colour saturation

Low Power Consumption: Efficient transformation of electricity into light, low heat output.

Easy to interface to: Choice of Parallel / SPI.

Competitive to LCD Costs in Volume.

Applications of OLED technology

Today OLED displays are used in a wide range of devices that require electronic display panels. Some of the most popular types of applications are:

- Personal Digital Assistants (PDAs)
- Audio/Visual display systems
- Mobile telephones
- Portable games
- Personal care appliances
- Household goods
- Dynamic information displays
- Medical handheld devices

However, the number of possible applications is growing every day, and is not restricted to particular industry sectors or product types.

Densitron Specific Examples

DENSITRON DISPLAYS

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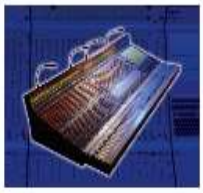
OLED Example Projects

The versatility of OLED is evident through its adoption by companies across a broad spectrum of industries. Many organisations chose OLED for its vivid images, excellent contrast ratio and an almost 175° viewing angle, which allow their offerings to be clearly differentiated from those of their competitors'.

Through managing a wide variety of OLED projects for industrial applications, Densitron has become very experienced in providing customers with OLED solutions that best meet with their requirements, and enhance their products' user-friendliness and aesthetic appeal to end consumers.

Examples of the projects that Densitron managed for customers are shown below:

Type of project	Description	Type of display used
	**Colour Mixing Desk Platform** This product is used to alter the colour of various digital media. Incorporating three of Densitron's blue PMOLED modules, the editing platform has been transformed, raising the profile of the product in its marketplace. The displays allow the user an easy to read interface with superb high contrast.	3.12" PMOLED DD-25664BE-3A
	**Digital Audio Mixing Desk** The product has replaced historical Analogue Audio technology introducing a large array of PMOLED modules. During concerts, when the lighting is low, the desk literally illuminates a room with the banks of OLED displays in five colours.	1.16" PMOLED DD-32645C-1A

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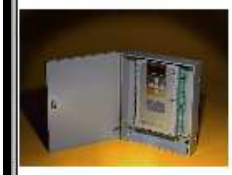
	**Broadcasting Communication Equipment** 1U high rack mounted Broadcasting equipment has benefited greatly from Densitron's blue OLED displays. The operator can see the displays from any angle at distances of several meters.	1.11" PMOLED DD-2832BE-1A
	**Rebreather Monitor** This is a novel Diving Rebreather Monitor, which dramatically lowers risk to the diver. The AMOLED displays used are perfect for the underwater, dark, low temperature environment.	2.4" AMOLED C0240QGLA-T
	**Formula2 Racing Car Monitor** This diagnostic unit has revolutionised the steering wheel and dash mounted racing industry allowing direct sunlight readability. The 4.3" AMOLED based product is currently being used on all Formula 2 cars in a steering wheel mounted version, allowing instant access to engine monitoring.	4.3" AMOLED P0430WQLC-T
	**Naval Maritime Instrumentation** On board ships, the OLED is used to great effect. In dim lighting conditions, the PMOLED illuminates the the ship's instrumentation panel.	2.8" PMOLED DD-25664YW-3A
	**Digital Pressure Controller** The smart keypad used in this general-purpose water pressure source and volume change gauge, incorporates the OLED to great effect, giving the product a distinct look and style.	2.7" PMOLED DD-12864YO-1A

Densitron OLED Technology

	**Intelligent RFID Control System** The Yellow OLED ensures the control box can be seen from any position it is located within a room. The wide viewing angle and high brightness make this ideal for the application.	2.7" PMOLED DD-12864YO-1A
	**Power Analysis Instrumentation** This range of instrumentation utilizes the 4.3'' AMOLED's resolution to its full capability. Allowing an extensive array of information to be displayed, the AMOLED provides a very powerful user interface, for Instrumentation where accurate complex data acquisition and measurement is paramount.	4.3" AMOLED P0430WQLC-T
	**Bluetooth Remote Control For Underground Mining Machine** The handsets integral AMOLED display provides clear visual feedback to the operator allowing them to maintain a safe distance from the cutting operation. The low power and ultra thin AMOLED is ideally suited to portable equipment.	2.4" AMOLED C0240QGLA-T

	**Hand Held Noise Detection Device** The AMOLED was chosen to allow large amounts of data to be analysed simultaneously, clearly and from all angles. Low power and thin profile are also features which benefit such application	2.8" AMOLED C0283QGLD-T
	**Personal Gas Alarm** The Yellow OLED gives this Gas Alarm application the ability to clearly display dangers from any angle. The user can wear it in all lighting conditions and see the information from any angle. Battery driven, low power, wide viewing and strong contrast, perfect example of PMOLED use.	1.54" PMOLED DD-12864YO-3A
	**Personal Asset Tracking** This security application used a Yellow PMOLED for this niche asset tracking device. The OLED is utilized in negative image mode to preserve power, and clearly works well to enhance the appearance of the device.	1.54" PMOLED DD-12864YO-3A

	**Laser Games** The OLED offers wide viewing angle and works especially well for these laser game packs which are used in a dark environment. The user is given the ability to read small text from a distance and from any direction.	2.7" PMOLED DD-12864YO-7A
	**Two Way Messaging and Tracking Device** The yellow OLED provides a superior customer interface and works well with the product's branding and colour scheme.	1.54" PMOLED DD-12864YO-3A
	**Audio Mixing Desk** The Dual Colour Mono OLED forms a bank of displays which offer the user a wide viewing angle and unparalleled optical interface, with dual colour advantage.	0.96" PMOLED DD-2864BY-5A
	**LED Lighting Controller** Colour OLED is perfect for control applications, where a large amount of information must be conveyed in a small viewable area. This customer was able to take advantage of the small pixel size, and utilise many colours to make their menu structure stands out.	1.5" PMOLED DD-128128FC-6A

PMOLED vs AMOLED

A PMOLED display uses a simple control scheme in which you control each row (or line) in the display sequentially (one at a time). PMOLED electronics do not contain a storage capacitor and so the pixels in each line are actually off most of the time. To compensate for this you need to use more voltage to make them brighter. If you have 10 lines, for example, you have to make the one line that is on 10 times as bright.

So while PMOLEDs are easy (and cheap) to fabricate, they are not efficient and the OLED materials suffer from lower lifetime (due to the high voltage needed). PMOLED displays are also restricted in resolution and size (the more lines you have, the more voltage you have to use). PMOLED displays are usually small (up to 3" typically) and are used to display character data or small icons: they are being used in MP3 players, mobile phone sub displays, etc.

An AMOLED (Active-Matrix OLED) is driven by a TFT which contains a storage capacitor that maintains the line pixel states, and so enables large size (and large resolution) displays. AMOLEDs can be made much larger than PMOLED

and have no restriction on size or resolution. AMOLED Technology is currently for the most part manufactured for use within the consumer/multimedia Industry, focusing on products such as Mobile Phone Technology and PDA's.

The first OLED products in the market used PMOLEDs - these were MP3 players, sub-displays on cellphones and radio decks for automobiles. The displays were small and usually with just one or two colors. When AMOLED panels started to emerge in 2007 and 2008 we have seen these larger displays in mobile video players, digital cameras, mobile phones main displays and even OLED TV sets.

Key Features:

Technology: Passive Matrix

Logic Supply Voltage: 2.8 ~ 3.6 V

Contrast: 2000:1

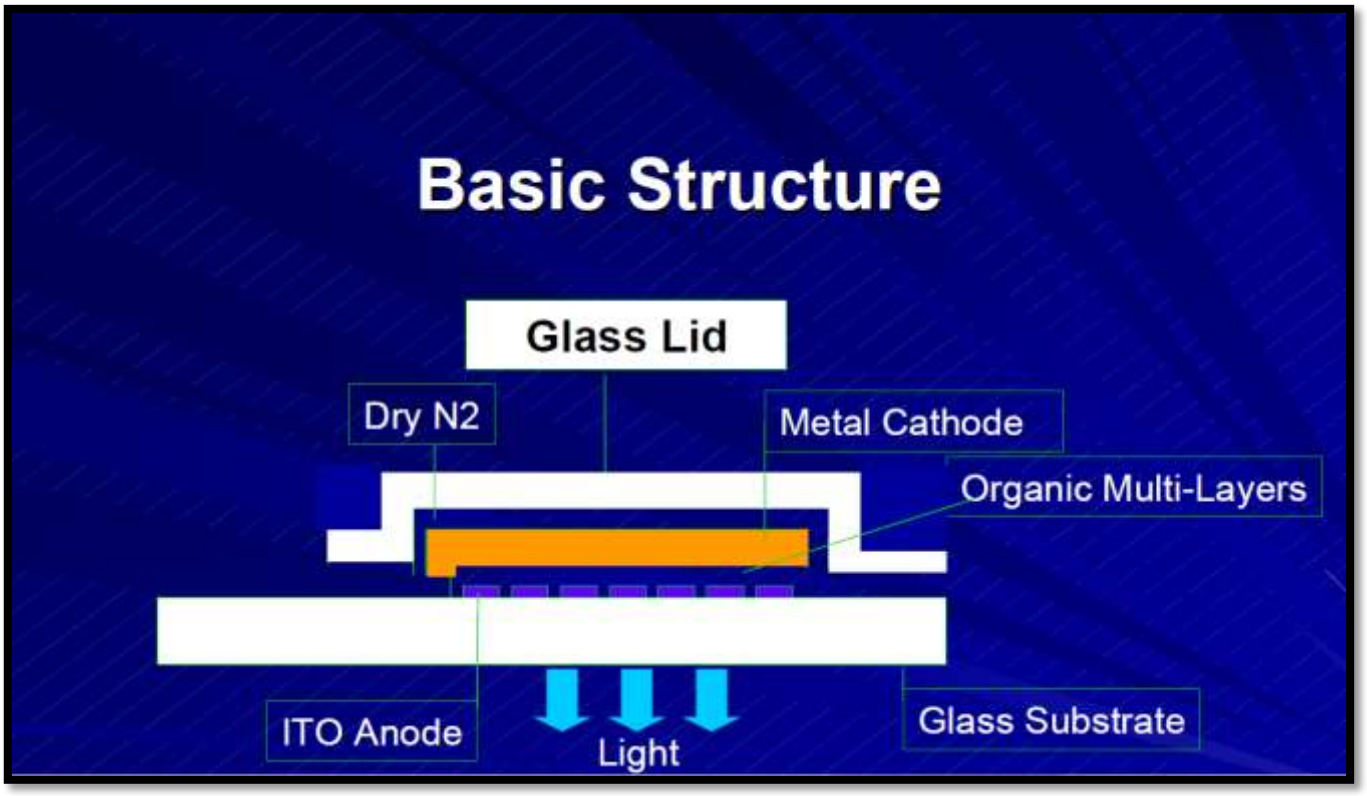
Viewing angle: >160°

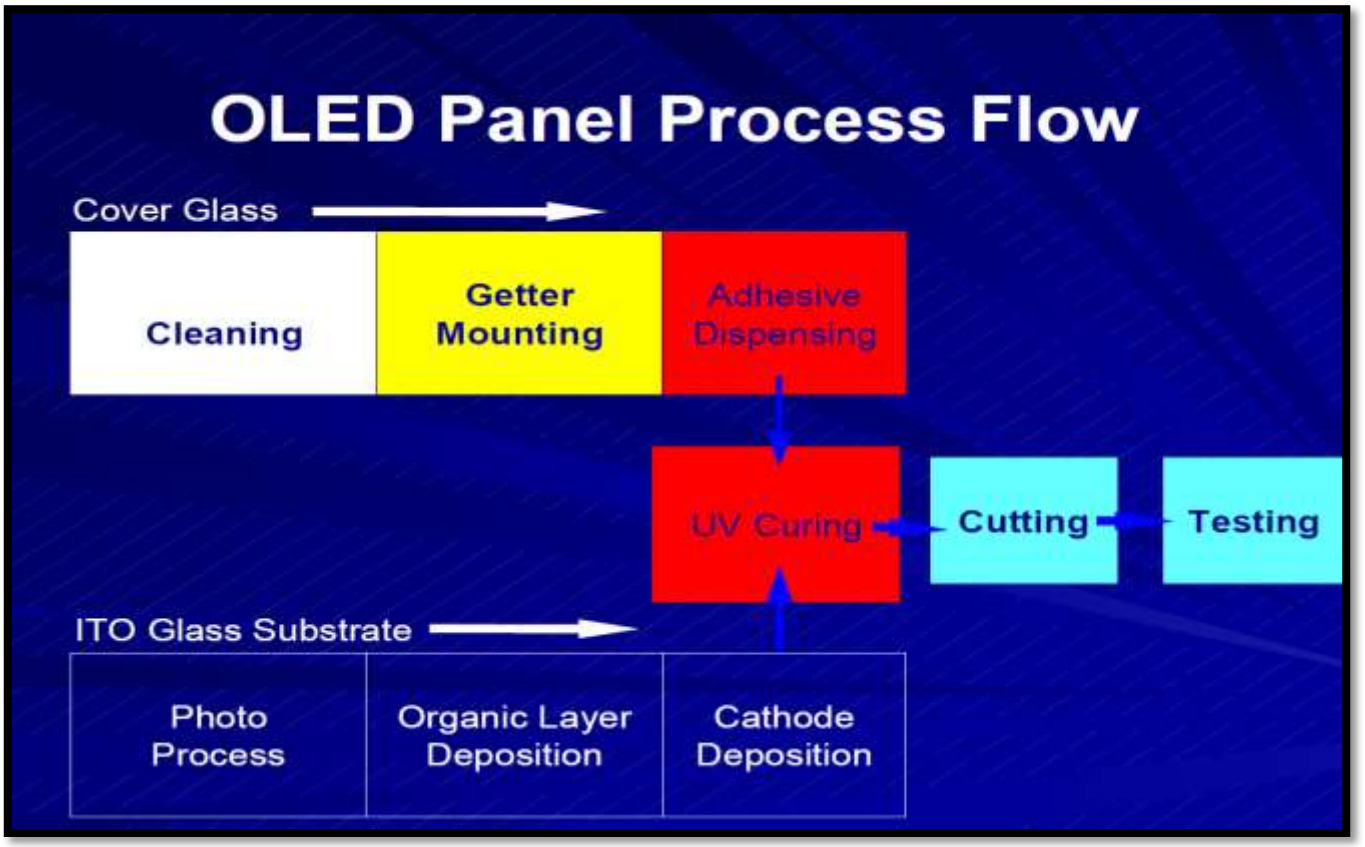
Response time: <10 µs

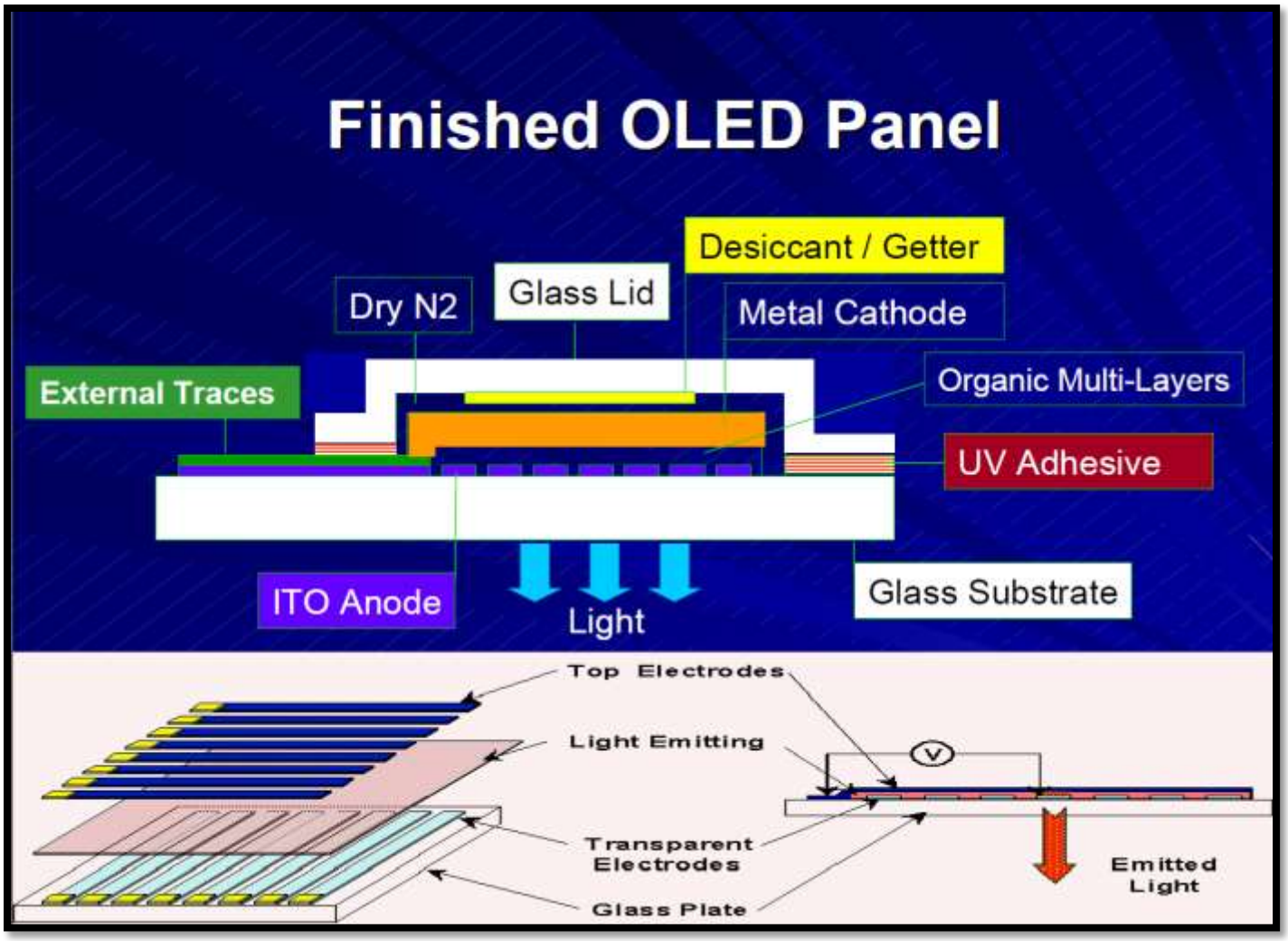
Operating Temperature: from -30°C up to 85°C

Storage Temperature: from -40°C up to 90°C

PMOLED Structure






Finished OLED Panel
Desiccant / Getter
Dry N2
Glass Lid
Metal Cathode
External Traces
Organic Multi-Layers
UV Adhesive
ITO Anode
Light
Glass Substrate
Top Electrodes
Light Emitting
V
Transparent Electrodes
Emitted Light
Glass Plate

PMOLED Lifetime Considerations

PMOLED Technology has an inherent lifetime, associated with the physical degradation of the organic material used to generate the specific colour(s).

The half-life is classified as the time taken for a unit to reach half brightness, operating under the test conditions of:

- Initial brightness of 80 Cd/m²
- The test pattern is 50% on for each pixel. (White/Black/Odd checkerboard/Even checkerboard repeated with 0.5S for each Display pattern.)
- Room Temperature.

High temperature accelerated ageing is used to determine the half-life of each type of OLED material.

$$AF = e^{\left[\frac{E_a}{k}\left(\frac{1}{Tu}-\frac{1}{Ts}\right)\right]}$$, where

AF = Thermal accelerati on factor
E_a = Activation energy in electron Volts (eV)
k = Boltzmann' s constant 8.62×10^{-5} $(eV)/°K$
Tu = Junction temperatio n at nomarl use condition in$°K$
Ts = The stress temperatur e in$°K$

Colors	Lifetime Estimation (hrs)
Full Color	15,000
Blue	15,000
Green	50,000
Yellow	150,000
Orange	70,000
White	40,000

* The estimation is based on the 80cd/m^2 initial luminance and 1/64 duty driving.

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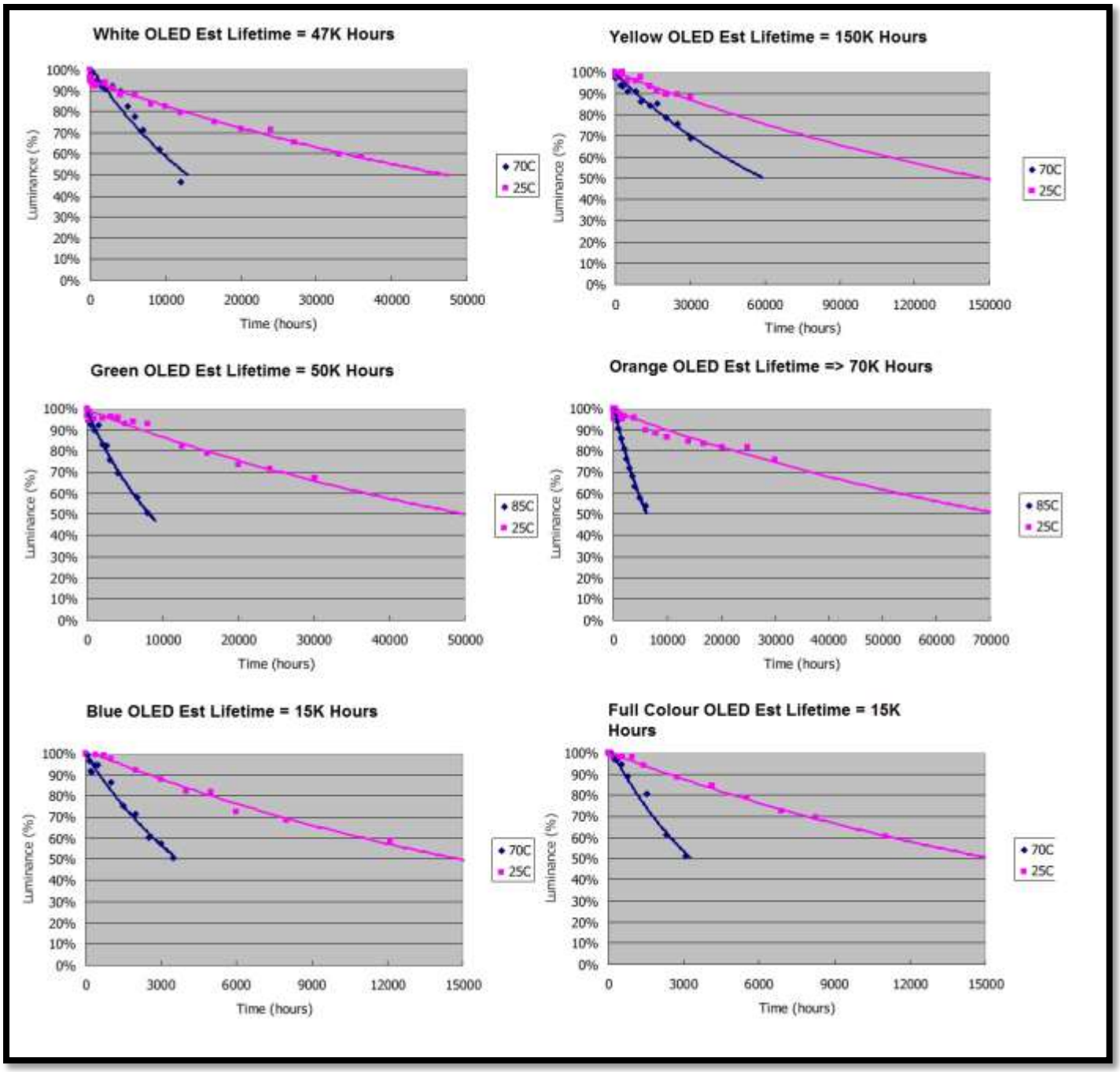
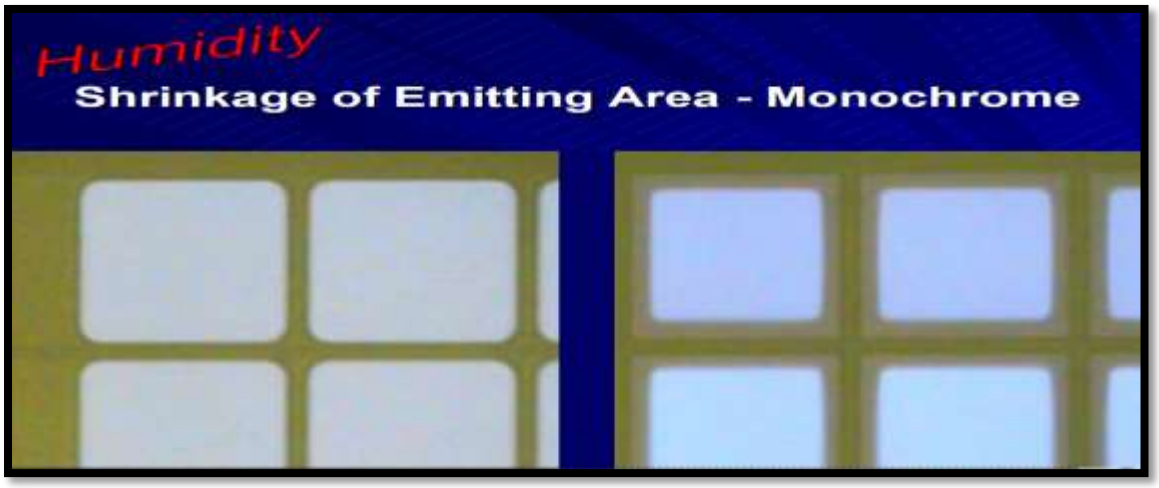
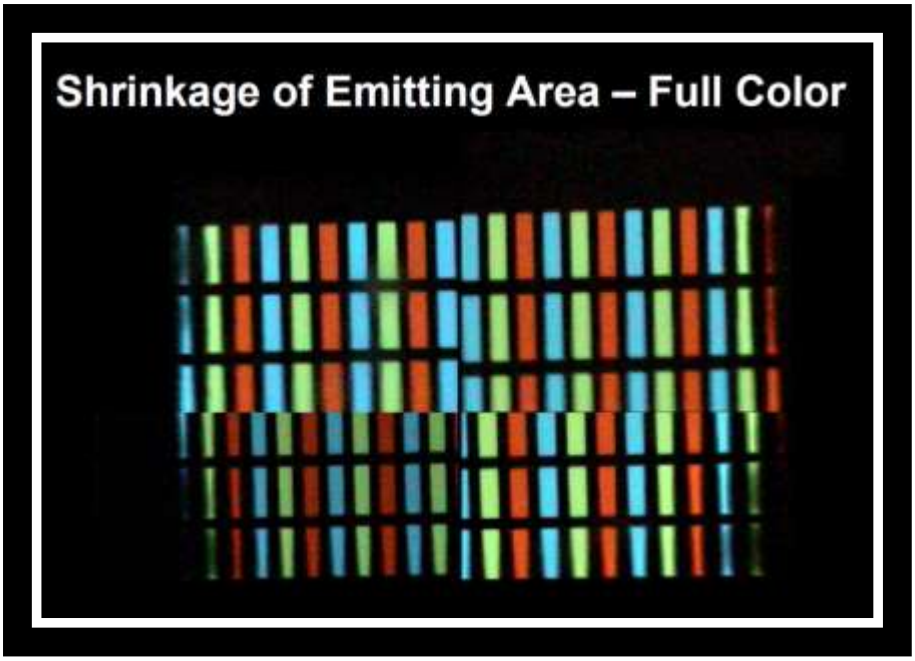


The OLED pixels physically shrink over time.

Note that reducing the average operating brightness, and thus current consumption will have a positive effect on the half-life, extending the lifetime of the OLED.





Densitron PMOLED Colour Chart:

Densitron's monographic OLED range comprises of Modules with set colours. Densitron offers customers to option to customise an OLED Module, by changing the colour of the organic substrate used in the design.

There is an inherent MOQ and NRE charge applicable to modification of colour. Please consult your local Sales Manager.

The below chart document the available colours and their associated CIE reference numbers.

Color	C.I.E. 1931 (Typ)	Lifetime
Light Blue	(0.16, 0.26)	Shorter
White	(0.29, 0.31)	Shorter
Green	(0.31, 0.62)	Longer
Yellow	(0.50, 0.49)	Longer
Orange	(0.56, 0.43)	Longer
Red	(0.64, 0.34)	Shorter
Tolerance	**±0.04**	-

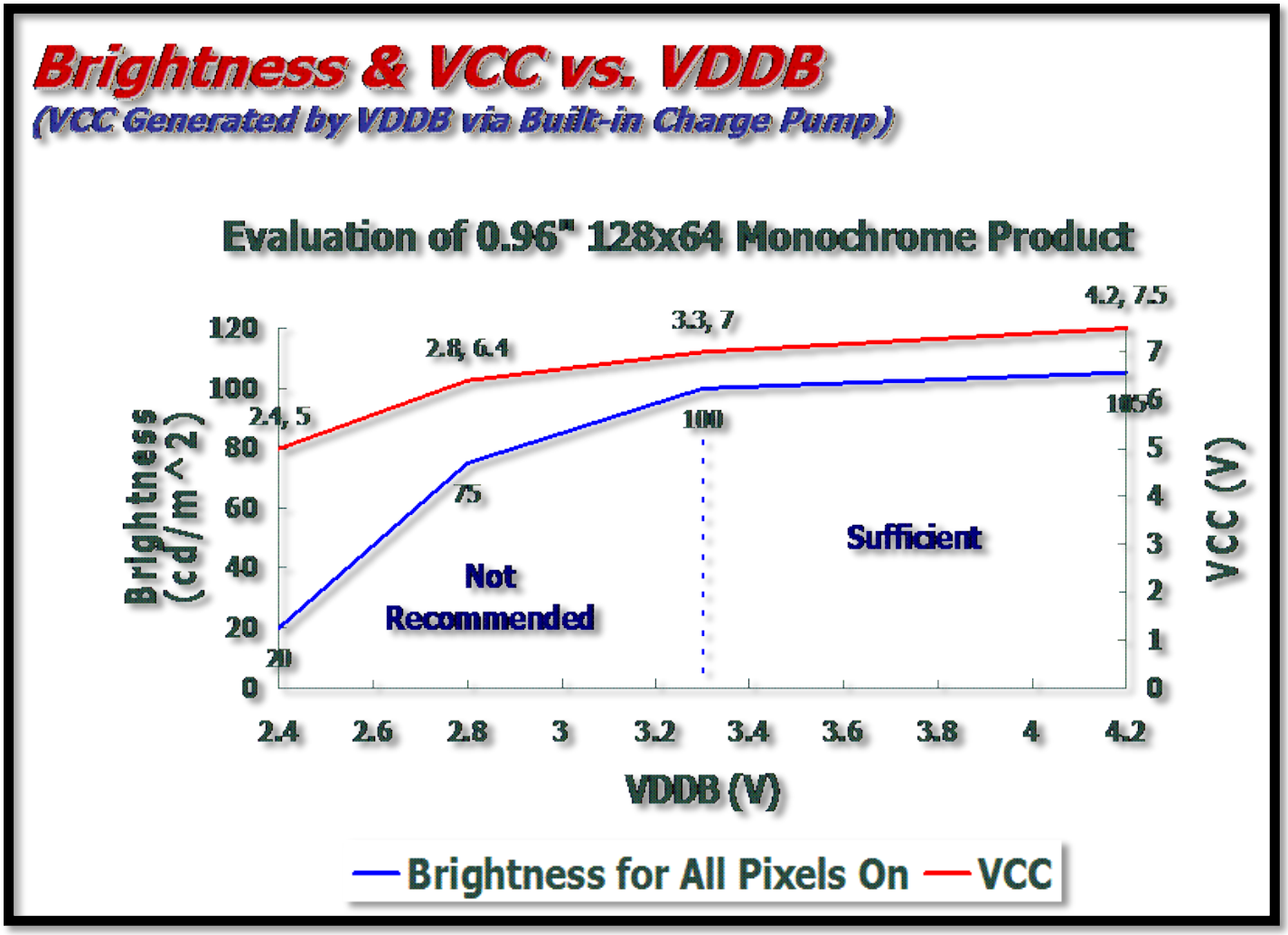
Densitron PMOLED Driver IC Packages:

PMOLED Modules available from Densitron can be classified by 3 main categories. Those with TCP, COG or COF Interfaces.

PMOLED Charge Pump Characteristics. Voltage vs Brightness.

Certain OLED Modules are designed with an integrated charge pump circuit, usually smaller sized modules which are inevitably designed into applications where space is constrained. In such cases it is useful to have an integrated charge pump circuit, with the feature of supplying one input Voltage.

Note that the tolerance applied to the Voltage range affects the brightness of the OLED substrate as outlined in the example below.



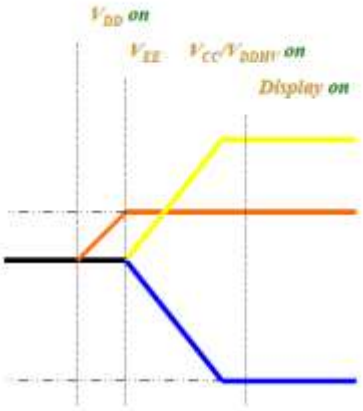
PMOLED Power up/down Sequence

When driving PMOLED Engineer's must take note of the correct power sequence. Ignoring this guidance can lead to spurious residual visual effects within pixels.

Power up Sequence

- Power up V_{DD}
- Send *Display* ***off*** command
- Clear Screen
- Power up V_{EE} or V_{CC}/V_{DDHV}
- Delay 100ms (when V_{DD} is stable)
- Send *Display* ***on*** command

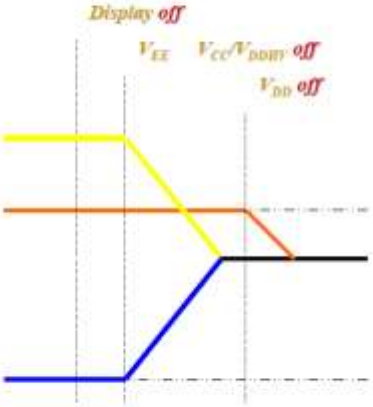
- High/Negative Voltage
  - V_{EE}
    - Used for Solomon Systech SSD1301 Application
  - V_{CC}/V_{DDHV}
    - Used for Most Driver ICs Application



Power down Sequence

- Send *Display* ***off*** command
- Power down V_{EE} or V_{CC}/V_{DDHV}
- Delay 100ms (when V_{EE} or V_{CC}/V_{DDHV} is reach 0 & panel is completely discharges)
- Power down V_{DD}

- High/Negative Voltage
  - V_{EE}
    - Used by Solomon Systech SSD1301 Application
  - V_{CC}/V_{DDHV}
    - Used for Most Driver ICs Application



PMOLED – Preventing Cross Talk Phenomenon

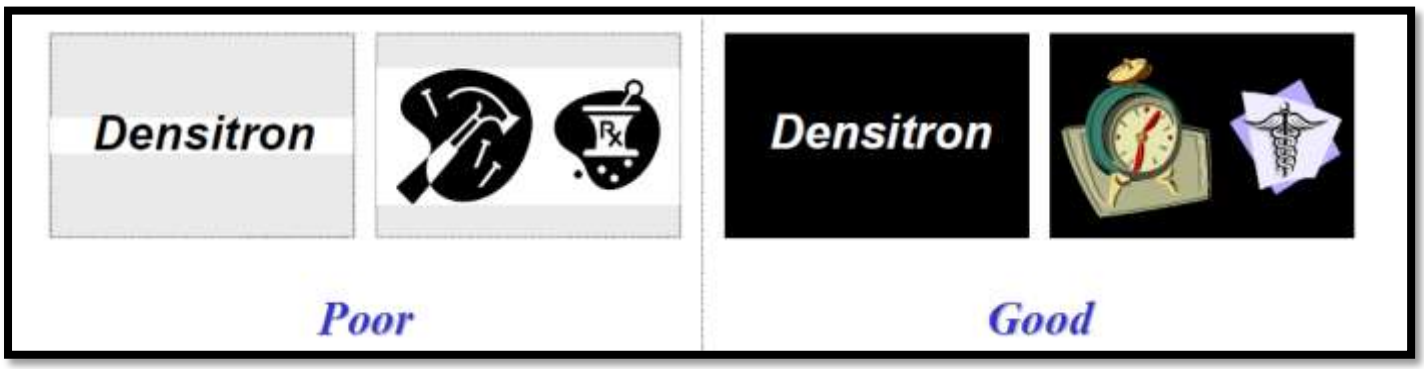
An OLED display panel is driven by a driver including a row driver and a column driver. A row driver typically selects a row of OLEDs in the display panel, and the column driver provides driving current to one or more of the OLEDs in the selected row to light the selected OLEDs according to the display data.

Conventional OLED display panels have the shortcoming that crosstalk is generated in the OLED display panel.

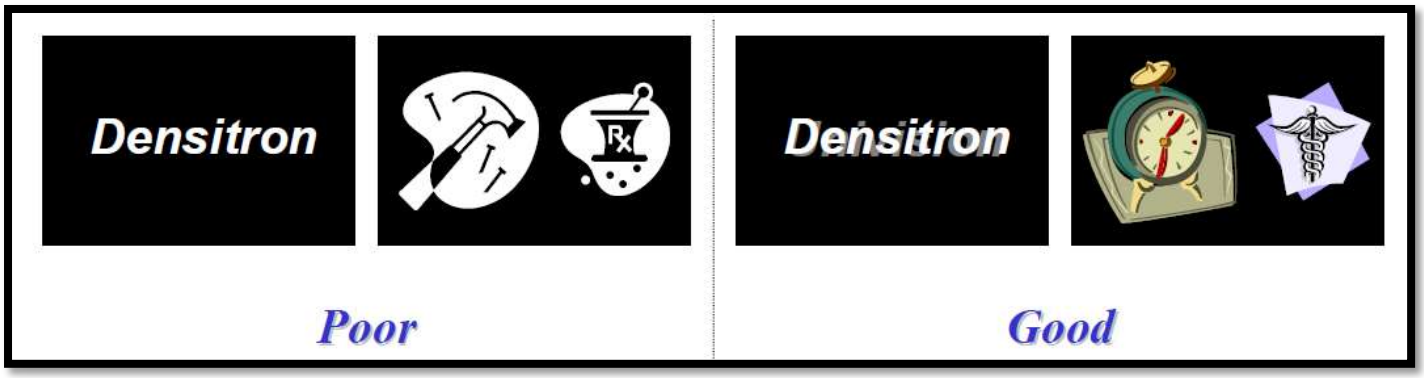
An organic light-emitting diode display driver adjusts the display scan period of the current driving the organic light-emitting diodes of a selected row. Unfortunately the difference in sink currents between rows leads to the display exhibiting lighter or darker areas than it's neighbour. This largely depends on the types of images which are being displayed.

A rough guide to intelligent OLED GUI Design is shown below pictorially.

- Prevent the use of White Backgrounds in GUI Design.



- Design around negative image display modes (dark B/G with light text).
- Use greyscale text and imagery.

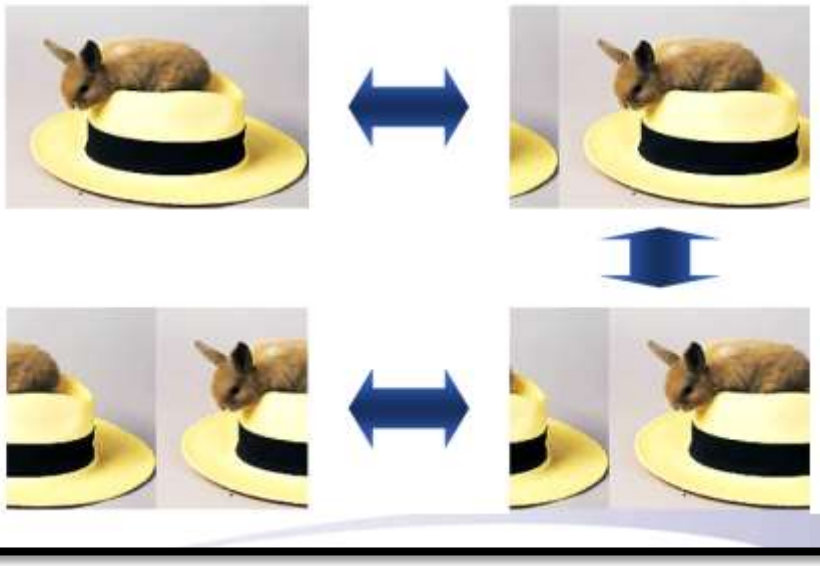


PMOLED – Image Retention

One feature of OLED which can be considered a negative inherent technology characteristic is image retention. If a static image is displayed for a long period of time, the pixels used to generate the image will degrade faster than their neighbouring pixels, leading to a burn in effect. The pictures below outline simple methods to reduce this effect.

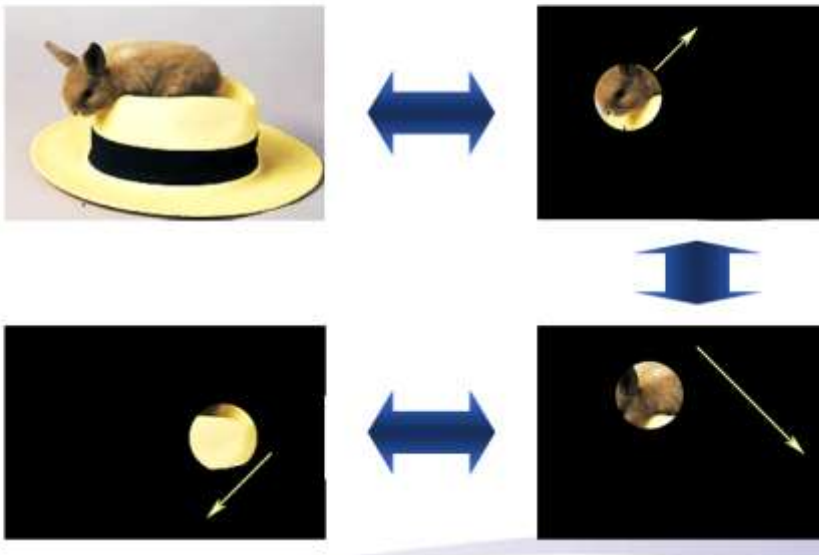
Vertical/Horizontal Scrolling

Display area scrolls gradually



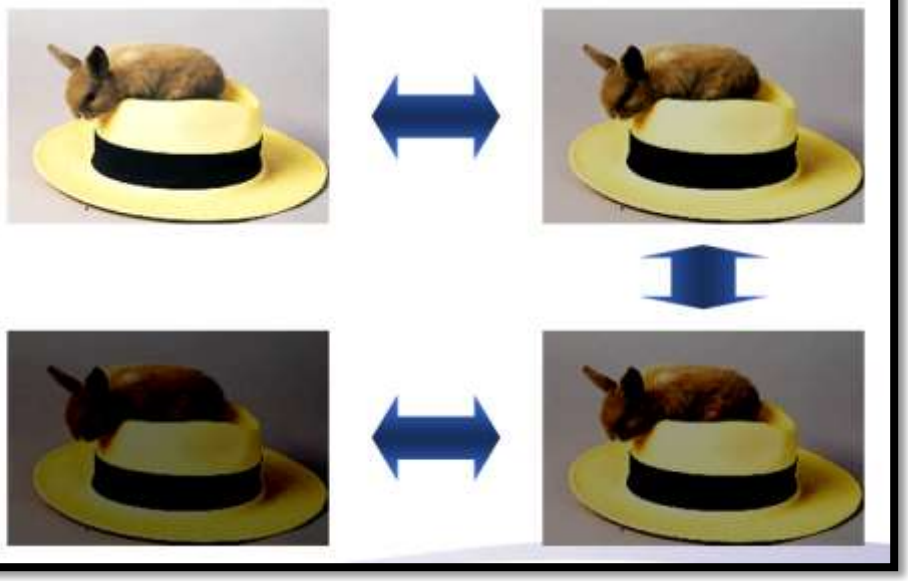
Block Move

Display box moves like snooker ball



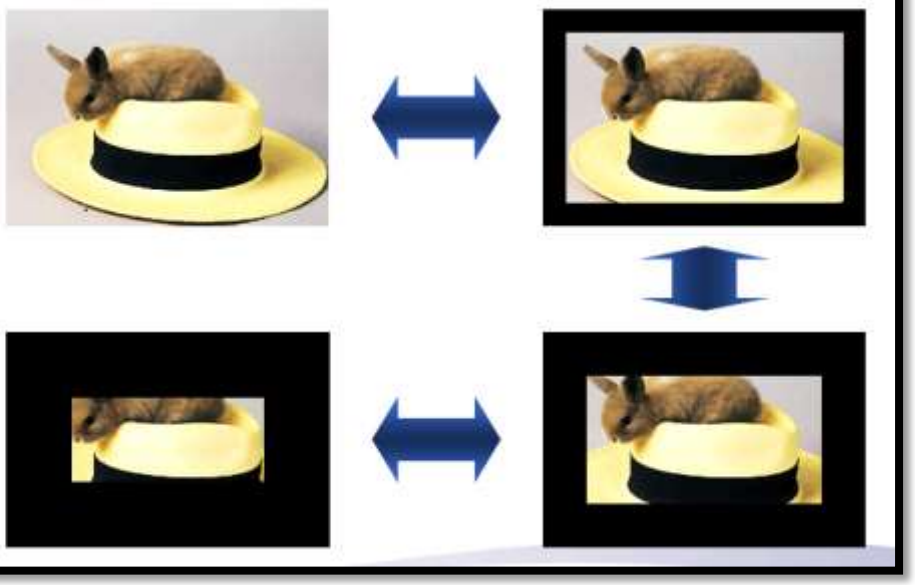
Fade in/out

Display brightness gradually changes



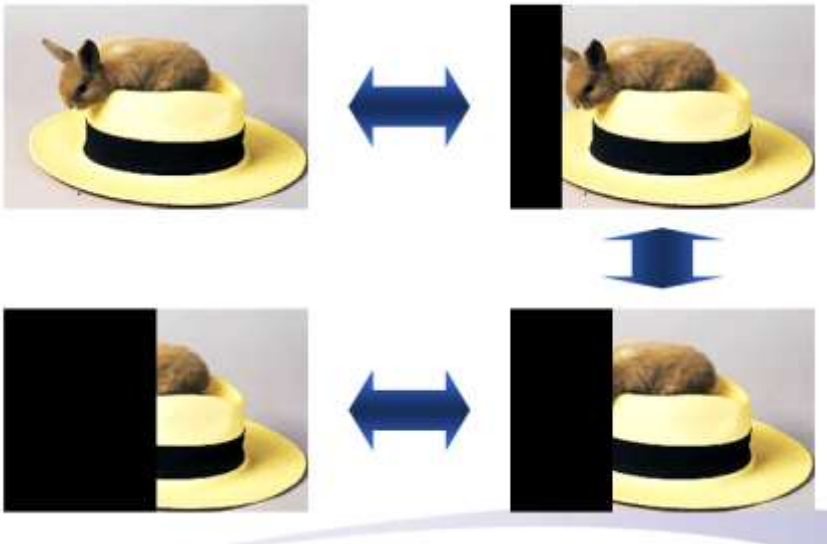
Fade Box

Display area gradually fades in black box



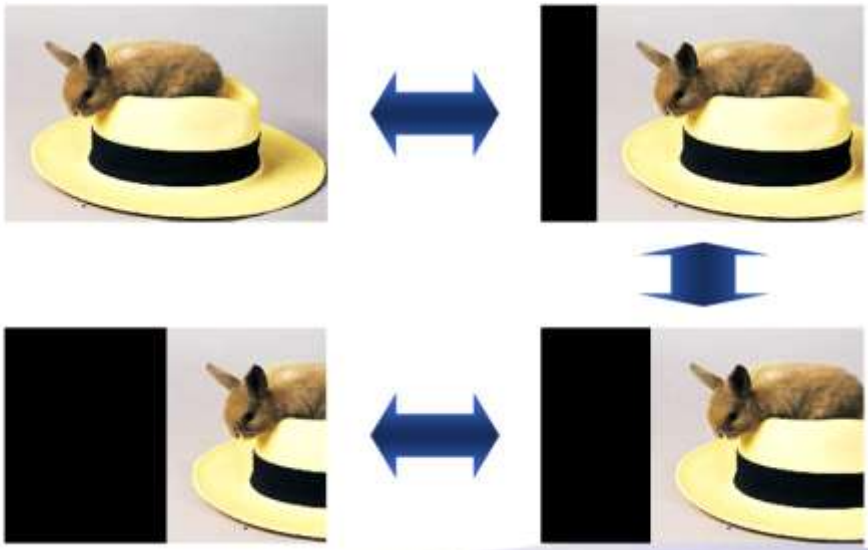
Fade Mask

Display area gradually narrows down vertically/horizontally



Fade Scroll

Display area gradually shifts up/down/left/right



Power Consumption Recommendations

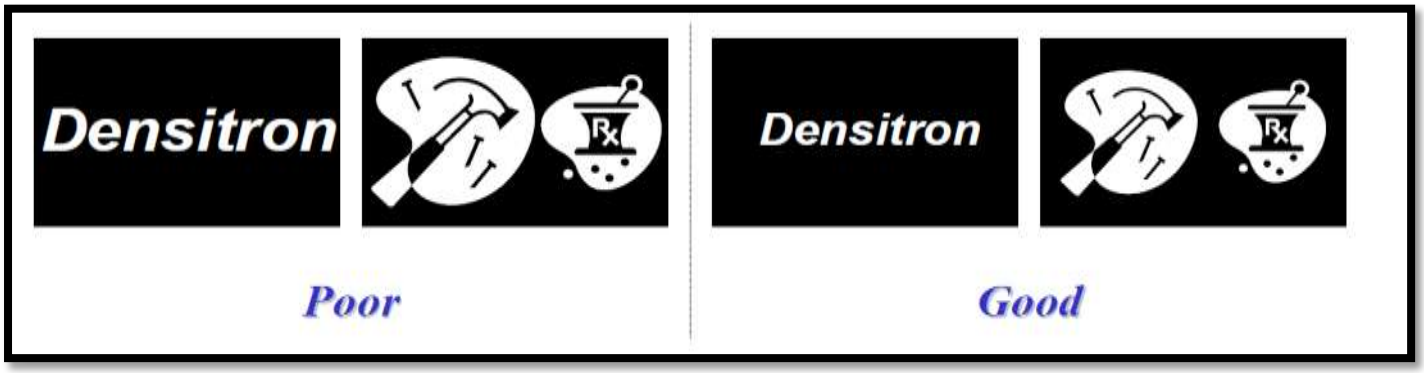
OLED Displays lend themselves to low power, often battery powered devices and applications.

The below images give an indication of best practice to reduce the power consumtion.

Always utilise NEGATIVE MODE GUI Design.

If using colour OLED, try to stick with the darker colours or black as a B/G.

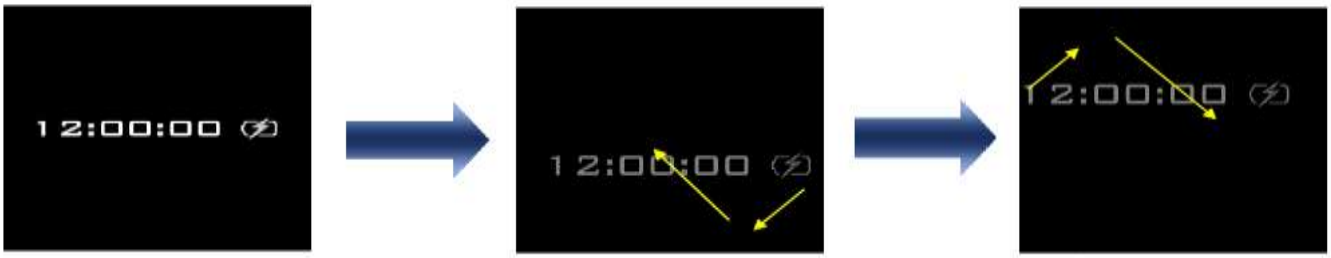
Minimize your graphics, icons and text size, to reduce power. Remember, the power consumption will be proportional to the number of pixels illuminated.



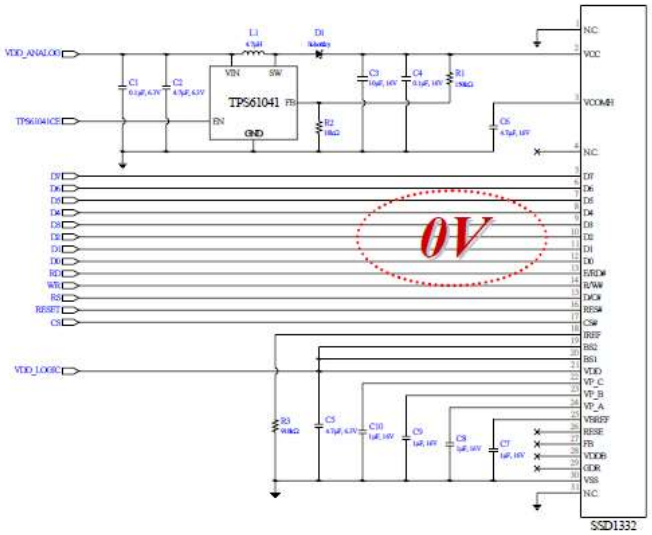
Densitron OLED Technology

- Drop Down the Brightness after Operation for few Seconds

- Run Screen Saver Only for Necessary Information & with Lower Luminance after Operation for few Seconds



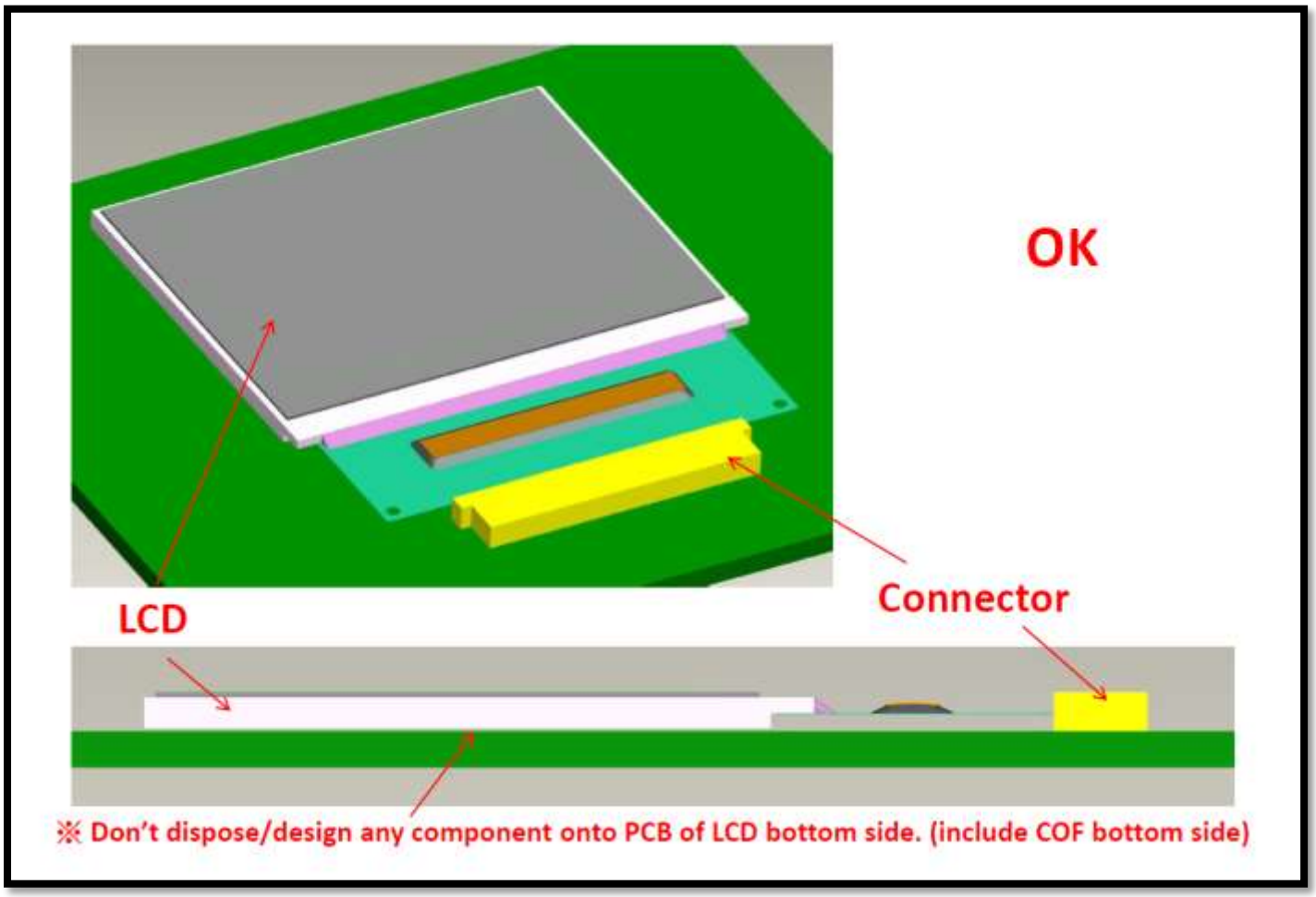
- Turn off the Screen after Operation for few Seconds
  - ***Make Sure the High Voltage Source Reaches 0V***

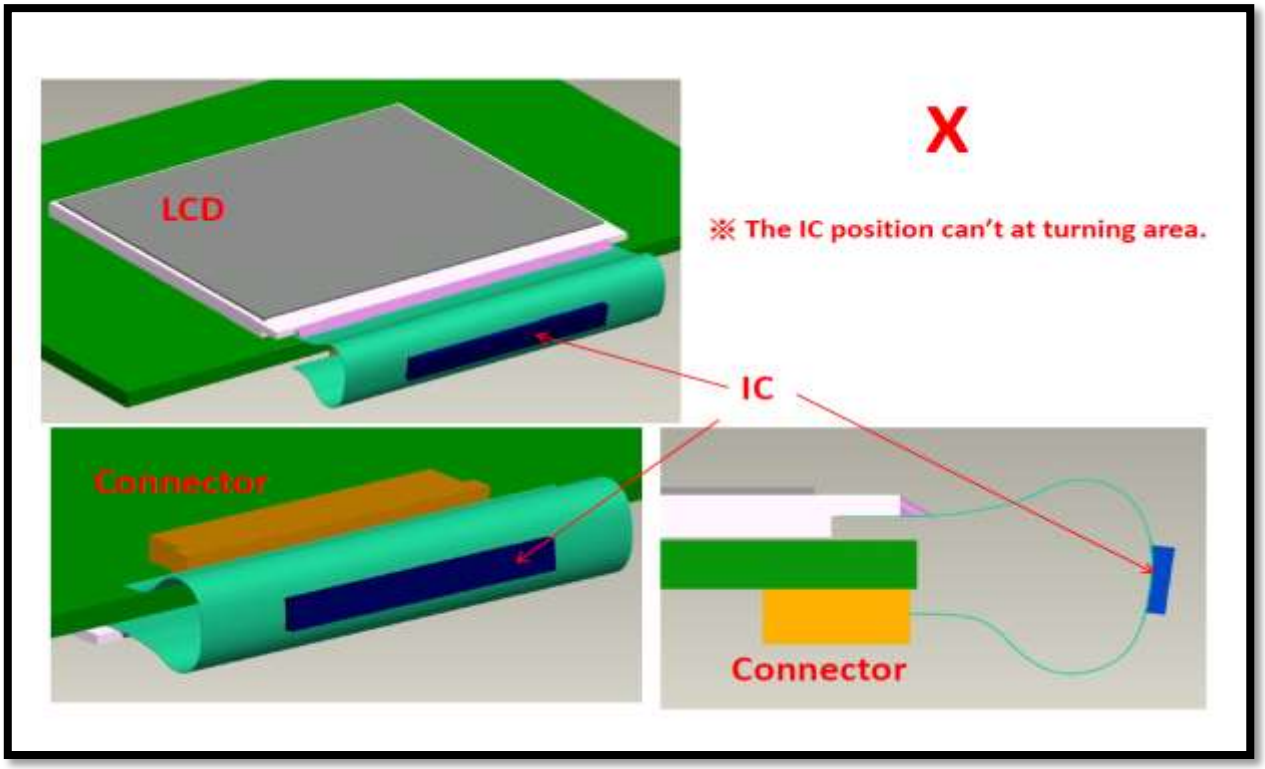


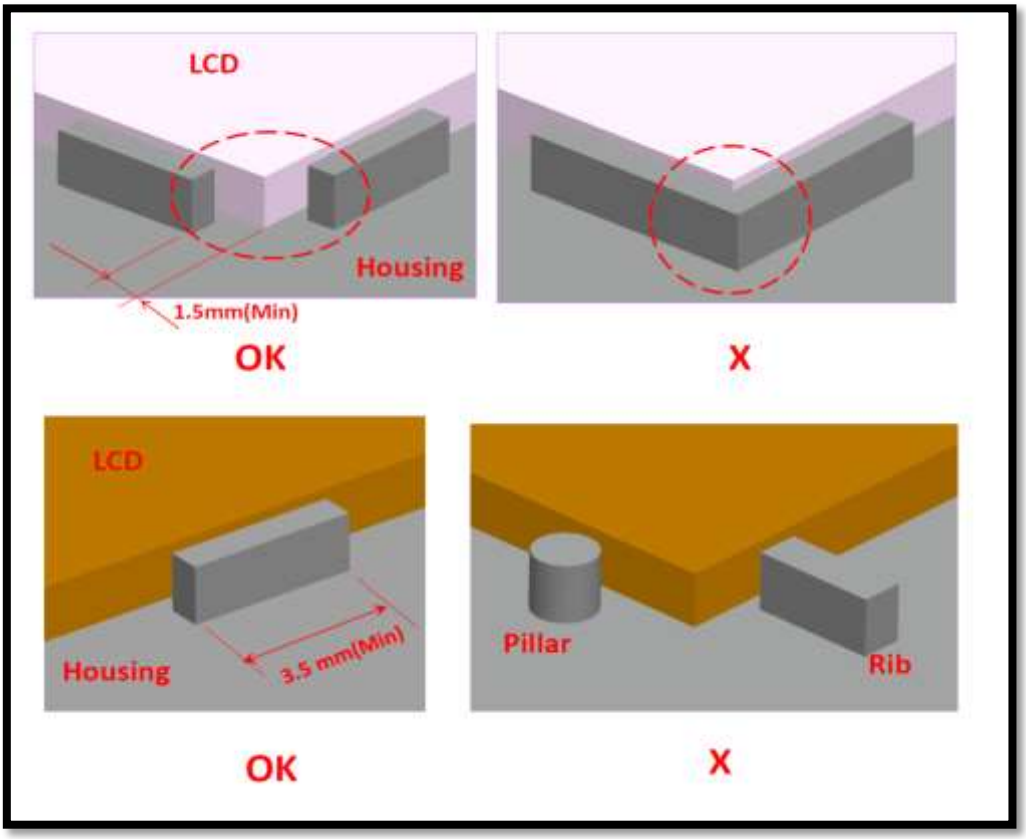
Connector Mechanical Design Guidance

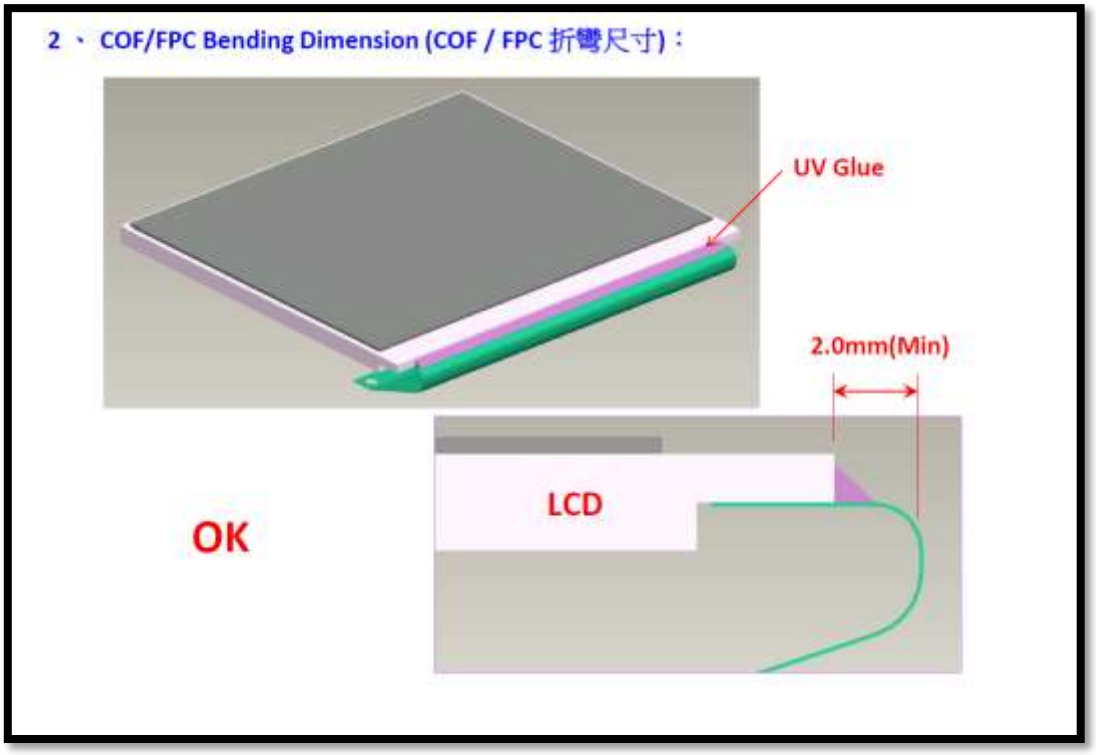
OLED FPC and COF Connectors are inherently fragile, like any similar display technology, whether TFT or LCD or OLED, a Design Engineer must pay careful attention to the PCB Design and OLED Mounting.

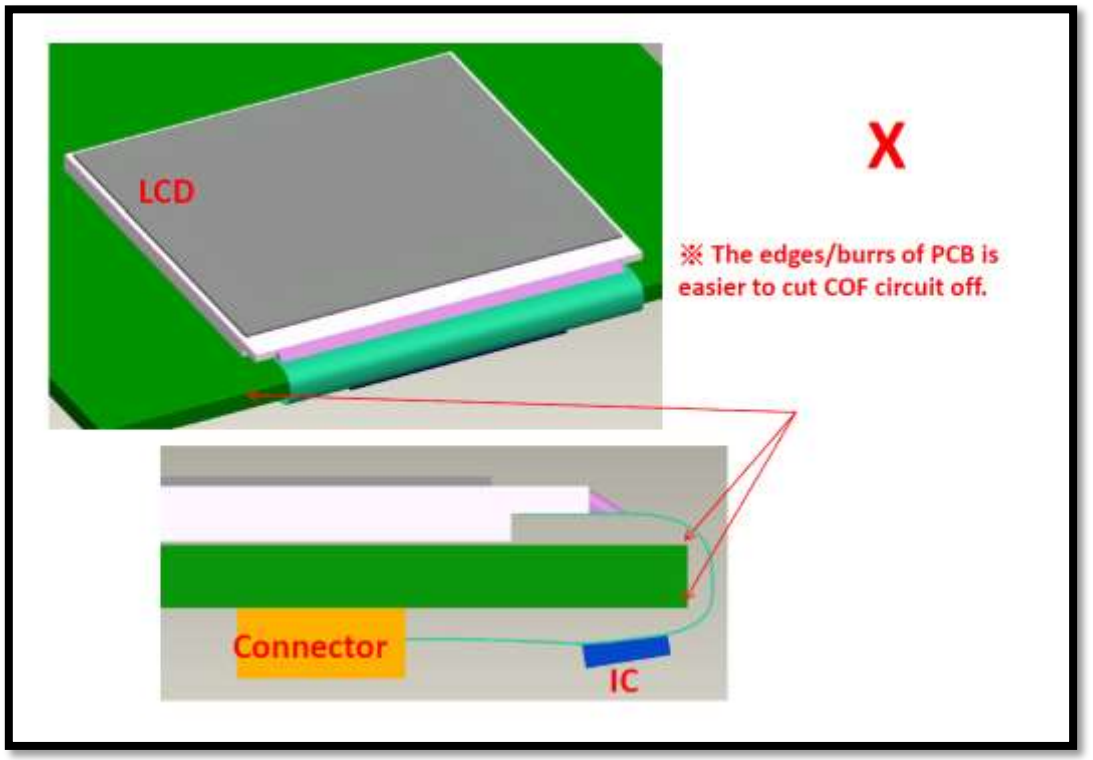
Below is a COF Design Guide, pictorially annotated and self-explanatory.

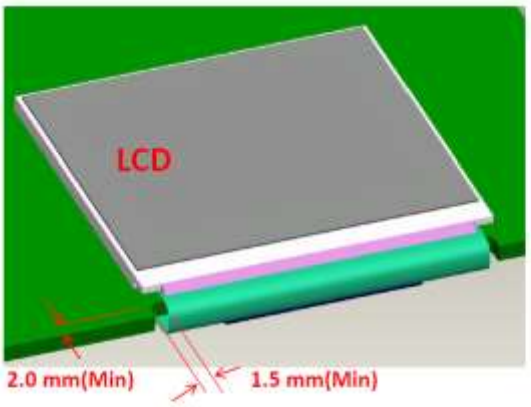


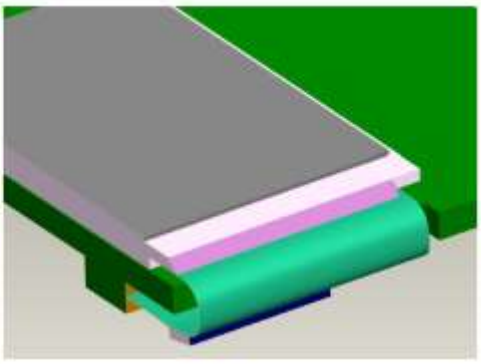

LCD
X
※ The IC position can't at turning area.
IC
Connector
Connector


LCD
Housing
1.5mm(Min)
OK
X
LCD
Housing
3.5 mm(Min)
Pillar
Rib
OK
X


2 、 COF/FPC Bending Dimension (COF / FPC 折彎尺寸)：
UV Glue
2.0mm(Min)
LCD
OK

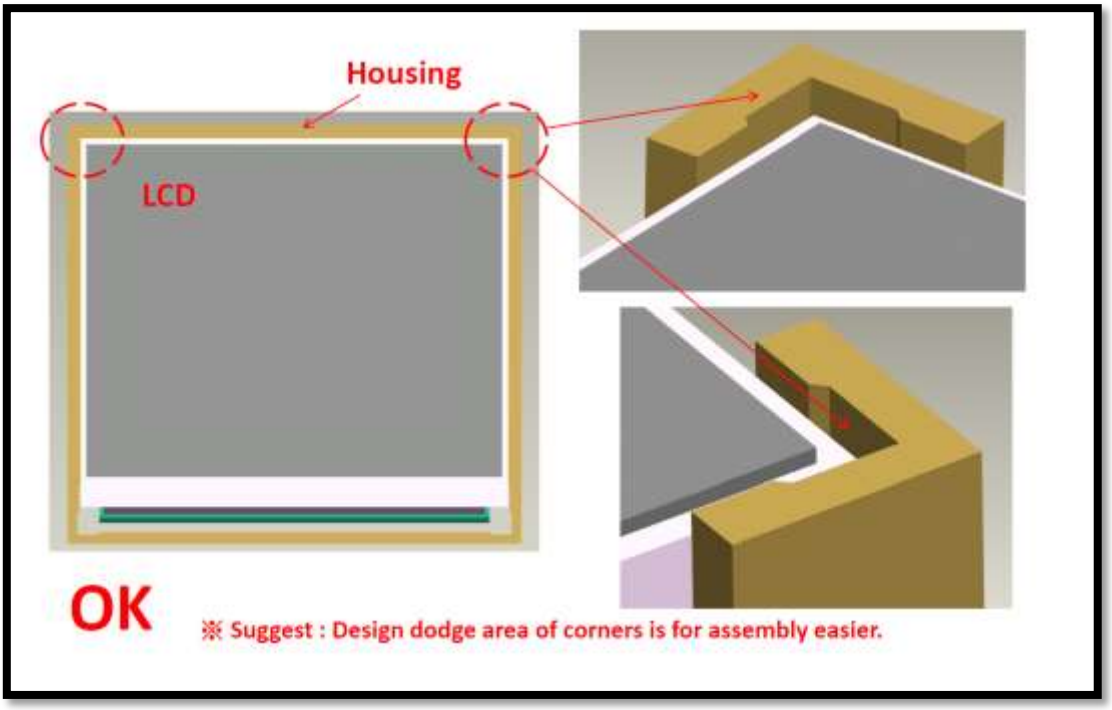

LCD
X
※ The edges/burrs of PCB is easier to cut COF circuit off.
Connector
IC



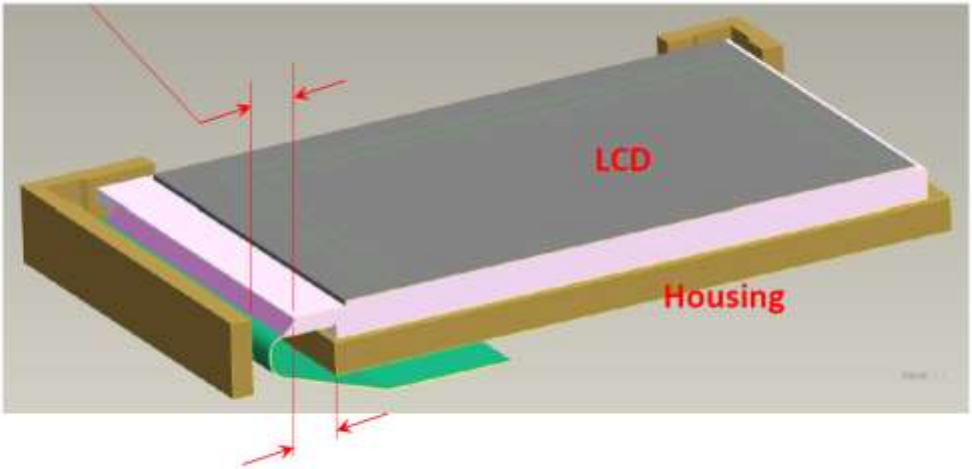


OK

※ PCB design a breach to prevent cut COF circuit off and more space for turning.

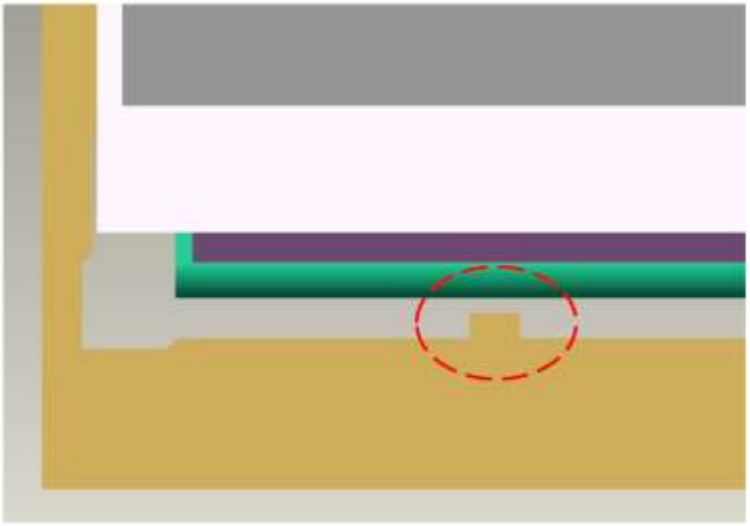


2.0 mm(Min) between LCD edge to Housing wall is necessarily for COF/FPC turning space.



Suggestion ： 1.5mm(Min) between LCD edge to Housing edge (as picture) will be avoid the burrs/edge scratch COF circuit during assemble process.

X



※ The bulge rib or pillar will be scratch/prick the COF/FPC circuit.
Please keep the surface on housing wall flatness.

X

※ The edge often with the burrs and easier scratch/prick the COF/FPC circuit.
Please keep the surface on housing wall flatness or design radius of edge/corner.

Thermal, Vibration, Environmental and ESD Testing

Densitron's OLED range can with stand operating temperatures of between -20 Deg C to + 70 Deg C. In a large number of cases the modules can now operate to within Automotive specification, from -30 Deg C to + 85 Deg C, please consult the relevant specification for the display of choice.

Humidity tolerance is equivalent to typical mono LCD packages, with OLED rated to withstand 95 % relative humidity.

Extensive vibration and ESD testing is carried out for all model groups.

Examples of the work undertaken are shown below for the 128*64 OLED model range, 1.54'' diagonal size.

1. Test Purpose : New Product Certificate

2. Judge condition : Produc Specification

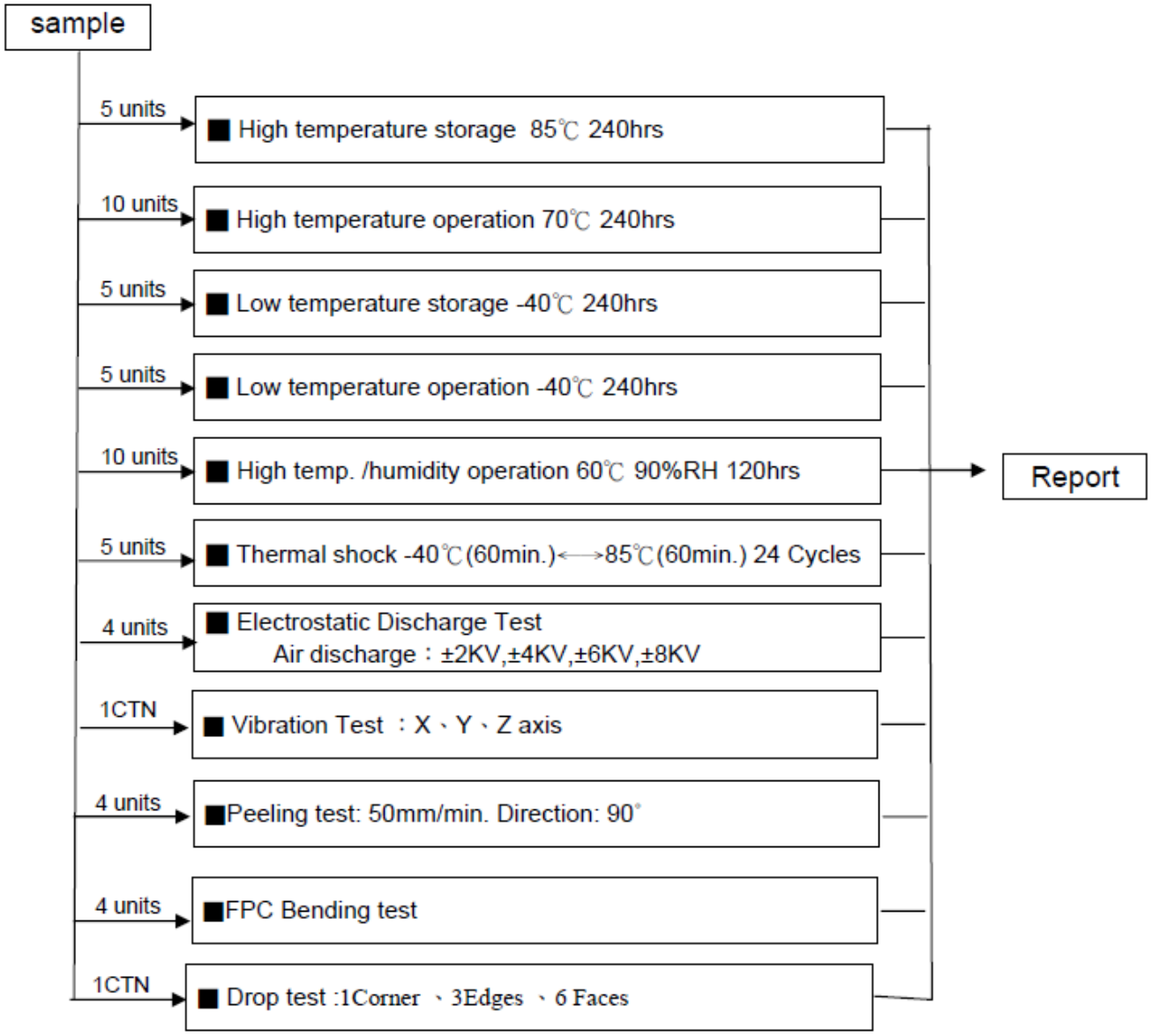
3. Conclusion : Pass

* Function :
  - HTS : Pass
  - HTO : Pass
  - LTS : Pass
  - LTO : Pass
  - HTHO : Pass
  - TS : Pass

* ESD (Air discharge ± 8KV) : Pass
* Vibration (CTN) : Pass
* Peeling test : Avg. kg-f (10mm) : 1 (Regerence: Tabel 14、15、16、17)
* FPC Bending test (UV glue): Pass (Reference: Tabel 18)
* Drop test : Pass(No damage)

4. Test Sample Information :

Product ID :	DD-12864XX-4A	Drive Duty :	1/64	Low Voltage :	2.8V
Panel Lot ID :	N1161004	Drive IC :	SSD1309	High Voltage :	12.5V
Module Lot ID :	WN11070009	Film :	UT-0209-P01		



6. Test Equipment：Temperature and Humidity Chamber ESPEC SH-641
Thermal Shock Chamber KSON TSK-A5C-150
NOISEKEN ESS-2002EX & TC-815R
Vibration & Shock Environmental Equipment KD-9363EM-1000F2K-50N250

7. Test Results：

Test Item	Duration	Defect	Remarks
■ High temperature storage (85℃)	240h	**0/5**	Pass
■ High temperature operation (70℃)	240h	**0/10**	Pass
■ Low temperature storage (-40℃)	240h	**0/5**	Pass
■ Low temperature operation (-40℃)	240h	**0/5**	Pass
■ High temp. /humidity operation (60℃90%)	120h	**0/10**	Pass
■ Thermal shock (-40℃←→85℃ / 60 min.)	24 Cycles	**0/5**	Pass
■ ESD Air discharge (± 8KV)	20times	**0/4**	Pass

Test Item	Condition	Defect	Remarks
■ Vibration test	Waveform： Sine Wave Frequency：10 ~ 55Hz Amplitude： 0.75mm Direction： X,Y,Z Axis Time： 60 mins for Each Axis	**0/1(CTN)**	Pass

Test Item	Condition		Result
■ Peeling test：	FPC Bonding width： Velocity： Direction:	12.50 (±0.2) mm 50mm/min. 90°	Avg. kg-f (10mm)：1.6
■ FPC Bending test		**UV sample**	Pass
■ Drop test		**0/1CTN**	Pass

● 0/5、0/10、0/4 、0/1(CTN) = No abnormal

8. Test Data :

(1) HTS 85℃ Lum. & CIE (x,y)

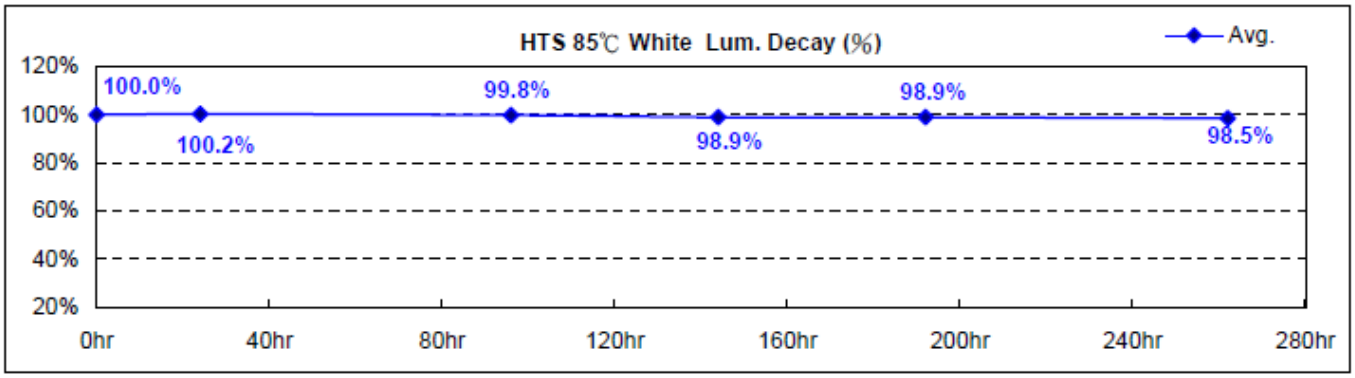


Table 2 White Brightness measurement(cd/m^2)

No.	Panel Lot ID	0hr	24hr	96hr	144hr	192hr	262hr
1	N1161004-04	117.9	119.3	118.1	117.6	117.5	117.0
2	N1161004-04	116.5	117.8	118.2	117.0	117.0	116.2
3	N1161004-04	118.6	117.7	118.0	117.9	117.6	117.1
4	N1161004-04	122.0	120.7	120.0	117.0	117.7	117.0
5	N1161004-04	121.2	122.0	120.9	120.0	120.0	119.6
Avg.		**119.2**	**119.5**	**119.0**	**117.9**	**118.0**	**117.4**
Max.		122.0	122.0	120.9	120.0	120.0	119.6
Min.		116.5	117.7	118.0	117.0	117.0	116.2

Table 3 White Lum. Decay (%)

No.	Panel Lot ID	0hr	24hr	96hr	144hr	192hr	262hr
1	N1161004-04	100.0%	101.2%	100.2%	99.7%	99.7%	99.2%
2	N1161004-04	100.0%	101.1%	101.5%	100.4%	100.4%	99.7%
3	N1161004-04	100.0%	99.2%	99.5%	99.4%	99.2%	98.7%
4	N1161004-04	100.0%	98.9%	98.4%	95.9%	96.5%	95.9%
5	N1161004-04	100.0%	100.7%	99.8%	99.0%	99.0%	98.7%
Avg.		**100.0%**	**100.2%**	**99.8%**	**98.9%**	**98.9%**	**98.5%**

(2) HTO 70℃ Lum. & CIE (x,y)

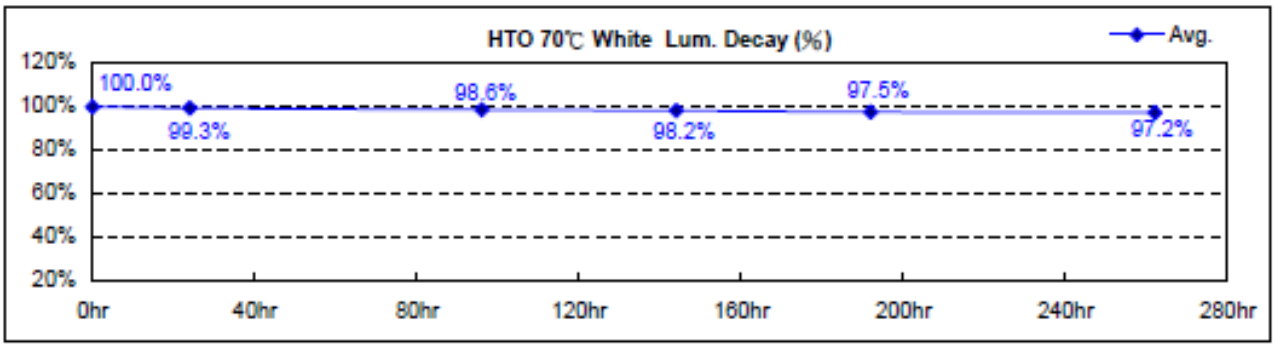


Table 4 White Brightness measurement(cd/m^2)

No.	Panel Lot ID	0hr	24hr	96hr	144hr	192hr	262hr
6	N1161004-03	121.1	119.0	117.2	117.2	117.2	115.3
7	N1161004-03	117.5	115.9	115.5	114.3	113.3	112.8
8	N1161004-03	115.8	114.7	113.6	112.9	111.8	111.6
9	N1161004-03	119.2	119.5	117.5	117.1	116.2	116.4
10	N1161004-03	115.3	115.6	115.5	115.0	114.3	114.0
11	N1161004-03	119.6	120.2	119.9	118.4	116.6	116.6
12	N1161004-03	120.4	118.5	118.1	117.7	117.7	116.9
13	N1161004-03	118.6	117.2	115.2	115.2	114.7	114.8
14	N1161004-03	115.2	114.1	115.3	114.8	114.4	114.6
15	N1161004-03	118.2	118.1	117.0	116.9	115.0	115.1
Avg.		**118.1**	**117.3**	**116.5**	**116.0**	**115.1**	**114.8**
Max.		121.1	120.2	119.9	118.4	117.7	116.9
Min.		115.2	114.1	113.6	112.9	111.8	111.6

Table 5 White Lum. Decay (%)

No.	Panel Lot ID	0hr	24hr	96hr	144hr	192hr	262hr
6	N1161004-03	100.0%	98.3%	96.8%	96.8%	96.8%	95.2%
7	N1161004-03	100.0%	98.6%	98.3%	97.3%	96.4%	96.0%
8	N1161004-03	100.0%	99.1%	98.1%	97.5%	96.5%	96.4%
9	N1161004-03	100.0%	100.3%	98.6%	98.2%	97.5%	97.7%
10	N1161004-03	100.0%	100.3%	100.2%	99.7%	99.1%	98.9%
11	N1161004-03	100.0%	100.5%	100.3%	99.0%	97.5%	97.5%
12	N1161004-03	100.0%	98.4%	98.1%	97.8%	97.8%	97.1%
13	N1161004-03	100.0%	98.8%	97.1%	97.1%	96.7%	96.8%
14	N1161004-03	100.0%	99.0%	100.1%	99.7%	99.3%	99.5%
15	N1161004-03	100.0%	99.9%	99.0%	98.9%	97.3%	97.4%
Avg.		**100.0%**	**99.3%**	**98.6%**	**98.2%**	**97.5%**	**97.2%**

(3) LTS -40℃ Lum. & CIE (x,y)

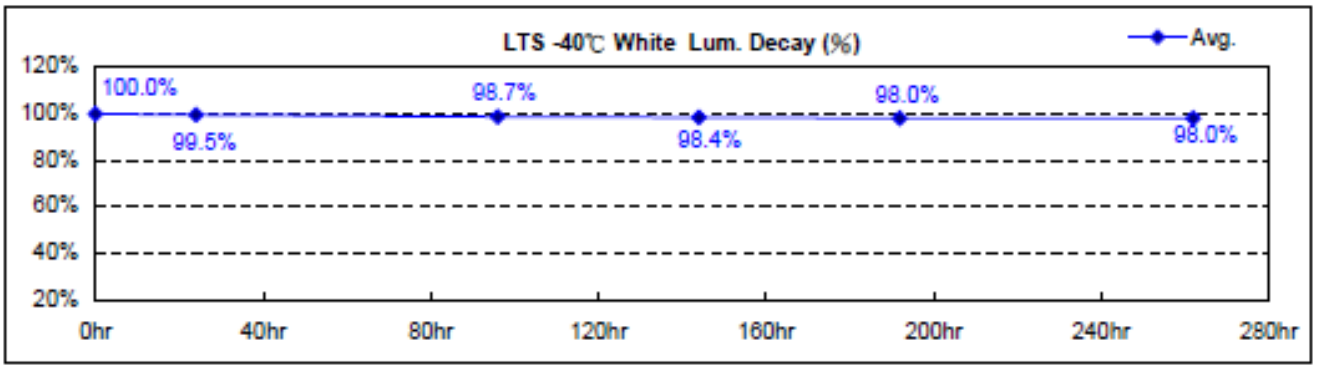


Table 6 White Brightness measurement(cd/m²)

No.	Panel Lot ID	0hr	24hr	96hr	144hr	192hr	262hr
16	N1161004-04	118.5	119.5	117.8	117.5	117.6	117.9
17	N1161004-04	118.3	118.5	116.7	116.3	115.9	115.8
18	N1161004-04	119.0	117.0	116.0	115.8	115.5	115.4
19	N1161004-04	120.0	117.0	117.3	117.1	115.5	115.7
20	N1161004-04	121.4	122.2	121.5	120.7	120.7	120.5
Avg.		**119.4**	**118.8**	**117.9**	**117.5**	**117.0**	**117.1**
Max.		121.4	122.2	121.5	120.7	120.7	120.5
Min.		118.3	117.0	116.0	115.8	115.5	115.4

Table 7 White Lum. Decay (%)

No.	Panel Lot ID	0hr	24hr	96hr	144hr	192hr	262hr
16	N1161004-04	100.0%	100.8%	99.4%	99.2%	99.2%	99.5%
17	N1161004-04	100.0%	100.2%	98.6%	98.3%	98.0%	97.9%
18	N1161004-04	100.0%	98.3%	97.5%	97.3%	97.1%	97.0%
19	N1161004-04	100.0%	97.5%	97.8%	97.6%	96.3%	96.4%
20	N1161004-04	100.0%	100.7%	100.1%	99.4%	99.4%	99.3%
Avg.		**100.0%**	**99.5%**	**98.7%**	**98.4%**	**98.0%**	**98.0%**

(4) LTO -40℃ Lum. & CIE (x,y)

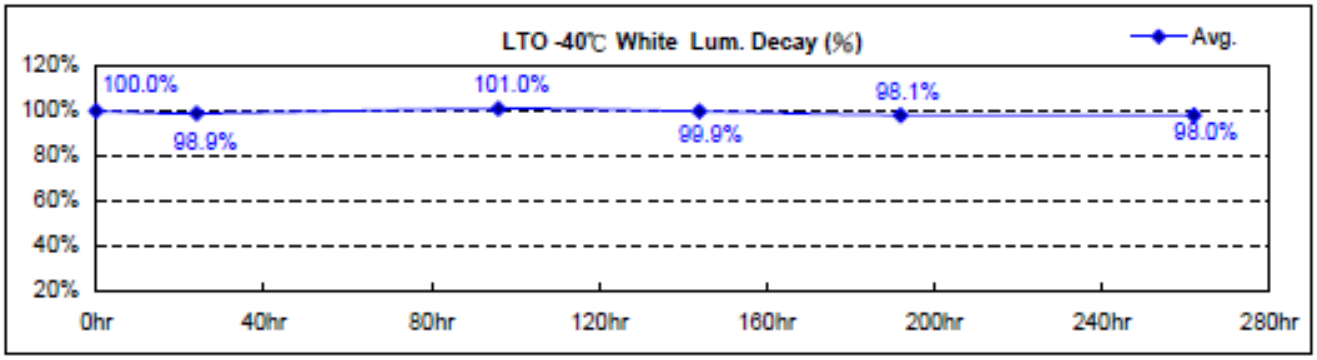


Table 8 White Brightness measurement(cd/m2)

No.	Panel Lot ID	0hr	24hr	96hr	144hr	192hr	262hr
21	N1161004-04	118.4	116.5	116.7	116.7	114.9	114.0
22	N1161004-04	120.3	119.2	117.6	117.3	116.9	116.1
23	N1161004-04	114.2	113.5	114.5	114.0	113.2	113.5
24	N1161004-04	116.9	115.4	115.2	114.5	112.4	112.8
25	N1161004-04	122.0	120.5	134.0	128.6	123.3	123.4
Avg.		**118.4**	**117.0**	**119.6**	**118.2**	**116.1**	**116.0**
Max.		122.0	120.5	134.0	128.6	123.3	123.4
Min.		114.2	113.5	114.5	114.0	112.4	112.8

Table 9 White Lum. Decay (%)

No.	Panel Lot ID	0hr	24hr	96hr	144hr	192hr	262hr
21	N1161004-04	100.0%	98.4%	98.6%	98.6%	97.0%	96.3%
22	N1161004-04	100.0%	99.1%	97.8%	97.5%	97.2%	96.5%
23	N1161004-04	100.0%	99.4%	100.3%	99.8%	99.1%	99.4%
24	N1161004-04	100.0%	98.7%	98.5%	97.9%	96.2%	96.5%
25	N1161004-04	100.0%	98.8%	109.8%	105.4%	101.1%	101.1%
Avg.		**100.0%**	**98.9%**	**101.0%**	**99.9%**	**98.1%**	**98.0%**

(5) HTHO 60℃90% Lum. & CIE (x,y)

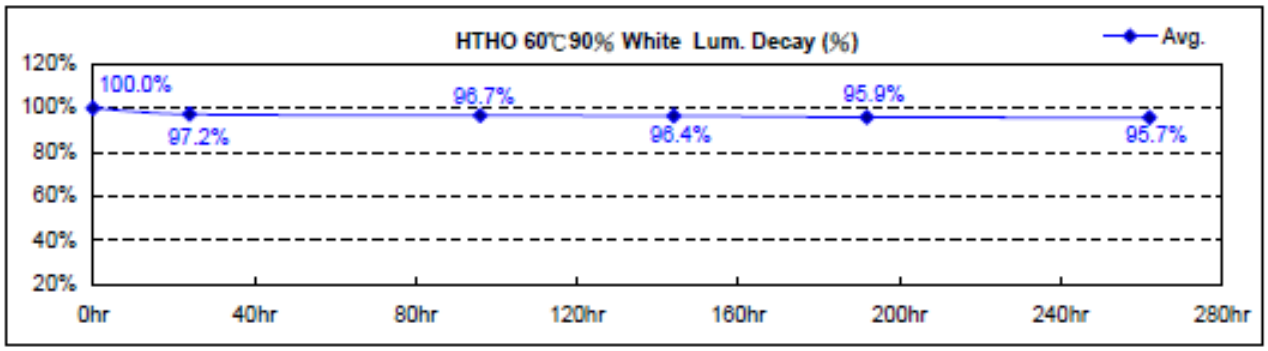


Table 10 White Brightness measurement(cd/m²)

No.	Panel Lot ID	0hr	24hr	96hr	144hr	192hr	262hr
26	N1161004-05	118.0	114.5	114.1	113.6	110.6	111.7
27	N1161004-05	122.9	111.8	111.1	111.1	111.0	111.1
28	N1161004-05	112.6	112.0	112.1	112.0	111.1	110.5
29	N1161004-05	123.8	122.9	121.6	121.5	121.4	121.5
30	N1161004-05	125.4	123.8	121.9	121.7	121.2	120.0
31	N1161004-05	122.3	118.0	117.6	117.5	117.4	117.2
32	N1161004-05	122.9	121.2	120.5	119.8	118.7	118.2
33	N1161004-05	127.0	120.7	120.1	119.9	119.5	119.3
34	N1161004-05	122.6	119.8	120.0	119.1	118.8	118.5
35	N1161004-05	123.4	121.7	121.4	120.9	120.9	120.7
Avg.		**122.1**	**118.6**	**118.0**	**117.7**	**117.1**	**116.9**
Max.		127.0	123.8	121.9	121.7	121.4	121.5
Min.		112.6	111.8	111.1	111.1	110.6	110.5

Table 11 White Lum. Decay (%)

No.	Panel Lot ID	0hr	24hr	96hr	144hr	192hr	262hr
26	N1161004-05	100.0%	97.0%	96.7%	96.3%	93.7%	94.7%
27	N1161004-05	100.0%	91.0%	90.4%	90.4%	90.3%	90.4%
28	N1161004-05	100.0%	99.5%	99.6%	99.5%	98.7%	98.1%
29	N1161004-05	100.0%	99.3%	98.2%	98.1%	98.1%	98.1%
30	N1161004-05	100.0%	98.7%	97.2%	97.0%	96.7%	95.7%
31	N1161004-05	100.0%	96.5%	96.2%	96.1%	96.0%	95.8%
32	N1161004-05	100.0%	98.6%	98.0%	97.5%	96.6%	96.2%
33	N1161004-05	100.0%	95.0%	94.6%	94.4%	94.1%	93.9%
34	N1161004-05	100.0%	97.7%	97.9%	97.1%	96.9%	96.7%
35	N1161004-05	100.0%	98.6%	98.4%	98.0%	98.0%	97.8%
Avg.		**100.0%**	**97.2%**	**96.7%**	**96.4%**	**95.9%**	**95.7%**

(6) TS -40℃←→85℃ / 60min Lum. & CIE (x,y)

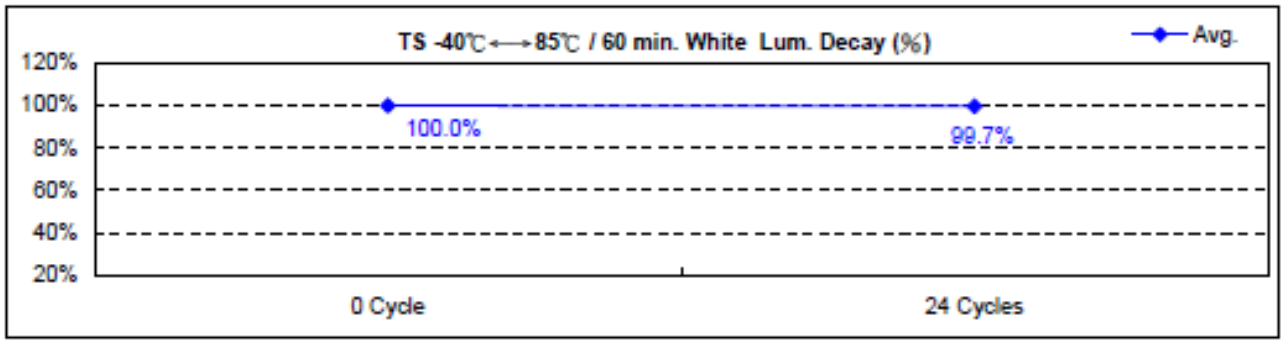


Table 12 White Brightness measurement(cd/m²)

No.	Panel Lot ID	0 Cycle	24 Cycles
36	N1161004-03	116.3	116.0
37	N1161004-03	120.3	120.1
38	N1161004-03	122.5	122.4
39	N1161004-03	122.8	122.5
40	N1161004-03	124.1	123.2
Avg.		**121.2**	**120.8**
Max.		124.1	123.2
Min.		116.3	116.0

Table 13 White Lum. Decay (%)

No.	0 Cycle	24 Cycles
36	100.0%	99.7%
37	100.0%	99.8%
38	100.0%	99.9%
39	100.0%	99.8%
40	100.0%	99.3%
Avg.	**100.0%**	**99.7%**
Max.	100.0%	99.9%
Min.	100.0%	99.3%

(7) ESD Test

Test point: 4 of Panel corners , 20times discharge for each corner(10times anode /10times cathode)

Air discharge :

NO.	+ 2 KV	- 2 KV	+ 4 KV	- 4 KV	+ 8 KV	- 8 KV
41	PASS	PASS	PASS	PASS	PASS	PASS
42	PASS	PASS	PASS	PASS	PASS	PASS
43	PASS	PASS	PASS	PASS	PASS	PASS
44	PASS	PASS	PASS	PASS	PASS	PASS

(8) Vibration Test

(1) Tested devices arrangement on sample carrier

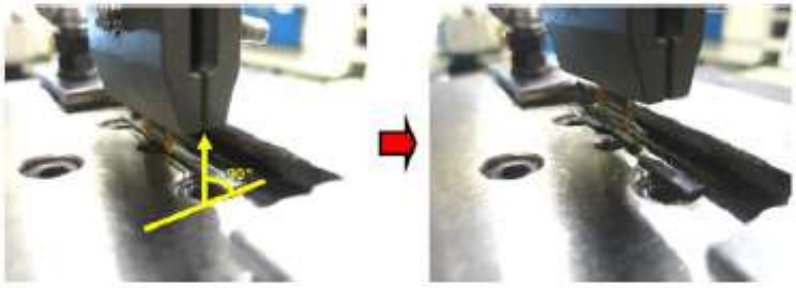
X axis

Y axis

Z axis

(9) Peeling Test

FPC Bonding width : 12.50 (±0.2) mm
Velocity : 50mm/min.
Direction: 90°



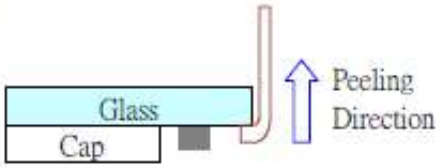
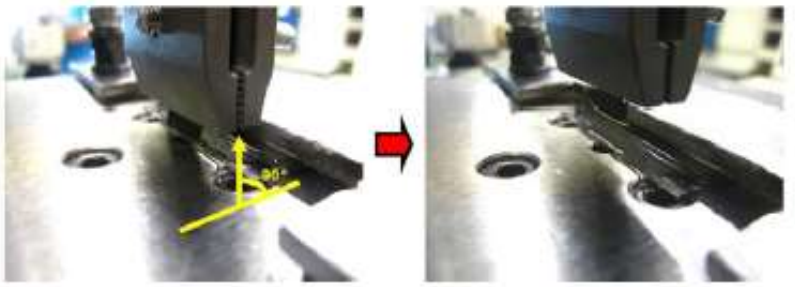


Table 14
Display side and FPC angle : 90° , Silicon Glue

No.	Kgf (10mm)	Remark
1	2.96	
2	2.73	
3	2.89	
4	2.52	
5	2.92	
Avg.	**2.80**	

Table 15
Display side and FPC angle : 90° , UV Glue

No.	Kgf (10mm)	Remark
1	2.36	
2	2.33	
3	2.30	
4	2.41	
5	2.42	
Avg.	**2.36**	



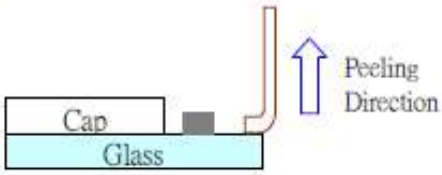


Table 16
Cap side and FPC angle : 90° , Silicon Glue

No.	Kgf (10mm)	Remark
1	1.34	
2	1.46	
3	1.38	
4	1.30	
5	1.50	
Avg.	**1.40**	

Table 17
Cap side and FPC angle : 90° , UV Glue

No.	Kgf (10mm)	Remark
1	2.71	
2	2.73	
3	2.76	
4	2.71	
5	2.64	
Avg.	**2.71**	

Remark :
Peeling Test Result (as picture shown in right)
The weak point of whole structure is ACF bonding area.

(10) Bending Test

Test method :

Fix the Panel side at vertical way , and bend FPC back and forth by hand.

Test Result:

Table 18

No.	Glue Type	Test times	FPC sealing area after bending test	Pattern Check
1	UV	100 times	No damage	Pass
2	UV	100 times	No damage	Pass
3	UV	100 times	No damage	Pass
4	UV	100 times	No damage	Pass
5	UV	100 times	No damage	Pass
6	UV	100 times	No damage	Pass
7	UV	100 times	No damage	Pass
8	UV	100 times	No damage	Pass
9	UV	100 times	No damage	Pass
10	UV	100 times	No damage	Pass

Remark :

According to the standard of IPC TM-650 in 2.4.3, test conductor was defined as 101.6mm in length with correspondence circuit design (as detial below) , and bending test will be proceeded by FPC supplier according to the IPC test method.

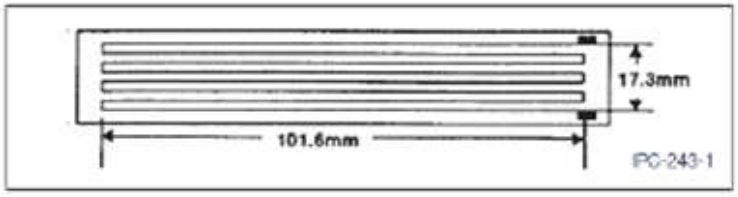


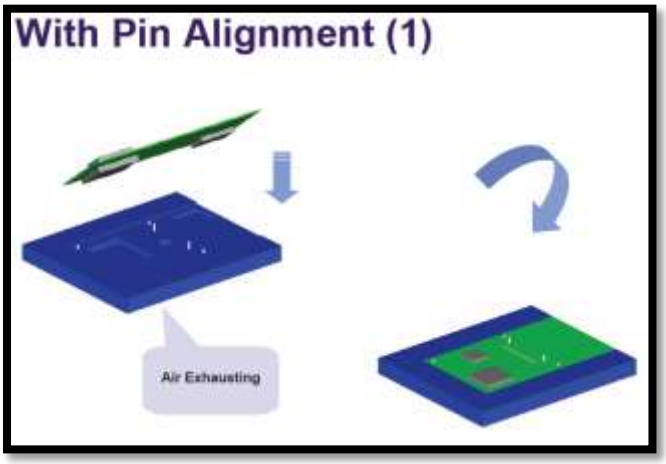
Figure 1 Flexural Endurance Test Pattern.

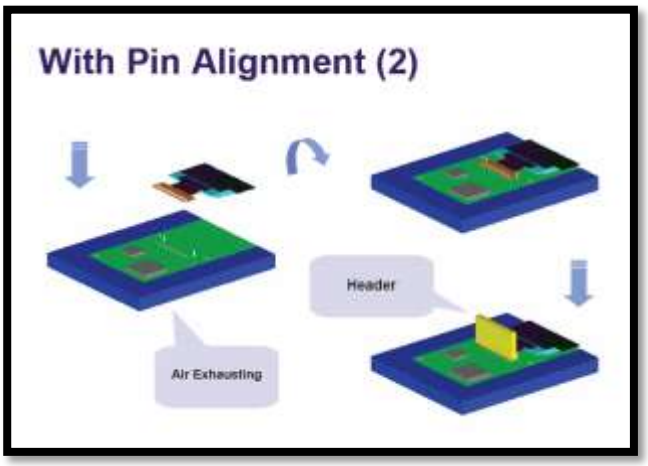
(NOTE: Conductors are 1.5 mm ± 0.1 mm [approximately, 0.059 in ± 0.004 in] wide on 2.5 mm ± 0.1 mm [approximately, 0.01 in ± 0.004 in] centers.)

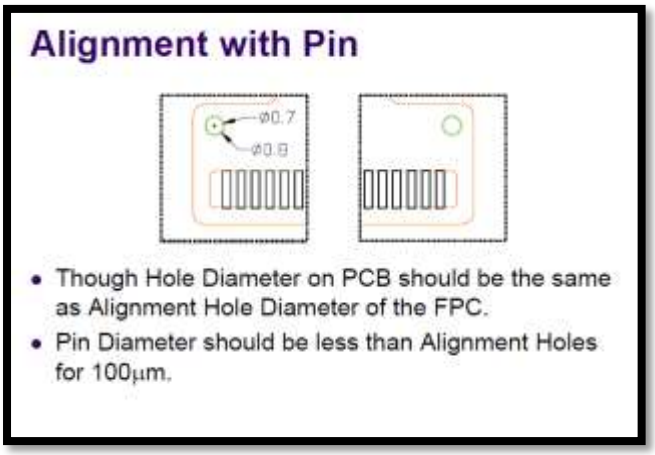
Guide to Hot Bar Soldering.

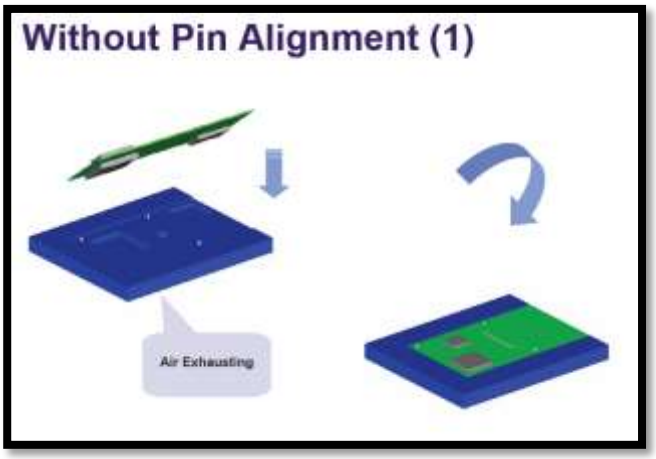
OLED Module connectors terminate with two types of construction method, ''FPC and ZIF'' or ''Hot Bar Solder''.

Hot Bar Solder connection requires automation in production, using a suitable Hot Bar Solder Press Tool. The following pictorial guide details some of the recommended processes and conditions when Hot Bar Soldering.

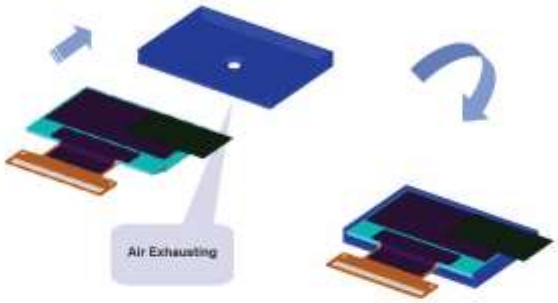




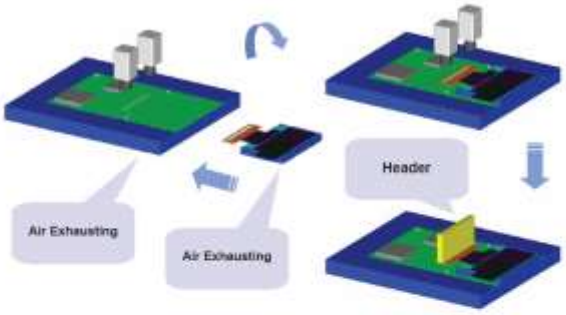




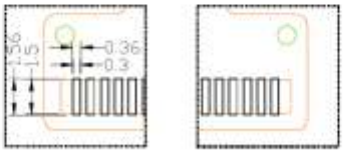
Without Pin Alignment (2)



Without Pin Alignment (3)

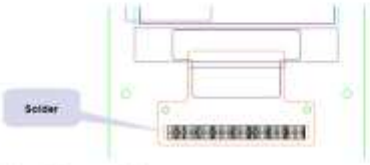


Alignment with Pad



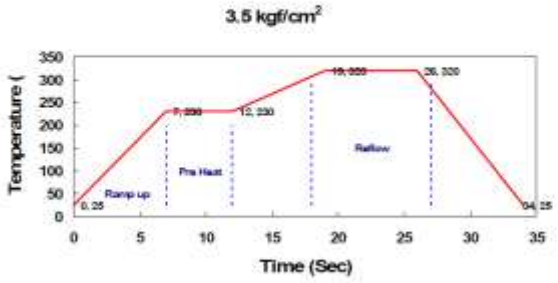
- Pad Size on PCB should be greater than that on the FPC for 30μm in four directions.

Solder Placement

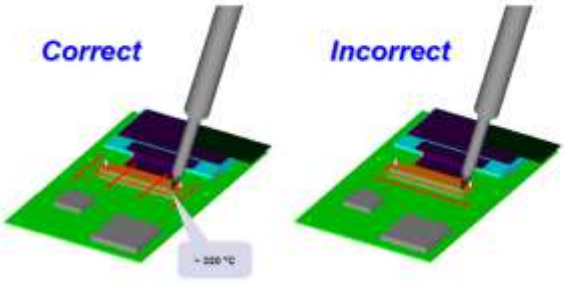


- Solder Bump Size
  - 1/2 Size of Flex Pad Width
  - 1/3 Size of Flex Pad Height

Hot Bar Process



Soldering Process



Lead Free Reflow

- Solder
  - Sn/Ag3.0/Cu0.5
- Melting Point
  - 228 °C ~ 238 °C
- Peak Temperature Time
  - Less than 20 Seconds

Densitron PMOLED Range

Densitron has a broad range of OLED Displays and Proprietary Evaluation Tools, which are constantly being added to.

Please refer to the www.densitron.com website for an up to date listing.

Full Colour Passive Matrix OLED

Full Colour OLED Displays

Organic Light-Emitting Diode (OLED) Display Panel, or Organic Electroluminescence (OEL), possesses the new generation technologies that other flat displays are hard to accomplish – brighter and clearer full color images with more agile responding speed.

DUO - Densitron USB OLED Evaluation Kit

Densitron have developed an extremely easy to use yet powerful demonstration tool for driving Passive Matrix OLED (PMOLED) displays from the USB port of a PC. Unlike other solutions, DUO is hot pluggable and does not require extra cables or power supply to run, allowing displays to be up and running in minutes.

The kit consists of a USB controller card, mini USB cable, an interchangeable OLED display card and a CD with software application and drivers.

Screen Size	Resolution	Module No.	Module Dimension WxHxD mm	Viewing Area WxH mm	Controller	Interface
0.95	96 x 64	DD-9664FC-2A	25.7 x 22.2 x 1.5	22.14 x 15.42	SSD1331	8 Bit 68XX/80XX Parallel,4-SPI
1.1	96 x 96	DD-9696FC-2A	25.9 x 30.1 x 1.3	21.85 x 21.85	SEPS114A	8 Bit 68XX/80XX Parallel,4-SPI
1.27	128 x 96	DD-12896FC-3A	41.35 x 33.7 x 1.6	27.71 x 21.28	SSD1351	8-Bit 68XX/80XX Parallel 3/4-SPI
1.45	160 x 128	DD-160128FC-1A	35.8 x 30.8 x 1.7	30.78 x 25.02	SEPS525F	6/8/9 Bit 68XX/80XX Parallel,6 Bit RGB,4-SPI
1.5	128 x 128	DD-128128FC-6A	33.8 x 34 x 1.7	28.865 x 28.865	SSD1351	8-Bit 68XX/80XX Parallel 3/4-SPI
1.69	160 x 128	DD-160128FC-2B	39.9 x 34 x 1.6	35.575 x 28.864	SEPS525	6/8/9 Bit 68XX/80XX Parallel,6 Bit RGB,4-SPI

DENSITRON DISPLAYS

Mono Passive Matrix OLED

Mono OLED Displays

Organic Light-Emitting Diode (OLED) Display Panel, or Organic Electroluminescence (OEL), possesses the new generation technologies that other flat displays are hard to accomplish –brighter and clearer full color images with more agile responding speed.

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The kit consists of a USB controller card, mini USB cable, an interchangeable OLED display card and a CD with software application and drivers.

Screen Size ▲	Resolution	Module No.	Module Dimension WxHxD mm	Viewing Area WxH mm	Controller	Interface
0.66	64 x 48	DD-6448BE-3A	18.46 x 18.1 x 1.45	15.42 x 12.06	SSD1306	8 Bit 68XX/80XX Parallel,4-SPI,I2C
0.82	96 x 39	DD-9639BE-4A	23.8 x 26 x 1.6	21.37 x 9.86	SSD1306	8-bit 68XX/80XX, 4-wire SPI, I2C
0.82	96 x 39	DD-9639WE-4A	23.8 x 26 x 1.6	21.37 x 9.86	SSD1306	8-bit 68XX/80XX, 4-wire SPI, I2C
0.84	96 x 16	DD-9616BE-3A	38.1 x 9.2 x 1.6	23.1 x 5.5	SSD1306	I2C
0.91	128 x 32	DD-2832WE-6A	30 x 11.5 x 1.45	24.38 x 7.58	SSD1306	4 Wire SPI
0.95	96 x 64	DD-9664BE-3A	24.9 x 22.95 x 1.4	21.95 x 15.42	SSD1305	8-bit 68XX/80XX, 4-wire SPI, I2C
0.95	96 x 64	DD-9664WE-3A	24.9 x 22.95 x 1.4	21.95 x 15.42	SSD1305	8-bit 68XX/80XX, 4-wire SPI, I2C
0.96	128 x 64	DD-12864WE-4A	26.7 x 19.26 x 1.45	23.74 x 12.86	SSD1306	8 Bit 68XX/80XX Parallel,3/4-SPI, I2C
0.96	128 x 64	DD-2864BY-3A	31.26 x 26.7 x 1.45	23.74 x 13.2	SSD1306	8-bit 68XX/80XX, 3/4-wire SPI, I2C
1.04	128 x 32	DD-2832WE-4A	29.8 x 14.5 x 1.3	27.58 x 8.38	SSD1306	8-bit 68XX/80XX, 3/4-wire SPI, I2C
1.10	128 x 36	DD-2836BE-1A	31.4 x 16.2 x 1.3	28.86 x 9.54	SSD1305	8 Bit 68XX/80XX Parallel,4-SPI,I2C
1.10	128 x 36	DD-2836WE-1A	31.4 x 16.2 x 1.3	28.86 x 9.54	SSD1305	8 Bit 68XX/80XX Parallel,4-SPI,I2C
1.30	128 x 64	DD-12864WE-10A	34.5 x 23 x 1.45	31.42 x 16.7	SSD1306	8-bit 68XX/80XX, 3/4-wire SPI, I2C
1.30	128 x 64	DD-12864WE-11A	34.5 x 23 x 1.45	31.42 x 16.7	SSD1306	8-bit 68XX/80XX, 3/4-wire SPI, I2C
1.54	128 x 64	DD-12864WO-3A	45.24 x 29.14 x 2	37.05 x 19.52	SSD1305	8 Bit 68XX/80XX Parallel,4-SPI,I2C
1.54	128 x 64	DD-12864WO-4A	42.04 x 27.22 x 1.45	37.05 x 19.51	SSD1309	8 Bit 68XX/80XX Parallel,4-SPI,I2C
1.54	128 x 64	DD-12864YO-4A	42.04 x 27.22 x 1.45	37.05 x 19.51	SSD1309	8 Bit 68XX/80XX Parallel,4-SPI,I2C
1.54	128 x 64	DD-12864YO-3A	45.24 x 29.14 x 2	37.05 x 19.52	SSD1305	8 Bit 68XX/80XX Parallel,4-SPI,I2C
2.23	128 x 32	DD-12832YW-1A	62 x 24 x 2	57.02 x 15.1	SSD1305	8 Bit 68XX/80XX Parallel, 4-SPI, I2C
2.23	128 x 32	DD-12832BE-1A	62 x 24 x 2	57.02 x 15.1	SSD1305	8 Bit 68XX/80XX Parallel, 4-SPI, I2C
2.42	128 x 64	DD-12864YW-6A	60.5 x 37 x 2	57.01 x 29.49	SSD1305	8 Bit 68XX/80XX Parallel,4-SPI,I2C
2.42	128 x 64	DD-12864GE-6A	60.5 x 37 x 2	57.01 x 29.49	SSD1305	8 Bit 68XX/80XX Parallel,4-SPI,I2C
2.70	128 x 64	DD-12864YO-7A	73 x 41.86 x 2	63.41 x 32.69	SSD1325	8 Bit 68XX/80XX Parallel,4-SPI
2.70	128 x 64	DD-12864YO-1A	73 x 41.86 x 3.4	63.41 x 32.69	SSD1325	8 Bit 68XX/80XX Parallel,4-SPI
2.70	128 x 64	DD-12864YO-5A	73 x 41.86 x 3.3	63.41 x 32.69	SSD1325	8 Bit 68XX/80XX Parallel,4-SPI
2.80	256 x 64	DD-25664YW-3A	84 x 25.8 x 2	71.1 x 19.26	SSD1322	8 Bit 68XX/80XX Parallel,4-SPI
2.80	256 x 64	DD-25664BE-4A	85.1 x 25.8 x 2	71.1 x 19.26	SSD1322	8 Bit 68XX/80XX Parallel,4-SPI
3.12	256 x 64	DD-25664WE-1A	88 x 27.8 x 2.2	78.78 x 21.18	SSD1322	8 Bit 68XX/80XX Parallel,4-SPI
3.12	256 x 64	DD-25664YW-4A	88 x 27.8 x 2.2	78.78 x 21.18	SSD1322	8 Bit 68XX/80XX Parallel,4-SPI
3.12	256 x 64	DD-25664BE-3A	88 x 27.8 x 2.2	78.78 x 21.18	SSD1322	8 Bit 68XX/80XX Parallel,4-SPI
5.50	256 x 64	DD-25664GE-1A	146 x 65 x 2	146 x 45	SSD1322	8 Bit 68XX/80XX Parallel,3 or 4-SPI

Densitron OLED Technology

Alphanumeric PMOLED

Densitron's Alphanumeric OLED displays come with great features and user-friendly connector boards that enable easy system integration and high display performance in an industrial environment.

- Slim profile (1.3-1.6 mm)
- Low power consumption
- A near 170° wide viewing angle
- Up to 50,000 hours half life time
- Standard interface options of 4/8 bit parallel, SPI and I2C
- Extended operating temperature of -40°C~80°C
- In-built font CGROM and Chip-On-Glass configuration
- High contrast ratio of 10000:1 vs. most standard alphanumeric displays of ~500:1.

Screen Size ▲	Resolution	Module No.	Module Dimension WxHxD mm	Viewing Area WxH mm	Controller	Interface
2.26	2 x 16	DD-2C16WE-1A	68.5 x 17.5 x 2	58.22 x 13.52	US2066	4/8 Bit 68XX/80XX Parallel,4-SPI, I2C
2.26	2 x 16	DD-2C16YW-1A	68.5 x 17.5 x 2	58.22 x 13.52	US2066	4/8 Bit 68XX/80XX Parallel,4-SPI, I2C
2.26	2 x 16	DD-2C16WE-2A	80 x 36 x 9.6	58.22 x 13.52	US2066	8 Bit 68XX Parallel
2.26	2 x 16	DD-2C16YW-2A	80 x 36 x 9.6	58.22 x 13.52	US2066	8 Bit 68XX Parallel
2.89	4 x 20	DD-4C20WE-1A	84.5 x 27.5 x 2	72.42 x 22.82	US2066	4/8 Bit 68XX/80XX Parallel,4-SPI, I2C
2.89	4 x 20	DD-4C20YW-1A	84.5 x 27.5 x 2	72.42 x 22.82	US2066	4/8 Bit 68XX/80XX Parallel,4-SPI, I2C
2.93	2 x 20	DD-2C20WE-1A	84.5 x 19.28 x 2	75.52 x 13.52	US2066	4/8 Bit 68XX/80XX Parallel,4-SPI, I2C
2.93	2 x 20	DD-2C20YW-1A	84.5 x 19.28 x 2	75.52 x 13.52	US2066	4/8 Bit 68XX/80XX Parallel,4-SPI, I2C

Densitron's Range of Proprietary USB Evaluation Tools

PMOLED Evaluation Kits - DUO

Densitron Evaluation Kit for Passive Matrix OLEDs

Densitron has developed an easy to use yet powerful development and demonstration tool for driving
its range of passive and active matrix OLED displays from the USB port of a PC.

DUO (Densitron USB OLED) kit is hot pluggable and does not require extra cables or power supply to run, allowing users to be up and running in minutes.

The kit consists of an OLED display with transition Board, USB controller card, mini USB cable and a CD
with software application and drivers.

USB Controller Card is common for all the available DUO kits. Combination of different OLED displays
with Transition boards are offered separately for existing DUO kit customer.

Recommended Connectors.

Densitron has a range of EVK break out boards for easy prototyping. Below is also a list of recommended mating connectors for use with the FOC / COF type interfaces. Note that some displays are Hot Bar Solder connector interfaced, and will require a Hot Bar Solder Press Tool process for production.

Type	Diagonal Size	Densitron	Connection Type	Recomanded connectors	EVK connector
Monochrome	0.66"	DD-6448BE-3A	Hot Bar Soldering		EVK-CONNECT-031
	0.84"	DD-9616BE-3A	Hot Bar Soldering		EVK-CONNECT-032
	~~0.84"~~	~~DD-9616BE-2B~~	~~Connecter~~		~~EVK-CONNECT-025~~
	0.82"	DD-9639BE-4A	Hot Bar Soldering		EVK-CONNECT-031
		DD-9639WE-4A	Hot Bar Soldering		EVK-CONNECT-031
	1.04"	DD-2832WE-4A	Hot Bar Soldering		EVK-CONECT-030
	0.91"	DD-2832WE-6A	Hot Bar Soldering		
	2.23"	DD-12832BE-1A	Connector	XF2M-2415-1A	EVK-CONNECT-015
		DD-12832YW-1A	Connector	XF2M-2415-1A	EVK-CONNECT-015
		DD-12832WE-1A	Connector	XF2M-2415-1A	EVK-CONNECT-015
	0.95"	DD-9664BE-3A	Hot Bar Soldering		EVK-CONECT-013
		DD-9664WE-3A	Hot Bar Soldering		EVK-CONECT-013
	0.96"	DD-12864WE-4A	Hot Bar Soldering		EVK-CONNECT-026
	1.1"	DD-2836BE-1A	Hot Bar Soldering		EVK-CONECT-013
		DD-2836WE-1A	Hot Bar Soldering		EVK-CONECT-013
	1.3"	DD-12864WE-10A	Connector	XF2M-3015-1A	EVK-CONECT-030
	1.3"	DD-12864WE-11A	Hot Bar Soldering		EVK-CONNECT-026
	1.54"	DD-12864YO-3A	Connector	XF2M-2415-1A	EVK-CONNECT-015
		DD-12864WO-3A	Connector	XF2M-2415-1A	EVK-CONNECT-015
	2.42"	DD-12864YW-6A	Hot Bar Soldering	-	EVK-CONNECT-028
	2.42"	DD-12864GE-6A	Hot Bar Soldering	-	EVK-CONNECT-028
	2.70"	DD-12864YO-1A	Connector	XF2M-3015-1A	EVK-CONNECT-016
	2.70"	DD-12864YO-5A	Connector	XF2M-3015-1A	EVK-CONNECT-016
	2.70"	DD-12864YO-7A	Connector	XF2M-3015-1A	EVK-CONNECT-016
	2.80"	DD-25664BE-4A	Connector	XF2M-3015-1A	EVK-CONNECT-021
		DD-25664YW-3A	Connector	XF2M-3015-1A	EVK-CONNECT-021
	3.12"	DD-25664BE-3A	Connector	XF2M-3015-1A	EVK-CONNECT-021
		DD-25664YW-4A	Connector	XF2M-3015-1A	EVK-CONNECT-021
		DD-25664WE-1A	Connector	XF2M-3015-1A	EVK-CONNECT-021
	5.5"	DD-25664WE-1A	Connector	XF2M-3015-1A	EVK-CONNECT-021
Area Color	0.96"	DD-2864BY-3A	Hot bar Soldering		EVK-CONNECT-026
Full Color	0.95"	DD-9664FC-2A	Hot Bar Soldering		EVK-CONNECT-018
	1.10"	DD-9696FC-2A	Hot Bar Soldering		
	1.27"	DD-12896FC-3A	Connector	XF2M-3015-1A	EVK-CONNECT-024
	1.50"	DD-128128FC-6A	Connector	XF2M-3015-1A	EVK-CONNECT-024
	1.45"	DD-160128FC-1A	Connector	XF2M-3515-1A	EVK-CONECT-010
	1.69"	DD-160128FC-2B	Connector	XF2M-3515-1A	EVK-CONECT-010
Alphanumeric	2.26"	DD-2C16YW-1A	Hot Bar Soldering		EVK-CONNECT-029
	2.26"	DD-2C16WE-1A	Hot Bar Soldering		EVK-CONNECT-029
	2.93"	DD-2C20YW-1A	Hot Bar Soldering		EVK-CONNECT-029
	2.93"	DD-2C20WE-1A	Hot Bar Soldering		EVK-CONNECT-029
	2.89"	DD-4C20YW-1A	Hot Bar Soldering		EVK-CONNECT-029
	2.89"	DD-4C20WE-1A	Hot Bar Soldering		EVK-CONNECT-029

Obsolescence and Risk

As with any display technology the components which make up an OLED Module have inherent lifetimes in the market. Densitron will always strive to maintain the physical parameters of an OLED, if for instance a Driver IC is updated or the glass substrate is modified. Most OLED Modules have a lifetime of 3-5 years before any changes are made. Changes can be a result of improvements to the lifetime of the modules, updated Driver IC's, Polarizer changes etc.

Lead Times and Stock Holding

Densitron endeavours to hold UK stock for all of the standard OLED modules.

Mass production lead times vary depending on times of year and can be anything from 12-16 weeks.

Conclusions

OLED Technology is fast becoming a replacement to traditional LCD products. With stunning visual impact, increasingly competitive costing and longer lifetimes.

Design Engineers can no longer afford to ignore the impact which OLED can have on a product development.

Please contact your local Sales Manager to begin your OLED development.