



MODEL NO. : G1601FP161GG-001

ISSUED DATE: 2017-12-01

VERSION : A0

■ Preliminary Specification

□ Final Product Specification

Customer : \_\_\_\_\_

| Approved by | Notes |
|-------------|-------|
|             |       |

GVO Confirmed :

| Prepared by | Checked by | Approved by |
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This technical specification is subjected to change without notice.



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## Record of Revision

[illegible]



## 1 General Specifications

| Feature                    |  | Spec                          | Remark |
|----------------------------|--|-------------------------------|--------|
| Display Spec               | Screen Size (inch)                       | 6.01                          |        |
|                            | Display Mode                             | AMOLED                        |        |
|                            | Resolution(dot)                          | 1080(W)×2160(H)               |        |
|                            | Active Area(mm)                          | 68.256(W)×136.512 (H)         |        |
|                            | Pixel Pitch (um)                         | 63.2 (W)×63.2(H)              |        |
|                            | Technology Type                          | LTPS                          |        |
|                            | Color Depth                              | 16.7M                         |        |
|                            | Interface                                | MIPI 4LANE                    |        |
|                            | Surface Treatment                        | Hard Coating                  |        |
| Mechanical Characteristics | With TP/Without TP                       | With TP(on Cell)              |        |
|                            | Module Outline Dimension(W x H x D) (mm) | 70.066(W)x142.297(H)x0.773(D) |        |
|                            | Weight (g)                               | TBD                           |        |
|                            |  |                               |        |
| Electronic                 | Driver IC(Type)                          | RM69298                       |        |
|                            | Touch IC(Type)                           | GT1151                        |        |

Note 1: Requirements on Environmental Protection: RoHS.



## 2 Input/output Terminals

### 2.1 Main FPC Pin Assignment

FPC connector: BM24-50DS/2-0.35V(51) (Socket), B-TO-B Connector.

Main board recommended connector: BM24-50DP/2-0.35V(51) (Header), B-TO-B Connector.

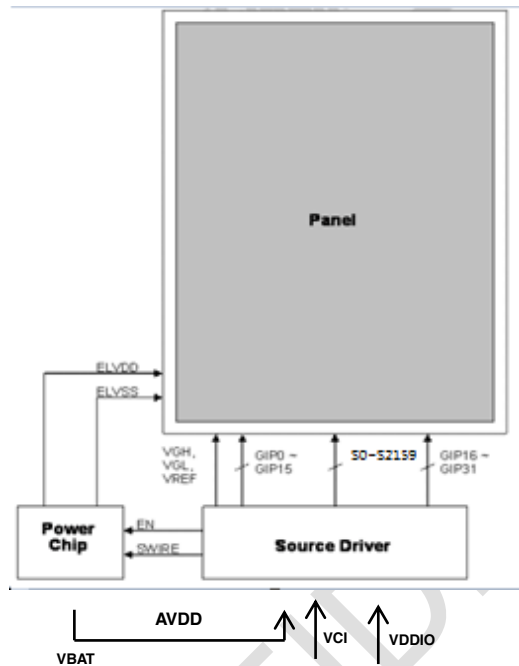
| No | Symbol  | I/O | Description  |
|----|---------|-----|--|
| 1  | GND     | GND | Ground   |
| 2  | ELVSS   | P   | Negative power supply for EL   |
| 3  | VPP     | P   | Power supply for MTP Programming or Erase.<br>If it is not used, please let it open. |
| 4  | ELVSS   | P   | Negative power supply for EL   |
| 5  | GND     | GND | Ground   |
| 6  | ELVSS   | P   | Negative power supply for EL   |
| 7  | D3N     | I   | MIPI data lane   |
| 8  | GND     | GND | Ground   |
| 9  | D3P     | I   | MIPI data lane   |
| 10 | ELVDD   | P   | Positive power supply for EL   |
| 11 | GND     | GND | Ground   |
| 12 | ELVDD   | P   | Positive power supply for EL   |
| 13 | D0N     | I   | MIPI data lane   |
| 14 | ELVDD   | P   | Positive power supply for EL   |
| 15 | D0P     | I   | MIPI data lane   |
| 16 | GND     | GND | Ground   |
| 17 | GND     | GND | Ground   |
| 18 | RESX    | I   | Display reset. Active low.   |
| 19 | CLKN    | I   | MIPI clock lane  |
| 20 | AVDD_EN | O   | Power IC enable control pin  |
| 21 | CLKP    | I   | MIPI clock lane  |
| 22 | SWIRE   | O   | Control signal for power IC  |
| 23 | GND     | GND | Ground   |
| 24 | ERR_FG  | O   | Error status of MIPI' s HSDT   |
| 25 | D1N     | I   | MIPI data lane   |



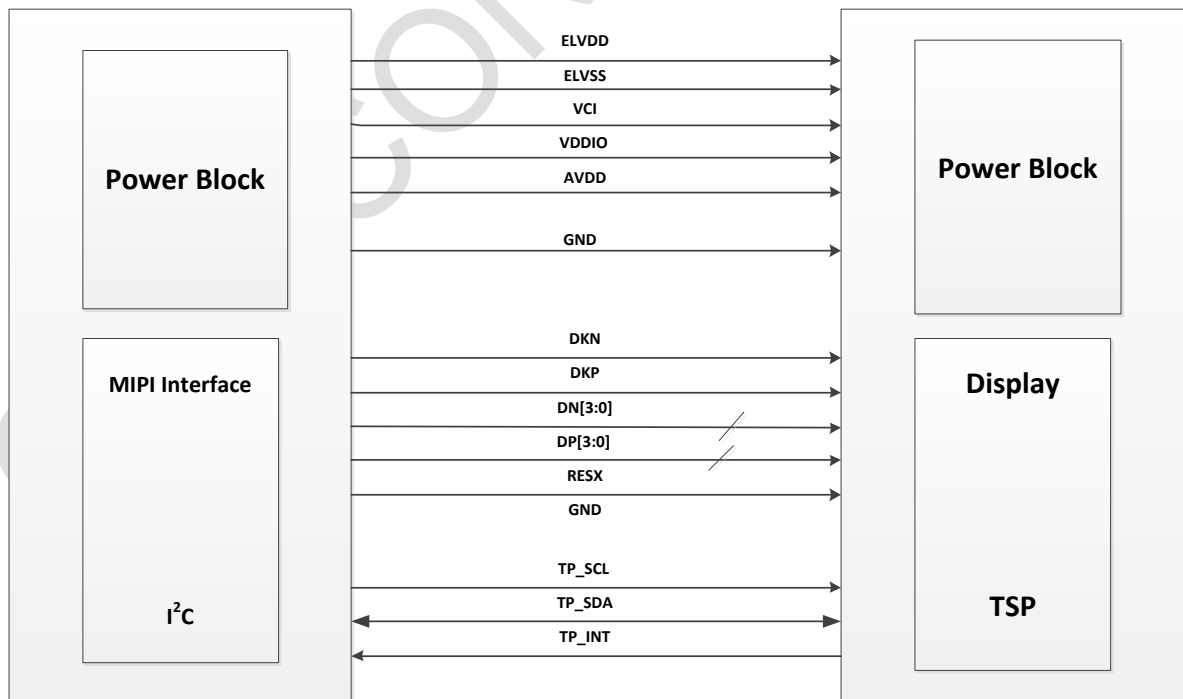
|    |               |     |  |
|----|---------------|-----|--|
| 26 | PCD           | I   | panel crack detection  |
| 27 | D1P           | I   | MIPI data lane   |
| 28 | TE            | I   | Sync Signal for preventing Tearing Effect                    |
| 29 | GND           | GND | Ground   |
| 30 | GND           | GND | Ground   |
| 31 | D2N           | I   | MIPI data lane   |
| 32 | TSP_AVDD_3.3V | P   | Analog Power for TP  |
| 33 | D2P           | I   | MIPI data lane   |
| 34 | AVDD          | P   | Power supply for Analog system                               |
| 35 | GND           | GND | Ground   |
| 36 | VCI           | P   | Power supply for display analog circuits                     |
| 37 | TSP_DVDD_1.8V | P   | Power supply for TP logic circuits                           |
| 38 | VDDIO         | P   | Power supply for interface system except MIPI/MDDI interface |
| 39 | TSP_TA        | NC  |  |
| 40 | GND           | GND | Ground   |
| 41 | TSP_INT       | I   | Interrupt signal for TP                                      |
| 42 | F_SCLK        | I   | Flash signal   |
| 43 | TSP_SCL       | I   | SCL pin for TP   |
| 44 | F_CSN         | I   | Flash signal   |
| 45 | TSP_SDA       | I/O | SDA pin for TP   |
| 46 | F_IO<0>       | I/O | Flash signal   |
| 47 | TSP_RESET     | I   | Reset Pin for TP, Active low.                                |
| 48 | F_IO<1>       | I/O | Flash signal   |
| 49 | GND           | GND | Ground   |
| 50 | GND           | GND | Ground   |

Note: I=Input; O=Output; P=Power; I/O=Input / Output

## 2.2 Circuit block diagram (Display)



## 2.3 MCU and Display Module Interface Configuration





### 3 Absolute Maximum Ratings

#### 3.1 Driving AMOLED Panel

Maximum Ratings (Voltage Referenced to VSS) Vss=0V, Ta=25°C

| Item                 | Symbol | MIN  | MAX  | Unit |
|----------------------|--------|------|------|------|
| Analog Power supply  | VCI    | -0.3 | +5.5 | V    |
| Logic Power supply   | VDDIO  | -0.3 | +5.5 | V    |
| Positive Power Input | ELVDD  | -    | +5.0 | V    |
| Negative Power Input | ELVSS  | -5.0 | -    | V    |

Note: Functional operation should satisfy the limits in the Electrical Characteristics tables or Pin Description section. If the module exceeds the absolute maximum ratings, permanent damage may occur. Besides, if the module is operated with the absolute maximum ratings for a long time, the reliability may also drop.

### 4 Electrical Characteristics

#### 4.1 Driving AMOLED Panel

| Item                  |            | Symbol                                 | MIN        | TYP  | MAX        | Unit |
|-----------------------|------------|--|------------|------|------------|------|
| Logic Power supply    |            | VDDIO                                  | 1.65       | 1.80 | 3.3        | V    |
| Analog Power supply   |            | VCI                                    | 2.5        | 2.80 | 3.60       | V    |
| ELVDD Supply Voltage  |            | ELVDD                                  | 4.55       | 4.60 | 4.65       | V    |
| ELVSS Supply Voltage  |            | ELVSS                                  | -5         | -3   | -          | V    |
| Input Signal Voltage  | High Level | VIH                                    | 0.80*VDDIO | -    | VDDIO      | V    |
|                       | Low Level  | VIL                                    | 0.00       | -    | 0.20*VDDIO | V    |
| Output Signal Voltage | High Level | VOH                                    | 0.80*VDDIO | -    | VDDIO      | V    |
|                       | Low Level  | VOL                                    | 0.00       | -    | 0.20*VDDIO | V    |
| Normal                |            | I <sub>ELVDD</sub> /I <sub>ELVSS</sub> | -          | TBD  | TBD        | mA   |
|                       |            | I <sub>VCI</sub>                       | -          | TBD  | TBD        | mA   |
|                       |            | I <sub>VDDIO</sub>                     | -          | TBD  | TBD        | mA   |
|                       |            | I <sub>avdd</sub>                      | -          | TBD  | TBD        | mA   |
| Stand-by              |            | I <sub>VCI</sub>                       | -          | TBD  | TBD        | uA   |
|                       |            | I <sub>VDDIO</sub>                     | -          | TBD  | TBD        | uA   |

Ta=25°C

Note1: The input digital voltage is the I/O reference voltage.

Note2: VDDIO usually ranges from 1.65V to 3.3 V. If VDDIO is changed, the remaining voltage needs to be changed to the same voltage as VDDIO.

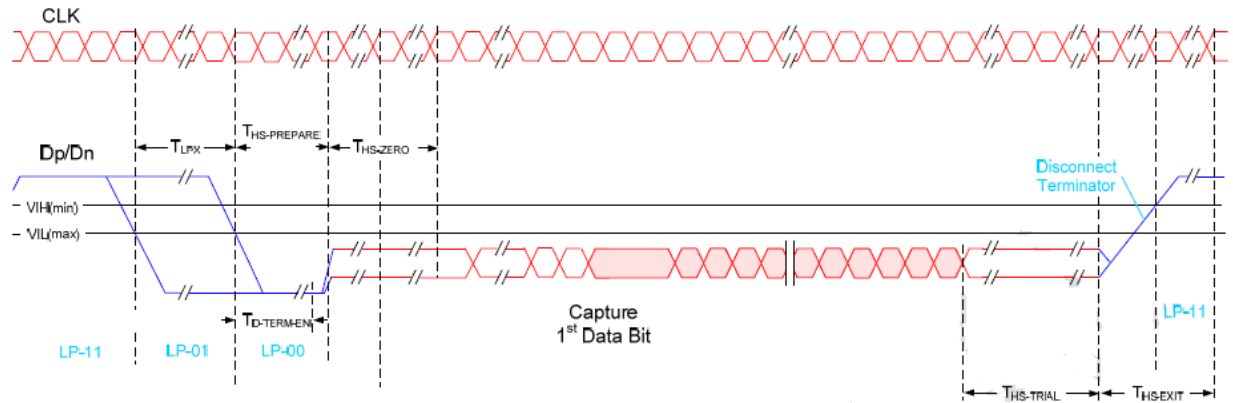
Note3: Under full white pattern, Video Mode 60 Hz.

Note4: 60Hz command mode at 800 Mbps.

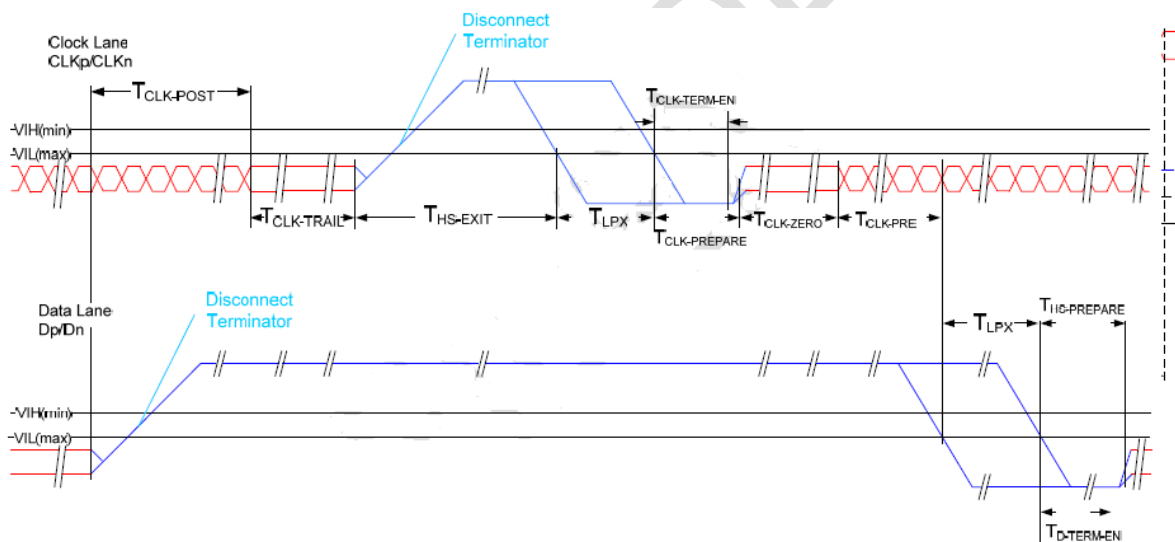


## 5 AC Characteristics

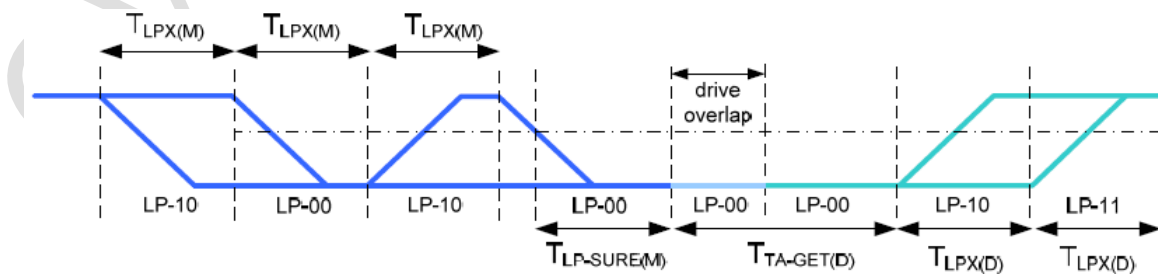
### 5.1 MIPI Interface Characteristics HS Data Transmission Burst



### HS clock transmission

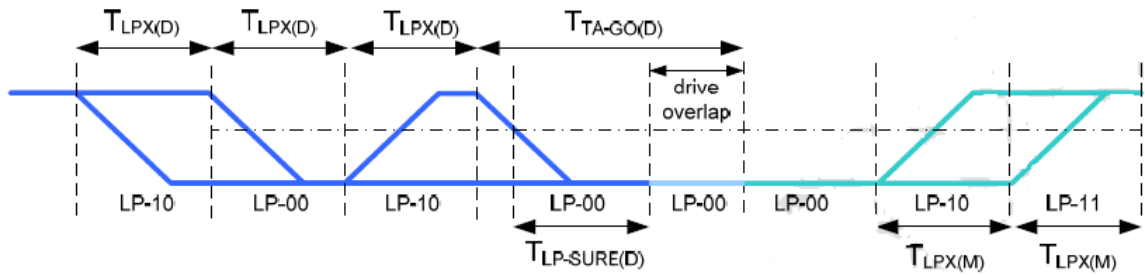


### Turnaround Procedure





## Bus turnaround (BAT) from MPU to display module timing



### Timing Parameters:

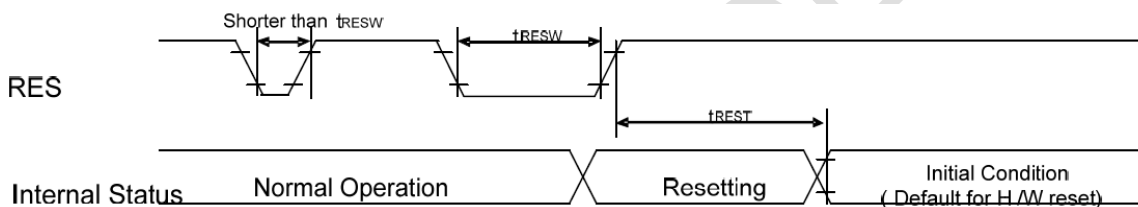
| Parameter                        | Description  | Min                                | Typ | Max            | Unit |
|----------------------------------|--|------------------------------------|-----|----------------|------|
| $T_{CLK-POST}$                   | Time that the transmitter continues to send HS clock after the last associated Data Lane has transitioned to LP Mode. Interval is defined as the period from the end of $T_{HS-TRAIL}$ to the beginning of $T_{CLK-TRAIL}$ . | $60ns + 52*UI$                     |     |                | ns   |
| $T_{CLK-TRAIL}$                  | Time that the transmitter drives the HS-0 state after the last payload clock bit of a HS transmission burst.   | 60                                 |     |                | ns   |
| $T_{HS-EXIT}$                    | Time that the transmitter drives LP-11 following a HS burst.   | 300                                |     |                | ns   |
| $T_{CLK-TERM-EN}$                | Time for the Clock Lane receiver to enable the HS line termination, starting from the time point when Dn crosses $V_{IL,MAX}$ .  | Time for Dn to reach $V_{TERM-EN}$ |     | 38             | ns   |
| $T_{CLK-PREPARE}$                | Time that the transmitter drives the Clock Lane LP-00 Line state immediately before the HS-0 Line state starting the HS transmission.  | 38                                 |     | 95             | ns   |
| $T_{CLK-PRE}$                    | Time that the HS clock shall be driven by the transmitter prior to any associated Data Lane beginning the transition from LP to HS mode.   | 8                                  |     |                | UI   |
| $T_{CLK-PREPARE} + T_{CLK-ZERO}$ | $T_{CLK-PREPARE}$ + time that the transmitter drives the HS-0 state prior to starting the Clock.   | 300                                |     |                | ns   |
| $T_{D-TERM-EN}$                  | Time for the Data Lane receiver to enable the HS line termination, starting from the time point when Dn crosses $V_{IL,MAX}$ .   | Time for Dn to reach $V_{TERM-EN}$ |     | $35 ns + 4*UI$ |      |
| $T_{HS-PREPARE}$                 | Time that the transmitter drives the Data Lane LP-00 Line state immediately before the HS-0 Line state starting the HS transmission  | $40ns + 4*UI$                      |     | $85 ns + 6*UI$ | ns   |
| $T_{HS-PREPARE} + T_{HS-ZERO}$   | $T_{HS-PREPARE}$ + time that the transmitter drives the HS-0 state prior to transmitting the Sync sequence.  | $145ns + 10*UI$                    |     |                | ns   |
| $T_{HS-TRAIL}$                   | Time that the transmitter drives the flipped differential state after last payload data bit of a HS transmission burst   | $60ns + 4*UI$                      |     |                | ns   |



| Parameter        | Description   | Min          | Typ                  | Max                  | Unit | Notes |
|------------------|---|--------------|----------------------|----------------------|------|-------|
| $T_{LPX(M)}$     | Transmitted length of any Low-Power state period of MCU to display module   | 50           |                      | 150                  | ns   | 1,2   |
| $T_{TA-SURE(M)}$ | Time that the display module waits after the LP-10 state before transmitting the Bridge state (LP-00) during a Link Turnaround. | $T_{LPX(M)}$ |                      | $2 \cdot T_{LPX(M)}$ | ns   | 2     |
| $T_{LPX(D)}$     | Transmitted length of any Low-Power state period of display module to MCU   | 50           |                      | 150                  | ns   | 1,2   |
| $T_{TA-GET(D)}$  | Time that the display module drives the Bridge state (LP-00) after accepting control during a Link Turnaround.                  |              | $5 \cdot T_{LPX(D)}$ |                      | ns   | 2     |
| $T_{TA-GO(D)}$   | Time that the display module drives the Bridge state (LP-00) before releasing control during a Link Turnaround.                 |              | $4 \cdot T_{LPX(D)}$ |                      | ns   | 2     |
| $T_{TA-SURE(D)}$ | Time that the MPU waits after the LP-10 state before transmitting the Bridge state (LP-00) during a Link Turnaround.            | $T_{LPX(D)}$ |                      | $2 \cdot T_{LPX(D)}$ | ns   | 2     |

## 5.2 Display RESET Timing Characteristics

Reset input timing:



VDDIO=1.65 to 3.3V, VDD=2.7 to 3.6V, AGND=DGND=0V, Ta=-40 to 85°C

### Timing Parameters

| Symbol     | Parameter                 | Related Pins | MIN | TYP | MAX | Note                                     | Unit    |
|------------|---------------------------|--------------|-----|-----|-----|--|---------|
| $t_{RESW}$ | *1) Reset low pulse width | RESX         | 10  | -   | -   | -  | $\mu s$ |
| $t_{REST}$ | *2) Reset complete time   | -            | -   | -   | 5   | When reset applied during Sleep in mode  | ms      |
|            |                           | -            | -   | -   | 120 | When reset applied during Sleep out mode | ms      |

Note1. Spike caused by an electrostatic discharge on RESX line does not cause irregular system reset according to the table below.

| RESX Pulse                       | Action   |
|----------------------------------|--|
| Shorter than 5 $\mu s$           | Reset Rejected   |
| Longer than 10 $\mu s$           | Reset  |
| Between 5 $\mu s$ and 10 $\mu s$ | Reset starts<br>(It depends on voltage and temperature condition.) |

Note 2. During the resetting period, the display will be blank (The display is entering blanking sequence,

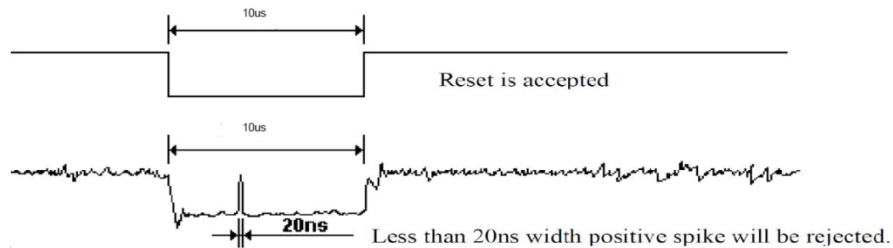
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whose maximum time is 120 ms, when Reset Starts in Sleep Out –mode. The display remains blank in Sleep In –mode) and then return to Default condition for H/W reset.

Note 3. During Reset Complete Time, data in OTP will be latched to internal register during this period. This loading is done every time when there is H/W reset complete time ( $t_{REST}$ ) within 5ms after a rising edge of RESX.

Note 4. Spike Rejection also applies during a valid reset pulse as shown below:



Note 5. It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.

### 5.3 TE Timing Characteristics

Mode1, The Tearing Effect Output line consists of V-Blanking information only.



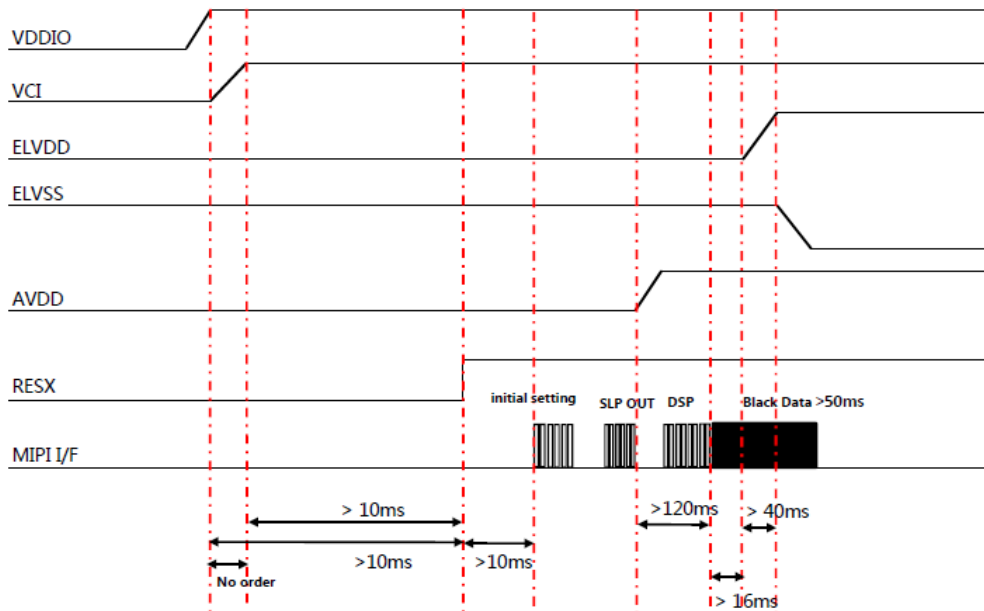
Tvdh = The display is not updated from the frame memory.

Tvdl = The display is updated from the frame memory.

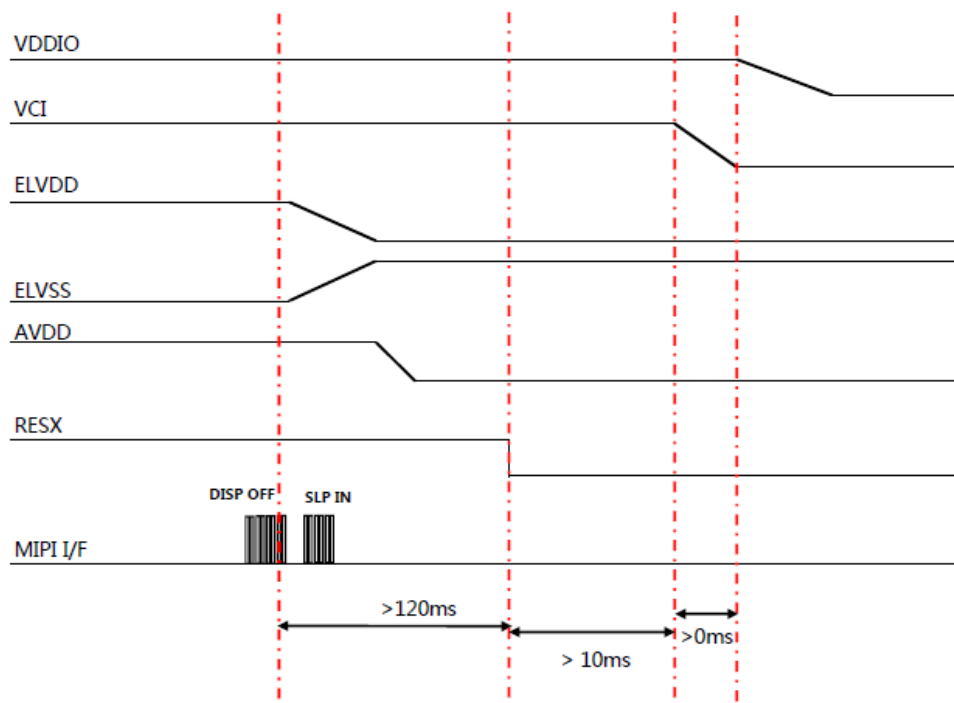
## 6 Recommended Operating Sequence

### 6.1 Display Power on / off Sequence

#### 6.1.1 Power On Sequence



#### 6.1.2 Power Off Sequence





## 6.2 Brightness control

Use “command 5100h, data xxh” to adjust the Manual Brightness value of the display:

In principle relationship is that 00h value means the lowest brightness and FFh value means the highest brightness.

| Inst/Para | R/W | Address |       | Date Type | Description          |
|-----------|-----|---------|-------|-----------|----------------------|
|           |     | MIPI    | Other |           |                      |
| BRTCTRL   | W   | 51h     | 5100h | Hex       | Value form 0~255(FF) |



## 7 Optical Characteristics Optical Specification

| Item           |       | Symbol           | Condition | Min     | Typ     | Max     | Unit              | Remark   |
|----------------|-------|------------------|-----------|---------|---------|---------|-------------------|--|
| View Angle     |       | θT               | CR≥10     | 80      | -       |         | Degree            | Note 2<br>Test Equipment:<br>CS2000A   |
|                |       | θB               |           | 80      | -       |         |                   |  |
|                |       | θL               |           | 80      | -       |         |                   |  |
|                |       | θR               |           | 80      | -       |         |                   |  |
| Contrast Ratio |       | CR               | θ=0°      | 100000  |         |         |                   | Note1<br>Note3<br>Test Equipment:<br>CS2000A   |
| Response Time  |       | T <sub>ON</sub>  | 25℃       |         |         | 1       | ms                | Note1<br>Note4<br>Test Equipment:<br>Admesy MSE  |
|                |       | T <sub>OFF</sub> |           |         |         |         |                   |  |
| Chromaticity   | White | x                |           | (0.280) | (0.300) | (0.320) |                   | Test Equipment:<br>CS2000A<br><br>Note: Chromaticity<br>can be modified<br>according to customer<br>demand |
|                |       | y                |           | (0.295) | (0.315) | (0.335) |                   |  |
|                | Red   | x                |           | (0.625) | (0.655) | (0.685) |                   |  |
|                |       | y                |           | (0.315) | (0.345) | (0.375) |                   |  |
|                | Green | x                |           | (0.210) | (0.250) | (0.290) |                   |  |
|                |       | y                |           | (0.670) | (0.710) | (0.750) |                   |  |
|                | Blue  | x                |           | (0.105) | (0.135) | (0.165) |                   |  |
|                |       | y                |           | (0.030) | (0.060) | (0.090) |                   |  |
| Uniformity     |       | U                |           | 75      |         |         | %                 | Note1<br>Note6<br>Test Equipment:<br>CS2000A   |
| NTSC           |       |                  |           | 90      | 100     |         | %                 | Note5  |
| Luminance      |       | L                | Normal    | 365     | 430     | 495     | Cd/m <sup>2</sup> | Note1<br>Note7<br>Test Equipment:<br>CS2000A   |
| Cross-talk     |       |                  |           |         |         | 1.5     | %                 | Note8<br>Test Equipment:<br>CS2000A  |



|       |  |  |     |     |     |  |   |
|-------|--|--|-----|-----|-----|--|---|
| Gamma |  |  | 2.0 | 2.2 | 2.4 |  | Gamma=2.2±0.2<br>Test Equipment:<br>CS2000A |
|-------|--|--|-----|-----|-----|--|---|

Test Conditions:

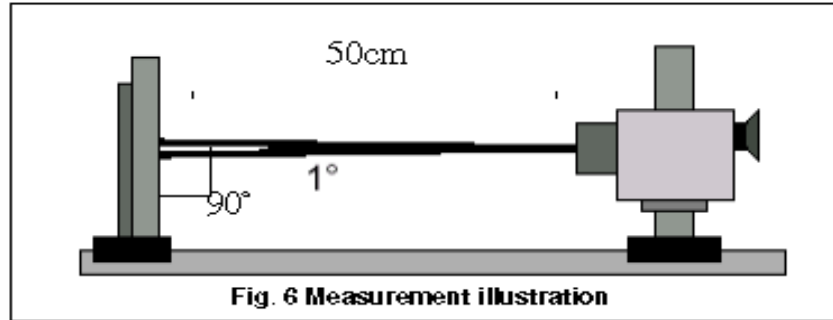
the ambient temperature is 25°C.

1. The test systems refer to Note1 and Note2.



Note 1: Definition of optical measurement system.

The optical characteristics should be measured in dark room. The optical properties are measured at the center point of the AMOLED screen. All input terminals AMOLED panel must be ground when measuring the center area of the panel.



Note 2: Definition of viewing angle range and measurement system.

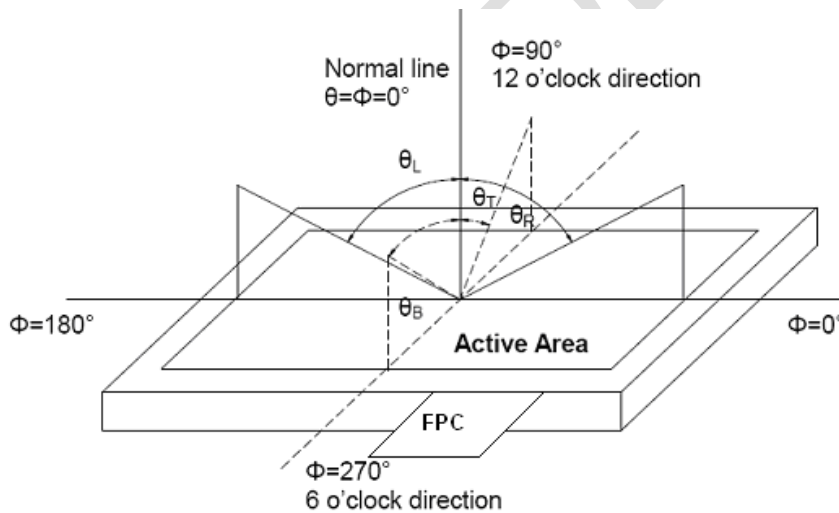


Fig. 1 Definition of viewing angle

Note 3: Definition of contrast ratio

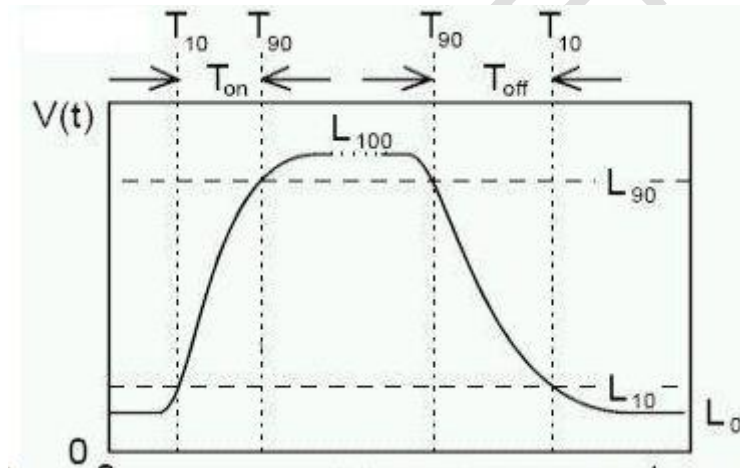
$$\text{Contrast ratio(CR)} = \frac{\text{Luminance measured when LCD is on the "white" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

“White state “: A state where the AMOLED should be driven by V<sub>white</sub>.

“Black state”: A state where the AMOLED should be driven by V<sub>black</sub>.

Note 4: Definition of response time

The response time is defined as the AMOLED optical switching time interval between “White” state and “Black” state. Rise time (T<sub>ON</sub>) is the time between photo detector output intensity changing from 10% to 90%. And fall time (T<sub>OFF</sub>) is the time between photo detector output intensity changing from 90% to 10%.



Note 5: Definition of color chromaticity (CIE1931)

Color coordinates are measured at the center point of AMOLED.

Note 6: Definition of luminance uniformity

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

$$\text{Luminance Uniformity}(U) = L_{\min} / L_{\max}$$

L-----Active area length W----- Active area width

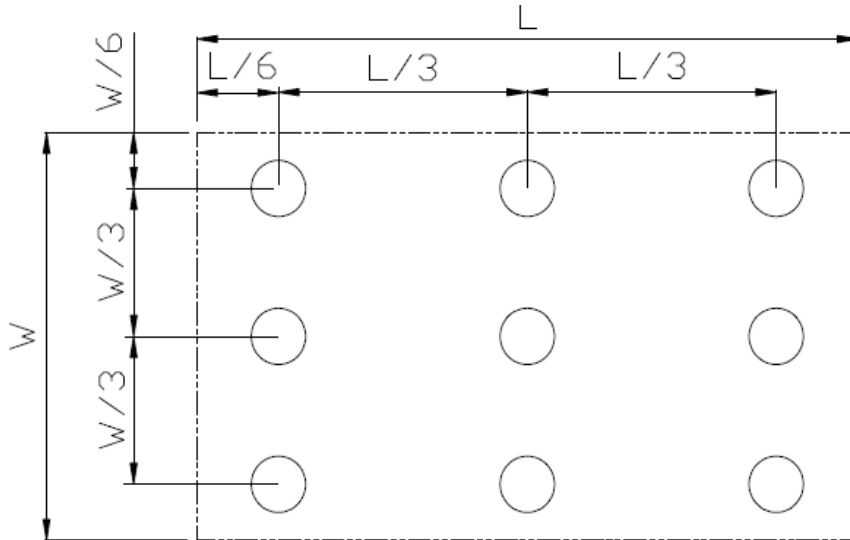


Fig. 2 Definition of uniformity

$L_{\max}$ : The measured maximum luminance of all measurement position.

$L_{\min}$ : The measured minimum luminance of all measurement position.

Note 7: Definition of luminance:

Measure the luminance of white state at the center point.

Note 8: Cross Talk

A. Measure luminance at the position, P0.

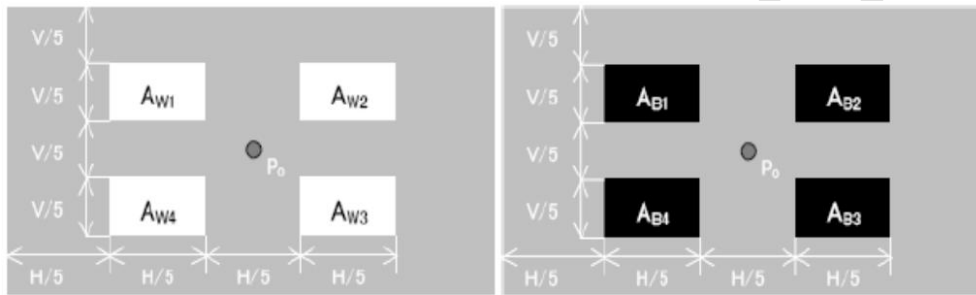
B. Calculate cross talk as below equation.

$$L_{W\_OFF} = \frac{L_{W1} + L_{W2} + L_{W3} + L_{W4}}{4}$$

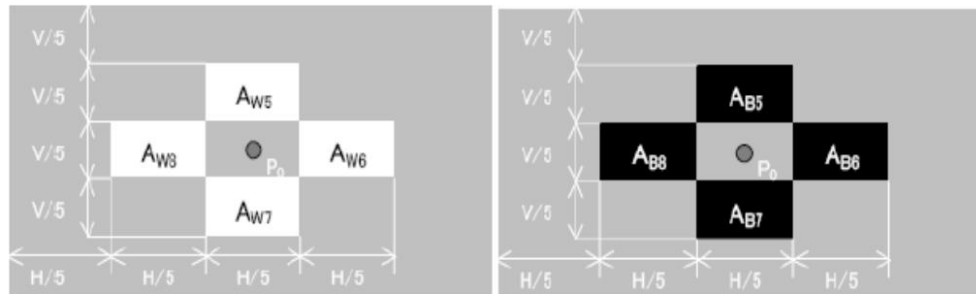
$$L_{B\_OFF} = \frac{L_{B1} + L_{B2} + L_{B3} + L_{B4}}{4}$$

$$\text{crosstalk} = \frac{|L_{Wi\_ON} - L_{W\_OFF}|}{L_{W\_OFF}} \times 100\% \quad (i = 5 \text{ to } 8)$$

$$\text{crosstalk} = \frac{|L_{Bi\_ON} - L_{B\_OFF}|}{L_{B\_OFF}} \times 100\% \quad (i = 5 \text{ to } 8)$$



(a)  $L_{W\_OFF}$ ,  $L_{B\_OFF}$  measuring pattern



(b)  $L_{W\_ON}$ ,  $L_{B\_ON}$  measuring pattern

## 8 Environmental / Reliability Test

| No | Test Item                                  | Condition   | Remark                            |
|----|--|---|-----------------------------------|
| 1  | High Temperature Operation                 | +70℃, 120hrs  | According to the customer request |
| 2  | Low Temperature Operation                  | -20℃, 120hrs  | According to the customer request |
| 3  | High Temperature Storage                   | +80℃, 120hrs  | According to the customer request |
| 4  | Low Temperature Storage                    | -30℃, 120hrs  | According to the customer request |
| 5  | High Temperature & High Humidity Operation | 60℃, 90% RH, 120hrs   | According to the customer request |
| 6  | High Temperature & High Humidity Storage   | 60℃, 90% RH, 120hrs   | According to the customer request |
| 7  | Thermal Shock (Non-operation)              | -30℃ (30 min) ~ +70℃ (30 min),<br>Change time: 10min, 30Cycles  | According to the customer request |
| 8  | Electro Static Discharge (Operation)       | <p>C=150pF, R=330Ω, 5points/panel<br/> Air: ±8KV, 5times;<br/> Contact: ±4KV, 5 times;<br/> (Environment: 15℃~35℃,<br/> 30%~60%, 86Kpa~106Kpa).</p>  | IEC61000-4-2<br>GB/T17626.2       |



## 9 Quality Level

### 9.1 AMOLED Module of Characteristic Inspection

The environmental condition and visual inspection shall be conducted as below:

- (1) Ambient temperature:  $23 \pm 3^{\circ}\text{C}$
- (2) Humidity:  $55 \pm 10\%\text{RH}$
- (3) Ambient light intensity of visual inspection: 800 ~ 1200 lux
- (4) Ambient light intensity of function inspection:  $\leq 200\text{lux}$
- (5) Viewing Distance:  $30 \pm 5\text{cm}$
- (6) Viewing angle (tolerance): the front side  $45^{\circ}$  (Z)  $\pm 15^{\circ}$
- (7) Inspection time:  $10 \pm 5\text{ sec}$

### 9.2 Sampling Procedures for each item acceptance table

| Defect type  | Sampling Procedures  | AQL  |
|--------------|--|------|
| Major defect | GB/T2828.1-2003 Inspection level II<br>normal inspection<br>single sample inspection | 0.65 |
| Minor defect | GB/T2828.1-2003 Inspection level II<br>normal inspection<br>single sample inspection | 1.0  |

Major defect:

Any defect may result in functional failure, or reduce the usability of product for its purpose. For example, electrical failure, deformation and etc.

Minor defect

A defect does not reduce the usability of product for its intended purpose and un-uniformity, such as dot defect and etc.

The criteria on major and/or minor judgment will be according with the classification of defects.

### 9.3 Inspection Item

| No | Item       | Area | Criterion of Defect   |                    |                   | Defect type |
|----|------------|------|-----------------------|--------------------|-------------------|-------------|
|    |            |      | Type                  | DS                 | Acceptable number |             |
| 1  | Dot Defect | AA   | Bright Dot            | $\geq 10\text{mm}$ | 0                 | Minor       |
|    |            |      | Dark Dot              | $\geq 10\text{mm}$ | 4                 |             |
|    |            |      | Dark Dot ( $\geq 2$ ) | $\geq 10\text{mm}$ | 2                 |             |
|    |            |      |                       |                    |                   |             |

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|    |   |       |  |             |         |                    |             |       |
|----|---|-------|--|-------------|---------|--------------------|-------------|-------|
|    |   |       | connections )  |             |         |                    |             |       |
| 2  | No Display  | AA    | /  |             |         |                    | Not allowed | Fatal |
| 3  | Abnormal Display                                  | AA    | /  |             |         |                    | Not allowed | Fatal |
| 4  | Normally white                                    | AA    | /  |             |         |                    | Not allowed | Fatal |
| 5  | Line Defect                                       | AA    | single line  | Bright line |         | Not allowed        | Fatal       |       |
|    |   |       |  | Dark line   |         | Not allowed        |             |       |
|    |   |       | Multiple lines   | Bright line |         | Not allowed        |             |       |
|    |   |       |  | Dark line   |         | Not allowed        |             |       |
|    |   |       | Half-Line  | Bright line |         | Not allowed        |             |       |
|    |   |       |  | Dark line   |         | Not allowed        |             |       |
| 6  | Image sticking                                    | AA    | Switch to the next screen and display the image of the previous picture                      |             |         |                    |             | Major |
| 7  | Color & Edge Mura                                 | AA    | See limit sample(under full white screen )   |             |         |                    |             | Major |
| 8  | Color crast                                       | AA    | See limit sample(under full white screen )   |             |         |                    |             | Major |
| 9  | Water Ripple                                      | AA    | Not allowed  |             |         |                    |             | Major |
| 10 | Other mura(Low gray-scale white spot、S-Line Mura) | AA    | Not allowed(under full white screen ) or See limit sample(under low gray-scale white screen) |             |         |                    |             | Major |
| 11 | TP  | AA    | TP function NG   |             |         |                    | Not allowed | Fatal |
| 12 | Glass crack                                       | AA、OA | /  |             |         |                    | Not allowed | Fatal |
| 13 | Screen bump                                       | AA、OA | Encap surface is not allowed and LTPS does not affect assembly                               |             |         |                    |             | Major |
| 14 | Line sefects (light visible)                      | AA    | W (mm)   | L (mm)      | DS (mm) | Acceptabl e number | Minor       |       |
|    |   |       | W≤0.03   | -           | -       | Ignore             |             |       |
|    |   |       | 0.03<W≤0.05  | L≤5.0       | ≥10     | 2                  |             |       |
|    |   |       | 0.05<W   | -           | -       | 0                  |             |       |
|    |   |       | -  | L>5.0       | -       | 0                  |             |       |
| 15 | Point sefects (light visible)                     | AA    | D (mm)   | DS (mm)     |         | Acceptabl e number | Minor       |       |
|    |   |       | D≤0.1  | /           |         | Ignore             |             |       |



|    |   |                           |   |           |             |                       |       |
|----|---|---------------------------|---|-----------|-------------|-----------------------|-------|
|    |   |                           | 0.1<D≤0.25  | ≥10       |             | 2                     |       |
|    |   |                           | 0.25<D  | -         |             | 0                     |       |
| 16 | Glass scratch   | AA                        | W（mm）   | L（mm）     | DS（mm）      | Acceptabl<br>e number | Minor |
|    |   |                           | W≤0.03  | L<5.0     | ≥10         | Ignore                |       |
|    |   |                           | 0.03<W≤0.05   | L≤2.0     | ≥10         | Ignore                |       |
|    |   |                           |   | 2.0<L≤5.0 | ≥10         | 2                     |       |
|    |   |                           | 0.05<W  | -         | 0           | 0                     |       |
|    |   |                           |   | L>5.0     | 0           | 0                     |       |
| 17 | Frit Encapsulation                                    | FA                        | Frit width uniformity. It should not have bubble or breakage. |           |             |                       | Major |
| 18 | Polarizer crease / indentation                        | AA                        | See limit sample  |           |             |                       | Minor |
| 19 | Protective film starved/overflow glue/burr            | Except AA                 | No control under W≤0.3mm                                      |           |             |                       | Minor |
| 20 | Polarizer bump point                                  | Whole area                | Bump:D≤0.25mm，dent ≤1mm or See limit sample                   |           | Allow 3     |                       | Minor |
| 21 | Polarizer bubble line                                 | Out of AA，<br>≤0.25m<br>m | Encap surface   |           | Not allowed |                       | Minor |
| 22 | Scratches on the surface of polarizer                 | Whole area                | No harm subject regardless of control                         |           |             |                       | Minor |
| 23 | Concave dot、Black and white dot、Polarizer Dent/Bubble | AA                        | Front（Encap surface）  | D（mm）     | DS（mm）      | Acceptabl<br>e number | Minor |
|    |   |                           |   | D≤0.1     | ≥10         | Ignore                |       |
|    |   |                           |   | 0.1<D≤0.2 | ≥10         | 3                     |       |
|    |   |                           |   | 0.2<D     | ≥10         | 0                     |       |
|    |   |                           | Metal material foreign material                               | /         | ≥10         | Not allowed           |       |
| 24 | Polarizer Scratch/Fiber(Linear)                       | AA                        | W（mm）   | L（mm）     | DS（mm）      | Acceptabl<br>e number | Minor |
|    |   |                           | W≤0.03  | L≤5.0     | ≥10         | Ignore                |       |
|    |   |                           | 0.03<W≤0.05   | L≤2.0     | ≥10         | Ignore                |       |
|    |   |                           |   | 2.0<      | ≥10         | 3                     |       |

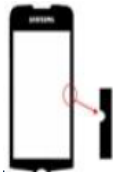


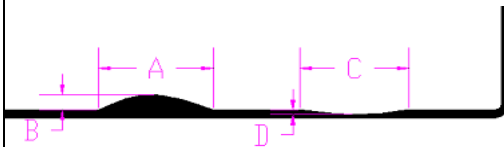

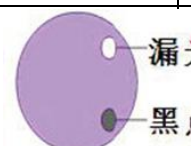


|    |                                |                         |  |      |                                      |                   |             |       |
|----|--------------------------------|-------------------------|--|------|--------------------------------------|-------------------|-------------|-------|
|    |                                |                         | 0.05<W   |      | -                                    | ≥10               | 0           |       |
|    |                                |                         |  |      | L>5.0                                | ≥10               | 0           |       |
| 25 | Edge/Side breakage             | OA                      | The following Criterion is applicable to any side (unit: mm)   |      |                                      |                   |             | Minor |
|    |                                |                         | Z  | X    | Y                                    | Acceptable number |             |       |
|    |                                |                         | ≤ T  | ≤2.0 | not extended to circuit Area or Frit | <5                |             |       |
| 26 | UV glue                        | Not IC side             | Over coating   |      |                                      |                   | Not allowed | Minor |
|    |                                | IC side                 | The coating of IC side is not higher than POL.   |      |                                      |                   | Not allowed |       |
|    |                                | IC side                 | The coating of IC side is not higher than POL.   |      |                                      |                   | Not allowed |       |
| 27 | Tuffy glue                     | IC and FPC bonding area | The coating should not have breakage or Bubble.  |      |                                      |                   |             | Minor |
|    |                                |                         | The coating is not higher than POL.  |      |                                      |                   |             |       |
|    |                                | Other area              | Tuffy glue is not allowed to interrupt and the diameter of Bubble is not more than 0.5mm.  |      |                                      |                   |             |       |
|    |                                |                         | The coating is not higher than POL.  |      |                                      |                   |             |       |
|    |                                | IC                      | Not allowed  |      |                                      |                   |             |       |
|    |                                | FPC                     | Ribbon glue: the width is not more than 1mm.<br>Dot glue: the diameter is not more than 2mm.   |      |                                      |                   |             |       |
| 28 | Rear reinforcement glue of FPC | FPC                     | The width is not more than 1mm .<br>The height is lower than LTPS.   |      |                                      |                   |             | Minor |
| 29 | ACF                            | Bonding Area            | The length of attachment is more than both ends of FPC, which should be range from 0.2 to 1mm.<br>Don't go beyond the edge of panel.<br>Effective lap width of wiring ACF is more than 2/3, which is compared with the width of the gold finger of FPC.<br>Don't have bubble or wrinkle. |      |                                      |                   |             | Minor |
| 30 | FPCA                           | FPC                     | The component can not reverse polarity   |      |                                      |                   |             | Minor |
|    |                                |                         | No wrong insertion   |      |                                      |                   |             |       |
|    |                                |                         | FPC should not have serious crease which destroy the line, prick and spots damage. Scratch is not allowed if Cu layer is exposed.  |      |                                      |                   |             |       |
|    |                                |                         | The gold fingers should not be oxidized, scraped, folded, impressed, broken, spotted or dissymmetry.   |      |                                      |                   |             |       |
|    |                                |                         | Make sure FPC is not scalded, with its location holes not having deficiency or obviously shift.  |      |                                      |                   |             |       |
|    |                                |                         | The component of FPC should be the same as BOM   |      |                                      |                   |             |       |

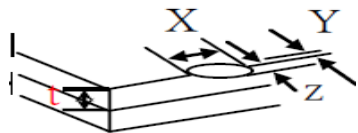
|    |             |              |   |       |
|----|-------------|--------------|---|-------|
|    |             |              | list.   |       |
|    |             |              | No remaining soldering Sn   |       |
|    |             |              | No visual particle on the pad line  |       |
| 31 | FPC bonding | Bonding area | Bubble: Visible bubble is not allowed   | Minor |
|    | FPC Skew    |              | Overhang : The size above 1/2 of soldering electrode of the parts overhang to the LAND is prohibited. The tilt height less than 0.5mm between FPC and foam. |       |
|    |             |              | Not allowed   |       |
| 32 | Package     | Other        | Products should put into the anti-static trays, with non-overlapping, and the trays should be staggered placed.   | Minor |
|    |             |              | Different products cannot be mixed into the same inner package.   |       |
|    |             |              | The package should not have obvious deformation or breakage .The printing labels type and quantity are correct.   |       |
|    |             |              | The package should have QC signature. ROHS label is needed if the product is under ROHS control.  |       |

Inspection standard for cover

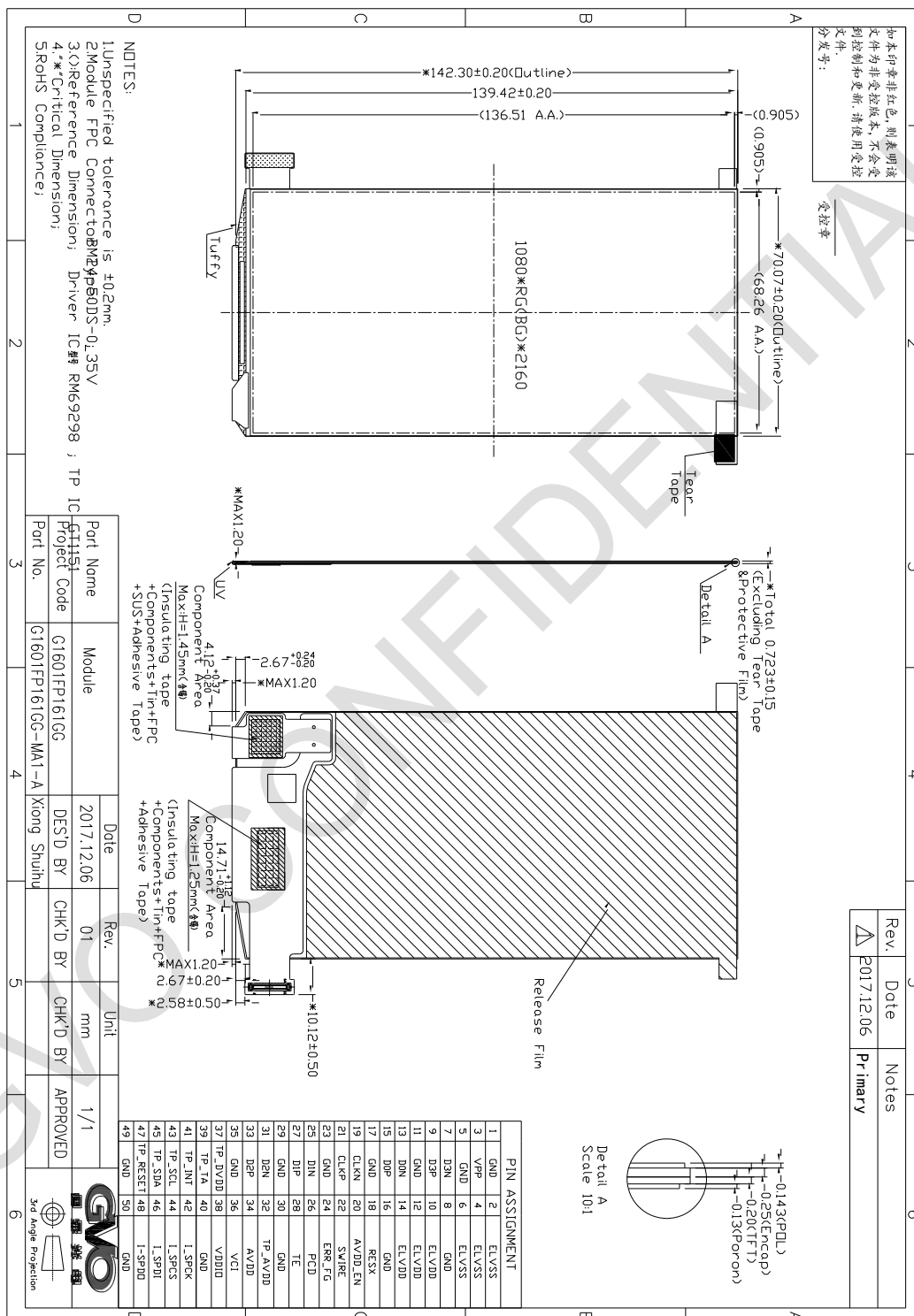
| No | Item  | Area          | Criterion of Defect  |                       |                                |   | Defect type |
|----|---|---------------|--|-----------------------|--------------------------------|---|-------------|
| 33 | Cover dot、Black and white dot、Polarizer Dent/Bubble | Whole area    | D (mm)   | DS (mm)               | Acceptable number              |   | Minor       |
|    |   |               | $D \leq 0.15\text{mm}$   | /                     | Ignore (specks is not allowed) |   |             |
|    |   |               | $0.15\text{mm} < D < 0.25\text{mm}$  | $DS \geq 10\text{mm}$ | 2                              |   |             |
|    |   |               | $D > 0.25\text{mm}$  | /                     | Not allowed                    |   |             |
|    |   |               | Specks: $D < 0.15\text{mm}$ , $N > 5$ in $10\text{mm} \times 10\text{mm}$ area |                       |                                |   |             |
| 34 | Cover Scratch/ Fiber(Linear)                        | AA            | W(mm)  | L(mm)                 | DS(mm)                         | Acceptable number   | Minor       |
|    |   |               | $W \leq 0.03\text{mm}$   | $L \leq 10\text{mm}$  | $\geq 10$                      | Ignore  |             |
|    |   |               | $0.03\text{mm} < W \leq 0.05\text{mm}$   | $L \leq 5.0\text{mm}$ | $\geq 10$                      | 2   |             |
|    |   |               | $W > 0.05$   | /                     | /                              | Not allowed   |             |
|    |   |               | /  | $L > 5.0\text{mm}$    | /                              | Not allowed   |             |
|    |   |               | Not allowed to scratch   |                       |                                |   |             |
| 35 | Edge pinhole  | Edge of cover | D (mm)   | DS (mm)               | Acceptable number              |   | Minor       |
|    |   |               | $D < 0.1\text{mm}$   | $DS \geq 10\text{mm}$ | one is allowed on each side    |  |             |

|    |  |               |  |   |   |       |  |
|----|--|---------------|--|---|---|-------|--|
| 36 | Uneven edge of the ink                                     | Edge of cover | W ( B or D )   | L(A or C)   | Acceptable number   | Minor |  |
|    |  |               | $W\leq 0.15\text{mm}$  | $L\leq 3\text{mm}$  | $\leq 2$  |       |  |
|    |  |               |    |   |   |       |  |
| 37 | ink silk screen serrated                                   | OA area       | D ( mm )   | DS ( mm )   | Acceptable number   | Minor |  |
|    |  |               | $D\leq 0.2$  | $DS\geq 10\text{mm}$  | 2   |       |  |
| 38 | Camera Hole  | OA area       | breakage or crack: $D\leq 0.1\text{mm}$  |  |   | Minor |  |
|    |  |               | Hole is not round: Refer to the limit sample   |   |   |       |  |
|    |  |               | Dot Defect: $D\leq 0.1\text{mm}$ , and $N\leq 1$ , heterochrosis and line defect are not allowed;  |   |   |       |  |
|    |  |               | Camera hole smudge: not allowed  |   |   |       |  |
| 39 | Printing defect  | OA area       | Wrongly、Missing、Ghosting and incomplete printing : not allowed   |   |   | Minor |  |
|    |  |               | Fonts consistent with the standard characters, no significant difference in visualization  |   |   |       |  |
|    |  |               | Penetrating scratch is not allowed   |   |   |       |  |
| 40 | IR Hole/ Black spots/ Line scratch foreign matter/ Residue | OA area       | DS(mm)   | Acceptable number   |  | Minor |  |
|    |  |               | $DS<0.1$   | Ignore  |   |       |  |
|    |  |               | $0.1\leq DS\leq 0.15$  | 1   |   |       |  |
|    |  |               | Note: Not visible on black background, don't affect the transmission rate  |   |   |       |  |
|    |  |               | Foreign body, dirty in IR hole: not allowed  |   |   |       |  |
|    |  |               | Scratched\Line defects in IR hole: $W\leq 0.03\text{mm}$ , $L\leq 1\text{mm}$ , $N\leq 1$ , Not visible on black background, don't affect the transmission rate. |   |   |       |  |
|    |  |               | Residual glue in IR hole: not allowed  |   |   |       |  |
| 41 | Cover lens deformation                                     | OA area       | Raised height<0.15mm, and the area is less than 25% of the entire non-display area in the cover lens   |   |   | Minor |  |
|    |  | AA area       | Deformation is not allowed in AA area  |   |   |       |  |

|    |                           |               |   |   |            |
|----|---------------------------|---------------|---|---|------------|
| 42 | Poor penetration of icons | OA area       | DS≤0.15 and N≤1   |   | Minor      |
| 43 | Cover dirt                | Whole area    | Not allowed   |   | Minor      |
| 44 | Cover crack               |               |   |   | Fatal flaw |
| 45 | Cover paint chips         |               |   |   |            |
| 46 | Burr                      | Edge of cover | L≤0.05mm, W<0.2mm accept (The premise does not affect the assembly and function and user operation)                         |   | Minor      |
| 47 | colour difference         | OA area       | No significant difference in visualization (refer to the limit sample if necessary)   |   |            |
| 48 | Overfill                  | Whole area    | Not allowed in AA area  |  | Minor      |
|    |                           |               | The visible part of the periphery can not be seen after assembly, and can not affect the assembly                           |   |            |
| 49 | Protective film           | Whole area    | Film position deviation≤0.15mm  |   | Minor      |
|    |                           |               | Scratch: no control when don't damage the body  |   |            |
|    |                           |               | Overfill/ lack of plastic/ Burr: no control   |   |            |
|    |                           |               | Not control the bubble inside the cover protection film   |   |            |
| 50 | Easy to tear              | Cover surface | Function failure\ damaged\ Missing label: not allowed   |   |            |
|    |                           |               | Wrinkle\ Convex-concave point\dirty\ punching\burr\ squeeze out: not control  |   |            |
| 51 | Composite tape            | LTPS          | Don't go beyond the edge of panel.  |   |            |
|    |                           |               | Folds\ Light leakage\ Impact assembly or thickness: not allowed   |   |            |
|    |                           |               | Damaged: not allowed  |   |            |
|    |                           |               | Bump does not affect the assembly: not control  |   |            |
|    |                           |               | Punching the bad size meet the drawings requirements: not control   |   |            |
|    |                           |               | Non-wipe dirty\foreign body: not allowed<br>Foreign objects in accordance with the standard line/point                      |   |            |
|    |                           |               | Burr does not exceed the screen edge: not control   |   |            |
|    |                           |               | Do not have obvious bubbles<br>Gumflower\Overfill: no control   |   |            |
| 52 | Film warpage              | Whole area    | Warpage ≤0.2mm  |   | Minor      |
| 53 | ICON hole                 | OA area       | chromatic aberration、double image、dot defect 、line defect: not allowed (or refer to limited sample)                         |   | Minor      |
| 54 | Earpiece hole             | OA area       | left-right asymmetry , Hole Rather large/small or off normal(Out of specification)No chamfer, Uneven polishing: not allowed |   |            |
| 55 | Ink bumps                 | OA area       | Positive side reference point defects; The back side does not affect the assembly; Ink overflow or                          |   |            |

|    |                            |                |   |         |  |             |                   |       |
|----|----------------------------|----------------|---|---------|--|-------------|-------------------|-------|
|    |                            |                | accumulation: not allowed   |         |  |             |                   |       |
| 56 | Cover concave convex point | Whole area     | Front : Height & depth ≤ 0.15mm, size ≤ 0.4mm, if necessary reference limit sample            |         |  |             |                   |       |
|    |                            |                | Back: Don't affect the fit process is not controlled  |         |  |             |                   |       |
| 57 | Insulation Tape            | Bonding area   | Obvious wrinkles and bubbles: not allowed   |         |  |             | Minor             |       |
|    |                            | Component area | Scratch/ Gumflower: not control   |         |  |             |                   |       |
|    |                            |                | Non-wipe dirty: not allowed   |         |  |             |                   |       |
|    |                            |                | Offset can not exceed the edge of the product, Others are required to the drawings            |         |  |             |                   |       |
|    |                            |                | Burr\ Overfill: not control   |         |  |             |                   |       |
|    |                            |                | Damaged/incomplete/missing paste: not allowed   |         |  |             |                   |       |
| 58 | Cover edge/side breakage   | Edge of cover  | X   | Y       | Z  | DS          | Acceptable number | Minor |
|    |                            |                | X<0.2mm   | Y<0.2mm | Z≤1/2t   | DS > 5mm    | Unilateral ≤2     |       |
|    |                            |                | X>0.2mm   | /       | /  | not allowed |                   |       |
|    |                            |                | /   | Y>0.2mm | /  | not allowed |                   |       |
|    |                            |                | /   | /       | Z>1/2T   | not allowed |                   |       |
|    |                            |                | Cracks are not allowed  |         |  |             |                   |       |
|    |                            |                |   |         |  |             |                   |       |
| 59 | Blunt                      | Whole area     | Not allowed   |         |  |             | Fatal flaw        |       |
| 60 | Fit bubble                 | AA             | According to the punctate specifications  |         |  |             | Minor             |       |
| 61 | Vision area edge defect    | OA             | D≤0.2mm, DS>10,N≤2 (hole saw tusk less than 2) , if necessary reference limit sample.         |         |  |             | Minor             |       |
| 62 | Cover heterochrosis        | OA             | Heterochrosis side execute according to point defect size, bulk/stick refer to Limited sample |         |  |             | Minor             |       |
|    |                            |                |   |         |  |             |                   |       |

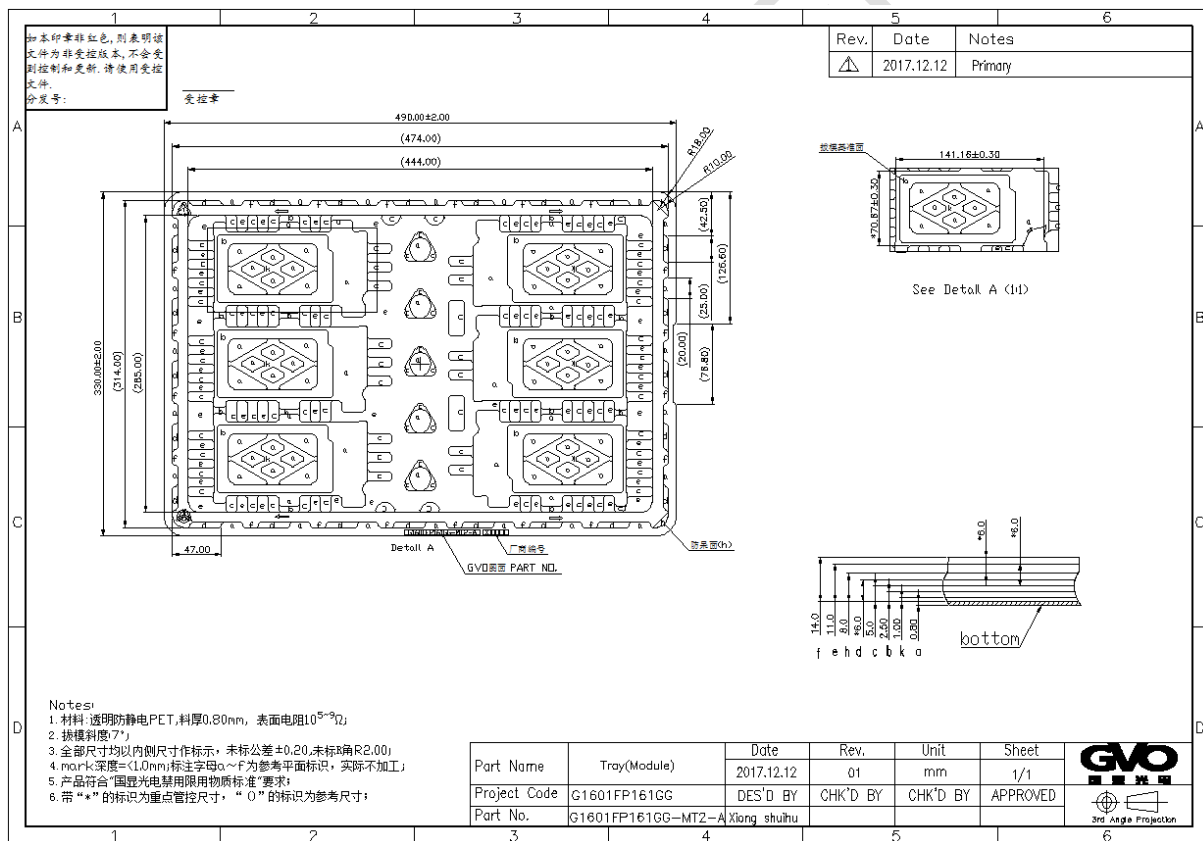
## 10 Mechanical Drawing





## Packing Drawing

| Packing Condition           | Contents                                |
|-----------------------------|---|
| Packing Type                | TRAY + Carton packing type              |
| TRAY material model         | tray ( $10^5 \sim 10^9 \Omega$ )        |
| Tray packing type           | See the picture 1                       |
| Number of panels per tray   | 6 pieces                                |
| Number of Tray per carton   | 24units (( 22 units + 2empty)PET tray ) |
| Number of panels per carton | 132 pieces                              |



Picture 1





## 11 Precautions for Use of AMOLED Modules

### 11.1 Handling Precautions:

- 11.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from height.
- 11.1.2 Do not press down the screen on the adjoining areas too hard because the color tone may be shifted.
- 11.1.3 The polarizer covering the display surface of the AMOLED module is soft and easily scratched. Handle this polarizer carefully.
- 11.1.4 If the display surface is contaminated, blow on the surface and gently wipe it with a soft dry cloth. If it is still not completely clear, moisten the cloth with ethyl alcohol.
- 11.1.5 Solvents may damage the polarizer. Do not use water, ketone or aromatic solvents except ethyl alcohol.  
Do not attempt to disassemble the AMOLED Module.
- 11.1.6 If the logic circuit power is off, do not apply the input signals.
- 11.1.7 To prevent destruction from static electricity, be careful to maintain an optimum working environment.
- 11.1.8 Be sure to make yourself in contact with the ground when handling with the AMOLED Modules.
- 11.1.9 Tools required for assembly, such as soldering irons, must be properly ground.
- 11.1.10 To reduce the generation of static electricity, do not conduct assembly or other work under dry conditions.
- 11.1.11 To protect the display surface, the AMOLED Module is coated with a film. Be careful when peeling off this protective film, because static electricity may generate.

### 11.2 Storage Precautions:

- 11.2.1 When storing the AMOLED modules, be sure that they are not directly exposed to the sunlight or the light of fluorescent lamps.
- 11.2.2 The AMOLED modules should be stored under the storage temperature range. If the AMOLED modules will be stored for a long time, the recommended condition is:  
Temperature: 0°C~40°C Relatively humidity: ≤80%
- 11.2.3 The AMOLED modules should be stored in the room without acid, alkali or harmful gas.

### 11.3 Transportation Precautions:

- 11.3.1 The AMOLED modules should not be suffered from falling and violent shocking during transportation. Besides, excessive press, water, damp and sunshine, should be avoided.