



Product Specification

# SPECIFICATION FOR APPROVAL

( ) Preliminary Specification

(◆) Final Specification

|          |                   |          |                      |
|----------|-------------------|----------|----------------------|
| Title    | 14.0" FHD TFT LCD |          |                      |
| Customer |                   | SUPPLIER | LG Display Co., Ltd. |
| MODEL    |                   | *MODEL   | LP140WFH             |
|          |                   | Suffix   | SPB1                 |

\*When you obtain standard approval,  
please use the above model name without suffix

| APPROVED BY | SIGNATURE |
|-------------|-----------|
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| _____       | _____     |

Please return 1 copy for your confirmation with your signature and comments.

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## Product Specification

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## Record of Revisions

| Revision No | Revision Date | Page  | Before                                                                                    | After                                                                                      | EDID version |
|-------------|---------------|-------|-------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|--------------|
| 0.0         | Mar. 09. 2020 | ALL   | First Draft<br>(Preliminary Specification)                                                |                                                                                            |              |
| 0.1         | Jul. 09. 2020 | 21~23 | . Mechanical Characteristics 'TBD'                                                        | . Mechanical Characteristics Update                                                        | -            |
|             |               | 8     | LED Power Consumption Typ 'TBD'                                                           | LED Power Consumption Typ update                                                           | -            |
| 0.2         | Aug. 08. 2020 | 17    | -                                                                                         | T9, T10 timing update                                                                      |              |
| 0.3         | Sep. 24. 2020 | 7     | Power Consumption<br>-Mosaic : 0.63W(typ.) / 0.7W(max.)<br>-Red : 1.0W(typ.) / 1.1W(max.) | Power Consumption<br>-Mosaic : 0.58W(typ.) / 0.65W(max.)<br>-Red : 1.1W(typ.) / 1.2W(max.) |              |
|             |               | 8     | LED Power Consumption<br>- 3.35W(typ.) / 3.4W(max.)                                       | LED Power Consumption<br>- 3.25W(typ.) / 3.3W(max.)                                        |              |
| 1.0         | Jan. 11. 2021 | -     | Final                                                                                     |                                                                                            |              |
|             |               | 56~58 | -                                                                                         | EDID updated(A00)                                                                          |              |

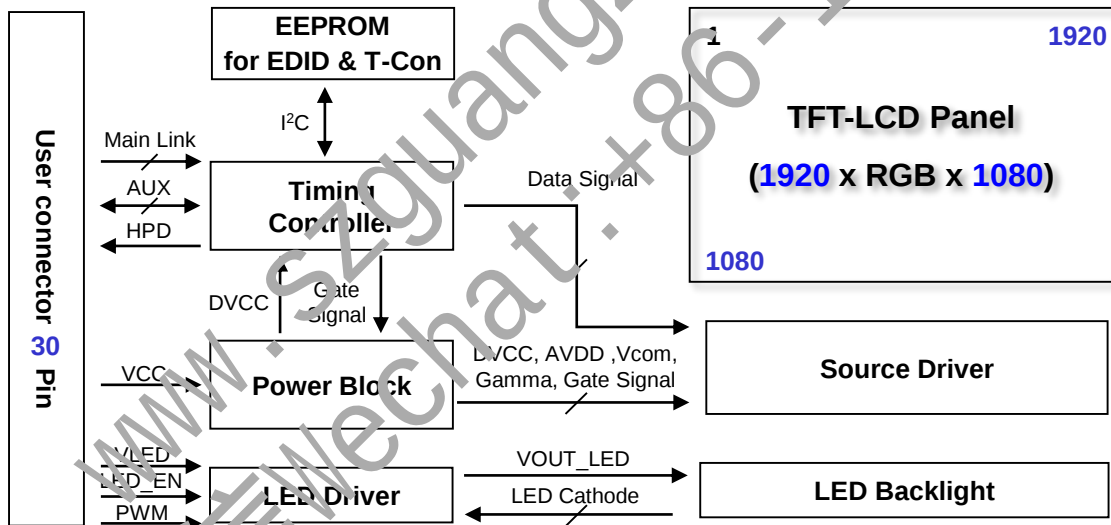


## Product Specification

## 1. General Description

### 1-1. Introduction

The LP140WFH is a Color Active Matrix Liquid Crystal Display with an integral LED backlight system. The matrix employs a-Si Thin Film Transistor as the active element. It is a transmissive type display operating in the normally Black mode. This TFT-LCD has 14.0 inches diagonally measured active display area with FHD resolution (1920 horizontal by 1080 vertical pixel array). Each pixel is divided into Red, Green and Blue sub-pixels or dots which are arranged in vertical stripes. Gray scale or the brightness of the sub-pixel color is determined with a 6-bit+2FRC gray scale signal for each dot, thus, presenting a palette of more than 16.7M colors with FRC. The LP140WFH has been designed to apply the interface method that enables low power, high speed, low EMI. The LP140WFH is intended to support applications where thin thickness, low power are critical factors and graphic displays are important. In combination with the vertical arrangement of the sub-pixels, the LP140WFH characteristics provide an excellent flat display for office automation products such as Notebook PC.



## Product Specification

### 1-2. General Feature

|                          |               |                                                                               |
|--------------------------|---------------|-------------------------------------------------------------------------------|
| Active Screen Size       |               | 14.0 inches diagonal                                                          |
| Outline Dimension        |               | 315.81 (H, Typ.) × 186.07 (V, Typ.) × 3.0 (D, Max.) [mm] (w/o PCB Board)      |
| Pixel Pitch              |               | 0.1611 mm x 0.1611 mm                                                         |
| Pixel Format             |               | 1920 horiz. By 1080 vert. Pixels RGB strip arrangement                        |
| Color Depth              |               | 6-bit+2FRC, 16.7M colors                                                      |
| Luminance, White         |               | 300 cd/m <sup>2</sup> (Typ. 5 point)                                          |
| Power Consumption        |               | Total 3.83W (Typ.) Logic : 0.58W (Typ. @ Mosaic), B/L 3.25 W (Typ. @ VLED12V) |
| Weight                   |               | 300 g (Max.)                                                                  |
| Display Operating Mode   |               | Normally Black                                                                |
| Surface Treatment        |               | Anti-Glare treatment of the front Polarizer                                   |
| Color Gamut              |               | sRGB 100%                                                                     |
| LED Dimming Control mode |               | DC Dimming                                                                    |
| RoHS Compliance          |               | Yes                                                                           |
| BFR / PVC / As Free      |               | Yes for all                                                                   |
| eDP version(Tcon)        |               | eDP1.3                                                                        |
| DPCD version             |               | Ver1.1                                                                        |
| Function                 | PSR           | support                                                                       |
|                          | sDRRS         | support                                                                       |
|                          | DMRRS         | Not support                                                                   |
|                          | Adaptive sync | Not support                                                                   |
|                          | NVSR          | Not support                                                                   |
|                          | SSC           | Down spread 0.5%                                                              |

## Product Specification

### 2. Absolute Maximum Ratings

The following are maximum values which, if exceeded, may cause faulty operation or damage to the unit.

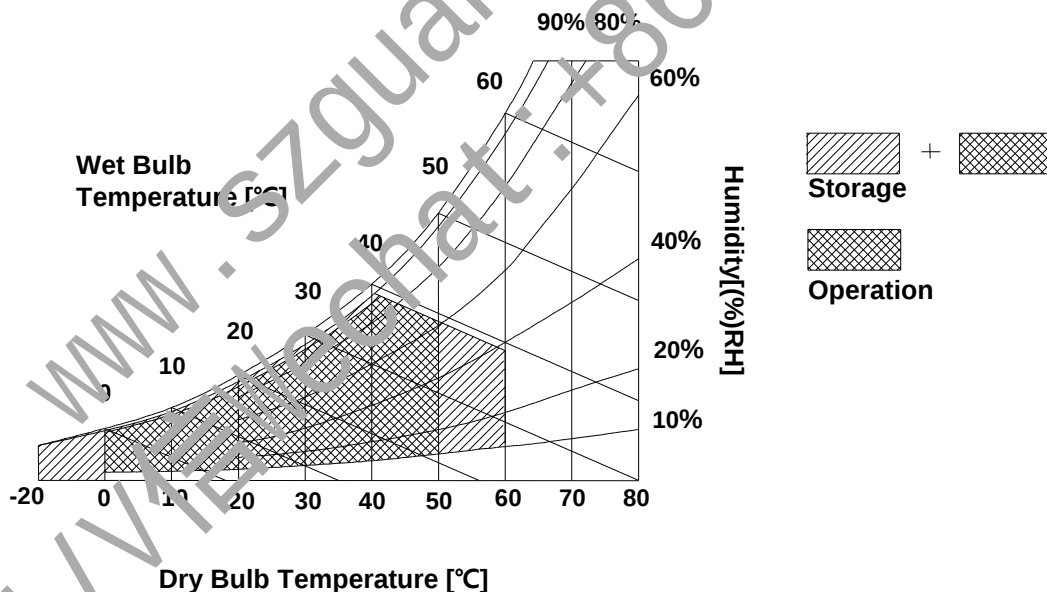
**Table 1. ABSOLUTE MAXIMUM RATINGS**

| Parameter                  | Symbol | Values |     | Units           | Notes       |
|----------------------------|--------|--------|-----|-----------------|-------------|
|                            |        | Min    | Max |                 |             |
| Power Input Voltage        | VCC    | -0.3   | 4.0 | V <sub>CC</sub> | at 25 ± 2°C |
| Operating Temperature      | TOP    | 0      | 50  | °C              | 1           |
| Storage Temperature        | HST    | -20    | 60  | °C              | 1           |
| Operating Ambient Humidity | HOP    | 10     | 90  | %RH             | 1           |
| Storage Humidity           | HST    | 10     | 90  | %RH             | 1           |

Note : 1. Temperature and relative humidity range are shown in the figure below.

Wet bulb temperature should be 39°C Max and no condensation of water.

Note : 2. Storage Condition is guaranteed under packing condition



Product Specification

### 3. Electrical Specifications

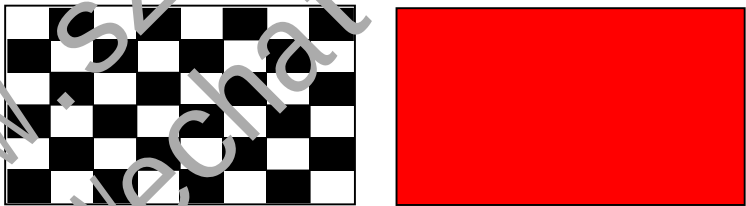
#### 3-1. LCD Electrical Characteristics

Table 2. LCD ELECTRICAL CHARACTERISTICS

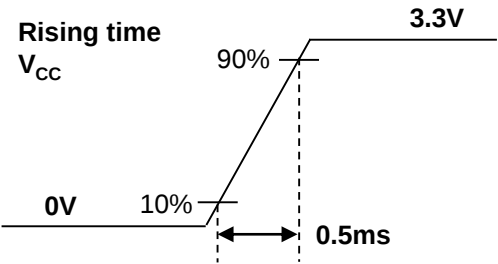
| Parameter                            |                   | Symbol              | Values |      |      | Unit              | Notes |
|--------------------------------------|-------------------|---------------------|--------|------|------|-------------------|-------|
|                                      |                   |                     | Min    | Typ  | Max  |                   |       |
| Power Supply Input Voltage           |                   | V <sub>CC</sub>     | 3.0    | 3.3  | 3.6  | V                 | 1     |
| Permissive Power Supply Input Ripple |                   | V <sub>CCrp</sub>   | -      | -    | 100  | mV <sub>p-p</sub> |       |
| Power Supply Input Current           | Mosaic            | I <sub>CC</sub>     | -      | 177  | 197  | nA                | 2     |
|                                      | Red (Max. Rating) | I <sub>CC_MAX</sub> | -      | 333  | 333  | nA                |       |
| Power Consumption                    | Mosaic            | P <sub>CC</sub>     | -      | 0.58 | 0.65 | W                 |       |
|                                      | Red (Max. Rating) | P <sub>CC_MAX</sub> | -      | 1.1  | 1.2  | W                 |       |
| Power Supply Inrush Current          |                   | I <sub>CC_P</sub>   | -      | -    | 1.5  | A                 | 3     |
| Differential Impedance               |                   | Z <sub>DF</sub>     | 90     | 100  | 110  | Ω                 |       |

Note)

1. The measuring position is the connector of LCM and the test conditions are under 25°C, fv = 60Hz
2. The specified I<sub>CC</sub> current and power consumption are under the V<sub>CC</sub> = 3.3V , 25°C, fv = 60Hz condition and Mosaic pattern.



3. The V<sub>CC</sub> rising time is same as the minimum of T1 at Power on sequence.



## Product Specification

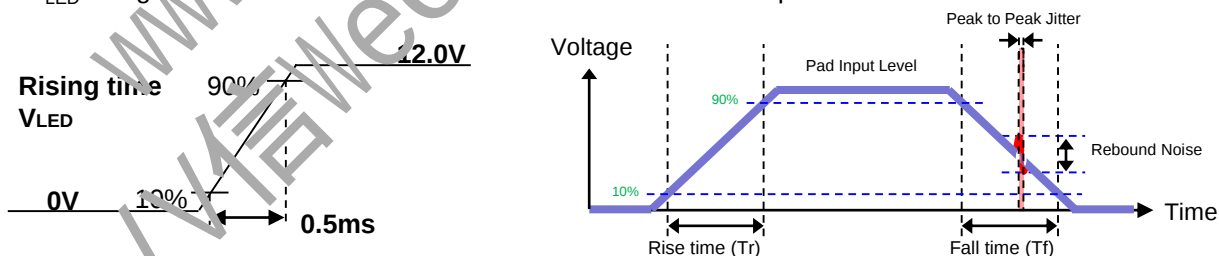
### 3-2. LED Backlight Electrical Characteristics

**Table 3. LED B/L ELECTRICAL CHARACTERISTICS**

| Parameter                |                       | Symbol           | Values |      |         | Unit | Notes |
|--------------------------|-----------------------|------------------|--------|------|---------|------|-------|
|                          |                       |                  | Min    | Typ  | Max     |      |       |
| LED Power Input Voltage  |                       | $V_{LED}$        | 5.0    | 12.0 | 21.0    | V    | 1     |
| LED Power Input Current  |                       | $I_{LED}$        | -      | 270  | 275     | mA   | 2     |
| LED Power Consumption    |                       | $P_{LED}$        | -      | 3.25 | 3.3     | W    | 2     |
| LED Power Inrush Current |                       | $I_{LED\_P}$     | -      | -    | 1.5     | A    | 2     |
| PWM Duty Ratio           |                       |                  | 5      | -    | 100     | %    | 4     |
| PWM Resolution           |                       |                  |        | 10   |         | Bit  | 5     |
| PWM Jitter               |                       |                  | 0      | -    | 0.05    | %    | 6     |
| PWM Frequency            |                       | $F_{PWM}$        | 200    | -    | 2000    | Hz   | 7     |
| PWM                      | High Level Voltage    | $V_{PWM\_H}$     | 2.5    | -    | 3.6     | V    |       |
|                          | Low Level Voltage     | $V_{PWM\_L}$     | 0      | -    | 0.3     | V    |       |
|                          | Tr / Tf @ 200Hz       |                  | -      | -    | 25/25   | us   |       |
|                          | Tr / Tf @ 2Khz        |                  | -      | -    | 2.5/2.5 | us   |       |
|                          | P to P Jitter @ 200hz |                  | -      | -    | 1       | us   | 8     |
|                          | P to P Jitter @ 2Khz  |                  | -      | -    | 0.1     | us   |       |
| LED_EN                   | High Voltage          | $V_{LED\_EN\_H}$ | 2.5    | -    | 3.6     | V    |       |
|                          | Low Voltage           | $V_{LED\_EN\_L}$ | 0      | -    | 0.3     | V    |       |
| Life Time                |                       |                  | 12,000 | -    | -       | Hrs  | 9     |

Note)

- The measuring position is the connector of LCM and the test conditions are under 25°C.
- The current and power consumption with LED Driver are under the  $V_{LED} = 12.0V$ , 25°C, PWM Duty 100% and White pattern with the normal frame frequency operated(60Hz).
- The  $V_{LED}$  rising time is same as the minimum of T13 at Power on sequence.

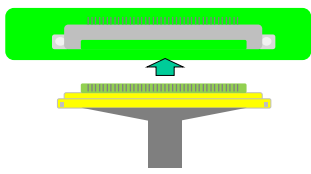


- The operation of LED Driver below minimum dimming ratio may cause flickering or reliability issue.
- 10bit resolution means it's possible to change PWM duty by 0.1% step. (8bit operated by 0.4% step)
- If jitter of PWM is bigger than maximum, it may induce flickering.
- This Spec. is not effective at 100% dimming ratio as an exception because it has DC level equivalent to 0Hz. In spite of acceptable range as defined, the PWM Frequency should be fixed and stable for more consistent brightness control at any specific level desired.
- PWM rebound spec  $\leq 0.1V$
- The life time is determined as the time at which brightness of LCD is 50% compare to that of minimum value specified in table 7. under general user condition.

## Product Specification

### 3-3. Interface Connections

Table 4. MODULE CONNECTOR PIN CONFIGURATION (CN1)

| Pin | Symbol              | Description                           | Notes                                                                                                                                                                                                                                                                                                                 |
|-----|---------------------|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | NC Reserved         | Reserved for LCD manufacturer's use   | <p>[Connector]<br/>MRS KN38B-30S-0.5H<br/>or JAE, equivalent</p> <p>[Connector pin arrangement]</p>  <p>Pin 30 Pin 1</p> <p>[LGD P-Vcom using information]<br/>1. Pin for P-Vcom : #24, #25<br/>2. P-Vcom Address : 0101000x</p> |
| 2   | GND                 | High Speed Ground                     |                                                                                                                                                                                                                                                                                                                       |
| 3   | Lane1_N             | Complement Signal Link Lane 1         |                                                                                                                                                                                                                                                                                                                       |
| 4   | Lane1_P             | True Signal Link Lane 1               |                                                                                                                                                                                                                                                                                                                       |
| 5   | GND                 | High Speed Ground                     |                                                                                                                                                                                                                                                                                                                       |
| 6   | Lane0_N             | Complement Signal Link Lane 0         |                                                                                                                                                                                                                                                                                                                       |
| 7   | Lane0_P             | True Signal Link Lane 0               |                                                                                                                                                                                                                                                                                                                       |
| 8   | GND                 | High Speed Ground                     |                                                                                                                                                                                                                                                                                                                       |
| 9   | AUX_CH_P            | True Signal Auxiliary Channel         |                                                                                                                                                                                                                                                                                                                       |
| 10  | AUX_CH_N            | Complement Signal Auxiliary Channel   |                                                                                                                                                                                                                                                                                                                       |
| 11  | GND                 | High Speed Ground                     |                                                                                                                                                                                                                                                                                                                       |
| 12  | VCC                 | LCD logic and driver power            |                                                                                                                                                                                                                                                                                                                       |
| 13  | VCC                 | LCD logic and driver power            |                                                                                                                                                                                                                                                                                                                       |
| 14  | LCD Self Test or NC | LCD Panel Self Test Enable (Optional) |                                                                                                                                                                                                                                                                                                                       |
| 15  | GND                 | LCD logic and driver ground           |                                                                                                                                                                                                                                                                                                                       |
| 16  | GND                 | LCD logic and driver ground           |                                                                                                                                                                                                                                                                                                                       |
| 17  | HPD                 | HPD signal pin                        |                                                                                                                                                                                                                                                                                                                       |
| 18  | BL_GND              | LED Backlight ground                  |                                                                                                                                                                                                                                                                                                                       |
| 19  | BL_GND              | LED Backlight ground                  |                                                                                                                                                                                                                                                                                                                       |
| 20  | BL_GND              | LED Backlight ground                  |                                                                                                                                                                                                                                                                                                                       |
| 21  | BL_GND              | LED Backlight ground                  |                                                                                                                                                                                                                                                                                                                       |
| 22  | BL ENABLE           | LED Backlight control on/off control  |                                                                                                                                                                                                                                                                                                                       |
| 23  | BL PWM              | System PWM signal input for dimming   |                                                                                                                                                                                                                                                                                                                       |
| 24  | NC Reserved         | Reserved for LCD manufacture's use    |                                                                                                                                                                                                                                                                                                                       |
| 25  | NC Reserved         | Reserved for LCD manufacture's use    |                                                                                                                                                                                                                                                                                                                       |
| 26  | VLED                | LED Backlight power (12V Typical)     |                                                                                                                                                                                                                                                                                                                       |
| 27  | VLED                | LED Backlight power (12V Typical)     |                                                                                                                                                                                                                                                                                                                       |
| 28  | VLED                | LED Backlight power (12V Typical)     |                                                                                                                                                                                                                                                                                                                       |
| 29  | VLED                | LED Backlight power (12V Typical)     |                                                                                                                                                                                                                                                                                                                       |
| 30  | NC Reserved         | Reserved for LCD manufacture's use    |                                                                                                                                                                                                                                                                                                                       |

### 3-3-1. Input/output signal circuit

Figure1.HPD Output circuit is as below

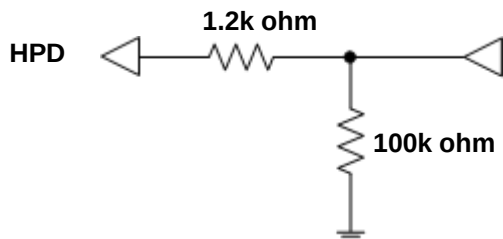


Figure2.BL PWM input circuit is as below

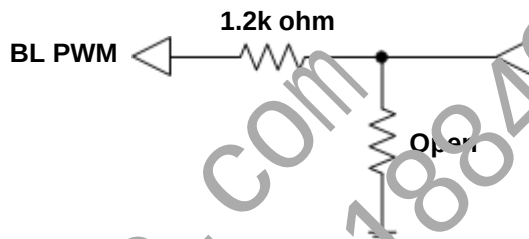


Figure3.BL Enable input circuit is as below

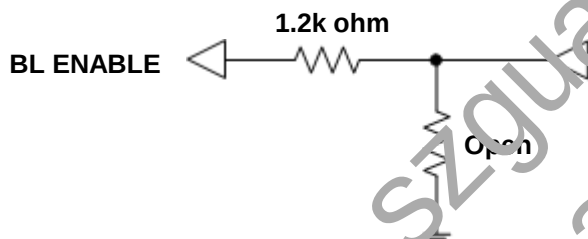
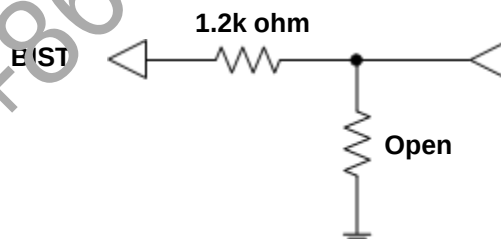


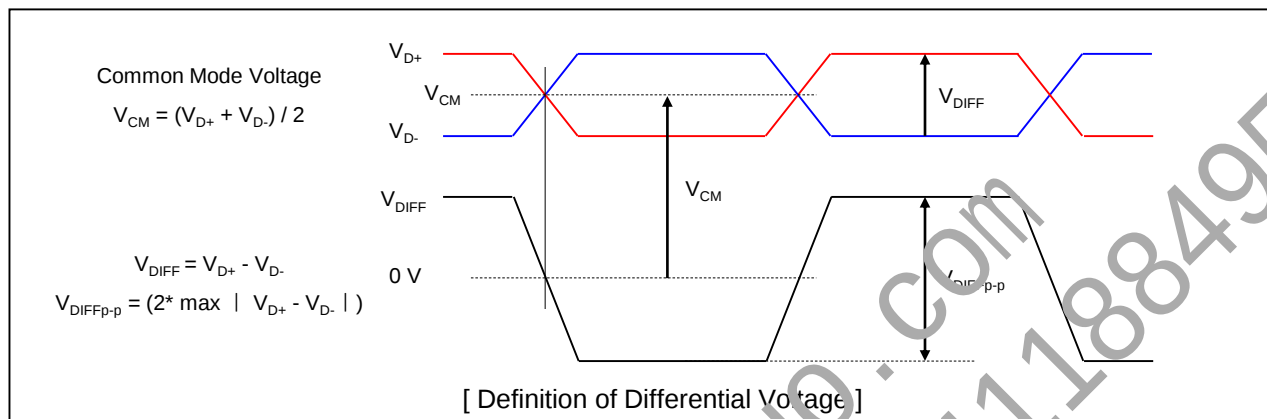
Figure4.BIST input circuit is as below



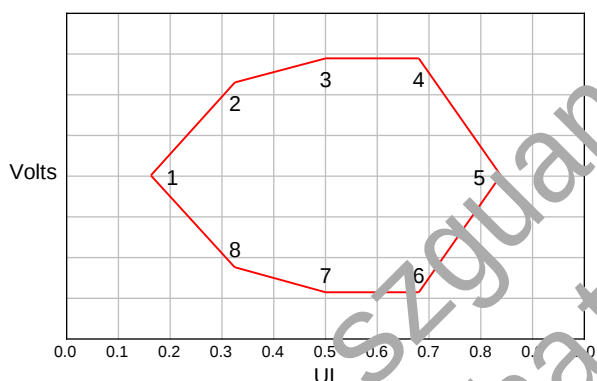
## Product Specification

### 3-4. eDP Signal Timing Specifications

#### 3-4-1. Definition of Differential Voltage

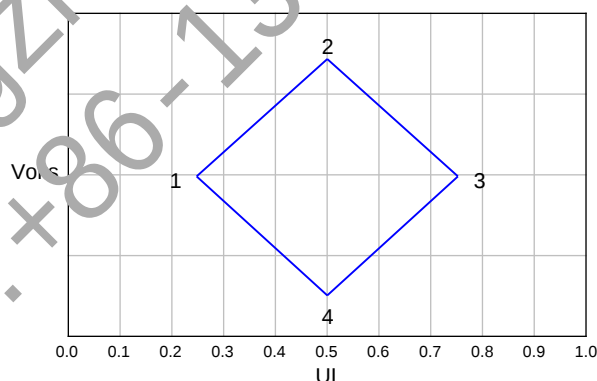


#### 3-4-2. Main Link EYE Diagram



| Point | Reduced Bit Rate |            | High Bit Rate |            |
|-------|------------------|------------|---------------|------------|
|       | Time(UI)         | Voltage(V) | Time(UI)      | Voltage(V) |
| 1     | 0.127            | 0.000      | 0.210         | 0.000      |
| 2     | 0.291            | 0.160      | 0.355         | 0.140      |
| 3     | 0.500            | 0.200      | 0.500         | 0.175      |
| 4     | 0.709            | 0.200      | 0.645         | 0.175      |
| 5     | 0.873            | 0.000      | 0.790         | 0.000      |
| 6     | 0.709            | -0.200     | 0.645         | -0.175     |
| 7     | 0.500            | -0.200     | 0.500         | -0.175     |
| 8     | 0.291            | -0.160     | 0.355         | -0.140     |

[ EYE Mask Vertices at Source Connector Pins ]



| Point | Reduced Bit Rate |            | High Bit Rate |            |
|-------|------------------|------------|---------------|------------|
|       | Time(UI)         | Voltage(V) | Time(UI)      | Voltage(V) |
| 1     | 0.375            | 0.000      | 0.246         | 0.000      |
| 2     | 0.500            | 0.023      | 0.500         | 0.075      |
| 3     | 0.625            | 0.000      | 0.755         | 0.000      |
| 4     | 0.500            | -0.023     | 0.500         | -0.075     |

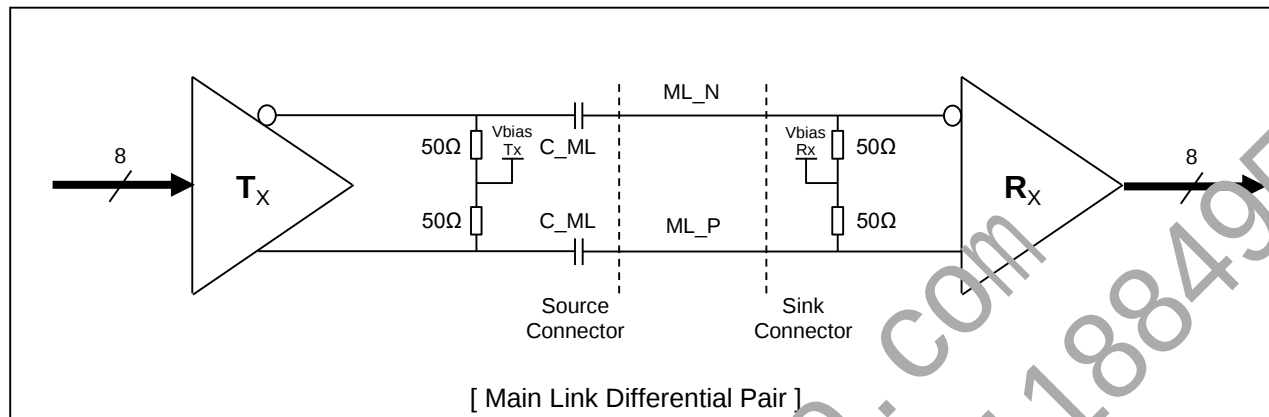
[ EYE Mask Vertices at Sink Connector Pins ]

| Point | Reduced Bit Rate |            | High Bit Rate |            |
|-------|------------------|------------|---------------|------------|
|       | Time(UI)         | Voltage(V) | Time(UI)      | Voltage(V) |
| 1     | 0.270            | 0.000      | 0.246         | 0.000      |
| 2     | 0.500            | 0.068      | 0.500         | 0.075      |
| 3     | 0.731            | 0.000      | 0.755         | 0.000      |
| 4     | 0.500            | -0.068     | 0.500         | -0.075     |

[ EYE Mask Vertices at embedded DP Sink Connector Pins ]

## Product Specification

### 3-4-3. eDP Main Link Signal



| Parameter                                                     | Symbol            | Min  | Typ | Max | Unit | Notes             |
|---------------------------------------------------------------|-------------------|------|-----|-----|------|-------------------|
| Unit Interval for high bit rate<br>(2.7Gbps / lane)           | UI_HBR            | -    | 370 | -   | ps   |                   |
| Unit Interval for reduced bit rate<br>(1.62Gbps / lane)       | UI_RBR            | -    | 617 | -   | ps   |                   |
| Link Clock Down Spreading                                     | Amplitude         | 0    | -   | 0.5 | %    |                   |
|                                                               | Frequency         | 30   | -   | 33  | kHz  |                   |
| Differential peak-to-peak voltage<br>at Source side connector | $V_{TX-DIFF-p}$   | 350  | -   | -   | mV   | For HBR(2.7Gbps)  |
|                                                               |                   | 400  | -   | -   |      | For RBR(1.62Gbps) |
| EYE width<br>at Source side connector                         | $T_{TX-EYE-CONN}$ | 0.58 | -   | -   | UI   | For HBR(2.7Gbps)  |
|                                                               |                   | 0.75 | -   | -   | UI   | For RBR(1.62Gbps) |
| Differential peak-to-peak voltage<br>at Sink side connector   | $V_{RX-DIFF-p}$   | 150  | -   | -   | mV   | For HBR(2.7Gbps)  |
|                                                               |                   | 136  | -   | -   |      | For RBR(1.62Gbps) |
| EYE width<br>at Sink side connector                           | $T_{RX-EYE-CONN}$ | 0.51 | -   | -   | UI   | For HBR(2.7Gbps)  |
|                                                               |                   | 0.46 | -   | -   | UI   | For RBR(1.62Gbps) |
| Rx DC common mode voltage                                     | $V_{RX-CM}$       | 0    | -   | 1.0 | V    |                   |
| AC Coupling Capacitor                                         | $C_{SOURCE\_ML}$  | 75   | -   | 200 | nF   | Source side       |

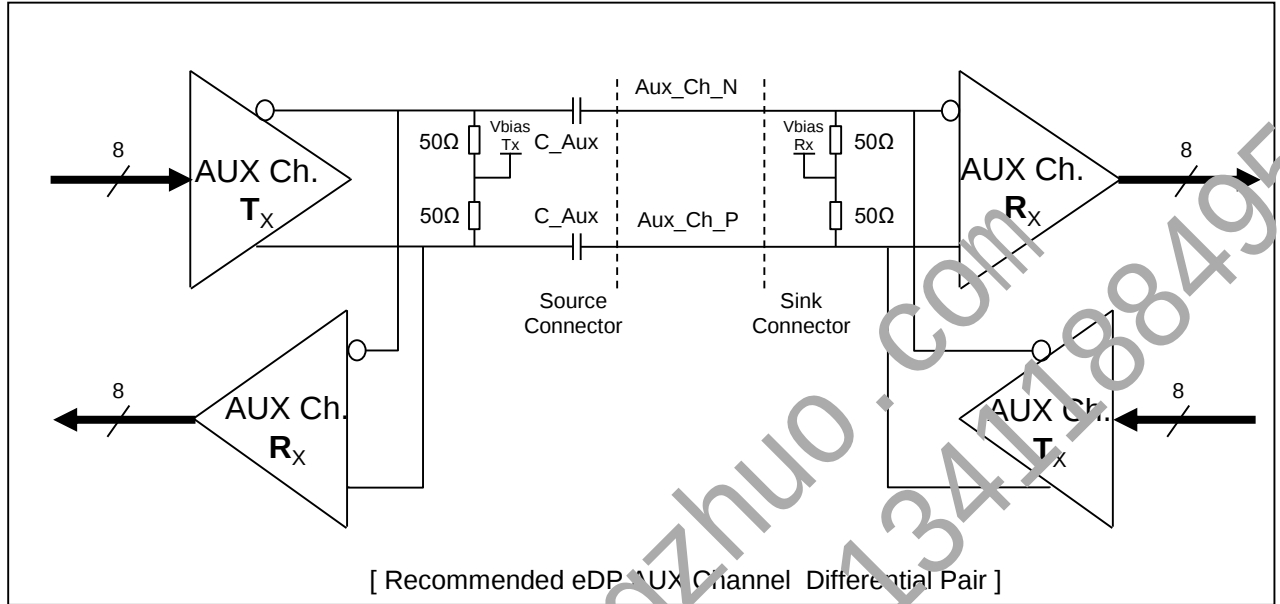
#### Note

1. Termination resistor is typically integrated into the transmitter and receiver implementations.
2. AC Coupling Capacitor is not placed at the sink side.
3. In cabled embedded system, it is recommended the system designer ensure that EYE width and voltage are met at the sink side connector pins.



## Product Specification

### 3-4-4. eDP AUX Channel Signal



| Parameter                                                  | Symbol                   | Min  | Typ | Max  | Unit | Notes         |
|------------------------------------------------------------|--------------------------|------|-----|------|------|---------------|
| AUX Unit Interval                                          | UI                       | 0.4  | -   | 0.6  | us   |               |
| AUX Jitter at Tx IC Package Pins                           | J <sub>AUX</sub>         | -    | -   | 0.04 | UI   | Equal to 24ns |
| AUX Jitter at Rx IC Package Pins                           |                          | -    | -   | 0.05 | UI   | Equal to 30ns |
| AUX Peak-to-peak voltage at Connector Pins of Receiving    | V <sub>AUX DIFFp-p</sub> | 0.39 | -   | 1.38 | V    |               |
| AUX Peak-to-peak voltage at Connector Pins of Transmitting |                          | 0.36 | -   | 1.36 | V    |               |
| AUX EYE width at Connector Pins of Tx and Rx               |                          | 0.98 | -   | -    | UI   |               |
| AUX DC common mode voltage                                 | V <sub>AUX-CM</sub>      | 0    | -   | 1.0  | V    |               |
| AUX AC Coupling Capacitor                                  | C <sub>SOURCE-AUX</sub>  | 75   |     | 200  | nF   | Source side   |

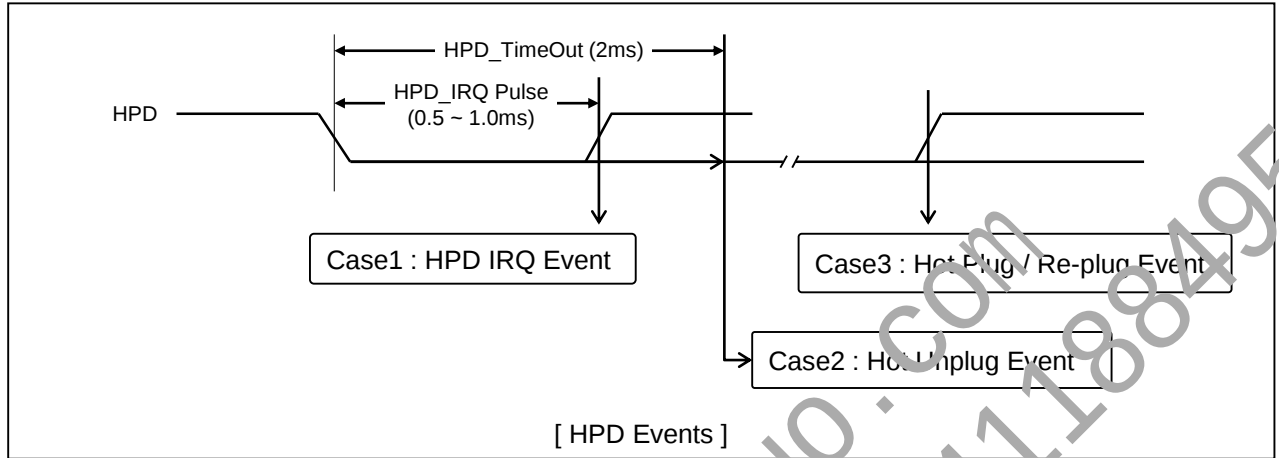
#### Note)

1. Termination resistor is typically integrated into the transmitter and receiver implementations.
2. AC Coupling Capacitor is not placed at the sink side.
3.  $V_{AUX DIFFp-p} = 2 * |V_{AUXP} - V_{AUXN}|$



## Product Specification

### 3-4-5. eDP HPD Signal



| Parameter                      | Symbol  | Min  | Typ | Max | Unit | Notes                 |
|--------------------------------|---------|------|-----|-----|------|-----------------------|
| HPD Voltage                    | HPD     | 2.25 | -   | 3.6 | V    | Sink side Driving     |
| Hot Plug Detection Threshold   |         | 2.0  | -   | -   | V    | Source side Detecting |
| Hot Unplug Detection Threshold |         | -    | -   | 0.8 | V    |                       |
| HPD_IRQ Pulse Width            | HPD_IRQ | 0.5  | -   | 1.0 | ms   |                       |
| HPD_TimeOut                    |         | 2.0  | -   | -   | ms   | HPD Unplug Event      |

#### Note)

1. HPD IRQ : Sink device wants to notify the Source device that Sink's status has changed so it toggles HPD line, forcing the Source device to read its Link / Sink Receiver DPCD field via the AUX-CH
2. HPD Unplug : The Sink device is no longer attached to the Source device and the Source device may then disable its Main Link as a power saving mode
3. Plug / Re-plug : The Sink device is now attached to the Source device, forcing the Source device to read its Receiver capabilities and Link / Sink status Receiver DPCD fields via the AUX-CH



## Product Specification

## 3-5. Signal Timing Specifications

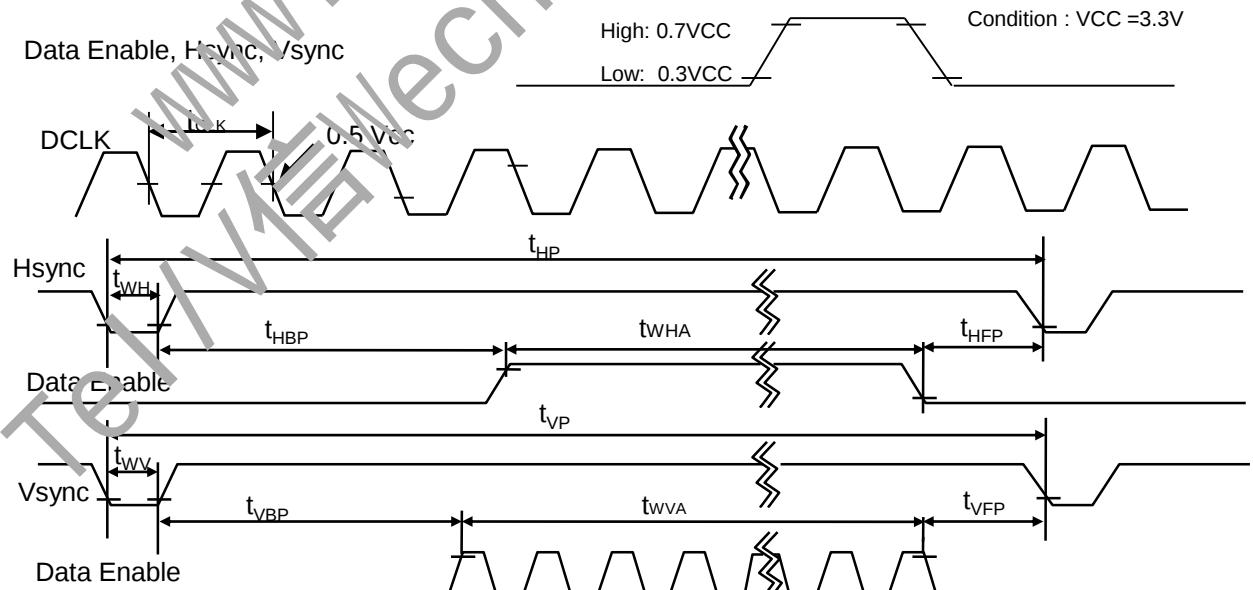
This is the signal timing required at the input of the User connector. All of the interface signal timing should be satisfied with the following specifications and specifications of eDP Tx/Rx for its proper operation.

Table 4. TIMING TABLE

| ITEM         | Symbol                 |                  | Min  | Typ   | Max  | Unit             | Note |
|--------------|------------------------|------------------|------|-------|------|------------------|------|
| DCLK         | Frequency              | f <sub>CLK</sub> | -    | 138.7 | -    | MHz              |      |
| Hsync        | Period                 | t <sub>HP</sub>  | 2072 | 2080  | 2088 | t <sub>CLK</sub> |      |
|              | Width                  | t <sub>WH</sub>  | 32   | 32    | 32   |                  |      |
|              | Width-Active           | t <sub>WHA</sub> | 1920 |       |      |                  |      |
| Vsync        | Period                 | t <sub>VP</sub>  | 1108 | 1111  | 1114 | t <sub>HP</sub>  |      |
|              | Width                  | t <sub>WV</sub>  | 5    | 5     | 5    |                  |      |
|              | Width-Active           | t <sub>WVA</sub> | 1080 |       |      |                  |      |
| Data Enable  | Horizontal back porch  | t <sub>HBP</sub> | 72   | 80    | 88   | t <sub>CLK</sub> |      |
|              | Horizontal front porch | t <sub>HFP</sub> | 48   | 48    | 48   |                  |      |
|              | Vertical back porch    | t <sub>VBP</sub> | 20   | 23    | 24   | t <sub>HP</sub>  |      |
|              | Vertical front porch   | t <sub>VFP</sub> | 3    | 3     | 5    |                  |      |
| Refresh rate |                        | Hz               | -    | 60    | -    |                  |      |

**Notice.** all reliabilities are specified for timing specification based on refresh rate of 60Hz. However, LP140WFH has a good actual performance even at lower refresh rate (e.g. 40Hz or 50Hz) for power saving Mode, whereas LP140WFH is secured only for function under lower refresh rate. 60Hz at Normal mode, 50Hz, 40Hz at Power save mode. Don't care Flicker level (Power save mode).

## 3-6. Signal Timing Waveforms



## Product Specification

### 3-7. Color Input Data Reference

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color ; the higher the binary input, the brighter the color. The table below provides a reference for color versus data input.

**Table 5. COLOR DATA REFERENCE**

| Color       |             | Input Color Data |    |    |    |     |    |    |    |       |    |    |    |     |    |    |    |      |    |    |    |     |    |    |    |
|-------------|-------------|------------------|----|----|----|-----|----|----|----|-------|----|----|----|-----|----|----|----|------|----|----|----|-----|----|----|----|
|             |             | RED              |    |    |    |     |    |    |    | GREEN |    |    |    |     |    |    |    | BLUE |    |    |    |     |    |    |    |
|             |             | MSB              |    |    |    | LSB |    |    |    | MSB   |    |    |    | LSB |    |    |    | MSB  |    |    |    | LSB |    |    |    |
|             |             | R7               | R6 | R5 | R4 | R3  | R2 | R1 | R0 | G7    | G6 | G5 | G4 | G3  | G2 | G1 | G0 | B7   | B6 | B5 | B4 | B3  | B2 | B1 | B0 |
| Basic Color | Black       | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
|             | Red         | 1                | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
|             | Green       | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 0    | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
|             | Blue        | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1   | 1  | 1  | 1  |
|             | Cyan        | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 1   | 1  | 1  | 1  |
|             | Magenta     | 1                | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1   | 1  | 1  | 1  |
|             | Yellow      | 1                | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 1     | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 0    | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
|             | White       | 1                | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 1     | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 1   | 1  | 1  | 1  |
| RED         | RED (0)     | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
|             | RED (1)     | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 1  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
|             | ...         |                  |    |    |    |     |    |    |    |       |    |    |    |     |    |    |    |      |    |    |    |     |    |    |    |
|             | RED (254)   | 1                | 1  | 1  | 1  | 1   | 1  | 1  | 0  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
|             | RED (255)   | 1                | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
| GREEN       | GREEN (0)   | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
|             | GREEN (1)   | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 1  | 0    | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
|             | ...         |                  |    |    |    |     |    |    |    |       |    |    |    |     |    |    |    |      |    |    |    |     |    |    |    |
|             | GREEN (254) | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1   | 1  | 1  | 0  | 0    | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
|             | GREEN (255) | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 0    | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
| BLUE        | BLUE (0)    | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
|             | BLUE (1)    | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0   | 0  | 1  |    |
|             | ...         |                  |    |    |    |     |    |    |    |       |    |    |    |     |    |    |    |      |    |    |    |     |    |    |    |
|             | BLUE (254)  | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1   | 1  | 1  | 0  |
|             | BLUE (255)  | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1   | 1  | 1  | 1  |

## Product Specification

### 3-8. Power Sequence

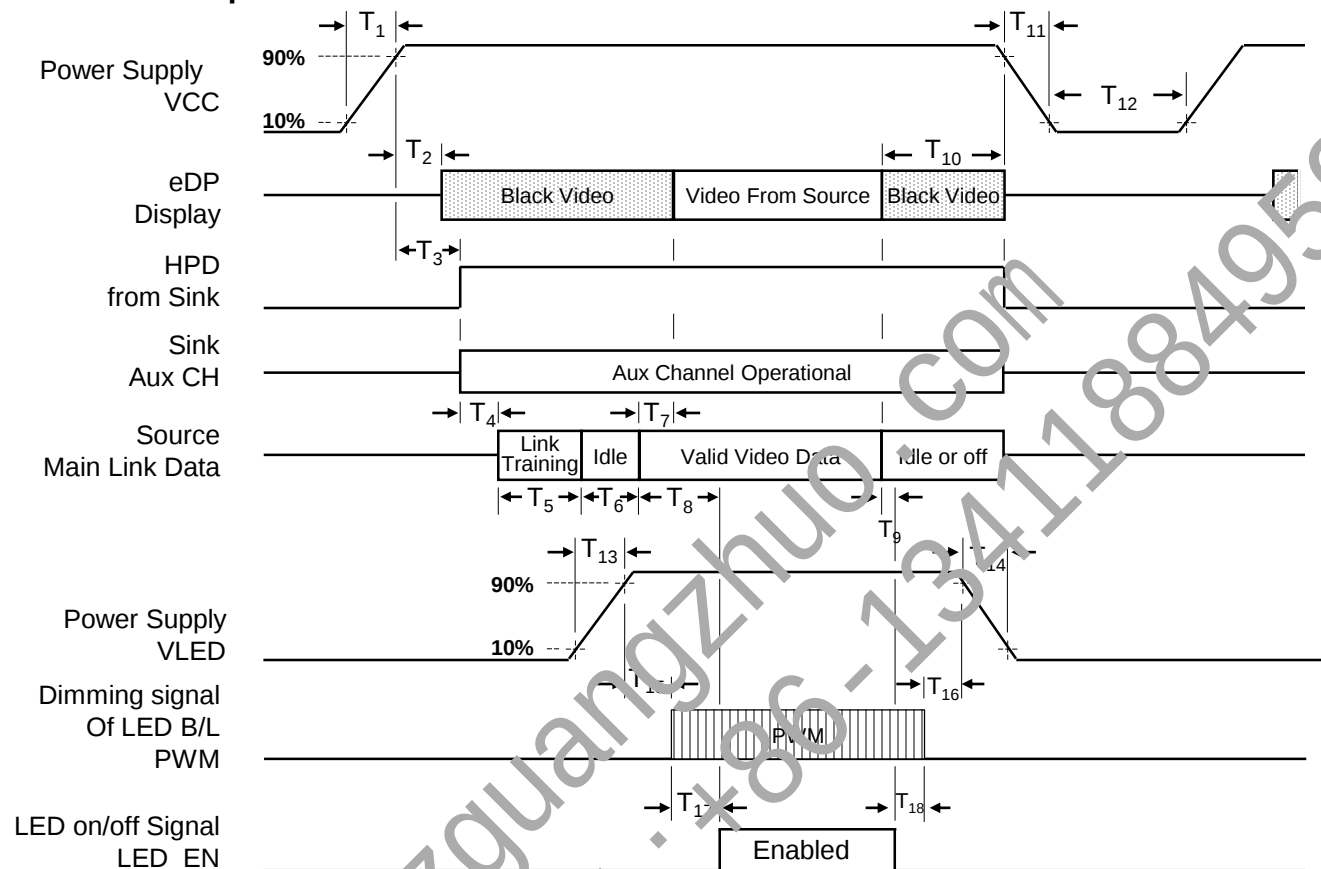


Table 6. POWER SEQUENCE TABLE

| Symbol         | Required By | Limits |     | Units | Notes | Symbol          | Required By | Limits |     | Units | Notes |
|----------------|-------------|--------|-----|-------|-------|-----------------|-------------|--------|-----|-------|-------|
|                |             | Min    | Max |       |       |                 |             | Min    | Max |       |       |
| T <sub>1</sub> | Source      | 0.5    | 10  | ms    |       | T <sub>10</sub> | Source      | 100    | 500 | ms    | 7     |
| T <sub>2</sub> | Sink        | 0      | 200 | ms    | -     | T <sub>11</sub> | Source      | -      | 10  | ms    | -     |
| T <sub>3</sub> | Sink        | 0      | 200 | ms    | -     | T <sub>12</sub> | Source      | 500    | -   | ms    |       |
| T <sub>4</sub> | Source      | -      | -   | ms    | -     | T <sub>13</sub> | Source      | 0.5    | 10  | ms    | -     |
| T <sub>5</sub> | Source      | -      | -   | ms    | -     | T <sub>14</sub> | Source      | 0.5    | 10  | ms    | -     |
| T <sub>6</sub> | Source      | -      | -   | ms    | -     | T <sub>15</sub> | Source      | 10     | -   | ms    | -     |
| T <sub>7</sub> | Sink        | 0      | 50  | ms    | -     | T <sub>16</sub> | Source      | 10     | -   | ms    | -     |
| T <sub>8</sub> | Source      | -      | -   | ms    | 5     | T <sub>17</sub> | Source      | 0      | -   | ms    | -     |
| T <sub>9</sub> | Source      | 50     | 100 | ms    | 6     | T <sub>18</sub> | Source      | 0      | -   | ms    | -     |

- Note)
1. Do not insert the mating cable when system turn on.
  2. Valid Data have to meet "3-3. eDP Signal Timing Specifications"
  3. Video Signal, LED\_EN and PWM need to be on pull-down condition on invalid status.
  4. LGD recommend the rising sequence of VLED after the Vcc and valid status of Video Signal turn on.
  5. Driving signal of B/L must be "On" after normal video signal (Normal operating data from source) input.
  6. When VCC off, LED EN must be dropped to low level within black video data.
  7. For stable operation of BL, Black video data have to meet min 100ms.

Product Specification

4. Optical Specification

Optical characteristics are determined after the unit has been ‘ON’ and stable for approximately 20 minutes in a dark environment at 25°C. The values specified are at an approximate distance 50cm from the LCD surface at a viewing angle of  $\Phi$  and  $\Theta$  equal to 0°.

FIG. 1 presents additional information concerning the measurement equipment and method.

FIG. 1 Optical Characteristic Measurement Equipment and Method

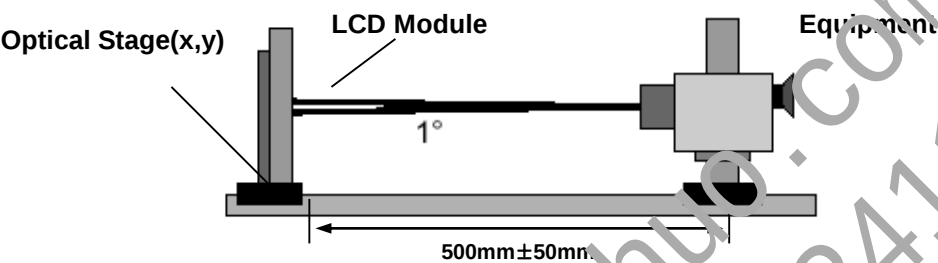


Table 7. OPTICAL CHARACTERISTICS

Ta=25°C, VCC=3.3V, fv=60Hz

| Parameter                |                              | Symbol                  | Values            |       |                   | Units             | Notes    |
|--------------------------|------------------------------|-------------------------|-------------------|-------|-------------------|-------------------|----------|
|                          |                              |                         | Min               | Typ   | Max               |                   |          |
| Contrast Ratio           |                              | CR                      | 600               | 600   | -                 |                   | 1        |
| Surface Luminance, white |                              | L <sub>wH</sub>         | 255               | 300   | -                 | cd/m <sup>2</sup> | 2        |
| Luminance Variation      |                              | δ <sub>WHITE(5P)</sub>  | 80%               | -     | -                 | -                 | 3        |
|                          |                              | δ <sub>WHITE(13P)</sub> | 60%               | 70%   | -                 |                   |          |
| Response Time            |                              | Tr+Tf                   | -                 | 25    | 35                | ms                | 4        |
| Color Gamut              |                              | sRGB                    | 95%               | 100%  | -                 |                   | CIE 1931 |
| Color Coordinates        | RED                          | Rx                      | Typical<br>- 0.03 | 0.645 | Typical<br>+ 0.03 |                   | 5        |
|                          |                              | Ry                      |                   | 0.330 |                   |                   |          |
|                          | GREEN                        | Gx                      |                   | 0.300 |                   |                   |          |
|                          |                              | Gy                      |                   | 0.600 |                   |                   |          |
|                          | BLUE                         | Bx                      |                   | 0.145 |                   |                   |          |
|                          |                              | By                      |                   | 0.055 |                   |                   |          |
|                          | WHITE                        | Wx                      |                   | 0.313 |                   |                   |          |
|                          |                              | Wy                      |                   | 0.329 |                   |                   |          |
| Viewing Angle            | x axis, right( $\Phi$ =0°)   | θ <sub>r</sub>          | 80                | 85    | -                 | Degree            | 6        |
|                          | x axis, left( $\Phi$ =180°)  | θ <sub>l</sub>          | 80                | 85    | -                 |                   |          |
|                          | y axis, up ( $\Phi$ =90°)    | θ <sub>u</sub>          | 80                | 85    | -                 |                   |          |
|                          | y axis, down ( $\Phi$ =270°) | θ <sub>d</sub>          | 80                | 85    | -                 |                   |          |
| Gray Scale               |                              |                         |                   |       |                   |                   | 7        |

## Product Specification

Note)

1. It should be measured in the center of screen(1 Point). Contrast Ratio(CR) is defined mathematically as

$$\text{Contrast Ratio(1 Point)} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

2. Surface luminance is the average of 5 point across the LCD surface 50cm from the surface with all pixels displaying white. For more information see FIG 2.

$$L_{WH} = \text{Average}(1,2, \dots 5 \text{ Point})$$

3. The variation in surface luminance , The panel total variation ( $\delta$  WHITE) is determined by measuring N at each test position 1 through 13 and then defined as following numerical formula.  
For more information see FIG 2.

$$\delta \text{ WHITE (5P)} = \frac{\text{Minimum (1,2, \dots 5 Point)}}{\text{Maximum (1,2, \dots 5 Point)}} * 100 \quad \delta \text{ WHITE (13P)} = \frac{\text{Minimum (1,2, \dots 13 Point)}}{\text{Maximum (1,2, \dots 13 Point)}} * 100$$

4. Response time is the time required for the display to transition from black to white (rise time,  $T_r$ ) and from white to black (falling time,  $T_f$ ). For additional information see FIG 3.

5. It should be measured in the center of screen (1Point).

6. Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG 4.

7. Gray scale specification

| Gray Level | Luminance [%] (Typ) |
|------------|---------------------|
| 0          | 0.07                |
| 7          | 0.80                |
| L15        | 4.25                |
| L23        | 10.90               |
| L31        | 21.01               |
| L39        | 34.82               |
| L47        | 52.49               |
| L55        | 74.17               |
| L63        | 100                 |



## Product Specification

FIG. 2 Luminance

&lt;Measuring point for Average Luminance &amp; measuring point for Luminance variation&gt;

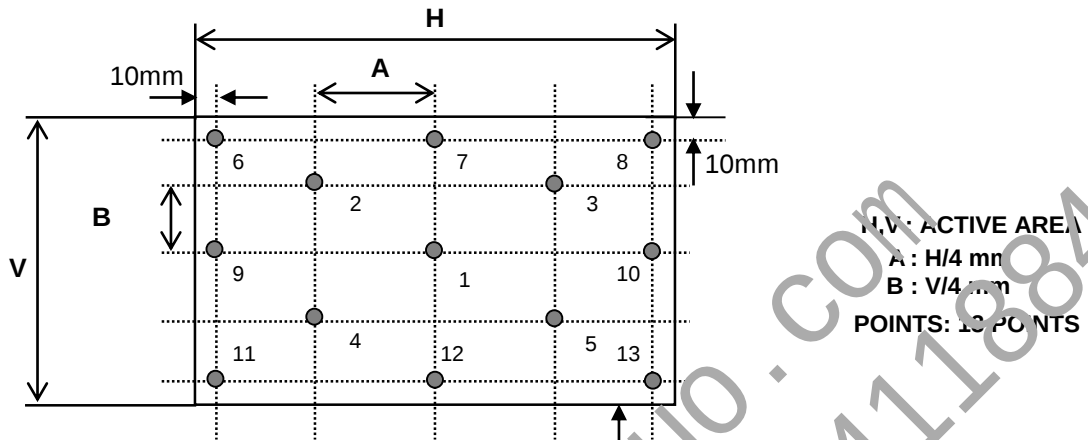


FIG. 3 Response Time

The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".

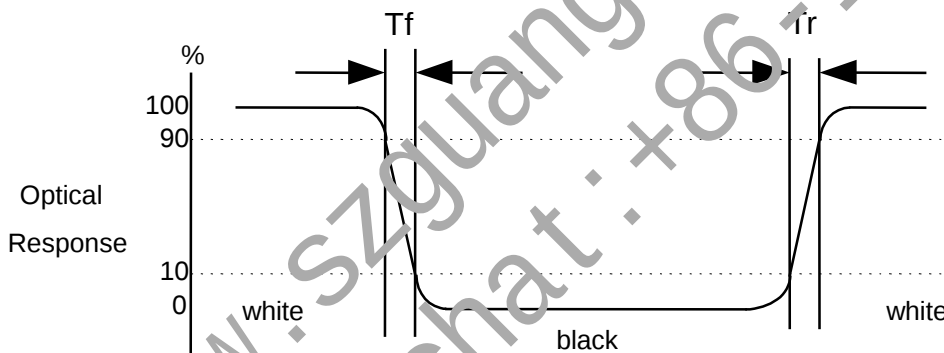
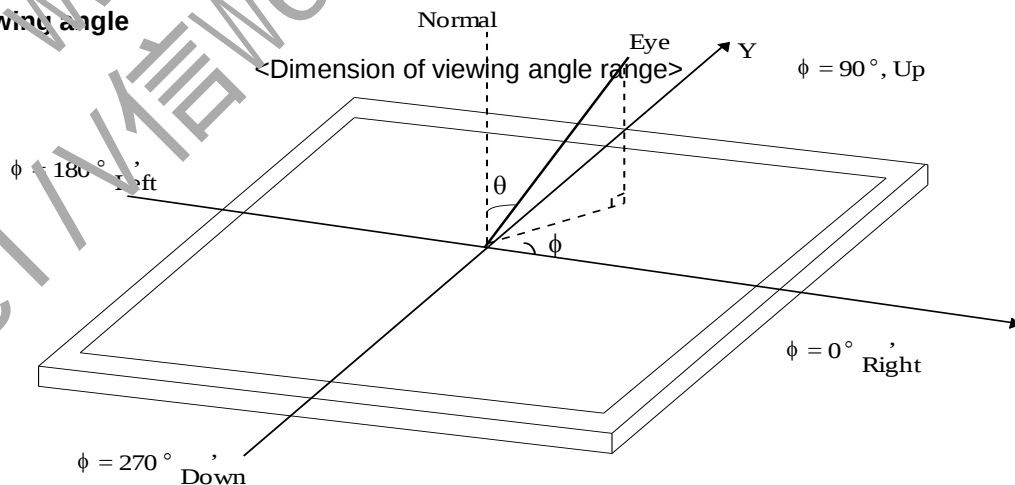


FIG. 4 Viewing angle



## Product Specification

### 5. Mechanical Characteristics

The contents provide general mechanical characteristics for the model LP140WFH. In addition the figures in the next page are detailed mechanical drawing of the LCD.

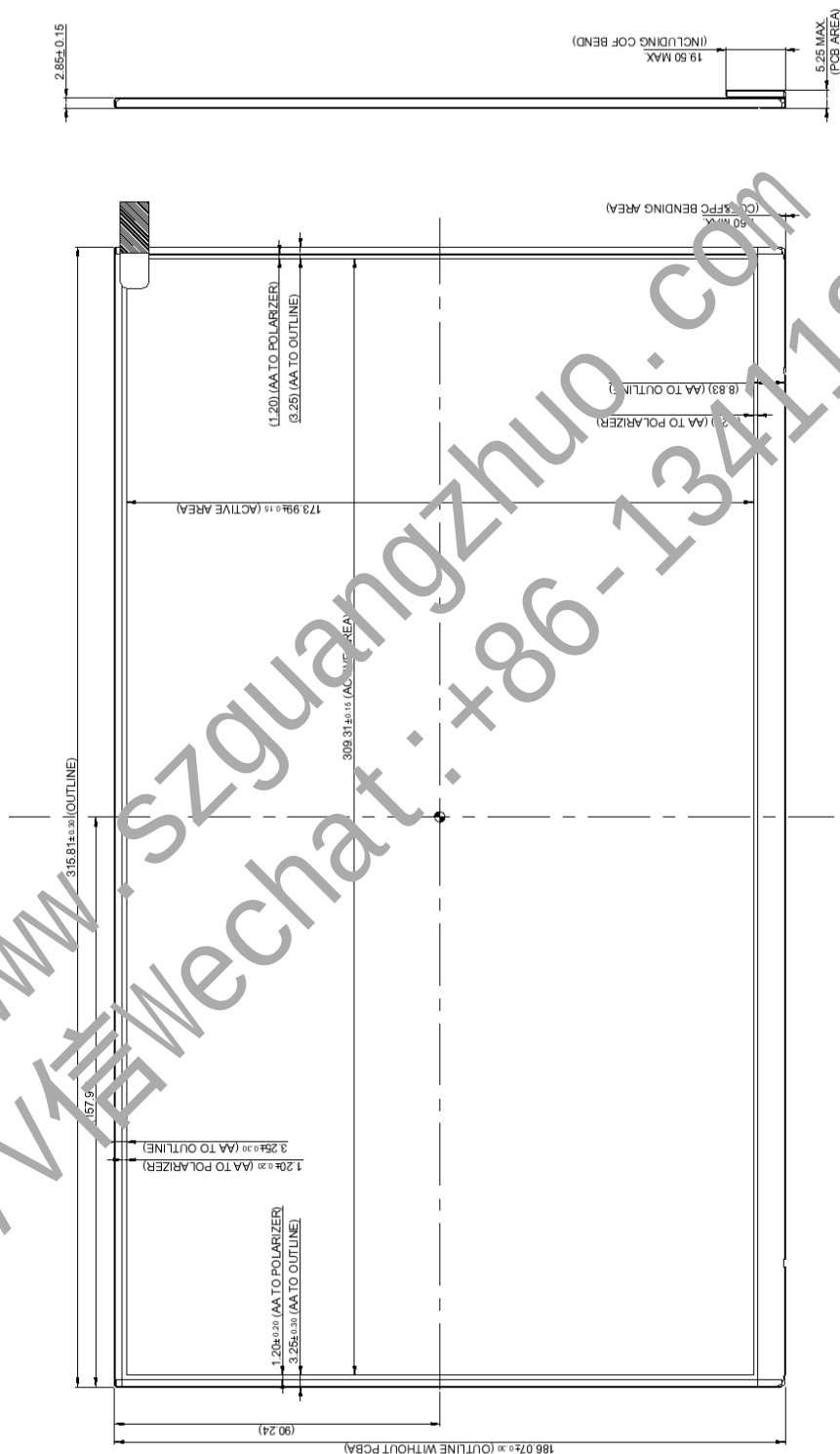
|                                  |                                             |                        |
|----------------------------------|---------------------------------------------|------------------------|
| <b>Outline Dimension</b>         | Horizontal                                  | 315.81 ± 0.3 mm        |
|                                  | Vertical                                    | 186.07 ± 0.3 mm        |
|                                  | Thickness                                   | 3.00 mm (Max, w/o PCB) |
| <b>Upper Polarizer Dimension</b> | Horizontal                                  | 311.71 ± 0.2 mm        |
|                                  | Vertical                                    | 176.39 ± 0.2 mm        |
| <b>Active Display Area</b>       | Horizontal                                  | 309.31 mm ± 0.15 mm    |
|                                  | Vertical                                    | 173.39 mm ± 0.15 mm    |
| <b>Weight</b>                    | 300g (Max.)                                 |                        |
| <b>Surface Treatment</b>         | Anti-Glare treatment of the front polarizer |                        |

## Product Specification

<FRONT VIEW>

Notes (Measurement method refer to the Appendix C)

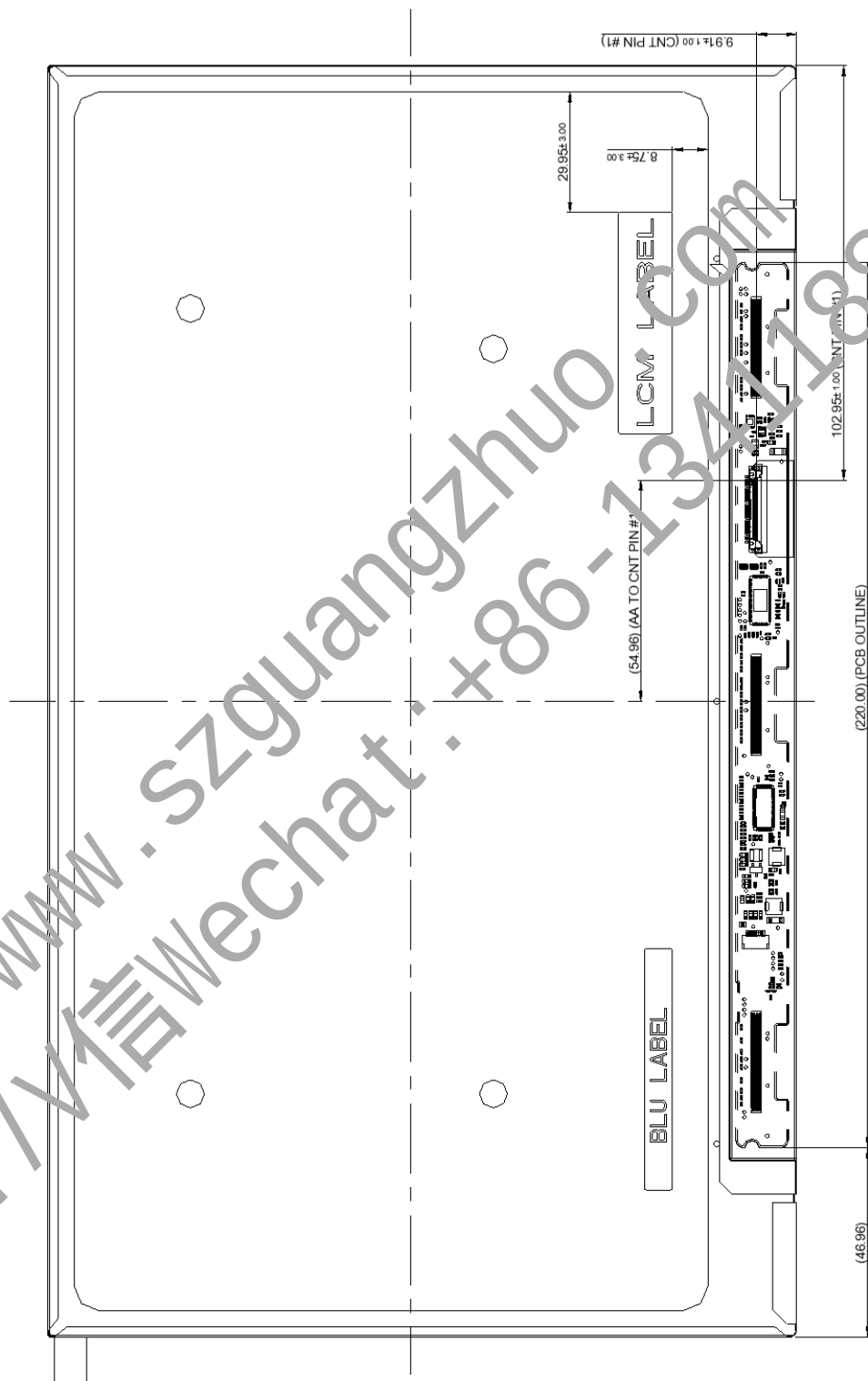
- 1) Unit[mm], General tolerance :  $\pm 0.5\text{mm}$   
2) All components except cover shield of LCM is under upper POL.



Product Specification

<REAR VIEW>

Note) Unit:[mm], General tolerance:  $\pm 0.5\text{mm}$   
LCM Label Information refer to the page 26



## Product Specification

### 6. Reliability

Environment test condition

| No. | Test Item                                   | Conditions                                                                                                                                                                                                                                                                                                                                                                                  |
|-----|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | High temperature storage test               | Ta= 60°C, 240h                                                                                                                                                                                                                                                                                                                                                                              |
| 2   | Low temperature storage test                | Ta= -20°C, 240h                                                                                                                                                                                                                                                                                                                                                                             |
| 3   | High temperature operation test             | Ta= 50°C, 50%RH, 240h                                                                                                                                                                                                                                                                                                                                                                       |
| 4   | Low temperature operation test              | Ta= 0°C, 240h                                                                                                                                                                                                                                                                                                                                                                               |
| 5   | Vibration test (non-operating)              | Random, 1.0Grms, 10 ~ 300Hz(PSD 0.0025)<br>3 axis, 30min/axis                                                                                                                                                                                                                                                                                                                               |
| 6   | Shock test (non-operating)                  | - No functional or cosmetic defects following a shock to all 6 sides delivering at least 180 G in a half sine pulse no longer than 2 ms to the display module<br>- No functional defects following a shock delivering at least 200 g in a half sine pulse no longer than 2 ms to each of 6 sides. Each of the 6 sides will be shock tested with one each display, for a total of 6 displays |
| 7   | Altitude<br>operating<br>storage / shipment | 0 ~ 10,000 feet (3,048m) 24Hr<br>0 ~ 40,000 feet (12,192m) 24Hr                                                                                                                                                                                                                                                                                                                             |

[ Result Evaluation Criteria ]

1. Comparing the initial functional FOS status, there should be no major change which might affect the practical display function when the display reliability test is conducted.
2. After conduct reliability tests, LGD guarantees only functional FOS quality.
3. In the Reliability Test, Confirm performance after leaving in room temp.
4. In the standard condition, there shall be no practical problems that may affect the display function 24 hours later after reliability test. After the reliability test, we can guarantee the product only when the corrosion is causing its malfunction. The corrosion causing no functional defect can not be guaranteed.



## Product Specification

### 7. International Standards

#### 7-1. Safety

- a) IEC 62368-1, The International Electro-technical Commission(IEC).  
Audio/video, Information and Communication Technology Equipment - Safety - Safety Requirements.
- b) EN 62368-1, European Committee for Electro-technical Standardization (CENELEC)  
Audio/video, Information and Communication Technology Equipment - Safety Requirements
- c) UL 62368-1, UL LLC.  
Audio/video, Information and Communication Technology Equipment - Safety Requirements
- d) CAN/CSA C22.2 No.62368-1, Canadian Standards Association (CSA).  
Audio/video, Information and Communication Technology Equipment - Safety Requirements
- e) IEC 60950-1, The International Electro technical Commission (IEC).  
Information Technology Equipment - Safety - Part 1 : General Requirements

#### 7-2. Environment

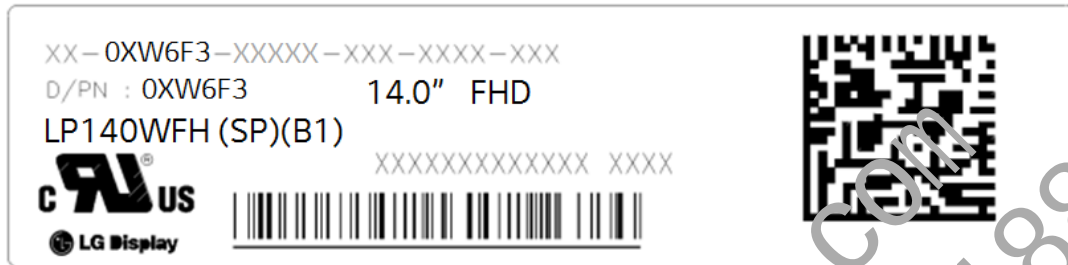
- a) RoHS, Directive 2011/65/EU of the European Parliament and of the council of 8 June 2011



## Product Specification

### 8. Packing

#### 8-1. Designation of Lot Mark



##### a) Lot Mark

|   |   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G | H | I | J | K | L | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|

A,B,C : SIZE(INCH)

E : MONTH

D : YEAR

F ~ M : SERIAL NO.

##### Note

##### 1. YEAR

| Year | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 |
|------|------|------|------|------|------|------|------|------|------|------|
| Mark | K    | L    | M    | N    | P    | R    | S    | T    | U    | V    |

##### 2. MONTH

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Mark  | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | A   | B   | C   |

##### b) Location of Lot Mark

Serial No. is printed on the label. The label is attached to the backside of the LCD module.  
This is subject to change without prior notice.

#### 8-2. Packing Form

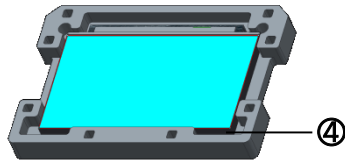
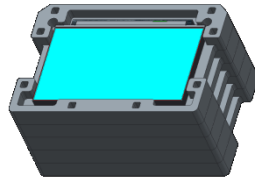
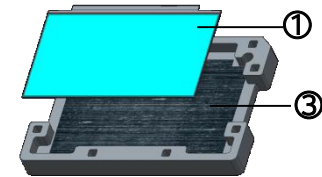
a) Package quantity in one box : 20pcs

b) Box Size : 410 \* 278 \* 244 mm

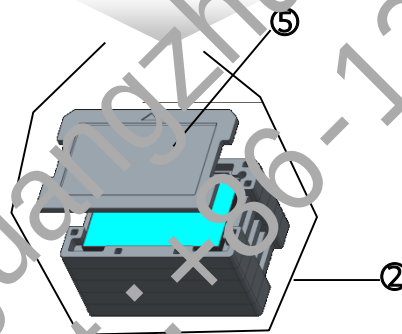


## Product Specification

### 8-3. Packing Assembly



(Sheet + LCM) ×4

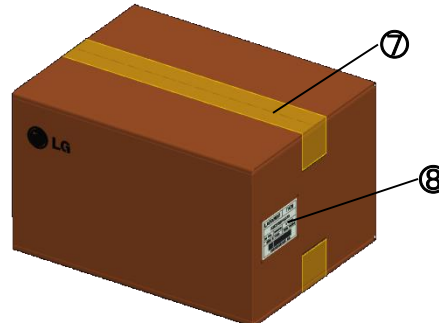
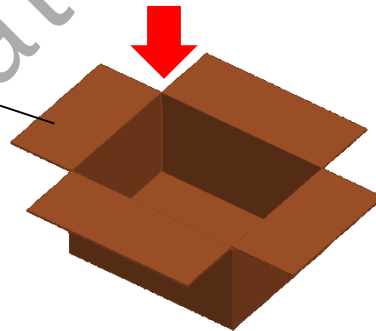


4 LCM / Tray

5 Tray / Bpx

20LCM/Box

2EA Desiccant in the box



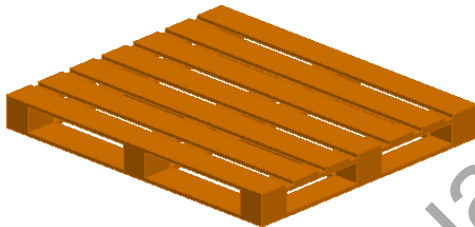
| NO. | DESCRIPTION | MATERIAL      |
|-----|-------------|---------------|
| 1   | LCD Module  |               |
| 2   | BAG         | AL            |
| 3   | Sheet       | PE            |
| 4   | Bottom Tray | EPO           |
| 5   | Top Tray    | EPO           |
| 6   | BOX         | SWR4          |
| 7   | TAPE        | OPP 70MMX300M |
| 8   | LABEL       | ART 100X70    |



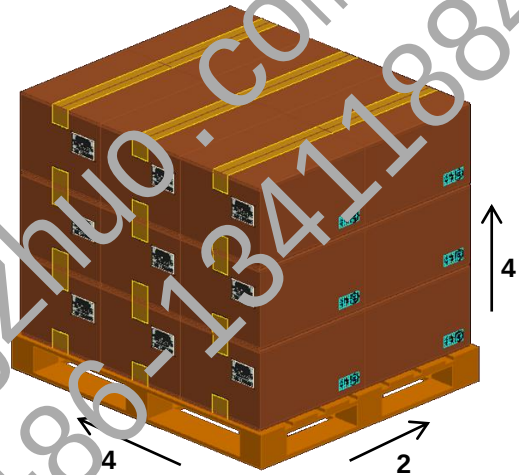
## Product Specification

### 8-4. Pallet Assembly

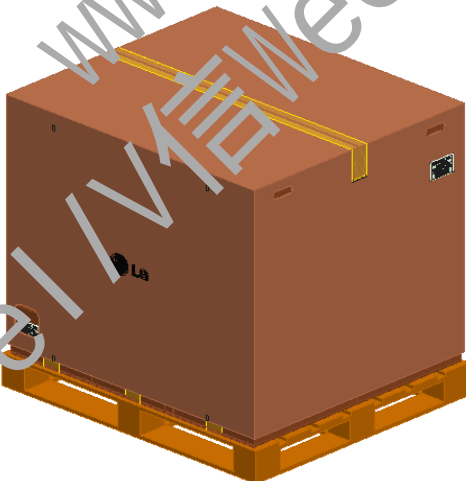
1. Pallet



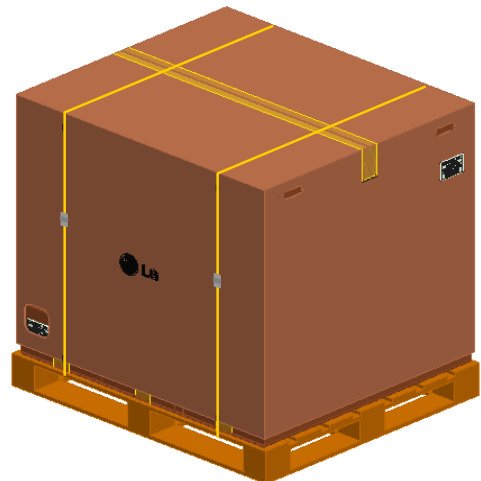
2. 4 x 2 x 4 Box Pattern



3. Angle Packing & Taping



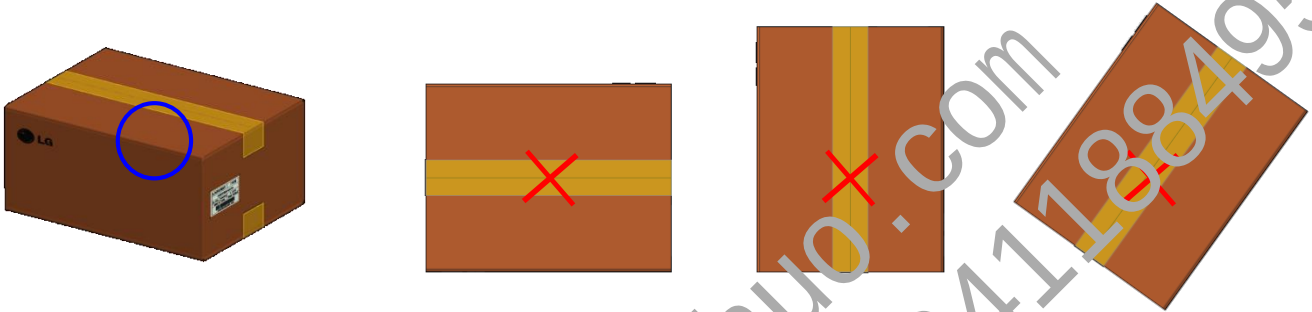
4. Banding



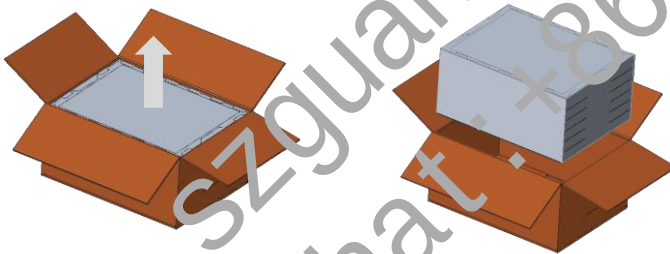


## 8-5. Precautions for unpacking the Box

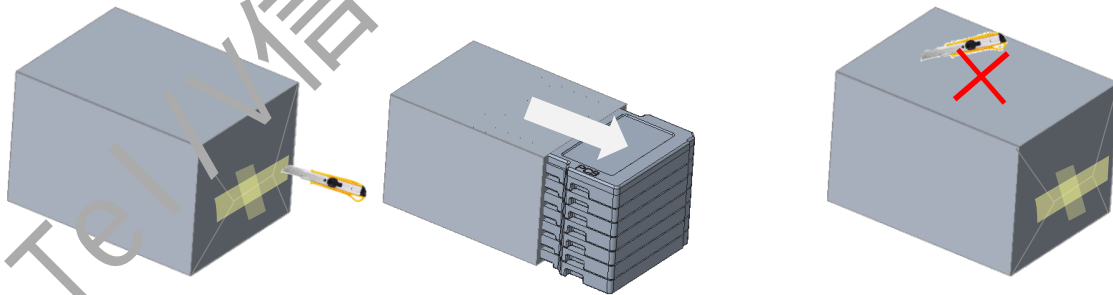
a.) Don't throw or tilt the box and put it on a flat surface.



b.) Place the box on a flat floor and Take out the AL bag vertically.



c.) Cut the tape on the side of the bag with a knife and Take out the tray horizontally.

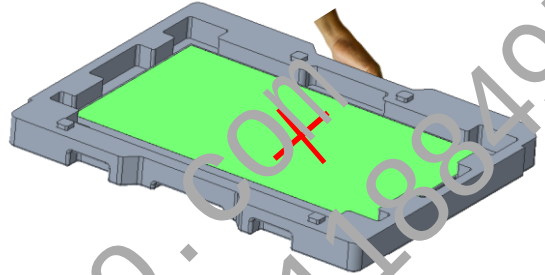
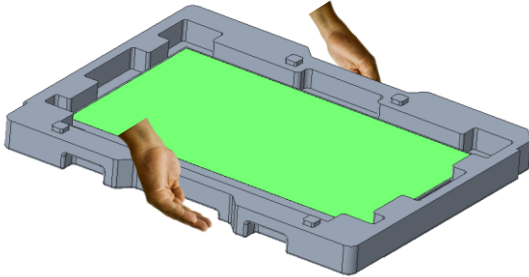


**Caution : Do not cut the top of the bag with a knife.  
(The Knife can damage product)**



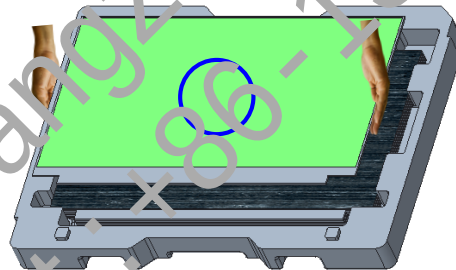
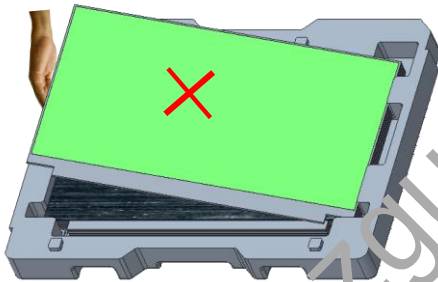
## 8-6. Precautions for Handling tray

- a.) Hold center of short or long side of the tray with both hands when handling one or more trays.

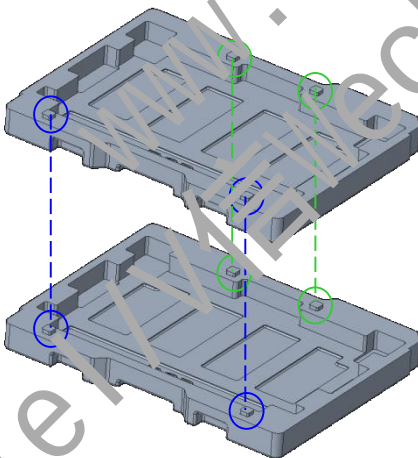


Caution : Do not handle with only one hand.

- b.) Always place tray on flat surface and Don't tilt with one hand to take out.



- c.) When stacking trays, Please align same position of the protrusion of each tray.



If not Aligned,  
The tray may slip without being loaded.

- d.) The maximum stacking quantity is equal to the number of loads per box.  
- Recommended as above because heavier weight can cause muscular skeletal disease and operator handling errors.



## Product Specification

### 9. PRECAUTIONS

Please pay attention to the followings when you use this TFT LCD module.

#### 9-1. MOUNTING PRECAUTIONS

- (1) You must mount a module using holes arranged in four corners or four sides.
- (2) You should consider the mounting structure so that uneven force (ex. Twisted stress) is not applied to the module. And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.
- (3) Please attach the surface transparent protective plate to the surface in order to protect the polarizer. Transparent protective plate should have sufficient strength in order to resist external force.
- (4) You should adopt radiation structure to satisfy the temperature specification.
- (5) Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.
- (6) Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment. Do not touch the surface of polarizer for bare hand or greasy cloth. (Some cosmetics are detrimental to the polarizer.)
- (7) When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with petroleum benzene. Normal-hexane is recommended for cleaning the adhesives used to attach front / rear polarizers. Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer.
- (8) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
- (9) Do not open the case because inside circuits do not have sufficient strength.
- (10) When handling the LCD module, it needs to handle with care not to give mechanical stress to the PCB and Mounting Hole area."

#### 9-2. OPERATING PRECAUTIONS

- (1) The spike noise causes the misoperation of circuits. It should be lower than following voltage :  $V = \pm 200\text{mV}$  (Over and under shoot voltage)
- (2) Response time depends on the temperature. (In lower temperature, it becomes longer.)
- (3) Brightness depends on the temperature. (In lower temperature, it becomes lower.) And in lower temperature, response time (required time that brightness is stable after turned on) becomes longer.
- (4) Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
- (5) When fixed patterns are displayed for a long time, remnant image is likely to occur.
- (6) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimized the interference.



## Product Specification

### 9-3. ELECTROSTATIC DISCHARGE CONTROL

Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wrist band etc. And don't touch interface pin directly.

### 9-4. PRECAUTIONS FOR STRONG LIGHT EXPOSURE

Strong light exposure causes degradation of polarizer and color filter.

### 9-5. STORAGE

When storing modules as spares for a long time, the following precautions are necessary:

- (1) Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5°C and 35°C at normal humidity.
- (2) The polarizer surface should not come in contact with any other object.  
It is recommended that they be stored in the container in which they were shipped.

### 9-6. HANDLING PRECAUTIONS FOR PROTECTION FILM

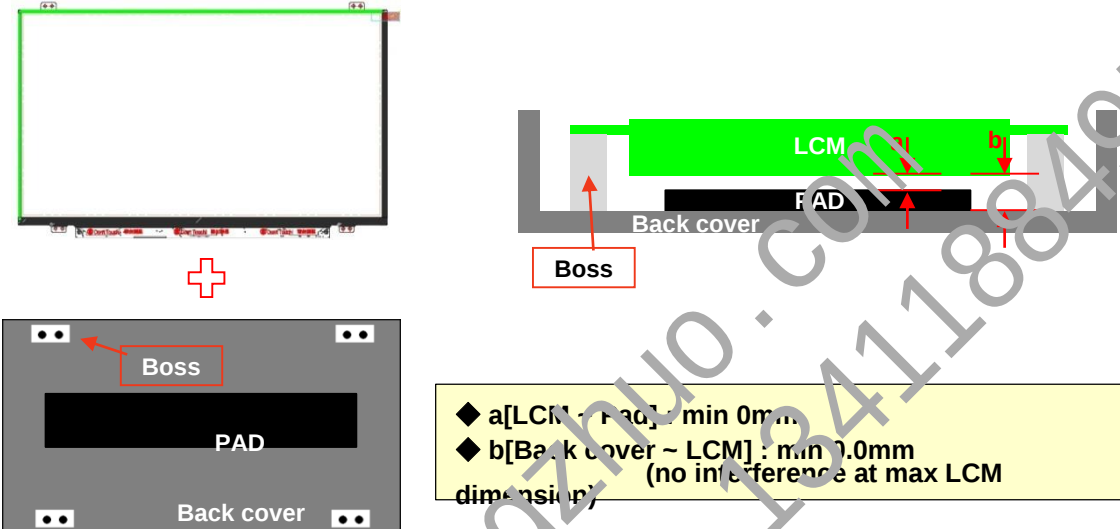
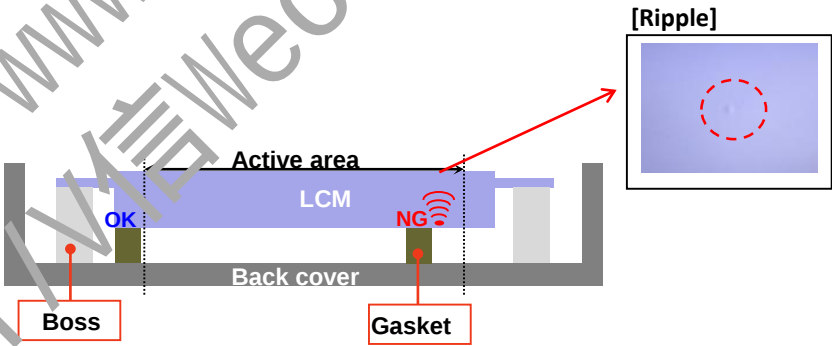
- (1) When the protection film is peeled off, static electricity is generated between the film and polarizer. This should be peeled off slowly and carefully by people who are electrically grounded and with well ion-blown equipment or in such a condition etc.
- (2) The protection film is attached to the polarizer with a small amount of glue. If some stress is applied to rub the protection film against the polarizer during the time you peel off the film, the glue is apt to remain on the polarizer.  
Please carefully peel off the protection film without rubbing it against the polarizer.
- (3) When the module with protection film attached is stored for a long time, sometimes there remains a very small amount of glue still on the polarizer after the protection film is peeled off.
- (4) You can remove the glue easily. When the glue remains on the polarizer surface or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with normal-hexane.

### 9-7. THE LGD QA RESPONSIBILITY WILL BE AVOIDED IN CASE OF BELOW

- (1) When the customer attaches TSM(Touch Sensor Module) on LCM without Supplier's approval.
- (2) When the customer attaches cover glass on LCM without Supplier's approval.
- (3) When the LCMs were repaired by 3rd party without Supplier's approval.
- (4) When the LCMs were treated like Disassemble and Rework by the Customer and/or Customer's representative without supplier's approval.

Product Specification

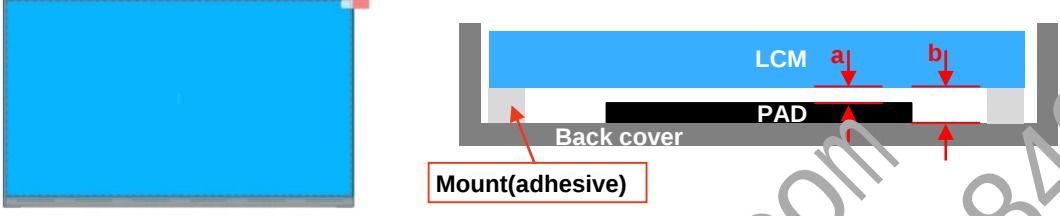
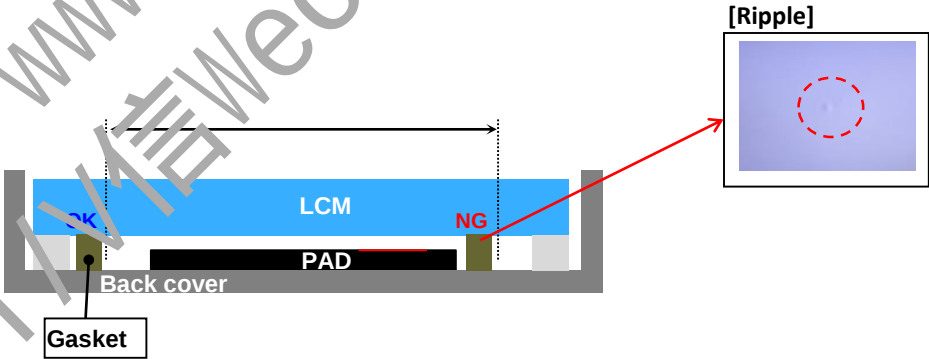
Appendix A. LGD Proposal for system cover design.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Gap check for securing the enough gap between LCM and System back cover.                                                                                  |
|  <p> <b>Top View:</b> Shows the LCM (green) and Back cover (grey) with a red cross indicating the gap check area.         </p> <p> <b>Side View:</b> Shows the LCM (green) on top of the PAD (black) which is on the Back cover (grey). Dimension 'a' is the gap between LCM and PAD, and dimension 'b' is the gap between Back cover and LCM.         </p> <p> <b>Bottom View:</b> Shows the Back cover (grey) with labels 'Boss' and 'PAD'.         </p> <p> <b>Dimensions:</b> <ul style="list-style-type: none"> <li>◆ a[LCM ~ Pad] : min 0mm</li> <li>◆ b[Back cover ~ LCM] : min 0.0mm (no interference at max LCM dimension)</li> </ul> </p> |                                                                                                                                                           |
| Risk point                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Rear side of LCM is sensitive against external stress, and previous check about interference is highly needed.                                            |
| Suggestion                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | In case there is something from system cover comes into the boundary above, mechanical interference may cause the FOS defects. (ex: Ripple, White spot..) |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Gasket position                                                                                                                                           |
|  <p> <b>Side View:</b> Shows the LCM (blue) on top of the PAD (black) which is on the Back cover (grey). The 'Active area' is indicated. The 'Boss' is on the left, and the 'Gasket' is on the right. The 'NG' label indicates a non-good position. A red arrow points from the 'NG' label to the 'Ripple' inset image.         </p> <p> <b>Ripple Inset:</b> Shows a blue square with a red dashed circle in the center, labeled '[Ripple]'.         </p>                                                                                                                                                                                        |                                                                                                                                                           |
| Risk point                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Ripple or white spot can be happened by interference between pad and LCM when gap is not enough.                                                          |
| Suggestion                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | It is recommended that gasket is posited out of active area .                                                                                             |



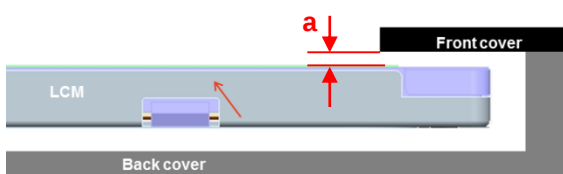
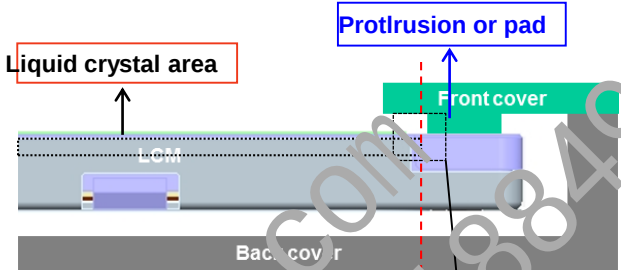
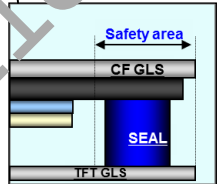
## Product Specification

### Appendix A. LGD Proposal for system cover design.

|            |                                                                                                                                                                                                                                                                                                                                                                                             |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3          | <b>Gap check for securing the enough gap between LCM and System back cover.</b>                                                                                                                                                                                                                                                                                                             |
|            |  <p>Mount(adhesive)</p> <p>Mount(adhesive)</p> <p>             ◆ <math>a[\text{LCM} \sim \text{Pad}] : \text{min } 0\text{mm}</math><br/>             ◆ <math>b[\text{Back cover} \sim \text{LCM}] : \text{min } 0.0\text{mm}</math><br/>             (no interference at max LCM dimension)         </p> |
| Risk point | Rear side of LCM is sensitive against external stress, and previous check about interference is highly needed.                                                                                                                                                                                                                                                                              |
| Suggestion | In case there is something from system cover comes into the boundary above, mechanical interference may cause the FOS defects.<br>(ex: Ripple, White spot..)                                                                                                                                                                                                                                |
| 4          | <b>Gasket position</b>                                                                                                                                                                                                                                                                                                                                                                      |
|            |  <p>[Ripple]</p> <p>LCM</p> <p>PAD</p> <p>Back cover</p> <p>Gasket</p> <p>NG</p>                                                                                                                                                                                                                        |
| Risk point | Ripple or white spot can be happened by interference between pad and LCM when gap is not enough.                                                                                                                                                                                                                                                                                            |
| Suggestion | It is recommended that gasket is posited out of active area .                                                                                                                                                                                                                                                                                                                               |

Product Specification

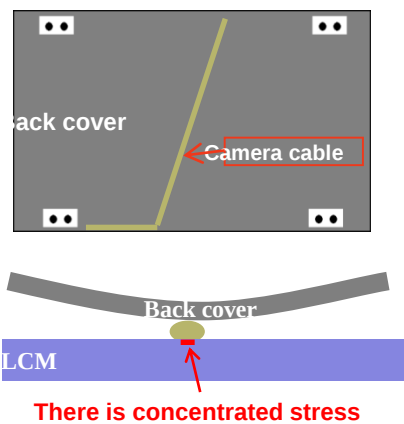
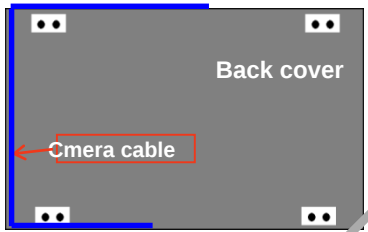
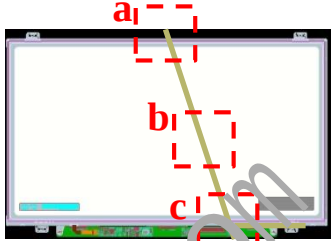
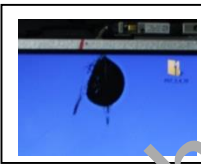
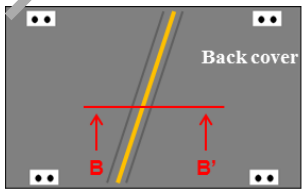
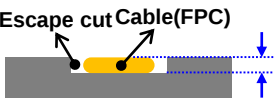
Appendix A. LGD Proposal for system cover design.

|            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5          | Check the gap between front cover and LCM(glass)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|            | <div data-bbox="92 376 649 550">  </div> <div data-bbox="699 367 1313 637">  </div> <div data-bbox="1135 656 1349 840">  </div> <div data-bbox="107 724 921 859"> <p> <b>[OK]</b> <math>0.1\text{mm} \leq a \leq 0.3\text{mm}</math><br/> <b>[Caution]</b> <math>0.0\text{mm} \leq a &lt; 0.1\text{mm}</math>, <math>0.3\text{mm} &lt; a \leq 0.5\text{mm}</math><br/> <b>[NG]</b> <math>a \leq 0\text{mm}</math> (overlap), <math>a &gt; 0.5\text{mm}</math> (leakage)         </p> </div> |
| Risk point | <p>Ripple can be happened by little gap between glass and front cover.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Suggestion | <p>Keep the gap between front cover and LCM from 0.1 to 0.3mm</p> <p>Ripple is prevented by add protrusion shape at the back side of front cover.<br/>In this case, protrusion must be created outside of liquid crystal area</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |



## Product Specification

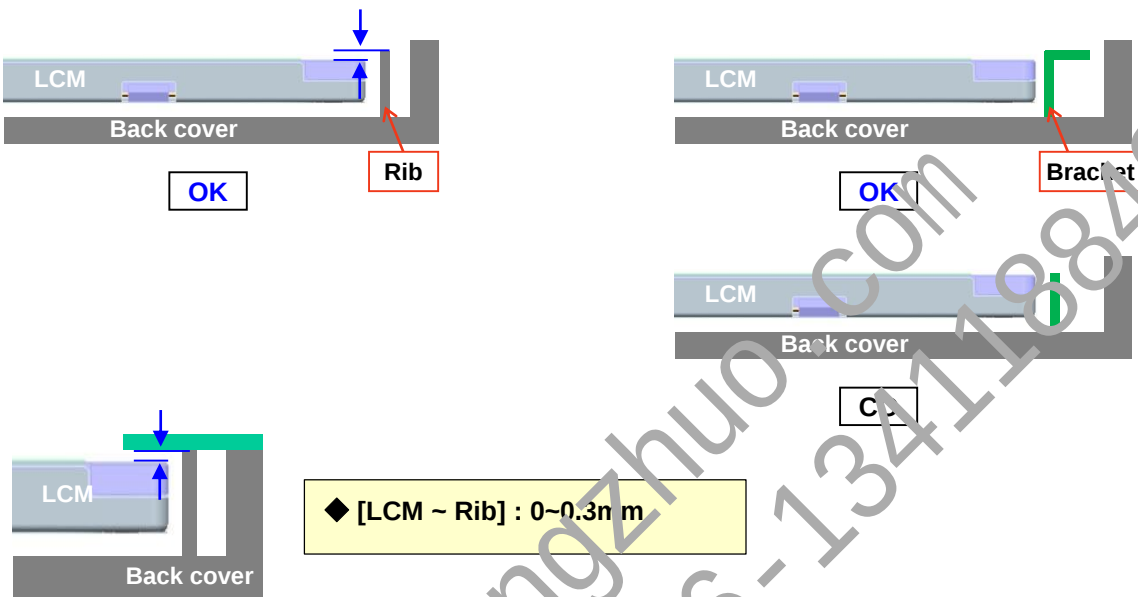
### Appendix A. LGD Proposal for system cover design.

| 6                                                                                                                                                                                                                                                                                                                 | Checking the path of the System cables                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p>[Suggestion]</p>  <p>[Cable path]</p>  <p>[Add pad]</p> |  <p>[Panel crack at "a"] [White spot at "b"] [Light leakage at "c"]</p>    <p>IPS model @ Black pattern</p>  <p>[Add cut]</p> <p>&lt;Section B-B'&gt;</p>  <p>Escape cut Cable(FPC)</p> <p>Escape cut depth = Cable thickness</p> |
| <p>Risk point</p>                                                                                                                                                                                                                                                                                                 | <p>LCM is easily damage by camera cable when cable is protruded from back cover.</p> <p>It is caused panel crack or white spot by concentrated stress and light leakage by panel bending at IPS model.</p> <p>It is recommended that camera cable path put outside of LCM.</p> <p>It is recommended that pad is added at both side of cable.</p> <p>Suggestion</p> <p>If cable path must be cross middle area of system, @slim &amp; narrow bezel</p> <ol style="list-style-type: none"> <li>1) Cable type is recommended to use flexible (Use FPC type).</li> <li>2) Add escape cut on back cover and add round at the edge of cut</li> </ol> <p>Depth of escape cut recommended to set the same as FPC thickness.</p>                          |



## Product Specification

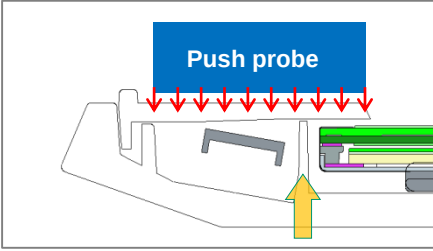
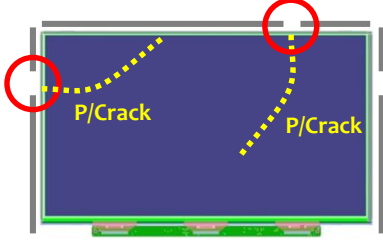
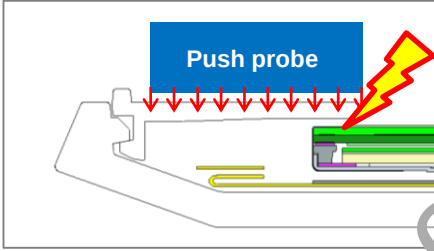
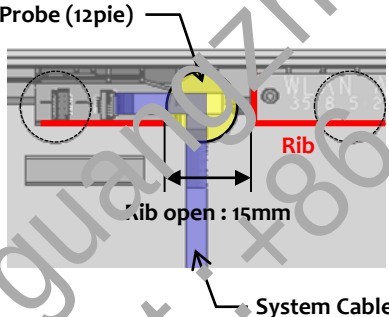
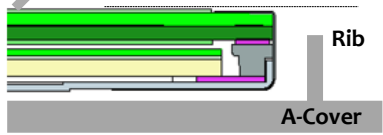
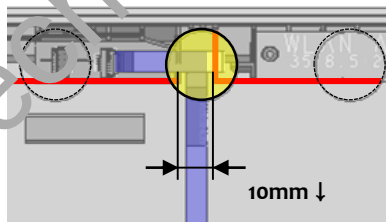
## Appendix A. LGD Proposal for system cover design.

|                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7                                                                                                                                                                                                                                                                                                             | Check the rib or Bracket on back cover                                                                                                                                                           |
|  <p>OK</p> <p>Rib</p> <p>OK</p> <p>Bracket</p> <p>OK</p> <p>LCM</p> <p>Back cover</p> <p>LCM</p> <p>Back cover</p> <p>LCM</p> <p>Back cover</p> <p>OK</p> <p>LCM</p> <p>Back cover</p> <p>OK</p> <p>LCM ~ Rib : 0~0.3mm</p> |                                                                                                                                                                                                  |
| Risk point                                                                                                                                                                                                                                                                                                    | It is necessary that the height of back cover rib or bracket is higher than LCM height. It can prevent direct compression of panel at LCM edge.                                                  |
| Suggestion                                                                                                                                                                                                                                                                                                    | "┐" shape bracket is stronger than "I" shape one.<br>It is recommended that rib height is same or more with LCM height.<br>In this case it must be considered light leakage at front cover, too. |



## Product Specification

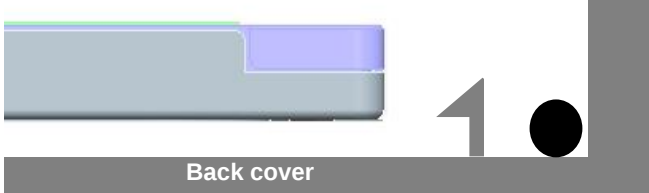
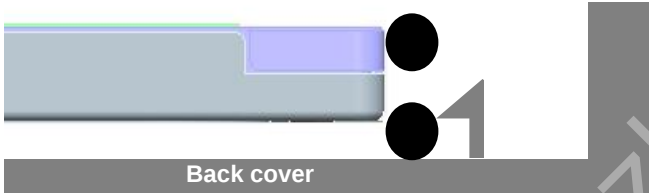
### Appendix A. LGD Proposal for system cover design.

| 8                                                                                                                                                                                                                                                                                                                                        | Rib design for panel crack prevention                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Rib 有</p>  <p>Rib structure supported by load<br/>LCM applied load distribution</p> <p>[Suggestion]</p>  <p>P/Crack</p> <p>P/Crack</p> <p>Continuous Rib design</p> | <p>Rib 無</p>  <p>Push probe</p> <p>Direct load is transferred to LCM<br/>It is vulnerable to panel crack.</p>  <p>Probe (12pie)</p> <p>Rib</p> <p>Rib open : 15mm</p> <p>System Cable</p>  <p>Rib</p> <p>A-Cover</p>  <p>10mm ↓</p> |
| <p>Risk point</p> <p>Suggestion</p>                                                                                                                                                                                                                                                                                                      | <p>When the area without the A-Cover Rib and the push point are matched, It is concentrated and vulnerable to panel cracks..</p> <p>LCM Peripheral Rib should be long enough without discontinuity.</p> <p>In case of unavoidable Rib discontinuity, Rib open interval is set to 10pie or less.</p> <p>Rib should be higher than LCM upper pol</p>                                                                                                                                                                                                                           |



Product Specification

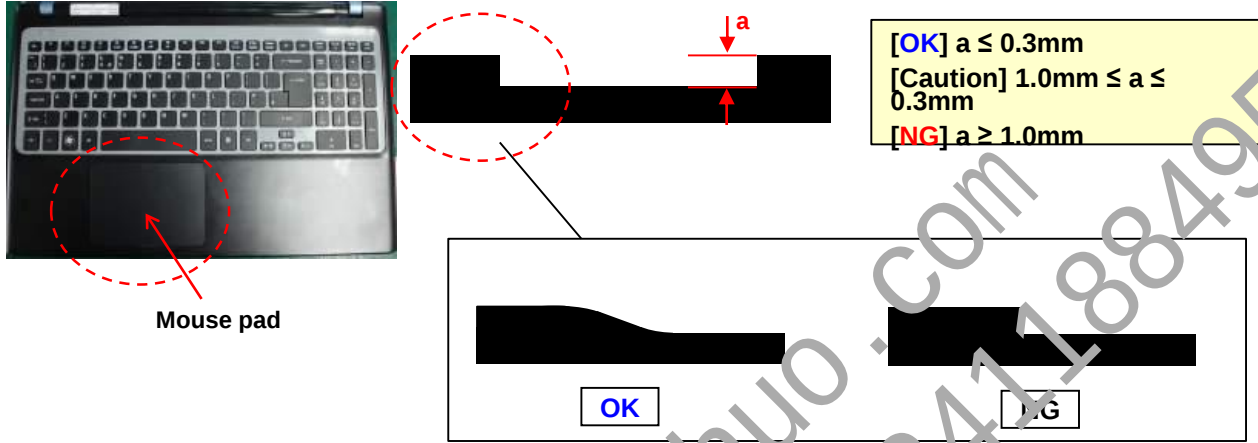
Appendix A. LGD Proposal for system cover design.

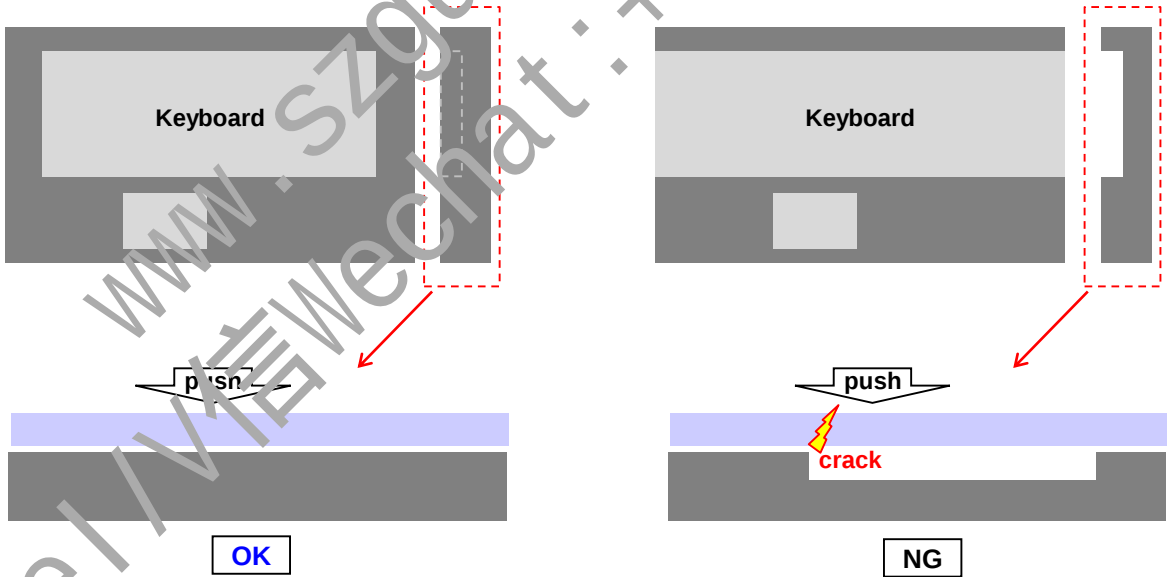
|                                                                                                                                                                                                                                   |                                                                                                             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| 9                                                                                                                                                                                                                                 | Check the wire position(path)                                                                               |
| <div><p>Back cover</p><p>OK</p><p>Back cover</p><p>NG</p></div> |                                                                                                             |
| Risk point                                                                                                                                                                                                                        | It is necessary that wire is posited out of hook, not posited near hook,.                                   |
| Suggestion                                                                                                                                                                                                                        | If wire is posited near hook, it can be happened assemble error and panel crack during assemble front cover |



## Product Specification

## Appendix A. LGD Proposal for system cover design.

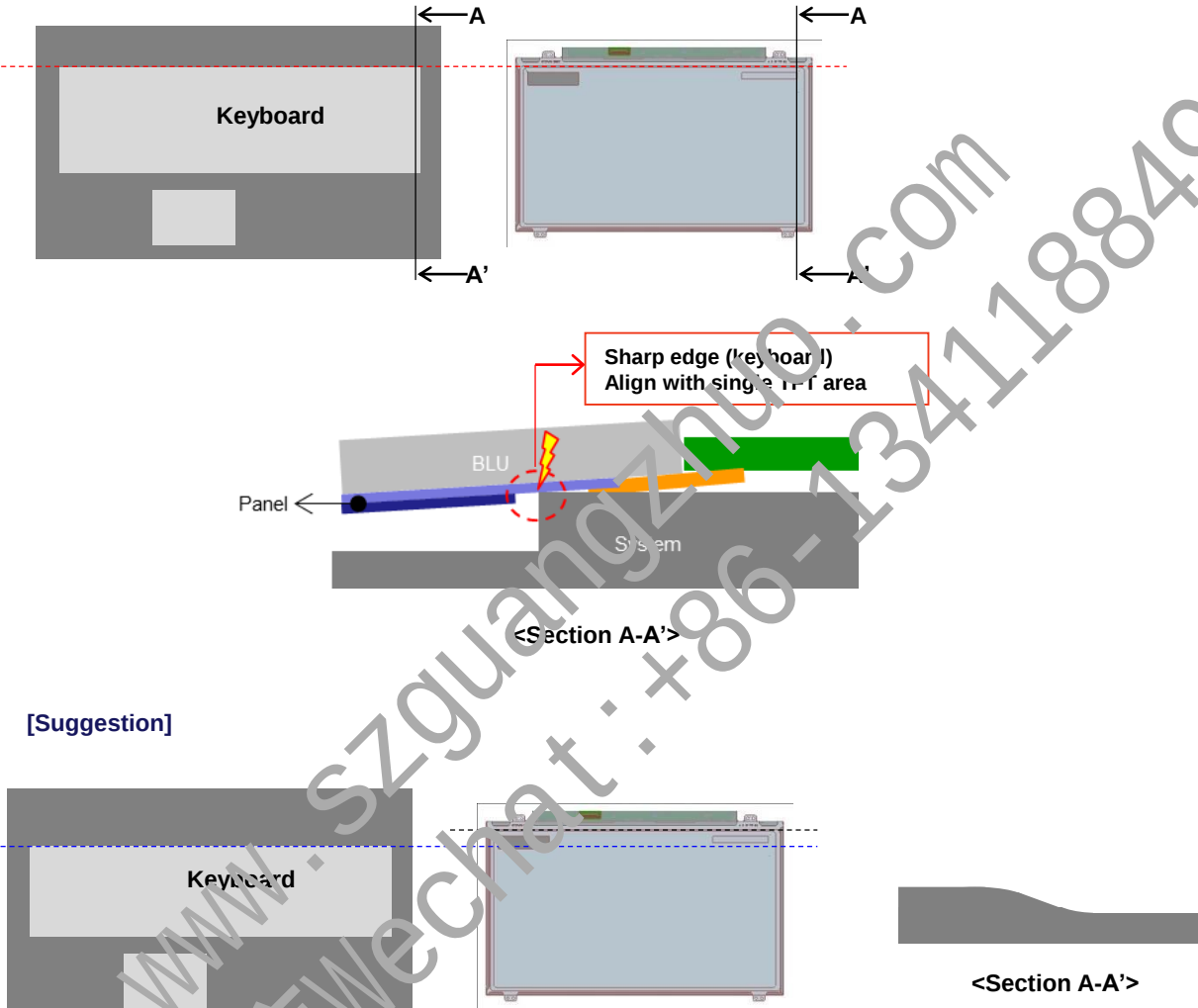
|                                                                                                                                                                                                                                                                         |                                                                    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|
| 10                                                                                                                                                                                                                                                                      | Check mouse pad (touch pad) depth and shape of edge                |
|  <p>Mouse pad</p> <p>[OK] <math>a \leq 0.3\text{mm}</math><br/>[Caution] <math>1.0\text{mm} \leq a \leq 0.3\text{mm}</math><br/>[NG] <math>a \geq 1.0\text{mm}</math></p> <p>OK NG</p> |                                                                    |
| Risk point                                                                                                                                                                                                                                                              | Mouse pad step is deep, it is caused panel crack by external load. |
| Suggestion                                                                                                                                                                                                                                                              | The edge shape must be smooth.                                     |

|                                                                                                                                                                        |                                                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| 11                                                                                                                                                                     | Check the step of keyboard area                                              |
|  <p>Keyboard</p> <p>Keyboard</p> <p>push</p> <p>push</p> <p>crack</p> <p>OK NG</p> |                                                                              |
| Risk point                                                                                                                                                             | The step of keyboard at the side edge of main body, it is caused panel crack |
| Suggestion                                                                                                                                                             | Keep to flat out side of keyboard.                                           |



## Product Specification

### Appendix A. LGD Proposal for system cover design.

| 12 | The position and shape of keyboard step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    |  <p>The diagram illustrates the proposed design for the keyboard step on the system cover. It includes a top view of the keyboard and system, a cross-section A-A' showing the sharp edge of the keyboard aligned with the single-TFT area, and a suggestion for a rounded edge shape.</p> <p><b>[Suggestion]</b></p> <p>Keyboard edge is sharp (a right angle), panel is get concentrated stress, by external force at this edge.</p> <p>Especially, keyboard edge is aligned with panel edge (single-TFT area), crack risk is seriously increase.</p> <p>It is recommended that keyboard edge is posited to avoid single-TFT area.</p> <p>It is recommended that edge shape of touch pad is rounded.</p> |



## Product Specification

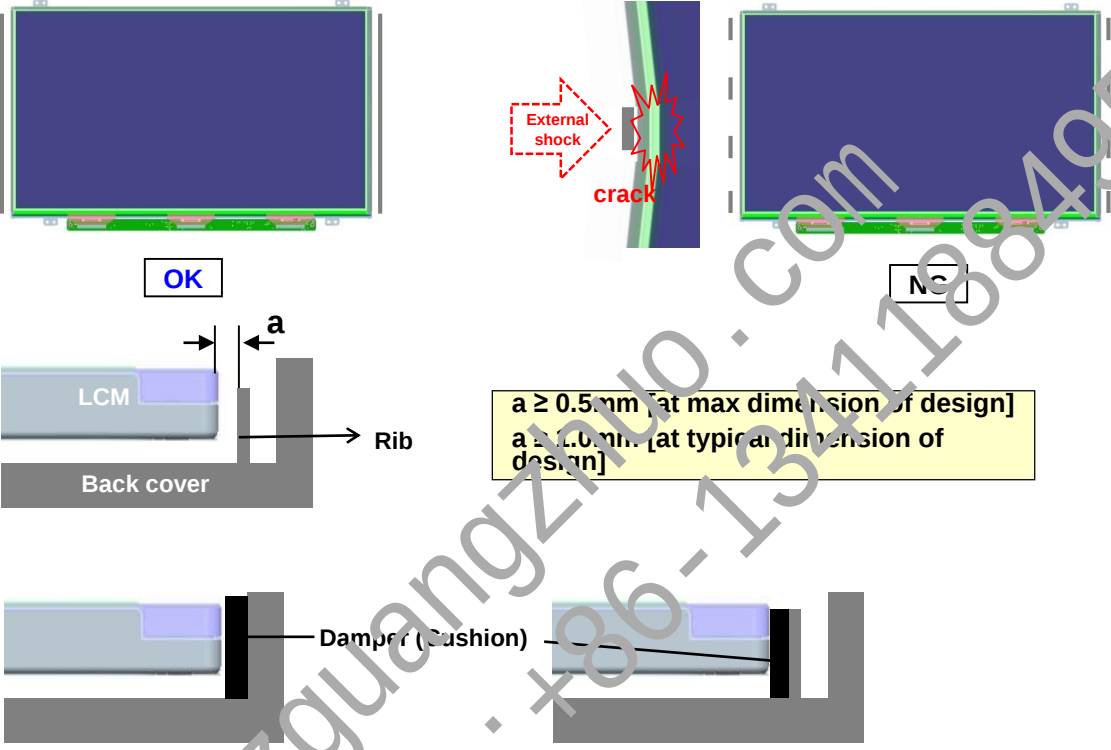
## Appendix A. LGD Proposal for system cover design.

| 13         | FPC escape figure                                                                                                                                                                                                                                                           |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|            | <p>[mechanism of risk point]</p> <p>[Suggestion]</p> <p>[mechanism of Improved effect]</p> <p>There is not interfered [a]</p> <p>There is not interfered [b]</p> <p>&lt; Notebook type &gt;</p> <p>Suggestion : <math>a \geq 1.0\text{mm}</math> (at max LCM dimension)</p> |
| Risk point | FPC is easily cracked by interference between FPC and frame during repetitive external shock or vibration.<br>It is also happened when gap between is exist.                                                                                                                |
| Suggestion | FPC crack can be improved by add escape figure at middle frame<br>The gap is recommended to keep more than 1.0mm                                                                                                                                                            |



## Product Specification

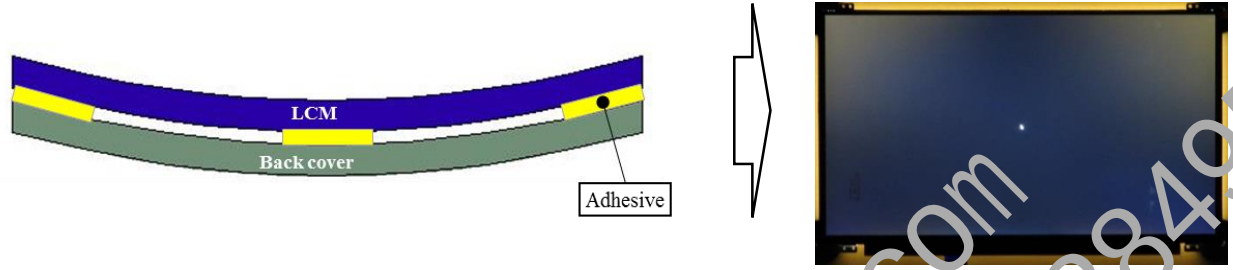
### Appendix A. LGD Proposal for system cover design.

| 14         | Back cover rib / wall (path & gap)                                                                                                                                                                                                                                                                                                                     |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|            |  <p>OK</p> <p>LCM</p> <p>Back cover</p> <p>Rib</p> <p>Damper (Cushion)</p> <p>External shock</p> <p>crack</p> <p>NC</p> <p><math>a \geq 0.5\text{mm}</math> [at max dimension of design]<br/> <math>a \geq 1.0\text{mm}</math> [at typical dimension of design]</p> |
| Risk point | Gap is too small and rib is too short, panel is easily cracked by external stress.                                                                                                                                                                                                                                                                     |
| Suggestion | <p>Gap is must be kept more than 0.5mm(max dim.) and 1.0mm(typ dim.) .</p> <p>The figure of rib is continuous or fully long.</p> <p>"a" is not enough as narrow bezel type, add damper between LCM and system rib/wall</p>                                                                                                                             |



## Product Specification

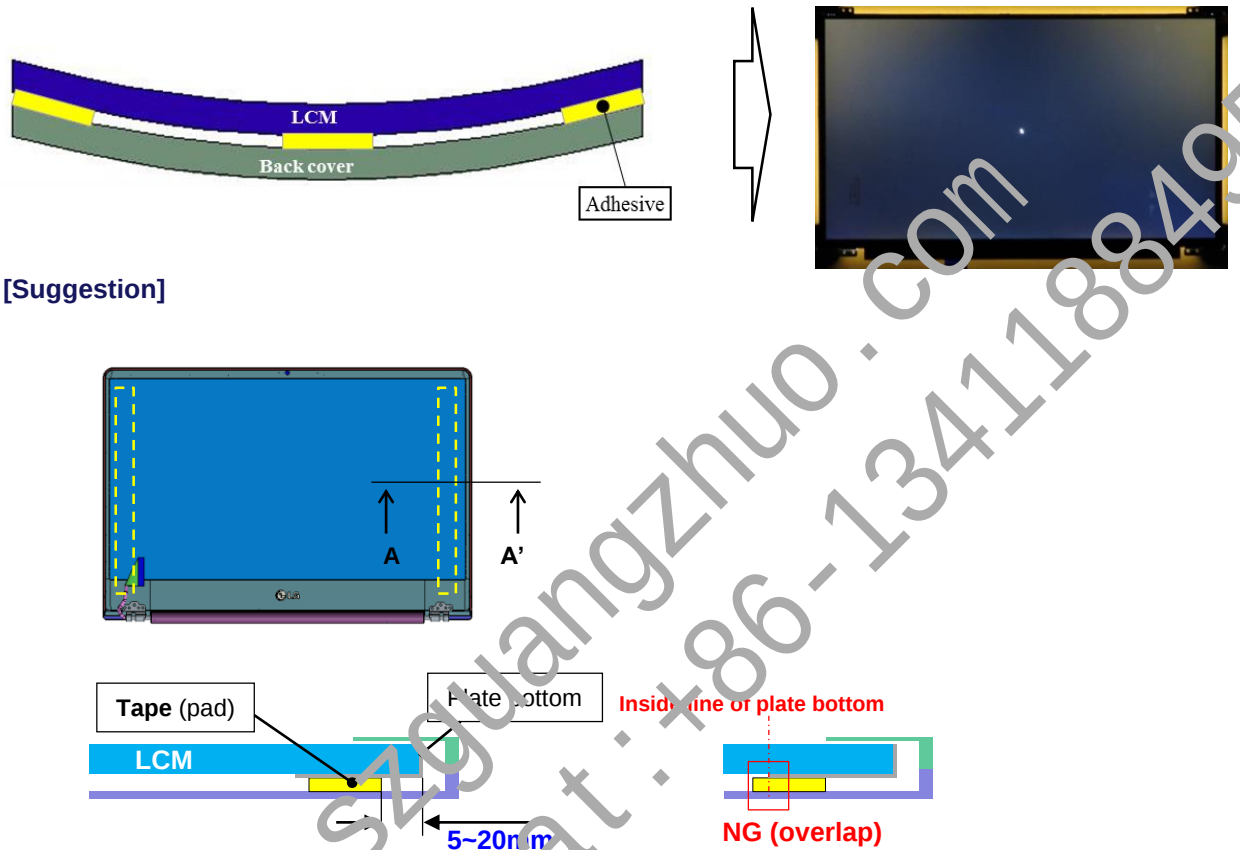
### Appendix A. LGD Proposal for system cover design.

| 15                                                                                                                                                                                                                 | LCM fixing (no flange model)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p data-bbox="107 598 268 627"><b>[Suggestion]</b></p> <p data-bbox="107 666 164 695">Flat</p> <p data-bbox="107 792 292 821">Adhesive width</p> <p data-bbox="107 946 421 975">Position of pad &amp; adhesive</p> |  <p data-bbox="585 676 721 705">Back cover</p> <p data-bbox="635 734 678 763">OK</p> <p data-bbox="1063 734 1120 763">Risk</p> <p data-bbox="878 850 949 879">Back cover</p> <p data-bbox="878 782 949 811">LCM</p> <p data-bbox="471 927 849 975">LCM</p> <p data-bbox="913 927 1306 975">LCM</p> <p data-bbox="535 1110 778 1139">Pad or empty area</p> <p data-bbox="471 1255 606 1284">Adhesive</p> <p data-bbox="628 1246 706 1275">Case 1</p> <p data-bbox="799 1255 863 1284">Pad</p> <p data-bbox="978 1110 1220 1139">Pad or empty area</p> <p data-bbox="1078 1246 1163 1275">Case 2</p> <p data-bbox="714 1323 992 1352"><b>[Mapping on back cover]</b></p>                                        |
| <p data-bbox="107 1458 264 1487">Risk point</p> <p data-bbox="107 1690 264 1719">Suggestion</p>                                                                                                                    | <p data-bbox="307 1371 1278 1410">In IPS model, bended LCM, light leakage of IPS (mura) is happened.</p> <p data-bbox="307 1439 792 1468">LCM is bended by below condition.</p> <ol data-bbox="328 1477 935 1593" style="list-style-type: none"> <li>1. Back cover is not flat or distorted.</li> <li>2. LCM is fixed by adhesive at center area.</li> <li>3. Adhesive width is too large.</li> </ol> <p data-bbox="307 1613 949 1651">It is recommended that back cover is flat type.</p> <p data-bbox="307 1680 1263 1719">Adhesive width need to be minimized if adhesive strength is enough.</p> <p data-bbox="307 1738 1263 1777">It is recommended that adhesive is posited at outside on back-cover.</p> <p data-bbox="307 1787 921 1816">Pad is recommended to apply at other area.</p> |



Product Specification

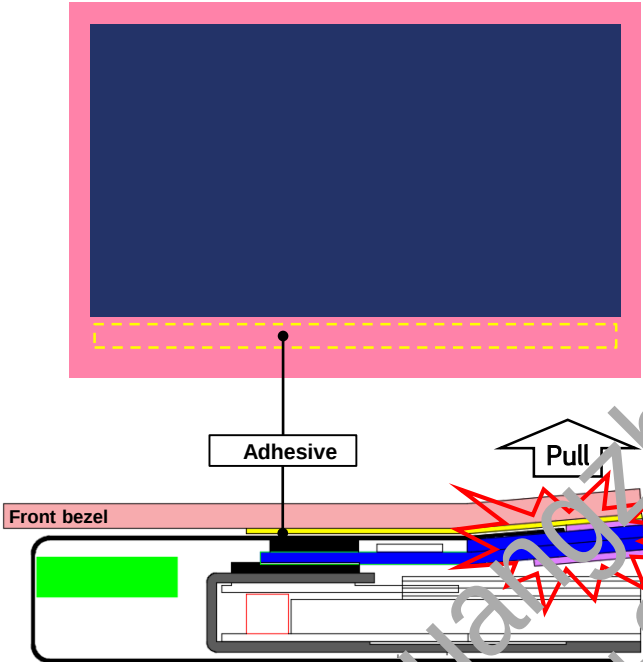
Appendix A. LGD Proposal for system cover design.

| 16                                                                                                      | LCM fixing (no flange model)                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>[Suggestion]</p>  | <p>In IPS model, bended LCM, light leakage of IPS (mura) is happened.</p> <p>LCM is bended by below condition.</p> <ol style="list-style-type: none"> <li>1. Back cover is not flat or distorted.</li> <li>2. LCM is fixed by adhesive at center area.</li> <li>3. Adhesive width is too large.</li> </ol> <p>It is recommended to attach LCM fixing tape to the inside with reference to the outside (5~20mm).<br/>But do not overlap the pad with the inside line of the plate bottom</p> |



Product Specification

Appendix A. LGD Proposal for system cover design.

| 17                                                                                                                                                                                                               | Parts in system main body                                                                           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| <div></div> <p>[Suggestion]</p> <div></div> |                                                                                                     |
| Risk point                                                                                                                                                                                                       | If adhesive strength behind front bezel, panel is easily broken when disassembling the front bezel. |
| Suggestion                                                                                                                                                                                                       | Make the adhesive as weak as possible.<br>Make the adhesive less than 3.0mm wide.                   |



## Product Specification

### APPENDIX B. LGD Proposal for eDP Interface Design Guide

|               |                                                                                                                                                                                                                                                                                                                                                   |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1             | HPD Signal recognition                                                                                                                                                                                                                                                                                                                            |
|               | <div style="display: flex; justify-content: space-around;"> <div data-bbox="107 382 721 782"> <p>[ Abnormal Communication By HPD Glitch ]</p> </div> <div data-bbox="742 382 1349 782"> <p>[ Normal Communication By HPD Signal ]</p> </div> </div>                                                                                               |
| Define        | <ol style="list-style-type: none"> <li>1. Hot Plug Detection (HPD) Threshold level of Source Device is minimum 2.0V</li> <li>2. HPD Unplug : HPD pulse stays low longer than 2ms.<br/>DP Tx shall wait for HPD signal to go high again.</li> <li>3. "HPD High" is confirmed only after HPD has been asserted continuously for 100msec.</li> </ol> |
| 2             | IRQ (Interrupt Request) HPD Pulse Definition                                                                                                                                                                                                                                                                                                      |
| Ex) HPD Pulse |                                                                                                                                                                                                                                                                                                                                                   |
| Define        | <p>Upon detection this "HPD IRQ Event"(0.5ms ~ 1ms) ,the source device must read the link / sink status field of the DPCD and take corrective action.</p>                                                                                                                                                                                         |

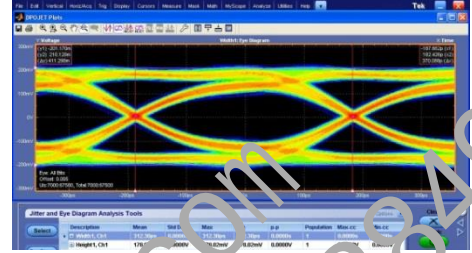
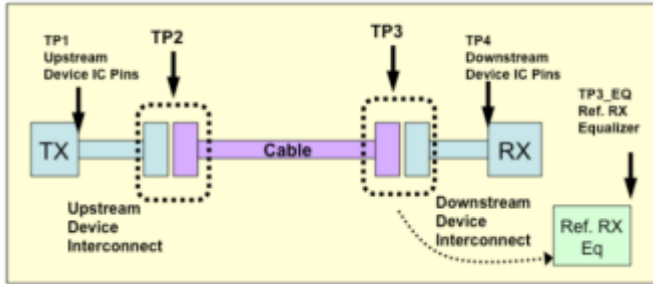


## Product Specification

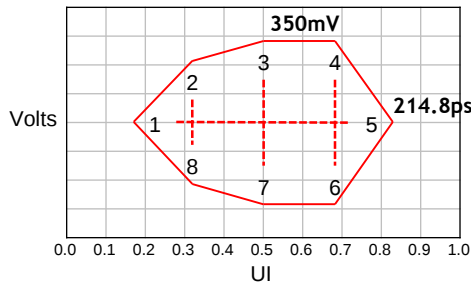
### APPENDIX B. LGD Proposal for eDP Interface Design Guide

#### 3

#### Main Link EYE Diagram

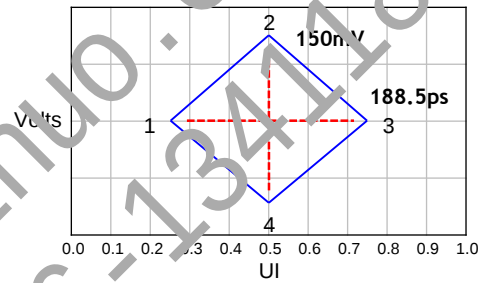


Eye Diagram



| Point | UI    | Voltage (Volts) |
|-------|-------|-----------------|
| 1     | 0.210 | 0.000           |
| 2     | 0.355 | 0.140           |
| 3     | 0.500 | 0.175           |
| 4     | 0.645 | 0.175           |
| 5     | 0.790 | 0.000           |
| 6     | 0.645 | -0.175          |
| 7     | 0.500 | -0.175          |
| 8     | 0.355 | -0.140          |

[EYE Vertices for TP2 at HBR]



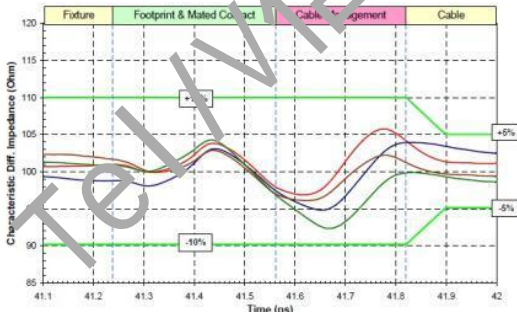
| Point | UI    | Voltage (Volts) |
|-------|-------|-----------------|
| 1     | 0.246 | 0.000           |
| 2     | 0.500 | 0.075           |
| 3     | 0.755 | 0.000           |
| 4     | 0.500 | -0.075          |

[EYE Vertices for TP3 at HBR]

Define Main Link EYE Diagram should meet TP2 and TP3 point

#### 4

#### Cable Impedance management



| Segment         | Differential Impedance | Maximum Tolerance |
|-----------------|------------------------|-------------------|
| Fixture         | 100 $\Omega$           | $\pm 10\%$        |
| Connector       | 100 $\Omega$           |                   |
| Wire management | 100 $\Omega$           |                   |
| Cable           | 100 $\Omega$           | $\pm 5\%$         |

Define Cable Impedance 100  $\Omega$   $\pm 5\%$  ( 95 $\Omega$  ~ 105 $\Omega$  )

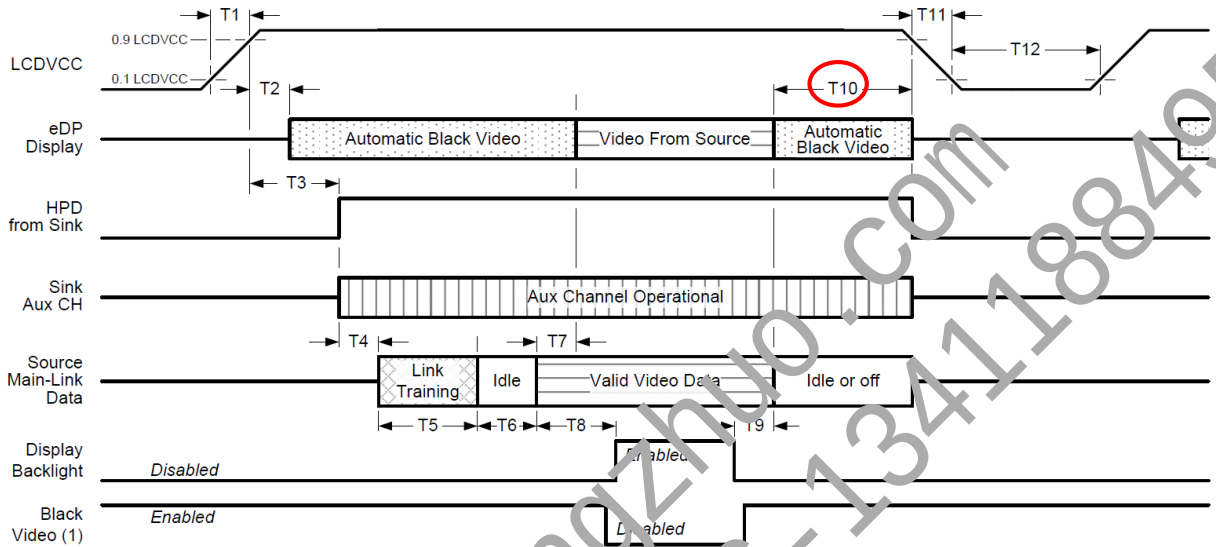


## Product Specification

### APPENDIX B. LGD Proposal for eDP Interface Design Guide

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#### Main Link Off vs. LCD Power Off at Non-PSR

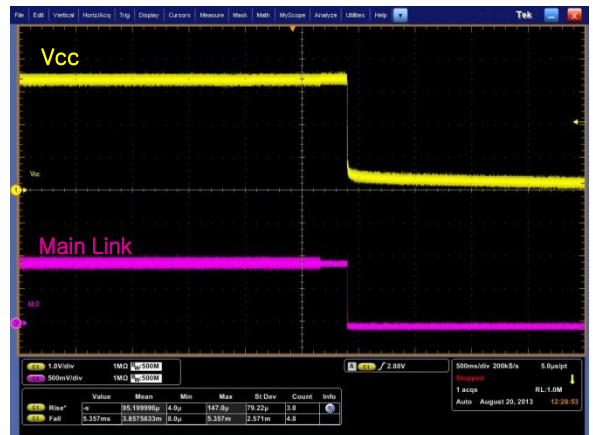


| Timing Parameter | Description                                            | Required By | Min | Max   |
|------------------|--------------------------------------------------------|-------------|-----|-------|
| T10              | Delay from end of valid video from Source to Power Off | Source      | 0ms | 500ms |

\* LGD recommend that Source must power off the LCDVCC in Main Link off like below.



[Case1. Resolution Change]



[Case2. Close the Lid]

Define

If Main Link off signal from Source, then LCDVCC must be Power Off within T10 period at Non-PSR mode

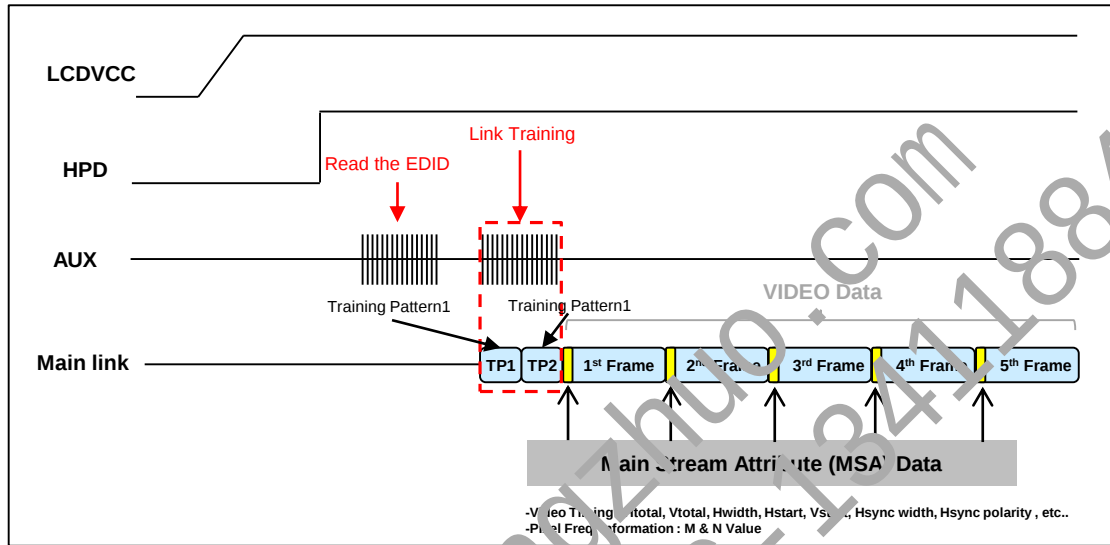


## Product Specification

### APPENDIX B. LGD Proposal for eDP Interface Design Guide

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Main Link M & N value of MSA data



Define

It need to fix M& N value of MSA data output to prevent the initial abnormal M& N Value from incoming after power on.



## Product Specification

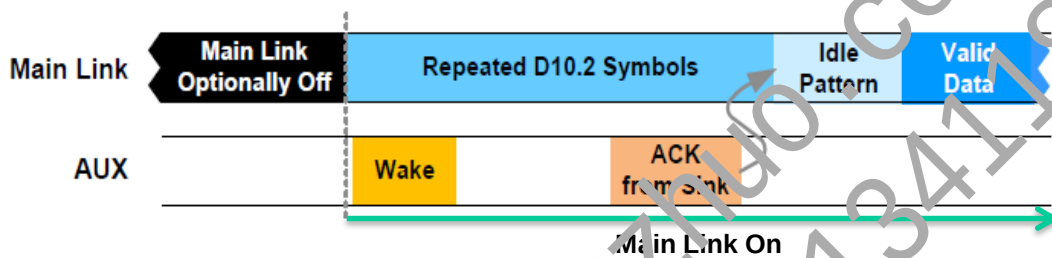
## APPENDIX B. LGD Proposal for eDP Interface Design Guide

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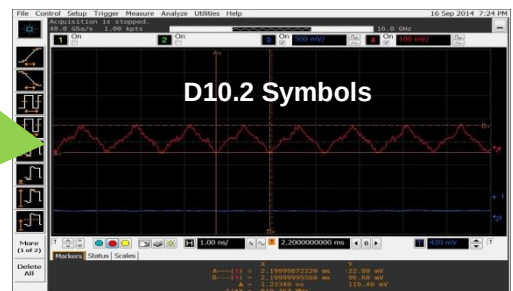
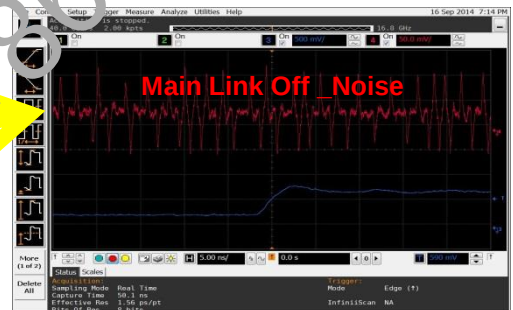
## PSR Exit

If link training is not required, the Source must begin transmitting data on the Main Link prior to the wake AUX command which occurs through writing 01h to the SET\_POWER & SET\_DP\_PWR\_VOLTAGE register (DPCD Address 00600h; see DP v1.2a), as illustrated in the upper portion of Figure 6-9. This transmitted data must be a repetition of D10.2 symbols (which is the same as Link Training Pattern 1). Note the requirement above to transmit five repeats of the Idle Pattern after receiving ACK from the Sink.

## PSR Exit Link Management with No Link Training



- The below waveform is the issued case



Define

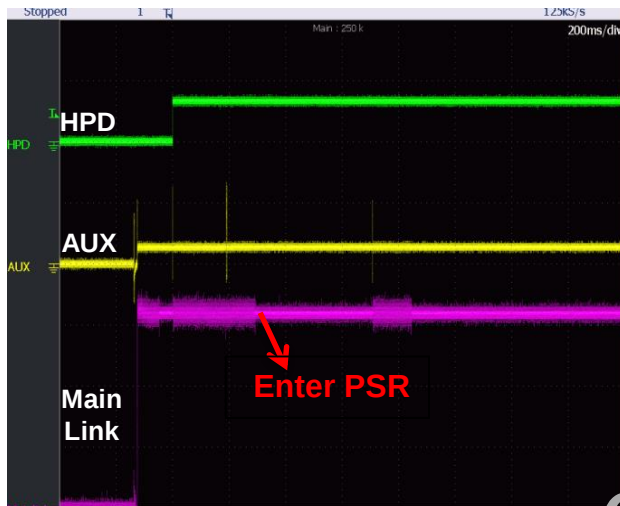
If link training is not required, the source must begin transmitting data on the ML prior to the wake AUX wake-up command.



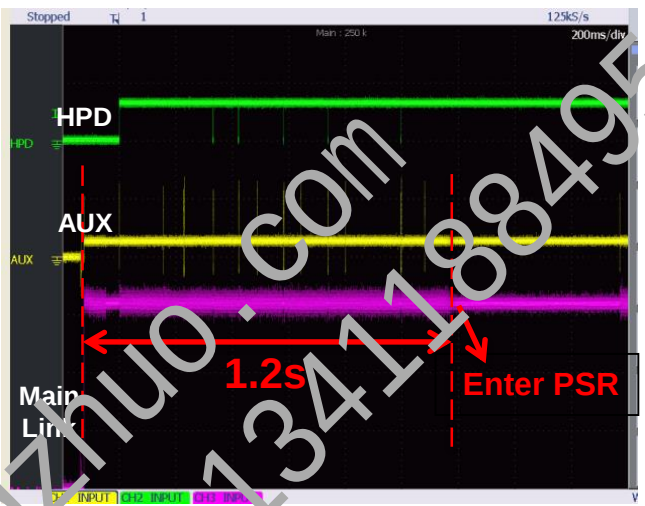
## Product Specification

## APPENDIX B. LGD Proposal for eDP Interface Design Guide

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1<sup>st</sup> time PSR Entry after Power on

&lt; Issue waveform &gt;



&lt; solution waveform &gt;

1. It is found that with solution , the TCON enter the PSR timing is 1.2s delay from VCC on which avoid TCON capture the wrong data from DP link (poor link quality) and enter the BIST mode + PSR mode(black screen).
2. According to test, link is stable 800ms after VCC on.

Define

After power(Vcc) on, the DP link is not stable, so the source try to PSR entry at 800ms after Power(Vcc) on..

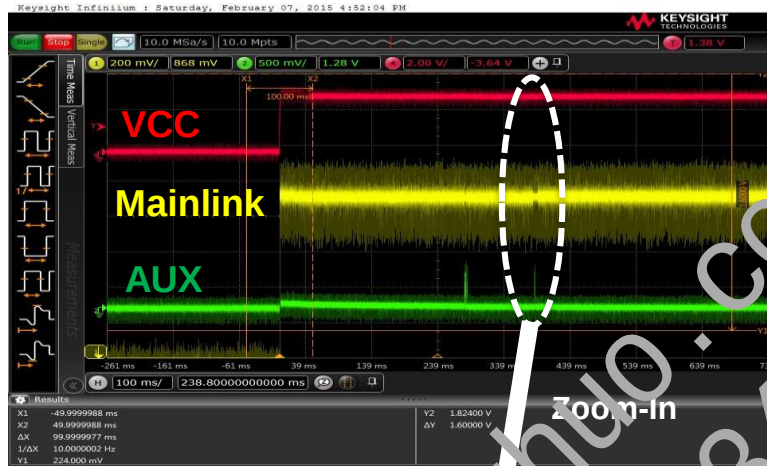


## Product Specification

### APPENDIX B. LGD Proposal for eDP Interface Design Guide

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#### PSR Period Issue



1. When issue is happened, system go to PSR mode for very short time.
2. If PSR active period is shorter than 1frame(16.67ms), T-Con can not go to the standby mode for PSR exit.

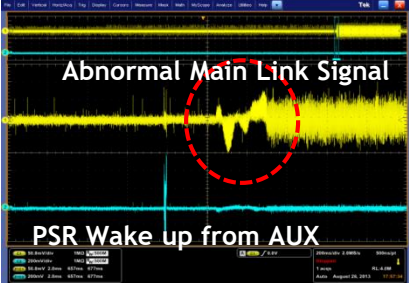
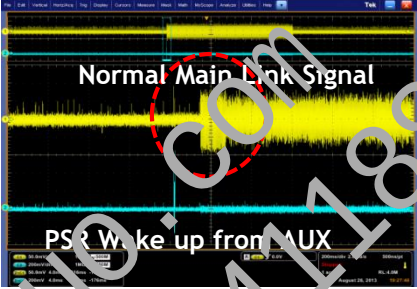
Define

When GPU go to the PSR mode, the source must hold the main link off over than 1frame.



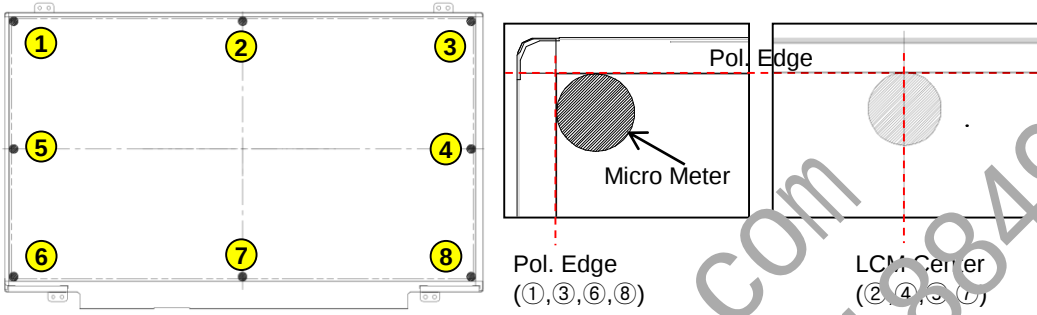
## Product Specification

### APPENDIX B. LGD Proposal for eDP Interface Design Guide

| 10     | Main Link Noise at PSR Exit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|        | <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p><b>Abnormal Main Link Signal</b></p> <p>PSR Wake up from AUX</p> <p>[ Abnormal Main Link Noise ]</p> </div> <div style="text-align: center;">  <p><b>Normal Main Link Signal</b></p> <p>PSR Wake up from AUX</p> <p>[ Normal Main Link Signal ]</p> </div> </div> |
| Define | Main Link Noise at PSR Exit mode can be a cause abnormal display.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

## Product Specification

### APPENDIX C. LGD Proposal for Measurement Method

| 1            | LCM Thickness                                                                                                                                                                                           |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Point        |  <p>Pol. Edge (①,③,⑥,⑧)</p> <p>LCM Center (②,④,⑤,⑦)</p>                                                               |
| Measure Tool | <p>Micro Meter</p>                                                                                                    |
| Guide        | <ul style="list-style-type: none"> <li>✓ Measure the thickness between Polarizer surface and M Chassis on the rear of LCM</li> <li>✓ Subtract Pol. protect film thickness from LCM thickness</li> </ul> |

Product Specification

APPENDIX D. Enhanced Extended Display Identification Data (EEDID™) 1/3

|                                  | Byte (Dec) | Byte (Hex) | Field Name and Comments                                                                                                                                                                                                                                                                                                                              | Value (Hex) | Value (Bin) |
|----------------------------------|------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|
| Header                           | 0          | 00         | Header                                                                                                                                                                                                                                                                                                                                               | 00          | 00000000    |
|                                  | 1          | 01         | Header                                                                                                                                                                                                                                                                                                                                               | FF          | 11111111    |
|                                  | 2          | 02         | Header                                                                                                                                                                                                                                                                                                                                               | FF          | 11111111    |
|                                  | 3          | 03         | Header                                                                                                                                                                                                                                                                                                                                               | FF          | 11111111    |
|                                  | 4          | 04         | Header                                                                                                                                                                                                                                                                                                                                               | FF          | 11111111    |
|                                  | 5          | 05         | Header                                                                                                                                                                                                                                                                                                                                               | FF          | 11111111    |
|                                  | 6          | 06         | Header                                                                                                                                                                                                                                                                                                                                               | FF          | 11111111    |
| Vendor / Product<br>EDID Version | 7          | 07         | Header                                                                                                                                                                                                                                                                                                                                               | 00          | 00000000    |
|                                  | 8          | 08         | ID Manufacture Name LGD                                                                                                                                                                                                                                                                                                                              | 30          | 00110000    |
|                                  | 9          | 09         | ID Manufacture Name                                                                                                                                                                                                                                                                                                                                  | E4          | 11100100    |
|                                  | 10         | 0A         | ID Product Code 06A4h                                                                                                                                                                                                                                                                                                                                | A4          | 10001000    |
|                                  | 11         | 0B         | Feature Support [ Display Power Management(DPM): Standby Mode is not supported, Suspend Mode is not supported, Active Off = Very Low Power is not supported, Supported Color Encoding Formats : RGB 4:4:4 ,Other                                                                                                                                     | 06          | 00000110    |
|                                  | 12         | 0C         | ID Serial No. - Optional ("00h" If not used, Number Only and LSB First)                                                                                                                                                                                                                                                                              | 00          | 00000000    |
|                                  | 13         | 0D         | ID Serial No. - Optional ("00h" If not used, Number Only and LSB First)                                                                                                                                                                                                                                                                              | 00          | 00000000    |
|                                  | 14         | 0E         | ID Serial No. - Optional ("00h" If not used, Number Only and LSB First)                                                                                                                                                                                                                                                                              | 00          | 00000000    |
|                                  | 15         | 0F         | ID Serial No. - Optional ("00h" If not used, Number Only and LSB First)                                                                                                                                                                                                                                                                              | 00          | 00000000    |
|                                  | 16         | 10         | Week of Manufacture - Optional 00 weeks                                                                                                                                                                                                                                                                                                              | 00          | 00000000    |
| Display<br>Parameters            | 17         | 11         | Year of Manufacture 2020 year                                                                                                                                                                                                                                                                                                                        | 1E          | 00011110    |
|                                  | 18         | 12         | EDID structure version # = 1                                                                                                                                                                                                                                                                                                                         | 01          | 00000001    |
|                                  | 19         | 13         | EDID revision # = 4                                                                                                                                                                                                                                                                                                                                  | 04          | 00000100    |
|                                  | 20         | 14         | Video input Definition = Input is a Digital Video signal Interface , Color Bit Depth : 8 Bits per Primary Color , Digital Video Interface Standard Supported: DisplayPort is supported                                                                                                                                                               | A5          | 10100101    |
|                                  | 21         | 15         | Horizontal Screen Size (Rounded cm) = 31 cm                                                                                                                                                                                                                                                                                                          | 1F          | 00011111    |
| Panel Color<br>Coordinates       | 22         | 16         | Vertical Screen Size (Rounded cm) = 17 cm                                                                                                                                                                                                                                                                                                            | 11          | 00010001    |
|                                  | 23         | 17         | Display Transfer Characteristic (Gamma) = (gamma*100)-100 Example:(2.2*100)-100=120                                                                                                                                                                                                                                                                  | 78          | 01111000    |
|                                  | 24         | 18         | Feature Support [ Display Power Management (DPM): Standby Mode is not supported, Suspend Mode is not supported, Active Off = Very Low Power is not supported, Supported Color Encoding Formats : RGB 4:4:4 ,Other Feature Support Flags : sRGB, Preferred Timing Mode, No_Displays continuous frequency (Multi-mode_Base EDID and Extension Block).] | 06          | 00000110    |
|                                  | 25         | 19         | Red/Green Low Bits (RxBY/GxBY)                                                                                                                                                                                                                                                                                                                       | 2E          | 00101110    |
|                                  | 26         | 1A         | Blue/White Low Bits (BxBY/WxBY)                                                                                                                                                                                                                                                                                                                      | 05          | 00000101    |
| Established<br>Timings           | 27         | 1B         | Red X Rx = 0.645                                                                                                                                                                                                                                                                                                                                     | A5          | 10100101    |
|                                  | 28         | 1C         | Red Y Ry = 0.330                                                                                                                                                                                                                                                                                                                                     | 54          | 01010100    |
|                                  | 29         | 1D         | Green X Gx = 0.30                                                                                                                                                                                                                                                                                                                                    | 4C          | 01001100    |
|                                  | 30         | 1E         | Green Y Gy = 0.60                                                                                                                                                                                                                                                                                                                                    | 99          | 10011001    |
|                                  | 31         | 1F         | Blue X Bx = 0.145                                                                                                                                                                                                                                                                                                                                    | 25          | 00100101    |
| Standard<br>Timing ID            | 32         | 20         | Blue Y By = 0.355                                                                                                                                                                                                                                                                                                                                    | 0E          | 00001110    |
|                                  | 33         | 21         | White X Wx = 0.313                                                                                                                                                                                                                                                                                                                                   | 50          | 01010000    |
|                                  | 34         | 22         | White Y Wy = 0.329                                                                                                                                                                                                                                                                                                                                   | 54          | 01010100    |
|                                  | 35         | 23         | Established timing 1 ( Optional_00h if not used)                                                                                                                                                                                                                                                                                                     | 00          | 00000000    |
|                                  | 36         | 24         | Established timing 2 ( Optional_00h if not used)                                                                                                                                                                                                                                                                                                     | 00          | 00000000    |
| Standard<br>Timing ID            | 37         | 25         | Manufacturers timing ( Optional_00h if not used)                                                                                                                                                                                                                                                                                                     | 00          | 00000000    |
|                                  | 38         | 26         | Standard timing ID1 ( Optional_01h if not used)                                                                                                                                                                                                                                                                                                      | 01          | 00000001    |
|                                  | 39         | 27         | Standard timing ID1 ( Optional_01h if not used)                                                                                                                                                                                                                                                                                                      | 01          | 00000001    |
|                                  | 40         | 28         | Standard timing ID2 ( Optional_01h if not used)                                                                                                                                                                                                                                                                                                      | 01          | 00000001    |
|                                  | 41         | 29         | Standard timing ID2 ( Optional_01h if not used)                                                                                                                                                                                                                                                                                                      | 01          | 00000001    |
|                                  | 42         | 2A         | Standard timing ID3 ( Optional_01h if not used)                                                                                                                                                                                                                                                                                                      | 01          | 00000001    |
|                                  | 43         | 2B         | Standard timing ID3 ( Optional_01h if not used)                                                                                                                                                                                                                                                                                                      | 01          | 00000001    |
|                                  | 44         | 2C         | Standard timing ID4 ( Optional_01h if not used)                                                                                                                                                                                                                                                                                                      | 01          | 00000001    |
|                                  | 45         | 2D         | Standard timing ID4 ( Optional_01h if not used)                                                                                                                                                                                                                                                                                                      | 01          | 00000001    |
|                                  | 46         | 2E         | Standard timing ID5 ( Optional_01h if not used)                                                                                                                                                                                                                                                                                                      | 01          | 00000001    |
|                                  | 47         | 2F         | Standard timing ID5 ( Optional_01h if not used)                                                                                                                                                                                                                                                                                                      | 01          | 00000001    |
|                                  | 48         | 30         | Standard timing ID6 ( Optional_01h if not used)                                                                                                                                                                                                                                                                                                      | 01          | 00000001    |
|                                  | 49         | 31         | Standard timing ID6 ( Optional_01h if not used)                                                                                                                                                                                                                                                                                                      | 01          | 00000001    |
|                                  | 50         | 32         | Standard timing ID7 ( Optional_01h if not used)                                                                                                                                                                                                                                                                                                      | 01          | 00000001    |
|                                  | 51         | 33         | Standard timing ID7 ( Optional_01h if not used)                                                                                                                                                                                                                                                                                                      | 01          | 00000001    |
|                                  | 52         | 34         | Standard timing ID8 ( Optional_01h if not used)                                                                                                                                                                                                                                                                                                      | 01          | 00000001    |
|                                  | 53         | 35         | Standard timing ID8 ( Optional_01h if not used)                                                                                                                                                                                                                                                                                                      | 01          | 00000001    |



## Product Specification

## APPENDIX D. Enhanced Extended Display Identification Data (EEDID™) 2/3

|                      | Byte<br>(Dec) | Byte<br>(Hex) | Field Name and Comments                                                                                       | Value<br>(Hex) | Value<br>(Bin) |
|----------------------|---------------|---------------|---------------------------------------------------------------------------------------------------------------|----------------|----------------|
| Timing Descriptor #1 | 54            | 36            | Pixel Clock/10,000 (LSB) 138.7 MHz @ 60 Hz                                                                    | 2E             | 00101110       |
|                      | 55            | 37            | Pixel Clock/10,000 (MSB)                                                                                      | 36             | 00110110       |
|                      | 56            | 38            | Horizontal Active (HA) (lower 8 bits) 1920 pixels                                                             | 80             | 10000000       |
|                      | 57            | 39            | Horizontal Blanking (HB) (lower 8 bits) 160 pixels                                                            | A0             | 10100000       |
|                      | 58            | 3A            | Horizontal Active (HA) / Horizontal Blanking (HB) (upper 4:4bits)                                             | 70             | 01110000       |
|                      | 59            | 3B            | Vertical Active (VA) 1080 lines                                                                               | 38             | 00111000       |
|                      | 60            | 3C            | Vertical Blanking (VB) (DE Blanking typ.for DE only panels) 31 lines                                          | 1F             | 00011111       |
|                      | 61            | 3D            | Vertical Active (VA) / Vertical Blanking (VB) (upper 4:4bits)                                                 | 40             | 01000000       |
|                      | 62            | 3E            | Horizontal Front Porch in pixels (HF) (lower 8 bits) 48 pixels                                                | 30             | 00110000       |
|                      | 63            | 3F            | Horizontal Sync Pulse Width in pixels (HS) (lower 8 bits) 32 pixels                                           | 20             | 00010000       |
|                      | 64            | 40            | Vertical Front Porch in lines (VF) : Vertical Sync Pulse Width in lines (VS) (lower 4 bits) 3 lines : 5 lines | 35             | 00110101       |
|                      | 65            | 41            | Horizontal Front Porch/ Sync Pulse Width/ Vertical Front Porch/ Sync Pulse Width (upper 2bits)                | 00             | 00000000       |
|                      | 66            | 42            | Horizontal Video Image Size (mm) (lower 8 bits) 309 mm                                                        | 35             | 00110101       |
|                      | 67            | 43            | Vertical Video Image Size (mm) (lower 8 bits) 174 mm                                                          | AE             | 10101110       |
|                      | 68            | 44            | Horizontal Image Size / Vertical Image Size (upper 4 bits)                                                    | 10             | 00010000       |
|                      | 69            | 45            | Horizontal Border = 0 (Zero for Notebook LCD)                                                                 | 00             | 00000000       |
|                      | 70            | 46            | Vertical Border = 0 (Zero for Notebook LCD)                                                                   | 00             | 00000000       |
|                      | 71            | 47            | Non-Interlace, Normal display, no stereo, Digital Separate [ Vsync_NEG, Hsync_POS (outside of V-sync) ]       | 1A             | 00011010       |
| Timing Descriptor #2 | 72            | 48            | Pixel Clock/10,000 (LSB) 111.4 MHz @ 48 Hz                                                                    | 58             | 01011000       |
|                      | 73            | 49            | Pixel Clock/10,000 (MSB)                                                                                      | 2B             | 00101011       |
|                      | 74            | 4A            | Horizontal Active (HA) (lower 8 bits) 1920 pixels                                                             | 80             | 10000000       |
|                      | 75            | 4B            | Horizontal Blanking (HB) (lower 8 bits) 160 pixels                                                            | A0             | 10100000       |
|                      | 76            | 4C            | Horizontal Active (HA) / Horizontal Blanking (HB) (upper 4:4bits)                                             | 70             | 01110000       |
|                      | 77            | 4D            | Vertical Active (VA) 1080 lines                                                                               | 38             | 00111000       |
|                      | 78            | 4E            | Vertical Blanking (VB) (DE Blanking typ.for DE only panels) 31 lines                                          | 1F             | 00011111       |
|                      | 79            | 4F            | Vertical Active (VA) / Vertical Blanking (VB) (upper 4:4bits)                                                 | 40             | 01000000       |
|                      | 80            | 50            | Horizontal Front Porch in pixels (HF) (lower 8 bits) 48 pixels                                                | 30             | 00110000       |
|                      | 81            | 51            | Horizontal Sync Pulse Width in pixels (HS) (lower 8 bits) 32 pixels                                           | 20             | 00100000       |
|                      | 82            | 52            | Vertical Front Porch in lines (VF) : Vertical Sync Pulse Width in lines (VS) (lower 4 bits) 3 lines : 5 lines | 35             | 00110101       |
|                      | 83            | 53            | Horizontal Front Porch/ Sync Pulse Width/ Vertical Front Porch/ Sync Pulse Width (upper 2bits)                | 00             | 00000000       |
|                      | 84            | 54            | Horizontal Video Image Size (mm) (lower 8 bits) 309 mm                                                        | 35             | 00110101       |
|                      | 85            | 55            | Vertical Video Image Size (mm) (lower 8 bits) 174 mm                                                          | AE             | 10101110       |
|                      | 86            | 56            | Horizontal Image Size / Vertical Image Size (upper 4 bits)                                                    | 10             | 00010000       |
|                      | 87            | 57            | Horizontal Border = 0 (Zero for Notebook LCD)                                                                 | 00             | 00000000       |
|                      | 88            | 58            | Vertical Border = 0 (Zero for Notebook LCD)                                                                   | 00             | 00000000       |
|                      | 89            | 59            | Non-Interlace, Normal display, no stereo, Digital Separate [ Vsync_NEG, Hsync_POS (outside of V-sync) ]       | 1A             | 00011010       |
| Timing Descriptor #3 | 90            | 5A            | Flag                                                                                                          | 00             | 00000000       |
|                      | 91            | 5B            | Flag                                                                                                          | 00             | 00000000       |
|                      | 92            | 5C            | Flag                                                                                                          | 00             | 00000000       |
|                      | 93            | 5D            | Data Sync Tag : Alphanumeric Data String (ASCII String)                                                       | FE             | 11111110       |
|                      | 94            | 5E            | Flag                                                                                                          | 00             | 00000000       |
|                      | 95            | 5F            | Dell P/N 1st Character = X                                                                                    | 58             | 01011000       |
|                      | 96            | 60            | Dell P/N 2nd Character = W                                                                                    | 57             | 01010111       |
|                      | 97            | 61            | Dell P/N 3rd Character = 6                                                                                    | 36             | 00110110       |
|                      | 98            | 62            | Dell P/N 4th Character = F                                                                                    | 46             | 01000110       |
|                      | 99            | 63            | Dell P/N 5th Character = 3                                                                                    | 33             | 00110011       |
|                      | 100           | 64            | EDID Revision Build Name = MP(X-Build) , Revision # = a00                                                     | 80             | 10000000       |
|                      | 101           | 65            | Manufacturer P/N = 1                                                                                          | 31             | 00110001       |
|                      | 102           | 66            | Manufacturer P/N = 4                                                                                          | 34             | 00110100       |
|                      | 103           | 67            | Manufacturer P/N = 0                                                                                          | 30             | 00110000       |
|                      | 104           | 68            | Manufacturer P/N = W                                                                                          | 57             | 01010111       |
|                      | 105           | 69            | Manufacturer P/N = F                                                                                          | 46             | 01000110       |
|                      | 106           | 6A            | Manufacturer P/N = H                                                                                          | 48             | 01001000       |
|                      | 107           | 6B            | Manufacturer P/N (If < 13 char, then terminate with ASCII code 0Ah,set remaining char = 20h)                  | 0A             | 00001010       |



## Product Specification

### APPENDIX D. Enhanced Extended Display Identification Data (EEDID™) 3/3

|                      | Byte<br>(Dec) | Byte<br>(Hex) | Field Name and Comments                                                                                                         | Value<br>(Hex) | Value<br>(Bin) |
|----------------------|---------------|---------------|---------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|
| Timing Descriptor #4 | 108           | 6C            | Flag                                                                                                                            | 00             | 00000000       |
|                      | 109           | 6D            | Flag                                                                                                                            | 00             | 00000000       |
|                      | 110           | 6E            | Flag                                                                                                                            | 00             | 00000000       |
|                      | 111           | 6F            | Data Type Tag : Descriptor Defined by manufacturer                                                                              | 00             | 00000000       |
|                      | 112           | 70            | Flag                                                                                                                            | 00             | 00000000       |
|                      | 113           | 71            | Color Management [ +2 FRC Support, True Color Depth : 6 bit ]                                                                   | 01             | 00000001       |
|                      | 114           | 72            | Panel Type [ WLED ], Configuration [ Single light bar ], Number Lamp or LED Light Bar [ one ]                                   | 41             | 01000001       |
|                      | 115           | 73            | Frame Rate Details [ Minimum Frame Rate : 40Hz, Maximum Frame Rate : 65Hz , Tcon provides native interlaced / sDRRS support ]   | 31             | 0110011        |
|                      | 116           | 74            | Controller Interface and Maximum Luminance [ PWM type, 300 nit ]                                                                | 9F             | 10011110       |
|                      | 117           | 75            | Front Surface / Polarizer [ Anti-Glare, No Transflective ], Pixel Structure [ RGB h-stripe ]                                    | 50             | 01010000       |
|                      | 118           | 76            | Multi-Media Features [ Color Management : NTSC and sRGB, Dynamic Backlight Control : Type 1 ]                                   | 11             | 00011001       |
|                      | 119           | 77            | Multi-Media Features [ Motion Blur : No support , Active Gamma Control : No support ]                                           | 00             | 00000000       |
|                      | 120           | 78            | Special Features [ Wireless Enhancement Hardware : No support , In-Cell Scanning : No support ]                                 | 00             | 00000000       |
|                      | 121           | 79            | Special Features [ Number of LVDS channels or eDP lanes : two , Overdrive : No , Interface : eDP , In-Cell Touch Support : No ] | 0A             | 00001010       |
|                      | 122           | 7A            | Special Features [ BIST Support : yes , Electronic Privacy : No electronic privacy hardware support , 3-D support : No ]        | 01             | 00000001       |
| Checksum             | 123           | 7B            | (If<13 char--> 0Ah, then terminate with ASCII code 0Ah, set remaining char = 20h)                                               | 0A             | 00001010       |
|                      | 124           | 7C            | (If<13 char--> 0Ah, then terminate with ASCII code 0Ah, set remaining char = 20h)                                               | 20             | 00100000       |
|                      | 125           | 7D            | (If<13 char--> 0Ah, then terminate with ASCII code 0Ah, set remaining char = 20h)                                               | 20             | 00100000       |
|                      | 126           | 7E            | Extension flag (# of optional 128 byte panel ID extension blocks to follow, Typ = 0)                                            | 00             | 00000000       |
|                      | 127           | 7F            | Check Sum (The 1-byte sum of all 128 bytes of this panel ID blocks shall = 0)                                                   | 5A             | 01011010       |