



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   | SPP1                 |

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

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

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

| APPROVED BY              | SIGNATURE    |
|--------------------------|--------------|
| J. Y. Lee / G. Manager   | <u>here</u>  |
| REVIEWED BY              |              |
| P. A. Choi / Manager [C] | <u>3/1/1</u> |
| Y. J. Park / Manager [M] | <u>1/1/1</u> |
| Y. D. Kim / Manager [P]  | <u>1/1/1</u> |
| PREPARED BY              |              |
| J. H. Park / Engineer    | <u>1/1/1</u> |

Products Engineering Dept.  
LG Display Co., Ltd

## Product Specification

### Contents

| No  | ITEM                                                                            | Page |
|-----|---------------------------------------------------------------------------------|------|
|     | COVER                                                                           | 1    |
|     | CONTENTS                                                                        | 2    |
|     | RECORD OF REVISIONS                                                             | 3    |
| 1   | GENERAL DESCRIPTION                                                             | 4    |
| 2   | ABSOLUTE MAXIMUM RATINGS                                                        | 5    |
| 3   | ELECTRICAL SPECIFICATIONS                                                       | 7    |
| 3-1 | LCD ELECTRICAL CHARACTERISTICS                                                  | 7    |
| 3-2 | LED BACKLIGHT ELECTRICAL CHARACTERISTICS                                        | 8    |
| 3-3 | INTERFACE CONNECTIONS                                                           | 9    |
| 3-4 | eDP SIGNAL TIMING SPECIFICATIONS                                                | 11   |
| 3-5 | SIGNAL TIMING SPECIFICATIONS                                                    | 15   |
| 3-6 | SIGNAL TIMING WAVEFORMS                                                         | 15   |
| 3-7 | COLOR INPUT DATA REFERENCE                                                      | 16   |
| 3-8 | POWER SEQUENCE                                                                  | 17   |
| 4   | OPTICAL SPECIFICATIONS                                                          | 18   |
| 5   | MECHANICAL CHARACTERISTICS                                                      | 21   |
| 6   | RELIABILITY                                                                     | 24   |
| 7   | INTERNATIONAL STANDARD                                                          | 25   |
| 7-1 | SAFETY                                                                          | 25   |
| 7-2 | ENVIRONMENT                                                                     | 25   |
| 8   | PACKING                                                                         | 26   |
| 8-1 | DESIGNATION OF LOT MARK                                                         | 26   |
| 8-2 | PACKING FORM                                                                    | 26   |
| 9   | PRECAUTIONS                                                                     | 31   |
|     | APPENDIX A. LGD PROPOSAL FOR SYSTEM COVER DESIGN                                | 33   |
|     | APPENDIX B. LGD PROPOSAL FOR eDP INTERFACE DESIGN GUIDE                         | 47   |
|     | APPENDIX C. LGD Proposal for Measurement Method (Thickness/Bracket Height/etc.) | 51   |
|     | APPENDIX D. ENHANCED EXTENDED DISPLAY IDENTIFICATION DATA                       | 54   |

Product Specification

## Record of Revisions

| Revision No | Revision Date | Page  | Before                                                | After                            | EDID version |
|-------------|---------------|-------|-------------------------------------------------------|----------------------------------|--------------|
| 0.0         | Jun. 05. 2020 | ALL   | First Draft<br>(Preliminary Specification)            |                                  | -            |
| 0.1         | Sep. 08. 2020 | 22,23 | Update 2D Drawing<br>- PCB X-Size : 220.0mm           | - PCB X-Size : 219.2mm           |              |
| 0.2         | Nov. 17. 2020 | 22    | Update 2D Drawing<br>- Pol Attach Tolerance $\pm 0.3$ | - Pol Attach Tolerance $\pm 1.2$ |              |
| 1.0         | Dec. 24. 2020 | -     |                                                       | Final                            |              |
|             |               |       |                                                       |                                  |              |
|             |               |       |                                                       |                                  |              |

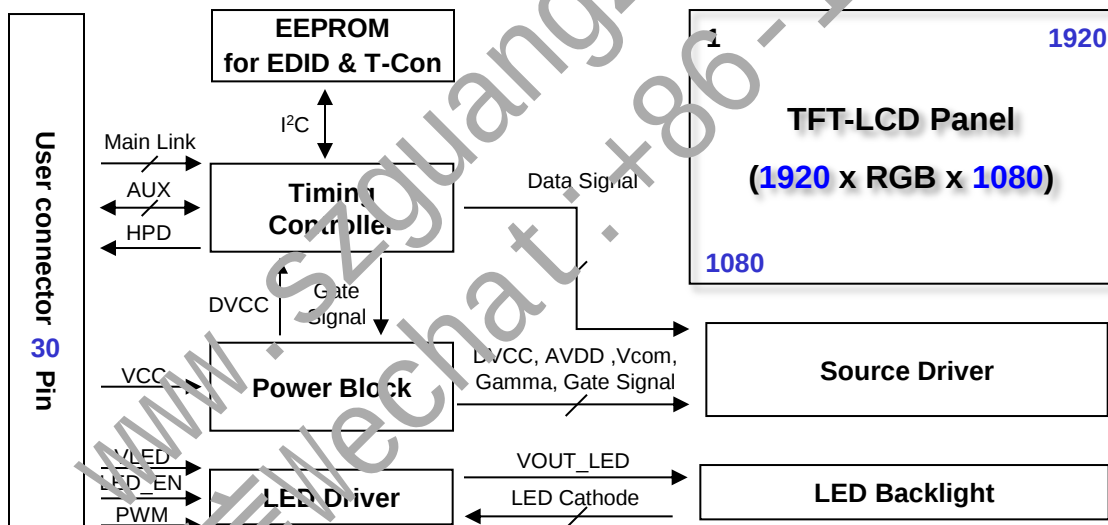


## Product Specification

### 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+FRC 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] (with 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+FRC, 16,777,216 colors                                                   |
| Luminance, White         |               | 300 cd/m <sup>2</sup> (Typ. 5 point)                                           |
| Power Consumption        |               | Total 3.39W (Typ.) Logic : 0.6W (Typ. @ Mosaic), B/L : 2.79W (Typ. @ 1" ED12V) |
| Weight                   |               | 280g (Max.)                                                                    |
| Display Operating Mode   |               | Normally Black                                                                 |
| Surface Treatment        |               | Anti-Glare treatment of the front Polarizer                                    |
| Color Gamut              |               | NTSC 45%                                                                       |
| LED Dimming Control mode |               | DC Dimming                                                                     |
| RoHS Compliance          |               | Yes                                                                            |
| BFR / PVC / As Free      |               | Yes for all                                                                    |
| eDP version(Tcon)        |               | eDP1.2                                                                         |
| DPCD version             |               | Ver1.1                                                                         |
| Function                 | PSR           | Not support                                                                    |
|                          | sDRRS         | Not Support                                                                    |
|                          | DMRRS         | Support                                                                        |
|                          | Adaptive sync | Free 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.

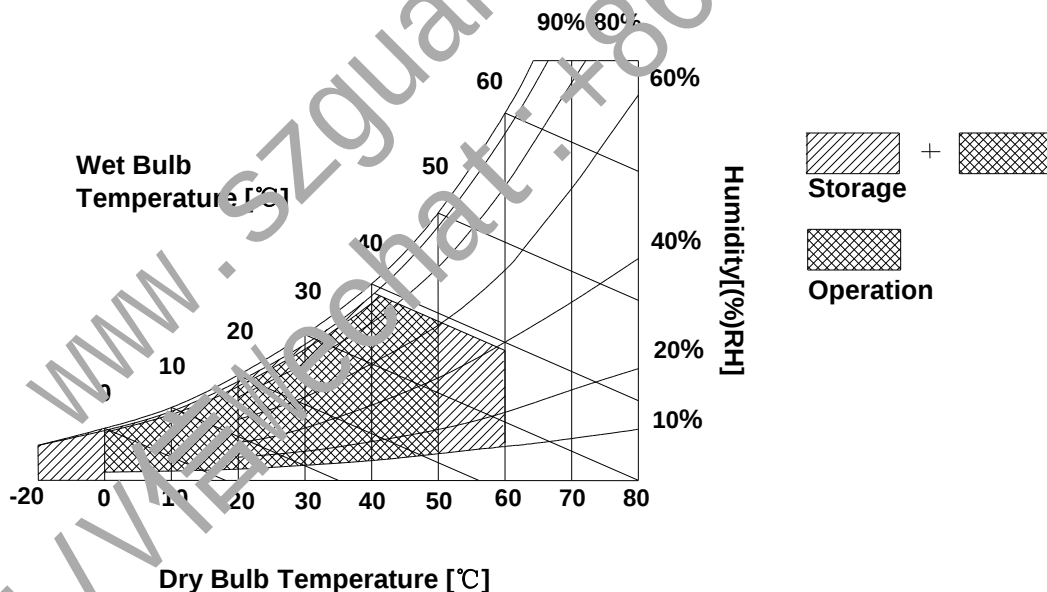
**Table 1. ABSOLUTE MAXIMUM RATINGS**

| 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

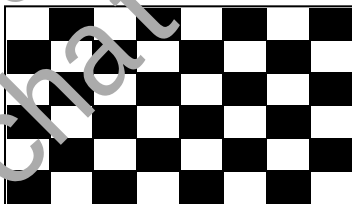
#### 3-1. LCD Electrical Characteristics

Table 2. LCD ELECTRICAL CHARACTERISTICS

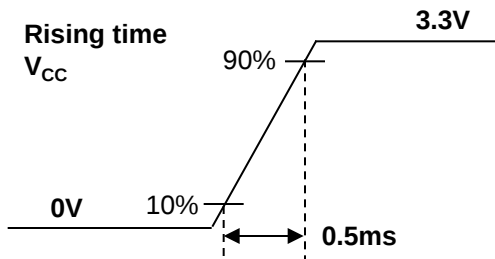
| Parameter                            |                    | Symbol              | Values |     |      | Unit              | Notes |
|--------------------------------------|--------------------|---------------------|--------|-----|------|-------------------|-------|
|                                      |                    |                     | 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>rms</sub> |       |
| Power Supply Input Current           | Mosaic             | I <sub>CC</sub>     | -      | 181 | 200  | mA                | 2     |
| Power Consumption                    |                    | P <sub>CC</sub>     | -      | 0.6 | 0.66 | W                 |       |
| Power Supply Inrush Current          |                    | I <sub>CCP</sub>    | -      | -   | 1.5  | A                 | 3     |
| Differential Impedance               |                    | Z <sub>diff</sub>   | 90     | 100 | 110  | Ω                 |       |
| BIST                                 | High Level Voltage | V <sub>BIST_H</sub> | 2.5    | -   | 3.6  | V                 |       |
|                                      | Low Level Voltage  | V <sub>BIST_L</sub> | 0      | -   | 0.3  | V                 |       |

Note)

1. The measuring position is the connector of LCM and the test conditions are under 25℃, f<sub>v</sub> = 60Hz
2. The specified I<sub>CC</sub> current and power consumption are under the V<sub>CC</sub> = 3.3V, 25℃, f<sub>v</sub> = 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

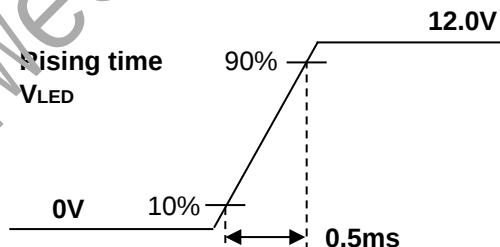
### 3-2. LED Backlight Electrical Characteristics

Table 3. LED B/L ELECTRICAL CHARACTERISTICS

| Parameter                |                    | Symbol                | Values |      |      | Unit | Notes |
|--------------------------|--------------------|-----------------------|--------|------|------|------|-------|
|                          |                    |                       | Min    | Typ  | Max  |      |       |
| LED Power Input Voltage  |                    | V <sub>LED</sub>      | 5.0    | 12.0 | 21.0 | V    | 1     |
| LED Power Input Current  |                    | I <sub>LED</sub>      | -      | 280  | 288  | mA   | 2     |
| LED Power Consumption    |                    | P <sub>LED</sub>      | -      | 2.79 | 2.84 | W    | 3     |
| LED Power Inrush Current |                    | I <sub>LED_P</sub>    | -      | -    | 1.5  | A    | 4     |
| PWM Duty Ratio           |                    |                       | 1      | -    | 100  | %    | 5     |
| PWM Jitter               |                    |                       | 0      | -    | 0.05 | %    | 6     |
| PWM Frequency            |                    | F <sub>PWM</sub>      | 200    | -    | 2000 | Hz   |       |
| PWM                      | High Level Voltage | V <sub>PWM_H</sub>    | 2.5    | -    | 3.6  | V    |       |
|                          | Low Level Voltage  | V <sub>PWM_L</sub>    | 0      | -    | 0.3  | V    |       |
|                          | Rising Time        | T <sub>r_PWM</sub>    | -      | -    | 500  | ns   |       |
|                          | Falling Time       | T <sub>f_PWM</sub>    | -      | -    | 500  | ns   |       |
| LED_EN                   | High Voltage       | V <sub>LED_EN_H</sub> | 2.5    | -    | 3.6  | V    |       |
|                          | Low Voltage        | V <sub>LED_EN_L</sub> | 0      | -    | 0.3  | V    |       |
| Life Time                |                    |                       | 15,000 | -    | -    | Hrs  | 7     |

Note)

1. The measuring position is the connector of LCD and the test conditions are under 25°C.
2. The current and power consumption with LED Driver are under the V<sub>LED</sub> = 12.0V , 25°C , PWM Duty 100% and White pattern with the normal frame frequency operated(60Hz).
3. The V<sub>LED</sub> rising time is same as the minimum of T13 at Power on sequence.

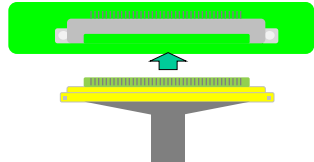


4. The operation of LED Driver below minimum dimming ratio may cause flickering or reliability issue.
5. If Jitter of PWM is bigger than maximum, it may induce flickering.
6. This Spec. is not effective at 100% dimming ratio as an exception because it has DC level equivalent to 0Hz. In spite of acceptable range as defined, the PWM Frequency should be fixed and stable for more consistent brightness control at any specific level desired.
7. 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   | [Connector]<br>MRS KN38B-30S-0.5H<br>or JAE, equivalent                                                                              |
| 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                     | [Connector pin arrangement]<br>Pin 30 Pin 1<br> |
| 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                  | [LGD P-Vcom using information]<br>1. Pin for P-Vcom : #24, #25<br>2. P-Vcom Address : 0101000x                                       |
| 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    |                                                                                                                                      |



Product Specification

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

Figure1.HPD Output circuit is as below

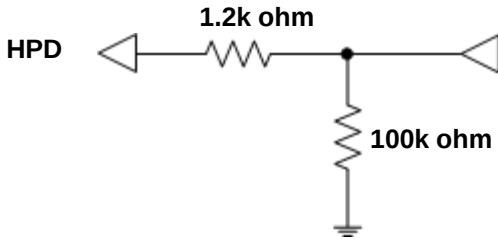


Figure2.BL PWM input circuit is as below

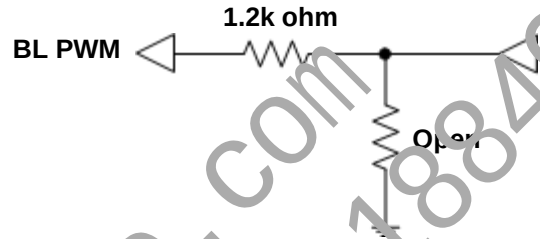


Figure3.BL Enable input circuit is as below

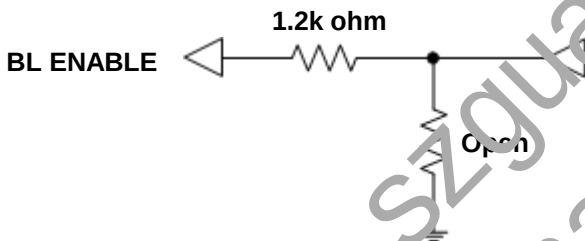
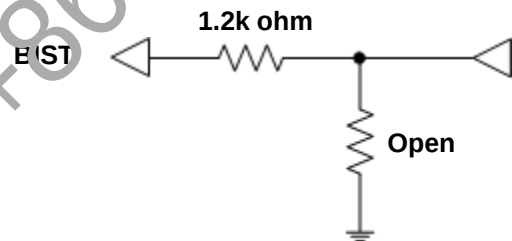


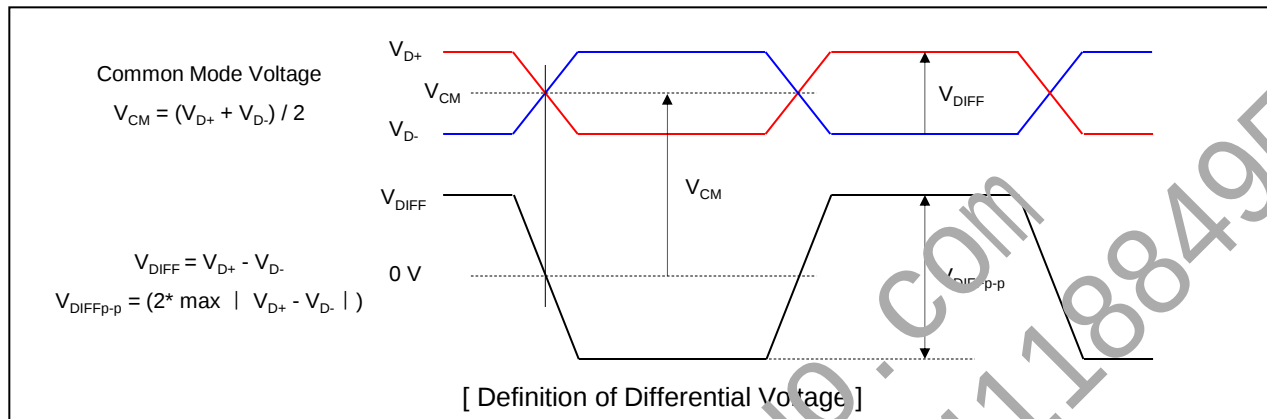
Figure4.BIST input circuit is as below



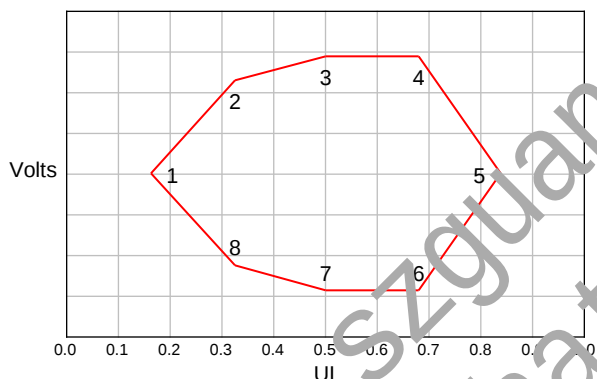
## Product Specification

### 3-4. eDP Signal Timing Specifications

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

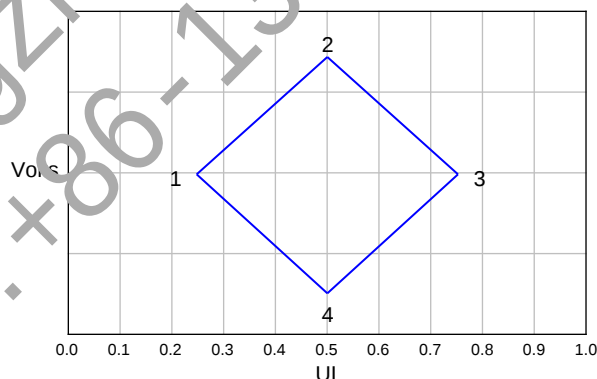


#### 3-4-2. Main Link EYE Diagram



| 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 ]

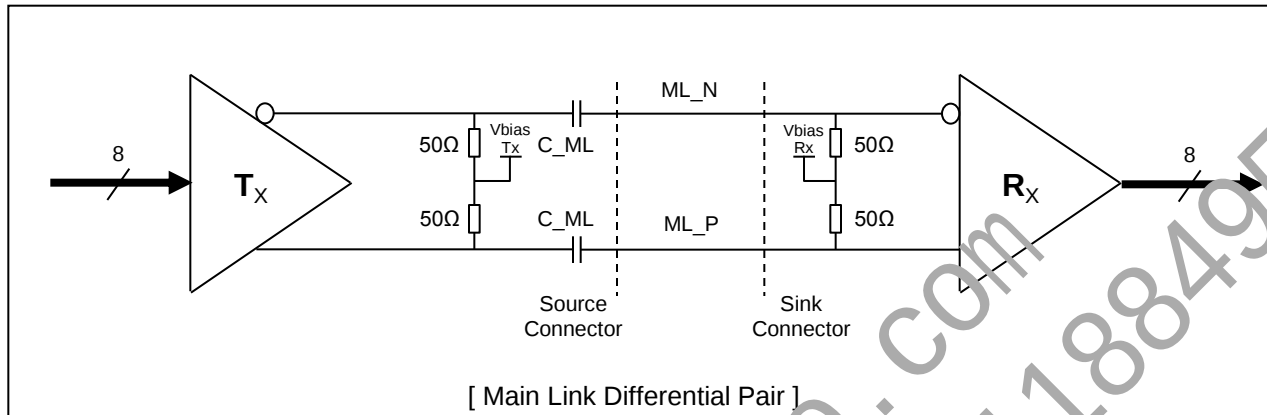
| Point | Reduced Bit Rate |            | High Bit Rate |            |
|-------|------------------|------------|---------------|------------|
|       | Time(UI)         | Voltage(V) | Time(UI)      | Voltage(V) |
| 1     | 0.270            | 0.000      | 0.246         | 0.000      |
| 2     | 0.500            | 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       |

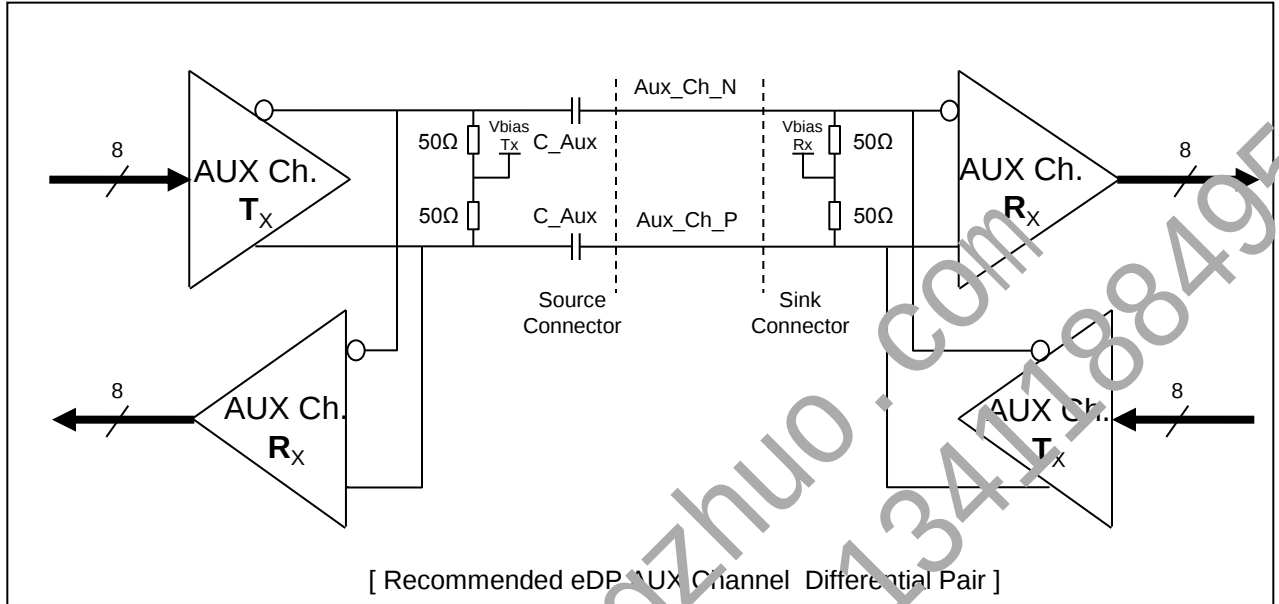
#### Note

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> jitter  | -    | -   | 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   |

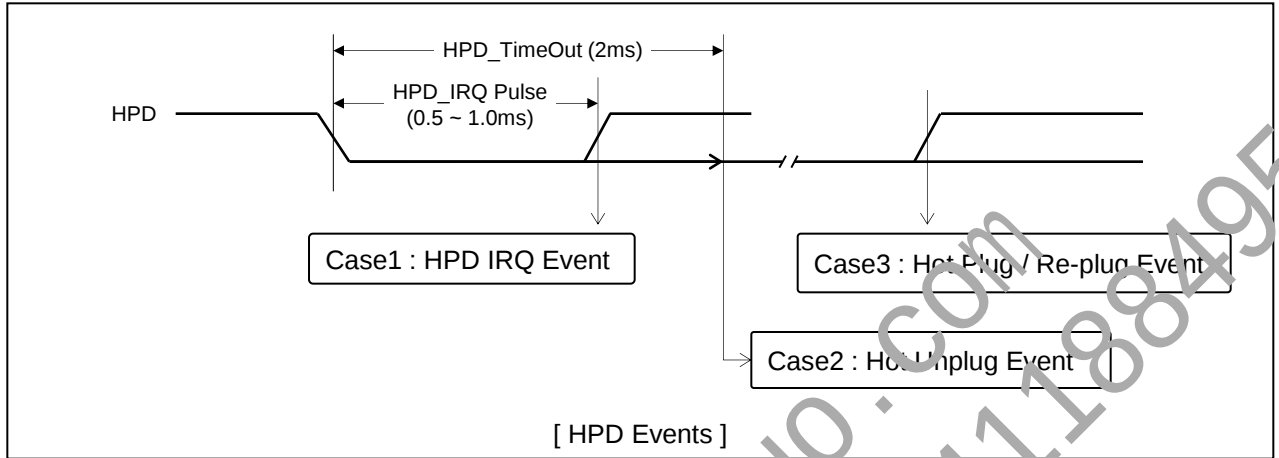
#### Note)

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

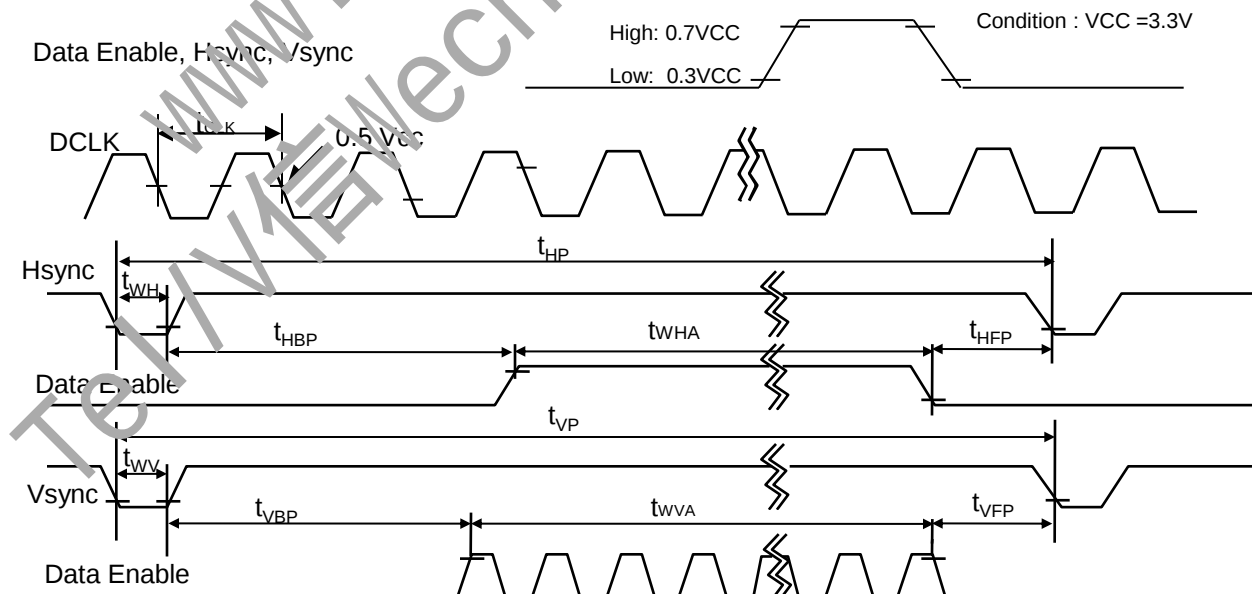
This is the signal timing required at the input of the User connector. All of the interface signal timing should be satisfied with the following specifications and specifications of eDP Tx/Rx for its proper operation.

**Table 4. TIMING TABLE**

| ITEM         | Symbol                 |           | Min  | Typ   | Max  | Unit      | Note |
|--------------|------------------------|-----------|------|-------|------|-----------|------|
| DCLK         | Frequency              | $f_{CLK}$ | -    | 138.7 | -    | MHz       |      |
| Hsync        | Period                 | $t_{HP}$  | 2072 | 2080  | 2088 | $t_{CLK}$ |      |
|              | Width                  | $t_{WH}$  | 32   | 32    | 32   |           |      |
|              | Width-Active           | $t_{WHA}$ | 1920 |       |      |           |      |
| Vsync        | Period                 | $t_{VP}$  | 1108 | 1111  | 1114 | $t_{HP}$  |      |
|              | Width                  | $t_{WV}$  | 5    | 5     | 5    |           |      |
|              | Width-Active           | $t_{WVA}$ | 1080 |       |      |           |      |
| Data Enable  | Horizontal back porch  | $t_{HBP}$ | 72   | 80    | 88   | $t_{CLK}$ |      |
|              | Horizontal front porch | $t_{HFP}$ | 48   | 48    | 48   |           |      |
|              | Vertical back porch    | $t_{VBP}$ | 20   | 23    | 24   | $t_{HP}$  |      |
|              | Vertical front porch   | $t_{VFP}$ | 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 6-bit+FRC 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  | 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

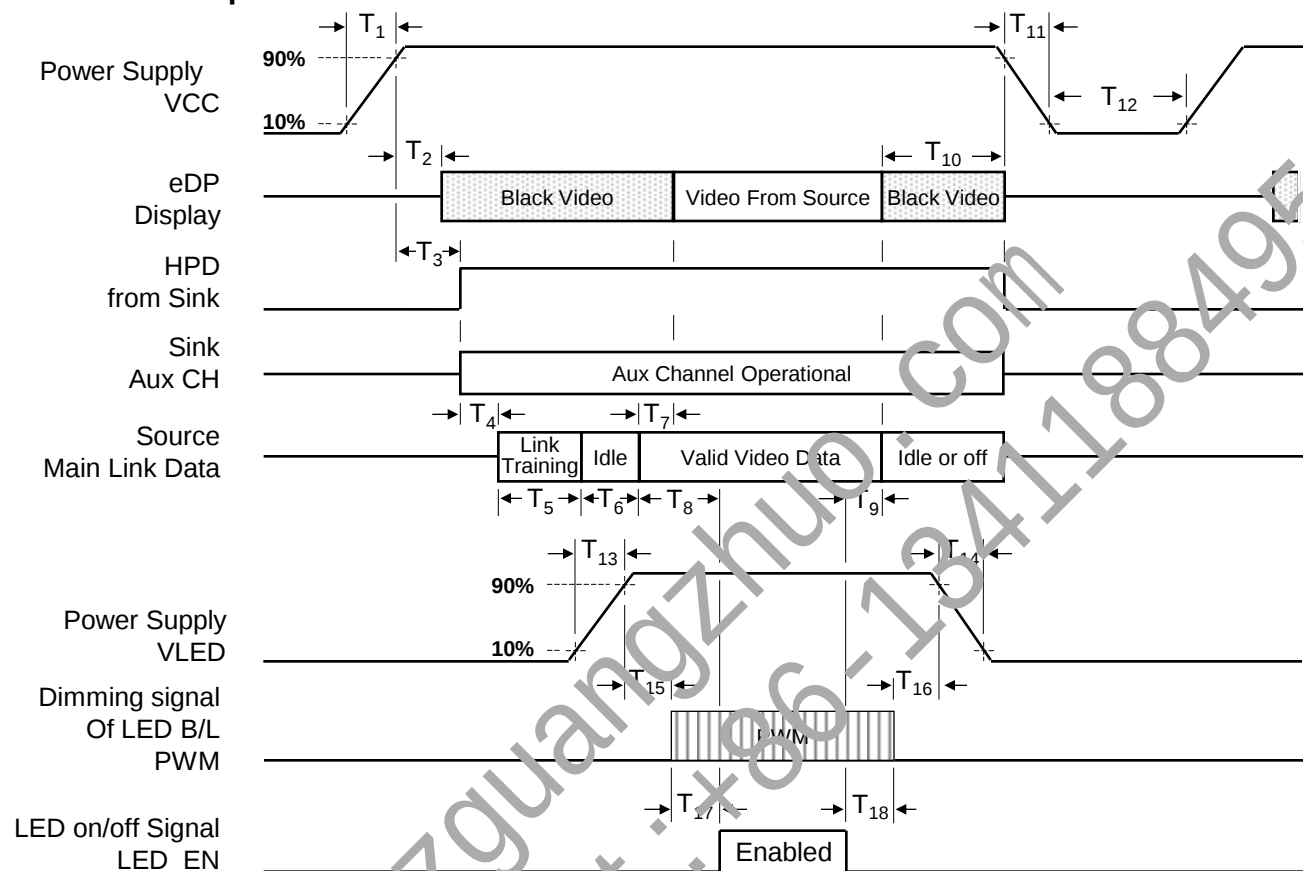


Table 6. POWER SEQUENCE TABLE

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

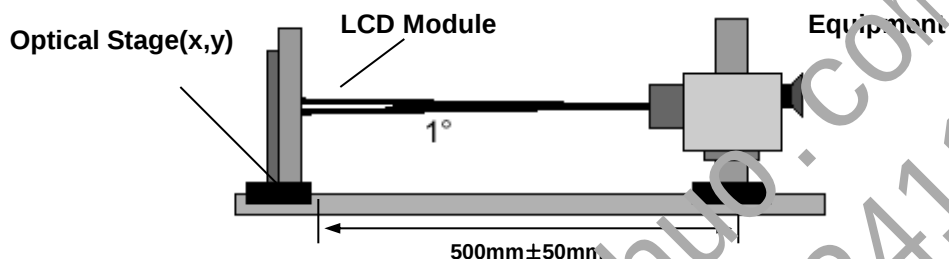
Product Specification

## 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             | 700               | 800   | -                 |                   | 1     |
| Surface Luminance, white |                                   | L <sub>w</sub> |                   | 300   |                   | cd/m <sup>2</sup> | 2     |
| Luminance Variation      |                                   | Δ WHITE (5P)   | 80%               | -     | -                 | -                 | 3     |
|                          |                                   | Δ WHITE (13P)  | 50%               | 70%   | -                 |                   |       |
| Response Time            |                                   | Tr + Tf        | -                 | 25    | 35                | ms                | 4     |
| Color Coordinates        | RED                               | Rx             | Typical<br>- 0.03 | 0.596 | Typical<br>+ 0.03 |                   | 5     |
|                          |                                   | Ry             |                   | 0.369 |                   |                   |       |
|                          | GREEN                             | Gx             |                   | 0.351 |                   |                   |       |
|                          |                                   | Gy             |                   | 0.544 |                   |                   |       |
|                          | BLUE                              | Bx             |                   | 0.151 |                   |                   |       |
|                          |                                   | By             |                   | 0.112 |                   |                   |       |
|                          | WHITE                             | Wx             |                   | 0.313 |                   |                   |       |
|                          |                                   | Wy             |                   | 0.329 |                   |                   |       |
| Viewing Angle            | x axis, right( $\Phi=0^\circ$ )   | $\Theta_r$     | 80                | -     | -                 | Degree            | 6     |
|                          | x axis, left( $\Phi=180^\circ$ )  | $\Theta_l$     | 80                | -     | -                 |                   |       |
|                          | y axis, up ( $\Phi=90^\circ$ )    | $\Theta_u$     | 80                | -     | -                 |                   |       |
|                          | y axis, down ( $\Phi=270^\circ$ ) | $\Theta_d$     | 80                | -     | -                 |                   |       |
| Gray Scale               |                                   |                |                   |       |                   |                   | 7     |
| Color Gamut              |                                   | %              | 42                | 45    | -                 |                   | -     |

## 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

<Measuring point for Average Luminance & measuring point for Luminance variation>

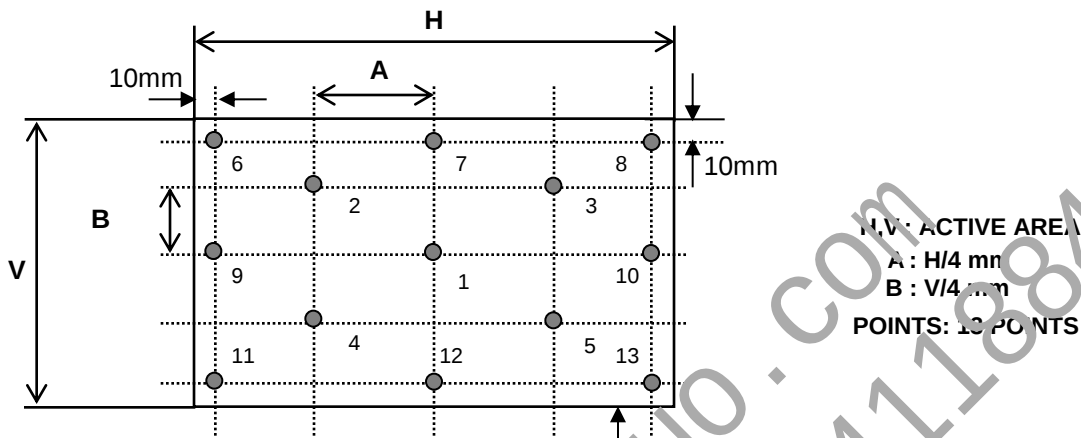


FIG. 3 Response Time

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

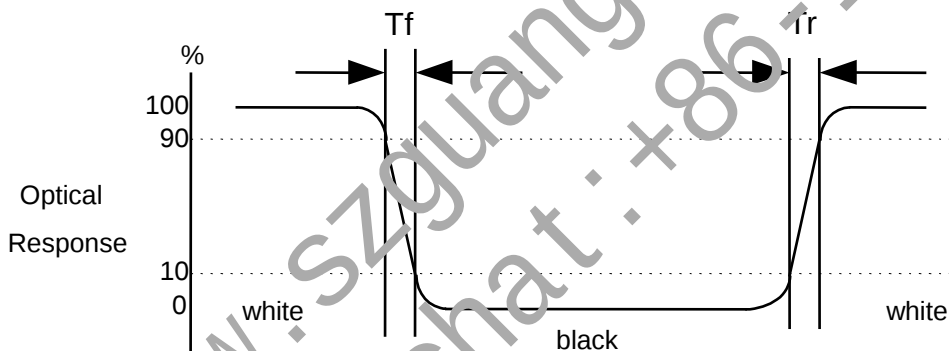
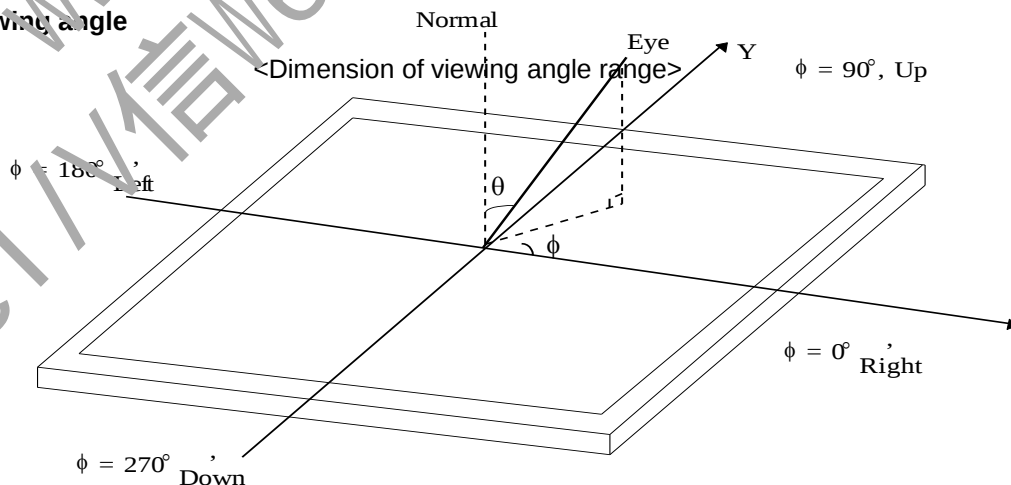


FIG. 4 Viewing angle



## 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                                  | $315.81 \pm 0.3 \text{ mm}$             |
|                                  | Vertical                                    | $195.57 \pm 0.5 \text{ mm}$             |
|                                  | Thickness                                   | $2.80 \pm 0.2 \text{ mm}$               |
| <b>Upper Polarizer Dimension</b> | Horizontal                                  | $311.71 \pm 0.2 \text{ mm}$             |
|                                  | Vertical                                    | $176.39 \pm 0.2 \text{ mm}$             |
| <b>Active Display Area</b>       | Horizontal                                  | $309.31 \text{ mm} \pm 0.15 \text{ mm}$ |
|                                  | Vertical                                    | $173.39 \text{ mm} \pm 0.15 \text{ mm}$ |
| <b>Weight</b>                    | 280g (Max.)                                 |                                         |
| <b>Surface Treatment</b>         | Anti-Glare treatment of the front polarizer |                                         |



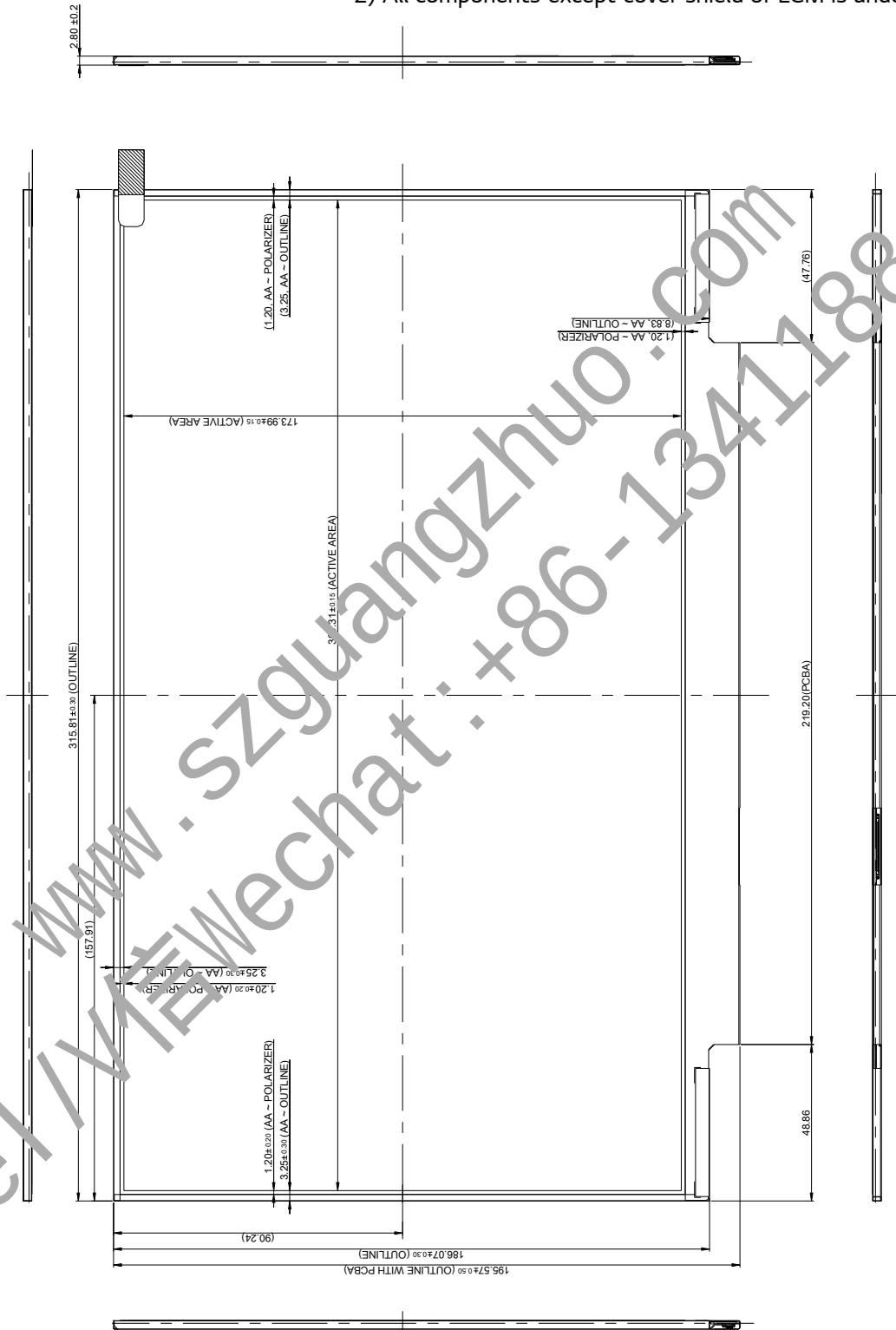
## Product Specification

<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.

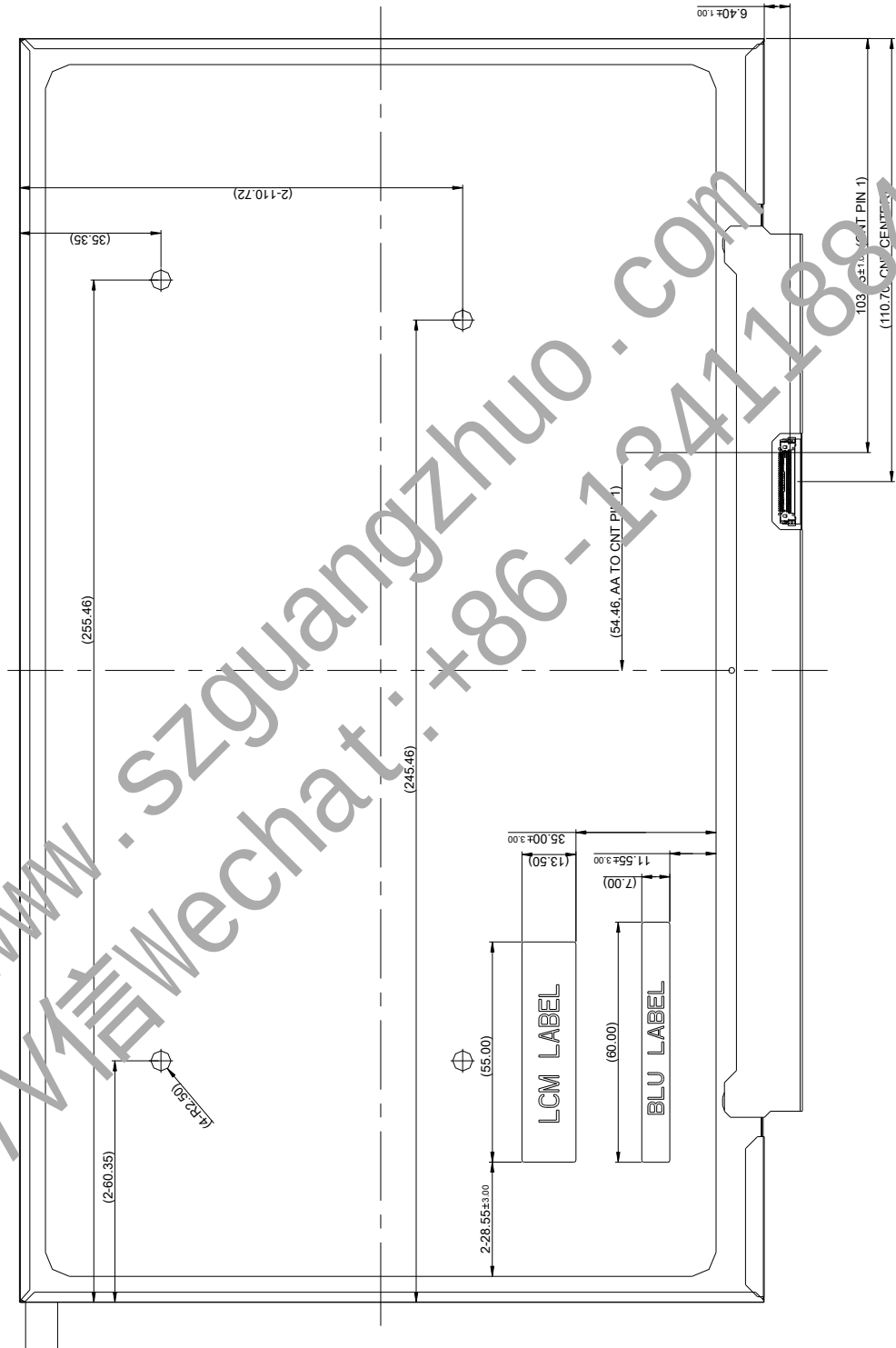




Product Specification

<REAR VIEW>

Note) Unit:[mm], General tolerance:  $\pm 0.5\text{mm}$   
LCM Label Information refer to the page 25



## 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

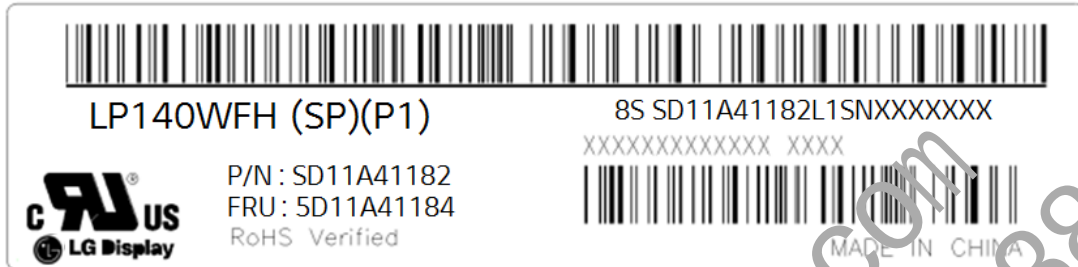
- a) RoHS, Directive 2011/65/EU of the European Parliament and of the council of 8 June 2011



## 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    | O    | 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

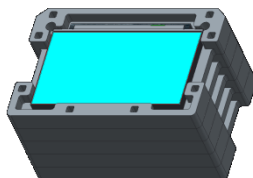
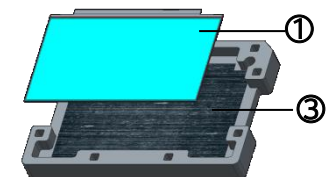
a) Package quantity in one box : 35pcs

b) Box Size : 410 \* 278 \* 328 mm

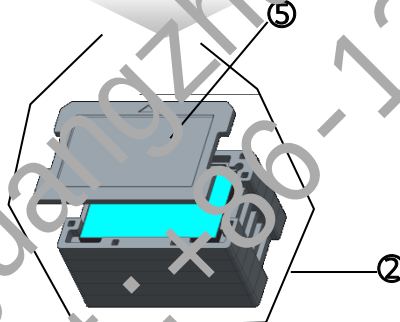


## Product Specification

### 8-3. Packing Assembly



(Sheet + LCM) × 5

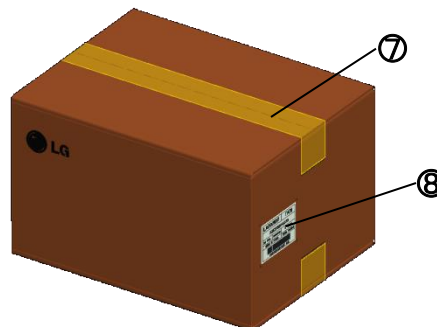
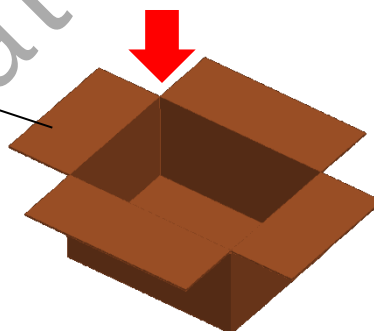


5 LCM / Tray

7 Tray / Bpx

35LCM/Box

2EA Desiccant in the box



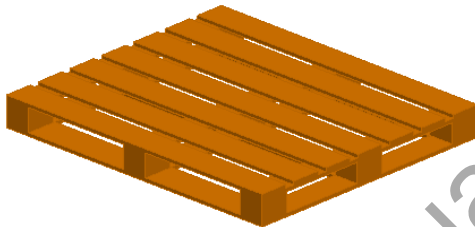
| NO. | DESCRIPTION | MATERIAL      |
|-----|-------------|---------------|
| 1   | LCD Module  |               |
| 2   | BAG         | AL            |
| 3   | Sheet       | PE            |
| 4   | Bottom Tray | EPO           |
| 5   | Top Tray    | EPO           |
| 6   | BOX         | SWR4        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



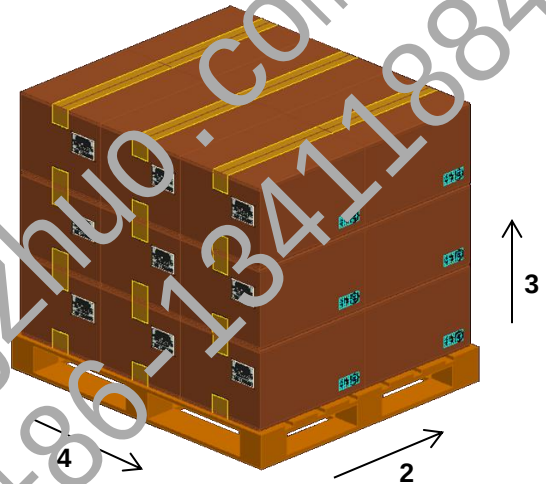
## Product Specification

### 8-4. Pallet Assembly

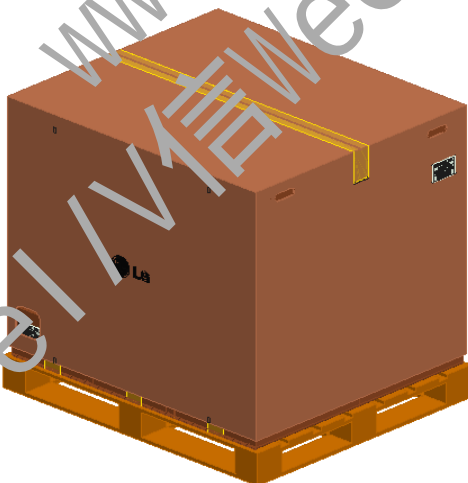
1. Pallet Ready



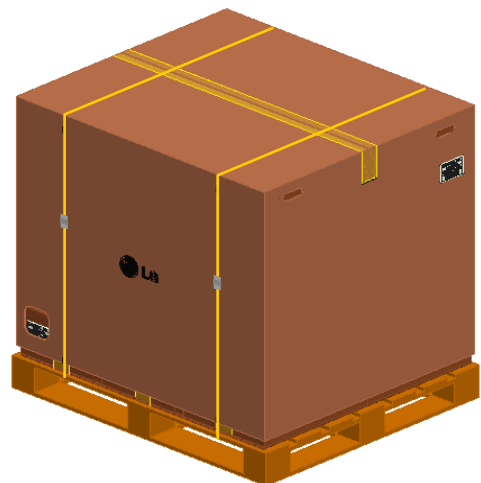
2. 4 x 2 x 3 Box Pattern



3. Angle Packing & Taping



4. Banding

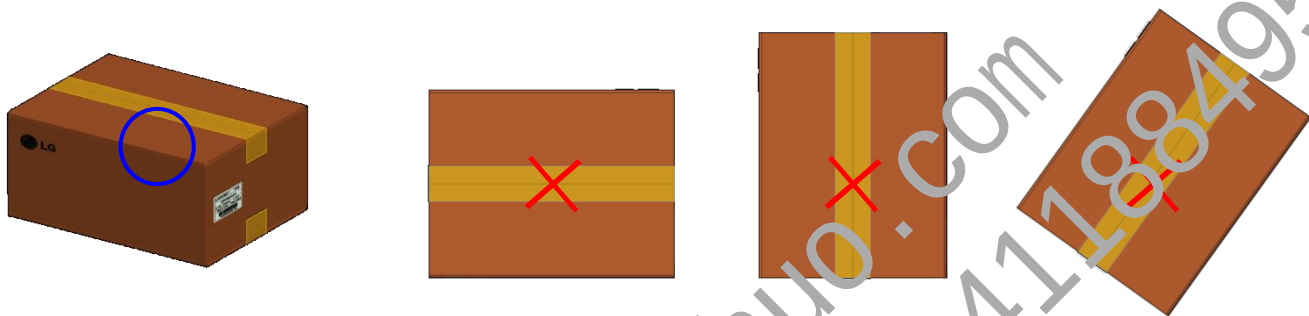




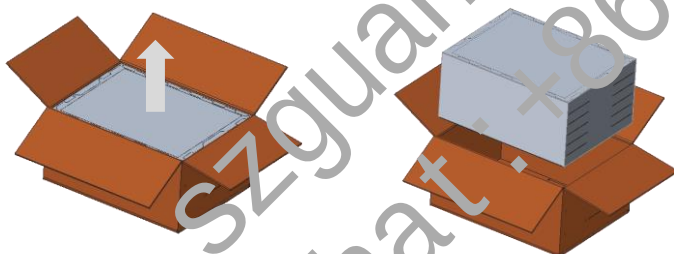
## Product Specification

### 8-5. Precautions for unpacking the Box

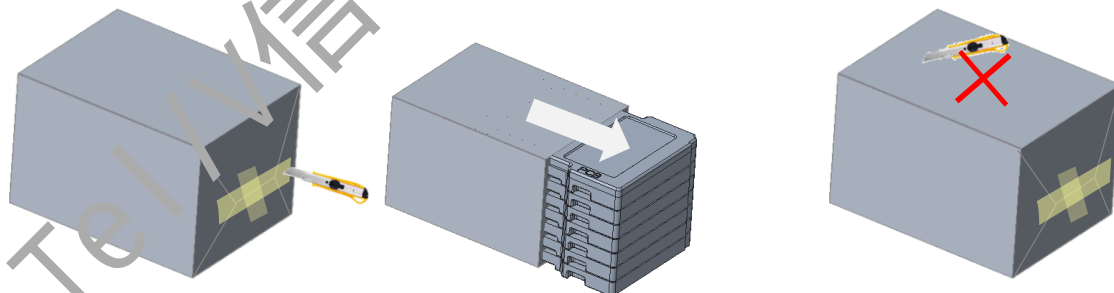
a.) Don't throw or tilt the box and put it on a flat surface.



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.



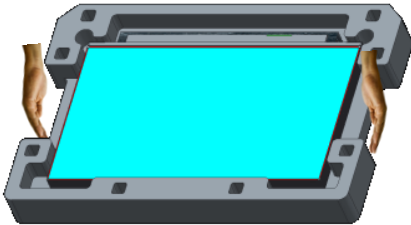
**Caution : Do not cut the top of the bag with a knife.  
(The Knife can damage product)**



## Product Specification

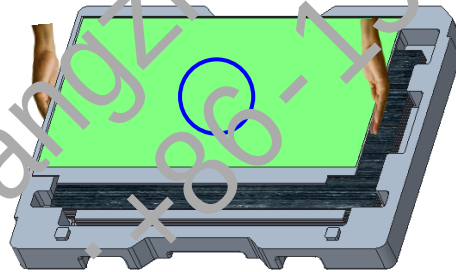
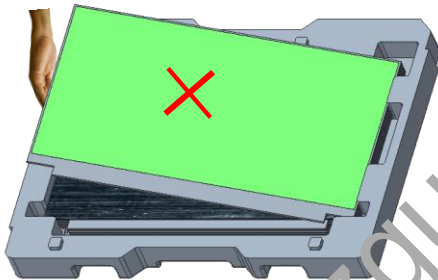
### 8-6. Precautions for Handling tray

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

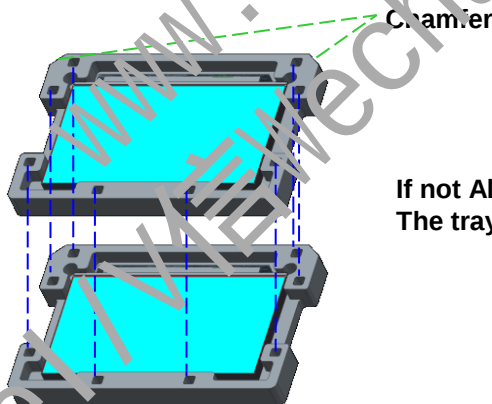


Caution : Do not handle with only one hand.

- 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 hollows of each tray.  
- Two corner is Chamfer corner



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.

※The packing shape may be different from the Image.



## 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

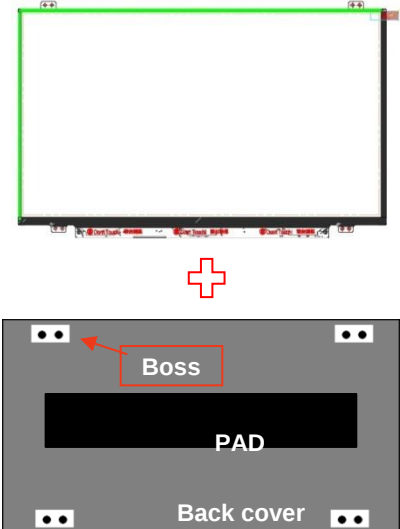
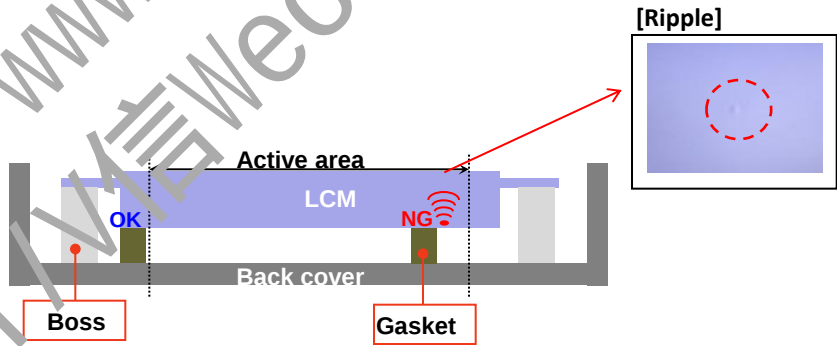
- (1) When the protection film is peeled off, static electricity is generated between the film and polarizer. This should be peeled off slowly and carefully by people who are electrically grounded and with well ion-blown equipment or in such a condition etc.
- (2) The protection film is attached to the 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

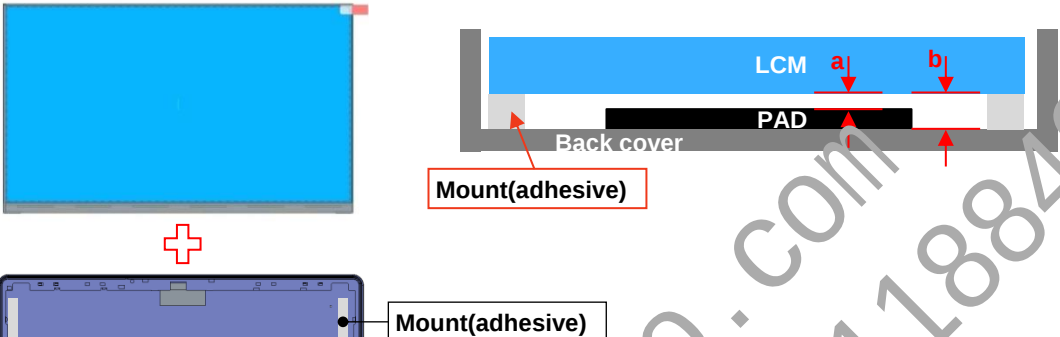
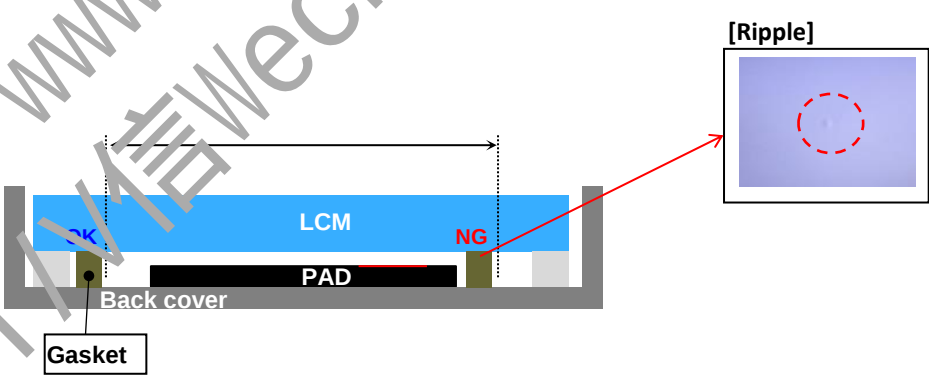
Appendix A. LGD Proposal for system cover design.

|            |                                                                                                                                                                                                                                                                                |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1          | <b>Gap check for securing the enough gap between LCM and System back cover.</b>                                                                                                                                                                                                |
|            |  <div data-bbox="621 743 1359 859"> <p>◆ a[LCM - Pad] : min 0mm<br/>                 ◆ b[Back cover - LCM] : min 0.0mm<br/>                 (no interference at max LCM dimension)</p> </div> |
| 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..)                                                                                                                   |
| 2          | <b>Gasket position</b>                                                                                                                                                                                                                                                         |
|            |                                                                                                                                                                                            |
| 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

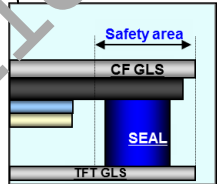
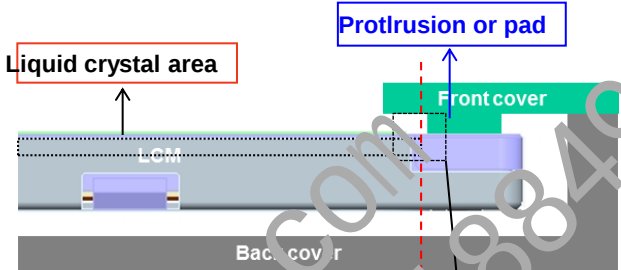
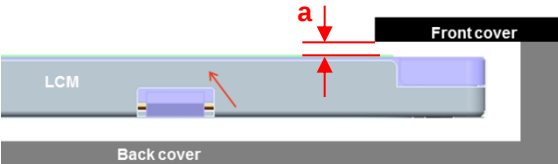
Appendix A. LGD Proposal for system cover design.

|                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                      | Gap check for securing the enough gap between LCM and System back cover.                                                                                     |
| <div><p>Mount(adhesive)</p><p>Mount(adhesive)</p><p>LCM</p><p>PAD</p><p>Back cover</p><p><math>a_1</math></p><p><math>b_1</math></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></div> |                                                                                                                                                              |
| 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                                                                                                                                                                                                                                                                                                                                                                                                                                      | Gasket position                                                                                                                                              |
| <div><p>LCM</p><p>PAD</p><p>Back cover</p><p>Gasket</p><p>[Ripple]</p></div>                                                                                                                                                                                                                                                                       |                                                                                                                                                              |
| 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

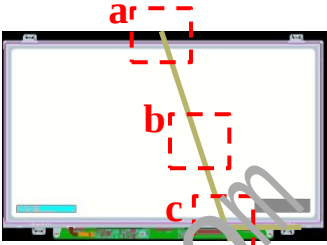
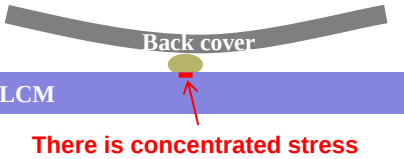
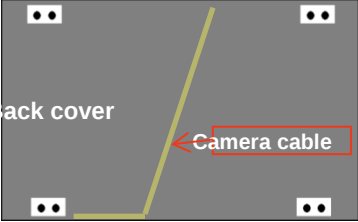
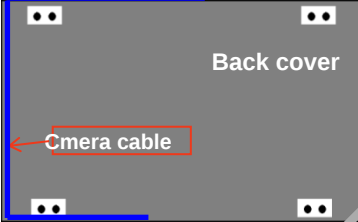
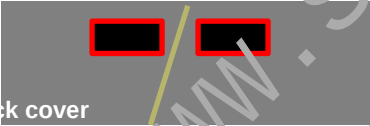
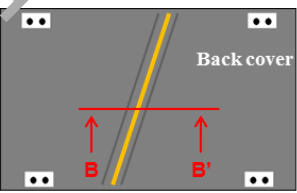
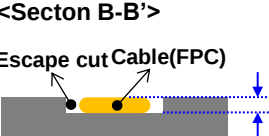
Appendix A. LGD Proposal for system cover design.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Check the gap between front cover and LCM(glass)                                                                                                                                                                      |
| <div></div> <div><p>[OK] <math>0.1\text{mm} \leq a \leq 0.3\text{mm}</math></p><p>[Caution] <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></p><p>[NG] <math>a \leq 0\text{mm}</math> (overlap), <math>a &gt; 0.5\text{mm}</math> (leakage)</p></div> |                                                                                                                                                                                                                       |
| Risk point                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Ripple can be happened by little gap between glass and front cover.                                                                                                                                                   |
| Suggestion                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Keep the gap between front cover and LCM from 0.1 to 0.3mm<br>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 |



Product Specification

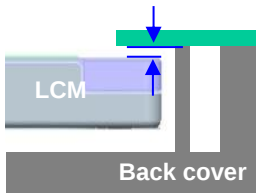
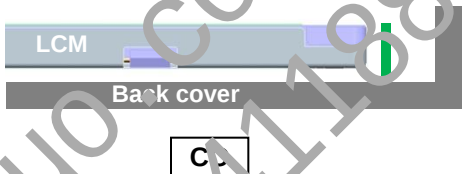
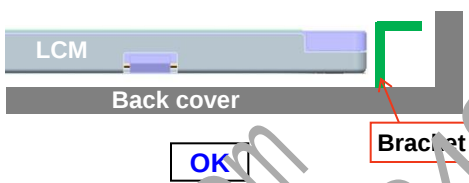
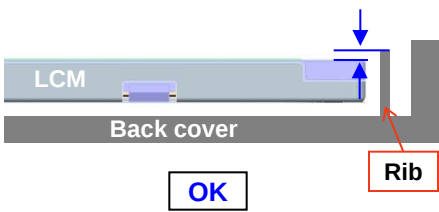
Appendix A. LGD Proposal for system cover design.

| 6          | Checking the path of the System cables                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|            | <div><p>[Panel crack at "a"] [White spot at "b"] [Light leakage at "c"]</p><p>[Suggestion]</p><p>[Cable path]</p><p>[Add pad]</p><p>[Add cut]</p><p>&lt;Section B-B'&gt;</p><p>Escape cut depth = Cable thickness</p></div> |
| Risk point | <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>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                                                                                                                                                           |
| <div><div><div><p>◆ [LCM ~ Rib] : 0~0.3mm</p></div></div></div> |                                                                                                                                                                                                  |
| 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

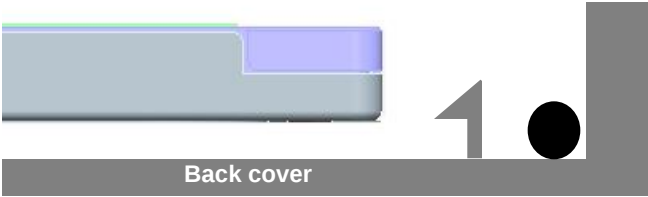
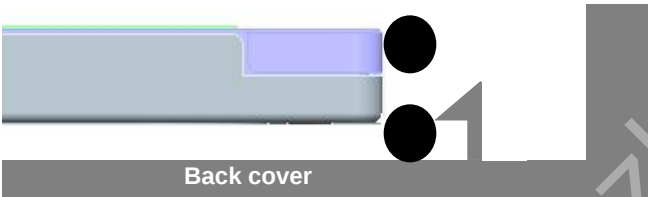
Appendix A. LGD Proposal for system cover design.

| 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Rib design for panel crack prevention                                                                                                                                                                                                                                                                                                              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div data-bbox="118 334 198 363">Rib 有</div> <div data-bbox="107 376 535 627"></div> <div data-bbox="154 643 519 701">Rib structure supported by load<br/>LCM applied load distribution</div> <div data-bbox="559 334 639 363">Rib 無</div> <div data-bbox="549 376 978 627"></div> <div data-bbox="609 643 983 701">Direct load is transferred to LCM<br/>It is vulnerable to panel crack.</div> <div data-bbox="114 761 262 790">[Suggestion]</div> <div data-bbox="85 813 464 1058"></div> <div data-bbox="512 790 909 1114"></div> <div data-bbox="949 890 1342 1020"></div> <div data-bbox="114 1215 464 1441"></div> <div data-bbox="521 1219 896 1443"></div> <div data-bbox="953 1261 1346 1392"></div> |                                                                                                                                                                                                                                                                                                                                                    |
| Risk point                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <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

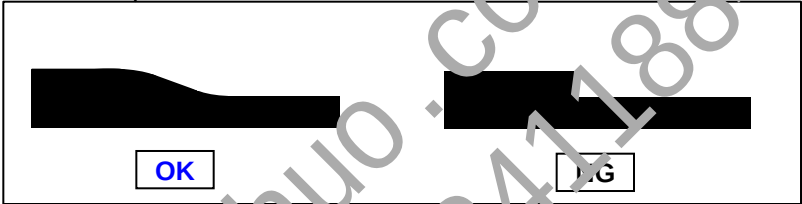
Appendix A. LGD Proposal for system cover design.

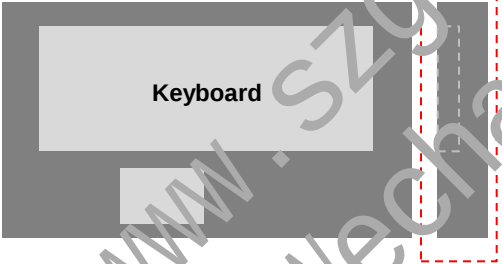
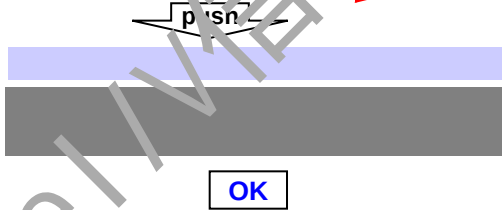
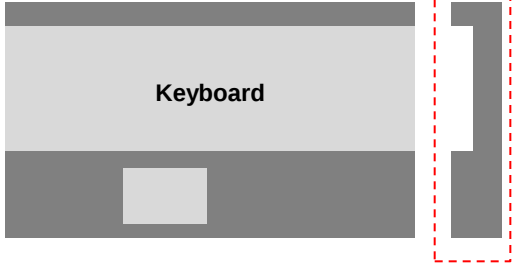
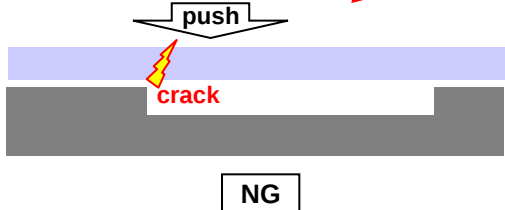
|                                                                                                                                                                                                                                   |                                                                                                             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| 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.

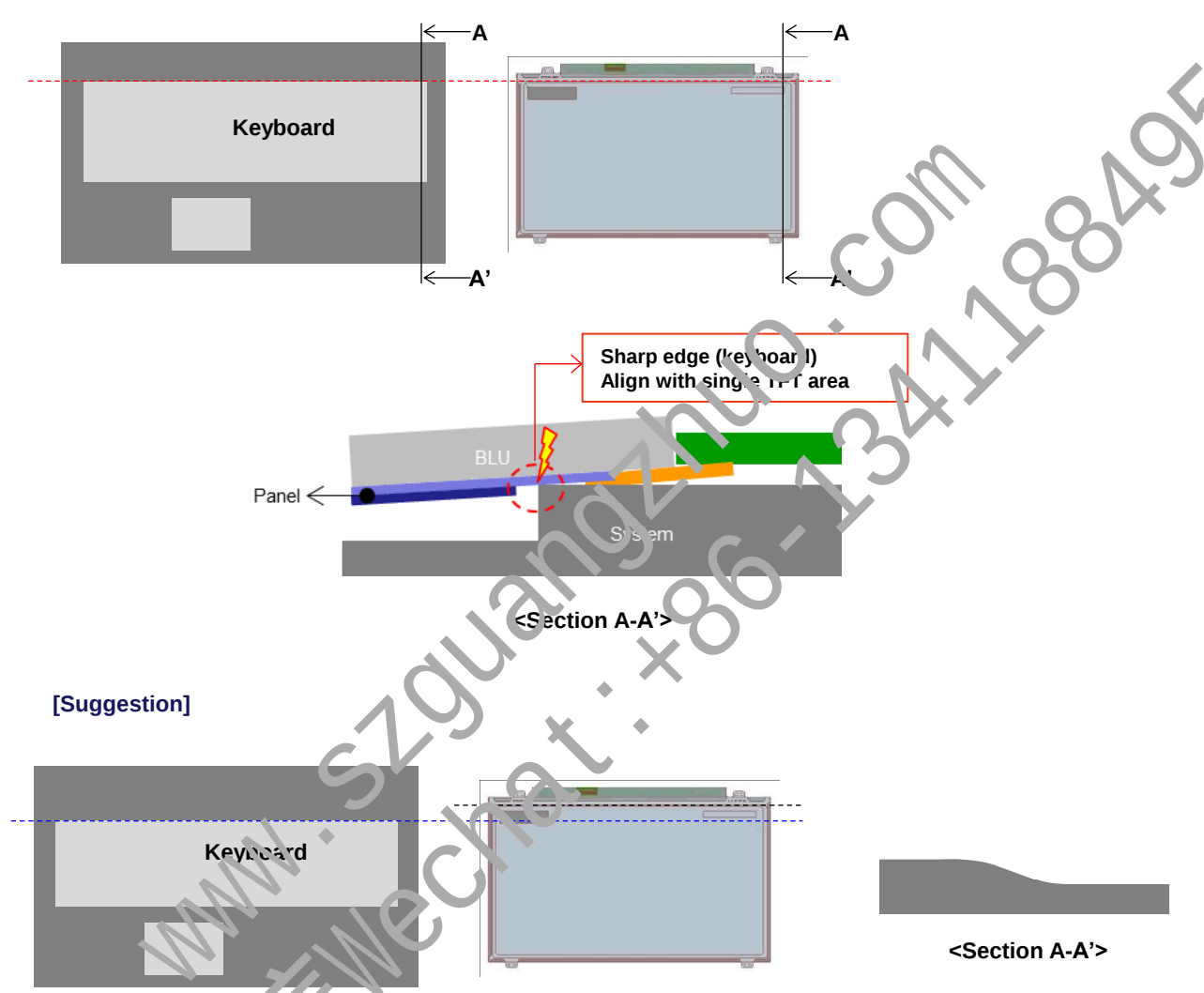
|                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|
| 10                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Check mouse pad (touch pad) depth and shape of edge                |
| <div><p>Mouse pad</p><div><p>[OK] <math>a \leq 0.3\text{mm}</math></p><p>[Caution] <math>1.0\text{mm} \leq a \leq 0.3\text{mm}</math></p><p>[NG] <math>a \geq 1.0\text{mm}</math></p></div></div> |                                                                    |
| 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                                              |
| <div><p>Keyboard</p><p>push</p><p>OK</p><p>Keyboard</p><p>push</p><p>crack</p><p>NG</p></div> |                                                                              |
| 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.                                           |



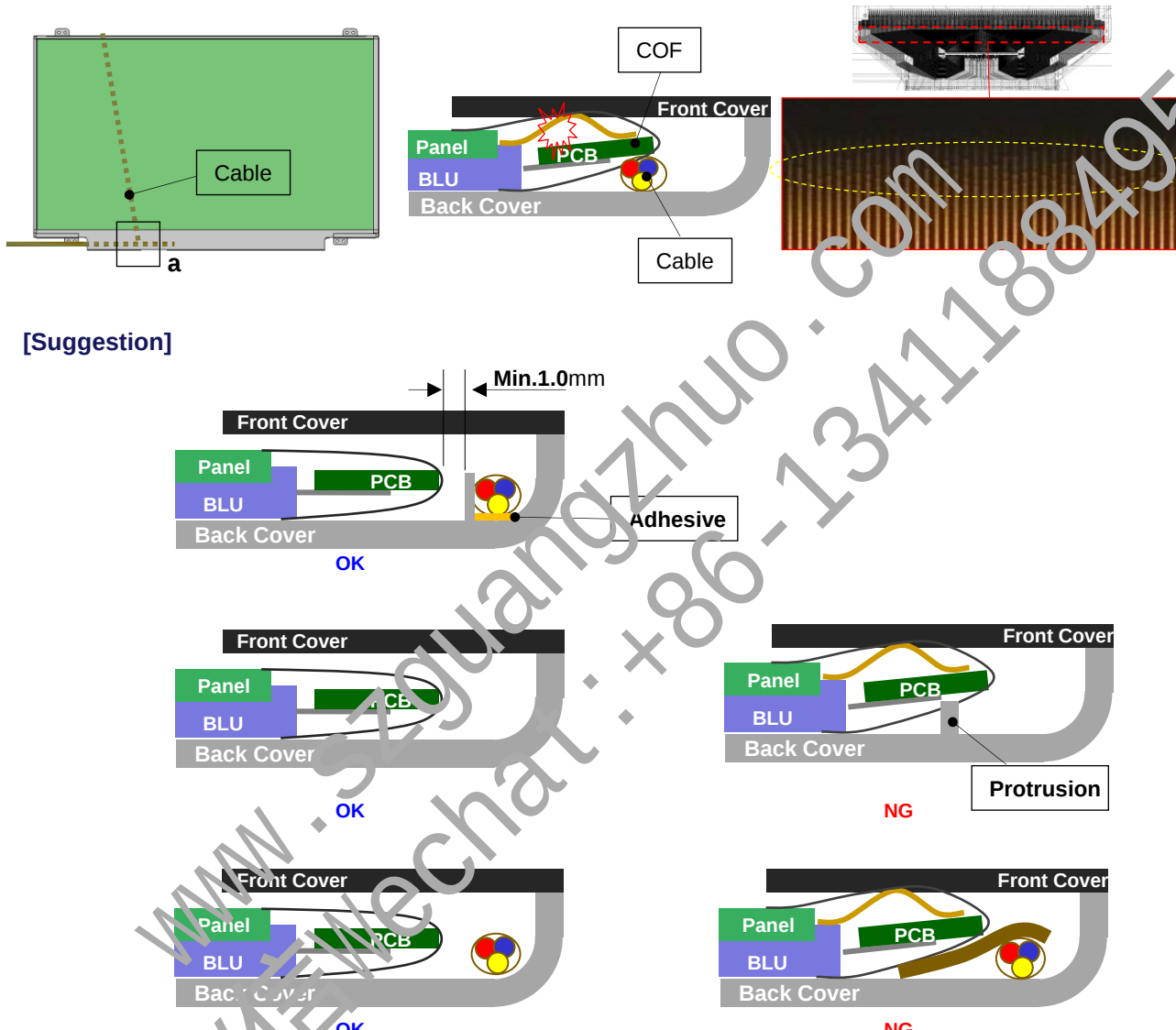
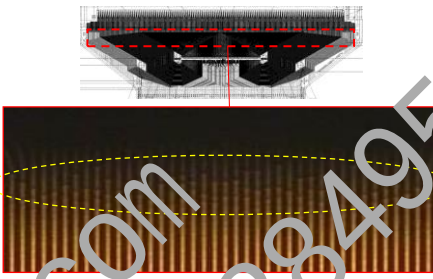
Product Specification

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 a 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> |                                                                                                                                                                                                                                   |
| Risk point                                                                                                                                                                                                                                                                                                                                                                                            | <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> |
| Suggestion                                                                                                                                                                                                                                                                                                                                                                                            | <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                                                                                                     | Cable path for line defect                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>[Suggestion]</p>  |                                                                                                                                                                                                                                                                         |
| <p>Risk point</p> <p>Suggestion</p>                                                                    | <p>If cable route is positioned below PCB, line defect or block dim can be happened by repetitive stress at COF during open and close hinge-up.</p> <p>Keep the gap between cable and PCB more than 1.0mm.</p> <p>Fully fix the cable by guide or adhesive</p> <p>Do not put protrusion on back-cover.</p> <p>Do not cross over the cable to another.</p> |



Product Specification

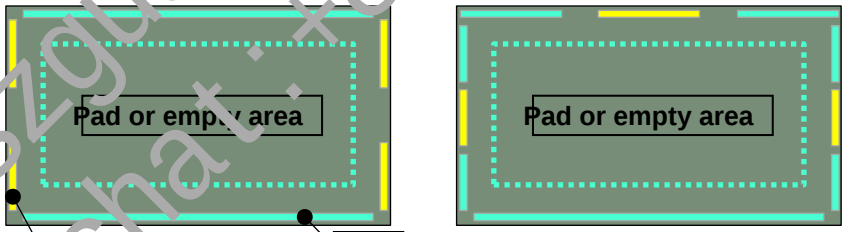
Appendix A. LGD Proposal for system cover design.

| 14         | Back cover rib / wall (path & gap)                                                                                                                                                                                                                                                                                                                                                            |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|            | <div data-bbox="235 338 611 569"></div> <div data-bbox="735 338 928 589"></div> <div data-bbox="949 338 1328 569"></div> <div data-bbox="235 589 642 850"></div> <div data-bbox="721 724 1263 821"><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></div> <div data-bbox="235 927 1092 1091"></div> |
| Risk point | Gap is too small and rib is too short, panel is easily cracked by external stress.                                                                                                                                                                                                                                                                                                            |
| Suggestion | Gap is must be kept more than 0.5mm(max dim.) and 1.0mm(typ dim.) .<br>The figure of rib is continuous or fully long.<br>“a” is not enough as narrow bezel type, add damper between LCM and system rib/wall                                                                                                                                                                                   |



Product Specification

Appendix A. LGD Proposal for system cover design.

| 15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | LCM fixing (no flange model)                                                                                                                                                                                                                                                                           |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div></div> <div><b>[Suggestion]</b></div> <div><p><b>Flat</b></p><p><b>Adhesive width</b></p><p><b>Position of pad &amp; adhesive</b></p><p><b>Case 1</b> <b>Case 2</b></p><p><b>[Mapping on back cover]</b></p></div> |                                                                                                                                                                                                                                                                                                        |
| Risk point                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <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> |
| Suggestion                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <p>It is recommended that back cover is flat type.</p> <p>Adhesive width need to be minimized if adhesive strength is enough.</p> <p>It is recommended that adhesive is posited at outside on back-cover.</p> <p>Pad is recommended to apply at other area.</p>                                        |



Product Specification

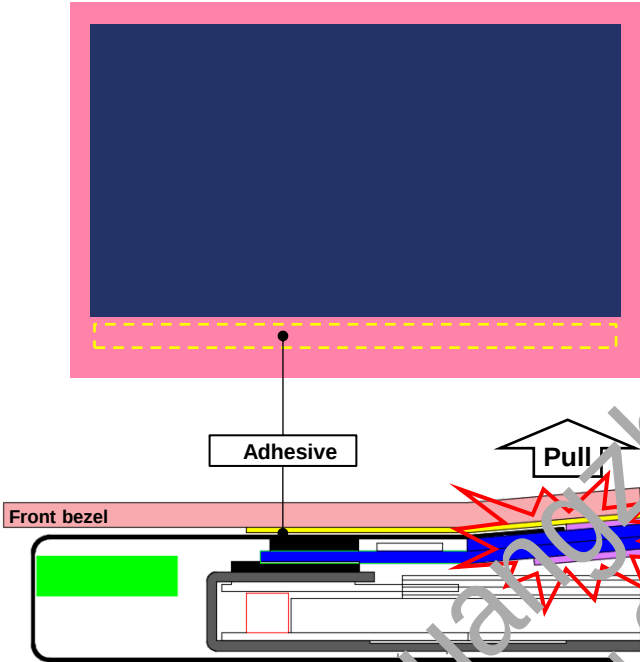
Appendix A. LGD Proposal for system cover design.

| 16                                                                                                                                                                                                                      | LCM fixing (no flange model)                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div data-bbox="111 382 771 544"></div> <div data-bbox="107 598 271 629">[Suggestion]</div> <div data-bbox="204 689 574 950"></div> <div data-bbox="189 1000 1028 1178"></div> <div data-bbox="906 328 1328 595"></div> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Risk point                                                                                                                                                                                                              | <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 style="border: 1px solid black; padding: 10px; width: 45%;"> <p><b>[ Abnormal Communication By HPD Glitch ]</b></p> </div> <div style="border: 1px solid black; padding: 10px; width: 45%;"> <p><b>[ Normal Communication By HPD Signal ]</b></p> </div> </div>         |
| Define        | <ol style="list-style-type: none"> <li>Hot Plug Detection (HPD) Threshold level of Source Device is minimum 2.0V</li> <li>HPD Unplug : HPD pulse stays low longer than 2ms.<br/>DP Tx shall wait for HPD signal to go high again.</li> <li>"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>                                                                                                                                                                                |

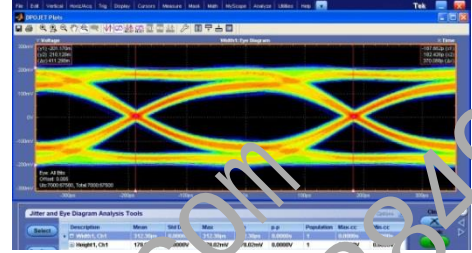
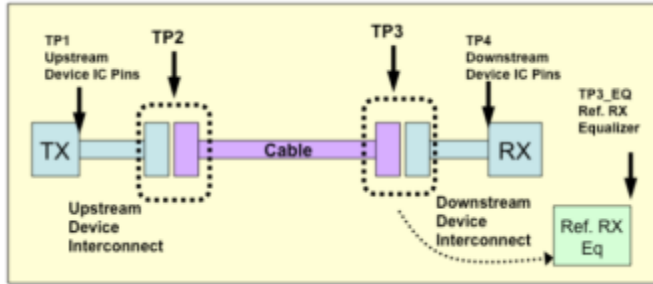


## Product Specification

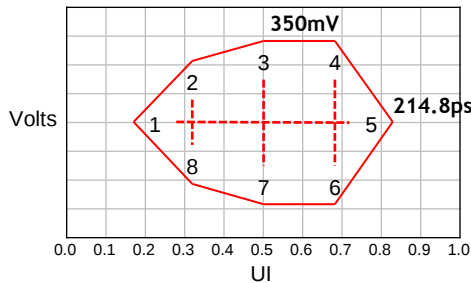
### APPENDIX B. LGD Proposal for eDP Interface Design Guide

3

#### Main Link EYE Diagram

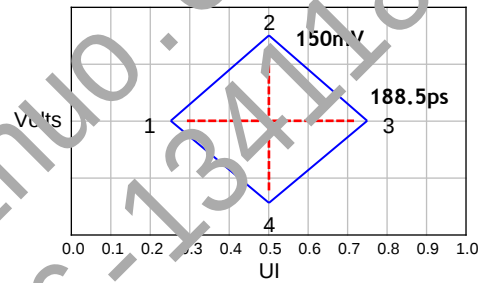


Eye Diagram



| 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]



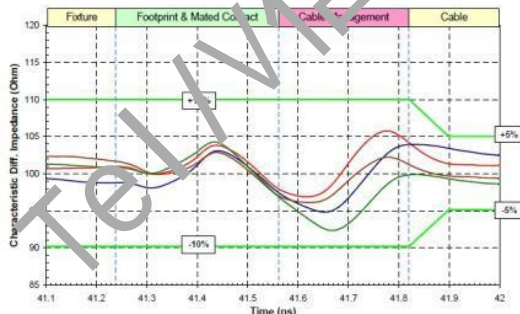
| Point | UI    | Voltage (Volts) |
|-------|-------|-----------------|
| 1     | 0.246 | 0.000           |
| 2     | 0.500 | 0.075           |
| 3     | 0.755 | 0.000           |
| 4     | 0.500 | -0.075          |

[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 $\Omega$           | +/- 10%           |
| Connector       | 100 $\Omega$           |                   |
| Wire management | 100 $\Omega$           |                   |
| Cable           | 100 $\Omega$           | +/- 5%            |

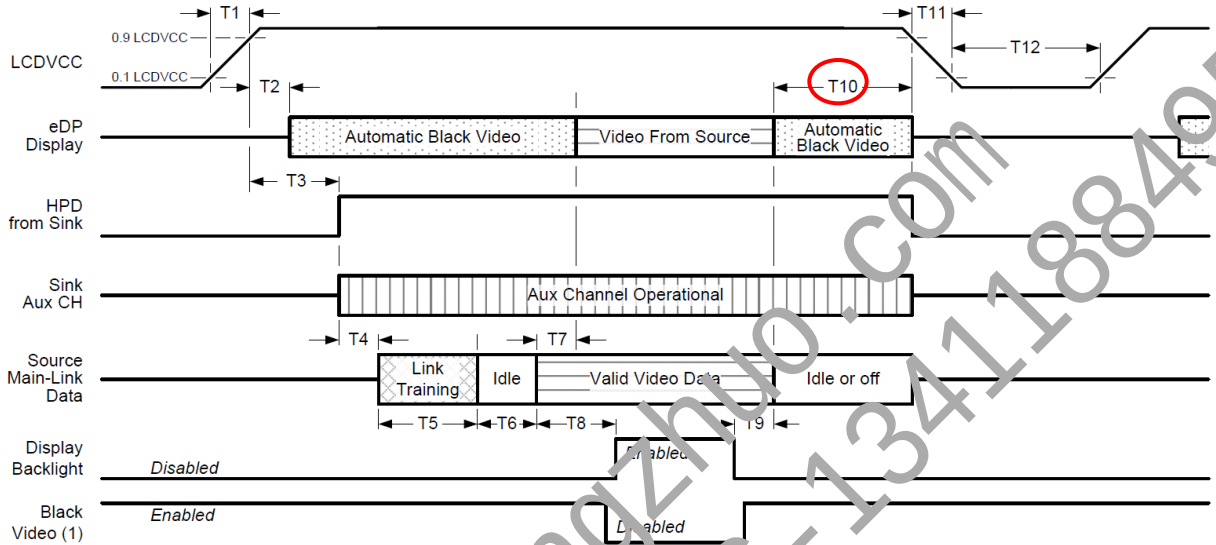
Define Cable Impedance 100  $\Omega$  +/- 5% ( 95 $\Omega$  ~ 105 $\Omega$  )

## Product Specification

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

5

#### 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 if Main Link off like below.



[Case1. Resolution Change]



[Case2. Close the Lid]

Define

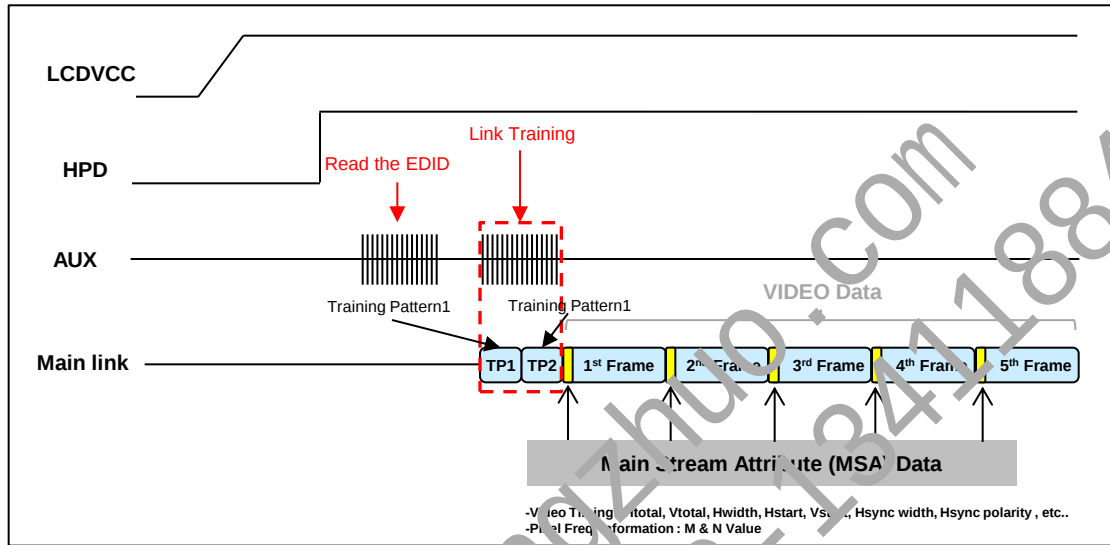
If Main Link off signal from Source, then LCDVCC must be Power Off within T10 period at Non-PSR mode



Product Specification

APPENDIX B. LGD Proposal for eDP Interface Design Guide

6 Main Link M & N value of MSA data

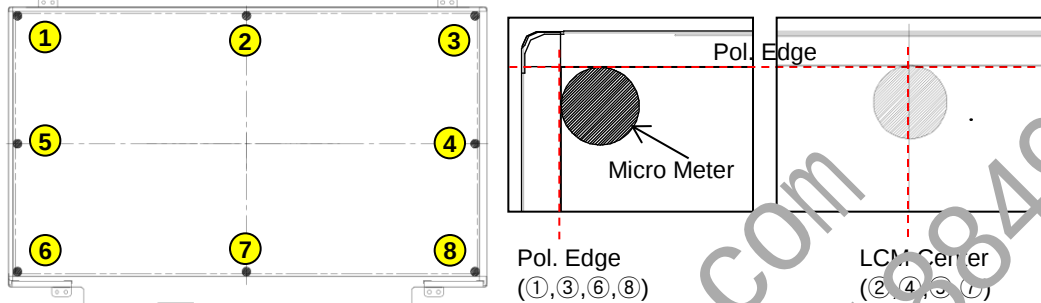
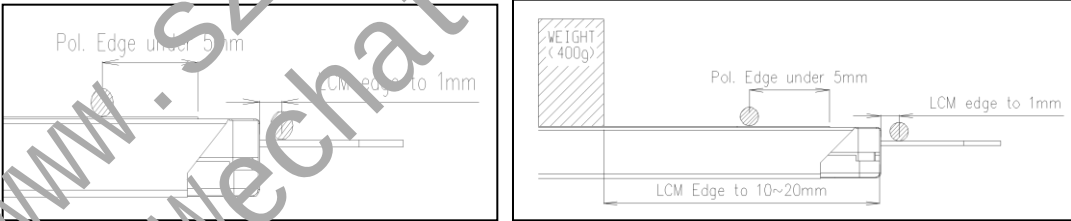
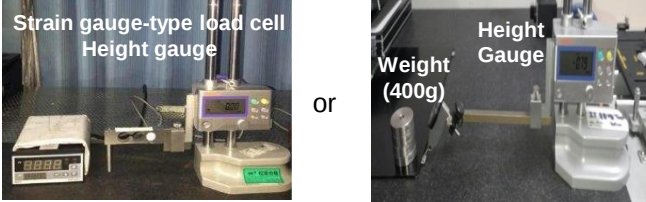


Define

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

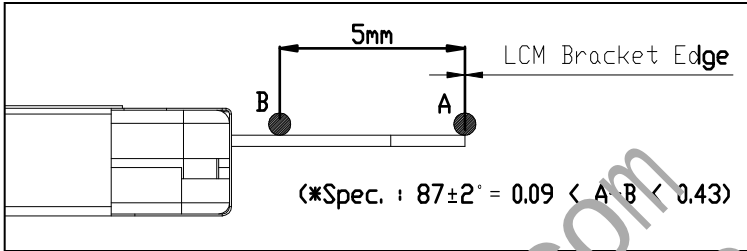
Product Specification

APPENDIX 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>                                                                                          |
| 2            | Dimension Between Upper Polarizer to Bottom surface of Bracket                                                                                                                                                                                                                                   |
| Point        |  <p>[ Height gauge with load cell]</p> <p>[ Height gauge with weight 400g]</p>                                                                                                                               |
| Measure Tool | <p>Height Gauge ( With Force 400gf)</p>  <p>Strain gauge-type load cell Height gauge</p> <p>Height Gauge</p> <p>Weight (400g)</p>                                                                            |
| Guide        | <ul style="list-style-type: none"> <li>✓ Measure the thickness between Polarizer surface and Bracket top surface.</li> <li>✓ Measure the thickness include force(400gf) on the Panel surface.</li> <li>✓ The CAS Spec. : Height from Pol. to Bracket top surface + Material Thickness</li> </ul> |

Product Specification

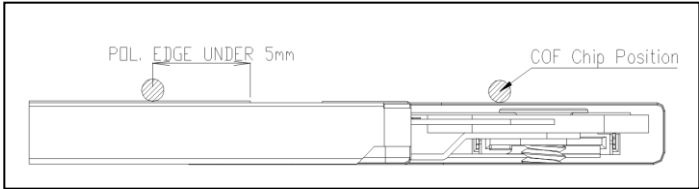
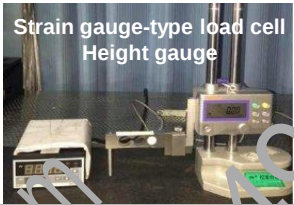
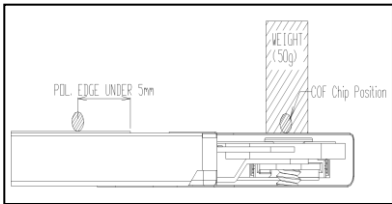
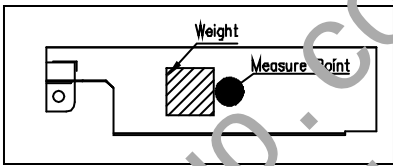
APPENDIX C. LGD Proposal for Measurement Method

| 3            | System Bracket Angle Management                                                                                                                                                                                                                                                                      |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Point        |  <p>(*Spec. : <math>87 \pm 2^\circ = 0.09 &lt; A-B &lt; 0.43</math>)</p>                                                                                                                                           |
| Measure Tool | Height Gauge<br>                                                                                                                                                                                                    |
| Guide        | <ul style="list-style-type: none"> <li>✓ Measure the Height point "A" and "B" at all system bracket in LCM</li> <li>✓ The CAS Spec. : <math>87 \pm 2^\circ \rightarrow 0.09 &lt; A-B &lt; 0.43</math></li> <li>✓ "A-B" spec. could be changed, if bracket dimension is no over than 5mm .</li> </ul> |



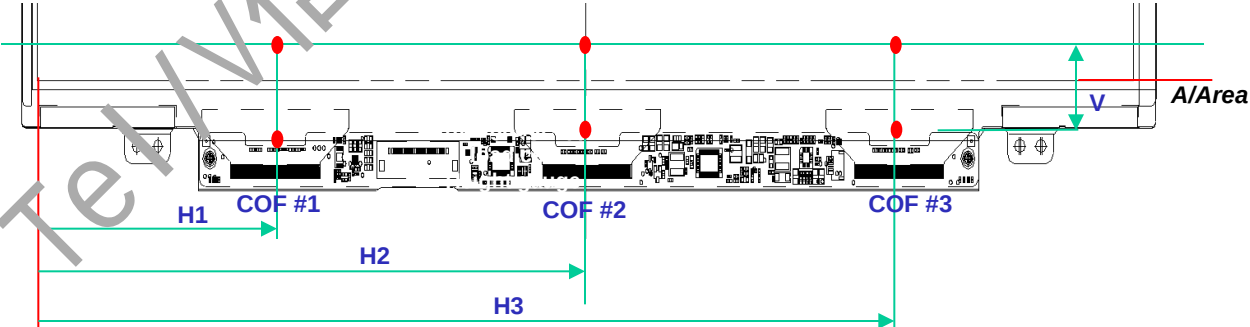
Product Specification

APPENDIX C. LGD Proposal for Measurement Method

|                      |                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4                    | Height of PCB Area                                                                                                                                                                                                                                                                                                                                                                       |
| Measure Tool & Point |                                                                                                                                                                                                                      |
| Measure Tool & Point |                                                                                                                                    |
| Guide                | <ul style="list-style-type: none"><li>✓ Measure the height between upper Polarizer surface and C/Shield top surface.</li><li>✓ Measure the height include force(50gf) on the C/Shield surface at FPC/COF Center.</li><li>✓ The CAS Spec. : All components except cover shield of LCM is under upper POL.<br/>Upper polarizer higher than source cover shield pressed down 50g.</li></ul> |
| Measure condition    | Put the LCM on flat ground w/o interference on PCB rear side                                                                                                                                                                                                                                                                                                                             |

| Item          | Description                                                                                                                                        |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| Measure Tool  | Height gauge<br>(with Strain gauge type load-cell or weight)                                                                                       |
| Measure Point | V-dimension<br>: Pol. Edge ~ 5mm, FPC/COF Center(or Chip)<br>H-dimension<br>: Each FPC/COF Center(or Chip)<br>→ Including all of components on PCB |

※ Measure Point





Product Specification

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

|                                  | Byte<br>(Dec) | Byte<br>(Hex) | Field Name and Comments                                                                                                                                                                                                                                                                                                                               | Value<br>(Hex) | Value<br>(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                                                                                                                                                                                                                                                                                                                                   | F4             | 11100100       |
|                                  | 10            | 0A            | ID Product Code 069Ch                                                                                                                                                                                                                                                                                                                                 | 9C             | 10011100       |
|                                  | 11            | 0B            | (Hex LSB first)                                                                                                                                                                                                                                                                                                                                       | 2C             | 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 - Optinal 00 weeks                                                                                                                                                                                                                                                                                                                | 00             | 00000000       |
|                                  | 17            | 11            | Year of Manufacture 2020 years                                                                                                                                                                                                                                                                                                                        | 1E             | 00011110       |
| Display<br>Parameters            | 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 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       |
|                                  | 22            | 16            | Vertical Screen Size (Rounded cm) = 17 cm                                                                                                                                                                                                                                                                                                             | 11             | 00010001       |
| Panel Color<br>Coordinates       | 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 : No_sRGB, Preferred Timing Mode, Display Continuous frequency, Display Range Limits Descriptor is required,] | 03             | 00000011       |
|                                  | 25            | 19            | Red/Green Low Bits (Rx/Ry/Gx/Gy)                                                                                                                                                                                                                                                                                                                      | AD             | 10101101       |
|                                  | 26            | 1A            | Blue/White Low Bits (Bx/By/Wx/Wy)                                                                                                                                                                                                                                                                                                                     | F5             | 11110101       |
|                                  | 27            | 1B            | Red X Rx = 0.596                                                                                                                                                                                                                                                                                                                                      | 98             | 10011000       |
|                                  | 28            | 1C            | Red Y Ry = 0.369                                                                                                                                                                                                                                                                                                                                      | 5E             | 01011110       |
|                                  | 29            | 1D            | Green X Gx = 0.351                                                                                                                                                                                                                                                                                                                                    | 59             | 01011001       |
|                                  | 30            | 1E            | Green Y Gy = 0.541                                                                                                                                                                                                                                                                                                                                    | 8B             | 10001011       |
| Established<br>Timings           | 31            | 1F            | Blue X Bx = 0.151                                                                                                                                                                                                                                                                                                                                     | 26             | 00100110       |
|                                  | 32            | 20            | Blue Y By = 0.112                                                                                                                                                                                                                                                                                                                                     | 1C             | 00011100       |
|                                  | 33            | 21            | White X Wx = 0.313                                                                                                                                                                                                                                                                                                                                    | 50             | 01010000       |
|                                  | 34            | 22            | White Y Wy = 0.329                                                                                                                                                                                                                                                                                                                                    | 54             | 01010100       |
| Standard Timing ID               | 35            | 23            | Established timing 1 ( Optional_00h if not used)                                                                                                                                                                                                                                                                                                      | 00             | 00000000       |
|                                  | 36            | 24            | Established timing 2 ( Optional_00h if not used)                                                                                                                                                                                                                                                                                                      | 00             | 00000000       |
|                                  | 37            | 25            | Manufacturers timings ( Optional_00h if not used)                                                                                                                                                                                                                                                                                                     | 00             | 00000000       |
| Standard Timing ID               | 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             | 00110000       |
|                      | 60            | 3C            | Vertical Blanking (VB) (DE Blanking typ.for DE only panels) 31 lines                                          | 1F             | 00111111       |
|                      | 61            | 3D            | Vertical Active (VA) / Vertical Blanking (VB) (upper 4:4bits)                                                 | 40             | 01010000       |
|                      | 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             | 00100000       |
|                      | 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_Nb, Hsync_Pos (outside of Vsync)]          | 1A             | 00011010       |
|                      | 72            | 48            | Flag                                                                                                          | 00             | 00000000       |
|                      | 73            | 49            | Flag                                                                                                          | 00             | 00000000       |
| Timing Descriptor #2 | 74            | 4A            | Flag                                                                                                          | 00             | 00000000       |
|                      | 75            | 4B            | Data Type Tag (Descriptor Defined by manufacturer)                                                            | 00             | 00000000       |
|                      | 76            | 4C            | Flag                                                                                                          | 00             | 00000000       |
|                      | 77            | 4D            | Descriptor Defined by manufacturer                                                                            | 00             | 00000000       |
|                      | 78            | 4E            | Descriptor Defined by manufacturer                                                                            | 00             | 00000000       |
|                      | 79            | 4F            | Descriptor Defined by manufacturer                                                                            | 00             | 00000000       |
|                      | 80            | 50            | Descriptor Defined by manufacturer                                                                            | 00             | 00000000       |
|                      | 81            | 51            | Descriptor Defined by manufacturer                                                                            | 00             | 00000000       |
|                      | 82            | 52            | Descriptor Defined by manufacturer                                                                            | 00             | 00000000       |
|                      | 83            | 53            | Descriptor Defined by manufacturer                                                                            | 00             | 00000000       |
|                      | 84            | 54            | Descriptor Defined by manufacturer                                                                            | 00             | 00000000       |
|                      | 85            | 55            | Descriptor Defined by manufacturer                                                                            | 00             | 00000000       |
|                      | 86            | 56            | Descriptor Defined by manufacturer                                                                            | 00             | 00000000       |
|                      | 87            | 57            | Descriptor Defined by manufacturer                                                                            | 00             | 00000000       |
|                      | 88            | 58            | Descriptor Defined by manufacturer                                                                            | 00             | 00000000       |
|                      | 89            | 59            | Descriptor Defined by manufacturer                                                                            | 00             | 00000000       |
| Timing Descriptor #3 | 90            | 5A            | Flag                                                                                                          | 00             | 00000000       |
|                      | 91            | 5B            | Flag                                                                                                          | 00             | 00000000       |
|                      | 92            | 5C            | Flag                                                                                                          | 00             | 00000000       |
|                      | 93            | 5D            | Data Type Tag (Alphanumeric Data String (ASCII String))                                                       | FE             | 11111110       |
|                      | 94            | 5E            | Flag                                                                                                          | 00             | 00000000       |
|                      | 95            | 5F            | Alphanumeric Data String (ASCII String) L                                                                     | 4C             | 01001100       |
|                      | 96            | 60            | Alphanumeric Data String (ASCII String) G                                                                     | 47             | 01000111       |
|                      | 97            | 61            | Alphanumeric Data String (ASCII String)                                                                       | 20             | 00100000       |
|                      | 98            | 62            | Alphanumeric Data String (ASCII String) D                                                                     | 44             | 01000100       |
|                      | 99            | 63            | Alphanumeric Data String (ASCII String) i                                                                     | 69             | 01101001       |
|                      | 100           | 64            | Alphanumeric Data String (ASCII String) s                                                                     | 73             | 01110011       |
|                      | 101           | 65            | Alphanumeric Data String (ASCII String) p                                                                     | 70             | 01110000       |
|                      | 102           | 66            | Alphanumeric Data String (ASCII String) l                                                                     | 6C             | 01101100       |
|                      | 103           | 67            | Alphanumeric Data String (ASCII String) a                                                                     | 61             | 01100001       |
|                      | 104           | 68            | Alphanumeric Data String (ASCII String) y                                                                     | 79             | 01111001       |
|                      | 105           | 69            | Manufacturer P/N(If<13 char--> 0Ah, then terminate with ASCII code 0Ah,set remaining char = 20h)              | 0A             | 00001010       |
|                      | 106           | 6A            | Manufacturer P/N(If<13 char--> 0Ah, then terminate with ASCII code 0Ah,set remaining char = 20h)              | 20             | 00100000       |
|                      | 107           | 6B            | Manufacturer P/N(If<13 char--> 0Ah, then terminate with ASCII code 0Ah,set remaining char = 20h)              | 20             | 00100000       |

## 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 (Alphanumeric Data String (ASCII String))                         | FE             | 11111111       |
|                      | 112           | 70            | Flag                                                                            | 00             | 00000000       |
|                      | 113           | 71            | Alphanumeric Data String (ASCII String) L                                       | 4C             | 01011000       |
|                      | 114           | 72            | Alphanumeric Data String (ASCII String) P                                       | 50             | 01010000       |
|                      | 115           | 73            | Alphanumeric Data String (ASCII String) 1                                       | 31             | 00110001       |
|                      | 116           | 74            | Alphanumeric Data String (ASCII String) 4                                       | 34             | 00110100       |
|                      | 117           | 75            | Alphanumeric Data String (ASCII String) 0                                       | 30             | 00110000       |
|                      | 118           | 76            | Alphanumeric Data String (ASCII String) W                                       | 57             | 01010111       |
|                      | 119           | 77            | Alphanumeric Data String (ASCII String) F                                       | 46             | 01000110       |
|                      | 120           | 78            | Alphanumeric Data String (ASCII String) 1                                       | 48             | 01001000       |
|                      | 121           | 79            | Alphanumeric Data String (ASCII String) -                                       | 2D             | 00101101       |
|                      | 122           | 7A            | Alphanumeric Data String (ASCII String) S                                       | 53             | 01010011       |
|                      | 123           | 7B            | Alphanumeric Data String (ASCII String) P                                       | 50             | 01010000       |
| Checksum             | 124           | 7C            | Alphanumeric Data String (ASCII String) P                                       | 50             | 01010000       |
|                      | 125           | 7D            | Alphanumeric Data String (ASCII String) 1                                       | 31             | 00110001       |
|                      | 126           | 7E            | Extension flag (# of optional 128 panel ID extension blocks to follow, typ = 0) | 00             | 00000000       |
|                      | 127           | 7F            | Check Sum (The 1-byte sum of all 128 bytes in this panel ID block shall = 0)    | 18             | 00011000       |