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# Datasheet

## **BOE**

### **MV270QUM-N20**

BO-01-011

**TITLE : MV270QUM-N20****Product Specification****Ver.A****HEFEI XINSHENG OPTOELECTRONICS TECHNOLOGY**SPEC. NUMBER  
S8-65-8A-125PRODUCT GROUP  
TFT-LCD

Ver.B

ISSUE DATE  
2018.07.26PAGE  
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## REVISION HISTORY

( ) Preliminary specification

(●) Final specification

| Revision No. | Page       | Description of changes                                  | Date       | Prepared  |
|--------------|------------|---|------------|-----------|
| Ver. P0      |            | Initial Release   | 2017.07.11 | Wangdejun |
| Ver. P1      | P30<br>P31 | Update Outline Spec                                     | 2017.08.22 | Wangdejun |
| Ver. P2      | P5         | Active Area: 597.736*335.66 → 596.736*335.664           | 2017.10.09 | Wangdejun |
| Ver. O       | P7         | Add Max value of Ptotal<br>Add the unit of Vcm          | 2017.10.24 | Wangdejun |
|              | P12        | Update the LED pin order                                |            |           |
|              | P14        | Add eDP Main Link Signal Spec                           |            |           |
|              | P30        | Add Depth value   |            |           |
| Ver. O       | P12        | Pin definition update:<br>Pin6:NC→GND<br>Pin30:GND→BIST | 2018.05.21 | Li Xing   |
|              | P17        | Mini-LVDS SSC is -1.5%~1.5%.                            |            | Li Xing   |
| Ver. O       | P14        | Modify VRX-DIFFP-P spec :<br>1.38V(max)→75mV(min)       | 2018.08.24 | Li Xing   |
| Ver. O       | P9         | Add color gamut spec                                    | 2018.10.08 | Li Xing   |
| Ver. A       |            | ES 8.0 Update   | 2019.07.17 | ZhangWang |

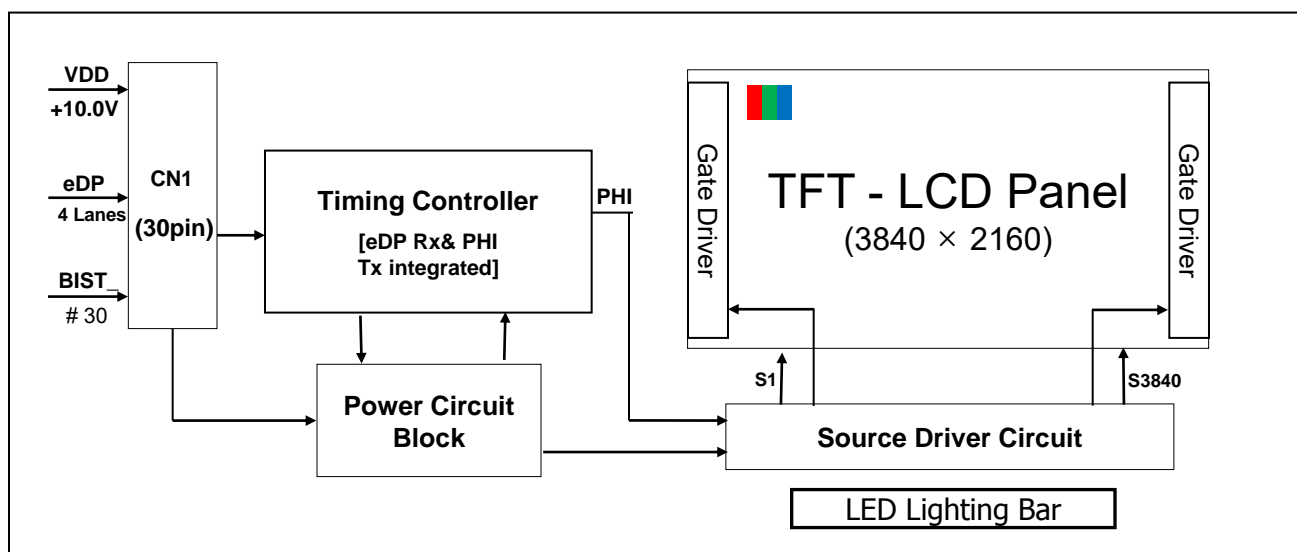
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## 1.0 GENERAL DESCRIPTION

### 1.1 Introduction

MV270QUM-N20 is a color active matrix TFT LCD module using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This module has a 27 inch diagonally measured active area with UHD resolutions (3840 horizontal by 2160 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this module can display 1.07B colors. The TFT-LCD panel used for this module is adapted for a low reflection and higher color type.



### 1.2 Features

- Reverse Type
- 4 lane eDP Interface with 5.4Gbps Link Rates
- 10bit (8bit+A-FRC) color depth, display 1.07B colors
- Incorporated edge type back-light (LED)
- Compatible with sRGB 100%
- High luminance and contrast ratio, low reflection and wide viewing angle
- RoHS/Halogen Free
- ES 8.0 compliant
- Gamma Correction
- ESD Grade: Class B

### 1.3 Application

- Desktop Type of PC & Workstation Use
- Slim-Size Display for Stand-alone Monitor
- Display Terminals for Control System
- Monitors for Process Controller

### 1.4 General Specification

The followings are general specifications at the model MV270QUM-N20.

<Table 1. General Specifications>

| Parameter           | Specification                      | Unit   | Remarks                 |
|---------------------|------------------------------------|--------|-------------------------|
| Active area         | 596.736(H) × 335.664(V)            | mm     |                         |
| Number of pixels    | 3840(H) × 2160 (V)                 | pixels |                         |
| Pixel pitch         | 0.1554(H) × 0.1554(V)              | mm     |                         |
| Pixel arrangement   | RGB Vertical stripe                |        |                         |
| Color Depth         | 1.07 B(8bit+A-FRC)                 | colors |                         |
| Display mode        | Normally Black                     |        |                         |
| Dimensional outline | 608.8(H) × 355.3 (V) × 13.4(Depth) | mm     | Detail refer to drawing |
| Weight              | 3220                               | g      |                         |
| Surface Treatment   | Haze 25%, 3H                       |        |                         |
| Back-light          | Down side, 1-LED Lighting Bar type |        |                         |

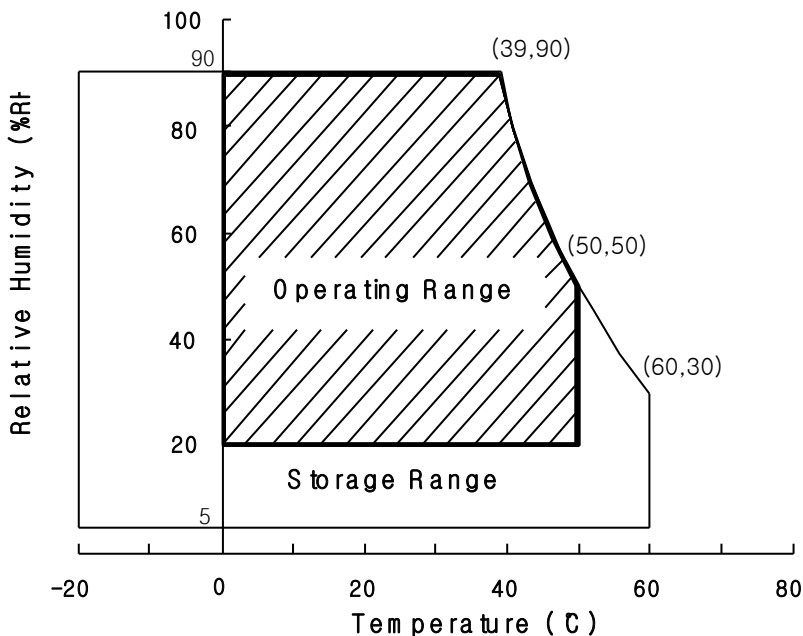
### 2.0 ABSOLUTE MAXIMUM RATINGS

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit. The operational and non-operational maximum voltage and current values are listed in Table 2.

< Table 2. Absolute Maximum Ratings > [VSS=GND=0V]

| Parameter                           | Symbol               | Min.    | Max.                 | Unit | Remarks    |
|-------------------------------------|----------------------|---------|----------------------|------|------------|
| Power Supply Voltage                | V <sub>DD</sub>      | GND-0.3 | 12                   | V    | Ta = 25 °C |
| Logic Supply Voltage                | V <sub>IN</sub>      | VSS-0.3 | V <sub>DD</sub> +0.3 | V    |            |
| Operating Temperature               | T <sub>OP</sub>      | 0       | +50                  | °C   | 1)         |
| Storage Temperature                 | T <sub>ST</sub>      | -20     | +60                  | °C   | 1)         |
| LCM Surface Temperature (Operation) | T <sub>Surface</sub> | 0       | +65                  | °C   | 2)         |

- 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.  
 2) Panel Surface Temperature should be Min. 0°C and Max. +65°C under the VDD = 10.0V, Frame rate = 60Hz, 25°C ambient Temp. no humidity control and LED string current is typical value.





## 3.0 ELECTRICAL SPECIFICATIONS

### 3.1 Electrical Specifications

< Table 3. Electrical specifications >

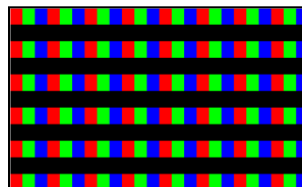
[Ta =25 ± 2 °C]

| Parameter                                       |                    | Min.  | Typ.  | Max.  | Unit | Remarks  |
|---|--------------------|-------|-------|-------|------|--|
| Power Supply Voltage                            | V <sub>DD</sub>    | 9     | 10.0  | 11    | V    | Note1  |
| Power Supply Current                            | I <sub>DD</sub>    | -     | 480   | 1150  | mA   |  |
| In-Rush Current                                 | I <sub>RUSH</sub>  | -     | 2.0   | 3.0   | A    | Note 2   |
| Permissible Input Ripple Voltage                | V <sub>RF</sub>    | -     | -     | 400   | mV   | Note1,3  |
| High Level Differential Input Threshold Voltage | V <sub>IH</sub>    | -     | -     | +100  | mV   |  |
| Low Level Differential Input Threshold Voltage  | V <sub>IL</sub>    | -100  | -     | -     | mV   |  |
| Differential input voltage                      | V <sub>ID</sub>    | 100   | -     | 600   | mV   |  |
| Differential input common mode voltage          | V <sub>cm</sub>    | 0     | -     | 2     | V    | V <sub>IH</sub> =100mV,<br>V <sub>IL</sub> =-100mV |
| Power Consumption                               | P <sub>D</sub>     | -     | 4.8   | 11.5  | W    |  |
|   | P <sub>BL</sub>    | 17.44 | 19.84 | 22.38 | W    |  |
|   | P <sub>total</sub> | -     | 24.64 | 33.88 | W    |  |

Notes : 1. The supply voltage is measured and specified at the interface connector of LCM.  
The current draw and power consumption specified is for VDD=10.0V, Frame rate=60Hz

Test Pattern of power supply current

- a) Typ : Mosaic Pattern
- b) Max : 1 line Inversion



- 2. Duration of rush current is about 2 ms and rising time of VDD is 520 μs ± 20 %
- 3. Ripple Voltage should be covered by Input voltage Spec.
- 4. Calculated value for reference (Input pins\*VPIN × IPIN) excluding inverter loss.

### 3.2 Backlight Unit

< Table 4. LED Backlight Unit >

| Parameter                                 |                 | Min.   | Typ.  | Max.  | Unit | Remarks   |
|---|-----------------|--------|-------|-------|------|-----------|
| LED Light Bar Input Voltage Per Input Pin | VPIN            | 51.3   | 55.1  | 58.9  | V    | Duty 100% |
| LED Light Bar Input Current Per Input Pin | IPIN            | 85     | 90    | 95    | mA   | Note1,2,  |
| LED Power Consumption                     | P <sub>BL</sub> | 17.44  | 19.84 | 22.38 | W    | Note 3    |
| LED Life-Time                             | -               | 30,000 | -     | -     | Hrs  | Note 4    |

LED bar consists of 76 LED packages,4 strings(parallel)19packages(serial)

Note1: There are one light bar ,and the specified current is input LED chip 100% duty current

Note2: The sense current of each input pin is 90mA

Note3:  $P_{BL}=4\text{Input pins} \times VPIN \times IPIN$

Note4: The lifetime is determined as the time at which luminance of LED become 50% of the initial brightness or not normal lighting at IPIN=90mA on condition of continuous operating at  $25 \pm 2 \text{ } ^\circ\text{C}$

< Table 5. LED Backlight Unit @Peak Brightness>

| Parameter                                 |      | Min. | Typ. | Max. | Unit | Remarks   |
|---|------|------|------|------|------|-----------|
| LED Light Bar Input Voltage Per Input Pin | VPIN | 53.2 | 57   | 60.8 | V    | Duty 100% |
| LED Light Bar Input Current Per Input Pin | IPIN | -    | 120  | -    | mA   |           |
| MDL peak brightness                       | -    | 400  | 480  | -    | nit  | Note 5    |

Note5: Peak brightness for a long time will affect the life of the product

## 4.0 OPTICAL SPECIFICATION

### 4.1 Overview

The test of Optical specifications shall be measured in a dark room (ambient luminance  $\leq 1$  lux and temperature =  $25 \pm 2^\circ\text{C}$ ) with the equipment of Luminance meter system (Goniometer system and TOPCONE PR730) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of  $\theta$  and  $\Phi$  equal to  $0^\circ$ . We refer to  $\theta_{\theta=0}$  ( $=\theta_3$ ) as the 3 o'clock direction (the "right"),  $\theta_{\theta=90}$  ( $=\theta_{12}$ ) as the 12 o'clock direction ("upward"),  $\theta_{\theta=180}$  ( $=\theta_9$ ) as the 9 o'clock direction ("left") and  $\theta_{\theta=270}$  ( $=\theta_6$ ) as the 6 o'clock direction ("bottom"). While scanning  $\theta$  and/or  $\Phi$ , the center of the measuring spot on the Display surface shall stay fixed. The measurement shall be executed after 30 minutes warm-up period. VDD shall be 5.0V +/-10% at  $25^\circ\text{C}$ . Optimum viewing angle direction is 6 o'clock.

### 4.2 Optical Specifications

[VDD = 10.0V, Frame rate = 60Hz, Clock = 533.25MHz,  $I_{BL} = 360\text{mA}$ ,  $T_a = 25 \pm 2^\circ\text{C}$ ]

< Table 6. Module Optical >

| Parameter                  |            | Symbol        | Condition  | Min.  | Typ.  | Max.  | Unit              | Remark |
|----------------------------|------------|---------------|--|-------|-------|-------|-------------------|--------|
| Viewing Angle range        | Horizontal | $\theta_3$    | CR > 10  | 85    | 89    | -     | Deg.              | Note 1 |
|                            |            | $\theta_9$    |  | 85    | 89    | -     | Deg.              |        |
|                            | Vertical   | $\theta_{12}$ |  | 85    | 89    | -     | Deg.              |        |
|                            |            | $\theta_6$    |  | 85    | 89    | -     | Deg.              |        |
| Luminance Contrast ratio   |            | CR            |  | 700   | 1000  |       |                   | Note 2 |
| Luminance of White         |            | $Y_w$         |  | 300   | 350   | -     | cd/m <sup>2</sup> | Note 3 |
| White luminance uniformity |            | $\Delta Y$    |  | 75    | 80    |       | %                 | Note 4 |
| Reproduction of color      | White      | $W_x$         | $\theta = 0^\circ$<br>(Center)<br>Normal<br>Viewing<br>Angle | 0.283 | 0.313 | 0.343 | -                 | Note 5 |
|                            |            | $W_y$         |  | 0.299 | 0.329 | 0.359 | -                 |        |
|                            | Red        | $R_x$         |  | 0.622 | 0.652 | 0.682 | -                 |        |
|                            |            | $R_y$         |  | 0.303 | 0.333 | 0.363 | -                 |        |
|                            | Green      | $G_x$         |  | 0.258 | 0.288 | 0.318 | -                 |        |
|                            |            | $G_y$         |  | 0.609 | 0.633 | 0.669 | -                 |        |
|                            | Blue       | $B_x$         |  | 0.122 | 0.150 | 0.182 | -                 |        |
|                            |            | $B_y$         |  | 0.028 | 0.060 | 0.088 | -                 |        |
| Color gamut                |            | sRGB          |  | 99    | 100   | -     | %                 |        |
| Response Time              | GTG        | $T_g$         |  |       | TBD   | TBD   | ms                | Note 6 |
| Cross Talk                 |            | CT            |  | -     | -     | 2.0   | %                 | Note 7 |

**Note :**

1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface.
2. Contrast measurements shall be made at viewing angle of  $\theta = 0^\circ$  and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state. (See FIGURE 1 shown in Appendix) Luminance Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3. Center Luminance of white is defined as the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display.
4. The White luminance uniformity on LCD surface is then expressed as :  
 $\Delta Y = ( \text{Minimum Luminance of 9points} / \text{Maximum Luminance of 9points} ) * 100$   
 (See FIGURE 2 shown in Appendix).
5. The color chromaticity coordinates specified in Table 5. shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.
6. Response time Tg is the average time required for display transition by switching the input signal as below table and is based on Frame rate fV =60Hz to optimize.  
 Each time in below table is defined as appendix Figure 3 and shall be measured by switching the input signal for “any level of gray(bright)”and “any level of gray(dark)”
7. Cross-Talk of one area of the LCD surface by another shall be measured by comparing the luminance ( $Y_A$ ) of a 25mm diameter area, with all display pixels set to a gray level, to the luminance ( $Y_B$ ) of that same area when any adjacent area is driven dark. (See FIGURE 4 shown in Appendix).

## 5.0 INTERFACE CONNECTION.

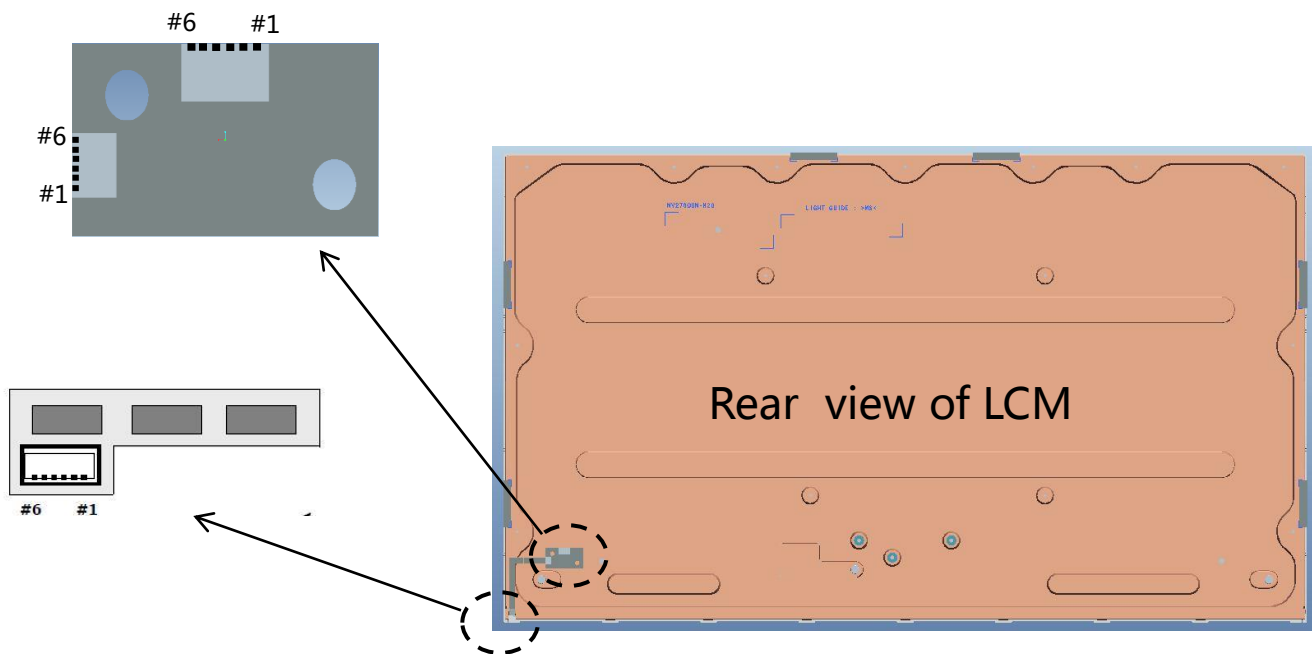
### 5.1 LED Light Bar

-LED connector : 7083K-F06N-04L manufactured by Entery.

-B/L connector : 3711K-Q06N-01R manufactured by Entery.

< Table 7. LED Light Bar >

| Pin No | Symbol | Description               |
|--------|--------|---------------------------|
| 1      | FB1    | Channel1 Current Feedback |
| 2      | FB2    | Channel2 Current Feedback |
| 3      | VLED   | LED Power Supply          |
| 4      | VLED   | LED Power Supply          |
| 5      | FB3    | Channel3 Current Feedback |
| 6      | FB4    | Channel4 Current Feedback |



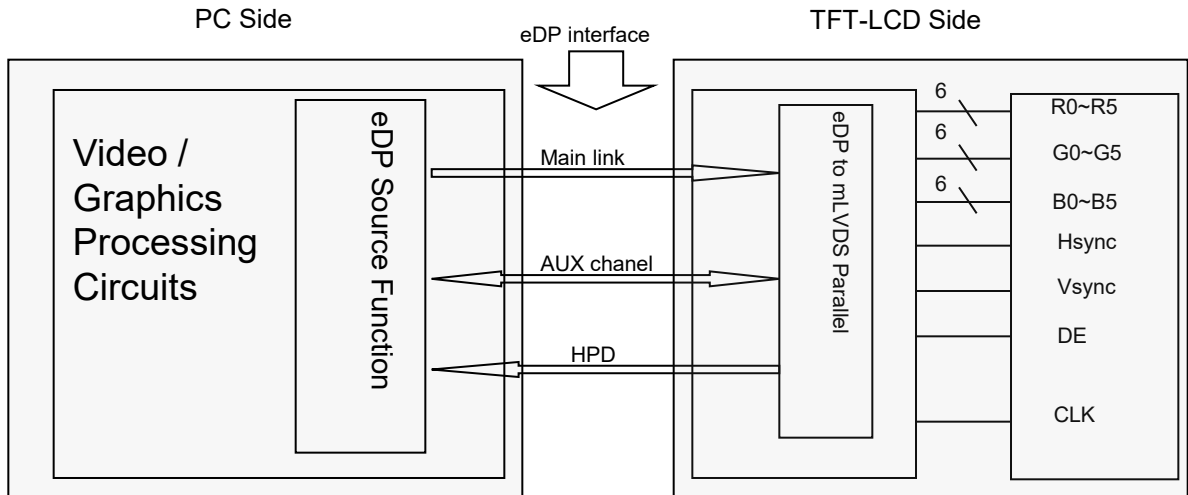
## 5.0 INTERFACE CONNECTION.

### 5.2 Electrical Interface Connection

- CN1 Module Side Connector : STM MSAK24025P30.

| Pin No | Symbol | Function                             | Remark |
|--------|--------|--------------------------------------|--------|
| 1      | VDD    | Power Supply (10.0V)                 |        |
| 2      | VDD    | Power Supply (10.0V)                 |        |
| 3      | VDD    | Power Supply (10.0V)                 |        |
| 4      | VDD    | Power Supply (10.0V)                 |        |
| 5      | VDD    | Power Supply (10.0V)                 |        |
| 6      | NC     | No connection                        |        |
| 7      | GND    | Ground                               |        |
| 8      | NC     | No connection                        |        |
| 9      | NC     | No connection                        |        |
| 10     | GND    | Ground                               |        |
| 11     | HPD    | Hot Plug Detection Signal            |        |
| 12     | GND    | Ground                               |        |
| 13     | DAUXN  | Negative Signal for Auxiliary Chanel |        |
| 14     | DAUXP  | Positive Signal for Auxiliary Chanel |        |
| 15     | GND    | Ground                               |        |
| 16     | DRX0P  | Positive Signal For eDP Lane0        |        |
| 17     | DRX0N  | Negative Signal For eDP Lane0        |        |
| 18     | GND    | Ground                               |        |
| 19     | DRX1P  | Positive Signal For eDP Lane1        |        |
| 20     | DRX1N  | Negative Signal For eDP Lane1        |        |
| 21     | GND    | Ground                               |        |
| 22     | DRX2P  | Positive Signal For eDP Lane2        |        |
| 23     | DRX2N  | Negative Signal For eDP Lane2        |        |
| 24     | GND    | Ground                               |        |
| 25     | DRX3P  | Positive Signal For eDP Lane3        |        |
| 26     | DRX3N  | Negative Signal For eDP Lane3        |        |
| 27     | GND    | Ground                               |        |
| 28     | GND    | Ground                               |        |
| 29     | NC     | No connection                        |        |
| 30     | GND    | Ground                               | BIST   |

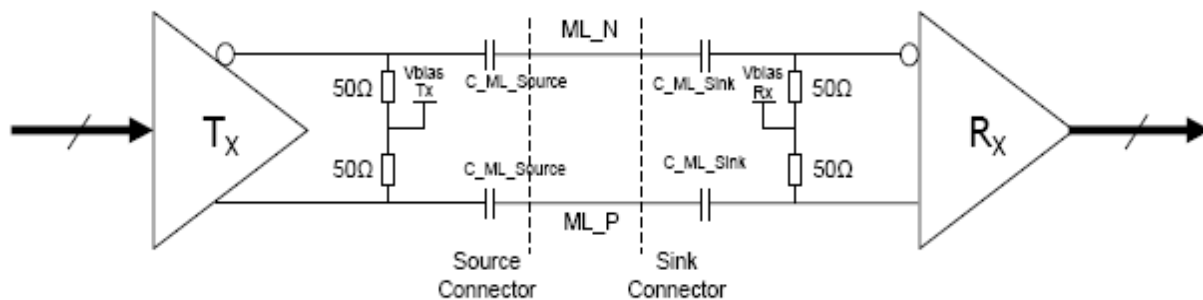
### 5.3.eDP Interface



Note. Transmitter : Parade DP501 or equivalent.

Transmitter is not contained in Module.

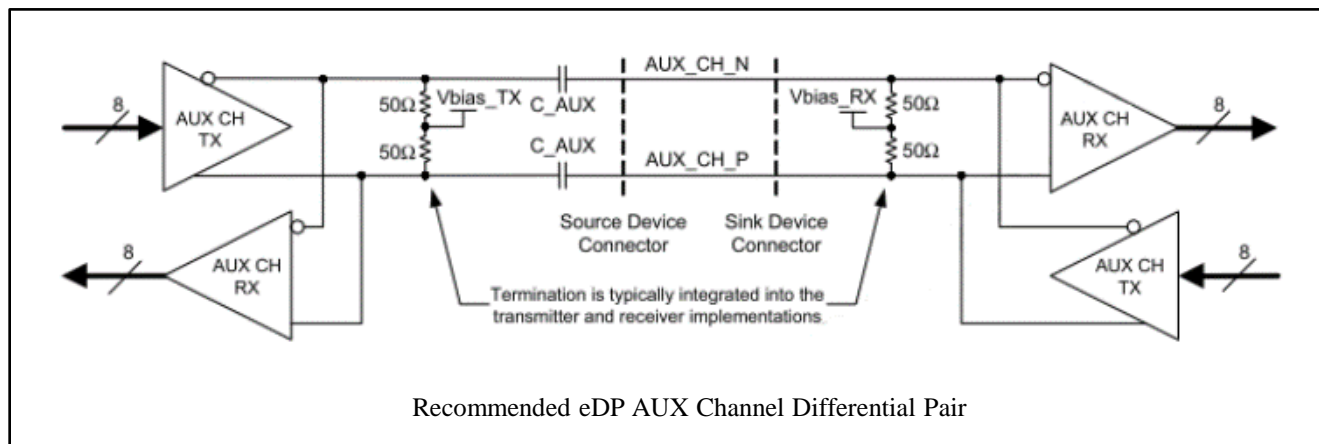
### 5.3.1 eDP Main Link Signal



| Parameter  | Symbol                    | Min  | Typ | Max           | Unit | Notes       |
|--|---------------------------|------|-----|---------------|------|-------------|
| Unit Interval for high bit rate (5.4Gbps/lane)           | UI_HBR2                   | -    | 185 | -             | ps   |             |
| Link Clock Down Spreading                                | Amplitude                 | 0    | -   | 0.5           | %    |             |
|  | Frequency                 | 30   |     | 33            | kHz  |             |
| Differential peak-to-peak voltage at Sink side connector | $V_{RX-DIFFP-P}$          | -    | -   | 1.38          | V    |             |
| EYE width at Sink side connector                         | $T_{RX-EYE-CONN}$         | 0.38 | -   | -             | UI   |             |
| Lane-to-Lane skew  | $L_{RX-SKEW-INTER\_PAIR}$ | -    | -   | 4UI+<br>500ps |      |             |
| Lane intra-pair skew                                     | $L_{RX-SKEW-INTER\_PAIR}$ | -    | -   | 50            | ps   |             |
| AC Coupling Capacitor                                    | $C_{SOURCE\_ML}$          | 75   |     | 200           | nF   | Source side |



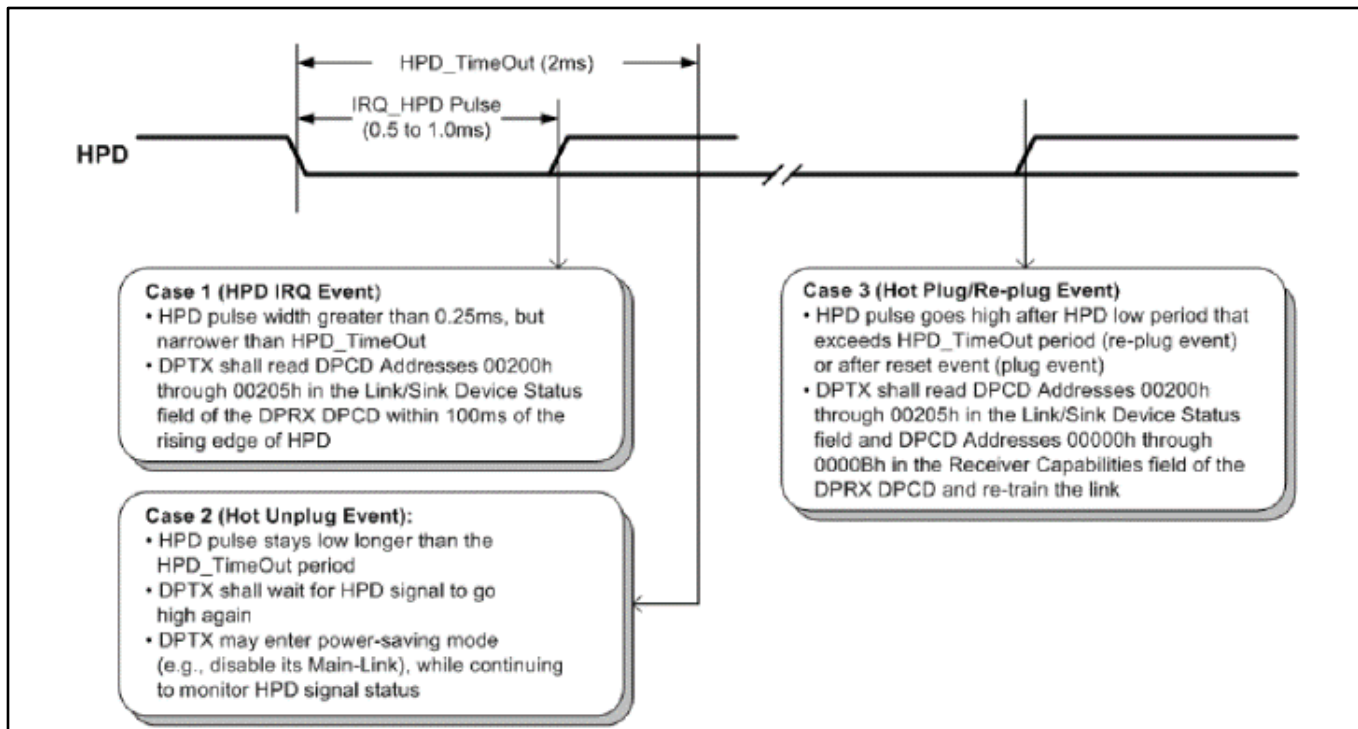
### 5.4 eDP AUX Channel Signal



Recommended eDP AUX Channel Differential Pair

| Parameter  | Symbol            | Min  | Typ | Max  | Unit | Notes |
|--|-------------------|------|-----|------|------|-------|
| AUX Unit Interval  | UI                | 0.4  | -   | 0.6  | us   |       |
| AUX Jitter at Tx IC Package Pins                           | $T_{jitter}$      | -    | -   | 0.04 | UI   |       |
| AUX Jitter at Rx IC Package Pins                           |                   | -    | -   | 0.05 | UI   |       |
| AUX Peak-to-peak voltage at Connector Pins of Receiving    | $V_{AUX-DIFFP-P}$ | 0.27 | -   | 1.36 | V    |       |
| AUX Peak-to-peak voltage at Connector Pins of Transmitting |                   | 0.29 | -   | 1.38 | V    |       |
| AUX EYE Width at Connector Pins of Tx and Rx               |                   | 0.98 | -   | -    | UI   |       |
| AUX DC common mode voltage                                 | $V_{AUX-CM\_RX}$  | 0    | -   | 1.2  | V    |       |
|  | $V_{AUX-CM\_TX}$  | 0    | -   | 1.2  | V    |       |
| AUX AC Coupling Capacitor                                  | $C_{SOURCE-AUX}$  | 75   | -   | 200  | nF   |       |

## 5.5 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      |

### 6.0 SIGNAL TIMING SPECIFICATION

6.1 The MV270QUM-N20 is operated by the DE only.

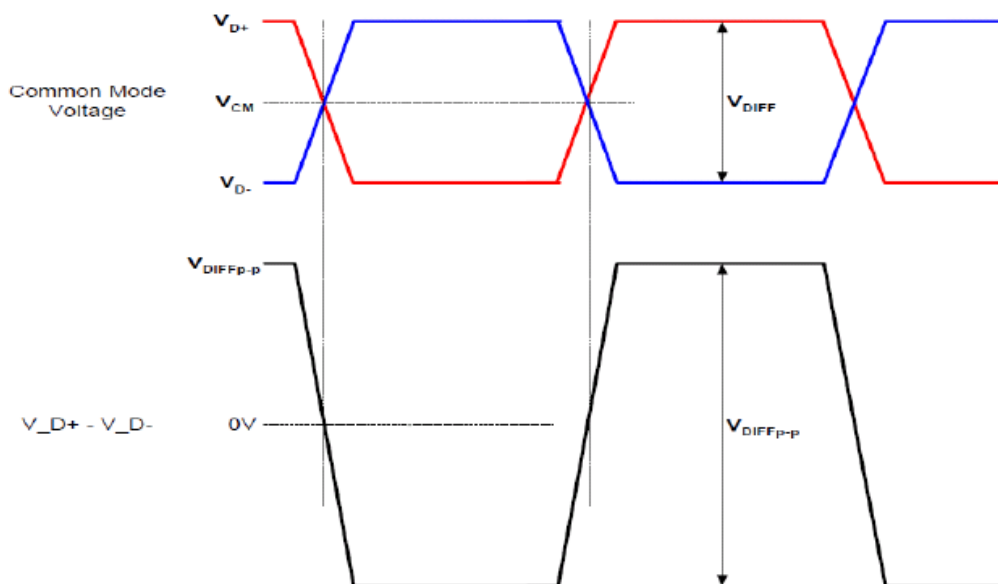
| Item         |                        | Symbol | Min  | Typ  | Max  | Unit | Note                   |
|--------------|------------------------|--------|------|------|------|------|------------------------|
| DCLK         | Period                 | tCLK   | 1.8  | 1.9  | 2.2  | ns   |                        |
|              | Frequency              | fCLK   | 444  | 533  | 551  | MHz  |                        |
| Hsync        | Period                 | tHP    | 3950 | 4000 | 4088 | tCLK |                        |
|              | Width-Active           | tWH    | 18   | 28   | 36   |      |                        |
| Vsync        | Period                 | tVP    | 2213 | 2222 | 2290 | tHP  |                        |
|              | Frequency              | fv     | 50   | 60   | 62   | HZ   | Adaptive Sync :40~60Hz |
|              | Width-Active           | tWV    | 6    | 8    | 12   | tHP  |                        |
| Data Eenlabe | Horizontal valld       | tHV    | 3840 | 3840 | 3840 | tCLK |                        |
|              | Horizontal Back Porch  | tHBP   | 32   | 54   | 112  |      |                        |
|              | Horizontal Front Porch | tHFP   | 60   | 78   | 100  |      |                        |
|              | Horizontal Blank       | -      | 110  | 160  | 248  |      | tWH+tHBP+tHFP          |
|              | Vertial valld          | tVV    | 2160 | 2160 | 2160 | tHP  |                        |
|              | Vertial Back Porch     | tVBP   | 5    | 7    | 18   |      |                        |
|              | Vertial Front Porch    | tVFP   | 42   | 47   | 100  |      |                        |
|              | Vertial Blank          | -      | 53   | 62   | 130  |      | twv+tvBP +tvFP         |

### 6.2 eDP Rx Interface Timing Parameter

The specification of the eDP Rx interface timing parameter is shown in Table 8.

<Table 8. eDP Rx Interface Timing Specification>

| Item  | Symbol                  | Min | Typ | Max  | Unit     | Remark |
|---|-------------------------|-----|-----|------|----------|--------|
| Spread spectrum clock   | ssc                     | 0   | -   | 0.5  | %        |        |
| Differential peak-to-peak input voltage at package pins                         | VRX-DIFFp-p             | -   | -   | 1.38 | V        |        |
| Rx input DC common mode voltage   | VRX_DC_CM               | -   | GND | -    | V        |        |
| Differential termination resistance   | RRX-DIFF                | 80  | -   | 100  | $\Omega$ |        |
| Single-ended termination resistance   | RRX-SE                  | 40  | -   | 60   | $\Omega$ |        |
| Rx short circuit current limit  | IRX_SHORT               | -   | -   | 20   | mA       |        |
| Intra-pair skew at Rx package pins (HBR)<br>RX intra-pair skew tolerance at HBR | LRX_SKEW_<br>INTRA_PAIR | -   | -   | 150  | ps       |        |



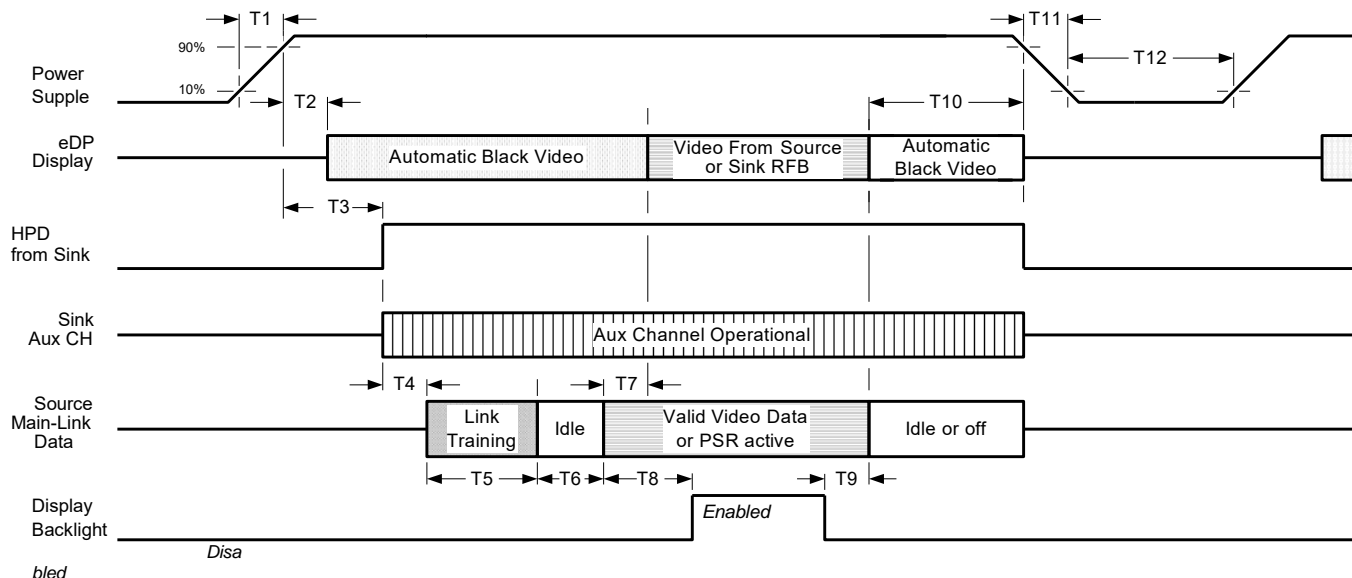
\*  $V_{diff} = (RXz+) - (RXz-), \dots, (RXCLK+) - (RXCLK-)$

## 7.0 INPUT SIGNALS, BASIC DISPLAY COLORS & GRAY SCALE OF COLORS

| Color & Gray Scale  |          | RED DATA |    |    |    |    |    |    |    | GREEN DATA |    |    |    |    |    |    |    | BLUE DATA |    |    |    |    |    |    |    |
|---------------------|----------|----------|----|----|----|----|----|----|----|------------|----|----|----|----|----|----|----|-----------|----|----|----|----|----|----|----|
|                     |          | 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 Colors        | Black    | 0        | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 0  | 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  |
|                     | 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  |
|                     | 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  |
|                     | 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  |
|                     | 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  |
| Gray Scale of RED   | 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        | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0          | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0  | 0  | 0  |    |
|                     | Darker   | 0        | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0  | 0  | 0  |    |
|                     | △        | ↑        |    |    |    |    |    |    |    | ↑          |    |    |    |    |    |    |    | ↑         |    |    |    |    |    |    |    |
|                     | ▽        | ↓        |    |    |    |    |    |    |    | ↓          |    |    |    |    |    |    |    | ↓         |    |    |    |    |    |    |    |
|                     | Brighter | 1        | 1  | 1  | 1  | 1  | 1  | 0  | 1  | 0          | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | ▽        | 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      | 1        | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0          | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| Gray Scale of GREEN | 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        | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0         | 0  | 0  | 0  | 0  | 0  | 0  |    |
|                     | Darker   | 0        | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0         | 0  | 0  | 0  | 0  | 0  | 0  |    |
|                     | △        | ↑        |    |    |    |    |    |    |    | ↑          |    |    |    |    |    |    |    | ↑         |    |    |    |    |    |    |    |
|                     | ▽        | ↓        |    |    |    |    |    |    |    | ↓          |    |    |    |    |    |    |    | ↓         |    |    |    |    |    |    |    |
|                     | Brighter | 0        | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1          | 1  | 1  | 1  | 1  | 1  | 0  | 1  | 0         | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | ▽        | 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    | 0        | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1          | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0         | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| Gray Scale of BLUE  | 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        | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0  | 0  | 1  |    |
|                     | Darker   | 0        | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0  | 0  | 1  |    |
|                     | △        | ↑        |    |    |    |    |    |    |    | ↑          |    |    |    |    |    |    |    | ↑         |    |    |    |    |    |    |    |
|                     | ▽        | ↓        |    |    |    |    |    |    |    | ↓          |    |    |    |    |    |    |    | ↓         |    |    |    |    |    |    |    |
|                     | Brighter | 0        | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1         | 1  | 1  | 1  | 1  | 1  | 0  | 1  |
|                     | ▽        | 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     | 0        | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1         | 1  | 1  | 1  | 1  | 1  | 1  | 1  |
| Gray Scale of WHITE | 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        | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0          | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0         | 0  | 0  | 0  | 0  | 0  | 1  |    |
|                     | Darker   | 0        | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0         | 0  | 0  | 0  | 0  | 0  | 1  |    |
|                     | △        | ↑        |    |    |    |    |    |    |    | ↑          |    |    |    |    |    |    |    | ↑         |    |    |    |    |    |    |    |
|                     | ▽        | ↓        |    |    |    |    |    |    |    | ↓          |    |    |    |    |    |    |    | ↓         |    |    |    |    |    |    |    |
|                     | Brighter | 1        | 1  | 1  | 1  | 1  | 1  | 0  | 1  | 1          | 1  | 1  | 1  | 1  | 1  | 0  | 1  | 1         | 1  | 1  | 1  | 1  | 1  | 0  | 1  |
|                     | ▽        | 1        | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 1          | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 1         | 1  | 1  | 1  | 1  | 1  | 1  | 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  |

## 8.0 POWER SEQUENCE

To prevent a latch-up or DC operation of the LCD module, the power on/off sequence shall be as shown in below



| Timing Parameter | Description   | Required By | Limits |       | Notes  |
|------------------|---|-------------|--------|-------|--|
|                  |   |             | Min    | Max   |  |
| T1               | Power rail rise time, 10% to 90%                            | Source      | 0.5ms  | 10ms  |  |
| T2               | Delay from Power Supply to automatic Black Video generation | Sink        | 0ms    | 200ms | Automatic Black Video generation prevents display noise until valid video data is received from the Source |
| T3               | Delay from Power Supply to HPD high                         | Sink        | 0ms    | 200ms | Sink AUX Channel must be operational upon HPD high   |
| T4               | Delay from HPD high to link training initialization         | Source      | -      | -     | Allows for the Source to read Link capability and initialize   |
| T5               | Link training duration                                      | Source      | -      | -     | Dependant on the Source link training protocol   |
| T6               | Link idle   | Source      | -      | -     | Min accounts for required BS-Idle Pattern. Max allows for Source frame synchronization.                    |

## 8.0 POWER SEQUENCE

|     |   |        |       |       |   |
|-----|---|--------|-------|-------|---|
| T7  | Delay from valid video data from Source to video on display | Sink   | 0ms   | 50ms  | Max value allows for the Sink to validate video data and timing. At the end of T7, the Sink will indicate the detection of valid video data by setting the SINK_STATUS bit to logic 1 (DPCD 00205h, bit 0), and the Sink will no longer generate automatic Black Video. |
| T8  | Delay from valid video data from Source to backlight enable | Source | -     | -     | The Source must assure display video is stable  |
| T9  | Delay from backlight disable to end of valid video data     | Source | -     | -     | The Source must assure backlight is no longer illuminated. At the end of T9, the Sink will indicate the detection of no valid video data by setting the SINK_STATUS bit to logic 0 (DPCD 00205h, bit 0), and the Sink will automatically display Black Video.           |
| T10 | Delay from end of valid video data from Source to power off | Source | 0ms   | 500ms |   |
| T12 | Power off time  | Source | 500ms | -     |   |

### Notes:

1. When the power supply VDD is 0V, keep the level of input signals on the low or keep high impedance.
2. Do not keep the interface signal high impedance when power is on.
3. Back Light must be turn on after power for logic and interface signal are valid.

## 9.0 MECHANICAL CHARACTERISTICS

### 9.1 Dimensional Requirements

FIGURE 6 (located in Appendix) shows mechanical outlines for the model MV270QUM-N10. Other parameters are shown in Table 9.

<Table 9. Dimensional Parameters>

| Parameter           | Specification                                 | Unit   |
|---------------------|---|--------|
| Dimensional outline | 608.8(H) × 355.3(V) × 13.4(Depth)             | mm     |
| Weight              | 3220  | gram   |
| Active area         | 596.736(H) × 335.664 (V)                      | mm     |
| Pixel pitch         | 0.1554 (H) × 0.1554(V)                        | mm     |
| Number of pixels    | 3840(H) × 2160 (V) (1 pixel = R + G + B dots) | pixels |
| Back-light          | Down side, 1-LED Lighting Bar type            |        |

### 9.2 Anti-Glare and Polarizer Hardness.

The surface of the LCD has an anti-glare coating to minimize reflection and a coating to reduce scratching.



## 10.0 RELIABILITY TEST

The Reliability test items and its conditions are shown in below.

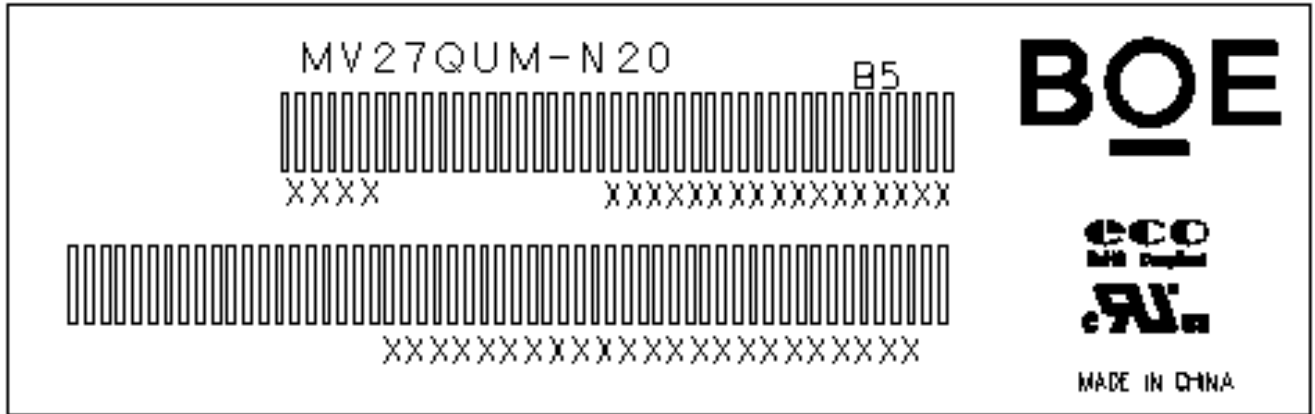
<Table 10 Reliability Test Parameters >

| No | Test Items                                      | Conditions                              |                                 |
|----|---|---|---------------------------------|
| 1  | High temperature storage test                   | Ta = 60 °C, 240 hrs                     |                                 |
| 2  | Low temperature storage test                    | Ta = -20 °C, 240 hrs                    |                                 |
| 3  | High temperature & high humidity operation test | Ta = 50 °C, 80%RH, 240hrs               |                                 |
| 4  | High temperature operation test                 | Ta = 50 °C, 240hrs                      |                                 |
| 5  | Low temperature operation test                  | Ta = 0°C, 240hrs                        |                                 |
| 6  | Thermal shock                                   | Ta = -20 °C ↔ 60 °C (0.5 hr), 100 cycle |                                 |
| 7  | Packing Vibration test (non-operating)          | Frequency                               | Random, 1 ~ 200 Hz, 30 min/Axis |
|    |   | Gravity / AMP                           | 1.2 Grms                        |
|    |   | Period                                  | X, Y, Z 30 min                  |
| 8  | Shock test (non-operating)                      | Gravity                                 | 50G                             |
|    |   | Pulse width                             | 11msec, Half sine wave          |
|    |   | Direction                               | ± X, ± Y, ± Z Once for each     |
| 9  | Electro-static discharge test                   | Air : 150 pF, 330Ω, 15 KV               | Contact : 150 pF, 330Ω, 8 KV    |

## 11.0 HANDLING & CAUTIONS

- (1) Cautions when taking out the module
  - Pick the pouch only, when taking out module from a shipping package.
- (2) Cautions for handling the module
  - As the electrostatic discharges may break the LCD module, handle the LCD module with care. Peel a protection sheet off from the LCD panel surface as slowly as possible.
  - As the LCD panel and back - light element are made from fragile glass material, impulse and pressure to the LCD module should be avoided.
  - As the surface of the polarizer is very soft and easily scratched, use a soft dry cloth without chemicals for cleaning.
  - Do not pull the interface connector in or out while the LCD module is operating.
  - Put the module display side down on a flat horizontal plane.
  - Handle connectors and cables with care.
- (3) Cautions for the operation
  - When the module is operating, do not lose CLK, ENAB signals. If any one of these signals is lost, the LCD panel would be damaged.
  - Obey the supply voltage sequence. If wrong sequence is applied, the module would be damaged.
- (4) Cautions for the atmosphere
  - Dew drop atmosphere should be avoided.
  - Do not store and/or operate the LCD module in a high temperature and/or humidity atmosphere. Storage in an electro-conductive polymer packing pouch and under relatively low temperature atmosphere is recommended.
- (5) Cautions for the module characteristics
  - Do not apply fixed pattern data signal to the LCD module at product aging.
  - Applying fixed pattern for a long time may cause image sticking.
- (6) Other cautions
  - Do not disassemble and/or re-assemble LCD module.
  - Do not re-adjust variable resistor or switch etc.
  - When returning the module for repair or etc., Please pack the module not to be broken. We recommend to use the original shipping packages.

## 12.0 PRODUCT SERIAL NUMBER



### MDL ID Naming Rule:

| Digit       | 1               | 2 | 3     | 4    | 5    | 6 | 7     | 8  | 9 | 10 | 11 | 12                     | 13 | 14 | 15 | 16 | 17 |
|-------------|-----------------|---|-------|------|------|---|-------|--|---|----|----|------------------------|----|----|----|----|----|
| Code        | S               | L | S     | 5    | 1    | 2 | 3     | 5  | 9 | 4  | 2  | 0                      | 0  | 0  | 1  | D  | B  |
| Description | Model Code /GBN |   | Grade | Line | Year |   | Month | Model Extension Code (Last 4 Digits Of FGCD) |   |    |    | Serial No 00001-ZZZZZZ |    |    |    |    |    |

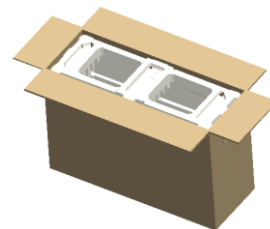
## 13.0 Packing

### 13.1 Packing Order

1. Put Bottom into the box



2. Put Protection Film on Panel , Put MDL in PE Bag  
-Put MDL in groove in order, keeping Panel side the same with arrow , Put 1ea Cover on top of Bottom  
-Capacity:8pcs Panel/Inner Box



4. Put the Pallet into Truck with 2 rows and 2 layers  
-Capacity:42EA Pallet/Truck, 4032pcs Panel/Truck

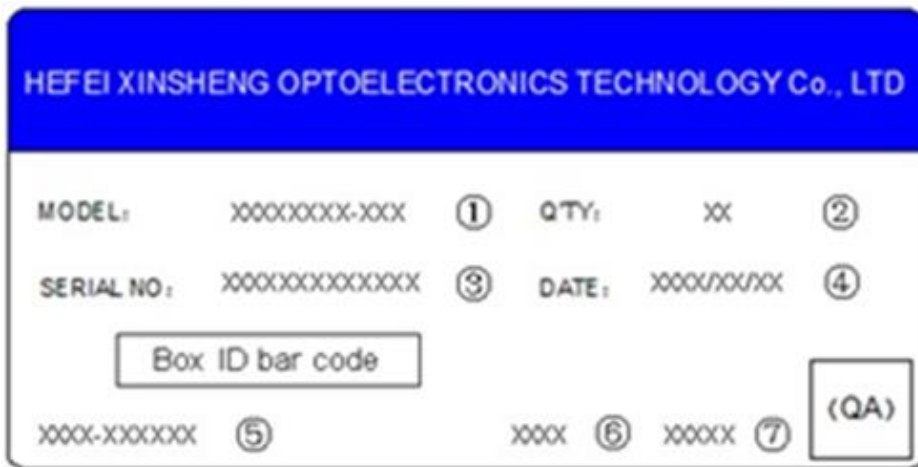
3. Put 6EA Box on surface of Pallet, pile 2 layers in total.  
-Use 8 Paper Corner to protect, Strapping tapes to fix and wrap film to package the Boxes  
-Capacity:6 EA Box/layer;2 layers in total;96pcs/ Pallet

### 13.2 Packing Note

- Box Dimension : 694mm(L) × 299mm(W) × 462mm(H)
- Package Quantity in one Box : 8pcs

### 13.3 Box label

- Label Size : 110 mm (L) × 55mm (W)
- Contents  
Model : MV270QUM-N20  
Q`ty : Module \* Q`ty in one box  
Serial No. : Box Serial No.  
Date : Packing Date

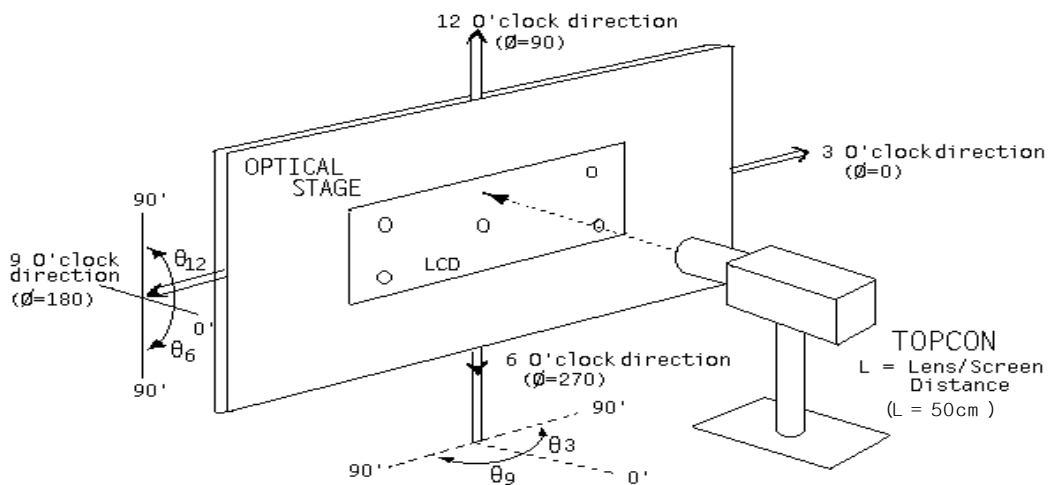


The printed part follow as:

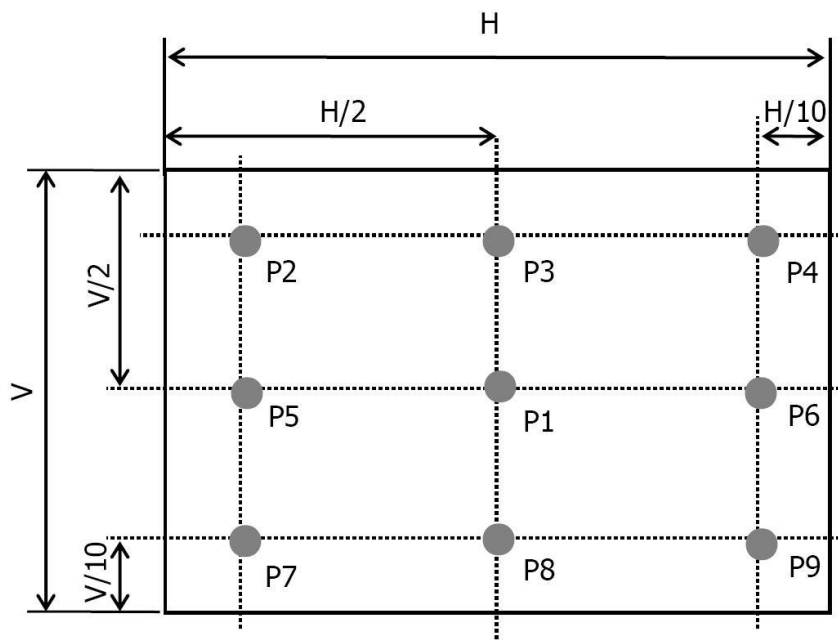
1. FG-CODE
2. Quantity
3. Box ID
4. Packing Date
4. Customer Code
8. FG-CODE(the last four number)
7. Vendor Code

## 14.0 APPENDIX

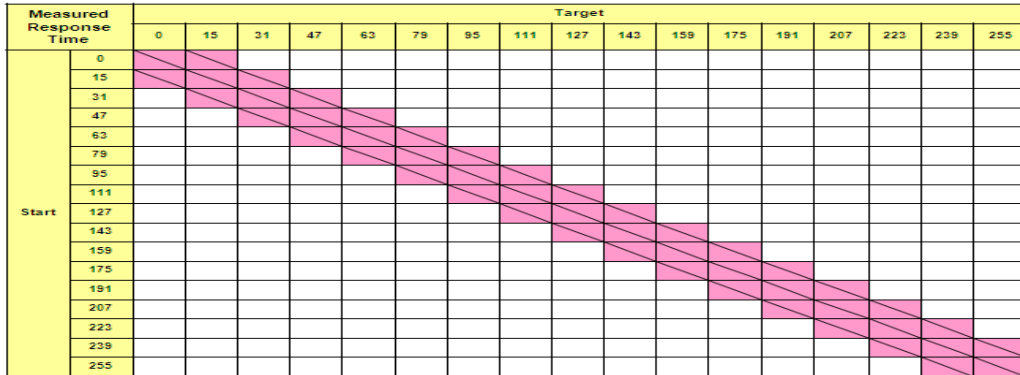
**Figure 1. Measurement Set Up**



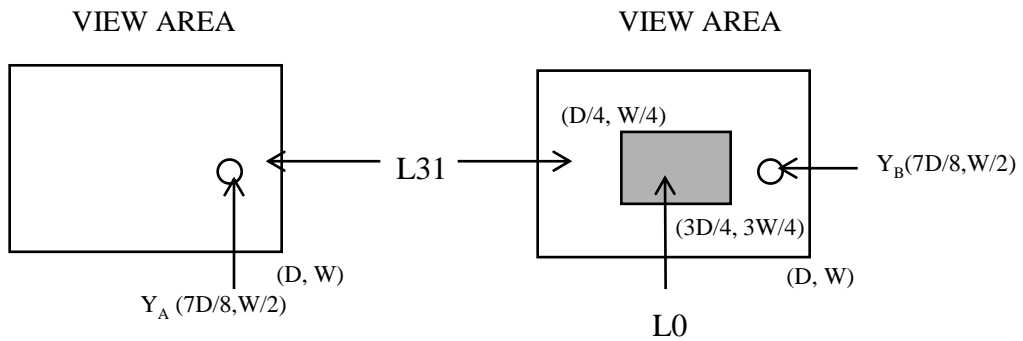
**Figure 2. White Luminance and Uniformity Measurement Locations (9 points)**



**Figure 3. Response Time Testing**



**Figure 4. Cross Modulation Test Description**



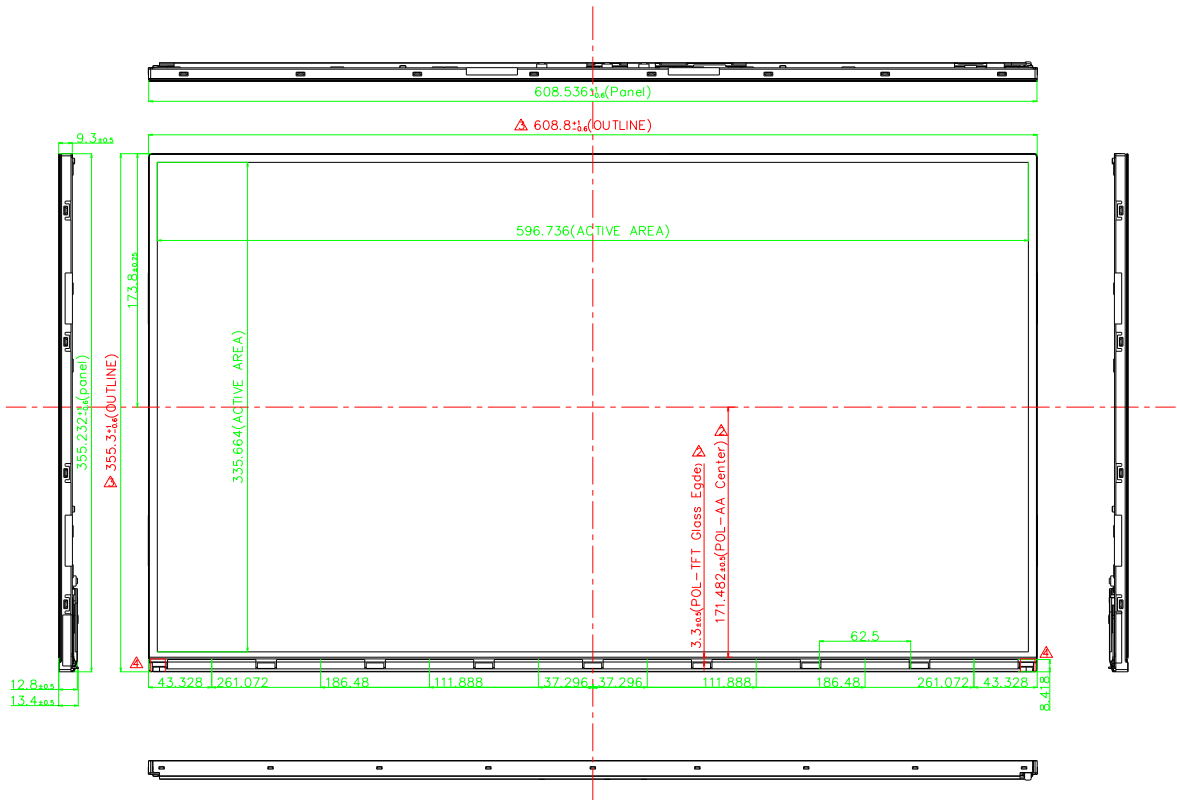
$$\text{Cross-Talk (\%)} = \left| \frac{Y_B - Y_A}{Y_A} \right| \times 100$$

Where:  $Y_A$  = Initial luminance of measured area (cd/m<sup>2</sup>)

$Y_B$  = Subsequent luminance of measured area (cd/m<sup>2</sup>)

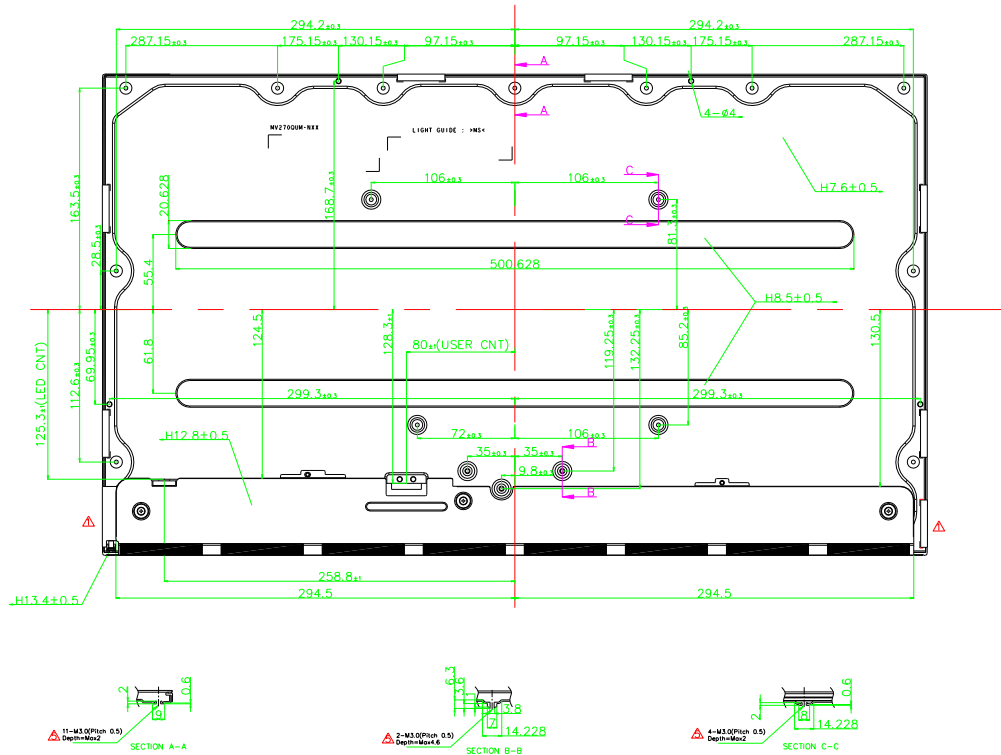
The location measured will be exactly the same in both patterns

**Figure 5. TFT-LCD Module Outline Dimensions (Front & Side view)**



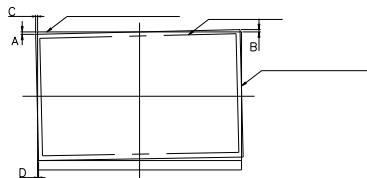


**Figure 6. TFT-LCD Module Outline Dimensions (Rear view)**



**NOTE:**

1. I/F CONNECTOR SPECIFICATION  
IS100-L300-C23 (UJU) or EQUIVALENT
2. LED CONNECTOR SPECIFICATION  
3711K-Q06N-01R(Entery) or EQUIVALENT
3. TORQUE of USER HOLE: 3.0~4.0kgf-cm
4. Tilt and partial disposition tolerance of display area as following
  - (1) Y-direction:  $-0.45 \leq A \leq 0.45, -0.45 \leq B \leq 0.45$
  - (2) X-direction:  $-0.45 \leq C \leq 0.45, -0.45 \leq D \leq 0.45$



5. Unspecified tolerance to be  $\pm 0.5$
6. The LCM warp is less than 1.0 on the surface plate
7. The COF area is weak and sensitive, so please don't press the COF area

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