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**EV101WXM-N80 Product Specification Rev.P1**

HEFEI BOE OPTOELECTRONICS TECHNOLOGY

|                      |                                                      |     |            |                 |
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| REVISION HISTORY |         |                                          |            |          |
|------------------|---------|------------------------------------------|------------|----------|
| REV.             | ECN No. | DESCRIPTION OF CHANGES                   | DATE       | PREPARED |
| P0               |         | Initial Release                          | 2018-03-20 |          |
| P1               |         | Update optical & electronical characters | 2018-07-09 |          |
|                  |         |                                          |            |          |
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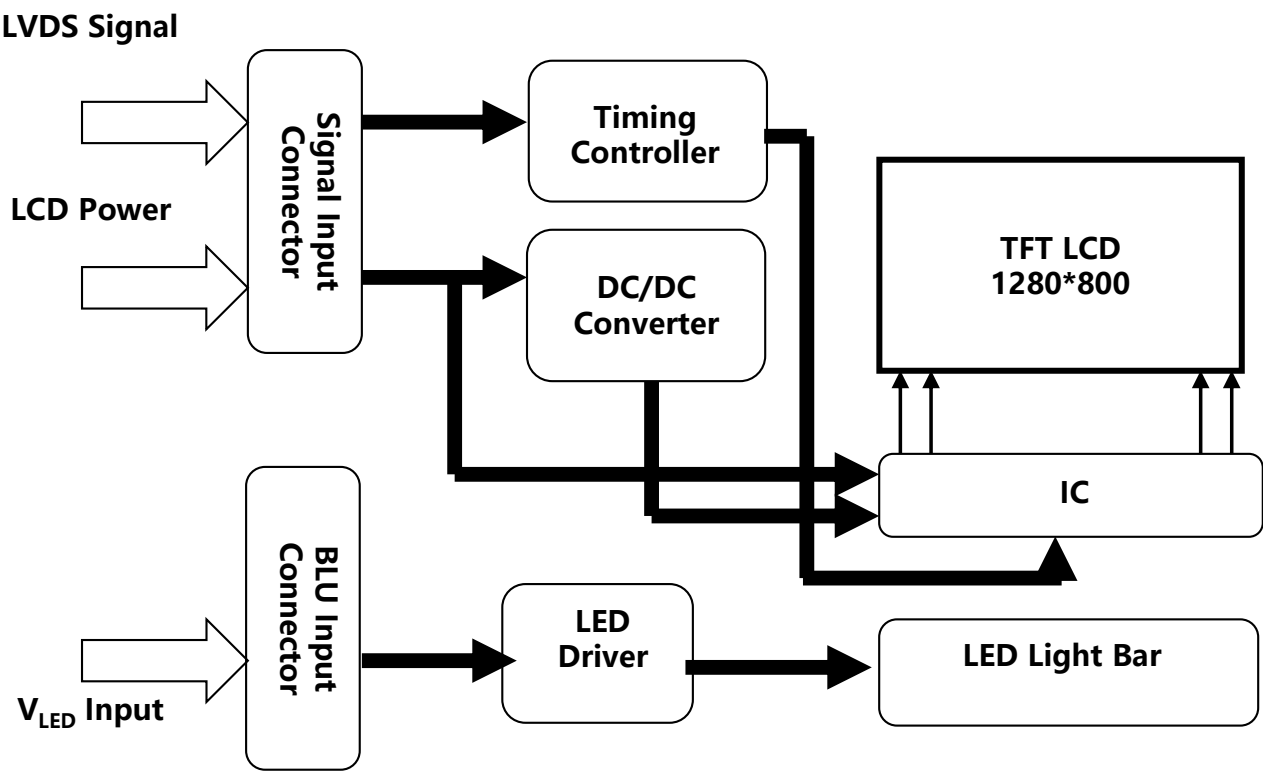
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| 3.0 | Electrical Specifications |      |
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# 1.0 GENERAL DESCRIPTION

## 1.1 Introduction

EV101WXM-N80 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 10.1 inch diagonally measured active area with WXGA resolutions (1280 horizontal by 800 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this module can display 16.2M colors.



## 1.2 Features

- 1 Port LVDS Interface Input;
- 6+2bit color depth, display 16.2M colors
- Thin and light weight
- High luminance and contrast ratio, low reflection and wide viewing angle
- RoHS compliant

|                      |                                                      |     |            |                 |
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### 1.3 Application

- Medical Monitor

### 1.4 General Specification

The followings are general specifications at the EV101WXM-N80-3850

**<Table 1. LCD Module Specifications>**

| Parameter             | Specification                                               | Unit   | Remarks |
|-----------------------|-------------------------------------------------------------|--------|---------|
| Active Area           | 216.96 (H) × 135.6(V)                                       | mm     |         |
| Number Of Pixels      | 1280(H)×800(V)                                              | pixels |         |
| Pixel Pitch           | 56.5(H) × RGB × 169.5(V)                                    | um     |         |
| Pixel Arrangement     | Pixels RGB stripe arrangement                               |        |         |
| Display Mode          | Normally Black                                              |        |         |
| Display Colors        | 16.2M                                                       | colors | 6+ FRC  |
| Surface Treatment     | Normal                                                      |        |         |
| Contrast Ratio        | 900:1(typ); 700:1(min)                                      |        |         |
| Viewing Angle(CR>10)  | 85/85/85/85(typ);<br>80/80/80/80(min)                       | deg.   |         |
| Response Time         | 30(typ); 40(max)                                            | ms     |         |
| Color Gamut           | 48%(typ); 43%(min)                                          |        |         |
| Brightness            | 400 nit(typ); 340 nit(min)                                  | cd/m2  |         |
| Brightness Uniformity | 9 point: min 65% (Before RA)<br>9 point: min 60% (After RA) |        |         |
| Power Consumption     | 3.4(typ.)                                                   | watt   |         |
| Outline Dimension     | 233.2(H)*152.9(V)*6.70(typ)(LCM)                            | mm     |         |
| Weight                | 505                                                         | gram   |         |

|                  |                                       |     |            |         |
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## 2.0 ABSOLUTE MAXIMUM RATINGS

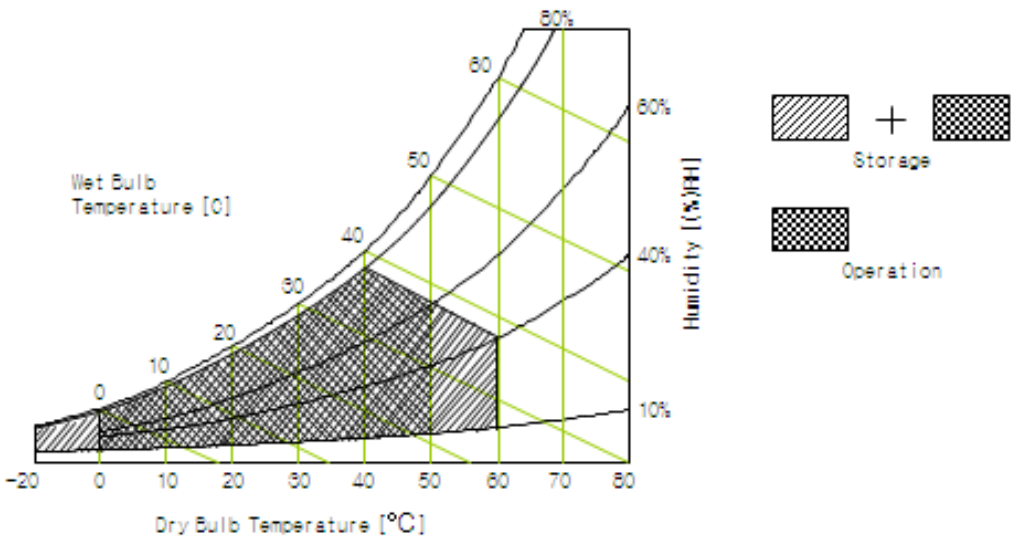
The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit. The operational and non-operational maximum voltage and current values are listed in Table 2.

< Table 2. Absolute Maximum Ratings>

| Parameter             |            | Symbol          | Min.    | Max. | Unit | Remarks    |
|-----------------------|------------|-----------------|---------|------|------|------------|
| Power Supply          | LCD Module | VDD             | VSS-0.3 | 4.0  | V    | Ta = 25 °C |
|                       | BLU        | VLED            | VSS-0.3 | 13.2 | V    |            |
|                       |            | PWM             | VSS-0.3 | 6    | V    |            |
|                       |            | BRTC            | VSS-0.3 | 6    | V    |            |
| Operating Temperature |            | T <sub>OP</sub> | -20     | +70  | °C   | Note 1     |
| Storage Temperature   |            | T <sub>ST</sub> | -30     | +80  | °C   |            |

Note :

1. These range above is maximum value not the actual operating temperature . Actual Operating temperature is no more than 40°C and temperature refers to the Panel surface temperature ;
2. Temperature and relative humidity range are shown in the figure below. Wet bulb temperature should be 39 °C max. and no condensation of water.





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### 3.2 Back-Light Unit

Table 4. LED Driver Electrical Specifications > [Ta =25±2 °C]

| Parameter           |            | Symbol           | Values |      |      | Unit | Notes  |
|---------------------|------------|------------------|--------|------|------|------|--------|
|                     |            |                  | Min.   | Typ. | Max. |      |        |
| BLU Supply Voltage  |            | VDD              | 11.5   | 12   | 12.5 | V    |        |
| BLU Forward Current |            | I <sub>VDD</sub> | -      | 220  | 280  | mA   |        |
| Power Consumption   |            | PLED             | -      | 2.6  | -    | W    | Note 1 |
| BLU on/off Level    |            | BLU on           | 3.0    | 3.3  | 3.4  | V    |        |
|                     |            | BLU off          | 0      |      | 0.5  | V    |        |
| PWMIN               | Level      | High Level       | 3.0    | 3.3  | 3.6  | V    |        |
|                     |            | Low Level        | 0      |      | 0.5  | V    |        |
|                     | Frequency  | F <sub>PWM</sub> | 180    | 200  | 10K  | Hz   |        |
|                     | Duty Ratio | D <sub>PWM</sub> | 5      | -    | 100  | %    |        |
| LED Quantity        |            | QLED             | -      | 32   | -    | EA   |        |
| LED Life Time       |            | TLED             | 30000  | -    | -    | Hrs  | Note 2 |

- Notes:
1. PLED = VDD ×I<sub>VDD</sub> (Without LED converter transfer efficiency)
  2. The life time of LED, 30,000Hrs, is determined as the time at which luminance of the LED is 50% compared to that of initial value at the typical LED current on condition of continuous operating at 25 ± 2°C.

|                      |                                                      |     |            |                 |
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### 3.3 INPUT TERMINAL PIN ASSIGNMENT

This LCD employs two interface connections, a 20 pin ZIF connector is used for the LCD module electronics interface and a 9 pin ZIF connector is used for the internal backlight system.

#### 3.3.1 Pin assignment for LCD module

Connector : DF19G-20P-1H (56) or equivalent

< Table 5. Pin Assignment for LCD Module Connector >

| Pin No. | Symbol | Description  | Remark |
|---------|--------|--------------|--------|
| 1       | VCC    | Power supply |        |
| 2       | VCC    | Power supply |        |
| 3       | N.C.   | Not connect  |        |
| 4       | GND    | Ground       |        |
| 5       | D0-    | Pixel data   |        |
| 6       | D0+    | Pixel data   |        |
| 7       | GND    | Ground       |        |
| 8       | D1-    | Pixel data   |        |
| 9       | D1+    | Pixel data   |        |
| 10      | GND    | Ground       |        |
| 11      | D2-    | Pixel data   |        |
| 12      | D2+    | Pixel data   |        |
| 13      | GND    | Ground       |        |
| 14      | CLK-   | CLK data     |        |
| 15      | CLK+   | CLK data     |        |
| 16      | GND    | Ground       |        |
| 17      | SDA    | Not connect  | NC     |
| 18      | SCL    | Not connect  | NC     |
| 19      | D3-    | Pixel data   |        |
| 20      | D3+    | Pixel data   |        |

|                      |                                                      |     |            |                  |
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**3.4.2 Pin assignment for LED Bar**  
Connector : PF040-B09B-C09 (STM) or equivalent

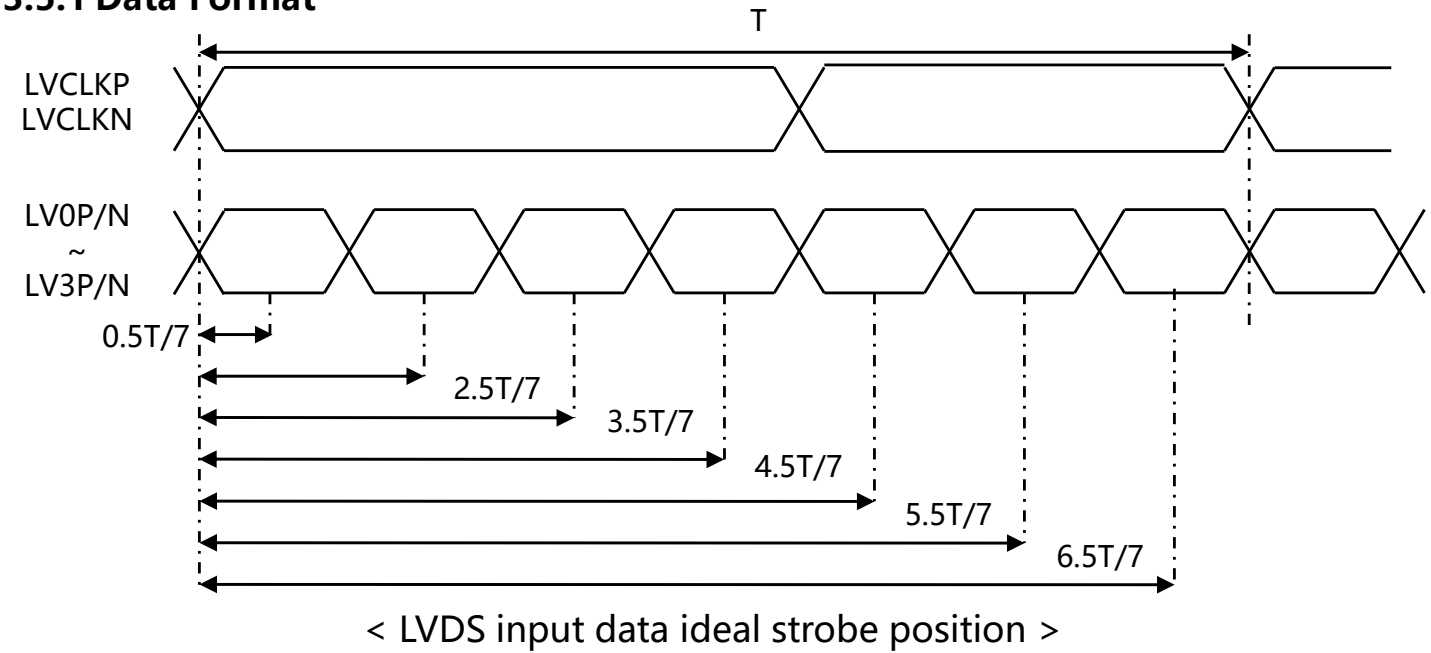
< Table 6. Pin assignment for LED Bar >

| Pin No | Symbol | Description              | Remarks                                            |
|--------|--------|--------------------------|----------------------------------------------------|
| 1      | PWM    | Luminance control        |                                                    |
| 2      | BRTC   | Backlight ON/OFF control | High or Open : Backlight ON<br>Low : Backlight OFF |
| 3      | GND    | Ground                   |                                                    |
| 4      | GND    | Ground                   |                                                    |
| 5      | VDD    | Power supply             |                                                    |
| 6      | VDD    | Power supply             |                                                    |

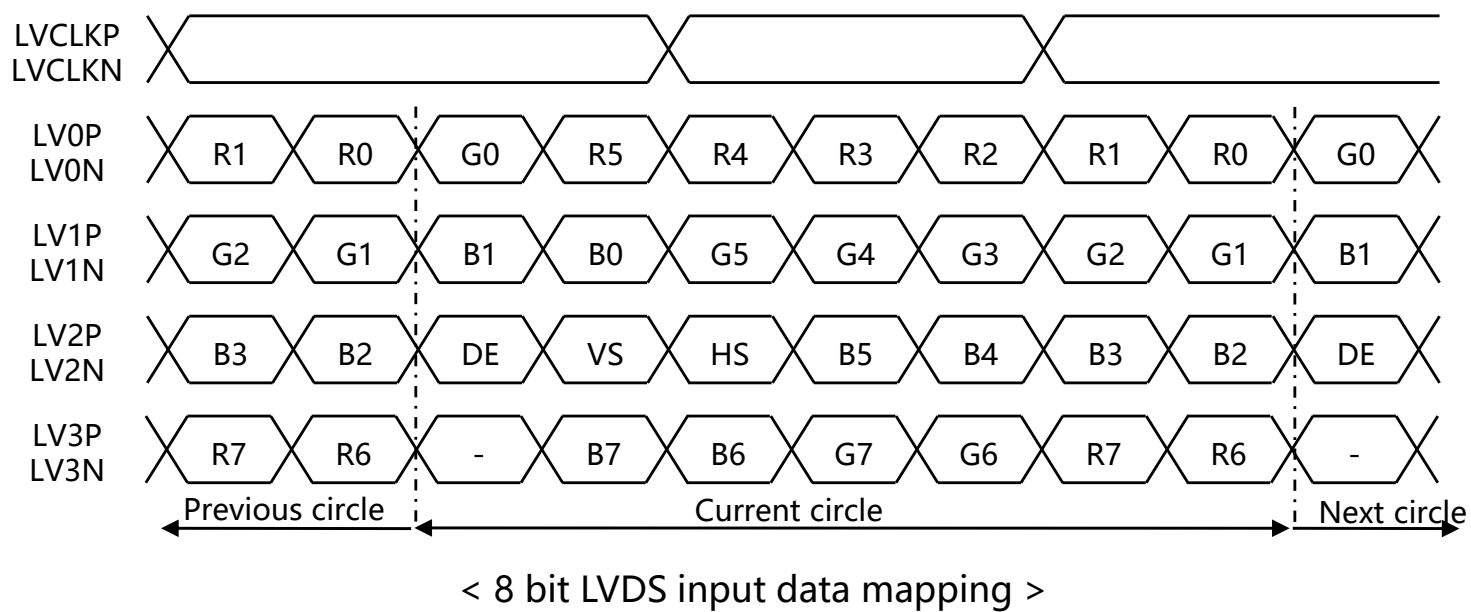
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|------------------|---------------------------------------|-----|------------|----------|
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### 3.5 LVDS Interface Characteristic

#### 3.5.1 Data Format

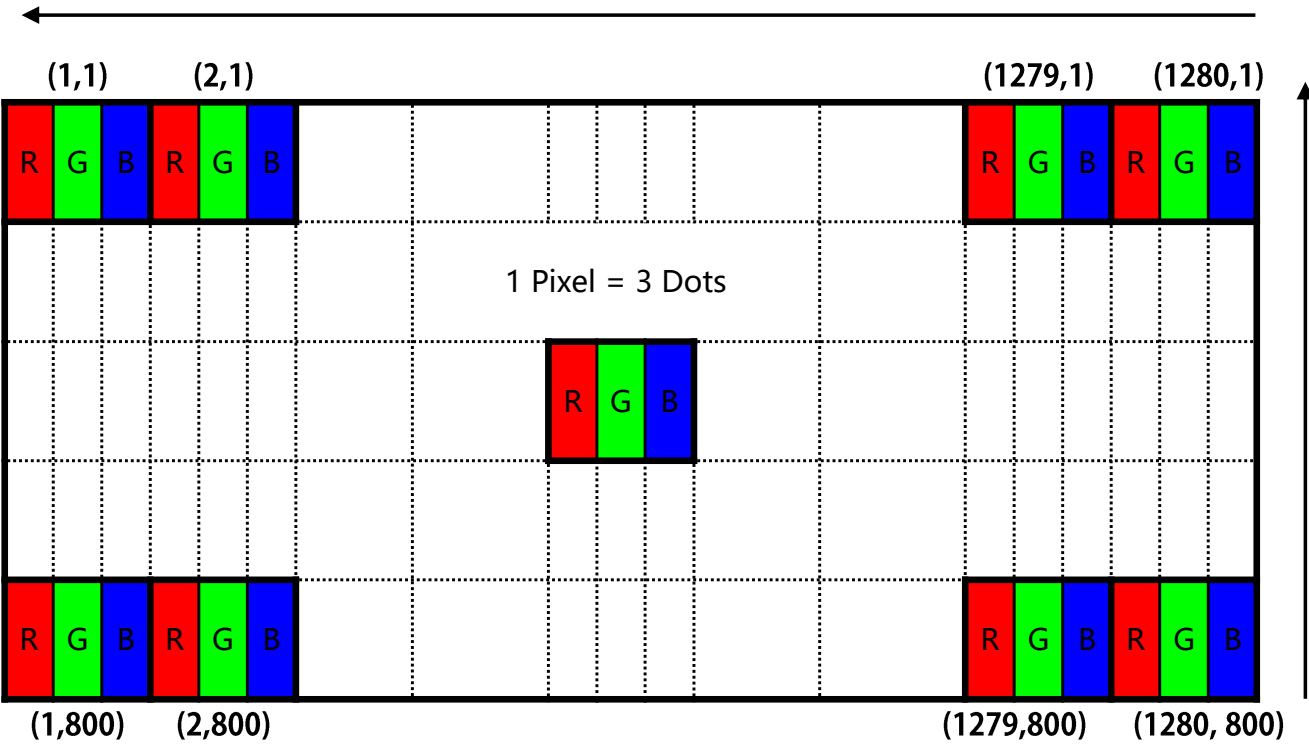


#### 3.5.2 LVDS input data mapping



|                      |                                                      |     |            |                  |
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3.5.3 Pixel Format



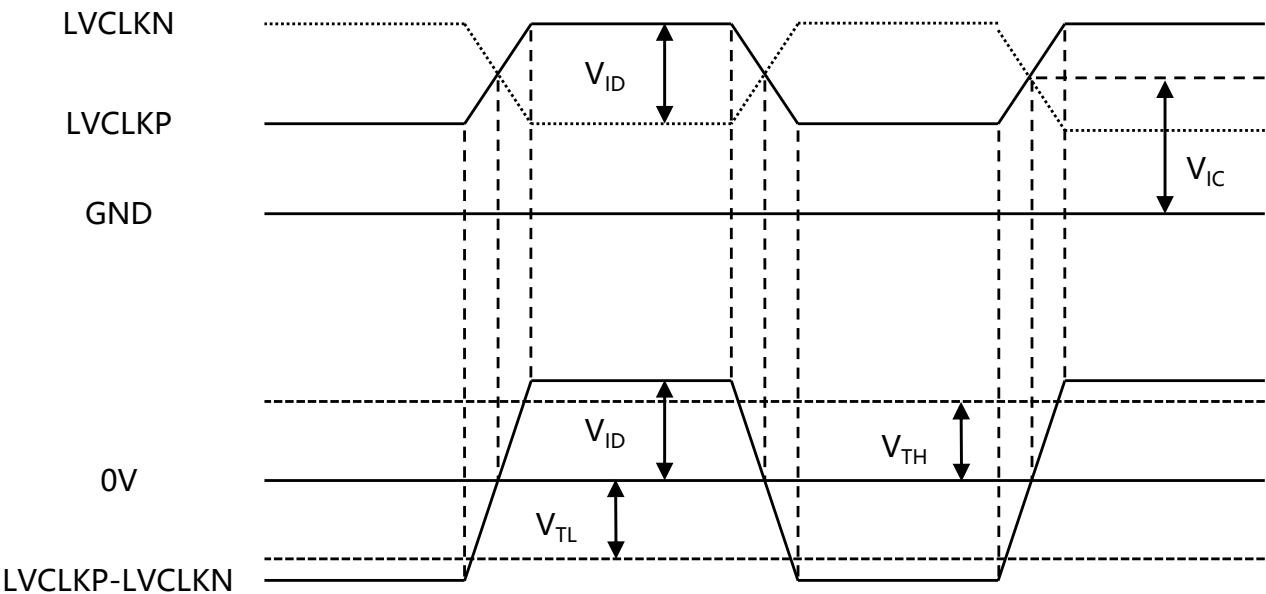
Display Position of Input Data (V-H)

|                  |                                       |     |            |          |
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### 3.5.2 DC Specification

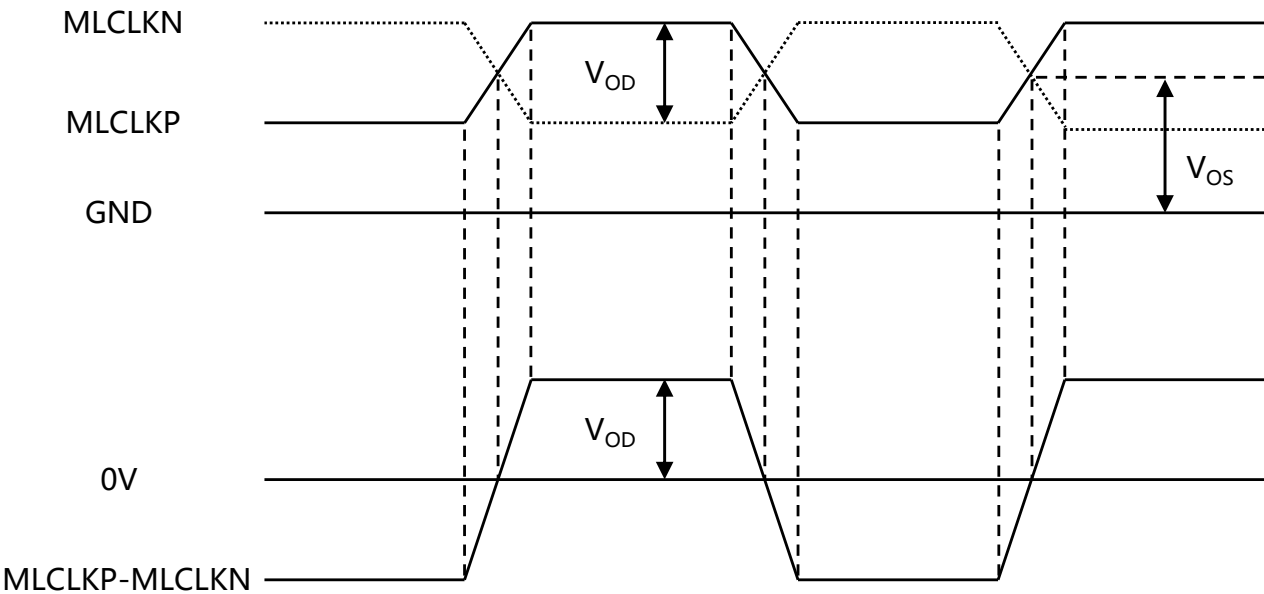
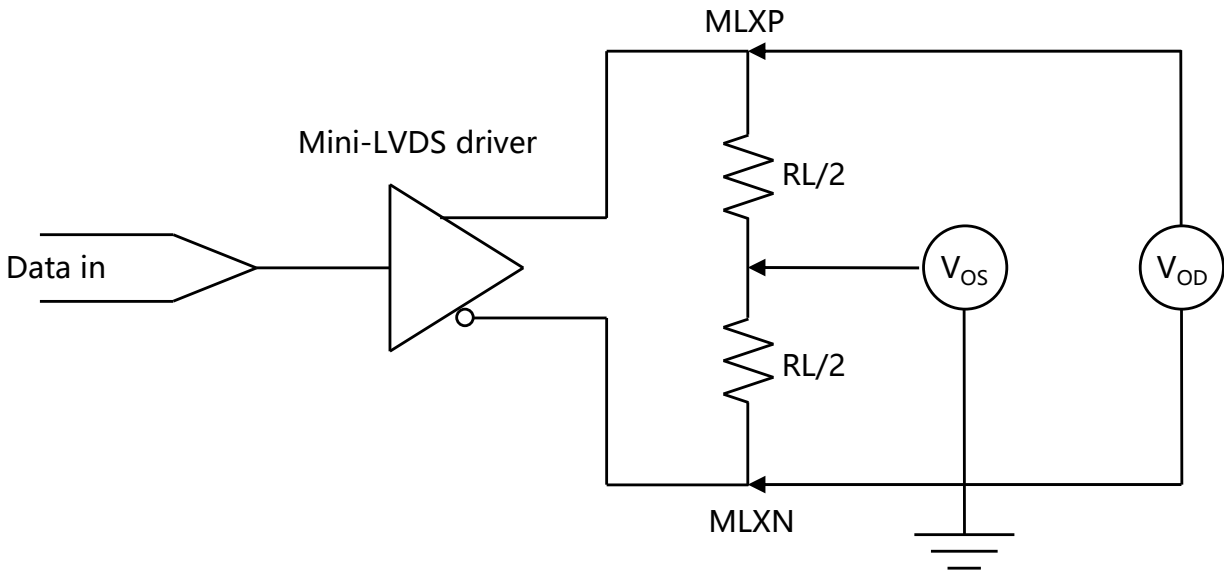
< Table 7. DC Specification >

| Parameter                             | Symbol          | Min  | Typ  | Max  | Unit | Condition                                   |
|---------------------------------------|-----------------|------|------|------|------|---------------------------------------------|
| Supply current                        | I <sub>DD</sub> | -    | 100  | -    | mA   |                                             |
| LVDS DC specifications                |                 |      |      |      |      |                                             |
| Differential input high threshold     | V <sub>TH</sub> | -    | -    | +100 | mV   | V <sub>IC</sub> =1.2V                       |
| Differential input low threshold      | V <sub>TL</sub> | -100 | -    | -    | mV   |                                             |
| LVDS common mode voltage              | V <sub>IC</sub> | 0.9  | -    | 1.4  | V    |                                             |
| LVDS swing voltage                    | V <sub>ID</sub> | ±100 | -    | ±600 | mV   |                                             |
| Mini-LVDS DC specifications           |                 |      |      |      |      |                                             |
| Output differential voltage range     | V <sub>OD</sub> | ±170 | ±200 | ±230 | mV   | PI=14KΩ<br>RL=100Ω<br>(T <sub>A</sub> =25℃) |
| Output differential voltage deviation |                 | 0.64 | -    | 0.96 | mV   |                                             |
| Output offset voltage range           | V <sub>OS</sub> | 1.1  | 1.2  | 1.3  | V    |                                             |
| Output offset voltage deviation       |                 | 1.1  | 1.2  | 1.3  | V    |                                             |



< LVDS V<sub>ID</sub> and V<sub>IC</sub> definition >

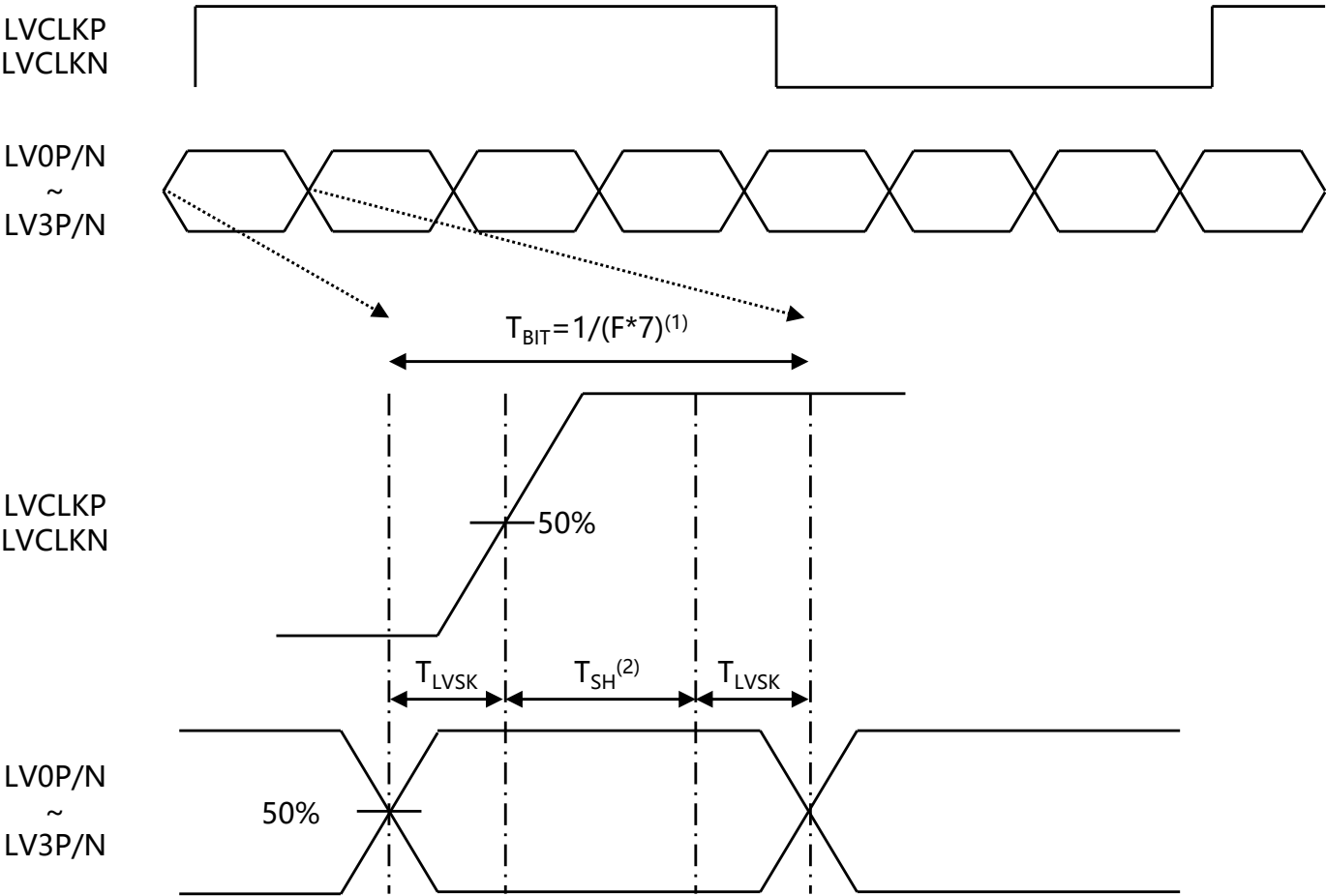
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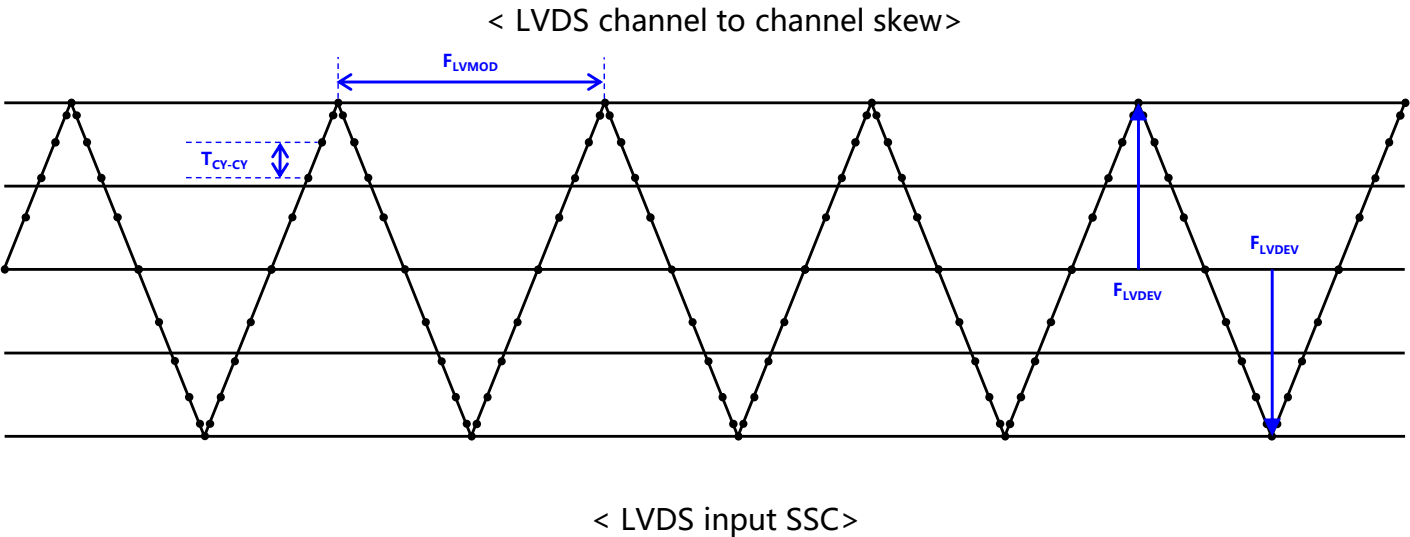
< Mini-LVDS  $V_{OD}$  and  $V_{OS}$  definition >

|                  |                                       |     |            |          |
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3.5.3 AC Specification



**Note:**  
(1)  $T_{BIT}$ : Data period  
(2) Internal CLK sampling data window



|                      |                                                      |     |            |                  |
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**< Table 8. AC Specification >**

| Description                                           | Symbol      | Condition                                      | Min  | Typ | Max  | Unit |
|-------------------------------------------------------|-------------|------------------------------------------------|------|-----|------|------|
| LVDS Input frequency                                  | F           | -                                              | 68   | -   | 74   | MHz  |
| LVDS channel to channel skew                          | $T_{LVSK}$  | F=65MHz<br>$V_{IC}=1.2V$<br>$V_{ID}=\pm 200mV$ | -600 | -   | +600 | ps   |
| Modulating frequency of input clock during SSC        | $F_{LVMOD}$ | F=85MHz<br>$V_{IC}=1.2V$<br>$V_{ID}=\pm 200mV$ | 10   | -   | 300  | KHz  |
| Maximum deviation of input clock frequency during SSC | $F_{LVDEV}$ |                                                | -3   | -   | +3   | %    |
| Cycle to cycle jitter                                 | $T_{CY-CY}$ |                                                | -    | -   | 200  | ps   |

|                  |                                       |     |            |          |
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### 3.6 Interface timing Parameter

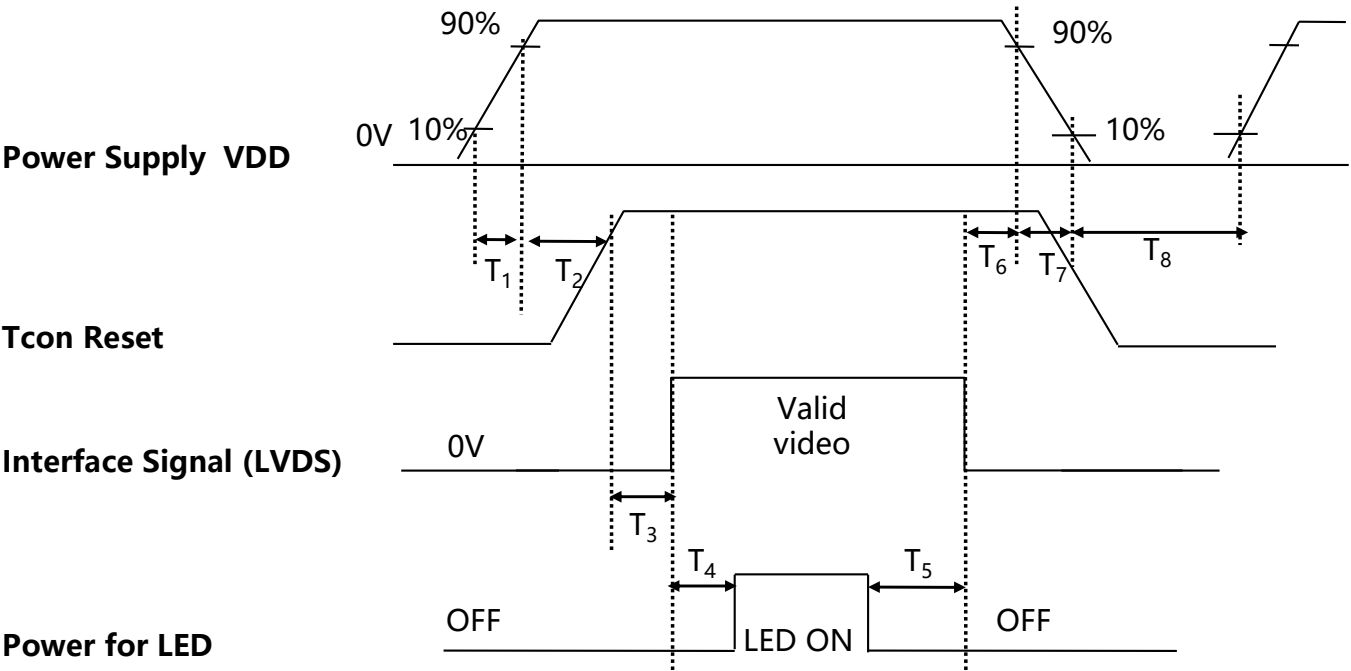
< Table 9. Timing Parameter >

| Item   |             |                        | Symbol | min    | typ  | max    | UNIT             |
|--------|-------------|------------------------|--------|--------|------|--------|------------------|
| LCD    | Frame Rate  |                        | -      | 59     | 60   | 61     | Hz               |
|        | Pixels Rate |                        | -      | 69.922 | 71   | 72.293 | MHz              |
| Timing | Horizontal  | Horizontal total time  | tHP    | -      | 1440 | -      | t <sub>CLK</sub> |
|        |             | Horizontal Active time | tHadr  | 1280   |      |        | t <sub>CLK</sub> |
|        |             | Horizontal Back Porch  | tHBP   |        | 80   |        | t <sub>CLK</sub> |
|        |             | Horizontal Front Porch | tHFP   |        | 48   |        | t <sub>CLK</sub> |
|        | Vertical    | Vertical total time    | tvp    |        | 823  |        | t <sub>H</sub>   |
|        |             | Vertical Active time   | tVadr  | 800    |      |        | t <sub>H</sub>   |
|        |             | Vertical Back Porch    | tVBP   |        | 14   |        | t <sub>H</sub>   |
|        |             | Vertical Front Porch   | tVFP   |        | 3    |        | t <sub>H</sub>   |
| Lane   |             |                        |        | -      | 1    | -      | Lane             |



3.8 Power Sequence

[Ta =25±2 °C]



< Table 10. Sequence Table >

| Parameter | Value |      |      | Units |
|-----------|-------|------|------|-------|
|           | Min.  | Typ. | Max. |       |
| T1        | 0.1   | -    | 8    | (ms)  |
| T2        | -     | 8    | -    | (ms)  |
| T3        | 0     | -    | -    | (ms)  |
| T4        | 300   | -    | -    | (ms)  |
| T5        | 300   | -    | -    | (ms)  |
| T6        | 0     | -    | 50   | (ms)  |
| T7        | 0     | -    | 10   | (ms)  |
| T8        | 500   | -    | -    | (ms)  |

|                      |                                                      |     |            |                  |
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## 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 TOPCON BM-5) 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  $0^\circ$ . The center of the measuring spot on the Display surface shall stay fixed.

The backlight should be operating for 30 minutes prior to measurement.

### 4.2 Optical Specifications

<Table 11. Optical Specifications >

| Parameter                  |            | Symbol | Condition | Min.  | Typ.  | Max.  | Unit  | Remark                  |
|----------------------------|------------|--------|-----------|-------|-------|-------|-------|-------------------------|
| Viewing Angle Range        | Horizontal | Θ3     | CR>10     | 80    | 85    | -     | Deg.  | Note1                   |
|                            |            | Θ9     |           | 80    | 85    | -     | Deg.  |                         |
|                            | Vertical   | Θ12    |           | 80    | 85    | -     | Deg.  |                         |
|                            |            | Θ6     |           | 80    | 85    | -     | Deg.  |                         |
| Contrast ratio             |            | CR     | Θ = 0°    | 700   | 900   | -     |       | Note2                   |
| Transmittance              |            | Tr     |           | 4.6   | 5.4   | -     | %     | Note3                   |
| Luminance of White         |            | Yw     |           | 340   | 400   |       | cd/m2 | Note 4                  |
| White luminance uniformity |            | ΔY     |           | 65    | 75    |       | %     | Note 5                  |
| Color Gamut                |            | CG     |           | 43    | 48    | -     | %     |                         |
| Reproduction of color      | Red        | Rx     | Θ = 0°    | 0.566 | 0.596 | 0.626 |       | Note6<br>(Based on BLU) |
|                            |            | Ry     |           | 0.323 | 0.353 | 0.383 |       |                         |
|                            | Green      | Gx     |           | 0.305 | 0.335 | 0.365 |       |                         |
|                            |            | Gy     |           | 0.529 | 0.559 | 0.589 |       |                         |

|                      |                                                      |     |            |                  |
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| Parameter                           | Symbol      | Condition                       | Min.  | Typ.  | Max.  | Unit | Remark |
|-------------------------------------|-------------|---------------------------------|-------|-------|-------|------|--------|
|                                     | Blue        | Bx                              | 0.123 | 0.153 | 0.183 |      |        |
|                                     |             | By                              | 0.086 | 0.116 | 0.146 |      |        |
| White Chromaticity                  | Wx          | $\Theta = 0^\circ$              | 0.283 | 0.313 | 0.343 |      |        |
|                                     | Wy          |                                 | 0.299 | 0.329 | 0.359 |      |        |
| Response Time<br>(Rising + Falling) | $T_r + T_f$ | Ta= 25° C<br>$\Theta = 0^\circ$ |       |       |       | ms   | Note 7 |

#### Note:

1.Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles 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 (see FIGURE 1).

2.Contrast measurements shall be made at viewing angle of  $\Theta = 0$  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 FIGUR 1)

Luminance Contrast Ratio (CR) is defined mathematically.

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

3.Transmittance is the Value without APF and without CG.

4.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.

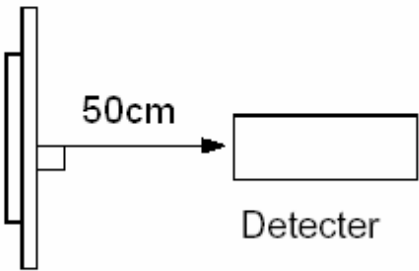
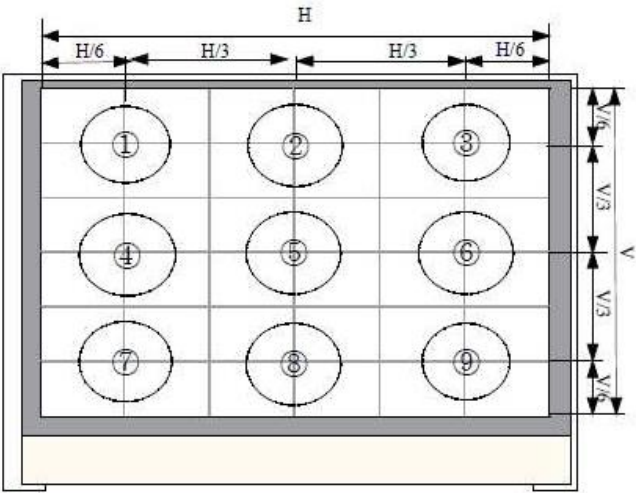
|                  |                                       |     |            |          |
|------------------|---------------------------------------|-----|------------|----------|
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5:Luminance measurement

The test condition is at ILED=20mA and measured on the surface of LCD module at 25 °C.

- The data are measured after LEDs are lighted on for more than 5 minutes and LCM di splays are fully white. The brightness is the average value of 9 measured spots. Measur ement equipment CS2000 or similar equipments(Field of view:1deg,Distance:50cm)
- Measuring surroundings: Dark room.
- Measuring temperature: Ta=25°C.
- Adjust operating voltage to get optimum contrast at the center of the display.
- Measured value at the center point of LCD panel must be after more than 5 minutes while backlight turning on.

$\Delta Y = ( \text{Minimum Luminance of 9points} / \text{Maximum Luminance of 9points} ) * 100$



6.The color chromaticity coordinates specified in the above table 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.

7.The electro-optical response time measurements shall be made as FIGURE 2 by switching the “data” input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Tr, and 90% to 10% is Tf.



|                      |                                                      |     |            |                  |
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## 5.0 RELIABILITY TEST

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

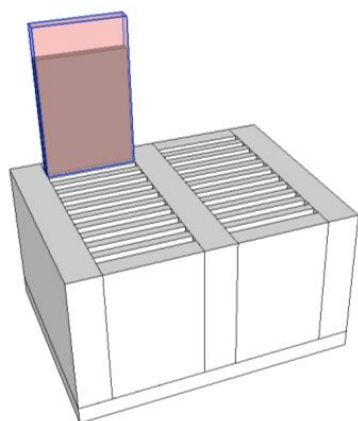
**<Table 12. Reliability Test Parameters >**

| No | Test Items                                           | Conditions                                                                                         |
|----|------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| 1  | High temperature storage test                        | 80°C 240hr Storage                                                                                 |
| 2  | Low temperature storage test                         | -30°C 240hr                                                                                        |
| 3  | High temperature & high humidity<br>(operation test) | 60°C 90%RH 240hr                                                                                   |
| 4  | Low temperature operation test                       | -20°C 240hr                                                                                        |
| 5  | High temperature operation test                      | 70°C 240hr                                                                                         |
| 6  | Thermal Shock Test                                   | [(-40°C 30min) → (80°C 30min)]/cycle, 10<br>0cycles                                                |
| 7  | 8585 Storage                                         | 85°C 85%RH 120hr                                                                                   |
| 8  | ESD                                                  | Air : +/- 15kV<br>Contact : +/- 8kV                                                                |
| 9  | Packing VIB                                          | Accleration:1.47Grms 5~100Hz 0.015G*2<br>/Hz /100~200Hz -6dB/Oct / 200Hz 0.00<br>38G*2/Hz / 30 min |
| 10 | Packing Drop                                         | 6 surfaces / 3edges / 1corner/ for Box Te<br>st                                                    |

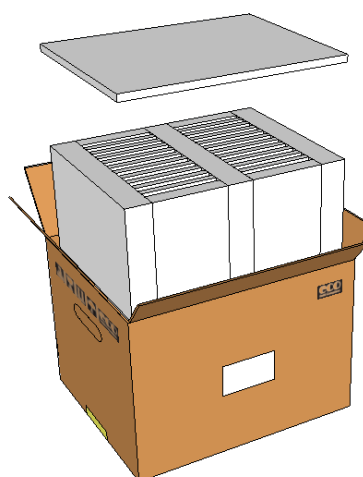
|                  |                                       |     |            |          |
|------------------|---------------------------------------|-----|------------|----------|
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## 6.0 PACKING INFORMATION(产品形态: )

### Packing procedure:

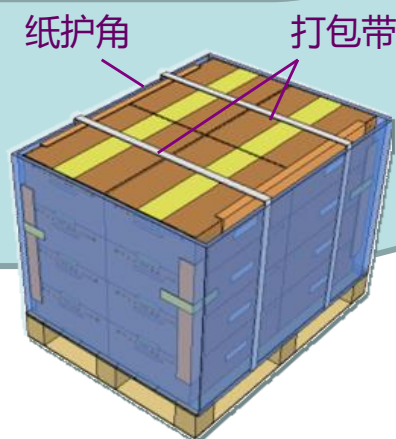


- 将1片产品竖向放入PE Bag  
PE Bag开口反折
- 将产品竖向插入卡槽内(1卡槽1片产品)
- 22pcs 产品/白色EPE Box



- 将EPE Bottom 放入纸箱后  
再放置EPE Cover
- 22pcs 产品/纸箱

- 每个Pallet上放3层Box  
1层4箱,共计12ea Box
- Pallet外进行缠膜包装
- 264pcs Panel / Pallet



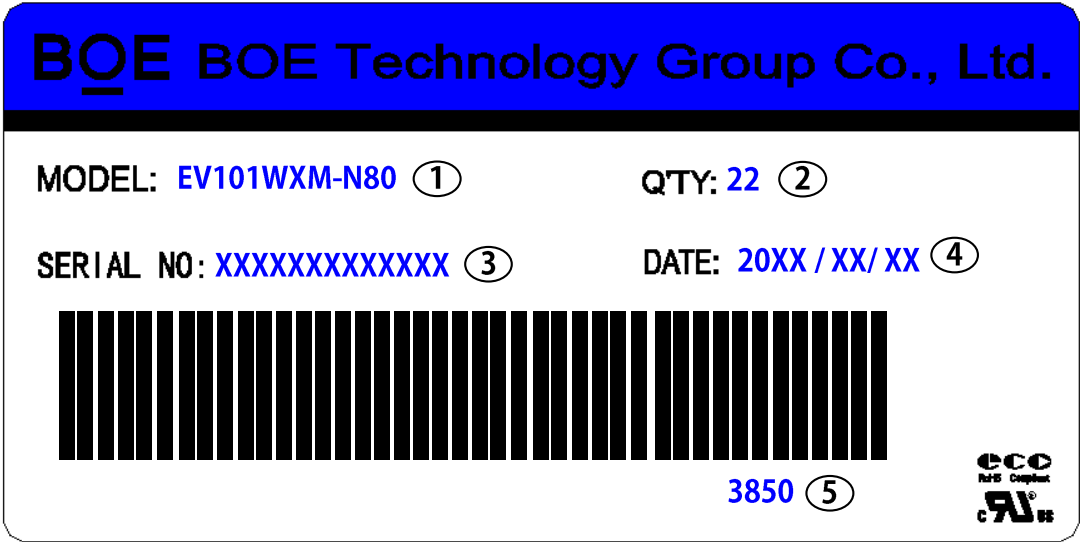
### 6.1 Packing Note(产品形态: LCM)

- Box Dimension: 500mm(W) x 400mm(D) x 290mm(H)
- Package Quantity in one Box: 22pcs

|                      |                                                      |     |            |                  |
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6.2 Box label (产品形态: )

- Label Size :115mm\*55mm
- Contents  
Model : LCM  
Q`ty : 22pcs/Box  
Serial No. : Box Serial No. as shown below.  
Date : Packing Date  
FG Code : FG Code of Product



|                  |  |                                       |  |     |            |          |  |
|------------------|--|---------------------------------------|--|-----|------------|----------|--|
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## 7.0 Product Label

BOE

eco

RoHS Compliant

EV101WXM-N80

XXXXXXXXXXXXXXXXXXXX

1

2

3

Label size: 48mm × 12mm × 0.08mm

1. FG-CODE: EV101WXM-N80

2. MDL ID bar code

3. MDL ID

### BOE MDL ID Rule

| 序列号 | 1     | 2 | 3  | 4  | 5 | 6 | 7 | 8          | 9 | 10 | 11 | 12  | 13 | 14 | 15 | 16 | 17 |
|-----|-------|---|----|----|---|---|---|------------|---|----|----|-----|----|----|----|----|----|
| 代码  | X     | X | X  | 3  | X | X | X | 3          | 8 | 5  | 0  | X   | X  | X  | X  | X  | X  |
| 描述  | GBN代码 |   | 等级 | B3 | 年 | 月 | 日 | FG Code后四位 |   |    |    | 序列号 |    |    |    |    |    |

|                  |                                       |     |            |            |
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## 8.0 Handling & Cautions

### 8.1 Mounting Method

- The panel of the LCD consists of two thin glasses with polarizers which easily get damaged. So extreme care should be taken when handling the LCD.
- Excessive stress or pressure on the glass of the LCD should be avoided. Care must be taken to insure that no torsional or compressive forces are applied to the LCD unit when it is mounted.
- If the customer's set presses the main parts of the LCD, the LCD may show the abnormal display. But this phenomenon does not mean the malfunction of the LCD and should be pressed by the way of mutual agreement.
- To determine the optimum mounting angle, refer to the viewing angle range in the specification for each model.
- Mount a LCD module with the specified mounting parts.

### 8.2 Caution of LCD Handling and Cleaning

- Since the LCD is made of glass, do not apply strong mechanical impact or static load onto it. Handling with care since shock, vibration, and careless handling may seriously affect the product. If it falls from a high place or receives a strong shock, the glass may be broken.
- The polarizers on the surface of panel are made from organic substances. Be very careful for chemicals not to touch the polarizers or it leads the polarizers to be deteriorated.
- If the use of a chemical is unavoidable, use soft cloth with solvent (recommended below) to clean the LCD's surface with wipe lightly.  
-IPA(Isopropyl Alcohol), Ethyl Alcohol, Trichlorotrifluoroethane
- Do not wipe the LCD's surface with dry or hard materials that will damage the polarizers and others. Do not use the following solvent.  
-Water, Ketone, Aromatics
- It is recommended that the LCD be handled with soft gloves during assembly, etc. The polarizers on the LCD's surface are vulnerable to scratch and thus to be damaged by sharp particles.
- Do not drop water or any chemicals onto the LCD's surface.
- A protective film is supplied on the LCD and should be left in place until the LCD is required for operation.
- The ITO pad area needs special careful caution because it could be easily corroded. Do not contact the ITO pad area with HCFC, Soldering flux, Chlorine, Sulfur, saliva or fingerprint. To prevent the ITO corrosion, customers are recommended that the ITO area would be covered by UV or silicon.

|                  |                                       |     |            |            |
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### 8.3 Caution Against Static Charge

- The LCD modules use C-MOS LSI drivers, so customers are recommended that any unused input terminal would be connected to Vdd or Vss, do not input any signals before power is turn on, and ground you body, work/assembly area, assembly equipments to protect against static electricity.
- Remove the protective film slowly, keeping the removing direction approximate 30-degree not vertical from panel surface, If possible, under ESD control device like ion blower, and the humidity of working room should be kept over 50%RH to reduce the risk of static charge.
- Avoid the use work clothing made of synthetic fibers. We recommend cotton clothing or other conductivity-treated fibers.
- In handling the LCD, wear non-charged material gloves. And the conducting wrist to the earth and the conducting shoes to the earth are necessary.

### 8.4 Caution For operation

- It is indispensable to drive the LCD within the specified voltage limit since the higher Voltage than the limit causes the shorter LCD's life. An electro-chemical reaction due to DC causes undesirable deterioration of the LCD so that the use of DC drive should avoid.
- Do not connect or disconnect the LCD to or from the system when power is on.
- Never use the LCD under abnormal conditions of high temperature and high humidity.
- When expose to drastic fluctuation of temperature (hot to cold or cold to hot) ,the LCD may be affected; Specifically, drastic temperature fluctuation from cold to hot ,produces dew on the LCD's surface which may affect the operation of the polarizer and the LCD.
- Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD may turn black at temperature above its operational range. However those phenomena do not mean malfunction or out of order with the LCD. The LCD will revert to normal operation once the temperature returns to the recommended temperature range for normal operation.
- Do not display the fixed pattern for a long time because it may develop image sticking due to the LCD structure. If the screen is displayed with fixed pattern, use a screen saver.

|                  |                                       |     |            |            |
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## 8.5 Packaging

- Modules use LCD element, and must be treated as such.
  - Avoid intense shock and falls from a height.
  - To prevent modules from degradation, do not operate or store them exposed directly to sunshine or high temperature/humidity for long periods.

## 8.6 Storage

- A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit. Relative humidity of the environment should therefore be kept below 60%RH.
- Original protective film should be used on LCD' s surface (polarizer). Adhesive type protective film should be avoided, because it may change color and/or properties of the polarizers.
- Do not store the LCD near organic solvents or corrosive gasses.
- Keep the LCD safe from vibration, shock and pressure.
- Black or white air-bubbles may be produced if the LCD is stored for long time in the lower temperature or mechanical shocks are applied onto the LCD.
- In the case of storing for a long period of time for the purpose or replacement use, the following ways are recommended.
  - Store in a polyethylene bag with sealed so as not to enter fresh air outside in it.
  - Store in a dark place where neither exposure to direct sunlight nor light is.
  - Keep temperature in the specified storage temperature range.
  - Store with no touch on polarizer surface by the anything else. If possible, store the LCD in the packaging situation LCD when it was delivered.

## 8.7 Safety

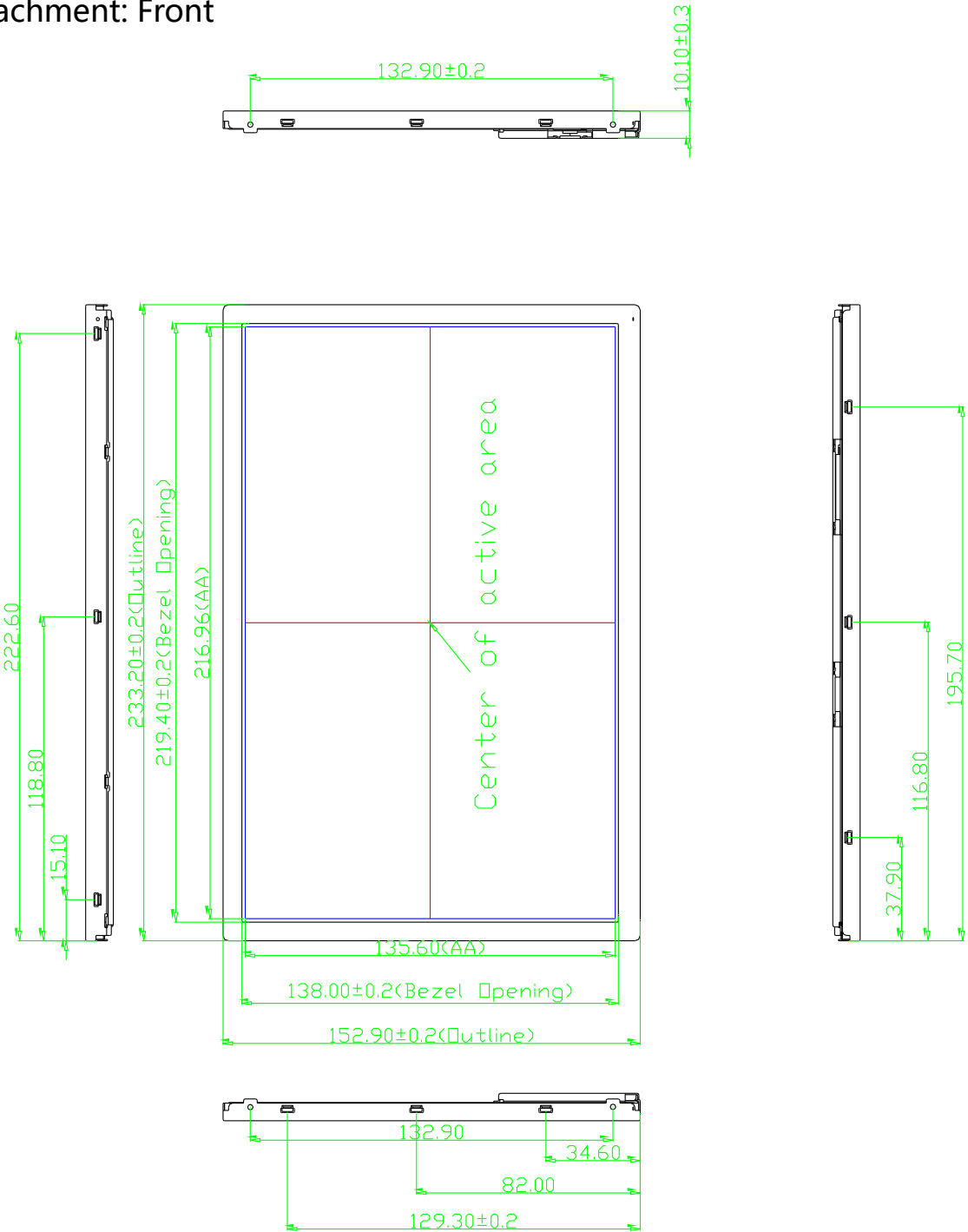
- For the crash damaged or unnecessary LCD, it is recommended to wash off liquid crystal by either of solvents such as acetone and ethanol an should be burned up later.
- In the case the LCD is broken, watch out whether liquid crystal leaks out or not. If your hands touch the liquid crystal, wash your hands cleanly with water an soap as soon as possible.
- If you should swallow the liquid crystal, first, wash your mouth thoroughly with water, then drink a lot of water and induce vomiting, and then, consult a physician.
- If the liquid crystal should get in your eyes, flush your eyes with running water for at least fifteen minutes.
- If the liquid crystal touches your skin or clothes, remove it and wash the affected part of your skin or clothes with soap and running water.

|                  |                                       |     |            |          |
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## 9.0 APPENDIX

### Mechanical Drawing

Drawing Attachment: Front



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Mechanical Drawing  
Drawing Attachment: Back

