




# Product Specification

AU OPTRONICS CORPORATION

( ) Preliminary Specifications

( V ) Final Specifications

|   |   |
|---|---|
| <b>Module</b>   | <b>10.1" SD+ 16:9 Color TFT-LCD</b>                     |
| <b>Model Name</b>   | B101EW01 V2   |
| <b>Note</b> (  ) | <b><i>LED Backlight with driving circuit design</i></b> |

|   |                  |
|---|------------------|
| <b>Customer</b>   | <b>Date</b>      |
| <u>All</u>  | <u>7/23/2009</u> |
| <b>Checked &amp; Approved by</b>                              | <b>Date</b>      |
| _____   | _____            |
| Note: This Specification is subject to change without notice. |                  |

|   |                  |
|---|------------------|
| <b>Approved by</b>  | <b>Date</b>      |
| <u>Howard Lee</u>   | <u>7/23/2009</u> |
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| <u>Carol Tang</u>   | <u>7/23/2009</u> |
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## Contents

|   |                                    |
|---|------------------------------------|
| <b>1. Handling Precautions</b>  | <b>4</b>                           |
| <b>2. General Description</b>   | <b>5</b>                           |
| 2.1 General Specification   | 5                                  |
| 2.2 Optical Characteristics   | 6                                  |
| <b>3. Functional Block Diagram</b>  | <b>11</b>                          |
| <b>The following diagram shows the functional block of the 10.1 inches wide Color TFT/LCD</b> |                                    |
| <b>40 Pin (One ch/connector Module).</b>  | <b>4. Absolute Maximum Ratings</b> |
| <b>4. Absolute Maximum Ratings</b>  | <b>12</b>                          |
| 4.1 Absolute Ratings of TFT LCD Module  | 12                                 |
| 4.2 Absolute Ratings of Environment   | 12                                 |
| <b>5. Electrical characteristics</b>  | <b>13</b>                          |
| 5.1 TFT LCD Module  | 13                                 |
| 5.2 Backlight Unit  | 15                                 |
| <b>6. Signal Characteristic</b>   | <b>16</b>                          |
| 6.1 Pixel Format Image  | 16                                 |
| 6.2 The input data format   | 17                                 |
| 6.3 Integration Interface Requirement   | 18                                 |
| 6.4 Interface Timing  | 20                                 |
| 6.5 Power Sequence  | 21                                 |
| 6.5.1 Panel Power Sequence  | 21                                 |
| <b>7. Panel Reliability Test</b>  | <b>23</b>                          |
| 7.1 Vibration Test  | 23                                 |
| 7.2 Shock Test  | 23                                 |
| 7.3 Reliability Test  | 23                                 |
| <b>8. Mechanical Characteristics</b>  | <b>24</b>                          |
| 8.1 LCM Outline Dimension   | 24                                 |
| <b>9. Shipping and Package</b>  | <b>26</b>                          |
| 9.1 Shipping Label Format   | 26                                 |
| 9.2 Carton Package  | 27                                 |
| 9.3 Shipping package of palletizing sequence  | 27                                 |
| <b>10. Appendix</b>   | <b>28</b>                          |
| 10.1 EDID description   | 28                                 |
| 10.1 IIS description  | 31                                 |



## Record of Revision

| Version and Date | Page  | Old description              | New Description                                | Remark |
|------------------|-------|------------------------------|--|--------|
| 0.1 2009/04/15   | All   | First Edition for Customer   |  |        |
| 0.2 2009/04/27   | 22    |                              | Update timing drawing                          |        |
| 0.3 2009/05/07   | 21    | Clock frequency max 90MHz    | Clock frequency max 80MHz                      |        |
|                  | 26    | HW control table [Radium IC] | HW control table [Novatek IC]                  |        |
|                  | 27    | Carton Package (1 layer)     | Carton Package (2 layer)                       |        |
|                  | 28~31 |                              | Update EDID                                    |        |
| 0.4 2009/05/18   | 21    | Clock Frequency 62.18 MHz    | Clock Frequency 61.5 MHz                       |        |
|                  | 26    | Shipping Label Format        | Add Lenovo barcode information                 |        |
|                  | 32~39 |                              | Add Appendix IIS description                   |        |
| 1.0 2009/06/04   | 23~24 |                              | 2D drawing update                              |        |
|                  | 27~29 |                              | EDID update                                    |        |
| 1.1 2009/07/20   | 15    | PWM duty ratio min 5%        | PWM duty ratio min 1% (remark frequency <5KHz) |        |
|                  | 21~22 | Panel power sequency         | Update timing drawing and setting              |        |
| 2.0 2009/07/23   | 5~6   | Response time 16ms typ       | Response time 16ms typ / 32ms max              |        |

## 1. Handling Precautions

- 1) Since front polarizer is easily damaged, pay attention not to scratch it.
- 2) Be sure to turn off power supply when inserting or disconnecting from input connector.
- 3) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.
- 4) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.
- 5) Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface.
- 6) Since CMOS LSI is used in this module, take care of static electricity and insure human earth when handling.
- 7) Do not open nor modify the Module Assembly.
- 8) Do not press the reflector sheet at the back of the module to any directions.
- 9) At the insertion or removal of the Signal Interface Connector, be sure not to rotate nor tilt the Interface Connector of the TFT Module.
- 11) After installation of the TFT Module into an enclosure (Notebook PC Bezel, for example), do not twist nor bend the TFT Module even momentary. At designing the enclosure, it should be taken into consideration that no bending/twisting forces are applied to the TFT Module from outside. Otherwise the TFT Module may be damaged.
- 12) Small amount of materials having no flammability grade is used in the LCD module. The LCD module should be supplied by power complied with requirements of Limited Power Source (IEC60950 or UL1950), or be applied exemption.
- 13) Disconnecting power supply before handling LCD modules, it can prevent electric shock, DO NOT TOUCH the electrode parts, cables, connectors and LED circuit part of TFT module that a LED light bar build in as a light source of back light unit. It can prevent electrostatic breakdown.



## 2. General Description

B101EW01 V2 is a Color Active Matrix Liquid Crystal Display composed of a TFT LCD panel, a driver circuit, and LED backlight system. The screen format is intended to support 1280(H) x 720(V) screen and 262k colors (RGB 6-bits data driver) with LED backlight driving circuit. All input signals are LVDS interface compatible.

B101EW01 V2 is designed for a display unit of notebook style personal computer and industrial machine.

### 2.1 General Specification

The following items are characteristics summary on the table at 25 °C condition:

| Items  | Unit                 | Specifications          |       |                               |     |
|--|----------------------|-------------------------|-------|-------------------------------|-----|
| Screen Diagonal  | [mm]                 | 255.54(10.1W")          |       |                               |     |
| Active Area  | [mm]                 | 222.72(H) X 125.28(V)   |       |                               |     |
| Pixels H x V   |                      | 1280x3(RGB) x 720       |       |                               |     |
| Pixel Pitch  | [mm]                 | 0.1740 (H) x 0.1740 (V) |       |                               |     |
| Pixel Arrangement  |                      | R.G.B. Vertical Stripe  |       |                               |     |
| Display Mode   |                      | Normally White          |       |                               |     |
| White Luminance<br>Note: I <sub>LED</sub> is LED current | [cd/m <sup>2</sup> ] | 180 typ<br>(Note1)      |       |                               |     |
| Luminance Uniformity (5P)                                |                      | 1.25 max                |       |                               |     |
| Contrast Ratio   |                      | 500 typ                 |       |                               |     |
| Response Time  | [ms]                 | 16 typ, 32ms max        |       |                               |     |
| Nominal Input Voltage VDD                                | [Volt]               | +3.3 typ.               |       |                               |     |
| Power Consumption  | [Watt]               | Typ                     | Max   | Note                          |     |
|  |                      | 2.7W                    | 2.9W  | Type I , V <sub>in</sub> =12V |     |
|  |                      | 3.1W                    | 3.3W  | Type I , V <sub>in</sub> =5V  |     |
|  |                      | @ Black pattern         |       |                               |     |
| Weight   | [Grams]              | 175 max.                |       |                               |     |
| Physical Size<br>(w/ bracket & PCBA)                     | [mm]                 |                         | L     | W                             | T   |
|  |                      | Max                     | 233.5 | 147                           | 3.6 |
|  |                      | Typical                 | 233.0 | 146.5                         |     |
|  | Min                  | 232.5                   | 146.0 | -                             |     |
| Electrical Interface                                     |                      | 1 channel LVDS          |       |                               |     |



# Product Specification

AU OPTRONICS CORPORATION

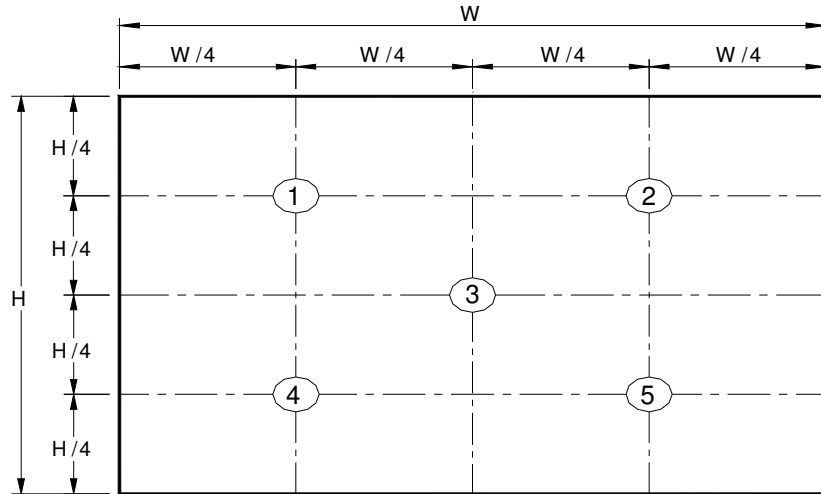
|   |              |                           |
|---|--------------|---------------------------|
| Glass Thickness   | [mm]         | 0.5                       |
| Surface Treatment   |              | Anti-Glare                |
| Support Color   |              | 262K colors ( RGB 6-bit ) |
| Temperature Range<br>Operating<br>Storage (Non-Operating) | [°C]<br>[°C] | 0 to +50<br>-20 to +60    |
| RoHS Compliance   |              | RoHS Compliance           |

## 2.2 Optical Characteristics

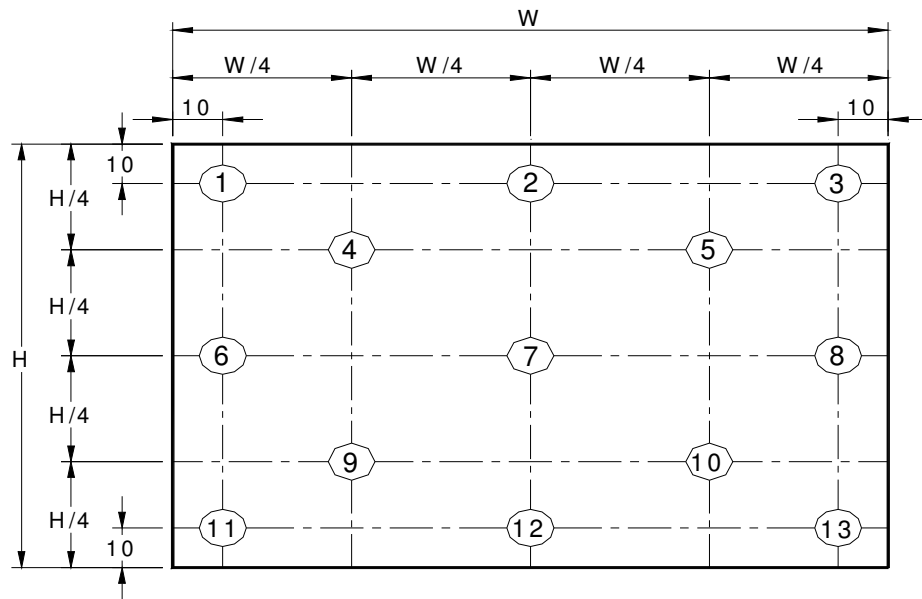
The optical characteristics are measured under stable conditions at 25°C (Room Temperature) :

| Item                                    | Symbol         | Conditions         | Min.       | Typ.         | Max.         | Unit              | Note    |
|---|----------------|--------------------|------------|--------------|--------------|-------------------|---------|
| <b>White Luminance</b><br>ILED=20mA     |                | 5 points average   | <b>153</b> | <b>180</b>   | -            | cd/m <sup>2</sup> | 1, 4, 5 |
| <b>Viewing Angle</b>                    | $\theta_R$     | Horizontal (Right) | <b>40</b>  | <b>45</b>    | -            | degree            | 4, 9    |
|   | $\theta_L$     | CR = 10 (Left)     | <b>40</b>  | <b>45</b>    | -            |                   |         |
|   | $\phi_H$       | Vertical (Upper)   | <b>10</b>  | <b>15</b>    | -            |                   |         |
|   | $\phi_L$       | CR = 10 (Lower)    | <b>30</b>  | <b>35</b>    | -            |                   |         |
| <b>Luminance Uniformity</b>             | $\delta_{5P}$  | 5 Points           | -          | -            | <b>1.25</b>  |                   | 1, 3, 4 |
| <b>Luminance Uniformity</b>             | $\delta_{13P}$ | 13 Points          | -          | -            | <b>1.60</b>  |                   | 2, 3, 4 |
| <b>Contrast Ratio</b>                   | <b>CR</b>      |                    | <b>400</b> | <b>500</b>   | -            |                   | 4, 6    |
| <b>Cross talk</b>                       | %              |                    |            |              | <b>4</b>     |                   | 4, 7    |
| <b>Response Time</b>                    | $T_r$          | Rising             | -          | -            | -            | msec              | 4, 8    |
|   | $T_f$          | Falling            | -          | -            | -            |                   |         |
|   | $T_{RT}$       | Rising + Falling   | -          | <b>16</b>    | <b>32</b>    |                   |         |
| <b>Color / Chromaticity Coordinates</b> | <b>Red</b>     | <b>Rx</b>          | CIE 1931   | <b>0.551</b> | <b>0.581</b> | <b>0.611</b>      | 4       |
|   |                | <b>Ry</b>          |            | <b>0.307</b> | <b>0.337</b> | <b>0.367</b>      |         |
|   | <b>Green</b>   | <b>Gx</b>          |            | <b>0.302</b> | <b>0.332</b> | <b>0.362</b>      |         |
|   |                | <b>Gy</b>          |            | <b>0.545</b> | <b>0.575</b> | <b>0.605</b>      |         |
|   | <b>Blue</b>    | <b>Bx</b>          |            | <b>0.130</b> | <b>0.160</b> | <b>0.190</b>      |         |
|   |                | <b>By</b>          |            | <b>0.108</b> | <b>0.138</b> | <b>0.168</b>      |         |
|   | <b>White</b>   | <b>Wx</b>          |            | <b>0.283</b> | <b>0.313</b> | <b>0.343</b>      |         |
|   |                | <b>Wy</b>          |            | <b>0.299</b> | <b>0.329</b> | <b>0.359</b>      |         |
|   | <b>NTSC</b>    | %                  |            |              | -            | <b>45</b>         |         |

**Note 1:** 5 points position (Ref: Active area)



**Note 2:** 13 points position (Ref: Active area)



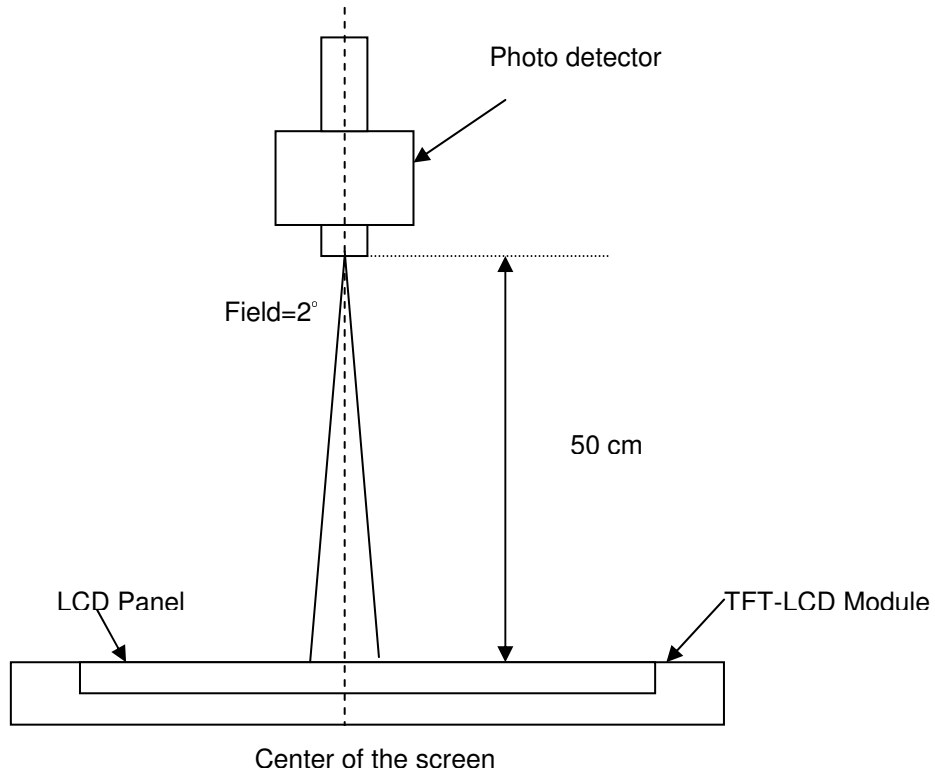
**Note 3:** The luminance uniformity of 5 or 13 points is defined by dividing the maximum luminance values by the minimum test point luminance

$$\delta_{W5} = \frac{\text{Maximum Brightness of five points}}{\text{Minimum Brightness of five points}}$$

$$\delta_{W13} = \frac{\text{Maximum Brightness of thirteen points}}{\text{Minimum Brightness of thirteen points}}$$

**Note 4:** Measurement method

The LCD module should be stabilized at given temperature for 30 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 30 minutes in a stable, windless and dark room, and it should be measured in the center of screen.



**Note 5 :** Definition of Average Luminance of White ( $Y_L$ ):

Measure the luminance of gray level 63 at 5 points ,  $Y_L = [L (1)+ L (2)+ L (3)+ L (4)+ L (5)] / 5$

$L (x)$  is corresponding to the luminance of the point X at Figure in Note (1).

**Note 6 :** Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "White" state}}{\text{Brightness on the "Black" state}}$$



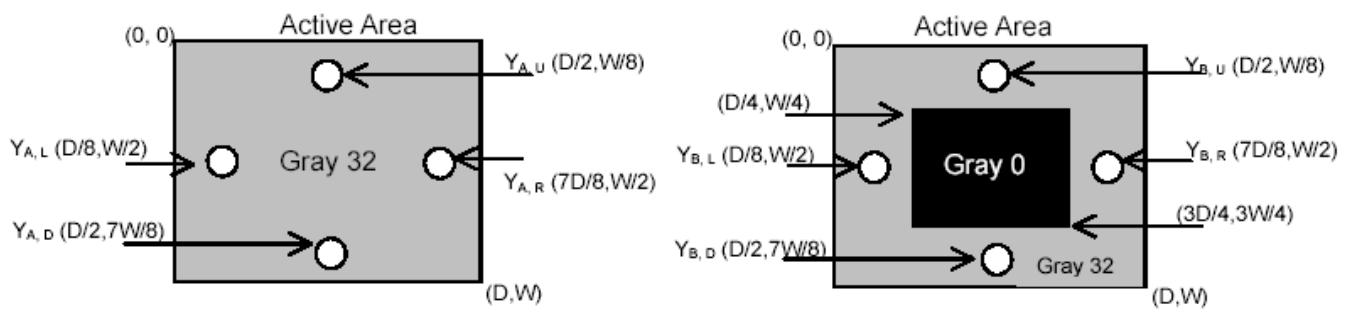
**Note 7 :** Definition of Cross Talk (CT)

$$CT = |Y_B - Y_A| / Y_A \times 100 (\%)$$

Where

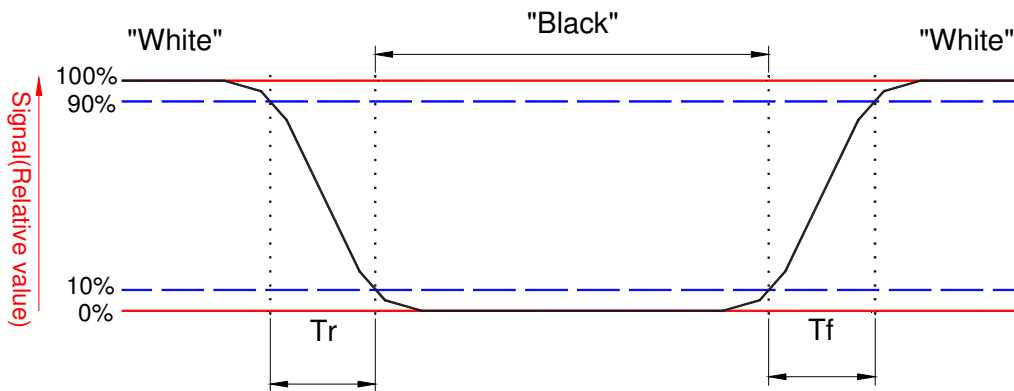
$Y_A$  = Luminance of measured location without gray level 0 pattern (cd/m<sup>2</sup>)

$Y_B$  = Luminance of measured location with gray level 0 pattern (cd/m<sup>2</sup>)



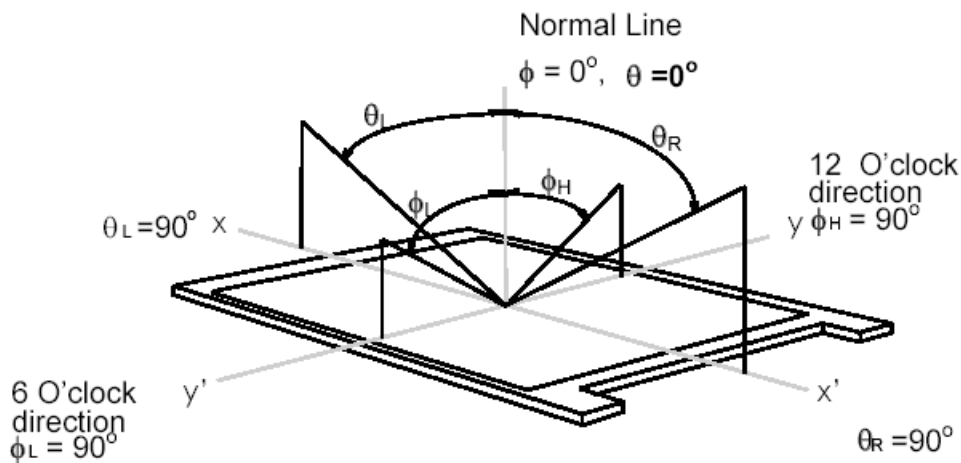
**Note 8:** Definition of response time:

The output signals of BM-7 or equivalent are measured when the input signals are changed from “Black” to “White” (falling time) and from “White” to “Black” (rising time), respectively. The response time interval between the 10% and 90% of amplitudes. Refer to figure as below.



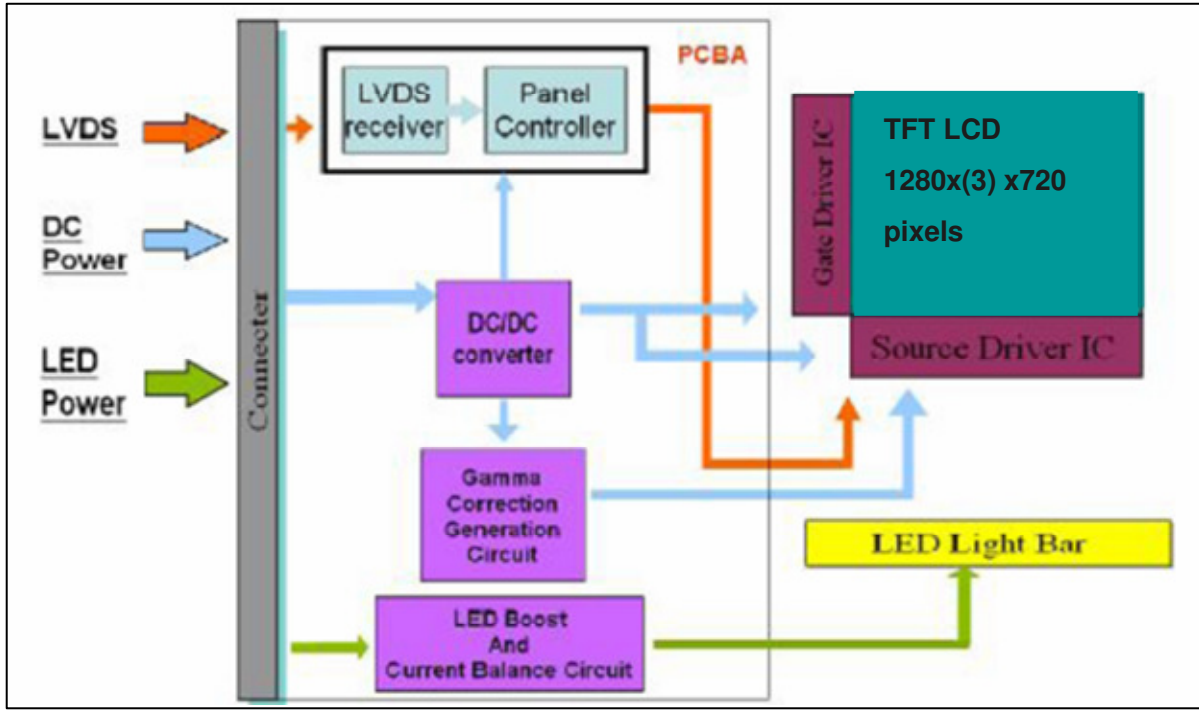
**Note 9.** Definition of viewing angle

Viewing angle is the measurement of contrast ratio  $\geq 10$ , at the screen center, over a  $180^\circ$  horizontal and  $180^\circ$  vertical range (off-normal viewing angles). The  $180^\circ$  viewing angle range is broken down as follows;  $90^\circ$  ( $\theta$ ) horizontal left and right and  $90^\circ$  ( $\Phi$ ) vertical, high (up) and low (down). The measurement direction is typically perpendicular to the display surface with the screen rotated about its center to develop the desired measurement viewing angle.



## 3. Functional Block Diagram

The following diagram shows the functional block of the 10.1 inches wide Color TFT/LCD 40 Pin (One ch/connector Module).



## 4. Absolute Maximum Ratings

An absolute maximum rating of the module is as following:

### 4.1 Absolute Ratings of TFT LCD Module

| Item                    | Symbol | Min  | Max  | Unit   | Conditions |
|-------------------------|--------|------|------|--------|------------|
| Logic/LCD Drive Voltage | Vin    | -0.3 | +4.0 | [Volt] | Note 1,2   |

### 4.2 Absolute Ratings of Environment

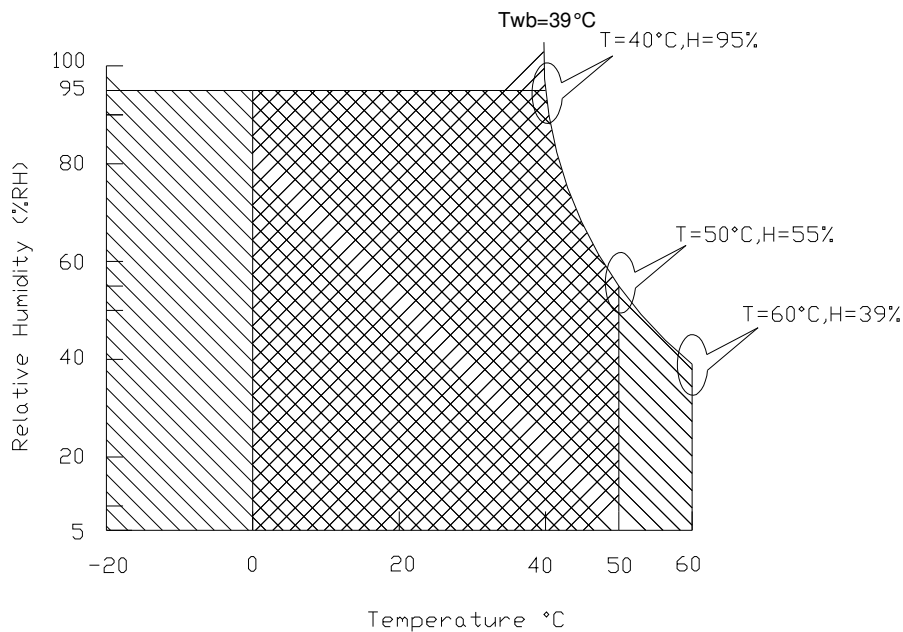
| Item                  | Symbol | Min | Max | Unit  | Conditions |
|-----------------------|--------|-----|-----|-------|------------|
| Operating Temperature | TOP    | 0   | +50 | [°C]  | Note 4     |
| Operation Humidity    | HOP    | 5   | 95  | [%RH] | Note 4     |
| Storage Temperature   | TST    | -20 | +60 | [°C]  | Note 4     |
| Storage Humidity      | HST    | 5   | 95  | [%RH] | Note 4     |

Note 1: At Ta (25°C )

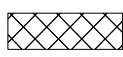
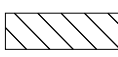
Note 2: Permanent damage to the device may occur if exceed maximum values

Note 3: LED specification refer to section 5.2

**Note 4: For quality performance, please refer to AUO IIS (Incoming Inspection Standard).**



Operating Range 

Storage Range  + 

## 5. Electrical characteristics

### 5.1 TFT LCD Module

#### 5.1.1 Power Specification

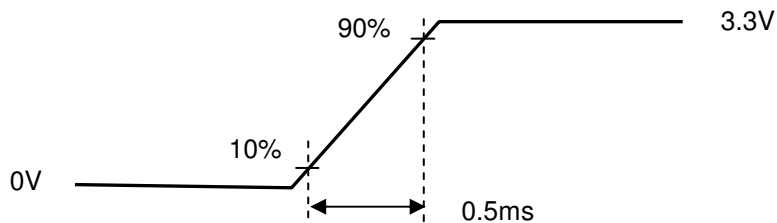
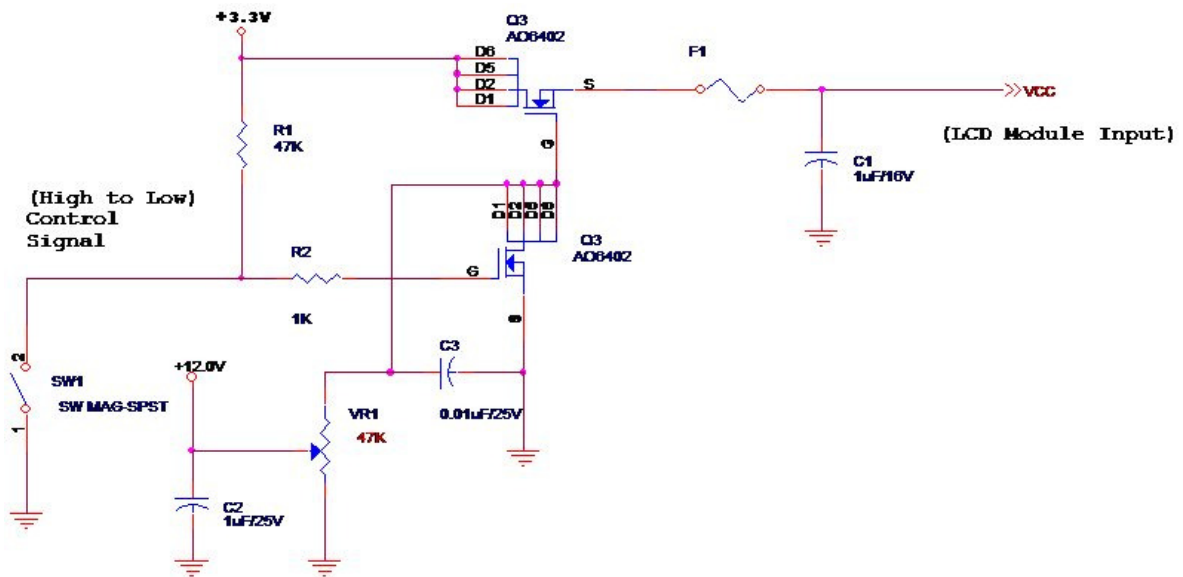
Input power specifications are as follows;

| Symble | Parameter                                | Min | Typ | Max  | Unit        | Note     |
|--------|--|-----|-----|------|-------------|----------|
| VDD    | Logic/LCD Drive Voltage                  | 3.0 | 3.3 | 3.6  | [Volt]      |          |
| PDD    | VDD Power                                | -   | 0.7 | 0.8  | [Watt]      | Note 1/2 |
| IDD    | IDD Current                              | -   | -   | 250  | [mA]        | Note 1/2 |
| IRush  | Inrush Current                           | -   | -   | 1500 | [mA]        | Note 3   |
| VDDrp  | Allowable Logic/LCD Drive Ripple Voltage | -   | -   | 100  | [mV]<br>p-p |          |

Note 1 : Maximum Measurement Condition : Black Pattern

Note 2 : Typical Measurement Condition: Mosaic Pattern

Note 3 : Measure Condition



## 5.1.2 Signal Electrical Characteristics

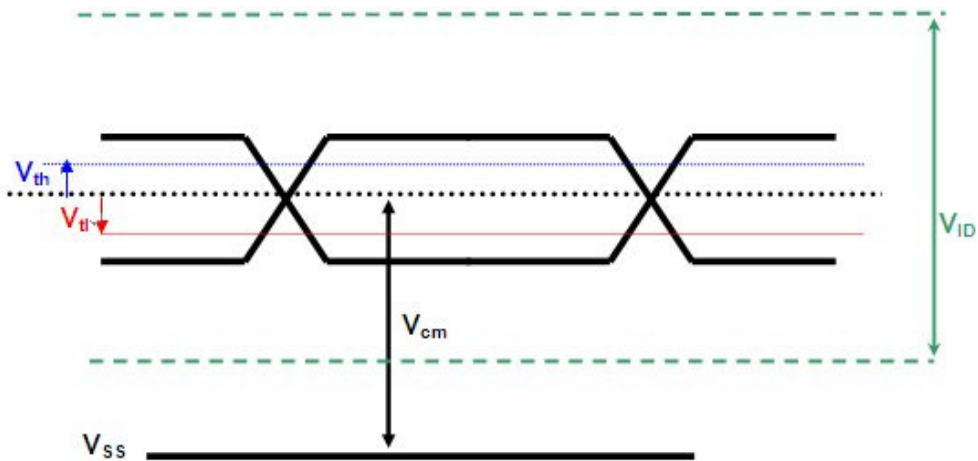
Input signals shall be low or High-impedance state when VDD is off.

It is recommended to refer the specifications of SN75LVDS82DGG (Texas Instruments) in detail.

Signal electrical characteristics are as follows;

| Parameter | Condition  | Min   | Max   | Unit |
|-----------|--|-------|-------|------|
| $V_{th}$  | Differential Input High Threshold ( $V_{cm}=+1.2V$ ) |       | 100   | [mV] |
| $V_{tl}$  | Differential Input Low Threshold ( $V_{cm}=+1.2V$ )  | -100  | -     | [mV] |
| $V_{ID}$  | Differential Input Voltage                           | 100   | 600   | [mV] |
| $V_{cm}$  | Differential Input Common Mode Voltage               | 1.125 | 1.375 | [V]  |

Note: LVDS Signal Waveform



## 5.2 Backlight Unit

### 5.2.1 LED characteristics

| Parameter                   | Symbol | Min    | Typ | Max | Units  | Condition   |
|-----------------------------|--------|--------|-----|-----|--------|---|
| Backlight Power Consumption | PLED   | -      | 2.0 | 2.1 | [Watt] | (Ta=25°C), Note 1<br><b>Type I, V<sub>in</sub> =12V</b> |
|                             |        | -      | 2.4 | 2.5 | [Watt] | (Ta=25°C), Note 1<br><b>Type II, V<sub>in</sub>=5V</b>  |
| LED Life-Time               | N/A    | 12,000 | -   | -   | Hour   | (Ta=25°C), Note 2<br>I <sub>F</sub> =20 mA              |

**Note 1:** Calculator value for reference  $P_{LED} = VF$  (Normal Distribution) \* I<sub>F</sub> (Normal Distribution) / Efficiency

**Note 2:** The LED life-time define as the estimated time to 50% degradation of initial luminous

**Note 3:** This panel will support lower duty ratio at PWM conditional frequency. The PWM frequency constrain between 100 Hz to 300 Hz and a same typical 200Hz. The duty ratio support from 5% to 100%.

### 5.2.2 Backlight input signal characteristics

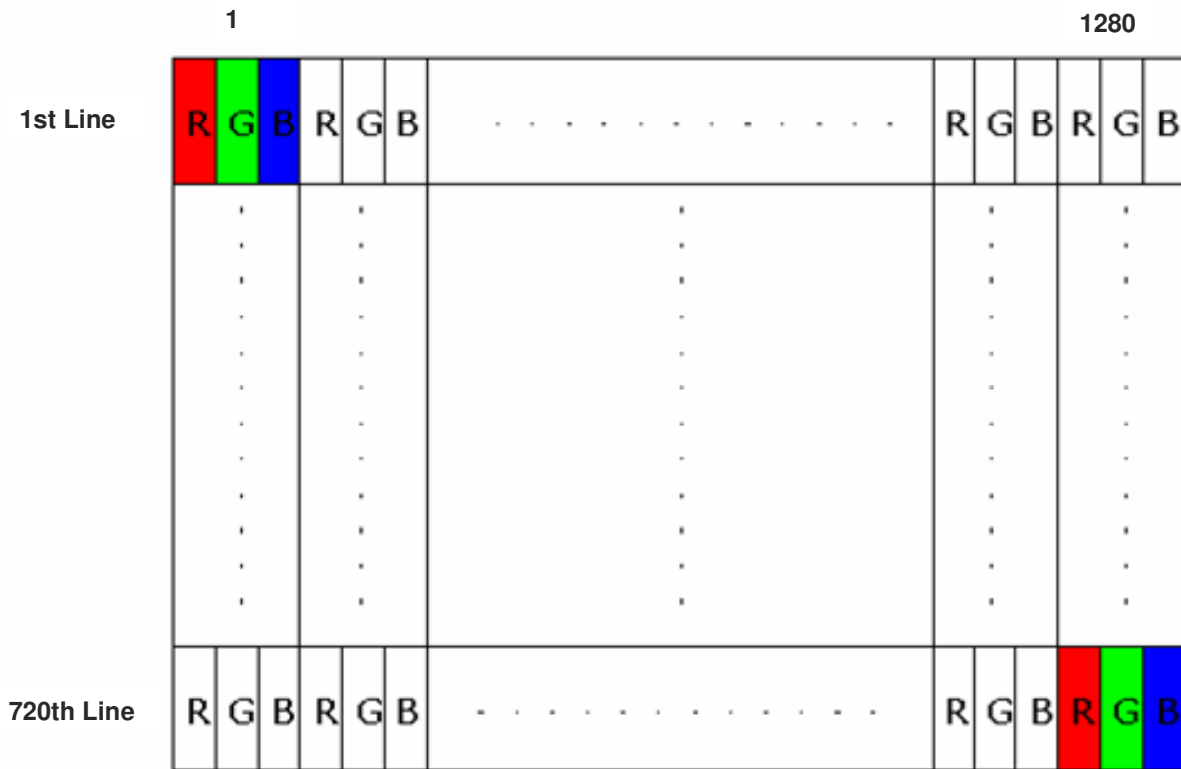
| Parameter                   | Symbol  | Min | Typ  | Max  | Units  | Remark   |
|-----------------------------|---------|-----|------|------|--------|--|
| LED Power Supply            | VLED    | 6.0 | 12.0 | 21.0 | [Volt] | <b>Type I, Note 1</b>                                |
|                             |         | 4.5 | 5    | 5.5  | [Volt] | <b>Type II, Note 1</b>                               |
| LED Enable Input High Level | VLED_EN | 2.5 | -    | 5.5  | [Volt] | PWM Frequency<br><5K Hz<br>PWM Frequency<br>≥ 500 Hz |
| LED Enable Input Low Level  |         | -   | -    | 0.8  | [Volt] |  |
| PWM Logic Input High Level  | VPWM_EN | 2.5 | -    | 5.5  | [Volt] |  |
| PWM Logic Input Low Level   |         | -   | -    | 0.8  | [Volt] |  |
| PWM Input Frequency         | FPWM    | 100 | -    | 1K   | Hz     |  |
| PWM Duty Ratio              | Duty    | 1   | --   | 100  | %      |  |
| PWM Duty Ratio              | Duty    | 15  | --   | 100  | %      |  |

Note 1: **Type I** and **II** is an independent of design parameter. It should be separated from system design.

## 6. Signal Characteristic

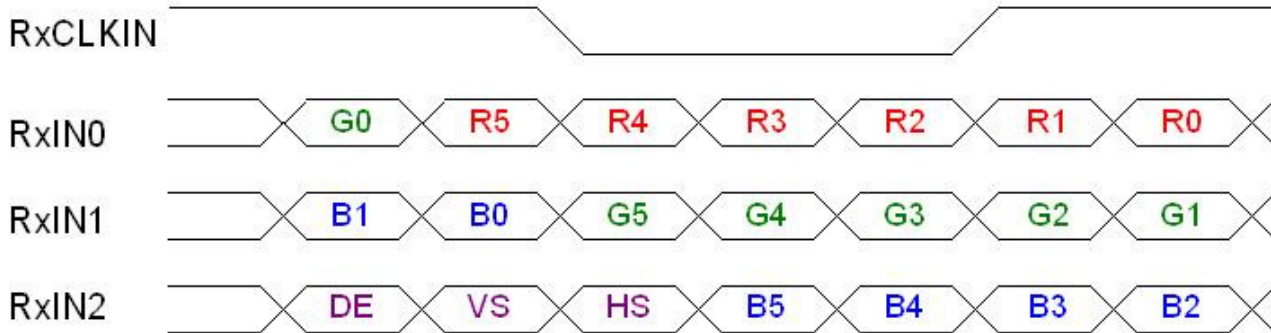
### 6.1 Pixel Format Image

Following figure shows the relationship of the input signals and LCD pixel format.





## 6.2 The input data format



| Signal Name                      | Description  |   |
|----------------------------------|--|---|
| R5<br>R4<br>R3<br>R2<br>R1<br>R0 | Red Data 5 (MSB)<br>Red Data 4<br>Red Data 3<br>Red Data 2<br>Red Data 1<br>Red Data 0 (LSB)             | Red-pixel Data<br>Each red pixel's brightness data consists of these 6 bits pixel data.   |
| G5<br>G4<br>G3<br>G2<br>G1<br>G0 | Green Data 5 (MSB)<br>Green Data 4<br>Green Data 3<br>Green Data 2<br>Green Data 1<br>Green Data 0 (LSB) | Green-pixel Data<br>Each green pixel's brightness data consists of these 6 bits pixel data.   |
| B5<br>B4<br>B3<br>B2<br>B1<br>B0 | Blue Data 5 (MSB)<br>Blue Data 4<br>Blue Data 3<br>Blue Data 2<br>Blue Data 1<br>Blue Data 0 (LSB)       | Blue-pixel Data<br>Each blue pixel's brightness data consists of these 6 bits pixel data.   |
| RxCLKIN                          | Data Clock   | The typical frequency is 54.2MHZ. The signal is used to strobe the pixel data and DE signals. All pixel data shall be valid at the falling edge when the DE signal is high. |
| DE                               | Display Timing   | This signal is strobed at the falling edge of RxCLKIN. When the signal is high, the pixel data shall be valid to be displayed.  |
| VS                               | Vertical Sync  | The signal is synchronized to RxCLKIN .   |
| HS                               | Horizontal Sync  | The signal is synchronized to RxCLKIN .   |

Note: Output signals from any system shall be low or High-impedance state when VDD is off.

## 6.3 Integration Interface Requirement

### 6.3.1 Connector Description

Physical interface is described as for the connector on module.

These connectors are capable of accommodating the following signals and will be following components.

| Connector Name / Designation | For Signal Connector             |
|------------------------------|----------------------------------|
| Manufacturer                 | IPEX                             |
| Type / Part Number           | IPEX 20455-040E-12               |
| Mating Housing/Part Number   | IPEX 20453-040T-11 or compatible |

### 6.3.2 Pin Assignment

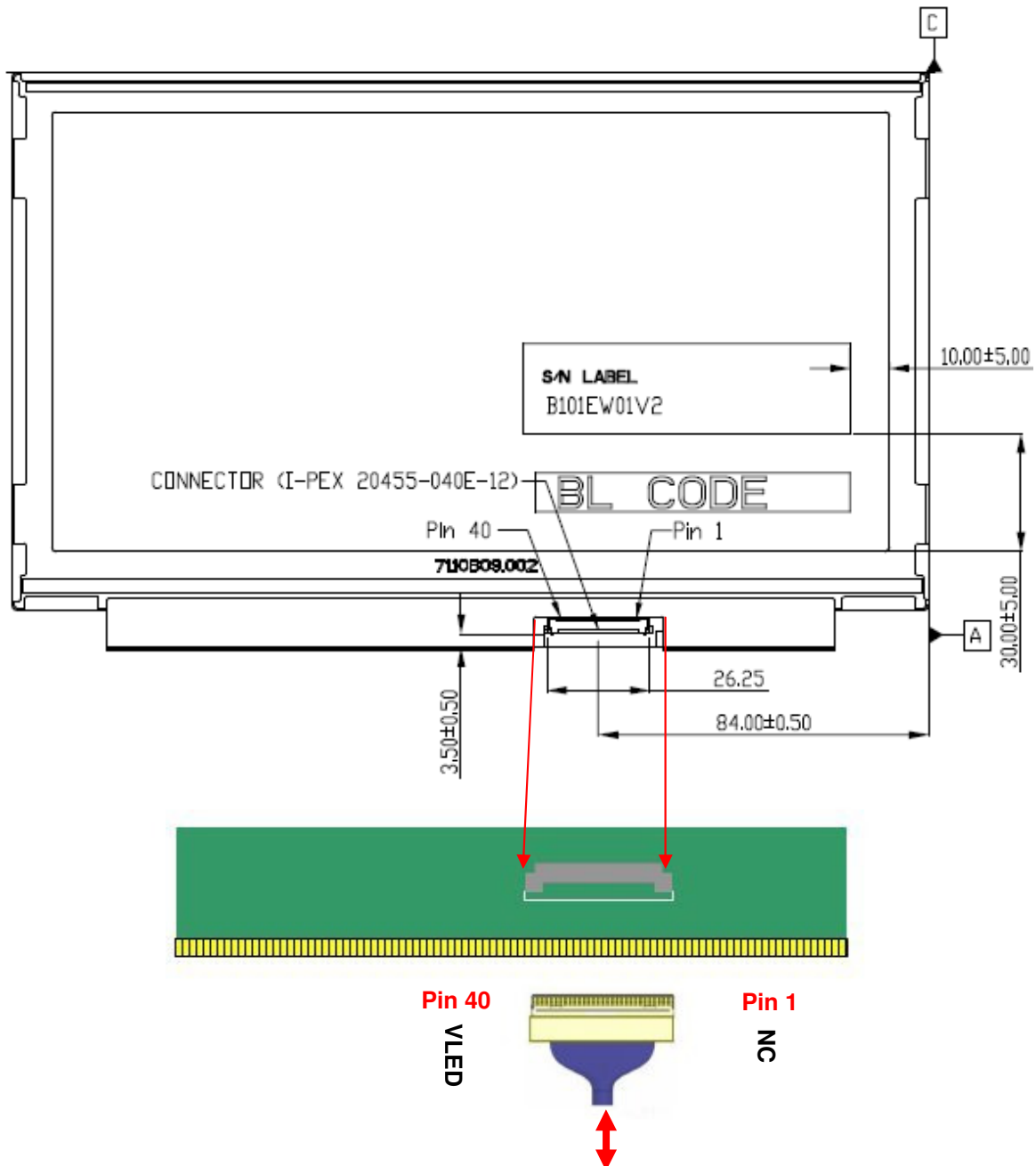
LVDS is a differential signal technology for LCD interface and high speed data transfer device.

| Pin | Signal   | Description                                  |
|-----|----------|--|
| 1   | GND      | Ground                                       |
| 2   | AVDD     | Power Supply +3.3V                           |
| 3   | AVDD     | Power Supply +3.3V                           |
| 4   | VEDID    | EDID +3.3V Power                             |
| 5   | NC       | No Connection (Reserve)                      |
| 6   | CLK_EDID | EDID Clock Input                             |
| 7   | DAT_EDID | EDID Data Input                              |
| 8   | Rin0-    | -LVDSdifferential data input(R0-R5,G0)       |
| 9   | Rin0+    | +LVDSdifferential data input(R0-R5,G0)       |
| 10  | GND      | Ground                                       |
| 11  | Rin1-    | -LVDSdifferential data input(G1-G5,B0-B1)    |
| 12  | Rin1+    | +LVDSdifferential data input(G1-G5,B0-B1)    |
| 13  | GND      | Ground                                       |
| 14  | Rin2-    | -LVDSdifferential data input(B2-B5,HS,VS,DE) |
| 15  | Rin2+    | +LVDSdifferential data input(B2-B5,HS,VS,DE) |
| 16  | GND      | Ground                                       |
| 17  | ClkIN-   | -LVDSdifferential clock input                |
| 18  | ClkIN+   | +LVDSdifferential clock input                |
| 19  | GND      | Ground–Shield                                |
| 20  | LVDS_EN  | LVDS Enable                                  |
| 21  | NC       | No Connection (Reserve)                      |
| 22  | GND      | Ground–Shield                                |
| 23  | NC       | No Connection (Reserve)                      |
| 24  | NC       | No Connection (Reserve)                      |
| 25  | GND      | Ground–Shield                                |
| 26  | NC       | No Connection (Reserve)                      |
| 27  | NC       | No Connection (Reserve)                      |
| 28  | GND      | Ground–Shield                                |
| 29  | NC       | No Connection (Reserve)                      |

|    |          |                              |
|----|----------|------------------------------|
| 30 | NC       | No Connection (Reserve)      |
| 31 | VLED_GND | LED Ground                   |
| 32 | VLED_GND | LED Ground                   |
| 33 | VLED_GND | LED Ground                   |
| 34 | NC       | No Connection (Reserve)      |
| 35 | VPWM_EN  | System PWM Logic Input Level |
| 36 | VLED_EN  | LED enable input level       |
| 37 | NC       | No Connection (Reserve)      |
| 38 | VLED     | LED Power Supply             |
| 39 | VLED     | LED Power Supply             |
| 40 | VLED     | LED Power Supply             |

LVDS is a differential signal technology for LCD interface and high speed data transfer device.

**Note1:** Start from right side



Note1: Input signals shall be low or High-impedance state when VDD is off.

## 6.4 Interface Timing

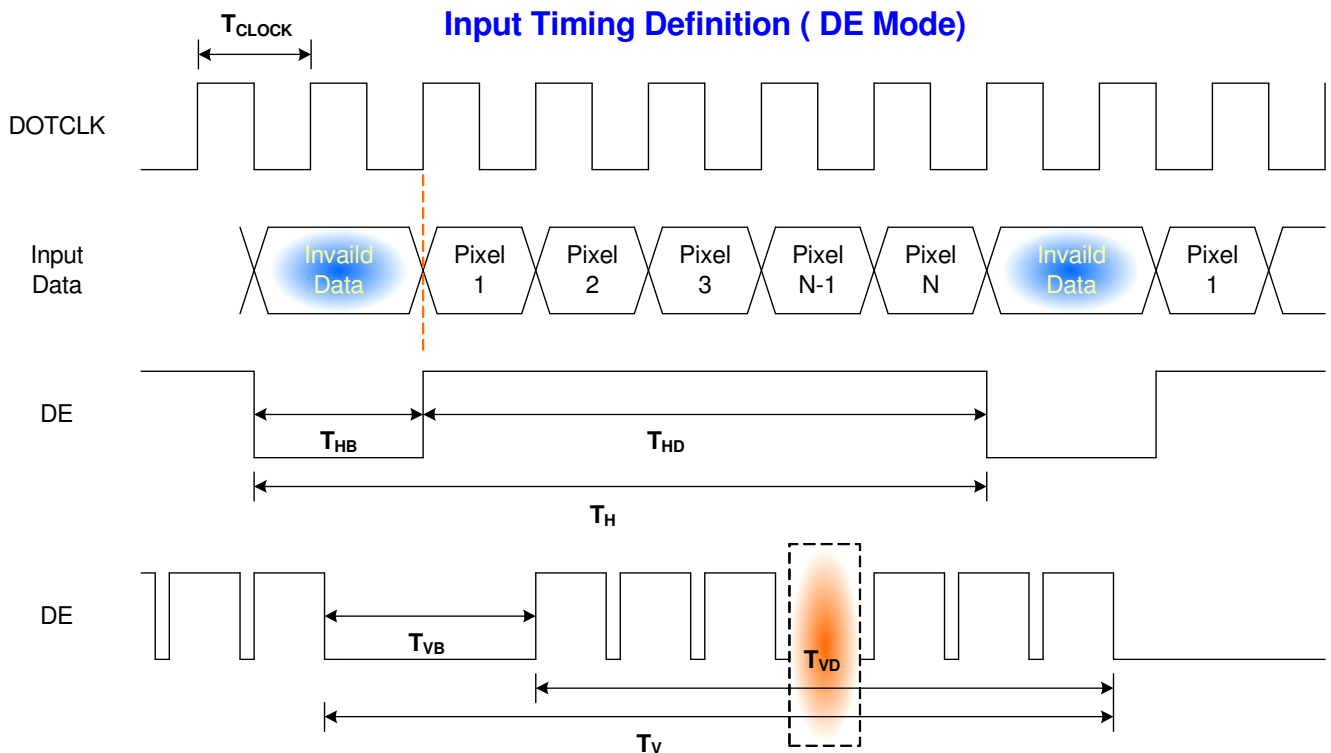
### 6.4.1 Timing Characteristics

Basically, interface timings should match the 1280 x 720 /60Hz manufacturing guide line timing.

| Parameter          | Symbol        | Min.     | Typ. | Max. | Unit |             |
|--------------------|---------------|----------|------|------|------|-------------|
| Frame Rate         | -             |          | 60   |      | Hz   |             |
| Clock frequency    | $1/T_{Clock}$ | 57.2     | 61.5 | 80   | MHz  |             |
| Vertical Section   | Period        | $T_V$    | 728  | 736  | 1023 | $T_{Line}$  |
|                    | Active        | $T_{VD}$ | 720  | 720  | 720  |             |
|                    | Blanking      | $T_{VB}$ | 8    | 16   | 303  |             |
| Horizontal Section | Period        | $T_H$    | 1310 | 1408 | 2047 | $T_{Clock}$ |
|                    | Active        | $T_{HD}$ | 1280 | 1280 | 1280 |             |
|                    | Blanking      | $T_{HB}$ | 30   | 128  | 767  |             |

Note : DE mode only

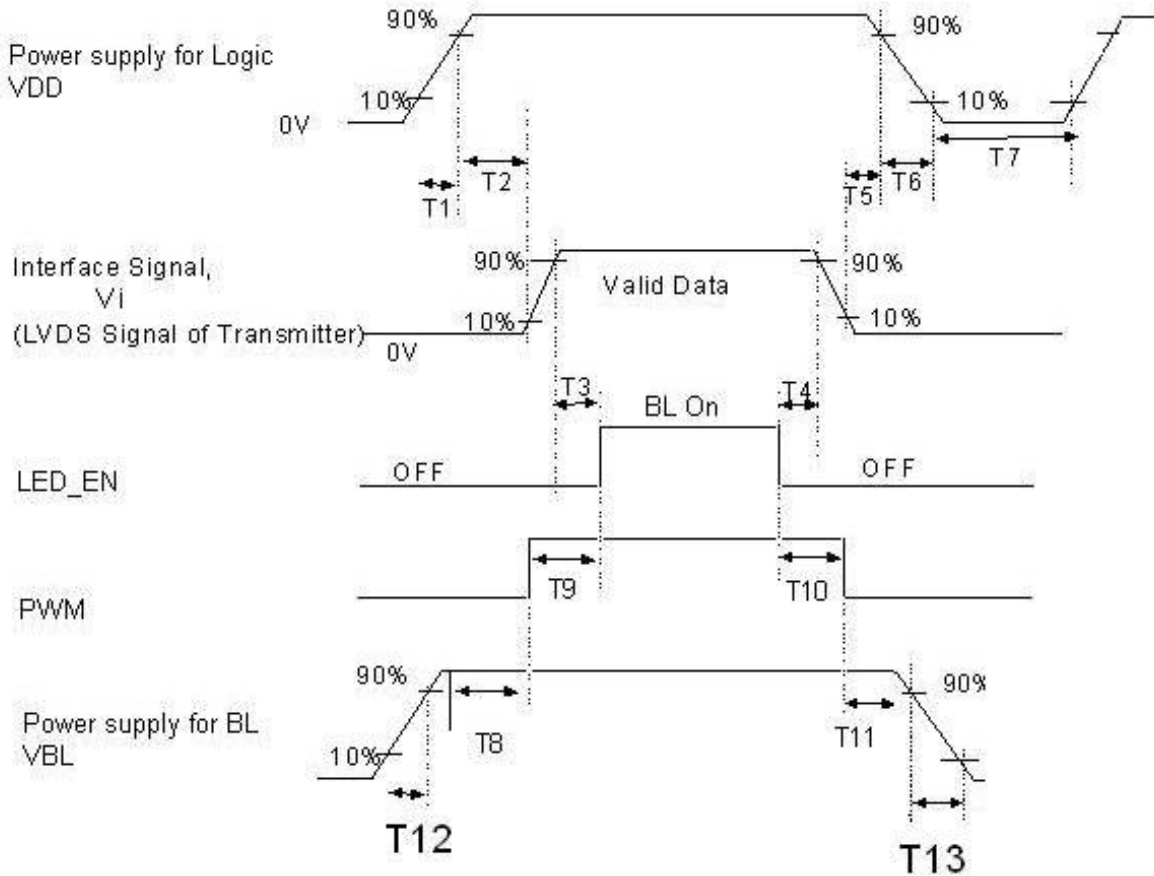
### 6.4.2 Timing diagram



## 6.5 Power Sequence

### 6.5.1 Panel Power Sequence

VDD power and LED on/off sequence is as follows. Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state or low level when VDD is off.





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| Parameter | Value    |          |          |
|-----------|----------|----------|----------|
|           | Min.(ms) | Typ.(ms) | Max.(ms) |
| T1        | 0.5      | -        | 10       |
| T2        | 0        | -        | 50       |
| T3        | 200      | -        | -        |
| T4        | 0        | -        | -        |
| T5        | 0        | -        | -        |
| T6        | 0        | -        | 10       |
| T7        | 150      | -        | -        |
| T8        | 0        | -        | -        |
| T9        | 0        | -        | -        |
| T10       | 0        | -        | -        |
| T11       | 0        | -        | -        |
| T12       | 0.5      | -        | -        |
| T13       | 0        | -        | -        |

Note 1 : If  $T4 < 200ms$  , the display garbage may occur. We suggest  $T4 > 200ms$  to avoid the display garbage.

Note 2 : If  $T1$  or  $T2 < 0.5 ms$ , the inrush current may cause the damage of fuse. If the  $T1$  or  $T12 < 0.5ms$ , the inrush current  $I^2 t$  is under typical melt of fuse Spec., there's no above mentioned problem.

## 7. Panel Reliability Test

### 7.1 Vibration Test

**Test Spec:**

- Test method: Non-Operation
- Acceleration: 1.5 G
- Frequency: 10 - 500Hz Random
- Sweep: 30 Minutes each Axis (X, Y, Z)

### 7.2 Shock Test

**Test Spec:**

- Test method: Non-Operation
- Acceleration: 220 G , Half sine wave
- Active time: 2 ms
- Pulse: X,Y,Z .one time for each side

### 7.3 Reliability Test

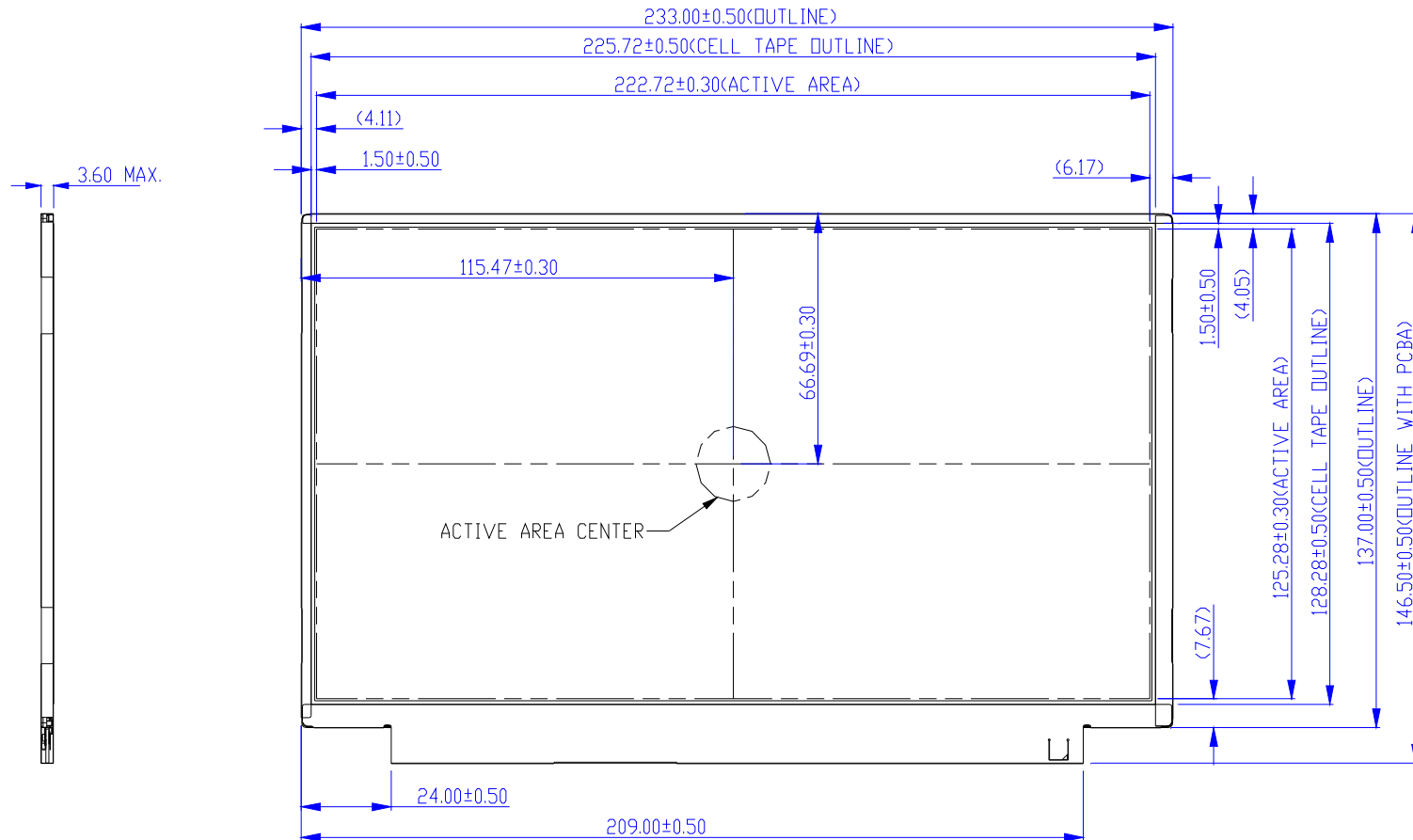
| Items                      | Required Condition                               | Note   |
|----------------------------|--|--------|
| Temperature Humidity Bias  | Ta= 40°C, 90%RH, 300h                            |        |
| High Temperature Operation | Ta= 50°C, Dry, 300h                              |        |
| Low Temperature Operation  | Ta= 0°C, 300h                                    |        |
| High Temperature Storage   | Ta= 60°C, 35%RH, 300h                            |        |
| Low Temperature Storage    | Ta= -20°C, 50%RH, 250h                           |        |
| Thermal Shock Test         | Ta=-20°C to 60°C, Duration at 30 min, 100 cycles |        |
| ESD                        | Contact : ±8 KV<br>Air : ±15 KV                  | Note 1 |

**Note1:** According to EN 61000-4-2 , ESD class B: Some performance degradation allowed. No data lost . Self-recoverable. No hardware failures.

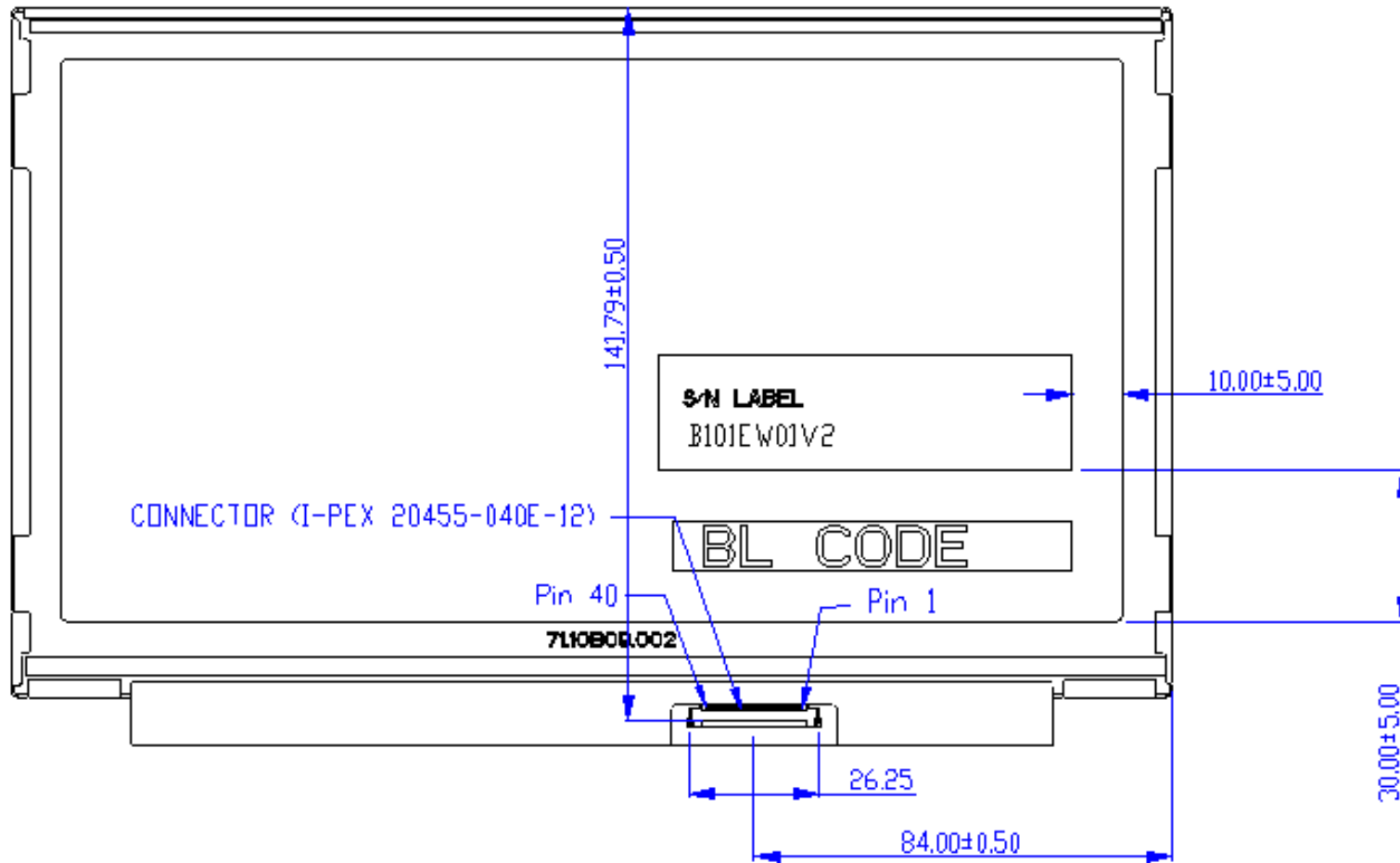
**Remark:** MTBF (Excluding the LED): 30,000 hours with a confidence level 90%

## 8. Mechanical Characteristics

### 8.1 LCM Outline Dimension







## 9. Shipping and Package

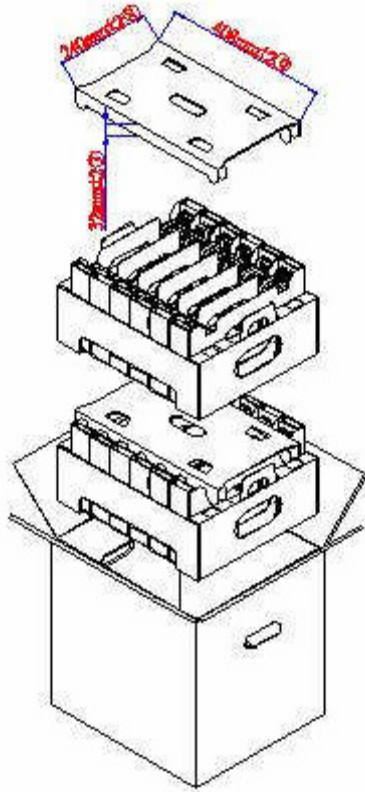
### 9.1 Shipping Label Format



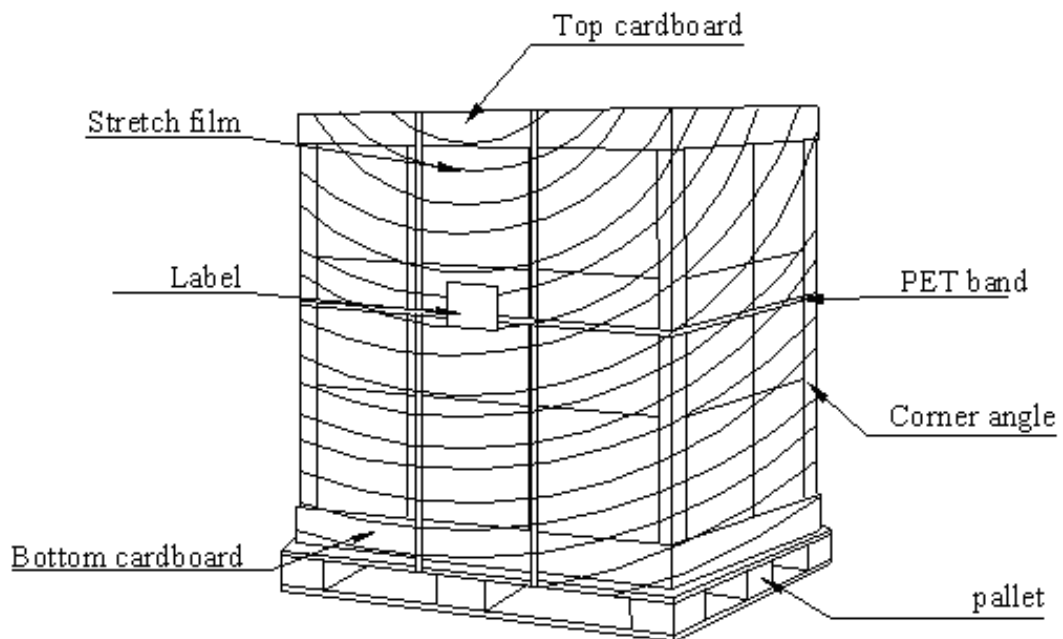
\* H/W code control table :

| IC Combination |         | Control Code | H/W |
|----------------|---------|--------------|-----|
| Source         | Novatek | OAXXG        | OA  |
| Gate           | Novatek |              |     |

## 9.2 Carton Package



## 9.3 Shipping package of palletizing sequence





## 10. Appendix

### 10.1 EDID description

#### B101EW01 V2 EDID Code

| Address | FUNCTION                                | Value | Value    | Value |
|---------|---|-------|----------|-------|
| HEX     |   | HEX   | BIN      | DEC   |
| 00      | Header                                  | 00    | 00000000 | 0     |
| 01      | Header                                  | FF    | 11111111 | 255   |
| 02      | Header                                  | FF    | 11111111 | 255   |
| 03      | Header                                  | FF    | 11111111 | 255   |
| 04      | Header                                  | FF    | 11111111 | 255   |
| 05      | Header                                  | FF    | 11111111 | 255   |
| 06      | Header                                  | FF    | 11111111 | 255   |
| 07      | Header                                  | 00    | 00000000 | 0     |
| 08      | ID Manufacturer Name                    | 30    | 00110000 | 48    |
| 09      |   | AE    | 10101110 | 174   |
| 0A      | ID Product Code                         | 11    | 00010001 | 17    |
| 0B      |   | 40    | 01000000 | 64    |
| 0C      | ID Serial Number (32-bit serial number) | 00    | 00000000 | 0     |
| 0D      |   | 00    | 00000000 | 0     |
| 0E      |   | 00    | 00000000 | 0     |
| 0F      |   | 00    | 00000000 | 0     |
| 10      | Week of Manufacture                     | 01    | 00000001 | 1     |
| 11      | Year of Manufacture                     | 13    | 00010011 | 19    |
| 12      | EDID Structure version                  | 01    | 00000001 | 1     |
| 13      | EDID Revision                           | 03    | 00000011 | 3     |
| 14      | Video Input Definition                  | 80    | 10000000 | 128   |
| 15      | Max H Image Size(cm)                    | 16    | 00010110 | 22    |
| 16      | Max V Image Size(cm)                    | 0D    | 00001101 | 13    |
| 17      | Display gamma (gamma x 100)-100         | 78    | 01111000 | 120   |
| 18      | Feature support(DPMS)                   | EA    | 11101010 | 234   |
| 19      | Red/Green Low Bits                      | D1    | 11010001 | 209   |
| 1A      | Blue/White Low Bits                     | 15    | 00010101 | 21    |
| 1B      | Red x                                   | 94    | 10010100 | 148   |
| 1C      | Red y                                   | 56    | 01010110 | 86    |
| 1D      | Green x                                 | 55    | 01010101 | 85    |
| 1E      | Green y                                 | 93    | 10010011 | 147   |
| 1F      | Blue x                                  | 29    | 00101001 | 41    |
| 20      | Blue y                                  | 23    | 00100011 | 35    |
| 21      | White x                                 | 50    | 01010000 | 80    |
| 22      | White y                                 | 54    | 01010100 | 84    |
| 23      | Established Timing 1                    | 00    | 00000000 | 0     |
| 24      | Established Timing 2                    | 00    | 00000000 | 0     |
| 25      | Manufacturer's Timings                  | 00    | 00000000 | 0     |
| 26      | Standard Timing Identification #1       | 01    | 00000001 | 1     |
| 27      |   | 01    | 00000001 | 1     |
| 28      | Standard Timing Identification #2       | 01    | 00000001 | 1     |



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|    |   |    |          |     |
|----|---|----|----------|-----|
| 29 |   | 01 | 00000001 | 1   |
| 2A | Standard Timing Identification #3                     | 01 | 00000001 | 1   |
| 2B |   | 01 | 00000001 | 1   |
| 2C | Standard Timing Identification #4                     | 01 | 00000001 | 1   |
| 2D |   | 01 | 00000001 | 1   |
| 2E | Standard Timing Identification #5                     | 01 | 00000001 | 1   |
| 2F |   | 01 | 00000001 | 1   |
| 30 | Standard Timing Identification #6                     | 01 | 00000001 | 1   |
| 31 |   | 01 | 00000001 | 1   |
| 32 | Standard Timing Identification #7                     | 01 | 00000001 | 1   |
| 33 |   | 01 | 00000001 | 1   |
| 34 | Standard Timing Identification #8                     | 01 | 00000001 | 1   |
| 35 |   | 01 | 00000001 | 1   |
| 36 | Pixel Clock/10,000 (LSB)                              | 06 | 00000110 | 6   |
| 37 | Pixel Clock/10,000 (MSB) /                            | 18 | 00011000 | 24  |
| 38 | Horizontal Active                                     | 00 | 00000000 | 0   |
| 39 | Horizontal Blanking                                   | 70 | 01110000 | 112 |
| 3A | Horizontal Active : Horizontal Blanking               | 50 | 01010000 | 80  |
| 3B | Vertical Active                                       | D0 | 11010000 | 208 |
| 3C | Vertical Blanking                                     | 10 | 00010000 | 16  |
| 3D | Vertical Active : Vertical Blanking                   | 20 | 00100000 | 32  |
| 3E | Horizontal Sync. Offset                               | 30 | 00110000 | 48  |
| 3F | Horizontal Sync Pulse Width                           | 20 | 00100000 | 32  |
| 40 | Vertical Sync Offset : Sync Width                     | 36 | 00110110 | 54  |
| 41 | Horizontal Vertical Sync Offset/Width upper 2bits     | 00 | 00000000 | 0   |
| 42 | Horizontal Image Size                                 | DE | 11011110 | 222 |
| 43 | Vertical Image Size                                   | 7D | 01111101 | 125 |
| 44 | Horizontal & Vertical Image Size                      | 00 | 00000000 | 0   |
| 45 | Horizontal Border                                     | 00 | 00000000 | 0   |
| 46 | Vertical Border                                       | 00 | 00000000 | 0   |
| 47 | Flags   | 18 | 00011000 | 24  |
| 48 | Pixel Clock/10,000 (LSB) (Slow Refresh rate)          | 03 | 00000011 | 3   |
| 49 | Pixel Clock/10,000 (MSB) / (Slow Refresh rate)        | 14 | 00010100 | 20  |
| 4A | Horizontal Active                                     | 00 | 00000000 | 0   |
| 4B | Horizontal Blanking                                   | 70 | 01110000 | 112 |
| 4C | Horizontal Active : Horizontal Blanking               | 50 | 01010000 | 80  |
| 4D | Vertical Active                                       | D0 | 11010000 | 208 |
| 4E | Vertical Blanking                                     | 10 | 00010000 | 16  |
| 4F | Vertical Active : Vertical Blanking                   | 20 | 00100000 | 32  |
| 50 | Horizontal Sync. Offset                               | 30 | 00110000 | 48  |
| 51 | Horizontal Sync Pulse Width                           | 20 | 00100000 | 32  |
| 52 | Vertical Sync Offset : Sync Width                     | 36 | 00110110 | 54  |
| 53 | Horizontal Vertical Sync Offset/Width upper 2bits = 0 | 00 | 00000000 | 0   |
| 54 | Horizontal Image Size                                 | DE | 11011110 | 222 |
| 55 | Vertical Image Size                                   | 7D | 01111101 | 125 |
| 56 | Horizontal & Vertical Image Size                      | 00 | 00000000 | 0   |



# Product Specification

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|    |  |    |          |     |
|----|--|----|----------|-----|
| 57 | Horizontal Border                              | 00 | 00000000 | 0   |
| 58 | Vertical Border                                | 00 | 00000000 | 0   |
| 59 | Flags  | 18 | 00011000 | 24  |
| 5A | Flag   | 00 | 00000000 | 0   |
| 5B | Flag   | 00 | 00000000 | 0   |
| 5C | Flag   | 00 | 00000000 | 0   |
| 5D | Data Type Tag                                  | 0F | 00001111 | 15  |
| 5E | Flag   | 00 | 00000000 | 0   |
| 5F | (Horizontal active pixel /8)-31                | 81 | 10000001 | 129 |
| 60 | Image Aspect Ratio                             | 0A | 00001010 | 10  |
| 61 | Middle Refresh Rate                            | 32 | 00110010 | 50  |
| 62 | (Horizontal active pixel /8)-31                | 81 | 10000001 | 129 |
| 63 | Image Aspect Ratio                             | 0A | 00001010 | 10  |
| 64 | Low Refresh Rate                               | 28 | 00101000 | 40  |
| 65 | Brightness(1/10nit)                            | 12 | 00010010 | 18  |
| 66 | Feature flag                                   | 09 | 00001001 | 9   |
| 67 | Reserved                                       | 00 | 00000000 | 0   |
| 68 | LCD Supplier manufacture Code (3 character ID) | 06 | 00000110 | 6   |
| 69 |  | AF | 10101111 | 175 |
| 6A | LCD Supplier Product code                      | 56 | 01010110 | 86  |
| 6B | LCD Supplier Product code                      | 32 | 00110010 | 50  |
| 6C | Flag   | 00 | 00000000 | 0   |
| 6D | Flag   | 00 | 00000000 | 0   |
| 6E | Flag   | 00 | 00000000 | 0   |
| 6F | Data Type Tag                                  | FE | 11111110 | 254 |
| 70 | Flag   | 00 | 00000000 | 0   |
| 71 | Model Name                                     | 42 | 01000010 | 66  |
| 72 | Model Name                                     | 31 | 00110001 | 49  |
| 73 | Model Name                                     | 30 | 00110000 | 48  |
| 74 | Model Name                                     | 31 | 00110001 | 49  |
| 75 | Model Name                                     | 45 | 01000101 | 69  |
| 76 | Model Name                                     | 57 | 01010111 | 87  |
| 77 | Model Name                                     | 30 | 00110000 | 48  |
| 78 | Model Name                                     | 31 | 00110001 | 49  |
| 79 | Model Name                                     | 20 | 00100000 | 32  |
| 7A | Model Name                                     | 56 | 01010110 | 86  |
| 7B | Model Name                                     | 32 | 00110010 | 50  |
| 7C | Model Name                                     | 20 | 00100000 | 32  |
| 7D | Model Name                                     | 0A | 00001010 | 10  |
| 7E | Extension flag                                 | 00 | 00000000 | 0   |
| 7F | Checksum                                       | E3 | 11100011 | 227 |