



|  |  |      |     |      |
|--|--|------|-----|------|
| Product Description: 26 inch TFT-LCD PANEL |  |      |     |      |
|  |  |      |     |      |
| AUO Model Name: T260XW02 VG                |  |      |     |      |
| Customer Part No/Project Name:             |  |      |     |      |
| Customer Signature                         |  | Date | AUO | Date |
|  |  |      |     |      |
|  |  |      |     |      |
|  |  |      |     |      |



*Document Version: 1.0*

*Date:2006/12/1*

## **Product Functional Specification**

**26" Color TFT-LCD Module**  
**Model Name: T260XW02 VG**  
**(QDI Model: QD26HL0101)**

**() Preliminary Specification**  
**(\*) Final Specification**



**This specification sheet is for model name change, since AUO merged QDI from 2006/10/1**

**This Specification Sheet keep the original QDI Model name and Spec.**

**New Model name and old model name comparison table as following:**

|                    | <b>AUO</b>  | <b>QDI</b>        |
|--------------------|---|-------------------|
| <b>Model Name</b>  | <b>T260XW02 VG</b>  | <b>QD26HL0101</b> |
| <b>Change Item</b> | <b>1. Carton Printing format</b><br><b>2. Product Serial label format</b> |                   |

[illegible]



## Content List

|  | Page |
|--|------|
| 1. Application   | 5    |
| 2. Overview  | 5    |
| 3. General Specifications  | 5    |
| 4. Input Terminals   | 6    |
| 5. Absolute Maximum Ratings  | 5    |
| 6. Electrical Characteristics  | 11   |
| 7. Timing Characteristics  | 15   |
| 8. Input Signals, Basic Display Colors and Gray<br>Scale of Each Color | 17   |
| 9. Optical Characteristics   | 18   |
| 10. Display Quality  | 21   |
| 11. Handling Precautions   | 21   |
| 12. Reliability Test Items   | 21   |
| 13. Others   | 22   |
| 14. Drawing  | 23   |



## 1. Application

This specification applies to a color TFT-LCD module, QD26HL01

## 2. Overview

This module is a color active matrix LCD module incorporating amorphous silicon TFT (Thin Film Transistor). It is composed of a color TFT-LCD panel; driver ICs, control circuit and power supply circuit and a backlight unit.

Graphics and texts can be displayed on a 1366×3×768 dots panel with 16.7 million colors by using the LVDS (Low Voltage Differential Signaling) interface, 8-bit driving method and supplying +12V DC supply voltage for TFT-LCD panel driving.

The TFT-LCD panel used for this module has very high aperture ratio. A low-reflection and higher-color-saturation type color filter is also used for this panel. Therefore, high-brightness and high-contrast image, which is suitable for the LCD TV, HDTV and multimedia use, can be obtained by using this module.

### [Features]

- 1) High aperture panel; high-brightness
- 2) Brilliant and high contrast image.
- 3) High speed response
- 4) WXGA resolution. 16:9
- 5) LVDS interface.
- 6) QSV technology
- 7) Wide viewing angle.

## 3. General Specifications

| Parameter               | Specifications          | Unit  |
|-------------------------|-------------------------|-------|
| Display size            | 66.05 (26") Diagonal    | cm    |
| Active area             | 575.769 (H)×323.712 (V) | mm    |
| Pixel format            | 1366 (H)×768 (V)        | Pixel |
|                         | (1 pixel = R+G+B dots)  |       |
| Pixel pitch             | 0.4215 (H) × 0.4215 (V) | mm    |
| Pixel configuration     | R,G,B vertical stripe   |       |
| Display mode            | Normally Black          |       |
| Unit outline dimensions | 626 x 373               | mm    |
| Thickness               | Typ. 40.9               | mm    |



|                          |  |            |
|--------------------------|--|------------|
| <b>Weight</b>            | <b>TBD</b>                                     | <b>g</b>   |
| <b>Surface treatment</b> | <b>Anti-glare(12%) and<br/>hard-coating 3H</b> |            |
| <b>Lamp Quantity</b>     | <b>8 U shape</b>                               | <b>pcs</b> |



#### 4. Input Terminals

##### 4-1. TFT-LCD panel driving

**CN1 (LVDS signals and +12V DC power supply)**

**Connector on Panel : FI-X30SSL-HF(Manufactured by JAE) or**

**Equivalent**

**Mating connector : FI-30C2L (Manufactured by JAE) or Equivalent**

| Pin No | Symbol      | Description                              | Default         |
|--------|-------------|--|-----------------|
| 1      | VCC         | +12V, DC, Regulated                      |                 |
| 2      | VCC         | +12V, DC, Regulated                      |                 |
| 3      | VCC         | +12V, DC, Regulated                      |                 |
| 4      | VCC         | +12V, DC, Regulated                      |                 |
| 5      | GND         | Ground and Signal Return                 |                 |
| 6      | GND         | Ground and Signal Return                 |                 |
| 7      | GND         | Ground and Signal Return                 |                 |
| 8      | GND         | Ground and Signal Return                 |                 |
| 9      | LVDS Option | High/Open for Normal (NS), Low for JEIDA | Default NS type |
| 10     | Reserved    | N.C.                                     | Test Mode?      |
| 11     | GND         | Ground and Signal Return for LVDS        |                 |
| 12     | RXIN0-      | LVDS Channel 0 negative                  |                 |
| 13     | RXIN0+      | LVDS Channel 0 positive                  |                 |
| 14     | GND         | Ground and Signal Return for LVDS        |                 |
| 15     | RXIN1-      | LVDS Channel 1 negative                  |                 |
| 16     | RXIN1+      | LVDS Channel 1 positive                  |                 |
| 17     | GND         | Ground and Signal Return for LVDS        |                 |
| 18     | RXIN2-      | LVDS Channel 2 negative                  |                 |
| 19     | RXIN2+      | LVDS Channel 2 positive                  |                 |
| 20     | GND         | Ground and Signal Return for LVDS        |                 |
| 21     | RXCLKIN-    | LVDS Clock negative                      |                 |





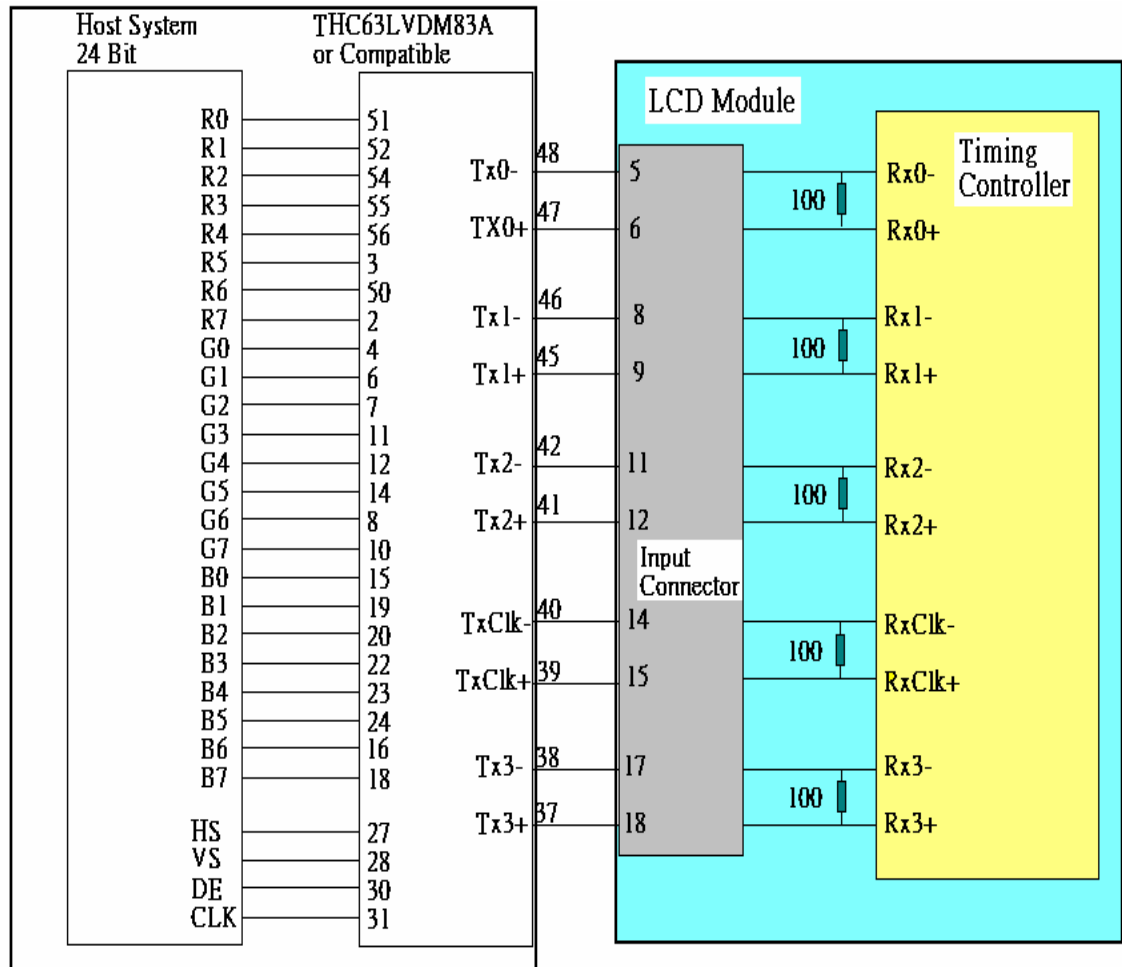
|    |          |                                   |            |
|----|----------|-----------------------------------|------------|
| 22 | RXCLKIN+ | LVDS Clock Positive               |            |
| 23 | GND      | Ground and Signal Return for LVDS |            |
| 24 | RXIN3-   | LVDS Channel 3 negative           |            |
| 25 | RXIN3+   | LVDS Channel 3 positive           |            |
| 26 | GND      | Ground and Signal Return for LVDS |            |
| 27 | Reserved | N.C.                              | Test Mode? |
| 28 | Reserved | N.C.                              | Test Mode? |
| 29 | GND      | Ground and Signal Return          |            |
| 30 | GND      | Ground and Signal Return          |            |

**【Note 1】 All GND(ground) pins should be connected together.**

**【Note 2】 All  $V_{DD}$  (power supply) pins should be connected together.**



4-2 Interface block diagram





### 4-3. Backlight driving

#### 4-3-1. Inverter Connector

Connector on Inverter : S14B-PH-SM3(Manufactured by JST) or Equivalent

Mating connector : PHR-14 (Manufactured by JST) or Equivalent  
( ):need further discussion on both sides

| Pin No | Symbol | Description  | Default |
|--------|--------|--|---------|
| 1      | VIN    | Operating Voltage Supply, +24V DC regulated                              | 24V     |
| 2      | VIN    | Operating Voltage Supply, +24V DC regulated                              | 24V     |
| 3      | VIN    | Operating Voltage Supply, +24V DC regulated                              | 24V     |
| 4      | VIN    | Operating Voltage Supply, +24V DC regulated                              | 24V     |
| 5      | VIN    | Operating Voltage Supply, +24V DC regulated                              | 24V     |
| 6      | BLGND  | Ground and Current Return  | GND     |
| 7      | BLGND  | Ground and Current Return  | GND     |
| 8      | BLGND  | Ground and Current Return  | GND     |
| 9      | BLGND  | Ground and Current Return  | GND     |
| 10     | BLGND  | Ground and Current Return  | GND     |
| 11     | ADIM   | Analog Dimming : Open/High(3.3V) for Max. Lum.                           | Max     |
| 12     | ON/OFF | BL On-Off : High(3.3V)or( Open) for BL On as default                     | On      |
| 13     | PDIM   | PWM Dimming Control : Open/High(3.3V) for Max. Lum                       | Max     |
| 14     | PESEL  | Selection of luminance control method, Vcx duty:high/, PWM duty:low/open |         |

#### 4-3-2. Lamp connector

**TBD**

## 5. Absolute Maximum Ratings

### LCD module

| Parameter           | Symbol           | Condition | Ratings      | Unit | Remark  |
|---------------------|------------------|-----------|--------------|------|---------|
| +12V supply voltage | V <sub>DD</sub>  | Ta=25°C   | -0.3 ~ +14.0 | V    |         |
| Storage temperature | T <sub>stg</sub> | —         | -20 ~ +60    | °C   | 【Note1】 |



|                                 |      |   |         |   |
|---------------------------------|------|---|---------|---|
| Operating temperature (Ambient) | Topa | — | 0 ~ +50 | ℃ |
|---------------------------------|------|---|---------|---|

**【Note1】 Humidity : 90% RH Max. at  $T_a \leq 40^\circ\text{C}$ .**

**Maximum wet-bulb temperature at  $39^\circ\text{C}$  or less at  $T_a > 40^\circ\text{C}$ .**

**No condensation.**



## 6. Electrical Characteristics

### 6-1.TFT-LCD panel driving

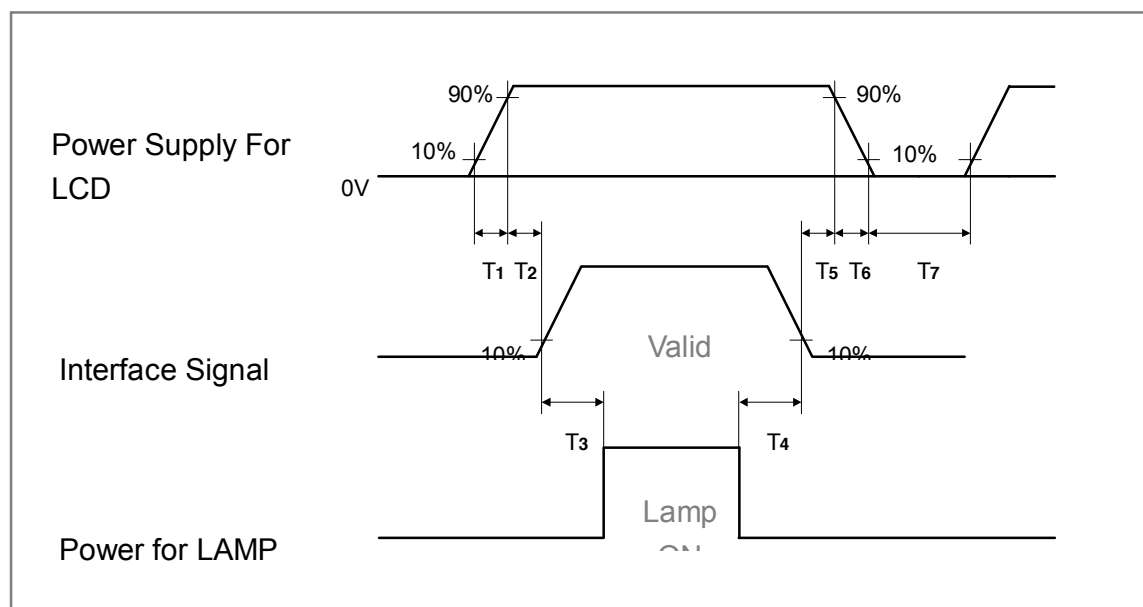
Ta = 25°C

| Parameter                            |                     | Symbol            | Min. | Typ.  | Max. | Unit   | Remark                            |
|--------------------------------------|---------------------|-------------------|------|-------|------|--------|-----------------------------------|
| V <sub>DD</sub>                      | Supply voltage      | V <sub>DD</sub>   | 11.4 | +12.0 | 12.6 | V      | 【Note2】                           |
|                                      | Current dissipation | I <sub>DD</sub>   | —    | 340   | 700  | m A    | 【Note3】                           |
| Permissive input ripple voltage      |                     | V <sub>RP</sub>   | —    | —     | 120  | mV p-p | V <sub>DD</sub> =+12V             |
| Differential input threshold voltage | High                | V <sub>TH</sub>   | —    | —     | 100  | mV     | V <sub>CM</sub> =+1.2V<br>【Note1】 |
|                                      | Low                 | V <sub>TL</sub>   | -100 | —     | —    | mV     |                                   |
| Rush current                         |                     | I <sub>RUSH</sub> |      |       | 3.0  | A      | Rise time<br>470uS                |

【Note1】 V<sub>CM</sub> : Common mode voltage of LVDS driver.

【Note2】

Power On-off sequence





1ms < T1, T6 ≤ 10 ms      0.5ms < T2, T5 ≤ 50 ms      200ms < T3, T4      T7 > 1 s

【Note3】 Maximum current condition; Change to 1x1 dot checker board pattern. V<sub>DD</sub>=+12V



|   |   |   |   |   |   |
|---|---|---|---|---|---|
| R | G | B | R | G | B |
| R | G | B | R | G | B |
| R | G | B | R | G | B |
| R | G | B | R | G | B |

 : 0 GS

 : 255 GS



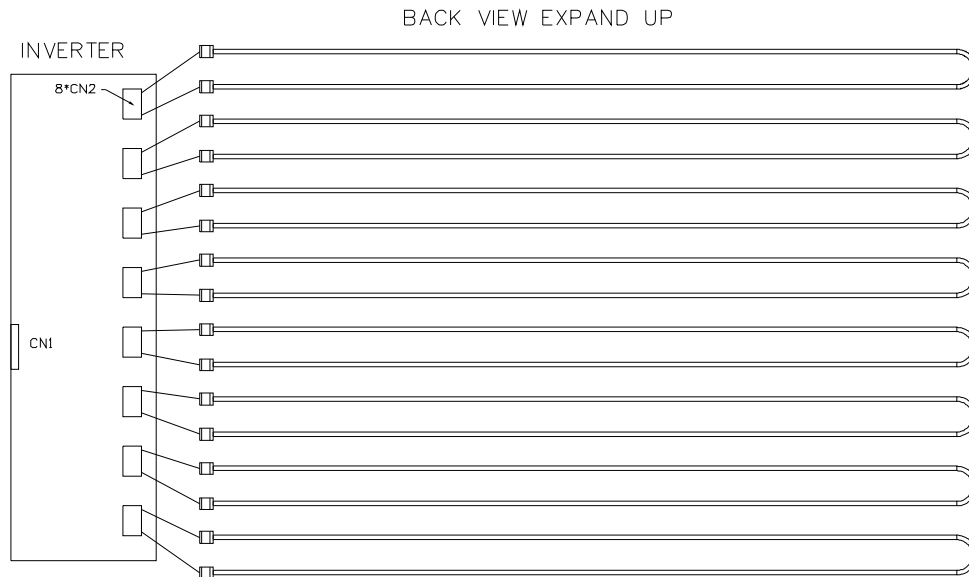
## 6-2. Backlight driving

The backlight system is a direct-lighting type with 8 U shape CCFT (Cold Cathode Fluorescent Tube).

The characteristics of the lamp are shown in the following table.

| Parameter                    | Symbol         | Min.  | Typ. | Max. | Unit  | Remark        |         |
|------------------------------|----------------|-------|------|------|-------|---------------|---------|
| Lamp current range           | I <sub>L</sub> | 5.5   | 6    | 6.5  | mArms | 【Note1】       |         |
| Lamp voltage                 | V <sub>L</sub> |       | 1000 |      | Vrms  |               |         |
| Lamp power consumption       | P <sub>L</sub> |       | 6    |      | W     | 【Note2】 IL=mA |         |
| Lamp frequency               | F <sub>L</sub> | 42    | 45   | 48   | kHz   | 【Note3】       |         |
| Established starting voltage | Vs             |       | 1100 | 1500 | Vrms  | Ta=25℃        | 【Note4】 |
|                              |                |       | 1200 | 1500 | Vrms  | Ta=0℃         |         |
| Lamp life time               | L <sub>L</sub> | 50000 |      |      | hour  | 【Note5】       |         |

【Note1】 Lamp current is measured with current meter for high frequency as shown below.



【Note2】 Calculated Value for reference ( $I_L \times V_L$ )

【Note3】 Lamp frequency may produce interference with horizontal synchronous frequency, and this may cause beat on the display.

Therefore lamp frequency shall be detached as much as possible from



the horizontal synchronous frequency and from the harmonics of horizontal synchronous to avoid interference.

**【Note4】** The voltage above this value should be applied to the lamp for more than 1 second to start-up. Otherwise the lamp may not be turned on.

**【Note5】** Lamp life time is defined as the time when either ① or ② occurs in the continuous operation under the condition of  $T_a = 25^{\circ}\text{C}$  and  $I_L = 6\text{mA}_{\text{rms}}$ .

① Brightness becomes 50 % of the original value under standard condition.

② Kick-off voltage at  $T_a = 0^{\circ}\text{C}$  exceeds maximum value.





**【Note6】** The performance of the backlight, for example life time or brightness, is much influenced by the characteristics of the DC-AC inverter for the lamp. When you design or order the inverter, please make sure that a poor lighting caused by the mismatch of the backlight and the inverter (miss-lighting, flicker, etc.) never occur. When you confirm it, the module should be operated in the same condition as it is installed in your instrument.

**【Note7】** The lamp wire length is TBD mm(from AL back cover surface to connector, not including connector length)

### 6-3 Backlight inverter

#### 6-3-1. Inverter Electrical Characteristics

| Parameter                  | Symbol           | Min. | Typ. | Max. | Unit | Notes |
|----------------------------|------------------|------|------|------|------|-------|
| Power Supply Input Voltage | V <sub>DDB</sub> | 22.8 | 24   | 25.2 | Vdc  |       |
| Power Supply Input Current | I <sub>DDB</sub> | 3300 | 3600 | 3900 | mA   |       |
| Power Consumption          | P <sub>B</sub>   |      | 86.4 |      | W    |       |

#### 6.4 Luminance Controls

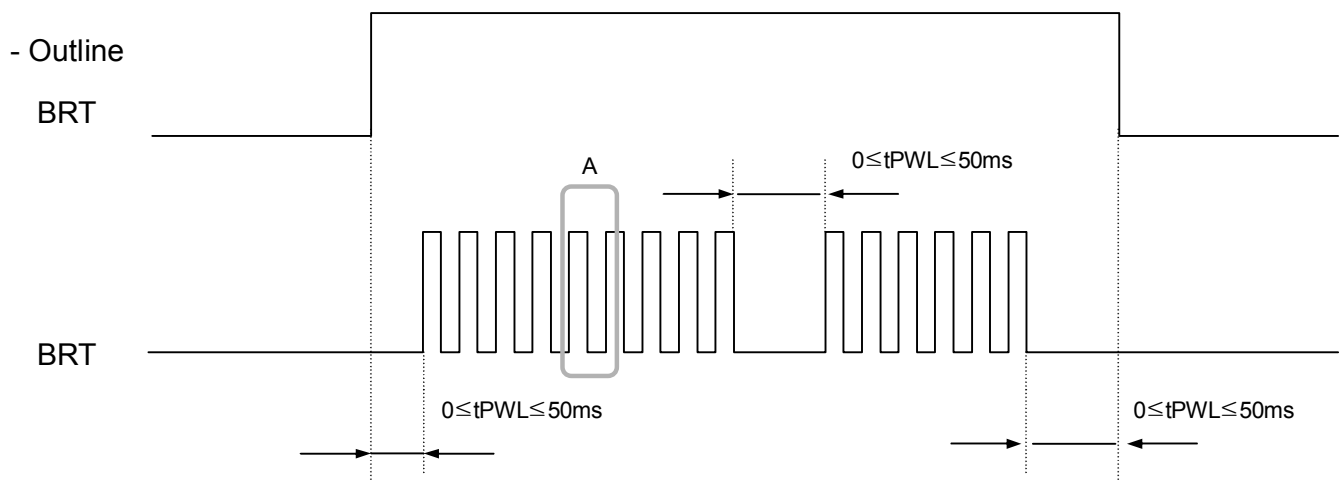
| Method          | Adjustment and Luminance Ratio   |                 | PESEL              | PDIM       | Remark  |
|-----------------|--|-----------------|--------------------|------------|---------|
| Voltage control | Adjustment – Continuous adjustment of Luminance by adjusting the voltage of BRTI within the rated range. |                 | High/Open for max. | N/A        |         |
|                 | BRTI voltage   | Luminance ratio |                    |            |         |
|                 | 0V   | 20 % (minimum)  |                    |            |         |
|                 | 3.3V   | 100 % (maximum) |                    |            |         |
| PWM control     | Adjustment- The luminance is controlled by duty ratio of BRTP  |                 | LOW                | PWM singal | See PWM |



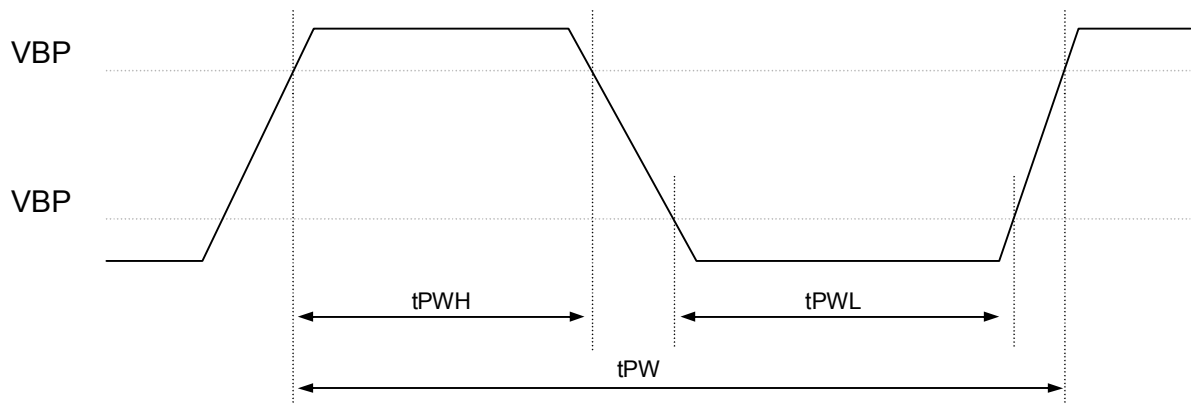
|  |  |                 |  |  |        |
|--|--|-----------------|--|--|--------|
|  | signal when PWSEL is low and PWM signal is inputted into B RTP terminal. |                 |  |  | timing |
|  | Duty Ratio   | Luminance Ratio |  |  |        |
|  | 0.2  | 20 % (minimum)  |  |  |        |
|  | 1.0  | 100 % (maximum) |  |  |        |

## 6-5. PWM timing

### 6-5-1. Timing diagram



#### - Detail of A part





### 6-5-2. Each parameter

| Parameter         | Symbol | Min. | Typ. | Max. | Unit | Notes |
|-------------------|--------|------|------|------|------|-------|
| Luminance control | FL     | 230  | 255  | 280  | Hz   | 1, 2  |
| Duty Ratio        | DL     | 0.2  | -    | 1.0  | -    | 1, 3  |
| Non signal Period | tPWL   | 0    | -    | 50   | Ms   | 4     |

Notes : 1. Definition of parameters is as follows

$$FL = \frac{1}{tPW}, \quad DL = \frac{tPWH}{tPW}$$

2. See the following formula for luminance control frequency.

Luminance control frequency =  $tvv \times (n+0.25)$  [or  $(n+0.72)$ ]

$n=1,2,3,\dots$

tvv : See "7.1 Signal timing specification"

The interference noise of luminance control frequency and input signal frequency for  
LCD



## 7. Timing characteristics of LCD module input signals

### 7-1. Timing characteristics

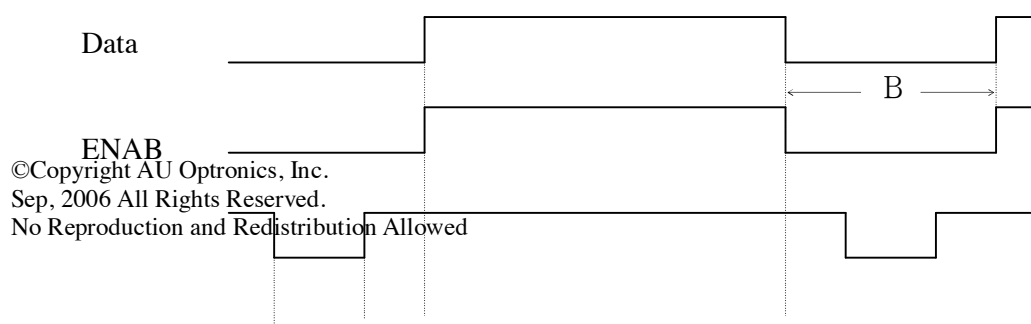
(This is specified at digital outputs of LVDS driver.)

|                    | Symbol                 |           | Min  | Typ   | Max  | Unit      | Notes |
|--------------------|------------------------|-----------|------|-------|------|-----------|-------|
| <b>ITIME</b>       |                        |           |      |       |      |           |       |
| <b>DCLK</b>        | Frequency              | $F_{CLK}$ | -    | 80    | 82   | MHz       |       |
|                    | Period                 | $t_{CLK}$ | 12.2 | 12.5  | -    | ns        |       |
| <b>Hsync</b>       | Period                 | $t_{HA}$  | 1512 | 1648  | 1780 | $t_{CLK}$ |       |
|                    | Width-Active           | $t_{HC}$  | 8    | 16    | -    |           |       |
|                    | Frequency              | $f_H$     | 44   | 48.54 | 52   | kHz       |       |
| <b>Vsync</b>       | Frequency              | $f_V$     | 47   | 60    | 63   | Hz        |       |
|                    | Period                 | $t_{VA}$  | 774  | 810   | -    | $t_{HA}$  |       |
|                    | Width-Active           | $t_{VC}$  | 2    | 6     | -    |           |       |
| <b>Data Enable</b> | Horizontal back porch  | $t_{HD}$  | 8    | 80    | -    | $t_{CLK}$ |       |
|                    | Horizontal front porch | $t_{HF}$  | 16   | 186   | -    | $t_{CLK}$ |       |
|                    | Horizontal active      | $t_{HE}$  | 1366 | 1366  | 1366 | $t_{CLK}$ |       |
|                    | Horizontal blanking    | $t_{HB}$  | 146  | 282   |      | $t_{CLK}$ |       |
|                    | Vertical back porch    | $t_{VD}$  | 2    | 20    | -    | $t_{HA}$  |       |
|                    | Vertical front porch   | $t_{VF}$  | 2    | 16    | -    | $t_{HA}$  |       |
|                    | Vertical active        | $t_{VE}$  | 768  | 768   | 768  | $t_{HA}$  |       |
|                    | Vertical blanking      | $t_{VB}$  | 6    | 42    |      | $t_{HA}$  |       |

Notes : 1.The performance of electro-optical characteristics may be influenced by variance of the vertical refresh rate.

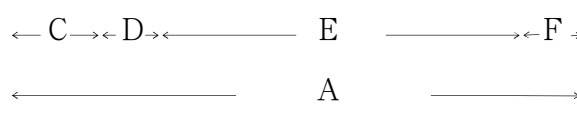
2. Hsync period will be a double number of character (8).

7-2 Signal Timing Waveform(The time “B” is  $t_{HB}$  on horizontal timing and  $t_{VB}$  on vertical timing)





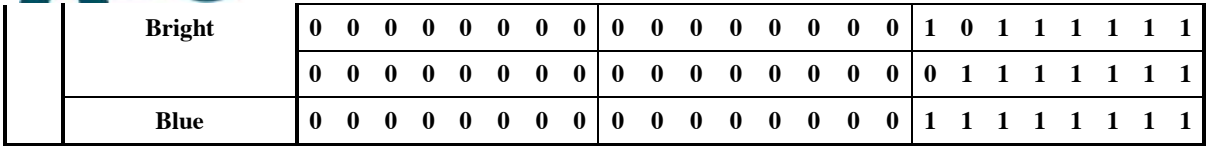
Sync





## 8. Input Signals, Basic Display Colors and Gray Scale of Each Color

|                     | Colors &<br>Gray scale | Data Signal             |                         |                         |                 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|---------------------|------------------------|-------------------------|-------------------------|-------------------------|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
|                     |                        | R0 R1 R2 R3 R4 R5 R6 R7 | G0 G1 G2 G3 G4 G5 G6 G7 | B0 B1 B2 B3 B4 B5 B6 B7 |                 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Basic Color         | Black                  | 0 0 0 0 0 0 0 0         | 0 0 0 0 0 0 0 0         | 0 0 0 0 0 0 0 0         |                 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                     | 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         |                 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                     | æ<br>Darker æ          | 1 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 0 0 0 0 0 0 0         |                 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                     | æ<br>Bright            | Æ                       | Æ                       | Æ                       |                 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                     |                        | 1 0 1 1 1 1 1 1         | 0 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         |                         |                 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                     | 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         |                 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                     | æ<br>Darker æ          | 0 0 0 0 0 0 0 0         | 1 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         |                 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                     | æ<br>Bright            | Æ                       | Æ                       | Æ                       |                 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                     |                        | 0 0 0 0 0 0 0 0         | 1 0 1 1 1 1 1 1         | 0 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         |                         |                 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                     | 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 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| æ<br>Darker æ       |                        | 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         | 0 0 0 0 0 0 0 0         | 0 1 0 0 0 0 0 0         |                 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| æ                   |                        | Æ                       | Æ                       | Æ                       |                 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |



©Copyright AU Optonics, Inc.  
Sep, 2006 All Rights Reserved.  
No Reproduction and Redistribution Allowed

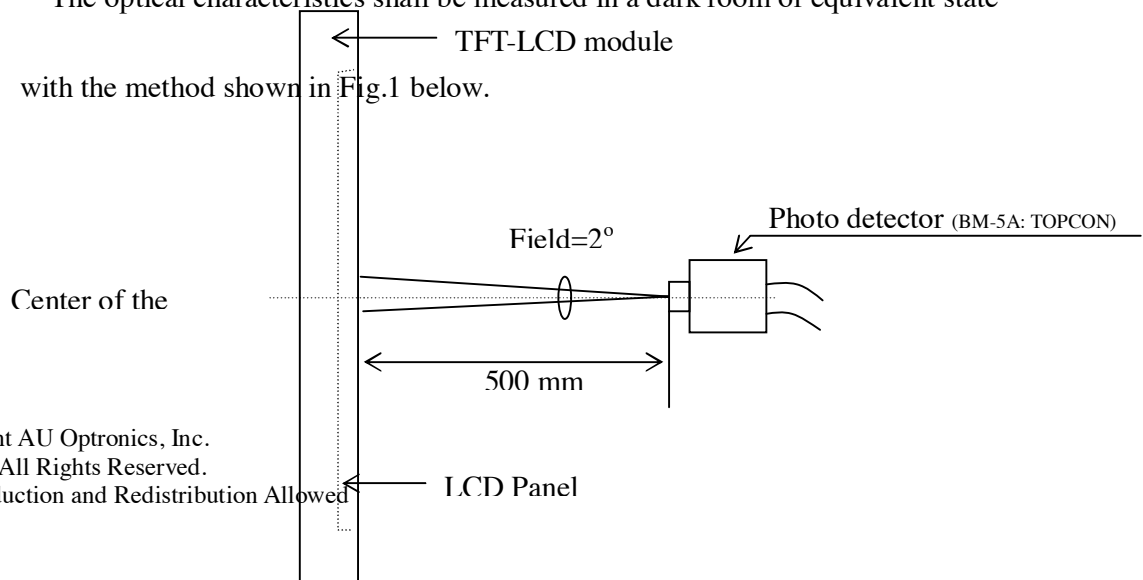
## 9. Optical Characteristics

Ta=25°C, V<sub>DD</sub>=+12V

| Parameter                        |          | Symbol                     | Condition          | Min.  | Typ.  | Max.  | Unit              | Remark   |
|----------------------------------|----------|----------------------------|--------------------|-------|-------|-------|-------------------|--|
| Viewing angle range              | L/R      | $\theta_{21}, \theta_{22}$ | CR>10              |       | 85    |       | Deg.              | 【Note1,4】  |
|                                  | U        | $\theta_{11}$              |                    |       | 85    |       | Deg.              |  |
|                                  | D        | $\theta_{12}$              |                    |       | 85    |       | Deg.              |  |
| Contrast ratio                   |          | C R n                      | $\theta = 0^\circ$ |       | 600   | —     |                   | 【Note2,4】  |
| Response time                    |          | $\tau$                     |                    | —     | 25    | —     | ms                | 【Note3,4】  |
| Rise time                        | $\tau_r$ |                            |                    |       | TBD   | —     | ms                |  |
| Fall time                        | $\tau_d$ |                            |                    |       | TBD   | —     | ms                |  |
| Chromaticity of White (CIE 1931) |          | W <sub>x</sub>             |                    | 0.245 | 0.275 | 0.305 |                   | 【Note4】<br>Color temperature<br>10000K<br>NTSC 72% |
|                                  |          | W <sub>y</sub>             |                    | 0.268 | 0.298 | 0.328 |                   |  |
| Chromaticity of Red (CIE 1931)   |          | R <sub>x</sub>             |                    |       | TBD   |       |                   |  |
|                                  |          | R <sub>y</sub>             |                    |       | TBD   |       |                   |  |
| Chromaticity of Green (CIE 1931) |          | G <sub>x</sub>             |                    |       | TBD   |       |                   |  |
|                                  |          | G <sub>y</sub>             |                    |       | TBD   |       |                   |  |
| Chromaticity of Blue (CIE 1931)  |          | B <sub>x</sub>             |                    |       | TBD   |       |                   |  |
|                                  |          | B <sub>y</sub>             |                    |       | TBD   |       |                   |  |
| Luminance of white<br>【Note4】    |          | Y <sub>L</sub>             |                    | 400   | 500   |       | Cd/m <sup>2</sup> |  |
| White Uniformity                 |          | $\delta_w$                 |                    | —     | -     | 1.3   |                   | 【Note5】  |
| Black Uniformity                 |          | $\delta_b$                 |                    |       |       | 1.3   |                   | 【Note5】  |

※ The measurement shall be executed 30 minutes after lighting at rating. (typical condition : I<sub>L</sub> = 6mA<sub>rms</sub>)

The optical characteristics shall be measured in a dark room or equivalent state with the method shown in Fig.1 below.

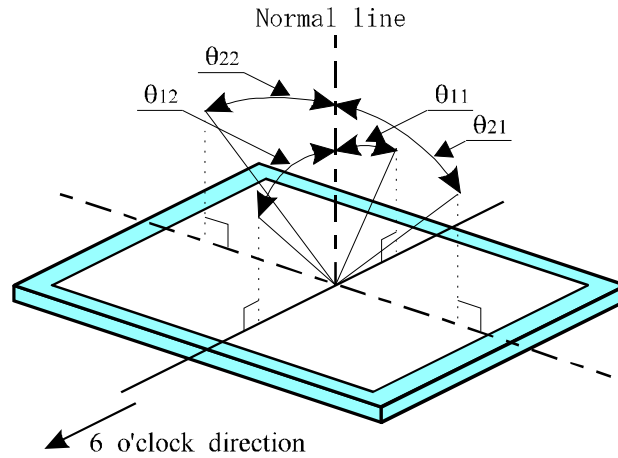








**【Note1】 Definitions of viewing angle range:**



**【Note2】 Definition of contrast ratio:**

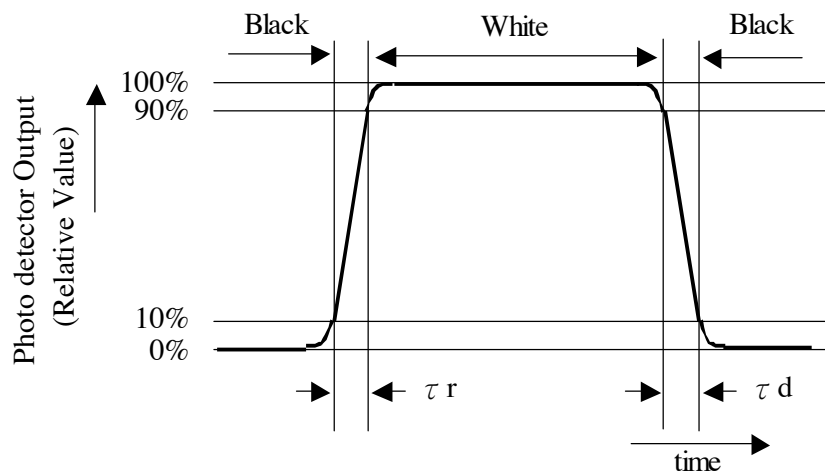
The contrast ratio is defined as the following.

$$\text{Contrast Ratio (CR)} = \frac{\text{Luminance (brightness) with all pixels}}{\text{Luminance (brightness) with all pixels}}$$

**【Note3】 Definition of response time:**

The response time is defined as the following figure and shall be measured by

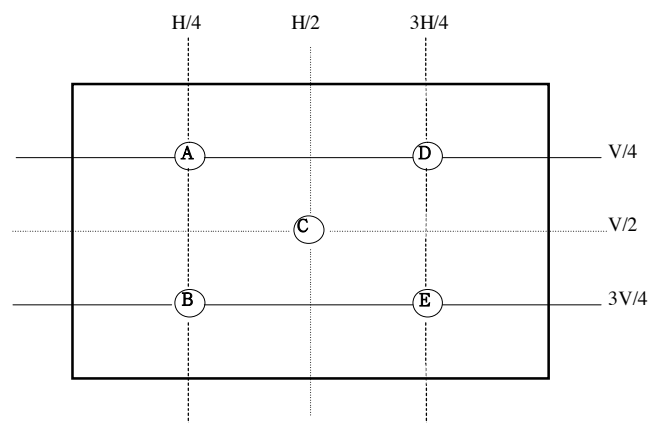
switching the input signal for "black" and "white" .



**【Note4】 This shall be measured at center of the screen.**

**【Note5】 Definition of white uniformity:**

White and black uniformity is defined as the following with nine measurements



**Maximum Luminance (of 5 points measurement)**

**$\delta_{wR}$  = Minimum Luminance (of 5 points measurement)**



## 10. Display Quality

The display quality of the color TFT-LCD module shall be in compliance with the Incoming Inspection Standard.

## 11 · Handling Precautions

- a) Be sure to turn off the power supply when inserting or disconnecting the cable.
- b) Be sure to design the cabinet so that the module can be installed without any extra stress such as warp or twist.
- c) Since the front polarizer is easily damaged, pay attention not to scratch it.
- d) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.
- e) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.
- f) Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface. Handle with care.
- g) Since CMOS LSI is used in this module, take care of static electricity and injure the human earth when handling.
- h) Observe all other precautionary requirements in handling components.
- i) This module has its circuitry PCBs on the rear side and should be handled carefully in order not to be stressed.
- j) Laminated film is attached to the module surface to prevent it from being scratched . Peel the film off slowly just before the use with strict attention to electrostatic charges. Ionized air shall be blown over during the action. Blow off the 'dust' on the polarizer by using an ionized nitrogen gun, etc..

## 12. Reliability test items

| No. | Test item                                       | Conditions                   |
|-----|---|------------------------------|
| 1   | High temperature storage test                   | Ta = 60°C      240h          |
| 2   | Low temperature storage test                    | Ta = -20°C      240h         |
| 3   | High temperature & high humidity operation test | Ta = 50°C ; 80 %RH      240h |
| 4   | High temperature operation test                 | Ta = 60°C      240h          |
| 5   | Low temperature operation test                  | Ta = 0°C      240h           |

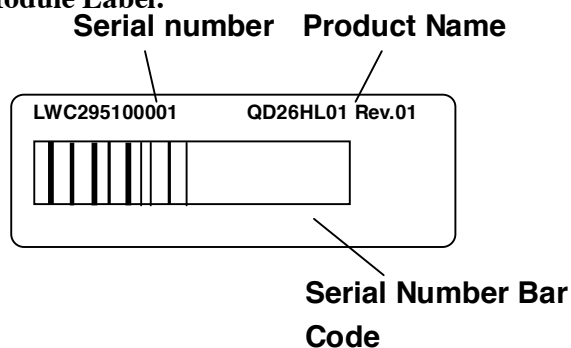


|   |                                |  |
|---|--------------------------------|--|
| 6 | Vibration test (non-operating) | Frequency: 10~500Hz, 1.0G , 20 min/each axis   |
| 7 | Shock test (non- operating)    | Gravity : 100G<br>Pulse width : 2ms, half sine wave<br>Direction : $\pm X, \pm Y, \pm Z$<br>Once for each direction. |



## 13 · Others

### 1) LCD Module Label:



**LWC295100001** Digital code 4, 5 is Date code.

Digital 4 (Year) 1: 2001, 2: 2002, 3:2003,....

Digital 5 (Month) 1: Jan, 2: Feb,... , A:Oct, B:Nov., C: Dec.

2) Adjusting volume has been set optimally before shipment, so do not change any adjusted value.

If adjusted value is changed, the specification may not be satisfied.

**3) Disassembling the module can cause permanent damage and should be strictly avoided.**

4) Please be careful since image retention may occur when a fixed pattern is displayed for a long time.

**5) If any problem occurs in relation to the description of this specification, it shall be resolved through discussion with spirit of cooperation.**



