

## TFT LCD Approval Specification

# MODEL NO.: N121X5 -L06

Customer : Lenovo

Approved by : \_\_\_\_\_

Note :

| 記錄                         | 工作                              | 審核                                   | 角色                           | 投票     |
|----------------------------|---------------------------------|--------------------------------------|------------------------------|--------|
| 2007-01-11<br>19:10:37 CST | Approve by Dept.<br>Mgr.(QA RA) | tomy_chen(陳永一<br>/52720/54140/43150) | Department<br>Manager(QA RA) | Accept |
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### REVISION HISTORY

| Version | Date         | Page (New) | Section | Description  |
|---------|--------------|------------|---------|--|
| Ver 1.0 | Sep. 29. '06 | All        | All     | Preliminary Specification was first issued.  |
| Ver 2.0 | Nov. 13. '06 | All        | All     | Approval Specification was first issue   |
|         | Nov. 15. '06 | 9          | 3.2     | Backlight unit Power Consumption TEST condition change 6mA to 5mA.<br>Lamp Life Time change Min10,000H(6.0mA) to 12,000H(5.0mA).<br>Lamp Current change Min 3.0mA Typ 6.0mA to Min no Spec Typ 5.0mA.<br>Operating Frequency change Min50KHz to Min 45kHz.<br>Lamp Turn On Voltage change MAX 1340V 0 to Max 1300V 0 . |
| Ver 3.0 | Nov.22. '06  | 20         | 6.1     | DCLK Frequency change Min 50MHz to Min 43.3MHz.  |
|         |              | 21         | 6.2     | Modify Power on/off sequence.  |
|         |              | 4          | 1.4     | Modify the surface treatment from 41% to 42% (Haze value)  |
|         |              | 7          | 3.1     | Modify power supply current.   |
| Ver 3.1 | Jan.10. '07  | 22         | 7.1     | Modify the inverter current from 6mA to 5mA  |
|         |              |            | 7.2     | Modify the Wx ..   |
|         |              | 27         | 10      | Modify DEFINITION OF LABELS  |
|         |              | 9          | 3.2     | Modify 3.2 note (1) lamp wire color  |

## 1. GENERAL DESCRIPTION

### 1.1 OVERVIEW

N121X5 -L06 is a 12.1" TFT Liquid Crystal Display module with single CCFL Backlight unit and 20 pins LVDS interface. This module supports 1024 x 768 XGA mode and can display 262,144 colors. The optimum viewing angle is at 6 o'clock direction. The inverter module for Backlight is not built in.

### 1.2 FEATURES

- Thin and light weight
- XGA (1024 x 768 pixels) resolution
- DE (Data Enable) only mode
- 3.3V LVDS (Low Voltage Differential Signaling) interface with 1 pixel/clock
- Support EDID Structure Version 1 Revision 3

### 1.3 APPLICATION

- TFT LCD Notebook

### 1.4 GENERAL SPECIFICATIONS

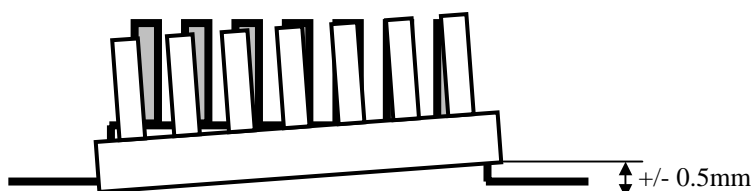
| Item               | Specification                             | Unit  | Note |
|--------------------|---|-------|------|
| Active Area        | 245.76 (H) X 184.32 (V)                   | mm    | (1)  |
| Bezel Opening Area | 250.5 (H) x 188.9 (V)                     | mm    |      |
| Driver Element     | a-si TFT active matrix                    | -     | -    |
| Pixel Number       | 1024 x R.G.B. x 768                       | pixel | -    |
| Pixel Pitch        | 0.24 (H) x 0.24 (V)                       | mm    | -    |
| Pixel Arrangement  | RGB vertical stripe                       | -     | -    |
| Display Colors     | 262,144                                   | color | -    |
| Transmissive Mode  | Normally white                            | -     | -    |
| Surface Treatment  | Hard coating (2H), Anti-glare (Haze 42 %) | -     | -    |

### 1.5 MECHANICAL SPECIFICATIONS

| Item        | Min.          | Typ.  | Max. | Unit  | Note |     |
|-------------|---------------|-------|------|-------|------|-----|
| Module Size | Horizontal(H) | 260.5 | 261  | 261.5 | mm   | (1) |
|             | Vertical(V)   | 197.5 | 198  | 198.5 | mm   |     |
|             | Depth(D)      | --    | 4.7  | 5.0   | mm   |     |
| Weight      | --            | 260   | 270  | g     | -    |     |

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

Note (2) Connector mounting position



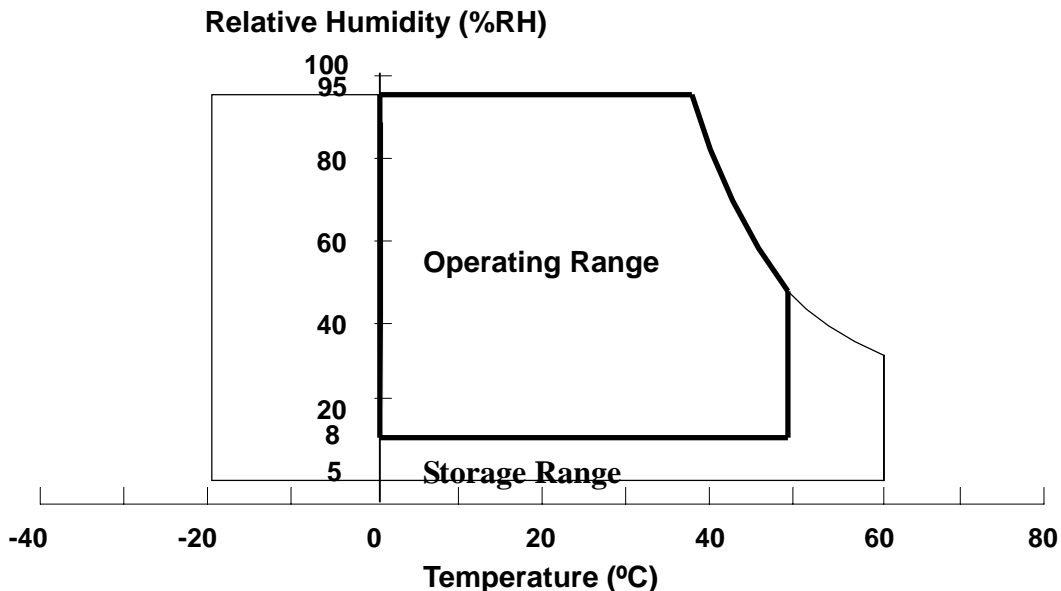
## 2. ABSOLUTE MAXIMUM RATINGS

### 2.1 ABSOLUTE RATINGS OF ENVIRONMENT

| Item                          | Symbol           | Value |        | Unit | Note     |
|-------------------------------|------------------|-------|--------|------|----------|
|                               |                  | Min.  | Max.   |      |          |
| Storage Temperature           | T <sub>ST</sub>  | -20   | +60    | °C   | (1)      |
| Operating Ambient Temperature | T <sub>OP</sub>  | 0     | +50    | °C   | (1), (2) |
| Shock (Non-Operating)         | S <sub>NOP</sub> | -     | 210/50 | G    | (3), (5) |
| Vibration (Non-Operating)     | V <sub>NOP</sub> | -     | 1.5    | G    | (4), (5) |

Note (1) Temperature and relative humidity range is shown in the figure below.

- (a) 90 %RH Max. (Ta = 40 °C).
- (b) Wet-bulb temperature should be 39 °C Max. (Ta > 40 °C).
- (c) No condensation.

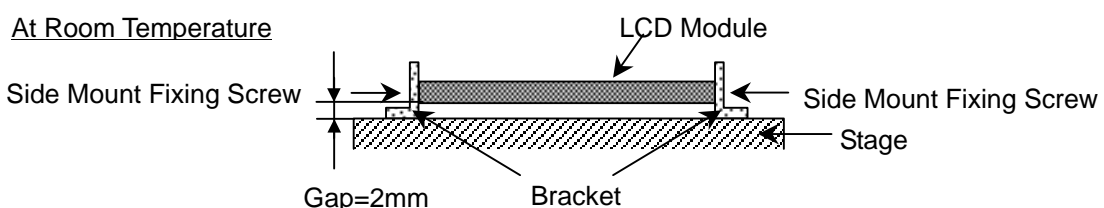


Note (2) The temperature of panel surface should be 0 °C Min. and 50 °C Max.

Note (3) 1 time for ± X, ± Y, ± Z. for Condition (210G / 3ms) is half Sine Wave, Condition (50G / 18ms) is Rectangle Wave,

Note (4) 10 ~ 200 Hz, 0.5 Hr / Cycle, 1 cycles for each X, Y, Z.

Note (5) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture. The fixing condition is shown as below:



## 2.2 ELECTRICAL ABSOLUTE RATINGS

### 2.2.1 TFT LCD MODULE

| Item                 | Symbol          | Value |                      | Unit | Note |
|----------------------|-----------------|-------|----------------------|------|------|
|                      |                 | Min.  | Max.                 |      |      |
| Power Supply Voltage | V <sub>CC</sub> | -0.3  | +4.0                 | V    | (1)  |
| Logic Input Voltage  | V <sub>IN</sub> | -0.3  | V <sub>CC</sub> +0.3 | V    |      |

### 2.2.2 BACKLIGHT UNIT

| Item           | Symbol         | Value |      | Unit              | Note                                |
|----------------|----------------|-------|------|-------------------|-------------------------------------|
|                |                | Min.  | Max. |                   |                                     |
| Lamp Voltage   | V <sub>L</sub> | -     | 2.5K | V <sub>RMS</sub>  | (1), (2), I <sub>L</sub> = (6.0) mA |
| Lamp Current   | I <sub>L</sub> | -     | 6.5  | mA <sub>RMS</sub> |                                     |
| Lamp Frequency | F <sub>L</sub> | -     | 80   | KHZ               |                                     |

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

Note (2) Specified values are for lamp (Refer to Section 3.2 for further information).

### 3. ELECTRICAL CHARACTERISTICS

#### 3.1 TFT LCD MODULE

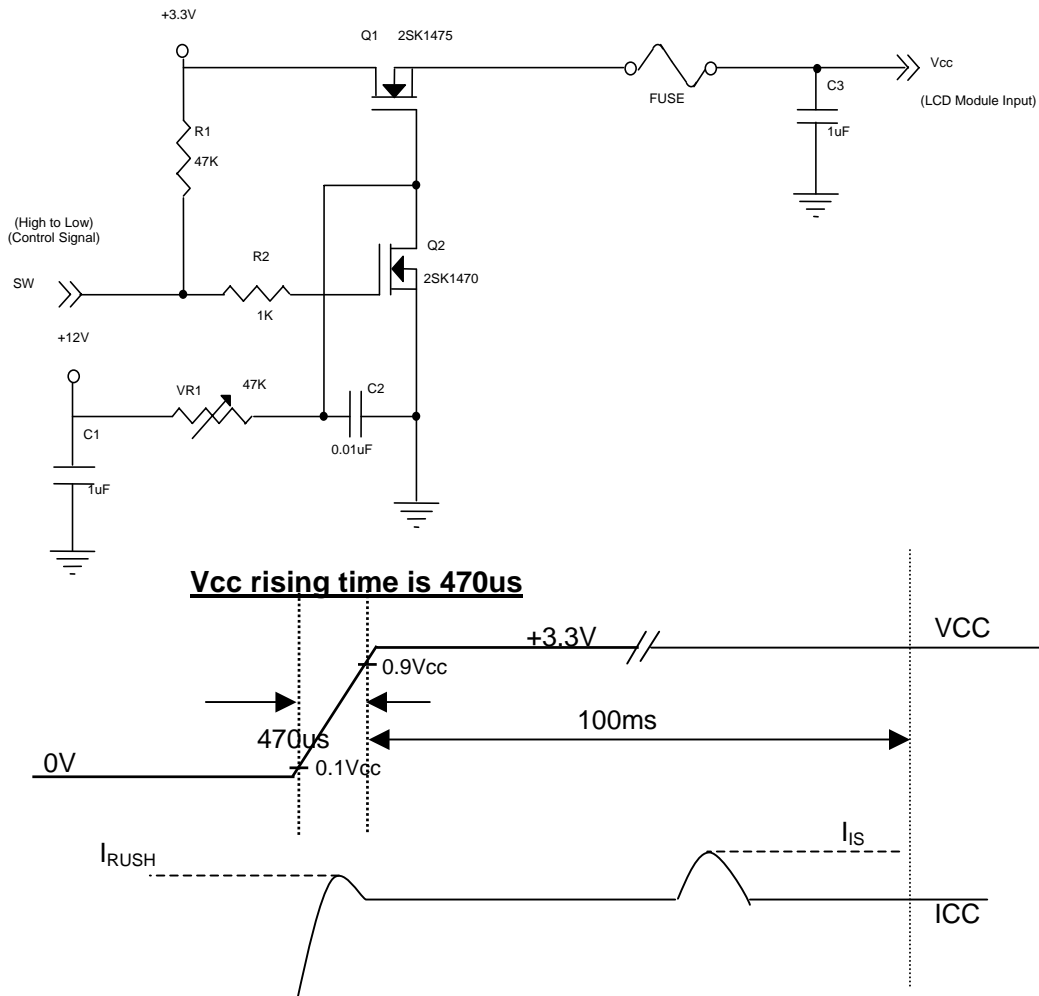
| Parameter                              | Symbol                | Value           |      |       | Unit | Note                          |      |
|--|-----------------------|-----------------|------|-------|------|-------------------------------|------|
|  |                       | Min.            | Typ. | Max.  |      |                               |      |
| Power Supply Voltage                   | V <sub>CC</sub>       | 3.0             | 3.3  | 3.6   | V    | -                             |      |
| Permissible Ripple Voltage             | V <sub>RP</sub>       |                 | 50   |       | mV   | -                             |      |
| Rush Current                           | I <sub>RUSH</sub>     |                 |      | 1.5   | A    | (2)                           |      |
| Initial Stage Current                  | I <sub>IS</sub>       |                 |      | 1.0   | A    | (2)                           |      |
| Power Supply Current                   | White                 | I <sub>CC</sub> |      | 240   | 280  | mA                            | (3)a |
|  | Black                 |                 |      | 290   | 340  | mA                            | (3)b |
| LVDS Differential Input High Threshold | V <sub>TH(LVDS)</sub> |                 |      | +100  | mV   | (5),<br>V <sub>CM</sub> =1.2V |      |
| LVDS Differential Input Low Threshold  | V <sub>TL(LVDS)</sub> | -100            |      |       | mV   | (5)<br>V <sub>CM</sub> =1.2V  |      |
| LVDS Common Mode Voltage               | V <sub>CM</sub>       | 1.125           |      | 1.375 | V    | (5)                           |      |
| LVDS Differential Input Voltage        | V <sub>ID</sub>       | 100             |      | 600   | mV   | (5)                           |      |
| Terminating Resistor                   | R <sub>T</sub>        |                 | 100  |       | Ohm  |                               |      |
| Power per EBL WG                       | P <sub>EBL</sub>      | -               | 2.6  | -     | W    | (4)                           |      |

Note (1) The ambient temperature is Ta = 25 ± 2 °C.

Note (2) I<sub>RUSH</sub>: the maximum current when VCC is rising

I<sub>IS</sub>: the maximum current of the first 100ms after power-on

Measurement Conditions: Shown as the following figure. Test pattern: black.



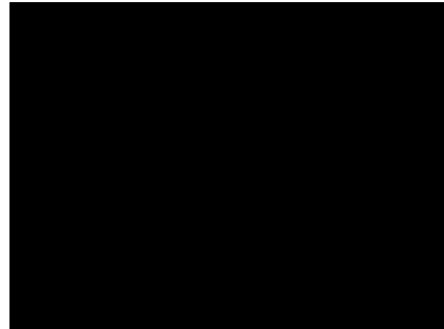
Note (3) The specified power supply current is under the conditions at  $V_{CC} = 3.3\text{ V}$ ,  $T_a = 25 \pm 2\text{ }^\circ\text{C}$ ,  $f_v = 60\text{ Hz}$ , whereas a power dissipation check pattern below is displayed.

a. White Pattern



Active Area

b. Black Pattern

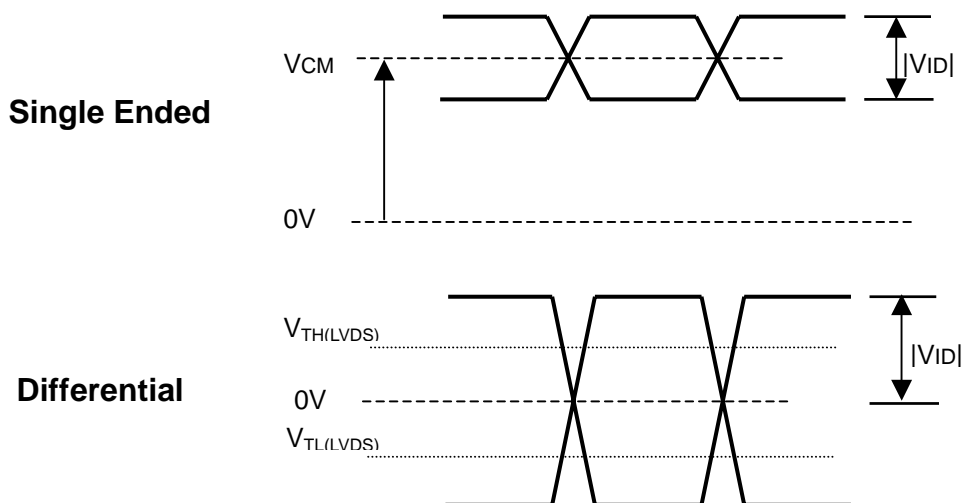


Active Area

Note (4) The specified power are the sum of LCD panel electronics input power and the inverter input power. Test conditions are as follows.

- (a)  $V_{CC} = 3.3\text{ V}$ ,  $T_a = 25 \pm 2\text{ }^\circ\text{C}$ ,  $f_v = 60\text{ Hz}$ ,
- (b) The pattern used is a black and white 32 x 36 checkerboard, slide #100 from the VESA file "Flat Panel Display Monitor Setup Patterns", FPDMSU.ppt.
- (c) Luminance: 60 nits.
- (d) The inverter used is provided from Sumida. Please contact them for detail information. CMO doesn't provide the inverter in this product.

Note (5) The parameters of LVDS signals are defined as the following figures.



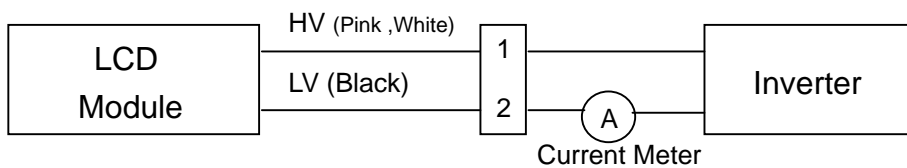


### 3.2 BACKLIGHT UNIT

Ta = 25 ± 2 °C

| Parameter            | Symbol          | Value  |      |              | Unit              | Note                         |
|----------------------|-----------------|--------|------|--------------|-------------------|------------------------------|
|                      |                 | Min.   | Typ. | Max.         |                   |                              |
| Lamp Input Voltage   | V <sub>L</sub>  | -      | 624  | -            | V <sub>RMS</sub>  | I <sub>L</sub> = 5.0 mA      |
| Lamp Current         | I <sub>L</sub>  | -      | 5.0  | -            | mA <sub>RMS</sub> | (1),(7)                      |
| Lamp Turn On Voltage | V <sub>S</sub>  | -      | -    | 1170 (25 °C) | V <sub>RMS</sub>  | (2)                          |
|                      |                 | -      | -    | 1300 (0 °C)  | V <sub>RMS</sub>  | (2)                          |
| Operating Frequency  | F <sub>L</sub>  | 45     | -    | 80           | KHz               | (3)                          |
| Power Consumption    | P <sub>L</sub>  | -      | 3.12 | -            | W                 | (4), I <sub>L</sub> = 5.0 mA |
| Lamp Life Time       | L <sub>BL</sub> | 12,000 | -    | -            | Hrs               | (5)                          |

Note (1) Lamp current is measured by utilizing a high frequency current meter as shown below:



Note (2) The voltage shown above should be applied to the lamp for more than 1 second after startup. Otherwise the lamp may not be turned on.

Note (3) The lamp frequency may generate interference with horizontal synchronous frequency from the display, and this may cause line flow on the display. In order to avoid interference, the lamp frequency should be detached from the horizontal synchronous frequency and its harmonics as far as possible.

Note (4)  $P_L = I_L \times V_L$

Note (5) The lifetime of lamp is defined as the time when it continues to operate under the conditions at Ta = 25 ± 2 °C and I<sub>L</sub> = 5.0 mA<sub>RMS</sub> until one of the following events occurs:

- (a) When the brightness becomes 50% of its original value.
- (b) When the effective ignition length becomes 80% of its original value. (Effective ignition length is defined as an area that the brightness is less than 70% compared to the center point.)

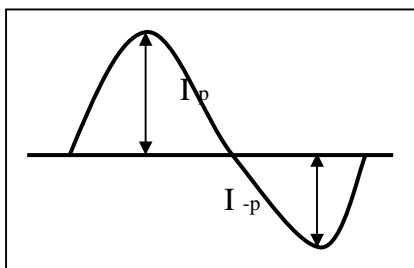
Note (6) The waveform of the voltage output of inverter must be area-symmetric and the design of the inverter must have specifications for the modularized lamp. The performance of the Backlight, such as lifetime or brightness, is greatly influenced by the characteristics of the DC-AC inverter for the lamp. All the parameters of an inverter should be carefully designed to avoid generating too much current leakage from high voltage output of the inverter. When designing or ordering the inverter please make sure that a poor lighting caused by the mismatch of the Backlight and the inverter (miss-lighting, flicker, etc.) never occurs. If the above situation is confirmed, the module should be operated in the same manners when it is installed in your instrument.

The output of the inverter must have symmetrical (negative and positive) voltage waveform and symmetrical current waveform. (Unsymmetrical ratio is less than 10%) Please do not use the inverter,

which has unsymmetrical voltage and unsymmetrical current and spike wave. Lamp frequency may produce interface with horizontal synchronous frequency and as a result this may cause beat on the display. Therefore lamp frequency shall be as away possible from the horizontal synchronous frequency and from its harmonics in order to prevent interference.

Requirements for a system inverter design, which is intended to have a better display performance, a better power efficiency and a more reliable lamp. It shall help increase the lamp lifetime and reduce its leakage current.

- a. The asymmetry rate of the inverter waveform should be 10% below;
- b. The distortion rate of the waveform should be within  $2 \pm 10\%$ ;



\* Asymmetry rate:

$$| I_p - I_{-p} | / I_{rms} * 100\%$$

\* Distortion rate

$$I_p \text{ (or } I_{-p}) / I_{rms}$$

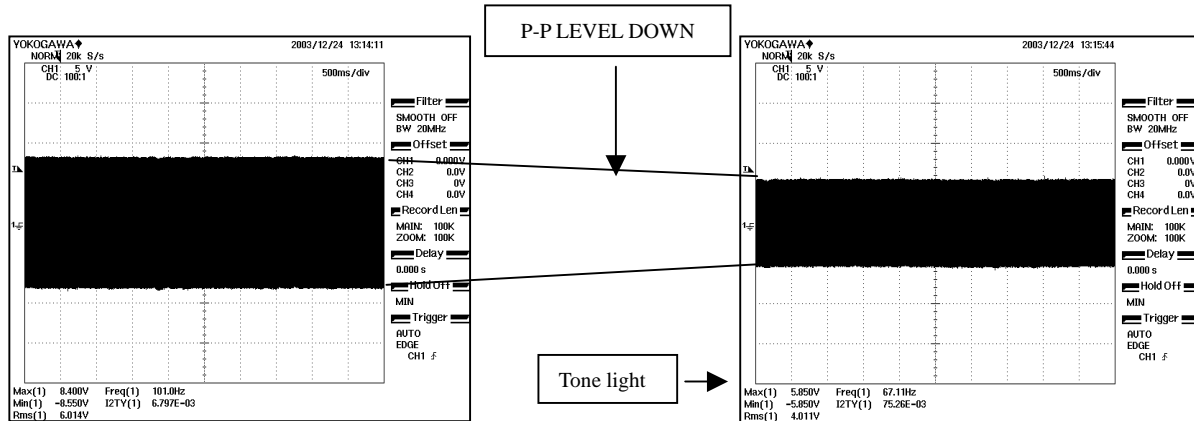
- c. The ideal sine wave form shall be symmetric in positive and negative polarities.

Note (7) About operating current min 2.0mA , lamp maker has some advice as below

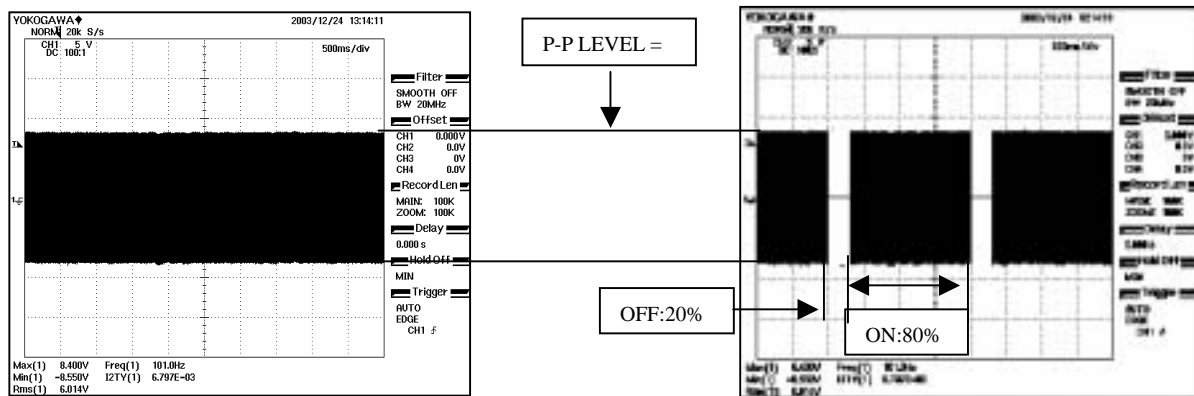
(Reference) Light quantity adjustment method

Explanation and comparison of the kind of tone light:

Lamp current wave-like by the adjustment of the current.



Lamp current wave-like by the adjustment of the burst.



Comparative table

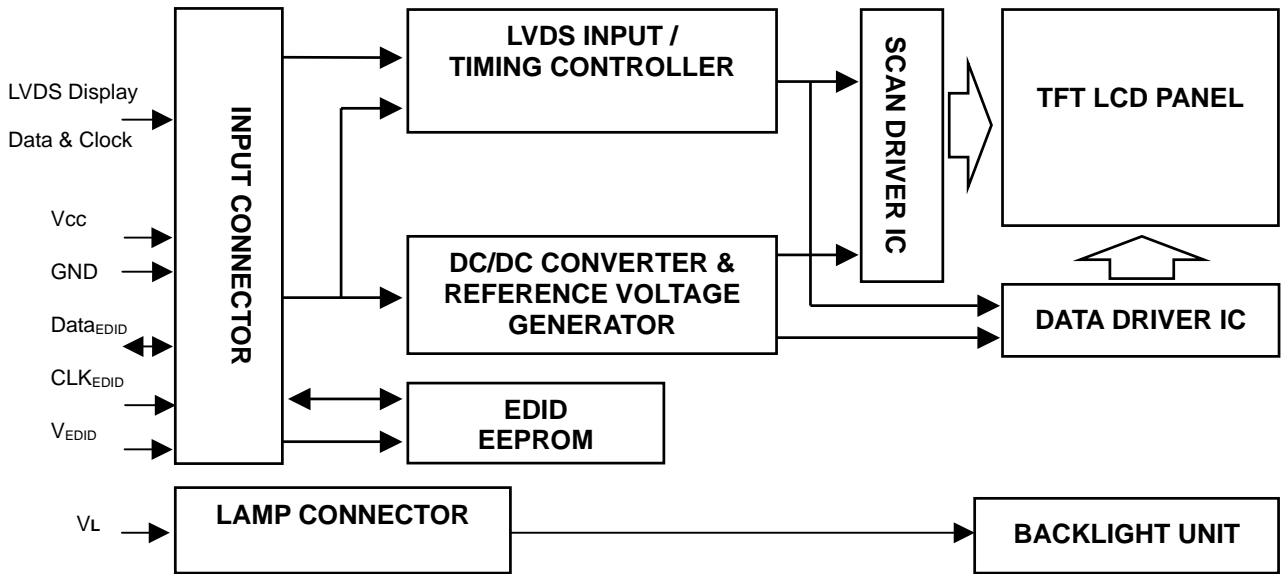
| Method  | Backlight efficiency (INV + LAMP) | Tone light rate (%) | Circuitry   |
|---------|-----------------------------------|---------------------|-------------|
| current | Good ( 75 % 85% )                 | 58                  | Complicated |
| burst   | Bad ( 65 % 75% )                  | 10                  | Easy        |

Method of case that Lamp current MIN2.0mA is controlled.

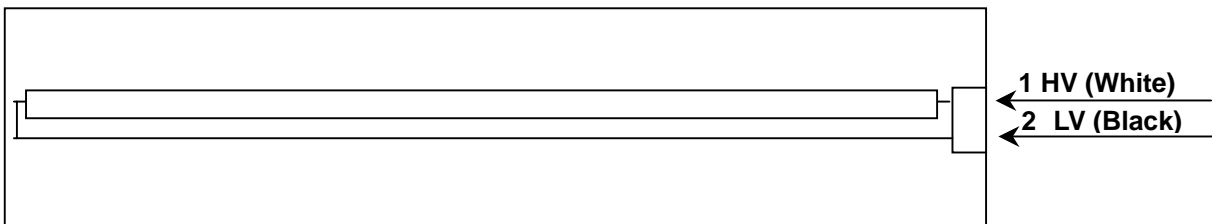
It is the setting of minimum 2mA (MIN) to Lamp current 6.0mA in the lamp specification. The burst is excellent for circuitry. The marker proposes that pays attention to the following contents.

4. BLOCK DIAGRAM

4.1 TFT LCD MODULE



4.2 BACKLIGHT UNIT



## 5. INPUT TERMINAL PIN ASSIGNMENT

### 5.1 TFT LCD MODULE

| Pin | Symbol               | Description                   | Polarity | Remark               |
|-----|----------------------|-------------------------------|----------|----------------------|
| 1   | Vss                  | Ground                        |          |                      |
| 2   | Vcc                  | Power Supply +3.3 V (typical) |          |                      |
| 3   | Vcc                  | Power Supply +3.3 V (typical) |          |                      |
| 4   | V <sub>EDID</sub>    | DDC 3.3V Power                |          | DDC 3.3V Power       |
| 5   | NC                   | Non-Connection                |          |                      |
| 6   | CLK <sub>EDID</sub>  | DDC Clock                     |          | DDC Clock            |
| 7   | DATA <sub>EDID</sub> | DDC Data                      |          | DDC Data             |
| 8   | Rxin0-               | LVDS Differential Data Input  | Negative | R0~R5,G0             |
| 9   | Rxin0+               | LVDS Differential Data Input  | Positive |                      |
| 10  | Vss                  | Ground                        |          |                      |
| 11  | Rxin1-               | LVDS Differential Data Input  | Negative | G1~G5,B0,B1          |
| 12  | Rxin1+               | LVDS Differential Data Input  | Positive |                      |
| 13  | Vss                  | Ground                        |          |                      |
| 14  | Rxin2-               | LVDS Differential Data Input  | Negative | B2~B5,DE,Hsync,Vsync |
| 15  | Rxin2+               | LVDS Differential Data Input  | Positive |                      |
| 16  | Vss                  | Ground                        |          |                      |
| 17  | CLK-                 | LVDS Clock Data Input         | Negative | LVDS Level Clock     |
| 18  | CLK+                 | LVDS Clock Data Input         | Positive |                      |
| 19  | Vss                  | Ground                        |          |                      |
| 20  | Vss                  | Ground                        |          |                      |

Note (1) The first pixel is even.

Note (2) Connector Part No.: HIROSE DF19L-20P-1H or equivalent

Note (3) User's connector Part No: HIROSE DF19G-20S-1C or equivalent

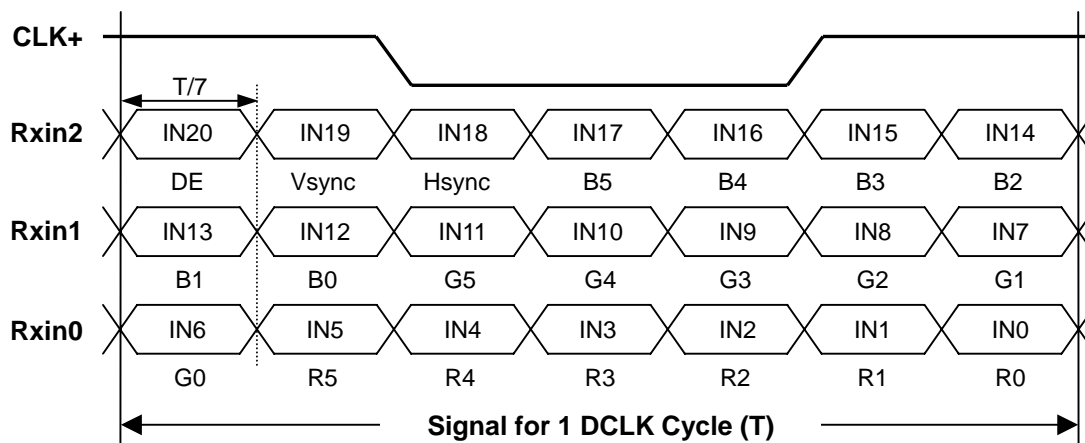
### 5.2 BACKLIGHT UNIT

| Pin | Symbol | Description  | Color |
|-----|--------|--------------|-------|
| 1   | HV     | High Voltage | White |
| 2   | LV     | Ground       | Black |

Note (1) Connector Part No.: JST-BHSR-02VS-1 or equivalent

Note (2) User's connector Part No.: JST-SM02B-BHSS-1-TB or equivalent

### 5.3 TIMING DIAGRAM OF LVDS INPUT SIGNAL



#### 5.4 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 6-bit gray scale data input for the color. The higher the binary input the brighter the color. The table below provides the assignment of color versus data input.

| Color               |               | Data Signal |    |    |    |    |    |       |    |    |    |    |    |      |    |    |    |    |    |
|---------------------|---------------|-------------|----|----|----|----|----|-------|----|----|----|----|----|------|----|----|----|----|----|
|                     |               | Red         |    |    |    |    |    | Green |    |    |    |    |    | Blue |    |    |    |    |    |
|                     |               | R5          | R4 | R3 | R2 | R1 | R0 | G5    | G4 | G3 | G2 | G1 | G0 | B5   | B4 | B3 | B2 | B1 | B0 |
| Basic Colors        | Black         | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Red           | 1           | 1  | 1  | 1  | 1  | 1  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Green         | 0           | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1  | 1  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Blue          | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1  | 1  |
|                     | Cyan          | 0           | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 1  | 1  |
|                     | Magenta       | 1           | 1  | 1  | 1  | 1  | 1  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 1  | 1  | 1  | 1  | 1  |
|                     | Yellow        | 1           | 1  | 1  | 1  | 1  | 1  | 1     | 1  | 1  | 1  | 1  | 1  | 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  |
| Gray Scale Of Red   | Red(0)/Dark   | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Red(1)        | 0           | 0  | 0  | 0  | 0  | 1  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Red(2)        | 0           | 0  | 0  | 0  | 1  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | :             | :           | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  |
|                     | :             | :           | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  |
|                     | :             | :           | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  |
|                     | Red(61)       | 1           | 1  | 1  | 1  | 0  | 1  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Red(62)       | 1           | 1  | 1  | 1  | 1  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
| Red(63)             | 1             | 1           | 1  | 1  | 1  | 1  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  |    |
| Gray Scale Of Green | Green(0)/Dark | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Green(1)      | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 1  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Green(2)      | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 1  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | :             | :           | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  |
|                     | :             | :           | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  |
|                     | :             | :           | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  |
|                     | Green(61)     | 0           | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 0  | 1  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Green(62)     | 0           | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
| Green(63)           | 0             | 0           | 0  | 0  | 0  | 0  | 1  | 1     | 1  | 1  | 1  | 1  | 0  | 0    | 0  | 0  | 0  | 0  |    |
| Gray Scale Of Blue  | Blue(0)/Dark  | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Blue(1)       | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 1  |
|                     | Blue(2)       | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 1  | 0  |
|                     | :             | :           | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  |
|                     | :             | :           | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  |
|                     | :             | :           | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  |
|                     | Blue(61)      | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 0  | 1  |
|                     | Blue(62)      | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1  | 0  |
| Blue(63)            | 0             | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 1  | 1    | 1  | 1  | 1  | 1  |    |

Note (1) 0: Low Level Voltage, 1: High Level Voltage

## 5.5 EDID DATA STRUCTURE

The EDID (Extended Display Identification Data) data formats are to support displays as defined in the VESA Plug & Display and FPD standards.

| Byte #<br>(decimal) | Byte #<br>(hex) | Field Name and Comments                             | Value<br>(hex) | Value<br>(binary) |
|---------------------|-----------------|---|----------------|-------------------|
| 0                   | 0               | Header  | 00             | 00000000          |
| 1                   | 1               | Header  | FF             | 11111111          |
| 2                   | 2               | Header  | FF             | 11111111          |
| 3                   | 3               | Header  | FF             | 11111111          |
| 4                   | 4               | Header  | FF             | 11111111          |
| 5                   | 5               | Header  | FF             | 11111111          |
| 6                   | 6               | Header  | FF             | 11111111          |
| 7                   | 7               | Header  | 00             | 00000000          |
| 8                   | 8               | ID system Manufacturer Name                         | 30             | 00110000          |
| 9                   | 9               | Compressed ASCII                                    | AE             | 10101110          |
| 10                  | 0A              | ID Product Code (LSB)                               | 00             | 00000000          |
| 11                  | 0B              | ID Product Code (MSB)                               | 40             | 01000000          |
| 12                  | 0C              | LCD Module Serial No. = 0 (If not used)             | 00             | 00000000          |
| 13                  | 0D              | LCD Module Serial No. = 0 (If not used)             | 00             | 00000000          |
| 14                  | 0E              | LCD Module Serial No. = 0 (If not used)             | 00             | 00000000          |
| 15                  | 0F              | LCD Module Serial No. = 0 (If not used)             | 00             | 00000000          |
| 16                  | 10              | Week of Manufacture                                 | 30             | 00110000          |
| 17                  | 11              | Year of Manufacture                                 | 10             | 00010000          |
| 18                  | 12              | EDID Structure version                              | 01             | 00000001          |
| 19                  | 13              | EDID Revision                                       | 03             | 00000011          |
| 20                  | 14              | Video Input Definition = Digital I/P, non TMDS CRGB | 80             | 10000000          |
| 21                  | 15              | Max H image size(cm) = 30.5 cm                      | 19             | 00011001          |
| 22                  | 16              | Max V image size(cm) = 18.3 cm                      | 12             | 00010010          |
| 23                  | 17              | Display gamma                                       | 78             | 01111000          |
| 24                  | 18              | Feature support(DPMS) = Active off, RGB Color       | EA             | 11101010          |
| 25                  | 19              | Red/Green low Bits                                  | FE             | 11111110          |
| 26                  | 1A              | Blue/White Low Bits                                 | 60             | 01100000          |
| 27                  | 1B              | Red X   | 95             | 10010101          |
| 28                  | 1C              | Red Y   | 55             | 01010101          |
| 29                  | 1D              | Green X   | 51             | 01010001          |
| 30                  | 1E              | Green Y   | 87             | 10000111          |
| 31                  | 1F              | Blue X  | 26             | 00100110          |
| 32                  | 20              | Blue Y  | 22             | 00100010          |
| 33                  | 21              | White X   | 50             | 01010000          |
| 34                  | 22              | White Y   | 54             | 01010100          |
| 35                  | 23              | Established Timing I = 00h(If not used)             | 21             | 00100001          |
| 36                  | 24              | Established Timing II = 00h(If not used)            | 08             | 00001000          |
| 37                  | 25              | Manufacturer's Timings = 00h(If not used)           | 00             | 00000000          |
| 38                  | 26              | Standard Timing Identification 1 was not used       | 01             | 00000001          |
| 39                  | 27              | Standard Timing Identification 1 was not used       | 01             | 00000001          |
| 40                  | 28              | Standard Timing Identification 2 was not used       | 01             | 00000001          |
| 41                  | 29              | Standard Timing Identification 2 was not used       | 01             | 00000001          |

| Byte #<br>(decimal) | Byte #<br>(hex) | Field Name and Comments   | Value<br>(hex) | Value<br>(binary) |
|---------------------|-----------------|---|----------------|-------------------|
| 42                  | 2A              | Standard Timing Identification 3 was not used                                   | 01             | 00000001          |
| 43                  | 2B              | Standard Timing Identification 3 was not used                                   | 01             | 00000001          |
| 44                  | 2C              | Standard Timing Identification 4 was not used                                   | 01             | 00000001          |
| 45                  | 2D              | Standard Timing Identification 4 was not used                                   | 01             | 00000001          |
| 46                  | 2E              | Standard Timing Identification 5 was not used                                   | 01             | 00000001          |
| 47                  | 2F              | Standard Timing Identification 5 was not used                                   | 01             | 00000001          |
| 48                  | 30              | Standard Timing Identification 6 was not used                                   | 01             | 00000001          |
| 49                  | 31              | Standard Timing Identification 6 was not used                                   | 01             | 00000001          |
| 50                  | 32              | Standard Timing Identification 7 was not used                                   | 01             | 00000001          |
| 51                  | 33              | Standard Timing Identification 7 was not used                                   | 01             | 00000001          |
| 52                  | 34              | Standard Timing Identification 8 was not used                                   | 01             | 00000001          |
| 53                  | 35              | Standard Timing Identification 8 was not used                                   | 01             | 00000001          |
| 54                  | 36              | Pixel Clock/10,000 (LSB)  | 28             | 00101000          |
| 55                  | 37              | Pixel Clock/10,000 (MSB) /  | 15             | 00010101          |
| 56                  | 38              | Horizontal Active   | 00             | 00000000          |
| 57                  | 39              | Horizontal Blanking   | 40             | 01000000          |
| 58                  | 3A              | Horizontal Active : Horizontal Blanking   | 41             | 01000001          |
| 59                  | 3B              | Vertical Avtive   | 00             | 00000000          |
| 60                  | 3C              | Vertical Blanking   | 26             | 00100110          |
| 61                  | 3D              | Vertical Active : Vertical Blanking   | 30             | 00110000          |
| 62                  | 3E              | Horizontal Sync. Offset   | 18             | 00011000          |
| 63                  | 3F              | Horizontal Sync Pulse Width   | 88             | 10001000          |
| 64                  | 40              | Vertical Sync Offset : Sync Width   | 36             | 00110110          |
| 65                  | 41              | Horizontal Vertical Sync Offset/Width upper 2bits = 0                           | 00             | 00000000          |
| 66                  | 42              | Horizontal Image Size   | F6             | 11110110          |
| 67                  | 43              | Vertical Image Size   | B8             | 10111000          |
| 68                  | 44              | Horizontal & Vertical Image Size (upper 4bit)                                   | 00             | 00000000          |
| 69                  | 45              | Horizontal Border = 0   | 00             | 00000000          |
| 70                  | 46              | Vertical Border = 0   | 00             | 00000000          |
| 71                  | 47              | Non-interlaced,Normal display,no stereo,Digital separate sync,H/V pol negatives | 18             | 00011000          |
| 72                  | 48              | Pixel Clock/10,000 (LSB) 40Hz   | ED             | 11101101          |
| 73                  | 49              | Pixel Clock/10,000 (MSB) / 40Hz   | 10             | 00010000          |
| 74                  | 4A              | Horizontal Active   | 00             | 00000000          |
| 75                  | 4B              | Horizontal Blanking   | 40             | 01000000          |
| 76                  | 4C              | Horizontal Active : Horizontal Blanking   | 41             | 01000001          |
| 77                  | 4D              | Vertical Avtive   | 00             | 00000000          |
| 78                  | 4E              | Vertical Blanking   | 26             | 00100110          |
| 79                  | 4F              | Vertical Active : Vertical Blanking   | 30             | 00110000          |
| 80                  | 50              | Horizontal Sync. Offset   | 18             | 00011000          |
| 81                  | 51              | Horizontal Sync Pulse Width   | 88             | 10001000          |
| 82                  | 52              | Vertical Sync Offset : Sync Width   | 36             | 00110110          |
| 83                  | 53              | Horizontal Vertical Sync Offset/Width upper 2bits = 0                           | 00             | 00000000          |
| 84                  | 54              | Horizontal Image Size   | F6             | 11110110          |
| 85                  | 55              | Vertical Image Size   | B9             | 10111001          |

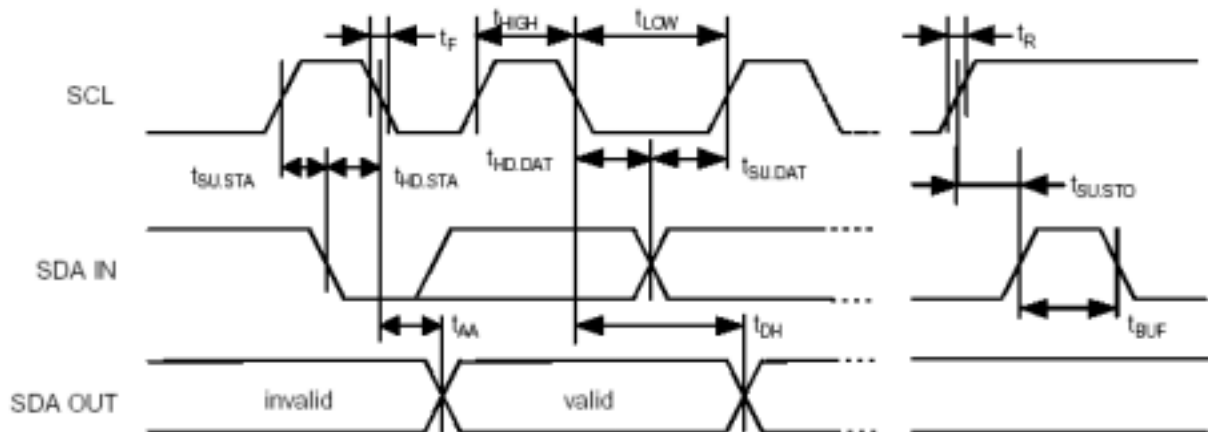


| Byte #<br>(decimal) | Byte #<br>(hex) | Field Name and Comments   | Value<br>(hex) | Value<br>(binary) |
|---------------------|-----------------|---|----------------|-------------------|
| 86                  | 56              | Horizontal & Vertical Image Size (upper 4bit)                                   | 00             | 00000000          |
| 87                  | 57              | Horizontal Border = 0   | 00             | 00000000          |
| 88                  | 58              | Vertical Border = 0   | 00             | 00000000          |
| 89                  | 59              | Non-interlaced,Normal display,no stereo,Digital separate sync,H/V pol negatives | 18             | 00011000          |
| 90                  | 5A              | Detailed Timing Descriptor #3   | 00             | 00000000          |
| 91                  | 5B              |   | 00             | 00000000          |
| 92                  | 5C              |   | 00             | 00000000          |
| 93                  | 5D              |   | 0F             | 00001111          |
| 94                  | 5E              |   | 00             | 00000000          |
| 95                  | 5F              | (Horizontal active pixel /8)-31   | 61             | 01100001          |
| 96                  | 60              | Image Aspect Ratio(16:10)   | 43             | 01000011          |
| 97                  | 61              | Low Refresh Rate #1(50Hz)   | 32             | 00110010          |
| 98                  | 62              | (Horizontal active pixel /8)-31   | 61             | 01100001          |
| 99                  | 63              | Image Aspect Ratio(16:10)   | 43             | 01000011          |
| 100                 | 64              | Low Refresh Rate #2(40Hz)   | 28             | 00101000          |
| 101                 | 65              | Brightness(1/10nit)   | 0F             | 00001111          |
| 102                 | 66              | Feature flag(TN mode)   | 01             | 00000001          |
| 103                 | 67              | Reserved 00h  | 00             | 00000000          |
| 104                 | 68              | EISA manufacturer code(3 Character ID)  | 0D             | 00001101          |
| 105                 | 69              | Compressed ASCII  | AF             | 10101111          |
| 106                 | 6A              | Panel Supplier Reserved - Product code  | 07             | 00000111          |
| 107                 | 6B              | (Hex, LSB first)  | 14             | 00010100          |
| 108                 | 6C              | Detailed Timing Descriptor #4   | 00             | 00000000          |
| 109                 | 6D              |   | 00             | 00000000          |
| 110                 | 6E              |   | 00             | 00000000          |
| 111                 | 6F              |   | FE             | 11111110          |
| 112                 | 70              |   | 00             | 00000000          |
| 113                 | 71              | (Supplier S/N)  | 4E             | 01001110          |
| 114                 | 72              | (Supplier S/N)  | 31             | 00110001          |
| 115                 | 73              | (Supplier S/N)  | 32             | 00110010          |
| 116                 | 74              | (Supplier S/N)  | 31             | 00110001          |
| 117                 | 75              | (Supplier S/N)  | 58             | 01011000          |
| 118                 | 76              | (Supplier S/N)  | 35             | 00110101          |
| 119                 | 77              | (Supplier S/N)  | 2d             | 00101101          |
| 120                 | 78              | (Supplier S/N)  | 4C             | 01001100          |
| 121                 | 79              | (Supplier S/N)  | 30             | 00110000          |
| 122                 | 7A              | (Supplier S/N)  | 36             | 00110110          |
| 123                 | 7B              | (Supplier S/N)  | 20             | 00100000          |
| 124                 | 7C              | (Supplier S/N)  | 20             | 00100000          |
| 125                 | 7D              | (Supplier S/N)  | 20             | 00100000          |
| 126                 | 7E              | Extension flag = 00   | 00             | 00000000          |
| 127                 | 7F              | Checksum  | ED             | 11101101          |

## 5.6 EDID SIGNAL SPECIFICATION

### (1) EDID Power

| Parameter            | Symbol | Conditions     | Min. | Typ. | Max. | Unit |
|----------------------|--------|----------------|------|------|------|------|
| Power supply voltage | Vcc    | Read Operation | 2.2  | —    | 5.5  | V    |



### (2) DC characteristics

|   |              | Symbol                | Min.       | Max.       | Unit | Index                                |
|---|--------------|-----------------------|------------|------------|------|--------------------------------------|
| SCL, SDA terminal input voltage                       | High Voltage | VIH                   | 0.7 Vcc    | —          | V    |                                      |
|   | Low Voltage  | VIL                   | —          | 0.3 Vcc    | V    |                                      |
| Hysteresis Voltage                                    |              | VHYS                  | 0.05 VCC   | —          | V    |                                      |
| Output Voltage  |              | VOL1<br>VOL2          | —          | 0.4<br>0.6 | V    | IOL=3mA, CC=2.5V<br>IOL=6mA, CC=2.5V |
| Input Leak current (Vin =0.1V~VCC)                    |              | ILI                   | -10<br>-10 | 10<br>50   | uA   | WP=VSS<br>WP=VCC                     |
| Output Leak current                                   |              | ILO                   | -10        | 10         | uA   | Vout =0.1V~VCC,<br>WP=VSS            |
| Terminal capacity(Input, Output)                      |              | Cin, Cout             | —          | 10         | pF   | VCC=5.0V<br>Ta=25°C, Fclk=1.0MHz     |
| Operating current                                     |              | ICC Write<br>ICC Read | —          | 3<br>1     | mA   | VCC=5.5V,<br>SCL=400KHz              |
| Stillness current (SDA=SCL=VCC) (WP=VSS,A0,A1,A2=VSS) |              | ICCS                  | —          | 30<br>100  | uA   | VCC=3.0V<br>VCC=5.5V                 |

## (3) AC characteristics (VCC=2.5~5.5V standard operation mode)

| Item                                  | Symbol       | VCC=2.5V-5.5V<br>(Standard operation mode) |      | VCC=4.5V-5.5V<br>(High-speed operation mode) |      | Unit   | Index                |
|---------------------------------------|--------------|--|------|--|------|--------|----------------------|
|                                       |              | Min.                                       | Max. | Min.   | Max. |        |                      |
| Clock frequency                       | Fclk         | —  | 100  | —  | 400  | KHz    |                      |
| Clock High Time                       | THIGH        | 4000                                       | —    | 900  | —    | ns     |                      |
| Clock Low Time                        | TLOW         | 4700                                       | —    | 1300   | —    | ns     |                      |
| SDA, SCL falling time                 | TR           | —  | 1000 | —  | 300  | ns     |                      |
| SDA, SCL rising time                  | TF           | —  | 300  | —  | 300  | ns     |                      |
| START hold time                       | THD:<br>STA  | 4000                                       | —    | 600  | —    | ns     |                      |
| START setup time                      | TSU:<br>STA  | 4700                                       | —    | 600  | —    | ns     |                      |
| Data input hold time                  | THD:<br>Data | 0  | —    | 0  | —    | ns     |                      |
| Data input setup time                 | TSU:<br>Data | 250  | —    | 100  | —    | ns     |                      |
| STOP setup time                       | TSU:<br>STO  | 4700                                       | —    | 600  | —    | ns     |                      |
| Output decision time from a clock     | TAA          | —  | 3500 | 100  | 900  | ns     |                      |
| Bus free time                         | TBUF         | 4700                                       | —    | 1300   | —    | ns     |                      |
| Rising time of Min VIH, VIL           | TOF          | —  | 250  | 20   | 250  | ns     | CB 100pF             |
| Spike oppression                      | TSP          | —  | 50   | —  | 50   | ns     |                      |
| A write-in cycle time                 | TWR          | —  | 10   | —  | 10   | ms     | Byte and page mode   |
| The number of times of data rewriting | —            | 1M   | —    | 1M   | —    | cycles | VCC=5.0V<br>Ta=25°C, |

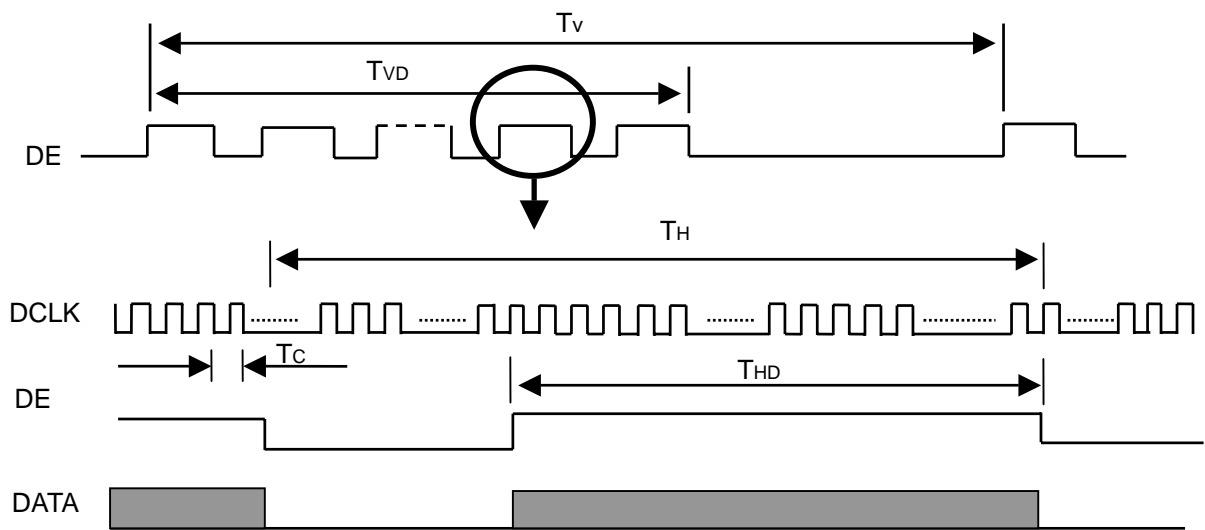
## 6. INTERFACE TIMING

### 6.1 INPUT SIGNAL TIMING SPECIFICATIONS

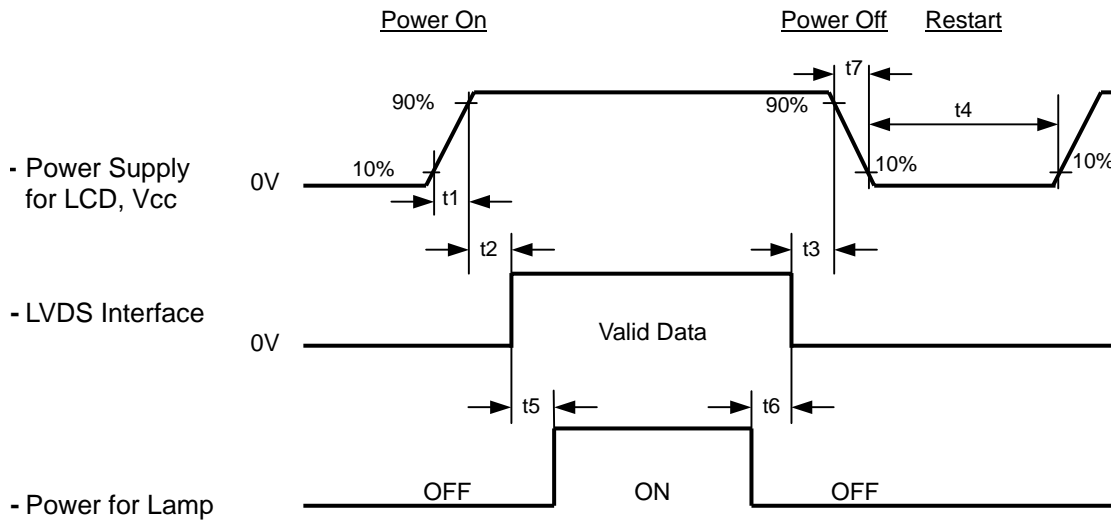
The input signal timing specifications are shown as the following table and timing diagram.

| Signal | Item                       | Symbol | Min. | Typ. | Max. | Unit | Note |
|--------|----------------------------|--------|------|------|------|------|------|
| DCLK   | Frequency                  | 1/Tc   | 43.3 | 65   | 68   | MHz  | -    |
| DE     | Vertical Total Time        | Tv     | 771  | 806  | 850  | TH   | -    |
|        | Vertical Addressing Time   | TvD    | 768  | 768  | 768  | TH   | -    |
|        | Horizontal Total Time      | TH     | 1200 | 1344 | 1500 | Tc   | -    |
|        | Horizontal Addressing Time | THD    | 1024 | 1024 | 1024 | Tc   | -    |

**INPUT SIGNAL TIMING DIAGRAM**



## 6.2 POWER ON/OFF SEQUENCE



### Timing Specifications:

|        |                           |
|--------|---------------------------|
| t1     | 10 msec                   |
| 0 < t2 | 50 msec                   |
| 0 < t3 |                           |
| t4     | 150 msec                  |
| t5     | 200 msec                  |
| t6     | 0 msec                    |
| t7     | 10 msec (given by system) |

Note (1) Please follow the power on/off sequence described above. Otherwise, the LCD module might be damaged.

Note (2) Please avoid floating state of interface signal at invalid period. When the interface signal is invalid, be sure to pull down the power supply of LCD Vcc to 0 V.

Note (3) The Backlight inverter power must be turned on after the power supply for the logic and the interface signal is valid. The Backlight inverter power must be turned off before the power supply for the logic and the interface signal is invalid.

Note (4) Sometimes some slight noise shows when LCD is turned off (even backlight is already off). To avoid this phenomenon, we suggest that the Vcc falling time had better to follow  $5 \cdot t7 \cdot 300$  ms.

## 7. OPTICAL CHARACTERISTICS

### 7.1 TEST CONDITIONS

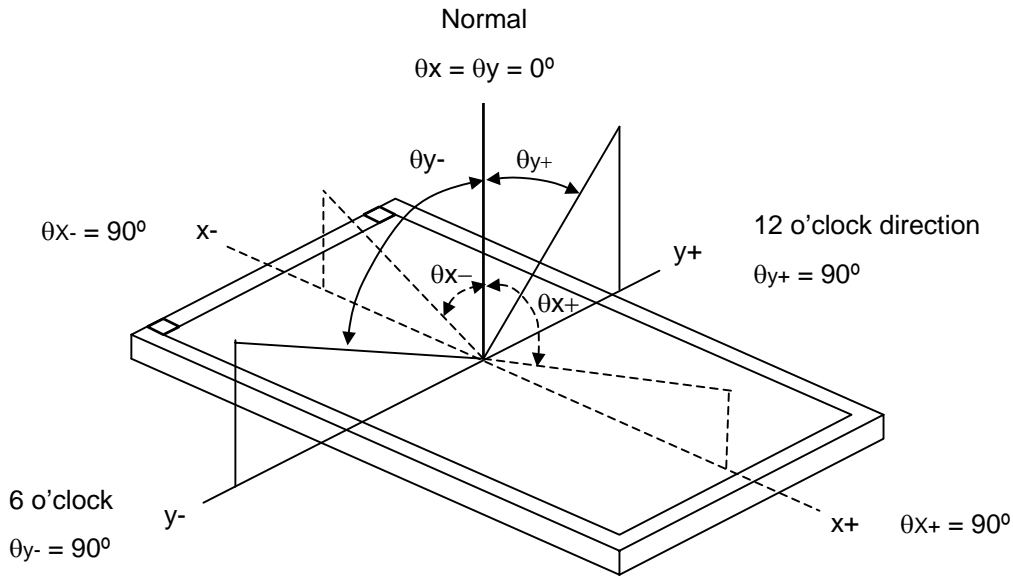
| Item                       | Symbol  | Value | Unit |
|----------------------------|---|-------|------|
| Ambient Temperature        | Ta  | 25±2  | °C   |
| Ambient Humidity           | Ha  | 50±10 | %RH  |
| Supply Voltage             | V <sub>CC</sub>   | 3.3   | V    |
| Input Signal               | According to typical value in "3. ELECTRICAL CHARACTERISTICS" |       |      |
| Inverter Current           | I <sub>L</sub>  | 5.0   | mA   |
| Inverter Driving Frequency | F <sub>L</sub>  | 61    | KHz  |
| Inverter                   | Sumida-H05-4915   |       |      |

The measurement methods of optical characteristics are shown in Section 7.2. The following items should be measured under the test conditions described in Section 7.1 and stable environment shown in Note (6).

### 7.2 OPTICAL SPECIFICATIONS

| Item                       |            | Symbol           | Condition  | Min.   | Typ.         | Max.  | Unit              | Note     |     |   |
|----------------------------|------------|------------------|--|--|--------------|-------|-------------------|----------|-----|---|
| Contrast Ratio             |            | CR               | $\theta_x=0^\circ, \theta_y=0^\circ$<br>Viewing Normal Angle | 180  | 300          | -     | -                 | (2), (5) |     |   |
| Response Time              |            | T <sub>R</sub>   |  | -  | 5            | 10    | ms                | (3)      |     |   |
|                            |            | T <sub>F</sub>   |  | -  | 11           | 16    | ms                |          |     |   |
| Central Luminance of White |            | L <sub>Ave</sub> |  | 120  | 150          | -     | cd/m <sup>2</sup> | (4), (5) |     |   |
| White Variation            |            | $\delta W$       |  | 5pts   |              | 1.25  | -                 | (5), (6) |     |   |
|                            |            |                  |  | 13pts  |              | 1.54  |                   |          |     |   |
| Color Chromaticity         | Red        | R <sub>x</sub>   |  | $\theta_x=0^\circ, \theta_y=0^\circ$<br>Viewing Normal Angle | TYP<br>-0.03 | 0.595 | TYP<br>+0.03      | -        | (1) |   |
|                            |            | R <sub>y</sub>   |  |  |              | 0.338 |                   | -        |     |   |
|                            | Green      | G <sub>x</sub>   |  |  |              | 0.320 |                   | -        |     |   |
|                            |            | G <sub>y</sub>   |  |  |              | 0.533 |                   | -        |     |   |
|                            | Blue       | B <sub>x</sub>   | 0.150  |  |              | -     |                   |          |     |   |
|                            |            | B <sub>y</sub>   | 0.135  |  |              | -     |                   |          |     |   |
|                            | White      | W <sub>x</sub>   | 0.285  |  |              | 0.313 |                   | 0.341    |     | - |
|                            |            | W <sub>y</sub>   | 0.309  |  |              | 0.329 |                   | 0.349    |     | - |
| Viewing Angle              | Horizontal | $\theta_{x+}$    | CR≥10  | 40   | 45           | -     | Deg.              |          |     |   |
|                            |            | $\theta_{x-}$    |  | 40   | 45           | -     |                   |          |     |   |
|                            | Vertical   | $\theta_{y+}$    |  | 15   | 20           | -     |                   |          |     |   |
|                            |            | $\theta_{y-}$    |  | 40   | 45           | -     |                   |          |     |   |

Note (1) Definition of Viewing Angle ( $\theta_x, \theta_y$ ):



Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = L_{63} / L_0$$

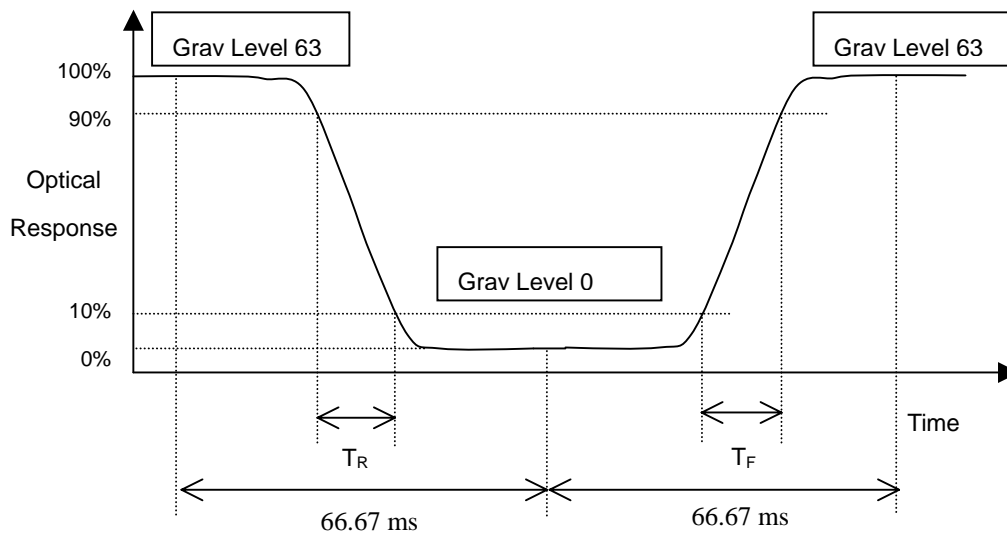
L63: Luminance of gray level 63

L 0: Luminance of gray level 0

$$\text{CR} = \text{CR (5)}$$

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (7).

Note (3) Definition of Response Time ( $T_R, T_F$ ):



Note (4) Definition of Average Luminance of White ( $L_{AVE}$ ):

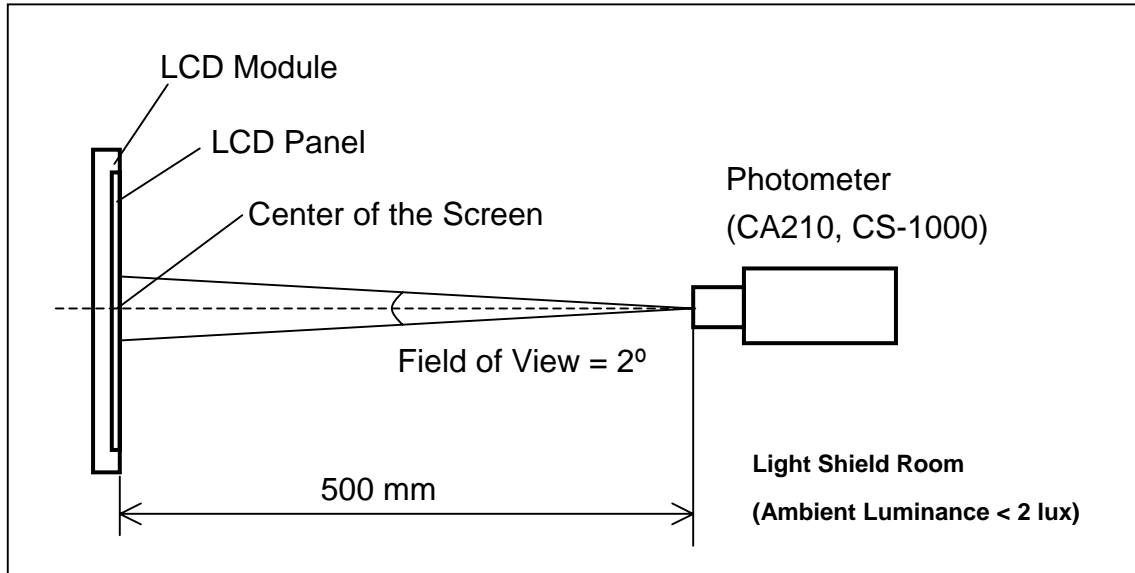
Measure the luminance of gray level 63 at 5 points

$$L_{AVE} = [L(1) + L(2) + L(3) + L(4) + L(5)] / 5$$

L (x) is corresponding to the luminance of the point X at Figure in Note (6)

**Note (5) Measurement Setup:**

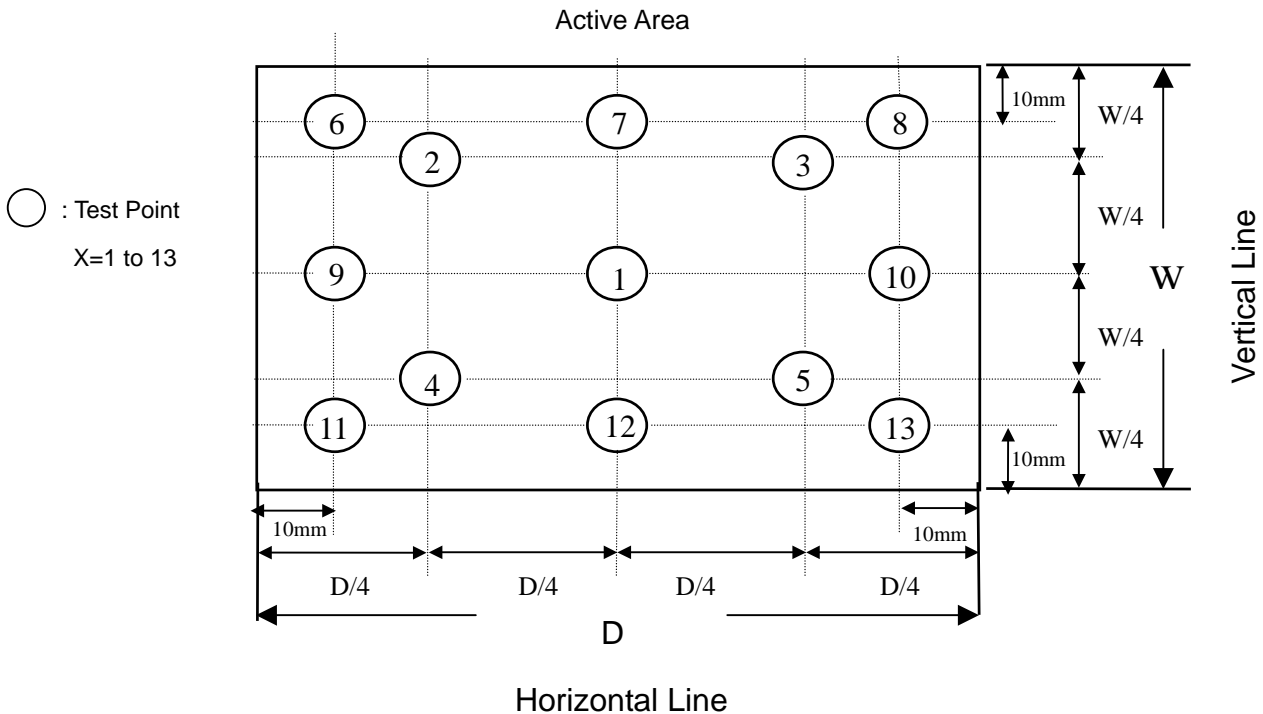
The LCD module should be stabilized at given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.


**Note (6) Definition of White Variation ( $\delta W$ ):**

Measure the luminance of gray level 63 at 13 points

$$\delta W_{5p} = \text{Maximum [L (1), L (2), L (3), L (4), L (5)]} / \text{Minimum [L (1), L (2), L (3), L (4), L (5)]}$$

$$\delta W_{13p} = \text{Maximum [L (1) ~ L (13)]} / \text{Minimum [L (1) ~ L (13)]}$$





## 8. PRECAUTIONS

### 8.1 HANDLING PRECAUTIONS

- (1) The module should be assembled into the system firmly by using every mounting hole. Be careful not to twist or bend the module.
- (2) While assembling or installing modules, it can only be in the clean area. The dust and oil may cause electrical short or damage the polarizer.
- (3) Use fingerstalls or soft gloves in order to keep display clean during the incoming inspection and assembly process.
- (4) Do not press or scratch the surface harder than a HB pencil lead on the panel because the polarizer is very soft and easily scratched.
- (5) If the surface of the polarizer is dirty, please clean it by some absorbent cotton or soft cloth. Do not use Ketone type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanently damage the polarizer due to chemical reaction.
- (6) Wipe off water droplets or oil immediately. Staining and discoloration may occur if they left on panel for a long time.
- (7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contacting with hands, legs or clothes, it must be washed away thoroughly with soap.
- (8) Protect the module from static electricity, it may cause damage to the C-MOS Gate Array IC.
- (9) Do not disassemble the module.
- (10) Do not pull or fold the lamp wire.
- (11) Pins of I/F connector should not be touched directly with bare hands.

### 8.2 STORAGE PRECAUTIONS

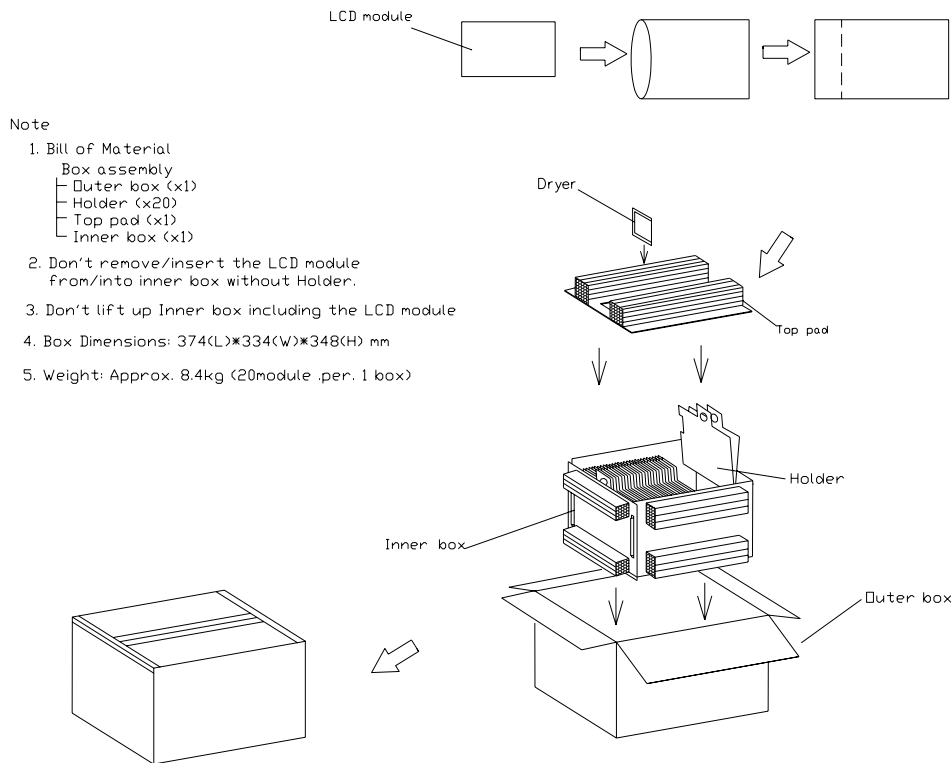
- (1) High temperature or humidity may reduce the performance of module. Please store LCD module within the specified storage conditions.
- (2) It is dangerous that moisture come into or contacted the LCD module, because the moisture may damage LCD module when it is operating.
- (3) It may reduce the display quality if the ambient temperature is lower than 10 °C. For example, the response time will become slowly, and the starting voltage of lamp will be higher than the room temperature.

### 8.3 OPERATION PRECAUTIONS

- (1) Do not pull the I/F connector in or out while the module is operating.
- (2) Always follow the correct power on/off sequence when LCD module is connecting and operating. This can prevent the CMOS LSI chips from damage during latch-up.
- (3) The startup voltage of Backlight is approximately 1000 Volts. It may cause electrical shock while assembling with inverter. Do not disassemble the module or insert anything into the Backlight unit.

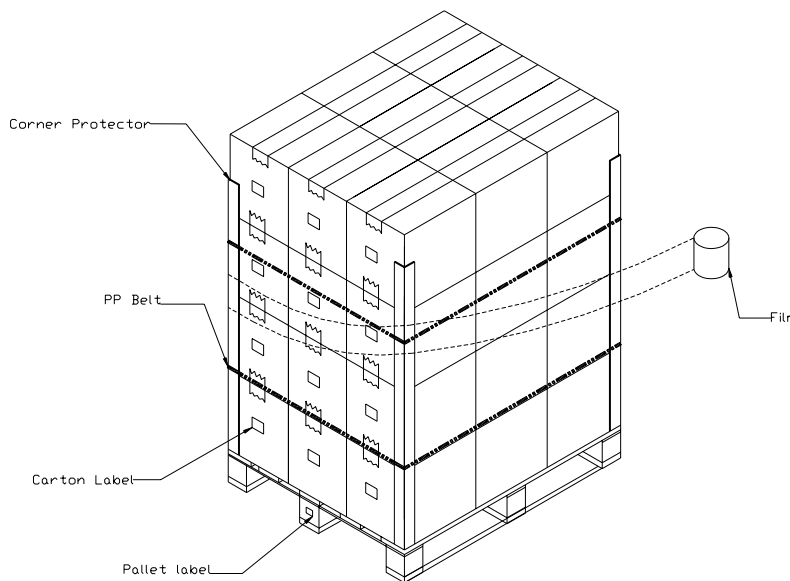
## 9. PACKING

### 9.1 CARTON



### 9.2 PALLET

NOTES:  
 Corner Protector:L1170mm\*50mm\*50mm  
 Pallet:L1180\*W1000\*H135mm  
 Pallet Stock Dim:L1180\*W1000\*H1527mm  
 Weight:Approx.317kg



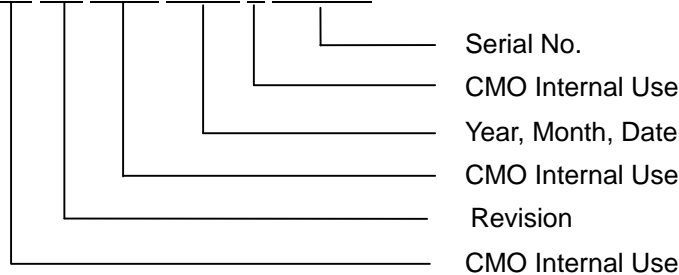
## 10. DEFINITION OF LABELS

### 10.1 CMO MODULE LABEL

The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.



- (a) Model Name: N121X5 - L06
- (b) Revision: Rev. XX, for example: A1, ..., C1, C2 ...etc.
- (c) Serial ID: X X X X X X Y M D X N N N N



Serial ID includes the information as below:

- (a) Manufactured Date: Year: 1~9, for 2001~2009  
 Month: 1~9, A~C, for Jan. ~ Dec.  
 Day: 1~9, A~Y, for 1<sup>st</sup> to 31<sup>st</sup>, exclude I , O and U
- (b) Revision Code: cover all the change
- (c) Serial No.: Manufacturing sequence of product

For Lenovo's barcode content

**11S PPPPPP Z1Z HHH SSSSSS YMM**

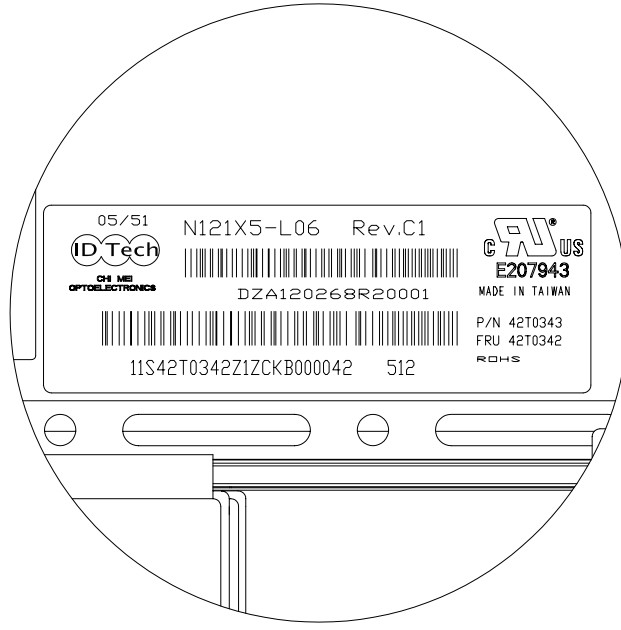
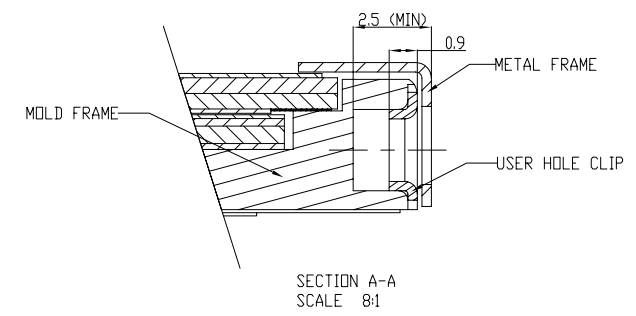
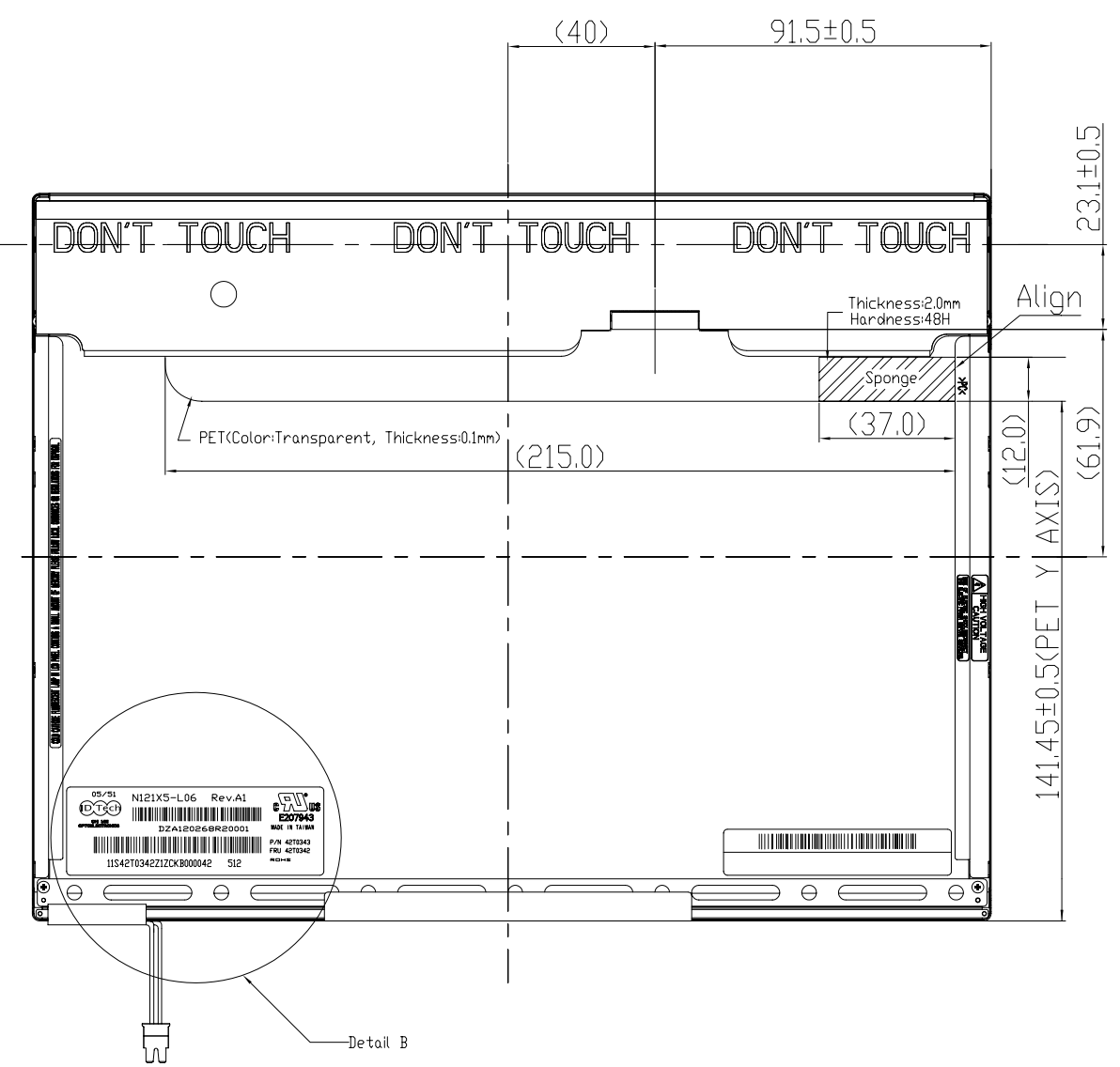
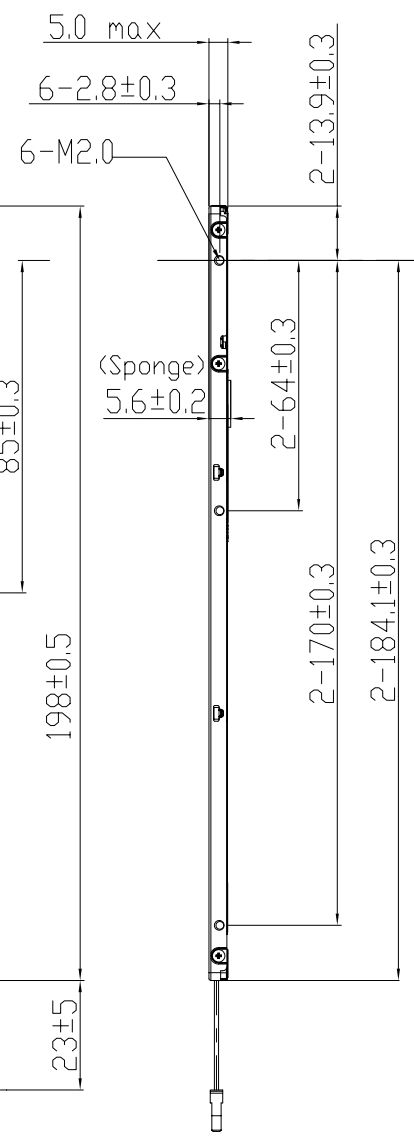
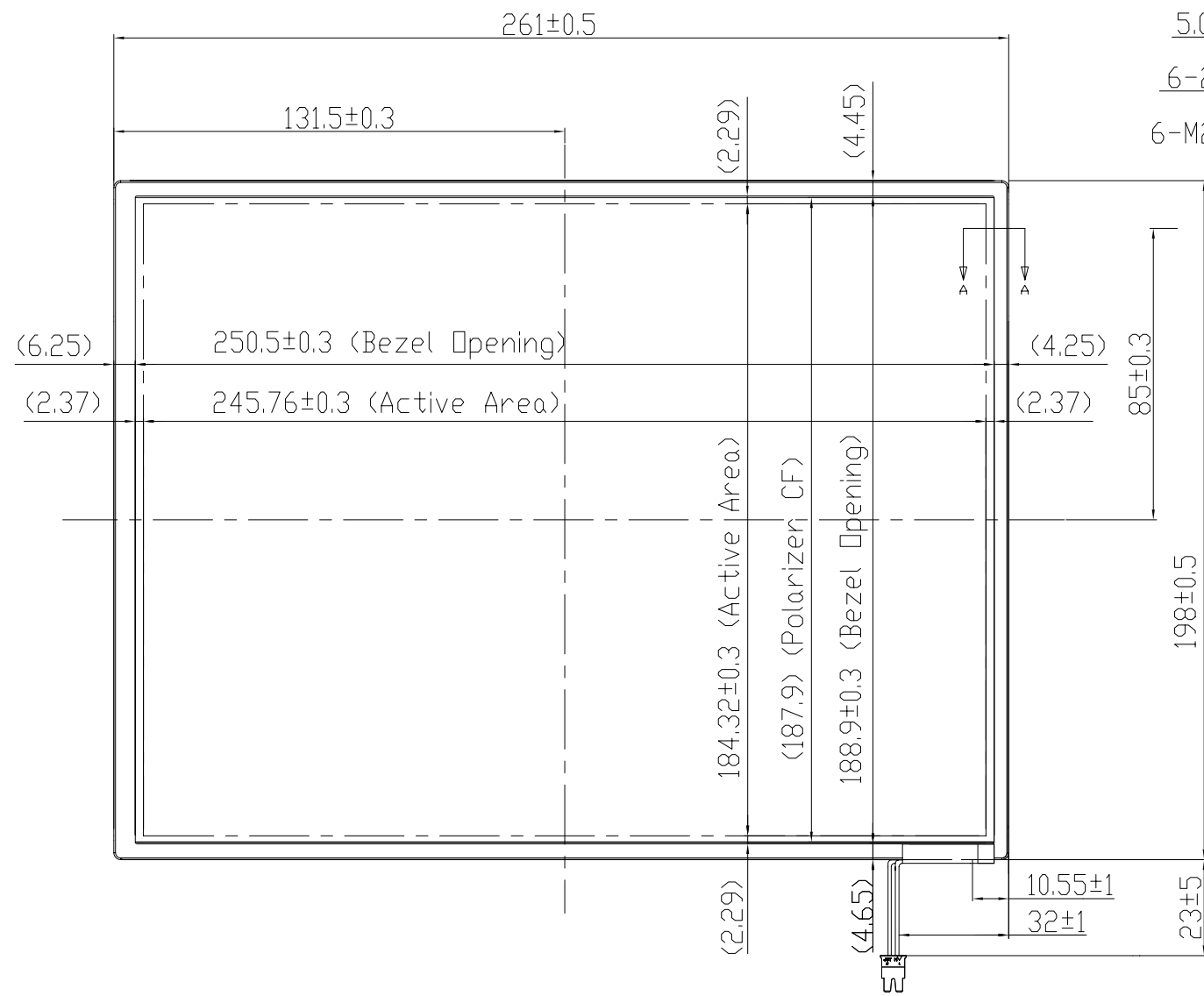
- (a) 11S: Fixed characters.
- (b) PPPPPP (P/N): Customer part number 42T0342, fixed characters
- (c) Z1Z: Fixed characters.
- (d) HHH (Header Code): CKB
- (e) SSSSSS: Series number.
- (f) YMM: Y: The last character of year.

MM: Month

10.2 CARTON LABEL



The image shows a template for a carton label. At the top left is the CHI MEI logo (a square with 'm' inside) and the text 'CHI MEI OPTOELECTRONICS'. Below this are four lines of text with horizontal lines for input: 'PO. NO.', 'Part ID.', 'Model Name', and 'Carton ID.'. The 'Part ID.' line contains the text 'P/N 42T0342' and the 'Model Name' line contains 'N121X5-L06'. To the right of the 'Carton ID.' line is the word 'Quantities'. At the bottom left, it says 'Made in XXXX'. At the bottom right, there is a circular logo with 'GP' inside and the text 'RoHS' below it.



- NOTES:
- 1."\*" MARKS THE DESIGN CRITICAL DIMENSION.
  - 2."Ⓟ" MARKS THE PROCESS CRITICAL DIMENSION.
  - 3.MIN. SCREW HOLE LENGTH: 2.5 mm.
  - 4.MAX. SCREW TORQUE: 2.5 kgf-cm.
  - 5.SIGNAL INTERFACE CONNECTOR: DF19L-20P-1H (HIROSE)
  - 6.CCFL CONNECTOR: BHSR-02VS-1 (JST)

| Mark | Description | Date | Changed_By | Approved_By | ECN No. | Remark |
|------|-------------|------|------------|-------------|---------|--------|
|      |             |      |            |             |         |        |

|          |                            |             |                             |
|----------|----------------------------|-------------|-----------------------------|
| TITLE    | N121X5-L06 Outline Drawing |             | 2D REV. A                   |
| Approved | Cliff Tsai                 | Drawing No. | N12154114A                  |
| Checked  | Mulciber Hsieh             | Part No.    |                             |
| Drawer   | Joye Wu                    | Material    | Sheet 1 / 1 A1              |
| Designer | Joye Wu                    | Date        | 09-9-2006 Scale 1:1 Unit:mm |

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