



# LITEMAX ALF/ALH4215

## Sunlight Readable 42" LCD

(

2<sup>nd</sup> Edition 5/ 1/ 2009 )

All information is subject to change without notice.

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## Record of Revision

| Version and Date | Page | Old Description | New Description                  | Remark |
|------------------|------|-----------------|----------------------------------|--------|
| 8/28/2008 v.01   | all  |                 | Preliminary Spec. (First Draft)  |        |
| 5/1/2009 v.02    | all  |                 | Preliminary Spec. (Second Draft) |        |
|                  |      |                 |                                  |        |
|                  |      |                 |                                  |        |

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## 1.0 GENERAL DESCRIPTION

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### 1.1 OVERVIEW

This specification applies to the 42 inch Color TFT-LCD Module T420XW01 V0. This LCD module has a TFT active matrix type liquid crystal panel 1366x768 pixels, and diagonal size of 42 inch. This module supports 1366x768 WXGA mode (Non-interlace). Each pixel is divided into Red, Green and Blue sub-pixels or dots which are arranged in vertical stripes. Gray scale or the brightness of the sub-pixel color is determined with a 8-bit gray scale signal for each dot. The T420XW01 V0 has been designed to apply the 8-bit 1 channel LVDS interface method. It is intended to support displays where high brightness, wide viewing angle, high color saturation, and high color depth are very important..

### 1.2 GENERAL SPECIFICATIONS

|                        |                                   |
|------------------------|-----------------------------------|
| Active Screen Size     | 42.02 inches                      |
| Pixel Arrangement      | RGB vertical stripe               |
| Pixel Format           | 1366 x 768                        |
| Display Color          | 8-bit, 16.7 M colors              |
| Luminance, White       | 1,000 cd/m <sup>2</sup>           |
| Display Operating Mode | Transmissive mode, normally black |
| Surface Treatment      | AG, 3H                            |

## 2.0 ABSOLUTE MAXIMUM RATINGS

The following are maximum values which, if exceeded, may cause faulty operation or damage to the unit.

| Item                           | Symbol            | Min  | Max  | Unit   | Note |
|--------------------------------|-------------------|------|------|--------|------|
| Logic/LCD Drive Voltage        | V <sub>DD</sub>   | -0.3 | 14.0 | [Volt] | 1    |
| Input Voltage of Signal        | V <sub>in</sub>   | -0.3 | 3.6  | [Volt] | 1    |
| BLU Input Voltage              | V <sub>DDB</sub>  | -0.3 | 27.0 | [Volt] | 1    |
| BLU Brightness Control Voltage | B <sub>LON</sub>  | -0.3 | 5.5  | [Volt] | 1    |
| Operating Temperature          | T <sub>OP</sub>   | 0    | +50  | [°C]   | 2    |
| Operating Humidity             | H <sub>OP</sub>   | 10   | 90   | [%RH]  | 2    |
| Storage Temperature            | T <sub>ST</sub>   | -20  | +60  | [°C]   | 2    |
| Storage Humidity               | H <sub>ST</sub>   | 10   | 90   | [%RH]  | 2    |
| Shock (non-operation)          |                   | -    | 50   | G      | 3    |
| Vibration (non-operation)      |                   | -    | 1.5  | G      | 4    |
| Thermal shock                  |                   | -20  | 60   | C      | 5    |
| Altitude test                  | 50000feet (12Kpa) |      |      |        |      |

Note 1 : Duration = 50msec

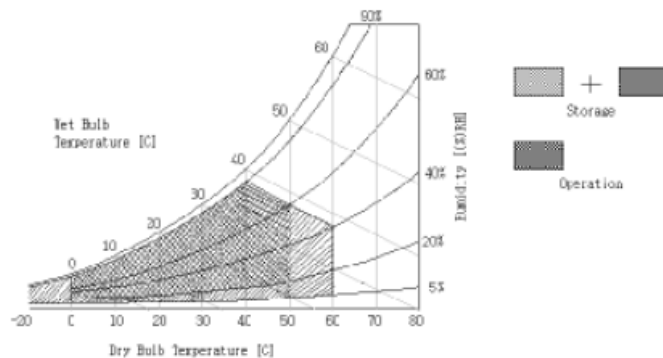
Note 2 : Maximum Wet-Bulb should be 39 °C and No condensation.

Note 3 : Half sine wave, shock level : 50G(11ms), direction : ±x, ±y, ±z (one time each direction)

Note 4 : Wave form : random, vibration level : 1.5G RMS, Bandwidth : 10--300Hz

Duration : X,Y,Z 30min (one time each direction)

Note 5 : -20C/0.5hr ~ 60C/0.5hr, 10 cycles



### 3.0 ELECTRICAL CHARACTERISTICS

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#### 3.1 ELECTRICAL CHARACTERISTICS

| Parameter                  | Symbol                                    | Values                 |      |      | Unit            | Notes           |   |
|----------------------------|---|------------------------|------|------|-----------------|-----------------|---|
|                            |   | Min                    | Typ  | Max  |                 |                 |   |
| LCD:                       |   |                        |      |      |                 |                 |   |
| Power Supply Input Voltage | V <sub>dd</sub>                           | 11.4                   | 12   | 12.6 | V <sub>dc</sub> |                 |   |
| Power Supply Input Current | I <sub>dd</sub>                           | -                      | 0.75 | -    | A               | 1               |   |
| Power Consumption          | P <sub>c</sub>                            | -                      | 9    | -    | Watt            | 1               |   |
| Inrush Current             | I <sub>RUSH</sub>                         | -                      | -    | 5    | A               | 5               |   |
| LVDS Interface             | Differential Input High Threshold Voltage | V <sub>TH</sub>        |      |      | +100            | mV              | 4 |
|                            | Differential Input Low Threshold Voltage  | V <sub>TL</sub>        | -100 |      |                 | mV              | 4 |
|                            | Common Input Voltage                      | V <sub>CIM</sub>       | 1.10 | 1.25 | 1.40            | V               |   |
| CMOS Interface             | Input High Threshold Voltage              | V <sub>IH</sub> (High) | 2.4  |      | 3.3             | V <sub>dc</sub> |   |
|                            | Input Low Threshold Voltage               | V <sub>IL</sub> (Low)  | 0    |      | 0.7             | V <sub>dc</sub> |   |

The performance of the Lamp in LCM, for example life time or brightness, is extremely influenced by the characteristics of the DC-AC Inverter. So all the parameters of an inverter should be carefully designed so as not to produce too much leakage current from high-voltage output of the inverter. When you design or order the inverter, please make sure unwanted lighting caused by the mismatch of the lamp and the inverter (no lighting, flicker, etc) never occurs. When you

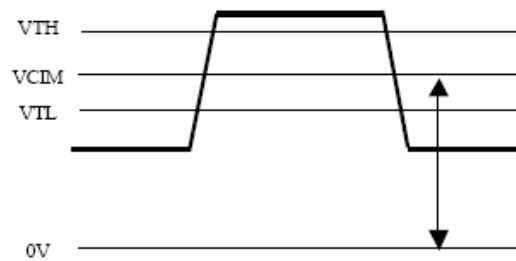
confirm it, the LCD Assembly should be operated in the same condition as installed in your instrument.

Do not attach a conducting tape to lamp connecting wire. If the lamp wire attach to conducting tape, TFT-LCD Module have a low luminance and the inverter has abnormal action because leakage current occurs between lamp wire and conducting tape.

The relative humidity must not exceed 80% non-condensing at temperatures of 40 °C or less. At temperatures greater than 40 °C, the wet bulb temperature must not exceed 39 °C. When operate at low temperatures, the brightness of CCFL will drop and the lifetime of CCFL will be reduced.

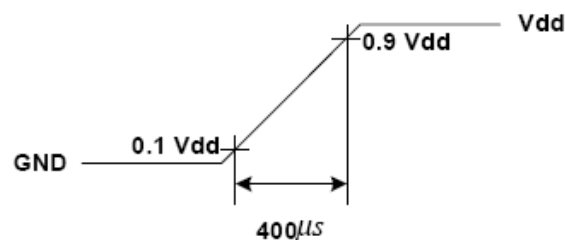
**Note :**

1.  $V_{dd}=12.0V$ ,  $f_v=60Hz$ ,  $f_{clk}=81.5\text{ Mhz}$  ,  $25^{\circ}C$  ,  $V_{dd}$  Duration time=  $400\ \mu s$  , Test pattern : white pattern
2. The Backlight power consumption shown above does include loss of external inverter at  $25\ ^{\circ}C$ . The used lamp current is the lamp typical current
3. The life is determined as the time at which luminance of the lamp is 50% compared to that of initial value at the typical lamp current on condition of continuous operating at  $25\ \pm 2^{\circ}C$ .
4.  $V_{CIM} = 1.2V$



**Figure : LVDS Differential Voltage**

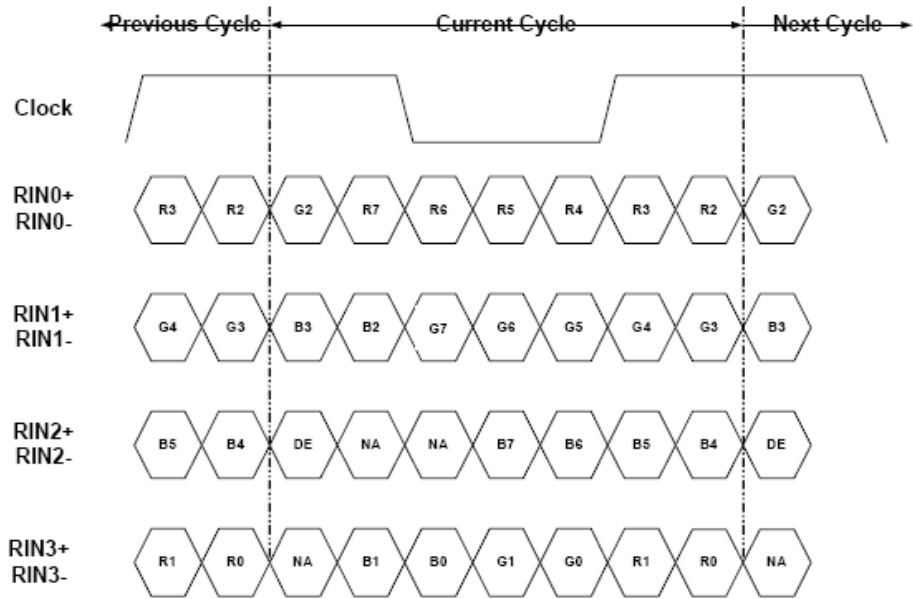
5. Measurement Condition: Rising time =  $400\ \mu s$



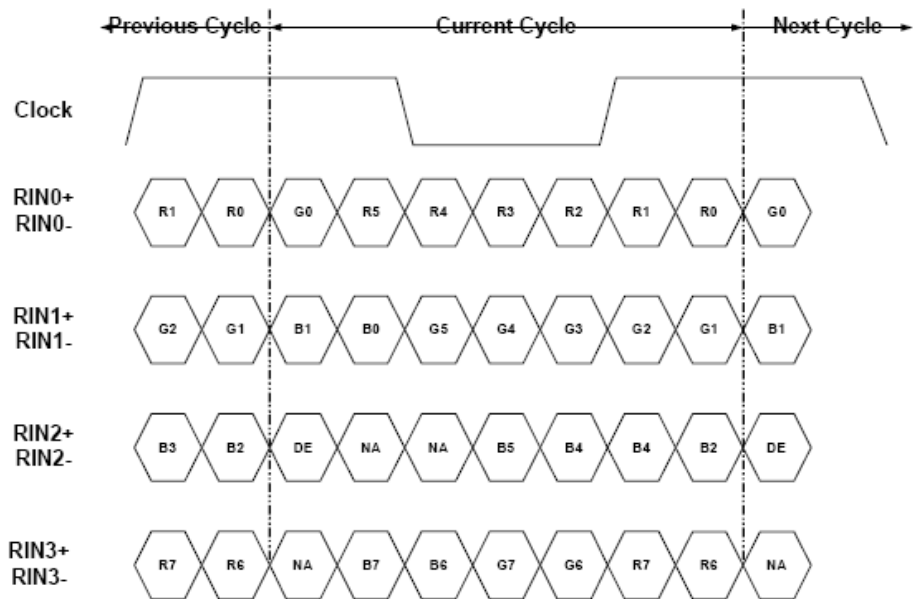
### 3.2 INTERFACE CONNECTIONS

| Pin No | Symbol      | Description                              | Note              |
|--------|-------------|--|-------------------|
| 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 | Low/Open for Normal (NS), High for JEIDA | Default : NS mode |
| 10     | Reserved    | Open or High                             | AUO internal test |
| 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    | Open or High                             | AUO internal test |
| 28     | Reserved    | Open or High                             | AUO internal test |
| 29     | GND         | Ground and Signal Return                 |                   |
| 30     | GND         | Ground and Signal Return                 |                   |

**LVDS Option = High → JEIDA**



**LVDS Option = Low/OPEN → NS**



### 3.3 COLOR INPUT DATA ASSIGNMENT

The brightness of each primary color (red, green, blue) is based on the 8bit gray scale data input for the color the higher the binary input, the brighter the color. The table below provides a reference for color versus data input.

| Color       |                  | Input Color Data |    |    |    |    |    |    |     |       |    |    |    |    |    |    |     |      |    |    |    |    |    |   |     |
|-------------|------------------|------------------|----|----|----|----|----|----|-----|-------|----|----|----|----|----|----|-----|------|----|----|----|----|----|---|-----|
|             |                  | RED              |    |    |    |    |    |    |     | GREEN |    |    |    |    |    |    |     | BLUE |    |    |    |    |    |   |     |
|             |                  | MSB              |    |    |    |    |    |    | LSB | MSB   |    |    |    |    |    |    | LSB | MSB  |    |    |    |    |    |   | LSB |
| R7          | R6               | R5               | R4 | R3 | R2 | R1 | R0 | G7 | G6  | G5    | G4 | G3 | G2 | G1 | G0 | B7 | B6  | B5   | B4 | B3 | B2 | B1 | B0 |   |     |
| Basic 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   |
|             | Red (255)        | 1                | 1  | 1  | 1  | 1  | 1  | 1  | 1   | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0    | 0  | 0  | 0  | 0  | 0  | 0 | 0   |
|             | Green (255)      | 0                | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 1     | 1  | 1  | 1  | 1  | 1  | 1  | 1   | 0    | 0  | 0  | 0  | 0  | 0  | 0 | 0   |
|             | Blue (255)       | 0                | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 1    | 1  | 1  | 1  | 1  | 1  | 1 | 1   |
|             | 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   |
|             | 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   |
| RED         | RED (000) Dark   | 0                | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0    | 0  | 0  | 0  | 0  | 0  | 0 | 0   |
|             | RED (001)        | 0                | 0  | 0  | 0  | 0  | 0  | 0  | 1   | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0    | 0  | 0  | 0  | 0  | 0  | 0 | 0   |
|             | ...              | ...              |    |    |    |    |    |    |     | ...   |    |    |    |    |    |    |     | ...  |    |    |    |    |    |   |     |
|             | RED (254)        | 1                | 1  | 1  | 1  | 1  | 1  | 1  | 0   | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0    | 0  | 0  | 0  | 0  | 0  | 0 | 0   |
|             | RED (255)        | 1                | 1  | 1  | 1  | 1  | 1  | 1  | 1   | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0    | 0  | 0  | 0  | 0  | 0  | 0 | 0   |
| GREEN       | GREEN (000) Dark | 0                | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0    | 0  | 0  | 0  | 0  | 0  | 0 | 0   |
|             | GREEN (001)      | 0                | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 1   | 0    | 0  | 0  | 0  | 0  | 0  | 0 | 0   |
|             | ...              | ...              |    |    |    |    |    |    |     | ...   |    |    |    |    |    |    |     | ...  |    |    |    |    |    |   |     |
|             | GREEN (254)      | 0                | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 1     | 1  | 1  | 1  | 1  | 1  | 1  | 0   | 0    | 0  | 0  | 0  | 0  | 0  | 0 | 0   |
|             | GREEN (255)      | 0                | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 1     | 1  | 1  | 1  | 1  | 1  | 1  | 1   | 0    | 0  | 0  | 0  | 0  | 0  | 0 | 0   |
| BLUE        | BLUE (000) Dark  | 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 (001)       | 0                | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0    | 0  | 0  | 0  | 0  | 0  | 0 | 1   |
|             | ...              | ...              |    |    |    |    |    |    |     | ...   |    |    |    |    |    |    |     | ...  |    |    |    |    |    |   |     |
|             | BLUE (254)       | 0                | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 1    | 1  | 1  | 1  | 1  | 1  | 1 | 0   |
|             | BLUE (255)       | 0                | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 1    | 1  | 1  | 1  | 1  | 1  | 1 | 1   |

### 3.4 INPUT SIGNAL TIMING SPECIFICATIONS

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

This is the signal timing required at the input of the User connector. All of the interface signal timing should be satisfied with the following specifications for it's proper operation.

Timing Table (DE only Mode)

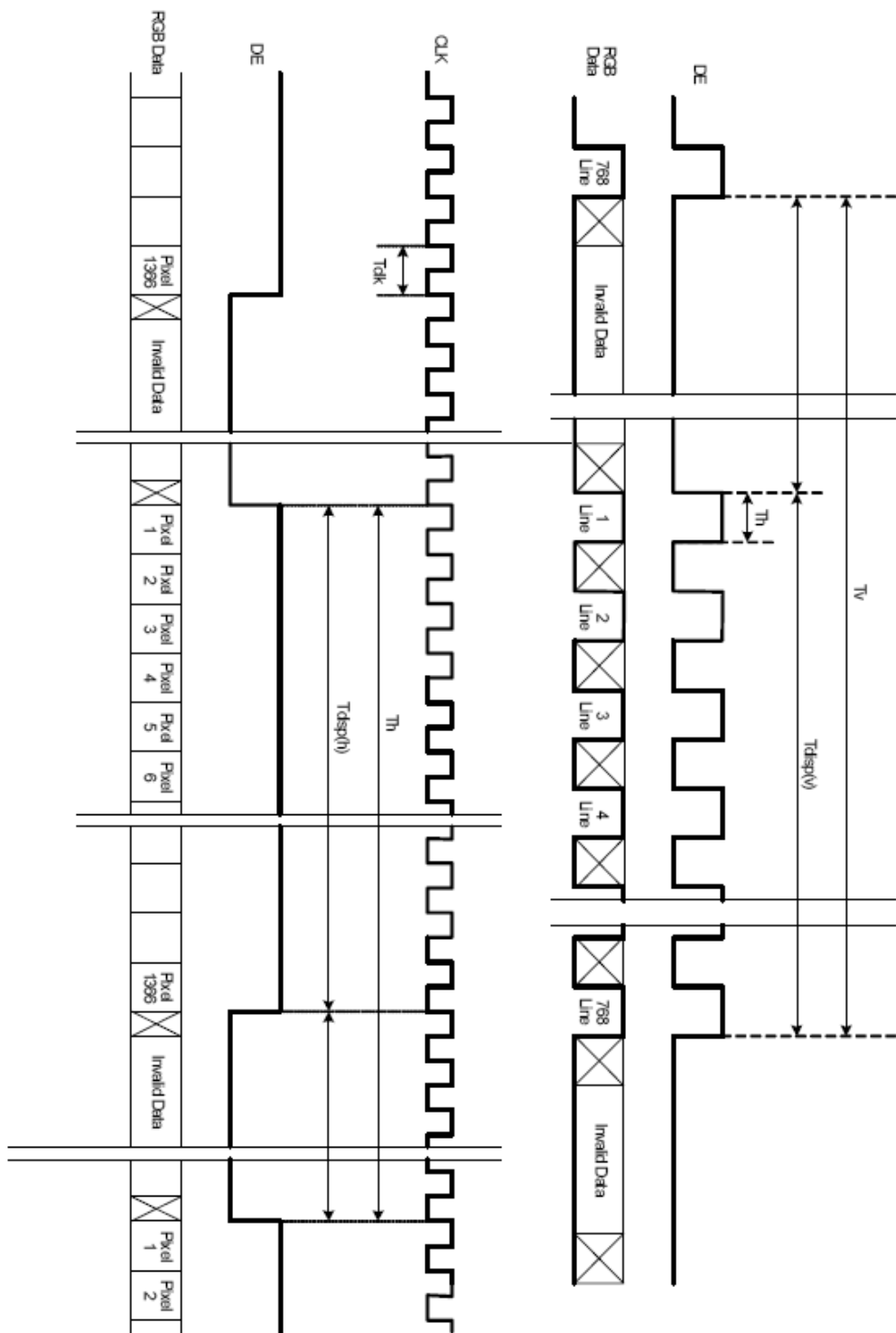
Vertical Frequency Range A (60Hz)

| Signal               | Item      | Symbol    | Min   | Type | Max   | Unit |
|----------------------|-----------|-----------|-------|------|-------|------|
| Vertical Section     | Period    | Tv        | 789   |      | 822   | Th   |
|                      | Active    | Tdisp (v) | —     | 768  | —     | Th   |
|                      | Blanking  | Tblk (v)  | 21    |      | 54    | Th   |
| Horizontal Section   | Period    | Th        | 1414  |      | 1722  | Tclk |
|                      | Active    | Tdisp (h) | —     | 1366 | —     | Tclk |
|                      | Blanking  | Tblk (h)  | 48    |      | 356   | Tclk |
| Clock                | Period    | CLK       | 11.36 | —    | 15.38 | ns   |
|                      | Frequency | Freq      | 65    |      | 88    | MHz  |
| Vertical Frequency   | Frequency | Vs        | 58    | 60   | 62    | Hz   |
| Horizontal Frequency | Frequency | Hs        | 45.76 |      | 50.96 | KHz  |

Vertical Frequency Range B (50Hz)

| Signal               | Item      | Symbol    | Min   | Type | Max   | Unit |
|----------------------|-----------|-----------|-------|------|-------|------|
| Vertical Section     | Period    | Tv        | 789   |      | 822   | Th   |
|                      | Active    | Tdisp (v) | —     | 768  | —     | Th   |
|                      | Blanking  | Tblk (v)  | 21    |      | 54    | Th   |
| Horizontal Section   | Period    | Th        | 1414  |      | 1722  | Tclk |
|                      | Active    | Tdisp (h) | —     | 1366 | —     | Tclk |
|                      | Blanking  | Tblk (h)  | 48    |      | 356   | Tclk |
| Clock                | Period    | CLK       | 13.51 | —    | 18.52 | ns   |
|                      | Frequency | Freq      | 54    |      | 74    | MHz  |
| Vertical Frequency   | Frequency | Vs        | 48    | 50   | 52    | Hz   |
| Horizontal Frequency | Frequency | Hs        | 37.87 |      | 42.74 | KHz  |

# Signal Timing Waveforms



## Color Input Data Reference

The brightness of each primary color (red, green and blue) is based on the 8 bit gray scale data input for the color; the higher the binary input, the brighter the color. The table below provides a reference for color versus data input.

COLOR DATA REFERENCE

| Color       |            | Input Color Data |    |    |    |     |    |    |    |       |    |    |    |     |    |    |    |      |    |    |    |     |    |    |    |
|-------------|------------|------------------|----|----|----|-----|----|----|----|-------|----|----|----|-----|----|----|----|------|----|----|----|-----|----|----|----|
|             |            | RED              |    |    |    |     |    |    |    | GREEN |    |    |    |     |    |    |    | BLUE |    |    |    |     |    |    |    |
|             |            | MSB              |    |    |    | LSB |    |    |    | MSB   |    |    |    | LSB |    |    |    | MSB  |    |    |    | LSB |    |    |    |
|             |            | R7               | R6 | R5 | R4 | R3  | R2 | R1 | R0 | G7    | G6 | G5 | G4 | G3  | G2 | G1 | G0 | B7   | B6 | B5 | B4 | B3  | B2 | B1 | B0 |
| Basic 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  |
|             | Red(255)   | 1                | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
|             | Green(255) | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 0    | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
|             | Blue(255)  | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1   | 1  | 1  | 1  |
|             | 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  |
|             | 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  |    |
| RED         | RED(000)   | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
|             | RED(001)   | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 1  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
|             | ----       |                  |    |    |    |     |    |    |    |       |    |    |    |     |    |    |    |      |    |    |    |     |    |    |    |
|             | RED(254)   | 1                | 1  | 1  | 1  | 1   | 1  | 1  | 0  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
|             | RED(255)   | 1                | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
| GREEN       | GREEN(000) | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
|             | GREEN(001) | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 1  | 0    | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
|             | ----       |                  |    |    |    |     |    |    |    |       |    |    |    |     |    |    |    |      |    |    |    |     |    |    |    |
|             | GREEN(254) | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 0    | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
|             | GREEN(255) | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 0    | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
| BLUE        | BLUE(000)  | 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(001)  | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0   | 0  | 0  | 1  |
|             | -----      |                  |    |    |    |     |    |    |    |       |    |    |    |     |    |    |    |      |    |    |    |     |    |    |    |
|             | BLUE(254)  | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1   | 1  | 1  | 0  |
|             | BLUE(255)  | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1   | 1  | 1  | 1  |

## 4.0 LIPS DRIVING BOARD SPECIFICATION:

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### 4.1 POWER SPECIFICATION:

#### 1、General :

This specification defines the performance characteristics of, [12sbV/4A, 12V/2A](#) output AC-DC power. This specification also defines the worldwide safety requirements and EMC requirements.

#### 2、SCOPE :

This specification requirements of the subject parts used in [42 inch LIPS](#) ( LCD Integrated Power System ).

#### 3、SUITABLE LOAD : 32" & 42" TFT-LCD Module

Panel Model :     

#### 4、Input Characteristic :

- 4-1、AC Input Voltage ----- [90Vac ~ 264Vac](#)
- 4-2、AC Input Frequency ----- [47Hz ~ 63Hz](#)
- 4-3、Input Power ----- Max. [300W @ 100V](#)
- 4-4、Input Current ----- Max. [3A @ 100V](#)
- 4-5、Power Factor -----  $\geq$  [0.9](#)
- 4-6、Inrush Current -----  $\leq$  [80A peak @ 264Vac](#)
- 4-7、Fuse ----- [5A/250V](#)
- 4-8、DPMS Mode -----  $\leq$ [1W@240Vac](#)
- 4-9、Configuration-----3 Conductors (Live, Neutral,GND)
- 4-10、Hold up time ----- The output hold up time (measured at the 90% point of normal voltage output)will be guaranteed [8msec](#) at test condition which is full load,100 VAC /60Hz, normally line, 25°C Ambient temperature

## 5、OUTPUT CHARACTERISTIC：

### 5-1、Power Unit

|                        |             |             |  |  |  |  |
|------------------------|-------------|-------------|--|--|--|--|
| Regular Output Voltage | Stand-by    | V1          |  |  |  |  |
| Output Voltage         | +12V        | +12V        |  |  |  |  |
| Regular Output Voltage | 11.4V~12.6V | 11.4V~12.6V |  |  |  |  |
| Regulation Tolerance   | ±5%         | ±5%         |  |  |  |  |
| Minimum Load Current   | 0A          | 0A          |  |  |  |  |
| Maximum Load Current   | 4A          | 2A          |  |  |  |  |
| Peak Load Current      |             |             |  |  |  |  |

Note:

- (1)、Inverter Down Signal(BL On/Off)(CN301 Pin 1)  
 Pin1 Low (0V~1V) Lighting Turn Off.  
 Pin1 High (2.5V~5V) Lighting Turn On.

### 5-2、Ripple & Noise

|                        |        |       |  |  |  |  |
|------------------------|--------|-------|--|--|--|--|
| Regular Output Voltage | +12VSB | +12V  |  |  |  |  |
| Ripple & Noise         | 120mV  | 120mV |  |  |  |  |

Note: 0.1  $\mu$ F Ceramic and 47  $\mu$ F Tantalum capacitors should be put across output terminals during ripple & noise test. The oscilloscope bandwidth is set at 20MHz and co-axial probe will be used to measure it.

The test condition is max. load and normally line.

remark 1: Over / Under Shoot : Less than 5% of nominal value.

remark 2: Turn On Time : 2 seconds Maximum.

### 5-3、Overshoot

The power use in overshoot at turn on or turn off AC input will be less than 10% of the nominal value and will decay itself within the regulation band in less than 50m sec.

### 5-4、Dynamic Load Regulation

OUTPUT VOLTAGE for 0%↔50% or 50%↔100% load change for 12Vdc

## 6、PROTECTION：

### 6.1、Primary (Input) Protection

The input power line will be fused with a fuse 5.0A, 250 VAC.

### 6.2、Secondary (Output) protection

#### 6.2.1、Over Current Protection(OCP)

When an internal fault occurs, or an external fault is applied to the power, such that an overload or short circuit is applied to the output, the power will be shutdown.

\* +12VSB,+12V : Latch Off

#### 6.2.2、Over Voltage Protection(OVP)

The voltage will not exceed the upper trip limit.

|                |                   |  |  |  |  |  |
|----------------|-------------------|--|--|--|--|--|
| Output Voltage | +12V              |  |  |  |  |  |
| Upper          | 16V <sub>DC</sub> |  |  |  |  |  |

\* +12VSB,12V : Latch Off

#### 6.2.3、Short Circuit Protection

+12VSB,+12V: Auto Recoverable

DC return and the output. This condition will cause no damage to the power.

Power latch is not allowed.

## 7、Power Supply Sequencing：

### 7.1、AC Power On

When proper AC power is applied, the output will reach its regulation limits within 2.0 Second at 100 VAC.

### 7.2、Output Rise Time

The output rise time (measured from the 10% point to the 90% point on the waveform) will be greater than 1m sec and less than 20m sec.

## 8、Cooling

Cooling shall be will natural convection cooling.

Storage : 5% to 90% non-condensing

## 9、Reliability

### 9.1、Mean Time Between Failure 《MTBF》

The power supply shall be designed and produced to have a mean time between failures 《MTBF》 of 50,000 operating hours at 90% confidence-level while operating under the following condition.

- a .AC input voltage : 100Vac and 240Vac
- b .Duty Cycle : 100Vac and 240Vac
- c .Ambient TEMP. :  $25^{\circ}\text{C}\pm 2^{\circ}\text{C}$
- d .Humidity : Prevailing Conditions

### 9.2、On - off Life

To verify the LIPS withstand 10,000 time on-off repetition of primary power without failure or damage at 100Vac or 240Vac input.

### 9.3、Operational Life

The LIPS is designed for a minimum life of 50,000 power-on hours at  $25^{\circ}\text{C}$  Ambient temperature.

## 10、Environmental Condition :

### 10.1、Operationg:

The storage temperature is  $0^{\circ}\text{C}$  to  $50^{\circ}\text{C}$ .

The storage relative humidity is 25% to 85%.

### 10.2、Storage : (without frosting or clewdrop)

The operating ambient temperature is  $-20^{\circ}\text{C}$  to  $80^{\circ}\text{C}$

The operating relative humidity is 25% to 95%.

**11 、 Burn-In :**

4 hours at 50°C (±5°C), nominal input voltage, 80% load.

AC on/off must be test 1time after burn-in.

**12 、 E.M.I. :**

12.1 、 Conduction

The power will conform to FCC Class B, VCCI Class B, and CISPR Class B.

12.2 、 Radiation

The power will conform to FCC Class B, VCCI Class B, and CISPR Class B.

**13 、 Safety Characteristics :**

13.1 、 Safety Meet Requirements

UL : UL60950 Third Edition & UL6500

cUL : CSA 22.2 No.60950 & E60065

TUV : EN60950 & EN60065

CCC : GB4943 & GB8898

CB : IEC60950 & IEC60065

13.2 、 Withstand Voltage

Primary to secondary : 3000VAC 10mA for 60 seconds.

13.3 、 Isolation Resistance

More than 10M $\Omega$  while withstanding of 500Vdc.

13.4 、 Inrush Current

The power inrush current is less than 80Amps(peak to peak) at the time of cold start at 264 VAC Condition.

## 4.2 INTERTER SPECIFICATION:

### 1、GENERAL DESCRIPTION

THIS INVERTER(OEM) WAS DESIGNED FOR 42" PANEL

### 2、MAXIMUM OPERATING CONDITION：

2-1.INPUT SUPPLY VOLTAGE：400V<sub>DC</sub>±5%

2-2.INPUT SIGNAL VOLTAGE ON/OFF：2.5V~5V

2-3.AMBIENT OPERATING TEMPERATURE：0℃~+50℃

2-4.AMBIENT OPERATING HUMIDITY：10%~90%

2-5.STORAGE TEMPERATURE：-20℃~80℃

2-6.Environment T 25℃ TEMPERATURE RISE OF  $\Delta T$  LIMITS：  
 $\Delta T$  50℃ (MAX.)

### 3、ELECTRIC FUNCTION SPECIFICATION

#### 3-1.FEATURE

3-1-1.CONSTANT CURRENT OUTPUT

3-1-2.RESONANCE CIRCUIT WITH LOW-NOISE SINE WAVE OUTPUT。

3-1-3.SHORT、OPEN AND HUMAN CIRCUIT SHUT DOWN LATCH OFF  
PROTECTION

3-1-4.BACKLIGHT ADJUSTABLE

#### 3-2 OPERATION CONDITION

3-2-1.OPERATING TEMPERATURE 0 TO +50℃

3-2-2.HUMIDITY 10%~90% R.H.

3-2-3.STORAGE TEMPERATURE -20 TO +80℃

#### 4、Inverter Unit :

These specifications are applied to JW121011 for driving 32" & 42" panel.

| Item                         | Symbol            | Minimum | Typical | Maximum | Unit | Remark   |
|------------------------------|-------------------|---------|---------|---------|------|--|
| Input Voltage                | Vin               | -----   | 400     | -----   | Vdc  |  |
| Input Current                | Iin               | -----   | -----   | 0.58    | A    |  |
| Input Power                  | Pin               | -----   | -----   | 230     | W    | Vin = 400V<br>Full Load<br>(after heat run<br>30min) |
| BLON<br>ON/OFF Control       | On                | 2.5     | -----   | 5       | Vdc  | On Stage   |
|                              | Off               | 0       | -----   | 1       | Vdc  | On Stage   |
| PWM Dimming<br>Control       | BLDIM             | 0       | -----   | 5       | Vdc  |  |
| Output Current<br>BLdim=3.3V | Iout<br>( max. )  | -----   | 108     | -----   | mA   |  |
| Balance of<br>Lamps Current  |                   | -----   | -----   | 5       | %    | for total<br>Lamps                                   |
| Uniformity                   |                   | 80      | -----   | -----   | %    | 9 points<br>uniformity on<br>Backlight               |
| Operating<br>Frequency       | Freq.             | 44      | 46      | 48      | KHz  |  |
| Operating<br>Voltage         | Vload<br>( max. ) | -----   | 1370    | -----   | Vrms |  |

#### 5、CONNECTOR PIN ASSIGNMENT :

##### 5-1. AC Input Connector

CN101 : P=3.96

|         |      |         |     |
|---------|------|---------|-----|
| Pin No. | 1    | 2       | 3   |
| Signal  | LINE | NEUTRAL | F.G |

## 5-2.Signal Connector

CN201 : P=2.5mm

Pin assignment

| Pin No. | name  | Volage |
|---------|-------|--------|
| 1       | 12VSB | 12Vdc  |
| 2       | 12VSB | 12Vdc  |
| 3       | 12VSB | 12Vdc  |
| 4       | 12VSB | 12Vdc  |
| 5       | GND   | GND    |
| 6       | GND   | GND    |
| 7       | GND   | GND    |
| 8       | GND   | GND    |

CN202~CN209 : P=2.0mm

Pin assignment

| Pin No. | name | Volage |
|---------|------|--------|
| 1       | 12V  | 12Vdc  |
| 2       | GND  | GND    |

CN301 : P=2.5mm

Pin assignment

| Pin No. | name  | Volage |
|---------|-------|--------|
| 1       | BL_ON | TTL    |
| 2       | DIM   |        |
| 3       | GND   | GND    |

CN401,CN402 : P=4mm

Pin assignment

| Pin No. | name | Volage |
|---------|------|--------|
| 1       | HV   | HV     |
| 2       | HV   | HV     |

## 6、RELIABILITY TEST :

THE FINAL TEST IS BASED ON ELECTRONIC SPECIFICATION OF THE RESISTOR LOAD

6-1. THB-HIGH TEMPERATURE OPERATION PLUS ON/OFF TEST POWER ON AT MAX

$V_{\text{INPUT}}$  WITH LOAD OPERATION AT  $T_a = 60^\circ\text{C}$   
50 MIN ON / 10 MIN OFF , 100 HOURS

6-2. COLD OPERATION TEST

POWER ON AT MIN

$V_{\text{INPUT}}$  WITH LOAD OPERATION AT  $T_a = 0^\circ\text{C}$  , 100 HOURS

6-3. COLD & HOT STORAGE TEST

POWER OFF STORAGE LOW TEMPERATURE  $-10^\circ\text{C}$  STORAGE FOR 12 HOURS  
HIGH TEMPERATURE  $60^\circ\text{C}$  STORAGE FOR 12 HOURS .

6-4. THERMAL SHOCK TEST

POWER OFF STORAGE  $T_a = -10^\circ\text{C}$  (30 MIN)  $\sim$   $60^\circ\text{C}$  (30 MIN) FOR 100 CYCLES

6-5. POWER ON/OFF TEST

MAX & MIN  $V_{\text{INPUT}}$  POWER-ON WITH LOAD 10 SEC ON / 10 SEC OFF , 10000 CYCLES

6-6. ENABLE ON/OFF TEST

ENABLE HI 10 SEC ON / ENABLE LOW 10 SEC OFF

$V_{\text{INPUT}}$  POWER-ON WITH MAX LOAD 10000 CYCLES

6-7. HOT START TEST

AFTER STORAGE AT  $T_a = 50^\circ\text{C}$  FOR 2 HOURS , THEN POWER ON AT MIN

$V_{\text{INPUT}}$  POWER-ON WITH LOAD TESTING 10 TIME

6-8.COLD START TEST

AFTER STORAGE AT  $T_a=0^{\circ}\text{C}$  FOR 2 HOURS , THEN POWER AT 42”  
TV  $V_{\text{INPUT}}$ ,TESTING 10 TIMES.

6-9.OPEN LAMP PROTECTION TEST

OPWER ON 10 TIMES UNDER ABNORMAL SITUATION-OPEN LAMP  
PROTECTION

CIRCUIT SHOULD WORK BEFORE AND COMPONENT BURN OR FAILED

**7 、 PROTECTION**

7-1.OPEN LAMP

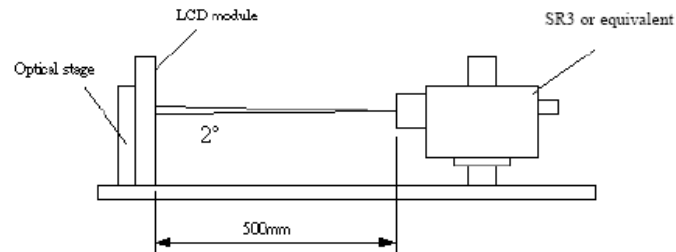
THE LIPS WILL PROTECT BY ITSELF, AND LATCH OFF 3 SECONDS LATER, IF  
OPEN 9 LAMPS WILL CAUSE NO DAMAGE TO THE POWER SUPPLY.

7-2. HUMAN BODY TEST

THE LIPS WILL PROTECT BY ITSELF, AND LATCH OFF 3 SECONDS LATER, IF A  
 $2\text{K } \Omega$  (HUMAN RESISTANCE) IS PLACED BETWEEN HIGH VOLTAGE  
TRANSFORMER OUTPUT, THIS CONDITION WILL CAUSE NO DAMAGE TO THE  
POWER SUPPLY.

## 5.0 OPTICAL CHARACTERISTICS

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 45 minutes in a dark environment at 25°C. The values specified are at an approximate distance 50cm from the LCD surface at a viewing angle of  $\Phi$  and  $\theta$  equal to 0°.



### 5.1 OPTICAL SPECIFICATIONS

| Parameter                | Symbol                               | Values     |       |      | Units             | Notes              |
|--------------------------|--------------------------------------|------------|-------|------|-------------------|--------------------|
|                          |                                      | Min.       | Typ.  | Max. |                   |                    |
| Contrast Ratio           | CR                                   | 1000       | 1200  |      |                   | 1                  |
| Surface Luminance, white | LWH                                  | 900        | 1000  |      | cd/m <sup>2</sup> | 2                  |
| Luminance Variation      | $\delta_{\text{WHITE}}$              | 9 p        |       | 1.3  |                   | 3                  |
| Response Time (Average)  | $T_{\gamma}$                         |            | 8     |      | ms                | 4,5 (Gray to Gray) |
|                          | Rise Time                            |            | 15    |      | ms                |                    |
|                          | Decay Time                           |            | 5     |      | ms                |                    |
| Color Coordinates        |                                      |            |       |      |                   |                    |
|                          | RED                                  | $R_x$      | 0.640 |      |                   |                    |
|                          |                                      | $R_y$      | 0.330 |      |                   |                    |
|                          | GREEN                                | $G_x$      | 0.270 |      |                   |                    |
|                          |                                      | $G_y$      | 0.600 |      |                   |                    |
|                          | BLUE                                 | $B_x$      | 0.150 |      |                   |                    |
|                          |                                      | $B_y$      | 0.060 |      |                   |                    |
|                          | WHITE                                | $W_x$      | 0.280 |      |                   |                    |
|                          |                                      | $W_y$      | 0.290 |      |                   |                    |
| Viewing Angle            |                                      |            |       |      |                   |                    |
|                          | x axis, right ( $\varphi=0^\circ$ )  | $\theta_r$ | 89    |      | Degree            | 6                  |
|                          | x axis, left ( $\varphi=180^\circ$ ) | $\theta_l$ | 89    |      |                   |                    |
|                          | y axis, up ( $\varphi=90^\circ$ )    | $\theta_u$ | 89    |      |                   |                    |
|                          | y axis, down ( $\varphi=0^\circ$ )   | $\theta_d$ | 89    |      |                   |                    |

Note:

1. Contrast Ratio (CR) is defined mathematically as:

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

2. Surface luminance is luminance value at point 1 across the LCD surface 50cm from the surface with all pixels displaying white. From more information see Fig. 4-2. When  $V_{DDB} = 24V$ ,  $I_{DDb} = \text{TBD}$ .  $L_{WH} = L_{on1}$ . Where  $L_{on1}$  is the luminance with all pixels displaying white at center 1 location.

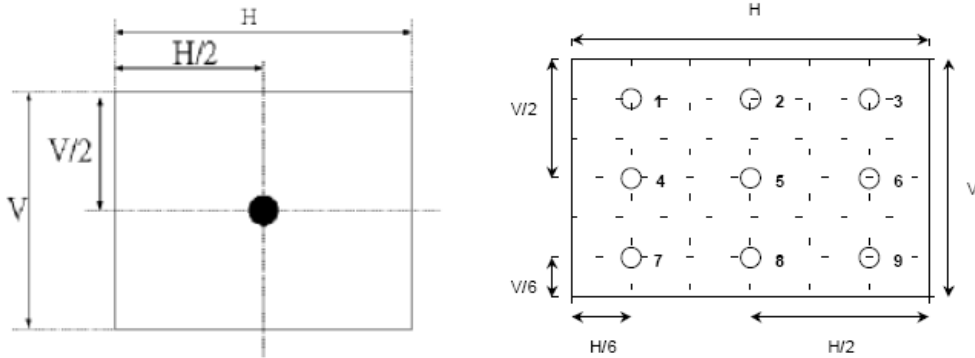


Fig.4-2 Optical measurement point

3. The variation in surface luminance,  $\delta_{\text{WHITE}}$  is defined under 100% brightness as:

$$\delta_{\text{WHITE(9P)}} = \frac{\text{Maximum}(L_{on1}, L_{on2}, \dots, L_{on9})}{\text{Minimum}(L_{on1}, L_{on2}, \dots, L_{on9})}$$

4. Response time is the time required for the display to transition from white(L255) to black(L0) (Decay Time,  $Tr_D = T_f$ ) and from black(L0) to white(L255) (Rise Time,  $Tr_R = T_r$ ). For additional information see Fig. 4-3.

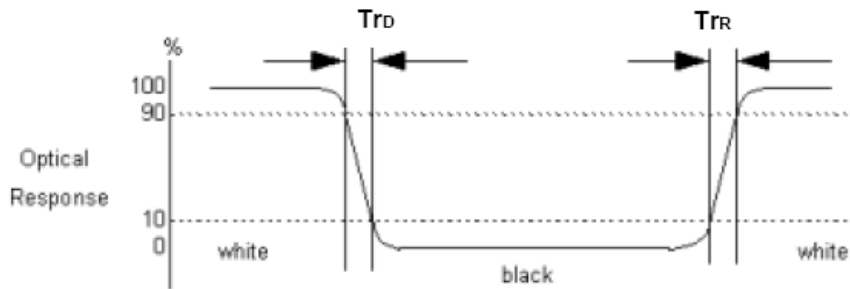
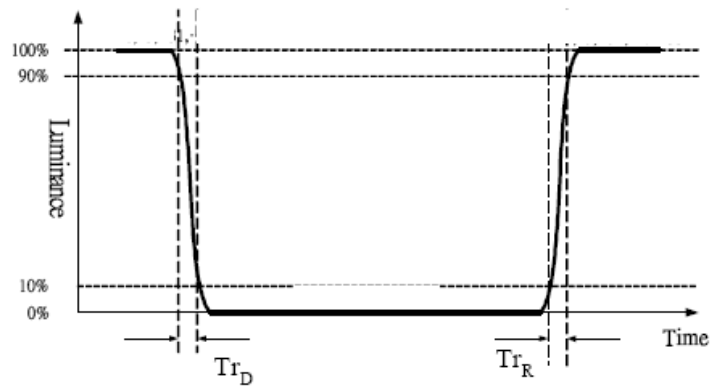


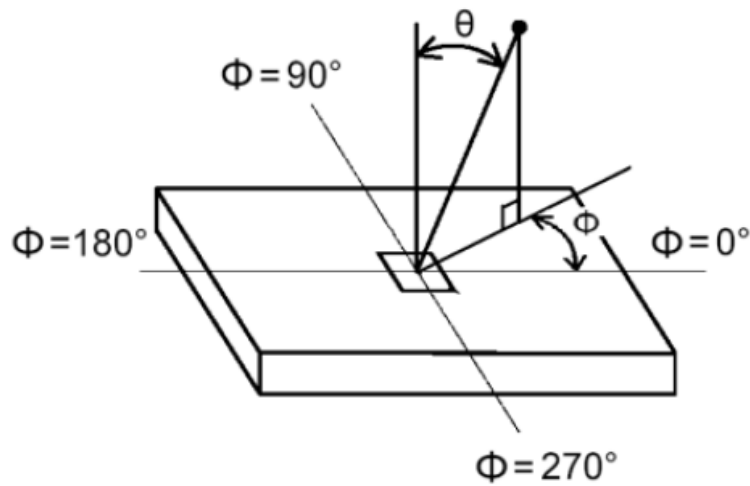
Fig.4-3 Response time

5. The response time is defined as the following figure and shall be measured by switching the input signal for 0, 63, 127, 191, 255 different gray level. For additional information see Fig. 4-4.



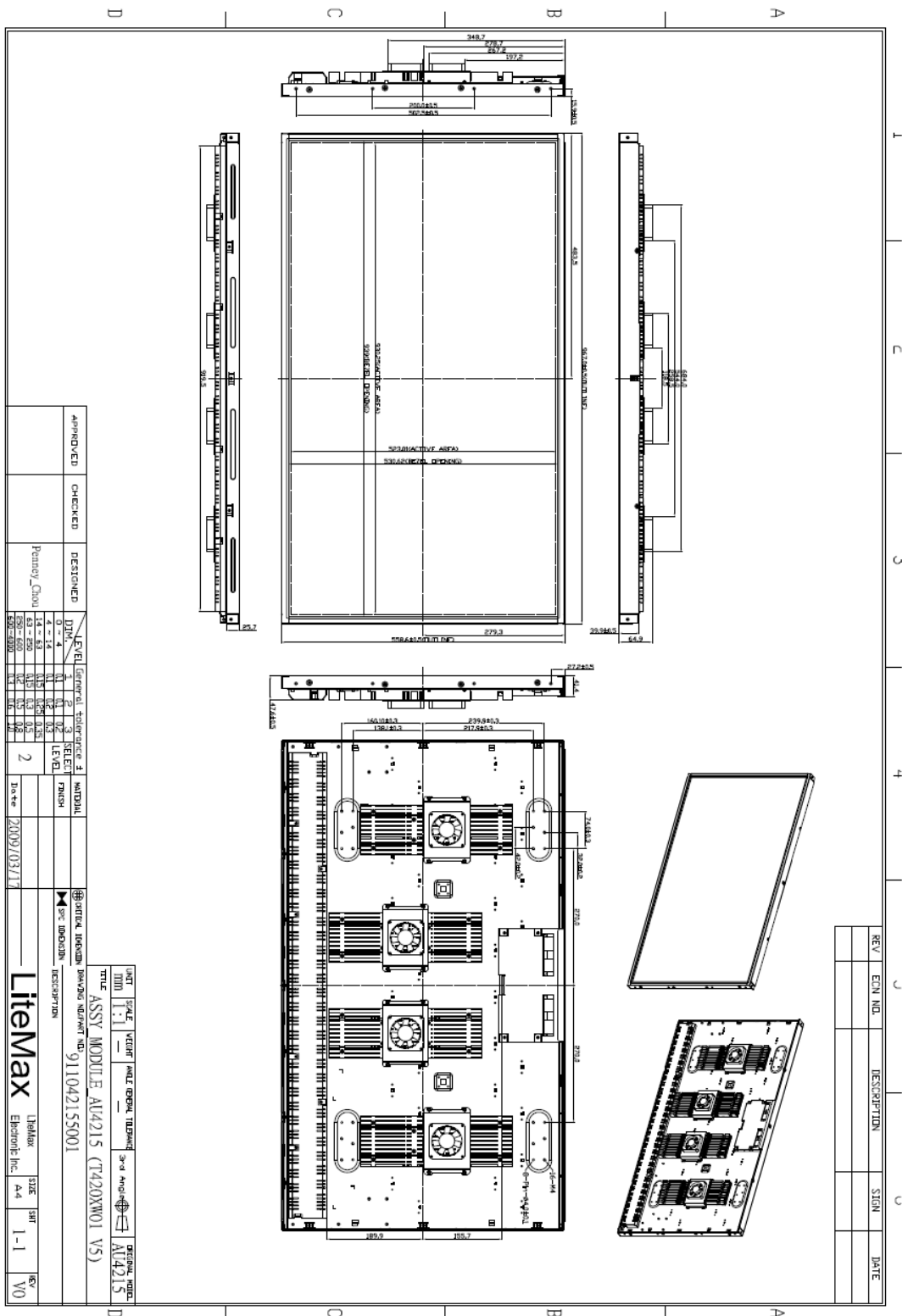
**Fig.4-4 Response time**

6. Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see Fig. 4-5.



**Fig.4-5 Viewing Angle Definition**

# 6.0 MECHANICAL DRAWING



## **7.0 PRECAUTIONS**

---

### **7.1 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.

### **7.2 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.

### **7.3 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.