

|                        |                                                                                                                                                                                         |                                                         |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|
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|                        |                                                                                                                                                                                         | APPLICABLE GROUP<br>TFT Liquid Crystal Display<br>Group |

DEVICE SPECIFICATION FOR

# TFT-LCD Module

MODEL No.

# LQ150X1DG11

☐ CUSTOMER'S APPROVAL

DATE \_\_\_\_\_

BY \_\_\_\_\_

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## RECORDS OF REVISION

LQ150X1DG11

[illegible]

## 1. Application

This specifications applies to a color TFT-LCD module, LQ150X1DG11.

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## 2. Overview

This module is a color active matrix LCD module incorporating amorphous silicon TFT (Thin Film Transistor). It is composed of a color TFT-LCD panel, driver ICs, control circuit, power supply circuit and a back light unit. Graphics and texts can be displayed 1024×3×768 dots on a panel with 262,144 colors by supplying 36 bit data signals(6 bit×2pixel×RGB), four timing signals, +5V DC supply voltage for TFT-LCD panel driving and supply voltage for back light .

It is a wide viewing-angle-module (Vertical viewing angle:120° Horizontal viewing angle:140° ).

Current module (TFT:LQ15X01/01W/11/14,STN:LM15X80)and this module(LQ150X1DG11) are compatible (center of screen and mounting hole) by equipping with metal fittings.

Current model(13.8 inch:LQ14X03E,15inch:LQ15X01 series/14) are I/F compatible with this module (LQ150X1DG11).

Input signal timing conform with 75Hz mode of VESA standard.

## 3. Mechanical Specifications

| Parameter                  | Specifications                                      | Unit  |
|----------------------------|-----------------------------------------------------|-------|
| Display size               | 38 (Diagonal)                                       | cm    |
|                            | 15.0 (Diagonal)                                     | inch  |
| Active area                | 304.1 (H)×228.1 (V)                                 | mm    |
| Pixel format               | 1024 (H)×768 (V)                                    | pixel |
|                            | (1 pixel=R+G+B dots)                                |       |
| Pixel pitch                | 0.297 (H)×0.297 (V)                                 | mm    |
| Pixel configuration        | R,G,B vertical stripe                               |       |
| Display mode               | Normally white                                      |       |
| Unit outline dimensions *1 | 331.3 (W)×257.9 (H)×15.9(D)                         | mm    |
| Mass                       | 1300 (max.)                                         | g     |
| Surface treatment          | Anti-glare and hard-coating 2H<br>(Haze value = 28) |       |

\*1.Note: excluding back light cables .

The thickness of module (D) doesn't contain the projection .

\*2.Outline dimension is shown in Fig.1

## 4. Input Terminals

## 4-1. TFT-LCD panel driving

CN1

The module-side connector : FX8-60S-SV (Hirose Electric Co., Ltd.)

The user-side connector : FX8-60P-SV (Hirose Electric Co., Ltd.)

| Pin No. | Symbol | Function                     | Remark |
|---------|--------|------------------------------|--------|
| 1       | GND    | GND                          |        |
| 2       | RB0    | RED even data signal (LSB)   |        |
| 3       | RB1    | RED even data signal         |        |
| 4       | RB2    | RED even data signal         |        |
| 5       | RB3    | RED even data signal         |        |
| 6       | RB4    | RED even data signal         |        |
| 7       | RB5    | RED even data signal (MSB)   |        |
| 8       | GND    | GND                          |        |
| 9       | GB0    | GREEN even data signal (LSB) |        |
| 10      | GB1    | GREEN even data signal       |        |
| 11      | GB2    | GREEN even data signal       |        |
| 12      | GB3    | GREEN even data signal       |        |
| 13      | GB4    | GREEN even data signal       |        |
| 14      | GB5    | GREEN even data signal (MSB) |        |
| 15      | GND    | GND                          |        |
| 16      | BB0    | BLUE even data signal (LSB)  |        |
| 17      | BB1    | BLUE even data signal        |        |
| 18      | BB2    | BLUE even data signal        |        |
| 19      | BB3    | BLUE even data signal        |        |
| 20      | BB4    | BLUE even data signal        |        |
| 21      | BB5    | BLUE even data signal (MSB)  |        |
| 22      | GND    | GND                          |        |
| 23      | RA0    | RED odd data signal (LSB)    |        |
| 24      | RA1    | RED odd data signal          |        |
| 25      | RA2    | RED odd data signal          |        |
| 26      | RA3    | RED odd data signal          |        |
| 27      | RA4    | RED odd data signal          |        |
| 28      | RA5    | RED odd data signal (MSB)    |        |
| 29      | GND    | GND                          |        |
| 30      | GA0    | GREEN odd data signal (LSB)  |        |
| 31      | GA1    | GREEN odd data signal        |        |
| 32      | GA2    | GREEN odd data signal        |        |
| 33      | GA3    | GREEN odd data signal        |        |
| 34      | GA4    | GREEN odd data signal        |        |
| 35      | GA5    | GREEN odd data signal (MSB)  |        |
| 36      | GND    | GND                          |        |
| 37      | BA0    | BLUE odd data signal (LSB)   |        |
| 38      | BA1    | BLUE odd data signal         |        |
| 39      | BA2    | BLUE odd data signal         |        |
| 40      | BA3    | BLUE odd data signal         |        |

| Pin No. | Symbol | Function                                                   | Remark   |
|---------|--------|------------------------------------------------------------|----------|
| 41      | BA4    | BLUE odd data signal                                       |          |
| 42      | BA5    | BLUE odd data signal (MSB)                                 |          |
| 43      | GND    | GND                                                        |          |
| 44      | GND    | GND                                                        |          |
| 45      | GND    | GND                                                        |          |
| 46      | Vsync  | Vertical synchronous signal                                |          |
| 47      | Hsync  | Horizontal synchronous signal                              |          |
| 48      | ENAB   | Data enable signal (Signal to settle the display position) | 【Note 1】 |
| 49      | GND    | GND                                                        |          |
| 50      | GND    | GND                                                        |          |
| 51      | CKB    | Clock B signal for sampling even data signal               |          |
| 52      | CKA    | Clock A signal for sampling odd data signal                |          |
| 53      | GND    | GND                                                        |          |
| 54      | GND    | GND (Reserve)                                              |          |
| 55      | GND    | GND (Reserve)                                              |          |
| 56      | MODE   | Timing signal select                                       | 【Note 1】 |
| 57      | Vcc    | +5V power supply                                           |          |
| 58      | Vcc    | +5V power supply                                           |          |
| 59      | Vcc    | +5V power supply                                           |          |
| 60      | Vcc    | +5V power supply                                           |          |

※The shielding case is connected with GND in the module.

【Note 1】 In case MODE is fixed “Low”, the display start timing is determined by Vsync and ENAB.

The vertical display start position and horizontal display start position are determined as described in 7-1-2, 7-1-3. Do not keep ENAB “high” during operation.

In case MODE is fixed “High” or “Open”, the display start timing is determined by only ENAB.

#### 4-2. Back light driving

CN2,CN3

The module-side connector : BHR-03VS-1(JST)

The user-side connector : SM02(8.0)B-BHS-1(JST)

| Pin no. | symbol            | function                                  |
|---------|-------------------|-------------------------------------------|
| 1       | V <sub>HIGH</sub> | Power supply for lamp (High voltage side) |
| 2       | NC                | This is electrically opened.              |
| 3       | V <sub>LOW</sub>  | Power supply for lamp (Low voltage side)  |

#### 5. Absolute Maximum Ratings

| Parameter                       | Symbol         | Condition | Ratings     | Unit | Remark  |
|---------------------------------|----------------|-----------|-------------|------|---------|
| Input voltage                   | V <sub>I</sub> | Ta=25℃    | -0.3 ~ +5.5 | V    | 【Note1】 |
| +5.0V supply voltage            | Vcc            | Ta=25℃    | 0 ~ + 6     | V    |         |
| Storage temperature             | Tstg           | —         | -25 ~ +60   | ℃    | 【Note2】 |
| Operating temperature (Ambient) | Topa           | —         | 0 ~ +50     | ℃    |         |

【Note1】 CKA, CKB, RA0~RA5, GA0~GA5, BA0~BA5, RB0~RB5, GB0~GB5, BB0~BB5,  
Hsync, Vsync, ENAB, MODE

【Note2】 Humidity : 95%RH Max. ( Ta≤40℃ )

Maximum wet-bulb temperature at 39℃ or less ( Ta>40℃ )

No condensation.

## 6. Electrical Characteristics

## 6-1. TFT-LCD panel driving

 $T_a = 25^\circ\text{C}$ 

| Parameter                       |                     | Symbol          | Min. | Typ. | Max. | Unit  | Remark                      |
|---------------------------------|---------------------|-----------------|------|------|------|-------|-----------------------------|
| Vcc                             | Supply voltage      | Vcc             | +4.5 | +5.0 | +5.5 | V     | 【Note1】                     |
|                                 | Current dissipation | Icc             | —    | 300  | 450  | mA    | 【Note2】                     |
| Permissive input ripple voltage |                     | V <sub>RF</sub> | —    | —    | 100  | mVp-p | Vcc=+5.0V                   |
| Input voltage (Low)             |                     | V <sub>IL</sub> | GND  | —    | 0.6  | V     | 【Note3】                     |
| Input voltage (High)            |                     | V <sub>IH</sub> | 2.6  |      | Vcc  | V     | 【Note3】                     |
| Input current (Low)             |                     | I <sub>IL</sub> | —    | —    | 10   | μA    | V <sub>I</sub> =GND 【Note3】 |
|                                 |                     |                 | —    | —    | 400  | μA    | V <sub>I</sub> =GND 【Note4】 |
| Input current (High)            |                     | I <sub>IH</sub> | —    | —    | 10   | μA    | V <sub>I</sub> =Vcc 【Note3】 |
|                                 |                     |                 | —    | —    | 600  | μA    | V <sub>I</sub> =Vcc 【Note4】 |

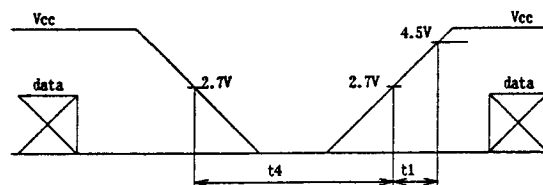
※ 3.3(v) logic is recommended as  
input signals .

【Note1】

On-off conditions for supply voltage

$$0 < t_1 \leq 10\text{ms}$$

$$t_4 \geq 1\text{s}$$



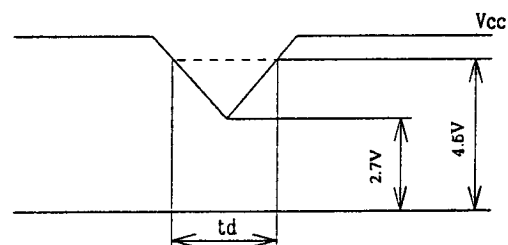
Vcc-dip conditions

$$1) \quad 2.7\text{V} \leq V_{\text{cc}} < 4.5\text{V}$$

$$t_d \leq 10\text{ms}$$

$$2) \quad V_{\text{cc}} < 2.7\text{V}$$

Vcc-dip conditions should also follow the  
on-off conditions



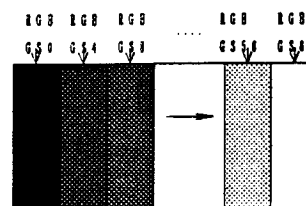
【Note2】 Typical current situation : 16-gray-bar pattern.

Vcc=+5.0V,

Gray scale : GS(4n)

$$n=0 \sim 15$$

The explanation of each gray scale ,GS(4n), is described  
below section (8).

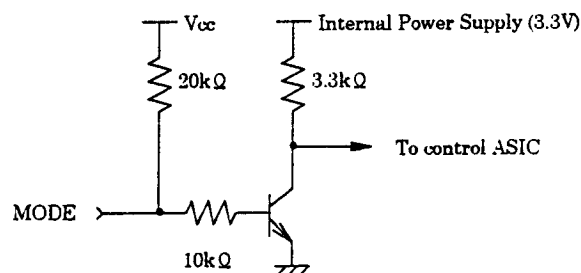


【Note3】 CKA, CKB, RA0~RA5, GA0~GA5, BA0~BA5, RB0~RB5, GB0~GB5, BB0~BB5,

Hsync, Vsync, ENAB

【Note4】 MODE

Input circuit of MODE is  
shown in right figure.



## 6-2. Back light driving

The back light system is an edge-lighting type with a couple of CCFT (Cold Cathode Fluorescent Tube). The characteristics of the lamp are shown in the following table .

The value mentioned below is at the case of one CCFT .

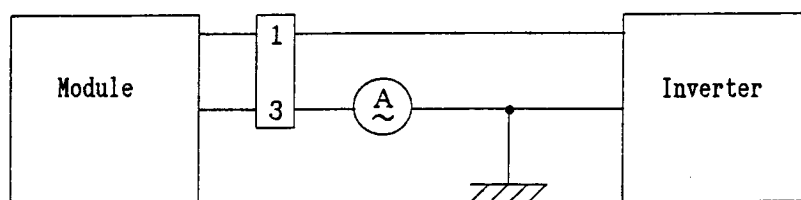
| Parameter              | Symbol | Min.  | Typ. | Max. | Unit  | Remark                           |
|------------------------|--------|-------|------|------|-------|----------------------------------|
| Lamp current range     | $I_L$  | 2.5   | 6.0  | 6.5  | mArms | 【Note1】                          |
| Lamp voltage           | $V_L$  | —     | 690  | —    | Vrms  | $T_a=25^{\circ}\text{C}$         |
| Lamp power consumption | $P_L$  | —     | 4.1  | —    | W     | 【Note2】                          |
| Lamp frequency         | $F_L$  | 20    | 60   | 70   | KHz   | 【Note3】                          |
| Kick-off voltage       | $V_s$  | —     | —    | 850  | Vrms  | $T_a=25^{\circ}\text{C}$ 【Note4】 |
|                        |        | —     | —    | 1450 | Vrms  | $T_a=0^{\circ}\text{C}$ 【Note4】  |
| Lamp life time         | $L_L$  | 50000 | —    | —    | hour  | 【Note5】                          |

【Note1】 A lamp can be light in the range of lamp current shown above .

Maximum rating for current is measured by high frequency current measurement equipment connected to  $V_{\text{Low}}$  at circuit showed below . (Note : To keep enough kick-off voltage and necessary steady voltage for CCFT .)

Lamp frequency : 20~60kHz

Ambient temperature : 0~50°C



\* 3pin is  $V_{\text{Low}}$

【Note2】 Referential data per one CCFT by calculation ( $I_L \times V_L$ ).

The data doesn't include loss at inverter .

【Note3】 Lamp frequency of inverter may produce interference with horizontal synchronous frequency, and this may cause horizontal beat on the display. Therefore, adjust lamp frequency, and keep inverter as far as from module or use electronic shielding between inverter and module to avoid interference.

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

【Note5】 Lamp life time is defined as the time when either ① or ② occurs in the continuous operation under the condition of  $T_a=25^{\circ}\text{C}$  and  $I_L=6.0\text{mArms}$  .

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

② Kick-off voltage at  $T_a=0^{\circ}\text{C}$  exceeds maximum value, 1450Vrms .

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

## 7. Timing characteristics of input signals

### 7-1. H-V mode (MODE = "Low" )

Timing diagrams of input signal are shown in Fig.2 .

#### 7-1-1. Timing characteristics

| Parameter                    |             | Symbol   | Min. | Typ. | Max.   | Unit  | Remark  |
|------------------------------|-------------|----------|------|------|--------|-------|---------|
| Clock A                      | Frequency   | 1/Tc     | 25   | 32.5 | 40     | MHz   |         |
|                              | High time   | Tch      | 9    | —    | —      | ns    |         |
| Clock B                      | Low time    | Tcl      | 9    | —    | —      | ns    |         |
|                              | Duty ratio  | Tch/ Tcl | 0.67 | 1.00 | 1.50   | —     |         |
| Data                         | Setup time  | Tds      | 8    | —    | —      | ns    |         |
|                              | Hold time   | Tdh      | 8    | —    | —      | ns    |         |
| Horizontal sync. signal      | Cycle       | TH       | 16.6 | 20.7 | —      | μs    |         |
|                              |             |          | 528  | 672  | 860    | clock |         |
|                              | Pulse width | THp      | 2    | 68   | —      | clock |         |
| Horizontal data start        |             | THbp     | —    | 148  | —      | clock |         |
| Hsync-Clock phase difference |             | TFc      | 5    | —    | —      | ns    |         |
| Vertical sync. signal        | Cycle       | TV       | —    | 16.7 | —      | ms    | 【Note1】 |
|                              |             |          | 773  | 806  | 990    | line  |         |
|                              | Pulse width | TVp      | 1    | 6    | —      | line  |         |
| Vertical data start          |             | TVbp     | 35   | 35   | 35     | line  |         |
| Hsync-Vsync phase difference |             | TVh      | 1    | —    | TH-THp | clock |         |

【Note1】 In case of lower frequency, the deterioration of display quality, flicker etc may be occurred .

#### 7-1-2. Horizontal display position

- ① The horizontal display position is determined by ENAB signal and the input data corresponding to the rising edge of ENAB signal is displayed at the left end of the active area .

| Parameter                   |             | symbol | Min.  | Typ. | Max.   | Unit  | Remark |
|-----------------------------|-------------|--------|-------|------|--------|-------|--------|
| ENAB signal                 | Setup time  | Tes    | 8     | —    | Tc-10  | ns    |        |
|                             | Pulse width | Tep    | 10    | 512  | 512    | clock |        |
| Hsync-ENAB phase difference |             | THe    | THp+1 | 148  | TH-512 | clock |        |

- ② Do not keep ENAB "Low" during operation.

#### 7-1-3. Vertical display position

The vertical display start position is the 35th line from the falling edge of Vsync .(cf. Fig.2)

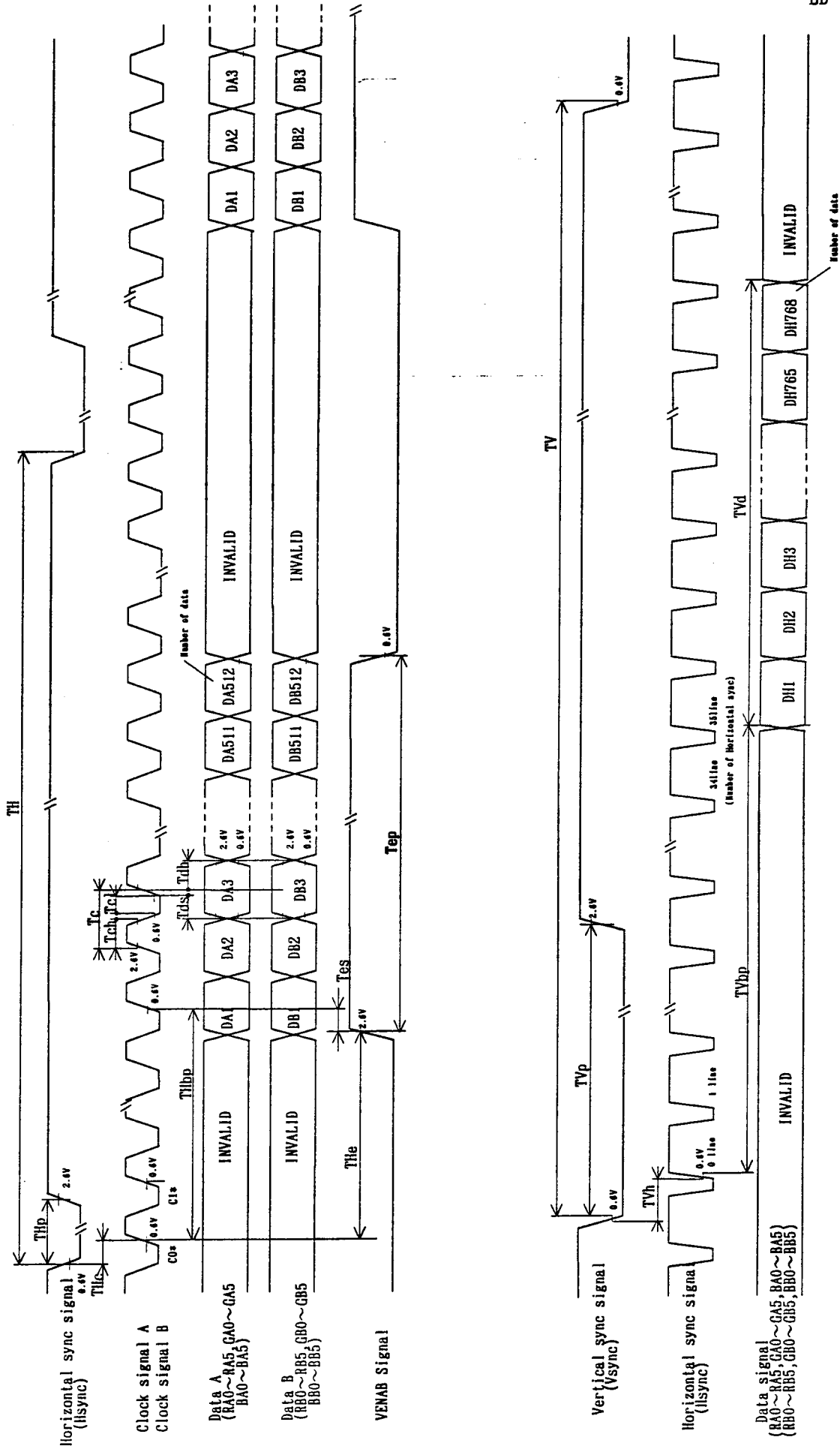


Fig.2 Input Signal Waveforms(H-V Mode)

## 7-2. ENAB mode (MODE = "High" or "Open" )

Timing diagrams of input signal are shown in Fig.3.

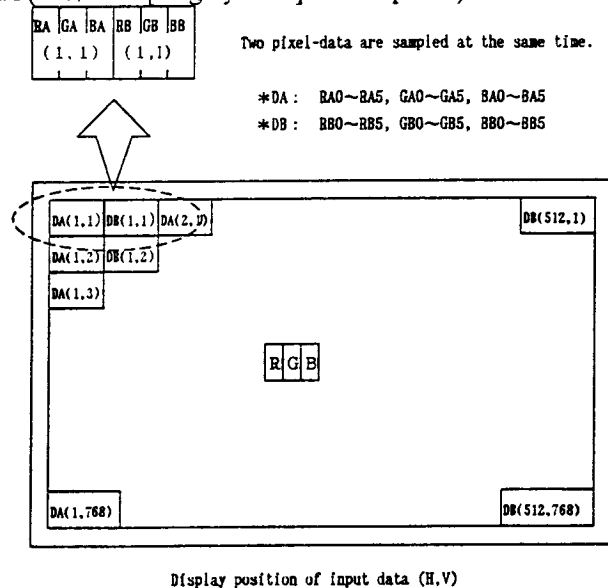
### 7-2-1. Timing characteristics

| Parameter             |                             | Symbol   | Min. | Typ. | Max.  | Unit  |
|-----------------------|-----------------------------|----------|------|------|-------|-------|
| Clock A<br>Clock B    | Frequency                   | 1/Tc     | 25   | 32.5 | 40    | MHz   |
|                       | High time                   | Tch      | 9    | —    | —     | ns    |
|                       | Low time                    | Tcl      | 9    | —    | —     | ns    |
|                       | Duty ratio                  | Tch/ Tcl | 0.67 | 1.00 | 1.50  | —     |
| Data                  | Setup time                  | Tds      | 8    | —    | —     | ns    |
|                       | Hold time                   | Tdh      | 8    | —    | —     | ns    |
| Data enable<br>signal | Setup time                  | Tes      | 8    | —    | Tc-10 | ns    |
|                       | Horizontal period           | TH       | 16.6 | 20.7 | —     | μs    |
|                       |                             |          | 528  | 672  | 860   | clock |
|                       | Horizontal period<br>(High) | THp      | 10   | 512  | 512   | clock |
|                       | Vertical period             | TV       | 770  | 806  | 990   | line  |
|                       | Vertical blanking width     | TVb      | 2    | 38   | 222   | line  |

【Note】 In case of using the long vertical period, the deterioration of display quality, flicker etc., may be occurred.

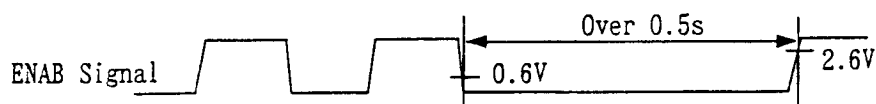
## 7-3. Input Data Signals and Display Position on the screen

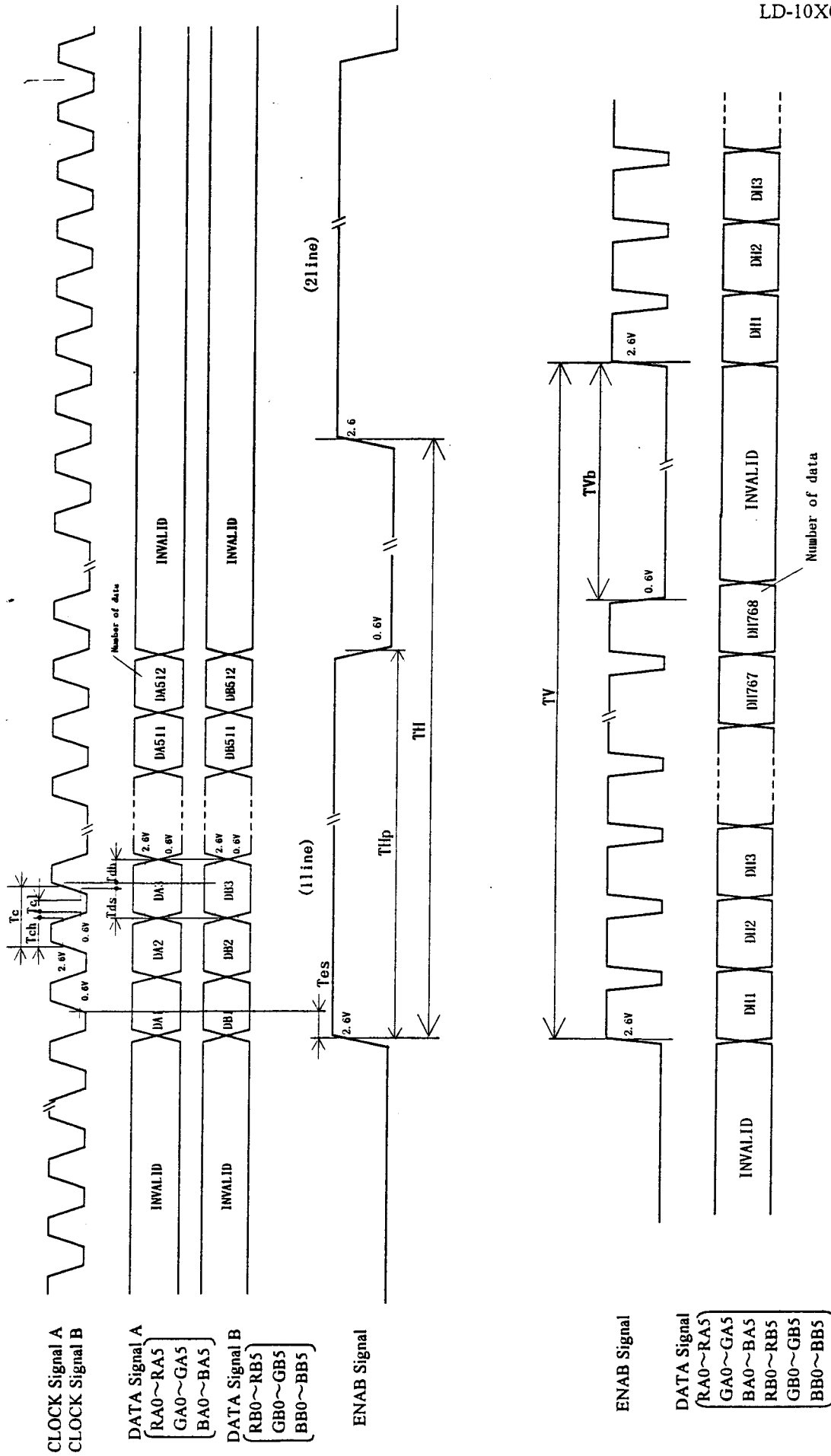
Graphics and texts can be displayed  $1024 \times 3 \times 768$  dots on a panel with 262,144 colors by supplying 36 bit data signal (6bit/color [64 gray scale] x 3 x 2 pixels) .



## 7-4. Sleep Mode

This LCD module stops operation, and the picture of the LCD module becomes wholly white, if ENAB signal stays "Low" for over 0.5 sec. Follow the above input signal timing for normal operation.





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

|                     | Colors &<br>Gray scale | Data signal   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|---------------------|------------------------|---------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                     |                        | Gray<br>Scale | RA0 | RA1 | RA2 | RA3 | RA4 | RA5 | GA0 | GA1 | GA2 | GA3 | GA4 | GA5 | BA0 | BA1 | BA2 | BA3 | BA4 | BA5 |
|                     |                        |               | RB0 | RB1 | RB2 | RB3 | RB4 | RB5 | GB0 | GB1 | GB2 | GB3 | GB4 | GB5 | BB0 | BB1 | BB2 | BB3 | BB4 | BB5 |
| Basic Color         | Black                  | —             | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
|                     | Blue                   | —             | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 1   | 1   | 1   | 1   | 1   | 1   |
|                     | Green                  | —             | 0   | 0   | 0   | 0   | 0   | 0   | 1   | 1   | 1   | 1   | 1   | 1   | 0   | 0   | 0   | 0   | 0   | 0   |
|                     | Cyan                   | —             | 0   | 0   | 0   | 0   | 0   | 0   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   |
|                     | Red                    | —             | 1   | 1   | 1   | 1   | 1   | 1   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
|                     | Magenta                | —             | 1   | 1   | 1   | 1   | 1   | 1   | 0   | 0   | 0   | 0   | 0   | 0   | 1   | 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   | Black                  | GS0           | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
|                     | ↑                      | GS1           | 1   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
|                     | Darker                 | GS2           | 0   | 1   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
|                     | ↑                      | ↓             | ↓   |     |     |     |     |     | ↓   |     |     |     |     |     | ↓   |     |     |     |     |     |
|                     | ↓                      | ↓             | ↓   |     |     |     |     |     | ↓   |     |     |     |     |     | ↓   |     |     |     |     |     |
|                     | Brighter               | GS61          | 1   | 0   | 1   | 1   | 1   | 1   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
|                     | ↓                      | GS62          | 0   | 1   | 1   | 1   | 1   | 1   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
|                     | Red                    | GS63          | 1   | 1   | 1   | 1   | 1   | 1   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
| Gray Scale of Green | Black                  | GS0           | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
|                     | ↑                      | GS1           | 0   | 0   | 0   | 0   | 0   | 0   | 1   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
|                     | Darker                 | GS2           | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 1   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
|                     | ↑                      | ↓             | ↓   |     |     |     |     |     | ↓   |     |     |     |     |     | ↓   |     |     |     |     |     |
|                     | ↓                      | ↓             | ↓   |     |     |     |     |     | ↓   |     |     |     |     |     | ↓   |     |     |     |     |     |
|                     | Brighter               | GS61          | 0   | 0   | 0   | 0   | 0   | 0   | 1   | 0   | 1   | 1   | 1   | 1   | 0   | 0   | 0   | 0   | 0   | 0   |
|                     | ↓                      | GS62          | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 1   | 1   | 1   | 1   | 1   | 0   | 0   | 0   | 0   | 0   | 0   |
|                     | Green                  | GS63          | 0   | 0   | 0   | 0   | 0   | 0   | 1   | 1   | 1   | 1   | 1   | 1   | 0   | 0   | 0   | 0   | 0   | 0   |
| Gray Scale of Blue  | Black                  | GS0           | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
|                     | ↑                      | GS1           | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 1   | 0   | 0   | 0   | 0   | 0   |
|                     | Darker                 | GS2           | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 1   | 0   | 0   | 0   | 0   |
|                     | ↑                      | ↓             | ↓   |     |     |     |     |     | ↓   |     |     |     |     |     | ↓   |     |     |     |     |     |
|                     | ↓                      | ↓             | ↓   |     |     |     |     |     | ↓   |     |     |     |     |     | ↓   |     |     |     |     |     |
|                     | Brighter               | GS61          | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 1   | 0   | 1   | 1   | 1   | 1   |
|                     | ↓                      | GS62          | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 1   | 1   | 1   | 1   | 1   |
|                     | Blue                   | GS63          | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 1   | 1   | 1   | 1   | 1   | 1   |

0 : Low level voltage, 1 : High level voltage

Each basic color can be displayed in 64 gray scales from 6 bit data signals. According to the combination of total 18 bit data signals, the 262,144-color display can be achieved on the screen.

## 9. Optical Characteristics

Ta=25°C, Vcc=+5V

| Parameter                 |            | Symbol                   | Condition            | Min.  | Typ.  | Max.  | Unit              | Remark                                          |
|---------------------------|------------|--------------------------|----------------------|-------|-------|-------|-------------------|-------------------------------------------------|
| Viewing<br>angle<br>range | Horizontal | $\theta$ 21, $\theta$ 22 | CR>5                 | 60    | 70    | —     | Deg.              | 【Note1,4】                                       |
|                           | Vertical   | $\theta$ 11              |                      | 45    | 60    | —     | Deg.              |                                                 |
|                           |            | $\theta$ 12              |                      | 50    | 60    | —     | Deg.              |                                                 |
| Contrast ratio            |            | C R <sub>n</sub>         | $\theta = 0^{\circ}$ | 200   | 300   | —     |                   | 【Note2,4】                                       |
| Response<br>time          | Rise       | $\tau$ r                 |                      | —     | 10    | 25    | m s               | 【Note3,4】                                       |
|                           | Decay      | $\tau$ d                 |                      | —     | 35    | 50    | m s               |                                                 |
| Chromaticity of<br>white  |            | x                        |                      | 0.283 | 0.313 | 0.343 |                   | 【Note4】                                         |
|                           |            | y                        |                      | 0.299 | 0.329 | 0.359 |                   |                                                 |
| Luminance of white        |            | Y <sub>L1</sub>          |                      | 150   | 200   | —     | cd/m <sup>2</sup> | I <sub>L</sub> =6.0mA <sub>rms</sub><br>【Note4】 |
| White Uniformity          |            | $\delta$ w               |                      | —     | —     | 1.35  |                   | 【Note5】                                         |

▲1

※The measurement shall be executed 30 minutes after lighting at rating .

(typical condition:  $I_L=6.0\text{mA rms}$ )

The optical characteristics shall be measured in a dark room or equivalent state with the method shown in Fig.4 below .

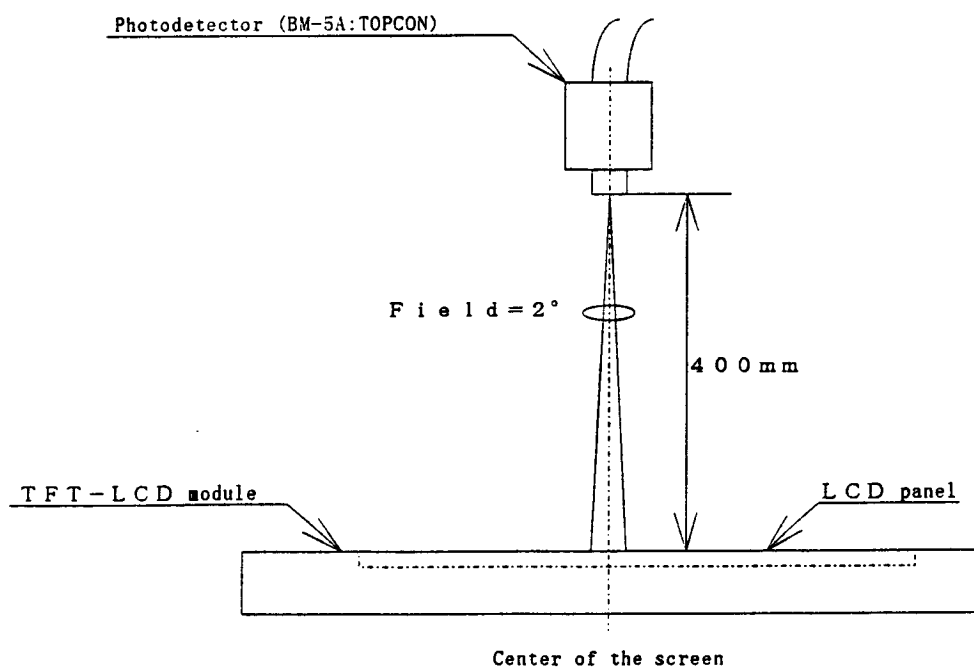
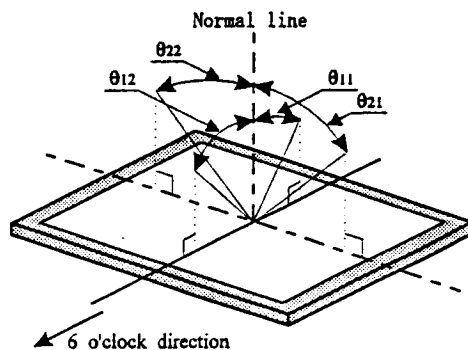


Fig.4 Optical characteristics measurement method

【Note1】 Definitions of viewing angle range:



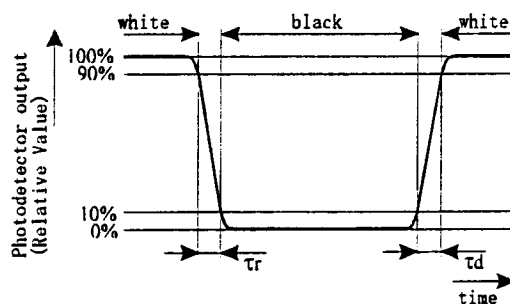
【Note2】 Definition of contrast ratio:

The contrast ratio is defined as the following .

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

【Note3】 Definition of response time:

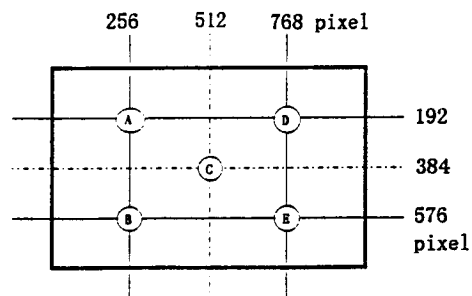
The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white" .



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

【Note5】 Definition of white uniformity:

White uniformity is defined as the following with five measurements (A~E) .



$$\delta_w = \frac{\text{Maximum Luminance of five points (brightness)}}{\text{Minimum Luminance of five points (brightness)}}$$

## 10. Handling Precautions

- a) Be sure to turn off the power supply when inserting or disconnecting the cable .
- b) Be sure to design the cabinet so that the module can be installed without any extra stress such as warp or twist .
- c) Since the front polarize is easily damaged, pay attention not to scratch it .
- d) Since long contact with water may cause discoloration or spots, wipe off water drop immediately .
- e) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth. .
- f) Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface. Handle with care .
- g) Since CMOS LSI is used in this module, take care of static electricity and take the human earth into consideration when handling .
- h) Observe all other precautionary requirements in handling components .
- i) This module has its circuitry PCBs on the rear side and should be handled carefully in order not to be stressed .
- j) At lamp unit exchange , the screw behind the module need to be removed . So , please consider the necessity for cabinet design .
- k) When some pressure is added onto the module from rear side constantly , it causes display non-uniformity issue , functional defect , etc . So , please avoid such design .

## 11. Packing form

- a) Piling number of cartons : 5 cartons
- b) Packing quantity in one carton : 5 modules
- c) Carton size : 410mm (W) × 500mm (D) × 255mm (H)
- d) Total mass of one carton filled with full modules : 8350 g
- e) Packing form is shown in Fig .5

## 12. Reliability test items

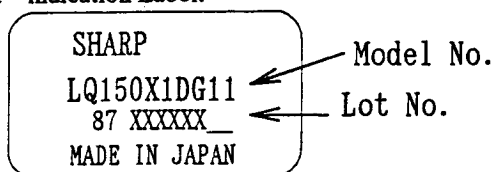
| No. | Test item                                          | Conditions                                                                                                                                                                                 |
|-----|----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | High temperature storage test                      | Ta=60°C 240h                                                                                                                                                                               |
| 2   | Low temperature storage test                       | Ta=-25°C 240h                                                                                                                                                                              |
| 3   | High temperature<br>& high humidity operation test | Ta=40°C ; 95%RH 240h<br>(No condensation)                                                                                                                                                  |
| 4   | High temperature operation test                    | Ta=50°C 240h<br>(The panel temp. must be less than 60°C)                                                                                                                                   |
| 5   | Low temperature operation test                     | Ta=0°C 240H                                                                                                                                                                                |
| 6   | Vibration test<br>(non- operating)                 | Frequency : 10~57Hz/Vibration width (one said) : 0.075mm<br>: 58~500Hz/Gravity : 9.8m/s <sup>2</sup><br>Sweep time : 11minutes<br>Test period : 3 hours (1 hours for each direction X,Y,Z) |
| 7   | Shock test<br>(non- operating)                     | Max, gravity : 490m/s <sup>2</sup><br>Pulse width : 11 ms, sine wave<br>Direction : $\pm X, \pm Y, \pm Z$ once for each direction                                                          |

## 【Result Evaluation Criteria】

Under the display quality test conditions with normal operation state, these shall be no change which may affect practical display function .

## 13. Others

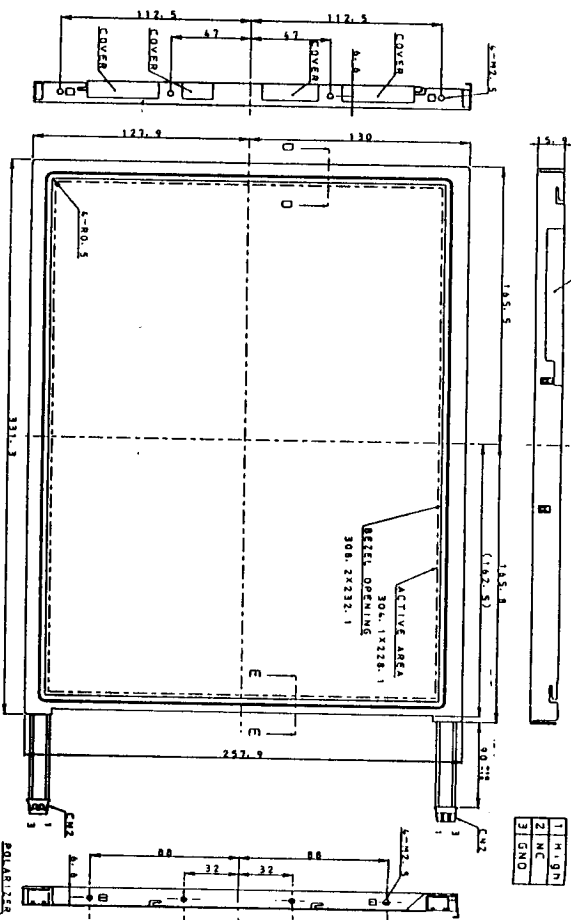
1) Lot No. and indication Label:



How to express Lot No.

|                                                           |             |                    |
|-----------------------------------------------------------|-------------|--------------------|
| ○ ○                                                       | ○ ○ ○ ○ ○ ○ | — —                |
| A production year (the last figures of the Christian Era) |             | Serial No.         |
| A production month (1~9,X,Y,Z)                            |             | Administration No. |

- 2) Adjusting volume have been set optimally before shipment, so do not change any adjusted value .  
If adjusted value is changed, the specification may not be satisfied .
- 3) Disassembling the module can cause permanent damage and should be strictly avoided .
- 4) Please be careful since image retention may occur when a fixed pattern is displayed for a long time .
- 5) When any question or issue occurs , it shall be solved by mutual discussion .



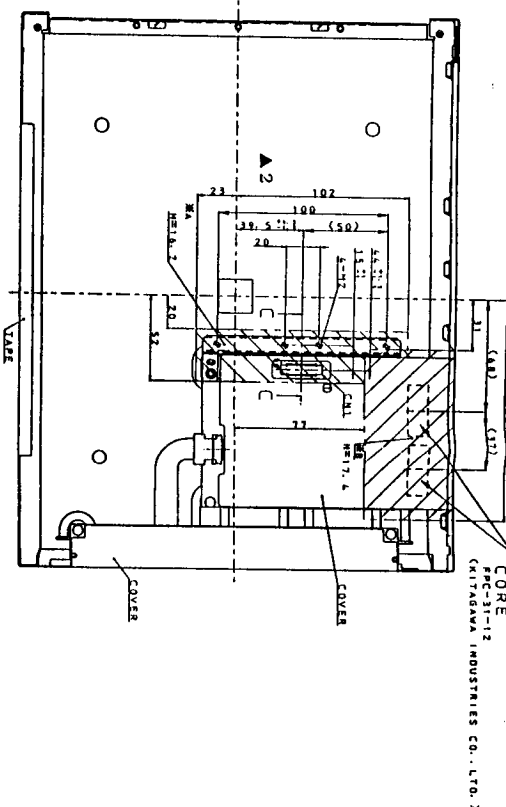
NOTES

1. UNSPECIFIED TOLERANCE TO BE  $\pm 0.5$
2. WARP AND FLATING FOR PCB AND CHASSIS ARE EXCLUDED FROM THICKNESS AND DIMENSION OF THE UNIT.
3. THE THICKNESS IS EXCEPT FOR PORTION OF PROJECTION.

(CMA & MB)

135

DATE



```
CN1:FX8-60S-SV(HIROSE)
    PIN LAYOUT(60pins)
```

MODULE SURFACE  
CONNECTOR(CM1) STACKING HEIGHT=3mm

| Run | 1   | 2    | 3    | 4   | 5   | 6   | 7    | 8   | 9   | 10  | 11  | 12  | 13  | 14  | 15  |
|-----|-----|------|------|-----|-----|-----|------|-----|-----|-----|-----|-----|-----|-----|-----|
| GND | R0  | R0   | R1   | R2  | R3  | R4  | R5   | GND | GND | G1  | G2  | G3  | G4  | G5  | G6  |
| 16  | 17  | 18   | 19   | 20  | 21  | 22  | 23   | 24  | 25  | 26  | 27  | 28  | 29  | 30  | 31  |
| 000 | 001 | 002  | 003  | 004 | 005 | GND | R40  | R41 | R42 | R43 | R44 | R45 | GND | G40 | G41 |
| 32  | 33  | 34   | 35   | 36  | 37  | 38  | 39   | 40  | 41  | 42  | 43  | 44  | 45  | 46  | 47  |
| G42 | G43 | G44  | G45  | GND | R46 | R47 | R48  | R49 | R50 | GND | GND | GND | GND | V5  | V6  |
| 48  | 49  | 50   | 51   | 52  | 53  | 54  | 55   | 56  | 57  | 58  | 59  | 60  | 61  | 62  | 63  |
| GND | GND | CL-R | CL-R | GND | GND | GND | MODE | VCC | VCC | VCC | VCC | VCC | 64  | 65  | 66  |

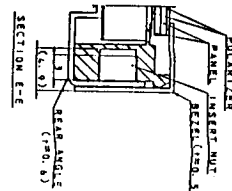
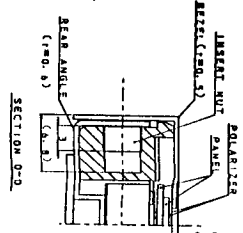
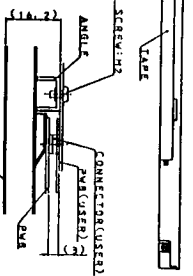


Fig1. OUTLINE DIMENSIONS  
(LQ150X10G11)

1) STAINLESS STEEL  
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TFT, LQ150X1DG11