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## HannStar Product Information

Model : **HSD150MX47**  
**-A**

Issue Date: 2001-7-18

- Note: 1. The information contained herein is preliminary and may be changed without prior notices.  
2. Please contact HannStar Display Corp. before designing your product based on this module specification.  
3. The information contained herein is presented merely to indicate the characteristics and performance of our products. No responsibility is assumed by HannStar for any intellectual property claims or other problems that may result from application based on the module described herein.



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### Record of Revisions

| Rev. | Date | Description of change |
|------|------|-----------------------|
|      |      | •                     |



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## 1.0 GENERAL DESCRIPTION

### 1.1 Introduction

HannStar Display model HSD150MX47-A is a color active matrix thin film transistor (TFT) liquid crystal display(LCD) that uses amorphous silicon TFT as a switching device. This

model is composed of a TFT LCD panel, a driving circuit and a back light system. This TFT LCD has a 15 inch diagonally measured active display area with XGA resolution (768 vertical by 1024 horizontal pixel array) and can display up to 8bit colors.

### 1.2 Features

- High brightness with low power consumption
- Wide viewing angle
- Compact and light weight design
- 4 CCFLs(Cold Cathode Fluorescent Lamp)
- Input timing : DE+Hs+Vs mode
- 2ch-TTL interface system with simulated 8bit color data

### 1.3 Applications

- Desktop monitors
- Moniputers
- Display terminals for AV applications
- Monitors for industrial applications

### 1.4 General information

| Item                      | Specification               | Unit   |
|---------------------------|-----------------------------|--------|
| Display area              | 304.128(W) x 228.096(H)     | mm     |
| Number of Pixel           | 1024(H) x 768(V)            | pixels |
| Pixel pitch               | 0.297(H) x 0.297(V)         | mm     |
| Pixel arrangement         | RGB Vertical stripe         |        |
| Display color             | 16M (simulated 8 bits)      | colors |
| Display mode              | Normally white              |        |
| Surface treatment         | Antiglare, Hard-Coating(3H) |        |
| Weight                    | (1300)                      | g      |
| Back-light                | 4-CCFLs at up & Bottom side |        |
| Input signal              | 2-ch TTL                    |        |
| Power consumption         | TBD                         | W      |
| Optimum viewing direction | 6 o'clock                   |        |

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### 1.5 Mechanical Information

| Item                      |               | Min. | Typ.   | Max. | Unit |
|---------------------------|---------------|------|--------|------|------|
| Module Size               | Horizontal(H) | ---  | 331.6  | ---  | mm   |
|                           | Vertical(V)   | ---  | 255.5  | ---  | mm   |
|                           | Depth(D)      | ---  | 14.4   | 14.9 | mm   |
| Weight (Without inverter) |               | ---  | (1300) | ---  | g    |

## 2.0 ABSOLUTE MAXIMUM RATING

### 2.1 Absolute Rating of Environment

| Item                        | Symbol            | Min. | Max. | Unit | Note |
|-----------------------------|-------------------|------|------|------|------|
| Storage temperature         | T <sub>STG</sub>  | -20  | 65   | °C   |      |
| Operating temperature       | T <sub>OPR</sub>  | 0    | 50   | °C   |      |
| Vibration(non-operating)    | V <sub>NOP</sub>  | --   | 4    | G    | (1)  |
| Shock(non-operating)        | S <sub>NOP</sub>  | --   | 120  | G    | (2)  |
| Shock(non-operating)        | S <sub>NOP</sub>  | --   | 150  | G    | (3)  |
| Storage humidity            | H <sub>STG</sub>  | 10   | 90   | %RH  | (4)  |
| Operating humidity          | H <sub>OP</sub>   | 10   | 80   | %RH  | (4)  |
| Low pressure(operating)     | P <sub>LOP</sub>  | 697  | --   | hPa  | (5)  |
| Low pressure(non-operating) | P <sub>LNOP</sub> | 116  | --   | hPa  | (6)  |

- Note
- (1) 5-500Hz sweep/cycle, sine wave, X,Y,Z each directions, 10min each
  - (2) 2ms, ±X, ±Y, ±Z direction, 3 time each, half sine wave. There will be no functional or cosmetic defects.
  - (3) 10ms, ±X, ±Y, ±Z direction, 3 time each, half sine wave. There will be no functional defects.
  - (4) Max wet bulb temp.=39°C
  - (5) 2hrs. (10000 feet)
  - (6) 24hrs. (50000 feet)

### 2.2 Electrical Absolute Rating

#### 2.2.1 TFT LCD Module

| Item                 | Symbol          | Min. | Max.    | Unit | Note |
|----------------------|-----------------|------|---------|------|------|
| Power supply voltage | V <sub>DD</sub> | -0.3 | 4.0     | V    | (1)  |
| Logic input voltage  | V <sub>IN</sub> | -0.3 | VDD+0.3 | V    | (1)  |

#### 2.2.2 Back-Light Unit

| Item           | Symbol          | Min. | Max. | Unit             | Note |
|----------------|-----------------|------|------|------------------|------|
| Lamp voltage   | V <sub>L</sub>  | TBD  | TBD  | V <sub>rms</sub> | (1)  |
| Lamp current   | I <sub>FL</sub> | --   | TBD  | mA               | (1)  |
| Lamp frequency | f <sub>L</sub>  | TBD  | TBD  | kHz              | (1)  |

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Note (1) Permanent damage may occur to the LCD module if beyond this specification.  
Functional operation should be restricted to the conditions described under normally operating conditions.

### 3.0 OPTICAL CHARACTERISTICS

#### 3.1 Optical specification

| Item                                  | Symbol    | Condition  | Min.    | Typ. | Max.                     | Unit | Note              |        |
|---------------------------------------|-----------|--|---------|------|--------------------------|------|-------------------|--------|
| Contrast                              | CR        | $\Theta=0^\circ$<br>$\Phi=0^\circ$<br>Normal viewing angle | --      | 350  | --                       |      | (1)(2)            |        |
| Response time                         | Rising    |  | $T_R$   | --   | $T_R+T_F$                | --   | msec              | (1)(3) |
|                                       | Falling   |  | $T_F$   | --   | =35ms                    | --   |                   |        |
| White luminance<br>(center of screen) | $Y_L$     |  |         | --   | 350<br>( $I_{FL}=12mA$ ) | --   | cd/m <sup>2</sup> |        |
| Color chromaticity<br>(CIE1931)       | Red       |  | $R_x$   | TBD  | (0.623)                  | TBD  |                   | (1)(4) |
|                                       |           |  | $R_y$   | TBD  | (0.350)                  | TBD  |                   |        |
|                                       | Green     |  | $G_x$   | TBD  | (0.293)                  | TBD  |                   |        |
|                                       |           |  | $G_y$   | TBD  | (0.579)                  | TBD  |                   |        |
|                                       | Blue      |  | $B_x$   | TBD  | (0.144)                  | TBD  |                   |        |
|                                       |           |  | $B_y$   | TBD  | (0.091)                  | TBD  |                   |        |
| White                                 | $W_x$     | TBD  | (0.298) | TBD  |                          |      |                   |        |
|                                       | $W_y$     | TBD  | (0.322) | TBD  |                          |      |                   |        |
| Viewing angle                         | Hor.      | $\Theta_L$   | --      | (65) | --                       |      |                   |        |
|                                       |           | $\Theta_R$   | --      | (65) | --                       |      |                   |        |
|                                       | Ver.      | $\Theta_U$   | --      | (45) | --                       |      |                   |        |
|                                       |           | $\Theta_D$   | --      | (55) | --                       |      |                   |        |
| Brightness uniformity                 | $B_{UNI}$ | $\Theta=0^\circ$   | 70      | --   | --                       | %    | (5)               |        |
| Cross Talk                            | CT(n)     | $\Phi=0^\circ$   |         |      | 1.3                      | %    | (6)               |        |

#### 3.2 Measuring Condition

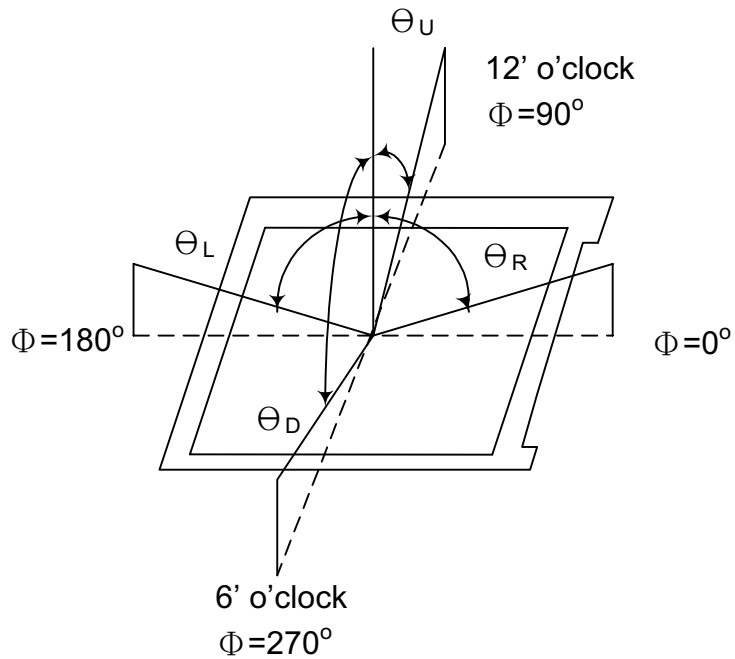
- Measuring surrounding : dark room
- Lamp current  $I_{FL}$  : 12mA, lamp freq.  $F_L=50KHz$
- $V_{DD}=3.3V \pm 0.3V$
- Surrounding temperature : 25°C

#### 3.3 Measuring Equipment

- LCD-7000 of Otsuka Electrics Corp., which utilized MCPD-7000 for Chromaticity and BM-5A for other optical characteristics.
- Measuring spot size : 10~12mm

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Note (1) Definition of Viewing Angle :

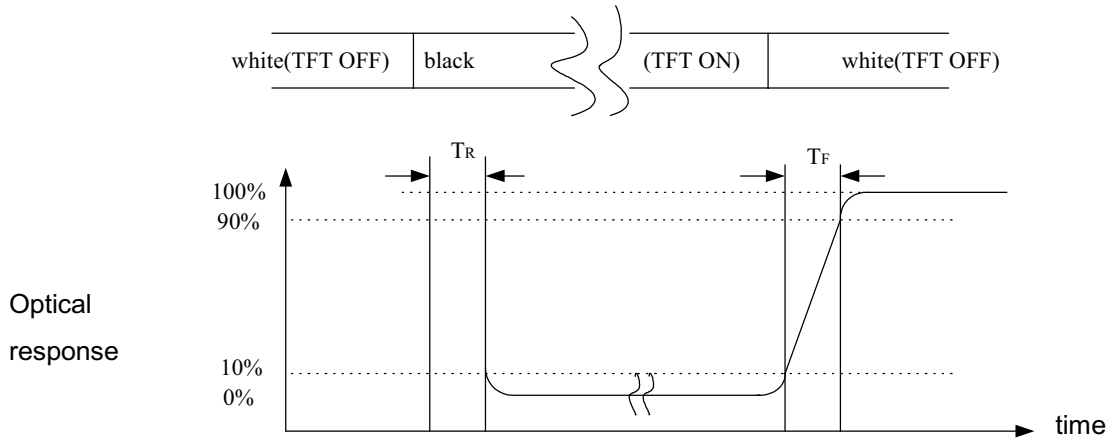


Note (2) Definition of Contrast Ratio(CR) :  
measured at the center point of panel

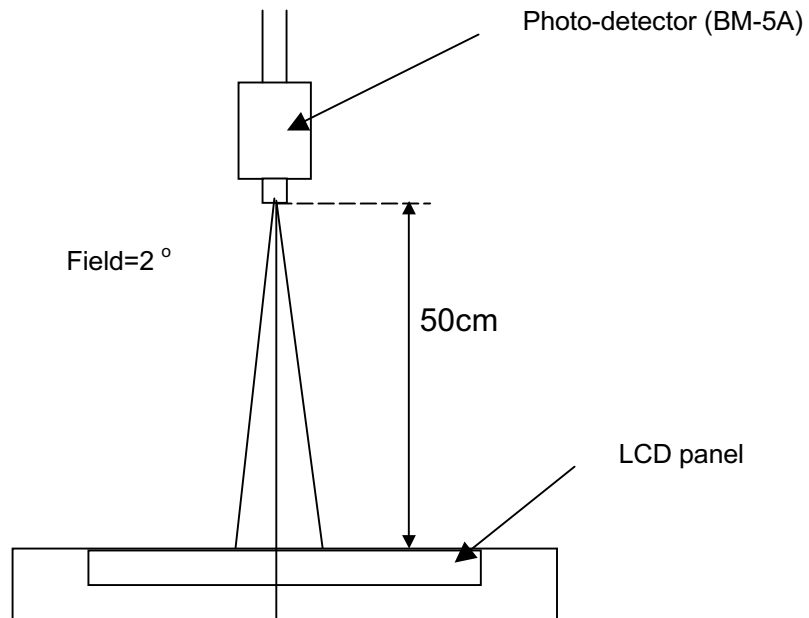
$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

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



Note (4) Definition of brightness uniformity

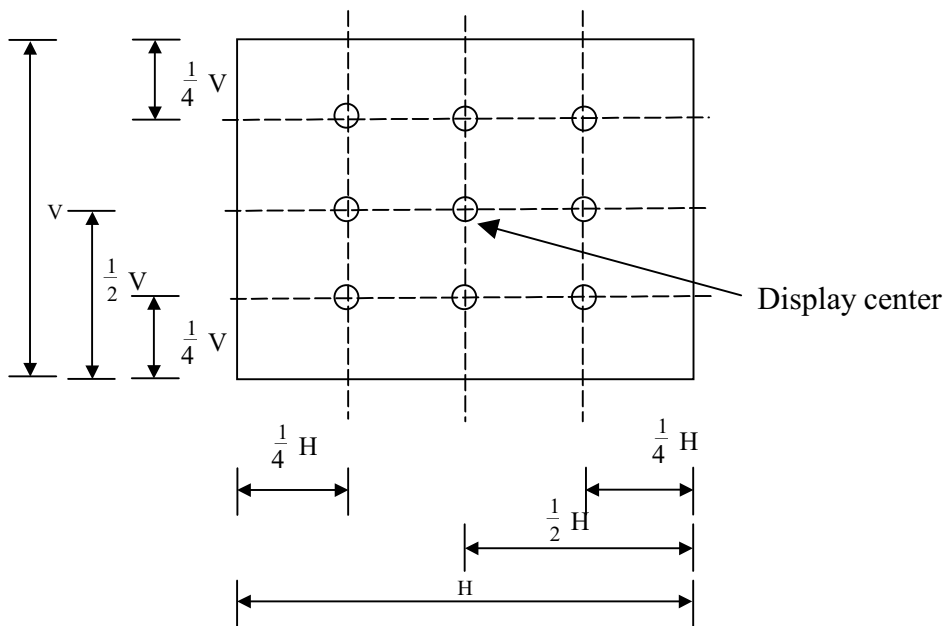




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Note (5) Definition of brightness uniformity

$$\text{Luminance uniformity} = (\text{Min Luminance})/(\text{Max Luminance}) \times 100\%$$



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Note (6) Definition of crosstalk CT(1) ~ CT(4)

$$CT(n) = \frac{|L(n) - LB(n)|}{L(n)} \times 100\%, n = 1 \sim 4$$

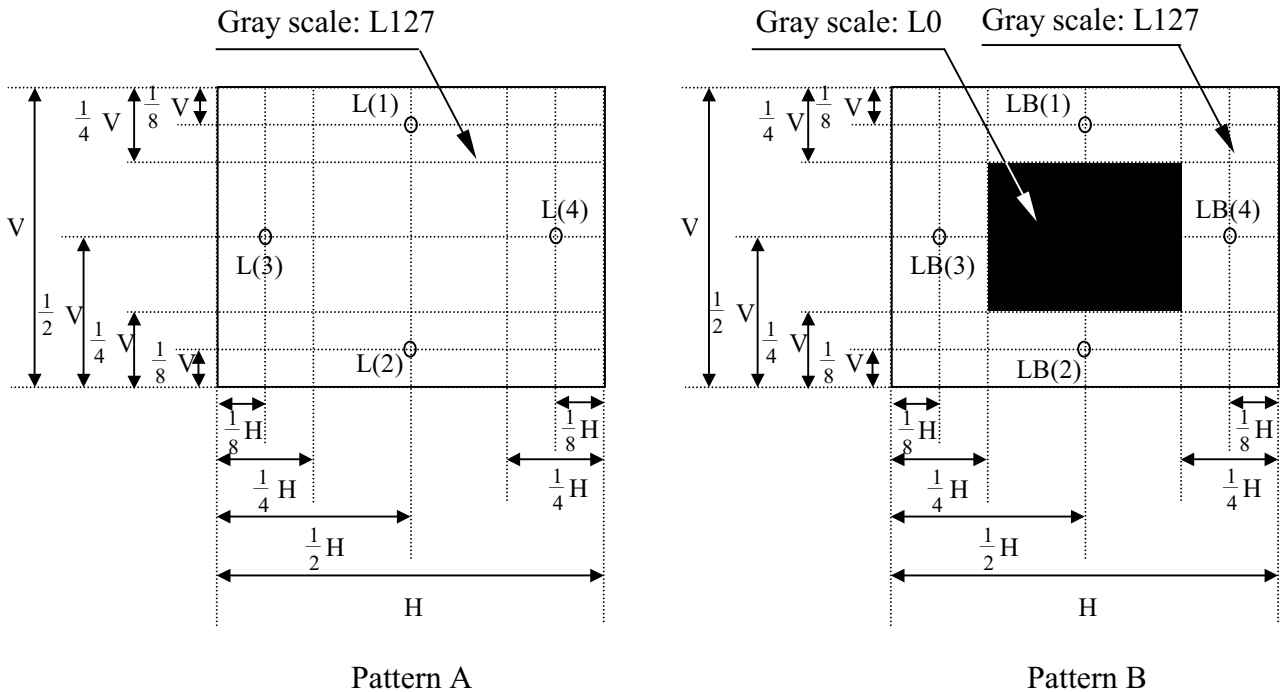
Where L(n) = Luminance of point "n" at pattern A (cd/m<sup>2</sup>), n=1~4

LB(n) = Luminance of point "n" at pattern B (cd/m<sup>2</sup>), n=1~4

The location measured will be exactly the same in both patterns.

L0 : Luminance with all pixels black

L255 : Luminance with all pixels white



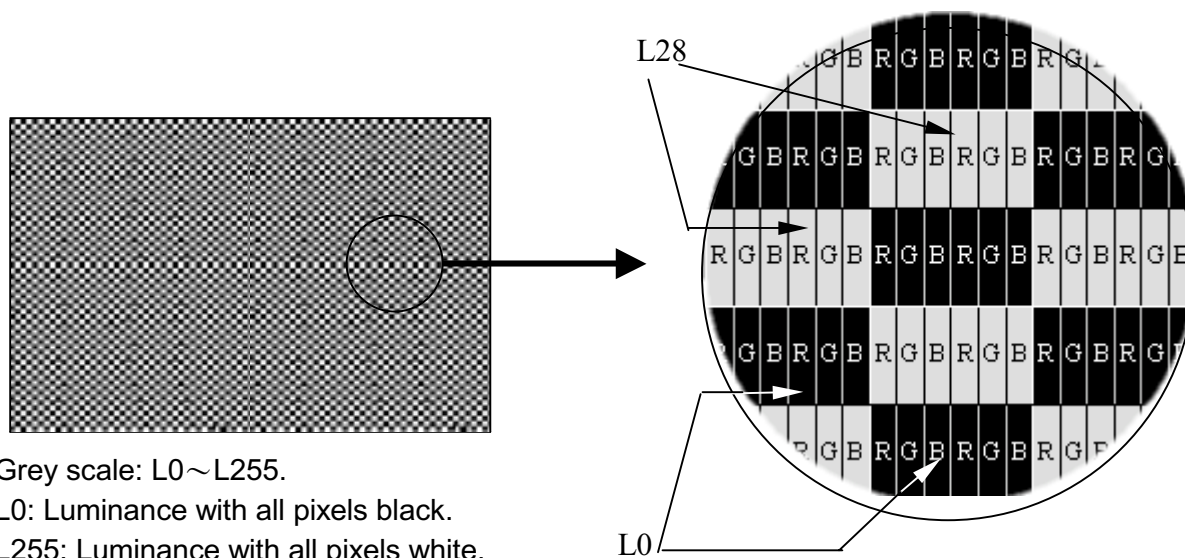
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## 4.0 ELECTRICAL CHARACTERISTICS

### 4.1 TFT LCD Module

| Item                    | Symbol     | Min.     | Typ.  | Max.  | Unit | Note |
|-------------------------|------------|----------|-------|-------|------|------|
| Voltage of power supply | $V_{DD}$   | 3.0      | 3.3   | 3.6   | V    |      |
| Input voltage           | High       | $V_{IH}$ | --    | 3.6   | V    |      |
|                         | Low        | $V_{IL}$ | --    | 0.9   | V    |      |
| Current of power supply | Mosaic     | $I_{DD}$ | TBD   | --    | mA   | (1)  |
| Vsync frequency         | $f_V$      | --       | 60.00 | 75.00 | Hz   |      |
| Hsync frequency         | $f_H$      | --       | 48.35 | 60.00 | KHz  |      |
| Main frequency          | $f_{DCLK}$ | --       | 32.50 | 39.37 | MHz  |      |

Note (1) Mosaic : Dot checker image



Note (2) When  $f_V$  is too low, a flicker may be occurred on the display.



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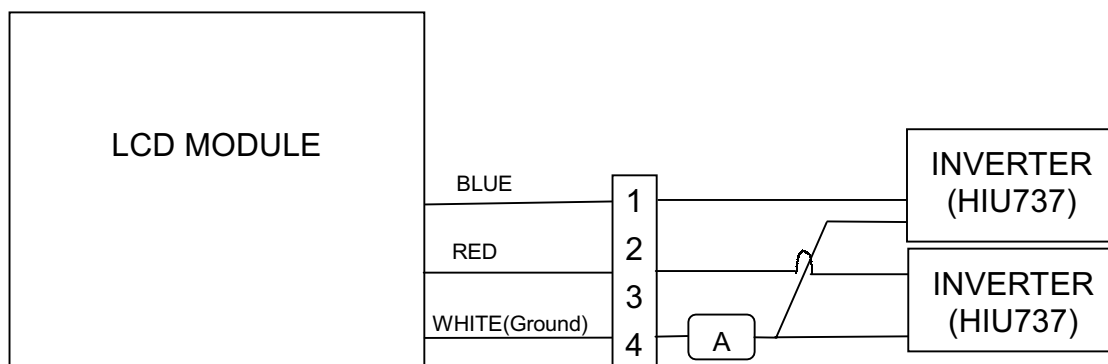
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#### 4.2 Back-Light Unit

The back-light system is an edge-lighting type with 4 CCFL(Cold Cathode Fluorescent Lamp). The characteristics of four lamps are shown in the following tables.

| Item                | Symbol | Min.   | Typ. | Max. | Unit    | Note         |
|---------------------|--------|--------|------|------|---------|--------------|
| Lamp current        | IL     | 6.0    | 12.0 | 14.0 | mA(rms) | (1)          |
| Lamp voltage        | VL     | --     | TBD  | --   | V(rms)  | $I_L=12.0mA$ |
| Frequency           | fL     | 30     | 50   | 80   | KHz     | (2)          |
| Operating life time | Hr     | 30,000 | --   | --   | Hour    | (3)          |
| Startup voltage     | Vs     | --     | --   | TBD  | V(rms)  | at 25°C      |
|                     |        |        |      | TBD  |         | at 0°C       |

Note (1) Lamp current is measured with current meter for high frequency as shown below. Specified valued are for a lamp.



Note (2) Lamp frequency may produce interference with horizontal synchronous frequency and this may cause line flow on the display. Therefore lamp frequency shall be detached from the horizontal synchronous frequency and its harmonics as far as possible in order to avoid interference.

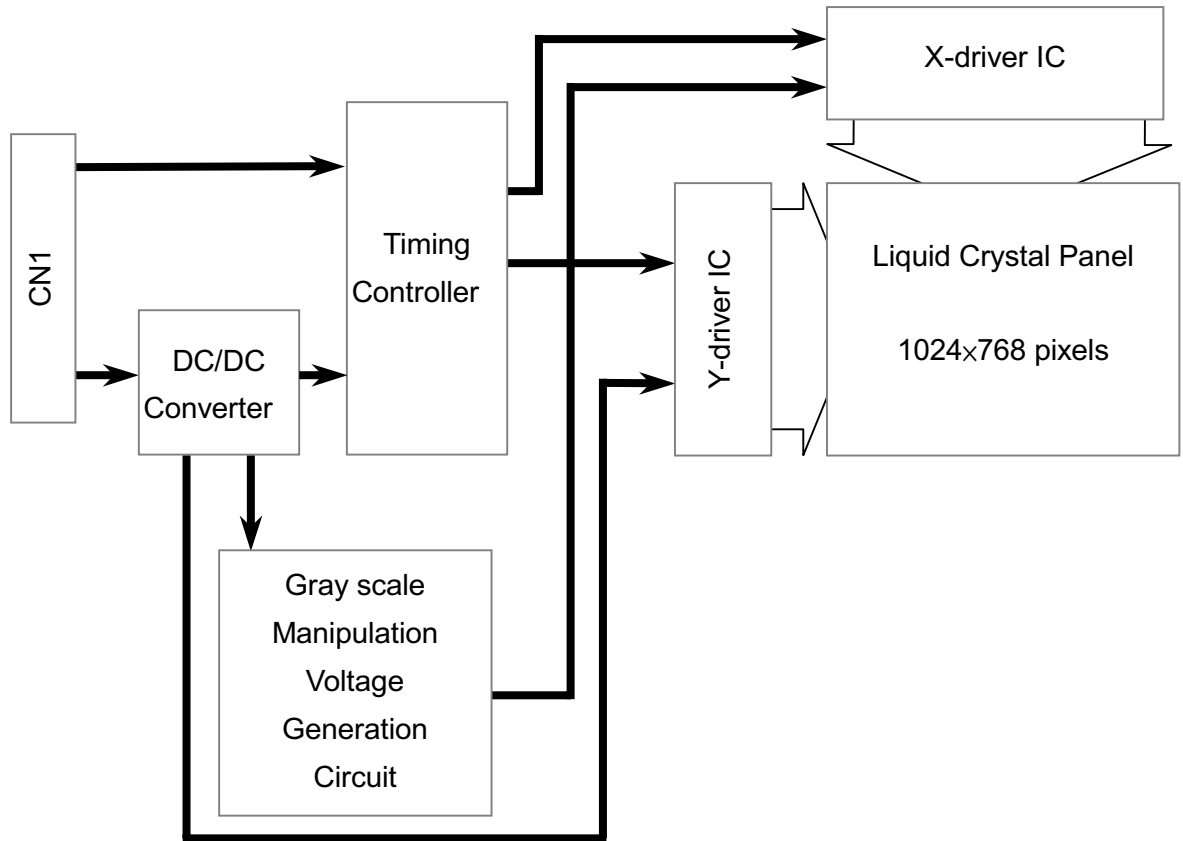
Note (3) Life time (Hr) can be defined as the time in which it continues to operate under the condition :  $T_a=25\pm 3^\circ C$ ,  $I_L=12.0mA(rms)$  and  $f_L=50kHz$  until one of the following event occurs :

1. When the brightness becomes 50%
2. When the startup voltage( $V_s$ ) at 0°C becomes higher than the maximal Value of  $V_s$  specified above.

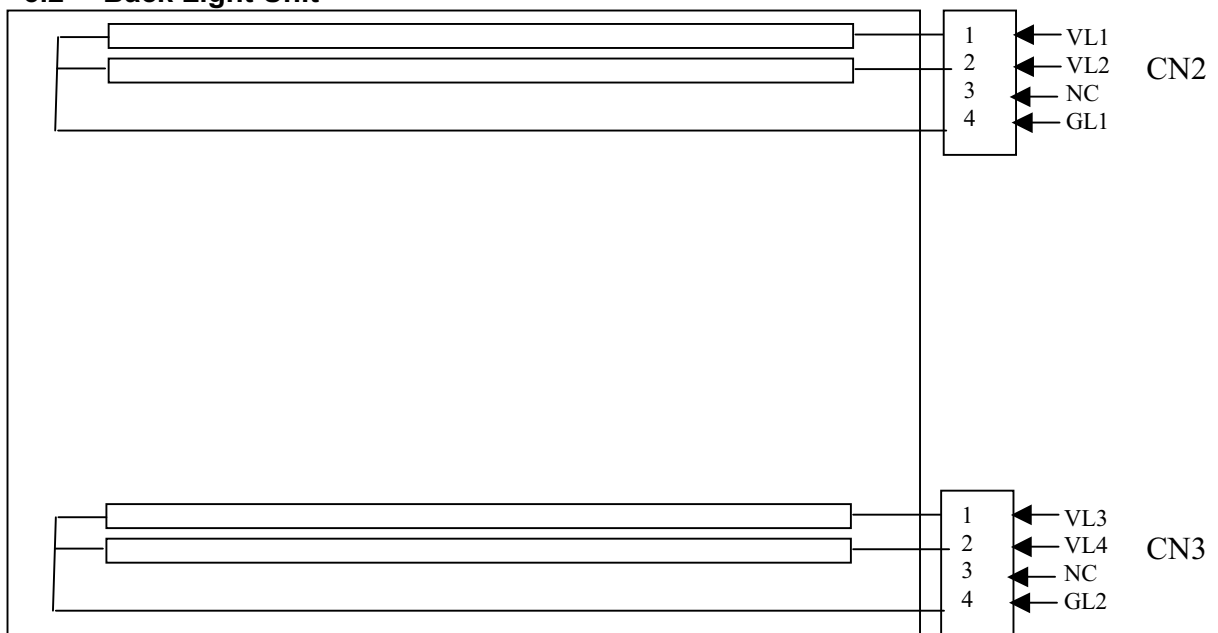
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## 5.0 BLOCK DIAGRAM

### 5.1 TFT LCD Module



### 5.2 Back Light Unit



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## 6.0 INTERFACE PIN CONNECTION

### 6.1 TFT LCD Module

CN1<sup>1)2)3)</sup> INPUT SIGNAL (802RVS-080005R / HANNSTAR ELECTRONICS CO.)<sup>1)2)3)</sup>

MATING CONNECTOR: 802PVS-080405R-M / HANNSTAR ELECTRONICS CO.)

| Terminal no. | Symbol | Function                | Terminal No. | Symbol | Function                          |
|--------------|--------|-------------------------|--------------|--------|-----------------------------------|
| 1            | GND    | Ground                  | 41           | GND    | Ground                            |
| 2            | OR0    | RED DATA R0 (LSB) ODD   | 42           | EG0    | GREEN DATA G0 (LSB) EVEN          |
| 3            | OR1    | RED DATA R1 ODD         | 43           | EG1    | GREEN DATA G1 EVEN                |
| 4            | OR2    | RED DATA R2 ODD         | 44           | EG2    | GREEN DATA G2 EVEN                |
| 5            | OR3    | RED DATA R3 ODD         | 45           | EG3    | GREEN DATA G3 EVEN                |
| 6            | GND    | Ground                  | 46           | GND    | Ground                            |
| 7            | OR4    | RED DATA R4 ODD         | 47           | EG4    | GREEN DATA G4 EVEN                |
| 8            | OR5    | RED DATA R5 ODD         | 48           | EG5    | GREEN DATA G5 EVEN                |
| 9            | OR6    | RED DATA R6 ODD         | 49           | EG6    | GREEN DATA G6 EVEN                |
| 10           | OR7    | RED DATA R7 (MSB) ODD   | 50           | EG7    | GREEN DATA G7 (MSB) EVEN          |
| 11           | GND    | Ground                  | 51           | GND    | Ground                            |
| 12           | OG0    | GREEN DATA G0 (LSB) ODD | 52           | EB0    | BLUE DATA B0 (LSB) EVEN           |
| 13           | OG1    | GREEN DATA G1 ODD       | 53           | EB1    | BLUE DATA B1 EVEN                 |
| 14           | OG2    | GREEN DATA G2 ODD       | 54           | EB2    | BLUE DATA B2 EVEN                 |
| 15           | OG3    | GREEN DATA G3 ODD       | 55           | EB3    | BLUE DATA B3 EVEN                 |
| 16           | GND    | Ground                  | 56           | GND    | Ground                            |
| 17           | OG4    | GREEN DATA G4 ODD       | 57           | EB4    | BLUE DATA B4 EVEN                 |
| 18           | OG5    | GREEN DATA G5 ODD       | 58           | EB5    | BLUE DATA B5 EVEN                 |
| 19           | OG6    | GREEN DATA G6 ODD       | 59           | EB6    | BLUE DATA B6 EVEN                 |
| 20           | OG7    | GREEN DATA G7 (MSB) ODD | 60           | EB7    | BLUE DATA B7 (MSB) EVEN           |
| 21           | GND    | Ground                  | 61           | GND    | Ground                            |
| 22           | OB0    | BLUE DATA B0 (LSB) ODD  | 62           | GND    | Ground                            |
| 23           | OB1    | BLUE DATA B1 ODD        | 63           | CLK    | PIXEL CLOCK                       |
| 24           | OB2    | BLUE DATA B2 ODD        | 64           | GND    | Ground                            |
| 25           | OB3    | BLUE DATA B3 ODD        | 65           | GND    | Ground                            |
| 26           | GND    | Ground                  | 66           | HSYNC  | Horizontal synchronization signal |
| 27           | OB4    | BLUE DATA B4 ODD        | 67           | GND    | Ground                            |
| 28           | OB5    | BLUE DATA B5 ODD        | 68           | GND    | Ground                            |
| 29           | OB6    | BLUE DATA B6 ODD        | 69           | ENAB   | DATA ENABLE                       |
| 30           | OB7    | BLUE DATA B7 (MSB) ODD  | 70           | VSYNC  | Vertical synchronization signal   |
| 31           | GND    | Ground                  | 71           | VDD    | 3.3 V POWER SUPPLY                |
| 32           | ER0    | RED DATA R0 (LSB) EVEN  | 72           | VDD    | 3.3 V POWER SUPPLY                |
| 33           | ER1    | RED DATA R1 EVEN        | 73           | VDD    | 3.3 V POWER SUPPLY                |
| 34           | ER2    | RED DATA R2 EVEN        | 74           | VDD    | 3.3 V POWER SUPPLY                |
| 35           | ER3    | RED DATA R3 EVEN        | 75           | VDD    | 3.3 V POWER SUPPLY                |
| 36           | GND    | Ground                  | 76           | NC     | No Connection                     |
| 37           | ER4    | RED DATA R4 EVEN        | 77           | PTRN   | No Connection                     |
| 38           | ER5    | RED DATA R5 EVEN        | 78           | MLCNG1 | No Connection                     |
| 39           | ER6    | RED DATA R6 EVEN        | 79           | FRC    | No Connection                     |
| 40           | ER7    | RED DATA R7 (MSB) EVEN  | 80           | GND    | Ground                            |

Note 1) Please connect NC pin to nothing. Don't connect it to ground nor to other signal input. (NC pin should be open.)

Note 2) Please connect GND pin to ground. Don't use it as no-connect nor connect with high impedance.

Note 3) 16.7 million colors are displayed by the combinations of 24 bits data.

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## 6.2 Back-Light Unit

CN2<sup>1)</sup> CCFL Power Source (BHR-04VS-1/Japan Solderless Terminal MFG Co., LTD)

| Terminal no. | Symbol           | Function                         |
|--------------|------------------|----------------------------------|
| 1            | VL1              | CCFL power supply (high voltage) |
| 2            | VL2              | CCFL power supply (high voltage) |
| 3            | NC <sup>1)</sup> |                                  |
| 4            | GL1              | CCFL power supply (low voltage)  |

CN3<sup>1)</sup> CCFL Power Source (BHR-04VS-1/Japan Solderless Terminal MFG Co., LTD)

| Terminal no. | Symbol           | Function                         |
|--------------|------------------|----------------------------------|
| 1            | VL3              | CCFL power supply (high voltage) |
| 2            | VL4              | CCFL power supply (high voltage) |
| 3            | NC <sup>1)</sup> |                                  |
| 4            | GL2              | CCFL power supply (low voltage)  |

Note 1) Please connect NC pin to nothing. Don't connect it to ground nor to other signal Input. (NC pin should be open.)



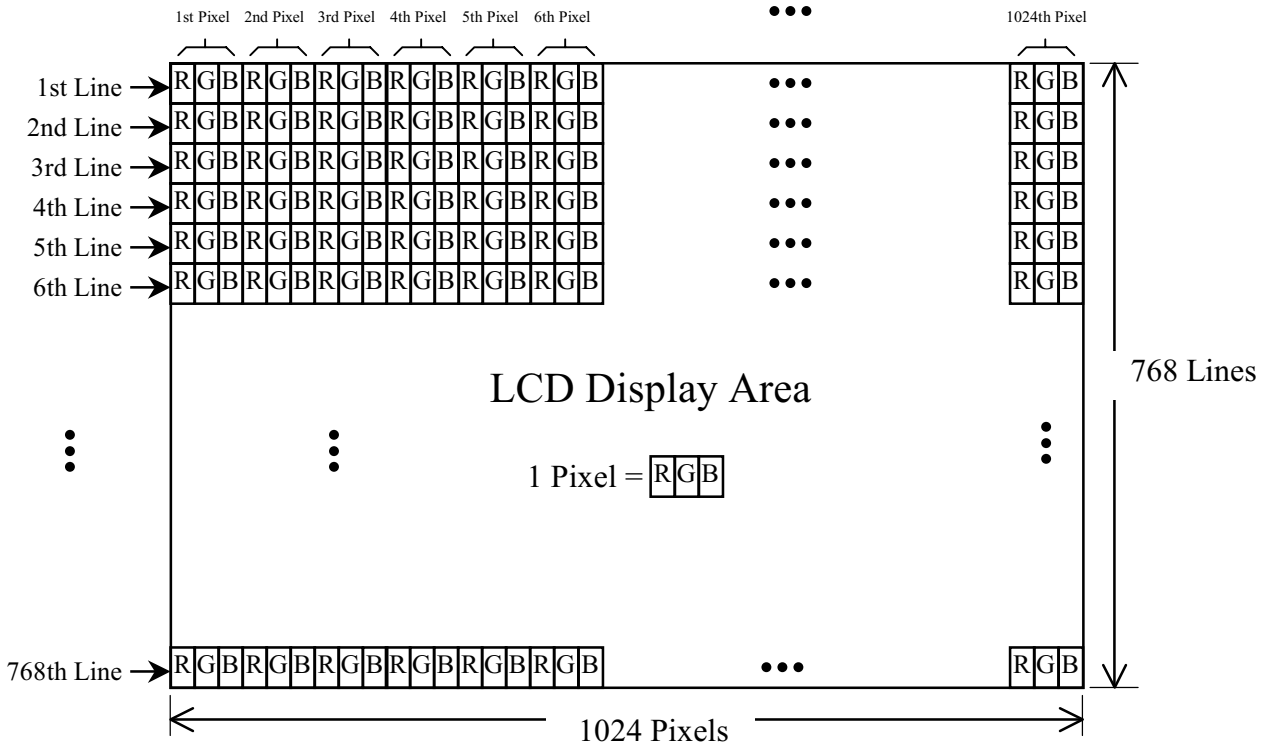
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### 6.3 Relationship between Displayed Color and Input

| Display                     | MSB        |    |    |    | LSB |    |    |    | MSB |    |    |    | LSB |    |    |    | Gray scale level |    |    |    |    |    |      |      |            |           |
|-----------------------------|------------|----|----|----|-----|----|----|----|-----|----|----|----|-----|----|----|----|------------------|----|----|----|----|----|------|------|------------|-----------|
|                             | 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      | L  | L  | L  | L   | L  | L  | L  | L   | L  | L  | L  | L   | L  | L  | L  | L                | L  | L  | L  | L  | L  | L    | L    | L          | -         |
|                             | Blue       | L  | L  | L  | L   | L  | L  | L  | L   | L  | L  | L  | L   | L  | L  | L  | L                | H  | H  | H  | H  | H  | H    | H    | H          | -         |
|                             | Green      | L  | L  | L  | L   | L  | L  | L  | L   | H  | H  | H  | H   | H  | H  | H  | H                | L  | L  | L  | L  | L  | L    | L    | L          | -         |
|                             | Light Blue | L  | L  | L  | L   | L  | L  | L  | L   | H  | H  | H  | H   | H  | H  | H  | H                | H  | H  | H  | H  | H  | H    | H    | H          | -         |
|                             | Red        | H  | H  | H  | H   | H  | H  | H  | H   | L  | L  | L  | L   | L  | L  | L  | L                | L  | L  | L  | L  | L  | L    | L    | L          | -         |
|                             | Purple     | H  | H  | H  | H   | H  | H  | H  | H   | L  | L  | L  | L   | L  | L  | L  | L                | H  | H  | H  | H  | H  | H    | H    | H          | -         |
|                             | Yellow     | H  | H  | H  | H   | H  | H  | H  | H   | H  | H  | H  | H   | H  | H  | H  | H                | L  | L  | L  | L  | L  | L    | L    | L          | -         |
|                             | White      | H  | H  | H  | H   | H  | H  | H  | H   | H  | H  | H  | H   | H  | H  | H  | H                | H  | H  | H  | H  | H  | H    | H    | H          | -         |
| Gray scale of Red           | Black      | L  | L  | L  | L   | L  | L  | L  | L   | L  | L  | L  | L   | L  | L  | L  | L                | L  | L  | L  | L  | L  | L    | L    | L          | L0        |
|                             | Dark       | L  | L  | L  | L   | L  | L  | L  | H   | L  | L  | L  | L   | L  | L  | L  | L                | L  | L  | L  | L  | L  | L    | L    | L          | L1        |
|                             |            | L  | L  | L  | L   | L  | L  | H  | L   | L  | L  | L  | L   | L  | L  | L  | L                | L  | L  | L  | L  | L  | L    | L    | L          | L2        |
|                             |            | :  | :  | :  | :   | :  | :  | :  | :   | :  | :  | :  | :   | :  | :  | :  | :                | :  | :  | :  | :  | :  | :    | :    | :          | L3...L251 |
|                             | Light      | H  | H  | H  | H   | H  | L  | H  | H   | L  | L  | L  | L   | L  | L  | L  | L                | L  | L  | L  | L  | L  | L    | L    | L          | L255      |
|                             |            | H  | H  | H  | H   | H  | H  | L  | H   | L  | L  | L  | L   | L  | L  | L  | L                | L  | L  | L  | L  | L  | L    | L    | L          | L255      |
|                             |            | H  | H  | H  | H   | H  | H  | H  | L   | L  | L  | L  | L   | L  | L  | L  | L                | L  | L  | L  | L  | L  | L    | L    | L          | L255      |
|                             | Red        | H  | H  | H  | H   | H  | H  | H  | H   | L  | L  | L  | L   | L  | L  | L  | L                | L  | L  | L  | L  | L  | L    | L    | L          | Red L255  |
| Gray scale of Green         | Black      | L  | L  | L  | L   | L  | L  | L  | L   | L  | L  | L  | L   | L  | L  | L  | L                | L  | L  | L  | L  | L  | L    | L    | L          | L0        |
|                             | Dark       | L  | L  | L  | L   | L  | L  | L  | L   | L  | L  | L  | L   | L  | L  | L  | H                | L  | L  | L  | L  | L  | L    | L    | L          | L1        |
|                             |            | L  | L  | L  | L   | L  | L  | L  | L   | L  | L  | L  | L   | L  | H  | L  | L                | L  | L  | L  | L  | L  | L    | L    | L2         |           |
|                             |            | :  | :  | :  | :   | :  | :  | :  | :   | :  | :  | :  | :   | :  | :  | :  | :                | :  | :  | :  | :  | :  | :    | :    | L3...L251  |           |
|                             | Light      | L  | L  | L  | L   | L  | L  | L  | L   | H  | H  | H  | H   | L  | H  | H  | L                | L  | L  | L  | L  | L  | L    | L    | L255       |           |
|                             |            | L  | L  | L  | L   | L  | L  | L  | L   | H  | H  | H  | H   | H  | L  | H  | L                | L  | L  | L  | L  | L  | L    | L    | L255       |           |
|                             |            | L  | L  | L  | L   | L  | L  | L  | L   | H  | H  | H  | H   | H  | H  | L  | L                | L  | L  | L  | L  | L  | L    | L    | L255       |           |
|                             | Green      | L  | L  | L  | L   | L  | L  | L  | L   | H  | H  | H  | H   | H  | H  | H  | L                | L  | L  | L  | L  | L  | L    | L    | Green L255 |           |
| Gray scale of Blue          | Black      | L  | L  | L  | L   | L  | L  | L  | L   | L  | L  | L  | L   | L  | L  | L  | L                | L  | L  | L  | L  | L  | L    | L    | L          | L0        |
|                             | Dark       | L  | L  | L  | L   | L  | L  | L  | L   | L  | L  | L  | L   | L  | L  | L  | L                | L  | L  | L  | L  | L  | L    | L    | H          | L1        |
|                             |            | L  | L  | L  | L   | L  | L  | L  | L   | L  | L  | L  | L   | L  | L  | L  | L                | L  | L  | L  | L  | L  | H    | L    | L          | L2        |
|                             |            | :  | :  | :  | :   | :  | :  | :  | :   | :  | :  | :  | :   | :  | :  | :  | :                | :  | :  | :  | :  | :  | :    | :    | L3...L251  |           |
|                             | Light      | L  | L  | L  | L   | L  | L  | L  | L   | L  | L  | L  | L   | L  | L  | L  | L                | H  | H  | H  | H  | L  | H    | H    | H          | L255      |
|                             |            | L  | L  | L  | L   | L  | L  | L  | L   | L  | L  | L  | L   | L  | L  | L  | L                | H  | H  | H  | H  | H  | L    | H    | H          | L255      |
|                             |            | L  | L  | L  | L   | L  | L  | L  | L   | L  | L  | L  | L   | L  | L  | L  | L                | H  | H  | H  | H  | H  | H    | L    | H          | L255      |
|                             | Blue       | L  | L  | L  | L   | L  | L  | L  | L   | L  | L  | L  | L   | L  | L  | L  | L                | H  | H  | H  | H  | H  | H    | H    | H          | Blue L255 |
| Gray scale of White & Black | Black      | L  | L  | L  | L   | L  | L  | L  | L   | L  | L  | L  | L   | L  | L  | L  | L                | L  | L  | L  | L  | L  | L    | L    | L          | L0        |
|                             | Dark       | L  | L  | L  | L   | L  | L  | L  | H   | L  | L  | L  | L   | L  | L  | H  | L                | L  | L  | L  | L  | L  | L    | H    | L1         |           |
|                             |            | L  | L  | L  | L   | L  | L  | H  | L   | L  | L  | L  | L   | L  | H  | L  | L                | L  | L  | L  | L  | H  | L    | L    | L2         |           |
|                             |            | :  | :  | :  | :   | :  | :  | :  | :   | :  | :  | :  | :   | :  | :  | :  | :                | :  | :  | :  | :  | :  | :    | :    | L3...L251  |           |
|                             | Light      | H  | H  | H  | H   | L  | H  | H  | H   | H  | H  | H  | L   | H  | H  | H  | H                | H  | H  | L  | H  | H  | H    | L255 |            |           |
|                             |            | H  | H  | H  | H   | H  | L  | H  | H   | H  | H  | H  | H   | L  | H  | H  | H                | H  | H  | H  | L  | H  | H    | L255 |            |           |
|                             |            | H  | H  | H  | H   | H  | H  | L  | H   | H  | H  | H  | H   | L  | H  | H  | H                | H  | H  | L  | H  | H  | L255 |      |            |           |
|                             | White      | H  | H  | H  | H   | H  | H  | H  | H   | H  | H  | H  | H   | H  | H  | H  | H                | H  | H  | H  | H  | H  | H    | H    | White L255 |           |

|                |                                     |          |         |
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### 6.4 Pixel Format



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## 7.0 INTERFACE TIMING <sup>1)2)3)4)5)6)</sup>

### 7.1 Timing Parameters (Hsync, Vsync and DE mode)

| Item                    |               | Symbol | Min.        | Typ.            | Max.        | Unit    | Remarks |
|-------------------------|---------------|--------|-------------|-----------------|-------------|---------|---------|
| Vertical display term   | Period        | t1     | 778×t4<br>— | 806×t4<br>16.67 | 860×t4<br>— | —<br>ms | 1) 5)   |
|                         | Active        | t2     | —           | 768×t4<br>15.88 | —           | —<br>ms | 1)      |
|                         | Display start | t3     | 4×t4<br>—   | —               | 256×t4<br>— | —<br>ms | 1)      |
| Horizontal display term | Period        | t4     | 590×t7<br>— | 672×t7<br>20.68 | 700×t7<br>— | —<br>μs | 1) 5)   |
|                         | Active        | t5     | —           | 512×t7<br>15.76 | —           | —<br>μs | 1)      |
|                         | Display Start | t6     | 16×t7<br>—  | —               | 512×t7<br>— | —<br>μs | 1)      |
| Clock                   | Period        | t7     | 25.00       | 30.77           | —           | ns      | 5)      |
|                         | Low time      | t8     | 9           | —               | —           | ns      |         |
|                         | High time     | t9     | 9           | —               | —           | ns      |         |
| Data                    | Setup time    | t10    | 2           | —               | —           | ns      |         |
|                         | Hold time     | t11    | 5           | —               | —           | ns      |         |

Note 1) Refer to TIMING CHART at page18, 19 and 20.

Note 2) In case of using the long frame period, the deterioration of display quality, noise etc. may be occurred.

Note 3) When ENAB is fixed to “L” level after NCLK input, the panel is displayed as

black.

However, a flicker may be occurred on the display. When ENAB is fixed to “H” level after NCLK input, the panel will be damaged.

Note 4) Do not fix NCLK to “H” or “L” level while the  $V_{DD}$  (+3.3V) is supplied. If NCLK is fixed to “H” level or “L” level for certain period while the  $V_{DD}$  (+3.3V) is supplied, the panel may be damaged.

Note 5) Do not change t1 and t4 values in the operation. When t1 or t4 is changed, the panel is displayed as black.

Note 6) Please adjust LCD operating signal timing and FL driving frequency, to optimize the display quality. There is a possibility that flicker is observed by the

interference

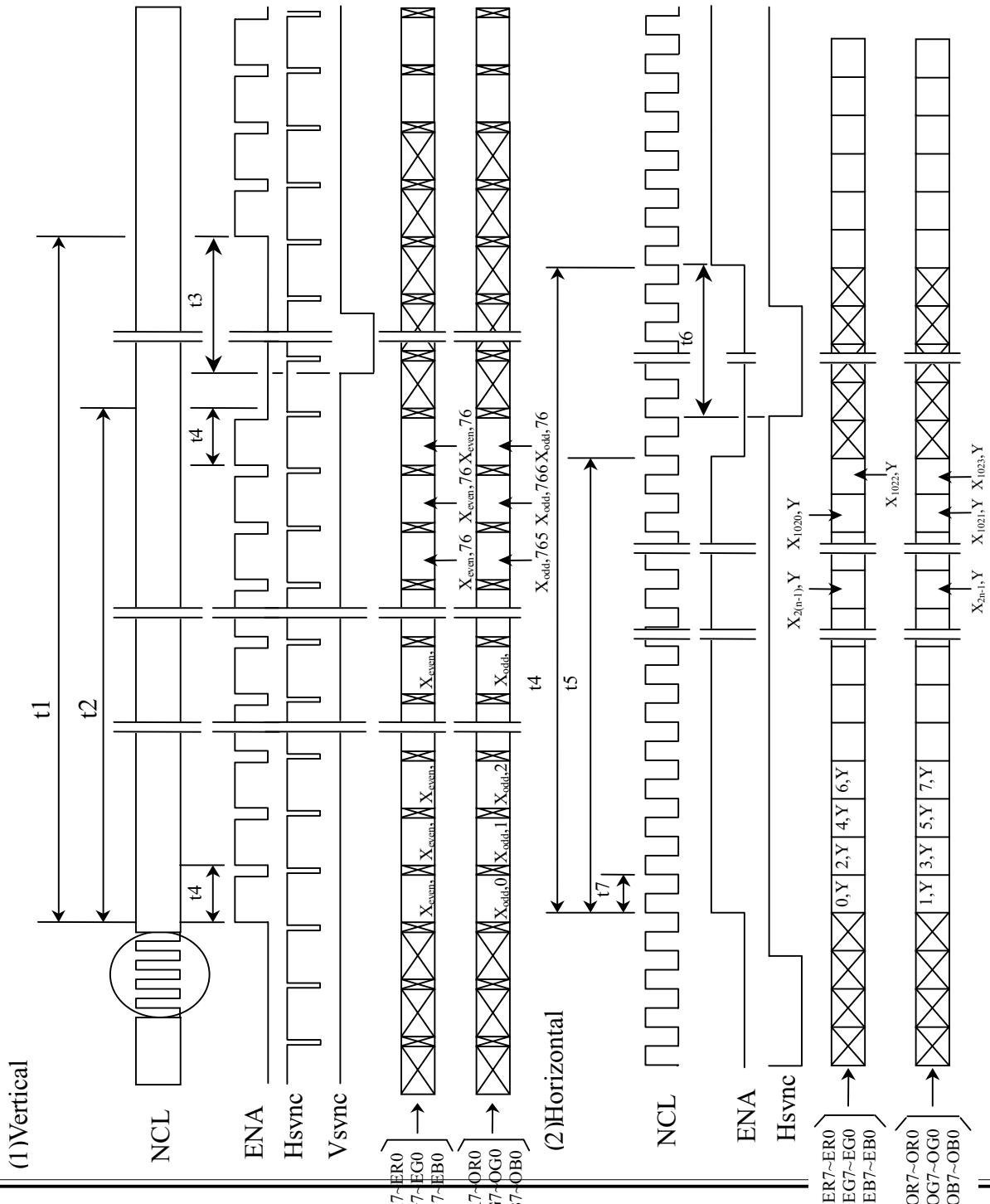
of LCD operating signal timing and FL driving condition (especially driving frequency).

Note 7) Input vertical display term quantity should be  $2+768 = 770$  lines

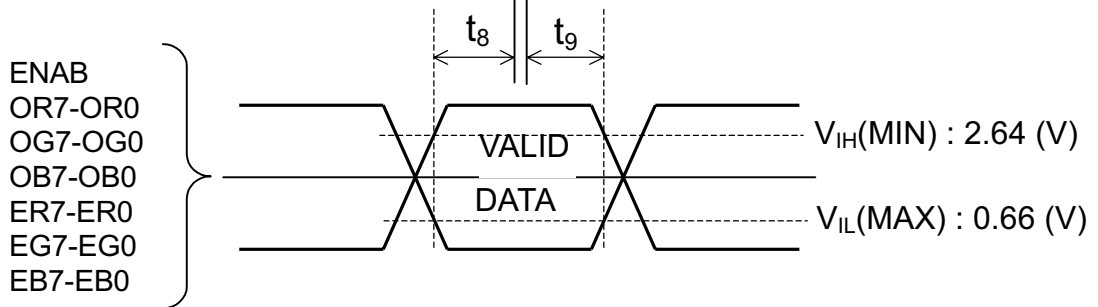
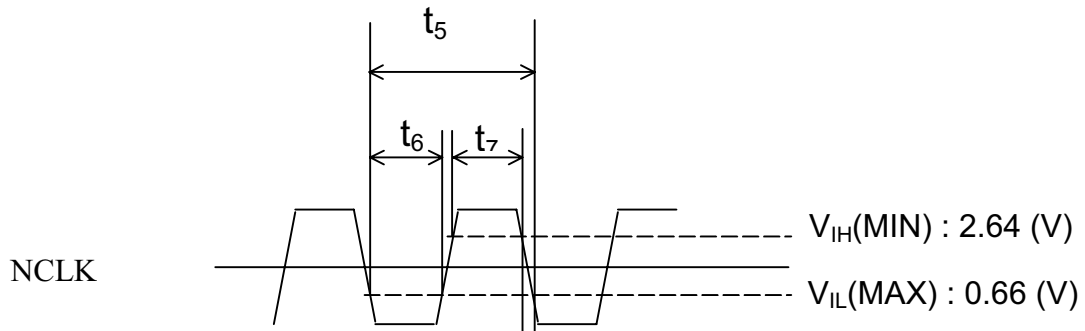
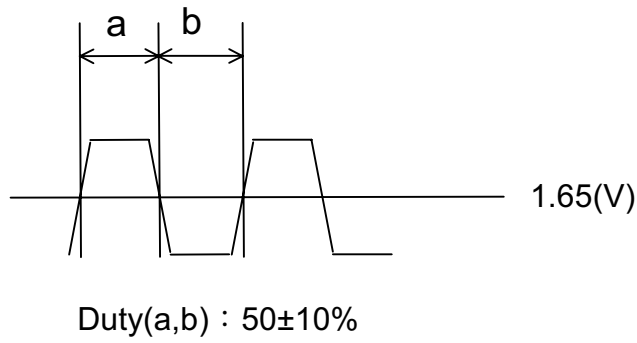
|                |                                     |          |         |
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### 7.2 Timing Diagram of Interface Signal (Hsync, Vsync and DE mode)

24 Bit two pixel/clock input mode

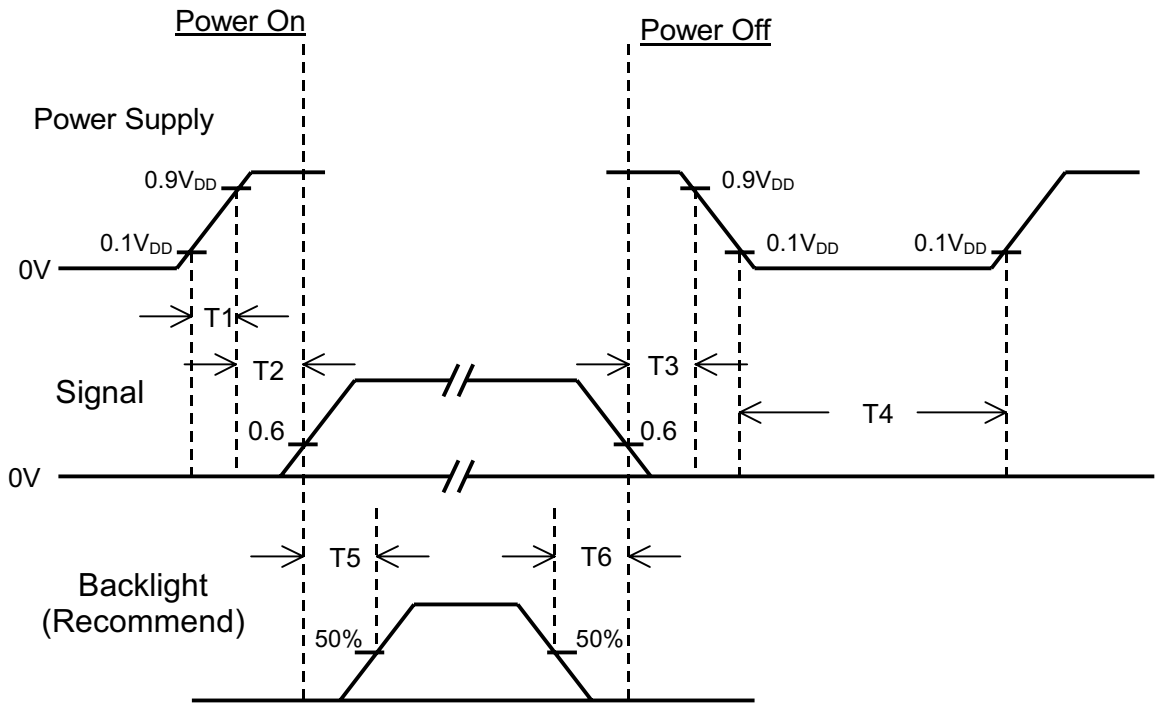


|                |                                     |          |         |
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### 7.3 Power ON/OFF Sequence



| Item | Min. | Typ. | Max. | Unit | Remark |
|------|------|------|------|------|--------|
| T1   | 0    | —    | 10   | msec |        |
| T2   | 0    | —    | 50   | msec |        |
| T3   | 0    | —    | 50   | msec |        |
| T4   | 1    | —    | —    | sec  |        |
| T5   | 200  | —    | —    | msec |        |
| T6   | 200  | —    | —    | msec |        |

Note (1) The supply voltage of the external system for the module input should be the same

as the definition of V<sub>DD</sub>.

(2) Apply the lamp voltage within the LCD operation range. When the back-light turns on before the LCD operation or the LCD turns off before the back-light turns off, the display may momentarily become white.

(3) In case of V<sub>DD</sub> = off level, please keep the level of input signal on the low or keep a high impedance.

(4) T4 should be measured after the module has been fully discharged between power

off and on period.

|                |                                     |          |         |
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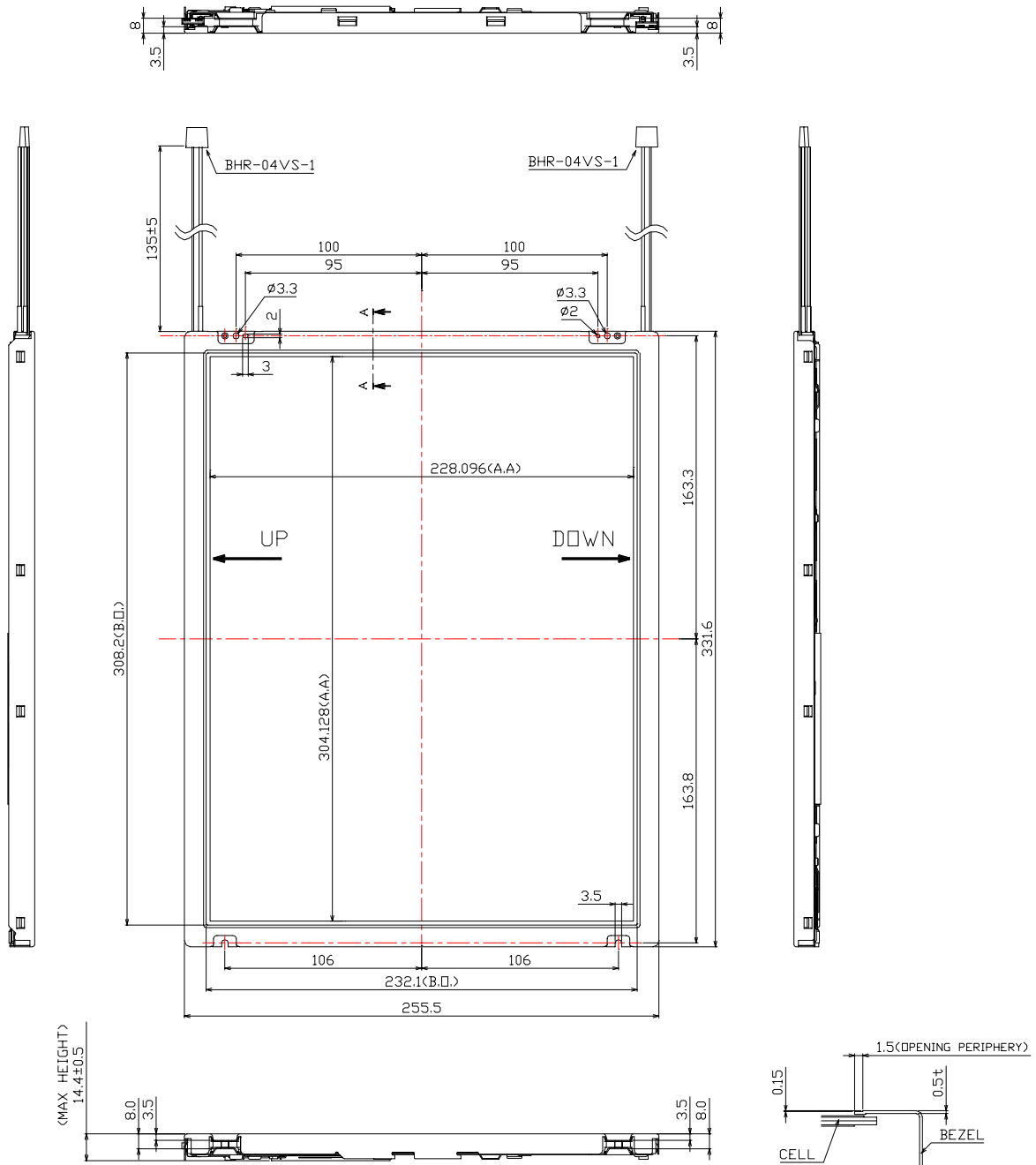
(5) Interface signal shall not be kept at high impedance when the power is on.

### 8.0 OUTLINE DIMENSION

Unit : mm

#### 8.1 Front View Outline Dimension

Date: 20010507



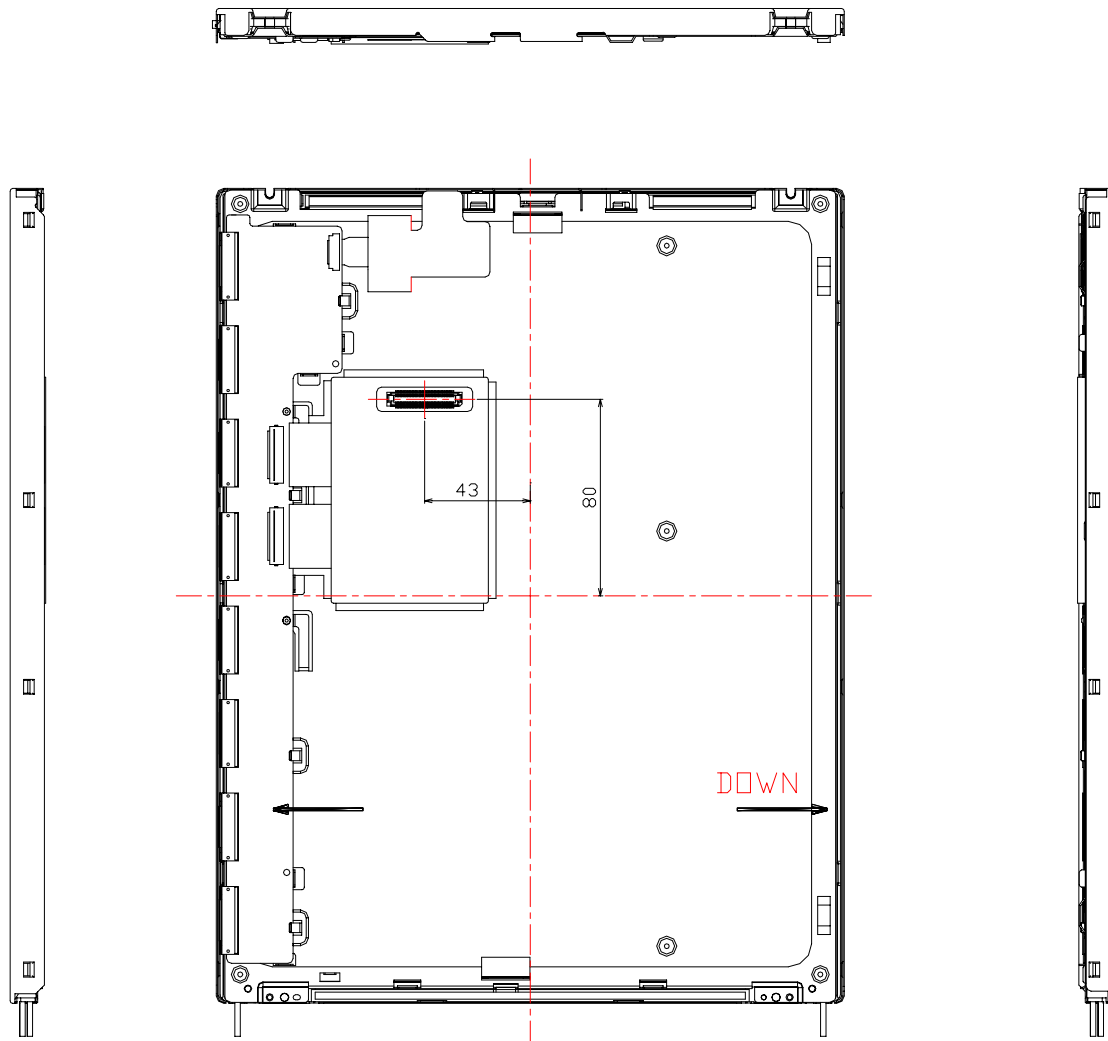
NOTE:  
1. UNSPECIFIED DIMENSIONAL TOLERANCE ARE ±0.5mm

A-A cross section

|                |                                     |          |         |
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**8.2 Back View Outline Dimension**

**Date: 20010507**



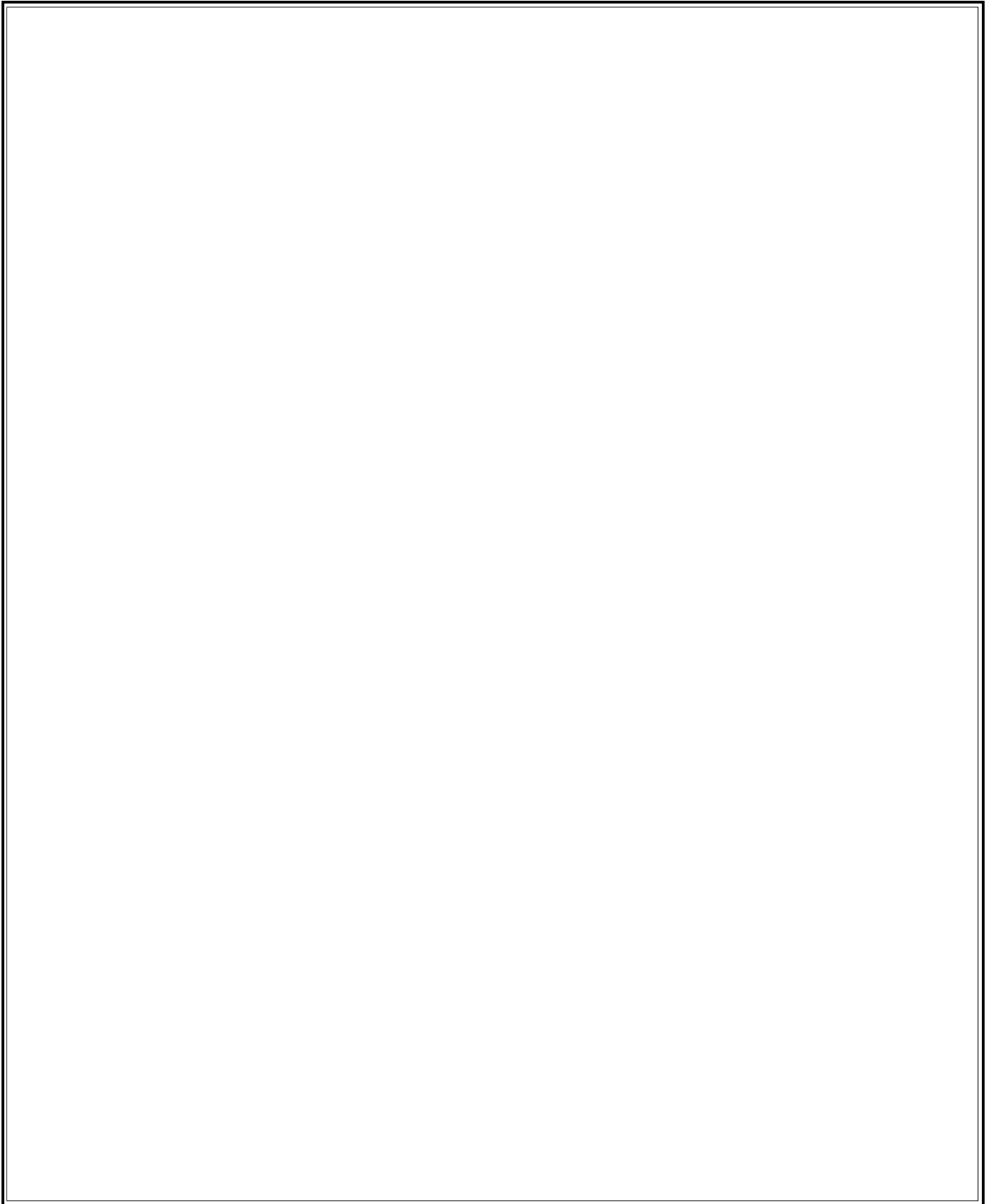
**Note:**

1. UNSPECIFIED DIMENSIONAL TOLERANCE ARE  $\pm 0.5\text{mm}$
2. CN1 CONNECTOR: 802RVS-080005R(HANNSTAR ELECTRONICS CO.)





|                |                                     |          |         |
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### 9.0 LOT MARK

#### 9.1 Lot Mark

|   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|

code 1,2,3,4,5,6: HannStar internal flow control code.

code 7: production location.

code 8: production year.

code 9: production month.

code 10,11,12,13,14,15: serial number.

#### Note (1) Production Year

|      |      |      |      |      |      |      |      |      |      |      |
|------|------|------|------|------|------|------|------|------|------|------|
| Year | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
| Mark | 9    | 0    | 1    | 2    | 3    | 4    | 5    | 6    | 7    | 8    |

#### Note (2) Production Month

|       |      |      |      |      |      |      |      |      |      |     |      |      |
|-------|------|------|------|------|------|------|------|------|------|-----|------|------|
| Month | Jan. | Feb. | Mar. | Apr. | May. | Jun. | Jul. | Aug. | Sep. | Oct | Nov. | Dec. |
| Mark  | 1    | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | A   | B    | C    |

|                |                                     |          |         |
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## **10.0 GENERAL PRECAUTION**

### **10.1 Use Restriction**

This product is not authorized for use in life supporting systems, aircraft navigation control systems, military systems and any other application where performance failure could be life-threatening or otherwise catastrophic.

### **10.2 Disassembling or Modification**

Do not disassemble or modify the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display. HannStar does not warrant the module, if customers disassemble or modify the module.

### **10.3 Breakage of LCD Panel**

- 10.3.1 If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid crystal, and do not contact liquid crystal with skin.
- 10.3.2 If liquid crystal contacts mouth or eyes, rinse out with water immediately.
- 10.3.3 If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.
- 10.3.4 Handle carefully with chips of glass that may cause injury, when the glass is broken.

### **10.4 Electric Shock**

- 10.4.1 Disconnect power supply before handling LCD module.
- 10.4.2 Do not pull or fold the CCFL cable.
- 10.4.3 Do not touch the parts inside LCD modules and the fluorescent lamp's connector or cables in order to prevent electric shock.

### **10.5 Absolute Maximum Ratings and Power Protection Circuit**

- 10.5.1 Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts' parameters, environmental temperature, etc., otherwise LCD module may be damaged.
- 10.5.2 Please do not leave LCD module in the environment of high humidity and high temperature for a long time.
- 10.5.3 It's recommended to employ protection circuit for power supply.

### **10.6 Operation**

- 10.6.1 Do not touch, push or rub the polarizer with anything harder than HB pencil lead.
- 10.6.2 Use fingerstalls of soft gloves in order to keep clean display quality, when persons handle the LCD module for incoming inspection or assembly.
- 10.6.3 When the surface is dusty, please wipe gently with absorbent cotton or other soft material.
- 10.6.4 Wipe off saliva or water drops as soon as possible. If saliva or water drops

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contact with polarizer for a long time, they may causes deformation or color

fading.

10.6.5 When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzine or other adequate solvent.

#### **10.7 Mechanism**

Please mount LCD module by using mounting holes arranged in four corners tightly.

#### **10.8 Static Electricity**

10.8.1 Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.

10.8.2 Because LCD module use CMOS-IC on circuit board and TFT-LCD panel, it is very weak to electrostatic discharge. Please be careful with electrostatic discharge. Persons who handle the module should be grounded through adequate methods.

#### **10.9 Strong Light Exposure**

The module shall not be exposed under strong light such as direct sunlight. Otherwise, display characteristics may be changed.

#### **10.10 Disposal**

When disposing LCD module, obey the local environmental regulations.