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**TITLE : HV121X02-100  
Product Specification**

Rev. O

**BOE HYDIS TECHNOLOGY**

|                                  |   |                  |                                 |                        |
|----------------------------------|---|------------------|---------------------------------|------------------------|
| <b>SPEC. NUMBER</b><br>S864-1266 | <b>PRODUCT GROUP</b><br>TFT-LCD PRODUCT | <b>REV.</b><br>O | <b>ISSUE DATE</b><br>2006.01.25 | <b>PAGE</b><br>1 OF 22 |
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REVISION HISTORY

| REV. | ECN NO. | DESCRIPTION OF CHANGES | DATE     | PREPARED |
|------|---------|------------------------|----------|----------|
| 0    | -       | Initial Release        | 06.01.25 | J.K.Han  |

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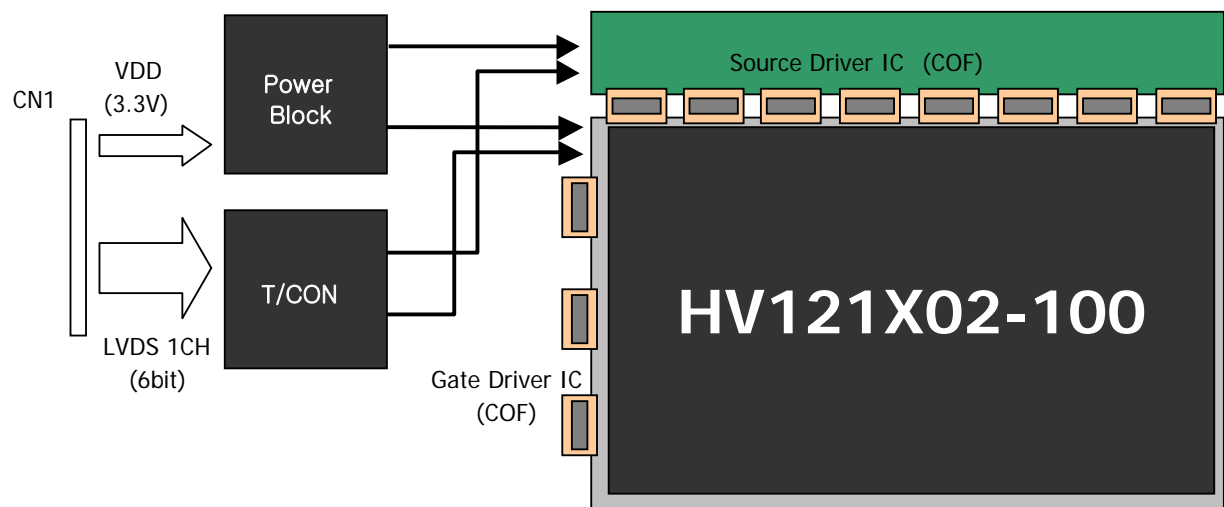
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**1.0 GENERAL DESCRIPTION**

1.1 Introduction

HV121X02-100 is a color active matrix TFT LCD module using amorphous silicon TFT's (Thin Film Transistors) as active switching devices. This module has a 12.1 inch diagonally measured active area with XGA resolutions (1024 horizontal by 768 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe. This module consists of TFT-LCD panel, which Tabs bonded data D-IC and gate D-IC and PCB are attached.



1.2 Features

- Product Scope: HV121X02 Panel (High Reliable LC and AR pol.) with Driver IC and Driving Circuit Board (PCB) without BLU  
\*BLU will be assembled by Customer.
- LVDS Interface with 1pixel / clock
- High-speed response at high temperature
- High contrast ratio and wide viewing angle
- High-temperature operations enable
- 6-bit color depth, Display 262,144 colors
- DE (Data Enable) mode only
- RoHS

1.3 Applications

- ATM / Car / Avionics

|                           |   |                 |
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**1.4 General Specifications**

The followings are general specifications at the model HV121X02-100.

| Parameter                           | Specification                                      | Unit   | Remark  |
|-------------------------------------|--|--------|---------|
| Active area                         | 245.76 (H) × 184.32 (V)                            | mm     |         |
| Number of pixels                    | 1024(H) × 768(V)                                   | pixels |         |
| Pixel pitch                         | 0.24(H) × 0.24(V)                                  | mm     |         |
| Pixel arrangement                   | RGB Vertical stripe                                | -      |         |
| Display mode                        | Normally Black (FFS)                               | -      |         |
| Surface treatment                   | Anti-Reflective (No Haze)                          | -      |         |
| Liquid Crystal clearing temperature | ≥ 103  | ℃      |         |
| Color filter Chromaticity           | x=0.312, y=0.342                                   |        |         |
| CF Color Gamut                      | 40   | %      |         |
| Panel Transmittance                 | 5.91<br>(excluding the gain of the rear-polarizer) | %      | Note. 1 |

Note 1) The Panel Transmittance as described above, will be obtained after electronics and back-light driving circuit are optimized to a panel.

**2.0 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS**

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

| Parameter             | Symbol          | Min | Max | Unit | Remark  |
|-----------------------|-----------------|-----|-----|------|---------|
| Operating Temperature | T <sub>OP</sub> | -20 | +85 | ℃    | Note. 1 |

Note. 1) As compromised with Customer, T-CON, D-IC, Polarizer are excluded within the range of guarantee for Operating Temperature.

T-CON : 0 ~ 75℃, D-IC : -10 ~ 75℃, Polarizer : -20 ~ 80℃

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**3.0 OPTICAL SPECIFICATIONS**

3.1 Overview

The test of Optical specifications shall be measured in a dark room (ambient luminance  $\leq 1$  lux and temperature =  $25 \pm 2^\circ\text{C}$ ) with the equipment of Luminance meter system (Goniometer system and TOPCON BM-5) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of  $\theta$  and  $\phi$  equal to  $0^\circ$ . We refer to  $\theta_{\phi=0}$  ( $=\theta_3$ ) as the 3 o'clock direction (the "right"),  $\theta_{\phi=90}$  ( $=\theta_{12}$ ) as the 12 o'clock direction ("upward"),  $\theta_{\phi=180}$  ( $=\theta_9$ ) as the 9 o'clock direction ("left") and  $\theta_{\phi=270}$  ( $=\theta_6$ ) as the 6 o'clock direction ("bottom"). While scanning  $\theta$  and/or  $\phi$ , the center of the measuring spot on the display surface shall stay fixed. The test setup, geometry, and measurement location are shown in FIGURE 1, and FIGURE 2. (shown in Appendix)

3.2 Optical Specifications

The measurement shall be executed after 30 minutes warm-up period.

[VDD=3.3V, Frame rate=60Hz, Clock=65MHz, Ta =  $25 \pm 2^\circ\text{C}$ ]

| Parameter                                 |                     | Symbol        | Condition                      | Min | Typ | Max | Unit | Remark |
|---|---------------------|---------------|--------------------------------|-----|-----|-----|------|--------|
| Viewing Angle                             | Horizontal          | $\Theta_3$    | CR > 10                        |     | 89  | 90  | Deg  | Note 1 |
|   |                     | $\Theta_9$    |                                |     | 89  | 90  | Deg  |        |
|   | Vertical            | $\Theta_{12}$ |                                |     | 89  | 90  | Deg  |        |
|   |                     | $\Theta_6$    |                                |     | 89  | 90  | Deg  |        |
| Luminance contrast ratio                  |                     | CR            | $\Theta = 0^\circ$<br>(Center) | -   | 450 | -   |      | Note 2 |
| Color Reproduction                        |                     |               |                                | 40  | 45  | -   | %    |        |
| Response time<br>(at $45^\circ\text{C}$ ) | Ttotal<br>(Tr + Td) | Ttotal        | Normal Viewing Angle           | -   | -   | 32  | msec | Note 3 |
| Cross talk                                |                     | CT            |                                | -   | -   | 2.0 | %    | Note 4 |

Note:

- Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface (see FIGURE 1 shown in Appendix).
- Contrast measurements shall be made at viewing angle of  $\Theta = 0^\circ$  and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state. (See FIGURE 1 shown in Appendix) Luminance Contrast Ratio (CR) is defined mathematically.

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$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3. The electro-optical response time measurements shall be made as FIGURE 2 shown in Appendix by switching the “data” input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Tr, and 90% to 10% is Td.

4. Cross-Talk of one area of the LCD surface by another shall be measured by comparing the luminance (Y<sub>A</sub>) of a 25mm diameter area, with all display pixels set to a gray level, to the luminance (Y<sub>B</sub>) of that same area when any adjacent area is driven dark. (See FIGURE 3 shown in Appendix).

**4.0 ELECTRICAL SPECIFICATIONS**

[Ta = 25±2°C]

| Parameter                                       |                 | Min  | Typ | Max  | Unit | Remark                         |
|---|-----------------|------|-----|------|------|--------------------------------|
| Power Supply Voltage                            | V <sub>DD</sub> | 3.0  | 3.3 | 3.6  | V    |                                |
| Power Supply Current                            | I <sub>DD</sub> | -    | 220 |      | mA   | Note1                          |
| Power Consumption                               | P <sub>D</sub>  |      | 0.7 | 1.1  | W    |                                |
| Permissible Input Ripple Voltage                | V <sub>RF</sub> | -    | -   | 100  | mV   | V <sub>DD</sub> = 3.3V         |
| High Level Differential Input Threshold Voltage | V <sub>IH</sub> | -    | -   | +100 | mV   | V <sub>cm</sub><br>= 1.2V typ. |
| Low Level Differential Input Threshold Voltage  | V <sub>IL</sub> | -100 | -   | -    | mV   |                                |

Notes:

- The supply voltage is measured and specified at the interface connector of LCM.  
 The current draw and power consumption specified is for VDD = 3.3V, Frame rate = 60 Hz and Clock frequency = 65MHz.  
 Test Pattern of power supply current  
 a) Typ: Vertical color bar pattern  
 b) Max : Gray 28 @ Vertical 2 Skip line pattern

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**5.0 INTERFACE CONNECTION**

## 5.1 Electrical Interface

CN1 Interface connector : DF19L-20P-1H (HIROSE) or equivalent

User side connector : DF19G-20S-1C (HIROSE) or equivalent

| Pin No | Symbol  | Function                       | Remark                         |
|--------|---------|--------------------------------|--------------------------------|
| 1      | VDD1    | Power Supply: +3.3V            |                                |
| 2      | VDD2    | Power Supply: +3.3V            |                                |
| 3      | VSS     | Ground                         |                                |
| 4      | VSS     | Ground                         |                                |
| 5      | RIN0-   | LVDS Negative data signal (-)  | R0,R1,R2,R3,R4,R5,G0           |
| 6      | RIN0+   | LVDS Positive data signal (+)  |                                |
| 7      | VSS     | Ground                         |                                |
| 8      | RIN1-   | LVDS Negative data signal (-)  | G1,G2,G3,G4,G5,B0,B1           |
| 9      | RIN1+   | LVDS Positive data signal (+)  |                                |
| 10     | VSS     | Ground                         |                                |
| 11     | RIN2-   | LVDS Negative data signal (-)  | B2,B3,B4,B5,<br>Hsync,Vsync,DE |
| 12     | RIN2+   | LVDS Positive data signal (+)  |                                |
| 13     | VSS     | Ground                         |                                |
| 14     | RCLKIN- | LVDS Negative clock signal (-) |                                |
| 15     | RCLKIN+ | LVDS Positive clock signal (+) |                                |
| 16     | VSS     | Ground                         |                                |
| 17     | NC      | No Connection                  |                                |
| 18     | NC      | No Connection                  |                                |
| 19     | VSS     | Ground                         |                                |
| 20     | VSS     | Ground                         |                                |

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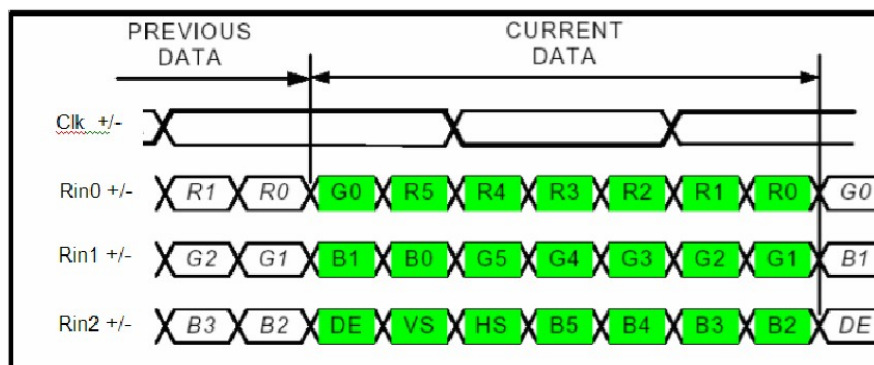
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**6.0 SIGNAL TIMING SPECIFICATIONS**

6.1 The HV121X02-100 is operated by the only DE (Data enable) mode (LVDS Transmitter Input)

| Item                      | Symbols    | Min  | Typ  | Max  | Unit   |     |
|---------------------------|------------|------|------|------|--------|-----|
| Clock                     | Frequency  | 1/Tc | -    | 65   | 80     | MHz |
|                           | High Time  | Tch  | 4.5  | -    | -      | ns  |
|                           | Low Time   | Tcl  | 4.5  | -    | -      | ns  |
| Data                      | Setup Time | Tds  | 2.7  | -    | -      | ns  |
|                           | Hold Time  | Tdh  | 0    | -    | -      | ns  |
| Data Enable Setup Time    | Tes        | 2.7  | -    | -    | ns     |     |
| Frame Period              | Tv         | 772  | 806  | 1022 | lines  |     |
| Vertical Display Period   | Tvd        | 768  | 768  | 768  | lines  |     |
| One Line Scanning Period  | Th         | 1100 | 1344 | 2046 | clocks |     |
| Horizontal Display Period | Thd        | 1024 | 1024 | 1024 | clocks |     |

6.2 LVDS data mapping

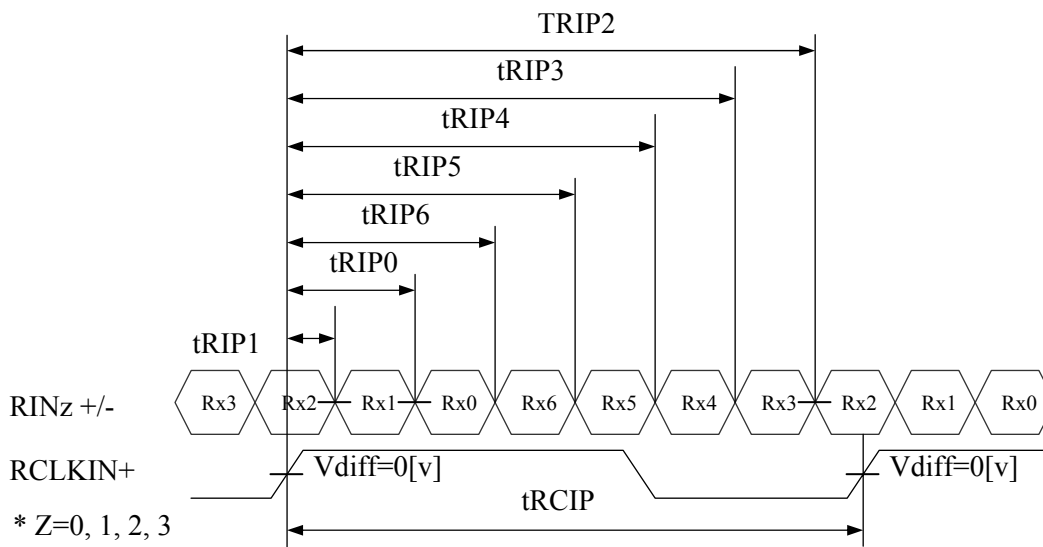


6.3 LVDS Rx interface timing parameter

The specification of the LVDS Rx interface timing parameter

<LVDS Rx Interface Timing Specification>

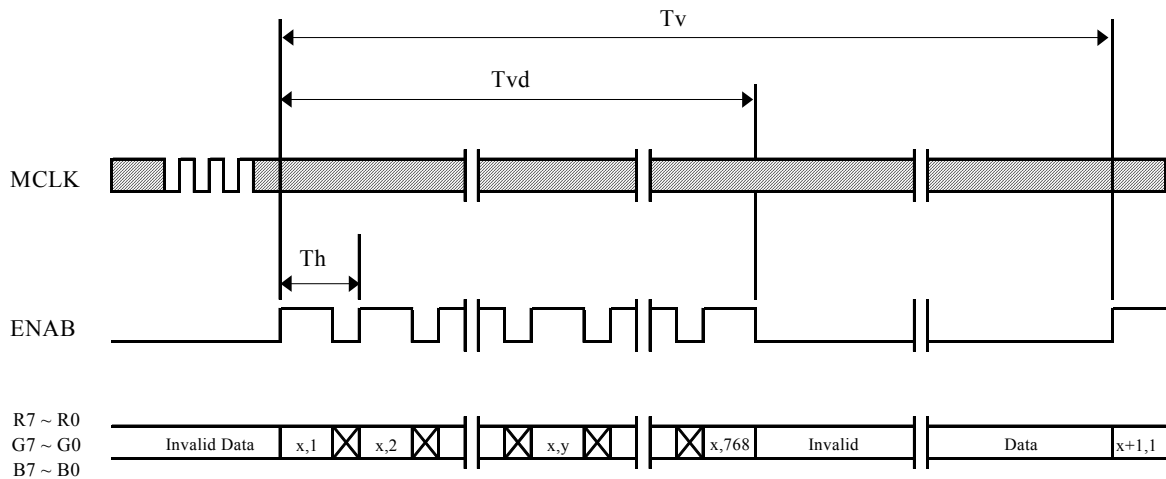
| Item         | Symbol | Min               | Typ       | Max               | Unit | Remark |
|--------------|--------|-------------------|-----------|-------------------|------|--------|
| CLKIN Period | tRCIP  | 12.5              | 15.38     | -                 | nsec |        |
| Input Data 0 | tRIP1  | -0.4              | 0.0       | +0.4              | nsec |        |
| Input Data 1 | tRIP0  | 1*tRCIP/7<br>-0.4 | 1*tRCIP/7 | 1*tRCIP/7<br>+0.4 | nsec |        |
| Input Data 2 | tRIP6  | 2*tRCIP/7<br>-0.4 | 2*tRCIP/7 | 2*tRCIP/7<br>+0.4 | nsec |        |
| Input Data 3 | tRIP5  | 3*tRCIP/7<br>-0.4 | 3*tRCIP/7 | 3*tRCIP/7<br>+0.4 | nsec |        |
| Input Data 4 | tRIP4  | 4*tRCIP/7<br>-0.4 | 4*tRCIP/7 | 4*tRCIP/7<br>+0.4 | nsec |        |
| Input Data 5 | tRIP3  | 5*tRCIP/7<br>-0.4 | 5*tRCIP/7 | 5*tRCIP/7<br>+0.4 | nsec |        |
| Input Data 6 | tRIP2  | 6*tRCIP/7<br>-0.4 | 6*tRCIP/7 | 6*tRCIP/7<br>+0.4 | nsec |        |



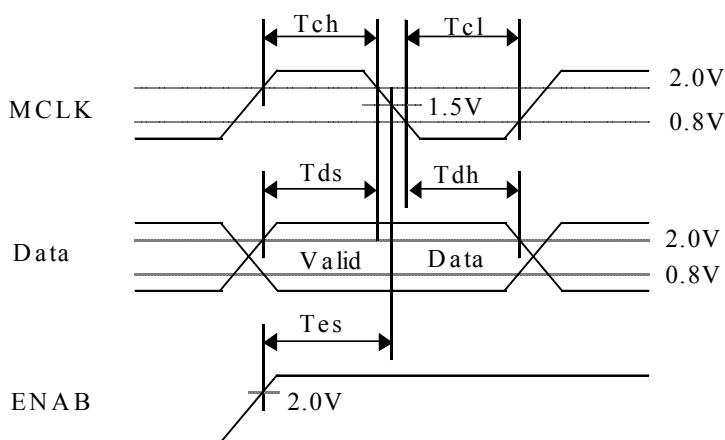
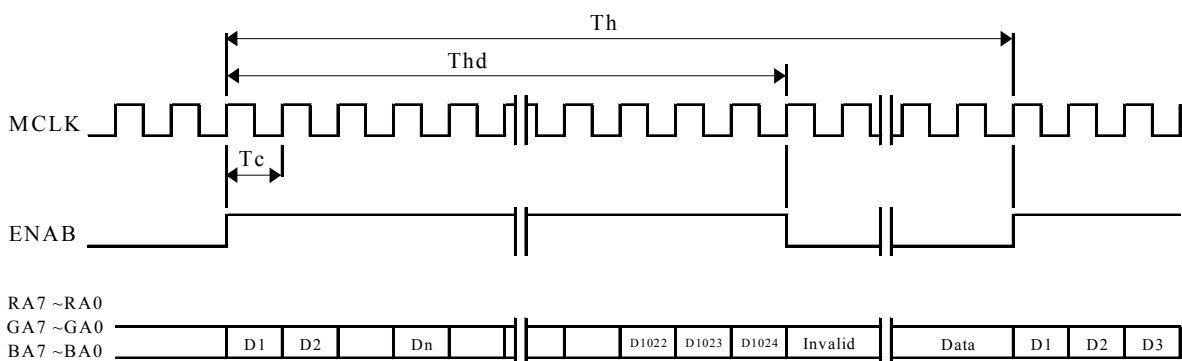
\*  $V_{diff} = (RINz+) - (RINz-), (RCLKIN+) - (RCLKIN-)$

**7.0 SIGNAL TIMING WAVEFORMS OF INTERFACE SIGNAL (DE MODE)**

7.1 Vertical Timing Waveforms



7.2 Horizontal Timing Waveforms





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**8.0 INPUT SIGNALS, BASIC DISPLAY COLORS & GRAY SCALE OF COLORS**

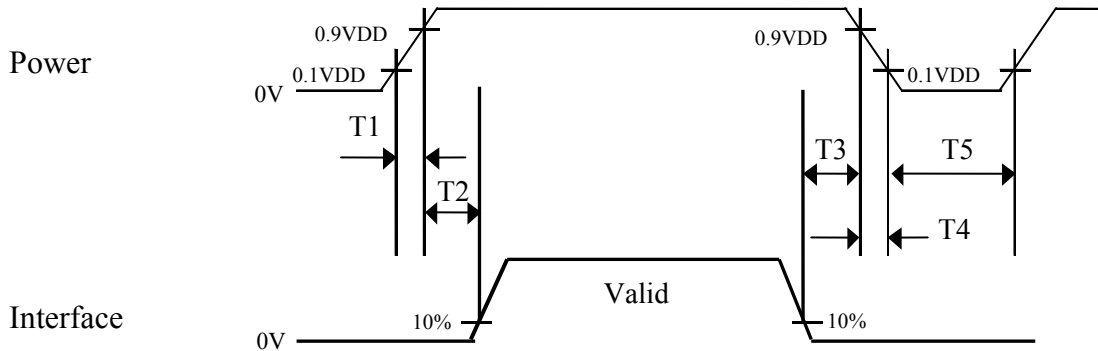
| Colors & Gray Scale         |          | Red Data |    |    |    |    |    | Green Data |    |    |    |    |    | Blue Data |    |    |    |    |    |   |
|-----------------------------|----------|----------|----|----|----|----|----|------------|----|----|----|----|----|-----------|----|----|----|----|----|---|
|                             |          | R5       | R4 | R3 | R2 | R1 | R0 | G5         | G4 | G3 | G2 | G1 | G0 | B5        | B4 | B3 | B2 | B1 | B0 |   |
| Basic Colors                | Black    | 0        | 0  | 0  | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0  | 0  |   |
|                             | 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    | 0        | 0  | 0  | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0  | 0  |   |
|                             | △        | 0        | 0  | 0  | 0  | 0  | 1  | 0          | 0  | 0  | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0  | 0  |   |
|                             | Darker   | 0        | 0  | 0  | 0  | 1  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0  | 0  |   |
|                             | ▽        | ↓        |    |    |    |    |    | ↓          |    |    |    |    |    | ↓         |    |    |    |    |    |   |
|                             | Brighter | 1        | 1  | 1  | 1  | 0  | 1  | 0          | 0  | 0  | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0  | 0  |   |
|                             | ▽        | 1        | 1  | 1  | 1  | 1  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0  | 0  | 0 |
| Red                         | 1        | 1        | 1  | 1  | 1  | 1  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0  | 0  |   |
| Gray Scale Of Green         | Black    | 0        | 0  | 0  | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0  | 0  |   |
|                             | △        | 0        | 0  | 0  | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0  | 1  | 0         | 0  | 0  | 0  | 0  | 0  |   |
|                             | Darker   | 0        | 0  | 0  | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 1  | 0  | 0         | 0  | 0  | 0  | 0  | 0  |   |
|                             | ▽        | ↓        |    |    |    |    |    | ↓          |    |    |    |    |    | ↓         |    |    |    |    |    |   |
|                             | Brighter | 0        | 0  | 0  | 0  | 0  | 0  | 1          | 1  | 1  | 1  | 0  | 1  | 0         | 0  | 0  | 0  | 0  | 0  |   |
|                             | ▽        | 0        | 0  | 0  | 0  | 0  | 0  | 1          | 1  | 1  | 1  | 1  | 0  | 0         | 0  | 0  | 0  | 0  | 0  |   |
| Green                       | 0        | 0        | 0  | 0  | 0  | 0  | 1  | 1          | 1  | 1  | 1  | 1  | 0  | 0         | 0  | 0  | 0  | 0  |    |   |
| Gray Scale Of Blue          | Black    | 0        | 0  | 0  | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0  | 0  |   |
|                             | △        | 0        | 0  | 0  | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0  | 1  |   |
|                             | Darker   | 0        | 0  | 0  | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 1  | 0  |   |
|                             | ▽        | ↓        |    |    |    |    |    | ↓          |    |    |    |    |    | ↓         |    |    |    |    |    |   |
|                             | Brighter | 0        | 0  | 0  | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 1         | 1  | 1  | 1  | 1  | 0  | 1 |
|                             | ▽        | 0        | 0  | 0  | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 1         | 1  | 1  | 1  | 1  | 1  | 0 |
| Blue                        | 0        | 0        | 0  | 0  | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0  | 1  | 1         | 1  | 1  | 1  | 1  | 1  |   |
| Gray Scale Of White & Black | Black    | 0        | 0  | 0  | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0  | 0  |   |
|                             | △        | 0        | 0  | 0  | 0  | 0  | 1  | 0          | 0  | 0  | 0  | 0  | 1  | 0         | 0  | 0  | 0  | 0  | 1  |   |
|                             | Darker   | 0        | 0  | 0  | 0  | 1  | 0  | 0          | 0  | 0  | 0  | 1  | 0  | 0         | 0  | 0  | 0  | 1  | 0  |   |
|                             | ▽        | ↓        |    |    |    |    |    | ↓          |    |    |    |    |    | ↓         |    |    |    |    |    |   |
|                             | Brighter | 1        | 1  | 1  | 1  | 0  | 1  | 1          | 1  | 1  | 1  | 0  | 1  | 1         | 1  | 1  | 1  | 0  | 1  |   |
|                             | ▽        | 1        | 1  | 1  | 1  | 1  | 0  | 1          | 1  | 1  | 1  | 1  | 0  | 1         | 1  | 1  | 1  | 1  | 0  |   |
| White                       | 1        | 1        | 1  | 1  | 1  | 1  | 1  | 1          | 1  | 1  | 1  | 1  | 1  | 1         | 1  | 1  | 1  | 1  | 1  |   |

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**9.0 POWER SEQUENCE**



To prevent a latch-up or DC operation of the LCD module, the power on/off sequence should be as shown in below

- $0 < T1 \leq 10 \text{ ms}$
- $0 < T2 \leq 50 \text{ ms}$
- $0 \text{ ms} \leq T3$
- $0 \leq T4 \leq 10 \text{ ms}$
- $150 \text{ ms} \leq T5$

Notes:

1. When the power supply VDD is 0V, Keep the level of input signals on the low or keep high impedance.
2. Do not keep the interface signal high impedance when power is on.
3. Back Light must be turn on after power for logic and interface signal are valid.

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**10.0 RELIABILITY TEST**

## 10.1 BOE HYDIS Test condition

The following test is performed for the HV121X02-100 module with HT12X21-220 BLU.

| No | Test Items                                      | Conditions  |
|----|---|---|
| 1  | High temperature storage test                   | Ta = 60 °C, 240 hrs   |
| 2  | Low temperature storage test                    | Ta = -20 °C, 240 hrs  |
| 3  | High temperature & high humidity operation test | Ta = 50 °C, 80 %RH, 240 hrs   |
| 4  | High temperature operation test                 | Ta = 50 °C, 240 hrs   |
| 5  | Low temperature operation test                  | Ta = 0 °C, 240 hrs  |
| 6  | Thermal shock                                   | Ta = -20 °C ↔ 60 °C (30 min), 100 cycle   |
| 7  | Vibration test<br>(non-operating)               | Frequency : 10 ~ 300 Hz<br>Gravity/AMP : 1.5G<br>Period : X, Y, Z 30 min                  |
| 8  | Shock test<br>(non-operating)                   | Gravity : 150G<br>Pulse width : 6ms, half sine wave<br>±X, ±Y, ±Z Once for each direction |

\*As Guarantee Range of Specific part (Pol. / D-IC / LC), BOEHYDIS have responsibility within this Range of these parts.

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## 10.2 Customer Test condition

The following test is performed with the HV121X02-100.

| No | Test Items                                      | Conditions   | Remark |
|----|---|--|--------|
| 1  | High temperature storage test                   | Ta = 85 °C, 50%, 240 hrs   |        |
| 2  | Low temperature storage test                    | Ta = -25 °C, 240 hrs   |        |
| 3  | High temperature & high humidity operation test | Ta = 85 °C, 80 %RH, 240 hrs  |        |
| 4  | Low temperature operation test                  | Ta = -25 °C, 240 hrs   |        |
| 5  | Shock   | Gravity : 120G<br>Pulse Width : 2ms, Half Sine<br>Wave for x, y, z direction |        |
| 6  | Vibration test<br>(non-operating)               | Frequency : 1 ~ 300Hz<br>Gravity / AMP : 1.5G Period<br>X, y, z 30min.       |        |

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**11.0 HANDLING & CAUTIONS**

11.1 Cautions for handling the module

- As the electrostatic discharges may break the LCD module, handle the LCD module with care. Peel a protection sheet off from the LCD panel surface as slowly as possible.
- As the LCD panel is made from fragile glass material, impulse and pressure to the LCD module should be avoided.
- As the surface of the polarizer is very soft and easily scratched, use a soft dry cloth without chemicals for cleaning.
- Put the module display side down on a flat horizontal plane.

11.2 Other cautions

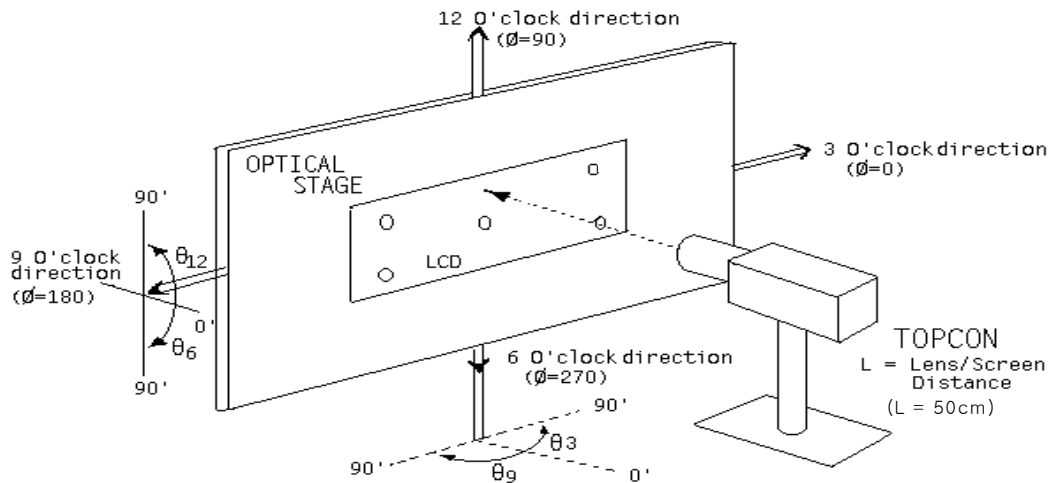
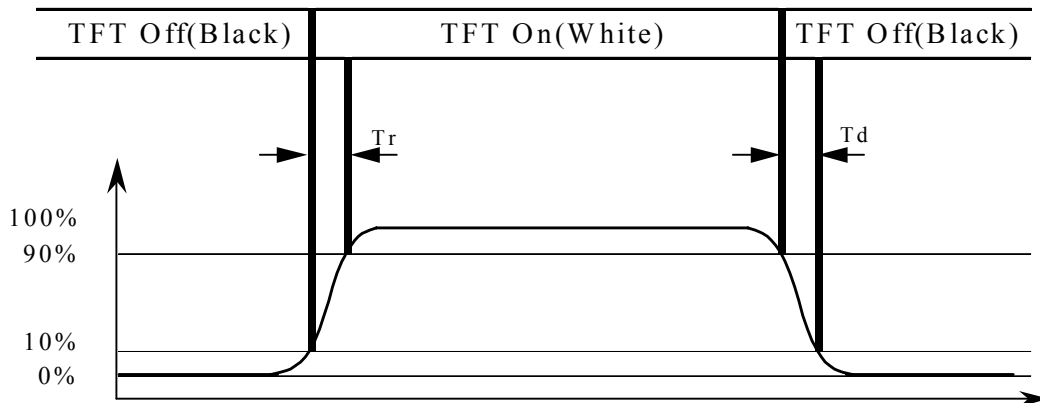
- Do not disassemble and/or re-assemble LCD module.
- When returning the module for repair or etc, please pack the module not to be broken. We recommend using the original shipping packages.

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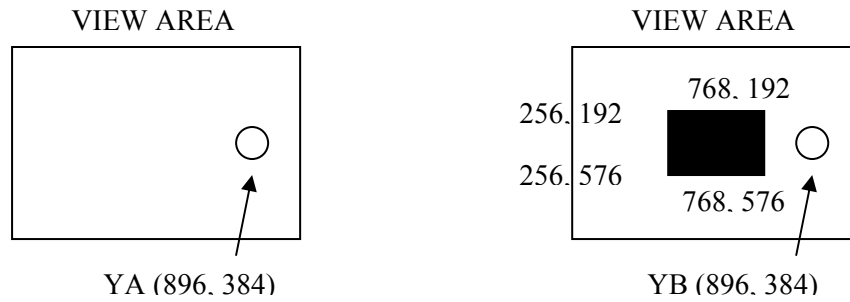
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**12.0 APPENDIX**
**Figure 1. Measurement Set Up**

**Figure 2. Response Time Testing**


**Figure 3. Cross Modulation Test Description**



$$\text{Cross-Talk} = \left| \frac{Y_B - Y_A}{Y_A} \right| \times 100$$

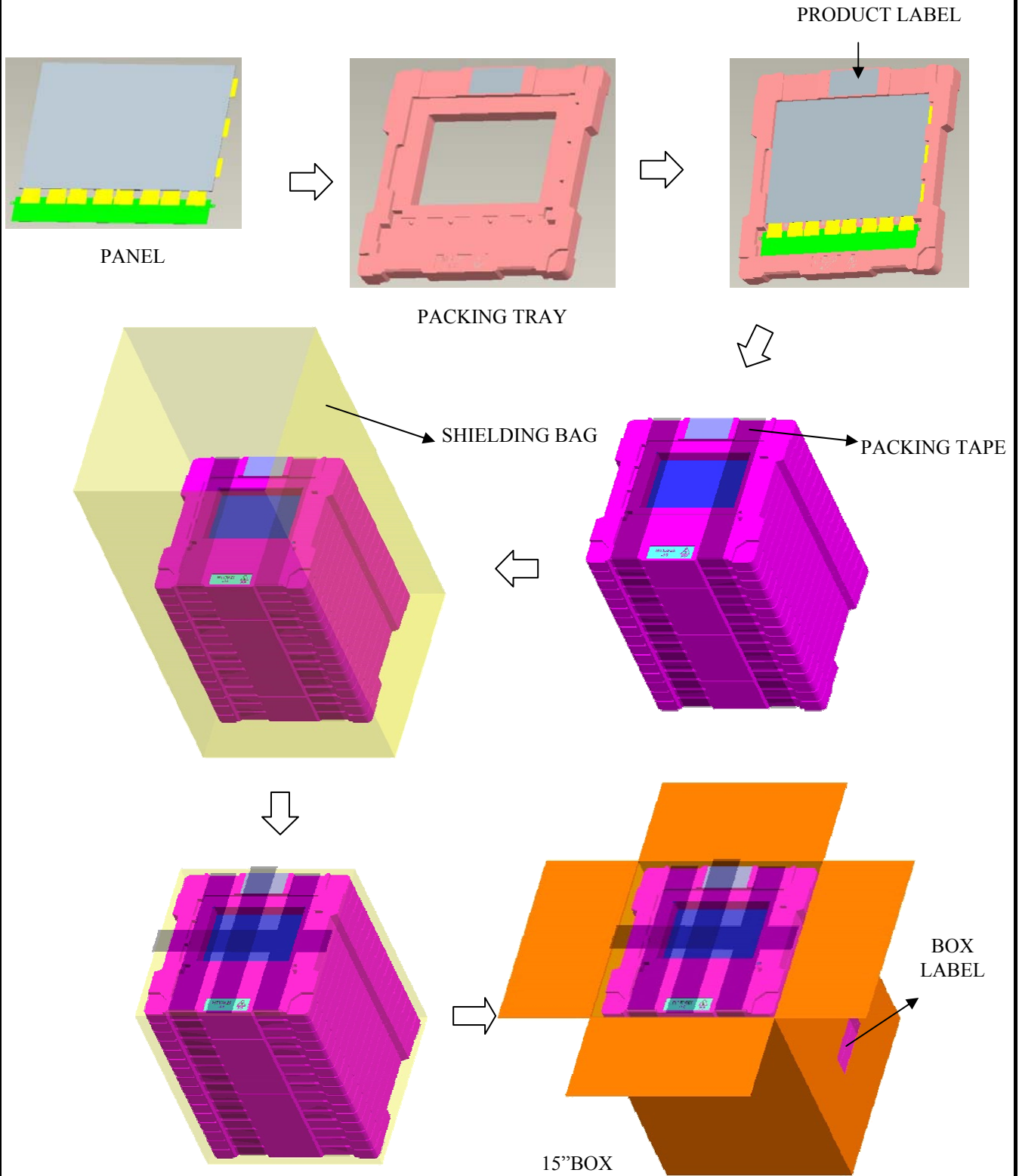
Where:

$Y_A$  = Initial luminance of measured area (cd/m<sup>2</sup>)

$Y_B$  = Subsequent luminance of measured area (cd/m<sup>2</sup>)

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

**Figure 4. Packing Sequence of HV121X02-100**



|                                   |   |                          |
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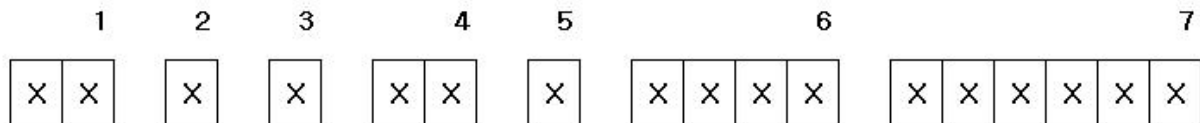
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**Figure 5. Product Serial Number**



**Type**

No 1. Control

No 2. Rank

No 3. Line Classification(BOE HYDIS : H, LCM : L, BOE OT : A/B/C)

No 4. Year(2001 : 01, 2002 : 02, ...)

No 5. Month(1, 2, 3, ...,9 X, Y, Z)

No 6. FG Code

No 7. Serial No.

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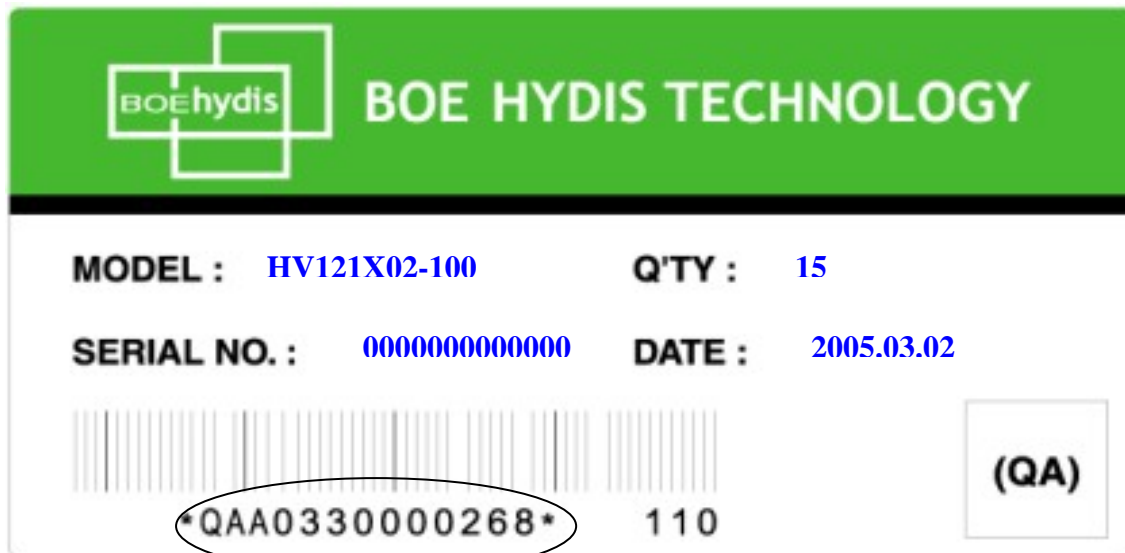
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\*. Packing Note

- Box Dimension: 333mm(W)X 333mm(D)X 435(H)
- Package Quantity in one Box: 15pcs

Figure 6. Box Label

- Label Size: 108 mm (L) × 56 mm (W)
- Contents
  - Model: HV121X02-100
  - Q`ty: Module Q`ty in one box
  - Serial No.: Box Serial No. See next page for detail description.
  - Date: Packing Date
  - FG Code: FG Code of Product



|           |          |          |           |          |           |              |
|-----------|----------|----------|-----------|----------|-----------|--------------|
| <u>00</u> | <u>0</u> | <u>0</u> | <u>00</u> | <u>0</u> | <u>0</u>  | <u>00000</u> |
| Type      | Grade    | Line     | Year      | Month    | ITEM-CODE | Serial_no    |

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Figure 7. TFT-LCD Panel Outline Dimension (Front view)

