# SmarterGlass

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# TITLE : HV121WX5-120

# Product Specification for Customer

# Rev. P0

## HYDIS TECHNOLOGIES

# REVISION HISTORY

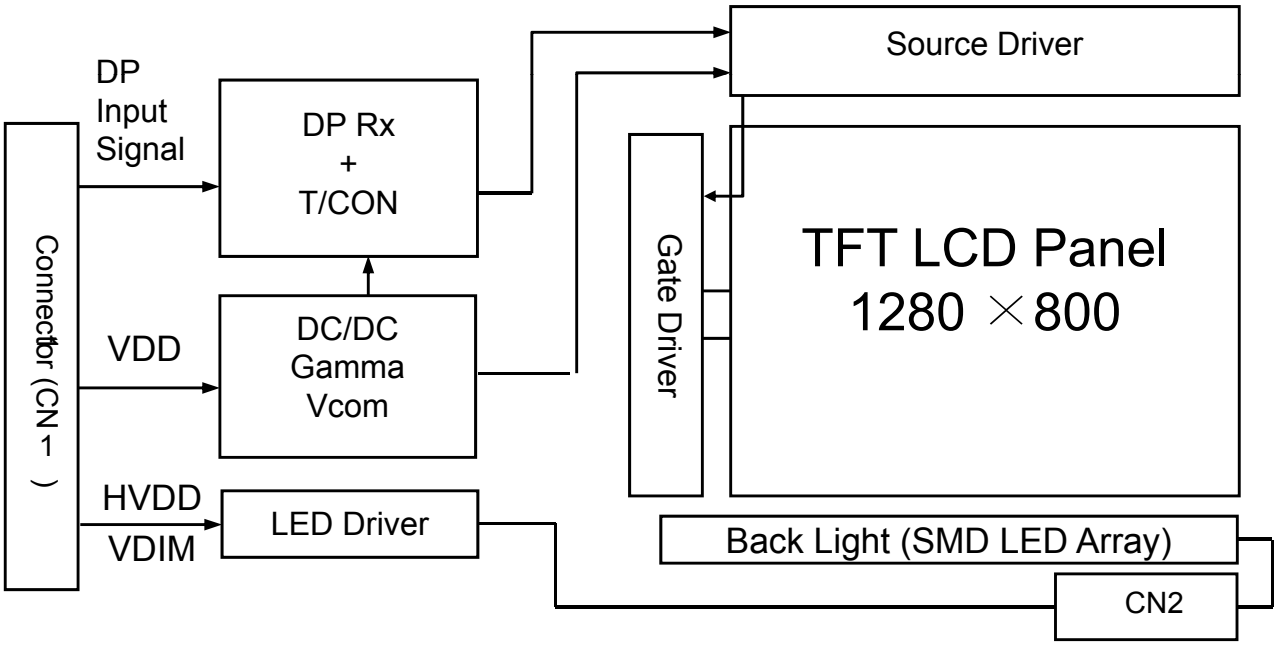
| REV. | ECN NO. | DESCRIPTION OF CHANGES | DATE | PREPARED |
|---|---|---|---|---|
| P0 | | ▪ Initial Release | 09.03.10 | Joseph Ha |
| | | | | |
| | | | | |
| | | | | |

# Contents

# 1.0 GENERAL DESCRIPTION

## 1.1 Introduction

HV121WX5-120 is a color active matrix TFT LCD module using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This module has a 12.1 inch diagonally measured active area with WXGA resolutions (1280 horizontal by 800 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical Stripe and this module can display 262,144 colors. The TFT-LCD panel used for this module is a low reflection and higher color type.




## 1.2 Features

- Thin and Light Weight
- 3.3 V Logic Power Supply
- 12V Back-light Power Supply
- 1 lane eDP Interface
- SMD LED (48EA) Array (Bottom Side/Horizontal Direction)
- 262,144 Colors
- Data Enable Signal Mode
- Side Mounting Frame
- Green Product (RoHS)

### 1.3 Application

- Tablet PC (Wide type)

### 1.4 General Specifications

| Parameter | Specification | Unit | Remarks |
|---|---|---|---|
| Active area | 261.12(H) ×163.20(V) | mm | |
| Number of pixels | 1280(H) ×800(V) | pixels | |
| Pixel pitch | 0.204(H) ×0.204(V) | mm | |
| Pixel arrangement | RGB Vertical Stripe | | |
| Display colors | 262,144 | colors | |
| Display mode | Normally Black | | |
| Outline dimension | 276.8±0.3(H) ×180.0±0.3(V) ×6.8(D:Max.) | mm | Note 1 |
| Weight | 265(Typ.) | g | Note 2 |
| Back-light | SMD LED (48EA) Array | | |

Note 1 : at PCB side
Note 2 : without digitizer

## 2.0 ABSOLUTE MAXIMUM RATINGS

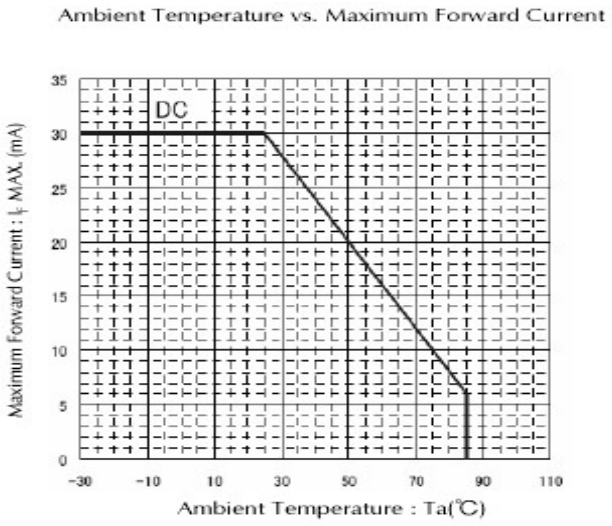
The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit.

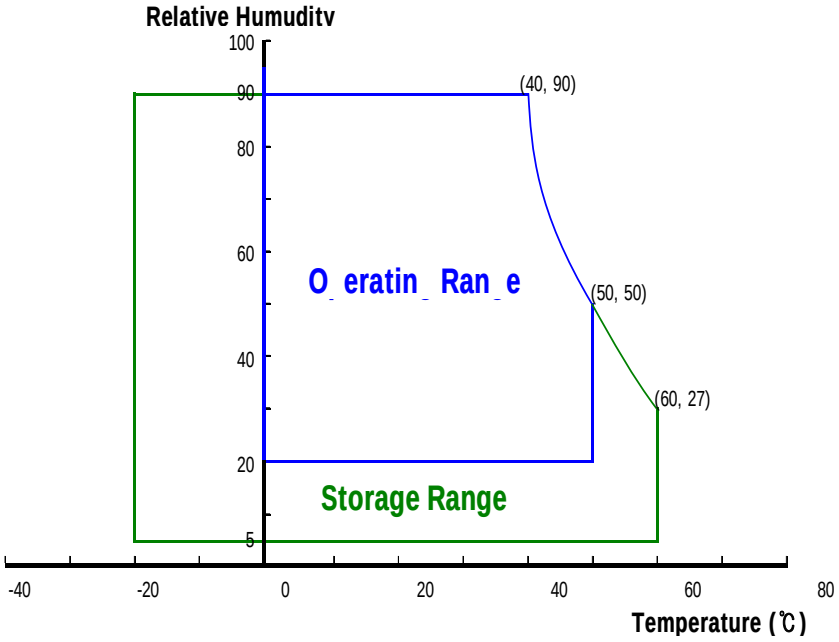
Ta=25+/-2°C

| Parameter | Symbol | Min. | Max. | Unit | Remarks |
|---|---|---|---|---|---|
| Logic Power Supply Voltage | $V_{DD}$ | -0.3 | 4.0 | V | |
| Logic Power Supply Voltage | $V_{IN}$ | -0.3 | $V_{DD}$+0.3 | V | |
| Back-light Power Supply Voltage | $HV_{DD}$ | -0.3 | 40 | V | |
| Back-light LED Current | $I_{LED}$ | - | 30 | mA | Note 1 |
| Back-light LED Reverse Voltage | $V_R$ | - | 5 | V | |
| Operating Temperature | $T_{OP}$ | 0 | +50 | ℃ | Note 1, Note 2 |
| Storage Temperature | $T_{SP}$ | -20 | +60 | ℃ | |

Note 1. Ambient temperature vs allowable forward current are shown in the figure below.

Note 2. Temperature and relative humidity range are shown in the figure below.
90% RH Max. ( 40℃ ≥ Ta)
Maximum wet - bulb temperature at 39℃ or less. ( > 40℃) No condensation.



# 3.0 ELECTRICAL SPECIFICATIONS

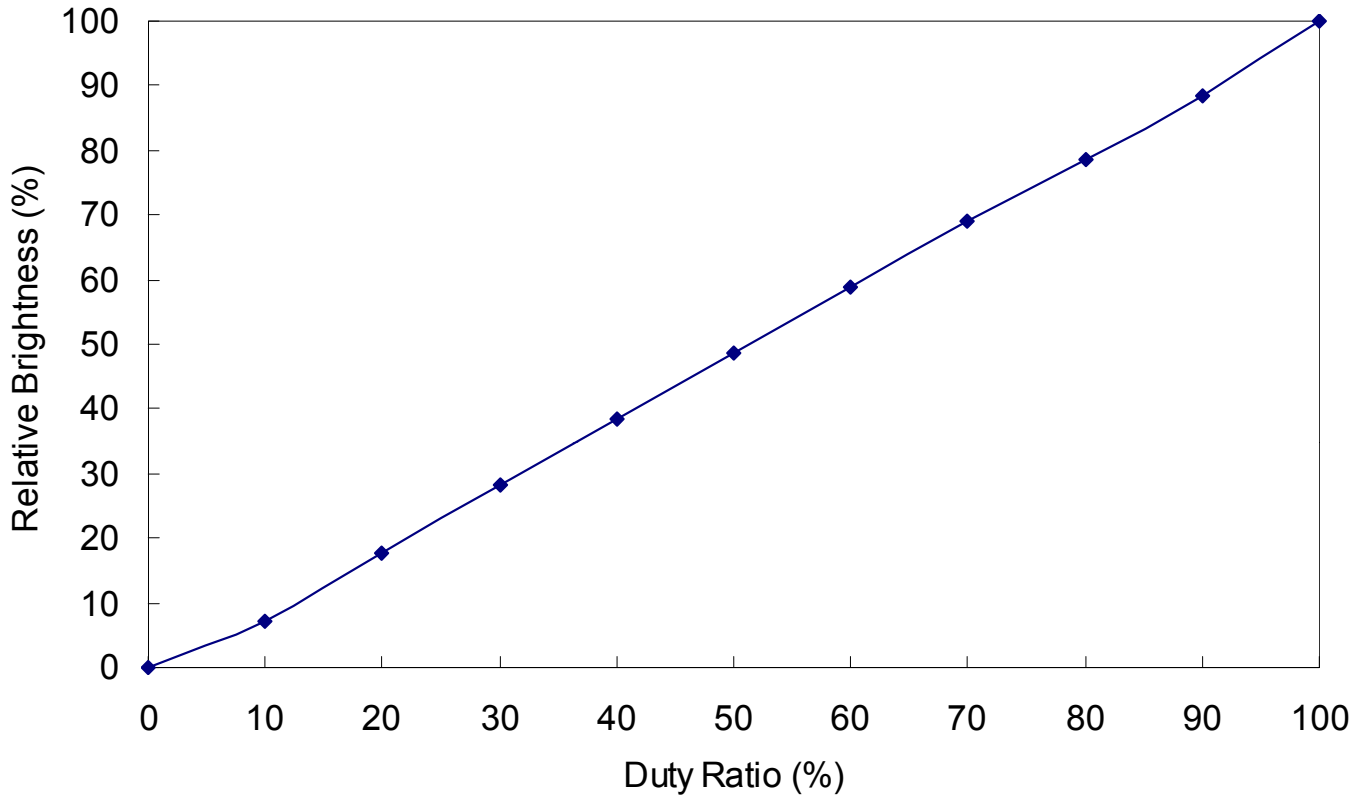
## 3.1 Electrical Specifications

< Table 3. Electrical Specifications >

| Parameter | | Min. | Typ. | Max. | Unit | Remarks |
|---|---|---|---|---|---|---|
| Logic Power Supply Voltage | $V_{DD}$ | 3.0 | 3.3 | 3.6 | V | Note 1 |
| Logic Power Supply Current | $I_{DD}$ | - | 300 | 470 | mA | Note 1 |
| Back-light Power Supply Voltage | $HV_{DD}$ | 7.0 | 12.0 | 20 | V | Note 2 |
| Back-light Power Supply Current | $I_{HVDD}$ | - | 255 | 305 | mA | Note 2, 3 |
| Back-light Power Consumption | $P_{BL}$ | - | 3.06 | 3.66 | W | Note 2, 3 |
| Power Consumption (EBL) | $P_{EBL}$ | - | 1.83 | 2.0 | W | Note 1, 2, 3 |
| LED Driver's Efficiency | η | - | 82 | - | % | Note 2, 3 |
| Back-light PWM Frequency | $F_{PWM}$ | 200 | 280 | 350 | Hz | |
| High Level PWM Signal Voltage | $V_{PWMH}$ | 2.1 | 3.3 | 5.0 | V | |
| Low Level PWM Signal Voltage | $V_{PWML}$ | - | 0 | 0.6 | V | |
| High Level Differential Input Signal Voltage | $V_{IH}$ | - | - | +100 | mV | $V_{CM}$ = 1.2V |
| Low Level Differential Input Signal Voltage | $V_{IL}$ | -100 | - | - | mV | |
| Back-light LED Voltage / Back-light LED Total Voltage | $V_{LED}$ /$V_{BL}$ | - | 3.1 / 37.2 | 3.5/ 42.0 | V | Note 4 |
| Back-light LED Current / Back-light LED Total Current | $I_{LED}$ /$I_{BL}$ | - | 16.9 / 67.6 | 17.8/ 71.2 | mA | Note 4 |
| Life Time | | 10,000 | - | - | Hrs | Based on LED |
| Power Consumption | $P_D$ | - | 1.0 | 1.55 | W | Note 1 |
| | $P_{LED}$ | - | 2.51 | 2.99 | W | Note 4 |
| | $P_{total}$ | - | 3.51 | 4.54 | W | Note 1, 4 |

Notes : 1. The supply voltage is measured and specified at the interface connector of LCM.
The current draw and power consumption specified is for 3.3V at 25℃.
a) Typ : Window XP pattern, b) Max : Vertical Sub line pattern
c) EBL : Mosaic pattern ( 32 X 32 )
2. The power supply voltage and current is measured and specified at the interface connector of LCM including LED Driver.
3. Reference value, which is measured with LED Driver [illegible]V.
4. Reference value, which is measured without LED Driver.
5. Calculated value for reference ($V_{LED}$ × $I_{LED}$ × # of LEDs (48EA) ).

### 3.2 PWM Duty Ratio vs Brightness




Notes :

In case of duty ratio 0%, LED can't illuminate itself so this state is LED off.

In case of duty ratio 100%, the brightness of LED is maximum and the state is LED on.

# 4.0 OPTICAL SPECIFICATIONS

## 4.1 Overview

The test of optical specifications shall be measured in a dark room (ambient luminance ≤ 1 lux and temperature = 25±2℃) with the equipment of Luminance meter system (Goniometer system and TOPCON BM-5A) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of θ and Φ equal to 0°. We refer to $\theta_{Ø=0}$ (=θ3 ) as the 3 o'clock direction (the "right"), $\theta_{Ø=90}$ (= θ12 ) as the 12 o'clock direction ("upward"), $\theta_{Ø=180}$ (= θ9 ) as the 9 o'clock direction ("left") and $\theta_{Ø=270}$(= θ6 ) as the 6 o'clock direction ("bottom"). While scanning θ and/or Ø, the center of the measuring spot on the Display surface shall stay fixed. The backlight should be operating for 30 minutes prior to measurement. $V_{DD}$ shall be 3.3+/- 0.3V at 25°C. Optimum viewing angle direction is 6 o'clock.

## 4.2 Optical Specifications

<Table 4. Optical Specifications>

| Parameter | | Symbol | Condition | Min. | Typ. | Max. | Unit | Remarks |
|---|---|---|---|---|---|---|---|---|
| Viewing Angle range | 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 | Θ = 0° | - | 500 | - | | Note 2 |
| Luminance of White | 5 Points | $Y_w$ | Θ = 0° | 190 | 220 | - | $cd/m^2$ | Note 4 Note 5 |
| White Luminance uniformity | 5 Points | ΔY5 | | 80 | - | - | % | |
| | 13 Points | ΔY13 | | 60 | - | - | | |
| White Chromaticity | | $W_x$ | Θ = 0° | 0.260 | 0.300 | 0.340 | | Note 3 |
| | | $W_y$ | | 0.280 | 0.320 | 0.360 | | |
| Reproduction of color | Red | $R_x$ | Θ = 0° | 0.523 | 0.563 | 0.603 | | |
| | | $R_y$ | | 0.314 | 0.354 | 0.394 | | |
| | Green | $G_x$ | | 0.291 | 0.331 | 0.371 | | |
| | | $G_y$ | | 0.502 | 0.542 | 0.582 | | |
| | Blue | $B_x$ | | 0.106 | 0.146 | 0.186 | | |
| | | $B_y$ | | 0.077 | 0.117 | 0.157 | | |
| Response Time | | Total ($T_r + T_d$) | Ta= 25° C Θ = 0° | - | 30 | - | ms | Note 6 |
| Cross Talk | | CT | Θ = 0° | - | - | 2.0 | % | Note 7 |

Notes :

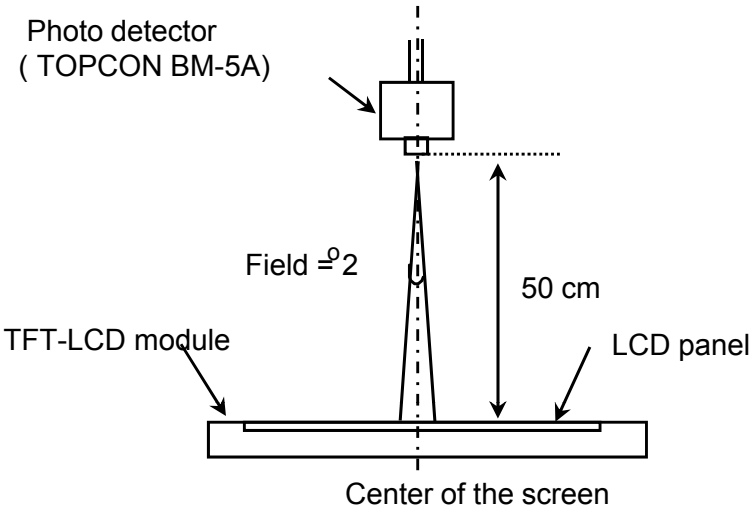
1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface (see Figure1).

2. Contrast measurements shall be made at viewing angle of Θ= 0 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 Figure1). Luminance Contrast Ratio (CR) is defined mathematically as CR = Luminance when displaying a white raster / Luminance when displaying a black raster.

3. Reference only / Standard Front Surface Treatment Measured with green cover glass. The color chromaticity coordinates specified in Table 4 shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.

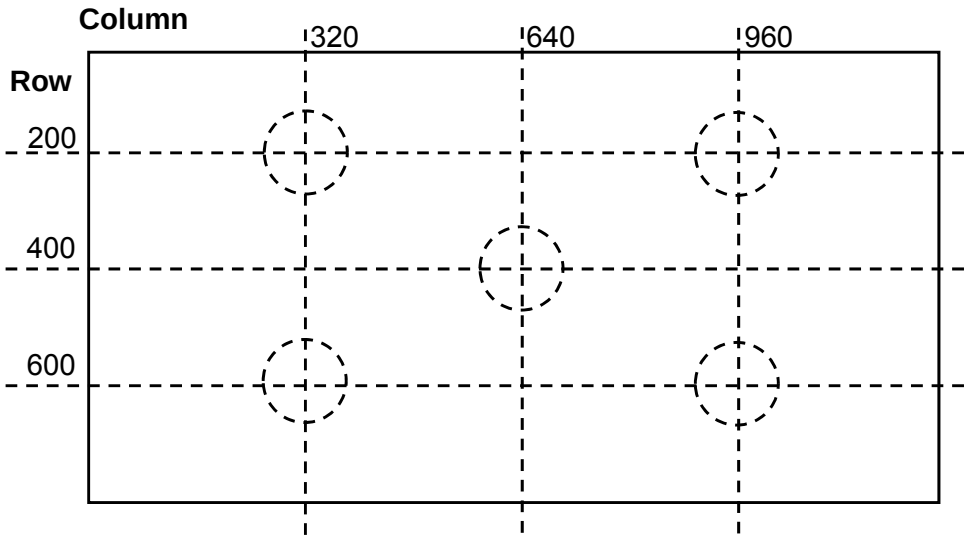
### 4.3 Optical Measurements

**Figure 1. Measurement Set Up**




Optical characteristics measurement setup

**Figure 2. White Luminance and Uniformity Measurement Locations (5 points)**

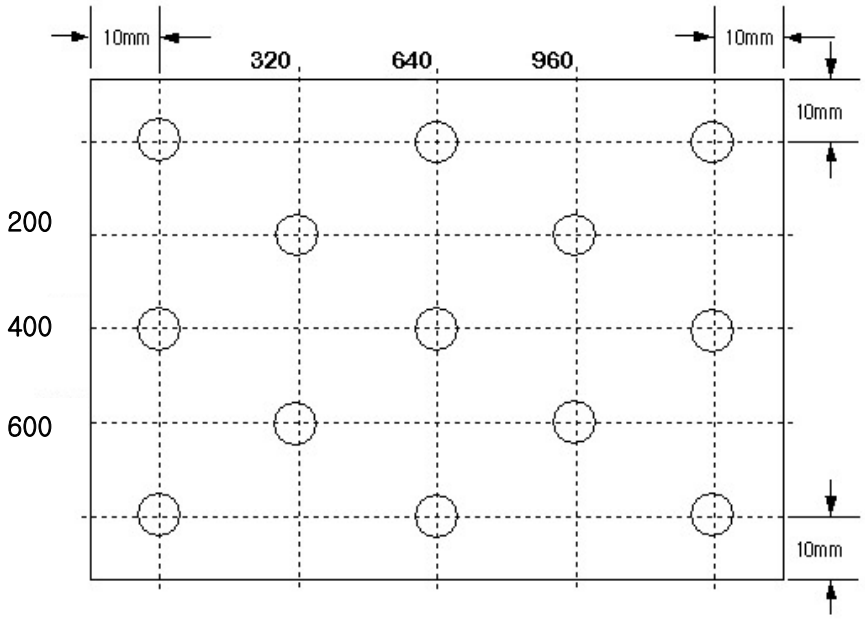



Note 4.

Luminance of white is defined as luminance values of 5 points across the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in Figure 2 for a total of the measurements per display.

* Yw = (Sum of 5 Points Luminance / 5 )

**Figure 3. Uniformity Measurement Locations (13 points)**




Note 5.

The White luminance uniformity on LCD surface is then expressed as : ΔY5 = ¸Minimum Luminance of five ¸ oints / Maximum Luminance of five ¸ oints¸ X 100% (see Figure 2) , ΔY13 = (Minimum Luminance of 13 points /Maximum Luminance of 13 points) X 100% (see Figure 3).

**Figure 4. Response ..... Testing**

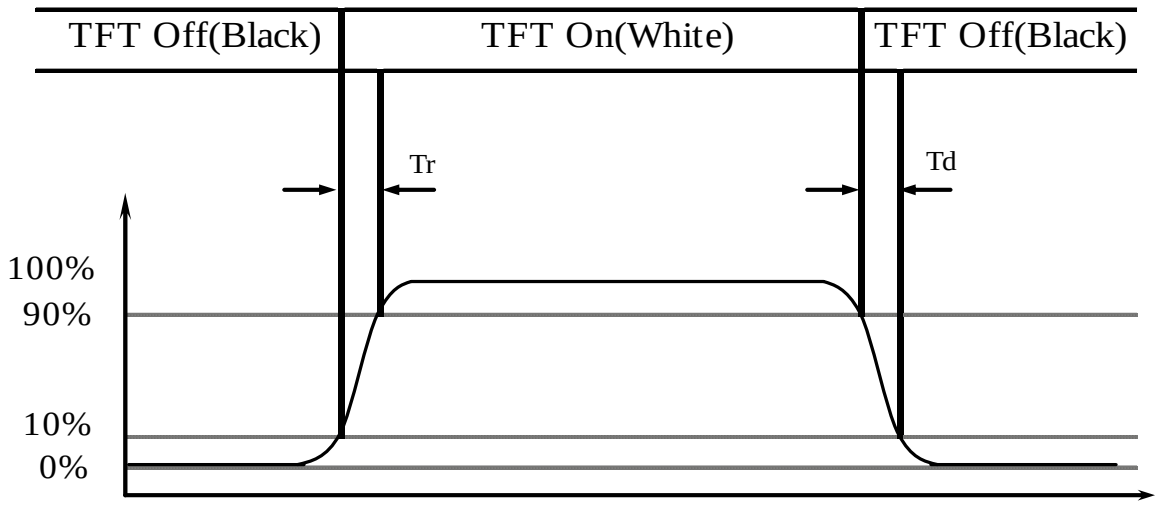
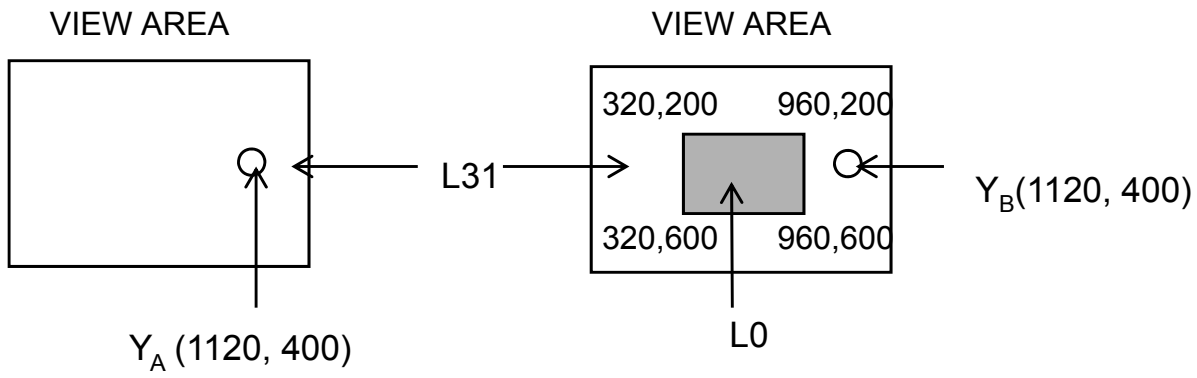


**Figure 5. Cross Modulation Test Description**




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

Where:

$Y_A$ = Initial luminance of measured area (cd/m$^2$)

$Y_B$ = Subsequent luminance of measured area (cd/m$^2$)

The location measured will be exactly the same in both patterns

Note 6.

The electro-optical response time measurements shall be made as Figure 4 by switching the “data” input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is ‥, and 90% to 10% is Td.

Note 7.

Cross-Talk of one area of the LCD surface by another shall be measured by comparing the luminance (YA) of a 25mm diameter area, with all display pixels set to a gray level, to the luminance (YB) of that same area when any adjacent area is driven dark ˛Refer to Fi˘ure 5˛.

# 5.0 INTERFACE CONNECTIONS

## 5.1 Electrical Interface Connection

### CN1 Interface Connector (I-PEX 20455-030E-02)

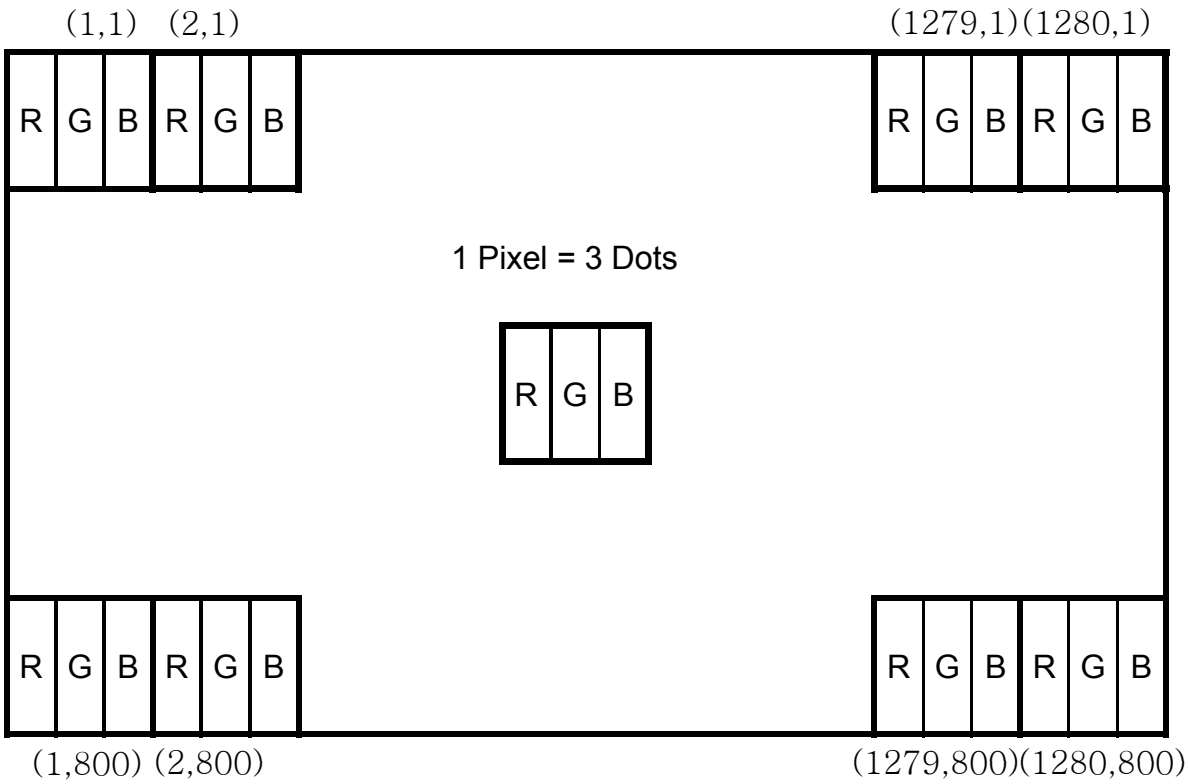
| Pin | Signal | Description |
|---|---|---|
| 1 | NC | No Connection (Reserved) |
| 2 | NC | No Connection (Reserved) |
| 3 | NC | No Connection (Reserved) |
| 4 | NC | No Connection (Reserved) |
| 5 | H_GND | High Speed (Main Link) Ground |
| 6 | ML_Lane 0 (n) | Complement Signal-Main Link Lane |
| 7 | ML_Lane 0 (p) | True Signal-Main Link Lane |
| 8 | H_GND | High Speed (Main Link) Ground |
| 9 | AUX_CH(p) | True Signal-Auxiliary channel |
| 10 | AUX_CH(n) | Complement Signal-Auxiliary |
| 11 | H_GND | High Speed (Main Link) Ground |
| 12 | VCC | VCC for Module (3.3V) |
| 13 | VCC | VCC for Module (3.3V) |
| 14 | BIST* | Built-In Self Test (active low) |
| 15 | GND | Ground |
| 16 | GND | Ground |
| 17 | NC | No Connection (Reserved) |
| 18 | BL_GND | BL Ground |
| 19 | BL_GND | BL Ground |
| 20 | BL_GND | BL Ground |
| 21 | BL_GND | BL Ground |
| 22 | BL_EN | PWM for luminance control (200~1KHz, 3.3V, 10~100%, 0V=off) 5V tolerant |
| 23 | BL_PWM | BL On/Off (On: 2.0~3.3V, Off: 0~0.5V) / NC (100K pull-up) / 5V tolerant |
| 24 | NC | No Connection (Reserved) |
| 25 | NC | No Connection (Reserved) |
| 26 | VBL | BL Power 6V-20V |
| 27 | VBL | BL Power 6V-20V |
| 28 | VBL | BL Power 6V-20V |
| 29 | VBL | BL Power 6V-20V |
| 30 | NC | No Connection (Reserved) |

## 5.2 Back-light Interface

**CN2 LED FPC Connector (04-6298-009, Manufactured by Kyocera)**

| Pin No. | Symbol | Function | Remark |
|---|---|---|---|
| 1 | Anode1 | LED Anode Power Supply | LED Anode Power Supply (3.1V X 12EA = 37.2V) |
| 2 | Anode2 | LED Anode Power Supply | |
| 3 | Anode3 | LED Anode Power Supply | |
| 4 | Anode4 | LED Anode Power Supply | |
| 5 | NC | Non-Connection | |
| 6 | Cathode1 | LED Cathode Power Supply | LED Cathode Power Supply |
| 7 | Cathode2 | LED Cathode Power Supply | |
| 8 | Cathode3 | LED Cathode Power Supply | |
| 9 | Cathode4 | LED Cathode Power Supply | |

## 5.3 Data Input Format



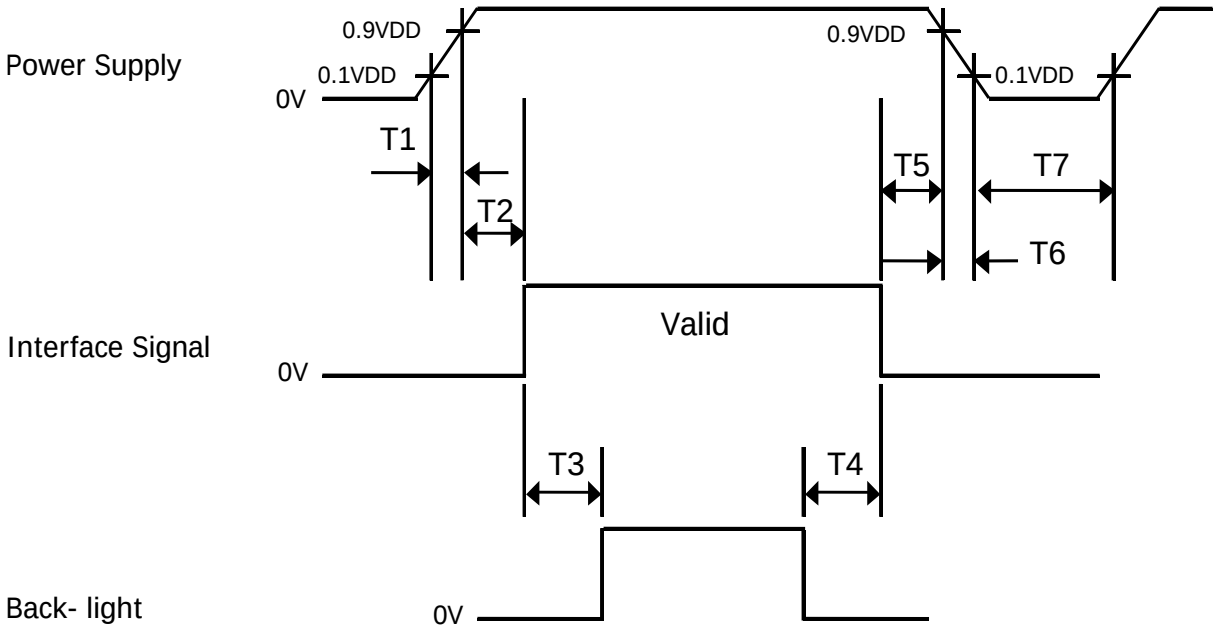
## 6.0 INPUT SIGNALS, BASIC DISPLAY COLORS & GRAY SCALE OF COLORS

Each color is displayed in sixty-four gray scales from a 6 bit data signal input. A total of 262,144 colors are derived from the resultant 18 bit data.

| 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 |
| | Red | 1 | 1 | 1 | 1 | 1 | 1 | 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 | 0 | 1 |
| | ▽ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 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 |
| 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 |

## 7.0 POWER SEQUENCE

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




- T1 ≤ 10 ms
- 0 ≤ T2 ≤ 50 ms
- 200 ms ≤ T3
- 200 ms ≤ T4
- 0 ≤ T5 ≤ 50 ms
- 0 ≤ T6 ≤ 10ms
- 500ms ≤ T7

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.

# 8.0 MECHANICAL CHARACTERISTICS

## 8.1 Dimensional Requirements

Figure 6 & 7 (located in 11.0) shows mechanical outlines for the model

| Parameter | Specification | Unit |
|---|---|---|
| Active Area | 261.12(H) X 163.20(V) | mm |
| Number of pixels | 1280(H) X 800(V) (1 pixel = R + G + B dots) | |
| Pixel pitch | 0.204(H) X 0.204(V) | |
| Pixel arrangement | RGB Vertical stripe | |
| Display colors | 262,144 | |
| Display mode | Normally Black | |
| Outline dimension | 276.8±0.3(H)×180.0(V)±0.3×6.8(D:Max.) | mm |
| Weight | 265(Typ.) | g |
| Back-light | SMD LED (48EA) Array | |

## 8.2 Mounting

See Figure 6 & 7 & 8. (shown in 11.0)

| Parameter | Specification | Unit |
|---|---|---|
| Torque of side mounting screw | 2.5(Max.) | kgf |
| Torque of ground plate screw | 1.5(Max.) | kgf |
| Torque of top side screw | 2.5(Max.) | kgf |

## 10.3 Anti-Glare and Polarizer Hardness.

The surface of the LCD has an anti-glare coating to minimize reflection and a coating to reduce scratching.

## 10.4 Light Leakage

There shall not be visible light from the back-lighting system around the edges of the screen as seen from a distance 50cm from the screen with an overhead light level of 150lux. The manufacture shall furnish limit samples of the panel showing the light leakage acceptable.

## 9.0 Mechanical Drawing

## 10.0 RELIABLITY TEST

The Reliability test items and its conditions are shown in below.

<Table 12. Reliability Test>

| No | Test Item | 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 ℃, 80%RH, 240hrs |
| 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 (non-operating) | Frequency : 10~500Hz<br>Gravity/AMP : 1.5G<br>Period : X,Y,Z 30min |
| 8 | Shock test (non-operating) | Gravity : 220G<br>Pulse width : 2ms, half sine wave<br>±X, ±Y, ±Z Once for each direction |
| 9 | Electro-static discharge test (non-operating) | Air : 150pF, 330ohm, 15KV<br>Contact : 150pF, 330ohm, 8KV |

## 11.0 HANDLING & CAUTIONS

### 11.1 Cautions when taking out the module

- Pick the pouch only, when taking out module from a shipping package.

### 11.2 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 and back - light element are made from fragile glass (epoxy) 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.
- Do not pull the interface connector in or out while the LCD module is operating.
- Put the module display side down on a flat horizontal plane.
- Handle connectors and cables with care.

**11.3 Cautions for the operation**

- When the module is operating, do not lose MCLK, DE signals. If any one of these signals were lost, the LCD panel would be damaged.
- Obey the supply voltage sequence. If wrong sequence is applied, the module would be damaged.

**11.4 Cautions for the atmosphere**

- Dew drop atmosphere should be avoided.
- Do not store and/or operate the LCD module in a high temperature and/or humidity atmosphere. Storage in an electro-conductive polymer packing pouch and under relatively low temperature atmosphere is recommended.

**11.5 Cautions for the module characteristics**

- Do not apply fixed pattern data signal to the LCD module at product aging.
- Applying fixed pattern for a long time may cause image sticking.

**11.6 Cautions for the digitizer assembly**

- When assembling FPC connector, do not flip connector past 90° due to possible damage to connector.
- When positioning digitizer underneath driver IC, do not lift driver IC past 90° due to possible damage to drive IC pattern.
- Please be warned that during assembly of digitizer, the opening or closing of FPC will result in possible electrostatic discharge damage to the LED

**11.7 Other cautions**

- Do not re-adjust variable resistor or switch etc.
- When returning the module for repair or etc., Please pack the module not to be broken. We recommend to use the original shipping packages.

# 12.0 LABELS

## 12.1 Product Label

**HYDIS Barcode**

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| X X | X | X | X X | X | X X X X | X X X X X X |

No 1. Control Number

No 2. Rank / Grade

No 3. Line Classification

No 4. Year (5 : 2005, 6 : 2006, …)

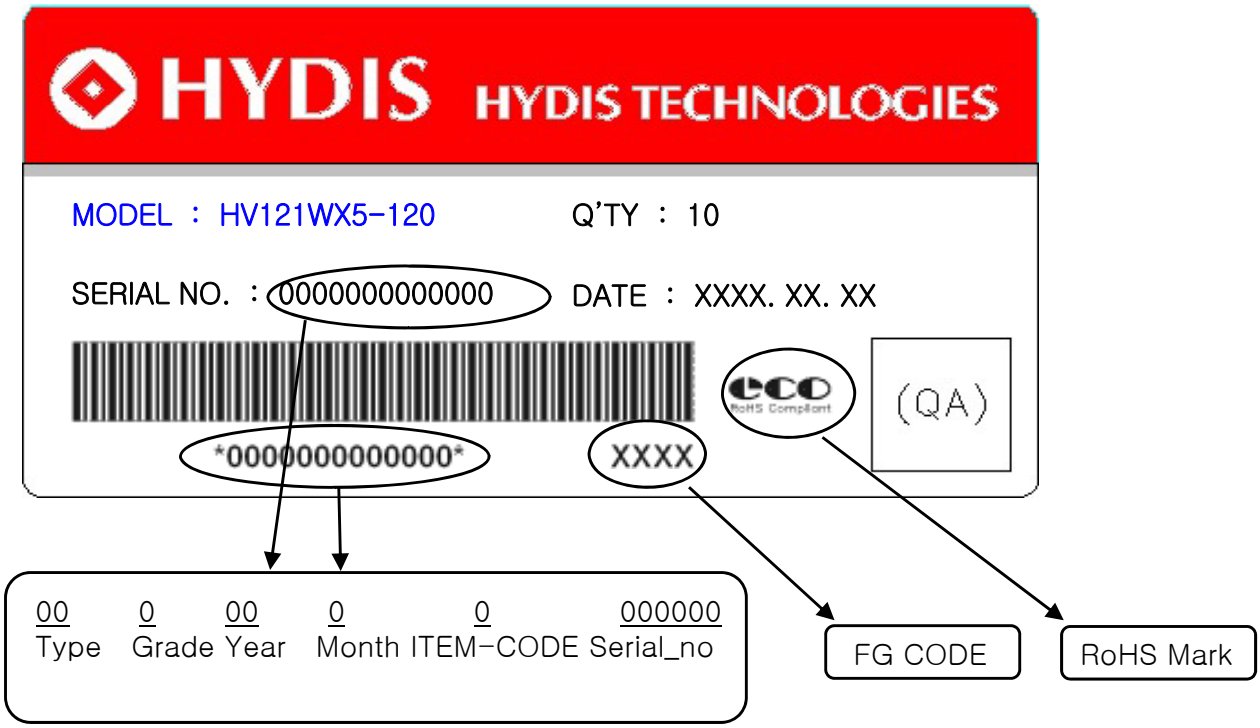
N M nth (1, 2, , , , X, Y, Z,

No 6. FG Code

No 7. Serial Number

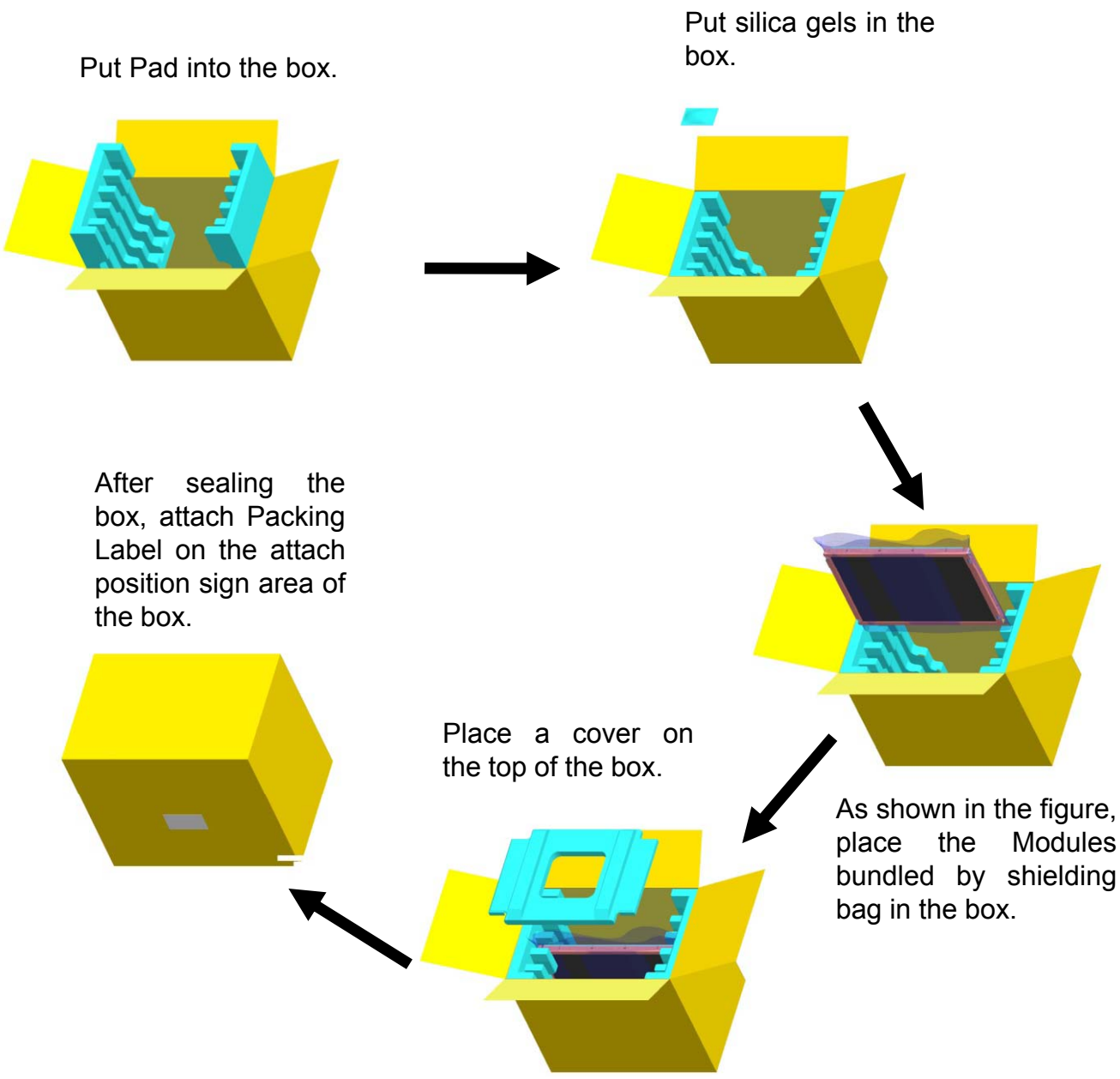
### 12.2 Packing Label

Label Size: 108 mm (L) × 56 mm (W)
Contents
Model: HV121WX5-120
Q`ty: Module Q`ty in one box
Serial No.: Box Serial No. See next figure for detail description.
Date: Packing Date
FG Code: FG Code of Product



# 13.0 PACKING INFORMATION

## 15.1 Packing order




## 13.2 Notes

- Box Dimension : 349.0mm(W) X 261.0mm(D) X 311.0mm(H)
- Package Quantity in one Box : 10pcs