**DATE : 06. Feb. 2012**

***SAMSUNG TFT-LCD***

# MODEL : LSJ400HV05

*The Information Described in this Specification is Preliminary and can be changed without prior notice*

LCD Business

Samsung Electronics Co . , LTD.

# Contents

## Revision History

| Date | Rev. No | Page | Summary |
|---|---|---|---|
| 06.Feb.2012 | 000 | all | First issued |

# General Description

## Description

LSJ400HV05 is a color active matrix liquid crystal display (LCD) that uses amorphous silicon TFT( Thin Film Transistor) as switching components. This model is composed of a TFT LCD panel, a driver circuit. The resolution of a 46“ is 1920 x 1080 and this model can display up to 16.7 million colors with wide viewing angle of 89° or higher in all directions. This panel is intended to support applications to provide a excellent performance for Flat Panel Display such as Home-alone Multimedia TFT-LCD TV and High Definition TV.

## Features

- High contrast & aperture ratio with wide color gamut
- SPVA (Super Patterned Vertical Align) mode
- Wide viewing angle (±178°)
- High speed response
- FHD resolution (16:9)
- 4Ch LVDS (Low Voltage Differential Signaling) interface
- 2D / 3D function compatible

# General Information

| Items | Specification | Unit | Note |
|---|---|---|---|
| Panel Size | 902.6(H) x 517.1(V) | mm | ±1.0mm |
| | 1.76(D) | | Max |
| Weight | 1.8(Max) | kg | |
| Pixel Pitch | 0.46125(H) X 0.15375(V) | mm | |
| Active Display Area | 885.6(H) X 498.15(V) | mm | |
| Surface Treatment | Haze 2%, Hard-coating (2H) | | |
| Display Colors | 16.7M (8Bits Dithering) | colors | |
| Number of Pixels | 1920 x 1080 | pixel | |
| Pixel Arrangement | RGB vertical stripe | | |
| Display Mode | Normally Black | | |

## 1. Absolute Maximum Ratings

If the condition exceeds maximum ratings, it can cause malfunction or unrecoverable damage to the device.

($V_{SS}$ = 0 V)

| Item | | Symbol | Min. | Max. | Unit | Note |
|---|---|---|---|---|---|---|
| Power Supply Voltage | | $V_{DD}$ | 10.8 | 13.2 | V | (1) |
| Storage temperature | | $T_{STG}$ | 5 | 40 | ℃ | (2) |
| Glass surface temperature (Operation) | Center | $T_{OPR}$ | 0 | 50 | ℃ | (2) |

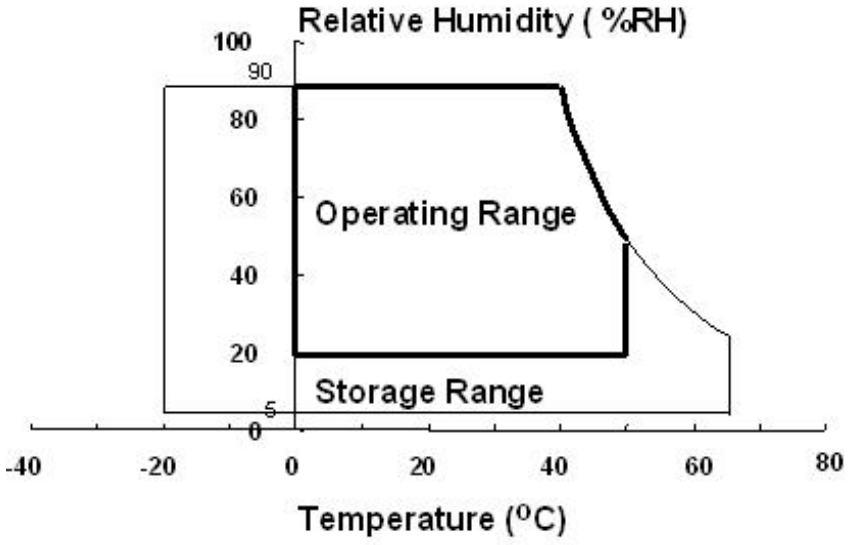
Note (1) Ta= 25 ± 2 °C

(2) Temperature and relative humidity range are shown in the figure below.

a. 90 % RH Max. (Ta ≤ 39 °C)

b. Relative Humidity is 90% or less. (Ta > 39 °C)

c. No condensation



## 2. Optical Characteristics

The optical characteristics should be measured in a dark room or equivalent.
Measuring equipment : TOPCON RD-80S ,ELDIM EZ-Contrast

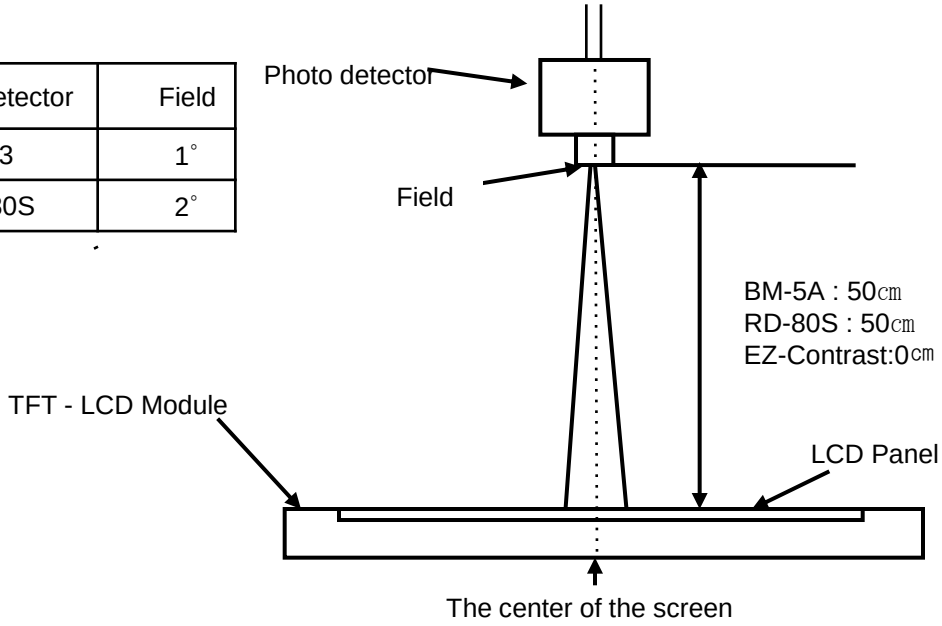
(Ta = 25 ± 2°C, VDD=12V)

| Item | | Symbol | Condition | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|---|
| Contrast Ratio (Center of screen) | | C/R | Normal θL,R=0 θU,D=0 Viewing Angle | 4,000 | 5,000 | - | | (1) D65 |
| Response Time | G-to-G | Tg | | - | 8 | 15 | msec | (3) RD-80S |
| Color Chromaticity (CIE 1931) | Red | Rx | | TYP. -0.03 | 0.640 | TYP. +0.03 | | (5),(6) D65 |
| | | Ry | | | 0.330 | | | |
| | Green | Gx | | | 0.300 | | | |
| | | Gy | | | 0.600 | | | |
| | Blue | Bx | | | 0.150 | | | |
| | | By | | | 0.060 | | | |
| | White | Wx | | | 0.280 | | | |
| | | Wy | | | 0.290 | | | |
| sRGB Concordance | | - | | - | 98.5 | - | % | (5) D65 |
| Color Temperature | | - | | - | 10,000 | - | K | |
| Viewing Angle | Hor. | $\theta_L$ | C/R≥10 | 75 | 89 | - | Degree | (6) EZ-Contrast |
| | | $\theta_R$ | | 75 | 89 | - | | |
| | Ver. | $\theta_U$ | | 75 | 89 | - | | |
| | | $\theta_D$ | | 75 | 89 | - | | |
| Transmittance Uniformity (9 Points) | | $T_{uni}$ | | - | - | 10 | % | (2) D65 |

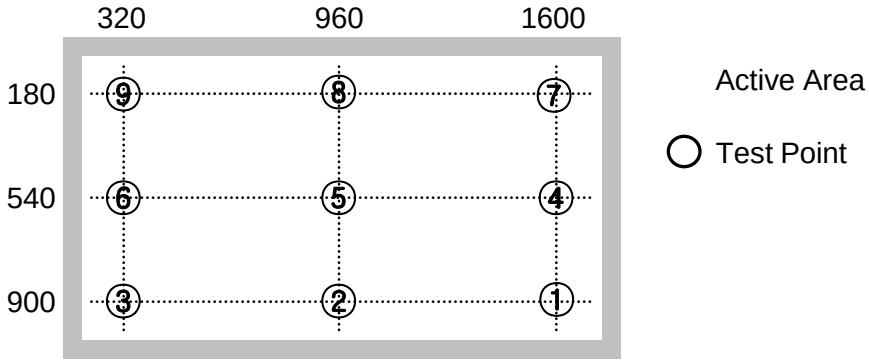
Notice

(a) Test Equipment Setup
The measurement should be executed in a stable, windless and dark room between 40min and 60min after operating the Panel at the given temperature for stabilization of the standard light(SEC use standard illuminant D65 Media).
This should be measured in the center of screen. Environment condition : Ta = 25 ± 2 °C

| Photo detector | Field |
|---|---|
| SR3 | 1° |
| RD-80S | 2° |




- Definition of test point




Note (1) Definition of Contrast Ratio (C/R)

: Ratio of gray max (Gmax) & gray min (Gmin) at the center point ⑤ of the panel

: The measurement goes in D65 Standard Light Source

$$C/R = \frac{G\max}{G\min}$$

Gmax : Luminance with all pixels white

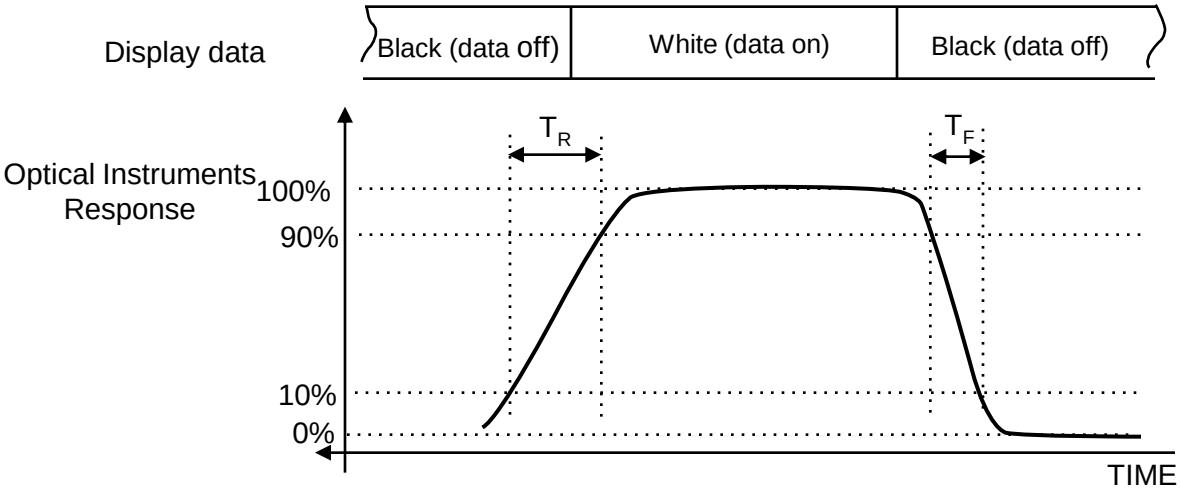
Gmin : Luminance with all pixels black

Note (2) Definition of 9 points Transmittance uniformity (Test pattern : Full White)
The measurement goes in D65 Standard Light Source

$$Tuni = \frac{(T\max - T\min)}{T\max} \times 100$$

Tmax : Maximum Transmittance
Tmin : Minimum Transmittance

Note (3) Definition of Response time : Sum of Tr, Tf

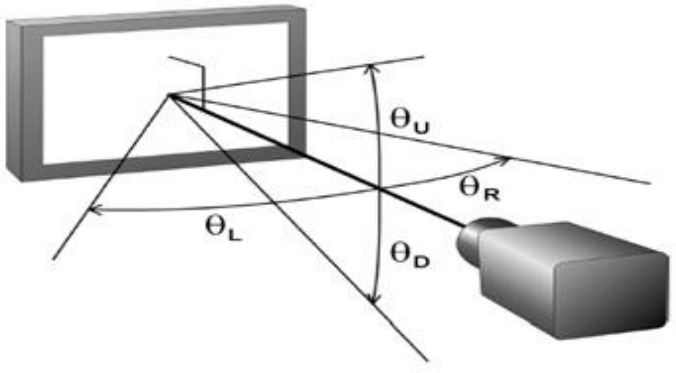



※ G-to-G : Average response time between Gray to Gray (Scale)

Note (4) Definition of Luminance of White : Luminance of white at center point ⑤
The measurement goes in D65 Standard Light Source

Note (5) Definition of Color Chromaticity (CIE 1931)
Color coordinate of Red, Green, Blue & White at center point ⑤
The measurement goes in D65 Standard Light Source

Note (6) Definition of Viewing Angle
: Viewing angle range (C/R ≥10)
The measurement goes in D65 Standard Light Source



# 3. Electrical Characteristics

## 3.1 TFT LCD Module

The connector for display data & timing signal should be connected.

Ta = 25°C ± 2 °C

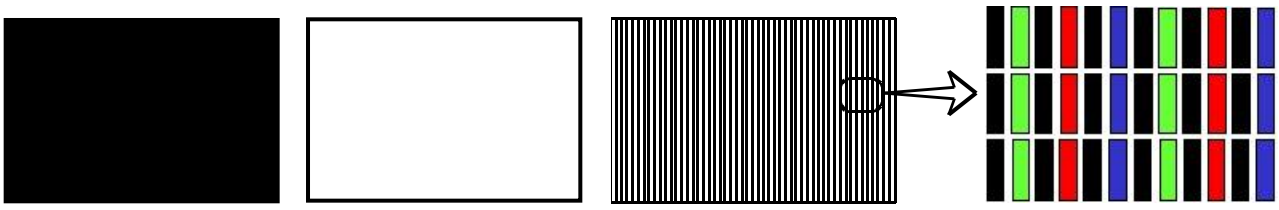
| Item | | Symbol | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|
| Voltage of Power Supply | | VDD | 10.8 | 12.0 | 13.2 | V | (1) |
| Current of Power Supply | (a) Black | IDD | - | 1000 | 1200 | mA | (2),(3) |
| | (b) White | | - | 1000 | 1200 | mA | |
| | (c) N-pattern | | - | 1400 | 1800 | mA | |
| Vsync Frequency | | fV | 95 | 120 | 125 | Hz | |
| Hsync Frequency | | fH | 120 | 135 | 140 | kHz | |
| Main Frequency | | Fdclk | 260 | 297 | 305 | MHz | |
| Rush Current | | IRUSH | - | 4 | 6 | A | (4) |

Note (1) The ripple voltage should be controlled under 10% of $V_{DD}$.

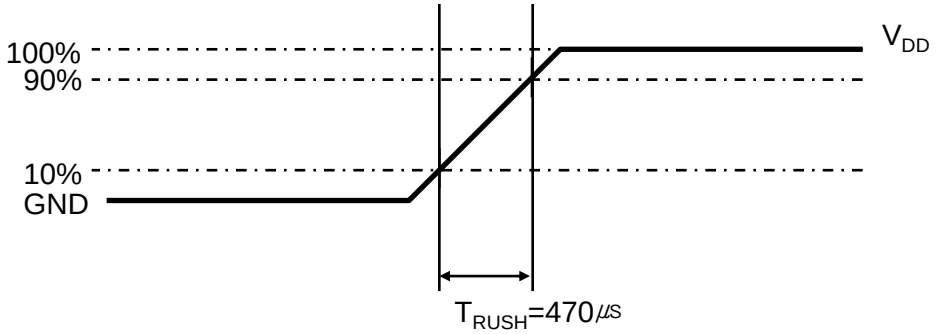
(2) fv= 120 Hz, $f_{DCLK}$ = 297 MHz, $V_{DD}$ = 12.0V, DC Current.

(3) Power dissipation check pattern (LCD Module only)

a) Black Pattern b) White Pattern c) N-pattern



(4) Measurement Conditions




Rush Current $I_{RUSH}$ can be measured when $T_{RUSH}$. is 470㎲.

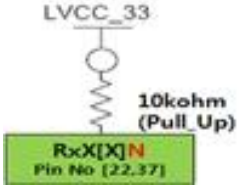
# 4. Input Terminal Pin Assignment

## 4.1. Input Signal & Power

| Pin | Description | | | Pin | Description | | |
|---|---|---|---|---|---|---|---|
| 1 | Vdd (12V) | | | 26 | Even LVDS Signal | Rx3[0]P | |
| 2 | Vdd (12V) | | | 27 | | Rx3[1]N | |
| 3 | Vdd (12V) | | | 28 | | Rx3[1]P | |
| 4 | Vdd (12V) | | | 29 | | Rx3[2]N | |
| 5 | Vdd (12V) | | | 30 | | Rx3[2]P | |
| 6 | N.C | | | 31 | | GND | |
| 7 | GND | | | 32 | | Rx3CLK- | |
| 8 | GND | | | 33 | | Rx3CLK+ | |
| 9 | GND | | | 34 | | GND | |
| 10 | Even LVDS Signal | Rx1[0]N | | 35 | | Rx3[3]N | |
| 11 | | Rx1[0]P | | 36 | | Rx3[3]P | |
| 12 | | Rx1[1]N | | 37 | | Rx3[4]N | NOTE3 |
| 13 | | Rx1[1]P | | 38 | | Rx3[4]P | NOTE3 |
| 14 | | Rx1[2]N | | 39 | GND | | |
| 15 | | Rx1[2]P | | 40 | No connection | | |
| 16 | | GND | | 41 | No connection | | |
| 17 | | Rx1CLK- | | 42 | No connection | | |
| 18 | | Rx1CLK+ | | 43 | No connection | | |
| 19 | | GND | | 44 | No connection | | |
| 20 | | Rx1[3]N | | 45 | No connection | | |
| 21 | | Rx1[3]P | | 46 | No connection | | |
| 22 | | Rx1[4]N | NOTE3 | 47 | No connection | | |
| 23 | | Rx1[4]P | NOTE3 | 48 | No connection | | |
| 24 | GND | | | 49 | No connection | | |
| 25 | Even LVDS | Rx3[0]N | | 50 | No connection | | |
| | | | | 51 | Aging EN | | NOTE4 |

Note 1) NOT CONNECTED : THIS PINS ARE ONLY USED FOR SEC INTERNAL OPERATIONS.

Note 2) IF LVDS 8Bit Input




Note(1) Pin number starts from Bottom side

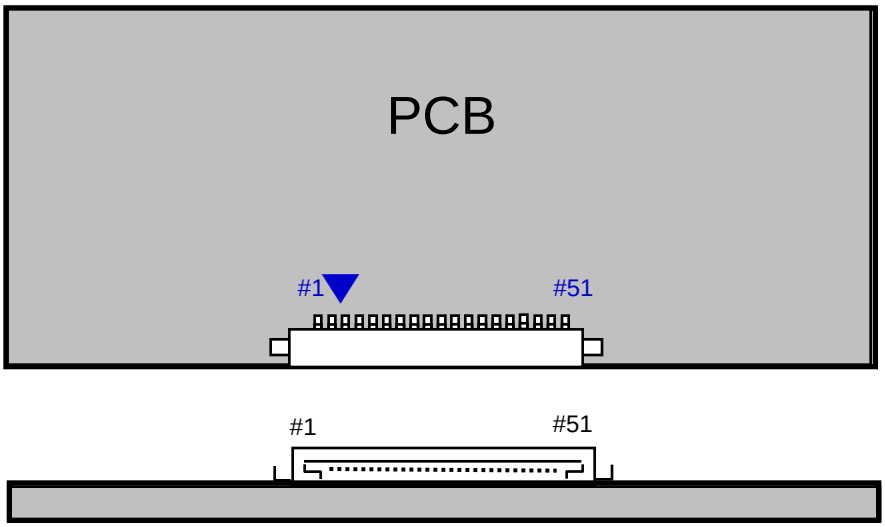



**Fig. Connector diagram**

a. Power GND pins should be connected to the LCD's metal chassis.
b. All power input pins should be connected together.
c. All NC pin should be separated from other signal or power.

## 4.2 LVDS Interface

- LVDS Receiver : Tcon (merged)  - Data Format (JEIDA)

| | LVDS pin | JEIDA -DATA |
|---|---|---|
| TxOUT/RxIN0 | TxIN/RxOUT0 | R2 |
| | TxIN/RxOUT1 | R3 |
| | TxIN/RxOUT2 | R4 |
| | TxIN/RxOUT3 | R5 |
| | TxIN/RxOUT4 | R6 |
| | TxIN/RxOUT6 | R7 |
| | TxIN/RxOUT7 | G2 |
| TxOUT/RxIN1 | TxIN/RxOUT8 | G3 |
| | TxIN/RxOUT9 | G4 |
| | TxIN/RxOUT12 | G5 |
| | TxIN/RxOUT13 | G6 |
| | TxIN/RxOUT14 | G7 |
| | TxIN/RxOUT15 | B2 |
| | TxIN/RxOUT18 | B3 |
| TxOUT/RxIN2 | TxIN/RxOUT19 | B4 |
| | TxIN/RxOUT20 | B5 |
| | TxIN/RxOUT21 | B6 |
| | TxIN/RxOUT22 | B7 |
| | TxIN/RxOUT24 | HSYNC |
| | TxIN/RxOUT25 | VSYNC |
| | TxIN/RxOUT26 | DEN |
| TxOUT/RxIN3 | TxIN/RxOUT27 | R0 |
| | TxIN/RxOUT5 | R1 |
| | TxIN/RxOUT10 | G0 |
| | TxIN/RxOUT11 | G1 |
| | TxIN/RxOUT16 | B0 |
| | TxIN/RxOUT17 | B1 |
| | TxIN/RxOUT23 | RESERVED |

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

| COLOR | DISPLAY (8bit) | DATA SIGNAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | GRAY SCALE LEVEL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | RED | | | | | | | | | | GREEN | | | | | | | | | | BLUE | | | | | | | | | | |
| | | R0 | R1 | R2 | R3 | R4 | R5 | R6 | R7 | R8 | R9 | G0 | G1 | G2 | G3 | G4 | G5 | G6 | G7 | G8 | G9 | B0 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | B8 | B9 | |
| BASIC COLOR | BLACK | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| | BLUE | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | - |
| | GREEN | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| | CYAN | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | - |
| | RED | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| | MAGENTA | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | - |
| | YELLOW | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| | WHITE | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 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 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | R0 |
| | DARK ↑ | 1 | 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 | R1 |
| | | 0 | 1 | 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 | R2 |
| | | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | R3~ R1020 |
| | ↓ LIGHT | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | |
| | | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | R1021 |
| | | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | R1022 |
| | RED | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | R1023 |
| 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 | 0 | G0 |
| | DARK ↑ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | G1 |
| | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | G2 |
| | | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | G3~ G1020 |
| | ↓ LIGHT | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | |
| | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | G1021 |
| | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | G1022 |
| | GREEN | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | G1023 |
| 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 | B0 |
| | DARK ↑ | 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 | B1 |
| | | 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 | B2 |
| | | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | B3~ B1020 |
| | ↓ LIGHT | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | |
| | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B1021 |
| | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B1022 |
| | BLUE | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B1023 |

Note) Definition of Gray :

Rn : Red Gray, Gn : Green Gray, Bn : Blue Gray (n = Gray level)

Input Signal : 0 = Low level voltage, 1 = High level voltage

# 5. Interface Timing

## 5.1 Timing Parameters ( Timing-Controller )

| SIGNAL | ITEM | SYMBOL | MIN. | TYP. | MAX. | Unit | NOTE |
|---|---|---|---|---|---|---|---|
| Clock | Frequency | $1/T_C$ | 260 | 297 | 305 | MHz | |
| Frame Frequency | Cycle | $T_V$ | 95 | 120 | 125 | Hz | |
| | | $T_H$ | 120 | 135 | 140 | KHz | |
| Vertical Display Term | Active Display Period | $T_{VD}$ | - | 1080 | - | Lines | |
| | Vertical Total | $T_{VB}$ | 1110 | 1125 | 1350 | Lines | |
| Horizontal Display Term | Active Display Period | $T_{HD}$ | - | 1920 | - | Clocks | |
| | Horizontal Total | $T_H$ | 2092 | 2200 | 2596 | clocks | |

Note) This product is DE only mode. The input of Hsync & Vsync signal does not have an effect on normal operation.

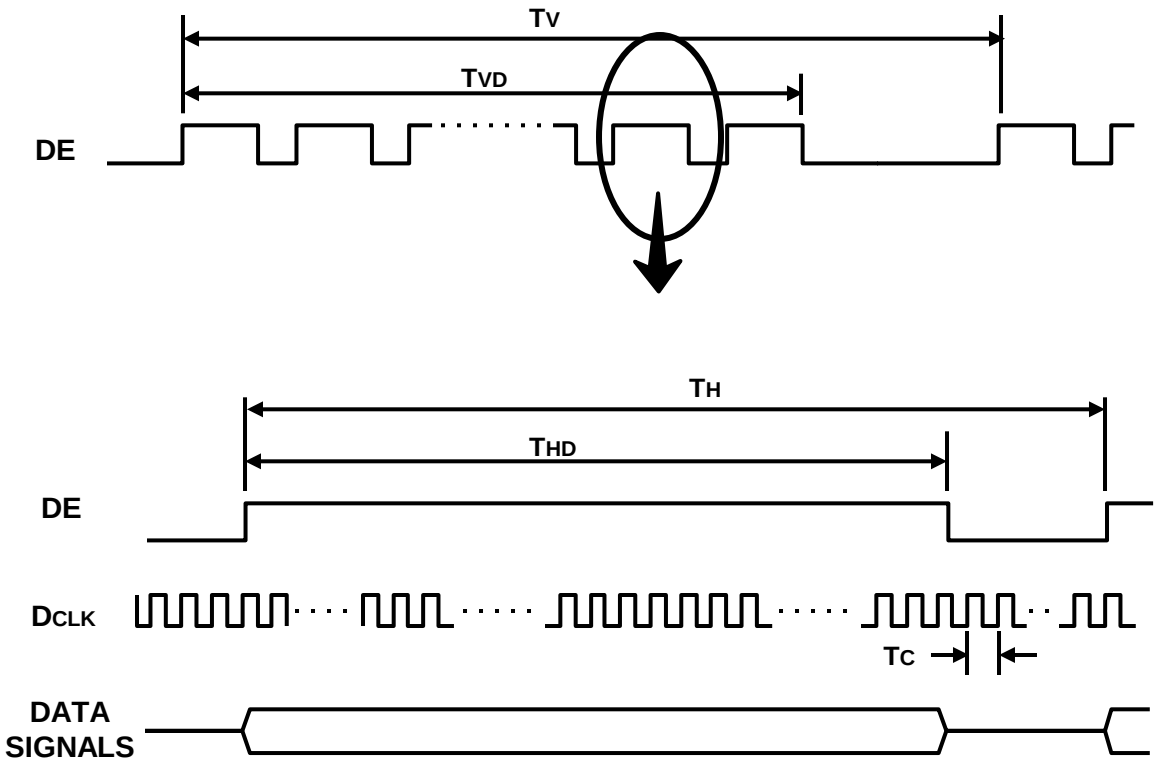
(1) Test Point : TTL control signal and CLK at LVDS Tx input terminal in system

(2) Internal $V_{DD}$ = 3.3V

(3) Spread spectrum

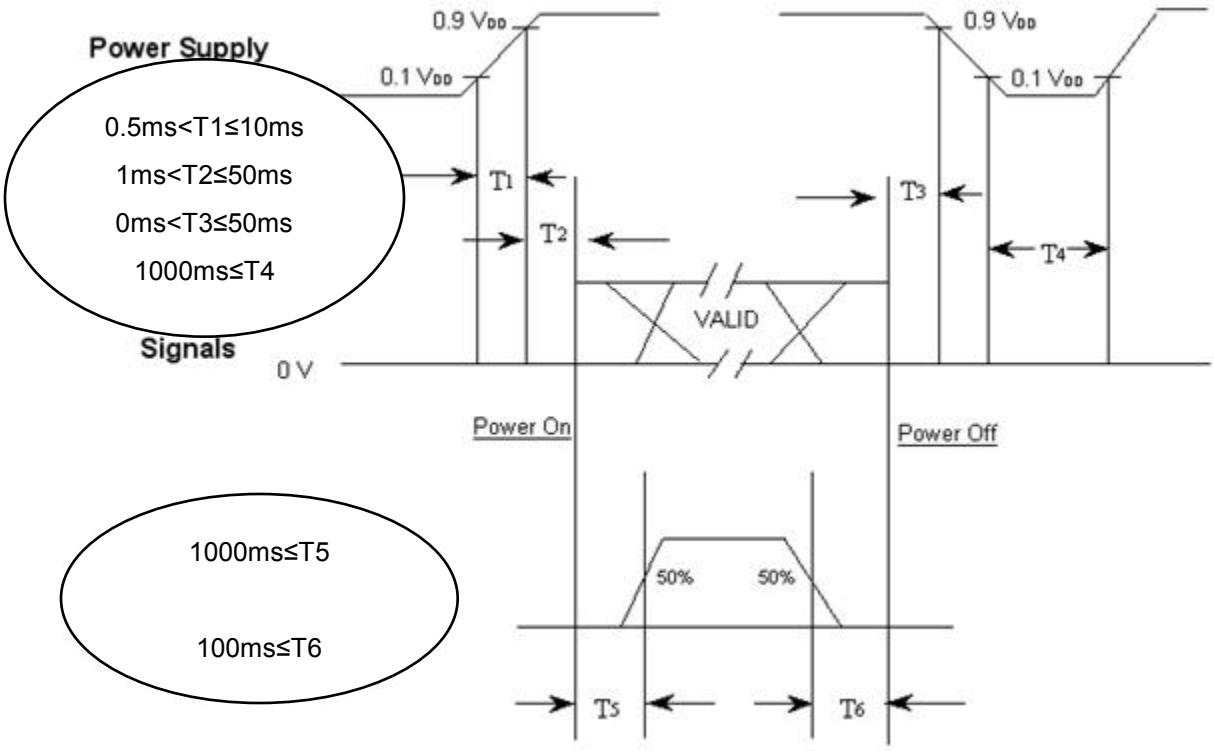
- Modulation rate (max) : ± 1.5 %
- Modulation Frequency : 30 ~ 300KHz

## 5.2 Timing diagrams of interface signal ( DE only mode )



## 5.3 Power ON/OFF Sequence

To prevent a latch-up or DC operation of the LCD Module, the power on/off sequence should be as the diagram below.




T1 : $V_{DD}$ rising time from 10% to 90%
T2 : The time from $V_{DD}$ to valid data at power ON.
T3 : The time from valid data off to $V_{DD}$ off at power Off.
T4 : $V_{DD}$ off time for Windows restart
T5 : The time from valid data to B/L enable at power ON.
T6 : The time from valid data off to B/L disable at power Off.

- The supply voltage of the external system for the Module input should be the same as the definition of $V_{DD}$.
- 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 show abnormal screen.
- In case of $V_{DD}$ = off level, please keep the level of input signals low or keep a high impedance.
- T4 should be measured after the Module has been fully discharged between power off and on period.
- Interface signal should not be kept at high impedance when the power is on.

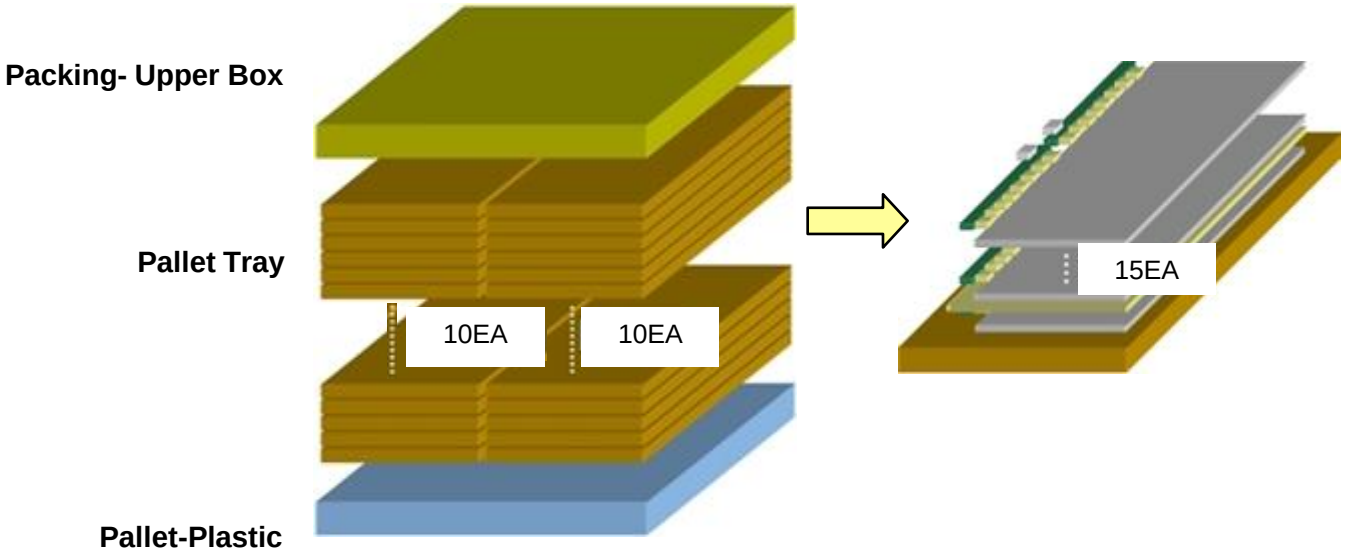
## 6. Outline Dimension

# 7. PACKING

## 7.1 CARTON (Internal Package)

(1) Packing Form Corrugated fiberboard box and corrugated cardboard as shock absorber

(2) Packing Method



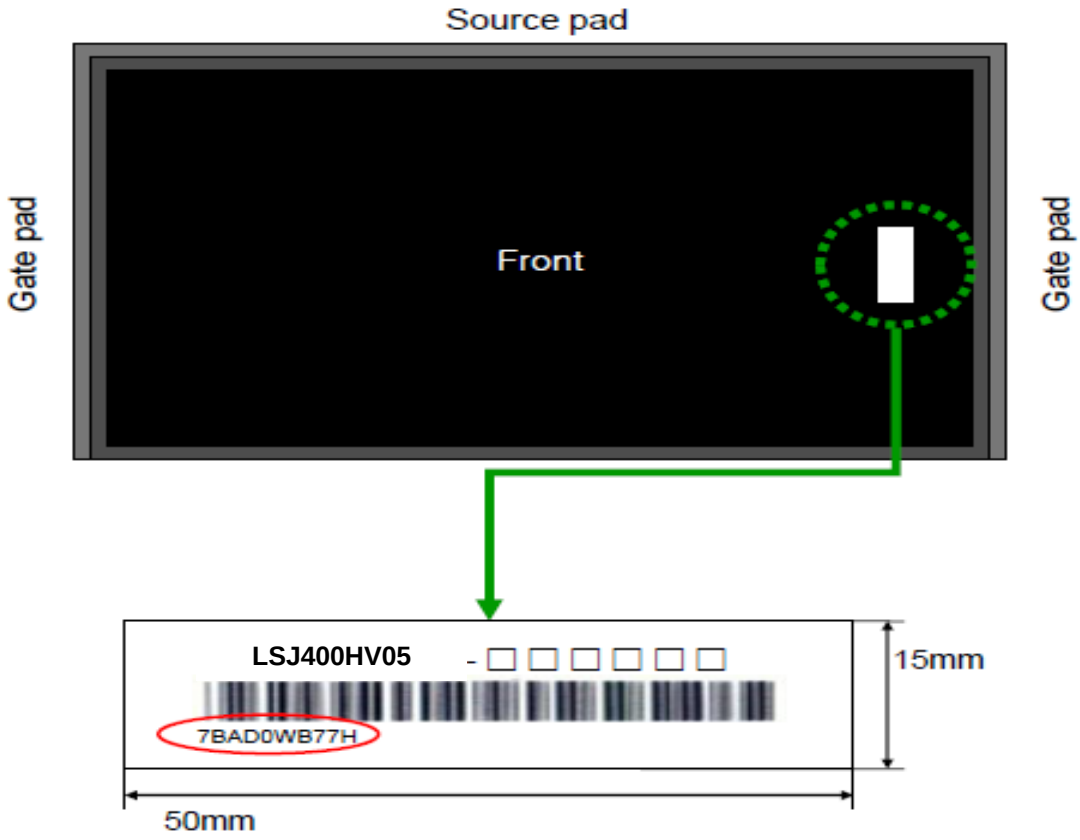

## 7.2 Packing Specification

| ITEM | Specification | Remark |
|---|---|---|
| LCD Packing | 300ea / Box | 1. 1.90 Kg / LCD (15[ea]/Tray, 300[ea]/Pallet)<br>2. 0.05 Kg / Middle sheet (18[ea]/Tray, 360[ea]/Pallet)<br>3. 1.60 Kg / Panel tray (10ea/Pallet)<br>4. 1.00 Kg / Packing Box (1ea) |
| Pallet-Wood | 1Box / Pallet | 1. Pallet weight = 27kg<br>2. 27 Kg / Pallet |
| Pallet size | H x V x height | 1,48500mm(H) x 1,150mm(V) x 1,192mm(height) |
| Pallet weight | 652 kg | Pallet(27kg) + Panel tray(32kg) + Panel(570kg)<br>+ Middle sheet(18Kg) + Packing Box (5kg) |

## 8. MARKING & OTHERS

A nameplate bearing followed by is affixed to a shipped product at the specified location on each product.

(1) Cell Label




Lot number : X X X X XXX XX X

- Cell Position No. (In the Glass)
- Glass No. (In the one Lot)
- Lot No. (Glass)
- Month
- Year (Note1)
- Product code
- Line

(2) Box Label


BOX Serial : X X X X X X XXXX XX XX

- Week
- Year
- Box No.
- Day
- Month
- Year
- Site
- Module Line
- Product Type

# 9. General Precautions

## 9.1 Handling

(a) When the Module is assembled, it should be attached to the system firmly using all mounting holes. Be careful not to twist and bend the Module.

(b) Refrain from strong mechanical shock and / or any force to the Module. In addition to damage, this may cause improper operation or damage to the Module and CCFL back light.

(c) Note that polarizers are very fragile and could be damage easily. Do not press or scratch the surface harder than a HB pencil lead.

(d) Wipe off water droplets or oil immediately. If you leave the droplets for a long time, staining or discoloration may occur.

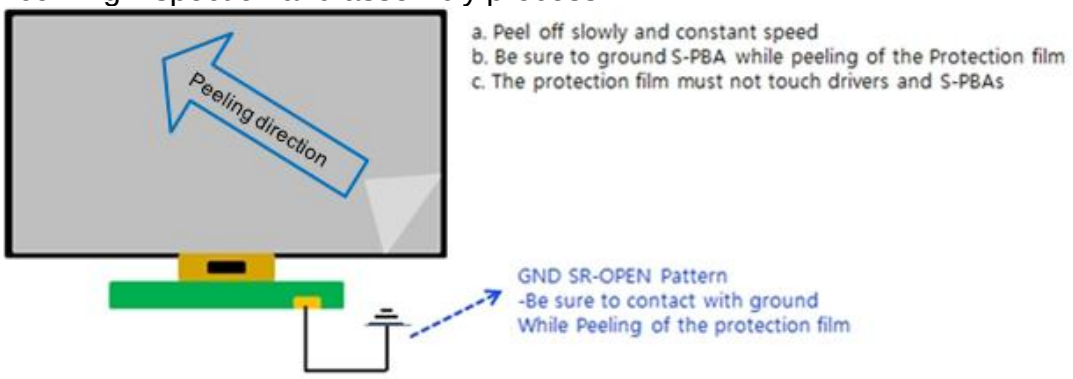
(e) If the surface of the polarizer is dirty, clean it using absorbent cotton or soft cloth.

(f) Desirable cleaners are water, IPA(Isopropyl Alcohol) or Hexane. Do not use Ketone type materials(ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.

(g) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth . In case of contact with hands, legs or clothes, it must be washed away with soap thoroughly.

(h) Protect the module from Electrostatic discharge. Otherwise the ASIC IC or Semiconductor would be damaged.

(i) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.




(k) Protection film for polarizer on the Module should be slowly peeled off just before use so that the electrostatic charge can be minimized. Must put on antistatic glove while handle a module

(l) Pins of I/F connector should not be touched directly with bare hands.

| | Item | Management standard value and performance standard |
|---|---|---|
| 1 | Anti-static mat (shelf) | 1 to 50 [Mohm] |
| 2 | Anti-static mat (floor, desk) | 1 to 100 [Mohm] |
| 3 | Ionizer | Attenuate from ± 1,000V to ± 100V within 2 sec |
| 4 | Anti-static wrist band | 0.8 to 10 [Mohm] |
| 5 | Anti-static wrist band entry and ground resistance | Below 1,000 [ohm] |
| 6 | Temperature | 0 ~ 35℃ |
| 7 | Humidity | 60 to 70 [%RH] |

## 9.2 Storage

We highly recommend to comply with the criteria in the table below

| ITEM | Unit | Min. | Max. |
|---|---|---|---|
| Storage Temperature | (℃) | 5 | 40 |
| Storage Humidity | (%rH) | 35 | 75 |
| Storage life | 6 months | | |

**Storage Condition**

- The storage room should provide good ventilation and temperature control.
- Products should not be placed on the floor, but on the Pallet away from a wall.
- Prevent products from direct sunlight, moisture nor water; Be cautious of a build up of condensation.
- Avoid other hazardous environment while storing goods.

| After | 1 month | 2 month | 3 month | 4month | 5 month | 6month |
|---|---|---|---|---|---|---|
| Baking | No backing | | 50℃ 10% 24Hr | 50℃ 10% 48Hr | | |

## 9.3 Operation

(a) Do not connect or disconnect the Module in the "Power On" condition.

(b) Power supply should always be turned on/off by the "Power on/off sequence"

(c) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference should be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.

(d) The cable between the back light connector and its inverter power supply should be connected directly with a minimized length. A longer cable between the back light and the inverter may cause lower luminance of lamp(CCFT) and may require higher startup voltage(Vs).

## 11.4 Operation Condition Guide

(a) The LCD product should be operated under normal conditions.
Normal condition is defined as below;
- Temperature : 20±15℃
- Humidity : 55±20%
- Display pattern : continually changing pattern (Not stationary)

(b) If the product will be used in extreme conditions such as high temperature, humidity, display patterns or operation time etc.., It is strongly recommended to contact SEC for Application engineering advice. Otherwise, its reliability and function may not be guaranteed. Extreme conditions are commonly found at Airports, Transit Stations, Banks, Stock market, and Controlling systems.

## 11.5 Others

(a) Ultra-violet ray filter is necessary for outdoor operation.

(b) Avoid condensation of water. It may result in improper operation or disconnection of electrode.

(c) Do not exceed the absolute maximum rating value. ( supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on)
Otherwise the Module may be damaged.

(d) If the Module keeps displaying the same pattern for a long period of time, the image may be "sticked" to the screen.
To avoid image sticking, it is recommended to use a screen saver.

(e) This Module has its circuitry PCB's on the rear side and should be handled carefully in order not to be stressed.

(f) Please contact SEC in advance when you display the same pattern for a long time.