# AZ DISPLAYS

# SPECIFICATIONS FOR LIQUID CRYSTAL DISPLAY

| CUSTOMER APPROVAL | | |
|---|---|---|
| | | |
| ※ **PART NO. :** ATM0800D9A-T (AZ DISPLAYS) VER1.0 | | |
| **APPROVAL** | | **COMPANY CHOP** |
| **CUSTOMER COMMENTS** | | |

| AZ DISPLAYS ENGINEERING APPROVAL | | |
|---|---|---|
| **DESIGNED BY** | **CHECKED BY** | **APPROVED BY** |
| GZC | ZZK | GuZH |

## REVISION RECORD

| REVISION | REVISION DATE | PAGE | CONTENTS |
|---|---|---|---|
| **VER1.0** | **2019-03-14** | | **FIRST ISSUED (BACKLIGHT LINE:190MM$\pm$10MM)** |

# ※ CONTENTS

## 1. GENERAL  SPECIFICATIONS

| Item | Specification | Remark |
|---|---|---|
| 1.  LCD size | 8.0 inch(Diagonal) | |
| 2.  Driver element | a-Si TFT active matrix | |
| 3.  Resolution | 800x(RGB)x600 | |
| 4.  Display mode | Normally white , Transmissive | |
| 5.  Dot Pitch (W*H) | 0.0675(W) × 0.2025(H) mm | |
| 6.  Pixel pitch(W*H) | 0.2025 (W) × 0.2025(H) mm | |
| 7.  Active  Area(W*H) | 162.0(W) × 121.5(H) mm | |
| 8.  Module size (W*H) | 183.0(W) × 141.0(H) × 8.0(D) mm | Note 1 |
| 9.  Surface treatment | Anti-glare | |
| 11.   Color arrangement | RGB-stripe | |
| 12.  Color | 16.7M | |
| 13.  Interface | 24bit RGB interface | |
| 14.  Weight | TBD | |
| 15.  RoHS | RoHS compliant | |

**Note 1:** **Please refer to mechanical drawing.**

## 2.  PIN ASSIGNMENT

**TFT LCD Panel Driving Section**

FPC Connector is used for the module electronics interface. The recommended model is
FH12A-50S-0.5SH manufactured by Hirose.

| PinNo. | Symbol | I/O | Function | Remark |
|--------|--------|-----|----------|--------|
| 1 | NC | | No connection | |
| 2 | NC | | No connection | |
| 3 | NC | | No connection | |
| 4 | NC | | No connection | |
| 5 | GND | P | Power ground | |
| 6 | VCOM | I | Common voltage | |
| 7 | VCC | P | Power for Digital circuit | |
| 8 | MODE | I | DE/SYNC mode select | Note3 |
| 9 | DE | I | Data Input Enable | |
| 10 | VS | I | Vertical Sync Input | |
| 11 | HS | I | Horizontal Sync Input | |
| 12 | B7 | I | Blue data(MSB) | |
| 13 | B6 | I | Blue data | |
| 14 | B5 | I | Blue data | |
| 15 | B4 | I | Blue data | |
| 16 | B3 | I | Blue data | |
| 17 | B2 | I | Blue data | |
| 18 | B1 | I | Blue data | |
| 19 | B0 | I | Blue data(LSB) | |
| 20 | G7 | I | Green data (MSB) | |
| 21 | G6 | I | Green data | |
| 22 | G5 | I | Green data | |
| 23 | G4 | I | Green data | |
| 24 | G3 | I | Green data | |
| 25 | G2 | I | Green data | |
| 26 | G1 | I | Green data | |
| 27 | G0 | I | Green data (LSB) | |
| 28 | R7 | I | Red data (MSB) | |
| 29 | R6 | I | Red data | |
| 30 | R5 | I | Red data | |

| 31 | R4 | I | Red data | |
| 32 | R3 | I | Red data | |
| 33 | R2 | I | Red data | |
| 34 | R1 | I | Red data | |
| 35 | R0 | I | Red data (LSB) | |
| 36 | GND | P | Power ground | |
| 37 | DCLK | I | Sample clock | |
| 38 | GND | P | Power ground | |
| 39 | L/R | I | Right/ left selection | Note2,5 |
| 40 | U/D | I | Up/down selection | Note2,5 |
| 41 | VGH | P | Gate ON voltage | |
| 42 | VGL | P | Gate OFF voltage | |
| 43 | AVDD | P | Power for Analog circuit | |
| 44 | RESET | I | Global reset pin. | Note1 |
| 45 | NC | | No connection | |
| 46 | VCOM | I | Common voltage | |
| 47 | DITHB | I | Dithering function | Note 4 |
| 48 | GND | P | Power ground | |
| 49 | NC | | No connection | |
| 50 | NC | | No connection | |

I: input, O: output, P: Power

Note 1: Global reset pin. Active Low to enter Reset State. Suggest to connecting with an RC reset circuit for stability. Normally pull high.

Note 2: Selection of scanning mode

| Setting of scan control input | | Scanning direction |
|---|---|---|
| U/D | R/L | |
| GND | $V_{CC}$ | Up to down, left to right |
| $V_{CC}$ | GND | Down to up, right to left |
| GND | GND | Up to down, right to left |
| $V_{CC}$ | $V_{CC}$ | Down to up, left to right |

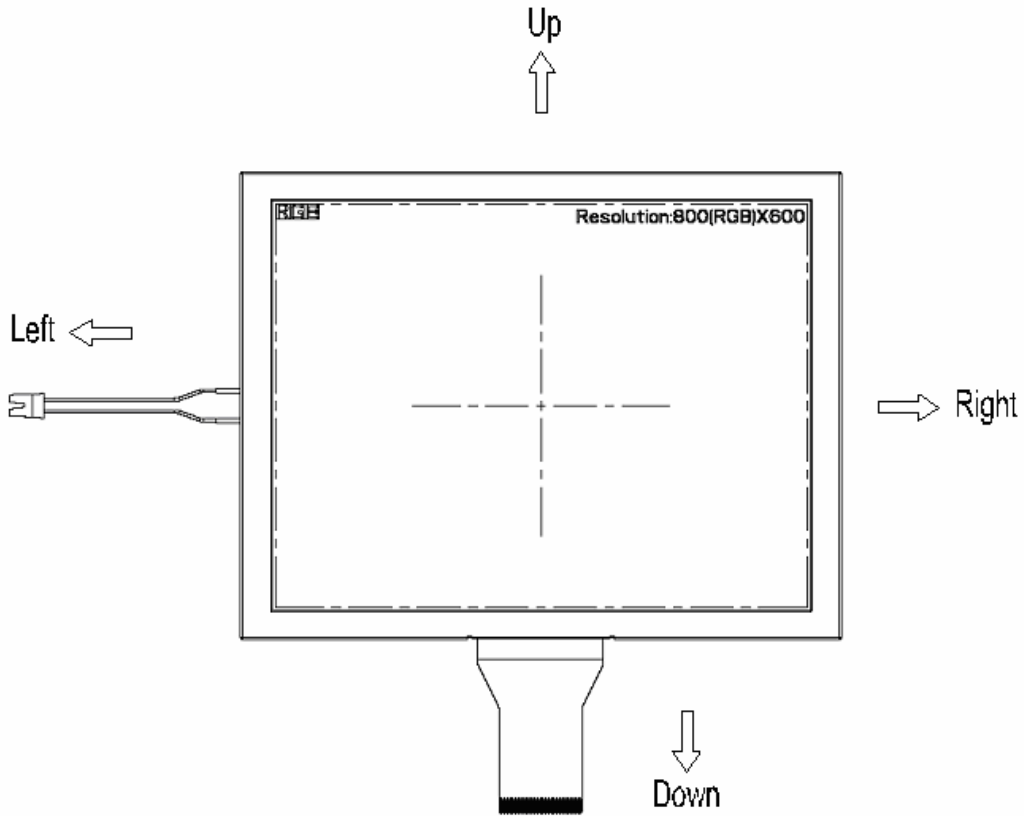Note 3: DE/SYNC mode select, Normally pull high.
  H: DE mode.
  L: HS/VS mode.
Note4: Dithering function enable control.Normally pull high.
  DITHB="1" ,Disable internal dithering function. For 18bit RGB interface, connect two LSB bits of all the R/G/B data buses to GND.
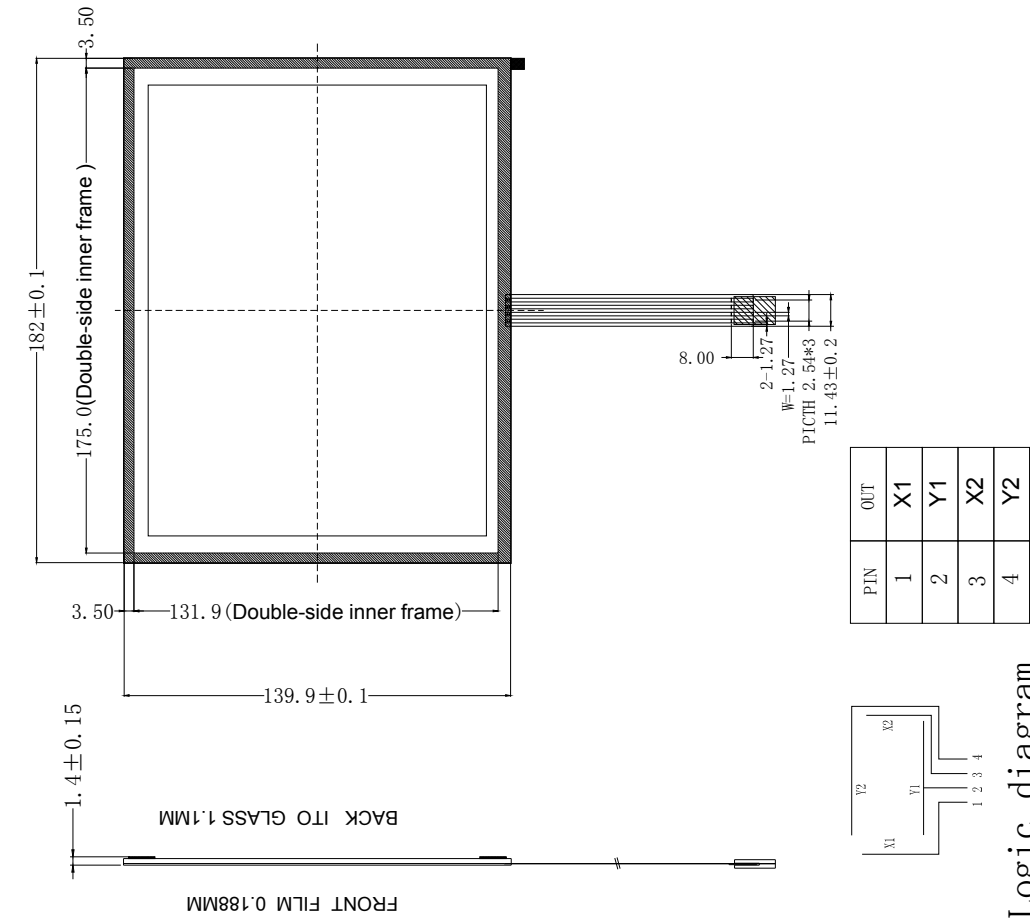
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DITHB=ï¼0ï¼ï¼Enable internal dithering function, For TTL 24bit parallel RGB image
data input.

Note 5: Definition of scanning direction.
Refer to the figure as below:

**Touch Panel Section**



3.50

182±0.1

175.0（Double-side inner frame）

3.50 — 131.9（Double-side inner frame）

139.9±0.1

8.00

2-1.27
W=1.27
PICTH 2.54*3
11.43±0.2

| PIN | OUT |
|-----|-----|
| 1 | X1 |
| 2 | Y1 |
| 3 | X2 |
| 4 | Y2 |

Logic diagram

1.4±0.15

BACK ITO GLASS 1.1MM

FRONT FILM 0.188MM

9.95

95.70±1

87.70±0.5

12.00

182.5 +0.00 −0.20

A.A 162.7

91.25±0.5

X2

Y2

Y1

X1

A.A 122.5

9.2

140.4 +0.00 −0.20
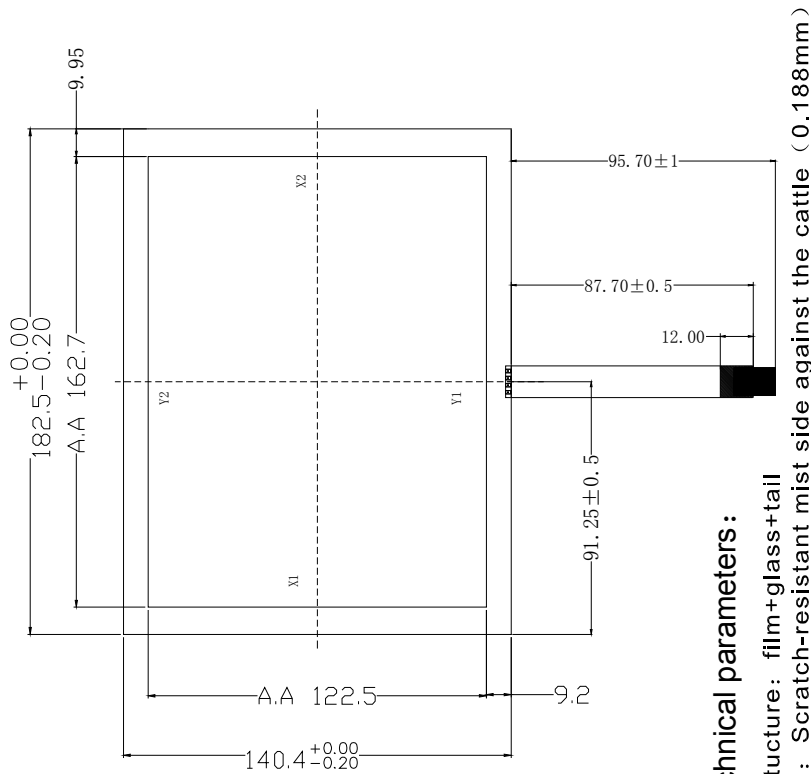
**Technical parameters：**

1.Stucture： film+glass+tail
film: Scratch-resistant mist side against the cattle （0.188mm）
glass:1.1mm
tail: FPC (pitch2.54)
2.Circuit: DC5V 1mA
3.Insulation resistance： ≥20MΩ (25V DC)
4.Linearity： ≤1.5％
5.Light transmittance： ≥78％
6Operating pressure： 50-120g
7.Operating temperature： -10℃～+60℃,
8.Storage temperature： -20℃～+70℃,
9.X:200-900ΩY:200-900Ω.
10.Unmark tolerance:±0.50

## 3. Operating Specification

### 3.1  ABSOLUTE MAXIMUM RATINGS

| Item | Symbol | Values | | Unit | Remark |
|------|--------|--------|--------|------|--------|
| | | Min. | Max. | | |
| Power Voltage | $DV_{DD}$ | -0.3 | 5.0 | V | |
| | $AV_{DD}$ | -0.5 | 13.5 | V | |
| | $V_{GH}$ | 13.0 | 19.0 | V | |
| | $V_{GL}$ | -12.0 | -2.0 | V | |
| | $V_{GH}$-$V_{GL}$ | -- | 31 | V | |
| Operation Temperature | $T_{OP}$ | -20 | 70 | ℃ | |
| Storage Temperature | $T_{ST}$ | -30 | 80 | ℃ | |
| LED Reverse Voltage | $V_R$ | - | 1.2 | V | Each LED Note 2 |
| LED Forward Current | $I_F$ | | 25 | mA | Each LED |

**Note 1**: The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

**Note 2**: $V_R$ Conditions: Zener Diode 20mA

### 3.1.1 Typical Operation Conditions

| Item | Symbol | Values | | | Unit | Remark |
|------|--------|--------|------|------|------|--------|
| | | Min. | Typ. | Max. | | |
| Power Voltage | $DV_{DD}$ | 3.1 | 3.3 | 3.5 | V | Note 2 |
| | $AV_{DD}$ | 10.2 | 10.4 | 10.6 | V | |
| | $V_{GH}$ | 15.3 | 16.0 | 16.7 | V | |
| | $V_{GL}$ | -7.7 | -7 | -6.3 | V | |
| Input Signal Voltage | $V_{COM}$ | 2.8 | 3.8 | 4.8 | V | |
| Input Logic High Voltage | $V_{IH}$ | $0.8DV_{DD}$ | -- | $DV_{DD}$ | V | Note 3 |
| Input Logic Low Voltage | $V_{IL}$ | 0 | -- | $0.2DV_{DD}$ | V | Note 3 |

**Note 1**: Be sure to apply $DV_{DD}$ and $V_{GL}$ to the LCD first, and then apply $V_{GH}$.
**Note 2**: $DV_{DD}$ setting should match the signals output voltage (refer to Note 3) of customer's system board.
**Note 3**: DCLK,HS,VS,RESET,U/D, L/R,DE,R0~R7,G0~G7,B0~B7,MODE,DITHB.

### 3.1.2 Current Consumption

| Item | Symbol | Values | | | Unit | Remark |
|------|--------|--------|------|------|------|--------|
| | | Min. | Typ. | Max. | | |
| Power Voltage | $I_{GH}$ | -- | 0.2 | 0.5 | mA | $V_{GH}$=16.0V |
| | $I_{GL}$ | -- | 0.2 | 1.0 | mA | $V_{GL}$=-7.0V |
| | $I_{DVDD}$ | -- | 5.5 | 10 | mA | $DV_{DD}$=3.3V |
| | $I_{AVDD}$ | -- | 32 | 50 | mA | $AV_{DD}$=10.4V |

## 3.1.3 Backlight driving conditions

| Item | Symbol | Values | | | Unit | Remark |
|------|--------|--------|--------|--------|------|--------|
| | | Min. | Typ. | Max. | | |
| **Voltage for LED Backlight** | $V_L$ | 8.8 | 9.2 | 9.6 | V | Note 1 |
| **Current for LED Backlight** | $I_L$ | -- | 200 | -- | mA | |
| **LED life time** | -- | 20000 | -- | -- | Hr | Note 2 |

**Note 1**: The LED Supply Voltage is defined by the number of LED at Ta=25℃ and $I_L$ =100mA.

**Note 2**: The "LED life time" is defined as the module brightness decrease to 50% original brightness at Ta=25℃ and $I_L$ =100mA.

## 3.2 Power Sequence

### a.Power on:
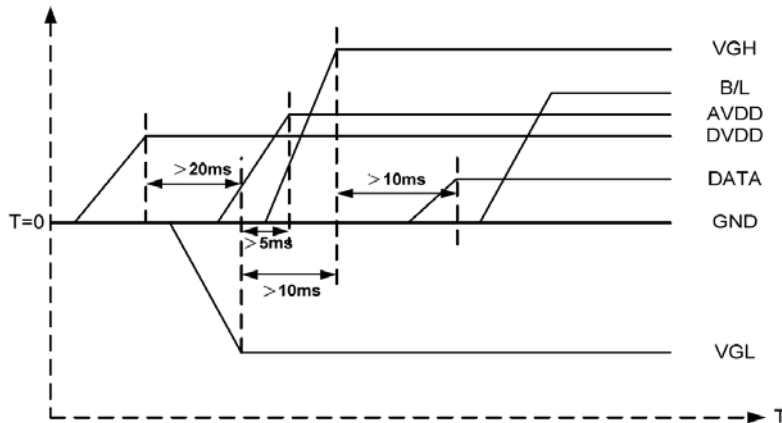


$DV_{DD} \rightarrow V_{GL} \rightarrow V_{GH} \rightarrow Data \rightarrow B/L$

### b.Power off:
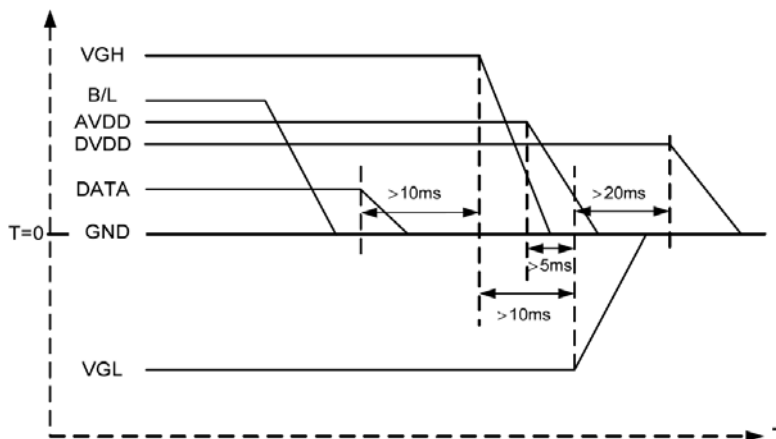


$B/L \rightarrow Data \rightarrow V_{GH} \rightarrow V_{GL} \rightarrow DV_{DD}$

**Note**: Data include R0~R7, B0~B7, G0~G7, U/D, L/R, DCLK, HS,VS,DE.

## 3.3 Timing Characteristics

### 3.3.1 AC Electrical Characteristics

| Item | Symbol | Values | | | Unit | Remark |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| **HS Setup Time** | Thst | 8 | -- | -- | ns | |
| **HS Hold Time** | Thhd | 8 | -- | -- | ns | |
| **VS Setup Time** | Tvst | 8 | -- | -- | ns | |
| **VS Hold Time** | Tvhd | 8 | -- | -- | ns | |
| **Data Setup Time** | Tdsu | 8 | -- | -- | ns | |
| **Data Hold Time** | Tdhd | 8 | -- | -- | ns | |
| **DE Setup Time** | Tesu | 8 | -- | -- | ns | |
| **DE Hold Time** | Tehd | 8 | -- | -- | ns | |
| **$DV_{DD}$ Power On Slew Time** | TPOR | -- | -- | 20 | ms | From 0 to 90% $DV_{DD}$ |
| **Reset Pulse Width** | TRst | 10 | -- | -- | ms | |
| **DCLK Cycle Time** | Tcoh | 20 | -- | -- | ns | |
| **DCLK Pulse Duty** | Tcwh | 40 | 50 | 60 | % | |

## 3.3.2 Data Input Format
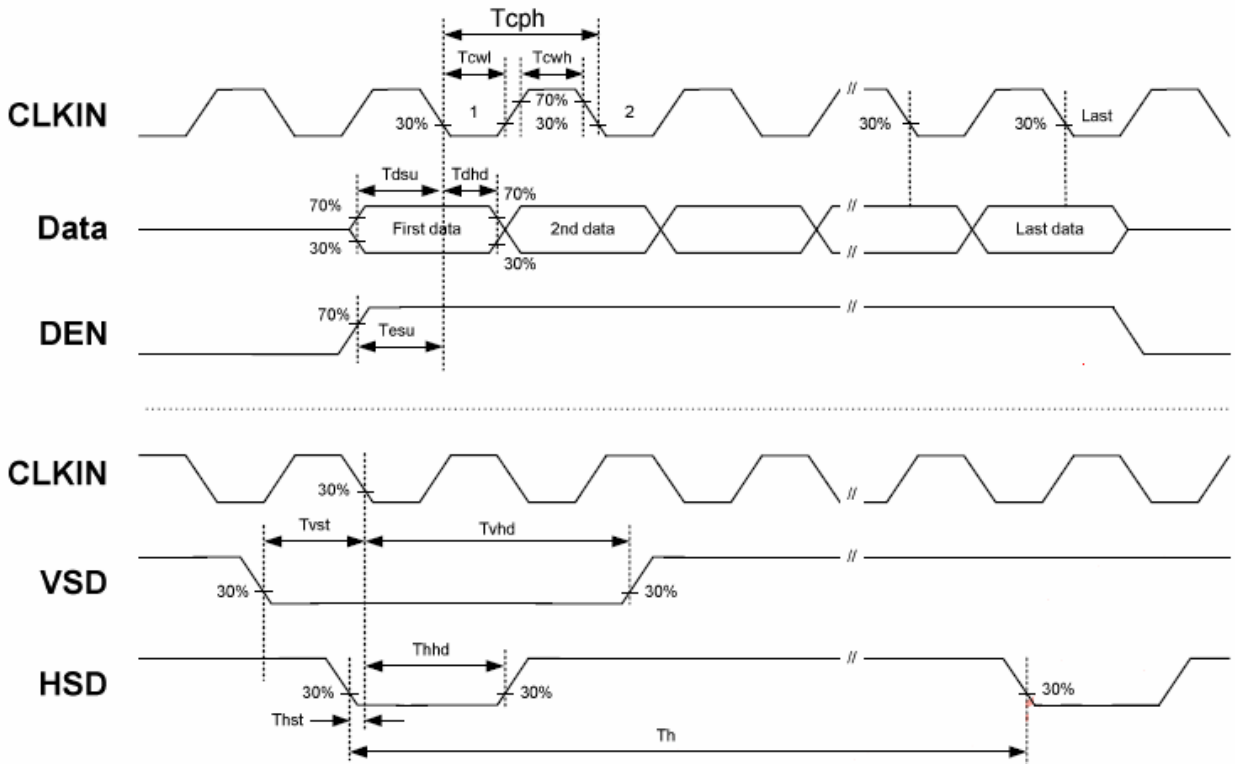


**Figure 3.1 Input Clock and Data Timing Diagram**
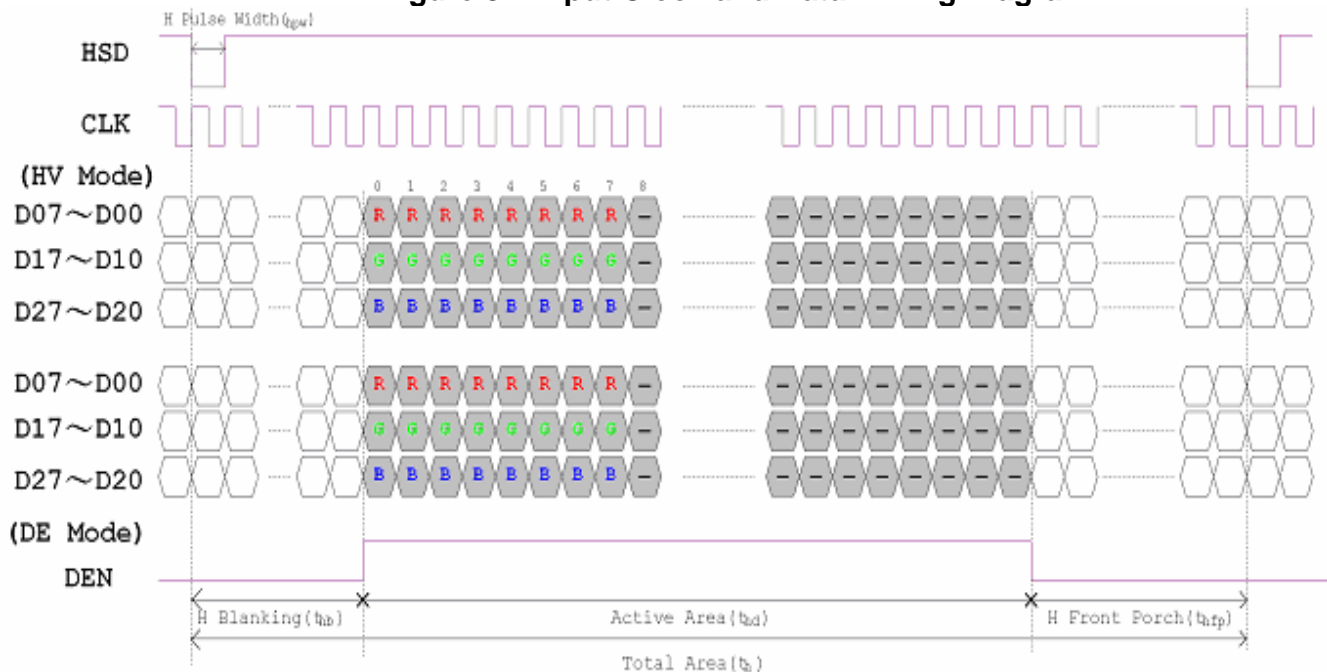


**Figure 3.2 Horizontal input timing diagram.**

### 3.3.3 Timing

| Item | Symbol | Values | | | Unit | Remark |
|------|--------|--------|------|------|------|--------|
| | | Min. | Typ. | Max. | | |
| **Horizontal Display Area** | thd | -- | 800 | -- | DCLK | |
| **DCLK Frequency** | fclk | -- | 40 | 50 | MHz | |
| **One Horizontal Line** | th | 862 | 1056 | 1200 | DCLK | |
| **HS Pulse Width** | thpw | 1 | -- | 40 | DCLK | |
| **HS Blanking** | thb | 46 | 46 | 46 | DCLK | |
| **HS Front Porch** | thfp | 16 | 210 | 354 | DCLK | |

| Item | Symbol | Values | | | Unit | Remark |
|------|--------|--------|------|------|------|--------|
| | | Min. | Typ. | Max. | | |
| **Vertical Display Area** | tvd | -- | 600 | -- | TH | |
| **VS Period Time** | tv | 624 | 635 | 700 | TH | |
| **VS Pulse Width** | tvpw | 1 | -- | 20 | TH | |
| **VS Blanking** | tvb | 23 | 23 | 23 | TH | |
| **VS Front Porch** | tvfp | 1 | 12 | 77 | TH | |

## 4.0 OPTICAL SPECIFICATIONS

| Item | Symbol | Condition | Values | | | Unit | Remark |
|---|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | | |
| Viewing Angle (CR≥10) | $\theta_L$ | Φ=180°(9 O'CLOCK) | 60 | 70 | -- | degree | Note 1 |
| | $\theta_R$ | Φ=0°(3 O'CLOCK) | 60 | 70 | -- | | |
| | $\theta_T$ | Φ=90°(12 O'CLOCK) | 60 | 70 | -- | | |
| | $\theta_B$ | Φ=270°(6 O'CLOCK) | 40 | 50 | -- | | |
| Response Time | $T_{ON}$ | | -- | 10 | 20 | msec | Note 3 |
| | $T_{OFF}$ | | -- | 15 | 30 | msec | Note 3 |
| Contrast Ratio | CR | | 400 | 500 | -- | -- | Note 4 |
| Color Chromaticity | $W_X$ | Normal Θ=Φ=0° | 0.26 | 0.31 | 0.36 | -- | Note 2 |
| | $W_Y$ | | 0.28 | 0.33 | 0.38 | -- | Note 5 Note 6 |
| Luminance | L | | 240 | 280 | -- | $cd/m^2$ | Note 6 |
| Luminance Uniformity | YU | | 70 | 75 | -- | % | Note 7 |

Test Conditions:
1. IL=100mA (Backlight current), the ambient temperature is 25℃.
2. The test systems refer to Note 2.

**Note 1**: Definition of viewing angle range
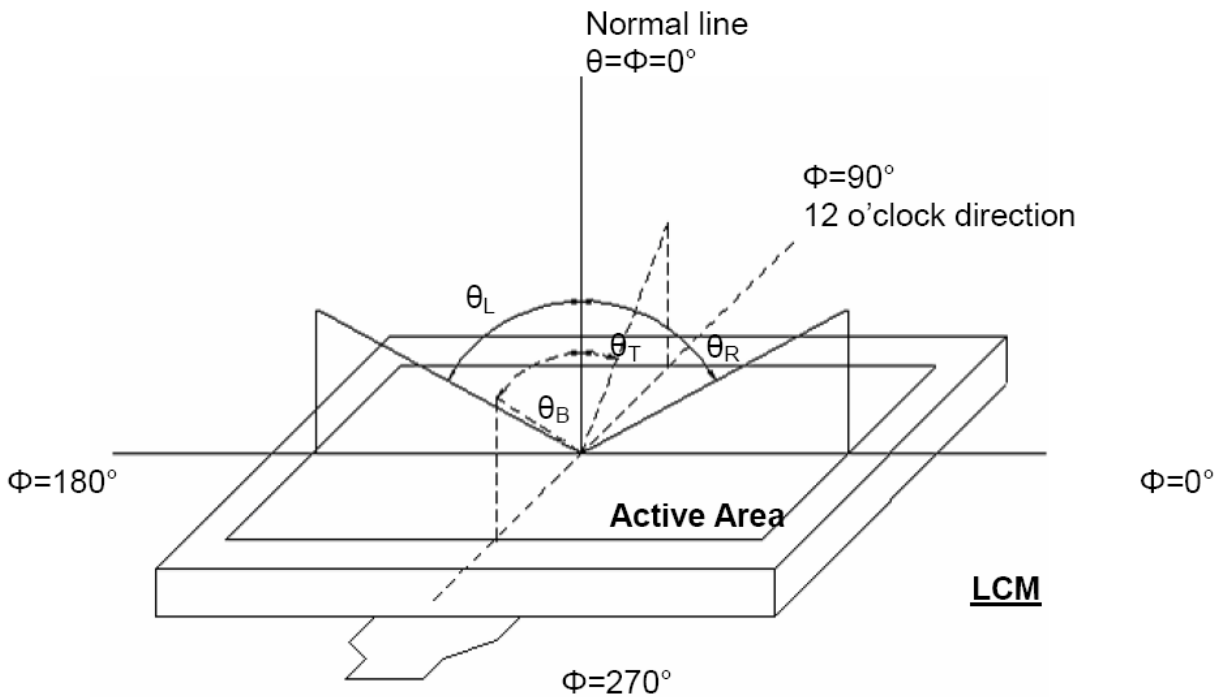


Figure 4.1 Definition of viewing angle.

**Note 2**: Definition of optical measurement system.
The optical characteristics should be measured in dark room. After 30 minutes  operation, the optical properties are measured at the center point of the LCD screen. (Response time is measured by Photo detector TOPCON
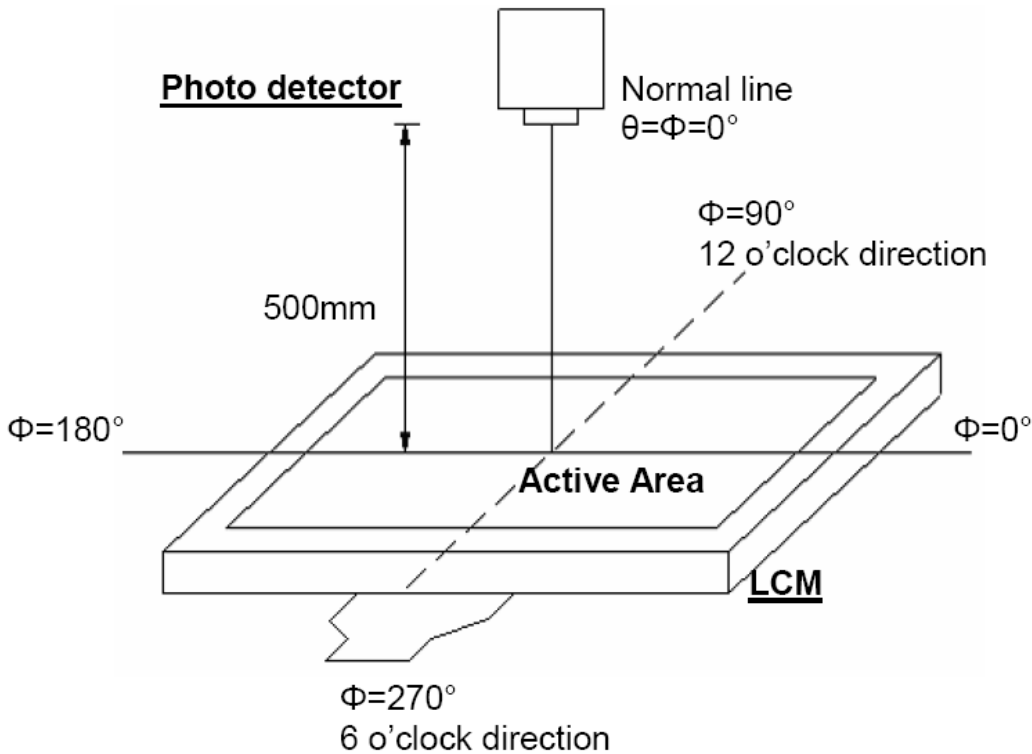
Figure 4.2 Optical measurement system setup

**Note 3**: Definition of Response time
The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time (TON) is the time between photo detector output intensity changed from 90% to 10%. And fall time (TOFF) is the time between photo detector output intensity changed from 10% to 90%.
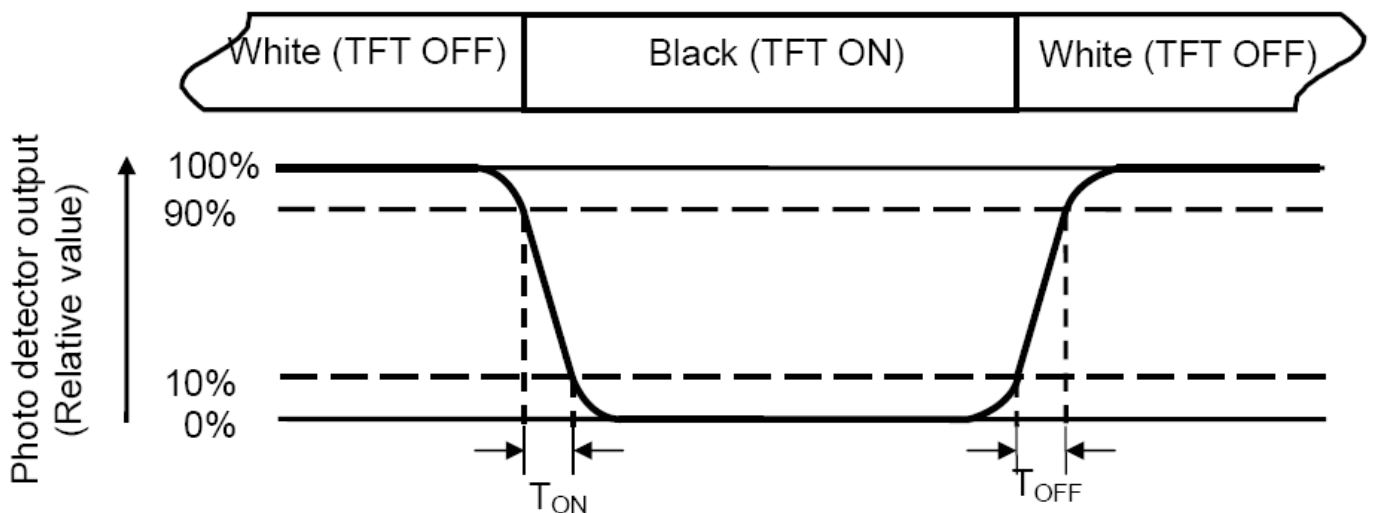
Figure 4.3 Definition of response.

**Note 4**: Definition of contrast ratio

$$Contrast\ ratio(CR)= \frac{Luminance\ measured\ when\ LCD\ on\ the\ ”white”\ state}{Luminance\ measured\ when\ LCD\ on\ the\ ”black”\ state}$$

**Note 5**: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

**Note 6**: All input terminals LCD panel must be ground while measuring the center area of the panel.

**Note 7**: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer to Fig. 4-4 ).Every measuring point is placed at the center of each measuring area.

$$Luminance\ \ Uniformity\ (Yu) = \frac{B_{min}}{B_{max}}$$

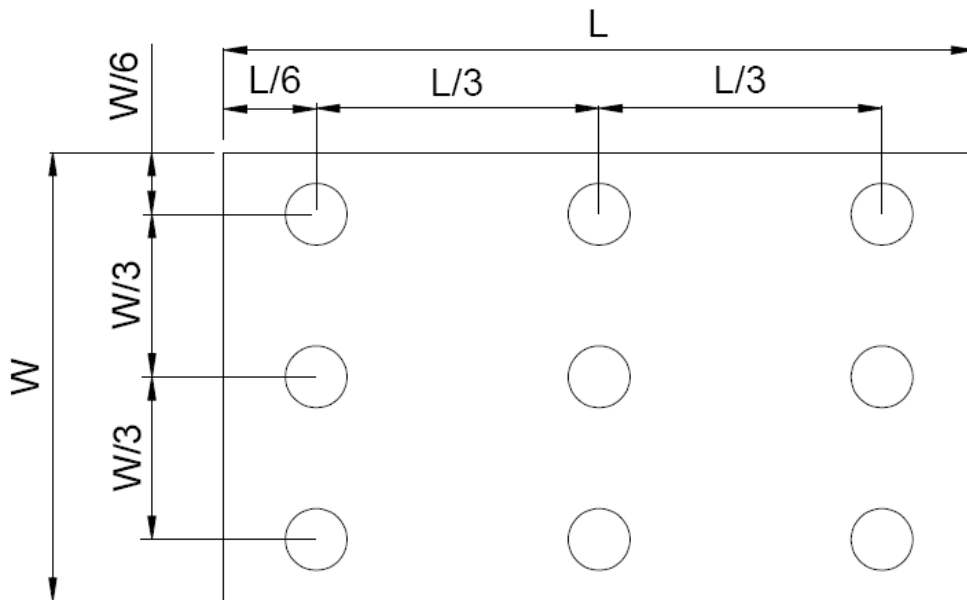L-------Active area length      W----- Active area width



Figure 4.3 Definition of measuring points.

Bmax: The measured maximum luminance of all measurement position.

Bmin:  The measured minimum luminance of all measurement position.

## 5. RELIABILITY TEST

| Item | Test Condition Item | Remark |
|---|---|---|
| High temperature storage | Ta= 80 ºC 120hrs | Note 1<br>Note 4 |
| Low temperature storage | Ta=-30 ºC  120hrs | Note 1<br>Note 4 |
| High temperature operation | Ts= 70 ºC  120hrs | Note 2<br>Note 4 |
| Low temperature operation | Ts=-20 ºC  120hrs | Note 1<br>Note 4 |
| High temperature/High humidity  operation | 90% RH  60ºC  120hrs | Note 4 |
| Thermal Shock | -30℃/30 min ~ +80℃/30 min for a total 50 cycles, Start with cold temperature and end with high temperature. | Note 4 |
| Vibration test | Freq:10~55~10Hz<br>Amplitude:1.5mm<br>1 hours for each direction of X,Y,Z<br>(3 hours for total) | |
| Mechanical shock | 50G 6ms,±X, ±Y, ±Z 3 times for each direction | |
| Package vibration test | Random Vibration :<br>0.015G*G/Hz from 5-200HZ, -6dB/Octave from 200-500HZ<br>1 hours for each direction of X. Y. Z.<br>(3 hours for total) | |
| Package drop test | Height:60 cm<br>1 corner, 3 edges, 6 surfaces | |
| Electro static discharge | ± 2KV, Human Body Mode, 100pF/1500Ω | |

**Note 1**: Ta is the ambient temperature of samples.
**Note 2**: Ts is the temperature of panel's surface.
**Note 3**: In the standard condition, there shall be no practical problem that may affect the
display function. After the reliability test, the product only guarantees operation,
but don't guarantee all of the cosmetic specification.
**Note 4**: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours
 at room temperature.

# 6. PRECAUTION FOR USING LCM

1. When design the product with this LCD Module, make sure the viewing angle matches to its purpose of usage.
2. As LCD panel is made of glass substrate, Dropping the LCD module or banging it against hard objects may cause cracking or fragmentation. Especially at corners and edges.
3. Although the polarizer of this LCD Module has the anti-glare coating, always be careful not to scratch its surface. Use of a plastic cover is recommended to protect the surface of polarizer.
4. If the LCD module is stored at below specified temperature, the LC material may freeze and be deteriorated. If it is stored at above specified temperature, the molecular orientation of the LC material may change to Liquid state and it may not revert to its original state. Excessive temperature and humidity could cause polarizer peel off or bubble. Therefore, the LCD module should always be stored within specified temperature range.
5. Saliva or water droplets must be wiped off immediately as those may leave stains or cause color changes if remained for a long time. Water vapor will cause corrosion of ITO electrodes.
6. If the surface of LCD panel needs to be cleaned, wipe it swiftly with cotton or other soft cloth. If it is not still clean enough, blow a breath on the surface and wipe again.
7. The module should be driven according to the specified ratings to avoid malfunction and permanent damage. Applying DC voltage cause a rapid deterioration of LC material. Make sure to apply alternating waveform by continuous application of the M signal. Especially the power ON/OFF sequence should be kept to avoid latch-up of driver LSIs and DC charge up to LCD panel.
8. Mechanical Considerations
   a) LCM are assembled and adjusted with a high degree of precision. Avoid excessive shocks and do not make any alterations or modifications. The following should be noted.
   b) Do not tamper in any way with the tabs on the metal frame.
   c) Do not modify the PCB by drilling extra holes, changing its outline, moving its components or modifying its pattern.
9. Static Electricity
   a) Operator

Wear the electrostatics shielded clothes because human body may be statically charged if not ware shielded clothes. Never touch any of the conductive parts such as the LSI pads; the copper leads on the PCB and the interface terminals with any parts of the human body.

   b) Equipment

There is a possibility that the static electricity is charged to the equipment, which has a function of peeling or friction action (ex: conveyer, soldering iron, working table). Earth the equipment through proper resistance (electrostatic earth: $1 \times 10^8$ ohm).

Only properly grounded soldering irons should be used.

If an electric screwdriver is used, it should be well grounded and shielded from commutator sparks.

The normal static prevention measures should be observed for work clothes and working benches; for the latter conductive (rubber) mat is recommended.

   c) Floor

Floor is the important part to drain static electricity, which is generated by operators or equipment.

There is a possibility that charged static electricity is not properly drained in case of insulating floor. Set the electrostatic earth (electrostatic earth: $1 \times 10^8$ ohm).

   d) Humidity

Proper humidity helps in reducing the chance of generating electrostatic charges. Humidity should be kept over 50%RH.

   e) Transportation/storage

The storage materials also need to be anti-static treated because there is a possibility that the human body or storage materials such as containers may be statically charged by friction or peeling.

The modules should be kept in antistatic bags or other containers resistant to static for storage.

   f) Soldering

Soldering anything to this TFT display would void the warranty.

   g) Others

The laminator (protective film) is attached on the surface of LCD panel to prevent it from scratches or stains. It should be peeled off slowly using static eliminator.
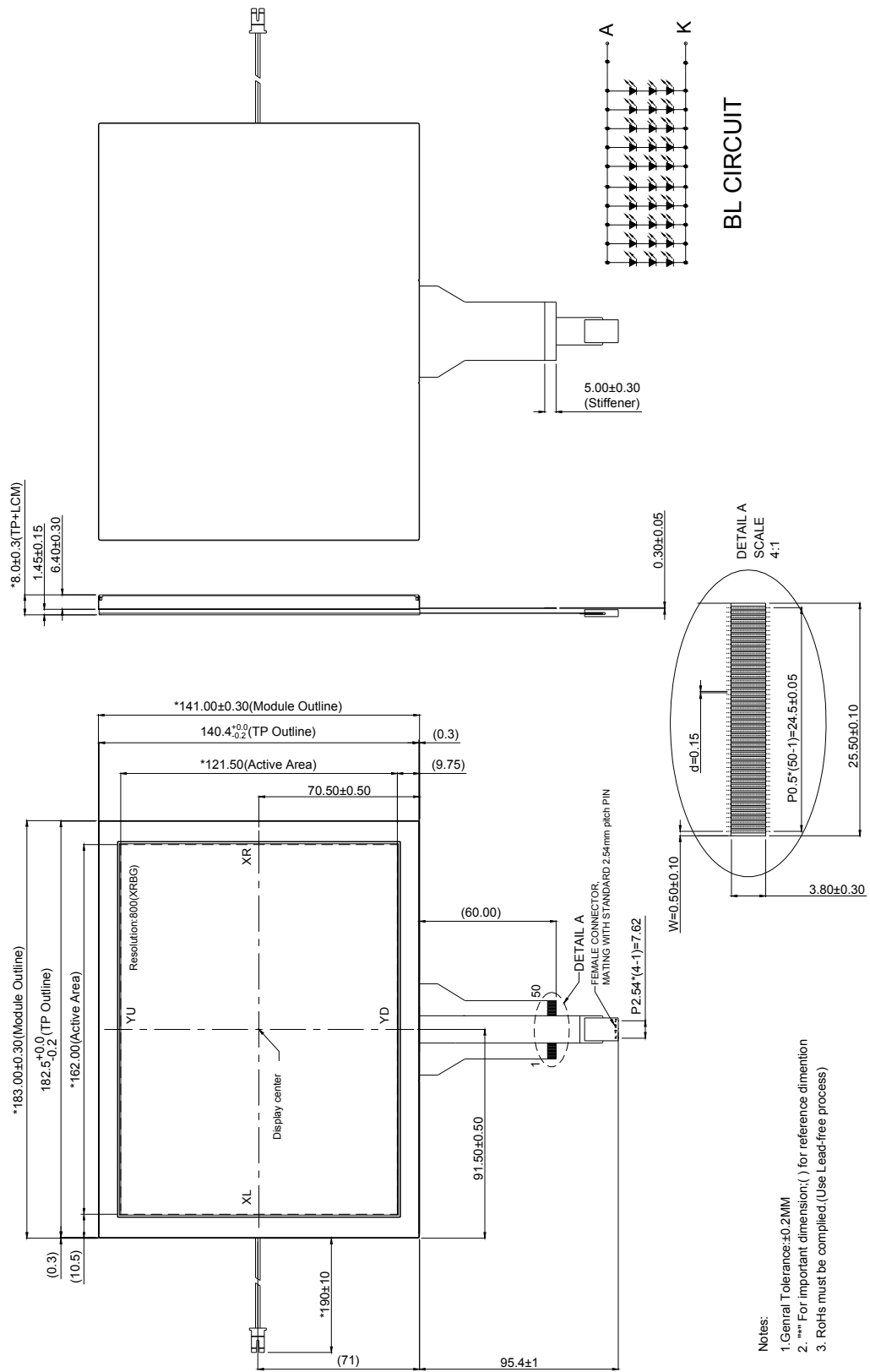
Static eliminator should also be installed to the workbench to prevent LCD module from static charge.

10. Operation
    a) Driving voltage should be kept within specified range; excess voltage shortens display life.
    b) Response time increases with decrease in temperature.
    c) Display may turn black or dark blue at temperatures above its operational range; this is (however not pressing on the viewing area) may cause the segments to appear "fractured".
    d) Mechanical disturbance during operation (such as pressing on the viewing area) may cause the segments to appear "fractured".
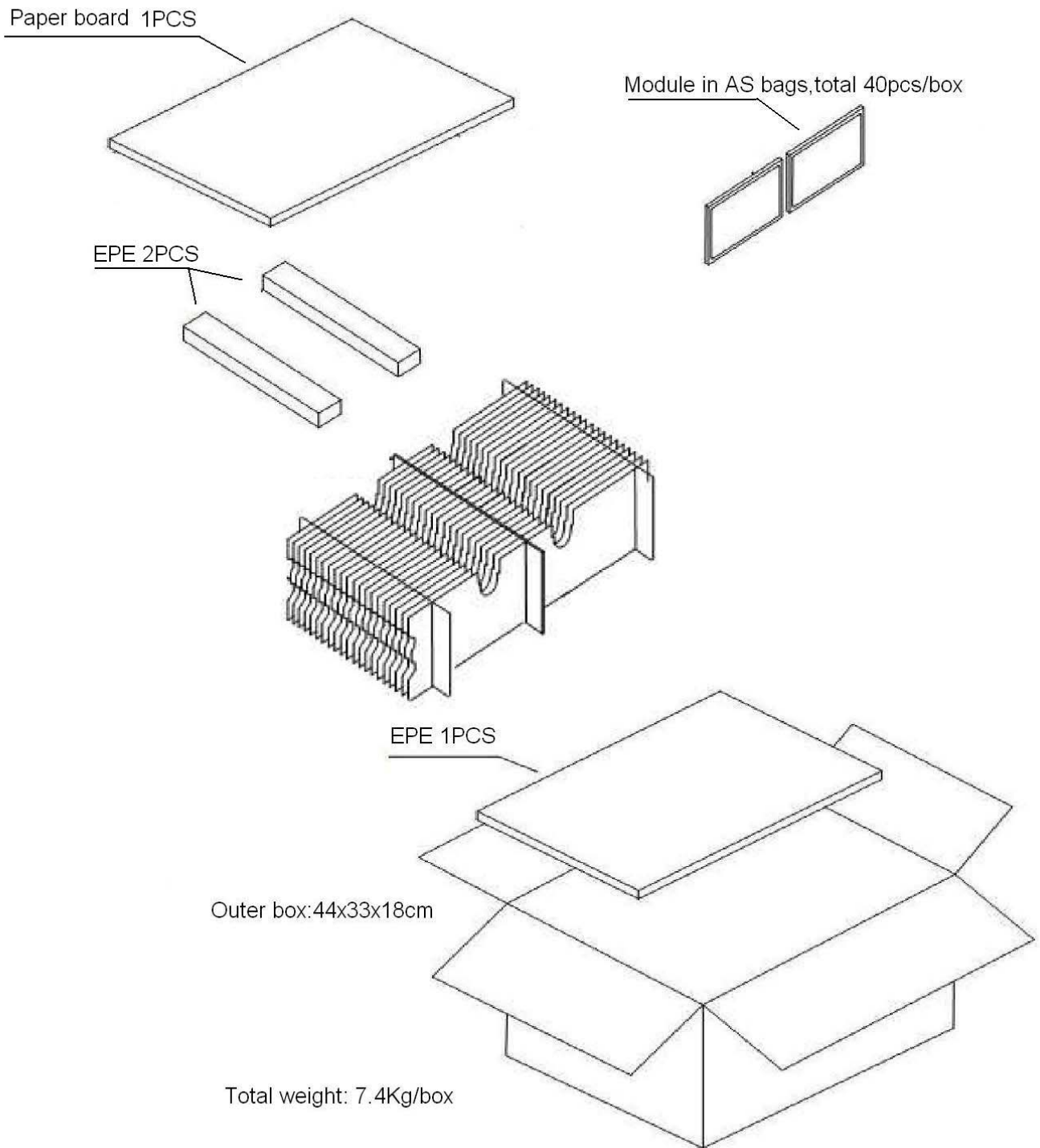
11. If any fluid leaks out of a damaged glass cell, wash off any human part that comes into contact with soap and water. The toxicity is extremely low but caution should be exercised at all the time.
12. Disassembling the LCD module can cause permanent damage and it should be strictly avoided.
13. LCD retains the display pattern when it is applied for long time (Image retention). To prevent image retention, do not apply the fixed pattern for a long time. Image retention is not a deterioration of LCD. It will be removed after display pattern is changed.
14. Do not use any materials, which emit gas from epoxy resin (hardener for amine) and silicone adhesive agent (dealcohol or deoxym) to prevent discoloration of polarizer due to gas.
15. Avoid the exposure of the module to the direct sunlight or strong ultraviolet light for a long time.

# 7. MECHANICAL  DRAWING

## 8. PACKAGE DRAWING

Paper board  1PCS

Module in AS bags,total 40pcs/box

EPE 2PCS

EPE 1PCS

Outer box:44x33x18cm

Total weight: 7.4Kg/box

# 9. INSPECTION SPECIFICATION
## T.B.D.