

# DISPLAYTRONIC

*XIAMEN ZETTLER ELECTRONICS CO., LTD*

## SPECIFICATIONS FOR LIQUID CRYSTAL DISPLAY

| CUSTOMER APPROVAL                 |  |                 |  |
|-----------------------------------|--|-----------------|--|
|                                   |  |                 |  |
| ※ PART NO. : <u>ATM0700D4B-T1</u> |  |                 |  |
| APPROVAL                          |  | COMPANY<br>CHOP |  |
| CUSTOMER<br>COMMENTS              |  |                 |  |

| DISPLAYTRONIC ENGINEERING APPROVAL |            |             |
|------------------------------------|------------|-------------|
| DESIGN BY                          | CHECKED BY | APPROVED BY |
|                                    |            |             |

**REVISION RECORD**

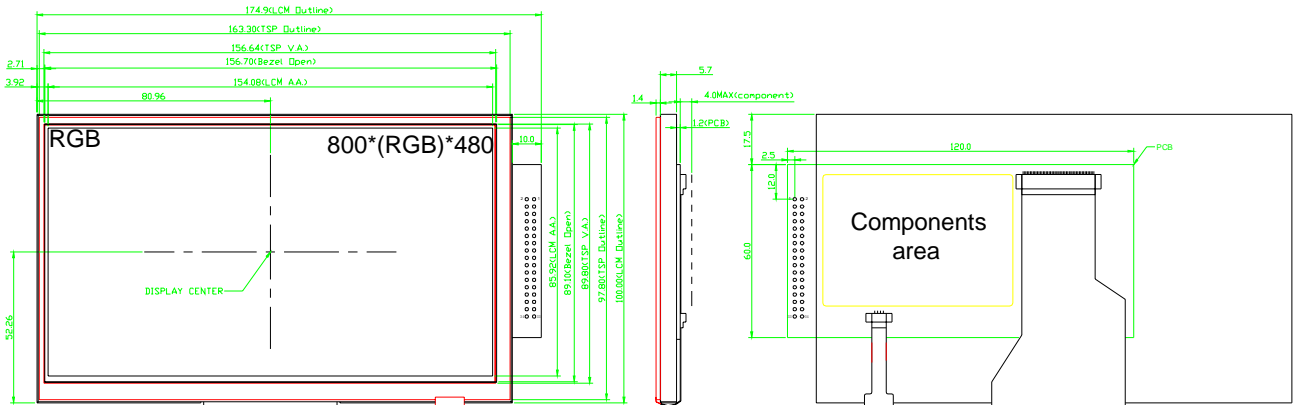
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※ **CONTENTS**

- 1.0 MECHANICAL DIAGRAM
- 2.0 GENERAL SPECIFICATION
- 3.0 ABSOLUTE MAXIMUM RATINGS
- 4.0 ELECTRICAL CHARACTERISTICS
- 5.0 OPTICAL CHARACTERISTICS
- 6.0 BLOCK DIAGRAM
- 7.0 PIN ASSIGNMENT
- 8.0 POWER SUPPLY
- 9.0 TIMING CHARACTERISTICS
- 10.0 RELIABILITY TEST
- 11.0 INSTRUCTION DESCRIPTION
- 12.0 PRECAUTION FOR USING LCM

# ATM0700D4B-T1 TFT MODULE V1.0

## 1.0 MECHANICAL DIAGRAM



## 2.0 MECHANICAL SPECS

|                               |                               |
|-------------------------------|-------------------------------|
| 1. Display Format             | 800RGB x 480 DOTS             |
| 2. Power Supply               | LCD 3.3V/ BACKLIGHT 5.0V      |
| 3. Overall Module Size(L*W*T) | 174.9mm x 100.0mm x MAX12.3mm |
| 4. Active Area(W*H)           | 154.08mm x 85.92mm            |
| 5. Dot Pitch (W*H)            | 0.06422mm x 0.1790mm          |
| 6. Viewing Area(W*H)          | 156.6mm x 89.8mm              |
| 7. Color Configuration        | RGB stripe                    |
| 8. Color Depth                | 65K colors                    |
| 9. Viewing Direction          | 6 O'clock                     |
| 10. Display mode              | Normally White, Transmissive  |
| 11. Backlight Options         | LED-SIDE(White)               |
| 12. DRIVING IC                | SSD1963                       |
| 13. Operating temperature     | -20°C ~ 70°C                  |
| 14. Storage temperature       | -30°C ~ 80°C                  |
| 15. Weight                    | T.B.D.                        |
| 16. ROHS                      | ROHS compliant                |

## 3.0 ABSOLUTE MAXIMUM RATINGS

| Item                     | Symbol   | Min     | Typ | Max     | Unit |
|--------------------------|----------|---------|-----|---------|------|
| Operating temperature    | Top      | -20     | -   | 70      | °C   |
| Storage temperature      | Tst      | -30     | -   | 80      | °C   |
| Input voltage            | Vin      | Vss-0.3 | -   | Vdd+0.3 | V    |
| Supply voltage for logic | Vdd- Vss | -0.3    | -   | 3.6     | V    |

## 4.0 ELECTRICAL CHARACTERISTICS

### 4.1 Electrical Characteristics Of LCM

| Item                 | Symbol           | Condition              | Min    | Typ  | Max    | Unit |
|----------------------|------------------|------------------------|--------|------|--------|------|
| Power Supply Voltage | VDD              | Ta=25°C                | 3.0    | 3.3  | 3.6    | V    |
| BL power consumption | P <sub>BL</sub>  | V <sub>BL_IN</sub> =5V | --     | 370  | --     | mA   |
| Power Consumption    | P <sub>TFT</sub> | Vdd=3.3V               | -      | 0.23 | --     | W    |
| Input voltage (high) | V <sub>ih</sub>  | H level                | 0.8Vdd | -    | Vdd    | V    |
| Input voltage (low)  | V <sub>il</sub>  | L level                | Vss    | -    | 0.2Vdd | V    |

### 4.2 The Characteristics Of Backlight

| Item              | Symbol           | Condition | Min   | Typ   | Max | Unit |
|-------------------|------------------|-----------|-------|-------|-----|------|
| Power consumption | P <sub>LED</sub> | IL=180mA  | --    | 1.674 | --  | W    |
| LED life time     | --               | --        | 20000 | --    | --  | H    |

Note 1: The LED Supply Voltage is defined by the number of LED at Ta=25°C and IL =180mA.

Note 2: The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25°C and IL =180mA. The LED lifetime could be decreased if operating IL is larger than 180 mA.

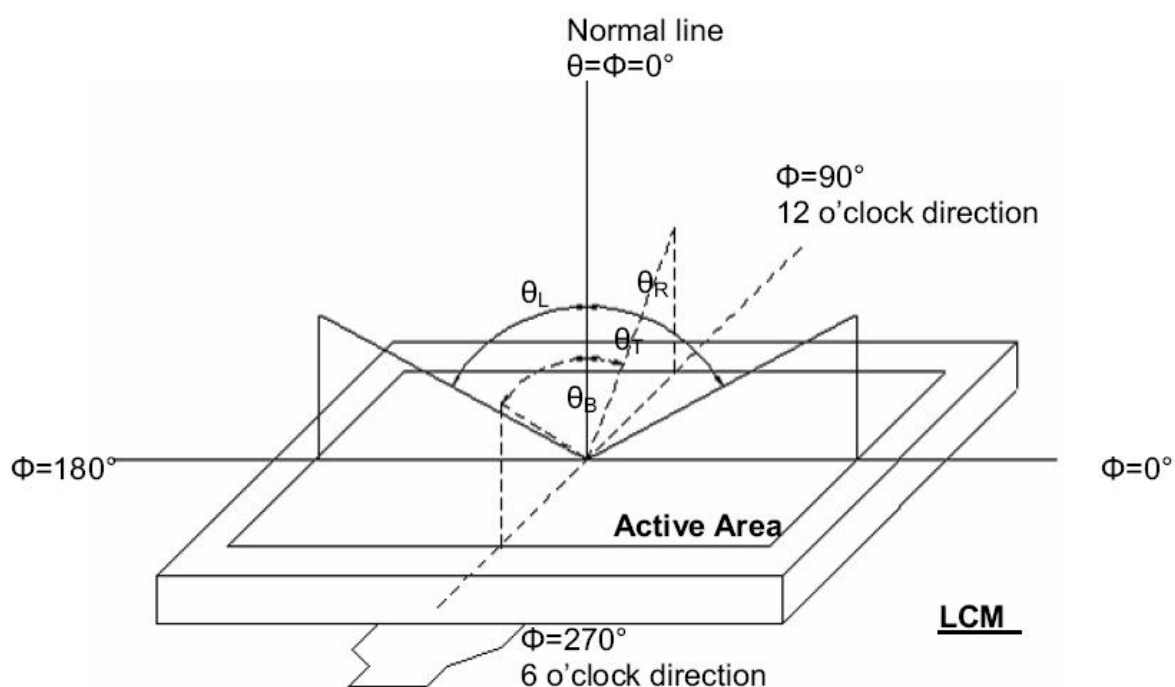
### 5.0 OPTICAL CHARACTERISTICS

| Item                | Symbol   | Condition    | Min | Typ | Max | Unit  | Remarks                   | Note |
|---------------------|----------|--------------|-----|-----|-----|-------|---------------------------|------|
| Reponse time        | Tr       | Ta = 25°C    | --- | 10  | 15  | ms    | ---                       | 1    |
|                     | Tf       |              | --- | 20  | 30  | ms    | ---                       | 7    |
| Luminance           | L        | Il=180mA     | 250 | 320 | --  | Cd/m2 | ---                       | 6    |
| Contrast            | CR       | Ta = 25°C    | 400 | 500 | --- | ---   | ---                       | 4    |
| Viewing angle range | $\theta$ | Cr $\geq$ 10 | 40  | 50  | --- | deg   | $\varnothing = 90^\circ$  | 1,3  |
|                     |          |              | 60  | 70  | --- | deg   | $\varnothing = 270^\circ$ |      |
|                     |          |              | 60  | 70  | --- | deg   | $\varnothing = 0^\circ$   |      |
|                     |          |              | 60  | 70  | --- | deg   | $\varnothing = 180^\circ$ |      |

Test Conditions:

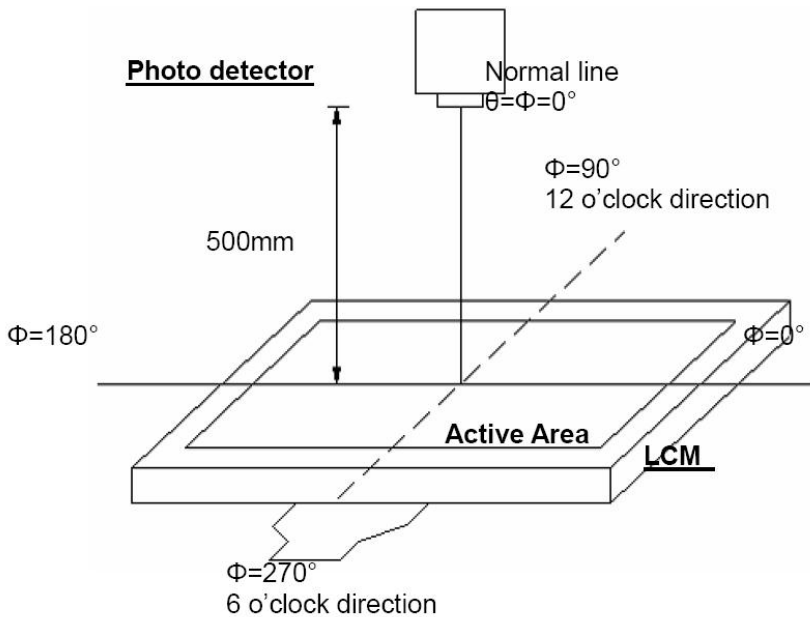
1. DVDD=3.3V, IL=180mA (Backlight current), the ambient temperature is 25°C.
2. The test systems refer to Note 2.

Note 1: Definition of viewing angle range



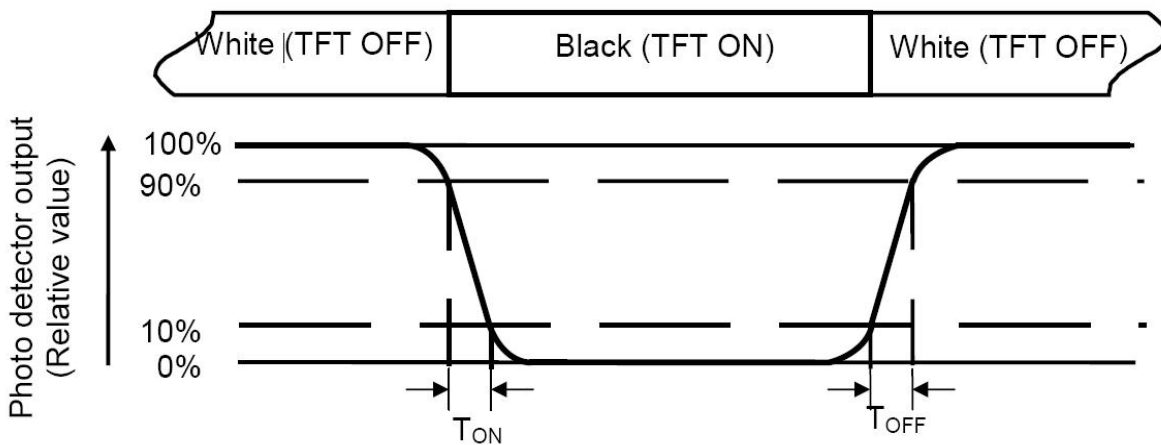
Note 2: Definition of optical measurement system.

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 BM-7, other items are measured by BM-5A/Field of view: 1° /Height: 500mm.)



**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 ( $T_{ON}$ ) is the time between photo detector output intensity changed from 90% to 10%. And fall time ( $T_{OFF}$ ) is the time between photo detector output intensity changed from 10% to 90%.



**Note 4: Definition of contrast ratio**

Luminance measured when LCD on the "Black" state  
 Luminance measured when LCD on the "White" state  
 Contrast ratio (CR) =

**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. The LED driving condition is IL=180mA .

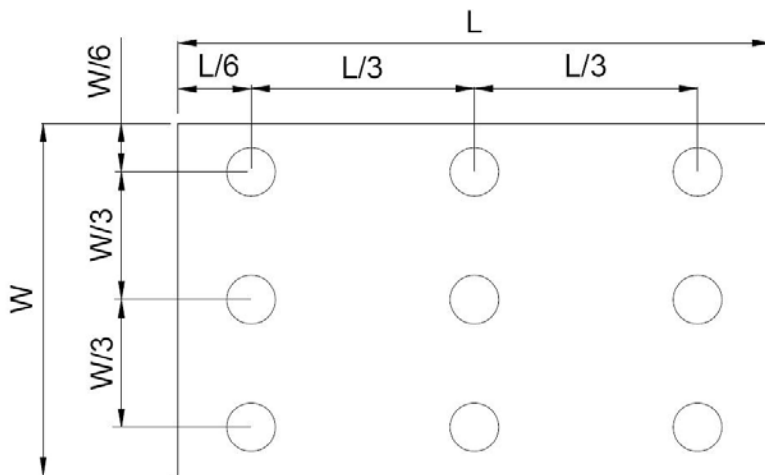
Note 7: The values shall be measured without Touch Screen Panel.

Note 8: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas .Every measuring point is placed at the center of each measuring area.

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

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

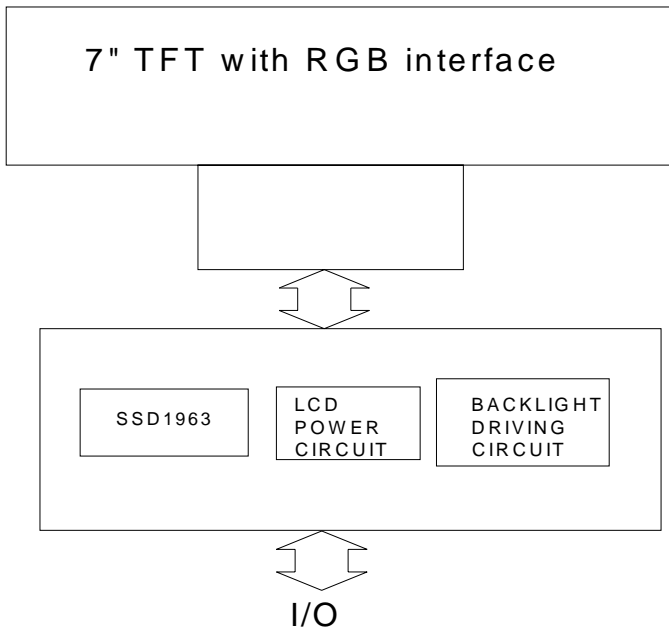


Bmax: The measured maximum luminance of all measurement position.

Bmin: The measured minimum luminance of all measurement position.



## 6.0 BLOCK DIAGRAM



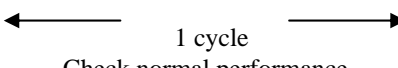
## 7.0 PIN ASSIGNMENT

| Pin No. | Symbol    | Function                                                          |
|---------|-----------|-------------------------------------------------------------------|
| 1       | XL        | TOUCH PANEL LEFT AXIS                                             |
| 2       | YD        | TOUCH PANEL DOWN AXIS                                             |
| 3       | XR        | TOUCH PANEL RIGHT AXIS                                            |
| 4       | YU        | TOUCH PANEL UP AXIS                                               |
| 5       | VDD       | Power Supply for LCM                                              |
| 6       | VSS       | POWER GND                                                         |
| 7       | RESET     | Reset pin                                                         |
| 8       | CS#       | Chip select pin                                                   |
| 9       | DC#       | Data/Command select                                               |
| 10      | E(RD#)    | 6800 mode: E (enable signal); 8080 mode: RD# (read strobe signal) |
| 11      | R/W#(WR#) | 6800 mode: R/W#; 8080 mode: WR# (write strobe signal)             |
| 12      | TE        | Tearing effect                                                    |
| 13      | VSS       | POWER GND                                                         |
| 14      | DB0       | Data bus                                                          |
| 15      | DB1       | Data bus                                                          |
| 16      | DB2       | Data bus                                                          |
| 17      | DB3       | Data bus                                                          |
| 18      | DB4       | Data bus                                                          |
| 19      | DB5       | Data bus                                                          |
| 20      | DB6       | Data bus                                                          |
| 21      | DB7       | Data bus                                                          |
| 22      | VSS       | POWER GND                                                         |
| 23      | DB8       | Data bus(IF USE 8BIT INTERFACE,PLEASE LEAVE IT OPEN)              |
| 24      | DB9       | Data bus(IF USE 8BIT INTERFACE,PLEASE LEAVE IT OPEN)              |
| 25      | DB10      | Data bus(IF USE 8BIT INTERFACE,PLEASE LEAVE IT OPEN)              |
| 26      | DB11      | Data bus(IF USE 8BIT INTERFACE,PLEASE LEAVE IT OPEN)              |
| 27      | DB12      | Data bus(IF USE 8BIT INTERFACE,PLEASE LEAVE IT OPEN)              |
| 28      | DB13      | Data bus(IF USE 8BIT INTERFACE,PLEASE LEAVE IT OPEN)              |
| 29      | DB14      | Data bus(IF USE 8BIT INTERFACE,PLEASE LEAVE IT OPEN)              |
| 30      | DB15      | Data bus(IF USE 8BIT INTERFACE,PLEASE LEAVE IT OPEN)              |
| 31      | VSS       | POWER GND                                                         |
| 32      | BL_EN     | BACKLIGHT ENABLE                                                  |
| 33      | VBL+      | POWER SUPPLY FOR BACKLIGHT                                        |
| 34      | VBL+      | POWER SUPPLY FOR BACKLIGHT                                        |

## **8.0 TIMING CHARACTERISTICS**

PLEASE REFER TO SSD1963 DATASHEET

**9.0 RELIABILITY TEST**

| NO | Test Item                  | Description                            | Test Condition                                                                                                                                                                                                                    | Remark                                                                                                |                |
|----|----------------------------|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|----------------|
| 1  | Environmental<br>1<br>Test | High temperature storage               | Applying the high storage temperature Under normal humidity for a long time Check normal performance                                                                                                                              | 80 °C<br>96hrs                                                                                        |                |
| 2  |                            | Low temperature storage                | Applying the low storage temperature Under normal humidity for a long time Check normal performance                                                                                                                               | -30°C<br>96hrs                                                                                        |                |
| 3  |                            | High temperature Operation             | Apply the electric stress(Voltage and current) Under high temperature for a long time                                                                                                                                             | 70 °C<br>96hrs                                                                                        | Note1          |
| 4  |                            | Low temperature Operation              | Apply the electric stress Under low temperature for a long time                                                                                                                                                                   | -20°C<br>96hrs                                                                                        | Note1<br>Note2 |
| 5  |                            | High temperature/High Humidity Storage | Apply high temperature and high humidity storage for a long time                                                                                                                                                                  | 90% RH<br>40°C<br>96hrs                                                                               | Note2          |
| 6  |                            | Temperature Cycle                      | Apply the low and high temperature cycle<br>-30°C <> 25°C <> 80°C <> 25°C<br>30min 10min 30min 10min<br><br>1 cycle<br>Check normal performance | -30°C/80°C<br>10 cycle                                                                                |                |
| 7  | Mechanical<br>Test         | Vibration test(Package state)          | Applying vibration to product check normal performance                                                                                                                                                                            | Freq:10-55Hz<br>Max<br>Acceleration 5G<br>1 cycle time:1min<br>time<br>X.Y.Z direction<br>for 15 mins |                |
| 8  |                            | Shock test(package state)              | Applying shock to product check normal performance                                                                                                                                                                                | Drop them through 70cm height to strike horizontal plane                                              |                |
| 9  | Other                      |                                        |                                                                                                                                                                                                                                   |                                                                                                       |                |

Remark

Note1:Normal operations condition (25°C±5°C).

Note2:Pay attention to keep dewdrops from the module during this test.

## 10.0 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 latching 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.
- d) Do not touch the elastomer connector; especially insert a backlight panel (for example, EL).
- e) When mounting a LCM makes sure that the PCB is not under any stress such as bending or twisting.  
Elastomer contacts are very delicate and missing pixels could result from slight dislocation of any of the elements.
- f) Avoid pressing on the metal bezel, otherwise the elastomer connector could be deformed and lose contact, resulting in missing pixels.

### 9. Static Electricity

#### a) Operator

**Wear the electrostatics shielded clothes because human body may be statically charged if not wear 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

Solder only to the I/O terminals. Use only soldering irons with proper grounding and no leakage.

Soldering temperature :  $280^{\circ} \text{C} \pm 10^{\circ} \text{C}$

Soldering time: 3 to 4 sec.

Use eutectic solder with resin flux fill.

If flux is used, the LCD surface should be covered to avoid flux spatters. Flux residue should be removed afterwards.

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

## ATM0700D4B-T1 TFT MODULE V1.0

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- 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.
  16. The brightness of LCD module may be affected by the routing of CCFL cables due to leakage to the chassis through coupling effect. The inverter circuit needs to be designed taking the level of leakage current into consideration. Thorough evaluation is needed for LCD module and inverter built into its host equipment to ensure specified brightness.