

Specification for Approval

Customer: _____

Model Name: _____

| Supplier Approval | | | Customer approval |
|-------------------|-----------------|-------------|-------------------|
| R&D Designed | R&D Approved | QC Approved | |
| <i>Peter</i> | <i>Peng Jun</i> | | |

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1. Scope

This specification defines general provisions as well as inspection standards for TFT module supplied by AMSON electronics.

If the event of unforeseen problem or unspecified items may occur, naturally shall negotiate and agree to solution.

2. General Information

| Item | Specification | Unit |
|--------------------------|---------------------------|-------|
| LCD size | 4.0 | inch |
| Display Mode | Normally Black | -- |
| Resolution | 720(RGB)x720 | Pixel |
| Pixel pitch | 0.047*RGB*0.141 | mm |
| Pixel Arrangement | RGB Vertical Stripe | |
| Viewing direction | IPS | -- |
| Module outline dimension | 105.3(H)*109.62(V)*2.3(D) | mm |
| LCD AA | 101.52x101.52 | mm |
| Colors | 16.7M | -- |
| Driver IC | FL7707 | -- |
| Interface | MIPI 4lane | -- |
| Backlight | White LED | -- |
| Operating Temperature | -20°C ~ +70°C | -- |
| Storage Temperature | -30°C ~ +80°C | -- |

3. External Dimensions

LED CIRCUIT DIAGRAM:

背光源路图 (CIRCUIT DIAGRAM)
IF=40mA VF=30V 双芯灯

| PN: | SYMBOL |
|-----|------------|
| 1 | LEDA |
| 2 | LEDK1 |
| 3 | LEDK2 |
| 4 | VCL_3.3V |
| 5 | 100CC_3.3V |
| 6 | RESET |
| 7 | TE |
| 8 | PMW |
| 9 | GND |
| 10 | DOP |
| 11 | DON |
| 12 | GND |
| 13 | DIP |
| 14 | DIN |
| 15 | GND |
| 16 | CLKP |
| 17 | CLKN |
| 18 | GND |
| 19 | D2P |
| 20 | D2N |
| 21 | GND |
| 22 | D3P |
| 23 | D3N |
| 24 | GND |
| 25 | NC |
| 26 | NC |
| 27 | NC |
| 28 | NC |
| 29 | NC |
| 30 | NC |

1. Unit: mm.
2. Δ Modification rev. number.
3. All radii without dimension R0.3mm.
4. All draft angles to be 1.5°.
5. Unspecified Tolerances is: ± 0.20 mm.
6. LCD Driver IC: FL7707
7. LCD Driver Voltage: 2.8 ± 0.3 V
8. Color: White
9. Operating Temperature: -20° --- $+70^{\circ}$ C
10. Storage Temperature: -30° --- $+80^{\circ}$ C
11. Requirements on Environmental Protection: ROHS HSF

LED CIRCUIT DIAGRAM:

背光源路图 (CIRCUIT DIAGRAM)
IF=40mA VF=30V 双芯灯

| SW. | DESCRIPTION OF REVISION | REASON | REVISED BY | DATE |
|----------|-------------------------|--------|------------|------------|
| Δ | first issue | A | | 2026/03/05 |

Amson

于都上晴电子有限公司

YU DU AMSON ELECTRONICS Co., Ltd.

YU DU AMSON ELECTRONICS Co., Ltd.

SCALE: 1 : 1

SHEET NO: 1 OF 1

于都上晴电子有限公司

YU DU AMSON ELECTRONICS Co., Ltd.

SCALE: 1 : 1

SHEET NO: 1 OF 1

4. Interface Description

| PIN | Symbol | Description | Remark |
|-------|---------|--|--------|
| 1 | LEDA | LED ANODE | |
| 2 | LEDK | LED CATHODE | |
| 3 | LEDK | LED CATHODE | |
| 4 | VCI | LCD analog power supply (3.3V) | |
| 5 | IOVCC | LCD analog power supply (3.3V) | |
| 6 | RESET | Reset Signal | |
| 7 | TE | Tearing effect output | |
| 8 | PWM | The PWM frequency output for LCD driver control. | |
| 9 | GND | Ground | |
| 10 | D0P | DSI-D0+ data signals | |
| 11 | D0N | DSI-D0- data signals | |
| 12 | GND | Ground | |
| 13 | D1P | DSI-D1+ data signals | |
| 14 | D1N | DSI-D1- data signals | |
| 15 | GND | Ground | |
| 16 | CLKP | DSI-Clock+ | |
| 17 | CLKN | DSI-Clock- | |
| 18 | GND | Ground | |
| 19-20 | D2P/D2N | DSI-D2+ data signals/DSI-D2- data signals | |
| 21 | GND | Ground | |
| 22-23 | D3P/D3N | DSI-D3+ data signals/DSI-D3- data signals | |
| 24 | GND | Ground | |
| 25 | NC | No Connection | |
| 26 | NC | No Connection | |
| 27 | NC | No Connection | |
| 28 | NC | No Connection | |
| 29 | NC | No Connection | |
| 30 | NC | No Connection | |

5. Absolute Maximum Ratings

| Item | Symbol | Min. | Max. | Unit | Remark |
|--------------------------------|------------------|-------|------|-------|--------|
| Power Voltage | VCI | 1.65 | 3.3 | V | |
| | IOVCC | 1.65 | 3.3 | V | |
| Operating Temperature | Top | -20.0 | 70.0 | °C | |
| Storage Temperature | T _{st} | -30.0 | 80.0 | °C | |
| Operating and Storage Humidity | H _{stg} | 10% | 90% | %(RH) | |

6. DC Characteristics

| Item | Symbol | Min. | TYP | Max. | Unit |
|------------------------|-------------------|-------------|-----|-------------|------|
| Analog supply Voltage | VCI | 2.5 | 2.8 | 3.3 | V |
| Digital supply Voltage | IOVCC | - | 2.8 | 3.3 | V |
| Input Signal Voltage | Low Level VIL | 0 | - | 0.3 x IOVCC | V |
| | High Level VIH | 0.7 x IOVCC | - | IOVCC | V |

7. Backlight Characteristic

| Item | Symbol | Min. | Typ. | Max. | Unit |
|-----------------------------|--------|-------|------|------|------|
| Forward Current | IF | - | 40 | - | mA |
| Forward Current Voltage | VF | - | 30 | - | V |
| Backlight Power Consumption | WBL | - | 1200 | - | mW |
| Operating Life Time | -- | 20000 | -- | -- | hrs |

8. Optical Characteristics

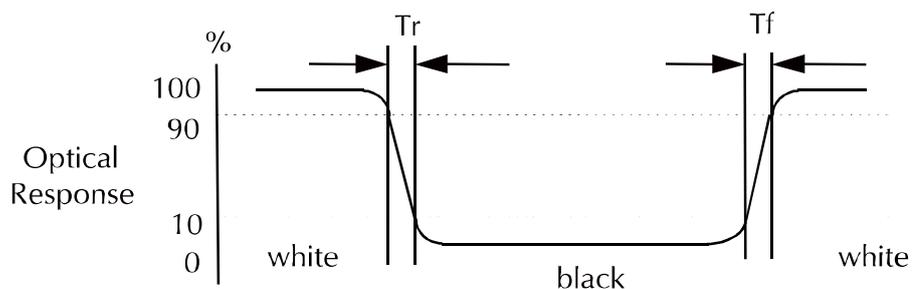
| Item | | Symbol | Min. | Typ. | Max. | Unit | Note |
|--------------------------|------------|------------------|-------|------|-------|--------|------|
| Contrast Ratio | | CR | 1000 | 1200 | - | - | |
| Color gamut (NTSC ratio) | | - | - | 60 | - | % | |
| Response Time | | Rising + Falling | - | 30 | 45 | ms | |
| Viewing Angle | Horizontal | θx^+ | 80 | 85 | - | degree | |
| | | θx^- | 80 | 85 | - | | |
| | Vertical | θy^+ | 80 | 85 | - | | |
| | | θy^- | 80 | 85 | - | | |
| | White | X | +0.05 | TBD | -0.05 | | |
| | | Y | | TBD | | | |
| Luminance(Center) | | L | - | 800 | - | cd/m2 | |
| Luminance Uniformity | | ΔL | 70 | 80 | | % | |

a. Test equipment setup

After stabilizing and leaving the panel alone shall be warmed up for the stable operation of LCM, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7(fast) with a viewing angle of 2° at a distance of 50cm and normal direction.

b. Definition of response time: Tr and Tf

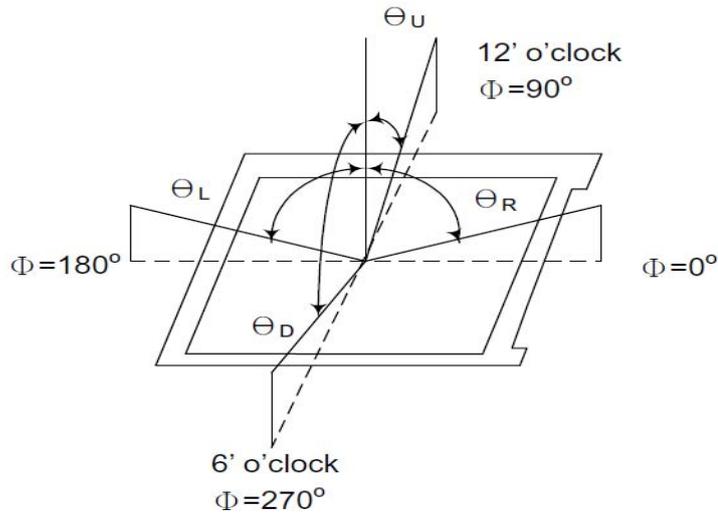
The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".



c. Definition of contrast ratio:

$$\text{Contrast Ratio (CR)} = \frac{\text{Brightness measured when LCD is at "white state"}}{\text{Brightness measured when LCD is at "black state"}}$$

d. Measured at the center area of the panel when all the input terminals of LCD panel are electrically



e. Definition of Luminance of White: Luminance of white at the center points

| Light Source of Back-Light Unit | LED Type |
|---------------------------------|----------|
|---------------------------------|----------|

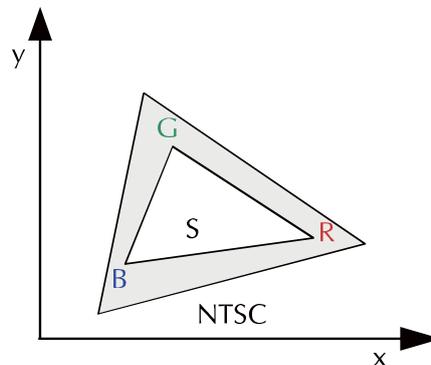
f. Definition of White Uniformity

$$\text{White Uniformity} = \frac{\text{Min. luminance of white among 9-points}}{\text{Max. luminance of white among 9-points}} \times 100\%$$

g. The definition of Color Gamut -Color Chromaticity CIE 1931

Color coordinate of white & red, green, blue at center point.

Color Gamut : NTSC(%) = (RGB Triangle Area / NTSC Triangle Area) x 100



9. Timing Characteristics

9.1 DSI Interface Timing Characteristics :

High Speed Mode

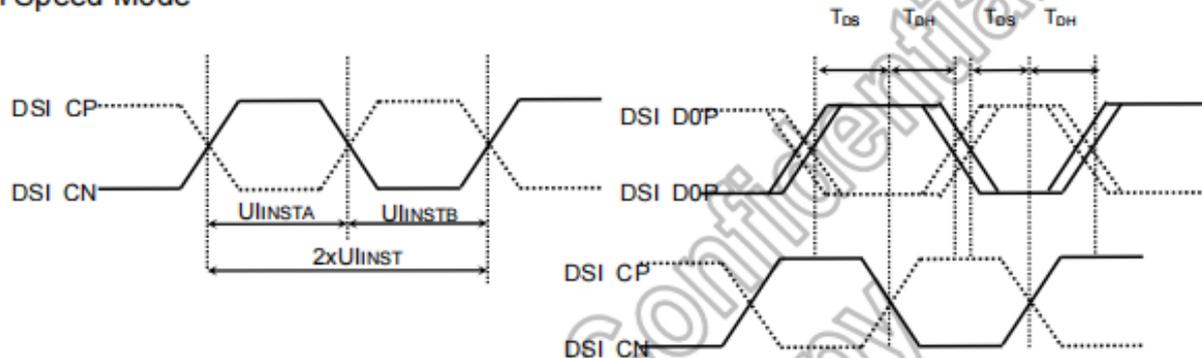


Figure 7-4: DSI clock timing Characteristics

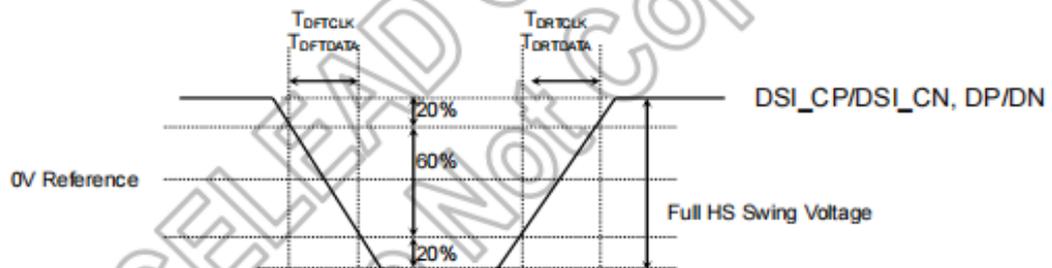


Figure 7-5: Rising and falling time on clock and data channel

(VSSA=0V, IOVCC=1.65V to 3.3V, VCI=2.5V to 3.3V, TA = -40 to 85°C)

| Signal | Item | Symbol | Spec. | | | Unit |
|-------------------|----------------------------------|----------------------|---|------|-------|------|
| | | | Min. | Typ. | Max. | |
| DSI_CP/ DSI_CN | Double UI instantaneous | 2xUIINST | 4LANE: 3.30 3LANE: 2.85 @ VDDD=1.8V | - | 25 | ns |
| | UI instantaneous | UIINSTA UIINSTB | 4LANE: 1.67 3LANE: 1.43 @ VDDD=1.8V | - | 12.5 | ns |
| DP/DN | Data to clock setup time | T _{DS} | 0.15xUI | - | - | ps |
| | Data to clock hold time | T _{DH} | 0.15xUI | - | - | ps |
| DSI_CP/ DSI_CN | Differential rise time for clock | T _{DRTCLK} | 150 | - | 0.3UI | ps |
| | Differential fall time for clock | T _{DFTCLK} | 150 | - | 0.3UI | ps |
| DP/DN | Differential rise time for data | T _{DRTDATA} | 150 | - | 0.3UI | ps |
| | Differential fall time for data | T _{DFTDATA} | 150 | - | 0.3UI | ps |

Table 7-3: DSI High Speed Mode Characteristics

Low Power Mode

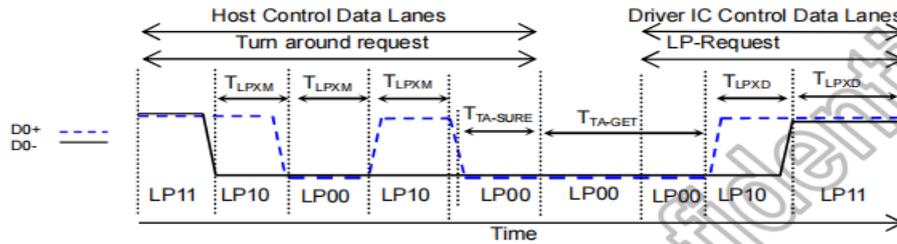


Figure 7-6: BTA from HOST to Display Module Timing

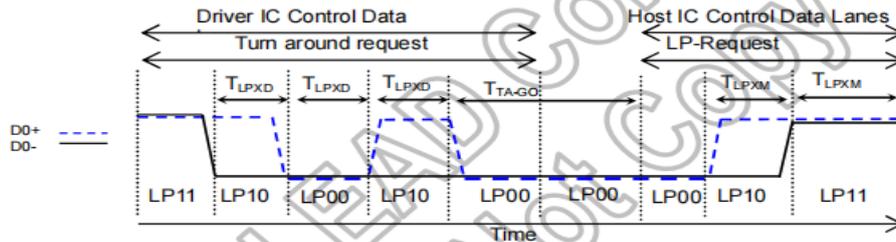


Figure 7-7: BTA from Display Module Timing to HOST

(VSSA=0V, IOVCC=1.65V to 3.3V, VCI=2.3V to 3.3V, TA = -40 to 85°C)

| Signal | Item | Symbol | Spec. | | | Unit |
|---------------------|--|----------------------|---------------------|------|---------------------|------|
| | | | Min. | Typ. | Max. | |
| DSI_D0P/ DSI_D0P | Length of LP-00/LP01/LP10/LP11 Host → Display module | T _{LPXM} | 50 | - | - | ns |
| | Length of LP-00/LP01/LP10/LP11 Display module → Host | T _{LPXD} | 50 | - | - | ns |
| | Time-out before the MPU start driver | T _{TA-SURE} | T _{LPXD} | - | 2xT _{LPXD} | ns |
| | Time to drive LP-00 by display module | T _{TA-GET} | 5xT _{LPXD} | - | - | ns |
| | Time to drive LP-00 after turnaround request Host | T _{TAGO} | 4xT _{LPXD} | - | - | ns |

9.2 MIPI Input Timing Table

| 720RGB X 720 Resolution Timing Table | | | | | | | |
|--------------------------------------|----------------|--------|------|------|------|--------|--|
| Item | Symbol | Min. | Typ. | Max. | Unit | Remark | |
| DCLK Frequency | Fclk | - | 49 | - | MHz | | |
| HSYNC | Display Period | Thdisp | | | 720 | DCLK | |
| | Back Porch | Thbp | 4 | 120 | 255 | DCLK | |
| | Front Porch | Thfp | 4 | 120 | 255 | DCLK | |
| | Pulse Width | Thw | 2 | 120 | 255 | DCLK | |
| VSYNC | Display Period | Tvdisp | | | 720 | HSYNC | |
| | Back Porch | Tvbp | 8 | 16 | 254 | HSYNC | |
| | Front Porch | Tvfp | 8 | 16 | 254 | HSYNC | |
| | Pulse Width | Tvw | 2 | 4 | 8 | HSYNC | |

9.3 Power On Timing

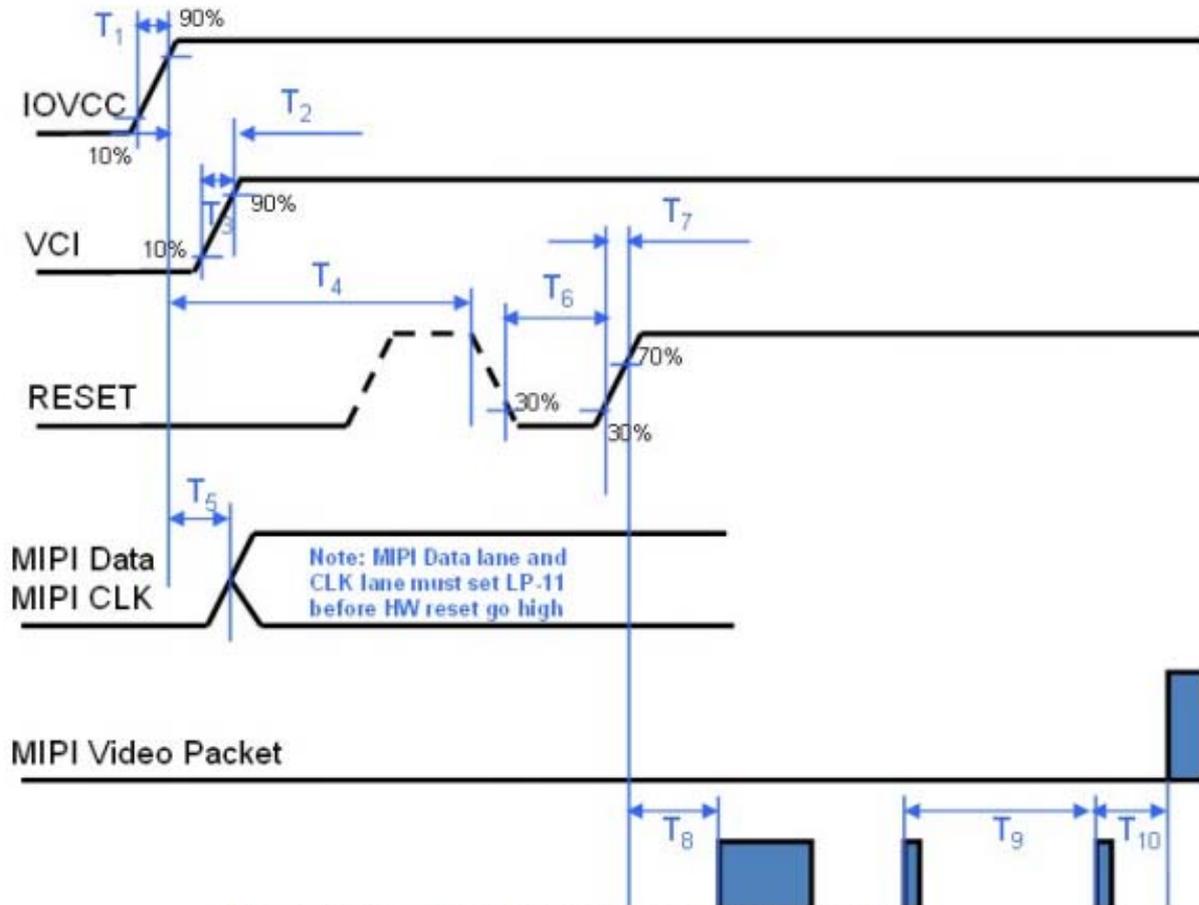


Figure 8-6: DSI Power On Sequence of Power IC Mode

| | Min. | Typ. | Max. | Unit |
|-----|----------|------|------|------|
| T1 | 0.01 | - | 10 | ms |
| T2 | No Limit | | | ms |
| T3 | 0.01 | - | 10 | ms |
| T4 | 1 | - | - | ms |
| T5 | 1 | - | - | ms |
| T6 | 10 | - | - | us |
| T7 | No Limit | | | ns |
| T8 | 15 | - | - | ms |
| T9 | 120 | - | - | ms |
| T10 | No Limit | | | ms |
| T11 | 100 | 150 | - | ms |

Table 8-1: DSI Power On Timing of Power IC Mode

9.4 Power OFF Timing

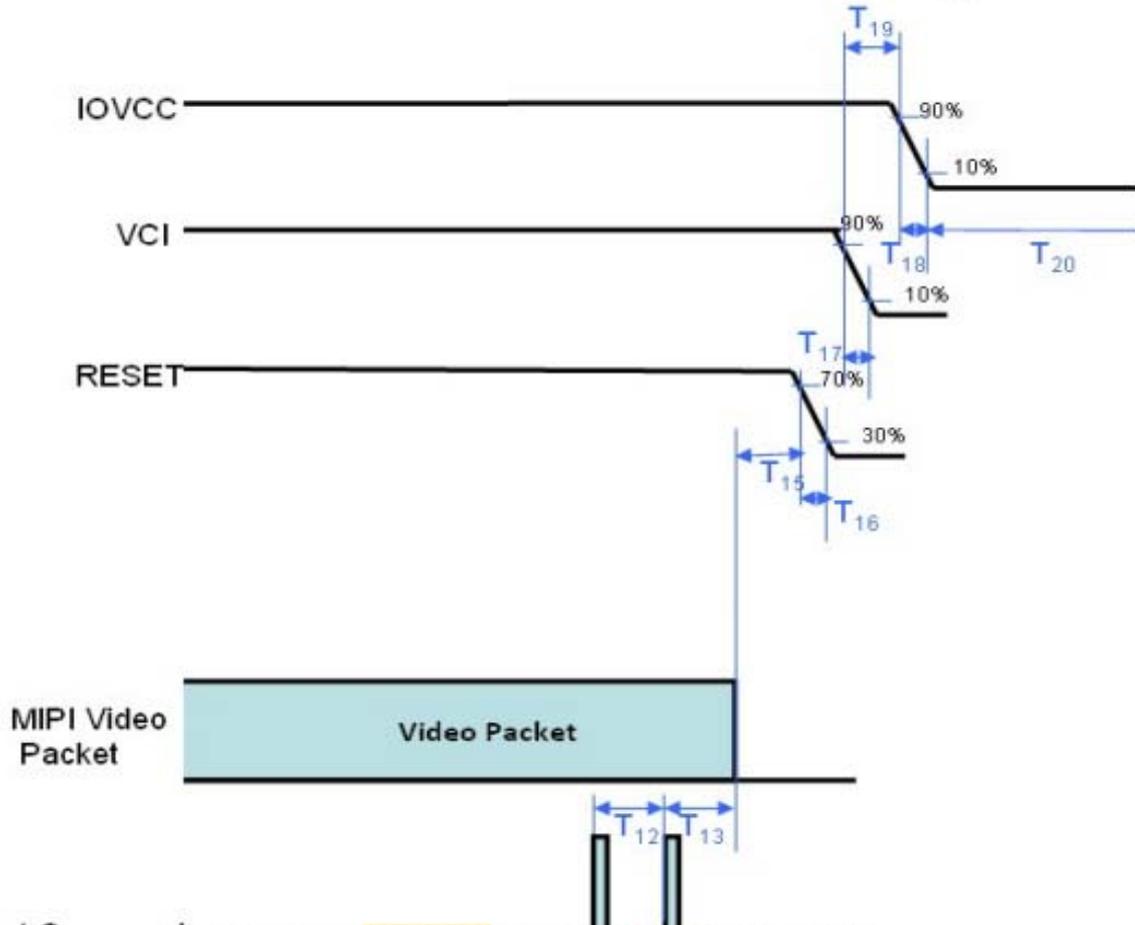


Figure 8-7: DSI Power Off Sequence of Power IC Mode

| | Min. | Typ. | Max. | Unit |
|-----|----------|------|------|-------|
| T12 | 2 | - | - | Frame |
| T13 | 2 | - | - | Frame |
| T14 | 40 | 100 | - | ms |
| T15 | 10 | - | - | ms |
| T16 | No Limit | | | ms |
| T17 | No Limit | | | ms |
| T18 | No Limit | | | ms |
| T19 | No Limit | | | ms |
| T20 | 100 | | | ms |

Table 8-2: DSI Power Off Timing of Power IC Mode

9.5 Reset Timing

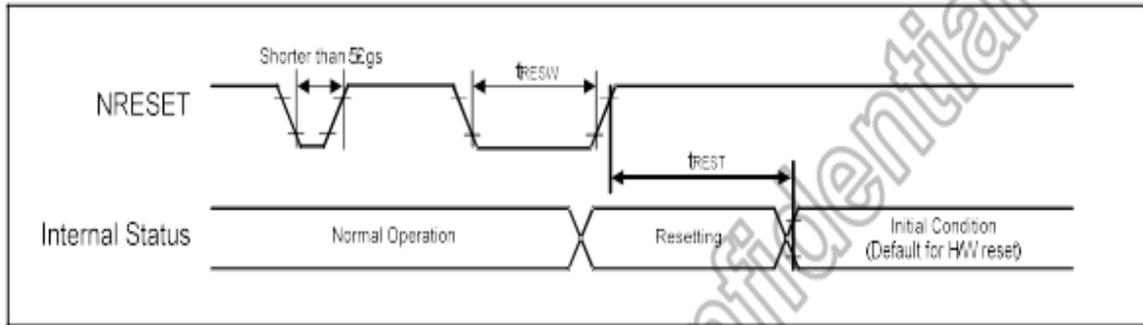


Figure 7-8: Reset input timing

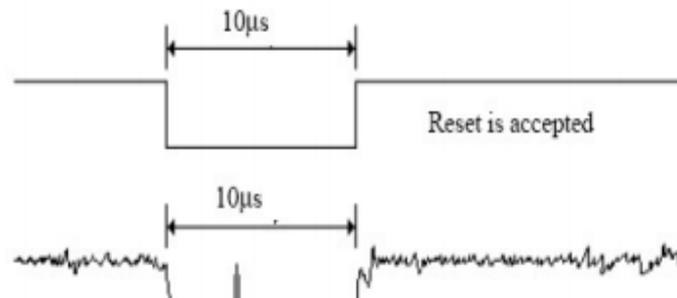
| Symbol | Parameter | Related Pins | Spec. | | | Note | Unit |
|--------|--------------------------------------|--------------|-------|------|------|---------------------------------------|------|
| | | | Min. | Typ. | Max. | | |
| tRESW | Reset low pulse width ⁽¹⁾ | NRESET | 10 | - | - | - | µs |
| tREST | Reset complete time ⁽²⁾ | - | 15 | - | - | When reset applied during SLPIN mode | ms |
| | | - | 120 | - | - | When reset applied during SLPOUT mode | ms |

Table 7-8: Reset Input Timing

Note: (1) Spike due to an electrostatic discharge on NRESET line does not cause irregular system reset according to the following table.

| NRESET Pulse | Action |
|------------------------|----------------|
| Shorter than 5 µs | Reset Rejected |
| Longer than 10 µs | Reset |
| Between 5 µs and 10 µs | Reset Start |

- (2) During the resetting period, the display will be blanked (The display is entering blanking sequence, which Maximum time is 120 ms, when Reset Starts in Sleep Out –mode. The display remains the blank state in Sleep In –mode) and then return to Default condition for HW reset.
- (3) During Reset Complete Time, ID and VCOM value in OTP will be latched to internal register during this period. This loading is done every time when there is HW reset complete time (tREST) within 15ms after a rising edge of NRESET.
- (4) Spike Rejection also applies during a valid reset pulse as shown as below:



- (5) It is necessary to wait 15msec after releasing NRESET before sending commands. Also Sleep Out command cannot be sent for 120msec.

10. Reliability Test Conditions and Methods

| No. | Items | Condition | Inspection after test |
|-----|--|---|---|
| 1 | High Temperature Storage | T = 80°C for 120 hr | Inspection after 4 hours storage at room temperature, the sample shall be free from defects: 1. Air bubble in the LCD 2. Seal leak; 3. Non-display; 4. missing segments; 5. Glass crack; 6. Current IDD is twice higher than initial value. |
| 2 | Low Temperature Storage | T = -30°C for 120 hr | |
| 3 | High Temperature Operating | T = 70°C for 120 hr | |
| 4 | Low Temperature Operating | T = -20°C for 120 hr (But no condensation of dew) | |
| 5 | High Temp. and High Humidity Operating | T = 40°C/90% for 120 hr (But no condensation dew) | |
| 6 | Thermal Shock | -20±2°C~25~70±2°C×10cycles (30min.) (5min.) (30min.) | |
| 7 | ESD | Voltage:±4KV R: 330Ω C: 150pF Air discharge, 10time | |

Note1: Ts is the temperature of panel's surface.

Note2: Ta is the ambient temperature of samples

11. Inspection Standard

11.1 Inspection conditions is as follows:

- (1) Viewing distance is approximately 25 ~ 30 cm
- (2) Viewing angle is normal to the LCD panel as Fig _1 (45°)
- (3) Ambient temperature is approximately $25 \pm 5^\circ\text{C}$
- (4) Ambient humidity is $60 \pm 5\%$ RH
- (5) Function ambient luminance is from 300 ~ 500 Lux,
Appearance ambient luminance is from 500 ~ 800 Lux.
- (6) Input signal timing should be typical value.
- (7) Mura & Light leakage in View Area should be judged through ND-Filter 5% .

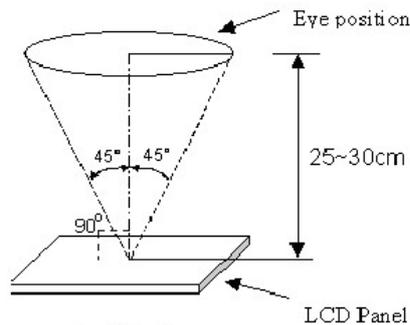


Fig _1

11.2 Test method: According to MIL-STD105E.General Inspection Level II take a single time.

The defects classify of AQL as following:

Major defect: AQL = 0.65

Minor defect: AQL = 1.5

Total defects: AQL = 1.5

Major defects (MA): A major defect refers to a defect that may substantially degrade usability for product applications, including all functional defects (such as no display, abnormal display, open or missing segment, short circuit, missing component), outline dimension beyond the drawing, progressive defects and those affecting reliability.

Minor defects (MI): A minor defect refers to a defect which is not considered to be able to substantially degrade the product application or a defect that deviates from existing standards almost unrelated to the effective use of the product or its operation, such as black spot, white spot, bright spot, pinhole, black line, white line, contrast variation, glass defect, polarizer defect, etc.

11.3 Non-conforming Analysis & Deal with Manners

11.3.1 Non- conforming Analysis:

11.3.1.1 Purchaser should supply the detail data of non- conforming sample and the non-conforming.

11.3.1.2 After accepting the detail data from purchaser, the analysis of non- conforming should be finished in two weeks.

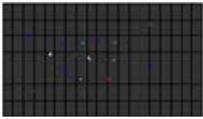
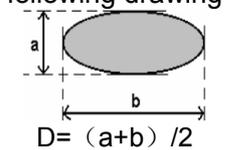
11.3.1.3 If supplier cannot finish analysis on time, must announce purchaser before 3 days.

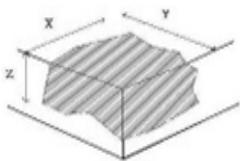
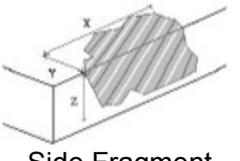
11.3.2 Disposition of non- conforming:

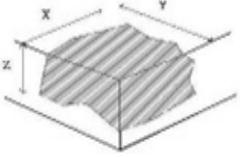
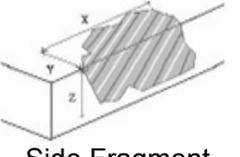
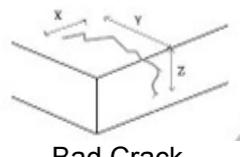
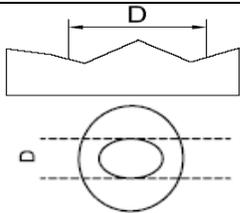
11.3.2.1 If find any product defect of supplier during assembly time, supplier must change the good product for every defect after recognition.

11.3.2.2 Both supplier and customer should analyze the reason and discuss the disposition of non- conforming when the reason of nonconforming is not sure.

11.4 Inspection Criteria

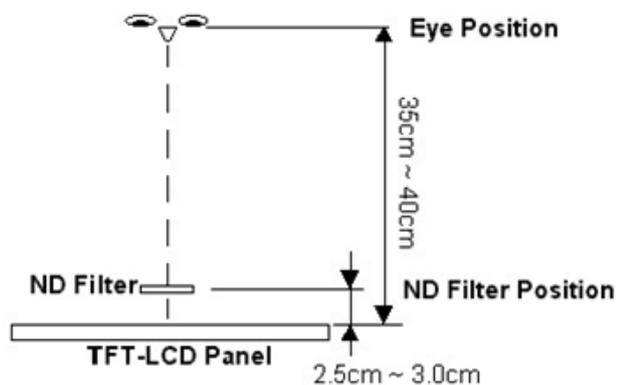
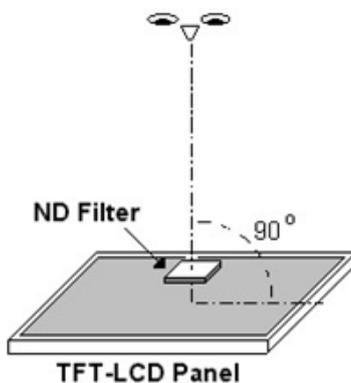
| NO | Item | Criterion | AQL | | | | | | | | | | | | | |
|--|---|--|---|-----------------|-----------------|----------------------|---------|----------------------|---------|----------------------|----------------------|------------|-----|------------|-----------|-----|
| 01 | Electrical Testing | 1.1 Missing vertical, horizontal segment, segment contrast defect. 1.2 Missing character, dot or icon. 1.3 Display malfunction. 1.4 No function or no display. 1.5 Current consumption exceeds product specifications. 1.6 LCD viewing angle defect. 1.7 Mixed product types. 1.8 Flicker 1.9 Touch Panel: no touch, bad touch | 0.65 | | | | | | | | | | | | | |
| 02 | Black or White spots or Bright spots or Color spots on LCD (Display only) | 2.1 White and black or color spots on display $\leq 0.35\text{mm}$, no more than three spots. 2.2 Densely spaced: No more than three spots within 10mm. | 1.5 | | | | | | | | | | | | | |
| 03 | Frame Pattern | Four border lines are fully visible in vertical view angle. | 1.5 | | | | | | | | | | | | | |
| 04 | Mura | Invisible through 5% ND filter or limited (Judged by limit sample if it has been defined) | 1.5 | | | | | | | | | | | | | |
| 05 | Tiny bright dot |  | Visible through 5% ND filter or limited | 1.5 | | | | | | | | | | | | |
| 06 | LCD Panel black spots, white spots, contamination (non – display) | Line type: (As following drawing)  | <table border="1"> <thead> <tr> <th>Length(mm)</th> <th>Width(mm)</th> <th>Acceptable Q'ty</th> </tr> </thead> <tbody> <tr> <td>---</td> <td>$W \leq 0.05$</td> <td>ignored</td> </tr> <tr> <td>$L \leq 8.0$</td> <td>$0.05 < W \leq 0.08$</td> <td>3</td> </tr> <tr> <td>---</td> <td>$0.08 < W$</td> <td>Rejection</td> </tr> </tbody> </table> | Length(mm) | Width(mm) | Acceptable Q'ty | --- | $W \leq 0.05$ | ignored | $L \leq 8.0$ | $0.05 < W \leq 0.08$ | 3 | --- | $0.08 < W$ | Rejection | 1.5 |
| | | Length(mm) | Width(mm) | Acceptable Q'ty | | | | | | | | | | | | |
| --- | $W \leq 0.05$ | ignored | | | | | | | | | | | | | | |
| $L \leq 8.0$ | $0.05 < W \leq 0.08$ | 3 | | | | | | | | | | | | | | |
| --- | $0.08 < W$ | Rejection | | | | | | | | | | | | | | |
| Round type: As following drawing  $D = (a+b) / 2$ | <table border="1"> <thead> <tr> <th>Size(mm)</th> <th>Acceptable Q'ty</th> </tr> </thead> <tbody> <tr> <td>$D \leq 0.10$</td> <td>ignored</td> </tr> <tr> <td>$0.10 < D \leq 0.35$</td> <td>3</td> </tr> <tr> <td>$0.35 < D$</td> <td>0</td> </tr> </tbody> </table> | Size(mm) | Acceptable Q'ty | $D \leq 0.10$ | ignored | $0.10 < D \leq 0.35$ | 3 | $0.35 < D$ | 0 | | | | | | | |
| Size(mm) | Acceptable Q'ty | | | | | | | | | | | | | | | |
| $D \leq 0.10$ | ignored | | | | | | | | | | | | | | | |
| $0.10 < D \leq 0.35$ | 3 | | | | | | | | | | | | | | | |
| $0.35 < D$ | 0 | | | | | | | | | | | | | | | |
| 07 | Polarizer bubbles | If bubbles are visible, judge using black spot specifications, | <table border="1"> <thead> <tr> <th>Size D(mm)</th> <th>Acceptable Q'ty</th> </tr> </thead> <tbody> <tr> <td>$D \leq 0.10$</td> <td>ignored</td> </tr> <tr> <td>$0.10 < D \leq 0.20$</td> <td>2</td> </tr> <tr> <td>$0.20 < D \leq 0.35$</td> <td>2</td> </tr> <tr> <td>$0.35 < D$</td> <td>0</td> </tr> </tbody> </table> | Size D(mm) | Acceptable Q'ty | $D \leq 0.10$ | ignored | $0.10 < D \leq 0.20$ | 2 | $0.20 < D \leq 0.35$ | 2 | $0.35 < D$ | 0 | 1.5 | | |
| Size D(mm) | Acceptable Q'ty | | | | | | | | | | | | | | | |
| $D \leq 0.10$ | ignored | | | | | | | | | | | | | | | |
| $0.10 < D \leq 0.20$ | 2 | | | | | | | | | | | | | | | |
| $0.20 < D \leq 0.35$ | 2 | | | | | | | | | | | | | | | |
| $0.35 < D$ | 0 | | | | | | | | | | | | | | | |

| | | | | |
|----|--------------------|--|---|------|
| 08 | Chipped glass |  <p>Corner Fragment</p> | <p>Length $X < 2.0\text{mm}$ Width $Y < 1.0\text{ mm}$ Thickness $Z \leq$ Glass thickness (Sealant area could not be broken)</p> | 1.5 |
| | |  <p>Side Fragment</p> | <p>Length $X < 3.0\text{ mm}$ Width $Y < 1.0\text{ mm}$ Thickness $Z \leq$ Glass thickness (Sealant area could not be broken)</p> | 1.5 |
| | |  <p>Bad Crack</p> | NOT ALLOWED | 0.65 |
| 09 | Backlight elements | Illumination source flickers when lit. | | 0.65 |
| | | Spots or scratches that appear when lit must be judged. Using LCD spot, lines and contamination standards. | | 1.5 |
| | | Backlight doesn't light or color is wrong | | 0.65 |
| | | Light leak | View Area: Invisible through 5% ND filter or limited sample. Outside of View Area: ignored | 0.65 |
| 10 | Bezel | Bezel must comply with product specifications. | | 0.65 |
| 11 | FPC | FPC terminal damage $\leq 1/2$ FPC terminal width and can not affect the function, we judge accept. | | 1.5 |
| | | FPC alignment hole damage $\leq 1/2$ alignment area and can not affect the function, we judge accept. | | 0.65 |
| 12 | Soldering | No cold solder joints, missing solder connections, oxidation or icicle. | | 1.5 |
| | | No short circuits in components on FPC | | 0.65 |
| 13 | General appearance | 13.1 Pin type must match type in specification sheet. 13.2 LCD pin loose or missing pins. 13.3 Product packaging must the same as specified on packaging | | |

| 14 | Touch Panel Chipped glass |  <p>Corner Fragment</p> | <p>Length $X < 2.0\text{mm}$ Width $Y < 1.0\text{ mm}$ Thickness $Z \leq \text{Glass thickness}$ (Sealant area could not be broken)</p> | 1.5 | | | | | | | | |
|----------------------|---|---|---|----------|-----------------|---------------|-----------------|----------------------|---|------------|---|-----|
| | |  <p>Side Fragment</p> | <p>Length $X < 3.0\text{ mm}$ Width $Y < 1.0\text{ mm}$ Thickness $Z \leq \text{Glass thickness}$ (Sealant area could not be broken)</p> | 1.5 | | | | | | | | |
| | |  <p>Bad Crack</p> | NOT ALLOWED | 0.65 | | | | | | | | |
| 15 | Touch Panel(Fish eye, dent, bubble on film and off the paint) |  | <table border="1"> <thead> <tr> <th>Size(mm)</th> <th>Acceptable Q'ty</th> </tr> </thead> <tbody> <tr> <td>$D \leq 0.15$</td> <td>Accept no dense</td> </tr> <tr> <td>$0.15 < D \leq 0.35$</td> <td>3</td> </tr> <tr> <td>$0.35 < D$</td> <td>0</td> </tr> </tbody> </table> | Size(mm) | Acceptable Q'ty | $D \leq 0.15$ | Accept no dense | $0.15 < D \leq 0.35$ | 3 | $0.35 < D$ | 0 | 1.5 |
| Size(mm) | Acceptable Q'ty | | | | | | | | | | | |
| $D \leq 0.15$ | Accept no dense | | | | | | | | | | | |
| $0.15 < D \leq 0.35$ | 3 | | | | | | | | | | | |
| $0.35 < D$ | 0 | | | | | | | | | | | |
| 16 | Touch Panel Newton ring | Newton ring dimension $\leq 1/2$ touch panel area and not affect font and line distortion ($\leq 2.5\%$), it is acceptable. | | 1.5 | | | | | | | | |

[Note1] The definition of Bright dot

- (1)The defective area of the dot is larger than 50% of one sub-pixel area.
- (2)The bright dot shall be visible under ND-Filter 5%as following.



12. Handling Precautions

12.1 Handling Precautions

12.1.1 The display panel is made of glass and polarizer. As glass are fragile. It tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring. Do not subject it to a mechanical shock by dropping it or impact.

12.1.2 If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.

12.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary. Do not touch the display with bare hands. This will stain the display area and degraded insulation between terminals (some cosmetics are determined to the polarizer).

12.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully. Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.). Do not put or attach anything on the display area to avoid leaving marks on it. Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizer. After products are tested at low temperature they must be warmed up in a container before coming in to contact with room temperature air.

12.1.5 If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents

- Isopropyl alcohol
- Ethyl alcohol

Do not scrub hard to avoid damaging the display surface.

12.1.6 Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the following.

- Water
- Ketone
- Aromatic solvents

Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading. Avoid contact with oil and fats.

12.1.7 Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.

12.1.8 Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.

12.1.9 Do not attempt to disassemble or process the LCD module.

12.1.10 NC terminal should be open. Do not connect anything.

12.1.11 If the logic circuit power is off, do not apply the input signals.

12.1.12 Electro-Static Discharge Control, Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

(1) Before removing LCM from its packing case or incorporating it into a set, be sure the module and your body have the same electric potential. Be sure to ground the body when handling the LCD modules.

(2) Tools required for assembling, such as soldering irons, must be properly grounded. Make certain the AC power source for the soldering iron does not leak. When using an electric screwdriver to attach LCM, the screwdriver should be of ground potential to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutator of the motor.

(3) To reduce the amount of static electricity generated, do not conduct assembling and other work under dry conditions. To reduce the generation of static electricity be careful that the air in the work is not too dry. A relative humidity of 50%-60% is recommended. As far as possible make the electric potential of your work clothes and that of the work bench the ground potential.

(4) The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.

12.1.13 Since LCM has been assembled and adjusted with a high degree of precision; avoid applying excessive shocks to the module or making any alterations or modifications to it.

(1) Do not alter, modify or change the shape of the tab on the metal frame.

(2) Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.

(3) Do not damage or modify the pattern writing on the printed circuit board.

(4) Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector.

(5) Except for soldering the interface, do not make any alterations or modifications with a soldering iron.

(6) Do not drop, bend or twist the LCM

12.2 Handling precaution for LCM

12.2.1 LCM is easy to be damaged. Please note below and be careful for handling.

12.2.2 Correct handling:



As above picture, please handle with anti-static gloves around LCM edges.



Please don't touch IC directly.



Please don't stack LCM.



Please don't hold the surface of panel



Please don't stretch interface of output, such as FPC cable.



Please don't hold the surface of IC.



Please don't operate with sharp stick such as pens.

12.3 Storage Precautions

12.3.1 When storing the LCD modules, the following precaution are necessary.

12.3.1.1 Store them in a sealed polyethylene bag. If properly sealed, there is no need for the

12.3.1.2 Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C, and keep the relative humidity between 40%RH and 60%RH.

12.3.1.3 The polarizer surface should not come in contact with any other objects (We advise you to store them in the anti-static electricity container in which they were shipped).

12.3.2 Transportation Precautions

12.3.2.1 During shipment, please handle with care. The packaging bag cannot be broken, step on trap. Packaging Carton layer height cannot be over two meters.

12.3.2.2 The transportation process should pay attention to the waterproof and moisture-proof measures. Product cannot be watering. Ethylene sealed bags cannot be unsealed.

12.3.3 Others

12.3.3.1 Liquid crystals solidify under low temperature (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subject to a low temperature.

12.3.3.2 If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability. Please do not uses in one picture for a long time; If fixed for a long time, an unrecoverable ghost images will appear.

12.3.4 Precautions for Operation

12.3.4.1 Viewing angle varies with the change of liquid crystal driving voltage (VLCD). Adjust VLCD to show the best contrast.

12.3.4.2 It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage then the limit cause the shorter LCD life. An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided.

12.3.4.3 Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD's show dark color in them. However those phenomena do not mean malfunction or out of order with LCD's, which will come back in the specified operating temperature.

12.3.4.4 If the display area is pushed hard during operation, the display will become abnormal. However, it will return to normal if it is turned off and then back on.

12.3.4.5 A slight dew's depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit. Usage under the maximum operating temperature, 50%RH or less is required.

12.3.4.6 Input logic voltage before apply analog high voltage such as LCD driving voltage when power on. Remove analog high voltage before logic voltage when power off the module. Input each signal after the positive/negative voltage becomes stable.

12.3.4.7 Please keep the temperature within the specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity.

12.3.4.8 It is easy to cause image sticking while displaying the same pattern for very long time.

12.4 Safety

12.4.1 It is recommended to crush damaged or unnecessary LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned.

12.4.2 If any liquid leaks out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water.

12.5 Limited Warranty

Unless agreed between AMSON and the customer, AMSON will replace or repair any of its LCD modules and Touch Panel which are found to be functionally defective when inspected in accordance with AMSON LCD acceptance standards (copies available upon request) for a period of one year from date of production.

Cosmetic/visual defects must be returned to AMSON within 90 days of shipment. Confirmation of such date shall be based on data code on product. The warranty liability of AMSON limited to repair and/or replace on the terms set forth above. AMSON will not be responsible for any subsequent or consequential events.

12.6 Return LCM under warranty

12.6.1 No warranty can be granted if the precautions stated above have been disregarded. The typical examples of violations are:

12.6.1.1 - Broken LCD glass and Touch Panel Chipped glass.

12.6.1.2- FPC eyelet is damaged or modified

12.6.1.3- FPC conductors damaged.

12.6.1.4- Circuit modified in any way, including addition of components.

12.6.1.5- FPC tampered with by grinding, engraving or painting varnish.

12.6.1.6- Soldering to or modifying the bezel in any manner.

12.6. Agreement items

Both sides should discuss together when the following problems happen.

12.6.1 There is any problem of standard of quality assurance, and both sides should think that must be modified.

12.6.2 There is any argument item which does not record in the standard of quality assurance.

12.6.3 Any other special problem.

13. Precaution for Use

13.1

A limit sample should be provided by the both parties on an occasion when the both parties agreed its necessity. Judgment by a limit sample shall take effect after the limit sample has been established and confirmed by the both parties.

13.2

On the following occasions, the handing of problem should be decided through discussion and agreement between responsible of the both parties.

- When a question is arisen in this specification.
- When a new problem is arisen this is not specified in this specification.
- When an inspection specifications change or operating condition change in customer is reported to AMSON TFT and some problem is arisen in this specification due to the change.

When a new problem is arisen at the customer's operating set for sample evaluation in the customer site.

14. Packing Method

TBD