ORIENT DISPLAY

*Your Total LCD Solution Provider*

http://www.orientdisplay.com

# SPECIFICATION
# FOR
# LCD MODULE

## MODULE NO: AFK240400A0-3.2N6NTM

## REVISION NO: V01

Customer's Approval:

| | |
|---|---|
| | |

| | SIGNATURE | DATE |
|---|---|---|
| PREPARED BY (RD ENGINEER) | | |
| CHECKED BY | | |
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# Records of Revision

| DATE | REF. PAGE<br>PARAGRAPH<br>DRAWING No. | REVISED No. | SUMMARY | REMARK |
|---|---|---|---|---|
| 2015-9-26 | | 01 | First Issue | |
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# Contents

# 1. Introduction

## 1.1 Scope of application

This specification applies to the positive type TFT transmissive dot matrix LCD module.

LCD resolution: Dots 240*RGBx400.

As to basic specification of the driver IC, refer to the IC (ST7793) data sheet.

## 1.2 Structure:

Structure: TFT Panel+Polarizer+IC+FPC+BL;

Full 262K Color 3.2 inch TFT Panel;

One bare chip with gold bump (COG) TECH;

White LED back light;

## 1.3 TFT features:

Transmissive Type LCD, normally white;

240 dot-source and 400 dot-gate outputs;

Optimum viewing direction:6 o’ clock;

Support MCU and RGB interface mode;

## 1.4 Applications:

Mobile phone

PSP

PDA

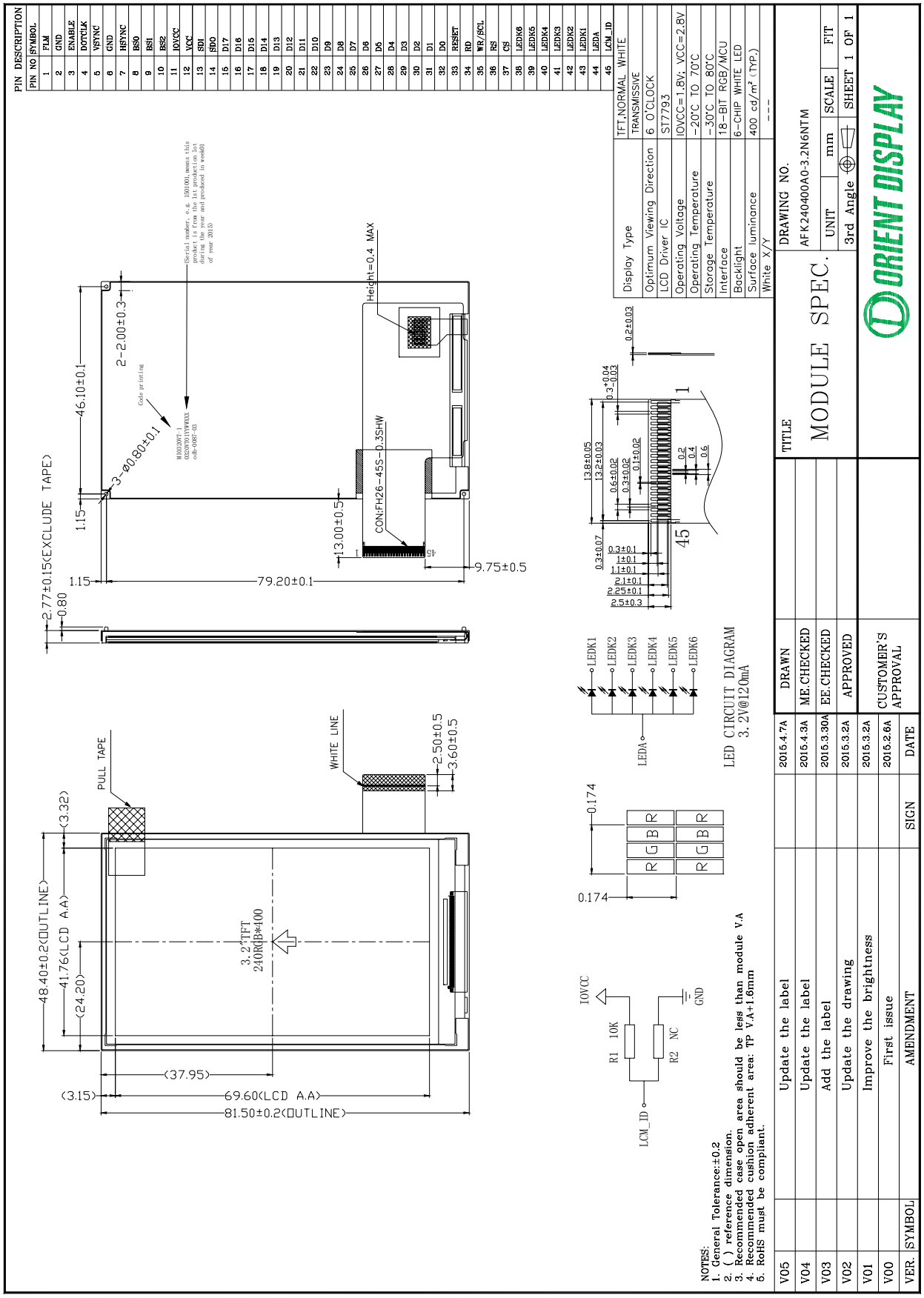
GPS

Etc…

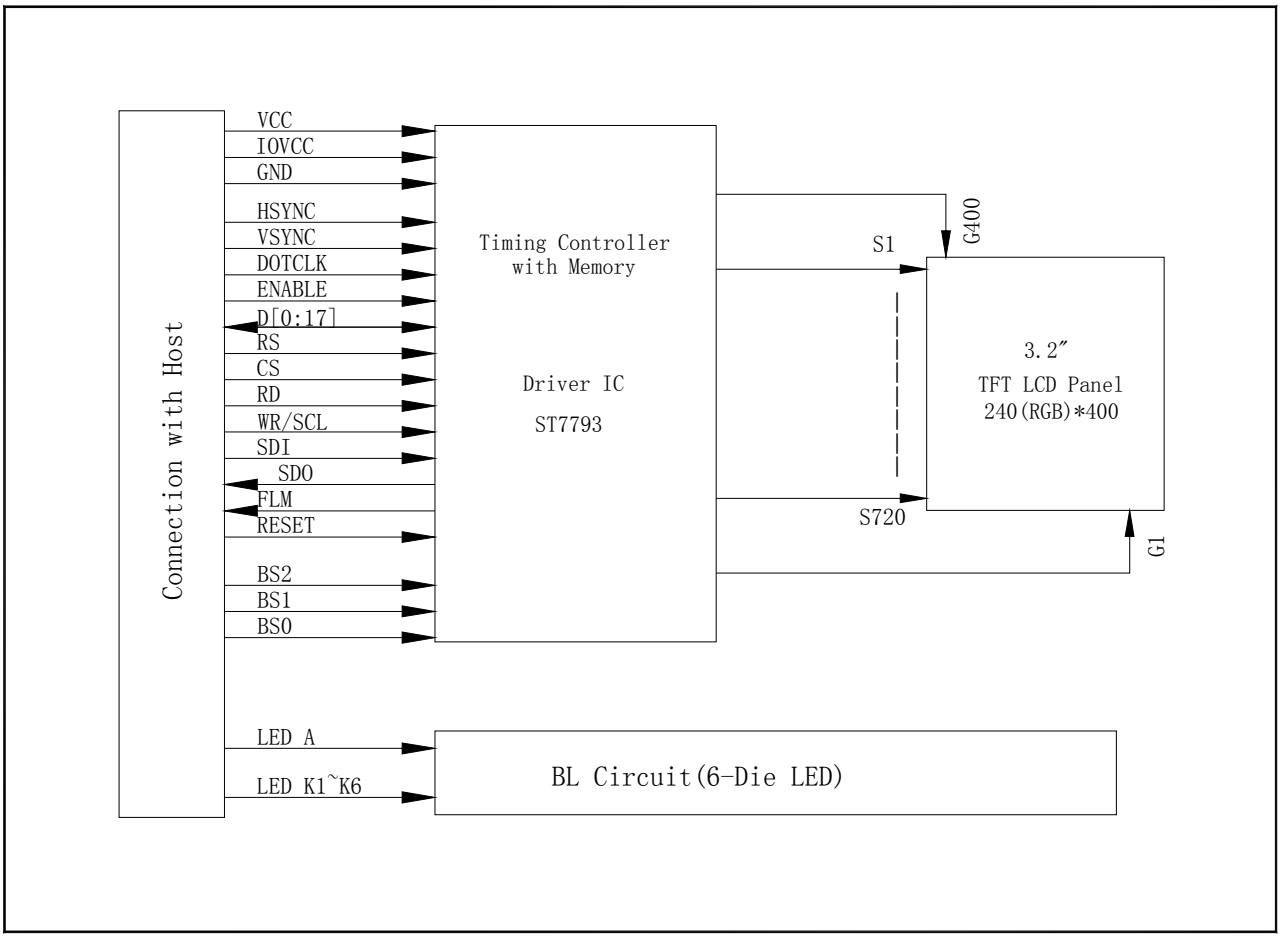
## 2. General specification

| ITEM | Standard value | UNIT |
|---|---|---|
| Display Mode | Transmissive,Normally white | --- |
| Driver Mothod | TFT Active matrix | |
| Number of Dots | 240(RGB)*400 | Dots |
| Pixel Arrangement | RGB Vertical Stripe | |
| Active Area | 41.76*69.60 | mm |
| Optimum Viewing Direction | 6 | o’ clock |
| Gray Scale Inversion Direction | 12 | o’ clock |
| Driver IC | ST7793 | |
| Module Size(W*H*T) | 48.40*81.50*2.77 | mm |
| Approx. Weight | TBD | g |
| Back Light | White LED | |
| System interface | MCU & RGB | |

# 3. Mechanical drawing



# 4. BLOCK DIAGRAM



# 5. Interface Pin Function

| Pin No. | Symbol | Description |
|---|---|---|
| 1 | FLM | Output a frame head pulse signal is used as synchronies MCU to frame rate.<br>If not used, leave this pin open. |
| 2 | GND | Power ground. |
| 3 | ENABLE | Data enable signal for RGB interface operation.<br>If not used, please fix this pin at VDDI or DGND level. |
| 4 | DOTCLK | Dot clock signal for RGB interface operation.<br>If not used, please fix this pin at VDDI or DGND level. |
| 5 | VSYNC | Vertical (Frame) synchronizing input signal for RGB interface operation.<br>Fix to the GND level when not in use. |
| 6 | GND | Power ground. |
| 7 | HSYNC | Horizontal (Line) synchronizing input signal for RGB interface operation.<br>Fix to the VDDI or GND level when not in use. |
| 8 | BS0 | Interface mode select. |
| 9 | BS1 | |
| 10 | BS2 | |
| 11 | IOVCC | Digital I/O Pad power supply. |
| 12 | VCC | Analog power supply. |
| 13 | SDI | SPI interface input pin.<br>The data is latched on the rising edge of the SCL signal.<br>If not used, please fix this pin at IOVCC or GND level. |
| 14 | SDO | SPI interface output pin.<br>The data is outputted on the falling edge of the SCL signal.<br>If not used, please fix this pin at floating. |
| 15~32 | D17~D0 | Data bus. |
| 33 | RESET | This signal will reset the device and it must be applied to properly initialize the chip.<br>Signal is active low. |
| 34 | RD | Read enable in 8080 MCU parallel interface. Low-active.<br>If not used, please fix this pin at IOVCC or GND level. |
| 35 | WR/SCL | Write enable in MCU parallel interface.<br>In SPI mode, this pin is used as SCL.<br>If not used, please fix this pin at IOVCC level. |
| 36 | RS | Display data/command selection (RS) pin in MCU interface.<br>RS=1: display data or parameter.<br>RS=0: register index / command. |

| | | |
|---|---|---|
| | | If not used, please fix this pin at IOVCC or GND level. |
| 37 | CS | Chip selection pin. Low-active.<br>If not used, please fix this pin at IOVCC level. |
| 38 | LEDK6 | Cathode of LED backlight. |
| 39 | LEDK5 | Cathode of LED backlight. |
| 40 | LEDK4 | Cathode of LED backlight. |
| 41 | LEDK3 | Cathode of LED backlight. |
| 42 | LEDK2 | Cathode of LED backlight. |
| 43 | LEDK1 | Cathode of LED backlight. |
| 44 | LEDA | Anode of LED backlight. |
| 45 | LCM_ID | Customer define PIN(default connect to IOVCC). |

Note: Interface mode select:

| BS2 | BS1 | BS0 | Interface Mode | Data Pin |
|---|---|---|---|---|
| 0 | 0 | 0 | 8080 18-bit interface | D[17:0] |
| 0 | 0 | 1 | 8080 9-bit interface | D[17:9] |
| 0 | 1 | 0 | 8080 16-bit interface | D[17:10],D[8:1] |
| 0 | 1 | 1 | 8080 8-bit interface | D[17:10] |
| 1 | 0 | ID | SPI | SDI,SDO |

When the SPI interface is selected, BS0 pin is used for the ID setting.

# 6. ABSOLUTE MAXIMUM RATINGS

| Parameter | Symbol | Min | Max | Unit |
|---|---|---|---|---|
| Supply voltage for logic | IOVCC | -0.3 | 4.6 | V |
| Supply voltage for analog | VCC | -0.3 | 4.6 | V |
| Input voltage | VIN | -0.3 | VCC+0.3 | V |
| Supply current (One LED) | $I_{LED}$ | | 30 | mA |
| Operating temperature | $T_{OP}$ | -20 | +70 | ℃ |
| Storage temperature | $T_{ST}$ | -30 | +80 | ℃ |

# 7. ELECTRICAL CHARACTERISTICS

For IC

| Item | Symbol | Min | Typ | Max | Unit | Applicable terminal |
|---|---|---|---|---|---|---|
| Supply voltage for logic | IOVCC | 1.65 | 1.8 | VCC | V | |
| Supply voltage for analog | VCC | 2.5 | 2.75 | 3.3 | V | |
| Input voltage | VIL | GND | - | 0.2IOVCC | V | |
| | VIH | 0.8IOVCC | - | IOVCC | | |
| Input leakage current | $I_{LKG}$ | -0.1 | | 0.1 | μA | |

For backlight

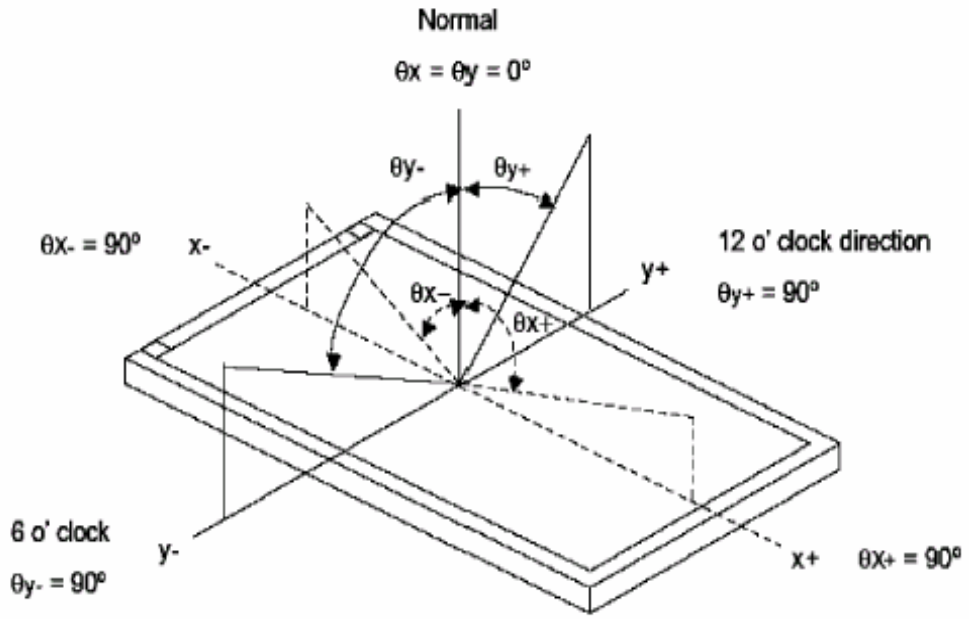
| Item | Symbol | Min | Typ | Max | Unit | Condition |
|---|---|---|---|---|---|---|
| Supply Current | I | | 120 | | mA | |
| Forward Voltage | $V_{LED}$ | 3.0 | 3.2 | 3.4 | V | I=120mA |
| Power Consumption | P | | 384 | | mW | |
| Life Time | | 20000 | | | Hours | Note |

**Note**: Brightness to be decreased to 50% of the initial value at ambient temperature TA=25℃

# 8. OPTICAL CHARACTERISTICS

| ITEM | | SYMBOL | CONDITIONS | SPECIFICATIONS | | | UNIT | NOTE |
|---|---|---|---|---|---|---|---|---|
| | | | | MIN. | TYP. | MAX | | |
| Brightness | | B | Viewing normal angle | - | 400 | - | $Cd/m^2$ | |
| Contrast Ratio | | CR | | | 350 | -- | -- | |
| Response Time | | Tr+Tf | | -- | 20 | 30 | ms | |
| CIE Color coordinate | Red | $X_R$ | | -- | | | | |
| | | $Y_R$ | | | | | | |
| | Green | $X_G$ | | -- | | | | |
| | | $Y_G$ | | | | | | |
| | Blue | $X_B$ | | -- | | | | |
| | | $Y_B$ | | | | | | |
| | White | $X_W$ | | -- | | | | |
| | | $Y_W$ | | | | | | |
| Viewing Angle | Hor. | $\theta_{X+}$ | Center CR>=10 | | 70 | -- | Deg. | |
| | | $\theta_{X-}$ | | | 70 | -- | | |
| | Ver. | $\theta_{Y+}$ | | | 70 | -- | | |
| | | $\theta_{Y-}$ | | | 60 | | | |
| Uniformity | Un | | | 80 | | | % | |

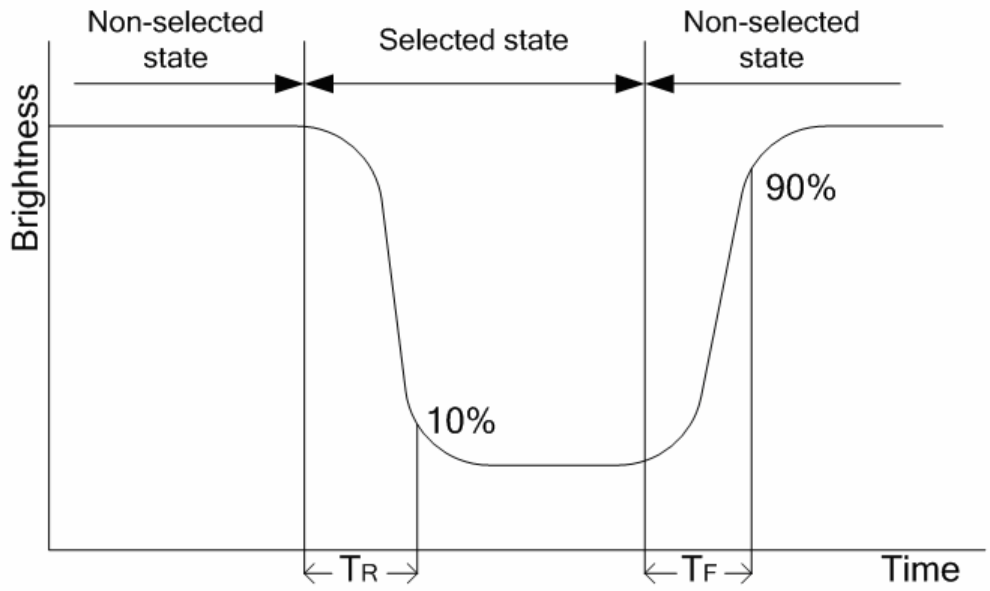
Note 1 : Definition of Viewing Angle $\theta_x$ and $\theta_y$ :




Note 2: Definition of contrast ratio CR:

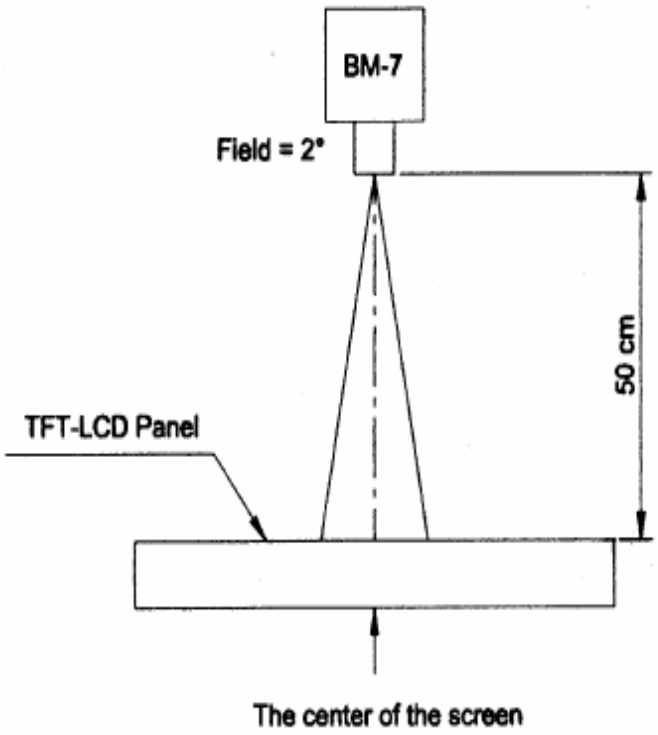
$$CR = \frac{\text{Brightness of non-selected dots (white)}}{\text{Brightness of selected dots (black)}}$$

Note 3: Definition of response time ($T_R$, $T_F$)

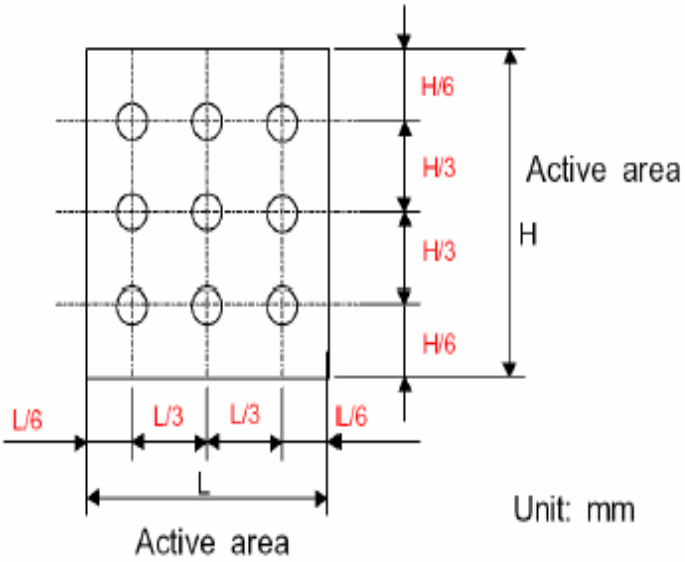


: The brightness test equipment setup

20mA Field=2° (As measuring "black" image, field=2° is the best testing condition)




Note 4 :



# 9. Timing characteristics

## 9.1 8080 series MCU parallel interface Characteristics:18/16/9/8-bit bus

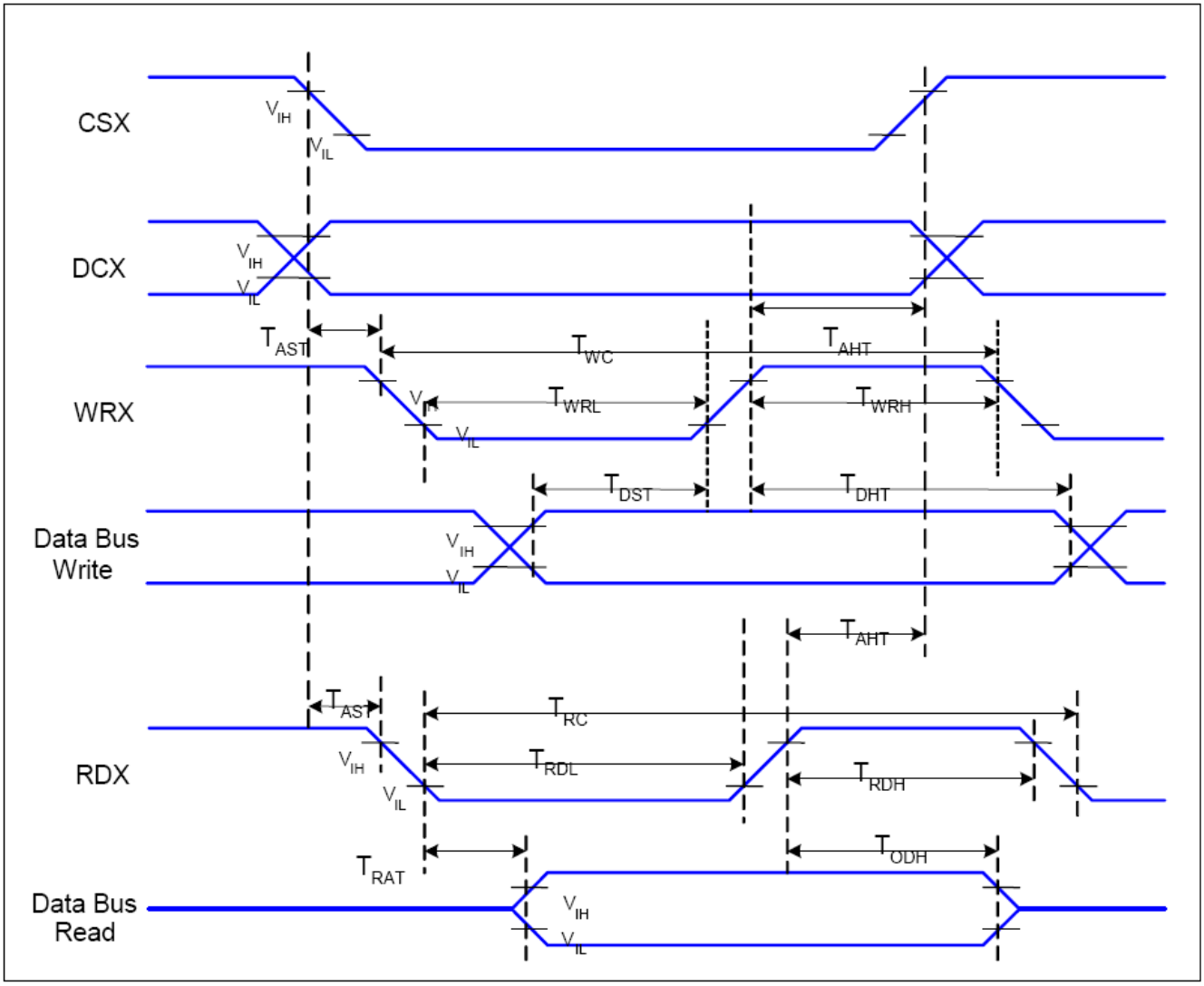



**Figure 1. Parallel interface timing characteristics (8080-Series MCU)**

IOVCC=1.65 to VCC, VCC=2.5 to 3.3V, AGND=DGND=0V, Ta=23℃

| Signal | Symbol | Parameter | Min | Max | Unit | Description |
|---|---|---|---|---|---|---|
| DCX | TAST | Address Setup Time | 0 | -- | ns | |
| | TAHT | Address Hold Time (Write/Read) | 2 | -- | ns | |
| WRX | TWC | Write Cycle | 75 | -- | ns | |
| | TWRH | Control Pulse “H” Duration | 25 | -- | ns | |
| | TWRL | Control Pulse “L” Duration | 30 | -- | ns | |
| RDX | TRC | Read Cycle (ID) | 450 | -- | ns | When Read ID Data |
| | TRDH | Control Pulse “H” Duration (ID) | 250 | -- | ns | |
| | TRDL | Control Pulse “L” Duration (ID) | 170 | -- | ns | |

| Signal | Symbol | Parameter | Min | Max | Unit | Description |
|---|---|---|---|---|---|---|
| DB[17:0] | TDST | Data Setup Time | 20 | -- | ns | TRAT, TRATFM: 3K ohm Pull up or Down and 30pF Parallel Cap. To GND. TODH: 3K ohm Pull up or Down. |
| | TDHT | Data Hold Time | 10 | -- | ns | |
| | TRAT | Read Access Time (ID) | -- | 150 | ns | |
| | TODH | Output Disable Time | 10 | -- | ns | |

**Figure 2. 8080 parallel interface characteristics**

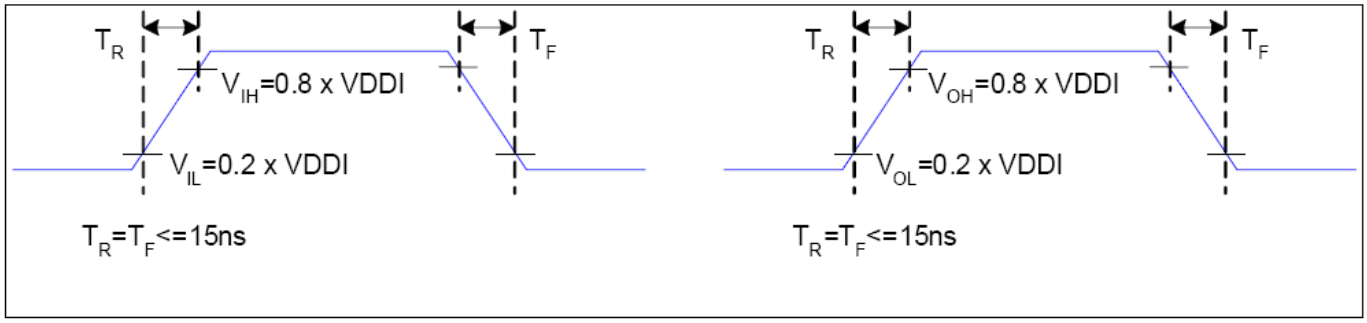



**Figure 3. Rising and falling timing for I/O signal**

*Note: The rising time and falling time (Tr, Tf) of input signal and fall time are specified at 15 ns or less. Logic high and low levels are specified as 20% and 80% of IOVCC for Input signals.*

## 9.2 Serial Interface Characteristics

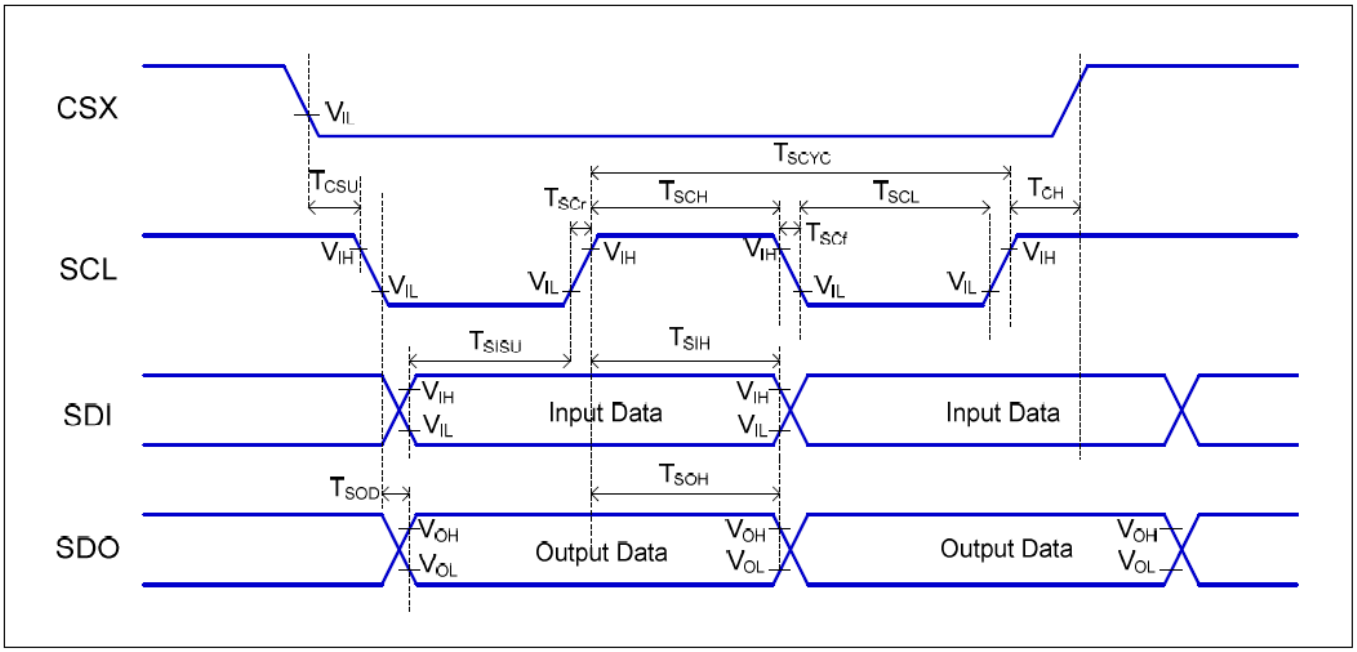



**Figure 4. SPI interface timing Characteristics**

IOVCC=1.65 to VCC, VCC=2.5 to 3.3V, AGND=DGND=0V, Ta=23℃

| Signal | Symbol | Parameter | Min | Max | Unit | Description |
|---|---|---|---|---|---|---|
| CSX | TCSU | Chip Select Setup Time | 20 | | ns | - |
| | TCH | Chip Select Hold Time | 60 | | ns | |
| SCL | TSCH | SCL “H” pulse width (Write) | 40 | | ns | |
| | TSCH | SCL “H” pulse width (Read) | 150 | | ns | |
| | TSCYC | Serial clock cycle (Write) | 100 | | ns | |
| | TSCYC | Serial clock cycle (Read) | 350 | | ns | |
| | TSCL | SCL “L” pulse width (Write) | 40 | | ns | |
| | TSCL | SCL “L” pulse width (Read) | 150 | | ns | |
| SDI | TSISU | Serial Input Data Setup Time | 30 | | ns | |
| | TSIH | Serial Input Data Hold Time | 30 | | ns | |
| SDO | TSOD | Serial Output Data Setup Time | -- | 130 | ns | |
| | TSOH | Serial Output Data Hold Time | 10 | -- | ns | |

**Figure 5. SPI interface Characteristics**

## 9.3 RGB Interface Characteristics

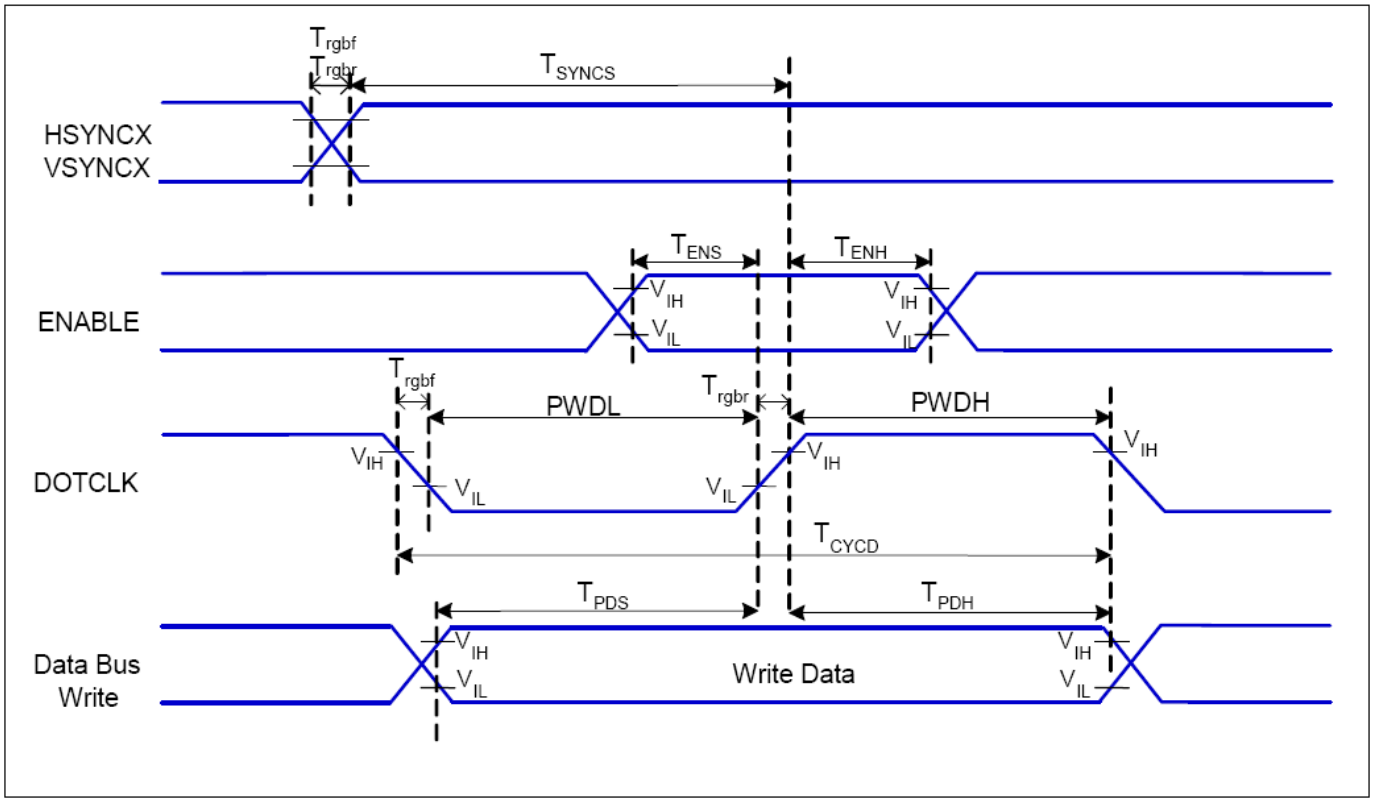



**Figure 6. RGB Interface timing Characteristics**

IOVCC=1.65 to VCC, VCC=2.5 to 3.3V, AGND=DGND=0V, Ta=23℃

| Signal | Symbol | Parameter | MIN | MAX | Unit | Description |
|---|---|---|---|---|---|---|
| HSYNCX<br>VSYNCX | TSYNCS | VSYNC, HSYNC Setup Time | 30 | - | ns | |
| ENABLE | TENS | Enable Setup Time | 30 | - | ns | |
| | TENH | Enable Hold Time | 30 | - | ns | |
| DOTCLK | PWDH | DOTCLK High-level Pulse Width | 40 | - | ns | |
| | PWDL | DOTCLK Low-level Pulse Width | 40 | - | ns | |
| | TCYCD | DOTCLK Cycle Time | 100 | - | ns | |
| DB | TPDS | PD Data Setup Time | 40 | - | ns | |
| | TPDH | PD Data Hold Time | 40 | - | ns | |

**Figure 7. RGB Interface Characteristics**

## 9.4 Reset input Timing

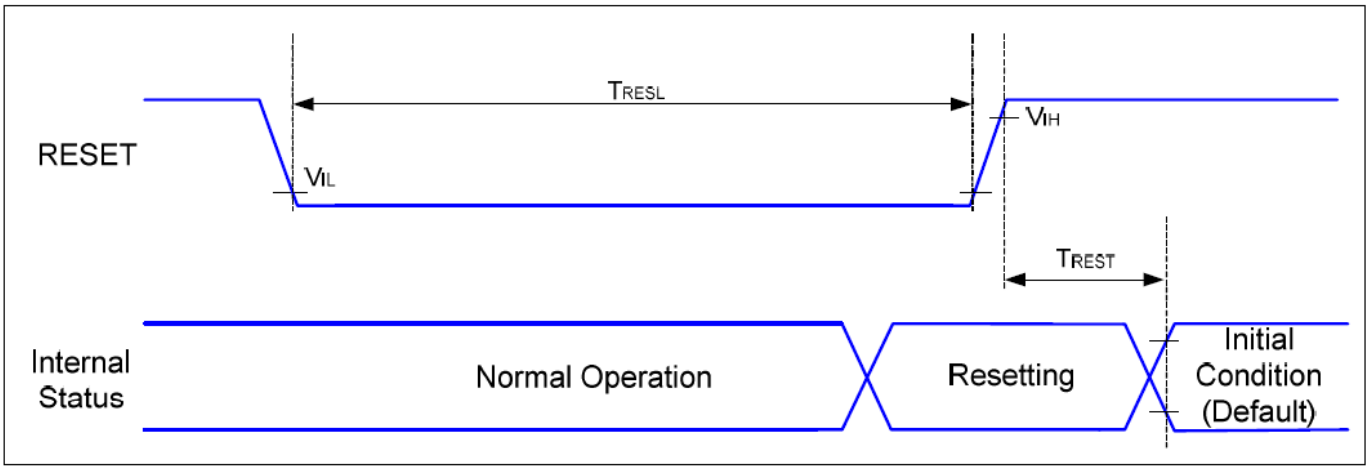



**Figure 8. Reset Timing Characteristics**

IOVCC=1.65 to VCC, VCC=2.5 to 3.3V, AGND=DGND=0V, Ta=23℃

| Signal | Symbol | Parameter | Min | Max | Unit | Description |
|---|---|---|---|---|---|---|
| RESET | TRESL | Reset Low Level Width | 1 | - | ms | - |
| | TREST | Reset Complete Time | 1 | | ms | |

**Figure 9. Reset Characteristics**

# 10. Standard Specification for Reliability :

10－1. Standard Specifications for Reliability of LCD Module

| No | Item | Description |
|---|---|---|
| 01 | High temperature operation | The sample should be allowed to stand at 70℃ for 240 hours under driving condition and then returning it to normal temperature condition, and allowing it stand for 2 hours. |
| 02 | Low temperature operation | The sample should be allowed to stand at -20℃ for 240 hours under driving condition and then returning it to normal temperature condition, and allowing it stand for 2 hours. |
| 03 | High temperature storage | The sample should be allowed to stand at 80℃ for 240 hours under no-load condition, and then returning it to normal temperature condition, and allowing it stand for 2 hours. |
| 04 | Low temperature storage | The sample should be allowed to stand at -30℃ for 240 hours under no-load condition, then returning it to normal temperature condition, and allowing it stand for 2 hours. |
| 05 | Moisture storage | The sample should be allowed to stand at 60℃,90%RH MAX for 240 hours under no-load condition, then taking it out and drying it at normal temperature for 2 hours. |
| 06 | Thermal shock storage | The sample should be allowed to stand the following 10 cycles :<br>-30℃ for 30 minutes → normal temperature for 5 minutes → +80℃ for 30 minutes → normal temperature for 5 minutes, as one cycle. |
| 07 | Packing vibration | Frequency range : 10Hz ~ 55Hz<br>Amplitude of vibration : 1.5mm Sweep time: 12 min<br>X,Y,Z 2 hours for each direction. |
| 08 | Packing drop test | According to ISTA 1A 2001. |
| 09 | Electrical Static Discharge | Air: ±4KV 150pF/330Ω 5 times |
| | | Contact: ±2KV 150pF/330Ω 5 time |

*Sample size for each test item is 3~5pcs

10 - 2. Testing Conditions and Inspection Criteria

For the final test the testing sample must be stored at room temperature for 24 hours, after the tests listed in Table 12.2, Standard specifications for Reliability have been executed in order to ensure stability.

| No | Item | Test Model | In section Criteria |
|---|---|---|---|
| 01 | Current Consumption | Refer To Specification | The current consumption should conform to the product specification. |
| 02 | Contrast | Refer To Specification | After the tests have been executed, the contrast must be larger than half of its initial value prior to the tests. |
| 03 | Appearance | Visual inspection | Defect free. |

10- 3. MTBF

| | |
|---|---|
| MTBF | Functions, performance, appearance, etc. shall be free from remarkable deterioration within10,000 hours under ordinary operating and storage conditions room temperature (25±5℃), normal humidity (50±10% RH), and in area not exposed to direct sun light. |

# 11. Specification of Quality Assurance:

11-1. Purpose

This standard for Quality Assurance should affirm the quality of LCD module products to supply to purchaser by Orient Display.

11-2. Standard for Quality Test

a. Inspection:

Before delivering, the supplier should take the following tests, and affirm the quality of product.

b. Electro-Optical Characteristics:

According to the individual specification to test the product.

c. Test of Appearance Characteristics:

According to the individual specification to test the product.

d. Test of Reliability Characteristics:

According to the definition of reliability on the specification for testing products.

e. Delivery Test:

Before delivering, the supplier should take the delivery test.

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

(ii) The defects classify of AQL as following:

Major defect: AQL = 0.65

Minor defect: AQL = 2.5

Total defects: AQL = 2.5 (MASS PRODUCTION FAILURE RATE: 5000~7000PPM)

11-3. Non- conforming Analysis & Deal With Manners

a. Non- conforming Analysis:

(i) Purchaser should supply the detail data of non- conforming sample and the non- conforming.

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

(iii) If supplier can not finish analysis on time, must announce purchaser before 3 days.

b. Disposition of non- conforming:

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

(ii) 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. Agreement items

Both sides should discuss together when the following problems happen.

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

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

c. Any other special problem.

11-5. Standard of The Product Appearance Test

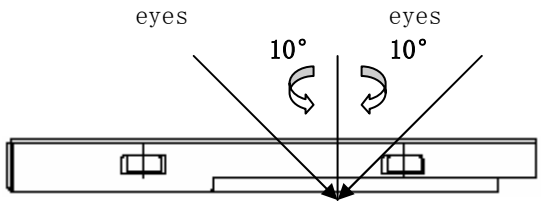
a. Manner of appearance test:

(i) The test must be under 20W × 2 or 40W fluorescent light, and the distance of view must be at 30±5cm.

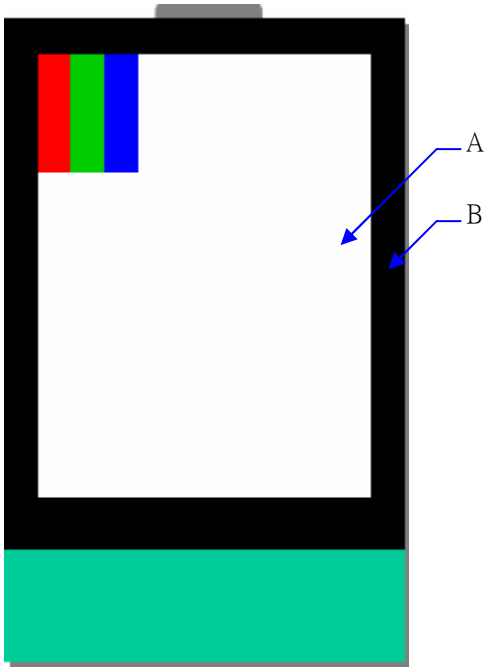
(ii) When test the model of transmissive product must add the reflective plate.

(iii)The test direction is base on around 10° of vertical line.

(iiii)Temperature: 25±5℃ Humidity: 60±10%RH




(iv) Definition of area:




A. Area: Viewing area.

B. Area: Out of viewing area.
(Outside viewing area)

b. Basic principle:

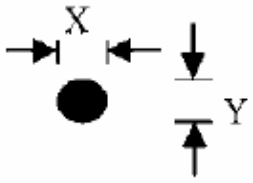
(i) It will accord to the AQL when the standard can not be described.

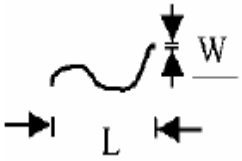
(ii) The sample of the lowest acceptable quality level must be discussed by both supplier and customer when any dispute happened.

(iii) Must add new item on time when it is necessary.

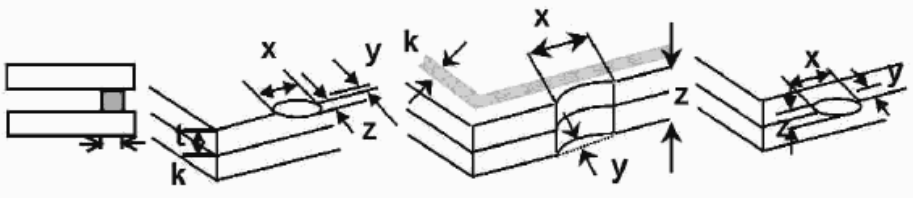
c. Standard of inspection: (Unit: mm)

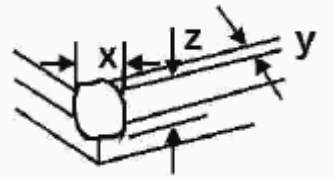
11-6. Inspection specification

<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>01</td><td>Electrical Testing</td><td>1.1 Missing vertical, horizontal segment, segment contrast defect.<br>1.2 Missing character, dot or icon.<br>1.3 Display malfunction.<br>1.4 No function or no display.<br>1.5 Current consumption exceeds product specifications.<br>1.6 LCD viewing angle defect.<br>1.7 Mixed product types.<br>1.8 Flicker</td><td>0.65</td></tr>
<tr><td>02</td><td>Black or White spots or Bright spots or Color spots on LCD (Display only)</td><td>2.1 White and black or color spots on display ≦ 0.25mm, no more than Five spots.<br>2.2 Densely spaced: No more than three spots within 3mm.</td><td>2.5</td></tr>
<tr><td rowspan="2">03</td><td rowspan="2">LCD and Touch Panel black spots, white spots, contamination (non - display)</td><td>3.1 Round type: As following drawing<br>Φ = (X+Y) / 2<br> 

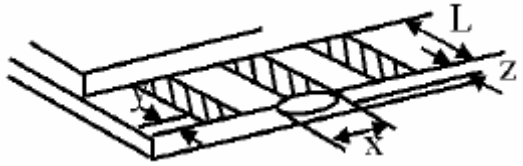
<table>
<tr><th>Size(mm)</th><th>Acceptable Q'ty</th></tr>
<tr><td>Φ≦0.10</td><td>Accept no dense</td></tr>
<tr><td>0.10< Φ≦0.20</td><td>2</td></tr>
<tr><td>0.20< Φ≦0.25</td><td>2</td></tr>
<tr><td>0.25< Φ≦0.30</td><td>1</td></tr>
<tr><td>0.30< Φ</td><td>0</td></tr>
</table>
* Densely spaced: No more than two spots within 3mm.</td><td>2.5</td></tr>
<tr><td>3.2 Line type: (As following drawing)<br> 

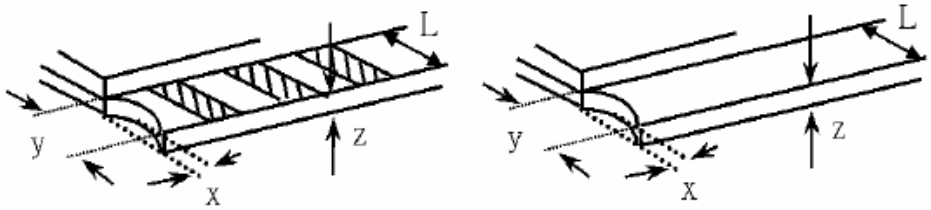
<table>
<tr><th>Length(mm)</th><th>Width(mm)</th><th>Acceptable Q'ty</th></tr>
<tr><td>---</td><td>W≦0.02</td><td>Accept no dense</td></tr>
<tr><td>L≦3.0</td><td>0.02<W≦0.05</td><td rowspan="2">2</td></tr>
<tr><td>L≦2.5</td><td>0.03<W≦0.08</td></tr>
<tr><td>---</td><td>0.08<W</td><td>Rejection</td></tr>
</table>
* Densely spaced: No more than two lines within 3mm.</td><td>2.5</td></tr>
</table>

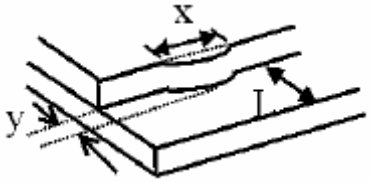
<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>04</td><td>Polarizer bubbles</td><td>If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction
<table>
<tr><td>Size Φ(mm)</td><td>Acceptable Q'ty</td></tr>
<tr><td>Φ≦0.20</td><td>Accept no dense</td></tr>
<tr><td>0.20< Φ≦0.50</td><td>3</td></tr>
<tr><td>0.50< Φ≦1.00</td><td>2</td></tr>
<tr><td>1.00< Φ</td><td>0</td></tr>
<tr><td>Total Q' ty</td><td>3</td></tr>
</table></td><td>2.5</td></tr>
<tr><td>05</td><td>Scratches</td><td>Follow NO.3 -2 Line Type.</td><td></td></tr>
<tr><td>06</td><td>Chipped glass</td><td>Symbols:<br>x: Chip length y: Chip width z: Chip thickness<br>k: Seal width t: Glass thickness a: LCD side length<br>L: Electrode pad length<br>6.1 General glass chip:<br>6.1.1 Chip on panel surface and crack between panels:<br> 

<table>
<tr><td>z: Chip thickness</td><td>y: Chip width</td><td>x: Chip length</td></tr>
<tr><td>Z≦1/2t</td><td>Not over viewing area</td><td>x≦1/8a</td></tr>
<tr><td>1/2t< z≦2t</td><td>Not exceed 1/3k</td><td>x≦1/8a</td></tr>
</table>
⊙ Unit: mm<br>⊙ If there are 2 or more chips, x is the total length of each chip<br><br>6.1.2 Corner crack:<br> 

<table>
<tr><td>z: Chip thickness</td><td>y: Chip width</td><td>x: Chip length</td></tr>
<tr><td>Z≦1/2t</td><td>Not over viewing area</td><td>x≦1/8a</td></tr>
<tr><td>1/2t< z≦2t</td><td>Not exceed 1/3k</td><td>x≦1/8a</td></tr>
</table>
⊙ Unit: mm<br>⊙ If there are 2 or more chips, x is the total length of each chip</td><td>2.5</td></tr>
</table>

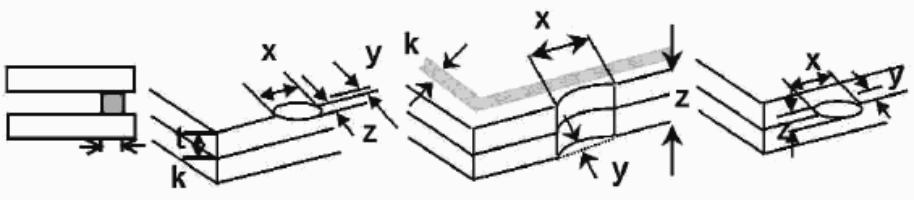
<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>07</td><td>Glass crack</td><td>
Symbols:<br>
x: Chip length y: Chip width z: Chip thickness<br>
k: Seal width t: Glass thickness a: LCD side length<br>
L: Electrode pad length<br>
7.2 Protrusion over terminal:<br>
7.2.1 Chip on electrode pad:<br>


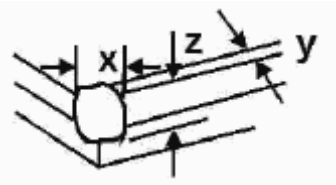
<table>
<tr><td>y: Chip width</td><td>x: Chip length</td><td>z: Chip thickness</td></tr>
<tr><td>y≦0.5mm</td><td>x≦1/8a</td><td>0< z≦t</td></tr>
</table>
7.2.2 Non-conductive portion:<br>


<table>
<tr><td>y: Chip width</td><td>x: Chip length</td><td>z: Chip thickness</td></tr>
<tr><td>y≦L</td><td>x≦1/8a</td><td>0< z≦t</td></tr>
</table>
⊙ If there chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications.<br>
⊙ If the product will be heat sealed by the customer, the alignment mark must mot be damaged.<br>
7.2.3 Substrate protuberance and internal crack<br>


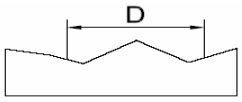
<table>
<tr><td>y: width</td><td>x: length</td></tr>
<tr><td>y≦1/3L</td><td>X≦a</td></tr>
</table>
</td><td>2.5</td></tr>
</table>

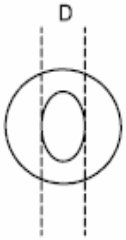
| NO | Item | Criterion | AQL |
|---|---|---|---|
| 08 | Cracked glass | The LCD with extensive crack is not acceptable. | 2.5 |
| 09 | Backlight elements | 9.1 Illumination source flickers when lit.<br>9.2 Spots or scratches that appear when lit must be judged.<br>Using LCD spot, lines and contamination standards.<br>9.3 Backlight doesn’t light or color is wrong. | 2.5<br>2.5<br><br>0.65 |
| 10 | Bezel | Bezel must comply with product specifications. | 2.5 |
| 11 | PCB、COB | 11.1 COB seal may not have pinholes larger than 0.2mm or contamination.<br>11.2 COB seal surface may not have pinholes through to the IC.<br>11.3 The height of the COB should not exceed the height indicated in the assembly diagram.<br>11.4 There may not be more than 2mm of sealant outside the seal area on PCB. And there should be no more than three places.<br>11.5 Parts on PCB must be the same as on the production characteristic chart, There should be no wrong parts, missing parts or excess parts.<br>11.6 The jumper on the PCB should conform to the product characteristic chart. | 2.5<br>2.5<br>2.5<br>2.5<br>0.65<br>0.65 |
| 12 | FPC | 12.1 FPC terminal damage ≦ 1/2 FPC terminal width and can not affect the function , we judge accept.<br>12.2 FPC alignment hole damage ≦ 1/2 alignment area and can not affect the function , we judge accept. | 2.5<br>2.5 |
| 13 | Soldering | 13.1 No cold solder joints, missing solder connections, oxidation or icicle.<br>13.2 No short circuits in components on PCB or FPC. | 2.5<br>0.65 |

<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>14</td><td>Touch Panel Chipped glass</td><td>
Symbols:<br>
x: Chip length y: Chip width z: Chip thickness<br>
k: Seal width t: Touch Panel Total thickness a: LCD side length<br>
L: Electrode pad length<br>
14.1 General glass chip:<br>
14.1.1 Chip on panel surface and crack between panels:<br>


<table>
<tr><th>z: Chip thickness</th><th>y: Chip width</th><th>x: Chip length</th></tr>
<tr><td>Z≦t</td><td>≦1/2 k and not over viewing area</td><td>x≦1/8a</td></tr>
</table>
⊙ Unit: mm<br>
⊙ If there are 2 or more chips, x is the total length of each chip<br><br>
14.1.2 Corner crack:<br>


<table>
<tr><th>z: Chip thickness</th><th>y: Chip width</th><th>x: Chip length</th></tr>
<tr><td>z≦t</td><td>≦1/2 k and not over viewing area</td><td>x≦1/8a</td></tr>
</table>
⊙ Unit: mm<br>
⊙ If there are 2 or more chips, x is the total length of each chip
</td><td>2.5</td></tr>
</table>

<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>15</td><td>Touch Panel(Fish eye、dent and bubble on film)</td><td>
<table>
<tr><th>SIZE(mm)</th><th>Acceptable Q’ty</th></tr>
<tr><td>Φ≦0.2</td><td>Accept no dense</td></tr>
<tr><td>0.2< D ≦0.4</td><td>5</td></tr>
<tr><td>0.4< D ≦0.5</td><td>2</td></tr>
<tr><td>0.5< D</td><td>0</td></tr>
</table>




</td><td>2.5</td></tr>
<tr><td>16</td><td>Touch Panel Newton ring</td><td>Newton ring dimension ≦ 1/2 touch panel area and not affect font and line distortion(≦2.5%) , it is acceptable.</td><td>2.5</td></tr>
<tr><td>17</td><td>Touch Panel Linearity</td><td>Less than 2.5% is acceptable.</td><td>2.5</td></tr>
<tr><td>18</td><td>LCD Ripple</td><td>Touch the touch panel , can not see the LCD ripple.<br>Pen: R 1.0mm silicon rubber.<br>Operation Force: 80g</td><td>2.5</td></tr>
<tr><td>19</td><td>General appearance</td><td>19.1 Pin type must match type in specification sheet.<br>19.2 LCD pin loose or missing pins.<br>19.3 Product packaging must the same as specified on packaging specification sheet.<br>19.4 Product dimension and structure must conform to product specification sheet.</td><td>0.65<br>0.65<br>0.65<br>0.65</td></tr>
</table>

# 12. Handling Precaution:

## 12-1 Handling of LCM

- Don't give external shock.
- Don't apply excessive force on the surface.
- Liquid in LCD is hazardous substance. Must not lick and swallow. when the liquid is attach to your hand, skin, cloth etc. Wash it out thoroughly and immediately.
- Don't operate it above the absolute maximum rating.
- Don't disassemble the LCM.
- The operators should be grounded whenever he/she comes into contact with the module. 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.
- The modules should be kept in antistatic bags or other containers resistant to static for storage.
- The module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

## 12-2 Storage

- Store in an ambient temperature of 25±10℃, and in a relative humidity of 50±10%RH. Don't expose to sunlight or fluorescent light.
- Storage in a clean environment, free from dust, active gas, and solvent.
- Store in anti-static electricity container.
- Store without any physical load.

## 11-3 Soldering

- Use only soldering irons with proper grounding and no leakage.
- Iron: No higher than 280±10℃ and less than 3 sec during Hand soldering.
- Rewiring: no more than 2 times.

# 13 Packing method

------TBD