



# Microtips

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## TECHNOLOGY

Model No: HA-080GIEBUBD0-A

| Approved By |  |
|-------------|--|
|             |  |

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## RECORD OF REVISION

| Version | Revised Date | Page | Content      |
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|         |              |      |              |
|         |              |      |              |

## TABLE OF CONTENTS

| No. | Content   | Page |
|-----|---|------|
|     | HDMI TFT Module Specification .....                 | 1    |
|     | TABLE OF CONTENTS .....                             | 3    |
| 1.  | GENERAL DESCRIPTION .....                           | 4    |
| 2.  | MECHANICAL SPECIFICATION .....                      | 5    |
| 3.  | PIN DESCRIPTION .....                               | 6    |
| 4.  | ABSOLUTE MAXIMUM RATINGS .....                      | 8    |
| 5.  | BLOCK DIAGRAM .....                                 | 9    |
| 6.  | ELECTRICAL CHARACTERISTICS .....                    | 10   |
| 7.  | PROJECTED CAPACITIVE TOUCH PANEL SPECIFICATION..... | 10   |
| 8.  | OPTICAL CHARACTERISTICS .....                       | 11   |
| 9.  | RELIABILITY.....                                    | 14   |
| 10. | PRECAUTION RELATING PRODUCT HANDLING .....          | 19   |

## 1. GENERAL DESCRIPTION

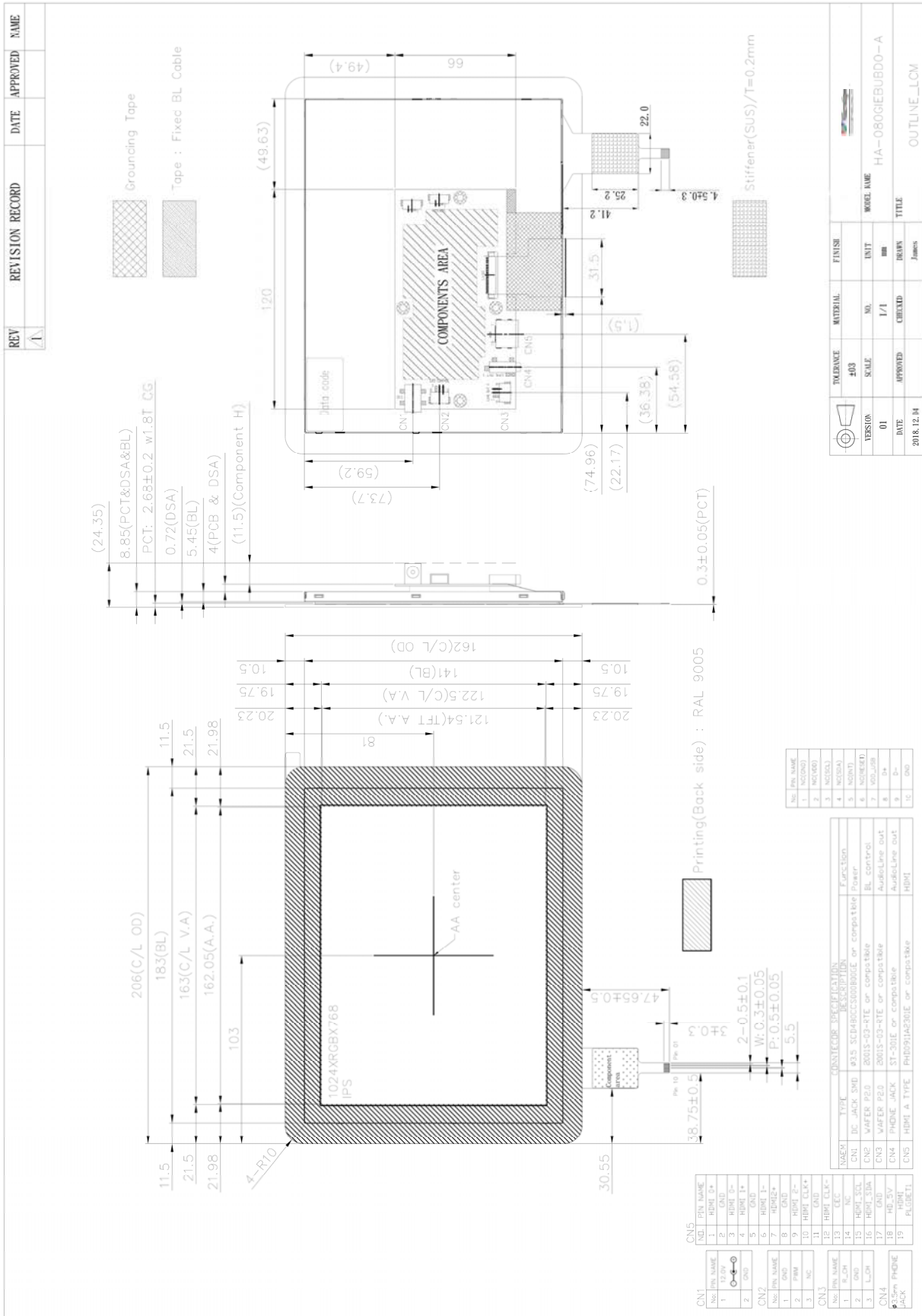
### 1.1 Description

HA-080GIEBUBD0-A is a 8.0 (4:3) inch diagonally measured active display with high resolution WXGA 1024x768 display and high brightness. This model is composed of a TFT LCD panel, backlight system, a projected capacitive touch panel and HDMI included Stereo D/A Converter . It is designed to make Raspberry Pi usage easy. You can simply use this TFT display with your Raspberry Pi, or also you can use this as computer display with any device which has HDMI output. This 8.0" TFT model comes in 1024x768 resolution that would be great for embedded computing usage too.

### 1.2 Features:

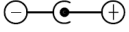
| No. | Item                           | Specification  | Unit              |
|-----|--------------------------------|--|-------------------|
| 1   | Panel Size                     | 8.0"   | Inch              |
| 2   | Number of Pixels               | 1024 (W) x RGB x 768 (H)                                   | Pixels            |
| 3   | Active Area                    | 162.05 (W) × 121.54 (H)                                    | mm                |
| 4   | Pixel Pitch                    | 0.15825 (W) × 0.15825(H)                                   | mm                |
| 5   | Outline Dimension              | 206 (W) × 162 (H) × 24.35 (T)                              | mm                |
| 6   | Number of Colors               | 16.7M  | - -               |
| 7   | Display Mode                   | IPS / Normally Black / Transmissive                        | - -               |
| 8   | View Direction                 | Free direction   | - -               |
| 9   | Display Format                 | RGB vertical stripe  | - -               |
| 10  | Surface Treatment              | Clear (7H)   | - -               |
| 11  | Contrast Ratio                 | 800 (Typ.)   | - -               |
| 12  | Luminance (cd/m <sup>2</sup> ) | 500 (Typ.)   | cd/m <sup>2</sup> |
| 13  | Video Input Interface          | HDMI<br>(Compliance HDMI V1.4 and include HDCP decryption) | - -               |
| 14  | Audio Output Interface         | Analog Output  | - -               |
| 15  | Backlight                      | White LED  | - -               |
| 16  | Operation Temperature          | -20 ~ 70   | °C                |
| 17  | Storage Temperature            | -30 ~ 70   | °C                |
| 18  | Weight                         | (TBD)  | g                 |

## 2. MECHANICAL SPECIFICATION



### 3. PIN DESCRIPTION

#### 3.1 Power Input(CN1) [DC JACK:SCD480CCS000B00GE or compatible]

| Pin No. | Symbol | I/O | Function          | Note   |
|---------|--------|-----|-------------------|--|
| 1       | 12V    | P   | Power Supply +12V | 12.0V<br> |
| 2       | GND    | P   | Ground            |  |

#### 3.2 Back-light Control(CN2) [WAFER P2.0mm:2001S-03-RTE or compatible]

| Pin No. | Symbol | I/O | Function  | Note |
|---------|--------|-----|---|------|
| 1       | GND    | P   | Ground  |      |
| 2       | PWM    | I   | Back-light Dimming control (internal pull up to 3.3V) | *1   |
| 3       | LED_EN | I   | No connection. ( internal control)                    |      |

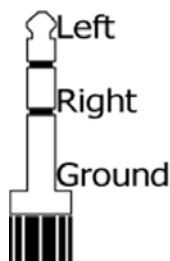
\*1: When PWM, LED\_EN not connected, back-light default is typical brightness.

#### 3.3 Audio line out(CN3) [WAFER P2.0mm:2001S-03-RTE or compatible]

| Pin No. | Symbol | I/O | Function                               | Note |
|---------|--------|-----|--|------|
| 1       | R_CH   | A   | HDMI Audio:Right Channel Analog Output |      |
| 2       | GND    | P   | Ground                                 |      |
| 3       | L_CH   | A   | HDMI Audio:Left Channel Analog Output  |      |

#### 3.4 Standard 3.5mm Phone Jack (CN4) [PHONE JACK:ST-301E or compatible]

HDMI Audio Analog Output



### 3.5 HDMI (CN5)

[HDMI A TYPE:PHD0911A2301E or compatible]

| Pin No. | Symbol    | I/O | Function            | Note |
|---------|-----------|-----|---------------------|------|
| 1       | TMDS 2+   | I   | TMDS Data2+         |      |
| 2       | GND       | P   | TMDS Data2 Shield   |      |
| 3       | TMDS 2-   | I   | TMDS Data2-         |      |
| 4       | TMDS 1+   | I   | TMDS Data1+         |      |
| 5       | GND       | P   | TMDS Data1 Shield   |      |
| 6       | TMDS 1-   | I   | TMDS Data1-         |      |
| 7       | TMDS 0+   | I   | TMDS Data0+         |      |
| 8       | GND       | P   | TMDS Data0 Shield   |      |
| 9       | TMDS 0-   | I   | TMDS Data0-         |      |
| 10      | TMDS CLK+ | I   | TMDS Clock+         |      |
| 11      | GND       | P   | TMDS Clock Shield   |      |
| 12      | TMDS CLK- | I   | TMDS Clock-         |      |
| 13      | CEC       | I   | CEC                 |      |
| 14      | N.C.      | -   | N.C.                |      |
| 15      | DDC_SCL   | I   | IIC SCL to EDID ROM |      |
| 16      | DDC_SDA   | I/O | IIC SDA to EDID ROM |      |
| 17      | GND       | P   | DDC/CEC Ground      |      |
| 18      | HD_5V     | P   | +5V Power           |      |
| 19      | HPD       | O   | Hot Plug Detect     |      |

### 3.6 PCT Control:USB (PCT\_USB FPC)

| Pin No. | Symbol | I/O | Function                 | Note |
|---------|--------|-----|--------------------------|------|
| 1       | NC     | -   | No connection            |      |
| 2       | NC     | -   | No connection            |      |
| 3       | NC     | -   | No connection            |      |
| 4       | NC     | -   | No connection            |      |
| 5       | NC     | -   | No connection            |      |
| 6       | NC     | -   | No connection            |      |
| 7       | VDD_5V | P   | Power supply for USB I/F |      |
| 8       | D+     | I/O | USB data +               |      |
| 9       | D-     | I/O | USB data -               |      |
| 10      | GND    | P   | Ground                   |      |

#### 4. ABSOLUTE MAXIMUM RATINGS

##### 4.1 Electrical Absolute Rating

##### 4.1.1 HDMI TFT LCD Module

| Item                 | Symbol | Values |      | Unit | Note |
|----------------------|--------|--------|------|------|------|
|                      |        | Min    | Max. |      |      |
| Power supply voltage | 12V    | TBD    | 14   | V    |      |

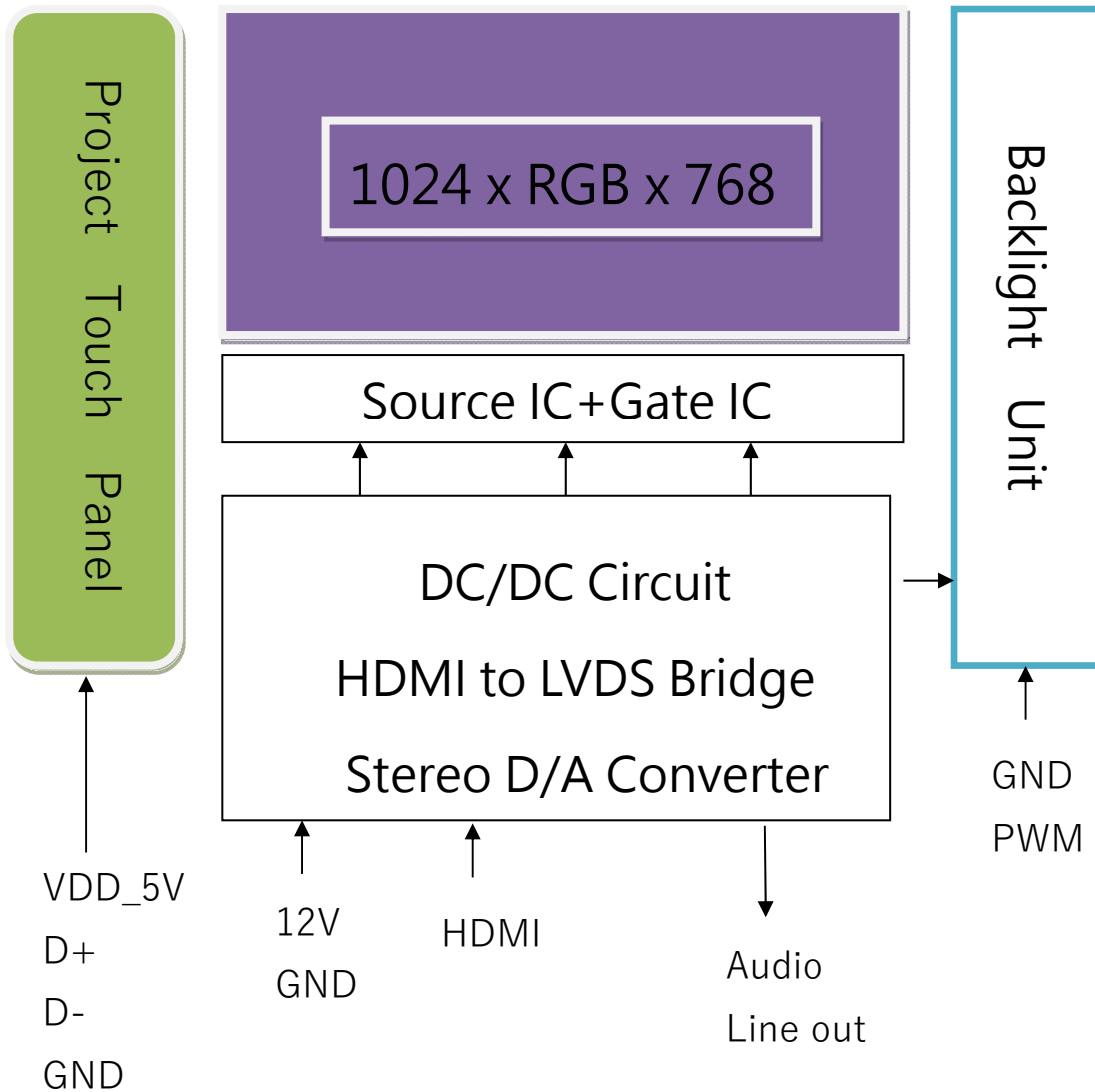
##### 4.1.2 Environment Absolute Rating

| Item                  | Symbol | Values |     |      | Unit | Note                |
|-----------------------|--------|--------|-----|------|------|---------------------|
|                       |        | Min    | Typ | Max. |      |                     |
| Operating Temperature | Top    | -20    | -   | 70   | °C   | Ambient temperature |
| Storage Temperature   | Tst    | -30    | -   | 70   | °C   |                     |



5. BLOCK DIAGRAM

5.1 TFT LCD Module



## 6. ELECTRICAL CHARACTERISTICS

### 6.1 HDMI TFT LCD Module

| Item                       | Symbol                 | Values |      |      | Unit | Note     |
|----------------------------|------------------------|--------|------|------|------|----------|
|                            |                        | Min    | Typ. | Max. |      |          |
| Supply Voltage             | 12V                    | TBD    | 12   | 13   | V    |          |
| PWM frequency              |                        | 100    | -    | 10K  | Hz   |          |
| PWM Duty                   |                        | 17     | -    | 100  | %    | <17%=OFF |
| PWM Dimming Voltage        | V <sub>PWM-IH</sub>    | 3.3    | -    | 8    | V    |          |
|                            | V <sub>PWM-IL</sub>    | -      | 0.3  | -    | V    |          |
| LED Enable Control Voltage | V <sub>LED_EN-IH</sub> | 3.3    | -    | 12   | V    |          |
|                            | V <sub>LED_EN-IL</sub> | -      | -    | 0.5  | V    |          |
| Supply Current             | ICC(12V)               | -      | 420  | 450  | mA   |          |
| LED life time              |                        | 40000  | -    | -    | Hr   | (1)      |

Note 1:

The “LED life time” is defined as the module brightness decrease to 50% original brightness that the ambient temperature is 25°C 60% RH.

## 7. PROJECTED CAPACITIVE TOUCH PANEL SPECIFICATION

### 7.1 Main Feature

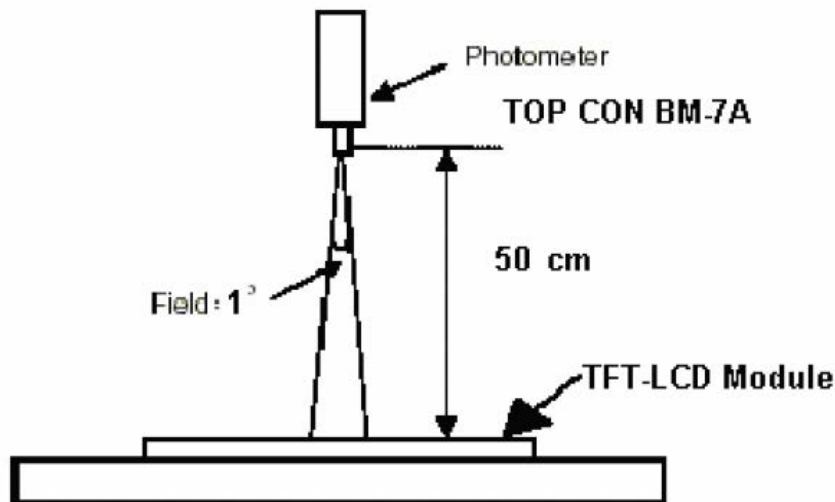
| Item                        | Specification                                     | Unit     |
|-----------------------------|---|----------|
| Screen Size                 | 8.0 inches  | Diagonal |
| Type                        | Transparent Type Projected Capacitive Touch Panel |          |
| Input Mode                  | Human's Finger                                    |          |
| Interface                   | USB   |          |
| Touch number                | 5 points  |          |
| Cover glass pencil-hardness | 7H(min) by JIS K5400                              |          |
| Response time               | ≤25   | ms       |
| Controller IC               | FT5826 or FT5926                                  |          |

## 8. OPTICAL CHARACTERISTICS

| Item               | Symbol     | Condition  | Min.  | Typ.  | Max.  | Unit              |
|--------------------|------------|--|-------|-------|-------|-------------------|
| Brightness         | --         | Note1,<br>Note 3,<br>( $\theta = 0^\circ$ ;<br>Normal<br>Viewing<br>Angle) | 400   | 500   | --    | cd/m <sup>2</sup> |
| Uniformity         | B-uni      |  | 70    | 75    | -     | %                 |
| Contrast Ratio     | CR         |  | 600   | 800   | --    | --                |
| Response Time      | Tr         |  | --    | 10    | 20    | ms                |
|                    | Tf         | --   | 15    | 30    | ms    |                   |
| Color Chromaticity | White      | Wx   | 0.238 | 0.288 | 0.338 | --                |
|                    |            | Wy   | 0.276 | 0.326 | 0.376 | --                |
| View angle         | Horizontal | $\theta_{x+}$  | 75    | 85    | --    |                   |
|                    |            | $\theta_{x-}$  | 75    | 85    | --    |                   |
|                    | Vertical   | $\theta_{Y+}$  | 75    | 85    | --    |                   |
|                    |            | $\theta_{Y-}$  | 75    | 85    | --    |                   |

Note : The following optical specifications shall be measured in a darkroom or equivalent state (ambient luminance  $\leq 1$  lux, and at room temperature). The operation temperature is  $25^\circ\text{C} \pm 2^\circ\text{C}$ . The measurement method is shown in Note1.

Note1: The method of optical measurement:

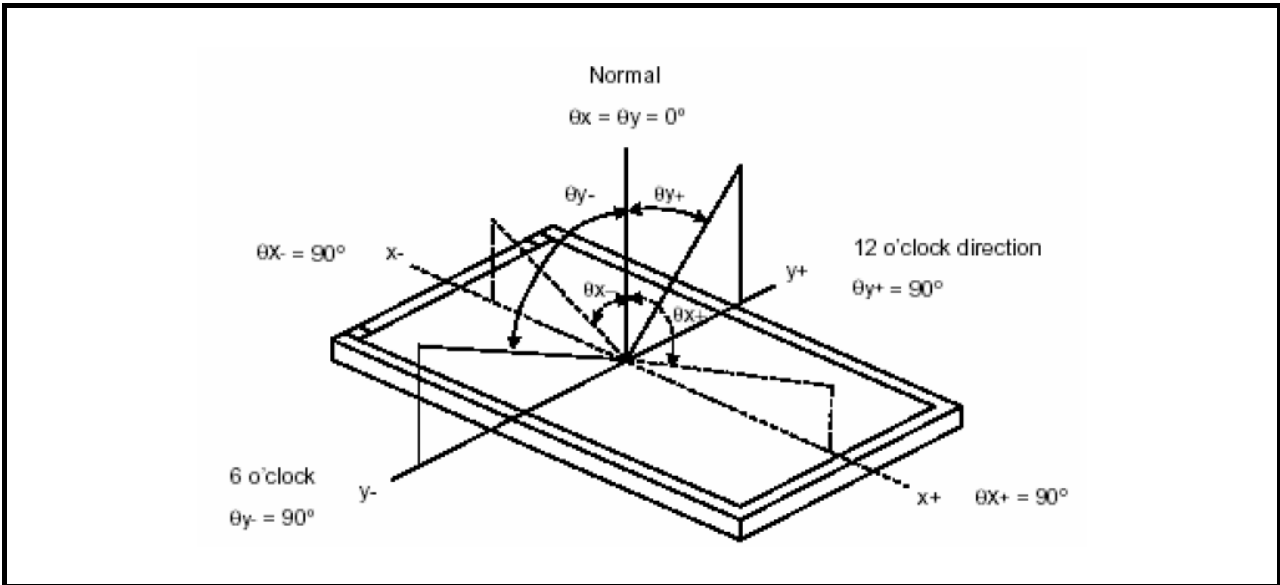


Note2: Measured at the center area of the panel and at the viewing angle of the  $\theta_x = \theta_y = 0^\circ$

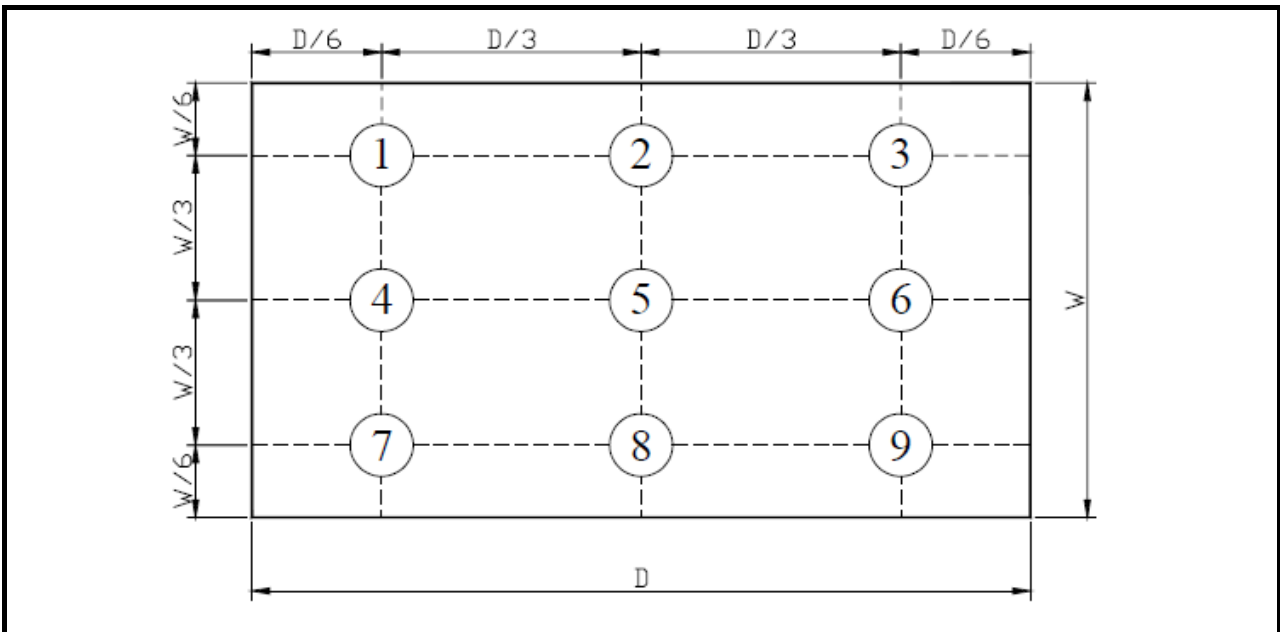
Note3: Definition of Contrast Ratio (CR):

CR = Luminance with all pixels in white state  $\div$  Luminance with all pixels in Black state

Note 4: Definition of Viewing Angle:



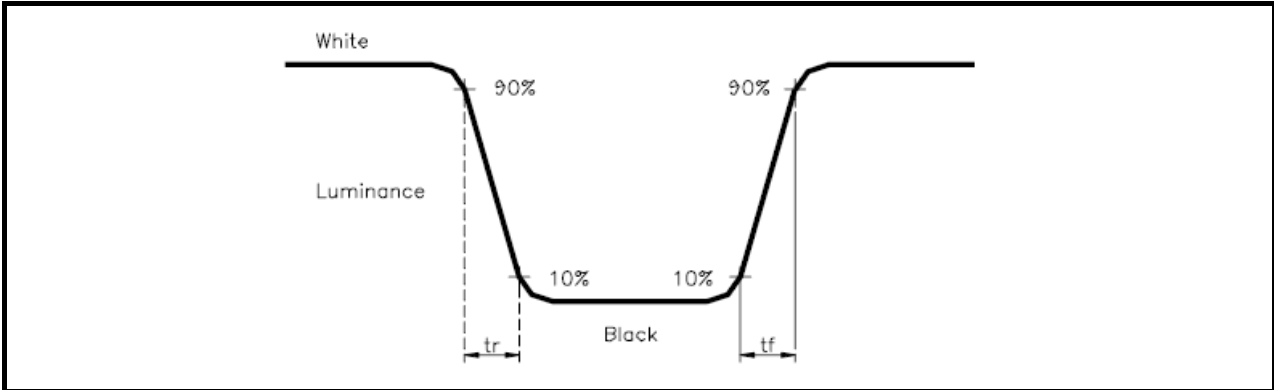
Note 5: Definition of Brightness Uniformity (B-uni):



$B\text{-uni} = (\text{Minimum luminance of 9 points} \div \text{Maximum luminance of 9 points}) \times 100\%$

**Note 6: Definition of Response Time:**

The Response Time is set initially by defining the “Rising Time ( $T_r$ )” and the “Falling Time ( $T_f$ )” respectively.  $T_r$  and  $T_f$  are defined as following figure



**Note 7: Definition of Chromaticity:**

The color coordinates ( $W_x, W_y$ ), ( $R_x, R_y$ ), ( $G_x, G_y$ ), and ( $B_x, B_y$ ) are obtained with all pixels in the viewing field at white, red, green, and blue states, respectively.

**9. RELIABILITY**

**9.1 Test Condition**

**9.1.1 Temperature and Humidity(Ambient Temperature)**

Temperature : 25 ± 5°C

Humidity : 65 ± 5%

**9.1.2 Operation**

Unless specified otherwise, test will be conducted under function state.

**9.1.3 Container**

Unless specified otherwise, vibration test will be conducted to the product itself without putting it in a container.

**9.1.4 Test Frequency**

In case of related to deterioration such as shock test. It will be conducted only once.

**9.2 TESTS**

| No. | ITEM                                    | CONDITION CRITERION  |
|-----|---|--|
| 1   | High Temperature Storage                | 70°C, 120 hrs  |
| 2   | Low Temperature Storage                 | -30°C, 120 hrs   |
| 3   | High Temperature Operating              | 70°C, 120 hrs  |
| 4   | Low Temperature Operating               | -20°C, 120 hrs   |
| 5   | High Temperature/Humidity Non-Operating | 40°C, 90%RH, 120 hrs   |
| 6   | Temperature Shock Non-Operating         | -20°C ↔ 70°C<br>(0.5hr each), 100 cycles   |
| 7   | Vibration Test Non-Operating            | Frequency:0 ~ 55 Hz Amplitude:1.5 mm<br>Sweep Time:11min<br>Test Period:6 Cycles for each Direction of X,Y,Z |
| 8   | Electro-static Discharge                | ± 2KV, Human Body Mode, 100pF/1500Ω  |

Note1: The test sample have recovery time for 24 hours at room temperature before the function check. In the standard conditions, there is no any touch panel function NG issue occurred.

### 9.3 JUDGMENT STANDARD

The judgment of the above test should be made as follow:

Pass: Normal display image with no obvious non-uniformity and no line defect. Partial transformation of the module parts should be ignored.

Fail: No display image, obvious non-uniformity, or line defects.

### 9.4 INCOMING INSPECTION STANDARDS

| No.   | Parameter                           | Criteria   |                        |                   |                   |             |                                      |   |                            |      |   |
|---|-------------------------------------|--|------------------------|-------------------|-------------------|-------------|--------------------------------------|---|----------------------------|------|---|
| 1   | Operating                           | Display function: No Display malfunction (Major)   |                        |                   |                   |             |                                      |   |                            |      |   |
|   |                                     | Contrast ratio (Black, White):<br>Does not meet specified range in the spec. (Major) (Note:3)  |                        |                   |                   |             |                                      |   |                            |      |   |
|   |                                     | Line Defect: No obvious Vertical and Horizontal line defect in bright, dark and colored. (Major) (Note:1)  |                        |                   |                   |             |                                      |   |                            |      |   |
|   |                                     | Point Defect : Active area $\leq 5$ dots (Minor) (Note:1)  |                        |                   |                   |             |                                      |   |                            |      |   |
|   |                                     | <table border="1"> <thead> <tr> <th rowspan="2">Item</th> <th>Acceptable number</th> <th rowspan="2">Total</th> </tr> <tr> <th>Active Area</th> </tr> </thead> <tbody> <tr> <td>Bright</td> <td>2</td> <td rowspan="2">5</td> </tr> <tr> <td>Dark</td> <td>4</td> </tr> </tbody> </table>  | Item                   | Acceptable number | Total             | Active Area | Bright                               | 2 | 5                          | Dark | 4 |
|   |                                     | Item   |                        | Acceptable number |                   | Total       |                                      |   |                            |      |   |
| Active Area   |                                     |  |                        |                   |                   |             |                                      |   |                            |      |   |
| Bright  | 2                                   | 5  |                        |                   |                   |             |                                      |   |                            |      |   |
| Dark  | 4                                   |  |                        |                   |                   |             |                                      |   |                            |      |   |
| Non-uniformity: Visible through 5%ND filter. (Minor)  |                                     |  |                        |                   |                   |             |                                      |   |                            |      |   |
| Foreign material in Black or White spots shape ( $W > 1/4L$ )   |                                     |  |                        |                   |                   |             |                                      |   |                            |      |   |
| <table border="1"> <thead> <tr> <th>Zone<br/>Dimension</th> <th>Acceptable number</th> <th rowspan="4">Class Of Defects</th> <th rowspan="4">AQL Level</th> </tr> </thead> <tbody> <tr> <td><math>D &gt; 0.5</math></td> <td>0</td> </tr> <tr> <td><math>0.3 &lt; D \leq 0.5</math></td> <td>5</td> </tr> <tr> <td><math>D \leq 0.3</math></td> <td>*</td> </tr> </tbody> </table> <p><math>D = (\text{Long} + \text{Short}) / 2</math> * : Disregard</p>   | Zone<br>Dimension                   | Acceptable number  | Class Of Defects       | AQL Level         | $D > 0.5$         | 0           | $0.3 < D \leq 0.5$                   | 5 | $D \leq 0.3$               | *    |   |
| Zone<br>Dimension   | Acceptable number                   | Class Of Defects   |                        |                   | AQL Level         |             |                                      |   |                            |      |   |
| $D > 0.5$   | 0                                   |  |                        |                   |                   |             |                                      |   |                            |      |   |
| $0.3 < D \leq 0.5$  | 5                                   |  |                        |                   |                   |             |                                      |   |                            |      |   |
| $D \leq 0.3$  | *                                   |  |                        |                   |                   |             |                                      |   |                            |      |   |
| Foreign Material in Line or spiral shape ( $W \leq 1/4L$ ) (Note: 4)  |                                     |  |                        |                   |                   |             |                                      |   |                            |      |   |
| <table border="1"> <thead> <tr> <th>L (mm) \ Zone<br/>W(mm)</th> <th>Acceptable number</th> <th rowspan="4">Class Of Defects</th> <th rowspan="4">AQL Level</th> </tr> </thead> <tbody> <tr> <td><math>L &gt; 5</math>    <math>W &gt; 0.1</math></td> <td>0</td> </tr> <tr> <td><math>0.5 &lt; L \leq 5</math>    <math>0.03 &lt; W \leq 0.1</math></td> <td>5</td> </tr> <tr> <td><math>L \leq 0.5</math>    <math>W \leq 0.03</math></td> <td>*</td> </tr> </tbody> </table> <p>L : Length    W : Width    * : Disregard</p> | L (mm) \ Zone<br>W(mm)              | Acceptable number  | Class Of Defects       | AQL Level         | $L > 5$ $W > 0.1$ | 0           | $0.5 < L \leq 5$ $0.03 < W \leq 0.1$ | 5 | $L \leq 0.5$ $W \leq 0.03$ | *    |   |
| L (mm) \ Zone<br>W(mm)  | Acceptable number                   | Class Of Defects   |                        |                   | AQL Level         |             |                                      |   |                            |      |   |
| $L > 5$ $W > 0.1$   | 0                                   |  |                        |                   |                   |             |                                      |   |                            |      |   |
| $0.5 < L \leq 5$ $0.03 < W \leq 0.1$  | 5                                   |  |                        |                   |                   |             |                                      |   |                            |      |   |
| $L \leq 0.5$ $W \leq 0.03$  | *                                   |  |                        |                   |                   |             |                                      |   |                            |      |   |
| 2   | External Inspection (non-operating) | Dimension: Outline (Major)   |                        |                   |                   |             |                                      |   |                            |      |   |
|   |                                     | Bezel appearance: uneven (Minor)   |                        |                   |                   |             |                                      |   |                            |      |   |
|   |                                     | Scratch on the polarize: (Note:2)  |                        |                   |                   |             |                                      |   |                            |      |   |
|   |                                     | <table border="1"> <thead> <tr> <th>L (mm) \ Zone<br/>W(mm)</th> <th>Acceptable number</th> <th rowspan="3">Class Of Defects</th> <th rowspan="3">AQL Level</th> </tr> </thead> <tbody> <tr> <td>--    <math>W &gt; 0.1</math></td> <td>0</td> </tr> <tr> <td><math>L \leq 3</math>    <math>W \leq 0.1</math></td> <td>3</td> </tr> </tbody> </table> <p>L : Length    W : Width    * : Disregard</p> | L (mm) \ Zone<br>W(mm) | Acceptable number | Class Of Defects  | AQL Level   | -- $W > 0.1$                         | 0 | $L \leq 3$ $W \leq 0.1$    | 3    |   |
|   |                                     | L (mm) \ Zone<br>W(mm)   | Acceptable number      | Class Of Defects  |                   |             | AQL Level                            |   |                            |      |   |
|   |                                     | -- $W > 0.1$   | 0                      |                   |                   |             |                                      |   |                            |      |   |
| $L \leq 3$ $W \leq 0.1$   | 3                                   |  |                        |                   |                   |             |                                      |   |                            |      |   |
| Dent or bubble on the polarize (Note:2)   |                                     |  |                        |                   |                   |             |                                      |   |                            |      |   |
| <table border="1"> <thead> <tr> <th>Zone<br/>Dimension</th> <th>Acceptable number</th> <th rowspan="3">Class Of Defects</th> <th rowspan="3">AQL Level</th> </tr> </thead> <tbody> <tr> <td><math>D \leq 0.3</math></td> <td>*</td> </tr> <tr> <td><math>D \leq 0.5</math></td> <td>3</td> </tr> </tbody> </table> <p><math>D = (\text{Long} + \text{Short}) / 2</math>    * : Disregard</p>  | Zone<br>Dimension                   | Acceptable number  | Class Of Defects       | AQL Level         | $D \leq 0.3$      | *           | $D \leq 0.5$                         | 3 |                            |      |   |
| Zone<br>Dimension   | Acceptable number                   | Class Of Defects   |                        |                   | AQL Level         |             |                                      |   |                            |      |   |
| $D \leq 0.3$  | *                                   |  |                        |                   |                   |             |                                      |   |                            |      |   |
| $D \leq 0.5$  | 3                                   |  |                        |                   |                   |             |                                      |   |                            |      |   |



| Class of defects |              |   | <b>Definition</b>  |
|------------------|--------------|---|--|
|                  | <b>Major</b> | AQL 0.65%   | It is a defect that is likely to result in failure or to reduce materially the usability of the product for the intended function. |
| <b>Minor</b>     | AQL 1.5%     | It is a defect that will not result in functioning problem with deviation classified. |  |

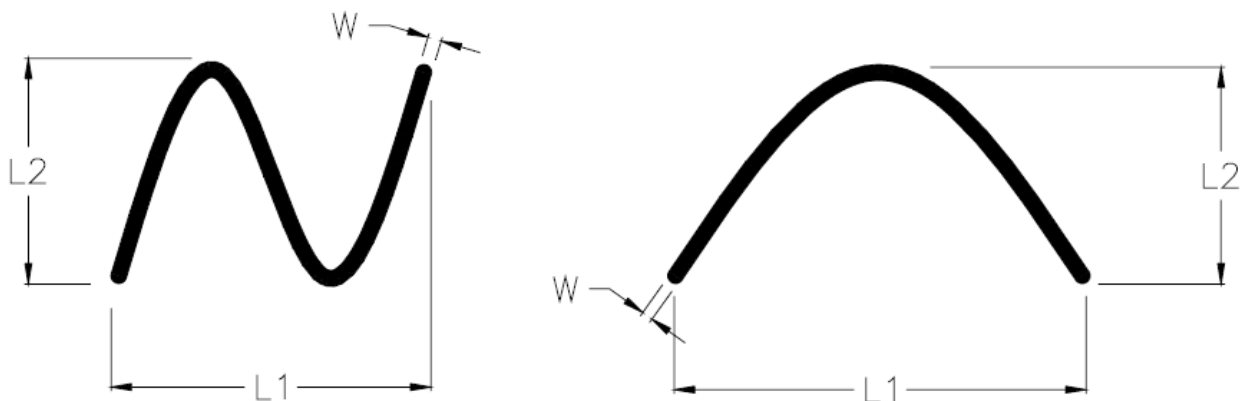
**Note1:**

- (a) Bright point defect is defined as point defect of R,G,B with area  $>1/2$  pixel respectively
- (b) Dark point defect is defined as visible in full white pattern.
- (c) Definition of distribution of point defect is as follows:
  - minimum separation between dark point defects should be larger than 5mm.
  - minimum separation between bright point defects should be larger than 5mm.
- (d) Definition of joined bright point defect and joined dark point defect are as follows:
  - Two or more joined bright point defects must be nil.
  - Three joined dark point defects must be nil.
  - Coupling of one dark and one bright point in junction is counted as one dark and bright spot with 1 pair maximum.
  - Two Joined dark point is counted as two dark points with 2 pair maximum.

Note2: The external inspection should be conducted at the distance  $30 \pm 5$ cm between the eyes of inspector and the panel.

Note3: Luminance measurement for contrast ratio is at the distance  $50 \pm 5$ cm between the detective head and the panel with ambient luminance less than 1 lux. Contrast ratio is obtained at optimum view angle.

Note4: W-Width in mm , L-length of Max.(L1,L2) in mm.



### 9.5 Sampling Condition

Unless otherwise agree in written, the sampling inspection shall be applied to the incoming inspection of customer.

Lot size: Quantity of shipment lot per model.

Sampling type: normal inspection, single sampling

Sampling table: MIL-STD-105E

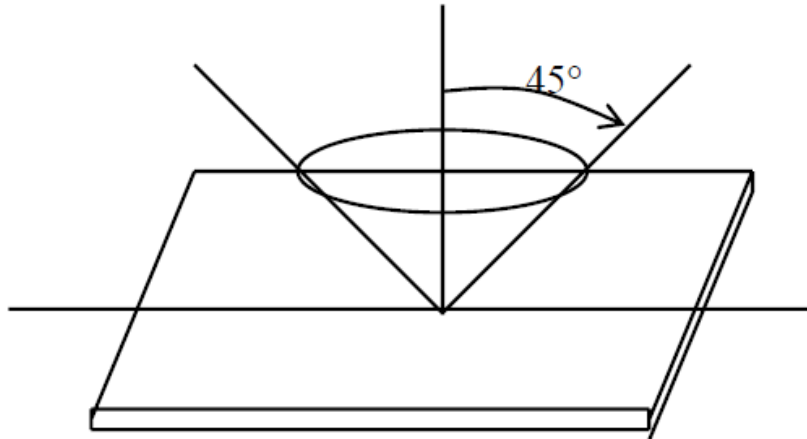
Inspection level: Level II

### 9.6 Inspection conditions

The LCD shall be inspected under 40W white fluorescent light.

$\theta \leq 45^\circ$  inspection under non-operating condition.

$\theta \leq 5^\circ$  inspection under operating condition



## **10. PRECAUTION RELATING PRODUCT HANDLING**

### **10.1 SAFETY**

**10.1.1** If the LCD panel breaks , be careful not to get the liquid crystal to touch your skin.

**10.1.2** If the liquid crystal touches your skin or clothes , please wash it off immediately by using soap and water.

### **10.2 HANDLING**

**10.2.1** Avoid any strong mechanical shock which can break the glass.

**10.2.2** Avoid static electricity which can damage the CMOS LSI—When working with the module, be sure to ground your body and any electrical equipment you may be using.

**10.2.3** Do not remove the panel or frame from the module.

**10.2.4** The polarizing plate of the display is very fragile. So , please handle it very carefully, Do not touch, push or rub the exposed polarizing with anything harder than an HB pencil lead (glass , tweezers , etc.)

**10.2.5** Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.

**10.2.6** Do not touch the display area with bare hands , this will stain the display area.

**10.2.7** Do not use ketonics solvent & aromatic solvent. Use with a soft cloth soaked with a cleaning naphtha solvent.

**10.2.8** To control temperature and time of soldering is  $280 \pm 10^{\circ}\text{C}$  and 3-5 sec.

**10.2.9** To avoid liquid (include organic solvent) stained on LCM.

### **10.3 STORAGE**

**10.3.1** Store the panel or module in a dark place where the temperature is  $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$  and the humidity is below 65% RH.

**10.3.2** Do not place the module near organics solvents or corrosive gases.

**10.3.3** Do not crush, shake, or jolt the module.

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