Display Elektronik GmbH

# DATA SHEET

***TFT MODULE***

# DEM 128128A TMH-PW-N (C-TOUCH)

## 1,44“ TFT + PCT

**Product Specification** **Ver.: 0**

**13.06.2017**

## Revision History

| Revision | Date | Detail | Remarks |
|---|---|---|---|
| 0 | 13.06.2017 | Initial Release | - |
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## Table of Contents

## 1. General Description

The specification is a transmissive type color active matrix liquid crystal display (LCD) which uses amorphous thin film transistor (TFT) as switching devices. This product is composed of a TFT-LCD Panel, Driver IC, a Touch Panel and a Backlight Unit.

## 2. Module Parameter

| Features | Details | Unit |
|---|---|---|
| Display Size (Diagonal) | 1.44” | - |
| LCD Type | TN TFT | - |
| Display Mode | Transmissive / Normally White | - |
| Resolution | 128 x RGB x 128 | Pixels |
| View Direction | 6 O’clock | Best Image |
| Gray Scale Inversion Direction | 12 O’clock | - |
| Module Outline | 36.70 x 43.00 x 4.15 (Note1 ) | mm |
| Active Area | 25.50 x 26.50 | mm |
| Pixel Size | 0.1992 x 0.207 | mm |
| Pixel Arrangement | RGB Stripe | - |
| Display Colors | 262k | - |
| Interface | 8080 / 8-Bit-MCU Interface;<br>Serial Interface (3-line). | - |
| Driver IC | ST7735S (Sitronix) | - |
| With or without touch panel | With Projective Capacitive Touch | - |
| Operating Temperature | -20°C to +70°C | ºC |
| Storage Temperature | -30°C to +80°C | ºC |
| Weight | 9 | g |

Note 1: Exclusive hooks, posts, FFC/FPC tail etc.

## 3. Absolute Maximum Ratings

$V_{SS}$=0V, Ta=25ºC

| Item | Symbol | Min. | Max. | Unit |
|---|---|---|---|---|
| Supply Voltage | VDD | -0.3 | 4.8 | V |
| Supply Voltage(Logic) | VDDIO | -0.3 | 4.6 | V |
| Storage temperature | $T_{stg}$ | -30 | +80 | ºC |
| Operating temperature | $T_{op}$ | -20 | +70 | ºC |

Note 1: If Ta below 50ºC, the maximal humidity is 90%RH, if Ta over 50ºC, absolute humidity should be less than 60%RH.

Note 2: The response time will be extremely slow when the operating temperature is around -10°C, and the back ground will become darker at high temperature operating.

## 4. DC Characteristics

| Item | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Supply Voltage | VDD | 2.6 | 2.75 | 3.3 | V |
| | VDDIO | 1.65 | 1.9 | 3.3 | V |
| Logic Low input voltage | $V_{IL}$ | 0 | - | 0.3*VDDIO | V |
| Logic High input voltage | $V_{IH}$ | 0.7*VDDIO | - | VDDIO | V |
| Logic Low output voltage | $V_{OL}$ | GND | - | 0.2*VDDIO | V |
| Logic High output voltage | $V_{OH}$ | 0.8*VDDIO | - | VDDIO | V |
| Current Consumption Normal Mode | $I_{CC}$ | - | - | 5 | mA |

## 5. Backlight Characteristic

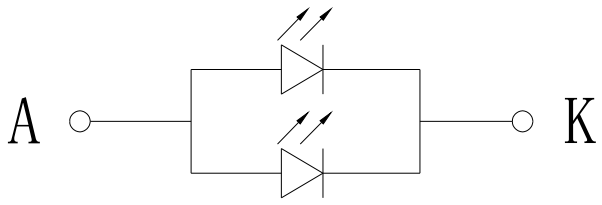
### 5.1. Backlight Characteristics

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Forward Voltage | $V_F$ | Ta=25ºC, $I_F$=20mA/LED | 2.8 | 3.2 | 3.4 | V |
| Forward Current | $I_F$ | Ta=25ºC, $V_F$=3.2V/LED | - | 40 | - | mA |
| Power Dissipation | Pd | | - | 64 | - | mW |
| LED Lifetime | - | - | | 20000 | | hrs |
| Uniformity | Avg | | - | 80 | - | % |
| Drive Method | Constant Current | | | | | |
| LED Configuration | 2 White LED | | | | | |

Note: LED life time defined as follows: The final brightness is at 50% of original brightness.

The environmental conducted under ambient air flow, at Ta=25°C±2 ºC, 60%RH±5%, $I_F$=20mA.

### 5.2. Backlighting Circuit



## 6. Touch Screen Panel Specifications

**Technical Parameters：**

1. Cover Glass+Film+FPC
   ITO Film: T=0.25mm
   Cover GLASS: 0.7mm
   Lead Line: FPC
   IC Model: FT3267 (Focaltech)
2. Operation Voltage：2.8-3.3 V
3. Transmittance：≥85%
4. Surface Hardness：≥6H
5. Operation Environment：-20°C to +70°C
6. Storage Environment：-30°C to +80°C

## 7. Optical Characteristics

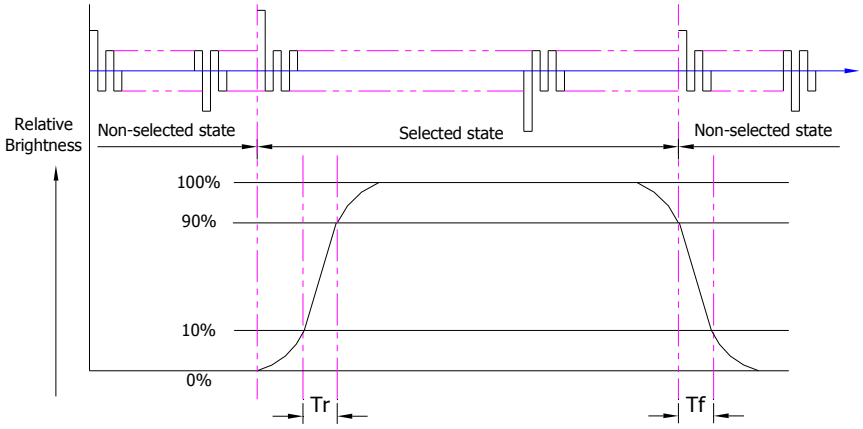
### 7.1. Optical Characteristics

Ta=25ºC, $V_{DD}$ =2.75V, TN LC+ Polarizer

| | Item | | Symbol | Condition | Specification | | | Unit |
|---|---|---|---|---|---|---|---|---|
| | | | | | Min. | Typ. | Max. | |
| Backlight On (Transmissive Mode) | Luminance on TFT($I_f$ =20mA/LED) | | Lv | Normally viewing angle θX = φY =0º | 290 | 360 | - | cd/m² |
| | Contrast Ratio(See 6.3) | | CR | | - | 350 | - | |
| | Response Time (See 6.2) | | TR+TF | | - | 25 | 40 | ms |
| | Chromaticity Transmissive (See 6.5) | Red | XR | | 0.520 | 0.570 | 0.620 | |
| | | | YR | | 0.272 | 0.322 | 0.372 | |
| | | Green | XG | | 0.251 | 0.301 | 0.351 | |
| | | | YG | | 0.559 | 0.609 | 0.659 | |
| | | Blue | XB | | 0.091 | 0.141 | 0.191 | |
| | | | YB | | 0.044 | 0.094 | 0.144 | |
| | | White | XW | | 0.210 | 0.260 | 0.310 | |
| | | | YW | | 0.265 | 0.315 | 0.365 | |
| | Viewing Angle (See 6.4) | Horizontal | θX+ | Center CR≥10 | 35 | 45 | - | Deg. |
| | | | θX- | | 35 | 45 | - | |
| | | Vertical | φY+ | | 35 | 45 | - | |
| | | | φY- | | 15 | 25 | - | |
| | NTSC Ratio(Gamut) | | | | - | 53 | - | % |

### 7.2. Definition of Response Time

7.2.1. Normally Black Type (Negative)

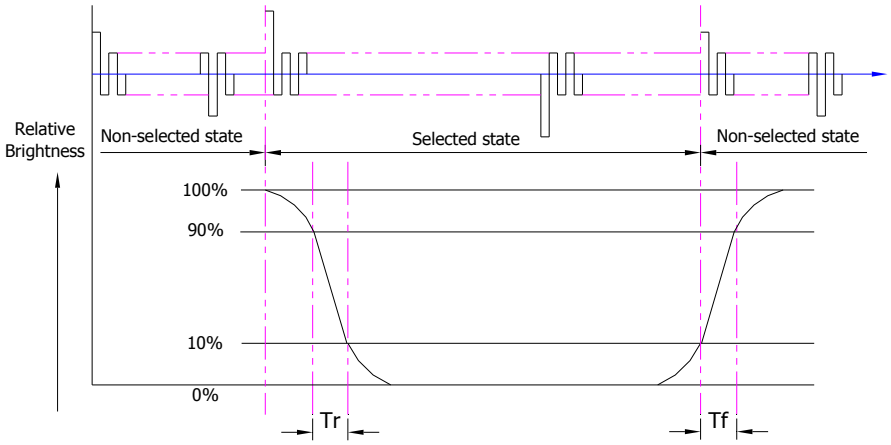



Tr is the time it takes to change form non-selected stage with relative luminance 10% to selected state with relative luminance 90%;

Tf is the time it takes to change from selected state with relative luminance 90% to non-selected state with relative luminance 10%.

Note: Measuring machine: LCD-5100

7.2.2. Normally White Type (Positive)




Tr is the time it takes to change form non-selected stage with relative luminance 90% to selected state with relative luminance 10%;

Tf is the time it takes to change from selected state with relative luminance 10% to non-selected state with relative luminance 90%;

Note: Measuring machine: LCD-5100 or EQUI

### 7.3. Definition of Contrast Ratio

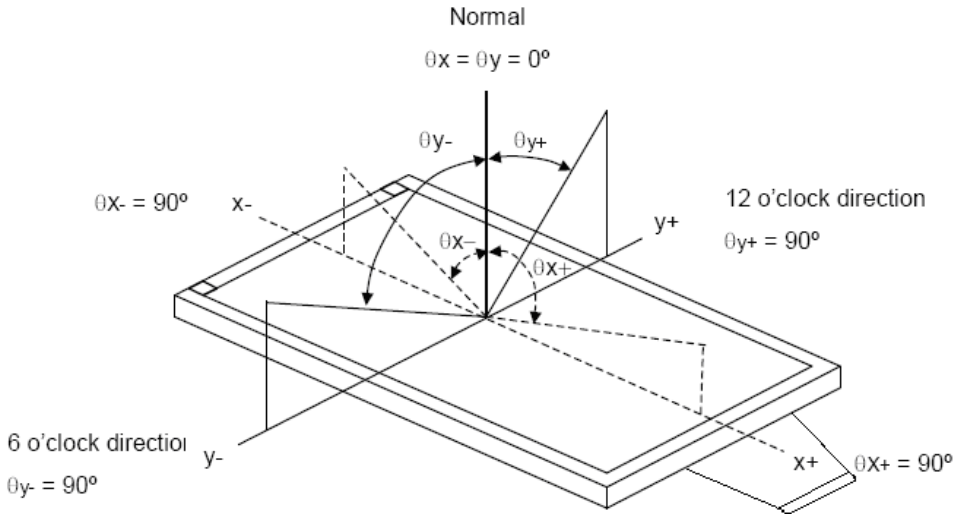
Contrast is measured perpendicular to display surface in reflective and transmissive mode.

The measurement condition is:

| | |
|---|---|
| Measuring Equipment | Eldim or Equivalent |
| Measuring Point Diameter | 3mm//1mm |
| Measuring Point Location | Active Area centre point |
| Test pattern | A: All Pixels white |
| | B: All Pixel black |
| Contrast setting | Maximum |

Definitions: CR (Contrast) = Luminance of White Pixel / Luminance of Black Pixel

### 7.4. Definition of Viewing Angles



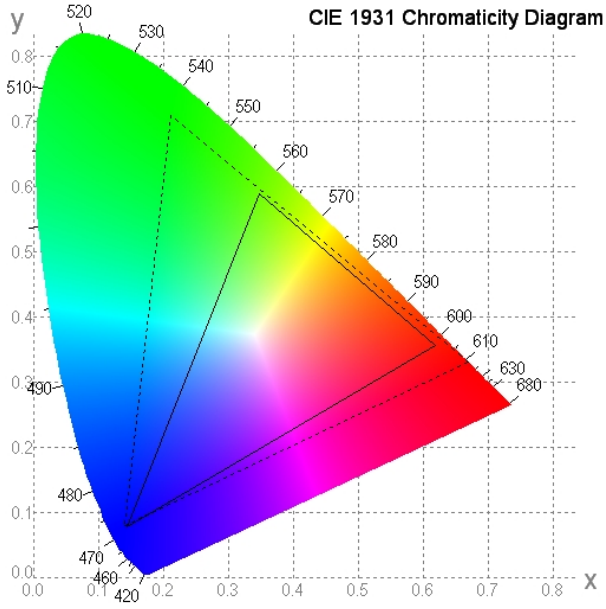

Measuring machine: LCD-5100 or EQUI

### 7.5. Definition of Color Appearance

R, G, B and W are defined by (x, y) on the IE chromaticity diagram

NTSC=area of RGB triangle/area of NTSC triangleX100%

Measuring picture: Red, Green, Blue and White (Measuring machine: BM-7)




### 7.6. Definition of Surface Luminance, Uniformity and Transmittance

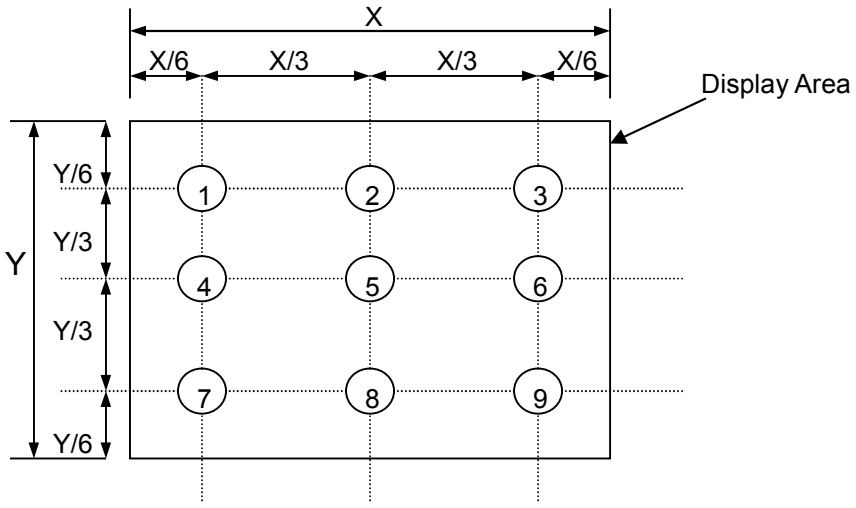
Using the transmissive mode measurement approach, measure the white screen luminance of the display panel and backlight.

7.6.1. Surface Luminance: $L_V$ = average ($L_{P1}$:$L_{P9}$)

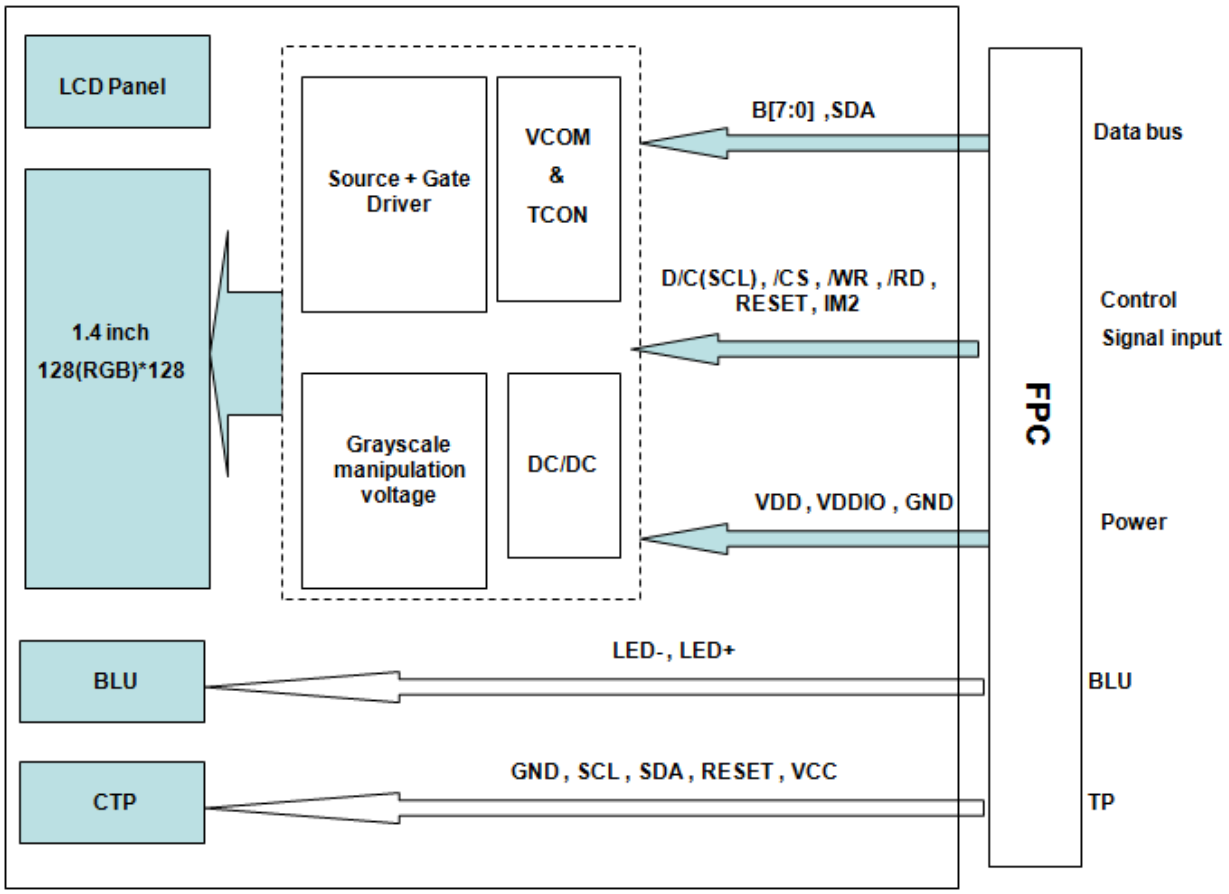
7.6.2. Uniformity = Minimal ($L_{P1}$:$L_{P9}$) / Maximal ($L_{P1}$:$L_{P9}$) * 100%

7.6.3. Transmittance = $L_V$ on LCD / $L_V$ on Backlight * 100%

Note: Measuring machine: BM-7



## 8. Block Diagram and Power Supply



## 9. Interface Pins Definition

### 9.1 TFT PIN:

| No. | Symbol | Function | Remark |
|---|---|---|---|
| 1 | GND | Ground | |
| 2 | LED- | LED power cathode | |
| 3 | LED+ | LED power anode | |
| 4 | VDDIO | Logic power | |
| 5 | VDD | Analog Power | |
| 6 | D/C(SCL) | Data /Command select;<br>In Serial Interface, this is used as SCL. | |
| 7 | /CS | Chip select input pin | |
| 8 | /WR | Write execution control pin | |
| 9 | /RD | Read execution control pin | |
| 10 | GND | Ground | |
| 11 | D7 | Data bus | |
| 12 | D6 | Data bus | |
| 13 | D5 | Data bus | |
| 14 | D4 | Data bus | |
| 15 | D3 | Data bus | |
| 16 | D2 | Data bus | |
| 17 | D1 | Data bus | |
| 18 | D0(SDA) | Data bus;<br>D0 is the serial input/output signal in serial interface mode. | |
| 19 | GND | Ground | |
| 20 | RESET | Reset Signal | |
| 21 | GND | Ground | |
| 22 | IM2 | MCU Parallel Interface Bus and Serial Interface select<br>IM2='1', Parallel Interface<br>IM2='0', Serial Interface | |

### 9.2 CTP PIN:

| No. | Symbol | Function | Remark |
|---|---|---|---|
| 1 | GND | Ground | |
| 2 | SCL | Clock | |
| 3 | SDA | Data | |
| 4 | INT | Interrupt | |
| 5 | RESET | Reset | |
| 6 | VCC | Power supply | |

## 10. AC Characteristics

### 10.1.8080-Series Parallel Interface

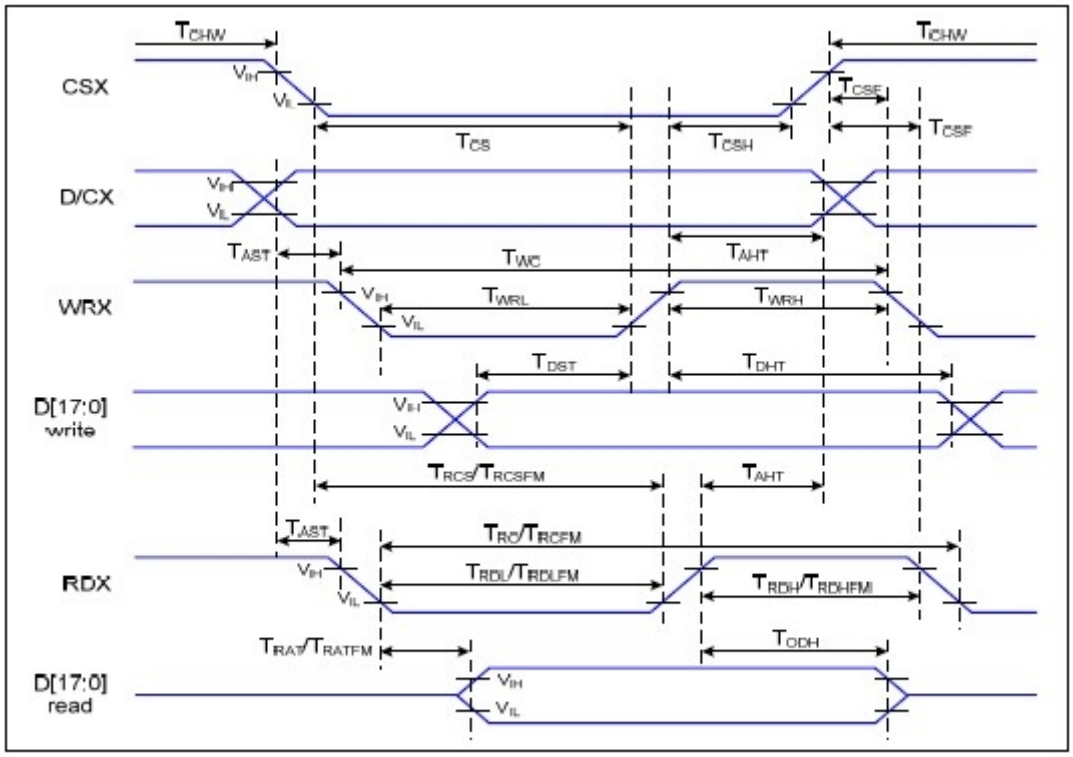



Figure 1 Parallel Interface Timing Characteristics (8080 Ceries MCU Interface)

Ta=25 ℃, VDDI=1.65~3.7V, VDD=2.5~4.8V

| Signal | Symbol | Parameter | Min | Max | Unit | Description |
|---|---|---|---|---|---|---|
| D/CX | TAST | Address Setup Ttime | 0 | | ns | - |
| | TAHT | Address Hold Time (Write/Read) | 10 | | ns | |
| CSX | TCHW | Chip Select "H" Pulse Width | 0 | | ns | - |
| | TCS | Chip Select Setup Time (Write) | 15 | | ns | |
| | TRCS | Chip Select Setup Time (Read ID) | 45 | | ns | |
| | TRCSFM | Chip Select Setup time (Read FM) | 355 | | ns | |
| | TCSF | Chip Select Wait Time (Write/Read) | 10 | | ns | |
| | TCSH | Chip Select Hold Time | 10 | | ns | |
| WRX | TWC | Write Cycle | 66 | | ns | |
| | TWRH | Control Pulse "H" Duration | 15 | | ns | |
| | TWRL | Control Pulse "L" Duration | 15 | | ns | |
| RDX (ID) | TRC | Read Cycle (ID) | 160 | | ns | When Read ID Data |
| | TRDH | Control Pulse "H" Duration (ID) | 90 | | ns | |
| | TRDL | Control Pulse "L" Duration (ID) | 45 | | ns | |

| | | | | | | |
|---|---|---|---|---|---|---|
| RDX (FM) | TRCFM | Read Cycle (FM) | 450 | | ns | When Read from Frame Memory |
| | TRDHFM | Control Pulse "H" Duration (FM) | 90 | | ns | |
| | TRDLFM | Control Pulse "L" Duration (FM) | 355 | | ns | |
| D[17:0] | TDST | Data Setup Time | 10 | | ns | For CL=30pF |
| | TDHT | Data Hold Time | 10 | | ns | |
| | TRAT | Read Access Time (ID) | | 40 | ns | |
| | TRATFM | Read Access Time (FM) | | 340 | ns | |
| | TODH | Output Disable Time | 20 | 80 | ns | |

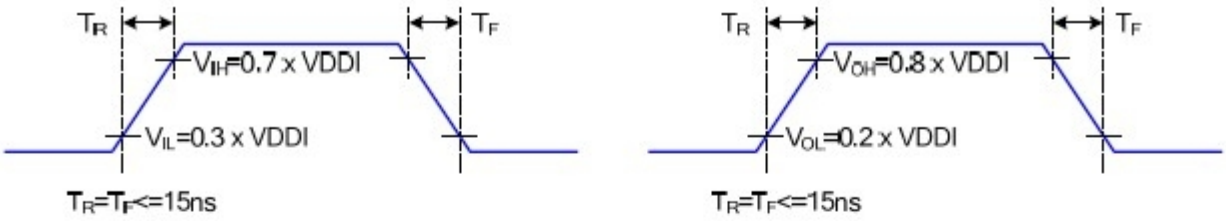



Figure 2 Rising And Falling Timing for Input And Output Signal

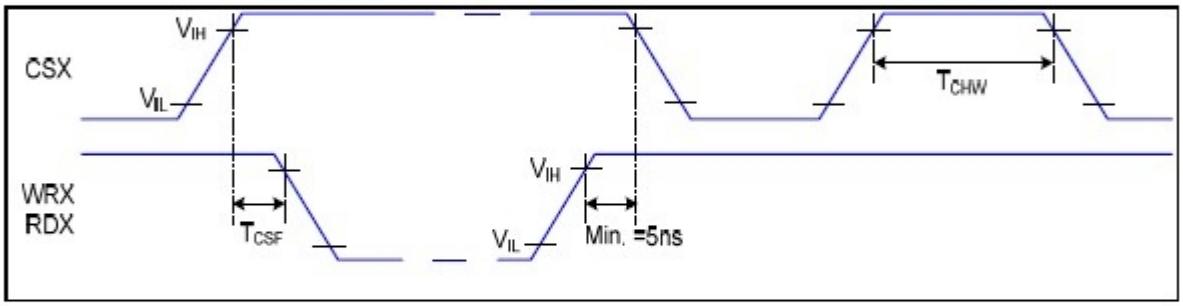



Figure 3 Chip Selection (CSX) Timing

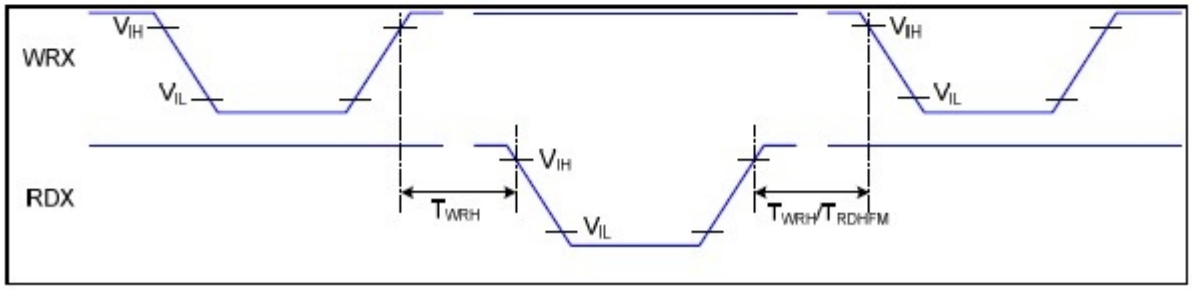



Figure 4 Write-to-Read And Read-to-Write Timing

### 10.2. Serial Interface Characteristics (3-line Serial)

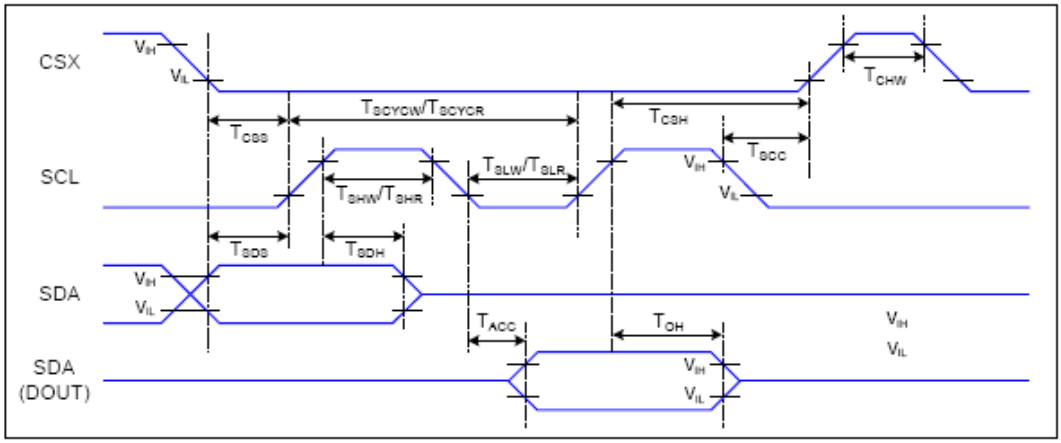



Figure 6 3-line Serial Interface Timing

Ta=25 ℃, VDDI=1.65~3.7V, VDD=2.5~4.8V

| Signal | Symbol | Parameter | Min | Max | Unit | Description |
|---|---|---|---|---|---|---|
| CSX | TCSS | Chip Select Setup Time (Write) | 15 | | ns | |
| | TCSH | Chip Select Hold Time (Write) | 15 | | ns | |
| | TCSS | Chip Select Setup Time (Read) | 60 | | ns | |
| | TSCC | Chip Select Hold Time (Read) | 65 | | ns | |
| | TCHW | Chip Select “H” pulse width | 40 | | ns | |
| SCL | TSCYCW | Serial Clock Cycle (Write) | 66 | | ns | |
| | TSHW | SCL “H” Pulse Width (Write) | 15 | | ns | |
| | TSLW | SCL “L” Pulse Width (Write) | 15 | | ns | |
| | TSCYCR | Serial Clock Cycle (Read) | 150 | | ns | |
| | TSHR | SCL “H” Pulse Width (Read) | 60 | | ns | |
| | TSLR | SCL “L” Pulse Width (Read) | 60 | | ns | |
| SDA (DIN) (DOUT) | TSDS | Data Setup Time | 10 | | ns | For Maximum CL=30pF For Minimum CL=8pF |
| | TSDH | Data Hold Time | 10 | | ns | |
| | TACC | Access Time | 10 | 50 | ns | |
| | TOH | Output Disable Time | 15 | 50 | ns | |

Table 6 3-line Serial Interface Characteristics

*Note : The rising time and falling time (Tr, Tf) of input signal are specified at 15 ns or less. Logic high and low levels are specified as 30% and 70% of VDDI for Input signals.*

# 11. Quality Assurance

## 11.1 Purpose

This standard for Quality Assurance assures the quality of LCD module products supplied to customer.

## 11.2 Standard for Quality Test

11.2.1 Sampling Plan:

GB2828.1-2012

Single sampling, general inspection level II

11.2.2 Sampling Criteria:

Visual inspection: AQL 1.5%

Electrical functional: AQL 0.65%.

11.2.3 Reliability Test:

Detailed requirement refer to Reliability Test Specification.

## 11.3 Nonconforming Analysis & Disposition

11.3.1 Nonconforming analysis:

11.3.1.1 Customer should provide overall information of non-conforming sample for their complaints.

11.3.1.2 After receipt of detailed information from customer, the analysis of nonconforming parts usually should be finished in one week.

11.3.1.3 If can not finish the analysis on time, customer will be notified with the progress status.

11.3.2 Disposition of nonconforming:

11.3.2.1 Non-conforming product over PPM level will be replaced.

11.3.2.2 The cause of non-conformance will be analyzed. Corrective action will be discussed and implemented.

## 11.4 Agreement Items

Shall negotiate with customer if the following situation occurs:

11.4.1 There is any discrepancy in standard of quality assurance.

11.4.2 Additional requirement to be added in product specification.

11.4.3 Any other special problem.

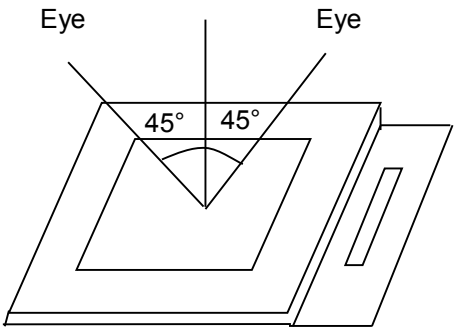
### 11.5 Standard of the Product Visual Inspection

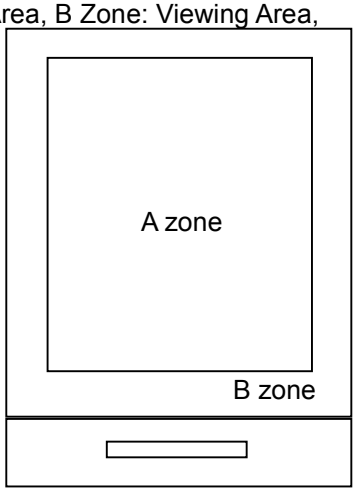
11.5.1 Appearance inspection:

11.5.1.1 The inspection must be under illumination about 1000 – 1500 lx, and the distance of view must be at 30cm ± 2cm.

11.5.1.2 The viewing angle should be 45° from the vertical line without reflection light or follows customer's viewing angle specifications.

11.5.1.3 Definition of area: A Zone: Active Area, B Zone: Viewing Area,



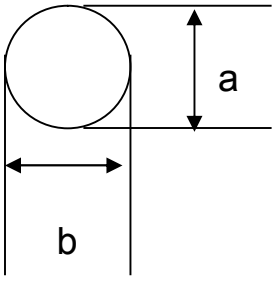




11.5.2 Basic principle:

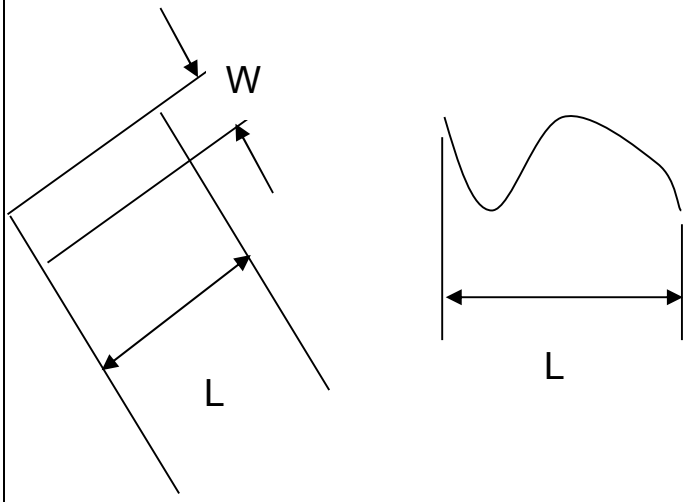
11.5.2.1 A set of sample to indicate the limit of acceptable quality level must be discussed by both us and customer when there is any dispute happened.

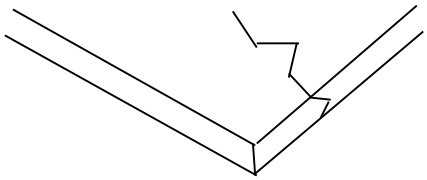
11.5.2.2 New item must be added on time when it is necessary.

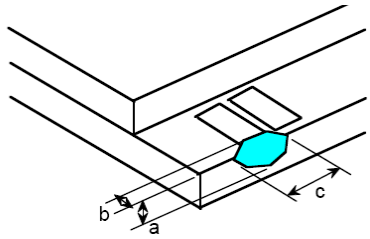
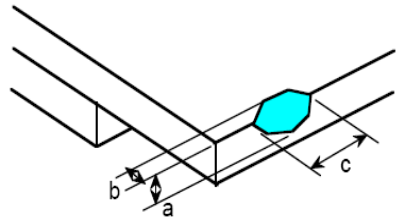
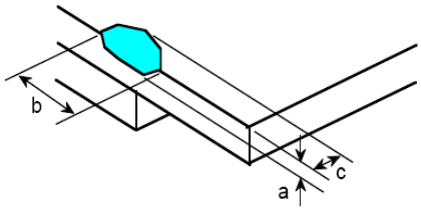
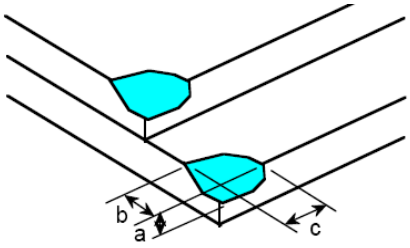
### 11.6 Inspection Specification

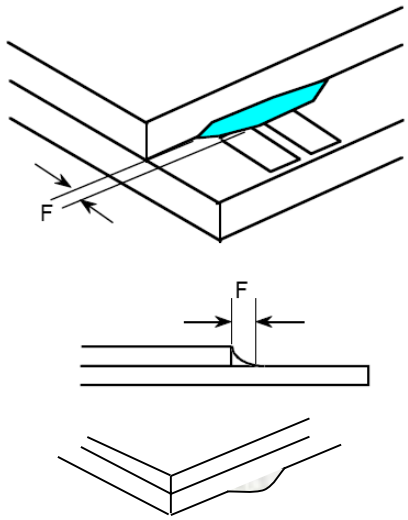
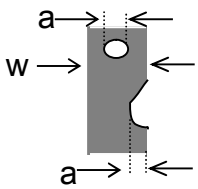
<table>
<tr><th>No.</th><th>Item</th><th>Criteria (Unit: mm)</th></tr>
<tr><td>01</td><td>Black / White spot<br>Foreign material<br>(Round type)<br>Pinholes<br>Stain<br>Particles inside cell.<br>(Minor defect)</td><td>


φ= ( a + b) /2
<table>
<tr><th>Area / Size</th><th>Acc. Qty</th></tr>
<tr><td>φ≤0.10</td><td>Ignore</td></tr>
<tr><td>0.10<φ≤0.15</td><td>2</td></tr>
<tr><td>0.15<φ≤0.25</td><td>1</td></tr>
<tr><td>0.25<φ</td><td>0</td></tr>
<tr><td>Total</td><td>2 no include φ≤ 0.10</td></tr>
</table>
Distance between 2 defects should more than 3mm apart.
</td></tr>
</table>

<table>
<tr>
<td>02</td>
<td>Electrical Defect<br>(Minor defect)</td>
<td>
<table>
<tr><td></td><td>Display Area</td><td>Total</td><td rowspan="3">Note1</td></tr>
<tr><td>Bright dot</td><td>0</td><td>0</td></tr>
<tr><td>Dark dot</td><td>N≤2</td><td>N≤2</td></tr>
<tr><td>Total dot</td><td>N≤2</td><td>N≤2</td><td></td></tr>
<tr><td>Mura</td><td colspan="2">Not visible through 5% ND filters.</td><td>Note2</td></tr>
</table>
Remark:<br>1. Bright dot caused by scratch and foreign object accords to item 1.
</td>
</tr>
<tr>
<td>03</td>
<td>Black and White line<br>Scratch<br>Foreign material<br>(Line type)<br>(Minor defect)</td>
<td>


<table>
<tr><th>Length</th><th>Width</th><th>Acc. Qty</th></tr>
<tr><td>/</td><td>W ≦ 0.03</td><td>Ignore</td></tr>
<tr><td>L ≦ 2.5</td><td>0.03 ＜ W ≦ 0.05</td><td>3</td></tr>
<tr><td>L ≦ 2.5</td><td>0.05 ＜ W ≦ 0.10</td><td>2</td></tr>
<tr><td>/</td><td>0.1 ＜ W</td><td>0</td></tr>
<tr><td colspan="2">Total</td><td>3</td></tr>
</table>
Distance between 2 defects should more than 3mm apart. Scratches not viewable through the back of the display are acceptable.
</td>
</tr>
<tr>
<td>04</td>
<td>Glass Crack<br>(Minor defect)</td>
<td>

Crack is potential to enlarge, any type is not allowed.
</td>
</tr>
</table>

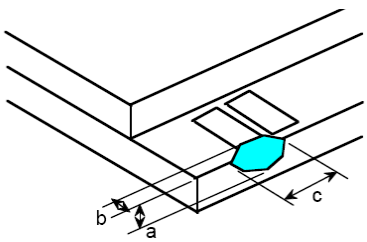
<table>
<tr>
<td>05</td>
<td>Glass Chipping Pad Area:<br>(Minor defect)<br>  <br></td>
<td><table>
<tr><th>Length and Width</th><th>Acc. Qty</th></tr>
<tr><td>c > 3.0, b< 1.0</td><td>1</td></tr>
<tr><td>c< 3.0, b< 1.0</td><td>3</td></tr>
<tr><td colspan="2">a<Glass Thickness</td></tr>
</table></td>
</tr>
<tr>
<td>06</td>
<td>Glass Chipping Rear of Pad Area:<br>(Minor defect)<br>  <br></td>
<td><table>
<tr><th>Length and Width</th><th>Acc. Qty</th></tr>
<tr><td>c > 3.0, b< 1.0</td><td>1</td></tr>
<tr><td>c< 3.0, b< 1.0</td><td>2</td></tr>
<tr><td>c< 3.0, b< 0.5</td><td>4</td></tr>
<tr><td colspan="2">a<Glass Thickness</td></tr>
</table></td>
</tr>
<tr>
<td>07</td>
<td>Glass Chipping Except Pad Area:<br>(Minor defect)<br>  <br></td>
<td><table>
<tr><th>Length and Width</th><th>Acc. Qty</th></tr>
<tr><td>c > 3.0, b< 1.0</td><td>1</td></tr>
<tr><td>c< 3.0, b< 1.0</td><td>2</td></tr>
<tr><td>c< 3.0, b< 0.5</td><td>4</td></tr>
<tr><td colspan="2">a<Glass Thickness</td></tr>
</table></td>
</tr>
<tr>
<td>08</td>
<td>Glass Corner Chipping:<br>(Minor defect)<br>  <br></td>
<td><table>
<tr><th>Length and Width</th><th>Acc. Qty</th></tr>
<tr><td>c < 3.0, b< 3.0</td><td>Ignore</td></tr>
<tr><td colspan="2">a<Glass Thickness</td></tr>
</table></td>
</tr>
</table>

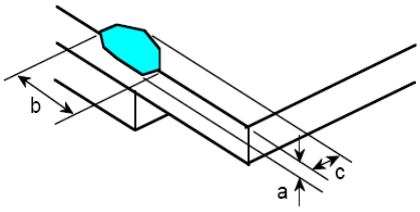
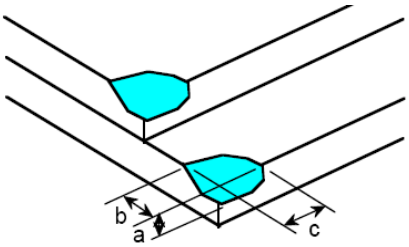
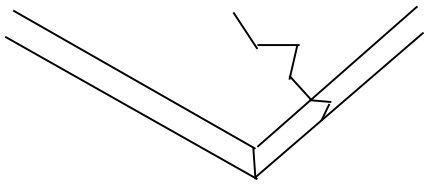
<table>
<tr>
<td>09</td>
<td>Glass Burr:<br>(Minor defect)<br>  <br><br><br><br></td>
<td><table><tr><th>Length</th><th>Acc. Qty</th></tr><tr><td>F < 1.0</td><td>Ignore</td></tr></table><br>Glass burr don’t affect assemble and module dimension.</td>
</tr>
<tr>
<td>10</td>
<td>FPC Defect:<br>(Minor defect)<br>  <br></td>
<td>10.1 Dent, pinhole width a<w/3.<br>(w: circuitry width.)<br>10.2 Open circuit is unacceptable.<br>10.3 No oxidation, contamination and distortion.</td>
</tr>
<tr>
<td>11</td>
<td>Bubble on Polarizer<br>(Minor defect)</td>
<td><table><tr><th>Diameter</th><th>Acc. Qty</th></tr><tr><td>φ≤0.20</td><td>Ignore</td></tr><tr><td>0.20 <φ≤0.30</td><td>4</td></tr><tr><td>0.30 <φ≤0.50</td><td>1</td></tr><tr><td>0.50 < φ</td><td>None</td></tr></table></td>
</tr>
<tr>
<td>12</td>
<td>Dent on Polarizer<br>(Minor defect)</td>
<td><table><tr><th>Diameter</th><th>Acc. Qty</th></tr><tr><td>φ≤0.20</td><td>Ignore</td></tr><tr><td>0.20 <φ≤0.30</td><td>4</td></tr><tr><td>0.30 <φ≤0.50</td><td>1</td></tr><tr><td>0.50 < φ</td><td>None</td></tr></table></td>
</tr>
<tr>
<td>13</td>
<td>Bezel</td>
<td>13.1 No rust, distortion on the Bezel.<br>13.2 No visible fingerprints, stains or other contamination.</td>
</tr>
</table>

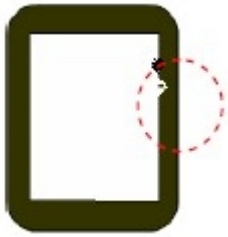
| | | |
|---|---|---|
| 14 | Touch Panel | D: Diameter W: width L: length<br>14.1 Spot: D<0.25 is acceptable<br>0.25≤D≤0.4<br>2dots are acceptable and the distance between defects should more than 10 mm.<br>D>0.4 is unacceptable<br>14.2 Dent: D>0.40 is unacceptable<br>14.3 Scratch: W≤0.03, L≤10 is acceptable,<br>0.03<W≤0.10, L≤10 is acceptable<br>Distance between 2 defects should more than 10 mm.<br>W>0.10 is unacceptable. |
| 15 | PCB | 15.1 No distortion or contamination on PCB terminals.<br>15.2 All components on PCB must same as documented on the BOM/component layout.<br>15.3 Follow IPC-A-600F. |
| 16 | Soldering | Follow IPC-A-610C standard |
| 17 | Electrical Defect<br>(Major defect) | The below defects must be rejected.<br>17.1 Missing vertical / horizontal segment,<br>17.2 Abnormal Display.<br>17.3 No function or no display.<br>17.4 Current exceeds product specifications.<br>17.5 LCD viewing angle defect.<br>17.6 No Backlight.<br>17.7 Dark Backlight.<br>17.8 Touch Panel no function. |

Remark: LCD Panel Broken shall be rejected. Defect out of LCD viewing area is acceptable.

Inspection Specification for the Capacitive Touch Panel

| | | |
|---|---|---|
| 01 | Chipping Pad Area(Not include the cover lens):<br>(Minor defect)<br>  <br> | The chip is seriously influence the product's function, any type is not allowed. |

<table>
<tr><td>02</td><td>Chipping Except Pad Area(Not include the cover lens):<br>(Minor defect)<br>  <br></td><td><table><tr><th>Length and Width</th><th>Acc. Qty</th></tr><tr><td>c< 1.5, b< 1</td><td>N≤5</td></tr><tr><td colspan="2">a<1/2 Glass Thickness</td></tr></table></td></tr>
<tr><td>03</td><td>Corner Chipping(Not include the cover lens):<br>(Minor defect)<br>  <br></td><td><table><tr><th>Length and Width</th><th>Acc. Qty</th></tr><tr><td>c < 1.5, b< 0.5</td><td>Ignore</td></tr><tr><td colspan="2">a<1/2 Glass Thickness</td></tr></table></td></tr>
<tr><td>04</td><td>Crack:<br>(Minor defect)</td><td>  <br>Crack is potential to enlarge, any type is not allowed.</td></tr>
<tr><td>05</td><td colspan="2">Cover lens must be without any chips, cracks or other damage when viewed from the front.</td></tr>
</table>

<table>
<tr>
<td>06</td>
<td>Same/Different color spot<br>  </td>
<td>D: Diameter W: width L: length
<table>
<tr><th>Diameter</th><th>Acc. Qty</th></tr>
<tr><td>D < 0.20</td><td>Ignore</td></tr>
</table>
Active Area：
<table>
<tr><th>Diameter</th><th>Acc. Qty</th></tr>
<tr><td>0.20 ＜ D ≦ 0.30</td><td>2</td></tr>
<tr><td>0.30 ＜ D ≦ 0.50</td><td>1</td></tr>
<tr><td>D>0.5</td><td>NG</td></tr>
</table>
Viewing Area：
<table>
<tr><th>Diameter</th><th>Acc. Qty</th></tr>
<tr><td>D<0.20</td><td>Ignore</td></tr>
<tr><td>0.20 ＜ D ≦ 0.5</td><td>3</td></tr>
<tr><td>D>0.5</td><td>NG</td></tr>
</table>
Distance between 2 defects should more than15mm apart.</td>
</tr>
<tr>
<td>07</td>
<td>Cover lens line Scratch<br>  </td>
<td>
<table>
<tr><th>Length</th><th>Width</th><th>Acc. Qty</th></tr>
<tr><td>/</td><td>W ≦ 0.08mm</td><td>Ignore</td></tr>
<tr><td>L ≦ 5</td><td>0.08 ＜ W ≦ 0.15</td><td>2</td></tr>
<tr><td>L ≦ 3</td><td>0.15 ＜ W ≦ 0.20</td><td>1</td></tr>
<tr><td>-</td><td>W>0.2</td><td>NG</td></tr>
<tr><td>L>5</td><td>-</td><td>NG</td></tr>
</table>
Distance between 2 defects should more than15mm apart.</td>
</tr>
<tr>
<td>08</td>
<td>Printing sawtooth<br>  </td>
<td>
<table>
<tr><th>Length</th><th>Width</th><th>Acc. Qty</th></tr>
<tr><td>/</td><td>W ≦ 0.2mm</td><td>2</td></tr>
<tr><td>L ≦ 2</td><td>0.2 ＜ W ≦ 0.3</td><td>1</td></tr>
<tr><td>L ≦ 2</td><td>W>0.3</td><td>NG</td></tr>
</table>
</td>
</tr>
</table>

**11.7 Classification of Defects**

11.7.1 Visual defects (Except no / wrong label) are treated as minor defect and electrical defect is major.

11.7.2 Two minor defects are equal to one major in lot sampling inspection.

**11.8 Identification/marking criteria**

Any unit with illegible / wrong /double or no marking/ label shall be rejected.

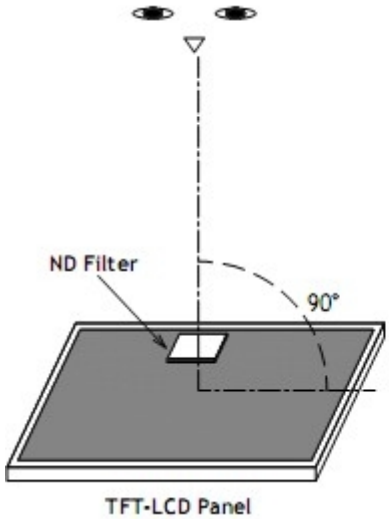
**11.9 Packaging**

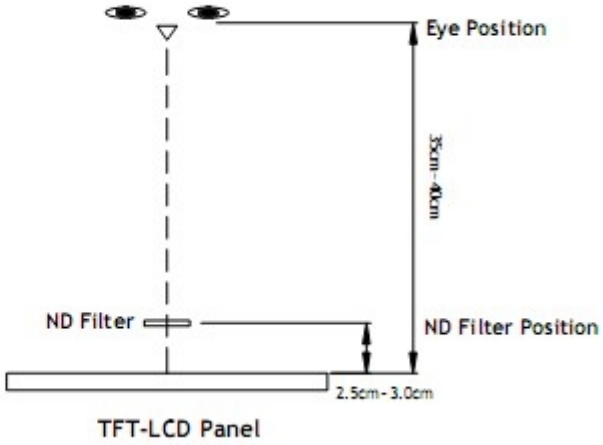
11.9.1 There should be no damage of the outside carton box, each packaging box should have one identical label.

11.9.2 Modules inside package box should have compliant mark.

11.9.3 All direct package materials shall offer ESD protection

**Note1**: Bright dot is defined as the defective area of the dot is larger than 50% of one sub-pixel area.




Bright dot: The bright dot size defect at black display pattern. It can be recognized by 2% transparency of filter when the distance between eyes and panel is 350mm±50mm.

Dark dot: Cyan, Magenta or Yellow dot size defect at white display pattern. It can be recognized by 5% transparency of filter when the distance between eyes and panel is 350mm±50mm.

**Note2:** Mura on display which appears darker / brighter against background brightness on parts of display area.

## 12. Reliability Specification

| No | Item | Condition | Quantity | Criteria |
|---|---|---|---|---|
| 1 | High Temperature Operating | +70°C, 96Hrs | 2 | GB/T2423.2 -2008 |
| 2 | Low Temperature Operating | -20°C, 96Hrs | 2 | GB/T2423.1 -2008 |
| 3 | High Humidity | +50°C, 90%RH, 96Hrs | 2 | GB/T2423.3 -2006 |
| 4 | High Temperature Storage | +80°C, 96Hrs | 2 | GB/T2423.2 -2008 |
| 5 | Low Temperature Storage | -30°C, 96Hrs | 2 | GB/T2423.1 -2008 |
| 6 | Thermal Cycling Test | -20°C, 60min~+70°C, 60min, 20 cycles. | 2 | GB/T2423.22 -2012 |
| 7 | Packing vibration | Frequency range:10Hz~50Hz<br>Acceleration of gravity:5G<br>X, Y, Z 30 min for each direction. | 2 | GB/T5170.14 -2009 |
| 8 | Electrical Static Discharge | Air:±8KV 150pF/330Ω 5 times | 2 | GB/T17626.2 -2006 |
| | | Contact:±4KV 150pF/330Ω 5 times | | |
| 9 | Drop Test (Packaged) | Height:80 cm,1 corner, 3 edges, 6 surfaces. | 2 | GB/T2423.8 -1995 |

Note1. No defection cosmetic and operational function allowable.

Note2. Total current Consumption should be below double of initial value

# 13. Precautions and Warranty

## 13.1 Safety

13.1.1 The liquid crystal in the LCD is poisonous. Do not put it in your mouth. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and water.

13.1.2 Since the liquid crystal cells are made of glass, do not apply strong impact on them. Handle with care.

## 13.2 Handling

13.2.1 Reverse and use within ratings in order to keep performance and prevent damage.

13.2.2 Do not wipe the polarizer with dry cloth, as it might cause scratch. If the surface of the LCD needs to be cleaned, wipe it swiftly with cotton or other soft cloth soaked with petroleum IPA, do not use other chemicals.

## 13.3 Storage

13.3.1 Do not store the LCD module beyond the specified temperature ranges.

## 13.4 Metal Pin (Apply to Products with Metal Pins)

13.4.1 Pins of LCD and Backlight

13.4.1.1 Solder tip can touch and press on the tip of Pin LEAD during the soldering

13.4.1.2 Recommended Soldering Conditions

Solder Type: Sn96.3~94-Ag3.3~4.3-Cu0.4~1.1

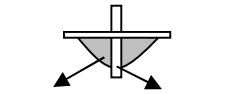
Maximum Solder Temperature: 370℃

Maximum Solder Time: 3s at the maximum temperature

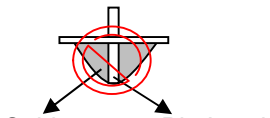
Recommended Soldering Temp: 350±20℃

Typical Soldering Time: ≤3s

13.4.1.3 Solder Wetting




Recommended




Not Recommended

13.4.2Pins of EL

13.4.2.1 Solder tip can touch and press on the tip of EL leads during soldering.

13.4.2.2 No Solder Paste on the soldering pad on the motherboard is recommended.

13.4.2.3 Recommended Soldering Conditions

Solder type: Nippon Alimit Leadfree SR-34, size 0.5mm

Recommended Solder Temperature: 270～290℃

Typical Soldering Time: ≤2s

Minimum solder distance from EL lamp (body):2.0mm

13.4.2.4 No horizontal press on the EL leads during soldering.

13.4.2.5 180° bend EL leads three times is not allowed.

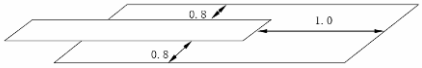
13.4.2.6 Solder Wetting


Recommended Not Recommended

13.4.2.7 The type of the solder iron:

Recommended Not Recommended

13.4.2.8 Solder Pad




**13.5 Operation**

13.5.1 Do not drive LCD with DC voltage

13.5.2 Response time will increase below lower temperature

13.5.3 Display may change color with different temperature

13.5.4 Mechanical disturbance during operation, such as pressing on the display area, may cause the segments to appear “fractured”.

**13.6 Static Electricity**

13.6.1 CMOS LSIs are equipped in this unit, so care must be taken to avoid the electro-static charge, by ground human body, etc.

13.6.2 The normal static prevention measures should be observed for work clothes and benches.

13.6.3 The module should be kept into anti-static bags or other containers resistant to static for storage.

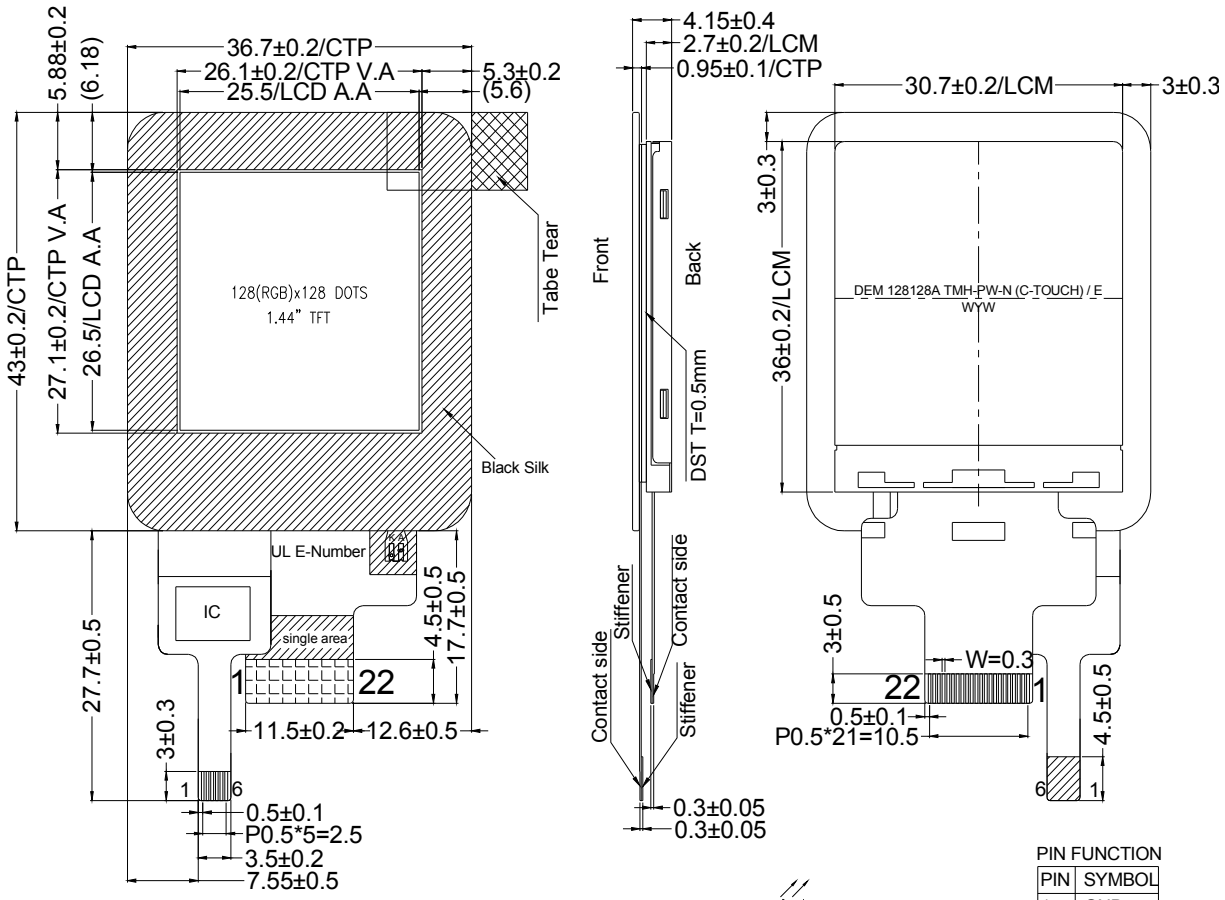
**13.7 Limited Warranty**

13.7.1 Our warranty liability is limited to repair and/or replacement. We will not be responsible for any consequential loss.

13.7.2 If possible, we suggest customer to use up all modules in six months. If the module storage time over twelve months, we suggest that recheck it before the module be used.

13.7.3 After the product shipped, any product quality issues must be feedback within three months, otherwise, we will not be responsible for the subsequent or consequential events.

## 14. Outline Drawing




NOTES:
1. Display Type: 1.44" TFT
2. Viewing Direction: 6:00
3. Grey Scale Inversion Direction: 12:00
4. Polarizer Mode: Transmissive / Normal White
5. Operation Temperature: -20°C to +70°C
6. Storage Temperature: -30°C to +80°C
7. Control/Driver IC: ST7735S (Sitronix)
8. Logic Power Supply Voltage: 2.8V (typ.)
9. Backlight: White(2xLED) / 3.2V/40mA (typ.)
10. Brightness: 360cd/m² / Lifetime: 20000h (typ.)

* Unspecification Tolerances are ±0.2mm

| IM2 | Interface | PIN in use |
|---|---|---|
| 1 | Parallel interface | D0-D7 |
| 0 | Serial interface | SDA/SCL |

PIN FUNCTION

| PIN | SYMBOL |
|---|---|
| 1 | GND |
| 2 | LED- |
| 3 | LED+ |
| 4 | VDDIO |
| 5 | VDD |
| 6 | D/C(SCL) |
| 7 | /CS |
| 8 | /WR |
| 9 | /RD |
| 10 | GND |
| 11 | D7 |
| 12 | D6 |
| 13 | D5 |
| 14 | D4 |
| 15 | D3 |
| 16 | D2 |
| 17 | D1 |
| 18 | D0(SDA) |
| 19 | GND |
| 20 | RESET |
| 21 | GND |
| 22 | IM2 |

Technical Parameters:
1. Cover Glass+Film+FPC
   ITO Film: T=0.25mm
   Cover Glass: 0.7mm
   Lead Line: FPC
   IC Model: FT3267 (Focaltech)
2. Operation Voltage: 2.8-3.3 Volt
3. Transmittance: ≥85%
4. Surface Hardness: ≥6H
5. Operation Environment: -20℃ to +70℃
6. Storage Environment: -30℃ to +80℃

CTP

| PIN | SYMBOL |
|---|---|
| 1 | GND |
| 2 | SCL |
| 3 | SDA |
| 4 | INT |
| 5 | RESET |
| 6 | VCC |