

Display Elektronik GmbH

DATA SHEET

TFT MODULE

DEM 1280800E VMX-PW-N

10,1“ TFT

Product Specification

Version: 0

13.12.2024

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*** Description**

This is a color active matrix TFT (Thin Film Transistor) LCD (liquid crystal display) that uses amorphous silicon TFT as a switching device. This module is composed of a Transmissive type TFT-LCD Panel, driver circuit, back-light unit. The resolution of a 10.1 " TFT-LCD contains 1280x800 pixels, and can display up to 16.7M colors.

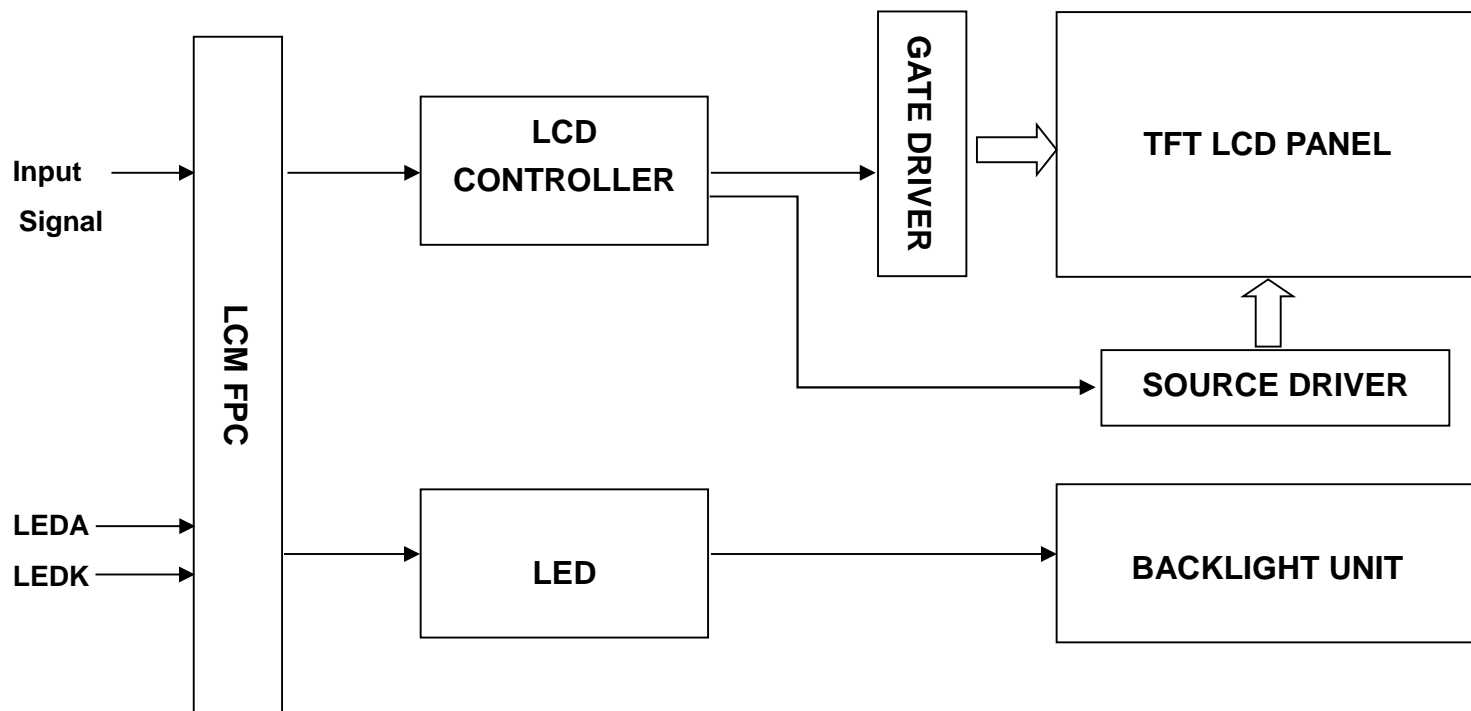
*** Features**

| General Information Items | Specification | Unit | Note |
|---------------------------|--------------------------------|---------|------|
| | Main Panel | | |
| Display area(AA) | 216.96(H)*135.6(V) (10.1 inch) | mm | |
| Driver element | TFT active matrix | - | |
| Display colors | 16.7M | colors | |
| Number of pixels | 1280(RGB)*800 | dots | |
| Pixel arrangement | RGB vertical stripe | - | |
| Pixel pitch | 0.1692(H)*0.1692(V) | mm | |
| Viewing angle | ALL | o'clock | |
| Controller IC | EK79202D_A | - | |
| LCM Interface | 8 BIT LVDS | - | |
| Display mode | Transmissive /Normally Black | - | |
| Operating temperature | -30~+85 | °C | |
| Storage temperature | -40~+85 | °C | |

*** Mechanical Information**

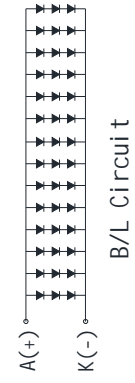
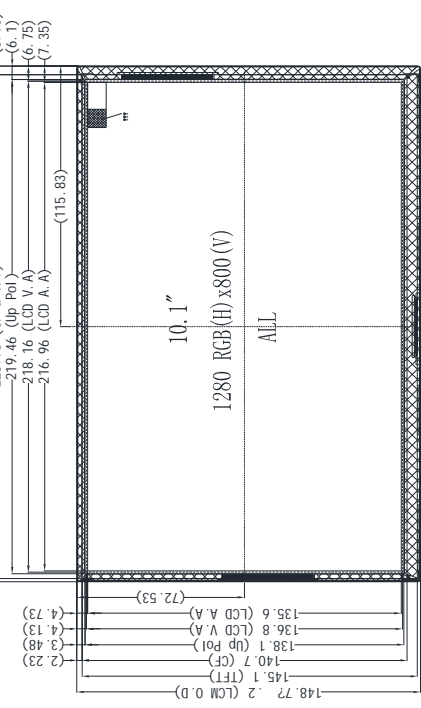
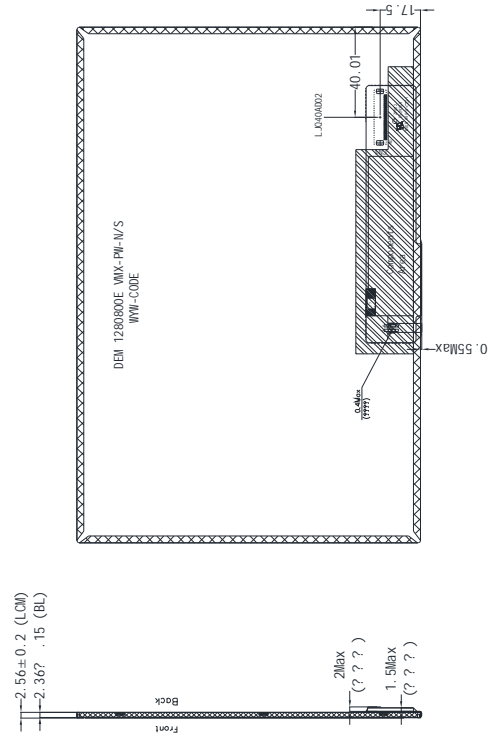
| Item | | Min. | Typ. | Max. | Unit | Note |
|-------------|---------------|------|--------|------|------|------|
| Module size | Horizontal(H) | - | 229.06 | - | mm | |
| | Vertical(V) | - | 148.70 | - | mm | |
| | Depth(D) | - | 2.56 | - | mm | |
| Weight | | - | 210 | - | g | |

1. Block Diagram



2. Outline dimension

| NO. | Pin Name |
|-----|----------|
| 1 | NC |
| 2 | VDD |
| 3 | VDD |
| 4 | NC |
| 5 | NC |
| 6 | NC |
| 7 | GND |
| 8 | RXIN0- |
| 9 | RXIN0+ |
| 10 | GND |
| 11 | RXIN1- |
| 12 | RXIN1+ |
| 13 | GND |
| 14 | RXIN2- |
| 15 | RXIN2+ |
| 16 | GND |
| 17 | RXCLK- |
| 18 | RXCLK+ |
| 19 | GND |
| 20 | RXIN3- |
| 21 | RXIN3+ |
| 22 | GND |
| 23 | NC |
| 24 | NC |
| 25 | GND |
| 26 | NC |
| 27 | NC |
| 28 | NC |
| 29 | NC |
| 30 | GND |
| 31 | LED- |
| 32 | LED+ |
| 33 | NC |
| 34 | NC |
| 35 | NC |
| 36 | NC |
| 37 | NC |
| 38 | NC |
| 39 | VLED+ |
| 40 | VLED+ |



- NOTE:
1. DISPLAY TYPE: 10.1", TFT-LCD, 16.7M COLORS
 2. DISPLAY MODE: NORMALLY BLACK/IPS
 3. VIEWING DIRECTION: ALL
 4. LCM DRIVER IC: EK79202D-A (COG)
LCM Interface: 8BIT LVDS
 5. VDD/VCC: 3.3V(TYP.)
 6. OPERATING TEMP: -30° C TO 85° C
STORAGE TEMP: -40° C TO 85° C
 7. BACK LIGHT: LED WHITE, 42 LED, 280mA, 8.4-10.2V
 8. RoHS COMPLIANT.

3. Input terminal Pin Assignment

40pin connector is used for the module electronics interface. The recommended model is Molex_505110-4096 manufactured by Molex.

| NO. | SYMBOL | DISCRIPTION | I/O |
|-----|--------|--|-----|
| 1 | NC | -- | -- |
| 2 | VDD | A power supply for analog circuit. VDD=3.3V; | P |
| 3 | VDD | | |
| 4 | NC | -- | -- |
| 5 | NC | -- | -- |
| 6 | NC | -- | -- |
| 7 | GND | Ground | P |
| 8 | RXIN0- | -LVDS Differential Data Input | I |
| 9 | RXIN0+ | +LVDS Differential Data Input | I |
| 10 | GND | Ground | P |
| 11 | RXIN1- | -LVDS Differential Data Input | I |
| 12 | RXIN1+ | +LVDS Differential Data Input | I |
| 13 | GND | Ground | P |
| 14 | RXIN2- | -LVDS Differential Data Input | I |
| 15 | RXIN2+ | +LVDS Differential Data Input | I |
| 16 | GND | Ground | P |
| 17 | RXCLK- | -LVDS Differential Clock Input | I |
| 18 | RXCLK+ | +LVDS Differential Clock Input | I |
| 19 | GND | Ground | P |
| 20 | RXIN3- | -LVDS Differential Data Input | I |
| 21 | RXIN3+ | +LVDS Differential Data Input | I |
| 22 | GND | Ground | P |
| 23 | NC | -- | -- |
| 24 | NC | -- | -- |
| 25 | GND | Ground | P |
| 26 | NC | -- | -- |
| 27 | NC | -- | -- |
| 28 | NC | -- | -- |
| 29 | NC | -- | -- |
| 30 | NC | -- | -- |
| 31 | LED- | LED Cathode | P |
| 32 | LED- | LED Cathode | P |
| 33 | NC | -- | -- |
| 34 | NC | -- | -- |

| | | | |
|----|------|-----------|----|
| 35 | NC | -- | -- |
| 36 | NC | -- | -- |
| 37 | NC | -- | -- |
| 38 | NC | -- | -- |
| 39 | LED+ | LED Anode | P |
| 40 | LED+ | LED Anode | P |

4. LCD Optical Characteristics

4.1 Optical specification

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit. | Note | |
|--|---------|-------------|----------------------|-------|--------|-------|--------|---|
| Contrast Ratio | CR | $\Theta=0$ | 800 | 1000 | -- | | CA-310 | |
| Response time | Rising | T_{R+T_F} | Normal viewing angle | -- | 25 | 35 | msec | * |
| | Falling | | | | | | | * |
| Uniformity | S(%) | | 42 | 45 | -- | % | * | |
| Color Filter Chromaticity ((CIE 1931)) | White | W_X | -0.04 | +0.04 | 0.3185 | | CA-310 | |
| | | W_Y | | | 0.3434 | | | |
| | Red | R_X | | | 0.5916 | | | |
| | | R_Y | | | 0.3594 | | | |
| | Green | G_X | | | 0.3624 | | | |
| | | G_Y | | | 0.5525 | | | |
| | Blue | B_X | | | 0.1484 | | | |
| | | B_Y | | | 0.1084 | | | |
| Viewing angle | Hor. | Θ_L | CR>10 | 70 | 80 | -- | * | |
| | | Θ_R | | 70 | 80 | -- | | |
| | Ver. | Θ_U | | 70 | 80 | -- | | |
| | | Θ_D | | 70 | 80 | -- | | |
| Option View Direction | ALL | | | | | | | |

* The data comes from the LCD specification.

Measuring Condition

Measuring surrounding : dark room

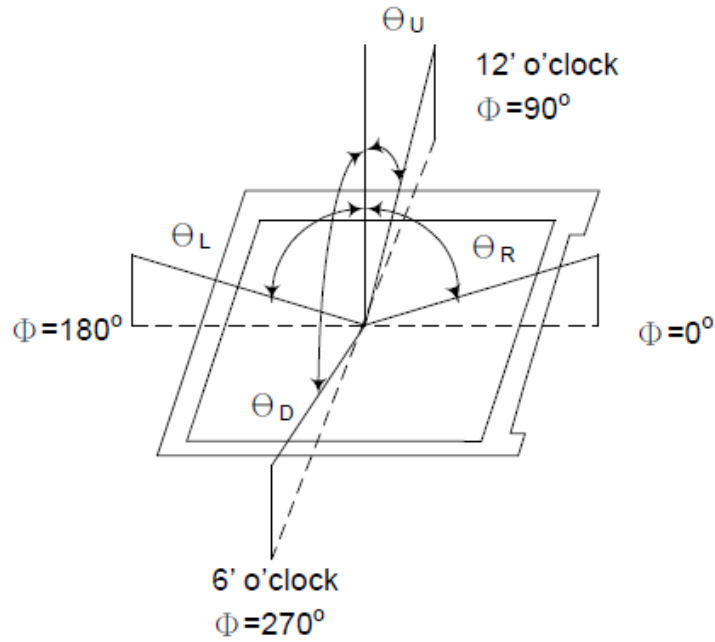
Ambient temperature : 25±2°C

15min. warm-up time.

Measuring Equipment

FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.

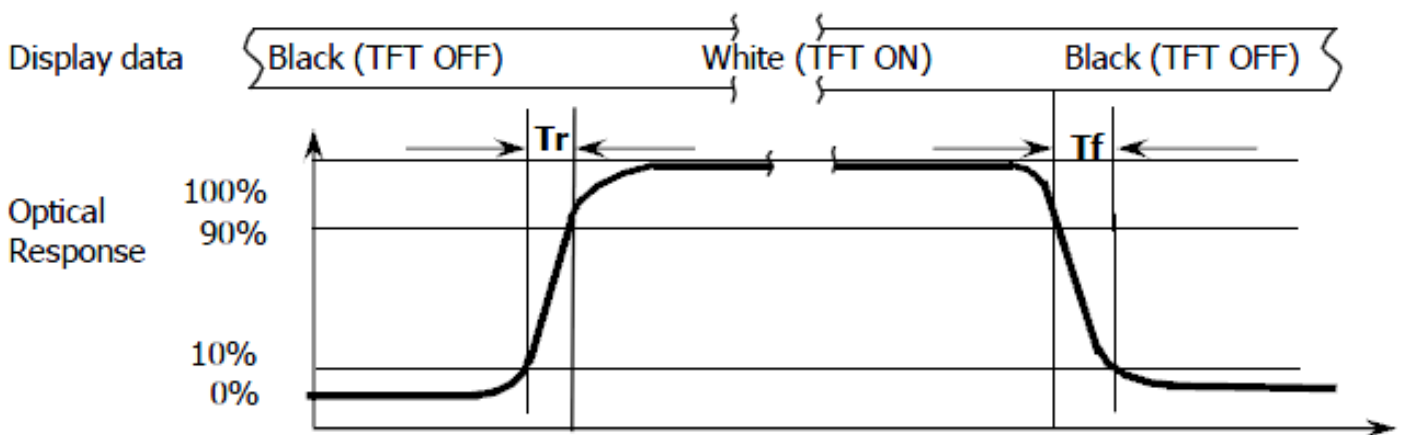
Note (1): Definition of Viewing Angle :



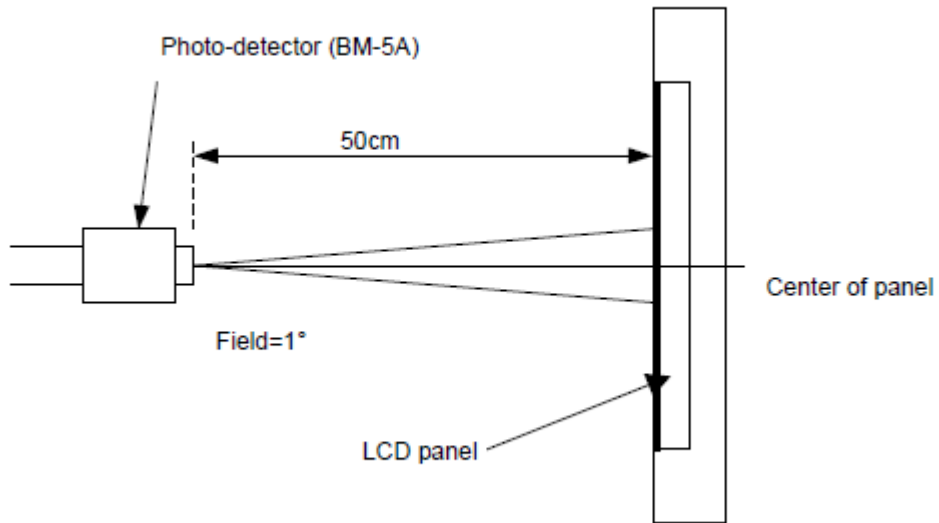
Note (2): Definition of Contrast Ratio(CR) :measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

Note (3): Response Time



Note (4): Definition of optical measurement setup



5. Electrical Characteristics

5.1 Absolute Maximum Rating

| Characteristics | Symbol | Min. | Max. | Unit | Note |
|------------------------|-----------------|------|------|------|-------|
| Digital Supply Voltage | VDD | -0.5 | 4 | V | Note1 |
| Operating temperature | T _{OP} | -30 | +85 | °C | |
| Storage temperature | T _{ST} | -40 | +85 | °C | |

NOTE1: If the absolute maximum rating of even is one of the above parameters is exceeded even momentarily, the quality of the product may be degraded. Absolute maximum ratings, therefore, specify the values exceeding which the product may be physically damaged. Be sure to use the product within the range of the absolute maximum ratings.

5.2 DC Electrical Characteristics

| Characteristics | Symbol | Min. | Typ. | Max. | Unit | Note |
|------------------------|-----------------|---------|------|---------|------|------|
| Digital Supply Voltage | VDD | - | 3.3 | - | V | |
| Normal mode Current | IDD | -- | 170 | 340 | mA | |
| Level input voltage | V _{IH} | 0.8*VDD | -- | VDD | V | |
| | V _{IL} | GND | -- | 0.2*VDD | V | |

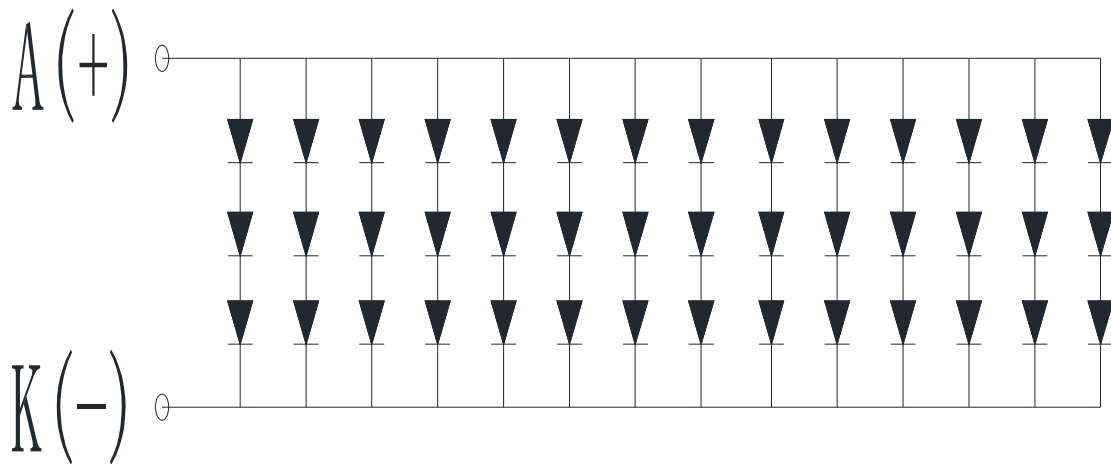
5.3 LED Backlight Characteristics

The back-light system is edge-lighting type with 42 chips LED

| Item | Symbol | Min. | Typ. | Max. | Unit | Note |
|-----------------|--------|-------|------|------|-------------------|---------|
| Forward Current | I_F | -- | 280 | -- | mA | |
| Forward Voltage | V_F | -- | 9.6 | -- | V | |
| LCM Luminance | LV | 500 | 550 | -- | cd/m ² | |
| LED life time | Hr | 50000 | -- | -- | Hour | Note1,2 |
| Uniformity | Avg | 70 | 80 | -- | % | Note3 |

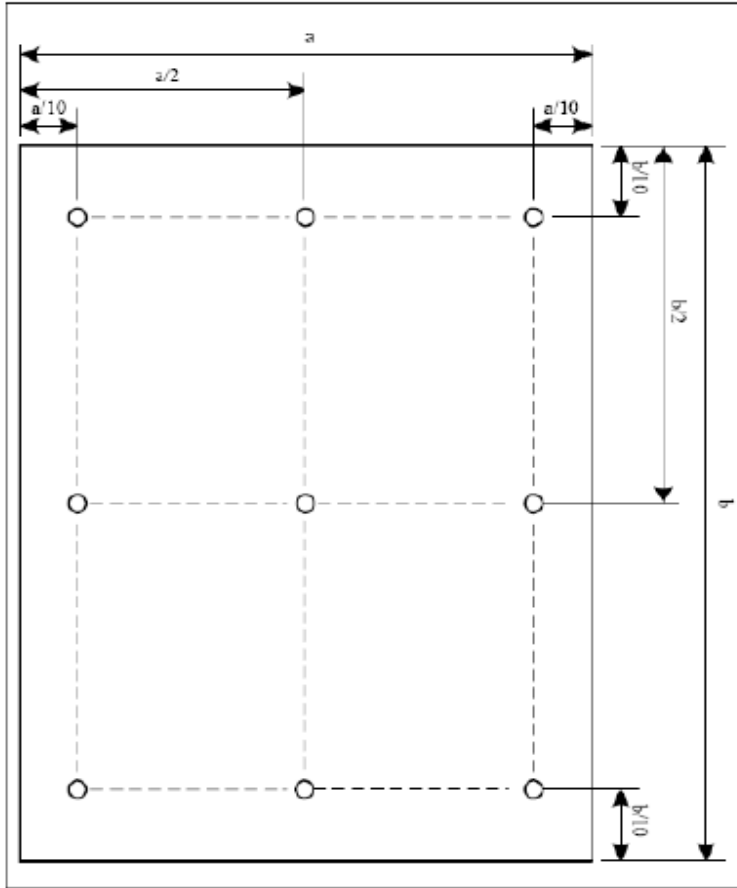
Note1: LED life time (Hr) can be defined as the time in which it continues to operate under the condition:
 $T_a=25\pm3$ °C, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note 2: The “LED life time” is defined as the module brightness decrease to 50% original brightness at $T_a=25$ °C and $I_L=280$ mA. The LED lifetime could be decreased if operating I_L is larger than 280mA. The constant current driving method is suggested.



B/L Circuit ($I_f=280$ mA, $V_f=8.4\sim 10.2$ V)

Note (3) Luminance Uniformity of these 9 points is defined as below:



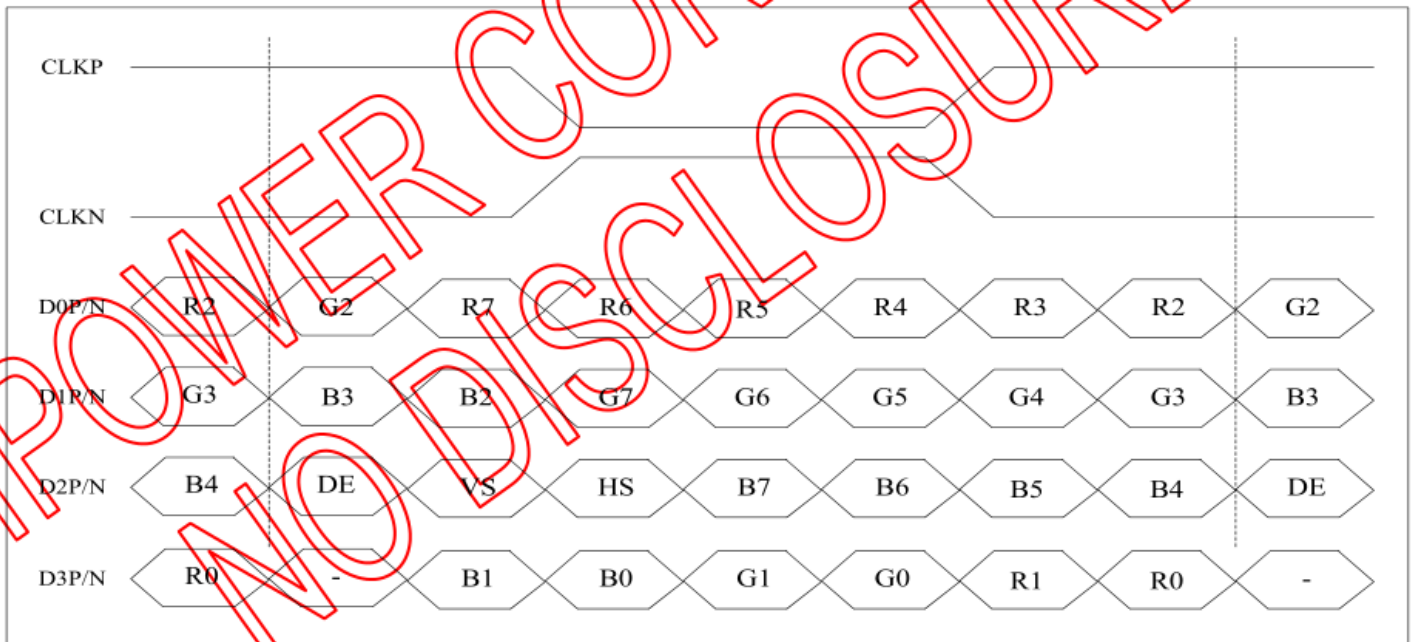
$$\text{Uniformity} = \frac{\text{minimum luminance in 9 points (1-9)}}{\text{maximum luminance in 9 points (1-9)}}$$

$$\text{Luminance} = \frac{\text{Total Luminance of 9 points}}{9}$$

6. Video Interface and Timing Table

6.1 LVDS interface

6.1.1 Data input format for LVDS



8-bit LVDS input (LVBIT=H, LVFMT=L)

6.1.2 LVDS Input Timing Table

For 1280RGBx800

| Parameter | Symbol | Value | | | Unit |
|--|-------------------|-------|------|------|------|
| | | Min. | Typ. | Max. | |
| DCLK frequency @Frame rate=60Hz (LVDS) | F _{DCLK} | 66.3 | 72.4 | 78.9 | MHz |
| HSYNC period time | T _H | 1380 | 1440 | 1500 | DCLK |
| Horizontal display area | T _{HD} | 1280 | | | DCLK |
| HSYNC pulse width | T _{HPW} | Min. | 2 | | |
| | | Typ. | - | | |
| | | Max. | 40 | | |
| HSYNC back porch(with pulse width) | T _{HBP} | 88 | 88 | 88 | DCLK |
| HSYNC front porch | T _{HFP} | 12 | 72 | 132 | DCLK |
| VSYNC period time | T _V | 824 | 838 | 872 | H |
| Vertical display area | T _{VD} | 800 | | | H |
| VSYNC pulse width | T _{VPW} | Min. | 2 | | H |
| | | Typ. | - | | |
| | | Max. | 20 | | |
| VSYNC back porch(with pulse width) | T _{VBP} | 23 | 23 | 23 | H |
| VSYNC front porch | T _{VFP} | 1 | 15 | 49 | H |

7. LCD Module Out-Going Quality Level

7.1 VISUAL & FUNCTION INSPECTION STANDARD

7.1.1 Inspection conditions

Inspection performed under the following conditions is recommended.

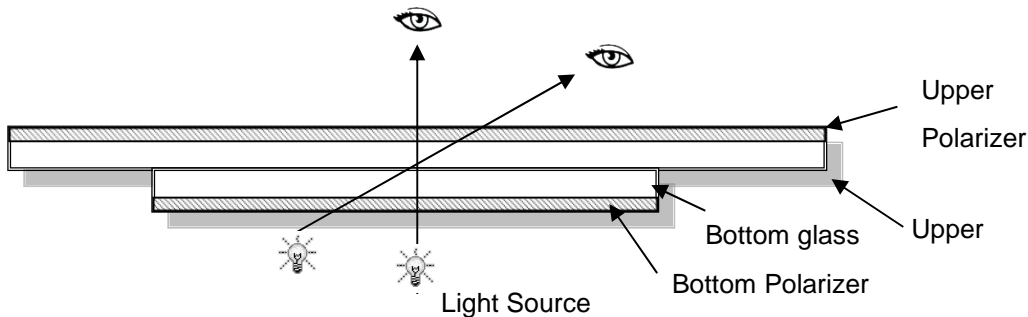
Temperature : $25 \pm 5^{\circ}\text{C}$

Humidity : $65\% \pm 10\% \text{RH}$

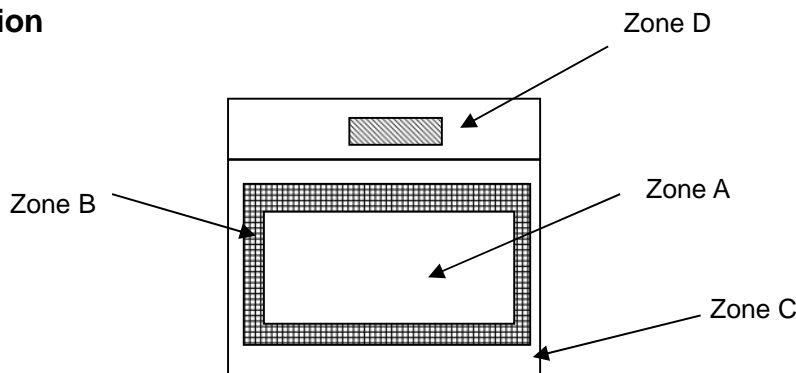
Viewing Angle : Normal viewing Angle.

Illumination: Single fluorescent lamp (300 to 700Lux)

Viewing distance:30-50cm



7.1.2 Definition



Zone A : Effective Viewing Area(Character or Digit can be seen)

Zone B : Viewing Area except Zone A

Zone C : Outside (Zone A+Zone B) which can not be seen after assembly by customer .)

Zone D : IC Bonding Area

Note:As a general rule ,visual defects in Zone C can be ignored when it doesn't effect product function or appearance after assembly by customer

7.1.3 Sampling Plan

According to GB/T 2828-2012 ; , normal inspection, Class II

AQL:

| | |
|--------------|--------------|
| Major defect | Minor defect |
| 0.65 | 1.5 |

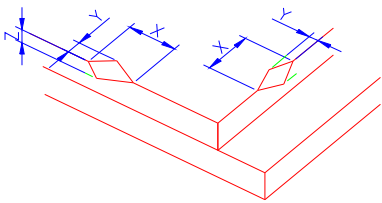
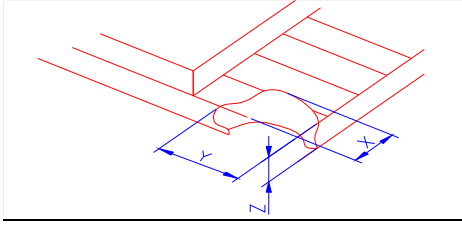
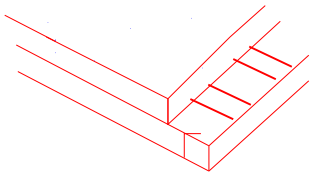
LCD: Liquid Crystal Display , LCM: Liquid Crystal Module

| No | Items to be inspected | Criteria | Classification of defects |
|----|-----------------------|--|---------------------------|
| 1 | Functional defects | 1) No display, Open or miss line 2) Display abnormally, Short 3) Backlight no lighting, abnormal lighting. etc... | Major |
| 2 | Missing | Missing components and etc... | |
| 3 | Outline dimension | Overall outline dimension beyond the drawing is not allowed,deformation and etc... | |
| 4 | Color tone | Color unevenness, refer to limited sample | Minor |
| 5 | Spot/Line defect | Light dot,Dim spot,(Note1) Polarizer Air Bubble, Polarizer accidented spot and etc... | |
| 6 | Soldering appearance | Good soldering , Peeling off is not allowed and etc... | |
| 7 | LCD/Polarizer | Black/White spot/line, scratch, crack, etc. | |

Note1: a) Light dot: Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern.

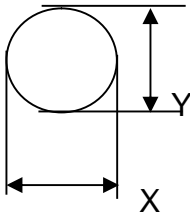
b) Dim dot: Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green, blue picture.

7.1.4 Criteria (Visual)

| Number | Items | Criteria(mm) | | | | | | |
|---|--------------------------------|---|---|---|---|--------|--------------------------------|----|
| 1.0 LCD Crack/Broken NOTE: X: Length Y: Width Z: Height L: Length of ITO, T: Height of LCD | (1) The edge of LCD broken |  <table border="1" data-bbox="751 611 1453 759"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>≤3.0mm</td> <td><Inner border line of the seal</td> <td>≤T</td> </tr> </tbody> </table> | X | Y | Z | ≤3.0mm | <Inner border line of the seal | ≤T |
| X | Y | Z | | | | | | |
| ≤3.0mm | <Inner border line of the seal | ≤T | | | | | | |
| | (2)LCD corner broken |  <table border="1" data-bbox="831 1066 1370 1167"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>≤3.0mm</td> <td>≤L</td> <td>≤T</td> </tr> </tbody> </table> | X | Y | Z | ≤3.0mm | ≤L | ≤T |
| X | Y | Z | | | | | | |
| ≤3.0mm | ≤L | ≤T | | | | | | |
| | (3) LCD crack |  <p style="text-align: center;">Crack Not allowed</p> | | | | | | |

2.0

Spot defect



$$\Phi = (X + Y) / 2$$

① light dot (black/white spot , pinhole, stain, etc.)

| Zone Size (mm) | Acceptable Qty | | |
|-------------------------|--------------------------|---|---|
| | A | B | C |
| $\Phi \leq 0.15$ | Ignore | | |
| $0.15 < \Phi \leq 0.25$ | 3(distance ≥ 10 mm) | | |
| $0.25 < \Phi \leq 0.4$ | 2(distance ≥ 10 mm) | | |
| $\Phi > 0.4$ | 0 | | |

② Dim spot (light leakage, dent, dark spot, etc)



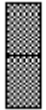
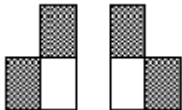
| Zone Size (mm) | Acceptable Qty | | |
|-------------------------|---------------------------|---|---|
| | A | B | C |
| $\Phi \leq 0.15$ | Ignore | | |
| $0.15 < \Phi \leq 0.25$ | 3(distance ≥ 10 mm) | | |
| $0.25 < \Phi \leq 0.4$ | 2(distance ≥ 10 mm) | | |
| $\Phi > 0.4$ | 0 | | |


③ Polarizer accidented spot

| Zone Size (mm) | Acceptable Qty | | |
|-----------------------|---------------------------|---|---|
| | A | B | C |
| $\Phi \leq 0.2$ | Ignore | | |
| $0.2 < \Phi \leq 0.5$ | 2(distance ≥ 10 mm) | | |
| $\Phi > 0.5$ | 0 | | |

④ Polarizer Bubble

| Zone Size (mm) | Acceptable Qty | | |
|-----------------------|--------------------------|---|---|
| | A | B | C |
| $\Phi \leq 0.2$ | Ignore | | |
| $0.2 < \Phi \leq 0.4$ | 3(distance ≥ 10 mm) | | |
| $\Phi > 0.4$ | 0 | | |

| 3.0 | LCD Pixel defect | <p>Pixel bad points</p> <table border="1"> <thead> <tr> <th data-bbox="523 253 715 304">Item</th> <th data-bbox="715 253 1230 304">Zone A</th> <th data-bbox="1230 253 1481 304">Acceptable Qty</th> </tr> </thead> <tbody> <tr> <td data-bbox="523 304 715 465" rowspan="3">Bright dot</td> <td data-bbox="715 304 1230 360">Random</td> <td data-bbox="1230 304 1481 360">N≤2</td> </tr> <tr> <td data-bbox="715 360 1230 416">2 dots adjacent</td> <td data-bbox="1230 360 1481 416">N≤0</td> </tr> <tr> <td data-bbox="715 416 1230 465">3 dots adjacent</td> <td data-bbox="1230 416 1481 465">N≤0</td> </tr> <tr> <td data-bbox="523 465 715 633" rowspan="3">Dark dot</td> <td data-bbox="715 465 1230 521">Random</td> <td data-bbox="1230 465 1481 521">N≤2</td> </tr> <tr> <td data-bbox="715 521 1230 577">2 dots adjacent</td> <td data-bbox="1230 521 1481 577">N≤0</td> </tr> <tr> <td data-bbox="715 577 1230 633">3 dots adjacent</td> <td data-bbox="1230 577 1481 633">N≤0</td> </tr> <tr> <td data-bbox="523 633 715 943">Distance</td> <td data-bbox="715 633 1230 943"> 1. Minimum Distance Between Bright dots. 2. Minimum Distance Between dark dots 3. Minimum Distance Between dark and bright dot. </td> <td data-bbox="1230 633 1481 943">5mm</td> </tr> <tr> <td colspan="2" data-bbox="523 943 1230 999">Total bright and dark dot</td> <td data-bbox="1230 943 1481 999">N≤4</td> </tr> </tbody> </table> <p>Note:</p> <p>A) Bright dot: Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern.</p> <p>B) Dark dot: Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green, blue picture.</p> <p>C) 2 dot adjacent = 1 pair = 2 dots</p> <p>Picture:</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;">  <p>2 dot adjacent</p> </div> <div style="text-align: center;">  <p>2 dot adjacent</p> </div> <div style="text-align: center;">  <p>2 dot adjacent (vertical)</p> </div> <div style="text-align: center;">  <p>2 dot adjacent (slant)</p> </div> </div> | Item | Zone A | Acceptable Qty | Bright dot | Random | N≤2 | 2 dots adjacent | N≤0 | 3 dots adjacent | N≤0 | Dark dot | Random | N≤2 | 2 dots adjacent | N≤0 | 3 dots adjacent | N≤0 | Distance | 1. Minimum Distance Between Bright dots. 2. Minimum Distance Between dark dots 3. Minimum Distance Between dark and bright dot. | 5mm | Total bright and dark dot | | N≤4 |
|---------------------------|---|--|------|--------|----------------|------------|--------|-----|-----------------|-----|-----------------|-----|----------|--------|-----|-----------------|-----|-----------------|-----|----------|---|-----|---------------------------|--|-----|
| Item | Zone A | Acceptable Qty | | | | | | | | | | | | | | | | | | | | | | | |
| Bright dot | Random | N≤2 | | | | | | | | | | | | | | | | | | | | | | | |
| | 2 dots adjacent | N≤0 | | | | | | | | | | | | | | | | | | | | | | | |
| | 3 dots adjacent | N≤0 | | | | | | | | | | | | | | | | | | | | | | | |
| Dark dot | Random | N≤2 | | | | | | | | | | | | | | | | | | | | | | | |
| | 2 dots adjacent | N≤0 | | | | | | | | | | | | | | | | | | | | | | | |
| | 3 dots adjacent | N≤0 | | | | | | | | | | | | | | | | | | | | | | | |
| Distance | 1. Minimum Distance Between Bright dots. 2. Minimum Distance Between dark dots 3. Minimum Distance Between dark and bright dot. | 5mm | | | | | | | | | | | | | | | | | | | | | | | |
| Total bright and dark dot | | N≤4 | | | | | | | | | | | | | | | | | | | | | | | |

| 4.0 | Line defect (LCD /Polarizer backlight black/white line, scratch, stain)  W: width, L : length N : Count | <table border="1"> <thead> <tr> <th rowspan="2">Width(mm)</th> <th rowspan="2">Length(mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.05$</td> <td>Ignore</td> <td colspan="2">Ignore</td> <td rowspan="3">Ignore</td> </tr> <tr> <td>$0.05 < W \leq 0.06$</td> <td>$L \leq 4.0$</td> <td colspan="2">N\leq3</td> </tr> <tr> <td>$0.06 < W \leq 0.08$</td> <td>$L \leq 3.0$</td> <td colspan="2">N\leq2</td> </tr> <tr> <td>$W > 0.08$</td> <td colspan="4">Define as spot defect</td> </tr> </tbody> </table> | Width(mm) | Length(mm) | Acceptable Qty | | | A | B | C | $\Phi \leq 0.05$ | Ignore | Ignore | | Ignore | $0.05 < W \leq 0.06$ | $L \leq 4.0$ | N \leq 3 | | $0.06 < W \leq 0.08$ | $L \leq 3.0$ | N \leq 2 | | $W > 0.08$ | Define as spot defect | | | |
|----------------------|---|---|--------------|------------|----------------|----------------|--|---|---|---|------------------|--------|--------|--|--------|----------------------|--------------|------------|--|----------------------|--------------|------------|--|------------|-----------------------|--|--|--|
| | | Width(mm) | | | Length(mm) | Acceptable Qty | | | | | | | | | | | | | | | | | | | | | | |
| | | | A | B | | C | | | | | | | | | | | | | | | | | | | | | | |
| | | $\Phi \leq 0.05$ | Ignore | Ignore | | Ignore | | | | | | | | | | | | | | | | | | | | | | |
| | | $0.05 < W \leq 0.06$ | $L \leq 4.0$ | N \leq 3 | | | | | | | | | | | | | | | | | | | | | | | | |
| $0.06 < W \leq 0.08$ | $L \leq 3.0$ | N \leq 2 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $W > 0.08$ | Define as spot defect | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5.0 | Electronic Components SMT. | Not allow missing parts, solderless connection, cold solder joint, mismatch, The positive and negative polarity opposite | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.0 | Display color & Brightness. | 1. Color: Measuring the color coordinates, The measurement standard according to the datasheet or samples. 2. Brightness: Measuring the brightness of White screen, The measurement standard according to the datasheet or Samples. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7.0 | LCD Mura/Waving/ Hot spot | Not visible through 5% ND filter in 50% gray or judge by limit sample if necessary. | | | | | | | | | | | | | | | | | | | | | | | | | | |

Criteria (functional items)

| Number | Items | Criteria (mm) |
|--------|-----------------------|---------------|
| 1 | No display | Not allowed |
| 2 | Missing segment | Not allowed |
| 3 | Short | Not allowed |
| 4 | Backlight no lighting | Not allowed |

8. Reliability Test Result

Remark:

| Item | Condition | Inspection after test |
|-------------------------------|--|--|
| High Temperature Operating | 85°C,96H | Inspection after 2~4hours storage at room temperature, the sample shall be free from defects: 1.Air bubble in the LCD; 2.Non-display; 3.Missing segments/line; 4.Glass crack; 5.Current IDD is twice higher than initial value. |
| Low Temperature Operating | -30°C, 96HR | |
| High Temperature Storage | 85°C, 96HR | |
| Low Temperature Storage | -40°C, 96HR | |
| High Temperature & High | +60°C, 90% RH ,96 hours. | |
| Thermal Shock (Non-operation) | -30°C,30 min ↔ +85°C,30 min, Change time:5min 20CYC. | |
| ESD test | C=150pF, R=330,5points/panel Air:±6KV, 5times; Contact:±4KV, 5 times; (Environment: 15°C~35°C. 30%~60%). | |
| Vibration (Non-operation) | Frequency range:10~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z. (6 hours for total) (Package condition). | |
| Box Drop Test | 1 Corner 3 Edges 6 faces,80cm(MEDIUM BOX) | |

- 1.The test samples should be applied to only one test item.
- 2.Sample size for each test item is 5~10pcs.
- 3.For Damp Proof Test, Pure water(Resistance > 10MΩ) should be used.
- 4.In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.
- 5.Failure Judgment Criterion: Basic Specification, Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

9. Cautions and Handling Precautions

9.1 Handling and Operating the Module

(1) When the module is assembled, it should be attached to the system firmly.

Do not warp or twist the module during assembly work.

(2) Protect the module from physical shock or any force. In addition to damage, this may cause improper operation or damage to the module and back-light unit.

(3) Note that polarizer is very fragile and could be easily damaged. Do not press or scratch the surface.

(4) Do not allow drops of water or chemicals to remain on the display surface.

If you have the droplets for a long time, staining and discoloration may occur.

(5) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.

(6) The desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane.

Do not use ketene type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.

(7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs, or clothes, it must be washed away thoroughly with soap.

(8) Protect the module from static; it may cause damage to the CMOS ICs.

(9) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.

(10) Do not disassemble the module.

(11) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.

(12) Pins of I/F connector shall not be touched directly with bare hands.

(13) Do not connect, disconnect the module in the "Power ON" condition.

(14) Power supply should always be turned on/off by the item 6.1 Power On Sequence & 6.2 Power Off Sequence

9.2 Storage and Transportation.

(1) Do not leave the panel in high temperature, and high humidity for a long time.

It is highly recommended to store the module with temperature from 0 to 35 °C and relative humidity of less than 70%

(2) Do not store the TFT-LCD module in direct sunlight.

(3) The module shall be stored in a dark place. When storing the modules for a long time, be sure to adopt effective measures for protecting the modules from strong ultraviolet radiation, sunlight, or fluorescent light.

(4) It is recommended that the modules should be stored under a condition where no condensation is allowed. Formation of dewdrops may cause an abnormal operation or a failure of the module.

In particular, the greatest possible care should be taken to prevent any module from being operated where condensation has occurred inside.

(5) This panel has its circuitry FPC on the bottom side and should be handled carefully in order not to be stressed.