



A Brighter Solution

AMP DISPLAY INC.

SPECIFICATIONS

7.0-in Color TFT Module

| | |
|----------------------|-----------------------------------|
| CUSTOMER: | |
| CUSTOMER PART NO. | |
| AMP DISPLAY PART NO. | A M 4 8 0 2 3 4 G 1 T M Q W - 0 0 |
| APPROVED BY: | |
| DATE: | |

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APPROVED FOR SPECIFICATIONS

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APPROVED FOR SPECIFICATION AND PROTOTYPES

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RECORD OF REVISION

| Revision Date | Page | Contents | Editor |
|---------------|------|--|--------|
| 2007/6/15 | - | New Release | Donlin |
| 2007/07/02 | 3 | Addition the Absolute max. ratings of Operation and Storage Temperature. | Emil |
| 2007/08/14 | 3 | Modified the LCM thickness to 5.0mm. | Emil |
| 2007/11/20 | 22 | Add the AMIPRE will provide one year warrantee for all products and three months warrantee for all repairing products. | JACK |
| 2008/01/22 | 11 | Add Uniformity (with LCM) | JACK |
| | 22 | AMPIRE will provide fourteen months warrantee | |

1 Features

Ampire 7 inch Amorphous-TFT-LCD (Thin Film Transistor Liquid Crystal Display) module for video equipments. This module is composed of a 7" TFT-LCD panel, a driver circuit and backlight unit.

- (1) Construction: 7" a-Si color TFT-LCD, White LED Backlight and PCB.
- (2) Resolution (pixel): 480(R.G.B) X234

2 Physical specifications

| Item | Specifications | Unit | |
|-------------------------|--------------------------|------|--|
| Display resolution(dot) | 1440 (W) x 234(H) | dot | |
| Active area | 154.08 (W) x 86.58 (H) | mm | |
| Screen size | 7.0(Diagonal) | mm | |
| Dot pitch | 0.107 (W) x 0.370 (H) | mm | |
| Color configuration | R.G.B stripe | | |
| Overall dimension | 164.9(W)x100.0(H)x5.0(D) | mm | |
| Weight | 153.45 ± 2.0 | g | |
| Backlight unit | LED | | |

3 Electrical specification

3.1 Absolute max. ratings

| Item | Symbol | Condition | Min. | Max. | Unit | Remark |
|-----------------------|----------------------------------|---------------------|------|-----------------------|------|--------|
| Power voltage | V _{CC} | GND=0 | -0.3 | 7 | V | |
| | AV _{DD} | AV _{SS} =0 | -0.3 | 7 | V | |
| | V _{GH} | GND=0 | -0.3 | 18 | V | |
| | V _{GL} | | -15 | 0.3 | V | |
| | V _{GH} —V _{GL} | | - | 33 | V | |
| Input signal voltage | V _i | | -0.3 | AV _{DD} +0.3 | V | Note 1 |
| | V ₁ | | -0.3 | V _{CC} +0.3 | V | Note 2 |
| | V _{COM} | | -2.9 | 5.2 | V | |
| Operation Temperature | Top | - | 0 | 60 | ℃ | |
| Storage Temperature | Tstg | | -20 | 70 | ℃ | |

Note1:VR,VG,VB

Note2:STHL,STHR,OEHL,L/R,CPH1~CPH3,STVL,OEVL,CKV,U/D.

3.2 Electrical characteristics

a. Typical operating conditions (GND=AVss=0V, Note 4)

| Item | | Symbol | Min. | Typ. | Max. | Unit | Remark |
|---|---------|------------------|---------------------|---------------------|-----------------------|------|-------------------------|
| Power supply | | V _{CC} | 3 | 5 | 5.2 | V | |
| | | AV _{DD} | 4.8 | 5 | 5.2 | V | |
| | | V _{GH} | 14.3 | 15 | 15.7 | V | |
| | | V _{GL} | -10.5 | -10 | -9.5 | V | |
| Video signal Amplitude (VR,VG,VB) | | V _{iA} | 0.4 | - | AV _{DD} -0.4 | V | Note 1 |
| | | V _{iAC} | - | 3 | - | V | AC component |
| | | V _{iDC} | - | AV _{DD} /2 | - | V | DC component |
| VCOM | | V _{CAC} | 3.5 | 5.6 | 6.5 | Vp-p | AC component, Note 2 |
| | | V _{CDC} | 1.4 | 1.7 | 2.0 | V | DC component |
| Input Signal voltage | H Level | V _{IH} | 0.8 V _{CC} | - | V _{CC} | V | Note 3 |
| | L Level | V _{IL} | 0 | - | 0.2 V _{CC} | V | |

Note1:Refer to Fig.2

Note2:The brightness of LCD panel could be changed by adjusting the AC component of VCOM.

Note3:STHL,STHR,OEHL,L/R,CPH1~CPH3,STVR,STVL,OEVL,CKV,U/D

Note4:Be sure to apply GND,V_{CC} and V_{GL} to the LCD first ,and then apply V_{GH}.

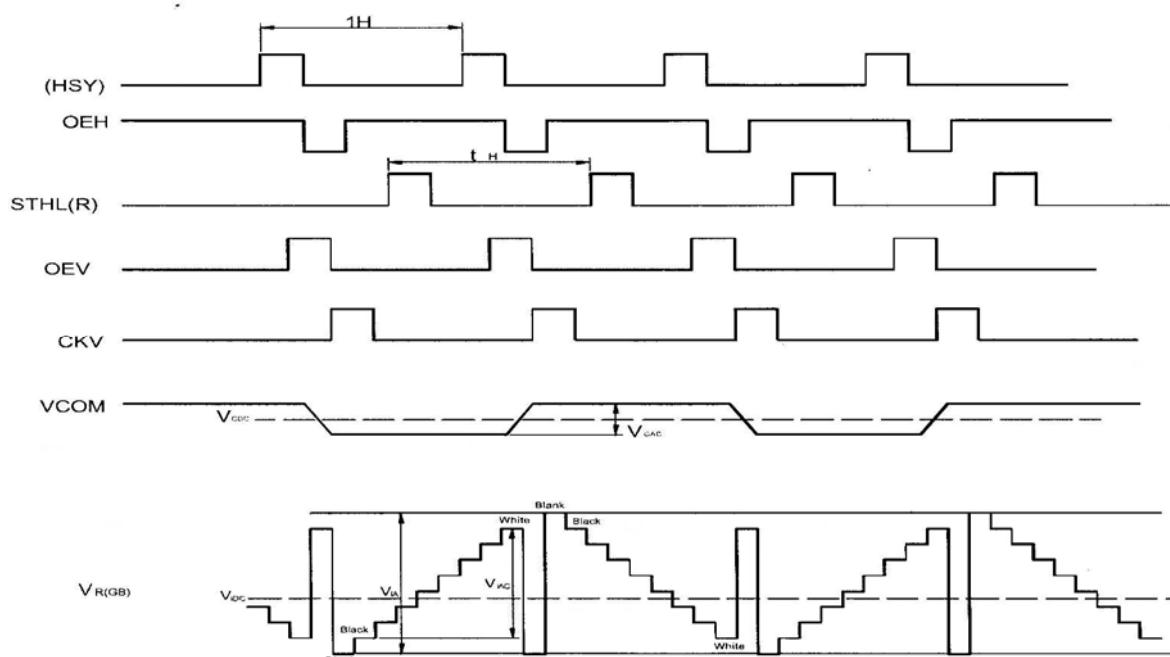


Fig.2 Horizontal timing

b. Current consumption (GND=AVss=0V)

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit | Remark |
|--------------------|-----------------|-----------------------|------|------|------|------|--------|
| Current for driver | I _{GH} | V _{GH} =15V | - | 0.20 | 0.5 | mA | |
| | I _{GL} | V _{GL} =-10V | - | 0.80 | 1.5 | mA | |
| | I _{CC} | V _{CC} =5V | - | 3.0 | 6.0 | mA | |
| | I _{DD} | AV _{DD} =5V | - | 17.0 | 30 | mA | |

c. Backlight driving conditions

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Remark |
|---------------------|----------------|------|------|------|------|--------|
| LED Forward Voltage | V _r | | 9.6 | | V | |
| LED Forward current | | | 140 | | mA | |

Note 1: Ta=25°C

3.3 AC Timing

a. Timing condition

| Parameter | Symbol | Min. | Typ. | Max. | Unit. | Remark |
|---------------------------------|-------------------------------------|------|-------------|-------------|-------------|-----------|
| Rising time | t_r | - | - | 10 | ns | Note 1 |
| Falling time | t_f | - | - | 10 | ns | Note 1 |
| High tans low level pulse width | t_{CPH} | 99 | 103 | 107 | ns | CPH1~CPH3 |
| CPH pulse duty | t_{CWH} | 40 | 50 | 60 | % | CPH1~CPH3 |
| CPH pulse delay | t_{C12} t_{C23} t_{C31} | 30 | $t_{CPH}/3$ | $t_{CPH}/2$ | ns | CPH1~CPH3 |
| STH setup time | t_{SUH} | 20 | - | - | ns | STHR,STHL |
| STH hold time | t_{HDH} | 20 | - | - | ns | STHR,STHL |
| STH pulse width | t_{STH} | - | 1 | - | t_{CPH} | STHR,STHL |
| STH period | t_H | 61.5 | 63.5 | 65.5 | μs | STHR,STHL |
| OEH pulse width | t_{OEH} | - | 1.22 | - | μs | OEH |
| Sample and hold disable time | t_{DIS1} | - | 8.28 | - | μs | |
| OEV pulse width | t_{OEV} | - | 5.40 | - | μs | OEV |
| CKV pulse width | t_{CKV} | - | 4.18 | - | μs | CKV |
| Clean enable time | t_{DIS2} | - | 3.74 | - | μs | |
| Horizontal display start | t_{SH} | - | 0 | - | $T_{CPH}/3$ | |
| Horizontal display timing range | t_{DH} | - | 1440 | - | $T_{CPH}/3$ | |
| STV setup time | t_{SUV} | 400 | - | - | ns | STVL,STVR |
| STV hold time | t_{HDV} | 400 | - | - | ns | STVL,STVR |
| STV pulse width | t_{STV} | - | - | 1 | t_H | STVL,STVR |
| Horizontal lines per field | t_V | 256 | 262 | 268 | t_H | Note 2 |
| Vertical display start | t_{SV} | | 3 | - | t_H | |
| Vertical display timing range | t_{DV} | | 234 | - | t_H | |
| VCOM rising time | t_{rCOM} | | - | 5 | μs | |
| VCOM falling time | t_{fCOM} | | - | 5 | μs | |
| VCOM delay time | t_{DCOM} | | - | 3 | μs | |
| RGB delay time. | t_{DCOM} | | - | 1 | μs | |

Note 1:For all of the logic signals.

Note 2:Please don't use odd horizontal lines to drive LCD panel for both odd and even field simultaneously.

b. Timing diagram

Please refer to the attached drawing, from Fig.3 to Fig.7

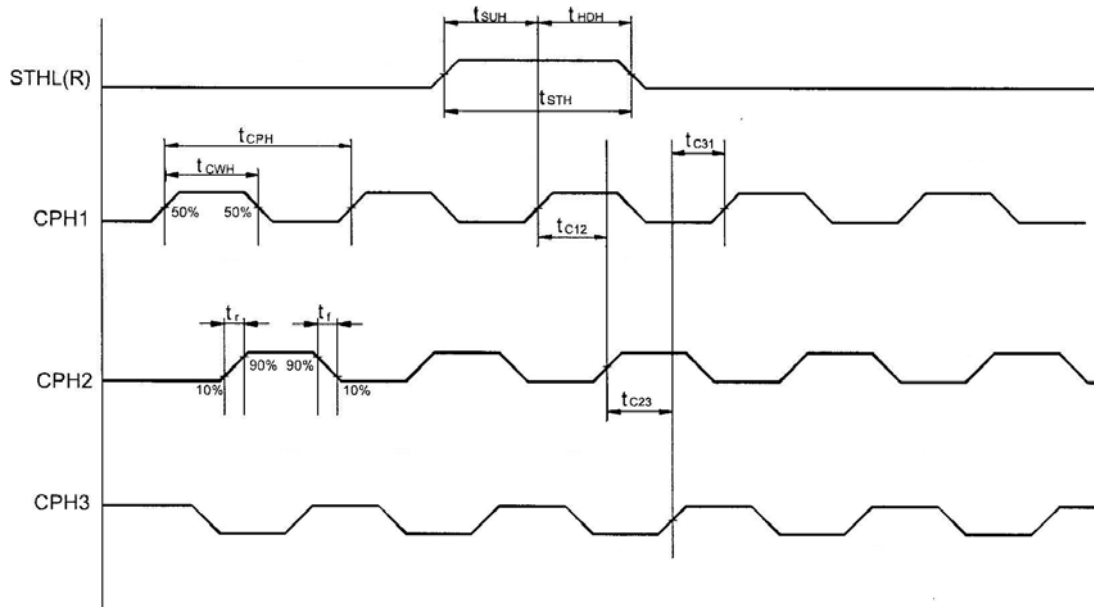


Fig.3 sampling clock timing

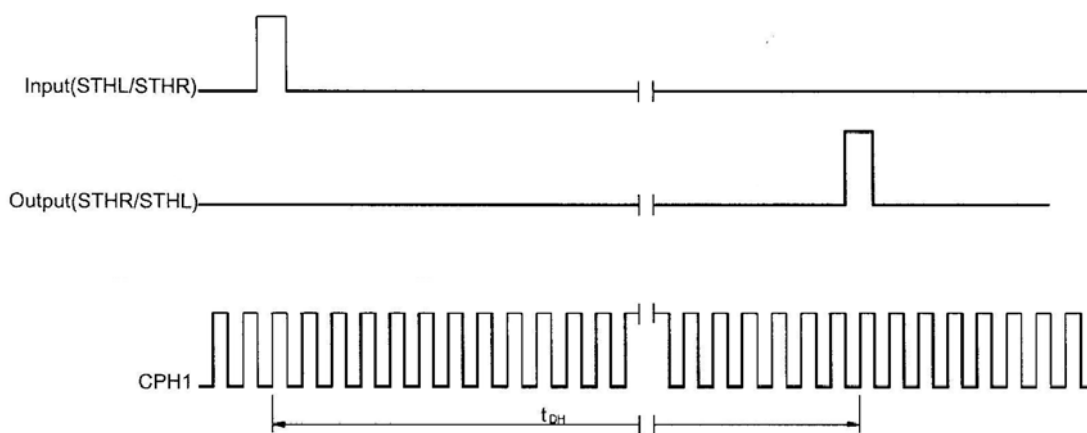


Fig.4 Horizontal display timing rage

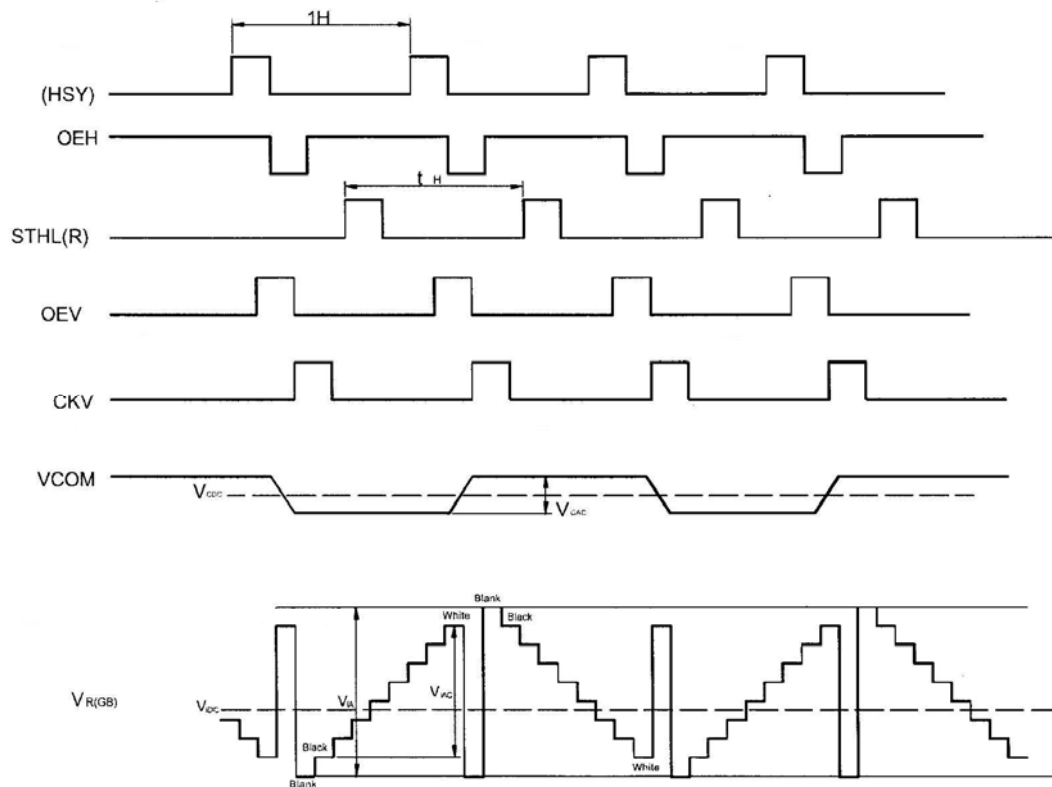


Fig.5 Horizontal timing

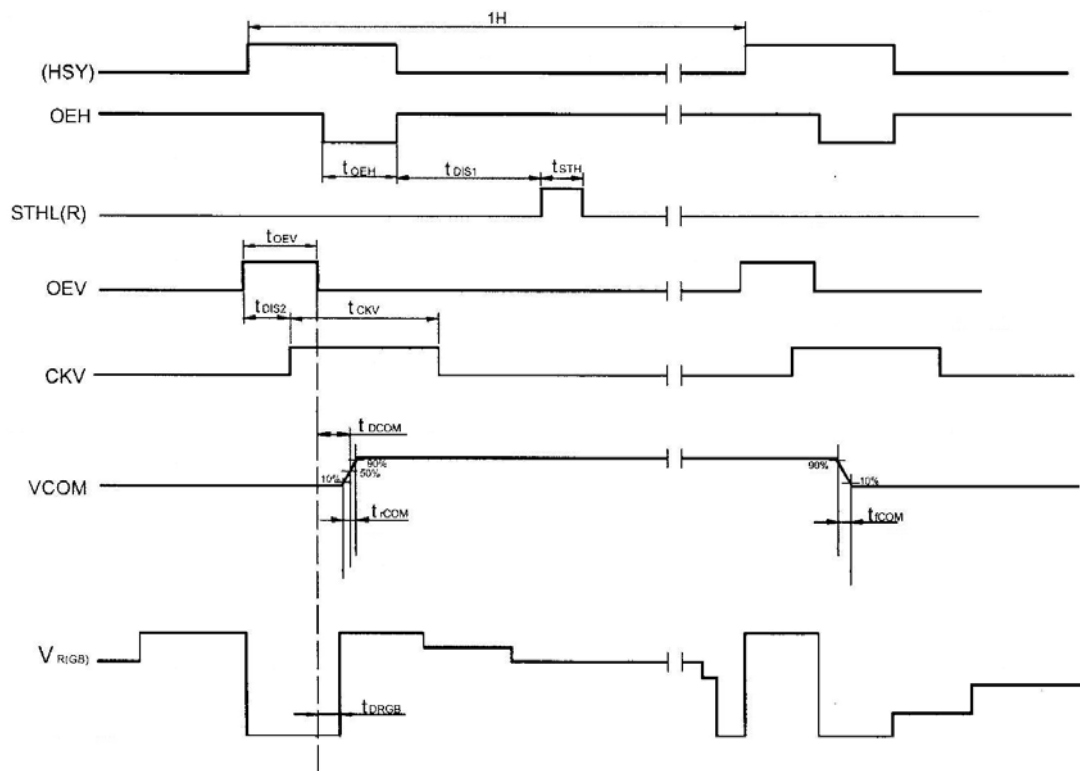


Fig.6 Detail horizontal timing

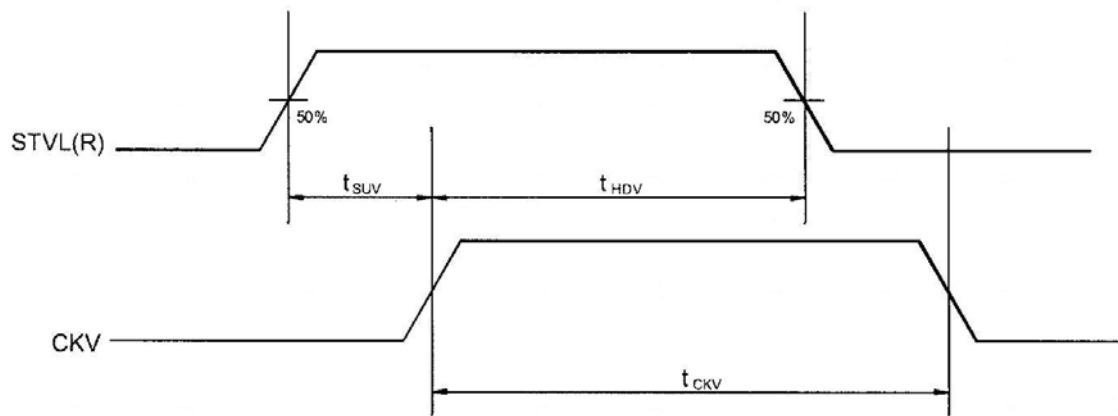


Fig.7 Vertical shift clock timing

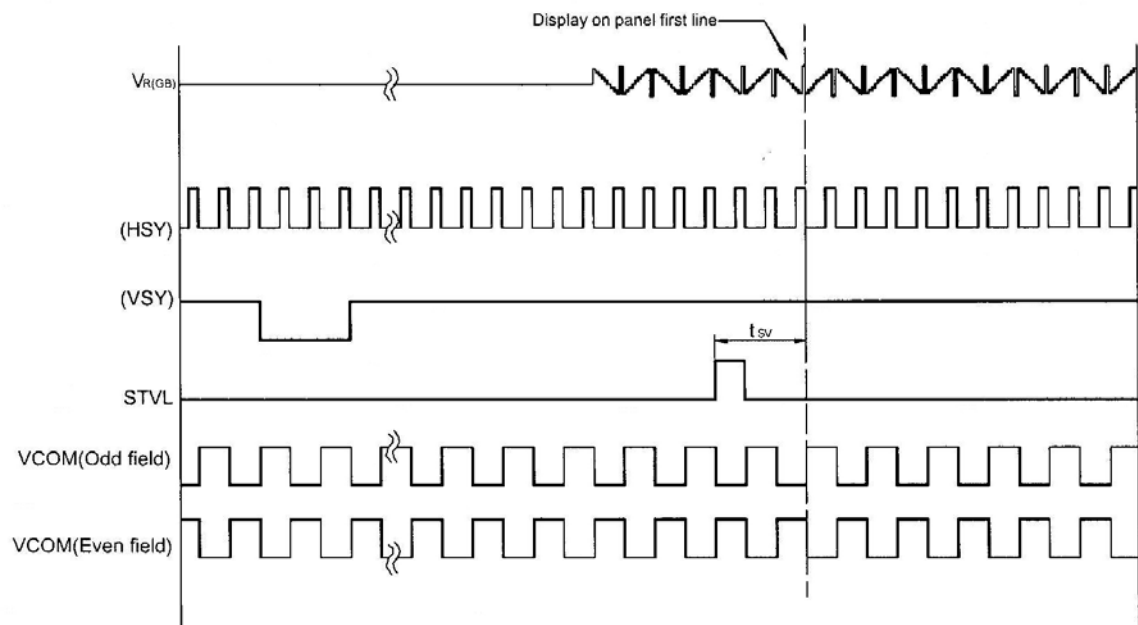


Fig.8 Vertical timing(From up to down)

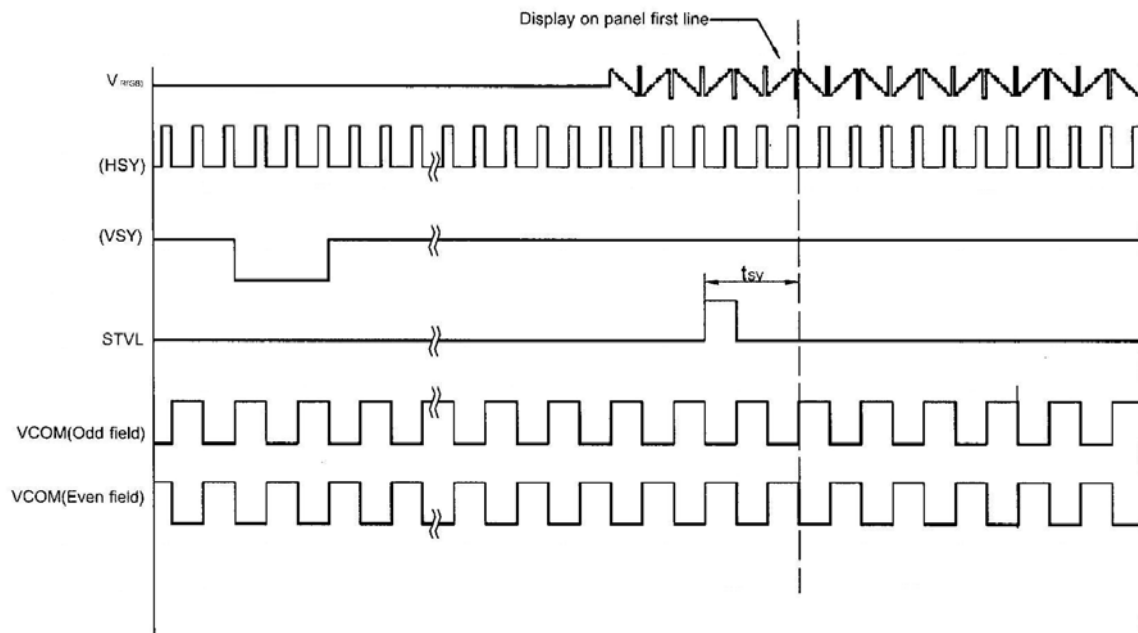
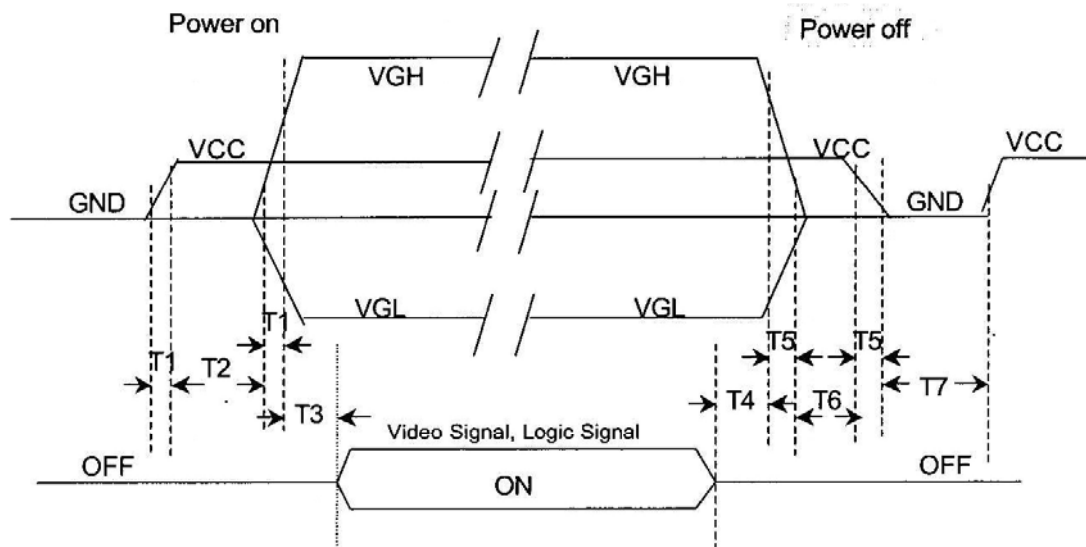


Fig.9 Horizontal timing(From down to up)

3.4 Power Sequence

Sequence for power on/off and signal on/off



- T1 \leq 15ms (From 10%*VCC to 90%*VCC , when VCC is Low to High) ;
- T2 \leq 10ms (From 90%*VCC to 10%*VGH , when VCC is Low to High) ;
- T3 \leq 10ms (From 90%*VGH to Video signal , when VGH is Low to High) ;
- T4 \leq 10ms (From Video signal to 90%*VGH , when VGH is High to Low) ;
- T5 \leq 20ms (From 90%*VCC to 10%*VCC , when VCC is High to Low) ;
- T6 \leq 10ms (From 10%*VGH to 90%*VCC , when VCC is Low to High) ;
- T7 \leq 0.4s (From 10%*VCC is H→L to 10%*VCC is L→H) .

4 Optical specification (Note1,Note2)

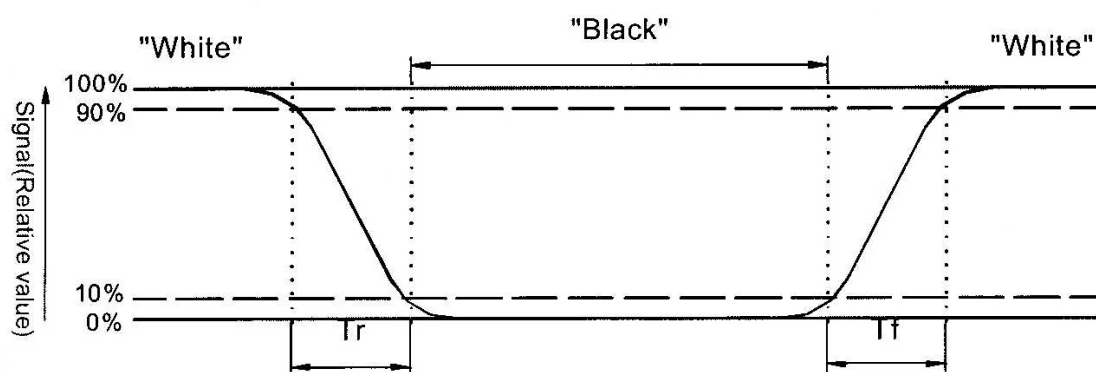
| Item | | Symbol | Condition | Min. | Typ. | Max. | Unit | Remark |
|-----------------------------------|--------|--------------|----------------------------|------|------|------|-------------------|----------|
| Response time | Rise | T_r | $\Theta=0^\circ$ | - | 15 | | ms | Note 3,5 |
| | Fall | T_f | | - | 35 | | ms | |
| Contrast ratio | | CR | At optimized viewing angle | 150 | 250 | - | | Note 4,5 |
| Viewing angle | Top | $CR \geq 10$ | | | 35 | - | deg. | Note 5,6 |
| | Bottom | | | | 55 | - | | |
| | Left | | | | 70 | - | | |
| | Right | | | | 70 | - | | |
| Brightness (9 point average) | | Y_L | $I_L=6mA, 25^\circ C$ | 200 | 250 | | cd/m ² | Note 7 |
| Uniformity (with LCM) | | - | $I_L=6mA$ | 80% | - | - | | Note 8 |
| White chromaticity | | X | $\Theta=0^\circ$ | | 0.31 | | | Note 7 |
| | | Y | $\Theta=0^\circ$ | | 0.32 | | | |

Note 1: Ambient temperature=25°C, and lamp current $I_L=140mA$ rms. to be measured in the dark room.

Note 2: To be measured on the center area of panel with a viewing cone of 1° by Topcon luminance meter BM-7, after 5 minutes operation.

Note 3. Definition of response time:

The output signals of photo detector are measured when the input signals are changed from “black” to “white”(falling time) and from “white” to “black” (rising time) respectively. The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figure as below.



Note 4. Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

$$\text{Contrast ratio(CR)} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector Output when LCD is at "Black" state}}$$

Note 5: White $V_i = V_{i50} + 1.5V$

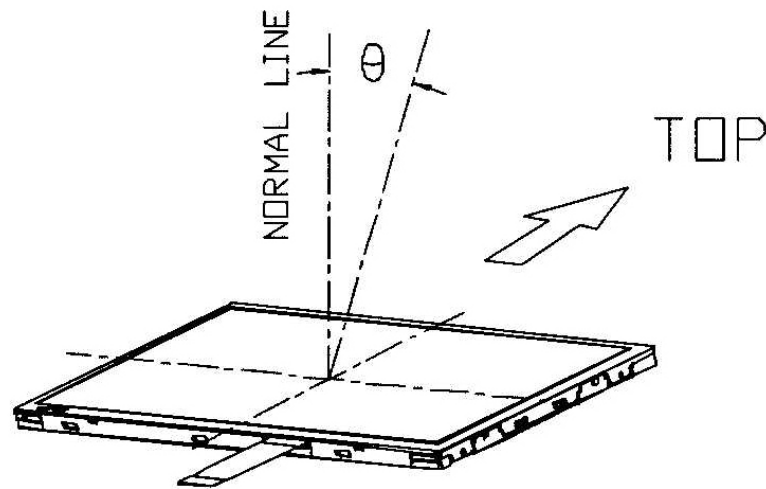
Black $V_i = V_{i50} + 2.0V$

“ \pm ” means that the analog input signal swings in phase with V_{COM} signal.

“ $\frac{-}{+}$ ” means that the analog input signal swings out of phase with V_{COM} signal.

V_{i50} : The analog input voltage when transmission is 50%. The 100% Transmission is defined as the transmission of LCD panel when all the Input terminals of module are electrically opened.

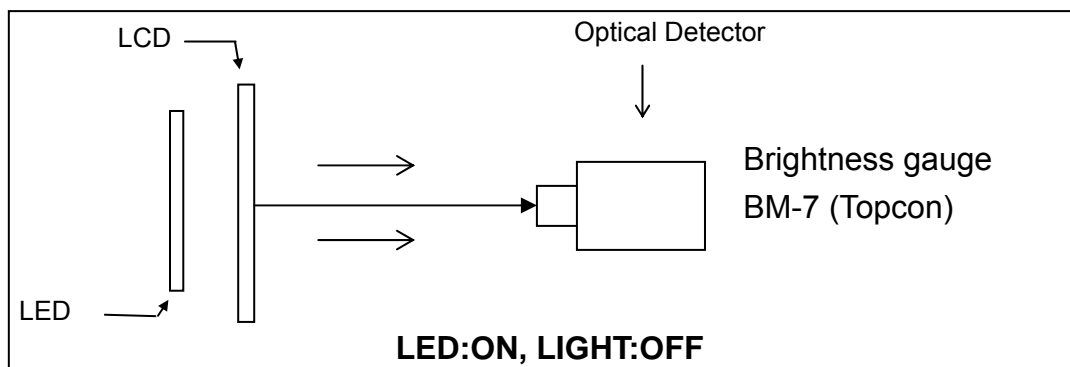
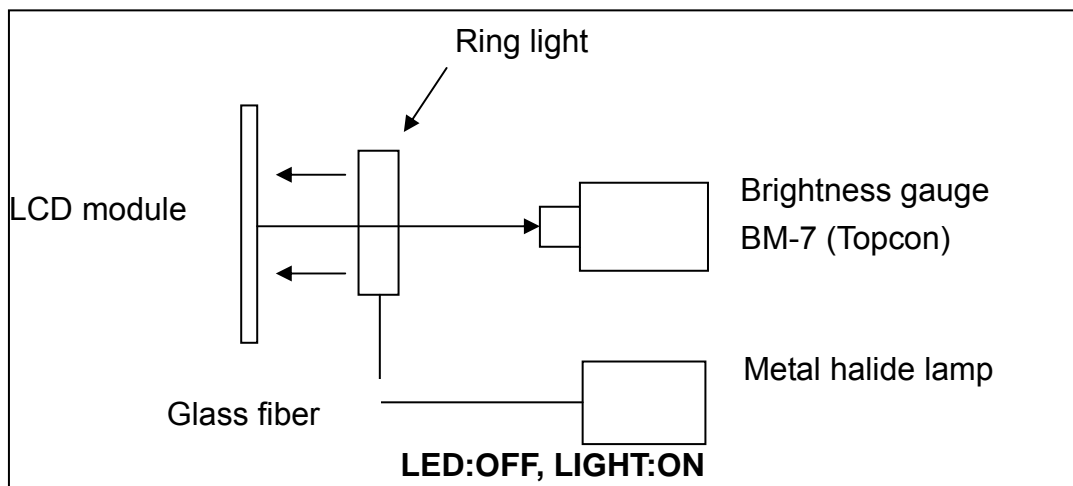
Note 6. Definition of viewing angle, Refer to figure as below.



Note 7. Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

Note 8.

$$\text{LCM Uniformity} = \frac{\text{MIN Brightness "white"}}{\text{MAX Brightness "white"}} \geq 80\%$$



5 Interface specifications

a.TFT –LCD panel driving section

| Pin no | Symbol | I/O | Description | Remark |
|--------|------------------|-----|---|----------|
| 1 | GND | - | Ground for logic circuit | |
| 2 | V _{CC} | I | Supply voltage of logic control circuit for scan drive | |
| 3 | V _{GL} | I | Negative power for scan driver | |
| 4 | V _{GH} | I | Positive power for scan driver | |
| 5 | STVR | I/O | Vertical start pulse | Note 1 |
| 6 | STVL | I/O | Vertical start pulse | Note 1 |
| 7 | CKV | I | Shift clock input for scan driver | |
| 8 | U/D | I | UP/DOWN scan control input | Note 1,2 |
| 9 | OE _V | I | Output enable input for scan driver | |
| 10 | V _{COM} | I | Common electrode driving signal | |
| 11 | V _{COM} | I | Common electrode driving signal | |
| 12 | L/R | I | LEFT/RIGHT scan control input | Note 1,2 |
| 13 | MOD | I | Sequential sampling and simultaneous sampling setting | Note 3 |
| 14 | OE _H | I | Output enable input for data driver | |
| 15 | STH _L | I/O | Start pulse for horizontal scan line | Note 1 |
| 16 | STH _R | I/O | Start pulse for horizontal scan line | Note 1 |
| 17 | CPH ₃ | I | Sampling and shifting clock pulse for data driver | |
| 18 | CPH ₂ | I | Sampling and shifting clock pulse for data driver | |
| 19 | CPH ₁ | I | Sampling and shifting clock pulse for data driver | |
| 20 | V _{CC} | I | Supply voltage of logic control circuit for data driver | |
| 21 | GND | - | Ground for logic circuit | |
| 22 | VR | I | Alternated video signal input(Red) | |
| 23 | VG | I | Alternated video signal input(Green) | |
| 24 | VB | I | Alternated video signal input(Blue) | |
| 25 | AV _{DD} | I | Supply voltage for analog circuit | |
| 26 | AV _{SS} | - | Ground for analog circuit | |

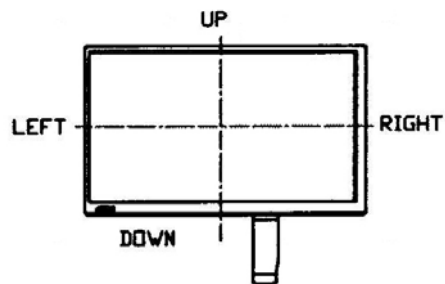
Note 1: Selection of scanning mode(please refer to the following table)

| Setting of scan Control input | | IN/OUT state for start pulse | | | | Scanning direction |
|-------------------------------|-----------------|------------------------------|------|------|------|---|
| U/D | L/R | STVR | STVL | STHR | STHL | |
| GND | V _{CC} | OUT | IN | OUT | IN | From up to down, and from left to right |
| V _{CC} | GND | IN | OUT | IN | OUT | From down to up, and from right to left |
| GND | GND | OUT | IN | IN | OUT | From up to down, and from right to left |
| V _{CC} | V _{CC} | IN | OUT | OUT | IN | From down to up, and from left to right |

IN: Input; OUT: output

Note 2: Definition of scanning direction.

Refer to figure as below:



Note 3: MOD = H: Simultaneous sampling.

MOD = L: Sequential sampling.

Please set CPH2 and CPH3 to GND when MOD =H

b. Backlight driving section

| No. | Symbol | I/O | Description | Remark |
|-----|--------|-----|---|--------|
| 1 | HI | I | Power supply for backlight unit(High voltage) | - |
| 2 | GND | - | Ground for backlight unit | - |

6 QUALITY AND RELIABILITY

6.1 TEST CONDITIONS

Tests should be conducted under the following conditions :

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

Humidity : $60 \pm 25\% \text{ RH}$.

6.2 SAMPLING PLAN

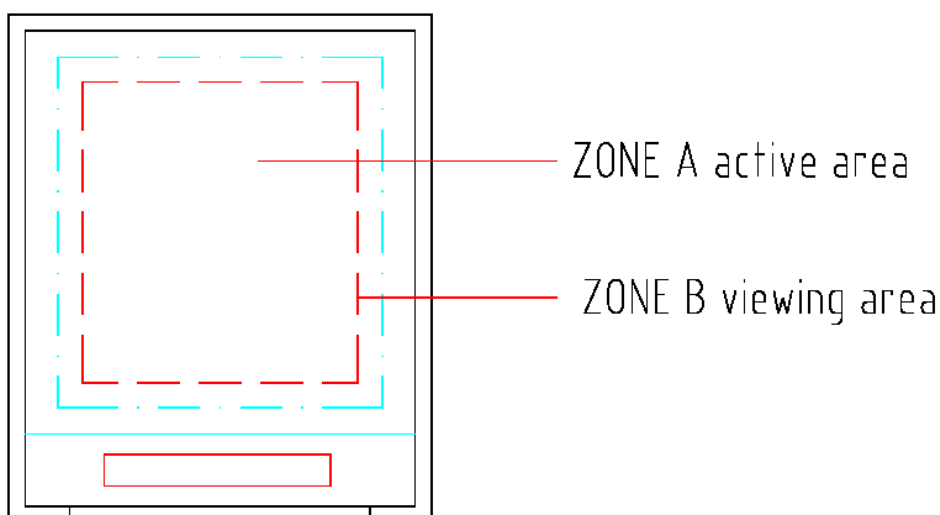
Sampling method shall be in accordance with MIL-STD-105E , level II, normal single sampling plan .

6.3 ACCEPTABLE QUALITY LEVEL

A major defect is defined as one that could cause failure to or materially reduce the usability of the unit for its intended purpose. A minor defect is one that does not materially reduce the usability of the unit for its intended purpose or is an infringement from established standards and has no significant bearing on its effective use or operation.

6.4 APPEARANCE

An appearance test should be conducted by human sight at approximately 30 cm distance from the LCD module under florescent light. The inspection area of LCD panel shall be within the range of following limits.



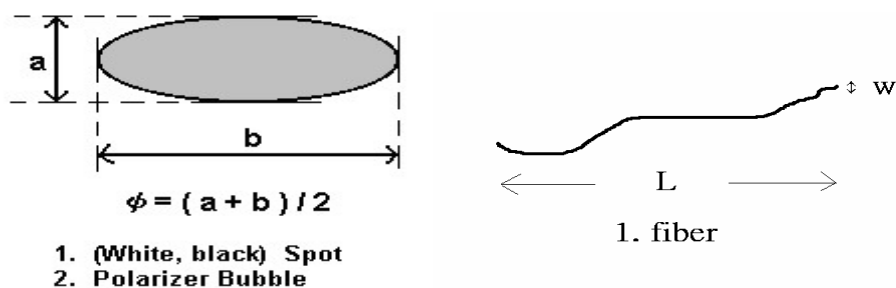
6.5 INSPECTION QUALITY CRITERIA

| DEFECT TYPE | | | LIMIT | | | | Note | | |
|-------------------|-------------------------------|------------------|--|--------------------|--------------------|--------------------|--------------------|--------------------|-------|
| VISUAL DEFECT | INTERNAL | SPOT | $\varphi < 0.15\text{mm}$ | | Ignore | | Note1 | | |
| | | | $0.15\text{mm} \leq \varphi \leq 0.5\text{mm}$ | | $N \leq 4$ | | | | |
| | | | $0.5\text{mm} < \varphi$ | | $N = 0$ | | | | |
| | | FIBER | $W \leq 0.1\text{mm}, L \leq 5\text{mm}$ | | $N \leq 3$ | | Note1 | | |
| | | | $1.0\text{mm} < W, 1.5\text{mm} < L$ | | $N = 0$ | | | | |
| | | POLARIZER BUBBLE | $\varphi < 0.25\text{mm}$ | | Ignore | | Note1 | | |
| | | | $0.25\text{mm} \leq \varphi \leq 0.5\text{mm}$ | | $N \leq 2$ | | | | |
| | | | $0.5\text{mm} < \varphi$ | | $N = 0$ | | | | |
| | | Mura | It' OK if mura is slight visible through 6%ND filter | | | | | | |
| ELECTRICAL DEFECT | BRIGHT DOT | | A Grade | | | B Grade | | | |
| | | | C Area | O Area | Total | C Area | O Area | Total | Note3 |
| | | | $N \leq 0$ | $N \leq 2$ | $N \leq 2$ | $N \leq 2$ | $N \leq 3$ | $N \leq 5$ | Note2 |
| | DARK DOT | | $N \leq 2$ | $N \leq 3$ | $N \leq 3$ | $N \leq 3$ | $N \leq 5$ | $N \leq 8$ | |
| | TOTAL DOT | | $N \leq 2$ | $N \leq 4$ | $N \leq 4$ | $N \leq 5$ | $N \leq 6$ | $N \leq 8$ | Note2 |
| | TWO ADJACENT DOT | | $N \leq 0$ | $N \leq 1$ pair | $N \leq 1$ pair | $N \leq 1$ pair | $N \leq 1$ pair | $N \leq 1$ pair | Note4 |
| | THREE OR MORE ADJACENT DOT | | NOT ALLOWED | | | | | | |
| | LINE DEFECT | | NOT ALLOWED | | | | | | |

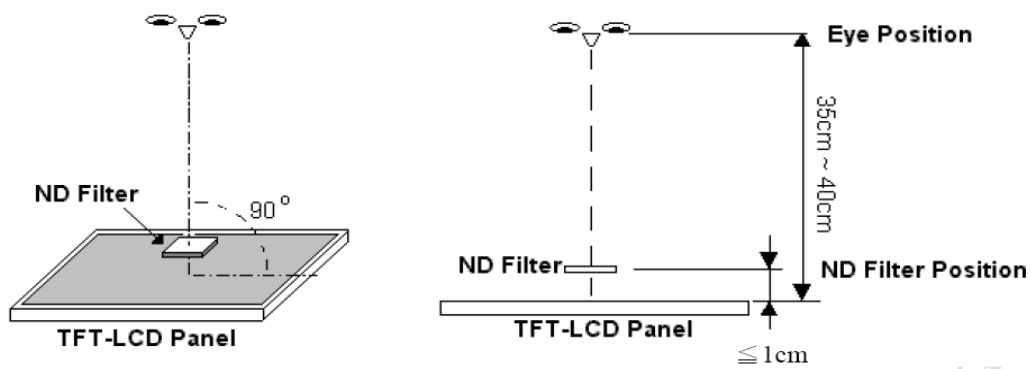
(1) One pixel consists of 3 sub-pixels, including R,G, and B dot.(Sub-pixel = Dot)

(2) **LITTLE BRIGHT DOT $N \leq 10$ at 5% ND-Filter**

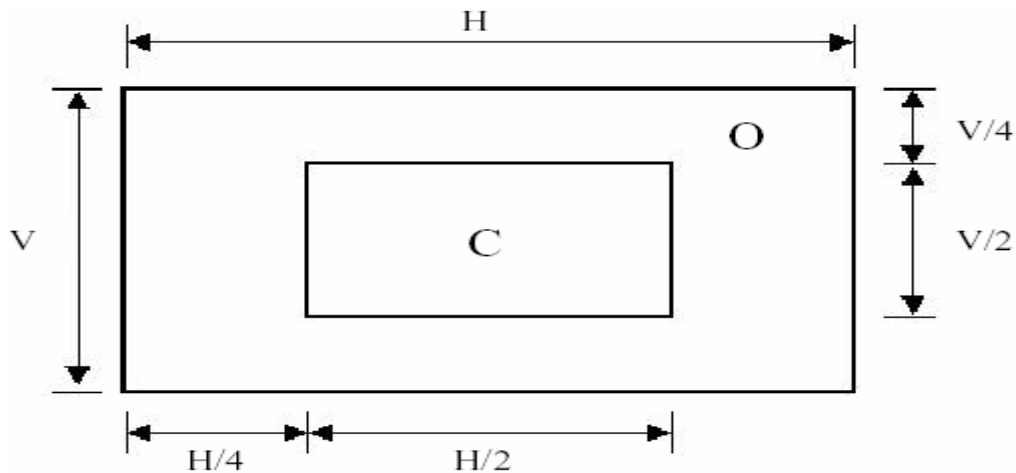
[Note1] W : Width[mm], L : Length[mm], N : Number, φ : Average Diameter



[Note2] Bright dot is defined through 5% transmission ND Filter as following.



[Note3]

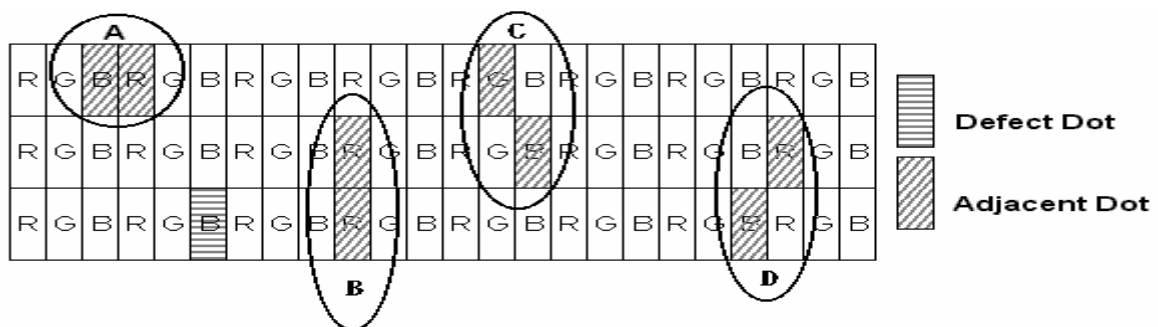


C Area: Center of display area

C Area: Outer of display area

[Note4]

Judge defect dot and adjacent dot as following. Allow below (as A, B, C and D status) adjacent defect dots, including bright and dark adjacent dot. And they will be counted 2 defect dots in total quantity.



- (1) The defects that are not defined above and considered to be problem shall be reviewed and discussed by both parties.
- (2) Defects on the Black Matrix, out of Display area, are not considered as a defect or counted.
- (3) Each defect dots shall depart over 5 mm.

7 Reliability test items (Note2):

| No. | Test items | Conditions | Remark |
|-----|------------------------------------|---|-----------------------------------|
| 1 | High temperature storage | Ta=70℃ 240Hrs | |
| 2 | Low temperature storage | Ta=-20℃ 240Hrs | |
| 3 | High temperature operation | Ta=60℃ 240Hrs | |
| 4 | Low temperature operation | Ta=0℃ 240Hrs | |
| 5 | High temperature and high humidity | Ta=70℃,90% RH 240Hrs | Operation |
| 6 | Heat shock | -0℃~60℃/200 cycles 1Hrs/cycle | Non-operation |
| 7 | Electrostatic discharge | ±200V,200Pf(0Ω),once for each terminal | Non-operation |
| 8 | Vibration | Frequency range :8~33.3Hz Stroke :1.3mm Sweep :2.9G,33.3~400Hz Cycle :15 minutes 2 hours for each direction of X,Z 4 hours for Y direction | JIS C7021, A-10 Condition A |
| 9 | Mechanical shock | 100G, 6ms,±X, ±Y,±Z 3 times for each direction | JIS C7021, A-7 Condition C |
| 10 | Vibration (With carton) | Random vibration: 0.015G ² /Hz from 5~200Hz -6dB/octave from 200~500Hz | IEC 68~34 |
| 11 | Drop (with carton) | Height:60cm 1 corner,3 edges,6 surfaces | JIS Z0202 |

Note 1:Ta:Ambient temperature.

Note 2:In the standard conditions, there is not display function NG issue occurred.

All the cosmetic specification is judged before the reliability stress.

8 USE PRECAUTIONS

8.1 Handling precautions

- 1) The polarizing plate may break easily so be careful when handling it. Do not touch, press or rub it with a hard-material tool like tweezers.
- 2) Do not touch the polarizing plate surface with bare hands so as not to make it dirty. If the surface or other related part of the polarizing plate is dirty, soak a soft cotton cloth or chamois leather in benzine and wipe off with it. Do not use chemical liquids such as acetone, toluene and isopropyl alcohol. Failure to do so may bring chemical reaction phenomena and deteriorations.
- 3) Remove any spit or water immediately. If it is left for hours, the suffered part may deform or decolorize.
- 4) If the LCD element breaks and any LC stuff leaks, do not suck or lick it. Also if LC stuff is stuck on your skin or clothing, wash thoroughly with soap and water immediately.

8.2 Installing precautions

- 1) The PCB has many ICs that may be damaged easily by static electricity. To prevent breaking by static electricity from the human body and clothing, earth the human body properly using the high resistance and discharge static electricity during the operation. In this case, however, the resistance value should be approx. $1\text{M}\Omega$ and the resistance should be placed near the human body rather than the ground surface. When the indoor space is dry, static electricity may occur easily so be careful. We recommend the indoor space should be kept with humidity of 60% or more. When a soldering iron or other similar tool is used for assembly, be sure to earth it.
- 2) When installing the module and ICs, do not bend or twist them. Failure to do so may crack LC element and cause circuit failure.
- 3) To protect LC element, especially polarizing plate, use a transparent protective plate (e.g., acrylic plate, glass etc) for the product case.
- 4) Do not use an adhesive like a both-side adhesive tape to make LCD surface (polarizing plate) and product case stick together. Failure to do so may cause the polarizing plate to peel off.

8.3 Storage precautions

- 1) Avoid a high temperature and humidity area. Keep the temperature between 0°C and 35°C and also the humidity under 60%.
- 2) Choose the dark spaces where the product is not exposed to direct sunlight or fluorescent light.

- 3) Store the products as they are put in the boxes provided from us or in the same conditions as we recommend.

8.4 Operating precautions

- 1) Do not boost the applied drive voltage abnormally. Failure to do so may break ICs. When applying power voltage, check the electrical features beforehand and be careful. Always turn off the power to the LC module controller before removing or inserting the LC module input connector. If the input connector is removed or inserted while the power is turned on, the LC module internal circuit may break.
- 2) The display response may be late if the operating temperature is under the normal standard, and the display may be out of order if it is above the normal standard. But this is not a failure; this will be restored if it is within the normal standard.
- 3) The LCD contrast varies depending on the visual angle, ambient temperature, power voltage etc. Obtain the optimum contrast by adjusting the LC drive voltage.
- 4) When carrying out the test, do not take the module out of the low-temperature space suddenly. Failure to do so will cause the module condensing, leading to malfunctions.
- 5) Make certain that each signal noise level is within the standard (L level: 0.2Vdd or less and H level: 0.8Vdd or more) even if the module has functioned properly. If it is beyond the standard, the module may often malfunction. In addition, always connect the module when making noise level measurements.
- 6) The CMOS ICs are incorporated in the module and the pull-up and pull-down function is not adopted for the input so avoid putting the input signal open while the power is ON.
- 7) The characteristic of the semiconductor element changes when it is exposed to light emissions, therefore ICs on the LCD may malfunction if they receive light emissions. To prevent these malfunctions, design and assemble ICs so that they are shielded from light emissions.
- 8) Crosstalk occurs because of characteristics of the LCD. In general, crosstalk occurs when the regularized display is maintained. Also, crosstalk is affected by the LC drive voltage. Design the contents of the display, considering crosstalk.

8.5 Other

- 1) Do not disassemble or take the LC module into pieces. The LC modules once disassembled or taken into pieces are not the guarantee articles.
- 2) The residual image may exist if the same display pattern is shown for hours. This residual image, however, disappears when another display pattern is shown or the drive is interrupted and left for a while. But this is not a problem on reliability.
- 3) AMPIRE will provide fourteen months warrantee for all products and three months warrantee for all repairing products.

9 OUTLINE DIMENSION

