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Chunghwa Picture Tubes, Ltd.

Product Specification

To : **Samrterglass**

Date : 160629

TFT LCD

CLAA050LA0ACW

ACCEPTED BY : (V0.9)

| APPROVED BY | CHECKED BY | PREPARED BY |
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| 0.1 | 3.5. Power on/off sequence | 8 | 2011/09/15 |
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1. OVERVIEW

CPT CLAA050LA01CW is 5" color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, driver ICs and backlight. The 5" screen produces a high resolution image that is composed of 384,000 (800x480) pixel elements and 16.2M-color images are displayed on the 5" diagonal screen. General specifications are summarized in the following table :

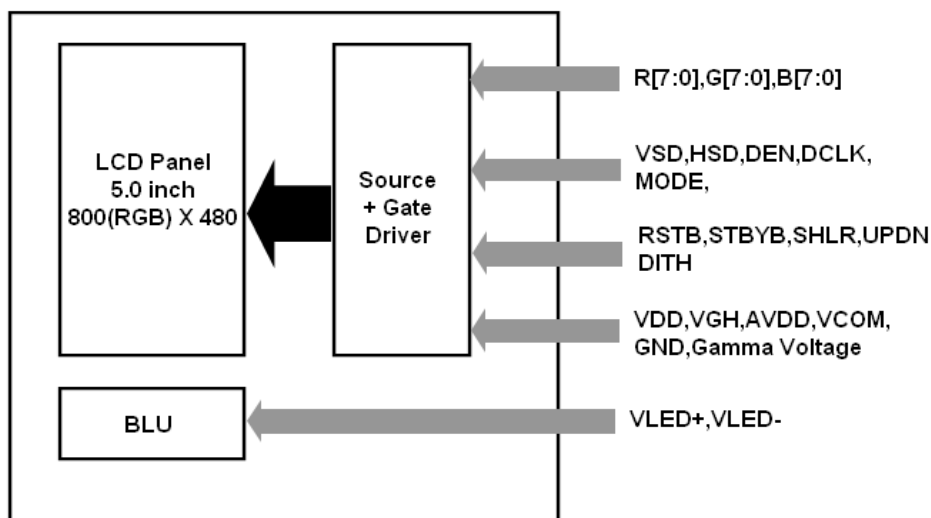
General specifications are summarized in the following table:

| ITEM | SPECIFICATION |
|--------------------------------|----------------------------|
| Panel Size | 5" inch |
| Display Area (mm) | 108.0(H) x 64.8(V) |
| Number of Pixels (dot) | 800(H) x 3(RGB) x 480(V) |
| Pixel Pitch(mm) | 0.135(H) x 0.135(V) |
| Color Pixel Arrangement | RGB island |
| Display Mode | Normally white TN |
| Number of color | 16.2M |
| Luminance (cd/m ²) | 500(Typ) |
| Contrast Ratio | 500:1 (Typ.) 350:1(Min.) |
| Optimum Viewing Angle | 6' o'clock |
| Electrical Interface | RGB 24Bits |
| Power Consumption(W) | 1.42 (Typical) |
| Surface Treatment | HC |
| Outline Dimension (mm) | 118.5(W)x 77.55(H)x 2.8(D) |
| Weight (g) | 65g(MAX) |

Note 1. Outline Dimension define without FPC

The LCD Products listed on this document are not suitable for use of aerospace equipments, submarine cables, nuclear reactor control systems and life support systems. If customers intend to use these LCD products for above applications or not listed in "Standard" as follows, please contact our sales people in advance.

1.1 Block Diagram



2. ABSOLUTE MAXIMUM RATINGS

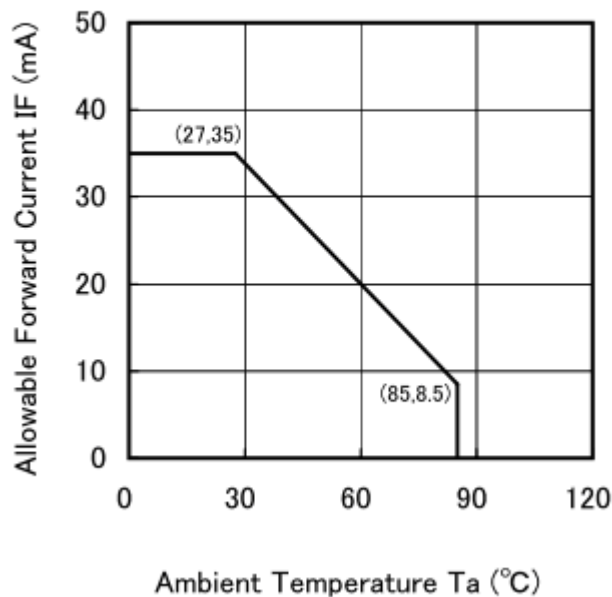
| ITEM | SYMBOL | MIN | MAX | UNIT | NOTE |
|-----------------------------------|-----------------------------|------|--------|------|-------|
| Digital Power Supply Voltage | VDD | -0.3 | +3.96 | V | |
| Analog Power Supply Voltage | AVDD | -0.5 | +14.85 | V | |
| Gate On Voltage | VGH | -0.3 | 40 | V | |
| Gate Off Voltage | VGL | -20 | 0.3 | V | |
| Signal Input Voltage | R0 ~ R7 G0 ~ G7 B0~B7 | -0.3 | +3.96 | V | |
| GAMMA Voltage | Vr1~Vr10 | -0.5 | +14.85 | V | |
| Forward Current (per LED) | If | | 35 | mA | |
| Reverse Voltage (per LED) | VR | | 5 | V | |
| Pulse forward current (per LED) | I _{fp} | | 100 | mA | Note1 |
| Operating temperature | Topa | -20 | 70 | °C | Note3 |
| Storage temperature | Tstg | -30 | 80 | °C | Note3 |

Note 1 : Absolute maximum rating is the limit value. When the panel is exposed operating environment beyond this range, the Panel can not assure operations and may be damaged permanently, not be able to be recovered

Note 2 : condition: 1 pcs LED 、 1/10 duty 、 10ms width ◦

Note 3 : Ambient temperature and the maximum input are fulfilling the following operating conditions

Ambient Temperature vs.
Allowable Forward Current



Note 4 : While the panel is used in normal temperature, the temperature in the center of panel's surface must be low than 40 °C

3. ELECTRICAL CHARACTERISTICS

3.1. Typical operation conditions

 $T_a=25^{\circ}\text{C}$

| ITEM | SYMBOL | MIN | TYP | MAX | UNIT | NOTE |
|--------------------------------------|--------|---------|-----|---------|------|-------|
| Digital Power Supply Voltage For LCD | VDD | 3 | 3.3 | 3.6 | V | |
| Logic Input Voltage | VIL | 0 | - | 0.3xVDD | V | |
| | VIH | 0.7xVDD | - | VDD | V | |
| Analog Power Supply Voltage | AVDD | 9.4 | 9.6 | 9.8 | V | |
| Gate On Power Supply Voltage | VGH | 17 | 18 | 19 | V | |
| Gate Off Power Supply Voltage | VGL | -6.6 | -6 | -5.4 | V | |
| Common Power Supply Voltage | VCOM | 3.6 | 3.8 | 4.0 | V | Note1 |

Note1: Please adjust VCOM to make the flicker level be minimum.

3.2. TFT-LCD current consumption

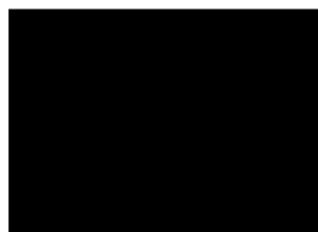
| ITEM | SYMBOL | CONDITIONS | MIN | Typ | MAX | UNIT | NOTE |
|-------------------------|--------|----------------|-----|-----|-----|------|-------|
| Gate on power current | IVGH | VGH =18V | - | 2 | 3 | mA | Note1 |
| Gate off power current | IVGL | VGL= -6V | - | 2 | 3 | mA | Note1 |
| Digital power current | IVDD | VDD = 3.3V | - | 15 | 25 | mA | Note1 |
| Analog power current | IAVDD | AVDD = Vr1+0.8 | - | 25 | 40 | mA | Note1 |
| Total Power Consumption | PC | | - | 338 | 539 | mW | Note1 |

Note 1 : Typ. specification : Gray-256 test Pattern

Max. specification : Black test Pattern



(a)Gray-256 Pattern



(b)Black Pattern

3.3. Gamma Voltage Setting

| Symbol | Value | Symbol | Vaule | Unit |
|--------|-------|--------|-------|------|
| Vr1 | 9.0 | Vr6 | 3.9 | V |
| Vr2 | 7.3 | Vr7 | 2.7 | |
| Vr3 | 6.8 | Vr8 | 2.4 | |
| Vr4 | 6.5 | Vr9 | 1.9 | |
| Vr5 | 5.4 | Vr10 | 0.1 | |
| | | | | |

3.4. Backlight system

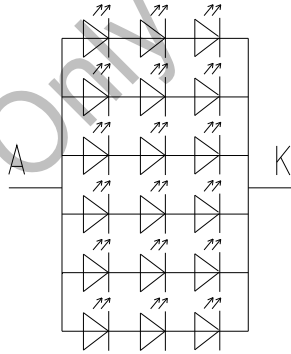
Ta=25°C

| ITEM | SYMBOL | CONDITION | MIN | TYP | MAX | UNIT | NOTE |
|-------------------|----------------|--------------------------------|-------|------|-------|------|--------|
| LED Voltage | VL | Ta=25°C Each serial=20mA | — | 9 | 10.05 | V | |
| LED Current | IL | Ta=25°C Each serial=20mA | — | 120 | 210 | mA | |
| Power consumption | W _L | Ta=25°C Each serial=20mA | — | 1080 | 1206 | mW | Note1 |
| LED Lifetime | - | Ta=60°C Each serial=20mA | 10000 | | | Hr | Note 2 |

Note 1 : $W_L = VL \times IL$, $IL=120mA$

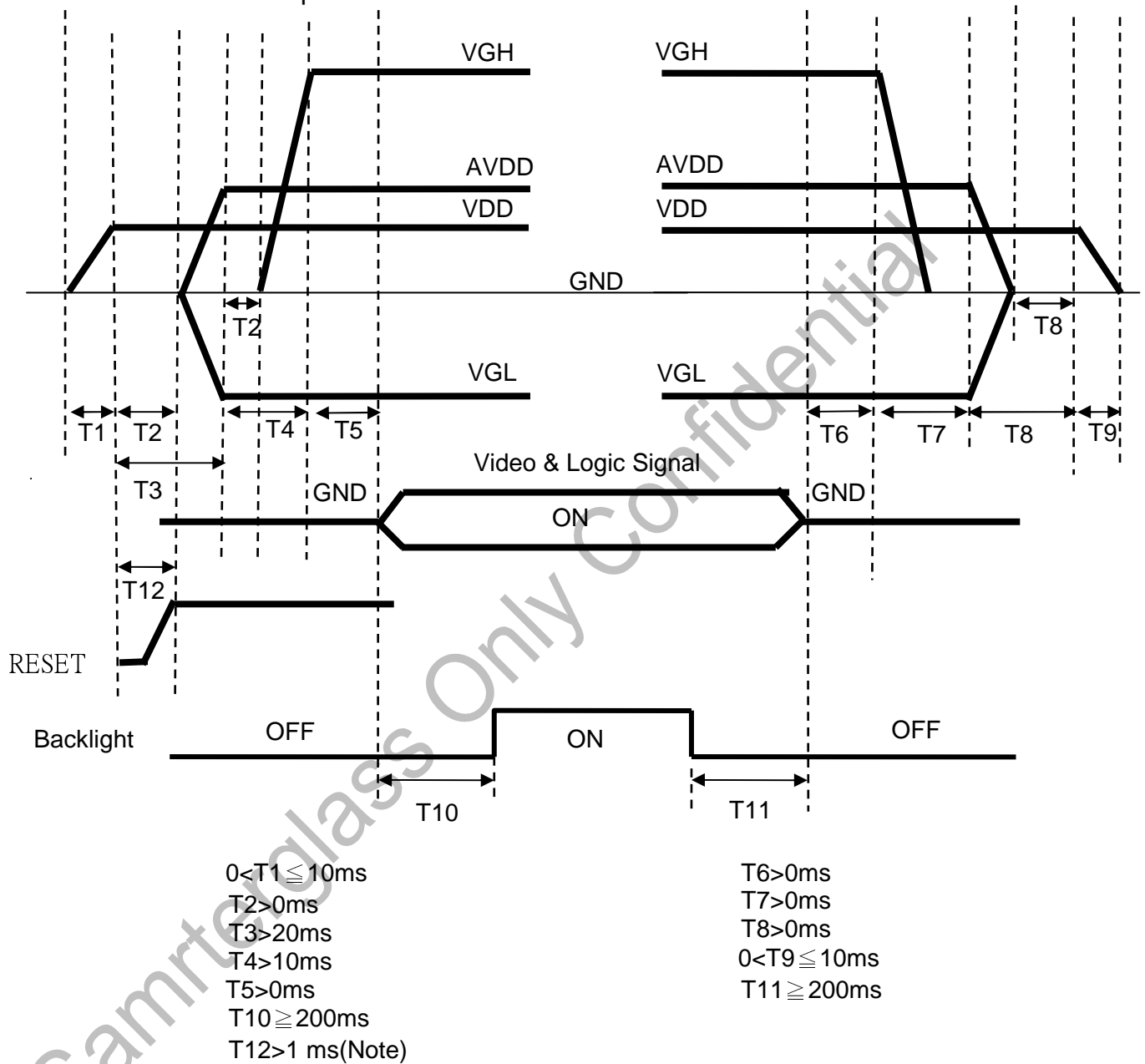
Note 2 : Brightness to be decreased to 50% of the initial value.

Note 3 : LED Circuit Diagram(A : Anode(+), K : Cathode(-)).



The frame of the LEDs is 3 series-6 parallel connection.

3.5. Power on/off sequence



Note: If reset pin without RC, please follow T12 timing to power on reset panel function.

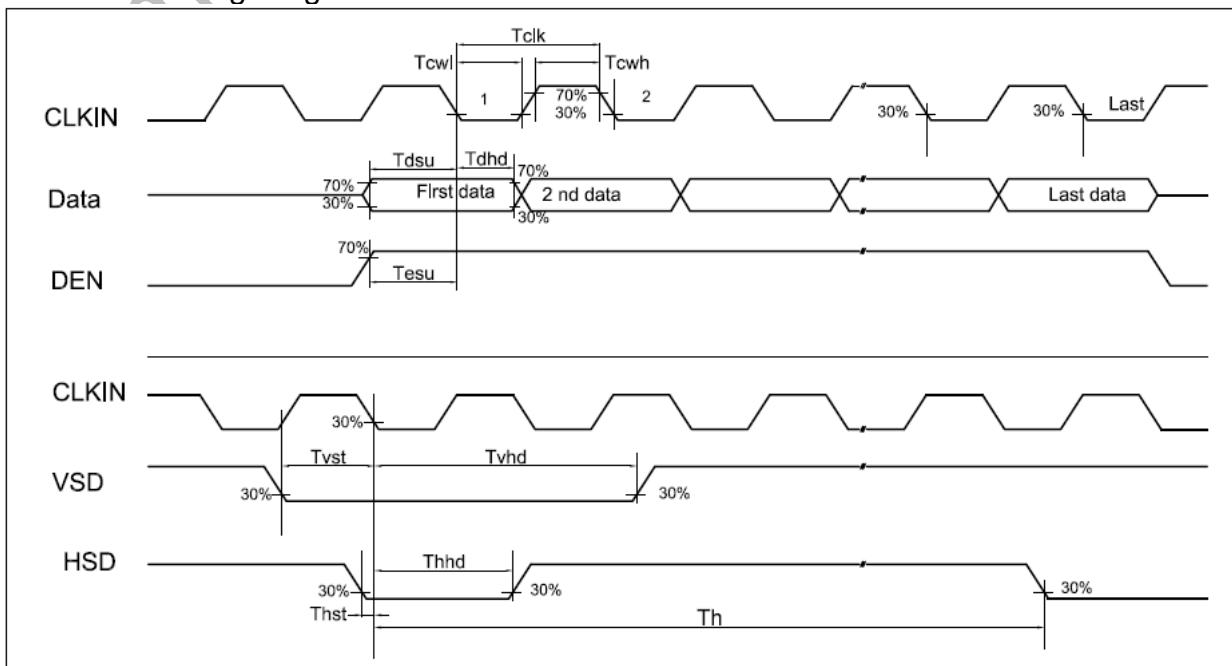
4. INPUT SIGNAL TIMING

4.1 TTL Timing

4.1.1 Timing Specification

| ITEM | | SYMBOL | MIN. | TYP. | MAX. | UNIT | Note |
|----------------|------------------------|-----------------|------|------|------|------------------|----------------------------|
| DCLK | Dot Clock | 1/Tclk | 28.5 | 30 | 38 | MHz | |
| | DCLK pulse duty | Tcwh | 40 | 50 | 60 | % | |
| DE | Setup Time | Tesu | 8 | - | - | ns | |
| | Hold time | Tehd | 8 | - | - | ns | |
| | Horizontal Period | t _H | 908 | 928 | 1000 | t _{CLK} | |
| | Horizontal Valid | t _{HA} | 800 | | | t _{CLK} | |
| | Horizontal Blank | t _{HB} | 108 | 128 | 200 | t _{CLK} | |
| | Vertical Period | t _V | 523 | 538 | 633 | t _H | |
| | Vertical Valid | t _{VA} | 480 | | | t _H | |
| | Vertical Blank | t _{VB} | 43 | 58 | 153 | t _H | |
| SYNC | HSYNC Setup Time | Thst | 8 | - | - | ns | |
| | HSYNC Hold Time | Thhd | 8 | - | - | ns | |
| | VSYNC Setup Time | Tvst | 8 | - | - | ns | |
| | VSYNC Hold Time | Tvhd | 8 | - | - | ns | |
| | Horizontal Period | th | 908 | 928 | 1000 | t _{CLK} | |
| | Horizontal Pulse Width | thpw | 4 | 48 | 60 | t _{CLK} | thb + thpw=88DCLK is fixed |
| | Horizontal Back Porch | thb | 28 | 40 | 84 | t _{CLK} | |
| | Horizontal Front Porch | thfp | 20 | 40 | 112 | t _{CLK} | |
| | Horizontal Valid | thd | 800 | | | t _{CLK} | |
| | Vertical Period | tv | 523 | 538 | 633 | th | |
| | Vertical Pulse Width | tpw | 3 | 3 | 3 | th | tpw + tvb = 32th is fixed |
| | Vertical Back Porch | tvb | 29 | 29 | 29 | th | |
| | Vertical Front Porch | tvfp | 11 | 26 | 121 | th | |
| Vertical Valid | tvd | 480 | | | th | | |
| DATA | Setup Time | Tdsu | 8 | - | - | ns | |
| | Hold Time | Tdhd | 8 | - | - | ns | |

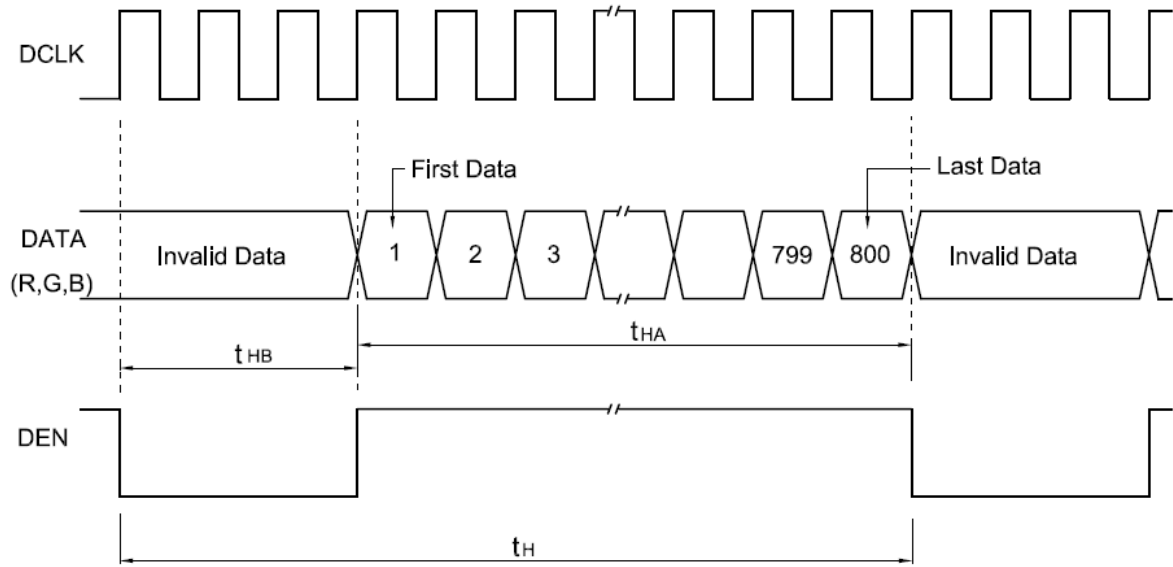
4.1.2 Timing Diagram



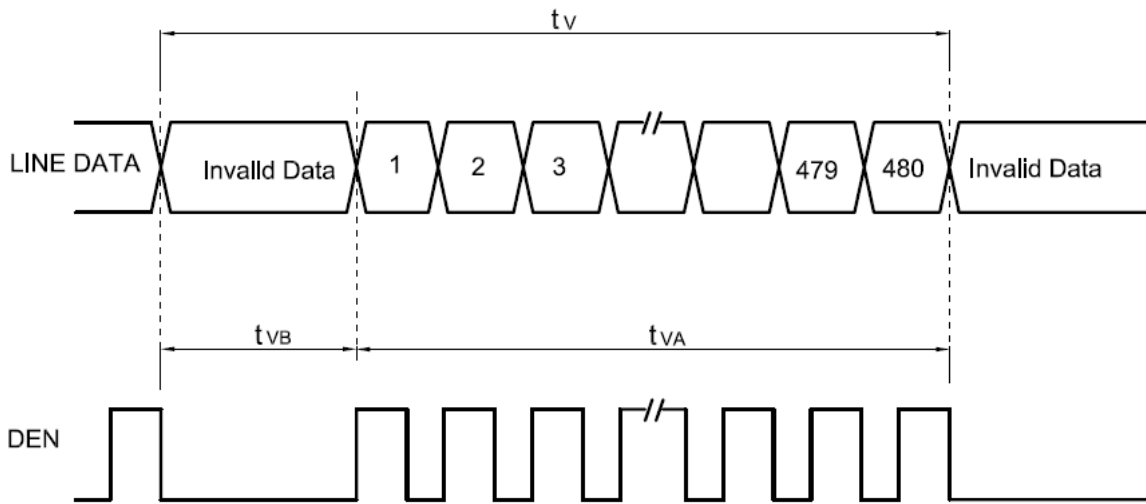
4.2 Timing Sequence(Timing Chart)

4.2.1 DE mode :

Horizontal timing :

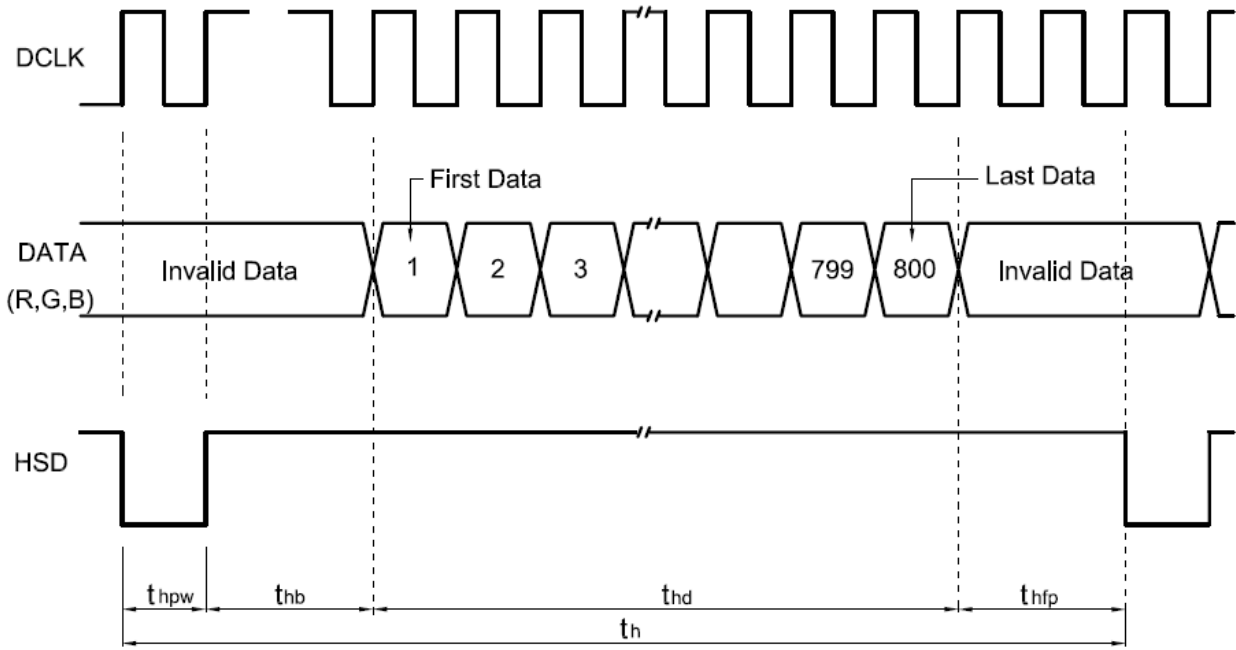


Vertical timing :

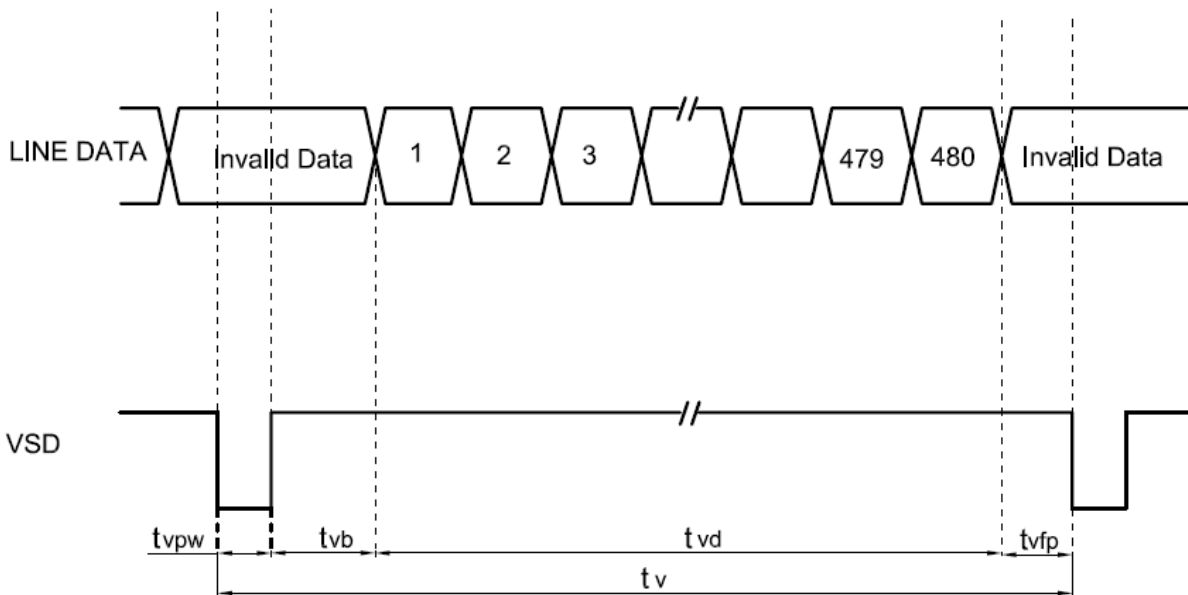


4.2.2 SYNC mode

Horizontal timing :



Vertical timing :



4.3 Color data definition

| COLOR | INPUT DATA | R DATA | | | | | | | | G DATA | | | | | | | | B DATA | | | | | | | |
|-------------|------------|--------|----|----|----|-----|----|----|----|--------|----|----|----|-----|----|----|----|--------|----|----|----|-----|----|----|----|
| | | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | G7 | G6 | G5 | G4 | G3 | G2 | G1 | G0 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| | | MSB | | | | LSB | | | | MSB | | | | LSB | | | | MSB | | | | LSB | | | |
| BASIC COLOR | BLACK | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | RED(255) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | GREEN(255) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | BLUE(255) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| | CYAN | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| | MAGENTA | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| | YELLOW | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | WHITE | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| RED | RED(0) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | RED(1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | RED(2) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | | | | | | | | | | | | | | | | | | | | | | | | |
| | RED(254) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | RED(255) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| GREEN | GREEN(0) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | GREEN(1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | GREEN(2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | | | | | | | | | | | | | | | | | | | | | | | | |
| | GREEN(254) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | GREEN(255) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| BLUE | BLUE(0) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | BLUE(1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | |
| | BLUE(2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | |
| | | | | | | | | | | | | | | | | | | | | | | | | | |
| | BLUE(254) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | |
| | BLUE(255) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |

Note 1 : Definition of gray scale:

Color (n): n means level of gray scale. Larger n means brighter level.

Note 2 : Data: 1= High, 0 = Low

5. INTERFACE CONNECTION

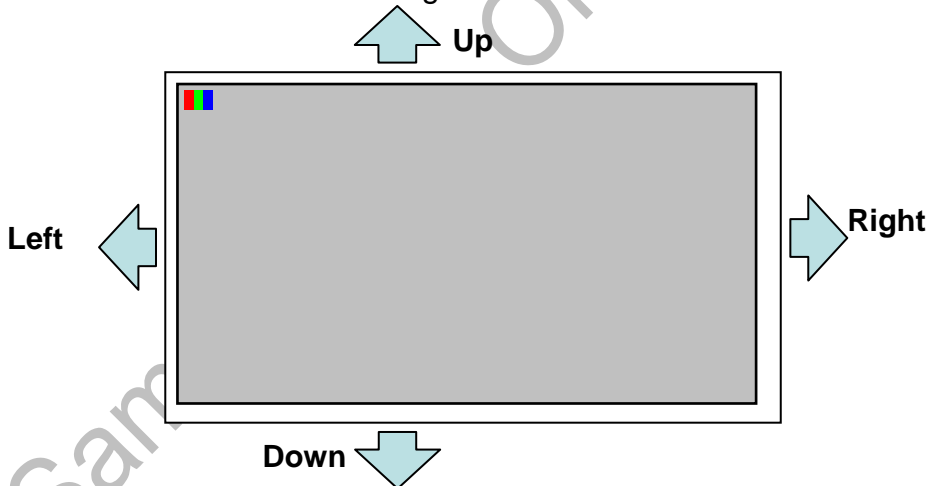
| Pin NO. | SYMBOL | DESCRIPTION |
|---------|--------|--|
| 1 | GND | GND |
| 2 | VDDA | Analog Power |
| 3 | VDD | Digital Power |
| 4 | R0 | Red data Input (LSB) |
| 5 | R1 | Red data Input |
| 6 | R2 | Red data Input |
| 7 | R3 | Red data Input |
| 8 | R4 | Red data Input |
| 9 | R5 | Red data Input |
| 10 | R6 | Red data Input |
| 11 | R7 | Red data Input (MSB) |
| 12 | G0 | Green data Input (LSB) |
| 13 | G1 | Green data Input |
| 14 | G2 | Green data Input |
| 15 | G3 | Green data Input |
| 16 | G4 | Green data Input |
| 17 | G5 | Green data Input |
| 18 | G6 | Green data Input |
| 19 | G7 | Green data Input (MSB) |
| 20 | B0 | Blue data Input (LSB) |
| 21 | B1 | Blue data Input |
| 22 | B2 | Blue data Input |
| 23 | B3 | Blue data Input |
| 24 | B4 | Blue data Input |
| 25 | B5 | Blue data Input |
| 26 | B6 | Blue data Input |
| 27 | B7 | Blue data Input |
| 28 | DCLK | Pixel clock |
| 29 | DE | Data Enable. When MODE="0", this pin is OPEN |
| 30 | HSD | Horizontal Sync Signal |
| 31 | VSD | Vertical Sync Signal |
| 32 | MODE | DE/SYNC mode select · Normal pull high MODE="1" DE mode MODE="0" SYNC mode |
| 33 | RSTB | Global reset pin. Active low to enter reset state. Suggest to connecting with an RC reset circuit for stability. Normally pull high. (R=10KΩ · C=1μF) |
| 34 | STBYB | Standby mode, normally pull high STBYB="1", normal operation STBYB="0", timing control, source driver will turn off, all output are high-Z |
| 35 | SHLR | Shift left or right control |
| 36 | VDD | Digital Power |
| 37 | UPDN | Shift up or down control |
| 38 | GND | GND |
| 39 | GND | GND |
| 40 | VDDA | Analog Power |
| 41 | VCOM | VCOM DC input |
| 42 | DITH | Dithering function enable control. DITHB = "1", Disable internal dithering function · LSB0 and LSB1 connect to ground. DITHB = "0", Enable internal dithering function |
| 43 | VR10 | Gamma Voltage input |
| 44 | VR9 | Gamma Voltage input |
| 45 | VR8 | Gamma Voltage input |
| 46 | VR7 | Gamma Voltage input |
| 47 | VR6 | Gamma Voltage input |
| 48 | VR5 | Gamma Voltage input |
| 49 | VR4 | Gamma Voltage input |
| 50 | VR3 | Gamma Voltage input |

| Pin NO. | SYMBOL | DESCRIPTION |
|---------|--------|------------------------------|
| 51 | VR2 | Gamma Voltage input |
| 52 | VR1 | Gamma Voltage input |
| 53 | VGH | Get on Voltage |
| 54 | VDD | Digital Power |
| 55 | VGL | Get off Voltage |
| 56 | GND | GND |
| 57 | VLED+ | Power Supply for LED (Anode) |
| 58 | VLED+ | Power Supply for LED (Anode) |
| 59 | VLED- | LED GND (Cathode) |
| 60 | VLED- | LED GND (Cathode) |

【Note1】 SHLR : left or right setting
UPDN : up or down setting

| SHLR | UPDN | Data shifting |
|------|------|-------------------------------|
| VDD | GND | Left→Right , Up→Down(default) |
| GND | GND | Right→Left , Up→Down |
| VDD | VDD | Left→Right , Down→Up |
| GND | VDD | Right→Left , Down→Up |

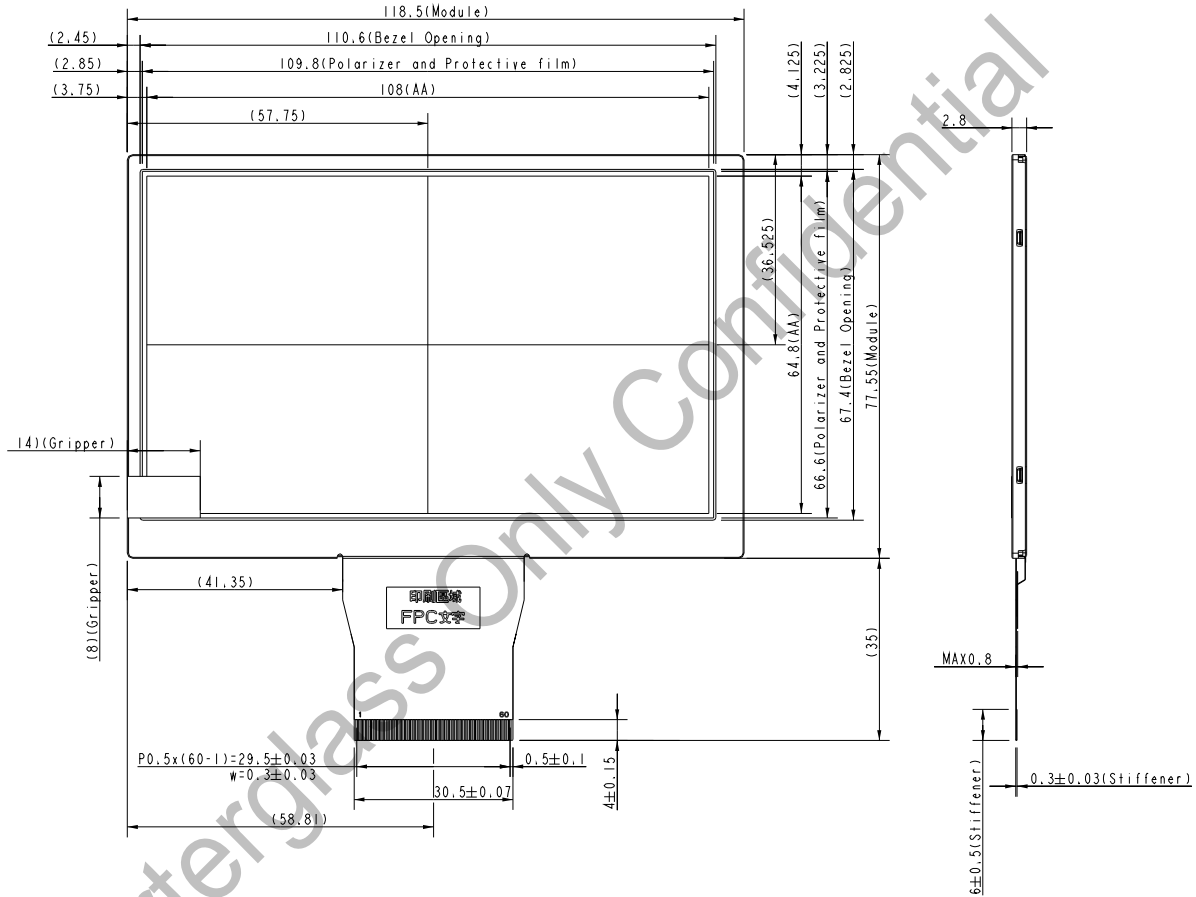
Definition of scanning direction.



6. MECHANICAL SPECIFICATION

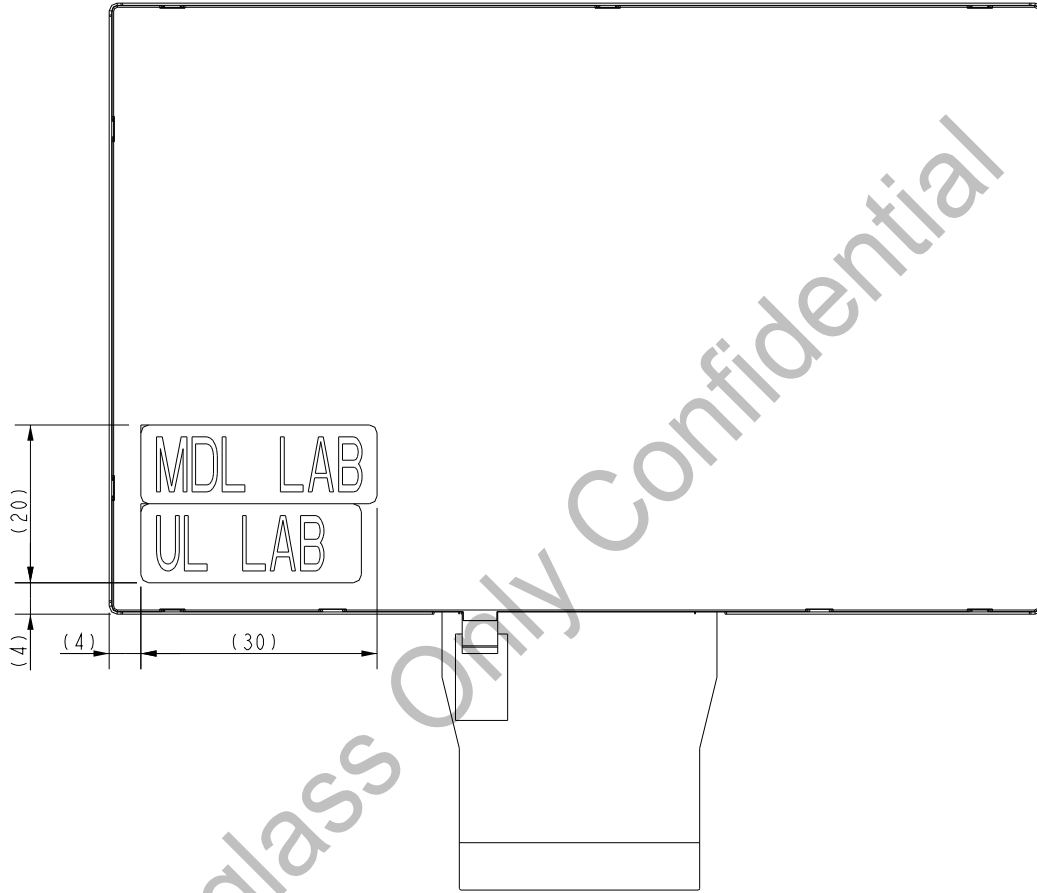
(Front View)

Unit:mm



Note : General tolerance = ±0.3mm
 Gripper size : 14mm x 8mm x 0.08mm
 Protective film size : 109.8 mm (H)X66.6 mm (V)

(Rear View)



Note : General tolerance =±0.3mm

7. OPTICAL SPECIFICATION

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit | Remark | |
|----------------------|------------|--------------------------------------|--------------------------------------|-----------|-----------|-------------------|--------|--------|
| Contrast Ratio | CR | $\theta = \psi = 0^\circ$ Point-5 | 350 | 500 | -- | | Note 3 | |
| Luminance | L | $\theta = \psi = 0^\circ$ Point-5 | 400 | 500 | -- | cd/m ² | | |
| Luminance Uniformity | ΔL | $\theta = \psi = 0^\circ$ | 70 | 80 | -- | % | Note 4 | |
| Response Time | Tr+Tf | $\theta = \psi = 0^\circ$ | -- | 20 | 35 | ms | Note 5 | |
| NTSC | | | 45 | 50 | -- | % | | |
| View angle | Horizontal | ϕ | CR \geq 10 Point-5 | 60(Right) | 70(Right) | -- | ° | Note 6 |
| | | | | 60(Left) | 70(Left) | | | |
| | Vertical | | | 45(Up) | 55(Up) | -- | ° | |
| | | | | 65(Down) | 75(Down) | | | |
| Color Coordinate | R | x | $\theta = \psi = 0^\circ$ Point-5 | 0.585 | 0.625 | 0.665 | | |
| | | y | | 0.313 | 0.353 | 0.393 | | |
| | G | x | | 0.313 | 0.353 | 0.393 | | |
| | | y | | 0.554 | 0.594 | 0.634 | | |
| | B | x | | 0.122 | 0.162 | 0.202 | | |
| | | y | | 0.066 | 0.106 | 0.146 | | |
| | W | x | | 0.273 | 0.313 | 0.353 | | |
| | | y | | 0.289 | 0.329 | 0.369 | | |

Note 1. Ambient condition : $25^\circ\text{C} \pm 2^\circ\text{C}$, $60 \pm 10\% \text{RH}$, under 10 Lux in the darkroom .
Lighting the LCM and measuring after 10 minutes.

Note 2. Measure device : BM-5A (TOPCON) , viewing cone= 1° , $I_L=80\text{mA}$.

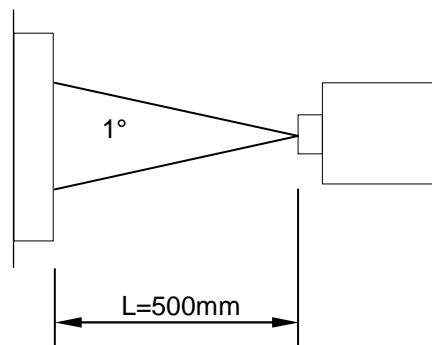


Fig.8-1 viewing cone= 1°

Note 3. Definition of Contrast Ratio :

$$CR = \text{White Luminance (ON)} / \text{Black Luminance (OFF)}$$

Note 4. Definition of Luminance Uniformity : $\Delta L = L(\text{MIN}) / L(\text{MAX}) \times 100\%$

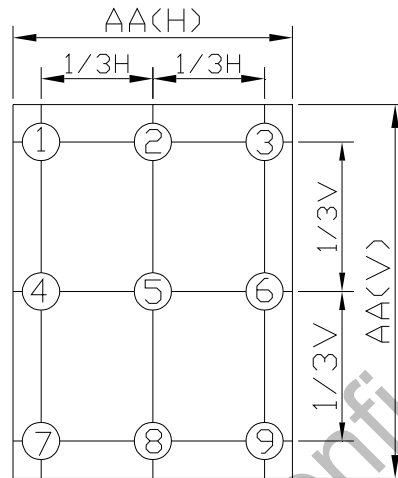


Fig.8-2 Measuring point

Note 5. Definition of response time : The response time is defined as the time interval between the 10% and 90% amplitudes.

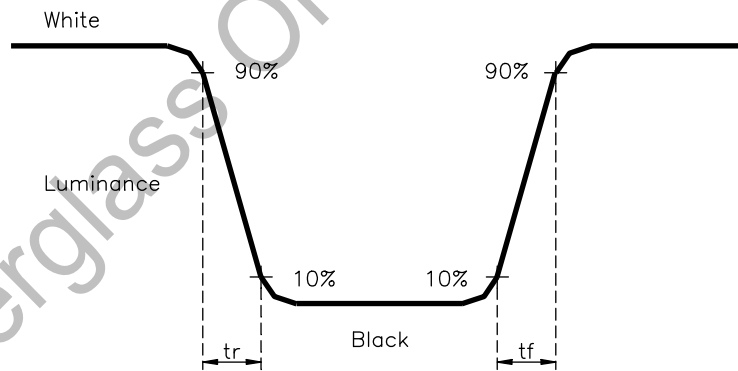


Fig.8-3 Definition of Response Time (White - Black)

Note 6. Definition of view angle(θ , ψ) :

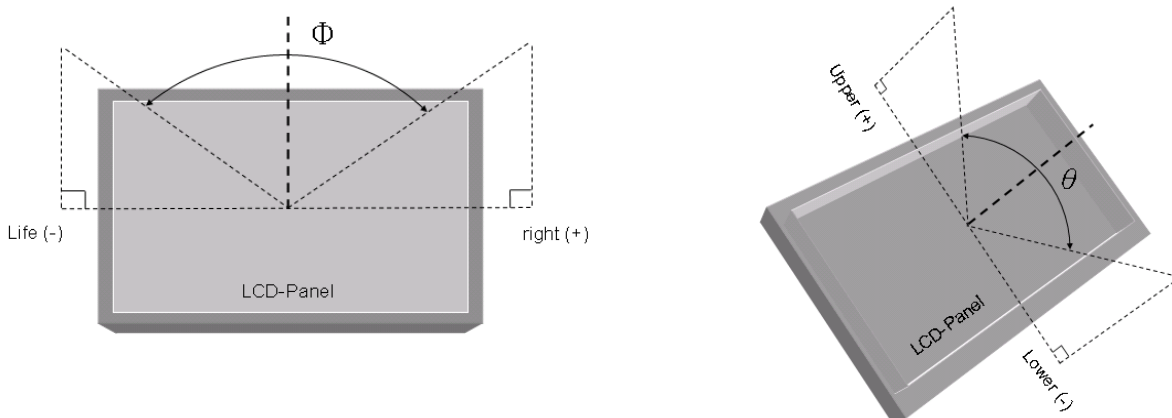


Fig.8-4 Definition of Viewing Angle

8. RELIABILITY TEST

8.1 Temperature and Humidity

| TEST ITEMS | CONDITIONS |
|--|-------------------------|
| HIGH TEMPERATURE OPERATION | 70° C ; 240Hrs |
| HIGH TEMPERATURE STORAGE | 80° C ; 240Hrs |
| HIGH TEMPERATURE AND HIGH HUMIDITY OPERATION | 60° C ; 90% RH ; 240Hrs |
| LOW TEMPERATURE OPERATION | -20° C ; 240Hrs |
| LOW TEMPERATURE STORAGE | -30° C ; 240Hrs |

8.2 Shock & Vibration

| TEST ITEMS | CONDITIONS |
|------------------------------|--|
| SHOCK (Non operation) | <ul style="list-style-type: none"> ● Shock level: 980m/s²(equal to 100G). ● Waveform: half sinusoidal wave,6ms. ● Number of shocks: one shock input in each direction of three mutually perpendicular axes(±X, ±Y, ±Z)for a total of 6 shock inputs. |
| VIBRATION (Non operation) | <ul style="list-style-type: none"> ● Frequency range:8~33.3Hz ● Stroke:1.3 mm ● Vibration:sinusoidal wave, perpendicular axis Each direction on X, Z axes: 2hrs, Y axes: 4hrs. ● Sweep:2.9G,33.3 Hz ~ 400 Hz ● Cycle:15 min |

8.3 ESD

| TEST ITEM | CONDITIONS | Note |
|------------------------|----------------------------|----------------|
| ESD (Non operation) | 150 pF 、 330Ω 、 ±8KV,±15KV | Air mode |
| | 150 pF 、 330Ω 、 ±8KV,±15KV | Contact mode |
| | 200pF 、 0Ω 、 ±200V | Connector mode |

8.4 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. Transformation of the carton which occurs at Shock and VIBRATION test should be ignored.

9. WARRANTY

9.1 The period is within 12 months since the date of shipping out under normal using and storage conditions.

9.2 The warranty will be avoided in case of defect induced by customer