

| |
|--------------------------------|
| TECHNICAL SPECIFICATION |
|--------------------------------|

| |
|----------------------------|
| MODEL NO : PD064VT7 |
|----------------------------|

The content of this information is subject to be changed without notice.
Please contact PVI or its agent for further information.

Customer's Confirmation

Customer _____

Date _____

By _____

PVI's Confirmation

| Dep | FAE | Panel Design | Electronic Design | Mechanical Design | Product Verification | Prepared by |
|------|-----|--------------|-------------------|-------------------|----------------------|-------------|
| SIGN | | | | | | |

Revision History

| Rev. | Issued Date | Revised Contents |
|------|--------------|---|
| 0.1 | July 10,2007 | New |
| 0.2 | Oct .24,2007 | Page 7 5. Input / Output Terminals Add 5-2) LED Backlight driving Page 8 7. Electrical Characteristics 7-2) Recommended driving condition for LED back light Modify Note 7-3 Back-light Diagram Modify Supply voltage of LED backlight Page 20 10. Handling Cautions Delete 10-1) Mounting of module b) description |

TECHNICAL SPECIFICATION**CONTENTS**

| <i>NO.</i> | <i>ITEM</i> | <i>PAGE</i> |
|-------------------|--------------------------------------|--------------------|
| - | Cover | 1 |
| - | Revision History | 2 |
| - | Contents | 3 |
| 1 | Application | 4 |
| 2 | Features | 4 |
| 3 | Mechanical Specifications | 4 |
| 4 | Mechanical Drawing of TFT-LCD module | 5 |
| 5 | Input / Output Terminals | 6 |
| 6 | Absolute Maximum Ratings | 7 |
| 7 | Electrical Characteristics | 8 |
| 8 | Power On Sequence | 16 |
| 9 | Optical Characteristics | 17 |
| 10 | Handling Cautions | 20 |
| 11 | Reliability Test | 21 |
| 12 | Block Diagram | 22 |
| 13 | Packing | 23 |

1. Application

This data sheet applies to a color TFT LCD module, PD064VT7. The module applies to OA product, GPS, which require high quality flat panel display. If you must use in high reliability environment can't over reliability test condition. If you use PD064VT7, Prime View advises your system sides must use PVI-2003A which one generates signal to control PD064VT7.

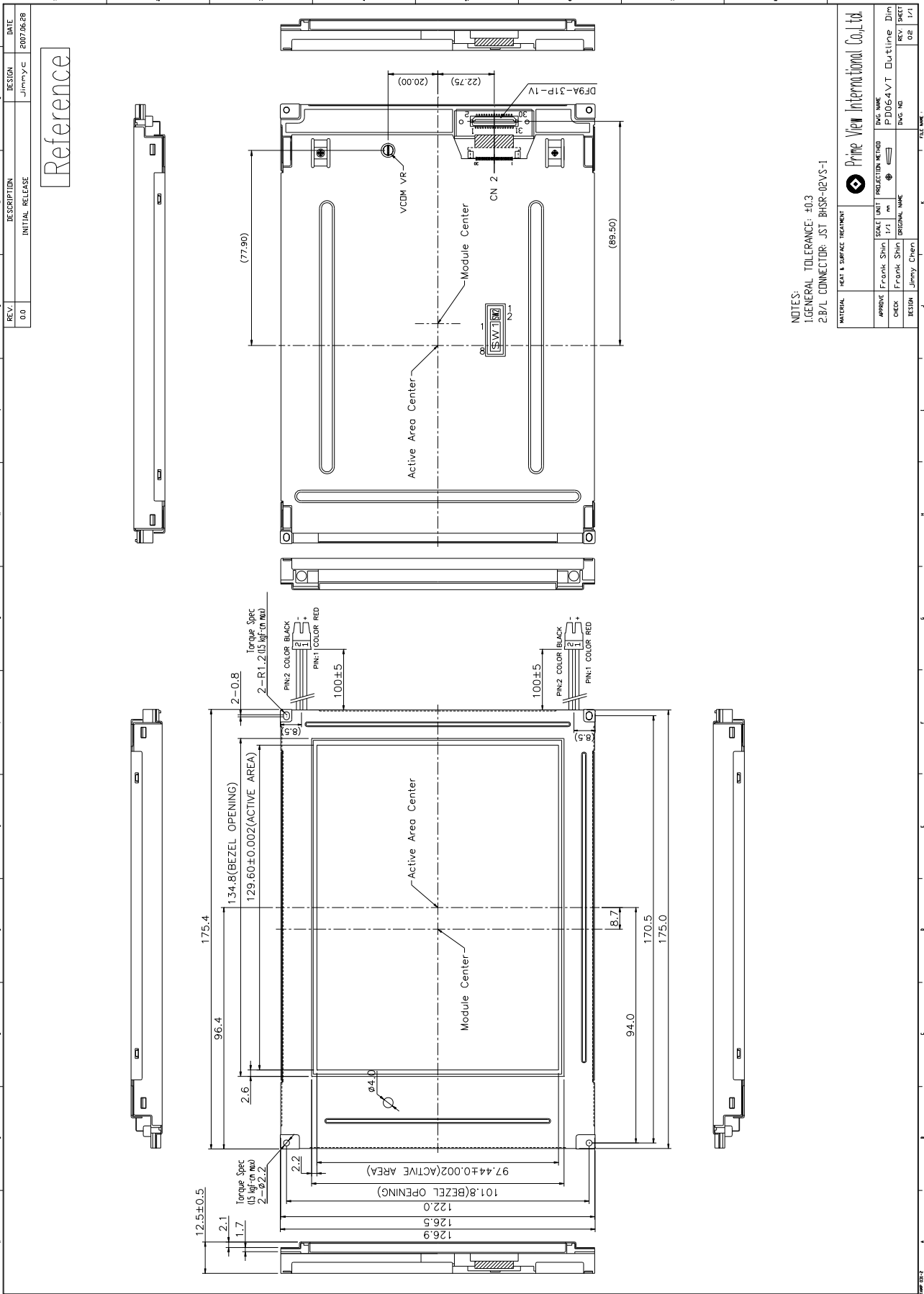
2. Features

- . Compatible with VGA-480 , VGA-400 , VGA-350 mode
- . Support the DENB mode
- . Pixel in stripe configuration
- . Slim and compact
- . Display Colors : 262,144 colors
- . Image Reversion : Up/Down and Left/Right
- . Viewing Direction : 6 o'clock
- . Backlight lamps are Replaceable
- . Use High Brightness LED BL

3. Mechanical Specifications

| Parameter | Specifications | Unit |
|--------------------------------|-------------------------------------|-------------|
| Screen Size | 6.4 Inch(diagonal) | inch |
| Display Format | 640×(R, G, B)×480 | dot |
| Display Colors | 262,144 | |
| Active Area | 129.6(H)×97.44(V) | mm |
| Pixel Pitch | 0.2025 (H)×0.203 (V) | mm |
| Pixel Configuration | Stripe | |
| Outline Dimension | 175.4 (W)×126.9 (H)×12.5 (typ.) (D) | mm |
| Weight | (340±10) reference only data | g |
| Back-light | 16-middle power LED | |
| Surface treatment | Anti – Glare &Wide View film | |
| Display mode | Normally white | |
| Gray scale inversion direction | 6 o'clock [Note 9-1] | |

4. Mechanical Drawing of TFT-LCD Module



NOTES:
 1. GENERAL TOLERANCE: ±0.3
 2. B/L CONNECTOR: JST BHSR-02VS-1

| | | | | | | |
|----------|------------|----------------|------|------------------------------------|---------------------|-----|
| MATERIAL | | HEAT TREATMENT | | Prime View International Co., Ltd. | | |
| APPROVE | FRANK SHIN | SCALE | UNIT | PROJECTION METHOD | DWG NAME | |
| CHECK | FRANK SHIN | 1/1 | mm | 1st | PD064VT Outline Dim | |
| DESIGN | JIMMY CHEN | DRAWING NAME | | DWG NO. | REV. SHEET | |
| | | | | | 02 | 1/1 |

5. Input / Output Terminals

5-1) TFT-LCD Panel Driving

LCD module connector (Reference)

DF9A-31P-1V

| Pin No. | Symbol | Function | Remark |
|---------|--------|--|----------|
| 1 | GND | Ground (0V) | |
| 2 | CLK | Clock Signal for Sampling Image Digital Data | |
| 3 | Hsync | Horizontal Synchronous Signal | Note 5-1 |
| 4 | Vsync | Vertical Synchronous Signal | |
| 5 | GND | Ground (0V) | |
| 6 | R0 | Red Image Data Signal (LSB) | |
| 7 | R1 | Red Image Data Signal | |
| 8 | R2 | Red Image Data Signal | |
| 9 | R3 | Red Image Data Signal | |
| 10 | R4 | Red Image Data Signal | |
| 11 | R5 | Red Image Data Signal (MSB) | |
| 12 | GND | Ground (0V) | |
| 13 | G0 | Green Image Data Signal (LSB) | |
| 14 | G1 | Green Image Data Signal | |
| 15 | G2 | Green Image Data Signal | |
| 16 | G3 | Green Image Data Signal | |
| 17 | G4 | Green Image Data Signal | |
| 18 | G5 | Green Image Data Signal (MSB) | |
| 19 | GND | Ground (0V) | |
| 20 | B0 | Blue Image Data Signal (LSB) | |
| 21 | B1 | Blue Image Data Signal | |
| 22 | B2 | Blue Image Data Signal | |
| 23 | B3 | Blue Image Data Signal | |
| 24 | B4 | Blue Image Data Signal | |
| 25 | B5 | Blue Image Data Signal (MSB) | |
| 26 | GND | Ground (0V) | |
| 27 | DENB | Enable | Note 5-1 |
| | | | Note 5-2 |
| 28 | VCC | DC +5.0V Power Supply | Note 5-3 |
| 29 | VCC | DC +5.0V Power Supply | Note 5-3 |
| 30 | R/L | Horizontal Image Shift-direction Select Signal | Note 5-4 |
| 31 | U/D | Vertical Image Shift-direction Select Signal | Note 5-5 |

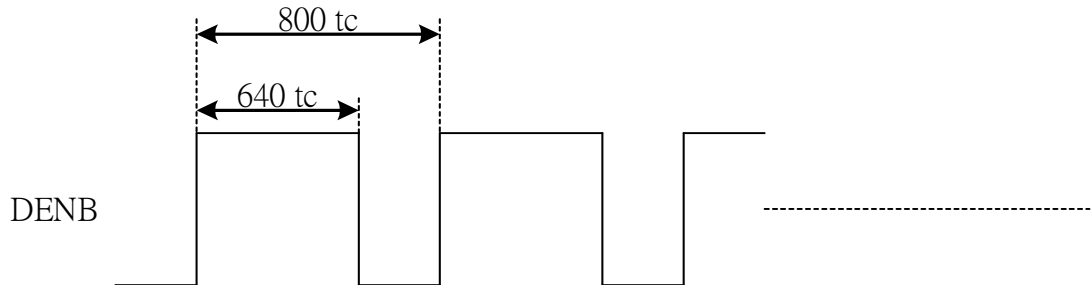
Note 5-1 : The relationship between DENB & SYNC. mode

1. DENB mode with the top priority.
2. When working with the SYNC. mode , the TFT-LCD module is compatible with three kinds of VGA timing . They are VGA-480 , VGA-400 and VGA-350 mode . The polarization of Hsync and Vsync determine the timings.

| Mode | DENB | VGA-480 | VGA-400 | VGA-350 |
|---------------------------|-------------------|----------------------------|-----------------|-----------------|
| SYNC. | | | | |
| Hsync Polarization | Don't care | Negative / Positive | Negative | Positive |
| Vsync Polarization | Don't care | Negative / Positive | Positive | Negative |

Note 5-2 : DENB input signal.

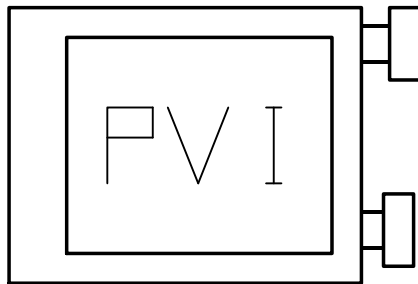
If customer wanted to off the DENB mode , you must keep the DENB (pin 27) always High or Low.



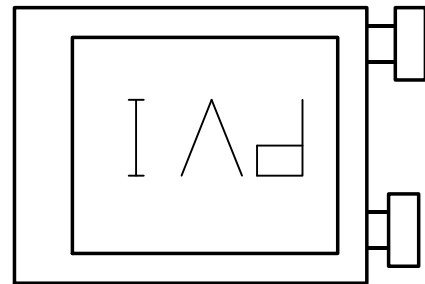
(tc: the period of sampling clock)

Note 5-3 : V_{CC} TYP.=+5V

Note 5-4 , 5-5 : The definitions of U/D & R/L



R/L(PIN 30)= High , U/D(PIN 31)= Low



R/L(PIN 30)= Low , U/D(PIN 31)= High

5-2) LED Backlight driving

Connector type: JST BHSR-02VS-1

| Pin No | Symbol | Description | Remark |
|--------|--------|--------------------------|--------------------|
| 1 | + | Input terminal (Anode) | Wire color : Red |
| 2 | - | Input terminal (Cathode) | Wire Color : Black |

6. Absolute Maximum Ratings :

The followings are maximum values , which if exceeded, may cause faulty operation or damage to the unit.

GND=0V, Ta=25°C

| Parameters | Symbol | MIN. | MAX. | Unit | Remark |
|-----------------------|-----------|------|--------------|------|----------|
| Supply Voltage | V_{CC} | -0.3 | +7.0 | V | |
| Input Signals Voltage | V_{sig} | -0.3 | $V_{CC}+0.3$ | V | Note 6-1 |

Note 6-1 : Input signals include CLK , Hsync , Vsync , DENB , R[0:5] , G[0:5] and B[0:5].

7. Electrical Characteristics

7-1) Recommended Operating Condition for TFT-LCD panel :

GND = 0V , Ta = 25°C

| Parameters | Symbol | Min. | Typ. | Max. | Unit | Remark |
|------------------------------|-------------------|-------|------|-------|------------------|----------------------|
| Supply Voltage | V _{CC} | +4.75 | +5.0 | +5.25 | V | |
| Supply Input Ripple Voltage | V _{CCRP} | - | - | 0.1 | V _{p-p} | V _{CC} =+5V |
| Input Signals Voltage (High) | V _{IH} | +2.6 | - | - | V | |
| Input Signals Voltage (Low) | V _{IL} | - | - | +0.5 | V | |

7-2) Recommended driving condition for LED back light

Ta = 25°C

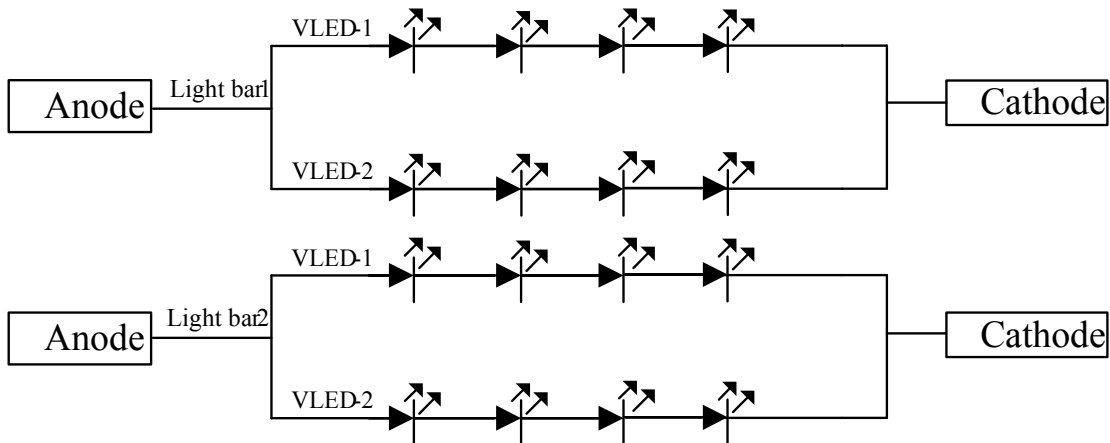
| Parameter | Symbol | Min | TYP | MAX | Unit | Remark |
|---------------------------------|------------------|-----|--------|-----|------|----------|
| Supply voltage of LED backlight | V _{LED} | - | (13.2) | - | V | Note 7-1 |
| Supply current of LED backlight | I _{LED} | - | 150 | - | mA | Note 7-2 |
| Backlight Power Consumption | P _{LED} | - | (7.92) | - | W | Note 7-3 |

Note 7-1 : I_{LED} = 150mA(Constant Current).

Note 7-2 : The LED driving condition is defined for each LED module. (4 LED Serial)

$$\text{Input current} = 150\text{mA} * 2 = 300\text{mA}(1 \text{ light bar})$$

Note 7-3 : P_{LED} = (V_{LED-1} * I_{LED-1} + V_{LED-2} * I_{LED-2}) * 2 (light bar)



7-3) Power Consumption

| Parameters | Symbol | Typ. | Max. | Unit | Remark |
|---------------------------------------|-----------------|--------|------|------|----------------------|
| Current Dissipation | I _{CC} | 100 | 120 | mA | V _{CC} =+5V |
| LCD Panel Power consumption (W/O B/L) | - | 0.5 | 0.6 | W | - |
| Backlight Power Consumption | - | (7.92) | - | W | Note 7-5 |
| Total Power Consumption | - | (8.42) | - | W | |

Note 7-5 : Backlight LED power consumption is calculated by I_L×V_L.

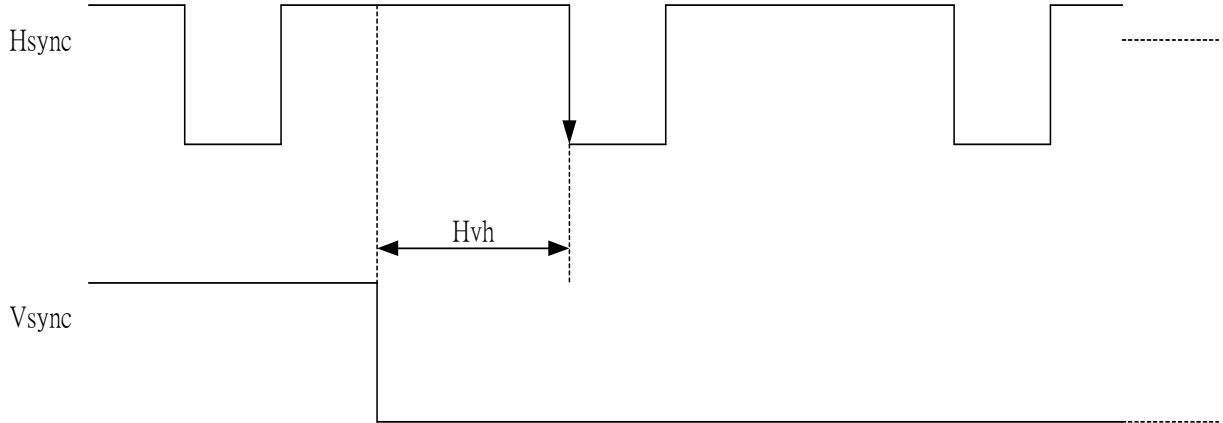
7-4) Input / Output signal timing chart

| Parameters | | Symbol | Format | Min. | Typ. | Max. | Unit | Note | |
|-------------|----------------------------|---------|--------|------|--------|-------|------|----------|--|
| CLK | Frequency | Fc=1/tc | All | - | 25.175 | - | MHz | Note 7-6 | |
| | | tc | All | - | 40 | - | ns | | |
| Hsync | Period | Hp | All | - | 31.778 | - | us | | |
| | | | | - | 800 | - | tc | | |
| | Display period | Hd | All | - | 640 | - | tc | | |
| | Pulse width | Hpw | All | 12 | 96 | 139 | tc | | |
| | Back-porch | Hbp | All | 12 | 46 | 139 | tc | | |
| | Front-porch | Hfp | All | - | 18 | - | tc | | |
| | Hpw+Hbp | | | All | 136 | 142 | 151 | tc | |
| | Hsync-CLK | Hhc | All | 10 | - | Tc-10 | ns | | |
| Vsync-Hsync | Hvh | All | 0 | 0 | 200 | tc | | | |
| Vsync | Period | Vp | 480 | - | 16.8 | - | ms | | |
| | | | | 515 | 525 | 800 | Hp | | |
| | | | | 400 | - | 14.3 | - | ms | |
| | | | | | 446 | 449 | 480 | Hp | |
| | 350 | - | 14.3 | - | ms | | | | |
| | | 447 | 449 | 510 | Hp | | | | |
| | Display period | Vdp | 480 | - | 480 | - | Hp | | |
| | | | | 400 | - | 400 | | - | |
| | | | | 350 | - | 350 | | - | |
| | Pulse width | Vpw | All | 2 | 2 | 35 | Hp | | |
| | Back-porch | Vbp | 480 | 2 | 33 | 35 | Hp | | |
| | | | | 400 | 2 | 35 | | 38 | |
| | | | | 350 | 2 | 60 | | 63 | |
| | Front-porch | Vfp | 480 | 1 | 10 | - | Hp | | |
| | | | | 400 | 1 | 12 | | - | |
| | | | | 350 | 1 | 37 | | - | |
| Vpw+Vbp | | 480 | 31 | 35 | 38 | Hp | | | |
| | | | 400 | 33 | 37 | | 40 | | |
| | | | 350 | 58 | 62 | | 65 | | |
| Data | CLK-DATA | Dcd | All | 10 | - | - | ns | | |
| | DATA-CLK | Ddc | All | 10 | - | - | ns | | |
| DENB | Horizontal scanning period | T1 | All | 780 | 800 | 900 | tc | | |
| | Horizontal display period | T2 | All | - | 640 | - | tc | | |
| | Vertical display period | T3 | All | - | 480 | - | T1 | | |
| | Frame cycling period | T4 | All | 515 | 525 | 800 | T1 | | |

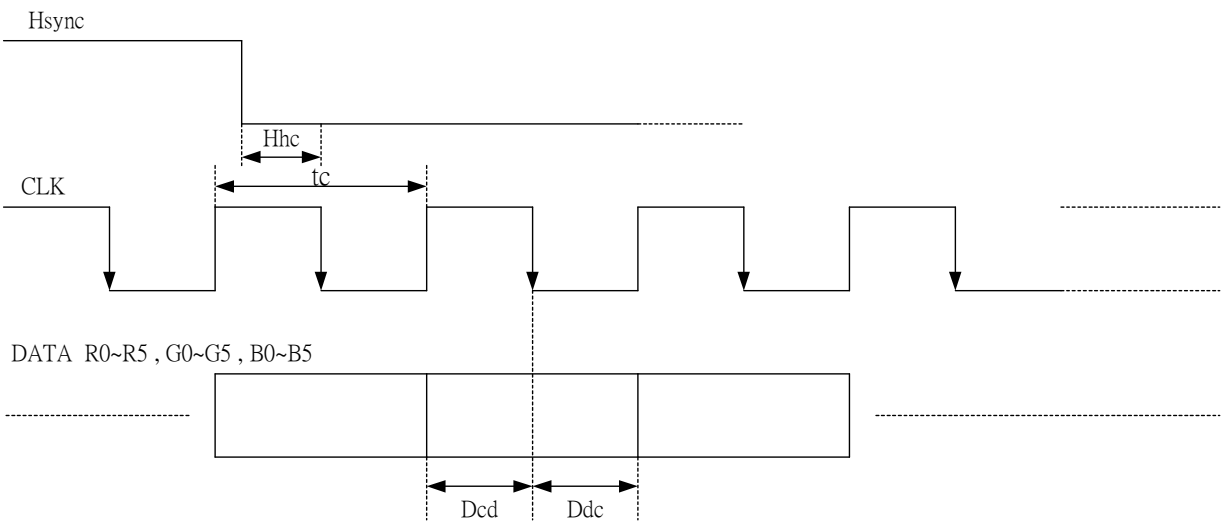
Note 7-6 : tc is the period of sampling clock. In case of low-frequency , the image-flicker may occur.

7-5) Display Time Range

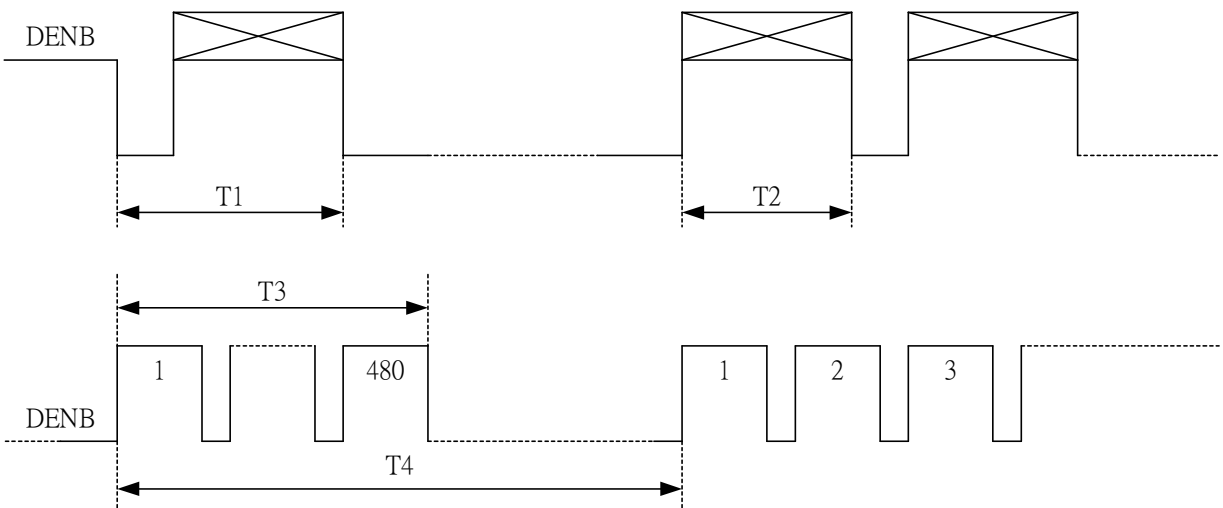
(1) Vertical Timing :



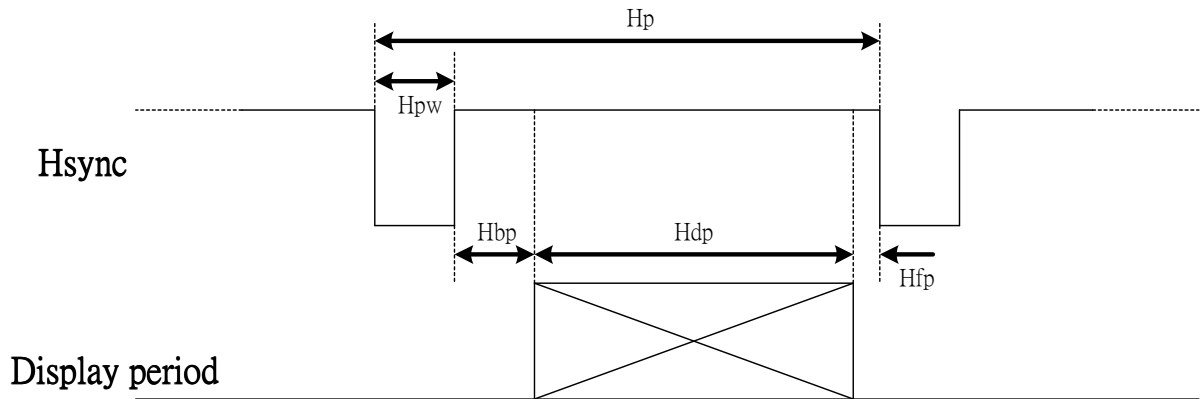
(2) Horizontal Timing :



(3) DENB Timing :



(4) Detail of Horizontal Timing :



(a) VGA-480 Mode (Hsync = Positive / Negative Polarization)

| Item | Description | Clock Cycles | Time |
|------|--------------------|--------------|----------------|
| A | Horizontal Width | 96 | 3.813 μs |
| B | Horizontal B-Porch | 48 | 1.907 μs |
| C | Horizontal Display | 640 | 25.422 μs |
| D | Horizontal F-Porch | 16 | 0.636 μs |
| E | Horizontal Total | 800 | 31.778 μs |

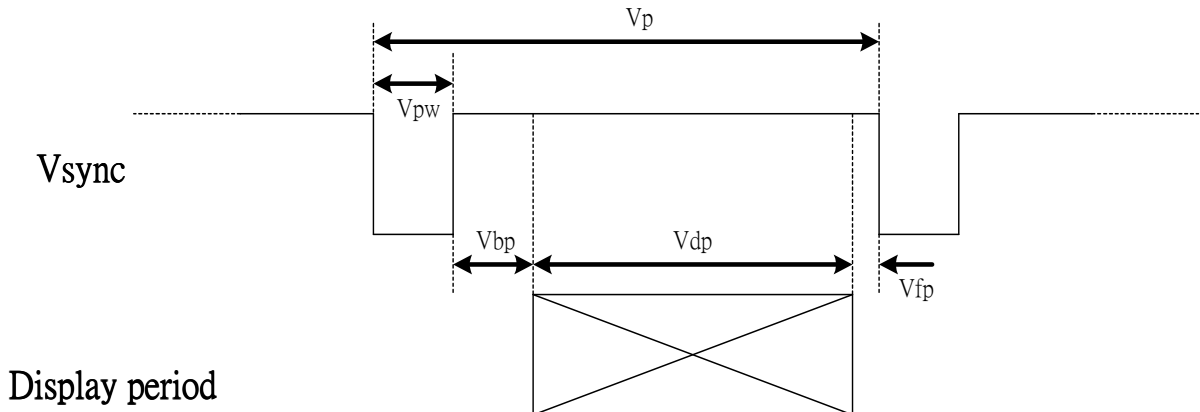
(b) VGA-400 Mode (Hsync = Negative Polarization)

| Item | Description | Clock Cycles | Time |
|------|--------------------|--------------|----------------|
| A | Horizontal Width | 96 | 3.813 μs |
| B | Horizontal B-Porch | 48 | 1.907 μs |
| C | Horizontal Display | 640 | 25.422 μs |
| D | Horizontal F-Porch | 16 | 0.636 μs |
| E | Horizontal Total | 800 | 31.778 μs |

(c) VGA-350 Mode (Hsync = Positive Polarization)

| Item | Description | Clock Cycles | Time |
|------|--------------------|--------------|----------------|
| A | Horizontal Width | 96 | 3.813 μs |
| B | Horizontal B-Porch | 48 | 1.907 μs |
| C | Horizontal Display | 640 | 25.422 μs |
| D | Horizontal F-Porch | 16 | 0.636 μs |
| E | Horizontal Total | 800 | 31.778 μs |

(5) Detail of Vertical Timing :



(a) VGA-480 Mode (Vsync = Positive / Negative Polarization)

| Item | Description | Horizontal Lines | Time |
|------|------------------|------------------|---------------|
| A | Vertical Width | 2 | 63.5 μs |
| B | Vertical B-Porch | 33 | 1.049 ms |
| C | Vertical Display | 480 | 15.253 ms |
| D | Vertical F-Porch | 10 | 317.8 μs |
| E | Vertical Total | 525 | 16.683 ms |

(b) VGA-400 Mode (Vsync = Positive Polarization)

| Item | Description | Horizontal Lines | Time |
|------|------------------|------------------|---------------|
| A | Vertical Width | 2 | 63.5 μs |
| B | Vertical B-Porch | 35 | 1.112 ms |
| C | Vertical Display | 400 | 12.711 ms |
| D | Vertical F-Porch | 12 | 381.0 μs |
| E | Vertical Total | 449 | 14.268 ms |

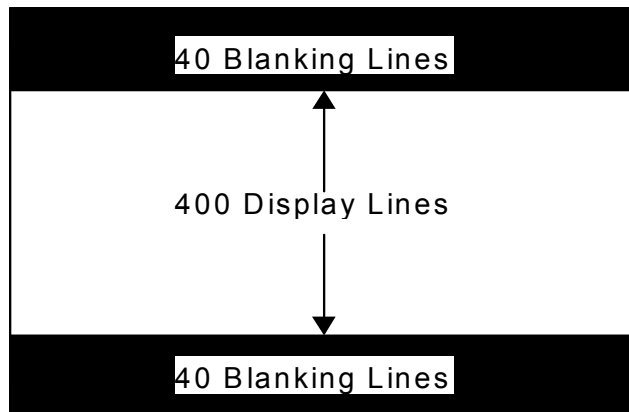
(c) VGA-350 Mode (Vsync = Negative Polarization)

| Item | Description | Horizontal Lines | Time |
|------|------------------|------------------|---------------|
| A | Vertical Width | 2 | 63.5 μs |
| B | Vertical B-Porch | 60 | 1.907 ms |
| C | Vertical Display | 350 | 11.122 ms |
| D | Vertical F-Porch | 37 | 1.176 μs |
| E | Vertical Total | 449 | 14.268 ms |

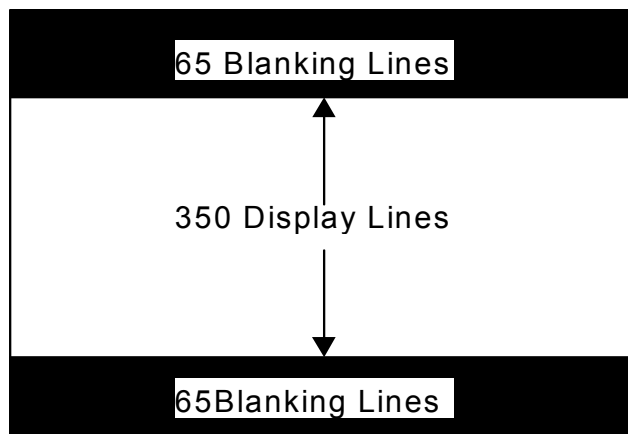
7-6) Vertical Display Position

| Mode | Hsync | Vsync | V-Start Position | V-Display | Remark |
|---------|---------------------|---------------------|------------------|-----------|----------|
| VGA-480 | Positive / Negative | Positive / Negative | 34 | 480 lines | |
| VGA-400 | Negative | Positive | 17 | 400 lines | Note 7-7 |
| VGA-350 | Positive | Negative | 30 | 350 lines | Note 7-8 |

Note 7-7 : As the format is VGA-400 (Hsync = Negative , Vsync = Positive) , LCD module will adjust the display area to the center of display . At this time , both of the upper and lower display areas have 40 blanking lines (the display color is black) . The actual display area is center 400 lines .



Note 7-8 : As the format is VGA-350 (Hsync = Positive, Vsync = Negative) , LCD module will adjust the display area to the center of display . At this time , both of the upper and lower display areas have 65 blanking lines (the display color is black) . The actual display area is center 350 lines .



7-7) Display Color and Gray Scale Reference

| Color | | Input Color Data | | | | | | | | | | | | | | | | | |
|--------------|------------|------------------|----|----|----|----|----|-------|----|----|----|----|----|------|----|----|----|----|----|
| | | Red | | | | | | Green | | | | | | Blue | | | | | |
| | | R5 | R4 | R3 | R2 | R1 | R0 | G5 | G4 | G3 | G2 | G1 | G0 | B5 | B4 | B3 | B2 | B1 | B0 |
| Basic Colors | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red (63) | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green (63) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue (63) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Cyan | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Magenta | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Yellow | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 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 |
| Red | Red (00) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red (01) | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red (02) | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Darker | | | | | | | | | | | | | | | | | | |
| | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ |
| | Brighter | | | | | | | | | | | | | | | | | | |
| | Red (61) | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red (62) | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Red (63) | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Green | Green (00) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green (01) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green (02) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Darker | | | | | | | | | | | | | | | | | | |
| | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ |
| | Brighter | | | | | | | | | | | | | | | | | | |
| | Green (61) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green (62) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Green (63) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Blue | Blue (00) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue (01) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | Blue (02) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | Darker | | | | | | | | | | | | | | | | | | |
| | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ |
| | Brighter | | | | | | | | | | | | | | | | | | |
| | Blue (61) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 |
| | Blue (62) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 |
| Blue (63) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | |

7-8) Control Board Dip Switch Format

SW1(8 Pins)

| Item | Symbol | Condition | Remark |
|--------|--------|---------------------------|---------------|
| SW 1-1 | - | No connection | Default (OFF) |
| SW 1-2 | HP3 | Horizontal Shift (8 Line) | Default (ON) |
| SW 1-3 | HP2 | Horizontal Shift (4 Line) | Default (OFF) |
| SW 1-4 | HP1 | Horizontal Shift (2 Line) | Default (OFF) |
| SW 1-5 | HP0 | Horizontal Shift (1 Line) | Default (ON) |
| SW 1-6 | VP2 | Vertical Shift (4 Line) | Default (OFF) |
| SW 1-7 | VP1 | Vertical Shift (2 Line) | Default (ON) |
| SW 1-8 | VP0 | Vertical Shift (1Line) | Default (ON) |

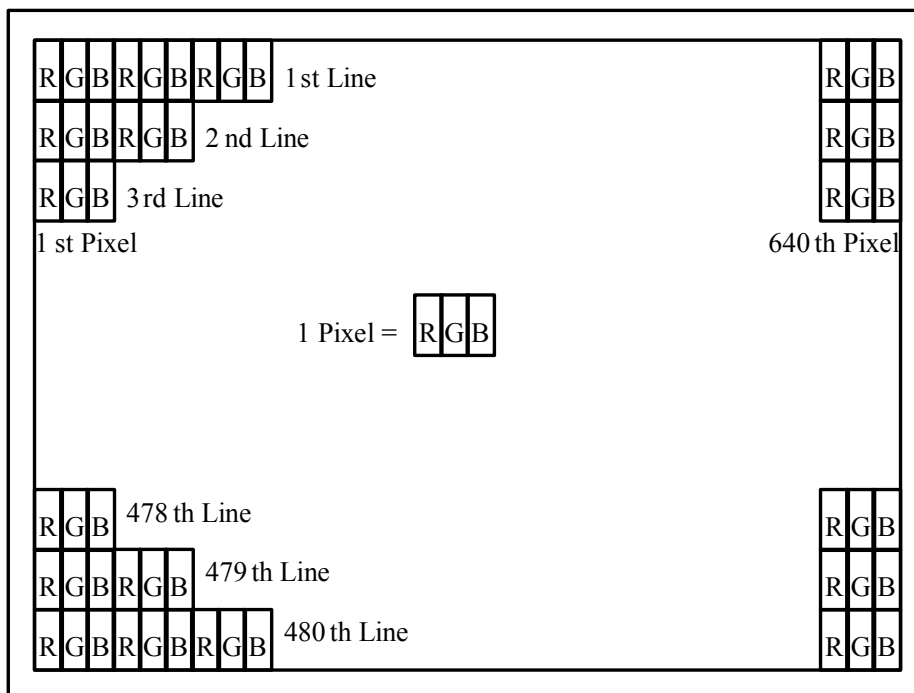
1. The default state is base on SYNC. mode (VGA-480)
2. Total horizontal shift line are 15 lines (HP0~HP3 on)
Total vertical shift line are 7 lines (VP0~VP2 on)

SW2 (2 Pins)

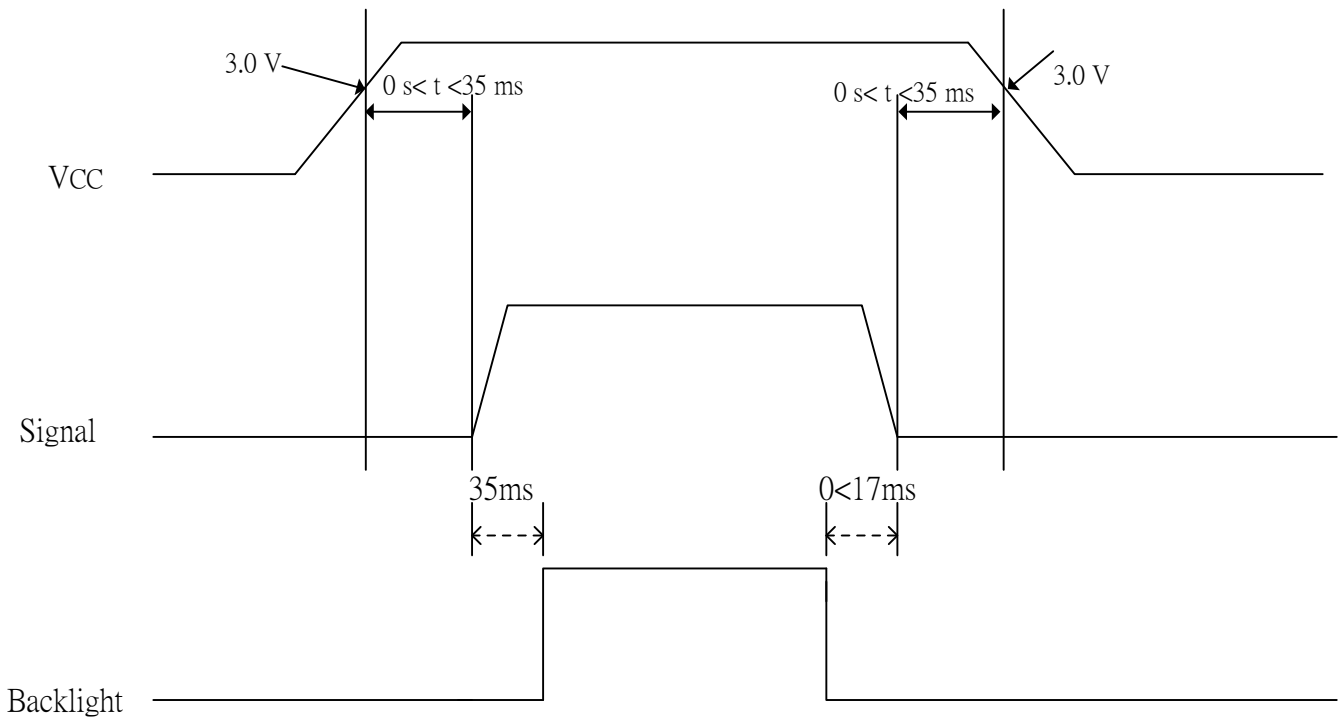
| Item | Symbol | Condition | Remark |
|--------|--------|---|--------------|
| SW 2-1 | UD | Vertical Image Shift-direction Select | Default (ON) |
| SW 2-2 | RL | Horizontal Image Shift-direction Select | Default (ON) |

7-9) Pixel Arrangement

The LCD module pixel arrangement is the stripe.



8. Power On Sequence



1. The supply voltage for input signals should be same as V_{CC} .
2. When the power is off , please keep whole signals (Hsync, Vsync, CLK, Data) low level or high impedance

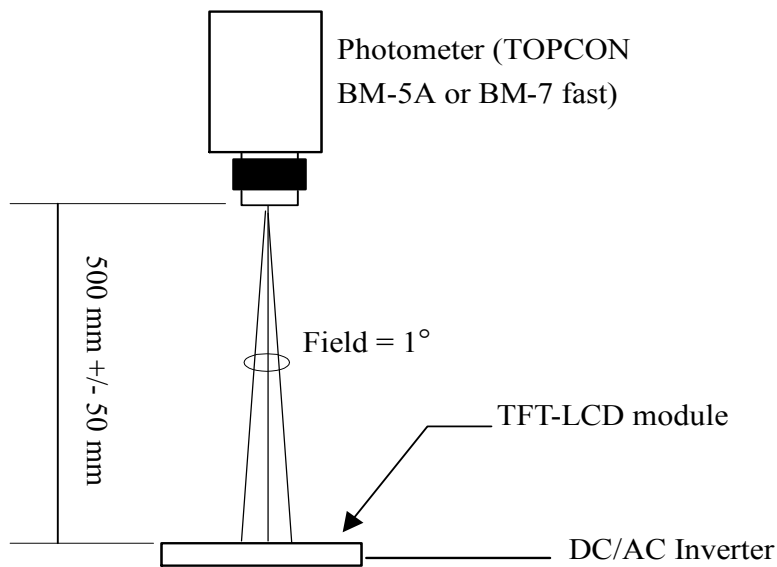
9. Optical Characteristic

9-1) Specification :

Ta=25°C

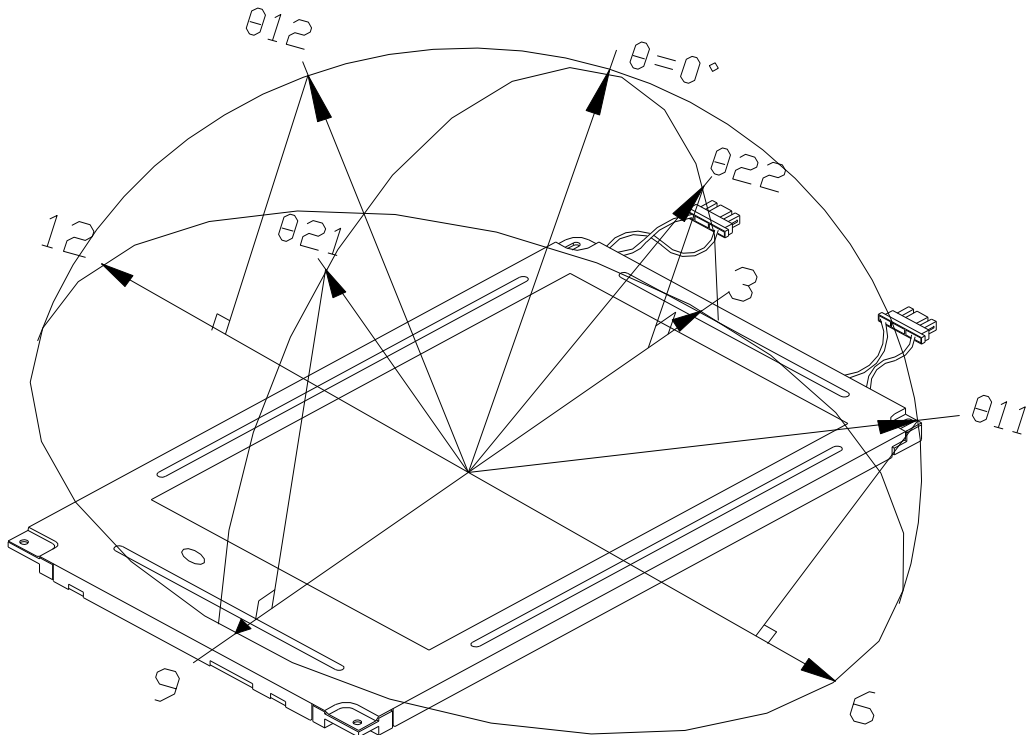
| Parameter | | Symbol | Condition | MIN. | TYP. | MAX. | Unit | Remarks |
|--------------------|------------|------------------------|----------------------------|------|------|------|-------------------|----------|
| Viewing Angle | Horizontal | $\theta 21, \theta 22$ | CR > 10 | 55 | 60 | - | deg | Note 9-1 |
| | Vertical | $\theta 12$ | | 35 | 40 | - | deg | |
| | | $\theta 11$ | | 50 | 55 | - | deg | |
| Contrast Ratio | | CR | At optimized Viewing angle | TBD | TBD | - | - | Note 9-2 |
| Brightness | | L | $\theta = 0^\circ$ | TBD | 1500 | - | cd/m ² | Note 9-3 |
| Response time | Rise | Tr | $\theta = 0^\circ$ | - | 15 | 30 | ms | Note 9-4 |
| | Fall | Tf | | - | 25 | 50 | ms | |
| Uniformity | | U | | (75) | (80) | - | % | Note 9-5 |
| Cross Talk | | - | $\theta = 0^\circ$ | - | - | 3.5 | % | Note 9-6 |
| White Chromaticity | | x | $\theta = 0^\circ$ | TBD | TBD | TBD | - | Note 9-3 |
| | | y | | TBD | TBD | TBD | - | |
| LED Life Time | | - | +25°C | TBD | - | - | hr | Note 9-7 |

All the optical measurement shall be executed 30 minutes after backlight being turn-on. The optical characteristics shall be measured in dark room (ambient illumination on panel surface less than 1 Lux). The measuring configuration shows as following figure.



Optical characteristics measuring configuration

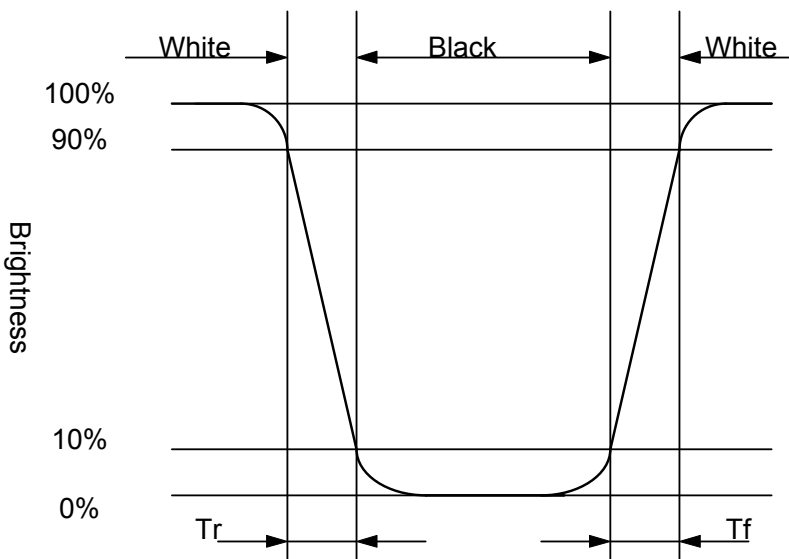
Note 9-1 : The definitions of viewing angle diagrams :



Note 9-2 : $CR = \frac{\text{Luminance when LCD is White}}{\text{Luminance when LCD is Black}}$
 Contrast Ratio is measured in optimum common electrode voltage.

Note 9-3 : 1. Topcon BM-7 (fast) luminance meter 1° field of view is used in the testing (after 20~30 minutes operation).
 2.LED current : **300 mA**(1 light bar)
 3.Inverter model : TDK-347.

Note 9-4 : The definitions of response time



Note 9-5 : The uniformity of LCD is defined as

$$U = \frac{\text{The Minimum Brightness of the 9 testing Points}}{\text{The Maximum Brightness of the 9 testing Points}}$$

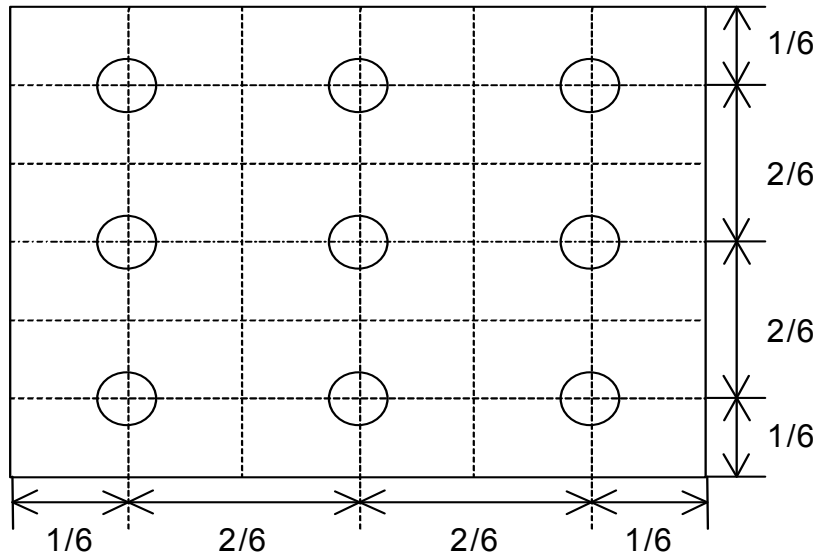
Luminance meter : BM-5A or BM-7 fast (TOPCON)

Measurement distance : 500 mm +/- 50 mm

Ambient illumination : < 1 Lux

Measuring direction : Perpendicular to the surface of module

The test pattern is white (Gray Level 63).

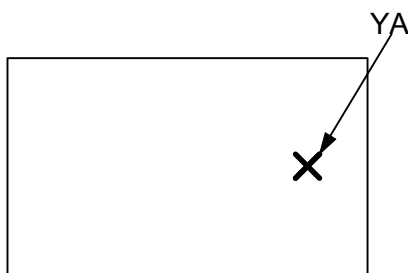


Note 9-6 : Cross Talk (CTK) = $\frac{|Y_A - Y_B|}{Y_A} \times 100\%$

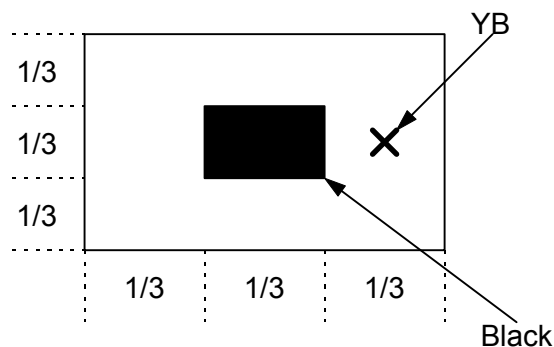
Y_A : Brightness of Pattern A

Y_B : Brightness of Pattern B

Pattern A
(Gray Level 46)



Pattern B
(Gray Level 46, central black box exclusive)



X: Testing Point (A and B are at the same point.)

(Gray Level 0)

Note 9-7: The “LED Life time “ is defined as the module brightness decrease to 50% original Brightness that the ambient temperature is 25°C and I_{LED} =150mA.

10. Handling Cautions

10-1) Mounting of module

- a) Please power off the module when you connect the input/output connector.
- b) Polarizer which is made of soft material and susceptible to flaw must be handled carefully.
- c) Protective film (Laminator) is applied on surface to protect it against scratches and dirt. It is recommended to peel off the laminator before use and taking care of static electricity.

10-2) Precautions in mounting

- a) When metal part of the TFT-LCD module (shielding lid and rear case) is soiled, wipe it with soft dry cloth.
- b) Wipe off water drops or finger grease immediately. Long contact with water may cause discoloration or spots.
- c) TFT-LCD module uses glass which breaks or cracks easily if dropped or bumped on hard surface. Please handle with care.
- d) Since CMOS LSI is used in the module. So take care of static electricity and earth yourself when handling.

10-3) Adjusting module

- a) Adjusting volumes on the rear face of the module have been set optimally before shipment.
- b) Therefore, do not change any adjusted values. If adjusted values are changed, the specifications described may not be satisfied.

10-4) Others

- a) Do not expose the module to direct sunlight or intensive ultraviolet rays for many hours.
- b) Store the module at a room temperature place.
- c) The voltage of beginning electric discharge may over the normal voltage because of leakage current from approach conductor by to draw lump read lead line around.
- d) If LCD panel breaks, it is possibly that the liquid crystal escapes from the panel. Avoid putting it into eyes or mouth. When liquid crystal sticks on hands, clothes or feet. Wash it out immediately with soap.
- e) Observe all other precautionary requirements in handling general electronic components.
- f) Please adjust the voltage of common electrode as material of attachment by 1 module.

11. Reliability Test

| No | Test Item | Test Condition |
|----|---|---|
| 1 | High Temperature Storage Test | Ta = +80 °C, 240 hrs |
| 2 | Low Temperature Storage Test | Ta = -30 °C, 240 hrs |
| 3 | High Temperature Operation Test | (Ta = +70 °C, 240 hrs) |
| 4 | Low Temperature Operation Test | Ta = -20 °C, 240 hrs |
| 5 | High Temperature & High Humidity Operation Test | Ta = +60 °C, 90%RH, 240 hrs |
| 6 | Thermal Cycling Test (non-operating) | -25°C → +70°C, 200 Cycles 30 min 30 min |
| 7 | Shock Test (non-operating) | Gravity :490m/s Direction: ±X, ±Y, ±Z Pulse Width :11ms, half sine wave |
| 8 | Vibration Test (non-operating) | Frequency : 10 ~ 57 Hz/Vibration Width :0.075mm 58-500 H// Gravity :9.8m/s Sweep time: 11 minutes Test period: 3 hrs for each direction of X, Y, Z |
| 9 | Electrostatic Discharge Test (non-operating) | 150pF, 330Ω Air : ±15KV ; Contact : ±8KV 10 times/point , 9 points/panel face |

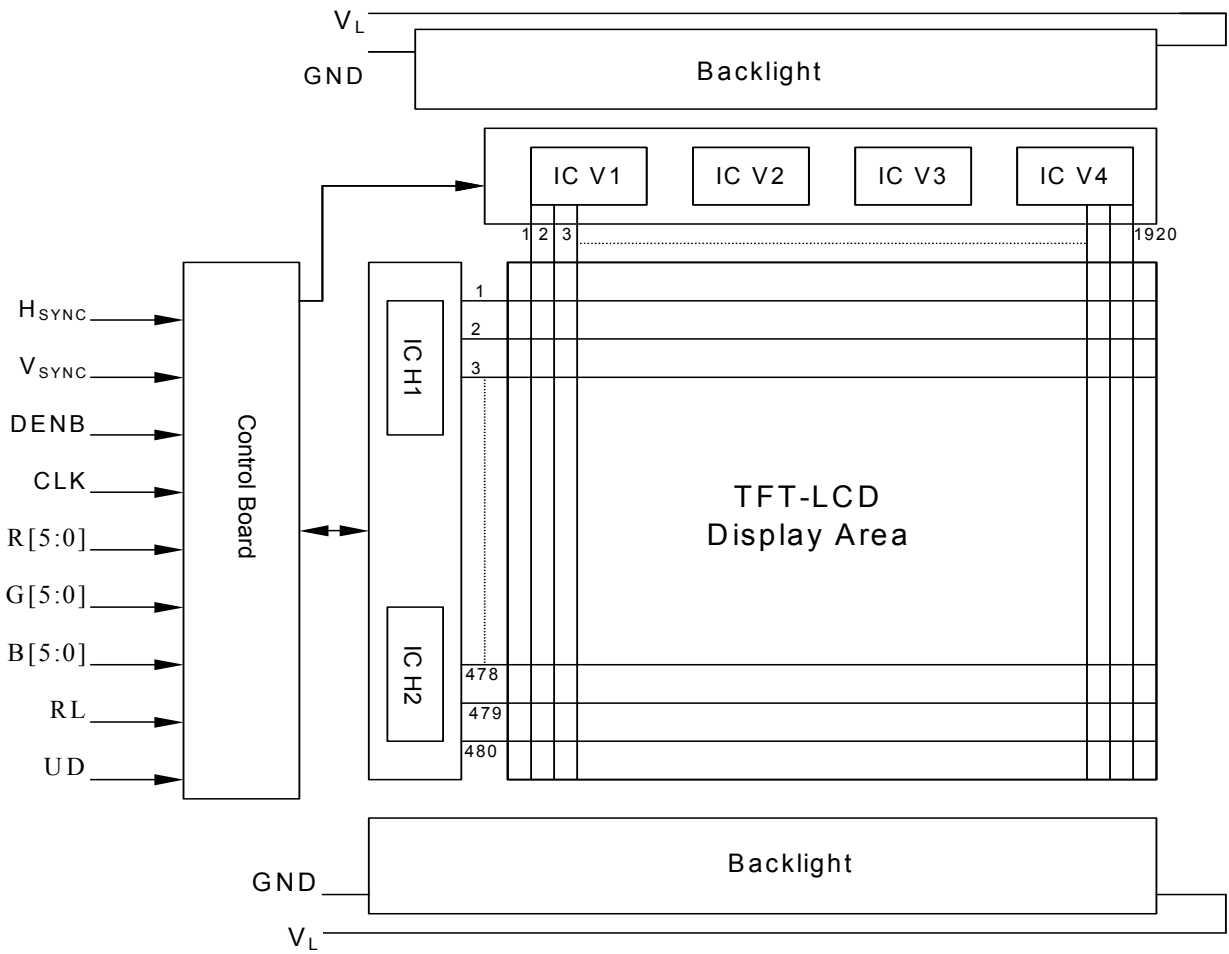
Ta: ambient temperature

Note : The protective film must be removed before temperature test.

[Criteria]

In the standard conditions, there is not display function NG issue occurred. (including : line defect ,no image).All the cosmetic specification is judged before the reliability stress.

12. Block Diagram



13. Packing
TBD