

# SPECIFICATION OF LCD MODULE

MODULE NO: AFY480272A0-4.3N6NTM-R

Customer Approval:

☐ Accept

☐ Reject

| FUTURE FOCUS | SIGNATURE | DATE |
|--------------|-----------|------|
| PREPARED BY  |           |      |
| CHECKED BY   |           |      |
| APPROVED BY  |           |      |



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## **NUMBER SYSTEM INTRODUCTION:**

AFY480272A0-4.3N6NTM-R:

**AF:** Orient Display TFT;

**Y:** JAZZ TFT;

**480272:** Length \* width pixel;

**A0:** Product Version;

**4.3:** Diagonal Dimension;

**N:** LCD Mode (N: TN; I: IPS; V: VA)

**6:** Viewing Direction (6-> 6:00; 12->12:00; Unavailable for IPS and VA);

**N:** Temperature Range (N: Normal; W: Wide);

**T:** Polarizer (T:Transmissive; F:Transflective);

**M:** Luminance (N: Normal <300 nit; M: Middle >=300 & <600 nit;

H: High >=600 nit);

**R:** TP Option (R: Resistive TP; C: Capacitive TP; N: Without TP);

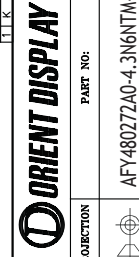
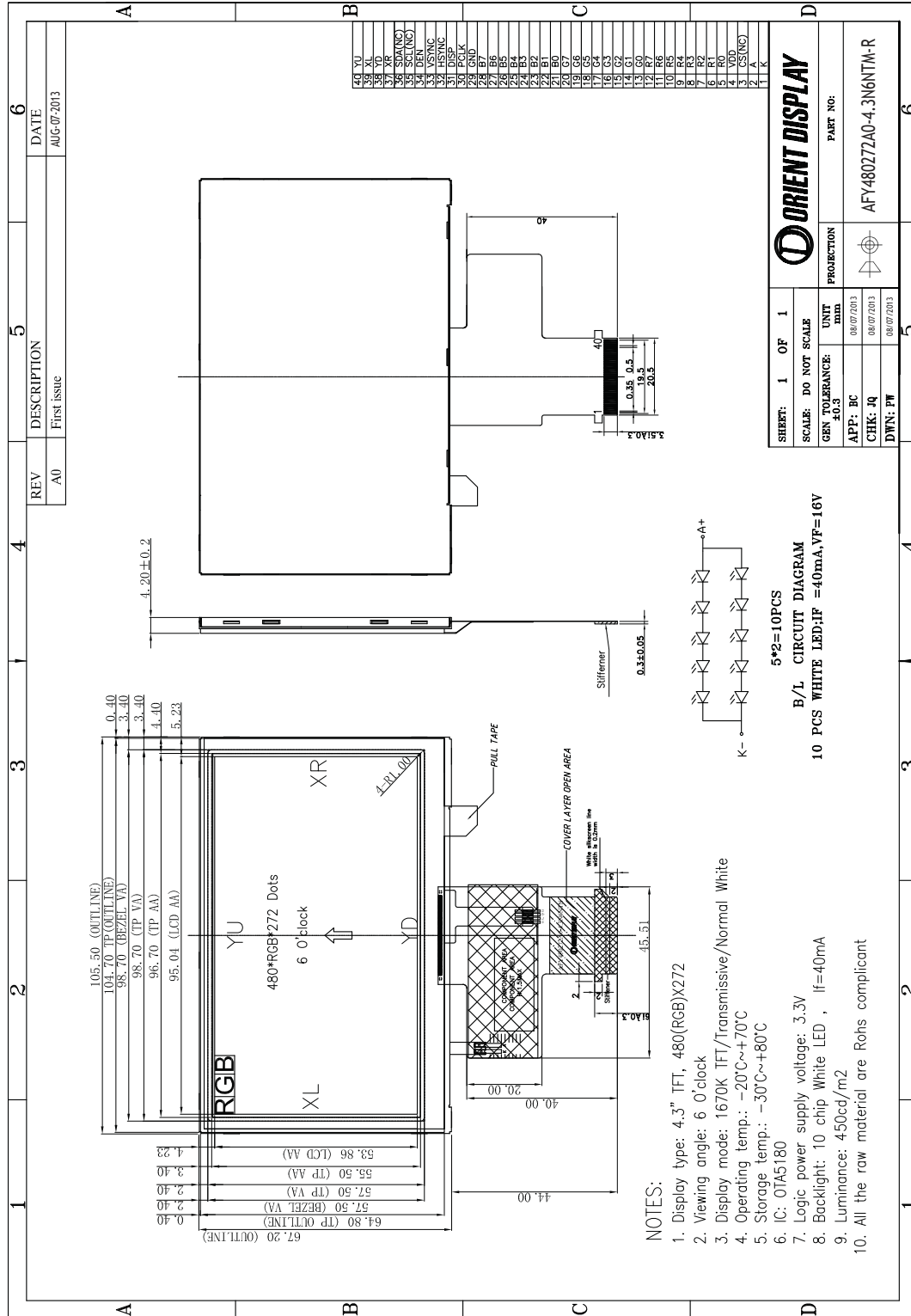
## **1. GENERAL SPECIFICATIONS**

| ITEM                           | SPECIFICATION                | UNIT |
|--------------------------------|------------------------------|------|
| OUTLINE DIMENSIONS             | 105.5 (W) X67.2 (H) X4.2 (D) | mm   |
| DISPLAY SIZE                   | 4.3                          | inch |
| DOT PITCH                      | 0.198mmX0.198mm              | mm   |
| NUMBER OF DOTS                 | 480* (RGB) *272              | -    |
| DRIVER IC                      | OTA5180A                     | -    |
| LCD TYPE                       | TFT(16.7M) TRANSMISSIVE      | -    |
| INTERFACE                      | RGB 24BITS                   | -    |
| BACKLIGHT TYPE                 | LED White                    | -    |
| VIEWING DIRECTION              | 6 O'clock                    | -    |
| GRAY SCALE INVERSION DIRECTION | 6 O'clock                    |      |

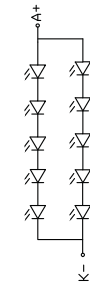
**\*See attached drawing for details.**



### 3. DIMENSIONAL OUTLINE



|                     |                     |            |                       |                                 |
|---------------------|---------------------|------------|-----------------------|---------------------------------|
| SHEET: 1 OF 1       | SCALE: DO NOT SCALE | UNIT: mm   | PROJECTION: 1st Angle | PART NO: AFY480272A0-4.3N6NTM-R |
| GEN TOLERANCE: ±0.3 | APP: BC             | CHK: IQ    | DWN: PW               |                                 |
| 08/07/2013          | 08/07/2013          | 08/07/2013 |                       |                                 |



5\*2=10PCS  
B/L CIRCUIT DIAGRAM  
10 PCS WHITE LED-IF =40mA,VF=1.6V

- Display type: 4.3" TFT, 480(RGB)X272
- Viewing angle: 6 O'clock
- Display mode: 1670K TFT/Transmissive/Normal White
- Operating temp.: -20°C~+70°C
- Storage temp.: -30°C~+80°C
- IC: 07A5180
- Logic power supply voltage: 3.3V
- Backlight: 10 chip White LED, If=40mA
- Luminance: 450cd/m2
- All the raw material are Rohs compliant

#### 4. PIN DESCRIPTION

| NO. | PIN NAME | Type | Description                     |
|-----|----------|------|---------------------------------|
| 1   | LED-     | P    | Power supply for LED (Cathode)  |
| 2   | LED+     | P    | Power supply for LED (Anode)    |
| 3   | CS (NC)  | -    | No connection                   |
| 4   | VDD      | P    | Power voltage                   |
| 5   | R0       | I    | RED data signal(LSB)            |
| 6   | R1       | I    | RED data signal                 |
| 7   | R2       | I    | RED data signal                 |
| 8   | R3       | I    | RED data signal                 |
| 9   | R4       | I    | RED data signal                 |
| 10  | R5       | I    | RED data signal                 |
| 11  | R6       | I    | RED data signal                 |
| 12  | R7       | I    | RED data signal(MSB)            |
| 13  | G0       | I    | GREEN data signal(LSB)          |
| 14  | G1       | I    | GREEN data signal               |
| 15  | G2       | I    | GREEN data signal               |
| 16  | G3       | I    | GREEN data signal               |
| 17  | G4       | I    | GREEN data signal               |
| 18  | G5       | I    | GREEN data signal               |
| 19  | G6       | I    | GREEN data signal               |
| 20  | G7       | I    | GREEN data signal(MSB)          |
| 21  | B0       | I    | BLUE data signal(LSB)           |
| 22  | B1       | I    | BLUE data signal                |
| 23  | B2       | I    | BLUE data signal                |
| 24  | B3       | I    | BLUE data signal                |
| 25  | B4       | I    | BLUE data signal                |
| 26  | B5       | I    | BLUE data signal                |
| 27  | B6       | I    | BLUE data signal                |
| 28  | B7       | I    | BLUE data signal(MSB)           |
| 29  | GND      | I    | Ground(0V)                      |
| 30  | DOTCLK   | I    | Pixel clock signal              |
| 31  | DISP     | I    | Display on/ off                 |
| 32  | HSYNC    | I    | Horizontal synchronizing signal |
| 33  | VSYNC    | I    | Vertical synchronizing signal   |
| 34  | DE       | I    | Data enable                     |
| 35  | SCL (NC) | -    | No connection                   |
| 36  | SDA (NC) | -    | No connection                   |
| 37  | XR       | -    | TP: X right                     |
| 38  | YD       | -    | TP: Y bottom                    |
| 39  | XL       | -    | TP: X left                      |
| 40  | YU       | -    | TP: Y top                       |

**Note:** I: input, O: output, P: Power

## 5. ELECTRICAL CHARACTERISTICS

### 5.1 Absolute Maximum Ratings

| Item                  | Symbol | Values |     | Unit | Remark |
|-----------------------|--------|--------|-----|------|--------|
|                       |        | Min    | Max |      |        |
| Power Supply for Pump | VDD    | -0.3   | 4.5 | V    |        |

Note: Stresses beyond those given in the Absolute Maximum Rating table may cause operational errors or damage to the device. For normal operational conditions see AC/DC Electrical Characteristics

### 5.2 DC Characteristics

#### 5.2.1 Operating Conditions

| Item                       | Symbol      | Values |     |       | Unit | Conditions |
|----------------------------|-------------|--------|-----|-------|------|------------|
|                            |             | Min    | Typ | Max   |      |            |
| Charge Pump Supply Voltage | PVDD        | 3      | 3.3 | 3.6   | V    | PWR_SEL=H  |
| Digital Supply Voltage     | VDD         | 3      | 3.3 | 3.6   | V    | PWR_SEL=H  |
| Digital Interface Supply   | VDDIO       | 1.65   | 1.8 | VDD   | V    |            |
| Digital Input Voltage      | Di          | 0      | -   | VDDIO | V    |            |
| OTP Supply Voltage         | V_OTP       | 7.4    | 7.5 | 7.6   | V    |            |
| VCOM AC Voltage            | VCOMH-VCOML | 3.46   | -   | 6.2   | V    |            |

#### 5.2.2 DC Characteristics for Digital Circuit

| Item                      | Symbol | Values    |      |           | Unit | Conditions |
|---------------------------|--------|-----------|------|-----------|------|------------|
|                           |        | Min       | Typ  | Max       |      |            |
| Low Level Input Voltage   | Vil    | GND       | -    | 0.3xVDDIO | v    |            |
| High Level Input Voltage  | Vih    | 0.7xVDDIO | -    | VDDIO     | uA   |            |
| High Level Output Voltage | Voh    | VDDIO-0.4 | -    | VDDIO     | ohm  |            |
| Low Level Output Voltage  | Vol    | GND       | -    | GND+0.4   | uA   |            |
| Input Leakage Current     | Iil    |           |      | ±1.0      |      |            |
| Pull High/Low Resistor    | Rp     | -         | 100K | -         | ohm  |            |

### 5.2.3 DC Characteristics for Analog Circuit

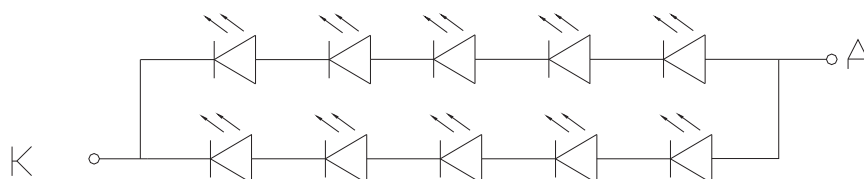
VDDIO=1.8V, VDD = 3.3V, AVDD = 6V, AGND = 0V, TA = -20°C to 80°C

| Item                           | Symbol            | Values |     |      | Unit | Conditions                       |
|--------------------------------|-------------------|--------|-----|------|------|----------------------------------|
|                                |                   | Min    | Typ | Max  |      |                                  |
| Analog Supply Voltage          | VDD2              |        | 5   |      | V    |                                  |
| Positive High-voltage power    | VGH               | 9      | 15  | 16   | V    | No Load. By VGH_SEL setting.     |
| Negative High-voltage power    | VGL               | -11    | -10 | -7   | V    | No Load. By VGL_SEL setting.     |
| VCOMH Output Level             | VCOMH             | 3.26   |     | 5.8  | V    | By VCOMH setting.                |
| VCOML Output Level             | VCOML             | -2     |     | -0.2 | V    | By VCOML setting                 |
| Output Voltage Deviation       | Vod               | -      | ±20 | ±35  | mV   | VO = 0.15V ~ 0.5V,<br>3.45V~3.8V |
|                                |                   | -      | ±15 | ±20  |      | VO = 0.5V ~ 3.45V                |
| Output Dynamic Range           | Vdr               | 0.2    | -   | 5.3  |      | MVA Mode                         |
|                                |                   | 0.15   |     | 4.8  |      | TN Mode                          |
| VCOM Low Level Output Current  | IOLFRP            |        | -10 |      | mA   | VCOM AC output = 0.5V            |
| VCOM High Level Output Current | IOHFRP            |        | -10 |      | mA   | VCOM AC output = 5.7V            |
| Analog Standby Current         | I <sub>last</sub> | -      | -   | 20   | uA   |                                  |
| Analog Operation Current       | IDD               | -      | 5.0 | -    | mA   | Without panel loading            |

### 5.3 DC Backlight Unit

| Item                       | Symbol          | Min   | Typ   | Max   | Unit              | Remark        |
|----------------------------|-----------------|-------|-------|-------|-------------------|---------------|
| Average luminous Intensity | I <sub>v</sub>  |       | 450   |       | cd/m <sup>2</sup> | IF=40mA       |
| Chromaticity Coordinates   | X               | 0.234 | 0.284 | 0.334 |                   | IF=40mA       |
|                            | Y               | 0.273 | 0.323 | 0.373 |                   | IF=40mA       |
| Forward Voltage            | V <sub>F</sub>  |       | 16.0  | 17.0  | V                 | IF=40mA       |
| Reverse Current            | I <sub>R</sub>  |       |       | 50    | μA                | VR=20V, 1LED  |
| Luminous Tolerance         | IV-M            | 80    |       |       | %                 | (MIN/MAX)×100 |
| Power Dissipation          | P <sub>d</sub>  | 640   |       |       | mW                |               |
| Peak Forward Current       | I <sub>fp</sub> | 100   |       |       | mA                |               |
| Reverse Voltage            | V <sub>R</sub>  | 5     |       |       | V                 |               |

### 5.3.1 Internal Circuit Diagram

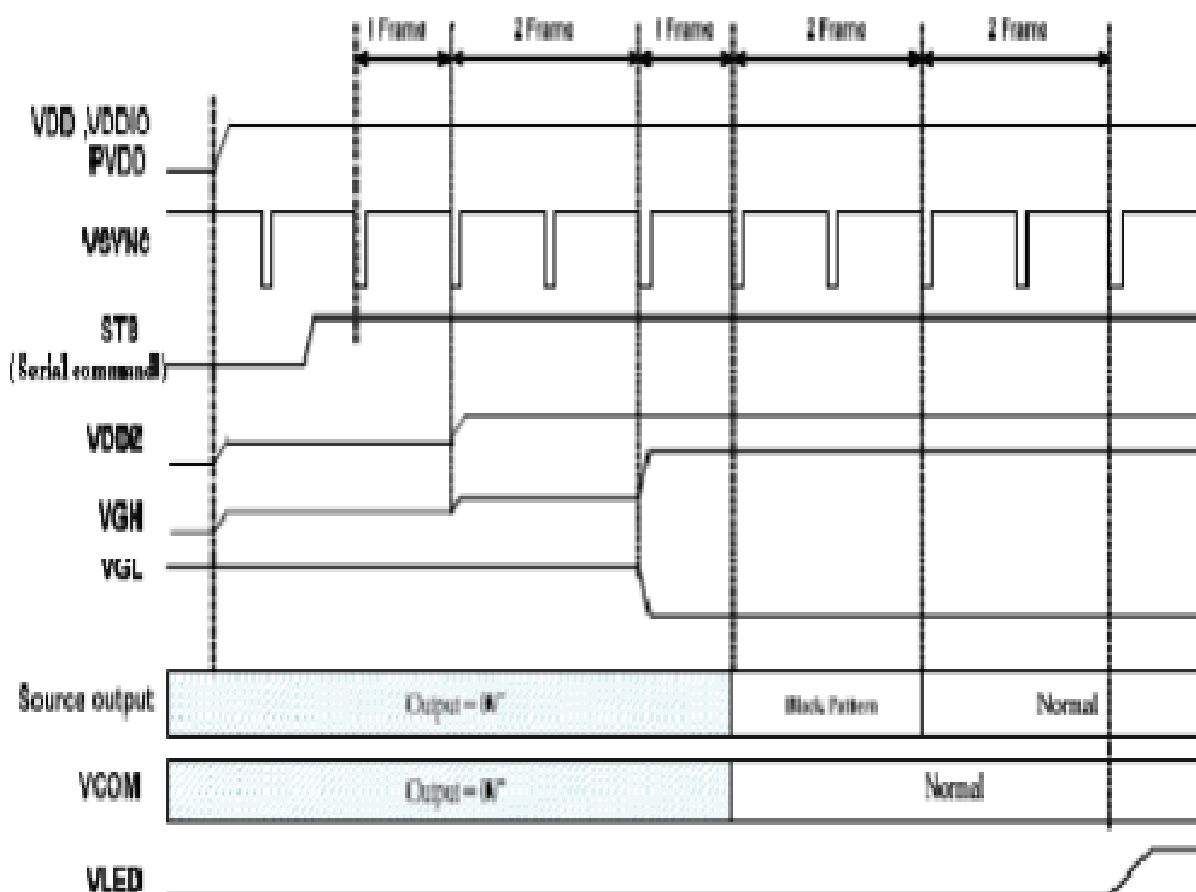


### B/L CIRCUIT DIAGRAM

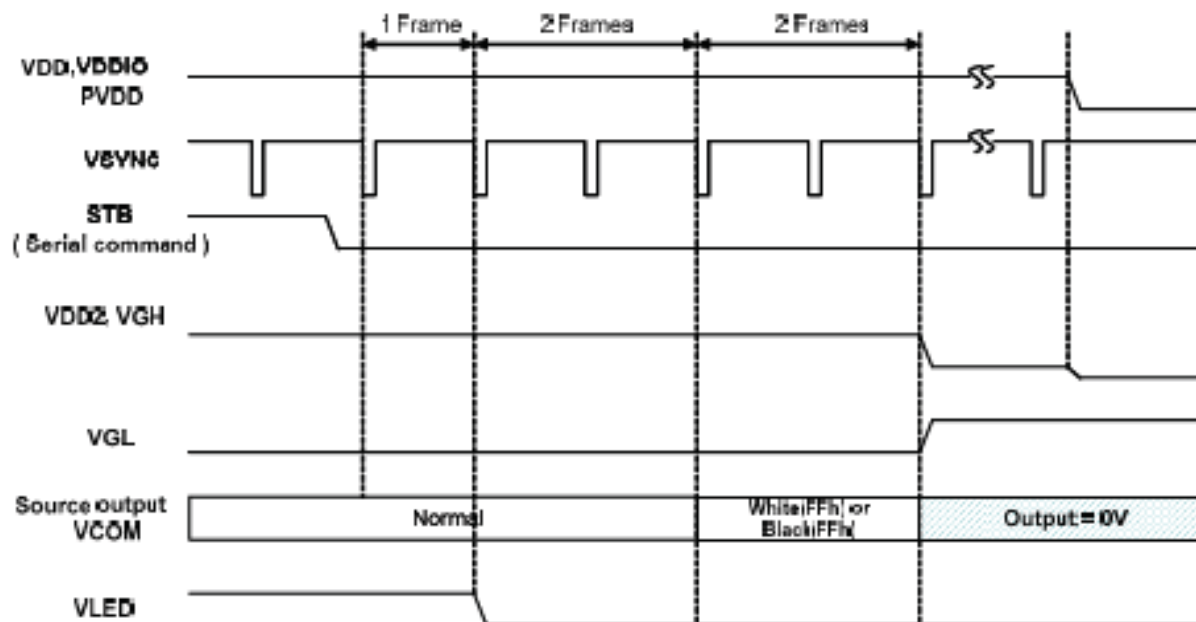
10 PCS WHITE LED;  $I_F = 40\text{mA}$ ,  $V_F = 16\text{V}$

### 5.4 POWER SEQUENCE

#### Power On Sequence



## Power Off Sequence



### Note:

- When normally-black LC is used, please send black pattern to discharge the panel.
- When normally-white LC is applied, please send white pattern to discharge the pane

## 6. INPUT SIGNAL TIMING

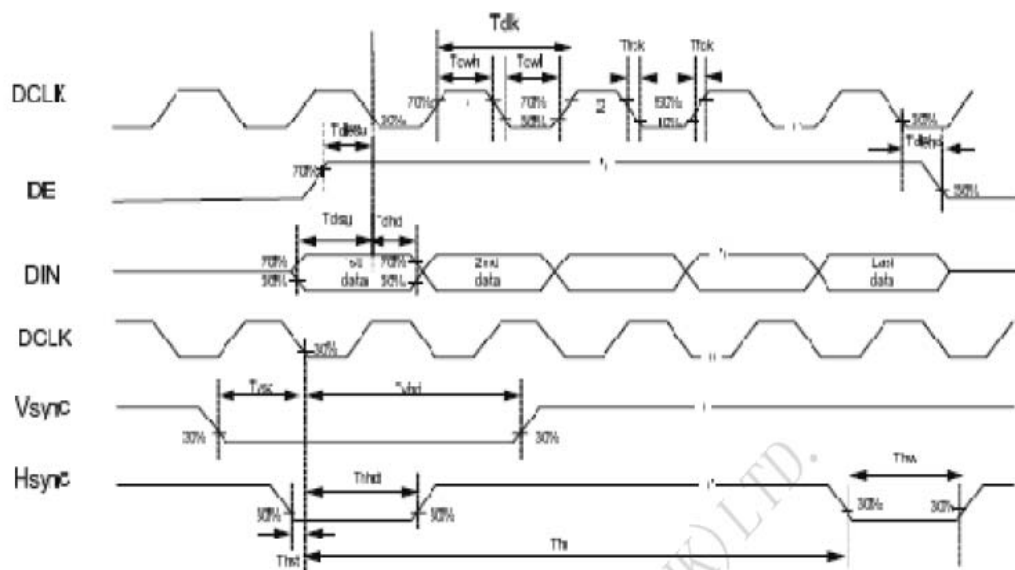
### 6.1 AC Characteristics

VDDIO=1.8V, VDD = 3.3V, AVDD = 6V, AGND = 0V, TA = -20°C to 80°C

| Item                         | Symbol            | Min | Typ | Max  | Unit | Note |
|------------------------------|-------------------|-----|-----|------|------|------|
| CLK pulse duty               | T <sub>cw</sub>   | 40  | 50  | 60   | %    |      |
| Hsync width                  | T <sub>hw</sub>   | 1.0 | -   | -    | DCLK |      |
| Hsync period                 | T <sub>h</sub>    | 55  | 60  | 65   | us   |      |
| Vsync setup time             | T <sub>vst</sub>  | 12  | -   | -    | ns   |      |
| Vsync hold time              | T <sub>vhd</sub>  | 12  | -   | -    | ns   |      |
| Hsync setup time             | T <sub>hst</sub>  | 12  | -   | -    | ns   |      |
| Hsync hold time              | T <sub>hhd</sub>  | 12  | -   | -    | ns   |      |
| Data set-up time             | T <sub>dsu</sub>  | 12  | -   | -    | ns   |      |
| Data hold time               | T <sub>dhd</sub>  | 12  | -   | -    | ns   |      |
| DE set-up time               | T <sub>desu</sub> | 12  | -   | -    | ns   |      |
| DE hold time                 | T <sub>dehd</sub> | 12  | -   | -    | ns   |      |
| SD output stable time        | T <sub>st</sub>   | -   | 10  | 12   | us   |      |
| GD output rise and fall time | T <sub>gst</sub>  | -   | 500 | 1000 | ns   |      |

### 6.2 AC Timing Diagram

Clock and Data Input Timing Diagram

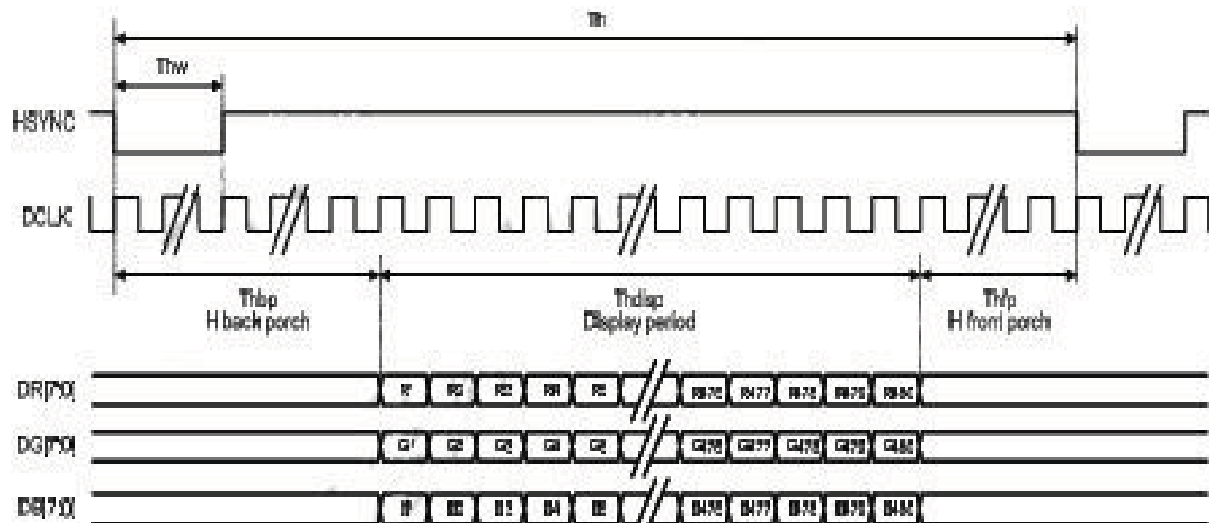


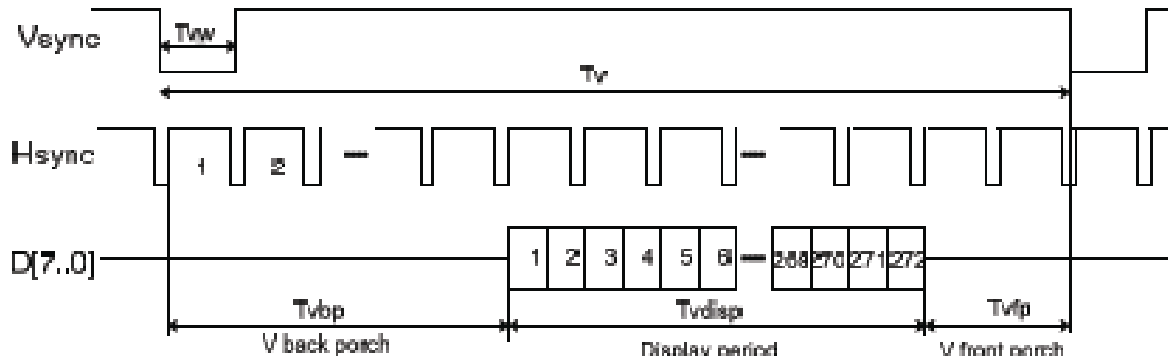
### 6.3 Parallel RGB Data Format

#### 6.3.1 Parallel RGB Input Timing Table

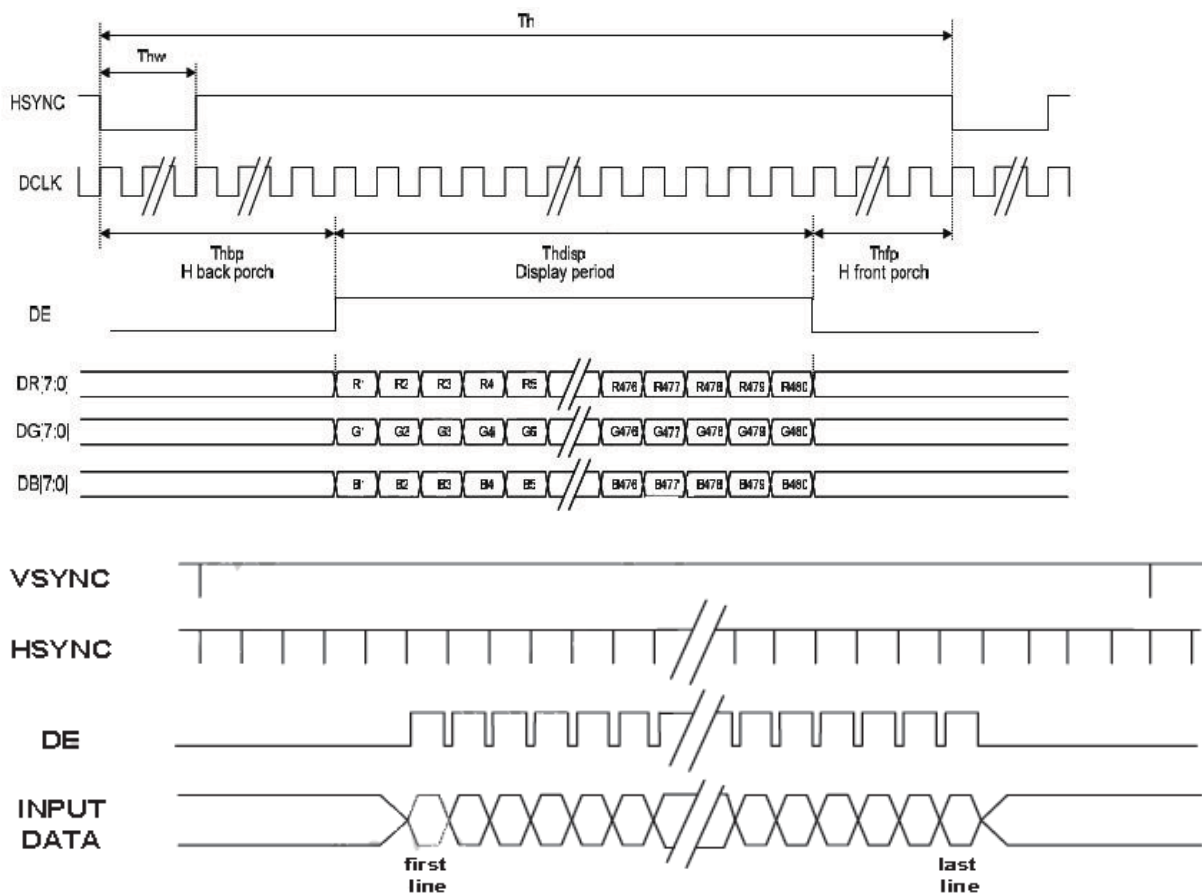
| Item           |                | Symbol | Min | Typ | Max | Unit | Note                  |
|----------------|----------------|--------|-----|-----|-----|------|-----------------------|
| DCLK Frequency |                | Fclk   | 5   | 9   | 12  | MHz  |                       |
| DCLK Period    |                | Tclk   | 83  | 110 | 200 | ns   |                       |
| Hsync          | Period Time    | Th     | 490 | 531 | 605 | DCLK |                       |
|                | Display Period | Thdisp |     | 480 |     | DCLK |                       |
|                | Back Porch     | Thbp   | 8   | 43  |     | DCLK | By H_BLANKING Setting |
|                | Front Porch    | Thfp   | 2   | 8   |     | DCLK |                       |
|                | Pulse Width    | Thw    | 1   |     |     | DCLK |                       |
| Vsync          | Period Time    | Tv     | 275 | 288 | 335 | H    |                       |
|                | Display Period | Tvdisp |     | 272 |     | H    |                       |
|                | Back Porch     | Tvbp   | 2   | 12  |     | H    | ByV_BLANKING Setting  |
|                | Front Porch    | Tvfp   | 1   | 4   |     | H    |                       |
|                | Pulse Width    | Tvw    | 1   | 10  |     | H    |                       |

#### 6.3.1 SYNC Mode Timing Diagram





### 6.3.2 SYNC-DE Mode Timing Diagram



### 6.4 Controller Information

IC: OTA5180A

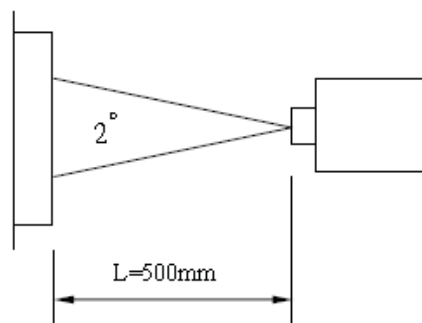
Please download IC specification at <http://www.orientdisplay.com/pdf/OTA5180A.pdf>

## 7. OPTICAL CHARACTERISTICS

| Item                                   |       | Symbol         | Condition               | Min   | Typ   | Max   | Unit  | Note   |
|----------------------------------------|-------|----------------|-------------------------|-------|-------|-------|-------|--------|
| Contrast Ratio                         |       | CR             | *1)                     |       | 400   | -     | -     | Note 3 |
| Luminance                              |       | B              |                         | 430   | 450   | 470   | cd/m2 |        |
| Response Time                          |       | Tr+ Tf         | *3)                     | -     | 30    | 45    | ms    | Note 4 |
| Color Filter Chromaticity with C light | White | x              | $\Theta=\phi=0^{\circ}$ | 0.234 | 0.284 | 0.334 |       | Note 6 |
|                                        |       | y              |                         | 0.273 | 0.323 | 0.373 |       |        |
|                                        | Red   | x              | $\Theta=\phi=0^{\circ}$ | 0.515 | 0.565 | 0.615 |       |        |
|                                        |       | y              |                         | 0.284 | 0.334 | 0.384 |       |        |
|                                        | Green | x              | $\Theta=\phi=0^{\circ}$ | 0.286 | 0.336 | 0.386 |       |        |
|                                        |       | y              |                         | 0.520 | 0.570 | 0.620 |       |        |
|                                        | Blue  | x              | $\Theta=\phi=0^{\circ}$ | 0.094 | 0.144 | 0.194 |       |        |
|                                        |       | y              |                         | 0.062 | 0.112 | 0.162 |       |        |
| View angle                             | Ver.  | $\theta^{*2)}$ | $CR\geq 10$             | 90    | 110   | -     |       | Note 5 |
|                                        |       |                |                         |       |       | -     |       |        |
|                                        | Hor.  | $\psi^{*2)}$   |                         | 110   | 130   | -     |       |        |
|                                        |       |                |                         |       |       | -     |       |        |

Note1: Ambient condition :  $25^\circ\text{C} \pm 2^\circ\text{C}$  ,  $60 \pm 10\% \text{RH}$  , under 10 Lux in the darkroom.

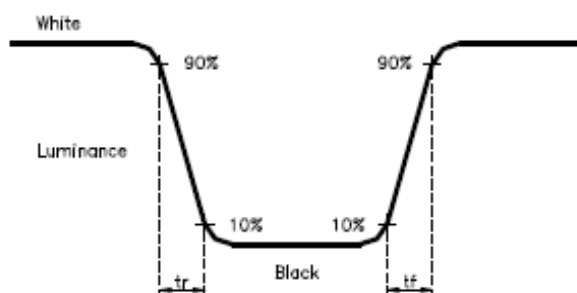
Note2: Measure device : BM-7 , viewing cone =  $1^\circ$  ,  $I_L = 20 \text{mA}$



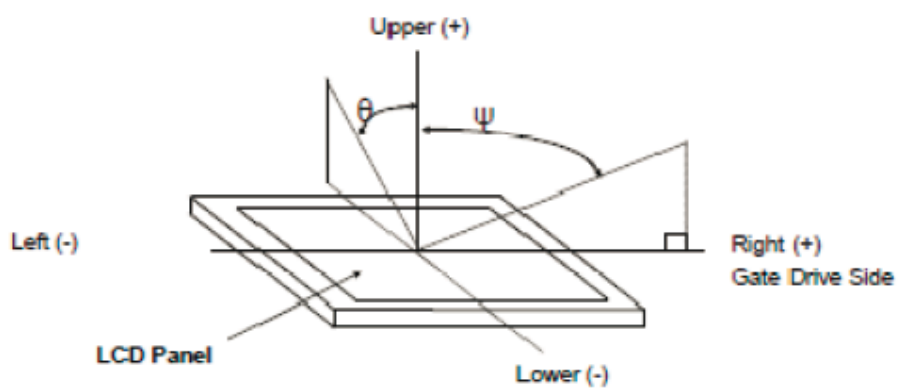
Note3: Definition of Contrast Ratio:

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

Note4: Definition of response time : The response time is defined as the time interval between the 10% and 90% amplitudes.



Note5:Definition of viewing angle ( $\theta$  ,  $\psi$ ):



Definition of viewing angle

Note6: Light source: C light



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## **8. RELIABILITY**

Please download details at <http://www.orientdisplay.com/Reliability.html>

## **9. SPECIFICATION OF QUALITY ASSURANCE**

Please download details at <http://www.orientdisplay.com/Delivery-TFT.html>

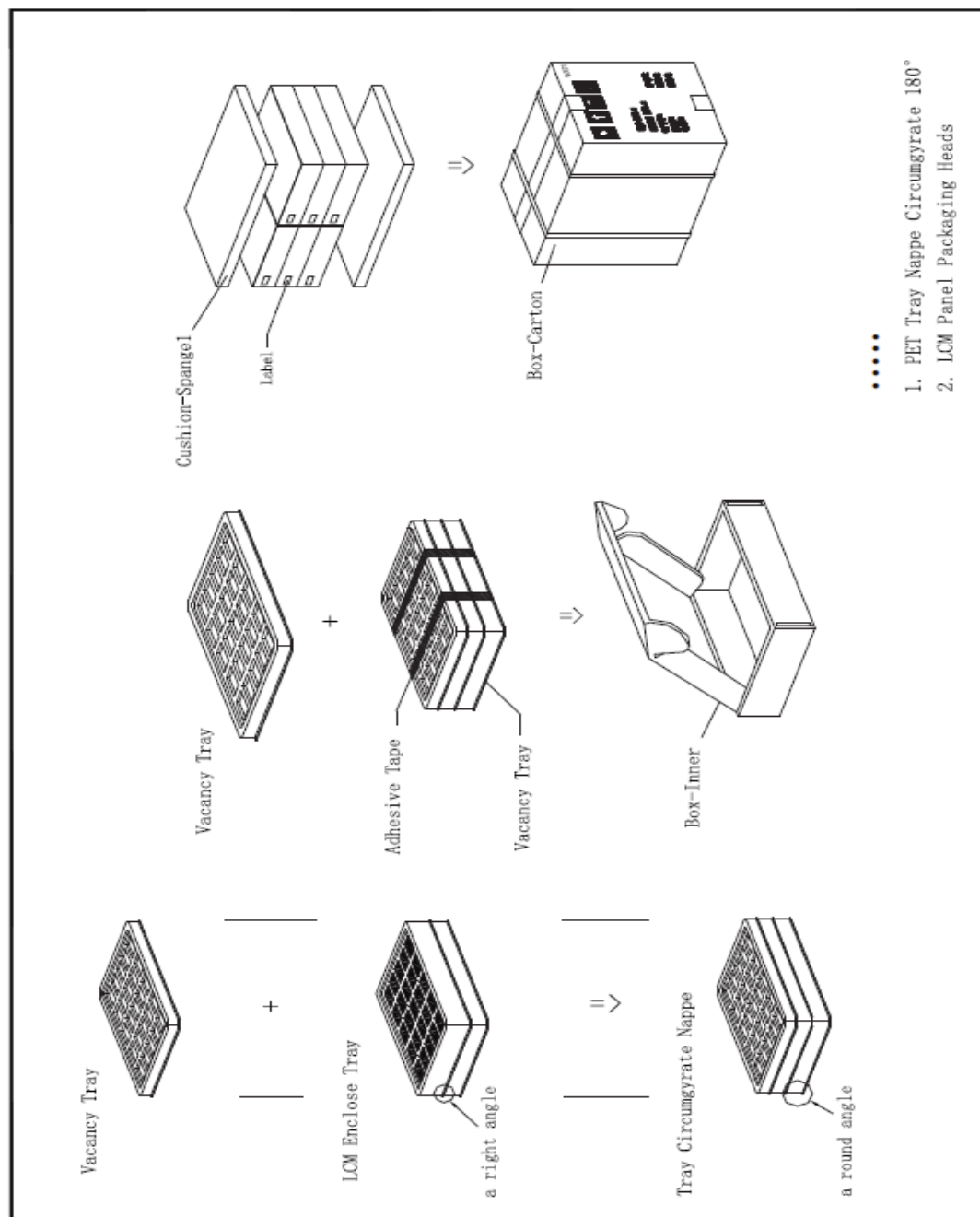
## **10. GENERAL PRECAUTIONS**

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## **11. LIMITED WARRANTY**

Please download details at <http://www.orientdisplay.com/Warranty.html>

## 12. PACKAGE



Orient Display Corporation reserves the right to change this specification.