

**DLC Display Co., Limited**

德爾西顯示器有限公司



MODEL No:DLC0570ADG

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## Record of Revision

| Date       | Revision No. | Summary                              |
|------------|--------------|--------------------------------------|
| 2008-07-27 | 1.0          | Rev 1.0 was issued                   |
| 2013-11-26 | 1.1          | Add the information of LED life time |
|            |              |                                      |

### 1. Scope

This data sheet is to introduce the specification of DLC0570ADG, active matrix TFT module. It is composed of a color TFT-LCD panel, driver ICs, FPC and a backlight unit. The 5.7 " display area contains 640(RGB) x 480 pixels.

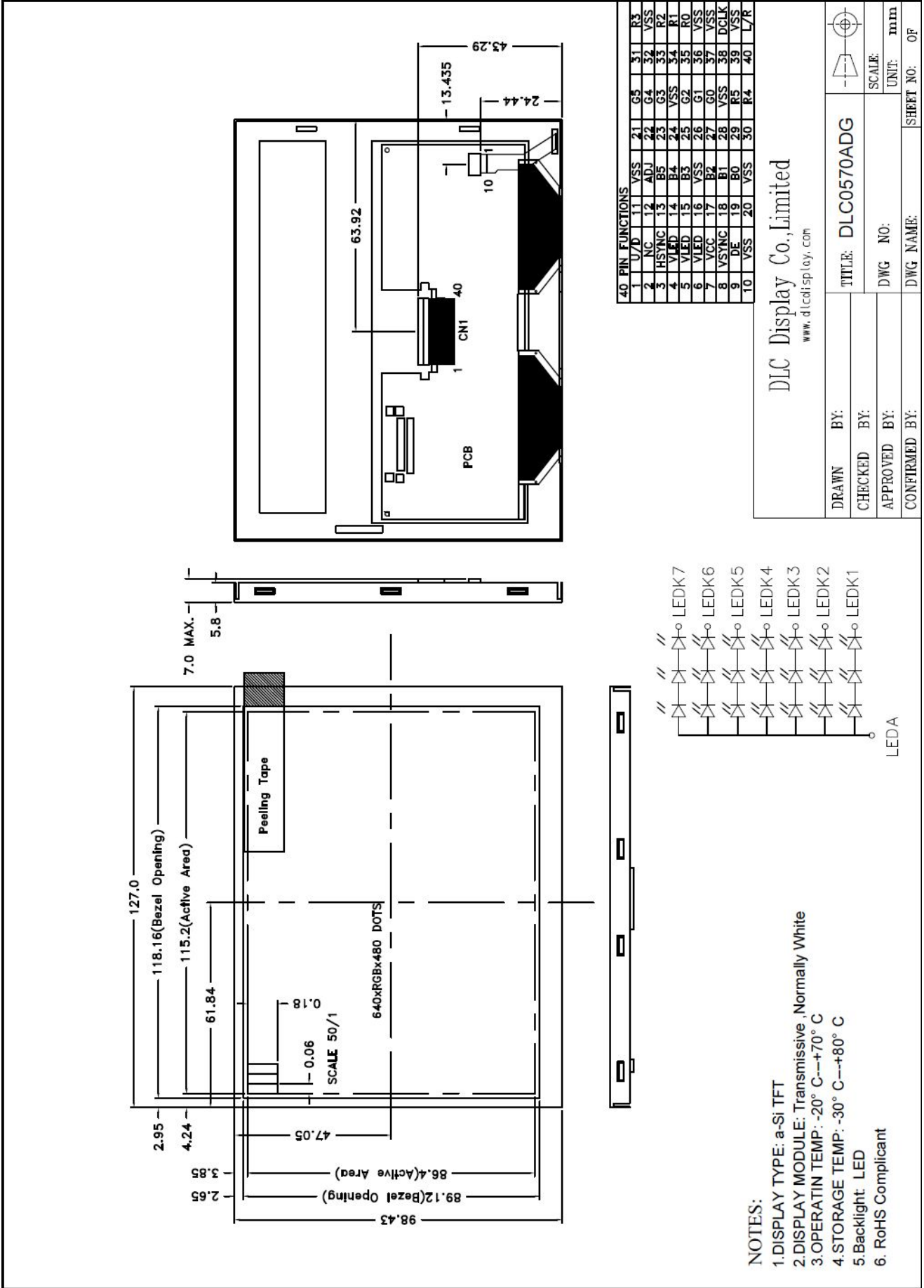
### 2. Application

Digital equipments which need color display, P.O.S, medical equipments and industrial equipments.

### 3. General Information

| Item                          | Contents                     | Unit |
|-------------------------------|------------------------------|------|
| Size                          | 5.7                          | inch |
| Resolution                    | 640x(RGB) x 480              | /    |
| Technology type               | a-si TFT                     | /    |
| Interface                     | RGB                          |      |
| Dot pitch                     | 0.06x0.18                    | mm   |
| Pixel Configuration           | R.G.B. Vertical Stripe       |      |
| Outline Dimension (W x H x D) | 127x 98.43 x 7.0             | mm   |
| Active Area                   | 115.2 x 86.4                 | mm   |
| Display Mode                  | Transmissive, Normally White | /    |
| Viewing Direction             | 12 O'clock                   | /    |

### 4. Outline Drawing



**NOTES:**

- 1.DISPLAY TYPE: a-Si TFT
- 2.DISPLAY MODULE: Transmissive, Normally White
- 3.OPERATING TEMP: -20° C--+70° C
- 4.STORAGE TEMP: -30° C--+80° C
- 5.Backlight: LED
6. RoHS Compliant

## 5. Interface signals

| No | Symbol | Description                                    | Remarks |
|----|--------|--|---------|
| 1  | U/D    | Up or Down Display Control                     |         |
| 2  | NC     | No Connection                                  |         |
| 3  | Hsync  | Horizontal SYNC.                               |         |
| 4  | VLED   | Power Supply for LED Driver circuit            |         |
| 5  | VLED   | Power Supply for LED Driver circuit            |         |
| 6  | VLED   | Power Supply for LED Driver circuit            |         |
| 7  | VCC    | Power Supply for LCD                           |         |
| 8  | Vsync  | Vertical SYNC.                                 |         |
| 9  | DE     | Data Enable                                    |         |
| 10 | VSS    | Power Ground                                   |         |
| 11 | VSS    | Power Ground                                   |         |
| 12 | ADJ    | Brightness control for LED B/L                 |         |
| 13 | B5     | Blue Data 5 (MSB)                              |         |
| 14 | B4     | Blue Data 4                                    |         |
| 15 | B3     | Blue Data 3                                    |         |
| 16 | VSS    | Power Ground                                   |         |
| 17 | B2     | Blue Data 2                                    |         |
| 18 | B1     | Blue Data 1                                    |         |
| 19 | B0     | Blue Data 0 (LSB)                              |         |
| 20 | VSS    | Power Ground                                   |         |
| 21 | G5     | Green Data 5 (MSB)                             |         |
| 22 | G4     | Green Data 4                                   |         |
| 23 | G3     | Green Data 3                                   |         |
| 24 | VSS    | Power Ground                                   |         |
| 25 | G2     | Green Data 2                                   |         |
| 26 | G1     | Green Data 1                                   |         |
| 27 | G0     | Green Data 0 (LSB)                             |         |
| 28 | VSS    | Power Ground                                   |         |
| 29 | R5     | Red Data 5 (MSB)                               |         |
| 30 | R4     | Red Data 4                                     |         |
| 31 | R3     | Red Data 3                                     |         |
| 32 | VSS    | Power Ground                                   |         |
| 33 | R2     | Red Data 2                                     |         |
| 34 | R1     | Red Data 1                                     |         |
| 35 | R0     | Red Data 0                                     |         |
| 36 | VSS    | Power Ground                                   |         |
| 37 | VSS    | Power Ground                                   |         |
| 38 | DCLK   | Clock Signals ; Latch Data at the Falling Edge |         |
| 39 | VSS    | Power Ground                                   |         |
| 40 | L/R    | Left or Right Display Control                  |         |

Recommend connector: JAE FA5B040HP1

Notes :

- 1) ADJ is brightness control Pin. The larger of the pulse duty is, the higher of the brightness.
- 2) ADJ signal is 0~3.3V. Operation frequency is 20KHz
- 3) VSS PIN must be grounding, can not be floating.

4)U/D and L/R control Function

| L/R | U/D | Function                                      |
|-----|-----|---|
| 1   | 0   | Normally display                              |
| 0   | 0   | Left and Right opposite                       |
| 1   | 1   | Up and Down opposite                          |
| 0   | 1   | Left and Right opposite, Up and Down opposite |

5)If DE signal is fixed low, SYNC mode is used. Otherwise, DE mode is used.

6. Absolute maximum Ratings

6.1. Electrical Absolute max. ratings

| Parameter            | Symbol | MIN  | MAX     | Unit | Remark       |
|----------------------|--------|------|---------|------|--------------|
| Power supply Voltage | VCC    | -0.3 | 5.0     | V    |              |
| Logic input voltage  | Vi     | -0.3 | VCC+0.3 | V    | For each LED |

6.2 Environment Conditions

| Item                  | Symbol | MIN | MAX | Unit | Remark |
|-----------------------|--------|-----|-----|------|--------|
| Operating Temperature | TOPR   | -20 | 70  | °C   |        |
| Storage Temperature   | TSTG   | -30 | 80  | °C   |        |

## 7. Electrical Specifications

### 7.1 Electrical characteristics

GND=0V, Ta=25°C

| Item                 | Symbol          | MIN     | TYP | MAX     | Unit  | Remark   |
|----------------------|-----------------|---------|-----|---------|-------|--|
| Power Supply Voltage | VCC             | 3.0     | 3.3 | 3.6     | V     |  |
| Ripple voltage       | V <sub>RF</sub> | -       | -   | 100     | mVp-p |  |
| Input Signal Voltage | V <sub>IL</sub> | 0       | -   | 0.3*VCC | V     | R0~R7,G0~G7,B0~B7,<br>HSYNC,VSYNC,PCLK,DE,DISP |
|                      | V <sub>IH</sub> | 0.7*VCC | -   | VCC     | V     |  |
| Power Supply Current | I <sub>CC</sub> | -       | 111 | 140     | mA    | VCC=3.3V                                       |
| ADJ frequency        |                 | 19K     | 20K | 21K     | Hz    |  |
| ADJ input voltage    | V <sub>IL</sub> | 0       | -   | 0.3     |       |  |
|                      | V <sub>IH</sub> | 3.0     | -   | 3.3     |       |  |

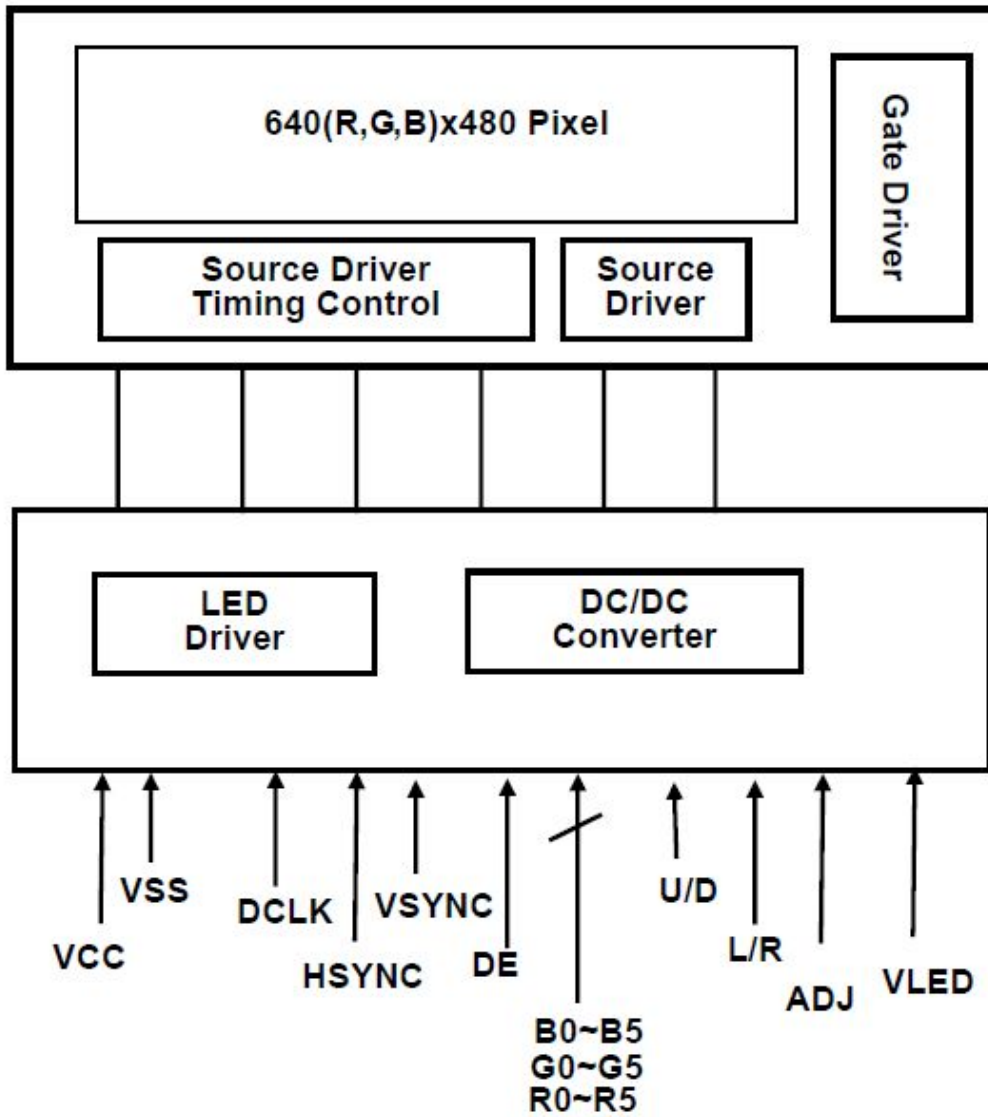
### 7.2 LED Backlight

Ta=25°C

| Item               | Symbol         | MIN | TYP   | MAX | Unit | Remark |
|--------------------|----------------|-----|-------|-----|------|--------|
| Forward Current    | I <sub>f</sub> | -   | 333   | 400 | mA   |        |
| Forward Voltage    | V <sub>F</sub> | 4.5 | 5.0   | 5.5 | V    |        |
| LED Dice life time |                | -   | 50000 | -   | Hr   |        |

Note : The "LED dice life time" is defined as the brightness decrease to 50% original brightness that the ambient temperature is 22°C and LED dice current=20mA.

### 7.3 Schematic of LCD module system



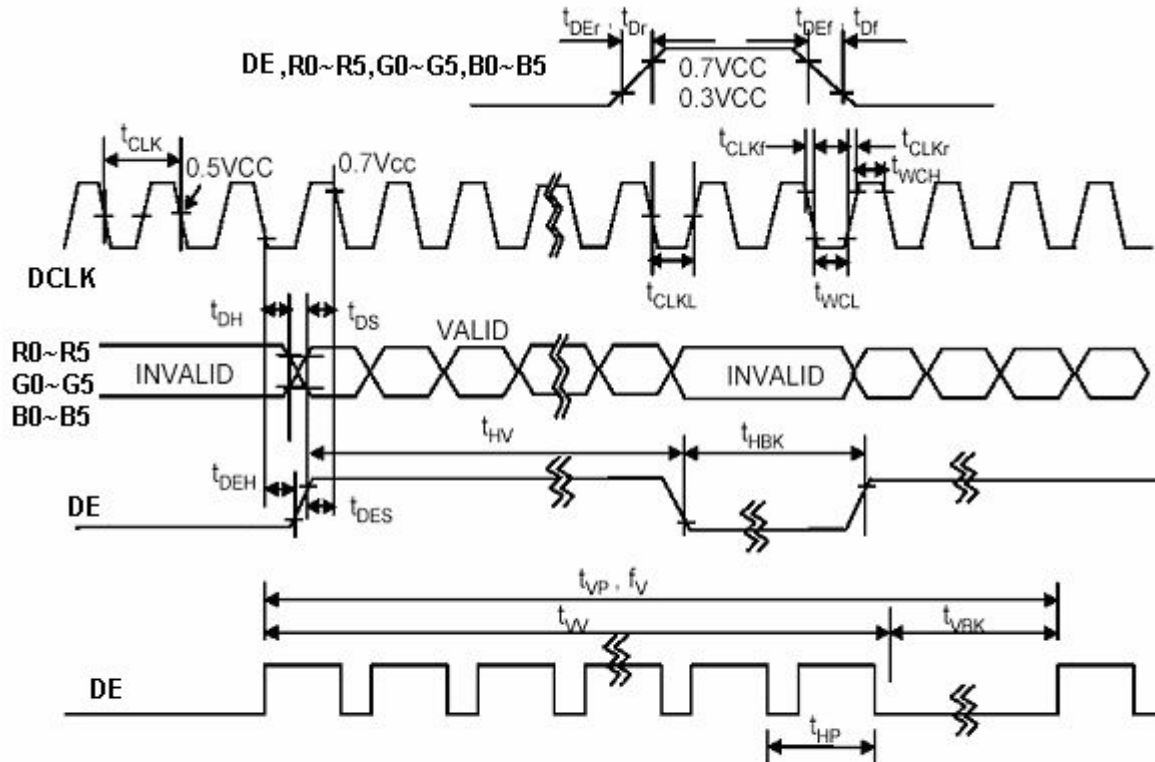


## 8. Command/AC Timing

### 8.1 DE mode Input signal characteristics

| Signal           | Parameter         | Symbol      | Min  | Typ | Max  | Unit |
|------------------|-------------------|-------------|------|-----|------|------|
| DCLK             | Period            | tCLK        | 33   | 40  | 43   | ns   |
|                  | Frequency         | fCLK        | 23   | 25  | 30   | MHz  |
|                  | Low Level Width   | tWCL        | 6    | -   | -    | ns   |
|                  | High Level Width  | tWCH        | 6    | -   | -    | ns   |
|                  | Rise, Fall Time   | tCLKr,tCLKf | -    | -   | 3    | ns   |
|                  | Duty (1)          | -           | 0.45 | 0.5 | 0.55 | -    |
| DE (Data Enable) | Setup Time        | tDES        | 5    | -   | -    | ns   |
|                  | Hold Time         | tDEH        | 10   | -   | -    | ns   |
|                  | Rise, Fall Time   | tDEr,tDEf   | -    | -   | 16   | ns   |
|                  | Horizontal Period | tHP         | 750  | 800 | 900  | tCLK |
|                  | Horizontal Valid  | tHV         | 640  | 640 | 640  | tCLK |
|                  | Horizontal Blank  | tHBK        | 110  | 160 | 260  | tCLK |
|                  | Vertical Period   | tVP         | 515  | 525 | 560  | tHP  |
|                  | Vertical Valid    | tW          | 480  | 480 | 480  | tHP  |
|                  | Vertical Blank    | tVBK        | 35   | 45  | 80   | tHP  |
| Data R,G,B       | Setup Time        | tDS         | 5    | -   | -    | ns   |
|                  | Hold Time         | tDH         | 10   | -   | -    | ns   |
|                  | Rise, Fall Time   | tDr,tDf     | -    | -   | 3    | ns   |

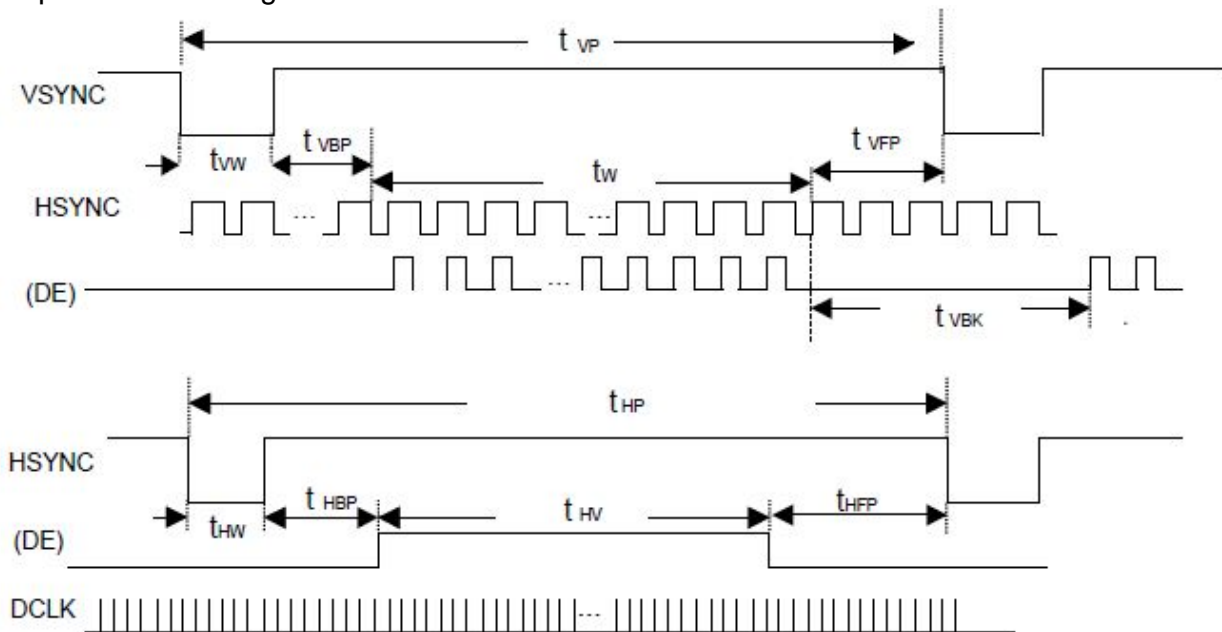
#### DE mode timing waveform



## 8.2 SYNC mode Input signal characteristics

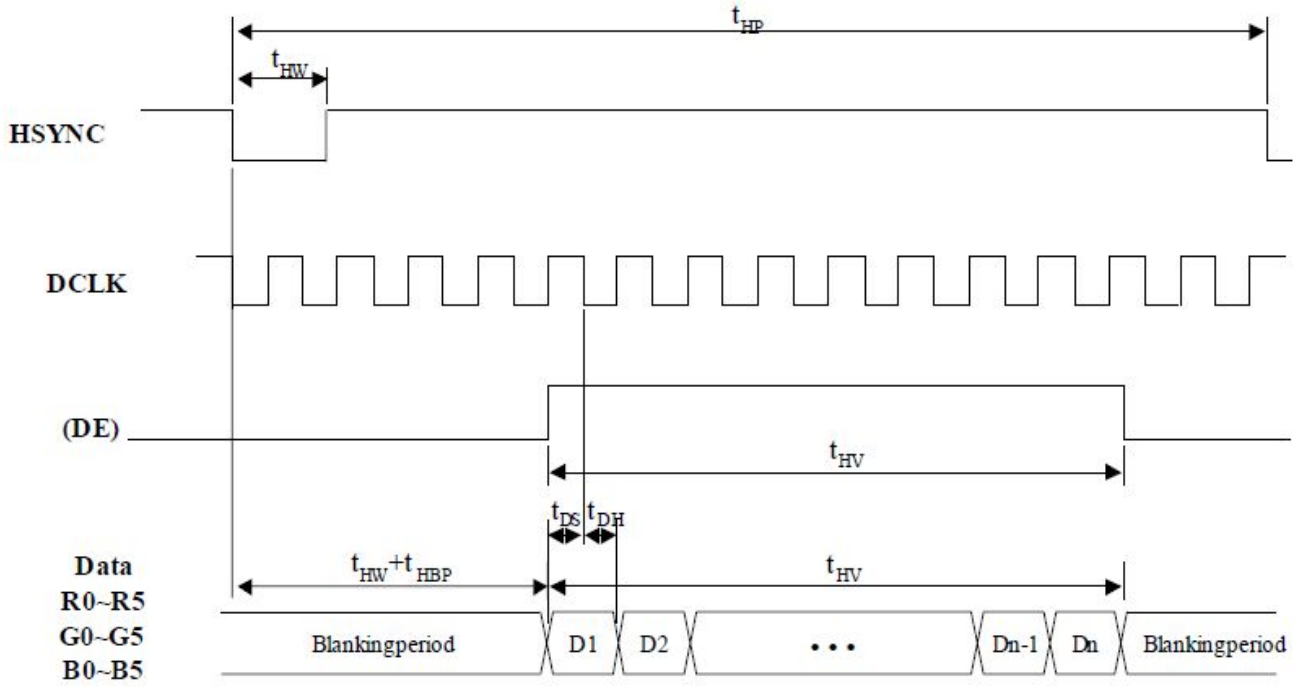
| Parameter                | Symbol      | MIN. | TYP. | MAX. | Unit |
|--------------------------|-------------|------|------|------|------|
| Clock Period             | tCLK        | 33   | 40   | 43   | ns   |
| Clock Frequency          | fCLK        | 23   | 25   | 30   | MHz  |
| Clock Low Level Width    | tWCL        | 6    | -    | -    | ns   |
| Clock High Level Width   | tWCH        | 6    | -    | -    | ns   |
| Clock Rise, Fall Time    | tCLKr,tCLKf | -    | -    | 3    | ns   |
| HSYNC Period             | tHP         | 750  | 800  | 900  | tCLK |
| HSYNC Pulse Width        | tHW         | 5    | 30   | -    | tCLK |
| HSYNC Front Porch        | tHFP        | 1    | 16   | 116  | tCLK |
| HSYNC Back Porch         | tHBP        | 1    | 114  | 139  | tCLK |
| HSYNC Width + Back Porch | tHW+ tHBP   | 144  | 144  | 144  | tCLK |
| Horizontal Blank         | tHBK        | 1    | 160  | 260  | tCLK |
| Horizontal Valid         | tHV         | 640  | 640  | 640  | tCLK |
| VSYNC Period             | tVP         | 515  | 525  | 560  | tHP  |
| VSYNC Pulse Width        | tVW         | 1    | 3    | 5    | tHP  |
| VSYNC Front Porch        | tVFP        | 1    | 10   | 45   | tHP  |
| VSYNC Back Porch         | tVBP        | 30   | 32   | 34   | tHP  |
| VSYNC Width + Back Porch | tVW+ tVBP   | 35   | 35   | 35   | tCLK |
| Vertical Blank           | tVBK        | 35   | 45   | 80   | tHP  |
| Valid data Width         | tW          | 480  | 480  | 480  | tHP  |
| Data Setup Time          | tDS         | 5    | -    | -    | ns   |
| Data Hold Time           | tDH         | 10   | -    | -    | ns   |

## 8.2.1 Input vertical timing



Remark : If SYNC mode is used, please fix DE signal to low, DE timing waveform is for reference only.

8.2.2 Input horizontal timing



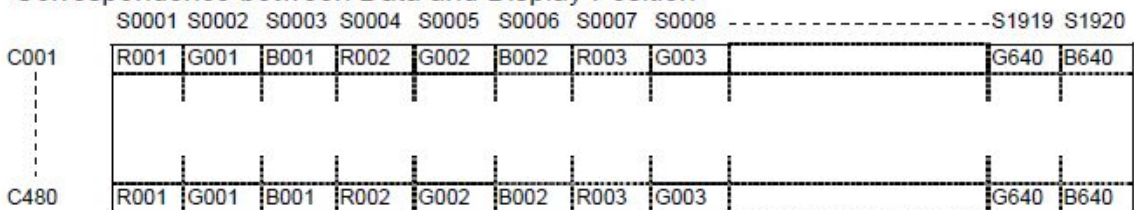
Remark : If SYNC mode is used, please fix DE signal to low, DE timing waveform is for reference only.

### 8.3 Color Data Assignment

| COLOR       | INPUT     | R DATA |    |    |    |    |     | G DATA |    |    |    |    |     | B DATA |    |    |    |    |     |
|-------------|-----------|--------|----|----|----|----|-----|--------|----|----|----|----|-----|--------|----|----|----|----|-----|
|             | DATA      | R5     | R4 | R3 | R2 | R1 | R0  | G5     | G4 | G3 | G2 | G1 | G0  | 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   |
|             | 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(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  | 1   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   |
|             | RED(2)    | 0      | 0  | 0  | 0  | 1  | 0   | 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(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  | 1   | 0      | 0  | 0  | 0  | 0  | 0   |
|             | GREEN(2)  | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 1  | 0   | 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(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  | 1   |
|             | BLUE(2)   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 1  | 0   |
|             | :         | :      | :  | :  | :  | :  | :   | :      | :  | :  | :  | :  | :   | :      | :  | :  | :  | :  | :   |
|             | :         | :      | :  | :  | :  | :  | :   | :      | :  | :  | :  | :  | :   | :      | :  | :  | :  | :  | :   |
|             | 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   |

Remarks: (1) Definition of Gray Scale  
 color(n):n is series of Gray Scale  
 The more n value is, the bright Gray Scale.  
 (2)Data:1-High,0-Low

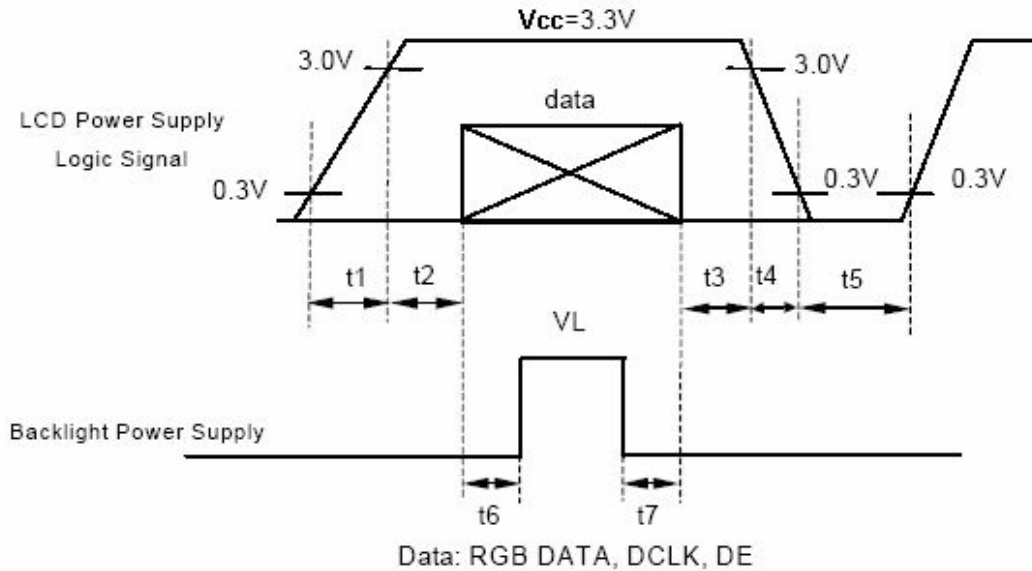
#### Correspondence between Data and Display Position



### 8.4 POWER ON/OFF SEQUENCE

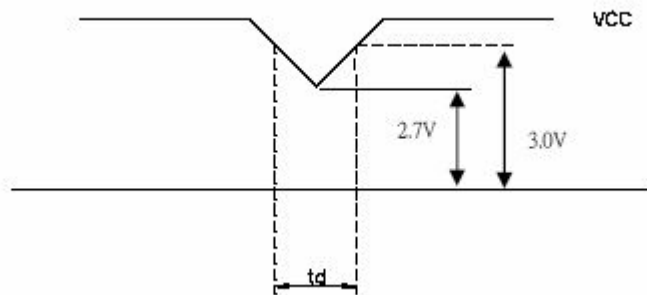
#### 8.4.1 Power Signal sequence:

- $t1 \leq 10\text{ms} : 1 \text{ sec} \leq t5$
- $50\text{ms} \leq t2 : 200\text{ms} \leq t6$
- $0 < t3 \leq 50\text{ms} : 200\text{ms} \leq t7$
- $0 < t4 \leq 10\text{ms}$



#### 8.4.2 VCC-dip condition:

- (1)  $2.7 \text{ V} \leq VCC < 3.0\text{V}, t_d \leq 10 \text{ ms}$
- (2)  $VCC > 3.0\text{V}$ , VCC-dip condition should be the same with VCC-turn-on condition.



9. Optical Specification

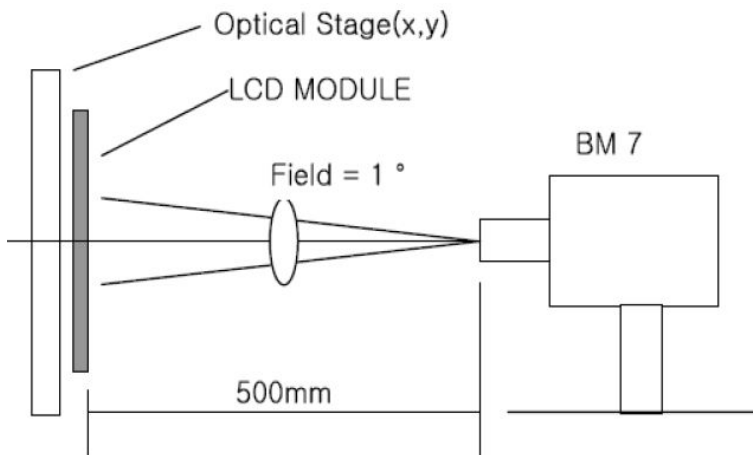
| Item           | Symbol     | Condition        | Min                 | Typ.     | Max.  | Unit              | Remark          |
|----------------|------------|------------------|---------------------|----------|-------|-------------------|-----------------|
| Contrast Ratio | CR         | $\theta=0^\circ$ | 200                 | 300      | -     |                   | Note1<br>Note2  |
| Response Time  | Ton        | 25°C             | -                   | 15       | -     | ms                | Note1           |
|                | Toff       |                  |                     | 35       |       |                   | Note3           |
| View Angles    | $\theta T$ | $CR \geq 10$     | 50                  | 60       | -     | Degree            | Note 4          |
|                | $\theta B$ |                  | 30                  | 40       | -     |                   |                 |
|                | $\theta L$ |                  | 60                  | 70       | -     |                   |                 |
|                | $\theta R$ |                  | 60                  | 70       | -     |                   |                 |
| Chromaticity   | White      | x                | Brightness<br>is on | Typ-0.05 | 0.309 | Typ+0.05          | Note5,<br>Note1 |
|                |            | y                |                     |          | 0.320 |                   |                 |
|                | Red        | x                |                     |          | 0.615 |                   |                 |
|                |            | y                |                     |          | 0.360 |                   |                 |
|                | Green      | x                |                     |          | 0.345 |                   |                 |
|                |            | y                |                     |          | 0.540 |                   |                 |
|                | Blue       | x                |                     |          | 0.148 |                   |                 |
|                |            | y                |                     |          | 0.106 |                   |                 |
| Luminance      | L          |                  | 360                 | 400      | -     | cd/m <sup>2</sup> | Note1<br>Note6  |
| NSTC           |            |                  | -                   | 50       |       | %                 |                 |
| Uniformity     | U          |                  | 70                  | 80       | -     | %                 | Note1<br>Note7  |

Test Conditions:  $I_F=20mA$ ,  $V_F=22.4V$ , the ambient temperature is 25°C.

Note 1: Definition of optical measurement system.

Temperature = 25°C(±3°C)

LED back-light: ON, Environment brightness < 150 lx

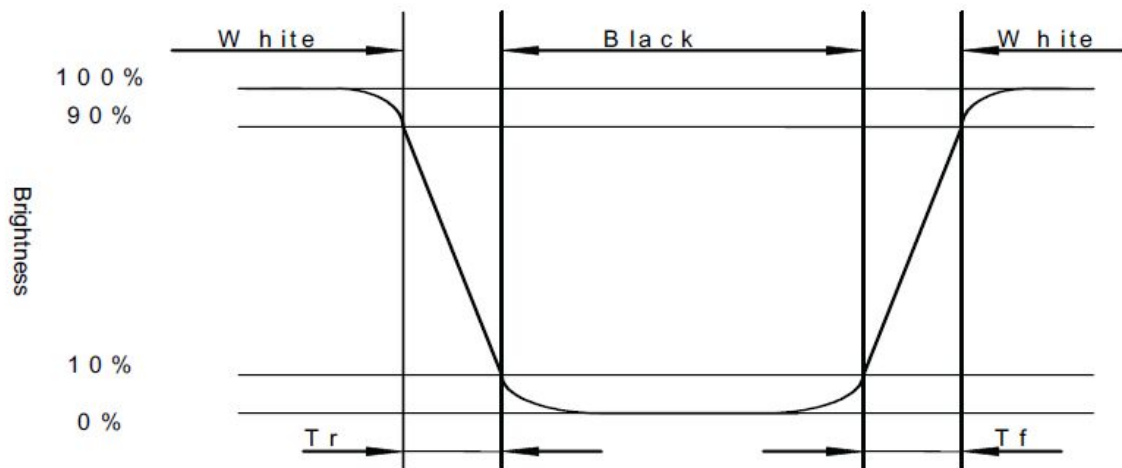


Note 2: Contrast ratio is defined as follow:

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

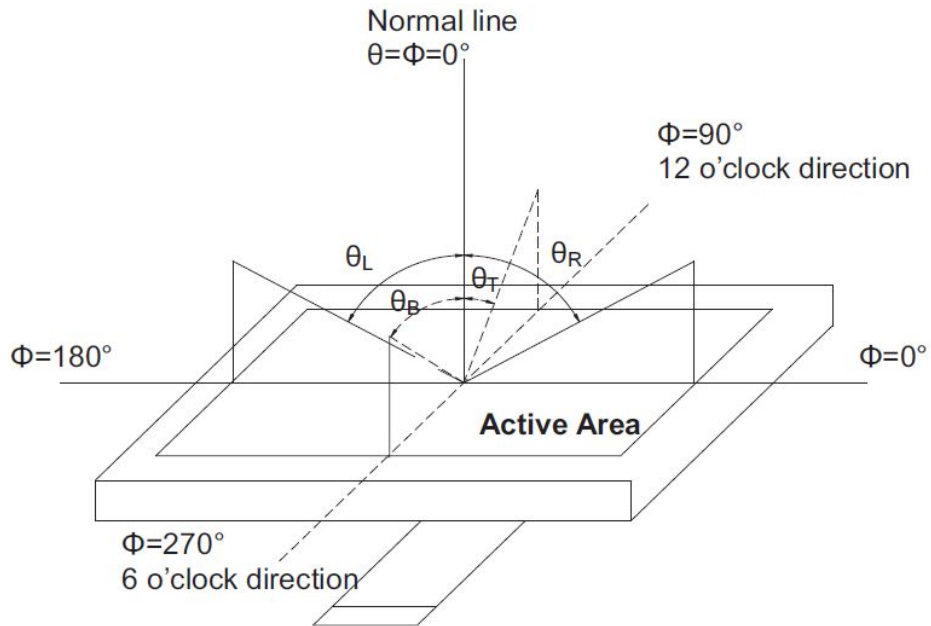
Note 3: Response time is defined as follow:

Response time is the time required for the display to transition from black to white (Rise Time,  $T_r$ ) and from white to black(Decay Time,  $T_f$ ).



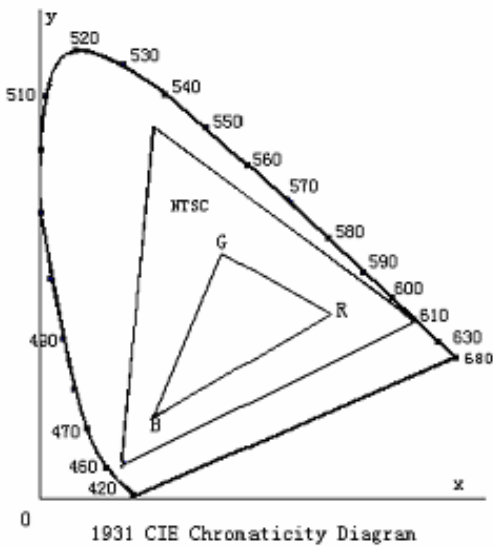
Note 4: Viewing angle range is defined as follow:

Viewing angle is measured at the center point of the LCD.



Note 5: Color chromaticity is defined as follow: (CIE1931)

Color coordinates measured at center point of LCD.



$$S = \frac{\text{area of RGB triangle}}{\text{area of NTSC triangle}} \times 100\%$$

Note 6: Luminance is defined as follow:

Luminance is defined as the brightness of all pixels “White” at the center of display area on optimum contrast

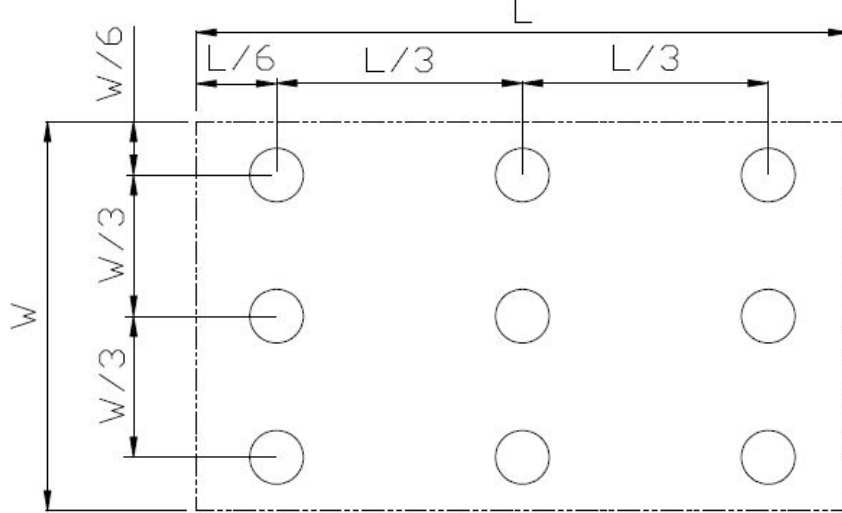


**Note 7: Definition of Luminance Uniformity**

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity (U) =  $L_{min} / L_{max}$

L-----Active area length W----- Active area width



## 10 Environmental / Reliability Tests

| No | Test Item                         | Condition  | Judgment criteria   |
|----|-----------------------------------|--|---|
| 1  | High Temp Operation               | Ts=+70°C, 120hrs   | Per table in below  |
| 2  | Low Temp Operation                | Ta=-20°C, 120hrs   | Per table in below  |
| 3  | High Temp Storage                 | Ta=+80°C, 120hrs   | Per table in below  |
| 4  | Low Temp Storage                  | Ta=-30°C, 120hrs   | Per table in below  |
| 5  | High Temp & High Humidity Storage | Ta=+40°C, 90% RH<br>120 hours  | Per table in below<br>(polarizer discoloration is excluded) |
| 6  | Thermal Shock<br>(Non-operation)  | -30°C 30 min~+80°C 30 min,<br>Change time:5min, 10 Cycles  | Per table in below  |
| 7  | ESD (Operation)                   | C=150pF, R=330Ω , 5points/panel<br>Air:±8KV, 5times;<br>Contact:±4KV, 5 times;                           | Per table in below  |
| 8  | Vibration<br>(Non-operation)      | Frequency range:10~55Hz,<br>Stroke:1.5mm<br>Sweep:10Hz~55Hz~10Hz 2 hours<br>for each direction of X.Y.Z. | Per table in below  |
| 9  | Shock<br>(Non-operation)          | 60G 6ms, ±X,±Y,±Z 3times,<br>for each direction  | Per table in below  |
| 10 | Package<br>Drop Test              | Height:80 cm,<br>1 corner, 3 edges, 6 surfaces   | Per table in below  |

| INSPECTION             | CRITERION(after test)   |
|------------------------|---|
| Appearance             | No Crack on the FPC, on the LCD Panel   |
| Alignment of LCD Panel | No Bubbles in the LCD Panel<br>No other Defects of Alignment in Active area         |
| Electrical current     | Within device specifications  |
| Function / Display     | No Broken Circuit, No Short Circuit or No Black line<br>No Other Defects of Display |

## 11 Precautions for Use of LCD Modules

### 11.1 Safety

The liquid crystal in the LCD is poisonous. Do not put it in your mouth. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and water.

### 11.2 Handling

- A. The LCD and touch panel is made of plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.
- B. Do not handle the product by holding the flexible pattern portion in order to assure the reliability
- C. Transparency is an important factor for the touch panel. Please wear clear finger sacks, gloves and mask to protect the touch panel from finger print or stain and also hold the portion outside the view area when handling the touch panel.
- D. Provide a space so that the panel does not come into contact with other components.
- E. To protect the product from external force, put a covering lens (acrylic board or similar board) and keep an appropriate gap between them.
- F. Transparent electrodes may be disconnected if the panel is used under environmental conditions where dew condensation occurs.
- G. Property of semiconductor devices may be affected when they are exposed to light, possibly resulting in IC malfunctions.
- H. To prevent such IC malfunctions, your design and mounting layout shall be done in the way that the IC is not exposed to light in actual use.

### 11.3 Static Electricity

- A. Ground soldering iron tips, tools and testers when they are in operation.
- B. Ground your body when handling the products.
- C. Power on the LCD module before applying the voltage to the input terminals.
- D. Do not apply voltage which exceeds the absolute maximum rating.
- E. Store the products in an anti-electrostatic bag or container.

### 11.4 Storage

- A. Store the products in a dark place at  $+25^{\circ}\text{C} \pm 10^{\circ}\text{C}$  with low humidity (40% RH to 60% RH). Don't expose to sunlight or fluorescent light.
- B. Storage in a clean environment, free from dust, active gas, and solvent.

### 11.5 Cleaning

- A. Do not wipe the touch panel with dry cloth, as it may cause scratch.
- B. Wipe off the stain on the product by using soft cloth moistened with ethanol. Do not allow ethanol to get in between the upper film and the bottom glass. It may cause peeling issue or defective operation. Do not use any organic solvent or detergent other than ethanol.

### 11.6 Cautions for installing and assembling

Bezel edge must be positioned in the area between the Active area and View area. The bezel may press the touch screen and cause activation if the edge touches the active area. A gap of approximately 0.5mm is needed between the bezel and the top electrode. It may cause unexpected activation if the gap is too narrow. There is a tolerance of 0.2 to 0.3mm for the outside dimensions of the touch panel and tail. A gap must be made to absorb the tolerance in the case and connector.

