



## ASI-T-350EB3FN/D

| Item                          | Contents                                | Unit |
|-------------------------------|-----------------------------------------|------|
| Size                          | 3.5                                     | inch |
| Resolution                    | 320(RGB) x 240                          | /    |
| Interface                     | 24 bits RGB/ Serial RGB/<br>CCIR656/601 | /    |
| Technology type               | a-Si TFT                                | /    |
| Pixel pitch                   | 0.219x0.219                             | mm   |
| Pixel Configuration           | R.G.B. Vertical Stripe                  |      |
| Outline Dimension (W x H x D) | 76.9x64.0x3.3(max.)                     | mm   |
| Active Area                   | 70.08 x 52.56                           | mm   |
| Display Mode                  | Transmissive,<br>Normally White         | /    |
| Backlight Type                | LED                                     | /    |
| Driver IC                     | HX8238D                                 | /    |



| Date       | Revision No. | Summary            |
|------------|--------------|--------------------|
| 2011-06-25 | 1.0          | Rev 1.0 was issued |
|            |              |                    |



## ASI-T-350EB3FN/D

### 1. Scope

This data sheet is to introduce the specification of ASI-T-350EB3FN/D active matrix TFT module. It is composed of a color TFT-LCD panel, driver ICs, FPC and a backlight unit. The 3.5'' display area contains 320(RGB) x 240 pixels.

### 2. Application

Digital equipments which need color display, mobile navigator/video systems.

### 3. General Information

| Item                          | Contents                                | Unit |
|-------------------------------|-----------------------------------------|------|
| Size                          | 3.5                                     | inch |
| Resolution                    | 320(RGB) x 240                          | /    |
| Interface                     | 24 bits RGB/ Serial RGB/<br>CCIR656/601 | /    |
| Technology type               | a-Si TFT                                | /    |
| Pixel pitch                   | 0.219x0.219                             | mm   |
| Pixel Configuration           | R.G.B. Vertical Stripe                  |      |
| Outline Dimension (W x H x D) | 76.9x64.0x3.3(max.)                     | mm   |
| Active Area                   | 70.08 x 52.56                           | mm   |
| Display Mode                  | Transmissive,<br>Normally White         | /    |
| Backlight Type                | LED                                     | /    |
| Driver IC                     | HX8238D                                 | /    |





## ASI-T-350EB3FN/D

### 5. Interface signals

| No    | Symbol      | I/O | Description                              | Remarks   |
|-------|-------------|-----|------------------------------------------|-----------|
| 1     | LED_Cathode | P   | LED_Cathode                              |           |
| 2     | LED_Cathode | P   | LED_Cathode                              |           |
| 3     | LED_Anode   | P   | LED_Anode                                |           |
| 4     | LED_Anode   | P   | LED_Anode                                |           |
| 5     | NC (YU)     | -   | No Connect                               |           |
| 6     | NC (XR)     | -   | No Connect                               |           |
| 7     | NC          | -   | No Connect                               |           |
| 8     | RESET       | I   | Reset                                    |           |
| 9     | SPENA       | I   | SPI interface data enable signal         | Note 3    |
| 10    | SPCLK       | I   | SPI interface data clock                 |           |
| 11    | SPDAT       | I/O | SPI data input                           |           |
| 12~19 | B0~B7       | I   | Blue data bus                            |           |
| 20~27 | G0~G7       | I   | Green data bus                           |           |
| 28~35 | R0~R7       | I   | Red data bus / DX0~DX7                   | Note 4    |
| 36    | HSYNC       | I   | Horizontal Synchronous Signal            |           |
| 37    | VSYNC       | I   | Vertical Synchronous Signal              |           |
| 38    | DCLK        | I   | Dot-clock signal                         |           |
| 39    | NC          | -   | No Connect                               |           |
| 40    | NC          | -   | No Connect                               |           |
| 41    | VDD         | P   | power supply (3.3V)                      |           |
| 42    | VDD         | P   | power supply (3.3V)                      |           |
| 43    | NC (YD)     | -   | No Connect                               |           |
| 44    | NC (XL)     | -   | No Connect                               |           |
| 45    | NC          | -   | No Connect                               |           |
| 46    | NC          | -   | No Connect                               |           |
| 47    | NC          | -   | No Connect                               |           |
| 48    | IF2         | I   | Control the input data format / floating | Note 1    |
| 49    | IF1         | I   | Control the input data format            | Note 1, 5 |
| 50    | IF0         | I   | Control the input data format            | Note 1, 5 |
| 51    | NC          | -   | No Connect                               |           |
| 52    | DE          | I   | Data enabling signal                     | Note 2    |

|    |     |   |        |  |
|----|-----|---|--------|--|
| 53 | GND | P | Ground |  |
| 54 | GND | P | Ground |  |

Note:

1. The mode control (IF2) is not used, it can't control CCIR601 interface, If not use CCIR601, it can be floating.
2. For digital RGB input data format, both SYNC mode and DE+SYNC mode are supported. If DE signal is fixed low, SYNC mode is used. Otherwise, DE+SYNC mode is used. Suggest used SYNC mode.
3. Usually pull high.
4. If select serial RGB or CCIR601/656 input mode is selected, only DX0-DX7 used, and the other short to GND, Only selected serial RGB\_CCIR601/656 interface, DX BUS will enable, Digital input mode DX0 is LSB and DX7 is MSB.
5. Control the input data format

IF2-0: Define the input interface mode.

| IF2 | IF1 | IF0 | Format                                                              | Operating Frequency |
|-----|-----|-----|---------------------------------------------------------------------|---------------------|
| 0   | 0   | 0   | Parallel-RGB data format<br>(only support stripe type color filter) | 6.5MHz              |
| 0   | 0   | 1   | Serial-RGB data format                                              | 19.5MHz             |
| 0   | 1   | 0   | CCIR 656 data format (640RGB)                                       | 24.54MHz            |
| 0   | 1   | 1   | CCIR 656 data format (720RGB)                                       | 27MHz               |
| 1   | 0   | 0   | YUV mode A data format (Cr-Y-Cb-Y)                                  | 24.54MHz            |
| 1   | 0   | 1   | YUV mode A data format (Cr-Y-Cb-Y)                                  | 27MHz               |
| 1   | 1   | 0   | YUV mode B data format (Cb-Y-Cr-Y)                                  | 27MHz               |
| 1   | 1   | 1   | YUV mode B data format (Cb-Y-Cr-Y)                                  | 24.54MHz            |

| Input format | DOTCLK Freq (MHz) | Display Data | Active Area (DOTCLK) |
|--------------|-------------------|--------------|----------------------|
| YUV mode     | 24.54             | 640          | 1280                 |
|              | 27                | 720          | 1440                 |

| Mode         | D[23:16] | D[15:8] | D[7:0] | IHS | IVS | DEN                                |
|--------------|----------|---------|--------|-----|-----|------------------------------------|
| ITU-R BT 656 | D[23:16] | GND     | GND    | NC  | NC  | NC                                 |
| ITU-R BT 601 | D[23:16] | GND     | GND    | IHS | IVS | NC                                 |
| 8 bit RGB    | D[23:16] | GND     | GND    | IHS | IVS | NC for HV Mode<br>DEN for DEN Mode |
| 24 bit RGB   | R[7:0]   | G[7:0]  | B[7:0] | IHS | IVS | NC for HV Mode<br>DEN for DEN Mode |



## 6. Absolute maximum Ratings

### 6.1. Electrical Absolute max. ratings

| Parameter      | Symbol | MIN  | MAX | Unit | Remark |
|----------------|--------|------|-----|------|--------|
| Supply Voltage | VDD    | -0.3 | 5.0 | V    |        |

### 6.2. Environment Conditions

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

### 6.3. LED Backlight Absolute max. ratings

| Item                | Symbol           | MIN | MAX | Unit | Remark       |
|---------------------|------------------|-----|-----|------|--------------|
| LED Forward Current | I <sub>LED</sub> | --  | 25  | mA   | For each LED |

## 7. Electrical Specifications

### 7.1 Electrical characteristics

GND=0V, Ta=25°C

| Item                  | Symbol | MIN    | TYP | MAX    | Unit | Remark |
|-----------------------|--------|--------|-----|--------|------|--------|
| Supply Voltage        | VDD    | 3.0    | 3.3 | 3.6    | V    |        |
| Input Signal Voltage  | VIL    | GND    | --  | 0.1VDD | V    |        |
|                       | VIH    | 0.8VDD | --  | VDD    | V    |        |
| Output Signal Voltage | VOL    | 0      | --  | 0.1VDD | V    |        |
|                       | VOH    | 0.9VDD | --  | VDD    | V    |        |

### 7.2 LED Backlight

Ta=25°C

| Item            | Symbol | MIN | TYP  | MAX | Unit | Remark |
|-----------------|--------|-----|------|-----|------|--------|
| Forward Current | IF     | --  | 20   | --  | mA   |        |
| Forward Voltage | VF     | --  | 19.8 | --  | V    |        |

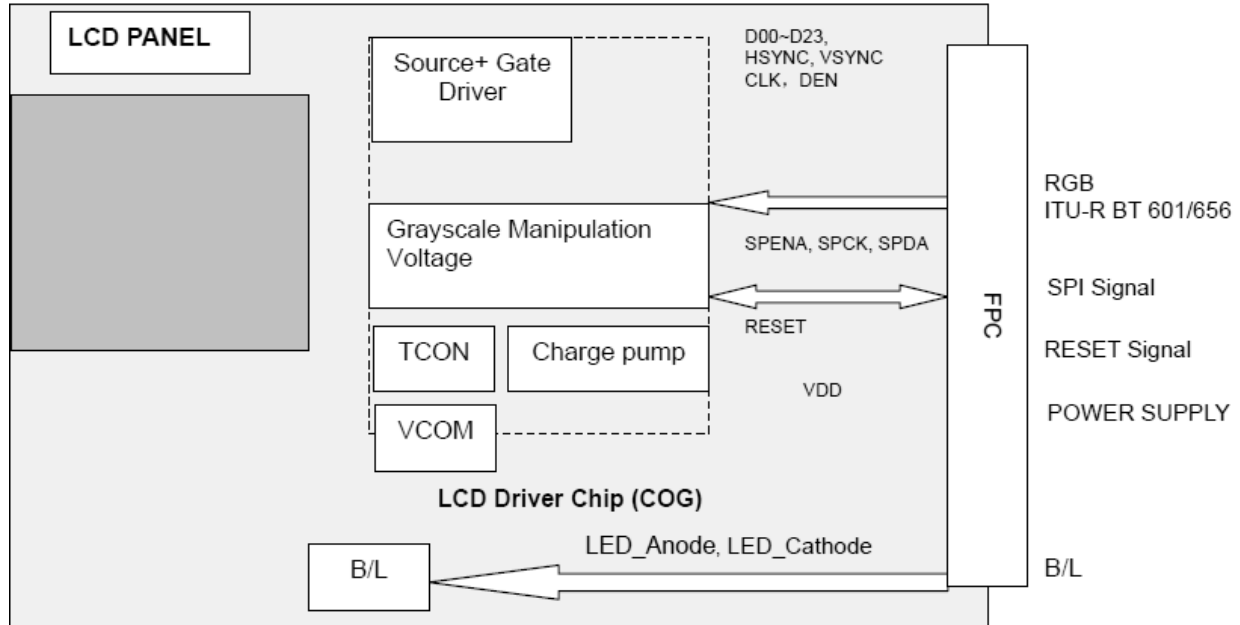
Note 1: The figure below shows the connection of backlight LED.



Note 2: One LED: IF =20mA, VF =3.3V.



### 7.3 Block Diagram



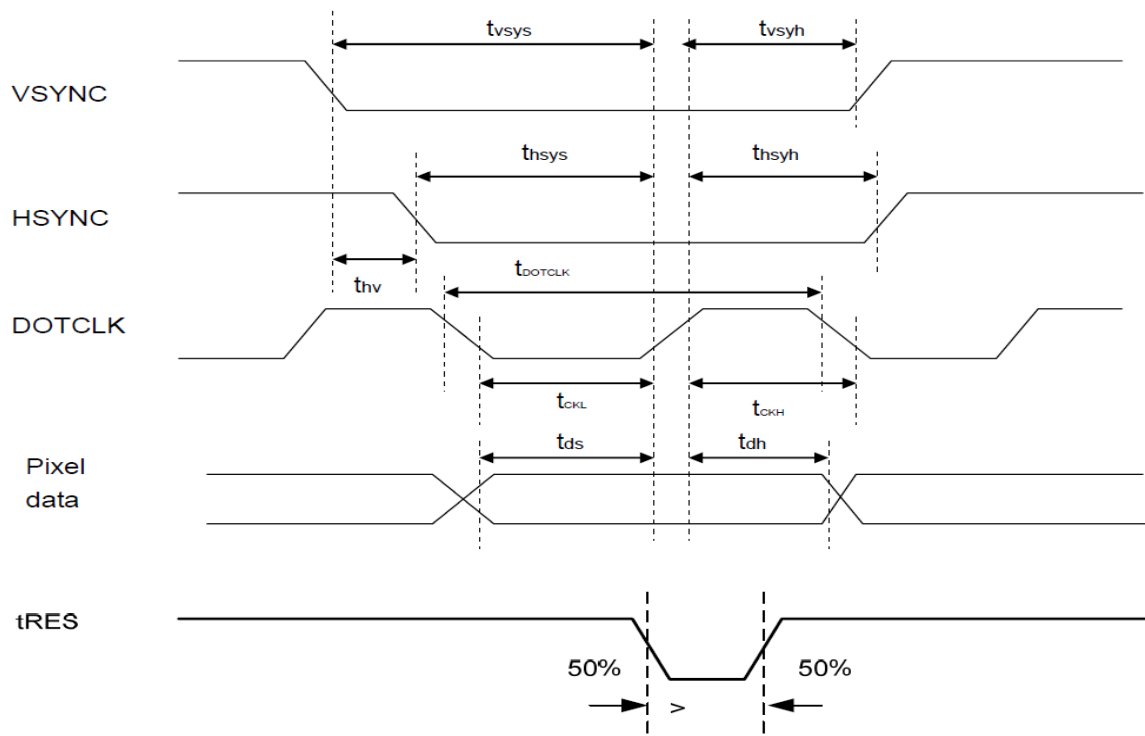
## 8. Command/AC Timing

### 8.1 Timing Parameter

#### 8.1.1AC Electrical Characteristics (VDD=3.3V, GND= 0V,Ta=25°C)

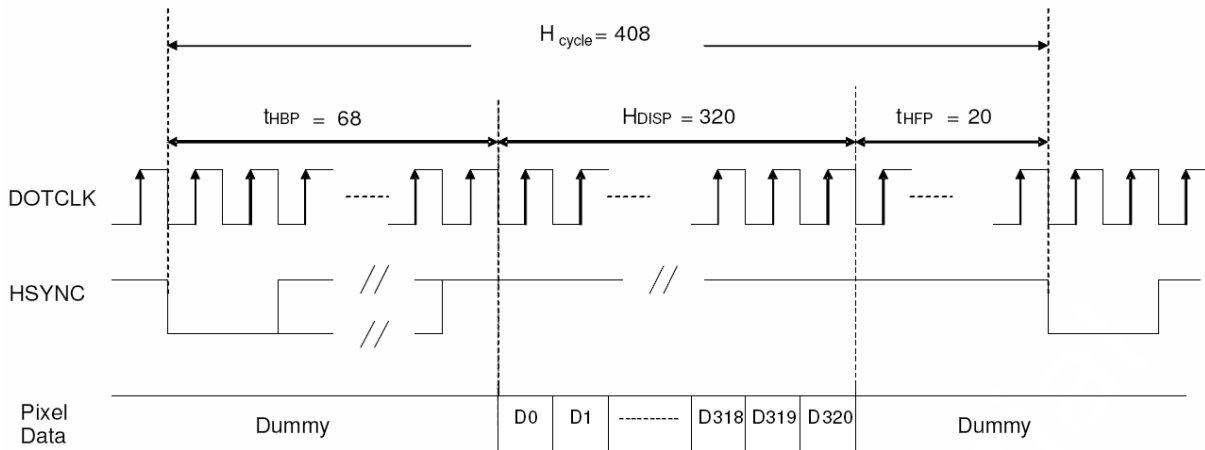
| Characteristics                              | Symbol  | Min.   |       | Typ.   |       | Max.   |       | Unit    |
|----------------------------------------------|---------|--------|-------|--------|-------|--------|-------|---------|
|                                              |         | 24-bit | 8-bit | 24-bit | 8-bit | 24-bit | 8-bit |         |
| DOTCLK Frequency                             | fDOTCLK | -      | -     | 6.5    | 19.5  | 10     | 30    | MHz     |
| DOTCLK Period                                | tDOTCLK | 100    | 33.3  | 154    | 51.3  | -      | -     | ns      |
| Vertical Sync Setup Time                     | tvsys   | 20     | 10    | -      | -     | -      | -     | ns      |
| Vertical Sync Hold Time                      | tvsyh   | 20     | 10    | -      | -     | -      | -     | ns      |
| Horizontal Sync Setup Time                   | thsys   | 20     | 10    | -      | -     | -      | -     | ns      |
| Horizontal Sync Hold Time                    | thsyh   | 20     | 10    | -      | -     | -      | -     | ns      |
| Phase difference of Sync Signal Falling Edge | thv     | 1      |       | -      |       | 240    |       | tDOTCLK |
| DOTCLK Low Period                            | tCKL    | 50     | 15    | -      | -     | -      | -     | ns      |
| DOTCLK High Period                           | tCKH    | 50     | 15    | -      | -     | -      | -     | ns      |
| Data Setup Time                              | tds     | 12     | 10    | -      | -     | -      | -     | ns      |
| Data hold Time                               | tdh     | 12     | 10    | -      | -     | -      | -     | ns      |
| Reset pulse width                            | tRES    | 10     |       | -      |       | -      |       | μs      |

Note: External clock source must be provided to DOTCLK pin of HX8238-D. The driver will not operate if absent of the clocking signal.

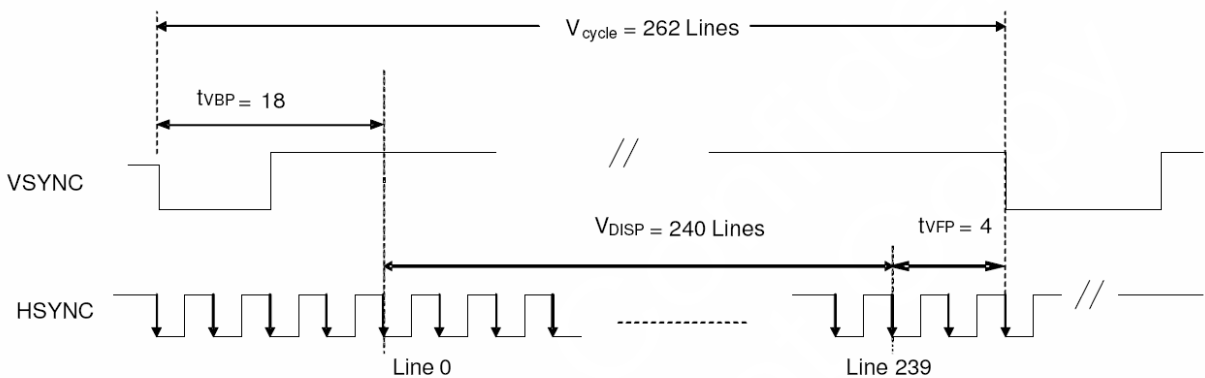


8.2 24 bit RGB mode for 320RGB x 240

| Characteristics              |      | Symbol      | Min.   |       | Typ.        |       | Max.   |       | Unit    |
|------------------------------|------|-------------|--------|-------|-------------|-------|--------|-------|---------|
|                              |      |             | 24-bit | 8-bit | 24- bit     | 8-bit | 24-bit | 8-bit |         |
| DOTCLK Frequency             |      | fDOTCLK     | -      | -     | 6.5         | 19.5  | 10     | 30    | MHz     |
| DOTCLK Period                |      | tDOTCLK     | 100    | 33.3  | 154         | 51.3  | -      | -     | ns      |
| Horizontal Frequency (Line)  |      | fH          | -      |       | 14.9        |       | 22.35  |       | KHz     |
| Vertical Frequency (Refresh) |      | fV          | -      |       | 60          |       | 90     |       | Hz      |
| Horizontal Back Porch        |      | tHBP        | -      | -     | 68          | 204   | -      | -     | tDOTCLK |
| Horizontal Front Porch       |      | tHFP        | -      | -     | 20          | 60    | -      | -     | tDOTCLK |
| Horizontal Data Start Point  |      | tHBP        | -      | -     | 68          | 204   | -      | -     | tDOTCLK |
| Horizontal Blanking Period   |      | tHBP + tHFP | 52     | 146   | 88          | 264   | 180    | 960   | tDOTCLK |
| Horizontal Display Area      |      | HDISP       | -      | -     | 320         | 960   | -      | -     | tDOTCLK |
| Horizontal Cycle             |      | Hcycle      | 372    | 1106  | 408         | 1224  | 500    | 1920  | tDOTCLK |
| Vertical Back Porch          |      | tVBP        | -      |       | 18          |       | -      |       | Lines   |
| Vertical Front Porch         |      | tVFP        | -      |       | 4           |       | -      |       | Lines   |
| Vertical Data Start Point    |      | tVBP        | -      |       | 18          |       | -      |       | Lines   |
| Vertical Blanking Period     | NTSC | tVBP + tVFP | 10     |       | 22          |       | 47     |       | Lines   |
|                              | PAL  |             | 20     |       | 33          |       | 120    |       |         |
|                              | PAL  |             | 12     |       | 25          |       | 112    |       |         |
| Vertical Display Area        | NTSC | VDISP       | -      |       | 240         |       | -      |       | Lines   |
|                              | PAL  |             |        |       | 280(PALM=0) |       |        |       |         |
|                              | PAL  |             |        |       | 288(PALM=1) |       |        |       |         |
| Vertical Cycle               | NTSC | Vcycle      | 250    |       | 262         |       | 287    |       | Lines   |
|                              | PAL  |             | 300    |       | 313         |       | 400    |       |         |



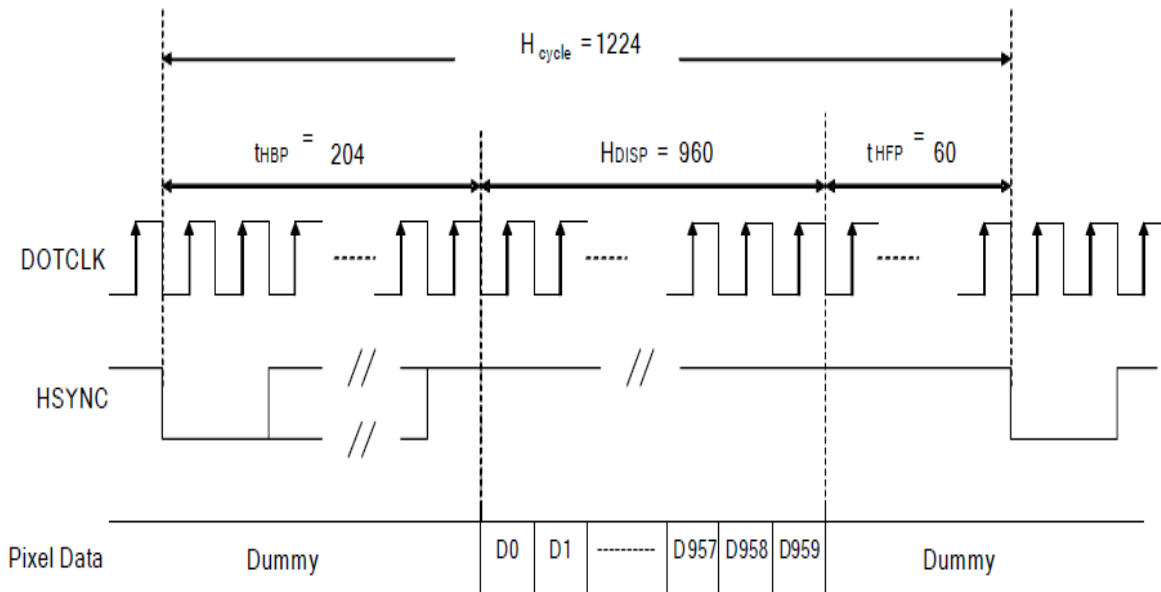
a) Horizontal Data Transaction Timing



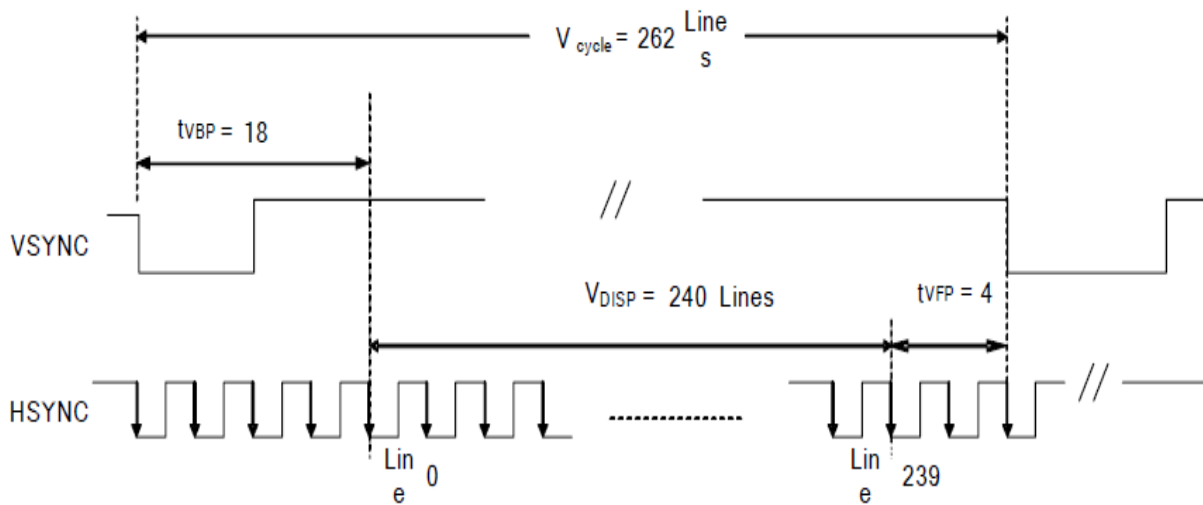
b) Vertical Data Transaction Timing

### 8.38 bit RGB mode for 320RGB x 240

| Characteristics            | Symbol              | Min.   |       | Typ.   |       | Max.   |       | Unit    |
|----------------------------|---------------------|--------|-------|--------|-------|--------|-------|---------|
|                            |                     | 24-bit | 8-bit | 24-bit | 8-bit | 24-bit | 8-bit |         |
| DOTCLK Frequency           | fDOTCLK             | -      | -     | 6.5    | 19.5  | 10     | 30    | MHz     |
| DOTCLK Period              | tDOTCLK             | 100    | 33.3  | 154    | 51.3  | -      | -     | ns      |
| Horizontal Blanking Period | $t_{HBP} + t_{HFP}$ | 52     | 146   | 88     | 264   | 180    | 960   | tDOTCLK |
| Horizontal Display Area    | HDISP               | -      | -     | 320    | 960   | -      | -     | tDOTCLK |
| Horizontal Cycle           | Hcycle              | 372    | 1106  | 408    | 1224  | 500    | 1920  | tDOTCLK |
| Vertical Blanking Period   | $t_{VBP} + t_{VFP}$ | 2      |       | -      |       | 47     |       | Lines   |
| Vertical Display Area      | VDISP               | -      |       | 240    |       | -      |       | Lines   |
| Vertical Cycle             | Vcycle              | 242    |       | -      |       | 287    |       | Lines   |

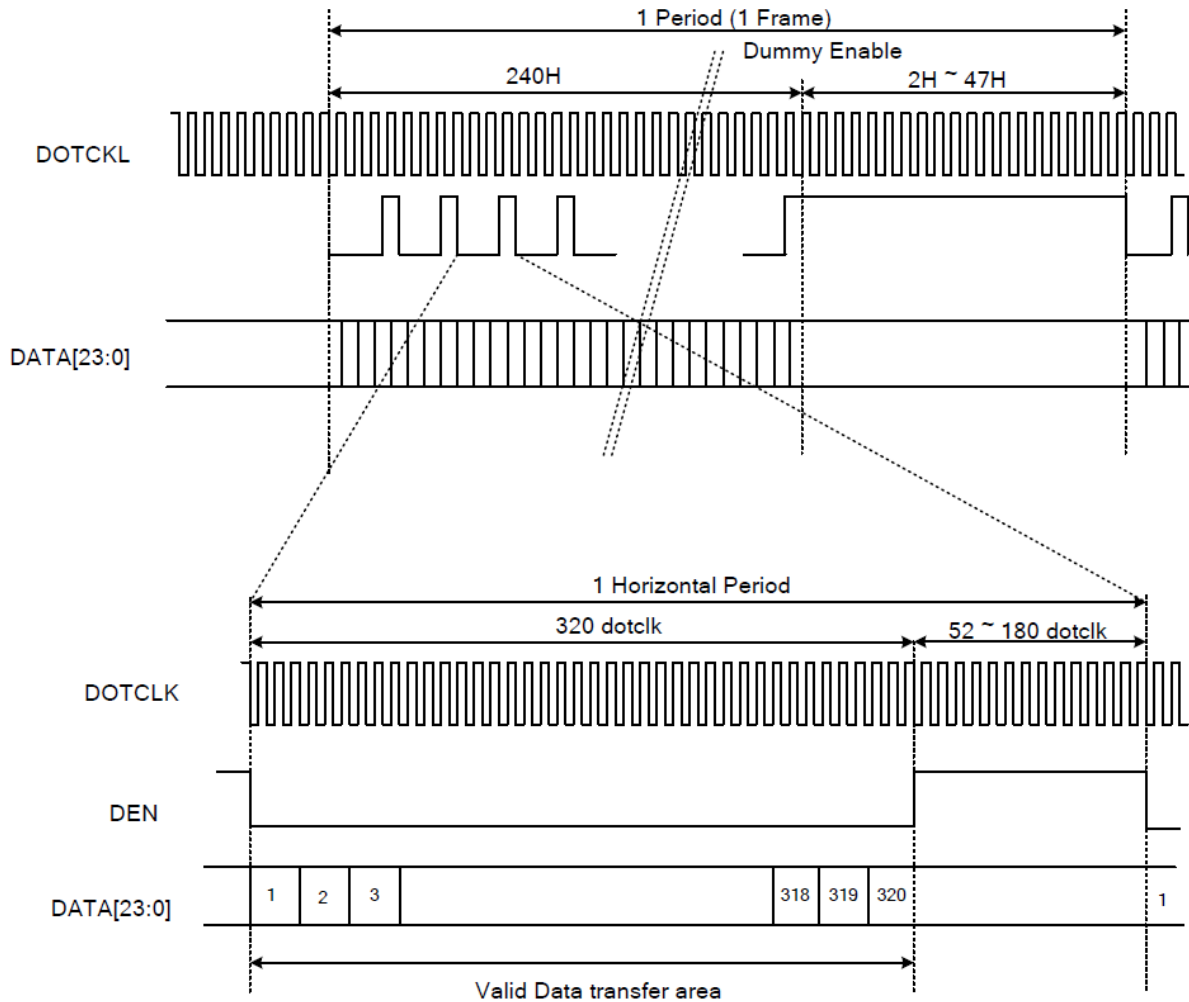


(1) Horizontal Data Transaction Timing

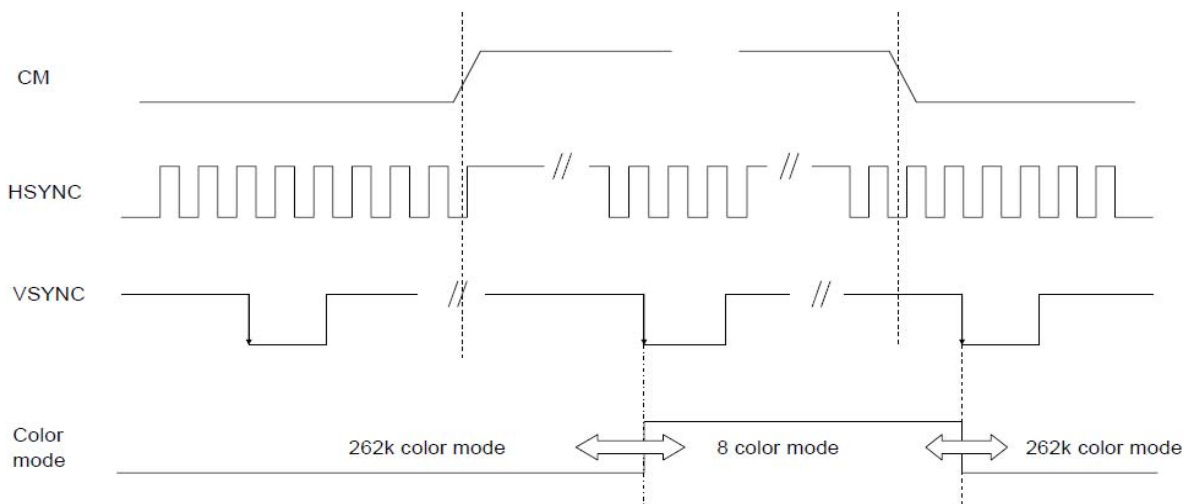


(2) Vertical Data Transaction Timing

#### 8.4 Signal timing DE only mode



#### 8.5 Color mode conversion timing



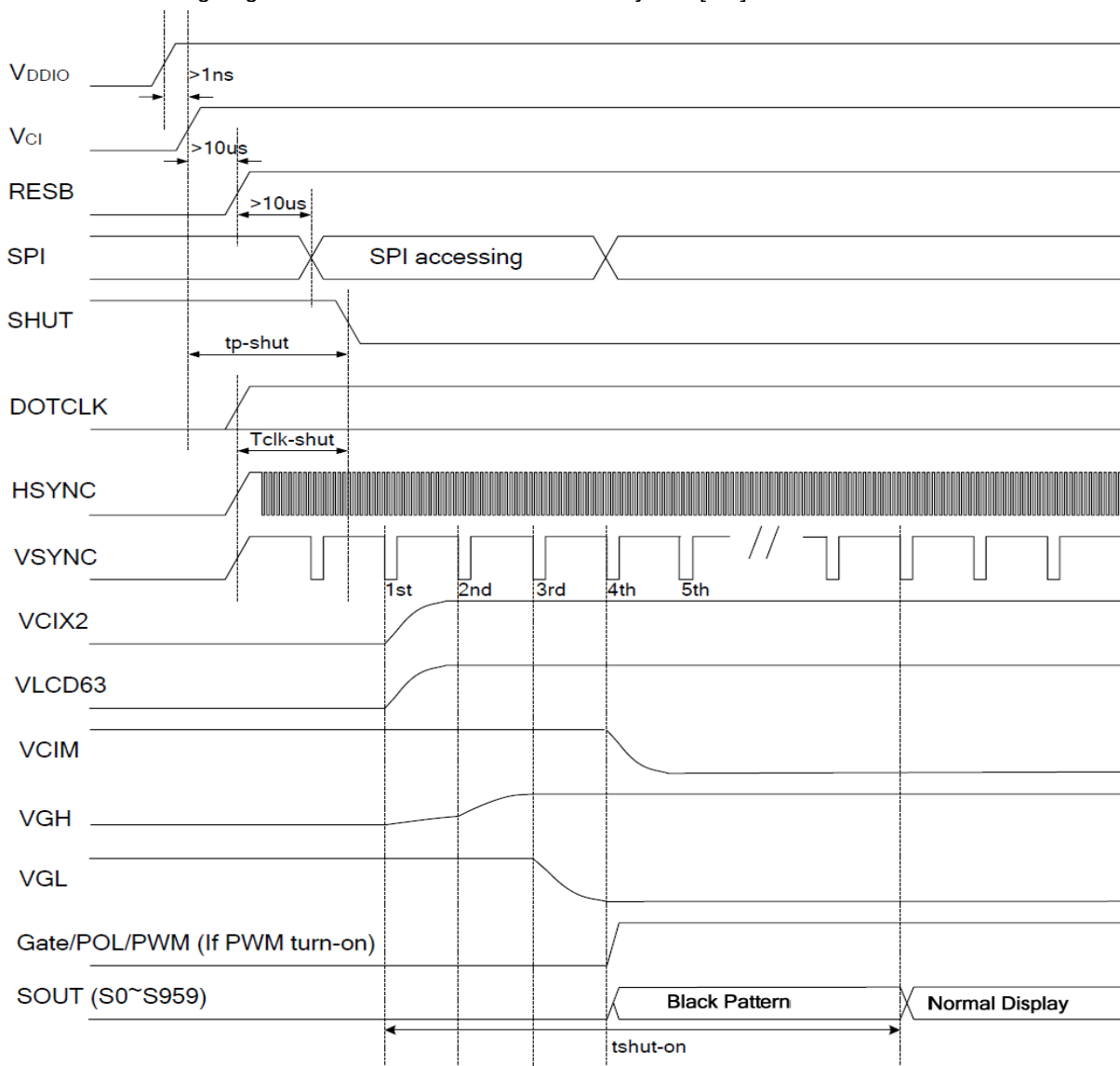
Note: The color mode conversion starts at the first falling edge of VSYNC after stage change of CM.

## 8.6 power on sequence

| Characteristics                                                                                     | Symbol             | Spec. |      |      | Unit  |
|-----------------------------------------------------------------------------------------------------|--------------------|-------|------|------|-------|
|                                                                                                     |                    | Min.  | Typ. | Max. |       |
| VCI / VDDIO on to falling edge of SHUT                                                              | tp-shut            | 1     | -    | -    | μs    |
| DOTCLK to falling edge of SHUT                                                                      | tclk-shut (Note 1) | 1     | -    | -    | clk   |
| Falling edge of SHUT to display start<br>-1 line: 408 clk<br>-1 frame: 262 line<br>-DOTCLK = 6.5MHz | tshut-on (Note 2)  | -     | -    | 14   | frame |

**Note:** (1) It is necessary to input DOTCLK before the falling edge of SHUT.

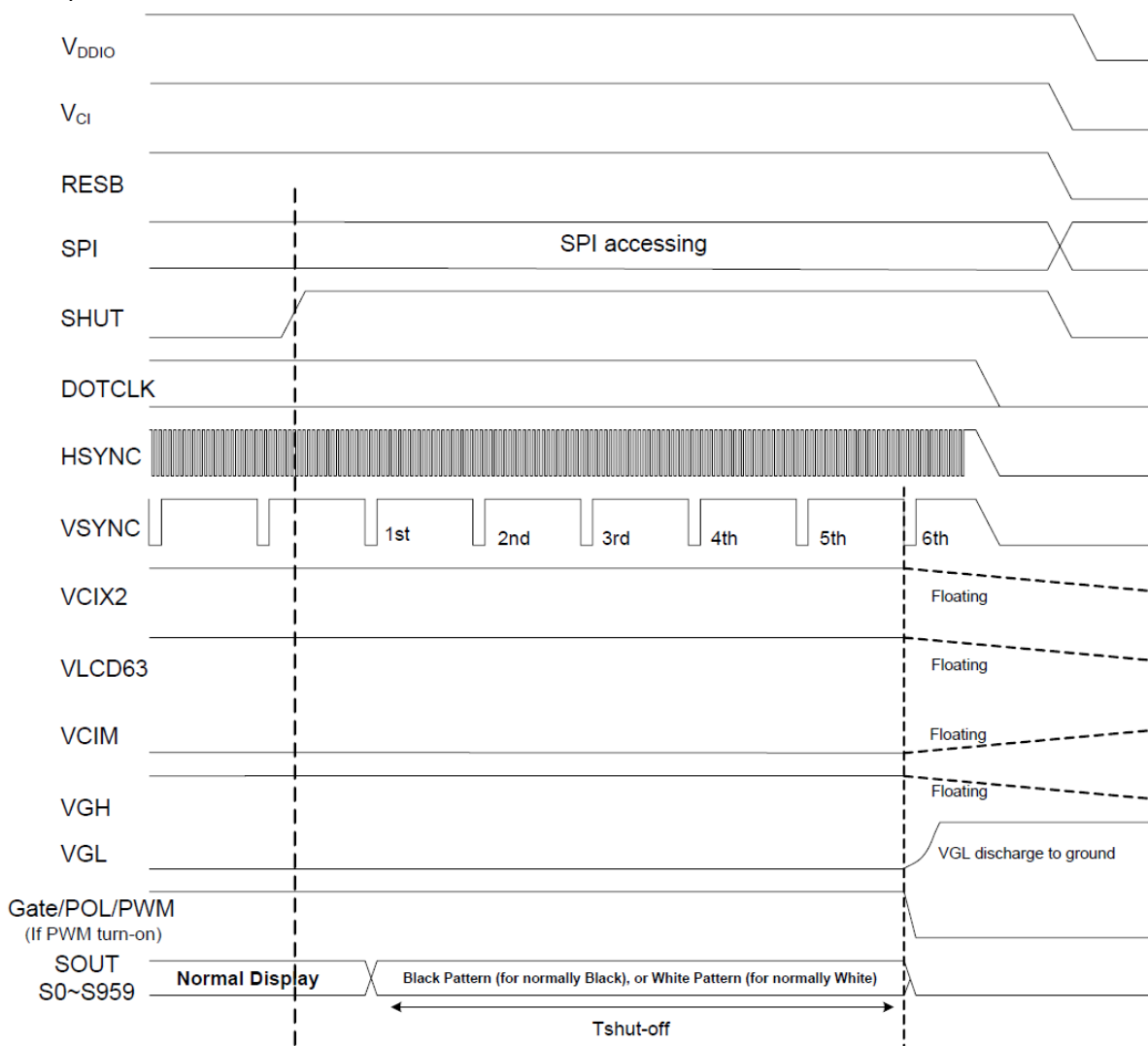
(2) Display starts at 14th falling edge of VSTNC after the falling edge of SHUT. The display starts at the falling edge of VSYNC which is determined by BLT[1:0] of R04h.



### 8.7 power off sequence

| Characteristics                                                                                | Symbol    | Spec. |      |      | Unit  |
|------------------------------------------------------------------------------------------------|-----------|-------|------|------|-------|
|                                                                                                |           | Min.  | Typ. | Max. |       |
| Rising edge of SHUT to display off<br>-1 line: 408 clk<br>-1 frame: 262 line<br>-DOTCLK=6.5MHz | tshut-off | -     | -    | 6    | frame |

**Note:** DOTCLK must be maintained at least 6 frames after the rising edge of SHUT.  
Display become off at the 6th falling edge of VSYNC after the rising edge of SHUT.  
If RESET signal is necessary for power down, provide it after the 6-frames-cycle of the SHUT period.





## 9. Optical Specification

Ta=25°C

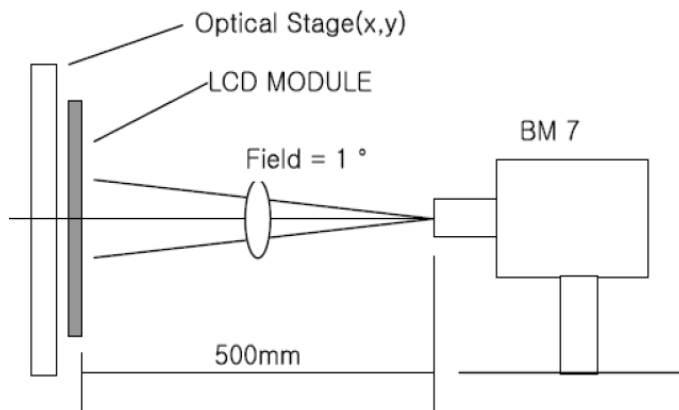
| Item           |       | Symbol    | Condition           | Min | Typ. | Max. | Unit              | Remark          |
|----------------|-------|-----------|---------------------|-----|------|------|-------------------|-----------------|
| Contrast Ratio |       | CR        | $\theta=0^{\circ}$  | -   | 350  | -    |                   | Note1<br>Note2  |
| Response Time  |       | Ton/ Toff | 25℃                 | -   | 50   | 80   | ms                | Note1<br>Note3  |
| View Angles    |       | ΘT        | CR≧10               | -   | 50   | -    | Degree            | Note 4          |
|                |       | ΘB        |                     | -   | 60   | -    |                   |                 |
|                |       | ΘL        |                     | -   | 60   | -    |                   |                 |
|                |       | ΘR        |                     | -   | 60   | -    |                   |                 |
| Chromaticity   | White | x         | Brightness<br>is on | -   | 0.31 | -    |                   | Note5,<br>Note1 |
|                |       | y         |                     | -   | 0.33 | -    |                   |                 |
| NTSC           |       | S         |                     | -   | 60   | -    | %                 | Note5           |
| Luminance      |       | L         |                     | -   | 300  | -    | cd/m <sup>2</sup> | Note1<br>Note6  |
| Uniformity     |       | U         |                     | 75  | 80   | -    | %                 | Note1<br>Note7  |

Test condition:  $I_F=20\text{mA}$ (LED current), 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

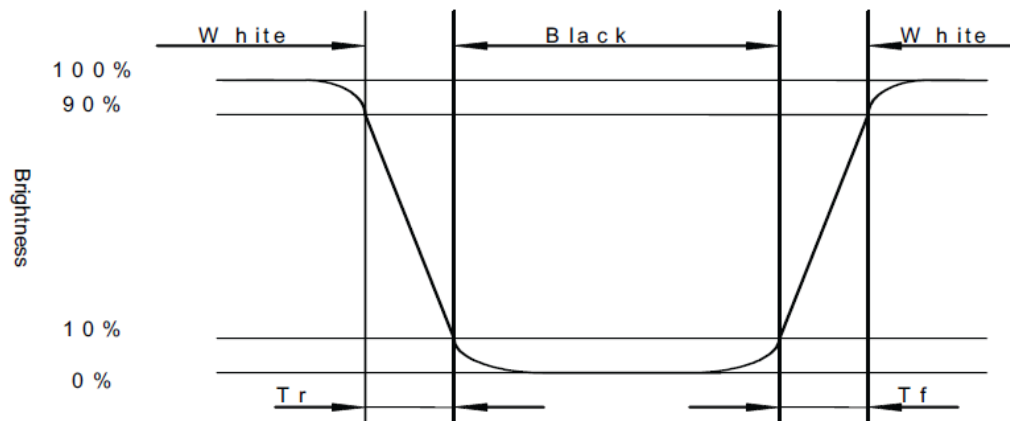


**Note 2: Contrast ratio is defined as follow:**

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

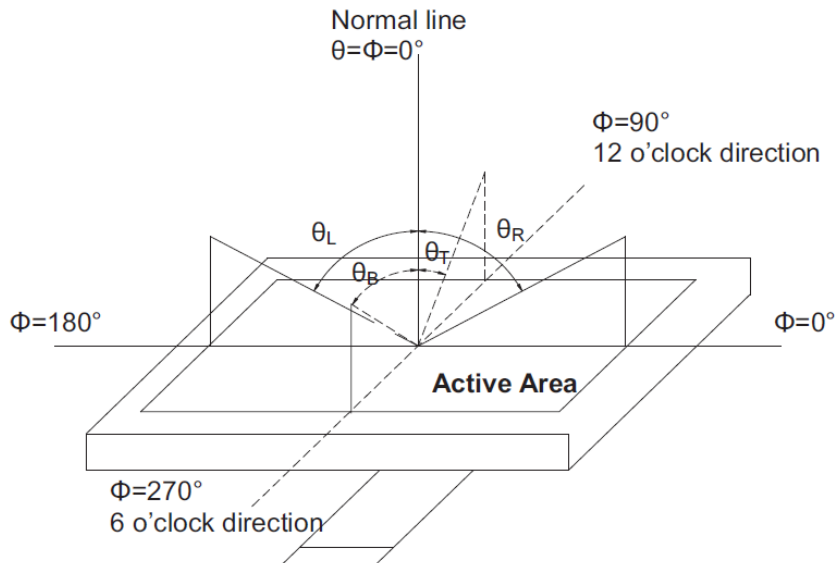
**Note 3: Response time is defined as follow:**

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,  $T_f$ ).



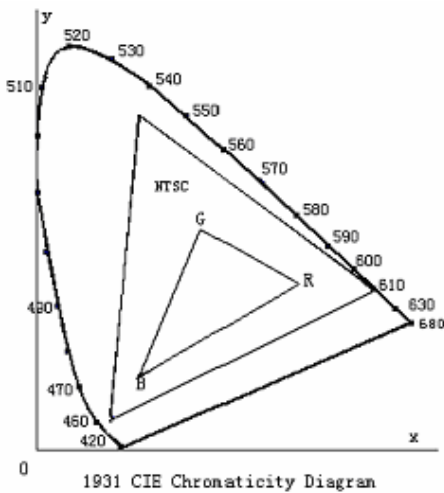
Note 4: Viewing angle range is defined as follow:

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: Luminance Uniformity is defined as follow:

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

$$\text{Uniformity (U)} = \frac{\text{Minimum Luminance( brightness ) in 9 points}}{\text{Maximum Luminance( brightness ) in 9 points}}$$

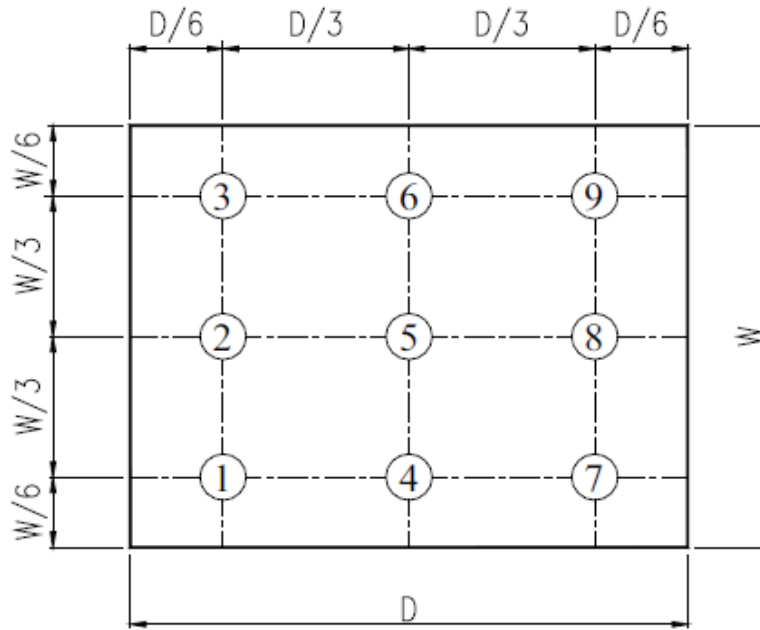


Fig. 2 Definition of uniformity

## 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=+60°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, 5 points/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 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.

