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DLC Display Co., Limited

德爾西顯示器有限公司



MODEL No: DLC0700JMG-6

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Record of Revision

| Date | Revision No. | Summary |
|------------|--------------|--------------------|
| 2012 01 11 | 1.0 | Rev 1.0 was issued |
| | | |
| | | |

1. Scope

This data sheet is to introduce the specification of DLC0700JMG-6 active matrix TFT module. It is composed of a color TFT-LCD panel, driver ICs, FPC and a backlight unit. The 7.0'' display area contains 1024 (RGB) x 600 pixels.

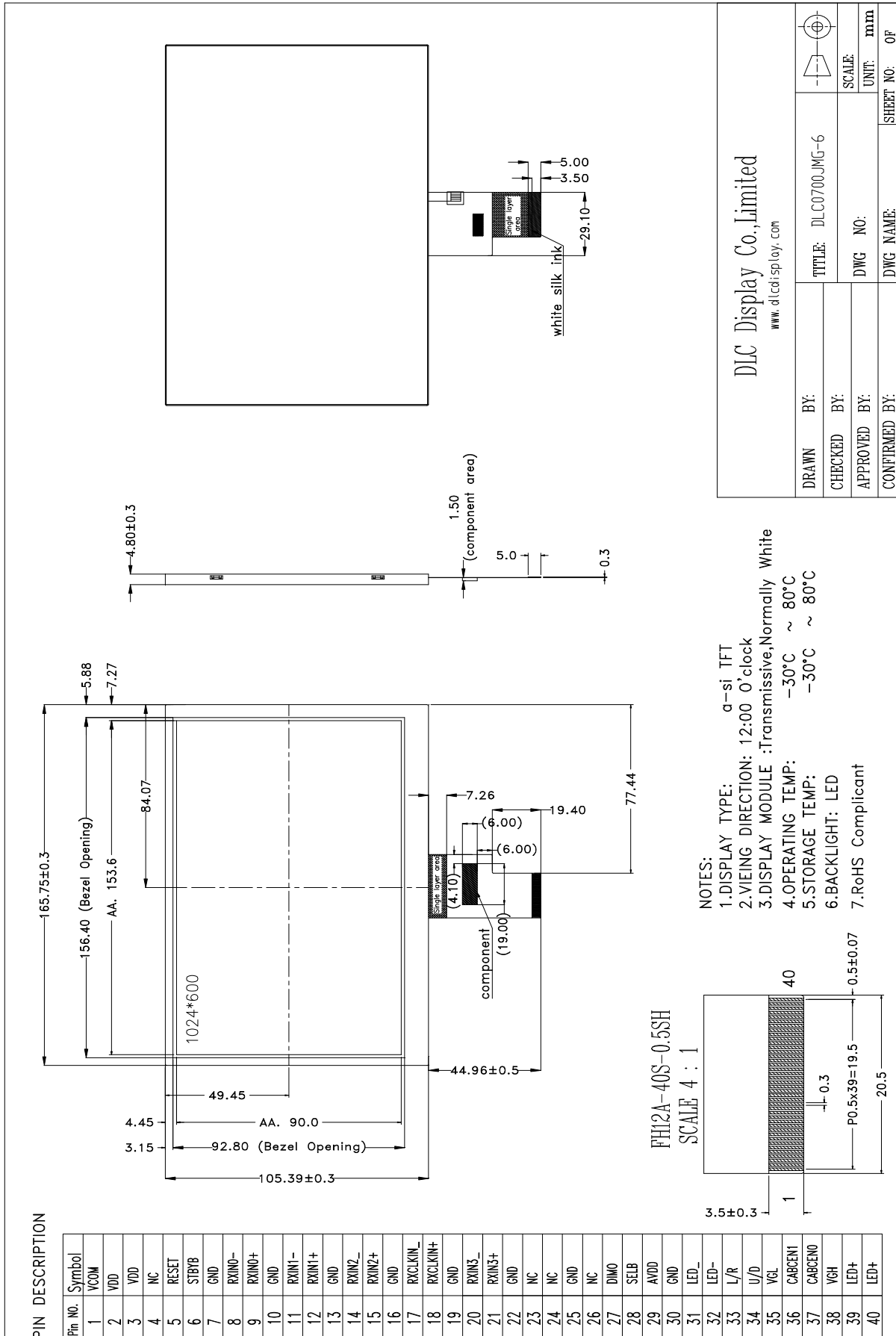
2. Application

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

3. General Information

| Item | Contents | Unit |
|-------------------------------|--------------------|------|
| Size | 7.0 | inch |
| Resolution | 1024 (RGB)×600 | / |
| Interface | LVDS | |
| Technology type | a-Si TFT | / |
| Pixel pitch | 0.150×0.150 | mm |
| Pixel Configuration | RGB stripe | |
| Outline Dimension (W x H x D) | 165.75×105.39×4.80 | mm |
| Active Area(W x H) | 153.6×90.0 | mm |
| Display Mode | TM, Normally White | / |
| Viewing Direction | 12 O'clock | / |
| Backlight Type | LED | / |

4. Outline Drawing



5. Interface signals

| No | Symbol | Description | Remarks |
|----|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| 1 | VCOM | Common Voltage | |
| 2 | VDD | Power Voltage for digital circuit | |
| 3 | VDD | Power Voltage for digital circuit | |
| 4 | NC | No connection | |
| 5 | Reset | Global reset pin | |
| 6 | STBYB | Standby mode, Normally pulled high STBYB="1", Normally operation STBYB="0", Timing controller, source driver will turn off, all output are High-Z | |
| 7 | GND | Ground | |
| 8 | RXIN0- | - LVDS differential data input | |
| 9 | RXIN0+ | +LVDS differential data input | |
| 10 | GND | Ground | |
| 11 | RXIN1- | -LVDS differential data input | |
| 12 | RXIN1+ | +LVDS differential data input | |
| 13 | GND | Ground | |
| 14 | RXIN2- | -LVDS differential data input | |
| 15 | RXIN2+ | +LVDS differential data input | |
| 16 | GND | Ground | |
| 17 | RXCLKIN- | -LVDS differential clock input | |
| 18 | RXCLKIN+ | +LVDS differential clock input | |
| 19 | GND | Ground | |
| 20 | RXIN3- | -LVDS differential data input | |
| 21 | RXIN3+ | +LVDS differential data input | |
| 22 | GND | Ground | |
| 23 | NC | No connection | |
| 24 | NC | No connection | |
| 25 | GND | Ground | |
| 26 | NC | No connection | |
| 27 | DIMO | Backlight CAB controller signal output | |
| 28 | SELB | 6-bit / 8-bit mode select | Note 2 |
| 29 | AVDD | Power for Analog Circuit | |
| 30 | GND | Ground | |
| 31 | LED- | LED Cathode | |
| 32 | LED- | LED Cathode | |

| | | | |
|----|---------|----------------------|--------|
| 33 | L/R | Horizontal inversion | Note 4 |
| 34 | U/D | Vertical inversion | Note 4 |
| 35 | VGL | Gate off voltage | |
| 36 | CABCEN1 | CABC H/W enable | Note 3 |
| 37 | CABCEN0 | CABC H/W enable | Note 3 |
| 38 | VGH | Gate ON Voltage | |
| 39 | LED+ | LED Anode | |
| 40 | LED+ | LED Anode | |

Note 1: The recommended FPC connector model is FH12A-40S-0.5SH manufactured by Hirose.

Note 2: If LVDS input data is 6 bits, SELB must be set to High;
If LVDS input data is 8 bits, SELB must be set to Low.

Note 3: When CABC_EN="00", CABC OFF.
When CABC_EN="01", user interface image.
When CABC_EN="10", still picture.
When CABC_EN="11", moving image.
When CABC off, don't connect DIMO, else connect it to backlight.

Note 4: When L/R="0", set right to left scan direction.
When L/R="1", set left to right scan direction.
When U/D="0", set top to bottom scan direction.
When U/D="1", set bottom to top scan direction.

6. Absolute maximum Ratings

6.1. Electrical Absolute max. ratings

| Parameter | Symbol | MIN | MAX | Unit | Remark |
|----------------------|--------|-------|------|------|--------|
| Power Supply Voltage | VDD | -0.3 | 5.0 | V | |
| | AVDD | 6.5 | 13.5 | V | |
| | VGH | -0.3 | 42.0 | V | |
| | VGL | -20.0 | 0.3 | V | |

6.2. Environment Conditions

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

6.3 Backlight Unit

| Item | Symbol | MIN | MAX | Unit | Remark |
|-----------------|--------|-----|-----|------|----------|
| Forward Current | IF | - | 60 | mA | Each LED |

7. Electrical Specifications

7.1 Electrical characteristics (Note 1)

GND=0V, Ta=25°C

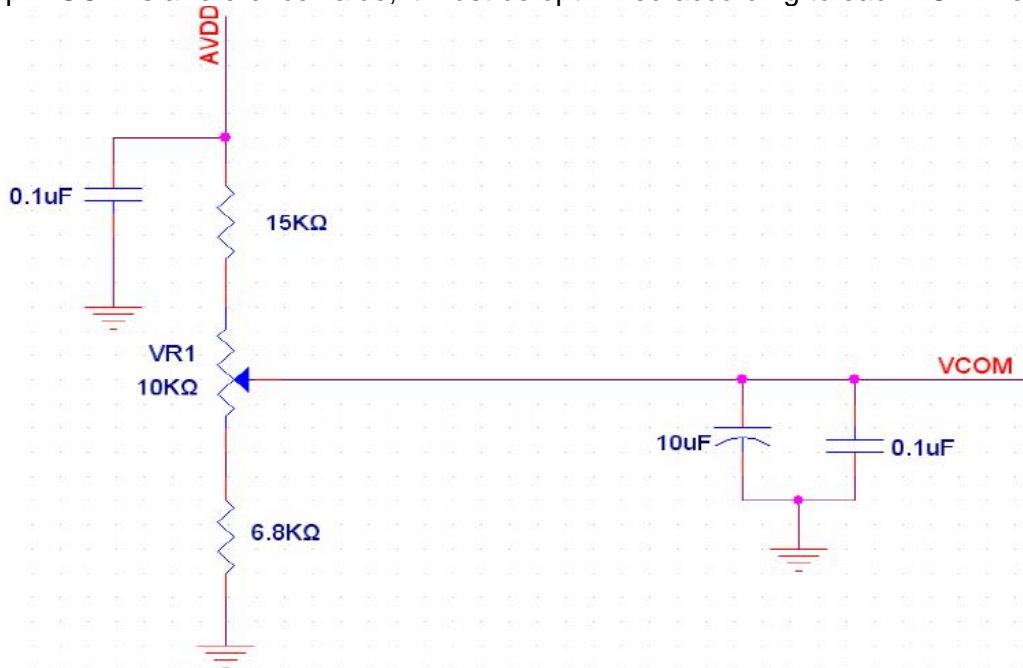
| Item | Symbol | MIN | TYP | MAX | Unit | Remark |
|---------------------------------|--------|--------|-------|--------|------|--------|
| Digital Supply Voltage | VDD | 3.0 | 3.3 | 3.6 | V | Note 2 |
| Analog Supply Voltage | AVDD | 10.8 | 11.0 | 11.2 | V | |
| Gate On Voltage | VGH | 19.7 | 20.0 | 20.3 | V | |
| Gate Off Voltage | VGL | -6.5 | -6.8 | -7.1 | V | |
| Common Electrode Driving Signal | VCOM | 2.7 | (3.7) | 4.7 | V | Note 4 |
| Input high voltage | VIH | 0.7VDD | - | VDD | | |
| Input low voltage | VIL | 0 | - | 0.3VDD | V | Note 3 |

Note 1: Be sure to apply VDD and VGL to the LCD first, and then apply VGH.

Note 2: VDD setting should match the signals output voltage (refer to Note 3) of customer's system board.

Note 3: LVDS, Reset.

Note 4: Typ. VCOM is a reference value, it must be optimized according to each LCM. Be sure to use VR.

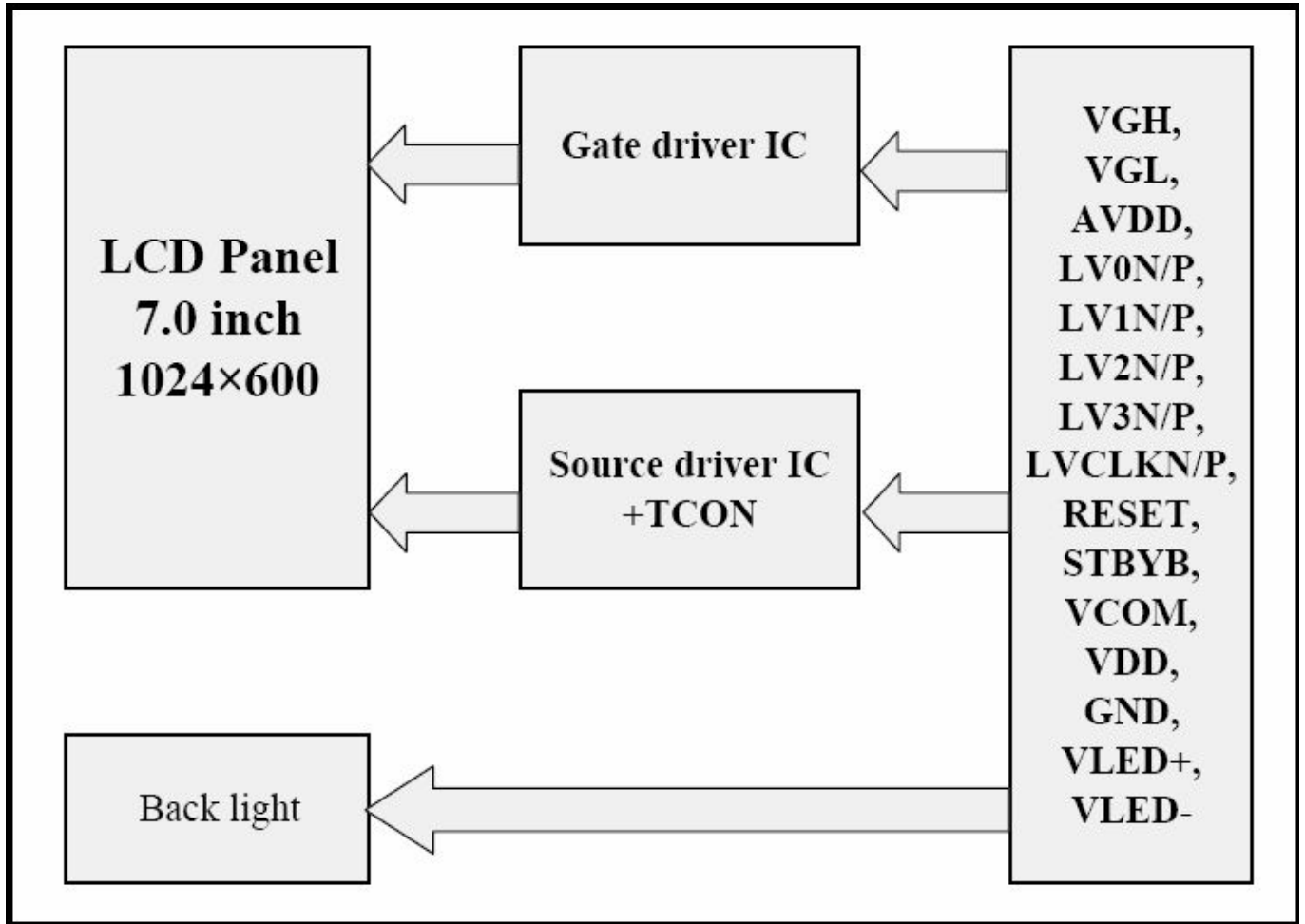


7.2 LED Backlight

Ta=25°C

| Item | Symbol | MIN | TYP | MAX | Unit | Remark |
|-----------------|--------|-----|-----|------|------|-------------------------------------------|
| Forward Current | IF | - | 360 | 420 | mA | 18 LEDs (3 LED Serial, 6 LED Parallel) |
| Forward Voltage | VF | - | 9.9 | 10.5 | V | |

7.3 Schematic of LCD module system

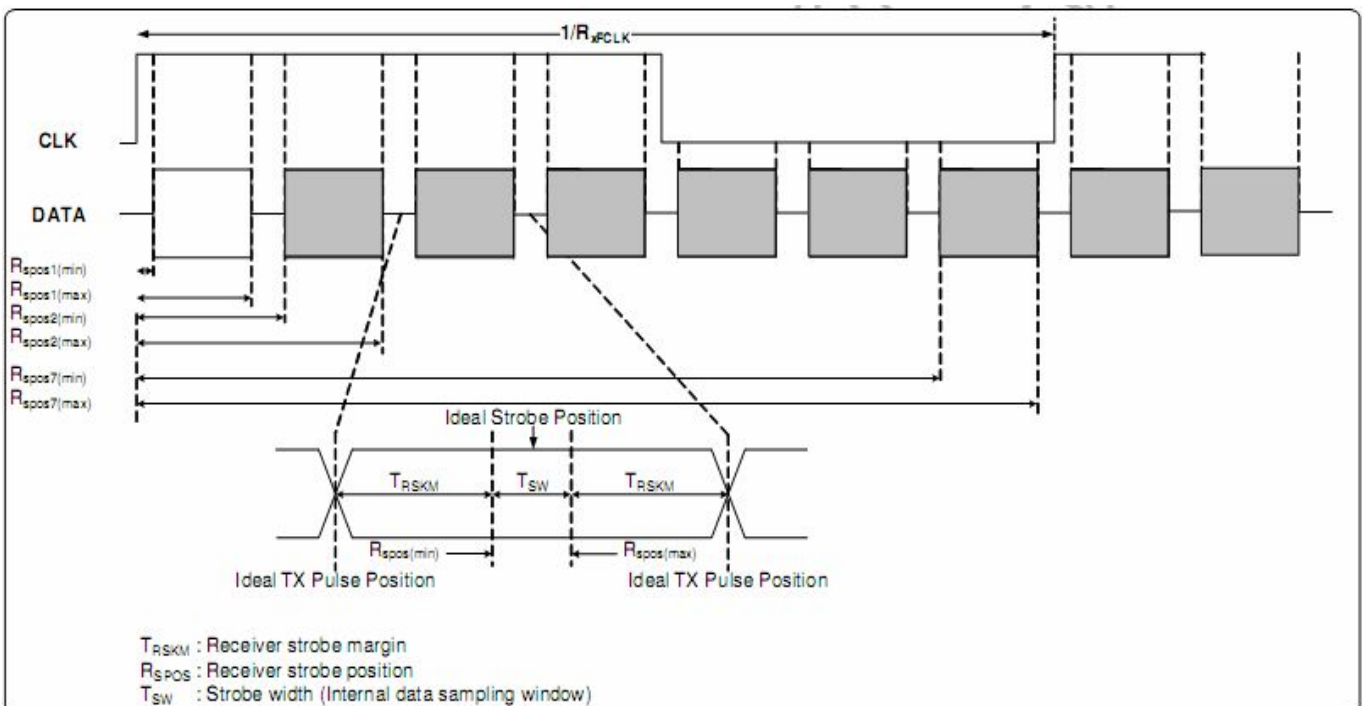
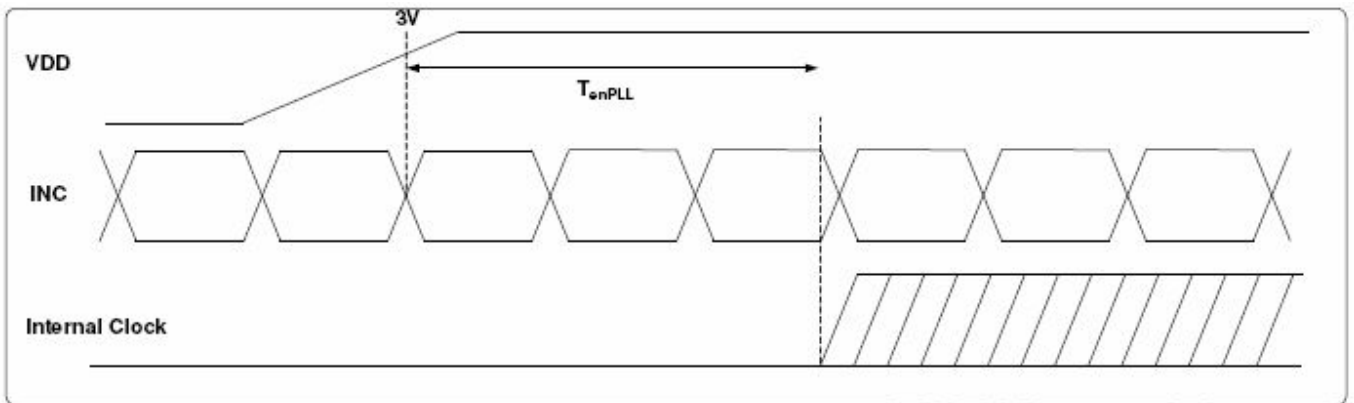
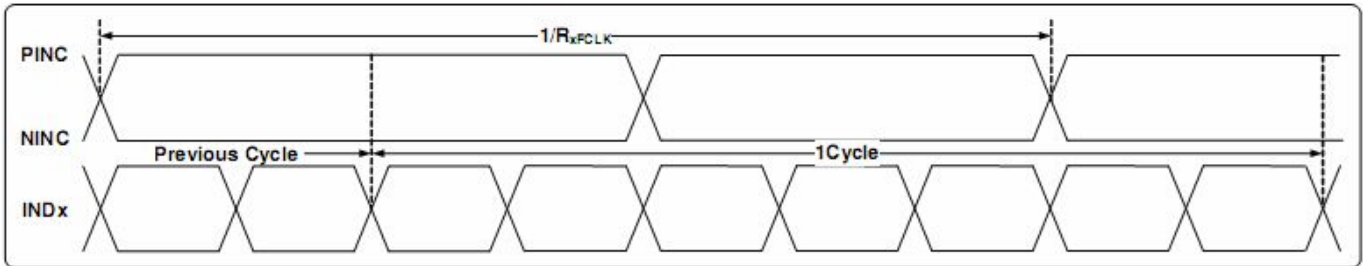


8. Command/AC Timing

8.1 AC Electrical Characteristics

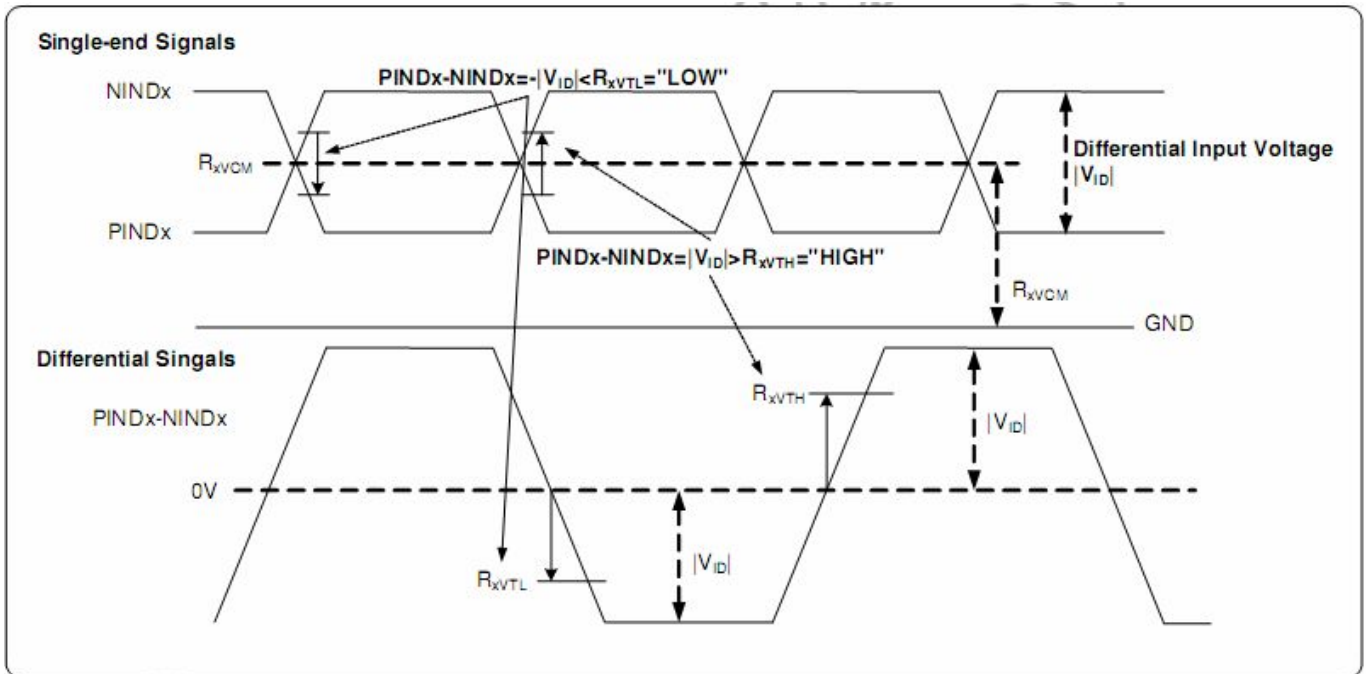
| Parameter | Symbol | Min | Typ | Max | Unit | Remark |
|------------------------|--------|------|------------------|-----|------|--------|
| Clock Frequency | RxFCLK | 40.8 | 51.2 | 71 | MHz | |
| Input data skew margin | TRSKM | 500 | - | - | ps | |
| Clock high time | TLVCH | - | $4/(7 * RxFCLK)$ | - | ns | |
| Clock low time | TLVCL | - | $3/(7 * RxFCLK)$ | - | ns | |
| PLL wake-up time | TenPLL | - | - | 150 | us | |

8.2 Input Clock and Data Timing Diagram



8.3 DC Electrical Characteristics

| Parameter | Symbol | Min | Typ | Max | Unit | Remark |
|-------------------------------------------|---------|-----------|---------|---------------|------|-----------------------------------|
| Differential input high Threshold voltage | RXVTH | - | - | 0.1 | V | |
| Differential input Low Threshold voltage | RXVTL | -0.1 | - | - | V | |
| Input voltage range | RXVIN | 0 | - | 2.4 | V | |
| Differential input common Mode voltage | RXVCM | $ VID /2$ | - | $2.4- VID /2$ | V | |
| Differential input voltage | $ VID $ | 0.2 | v | 0.6 | V | |
| Differential input leakage Current | RVXliz | -10 | v | 10 | uA | |
| LVDS Digital Operating Current | Iddlvs | - | 15(TBD) | 30(TBD) | mA | Fclk=65MHz,VDD=3.3V |
| LVDS Digital Stand-by Current | Istlvds | - | 10(TBD) | 50(TBD) | uA | Clock & all functions are stopped |



8.4 Timing

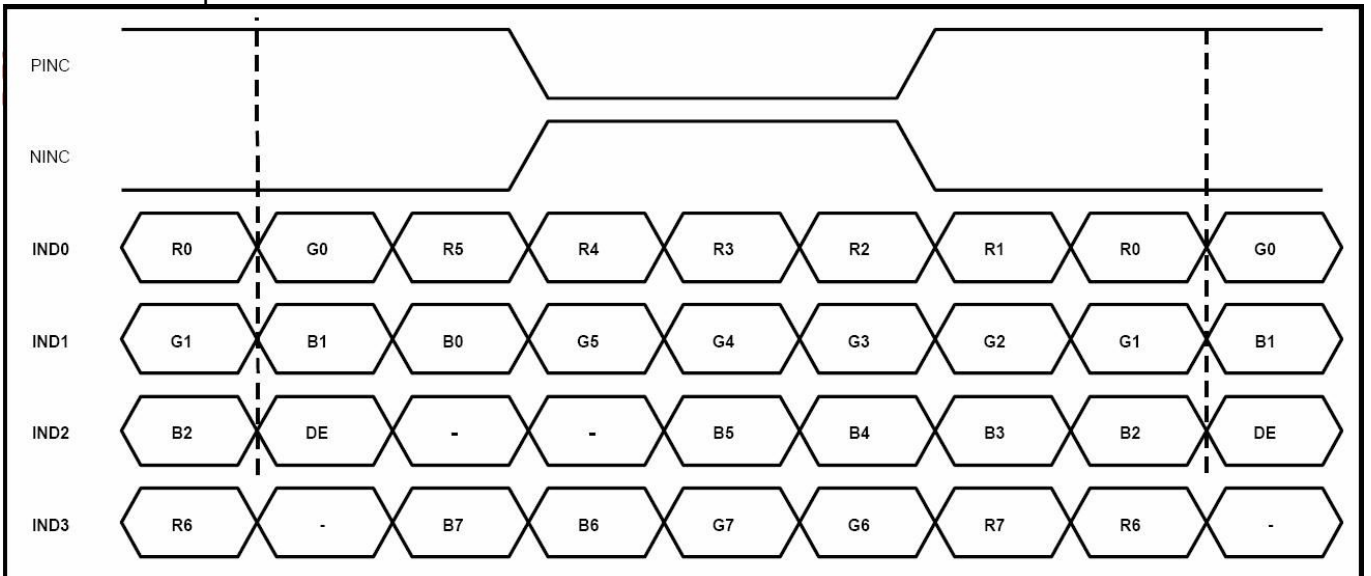
| Parameter | Symbol | Min | Typ | Max | Unit | Remark |
|-------------------------|-----------|------|------|------|------|-----------------|
| Clock frequency | fclk | 40.8 | 51.2 | 67.2 | MHz | Frame rate=60Hz |
| Horizontal display area | thd | 1024 | | | DCLK | |
| HS period time | th | 1114 | 1344 | 1400 | DCLK | |
| HS Blanking | thbp+thfp | 90 | 320 | 376 | DCLK | |
| Vertical display area | tvd | 600 | | | H | |
| VS period time | tv | 610 | 635 | 800 | H | |
| VS Blanking | tvbp+tvfp | 10 | 35 | 200 | H | |

8.5 Data Input Format

6 bit LVDS input

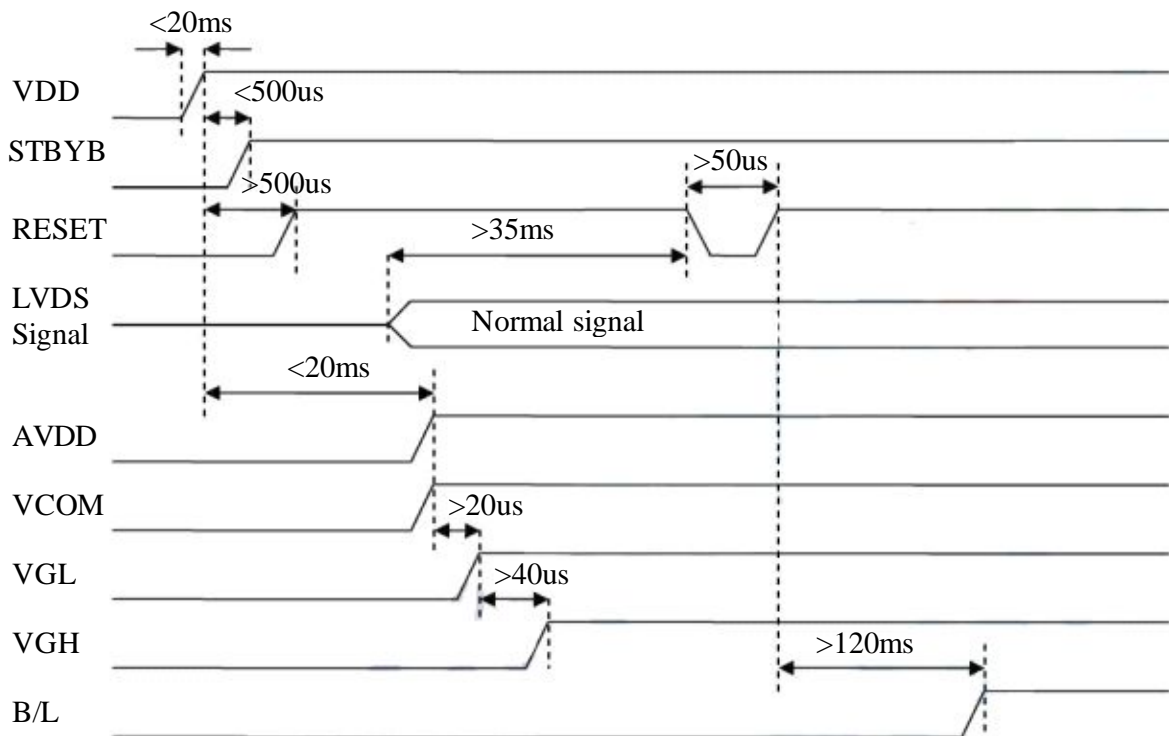


8 bit LVDS input

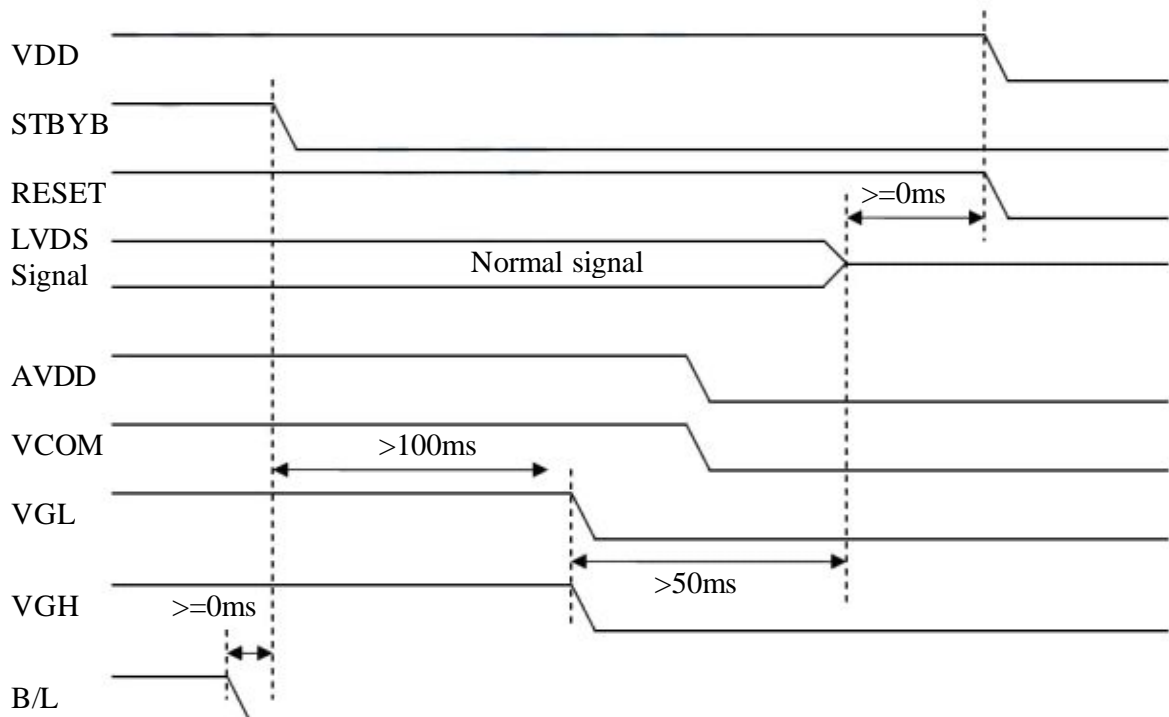


8.6 POWER ON/OFF SEQUENCE

a. Power on:



b. Power off:



9. Optical Specification

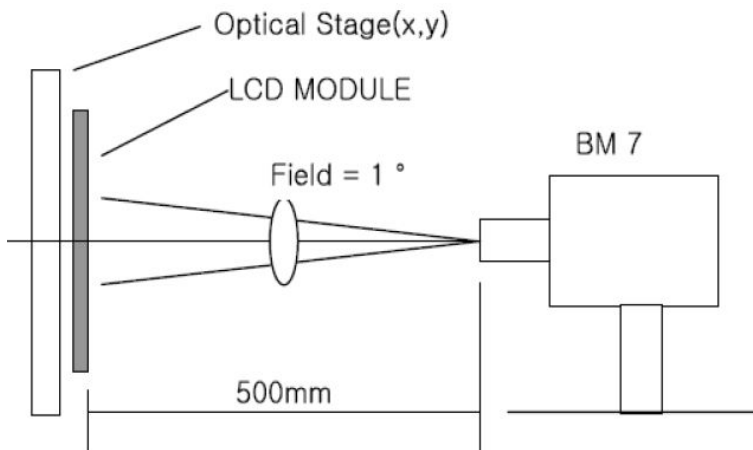
Ta=25°C

| Item | Symbol | Condition | Min | Typ. | Max. | Unit | Remark |
|----------------|------------|------------------|------------------|-------|------|-------------------|-----------------|
| Contrast Ratio | CR | $\theta=0^\circ$ | 500 | (700) | | | Note1 Note2 |
| Response Time | Ton | 25°C | | 10 | 20 | ms | Note1 Note3 |
| | Toff | | | 15 | 30 | | |
| View Angles | θT | $CR \geq 10$ | | 70 | | Degree | Note 4 |
| | θB | | | 75 | | | |
| | θL | | | 75 | | | |
| | θR | | | 75 | | | |
| Chromaticity | White | x | Brightness is on | 0.26 | 0.31 | 0.36 | Note5, Note1 |
| | | y | | 0.28 | 0.33 | 0.38 | |
| | Red | x | | | TBD | | |
| | | y | | | TBD | | |
| | Green | x | | | TBD | | |
| | | y | | | TBD | | |
| | Blue | x | | | TBD | | |
| | | y | | | TBD | | |
| Luminance | L | | 400 | 500 | | cd/m ² | Note1 Note6 |
| Uniformity | U | | 70 | 75 | | % | Note1 Note7 |

Note 1: Definition of optical measurement system.

Temperature = 25°C(±3°C)

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

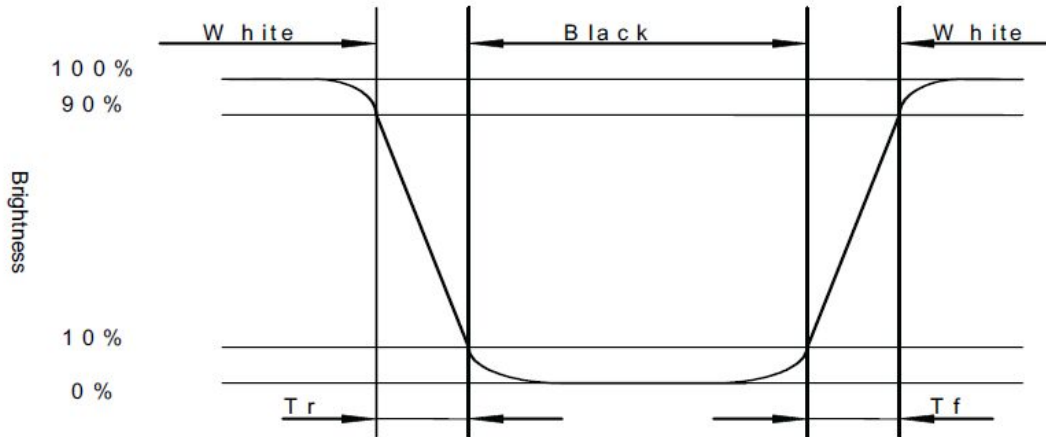


Note 2: Contrast ratio is defined as follow:

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

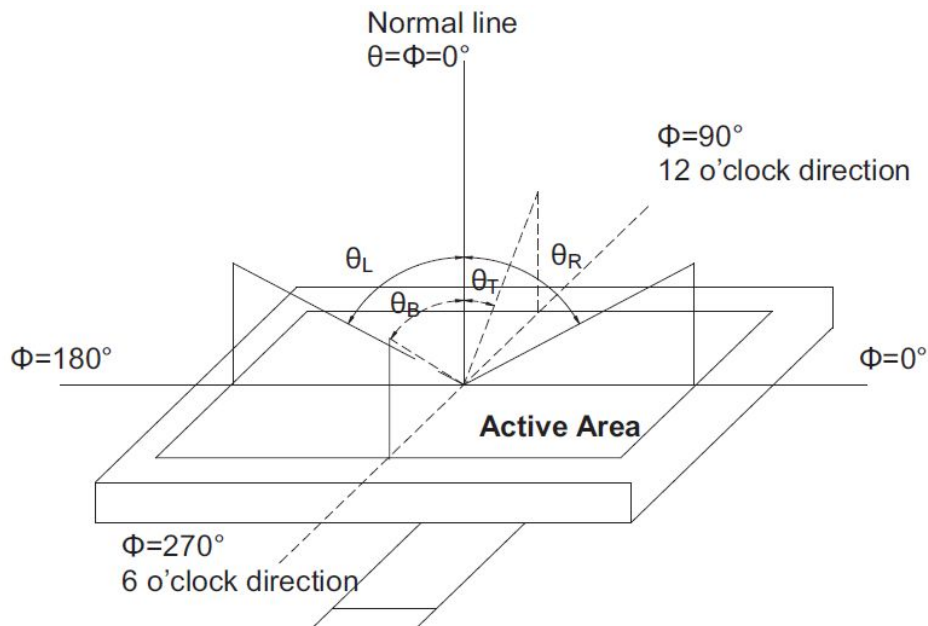
Note 3: Response time is defined as follow:

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).



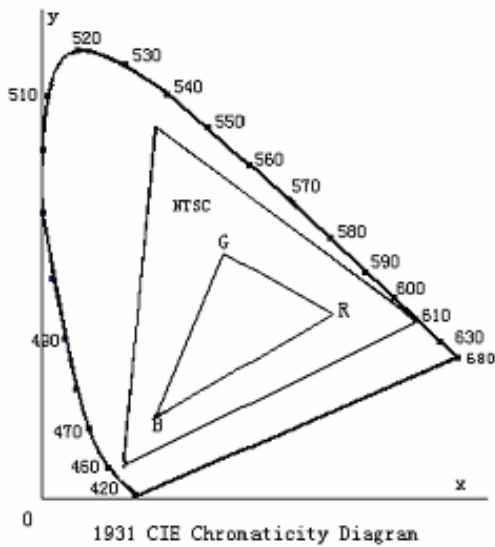
Note 4: Viewing angle range is defined as follow:

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.

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

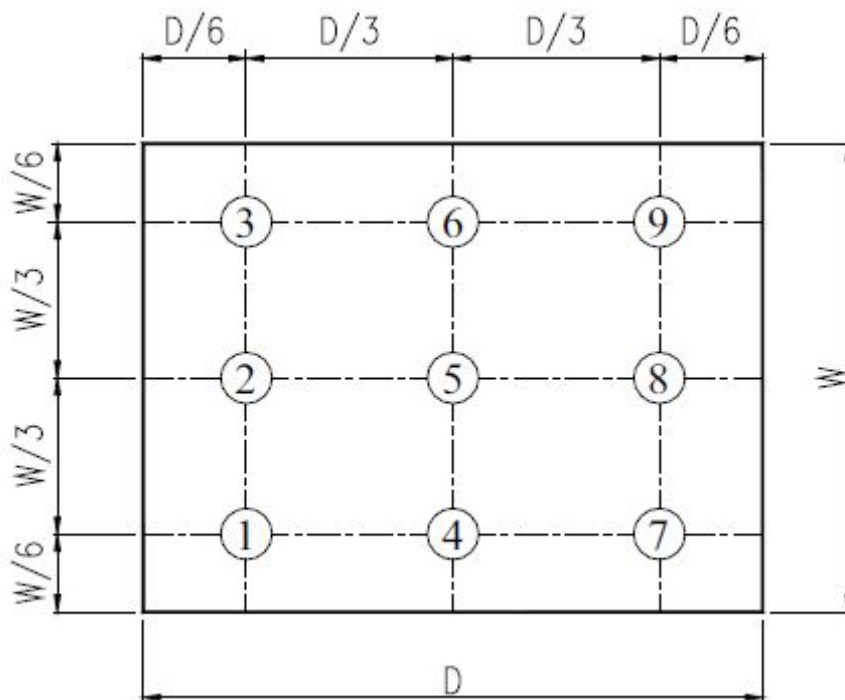


Fig. 2 Definition of uniformity

10. Environmental / Reliability Tests

| No | Test Item | Condition | Judgment criteria |
|----|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| 1 | High Temp Operation | Ts=+80°C, 240hrs | Per table in below |
| 2 | Low Temp Operation | Ta= 30°C, 240hrs | Per table in below |
| 3 | High Temp Storage | Ta=+80°C, 240hrs | Per table in below |
| 4 | Low Temp Storage | Ta= 30°C, 240hrs | Per table in below |
| 5 | High Temp & High Humidity Storage | Ta=+40°C, 90% RH 240 hours | Per table in below (polarizer discoloration is excluded) |
| 6 | Thermal Shock (Non operation) | 30°C 30 min~+80°C 30 min, Change time:5min, 20 Cycles | Per table in below |
| 7 | ESD (Operation) | 2KV, Human Body Mode, 100pF/1500 Ω | Per table in below |
| 8 | Vibration (Non operation) | Random Vibration : 0.015G*G/Hz from 5 100HZ, 6dB/Octave from 100 200HZ 2 hours for each direction of X. Y. Z. (6 hours for total) | Per table in below |
| 9 | Shock (Non operation) | 100G 6ms, X, Y, Z 3 times for each direction | Per table in below |
| 10 | Package Drop Test | Height:60 cm 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 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 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 $+25^{\circ}\text{C} \sim 10^{\circ}\text{C}$ 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.

