



**SPECIFICATION
FOR
LCD MODULE**

**MODULE NO: AFK1024600A0-8.0N12NTM
REVISION NO: V01**

Customer's Approval:

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| | SIGNATURE | DATE |
|---------------------------|-----------|------|
| PREPARED BY (RD ENGINEER) | | |
| CHECKED BY | | |
| APPROVED BY | | |

Records of Revision

| DATE | REF.PAGE PARAGRAPH DRAWING No. | REVISED No. | SUMMARY | REMARK |
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| 2015-11-25 | | V01 | First Issue | |
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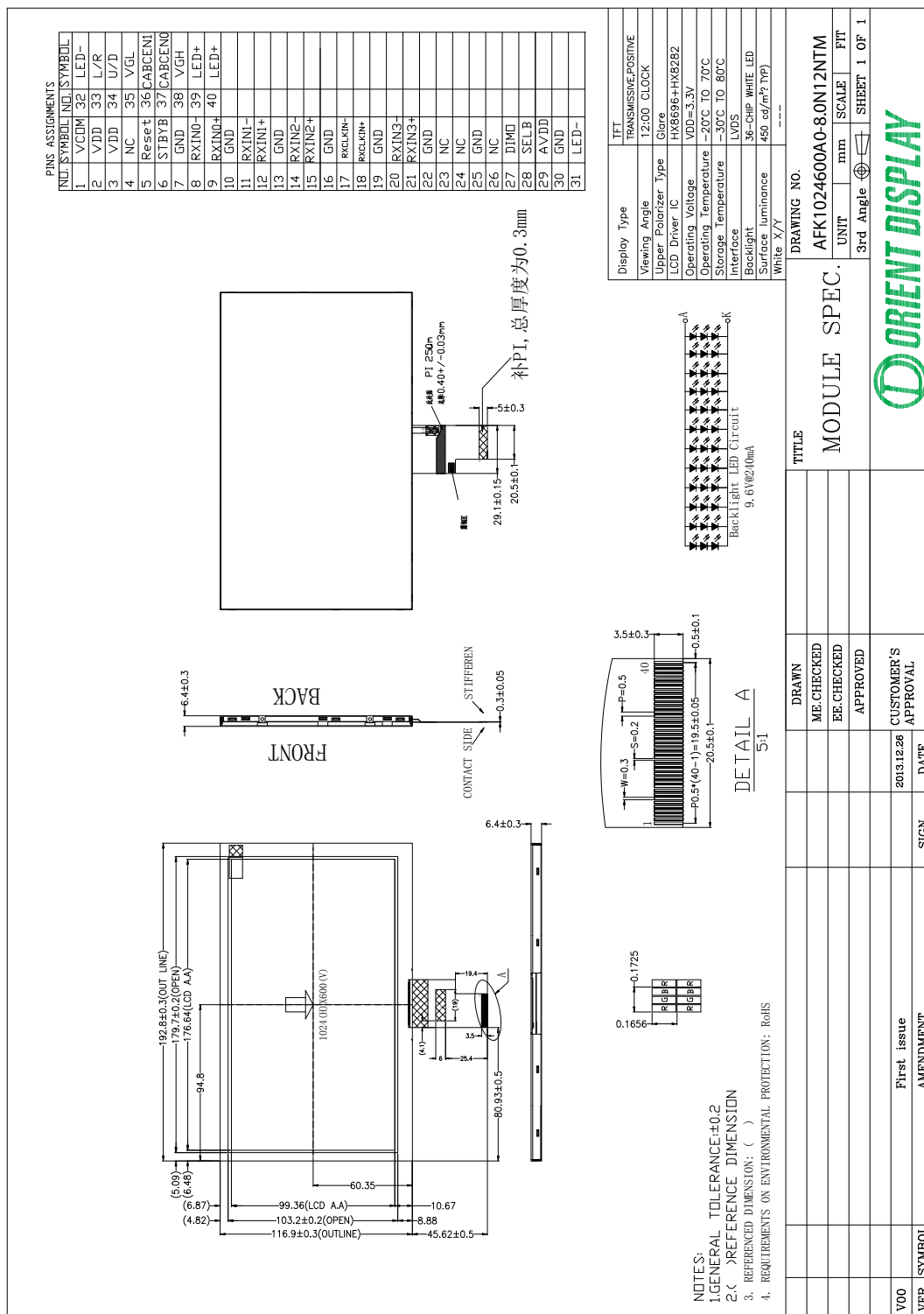
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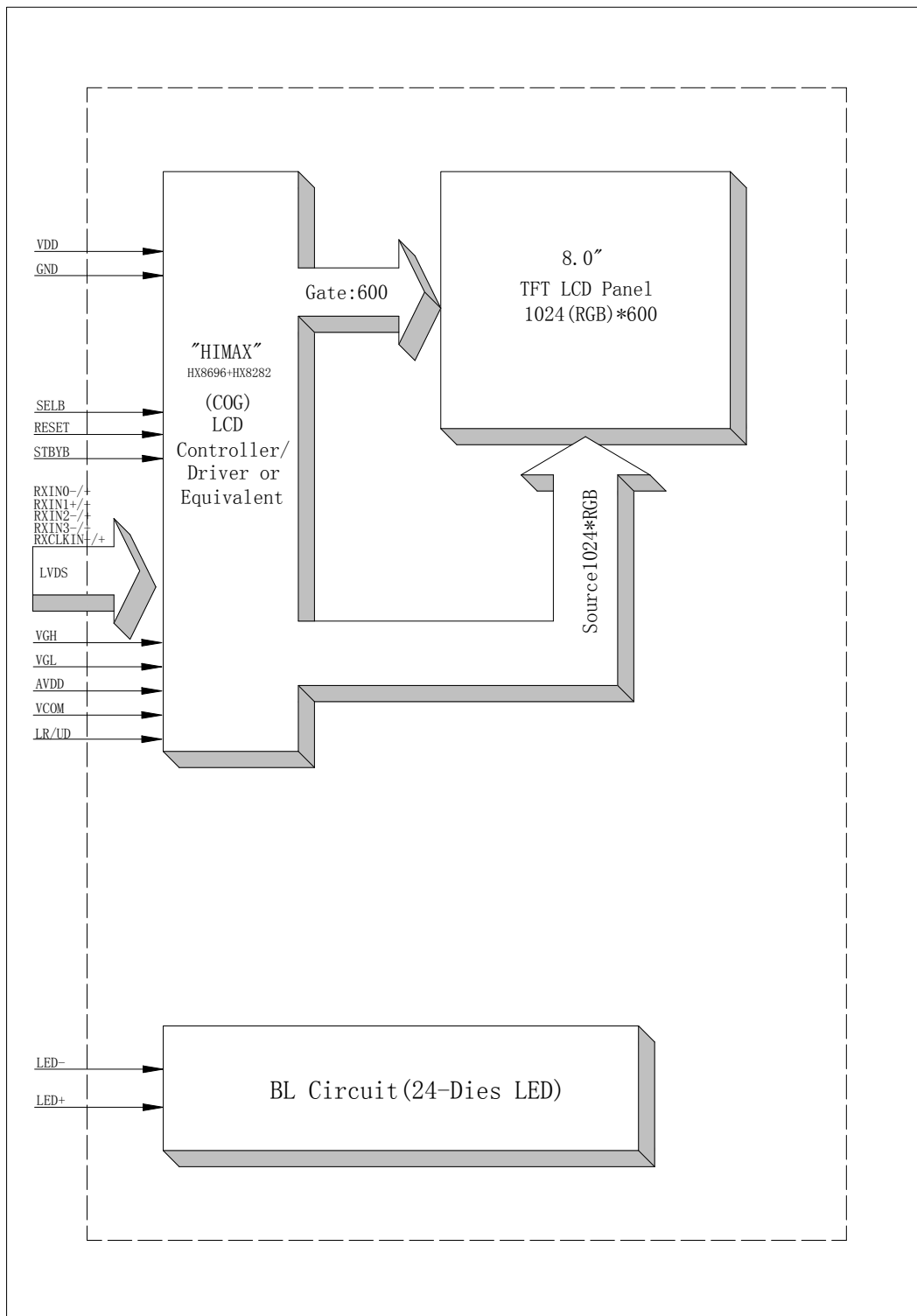
1. General Specification

| Item | Contents | Unit |
|--------------------------------|-------------------|-------------|
| LCD TYPE | TFT/TRANSMISSIVE | |
| MODULE SIZE (W*H*T) | 192.8*116.9*6.4 | MM |
| ACTIVE SIZE (W*H) | 176.64*99.36 | MM |
| PIXEL PITCH (W*H) | 0.1656*0.1725 | MM |
| NUMBER OF DOTS | 1024*600 | |
| DIVER IC | HX8696+HX8282 | |
| INTERFACE TYPE | LVDS | |
| TOP POLARIZER TYPE | GLARE | |
| RECOMMEND VIEWING DIRECTION | 12 | O'CLOCK |
| GRAY SCALE INVERSION DIRECTION | 6 | O'CLOCK |
| COLORS | 16.7M | |
| BACKLIGHT TYPE | 36-CHIP WHITE LED | |
| TOUCH PANEL TYPE | WITHOUT | |

2. Mechanical Drawing



3. Block Diagram



4. Interface Pin Function

| Pin No. | Symbol | Description |
|---------|----------|---|
| 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", normal 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 data 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 CABC controller signal output |
| 28 | SELB | 6bit/8bit mode select |
| 29 | AVDD | Power for Analog Circuit |
| 30 | GND | Ground |
| 31 | LED- | LED Cathode |
| 32 | LED- | LED Cathode |
| 33 | L/R | Horizontal inversion |
| 34 | U/D | Vertical inversion |
| 35 | VGL | Gate OFF Voltage |
| 36 | CABCEN1 | CABC H/W enable |
| 37 | CABCEN0 | CABC H/W enable |
| 38 | VGH | Gate ON Voltage |

| | | |
|----|------|--------------|
| 39 | LED+ | Anode of LED |
| 40 | LED+ | Anode of LED |

Note1: 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.

Note2: 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.

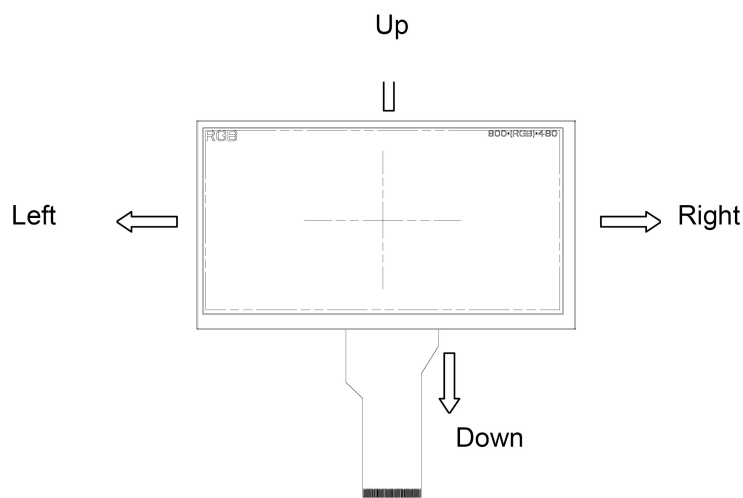
When CABC off, don't connect DIMO, else connect it to backlight.

Note3: 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.



5. Absolute Maximum Ratings

| Parameter | Symbol | Min | Max | Unit |
|---------------------------|------------------|------|------|------|
| Supply voltage for logic | VDD | -0.3 | 5 | V |
| Supply voltage for analog | AVDD | 6.5 | 13.5 | V |
| Power supply | VGH | -0.3 | 40 | V |
| Power supply | VGL | -20 | 0.3 | V |
| Power supply | VGH-VGL | - | 40 | V |
| Supply current (One LED) | I _{LED} | | 30 | mA |
| Operating temperature | T _{OP} | -20 | +80 | °C |
| Storage temperature | T _{ST} | -30 | +80 | °C |

Note: The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

6. Electrical Characteristics

6.1 Input Power

| Item | Symbol | Min | Typ. | Max | Unit | Applicable terminal |
|---------------------------|------------------|---------|------|--------|------|---------------------|
| Supply Voltage for Analog | VDD | 3.0 | 3.3 | 3.6 | V | |
| Supply Voltage for Logic | AVDD | 10.8 | 11 | 11.2 | V | |
| Power supply | VGH | 16 | 20 | 24 | | |
| Power supply | VGL | -9.8 | -6.8 | -3.8 | | |
| Power supply | VCOM | 3.4 | 3.7 | 4.0 | | |
| Input Voltage | V _{IL} | 0 | - | 0.3VDD | V | |
| | V _{IH} | 0.7 VDD | - | VDD | | |
| Input leakage Current | I _{LKG} | - | | - | μA | |

6.2 Backlight Driving Conditions

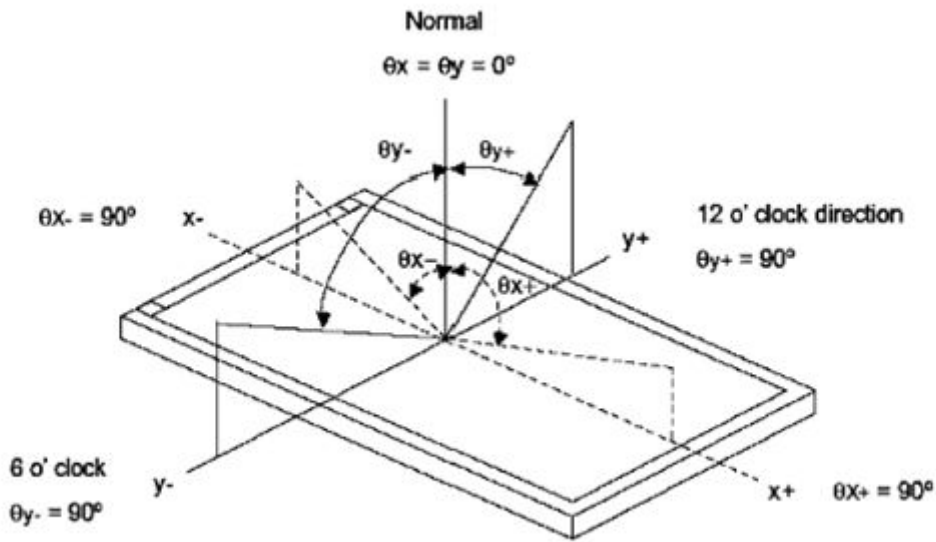
| Item | Symbol | Value | | | Unit | Remark |
|---------------------------|----------------|--------|-------|------|------|-----------------------|
| | | Min. | Typ. | Max. | | |
| Voltage for LED Backlight | V _F | - | 9.6 | 10.8 | V | I _L =240mA |
| Current for LED Backlight | I _L | | 240 | | mA | |
| Power Consumption | P | | 2.304 | | W | |
| LED Life Time | | 30,000 | | | Hr | Note |

Note: Brightness to be decreased to 50% of the initial value at ambient temperature TA=25°C

7. Optical Characteristics

| ITEM | SYMBOL | CONDITIONS | SPECIFICATIONS | | | UNIT | NOTE |
|----------------------|------------------|----------------------|----------------------|------|-----|-----------------|------|
| | | | MIN | TYP. | MAX | | |
| Luminance | L | $I_L = 240\text{mA}$ | - | 450 | - | Cd/m^2 | |
| Contrast Ratio | CR | $\theta = 0^\circ$ | 500 | 700 | | | |
| Response Time | T_{ON} | 25°C | | 10 | 20 | ms | |
| | T_{OFF} | | | 20 | 30 | | |
| CIE Color Coordinate | Red | X_R | Viewing normal angle | | | | |
| | | Y_R | | | | | |
| | Green | X_G | | | | | |
| | | Y_G | | | | | |
| | Blue | X_B | | | | | |
| | | Y_B | | | | | |
| | White | X_W | | | - | | |
| | | Y_W | | | - | | |
| Viewing Angle | Hor. | θ_{X+} | $\text{CR} \geq 10$ | 70 | 70 | Degree | |
| | | θ_{X-} | | 70 | 70 | | |
| | Ver. | θ_{Y+} | | 60 | 65 | | |
| | | θ_{Y-} | | 70 | 70 | | |
| Uniformity | Un | | | 70 | 75 | % | |

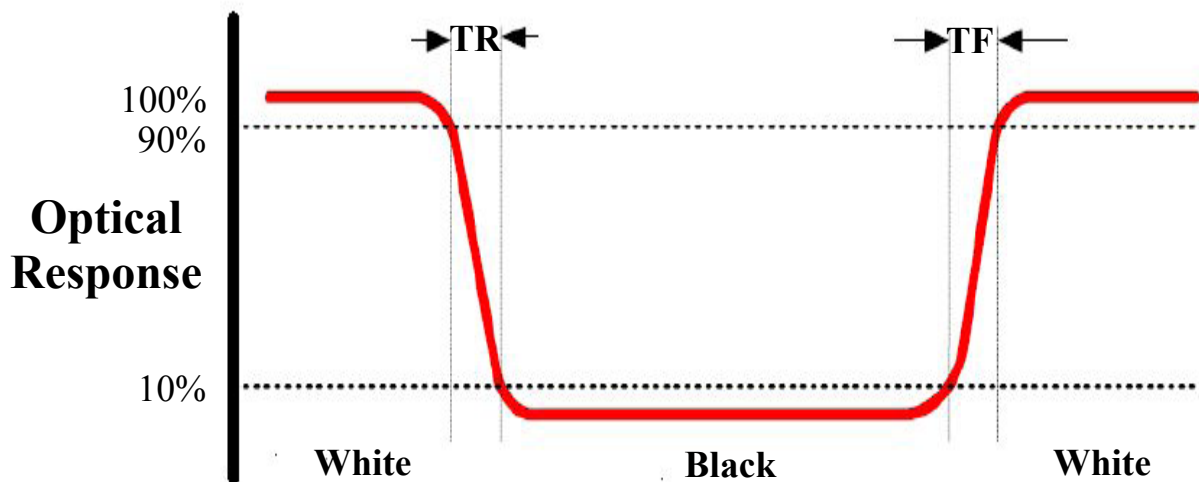
Note 1: Definition of Viewing Angle θ_x and θ_y :



Note 2: Definition of contrast ratio CR:

$$CR = \frac{\text{Luminance of white state}}{\text{Luminance of black state}}$$

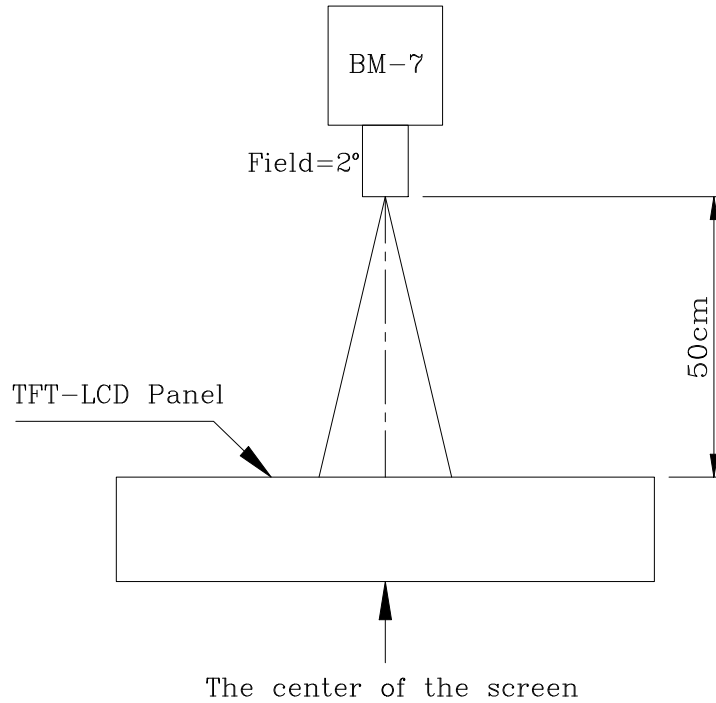
Note 3: Definition of Response Time (T_r, T_f)



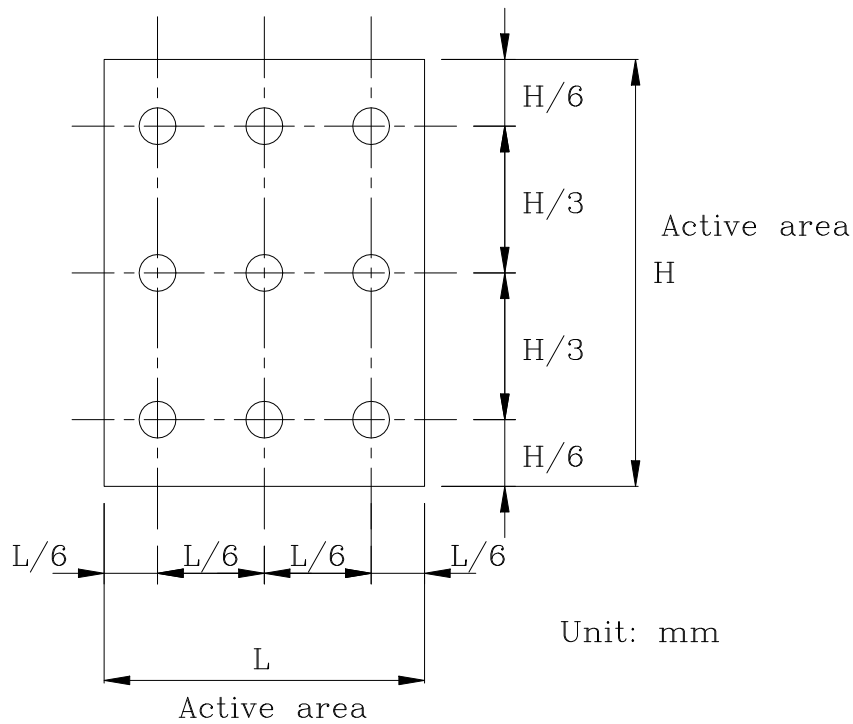
Note 4: Definition of Luminance

①The Brightness Test Equipment Setup

Field=2° (As measuring “black” image, field=2° is the best testing condition)



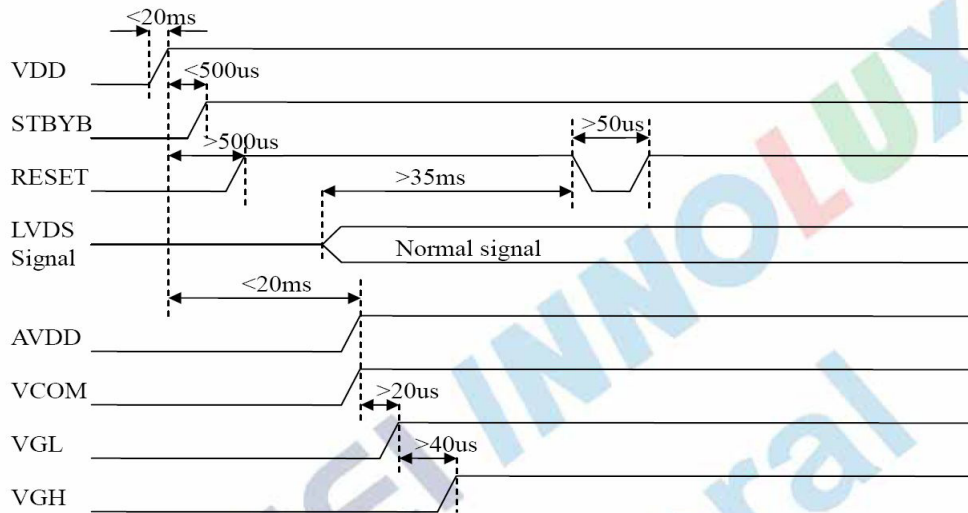
②The Brightness Test Point Setup



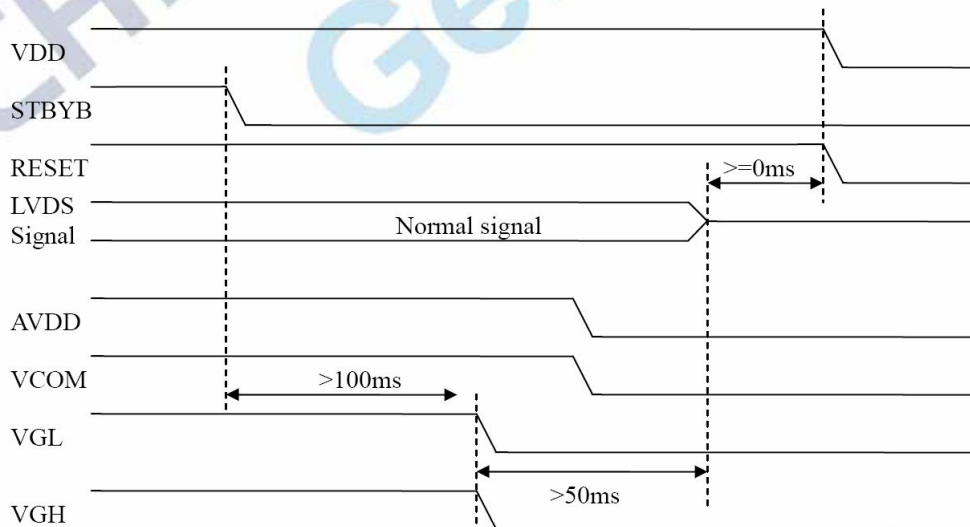
8. Timing Characteristics

8.1 Power Sequence

Power on



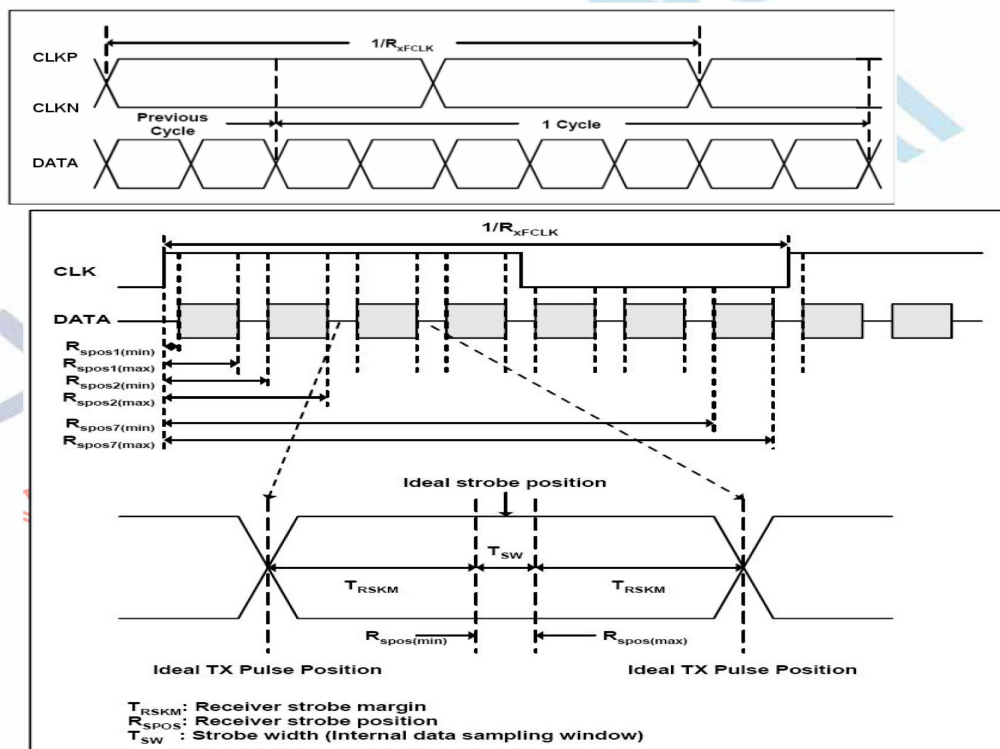
Power off



8.2 AC electrical characteristics

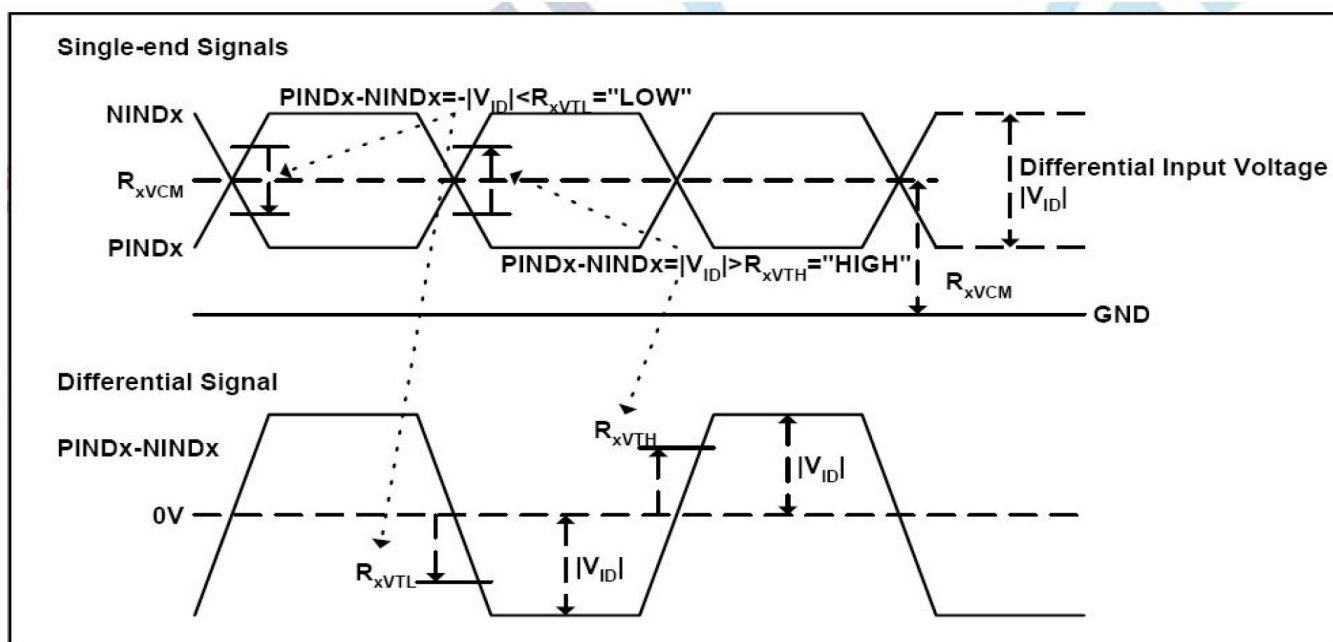
| Item | Symbol | Values | | | Unit | Remark |
|------------------------|--------|--------|-----------------|------|------|--------|
| | | Min. | Typ. | Max. | | |
| Clock frequency | RXFCLK | 20 | - | 71 | MHZ | |
| Input data skew margin | TRSKM | 500 | - | - | Ps | |
| Clock high time | TLVCH | - | $4/(7 \cdot r)$ | - | ns | |
| Clock low time | TLVCL | - | $3/(7 \cdot r)$ | - | ns | |

8.3 Input data format

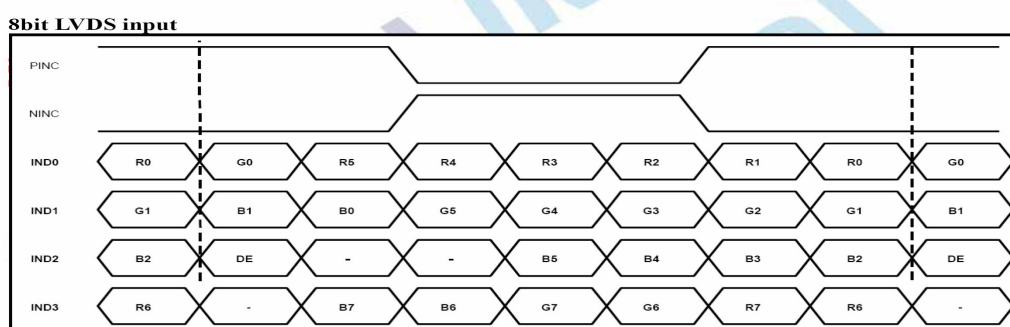
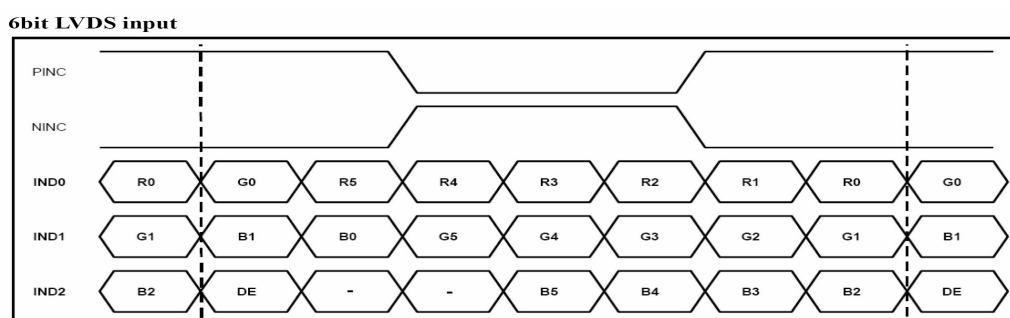


8.4 DC Electrical Characteristics

| Parameter | Symbol | Values | | | Unit | Remark |
|---|----------------|--------------|-----|------------------|---------|-----------------|
| | | Min | Typ | Max | | |
| Differential input high Threshold voltage | R_{xVTH} | - | - | +0.1 | V | $R_{xVCM}=1.2V$ |
| Differential input low Threshold voltage | R_{xVTL} | -0.1 | - | - | V | |
| Input voltage range (singled-end) | R_{xVIN} | 0 | - | 2.4 | V | |
| Differential input common mode voltage | R_{xVCM} | $ V_{ID} /2$ | - | $2.4- V_{ID} /2$ | V | |
| Differential voltage | $ V_{ID} $ | 0.2 | - | 0.6 | V | |
| Differential input leakage current | $R_{V_{xliz}}$ | -10 | - | +10 | μA | |



8.5 Data input format



Note: Support DE timing mode only, SYNC mode not supported.

8.6 Data input format

| Item | Symbol | Values | | | Unit | Remark |
|-------------------------|--------|--------|------|------|------|-----------------|
| | | Min | Typ | Max | | |
| 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 | Thb | 90 | 320 | 376 | DCLK | |
| Vertical display area | Tvd | 600 | | | H | |
| VS period time | Tv | 610 | 635 | 800 | H | |
| VS blanking | Thb | 10 | 35 | 200 | H | |

9. Standard Specification for Reliability

9.1 Standard Specification for Reliability of LCD Module

| Item | Test Conditions | Remark |
|--|--|---------------|
| High temperature storage | Ta=80°C 240hrs | NOTE1 , NOTE4 |
| Low temperature storage | Ta=-30°C 240hrs | NOTE1 , NOTE4 |
| High temperature operation | Ta=80°C 240hrs | NOTE2 , NOTE4 |
| Low temperature operation | Ta=-20°C 240hrs | NOTE2 , NOTE4 |
| Operate at high temperature and humidity | +60°C , 90%RH 240hrs | NOTE4 |
| Thermal Shock | -30°C/30min~+80°C/30min for a total 100 cycles, start with cold temperature and end with high temperature. | NOTE4 |
| Vibration Test | Frequency range:10~55HZ Stroke:1.5mm Swap:10HZ~55HZ~10HZ 2 hours of each direction of X.Y. Z (6 hours for total) | |
| Mechanical shock | 100G 6ms, ±X, ±Y, ±Z 3 times for each direction | |
| Package vibration test | Random vibration :0.15G*G/HZ from 5-200 HZ,-6dB/Octave from 200-500HZ of each direction of X.Y. Z (6 hours for total) | |
| Low temperature storage | Height:60cm 1 corner ,3 edges ,6 surfaces | |
| Low temperature storage | ±2KV ,Human Body Mode, 100pF/1500Ω | |

Note 1: Ta is the ambient temperature of samples.

Note 2: Ts is the temperature of panel's surface.

Note 3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.

Note 4: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

10. General Precautions

10.1. Safety

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

10.2. Handling

- The LCD panel is plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.
- The polarizer attached to the display is easily damaged. Please handle it carefully to avoid scratch or other damages.
- To avoid contamination on the display surface, do not touch the module surface with bare hands.
- Keep a space so that the LCD panels do not touch other components.
- Put cover board such as acrylic board on the surface of LCD panel to protect panel from damages.
- Transparent electrodes may be disconnected if you use the LCD panel under environmental conditions where the condensation of dew occurs.
- Do not leave module in direct sunlight to avoid malfunction of the ICs.

10.3. Static Electricity

- Be sure to ground module before turning on power or operating module.
- Do not apply voltage which exceeds the absolute maximum rating value.

10.4. Storage

- Store the module in a dark room where must keep at $25\pm 10^{\circ}\text{C}$ and 65%RH or less.
- Do not store the module in surroundings containing organic solvent or corrosive gas.
- Store the module in an anti-electrostatic container or bag.

10.5. Cleaning

- Do not wipe the polarizer with dry cloth. It might cause scratch.
- Only use a soft sloth with IPA to wipe the polarizer, other chemicals might permanent damage to the polarizer.

11. Packing Method

----TBD