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SPECIFICATION FOR LCD MODULE

MODULE NO: AFU1280768HD-8.0-WX800V31
REVISION NO: 3.0

Customer's Approval:

| |
|--|
| |
|--|

| | SIGNATURE | DATE |
|---------------------------|-----------|------------|
| PREPARED BY (RD ENGINEER) | | 2010-12-30 |
| CHECKED BY | | 2010-12-30 |
| APPROVED BY | | 2010-12-30 |

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1 General Specifications

1.1 General Specifications

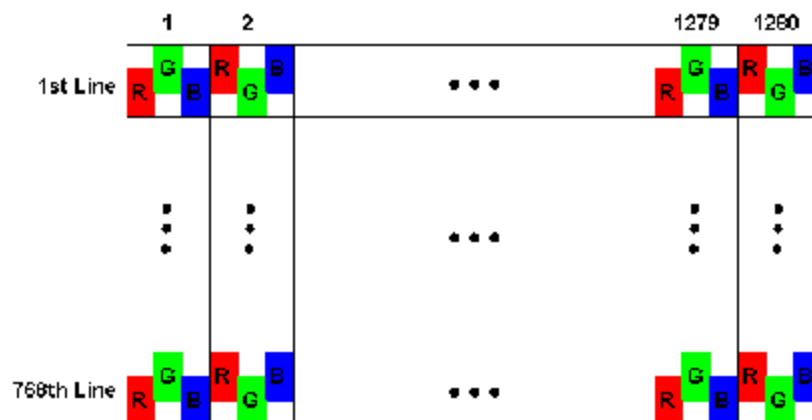
| Feature | | Spec |
|-----------------------------------|----------------------------------|------------------------|
| Display Spec | Size | 8 inch |
| | Resolution | 1280(RGB)×768 |
| | Interface | 6 pairs Mini-LVDS |
| | Color Depth | 262.144K |
| | Technology Type | a-Si |
| | Pixel Pitch (mm) | 0.1358(H)×0.1358(V) |
| | Pixel Configuration | R.G.B. Vertical Stripe |
| | Display Mode | TM with Normally White |
| | Surface Treatment (Up Polarizer) | Anti Glare |
| | Viewing Direction (Note 1) | 12 o'clock |
| | Gray Scale Inversion Direction | 6 o'clock |
| Mechanical Characteristics | DIM. Panel (W x H x D)(mm) | 185.4×117×3.8 |
| | Active Area (W x H)(mm) | 173.76×104.256 |
| | With /Without TSP | Without TSP |
| | Weight (g)(Note 3) | 180 |
| | LED Numbers | 24 LEDS |

Note 1: Viewing direction for best image quality is different from TFT definition. There is a 180 degree shift.

Note 2: Requirements on Environmental Protection: RoHS

Note 3: Weight tolerance: +/- 5%

1.2 Pixel Format Image



2 Input/Output Terminals

2.1 INPUT TERMINALS PIN ASSIGNMENT

| Pin No. | Symbol | I/O (Note1) | Description | Comment |
|---------|--------|-------------|--|---------|
| 1 | VCOM | P | Common voltage | - |
| 2 | EVEN | P | Frame selection | - |
| 3 | GND | P | Ground | - |
| 4 | VCC | P | Power supply 3.3V | - |
| 5 | VCC | P | Power supply 3.3V | - |
| 6 | VGL | P | Power supply for Gate off output | - |
| 7 | VGH | P | Power supply for Gate on output | - |
| 8 | STV2 | I | Start pulse input/output pin | - |
| 9 | STV1 | I | Start pulse input/output pin | - |
| 10 | CLK | I | Shift clock input | - |
| 11 | UPDN | I | Up/Down shift direction control input | Note2 |
| 12 | OE | I | Output enable control | - |
| 13 | XON | I | Output all-on control | - |
| 14 | VCOM | P | common voltage | - |
| 15 | DIO1 | I | Start pulse input/output | - |
| 16 | GND | P | Ground | - |
| 17 | SHL | I | Left/Right Shift direction control input | Note2 |
| 18 | LV0A | I | Mini-LVDS data input | - |
| 19 | LV0B | I | Mini-LVDS data input | - |
| 20 | LV1A | I | Mini-LVDS data input | - |
| 21 | LV1B | I | Mini-LVDS data input | - |
| 22 | LV2A | I | Mini-LVDS data input | - |
| 23 | LV2B | I | Mini-LVDS data input | - |
| 24 | CLKA | I | Mini-LVDS data input | - |
| 25 | CLKB | I | Mini-LVDS data input | - |
| 26 | LV3A | I | Mini-LVDS data input | - |
| 27 | LV3B | I | Mini-LVDS data input | - |
| 28 | LV4A | I | Mini-LVDS data input | - |
| 29 | LV4B | I | Mini-LVDS data input | - |
| 30 | LV5A | I | Mini-LVDS data input | - |
| 31 | LV5B | I | Mini-LVDS data input | - |
| 32 | AVDD | P | Analog power input,6.5V~13.5V | - |
| 33 | GND | P | Ground | - |
| 34 | LD | I | Latch input, For normal operation, it is required to input one LD per horizontal display line. | - |
| 35 | REV | I | The REV signal controls data inversion internally to the driver. Display data is inverted when REV=H, Display data is not inverted when REV=L. | - |
| 36 | POL | I | Polarity inverting input | - |
| 37 | GND | P | Ground | - |

| | | | | |
|----|------|---|--------------------------------|---|
| 38 | AVDD | P | Analog power input, 6.5V~13.5V | - |
| 39 | DIO2 | I | Start pulse input/output | - |
| 40 | VCOM | P | common voltage | - |

Note1: I/O----definition, I----Input, O----Output, P----Power

Note2: SHL=H, DIO1->OUT1->----OUT1920->DIO2;
 SHL=L, DIO2->OUT1920->----OUT1->DIO1.
 UPDN=H, STV1->G1->----G1536->STV2;
 UPDN=L, STV2->G1536->----G1->STV1.

2.2 U/D R/L Function Description

| Scan Control Input | | Scanning Direction |
|--------------------|------|---------------------------|
| UPDN | SHLR | |
| GND | VCC | Up to Down, Left to Right |
| VCC | GND | Down to Up, Right to Left |
| GND | GND | Up to Down, Right to Left |
| VCC | VCC | Down to Up, Left to Right |

3 Absolute Maximum Ratings

Ta = 25°C

| Item | Symbol | Min | Max | Unit | Remark |
|------------------------|------------------|--------|------|------|--------|
| Digital supply voltage | VCC | -0.5 | 5.0 | V | - |
| Analog supply voltage | AVDD | -0.5 | 13.5 | V | - |
| Power supply voltage 1 | VGH | -0.3 | 42 | V | - |
| Power supply voltage 2 | VGL | VGH-42 | +0.3 | V | - |
| Operating temperature | T _{OPR} | -20 | 70 | °C | - |
| Storage temperature | T _{STG} | -30 | 80 | °C | - |

4 Electrical Characteristics

4.1 Recommended Operating Condition

GND=0V, Ta = 25°C

| Item | Symbol | Min | Typ | Max | Unit | Remark | |
|---------------------------------|------------|-----------------|---------|-------|---------|--------|--|
| Digital Supply Voltage | VCC | 2.3 | 3.3 | 3.6 | V | - | |
| Analog Supply Voltage | AVDD | | 12.625 | | V | - | |
| Gate On Voltage | VGH | | 22 | | V | - | |
| Gate Off Voltage | VGL | | -7.5 | | V | - | |
| Common Electrode Driving Signal | VCOM | | 3.3 | | V | - | |
| Logic Supply Voltage | DVDD | (2.8) | 3.3 | (3.6) | V | - | |
| Input Signal Voltage | Low Level | V _{IL} | 0 | - | 0.3×VCC | V | LV0A, LV0B, LV1A, LV1B, LV2A, LV2B, CLKA, CLKB, LV3A, LV3B, LV4A, LV4B, LV5A, LV5B |
| | High Level | V _{IH} | 0.7×VCC | - | VCC | V | |
| Output Signal Voltage | Low Level | V _{OL} | GND | - | GND+0.4 | V | - |
| | High Level | V _{OH} | VCC-0.4 | - | - | V | |

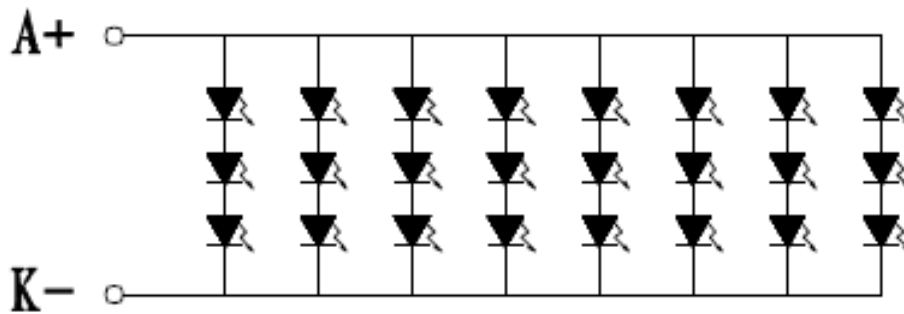
4.2 Power Consumption

AGND=GND=0V, Ta = 25°C

| Item | Symbol | Condition | Min | Typ | Max | Unit | Remark |
|------------------------|-------------------|--------------|-----|-------|-------|------|--------|
| Digital Supply Current | I _{VCC} | VCC=3.3V | - | 11.57 | 12.73 | mA | - |
| Analog Supply Current | I _{AVDD} | AVDD=12.625V | - | 40.63 | 57.38 | mA | - |
| Gate On Current | I _{VGH} | VGH=22.0V | - | 0.29 | 0.31 | mA | - |
| Gate Off Current | I _{VGL} | VGL=-7.5V | - | 0.29 | 0.31 | mA | - |
| Power Consumption | Panel&Gamma | - | - | 554.5 | 778.2 | mW | - |

4.3 ELECTRICAL/OPRICAL CHARACTERISTICS AT Ta=25°C

| Item | Symbol | Values | | | Unit | Remark |
|---------------------------|--------------------|--------|-----|------|-------------------|---------------------------------|
| | | Min | Typ | Max. | | |
| LED Voltage | V_F | 9.0 | 9.9 | 10.8 | V | $I_F=160\text{mA}$ $3*8=24$ |
| Center luminous Intensity | LCD(Module Center) | 180 | 200 | -- | cd/m ² | $I_F=160\text{mA}$ $3*8=24$ |
| Reverse Current | I_R | - | - | 50 | μA | $V_R=5\text{V}$ |
| Luminous Tolerance | $I_v\text{-m}$ | 75 | 80 | - | % | $(\text{mix}/\text{max}) * 100$ |



LED CIRCUIT

$3*8=24\text{EA}$, $20\text{mA}*8=160\text{mA}$

4.4 Block Diagram

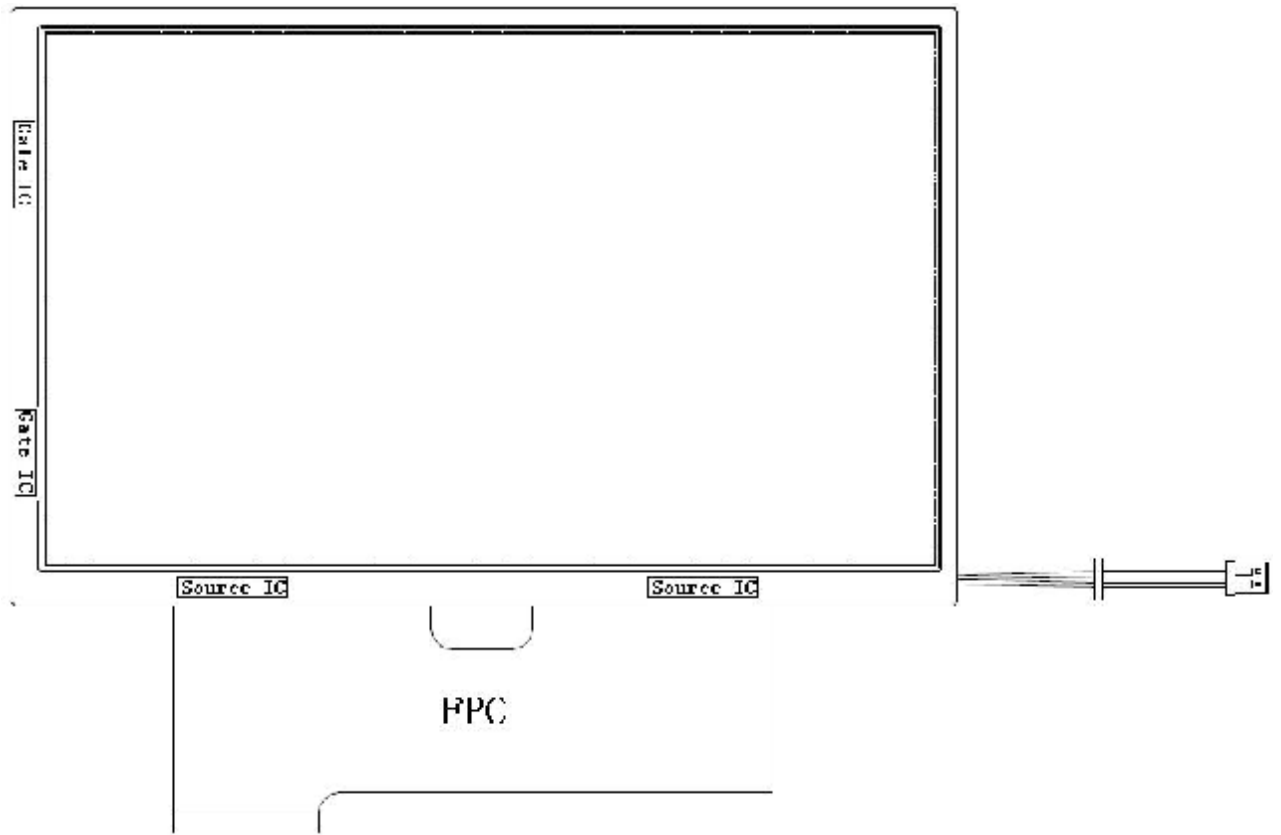


Figure 4.4 LCD module diagram

5 Interface Timing

5.1 AC Electrical Characteristics (For mini-LVDS input mode)

VDD=3.3V, Ta=25°C

| Parameter | Symbol | Min | Typ | Max | Unit | Conditions |
|-----------------------------|----------------|-----------------------|-----|-----|------|--|
| Clock period | t_{clk} | 5.4 | - | - | ns | VCC=2.3V to 3.0V |
| | | 4 | - | - | ns | VCC=3.0V to 3.6V |
| Clock low pulse width | $t_{clk(l)}$ | 2.2 | - | - | ns | VCC=2.3V to 3.0V |
| | | 1.6 | - | - | ns | VCC=3.0V to 3.6V |
| Clock high pulse width | $t_{clk(h)}$ | 2.2 | - | - | ns | VCC=2.3V to 3.0V |
| | | 1.6 | - | - | ns | VCC=3.0V to 3.6V |
| Data setup time | T_{setup1} | 1.1 | - | - | ns | VCC=2.3V to 3.0V |
| | | 0.7 | - | - | ns | VCC=3.0V to 3.6V |
| Data hold time | T_{hold1} | 1.1 | - | - | ns | VCC=2.3V to 3.0V |
| | | 0.7 | - | - | ns | VCC=3.0V to 3.6V |
| CLK,LV[5:0] rising time | T_{rise} | - | - | 0.5 | ns | VCC=2.3V to 3.0V |
| | | - | - | 0.4 | ns | VCC=3.0V to 3.6V |
| CLK,LV[5:0] falling time | T_{fall} | - | - | 0.5 | ns | VCC=2.3V to 3.0V |
| | | - | - | 0.4 | ns | VCC=3.0V to 3.6V |
| Start pulse setup time | T_{setup2} | 1 | - | - | ns | VCC=2.3V to 3.0V |
| | | 1 | - | - | ns | VCC=3.0V to 3.6V |
| Start pulse delay time | T_{plh1} | - | - | 13 | ns | VCC=2.3V to 3.0V Loading=15pF |
| | | - | - | 13 | ns | VCC=3.0V to 3.6V Loading=15pF |
| | | - | - | 13 | ns | VCC=2.3V to 3.0V Loading=15pF |
| | | - | - | 13 | ns | VCC=3.0V to 3.6V Loading=15pF |
| Reset(RST)high period | T_{reseth} | 50ns over 3 CLK | - | - | - | - |
| LD high period | $T_{LD(H)}$ | 200 | - | - | ns | - |
| POL to LD setup time | T_{POL-LD} | 5 | - | - | ns | POL toggle to TP1 rising |
| LD to POL hold time | T_{LD-POL} | 6 | - | - | ns | TP1 falling to POL toggle |
| Receiver off to LD timing | $T_{REC-OFF}$ | 5 | - | - | CLK | - |
| LD to reset input time | $T_{LD-RESET}$ | 200 | - | - | ns | - |
| Reset low to LD rising time | $T_{RESET-LD}$ | 0 | - | - | ns | - |
| Output stable time | T_{ST} | - | - | 6 | us | 10% or 90% target voltage CL=120PF, r=4KΩ |
| Repair output delay time | T_{ST1} | - | - | 20 | us | 10% or 90% target voltage CL=190PF, r=2KΩ |

1280 X 768 HV mode Timing

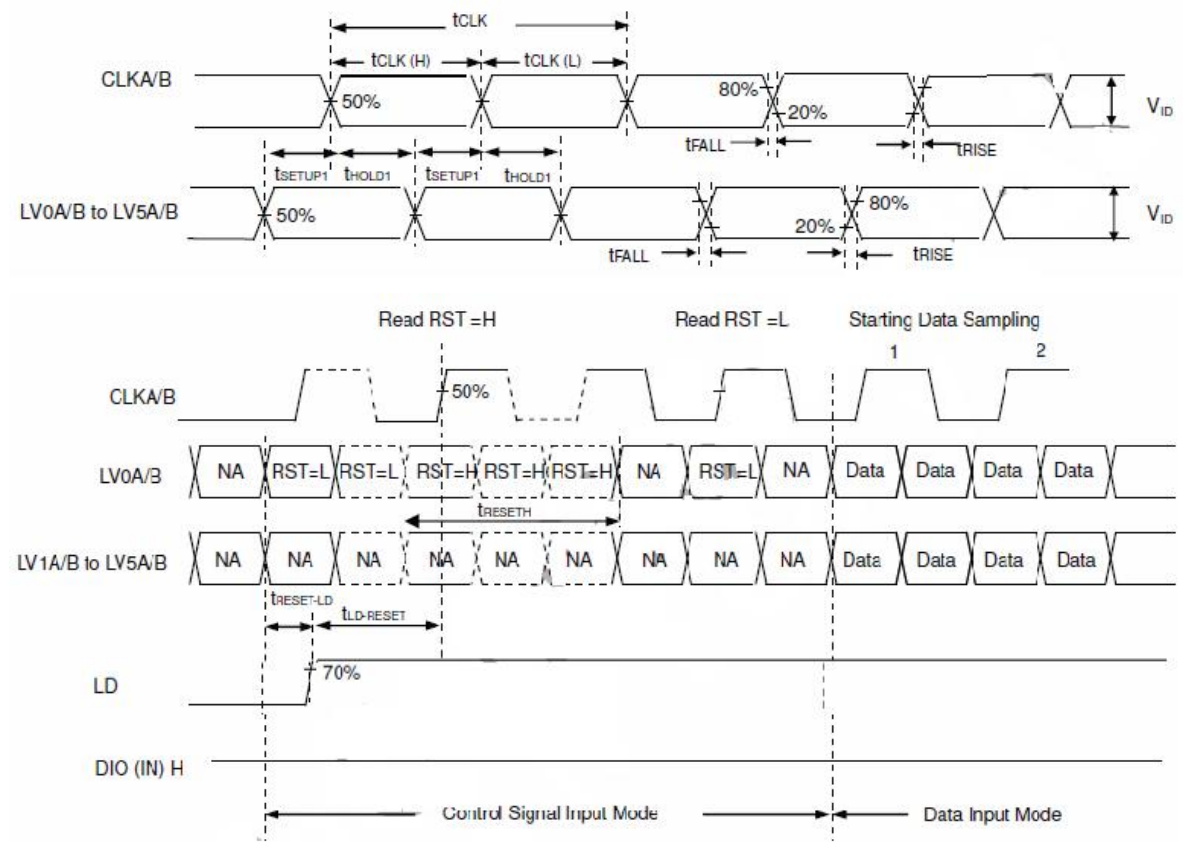
Ta =25°C

| Parameter | Symbol | Value | | | Unit |
|--|--------|-------|-------|-----|------|
| Horizontal display area | thd | 1280 | | | DCLK |
| PCLK frequency @ Frame rate = 60 HZ | fclk | Min | Typ. | Max | |
| | | - | 68.25 | | MHZ |
| 1 Horizontal Line | th | 1440 | | | DCLK |
| HSYNC pulse width | thpw | - | 48 | | |
| HYNC blanking | thb | - | 60 | | |
| HYNC front porch | thfp | - | 60 | | |
| DE mode Blanking | Th-thd | | - | | |
| Vertical display area | tvd | 768 | | | H |
| VSYNC period time | tv | | 790 | | |
| VSYNC pulse width | tvpw | - | 3 | - | H |
| VSYNC Blanking(tvb) | tvb | - | 10 | - | H |
| VSYNC Front proch(tvfp) | tvfp | - | 12 | - | H |
| DE mode Blanking | Tv-tvd | | - | | |

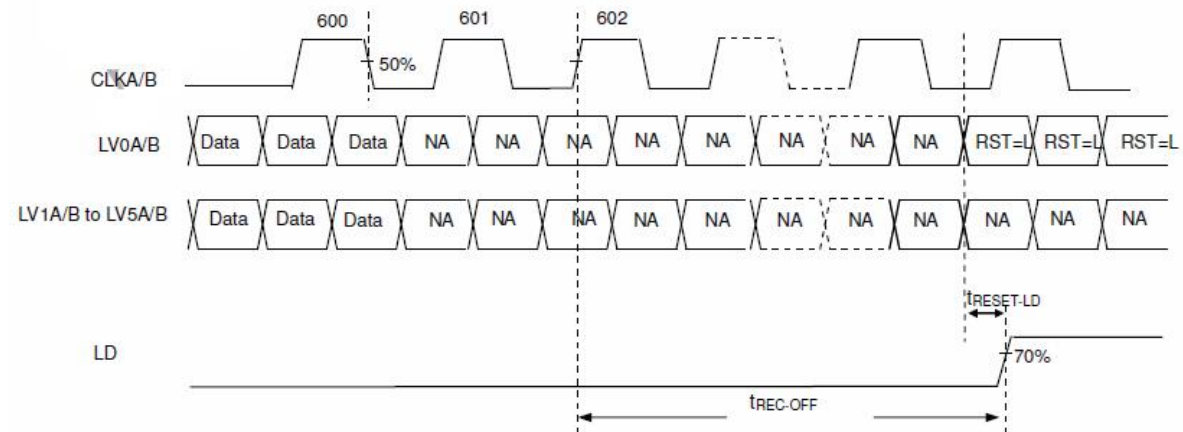
5.2 Data mapping for mini-LVDS input mode



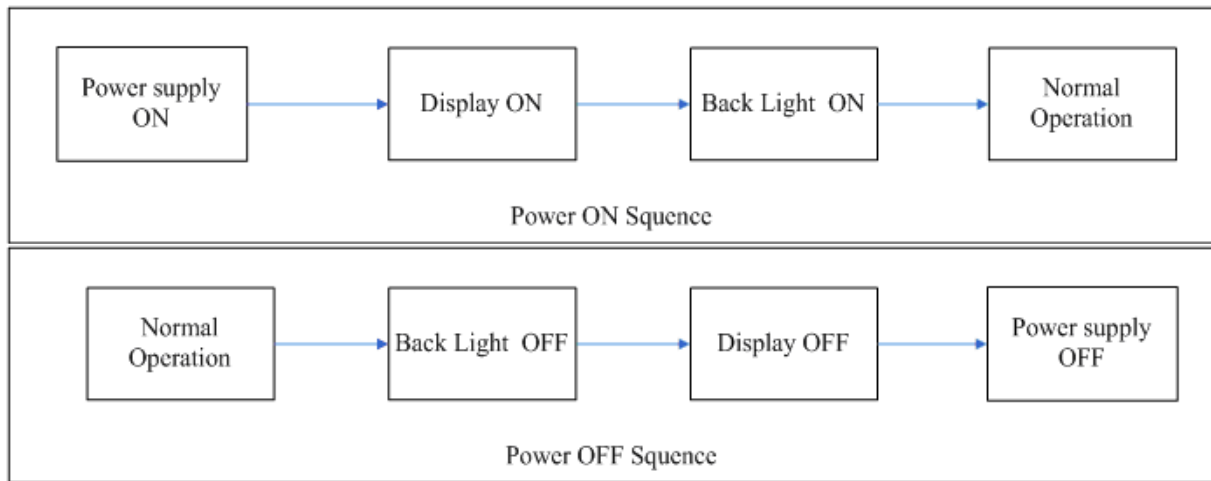
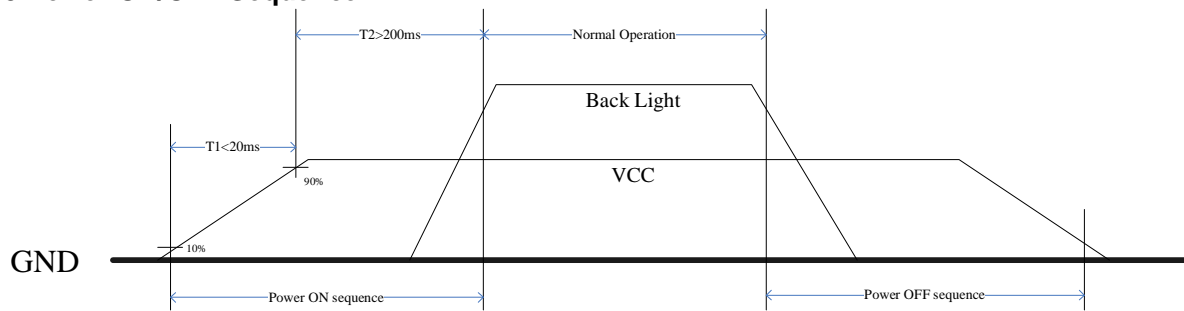
5.3 Timing waveforms



5.4 Last data sampling to LD timing



5.5 Power ON/OFF Sequence



6 Optical Characteristics

Light Source : C-light (With Normal Polarizer)

Ta=25°C

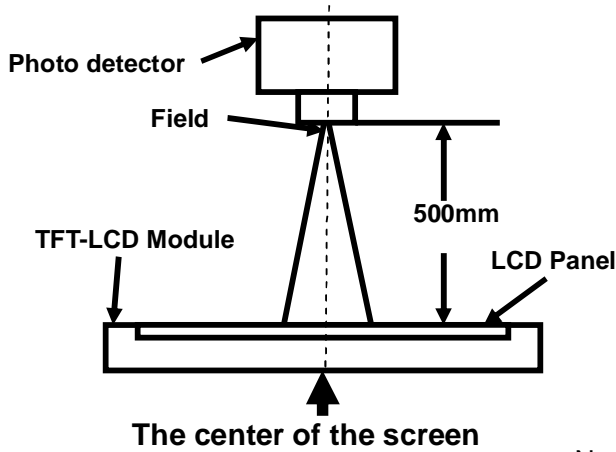
| Item | Symbol | Condition | Min | Typ | Max | Unit | Remark | |
|----------------|------------------|------------------|-----|--------|--------|--------|----------------|----------------|
| View Angles | θT | $CR \geq 10$ | -- | 60 | -- | Degree | Note 2 | |
| | θB | | -- | 70 | -- | | | |
| | θL | | -- | 70 | -- | | | |
| | θR | | -- | 70 | -- | | | |
| Contrast Ratio | CR | $\theta=0^\circ$ | -- | 400 | -- | | Note1 Note3 | |
| Response Time | T _{ON} | 25°C | -- | 25 | -- | ms | Note1 | |
| | T _{OFF} | | | | | | Note4 | |
| Chromaticity | White | C-light | x | 0.2647 | 0.3147 | 0.3647 | | Note5 Note1 |
| | | | y | 0.2881 | 0.3381 | 0.3881 | | |
| | Red | | x | 0.5538 | 0.6038 | 0.6538 | | |
| | | | y | 0.2759 | 0.3259 | 0.3759 | | |
| | Green | | x | 0.2547 | 0.3047 | 0.3547 | | |
| | | | y | 0.5020 | 0.5520 | 0.6020 | | |
| | Blue | | x | 0.0880 | 0.1380 | 0.1880 | | |
| | | | y | 0.0862 | 0.1362 | 0.1862 | | |
| NTSC | | | -- | 50 | -- | % | Note 5 | |
| Transmittance | L | | -- | 4.0 | -- | % | Note1 Note7 | |

Test Conditions:

1. The ambient temperature is 25°C.
2. The test systems refer to Note 1 and Note 2.

Note 1: Definition of optical measurement system.

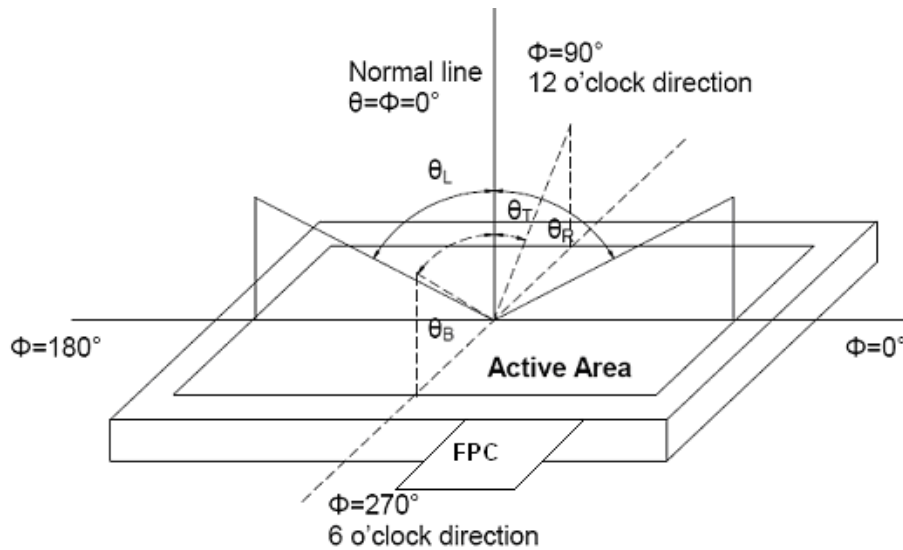
The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



| Item | Photo detector | Field |
|----------------|----------------|-------|
| Contrast Ratio | SR-3A | 1° |
| Luminance | | |
| Chromaticity | | |
| Lum Uniformity | | |
| Response Time | BM-7A | 2° |

Note 2: Definition of viewing angle range and measurement system.

viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80).



Note 3: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

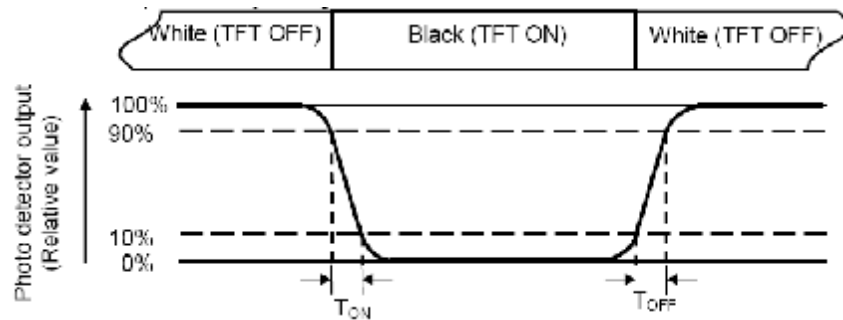
“White state “: The state is that the LCD should drive by V_{white} .

“Black state”: The state is that the LCD should drive by V_{black} .

V_{white} : To be determined V_{black} : To be determined.

Note 4: Definition of Response time

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time (T_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.



Note 5: Definition of color chromaticity (CIE1931)

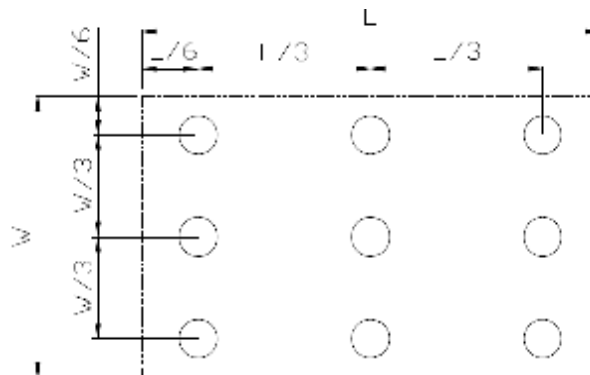
Color coordinates measured at center point of LCD.

Note 6: 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.

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

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



L_{\max} : The measured Maximum luminance of all measurement position.

L_{\min} : The measured Minimum luminance of all measurement position.

Note 7: Definition of Luminance:

Measure the luminance of white state at center point.

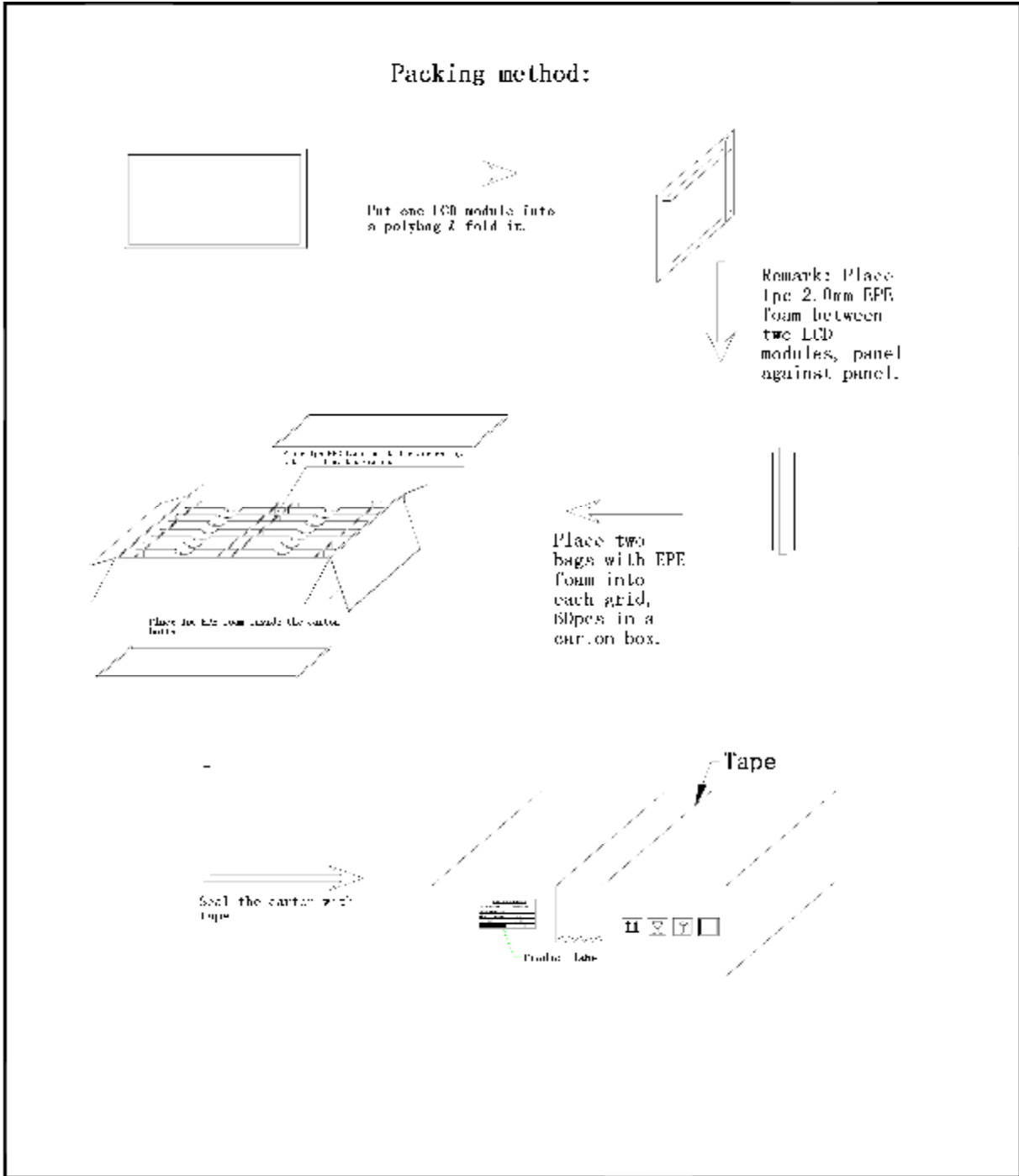
7 Environmental / Reliability Test

| No | Test Item | Condition | Remarks |
|----|--|---|---|
| 1 | High Temperature Operation | Ts = +70°C, 240 hours (Note1) | IEC60068-2-1:2007 GB2423.2-2008 |
| 2 | Low Temperature Operation | Ta = -20°C, 240 hours (Note2) | IEC60068-2-1:2007 GB2423.1-2008 |
| 3 | High Temperature Storage | Ta = +80°C, 240 hours | IEC60068-2-1:2007 GB2423.2-2008 |
| 4 | Low Temperature Storage | Ta = -30°C, 240 hours | IEC60068-2-1:2007 GB2423.1-2008 |
| 5 | Storage at High Temperature and Humidity | Ta = +60°C, 90% RH max,240hours | IEC60068-2-78 :2001 GB/T2423.3—2006 |
| 6 | Thermal Shock (non-operation) | -30°C 30 min~ +80°C 30 min, Change time:5min, 20 Cycles | Start with cold temperature, End with high temperature, IEC60068-2-14:1984,G B2423.22-2002 |
| 7 | ESD | C=150pF,R=330Ω,5point/panel Air:±8Kv,5times; Contact:±4Kv,5times (Environment:15°C~35°C, 30%~60%.86Kpa~106Kpa) | IEC61000-4-2:2001 GB/T17626.2-2006 |
| 8 | Vibration Test | Frequency range:10~55Hz Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 1 hour for each direction of X.Y.Z. (3 hours for total) | IEC60068-2-6:1982 GB/T2423.10—1995 |
| 9 | Mechanical Shock (Non Op) | Half Sine Wave 60G 6ms, ±X,±Y,±Z 3times for each direction | IEC60068-2-27:1987 GB/T2423.5—1995 |
| 10 | Package Drop Test | Height:60cm, 1corner,3edges,6surfaces | IEC60068-2-32:1990 GB/T2423.8—1995 |

Note1: Ts is the temperature of panel's surface.

Note2: Ta is the ambient temperature of samples.

9 Packing Drawing



10 Precautions for Use of LCD Modules

10.1 Handling Precautions

10.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

10.1.2 If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

10.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

10.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

10.1.5 If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

- Isopropyl alcohol
- Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

- Water
- Ketone
- Aromatic solvents

10.1.6 Do not attempt to disassemble the LCD Module.

10.1.7 If the logic circuit power is off, do not apply the input signals.

10.1.8 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

10.1.8.1 Be sure to ground the body when handling the LCD Modules.

10.1.8.2 Tools required for assembly, such as soldering irons, must be properly ground.

10.1.8.3 To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

10.1.8.4 The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

10.2 Storage precautions

10.2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

10.2.2 The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is:

Temperature mperature : 0°C ~ 40°C, Relatively humidity: ≤80%

10.2.3 The LCD modules should be stored in the room without acid, alkali and harmful gas.

10.3 Transportation Precautions

10.3.1 The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.