



PRODUCT SPECIFICATION

For Customer: _____

: APPROVAL FOR SPECIFICATION

Customer Model No. _____

: APPROVAL FOR SAMPLE

Module No.: IE-A-1816BH07-CB-1

Date : 2020-03-21

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For Customer's Acceptance:

| Approved By | Comment |
|-------------|---------|
| | |

| PREPARED | CHECKED | VERIFIED BY QA DEPT | VERIFIED BY R&D DEPT |
|----------|---------|---------------------|----------------------|
| John | Techshu | | Dmzhou |

3. General Specifications

IE-A-1816BH07-CB-1 is a TFT-LCD module. It is composed of a TFT-LCD panel, driver IC, FPC, a back light ,CTP unit. The 7.0 ''display area contains 800 x 480pixels and can display up to 16.7M colors. This product accords with RoHS environmental criterion.

| Item | Contents | Unit | Note |
|--------------------------------|--------------------------|---------|------|
| LCD Type | TFT | - | |
| Display color | 16.7M | | |
| Viewing Direction | 12 | O'Clock | |
| Gray scale inversion direction | 6 | O'Clock | |
| Operating temperature | -20~+70 | °C | |
| Storage temperature | -30~+80 | °C | |
| Module size | Refer to outline drawing | mm | |
| Active Area(W×H) | 154.08(W)*85.92(H) | mm | |
| Number of Dots | 800×480 | dots | |
| LCM Controller | ILI6122M-9G+ ILI5960-9G | - | |
| CTP Driver | FT5426 | - | |
| Power Supply Voltage | 3.3 | V | |
| Outline Dimensions | Refer to outline drawing | - | |
| Backlight | 30-LEDs (white) | pcs | |
| Weight | --- | g | |
| Interface | RGB888 | - | |

Note 1: Color tune is slightly changed by temperature and driving voltage.

Note 2: Without FPC and Solder.

5. Absolute Maximum Ratings($T_a=25\text{ }^\circ\text{C}$)

5.1 Electrical Absolute Maximum Ratings.($V_{SS}=0\text{V}$, $T_a=25\text{ }^\circ\text{C}$)

| Item | Symbol | Min. | Max. | Unit | Note |
|----------------------|--------|------|------|------|------|
| Power Supply Voltage | VDD | -0.3 | 3.96 | V | 1, 2 |

Notes:

1. If the module is above these absolute maximum ratings. It may become permanently damaged. Using the module within the following electrical characteristic conditions are also exceeded, the module will malfunction and cause poor reliability.

2. $V_{DD} > V_{SS}$ must be maintained.

3. Please be sure users are grounded when handling LCD Module.

5.2 Environmental Absolute Maximum Ratings.

| Item | Storage | | Operating | | Note |
|---------------------|---------|------|-----------|------|------|
| | MIN. | MAX. | MIN. | MAX. | |
| Ambient Temperature | -30°C | 80°C | -20°C | 70°C | 1,2 |
| Humidity | - | - | - | - | 3 |

1. The response time will become lower when operated at low temperature.

2. Background color changes slightly depending on ambient temperature.

The phenomenon is reversible.

3. $T_a \leq 40\text{ }^\circ\text{C}$:85%RH MAX.

$T_a > 40\text{ }^\circ\text{C}$:Absolute humidity must be lower than the humidity of 85%RH at 40 °C.

6. Electrical Specifications and Instruction Code

6.1 Electrical characteristics ($V_{SS}=0V, T_a=25^\circ C$)

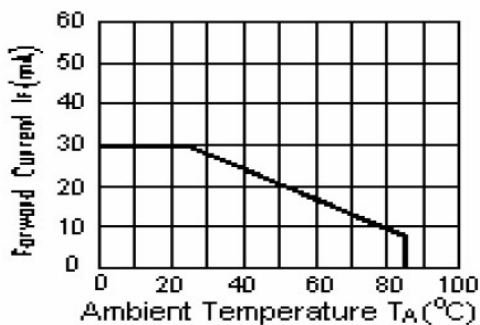
| Parameter | Symbol | Condition | Min | Typ | Max | Unit | Note |
|---------------------|-----------|------------------|-------------|-----|-------------|------|------|
| Power supply | VDD | $T_a=25^\circ C$ | 3.0 | 3.3 | 3.6 | V | |
| Input voltage | 'H' | $V_{DD}=3.3V$ | $0.7V_{DD}$ | - | V_{DD} | V | |
| | 'L' | $V_{DD}=3.3V$ | 0 | - | $0.3V_{DD}$ | V | |
| Current Consumption | I_{CC1} | Normal mode | - | - | - | mA | 1 |
| | I_{CC2} | Sleep mode | - | - | - | mA | 1 |

Note:

1: Tested in 1×1 chessboard pattern.

6.2 LED backlight specification ($V_{SS}=0V, T_a=25^\circ C$)

| Item | Symbol | Condition | Min | Typ | Max | Unit | Note |
|----------------|--------------|-------------|-----|-----|-----|-------|------|
| Supply voltage | V_f | $I_f=200mA$ | -- | 9.6 | -- | V | |
| Uniformity | ΔB_p | $I_f=200mA$ | 70 | | | % | |
| Life Time | time | $I_f=200mA$ | 30k | - | | hours | |



6.3 Interface signals

| Pin No. | Symbol | I/O | Function |
|---------|--------|-----|-------------------------|
| 1 | VLED- | P | LED back light(Cathode) |
| 2 | V LED+ | P | LED back light(Anode) |
| 3 | GND | P | Ground. |
| 4 | VDD | P | Power supply |
| 5-12 | R0~R7 | I | Red data bus |
| 13-20 | G0~G7 | I | Green data bus |
| 21-28 | B0~B7 | I | Blue data bus |
| 29 | GND | P | Ground. |
| 30 | DCLK | I | Data clock |
| 31 | DISP | I | Standby mode select pin |
| 32 | HSYNC | I | Line sync signal |
| 33 | VSYNC | I | Frame sync signal |
| 34 | DE | I | Data enable pin |
| 35 | NC | - | No connection. |
| 36 | GND | P | Ground. |
| 37 | NC | - | No connection. |
| 38 | NC | - | |
| 39 | NC | - | |
| 40 | NC | - | |

CTP interface

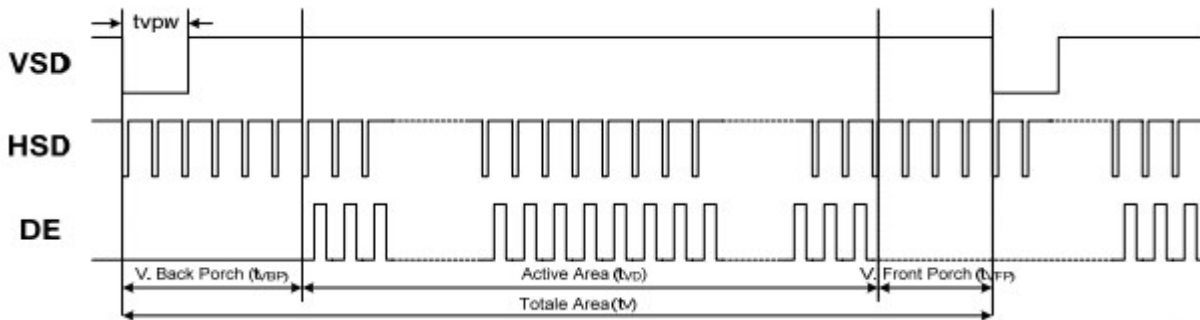
| Pin No | Symbol | I/O | Function |
|--------|--------|-----|-------------------------------------|
| 1 | GND | P | Ground |
| 2 | VDD | P | CTP Power supply |
| 3 | SCL | I | Serial clock |
| 4 | NC | - | No connection. |
| 5 | SDA | I/O | Serial Input/output data bus |
| 6 | NC | - | No connection. |
| 7 | RST | I | Reset the display |
| 8 | NC | - | No connection. |
| 9 | INT | O | External Interrupt to the IC of CTP |
| 10 | GND | P | Ground |

6.4 RGB Input Timing Table

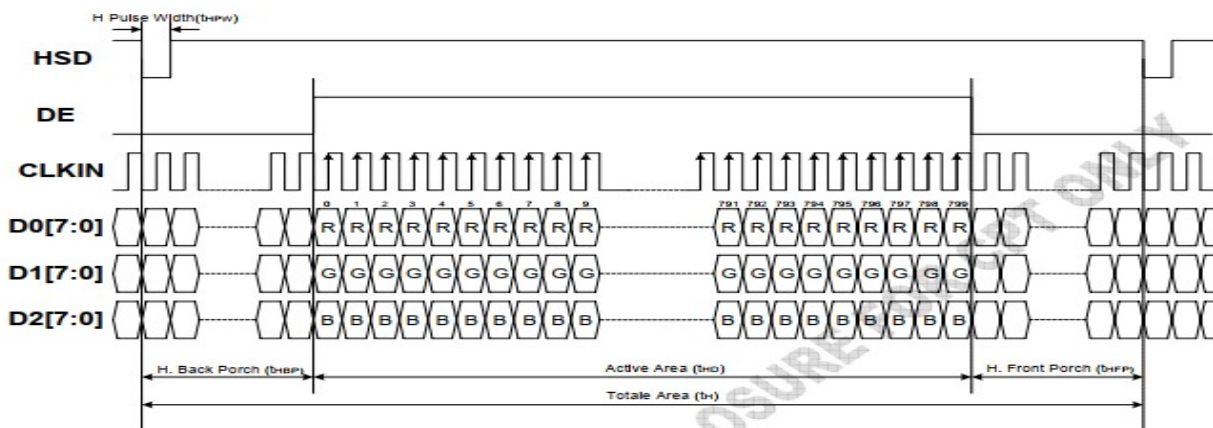
6.4.1 Parallel 24-bit RGB Timing Tabel

| Parameter | Symbol | Value | | | Unit |
|------------------------|--------|-------|------|------|--------|
| | | Min. | Typ. | MAX. | |
| Bit rate per lane | BRPHY | 80 | - | 1000 | Mbps |
| Active pixel per line | HACT | - | 800 | - | Pixels |
| Horizontal back porch | tHBP | - | 46 | - | DCLK |
| Horizontal sync active | tHSA | - | 40 | - | DCLK |
| Horizontal front porch | tHFP | - | 21 | - | DCLK |
| Active pixel per frame | VACT | - | 480 | - | H |
| Vertical back porch | tVBP | - | 23 | - | H |
| Vertical sync active | tVSA | - | 10 | - | H |
| Vertical front porch | tVFP | - | 22 | - | H |

6.4.2 Vertical Timings

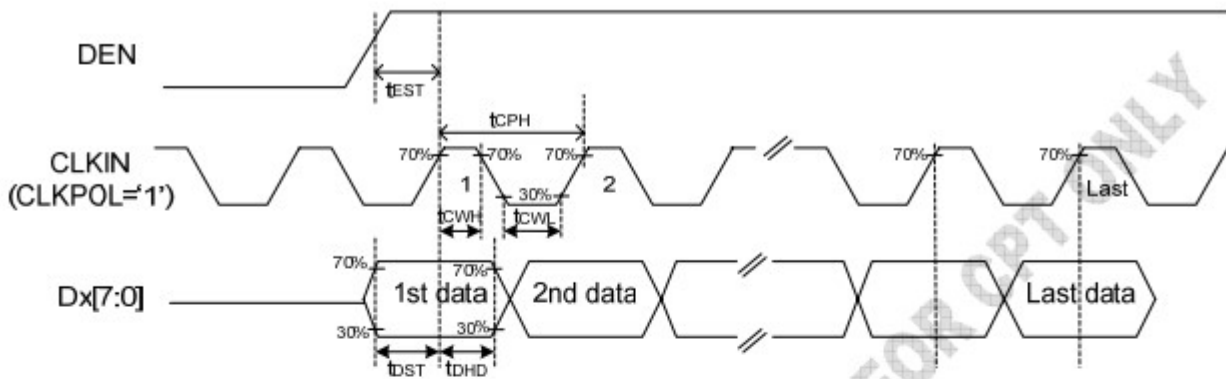


6.4.2 Horizontal Timings

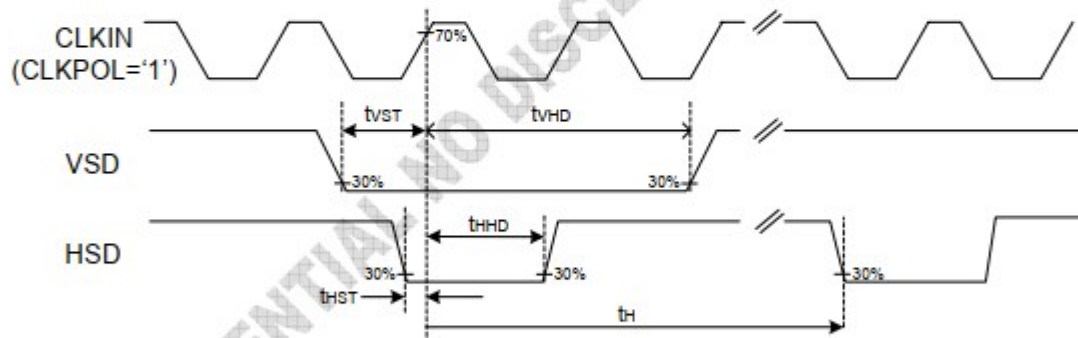


6.5 AC Characteristics

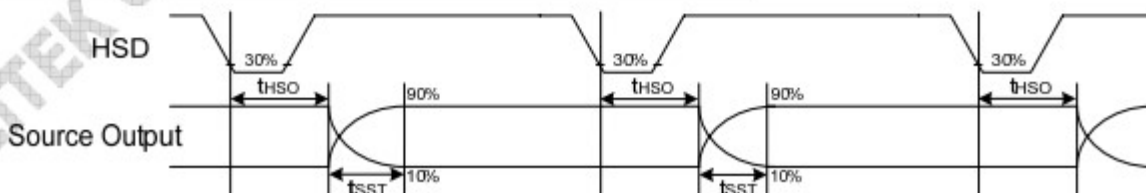
DE Mode (MODE='1')

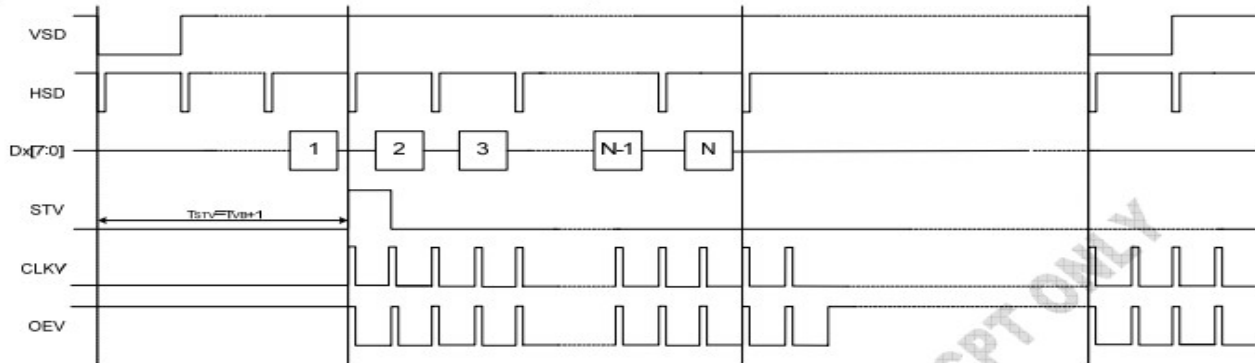
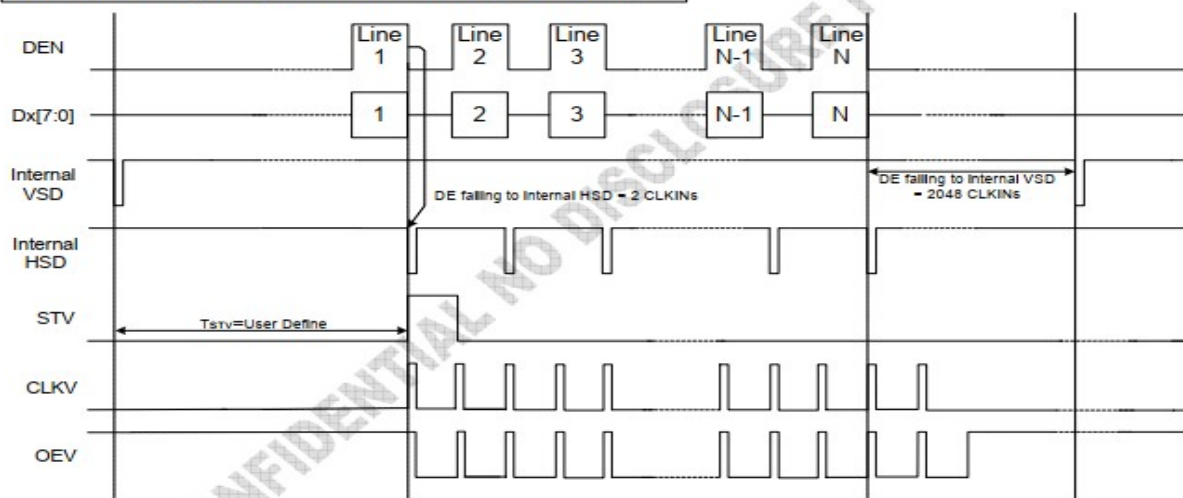


SYNC Mode (MODE='0')



Source Output timing Diagram (Cascade)



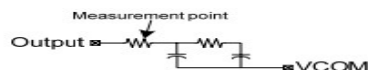
Vertical Timing Diagram of SYNC Mode (Dual Gate)

Vertical Timing Diagram of DE Mode (Dual Gate)


| Parameter | Symbol | Spec | | | Unit | Conditions |
|--------------------------------|--------|------|------|------|-------|--|
| | | Min. | Typ. | Max. | | |
| VDD Power ON slew rate | tpOR | -- | -- | 20 | ms | 0V ~ 0.9VDD |
| RSTB pulse width | trST | 10 | -- | -- | us | CLKIN=50MHz |
| CLKIN cycle time | tCPH | 20 | -- | -- | ns | |
| CLKIN pulse duty | tCWH | 40 | 50 | 60 | % | |
| VSD setup time | tVST | 8 | -- | -- | ns | |
| VSD hold time | tVHD | 8 | -- | -- | ns | |
| HSD setup time | tHST | 8 | -- | -- | ns | |
| HSD hold time | tHHD | 8 | -- | -- | ns | |
| Data setup time | tDST | 8 | -- | -- | ns | D0[7:0], D1[7:0], D2[7:0] to CLKIN |
| Data hold time | tDHD | 8 | -- | -- | ns | D0[7:0], D1[7:0], D2[7:0] to CLKIN |
| DE setup time | tEST | 8 | -- | -- | ns | |
| DE hold time | tEHD | 8 | -- | -- | ns | |
| Output stable time | tSST | -- | -- | 6 | us | 10% to 90% target voltage. CL=120pF, R=10KΩ |
| CLKIN frequency | fCLK | -- | 40 | 50 | MHz | VDD=3.0 ~ 3.6V |
| CLKIN cycle time | tCLK | 20 | 25 | -- | ns | |
| CLKIN pulse duty | tCWH | 40 | 50 | 60 | % | TCLK |
| Time from HSD to Source output | tHSO | -- | 20 | -- | CLKIN | |
| Time from HSD to LD | tHLD | -- | 20 | -- | CLKIN | Note (2) |
| Time from HSD to STV | tHSTV | -- | 2 | -- | CLKIN | |
| Time from HSD to CKV | tHCKV | -- | 20 | -- | CLKIN | |
| Time from HSD to OEV | tHOEV | -- | 4 | -- | CLKIN | |
| LD pulse width | tWLD | -- | 10 | -- | CLKIN | Note (2) |
| CKV pulse width | tWCKV | -- | 66 | -- | CLKIN | |
| OEV pulse width | tWOEV | -- | 74 | -- | CLKIN | |

Note: (1) VDD=3.0 ~ 3.6V, VDDA=6.5~13.5V, DGND=AGND=0V, Ta=-20~+85°C

(2) The contents of the data register are transferred to the latch circuit at the rising edge of LD. Then the gray scale voltage is output from the device at the falling edge of LD.

(3) Output loading condition :



7. Optical Characteristics

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit | Note | |
|-------------------------|--------------------------------|------------------------------------|------------------------------------|-------|-------|-------------------|------|-----|
| Brightness (with TP) | Bp | $\theta=0^\circ$ $\Phi=0^\circ$ | - | 700 | - | Cd/m ² | 1 | |
| Uniformity | ΔBp | | 70 | 80 | - | % | 1,2 | |
| Viewing Angle | 3:00 | Cr \geq 10 | - | 70 | - | Deg | 3 | |
| | 6:00 | | - | 60 | - | | | |
| | 9:00 | | - | 70 | - | | | |
| | 12:00 | | - | 70 | - | | | |
| Contrast Ratio | Cr | $\theta=0^\circ$ $\Phi=0^\circ$ | 500 | 800 | - | - | 4 | |
| Response Time | T _r +T _f | | - | 25 | 35 | ms | 5 | |
| | | | - | | | ms | | |
| Color of CIE Coordinate | W | x | $\theta=0^\circ$ $\Phi=0^\circ$ | 0.280 | 0.310 | 0.340 | - | 1,6 |
| | | y | | 0.300 | 0.330 | 0.360 | - | |
| | R | x | | | | | - | |
| | | y | | | | | - | |
| | G | x | | | | | - | |
| | | y | | | | | - | |
| | B | x | | | | | - | |
| | | y | | | | | - | |
| NTSC Ratio | S | | 25 | 50 | - | % | | |

Note: The parameter is slightly changed by temperature, driving voltage and materiel

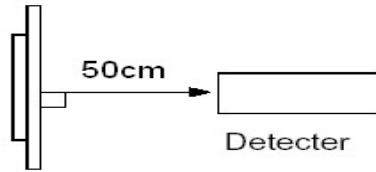
Note 1: The data are measured after LEDs are turned on for 5 minutes. LCM displays full white. The brightness is the average value of 9 measured spots. Measurement equipment PR-705 (Φ 8mm)

Measuring condition:

- Measuring surroundings: Dark room.
- Measuring temperature: Ta=25 °C.
- Adjust operating voltage to get optimum contrast at the center of the display.

Measured value at the center point of LCD panel after more than 5 minutes while backlight

turning on.

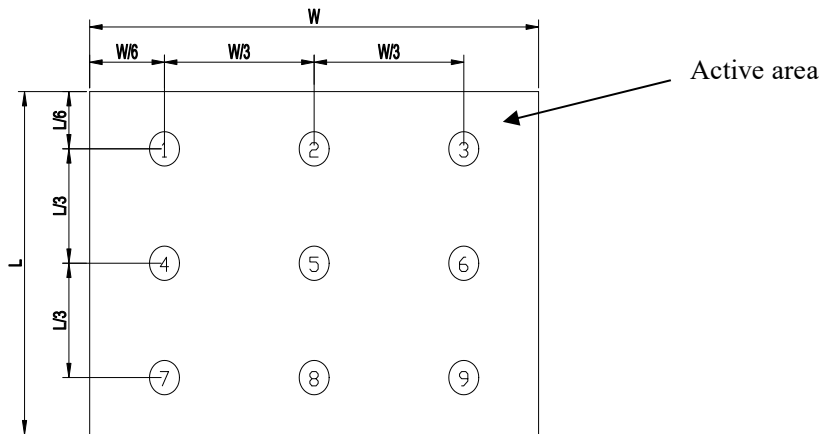


Note 2: The luminance uniformity is calculated by using following formula.

$$\Delta Bp = Bp (\text{Min.}) / Bp (\text{Max.}) \times 100 (\%)$$

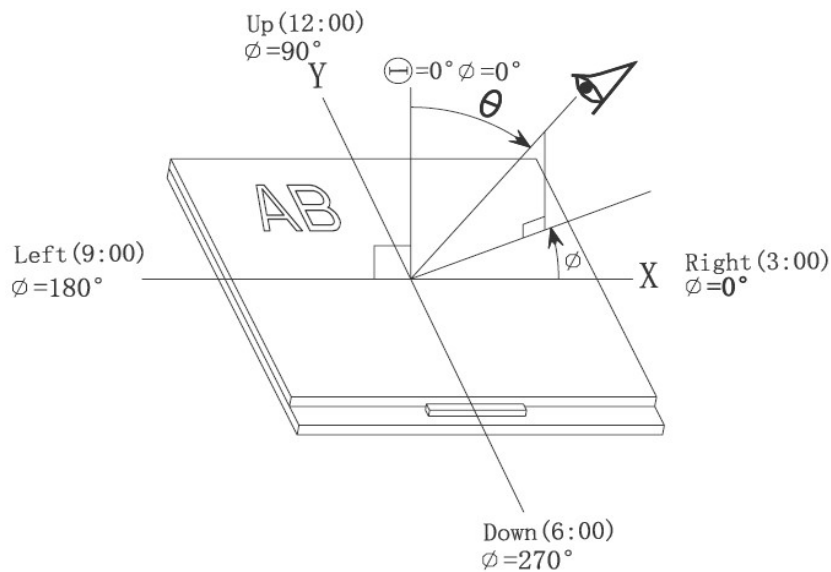
$Bp (\text{Max.})$ = Maximum brightness in 9 measured spots

$Bp (\text{Min.})$ = Minimum brightness in 9 measured spots.

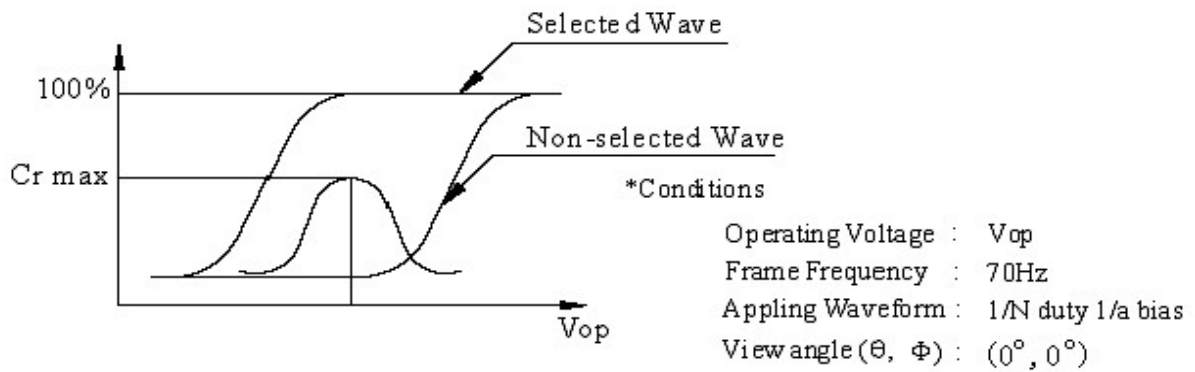


Note 3: The definition of viewing angle:

Refer to the graph below marked by ϑ and ϕ



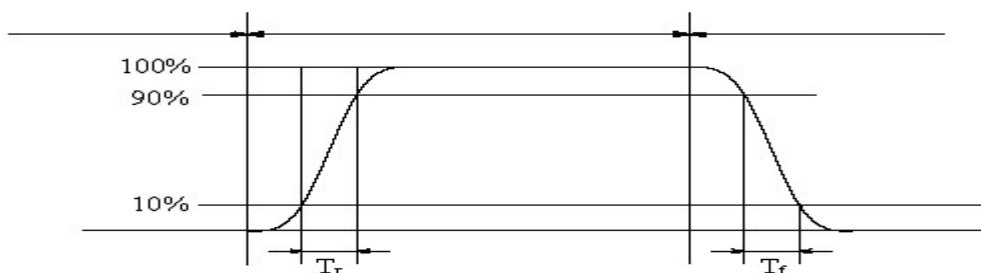
Note 4: Definition of contrast ratio.(Test LCD using DMS501)



$$\text{Contrast ratio}(Cr) = \frac{\text{Brightness of selected dots}}{\text{Brightness of non-selected dots}}$$

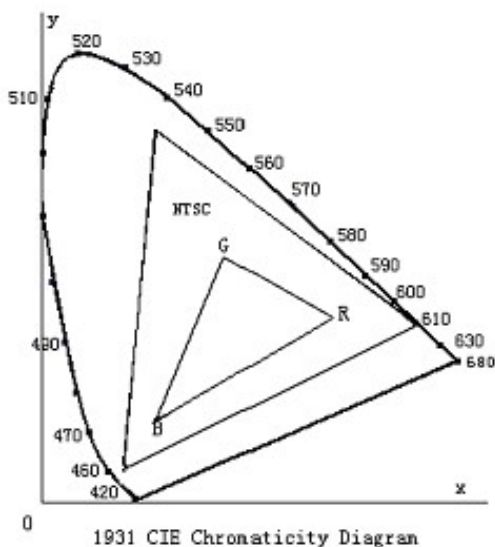
Note 5: Definition of Response time. (Test LCD using DMS501):

The output signals of photo detector are measured when the input signals are changed from "black" to "white"(falling time) and from "white" to "black"(rising time), respectively. The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figure as below.



The definition of response time

Note 6: Definition of Color of CIE Coordinate and NTSC Ratio.

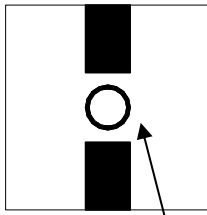


Color gamut:

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

Note 7: Definition of cross talk.

$$\text{Cross talk ratio}(\%) = \frac{|\text{pattern A Brightness} - \text{pattern B Brightness}|}{\text{pattern A Brightness}} \times 100$$



Pattern A



Pattern B

Measurement point(center)

Electric volume value=3F+/-3Hex

8. Reliability Test Items and Criteria

| No | Test Item | Test condition | Criterion |
|----|-----------------------------------|---|--|
| 1 | High Temperature Storage | 80°C±2°C 96H Restore 2H at 25°C Power off | 1. After testing, cosmetic and electrical defects should not happen. 2. Total current consumption should not be more than twice of initial value. |
| 2 | Low Temperature Storage | -30°C±2°C 96H Restore 2H at 25°C Power off | |
| 3 | High Temperature Operation | 70°C±2°C 96H Restore 2H at 25°C Power on | |
| 4 | Low Temperature Operation | -20°C±2°C 96H Restore 4H at 25°C Power on | |
| 5 | High Temperature/Humidity Storage | 60°C±2°C 90%RH 96H Power off | |
| 6 | Temperature Cycle | -30°C ———— 80°C after 5 cycle, Restore 2H at 25°C 30min 5min 30min Power off | |
| 7 | Vibration Test | 10Hz~150Hz, 100m/s ² , 120min | Not allowed cosmetic and electrical defects. |
| 8 | Shock Test | Half- sine wave, 300m/s ² , 11ms | |

Note: Operation: Supply 3.3V for logic system.

9. Precautions for Use of LCD Modules

9.1 Handling Precautions

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

9.1.2 *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.*

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

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

9.1.5 *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

9.1.6 *Do not attempt to disassemble the LCD Module.*

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

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

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

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

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

d. 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.

9.2 Storage precautions

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

9.2.2 *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 : 0 °C ~ 40 °C

Relatively humidity: ≤80%

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

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

END