

PRODUCT SPECIFICATIONS

For Customer: _____

: APPROVAL FOR SPECIFICATION

Customer Model No. _____

: APPROVAL FOR SAMPLE

Module No.: 3.5" TFT with CTP and bezel

Date : 2020-02-28

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For Customer's Acceptance:

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

| PREPARED | CHECKED | VERIFIED BY QA DEPT | VERIFIED BY R&D DEPT |
|----------|---------|------------------------|-------------------------|
| | | | |

2. Revision Record

| Date | Rev.No. | Page | Revision Items | Prepared |
|------|---------|------|----------------|----------|
| | | | | |
| | | | | |

3. General Specifications

3.5" TFT with Capacitive Touch Screen and bezel is composed of a TFT - LCD panel, driver IC, FPC, TP, a back light unit. The 3.5" display area contains 320 x 240pixels 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 | | 1 |
| Viewing Direction | 12 | O'Clock | |
| Gray inversion | 6 | O'Clock | |
| Operating temperature | -20~+70 | °C | |
| Storage temperature | -30~+80 | °C | |
| Module size | 91.0X76.0X4.8 | mm | 2 |
| Active Area(W×H) | 70.08X52.56 | mm | |
| Number of Dots | 320×240 | dots | |
| TFT Controller | HX8238D | - | |
| CTP Driver | FT5346 | - | |
| Power Supply Voltage | 3.3 | V | |
| Backlight | 6S-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.With CTP.

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

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

| Item | Symbol | Min. | Max. | Unit | Note |
|----------------------|---------|------|------|------|------|
| Power Supply Voltage | VCC | -0.3 | 5.0 | V | 1, 2 |
| Power Supply Voltage | VDD-CTP | 2.7 | 3.6 | 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. $V_{CC} > V_{SS}$ must be maintained.

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

5.2 Environmental Absolute Maximum Ratings.

| Item | Storage | | Operating | | Note |
|---------------------|-----------------------------|----------------------------|-----------------------------|----------------------------|------|
| | MIN. | MAX. | MIN. | MAX. | |
| Ambient Temperature | $-30\text{ }^\circ\text{C}$ | $80\text{ }^\circ\text{C}$ | $-20\text{ }^\circ\text{C}$ | $70\text{ }^\circ\text{C}$ | 1,2 |
| Humidity | - | - | - | - | 3 |

Notes:

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 $40\text{ }^\circ\text{C}$.

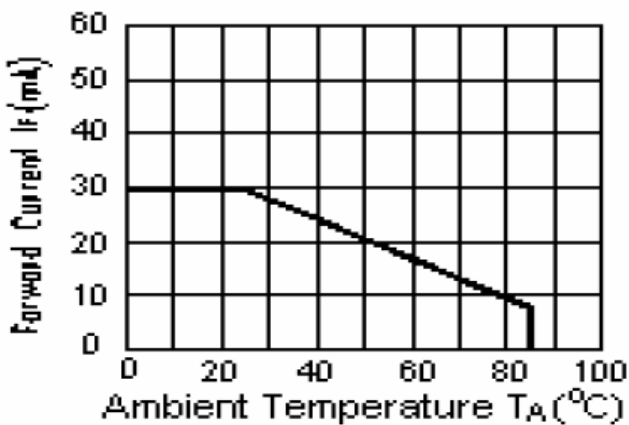
6. Electrical Specifications

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

| Parameter | Symbol | Condition | Min | Typ | Max | Unit | Note |
|---------------|-------------|------------------|------------|-----------|-----|-----------|------|
| Power supply | VCC | $T_a=25^\circ C$ | 3.0 | 3.3 | 3.6 | V | |
| Power supply | VDD-C TP | $T_a=25^\circ C$ | - | 2.8 | 3.3 | V | |
| Input voltage | 'H' | V_{IH} | $VCC=3.3V$ | $0.8*VCC$ | - | VCC | V |
| | 'L' | V_{IL} | $VCC=3.3V$ | 0 | - | $0.2*VCC$ | V |

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 | $I_f=20mA$ | 16.2 | 18.0 | 19.8 | V | |
| Uniformity | ΔB_p | $I_f=20mA$ | 75 | 80 | - | % | |
| Life Time | time | $I_f=20mA$ | 20K | - | - | hours | 1 |



Note 1: Brightness to be decreased to 50% of the initial value at ambient temperature $T_a=25^\circ C$

6.3 Interface signals

| Pin No. | Symbol | I/O | Function |
|---------|---------|-----|---|
| 1-2 | LED- | P | LED cathode |
| 3-4 | LED+ | P | LED anode |
| 5 | YU | I | RTP control pin,no use please NC |
| 6 | XR | I | RTP control pin,no use please NC |
| 7 | NC | - | No connection. |
| 8 | RESET | I | Reset pin,active"L" |
| 9 | SPENA | I | Chip select pin of serial |
| 10 | SPCLK | I | Clock pin of serial interface. |
| 11 | SPDAT | I | Data input pin in serial mode. |
| 12-19 | B0-B7 | I | Blue data bus |
| 20-27 | G0-G7 | I | Green data bus |
| 28-35 | R0-R7 | I | Red data bus |
| 36 | HSYNC | I | Horizontal synchronous signal |
| 37 | VSYNC | I | Vertical synchronous signal |
| 38 | DCLK | I | Dot-clock signal and oscillator source. |
| 39-40 | NC | - | NC |
| 41-42 | VCC | P | Power supply |
| 43 | YD | I | RTP control pin,no use please NC |
| 44 | XL | I | RTP control pin,no use please NC |
| 45-47 | NC | - | No connection. |
| 48-50 | IF2-IF0 | I | Define the input interface mode. |
| 51 | NC | - | No connection. |
| 52 | DE | I | Data Enable |
| 53-54 | GND | P | Ground |

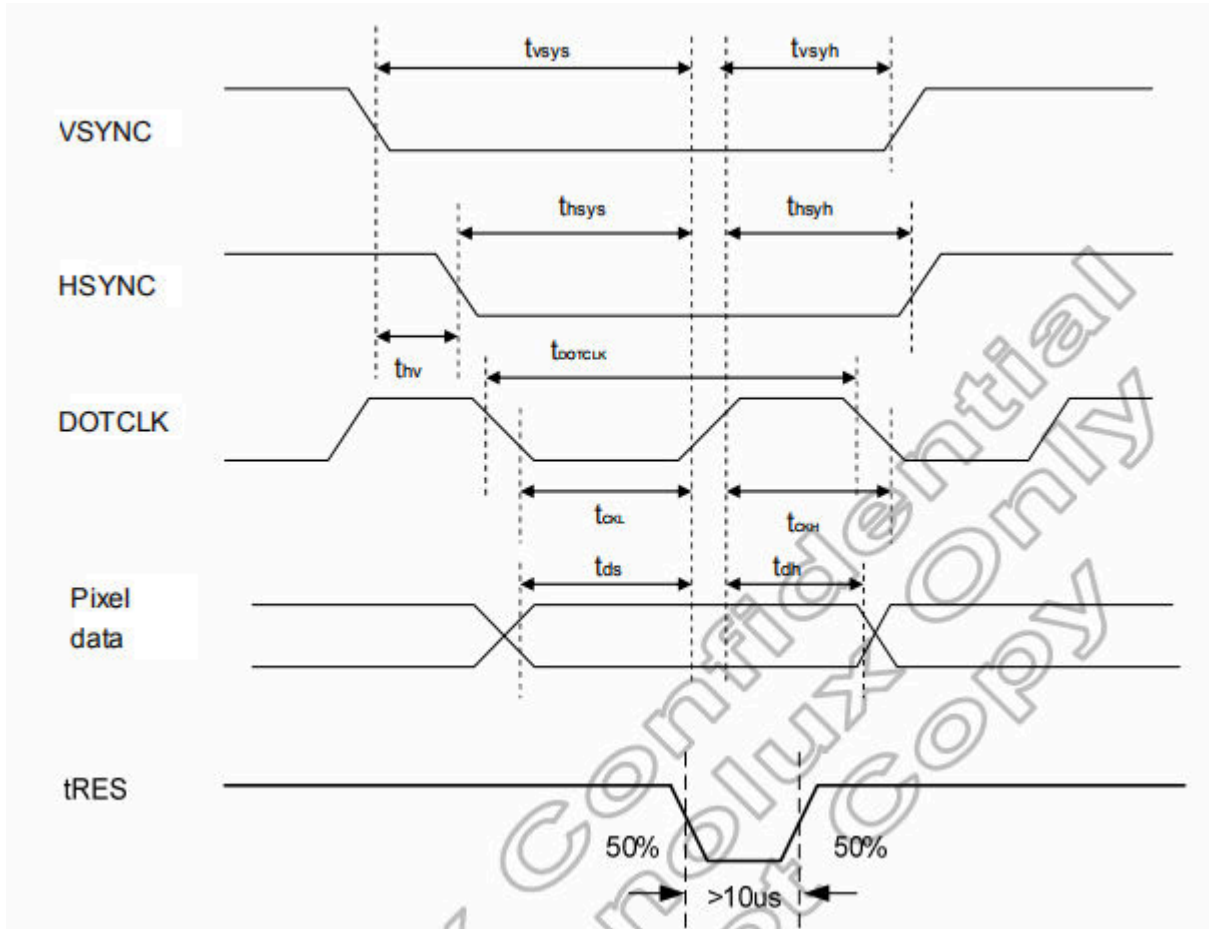
CTP interface

| Pin No | Symbol | I/O | Function |
|--------|-----------|-----|-------------------------------------|
| 1 | SCL(3.3V) | I | I2C clock |
| 2 | SDA(3.3V) | I | I2C data |
| 3 | VDD | P | CTP Power supply |
| 4 | RESET | I | CTP Reset pin,active"L" |
| 5 | INT | I | External Interrupt to the IC of CTP |
| 6 | GND | P | Ground |

Note:firmware DZ35-CG082_FT5346_320x240_Va2_D01_20190401_all

6.4 AC Characteristics

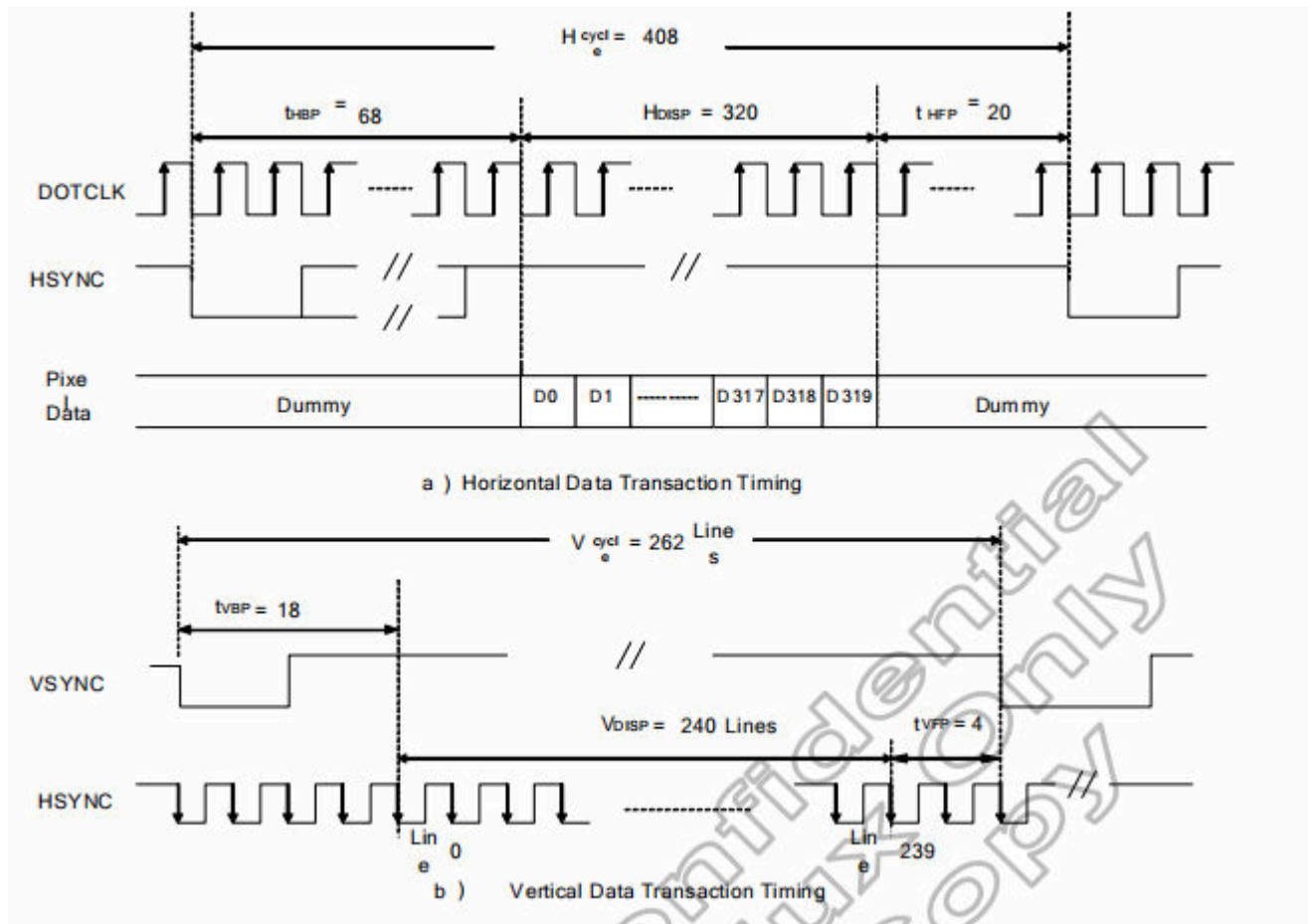
6.4.1 AC Characteristics



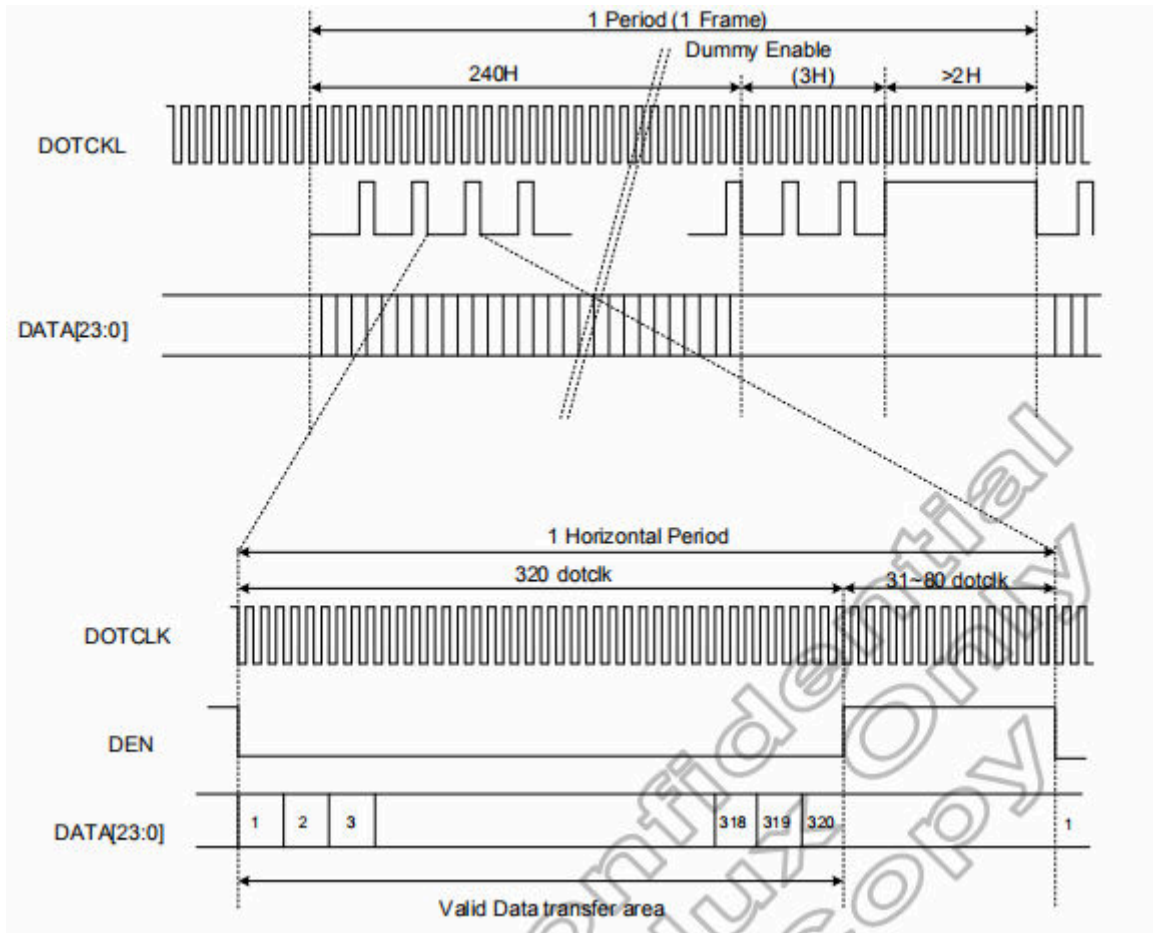
| Characteristics | Symbol | Min. | | Typ. | | Max. | | Unit |
|--|---------|--------|-------|--------|-------|--------|-------|---------|
| | | 24 bit | 8 bit | 24 bit | 8 bit | 24 bit | 8 bit | |
| DOTCLK Frequency | fDOTCLK | - | - | 6.5 | 19.5 | 10 | 30 | MHz |
| DOTCLK Period | tDOTCLK | 100 | 33.3 | 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 | | - | | - | | us |

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

6.4.2 Data Transaction Timing



| Characteristics | Symbol | Min- | | Typ. | | Max. | | Unit |
|------------------------------|-------------------------------------|--------------------|-------|--------|-------------|--------|-------|---------------------|
| | | 24 bit | 8 bit | 24 bit | 8 bit | 24 bit | 8 bit | |
| DOTCLK Frequency | f _{DOTCLK} | - | - | 6.5 | 19.5 | 10 | 30 | MHz |
| DOTCLK Period | t _{DOTCLK} | 100 | 33.3 | 154 | 51.3 | - | - | ns |
| Horizontal Frequency (Line) | f _H | - | - | 14.9 | | 22.35 | | KHz |
| Vertical Frequency (Refresh) | f _V | - | - | 60 | | 90 | | Hz |
| Horizontal Back Porch | t _{HBP} | - | - | 68 | 204 | - | - | t _{DOTCLK} |
| Horizontal Front Porch | t _{HFP} | - | - | 20 | 60 | - | - | t _{DOTCLK} |
| Horizontal Data Start Point | t _{HBP} | - | - | 68 | 204 | - | - | t _{DOTCLK} |
| Horizontal Blanking Period | t _{HBP} + t _{HFP} | - | - | 88 | 264 | - | - | t _{DOTCLK} |
| Horizontal Display Area | H _{DISP} | - | - | 320 | 960 | - | - | t _{DOTCLK} |
| Horizontal Cycle | H _{cycle} | - | - | 408 | 1224 | 450 | 1350 | t _{DOTCLK} |
| Vertical Back Porch | t _{VBP} | - | - | 18 | | - | | Lines |
| Vertical Front Porch | t _{VFP} | - | - | 4 | | - | | Lines |
| Vertical Data Start Point | t _{VBP} | - | - | 18 | | - | | Lines |
| Vertical Blanking Period | t _{VBP} + t _{VFP} | - | - | 22 | | - | | Lines |
| Vertical Display Area | NTSC | V _{DISP} | - | | 240 | | - | Lines |
| | | | - | | 280(PALM=0) | | | |
| | | | - | | 288(PALM=1) | | | |
| Vertical Cycle | NTSC | V _{cycle} | - | | 262 | | 350 | Lines |
| | PAL | | - | | 313 | | | |



Signal Timing in DE Mode

7. Optical Characteristics

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit | Note | |
|-------------------------|--------------------------------|------------------------------------|------------------------------------|--------------|-------|-------------------|------|-----|
| Brightness | Bp | $\theta=0^\circ$ $\Phi=0^\circ$ | - | 480 | - | Cd/m ² | 1 | |
| Uniformity | $\triangle Bp$ | | 75 | 80 | - | % | 1,2 | |
| Viewing Angle | 3:00 | Cr \geq 10 | - | 65 | - | Deg | 3 | |
| | 6:00 | | - | 55 | - | | | |
| | 9:00 | | - | 65 | - | | | |
| | 12:00 | | - | 65 | - | | | |
| Contrast Ratio | Cr | $\theta=0^\circ$ $\Phi=0^\circ$ | 200 | 300 | - | - | 4 | |
| Response Time | T _r +T _f | | - | 50 | 80 | ms | 5 | |
| Color of CIE Coordinate | W | x | $\theta=0^\circ$ $\Phi=0^\circ$ | Typ -0.05 | 0.317 | Typ +0.05 | - | 1,6 |
| | | y | | | 0.322 | | - | |
| | R | x | | | 0.639 | | - | |
| | | y | | | 0.344 | | - | |
| | G | x | | | 0.294 | | - | |
| | | y | | | 0.587 | | - | |
| | B | x | | | 0.132 | | - | |
| | | y | | | 0.136 | | - | |

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

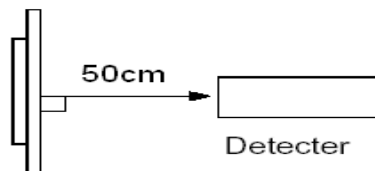
Note 1: The data are measured after LEDs are turned on for 5 minutes. LCM displays full white.

The brightness is the average value of 9 measured spots. Measurement equipment BM-7 (Φ5mm)

Measuring condition:

- Measuring surroundings: Dark room.
- Measuring temperature: $T_a = 25^\circ\text{C}$
- 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.

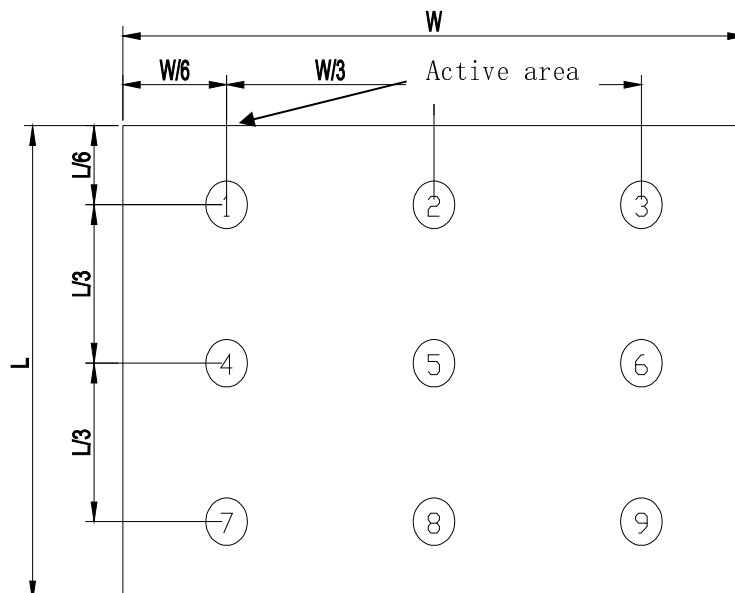


Note 2: The luminance uniformity is calculated by using following formula.

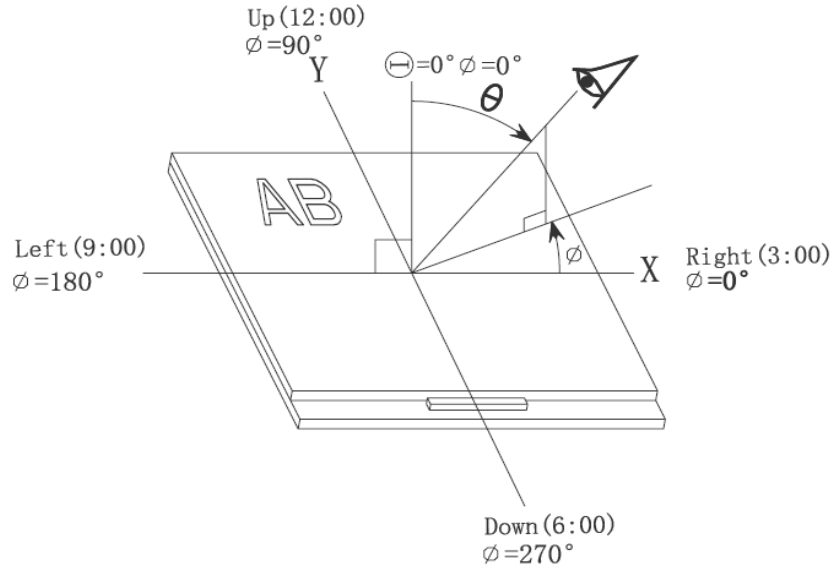
$$\Delta B_p = B_p (\text{Min.}) / B_p (\text{Max.}) \times 100 (\%)$$

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

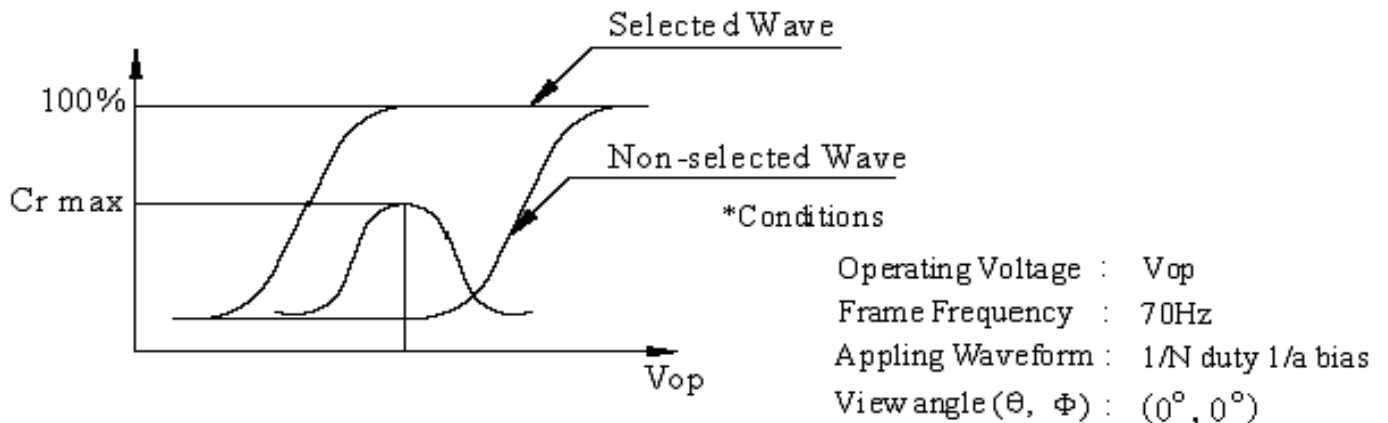
$B_p (\text{Min.})$ = Minimum brightness in 9 measured spots.



Note 3: The definition of viewing angle:
 Refer to the graph below marked by θ and Φ



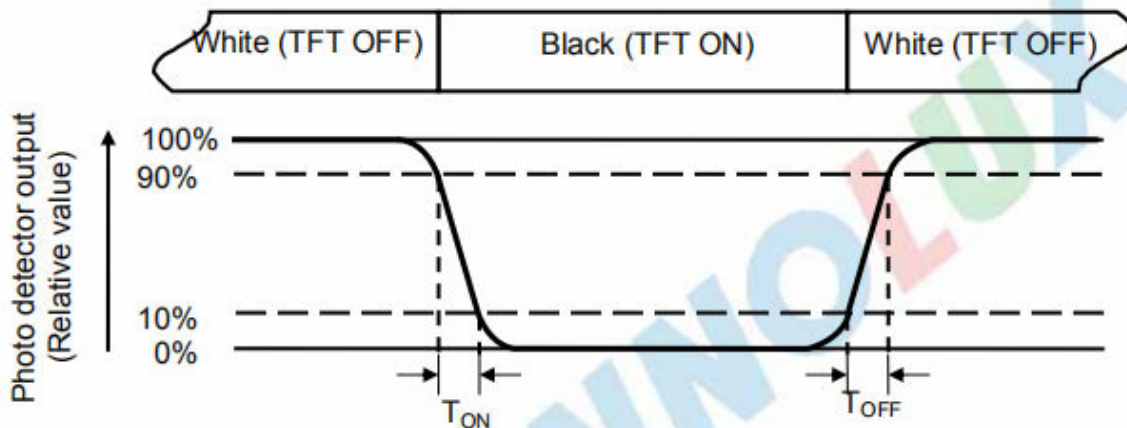
Note 4: Definition of contrast ratio. (Test LCD using DMS501)



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

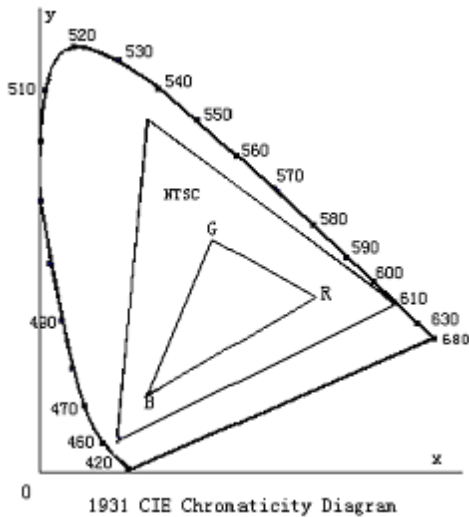
Note 5: Definition of Response time. (Test LCD using DMS501):

The 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 phot detector output intensity changed from 10% to 90%.



The definition of response time

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

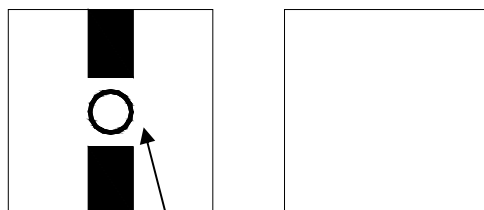


Color gamut:

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

Note 7: Definition of cross talk.

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 = $3F \pm 3Hex$

8. Reliability Test Items and Criteria

| Test Item | Test condition | Remark |
|--|--|----------------|
| High Temperature Storage | $T_a = 80^{\circ}\text{C}$ 96hrs | Note1,Note3, 4 |
| Low Temperature Storage | $T_a = -20^{\circ}\text{C}$ 96hrs | Note1,Note3, 4 |
| High Temperature Operation | $T_s = 70^{\circ}\text{C}$ 96hrs | Note2,Note3, 4 |
| Low Temperature Operation | $T_s = -20^{\circ}\text{C}$ 96hrs | Note1,Note3, 4 |
| Operation at High Temperature/Humidity | +60°C, 90%RH 96hrs | Note3, 4 |
| Thermal Shock | -30°C/30 min ~ +80°C/30 min for a total 10 cycles, Start with cold temperature and end with high | Note3, 4 |
| Vibration Test | Frequency range:10~55Hz Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for 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 : 0.015G*G/Hz from 5-200HZ, -6dB/Octave from 200-500HZ 2 hours for each direction of X. Y. Z. (6 hours for total) | |
| Package Drop Test | Height:60cm 1 corner, 3 edges, 6 surfaces | |
| Electro Static Discharge | ±2KV, Human Body Mode, 100pF/1500Ω | |

Note 1: T_a is the ambient temperature of samples.

Note 2: T_s 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

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

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