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| Doc. Version | 1.0 |
| Total Page | 23 |
| Date | 2008/03/27 |

Product Specification

4.3" COLOR TFT-LCD MODULE

MODEL NAME: A043FL01 V4

< ☐ > Preliminary Specification

< ☐ > Final Specification

Note: The content of this specification is subject to change.

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Version 1.0

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Record of Revision

| Version | Revise Date | Page | Content |
|---------|-------------|------|-------------------------------------|
| 0.0 | 2007/06/18 | | First draft. |
| 0.1 | 2007/12/06 | | Update drawing and packing form |
| 1.0 | 2008/03/27 | 5 | Modify Outline Drawing |
| | | 6~7 | Modify Pin Assignment |
| | | 7 | Modify Power Supply Spec |
| | | 8 | Modify Application Circuit |
| | | 11 | Remove Register Setting Description |
| | | 12 | Update transmittance |



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A. General Description

A043FL01 V4 is an LTPS transmissive type Thin Film Transistor Liquid crystal Display (TFT-LCD) semi-module. This model is composed of a TFT-LCD, a driver and an FPC.

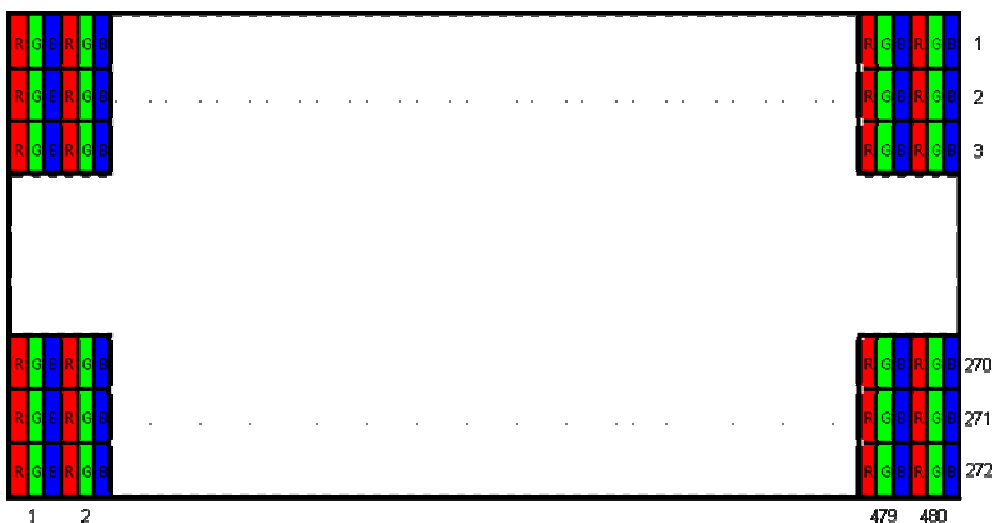
B. Features

- 4.3-inch display
- WQVGA resolution in RGB stripe dot arrangement
- DC/DC integrated
- Interfaces: parallel RGB 24-bit
- Wide viewing angle
- Green design

C. Physical Specifications

| NO. | Item | Unit | Specification | Remark |
|-----|--------------------------------|------|-------------------------------|--------|
| 1 | Display Resolution | dot | 480 RGB (H)×272(V) | |
| 2 | Active Area | mm | 95.04(H)×53.856(V) | |
| 3 | Screen Size | inch | 4.3(Diagonal) | |
| 4 | Dot Pitch | mm | 0.066(H)×0.198(V) | |
| 5 | Color Configuration | -- | R. G. B. Stripe | Note 1 |
| 6 | Color Depth | -- | 16.7M Colors | |
| 7 | Overall Dimension | mm | 99.24(H) × 61.46(V) × 1.43(T) | |
| 8 | Weight | g | TBD | |
| 9 | Display Mode | -- | Normally White | |
| 10 | Gray Level Inversion Direction | | 6 O'clock | |

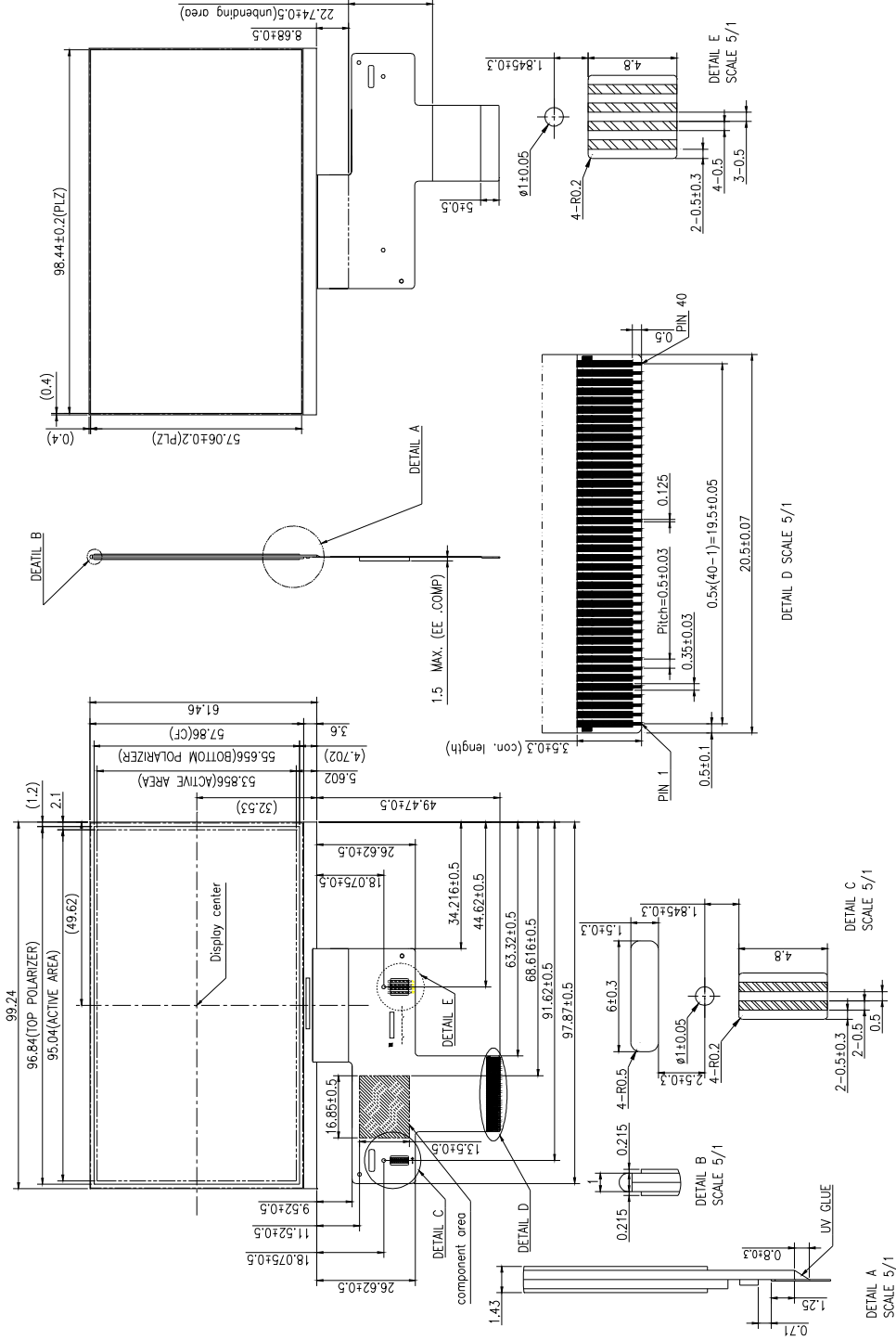
Note 1: Below figure shows dot stripe arrangement.



D. Outline Dimension

Notes:

1. General tolerance $\pm 0.2\text{mm}$
2. The bending radius of FPC should be larger than 0.6mm



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E. Electrical Specifications

1. Pin Assignment

| No. | Pin Name | I/O | Description | Remarks |
|-----|----------|-----|---------------------------------|---------|
| 1 | VLED- | PI | LED backlight cathode | |
| 2 | VLED+ | PI | LED backlight anode | |
| 3 | GND | G | Ground | |
| 4 | VDD | P | Power Supply | |
| 5 | R0 | I | Red Data (LSB) | |
| 6 | R1 | I | Red Data | |
| 7 | R2 | I | Red Data | |
| 8 | R3 | I | Red Data | |
| 9 | R4 | I | Red Data | |
| 10 | R5 | I | Red Data | |
| 11 | R6 | I | Red Data | |
| 12 | R7 | I | Red Data (MSB) | |
| 13 | G0 | I | Green Data (LSB) | |
| 14 | G1 | I | Green Data | |
| 15 | G2 | I | Green Data | |
| 16 | G3 | I | Green Data | |
| 17 | G4 | I | Green Data | |
| 18 | G5 | I | Green Data | |
| 19 | G6 | I | Green Data | |
| 20 | G7 | I | Green Data (MSB) | |
| 21 | B0 | I | Blue Data (LSB) | |
| 22 | B1 | I | Blue Data | |
| 23 | B2 | I | Blue Data | |
| 24 | B3 | I | Blue Data | |
| 25 | B4 | I | Blue Data | |
| 26 | B5 | I | Blue Data | |
| 27 | B6 | I | Blue Data | |
| 28 | B7 | I | Blue Data (MSB) | |
| 29 | GND | G | Ground | |
| 30 | DCLK | I | Pixel Clock | |
| 31 | DISP | I | Display On/Off Signal | |
| 32 | HSYNC | I | Horizontal Synchronizing Signal | |
| 33 | VSYNC | I | Vertical Synchronizing Signal | |

| | | | | |
|----|-----|---|--------------------------|--|
| 34 | DE | I | Data Enable | |
| 35 | NC | | Not Connected | |
| 36 | GND | G | Ground | |
| 37 | NC | - | Reserved for Touch Panel | |
| 38 | NC | - | Reserved for Touch Panel | |
| 39 | NC | - | Reserved for Touch Panel | |
| 40 | NC | - | Reserved for Touch Panel | |

I: Digital signal input, O: Digital signal output, G: GND, PI: Power input, C: Capacitor

2. Absolute Maximum Ratings

| Items | Symbol | Values | | Unit | Condition |
|----------------------|----------------|----------|----------|------|-----------|
| | | Min. | Max. | | |
| Power Voltage | VDD | -0.3 | 4.5 | V | |
| Input Signal Voltage | V _i | 0.8* VDD | VDD | V | |
| | V _I | GND | 0.2* VDD | V | |

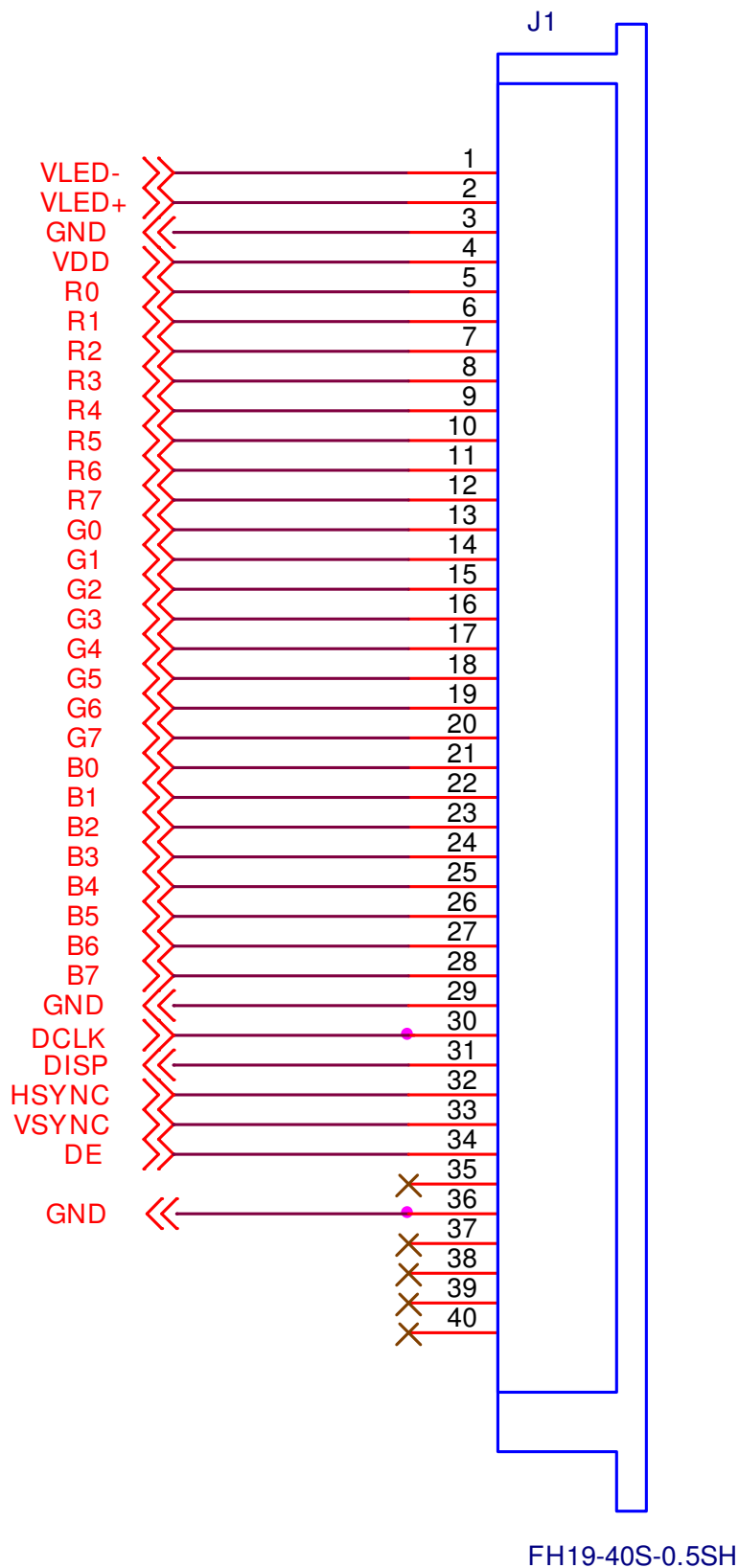
Note 1.If the operating condition exceeds the absolute maximum ratings, the TFT-LCD module may be damaged permanently. Also, if the module operated with the absolute maximum ratings for a long time, its reliability may drop.

3. Electrical Characteristics

The following items are measured under stable condition and suggested application circuit.

| Parameter | Symbol | Min | Typ | Max | Unit | Notes |
|-----------------|--------------------|-----|-----|-----|------|-------|
| Power Supply | VDD | 3.1 | 3.3 | 3.5 | V | |
| Frame Frequency | f _{Frame} | | 60 | 70 | Hz | |
| Dot Data Clock | DCLK | | 9.2 | TBD | MHz | |

4. Suggested Application Circuit

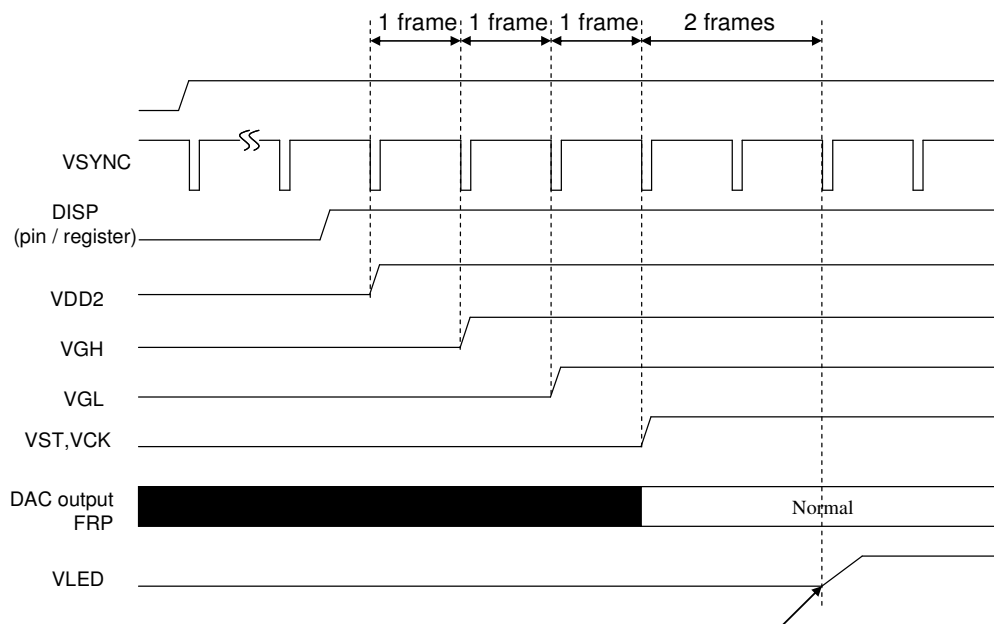


5. AC Timing

a. Power on/off sequence

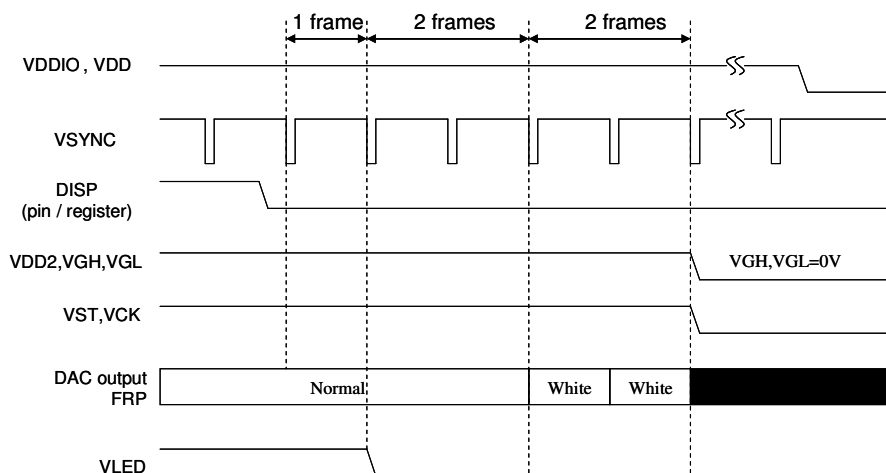
Power On (Display ON; Standby Disabling)

The LCD driver is in default standby mode after VDD/VDDIO power-on, and set the register DISP to high to disable the standby mode is required for normal operation. When the standby mode is disabled, a build-in power on sequence is started. The driver IC analog power VDD2 is turned on first, and then the LCD positive and negative power supplies VGH/VGL are pumped, and followed by the LED power. Since we recommend using external LED driver, the backlight power should be provided at this time. Please refer to power on sequence for the detail timing.



Power-Off (Display Off; Standby Enabling)

When the register DISP is set to low to enable standby mode, a build-in power off sequence is started. Please also refer to the power off sequence for the detail timing.

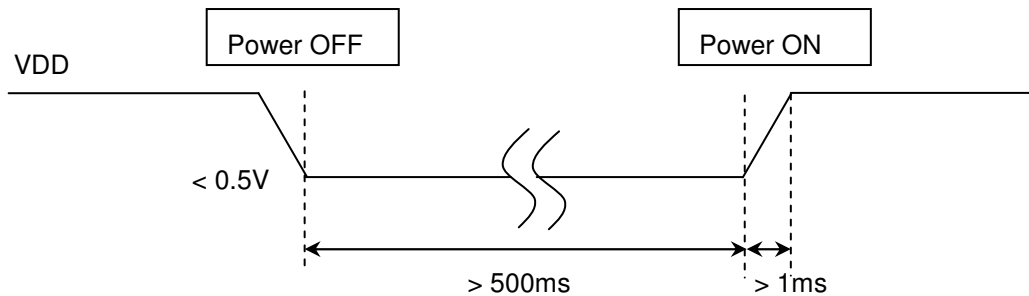


Low-voltage reset

Following figure suggests for low voltage reset function on power on sequence. When low voltage reset function enable, all the registers are loaded to default setting.

A. The rising time (10%-90%) of VDD needs larger than 1ms.

B. After power off, VDD needs to be keep under 0.5V more than 500ms, then it can be power on again.

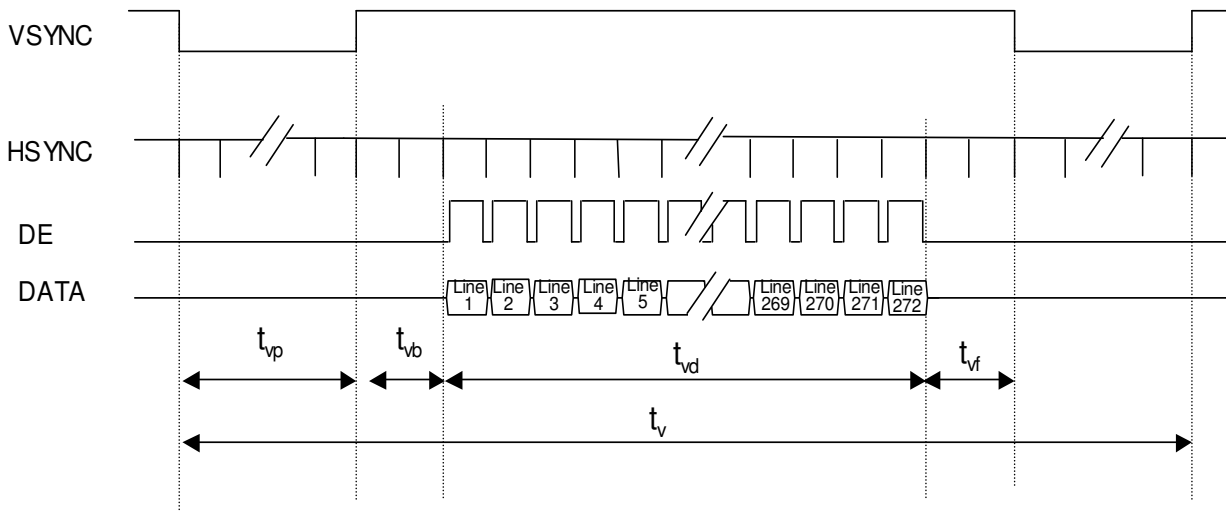


b. Timing Condition

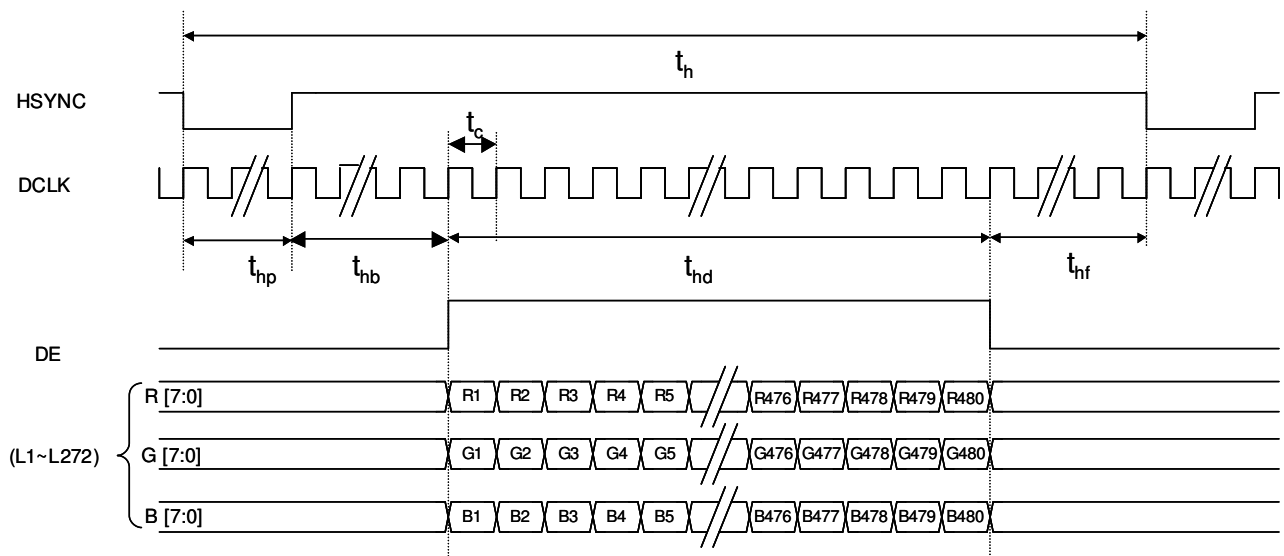
| Parameter | | Symbol | Min. | Typ. | Max. | Unit. | Remark |
|-----------------------|----------------|-----------------|------|------|------|-------|--------|
| Clock | Frequency | 1/Tc | -- | 9.2 | 10 | MHz | |
| | High Time | TCH | 40 | -- | -- | ns | |
| | Low Time | TCL | 40 | -- | -- | ns | |
| Data | Setup Time | TDS | 10 | -- | -- | ns | |
| | Hold Time | TDH | 3 | -- | -- | ns | |
| DE | Setup Time | TDES | 10 | -- | -- | ns | |
| | Hold Time | TDEH | 3 | -- | -- | ns | |
| Frame Frequency | Cycle | tv | | 16.7 | | ms | |
| 1 Frame Scanning Time | Cycle | tv | -- | 288 | -- | H | |
| | Display Period | tv _d | 272 | | | H | |
| | Front porch | tv _f | 2 | 4 | | H | |
| | Pulse width | tv _p | 1 | 10 | | H | |
| | Back porch | tv _b | 2 | 2 | | H | |
| 1 Line Scanning Time | Cycle | th | 490 | 533 | 545 | DCLK | |
| | Display Period | th _d | 480 | | | DCLK | |
| | Front porch | th _f | 2 | 8 | | DCLK | |
| | Pulse width | th _p | 1 | 41 | | DCLK | |
| | Back porch | th _b | 2 | 4 | | DCLK | |

c. Timing Diagram

Vertical Timing of Input



Horizontal Timing of Input



F. Optical specifications (Note 1, 2)

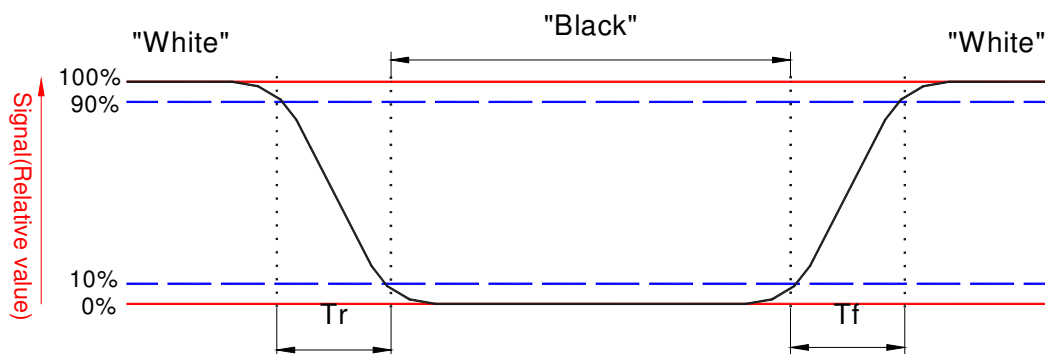
| Item | Symbol | Condition | Min. | Typ. | Max. | Unit | Remark |
|--------------------|--------|----------------------------|------|------|------|------|-----------|
| Response Time | | | | | | | |
| Rise | Tr | $\theta = 0^\circ$ | - | 15 | 25 | ms | Note 3 |
| Fall | Tf | | - | 20 | 30 | ms | |
| Contrast ratio | CR | At optimized viewing angle | 200 | 300 | - | | Note 5, 6 |
| Viewing Angle | | | | | | | |
| Top | | $CR \geq 10$ | 30 | 40 | - | deg. | Note 7, 8 |
| Bottom | | | 45 | 55 | - | | |
| Left | | | 50 | 60 | - | | |
| Right | | | 50 | 60 | - | | |
| Transmittance | | | | 7.1 | | % | |
| White Chromaticity | X | $\theta = 0^\circ$ | | TBD | | | |
| | y | $\theta = 0^\circ$ | | TBD | | | |

Note 1: Measurement should be performed in the dark room, optical ambient temperature $\approx 25^\circ\text{C}$, and backlight current $I_L = 20\text{ mA}$

Note 2: To be measured on the center area of panel with a field angle of 1° by Topcon luminance meter BM-7, after 10 minutes operation.

Note 3: Definition of response time:

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.



Note 4. From liquid crystal characteristics, response time will become slower and the color of panel will become darker when ambient temperature is below 25°C .

$$\text{Contrast ratio} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector output when LCD is at "Black" state}}$$

Note 5. Contrast ratio is calculated with the following formula.

Note 6. White $V_i = V_{i50} \mu 1.5V$

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Black $V_i = V_{i50} \pm 2.0V$

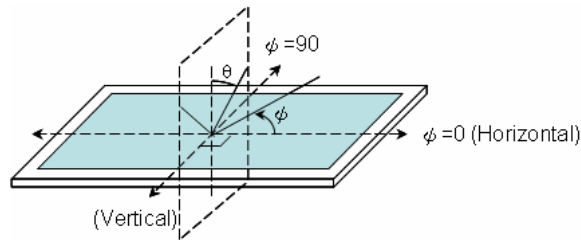
“ \pm ” means that the analog input signal swings in phase with COM signal.

“ μ ” means that the analog input signal swings out of phase with COM signal.

V_{i50} :The analog input voltage when transmission is 50%

The 100% transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened.

Note 7. Definition of viewing angle: refer to figure as below.



Note 8. The viewing angles are measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

Note 9. Color Filter white chromaticity is for reference. Actual panel white chromaticity varies based on different light sources.

G. Reliability Test Items

| No. | Test items | Conditions | | Remark |
|-----|----------------------------------|---|--------|---------------|
| 1 | High Temperature Storage | Ta= 80□ | 240Hrs | |
| 2 | Low Temperature Storage | Ta= -30□ | 240Hrs | |
| 3 | High Temperature Operation | Ta= 70□ | 240Hrs | |
| 4 | Low Temperature Operation | Ta= -20□ | 240Hrs | |
| 5 | High Temperature & High Humidity | Ta= 60□. 90% RH | 240Hrs | Operation |
| 6 | Heat Shock | -25□~70□, 50 cycle, 2Hrs/cycle | | Non-operation |
| 7 | Vibration (With Carton) | Random vibration: 0.015G ² /Hz from 5~200Hz -6dB/Octave from 200~500Hz | | IEC 68-34 |
| 8 | Drop (With Carton) | Height: 60cm 1 corner, 3 edges, 6 surfaces | | |

Note 1: Ta: Ambient temperature.

Note 2: In the standard condition, there is not display function NG issue occurred. All the cosmetic specification is judged before the reliability stress.



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H. Packing Form