# SPECIFICATION

AGO 035J0-NN-N

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# Contents

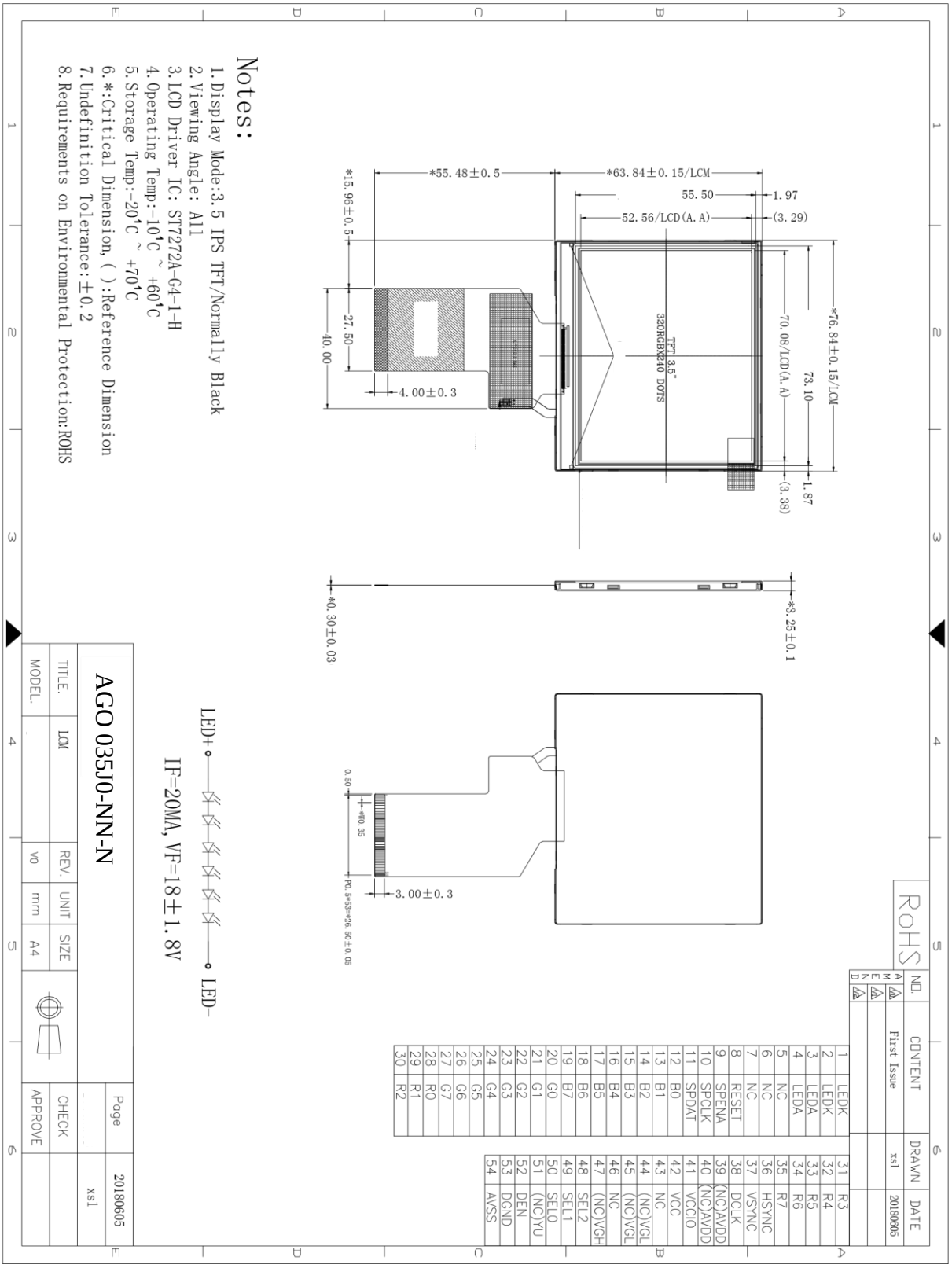
# 1. Document Revision History:

| DOCUMENT REVISION | DATE | DESCRIPTION | PREPARED BY |
|---|---|---|---|
| A | 2018-07-19 | First Release. | |

## 2. General Description

| No | Item | Specification | Remark |
|---|---|---|---|
| 1 | Screen Size | 3.5 inch | |
| 2 | Display Mode | Normally Black | |
| 3 | Resolution | 320 × RGB × 240 | |
| 4 | Active Area | 70.08*52.56 | |
| 5 | Outline Dimension | 76.84*63.84*3.25 | |
| 6 | Viewing Direction | ALL | |
| 7 | Driver IC | ST7272A-G4-1-H | |
| 8 | Color Number | 16.7M | |
| 9 | Interface | 3Line SPI+RGB 24Bit | |
| 10 | Back Light | White Led*6 | |
| 11 | Touch Panel | - | |

# 3. Outline Dimension



# 4. Interface Specification

| Pin No | Symbol | Description | Note |
|---|---|---|---|
| 1-2 | LEDK | Power Supply For LED Backlight Cathode Input. | |
| 3-4 | LEDA | Power Supply For LED Backlight Anode Input. | |
| 5-7 | NC | No Connection. | |
| 8 | RESET | Global reset pin. When GRB is executed. “L”, internal initialization procedure is | |
| 9 | SPENA（CS） | Chip selection signal pin. | |
| 10 | SPCLK（SCL） | Serial clock signal pin. | |
| 11 | SPDAT（SDA） | Serial data input/output pin. | |
| 12-19 | B0-B7 | Blue data (B0-LSB;B7-MSB) | |
| 20-27 | G0-G7 | Green data (G0-LSB; G7-MSB) | |
| 28-35 | R0-R7 | Red data (R0-LSB;R7-MSB) | |
| 36 | HSYNC | Line synchronous signal for RGB interface operation. | |
| 37 | VSYNC | Frame synchronous signal for RGB interface operation. | |
| 38 | DOTCLK | Dot clock signal for RGB interface operation. | |
| 39-40 | AVDD(NC) | No Connection. | |
| 41 | VCCIO | Power supply for digital I/O pin | |
| 42 | VCC | Power Supply For LCD. | |
| 43-45 | VGL(NC) | No Connection. | |
| 46 | NC | No Connection. | |
| 47 | VGH(NC) | No Connection. | |
| 48 | SEL2 | No Connection. | |
| 49 | SEL1 | No Connection. | |
| 50 | SEL0 | No Connection. | |
| 51 | YU(NC) | No Connection. | |
| 52 | DEN | Data enable signal for RGB interface operation. | |
| 53 | DGND | Ground. | |
| 54 | AVSS | Ground. | |

NOTE：Pin function description

(1) HDIR：Horizontal scan direction control pin.

| HDIR | Function Description |
|---|---|
| L | From right to left |
| H | From left to right |

HDIR=H (R1=NC；R2=0 /0402=DVDD)

(2) VDIR:Vertical scan direction control pin

| VDIR | Function Description |
|---|---|
| L | From down to up. |
| H | From up to down. |

VDIR=H (R3=NC；R4=0 /0402=DVDD)

(3) DCLPOL:VDPOL sets DCLK polarity in RGB interface.

| VDLKPOL | Function Description |
|---|---|
| L | VSYNC polarity: positive |
| H | YSNC polarity: negative |

DCLPOL=H (R5=NC；R6=0 /0402=DVDD)

(4) VDPOL:VDPOL sets VSYNCC polarity in RGB interface.

| DCLKPOL | Function Description |
|---|---|
| L | HSYNC polarity: positive |
| H | HSYNC polarity: negative |

VDPOL=H (R7=NC；R8=0 /0402=DVDD)

(5) HDPOL:HDPOL sets HSYNC polarity in RGB interface.

| HDLKPOL | Function Description |
|---|---|
| L | HSYNC polarity: positive |
| H | HSYNC polarity: negative |

HDPOL=H (R9=NC；R10=0 /0402=DVDD)

(6) SPI_12C_SEL:3-wire SPI and I 2 C interface control.

| SPI_ I²C _SEL | Function Description |
|---|---|
| L | I²C interface |
| H | 3-wire SPI interface |

SPI_12C_SEL=H (R11=NC；R12=0 /0402=DVDD)

(7)AUTODL:OTP trim function control pin.

| AUTODL | Function Description |
|---|---|
| L | Disable auto-refresh function |
| H | Enable auto-refresh function |

AUTODL=L (R13=0/0402=GND；R14=NC)

# 5.Absolute Maximum Ratings

**Electrical Maximum Ratings – for IC Only**

| Parameter | Symbol | Min. | Max. | Unit | Note |
|---|---|---|---|---|---|
| Power supply voltage (VCC) | VCC | -0.3 | +4.0 | V | 1 |
| Power supply voltage (VCCIO) | VCCIO | -0.3 | +4.0 | V | 1 |

Note:

1.VCCIO,VCI, GND must be maintained.

2.The modules may be destroyed if they are used beyond the absolute maximum ratings.

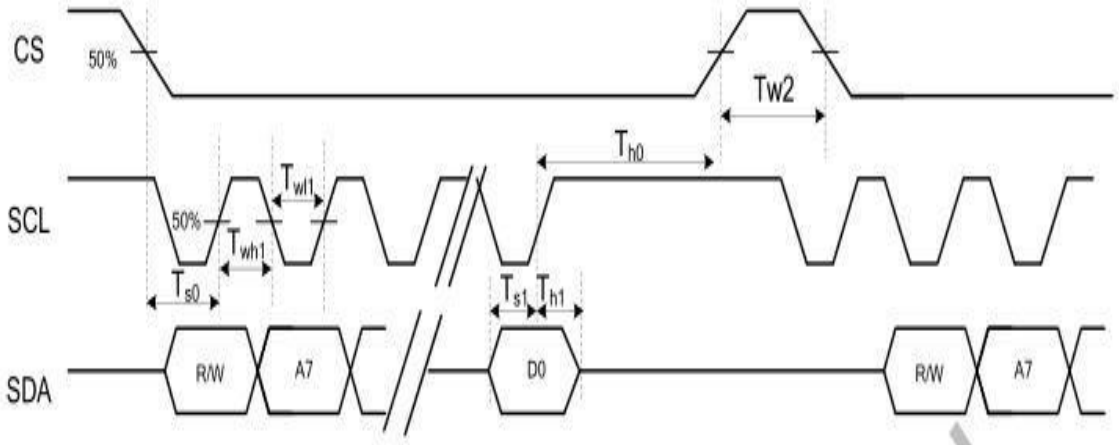
# 6. Electrical Specifications

At Ta = 25 ℃, VDD = 3.0V to 3.6V, GND=0V.

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Supply voltage | VDD-GND | | 3.0 | 3.3 | 3.6 | V |
| Supply voltage | VCCIO-GND | | 3.0 | - | 3.6 | V |
| Supply current (Logic & LCD) | ICC | VCC=2.8V | - | - | TBD | mA |
| Supply voltage of white LED backlight | VLED | Forward current =20mA Number of LED = 6 | - | 18 | - | V |

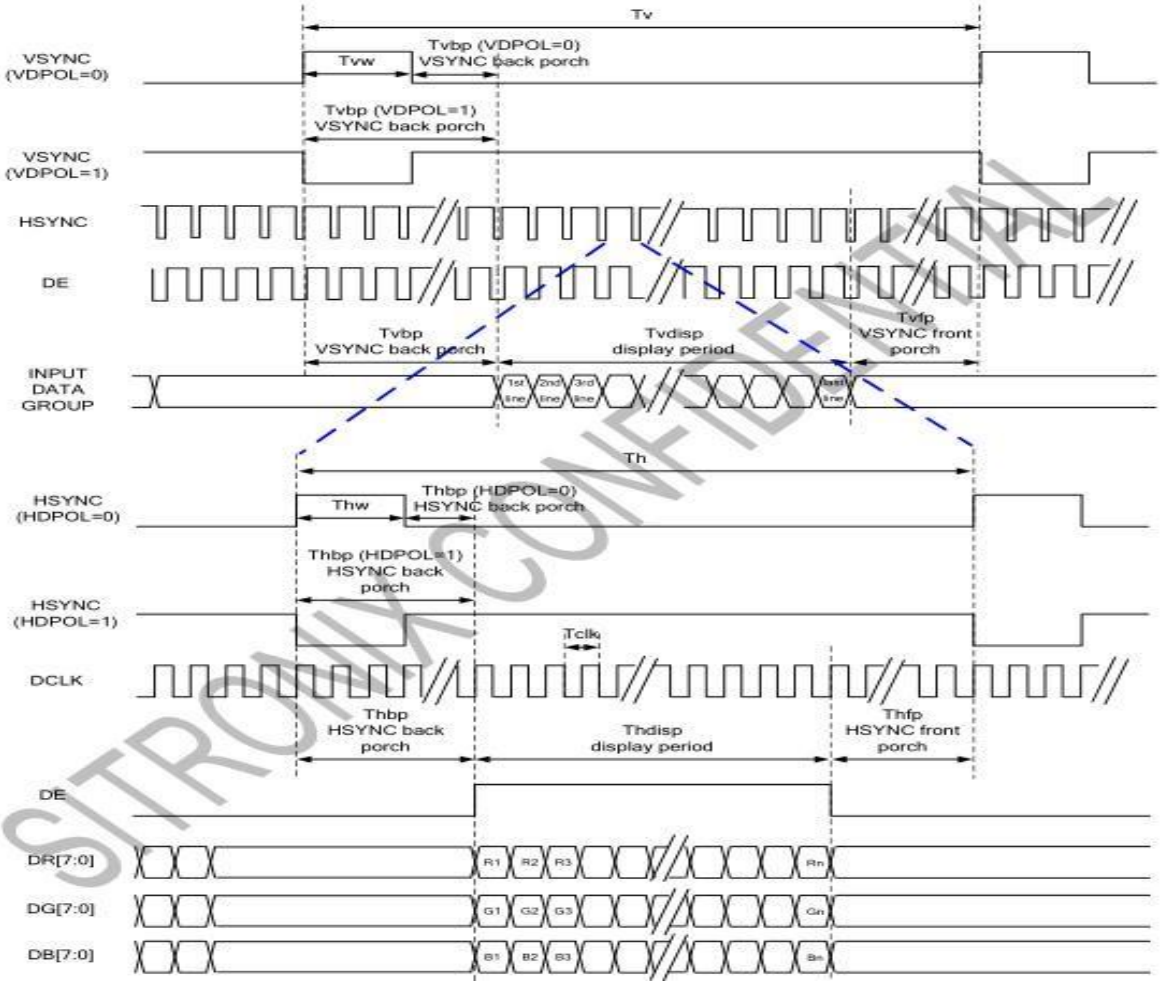
# 7. Timing Characteristics

## 7.1 System Bus Timing for 3-Wire SPI Interface




| Item | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| CS Input Setup Time | Ts0 | 50 | - | - | ns | |
| Serial Data Input Setup Time | Ts1 | 50 | - | - | ns | |
| CS Input Hold Time | Th0 | 50 | - | - | ns | |
| Serial Data Input Hold Time | Th1 | 50 | - | - | ns | |
| SCL Write Pulse High Width | Twh1 | 50 | - | - | ns | |
| SCL Write Pulse Low Width | Twl1 | 50 | - | - | ns | |
| SCL Read Pulse High Width | Trh1 | 300 | | | ns | |
| SCL Read Pulse Low Width | Trl1 | 300 | | | ns | |
| CS Pulse High Width | Tw2 | 400 | - | - | ns | |

### 7.3.2 SYNC-DE Mode






### 7.3.4 Parallel 24-bit RGB Input Timing Table

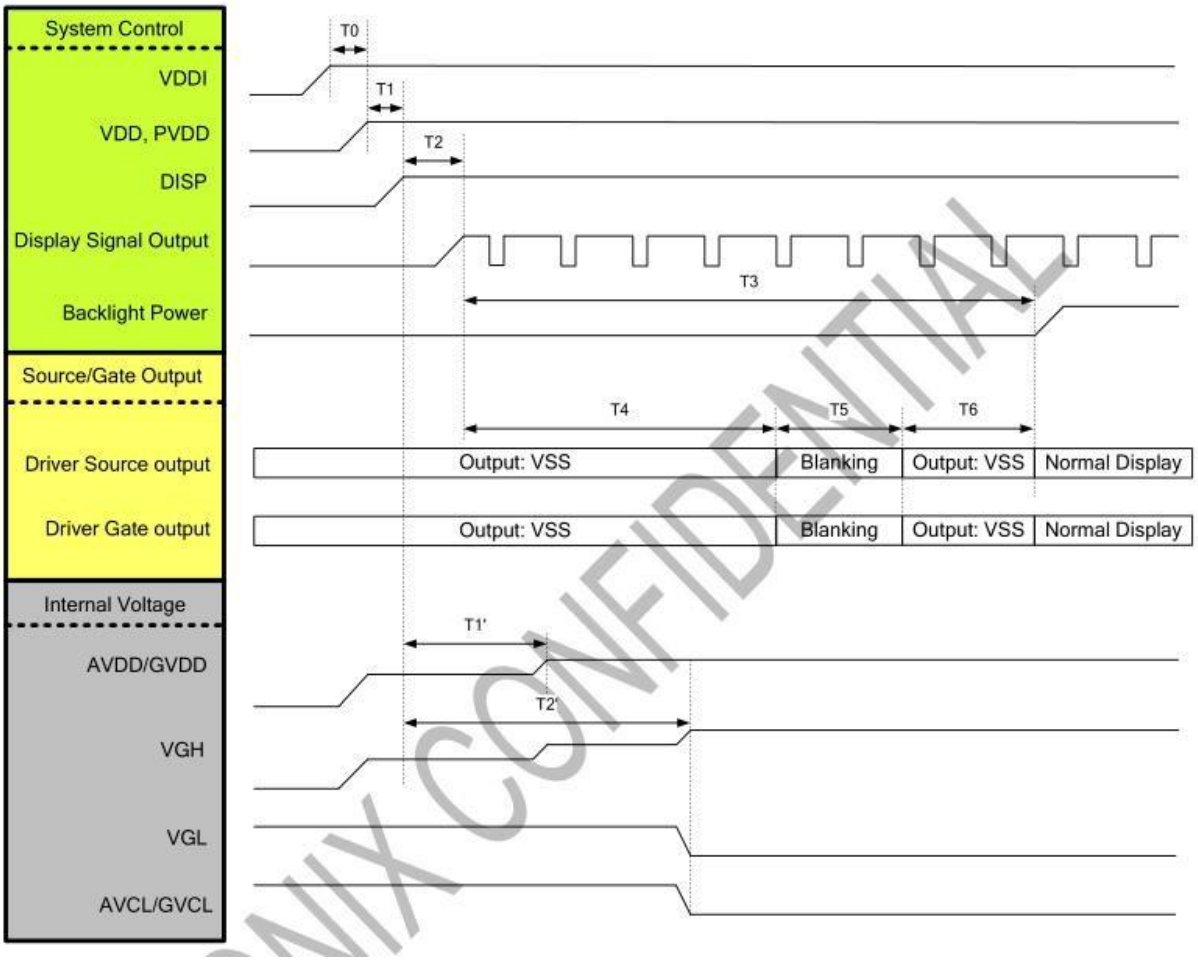
Parallel 24-bit RGB Input Timing (PVDD=VDD=VDDI= 3.3V, AGND= 0V, TA=25°C)

| Parallel 24-bit RGB Input Timing Table | | | | | | | |
|---|---|---|---|---|---|---|---|
| Item | | Symbol | Min. | Typ. | Max. | Unit | Remark |
| DCLK Frequency | | Fclk | 5 | 6 | 8 | MHz | |
| DCLK Period | | Tclk | 125 | 167 | 200 | ns | |
| HSYNC | Period Time | Th | 325 | 371 | 438 | DCLK | |
| | Display Period | Thdisp | | 320 | | DCLK | |
| | Back Porch | Thbp | 3 | 43 | 43 | DCLK | By H_BLANKING setting |
| | Front Porch | Thfp | 2 | 8 | 75 | DCLK | |
| | Pulse Width | Thw | 2 | 4 | 43 | DCLK | |
| VSYNC | Period Time | Tv | 244 | 260 | 289 | HSYNC | |
| | Display Period | Tvdisp | | 240 | | HSYNC | |
| | Back Porch | Tvbp | 2 | 12 | 12 | HSYNC | By V_BLANKING setting |
| | Front Porch | Tvfp | 2 | 8 | 37 | HSYNC | |
| | Pulse Width | Tvw | 2 | 4 | 12 | HSYNC | |

*Note: It is necessary to keep Tvbp =12 and Thbp =43 in sync mode. DE mode is unnecessary to keep it.*

# 8. Power Supply Configuration

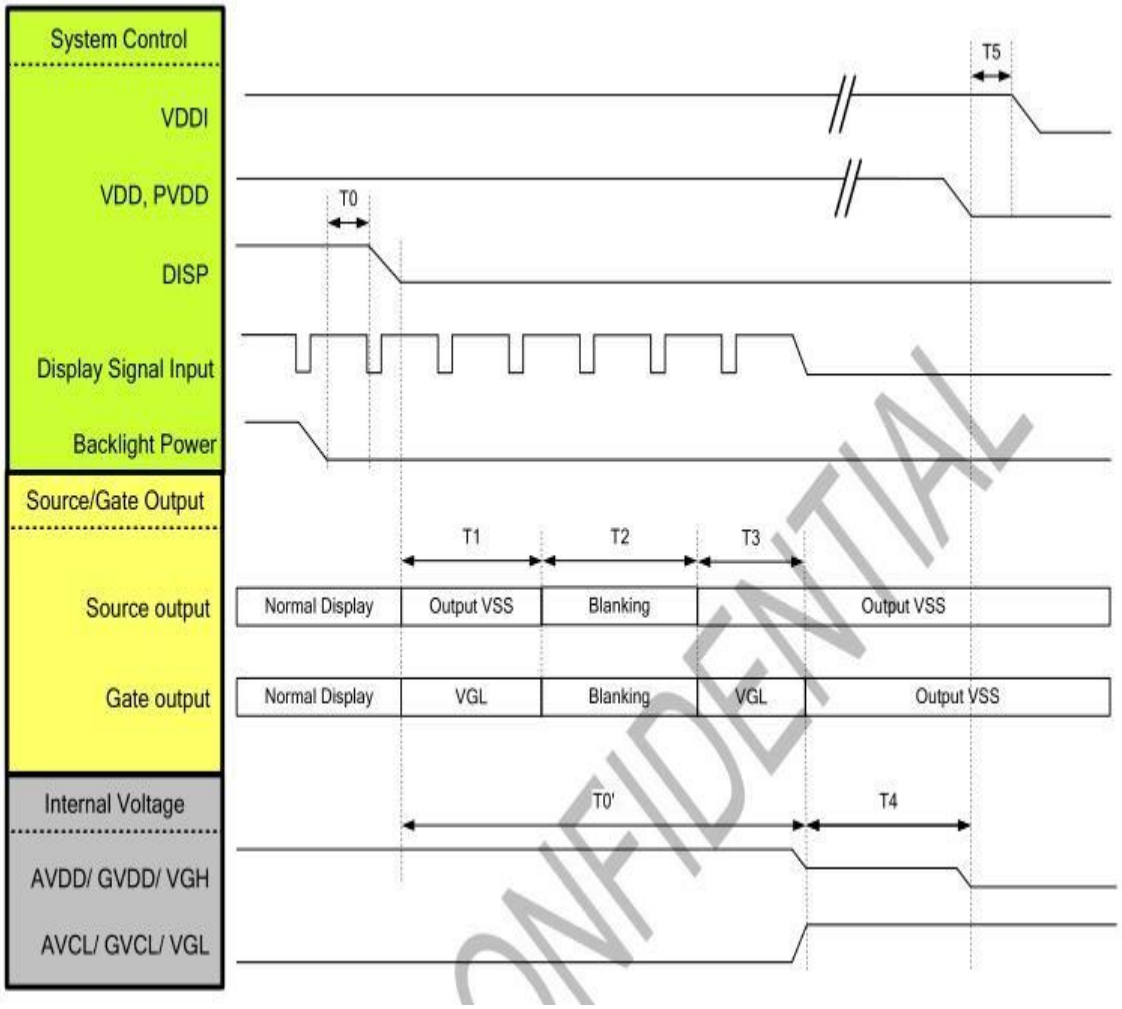
## 8.1 Power On Sequence






| Symbol | Description | Min. Time | Unit |
|---|---|---|---|
| T0 | Analog power on delay time | 0 | ms |
| T1 | System power stability to DISP= "High" | 0 | ms |
| T2 | DISP= "High" to display signal output | 10 | ms |
| T3 | Display signal output to backlight power on | 250 | ms |
| T4 | Display signal output to source output | 100 | ms |
| T5 | Source/ Gate blanking time | 30 | ms |
| T6 | Source/ Gate automatic output VSS | 80 | ms |
| T1' | DISP= "High" to AVDD/GVDD voltage stable time | 20 | ms |
| T2' | DISP= "High" to VGH/VGL/AVCL/GVCL voltage stable time | 60 | ms |

## 8.2 Power Off Sequence




| Symbol | Description | Min. Time | Unit |
|---|---|---|---|
| T0 | Backlight power off to DISP off | 5 | ms |
| T1 | Source voltage output VSS and Gate voltage output VGL | 30 | ms |
| T2 | Source/ Gate blanking time | 30 | ms |
| T3 | Source voltage output VSS and Gate voltage output VGL | 20 | ms |
| T4 | AVDD/ GVDD/ VGH discharge time | 5 | ms |
| T5 | Analog power off to digital power off time | 0 | ms |
| T0' | Source and Gate voltage discharge complete width | 80 | ms |

## 9.Optical Specification

| Item | Symbol | Condition | Min | Typ | Max | Unit | Note |
|---|---|---|---|---|---|---|---|
| Response time | Tr+Tf | Θ=0° Ø=0° Ta=25˚C | - | 30 | 40 | ms | 1 |
| Contrast ratio | Cr | | 640 | 800 | - | - | 2 |
| Color gamut | S(%) | | 55 | 60 | - | % | - |
| Luminance uniformity | δWHITE | | 80 | - | - | % | 3 |
| Viewing angle range | Θx+ | CR≧10 Ta=25˚C | - | 80 | - | deg | 4 |
| | Θx- | | - | 80 | - | deg | |
| | Θy+ | | - | 80 | - | deg | |
| | Θy- | | - | 80 | - | deg | |
| LCM Luminance | Lv | Θ=0° Ø=0° Ta=25˚C | - | 500 | - | Cd/m² | 5 |
| CIE (X,Y) Chromaticity | White(X) | | 0.27 | 0.30 | 0.33 | - | 6 |
| | White(Y) | | 0.30 | 0.33 | 0.36 | - | |

Note1.Response time is the time required for the display to transition from White to black(Rise Time,Tr)and from black to white(Decay Time,Tf).For additional information see FIG1...

Note2.contrast Ratio(CR) is defined mathematically by the following formula ,For more information see FIG2.

Contrast Ratio(CR)=Average Surface Luminance with all white pixels/ Average Surface Luminance with all black pixels

Note3.The uniformity in surface luminance(WHITE) is determined by measuring luminance at eath test position,and then dividing the maximum luminance of all white pixels by minimum luminance of all white pixels,For more information seeFIG2.

WHITE=Minimum Surface Luminance with all white pixels(P1,P2,.....)/Maximum Surface

Luminance with all white pixels(P1,P2,.....)

Note4.Viewing angle is the angel at which contrast ratio is greater than a specific value.For TET module,the specific value of contrast ratio is 10.For monochrome and color stn module,the specific value of contrast ratio is2.The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface.For more information see FIG3

Note5. Surface luminance is the LCD surface luminance with all white pixels,For more information see FIG2.

LV=Average Surface Luminance with all white pixels(P1,P2,.....)

Note6.CIE(X,Y)chromaticity is the Center point value.For more information see FIG2.

Note7.For Viewing angle and response time testing,the testing date is base on Autronic-Melchers's ConScope.Series instruments.For contrast ratio,Surface Luminance,Luminance uniformity and CIE,the testing date is base on CS-2000 photo detector.

Note8.For TN type TFT transmissive module,Gray scale reverse occurs in the direction of panel viewing angle

FIG1. The definition of Response time

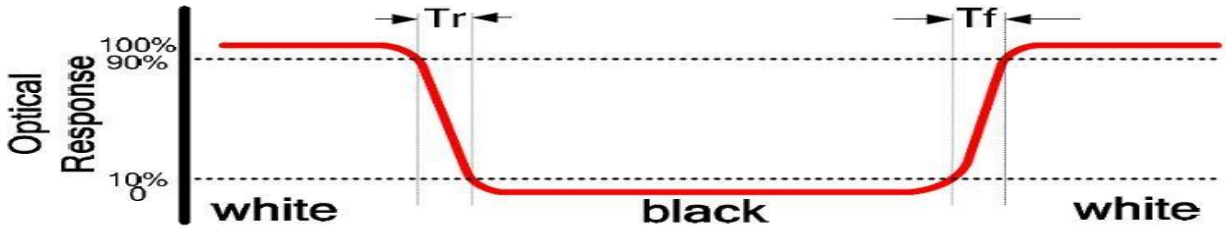



FIG2. Measuring method for Contrast ratio,surface luminance,Luminance uniformity,CIE(X,Y)chromaticity.

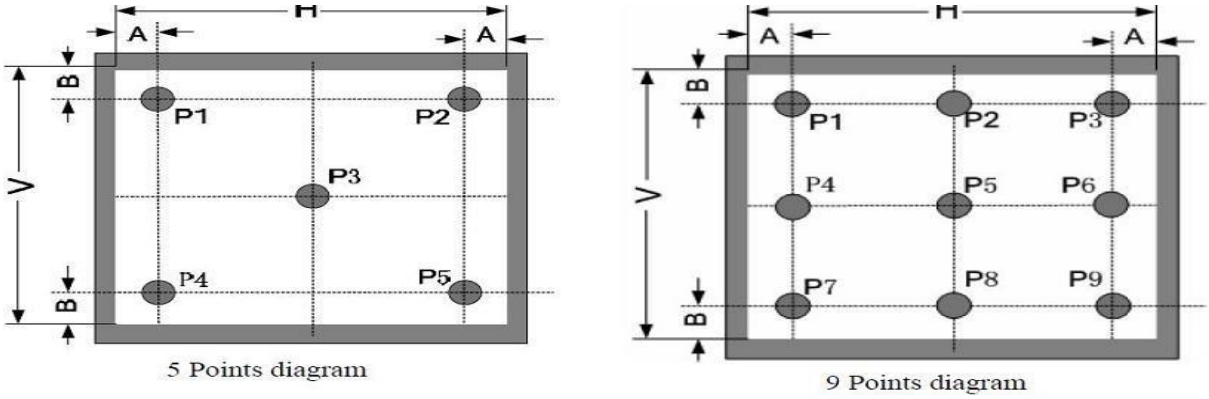
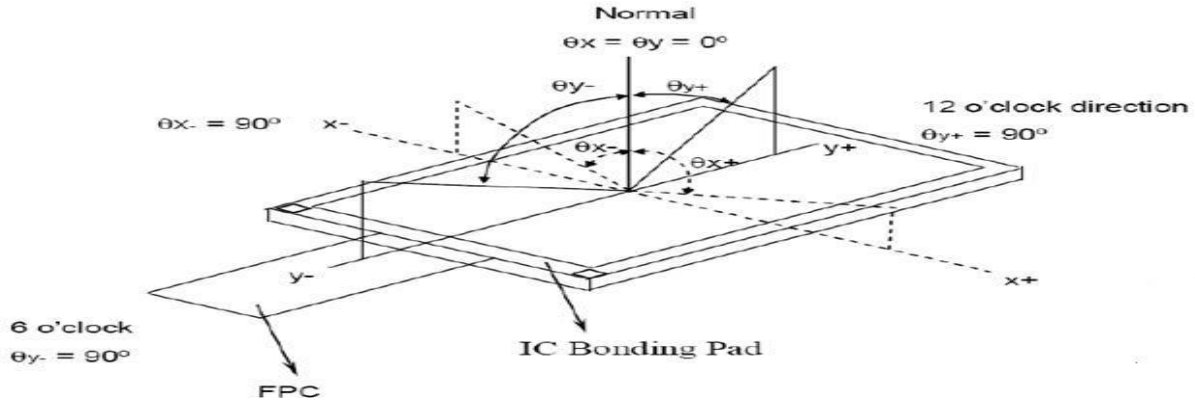



FIG3 The definition of viewing angle




## 10.Reliability Test Items

| Item | Test Condition | Criterion |
|---|---|---|
| High Temperature Storage | 70 ℃, 48 hrs | Note1,Note2 |
| Low Temperature Storage | -20 ℃, 48 hrs | |
| High Temp. & High Humidity Storage | 40 ℃, 80％ RH, 48hrs | |
| Thermal Shock (Static) | -20℃, 30 min /70℃, 30 min, 20 cycles | |
| High Temperature Operation | 60 ℃, 48 hrs | |

| | | |
|---|---|---|
| Low temperature Operation | -10 ℃, 48 hrs | |

Note1:Evaluation should be tested after storage at room temperature for two hours.
Note2:
Pass: Normal display image no line defect.
Fail: No display image, or line defects.
Partial transformation of the module parts should be ignored.

## 11.Precautions

Please pay attentions to the followings as using the LCD module.

**Handling**

(a) Do not apply strong mechanical stress like drop, shock or any force to LCD module. It may cause improper operation, even damage.

(b) Because the polarizer is very fragile and easy to be damaged, do not hit, press or rub the display surface with hard materials.

(c) Do not put heavy or hard material on the display surface, and do not stack LCD modules.

(d) If the display surface is dirty, please wipe the surface softly with cotton swab or clean cloth.

(e) Avoid using Ketone type materials (e.g. Acetone), Toluene, Ethyl acid or Methyl chloride to clean the display surface. It might damage the touch panel surface permanently. The recommended solvents are water and Isopropyl alcohol.

(f) Wipe off water droplets or oil immediately.

(g) Protect the LCD module from ESD. It will damage the LSI and the electronic circuit.

(h) Do not touch the output pins directly with bare hands.

(i) Do not disassemble the LCD module.

(j) Do not lift the FPC of Touch Panel.

**Storage**

(a) Do not leave the LCD modules in high temperature, especially in high humidity for a long time.

(b) Do not expose the LCD modules to sunlight directly.

(c) The liquid crystal is deteriorated by ultraviolet. Do not leave it in strong ultraviolet ray for a long time.

(d) Avoid condensation of water. It may cause improper operation.

(e) Please stack only up to the number stated on carton box for storage and transportation. Excessive weight will cause deformation and damage of carton box.

**Operation**

(a) When mounting or dismounting the LCD modules, turn the power off.

(b) Protect the LCD modules from electric shock.

(c) The Driver IC control algorithms stated above should always obeyed to avoid damaging the LSI and electronic circuit.

(d) Be careful to avoid mixing up the polarity of power supply for backlight.

(e) Absolute maximum rating specified above has to be always kept in any case. Exceeding it may cause non-recoverable damage of electronic components or, nevertheless, burning.

(f) When a static image is displayed for a long time, remnant image is likely to occur.

(g) Be sure to avoid bending the FPC to an acute shape, it might break FPC.

(h) Most of the touch screens have air vent to equalize the inside air pressure to the outside one. The air vent must be open and liquid contact must be avoided as the liquid may be absorbed if the liquid is accumulated near the air vent.

(i) For the fragility of ITO film, it should avoid to use too tapering pen as the input material.

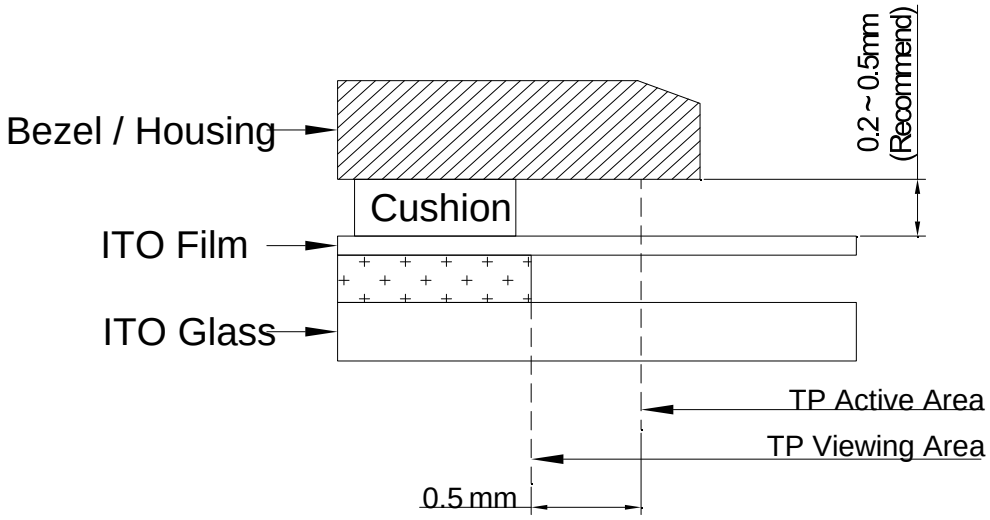
**Touch Panel Mounting Notes**

(a) If a cushion is used between bezel/housing and film must be choose as free as enough to absorb the expansion and contraction to avoid the distortion of film.

(b) The cushion must be placed out of the Viewing Area.

(c) Bezel/Housing edge must be posited between Key Area and Viewing Area. The edge enters the Key Area may cause unexpected input if the gap is too narrow or foreign particles like dusts exist between Bezel/Housing and ITO film.

(d) Mounting example:




The corner part has conductivity. Do not touch any metal part after mounting.

**Others**

a) If the liquid crystal leaks from the panel, it should be kept away from the eyes or mouth.

b) For the fragility of polarizer, it is recommended to attach a transparent protective plate over the display surface.

c) It is recommended to peel off the protection film on the polarizer slowly so that the electrostatic charge can be minimized.