# ORIENT DISPLAY
## Your Total LCD Solution Provider

# Specification for TFT

# AFC8001280A1-10.1INTM-I-C

Revision A

| A | Orient Display |
|---|---|
| FC | TFT Type |
| 8001280 | Resolution 800 x 1280 |
| A0 | Serial A0 |
| 10.1 | 10.1", Module Dimension 145.5 x 231.0 x 4.86 mm |
| I | IPS Display |
| N | Top: -20~+70°C; Tstr: -30~+80°C |
| T | Transmissive |
| M | Medium Brightness, 400 cd/m2 |
| I | MIPI Interface |
| C | Capacitive Touch Panel |
| / | Controller ILI9881C Or Compatible |

# Revision History

| Date | Rev. | Description | Note | Page |
|------|------|-------------|------|------|
| **2024-04-09** | **A** | **New issue** | | |
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# Contents

# 1. Features

| Item | Standard Value |
| --- | --- |
| Display Type | 800(RGB)*1280 Dots |
| LCD Type | Normal black，Transmissive |
| Screen Size(inch) | 10.1 |
| Viewing Direction | All o'clock |
| Backlight | 27pcs White LED |
| Weight | 346.2g |
| Interface | MIPI |
| Other(controller/driver IC) | ILI9881C |

# 2. Mechanical Specifications

| Item | Standard Value | Unit |
| --- | --- | --- |
| Outline Dimension | 145.5(L)*231.0(W)*4.86(T) | mm |
| Active Area | 135.36(L)*216.58(W) | mm |
| Dots Pitch | 0.1692(L)*0.1692(W) | mm |

# 3. Absolute Maximum Ratings

| Item | Symbol | Condition | Min. | Max. | Unit |
| --- | --- | --- | --- | --- | --- |
| Power Supply Voltage 1 | $V_{DD}$ | - | -0.3 | 3.8 | V |
| Input Voltage | $V_{IN}$ | - | -0.5 | VDDI+0.3 | V |
| HS Input Voltage | VHSIN | - | -0.3 | 1.65 | V |
| Operating Temperature | $T_{OP}$ | - | -20 | 70 | °C |
| Storage Temperature | $T_{ST}$ | - | -30 | 80 | °C |
| Humidity | - | $T_A \leqq 40℃$ | - | 90 | RH |

# 4. DC Electrical Characteristics

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Analog operating Voltage | $V_{ci}$ | Operating Voltage | 2.5 | -- | 6.6 | V |
| Digital operating Voltage | $V_{DDI}$ | -- | 1.65 | -- | 6.6 | V |
| Logic High level input Voltage | $V_{IH}$ | -- | $0.7*V_{DDI}$ | -- | $V_{DDI}$ | V |
| Logic Low level input Voltage | $V_{IL}$ | -- | -0.3 | -- | $0.3*V_{DDI}$ | V |
| Logic High level output Voltage TE LEDPWM | $V_{OH}$ | IOH = -1.0mA | $0.8*V_{DDI}$ | -- | $V_{DDI}$ | V |
| "L" Output Voltage | $V_{OL}$ | IOL = +1.0mA | 0 | -- | $0.2*V_{DDI}$ | V |
| Supply Current | $I_{DD}$ | - | 25 | 50 | 100 | mA |
| Gate Driver High voltage | VGH | -- | -- | 15 | -- | V |
| Gate Driver Low voltage | VGL | -- | -- | -11 | -- | V |
| Analog Power supply voltage | AVDD/AVEE | -- | -- | 5/-5 | -- | V |

## 5. Optical Characteristics

| Item | | Symbol | Conditions | Min. | Typ. | Max. | Reference |
|---|---|---|---|---|---|---|---|
| View Angle | Top | $\Theta T$ | C≥10 | 75deg. | 80deg. | -- | Notes 1 & 2 |
| | Bottom | $\Theta B$ | | 75deg. | 80deg. | -- | |
| | Left | $\Theta L$ | | 75deg. | 80deg. | -- | |
| | Right | $\Theta R$ | | 75deg. | 80deg. | -- | |
| CIE *1 | White | X | TA=25° C $\Theta x, \Theta Y=0°$ | 0.261 | 0.301 | 0.341 | Notes 5 |
| | | Y | | 0.294 | 0.334 | 0.374 | |
| | Red | X | | 0.585 | 0.625 | 0.665 | |
| | | Y | | 0.318 | 0.358 | 0.398 | |
| | Green | X | | 0.284 | 0.324 | 0.364 | |
| | | Y | | 0.545 | 0.585 | 0.625 | |
| | Blue | X | | 0.107 | 0.147 | 0.187 | |
| | | Y | | 0.087 | 0.127 | 0.167 | |
| Uniformity | | U | If=180mA | 70% | -- | -- | Note 4 |
| Contrast Ratio | | Cr | θ = ∅ = 0° | 800 | 1000 | -- | Note 3 |
| Surface Brightness | | L | ∅ = 0° | 400cd/m2 | 600cd/m2 | -- | Note 3 & 4 |
| Response Time (TR+ TF) | | TR+TF | TA=25° C ∅ = 0° | -- | 30ms | -- | Note 2 |

*1: This value will be changed while mass product.

Note 1.

Optical characteristics-2
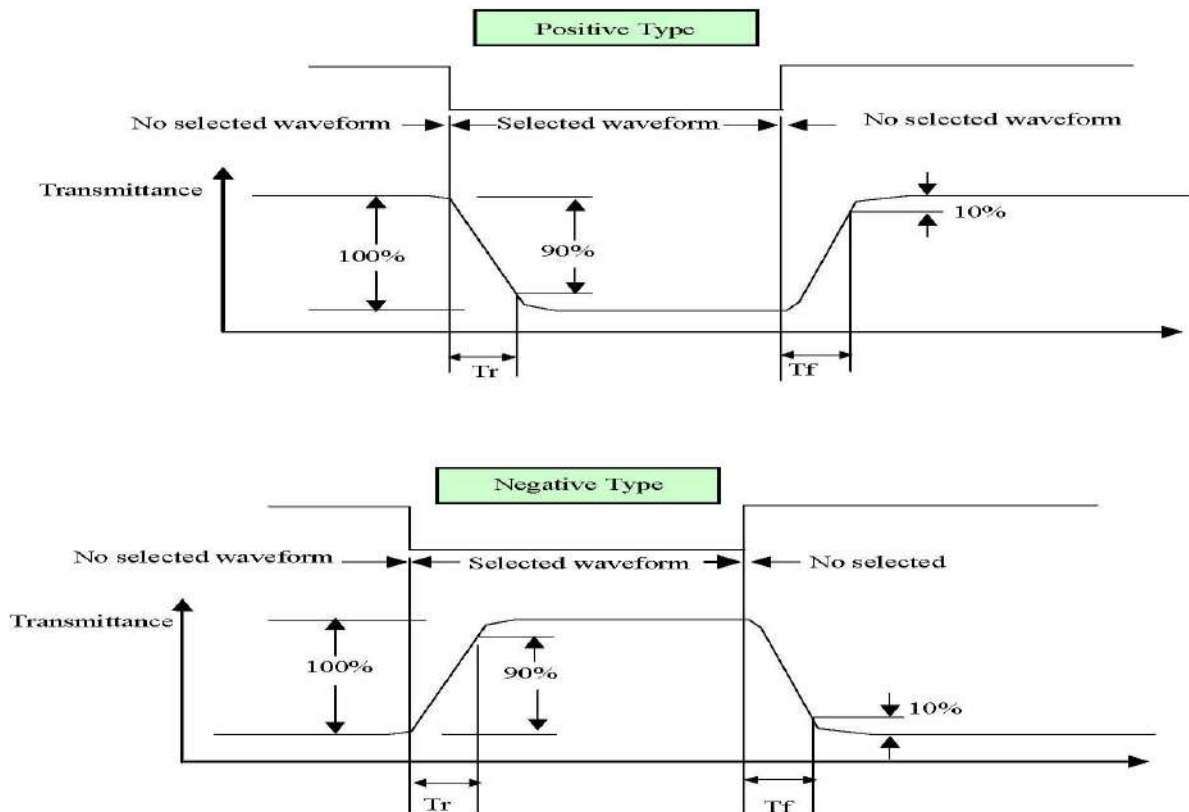
Viewing angle
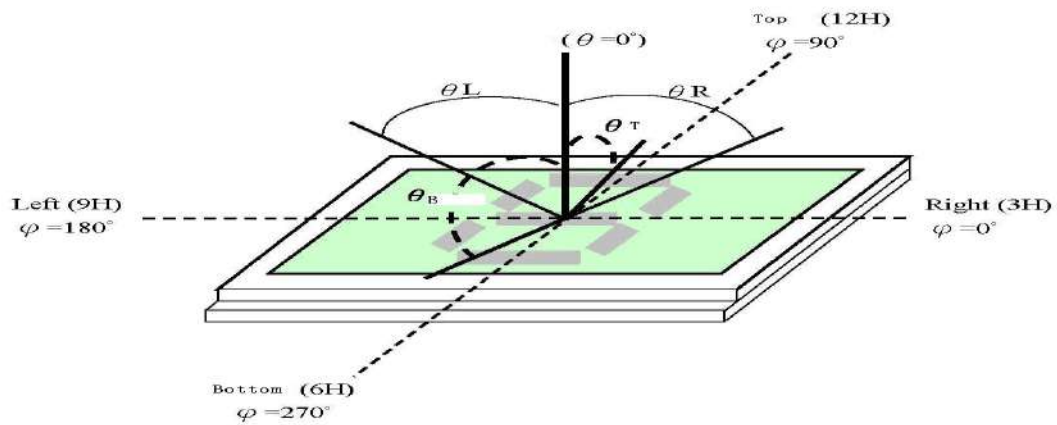


**Viewing angle**

Note 2.

Optical characteristics-3
Fig.2 Definition of response time

## Electrical characteristics-2
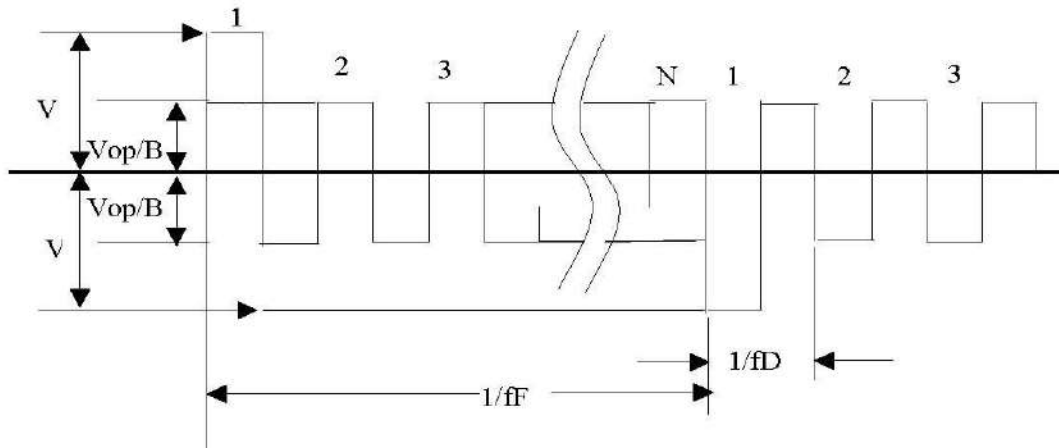
　※2 Drive waveform
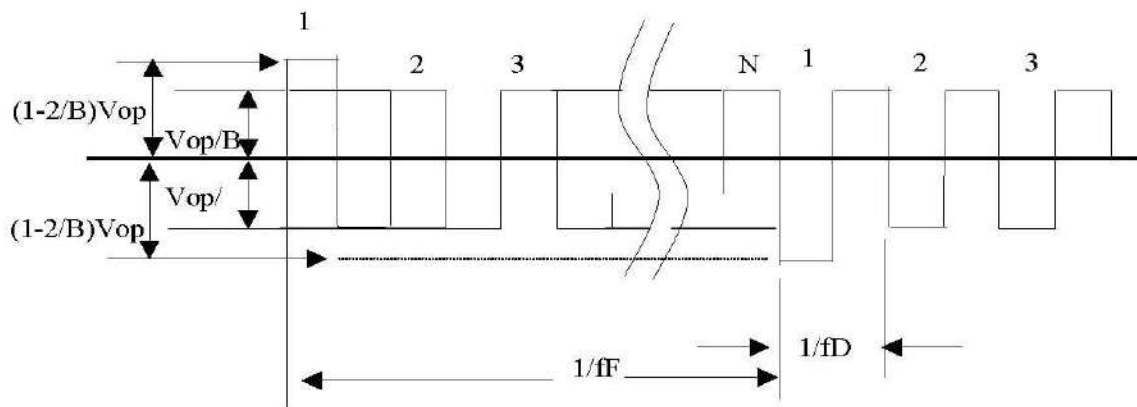
Vop: Drive voltage      fF: Frame frequency

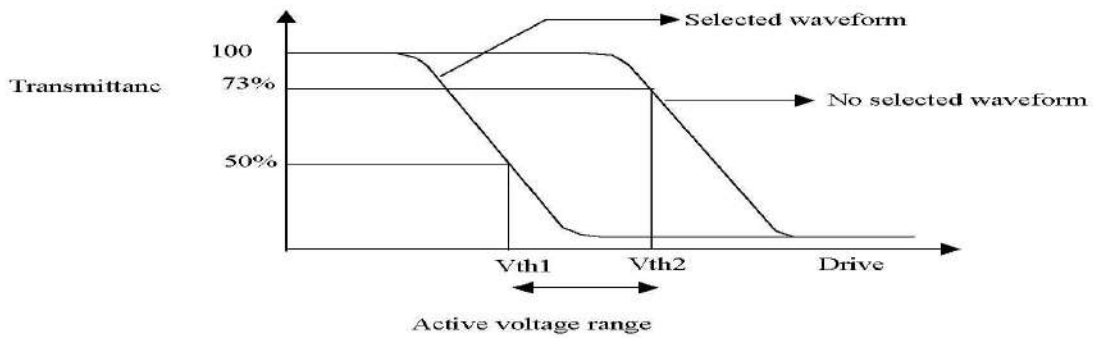1/B: Bias      fD :D rive frequency

N: Duty

(1) Selected waveform



(2) Non- Selected wave form



Note:
Frame frequency is defined as follows: Common side supply
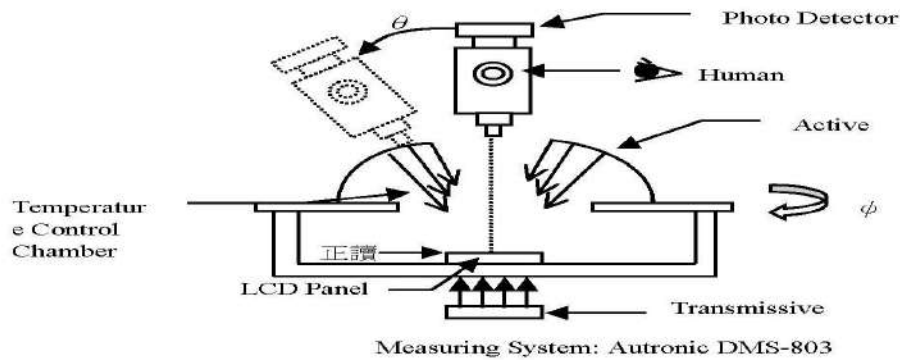voltage peak - to - peak /2 = 1 period

Note 3. : Definition of Vth

| | Vth1 | Vth2 |
|---|---|---|
| View direction | 10° | 40° |
| Drive waveform | (Selected waveform) | (No selected waveform) |
| Transmittance | 50% | 73% |

※1 Contrast ratio
= (Brightness in OFF state) / (Brightness in ON state)

Outline of Electro-Optical Characteristics Measuring System

Measuring System: Autronic DMS-803

Note 4. Definition of Surface Luminance，Uniformity.　(Ref Fig1)
Surface Luminance: LV=average (LP1:LP9)
Uniformity=Minimal (LP1:LP9)/Maximal (LP1:LP9)*100%
Color Coordinate: The test condition is at IF current of backlight and measured on the surface of LCD module.

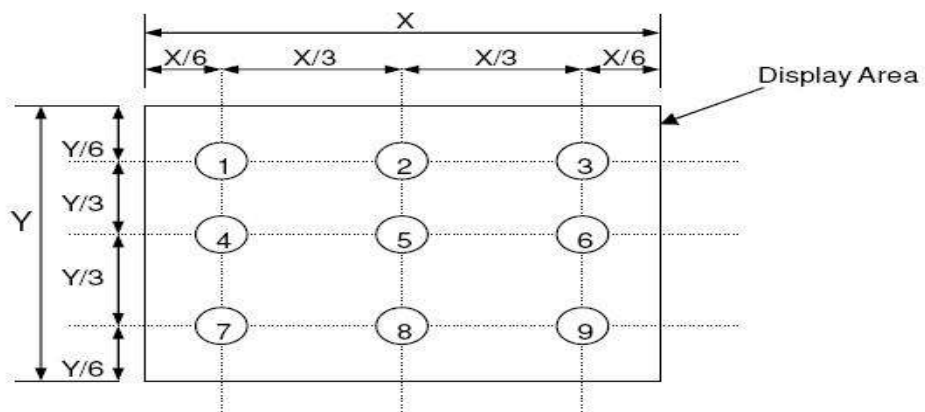Note 5. CIE(x, y) chromaticity is the Center point value. (Ref Fig1)



**Fig1**

## 6. Backlight Characteristics

| Item | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Forward Voltage | $V_F$ | If=180mA | 17.4 | -- | 18.6 | V |
| Forward Current | $I_F$ | -- | -- | 180mA | -- | mA |

## 7. Touch Panel Characteristics
### CTP

| Item | Requirement |
|---|---|
| Touch Panel Type | CTP |
| Touch Controller IC | GT9271 |
| Cover Glass surface treatment | -- |
| Capacitive Touch structure | GG |
| Cap Touch active area | 135.36*216.58mm |
| Number of Sensor traces X (Tx) | 32 |
| Number of Sensor traces Y (Rx) | 20 |
| Cover Lens thickness (sensor lens) | 1.1 |
| Air bonded to LCD | OCA 0.175mm |
| Interface | I2C |
| IO interface power (IOVDD) | 3.3V |
| Normal IC power (VDD) | 3.3V |
| Finger support | -- |

## 8. Interface Pin Description
### TFT Interface Pin Description

| Pin No. | Symbol | Function |
|---|---|---|
| 1 | LED+ | Backlight Anode |
| 2 | LED+ | Backlight Anode |
| 3~8 | NC | No connection |
| 9 | LED- | Backlight Cathod |
| 10 | LED- | Backlight Cathod |
| 11 | GND | Ground |
| 12~13 | NC | No connection |
| 14 | LCD_PWM | LCD backlight control PWM output pin. |
| 15 | LCD_ID | ID pin |
| 16 | GND | Ground |
| 17~18 | NC | No connection |
| 19 | GND | Ground |
| 20 | DSI_D3+ | MIPI Data Bus |
| 21 | DSI_D3- | MIPI Data Bus |
| 22 | GND | Ground |
| 23 | DSI_D2+ | MIPI Data Bus |
| 24 | DSI_D2- | MIPI Data Bus |
| 25 | GND | Ground |
| 26 | DSI_CLK+ | MIPI Data Bus |

| 27 | DSI_CLK- | MIPI Data Bus |
|----|----------|---------------|
| 28 | GND | Ground |
| 29 | DSI_D1+ | MIPI Data Bus |
| 30 | DSI_D1- | MIPI Data Bus |
| 31 | GND | Ground |
| 32 | DSI_D0+ | MIPI Data Bus |
| 33 | DSI_D0- | MIPI Data Bus |
| 34 | GND | Ground |
| 35 | NC | No connection |
| 36 | LCD_RST | LCD Reset signal. |
| 37 | GND | Ground |
| 38 | LCD_VDD | Power supply |
| 39 | LCD_VDD | Power supply |
| 40 | NC | No connection |

**CTP Interface Pin Description**

| Pin No. | Symbol | Function |
|---------|--------|----------|
| 1 | RST | CTP Reset signal, |
| 2 | VCC | Power supply |
| 3 | GND | Ground |
| 4 | INT | CTP IIC data |
| 5 | SDA | CTP IIC data |
| 6 | SCL | CTP IIC clock |
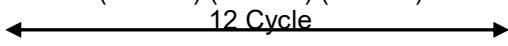
## 9. Block Diagram of Display

## 10. Count Drawing
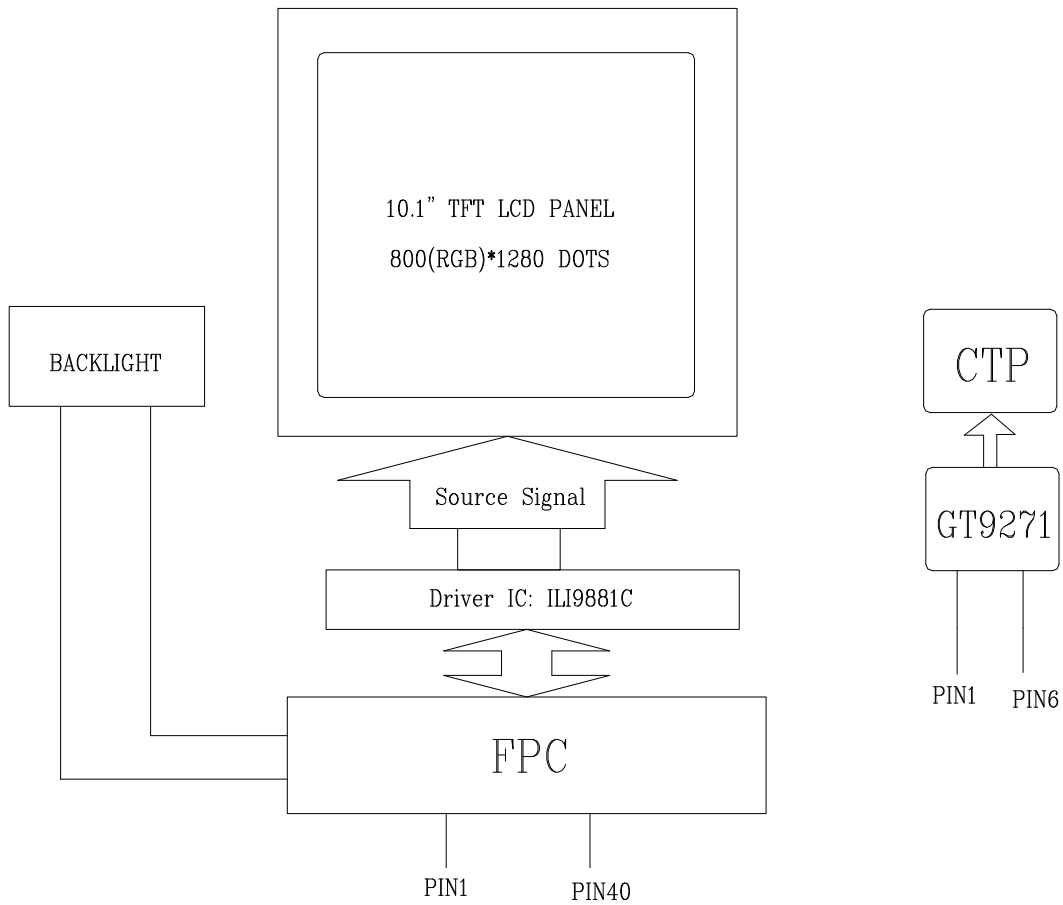
# 11. Timing Characteristics

**Please references ILI9881C data sheet**

## 12. Reliability

| NO | Item | Test Condition | |
|----|------|----------------|---|
| 1 | High Temperature Storage | Storage at 80 ± 2°C 24 hrs<br>Surrounding temperature, then storage at normal condition 4hrs | |
| 2 | Low Temperature Storage | Storage at -30 ± 2°C 24 hrs<br>Surrounding temperature, then storage at normal condition 4hrs | |
| 3 | High Temperature Operation | Operation at 70 ± 2°C 24 hrs | |
| 4 | Low Temperature Operation | Operation at -20 ± 2°C 24 hrs | |
| 5 | High Temperature /Humidity Operating | Operation at 60 ± 2°C, 90%RH 96 hrs surrounding temperature, then storage at normal condition 4hrs. | |
| 6 | Thermal shock (non-operation) | -30°C → 25°C → 70°C<br>(60mins) (10mins) (60mins)<br>←————— 12 Cycle —————→ | |
| 7 | Mechanical Test | Freq.: 10-55Hz Max.<br>Acceleration: 5G<br>X.Y.Z. each direction<br>For 10 mines. | |
| | | Drop them through<br>50cm height to strike horizontal plane | |
| 8 | ESD Test | Air Discharge:<br>Apply +/-8KV with 5 times<br>Discharge for each polarity +/- | Contact Discharge:<br>Apply +/-4KV with 5 times<br>Discharge for each polarity +/- |
| | | 1. Temperature ambiance: 15°C~35°C<br>2. Humidity relative: 30%~60%<br>3. Energy Storage Capacitance(Cs+Cd): 150pF+/-10%<br>4. Discharge Resistance(Rd): 330Ω+/-10%<br>5. Discharge, mode of operation:<br>Single Discharge (time between successive discharges at least 1 sec)<br>(Tolerance if the output voltage indication: +/-5%) | |

Note 1. For humidity test, DI water should be used
    Inspection Standard: Inspect after 1-2hrs storage at room temperature, the sample shall be free from the following defects:
    Air bubble in the LCD
        Seal Leakage
        Non-display
        Missing Segment
        Glass Crack
        IDD is greater than twice initial value
        Others as per QA Inspection Criteria
Note 2.    No defect is allowed after testing.
Note 3.    ESD should be applied to LCD glass panel, not other areas (such as on IC and so on)
      IDD should be within twice initial value.
      In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.
Note 4.    Only upon request.

Note 5.    ODNA carried out a high temperature and high humidity test at 60 ° C / 90% for 240 hours as an ability measurement of this product. As a result, it was confirmed that no abnormality occurred in the product. No indication or external shape abnormality. No FPC corrosion deterioration. Please refer to the official test report on the separate sheet.This result is only for confirming the ability of these 10pcs samples, and does not guarantee the reliability can always meet the above specifications.

## 13. Specification of Quality Assurance

### 13.1 Purpose
This standard for Quality Assurance assures the quality of LCD module products supplied to customer by ODNA.

### 13.2 Standard for Quality Test
ODNA performs the following tests to ensure the quality of product before shipment.

**Sampling Plan:**
GB/T2828.1-2003.  Single sampling, Normal Inspection Level Ⅱ.
Single sampling, normal inspection

**Sampling Level:**
Minor Defect: AQL 0.65%
Major Defect: AQL 0.15%.

Reliability Test:
Detailed requirement refer to Reliability Test Specification.
Nonconforming Analysis & Disposition

**Nonconforming analysis**
Customer should provide overall information of non-conforming sample for their complaints.
After receipt of detailed information from customer, the analysis of nonconforming parts usually should be finished in one week.
If ODNA can not finish the analysis on time, customer will be notified with the progress status.
Disposition of nonconforming:
Non-conforming product over ppm level will be replaced.
The cause of non-conformance will be analyzed. Corrective action will be discussed and implemented.

**Agreement Items**
ODNA and customer shall negotiate if the following situation occurs
There is any discrepancy in standard of quality assurance.
Additional requirement to be added in product specification.
Any other special problem.


### 13.3 Standard of the Product Visual Inspection
Appearance inspection
The normal inspection must be under illumination no less than 800lux, and the distance of view must be between 30cm and 45cm;
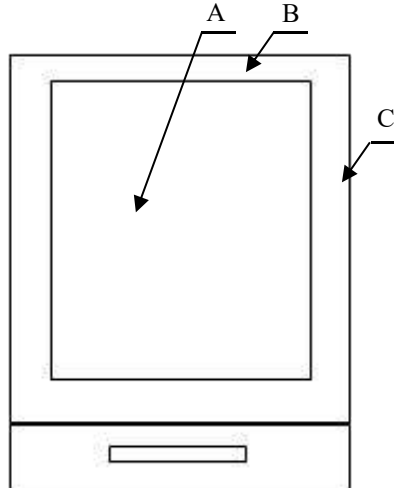When inspect the model of transmissive product, back light must be lighted.
The visual viewing angle should be 45° from the vertical line without reflection shine or follows customer's viewing angle specifications.
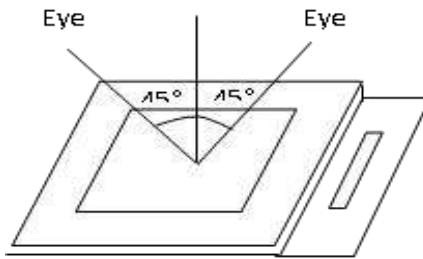
Definition of area( refer to product drawing)

A: Display   area   B: Viewing area   C: Out of Viewing area



Basic principle:

According to IPC standards if standard is not described in specification.

A set of sample to indicate the limit of acceptable quality level must be discussed by both ODNA and customer when there is any dispute happened.
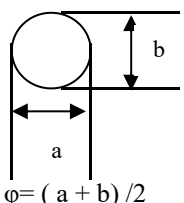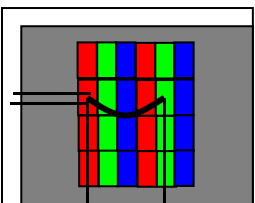
New item must be added on time when it is necessary.

## 13.4 Inspection Specification

| No. | Item | Criteria (Unit: mm) | | |
|---|---|---|---|---|
| **Functional** | | | | |
| 01 | LC leakage | LC leakage | Reject | Maj |
| 02 | Non-display | Non-display | Reject | Maj |
| 03 | Missing segment/ Missing character, dot or icon. |  | Reject | Maj |
| 04 | Exceeded dot/line/segment /Distortion |  | Reject | Maj |

| 05 | Dim Display | part of figures display dim than normal obviously | As the samples confirmed each other | Min |
|----|-----------|------|------|-----|
| 06 | Wrong view angle | View angle is different from spec. | Reject | Maj |
| 07 | Not light | 1.Backlight not work<br>2. Some LED not light | Reject | Maj |
| 08 | Backlight Luminance \ uniformity | According to the product specification or limited samples | Reject | Min |
| 09 | Backlight Color | According to the product specification or limited samples | Reject | Min |
| 10 | CTP no response | CTP touch no response | Reject | Maj |
| 11 | Connection failure | FPC gold finger damage | Reject | Maj |

**Appearance**

| 01 | Black and white spot, Red, blue and green spot<br>Dent<br>Foreign material<br>(Round type) | b<br>a<br>$\varphi = (a+b)/2$<br><br>Distance between 2 defects should more than 10 mm apart. | | | Min |
|----|------|------|------|------|-----|

| Size(mm) \ Area | Acc. Qty | | |
|-----|------|------|------|
| | Zone A | Zone B | Zone C |
| φ≤0.3 | Ignore | | NC |
| 0.3<φ≤0.5 | 4 | | NC |
| 0.50<φ≤0.8 | 2 | | NC |
| φ>0.80 | 0 | | NC |
| Total | 6 | | NC |

| 02 | Black and White line<br>Scratch<br>Foreign material (Line type)<br>(Min) | W | Min |
|----|------|---|-----|

| Length (mm) | Width mm) | Acc. Qty | | |
|-----|------|------|------|------|
| | | Zone A | Zone B | Zone C |
| / | W ≦ 0.03 | Ignor | | NC |
| L ≦ 5 | 0.03 < W ≦ 0.05 | 4 | | NC |
| L ≦ 3 | 0.05 < W ≦ 0.1 | 2 | | NC |
| | W>0.10 | 0 | | NC |
| Total | | 6 | | NC |

Distance between 2 defects should more than 10mm apart.

| 03 | Polarizer concave and convex/bubbles | | | | | Min |
|----|------|------|------|------|------|-----|

| Diameter: Φ(mm) | Accept Qty | | |
|-----|------|------|------|
| | Zone A | Zone B | ZoneC |
| Φ<0.3mm | Ignore | Ignore | Ignore |
| 0.3mm<Φ≤0.5mm | 5 | | |

| | | 0.5mm<Φ≤0.8mm | 2 | | | |
|---|---|---|---|---|---|---|
| | | Φ>0.8mm | Unacceptable | | | |
| | | Distance between 2 defects should more than 10mm apart. | | | | |
| 04 | Bright/Dark dots, lines, Pixel defects | *A dot is defined as a single sub-pixel (either red, green, or blue) within a pixel.<br>Definition of Bright dots: Dots that can be seen through **6**% ND filter. | Allow | | | Min |
| | | Bright dots(Min) | 3 | | | |
| | | Adjacent bright dots | 1 | | | |
| | | Dark dots | 5 | | | |
| | | Adjacent dark dots | 2 | | | |
| | | Tiny bright dots | Judge by 6% ND filter, check with 30cm distance, if still can see, NG | | | |
| | | Mura(50% GERY) | Judge by 6% ND filter, check with 30cm distance, if still can see, NG | | | |
| | | Dark or Bright Lines | 0 | | | |
| | | Blank pixel/ Missing pixel | Not allow | | | |

Remark: One pixel consists of 3 sub-pixels, including R,G and B dot(Sub-pixel=Dot)

Note 1
Bright dot is defined through 6% transmission ND filter as following:



Defects on the black Matrix, out of viewing area, aren't considered as a defect counted.

| 05 | TFT Glass cracked | Symbols<br>X: Chip length  Y: Chip width<br>Z: Chip thickness  K: Seal width<br>T: Glass thickness  A: LCD side length/LCD<br>L: Electrode pad length<br>a)  General glass chip<br>  1.  Chip on panel surface and crack between panels | | | | Min |
|---|---|---|---|---|---|---|



| Z: Chip thickness | Y: Chip width | X: Chip length |
|---|---|---|
| Z ≤1/2T | Not expanded in viewing area | X≤1/8A |
| 1/2T< Z ≤ 2Tmm | Not exceed 1/3K | X≤ 3mm |

If there are 2 or more chips, X is the total length of each chip.
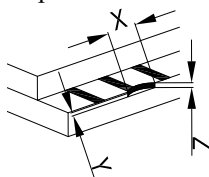
    2.    Corner crack:
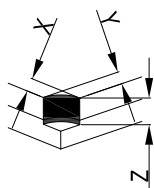
X, Y, Z Spec. same as a.1. If there are 2 or more chips, X is the total length of each chip.
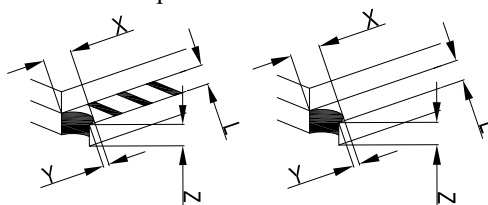
b)    Protrusion over terminal:

    1.    Chip on electrode pad

| Y: Chip width | X: Chip length | Z: Chip thickness |
|---|---|---|
| Y$\leq$ 1/4L | X$\leq$ 3mm | 0<Z$\leq$T |

    2.    Non-conductive portion

| Y: Chip width | X: Cip lngt | Z: Cip thickness |
|---|---|---|
| Y$\leq$1/3L | X$\leq$ 3mm | 0<Z$\leq$T |

If the chipped area reach the ITO terminal, over 2/3 of the ITO must be remained.
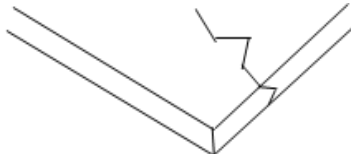
If the product will be heat sealed by the customer, the alignment mark must not be damaged.
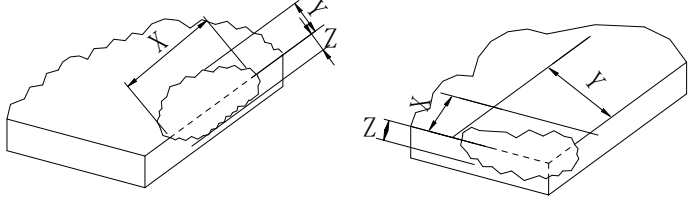
    3.    Substrate protuberance and internal crack
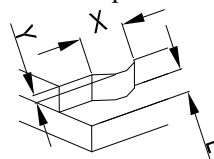
| Y: Width | X: Length |
|---|---|
| Y$\leq$1/4L | X$\leq$A |

c)    LCD with extensive crack line is unacceptable.

| 06 | Discolor/rainbow | Discolor between the LCDs or in the same LCD | Refer to the limit samples signed by customers or ODNA | Min |
|---|---|---|---|---|
| 07 | FPC/FFC /TAB/HSC | Connect surface oxidation | Not allow | Maj |
| | | Etching/damage /distortion | Not exceed 1/3 width of wire | Min |

| | | | | |
|---|---|---|---|---|
| | | Connect surface contamination /foreign material | Width & length of electric foreign material could not exceed the witdth of 2 pins | Min |
| | | Connect surface scratch | The scratch depth not exceed 1/2 thickness of gold layer. | Min |
| | | Copper/protective film/base board film separate | Not allow | Maj |
| | | Others: FPC follow IPC-6013A standard. | | |
| 08 | Soldering | Cold soldering，short soldering | Reject | Min |
| | | Not enough solder paste | Solder paste area < 75% solder pad area<br>Solder paste area < 75% component solder point<br>Solder paste height <1/2 component height | Min |
| | | FPC Pin deviation | Deviation area > 1/3 Solder pad | Min |
| | | Others: Follow IPC-A-610E standard | | |
| 09 | COG silicon coating | a) Not exceed the surface of top polarizer, LCD left/right edges. Cover fully ITO, IC and the juncture of HSC/FPC and LCD.<br>b) No visible non-metal foreign material and metal material in coating<br>c) Entrapped air bubble isn't permissible to exist on the juncture of coating glue and pins of LCD.<br>d) Bubbles or pinhole of silicon coating should Φ≤2mm<br>e) The silicon should cover all around the IC and not gap in between silicon and side of IC, lack of coating on top of IC can be accepted | | Min |
| 10 | CTP Cover Glass | Symbols<br>X: Chip length　　　　　　Y: Chip width<br>Z: Chip thickness<br>Chip on corner or edge | | Min |

| | | | | | |
|---|---|---|---|---|---|
| | |  | | | |
| | | Z: Chip thickness | Y: Chip width | X: Chip length | |
| | | Z ≤ 1/2T | < 0.5mm | < 1 mm | |
| | | 1/2T < Z ≤ T | < 0.3mm | < 1 mm | |
| | | Total allow 3 chips,. | | | |

| 11 | Glass warping | Product diagonal length (mm) | Warpage range (mm) | Maj |
|---|---|---|---|---|
| | | L≤10 | 0.05 | |
| | | 10<L≤30 | 0.1 | |
| | | 30<L≤100 | 0.2 | |
| | | 100<L≤300 | 0.4 | |
| | | 300<L≤1000 | 0.6 | |
| | | 1000<L≤3000 | 0.8 | |

| 12 | Color of silk Screen | Refer to limit sample or measurement data base on SPEC | | Min |
|---|---|---|---|---|

| 13 | Backlight | 1.Spots or scratches that appear when light must be judged using LCD glass spot, line and contamination standards.<br>2.Brightness and Chromaticity can't be out of specification. | | Min |
|---|---|---|---|---|

| 14 | Bezel | a)      No rust, distortion on the Bezel.<br>b)      No visible fingerprints, stains or other contamination. | | | Min |
|---|---|---|---|---|---|
| | | Dent | 1 mm＞Ø＞0.5 mm，2 | Accept | Min |
| | | | Ø≤0.5 mm | ignore | Min |
| | | Exposed base metal material on front surface | Ø≤0.5 mm ,2pcs | Accept | Min |
| | | Exposed base meta material on side | Dot : Ø≤1.0mm，Line: L≤2.0mm、W≤0.5mm | Accept | Min |
| | | Scratched | Exposed base metal material | Reject | Min |

## 13.5 RoHS Compliance

The product is compliant to RoHS.

14. Package Specification

TBD

## 15. Precaution for Using LCD Module

### 15.1 Handing Precaution

15.1.1 The display panel is made of glass and polarizer. As glass is fragile. It tends to become or chipped during handing especially on the edges. Please avoid dropping or jarring. Do not subject it to a mechanical shock by dropping it or impact.

15.1.2 If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.

15.1.3 Do not apply excessive force to the display surface or the adjoining areas since this many cause the color tone to vary. Do not touch the display with bare hands, This will stain the display area and degraded insulation between terminals(some cosmetics are determined to the polarizer)

15.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully. Do not touch, push or rub the exposed polarizer with anything harder than an HB pencil lead (glass, tweezers, etc.).Do not put or attach anything on the display area to avoid leaving marks on it. Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizer. After products are tested at low temperature they must be warmed up in a container before coming in to contact with room temperature air.

15.1.5 If the display surface becomes contaminated, breathe on the surface and gently wipe it whit a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents,-Isotropy alcohol or Ethyl alcohol; do not scrub hard to avoid damaging the display surface.

15.1.6 Solvents other than those above-mentioned madly damage the polarizer. Especially, do not use the following: water, Ketone, Aromatic solvents. Wipe off saliva or water drops immediately, contact with water over a ling period of time may cause deformation or color fading. Avoid contact with oil and fats.

15.1.7 Exerciser care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or current flow in a high-humidity environment.

15.1.8 Install the LCD module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.

15.1.9 Do not attempt to disassemble or process the LCD module.

15.1.10 NC terminal should be open. Do not connect anything.

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

15.1.12 Electro-Static Discharge control, since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

15.1.13 Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.

### 15.2  Storage Precaution

15.2.1 Store them in a sealed polyethylene bag. If properly sealed, there is no need for the desiccant.

15.2.2 Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0℃ and 35℃, and keep the relative humidity between 40% RH and 60% RH.

15.2.3 The polarizer surface should not come in contact with any other objects (we advise you to store them in anti-static electricity container in which they were shipped).

15.2.4 During shipment, please handle with care. The packaging bag can not be broken, step on trap. Packaging Carton layer height can not be over two meters.

15.2.5 The transportation process should pay attention to the waterproof and moisture-proof measures. Product can not be watering. Ethylene sealed bags can not be unsealed.

15.2.6 Liquid crystals solidify under low temperature (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subject to a low temperature.

15.2.7 If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.

15.2.8 To minimize the performance degradation of the LCD modules resulting from destruction caused by static electricity etc.,

## 15.3 Using LCD Modules

15.3.1 The hole in the printed circuit board is used to fix LCM. Attend to the following items when installing the LCM. Cover the surface with a transparent protective plate to protect the polarizer and LC cell.

15.3.2 When assembling the LCM into other equipment, the spacer to the bit between the LCM and the fitting plate should have enough height to avoid causing stress to the module surface, refer to the individual specifications for measurements. The measurement tolerance should be +/-0.1mm.

15.3.3 Precaution for assemble the module with BTB connector; Please note the position of the male and female connector position.

15.3.4 Precaution for soldering the LCM, Manual soldering temperature 300+/-20℃，time is 3~5S.

15.3.5 If soldering flux is used, be sure to remove any remaining flux after finishing to soldering operation (This does not apply in the case of a non-halogen type of flux). It is recommended that you protect the LCD surface with a cover during soldering to prevent any damage due to flux spatters.

15.3.6 When soldering the electroluminescent panel and PC board, the panel and board should not be detached more than three times. This maximum number is determined by the temperature and time conditions mentioned above, though there may be some variance depending on the temperature of the soldering iron.

15.3.7 When remove the electroluminescent panel from the PC board, be sure the solder has completely melted, the soldered pad on the PC board could be damaged.

## 15.4 Precautions for Operation

15.4.1 Viewing angle varies with the change of liquid crystal driving voltage (VLCD). Adjust VLCD to show the best contrast.

15.4.2 It is an indispensable condition to drive LCD within the specified voltage limit since the higher voltage then the limit cause the shorter LCD life. An electrochemical reaction due to direct current causes LCD undesirable deterioration, so that the use of direct current drive should be avoid.

15.4.3 Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD show dark color in them. However those phenomena do not mean malfunction or out of order with LCD which will come back in the specified operating temperature.

15.4.4 If the display area is pushed hard during operation, the display will become abnormal. However, it will return to normal if it is turned off and back on.

15.4.5 Slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit. Usage under the maximum operating temperature, 50%RH or less is required.

15.4.6 Input logic voltage before apply analog high voltage such as LCD driving voltage when power on. Remove analog high voltage before logic voltage when power off the module. Input each signal after the positive & negative voltage becomes stable.

15.4.7 Please keep the temperature within the specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off many occur with high temperature and high humidity.

## 15.5 Safety

15.5.1 It is recommended to crush damaged or unnecessary LCD into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned.

15.5.2 If any liquid leaks out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water.

## 15.6 Limited Warranty

15.6.1 Unless otherwise agreed between **ODNA** display and customer, **ODNA** display will replace or repair any of its LCD and LCM which **ODNA** display found to be defective electrically and visually when inspected in accordance with **ODNA** display quality standards, for a period of one year from date of shipment.

15.6.2 The warranty liability of **ODNA** display is limited to repair and/or replacement. **ODNA** display will not be responsible for any consequential loss.

15.6.3 If possible, we suggest you use up all modules in six months. If the module storage time over twelve months, we suggest that recheck it before the module be used.