# LTPS LCD Specification

## Model Name: TD043MTEA2

| Customer Signature |
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| |
| Date |
| |

This technical specification is subjected to change without notice

## Table of Contents

## Record of Revision

| Rev | Issued Date | Description |
|---|---|---|
| 0.00 | Feb. 5, 2007 | New create. |
| 0.1 | Mar. 16, 2007 | Update mechanic drawing |
| 0.2 | Mar. 20, 2007 | Update response time spec |
| 0.3 | May. 22, 2007 | Update measuring condition of brightness<br>Update mechanic drawing of bezel opening |
| 0.4 | May. 23, 2007 | Update absolute maximum rating<br>Update input/output terminals<br>Update electrical characteristics<br>Update timing chart |
| 0.5 | May. 28, 2007 | Update min SPEC of CR |
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## 1. FEATURES

The 4.3” LCD module is the active matrix color TFT LCD module. LTPS (Low Temperature Poly Silicon) TFT technology is applied with vertical and horizontal drivers built on the panel.

Both of horizontal and vertical scan are reversible and controlled by the parallel interface commands.

The product is designed for the requirement of the green product, and the specification complies with TPO’s “Green Product Chemical Substance Specification Standard Hand Book”.

## 2. GENERAL SPECIFICATIONS

| Item | Description | Unit |
|---|---|---|
| Display Size (Diagonal) | 4.3 | Inch |
| Aspect ratio | 15:9 | - |
| Display Type | Transmissive | - |
| Active Area (HxV) | 93.6 x 56.16 | mm |
| Number of Dots (HxV) | 800 x RGB x480 | Dot |
| Dot Pitch (HxV) | 0.039 x 0.117 | mm |
| Color Arrangement | Stripe | - |
| Color Numbers | 16Million | - |
| Outline Dimension (HxVxT) * | 100.6x68.45x4.1 | mm |
| Weight | TBD | G |

*Exclude FPC and protrusions.

## 3. INPUT/OUTPUT TERMINALS

### 3.1TFT LCD Panel

**Recommend connector: FH28-60S-0.5SH (51)**

| Pin | Symbol | I/O | Description | Remark |
|---|---|---|---|---|
| 1 | T1 | D | Only for Toppoly test pin | |
| 2 | CGH | C | Capacitor for VGH(+8.5 V)(1 uF) | |
| 3 | CPL1 | C | Capacitor for charge pump clock ( 0.2 uF) | |
| 4 | CPL2 | C | Capacitor for charge pump clock ( 0.2 uF) | |
| 5 | VCOM | C | Capacitor for VCOM (2.2 uF) | |
| 6 | VD | I | Vertical sync input | |
| 7 | HD | I | Horizontal sync input | |
| 8 | DEN | I | Data Enable | |
| 9 | NCLK | I | Clock signal, latch data onto line latches | |
| 10 | B0 | I | Blue data (LSB) | |
| 11 | B1 | I | Blue data | |
| 12 | B2 | I | Blue data | |
| 13 | B3 | I | Blue data | |
| 14 | B4 | I | Blue data | |
| 15 | B5 | I | Blue data | |
| 16 | B6 | I | Blue data | |
| 17 | B7 | I | Blue data (MSB) | |
| 18 | GND | P | Ground | |
| 19 | G0 | I | Green data (LSB) | |
| 20 | G1 | I | Green data | |
| 21 | G2 | I | Green data | |
| 22 | G3 | I | Green data | |
| 23 | G4 | I | Green data | |
| 24 | G5 | I | Green data | |
| 25 | G6 | I | Green data | |
| 26 | G7 | I | Green data (MSB) | |
| 27 | VCC | P | Power supply (3.3 V) for digital circuit | |
| 28 | R0 | I | Red data (LSB) | |
| 29 | R1 | I | Red data | |
| 30 | R2 | I | Red data | |
| 31 | R3 | I | Red data | |
| 32 | R4 | I | Red data | |
| 33 | R5 | I | Red data | |

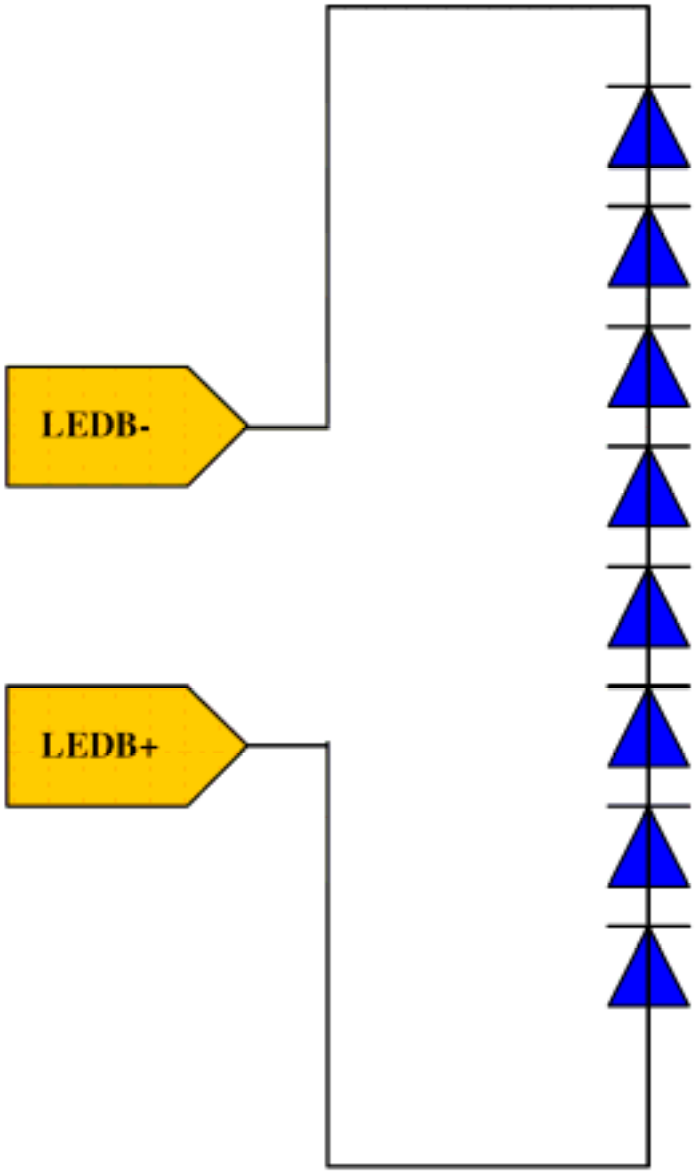
| | | | | |
|---|---|---|---|---|
| 34 | R6 | I | Red data | |
| 35 | R7 | I | Red data (MSB) | |
| 36 | VDDP | P | +5 V power supply for analog circuit | |
| 37 | VSS | P | Ground | |
| 38 | VDDN | P | -5 V power supply for analog circuit | |
| 39 | HVDE | I | Mode selection pin. HVDE="H" for SYNC(use HD +VD) mode, HVDE="L" for DE(use DEN) mode. | |
| 40 | GREST | I | Global reset pin | |
| 41 | STBY | I | Standby mode setting pin | |
| 42 | SCEN | I | Serial interface chip enable line | |
| 43 | SCL | I | Serial interface clock line | |
| 44 | SDA | I/O | Serial interface data line | |
| 45 | VCC | P | Power supply (3.3 V) for digital circuit | |
| 46 | FB | I | Main boost regulator feedback input( default:disable) | |
| 47 | GND | P | Ground | |
| 48 | VMP | C | Capacitor for +1.8 V power supply(2.2 uF) | |
| 49 | VMN | C | Capacitor for –1.8 V power supply(2.2 uF) | |
| 50 | C11 | C | Capacitor for charge pump (DC/DC) circuit (1 uF) | |
| 51 | C12 | C | Capacitor for charge pump (DC/DC) circuit (1 uF) | |
| 52 | CGL | C | Capacitor for VGL(-6.5V) (0.1 uF) | |
| 53 | Y_UP | I | For Touch panel Y_UP | Note 2 |
| 54 | X_LEFT | I | For Touch panel X_LEFT | |
| 55 | Y_BOTTOM | I | For Touch panel Y_BOTTOM | |
| 56 | X_RIGHT | I | For Touch panel X_RIGHT | |
| 57 | LED A+ | P | LEDA power: anode (no use) | Note 1 |
| 58 | LED B+ | P | LEDB power: anode | |
| 59 | LED B- | P | LEDB power: cathode | |
| 60 | LED A- | P | LEDA power: cathode (no use) | |

**I : Input O: Output P: Power C: Capacitor D: Dummy I/O : Input/Output**

**Note 1: The figure below shows the connection of backlight LED**

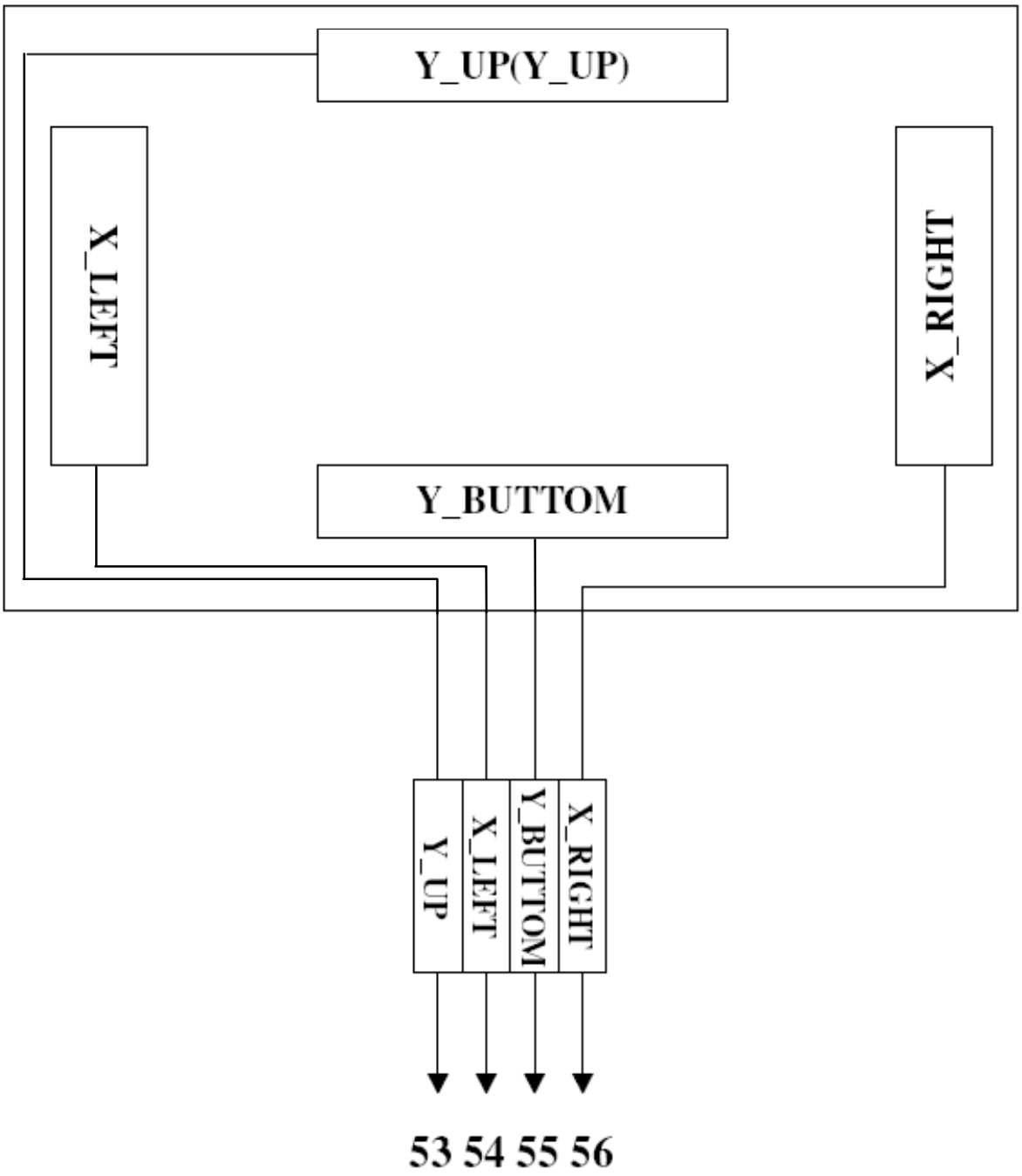
**Note 2: The figure below shows the connection of Touch panel.**

**Note 1: LEDA+ , LEDA- no use**



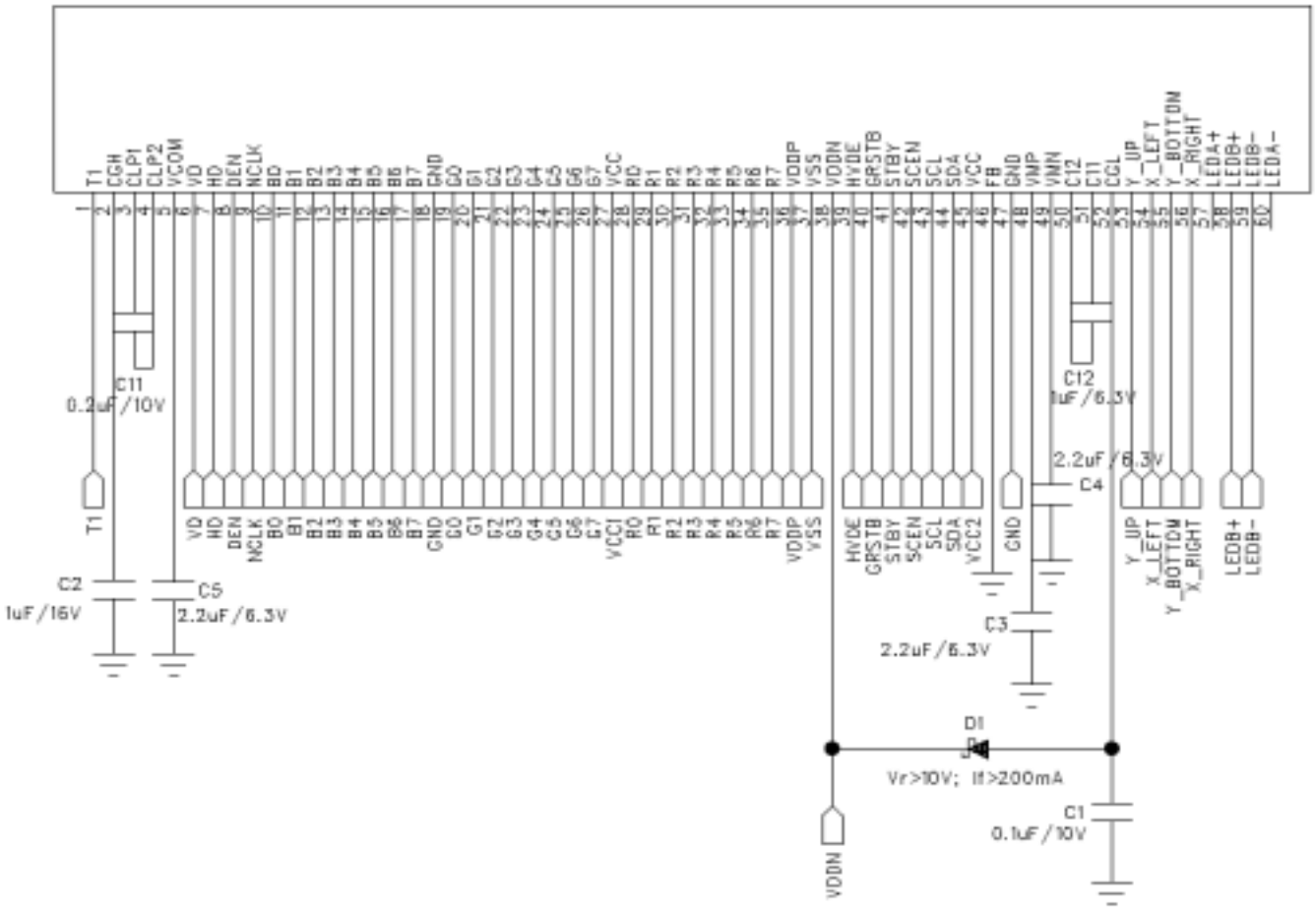
**Note 2: Touch Panel**

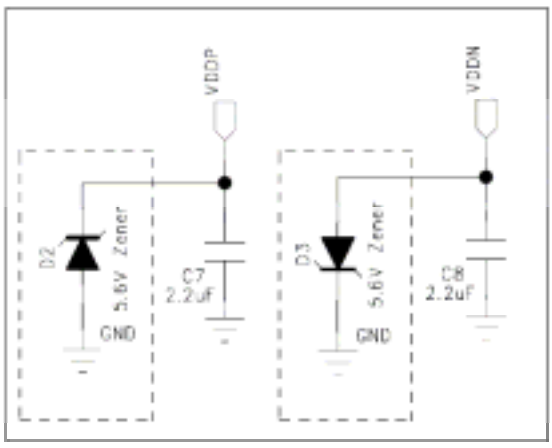
# TOP VIEW

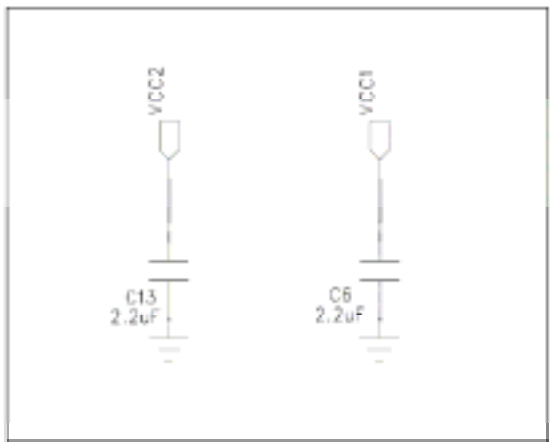


**Application circuit :**

**For LCD module**



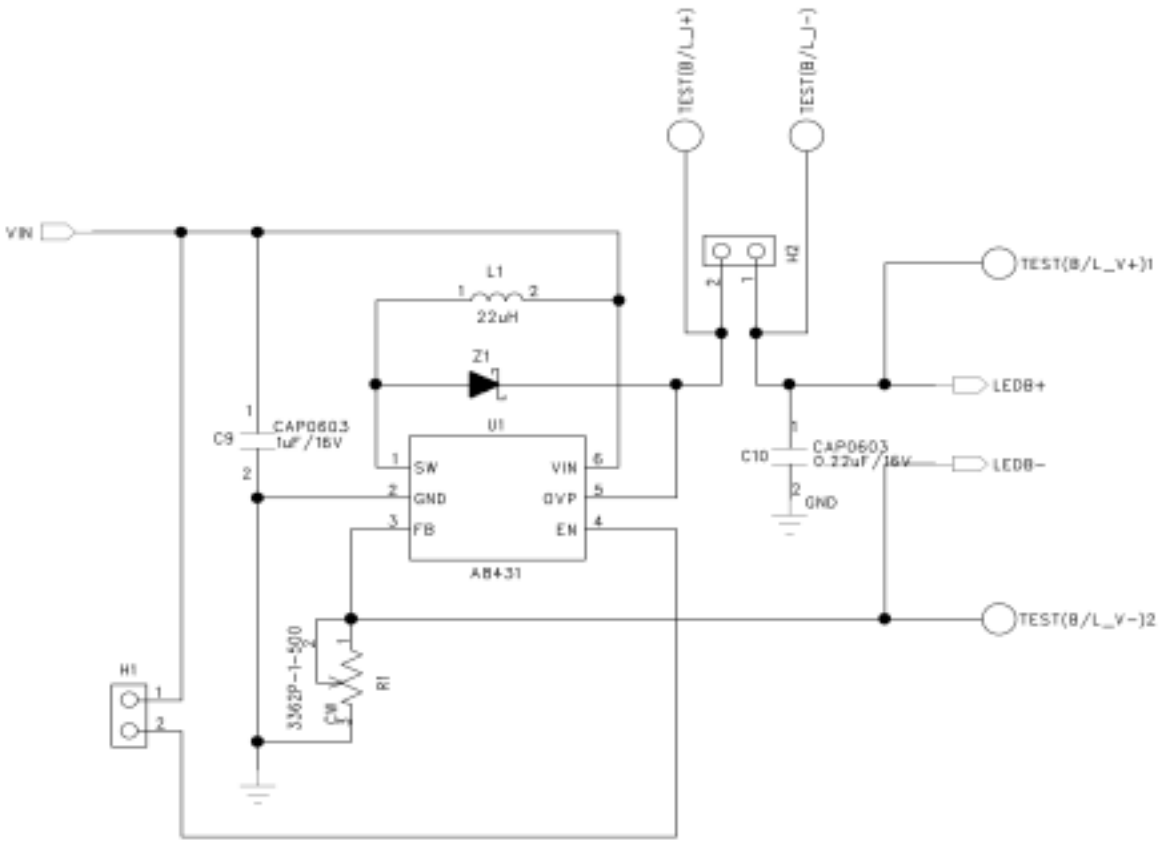




Recommendable Zener-Diode : PANJIT - BZT52 B5V6S

The Zener diode is used for protecting the voltage damping, spike or unclear power (have large noise etc.) to break down the driver IC on LCD module. If the LCD user can guarantee the voltage range of VDDP and VDDN will always lie in spec definition (please refer the 5. ELECTRICAL CHARACTERISTICS). The Zener-Diode is not necessary.

**For LED backlight driver**



## 4. ABSOLUTE MAXIMUM RATINGS

Ta = 25°C

| Item | Symbol | MIN | MAX | Unit | Remark |
|---|---|---|---|---|---|
| Digital Power Supply Voltage | VCC | -0.5 | 5.0 | V | |
| Analog Power Supply Voltage (positive) | VDDP | -0.5 | 5.5 | V | |
| Analog Power Supply Voltage (negative) | VDDN | -5.5 | 0.5 | V | |
| Logic input voltage | $V_{IN1}$ | -0.3 | VCC+0.3 | V | VD, HD, DEN, NCLK, R[7:0], G[7:0], B[7:0], SDA, SCL, SCEN, STBY, GRSTB, HVDE |
| Back Light Forward Current | $I_F$ | 18 | 23 | mA | |
| Operating Temperature | $T_{OPR}$ | -20 | +70 | °C | |
| Storage Temperature | $T_{STG}$ | -40 | +85 | °C | |

Please ensure that the power supply voltage (Digital & Analog) does not exceed the absolute maximum rating **in any condition** when the LCD module is operating. Or the driver IC on the LCD module can be broken.

## 5. ELECTRICAL CHARACTERISTICS

### 5.1. Driving TFT LCD Panel

GND=0V, Ta=25°C

| Item | | Symbol | MIN | TYP | MAX | Unit | Remark |
|---|---|---|---|---|---|---|---|
| Power Supply Voltage | | VCC | 2.7 | 3.3 | 3.6 | V | |
| | | VDDP | 4.5 | 5.0 | 5.5 | V | |
| | | VDDN | -5.5 | -5 | -4.5 | V | |
| Input Signal Voltage | Low Level | $V_{IL}$ | GND | - | 0.2x VCC* | V | VD, HD, DEN, NCLK, R[7:0], G[7:0], B[7:0], SDA, SCL, SCEN, STBY, GRSTB, HVDE |
| | High Level | $V_{IH}$ | 0.8x VCC* | - | VCC* | V | |
| Panel Power Consumption | | $W_P$ | - | 120 | 150 | mW | Base on 800RGBx480 |

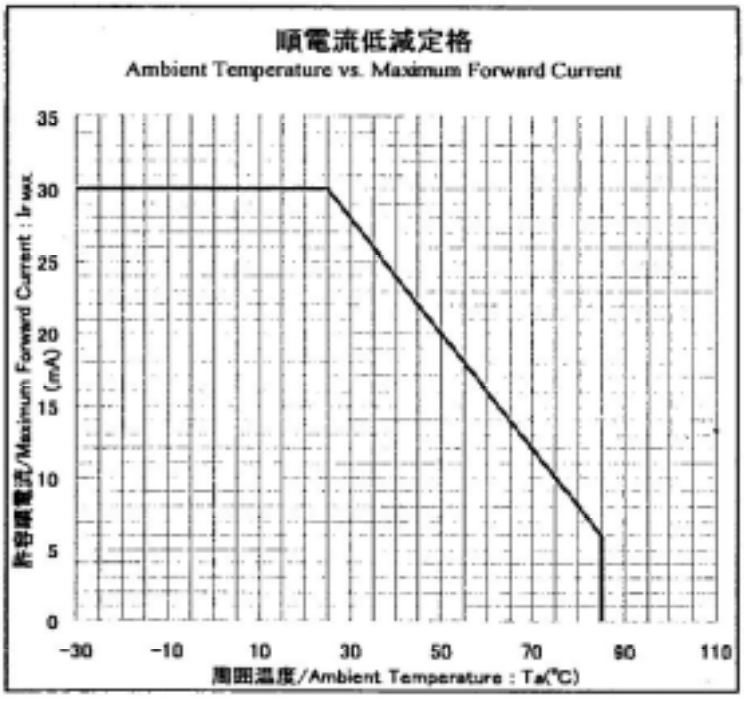
VCC* =VCC (TYP)

### 5.2. Driving Backlight

Ta=25°C

| Item | Symbol | MIN | TYP | MAX | Unit | Remark |
|---|---|---|---|---|---|---|
| Forward Current | $I_f$ | 18 | 20 | 23 | mA | |
| Forward Current Voltage | $V_f$ | - | 26.4 | 29.6 | V | |
| Backlight Power Consumption | $W_{BL}$ | - | 528 | 680.8 | mW | |

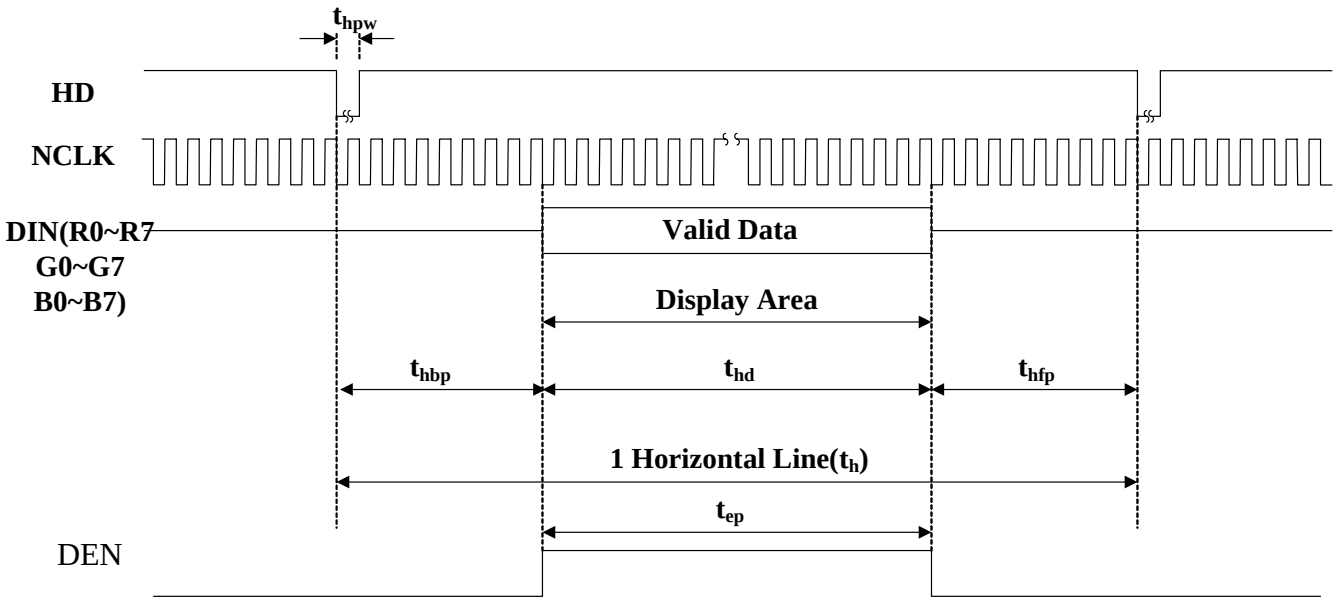
Backlight driving circuit is recommend as the fix current circuit.



## 6. TIMING CHART

**<Input timing >**

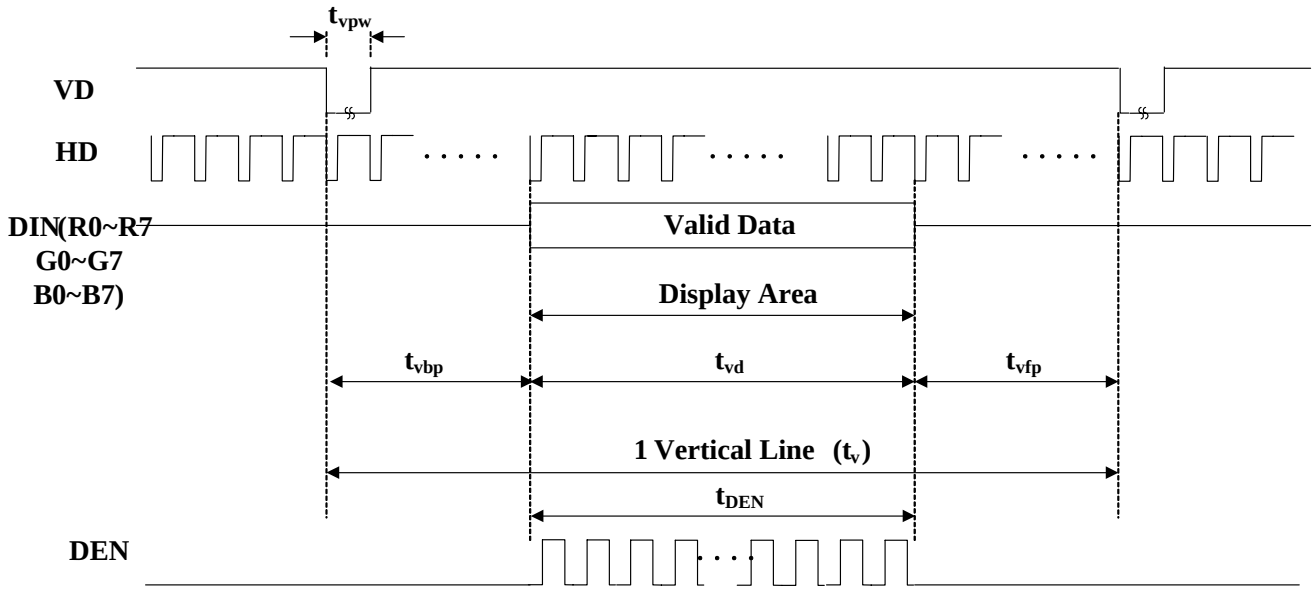
**--Horizontal--**




### Horizontal Input Data

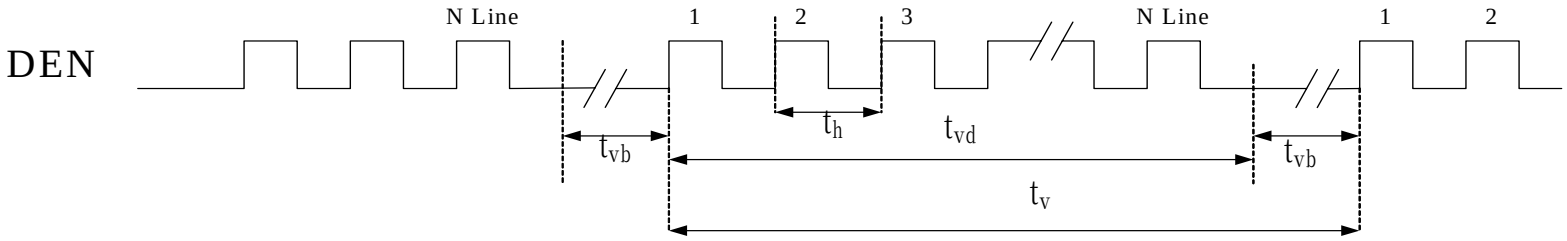
| Parameter | | Symbol | 800RGBx480 | 480RGBx272 | 400RGBx240 | Unit |
|---|---|---|---|---|---|---|
| NCLK Frequency | | $F_{NCLK}$ | 33.2 | 9 | 8.3 | MHz |
| Horizontal valid data | | $t_{hd}$ | 800 | 480 | 400 | NCLK |
| 1 Horizontal Line | | $t_h$ | 1056 | 525 | 528 | NCLK |
| HSYNC Pulse Width | Min. | $t_{hpw}$ | 1 | 1 | 1 | NCLK |
| | Typ. | | | | | |
| | Max. | | | | | |
| Hsync blanking | | $t_{hbp}$ | 216 | 43 | 108 | NCLK |
| Hsync front porch | | $t_{hfp}$ | 40 | 2 | 20 | NCLK |
| DEN Enable Time | | $t_{ep}$ | 800 | 480 | 400 | NCLK |

**--Vertical--**




| Parameter | | Symbol | 800RGBx480 | 480RGBx272 | 400RGBx240 | Unit |
|---|---|---|---|---|---|---|
| Vertical valid data | | $t_{vd}$ | 480 | 272 | 240 | H |
| Vertical period | | $t_v$ | 525 | 286 | 262 | H |
| VSYNC Pulse Width | Min. | $t_{vpw}$ | 1 | 1 | 1 | H |
| | Typ. | | | | | |
| | Max. | | | | | |
| Vertical back porch | | $t_{vbp}$ | 35 | 12 | 20 | H |
| Vertical front porch | | $t_{vfp}$ | 10 | 2 | 2 | H |
| Vertical blanking of DEN mode | | $t_{vb}$ | 45 | 14 | 22 | H |
| Total DEN in VD | | $t_{DEN}$ | 480 | 272 | 240 | H |

**DEN mode (The DEN signal can instead of HD and VD signals for ASIC to identify the input data)**



## 7. OPTICAL CHARACTERISTICS

### 7.1 Optical Specification

Ta=25°C

| Item | | Symbol | Condition | MIN | TYP | MAX | Unit | Remarks |
|---|---|---|---|---|---|---|---|---|
| Viewing Angles | | Θ11＋Θ12 | CR ≥ 10 | 150 | 170 | - | Degree | Note 7-1 |
| | | Θ21＋Θ22 | | 150 | 170 | - | | |
| Contrast Ratio | | CR | Θ=0° | 280 | 400 | - | | Note 7-2 |
| Response Time | Rising | Tr | | - | 30 | 40 | ms | Note 7-3 |
| | Falling | Tf | | - | 10 | 15 | | |
| Luminance ($I_F$=23mA) | | L | | 230 | 280 | - | cd/m$^2$ | Note 7-4 |
| Chromaticity | White | $x_W$ | | 0.26 | 0.31 | 0.36 | | Note 7-5 |
| | | $y_W$ | | 0.28 | 0.33 | 0.38 | | |

### 7.2 Basic Measure Conditions

(1) Driving voltage

Vcc= 3 V

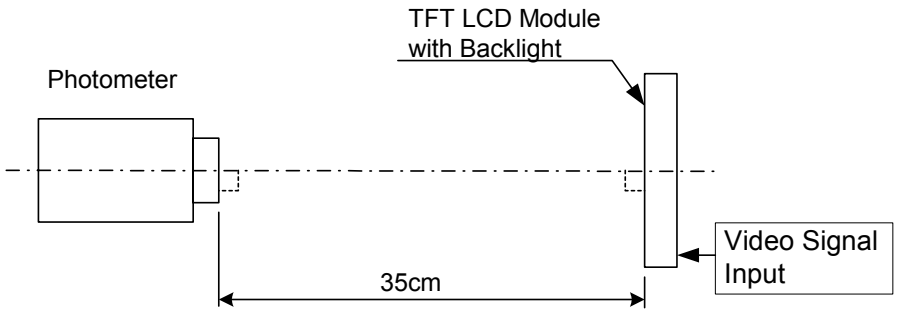
(2) Ambient Temperature: Ta=25°C

(3) Testing Point: Measure in the display center point and the test angle Θ=0°

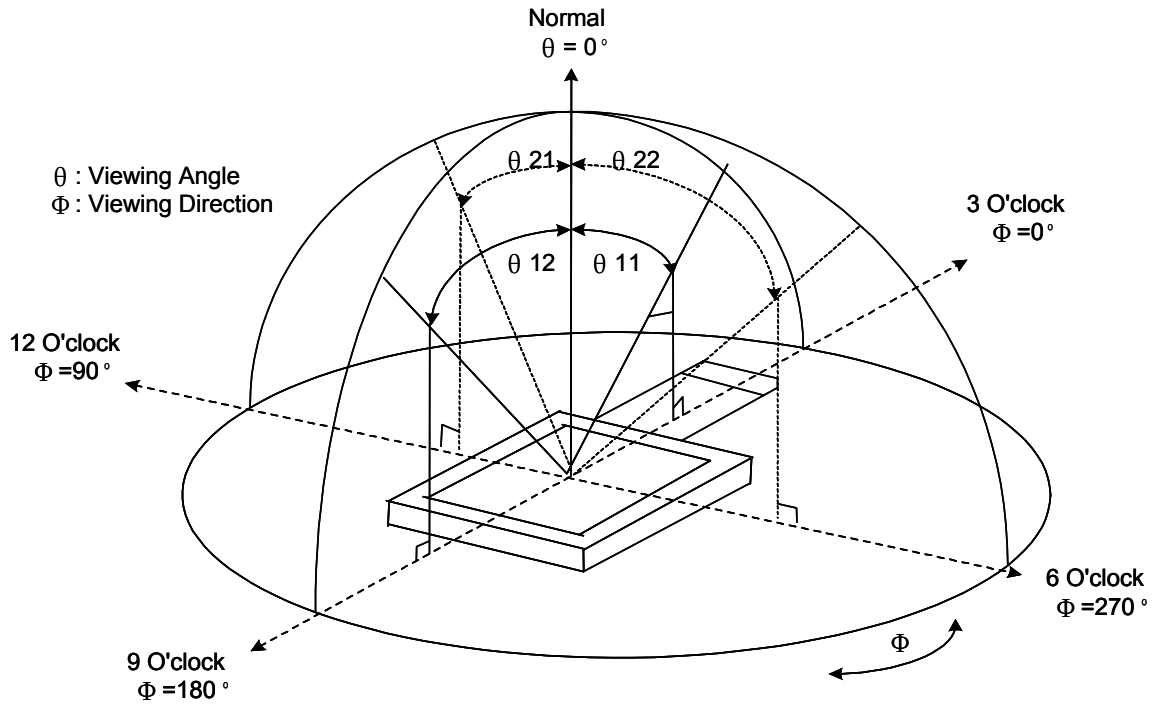
(4) LED Current: $I_F$=23mA.

(5) Testing Facility

Environmental illumination: ≤ 1 Lux



Note 7-1: Viewing angle diagrams:

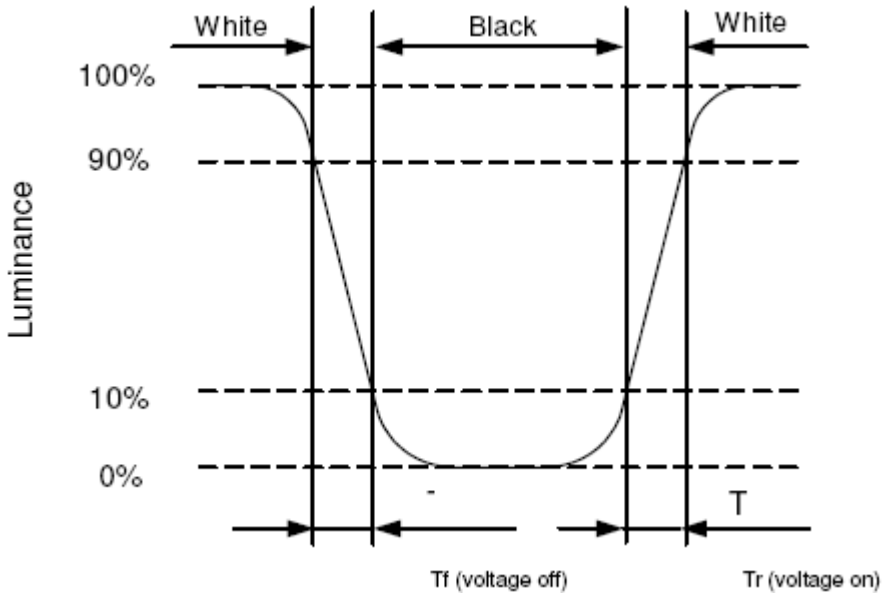



Note 7-2: Contrast Ratio:

Contrast ratio is measured in optimum common electrode voltage.

$$CR = \frac{\text{Luminance with white image}}{\text{Luminance with black image}}$$

Note 7-3: Definition of response time:




Note 7-4: Luminance:

Test Point: Display Center

Note 7-5: Chromaticity: The same test condition as Note 7-4.

## 8 RELIABILITY

| No | Test Item | Condition |
|---|---|---|
| 1 | High Temperature Operation | Ta=+70°C, 240hrs |
| 2 | High Temperature & High Humidity Operation | Ta=+40°C,95%RH, 240hrs |
| 3 | Low Temperature Operation | Ta=-20°C, 240hrs |
| 4 | High Temperature Storage (non-operation) | Ta=+85°C, 240hrs |
| 5 | Low Temperature Storage (non-operation) | Ta=-40°C, 240hrs |
| 6 | Thermal Shock (non-operation) | -30°C<-- --> +70°C, 50 cycles,<br>(30 min) (30 min) |
| 7 | Terminal Discharge (non-operation) | C=150pF, R=330 ohm;<br>Discharge:Air:+/-15kV; Contact:+/-8kV<br>5 times/Point; 5 points/ Panel |
| 8 | Vibration (non-operation) | Frequency:10~55Hz; Amplitude:1.5mm<br>Sweet Time: 11min<br>Test Time: 2hrs for each direction of X,Y,Z |
| 9 | Shock (non-operation) | Acceleration: 100G; Period:6ms<br>Directions:+/-X; +/-Y; +/-Z; Cycles: Once |
| 10 | Pin Activation Test(Touch Panel) | Hit 1000000 times with a silicon rubber of R8 HS60<br>Hitting Force:250g<br>Hitting Speed:3 time/sec. |
| 11 | Writing Friction Resistance Test (Touch Panel) | Pen:0.8R Polyacetal stylus<br>Load:250g<br>Speed: 3 strokes/sec<br>Stroke: 35mm<br>100000 times. |

Ta: Ambient Temperature,

# 9 HANDLING CAUTIONS

## 9.1 ESD (Electrical Static Discharge) Strategy

ESD will cause serious damage of the panel, ESD strategy is very important in handling. Following items are the recommend ESD strategy

(1) In handling LCD panel, please wear non-charged material gloves. And the conduction ring connect wrist to the earth and the conducting shoes to the earth is necessary.

(2) The machine and working table for the panel should have ESD prohibition strategy.

(3) In handling the panel, ionize flowing decrease the charge in the environment is necessary.

(4) In the process of assembly the module, shield case should connect to the ground.

## 9.2 Environment

(1) Working environment of the panel should in the clean room.

(2) The front polarizer is easy damaged, handle it carefully and do not scratch it by sharp material.

(3) Panel has polarizer protective film in the surface please remove the protection film of polarizer slowly with ionized air to prevent the electrostatic discharge.

## 9.3 Others

(1) Turn off the power supply before connecting and disconnecting signal input cable.

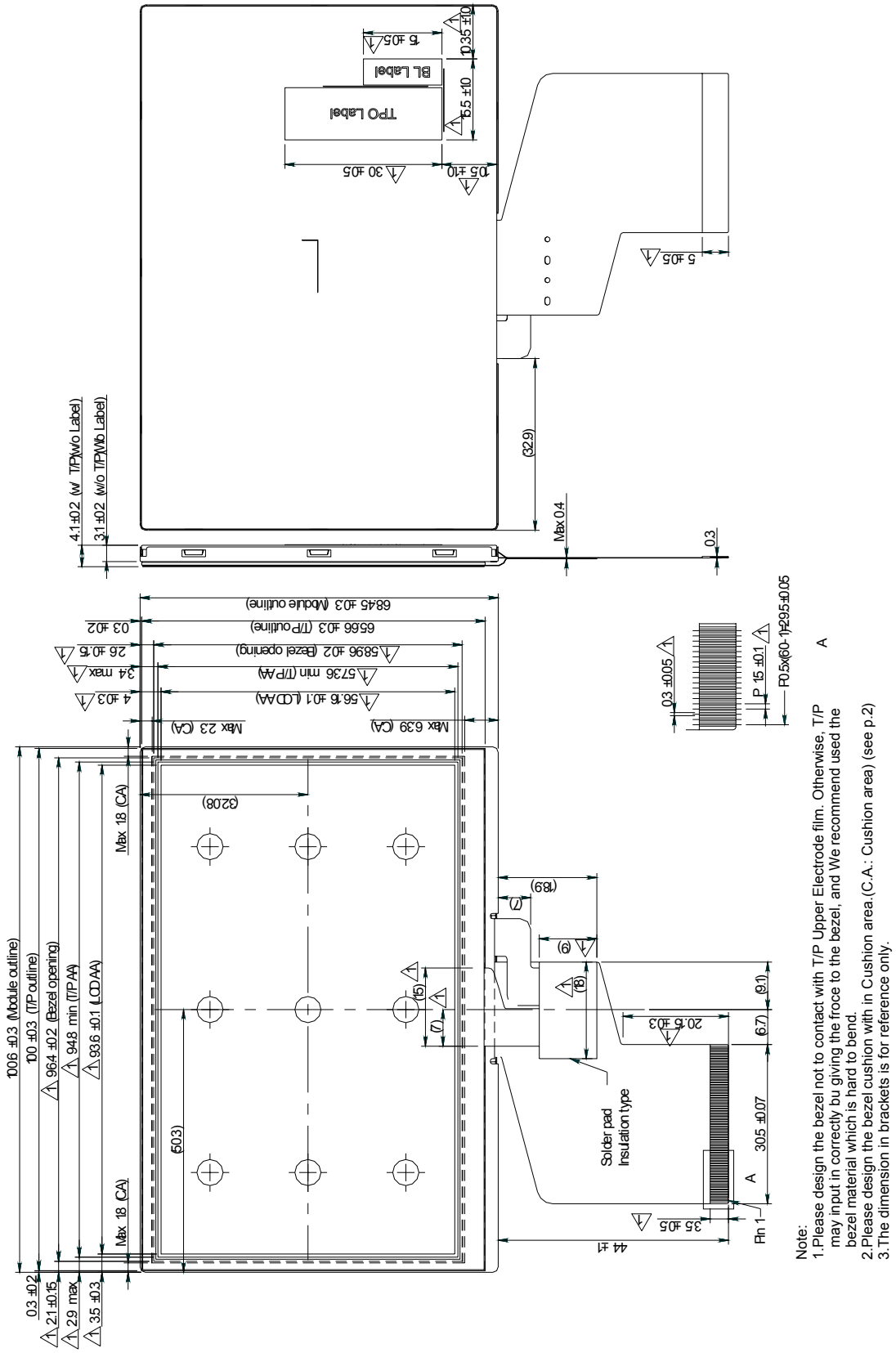
(2) The connection area of FPC and panel is very weak, do not handle panel only by FPC or bend FPC.

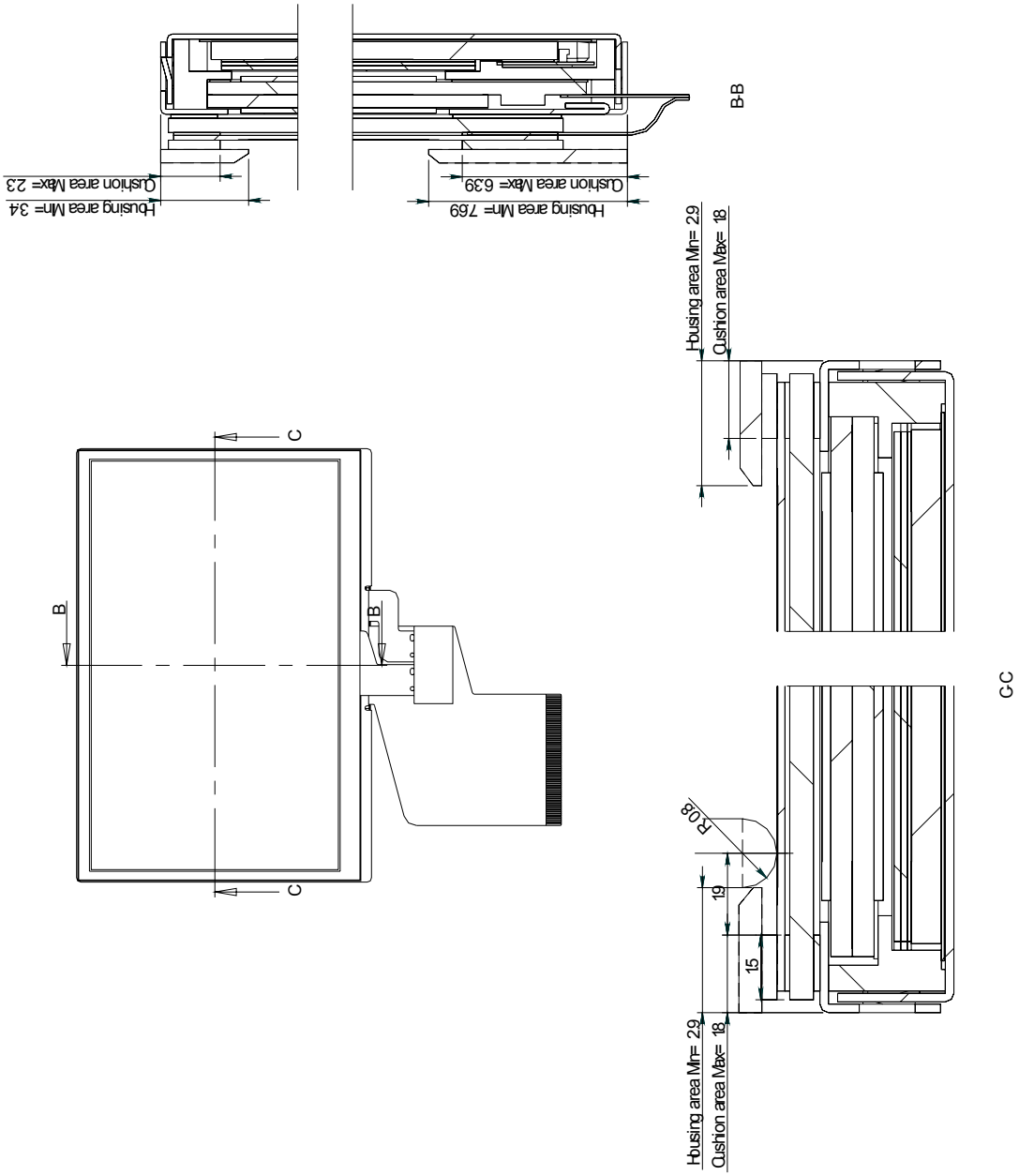
(3) Water drop on the surface or condensation as panel power on will corrode panel electrode.

(4) As the packing bag open, watch out the environment of the panel storage. High temperature and high humidity environment is prohibited.

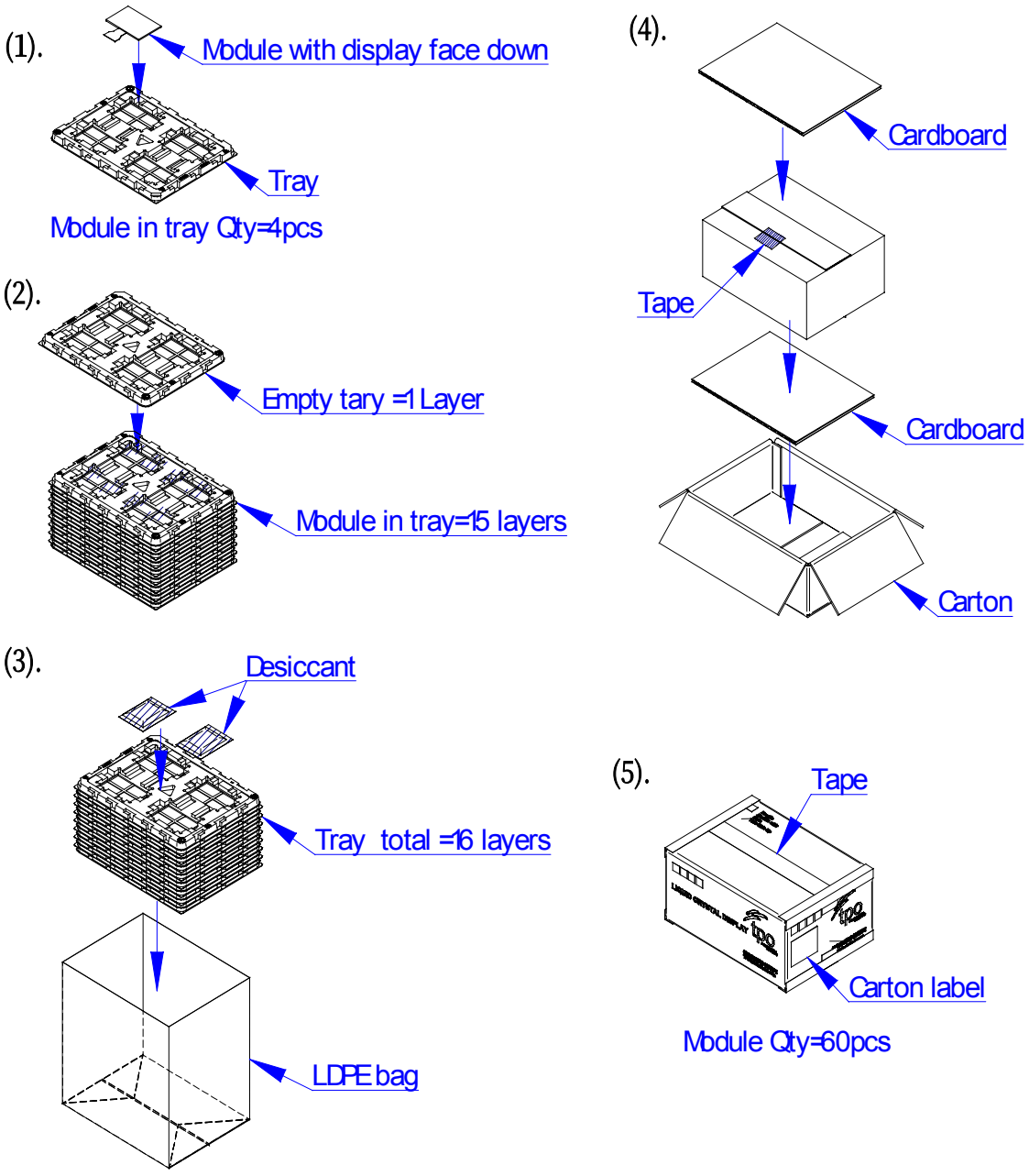
(5) When the TFT LCD module is broken, please watch out whether liquid crystal leaks out or not. If your hand touches liquid crystal, wash your hand cleanly by water and soap as soon as possible.

## 10 MECHANICAL DRAWING





## 11 Packing Drawing




4.3" module (TD043MTEA2) delivery packing method

(1). Module packed into tray cavity (with Module display face down).

(2). Tray stacking with 15 layers and with 1 empty tray above the stacking tray unit.
2pcs desiccant put above the empty tray

(3). Stacking tray unit put into the LDPE bag and fix by adhesive tape.

(4). Put 1pc cardboard inside the carton bottom, and then pack the package unit into the carton.
Put 1pc cardboard above the package unit.

(5). Carton tapping with adhesive tape.