# LCD MODULE
# SPECIFICATION

**Customer:** _____

**Model Name:**     HP-320004-V1

**Date:**     2018-06-10

**Version:**     1.0

| Approved by | Reviewed by | Prepared by |
|---|---|---|
|  |  |  |

**For Customer's Acceptance**

| Approved by | Comment |
|---|---|
|  |  |

# Contents

# 1. General Specifications

| No. | Item | Specification | Unit | Remark |
|-----|------|---------------|------|--------|
| 1 | LCD Size | 3.2" | inch | - |
| 2 | Panel Type | a-si TFT | - | - |
| 3 | Resolution | 240x(RGB)x320 | pixel | - |
| 4 | Display Mode | Normally white,Transmissive | - | - |
| 5 | Display Number of Colors | 262K | - | - |
| 6 | Viewing Direction | 12 o'clock | - | Note 1 |
| 7 | Contrast Ratio | 300 | - | - |
| 8 | Luminance | 250 | cd/m$^2$ | |
| 9 | Module Size | 54.34(W)x77.70(L)x2.3 (T) | mm | Note 1 |
| 12 | Weight | TBD | g | - |
| 13 | Driver IC | ILI9341V | - | - |
| 14 | Driver IC RAM Size | 240x16x320 | bit | - |
| 15 | Light Source | 6 LEDs in Parallel | - | - |
| 16 | Interface | MCU Interface 8/16bit | - | - |
| 17 | Operating Temperature | -20~70 | | - |
| 18 | Storage Temperature | -30~80 | | - |

Note 1: Please refer to the mechanical drawing.

## 2. Pin Assignments

| Pin No. | Symbol | I/O | Function | Remark |
|---|---|---|---|---|
| 1 | NC | / | NC | - |
| 2 | GND | P | Power Ground | - |
| 3 | NC | / | NC | - |
| 4 | LEDA | P | LED+ | - |
| 5 | LEDK1 | P | LED- | - |
| ~ | ~ | P | LED- | - |
| 10 | LEDK6 | P | LED- | - |
| 11 | NC | / | NC | - |
| 12 | NC | / | NC | - |
| 13 | NC | / | NC | - |
| 14 | GND | P | Power Ground | - |
| 15 | RESET | I | Resetsi gnal , act ive  l ow | - |
| 16 | NC | / | NC | - |
| 17 | D15 | I/O | DATA BUS H8 bit | - |
| ~ | ~ | I/O | DATA BUS H8 bit | - |
| 24 | D8 | I/O | DATA BUS H8 bit | - |
| 25 | NC | / | NC | - |
| 26 | D7 | I/O | DATA BUS L8 bit | - |
| ~ | ~ | I/O | DATA BUS L8 bit | |
| 33 | D0 | I/O | DATA BUS L8 bit | |
| 34 | GND | P | Power Ground | |
| 35 | NRD | I | Read Enable Signal | |
| 36 | NWR | I | Write Enable Signal | |
| 37 | RS | I | Command/Data Select | |
| 38 | NCS | I | Chip Select | |
| 39 | NC | / | NC | |
| 40 | VCI | P | Power supply   2.8V~3.3V | |
| 41 | IOVCC | P | Power supply   1.8V/2.8V~3.3V | |
| 42 | NC | / | NC | |
| 43 | NC | / | NC | |
| 44 | NC | / | NC | |
| 45 | NC | / | NC | |
| 46 | NC | / | NC | |

# 3.    Electrical Specifications

## 3.1.    Absolute Maximum Rating

($T_a$=+25  )

| Item | | Symbol | Values | | Unit | Remark |
|---|---|---|---|---|---|---|
| | | | Min. | Max. | | |
| TFT Module | I/O Circuit Supply Voltage | VDD | -0.3 | 4.6 | V | Note 1 |
| | Analog/Logic Supply Voltage | VCI | -0.3 | 4.6 | V | Note 1 |
| Backlight Unit | Current | $I_B$ | - | 150 | mA | Note 2 |
| | Power Consumption | $P_{BL}$ | - | 480 | mW | Note 2 |

Note1: Permanent damage to the device may occur if maximum values are exceeded or reverse voltage
       is applied.

Note2: Without LED driver IC, please refer to 2.4.

## 3.2.    Typical Operation Conditions

### 3.2.1   DC Characteristics

($T_a$=+25  , VCI=+2.8V)

| Item | Symbol | Values | | | Unit | Remark |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Logic Supply Voltage | VDD | 2.6 | 2.8 | 3.3 | V | |
| Analog Supply Voltage | VCI | 2.6 | 2.8 | 3.3 | V | |
| Input High Voltage | $V_{IH}$ | 0.7VDD | - | VDD | V | |
| Input Low Voltage | $V_{IL}$ | 0 | | 0.3VDD | V | Ta=25 |
| Output High Voltage | $V_{OH}$ | 0.8VDD | - | VDD | V | |
| Output Low Voltage | $V_{OL}$ | 0 | - | 0.2VDD | V | |
| Frame Frequency | $f_{FRAME}$ | - | 65 | - | Hz | |

Note: To prevent IC latch up or DC operation in LCD panel, the power on/off sequence should
      follow the driver IC specification.

### 3.2.2   Current Consumption

| Item | Symbol | Values | | Unit | Remark |
|---|---|---|---|---|---|
| | | Typ. | Max. | | |
| MCU Interfsce (8080 16-bit parallel Interface) | | | | | |
| Still Mode | VDD | - | TBD | uA | Note1 |
| | VCI | - | TBD | mA | |
| Sleep Mode | VDD | - | TBD | uA | Note1, Note3 |
| | VCI | - | TBD | uA | |

Note1: Test Condition

Typ:    VDD=2.8V                              Max:    VDD=3.0V

VCI=2.8V

Display Pattern: 8 Color Bar

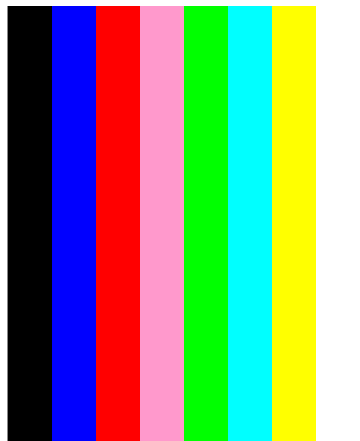Frame Rate=80Hz at Line Inversion

Operating Temperature: 25

VCI=3.3V

Display: Pattern:All Pixel Black

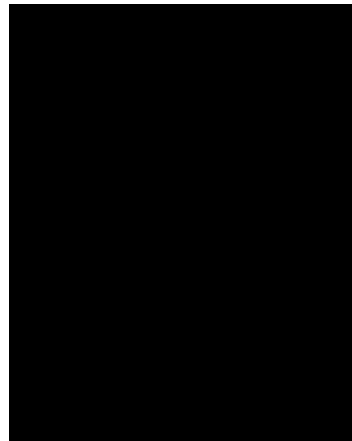Frame Rate=80Hz at Line Inversion

Operating Temperature: 25

**Typ. current check pattern:**

**Max. current check pattern:**

**8-Color Bar**

**Black**

Note2: In the standby mode, all the internal display operations are suspended including the internal R-C oscillator.

Note3: In the sleep mode, all the internal display operations are suspended except the internal R-C oscillator.

### 3.3. Backlight Unit

The backlight system is an edge lighting type with 4 white LEDs.

$(T_a=+25 \quad)$

| Item | Symbol | Values | | | Unit | Remark |
|------|--------|--------|--------|--------|------|--------|
| | | Min. | Typ. | Max. | | |
| Current | $I_B$ | - | 120 | - | mA | Note 1 |
| Power Consumption | $P_{BL}$ | - | 384 | - | mW | Note 2 |

Note1: 4 LEDs are connected in parallel; each LED's current consumption is 20mA.

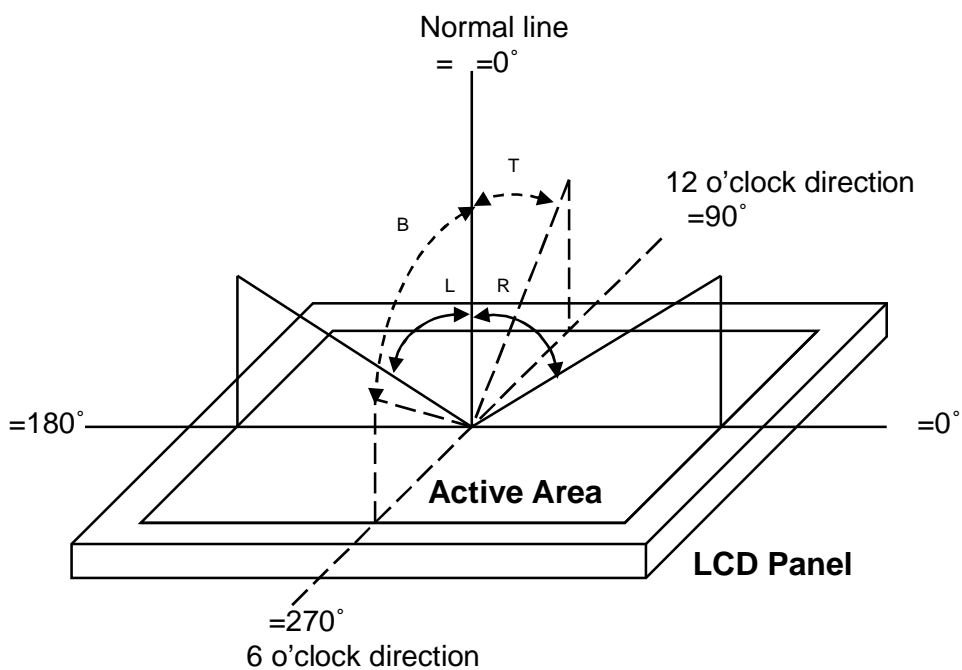Note2: Where $I_B= 120$ mA, $P_{BL} = I_B$ x $V_{BL,}$ $V_{BL}$ is backlight forward voltage.

# 4.    Optical Specifications

$(T_a=+25\ ,\ VCI=2.8V,\ VDD=1.8V,\ I_B=46mA)$

| Item | | Symbol | Condition | Values | | | Unit | Remark |
|---|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max. | | |
| Viewing Angle Range | Left | $\theta_L$ | CR$\geq$10 | | 50 | - | degree | Note 1,2 |
| | Right | $\theta_R$ | | | 50 | - | | |
| | Top | $\theta_T$ | | | 20 | - | | |
| | Bottom | $\theta_B$ | | | 50 | - | | |
| Response Time | | $T_{on}+T_{off}$ | Normal $\theta=\phi=0°$ | - | 30 | 50 | ms | Note 2,3 |
| Contrast Ratio | | CR | Normal $\theta=\phi=0°$ | 250 | 300 | - | - | Note 2,4 |
| Luminance | | L | Normal $\theta=\phi=0°$ | 200 | 250 | - | cd/m$^2$ | Note 2,5 |
| Flicker | | - | - | No Visible | | | - | Note 8 |
| Crosstalk | | - | - | No Visible | | | - | Note 9 |
| Color Chromaticity (CIE1931) | White | $W_x$ | Normal $\theta=\phi=0°$ | | 0.30 | | - | Note 2,6 |
| | | $W_y$ | | | 0.31 | | | |
| | Red | $R_x$ | | | 0.59 | | | |
| | | $R_y$ | | | 0.32 | | | |
| | Green | $G_x$ | | | 0.31 | | | |
| | | $G_y$ | | | 0.56 | | | |
| | Blue | $B_x$ | | | 0.15 | | | |
| | | $B_y$ | | | 0.08 | | | |
| Color Gamut | | NTSC | CIE1931 | - | 58 | - | % | - |
| Luminance Uniformity | | $U_L$ | Normal $\theta=\phi=0°$ | | 80 | - | % | Note 2,7 |

Note 1: Definition of viewing angle

Normal line
= =0°

T

12 o'clock direction
=90°

B

L   R

=180°

=0°

**Active Area**

**LCD Panel**

=270°
6 o'clock direction

range

Fig. 1 Definition of viewing angle

**Top**

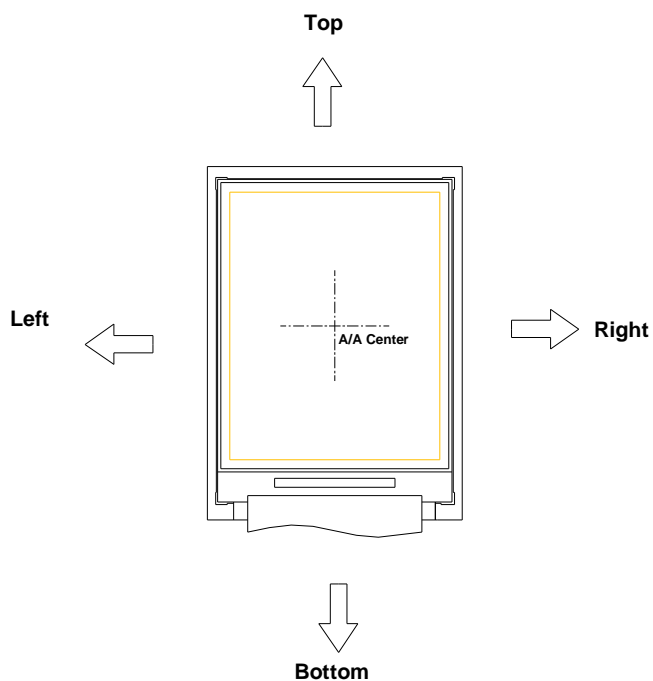**Left**

A/A Center

**Right**

**Bottom**

Fig. 2 Definition of viewing angle for display

Note 2: Definition of optical measurement system

     The optical characteristics should be measured in a dark room with ambient temperature $T_a$=+25.The optical properties are measured at the center point of the LCD screen after 5 minutes operation. (Equipment: Photo detector TOPCON BM-5A or BM-7 /Field of view: 1˚ /Height: 500mm.)
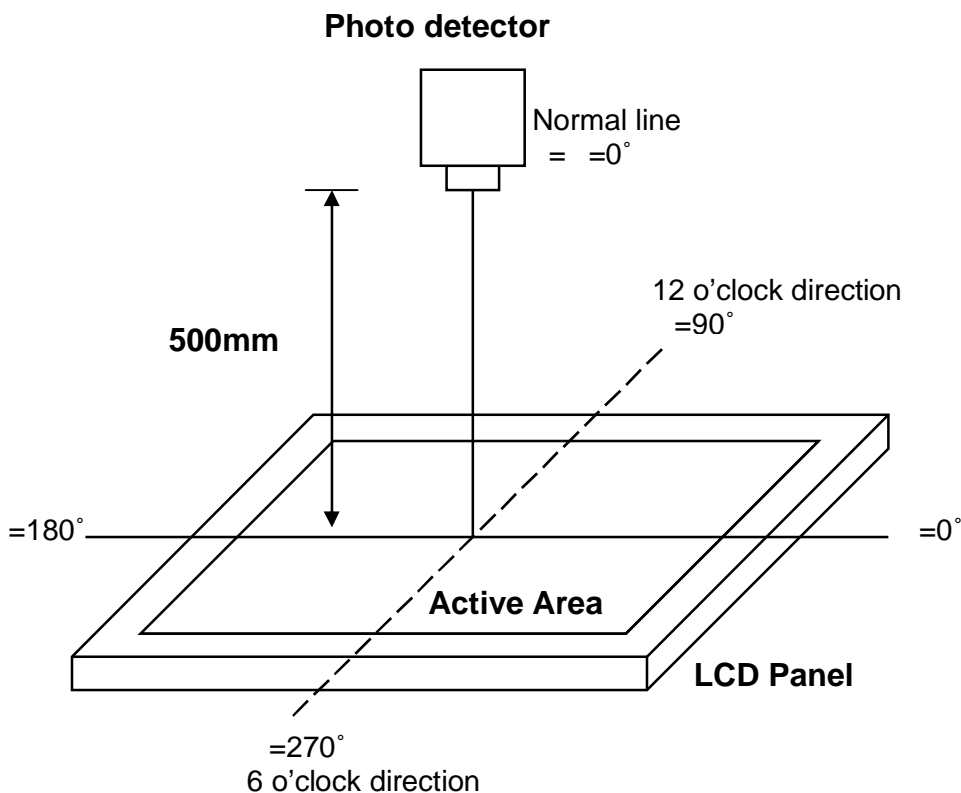
**Photo detector**

Normal line = =0˚

**500mm**

12 o'clock direction =90˚

=180˚

**Active Area**

=0˚

**LCD Panel**

=270˚
6 o'clock direction

Fig. 3 Optical measurement system setup

Note 3: Definition of response time

     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 photo detector output intensity changed from 10% to 90%.

**White (TFT OFF)** | **Black (TFT ON)** | **White (TFT OFF)**

Photo detector output (Relative value)
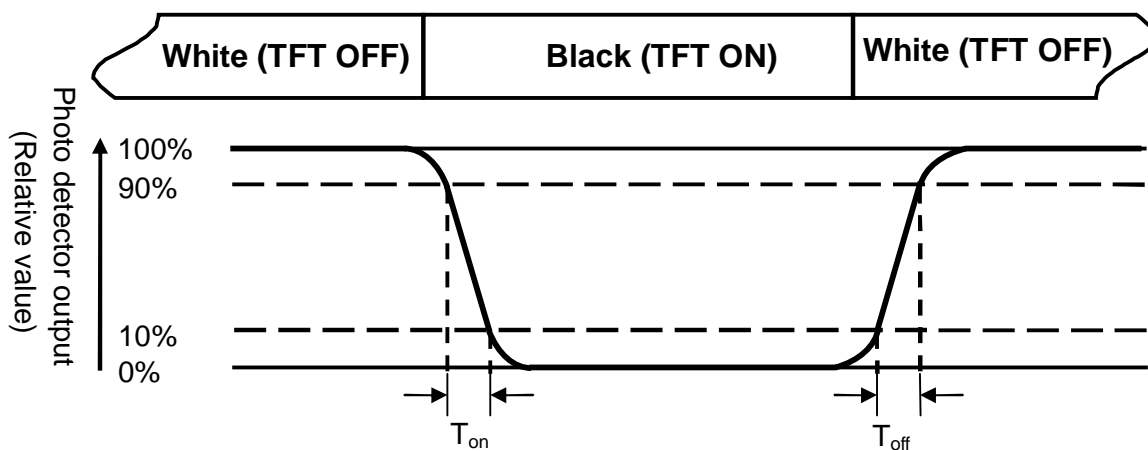
100%
90%
10%
0%

$T_{on}$      $T_{off}$

Fig. 4 Definition of response time

Note 4: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 5: Definition of luminance

Measured at the center area of the panel when LCD panel is driven at "white" state.

Note 6: Definition of color chromaticity (CIE1931)

Color coordinates measured at the center point of LCD when panel is driven at "White", "Red", "Green" and "Blue" state respectively.

Note 7: Definition of luminance uniformity

To test for uniformity, the tested area is divided into 3 rows and 3 columns. The measurement spot is placed at the center of each circle as below.

$$\text{Luminance Uniformity } (U_L) = \frac{L_{min}}{L_{max}}$$

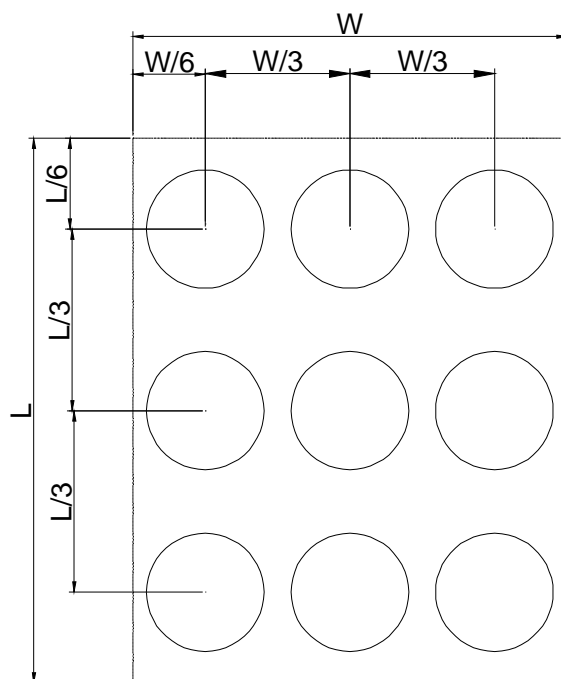L-------Active area length       W----- Active area width



Fig. 5 Definition of luminance uniformity

$L_{max}$ : The measured maximum luminance of all measurement position.

$L_{min}$ : The measured minimum luminance of all measurement position.

Note 8: Definition of Flicker

Flicker is the pattern usually used to describe the visual sensation produced by a rapidly varying light intensity. There should be no visible flicker in normal direction of the display when the following figure are loaded.
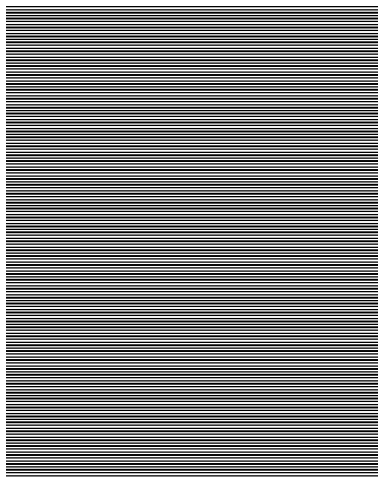


Fig.6 Flicker checker pattern

Note9: Definition of crosstalk

There should be no visible in normal direction of the display when the following figures are loaded.
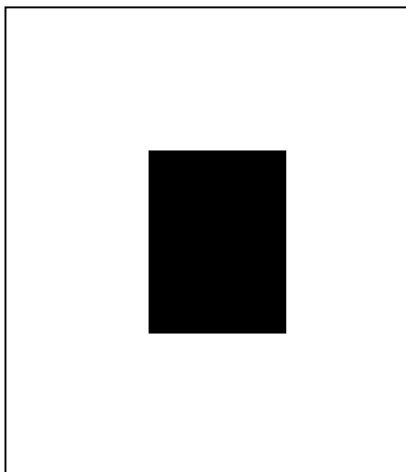


Fig.7 Crosstalk checker pattern

# 5.    Reliability Test Items

| Test Items | Test Conditions | Remark |
|---|---|---|
| High Temperature Storage | +80 ±3 for 240 hours | - |
| Low Temperature Storage | -30 ±3 for 240 hours | - |
| High Temperature Operation | +70 ±3 for 240 hours | - |
| Low Temperature Operation | -20 ±3 for 240 hours | - |
| High Temperature and Humidity Operation | +60 ±3 , 90%±3%RH max. for 240 hours | - |
| Thermal Shock | -30 /0.5h ~ +80 /0.5h for a total 100 cycles, Start with cold temp and end with high temp | - |
| Vibration Test | Frequency range:10~55Hz<br>Stoke:1.5mm<br>Sweep:10Hz~55Hz~10Hz<br>2 hours for each direction of X. Y. Z.<br>(6 hours for total) | - |
| Mechanical Shock | 100G 6ms,±X, ±Y, ±Z 3 times for each direction | - |
| Package Vibration Test | Random Vibration :<br>$0.015G^2$/Hz from 5-200Hz, -6dB/Octave from 200-500Hz<br>1 hour for each direction of X. Y. Z.<br>(3 hours for total) | - |
| Package Drop Test | Height :76cm(Weight 10kg);<br>60cm(Weight>10kg)<br>1 corner, 3 edges, 6 surfaces | - |
| Electro Static Discharge | ± 2KV, Human Body Mode, 100pF/1500 | - |

Note1: During the display practical test under normal operation condition, there shall be no change, which may affect display function.

Note2: Before functional check, the test sample requires a 2 hours storage time at room temperature.

# 6.     Handling Precautions

## 6.1.   Safety

6.1.1.   **The liquid crystal in the LCD is poisonous.** DO NOT **put it in your mouth. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and water.**

## 6.2.   Handling

6.2.1.   **The LCD and touch panel is made of plate glass.** DO NOT **subject the panel to mechanical shock or to excessive force on its surface.**

6.2.2.   Do not **handle the product by holding the flexible pattern portion in order to assure the reliability**

6.2.3.   **Transparency is an important factor for the touch panel. Please wear clear finger sacks, gloves and mask to protect the touch panel from finger print or stain and also hold the portion outside the view area when handling the touch panel.**

6.2.4.   **Provide a space so that the panel does not come into contact with other components.**

6.2.5.   **To protect the product from external force, put a covering lens (acrylic board or similar board) and keep an appropriate gap between them.**

6.2.6.   **Transparent electrodes may be disconnected if the panel is used under environmental conditions where dew condensation occurs.**

6.2.7.   **Property of semiconductor devices may be affected when they are exposed to light, possibly resulting in IC malfunctions.**

6.2.8.   **To prevent such IC malfunctions, your design and mounting layout shall be done in the way that the IC is not exposed to light in actual use.**

## 6.3.   Static Electricity

6.3.1.   **Ground soldering iron tips, tools and testers when they are in operation.**

6.3.2.   **Ground your body when handling the products.**

6.3.3.   **Power on the LCD module** BEFORE **applying the voltage to the input terminals.**

6.3.4.   DO NOT **apply voltage which exceeds the absolute maximum rating.**

6.3.5.   **Store the products in an anti-electrostatic bag or container.**
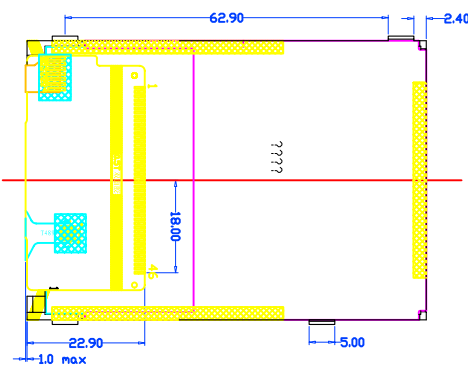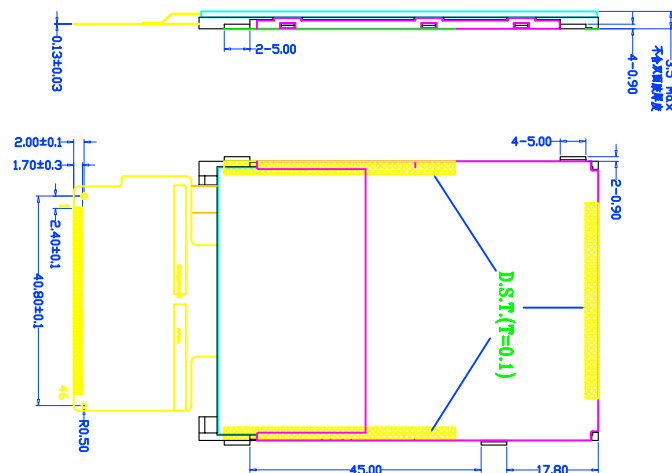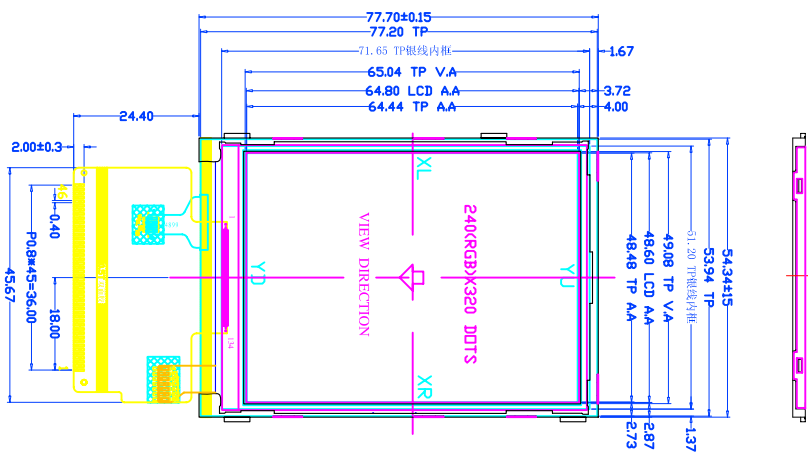
## 6.4.   Storage

6.4.1.   **Store the products in a dark place at +25  ±10   with low humidity (65%RH or less).**

6.4.2.   DO NOT **store the products in an atmosphere containing organic solvents or corrosive gas.**
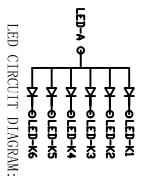
## 6.5.   Cleaning

6.5.1.   DO NOT **wipe the touch panel with dry cloth, as it may cause scratch.**

6.5.2.   **Wipe off the stain on the product by using soft cloth moistened with ethanol.** DO Not **allow ethanol to get in between the upper film and the bottom glass. It may cause peeling issue or defective operation.** Do not **use any organic solvent or detergent other than ethanol.**

# 7. Mechanical Drawing

Specification:
(1). Viewing angle: 12 O'clock
(2). Display mode:262K TFT/Normally White/Transmissive
(3). Operating temp.: -20°C~+70°C
   Storage temp.: -30°C~+80°C
(4). IC: GC9302
(5). Backlight: 6 chip White LED ,in Parallel Vr:3.2 V If:90 mA
(6). Dimensions with mark "*" are important, with mark "O"
   are referenced
(7). Request ROHS

| Pin NO | Assignment |
|--------|--------|
| 1 | YU |
| 2 | XL |
| 3 | YD |
| 4 | XR |

逻辑图

77.70±0.15
77.20 TP
71.65 TP银线内框
65.04 TP V.A
64.80 LCD A.A
64.44 TP A.A
1.67
3.72
4.00
24.40
2.00±0.3
XL
VIEW DIRECTION
240(RGB)X320 DOTS
YD
YU
XR
49.08 TP V.A
48.60 LCD A.A
48.48 TP A.A
51.20 TP银线内框
53.94 TP
54.34±15
0.40
P0.8#45-36.00
18.00
45.67
2.87
2.73
1.37

0.13±0.03
2-5.00
4-0.90
3.5 max
不在此段焊锡

2.00±0.1
1.70±0.3
2.40±0.1
40.80±0.1
46
R0.50
4-5.00
2-0.90
D.S.T.(T=0.1)
45.00
17.80

LED CIRCUIT DIAGRAM:
LED-A
LED-K1
LED-K2
LED-K3
LED-K4
LED-K5
LED-K6

FPC弯折示意图
展开出货

62.90
2.40
18.00
22.90
5.00
1.0 max

DRAWN BY: JACK    2013.05.08
CHECK BY:
APPROVER:
中

UNIT: mm
TOLERANCE: ±0.2
SCALE: 1:1
PAGE: 1 of 1
MATERIAL: -

REV. V1.0    FILE NO. ST3245A-C-LCM-V1.0

| Pin | Name |
|-----|------|
| 1 | NC |
| 2 | GND |
| 3 | IOVCC |
| 4 | LEDA |
| 5 | LEDK1 |
| 6 | LEDK2 |
| 7 | LEDK3 |
| 8 | LEDK4 |
| 9 | LEDK5 |
| 10 | LEDK6 |
| 11 | NC |
| 12 | NC |
| 13 | RX |
| 14 | GND |
| 15 | NRES |
| 16 | NC |
| 17 | DB15 |
| 18 | DB14 |
| 19 | DB13 |
| 20 | DB12 |
| 21 | DB11 |
| 22 | DB10 |
| 23 | DB9 |
| 24 | DB8 |
| 25 | NC |
| 26 | DB7 |
| 27 | DB6 |
| 28 | DB5 |
| 29 | DB4 |
| 30 | DB3 |
| 31 | DB2 |
| 32 | DB1 |
| 33 | DB0 |
| 34 | GND |
| 35 | NWR |
| 36 | RS |
| 37 | NCS |
| 38 | NRD |
| 39 | NC |
| 40 | VC1 |
| 41 | IOVCC |
| 42 | NC(YD) |
| 43 | NC(XR) |
| 44 | NC(YU) |
| 45 | NC(XL) |
| 46 | LCM_ID |