

# Shenzhen Leadtek Electronics Co.,Ltd

## PRODUCT SPECIFICATION

### TFT-LCD-TP MODULE

**Module No: LTK070P3078W**

☒ Preliminary Specification

☐ Approval Specification

| Designed by                                                                         | Checked by                                                                          | Approved by                                                                           |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|  |  |  |

### Final Approval by Customer

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

※The specification of "TBD" should refer to the measured value of sample . If there is difference between the design specification and measured value, we naturally shall negotiate and agree to solution with customer.

## Revision History

[illegible]

[illegible]

## 1.0 General Description

### 1.1 Introduction

LTK070P3078W is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT LCD panel and a driving circuit. This TFT LCD has a 7.0 (16:9) inch diagonally measured active display area with (1024 horizontal by 600 vertical pixel) resolution.

### 1.2. Features

7 (16:9 diagonal) inch configuration

Compatible with NTSC & PAL system

Image Reversion: UP/DOWN and LEFT/RIGHT

ROHS design

### 1.3. General information

| Item               | Specification                   | Unit   |
|--------------------|---------------------------------|--------|
| Outline Dimension  | 163.9(H) x 97 (V) x2.5(D)       | mm     |
| Display area       | 154.22 (H) x 85.92 (V)          | mm     |
| Number of Pixel    | 1024 (H) x3(RGB)x 600 (V)       | pixels |
| Pixel pitch        | 0.1506 (H) x3(RGB)x 0.1432 (V)s | mm     |
| Pixel arrangement  | RGB Vertical stripe             |        |
| Display mode       | Normally Black,FFS              |        |
| Color Filter Array | RGB vertical stripes            |        |
| Backlight          | White LED                       |        |
| Weight             | TBD                             | g      |
| Interface          | MIPI                            |        |

## 2.0 Absolute Maximum Ratings

### 2.1 Environment Absolute Rating

| Item                  | Symbol | Min. | Max. | Unit | Note |
|-----------------------|--------|------|------|------|------|
| Operating Temperature | Topa   | -10  | 50   | °C   |      |
| Storage Temperature   | Tstg   | -20  | 60   | °C   |      |

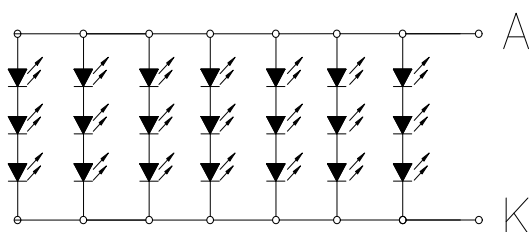
### 2.2 Back-light Unit:

| PARAMETER   | Sym.  | Min. | Typ.  | Max. | Unit | Test Condition | Note |
|-------------|-------|------|-------|------|------|----------------|------|
| LED Current | IF    | –    | 140   | –    | mA   | –              | –    |
| LED Voltage | VF    | 9    | 9.9   | 10.5 | V    | –              | –    |
| Life Time   |       | –    | 20000 | –    | Hr.  | I ≤ 140mA      | –    |
| Color       | White |      |       |      |      |                |      |

Note (1) Permanent damage may occur to the LCD module if beyond this specification. Functional operation should be restricted to the conditions described under normal operating conditions.

(2)Ta=25±2°C

(3)Test condition: LED Current 140mA



LED电路图

CIRCUIT DIAGRAM (3\*7=21 LED)

## 3.0 Optical Characteristics

### 3.1 Optical specification

Ta = 25°C, VCC=3.3V

| ITEM                             |       | SYMBOL   | CONDITIONS         | MIN            | TYP            | MAX            | UNIT              | NOTE    |
|----------------------------------|-------|----------|--------------------|----------------|----------------|----------------|-------------------|---------|
| Constrast Ratio                  |       | CR       | Point-5            | 700            | 900            |                | --                | 1, 2, 3 |
| Luminance(CEN)                   |       | Lw       | Point-5            | 200            | 250            |                | cd/m <sup>2</sup> | 1, 3    |
| Luminance Uniformity             |       | ΔL       |                    | 70             | 75             |                | %                 | 1, 3    |
| Response Time<br>(White - Black) |       | Tr + Tf  | Point-5            | -              | 20             | 40             | ms                | 1, 3, 5 |
| NTSC                             |       | -        | Point-5            | 45             | 50             | -              | %                 | 1, 3    |
| Viewing<br>Angle                 | Left  | Deg.     | CR ≥ 10<br>Point-5 |                | 85             | --             | °                 | 1, 4    |
|                                  | Right | Deg.     |                    |                | 85             |                |                   | 1, 4    |
|                                  | Upper | Deg.     |                    |                | 85             | --             | °                 | 1, 4    |
|                                  | Lower | Deg.     |                    |                | 85             |                |                   | 1, 4    |
| Color<br>Coordinate              | White | Wx<br>Wy | Point-5            | 0.273<br>0.289 | 0.313<br>0.329 | 0.353<br>0.369 | --                | 1, 3    |
|                                  | Red   | Rx<br>Ry |                    |                | -              |                |                   |         |
|                                  | Green | Gx<br>Gy |                    |                | -              |                |                   |         |
|                                  | Blue  | Bx<br>By |                    |                | -              |                |                   |         |

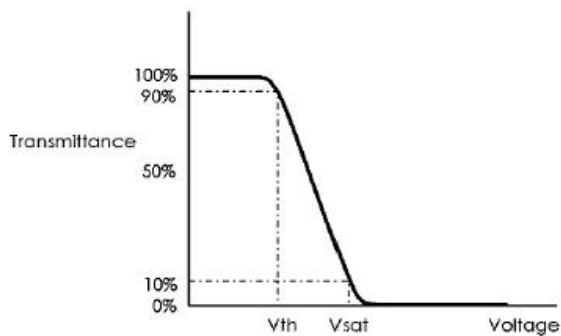
### 3.2 Measuring Condition

- Measuring surrounding : dark room
- Ambient temperature : 25±2°C
- 30min. warm-up time.

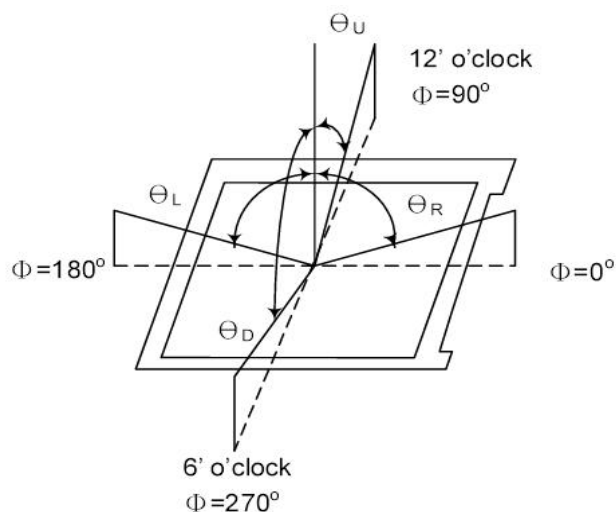
### 3.3 Measuring Equipment

- TOPCON BM-7
- Measuring spot size : field 2°

### Note (1) Definition of $V_{sat}$ and $V_{th}$ (at 20°C)



### Note (2) Definition of Viewing Angle :

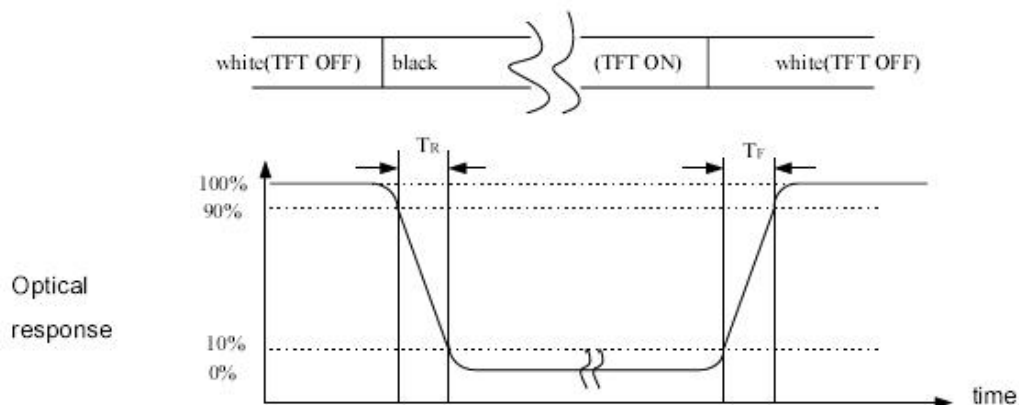


### Note (3) Definition of Contrast Ratio(CR) :

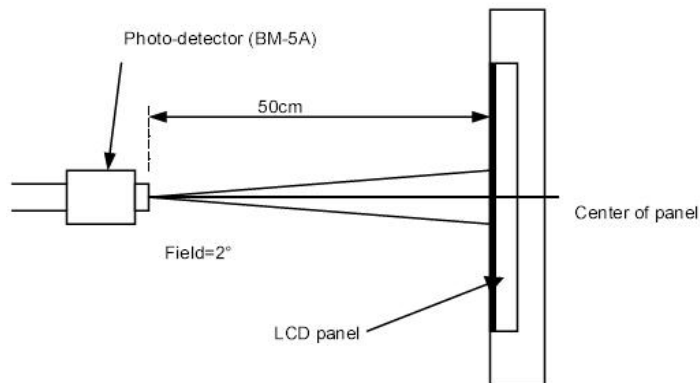
measured at the center point of panel

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

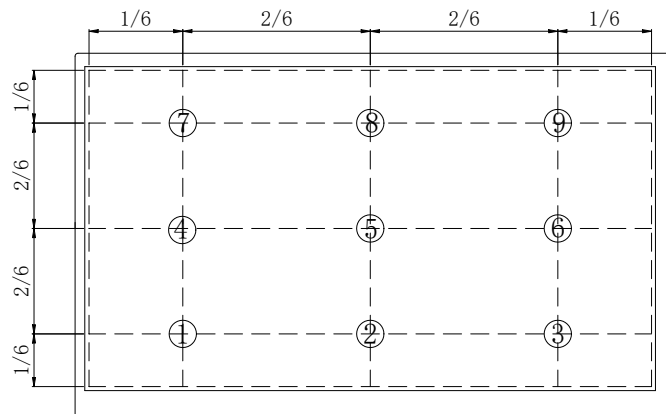
### Note (4) Definition of Response Time : Sum of $T_R$ and $T_F$



### Note (5) Definition of optical measurement setup



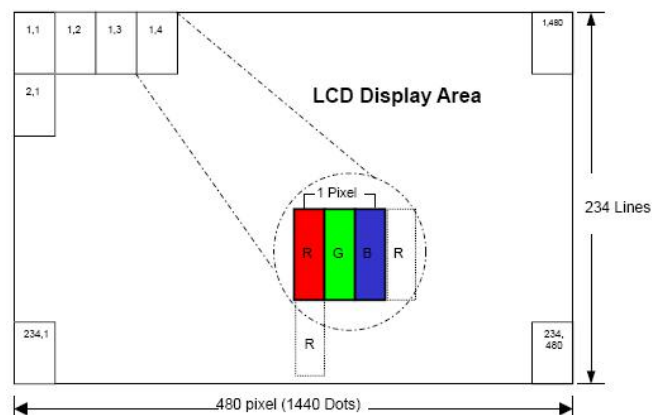
### Note (6) Definition of brightness uniformity



**Note (7) Rubbing Direction** (The different Rubbing Direction will cause the different optima view direction).

## 4.0 Block Diagram

### 4.1 TFT-LCD Module





## 5.0 Interface Pin Connection

| Pin No. | Symbol | Function                      | Remark |
|---------|--------|-------------------------------|--------|
| 1-2     | LED+   | LED Anode                     |        |
| 3       | VGH    | Gate ON Voltage               |        |
| 4       | VGL    | Gate OFF Voltage              |        |
| 5       | UPDN   | Gate Up or Down scan control  |        |
| 6       | SHLR   | Source Right or Left sequence |        |
| 7-8     | LED-   | LED Cathode                   |        |
| 9       | AVDD   | Power for Analog Circuit      |        |
| 10      | GND    | Ground                        |        |
| 11      | RXIN3P | MIPI Data lane3 input         |        |
| 12      | RXIN3N |                               |        |
| 13      | GND    | Ground                        |        |
| 14      | RXIN2P | MIPI Data lane2 input         |        |
| 15      | RXIN2N |                               |        |
| 16      | GND    | Ground                        |        |
| 17      | RXCLKP | MIPI CLK input                |        |
| 18      | RXCLKN |                               |        |
| 19      | GND    | Ground                        |        |
| 20      | RXIN1P | MIPI Data lane1 input         |        |
| 21      | RXIN1N |                               |        |
| 22      | GND    | Ground                        |        |
| 23      | RXIN0P | MIPI Data lane0 input         |        |
| 24      | RXIN0N |                               |        |
| 25      | GND    | Ground                        |        |
| 26      | STBYB  | Standby mode                  |        |
| 27      | RESET  | Global reset pin              |        |
| 28      | VDD    | Power Supply                  |        |
| 29      | VDD    | Power Supply                  |        |
| 30      | VCOM   | Common Voltage                |        |

## 6. Electrical Characteristics

### 6.1 TFT LCD Module

| Item                    | Symbol           | Min.                | Typ. | Max.                | Unit | Note                   |
|-------------------------|------------------|---------------------|------|---------------------|------|------------------------|
| Supply Voltage          | DV <sub>DD</sub> | 1.7                 | 1.8  | 2.0                 | V    |                        |
|                         | V <sub>GH</sub>  | 17                  | 18   | 19                  | V    |                        |
|                         | V <sub>GL</sub>  | -6.6                | -6   | -5.4                | V    |                        |
|                         | AV <sub>DD</sub> | 9.4                 | 9.6  | 9.8                 | V    |                        |
|                         | V <sub>COM</sub> | 2.95                | 3.15 | 3.35                | V    |                        |
| Input signal voltage    | V <sub>IH</sub>  | 0.7DV <sub>DD</sub> | -    | DV <sub>DD</sub>    | V    | (2)                    |
|                         | V <sub>IL</sub>  | 0                   | -    | 0.3DV <sub>DD</sub> | V    | (2)                    |
| Current of power supply | I <sub>DD</sub>  | -                   | -    |                     | mA   | DV <sub>DD</sub> =2.0V |
|                         | I <sub>ADD</sub> | -                   | -    |                     | mA   | AV <sub>DD</sub> =9.6V |
|                         | I <sub>GH</sub>  | -                   | -    |                     | uA   | V <sub>GH</sub> =18V   |
|                         | I <sub>GL</sub>  | -                   | -    |                     | mA   | V <sub>GL</sub> =-6V   |

Note (1): The brightness of LCD panel could be changed by adjusting the AC component of V<sub>COM</sub>.

**MIPI CLK Speed:340Mbps(170MHZ)**

**H back porch:160**

**H front porch:160**

**H pulse width:10**

**V back porch:23**

**V front porch:12**

**V pulse width:1**

**MIPI command 如:**

**regw(0x80,0xAC);**

**regw(0x81,0xB8);**

**regw(0x82,0x09);**

**regw(0x83,0x78);**

**regw(0x84,0x7F);**

**regw(0x85,0xBB);**

**regw(0x86,0x70);**

**注: 請用MIPI 短包 (0x15) 下初始化**

## 6.2 TFT-LCD Current Consum

| ITEM                    | SYMBOL | CONDITION   | MIN | TYPE | MAX | UNIT | NOTE  |
|-------------------------|--------|-------------|-----|------|-----|------|-------|
| Gate on power current   | IVGH   | VGH =18V    | --  | 0.5  | 1   | mA   | Note1 |
| Gate off power current  | IVGL   | VGL= -6V    | --  | 0.5  | 1   | mA   | Note1 |
| Digital power current   | IDVDD  | DVDD = 3.3V | --  | 30   | 45  | mA   | Note1 |
| Analog power current    | IAVDD  | AVDD = 9.6V | --  | 35   | 45  | mA   | Note1 |
| Total Power Consumption | PC     |             | --  | 447  | 604 | mW   | Note1 |

Note1: Typ. specification : Gray-level test Pattern

Max. specification : Black test Pattern



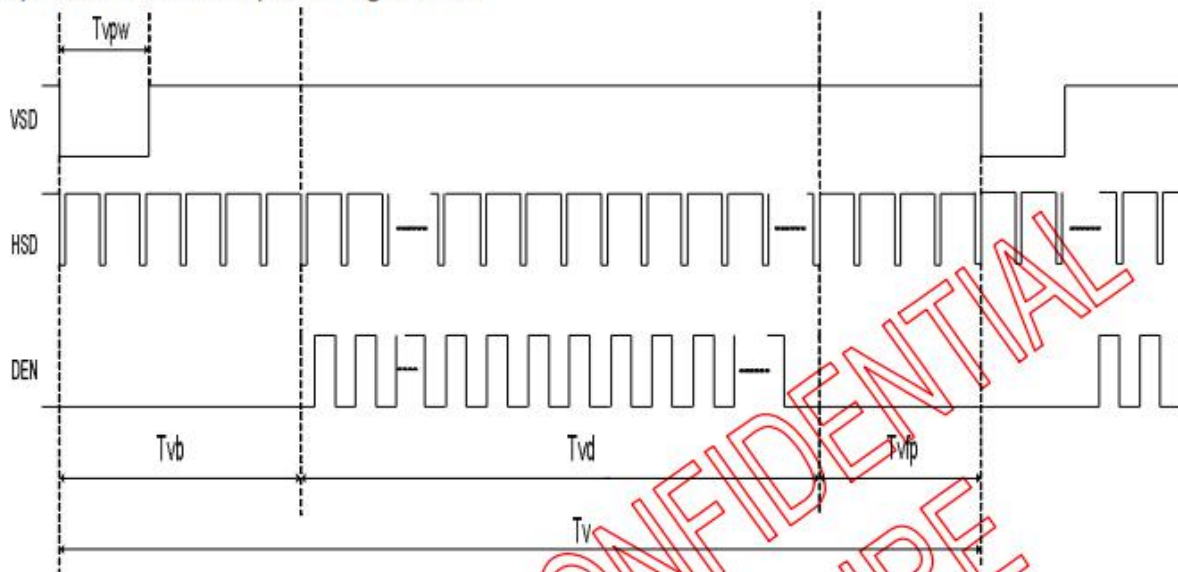
256 gray pattern



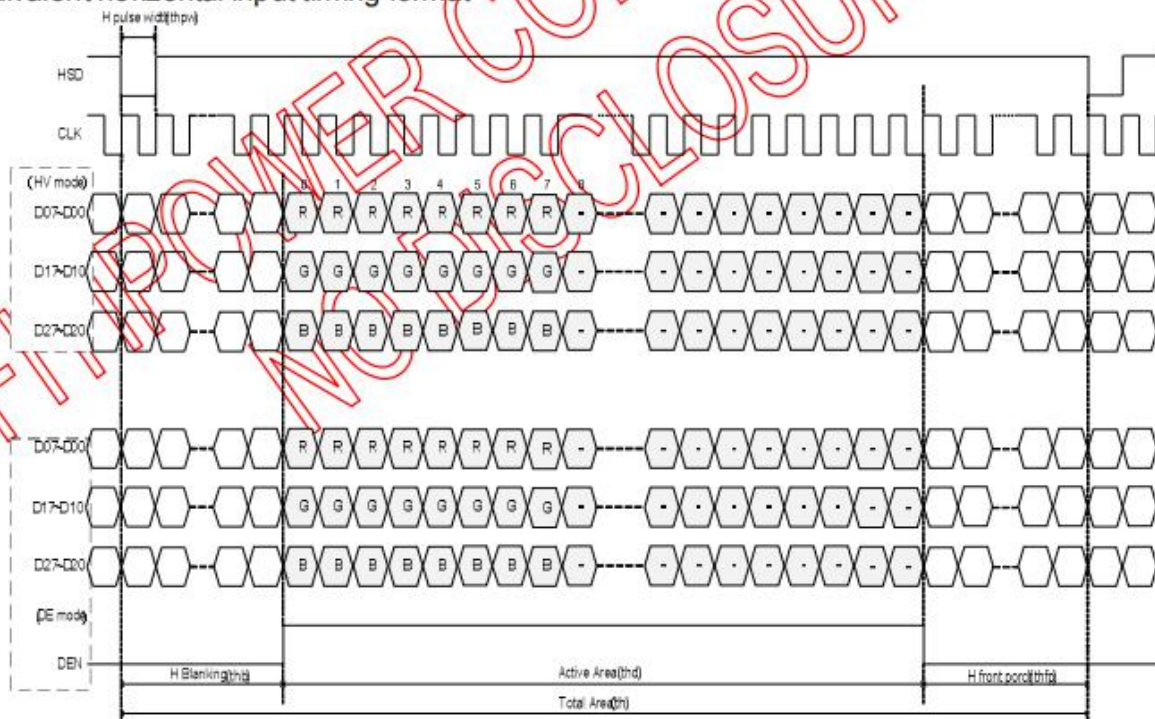
Black Pattern

## 6.3 Timing Diagram of Interface Signal

### • Equivalent vertical input timing format



### • Equivalent horizontal input timing format



|              | ITEM                      | SYMBOL | MIN. | TYP. | MAX. | UNIT | Note                         |
|--------------|---------------------------|--------|------|------|------|------|------------------------------|
| DE<br>MODE   | Dot Clock                 | 1/tCLK | 45   | 51.2 | 57   | MHz  |                              |
|              | DCLK pulse duty           | Tcwh   | 40   | 50   | 60   | %    |                              |
|              | Horizontal total Time     | tH     | 1324 | 1344 | 1364 | tCLK |                              |
|              | Horizontal effective Time | tHA    | 1024 |      |      | tCLK |                              |
|              | Horizontal Blank Time     | tHB    | 300  | 320  | 340  | tCLK |                              |
|              | Vertical total Time       | tV     | 625  | 635  | 645  | tH   |                              |
|              | Vertical effective Time   | tVA    | 600  |      |      | tH   |                              |
|              | Vertical Blank Time       | tVB    | 25   | 35   | 45   | tH   |                              |
| SYNC<br>MODE | Horizontal total Time     | TH     | 1324 | 1344 | 1364 | tCLK |                              |
|              | Horizontal Pulse Width    | Thpw   |      | 20   | -    | tCLK | thb + thpw =160DCLK is fixed |
|              | Horizontal Back Porch     | Thb    |      | 140  | -    | tCLK |                              |
|              | Horizontal Front Porch    | Thfp   | 140  | 160  | 180  | tCLK |                              |
|              | Horizontal effective Time | THA    | 1024 |      |      | tCLK |                              |
|              | Vertical total Time       | TV     | 625  | 635  | 645  | tH   |                              |
|              | Vertical Pulse Width      | Tvpw   |      | 3    | -    | th   | tvpw + tvb =23th is fixed    |
|              | Vertical Back Porch       | Tvb    | -    | 20   | -    | th   |                              |
|              | Vertical Front Porch      | Tvfp   | 2    | 12   | 22   | th   |                              |
|              | Vertical Valid            | Tvd    | 600  |      |      | th   |                              |

## 7.0 Reliability test items

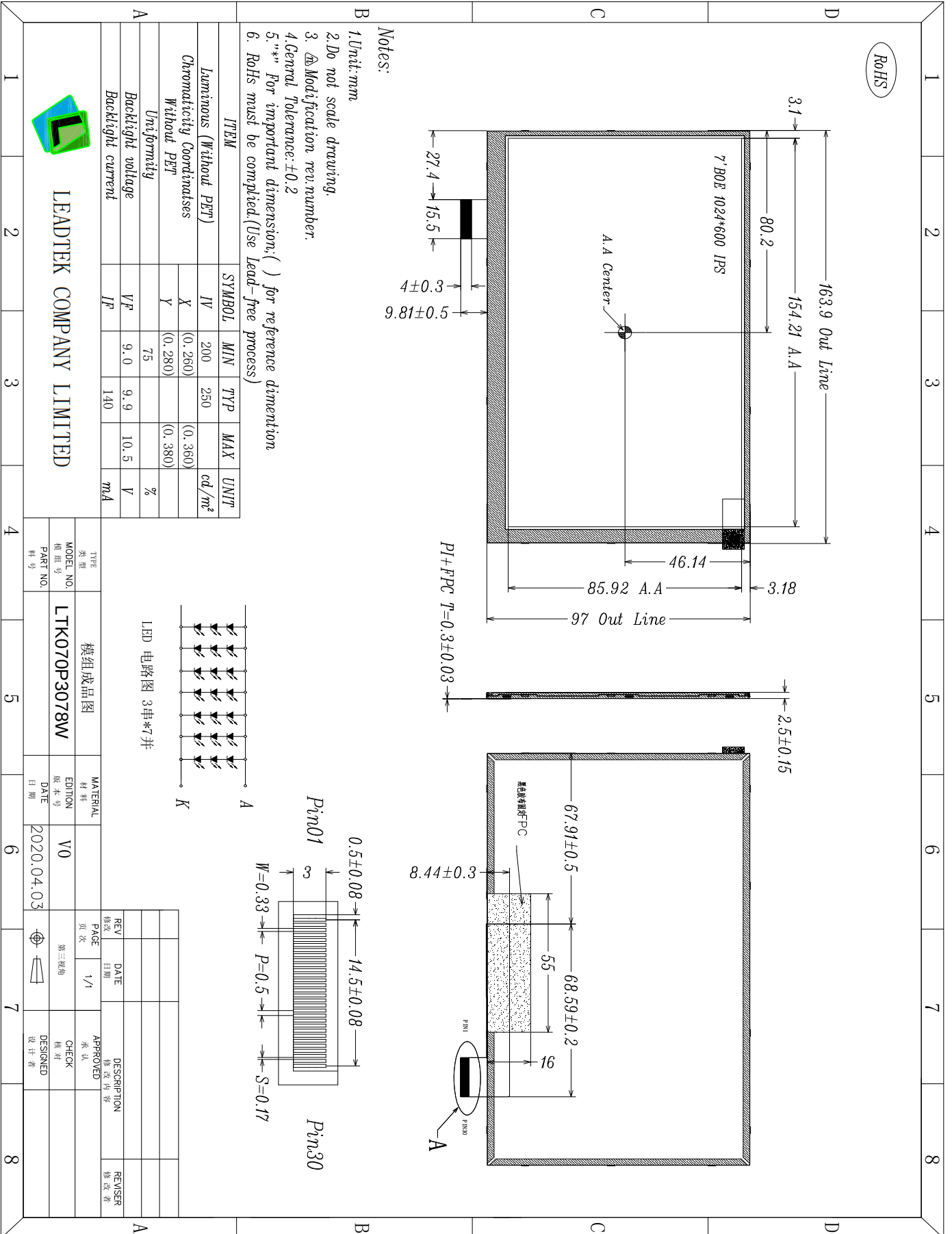
| NO | Item                                           | Conditions                                                                                                                  | Remark                           |
|----|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| 1  | High Temperature Storage                       | Ta=+60℃,48hrs                                                                                                               |                                  |
| 2  | Low Temperature Storage                        | Ta=-20℃,48hrs                                                                                                               |                                  |
| 3  | High Temperature Operation                     | Ta=+50℃,48hrs                                                                                                               |                                  |
| 4  | Low Temperature Operation                      | Ta=-10℃,48hrs                                                                                                               |                                  |
| 5  | High Temperature and High Humidity (operation) | Ta=+40℃,90%RH,48hrs                                                                                                         |                                  |
| 6  | Thermal Cycling Test (non operation)           | -20℃ (0.5hr)→+60℃ (0.5hr),100cycles                                                                                         |                                  |
| 7  | Vibration                                      | 1.Random:1.04G,10-500HZ,X,Y,Zdirection<br>30min/each direction<br>2.Sweep sine:1.5G, 5~500Hz,<br>X/Y/Z,30min/each direction |                                  |
| 8  | Shock                                          | 100G,6ms, ±X, ±Y, ±Z<br>3 time for each direction                                                                           | JIS C7021, A-10<br>(Condition A) |
| 9  | Vibration (with carton)                        | Random:1.04Grms, 10~500Hz, X/Y/Z<br>45min/each direction<br>Fixed:5Hz, 1.5Grms, X/Y/Z 45min/each<br>direction               |                                  |
| 10 | Drop (with carton)                             | Height: 60cm 1 corner, 3 edges, 6 surfaces                                                                                  | JIS Z0202                        |
| 11 | Electrostatic Discharge                        | ±200V,200PF,0Ω1 time/each terminal                                                                                          |                                  |

Note: All tests above are practiced at module type.

There is no display function NG issue occurred, All the cosmetic specification is judged before the reliability stress.



## 8.0 Outline dimension





## 9.0 Packing form

### 9.1 Packing form 1

TBD





## 10.0 General Precaution

### 10.1 Use Restriction

This product is not authorized for use in life supporting systems, aircraft navigation control systems, military systems and any other application where performance failure could be life-threatening or otherwise catastrophic.

### 10.2 Assembly Precaytton

10.2.1 Please use the mounting hole on the module side in installing and do not bending or wrenching LCD in assembling. And please do not drop, bend or twist LCD module in handling.

10.2.2 Please design display housing in accordance with the following guide lines.

10.2.2.1 Housing case must be destined carefully so as not to put stresses on LCD all sides and not to wrench module. The stresses may cause non-uniformity even if there is no non-uniformity statically.

10.2.2.2 Keep sufficient clearance between LCD module back surface and housing when the LCD module is mounted. The clearance in the design is recommended taking into account the tolerance of LCD module thickness and mounting structure height on the housing.

10.2.3 Please do not push or scratch LCD panel surface with any-thing hard. And do not soil LCD panel surface by touching with bare hands. ( Polarizer film, surface of LCD panel is easy to be flawed.)

10.2.4 Please do not press any parts on the rear side such as source IC, gate IC, and FPC during handling LCD module. If pressing rear part is unavoidable, handle the LCD module with care not to damage them.

10.2.5 Please wipe out LCD panel surface with absorbent cotton or soft cloth in case of it being soiled.

10.2.6 Please wipe out drops of adhesives like saliva and water on LCD panel surface immediately. They might damage to cause panel surface variation and color change.

10.2.7 Please do not take a LCD module to pieces and reconstruct it. Resolving and reconstructing modules may cause them not to work well.

### 10.3 Disassembling or Modification

Do not disassemble or modify the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display. HannStar does not warrant the module, if customers disassemble or modify the module.

### 10.4 Breakage of LCD Panel

10.4.1 If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid crystal, and do not contact liquid crystal with skin.

10.4.2 If liquid crystal contacts mouth or eyes, rinse out with water immediately.

10.4.3 If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.

10.4.4 Handle carefully with chips of glass that may cause injury, when the glass is broken.

## 10.5 Absolute Maximum Ratings and Power Protection Circuit

10.5.1 Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts' parameters, environmental temperature, etc., otherwise LCD module may be damaged.

10.5.2 Please do not leave LCD module in the environment of high humidity and high temperature for a long time.

10.5.3 It's recommended employing protection circuit for power supply.

### 10.6 Operation

10.6.1 Do not touch, push or rub the polarizer with anything harder than HB pencil lead. Use fingerstalls of soft gloves in order to keep clean display quality, when persons handle the LCD module for incoming inspection or assembly.

10.6.2 When the surface is dusty, please wipe gently with absorbent cotton or other soft material.

10.6.3 Wipe off saliva or water drops as soon as possible. If saliva or water drops contact with polarizer for a long time, they may causes deformation or color fading.

10.6.4 When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzine or other adequate solvent.

## 10.7 Static Electricity

10.7.1 Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.

10.7.2 Because LCD module uses CMOS-IC on TFT-LCD panel, it is very weak to electrostatic discharge. Please be careful with electrostatic discharge.

10.7.3 Persons who handle the module should be grounded through adequate methods.

## 10.8 Disposal

When disposing LCD module, obey the local environmental regulations.

## 10.9 OTHERS

10.9.1 A strong incident light into LCD panel might cause display characteristics' changing inferior because of polarizer film, color filter, and other materials becoming inferior.

Please do not expose LCD module direct sunlight land strong UV rays.

10.9.2 Please pay attention to a panel side of LCD module not to contact with other materials in preserving it alone.

10.9.3 For the packaging box, please pay attention to the followings:

10.9.3.1 Packaging box and inner case for LCD are designed to protect the LCDs from the damage or scratching during transportation. Please do not open except picking LCDs up from the box.

10.9.3.2 Please do not pile them up more than 6 boxes. (They are not designed so.) And please do not turn over.

10.9.3.3 Please handle packaging box with care not to give them sudden shock and vibrations. And also please do not throw them up.

10.9.3.4 Packing box and inner case for LCDs are made of cardboard. So please pay attention not to get them wet. (Such like keeping them in high humidity or wet place can occur getting them wet.)