# Model name: PT850GT01-2

**Date: 2. Sep. 2021**

( )Preliminary Specification

( √ ) Final Specification

Any modification is not allowed without HKC's permission

| **Customer's Approval** | **Changsha HKC** |
|---|---|
| Approved by<br><br>Company(公司): _____<br><br>Title(职称): _____<br><br>Signature(签名): _____ | Approved By Product Director Date<br>Name: Andy 9/2<br>Signature:<br><br>Reviewed By PM Manager Date<br>Name: 彭用江<br>Signature: 2021.9.2 |
| Note | Reviewed By Project Leader Date<br>Name: 田尚英pete 2021.09.02<br>Signature:<br><br>Reviewed By PM Date<br>Name: Taylor 2021.9.2<br>Signature: |

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# Content



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## Revision History

| Version | Date | Page (New) | Section | Description | Revision by |
|---|---|---|---|---|---|
| Rev. P1 | 2021/8/16 | - | All | Preliminary Specification was first issued. | |
| Rev. F.1 | 2021/8/31 | 22 | All | Optical spec update | RD |
| | | | | | |
| | | | | | |

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# 1. GENERAL DESCRIPTION

The specification is applied to 85” model (PT850GT01-2) TFT Liquid Crystal Display open cell and it supports 3840x2160 UD mode with 1.07G (8bit+FRC) colors. This product is with driver ICs and a 51-pins-8 lane-VBO circuit board and built in without backlight unit.

## 1.1 General Specifications

| Item | Specification | Unit | Note |
|---|---|---|---|
| **Screen Size** | 85 inch Diagonal | - | - |
| **Outline Dimension** | 1884.12（H）×1067.06（V） | mm | - |
| **Active Area** | 1872（H）×1053（V） | mm | |
| **Driver Element** | a-si TFT active matrix | - | - |
| **Cell Transmittance** | 5.5% | % | HKC light，Center point |
| **Pixel Number** | 3840×2160 | pixel | - |
| **Sub Pixel Pitch** | 0.1625(H)×0.4875(V) | mm | - |
| **Pixel Arrangement** | RGB vertical stripe | - | - |
| **Display Colors** | 1.07G | Color | 8bit+FRC |
| **Display Mode** | Normally Black | - | - |
| **Display Orientation** | Signal input with “ABC” | - | - |
| **Panel Inversion Type** | Column inversion | - | - |
| **Surface Treatment** | Type=AG | - | - |
| | Haze=2.3% | - | - |
| | Top surface Hardness:3H | - | - |
| **Weight** | 5.93 | Kg | - |

Note:

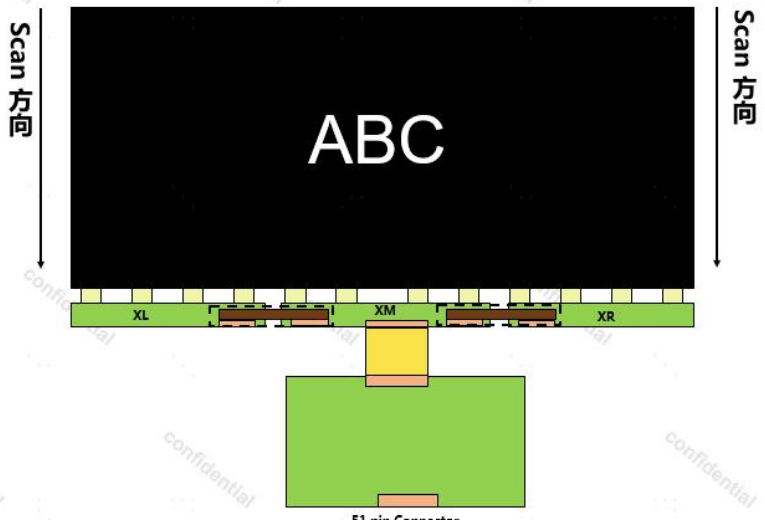


Fig 1.1 Display Orientation

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## 2. ABSOLUTE MAXIMUM RATINGS

### 2.1 Absolute Maximum Ratings

The followings are maximum values which, if exceeded, may cause damage to the unit.

| Item | Symbol | Value | | Unit | Note |
|---|---|---|---|---|---|
| | | Min. | Max. | | |
| Power Supply Voltage | $V_{CC}$ | -0.3 | 13.5 | V | (1) |
| Input Signal Voltage | $V_{in}$ | -0.3 | 3.6 | V | (1) |

Note:

(1) Within Ta=25±2°C

### 2.2 Absolute Ratings Of Environment

Temperature and relative humidity range are shown in the figure below.

| Item | Symbol | Value | | Unit | Note |
|---|---|---|---|---|---|
| | | Min. | Max. | | |
| **Storage Temperature** | TST | -20 | 60 | °C | (1) |
| **Operating Temperature** | TOP | 0 | 50 | °C | (1), (2) |

Note:

(1) a. 90 % RH Max. (Ta ≤ 40 °C).

b. Web-bulb temperature should be 39°C Max. (Ta>40°C)

c. No condensation

d. Operating condition with a assemble module

(2) Any point on the Driver surface must be less than 120 ºC under any condition ,If the surface temperature is out of the spec, thermal solutions should be applied to avoid be damaged.

(3) Surface temperature of display area is measured at 50°C dry condition.

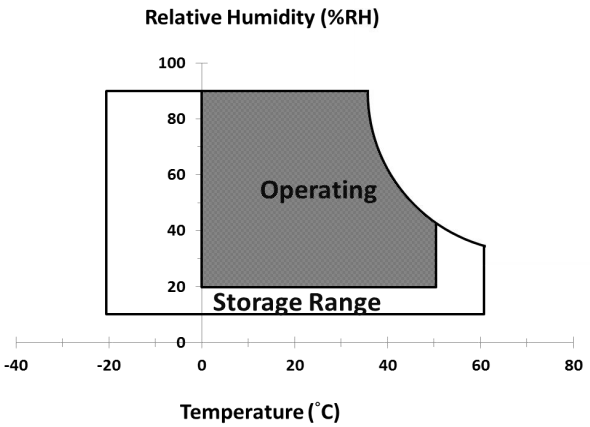


Fig. 2.1 Operating and storage environment

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**2.3 Package Storage**

When storing open cell as spares for a long time, please follow the precaution instructions:

(1) Do not store the open cell in high temperature and high humidity for a long time. It is highly recommended to store the module with temperature from 20ºC to 30ºC in normal humidity (50 ± 10%RH) with shipping package.

(2) The open cell should be keep within one month shelf life.

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# 3. ELECTRICAL SPECIFICATIONS

## 3.1 Electrical Characteristics

### 3.1.1 Power Consumption

| Parameter | | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | | |
| Power Supply Voltage | | $V_{CC}$ | 10.8 | 12 | 13.2 | V | (1) |
| Rush Current | | $I_{RUSH}$ | | | 5 | A | (2) |
| Power Supply Current | White Pattern | - | | 0.89 | 1.16 | A | (3) |
| | Horizontal Strip | - | | 3.1 | 4.03 | A | |
| | Black Pattern | - | | 0.85 | 1.11 | A | |

Note:

(1) Ambient temperature:25±2℃

(2) The ripple voltage should be controlled under 10% of VCC.

(3) Measurement Conditions: VCC rising time=470μs.

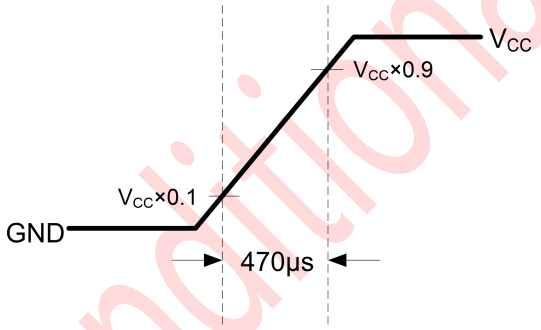
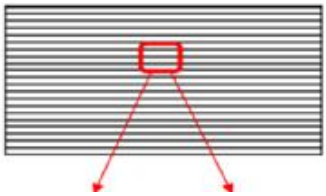



Fig.3.1 $V_{CC}$ rising time condition

(4) Measurement Conditions: Vcc =12V, Ta = 25 ± 2 ºC, Fv = 60 Hz, whereas the test pattern is shown as below. The heavy load pattern is figure B.

A. White Pattern

B. Horizontal Strip



C. Black Pattern

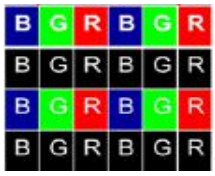



Fig.3.2 Test patterns

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### 3.1.2 V By One Characteristics

| Parameter | | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | | |
| V by one Interface | Differential Input High Threshold Voltage | VTH | - | - | +50 | mV | - |
| | Differential Input Low Threshold Voltage | VTL | -50 | - | - | mV | - |
| | Intra-pair Skew | TTOSK_intra | -0.3 | - | 0.3 | UI | (1) |
| | Inter-pair Skew | TTOSK_inter | -5 | - | 5 | UI | (2) |
| | Spread Spectrum Modulation range | 30KHz modulation | -0.5 | - | +0.5 | % | (3)(4) |
| | Spread Spectrum Modulation frequency | FSSM | | 30K | - | Hz | |
| | Differential Input Swing Voltage | V | 200 | - | 400 | mV | - |
| CMOS Interface | Input High Threshold Voltage | VIH | 2.4 | - | 3.3 | V | - |
| | Input Low Threshold Voltage | VIL | 0 | - | 0.6 | V | - |
| Data rate | | - | - | 2.97 | - | Gbps | - |
| Loop bandwidth | | - | - | 10 | - | MHZ | - |
| Damping factor | | - | - | 1 | - | - | - |

Note:

(1) Intra-pair skew

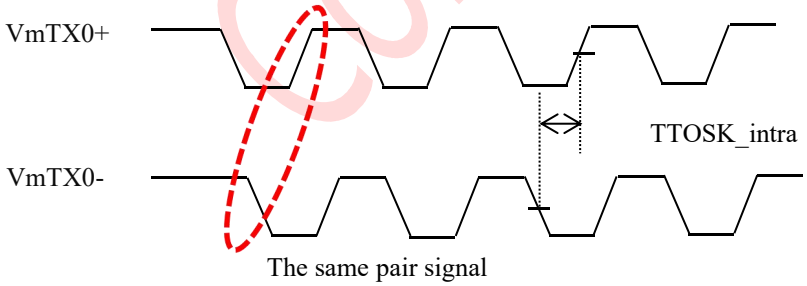


Fig. 3.3 V by one Intra-pair skew

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(2) Inter-pair skew

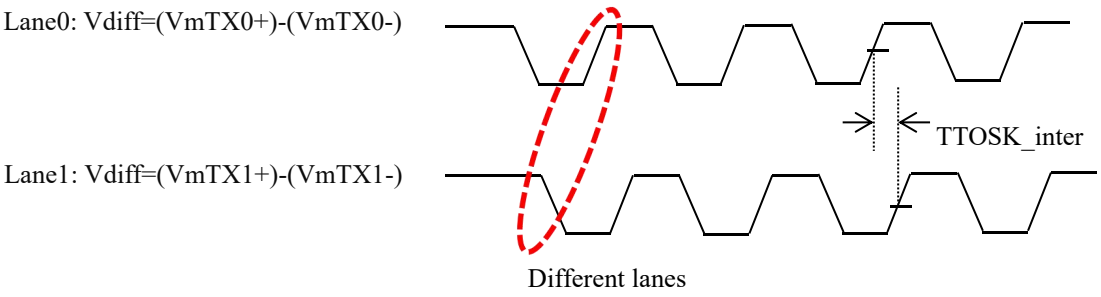


Fig. 3.4 V by one Inter-pair skew

(3) The SSCG (Spread Spectrum Clock Generator) is defined as the following figure.

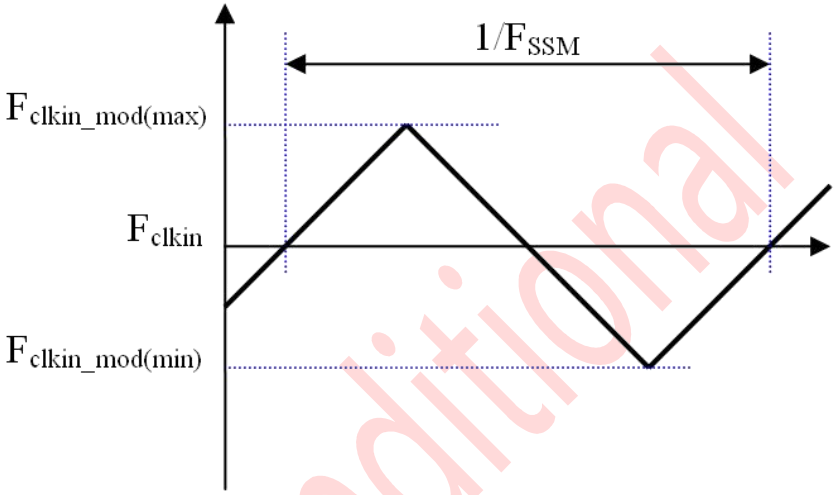


Fig. 3.5 Spread Spectrum Clock Generator

(4) The V by one SSM's suggestion is off by default, SOC board must test all validation if SOC board open the V by one SSM.

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### 3.1.3 V By One Input Signal Timing

| Item | X(UI) | Y(mV) | Note |
|---|---|---|---|
| A | 0.25 | 0 | (1) |
| B | 0.3 | 50 | (1) |
| C | 0.7 | 50 | (1) |
| D | 0.75 | 0 | (1) |
| E | 0.7 | -50 | (1) |
| F | 0.3 | -50 | (1) |

Note:

(1)

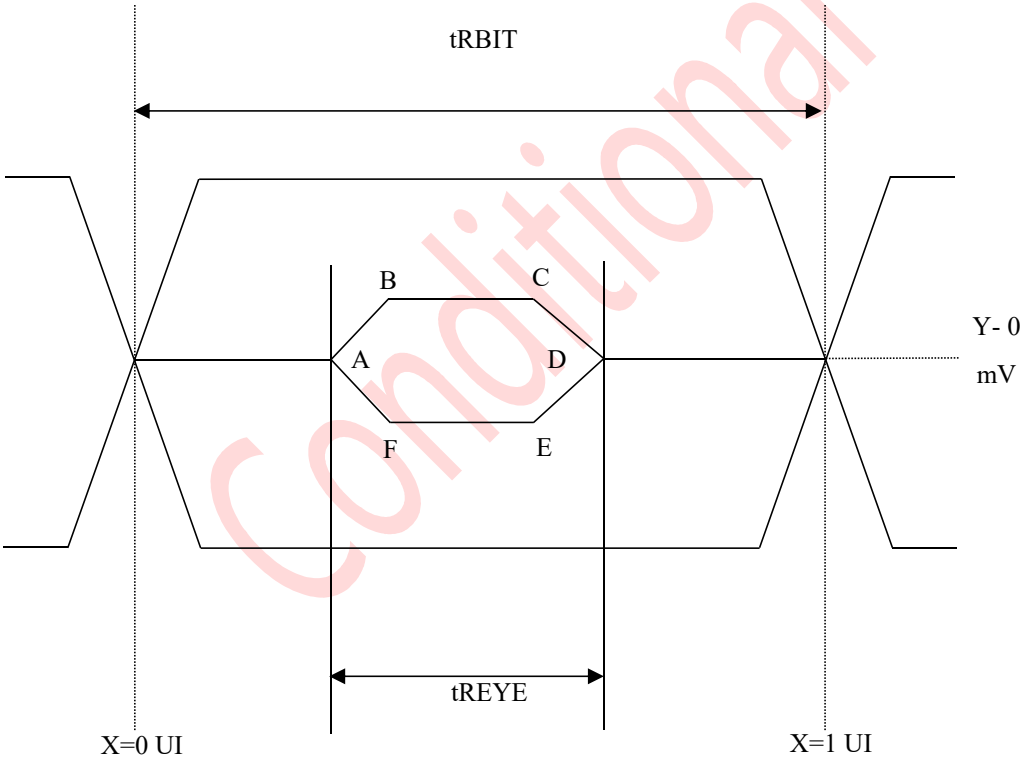


Fig. 3.6 V by one input signal timing

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### 3.1.4 V By One Data Mapping

V by One Data Mapping

| Lane | Data Stream |
|---|---|
| Lane 0 | Pixel 1, 5, 9, .....,1913, 1917 |
| Lane 1 | Pixel 2, 6, 10, .....,1914, 1918 |
| Lane 2 | Pixel 3, 7, 11, .....,1915, 1919 |
| Lane 3 | Pixel 4, 8, 12, .....,1916, 1920 |
| Lane 4 | Pixel 1921, 1925, 1929, .....,3833, 3837 |
| Lane 5 | Pixel 1922, 1926, 1930, .....,3834, 3838 |
| Lane 6 | Pixel 1923, 1927, 1931, .....,3835, 3839 |
| Lane 7 | Pixel 1924, 1928, 1932, .....,3836, 3840 |

TFT LCD Panel


### 3.1.5 Color Data Input Assignment

The brightness of each primary color is based on the 10-bit gray scale data input for each color. The higher the binary input, the brighter the color. The table below provides the assignment of the color versus.

| Data Input Color | | Data Signal | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Red | | | | | | | | | | Green | | | | | | | | | | Blue | | | | | | | | | |
| | | MSB | | | | | | | | | LSB | MSB | | | | | | | | | LSB | MSB | | | | | | | | | LSB |
| | | R9 | R8 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | G9 | G8 | G7 | G6 | G5 | G4 | G3 | G2 | G1 | G0 | B9 | B8 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| Basic Colors | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Red (1023) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green (1023) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue (1023) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Cyan | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Magenta | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Yellow | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | White | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Gray Scale of Red | Red (000) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red (001) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Red (1022) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red (1023) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gray Scale of Green | Green (000) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green (001) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Green (1022) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green (1023) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gray Scale of Blue | Blue (000) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue (001) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Blue (1022) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| | Blue (1023) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Attention:

0: Low level voltage; 1: High level voltage.

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### 3.2 Interface Connections

Interface Pin Assignment

CN1: F05035-51P-U (CT) or equivalent (1)

| Pin No. | Symbol | Description | Pin No. |
|---|---|---|---|
| 1 | VIN12 | Power input（+12V） | - |
| 2 | VIN12 | Power input（+12V） | - |
| 3 | VIN12 | Power input（+12V） | - |
| 4 | VIN12 | Power input（+12V） | - |
| 5 | VIN12 | Power input（+12V） | - |
| 6 | VIN12 | Power input（+12V） | - |
| 7 | VIN12 | Power input（+12V） | - |
| 8 | VIN12 | Power input（+12V） | - |
| 9 | NC | No Connection | （2） |
| 10 | GND | Ground | - |
| 11 | GND | Ground | - |
| 12 | GND | Ground | - |
| 13 | GND | Ground | - |
| 14 | GND | Ground | - |
| 15 | NC | No Connection | （2） |
| 16 | NC | No Connection | （2） |
| 17 | NC | No Connection | （2） |
| 18 | SDA | I2C Serial Data | - |
| 19 | SCL | I2C Serial Clock | |
| 20 | WP | Write Protection High(3.3V) for Writable, Open/Low(GND) for Protection | |
| 21 | NC | No Connection | （2） |
| 22 | NC | No Connection | （2） |
| 23 | NC | No Connection | （2） |
| 24 | NC | No Connection | （2） |
| 25 | HTPDN | Hot Plug Detect | （3） |
| 26 | LOCKN | Lock Detect | - |
| 27 | GND | Ground | - |
| 28 | VB1_Rx0N | V-By One HS Negative Data Lane 0 | - |
| 29 | VB1_Rx0P | V-By One HS Positive Data Lane 0 | - |
| 30 | GND | Ground | - |
| 31 | VB1_Rx1N | V-By One HS Negative Data Lane 1 | - |

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| | | | |
|---|---|---|---|
| 32 | VB1_Rx1P | V-By One HS Positive Data Lane 1 | - |
| 33 | GND | Ground | - |
| 34 | VB1_Rx2N | V-By One HS Negative Data Lane 2 | - |
| 35 | VB1_Rx2P | V-By One HS Positive Data Lane 2 | - |
| 36 | GND | Ground | - |
| 37 | VB1_Rx3N | V-By One HS Negative Data Lane 3 | - |
| 38 | VB1_Rx3P | V-By One HS Positive Data Lane 3 | - |
| 39 | GND | Ground | - |
| 40 | VB1_Rx4N | V-By One HS Negative Data Lane 4 | - |
| 41 | VB1_Rx4P | V-By One HS Positive Data Lane 4 | - |
| 42 | GND | Ground | - |
| 43 | VB1_Rx5N | V-By One HS Negative Data Lane 5 | - |
| 44 | VB1_Rx5P | V-By One HS Positive Data Lane 5 | - |
| 45 | GND | Ground | - |
| 46 | VB1_Rx6N | V-By One HS Negative Data Lane 6 | - |
| 47 | VB1_Rx6P | V-By One HS Positive Data Lane 6 | - |
| 48 | GND | Ground | - |
| 49 | VB1_Rx7N | V-By One HS Negative Data Lane 7 | - |
| 50 | VB1_Rx7P | V-By One HS Positive Data Lane 7 | - |
| 51 | GND | Ground | - |

Note:

(1) direction of pin assignment is shown as below:

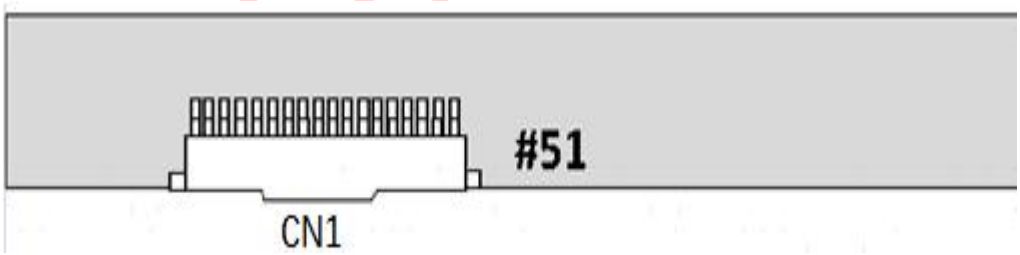


Fig 3.7 Connector direction sketch map

(2) Reserved internal use. Please leave it open.

(3) Connect 4.7K resistance to GND

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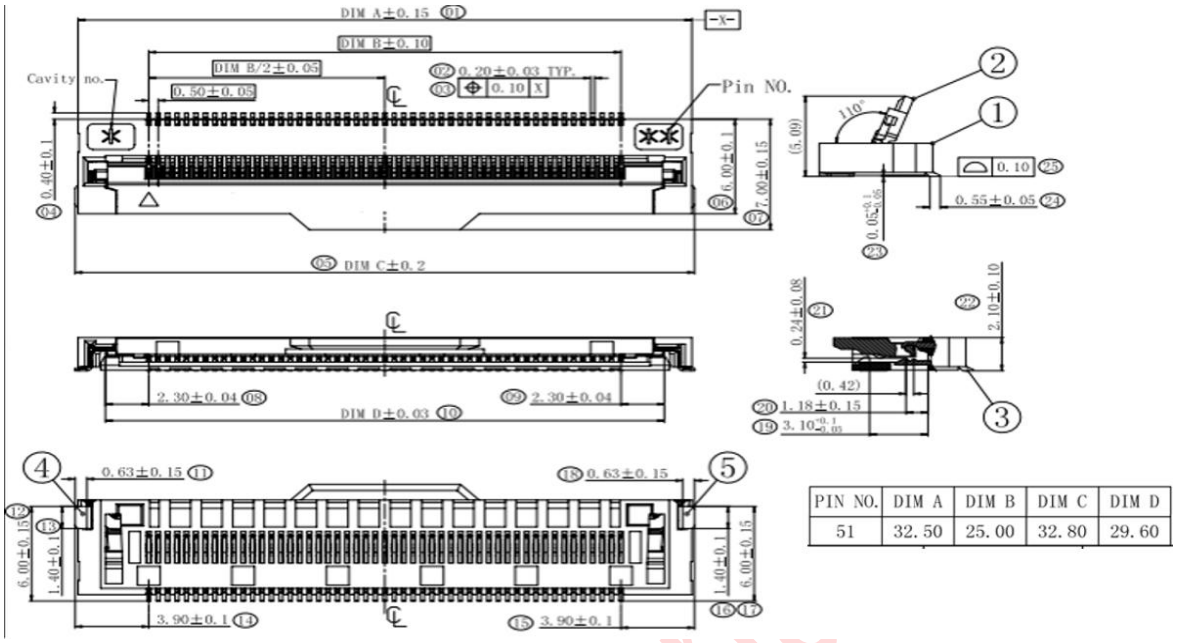
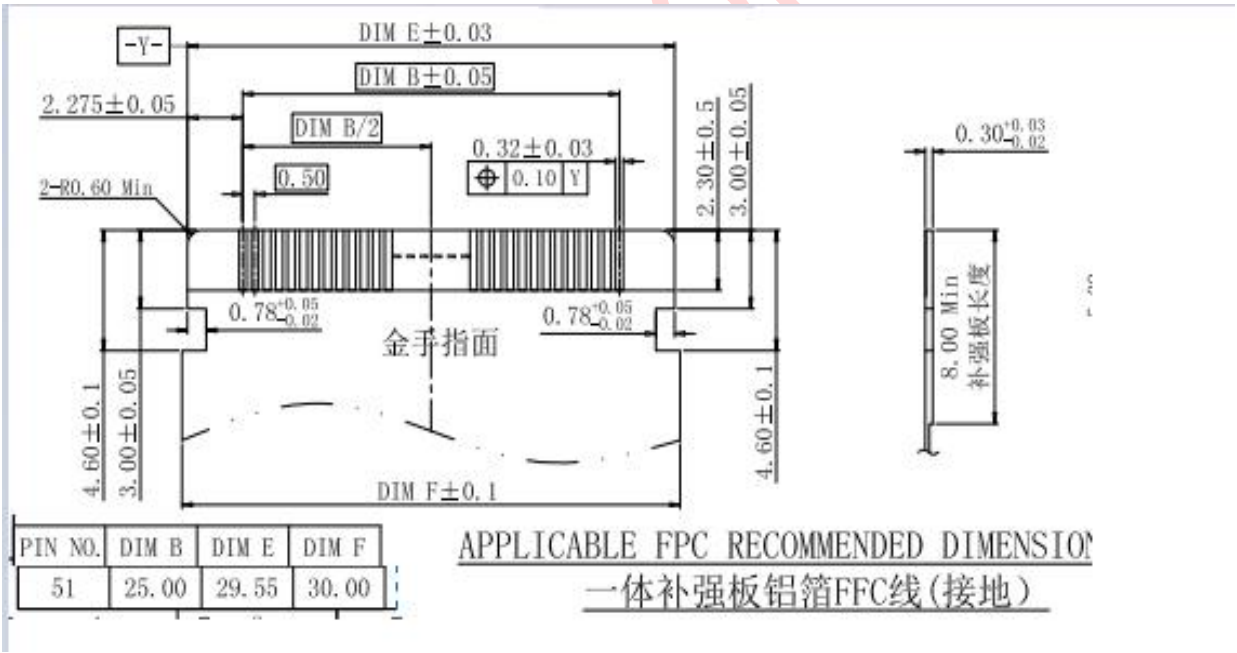
(4) Connector Drawing

TCON Board Input 51pin Connector Drawing- F05035-51P-U




| PIN NO. | DIM A | DIM B | DIM C | DIM D |
|---|---|---|---|---|
| 51 | 32.50 | 25.00 | 32.80 | 29.60 |

TCON Board Input 51pin FFC Drawing




| PIN NO. | DIM B | DIM E | DIM F |
|---|---|---|---|
| 51 | 25.00 | 29.55 | 30.00 |

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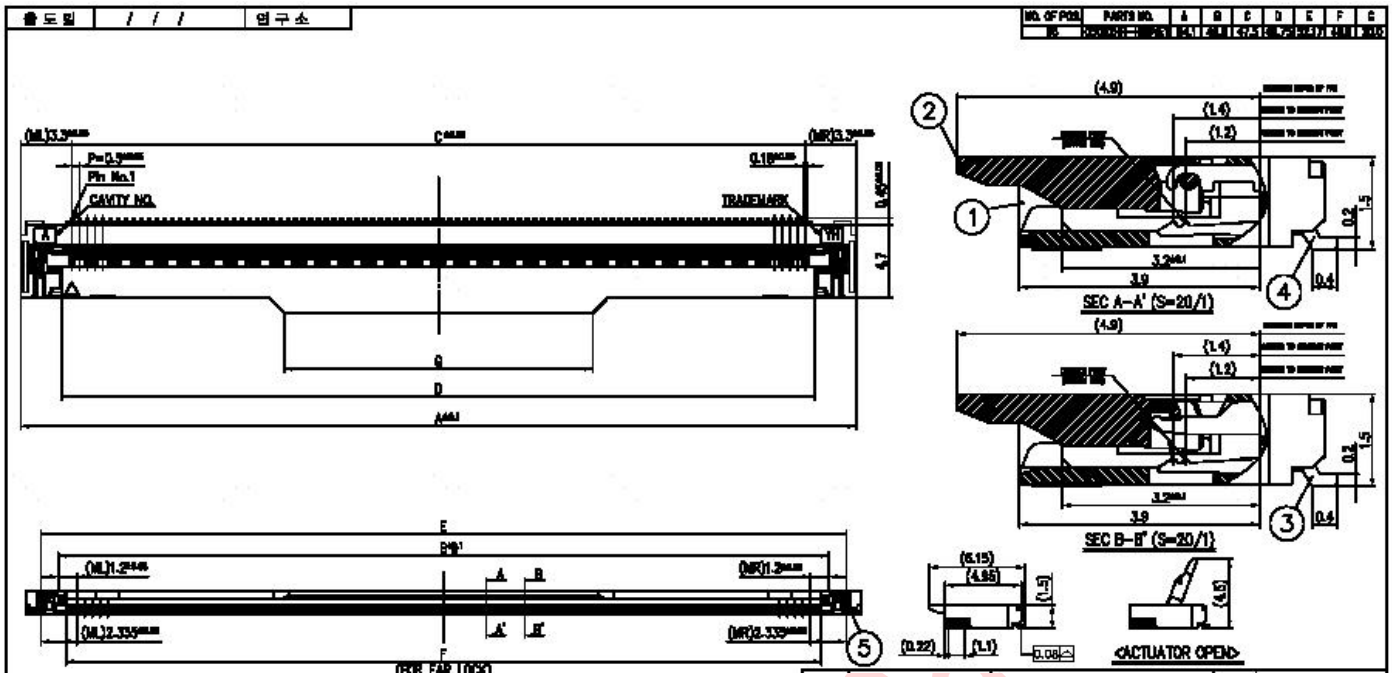
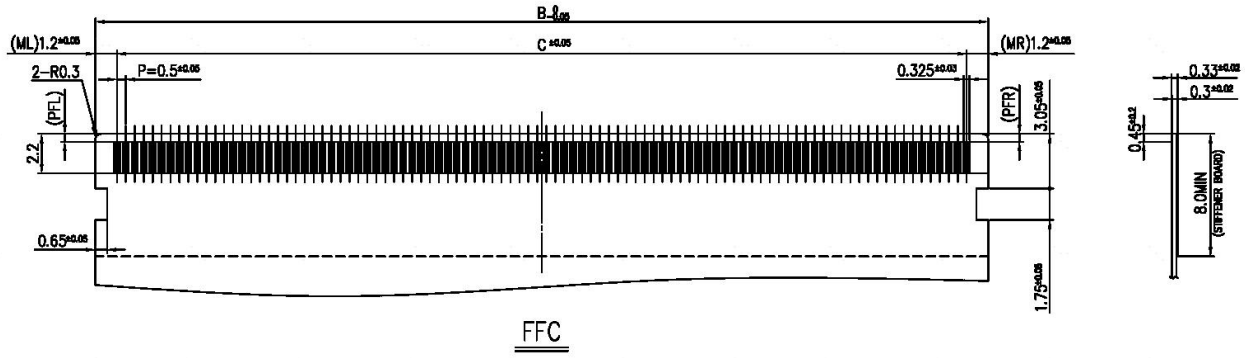
TCON Board Output 96 pin Connector Drawing- *05002HR-H96VE1(G)*




TCON Board Output 96pin FFC Drawing

FFC differential resistance RL=100Ω±10%，FFC recommends a maximum length of 10cm




FFC

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### 3.3 IC Characteristics

| Parameter | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | Min | Typ | Max | |
| TCON Surface Temperature | $T_{TS}$ | - | - | 100 | ℃ |
| Driver Surface Temperature | $T_{DS}$ | - | - | 120 | ℃ |
| PMIC Surface Temperature | $T_{PS}$ | - | - | 100 | ℃ |

Note :

(1) Any point on the IC surface must be less than the max value under any conditions.

(2) This test condition is based on HKC module

### 3.4 Timing Spec

Timing Table (DE Only Mode)

Frame Rate=60Hz

| Signal | Item | Symbol | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|
| Frequency | | $F_{CLK}$ (= 1 / $T_{CLK}$) | 71.75 | 74.25 | 76.75 | MHz | (1) |
| Frame Rate | | F | 58 | 60 | 62 | Hz | - |
| Vertical Term | Total | Tv | 2200 | 2250 | 2350 | TH | $T_V = T_{VD} + T_{VB}$ |
| | Display | $T_{VD}$ | 2160 | | | $T_H$ | - |
| | Blank | $T_{VB}$ | 40 | 90 | 190 | $T_H$ | - |
| Horizontal Term | Total | TH | 540 | 550 | 600 | $T_{CLK}$ | $T_H = T_{HD} + T_{HB}$ |
| | Display | $T_{HD}$ | 480 | | | $T_{CLK}$ | - |
| | Blank | $T_{HB}$ | 60 | 70 | 120 | $T_{CLK}$ | - |

Attention:

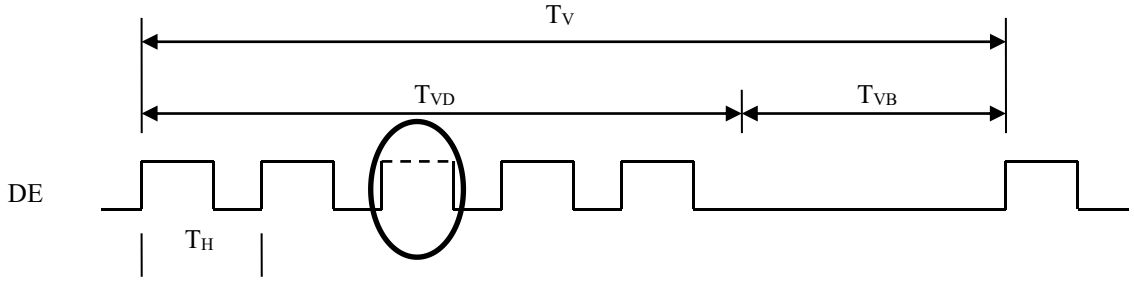
The module is operated in DE only mode, H sync and V sync input signal have no effect on normal operation.

Note:

(1) Please make sure the range of pixel clock follows the following equations:

Fclkin(max) ≥Fmax × Tv× Th

Fmin × Tv × Th ≥ Fclkin(min)




Conditional

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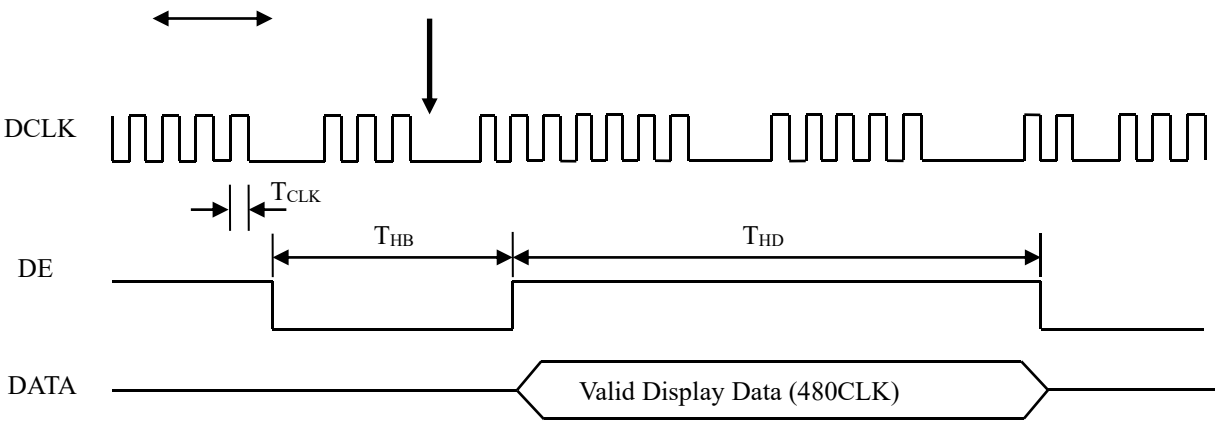


Fig.3.11 Interface signal timing diagram

Conditional

### 3.5 Power On/Off Sequence

To prevent a latch-up or DC operation of LCD module, the power on/off sequence should be as the diagram below.

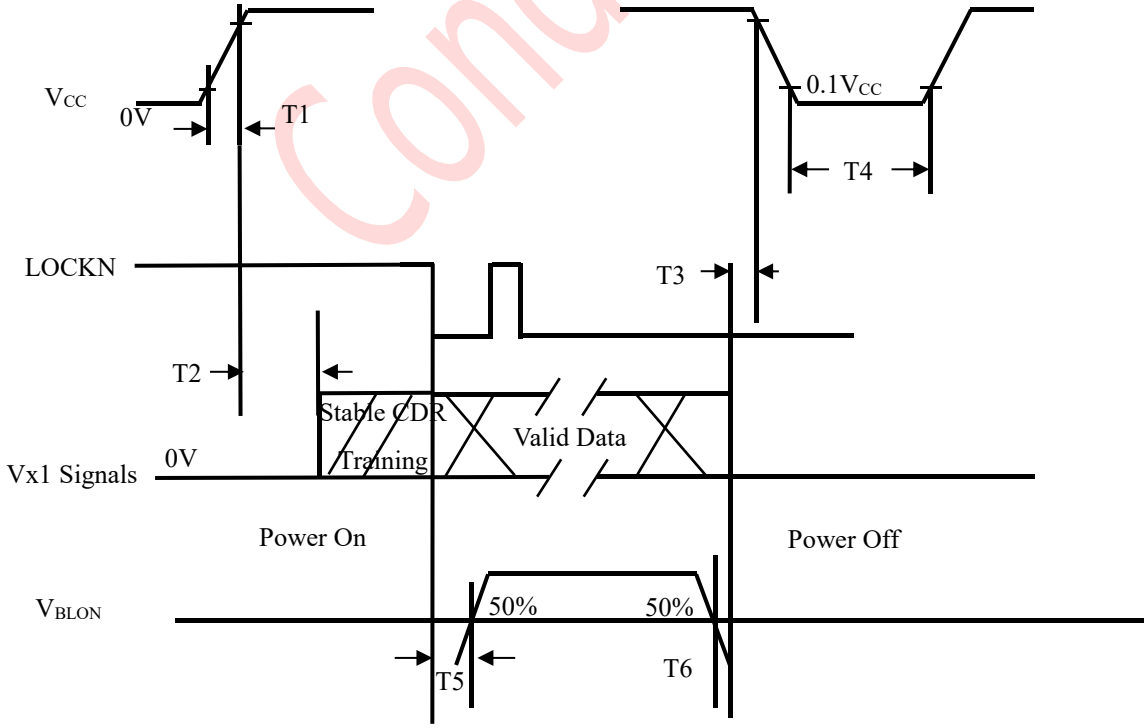


Fig. 3.12 Power on/off sequence

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| Parameter | Values | | | Unit |
|---|---|---|---|---|
| | Min. | Typ. | Max. | |
| T1 | 0.5 | | 10.0 | ms |
| T2 | 0 | | | ms |
| T3 | 0 | | | ms |
| T4 | 1000 | | | ms |
| T5 | 500 | | | ms |
| T6 | 100 | | | ms |

Attention:

(1) Apply the light bar voltage within the LCD operation range. When the backlight turns on before the LCD operation or the LCD turns off before the backlight turns off, the display may momentarily become abnormal screen.

(2) In case that $V_{CC}$ is in off level, please keep the level of input signals on the low or high impedance.

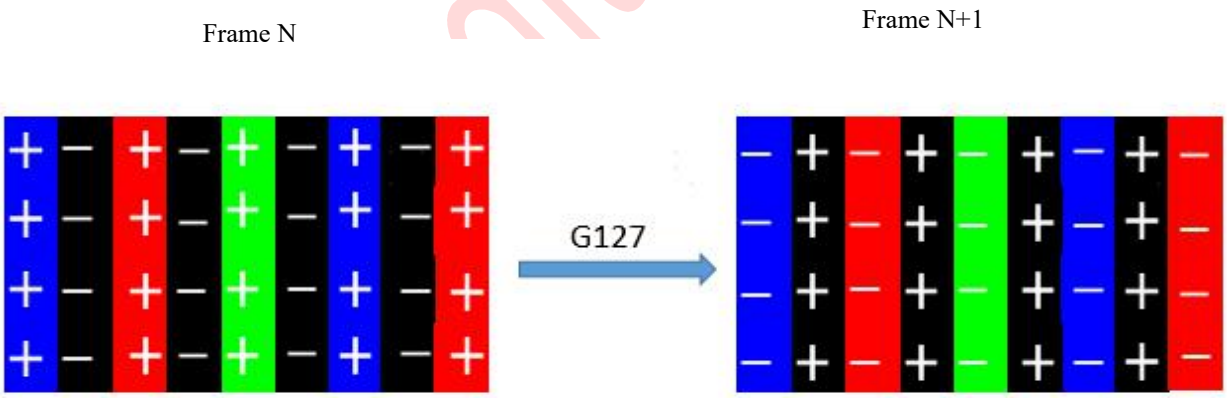
(3) T4 should be measured after the module has been fully discharged between power off and on period.

(4) Interface signal shall not be kept at high impedance when the power is on.

(5) The product should be always operated within above ranges.

### 3.6 Flicker Pattern

The Flicker adjustment pattern suggested as below.




Bright sub-pixel=G127(50% grayscale); dark sub-pixel=G0（0%grayscale）

Fig 3.13 Flicker pattern

### 3.7 Driver IC ESD spec

If the LCD module is designed with the Plastic Bezel, we suggest ESD protection solutions should be applied to avoid IC damaged, as shown in Fig.3.14.

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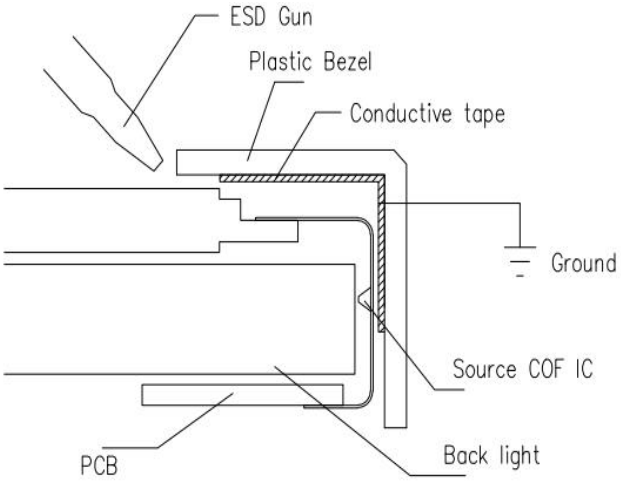


Fig. 3.14 Source COF IC ESD protection

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# 4. OPTICAL CHARACTERISTICS

## 4.1 Measurement Conditions

The table below is the test condition of optical measurement.

| Item | Symbol | Value | Unit |
|---|---|---|---|
| **Ambient Temperature** | $T_A$ | 25±2 | ºC |
| **Ambient Humidity** | $H_A$ | 50±10 | % RH |
| **Supply Voltage** | $V_{CC}$ | 12 | V |
| **Driving Signal** | Refer to the typical value in Chapter 3: Electrical Specification | | |
| **Vertical Refresh Rate** | $F_v$ | 60 | Hz |
| **Light source** | HKC module White LED Backlight Module/ Film structure | | |
| **Warm up time** | Twarm | >30 min | min |
| **Dark room** | ED | 1lux> | lux |

To avoid abrupt temperature change during optical measurement, the measurement should be executed in a stable, windless, in dark room after lighting the light source.

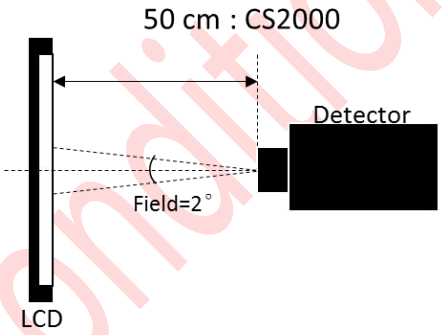


Fig.4.1 Measurement equipment.

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## 4.2 Optical Specifications

The relative measurement methods of optical characteristics are shown in 4.2. The following items should be measured under the test conditions described in 4.1 and stable environment shown in 4.1.

| | | Symbol | Condition | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|---|
| Color Chromaticity (CIE1931) | Red | Rx | $\theta_x$=0°,$\theta_y$=0° Viewing Angle at Normal Direction at center point of panel, Light source is HKC Backlight | Typ -0.03 | 0.641 | Typ + 0.03 | - | (1) |
| | | Ry | | | 0.335 | | | |
| | Green | Gx | | | 0.299 | | | |
| | | Gy | | | 0.628 | | | |
| | Blue | Bx | | | 0.147 | | | |
| | | By | | | 0.075 | | | |
| | White | Wx | | | 0.280 | | | |
| | | Wy | | | 0.313 | | | |
| Transmittance | | T% | | 4.9% | 5.5% | - | % | (2) |
| Color Gamut | | NTSC | | 68% | 72% | - | % | (3) |
| Contrast Ratio | | CR | $\theta_x$=0°,$\theta_y$=0° With HKC BLU | 4000 | 5000 | - | - | (4) |
| Response Time | | $T_g$ | | - | 8.5 | 16 | ms | (5) |
| Viewing Angle | Horizontal | $\theta_x$+ | CR≧10 | - | 89 | - | Deg. | (6) |
| | | $\theta_x$ - | | - | 89 | - | | |
| | Vertical | $\theta_y$+ | | - | 89 | - | | |
| | | $\theta_y$- | | - | 89 | - | | |

Note:

Light source here is the backlight of HKC Module, and film structure is one diffuser and two prism sheets.

(1) Each chromaticity coordinates (x, y) are measured in CIE1931 color space when full-screen displaying (Red, Green, Blue, White) and light source is defined by HKC Backlight, measurements shall be made at the center of the panel, and setup of measurement is shown in Fig 4.1.

(2) The color gamut is defined as the fraction in percent of the area of the triangle bounded by R, G, B coordinates and the area is defined by NTSC 1931 color standard in the CIE color space. Chromaticity coordinates are measured by CS2000 and the standard setup of measurement is shown in Fig 4.1.

(3) Definition of Transmittance (T%):

The transmittance is measured with full white pattern ($L_{max}$) at the center of the LCD panel.

$$\text{Transmittance (T\%)} = \frac{\text{Luminance of LCD module}}{\text{Luminance of backlight}}$$

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(4) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression,

Contrast Ratio (CR): $\boldsymbol{CR} = \frac{\boldsymbol{CR_W}}{\boldsymbol{CR_D}}$

$CR_W$ : Luminance of LCD module with full screen white pattern (255,255, 255) at center point.

$CR_D$ : Luminance of LCD module with full screen Dark pattern (0, 0, 0) at center point.

Where the measure point of to the Contrast Ratio is the center of the panel

(5) Definition of Response time (Tg):

Average of gray to gray response time ($T_g$) means the average switching time of luminance ratios among 0%,25%,50%,75%,and 100% to each other and is optimized on frame rate =60Hz.

| **Measured Response time** | | **To** | | | | |
|---|---|---|---|---|---|---|
| | | **0%** | **25%** | **50%** | **75%** | **100%** |
| From | 0% | | $T_{0\%to25\%}$ | $T_{0\% to 50\%}$ | $T_{0\% to 75\%}$ | $T_{0\% to 100\%}$ |
| | 25% | $T_{25\% to 0\%}$ | | $T_{25\% to 50\%}$ | $T_{25\% to 75\%}$ | $T_{25\% to 100\%}$ |
| | 50% | $T_{50\% to 0\%}$ | $T_{50\% to 25\%}$ | | $T_{50\% to 75\%}$ | $T_{50\% to 100\%}$ |
| | 75% | $T_{75\% to 0\%}$ | $T_{75\% to 25\%}$ | $T_{75\% to 50\%}$ | | $T_{75\% to 100\%}$ |
| | 100% | $T_{100\% to 0\%}$ | $T_{100\% to 0\%}$ | $T_{100\% to 50\%}$ | $T_{100\% to 75\%}$ | |

Table 4.2 Switching time of luminance ratios matrix

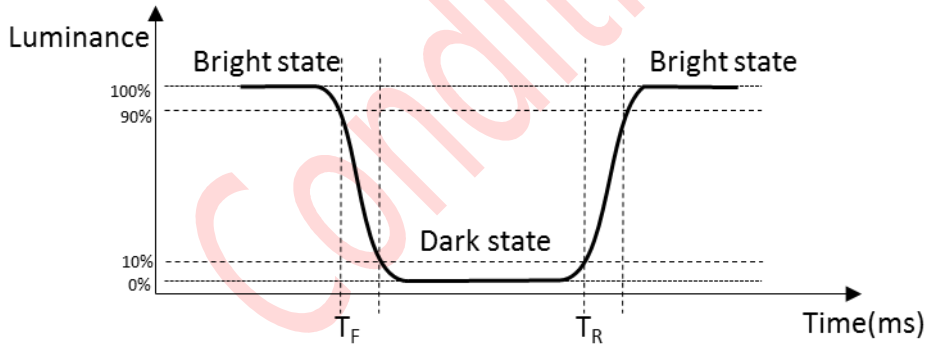


Fig 4.3 The definition of TR and TF

Measured response time is determined by 10% to 90% brightness difference of rising ($T_R$) or falling ($T_F$) time.

(6) Definition of Viewing angle:

As Note (4) the static contrast ratio definition, the viewing angles are defined at the angle that the contrast ratio is larger than 10 at four directions relative to the perpendicular direction of the HKC's module (two vertical angles: up $\theta_y$+ and down $\theta_y$-; and two horizontal angles: right $\theta_x$+ and left $\theta_x$-). The standard setup of measurement is shown in Fig 4.1 & 4.4

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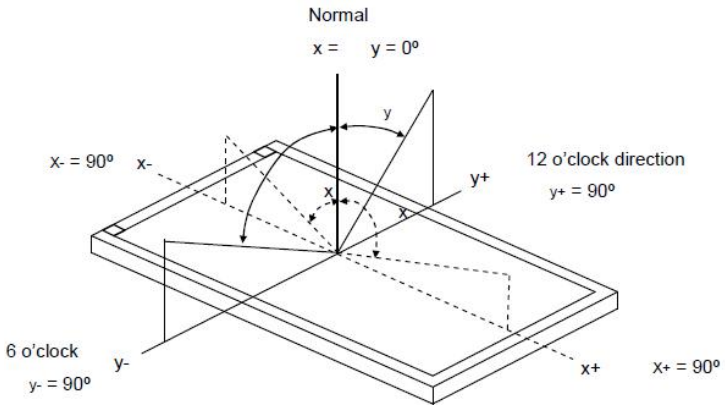


Fig 4.4 Definition of Viewing angle

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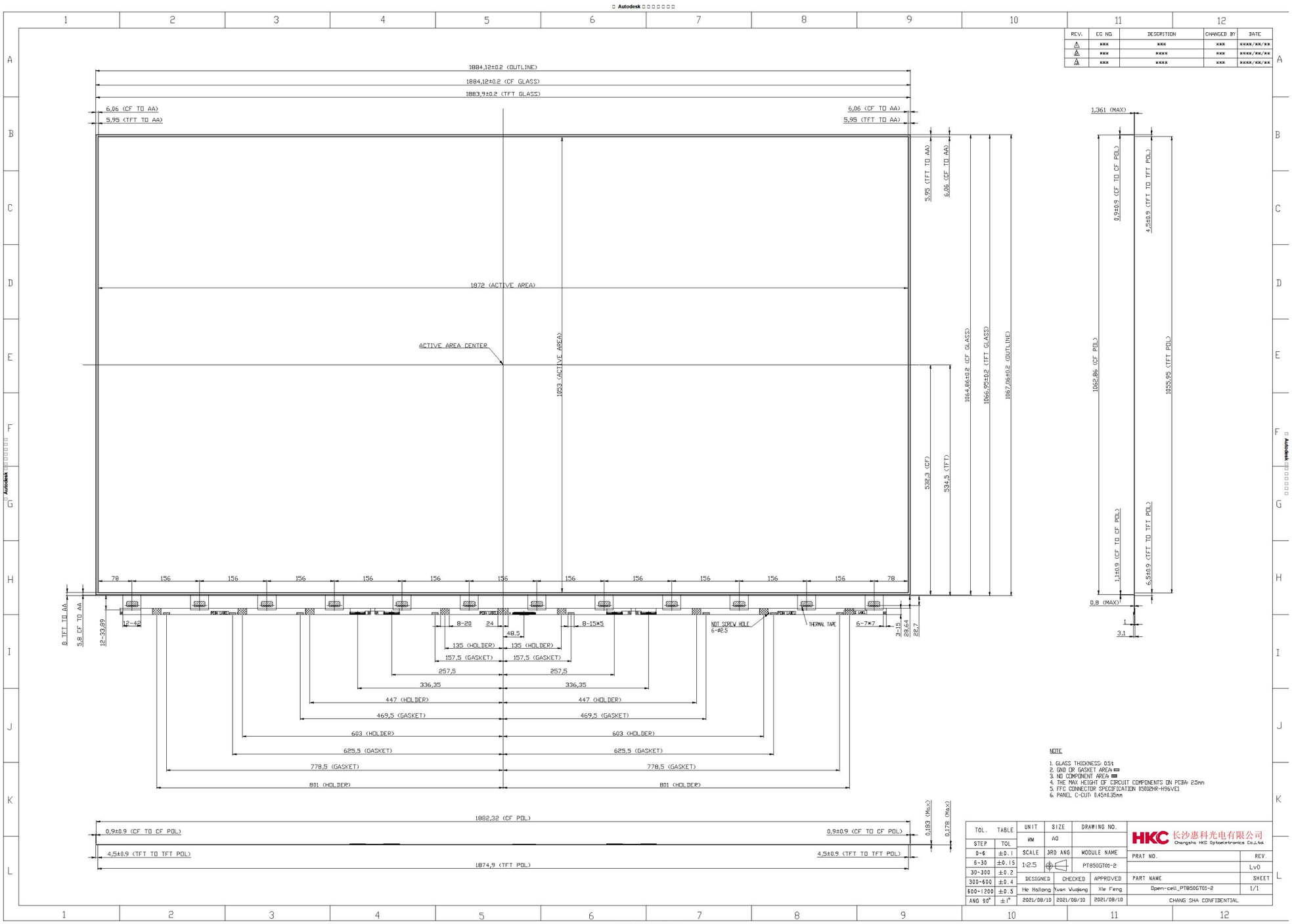
# 5. MECHANICAL CHARACTERISTICS

## 5.1 Mechanical Specification

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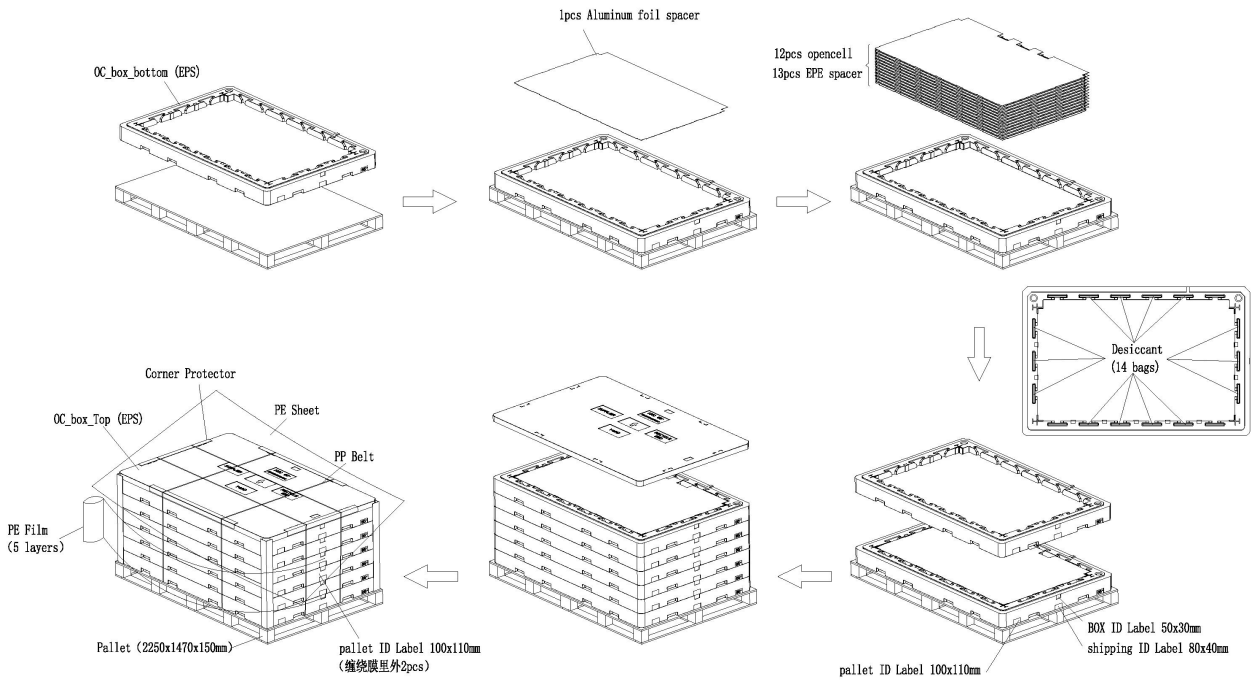
## 5.2 Packing

### 5.2.1 Packing Specifications

| Item | Specification | | | |
|---|---|---|---|---|
| | Quantity | Dimension(mm) | Item | Weight(Kg) |
| Packing Box | 12 pcs/box | 2200×1435×158 | Net Weight<br>Gross Weight | 71.2<br>87.9 |
| Pallet | 1 | 2250×1470×150 | Net Weight | 44.1 |
| Stack Layer | 6 | | | |
| Boxes per Pallet | 6 | | | |
| Pallet after Packing | 72 pcs/pallet | 2250x1470x1096 | Gross Weight | 582.9 |




1、先缠膜，再放纸护角，再打包带

2、opencell不够12pcs/box时，用EPE spacer代替填充，填充量以治具量测

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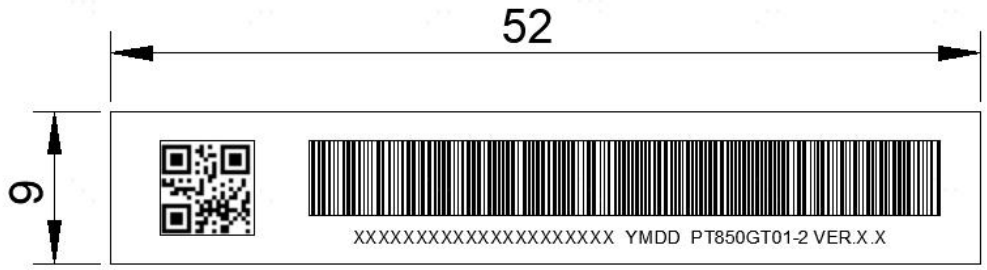
## 6. DEFINITION OF LABELS

### 6.1 Open Cell Label




XXXXXXXXXXXXXXXXXXXX YMDD PT850GT01-2 Ver.X.X

- Ver.X.X → Model Version Code
- PT850GT01-2 → Model Name
- YMDD → Manufactured Date
- XXXXXXXXXXXXXXXXXXXX → Serial Number

Serial Number: XXXXXXXXXXXX XXXXXXXXX

- XXXXXXXXX → HKC Internal Use
- XXXXXXXXXXXX → Panel ID

Manufactured Date: Y M DD

- DD → Date: 01~31
- M → Month: 1~9, A~C, for Jan.~Dec
- Y → Year: 2017=7, 2018=8, 2020=0……

Model Name: PT850GT01-2

Model Version Code: Ver.X.X, for example: 0.0,0.1…,1.0,1.1….,2.0,2.1……

Conditional

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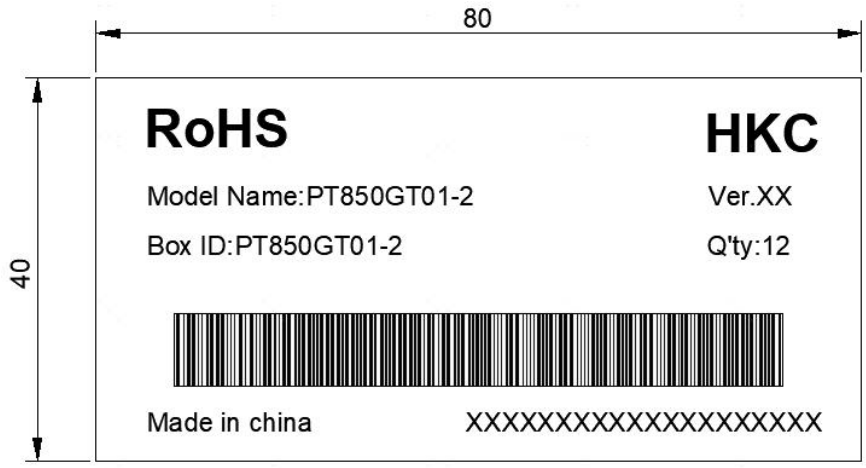
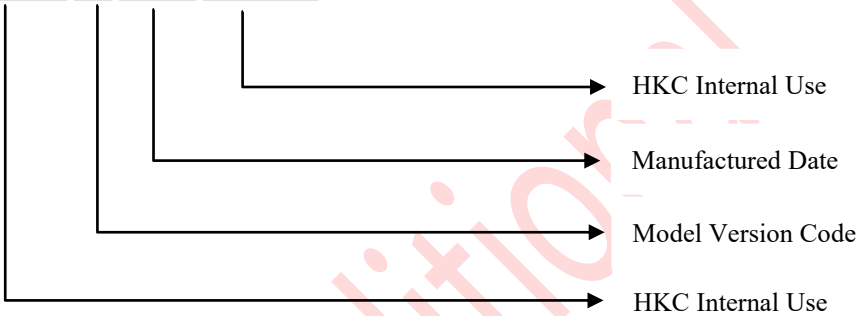
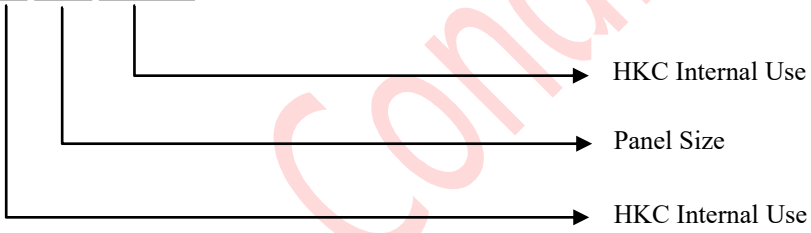
### 6.2 Carton Label




Serial Number: XXXXXXXX XX XXXX XXXXXX




Box ID: XX XXX XXXXX




Model VersionCode:Ver.X.X,forexample:0.0,0.1…,1.0,1.1….,2.0,2.1……

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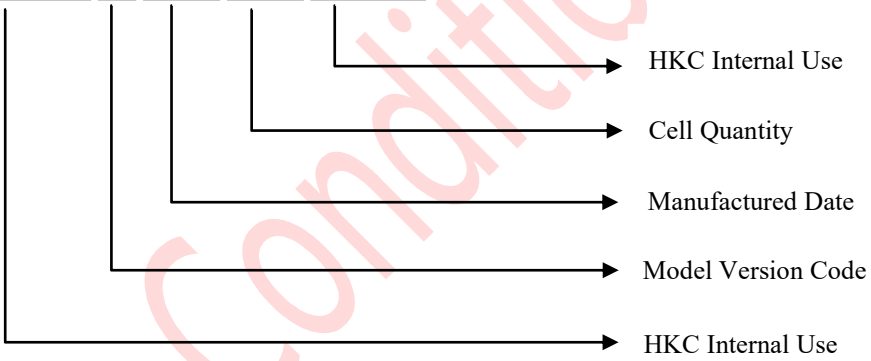
### 6.3 Pallet Label


Serial Number: XXXXXXXX XX XXXX XXXX XXXXXX




Pallet ID: XXXXXXXX

Conditional

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# 7. PRECAUTION

Please pay attention to the followings when a TFT-LCD cell is used, handled and mounted.

## 7.1 Unpacking

Should use immediately after unpacking TFT -LCD cell to prevent the terminal corrosion.

Protection film for a polarizer on a TFT open cell should be slowly peeled off so that the electrostatic charge can be minimized.

Source PCB should be connected to the ground when peel off the protection film.

The protection film should not be contacted to the driver during peeling off.

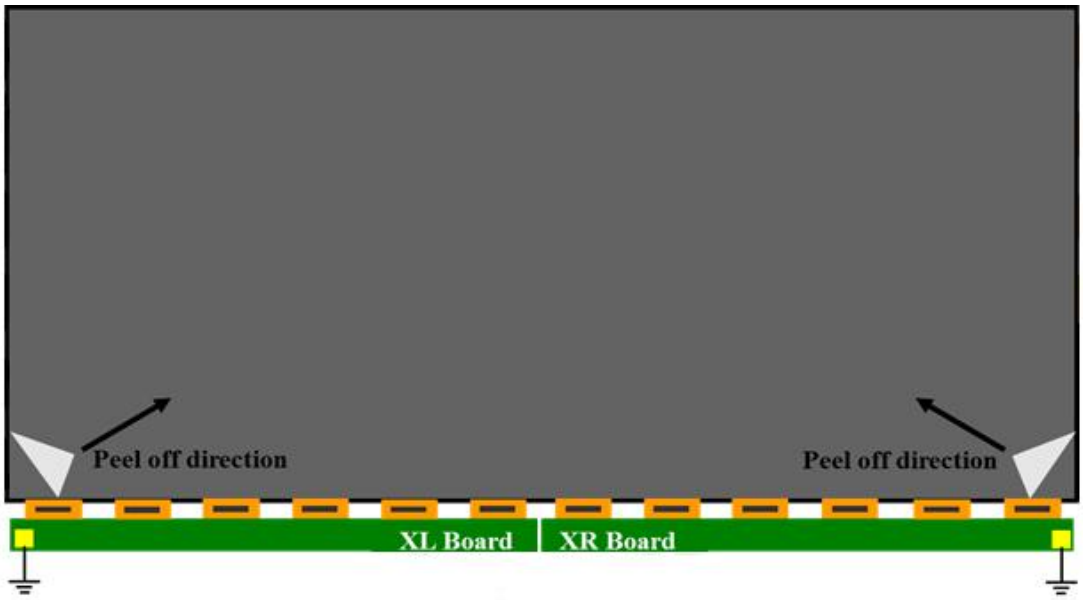


Fig 7.1 Unpacking

## 7.2 Storage Test

Any attachment on polarizer of open-cell,such as tape,is forbidden and not recommend,especially under the high temperature and high humidity environment.

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## 8. GP REQUIREMENT

a) RoHS, Directive 2011/65/EU of the European Parliament and council of 1 July 2011

b) RoHS, Directive (EU) 2015/863 of the European Parliament and council of 31 March 2015

c) PPW, Directive 94/62/EC on packaging and packaging waste with amendment(EU)2018/852

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