



## **12.3 inch TFT Display Series**



**GDTL123UL-S01**

Dalian Good Display Co., Ltd.

- ☐ Tentative Specification  
☒ Preliminary Specification  
☐ Approval Specification

# MODEL NAME: GDTL123UL-S01

## Version:C 2

**Customer: Common**

**APPROVED BY                      SIGNATURE**

**Name / Title** \_\_\_\_\_

Note \_\_\_\_\_

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| Approved By                                                                         | Checked By                                                                          | Prepared By                                                                           |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|  |  |  |

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## Revision History

| Version | Date       | Page (New) | Section | Description                            | Revision by |
|---------|------------|------------|---------|----------------------------------------|-------------|
| Pre.1.0 | 2023/06/05 | -          | All     | Preliminary Specification first update | P1          |
|         |            |            |         |                                        |             |
|         |            |            |         |                                        |             |
|         |            |            |         |                                        |             |
|         |            |            |         |                                        |             |
|         |            |            |         |                                        |             |
|         |            |            |         |                                        |             |

## 1. GENERAL DESCRIPTION

### 1.1 General Description

The specification is applied to 12.3 inch model (GDTL123UL-S01) TFT Liquid Crystal Display.

The matrix uses a-Si Thin Film Transistor as a switching device. This TFT LCD has a 12.3 inch diagonally measured active display area with FHD resolution (1920 horizontal by 720 vertical pixels array). All input signals are LVDS interface.

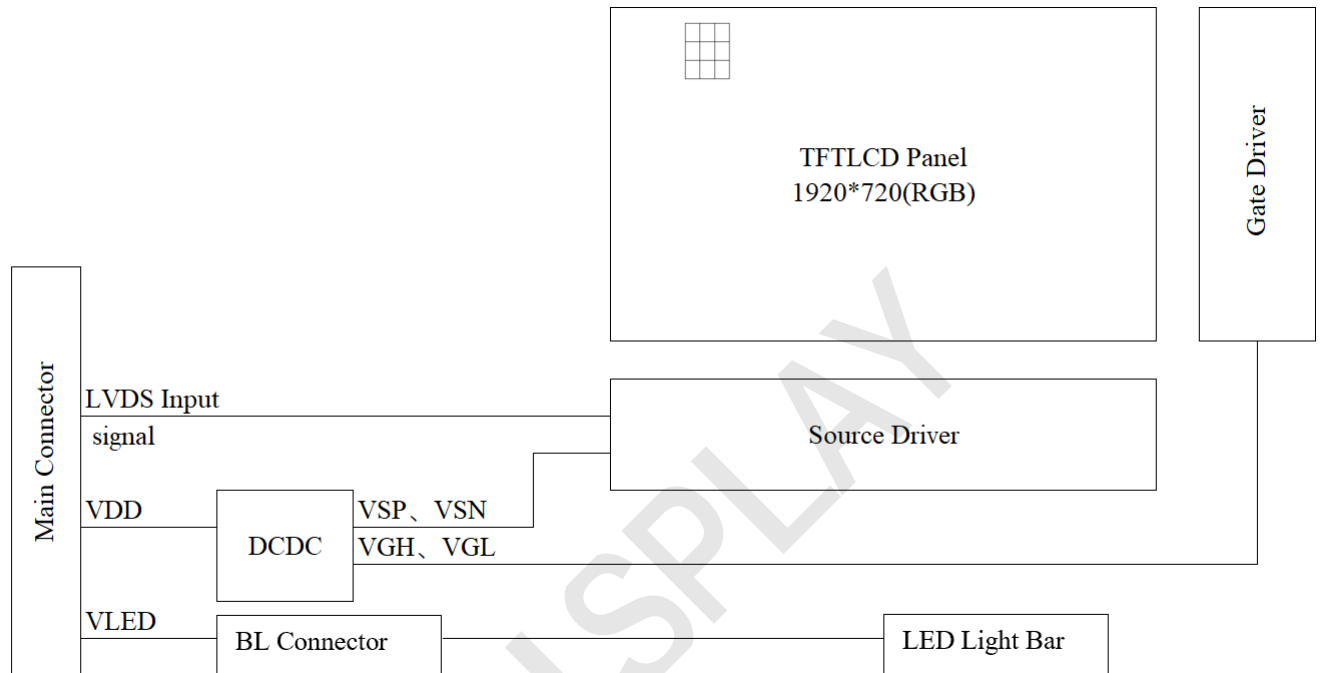


Figure 1. Drive Architecture

### 1.2 Features

- ( 1 ) 2 Port LVDS interface
- ( 2 ) 16.7M (8bit) color depth, color gamut typ. 75%
- ( 3 ) Green product (RoHS & Halogen free product)

## 1.3 General Specifications

The followings are general specifications at the model G123UL-S02. (listed in Table 1)

<Table 1. General Specifications>

| Item                    |                 | Specification                | Unit   | Note |
|-------------------------|-----------------|------------------------------|--------|------|
| Active area             |                 | 292.032 (H) ×109.512 (V)     | mm     | -    |
| Number of pixels        |                 | 1920(H) ×720(V)              | pixels | -    |
| Pixel pitch             |                 | 0.1521 (H) ×0.1521 (V)       | mm     | -    |
| Pixel arrangement       |                 | RGB Vertical stripe          | -      | -    |
| Display colors          |                 | 16.7M(8bits)                 | -      | -    |
| Color gamut             |                 | NTSC 75% Typ. , 70% min.     | -      | -    |
| Display mode            |                 | Normally black               | -      | -    |
| Outline<br>Dimension    | Without<br>PCBA | 302.63(H)*123.61(W)*6.65 (V) | mm     | -    |
| Surface treatment       |                 | HC                           | -      | -    |
| Surface hardness        |                 | 3H                           | -      | -    |
| Logic Power Consumption |                 | PD:TBD ( Max )               | W      | -    |

## 2. ABSOLUTE MAXIMUM RATINGS

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit.

The operational and non-operational maximum voltage and current values are listed in Table 2.

<Table 2. Absolute Maximum Ratings>

Ta=25+/-2 ℃

| Parameter             | Symbol          | Min.  | Max.                 | Unit | Remarks            |
|-----------------------|-----------------|-------|----------------------|------|--------------------|
| Power Supply Voltage  | V <sub>DD</sub> | -0.3  | 4                    | V    | (1),(2)<br>(3),(4) |
| Logic Supply Voltage  | V <sub>IN</sub> | - 0.3 | V <sub>DD</sub> +0.3 | V    |                    |
| Operating Temperature | T <sub>OP</sub> | -30   | 85                   | ℃    |                    |
| Storage Temperature   | T <sub>ST</sub> | -40   | 90                   | ℃    |                    |

Note (1) All the parameters specified in the table are absolute maximum rating values that may cause faulty operation or unrecoverable damage, if exceeded. It is recommended to follow the typical value.

Note (2) All the contents of electro-optical specifications and display fineness are guaranteed under Normal Conditions. All the display fineness should be inspected under normal conditions. Normal conditions are defined as follow: Temperature: 25 ℃, Humidity: 55±10%RH.

Note (3) Unpredictable results may occur when it was used in extreme conditions. Ta= Ambient Temperature, Tgs= Glass Surface Temperature. All the display fineness should be inspected under normal conditions.

Note (4) Temperature and relative humidity range are shown in the figure below. Wet bulb temperature should be lower than 57.8 ℃, and no condensation of water. Besides, protect the module from static electricity.

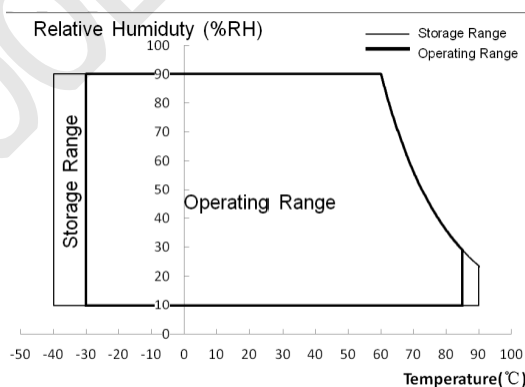


Figure 2. Operating and storage environment

## 3. ELECTRICAL SPECIFICATIONS

### 3.1 Electrical Specifications

<Table 3. Electrical Specifications>

Ta=25+/-2°C

| Parameter                        | Symbol | Min. | Typ. | Max. | Unit | Remarks |
|----------------------------------|--------|------|------|------|------|---------|
| Power Supply Voltage             | VDD    | -    | 3.3  | -    | V    | Note 2  |
| Permissible Input Ripple Voltage | VRF    | -    | -    | 200  | mV   | -       |
| Power Supply Current             | IDD    | -    | -    | TBD  | mA   | Note 1  |
| Power Supply Inrush Current      | Inrush | -    | -    | 1.5  | A    | Note 2  |
| Power Consumption                | mosaic | -    | -    | TBD  | W    | Note 1  |

#### Notes

- The supply voltage is measured and specified at the interface connector of LCM. The current draw and power consumption specified is for 3.3V at 25 °C.

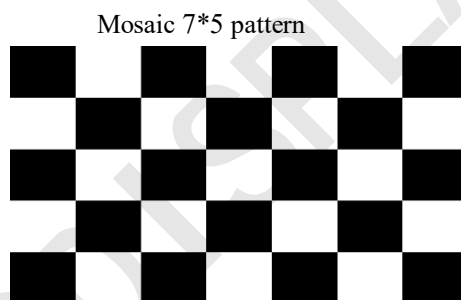


Figure 3 Power Measure Patterns

- Measure condition (Figure 4)

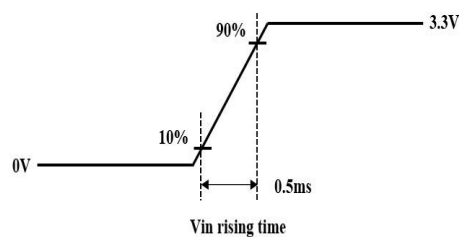


Figure 4 Inrush Measure Condition

## 3.2 Backlight Unit

| Parameter     | Symbol | Min    | Typ     | Max | Units | Condition                                                 |
|---------------|--------|--------|---------|-----|-------|-----------------------------------------------------------|
| LED Current   | $I_L$  | --     | 360     | --  | mA    | $T_a=25^{\circ}\text{C}$                                  |
| LED Voltage   | $V_L$  | --     | 24.5    | 28  | Volt  | $T_a=25^{\circ}\text{C}$                                  |
| LED Life-Time | N/A    | 30,000 | 100,000 | --  | Hour  | $T_a=25^{\circ}\text{C}$<br>$I_F=90\text{mA}$<br>Note (2) |

Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition:  $T_a=25\pm 3^{\circ}\text{C}$ , typical  $I_L$  value indicated in the above table until the brightness becomes less than 50%.

Note (2) The "LED life time" is defined as the module brightness decrease to 50% original brightness at  $T_a=25^{\circ}\text{C}$  and  $I_L=360\text{mA}$ . The LED life time could be decreased if operating  $I_L$  is larger than  $240\text{mA}$ . The constant current driving method is suggested.

Note (3) LED Light Bar Circuit.



## 4. OPTICAL SPECIFICATION

### 4.1 Measurement Conditions

The table below is the test condition of optical measurement.

<Table 4. the test condition of optical measurement >

| Item                  | Symbol                                                            | Value   | Unit |
|-----------------------|-------------------------------------------------------------------|---------|------|
| Ambient Temperature   | $T_A$                                                             | 23±5    | °C   |
| Ambient Humidity      | $H_A$                                                             | 50±20   | % RH |
| Supply Voltage        | $V_{CC}$                                                          | 3.3     | V    |
| Driving Signal        | Refer to the typical value in Chapter 3: Electrical Specification |         |      |
| Vertical Refresh Rate | $F_v$                                                             | 60      | Hz   |
| Warm up time          | $T_{warm}$                                                        | >15 min | min  |
| Dark room             | ED                                                                | <1 lux  | lux  |

### 4.2 Optical Specifications

<Table 5. Optical Specifications>

| Item                                                    |            | Symbol      | Condition                                                | Min.       | Typ.    | Max.          | Unit              | Note |
|---------------------------------------------------------|------------|-------------|----------------------------------------------------------|------------|---------|---------------|-------------------|------|
| Only CF Color<br>Chromaticity(CIE1931)<br>Under C-light | Red        | Rx          | $\theta x=0^{\circ}, \theta y=0^{\circ}$                 | Typ. -0.05 | (0.657) | Typ.<br>+0.05 | -                 | (1)  |
|                                                         |            | Ry          |                                                          |            | (0.320) |               |                   |      |
|                                                         | Green      | Gx          |                                                          |            | (0.283) |               |                   |      |
|                                                         |            | Gy          |                                                          |            | (0.606) |               |                   |      |
|                                                         | Blue       | Bx          |                                                          |            | (0.138) |               |                   |      |
|                                                         |            | By          |                                                          |            | (0.104) |               |                   |      |
|                                                         | White      | Wx          |                                                          |            | (0.300) |               |                   |      |
|                                                         |            | Wy          |                                                          |            | (0.330) |               |                   |      |
| Color Gamut                                             |            | CG          |                                                          | 70         | 75      | -             | %                 |      |
| Center Luminance of White                               |            | Lc          |                                                          | 800        | 1000    | -             | cd/m <sup>2</sup> |      |
| Contrast Ratio                                          |            | CR          | $\theta x=0^{\circ}, \theta y=0^{\circ}$                 | 1200:1     | 1500:1  | -             | -                 | (2)  |
| Response Time                                           |            | Tg=25°C     |                                                          | -          | -       | (30)          | ms                | (3)  |
|                                                         |            | Tg=-20°C    |                                                          | -          | -       | (250)         | ms                |      |
|                                                         |            | Tg=-30°C    |                                                          | -          | -       | (450)         | ms                |      |
| Viewing Angle                                           | Horizontal | $\theta x+$ | $CR \geq 10$<br>$\theta x=0^{\circ}, \theta y=0^{\circ}$ | 80         | 85      | -             | Deg.              | (4)  |
|                                                         |            | $\theta x-$ |                                                          | 80         | 85      | -             |                   |      |
|                                                         | Vertical   | $\theta y+$ |                                                          | 80         | 85      | -             |                   |      |
|                                                         |            | $\theta y-$ |                                                          | 80         | 85      | -             |                   |      |

## Notes:

(1) The chromaticity coordinates specified in Table 5 should be calculated from the measurement spectrum of all pixels in red, green, blue, and white, which need to be converted to C-light standard light source, and should be measured at the center of the panel.

(2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression,

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

$CR_W$  : 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.

The measure point of the Contrast Ratio is the center of the panel.

(3) Definition of Response time (RT):

The response time is defined as the LCD optical switching time interval between “Bright state” and “Dark state”,  $T_R$  is the rise time between Luminance rate changed from 10% to 90%,  $T_F$  is the fall time between Luminance rate changed from 90% to 10%.

<Table 6. Switching time of luminance ratios matrix>

| Measured Response time |     | To               |                  |
|------------------------|-----|------------------|------------------|
|                        |     | 10%              | 90%              |
| From                   | 10% |                  | $T_{10\%to90\%}$ |
|                        | 90% | $T_{90\%to10\%}$ |                  |

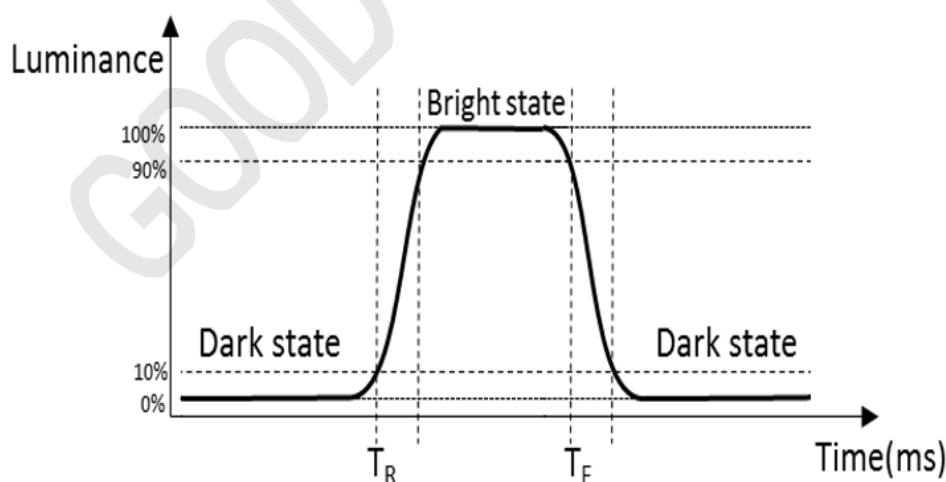


Figure 5. The definition of  $T_R$  and  $T_F$

Measured response time is determined by rise time ( $T_R$ ) and fall time ( $T_F$ ), and shown in Figure 5.

(4) Definition of Viewing angle:

As CR definition is stated in Note(2), the viewing angles are defined when the viewing angle is larger than  $10^\circ$  in four directions relative to the perpendicular direction of the Good Display'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 Figure 6.

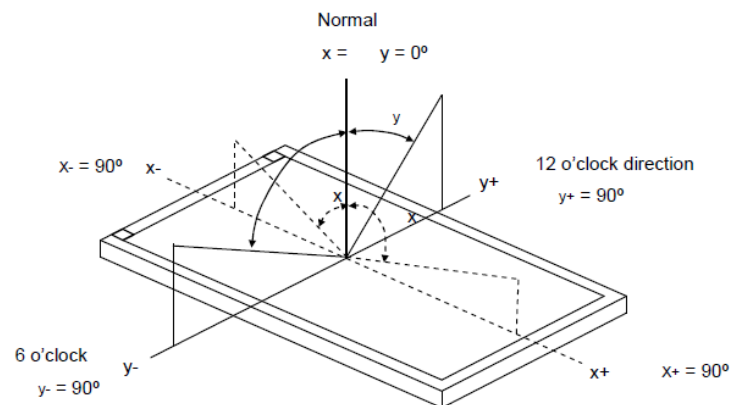


Figure 6. Definition of Viewing angle

### 4.3 Optical Measurements

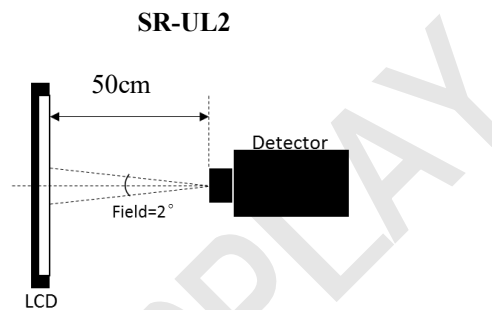


Figure 7. Measurement equipment

Center Luminance of white is defined as luminance value at the center of the display.

This optical measurement is shown in Figure 7.

## 5. INTERFACE CONNECTION

### 5.1 Electrical Interface Connection

The electronics interface connector is 昶通 F05047-50P-U

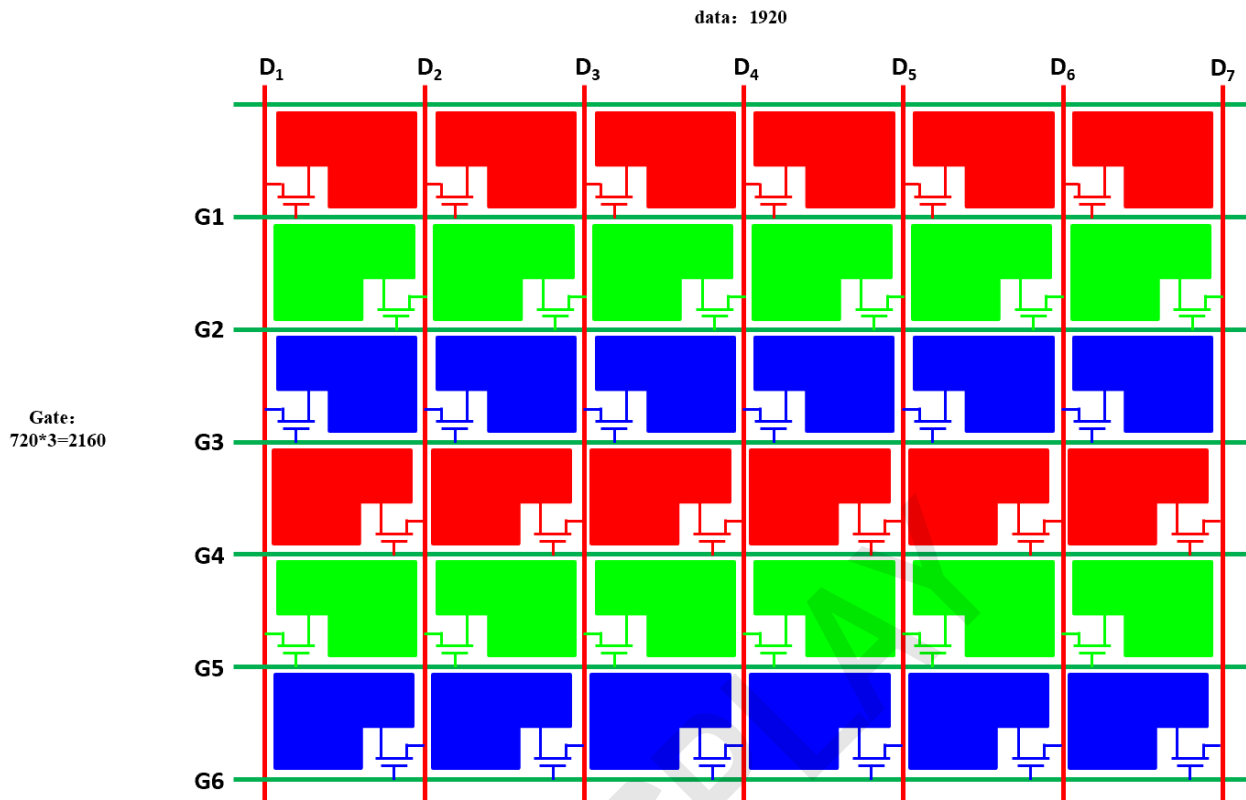
The connector interface pin assignments are listed in Table 7

<Table 7. Pin Assignments for the Interface Connector>

| Terminal | Symbol    | Functions                                                                                         |
|----------|-----------|---------------------------------------------------------------------------------------------------|
| Pin No.  | Symbol    | Description                                                                                       |
| 1        | GND       | Digital ground                                                                                    |
| 2        | BIST      | LCD Panel Self Test Enable, When it is not used, connecting to GND is recommended, don't floating |
| 3        | VCC       | Digital Power/Vin =3.3V                                                                           |
| 4        | VCC       | Digital Power/Vin =3.3V                                                                           |
| 5        | GND       | Power ground                                                                                      |
| 6        | GND       | Power ground                                                                                      |
| 7        | OTP       | Serial interface OTP power                                                                        |
| 8        | NC        | No connector                                                                                      |
| 9        | GND       | Power ground                                                                                      |
| 10       | ORXIN0-   | Negative LVDS differential data input(Odd data)                                                   |
| 11       | ORXIN0+   | Positive LVDS differential data input(Odd data)                                                   |
| 12       | ORXIN1-   | Negative LVDS differential data input(Odd data)                                                   |
| 13       | ORXIN1+   | Positive LVDS differential data input(Odd data)                                                   |
| 14       | ORXIN2-   | Negative LVDS differential data input(Odd data)                                                   |
| 15       | ORXIN2+   | Positive LVDS differential data input(Odd data)                                                   |
| 16       | ORXCLKIN- | Negative LVDS differential data input(Odd clock)                                                  |
| 17       | ORXCLKIN+ | Positive LVDS differential data input(Odd clock)                                                  |
| 18       | ORXIN3-   | Negative LVDS differential data input(Odd data)                                                   |
| 19       | ORXIN3+   | Positive LVDS differential data input(Odd data)                                                   |
| 20       | ERXIN0-   | Negative LVDS differential data input(Even data)                                                  |
| 21       | ERXIN0+   | Positive LVDS differential data input(Even data)                                                  |
| 22       | ERXIN1-   | Negative LVDS differential data input(Even data)                                                  |
| 23       | ERXIN1+   | Positive LVDS differential data input(Even data)                                                  |
| 24       | ERXIN2-   | Negative LVDS differential data input(Even data)                                                  |
| 25       | ERXIN2+   | Positive LVDS differential data input(Even data)                                                  |
| 26       | ERXCLKIN- | Negative LVDS differential data input(Even clock)                                                 |

|    |           |                                                   |
|----|-----------|---------------------------------------------------|
| 27 | ERXCLKIN+ | Positive LVDS differential data input(Even clock) |
| 28 | ERXIN3-   | Negative LVDS differential data input(Even data)  |
| 29 | ERXIN3+   | Positive LVDS differential data input(Even data)  |
| 30 | GND       | Power ground                                      |
| 31 | FAULT     | FAULT signal output(normal=H,abnormal=L)          |
| 32 | RESET     | Global reset pin,active High.                     |
| 33 | STBYB     | Standby mode,active High.                         |
| 34 | CSB       | Serial interface chip enable                      |
| 35 | SCL       | Serial interface clock input                      |
| 36 | SDAI      | Serial interface data input                       |
| 37 | SDAO      | Serial interface data output.                     |
| 38 | GND       | Power ground                                      |
| 39 | GND       | Power ground                                      |
| 40 | NC        | No connector                                      |
| 41 | LEDA      | LED power(Anode)                                  |
| 42 | LEDA      | LED power(Anode)                                  |
| 43 | LEDA      | LED power(Anode)                                  |
| 44 | NC        | No connector                                      |
| 45 | LEDK      | Cathode1                                          |
| 46 | LEDK      | Cathode2                                          |
| 47 | LEDK      | Cathode3                                          |
| 48 | LEDK      | Cathode4                                          |
| 49 | NTC_A     | NTC_Anode                                         |
| 50 | NTC_K     | NTC_Cathode                                       |

## 5.2 Pixel Structure



## 6. SIGNAL TIMING SPECIFICATION

### 6.1 Signal Timing Specification

<Table 8. Signal Timing Specification>

| Parameter             | Symbols | Panel Resoiution     |      |      | Unit |
|-----------------------|---------|----------------------|------|------|------|
|                       |         | 1920RGB*720 (2 port) |      |      |      |
|                       |         | Min                  | Typ. | Max  |      |
| DCLK frequency        | Fdclk   | -                    | 45.3 | -    | MHz  |
| Horizontal valid data | Thd     | -                    | 960  | -    | DCLK |
| 1 horiaontal line     | Th      | 1015                 | 1026 | 1248 | DCLK |
| Vertical valid data   | Tvd     | -                    | 720  | -    | H    |
| 1 vertical field      | Tv      | 730                  | 736  | 756  | H    |
| Frame rate            | FR      | -                    | 60   | -    | Hz   |

### 6.2 Signal Electrical Characteristics for LVDS Receiver

The built-in LVDS receiver is compatible with (ANSI/TIA/TIA-644 ) standard.

<Table 9. LVDS Receiver Electrical Characteristics>

| Parameter                                 | Symbol              | Condition | Spec. |      |                          | Unit |
|-------------------------------------------|---------------------|-----------|-------|------|--------------------------|------|
|                                           |                     |           | Min.  | Typ. | Max.                     |      |
| Differential input high Threshold voltage | Vth                 | Vcm=1.2V  | +0.10 | -    | -                        | V    |
| Differential input low threshold voltage  | Vtl                 | Vcm=1.2V  | -     | -    | -0.10                    | V    |
| Differential input common Mode voltage    | V <sub>CM</sub>     | -         | 1     | 1.2  | 1.7- V <sub>id</sub> ]/2 | V    |
| LVDS input voltage                        | V <sub>INLV</sub>   | -         | 0.7   | -    | 1.7                      | V    |
| Differential input voltage                | V <sub>id</sub>     | -         | 0.1   | -    | 0.6                      | V    |
| Differential input leakage Current        | I <sub>lvleak</sub> | -         | -10   | -    | +10                      | μA   |

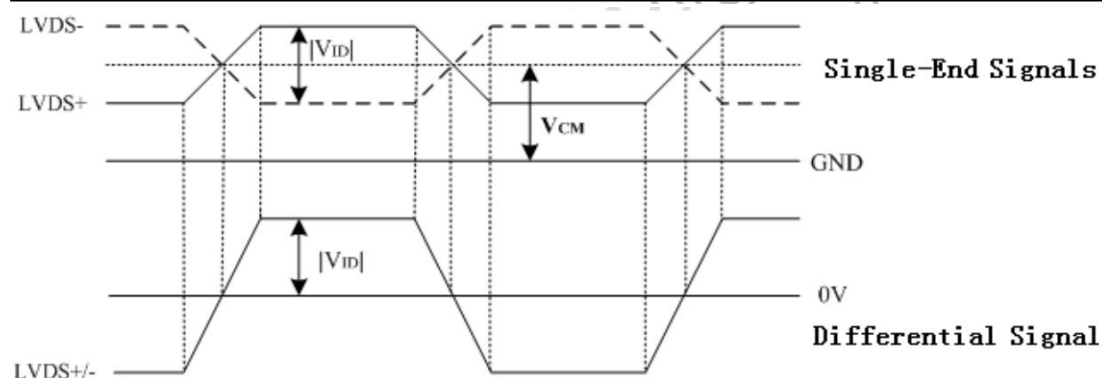


Figure 10. Voltage Definitions

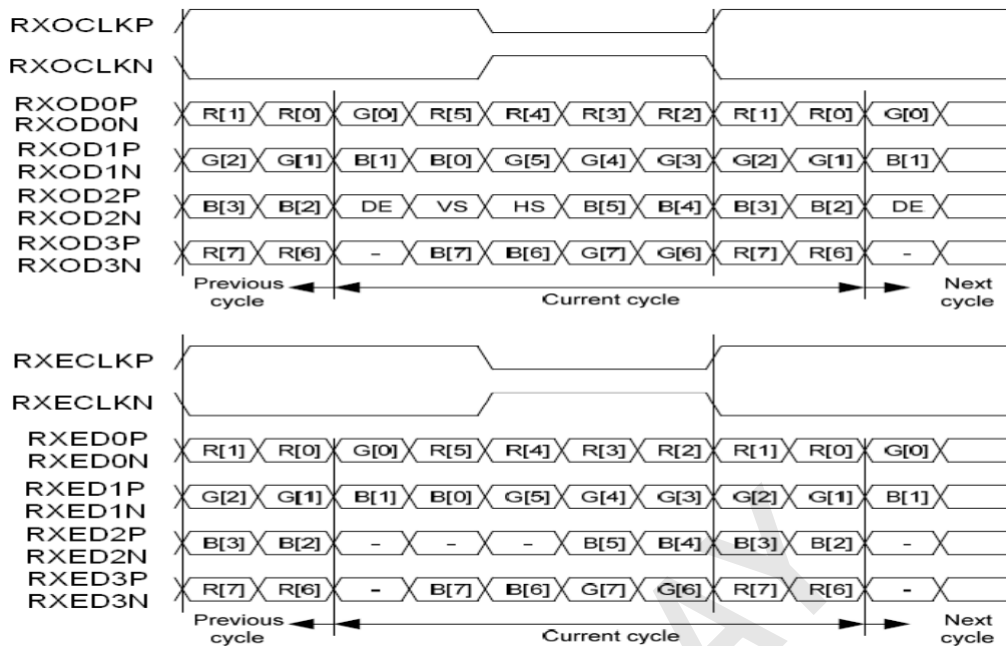


Figure 11. Data Mapping

### 6.3 LVDS Receiver Internal Circuit

Figure 12 shows the internal block diagram of the LVDS receiver. This LCD module equips termination resistors for LVDS link

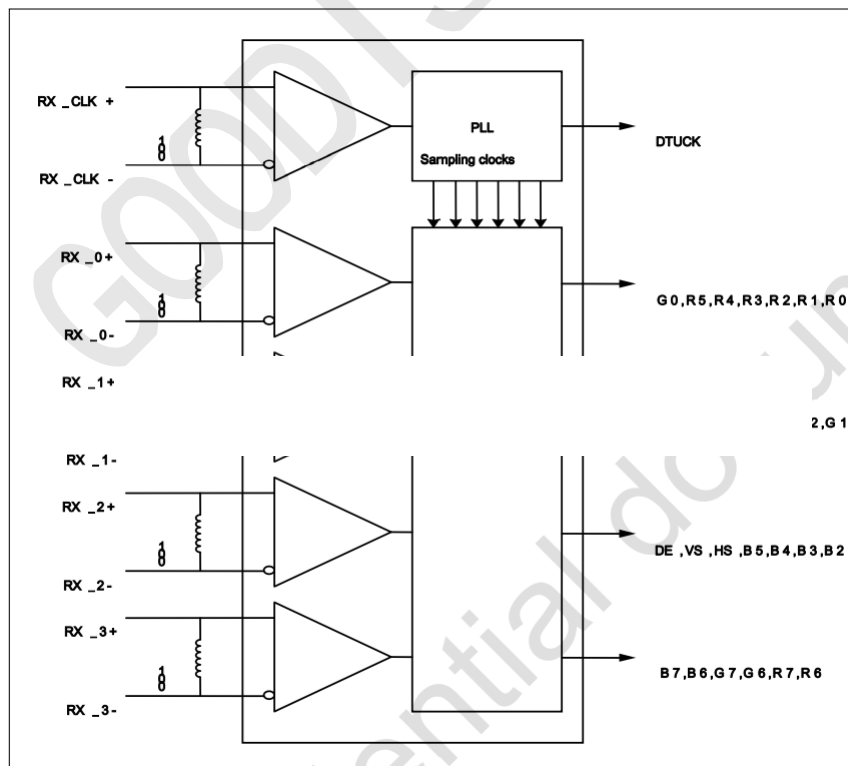


Figure 12. LVDS Receiver Internal Circuit

## 7. POWER SEQUENCE

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

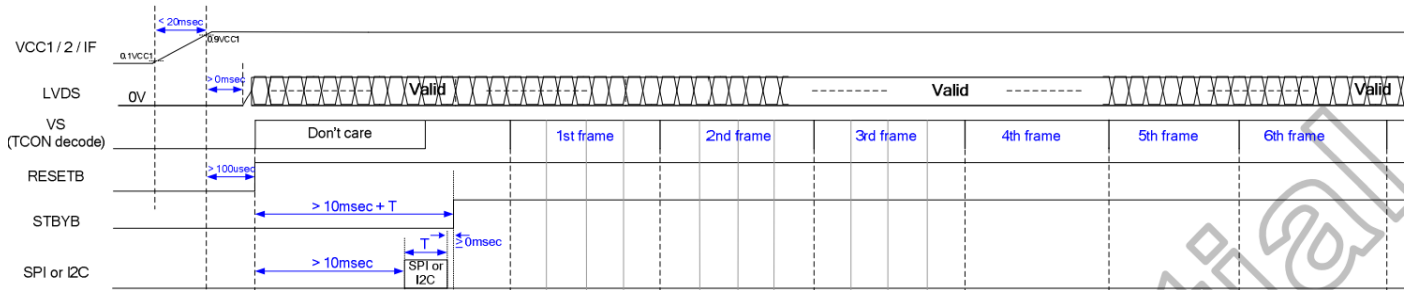


Figure 13. Power-on Sequence

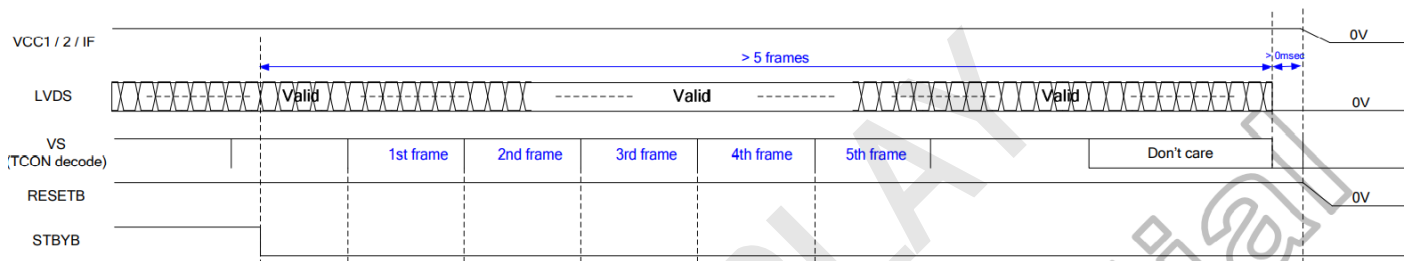


Figure 14. Power-off Sequence

## 8. CONNECTOR DESCRIPTION

Physical interface is described as for the connector on LCM.

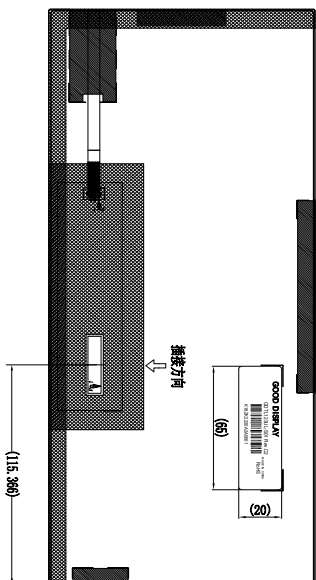
These connectors are capable of accommodating the following signals and will be following components.

### 8.1 TFT LCD Module

<Table 10. Connector>

| Connector Name /Description | Connector                 |
|-----------------------------|---------------------------|
| Manufacturer                | Changtong                 |
| Type/ Part Number           | F05047-50P-U/F05047-10P-U |

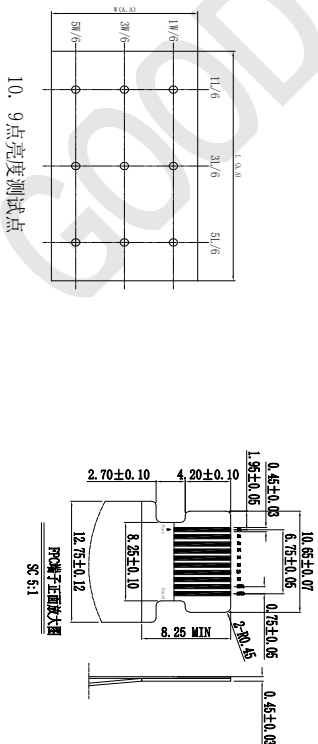
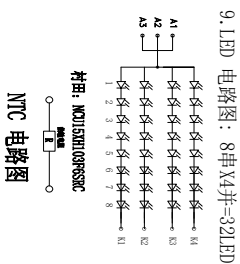
客户承认



| PN# | Assignment | PN# | Assignment |
|-----|------------|-----|------------|
| 1   | GND        | 26  | ERXCLK-    |
| 2   | BIST       | 27  | ERXCLK+    |
| 3   | VCC        | 28  | ERXIN+     |
| 4   | VCC        | 29  | ERXIN+     |
| 5   | GND        | 30  | GND        |
| 6   | GND        | 31  | FAULT      |
| 7   | OTP        | 32  | RESET      |
| 8   | NC         | 33  | STRBYB     |
| 9   | GND        | 34  | CSB        |
| 10  | GND        | 35  | SCL        |
| 11  | ORXIN0+    | 36  | SDAI       |
| 12  | ORXIN1-    | 37  | SDAO       |
| 13  | ORXIN1+    | 38  | GND        |
| 14  | ORXIN2-    | 39  | GND        |
| 15  | ORXIN2+    | 40  | NC         |
| 16  | ORXCLK-    | 41  | LEPA       |
| 17  | ORXCLK+    | 42  | LEDA       |
| 18  | ORXIN3-    | 43  | LEPA       |
| 19  | ORXIN3+    | 44  | NC         |
| 20  | ERXIN0-    | 45  | LEDK       |
| 21  | ERXIN0+    | 46  | LEDK       |
| 22  | ERXIN1-    | 47  | LEDK       |
| 23  | ERXIN1+    | 48  | LEDK       |
| 24  | ERXIN2-    | 49  | NTC A      |
| 25  | ERXIN2+    | 50  | NTC K      |

- ### 8. 光电特性参数:

| Item            |            | Symbol | Min   | Typ   | Max   | Unit              | Condition  |
|-----------------|------------|--------|-------|-------|-------|-------------------|------------|
| LCM             | Luminance  | Lv     | 800   | 1000  | ---   | cd/m <sup>2</sup> | If= 360 mA |
|                 | Uniformity | Avg    | 75    | 80    | ---   | %                 |            |
|                 | Colour     | X      | 0.250 | 0.300 | 0.350 | ---               |            |
|                 | Coordinate | Y      | 0.280 | 0.330 | 0.380 | ---               |            |
| Forward Voltage |            | Vf     | ---   | 24.5  | 28.0  | V                 |            |
| Reverse Voltage |            | Ir     |       |       | ---   | mA                | Vr= 5.0 V  |



|                                                                                    |       |             |                |             |         |
|------------------------------------------------------------------------------------|-------|-------------|----------------|-------------|---------|
| DALIAN GOOD DISPLAY CO., LTD.                                                      |       |             |                |             |         |
| UNIT                                                                               | mm    | TITLE       | 模组工程图          |             |         |
| RATIO:                                                                             | 1 : 1 | PRODUCT NO  | GD TL123UL-S01 | DRAWN BY    | YF_CHEN |
| VIEW:                                                                              |       | CUSTOMER NO |                | CHECKED BY  |         |
|                                                                                    |       | REV         | C2             | APPROVED BY |         |
|  |       |             |                |             |         |

**10. RELIABILITY TEST**

The reliability test items and its conditions are shown in below.

<Table 12. Reliability Test>

| No | Test Items                                      | Conditions                                                                                                                                                                  |
|----|-------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | High temperature storage test                   | 90°C, 500hrs                                                                                                                                                                |
| 2  | Low temperature storage test                    | -40°C, 500hrs                                                                                                                                                               |
| 3  | High temperature operating test                 | 85°C, 500hrs                                                                                                                                                                |
| 4  | Low temperature operating test                  | -30°C, 500hrs                                                                                                                                                               |
| 3  | High temperature & high humidity operation test | 65°C,95%, 500hrs                                                                                                                                                            |
| 5  | Thermal shock                                   | -40~90°C, per 30min, 100cycle, Storage                                                                                                                                      |
| 6  | Vibration test (Box)                            | Random<br>0.015G2/Hz from 5-200Hz<br>-6dB/octave from 200-500Hz<br>1hrs for X/Y/Z,total 3hrs                                                                                |
| 7  | Drop test (Box)                                 | With package , one corner/three edge/six face<br>Height: 76.20cm      0.45~9.52Kg<br>60.96cm      9.52~18.59Kg<br>45.72cm      18.59~27.66Kg<br>30.48cm      27.66~45.35 kg |
| 8  | ESD test (operating)                            | Air: 150pF, 330Ω, ±4kV<br>Contact: 150pF, 330Ω, ±4kV                                                                                                                        |

## 11. PACKING

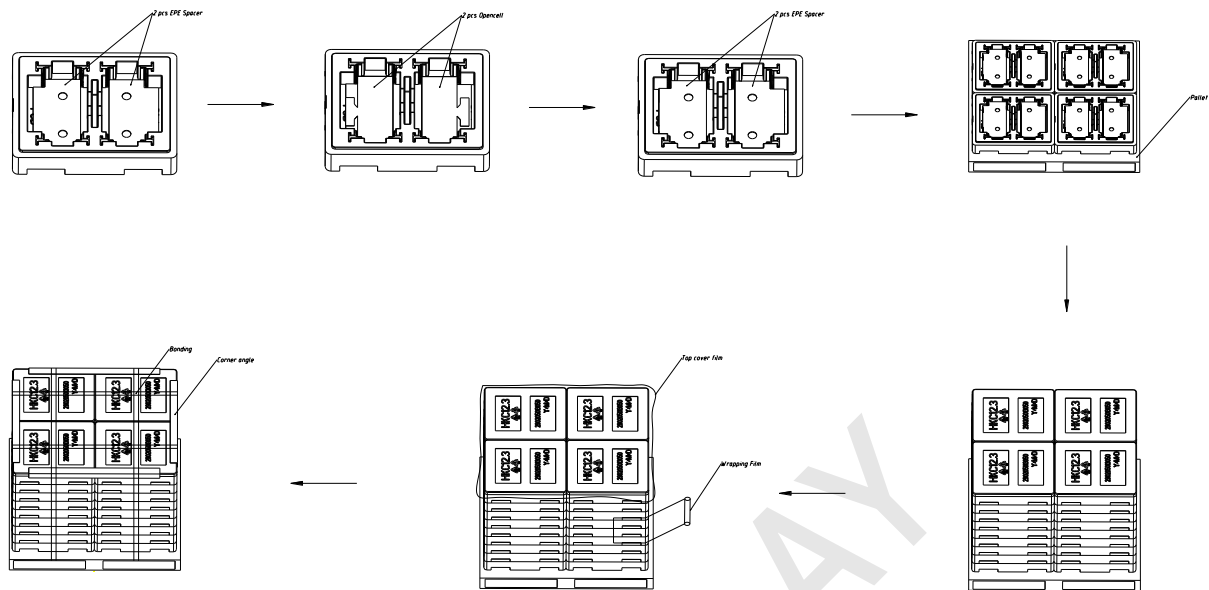


Figure 15. Packing Specifications

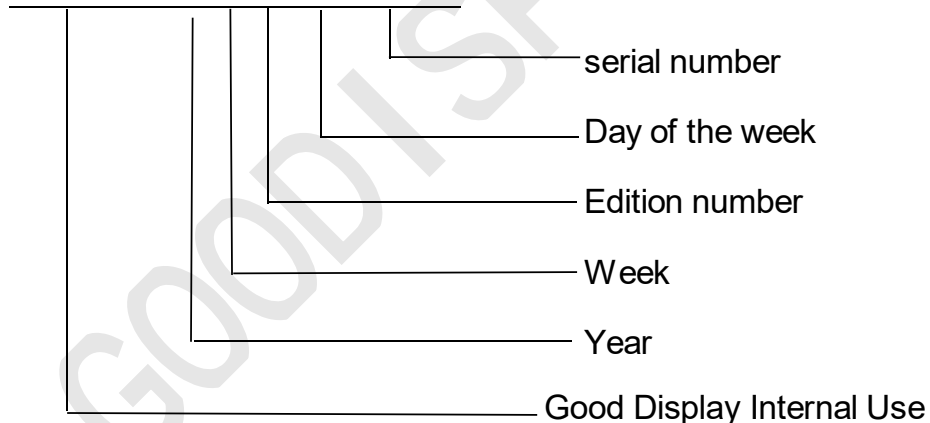
## 12. LABEL

The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.



(a) Model Name: GDTL123UL-S01

(b) Serial ID: X X X X X Y W X X X X X X X



Serial ID includes the information as below:

(a) Manufactured Date:

Year: 00~99, ... 2019=19, 2020=20, 2021=21..., 2028=28.

Week: 01~56, first week of the year=01; second week of the year=02; ...

Day of the week: A~G=Monday~Sunday

(b) Edition number: cover all the change; A1, A2... Sample order;

C for mass production, C1, C2... change of order

(c) Serial No.: Manufacturing sequence of product