# SPECIFICATION 

## PRODUCT NO．：TCXD185MBLON－01 <br> VERSION ：Ver 1.1 <br> ISSUED DATE ：2021－6－8

This module uses ROHS material

## FOR CUSTOMER：

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## 1．Record of Revision

| Revision | Description | Date |
| :---: | :---: | :---: |
| 1.0 | Initial Release | 2021／6／8 |
| 1.1 | UpdatingaDrawingUpdate | 2021／6／26 |
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## General Description

## 1．1 Introduction

TCXD185MBLON－01 is a color active matrix TFT LCD open cell using amorphous silicon TF T＇s（Thin Film Transistors）as an active switching devices．This open cell has a 18.5 inch dia gonally measured active area with HD resolutions（1366 horizontal by 768 vertical pixel arr ay）．Each pixel is divided into RED，GREEN，BLUE dots which are arranged in vertical stri pe and this module can display 16.7 M colors．The TFT－LCD panel used for this OC is adapt ed for a low reflection and higher color type．

## 1．2 Features

## －LVDS Interface with 1 pixel／clock

－High－speed response
－6－bit（Hi－FRC）color depth，display 16．7M colors
－High luminance and contrast ratio，low reflection and wide viewing angle
－DE（Data Enable）only
－RoHS／Halogen Free
－Gamma Correction
－Reverse type

## 1．3 Application

－Desktop Type of PC \＆Workstation Use
－Slim－Size Display for Stand－alone Monitor
－Display Terminals for Control System
－Monitors for Process Controller

## General Information

| Parameter | Specifications | Unit |
| :--- | :--- | :---: |
| Active area | $409.8(\mathrm{H}) \times 230.4(\mathrm{~V})$ | mm |
| Pixel Format | $1366(\mathrm{H}) \times 768(\mathrm{~V})$ <br> 1 pixel $=\mathrm{R}+\mathrm{G}+\mathrm{B}$ dot $)$ | pixel |
| Pixel configuration | R，G，B vertical stripe |  |
| Display mode | Normally Black | $\mathrm{Cd} / \mathrm{m}^{2}$ |
| Luminance of white | $250(T Y P)$ |  |

## Mechanical Information

| Item |  | Min． | Typ． | Max． | Unit | Note |
| :--- | :--- | :---: | :---: | :---: | :---: | :---: |
| Module size | Horizontal（H） | 430.23 | 430.73 | 431.23 | mm |  |
|  | Vertical（V） | 254.1 | 254.6 | 255.1 | mm |  |
|  | Depth（D） | 8.25 | 8.55 | 8.85 | mm |  |

## 2．0 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.

$$
<\text { Table 2. Absolute Maximum Ratings }>\quad[\mathrm{VSS}=\mathrm{GND}=0 \mathrm{~V}]
$$

| Parameter | Symbol | Min． | Max． | Unit | Remarks |
| :--- | :---: | :---: | :---: | :---: | :---: |
| Power Supply Voltage | $\mathrm{V}_{\mathrm{DD}}$ | -0.3 | 5.5 | V | $\mathrm{Ta}=25{ }^{\circ} \mathrm{C}$ |
| Logic Supply Voltage | $\mathrm{V}_{\mathrm{IN}}$ | $\mathrm{VSS}-0.3$ | $\mathrm{~V}_{\mathrm{DD}}+0.3$ | V |  |
| Operating Temperature | $\mathrm{T}_{\mathrm{OP}}$ | 0 | +50 | ${ }^{\circ} \mathrm{C}$ | $1)$ |
| Storage Temperature | $\mathrm{T}_{\mathrm{ST}}$ | -20 | +60 | ${ }^{\circ} \mathrm{C}$ | $1)$ |

Note ：1）Temperature and relative humidity range are shown in the figure below．
Wet bulb temperature should be $39^{\circ} \mathrm{C}$ max．and no condensation of water．
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## 3．Optical Characteristics

$$
\mathrm{Ta}=25^{\circ} \mathrm{C}, \mathrm{Vcc}=+12 \mathrm{~V}, \mathrm{~V}_{\mathrm{INV}}=+24 \mathrm{~V}
$$


＊The measurement shall be executed 30 minutes after lighting at ratıng．
＊These values are measured with CPL standard back light unit．
＊The optical characteristics are measured using the following equipment．

［Note 1］Definitions of viewing angle range：

［Note 2］Definition of contrast ratio：
The contrast ratio is defined as the following．

$$
\text { Contrast Ratio }=\frac{\text { Luminance (Brightness) with white screen }}{\text { Luminance (Brightness) with black screen }}
$$

［Note 3］Definition of response time
The output signals of photo detector are measured when the input signals are changed from＂Full White＂to＂Full Black＂（rising time，Tr），and from＂Full Black＂to＂Full White＂（falling time，Tf），respectively． The response time is interval between the $10 \%$ and $90 \%$（ 1 frame at 60 Hz ）of amplitudes．


Response time $=\mathrm{Tr}+\mathrm{Tf}$
［Note 4］This shall be measured at center of the screen．

## 4．0 ELECTRICAL SPECIFICATIONS

## 4．1Electrical Specifications

$$
\left[\mathrm{Ta}=25 \pm 2^{\circ} \mathrm{C}\right]
$$

| Parameter |  | Min． | Typ． | Max． | Unit | Remarks |
| :--- | :---: | :---: | :---: | :---: | :---: | :--- |
| Power Supply Voltage | $\mathrm{V}_{\mathrm{DD}}$ | 4.5 | 5.0 | 5.5 | V | Note1 |
| Power Supply Current | $\mathrm{I}_{\mathrm{DD}}$ | - | 500 | 720 | mA |  |
| In－Rush Current | $\mathrm{I}_{\mathrm{RUSH}}$ | - | 2.0 | 3.0 | A | Note 2 |
| Permissible Input Ripple Voltag <br> e | $\mathrm{V}_{\mathrm{RF}}$ | - | - | 300 | mV | Note1，3 |
| High Level Differential Input <br> Threshold Voltage | $\mathrm{V}_{\mathrm{IH}}$ | - | - | +100 | mV |  |
| Low Level Differential Input <br> Threshold Voltage | $\mathrm{V}_{\mathrm{IL}}$ | -100 | - | - | mV |  |
| Differential input voltage | $\mid \mathrm{V}_{\mathrm{ID}} \mathrm{l}$ | 200 | - | 600 | mV |  |
| Differential input common mod <br> e voltage | Vcm | 1.0 | 1.2 | 1.5 |  | $\mathrm{V}_{\mathrm{IH}}=100 \mathrm{mV}$, <br> V |
| Power Consumption | $\mathrm{P}_{\mathrm{D}}$ | - | 2.5 | 3.6 | W | $@ 60 \mathrm{~Hz}$ |

Notes：1．The supply voltage is measured and specified at the interface connector of LCM．
The current draw and power consumption specified is for VDD $=5.0 \mathrm{~V}$ ，Frame rate $=60 \mathrm{~Hz}$ Clock frequency 75.4 MHz ．Test Pattern of power supply current
a）Typ ：Color Test
b）Max ：Skip Sub－pixel


2．Duration of rush current is about 2 ms and rising time of VDD is $520 \mu \mathrm{~s} \pm 20 \%$
3．Ripple Voltage should be covered by Input voltage Spec．

## 5．1 Back Light Unit

Led Light Bar characteristics

| Parameter | Value | Unit | Note |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | Typ． | Max． | Unit | V |
| Light Bar Input Voltage |  | 39.2 | 42 | 49 | V | IL＝240mA |
| Light Bar Input Current | ILED |  |  |  |  |  |
| Power Consumption | PLED | 9.408 | 10.08 | 11.76 | W | （Duty 100\％） |
| LED Life Time LBL |  |  | 30000 |  | Hrs | Note（1） |

Note（1）．The lifetime is defined as the time which luminance of the LED decays to $50 \%$ compared to the initial value，Operating condition：Continuous operating at $\mathrm{Ta}=25 \pm 2^{\circ} \mathrm{C}$ ， $\mathrm{IL}=240 \mathrm{~mA}$

## 5．2 ．LED LIGHT BAR Electrical Circuit

LED light bar circuit is（4）Parallel（14）Series


## 6．0 SIGNAL TIMING SPECIFICATION

6．1 The is operated by the DE only．

| Item | Symbols |  | Min | Typ | Max | Unit |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Period | tCLK | 10.6 | 13.26 | 15.91 | ns |
|  | Frequency | - | 62.9 | 75.4 | 94.3 | MHz |
| Horizontal <br> Display Te <br> rm | Period | tHP | 1446 | 1560 | 1936 | tCLK |
|  | Horizontal Valid | tHV | 1366 | 1366 | 1366 | tCLK |
|  | Horizontal Blank | tHB | 80 | 194 | 570 | tCLK |
|  | Frequency | fH | $\mathbf{4 0 . 3}$ | $\mathbf{4 8 . 3 6}$ | $\mathbf{6 0 . 4 5}$ | KHz |
| Vertical <br> Display Te <br> rm | Period | Vertical Valid | tVV | 768 | 768 | 768 |
|  | Vertical Blank | tVB | 10 | 98 | 120 | tHP |
|  | Frequency | fV | 50 | 60 | 75 | Hz |
| LVDS Rec <br> eiver clock | Input spread spect <br> rum ratio | SSr | -3 | - | +3 | $\%$ |

Note：The DCLK range at last line of V－blanking should be set in 0～987

## 6．2 LVDS Rx Interface Timing Parameter

The specification of the LVDS Rx interface timing parameter is shown in Table 4.
＜Table 4．LVDS Rx Interface Timing Specification＞

| Item | Symbol | Min | Typ | Max | Unit | Remark |
| :---: | :---: | :---: | :---: | :---: | :--- | :--- |
| CLKIN Period | tRCIP | 10.60 | 13.26 | 15.91 | nsec |  |
| Input Data 0 | tRIP1 | -0.4 | 0.0 | +0.4 | nsec |  |
| Input Data 1 | tRIP0 | tRCIP $/ 7-0.4$ | $\mathrm{tRCIP} / 7$ | $\mathrm{tRCIP} / 7+0.4$ | nsec |  |
| Input Data 2 | tRIP6 | $2 \times \mathrm{tRCIP} / 7-0.4$ | $2 \times \mathrm{tRCIP} / 7$ | $2 \times \mathrm{tRCIP} / 7+0.4$ | nsec |  |
| Input Data 3 | tRIP5 | $3 \times \mathrm{tRCIP} / 7-0.4$ | $3 \times \mathrm{tRCIP} / 7$ | $3 \times \mathrm{tRCIP} / 7+0.4$ | nsec |  |
| Input Data 4 | tRIP4 | $4 \times \mathrm{tRCIP} / 7-0.4$ | $4 \times \mathrm{tRCIP} / 7$ | $4 \times \mathrm{tRCIP} / 7+0.4$ | nsec |  |
| Input Data 5 | tRIP3 | $5 \times \mathrm{tRCIP} / 7-0.4$ | $5 \times \mathrm{tRCIP} / 7$ | $5 \times \mathrm{tRCIP} / 7+0.4$ | nsec |  |
| Input Data 6 | tRIP2 | $6 \times \mathrm{tRCIP} / 7-0.4$ | $6 \times \mathrm{tRCIP} / 7$ | $6 \times \mathrm{tRCIP} / 7+0.4$ | nsec |  |



## 7．0 SIGNAL TIMING WAVEFORMS OF INTERFACE SIGNAL <br> 7．1 Sync Timing Waveforms



1）Need over 3 H－sync during V－Sync Low
2）Fix H－Sync width from V－Sync falling edge to first rising edge

## 7．2 Vertical Timing Waveforms



## 7．3 Horizontal Timing Waveforms



RA7－RA0
GA7～GA0
BA7 $\sim$ BA0



## 8．0 INTERFACE CONNECTION．

## 8．1 Electrical Interface Connection

－CN1 Module Side Connector ：UJU IS100－L30R－C23or Equivalent User Side Connector ：JAE FI－X30H or Equivalent

| Pin No | Symbol | Function | Remark |
| :---: | :---: | :---: | :---: |
| 1 | NC | Not Connect |  |
| 2 | NC | Not Connect（＊Reserved for LCD manufacturer＇s use ） |  |
| 3 | NC | Not Connect（＊Reserved for LCD manufacturer＇s use ） |  |
| 4 | GND | Power Ground |  |
| 5 | RX0－ | Negative Transmission data of Pixel 0 |  |
| 6 | RX0＋ | Positive Transmission data of Pixel 0 |  |
| 7 | GND | Power Ground |  |
| 8 | RX1－ | Negative Transmission data of Pixel 1 |  |
| 9 | RX1＋ | Positive Transmission data of Pixel 1 |  |
| 10 | GND | Power Ground |  |
| 11 | RX2－ | Negative Transmission data of Pixel 2 |  |
| 12 | RX2＋ | Positive Transmission data of Pixel 2 |  |
| 13 | GND | Power Ground |  |
| 14 | RXCLK－ | Negative Transmission Clock |  |
| 15 | RXCLK＋ | Positive Transmission Clock |  |
| 16 | GND | Power Ground |  |
| 17 | RX3－ | Negative Transmission data of Pixel 3 |  |
| 18 | RX3＋ | Positive Transmission data of Pixel 3 |  |
| 19 | GND | Power Ground |  |
| 20 | NC |  |  |
| 21 | NC | Not Connect |  |
| 22 | NC |  |  |
| 23 | GND |  |  |
| 24 | GND | Power Ground |  |
| 25 | GND |  |  |
| 26 | VDD |  |  |
| 27 | VDD |  |  |
| 28 | VDD | Power Supply：+5 V |  |
| 29 | VDD |  |  |
| 30 | VDD |  |  |

Note 1 ：This pin should be connected with GND．

## 8．2 LVDS Interface（Tx；THC63LVDF83A or Equivalent）

## 8．2．1 LVDS Interface

|  | Input <br> Signal | Transmitter |  | Interface |  | MV185WHB－N20 （CN11） | Remark |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Pin No． | Pin No． | System（Tx） | $\begin{aligned} & \text { TFT-LCD } \\ & (\mathrm{Rx}) \end{aligned}$ | Pin No． |  |
| $\begin{aligned} & \mathrm{L} \\ & \mathrm{~V} \\ & \mathrm{D} \\ & \mathrm{~S} \end{aligned}$ | OR0 | 51 | $\begin{aligned} & 48 \\ & 47 \end{aligned}$ | OUT0－ OUT0＋ | $\begin{aligned} & \text { RX0- } \\ & \text { RX0+ } \end{aligned}$ | $\begin{aligned} & 5 \\ & 6 \end{aligned}$ |  |
|  | OR1 | 52 |  |  |  |  |  |
|  | OR2 | 54 |  |  |  |  |  |
|  | OR3 | 55 |  |  |  |  |  |
|  | OR4 | 56 |  |  |  |  |  |
|  | OR5 | 3 |  |  |  |  |  |
|  | OG0 | 4 |  |  |  |  |  |
|  | OG1 | 6 | $\begin{aligned} & 46 \\ & 45 \end{aligned}$ | OUT1－ OUT1＋ | $\begin{aligned} & \text { RX1- } \\ & \text { RX1+ } \end{aligned}$ | $\begin{aligned} & 8 \\ & 9 \end{aligned}$ |  |
|  | OG2 | 7 |  |  |  |  |  |
|  | OG3 | 11 |  |  |  |  |  |
|  | OG4 | 12 |  |  |  |  |  |
|  | OG5 | 14 |  |  |  |  |  |
|  | OB0 | 15 |  |  |  |  |  |
|  | OB1 | 19 |  |  |  |  |  |
|  | OB2 | 20 | $\begin{aligned} & 42 \\ & 41 \end{aligned}$ | $\begin{aligned} & \text { OUT2- } \\ & \text { OUT2+ } \end{aligned}$ | $\begin{aligned} & \text { RX2- } \\ & \text { RX2+ } \end{aligned}$ | $\begin{aligned} & 11 \\ & 12 \end{aligned}$ |  |
|  | OB3 | 22 |  |  |  |  |  |
|  | OB4 | 23 |  |  |  |  |  |
|  | OB5 | 24 |  |  |  |  |  |
|  | Hsync | 27 |  |  |  |  |  |
|  | Vsync | 28 |  |  |  |  |  |
|  | DE | 30 |  |  |  |  |  |
|  | MCLK | 31 | $\begin{aligned} & 40 \\ & 39 \end{aligned}$ | CLK OUT－ CLK OUT＋ | $\begin{aligned} & \text { RX CLK- } \\ & \text { RX CLK+ } \end{aligned}$ | $\begin{aligned} & 14 \\ & 15 \end{aligned}$ |  |
|  | OR6 | 50 | $\begin{aligned} & 38 \\ & 37 \end{aligned}$ | OUT3－ OUT3＋ | $\begin{aligned} & \text { RX3- } \\ & \text { RX3+ } \end{aligned}$ | $\begin{aligned} & 17 \\ & 18 \end{aligned}$ |  |
|  | OR7 | 2 |  |  |  |  |  |
|  | OG6 | 8 |  |  |  |  |  |
|  | OG7 | 10 |  |  |  |  |  |
|  | OB6 | 16 |  |  |  |  |  |
|  | OB7 | 18 |  |  |  |  |  |
|  | RSVD | 25 |  |  |  |  |  |

## 8．3 Data Input Format



## 8．4 Block Diagram（Open－Cell）



## 8．5 LVDS Interface



DE：Display Enable

## NA：Not Available（Fixed Low）

R／G／B Data 7：MSB ，R／G／B Data 0：LSB ，O ：＂First Pixel Data＂E：＂Second Pixel Data＂

## 8．6 Color Data Input Assignment

| Color \＆Gray Scale |  | RED DATA |  |  |  |  |  |  |  | GREEN DATA |  |  |  |  |  |  |  | BLUE DATA |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | G7 | 766 | G5 | G4 | G3 | G2 | G1 | G0 | 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 |
|  | Blue | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
|  | Green | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Cyan | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
|  | Red | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Magenta | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 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 | 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 |
| Gray Scale of RED | 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 |
|  | $\triangle$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Darker | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | $\triangle$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | $\nabla$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Brighter | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | $\nabla$ | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Red | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gray Scale <br> of GREEN | 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 |
|  | $\triangle$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Darker | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | $\triangle$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | $\nabla$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Brighter | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | $\nabla$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Green | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | － | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gray Scale of BLUE | 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 |
|  | $\triangle$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
|  | Darker | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
|  | $\triangle$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | $\nabla$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Brighter | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 |
|  | $\nabla$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
|  | Blue | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Gray Scale of WHITE | 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 |
|  | $\triangle$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
|  | Darker | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
|  | $\triangle$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | $\nabla$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Brighter | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 |
|  | $\nabla$ | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 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 |

## 9．0 POWER SEQUENCE

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

Power Supply

Interface Signal

Back－light

－ $0.5 \mathrm{~ms} \leq \mathrm{T} 1 \leq 10 \mathrm{~ms}$
－ $0 \leq \mathrm{T} 2 \leq 50 \mathrm{~ms}$
$0 \leq \mathrm{T} 3 \leq 50 \mathrm{~ms}$
－ $1 \mathrm{sec} \leq \mathrm{T} 4$
－ $200 \mathrm{~ms} \leq \mathrm{T} 5$
－ $200 \mathrm{~ms} \leq \mathrm{T} 6$

## Notes：

1．When the power supply VDD is 0 V ，keep the level of input signals on the low or keep high impedance．
2．Do not keep the interface signal high impedance when power is on．
3．Back Light must be turn on after power for logic and interface signal are valid．
4．T7 decreases smoothly，there is none re－bouncing voltage．
5．The above power sequence be satisfied at these case
a．AC／DC Power On／Off
b．Mode Change（Resolution，Frequency，Timing，Sleep Mode，Color Depth Chang
e，etc）
If not to follow power sequence，these is a risk of abnormal display．

## 10．Precautions

a）Because the Open－Cell is weak to static electricity，please do not touch the terminal with bare hands．
b）Since the front polarizer is easily damaged，pay attention not to scratch it．
c）Since long contact with drops of water may cause discoloration or spots，please wipe off them as soon as put on the screen．
d）When the panel surface is soiled，wipe it with absorbent cotton or other soft cloth．
e）Since the panel is made of glass，it may break or crack if dropped or bumped on hard surface．Handle with care．
f）Precautions of peeling off the protection film：
－Be sure to peel off slowly（recommended more than 7 sec ）and constant speed．
－Peeling direction shown in Fig． 5.
－Be sure to ground person with adequate methods such as the anti－static wrist band．
－Be sure to ground S－PWBs while peeling off the protection film．
－Ionized air should be blown to the surface while peeling off．
－The protection film must not touch drivers and S－PWBs．
－If adhesive may remain on the polarizer after the protection film peeled off，please remove with isopropyl－alcohol．


Fig． 5 Direction of peeling off
g）Since the Open－Cell consists of TFT and electronic circuits with CMOS－ICs，which are very weak to electrostatic discharge，persons who are handling a Open－Cell should be grounded through adequate methods such as an anti－static wrist band．Connector pins should not be touched directly with bare hands．
h）Avoiding COF damage，do not bend PWB to display side when handling the open cell，recommend coating silicon or tuffy on front and back side of COF．
－Reference：Process control standard of CPL．

|  | item | Management standard value and performance standard |
| :--- | :--- | :--- |
| 1 | Anti－static mat（shelf） | 1 to $50[$ Mega ohm $]$ |
| 2 | Anti－static mat（floor，desk） | 1 to $100[\mathrm{Mega}$ ohm］ |
| 3 | Ionizer | Attenuate from $\pm 1000 \mathrm{~V}$ to $\pm 100 \mathrm{~V}$ within two seconds． |
| 4 | Anti－static wrist band | 0.8 to $10[$ Mega ohm］ |
| 5 | Anti－static wrist band entry and <br> ground resistance | Below $1000[\mathrm{ohm}]$ |
| 6 | Temperature | 22 to $26\left[{ }^{\circ} \mathrm{C}\right]$ |
| 7 | Humidity | 60 to $70[\%]$ |

i）Since the Open－Cell has some PWBs，please take care to keep them off any stress or pressure when handling or installing the Open－Cell，otherwise some of electronic parts on them may be damaged．
j）Be sure to turn off the power supply when inserting or disconnecting the cable．
k）Be sure to design the module and cabinet so that the Open－Cell can be installed without any extra stress such as warp or twist．
1）When handling and assembling Open－Cells into module and cabinets，please be noted that long－term storage in the
environment of oxidization or deoxidization gas and the use of materials such as reagent，solvent，adhesive，resin，etc． which generate these gasses，may cause corrosion and discoloration of the Open－Cell．
m）Applying too much force and stress to PWBs and drivers may cause a malfunction electrically and mechanically．
n）The Open－Cell has high frequency circuits．Sufficient suppression to EMI should be done by system manufactures．
o）Please be careful since image retention may occur when a fixed pattern is displayed for a long time．
p）The chemical compound，which causes the destruction of ozone layer，is not being used．
q）This Open－Cell module is corresponded to ROHS．
r）When any question or issue occurs，it shall be solved by mutual discussion．

## 11．Packing form

顶卡 2 PCS／SET


## 12．Carton storage condition

a）Temperature： $0^{\circ} \mathrm{C}$ to $40^{\circ} \mathrm{C}$
b）Humidity： $95 \%$ RH or less
Reference condition： $20^{\circ} \mathrm{C}$ to $35^{\circ} \mathrm{C}, 85 \% \mathrm{RH}$ or less（summer）

$$
: 5^{\circ} \mathrm{C} \text { to } 15^{\circ} \mathrm{C}, 85 \% \mathrm{RH} \text { or less (winter) }
$$

The total storage time $\left(40^{\circ} \mathrm{C}, 95 \% \mathrm{RH}\right): 240 \mathrm{H}$ or less
c）Sunlight：
Be sure to shelter a product from the direct sunlight．
d）Atmosphere：
Do not store in a place where exists the risk of corrosive gas（such as acid and alkali）or volatile solvents．
e）Prevent condensation：
Be sure to put cartons on a palette or base，don＇t put it on the floor，and store them keeping off the wall．Please take care of ventilation in storehouse and around cartons，and control temperature not to change abruptly beyond the natural environment．
f）Storage life： 1 year

## 13．Reliability test item

Reliability test item：

| No． | Test item | Condition |
| :---: | :---: | :--- |
| 1 | High temperature storage test | $\mathrm{Ta}=60^{\circ} \mathrm{C} 120 \mathrm{~h}$ |
| 2 | Low temperature storage test | $\mathrm{Ta}=-20^{\circ} \mathrm{C} 120 \mathrm{~h}$ |
| 3 | High temperature and high humidity <br> operation test | $\mathrm{Ta}=40^{\circ} \mathrm{C} ; 80 \% \mathrm{RH} \quad 120 \mathrm{~h}$ <br> $(\mathrm{No}$ condensation $)$ |
| 4 | High temperature operation test | $\mathrm{Ta}=50^{\circ} \mathrm{C} 120 \mathrm{~h}$ |
| 5 | Low temperature operation test | $\mathrm{Ta}=0^{\circ} \mathrm{C} 120 \mathrm{~h}$ |

Above tests are executed under the LED module conditions．
14.Others


