# CUSTOMER' S APPROVAL SPECIFICATIONS

# MODEL: CH101ILFL-CT6

# (Complied with RoHS)

**ISSUE:JUL.30.2014**

**Spec Condition: preliminary**

| CUSTOMER | CHEFREE | | |
|---|---|---|---|
| APPROVAL | APPROVAL | CHECKER | PREPARE |
| | ch lee | kevin | kevin |

# 2.RECORD OF REVISION

| Rev | DATE | PAGE | SUMMARY |
|---|---|---|---|
| 0.1 | 2014.02.25 | ALL | Preliminary specification was first issued. |
| 0.2 | 2014.07.30 | 1&2 | Modify Thickness from 7.59mm to 8.29mm. |
| | | | |
| | | | Preliminary specification was first issued. |

# 3.MECHANICAL   SPECIFICATIONS

| (1) | Number Of Dots (Dots) | 1024(R.G.B) X 600 |
|---|---|---|
| (2) | Module Size(mm) | 256.0(W) X 166.0(H) X 8.29(D)* |
| (3) | Active Area(mm) | 222.72(H) X 125.28(V) |
| (4) | Pixel Pitch(mm) | 0.2175 (H) X 0.2088(V) |
| (5) | LCD Model | TFT , Transmissive, Normally/White |
| (6) | Polarizer Model | 3H Anti-glare (PCAP is 7H anti-reflection glass) |
| (7) | LED Backlight Color | White |
| (8) | Viewing Direction | Wide Viewing Angle |
| (9) | Gray Scale Inversion Direction | 6 O'CLOCK |
| (10) | Color Configuration | R.G.B Stripe |
| (12) | Integration of LCM and Touch | Air gap tapes |
| (13) | PCAP Touch Function | 4 fingers multi-touch |
| (14) | Module Weight(g) | TBD |

(* )Module do not include bottom frame bezel.

2

| 文件題目 | | 圖號 | | | 頁 | 次頁 |
|---|---|---|---|---|---|---|
| 發行日 | | 舊版日 | | 登入號碼 | | 機密等級 |

樣式 QT2-RD02-008

| No. | 修定區塊 | 修 訂 內 容 | 作 成 | 修訂日期 |
|---|---|---|---|---|
| | | 新版 | Swallow | 2014.07.30 |
| | | | | |
| | | | | |

256.00(T/P OUTLINE)
235±0.5 (LCM OUTLINE)
225.72±0.3 (LCM OPENING)
223.30(T/P A.A)
222.72±0.2 (LCM A.A)
128.00

11.40
15.14
16.35
16.64

11.50
18.86
20.10
20.36

83.00

8.29 ±0.5
5.50
2.80

17.00
54.00
54.00

6-M2
7.54

166.00(T/P OUTLINE)
143±0.5 (LCM OUTLINE)
128.28±0.3 (LCM OPENING)
125.80(T/P A.A)
125.28±0.2 (LCM A.A)

37.50
77.50

IC parts

27.75
72.75

A VIEW(8:1)
0.3
5
PIN1
0.5
P0.5*(10-1)=4.5
44.00

MAX:2.5
0.34
6.00(STIFFENER)

(83.85)
74.25±1
22.85±1
(34.35)
40    1

4-R5.00

NOTE:
1. Unit: mm
2. Tolerance is ±0.3 mm unless noted。
3.Cover Glass:Black Silk Printing
4.Cover Glass:Anti Reflective Treatment

| CONNECTOR PINOUT | |
|---|---|
| PIN NO. | DESIGNATION |
| 1 | RESET |
| 2 | I2C_SCL |
| 3 | I2C_SDA |
| 4 | INT |
| 5 | GND |
| 6 | VCC |
| 7 | VCC |
| 8 | GND |
| 9 | GND |
| 10 | GND |

| 備考 | | | 單位:mm | 投影法: | | 比例尺: |
|---|---|---|---|---|---|---|
| 入庫 | 製圖 Swallow 140730 | 名稱: | | | | 圖號 |
| | 審查 | TFT+TP | | | | CH101ILFL-CT6 |
| | 承認 | | | | | |

# 5. INTERFACE PIN CONNECTION

## 5.1 LCM PANEL DRIVING SECTION

CN1:STM MSAK24025P40D or equivalent

| Pin # | Signal Name | Description | Remarks |
|-------|-------------|-------------|---------|
| 1 | BIST | BIST MODE SELECT(High Enable) | FOR INTERNAL TEST |
| 2 | VDD | LCD power supply (Typ. +3.3V) | |
| 3 | VDD | LCD power supply (Typ. +3.3V) | |
| 4 | V_EDID | EDID power supply | |
| 5 | NC | No connection | |
| 6 | CLK_EDID | EDID CLK   signal | |
| 7 | Data_EDID | EDID Data   signal | |
| 8 | LVDS input 0- | LVDS CH0 data signal(-)、R0～R5、G0 | |
| 9 | LVDS input 0+ | LVDS CH0 data signal(+)、R0～R5、G0 | |
| 10 | GND | GND | |
| 11 | LVDS input 1- | LVDS CH1 data signal(-)、G1～G5、B0、B1 | |
| 12 | LVDS input 1+ | LVDS CH1 data signal(+)、G1～G5、B0、B1 | |
| 13 | GND | GND | |
| 14 | LVDS input 2- | LVDS CH2 data signal(-)、B2～B5、DE | |
| 15 | LVDS input 2+ | LVDS CH0 data signal(+)、B2～B5、DE | |
| 16 | GND | GND | |
| 17 | LVDS CLK - | LVDS CLK data signal(-) | |
| 18 | LVDS CLK + | LVDS CLK data signal(+) | |
| 19 | GND | GND | |
| 20 | LVDS input 3- | LVDS CH3 data signal(-)、R6~R7、G6~G7、B6~B7 | |
| 21 | LVDS input 3+ | LVDS CH3 data signal(-)、R6~R7、G6~G7、B6~B7 | |
| 22 | GND | GND | |
| 23 | NC | No connection | |
| 24 | NC | No connection | |
| 25 | GND | GND | |
| 26 | NC | No connection | |
| 27 | NC | No connection | |
| 28 | GND | GND | |
| 29 | NC | No connection | |
| 30 | NC | No connection | |
| 31 | GND | GND | |
| 32 | GND | GND | |

| 33 | GND | GND | |
|----|-----|-----|---|
| 34 | NC | No connection | |
| 35 | PWM | LED dimming signal | |
| 36 | LED_EN | LED Enable signal | |
| 37 | NC | No connection | |
| 38 | VLED | LED power supply (Typ. 5V) | |
| 39 | VLED | LED power supply (Typ. 5V) | |
| 40 | VLED | LED power supply (Typ. 5V) | |

## CTP Electrical Characteristic

| Symbol Descri | ption | Min | Typ | Max | Unit | Notes |
|---------------|-------|-----|-----|-----|------|-------|
| VCC | Supply voltage | 3.3 | 5.0 | 5.5 | V | |

# 6. BLOCK DIAGRAM
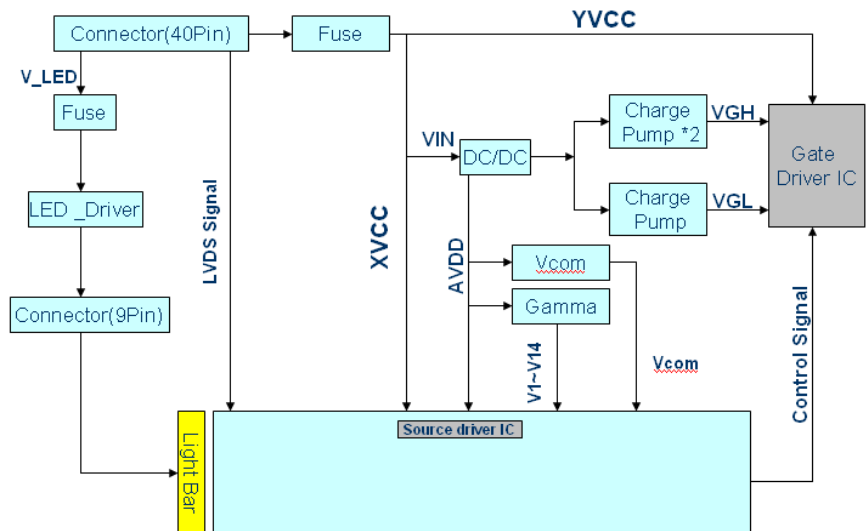


# 7. ABSOLUTE MAXIMUM RATINGS

## 7.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS

| ITEM | SYMBOL | MIN. | MAX. | UNIT | REMARK |
|------|--------|------|------|------|--------|
| Logic Power Supply Voltage | VDD | 3.0 | 3.6 | V | |
| LED Backlight Drive Voltage | VLED | -0.3 | 12 | V | |
| LVDS Input Signal | $V_S$ | -0.3 | 3.6 | V | |
| PWM Dimming Voltage | $V_{PWM}$ | -0.3 | 12 | V | |

## 7.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

| ITEM | OPERATING | | STORAGE | | REMARK |
|------|-----------|-----|---------|-----|--------|
| | MIN | MAX | MIN | MAX | |
| Ambient Temperature(℃) | -20 | 70 | -30 | 80 | Note 1,2 |

Note 1 : The response time will become lower when operated at low temperature.

Note 2 : Background color changes slightly depending on ambient temperature.

# 8. ELECTRICAL CHARACTERISTICS

## 8.1 ELECTRICAL CHARACTERISTICS OF LCD

| ITEM | SYMBOL | MIN. | TYP. | MAX. | UNIT | CONDITIONS |
|---|---|---|---|---|---|---|
| System Power Supply | | | | | | |
| Input Power Supply Voltage | $V_{IN}$ | 3.0 | 3.3 | 3.6 | V | |
| Input Power Supply Current | $I_{VIN}$ | - | - | 217 | mA | Black pattern，60Hz |
| Input Inrush Current | $I_{RUSH}$ | - | - | 1.5 | A | 0.5ms rise time (10%~90%) |
| Input Power Voltage Ripple | $V_{RPL}$ | - | - | 200 | mV | Vp-p |
| LED Power Supply | | | | | | |
| Input Power Supply Voltage | $V_{LED-IN}$ | 4.5 | 5 | 5.5 | V | |
| Input Power Supply Current | $I_{IN}$ | - | - | 586 | mA | V_LED=4.5V,η=85% |
| EN/PWM | VH | 2.0 | - | 5.0 | V | |
| | VL | 0 | - | 0.5 | V | |
| LVDS Signals | | | | | | |
| Differential Input High Threshold | $V_{th}$ | - | - | +100 | mV | $V_{cm}$=+1.2V |
| Differential Input Low Threshold | $V_{tl}$ | -100 | - | - | mV | $V_{cm}$=+1.2V |
| Magnitude Differential Input Voltage | $|V_{id}|$ | 200 | - | 600 | mV | |
| Common Mode Voltage | $V_{cm}$ | 1.0 | 1.2 | 1.4 | V | $V_{th}$ - $V_{tl}$ = 200mV |
| Common Mode Voltage Offset | $\Delta V_{cm}$ | -50 | - | +50 | mV | $V_{th}$ - $V_{tl}$ = 200mV |
| EDID Power Supply | | | | | | |
| Input Power Supply Voltage | V_EDID | 3.0 | | 3.6 | V | |

Note: A.   Input signals shall be low or Hi-Z state when VIN is off.

   B.   All electrical characteristics for LVDS signal are defined and shall be measured at the interface connector of LCD.

   C.   White Pattern at 3.3V driving voltage.

## 8.2 BACKLIGHT UNITS

Ta=25℃

| ITEM | SYMBOL | MIN. | TYP. | MAX. | UNIT | REMARK |
|---|---|---|---|---|---|---|
| LED Driving Voltage | VLED | 4.5 | 5 | 5.5 | V | |
| LED Driving Current | ILED | - | - | 585 | mA | |
| Brightness Control | VIH | 2 | 3.3 | 5 | V | |
| | VIL | 0 | - | 0.8 | V | |
| PWM Frequency | $F_{PWM}$ | 200 | | 1K | Hz | |
| LED Life Time | - | 30000 | - | - | Hr | Note1 |

   Note1：The LED life time  define as the estimated time to 50% degradation of the initial value.
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# 9. OPTICAL CHARACTERISTICS

Ta=25℃

| ITEM | | SYMBOL | CONDITIONS | MIN. | TYP. | MAX. | UNIT | REMARK |
|---|---|---|---|---|---|---|---|---|
| Contrast Ratio | | CR | Viewing | (400) | (500) | - | - | Note (1) |
| Response Time | | $T_{R+}$ $T_F$ | Normal Angle $\Theta x=\Theta y$ =0° | - | 16 | 20 | ms | Note (2) |
| Chromaticity | White | x | | (0.255) | (0.305) | (0.355) | - | Note (4) |
| | | y | | (0.275) | (0.325) | (0.375) | | |
| Viewing Angle | Hor. | $\Theta x+$ | Viewing Angle $\Theta x=\Theta y$ =0° CR≧10 | (70) | (80) | - | Deg. | Note (3) |
| | | $\Theta x-$ | | (70) | (80) | - | | |
| | Ver. | $\Theta Y+$ | | (70) | (80) | - | | |
| | | $\Theta Y-$ | | (50) | (60) | - | | |
| Luminance | | L | Center | (240) | (300) | - | cd/m2 | Note (4) |
| Luminance uniformity | | YU | PWM=100% | 70 | 80 | - | % | Note (5) |

*Note (1)  Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L63 / L0

L63: Luminance of gray level 63

L 0: Luminance of gray level 0
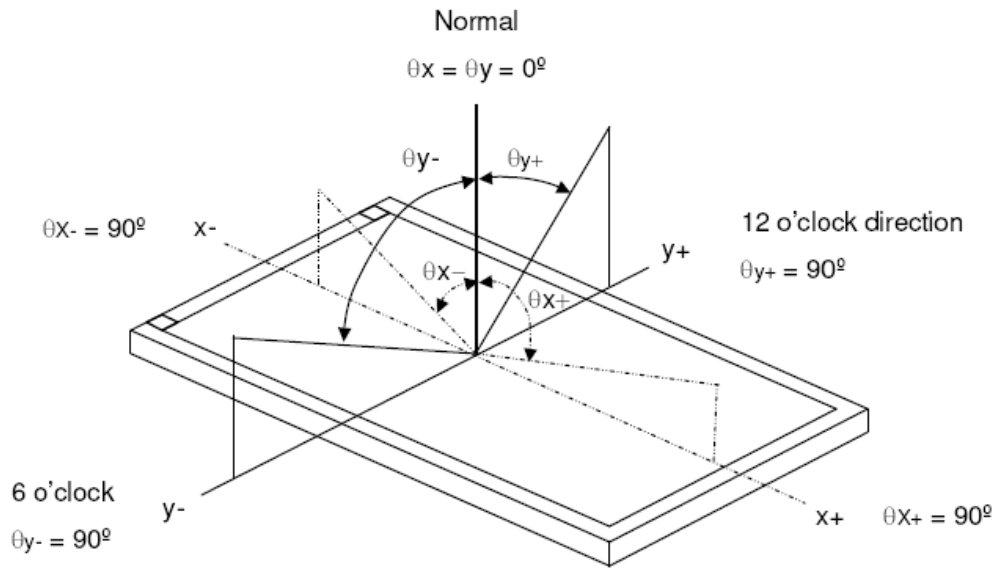
CR = CR (5)

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (5).

*Note (2)  Definition of Response Time ($T_R$, $T_F$):
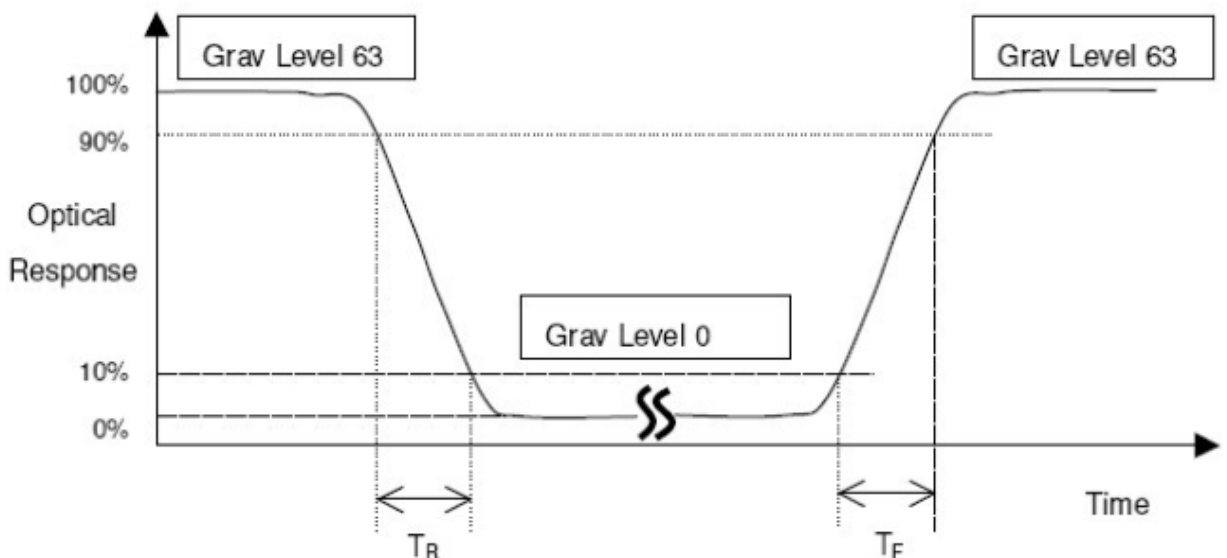
*Note(3)   Definition of Viewing Angle



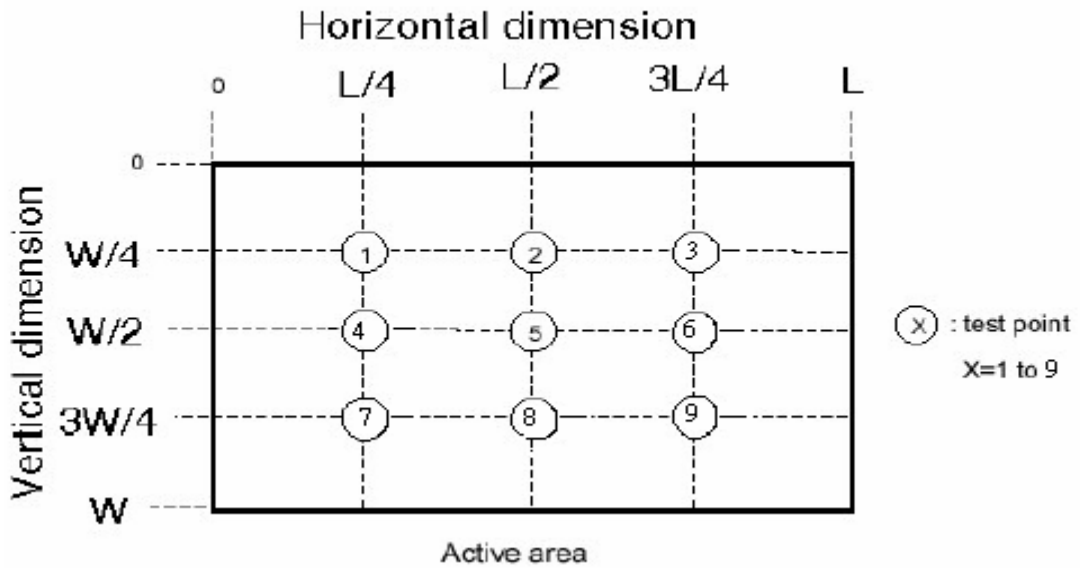*Note (4)   Measurement Set-Up:

The LCD module should be stabilized at a given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.
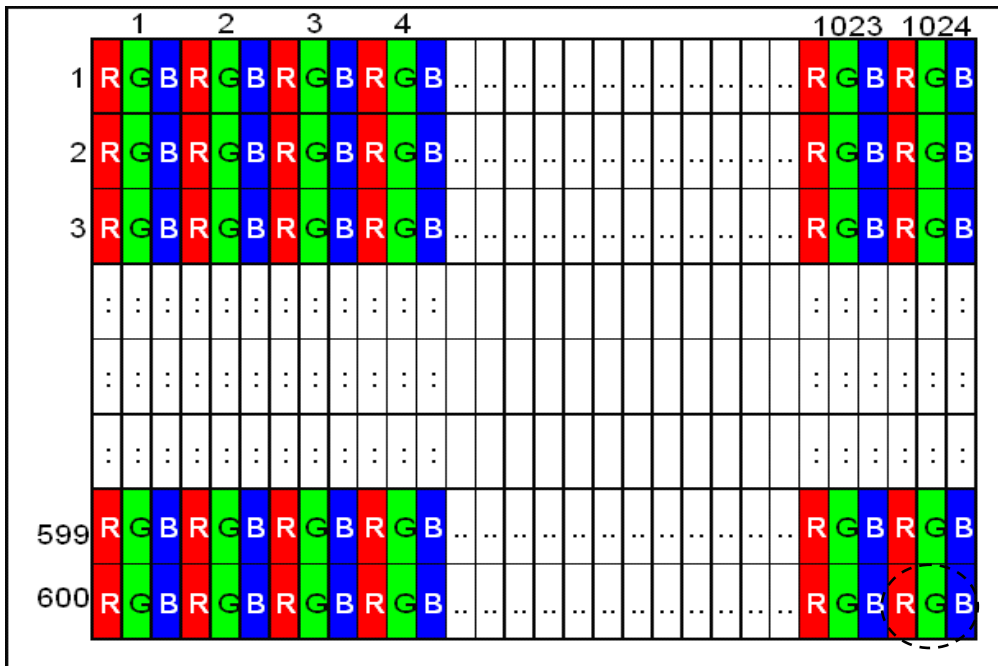
*Note (5)



Horizontal dimension
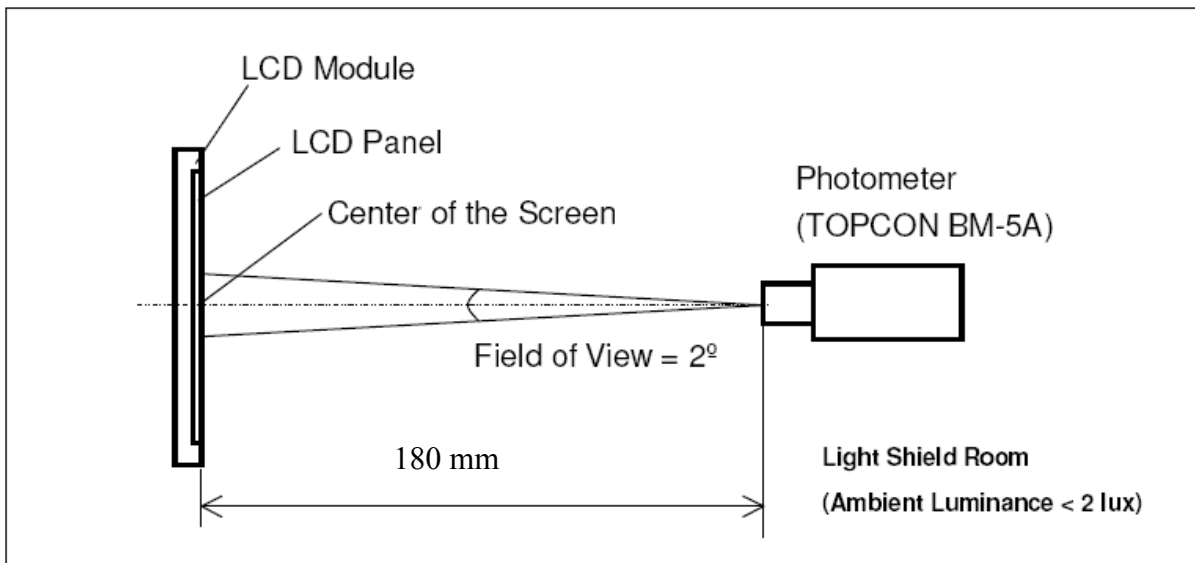
$$\left(1- \frac{\text{MAX Luminance - Average Luminance}}{\text{Average Luminance}}\right) \times 100\% > 70\%$$

### 3.0 Pixel Format Image

Figure 2 shows the relationship of the input signals and LCD pixel format image.

**Figure 2   Pixel Format**



R+G+B dots =1 Pixel

# 10. TIMING SPECIFICATIONS

## 10.1 POWER ON/OFF SEQUENCE

| Parameter | Symbol | Unit | min | Typ. | max |
|---|---|---|---|---|---|
| VDD rising Time | T1 | ms | 0.5 | -- | 10 |
| VDD Good to Signal Valid | T2 | ms | 30 | -- | 90 |
| Signal Valid to Backlight on | T3 | ms | 200 | -- | -- |
| Backlight Power on time | T4 | ms | 0.5 | -- | -- |
| Backlight VDD Good to System PWM on | T5 | ms | 10 | -- | -- |
| System PWM on to Backlight Enable on | T6 | ms | 10 | -- | -- |
| Backlight Enable off to System PWM off | T7 | ms | 0 | -- | -- |
| System PWM off to B/L Power Disable | T8 | ms | 10 | -- | -- |
| Backlight Power off time | T9 | ms | 1 | 10 | 30 |
| Backlight off to signal Disable | T10 | ms | 200 | -- | -- |
| Signal Disable to Power Down | T11 | ms | 0 | -- | 50 |
| VDD Falling Time | T12 | ms | 1 | 10 | 30 |
| Power Off | T13 | ms | 500 | -- | -- |
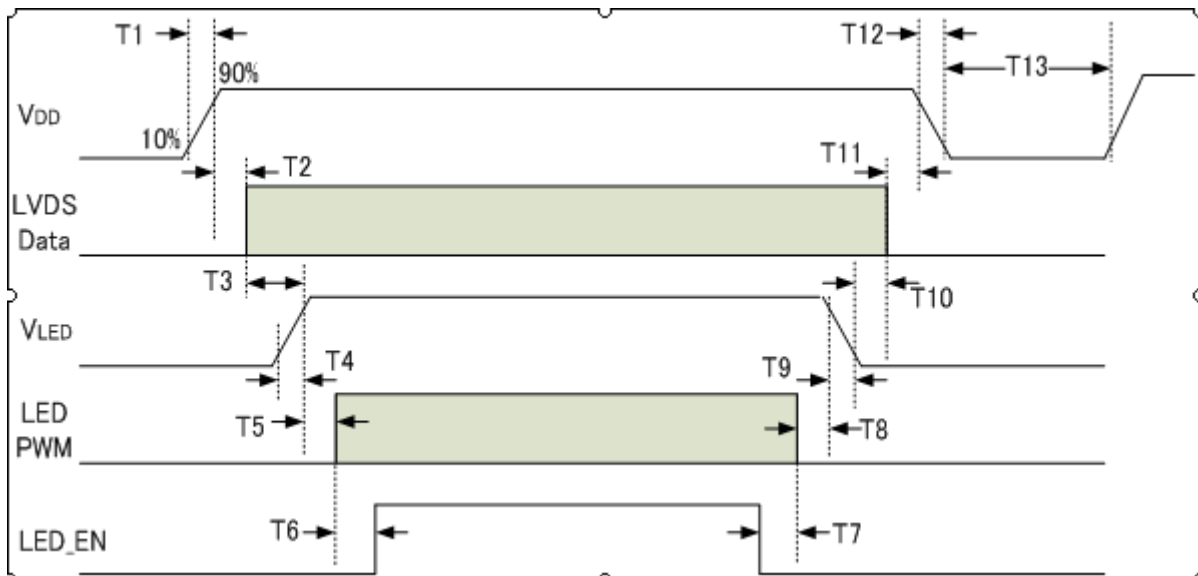


## Power Consumption

Input power specifications are as follows.

| Item | Symbol | Min. | Typ. | Max. | Units | Note |
|---|---|---|---|---|---|---|
| Input Power Supply Voltage | $V_{IN}$ | 3.0 | 3.3 | 3.6 | V | |
| Input Power Supply Current | $I_{VIN}$ | - | - | 217 | mA | Black pattern，60Hz |
| Input Inrush Current | $I_{RUSH}$ | - | - | 1.5 | A | 0.5ms rise time (10%~90%) |
| Input Power Voltage Ripple | $V_{RPL}$ | - | - | 200 | mV | Vp-p |

## 10.2 TIMING CHARACTERISTICS

Synchronization Method：DE only

| Parameter | Symbol | Unit | Min. | Typ. | Max. |
|---|---|---|---|---|---|
| LVDS Clock Frequency **<single>** | $f_{dck}$ | MHz | 45 | 51.2 | 65 |
| H Total Time | $T_{hp}$ | clocks | 1,324 | 1,344 | 1,364 |
| H Active Time | HA | clocks | 1,024 | 1,024 | 1,024 |
| H Blanking Time | $TH_{BLANK}$ | clocks | 300 | 320 | 340 |
| V Total Time | $T_{vp}$ | lines | 615 | 635 | 645 |
| V Active Time | VA | lines | 600 | 600 | 600 |
| V Blanking Time | $TV_{BLANK}$ | lines | 15 | 35 | 45 |
| V Frequency | $f_v$ | Hz | 55 | 60 | 65 |

**Figure 7 DE-only timing mode**
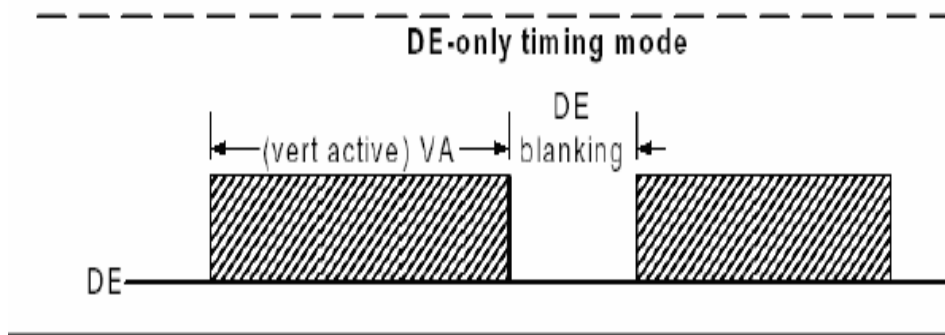


**Timing Diagram of Interface Signal**

**Figure 8 LVDS Data Mapping**
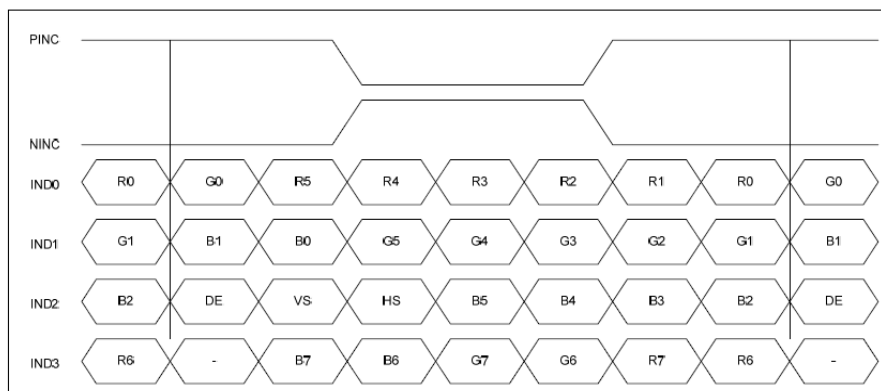
# 11. RELIABILITY TEST

| | | ENVIRONMENTAL TEST FOR LCM | | |
|---|---|---|---|---|
| NO. | ITEM | CONDITIONS | TIME PERIOD | REMARK |
| 1 | High Temperature Storage | 80℃ | 300HRS | Note1,4 |
| 2 | Low Temperature Storage | -30℃ | 300HRS | Note1,4 |
| 3 | High Temperature Operation | 70℃ | 300HRS | Note2,4 |
| 4 | Low Temperature Operation | -20℃ | 300HRS | Note1,4 |
| 5 | High Temperature Humidity Storage | 50℃ 85%RH | 300HRS | Note2,4 |
| 6 | Temperature Cycle | -20℃→60℃ (30min) (30min) | 100CYCLE | Note1,4 |

Note1 : Ta is the ambient temperature of samples.

Note2 : Ts is the temperature of panel's surface.

Note3 :  In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.

Note4 : Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

| | | |
|---|---|---|
| Thermal Shock Test | -20℃~60℃, 1h/each cycle,100cycles | |
| Shock Test   (Non-Operating) | 50G,20ms,Half Sine Wave, (±X, ±Y,±Z) | |
| Vibration Test   (Non-Operating) | 1.5G ,10~200 Hz, x、y、z each axis/30min | |
| ESD test | Contact Discharge: ±8KV,150pF(330Ω) ; Air Discharge: ±15KV,150pF(330Ω) | Note 1 |

Note1: ESD class C: Performance could be recovered by reset if temporary failure happened.

# 12. PRECAUTIONS FOR USE

## 12.1 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.

## 12.2 HANDING PRECAUTION

(1) Please mount LCD module by using mounting holes arranged in four corners tightly.

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

(3) 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. If liquid crystal contacts mouth or eyes, rinse out with water immediately. If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and Rinse thoroughly with water.

(4) Disconnect power supply before handling LCD module

(5) Refrain from strong mechanical shock and /or any force to the module.

(6) 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. It's recommended employing protection circuit for power supply.

(7) 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.

(8) When the surface is dusty, please wipe gently with absorbent cotton or other soft Material. When cleaning the adhesives, please use absorbent cotton wetted with a little Petroleum benzene or other adequate solvent.

(9) 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) Protection film must remove very slowly from the surface of LCD module to Prevent from electrostatic occurrence.

(11) Because LCD module uses CMOS-IC on circuit board and TFT-LCD panel, it is Very weak to electrostatic discharge, Please be careful with electrostatic Discharge .Persons who handle the module should be grounded through adequate methods.

(12) Do not adjust the variable resistor located on the module.

## 12.3 STORAGE PRECAUTION

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

(2) The module shall not be exposed under strong light such as direct sunlight. Otherwise, Display characteristics may be changed.

(3) The module should be stored in a dark place. It is prohibited to apply sunlight or fluorescent light in storage.

12.4 OPERATION PRECAUTION

    (1) Do not connect or disconnect the module in the "Power On" condition.

    (2) Power supply should always be turned on/off by 9.0 "Power on/off sequence"

    (3) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference should be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.

    (4) After installation of the TFT Module into an enclosure, do not twist nor bend the TFT Module even momentary. At designing the enclosure, it should be taken into consideration that no bending/twisting forces are applied to the TFT Module from outside. Otherwise the TFT Module may be damaged.

12.5 OTHERS

    (1) Ultra-violet ray filter is necessary for outdoor operation.

    (2) Avoid condensation of water which may result in improper operation or disconnection of electrode

    (3) If the module keeps displaying the same pattern for a long period of time, the image may be "sticked" to the screen.

    (4) This module has its circuitry PCB's on the rear side and should be handled carefully in order not to be stressed.

12.6 DISPOSAL

When disposing LCD module, obey the local environmental regulations.