**BOE**

| SPEC. NUMBER S8-65-AA-195 | PRODUCT GROUP TFT-LCD | P0 | ISSUE DATE 2023.7.27 | PAGE 1 OF 34 |
|---|---|---|---|---|

# TITLE :

# DV750QUM-R11 Product Specification P0

# Hefei BOE Display TECHNOLOGY CO., LTD

DBG-RD-商用器件-2022011-A

A4(210 X 297)

# REVISION  HISTORY

| REV. | ECN No. | DESCRIPTION OF CHANGES | DATE | PREPARED |
|---|---|---|---|---|
| P0 | - | Initial Release | 2023.7.27 | Yi Hong Liang |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

# Contents

# 1.0 GENERAL DESCRIPTION

## 1.1 Introduction

DV750QUM-R11 is a color active matrix TFT LCD open cell using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This module has a 75 inch diagonally measured active area with UHD resolutions (3840 horizontal by 2160 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this module can display 1.07G colors. The TFT-LCD panel used for this module is adapted for a low reflection and higher color type.
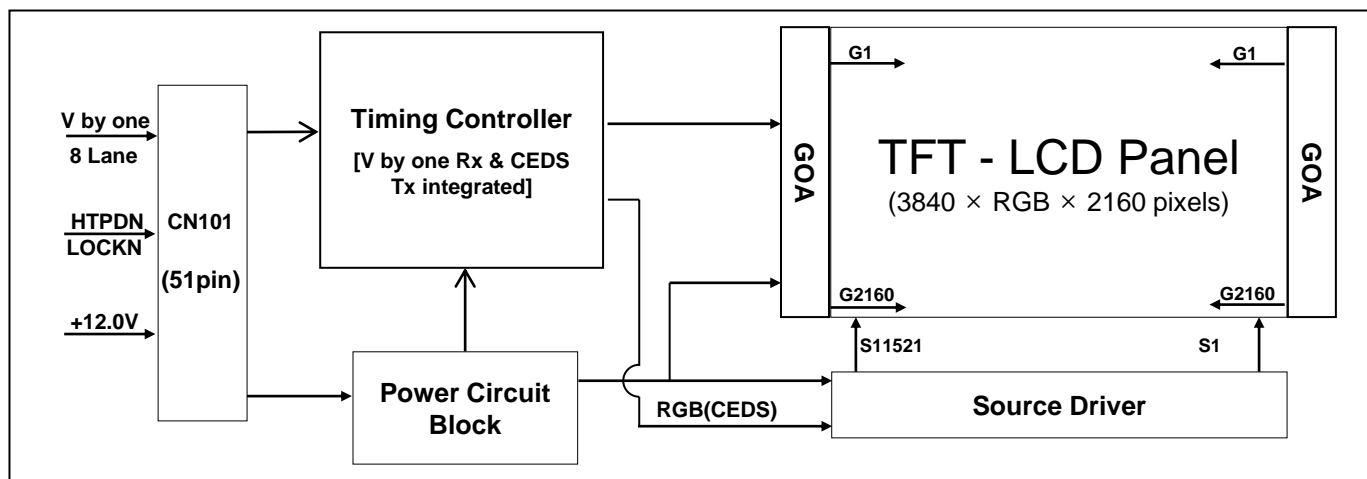


## 1.2 Features

- V by one interface with 8 lanes
- High-speed response
- Low color shift image quality
- 8-bit + FRC color depth, display 1.07G colors
- Wide viewing angle
- ADS technology is applied for high display quality
- RoHS compliant
- 7*18hrs usage support with dynamic video or 5min Static switching
- Landscape and Portrait usage support
- QWP Pol
- 3500nit BLU brightness usage support

## 1.3 Application

● Outdoor Commercial Digital Display

● Outdoor Display Terminals for Control System

● Outdoor Landscape and Portrait Signage Display

## 1.4 General Specification

< Table 1. General Specifications >

| Parameter | Specification | Unit | Remarks |
|---|---|---|---|
| Active area | 1649.664(H) × 927.936(V) | mm | |
| Number of pixels | 3840(H) ×2160 (V) | pixels | |
| Pixel pitch | 429.6(H) ×429.6(V) | um | |
| Pixel arrangement | Pixels RGB Vertical stripe | | |
| Display colors | 1.07G | colors | 8-bit + FRC |
| Display mode | Normally Black | | |
| Dimensional outline | 1675.7H*956.1V*66.8D | mm | Detail refer to drawing |
| Bezel width (L/R/U/D) | 10.9/10.9/10.9/13.1 | mm | |
| Weight | 30 | kg | |
| Power Consumption | 672 | Watt | Typ.400W(7*5 pattern) |
| Surface Treatment | AGLR (Front Polarizer)<br>Clear (Bottom Polarizer) | | |
| Back-light | D-LED | | |

| **BOE** | PRODUCT GROUP | REV | ISSUE DATE |
|---------|---------------|-----|------------|
| | TFT- LCD PRODUCT | P0 | 2023.7.27 |

| SPEC. NUMBER S8-65-AA-195 | SPEC. TITLE  DV750QUM-R11 Product Specification | PAGE 6 OF 34 |
|---------------------------|-------------------------------------------------|--------------|

## 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.

< Table 2. Module Electrical Specifications >

[VSS=GND=0V]

| Parameter | Symbol | Min. | Max. | Unit | Remark |
|-----------|--------|------|------|------|--------|
| Power Supply Voltage | VDD | VSS-0.3 | 13.5 | V | Ta = 25 ℃ |
| | VBLU | VSS-0.3 | 26.7 | V | Ta = 25 ℃ |
| Operating Temperature | $T_{SUR}$ | -30 | 80 | ℃ | Note 1 |
| Storage Temperature | $T_{ST}$ | -30 | 80 | ℃ | |
| Operating Ambient Humidity | Hop | 20 | 80 | %RH | |
| Storage Humidity | Hst | 10 | 80 | %RH | |

Note 1 : Temperature and relative humidity range are shown in the figure below.
    Wet bulb temperature should be 39 ℃ max. and no condensation of water.
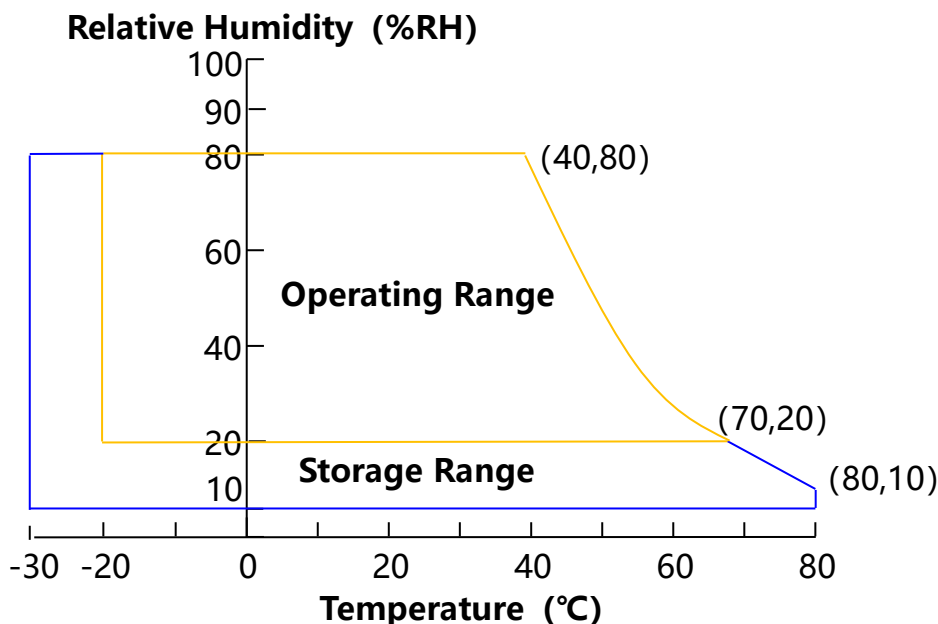
## 3.0 ELECTRICAL SPECIFICATIONS

### 3.1 TFT LCD Module

< Table 3 Module Electrical Specifications >

[Ta =25$\pm$2 ℃]

| Parameter | | Symbol | Values | | | Unit | Remark |
|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | | |
| Power Supply Input Voltage | | VDD | 10.8 | 12 | 13.2 | Vdc | |
| Power Supply Ripple Voltage | | VRP | - | - | 300 | mV | |
| Power Supply Current | | IDD | - | TBD | TBD | mA | Note 1 |
| Power Consumption | | PDD | - | TBD | TBD | Watt | |
| Rush current | | IRUSH | - | | TBD | A | Note 2 |
| V by One Interface | Differential Input High Threshold Voltage | VLVTH | - | - | +50 | mV | Note 3 |
| | Differential Input Low Threshold Voltage | VLVTL | -50 | - | - | mV | |
| | Common Input Voltage | VLVC | - | 0 | - | V | |
| CMOS Interface | Input High Threshold Voltage | VIH | 2.7 | - | 3.3 | | |
| | Input Low Threshold Voltage | VIL | 0 | - | 0.6 | V | |

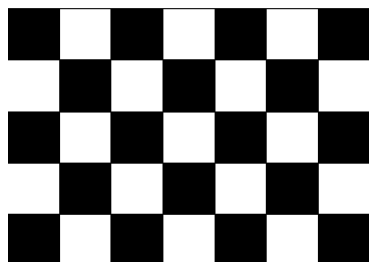Note 1 : The supply voltage is measured and specified at the interface connector of LCM.

　　　　The current draw and power consumption  specified is for VDD=12.0V,

　　　　Frame rate $f_V$=60Hz and Clock frequency = 74.25MHz.

　　　　Test Pattern of power supply current

Note 2 : The duration of  rush current is about 2ms and rising time of Power Input is 0.5ms(min)
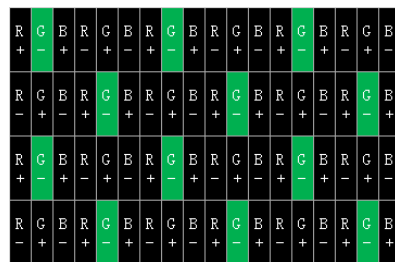
　　　　a) Typ :  Mosaic  7X5 (L0/L255)　　b) Max : Horizontal 1 Line (L0/L255)　　c) Flicker Test Pattern



Note 3 : V By one signal Eye diagram should be OK. Otherwise, there will be abnormal display.

## 3.0 ELECTRICAL SPECIFICATIONS

### 3.2 Backlight Unit

< Table 3. Backlight Unit Electrical Specifications >     [Ta =25±2 ℃]

| Parameter | | | Min. | Typ. | Max. | Unit | Remarks |
|---|---|---|---|---|---|---|---|
| Power Supply Input Voltage | | VDD | 21.6 | 24 | 26.4 | Vdc | |
| Power Supply Ripple Voltage | | VRP | - | - | 4500 | mV | |
| Power Supply Current | | IDD | - | 28 | 30 | A | |
| Rush current | | IRUSH | - | - | 35 | A | Note 1 |
| Power Consumption | | PDD | - | 672 | - | Watt | PWM Duty =100% |
| LED Forward Voltage | | $V_F$ | - | 84 | 90 | V | - |
| LED Forward Current | | $I_F$ | - | 100 | - | mA | - |
| LED Power Consumption | | $P_{LED}$ | | 672 | - | W | Note 2 |
| LED Life-Time | | N/A | 50000 | - | - | Hour | IF = 100mA |
| PWM Control Level | PWM High Level | - | 2.7 | 3.3 | 5 | V | |
| | PWM Low Level | - | 0 | - | 0.7 | V | |
| LEDEN Control Level | LEDEN High Level | - | 2.7 | 3.3 | 5 | V | |
| | LEDEN Low Level | - | 0 | - | 0.7 | V | |
| PWM Control Frequency | | $F_{PWM}$ | 120 | - | 300 | Hz | |
| Duty Ratio | | - | 1 | - | 100 | % | |

Notes : 1. The duration of rush current is about 2ms and rising time of Power Input is 1ms(min)
2. Power supply voltage12V for LED Driver, Driver efficiency 90%,
Calculator Value for reference IF × VF ×72/ 0.9 = PLED

## 3.3 Backlight Input Pin Assignments

Connector type : CI1015M1HRA_NH-15pin or equivalent

| Pin No. | Symbol | Feature |
|---|---|---|
| 1 | VIN | Operating Voltage Supply, +24V DC regulated |
| 2 | VIN | Operating Voltage Supply, +24V DC regulated |
| 3 | VIN | Operating Voltage Supply, +24V DC regulated |
| 4 | VIN | Operating Voltage Supply, +24V DC regulated |
| 5 | VIN | Operating Voltage Supply, +24V DC regulated |
| 6 | VIN | Operating Voltage Supply, +24V DC regulated |
| 7 | GND | Ground and Current Return |
| 8 | GND | Ground and Current Return |
| 9 | GND | Ground and Current Return |
| 10 | GND | Ground and Current Return |
| 11 | GND | Ground and Current Return |
| 12 | GND | Ground and Current Return |
| 13 | NC | NC |
| 14 | BL_ON | BLU On-Off control:<br>DC 0 to 0.3V off，DC 2.4 to 5V On |
| 15 | PWM | 1%≤Duty≤100% |

DC Input specification

| Parameter | Symbol | Value | | | Unit |
|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | |
| LED forward voltage per channel | VLED | - | 84 | 90 | V |
| LED forward current per channel | ILED | - | 100 | - | mA |

## 4.0 INTERFACE CONNECTION

4.1 Module Input Signal & Power：：Cable length suggest less than 500mm
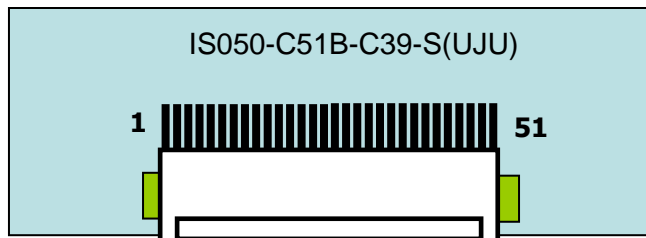 - VBO Connector : IS050-C51B-C39-S(UJU).

< Table 4. Module Input Connector Pin Configuration >

| Pin No | Symbol | Description | Pin No | Symbol | Description |
|---|---|---|---|---|---|
| 1 | VCC | Power supply（10.8~13.2V) | 16 | NC | No connection |
| 2 | VCC | Power supply（10.8~13.2V) | 17 | NC | No connection |
| 3 | VCC | Power supply（10.8~13.2V) | 18 | SDA | I2C Data for BOE Use Only |
| 4 | VCC | Power supply（10.8~13.2V) | 19 | SCL | I2C Clock fo BOE Use Only |
| 5 | VCC | Power supply（10.8~13.2V) | 20 | Local_ON | Local dimming on/off |
| 6 | VCC | Power supply（10.8~13.2V) | 21 | BIST | High（Default) or NC：On; Low : off |
| 7 | VCC | Power supply（10.8~13.2V) | 22 | Section | VX1 SECTION |
| 8 | VCC | Power supply（10.8~13.2V) | 23 | NC | No connection |
| 9 | NC | No connection | 24 | GND | GROUND |
| 10 | GND | GROUND | 25 | HTPDN | Hot plug |
| 11 | GND | GROUND | 26 | LOCKN | LOCK |
| 12 | GND | GROUND | 27 | GND | GROUND |
| 13 | GND | GROUND | 28 | RX0N | Negative VBO differential data input0 |
| 14 | GND | GROUND | 29 | RX0P | Positive VBO differential data input0 |
| 15 | NC | No connection | 30 | GND | GROUND |

DBG-RD-商用器件-2022011-A

A4(210 X 297)

| Pin No | Symbol | Description | Pin No | Symbol | Description |
|---|---|---|---|---|---|
| 31 | RX1N | Negative VBO differential data input1 | 42 | GND | GROUND |
| 32 | RX1P | Positive VBO differential data input1 | 43 | RX5N | Negative VBO differential data input5 |
| 33 | GND | GROUND | 44 | RX5P | Positive VBO differential data input5 |
| 34 | RX2N | Negative VBO differential data input2 | 45 | GND | GROUND |
| 35 | RX2P | Positive VBO differential data input2 | 46 | RX6N | Negative VBO differential data input6 |
| 36 | GND | GROUND | 47 | RX6P | Positive VBO differential data input6 |
| 37 | RX3N | Negative VBO differential data input3 | 48 | GND | GROUND |
| 38 | RX3P | Positive VBO differential data input3 | 49 | RX7N | Negative VBO differential data input7 |
| 39 | GND | GROUND | 50 | RX7P | Positive VBO differential data input7 |
| 40 | RX4N | Negative VBO differential data input4 | 51 | GND | GROUND |
| 41 | RX4P | Positive VBO differential data input4 | | | |

Notes : 1. NC (Not Connected) : This pins are only used for BOE internal operations.

      2.BIST : This pin is used for selecting display pattern mode when input DE or input CLOCK quits toggling.
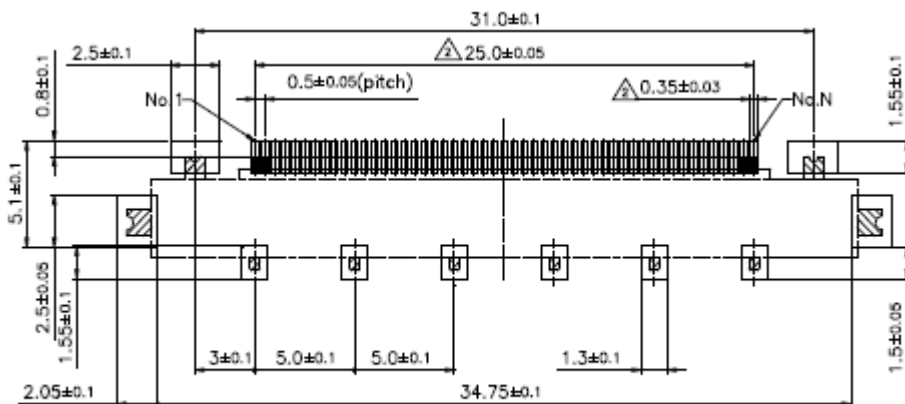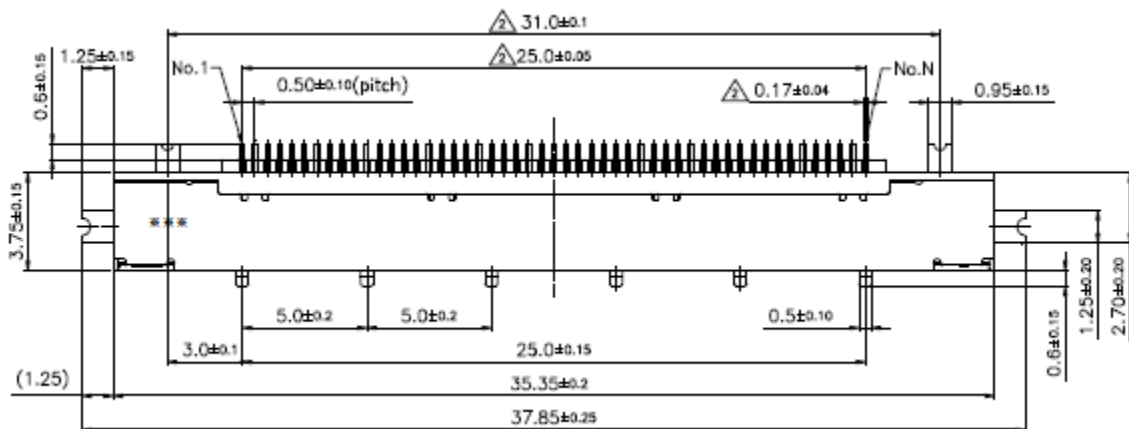
**Rear view of LCM**

IS050-C51B-C39-S(UJU)

1           51

**BIST Pattern**

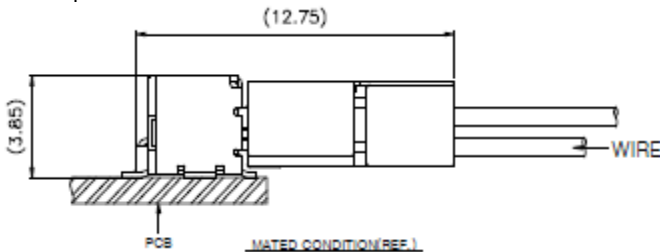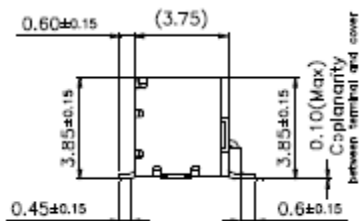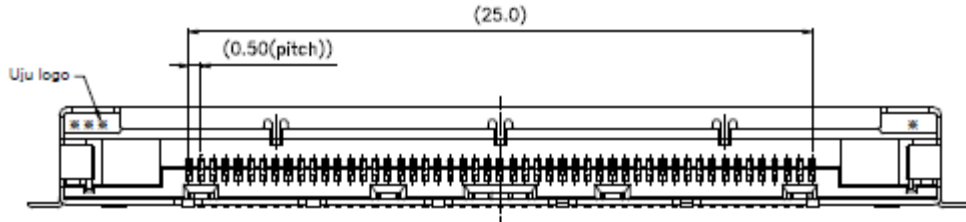| PT1:Black (2sec) | PT2:White ( 2sec) | PT3:Red (2sec) | PT4:Green(2sec) | PT5:Blue (2sec) |
|---|---|---|---|---|

## 4.2 Dimension

### 4-2 CNT Dimension

-51pin Connector：IS050-C51B-C39-S

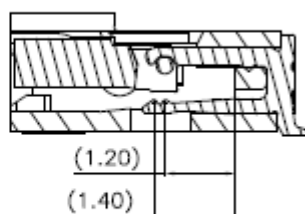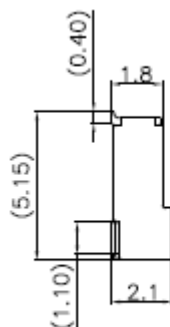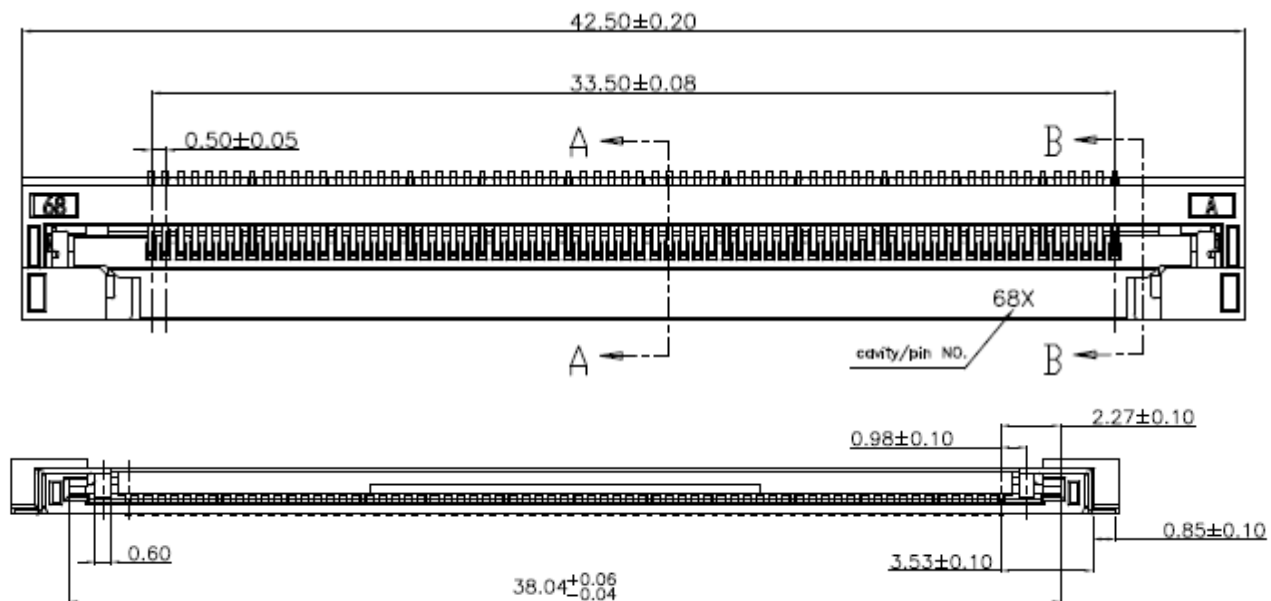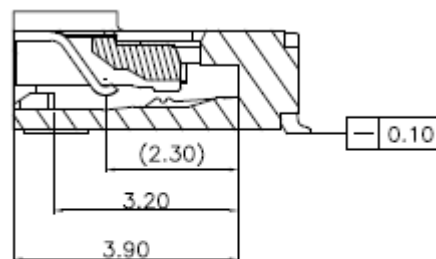## 4.2 Dimension

### 4-2 CNT Dimension
-68pin Connector：05030HR-H68D



DETAIL A-A
SCALE 2:1

DETAIL B-B
SCALE 2:1

## 4.2 Dimension

### 4-2 CNT Dimension

-68pin FFC Drawing
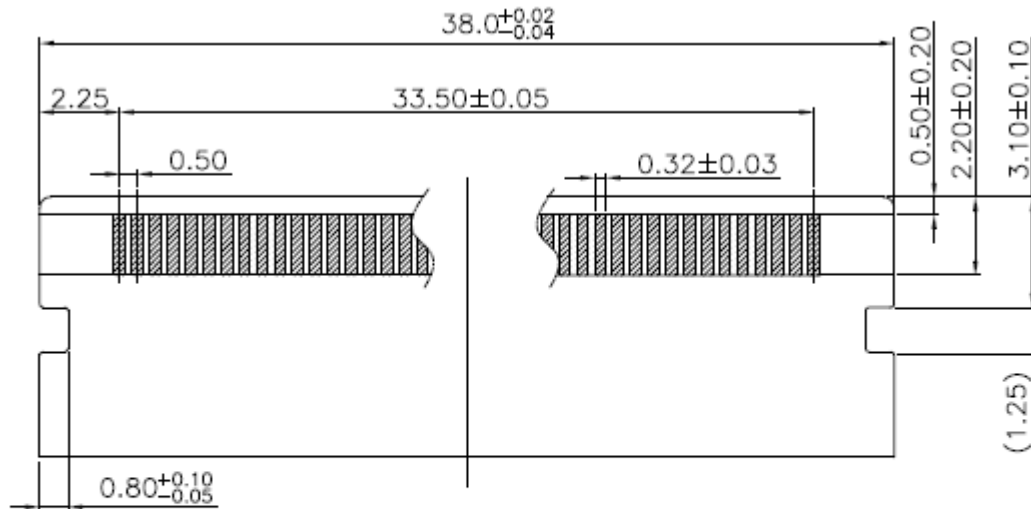


RECOMMENDED FFC DIM
(General Tolerance±0.05)

Notes: This FFC drawing are supplied by the connector vendor.

## 4.2 Dimension

### 4-2 CNT Dimension

- 15pin Connector : CI1015M1HRA_NH

Note:
* High temperature plastic UL94V−0, Color Nature
* Contact: Brass
* Fixed Tab: Brass, Matte Tin Plated
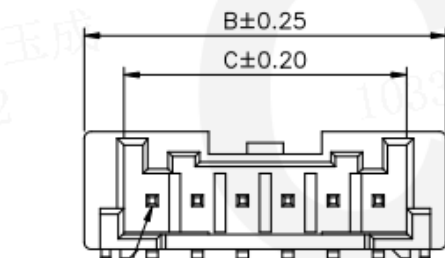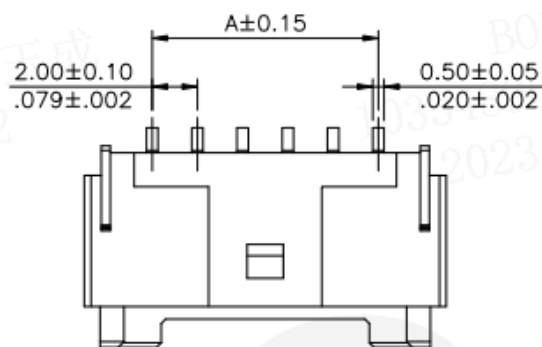


| Circuits | Dimensions | | |
|---|---|---|---|
| | A | B | C |
| * 2P | -- | 8.00(.315) | 4.50(.177) |
| * 3P | 4.00(.157) | 10.00(.394) | 6.50(.256) |
| * 4P | 6.00(.236) | 12.00(.472) | 8.50(.335) |
| * 5P | 8.00(.315) | 14.00(.551) | 10.50(.413) |
| * 6P | 10.00(.394) | 16.00(.630) | 12.50(.492) |
| 7P | 12.00(.472) | 18.00(.709) | 14.50(.571) |
| 8P | 14.00(.551) | 20.00(.787) | 16.50(.650) |
| 9P | 16.00(.630) | 22.00(.866) | 18.50(.728) |
| * 10P | 18.00(.709) | 24.00(.945) | 20.50(.807) |
| 11P | 20.00(.787) | 26.00(1.024) | 22.50(.886) |
| * 12P | 22.00(.866) | 28.00(1.102) | 24.50(.966) |
| 13P | 24.00(.945) | 30.00(1.181) | 26.50(1.043) |
| 14P | 26.00(1.024) | 32.00(1.260) | 28.50(1.122) |
| * 15P | 28.00(1.102) | 34.00(1.339) | 30.50(1.201) |
| 16P | 30.00(1.181) | 36.00(1.417) | 32.50(1.280) |

*= Available number of poles, Circuits not found above please consult manufacturer

2~9P with single locking ramp,
10~16P with double locking ramp
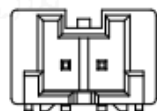
2~4P          5~8P          9~16P

## 4.3 V by One Misc. Setting.-1 Section

a) System side have to put pull high resistor on LOCKN/HTPDN pins.

b) V by one data mapping as follows.

< Table 9. V by one setting &data mapping Table >

| | 1Section | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Hactive=3840 | | | | | | | |
| | port0 | | port1 | | port2 | | port3 | |
| | Lane 0 | Lane 1 | Lane 2 | Lane 3 | Lane 4 | Lane 5 | Lane 6 | Lane 7 |
| **V Blanking** | PSBS | PSBS | PSBS | PSBS | PSBS | PSBS | PSBS | PSBS |
| | FSBP | FSBP | FSBP | FSBP | FSBP | FSBP | FSBP | FSBP |
| | … | … | … | … | … | … | … | … |
| | FSBP | FSBP | FSBP | FSBP | FSBP | FSBP | FSBP | FSBP |
| | FSBE SR | FSBE SR | FSBE SR | FSBE SR | FSBE SR | FSBE SR | FSBE SR | FSBE SR |
| **Line 1** | Pixel 1 | Pixel 2 | Pixel 3 | Pixel 4 | Pixel 5 | Pixel 6 | Pixel 7 | Pixel 8 |
| | Pixel 9 | Pixel 10 | Pixel 11 | Pixel 12 | Pixel 13 | Pixel 14 | Pixel 15 | Pixel 16 |
| | … | … | … | … | … | … | … | … |
| | … | … | … | … | … | … | … | … |
| | Pixel3833 | Pixel3834 | Pixel3835 | Pixel3836 | Pixel3837 | Pixel3838 | Pixel3839 | Pixel3840 |
| **H Blanking** | PSBS | PSBS | PSBS | PSBS | PSBS | PSBS | PSBS | PSBS |
| | FSBP | FSBP | FSBP | FSBP | FSBP | FSBP | FSBP | FSBP |
| | … | … | … | … | … | … | … | … |
| | FSBP | FSBP | FSBP | FSBP | FSBP | FSBP | FSBP | FSBP |
| | FSBE | FSBE | FSBE | FSBE | FSBE | FSBE | FSBE | FSBE |
| **Line 2** | Pixel 1 | Pixel 2 | Pixel 3 | Pixel 4 | Pixel 5 | Pixel 6 | Pixel 7 | Pixel 8 |
| | Pixel 9 | Pixel 10 | Pixel 11 | Pixel 12 | Pixel 13 | Pixel 14 | Pixel 15 | Pixel 16 |
| | … | … | … | … | … | … | … | … |
| | … | … | … | … | … | … | … | … |
| | Pixel3833 | Pixel3834 | Pixel3835 | Pixel3836 | Pixel3837 | Pixel3838 | Pixel3839 | Pixel3840 |

## 5.0 SIGNAL TIMING WAVEFORMS OF INTERFACE SIGNAL
## 5.1 Input Data Specification CN1

 - Table 6 Vx1 Byte length and Color mapping

| Byte | Packer input | Color data mapping |
|---|---|---|
| | | 30 bpp RGB |
| 0 | Bit-0 | R2 |
| | Bit-1 | R3 |
| | Bit-2 | R4 |
| | Bit-3 | R5 |
| | Bit-4 | R6 |
| | Bit-5 | R7 |
| | Bit-6 | R8 |
| | Bit-7 | R9 |
| 1 | Bit-8 | G2 |
| | Bit-9 | G3 |
| | Bit-10 | G4 |
| | Bit-11 | G5 |
| | Bit-12 | G6 |
| | Bit-13 | G7 |
| | Bit-14 | G8 |
| | Bit-15 | G9 |
| 2 | Bit-16 | B2 |
| | Bit-17 | B3 |
| | Bit-18 | B4 |
| | Bit-19 | B5 |
| | Bit-20 | B6 |
| | Bit-21 | B7 |
| | Bit-22 | B8 |
| | Bit-23 | B9 |
| 3 | Bit-24 | - |
| | Bit-25 | - |
| | Bit-26 | B0 |
| | Bit-27 | B1 |
| | Bit-28 | G0 |
| | Bit-29 | G1 |
| | Bit-30 | R0 |
| | Bit-31 | R1 |

## 5.2 Signal Timing Waveform     < Table 10. Signal Timing Table >

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Unit Interval(VBO Operation Bit Rate) | tRBIT | 3-byte | 380 | tTCIP/30 | 1667 | PS |
| | | 4-byte | 285 | tTCIP/40 | 1250 | PS |
| | | 5-byte | 266 | tTCIP/50 | 1000 | PS |
| Eye Width at Package Pin | tREYE | - | - | 0.5 | - | UI |
| Eye Width Position A at Package Pin | tA | - | - | 0.25 | - | UI |
| Eye Width Position B at Package Pin | tB | - | - | 0.3 | - | UI |
| Eye Width Position Cat Package Pin | tC | - | - | 0.7 | - | UI |
| Eye Width Position D at Package Pin | tD | - | - | 0.75 | - | UI |
| Eye Width Position E at Package Pin | tE | - | - | 0.7 | - | UI |
| Eye Width Position F at Package Pin | tF | - | - | 0.3 | - | UI |
| Intra – pair Skew | TTOSK_intra | - | - | - | 0.3 | UI |
| Inter – pair Skew | TTOSK_inter | - | - | - | 40 | UI |
| SSCG | — | | | | | % |



| | Y[mV] |
|---|---|
| A | 0 |
| B | 50 |
| C | 50 |
| D | 0 |
| E | -50 |
| F | -50 |
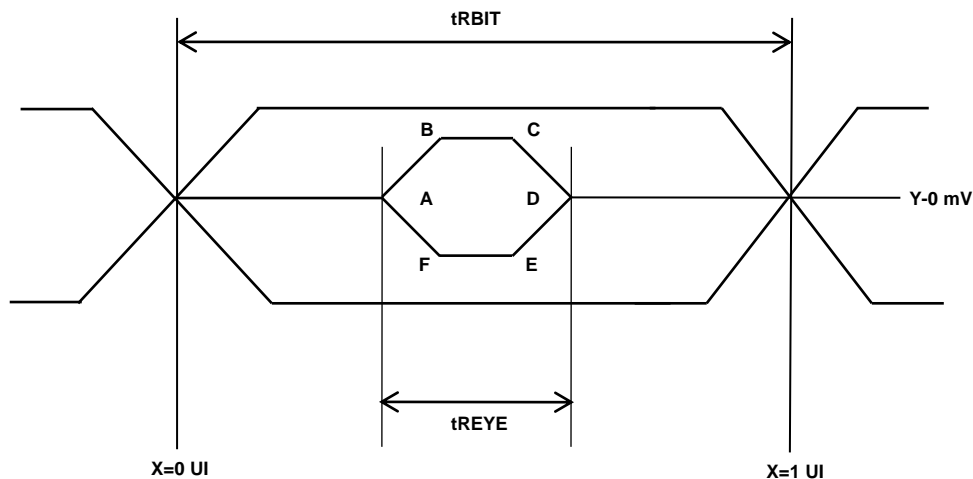
## 6.0 SIGNAL TIMING SPECIFICATION

### 6.1 Timing Parameters

< Table 7. Timing Table >

| Item | Symbol | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| DCLK | Period | tCLK | 12.5 | 13.47 | 15.1 | ns |
| | Frequency | - | 66 | 74.25 | 80 | MHz |
| Horizontal | Horizontal Period (Total) | tHP | 530 | 550 | 570 | tCLK |
| | Horizontal Valid | tHV | 480 | | | tCLK |
| | Horizontal Blank | tHB | 50 | 70 | 90 | - |
| Vertical | Vertical Period (Total) | tVP | 2180 | 2250 | 2450 | tHP |
| | Vertical Valid | tVV | 2160 | | | tHP |
| | Vertical Blank | tVB | 20 | 90 | 290 | tHP |
| | Frequency | fV | 57 | 60 | 63 | Hz |
| VBO Receiver Clock | Input spread spectrum ratio | SSr | -0.5 | - | +0.5 | % |
| | Inter-Pair Skew | $T_{RISK\_Inter}$ | -5 | - | 5 | UI |

Note

1. While operation, DE signal should be have the same cycle. The input of HSYNC & VSYNC signal does not have an effect on   normal operation (DE Only Mode, but the signals of Hsync and Vsync must be   inputted even though this TCON is operated at DE  Only Mode.

2. Best operation clock frequency is 74.25Mhz.

3. Frequency = [Htyp. Total] * [Vtyp. Total] * [vertical Frame rate]
   H Total, V Total and Frame rate should operate within the range between Frequency_Min and Frequency_Max

4. Except Best operation clock frequency, FOS(Flicker & Brightness & Crosstalk, Etc.) are not guaranteed.

5. Main frequency Max is 80MHz without spread spectrum

## 6.2 Input Signals, Basic Display Colors and Gray Scale of Colors

< Table 12. Input Signal and Display Color Table >

| Color | | Input Color Data | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MSB | | | RED | | | LSB | | | | MSB | | | GREEN | | | | LSB | | | MSB | | | BLUE | | | | 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 Color | 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 | | | | |
| | 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 | | | | |
| R | 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 | | | | |
| G | 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 (000) | 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 | | | | |
| B | 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(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 | 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 | | | | |

## 6.3 Power Sequence
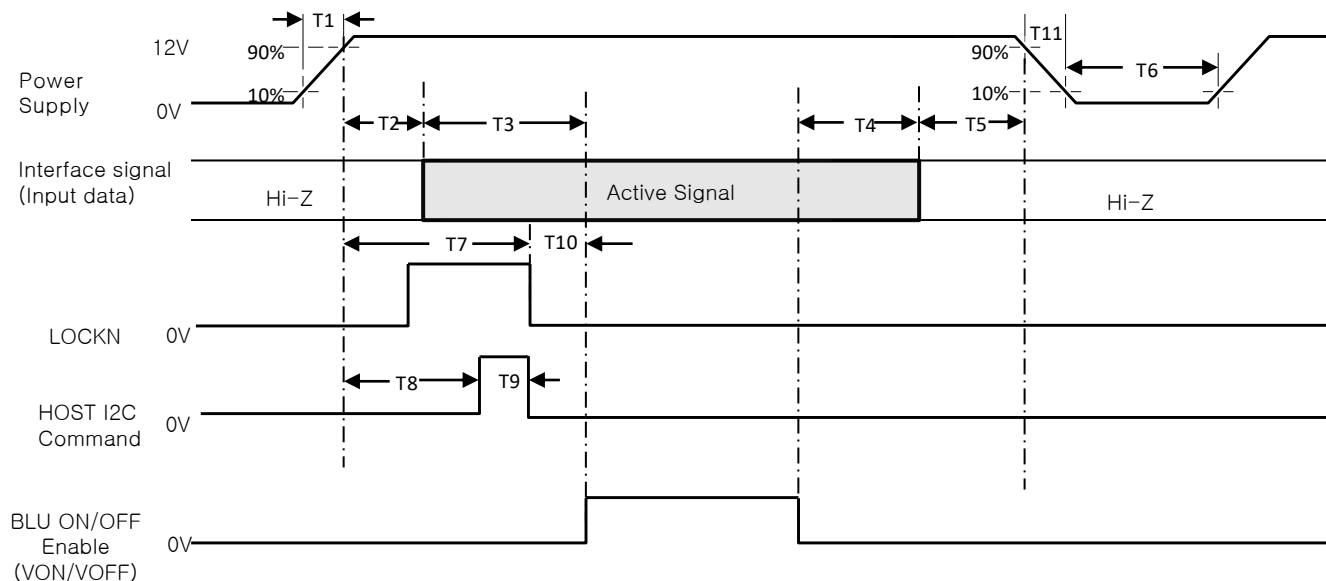


< Table 14. Sequence Table >

| Parameter | Values | | | Units |
|---|---|---|---|---|
| | **Min** | **Typ** | **Max** | |
| T1 | 0.5 | - | 10 | ms |
| T2 | 0 | - | 50 | ms |
| T3 | 200 | - | - | ms |
| T4 | 100 | - | - | ms |
| T5 | 0 | - | 50 | ms |
| T6 | 5 | - | - | s |
| T7 | - | - | 200 | ms |
| T8 | 1200 | - | - | ms |
| T9 | Depends on I2C command | | | |
| T10 | 300 | - | - | ms |
| T11 | - | - | - | |

Note 1:  Even though T1 is over the specified value, there is no problem if the rush current is within Spec.

Note 2:  When the power supply VDD is 0V, keep the level of input signals on the low or high impedance；

　　　※ Please avoid floating state of interface signal at invalid period.

　　　※ When the power supply for LCD (VDD) is off, be sure to pull down the valid and invalid data to 0V.

Note 3:  The T3 / T4 is recommended value, the case when failed to meet a minimum specification, abnormal display would be shown. There is no reliability problem.

Note 4：T5 should be measured after the Module has been fully discharged between power off and on period

Note 5: Even though T7&T10 is over the specified value, please extend the time of Back Light on to ensure invalid data will not be seen.
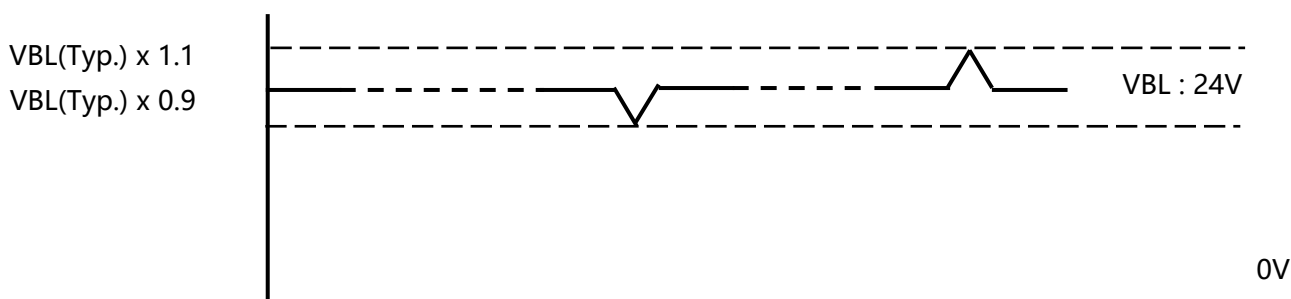
Note 6: T11: Voltage of VDD must decay smoothly after power-off, there should be none re-bounding voltage. (customer system decide this value)

## 6.3 Power Sequence

## Sequence for converter
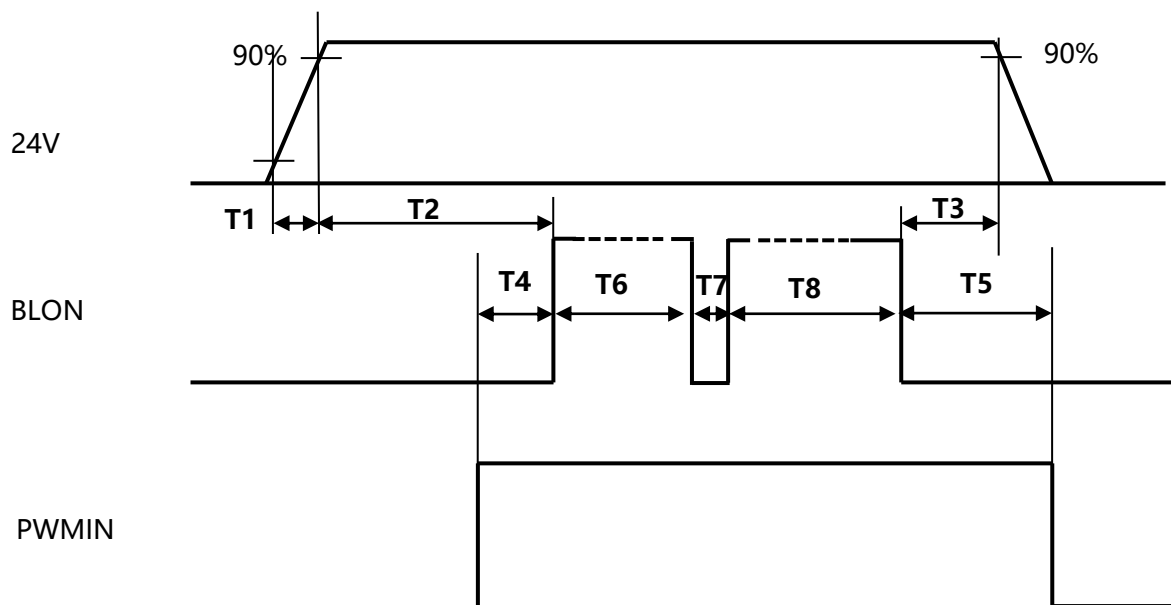


## Input Voltage deep condition for converter



- T1 /T3≥ 10ms
- T2 ≥ 200ms
- T4/T5 ≥ 0.1ms
- T6/T8 ≥ 2sec
- T7 ≥ 500ms

## 7.0 OPTICAL SPECIFICATIONS

The test of optical specifications shall be measured in a dark room (ambient luminance≤1 lux and temperature=25±2℃) with the equipment of Luminance meter system (Goniometer system and PR730) and test unit shall be located at an approximate distance 180cm from the LCD surface at a viewing angle of θ and Φ equal to 0°. We refer to $\theta_{\varnothing=0}$ (=$\theta_3$ ) as the 3 o'clock direction (the "right"), $\theta_{\varnothing=90}$ (= $\theta_{12}$ ) as the 12 o'clock direction ("upward"), $\theta_{\varnothing=180}$ (= $\theta_9$ ) as the 9 o'clock direction ("left") and $\theta_{\varnothing=270}$(= $\theta_6$ ) as the 6 o'clock direction ("bottom"). While scanning θ and/or Ø, the center of the measuring spot on the Display surface shall stay fixed. The measurement shall be executed after 30 minutes warm-up period. VDD shall be 12.0V at 25°C. Optimum viewing angle direction is 6 'clock.

< Table 12. Optical Table >

[VDD = 12.0V, Frame rate = 60Hz, Ta =25±2 ℃]

| Parameter | | Symbol | Condition | Min | Typ | Max | Unit | Remark |
|---|---|---|---|---|---|---|---|---|
| Viewing Angle | Horizontal | $\Theta_3$ | CR > 10 | | 89 | | Deg. | |
| | | $\Theta_9$ | | | 89 | | Deg. | |
| | Vertical | $\Theta_{12}$ | | | 89 | | Deg. | |
| | | $\Theta_6$ | | | 89 | | Deg. | |
| Contrast ratio | | CR | | 800:1 | 1200:1 | - | | Note 2 |
| Brightness | | Lv | | 2800 | 3500 | - | nit | MDL |
| White luminance uniformity | | ΔY | | 75 | - | - | % | Note 3 |
| Reproduction of color | White | $W_x$ | Θ = 0° (Center) Normal Viewing Angle | TYP. - 0.03 | 0.313 | TYP. + 0.03 | | Note 4 |
| | | $W_y$ | | | 0.329 | | | |
| | Red | $R_x$ | | | TBD | | | |
| | | $R_y$ | | | TBD | | | |
| | Green | $G_x$ | | | TBD | | | |
| | | $G_y$ | | | TBD | | | |
| | Blue | $B_x$ | | | TBD | | | |
| | | $B_y$ | | | TBD | | | |
| Color Gamut | | | | 68 | 72 | - | % | |
| Response Time | G to G | $T_g$ | | - | 10 | TBD | ms | Note 4 |
| Cell Transmittance | | Tr. | - | | TBD | - | % | Note 5 |

Note :

1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface.

2. Contrast measurements shall be made at viewing angle of $\theta = 0°$ and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state. (See Figure 1 shown in Appendix) Luminance Contrast Ratio (CR) is defined mathematically.

$$ CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}} $$

3. The color chromaticity coordinates specified in Table 9.shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel. The BLU is used by BOE.

4. Response time Tg is the average time required for display transition by switching the input signal as below table and is based on Frame rate fV =60Hz to optimize.
   Each time in below table is defined as Figure 2 and shall be measured by switching the input signal for "any level of gray(bright)"and "any level of gray(dark)".

| Measured Response Time | | Target | | | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | | 0 | 15 | 31 | 47 | 63 | 79 | 95 | 111 | 127 | 143 | 159 | 175 | 191 | 207 | 223 | 239 | 255 |
| Start | 0 | | | | | | | | | | | | | | | | | |
| | 15 | | | | | | | | | | | | | | | | | |
| | 31 | | | | | | | | | | | | | | | | | |
| | 47 | | | | | | | | | | | | | | | | | |
| | 63 | | | | | | | | | | | | | | | | | |
| | 79 | | | | | | | | | | | | | | | | | |
| | 95 | | | | | | | | | | | | | | | | | |
| | 111 | | | | | | | | | | | | | | | | | |
| | 127 | | | | | | | | | | | | | | | | | |
| | 143 | | | | | | | | | | | | | | | | | |
| | 159 | | | | | | | | | | | | | | | | | |
| | 175 | | | | | | | | | | | | | | | | | |
| | 191 | | | | | | | | | | | | | | | | | |
| | 207 | | | | | | | | | | | | | | | | | |
| | 223 | | | | | | | | | | | | | | | | | |
| | 239 | | | | | | | | | | | | | | | | | |
| | 255 | | | | | | | | | | | | | | | | | |

5. Definition of Transmittance (T%) :

   Module is with white(L255) signal input

$$ \text{Transmittance} = \frac{\text{Luminance of LCD Module}}{\text{Luminance of BLU}} \times 100\% $$

# 8.0 MECHANICAL CHARACTERISTICS

## 8.1 Dimensional Requirements

Figure 3(located in Appendix) shows mechanical outlines for the OC  DV366FBB-N10
. Other parameters are shown in Table 13.

< Table 13. Dimensional Parameters >

| Parameter | Specification | Unit |
|---|---|---|
| Weight | 30(预估) | KG |
| Active area | 1649.664(H) × 927.936(V) | mm |
| Pixel pitch | 429.6(H) × 429.6(V) | um |
| Number of pixels | 3840(H) × 2160 (V)  (1 pixel = R + G + B dots) | pixels |

## 8.2 Mounting
See FIGURE 3. (shown in Appendix)

## 8.3 Anti-Glare and Polarizer Hardness.
The surface of the LCD has an anti-glare coating to minimize reflection and a coating to reduce  scratching.

## 9.0 RELIABILITY TEST

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

< Table 14. Reliability Test Parameters >

| No | Test Items | Conditions |
|----|-----------|-----------|
| 1 | High temperature storage test | Ta = 80 ℃, 240 hrs |
| 2 | Low temperature storage test | Ta = -30 ℃, 240 hrs |
| 3 | High temperature & high humidity operation test | Ta = 50 ℃, 80%RH, 240hrs |
| 4 | High temperature operation test | Ta = 60 ℃, 240hrs |
| 5 | Low temperature operation test | Ta = -20℃, 240hrs |
| 6 | Thermal shock | Ta = -20 ℃ ↔ 60 ℃ (0.5 hr), 100 cycle |
| 7 | Electro-static discharge test (non-operating) | Air       : 150 pF, 330Ω, 15 KV<br>Contact   : 150 pF, 330Ω, 8 KV |

Note 1 : In the standard conditions, there is no function failure issue occurred.

This test condition is based on BOE module.

# 10.0 PRODCUT SERIAL NUMBER
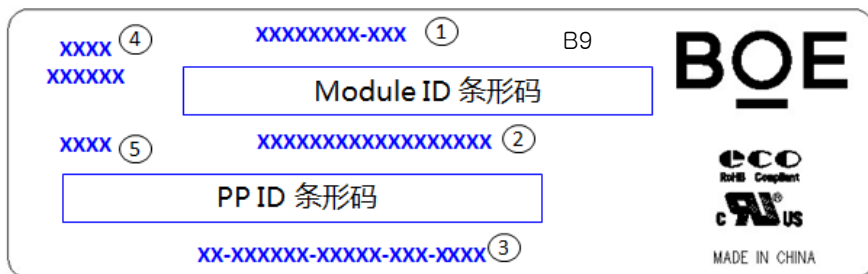


① FG-CODE
② Module ID，最后一位为Revision Code（扫描不显示），前17位编码规则如下
③ PPID（客户端ID）
④ D/PN码，规格待确定
⑤ 生产年份+生产周别（中间无空格）

MDL ID Naming Rule:

| Digit | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Code | S | L | S | A | 1 | 0 | 8 | 5 | 9 | 4 | 2 | 0 | 0 | 0 | 1 | D | B |
| Description | Product Code/GBN→FG-CODE一一对应 | Grade | line | Year | | Month | Model Extension Code (Last 4 Digits of FG-CODE ) | | | | Serial No. Hex-Decimal 000000-FFFFFF | | | | | | |

## 11.0 PACKING INFORMATION

BOE provides the standard shipping container for customers, unless customer specifies their packing information. The standard packing method and Barcode information are shown in below.

## 11.1 Packing Order
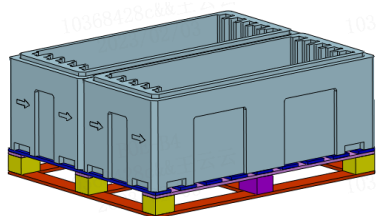
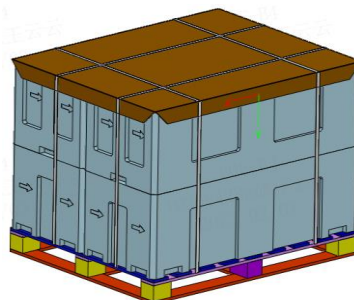1. Put 2 ea Bottom on the pallet.
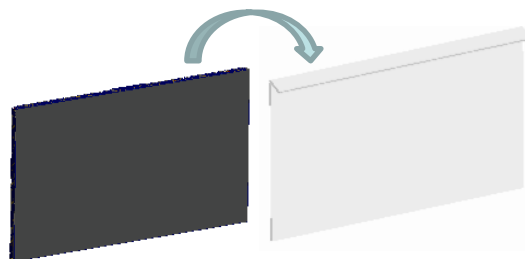
2. Put one MDL in the PE bag (PCB↓) .
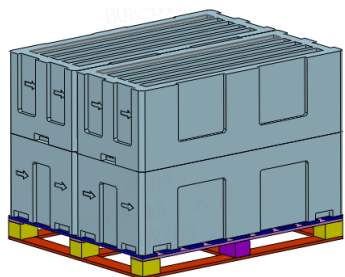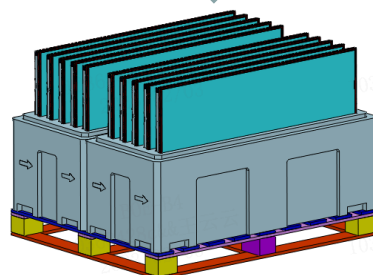
3. Put 5 Pcs MDL on the per box ,totally 10 Pcs MDL

4. Put 2 ea Cover on the box

5. Put one Top Cover on the Box and pack with wrap film,. Finally, pack with 4 packing belts.

6. 货车（12m）：一横摆放，单层码放

## 11.2 Packing Note

- Box Dimension : 1842mm(L)×610mm(W)×1180mm(H)
- Package Quantity in one Box : 5pcs

## 11.3 Box Label

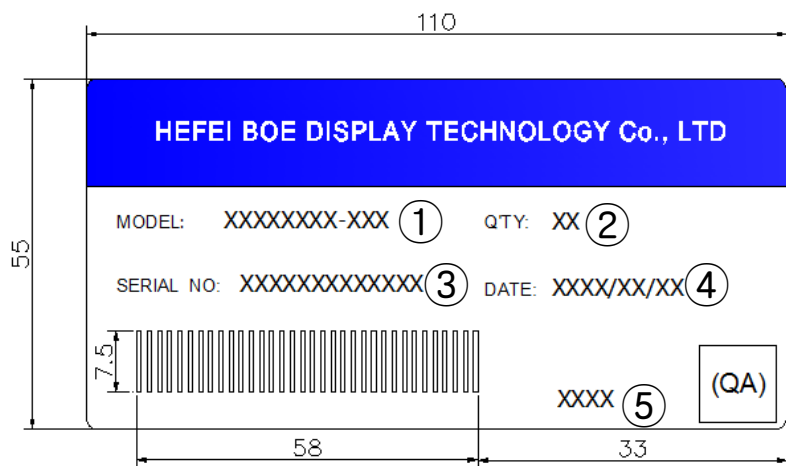- Label Size : 110mm (L) × 55mm (W)
  - Contents
    Model : DV750QUM-R11
    Q`ty : Module  5 Q`ty in one  box
    Serial No. : Box Serial No.
    Date : Packing Date



1. FG-CODE(前12位)
2. 包装数量
3. Box ID
4. 包装日期
5. FG-Code后四位

Box ID Naming Rule:

| Digit Code | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Code | S | L | S | 9 | 1 | 6 | 3 | 5 | 9 | 4 | 2 | 0 | 0 |
| Description | Products GBN | | Grade | Line | Year | | Month | Revision Code | Serial No 00001-ZZZZZZ | | | | |

## 12.0 PRECAUTIONS

Please pay attention to the followings when you use this TFT LCD  Module.

### 12.1  Mounting Precautions

- Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
- You must mount a module using specified mounting holes (Details refer to the drawings)
- You should consider the mounting structure so that uneven force (ex. Twisted stress, Concentrated stress)is not applied to the module. And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.
- Do not apply mechanical stress or static pressure on module; Abnormal display cause by pressing  some parts of  module  during assembly process , do not belong to product failure, the press should be  agreed by two sides.
- Determine the optimum mounting angle, refer to the viewing angle range in the specification for each model.
- Do not apply mechanical stress or static pressure on module , and avoid impact,   vibration and falling.
- Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.
- Protection film for polarizer on the module should be slowly peeled off before display.
- Be careful to prevent water & chemicals contact  the module  surface.
- You should adopt radiation structure to satisfy the temperature specification.
- Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment. Do not touch the surface of polarizer for bare hand or greasy cloth.(Some cosmetics are detrimental to the polarizer.)
- When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with petroleum benzine. Normal-hexane  & alcohol  is recommended for cleaning the adhesives used to attach front / rear polarizers. Do not use acetone, toluene , because they cause chemical damage to the polarizer.
- Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading..

- This module has its circuitry PCB's on the rear side and Driver IC, should be handled carefully in order not to be stressed.
- Avoid impose stress on PCB and Driver IC during assembly process ,Do not drawing, bending, COF package & wire
- Do not disassemble the module.

### 12.2 Operating Precautions

- Do not connector or disconnect the cable to/from the Module at the "Power On" Condition.
- When the module is operating, do not lose CLK, ENAB signals. If any one of these signals is lost, the module would be damaged.
- Obey the supply voltage sequence. If wrong sequence is applied, the module would be damaged.
- Do not allow to adjust the adjustable resistance or switch
- The electrochemical reaction caused by DC voltage will lead to LCD module degradation, so DC drive should be avoided.
- The LCD modules use C-MOS LSI drivers, so customers are recommended that any unused input terminal would be connected to Vdd or Vss, do not input any signals before power is turn on, and ground you body, work/assembly area, assembly equipment to protect against static electricity.
- Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on) Otherwise the Module may be damaged.
- Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimized the interference.
- Design the length of cable to connect between the connector for back-light and the converter as shorter as possible and the shorter cable shall be connected directly , The long cable between back-light and Converter may cause the Luminance of LED to lower and need a higher startup voltage
- The cables should be as short as possible between System Board and PCB interface.
- Connectors are precision devices to transmit electrical signals, and operators should plug in parallel
- Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.

## 12.3 Electrostatic Discharge Precautions

- Avoid the use work clothing made of synthetic fibers. We recommend cotton clothing or other conductivity-treated fibers.
- Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wrist band etc.
- Do not close to static electricity to avoid product damage.
- Do not touch interface pin directly.

## 12.4 Precautions for Strong Light Exposure

- Do not leave the module operation or storage in Strong light . Strong light exposure causes degradation of polarizer and color filter.

## 12.5 Precautions for Storage

A. Atmosphere Requirement

| ITEM | UNIT | MIN | TYP | MAX |
|---|---|---|---|---|
| Storage Temperature | (°C) | 5 | 25 | 40 |
| Storage Humidity | (%rH) | 40 | 50 | 75 |
| Storage Life | 6 months | | | |
| Storage Condition | <ul><li>The storage room should be equipped with a dark and good ventilation facility.</li><li>Prevent products from being exposed to the direct sunlight, moisture and water.</li><li>The product need to keep away from organic solvent and corrosive gas.</li><li>Be careful for condensation at sudden temperature change.</li><li>Storage condition is guaranteed under packing conditions.</li></ul> | | | |

B. Package Requirement

- The product should be placed in a sealed polythene bag.
- Product Should be placed on the pallet, Which is away from the floor, Be cautions not to pile the product up.
- The polarizer surface should not come in contact with any other object. It is recommended that they be stored in the container in which they were shipped.
- As the original protective film, do not use the adhesive protective film to avoid change of Pol color and characteristic.

## 12.6 Precautions for protection film

- Remove the protective film slowly, keeping the removing direction approximate 30-degree not vertical from panel surface, If possible, under ESD control device like ion blower, and the humidity of working room should be kept over 50%RH to reduce the risk of static charge.
- People who peeled off the protection film should wear anti-static strap and grounded well.

## 12.7 Appropriate Condition for Commercial Display

-Generally large-sized LCD modules are designed for consumer applications . Accordingly, long-term display like in Commercial Display application, can cause uneven display including image sticking. To optimize module's lifetime and function, several operating usages are required.

1. Normal operating condition

- Temperature: $20\pm15℃$
- Operating Ambient Humidity : $55\pm20\%$
- Display pattern: dynamic pattern (Real display)
- Well-ventilated place is recommended to set up Commercial Display system

2. Special operating condition

a. Ambient condition

- Well-ventilated place is recommended to set up Commercial Display system.

b. Power and screen save

- Periodical power-off or screen save is needed after long-term display.

c. As the low temperature, the response time is greatly delayed. As the high temperatures (higher than the operating temperature) the LCD module may turn black screen. The above phenomenon cannot explain the failure of the display. When the temperature returns to the normal operating temperature, the LCD module will return to normal display.

d. When expose to drastic fluctuation of temperature (hot to cold or cold to hot）,the LCD module may be affected; Specifically, drastic temperature fluctuation from cold to hot ,produces dew on the LCD module 's surface which may affect the operation of the polarizer and LCD module

e. Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on) Otherwise the Module may be damaged.

f. Products exposed to low temperature environment for a long time, need to carry out necessary protection , low temperature environment is usually refrigerators , vending machine Etc…

g. Long time and large angle forword use or unconventional use , It is strongly recommended to contact BOE for filed application engineering advice

h. Product reliability and functions are only guaranteed when the product is used under right operation usages. If product will be used in extreme conditions such as high temperature, high humidity, high altitude, special display images, running time, long time operation, outdoor operation, etc. It is strongly recommended to contact BOE for filed application engineering advice. Otherwise, its reliability and function may not be guaranteed. Extreme conditions are commonly found at airports, transit stations, banks, stock market and controlling systems.

3. Operating usages to protect against image sticking due to long-term static display.

   a. Suitable operating time: under 20 hours a day.

   b. Static information display recommended to use with moving image.

   - Cycling display between 5 minutes' information(static) display and 10 seconds' moving image.

   c. Background and character (image) color change

   - Use different colors for background and character, respectively.

   - Change colors themselves periodically.

   d. Avoid combination of background and character with large different luminance.

   1) Abnormal condition just means conditions except normal condition.

   2) Black image or moving image is strongly recommended as a screen save

4. Lifetime in this spec. is guaranteed only when Commercial Display is used according to operating usages.

5. Module should be turned clockwise based on front view when used in portrait mode.

## 12.8 Other Precautions

A. LC Leak

- If the liquid crystal material leaks from the panel, it is recommended to wash the LC with acetone or ethanol and then burn it.
- If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.
- If LC in mouth, mouth need to be washed, drink plenty of water to induce vomiting and follow medical advice.
- If LC touch eyes, eyes need to be washed with running water at least 15 minutes.
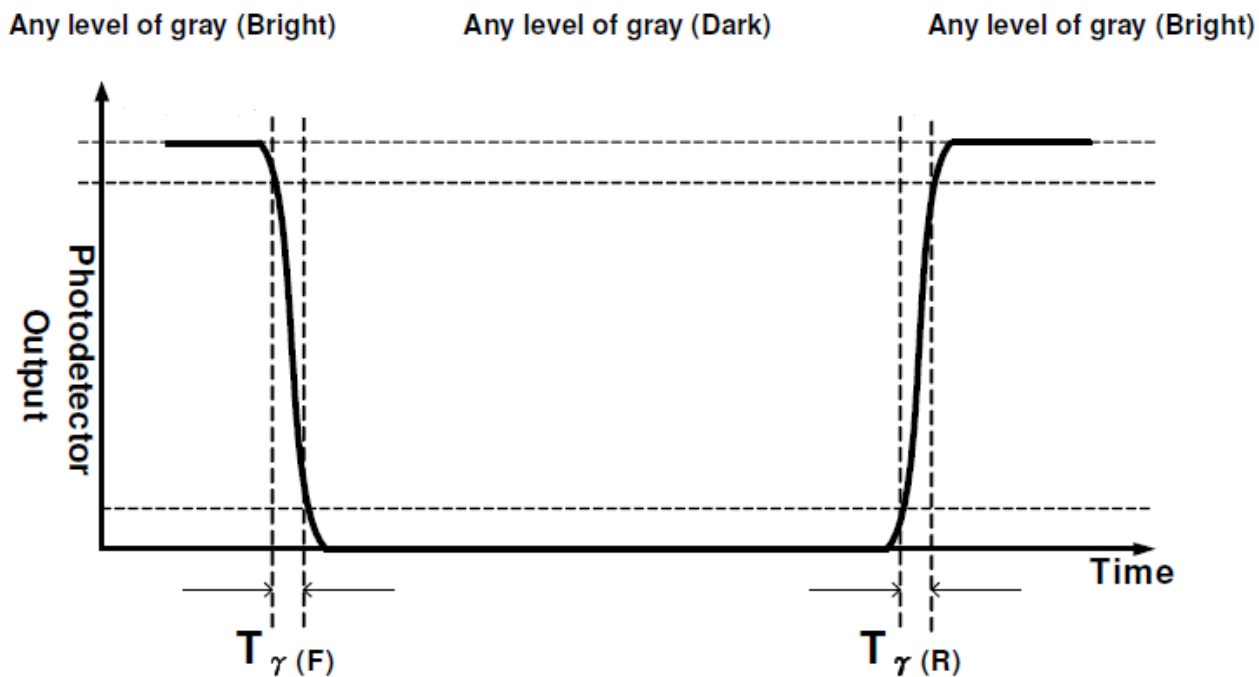
B. Rework

- When returning the module for repair or etc., Please pack the module not to be broken. We recommend to use the original shipping packages.
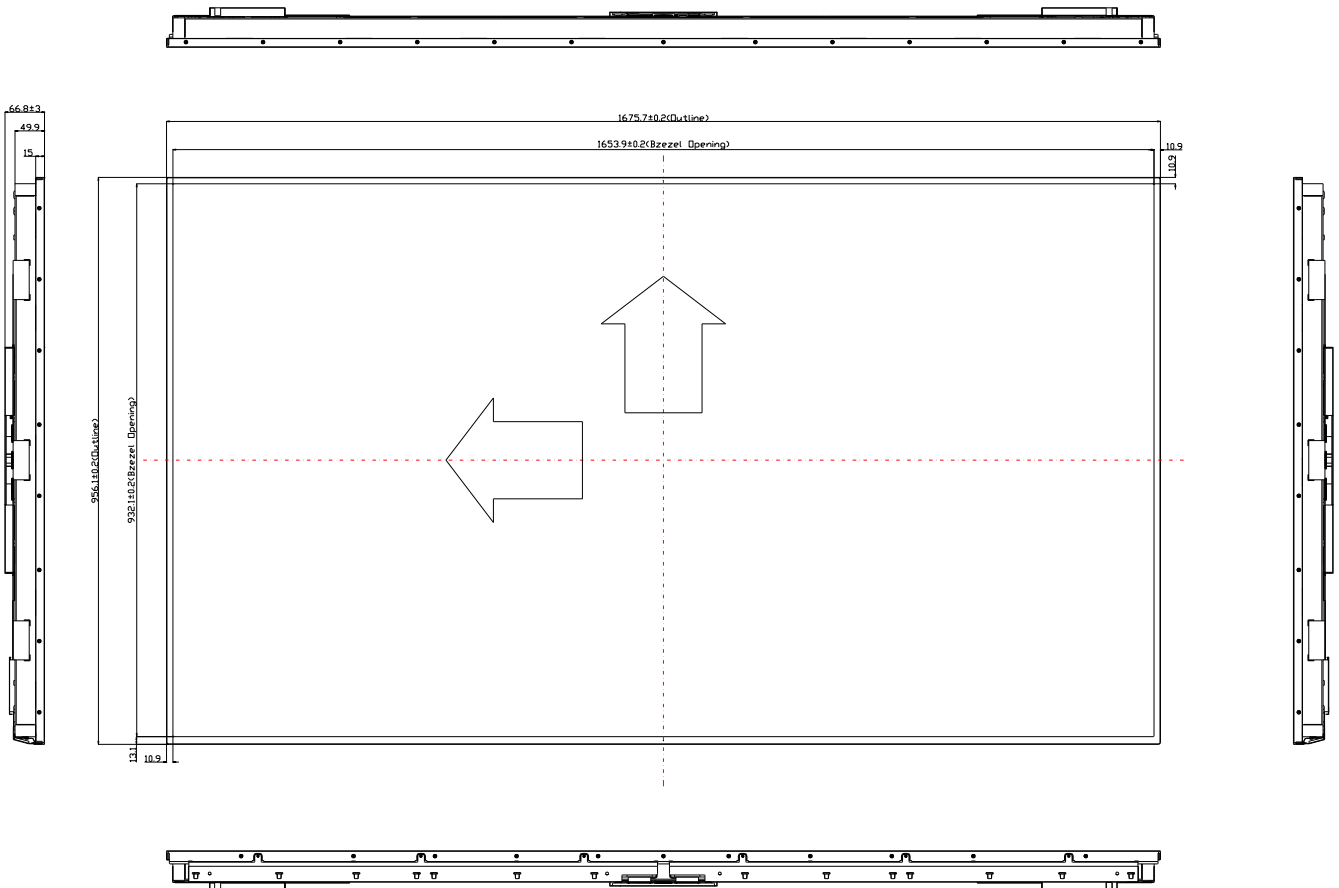
## 13.0 APPENDIX 1

< Figure 1. Measurement Set Up >
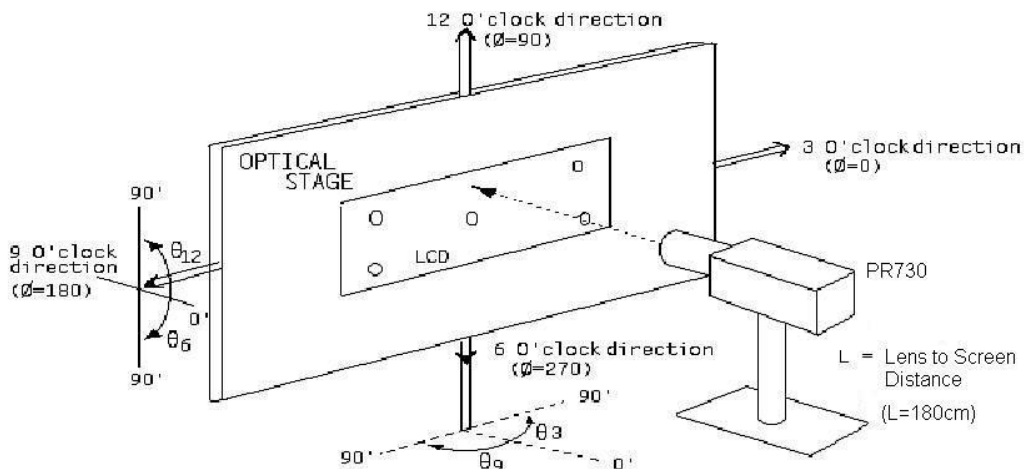


< Figure 2. Response Time Testing >

< Figure 3.TFT-LCD Module Outline Dimensions (Front View) >

< Figure 4.TFT-LCD Module Outline Dimensions (Rear View) >