# ORIENT DISPLAY

## *Your Total LCD Solution Provider*

http://www.orientdisplay.com

# SPECIFICATION
# FOR
# LCD MODULE

# MODULE NO : AFE1024768I-14.0N-9297A-N
# REVISION NO: A01

Customer's Approval:

|  | SIGNATURE | DATE |
|---|---|---|
| PREPARED BY (RD ENGINEER) |  |  |
| CHECKED BY |  |  |
| APPROVED BY |  |  |

## DOCUMENT REVISION HISTORY

| Sample Version | Doc. Version | DATE | DESCRIPTION | CHECKED BY |
|:---:|:---:|:---:|:---:|:---:|
| 01 | A | 2011-05-24 | First Release. | |

# CONTENTS

# 1. GENERAL DESCRIPTION:

**Display & LCD Type:   136  *   RGB   *   76   ,   TFT-Panel**

**Viewing Direction: 6 O′ clock**

**Backlight Type: White LED**

# 2. MECHANICAL SPECIFICATIONS:

| ITEM | SPECIFICATION | UNIT |
|---|---|---|
| **DISPLAY SIZE** | **14.00** | inch |
| **OUTLINE DIMEMSIONS** | **320.40*187.10*3.60** | mm |
| **DISPLAY MODE** | **Normally White** | - |
| **INTERFACE TYPE** | **1 channel LVDS** | - |

**\*See attached drawing for details.**

# 3.BLOCK DIAGRAM:

# 4.DIMENSIONAL OUTLINE:

BLU BARCODE AREA

CONNECTOR PIN #1

SHIPPING LABEL
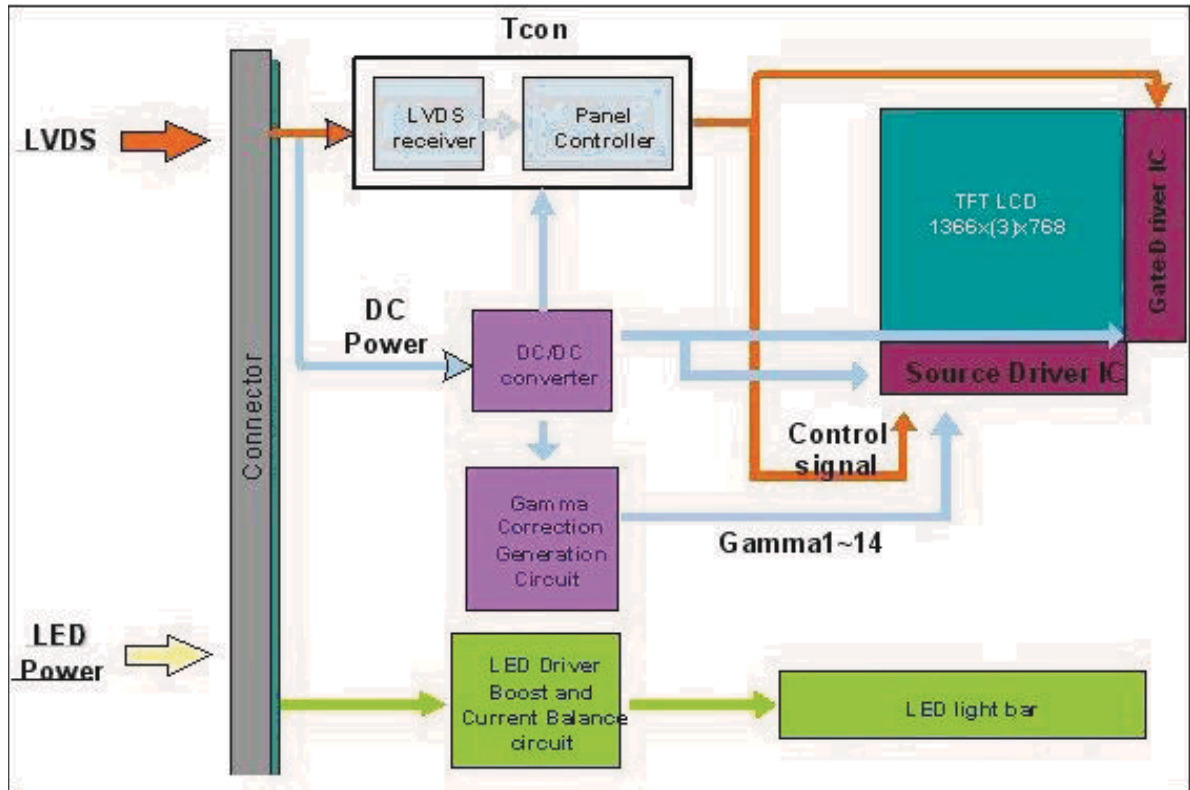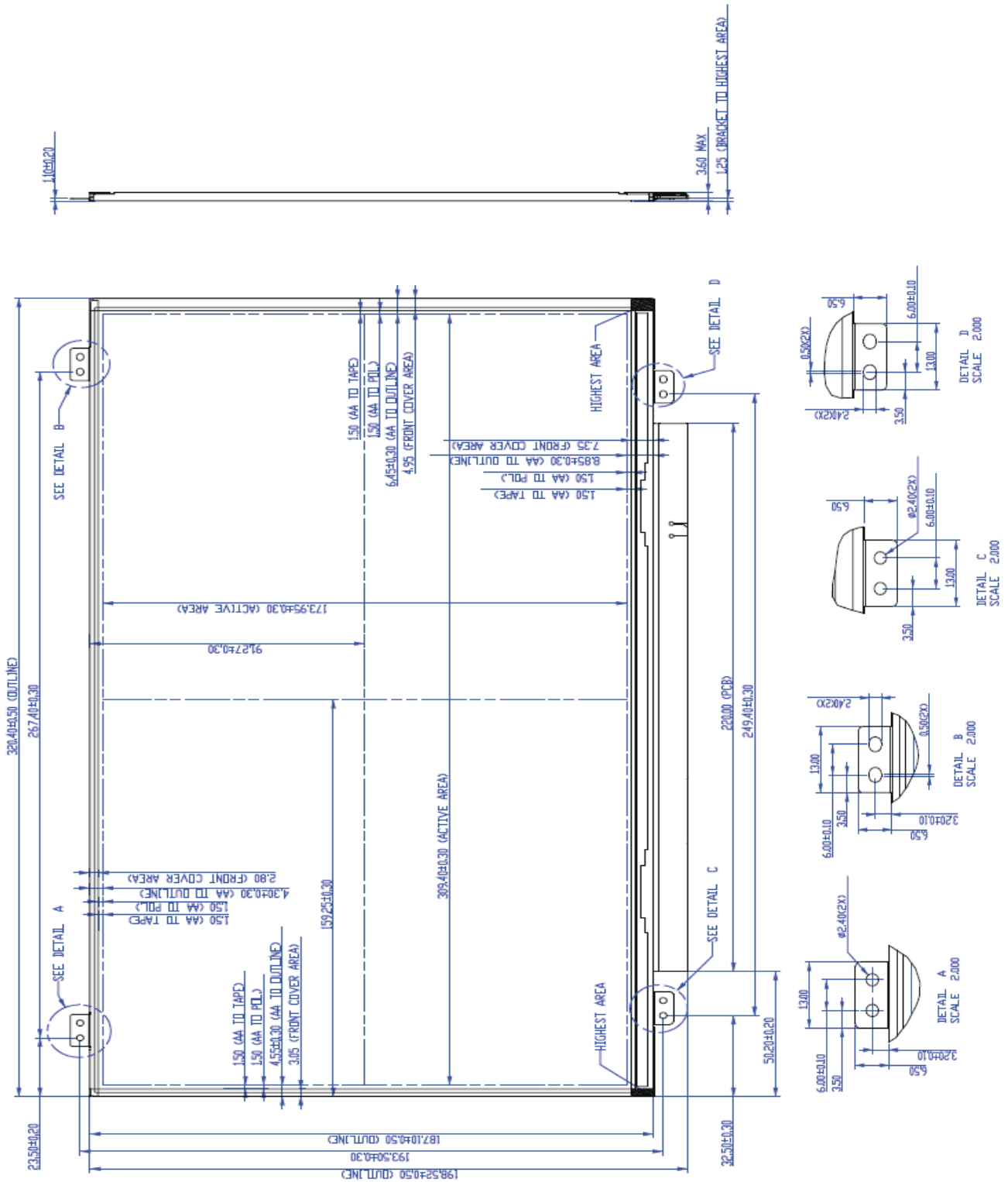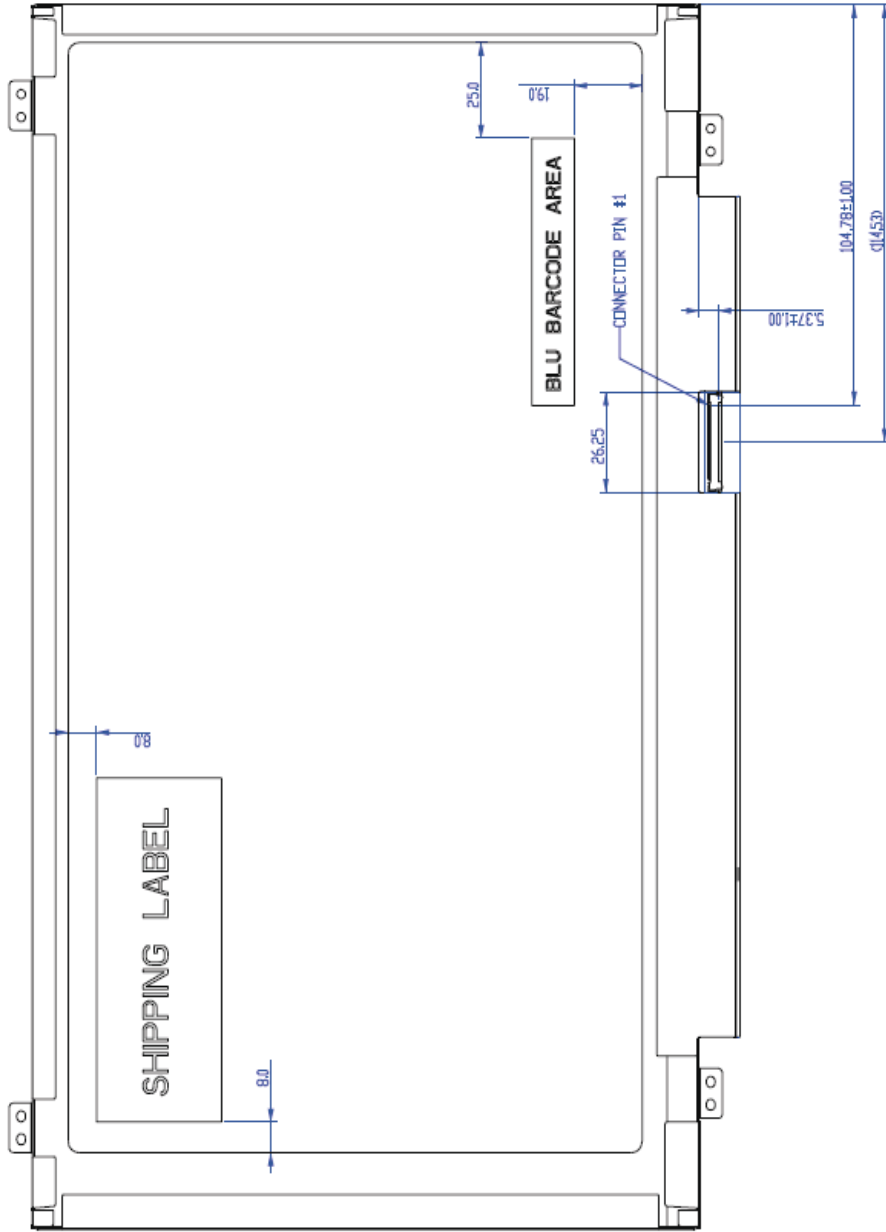
# 5. PIN DESCRIPTION:

LVDS is a differential signal technology for LCD interface and high speed data transfer device.

| | B140XW03 V0 | |
|---|---|---|
| Pin | Signal | Description |
| 1 | NC | No Connection (Reserve) |
| 2 | VDD | PowerSupply,3.3V(typical) |
| 3 | VDD | PowerSupply,3.3V(typical) |
| 4 | DVDD | DDC 3.3Vpower |
| 5 | NC | No Connection (Reserve) |
| 6 | SCL | DDC Clock |
| 7 | SDA | DDC Data |
| 8 | Rin0- | -LVDS differential data input(R0-R5,G0) |
| 9 | Rin0+ | +LVDS differential data input(R0-R5,G0) |
| 10 | GND | Ground |
| 11 | Rin1- | -LVDS differential data input(G1-G5,B0-B1) |
| 12 | Rin1+ | +LVDS differential data input(G1-G5,B0-B1) |
| 13 | GND | Ground |
| 14 | Rin2- | -LVDS differential data input(B2-B5,HS,VS,DE) |
| 15 | Rin2+ | +LVDS differential data input(B2-B5,HS,VS,DE) |
| 16 | GND | Ground |
| 17 | ClkIN- | -LVDS differential clock input |
| 18 | ClkIN+ | +LVDS differential clock input |
| 19 | NC | No Connection/ IMG_EN (Optional) |
| 20 | NC | No Connection (Reserve) |
| 21 | NC | No Connection (Reserve) |
| 22 | GND | Ground |
| 23 | NC | No Connection (Reserve) |

| 24 | NC | No Connection (Reserve) |
|---|---|---|
| 25 | GND | Ground–Shield |
| 26 | NC | No Connection (Reserve) |
| 27 | NC | No Connection (Reserve) |
| 28 | GND | Ground–Shield |
| 29 | NC | No Connection (Reserve) |
| 30 | NC | No Connection (Reserve) |
| 31 | VLED_GND | LED Ground |
| 32 | VLED_GND | LED Ground |
| 33 | VLED_GND | LED Ground |
| 34 | NC | No Connection (Reserve) |
| 35 | PWM | System PWM Signal Input |
| 36 | LED_EN | LED enable pin(+3V Input) |
| 37 | NC | No Connection/ DCR_EN (Optional) |
| 38 | VLED | LED Power Supply 7V-21V |
| 39 | VLED | LED Power Supply 7V-21V |
| 40 | VLED | LED Power Supply 7V-21V |

Note: I：input,O:output,P:Power
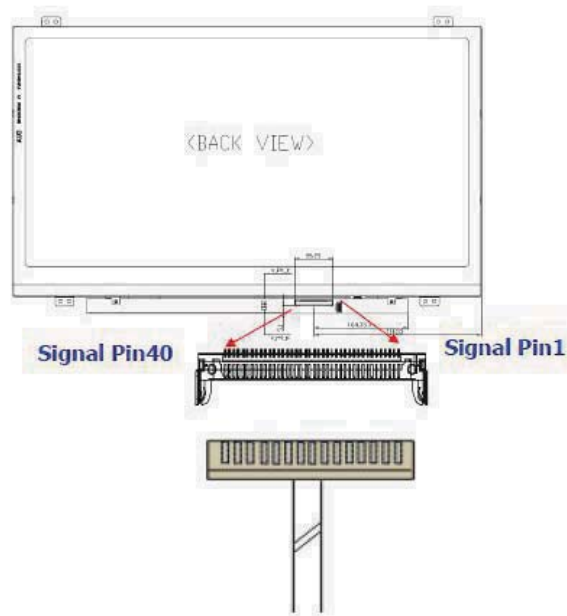
# 6. MAXIMUM ABSOLUTE LIMIT:

| Item | Symbol | Value | Unit |
|---|---|---|---|
| Power supply voltage for logic | $V_{DD}$ | 3.0-3.6 | V |
| Input voltage | Vin | $V_{DD}$+0.3 | V |
| Operating temperature | Topr | -20 to 70 | °C |
| Storage temperature | Tstg | -30 to 80 | °C |

**Note**:  Note1: Absolute maximum rating is the limit value beyond which the IC maybe broken. They do not assure operations.

Note2: Background color changes slightly depending on ambient temperature. This Phenomenon is reversible.

Ta≦70℃: 75%RH max

Ta>70℃: absolute humidity must be lower than the humidity of 75%RH at 70℃

Note3: Ta at -30℃  will be <48hrs, at 80 ℃  will be <120hrs

# 7.ELECTRICAL CHARACTERISTICS

## 7-1 DC Characteristics ($V_{DD}$=3.3V,Ta=25°C)

Input power specifications are as follows;

The power specification are measured under 25℃ and frame frenquency under 60Hz

| Symble | Parameter | Min | Typ | Max | Units | Note |
|---|---|---|---|---|---|---|
| VDD | Logic/LCD Drive Voltage | 3.0 | 3.3 | 3.6 | [Volt] | |
| PDD | VDD Power | - | - | 0.9 | [Watt] | Note 1 |
| IDD | IDD Current | - | - | 273 | [mA] | Note 1 |
| IRush | Inrush Current | - | - | 2000 | [mA] | Note 2 |
| VDDrp | Allowable Logic/LCD Drive Ripple Voltage | - | - | 100 | [mV] p-p | |

Note 1 : Maximum Measurement Condition : Black Pattern at 3.3V driving voltage. ($P_{max}=V_{3.3} \times I_{black}$)

Note 2 : Measure Condition

90% ─────────── 3.3V

10%

0V

0.5ms
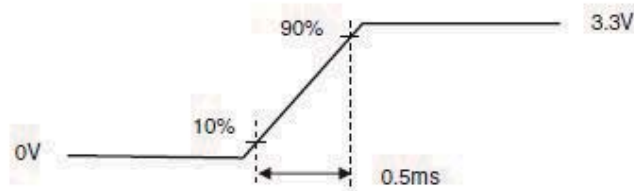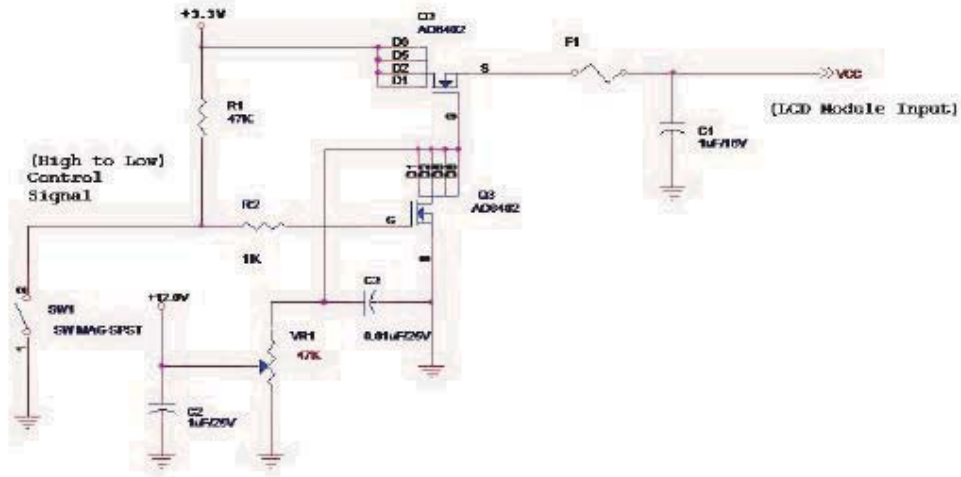
**Vin rising time**

## 7-2 Backlight Electrical-optical Characteristics

1. Stander Lamp Styles (Edge Lighting Type):

   The LED chips are distributed over the edge light area of the illumination unit, which gives the less power consumption:

2. The Main Advantages of the LED Backlight are as following:

2.1 The brightness of the backlight can simply be adjusted by a resistor or a potentiometer.

3. Data About LED Backlight:

| Parameter | Symbol | Min | Typ | Max | Units | Condition |
|-----------|--------|-----|-----|-----|-------|-----------|
| Backlight Power Consumption | PLED | - | - | 2.3 | [Watt] | (Ta=25℃), Note 1 Vin=12V |
| LED Life-Time | N/A | 12,000 | - | - | Hour | (Ta=25℃), Note 2 $I_F$=20 mA |

**Note 1:** Calculator value for reference $P_{LED}$ = VF (Normal Distribution) * IF (Normal Distribution) / Efficiency
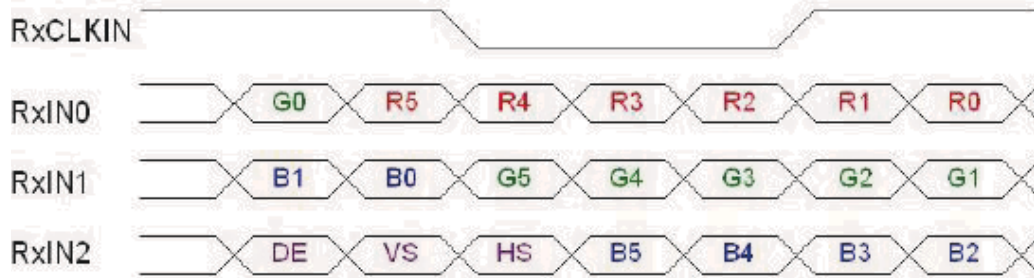
**Note 2:** The LED life-time define as the estimated time to 50% degradation of initial luminous.

| Parameter | Symbol | Min | Typ | Max | Units | Remark |
|---|---|---|---|---|---|---|
| LED Power Supply | VLED | 7.0 | 12.0 | 21.0 | [Volt] | |
| LED Enable Input High Level | VLED_EN | 2.5 | - | 5.5 | [Volt] | Define as Connector Interface (Ta=25℃) |
| LED Enable Input Low Level | | - | - | 0.8 | [Volt] | |
| PWM Logic Input High Level | VPWM_EN | 2.5 | - | 5.0 | [Volt] | |
| PWM Logic Input Low Level | | - | - | 0.8 | [Volt] | |
| PWM Input Frequency | FPWM | 100 | 600 | 1K | Hz | |
| PWM Duty Ratio | Duty | 1 note | -- | 100 | % | |

Note : Minimum PWM Duty Ratio (Duty) is 1%, when FPWM is lower than 5KHz. Otherwise, minimum PWM duty ratio (duty) is limited to 5%.

# 8. AC CHARACTERISTICS ($V_{DD}$=3.3V, TA=25°C)

## 8.1 Input Signal Characteristics:

RxCLKIN

RxIN0 | G0 | R5 | R4 | R3 | R2 | R1 | R0

RxIN1 | B1 | B0 | G5 | G4 | G3 | G2 | G1

RxIN2 | DE | VS | HS | B5 | B4 | B3 | B2

| Signal Name | Description | |
|---|---|---|
| R5<br>R4<br>R3<br>R2<br>R1<br>R0 | Red Data 5 (MSB)<br>Red Data 4<br>Red Data 3<br>Red Data 2<br>Red Data 1<br>Red Data 0 (LSB)<br><br>Red-pixel Data | Red-pixel Data<br>Each red pixel's brightness data consists of these 6 bits pixel data. |
| G5<br>G4<br>G3<br>G2<br>G1<br>G0 | Green Data 5 (MSB)<br>Green Data 4<br>Green Data 3<br>Green Data 2<br>Green Data 1<br>Green Data 0 (LSB)<br><br>Green-pixel Data | Green-pixel Data<br>Each green pixel's brightness data consists of these 6 bits pixel data. |
| B5<br>B4<br>B3<br>B2<br>B1<br>B0 | Blue Data 5 (MSB)<br>Blue Data 4<br>Blue Data 3<br>Blue Data 2<br>Blue Data 1<br>Blue Data 0 (LSB)<br><br>Blue-pixel Data | Blue-pixel Data<br>Each blue pixel's brightness data consists of these 6 bits pixel data. |
| RxCLKIN | Data Clock | The signal is used to strobe the pixel data and DE signals. All pixel data shall be valid at the falling edge when the DE signal is high. |
| DE | Display Timing | This signal is strobed at the falling edge of RxCLKIN. When the signal is high, the pixel data shall be valid to be displayed. |
| VS | Vertical Sync | The signal is synchronized to RxCLKIN . |
| HS | Horizontal Sync | The signal is synchronized to RxCLKIN . |

Note: Output signals from any system shall be low or High-impedance state when VDD is off.

## 1 Timing Characteristics

sically, interface timings should match the 1366x768 /60Hz manufacturing guide line timing.

| Parameter | | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Frame Rate | | - | 40 | 60 | - | Hz |
| Clock frequency | | $1/T_{Clock}$ | | 72 | 80 | MHz |
| Vertical Section | Period | $T_V$ | 776 | 818 | 1023 | $T_{Line}$ |
| | Active | $T_{VD}$ | | 768 | | |
| | Blanking | $T_{VB}$ | 8 | 50 | 255 | |
| Horizontal Section | Period | $T_H$ | 1396 | 1466 | 2047 | $T_{Clock}$ |
| | Active | $T_{HD}$ | | 1366 | | |
| | Blanking | $T_{HB}$ | 30 | 100 | 681 | |

Note : DE mode only
*1:Support customer systemer LVDS.

## 2 Timing diagram



Input Timing Definition ( DE Mode)
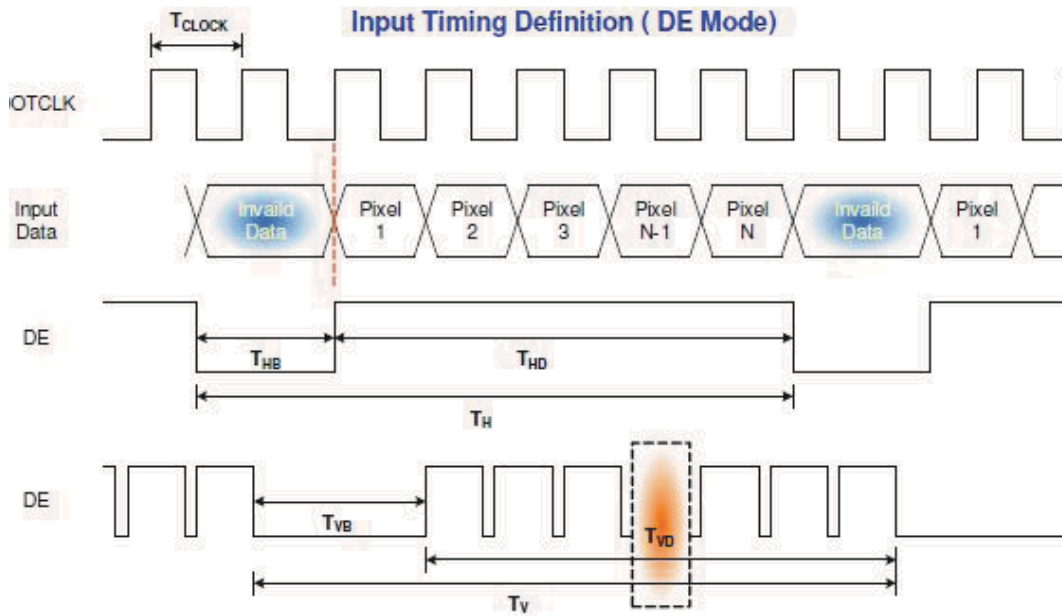
## 8.3 Power Sequence

Power on/off sequence is as follows. Interface signals and LED on/off sequence are also shown in the chart. Signals from any system shall be Hi-Z state or low level when VDD is off. Besides, no problem in the condition that PWM will be put into T-CON even when VDD is off
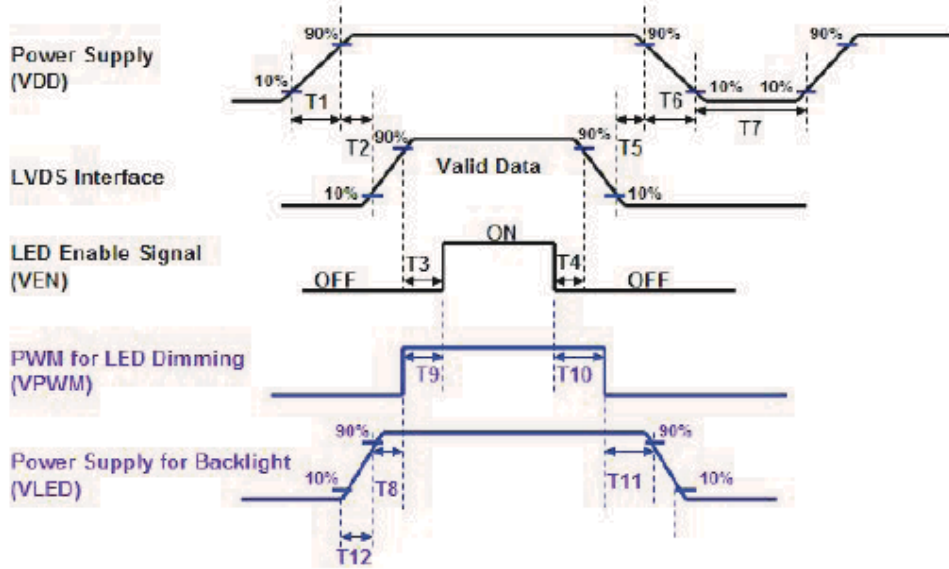


| Power Sequence Timing | | | | |
|---|---|---|---|---|
| Parameter | Value | | | Units |
| | Min. | Typ. | Max. | |
| T1 | 0.5 | - | 10 | ms |
| T2 | 0 | - | 50 | |
| T3 | 200 | - | - | |
| T4 | 0 | - | - | |
| T5 | 0 | - | - | |
| T6 | 0 | - | 10 | |
| T7 | 150 | - | - | |
| T8 | 0 | - | - | |
| T9 | 0 | - | - | |
| T10 | 0 | - | - | |
| T11 | 0 | - | - | |
| T12 | - | - | - | |

Note:1.If T3,T5,T6 couldn't match above specifications, must request T3+T5+T6 > 200ms at least.
2. Minmun vaule of T4 parameter is designed to be 200ms, if value is set to be 0ms, display garbage may occur
3. Maxium value of T5 parameter is designed to be 50ms, if the value do not define,display garbage may occur
4. Minmun vaule of T7 parameter is designed to be 500ms, if value is set to be 150ms, display garbage may occur
5. Minmun vaule of T8~T11 parameter is designed to be 10ms, if value is set to be 0ms, display garbage may occur
6. Minmun vaule of T12 parameter is designed to be 0.5ms, if the value do not define, display garbage may occur

# 9.OPTICALCHARACTERISTICS:

The optical characteristics are measured under stable conditions at 25℃ (Room Temperature) :

| Item | | Symbol | Conditions | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|---|
| White Luminance $I_{LED}$=20mA | | | 5 points average | 170 | 200 | - | cd/m$^2$ | 1, 4, 5. |
| Viewing Angle | | $\theta_R$ | Horizontal (Right) CR = 10 (Left) | 40 | 45 | - | degree | 4, 9 |
| | | $\theta_L$ | | 40 | 45 | - | | |
| | | $\phi_H$ | Vertical (Upper) CR = 10 (Lower) | 10 | 15 | - | | |
| | | $\phi_L$ | | 30 | 35 | - | | |
| Luminance Uniformity | | $\delta_{5P}$ | 5 Points | - | - | 1.25 | | 1, 3, 4 |
| Luminance Uniformity | | $\delta_{13P}$ | 13 Points | - | - | 1.60 | | 2, 3, 4 |
| Contrast Ratio | | CR | | 400 | 500 | - | | 4, 6 |
| Cross talk | | % | | | | 4 | | 4, 7 |
| Response Time | | $T_r$ | Rising | - | 2 | - | msec | 4, 8 |
| | | $T_f$ | Falling | - | 6 | - | | |
| | | $T_{RT}$ | Rising + Falling | - | 8 | 16 | | |
| Color / Chromaticity Coodinates | Red | Rx | CIE 1931 | 0.558 | 0.588 | 0.618 | | 4 |
| | | Ry | | 0.315 | 0.345 | 0.375 | | |
| | Green | Gx | | 0.297 | 0.327 | 0.357 | | |
| | | Gy | | 0.512 | 0.542 | 0.572 | | |
| | Blue | Bx | | 0.121 | 0.151 | 0.181 | | |
| | | By | | 0.113 | 0.143 | 0.173 | | |
| | White | Wx | | 0.283 | 0.313 | 0.343 | | |
| | | Wy | | 0.299 | 0.329 | 0.359 | | |
| NTSC | | % | | 42 | 45 | - | | |

**Note 1**: 5 points position (Ref: Active area)
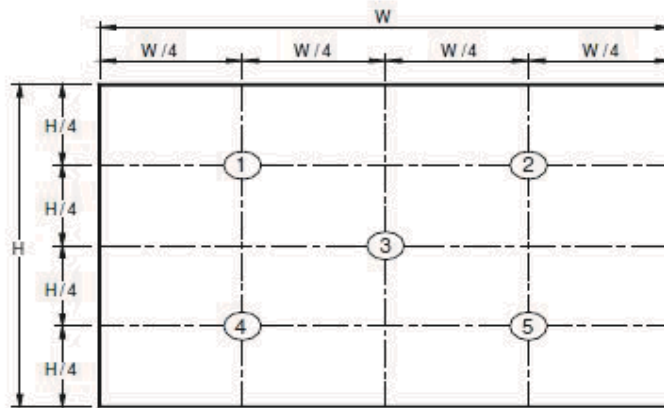


**Note 2**: 13 points position (Ref: Active area)
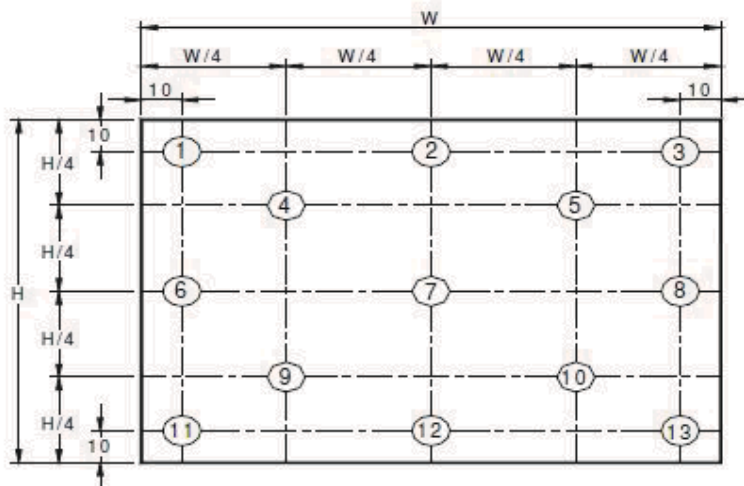


**Note 3**: The luminance uniformity of 5 or13 points is defined by dividing the maximum luminance values by the minimum test point luminance

$$\delta_{W5} = \frac{\text{Maximum Brightness of five points}}{\text{Minimum Brightness of five points}}$$

$$\delta_{W13} = \frac{\text{Maximum Brightness of thirteen points}}{\text{Minimum Brightness of thirteen points}}$$

**Note 4**: Measurement method

The LCD module should be stabilized at given temperature for 30 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting

Backlight for 30 minutes in a stable, windless and dark room, and it should be measured in the center of screen.

Photo detector

Field=2

50 cm

LCD Panel

TFT-LCD Module

Center of the screen
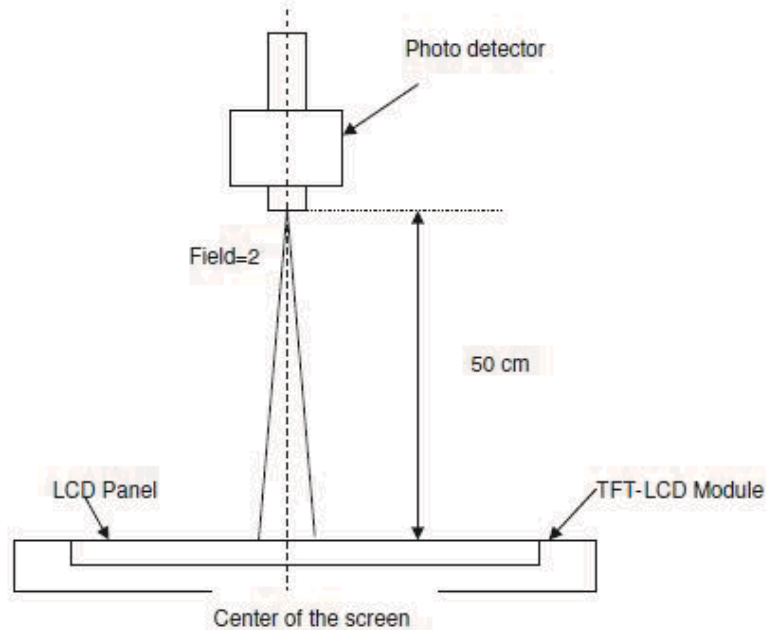
**Note 5 :** Definition of Average Luminance of White ($Y_L$):

Measure the luminance of gray level 63 at 5 points, $Y_L = [L(1) + L(2) + L(3) + L(4) + L(5)] / 5$

L (x) is corresponding to the luminance of the point X at Figure in Note (1).

**Note 6 :** Definition of contrast ratio:
Contrast ratio is calculated with the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "White" state}}{\text{Brightness on the "Black" state}}$$
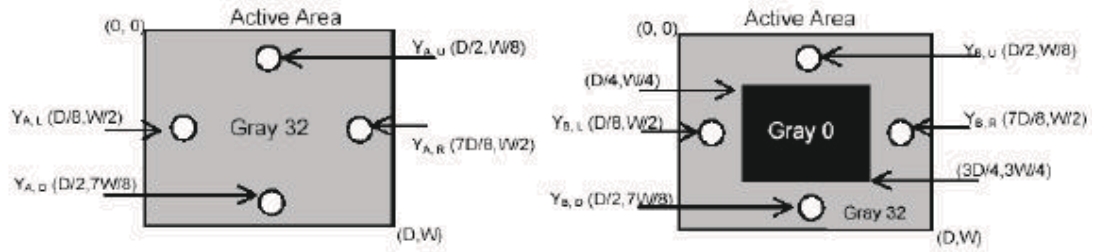
**Note 7 :** Definition of Cross Talk (CT)

$$CT = |Y_B - Y_A| / Y_A \times 100 \ (\%)$$

Where

$Y_A$ = Luminance of measured location without gray level 0 pattern ($cd/m_2$)

$Y_B$ = Luminance of measured location with gray level 0 pattern ($cd/m_2$)

Active Area

(0, 0)

$Y_{A,U}$ (D/2,W/8)

$Y_{A,L}$ (D/8,W/2)   Gray 32   $Y_{A,R}$ (7D/8,W/2)

$Y_{A,D}$ (D/2,7W/8)

(D,W)

Active Area

(0, 0)

$Y_{B,U}$ (D/2,W/8)

(D/4,W/4)

$Y_{B,L}$ (D/8,W/2)   Gray 0   $Y_{B,R}$ (7D/8,W/2)

(3D/4,3W/4)

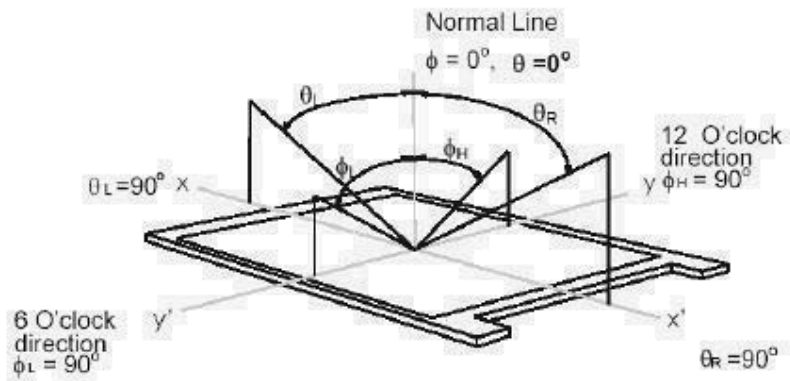$Y_{B,D}$ (D/2,7W/8)   Gray 32

(D,W)

**Note 8**: Definition of response time:

The output signals of BM-7 or equivalent are measured when the input signals are changed from "Black" to "White" (falling time) and from "White" to "Black" (rising time), respectively. The response time interval between the 10% and 90% of amplitudes. Refer to figure as below.
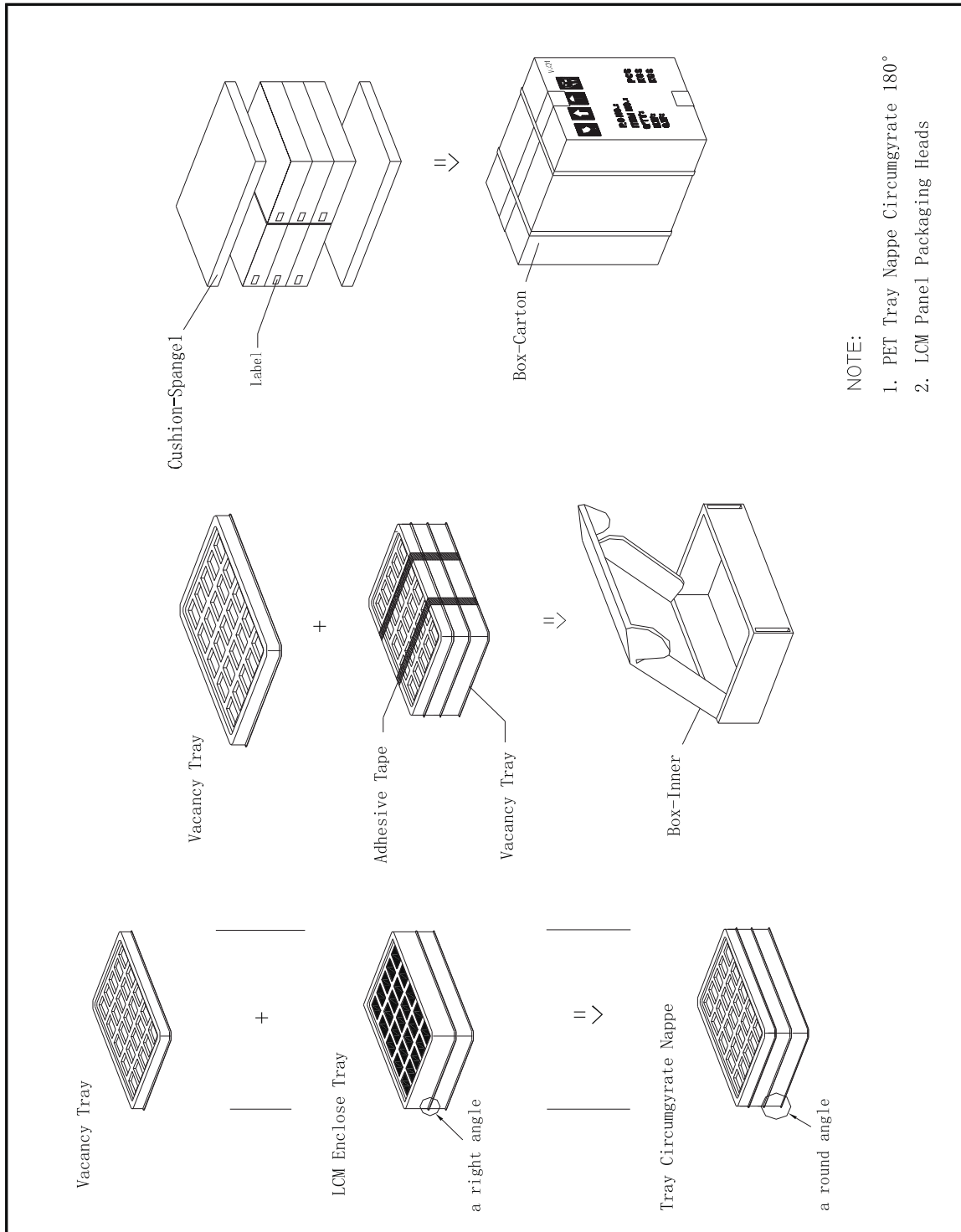
"White"          "Black"          "White"

Signal(Relative value)

100%
90%

10%
0%

Tr          Tf
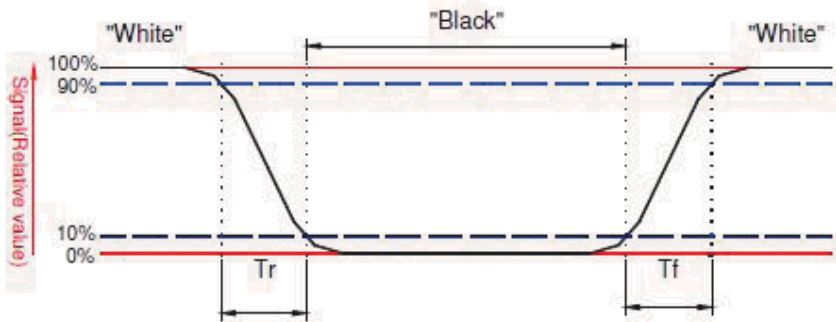
**Note 9.** Definition of viewing angle

Viewing angle is the measurement of contrast ratio ≥ 10, at the screen center, over a 180° horizontal and 180° vertical range (off-normal viewing angles). The 180° viewing angle range is broken down as follows; 90° ($\theta$) horizontal left and right and 90° ($\Phi$) vertical, high (up) and low (down). The measurement direction is typically perpendicular to the display surface with the screen rotated about its center to develop the desired measurement viewing angle.

# 10.PACKAGE:



Cushion-Spangel

Label

Box-Carton

NOTE:

1. PET Tray Nappe Circumgyrate 180°

2. LCM Panel Packaging Heads

Vacancy Tray

Adhesive Tape

Vacancy Tray

Box-Inner

Vacancy Tray

LCM Enclose Tray

a right angle

Tray Circumgyrate Nappe

a round angle

# 11. STANDARD SPECIFICATION FOR RELIABILITY:

| Items | Required Condition | Note |
|---|---|---|
| Temperature Humidity Bias | Ta= 40℃, 90%RH, 300h | |
| High Temperature Operation | Ta= 50℃, Dry, 300h | |
| Low Temperature Operation | Ta= 0℃, 300h | |
| High Temperature Storage | Ta= 60℃, 35%RH, 300h | |
| Low Temperature Storage | Ta= -20℃, 50%RH, 250h | |
| Thermal Shock Test | Ta=-20℃ to 60℃, Duration at 30 min, 100 cycles | |
| ESD | Contact : ±8 KV <br> Air : ±15 KV | Note 1 |

Functions, performance, appearance, etc. shall be free from remarkable deterioration within 50,000 hours under ordinary operating and storage conditions room temperature (25±10℃), normal humidity (45±20% RH), and in area not exposed to direct sun light. (Life time of backlight, please refer to Data about backlight.)

Testing Conditions and Inspection Criteria:

For the final test the testing sample must be stored at room temperature for 24 hours, after the tests listed in up Table, Standard specifications for Reliability have been executed in order to ensure stability.

| Item | Test Model | In section Criteria |
|---|---|---|
| Current Consumption | Refer To Specification | The current consumption should conform to the product specification. |
| Contrast | Refer To Specification | After the tests have been executed, the contrast must be larger than half of its initial value prior to the tests. |
| Appearance | Visual inspection | Defect free. |

# 12.SPECIFICATION OF QUALITY ASSURANCE:

## 12.1 Purpose

This standard for Quality Assurance should affirm the quality of LCD Module products to supply to purchaser by Orient Display.

## 12.2 Standard for Quality Test

a. Inspection:

Before delivering, the supplier should take the following tests, and affirm the quality of product.

b. Electro-Optical Characteristics:

According to the individual specification to test the product.

c. Test of Appearance Characteristics:

According to the individual specification to test the product.

d. Test of Reliability Characteristics:

According to the definition of reliability on the specification for testing products.

e. Delivery Test:

Before delivering, the supplier should take the delivery test.

(i) Test method: According to MIL-STD105E.General Inspection Level Ⅱ take a single time.

(ii) The defects classify of AQL as following:

Major defect: AQL = 0.65

Minor defect: AQL = 2.5

Total defects: AQL = 2.5

## 12.3 Nonconforming Analysis & Deal With Manners

a. Nonconforming Analysis:

(i) Purchaser should supply the detail data of non- conforming sample and the non- conforming.

(ii) After accepting the detail data from purchaser, the analysis of nonconforming should be finished in two weeks.

(iii) If supplier can not finish analysis on time, must announce purchaser before two weeks.

b. Disposition of nonconforming:

(i) If find any product defect of supplier during assembly time, supplier must change the good product for every defect after recognition.

(ii) Both supplier and customer should analyze the reason and discuss the disposition of nonconforming when the reason of nonconforming is not sure.

## 12.4 Agreement items

Both sides should discuss together when the following problems happen.

a. There is any problem of standard of quality assurance, and both sides think that it must be modified.

b. There is any argument item which does not record in the standard of quality assurance.

c. Any other special problem.

## 12-5 Standard of The Product Appearance Test

a. Manner of appearance test: This specification should be applied for both light on and off situation.

(i) The test must be under 20W × 2 or 40W fluorescent light, and the distance of view must

be at 30±5cm.

(ii) When test the model of transmissive product must add the reflective plate.

(iii)The test direction is base on about around 10° of vertical line (Left graph)

(iiii)Temperature: 25±5℃ Humidity: 65±10%RH
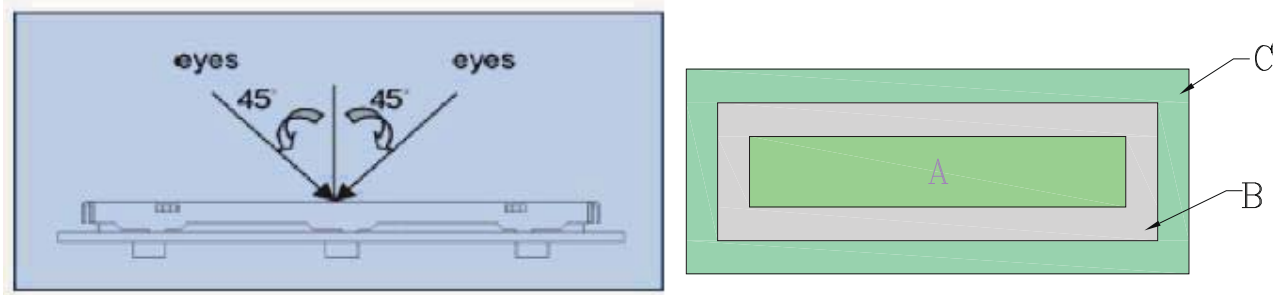


(iv) Definition of area (Right graph)

A. Area: Viewing area.      B. Area: Out of viewing area.(Outside viewing area)

b. Basic principle:

(i) It will accord to the AQL when the standard can not be described.

(ii) The sample of the lowest acceptable quality level must be discussed by both supplier and customer
when any dispute happened.

(iii) Must add new item on time when it is necessary.

c. Standard of inspection: (Unit: mm)


Allowable limits defined in follow Dot defect Table should be met for each white, black , R, G, B raster.
The limits apply to the entire area. Missing white in 60% or more of typical (one color, R or G or B) pixel
aperture is defined as a bright defect, less than 60% is acceptable .Black spot in 60% or more of typical
pixel aperture is defined as a dark defect, less than 60% is acceptable.

Dot defect table:

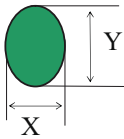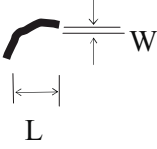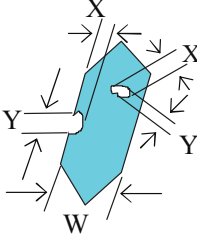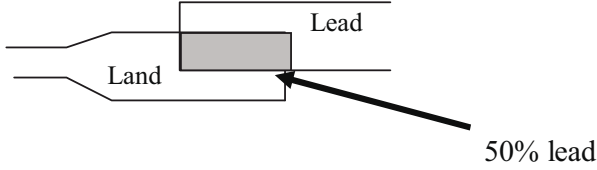| | Item | White dot defect | Black dot defect | Total |
|---|---|---|---|---|
| 1 | Defect counts | 3 | 3 | 3 |
| 2 | Combined defect Counts | No combined dot defect allowed. Two Single dot defect that within 5mm during each dot defect should becounted as combined dot defect. | | |

## 12.6 Inspection specification

AQL inspection standard

Sampling method: MIL-STD-105E, Level II, single sampling

| Classify | | Item | Note | AQL |
|---|---|---|---|---|
| **Major** | Display state | Short or open circuit | 1 | 0.65 |
| | | Contrast defect (dim, ghost) | | |
| | | LC leakage | | |
| | | Flickering | | |
| | | No display | | |
| | | Wrong viewing direction | 2 | |
| | | Wrong Back-light | 7 | |
| | Non-display | Flat cable or pin reverse | 9 | |
| | | Wrong or missing component | 10 | |
| **Minor** | Display state | Background color deviation | 2 | 2.5 |
| | | Black spot and dust | 3 | |
| | | Line defect | 4 | |
| | | Scratch | | |
| | | Rainbow | 5 | |
| | | Pin hole | 6 | |
| | Polarizer | Bubble and foreign material | 3 | |
| | | Scratch | 4 | |
| | PCB,FPC | Scratch | 4 | |
| | Soldering | Poor connection | 8 | |
| | Wire | Poor connection | 9 | |
| | LCD | CHIP OUT | 11 | |

**Note on defect classification**:

| No. | Item | Criterion |
|---|---|---|
| 1 | Short or open circuit<br>LC leakage<br>Flickering<br>No display<br>Wrong viewing direction<br>Wrong Back-light | Not allow |
| 2 | Contrast defect<br>Background color deviation | Refer to approval sample |

| No. | Item | Criterion |
|---|---|---|
| 3 | Point defect,<br>Black spot, dust<br>  (incl. Polarizer) ex.:<br>  dirt under polarizer,<br>Pinhole of<br>reflector ,glass<br>scratch, dirt under<br>glass,scratch on<br>polarizer<br>$\varphi = (X+Y)/2$ | <br><table><tr><td>Point Size</td><td>Acceptable Qty.</td></tr><tr><td>$\phi \le 0.10$</td><td>Disregard</td></tr><tr><td>$0.10 < \phi \le 0.20$</td><td>3</td></tr><tr><td>$0.20 < \phi \le 0.25$</td><td>2</td></tr><tr><td>$0.25 < \phi \le 0.30$</td><td>1</td></tr><tr><td>$\phi > 0.30$</td><td>0</td></tr></table><br>Unit：mm |

Point defect table:

| Point Size | Acceptable Qty. |
|---|---|
| $\phi \le 0.10$ | Disregard |
| $0.10 < \phi \le 0.20$ | 3 |
| $0.20 < \phi \le 0.25$ | 2 |
| $0.25 < \phi \le 0.30$ | 1 |
| $\phi > 0.30$ | 0 |

Unit：mm

| No. | Item | Criterion |
|---|---|---|
| 4 | Line defect | Line defect table below<br><br>Unit: mm |

Line defect table:

| L | W | Acceptable Qty. |
|---|---|---|
| --- | $0.015 \ge W$ | Disregard |
| $3.0 \ge L$ | $0.03 \ge W$ | 2 |
| $2.0 \ge L$ | $0.05 \ge W$ | |
| $1.0 \ge L$ | $0.1 > W$ | 1 |
| --- | $0.05 < W$ | Applied as point defect |

Unit: mm

| No. | Item | Criterion |
|---|---|---|
| 5 | Rainbow | Not more than two color changes across the viewing area |

| No. | Item | Criterion |
|---|---|---|
| 6 | **Segment pattern**<br>**W = Segment width**<br>**φ = (X+Y)/2** | **(1) Pin hole**<br><br>$\phi < 0.15$mm is acceptable.<br><br><br><br>| Point Size | Acceptable Qty |<br>|---|---|<br>| $\phi \leq 1/4W$ | Disregard |<br>| $1/4W < \phi \leq 1/2W$ | 1 |<br>| $\phi > 1/2W$ | 0 |<br><br>Unit: mm |
| 7 | **Back-light** | (1) The color of backlight should correspond its specification.<br>(2) Not allow flickering |
| 8 | **Soldering** | (1) Not allow heavy dirty and solder ball on PCB or FPC.<br>(The size of dirty refer to point and dust defect)<br>(2) Over 50% of lead should be soldered on Land.<br><br><br><br>50% lead |
| 9 | **Wire** | (1) Copper wire should not be rusted<br>(2) Not allow crack on copper wire connection.<br>(3) Not allow reversing the position of the flat cable.<br>（4）Not allow exposed copper wire inside the flat cable. |
| 10 | **PCB,FPC** | (1) Not allow screw rust or damage.<br>（2）Not allow missing or wrong putting of component. |

| 11 | LCD | **2.1.1 chip on the surface**  Note: A:LCD Length |



**2.1.1 chip on the surface**
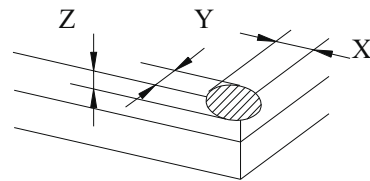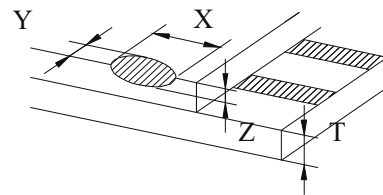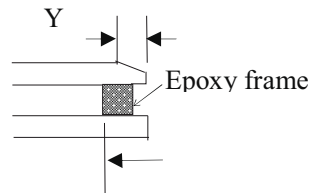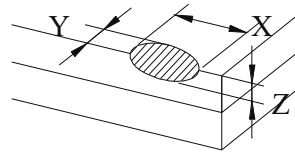
Note: A:LCD Length

| X | | Z |
|---|---|---|
| >1/8A | ≤0.3mm | ≤1/2T |
| ≤1/8A | Not enter into epoxy frame | ≤T |
| | Not enter into the inner edge of epoxy | ≤1/2T |

| | | **2.1.2chip on the terminal** |
|---|---|---|
| 11 | **LCD** |  |

| X | Y | Z |
|---|---|---|
| >1/8A | ≤0.3mm | ≤1/2T |
| ≤1/8A | ≤1/2L | ≤T |
| ≤1/8A&≤1mm | ≤L | ≤T |
| ≤1/8A&≤2mm | ≤L | ≤1/2T |
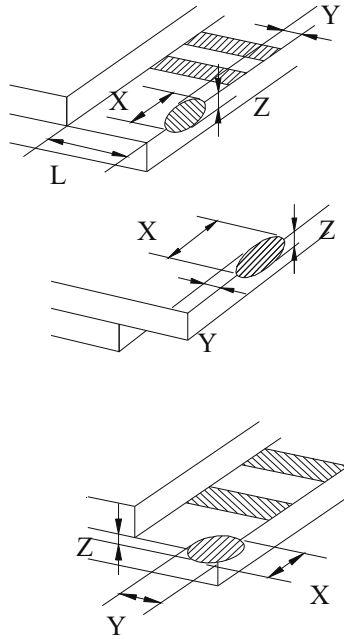
Note:　A:LCD Length.

the distance between crack and contact pad must be greater than

the width of 1st contact pad.

**2.1.3chip out on between side**

| 11 | **LCD** | <br>Epoxy frame<br><br>Note: A : LCD Length<br><br>2.1.4 including corner chip and side chip<br><br>Note: A:LCD Length |
|----|---------|
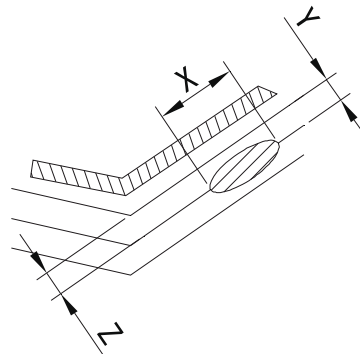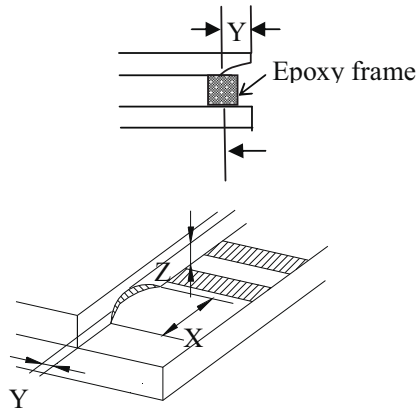
Epoxy frame

| X | Y | Z |
|---|---|---|
| ≤ 1/8A | Not enter into epoxy frame | Z≤2T |
|  | Not enter into 1/2 epoxy frame | Z≤1/2T |
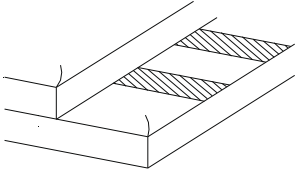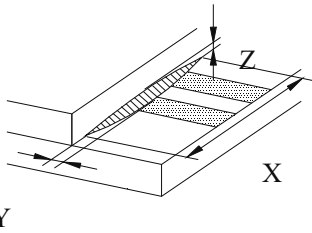
Note: A : LCD Length

2.1.4 including corner chip and side chip
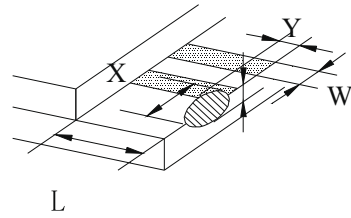
Note: A:LCD Length

| X | Y | Z |
|---|---|---|
| >1/8A | ≤1/6L |  |
| ≤1/8A | ≤1/3L | ≤1/2T |
| ≤1/4W | ≤2/3L |  |

| | | **2.2 Chip out** |
|---|---|---|
| 11 | LCD | 

1) Chip out is that crackles extend to inner edge.
2) Crackles round epoxy frame will be rejected.
3) Chip out on the terminal will be rejected: Z=T length >1mm or Z<T length >2mm
4) The chip out at ITO will be rejected.

**2.3 Poor cutting**



| X | Y | Z |
|---|---|---|
| >1/8 A | ≤0.3 | ≤1/2T |
| ≤1/8 A | According to drawing | 1/2T≤Z≤T |

**Note :** A: LCD Length. |
| **12** | **SMT** | According to the <Acceptable of electronic assemblies> IPC-A-610C class 2 stander. Component missing or function defect are Major defect ,the others are Minor defect. |
| | **Any one out of the specification will be rejected.** | |

# 13. GENERAL PRECAUTIONS

(1) Mounting Method

The panel of the LCD Module consists of two thin glass plates with polarizers
which easily get damaged since the Module is fixed by utilizing fitting holes
in the printed circuit board. Extreme care should be taken when handling
the LCD Modules.

(2) Caution of LCD handling & cleaning

When cleaning the display surface, use soft cloth with solvent (recommended below)
and wipe lightly.

- Isopropyl alcohol
- Ethyl alcohol
- Trichlorotrifloroethane

Do not wipe the display surface with dry or hard materials that will damage the polarizer
surface. Do not use the following solvent:

- Water
- Ketone
- Aromatics

(3) Caution against static charge

The LCD Module use C-MOS LSI drivers, so we recommend that you connect
any unused input terminal to VDD or VSS, do not input any signals before power
is turned on. And ground your body, Work/assembly table. And assembly
equipment to protect against static electricity.

(4) Packaging

Modules use LCD elements, and must be treated as such. Avoid intense shock
and falls from a height.

 - To prevent modules from degradation. Do not operate or store them exposed directly to sunshine or
high temperature/humidity.

(5) Caution for operation

- It is indispensable to drive LCD′s within the specified voltage limit since the higher voltage
than the limit shorten LCD life. An electrochemical reaction due to direct current causes
LCD deterioration, Avoid the use of direct current drive.
- Response time will be extremely delayed at lower temperature than the operating
temperature range and on the other hand at higher temperature LCD′s show dark color in
them.

However those phenomena do not mean malfunction or out of order with LCD′s which will
come back in the specified operating temperature range.

- If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.
- As light dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit.

Usage under the relative condition of 40°C, 50%RH or less is required.

(6) Storage

In the case of storing for a long period of time (for instance, for years) for the purpose or replacement use, The following ways are recommended.
- Storage in a polyethylene bag with sealed so as not to enter fresh air outside in it, And with no desiccant.
- Placing in a dark place where neither exposure to direct sunlight nor light is.

Keeping temperature in the specified storage temperature range.
- Storing with no touch on polarizer surface by the anything else. (It is recommended to store them as they have been contained in the inner container at the time of delivery)

(7) Safety

- It is recommendable to crash damaged or unnecessary LCD into pieces and wash off liquid crystal by using solvents such as acetone and ethanol which should be burned up later.
- When any liquid crystal leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water.


**Limited Warranty**

The LCM of Orient Display are not consumer products, but may be incorporated by Orient Display's customers into consumer products or components thereof, Orient Display does not warrant that its components are fit for any such particular purpose.

**1.** The liability of Orient Display is limited to repair or replacement on the terms set forth below. Orient Display will not be responsible for any subsequent or consequential events or injury or damage to any personnel or user including third party personnel and/or user. Unless otherwise agreed in writing between Orient Display and the customer, Orient Display will only replace or repair any of its LCM which is found defective electrically or visually when inspected in accordance with Orient Display.

**2.** No warranty can be granted if any of the precautions state in handling liquid crystal display above has been disregarded. Broken glass, scratches on polarizer mechanical damages as well as defects that are caused accelerated environment tests are excluded from warranty.

**3.** In returning the LCM, they must be properly packaged; there should be detailed description of the failures or defect.

| Address | FUNCTION | Value | Value | Value | Note |
|---|---|---|---|---|---|
| HEX | | HEX | BIN | DEC | |
| 00 | Header | 00 | 00000000 | 0 | |
| 01 | | FF | 11111111 | 255 | |
| 02 | | FF | 11111111 | 255 | |
| 03 | | FF | 11111111 | 255 | |
| 04 | | FF | 11111111 | 255 | |
| 05 | | FF | 11111111 | 255 | |
| 06 | | FF | 11111111 | 255 | |
| 07 | | 00 | 00000000 | 0 | |
| 08 | EISA Manuf. Code LSB | 06 | 00000110 | 6 | |
| 09 | Compressed ASCII | AF | 10101111 | 175 | |
| 0A | Product Code | 3C | 00111100 | 60 | |
| 0B | hex, LSB first | 30 | 00110000 | 48 | |
| 0C | 32-bit ser # | 00 | 00000000 | 0 | |
| 0D | | 00 | 00000000 | 0 | |
| 0E | | 00 | 00000000 | 0 | |
| 0F | | 00 | 00000000 | 0 | |
| 10 | Week of manufacture | 00 | 00000000 | 0 | |
| 11 | Year of manufacture | 14 | 00010100 | 20 | |
| 12 | EDID Structure Ver. | 01 | 00000001 | 1 | |
| 13 | EDID revision # | 03 | 00000011 | 3 | |
| 14 | Video input def.   (digital I/P, non-TMDS, CRGB) | 80 | 10000000 | 128 | |
| 15 | Max H image size    (rounded to cm) | 1F | 00011111 | 31 | |

| Address | FUNCTION | Value | Value | Value | Note |
|---|---|---|---|---|---|
| 16 | Max V image size   (rounded to cm) | 11 | 00010001 | 17 | |
| 17 | Display Gamma    (=(gamma*100)-100) | 78 | 01111000 | 120 | |
| 18 | Feature support   (no DPMS, Active OFF, RGB, tmg Blk#1) | 0A | 00001010 | 10 | |
| 19 | Red/green low bits (Lower 2:2:2:2 bits) | 10 | 00010000 | 16 | |
| 1A | Blue/white low bits (Lower 2:2:2:2 bits) | B5 | 10110101 | 181 | |
| 1B | Red x   (Upper 8 bits) | 97 | 10010111 | 151 | |
| 1C | Red y/ highER 8 bits | 58 | 01011000 | 88 | |
| 1D | Green x | 57 | 01010111 | 87 | |
| 1E | Green y | 92 | 10010010 | 146 | |
| 1F | Blue x | 26 | 00100110 | 38 | |
| 20 | Blue y | 1E | 00011110 | 30 | |
| 21 | White x | 50 | 01010000 | 80 | |
| 22 | White y | 54 | 01010100 | 84 | |
| 23 | Established timing 1 | 00 | 00000000 | 0 | |
| 24 | Established timing 2 | 00 | 00000000 | 0 | — |
| 25 | Established timing 3 | 00 | 00000000 | 0 | |
| 26 | Standard timing #1 | 01 | 00000001 | 1 | |

| Addr | Description | Hex | Binary | Dec | |
|---|---|---|---|---|---|
| 27 | | 01 | 00000001 | 1 | |
| 28 | Standard timing #2 | 01 | 00000001 | 1 | |
| 29 | | 01 | 00000001 | 1 | |
| 2A | Standard timing #3 | 01 | 00000001 | 1 | |
| 2B | | 01 | 00000001 | 1 | |
| 2C | Standard timing #4 | 01 | 00000001 | 1 | |
| 2D | | 01 | 00000001 | 1 | |
| 2E | Standard timing #5 | 01 | 00000001 | 1 | |
| 2F | | 01 | 00000001 | 1 | |
| 30 | Standard timing #6 | 01 | 00000001 | 1 | |
| 31 | | 01 | 00000001 | 1 | |
| 32 | Standard timing #7 | 01 | 00000001 | 1 | |
| 33 | | 01 | 00000001 | 1 | |
| 34 | Standard timing #8 | 01 | 00000001 | 1 | |
| 35 | | 01 | 00000001 | 1 | |
| 36 | Pixel Clock/10000   LSB | 12 | 00010010 | 18 | |
| 37 | Pixel Clock/10000   USB | 1B | 00011011 | 27 | |
| 38 | Horz active   Lower 8bits | 56 | 01010110 | 86 | |
| 39 | Horz blanking   Lower 8bits | 46 | 01000110 | 70 | |
| 3A | HorzAct:HorzBlnk      Upper 4:4 bits | 50 | 01010000 | 80 | |
| 3B | Vertical Active   Lower 8bits | 00 | 00000000 | 0 | |
| 3C | Vertical Blanking      Lower 8bits | 23 | 00100011 | 35 | |
| 3D | Vert Act : Vertical Blanking      (upper 4:4 bit) | 30 | 00110000 | 48 | |
| 3E | HorzSync. Offset | 26 | 00100110 | 38 | |
| 3F | HorzSync.Width | 16 | 00010110 | 22 | |
| 40 | VertSync.Offset : VertSync.Width | 36 | 00110110 | 54 | |
| 41 | Horz&Vert Sync Offset/Width Upper 2bits | 00 | 00000000 | 0 | |
| 42 | Horizontal Image Size   Lower 8bits | 35 | 00110101 | 53 | |
| 43 | Vertical Image Size   Lower 8bits | AD | 10101101 | 173 | |
| 44 | Horizontal & Vertical Image Size   (upper 4:4 bits) | 10 | 00010000 | 16 | |
| 45 | Horizontal Border   (zero for internal LCD) | 00 | 00000000 | 0 | |
| 46 | Vertical Border   (zero for internal LCD) | 00 | 00000000 | 0 | |
| 47 | Signal (non-intr, norm, no stero, sep sync, neg pol) | 18 | 00011000 | 24 | |
| 48 | Detailed timing/monitor | 00 | 00000000 | 0 | |
| 49 | descriptor #2 | 00 | 00000000 | 0 | |
| 4A | | 00 | 00000000 | 0 | |
| 4B | | 0F | 00001111 | 15 | |
| 4C | | 00 | 00000000 | 0 | |
| 4D | | 00 | 00000000 | 0 | |
| 4E | | 00 | 00000000 | 0 | |
| 4F | | 00 | 00000000 | 0 | |
| 50 | | 00 | 00000000 | 0 | |
| 51 | | 00 | 00000000 | 0 | |
| 52 | | 00 | 00000000 | 0 | |
| 53 | | 00 | 00000000 | 0 | |
| 54 | | 00 | 00000000 | 0 | |
| 55 | | 00 | 00000000 | 0 | |

| | | | | | |
|---|---|---|---|---|---|
| 56 | | 00 | 00000000 | 0 | |
| 57 | | 00 | 00000000 | 0 | |
| 58 | | 00 | 00000000 | 0 | |
| 59 | | 20 | 00100000 | 32 | |
| 5A | Detailed timing/monitor | 00 | 00000000 | 0 | |
| 5B | descriptor #3 | 00 | 00000000 | 0 | |
| 5C | | 00 | 00000000 | 0 | |
| 5D | | FE | 11111110 | 254 | |
| 5E | | 00 | 00000000 | 0 | |
| 5F | Manufacture | 41 | 01000001 | 65 | A |
| 60 | Manufacture | 55 | 01010101 | 85 | U |
| 61 | Manufacture | 4F | 01001111 | 79 | O |
| 62 | | 0A | 00001010 | 10 | |
| 63 | | 20 | 00100000 | 32 | |
| 64 | | 20 | 00100000 | 32 | |
| 65 | | 20 | 00100000 | 32 | |
| 66 | | 20 | 00100000 | 32 | |
| 67 | | 20 | 00100000 | 32 | |
| 68 | | 20 | 00100000 | 32 | |
| 69 | | 20 | 00100000 | 32 | |
| 6A | | 20 | 00100000 | 32 | |
| 6B | | 20 | 00100000 | 32 | |
| 6C | Detailed timing/monitor | 00 | 00000000 | 0 | |
| 6D | descriptor #4 | 00 | 00000000 | 0 | |

| | | | | | |
|---|---|---|---|---|---|
| 6E | | 00 | 00000000 | 0 | |
| 6F | | FE | 11111110 | 254 | |
| 70 | | 00 | 00000000 | 0 | |
| 71 | Manufacture P/N | 42 | 01000010 | 66 | B |
| 72 | Manufacture P/N | 31 | 00110001 | 49 | 1 |
| 73 | Manufacture P/N | 34 | 00110100 | 52 | 4 |
| 74 | Manufacture P/N | 30 | 00110000 | 48 | 0 |
| 75 | Manufacture P/N | 58 | 01011000 | 88 | X |
| 76 | Manufacture P/N | 57 | 01010111 | 87 | W |
| 77 | Manufacture P/N | 30 | 00110000 | 48 | 0 |
| 78 | Manufacture P/N | 33 | 00110011 | 51 | 3 |
| 79 | Manufacture P/N | 20 | 00100000 | 32 | |
| 7A | Manufacture P/N | 56 | 01010110 | 86 | V |
| 7B | Manufacture P/N | 30 | 00110000 | 48 | 0 |
| 7C | | 20 | 00100000 | 32 | |
| 7D | | 0A | 00001010 | 10 | |
| 7E | Extension Flag | 00 | 00000000 | 0 | |
| 7F | Checksum | 2B | 00101011 | 43 | |

**Orient Display reserves the right to change this specification.**