

AU OPTRONICS CORPORATION

Product Specification

17.0" WXGA+ Color TFT-LCD Module

Model Name: B170PW03 V9
Dell P/N: UM603

| Approved by | Prepared by |
|-------------|-------------|
| | |

NBBU Marketing Division / AU Optronics corporation

| Customer | Checked & Approved by |
|----------|-----------------------|
| | |

Product Specification

17.0" WXGA+ Color TFT-LCD Module

Model Name: B170PW03 V9

Customer: Dell

Dell Part No: UM603

() Preliminary Specifications

(V) Final Specifications

Note: This Specification is subject to change without notice.

Contents

| | |
|---|-----------|
| 1. Handling Precautions | 5 |
| 2. General Description | 6 |
| 2.1 General Characteristics | 6 |
| 2.2 Optical Characteristics | 7 |
| 3. Functional Block Diagram | 11 |
| 4. Absolute Maximum Ratings | 12 |
| 4.1 Absolute Ratings of TFT LCD Module | 12 |
| 4.2 Absolute Ratings of Backlight Unit | 12 |
| 4.3 Absolute Ratings of Environment | 12 |
| 5. Electrical characteristics | 13 |
| 5.1 TFT LCD Module | 13 |
| 5.2 Backlight Unit | 15 |
| 5.3 Inverter Characteristic | 16 |
| 6. Signal Characteristic | 19 |
| 6.1 Pixel Format Image | 19 |
| 6.2 The input data format | 20 |
| 6.3 Signal Description | 21 |
| 6.4 Interface Timing | 22 |
| 7. Connector Description | 25 |
| 7.1 TFT LCD Module | 25 |
| 7.2 Backlight Unit | 25 |
| 7.3 Signal for Lamp connector | 25 |
| 8. Vibration and Shock Test | 26 |
| 8.1 Vibration Test | 26 |
| 8.2 Shock Test Spec: | 26 |
| 9. Reliability | 27 |
| 10. Mechanical Characteristics | 28 |
| 10.1 LCM Outline Dimension(Front View) | 28 |
| 10.2 LCM Outline Dimension(Rear View) | 29 |
| 10.3 Screw Hole Depth and Center Position | 30 |
| 11. Shipping and Package | 31 |
| 11.1 Shipping Label Format | 31 |
| 11.2. Carton package | 31 |
| 12. Appendix: EDID description | 32 |

Record of Revision

| Version and Date | Page | Old description | New Description | Remark |
|------------------|------|-----------------|-----------------|--------|
| V0 2006/1/2 | All | First Edition | | |
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1. Handling Precautions

- 1) Since front polarizer is easily damaged, pay attention not to scratch it.
- 2) Be sure to turn off power supply when inserting or disconnecting from input connector.
- 3) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.
- 4) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.
- 5) Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface.
- 6) Since CMOS LSI is used in this module, take care of static electricity and insure human earth when handling.
- 7) Do not open nor modify the Module Assembly.
- 8) Do not press the reflector sheet at the back of the module to any directions.
- 9) In case if a Module has to be put back into the packing container slot after once it was taken out from the container, do not press the center of the CCFL Reflector edge. Instead, press at the far ends of the CFL Reflector edge softly. Otherwise the TFT Module may be damaged.
- 10) At the insertion or removal of the Signal Interface Connector, be sure not to rotate nor tilt the Interface Connector of the TFT Module.
- 11) After installation of the TFT Module into an enclosure (Notebook PC Bezel, for example), do not twist nor bend the TFT Module even momentarily. 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) Cold cathode fluorescent lamp in LCD contains a small amount of mercury. Please follow local ordinances or regulations for disposal.
- 13) Small amount of materials having no flammability grade is used in the LCD module. The LCD module should be supplied by power complied with requirements of Limited Power Source(, IEC60950 or UL1950), or be applied exemption.
- 14) The LCD module is designed so that the CCFL in it is supplied by Limited Current Circuit(IEC60950 or UL1950). Do not connect the CCFL in Hazardous Voltage Circuit.

2. General Description

B170PW03 V9 is a Color Active Matrix Liquid Crystal Display composed of a TFT LCD panel, a driver circuit, and backlight system. The screen format is intended to support the WXGA+ (1440(H) x 900(V)) screen and 262k colors (RGB 6-bits data driver). All input signals are LVDS interface compatible. Inverter of backlight is not included.

B170PW03 V9 is designed for a display unit of notebook style personal computer and industrial machine.

2.1 General Characteristics

The following items are characteristics summary on the table under 25 °C condition:

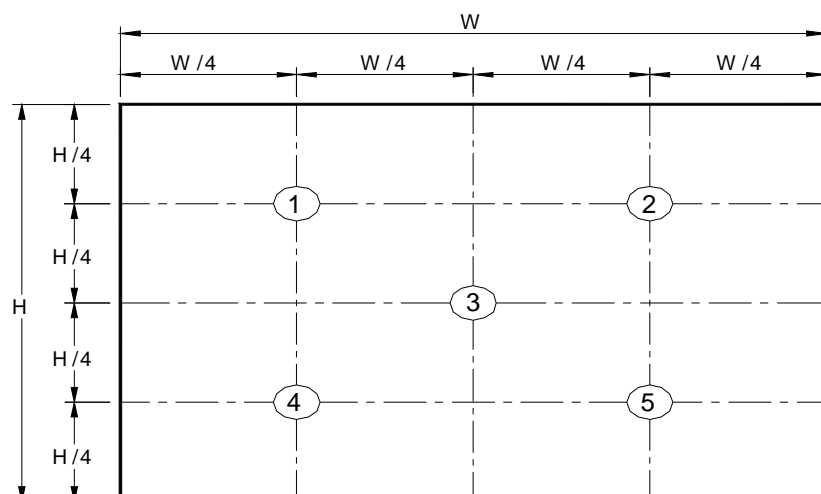
| Items | Unit | Specifications |
|-------------------------------|----------------------|---|
| Screen Diagonal | [mm] | 17.0" |
| Active Area | [mm] | 367.20(H) x 229.50(V) |
| Pixels H x V | | 1440x3(RGB) x 900 |
| Pixel Pitch | [mm] | 0.255(per one triad) x 0.255 |
| Pixel Arrangement | | R.G.B. Vertical Stripe |
| Display Mode | | Normally White |
| White Luminance (ICCFL=6.5mA) | [cd/m ²] | 220 typ. (5 points average) 200 min. (5 points average) (Note1) |
| Luminance Uniformity | | 1.25 max. (5 points) |
| Contrast Ratio | | 500 typ. |
| Response time | [msec] | 16 typ. |
| Nominal Input Voltage VDD | [Volt] | +3.3 typ. |
| Typical Power Consumption | [Watt] | 7.5 W max. (without Inverter) |
| Weight | [Grams] | 700 g max. |
| Physical Size | [mm] | 382.2(W) x 244.5(H) x 6.5(D) typ.; 7.0(D) max |
| Electrical Interface | | 2 channel LVDS |
| Surface Treatment | | Glare, Harness 3H |
| Support Color | | Native 262K colors (RGB 6-bit data driver) |
| Temperature Range | | |
| Operating | [°C] | 0 to +50 |
| Storage (Non-Operating) | [°C] | -40 to +65 |
| RoHS Compliance | | RoHS Compliance |

2.2 Optical Characteristics

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

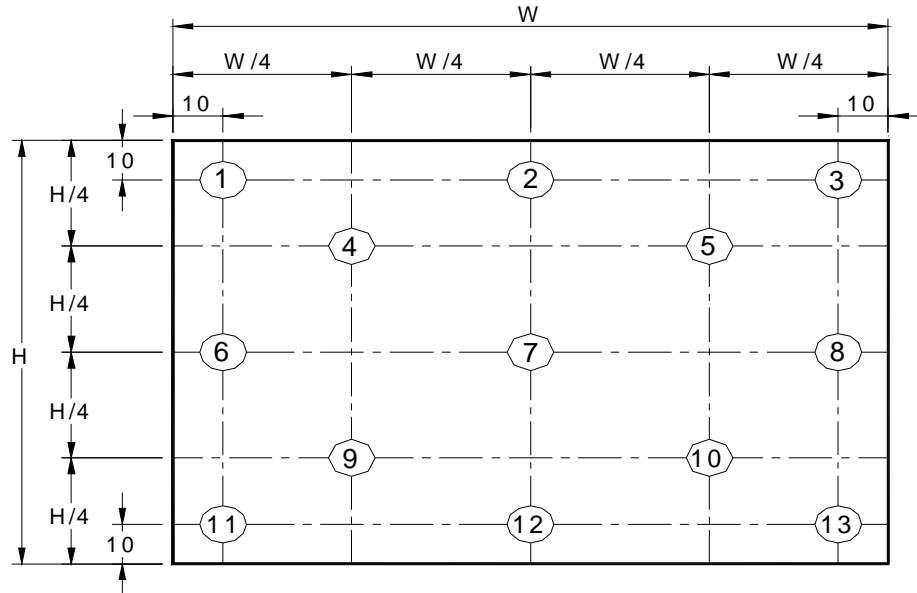
| Item | Unit | Conditions | Min. | Typ. | Max. | Note |
|---|----------------------|--------------------|-------|-------|-------|-------|
| Luminance CCFL 6.5mA | [cd/m ²] | 5 points average | 200 | 220 | - | 1,2,3 |
| Viewing Angle | [degree] | Horizontal (Right) | 40 | 45 | - | 2,7 |
| | [degree] | CR = 10 (Left) | 40 | 45 | - | |
| | [degree] | Vertical (Upper) | 15 | 20 | - | |
| | [degree] | CR = 10 (Lower) | 30 | 35 | - | |
| Luminance Uniformity | | 5 Points | | | 1.25 | 1 |
| Luminance Uniformity | | 13 Points | | | 2.0 | |
| CR: Contrast Ratio | | | 400 | 500 | - | 6 |
| Cross talk | % | | | | 4 | 4 |
| Response Time | [msec] | Rising | - | 12 | 17 | 5 |
| | [msec] | Falling | - | 4 | 8 | |
| | [msec] | Raising + Falling | | 16 | 25 | |
| Color / Chromaticity Coordinates (CIE 1931) | | Red x | 0.550 | 0.580 | 0.610 | 2,7 |
| | | Red y | 0.310 | 0.340 | 0.370 | |
| | | Green x | 0.280 | 0.310 | 0.340 | |
| | | Green y | 0.520 | 0.550 | 0.580 | |
| | | Blue x | 0.120 | 0.150 | 0.180 | |
| | | Blue y | 0.090 | 0.120 | 0.150 | |
| | | White x | 0.283 | 0.313 | 0.343 | |
| | | White y | 0.299 | 0.329 | 0.359 | |

Note 1: 5 points position (Display area : 367.20(H) x 229.50(V)mm)



Product Specification

Note 2: 13 points position



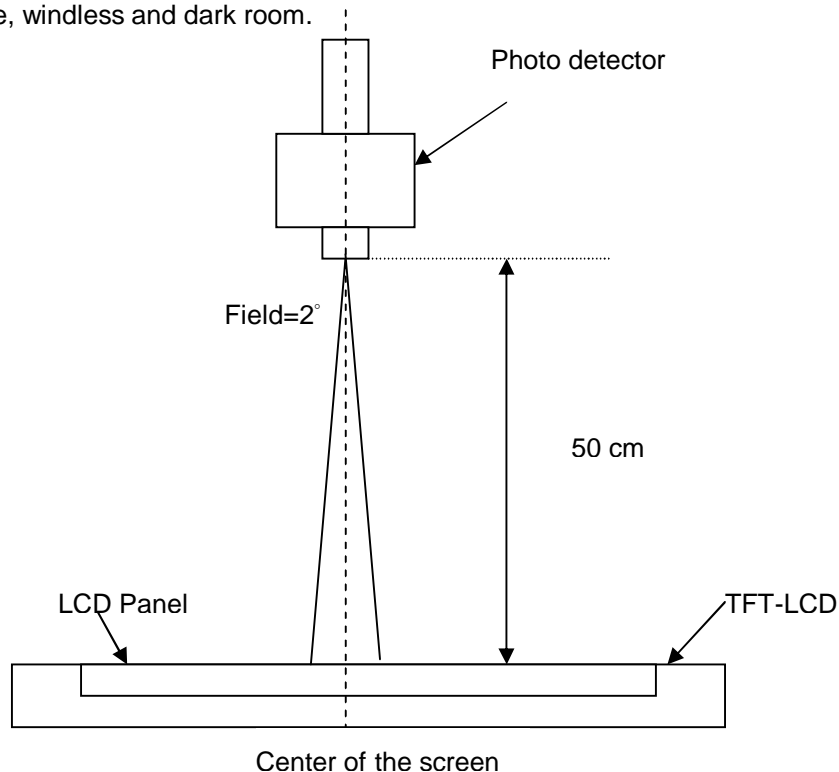
Note 3: The luminance uniformity of 5 and 13 points is defined by dividing the maximum luminance values by the minimum test point luminance

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

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

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.



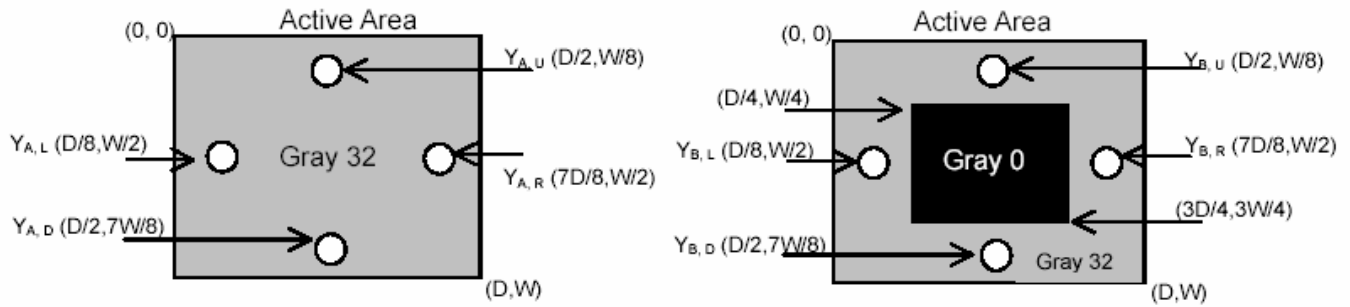
Note 5 : Definition of Cross Talk (CT)

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

Where

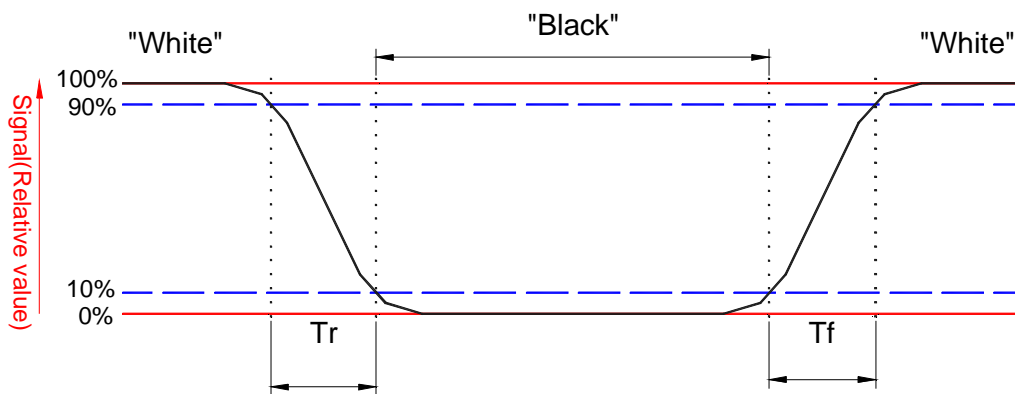
Y_A = Luminance of measured location without gray level 0 pattern (cd/m²)

Y_B = Luminance of measured location with gray level 0 pattern (cd/m²)



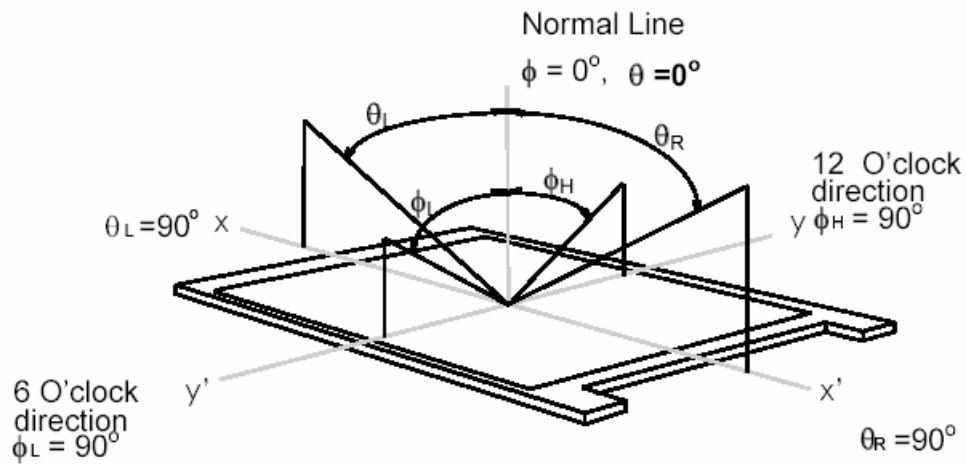
Note 6: Definition of response time:

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.



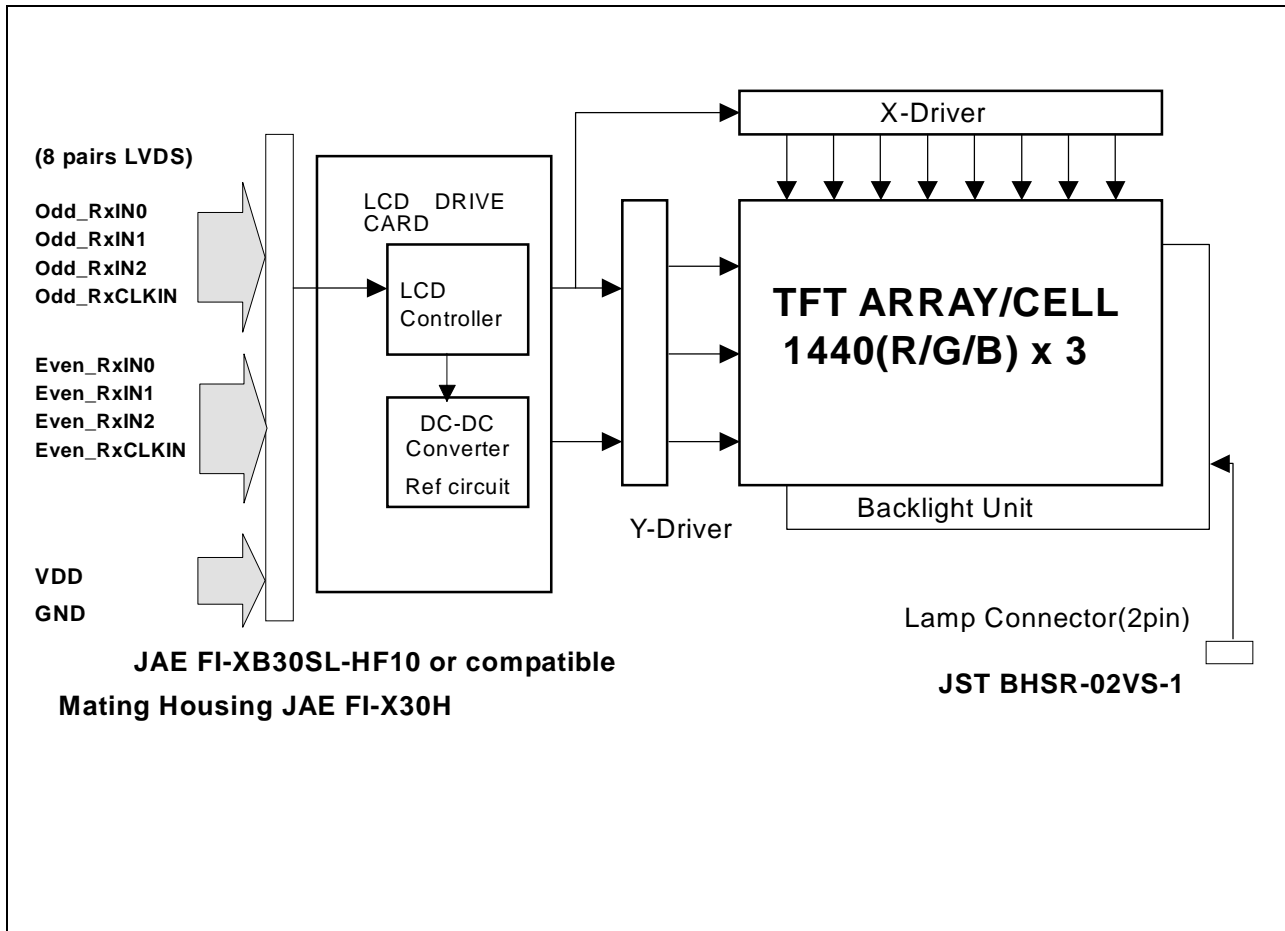
Note 7. Definition of viewing angle

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° (θ) horizontal left and right and 90° (Φ) 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.



3. Functional Block Diagram

The following diagram shows the functional block of the 17.0 inches wide Color TFT/LCD Module:



4. Absolute Maximum Ratings

Absolute maximum ratings of the module is as following:

4.1 Absolute Ratings of TFT LCD Module

| Item | Symbol | Min | Max | Unit | Conditions |
|-----------------|--------|------|------|--------|------------|
| Logic/LCD Drive | Vin | -0.3 | +4.0 | [Volt] | Note 1,2 |

4.2 Absolute Ratings of Backlight Unit

| Item | Symbol | Min | Max | Unit | Conditions |
|--------------|--------|-----|-----|----------|------------|
| CCFL Current | ICCFL | - | 6.5 | [mA] rms | Note 1,2 |

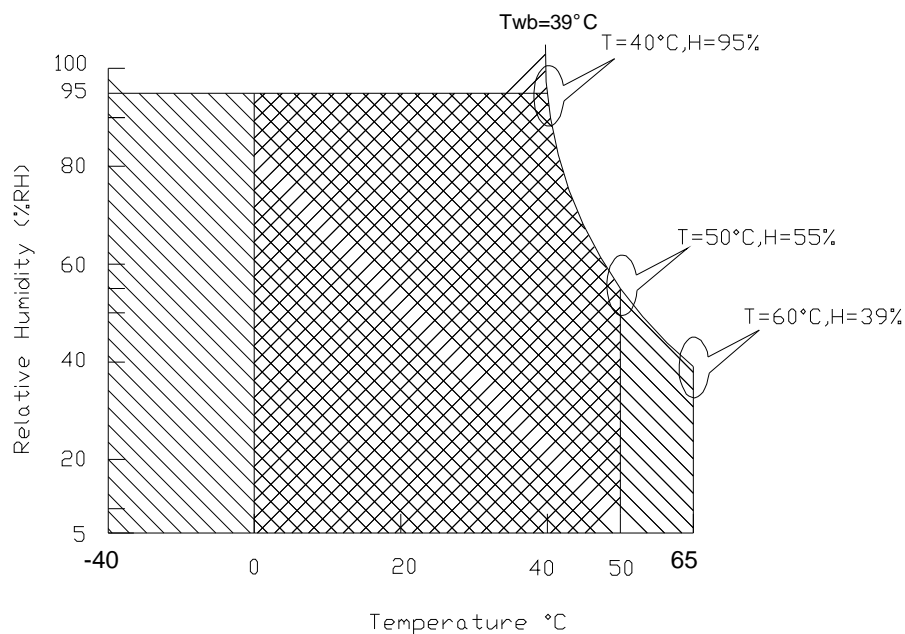
4.3 Absolute Ratings of Environment

| Item | Symbol | Min | Max | Unit | Conditions |
|-----------------------|--------|-----|-----|-------|------------|
| Operating Temperature | TOP | 0 | +50 | [°C] | Note 3 |
| Operation Humidity | HOP | 5 | 95 | [%RH] | Note 3 |
| Storage Temperature | TST | -20 | +60 | [°C] | Note 3 |
| Storage Humidity | HST | 5 | 95 | [%RH] | Note 3 |

Note 1: With in Ta (25°C)

Note 2: Permanent damage to the device may occur if exceed maximum values

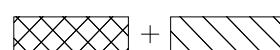
Note 3: For quality performance, please refer to AUO IIS(Incoming Inspection Standard).



Operating Range



Storage Range



5. Electrical characteristics

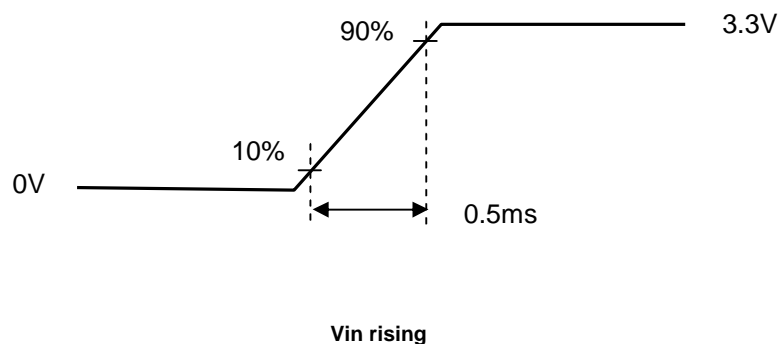
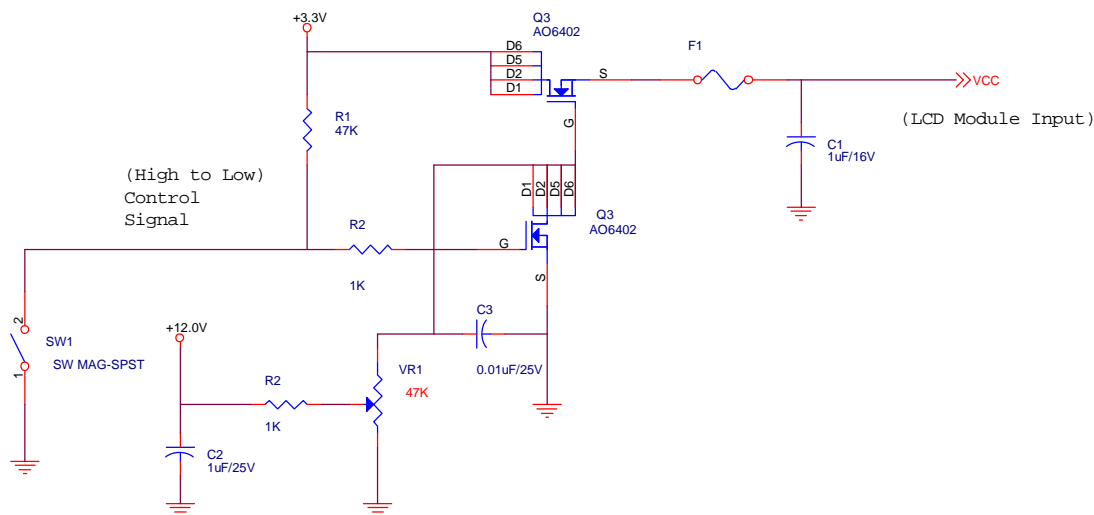
5.1 TFT LCD Module

5.1.1 Power Specification

Input power specifications are as follows;

| Symble | Parameter | Min | Typ | Max | Units | Condition |
|--------|--|-----|------|------|----------|-----------------------|
| VDD | Logic/LCD Drive Voltage | 3.0 | 3.3 | 3.6 | [Volt] | Load Capacitance 20uF |
| PDD | VDD Power | | 2.15 | | [Watt] | All White pattern |
| IDD | IDD Current | | 680 | | mA | Max:All Black Pattern |
| IRush | Inrush Current | | | 2000 | mA | |
| VDDrp | Allowable Logic/LCD Drive Ripple Voltage | | | 100 | [mV] p-p | |
| VDDns | Allowable Logic/LCD Drive Ripple Noise | | | 100 | [mV] p-p | |

Note 1 : Measurement conditions:



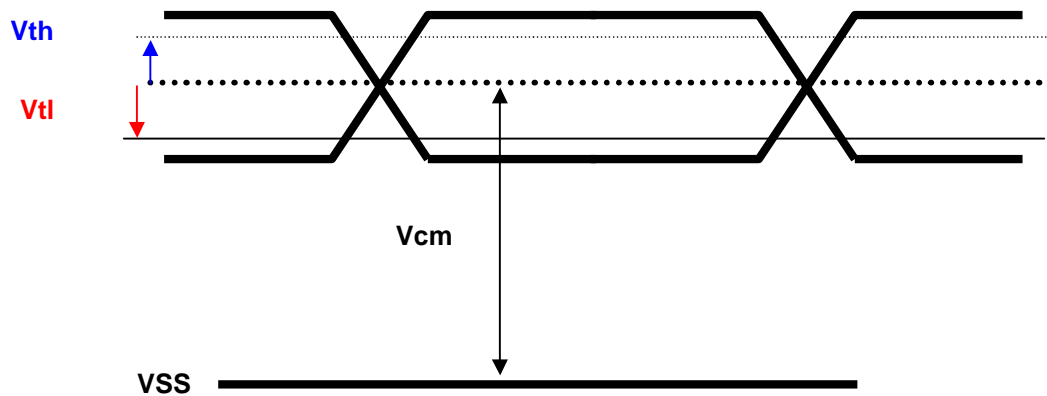
5.1.2 Signal Electrical Characteristics

Input signals shall be low or Hi-Z state when VDD is off.

It is recommended to refer the specifications of THC63LVDF84A(Thine Electronics Inc.) in detail. Signal electrical characteristics are as follows;

| Parameter | Condition | Min | Max | Unit |
|-----------|--|-------|-------|------|
| Vth | Differential Input High Threshold ($V_{cm}=+1.2V$) | | 100 | [mV] |
| Vtl | Differential Input Low Threshold ($V_{cm}=+1.2V$) | -100 | | [mV] |
| Vcm | Differential Input Common Mode Voltage | 1.125 | 1.375 | [V] |

Note: LVDS Signal Waveform



5.2 Backlight Unit

Parameter guideline for CCFL Inverter

| Parameter | Min | Typ | Max | Units | Condition |
|-------------------------------------|------|------|-----|----------------------|-----------------------|
| White Luminance 5 points average | 2800 | 3100 | - | [cd/m ²] | (Ta=25°C) |
| CCFL current(ICCFL) | 3.0 | 6.5 | 7.0 | [mA] rms | (Ta=25°C) Note 2 |
| CCFL Frequency(FCCFL) | 45 | 50 | 80 | [KHz] | (Ta=25°C) Note 3,4 |
| CCFL Ignition Voltage(Vs) | 1500 | | | [Volt] rms | (Ta= 0°C) Note 5 |
| CCFL Voltage (Reference) (VCCFL) | 775 | 815 | 940 | [Volt] rms | (Ta=25°C) Note 6 |
| CCFL Power consumption (PCCFL) | | 4.9 | | [Watt] | (Ta=25°C) Note 6 |

Note 1: Typ are AUO recommended Design Points.

*1 All of characteristics listed are measured under the condition using the AUO Test inverter.

*2 In case of using an inverter other than listed, it is recommended to check the inverter carefully. Sometimes, interfering noise stripes appear on the screen, and substandard luminance or flicker at low power may happen.

*3 In designing an inverter, it is suggested to check safety circuit very carefully. Impedance of CFL, for instance, becomes more than 1 [M ohm] when CFL is damaged.

*4 Generally, CFL has some amount of delay time after applying kick-off voltage. It is recommended to keep on applying kick-off voltage for 1 [Sec] until discharge.

*5 CFL discharge frequency must be carefully chosen so as not to produce interfering noise stripes on the screen.

*6 Reducing CFL current increases CFL discharge voltage and generally increases CFL discharge frequency. So all the parameters of an inverter should be carefully designed so as not to produce too much leakage current from high-voltage output of the inverter.

Note 2: It should be employed the inverter which has "Duty Dimming", if ICFL is less than 4mA.

Note 3: CFL discharge frequency should be carefully determined to avoid interference between inverter and TFT LCD.

Note 4: The frequency range will not affect to lamp life and reliability characteristics.

Note 5: CFL inverter should be able to give out a power that has a generating capacity of over 1,430 voltage. Lamp units need 1,400 voltage minimum for ignition.

Note 6: Calculator value for reference (ICCFL×VCCFL=PCCFL)

5.3 Inverter Characteristic

5.3.1 Foxconn inverter (with Maxim IC)

Electrical Characteristics : Vin= 7.5V~21V

| No. | Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|-----|---|---------------------|--------------------------------------|------|-------|------|-------------------|
| 1 | Input Voltage | INV_SRC | - | 7.5 | 14.0 | 21.0 | V |
| 2 | Input Voltage | 5VALW | - | 4.85 | - | 5.20 | V |
| 3 | Input Current | Iin | Vin=14.0V, max. output | - | 0.491 | - | A |
| 4 | Input Power | Pin | Vin=14.0V, Iout=6.5mA | 5.76 | 6.88 | 7.92 | W |
| 5 | SMBus Mode Brightness Adjust | SMB_DAT | Min. output: 00H Max. output: FFH | 00 | - | FF | Hex. |
| 6 | DPST mode (System side PWM input) | PWM(Hz) | - | - | 10 | - | KHz |
| | | PWM Voltage | - | 3.0 | 3.30 | 5.5 | V |
| | | Signal intensity | - | 00 | - | FF | Hex |
| 7 | Output Voltage | Vout | Max. output | - | 750 | - | Vrms |
| 8 | Output Current | Iout (Min) | Ta=25°C, after running 30 min. | 1.45 | 1.75 | 2.05 | mA _{rms} |
| | | Iout (Max) | | 6.3 | 6.5 | 6.8 | mA _{rms} |
| 9 | Frequency | Freq | Max. output | 45 | 55 | 65 | KHz |
| 10 | Output Power | Pout | Vin=14.0V, Iout(Max) | 4.17 | 4.88 | 5.61 | W |
| 11 | Burst Mode Frequency | f _B | | 200 | 210 | 220 | Hz |
| 12 | Ambient Light input signal | | | 5 | - | 1000 | Lux |
| 13 | Open Lamp Voltage ⁽²⁾ | Vopen | No Load | 1500 | - | - | Vrms |
| 14 | Striking Time | Ts | No Load | 0.6 | 1.0 | 1.4 | Sec |
| 15 | Efficiency | η | Vin=7.5V, Max. output, Load=100K | - | 80 | - | % |
| 16 | Start -up time | | | - | - | 0.1 | Sec |

5.3.2 Sumida inverter (with MPS IC)

Electrical Characteristics : Vin= 7.5V~21V

| | Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|----|--|-----------|---|------|------|------|-------|
| 1 | Input Voltage | Vin | | 7.5 | 14.4 | 21 | V |
| 2 | Input Current | Iin | Vin=7.5V,SMB_DATA=FFH,PWM DUTY =100%,AMBIENT LIGHT=1000LUX | 730 | 790 | 850 | mA |
| 3 | Input Power | Pin | Vin=21V,SMB_DATA=FFH,PWM DUTY =100%,AMBIENT LIGHT=1000LUX | --- | 6.3 | --- | W |
| 4 | Input Signal Level for 5VSUS,5VALW | | | 4.85 | 5 | 5.2 | V |
| 5 | Backlight Adjust(Lamp current control) | | SMB_DATA=FFH,PWM DUTY =100%,AMBIENT LIGHT=1000LUX | 00H | -- | FFH | |
| 6 | Output Voltage | Vout | SMDData=FFH | 630 | 700 | 770 | Vrms |
| 7 | Output current | Iout(Min) | Vin(7.5~21V)SMB_DATA=00H,PWM DUTY =100%,AMBIENT LIGHT=1000LUX Ta=25℃,after running 30 min | 1.25 | 1.55 | 1.85 | mArms |
| | | Iout(Max) | Vin(7.5~21V)SMB_DATA=FFH,PWM DUTY =100%,AMBIENT LIGHT=1000LUX Ta=25℃,after running 30 min | 6.2 | 6.5 | 6.8 | mArms |
| 8 | Frequency | Freq | Vin=7.5~21V | 45 | 55 | 65 | KHz |
| 9 | Output power | Pout | Vin=21V SMB_DATA=FFH,PWM DUTY =100%,AMBIENT LIGHT=1000LUX | --- | 4.55 | --- | W |
| 10 | Open lamp voltage | Vopen | No load | 1400 | -- | 1800 | Vrms |
| 11 | Striking time | Ts | Vin=7.5~21V | 0.6 | 1 | 1.4 | Sec |
| 12 | Efficiency | η | Vin=7.5V,Iout=Max. Load=115K Ω //15PF TO GND | 80 | -- | -- | % |

5.3.2 Sumida inverter (with MPS IC)

Electrical Characteristics : Vin= 7.5V~21V

Electrical Characteristics Ta=25°C (P/N : T73I017.00 Rev. : 0)

| No. | Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|-----|---|---------------------|--------------------------------------|-------|-------|-------|-------------------|
| 1 | Input Voltage | INV_SRC | - | 7.5 | 14.0 | 21.0 | V |
| 2 | Input Voltage | 5VALW | - | 4.75 | - | 5.20 | V |
| 3 | Input Current | Iin | Vin=14.0V, max. output | 0.411 | 0.491 | 0.565 | A |
| 4 | Input Power | Pin | Vin=14.0V, Iout=6.5mA | 5.75 | 6.88 | 7.91 | W |
| 5 | SMBus Mode Brightness Adjust | SMB_DAT | Min. output: 00H Max. output: FFH | 00 | - | FF | Hex. |
| 6 | DPST mode (System side PWM input) | PWM(Hz) | - | - | 10 | - | KHz |
| | | PWM Voltage | - | 3.135 | 3.30 | 3.465 | V |
| | | Signal intensity | - | 00 | - | FF | Hex |
| 7 | Output Voltage | Vout | Max. output | 650 | 750 | 850 | Vrms |
| 8 | Output Current | Iout (Min) | Ta=25°C, after running 30 min. | 1.25 | 1.55 | 1.85 | mA _{rms} |
| | | Iout (Max) | | 6.20 | 6.50 | 6.80 | mA _{rms} |
| 9 | Frequency | Freq | Max. output | 45 | 55 | 65 | KHz |
| 10 | Output Power | Pout | Vin=14.0V, Iout(Max) | 4.17 | 4.88 | 5.61 | W |
| 11 | Burst Mode Frequency | f _B | | 200 | 210 | 220 | Hz |
| 12 | Ambient Light input signal | | | 3 | - | 320 | Lux |
| 13 | Open Lamp Voltage ⁽²⁾ | Vopen | No Load | 1400 | - | 1800 | Vrms |
| 14 | Striking Time | Ts | No Load | 0.6 | 1.0 | 1.4 | Sec |
| 15 | Efficiency | η | Vin=7.5V, Max. output, Load=100K | - | 80 | - | % |
| 16 | Start -up time | | | - | - | 0.1 | Sec |

6. Signal Characteristic

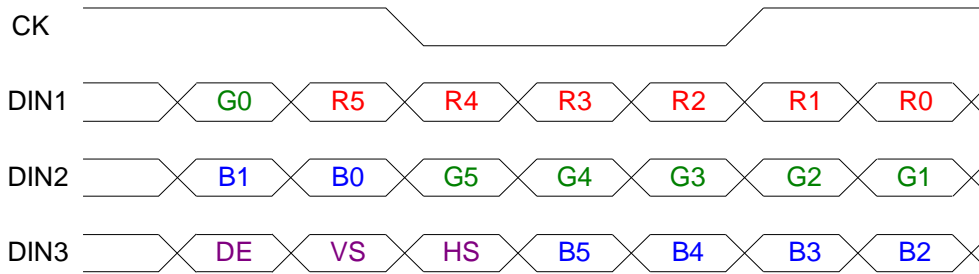
6.1 Pixel Format Image

Following figure shows the relationship of the input signals and LCD pixel format.

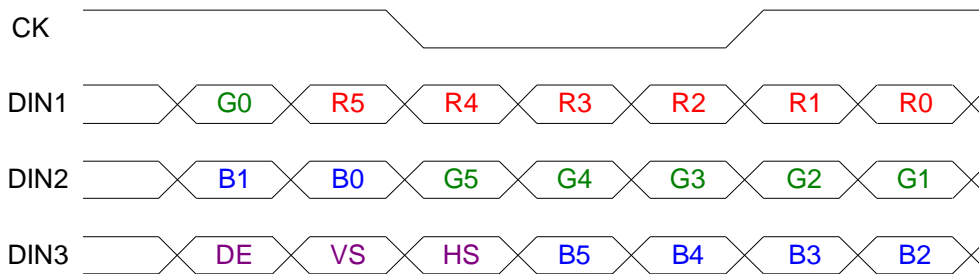
| | 1 | | | 2 | | | | | | 1439 | | | 1440 | | |
|------------|---|---|---|---|---|---|-----------|--|--|------|---|---|------|---|---|
| 1st Line | R | G | B | R | G | B | - - - - - | | | R | G | B | R | G | B |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
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| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| 900th Line | R | G | B | R | G | B | - - - - - | | | R | G | B | R | G | B |

6.2 The input data format

ODD pair(1st pixel input)



Even pair(2nd pixel input)



| Signal Name | Description | |
|----------------------------------|---|--|
| R5 R4 R3 R2 R1 R0 | Red Data 5 (MSB) Red Data 4 Red Data 3 Red Data 2 Red Data 1 Red Data 0 (LSB) Red-pixel Data | Red-pixel Data Each red pixel's brightness data consists of these 6 bits pixel data. |
| G5 G4 G3 G2 G1 G0 | Green Data 5 (MSB) Green Data 4 Green Data 3 Green Data 2 Green Data 1 Green Data 0 (LSB) Green-pixel Data | Green-pixel Data Each green pixel's brightness data consists of these 6 bits pixel data. |
| B5 B4 B3 B2 B1 B0 | Blue Data 5 (MSB) Blue Data 4 Blue Data 3 Blue Data 2 Blue Data 1 Blue Data 0 (LSB) Blue-pixel Data | Blue-pixel Data Each blue pixel's brightness data consists of these 6 bits pixel data. |
| RxCLKIN | Data Clock | The typical frequency is 48.2 MHz. The signal is used to strobe the pixel data and DSPTMG signals. All pixel data shall be valid at the falling edge when the DSPTMG signal is high. |
| DE | Display Timing | This signal is strobed at the falling edge of -DTCLK. When the signal is high, the pixel data shall be valid to be displayed. |
| VS | Vertical Sync | The signal is synchronized to -DTCLK . |
| HS | Horizontal Sync | The signal is synchronized to -DTCLK . |

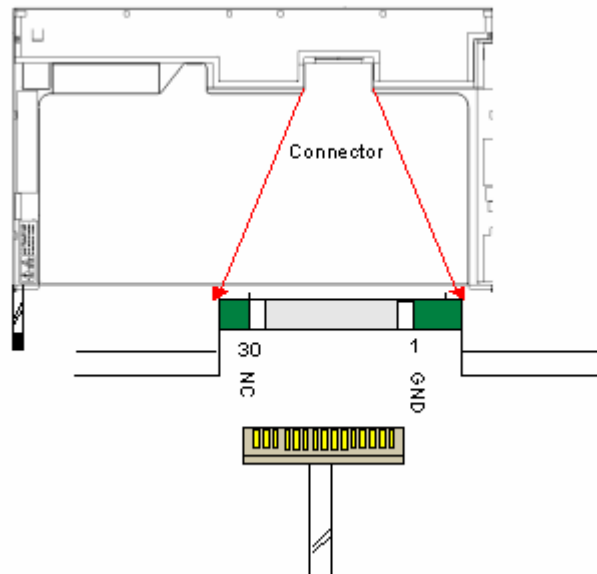
Note: Output signals from any system shall be low or Hi-Z state when VDD is off.

6.3 Signal Description

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

| Pin no | Symbol | Function | Etc. |
|--------|----------------------|---------------------------------------|------|
| 1 | GND | Ground | |
| 2 | VDD | Power supply ,3.3 V (typical) | |
| 3 | VDD | Power supply ,3.3 V (typical) | |
| 4 | V _{EDID} | DDC 3.3V power | |
| 5 | NC | No Connection (Reserved for AUO) test | |
| 6 | CLK _{EDID} | DDC Clock | |
| 7 | Data _{EDID} | DDC data | |
| 8 | Odd_RxIN0- | -LVDS differential data input | |
| 9 | Odd_RxIN0+ | +LVDS differential data input | |
| 10 | GND | Ground | |
| 11 | Odd_RxIN1- | -LVDS differential data input | |
| 12 | Odd_RxIN1+ | +LVDS differential data input | |
| 13 | GND | Ground | |
| 14 | Odd_RxIN2- | -LVDS differential data input | |
| 15 | Odd_RxIN2+ | +LVDS differential data input | |
| 16 | GND | Ground | |
| 17 | Odd_RxCLKIN- | -LVDS differential clock input | |
| 18 | Odd_RxCLKIN+ | +LVDS differential clock input | |
| 19 | GND | Ground | |
| 20 | Even_RxIN0- | -LVDS differential data input | |
| 21 | Even_RxIN0+ | +LVDS differential data input | |
| 22 | GND | Ground | |
| 23 | Even_RxIN1- | -LVDS differential data input | |
| 24 | Even_RxIN1+ | +LVDS differential data input | |
| 25 | GND | Ground | |
| 26 | Even_RxIN2- | -LVDS differential data input | |
| 27 | Even_RxIN2+ | +LVDS differential data input | |
| 28 | GND | Ground | |
| 29 | Even_RxCLKIN- | -LVDS differential clock input | |
| 30 | Even_RxCLKIN+ | +LVDS differential clock input | |

Product Specification



Note1: Start from right side

Note2: Please follow VESA standard.

Note3: Input signals shall be low or High-impedance when VDD is off.

Internal circuit of LVDS inputs are as following.

The module uses a 100ohm resistor between positive and negative data lines of each receiver input

6.4 Interface Timing

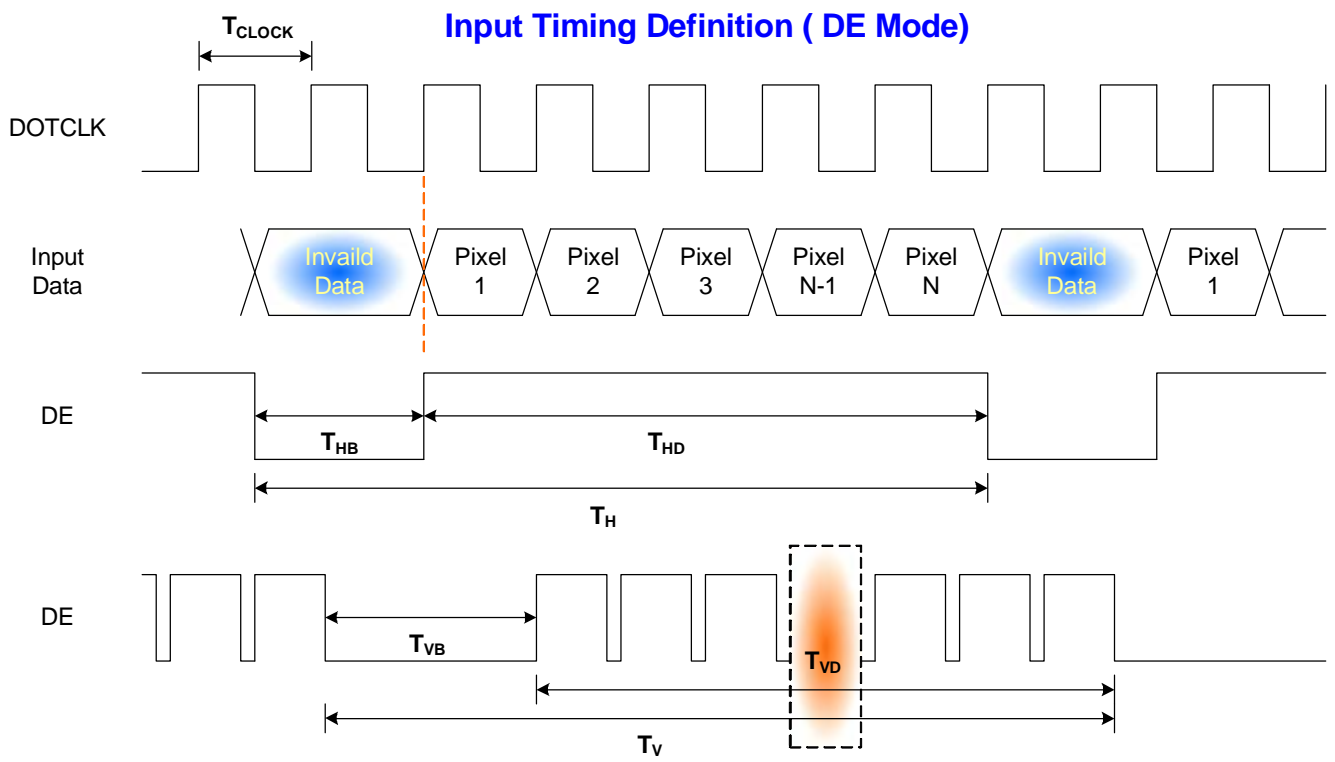
6.4.1 Timing Characteristics

Basically, interface timings should match the 1440x900 manufacturing guide line timing.

| Signal | Item | Symbol | Min | Typ | Max | Unit |
|--------------------|-----------|----------|-------|-------|------|------|
| Vertical Section | Period | Tv | 904 | 912 | 2048 | Th |
| | Active | Tdisp(v) | 900 | 900 | 900 | Th |
| | Blanking | Tblk(v) | 4 | 12 | – | Th |
| Horizontal Section | Period | Th | 760 | 880 | 1024 | Tclk |
| | Active | Tdisp(h) | 720 | 720 | 720 | Tclk |
| | Blanking | Tblk(h) | 40 | 160 | – | Tclk |
| Clock | Period | Tclk | 16.61 | 20.75 | – | ns |
| | Frequency | Freq | – | 48.2 | 60.2 | MHz |

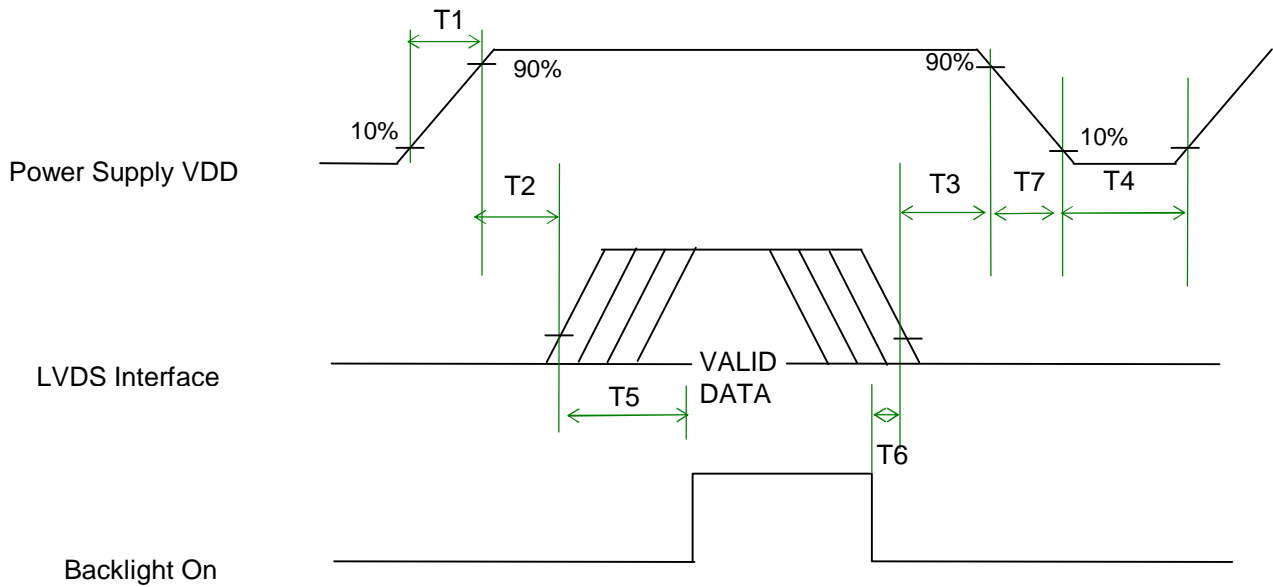
Note : DE mode only

6.4.2 Timing diagram



6.5 Power ON/OFF Sequence

VDD power and lamp on/off sequence is as follows. Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state or low level when VDD is off.



Power Sequence Timing

| Parameter | Value | | | Units |
|-----------|-------|------|------|-------|
| | Min. | Typ. | Max. | |
| T1 | 0.5 | - | 10 | (ms) |
| T2 | 0 | - | 50 | (ms) |
| T3 | 0 | - | 50 | (ms) |
| T4 | 400 | - | - | (ms) |
| T5 | 200 | - | - | (ms) |
| T6 | 200 | - | - | (ms) |
| T7 | 0 | - | 10 | (ms) |

7. Connector Description

Physical interface is described as for the connector on module.

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

7.1 TFT LCD Module

| Connector Name / Designation | For Signal Connector |
|------------------------------|------------------------------|
| Manufacturer | JAE or compatible |
| Type / Part Number | FI-XB30SL-HF10 or compatible |
| Mating Housing/Part Number | FI-X30H |
| Mating Contact/Part Number | FI-XC3-1-15000 |

7.2 Backlight Unit

Physical interface is described as for the connector on module.

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

| Connector Name / Designation | For Lamp Connector |
|------------------------------|--------------------|
| Manufacturer | JST |
| Type / Part Number | BHSR-02VS-1 |
| Mating Type / Part Number | SM02B-BHSS-1-TB |

7.3 Signal for Lamp connector

| Pin # | Cable color | Signal Name |
|-------|-------------|-------------------|
| 1 | Red | Lamp High Voltage |
| 2 | White | Lamp Low Voltage |

8. Vibration and Shock Test

8.1 Vibration Test

Test Spec:

- I Test method: Non-Operation
- I Acceleration: 1.5G
- I Frequency: 10 - 500Hz Random
- I Sweep: 30 Minutes each Axis (X, Y, Z)

8.2 Shock Test Spec:

Test Spec:

- I Test method: Non-Operation
- I Acceleration: 180 G , Half sine wave
- I Active time: 2 ms
- I Pulse: X,Y,Z .one time for each side

9. Reliability

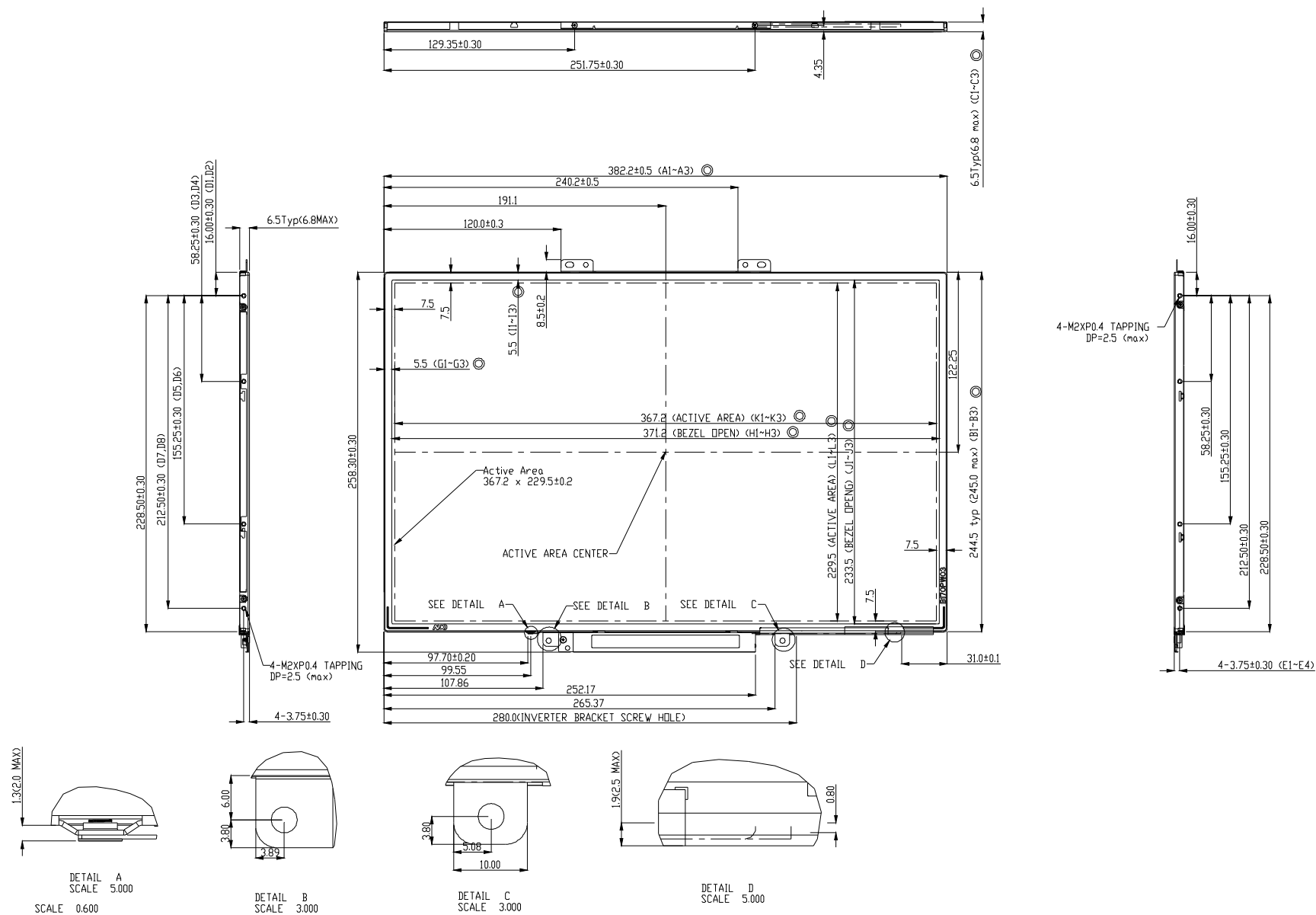
| Items | Required Conditions |
|--|--|
| Operating Life – High Temp. | Temp.= +50°C, Dynamic. 250 Hours, Humidity 20% |
| Operating Life – Low Temp. | Temp.= 0°C, Dynamic, 250 Hours, Humidity 20% |
| High Temp. Storage Life – Non-Operating | Temp.= +65°C, Non-Operating, 250 Hours, Humidity 20% |
| Low Temp. Storage Life – Non-Operating | Temp.= -40°C, Non-Operating, 250 Hours |
| High Temp & High Humidity Operating Life | Temp.=+40°C,Dynamic,Humidity 95%(Non-Condensing), 250 Hours |
| Shock – Non-Operating | 180g, 2.0 ms, Half Sine Wave |
| Vibration – Non-Operating | Random vibration, 1.5 G zero-to-peak, 10 to 500 Hz, 30 mins in each of three mutually perpendicular axes |
| Temp. Cycle – Operating | 0°C to +40°C ,Ramp< 20°C /min, Duration at Temp. = 30 min, Test Cycles =160 |
| Temp. Cycle – Non-Operating | -40°C to +65°C, Ramp ≤20°C/min, Duration at Temp. = 30min, Test Cycles = 50 |
| ESD | Contact : ±8KV/ operation Air : ±15KV / operation |
| Room temperature Test | 25°C, 2000hours, Operating with loop pattern |

Note1: According to EN61000-4-2 , ESD class B: Some performance degradation allowed. No data lost
. Self-recoverable. No hardware failures.

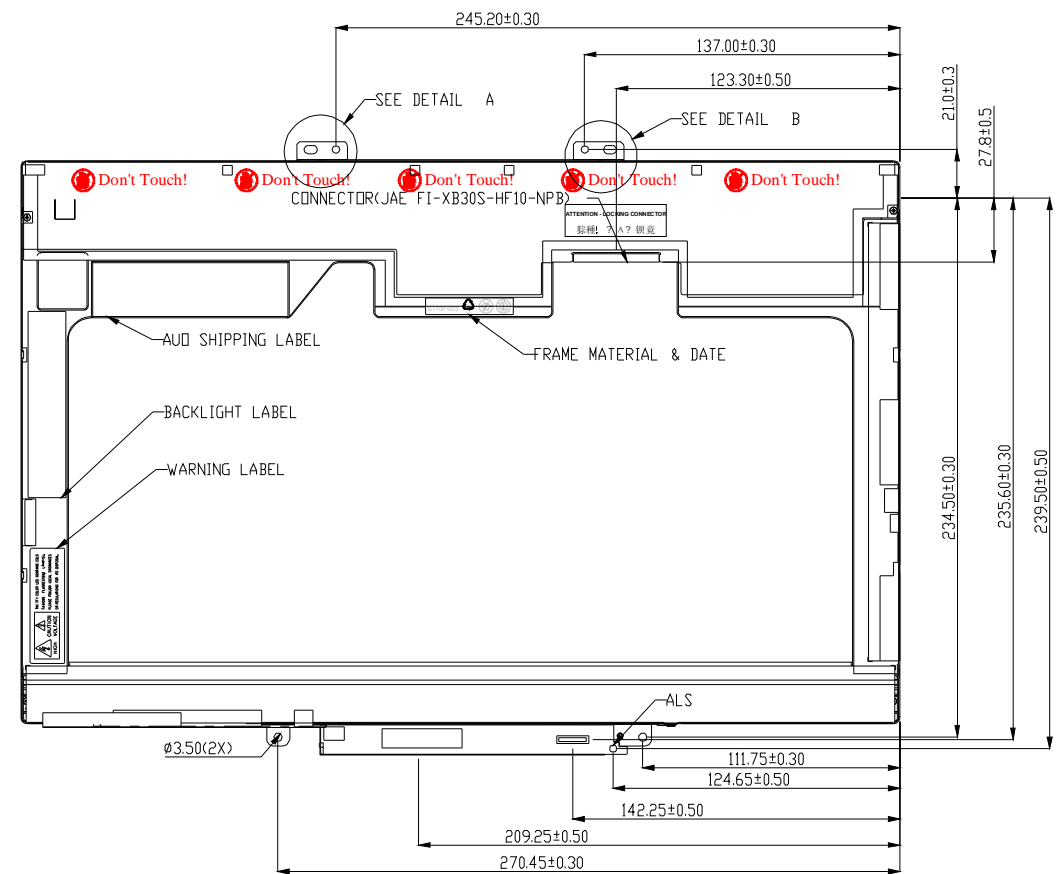
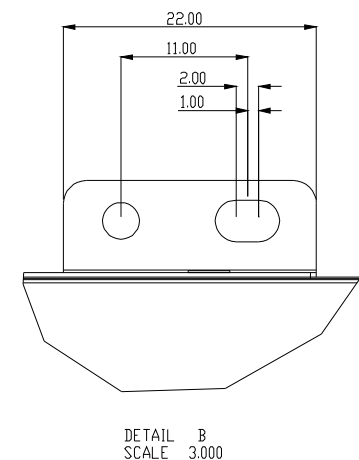
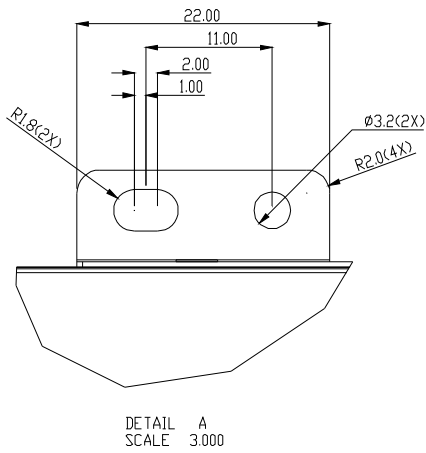
Note2: CCFL Life time: 10,000 hours minimum under normal module usage.

Note3: MTBF (Excluding the CCFL): 30,000 hours with a confidence level 90%

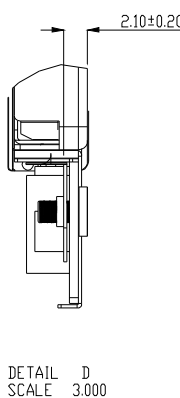
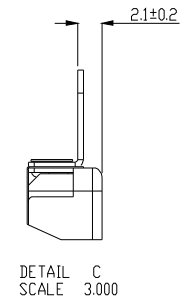
10.1 LCM Outline Dimension(Front View)



10.2 LCM Outline Dimension(Rear View)



SCALE 0.600



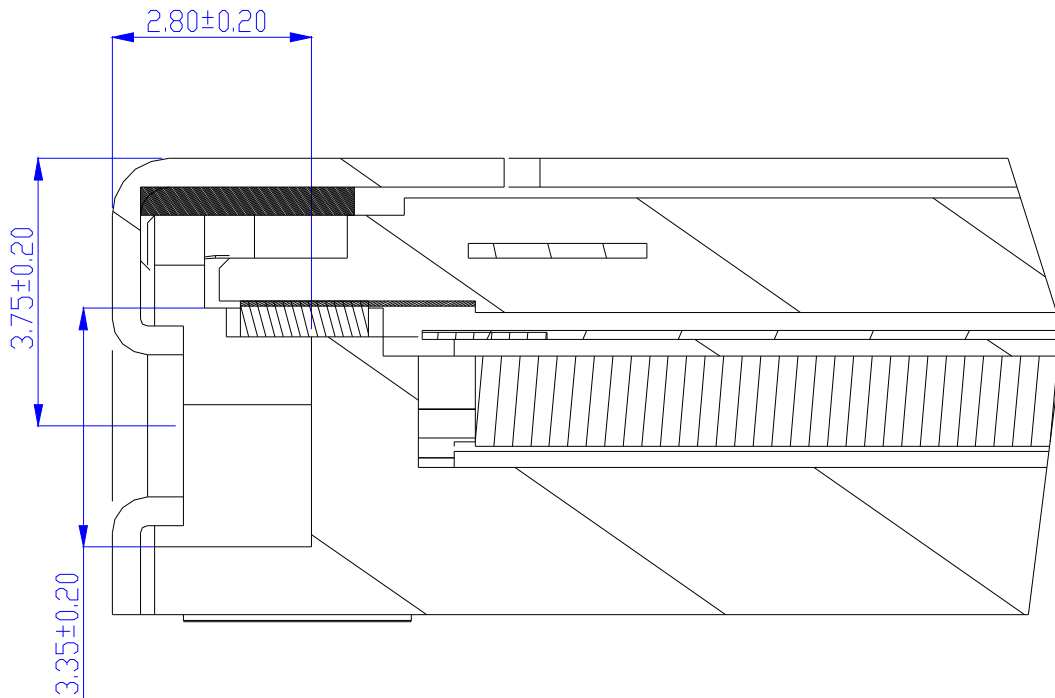
10.3 Screw Hole Depth and Center Position

Screw hole minimum depth, from side surface = 2.6 mm (See drawing)

Screw hole center location, from front surface = 3.75 ± 0.2 mm (See drawing)

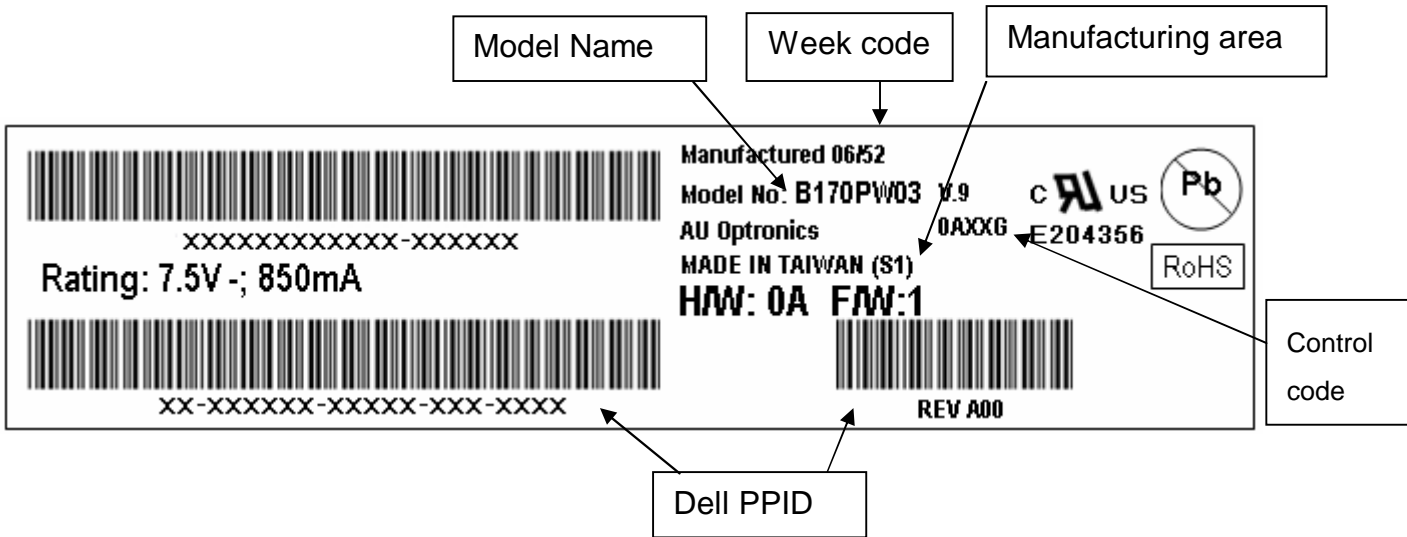
Screw maximum length = 2.3 mm (See drawing)

Screw Torque: Maximum 2.5 kgf-cm

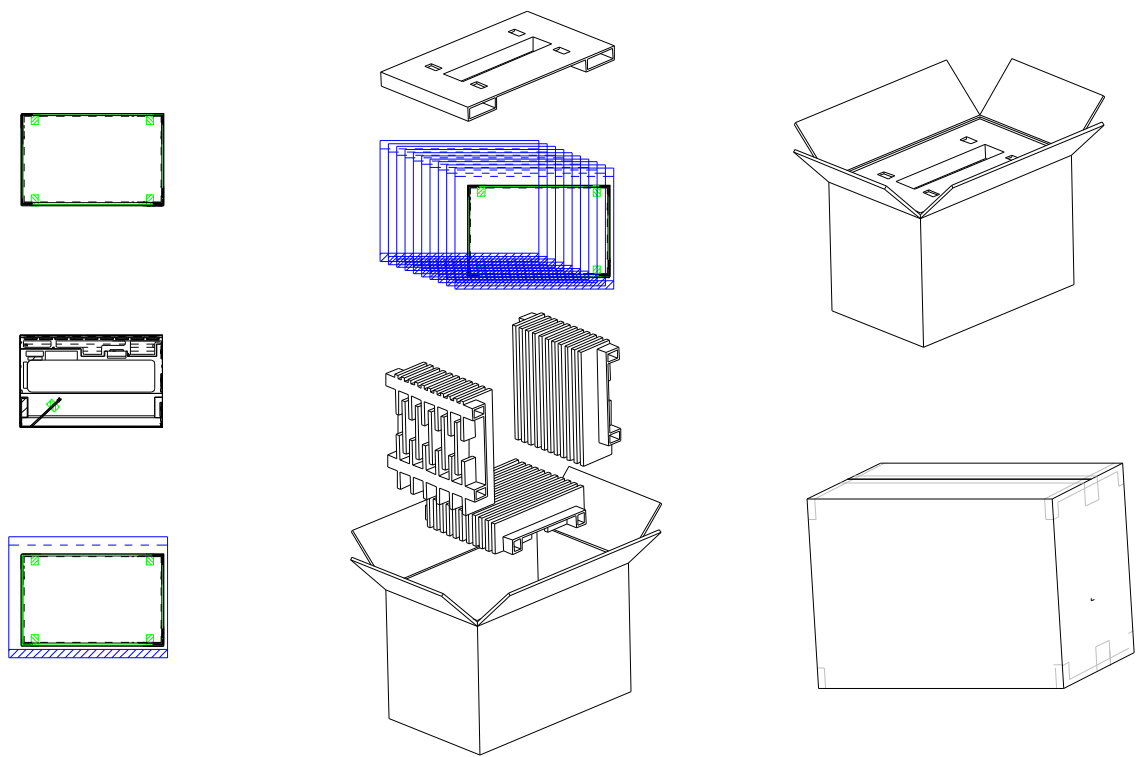


11. Shipping and Package

11.1 Shipping Label Format



11.2. Carton package



12. Appendix: EDID description

| Byte (hex) | Field Name and Comments | Value (hex) | Value (binary) | Value (DEC) |
|---------------|--|----------------|-------------------|----------------|
| 0 | Header | 00 | 00000000 | 0 |
| 1 | Header | FF | 11111111 | 255 |
| 2 | Header | FF | 11111111 | 255 |
| 3 | Header | FF | 11111111 | 255 |
| 4 | Header | FF | 11111111 | 255 |
| 5 | Header | FF | 11111111 | 255 |
| 6 | Header | FF | 11111111 | 255 |
| 7 | Header | 00 | 00000000 | 0 |
| 8 | EISA manufacture code = 3 Character ID | 06 | 00000110 | 6 |
| 9 | EISA manufacture code (Compressed ASCII) | AF | 10101111 | 175 |
| 0A | Panel Supplier Reserved – Product Code | 87 | 10000111 | 135 |
| 0B | Panel Supplier Reserved – Product Code | 39 | 00111001 | 57 |
| 0C | LCD module Serial No - Preferred but Optional ("0" if not used) | 00 | 00000000 | 0 |
| 0D | LCD module Serial No - Preferred but Optional ("0" if not used) | 00 | 00000000 | 0 |
| 0E | LCD module Serial No - Preferred but Optional ("0" if not used) | 00 | 00000000 | 0 |
| 0F | LCD module Serial No - Preferred but Optional ("0" if not used) | 00 | 00000000 | 0 |
| 10 | Week of manufacture | 01 | 00000001 | 1 |
| 11 | Year of manufacture | 11 | 00010001 | 17 |
| 12 | EDID structure version # = 1 | 01 | 00000001 | 1 |
| 13 | EDID revision # = 3 | 03 | 00000011 | 3 |
| 14 | Video I/P definition = Digital I/P (80h) | 80 | 10000000 | 128 |
| 15 | Max H image size = (Rounded to cm) | 25 | 00100101 | 37 |
| 16 | Max V image size = (Rounded to cm) | 17 | 00010111 | 23 |
| 17 | Display gamma = (gamma ×100)-100 = Example: (2.2×100) – 100 = 120 | 78 | 01111000 | 120 |
| 18 | Feature support (no DPMS, Active off, RGB, timing BLK 1) | 0A | 00001010 | 10 |
| 19 | Red/Green Low bit (RxRy/GxGy) | 87 | 10000111 | 135 |
| 1A | Blue/White Low bit (BxBY/WxWy) | B5 | 10110101 | 181 |
| 1B | Red X Rx = 0.580 | 94 | 10010100 | 148 |
| 1C | Red Y Ry = 0.340 | 57 | 01010111 | 87 |
| 1D | Green X Gx = 0.310 | 4F | 01001111 | 79 |
| 1E | Green Y Gy = 0.550 | 8C | 10001100 | 140 |
| 1F | Blue X Bx = 0.150 | 26 | 00100110 | 38 |
| 20 | Blue Y By = 0.120 | 1E | 00011110 | 30 |
| 21 | White X Wx = 0.313 | 50 | 01010000 | 80 |
| 22 | White Y Wy = 0.329 | 54 | 01010100 | 84 |
| 23 | Established timings 1 (00h if not used) | 00 | 00000000 | 0 |
| 24 | Established timings 2 (00h if not used) | 00 | 00000000 | 0 |

| | | | | |
|----|--|----|----------|-----|
| 25 | Manufacturer's timings (00h if not used) | 00 | 00000000 | 0 |
| 26 | Standard timing ID1 (01h if not used) | 01 | 00000001 | 1 |
| 27 | Standard timing ID1 (01h if not used) | 01 | 00000001 | 1 |
| 28 | Standard timing ID2 (01h if not used) | 01 | 00000001 | 1 |
| 29 | Standard timing ID2 (01h if not used) | 01 | 00000001 | 1 |
| 2A | Standard timing ID3 (01h if not used) | 01 | 00000001 | 1 |
| 2B | Standard timing ID3 (01h if not used) | 01 | 00000001 | 1 |
| 2C | Standard timing ID4 (01h if not used) | 01 | 00000001 | 1 |
| 2D | Standard timing ID4 (01h if not used) | 01 | 00000001 | 1 |
| 2E | Standard timing ID5 (01h if not used) | 01 | 00000001 | 1 |
| 2F | Standard timing ID5 (01h if not used) | 01 | 00000001 | 1 |
| 30 | Standard timing ID6 (01h if not used) | 01 | 00000001 | 1 |
| 31 | Standard timing ID6 (01h if not used) | 01 | 00000001 | 1 |
| 32 | Standard timing ID7 (01h if not used) | 01 | 00000001 | 1 |
| 33 | Standard timing ID7 (01h if not used) | 01 | 00000001 | 1 |
| 34 | Standard timing ID8 (01h if not used) | 01 | 00000001 | 1 |
| 35 | Standard timing ID8 (01h if not used) | 01 | 00000001 | 1 |
| 36 | Pixel Clock/10,000 (LSB) | 9E | 10011110 | 158 |
| 37 | Pixel Clock/10,000 (MSB) | 25 | 00100101 | 37 |
| 38 | Horizontal Active = 1024 pixels (lower 8 bits) | A0 | 10100000 | 160 |
| 39 | Horizontal Blanking (Thbp) = 320 pixels (lower 8 bits) | 40 | 01000000 | 64 |
| 3A | Horizontal Active/Horizontal blanking (Thbp) (upper 4:4 bits) | 51 | 01010001 | 81 |
| 3B | Vertical Active = 768 lines | 84 | 10000100 | 132 |
| 3C | Vertical Blanking (Tvbp) = 38 lines (DE Blanking typ. for DE only panels) | 0C | 00001100 | 12 |
| 3D | Vertical Active : Vertical Blanking (Tvbp) (upper 4:4 bits) | 30 | 00110000 | 48 |
| 3E | Horizontal Sync, Offset (Thfp) = 26 pixels | 40 | 01000000 | 64 |
| 3F | Horizontal Sync, Pulse Width = 136 pixels | 20 | 00100000 | 32 |
| 40 | Vertical Sync, Offset (Tvfp) = 3 lines Sync Width = 6 lines | 33 | 00110011 | 51 |
| 41 | Horizontal Vertical Sync Offset/Width upper 2 bits | 00 | 00000000 | 0 |
| 42 | Horizontal Image Size = 304 mm | 6F | 01101111 | 111 |
| 43 | Vertical image Size = 228 mm | E6 | 11100110 | 230 |
| 44 | Horizontal Image Size / Vertical image size | 10 | 00010000 | 16 |
| 45 | Horizontal Border = 0 (Zero for Notebook LCD) | 00 | 00000000 | 0 |
| 46 | Vertical Border = 0 (Zero for Notebook LCD) | 00 | 00000000 | 0 |
| 47 | Non-interlaced, Normal, no stereo, Separate sync, H/V pol Negatives, DE only note: LSB is set to "1" if panel is DE-timing only. H/V can be ignored. | 19 | 00011001 | 25 |

| | | | | |
|----|--|----|----------|-----|
| 48 | Pixel Clock/10,000 (LSB) | 5A | 01011010 | 90 |
| 49 | Pixel Clock/10,000 (MSB) | 1F | 00011111 | 31 |
| 4A | Horizontal Active = xxxx pixels (lower 8 bits) | A0 | 10100000 | 160 |
| 4B | Horizontal Blanking (Thbp) = xxxx pixels(lower 8 bits) | 40 | 01000000 | 64 |
| 4C | Horizontal Active/Horizontal blanking (Thbp) (upper4:4 bits) | 51 | 01010001 | 81 |
| 4D | Vertical Active = xxxx lines | 84 | 10000100 | 132 |
| 4E | Vertical Blanking (Tvbp) = xxxx lines (DE Blanking typ. for DE only panels) | 0C | 00001100 | 12 |
| 4F | Vertical Active : Vertical Blanking (Tvbp) (upper4:4 bits) | 30 | 00110000 | 48 |
| 50 | Horizontal Sync, Offset (Thfp) = xxxx pixels | 40 | 01000000 | 64 |
| 51 | Horizontal Sync, Pulse Width = xxxx pixels | 20 | 00100000 | 32 |
| 52 | Vertical Sync, Offset (Tvfp) = xx lines Sync Width = xx lines | 33 | 00110011 | 51 |
| 53 | Horizontal Vertical Sync Offset/Width upper 2 bits | 00 | 00000000 | 0 |
| 54 | Horizontal Image Size =xxx mm | 6F | 01101111 | 111 |
| 55 | Vertical image Size = xxx mm | E6 | 11100110 | 230 |
| 56 | Horizontal Image Size / Vertical image size | 10 | 00010000 | 16 |
| 57 | Horizontal Border = 0 (Zero for Notebook LCD) | 00 | 00000000 | 0 |
| 58 | Vertical Border = 0 (Zero for Notebook LCD) | 00 | 00000000 | 0 |
| 59 | Module "A" Revision = Example: 00, 01, 02, 03, etc. | 00 | 00000000 | 0 |
| 5A | Flag | 00 | 00000000 | 0 |
| 5B | Flag | 00 | 00000000 | 0 |
| 5C | Flag | 00 | 00000000 | 0 |
| 5D | Dummy Descriptor | FE | 11111110 | 254 |
| 5E | Flag | 00 | 00000000 | 0 |
| 5F | Dell P/N 1st Character | 55 | 01010101 | 85 |
| 60 | Dell P/N 2nd Character | 4D | 01001101 | 77 |
| 61 | Dell P/N 3rd Character | 36 | 00110110 | 54 |
| 62 | Dell P/N 4th Character | 30 | 00110000 | 48 |
| 63 | Dell P/N 5th Character | 33 | 00110011 | 51 |
| 64 | LCD Supplier EEDID Revision # | 00 | 00000000 | 0 |
| 65 | Manufacturer P/N | 42 | 01000010 | 66 |
| 66 | Manufacturer P/N | 31 | 00110001 | 49 |
| 67 | Manufacturer P/N | 37 | 00110111 | 55 |
| 68 | Manufacturer P/N | 30 | 00110000 | 48 |
| 69 | Manufacturer P/N | 50 | 01010000 | 80 |
| 6A | Manufacturer P/N | 57 | 01010111 | 87 |
| 6B | Manufacturer P/N (If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h) | 33 | 00110011 | 51 |
| 6C | Flag | 00 | 00000000 | 0 |
| 6D | Flag | 00 | 00000000 | 0 |

| | | | | |
|----|---|----|----------|-----|
| 6E | Flag | 00 | 00000000 | 0 |
| 6F | Data Type Tag: | FE | 11111110 | 254 |
| 70 | Flag | 00 | 00000000 | 0 |
| 71 | SMBUS Value = 10 nits | 2B | 00101011 | 43 |
| 72 | SMBUS Value = 17 nits | 3D | 00111101 | 61 |
| 73 | SMBUS Value = 24 nits | 4A | 01001010 | 74 |
| 74 | SMBUS Value = 30 nits | 54 | 01010100 | 84 |
| 75 | SMBUS Value = 60 nits | 76 | 01110110 | 118 |
| 76 | SMBUS Value = 100 nits | 97 | 10010111 | 151 |
| 77 | SMBUS Value = 160 nits | C7 | 11000111 | 199 |
| 78 | SMBUS Value = max nits (Typically = 00h, XXX nits) | FF | 11111111 | 255 |
| 79 | Number of LVDS receiver chips = '01' or '02' | 02 | 00000010 | 2 |
| 7A | BIST Enable: Yes = '01' No = '00' | 01 | 00000001 | 1 |
| 7B | (If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h) | 0A | 00001010 | 10 |
| 7C | (If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h) | 20 | 00100000 | 32 |
| 7D | (If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h) | 20 | 00100000 | 32 |
| 7E | Extension flag (# of optional 128 EDID extension blocks to follow, Typ = 0) | 00 | 00000000 | 0 |
| 7F | Checksum (The 1-byte sum of all 128 bytes in this EDID block shall = 0) | 0B | 00001011 | 11 |