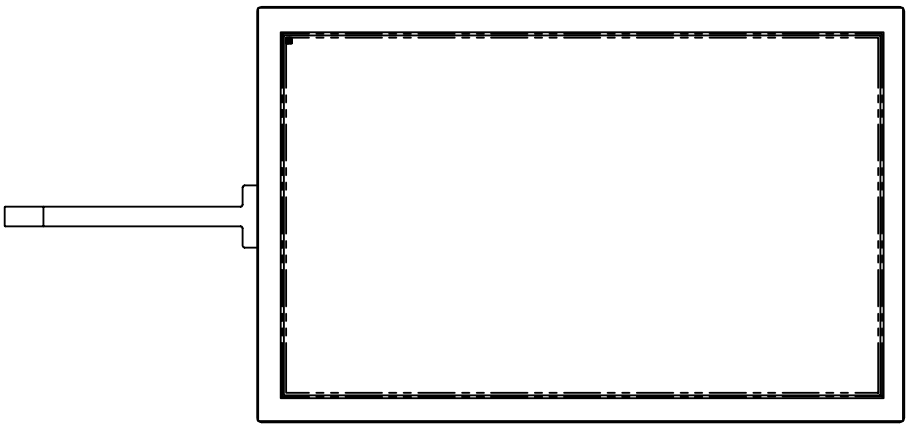
HANTRONIX

# PRODUCT SPECIFICATION

# HDA700L

## ( HIGH BRIGHTNESS VER. - HDA700L-H )

## WVGA (800 x 480 ), TFT COLOR GRAPHICS LCD DISPLAY MODULE



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|---|---|---|---|---|
| HANTRONIX, INC.<br>10080 BUBB RD.<br>CUPERTINO, CA 95014 | Q.A.:<br>ZW | REV.:<br>2.0 | HDA700L | SHEET 1 OF 19<br>DATE: 7/31/08 |

## Application

This specification is applied to the 7 inch WVGA supported TFT-LCD module, and can display true 262,144 colors(6 bit/ color). The module is designed for OA, Car TV application and other electronic products which require flat panel display of digital signal interface. This module is composed of a 7"TFT-LCD panel, a driver circuit and backlight unit.

## Features

- WVGA (800×480 pixels) resolution.
- Digital 18 bit parallel RGB.
- Dot inversion mode with stripe type.

## General Specifications

| Item | Specifications | Unit |
|---|---|---|
| Screen Size | 7 (Diagonal) | inch |
| Display Format | 800RGB(H)×480(V) | dot |
| Active Area | 152.4(H)×91.44(V) | mm |
| Dot Size | 0.0635(H)×0.1905(V) | mm |
| Pixel Configuration | RGB Vertical Stripe | - |
| Display Mode | TN Type<br>Transmissive Mode<br>Normally White | - |
| Surface Treatment | Anti-Glare | - |
| Viewing Direction | 6 O'clock<br>(The Gray Inversion will appear at this direction) | - |
| Outline Dimension | 166.6(W)×107.0(H)×10.0(D) | mm |
| Weight | (161) | g |

# 7. Absolute Maximum Ratings

## 7.1 Absolute Ratings of Environment

| Item | Symbol | Value | | Unit | Note |
|---|---|---|---|---|---|
| | | Min. | Max. | | |
| Storage Temperature | $T_{ST}$ | -30 | +80 | °C | (1) |
| Operating Ambient Temperature | $T_{OP}$ | -20 | +70 | °C | (1) |

Note (1) Temperature and relative humidity range are shown in the figure below.

(a) 85%RH Max. (Ta≦40°C).

(b) Wet-bulb temperature should be 39°C Max. (Ta>40°C).

(c) No condensation.

## 7.2 Electrical Absolute Ratings

### 7.2.1 TFT-LCD Module

(Ta=25±2°C, GND=VSS=0V)

| Item | Symbol | Value | | Unit | Note |
|---|---|---|---|---|---|
| | | Min. | Max. | | |
| Digital Power Supply Voltage | VCC | -0.3 | 4.3 | V | - |

### 7.2.2 Backlight Unit

(Ta=25±2°C)

| Item | Symbol | Value | | Unit | Note |
|---|---|---|---|---|---|
| | | Min. | Max. | | |
| Current of Backlight Unit | $I_B$ | - | 250 | mA | (1) |
| Voltage of Backlight Unit | $V_B$ | - | 15 | V | (1) |

Note (1) Permanent damage to the device may occur if maximum values are exceeded or reverse voltage is loaded.

## Electrical Characteristics
## TFT-LCD Module

(Ta=25±2°C)

| Item | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Power Supply Voltage | VCC | 3.0 | 3.3 | 3.6 | V | - |
| Power Supply Current | ICC | - | 450 | 585 | mA | (1) |
| Input High Threshold Voltage | VIH | 0.7VCC | - | VCC | V | - |
| Input Low Threshold Voltage | VIL | 0 | - | 0.3VCC | V | - |
| Power Consumption | $P_L$ | - | 1.485 | 1.931 | W | (1) |
| VSYNC Frequency | $F_V$ | - | 60 | 75 | Hz | - |
| HSYNC Frequency | Fh | - | 31.6 | 39.2 | KHz | |
| DCLK Frequency | DCLK | - | 33.3 | 40 | MHz | - |

Note (1) The specified power consumption is under the conditions at VCC=3.3V, $F_V$=60Hz, whereas a power dissipation check pattern below is displayed.

Black Pattern / 0 Gray

Active Area

## Backlight Unit

(Ta=25±2°C)

| Item | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Current of Backlight Unit | $I_B$ | - | 200 | - | mA | - |
| Voltage of Backlight Unit | $V_B$ | - | 9.9 | - | V | $I_B$ =200mA |
| Power Consumption | $P_{BL}$ | - | (1.98) | - | W | $I_B$ =200mA |
| LED Life Time(25℃) | | 40000 | - | - | hr | (1) |

Note (1)：LED life time is defined as under 25±2°C , when the average brightness decrease to 50% of original brightness

## Electrical Characteristics (HDA700L-H)
## TFT-LCD Module

(Ta=25±2°C)

| Item | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Power Supply Voltage | VCC | 3.0 | 3.3 | 3.6 | V | - |
| Power Supply Current | ICC | - | 450 | 585 | mA | (1) |
| Input High Threshold Voltage | VIH | 0.7VCC | - | VCC | V | - |
| Input Low Threshold Voltage | VIL | 0 | - | 0.3VCC | V | - |
| Power Consumption | $P_L$ | - | 1.485 | 1.931 | W | (1) |
| VSYNC Frequency | $F_V$ | - | 60 | 75 | Hz | - |
| HSYNC Frequency | Fh | - | 31.6 | 39.2 | KHz | |
| DCLK Frequency | DCLK | - | 33.3 | 40 | MHz | - |

Note (1) The specified power consumption is under the conditions at VCC=3.3V, $F_V$=60Hz, whereas a power dissipation check pattern below is displayed.

Black Pattern / 0 Gray

Active Area

## Backlight Unit

(Ta=25±2°C)

| Item | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Current of Backlight Unit | $I_B$ | - | 200 | - | mA | - |
| Voltage of Backlight Unit | $V_B$ | - | 9.9 | - | V | $I_B$ =200mA |
| Power Consumption | $P_{BL}$ | - | (1.98) | - | W | $I_B$ =200mA |
| LED Life Time(25℃) | | 40000 | - | - | hr | (1) |

Note (1)：LED life time is defined as under 25±2°C , when the average brightness decrease to 50% of original brightness

## 8.3 Transparent Touch panel (HDA700LT)

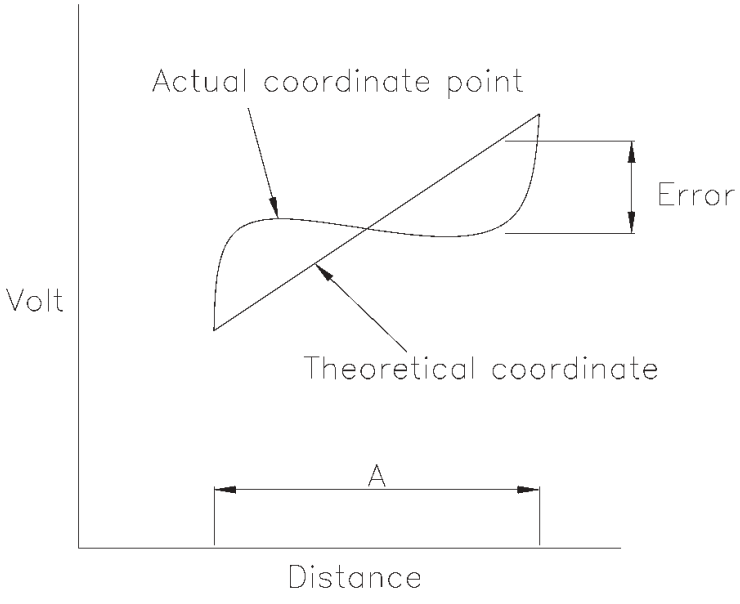
Electrical characteristics

| Item | | Value | | | Unit | Note |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Operating Voltage | | - | 5 | 7 | V | - |
| Terminal Resistance | X-direction | 300 | - | 900 | Ω | At connector |
| | Y-direction | 200 | - | 600 | Ω | At connector |
| Insulation Resistance | | ≧ 10MΩ | | | | At DC25V |
| Chatting | | ≦ 20 ms Max | | | | At connector |
| Linearity | | ≦1.5% | | | | (1) |

Note(1): Measurement condition of Linearity

Difference between actual voltage & Theoretical voltage is an error at any points.

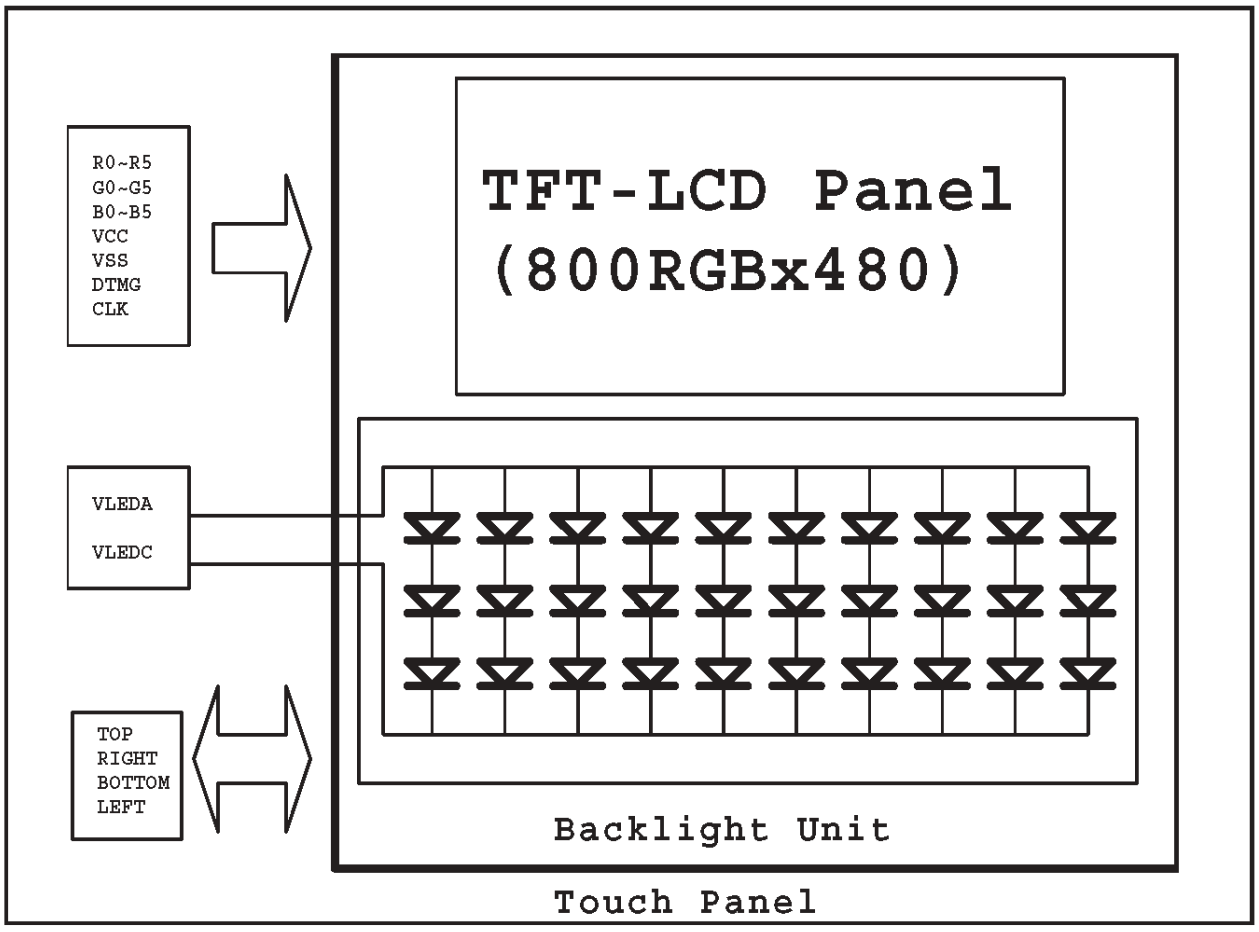
Linearity is the value max. Error voltage divided by voltage difference on active area.




Guaranteed active area

## 9. Block Diagram

### 9.1 TFT-LCD Module with Backlight Unit




TOUCH PANEL OPTIONAL

## Input / Output Terminals Pin Assignment
## TFT-LCD Module

Connector: JAE FA5B040HP1

| Pin No. | Symbol | I/O | Description |
|---|---|---|---|
| 1 | VCC | I | +3.3V power supply |
| 2 | VCC | I | +3.3V power supply |
| 3 | VCC | I | +3.3V power supply |
| 4 | VCC | I | +3.3V power supply |
| 5 | NC | I | No Connect |
| 6 | DTMG | I | Display Timing |
| 7 | VSS | I | Ground |
| 8 | NC | I | No Connect |
| 9 | VSS | I | Ground |
| 10 | NC | I | No Connect |
| 11 | VSS | I | Ground |
| 12 | B5 | I | Blue data(MSB) |
| 13 | B4 | I | Blue data |
| 14 | B3 | I | Blue data |
| 15 | VSS | I | Ground |
| 16 | B2 | I | Blue data |
| 17 | B1 | I | Blue data |
| 18 | B0 | I | Blue data(LSB) |
| 19 | VSS | I | Ground |
| 20 | G5 | I | GREEN data(MSB) |
| 21 | G4 | I | GREEN data |
| 22 | G3 | I | GREEN data |
| 23 | VSS | I | Ground |
| 24 | G2 | I | GREEN data |
| 25 | G1 | I | GREEN data |
| 26 | G0 | I | GREEN data(LSB) |
| 27 | VSS | I | Ground |
| 28 | R5 | I | RED data(MSB) |
| 29 | R4 | I | RED data |
| 30 | R3 | I | RED data |

| Pin No. | Symbol | I/O | Description |
|---|---|---|---|
| 31 | VSS | I | Ground |
| 32 | R2 | I | RED data |
| 33 | R1 | I | RED data |
| 34 | R0 | I | RED data (LSB) |
| 35 | NC | I | No Connect |
| 36 | VSS | I | Ground |
| 37 | VSS | I | Ground |
| 38 | DCLK | | Dot Clock |
| 39 | VSS | I | Ground |
| 40 | VSS | I | Ground |

## 10.2 Backlight Unit

Connector: JST BHSR-02VS-1(N)

| Pin No. | Symbol | I/O | Description | Wire Color |
|---|---|---|---|---|
| 1 | VLEDA | I | Backlight LED Anode. | Red |
| 2 | VLEDC | I | Backlight LED Cathode. | Black |

## 10.3 Transparent Touch Panel ( OPTIONAL - HDA700LT)

Connector: CVILUX CF25041D0R0-10

| Pin No. | Symbol |
|---|---|
| 1 | **RIGHT** |
| 2 | **TOP** |
| 3 | **LEFT** |
| 4 | **BOTTOM** |

## 10.4 Color Data Input Assignment

The brightness of each primary color(red, green and blue) is based on the 6 bit gray scale data input for the color. The higher the binary input, the brighter the color. The table provides the assignment of color versus data input.

| Color | | Data Signal | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Red | | | | | | Green | | | | | | Blue | | | | | |
| | | D05 | D04 | D03 | D02 | D01 | D00 | D15 | D14 | D13 | D12 | D11 | D10 | D25 | D24 | D23 | D22 | D21 | D20 |
| Basic Colors | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Cyan | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Magenta | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Yellow | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 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 |
| Gray Scale Of RED | Red(0) / Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(1) | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(2) | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Red(61) | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(62) | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(63) | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gray Scale Of Green | Green(0) / Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Green(61) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(62) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(63) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gray Scale Of Blue | Blue(0) / Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue(1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | Blue(2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Blue(61) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 |
| | Blue(62) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 |
| | Blue(63) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |

## 11. Interface Timing

### 11.1 Input Signal Characteristics

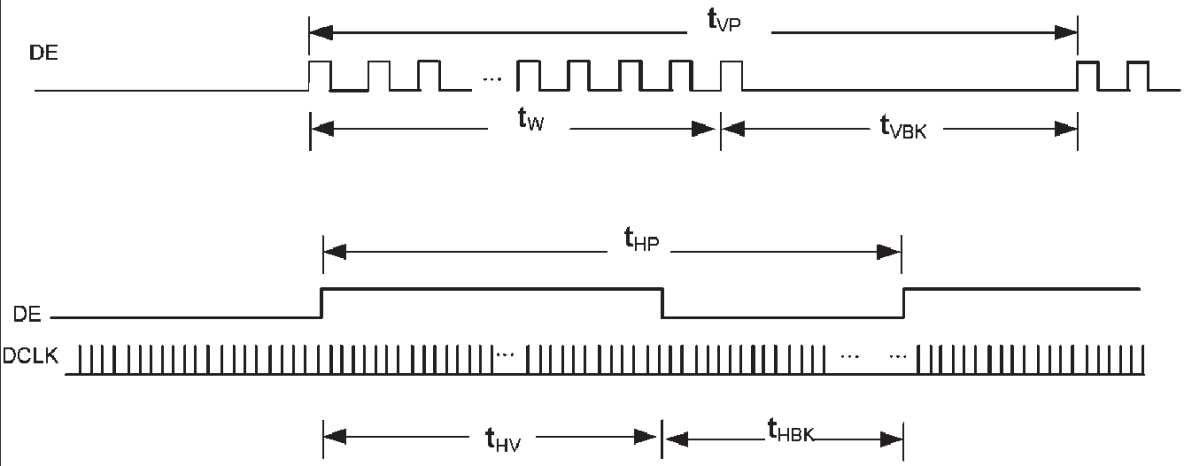
**RESOLUTION :(800x480)**

| Item | | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| DCLK | Period | $t_{CLK}$ | 25.0 | 37.0 | 50.0 | ns |
| | Frequency | $f_{CLK}$ | 20.0 | 27.0 | 40.0 | MHz |
| | Low Level Width | $t_{WCL}$ | 8 | - | - | ns |
| | High Level Width | $t_{WCH}$ | 8 | - | - | ns |
| | Rise, Fall Time | $t_{CLKr}$, $t_{CLKf}$ | - | - | 3 | ns |
| | Duty(1) | - | 0.45 | 0.50 | 0.55 | - |
| DE (Data Enable) | Setup Time | $t_{DES}$ | 5 | - | - | ns |
| | Hold Time | $t_{DEH}$ | 10 | - | - | ns |
| | Rise, Fall Time | $t_{DEr}$, $t_{DEf}$ | - | - | 16 | ns |
| | Horizontal Period | $t_{HP}$ | 832 | 900 | 1054 | $t_{CLK}$ |
| | Horizontal Valid | $t_{HV}$ | 800 | 800 | 800 | $t_{CLK}$ |
| | Horizontal Blank | $t_{HBK}$ | 32 | 100 | 254 | $t_{CLK}$ |
| | Vertical Period | $t_{VP}$ | 481 | 513 | 1023 | $t_{HP}$ |
| | Vertical Valid | $t_{W}$ | 480 | 480 | 480 | $t_{HP}$ |
| | Vertical Blank | $t_{VBK}$ | 1 | 33 | 543 | $t_{HP}$ |
| Data | Setup Time | $t_{DS}$ | 5 | - | - | ns |
| | Hold Time | $t_{DH}$ | 10 | - | - | ns |
| | Rise, Fall Time | $t_{Dr}$,$t_{Df}$ | - | - | 3 | ns |

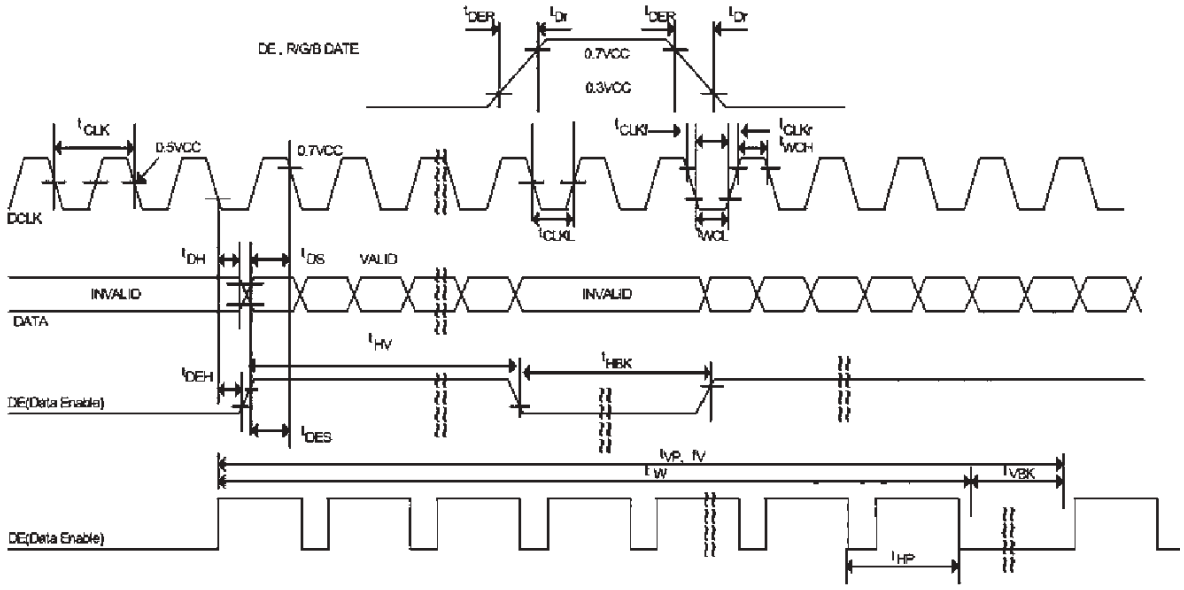
**Note:** (1) $t_{CLKl}$ / $t_{CLK}$.

## 11.2 Waveform

### 11.2.1 De mode input waveforms




### 11.2.2 DE and RGB input data timing waveform

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## Optical Characteristics (HDA700L)

The optical characteristics should be measured in a dark environment (≦ 1 lux) or equivalent state with the methods shown in Note (4).

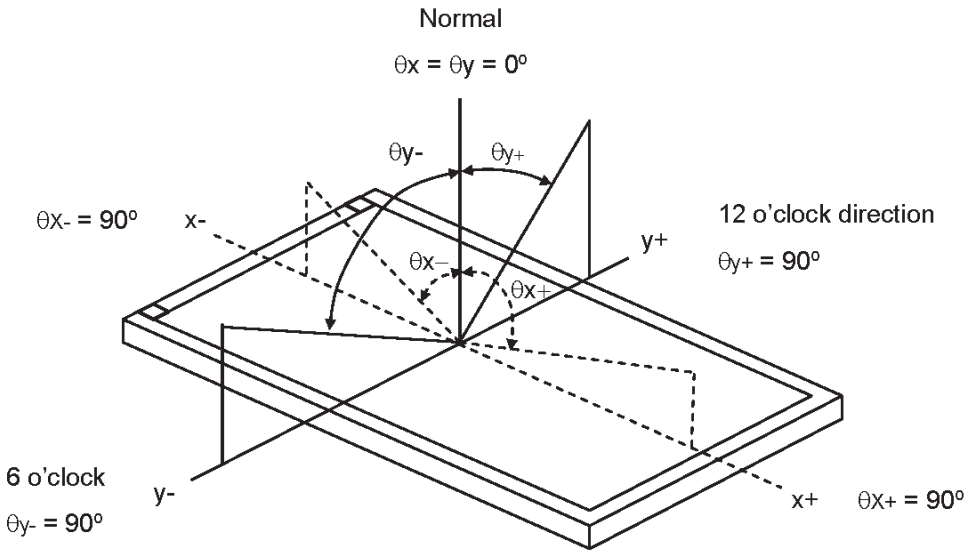
| Item | | Symbol | Conditions | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|---|
| Contrast Ratio | | CR | | 150 | (250) | - | - | (2) |
| Response Time | | $T_R$ | | - | 5 | 10 | ms | (3) |
| | | $T_F$ | | - | 15 | 20 | ms | |
| Luminance(Center) | | Y | | 300 | (350) | - | $cd/m^2$ | (4) |
| Brightness uniformity | | BUNI | | 70 | (75) | - | % | (5) |
| Color Chromaticity | Red | Rx | $\theta_X$=0°, $\theta_Y$ =0° Viewing Normal Angle | (0.527) | (0.577) | (0.627) | - | (1),(4) |
| | | Ry | | (0.311) | (0.361) | (0.411) | - | |
| | Green | Gx | | (0.270) | (0.320) | (0.370) | - | |
| | | Gy | | (0.504) | (0.554) | (0.604) | - | |
| | Blue | Bx | | (0.092) | (0.142) | (0.192) | - | |
| | | By | | (0.046) | (0.096) | (0.146) | - | |
| | White | Wx | | (0.245) | (0.295) | (0.345) | - | |
| | | Wy | | (0.287) | (0.337) | (0.387) | - | |
| Viewing Angle | Horizontal | $\theta_X$+ | CR≥10 | 55 | (65) | - | deg. | |
| | | $\theta_X$- | | 55 | (65) | - | | |
| | Vertical | $\theta_Y$+ | | 45 | (55) | - | | |
| | | $\theta_Y$- | | 55 | (65) | - | | |

## Optical Characteristics (High Brightness version - HDA700L-H)

The optical characteristics should be measured in a dark environment (≦ 1 lux) or equivalent state with the methods shown in Note (4).

| Item | | Symbol | Conditions | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|---|
| Contrast Ratio | | CR | | 150 | (250) | - | - | (2) |
| Response Time | | $T_R$ | | - | 5 | 10 | ms | (3) |
| | | $T_F$ | | - | 15 | 20 | ms | |
| Luminance(Center) | | Y | | 450 | (500) | - | $cd/m^2$ | (4) |
| Brightness uniformity | | BUNI | | 70 | (75) | - | % | (5) |
| Color Chromaticity | Red | Rx | $\theta_X$=0°, $\theta_Y$ =0° Viewing Normal wAngle | (0.537) | (0.587) | (0.637) | - | (1),(4) |
| | | Ry | | (0.298) | (0.348) | (0.398) | - | |
| | Green | Gx | | (0.285) | (0.335) | (0.385) | - | |
| | | Gy | | (0.492) | (0.542) | (0.592) | - | |
| | Blue | Bx | | (0.090) | (0.140) | (0.190) | - | |
| | | By | | (0.078) | (0.128) | (0.178) | - | |
| | White | Wx | | (0.274) | (0.324) | (0.374) | - | |
| | | Wy | | (0.218) | (0.368) | (0.418) | - | |
| Viewing Angle | Horizontal | $\theta_X$+ | CR≥10 | 55 | (65) | - | deg. | |
| | | $\theta_X$- | | 55 | (65) | - | | |
| | Vertical | $\theta_Y$+ | | 45 | (55) | - | | |
| | | $\theta_Y$- | | 55 | (65) | - | | |

Note (1) Definition of Viewing Angle (θx, θy):




Note (2) Definition of Contrast Ratio (CR):

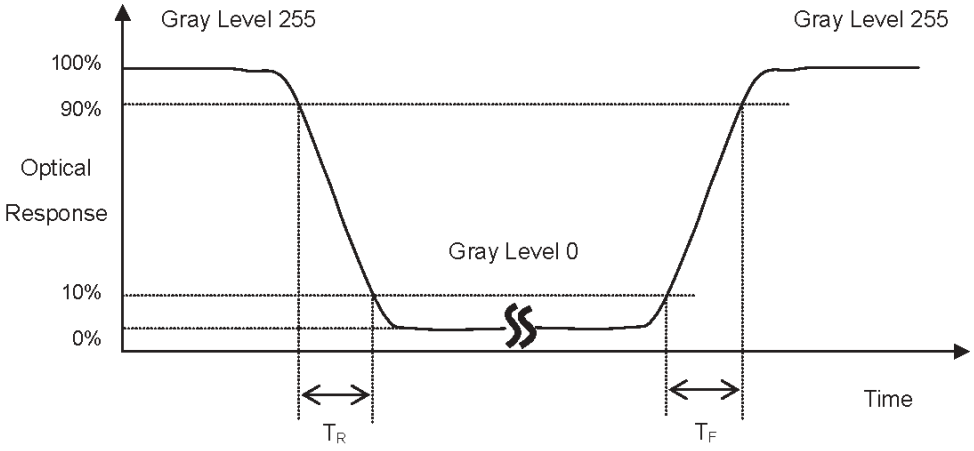
Measured at the center point of panel

Contrast Ratio (CR) = L255 / L0

L255: Luminance of gray level 255

L 0: Luminance of gray level 0.

Note (3) Definition of Response Time ($T_R$, $T_F$):

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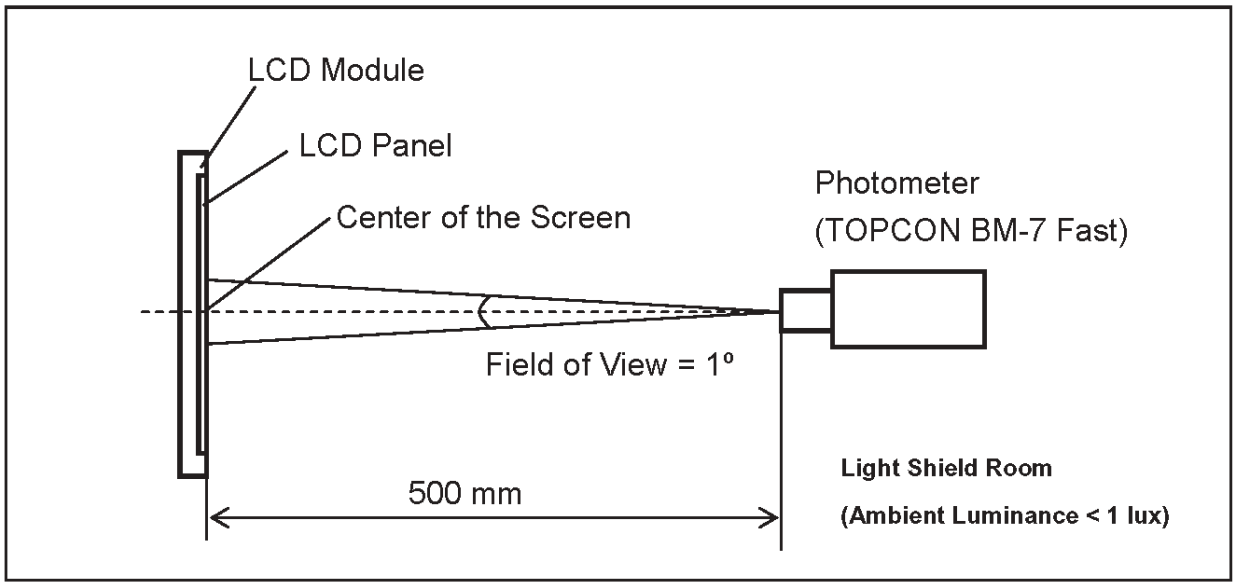
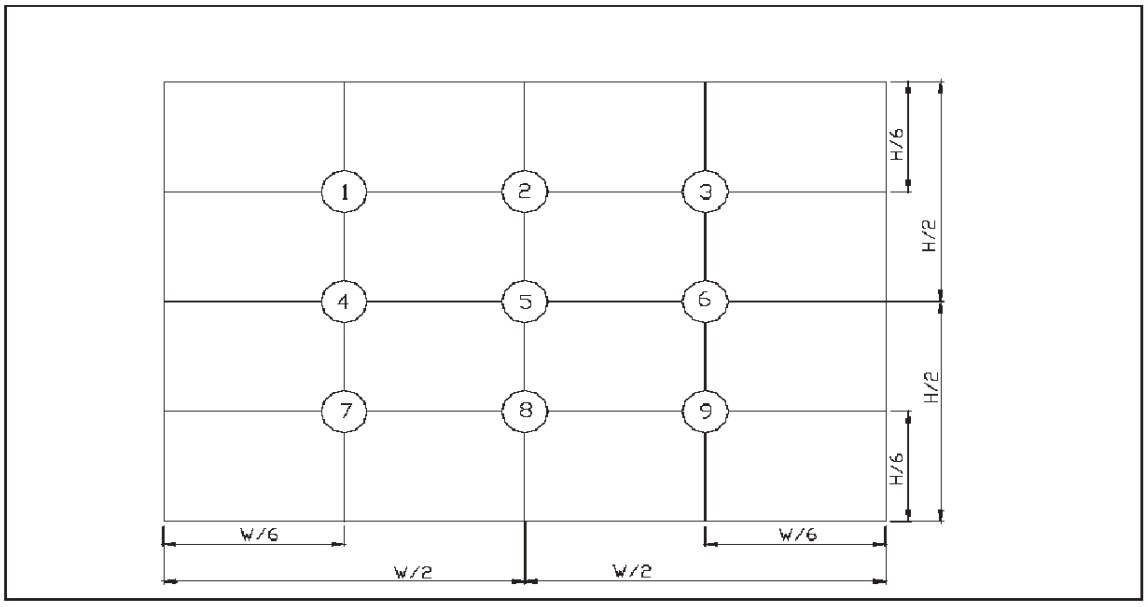
Note (4) Measurement Set-Up:

The LCD module should be stabilized at a 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 windless room.




Note (5) Definition of brightness uniformity

Brightness uniformity=(Min Luminance of 9 points)/(Max Luminance of 9 points)×100%

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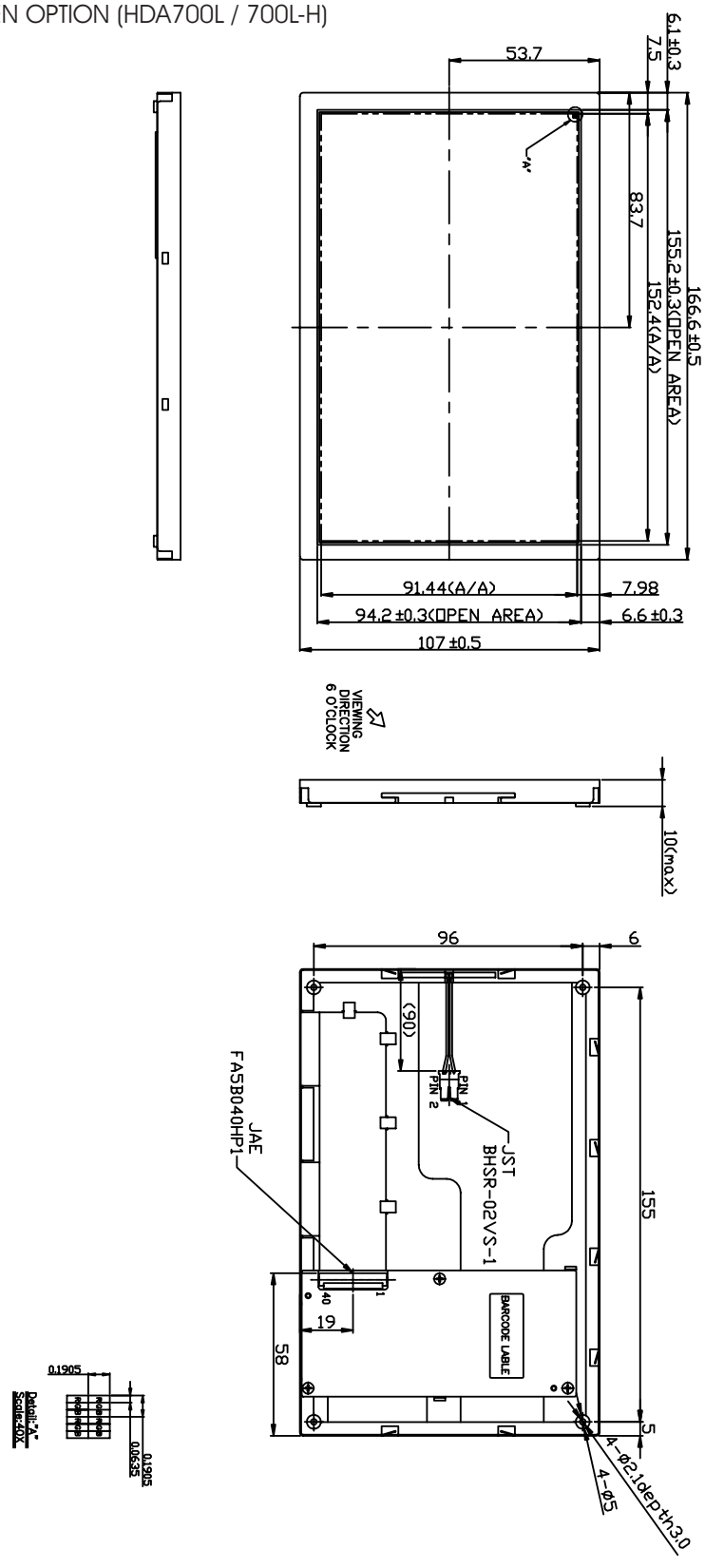
## 13. Reliability Test

| No. | Test Items | Test Condition | Remark |
|---|---|---|---|
| 1 | High Temperature Storage Test | $T_a$= 80℃ 240 hours | - |
| 2 | Low Temperature Storage Test | $T_a$= -30℃ 240 hours | - |
| 3 | High Temperature Operation Test | $T_a$= 70℃ 240 hours | - |
| 4 | Low Temperature Operation Test | $T_a$= -20℃ 240 hours | - |
| 5 | High Temperature and High Humidity Operation Test | $T_a$=60℃ 90%RH 240 hours | - |
| 6 | Electro Static Discharge Test (non-operating) | -Panel Surface/Top Case<br>: 150pF, 330Ω<br>Air: ±15kV, Contact: ±8kV | - |
| 7 | Mechanical Shock Test (non-operating) | Half sine wave,<br>80G, 11ms<br>3 times shock of each six surfaces | - |
| 8 | Vibration Test (non-operating) | Sine wave, 10 ~ 55 ~ 10Hz,<br>3 axis, 2 hours/axis | - |
| 9 | Thermal Shock Test | -20℃(1h) ~ 70℃, 200 cycles,<br>30min 30min | - |
| 10 | Drop Test(with Carton) | Height: 80cm<br>1 corner, 3 edges, 6 surfaces | - |

NO TOUCH SCREEN OPTION (HDA700L / 700L-H)

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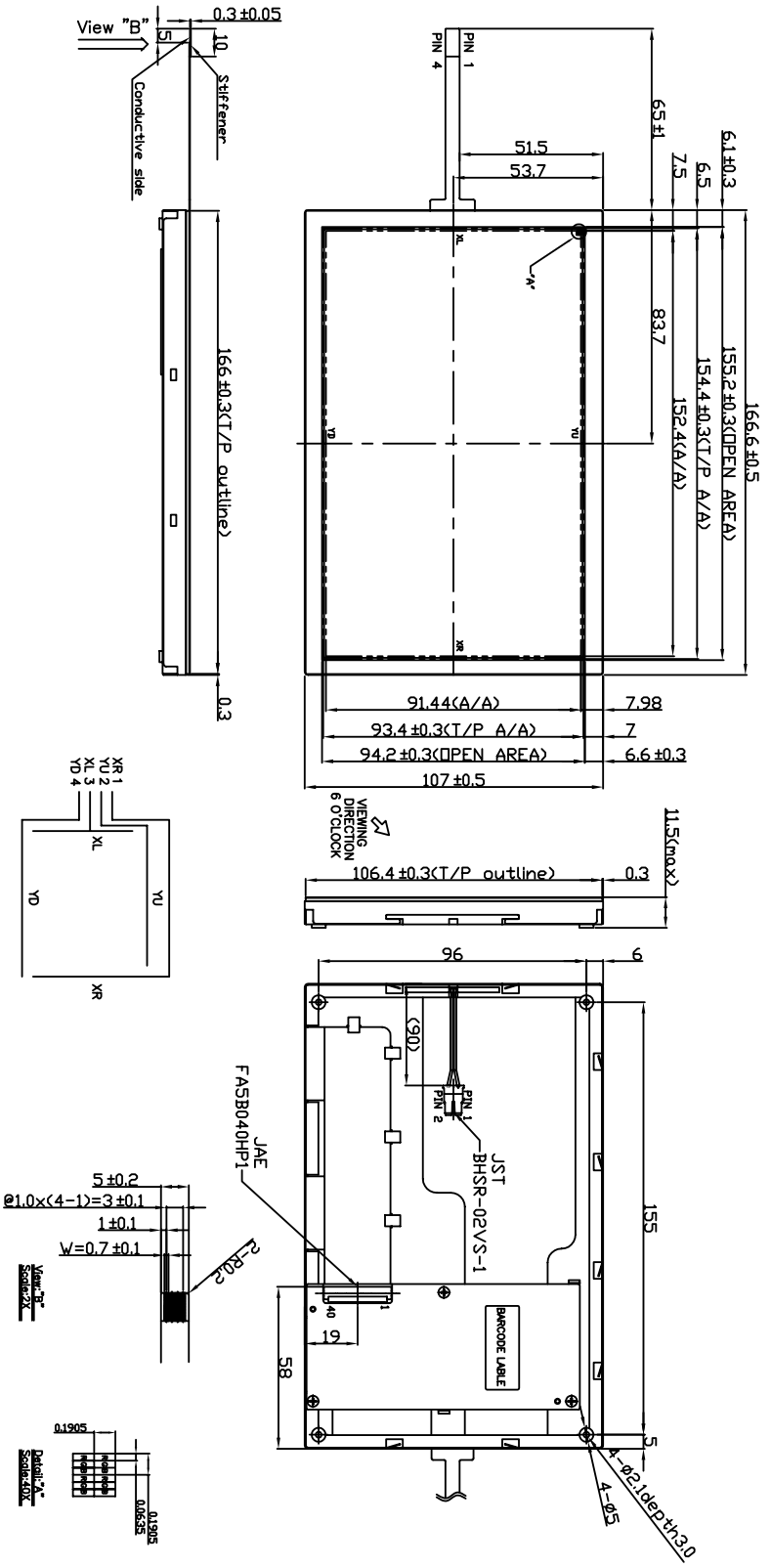
| HANTRONIX, INC.<br>10080 BUBB RD.<br>CUPERTINO, CA 95014 | Q.A.:<br>Z.W. | REV.:<br>2.0 | HDA700L | SHEET 18 OF 19<br>DATE: 7/31/08 |

TOUCH SCREEN OPTION - HDA700LT

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| HANTRONIX, INC.<br>10080 BUBB RD.<br>CUPERTINO, CA 95014 | Q.A.:<br>Z.W. | REV.:<br>2.0 | HDA700L | SHEET 19 OF 19<br>DATE: 7/31/08 |