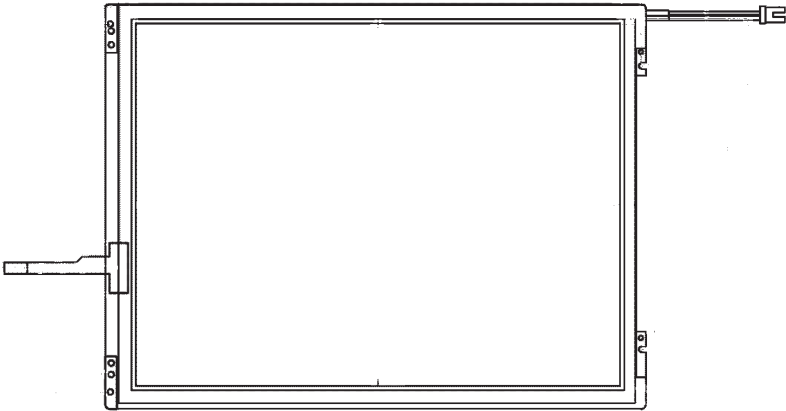




PRODUCT SPECIFICATION

**HDA1040ST-AH**

10.4", TFT SVGA (800 X 600) COLOR  
LCD DISPLAY MODULE



|                                                          |       |       |              |                   |
|----------------------------------------------------------|-------|-------|--------------|-------------------|
| HANTRONIX, INC.<br>10080 BUBB RD.<br>CUPERTINO, CA 95014 | Q.A.: | REV.: | HDA1040ST-AH | SHEET 1 OF 16     |
|                                                          | Z.W.  | 1.0   |              | DATE:<br>10/14/11 |

## 1. Overview

HDA1040ST-AH Display Module is a color active matrix a-Si TFT-LCM that uses amorphous silicon TFT as a switching device. This model is composed of a TFT-LCD panel , a driving circuit and 4-wire resistance touch Panel. This touch TFT LCD module has a high resolution (800 x (R.G.B) X 600) and can display up to 262,144 colors. Because it has built-in power supply circuit, the LCD power supply voltage is only 3.3V. The most important thing is that this touch module with high brightness LED backlight. **The brightness is reach 800 cd/m<sup>2</sup> with the touch panel.**

General specifications are summarized in the following table:

| Item                 | Specifications                     | unit              |
|----------------------|------------------------------------|-------------------|
| Panel Size           | 10.4 (panel Diagonal)              | inch              |
| Display Area         | 211.2 (W) x 158.4(H)               | mm                |
| Number of Pixels     | 800(H) x 3(RGB) x 600(V)           | -                 |
| Pixel pitch          | 88 (W) x 264 (H)                   | um                |
| Overall dimension    | 236.0(W)x176.9(H)x7(D)             | mm                |
| Color configuration  | R.GB -stripe                       | -                 |
| Display Mode         | Normally white                     | mm                |
| Number of colors     | 262,144                            | colors            |
| Brightness           | <b>800</b>                         | cd/m <sup>2</sup> |
| Backlight Unit       | LED                                |                   |
| Electrical Interface | LVDS 6 bits (data)                 |                   |
| Weight               | 300                                | g                 |
| Touch Panel          | With 4-wire Resistance Touch Panel |                   |
| Surface Treatment    | Anti-Glare 3H                      |                   |

## 2. ABSOLUTE MAXIMUM RATINGS

| Item                          | Symbol          | Min. | Max. | Unit | Note |
|-------------------------------|-----------------|------|------|------|------|
| Supply voltage range          | VDD             | -0.5 | 5    | V    |      |
| Voltage range at any terminal | V <sub>IN</sub> | -0.5 | 5    | V    | (1)  |
| Operating Temperature         | Top             | -20  | 70   | °C   |      |
| Storage Temperature           | Tstg            | -30  | 80   | °C   |      |

Note

(1): V<sub>IN</sub> represents IN0±, IN1±, IN2±, CLK±

## 3. OPTICAL CHARACTERISTICS

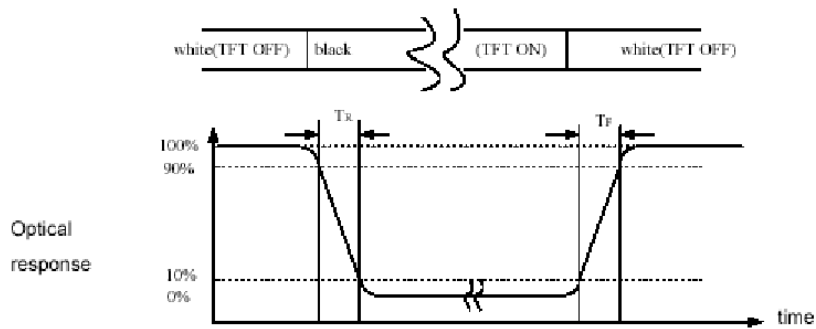
| Item                 | Symbol                         | Condition                 | Min.  | Typ.  | Max.  | Unit              | Note   |
|----------------------|--------------------------------|---------------------------|-------|-------|-------|-------------------|--------|
| Response Time        | T <sub>r</sub> +T <sub>f</sub> | $\Theta = \Phi = 0^\circ$ | -     | 25    | 40    | ms                | (1)    |
| Contrast ratio       | CR                             |                           | --    | 400   | -     | -                 | (2)(3) |
| Viewing Angle        | $\Theta T$                     | CR ≥ 10                   | 35    | 45    | -     | degree            | (5)    |
|                      | $\Theta B$                     |                           | 55    | 65    | -     |                   |        |
|                      | $\Theta L$                     |                           | 55    | 65    | -     |                   |        |
|                      | $\Theta R$                     |                           | 55    | 65    | -     |                   |        |
| Luminance            | L                              |                           | 720   | 800   | -     | cd/m <sup>2</sup> | (3)(4) |
| Luminance Uniformity | ΔL                             |                           | 70    | 80    | -     | %                 | (3)(4) |
| Color chromaticity   | Red                            | R <sub>x</sub>            | 0.550 | 0.600 | 0.650 | -                 |        |
|                      |                                | R <sub>y</sub>            | 0.296 | 0.346 | 0.396 | -                 |        |
|                      | Green                          | G <sub>x</sub>            | 0.283 | 0.333 | 0.383 | -                 |        |
|                      |                                | G <sub>y</sub>            | 0.516 | 0.566 | 0.616 | -                 |        |
|                      | Blue                           | B <sub>x</sub>            | 0.092 | 0.142 | 0.192 | -                 |        |
|                      |                                | B <sub>y</sub>            | 0.065 | 0.115 | 0.165 | -                 |        |
|                      | White                          | W <sub>x</sub>            | 0.259 | 0.309 | 0.359 | -                 |        |
|                      |                                | W <sub>y</sub>            | 0.284 | 0.334 | 0.384 | -                 |        |

NOTE :

- These items are measured by BM-5A(TOPCON) or CA-1000(MINOLTA) in the dark room (no ambient light)

|                                                          |       |       |              |                   |
|----------------------------------------------------------|-------|-------|--------------|-------------------|
| HANTRONIX, INC.<br>10080 BUBB RD.<br>CUPERTINO, CA 95014 | Q.A.: | REV.: | HDA1040ST-AH | SHEET 3 OF 16     |
|                                                          | Z.W.  | 1.0   |              | DATE:<br>10/14/11 |

(1) Definition of Response Time (White-Black)



(2) Definition of Contrast Ratio

Measure contrast ratio on the below 5 points (refer to figure, #1~#5 point) and take the average value

Contrast ratio is calculated with the following formula :

$$\text{Contrast Ratio (CR)} = (\text{White})\text{Luminance of ON} \div (\text{Black})\text{Luminance of OFF}$$

(3) Definition of Luminance :

Measure the luminance of white state at **center point**.

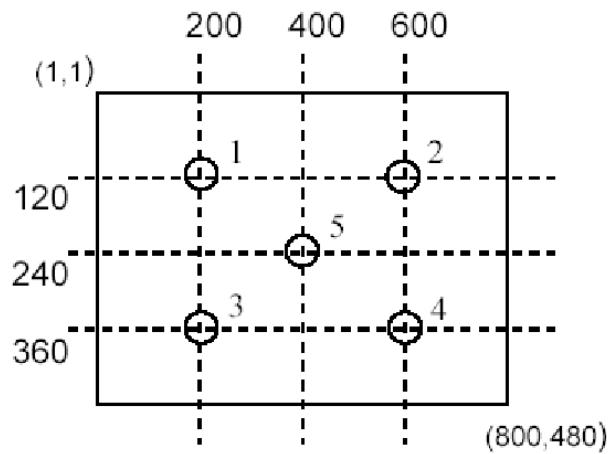


Fig.1 Measuring point

|                                                          |       |       |              |                   |
|----------------------------------------------------------|-------|-------|--------------|-------------------|
| HANTRONIX, INC.<br>10080 BUBB RD.<br>CUPERTINO, CA 95014 | Q.A.: | REV.: | HDA1040ST-AH | SHEET 4 OF 16     |
|                                                          | Z.W.  | 1.0   |              | DATE:<br>10/14/11 |

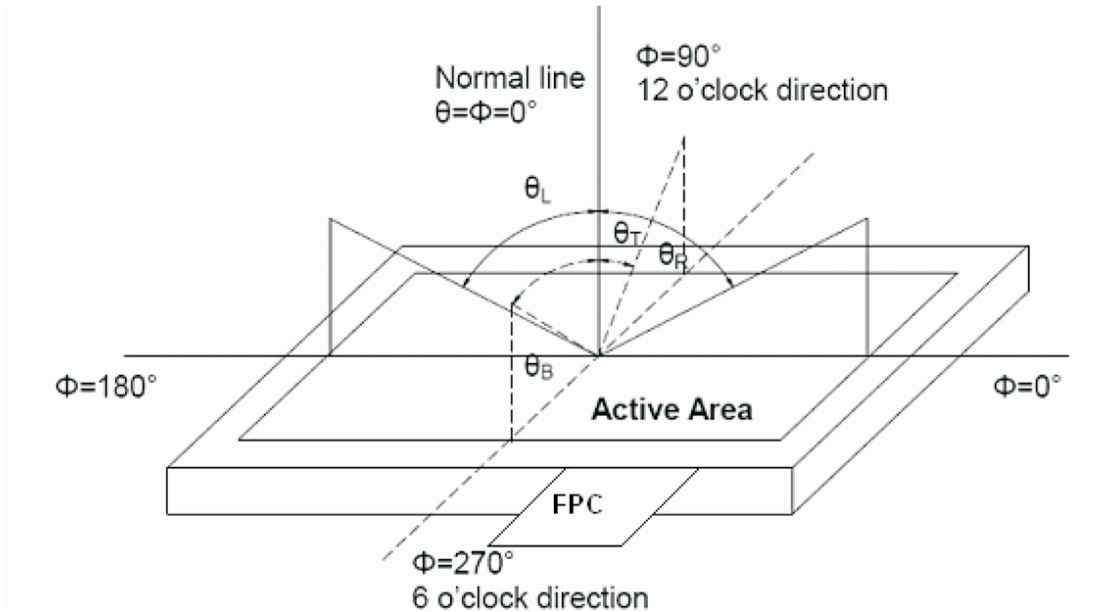
(4) Definition of Luminance Uniformity :

Measured Maximum luminance[L(MAX)] and Minimum luminance[L(MIN)] on the 5 points

Luminance Uniformity is calculated with the following formula :

$$? L = [ L(MIN) / L (MAX) ] \times 100\%$$

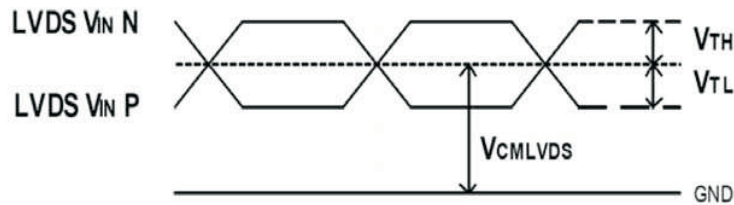
(5) Definition of Viewing Angle



|                                                          |       |       |              |                   |
|----------------------------------------------------------|-------|-------|--------------|-------------------|
| HANTRONIX, INC.<br>10080 BUBB RD.<br>CUPERTINO, CA 95014 | Q.A.: | REV.: | HDA1040ST-AH | SHEET 5 OF 16     |
|                                                          | Z.W.  | 1.0   |              | DATE:<br>10/14/11 |

## 4. ELECTRICAL CHARACTERISTICS

| Item                                   | Symbol       | Min.       | Typ. | Max              | Unit    | Remarks           |
|----------------------------------------|--------------|------------|------|------------------|---------|-------------------|
| LVDS Differential input high threshold | $V_{TH}$     | -          | -    | 100              | mV      | $V_{CMLVDS}=1.2V$ |
| Threshold LVDS Differential input low  | $V_{TL}$     | -100       | -    | -                | mV      |                   |
| Differential input voltage             | $V_{ID}$     | 0.1        | -    | 0.6              | V       |                   |
| LVDS input common mode Voltage         | $V_{CMLVDS}$ | $V_{ID}/2$ | -    | $1.4-(V_{ID}/2)$ | V       |                   |
| Input current                          | $I_{IN}$     | -10        | -    | 10               | $\mu A$ |                   |
| Supply Voltage                         | VDD          | 3.0        | 3.3  | 3.6              | V       |                   |
| Common Electrode Driving Signal        | VCOM         | -          | 4.36 | -                | V       | Note (1)          |
| Sync Frequency                         | FVD          | -          | 60   | 70               | H       |                   |
| VDD Power Consumption                  | $I_{DD}$     | -          | 260  | 380              | mA      | Note (2)          |



LVDS DC timing diagram

Note (1) : The value may be different for different LCM.

Note (2) : To test the current dissipation, using the “color bar” testing pattern shown as below:



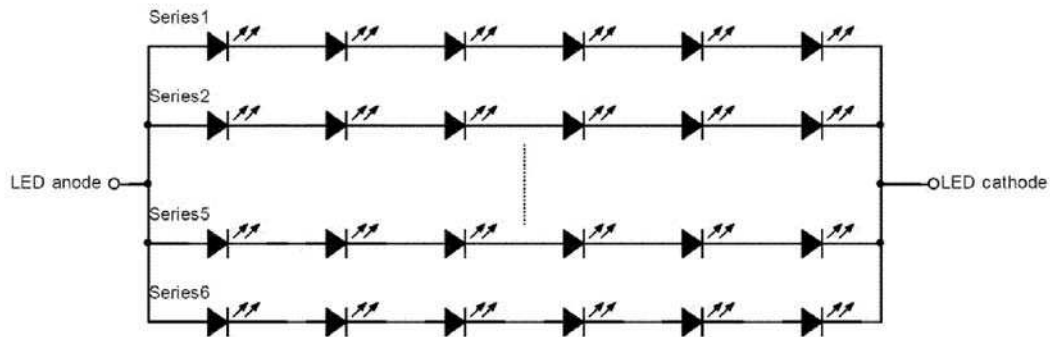
Current dissipation testing pattern

|                                                          |       |       |              |                   |
|----------------------------------------------------------|-------|-------|--------------|-------------------|
| HANTRONIX, INC.<br>10080 BUBB RD.<br>CUPERTINO, CA 95014 | Q.A.: | REV.: | HDA1040ST-AH | SHEET 6 OF 16     |
|                                                          | Z.W.  | 1.0   |              | DATE:<br>10/14/11 |

## 5. Backlight Driving Circuit

| ITEM                        | SYMBOL   | MIN   | TYP   | MAX  | UNIT | NOTE   |
|-----------------------------|----------|-------|-------|------|------|--------|
| Forward Current             | $I_F$    | -     | 280   | -    | mA   | Note 1 |
| Forward Voltage             | $V_F$    | 18.6  | 19.2  | 19.8 | V    | Note 1 |
| Backlight Power Consumption | $W_{BL}$ | -     | 5376  | -    | mW   | Note 1 |
| Operating Life Time         | -        | 40000 | 45000 | -    | hr   | Note 2 |

Note 1: LED connection of backlight shown as below:



Note 2: Optical performance should be evaluated at  $T_a=25^\circ\text{C}$  only.

If LED is driven by high ambient temperature & humidity condition. The life time of LED will be reduced.

Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

## 6. Touch Panel Electrical Specification

| Parameter              | Condition | Standard Value         |
|------------------------|-----------|------------------------|
| Terminal Resistance    | X Axis    | 340 ~ 1090 $\Omega$    |
|                        | Y Axis    | 180 ~ 470 $\Omega$     |
| Insulating Resistance  | DC 25 V   | More than 20M $\Omega$ |
| Linearity              | --        | $\pm 1.5$ %            |
| Pen writing Durability | Note A    | 100,000 times(min)     |
| Input life by finger   | Note B    | 1,000,000 times (min)  |

### Note A .

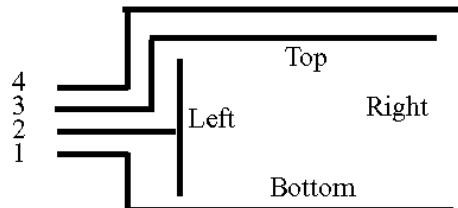
- Writing length 35 mm.
- Writing speed: 300mm/sec.
- Shape of pen end : R0.8
- Load : 250 g

### Note B

- By Silicon rubber tapping at same point
- Shape of rubber end : R8
- Load : 200g
- Frequency : 5 Hz

### Interface

| No. | Symbol | Function                  |
|-----|--------|---------------------------|
| 1   | YB     | Touch Panel Bottom Signal |
| 2   | XL     | Touch Panel Left Signal   |
| 3   | YT     | Touch Panel Top Signal    |
| 4   | XR     | Touch Panel Right Signal  |



|                                                          |       |       |              |                   |
|----------------------------------------------------------|-------|-------|--------------|-------------------|
| HANTRONIX, INC.<br>10080 BUBB RD.<br>CUPERTINO, CA 95014 | Q.A.: | REV.: | HDA1040ST-AH | SHEET 8 OF 16     |
|                                                          | Z.W.  | 1.0   |              | DATE:<br>10/14/11 |



## 7. INTERFACE

LVDS CONNECTOR:

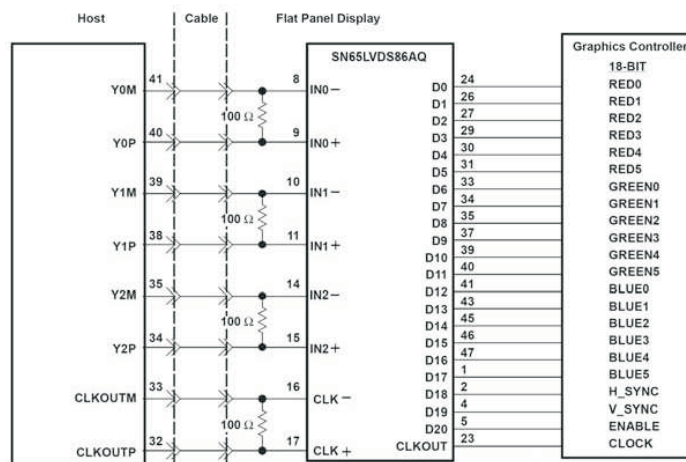
Connector : Starconn 107A20-0021RA-G3-R  
Matching connector : Hirose DF19K-20P-1H (56)

| Pin no | Symbol | Function                      |
|--------|--------|-------------------------------|
| 1      | VDD    | POWER SUPPLY:3.3V             |
| 2      | VDD    | POWER SUPPLY:3.3V             |
| 3      | Gnd    | Power Ground                  |
| 4      | Gnd    | Power Ground                  |
| 5      | IN0-   | Transmission Data of Pixels   |
| 6      | IN0+   | Transmission Data of Pixels   |
| 7      | Gnd    | Power Ground                  |
| 8      | IN1-   | Transmission Data of Pixels 1 |
| 9      | IN1+   | Transmission Data of Pixels 1 |
| 10     | Gnd    | Power Ground                  |
| 11     | IN2-   | Transmission Data of Pixels 2 |
| 12     | IN2+   | Transmission Data of Pixels 2 |
| 13     | Gnd    | Power Ground                  |
| 14     | CLK-   | Sampling Clock                |
| 15     | CLK+   | Sampling Clock                |
| 16     | Gnd    | Power Ground                  |
| 17     | NC     | No Connect                    |
| 18     | NC     | No Connect                    |
| 19     | Gnd    | Power Ground                  |
| 20     | Gnd    | Power Ground                  |

Back Light Connector:

Connector : JST BHSR-02VS-1

| Pin No | Symbol | Function                          | Wire Color |
|--------|--------|-----------------------------------|------------|
| 1      | LEDA   | LED driving anode (high voltage)  | Red        |
| 2      | LEDK   | LED driving cathode (low voltage) | White      |



HANTRONIX, INC.  
10080 BUBB RD.  
CUPERTINO, CA 95014

Q.A.:  
Z.W.

REV.:  
1.0

HDA1040ST-AH

SHEET 9 OF 16

DATE:  
10/14/11

## 8. AC Timing characteristic of the LVDS

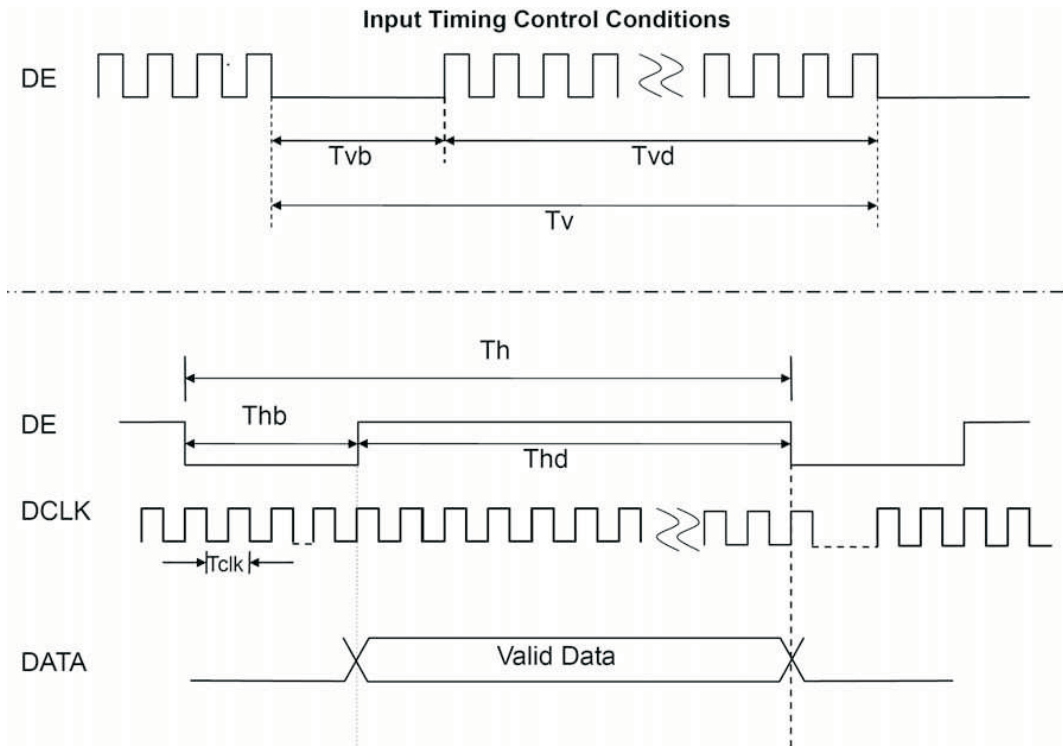
Timing Parameter:

| Item              | Symbol | Min  | Typ   | Max   | Unit | Condition |
|-------------------|--------|------|-------|-------|------|-----------|
| Clock period      | tLVCP  | 20.0 | 25    | 31.25 | ns   |           |
| Clock high time   | tLVCH  |      | 14.29 |       | ns   |           |
| Clock low time    | tLVCL  |      | 10.71 |       | ns   |           |
| PLL wake-up time  | tLVPLL |      |       |       | ns   |           |
| Input skew margin | tLVSKM | 400  |       |       | ps   | f=85MHz   |

### Recommended Input Timing of LVDS transmitter

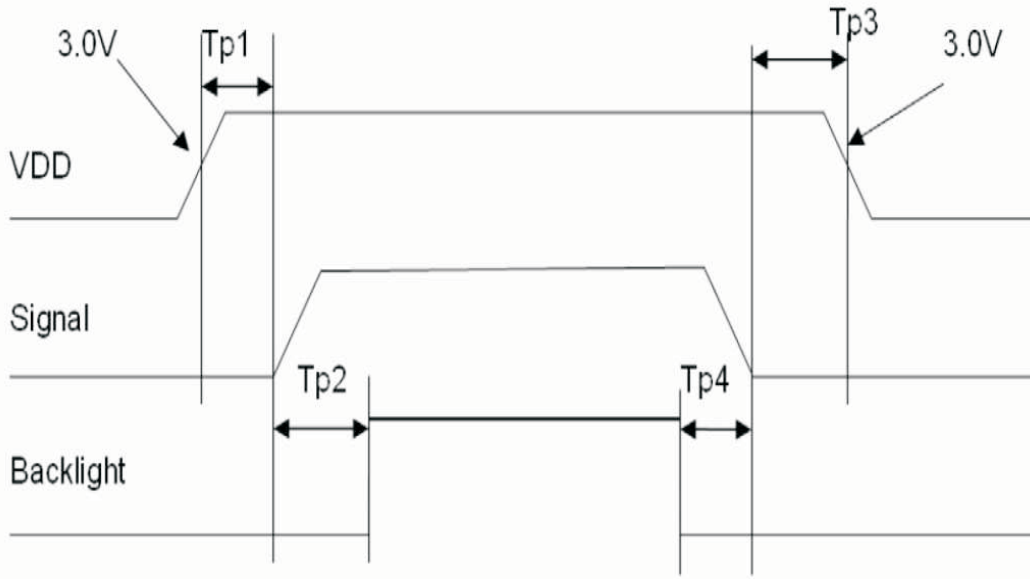
| Parameter          |                     | Symbol | Min. | Typ. | Max. | Unit |
|--------------------|---------------------|--------|------|------|------|------|
| Dclk frequency     |                     | 1/Tclk | 32   | 40   | 50   | MHz  |
| Horizontal Section | Horizontal total    | Th     | 866  | 1056 | 1064 | Tclk |
|                    | Horizontal blanking | Thb    | 66   | 256  | 264  | Tclk |
|                    | Valid Data Width    | Thd    | 800  | 800  | 800  | Tclk |
| Vertical Section   | Frame rate          | -      | -    | 60   | 70   | Hz   |
|                    | Vertical total      | Tv     | 604  | 628  | 800  | Th   |
|                    | Vertical blanking   | Tvb    | 4    | 28   | 200  | Th   |
|                    | Valid Data Width    | Tvd    | 600  | 600  | 600  | Th   |

Note : DE signal is necessary.



**Power On/Off Sequence**

| Item                            | Symbol | Min. | Typ. | Max. | Unit |
|---------------------------------|--------|------|------|------|------|
| VDD 3.0V to signal starting     | Tp1    | 0    | -    | 50   | ms   |
| Signal starting to backlight on | Tp2    | 150  | -    | -    | ms   |
| Signal off to VDD 3.0V          | Tp3    | 0    | -    | 50   | ms   |
| Backlight off to signal off     | Tp4    | 150  | -    | -    | ms   |



## 9 . QUALITY AND RELIABILITY

### 9.1 TEST CONDITIONS

Tests should be conducted under the following conditions : Ambient temperature :  $25 \pm 5^{\circ}\text{C}$   
Humidity :  $60 \pm 25\% \text{ RH}$ .

### 9.2 SAMPLING PLAN

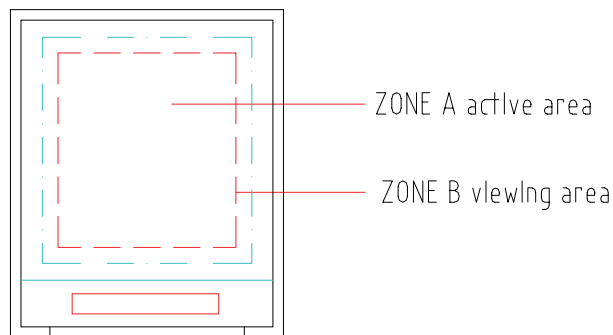
Sampling method shall be in accordance with MIL-STD-105E , level II, normal single sampling plan .

### 9.3 ACCEPTABLE QUALITY LEVEL

A major defect is defined as one that could cause failure to or materially reduce the usability of the unit for its intended purpose. A minor defect is one that does not materially reduce the usability of the unit for its intended purpose or is an infringement from established standards and has no significant bearing on its effective use or operation.

### 9.4 APPEARANCE

An appearance test should be conducted by human sight at approximately 30 cm distance from the LCD module under florescent light. The inspection area of LCD panel shall be within the range of following limits.



|                                                          |       |       |              |                   |
|----------------------------------------------------------|-------|-------|--------------|-------------------|
| HANTRONIX, INC.<br>10080 BUBB RD.<br>CUPERTINO, CA 95014 | Q.A.: | REV.: | HDA1040ST-AH | SHEET 13 OF 16    |
|                                                          | Z.W.  | 1.0   |              | DATE:<br>10/14/11 |

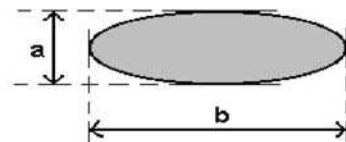
## 9.5 INCOMING INSPECTION STANDARD FOR TFT-LCD PANEL

| DEFECT TYPE       |                                                      |                  | LIMIT                                                    |                    |                    | Note               |                    |       |
|-------------------|------------------------------------------------------|------------------|----------------------------------------------------------|--------------------|--------------------|--------------------|--------------------|-------|
| VISUAL DEFECT     | INTERNAL                                             | SPOT             | $\phi < 0.15\text{mm}$                                   |                    | Ignore             | Note1              |                    |       |
|                   |                                                      |                  | $0.15\text{mm} \leq \phi \leq 0.5\text{mm}$              |                    | $N \leq 4$         |                    |                    |       |
|                   |                                                      |                  | $0.5\text{mm} < \phi$                                    |                    | $N=0$              |                    |                    |       |
|                   |                                                      | FIBER            | $0.03\text{mm} < W \leq 0.1\text{mm}, L \leq 5\text{mm}$ |                    | $N \leq 3$         | Note1              |                    |       |
|                   |                                                      |                  | $1.0\text{mm} < W, 1.5\text{mm} < L$                     |                    | $N=0$              |                    |                    |       |
|                   |                                                      | POLARIZER BUBBLE | $\phi < 0.15\text{mm}$                                   |                    | Ignore             | Note1              |                    |       |
|                   |                                                      |                  | $0.15\text{mm} \leq \phi \leq 0.5\text{mm}$              |                    | $N \leq 2$         |                    |                    |       |
|                   |                                                      |                  | $0.5\text{mm} < \phi$                                    |                    | $N=0$              |                    |                    |       |
| Mura              | It' OK if mura is slight visible through 6%ND filter |                  |                                                          |                    |                    |                    |                    |       |
| ELECTRICAL DEFECT | BRIGHT DOT                                           | A Grade          |                                                          |                    | B Grade            |                    |                    |       |
|                   |                                                      | C Area           | O Area                                                   | Total              | C Area             | O Area             | Total              | Note3 |
|                   | $N \leq 0$                                           | $N \leq 2$       | $N \leq 2$                                               | $N \leq 2$         | $N \leq 3$         | $N \leq 5$         | Note2              |       |
|                   | DARK DOT                                             | $N \leq 2$       | $N \leq 3$                                               | $N \leq 3$         | $N \leq 3$         | $N \leq 5$         | $N \leq 8$         |       |
|                   | TOTAL DOT                                            | $N \leq 4$       |                                                          |                    | $N \leq 5$         | $N \leq 6$         | $N \leq 8$         | Note2 |
|                   | TWO ADJACENT DOT                                     | $N \leq 0$       | $N \leq 1$<br>pair                                       | $N \leq 1$<br>pair | $N \leq 1$<br>pair | $N \leq 1$<br>pair | $N \leq 1$<br>pair | Note4 |
|                   | THREE OR MORE ADJACENT DOT                           | NOT ALLOWED      |                                                          |                    |                    |                    |                    |       |
| LINE DEFECT       | NOT ALLOWED                                          |                  |                                                          |                    |                    |                    |                    |       |

(1) One pixel consists of 3 sub-pixels, including R,G, and B dot.(Sub-pixel = Dot)

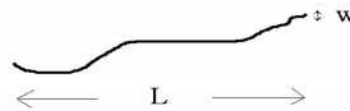
(2) LITTLE BRIGHT DOT ACCEPTABLE UNDER 6 % ND-Filter

[Note1] W : Width[mm], L : Length[mm], N : Number,  $\phi$  : Average Diameter



$$\phi = (a + b) / 2$$

1. (White, black) Spot
2. Polarizer Bubble



1. fiber

[Note2] Bright dot is defined through 6% transmission ND Filter as following.

|                                                          |       |       |              |                   |
|----------------------------------------------------------|-------|-------|--------------|-------------------|
| HANTRONIX, INC.<br>10080 BUBB RD.<br>CUPERTINO, CA 95014 | Q.A.: | REV.: | HDA1040ST-AH | SHEET 14 OF 16    |
|                                                          | Z.W.  | 1.0   |              | DATE:<br>10/14/11 |

## 9.6 Reliability Test

| Test Item                  | Test Conditions                                                                                                             | Note |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------|------|
| High Temperature Operation | 70±3°C , t=96 hrs                                                                                                           |      |
| Low Temperature Operation  | -20±3°C , t=96 hrs                                                                                                          |      |
| High Temperature Storage   | 80±3°C , t=96 hrs                                                                                                           | 1,2  |
| Low Temperature Storage    | -30±3°C , t=96 hrs                                                                                                          | 1,2  |
| Thermal Shock Test         | -20°C ~ 25°C ~ 70°C<br>30 m in. 5 min. 30 min. ( 1 cycle )<br>Total 5 cycle                                                 | 1,2  |
| Humidity Test              | 60 °C, Humidity 90%, 96 hrs                                                                                                 | 1,2  |
| Vibration Test (Packing)   | Sweep frequency : 10 ~ 55 ~ 10 Hz/1min<br>Amplitude : 0.75mm<br>Test direction : X.Y.Z/3 axis<br>Duration : 30min/each axis | 2    |

Note 1 : Condensation of water is not permitted on the module.

Note 2 : The module should be inspected after 1 hour storage in normal conditions  
(15-35°C , 45-65%RH).

Definitions of life end point :

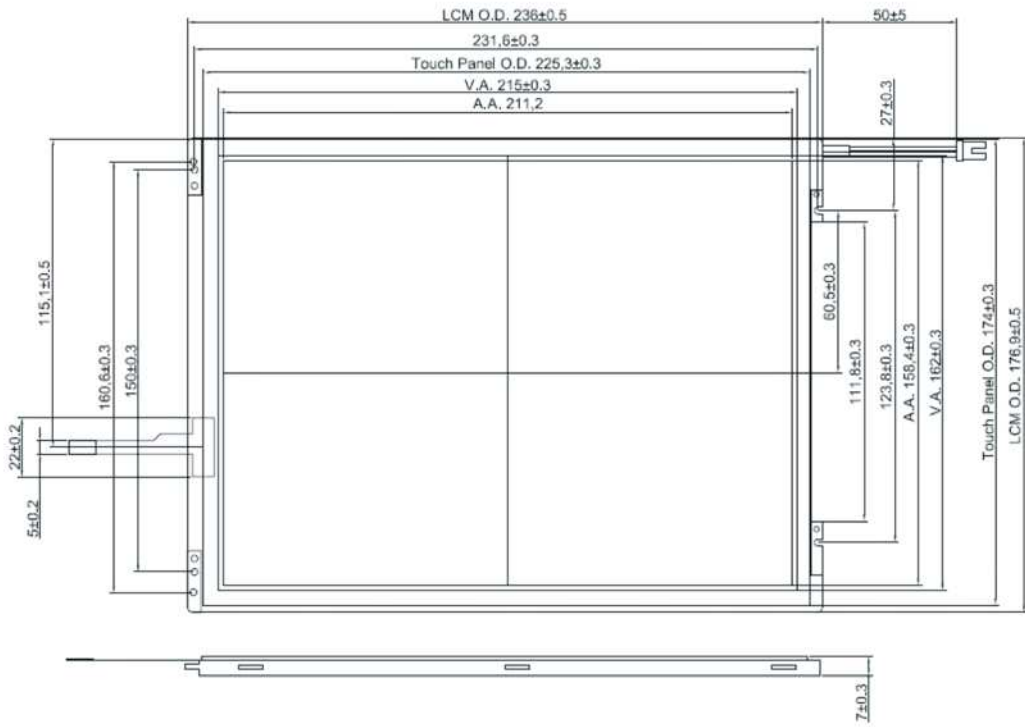
- ? Current drain should be smaller than the specific value.
- ? Function of the module should be maintained.
- ? Appearance and display quality should not have degraded noticeably.
- ? Contrast ratio should be greater than 50% of the initial value.

|                                                          |       |       |              |                   |
|----------------------------------------------------------|-------|-------|--------------|-------------------|
| HANTRONIX, INC.<br>10080 BUBB RD.<br>CUPERTINO, CA 95014 | Q.A.: | REV.: | HDA1040ST-AH | SHEET 15 OF 16    |
|                                                          | Z.W.  | 1.0   |              | DATE:<br>10/14/11 |

# 11. OUTLINE DIMENSION

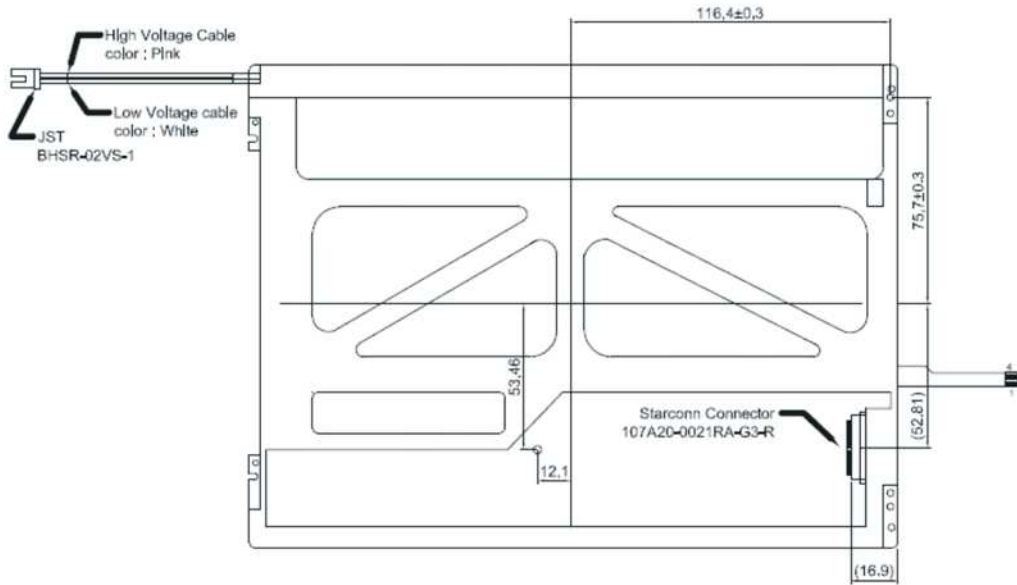
## 11.1 Front Side

Unit : mm



## 11.2 Rear side

Unit : mm



Q.A.:

REV:

|                                                          |      |     |              |                |
|----------------------------------------------------------|------|-----|--------------|----------------|
| HANTRONIX, INC.<br>10080 BUBB RD.<br>CUPERTINO, CA 95014 | Z.W. | 1.0 | HDA1040ST-AH | SHEET 16 OF 16 |
|                                                          |      |     |              | DATE: 10/14/11 |