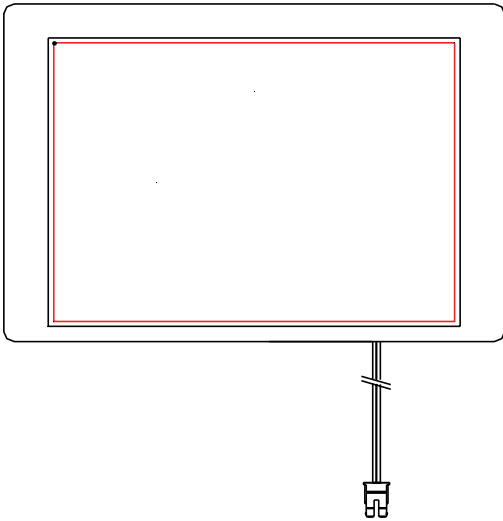




PRODUCT SPECIFICATION

HDA570V-GH

VGA(640X480) , TFT COLOR GRAPHICS
LCD DISPLAY MODULE



| | | | | |
|--|---------------|--------------|------------|--------------------------------|
| HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014 | Q.A.: Z.W. | REV.: 1.0 | HDA570V-GH | SHEET 1 OF 18 DATE: 1/16/11 |
|--|---------------|--------------|------------|--------------------------------|

1 General Description and Features

HDA570V-GH is a transmissive type color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT-LCD module, a driver circuit and a back-light unit. Graphics and texts can be displayed on a VGA 640 (W) x 3 x 480 (H) dots with 262,144 colors by supplying 18 bits data signal (6bits/each color).

1.1 Features

- ◆ Transmissive and back-light with 30 LEDs are available
- ◆ TN (Twisted Nematic) mode.
- ◆ Digital RGB (6bits/color) data transfer
- ◆ Clock signal: latching data at the falling edge.

1.2 LCD Module

| Item | Specification | Unit |
|--------------------|--|----------|
| Screen Size | 5.7 inches | Diagonal |
| Display Resolution | 640 (H) x 480 (V) | Pixel |
| Active Area | 115.20 (H) x 86.40 (V) | mm |
| Outline Dimension | 144.00 (H) x 104.60 (V) x 13.0 (T) | mm |
| Display Mode | Normally white mode/ Transmissive/ Wide view | -- |
| Pixel Arrangement | R,G,B Vertical Tripe | -- |
| Pixel size | 181.5 x 181.5 | um |
| Display Color | 262K Colors | -- |
| Viewing Direction | 6 o'clock | -- |
| Input Interface | Digital RGB (6bits/color) Data Transfer | -- |

2 Mechanical Information

| Item | | Min. | Typ. | Max. | Unit | Note |
|-------------|----------------|------|--------|------|------|------|
| Module Size | Horizontal (H) | -- | 144.00 | – | mm | (1) |
| | Vertical (V) | -- | 104.60 | – | mm | (1) |
| | Thickness (T) | -- | 13.0 | – | mm | (1) |
| Weight | | -- | 154 | – | g | -- |

Note (1) Excluding backlight cables. . Refer to the Outline Dimension Drawing as attached.

3 Electrical Specifications

3.1 Absolute Max. Ratings

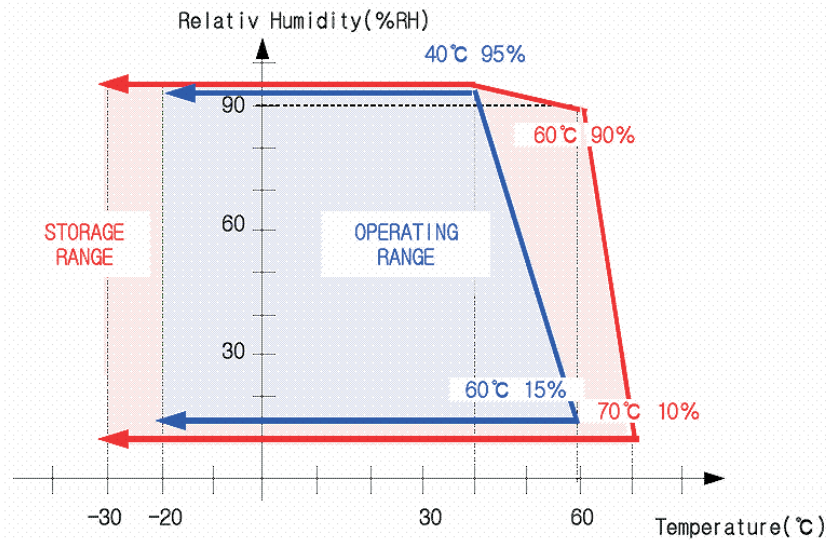
3.1.1 Absolute Ratings of Environment

If the operating condition exceeds the following absolute maximum ratings, the TFT LCD module may be damaged permanently.

($T_a = 25 \pm 2^\circ\text{C}$, $V_{SS} = \text{GND} = 0$)

| Item | Symbol | Min. | Max. | Unit | Note |
|-----------------------|-----------|------|------|------------------|---------|
| Storage temperature | T_{STG} | -30 | 80 | $^\circ\text{C}$ | (1) |
| Operating temperature | T_{OPR} | -20 | 70 | $^\circ\text{C}$ | (1,2,3) |

Note (1) 95 % RH Max. ($40^\circ\text{C} \geq T_a$). Maximum wet-bulb temperature at 39°C or less. ($T_a > 40^\circ\text{C}$) No condensation.



Note (2) In case of below 0° , the response time of liquid crystal (LC) becomes slower and the color of panel becomes darker than normal one. Level of retardation depends on temperature, because of LC's character

Note (3) Only operation is guaranteed at operating temperature. Contrast, response time, another display quality are evaluated at $+25^\circ\text{C}$.

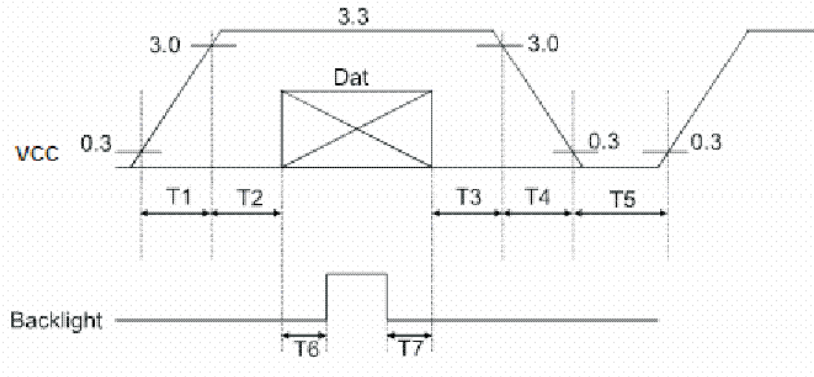
| | | | | |
|--|-------|-------|------------|------------------|
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3.1.2 Electrical Absolute Maximum Ratings

(V_{SS}=GND=0)

| Parameter | Symbol | Min. | Max. | Unit | Remark |
|----------------------------------|-------------------------------|------|----------------------|-------|-------------------------|
| Power supply voltage | V _{CC} | -0.3 | 5.0 | V | |
| Signal input voltage | R0-R5,G0-G5, B0-B5,DCLK,DE | -0.3 | V _{CC} +0.3 | V | -- |
| Permissible input ripple voltage | V _{RF} | — | 100 | mVp-p | V _{CC} = +3.3V |

Display On/Off Sequence :



Data: DCLK, R0 ~ R5, G0 ~ G5, B0 ~ B5, DE

T1 ≤ 10ms, 50ms ≤ T2, 0 < T3 ≤ 50ms, 0 < T4 ≤ 10ms, 1s ≤ T5, 200ms ≤ T6, 200ms ≤ T7

3.2 Electrical Characteristics

3.2.1 DC Electrical Characteristics of the TFT LCD

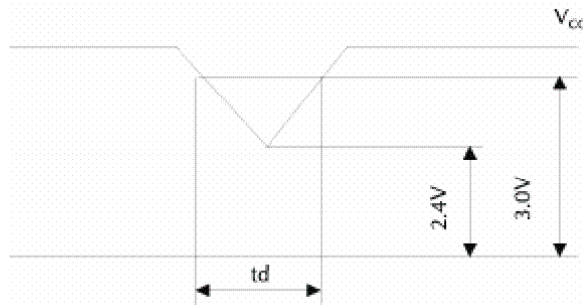
(Ta=25±2°C, V_{SS}=GND=0)

| Item | Symbol | Min. | Typ. | Max. | Unit | Remark |
|-------------------------|---------|-----------------|--------|------|--------|--------|
| Power supply | VCC | 3.0 | 3.3 | 3.6 | V | Note 1 |
| Input Voltage for logic | H Level | V _{IH} | 0.7VDD | - | VDD | V |
| | L Level | V _{IL} | 0 | - | 0.3VDD | V |
| Power Supply current | ICC | | (120) | TBD | mA | Note 2 |

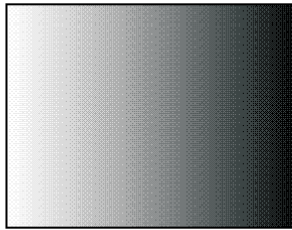
Note1: Vcc-dip conditions

Vcc-dip conditions should also follow the Vcc-turn-on conditions

Td ≤ 10ms



Note2: fv =60Hz , Ta=25°C , Display pattern : 64 Gray pattern



3.3 AC Timing Characteristic of The LCD

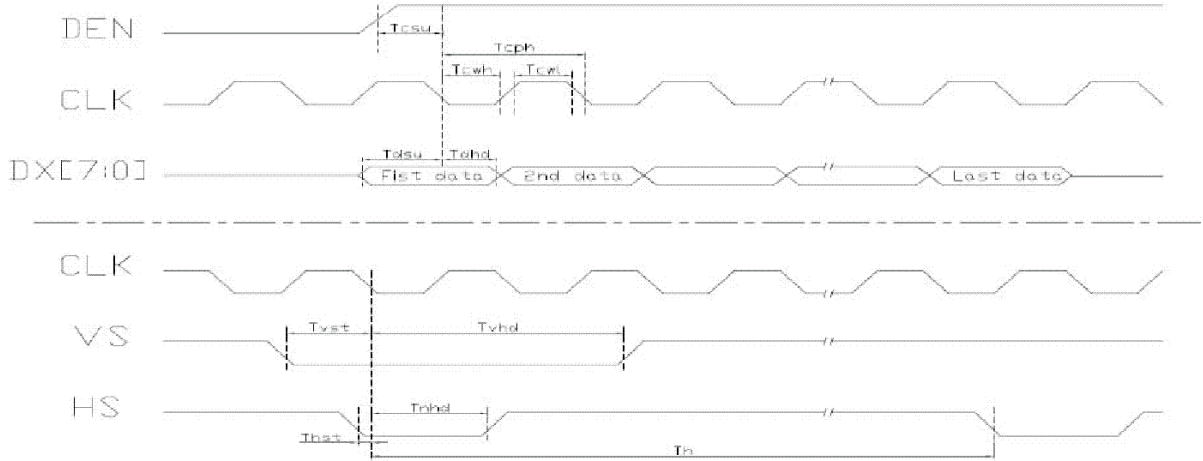
3.3.1 Timing Condition

| Parameter | Symbol | Min. | Typ. | Max. | Unit. | Remark |
|-----------------|-----------|------|--------|------|-----------|--------|
| CLK frequency | F_{CPH} | -- | 25.175 | -- | MHZ | |
| CLK period | T_{CPH} | -- | 39.7 | -- | ns | |
| CLK pulse duty | T_{CWH} | 40 | 50 | 60 | % | |
| HS period | T_H | -- | 800 | -- | T_{CPH} | |
| HS pulse width | T_{WH} | 5 | 30 | -- | T_{CPH} | |
| HS-DEN time | T_{HS} | 112 | 144 | 175 | T_{CPH} | |
| DEN pulse width | T_{EP} | -- | 640 | -- | T_{CPH} | |
| VS pulse width | T_{WV} | 1 | 3 | 5 | T_H | |
| VS-DEN time | T_{STV} | -- | 35 | -- | T_H | |
| VS period | T_V | -- | 525 | -- | T_H | |

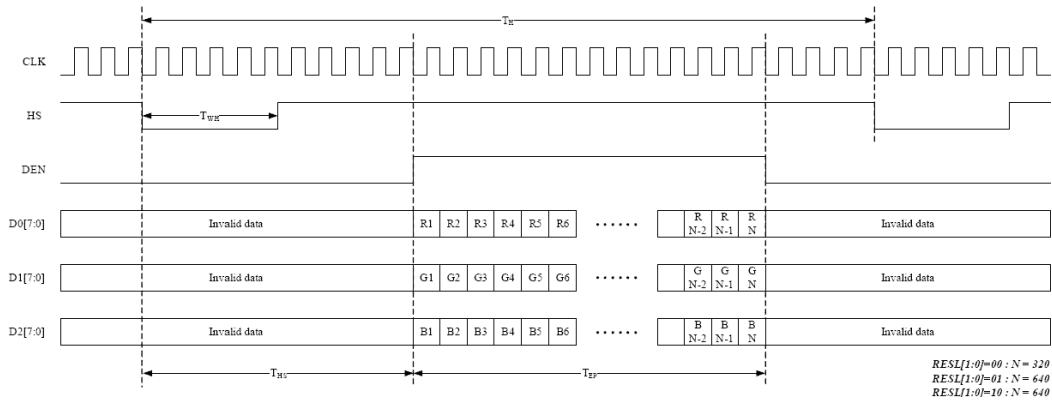
Note : When SYNC mode is used, 1st data start from 144th CLK after HS falling (when $STHD[5:0]=00000$)

| Parameter | Symbol | Min. | Typ. | Max. | Unit. | Remark |
|-----------------|------------|------|------|------|-----------|--------|
| OEV pulse width | T_{CVE} | -- | 100 | -- | T_{CPH} | |
| CKV pulse width | T_{CKV} | -- | 96 | -- | T_{CPH} | |
| HS-CKV time | T_1 | -- | 52 | -- | T_{CPH} | |
| HS-OEV tim | T_2 | -- | 8 | -- | T_{CPH} | |
| HS-POL time | T_3 | -- | 72 | -- | T_{CPH} | |
| STV setup time | T_{SUV} | -- | 46 | -- | T_{CPH} | |
| STV pulse width | T_{WSTV} | -- | 1 | -- | T_H | |

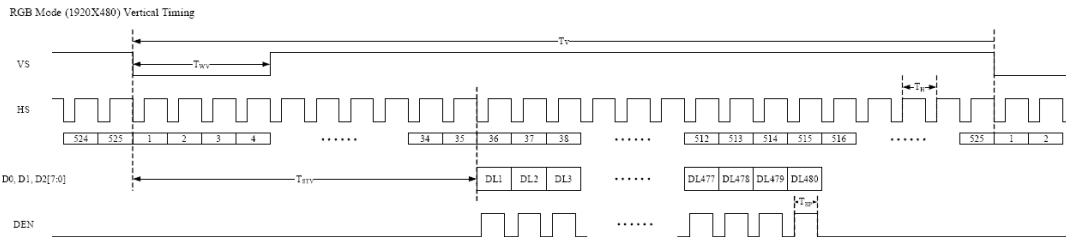
3.3.2 Clock and Data input waveforms

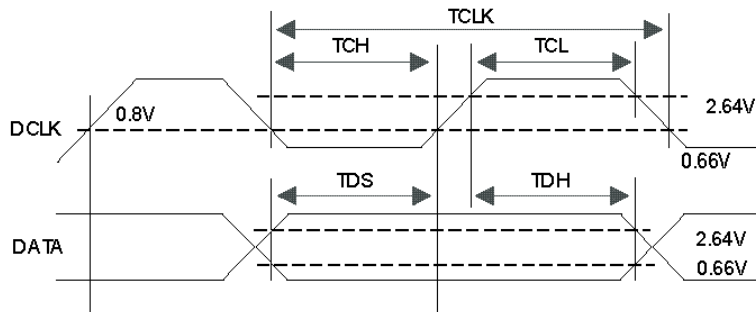


3.3.3 Data input format for parallel RGB Mode



3.3.4 Digital RGB mode Horizontal timing for RESL[1:0]=10





3.4 Back-Light Unit

The Back-light system is an edge-lighting type with 30 white LEDs(Light Emitting Diode). The characteristics of 30 white LEDs are shown in the following tables.

(Ta= Room Temp)

| Characteristics | Symbol | Min. | Typ. | Max. | Unit | Note |
|----------------------------|----------|------|---------|------|------|------|
| Current of Back-light Unit | I_B | - | 200 | TBD | mA | (1) |
| Voltage of Back-light Unit | V_B | - | (9.6) | | V | |
| Power Consumption | P_{BL} | - | (1920) | | mW | (2) |
| LED Life Time | 25°C | - | (30000) | | hr | (3) |

Note (1) LEDS in 3 series x 10 parallel type.

(2) Where $I_B = 200\text{mA}$, $V_B = 9.6$, $P_{BL} = V_B \times I_B$

(3) The environmental conducted under ambient air flow ,at $T_a=25\pm 2^\circ\text{C}$, $60\%RH\pm 5\%$

4 Optical Characteristics

4.1 Optical characteristic of the LCD

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state.

Measuring equipment: BM-5A ,BM-7

| Item | Symbol | Condition | Min | Typ | Max | Unit | Note |
|-------------------------------|----------------|----------------------------|---------------------------|-------|-------|-------------------|--------|
| Brightness | | | 700 | (900) | -- | cd/m ² | |
| Response time | T _r | θ=0° | - | 15 | 20 | ms | |
| | T _f | | -- | 25 | 35 | ms | |
| Contrast ratio | CR | At optimized viewing angle | 400 | (500) | -- | -- | |
| Color Gamut | NTSC % | -- | -- | 50 | -- | % | |
| Luminance Uniformity | ΔL | | 80 | 85 | | % | |
| Color Chromaticity (CIE 1931) | Red | R _x | θ=0° Normal Viewing Angle | 0.565 | 0.615 | 0.665 | -- |
| | | R _y | | 0.294 | 0.344 | 0.394 | |
| | Green | G _x | | 0.257 | 0.307 | 0.357 | -- |
| | | G _y | | 0.512 | 0.562 | 0.612 | |
| | Blue | B _x | | 0.090 | 0.140 | 0.190 | -- |
| | | B _y | | 0.080 | 0.130 | 0.180 | |
| | White | W _x | | 0.259 | 0.309 | 0.359 | -- |
| | | W _y | | 0.300 | 0.350 | 0.400 | |
| Viewing Angle (6H) | Hor. | θ _R | CR≥10 | 55 | 65 | -- | Degree |
| | | θ _L | | 55 | 65 | -- | |
| | Ver. | φ _H | | 55 | 55 | -- | |
| | | φ _L | | 40 | 65 | -- | |

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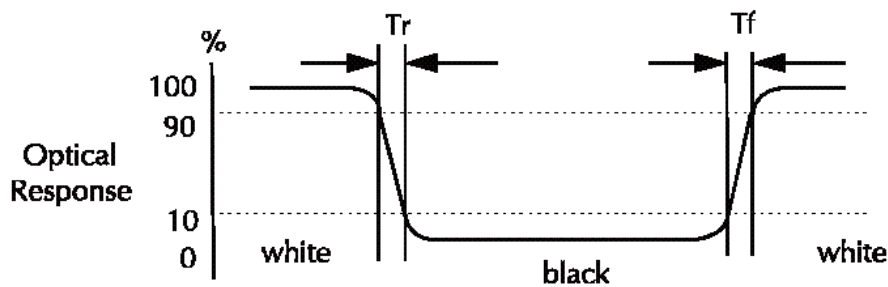
DATE:
1/16/11

a. Test equipment setup

After stabilizing and leaving the panel alone shall be warmed up for the stable operation of LCM, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7(fast) with a viewing angle of 2° at a distance of 50cm and normal direction.

b. Definition of response time: Tr and Tf

The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".



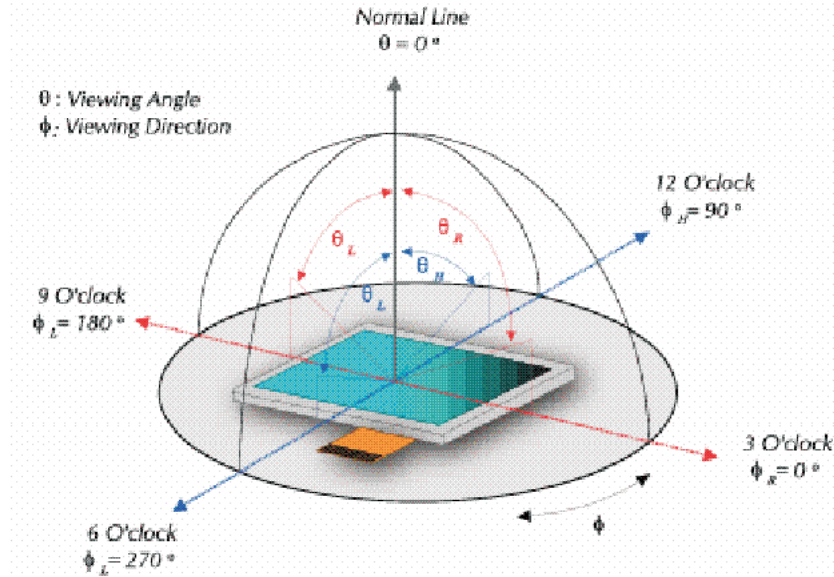
c. Definition of contrast ratio:

$$\text{Contrast Ratio (CR)} = \frac{\text{Brightness measured when LCD is at "white state"}}{\text{Brightness measured when LCD is at "black state"}}$$

d. Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

| | | | | |
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e. View Angle



f. Definition of Luminance of White: Luminance of white at the center points

| | |
|---------------------------------|----------|
| Light Source of Back-Light Unit | LED Type |
|---------------------------------|----------|

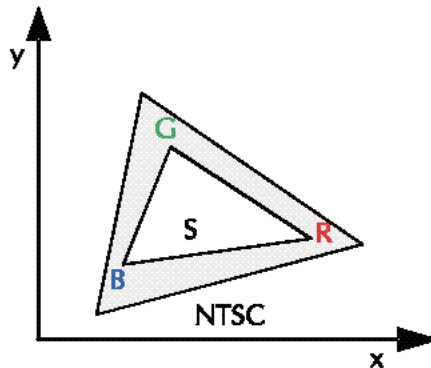
g. Definition of White Uniformity

$$\text{White Uniformity} = \frac{\text{Min. luminance of white among 9-points}}{\text{Max. luminance of white among 9-points}}$$

h. The definition of Color Gamut -Color Chromaticity CIE 1931

Color coordinate of white & red, green, blue at center point.

$$\text{Color Gamut : NTSC(\%)} = (\text{RGB Triangle Area} / \text{NTSC Triangle Area}) \times 100$$



| | | | | |
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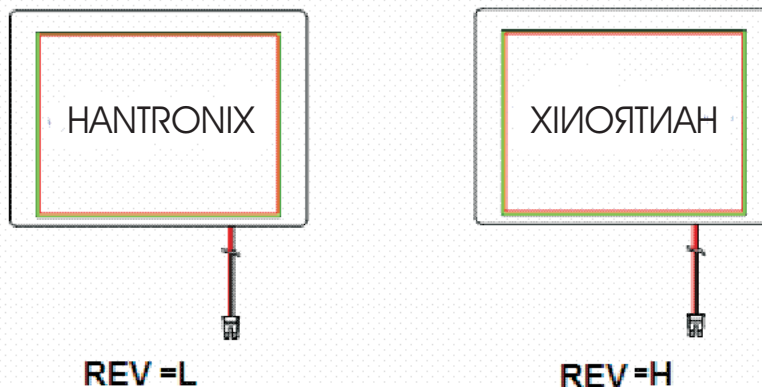
5 Input Terminal Pin Assignment

5.1 Pin Assignment

| Pin No. | Symbol | I/O | Function | Remark |
|---------|--------|-----|---|---------|
| 1 | VSS | -- | GND | |
| 2 | DCLK | I | Clock signal for sampling each data signal | |
| 3 | IHS | I | Horizontal synchronous signal (Negative) | |
| 4 | IVS | I | Vertical synchronous signal (Negative) | |
| 5 | VSS | I | GND | |
| 6 | R0 | I | RED data signal (LSB) | |
| 7 | R1 | I | RED data signal | |
| 8 | R2 | I | RED data signal | |
| 9 | R3 | I | RED data signal | |
| 10 | R4 | I | RED data signal | |
| 11 | R5 | I | RED data signal (MSB) | |
| 12 | VSS | -- | GND | |
| 13 | G0 | I | GREEN data signal (LSB) | |
| 14 | G1 | I | GREEN data signal | |
| 15 | G2 | I | GREEN data signal | |
| 16 | G3 | I | GREEN data signal | |
| 17 | G4 | I | GREEN data signal | |
| 18 | G5 | I | GREEN data signal (MSB) | |
| 19 | VSS | -- | GND | |
| 20 | B0 | I | BLUE data signal(LSB) | |
| 21 | B1 | I | BLUE data signal | |
| 22 | B2 | I | BLUE data signal | |
| 23 | B3 | I | BLUE data signal | |
| 24 | B4 | I | BLUE data signal | |
| 25 | B5 | I | BLUE data signal(MSB) | |
| 26 | VSS | -- | GND | |
| 27 | DEN | I | Signal to settle the horizontal display position (Positive) | Note5-1 |
| 28 | VCC | -- | 3.3V power supply | |
| 29 | VCC | -- | 3.3V power supply | |
| 30 | REV | I | Select horizontal and vertical scanning direction. | Note5-2 |
| 31 | VSS | I | GND | |
| 32 | NC | -- | No Connection | |
| 33 | VSS | I | GND | |

Note 5 - 1 The horizontal display start timing is settled in accordance with a rising timing of ENAB signal. In case ENAB is fixed "Low", the horizontal start timing is determined. Don't keep ENAB "High" during operation.

Note 5 - 2



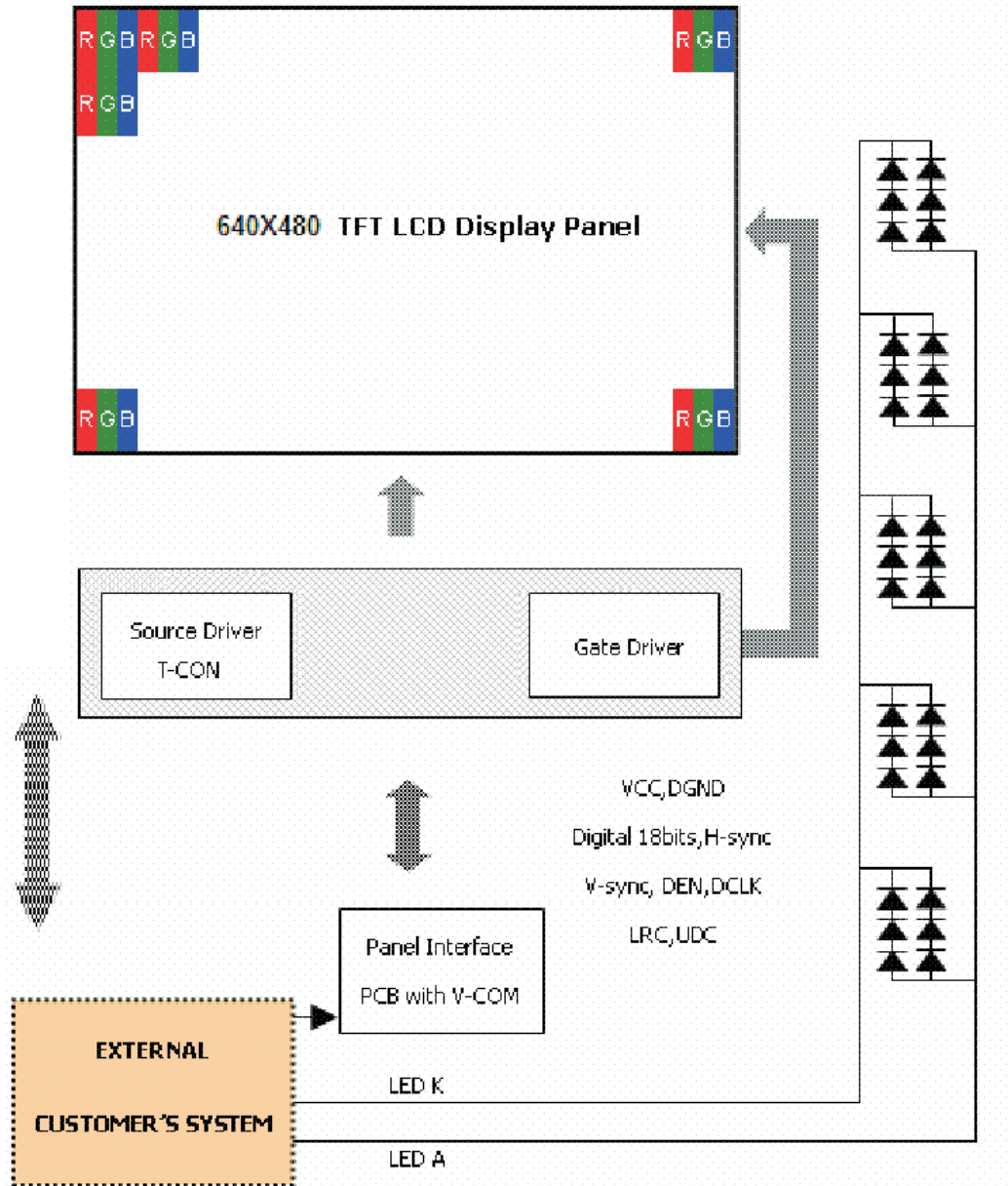
5.2 Back-light Unit (BLU)

| Pin No. | Symbol | Function | Remark |
|---------|--------|--------------------------------|--------|
| 1 | LEDA | Power Supply for LED backlight | Red |
| 2 | LEDK | GND for LED backlight | Black |

Connector: JST BHSR-02VS-1

| | | | | |
|--|-------|-------|------------|------------------|
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5.3 Block Diagram



| | | | | |
|--|-------|-------|------------|------------------|
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5.4 Basic Display Color and Gray Scale

| | Color & Gray Scale | Data Signal | | | | | | | | | | | | | | | | | | | | | | |
|-------------|--------------------|-------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| | | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | G7 | G6 | G5 | G4 | G3 | G2 | G1 | G0 | B7 | B6 | B5 | B4 | B3 | B2 | B1 |
| Basic Color | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(0) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(0) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue(0) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Cyan | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Magenta | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Yellow | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | White | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Red | Black | 0 | 0 | 0 | 0 | 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 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | Red(2) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | |
| | Red(31) | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | |
| | Red(62) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | Red(63) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Green | Black | 0 | 0 | 0 | 0 | 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 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | Green(2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | |
| | Green(31) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | |
| | Green(62) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | Green(63) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Blue | Black | 0 | 0 | 0 | 0 | 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 | 0 | 0 | 0 | 0 | 1 | |
| | Blue(2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | |
| | Blue(31) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | |
| | Blue(62) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | |
| | Blue(63) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |

0 : Low level voltage, 1 :High level voltage

Each basic color can be displayed in 64 gray scales from 6 bit data signals. With the combination of total 18 bit data signals, the 262,144-color display can be achieved on the screen.

6 Reliability Condition

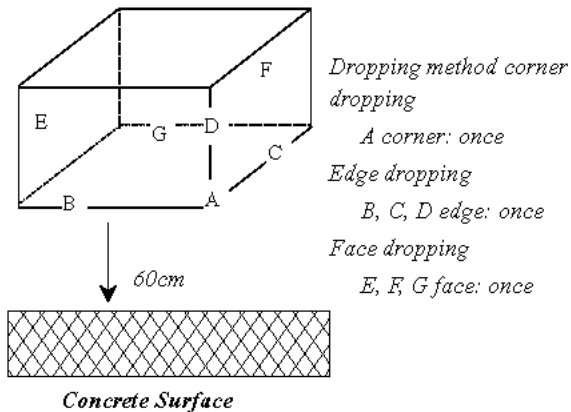
No change on display and in operation under the following test condition.

Condition: Unless otherwise specified, tests will be conducted under the following condition.

Temperature: $20\pm 5^{\circ}\text{C}$

Humidity: $65\pm 5\% \text{RH}$

Tests will be not conducted under functioning state.

| No. | Parameter | Condition | Notes |
|-----|---|--|-------|
| 1 | High Temperature Operating | $70^{\circ}\text{C}\pm 2^{\circ}\text{C}$, 240hrs (Operation state) | - |
| 2 | Low Temperature Operating | $-20^{\circ}\text{C}\pm 2^{\circ}\text{C}$, 240hrs (Operation state) | - |
| 3 | High Temperature Storage | $80^{\circ}\text{C}\pm 2^{\circ}\text{C}$, 240hrs | - |
| 4 | Low Temperature Storage | $-30^{\circ}\text{C}\pm 2^{\circ}\text{C}$, 240hrs | - |
| 5 | High Temperature and High Humidity Operation Test | $60^{\circ}\text{C}\pm 2^{\circ}\text{C}$, 90%, 240hrs. | - |
| 6 | Vibration Test | Total fixed amplitude: 1.5mm Vibration Frequency: 10~55Hz One cycle 60 seconds to 3 direction of X, Y, Z each 15 minutes. | - |
| 7. | Drop Test | To be measured after dropping from 60cm high on the concrete surface in packing state.  | - |

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Q.A.:
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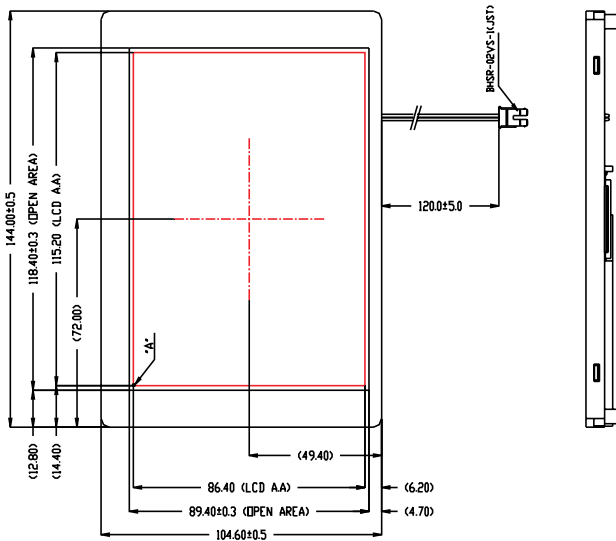
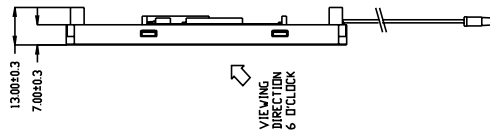
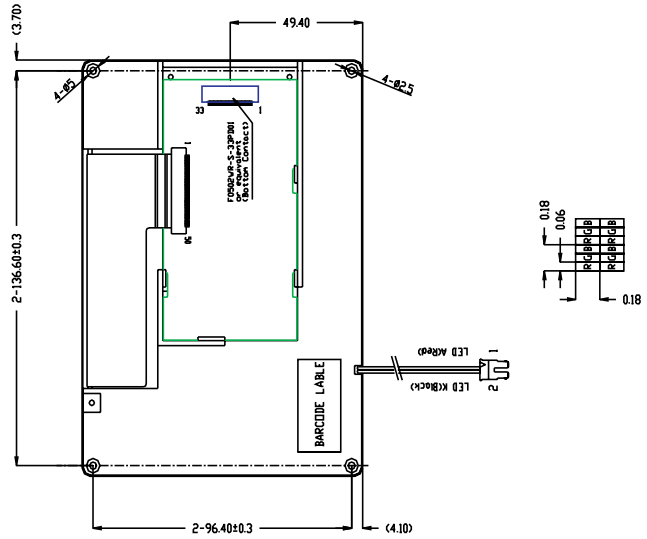
REV.:
1.0

HDA570V-GH

SHEET 17 OF 18

DATE:
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7 Dimensional Outlines



PIN ASSIGNMENT:

| | | | |
|-------|--------|--------|--------|
| 1.VSS | 11.R5 | 21.B1 | 31.VSS |
| 2.CLK | 12.VSS | 22.B2 | 32.NC |
| 3.IHS | 13.G0 | 23.B3 | 33.VSS |
| 4.IVS | 14.G1 | 24.B4 | |
| 5.VSS | 15.G2 | 25.B5 | |
| 6.R0 | 16.G3 | 26.VSS | |
| 7.R1 | 17.G4 | 27.DEN | |
| 8.R2 | 18.G5 | 28.VCC | |
| 9.R3 | 19.VSS | 29.VCC | |
| 10.R4 | 20.B0 | 30.REV | |

HANTRONIX, INC.
10080 BUBB RD.
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