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TO :

Date :

HANNSTAR PRODUCT INFORMATION

Model Name : HSD090IF41
-A00-0299

- Note:1. Please contact HannStar Display Corp. before designing your product based on this module specification.
2. The information contained herein is presented merely to indicate the characteristics and performance of our products. No responsibility is assumed by HannStar for any intellectual property claims or other problems that may result from application based on the module described herein.



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Record of Revisions

| Rev. | Date | Description of change |
|------|--------------|---------------------------------------|
| 1.0 | AUG 22, 2006 | Product information was first issued. |



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1.0 GENERAL DESCRIPTION

1.1 Introduction

HannStar Display model HSD090ICW1 is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT LCD panel, a driving circuit and a back light system. This TFT LCD has a 9.0 (16:9) inch diagonally measured active display area with 1920 x 234 dot (640 horizontal by 234 vertical pixel) resolution.

1.2 Features

- 9 (16:9 diagonal) inch configuration
- Portable DVD Player / TV
- ROHS design

1.3 General information

| Item | Specification | Unit |
|-------------------|------------------------|--------|
| Outline Dimension | 206.6(H) x 122(V) | mm |
| Display area | 197.76(H) x 111.735(V) | mm |
| Number of Pixel | 640 RGB(H) x 234(V) | pixels |
| Pixel pitch | 0.309(H) x 0.4775(V)s | mm |
| Pixel arrangement | RGB Vertical stripe | |
| Display mode | Normally white | |

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2.0 ABSOLUTE MAXIMUM RATINGS

2.1 Electrical Absolute Rating

2.1.1 TFT LCD Module

| Item | Symbol | Min. | Max. | Unit | Note |
|---------------------------|-------------------|------|----------------|------|--------|
| Power supply voltage | DV_{DD} | -0.3 | 6 | V | GND=0 |
| | V_{GH} | -0.3 | 40 | V | GND=0 |
| | V_{GL} | -20 | 0.3 | V | GND=0 |
| | $V_{GH} - V_{GL}$ | -0.3 | 40 | V | |
| | AV_{DD} | -0.3 | 7.0 | V | AGND=0 |
| | V_{COM} | -1.6 | 5.2 | V | |
| Analog Signal Input Level | V_R, V_G, V_B | -0.2 | $AV_{DD}+0.2$ | V | |
| Logic Signal Input Level | V_I | -0.3 | $DV_{DD} +0.3$ | V | |

Note (1) Permanent damage may occur to the LCD module if beyond this specification. Functional operation should be restricted to the conditions described under normal operating conditions.

(2) $T_a = 25 \pm 2^\circ\text{C}$

2.2 Environment Absolute Rating

| Item | Symbol | Min. | Max. | Unit | Note |
|-----------------------|-----------|------|------|------------------|------|
| Operating Temperature | T_{opa} | -20 | 70 | $^\circ\text{C}$ | |
| Storage Temperature | T_{stg} | -30 | 80 | $^\circ\text{C}$ | |

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3.0 OPTICAL CHARACTERISTICS

3.1 Optical specification

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit | Note |
|------------------------------|-----------|------------------------------------|-------|-------|-------|------|------------------------------|
| Transmittance | T | — | — | TBD | — | % | |
| Contrast Ratio | CR | $\Theta=0$ Normal viewing angle | — | 500 | — | — | (1)(2) |
| Response time | T_R+T_F | | — | 25 | — | msec | (1)(3) |
| Color gamut | S | | | 45 | | % | (C-light) |
| Color chromaticity (CIE1931) | White | W_x | 0.300 | 0.315 | 0.330 | | (1)(4) CF glass (C-light) |
| | | W_y | 0.331 | 0.346 | 0.361 | | |
| Viewing angle | Hor. | Θ_L | — | 70 | — | | |
| | | Θ_R | — | 70 | — | | |
| | Ver. | Θ_U | — | 65 | — | | |
| | | Θ_D | — | 65 | — | | |
| Optima View Direction | 6 O'clock | | | | | | (6) |

■ Measuring Condition

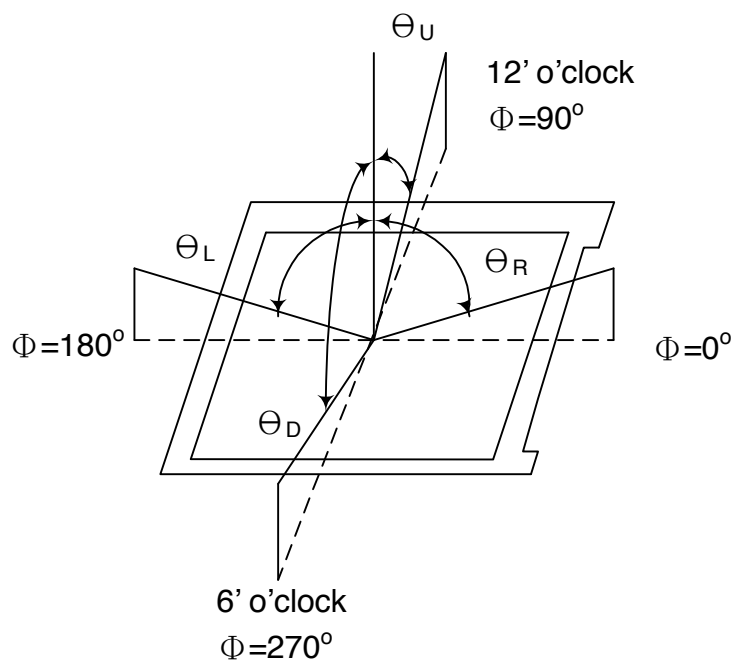
- Measuring surrounding : dark room
- Ambient temperature : $25\pm 2^\circ\text{C}$
- 30min. warm-up time.

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3.2 Measuring Equipment

- Otsuka Electrics Corp., which utilized MCPD-3000 for Chromaticity and BM-5 for other optical characteristics.
- Measuring spot size : 10 ~ 12 mm

Note (1) Definition of Viewing Angle :

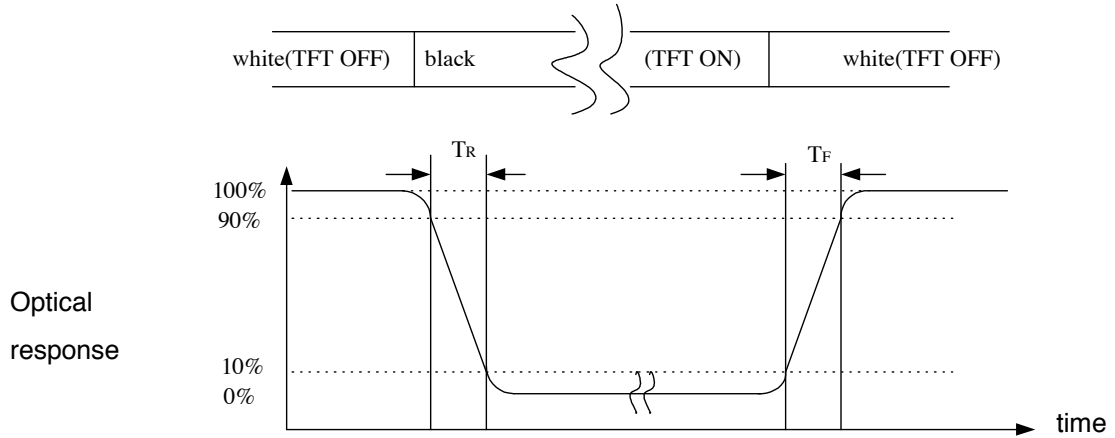


Note (2) Definition of Contrast Ratio(CR) :
measured at the center point of panel

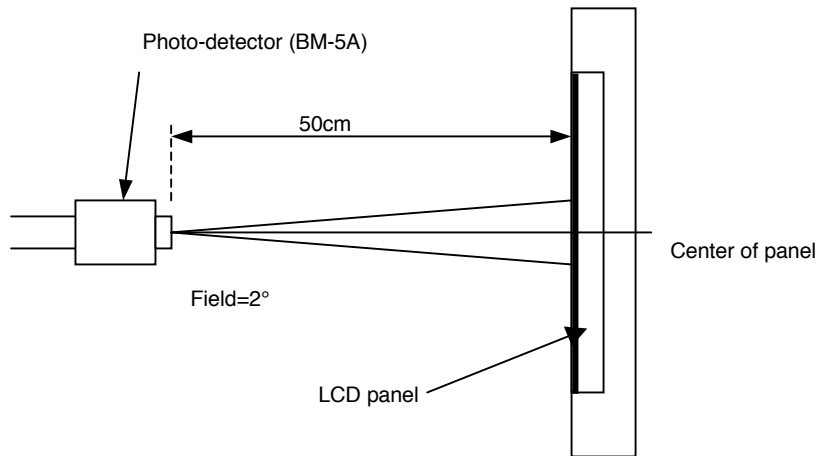
$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

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Note (3) Definition of Response Time : Sum of T_R and T_F

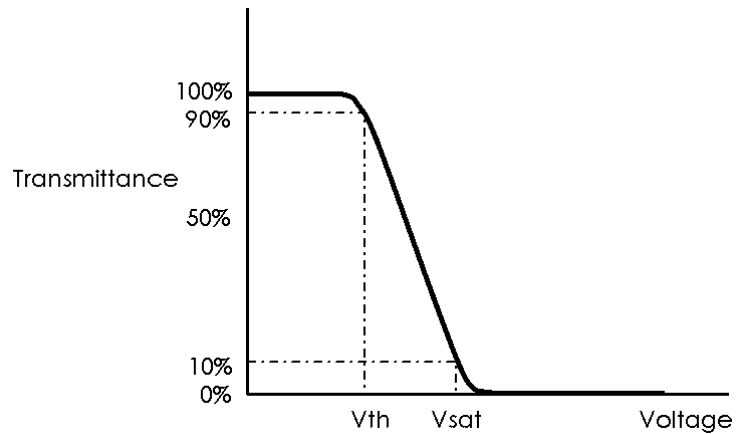


Note (4) Definition of optical measurement setup



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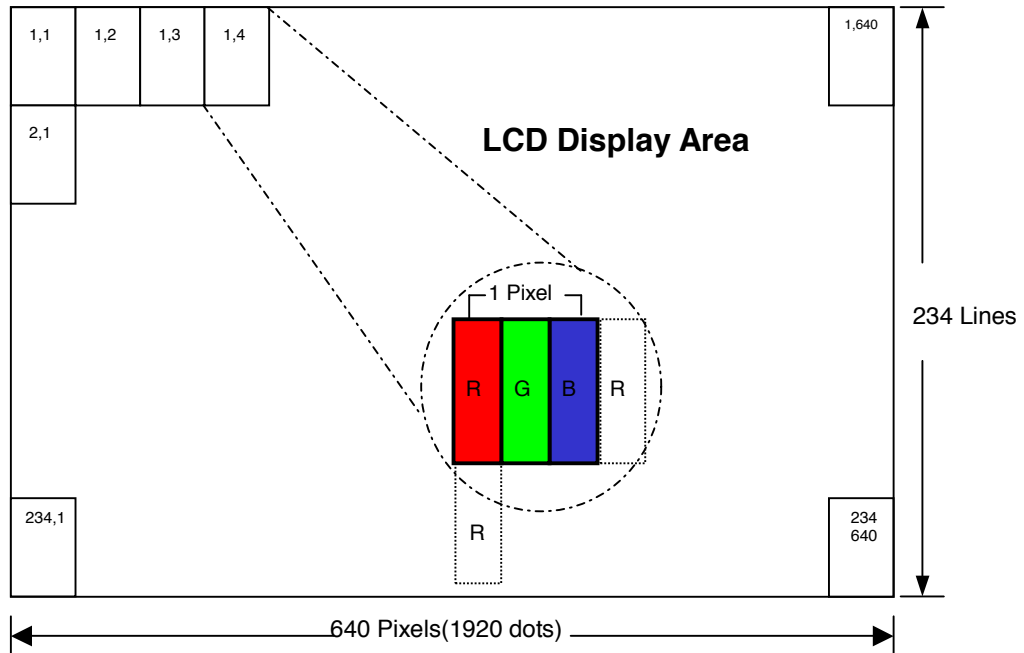
Note (5) Definition of V_{th} and V_{sat} (at 20°C)



Note (6) Rubbing Direction (The different Rubbing Direction will cause the different optima view direction).

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4.0 Pixel Format



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5.0 INTERFACE PIN CONNECTION

5.1 TFT LCD Module

| Pin No. | Signal | Description |
|---------|--------|---|
| 1 | GND | GND for Logic Circuit |
| 2 | VCC | Logic Power for Gate Driver |
| 3 | VGL | Negative Power for Gate Driver |
| 4 | VGH | Positive Power for Gate Driver |
| 5 | STVR | Vertical Start Pulse |
| 6 | STVL | Vertical Start Pulse |
| 7 | CKV | Shift CLK Input for Gate Driver |
| 8 | U/D | UP/Down Scan Setting |
| 9 | OEV | Output Enable Input for Gate Driver |
| 10 | VCOM | Common Electrode Driving Signal |
| 11 | VCOM | Common Electrode Driving Signal |
| 12 | L/R | Left/Right Shift Setting |
| 13 | MOD | Sequential or Simultaneous Sampling Setting |
| 14 | OEH | Output Enable Input for Source Driver |
| 15 | STHL | Horizontal Start Pulse |
| 16 | STHR | Horizontal Start Pulse |
| 17 | CPH3 | Sampling and Shifting CLK Pulse |
| 18 | CPH2 | Sampling and Shifting CLK Pulse |
| 19 | CPH1 | Sampling and Shifting CLK Pulse |
| 20 | VCC | Logic Power for Source Driver |
| 21 | GND | GND for Logic Circuit |
| 22 | VR | Alternated Video Input, R |
| 23 | VG | Alternated Video Input, G |
| 24 | VB | Alternated Video Input, B |
| 25 | AVDD | Supply Voltage for Analog Circuit |
| 26 | AVSS | GND for Analog Circuit |

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6.0 ELECTRICAL CHARACTERISTICS

6.1 TFT LCD Module

| Item | Symbol | Min. | Typ. | Max. | Unit | Note |
|--|-----------|--------------|-------------|---------------|---------|----------------------|
| Supply Voltage | DV_{DD} | - | 3.3 | - | V | |
| | V_{GH} | - | 15 | - | V | |
| | V_{GL} | - | -10 | - | V | |
| | AV_{DD} | 3 | 5 | 5.5 | V | |
| Video signal amplitude (VR, VG, VB) | V_{iA} | 0.4 | - | $AV_{DD}-0.4$ | V | |
| | V_{iAC} | - | 3 | - | V | AC component, |
| | V_{iDC} | - | $AV_{DD}/2$ | - | V | DC component |
| VCOM | V_{CAC} | - | 4.7 | - | VP-P | AC component |
| | V_{CDC} | 1.6 | 1.8 | 2.0 | V | DC component, (1) |
| Input signal voltage | V_{iH} | $0.8DV_{DD}$ | - | DV_{DD} | V | (2) |
| | V_{iL} | 0 | - | $0.2 DV_{DD}$ | V | (2) |
| Current of power supply | I_{DD} | - | 150 | - | μA | $DV_{DD}=3.3V$ (預估值) |
| | I_{ADD} | - | 9.0 | - | mA | $AV_{DD}=5V$ (預估值) |
| | I_{GH} | - | 70 | - | μA | $V_{GH}=15V$ (預估值) |
| | I_{GL} | - | 65 | - | μA | $V_{GL}=-10V$ (預估值) |

Note (1): The brightness of LCD panel could be changed by adjusting the AC component of V_{COM} .

Note (2): STHL, STHR, OEH, L/R, CPH1~CPH3, STVD, STVU, OEV, CKV, U/D

Note (3): Be sure to apply the power voltage as the power sequence spec.

Note (4): DGND=AGND=0V,

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6.2 AC Characteristics

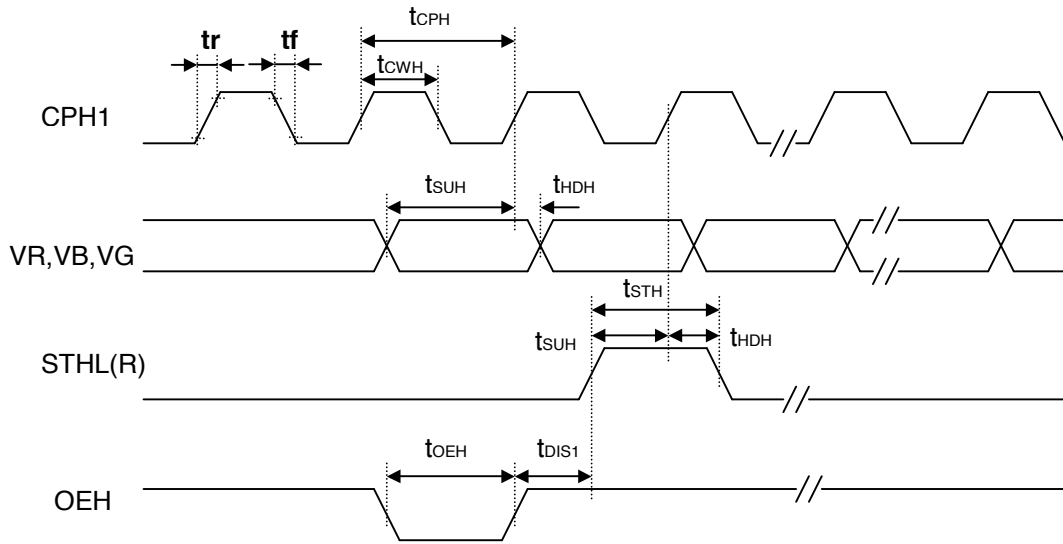
| Item | Symbol | Min. | Typ. | Max. | Unit | Note |
|---------------------------------|------------|------|------|------|-------------|-----------|
| Rising time | t_r | - | - | 10 | ns | (1) |
| Falling time | t_f | - | - | 10 | ns | (1) |
| High and low level pulse duty | t_{CPH} | 100 | 103 | - | ns | CPH1~CPH3 |
| CPH pulse duty | t_{CWH} | 40 | 50 | 60 | | CPH1~CPH3 |
| STH setup time | t_{SUH} | 20 | - | - | ns | STHR,STHL |
| STH hold time | t_{HDH} | 20 | - | - | ns | STHR,STHL |
| STH pulse width | t_{STH} | - | 1 | - | t_{CPH} | STHR,STHL |
| STH period | t_H | 61.5 | 63.5 | 65.5 | μs | STHR,STHL |
| OEH pulse width | t_{OEH} | - | 1.23 | - | μs | OEH |
| Sample and hold disable time | t_{DIS1} | - | 8.19 | - | μs | |
| OEV pulse width | t_{OEV} | - | 4.77 | - | μs | OEV |
| CKV pulse width | t_{CKV} | - | 3.91 | - | μs | CKV |
| Clean enable time | t_{DIS2} | - | 3.90 | - | μs | |
| Horizontal display timing range | t_{DH} | - | 1920 | - | $t_{CPH}/3$ | |
| STV setup time | t_{SUV} | 200 | - | - | ns | STVD,STVU |
| STV hold time | t_{HDV} | 300 | - | - | ns | STVD,STVU |
| STV pulse width | t_{STV} | - | 1 | - | t_H | STVD,STVU |
| Horizontal line per field | t_V | 256 | 262 | 268 | t_H | (2) |
| Vertical display start | t_{SV} | | 3 | - | t_H | |
| Vertical display timing range | t_{DV} | | 234 | - | t_H | |
| VCOM Rising time | t_{COM} | | - | 5 | μs | |
| VCOM Falling time | t_{COM} | | - | 5 | μs | |
| VCOM delay time | t_{DCOM} | | - | 3 | μs | |
| RGB delay time | t_{DRGB} | | * | 1 | μs | |

Note (1): For all of the logic signals.

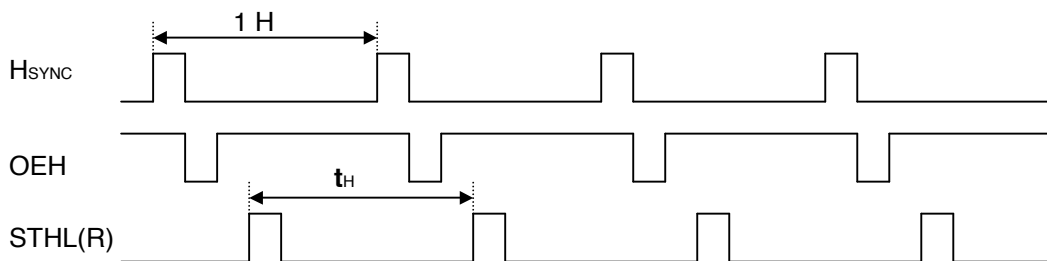
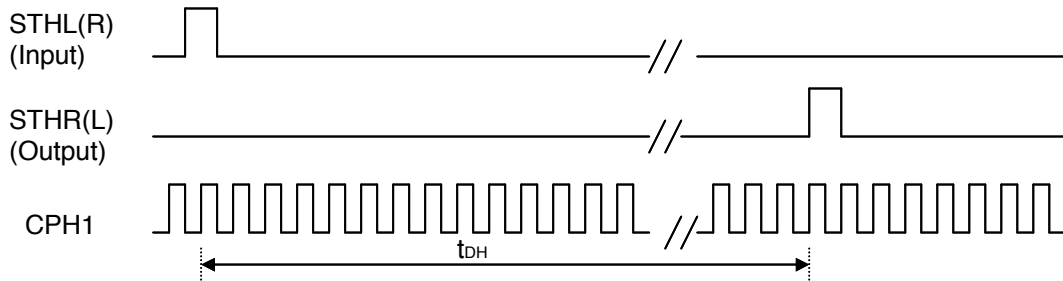
Note (2): Please don't use odd horizontal lines to drive LCD panel for both odd and even filed simultaneously.

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6.3 Timing Diagram of Interface Signal

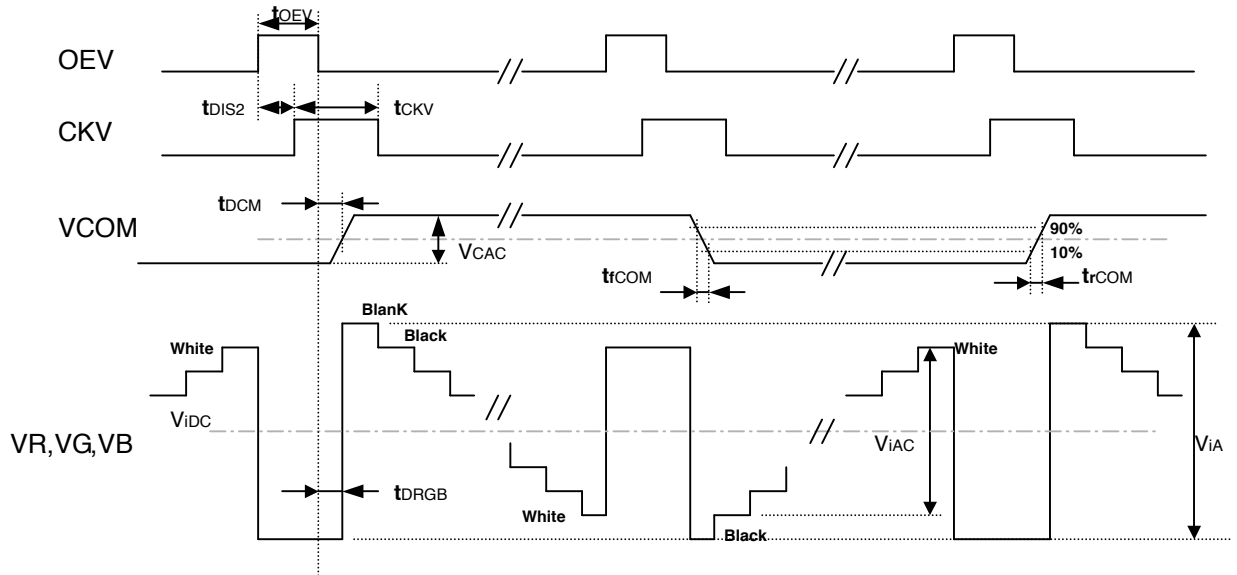


Sampling clock timing

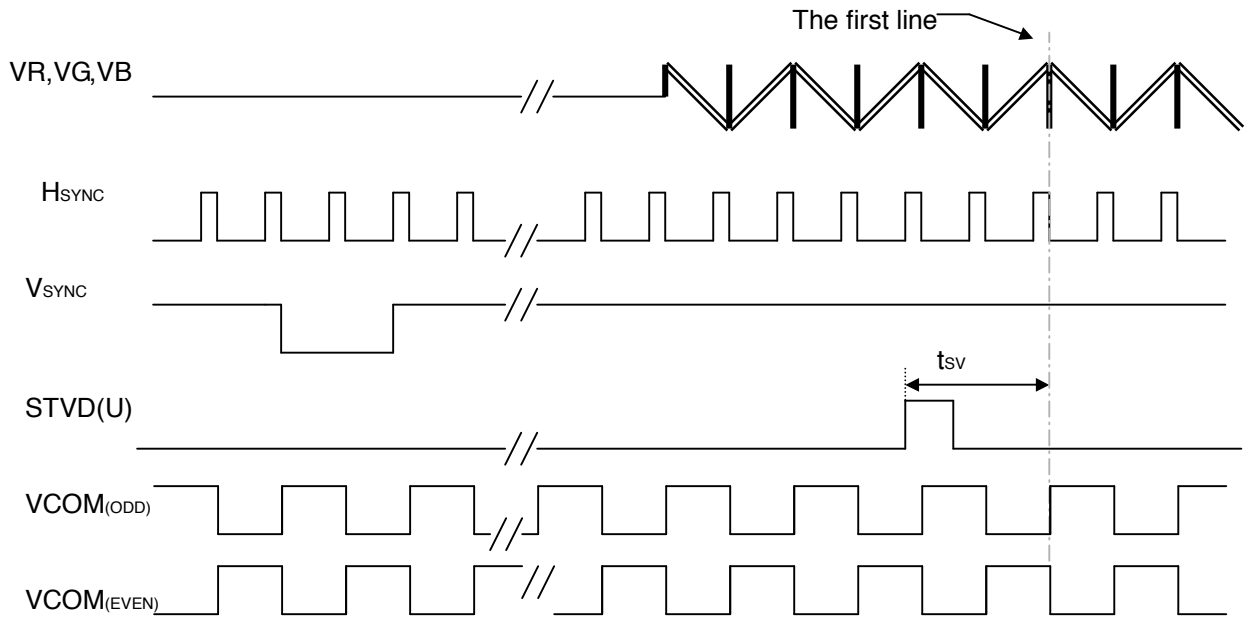


Horizontal display timing range

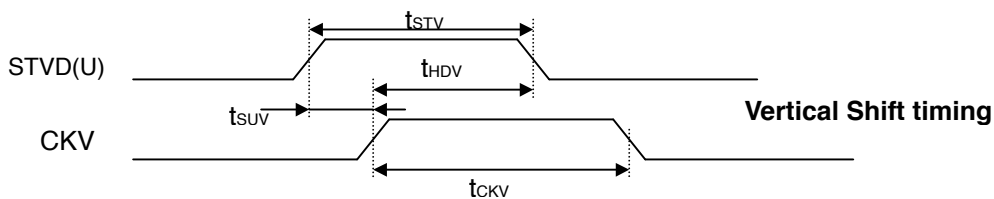
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Detail Horizontal timing



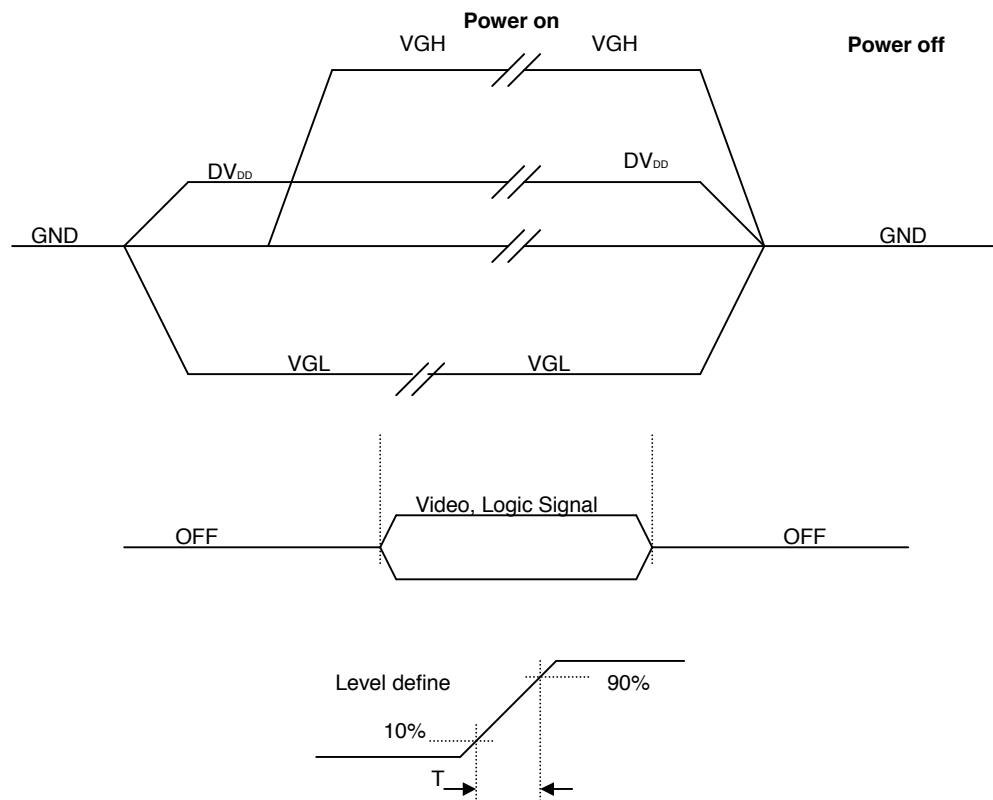
Vertical timing



Vertical Shift timing

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6.4 Power Sequence



Power Sequence: $DV_{DD} \rightarrow VGL \rightarrow VGH$

Note Apply the lamp voltage within the LCD operation range. When the back-light turns on before the LCD operation or the LCD turns off before the back-light turns off, the display may momentarily become white.

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8.0 Reliability test items

| No. | Item | Conditions | Remark |
|-----|--|--|--------|
| 1 | High Temperature Storage | Ta=+80°C, 240hrs | |
| 2 | Low Temperature Storage | Ta=-30°C, 240hrs | |
| 3 | High Temperature Operation | Ta=+70°C, 240hrs | |
| 4 | Low Temperature Operation | Ta=-20°C, 240hrs | |
| 5 | High Temperature and High Humidity (Operating) | Ta=+60°C, 90%RH, 240hrs | |
| 6 | Thermal Cycling Test (non operation) | -30°C(0.5hr) → +80°C(0.5hr), 200cycles | |
| 7 | Packing | <ol style="list-style-type: none"> 1. Sine, 1.5G, 5~200Hz, 1hr X,Y,Z direction 2. Random, 1.5Grms, 5~200Hz, 15min/ X,Y,Z direction 3. Half-Sine, 70G, 11ms+ X axis, 2 Times 4. Half-Sine, 200G, 2ms+ X axis, 2 Times 5. 90 degree topple to dash against the hard- face of table. | |
| 8 | Altitude Test (non operation) | 50000ft, 24hr (25°C) | |
| 9 | Altitude Test (operation) | 10000ft, 02hr (25°C) | |
| 10 | Pressure cooker Test | 121°C, 100%R.H., 2atm, 16hr/20hr | |
| 11 | Electrostatic Discharge | ± 200V, 200pF,0Ω | |

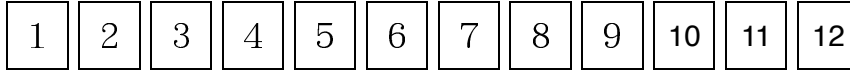
Note: All tests above are practiced at module type.

There is no display function NG issue occurred, all the cosmetic specification is judged before the reliability stress.

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9.0 LOT MARK

9.1 Lot Mark



code 1,2: HannStar internal flow control code.

code 3: production location.

code 4: production classification.

code 5: production year.

code 6: production month.

code 7,8,9,10,11,12: serial number.

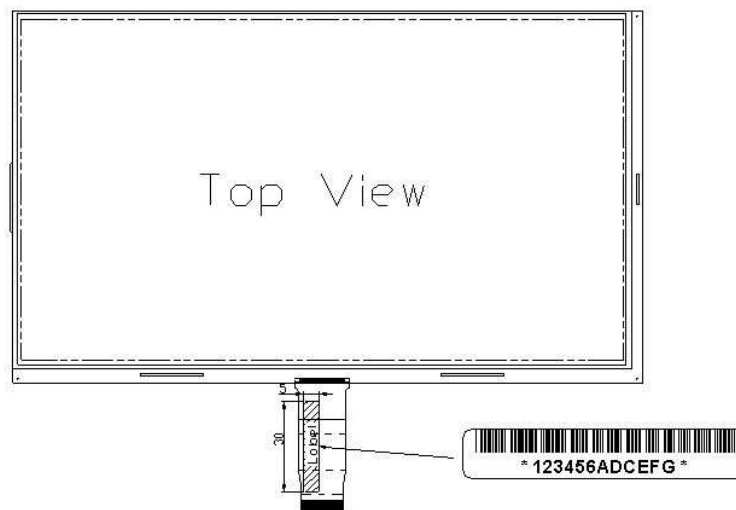
Note (1) Production Year

| | | | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|------|
| Year | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
| Mark | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C |

Note (2) Production Month

| | | | | | | | | | | | | |
|-------|------|------|------|------|------|------|------|------|------|-----|------|------|
| Month | Jan. | Feb. | Mar. | Apr. | May. | Jun. | Jul. | Aug. | Sep. | Oct | Nov. | Dec. |
| Mark | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C |

9.2 Location of Lot Mark





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10.0PACKAGE SPECIFICATION

TBD

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11.0 GENERAL PRECAUTION

11.1 Use Restriction

This product is not authorized for use in life supporting systems, aircraft navigation control systems, military systems and any other application where performance failure could be life-threatening or otherwise catastrophic.

11.2 ASSEMBLY PRECAUTION

- 10.2.1 Please use the mounting hole on the module side in installing and do not bending or wrenching LCD in assembling. And please do not drop, bend or twist LCD module in handling.
- 10.2.2 Please design display housing in accordance with the following guide lines.
 - 10.2.2.1 Housing case must be destined carefully so as not to put stresses on LCD all sides and not to wrench module. The stresses may cause on-uniformity even if there is no non-uniformity statically.
 - 10.2.2.2 Keep sufficient clearance between LCD module back surface and housing when the LCD module is mounted. The clearance in the design is recommended taking into account the tolerance of LCD module thickness and mounting structure height on the housing.
- 10.2.3 Please do not push or scratch LCD panel surface with any-thing hard. And do not soil LCD panel surface by touching with bare hands. (Polarizer film, surface of LCD panel is easy to be flawed.)
- 10.2.4 Please do not press any parts on the rear side such as source IC, gate IC, and FPC during handling LCD module. If pressing rear part is unavoidable, handle the LCD module with care not to damage them.
- 10.2.5 Please wipe out LCD panel surface with absorbent cotton or soft cloth in case of it being soiled.
- 10.2.6 Please wipe out drops of adhesives like saliva and water on LCD panel surface immediately. They might damage to cause panel surface variation and color change.
- 10.2.7 Please do not take a LCD module to pieces and reconstruct it. Resolving and reconstructing modules may cause them not to work well.

11.3 Disassembling or Modification

Do not disassemble or modify the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display. HannStar does not warrant the module, if customers disassemble or modify the module.

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11.4 Breakage of LCD Panel

- 10.4.1 If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid crystal, and do not contact liquid crystal with skin.
- 10.4.2 If liquid crystal contacts mouth or eyes, rinse out with water immediately.
- 10.4.3 If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.
- 10.4.4 Handle carefully with chips of glass that may cause injury, when the glass is broken.

11.5 Absolute Maximum Ratings and Power Protection Circuit

- 10.5.1 Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts' parameters, environmental temperature, etc., otherwise LCD module may be damaged.
- 10.5.2 Please do not leave LCD module in the environment of high humidity and high temperature for a long time.
- 10.5.3 It's recommended employing protection circuit for power supply.

11.6 Operation

- 10.6.1 Do not touch, push or rub the polarizer with anything harder than HB pencil lead. Use fingerstalls of soft gloves in order to keep clean display quality, when persons handle the LCD module for incoming inspection or assembly.
- 10.6.2 When the surface is dusty, please wipe gently with absorbent cotton or other soft material.
- 10.6.3 Wipe off saliva or water drops as soon as possible. If saliva or water drops contact with polarizer for a long time, they may causes deformation or color fading.
- 10.6.4 When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzine or other adequate solvent.

11.7 Static Electricity

- 10.6.3 Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.
- 10.7.2 Because LCD module uses CMOS-IC on TFT-LCD panel, it is very weak to electrostatic discharge. Please be careful with electrostatic discharge.
- 10.7.3 Persons who handle the module should be grounded through adequate methods.

11.8 Disposal

When disposing LCD module, obey the local environmental regulations(temperature 23±5humidity 60±10%)



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11.9 OTHERS

- 10.9.1 A strong incident light into LCD panel might cause display characteristics' changing inferior because of Polarizer film, color filter, and other materials becoming inferior. Please do not expose LCD module direct sunlight Land strong UV rays.
- 10.9.2 Please pay attention to a panel side of LCD module not to contact with other materials in preserving it alone.
- 10.9.3 For the. packaging box, please pay attention to the followings:
 - 10.9.3.1 Packaging box and inner case for LCD are designed to protect the LCDs from the damage or scratching during transportation. Please do not open except picking LCDs up from the box.
 - 10.9.3.2 Please do not pile them up more than 6 boxes. (They are not designed so.) And please do not turn over.
 - 10.9.3.3 Please handle packaging box with care not to give them sudden shock and vibrations. And also please do not throw them up.
 - 10.9.3.4 Packing box and inner case for LCDs are made of cardboard. So please pay attention not to get them wet. (Such like keeping them in high humidity or wet place can occur getting them wet.)