



Document Title	HSD050IDW1-A20-0299 Formal Specification	Page No.	1/26
Document No.		Revision	1.5

TO :

Date : Sep., 25, 2009

# **HannStar Product Specification** **(Formal)**

## **5.0” Color TFT-LCD Open Cell**

**Model : HSD050IDW1-A\*\*-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.
3. The mark “\*\*” of Model means sub-model code.



Document Title	HSD050IDW1-A20-0299 Formal Specification	Page No.	2/26
Document No.		Revision	1.5

### Record of Revisions

Rev.	Date	Sub-Model	Description of change
1.5	Sep, 25, 2009	A20-0299	Formal Product Specification was first released.

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Document Title	HSD050IDW1-A20-0299 Formal Specification	Page No.	3/26
Document No.		Revision	1.5

## Contents

1.0	General description .....	p.4
2.0	Absolute maximum ratings .....	p.5
3.0	Optical characteristics .....	p.6
4.0	Block diagram .....	p.10
5.0	Input interface pin assignment .....	p.11
6.0	Electrical characteristics .....	p.12
7.0	Reliability test items.....	p.17
8.0	Outline dimension .....	p.18
9.0	Lot mark .....	p.19
10.0	Package specification .....	p.20
11.0	General precaution .....	p.22

Document Title	HSD050IDW1-A20-0299 Formal Specification	Page No.	4/26
Document No.		Revision	1.5

## GENERAL DESCRIPTION

### 1.1 Introduction

HannStar Display model HSD050IDW1-A00-0299 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. This TFT LCD has a 5.0 (15:9) inch diagonally measured active display area with WVGA (800 horizontal by 480 vertical pixel) resolution.

### 1.2 Features

- 5.0 (15:9 diagonal) inch configuration
- 6 bits + FRC driver with 1 channel TTL interface
- RoHS and Halogen-Free Compliance

### 1.3 Applications

- Personal Navigation Device
- Multimedia applications and Others AV system

### 1.4 General information

Item	Specification	Unit
Outline Dimension	114.8 x 73.2 x 1.43 (Typ.)	mm
Display area	108.0(H) x 64.8(V)	mm
Number of Pixel	800 RGB (H) x 480(V)	pixels
Pixel pitch	0.135(H) x 0.135(V)	mm
Pixel arrangement	RGB Vertical stripe	
Display mode	Normally white	

Document Title	HSD050IDW1-A20-0299 Formal Specification	Page No.	5/26
Document No.		Revision	1.5

## 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	$V_{DD}$	-0.5	5.0	V	GND=0
Logic Signal Input Level	$V_i$	-0.3	$V_{DD} + 0.3$	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	$^\circ\text{C}$	

Document Title	HSD050IDW1-A20-0299 Formal Specification	Page No.	6/26
Document No.		Revision	1.5

### 3.0 OPTICAL CHARACTERISTICS

#### 3.1 Optical specification

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Threshold voltage	V <sub>sat</sub>		—	2.4	—		(6)
	V <sub>th</sub>		—	1.4	—		(6)
Transmittance (With PZ)	T		—	6.78	—		
Contrast	CR		480	600	—		(1)(2)
Response time	Rising	T <sub>R</sub>	—	3	6	msec	(1)(3)
	Falling	T <sub>F</sub>	—	7	14		
Color gamut	S		—	50	—	%	C light
Color chromaticity (CIE1931)	White	W <sub>x</sub>	θ=0 Normal viewing angle	0.292	0.307	0.322	(1)(4) CF Glass C light
		W <sub>y</sub>		0.333	0.348	0.363	
	Red	R <sub>x</sub>		0.616	0.631	0.646	
		R <sub>y</sub>		0.327	0.342	0.357	
	Green	G <sub>x</sub>		0.306	0.321	0.336	
		G <sub>y</sub>		0.538	0.553	0.568	
	Blue	B <sub>x</sub>		0.134	0.149	0.164	
		B <sub>y</sub>		0.168	0.183	0.198	
Viewing angle	Hor.	θ <sub>L</sub>	CR>10	65	75	—	
		θ <sub>R</sub>		65	75	—	
	Ver.	θ <sub>U</sub>		50	60	—	
		θ <sub>D</sub>		60	70	—	
Optima View Direction	6 O' clock						(5)

#### 3.2 Measuring Condition

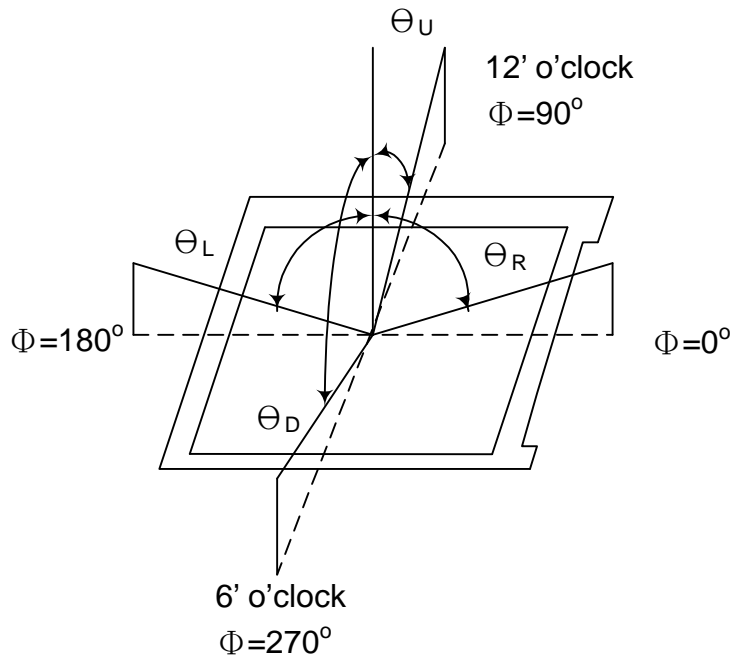
- Measuring surrounding: dark room
- Ambient temperature: 25±2°C

#### 3.3 Measuring Equipment

- FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.
- Measuring spot size: 20 ~ 21m

Document Title	HSD050IDW1-A20-0299 Formal Specification	Page No.	7/26
Document No.		Revision	1.5

Note (1) Definition of Viewing Angle:

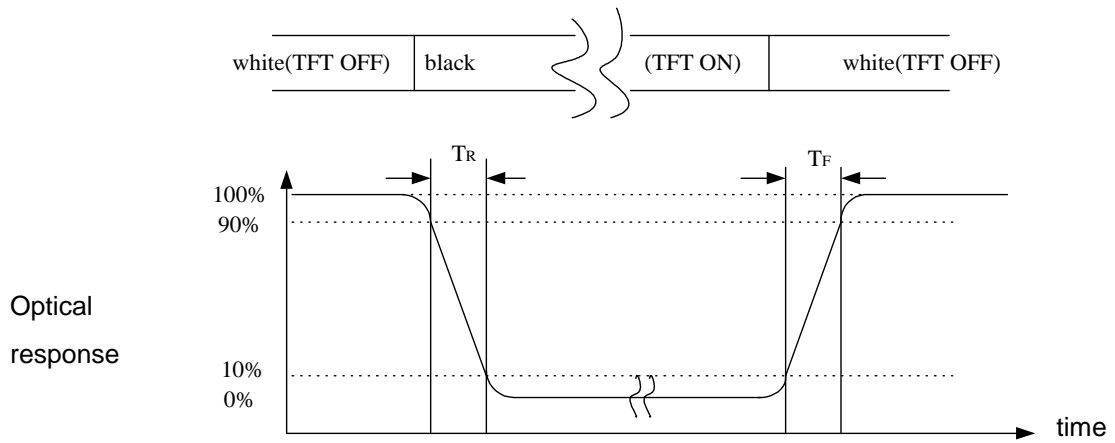


Note (2) Definition of Contrast Ratio (CR):  
 Measured at the center point of panel

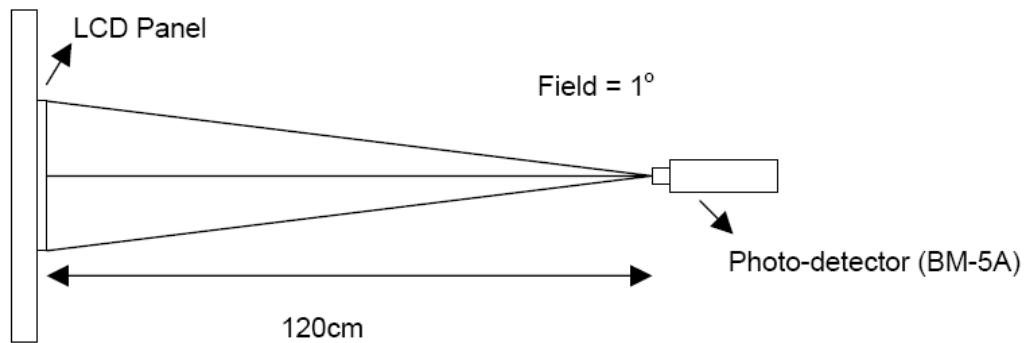
$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

Document Title	HSD050IDW1-A20-0299 Formal Specification	Page No.	8/26
Document No.		Revision	1.5

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



Note (4) Definition of optical measurement setup

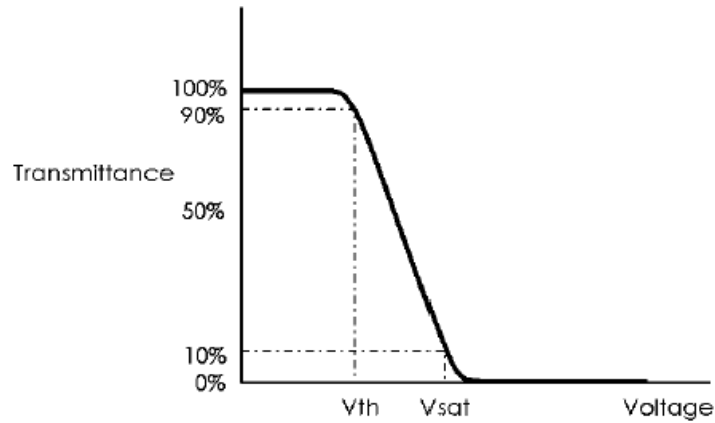




Document Title	HSD050IDW1-A20-0299 Formal Specification	Page No.	9/26
Document No.		Revision	1.5

Note (5) Rubbing Direction (The different Rubbing Direction will cause the different optimal view direction.)

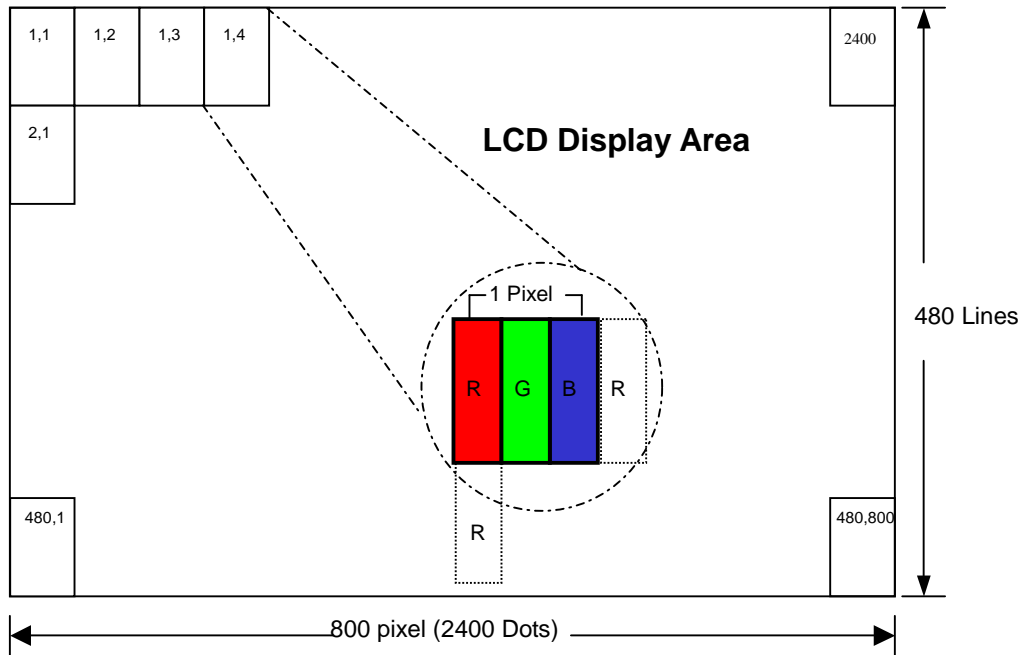
Note (6) Definition of  $V_{sat}$  and  $V_{th}$  (at 20°C)



Document Title	HSD050IDW1-A20-0299 Formal Specification	Page No.	10/26
Document No.		Revision	1.5

#### 4.0 BLOCK DIAGRAM

##### 4.1 Pixel Format



Document Title	HSD050IDW1-A20-0299 Formal Specification	Page No.	11/26
Document No.		Revision	1.5

## 5.0 INPUT INTERFACE PIN ASSIGNMENT

FPC connector is used for electronics interface.

The recommended model is FH19SC-40S-0.5SH (51) manufactured by HIROSE.

Pin No.	Symbol	I/O	Function
1	V <sub>LED-</sub>	P	Power for LED backlight cathode
2	V <sub>LED+</sub>	P	Power for LED backlight anode
3	GND	P	Power ground
4	V <sub>DD</sub>	P	Power voltage
5	R0	I	Red data (LSB)
6	R1	I	Red data
7	R2	I	Red data
8	R3	I	Red data
9	R4	I	Red data
10	R5	I	Red data
11	R6	I	Red data
12	R7	I	Red data (MSB)
13	G0	I	Green data (LSB)
14	G1	I	Green data
15	G2	I	Green data
16	G3	I	Green data
17	G4	I	Green data
18	G5	I	Green data
19	G6	I	Green data
20	G7	I	Green data (MSB)
21	B0	I	Blue data (LSB)
22	B1	I	Blue data
23	B2	I	Blue data
24	B3	I	Blue data
25	B4	I	Blue data
26	B5	I	Blue data
27	B6	I	Blue data
28	B7	I	Blue data (MSB)
29	DGND	I	Digital ground
30	DCLK	I	Pixel clock
31	DISP	I	Display on/ off
32	HSYNC	I	Horizontal sync signal
33	VSYSN	I	Vertical sync signal
34	DE	I	Data enable
35	NC	-	No Connect
36	GND	P	Power ground
37	X_R	I/O	Right electrode - differential analog
38	Y_B	I/O	Bottom electrode - differential analog
39	X_L	I/O	Left electrode - differential analog
40	Y_T	I/O	Top electrode - differential analog

I/O: I: input, O: output, P: power



Document Title	HSD050IDW1-A20-0299 Formal Specification	Page No.	12/26
Document No.		Revision	1.5

## 6.0 ELECTRICAL CHARACTERISTICS

### 6.1 TFT LCD Module

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply voltage	$V_{DD}$	3.0	3.3	3.6	V	
Input signal voltage	$V_{iH}$	$0.7 V_{DD}$	-	$V_{DD}$	V	Note (1)
	$V_{iL}$	GND	-	$0.3 V_{DD}$	V	Note (1)
Current of power supply	$I_{DD}$	-	-	220	mA	$V_{DD} = 3.3V$

Note (1): HSYNC, VSYNC, DE, R/G/B Data

Note (2): GND=0V

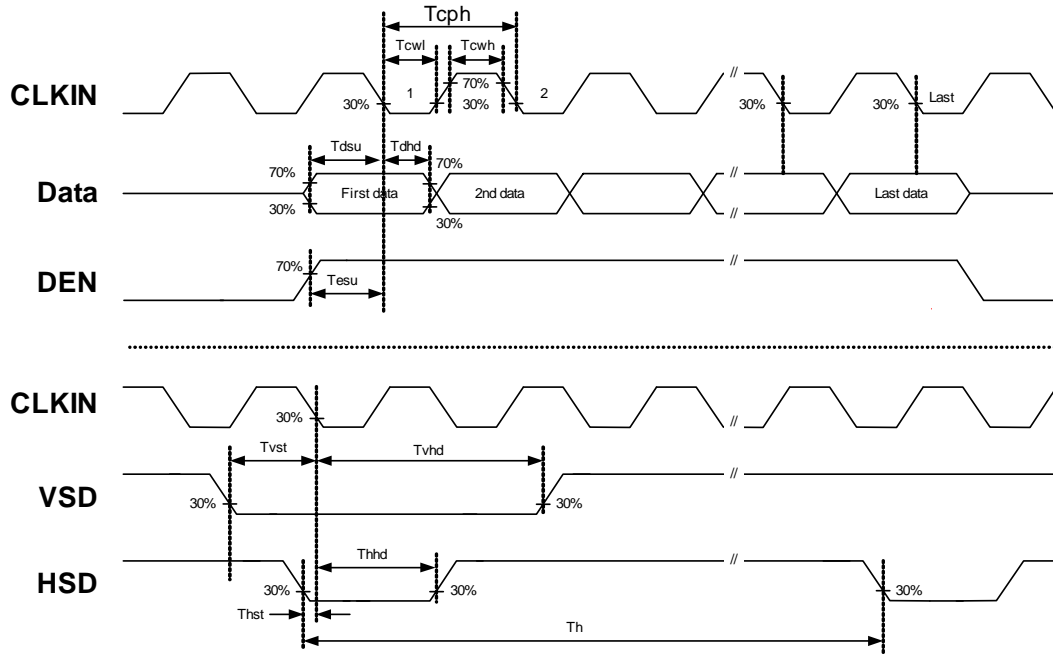
Document Title	HSD050IDW1-A20-0299 Formal Specification	Page No.	13/26
Document No.		Revision	1.5

## 6.2 AC Characteristics

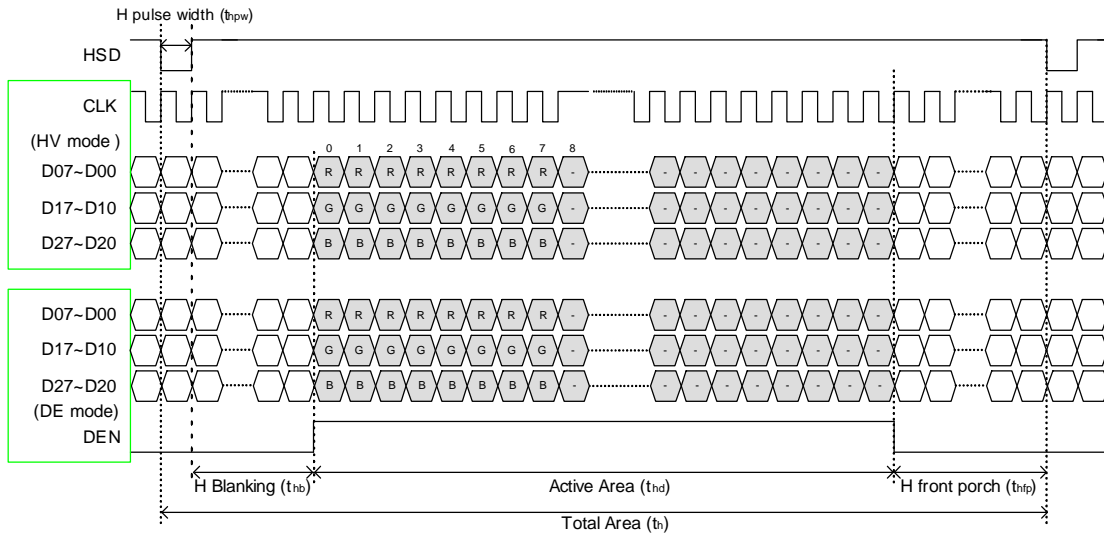
Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK cycle time	Tclk	25			ns	
DCLK frequency	fclk		33	40	MHz	
DCLK pulse duty	Tcwh	40	50	60	%	
VSYNC setup time	Tvst	8			ns	
VSYNC hold time	Tvhd	8			ns	
HSYNC setup time	Thst	8			ns	
HSYNC hold time	Thhd	8			ns	
Data setup time	Tdasu	8			ns	
Data hold time	Tdahd	8			ns	
DE setup time	Tdesu	8			ns	
DE hold time	Tdehd	8			ns	
Horizontal display area	Thd		800		Tcph	
HSYNC period time	Th		928		Tcph	
HSYNC width	Thwh	1	48		Tcph	
HSYNC back porch	Thbp		40		Tcph	
HSYNC front porch	Thfp		40		Tcph	
Vertical display area	Tvd		480		th	
VSYNC period time	Tv		525		th	
VSYNC width	Tvwh		3		th	
VSYNC back porch	Tvbp		29		th	
VSYNC front porch	Tvfp		13		th	

Document Title	HSD050IDW1-A20-0299 Formal Specification	Page No.	14/26
Document No.		Revision	1.5

### 6.3 Timing Diagram of Interface Signal

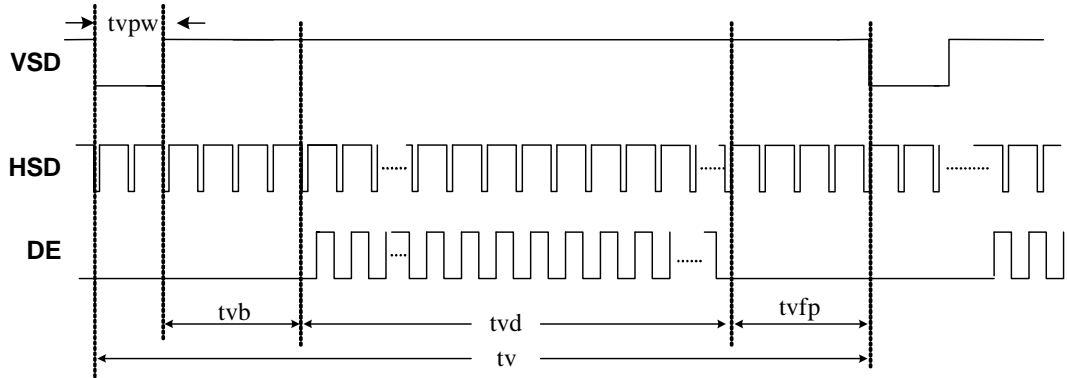


Sampling clock timing



Horizontal display timing range

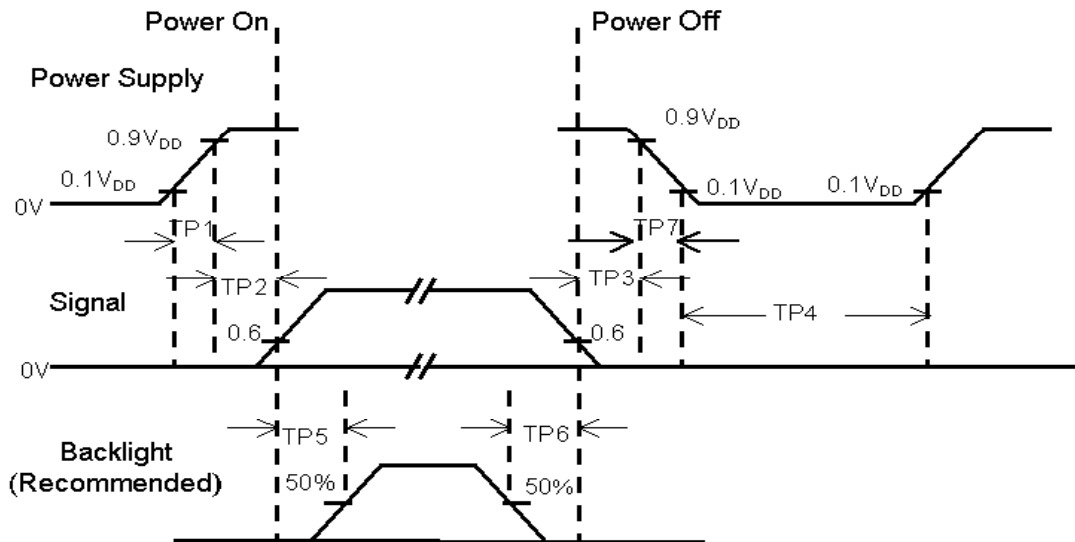
Document Title	HSD050IDW1-A20-0299 Formal Specification	Page No.	15/26
Document No.		Revision	1.5



Vertical timing

Document Title	HSD050IDW1-A20-0299 Formal Specification	Page No.	16/26
Document No.		Revision	1.5

### 6.4 Power Sequence



Item	Min.	Typ.	Max.	Unit	Remark
TP1	0.5	--	10	msec	
TP2	0	--	50	msec	
TP3	0	--	50	msec	
TP4	1000	--	--	msec	
TP5	200	--	--	msec	
TP6	200	--	--	msec	
TP7	0.5	--	10	msec	

- Note :**
- (1) The supply voltage of the external system for the module input should be the same as the definition of  $V_{DD}$ .
  - (2) 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.
  - (3) In case of  $V_{DD}$  = off level, please keep the level of input signal on the low or keep a high impedance.
  - (4) TP4 should be measured after the module has been fully discharged between power off and on period.
  - (5) Interface signal shall not be kept at high impedance when the power is on.



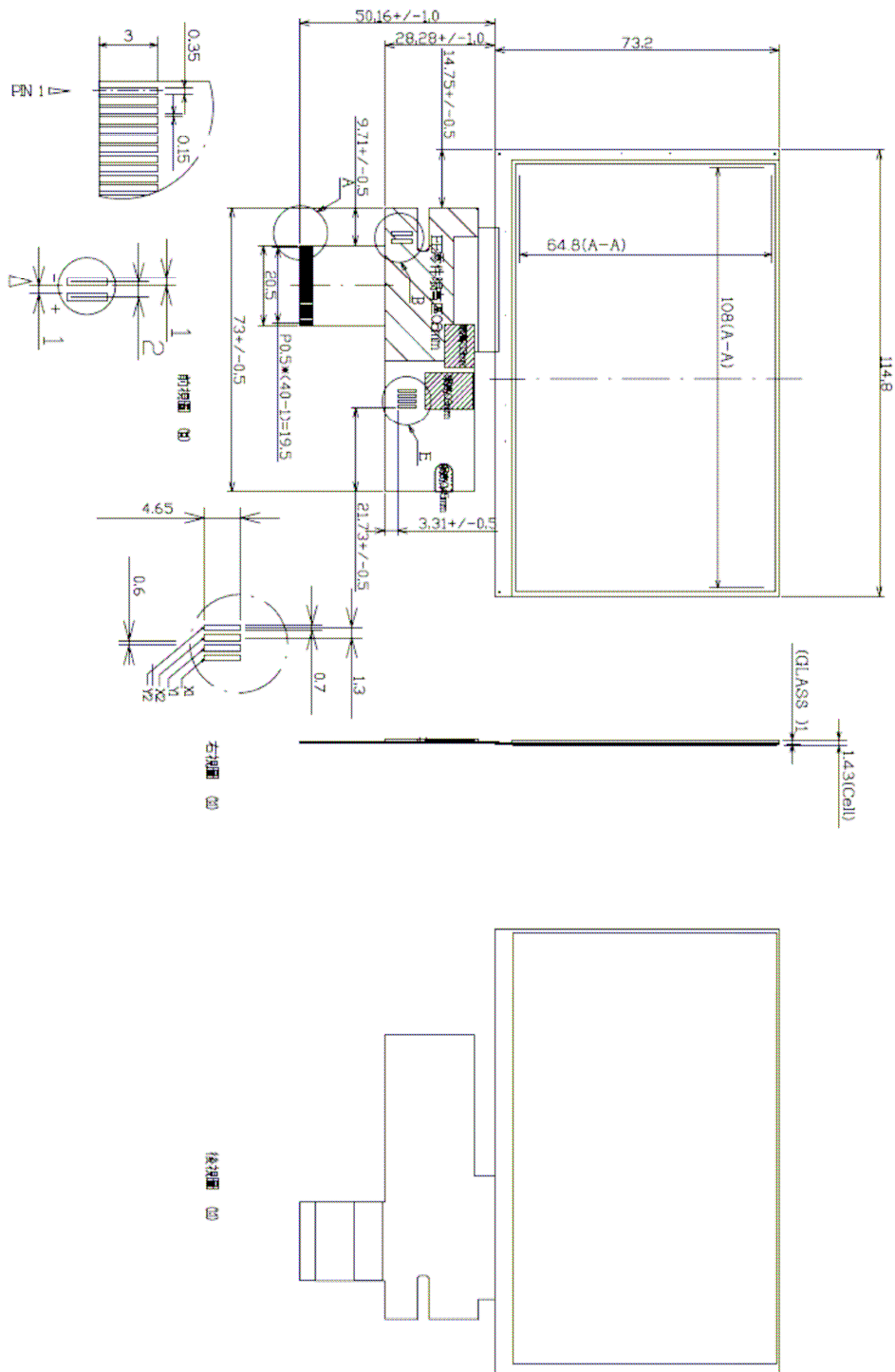
Document Title	HSD050IDW1-A20-0299 Formal Specification	Page No.	17/26
Document No.		Revision	1.5

## 7.0 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 (operation)	Ta=+60°C, 90%RH, 240hrs	
6	Thermal Cycling Test (non operation)	-30°C(30min) → +80°C(30min), 200cycles	
7	Electrostatic Discharge	±200V,200pF(0Ω) 1 time/each terminal	
8	Vibration	1.Random: 1.04Grms, 5~500Hz, X/Y/Z, 30min/each direction 2. Sine: Freq. Range: 8~33.3Hz Stoke: 1.3mm Sweep: 2.9G, 33.3~400Hz X/Z: 2hr, Y: 4hr, cyc: 15min	
9	Shock	100G, 6ms, ±X, ±Y, ±Z 3 time for each direction	JIS C7021, A-10 (Condition A)
10	Vibration (with carton)	Random: 0.015G <sup>2</sup> /Hz, 5~200Hz -6dB/Octave, 200~400Hz XYZ each direction: 2hr	
11	Drop (with carton)	Height: 60cm 1 corner, 3 edges, 6 surfaces	JIS Z0202

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

Document Title	HSD050IDW1-A20-0299 Formal Specification	Page No.	18/26
Document No.		Revision	1.5

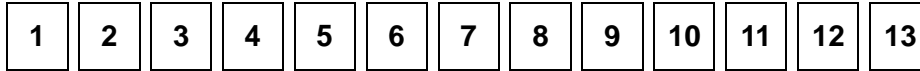
**8.0 OUTLINE DIMENSION****Unit: mm****Note: General Tolerance: +/- 0.3mm**

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Document Title	HSD050IDW1-A20-0299 Formal Specification	Page No.	19/26
Document No.		Revision	1.5

## 9.0 LOT MARK

### 9.1 Lot Mark



code 1,2,3: HannStar internal flow control code.

code 4: production location.

code 5: production classification.

code 6: production year.

code 7: production month.

code 8,9,10,11,12,13: serial number.

Note (1) Production Year

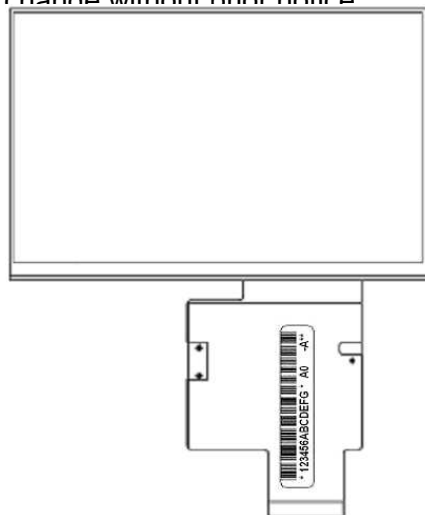
<b>Year</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>
<b>Mark</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>A</b>	<b>B</b>	<b>C</b>

Note (2) Production Month

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

### 9.2 Location of Lot Mark

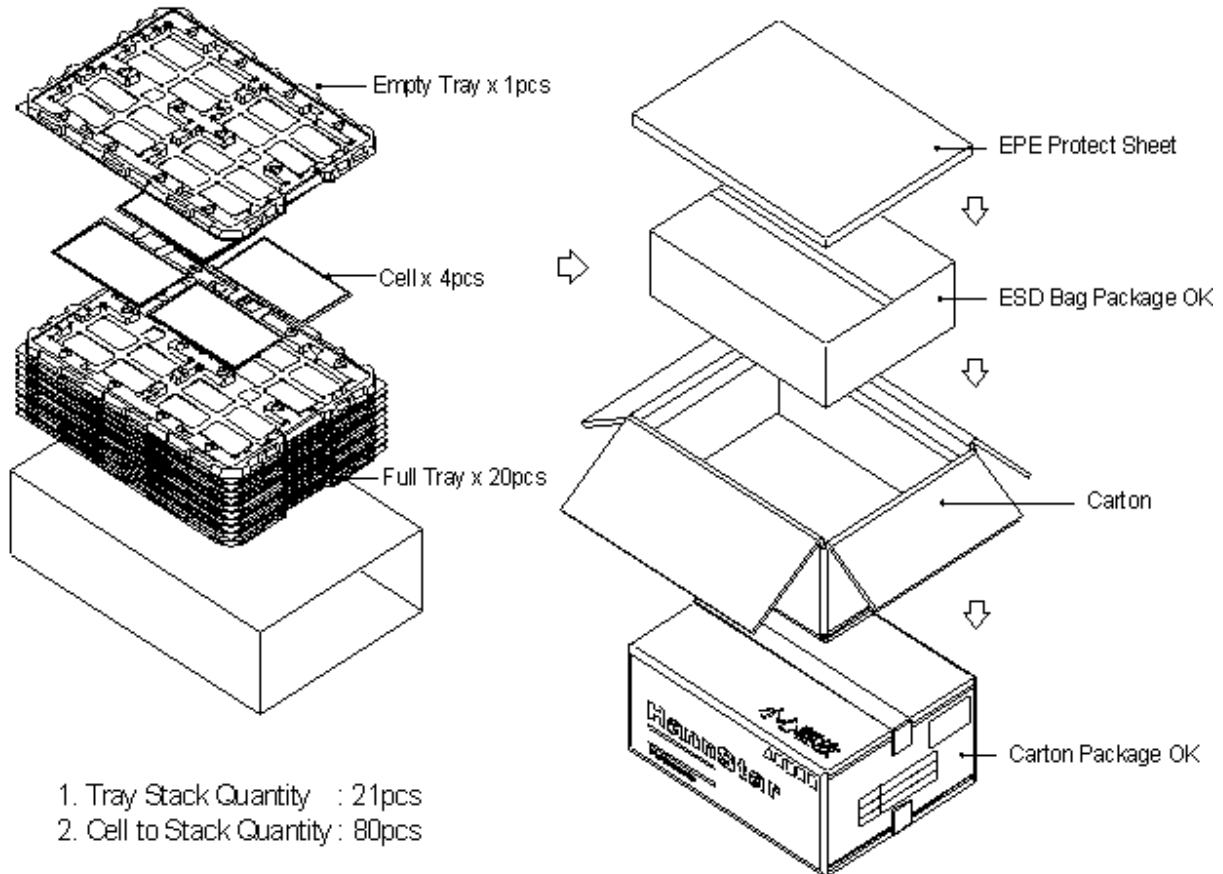
- (1) The label is attached to the backside of the LCD panel.
- (2) This is subject to change without prior notice.



Document Title	HSD050IDW1-A20-0299 Formal Specification	Page No.	20/26
Document No.		Revision	1.5

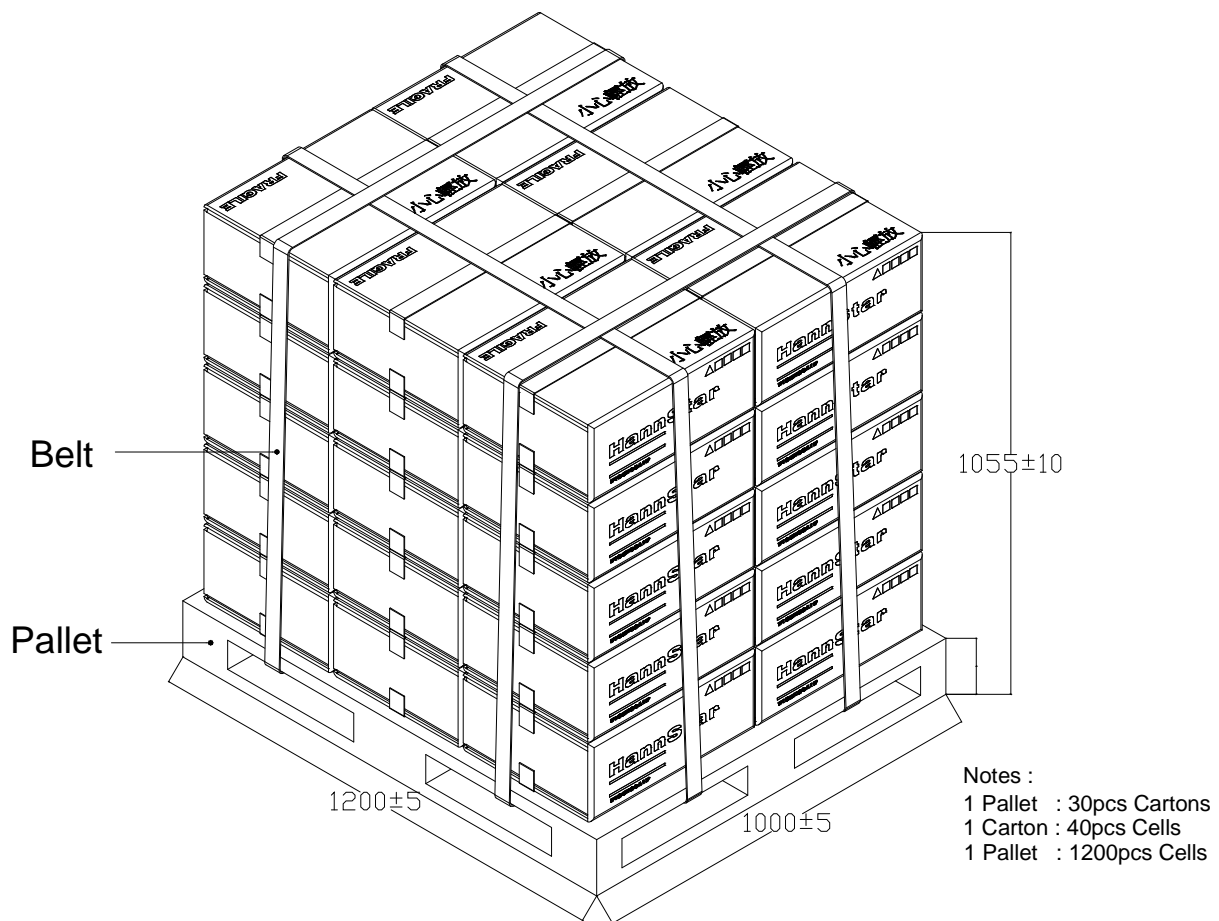
## 10.0 PACKAGE SPECIFICATION

### 10.1 5.0 inch Open Cell Package



Document Title	HSD050IDW1-A20-0299 Formal Specification	Page No.	21/26
Document No.		Revision	1.5

### 10.2 Pallet drawings



Document Title	HSD050IDW1-A20-0299 Formal Specification	Page No.	22/26
Document No.		Revision	1.5

## 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 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.

### 11.3 Breakage of LCD Panel

11.3.1. 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.

11.3.2. If liquid crystal contacts mouth or eyes, rinse out with water immediately.

11.3.3. If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.

11.3.4. Handle carefully with chips of glass that may cause injury, when the glass is broken.

### 11.4 Electric Shock

11.4.1. Disconnect power supply before handling LCD module.

11.4.2. Do not pull or fold the LED cable.

11.4.3. Do not touch the parts inside LCD modules and the fluorescent LED's connector or cables in order to prevent electric shock.

### 11.5 Absolute Maximum Ratings and Power Protection Circuit

11.5.1. 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.

11.5.2. Please do not leave LCD module in the environment of high humidity and high temperature for a long time.

11.5.3. It's recommended to employ protection circuit for power supply.

### 11.6 Operation

11.6.1 Do not touch, push or rub the polarizer with anything harder than HB pencil lead.

11.6.2 Use fingerstalls of soft gloves in order to keep clean display quality, when persons handle the LCD module for incoming inspection or assembly.

11.6.3 When the surface is dusty, please wipe gently with absorbent cotton or other soft material.

Document Title	HSD050IDW1-A20-0299 Formal Specification	Page No.	23/26
Document No.		Revision	1.5

11.6.4 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.

11.6.5 When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzine or other adequate solvent.

### **11.7 Mechanism**

Please mount LCD module by using mounting holes arranged in four corners tightly.

### **11.8 Static Electricity**

11.8.1 Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.

11.8.2. Because LCD module use CMOS-IC on circuit board and TFT-LCD panel, it is very weak to electrostatic discharge. Please be careful with electrostatic discharge. Persons who handle the module should be grounded through adequate methods.

### **11.9 Strong Light Exposure**

The module shall not be exposed under strong light such as direct sunlight. Otherwise, display characteristics may be changed.

### **11.10 Disposal**

When disposing LCD module, obey the local environmental regulations.