TO :

Date : JAN 16,2006

HannStar Product Information

(Preliminary)

10.2” Color TFT-LCD Module

Model : HSD102IDW1-A**

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.

Record of Revisions

Rev.	Date	Description of change
1.0	JAN 16, 2007	Product Information was first issued.

Contents

1.0 GENERAL DESCRIPTION

1.1 Introduction

HannStar Display model HSD102IDW1-A 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 10.2 (15:9) inch diagonally measured active display area with 2400 x 480 dot (800 horizontal by 480vertical pixel) resolution.

1.2 Features

- 10.2 (15:9 diagonal) inch configuration
- Portable DVD Player
- ROHS design

1.3 General information

Item	Specification	Unit
Outline Dimension	235(H) x 145.8(V)	mm
Display area	222.00(H) x 132.48(V)	mm
Number of Pixel	800 RGB(H) x 480(V)	pixels
Pixel pitch	0.2775(H) x 0.276(V)	mm
Pixel arrangement	RGB Vertical stripe	
Display mode	Normally white	

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	V	GND=0
	V_{GH}	-0.3	40	V	GND=0
	V_{GL}	-20	0.3	V	GND=0
	AV_{DD}	-0.5	13.5	V	AGND=0
Input Signal voltage	V_I	-0.5	VDD+0.5	V	
	VGMA(1~7)	0.4AVcc	AV_{DD}-0.1	V	
	VGMA(8~14)	0.1	$0.6AV_{DD}$	V	

2.1.2Back-Light Unit

Item	Symbol	Min.	Max.	Unit	Note
Lamp current	I_L	5.5	6.5	mA	
Lamp frequency	f_L	30	80	KHz	

2.2 Environment Absolute Rating

Item	Symbol	Min.	Max.	Unit	Note
Operating Temperature	T_{opa}	-30	85	℃	
Storage Temperature	T_{stg}	-40	85	℃	

3.0 OPTICAL CHARACTERISTICS

3.1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	Θ=0 Normal viewing angle	400	500	—	—	(1)(2)
Response time		T_R		—	5	10	msec	(1)(3)
		T_F			20	25	msec	
Color gamut		S			50%		%	
Color chromaticity (CIE1931)	White	W_x		0.282	0.312	0.342		(1)(4)
		Wy		0.301	0.331	0.361		
Viewing angle	Hor.	Θ_L	CR>10	60	70	—		
		Θ_R		60	70	—		
	Ver.	Θ_U		45	55	—		
		Θ_D		55	65	—		
Brightness uniformity	B_{UNI}	Θ=0		70	—	—	%	(5)
Optima View Direction		6 O'clock						(6)

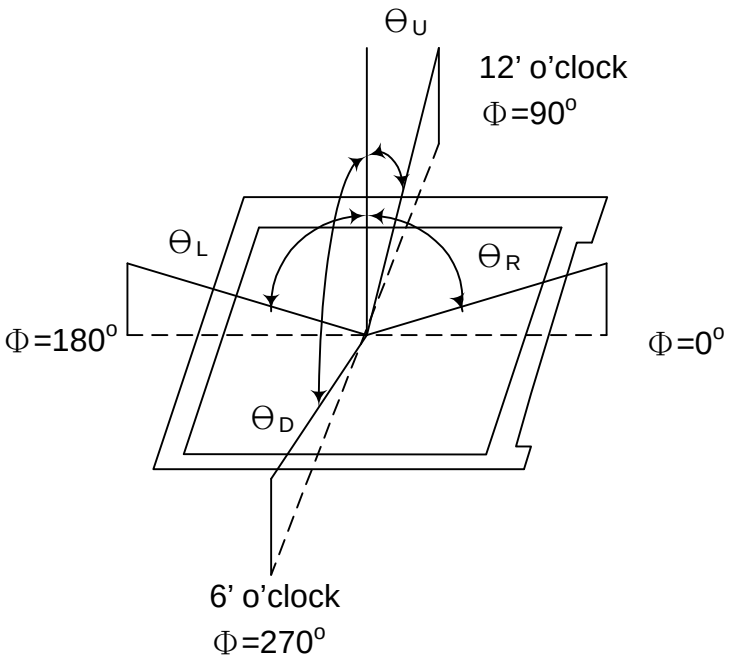
■ **Measuring Condition**

- ■ Measuring surrounding : dark room
- ■ Ambient temperature : 25±2°C
- ■ 30min. warm-up time.

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

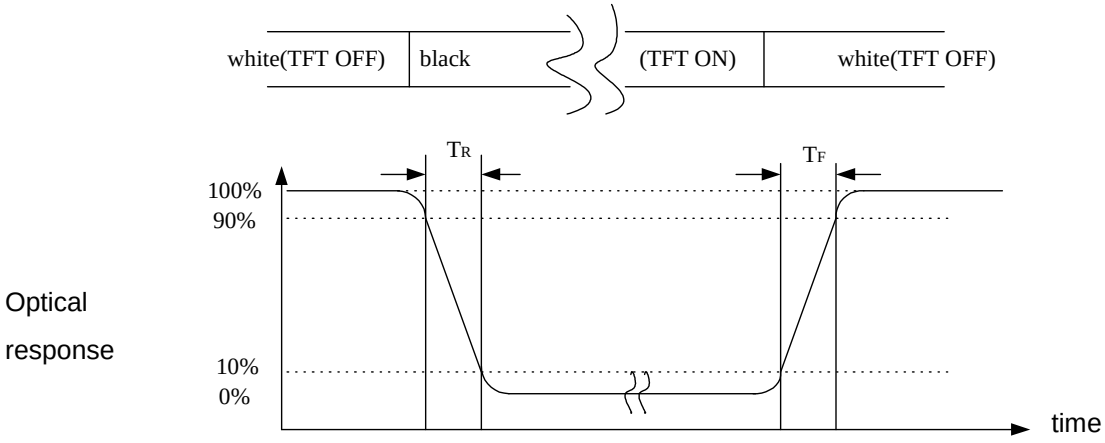
Note (1) Definition of Viewing Angle :



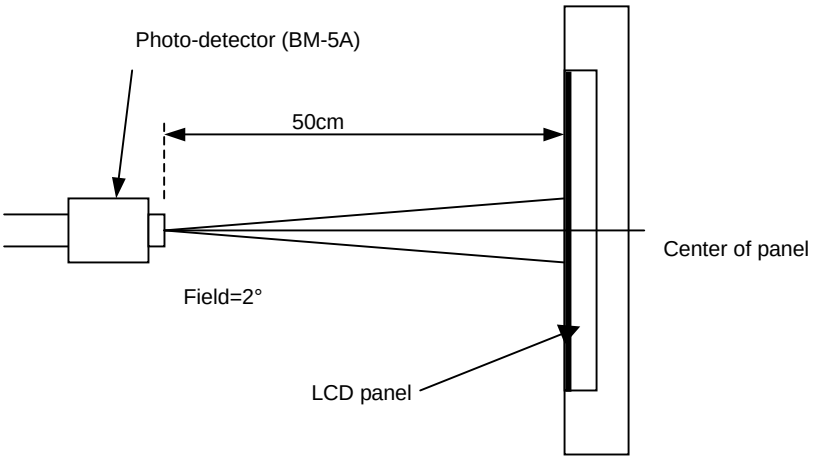
Note (2) Definition of Contrast Ratio(CR) :
measured at the center point of panel

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

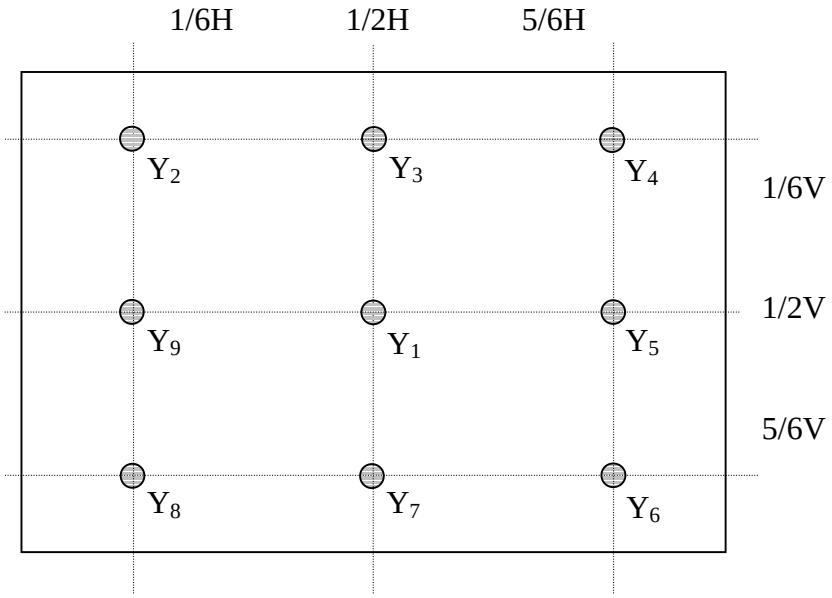
Note (3) Definition of Response Time : Sum of T_R and T_F



Note (4) Definition of optical measurement setup



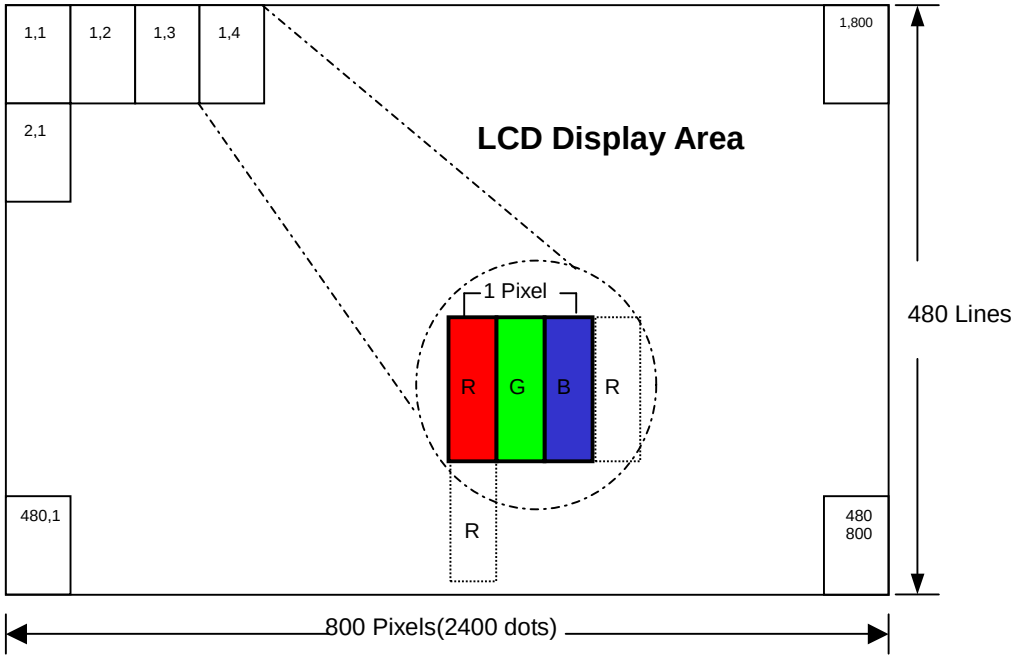
Note (5) Definition of brightness uniformity



$$\text{Luminance uniformity} = \frac{\text{(Min Luminance of 9 points)}}{\text{(Max Luminance of 9 points)}} \times 100\%$$

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

4.0 Pixel Format



5.0 INTERFACE PIN CONNECTION

5.1 System pin assignment

Terminal no.	Symbol	I/O	Description	Note
1	POL	I	Polarity Setting	
2	STVD	I/O	Vertical Line start pulse I/O signal	
3	OE123R	O	Vertical Line output Enable signal	
4	G-CLKR	I	Vertical Line Clock	
5	STVU	I/O	Vertical Line start pulse I/O signal	
6	GND	-	Digital Power Ground	
7	EDGSEL	I	Rising/Falling Selection	
8	VCC	-	Digital Voltage Input	
9	V9	I	Gamma Voltage Input	
10	VEER	-	GateOFF Voltage	
11	V2	I	Gamma Voltage Input	
12	VGGR	-	GateON Voltage	
13	V6	I	Gamma Voltage Input	
14	U/RD	I	Vertical Scanning Line Direction Selection	
15	VCOM	-	Common Voltage	
16	AGND	-	Analog Power Ground	
17	AVDD	-	Analog Voltage Input	
18	V14	I	Gamma Voltage Input	
19	V11	I	Gamma Voltage Input	
20	V8	I	Gamma Voltage Input	
21	V5	I	Gamma Voltage Input	
22	V3	I	Gamma Voltage Input	
23	GND	-	Digital Power Ground	
24	R5	I	Red Data Bus Input (MSB)	
25	R4	I	Red Data Bus Input	
26	R3	I	Red Data Bus Input	
27	R2	I	Red Data Bus Input	
28	R1	I	Red Data Bus Input	
29	R0	I	Red Data Bus Input (LSB)	
30	GND	-	Digital Power Ground	
31	GND	-	Digital Power Ground	
32	G5	I	Green Data Bus Input (MSB)	
33	G4	I	Green Data Bus Input	
34	G3	I	Green Data Bus Input	
35	G2	I	Green Data Bus Input	
36	G1	I	Green Data Bus Input	
37	G0	I	Green Data Bus Input (LSB)	
38	DIO2_COF3	I/O	Horizontal Line start pulse I/O signal(STHR)	
39	REV	I	Data Invert signal	
40	GND	-	Digital Power Ground	
41	CLK	I	Pixel clock	
42	VCC	-	Digital Voltage Input	
43	DIO1_COF1	I	Horizontal Line start pulse I/O signal(STHL)	

44	LD	O	Polarity latch and reflash new data to output	
45	B5	I	Blue Data Bus Input (MSB)	
46	B4	I	Blue Data Bus Input	
47	B3	I	Blue Data Bus Input	
48	B2	I	Blue Data Bus Input	
49	B1	I	Blue Data Bus Input	
50	B0	I	Blue Data Bus Input (LSB)	
51	SHL	-	Horizontal Scanning Line direction Selection	
52	V1	I	Gamma Voltage Input	
53	V4	I	Gamma Voltage Input	
54	V7	I	Gamma Voltage Input	
55	V10	I	Gamma Voltage Input	
56	V12	I	Gamma Voltage Input	
57	V13	I	Gamma Voltage Input	
58	AVDD	-	Analog Voltage Input	
59	AGND	-	Analog Power Ground	
60	VCOM	-	Common Voltage	

6.0 ELECTRICAL CHARACTERISTICS

6.1 TFT LCD Module

DC Electrical Characteristics

Parameter	Symbol	Min	Typ.	Max.	Unit	Note
Supply Voltage	V_{DD}	3.0	3.3	3.6	V	
	V_{GH}	10.0		35	V	
	V_{GL}	-15		-3	V	
	V_{GH} - V_{GL}	15.0		40.0	V	
	V_{COM}	7		Vgl+35	V	
Low Level Input Voltage	Vil	0	-	$0.3V_{DD}$	V	
High Level Input Voltage	Vih	0.7 V_{DD}	-	V_{DD}	V	
High Level Output Voltage	Voh	V_{DD} -0.4	-	V_{DD}	V	
Low Level Output Voltage	Vol	Gnd	-	Gnd+0.4	V	
Sinking Current of Outputs	IOL	|-80|	-	-	uA	
Driving Current of Outputs	IOH	80	-	-	uA	
Supply Analog Voltage	AV_{DD}	6.5	10	13.5	V	
Input level V1 ~ V7	V_{GMA} 1~7	0.4AVDD	-	AV_{DD}-0.1	V	
Input level V8 ~ V14	V_{GMA} 8~14	0.1	-	$0.6AV_{DD}$	V	
Current for driver	I_{GG}	-	100	-	uA	V_{GG}=25
	I_{EE}	-	-100	-	uA	V_{EE}=-15
	I_{CC}	-	50	-	mA	V_{CC}=3.3

(VCC=2.7V~3.6V,AVDD=6.5~13.5v,AVSS=GND=0V,TA=25℃)

6.2 AC Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
CLK frequency	Fclk	-	40	45	MHz
CLK pulse width	Tcw	40%	-	60%-	Tcph
Data set up time	Tsu	4	-	-	ns
Data hold time	Thd	2	-	-	ns
Propagation delay of DIO2/1	Tphl	6	10	15	ns
Time that the last data to LD	Tld	1	-	-	Tcph
Pulse width of LD	Twld	2	-	-	Tcph
Time that LD to DIO1/2	Tlds	5	-	-	Tcph
POL set up time	Tpsu	6	-	-	ns
POL hold time	Tphd	6	-	-	ns
Output stable time	Tst	-	-	12	us
CKV pulse width	TCKV	0.5			us
OEV pulse width	TOEV	1			us
STV set up time	Tsuv	200			ns
STV hold time	Thdv	300			ns

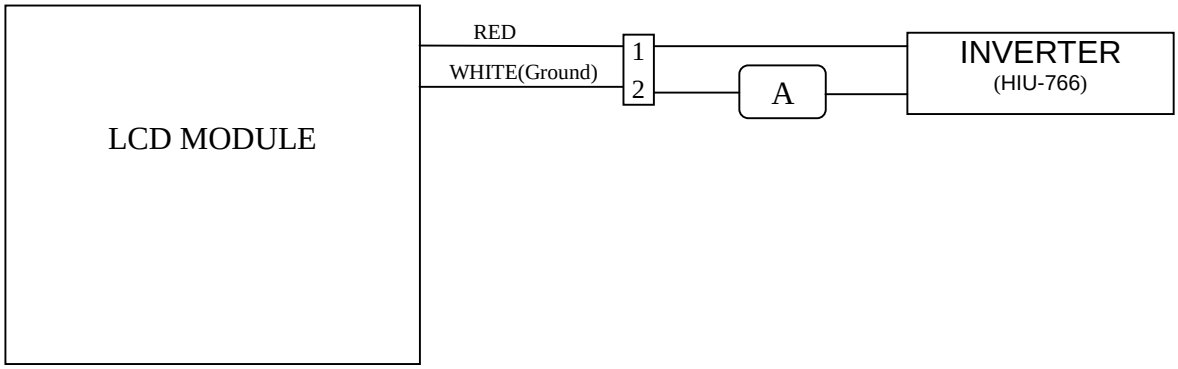
(V_{DD}=3.3V, AVDD=8.4V,AVSS= Gnd=0V, Ta=25℃)

6.3 Back-Light Unit

The back-light system is an edge-lighting type with 1 CCFL(Cold Cathode Fluorescent Lamp). The characteristics of the lamp is shown in the following tables.

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Lamp current	IL	5.5	6.0	6.5	mA(rms)	(1)(6)
Lamp voltage	VL	637	707	777	V(rms)	(6)I_L=6.0mA
Frequency	fL	30	55	80	KHz	(2)
Operating lamp life time	Hr	30000	—	—	Hour	(3)
Startup voltage	Vs	960	—	—	V	(4)(5)at 25°C

Note (1) Lamp current is measured with current meter for high frequency as shown below. Specified valued are for single lamp.



Note (2) Lamp frequency may produce interference with horizontal synchronous frequency and this may cause ripple noise on the display. Therefore lamp frequency shall be kept away from the horizontal synchronous frequency and its harmonics as far as possible in order to avoid interference.

Note (3) Lamp life time (Hr) can be defined as the time in which it continues to operate under the condition : Ta=25±3 °C, typical IL value indicated in the above table and fL=50kHz until the brightness becomes less than 50%.

Note (4) CCFL inverter should be able to provide a voltage over specified value (Vs) in the above table. Lamp units need at least Vs value shown above to ignition.

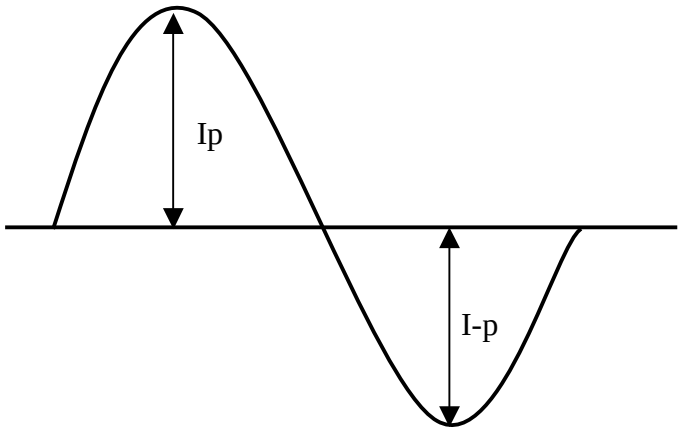
Note (5) The voltage over specified value (Vs) should be applied to the lamp more than 1
second after startup. Otherwise, the lamp may not be turned on. The used lamp current is the lamp typical current.

Note (6) The output voltage waveform and current waveform of the inverter must be symmetrical (Unsymmetrical ratio is less than 10%). Please do not use the inverter which has unsymmetrical voltage and current waveform, and spike waveform. The inverter design which can provide the best optical performance, power efficiency, and lamp life should under the following conditions.

a. The asymmetry rate of the inverter waveform should be less than 10%.

b. The distortion tae of the waveform should be within $\sqrt{2}$±10%.

c. The inverter output waveform should be better similar to the ideal sine wave.



Asymmetry rate = $|I_p - I_{-p}| / I_{rms} \times 100\%$

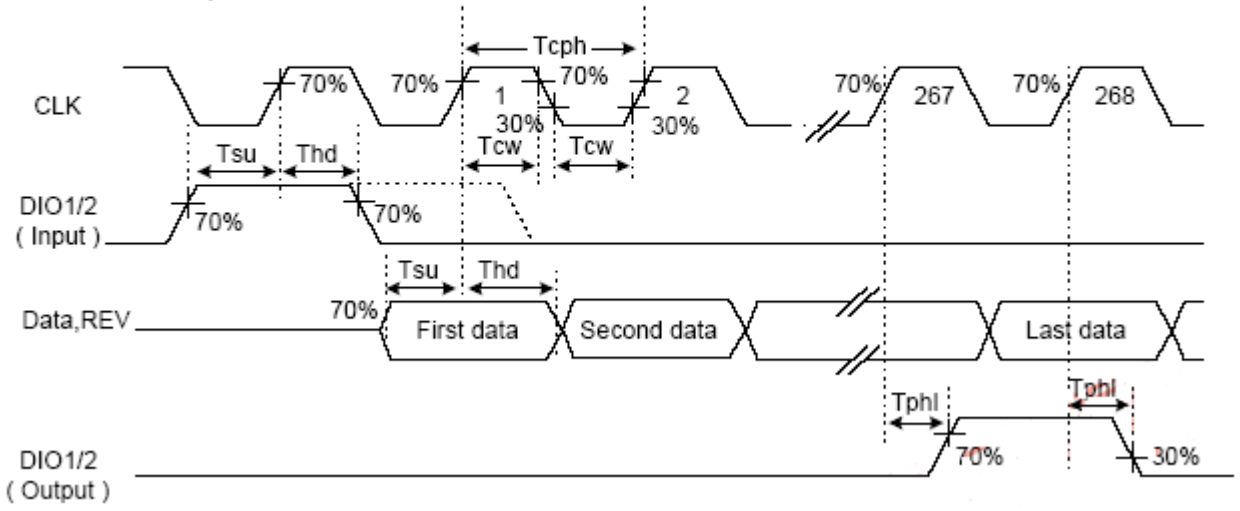
Distortion rate = I_p (or I_{-p}) / I_{rms}

6.4 Timing Diagram of Interface Signal

Timing Waveforms

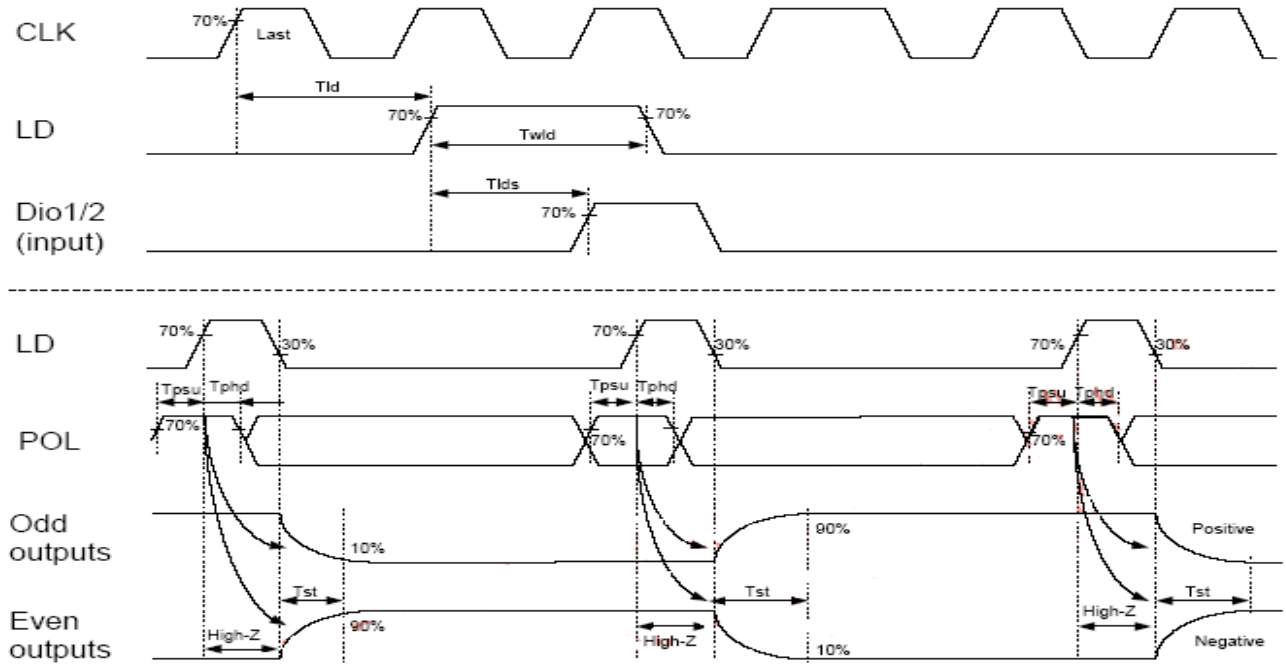
■ **Timing Diagram 1 (CHNSL="11" ,CHDNS="0", Default)**

<< EDGSL= "0", Default >>



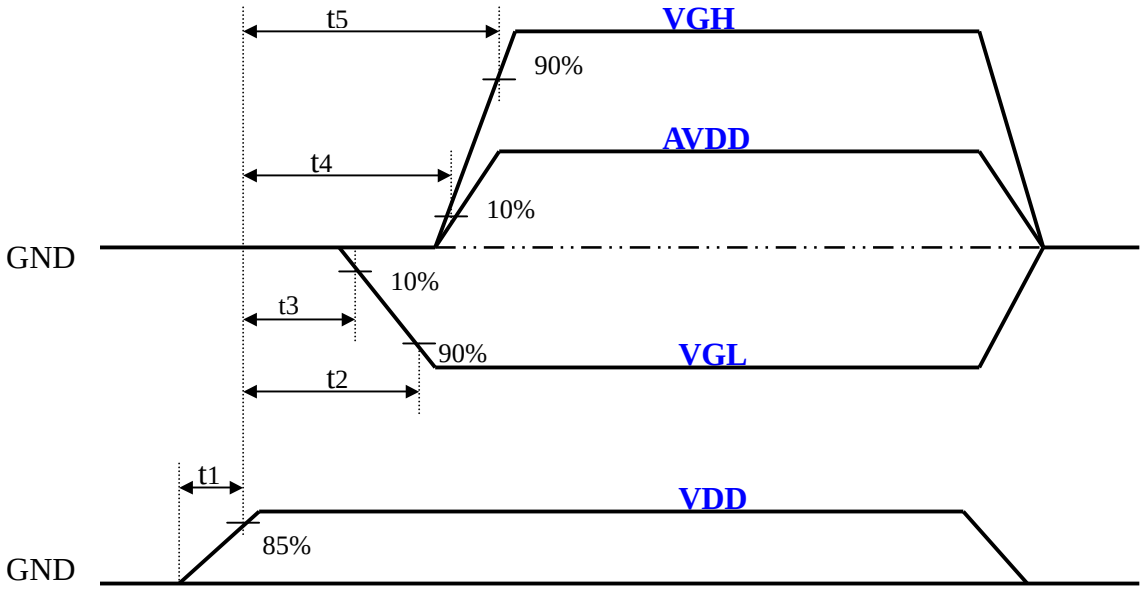
Operation Mode1

■ **Timing Diagram 2**



Operation Mode2

6.5 Power Sequence



Power Sequence

Power Sequence: VDD -> VGL-> AVDD -> VGH

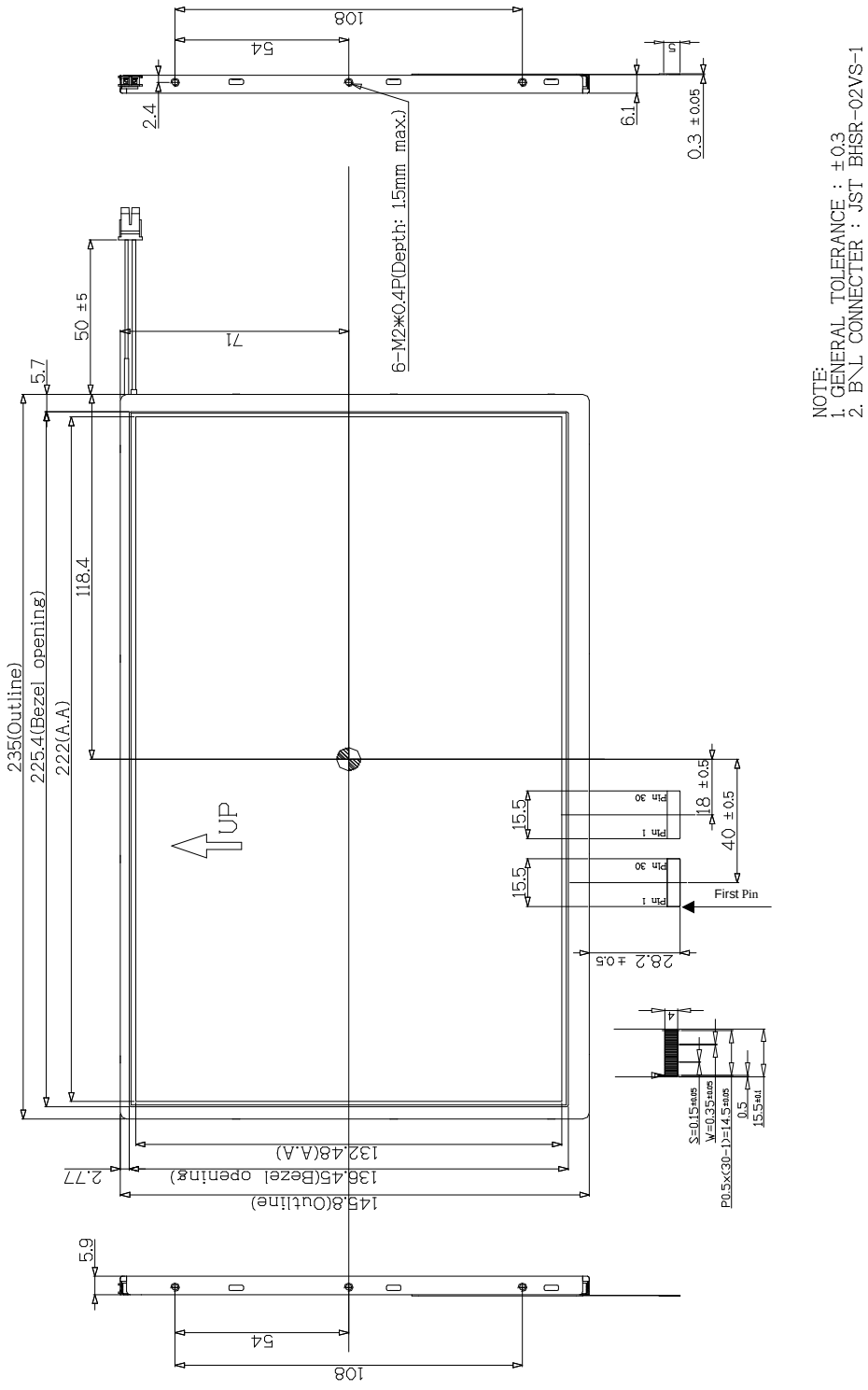
t1 < 10ms

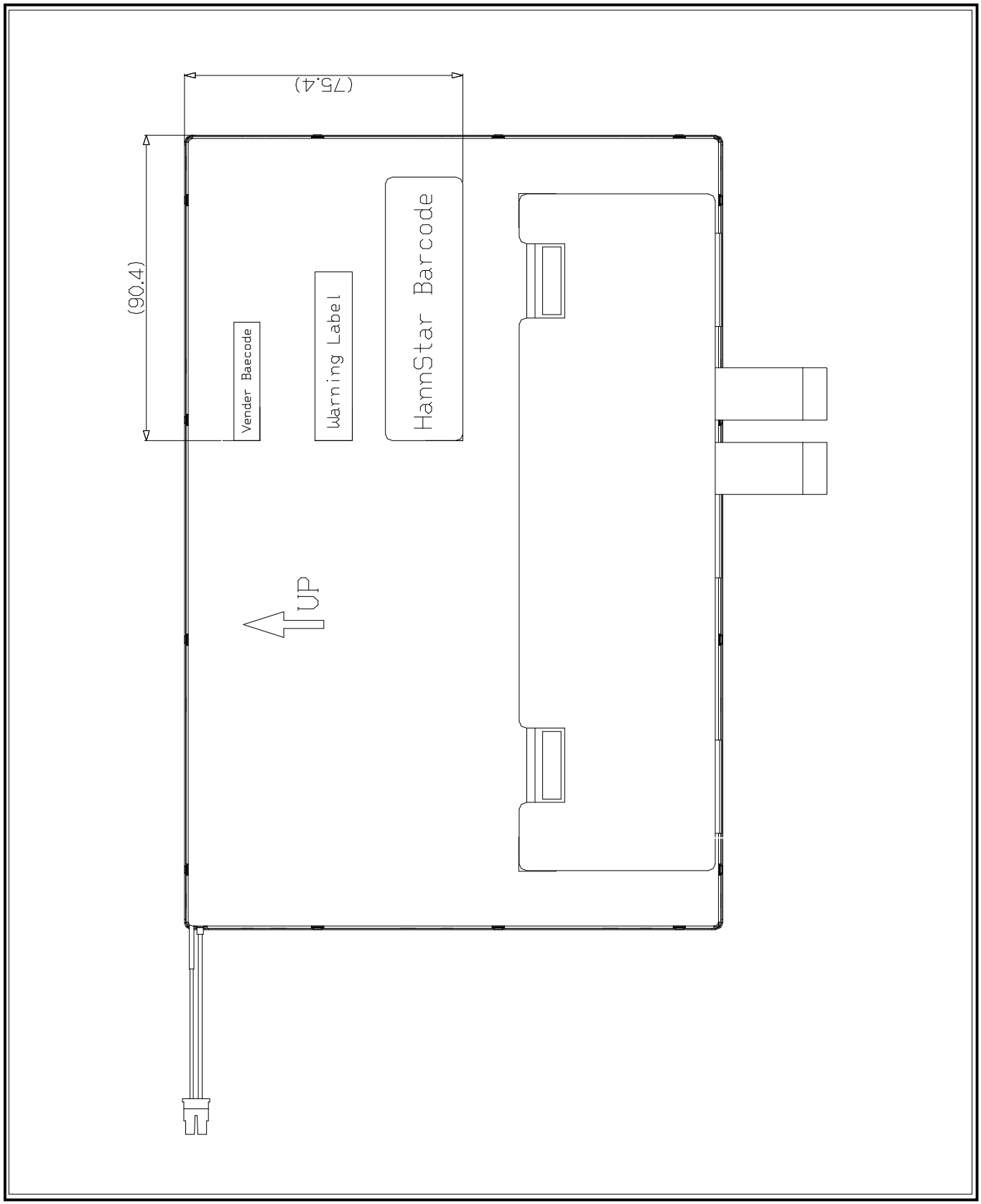
t3 < t4

t2 , t5 ≤ 40ms.

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

7.0 OUTLINE DIMENSION





8.0 Reliability test items

No.	Item	Conditions	Remark
1	High Temperature Storage	Ta=+85°C, 240hrs	
2	Low Temperature Storage	Ta=-40°C, 240hrs	
3	High Temperature Operation	Ta=+85°C, 240hrs	
4	Low Temperature Operation	Ta=-30°C, 240hrs	
5	High Temperature and High Humidity (Operating)	Ta=+60°C, 90%RH, 240hrs	
6	Thermal Cycling Test (non operation)	-40°C(0.5hr) → +85°C(0.5hr), 200cycles	
8	Altitude Test (non operation)	50000ft, 24hr (25℃)	
9	Altitude Test (operation)	10000ft, 02hr (25℃)	
10	Pressure cooker Test	121℃, 100%R.H., 2atm, 16hr/20hr	**Cell only**
11	Electrostatic Discharge	± 200V, 200pF,0Ω	
12	Room Temperature Operating Test	25℃, 2000hr (240hr判定)	
13	Mean Time Between Failure	60°C., 500hr	
14	衝擊測試-2	Half-sine,100G,6ms,±XYZ,3times for each direction	
15	振動測試-1	Sine,1.5G, 5~500~5Hz, XYZ, 1cycle , 30min/ each direction	
16	振動測試-2	Random 1.04Grms, 10~500Hz, XYZ, 30min/ each direction	
17	Cell包裝箱衝擊./振動試驗	1.Sine,1.5G,5~200Hz,1hr/ XYZ direction 2.Random,1.5Grms,5~200Hz,15min/XYZ 3.Half –sine,70G,11ms,+X axis, 2 time 4.Half –sine,200G,2ms,+X axis, 2 time 5.90° 傾倒撞擊剛性桌面,兩側正反放置各3次,	

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.

9.0 LOT MARK

9.1 Lot Mark

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

code 1,2,3,4,5,6: HannStar internal flow control code.
code 7: production location.
code 8: production year.
code 9: production month.
code 10,11,12,13,14,15: serial number.

Note (1) Production Year

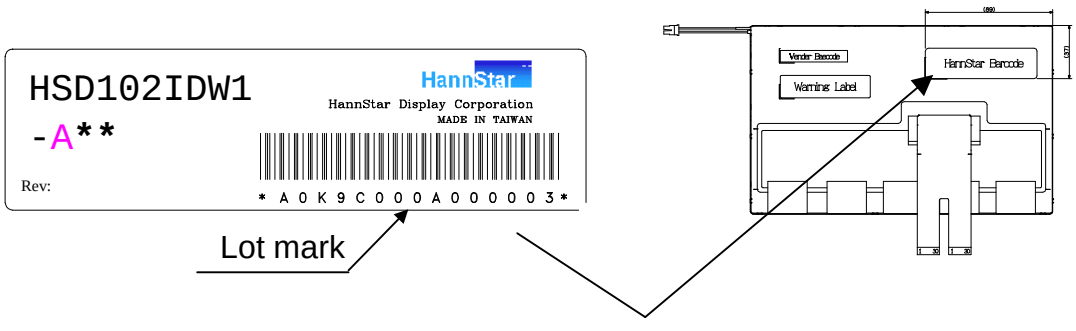
Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Mark	9	0	1	2	3	4	5	6	7	8

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

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



10.0 PACKAGE SPECIFICATION

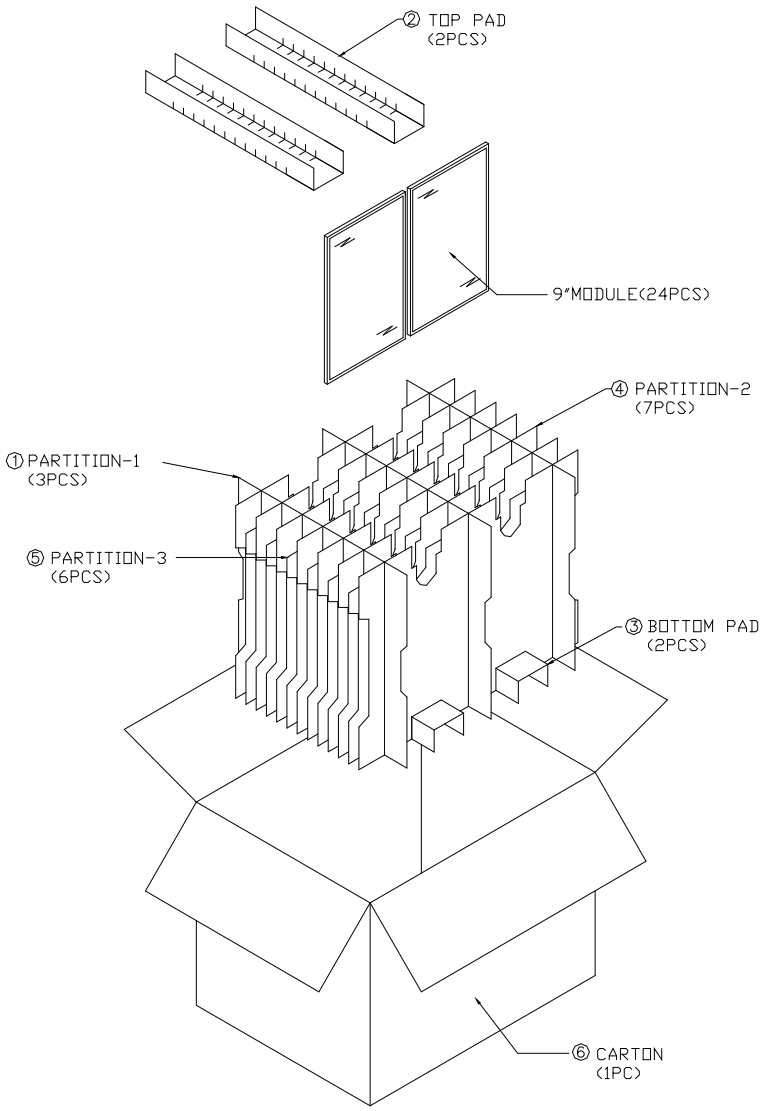
10.1 packing form

(1) Package quantity in one carton: 30 pieces.

(2) Carton size: 460±3 mm×355±3 mm×358±3 mm.

(3) For domestic transportation only.

10.2 packing assembly drawings



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.

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%)

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.

10.9.2Please pay attention to a panel side of LCD module not to contact with other materials in preserving it alone.

10.9.3For the. packaging box, please pay attention to the followings:

10.9.3.1Packaging 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.)