TO :

Date : Aug, 7, 2012

HannStar Product Information

(Preliminary)

Model: **HSD097PXN1-B00**

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.

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

Record of Revisions

Rev.	Date	Sub-Model	Description of change
1.0	Aug.7, 2012	B00	Preliminary specification was first released.

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

Contents

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

1.0 GENERAL DESCRIPTION

1.1 Introduction

HannStar Display model HSD097PXN1-B type 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. This TFT LCD has a 9.7 (4:3) inch diagonally measured active display area with XGA (1024 horizontal by 768 vertical pixel) resolution.

1.2 Features

- 9.7 (4:3 diagonal) inch configuration
- One channel LVDS interface
- 262K color by 6 bit R.G.B signal input
- RoHS Compliance
- Halogen Free

1.3 Applications

- Mobile NB
- Digital Photo frame
- Display terminal for AV application
- Tablet PC

1.4 General information

Item	Specification	Unit
Overall Dimension	210.3 (H) x 164.37 (V) x 3.0 (Typ.)	mm
Display area	196.608(H) x 147.456(V)	mm
Number of Pixel	1024 RGB (H) x 768(V)	pixels
Pixel pitch	0.192(H) x 0.192(V)	mm
Pixel arrangement	RGB Vertical stripe	
Display color	262K	
Display mode	Normally white	
NTSC	50	%
Surface treatment(Up Polarizer)	HC	
Weight	190g (typ.)	g
Power Consumption	3.0	W

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

1.5 Mechanical Information

Item		Min.	Typ.	Max.	Unit
Module Size	Horizontal (H)	210.00	210.30	210.60	mm
	Vertical (V)	164.07	164.37	164.67	mm
	Depth (D)	—	—	3.0	mm
Weight		—	(190)	—	g

2.0 ABSOLUTE MAXIMUM RATINGS

2.1 Electrical Absolute Rating

2.1.1 TFT LCD Module

Item	Symbol	Min.	Max.	Unit	Note
Logic Supply voltage	V_{DD}	-0.3	6.0	V	

2.1.2 Environment Absolute Rating

Item	Symbol	Min.	Max.	Unit	Note
Operating Temperature	T_{opa}	-20	60	℃	
Storage Temperature	T_{stg}	-30	70	℃	

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

3.0 OPTICAL CHARACTERISTICS

3.1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast		CR	Θ=0 Normal viewing angle	400	500	—		(1)(2)(4)
Response time		Tr+ Tf		—	20	25	msec	(1)(3)
White luminance (Center point)		Y_L		280	350	—	cd/m^2	(1)(4)(5) (I_L=200mA)
Color chromaticity (CIE1931)		White	W_x	-0.03	(0.313)	+0.03		
			W_y		(0.329)			
		Red	Rx		TBD			
			Ry		TBD			
		Green	Gx		TBD			
			Gy		TBD			
		Blue	Bx		TBD			
			By		TBD			
Viewing angle	Hor.	Θ_L	60	70	80	—		(1)(4)
		Θ_R		70	80	—		
	Ver.	Θ_U		60	70	—		
		Θ_D		70	80	—		
Brightness uniformity		B_{UNI}	Θ=0 (5point)	—	—	1.25		(5)
Brightness Uniformity		B_{UNI}	Θ=0 (13 points)	—	—	1.5		(6)
Optima View Direction		12 O' clock						

3.2 Measuring Condition

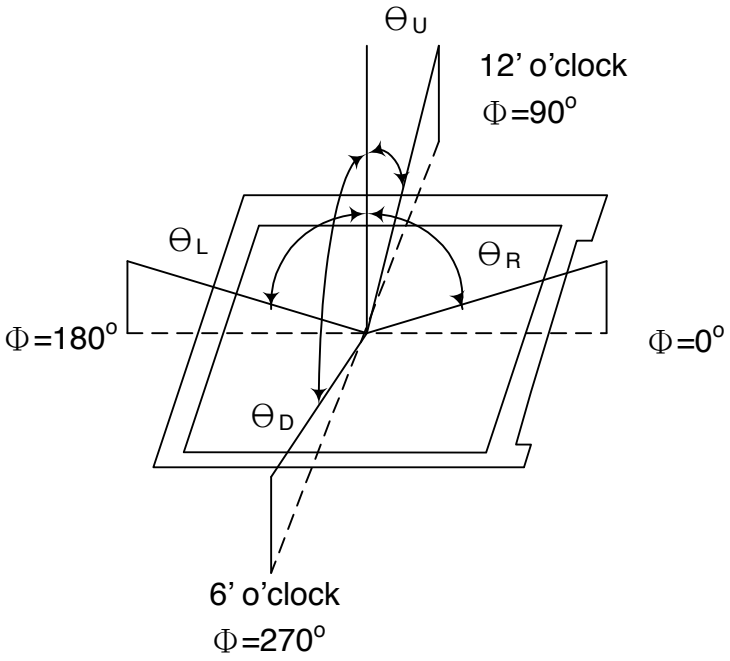
- Measuring surrounding：dark room
- LED Current I_L：215mA
- Ambient temperature：25±2°C
- 15min. warm-up time.

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

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 ~ 21 mm

Note (1) Definition of Viewing Angle:

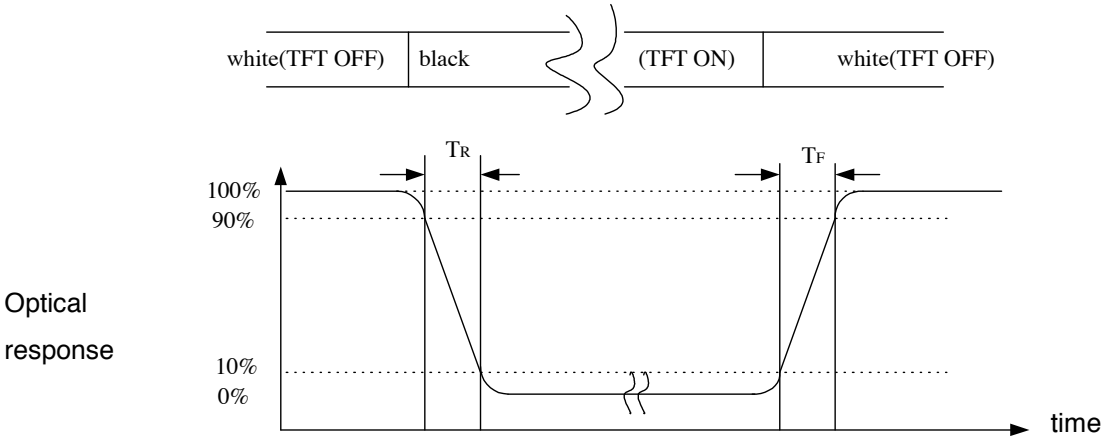


Note (2) Definition of Contrast Ratio (CR) :
measured at the center point of panel

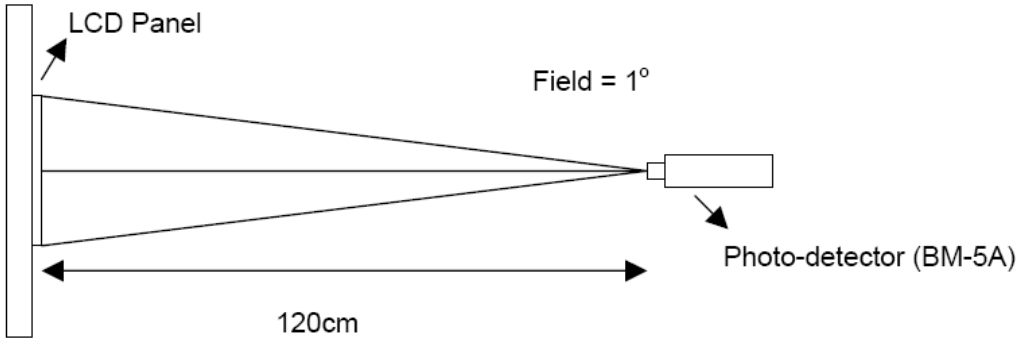
$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

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



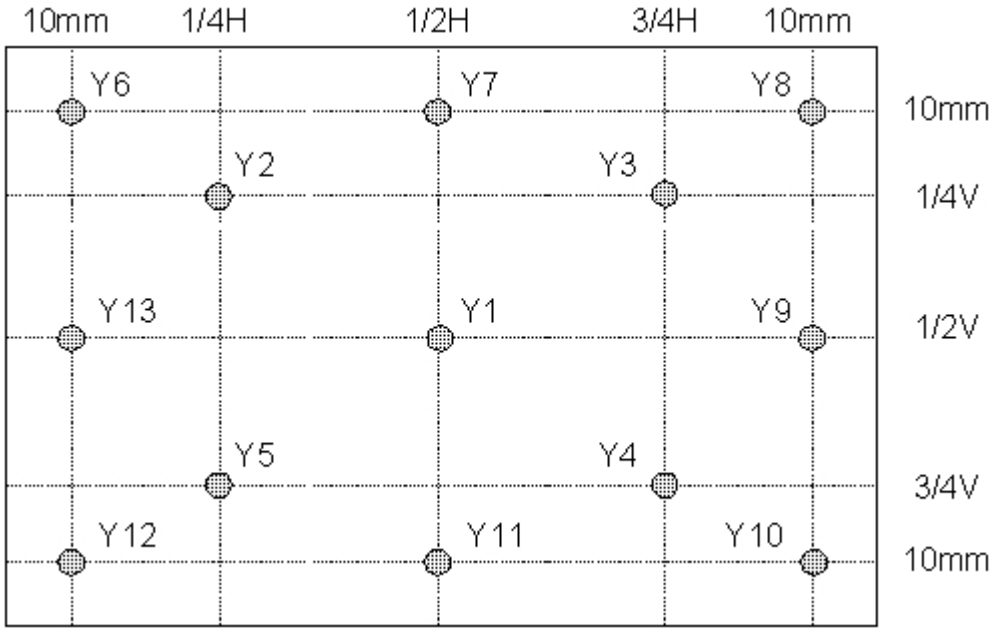
Note (4) Definition of optical measurement setup



The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

Note (5) Definition of Average Luminance Uniformity of White (5 Point)

$$\text{Average Luminance Uniformity} = \frac{Y_1+Y_2+Y_3+Y_4+Y_5}{5}$$



Note (6) Definition of brightness uniformity

$$\text{Luminance uniformity(5 points)} = \frac{\text{(Max Luminance of 5 points)}}{\text{(Min Luminance of 5 points)}}$$

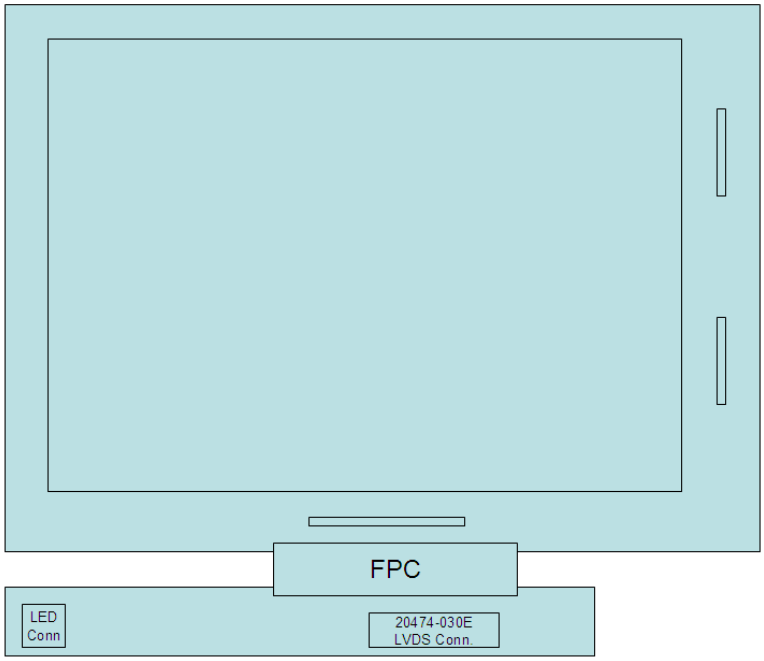
$$\text{Luminance uniformity(13points)} = \frac{\text{(Max Luminance of 13 points)}}{\text{(Min Luminance of 13 points)}}$$

Note (7) Rubbing Direction (The different Rubbing Direction will cause the different optimal view direction.

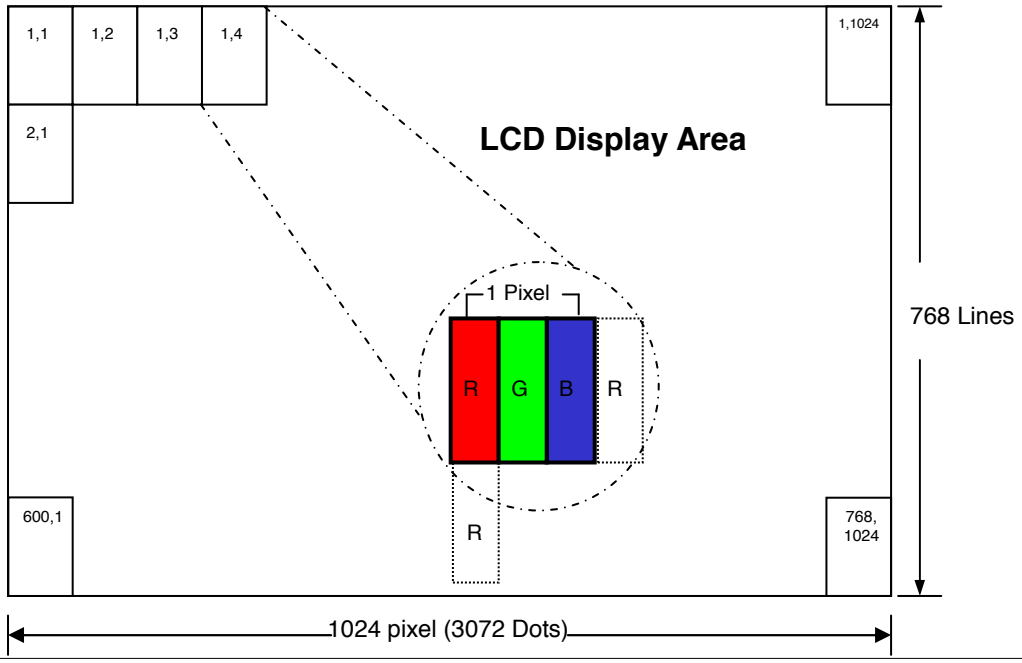
The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

4.0 BLOCK DIAGRAM

4.1 TFT LCD Module



4.2 Pixel Format



The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

4.3 Relationship Between Displayed Color and Input

	Display	MSB LSB R5	R4	R3	R2	R1	R0	MSB LSB G5	G4	G3	G2	G1	G0	MSB LSB B5	B4	B3	B2	B1	B0	Gray scale level
Basic color	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	-
	Green	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L	L	L	L	-
	Light Blue	L	L	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	-
	Red	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	-
	Purple	H	H	H	H	H	H	L	L	L	L	L	L	H	H	H	H	H	H	-
	Yellow	H	H	H	H	H	H	H	H	H	H	H	H	L	L	L	L	L	L	-
	White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-
Gray scale of Red	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark ↑ ↓ Light	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L1
		L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L2
		:						:						:						L3…L60
		H	H	H	H	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L61
		H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L62
	Red	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	Red L63
Gray scale of Green	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark ↑ ↓ Light	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L1
		L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L2
		:						: :						: :						L3…L60
		L	L	L	L	L	L	H	H	H	H	L	H	L	L	L	L	L	L	L61
		L	L	L	L	L	L	H	H	H	H	H	L	L	L	L	L	L	L	L62
	Green	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L	L	L	L	Green L63
Gray scale of Blue	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark ↑ ↓ Light	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L1
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L2
		:						:						:						L3…L60
		L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	L	H	L61
		L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	L	L62
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	Blue L63
Gray scale of White & Black	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark ↑ ↓ Light	L	L	L	L	L	H	L	L	L	L	L	H	L	L	L	L	L	H	L1
		L	L	L	L	H	L	L	L	L	L	H	L	L	L	L	L	H	L	L2
		:						:						:						L3…L60
		H	H	H	H	L	H	H	H	H	H	L	H	H	H	H	H	L	H	L61
		H	H	H	H	H	L	H	H	H	H	H	L	H	H	H	H	H	L	L62
	White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	White L63

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

5.0 INTERFACE PIN CONNECTION

Pin No.	Signal	Description
1	GND	Ground
2	VDD	3.3V Power
3	VDD	3.3V Power
4	V_EDID	3.3V Power for EDID
5	NC	No Connection
6	CLK_EDID	EDID Clock Input
7	DATA_EDID	EDID Data Input
8	RXIN0-	- LVDS differential data input
9	RXIN0+	+LVDS differential data input
10	GND	Ground
11	RXIN1-	- LVDS differential data input
12	RXIN1+	+LVDS differential data input
13	GND	Ground
14	RXIN2-	- LVDS differential data input
15	RXIN2+	+LVDS differential data input
16	GND	Ground
17	RXCLKIN-	- LVDS differential clock input
18	RXCLKIN+	+LVDS differential clock input
19	GND	Ground
20	NC	No Connection
21	LEDA	LED Anode (Positive)
22	LEDA	LED Anode (Positive)
23	NC	No Connection
24	LEDK1	LED Cathode (Negative)
25	LEDK2	LED Cathode (Negative)
26	LEDK3	LED Cathode (Negative)
27	LEDK4	LED Cathode (Negative)
28	NC	NC (Reserved)
29	NC	NC (Reserved)
30	NC	No Connection

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

6.0 ELECTRICAL CHARACTERISTICS

6.1 TFT LCD Module

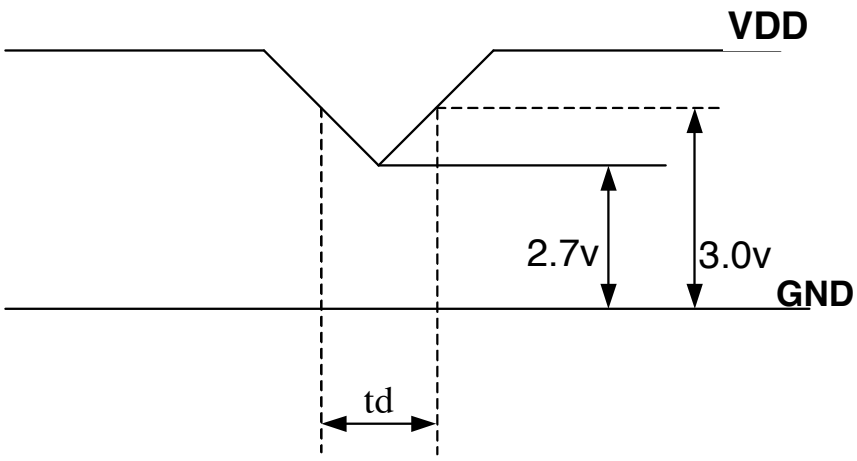
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	V_{DD}	3.0	3.3	3.6	V	Note (1)
Current of power supply	IDD	-	0.18	-	A	V_{DD} =3.3V、L0 pattern Ta=25℃ fv=60Hz
Inrush current	I_{RUSH}	-	-	1.50	A	Note (2)

Note (1): V_{DD}-dip condition:

When VDD operating within 2.7V≦VDD<3.0V，td≦10ms , the display may momentarily become abnormal.

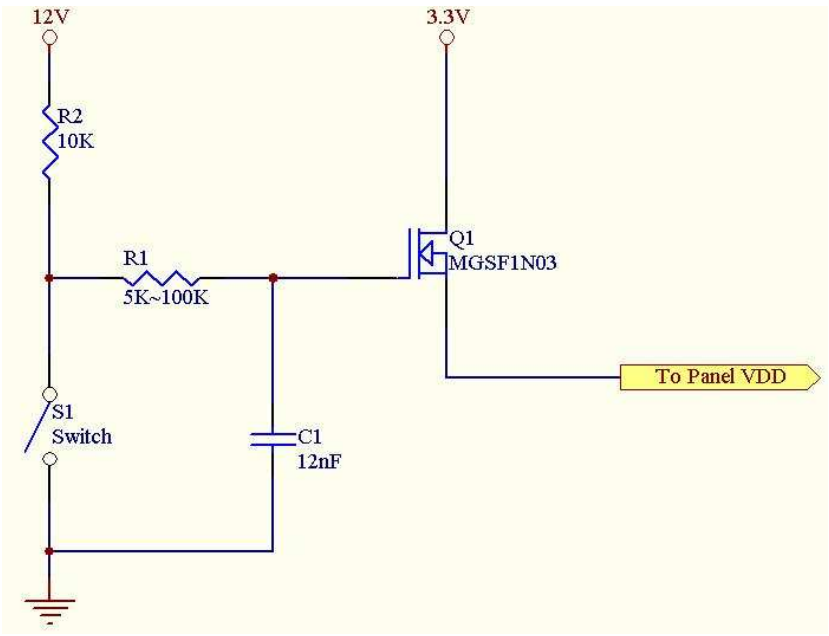
VDD<2.7V , VDD dip condition should also follow the Power On/Off conditions for supply voltage.

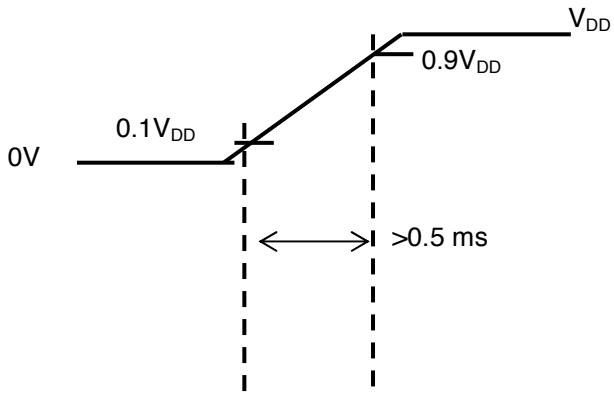
.



Note ：**(2)** Power on Inrush current test circuit

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.





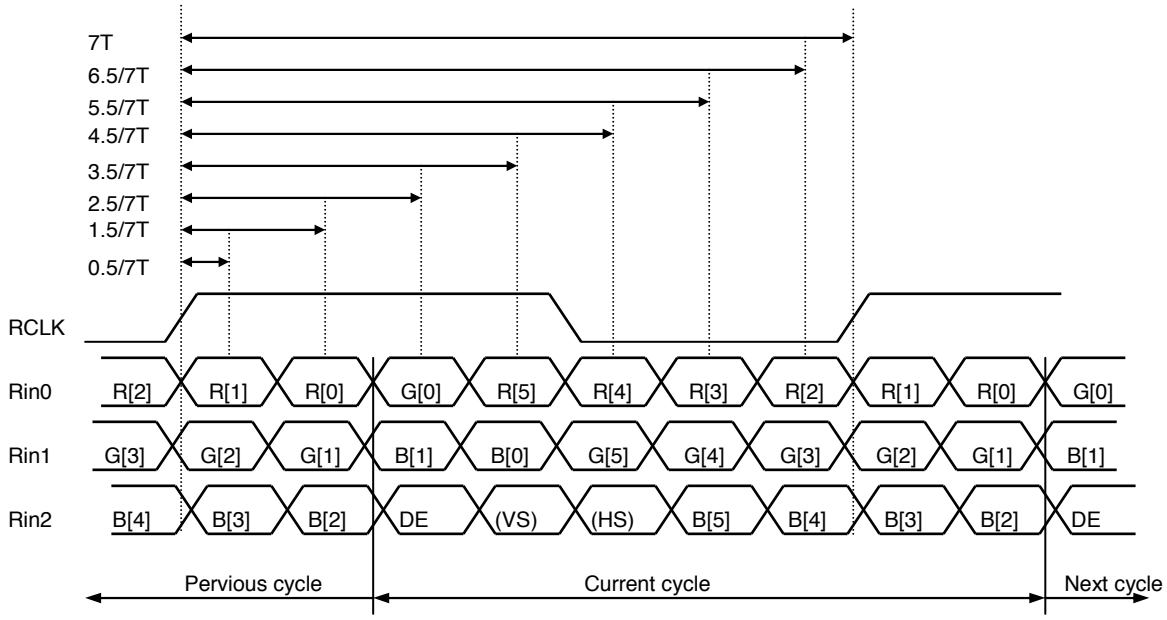
V_{in} rising time

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

6.2 Switching Characteristics for LVDS Receiver

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Differential Input High Threshold	Vth	—	—	100	mV	V_{CM}=1.2V
Differential Input Low Threshold	Vtl	-100	—	—	mV	
Input Current	I_{IN}	-10	—	+10	uA	
Differential input Voltage	$\|V_{ID}\|$	0.1	—	0.6	V	
Common Mode Voltage Offset	V_{CM}	($\|V_{ID}\|$/2)	1.25	1.8-0.4-($\|V_{ID}\|$/2)	V	

6.3 Bit Mapping & Interface Definition



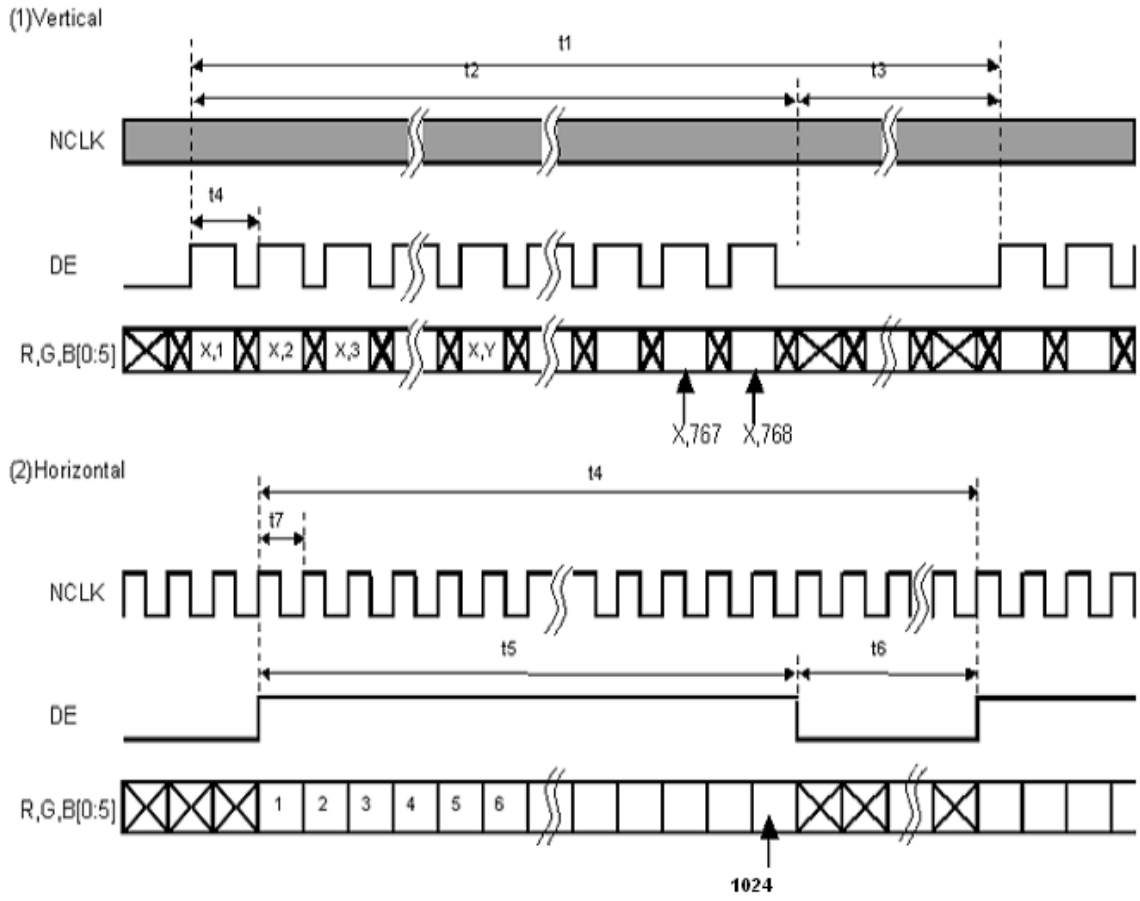
LVDS Receiver Input Timing Definition
for 6bits LVDS input

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

6.4 Interface Timing (DE mode)

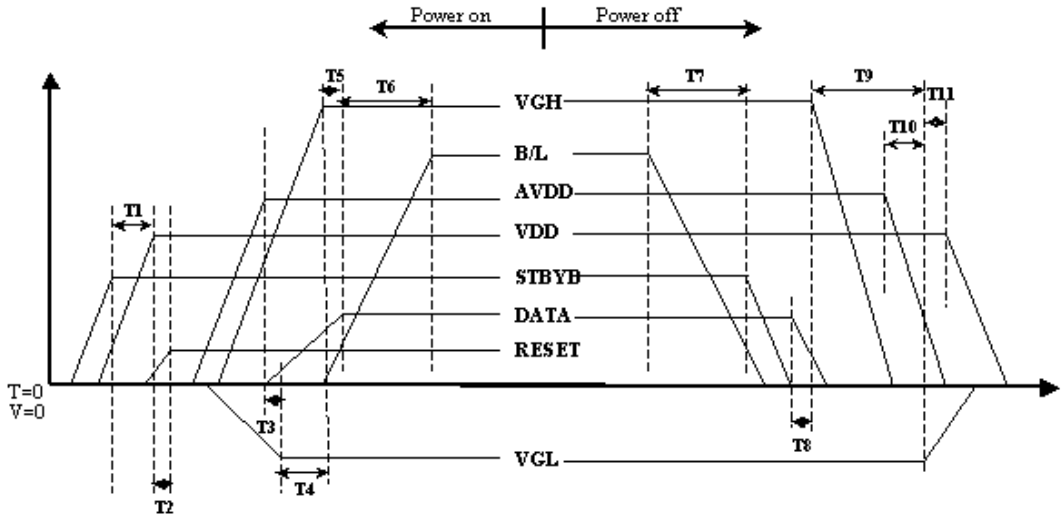
Item	Symbol	Min.	Typ.	Max.	Unit
Frame Rate	--	55	60	65	Hz
Frame Period	t1	793	806	819	line
Vertical Display Time	t2	768	768	768	line
Vertical Blanking Time	t3	25	38	51	line
1 Line Scanning Time	t4	1304	1344	1384	clock
Horizontal Display Time	t5	1024	1024	1024	clock
Horizontal Blanking Time	t6	280	320	360	clock
Clock Rate	t7	55	65	75	MHz

Timing Diagram of Interface Signal (DE mode)



The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

6.5 Power On / Off Sequence



Item	Min.	Typ.	Max.	Unit
T1	0	--	--	ms
T2	50	--	--	ms
T3	5	--	--	ms
T4	10	--	--	ms
T5	20	--	--	ms
T6	50	--	--	ms
T7	20	--	--	ms
T8	10	--	--	ms
T9	20	--	--	ms
T10	10	--	--	ms
T11	20	--	--	ms

Note (1) LED 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 until the brightness becomes less than 50%.

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

6.6 Backlight Unit

Parameter	Symbol	Min	Typ	Max	Units	Condition
LED Current	I_F	--	20	--	mA	Ta=25℃
LED Voltage	V_F	3.2	3.4	3.6	Volt	Ta=25℃
LED Power consumption	P_{LED}	--	2.04	2.16	Watt	Ta=25℃ Note (1)
LED Life-Time	N/A	10,000	--	--	Hour	Ta=25℃ $I_{F=}$20mA Note (2)

Note (1): Calculator value for reference $P=I_F \times V_F \times N$ (LED Qty')

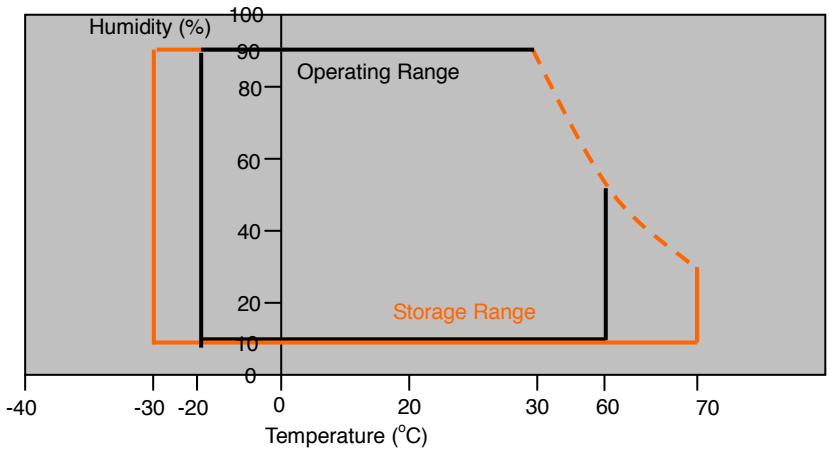
Note (2): The LED lifetime defines as the estimated time to 50% degradation of final luminous.

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

7.0 Reliability test items

No.	Item	Conditions	Remark
1	High Temperature Storage	Ta= +70°C, 240hrs	
2	Low Temperature Storage	Ta= -30°C, 240hrs	
3	High Temperature Operation	Ta= +60°C, 240hrs	
4	Low Temperature Operation	Ta= -20°C, 240hrs	
5	Thermal Cycling Test (non operation)	-30°C(30min)→+70°C(30min),200 cycles	
6	Vibration	Sine Wave 1.04G, 5~500Hz, XYZ 30min/each direction	
7	Shock	Half-Sine, 100G, 6ms, ±XYZ, 3 cycle	

Storage / Operating temperature



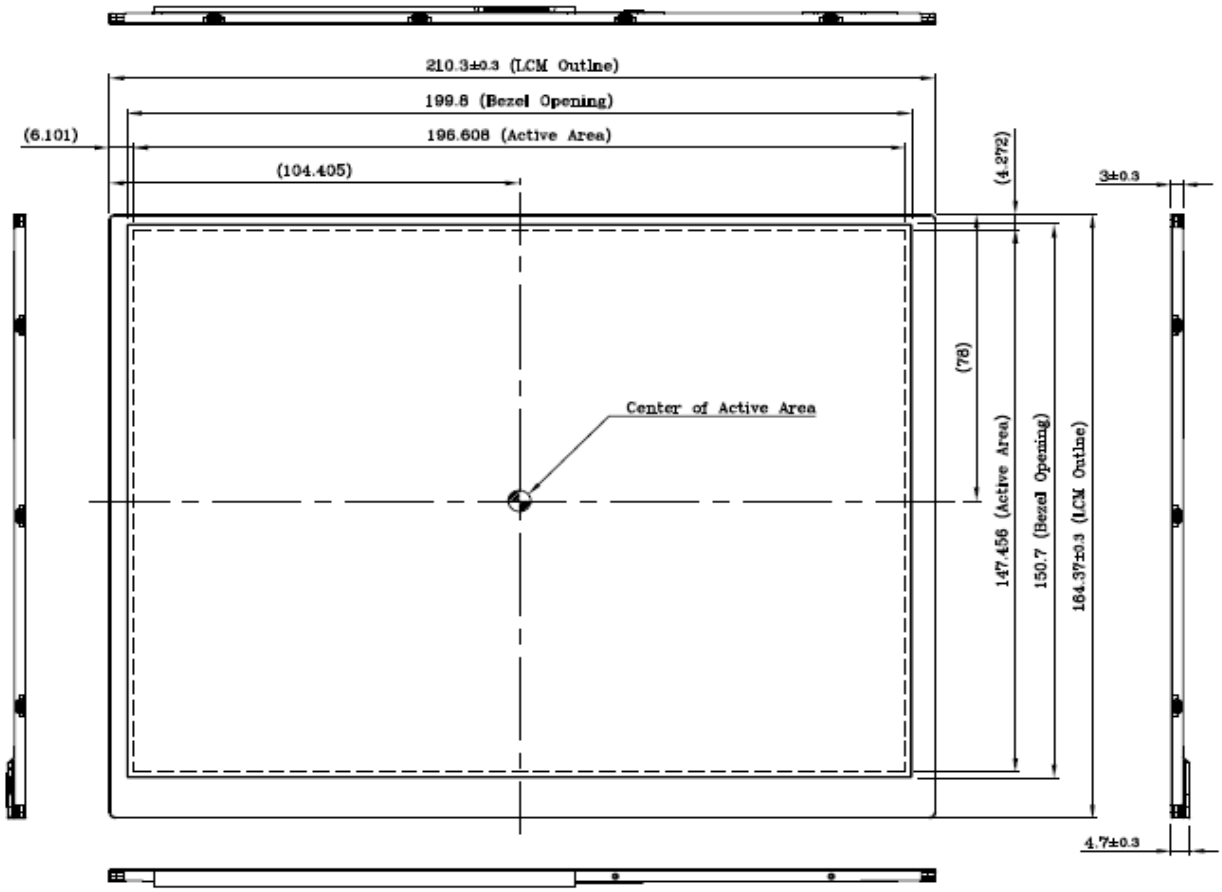
Note . Max wet bulb temp.=39°C

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

8.0 OUTLINE DIMENSION

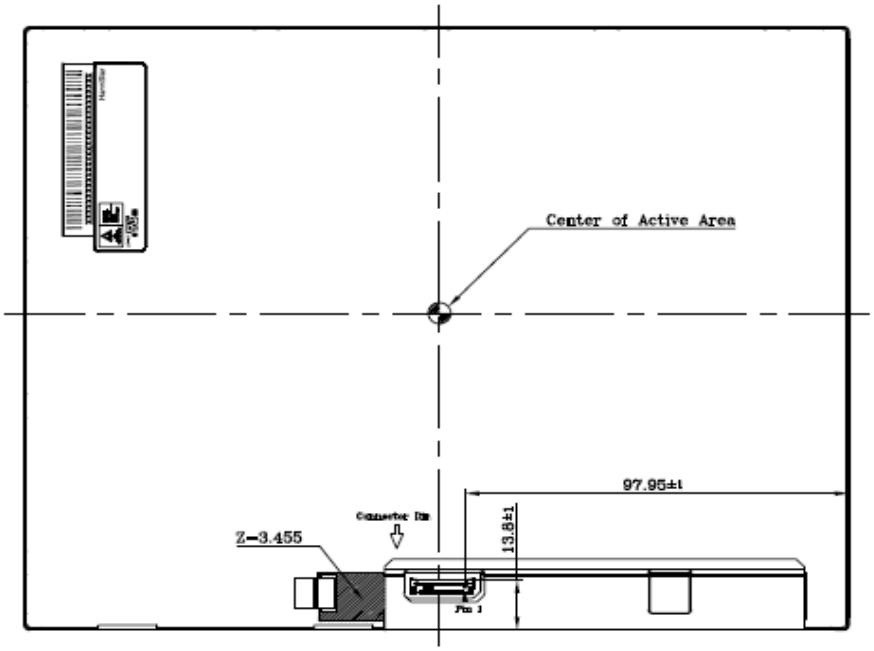
Unit : mm

8.1 Front View Outline Dimension



The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

8.2 Back View Outline Dimension



The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

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	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Mark	6	7	8	9	0	1	2	3	4	5

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

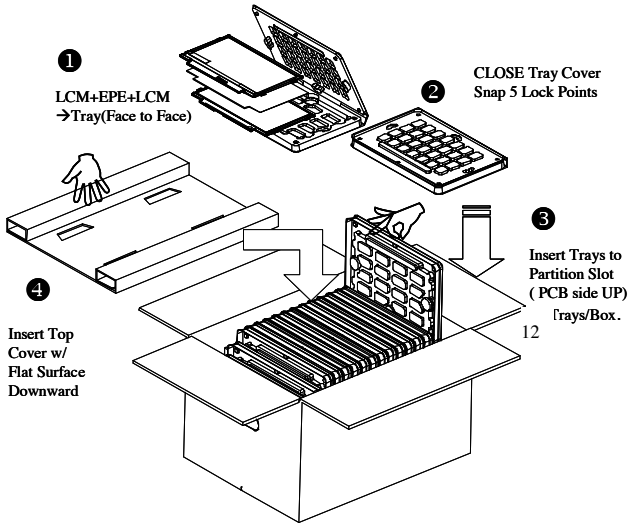
(1) Location : The label is attached to the backside of the LCD module.
(2) Detail of the Mark : As attached below.
(3) This is subject to change without prior notice.

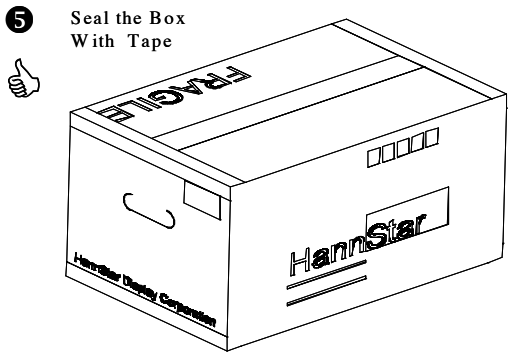
The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

10.0 PACKAGE SPECIFICATION

10.1 Packing form

LCM Model	LCM Qty. in the box	Inner Box Size (mm)	Notice
HSD097PXN1-B	TBD	TBD	





HSD100PXN1-A	Material	Notice
Box	Corrugated Paper Board	AB Flute
Partition/Pad	Corrugated Paper Board	B Flute
Corner Pad	Corrugated Paper Board	B Flute
Tray	PE	--
EPE	PET	--

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

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.

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

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.

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.