To :

Date : Nov, 19, 2015

Product Information

Model : **HSD150GXN1 - B****

Note: 1. The information contained herein is preliminary and may be changed without prior noticed.
2. Please contact HannStar Display Corp. before designing your product based on this module specification.
3. 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.

Record of Revisions

Rev.	Date	Sub-Model	Description of change
1.0	Apr., 17, 2015	B**	HSD 150GXN1-B** Product Information was 1st issued
	Nov.,19, 2015	B**	Update 5.1 Interface Connector

Contents

1.0 GENERAL DESCRIPTIONS

1.1 Introduction

HannStar Display model **HSD150GXN1-B*** 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, the voltage reference, common voltage, DC-DC converter, column, and row driver circuit. This TFT LCD has a 19-inch diagonally measured active display area with XGA resolution (1024 vertical by 768 horizontal pixel array) .

1.2 Features

- 15”SXGA TFT LCD Panel
- LED Backlight System
- Supported XGA (H:1024 pixels , V:768 lines) Resolution
- LCD Timing Controller
- RoHS Compliance
- VESA Compatible
- Halogen Free

1.3 Applications

- Desktop Monitors
- Display terminals for AV applications
- Monitors for industrial applications

1.4 General information

Item	Specification		Unit
Outline dimension	326.5(H) x 253.5(V) x 12.0(D) (Typ)		mm
Display area	304.128(H) x 228.096(V) (14.967” diagonal)		mm
Number of Pixel	1024(H) x 768(V)		Pixels
Pixel pitch	0.297(H) x 0.297(V)		mm
Pixel arrangement	RGB Vertical Stripe		
Display color	16.2M / 262K		
Color Gamut (NTSC)	60		%
Display mode	Normally white		
Surface treatment	Antiglare, Hard-Coating (3H)		
Weight	1200 (Max)		g
Back-light	White LED		
Input signal	1-ch LVDS		
Power consumption	System	1.9 (Typ.), 2.2 (Max.)	W
	B/L	7.14 (Max.)	

Remark(1): There are two functions, brightness and contrast tuning, to let luminance to 125cd/m2 in OSD. OSD shouldn't restrict the panel's G-T curve for brightness to be 125cd/m2. The higher contrast, the higher angular uniformity. That is to say, if OSD want to tune the panel's luminance to 125 cd/m2, the suitable way is to only tune the brightness function. And if tuning the brightness function to 125 cd/m2, it would be better only to tuning the inverter, not the gray level.

1.5 Mechanical Information

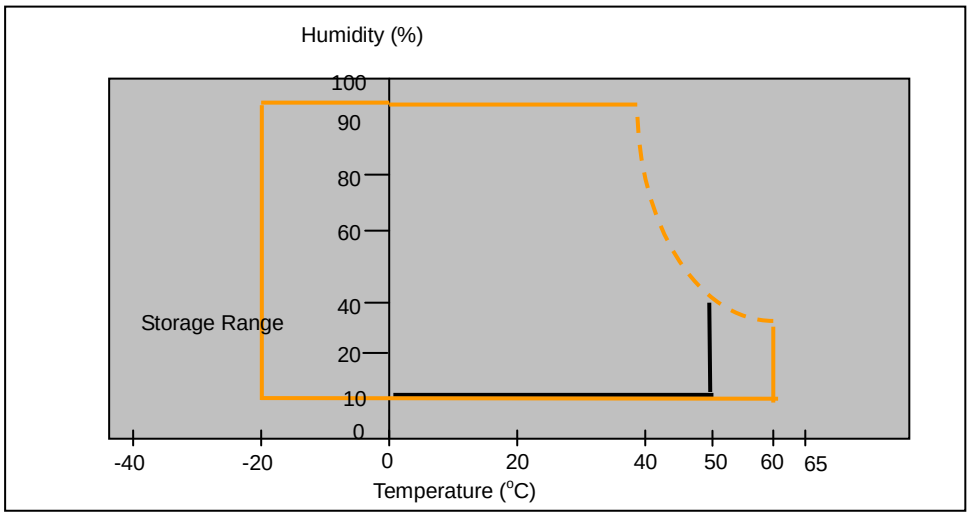
Item		Min.	Typ.	Max.	Unit
Module Size	Horizontal(H)		326.5		mm
	Vertical(V)		253.5		mm
	Depth(D)		12.0		mm
Weight (without inverter)		--	--	1200	g
Torque of customer screw hole		--	--	TBD	Kgf*Cm

2.0 ABSOLUTE MAXIMUM RATINGS

2.1 Absolute Rating of Environment

Item	Symbol	Min.	Max.	Unit	Note
Storage temperature	T_{STG}	-30	85	°C	
Operating temperature	T_{OPR}	-30	85	°C	(1)
Vibration (non-operating)	V_{NOP}	--	1.5	G	(2)
Shock (non-operating)	S_{NOP}	--	50	G	(3)
Storage humidity	H_{STG}	10	90	%RH	(3)
Operating humidity	H_{OP}	10	90	%RH	(4)

Note 1 (1)Storage /Operating temperature



(2) 5-500-5Hz sine wave, X, Y, Z each directions, 30 min/cycle.

(3) 11ms, ±X, ±Y, ±Z direction, one time each. For this shock test,
It is necessary to fill the silicon rubber between the shock jig as buffer.

(4) Max wet bulb temp. =39°C

Note 2: There is no display function NG issue occurred, all the cosmetic specification is judged before the reliability stress.

2.2 Electrical Absolute Rating:

2.2.1 TFT LCD Module:

Item	Symbol	Min.	Max.	Unit.	Note
Power supply Voltage	VDD	-0.3	3.6	V(DC)	(1)(2)

2.2.2 Back Light Unit:

Item	Symbol	Typ.	Max.	Unit	Note
LED current	I_F	240	--	mA	(1)(2)(3)
LED Voltage	V_F	22.4	2.38	Volt	(1)(2)(3)

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) To exceed 60mA, life time accelerate drop down.

(3) Within Ta=25±2℃

3.0 OPTICAL CHARACTERISTICS

3.1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast		CR	$\Theta=0^o$ $\phi=0^o$ Normal viewing angle	400	700	--		(1)(2)
Response time	Rising	TR +TF		--	12	--	msec	(1)(3)
	Falling							
White luminance (center of screen)		Y_L		--	450	--	cd/m^2	(1)(4)
Color chromaticity (CIE1931)	Red	Rx		-0.05	TBD	+0.05		(1)(4)
		Ry			TBD			
	Green	Gx			TBD			
		Gy			TBD			
	Blue	Bx			TBD			
		By			TBD			
	White	Wx			0.313			
		Wy			0.329			
Viewing angle	Hor.	Θ_L	CR>10	--	80	--		
		Θ_R		--	80	--		
	Ver.	Θ_H		--	60	--		
		Θ_L		--	80	--		
Viewing angle	Hor.	Θ_L	CR>5	--	TBD	--		
		Θ_R		--	TBD	--		
	Ver.	Θ_H		--	TBD	--		
		Θ_L		--	TBD	--		
Brightness uniformity		B_{UNI}	$\Theta=0^o$ $\phi=0^o$	75	--	--	%	(6)

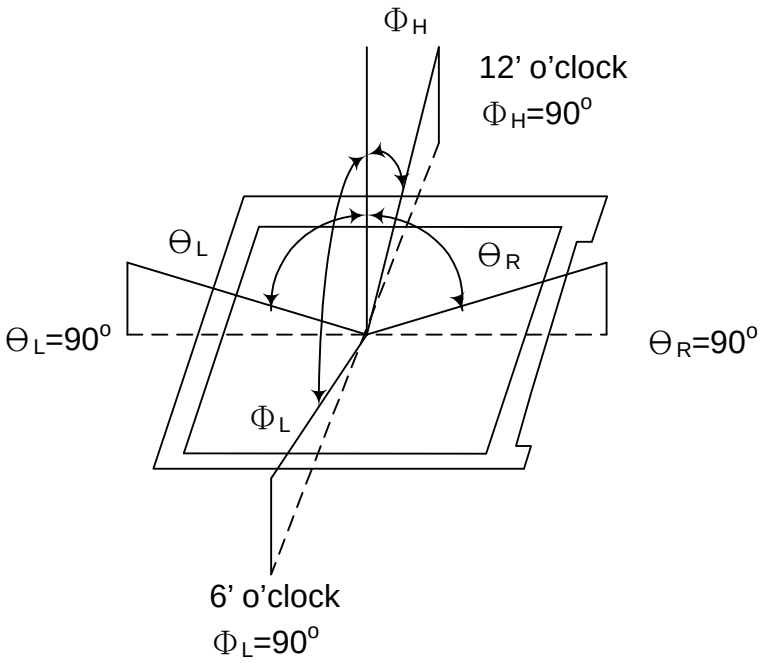
3.2 Measuring Condition

- Measuring surrounding: dark room
- Each LED current is 60 mA
- V_{DD1}=3.3V, f_V=60Hz, f_{DCLK}=TBDMHz
- Surrounding temperature: 25±2°C
- 20min. Warm-up time.

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: 20~21mm

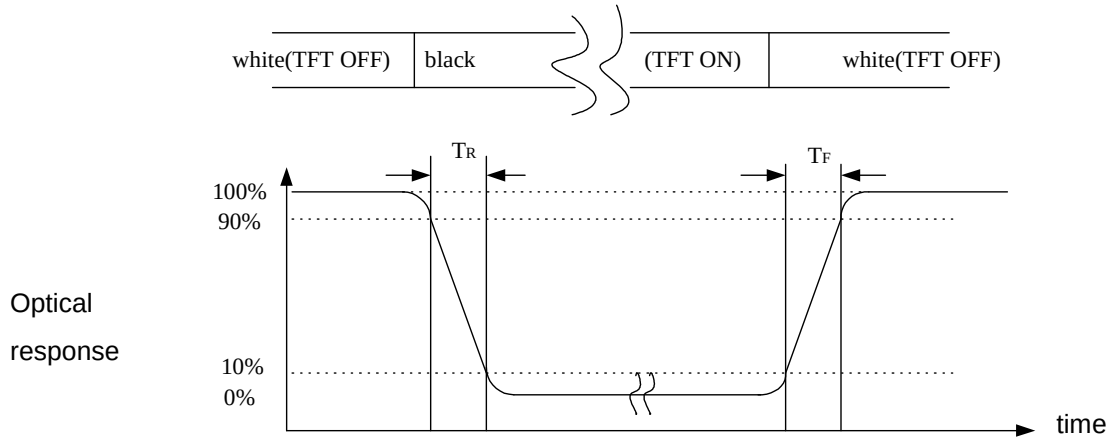
Note (1) Definition of Viewing Angle:



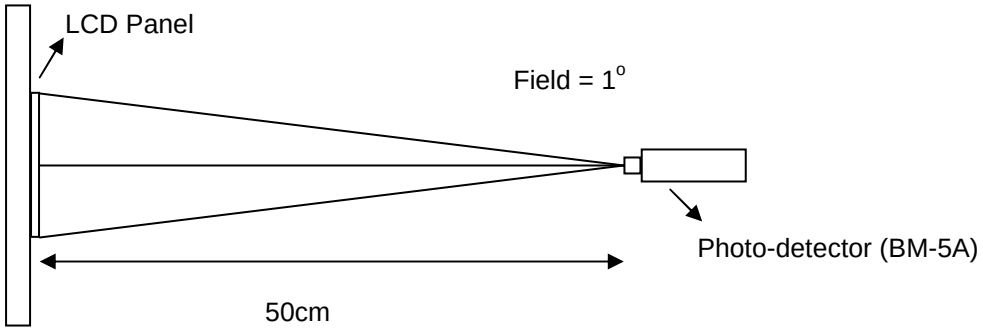
Note (2) Definition of Contrast Ratio(CR) :
measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white (L255)}}{\text{Luminance with all pixels black (L0)}}$$

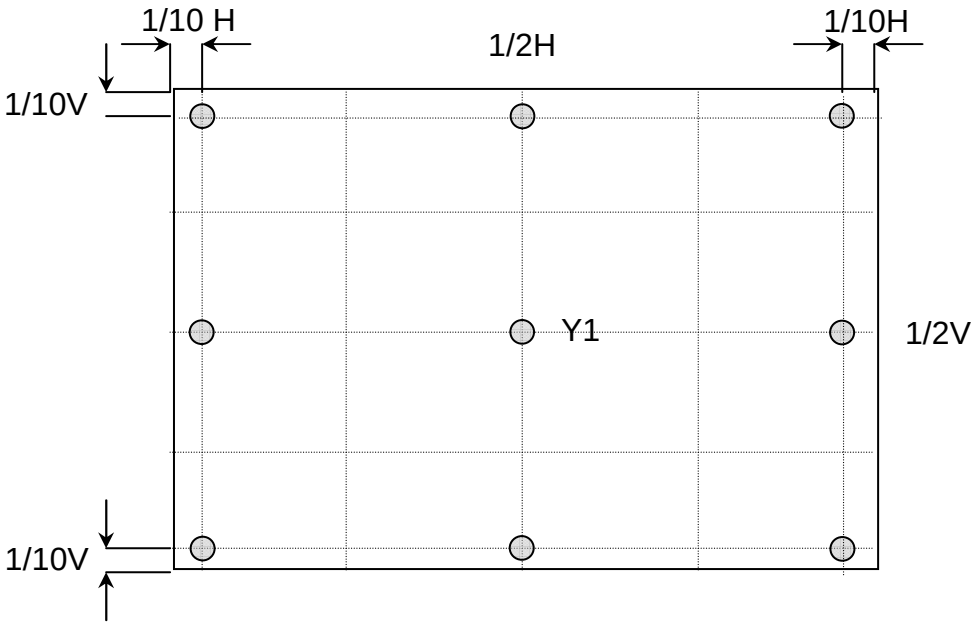
Note (3) Definition of Response Time: Sum of T_R and T_F



Note (4) Optical characteristic measurement setup



Note (5) Definition of Center Luminance of White (center)
Center Luminance= Y1

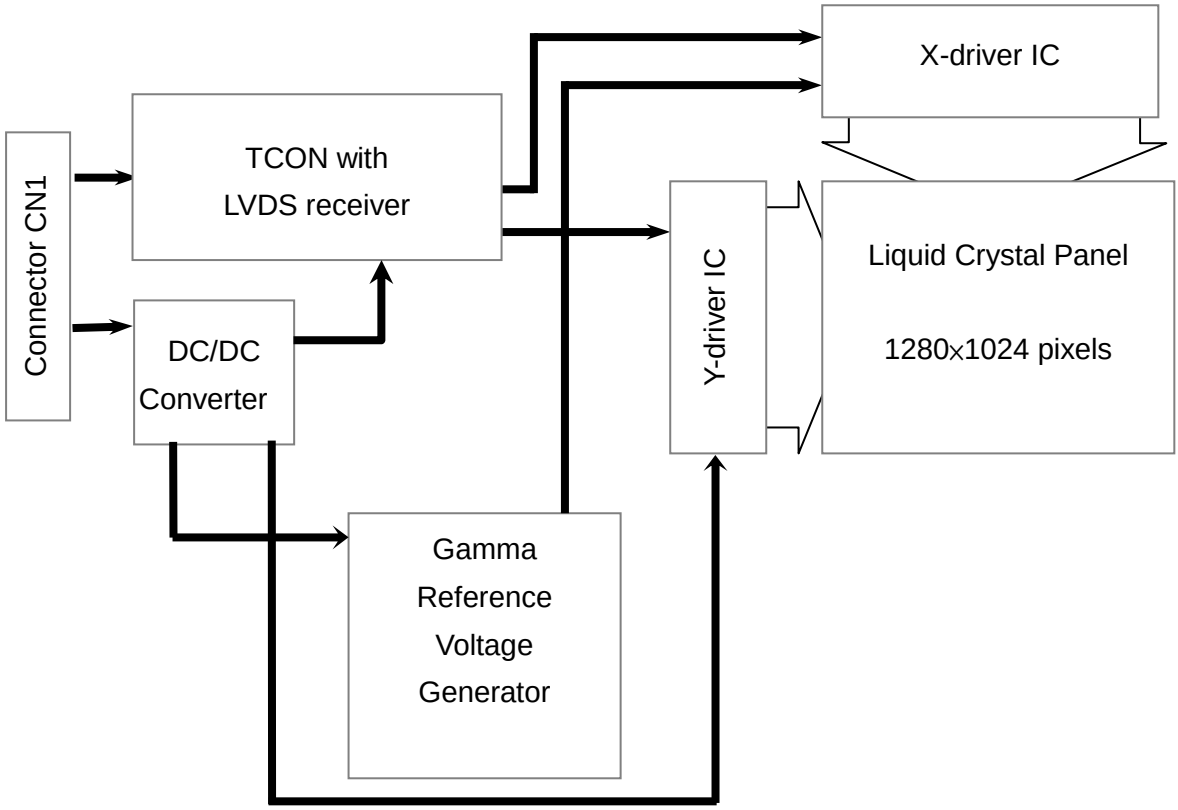


Note (6) Definition of brightness uniformity

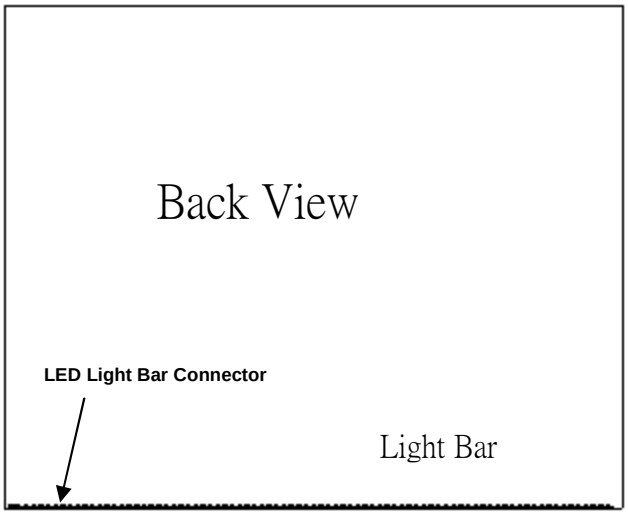
$$\text{Luminance uniformity} = \frac{\text{(Min Luminance of 9 points)}}{\text{(Max Luminance of 9 points)}} \times 100\%$$

4.0 BLOCK DIAGRAM

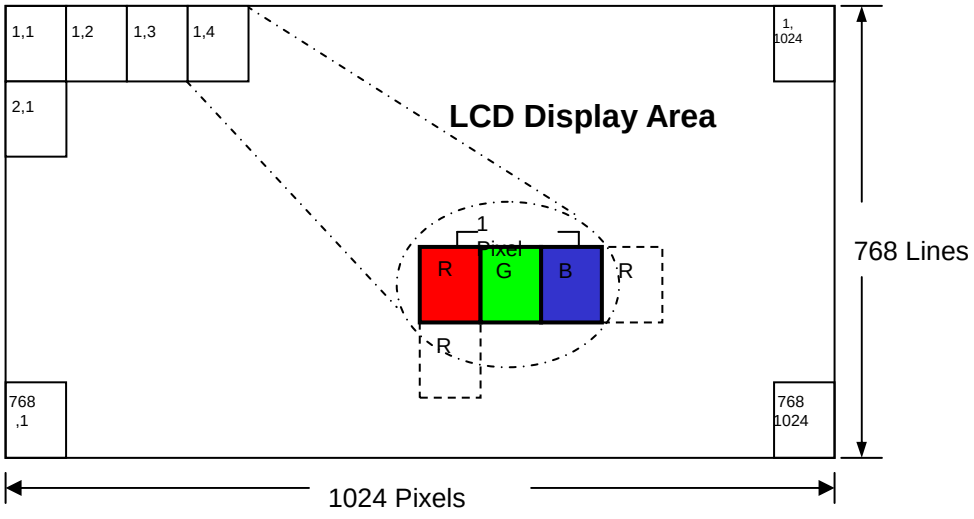
4.1 LCD Module Block Diagram:



4.2 Back Light Unit



4.3 Pixel Format



4.4 Relationship Between Displayed Color and Input

		MSB							LSB	MSB							LSB	MSB							LSB	Gray scale
	Display	R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0	Level
Basic color	Black	L	L	L	L	L	L	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	L	L	L	L	H	H	H	H	H	H	H	H	-
	Green	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	-
	Light Blue	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-
	Red	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-
	Purple	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	-
	Yellow	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L	L	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	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	L	L	L	L	L	L	L0
	Dark	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L1
	↑	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L2
	↓	:								:								:								L3⋯L251
	Light	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L252
		H	H	H	H	H	H	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L253
		H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L254
	Red	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	Red L255
Gray scale of Green	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L1
	↑	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L2
	↓	:								:								:								L3⋯L251
	Light	L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L252
		L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	H	L	L	L	L	L	L	L	L	L253
		L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L254
	Green	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	Green L255
Gray scale of Blue	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark	L	L	L	L	L	L	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	L	L	L	L	L	L	H	L	L2
	↓	:								:								:								L3⋯L251
	Light	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L252
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	H	L253
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	L	L254
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	Blue L255
Gray scale of White & Black	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	H	L1
	↑	L	L	L	L	L	L	H	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	H	L	L2
	↓	:								:								:								L3⋯L251
	Light	H	H	H	H	H	H	L	L	H	H	H	H	H	H	L	L	H	H	H	H	H	H	L	L	L252
		H	H	H	H	H	H	L	H	H	H	H	H	H	H	L	H	H	H	H	H	H	H	L	H	L253
		H	H	H	H	H	H	H	L	H	H	H	H	H	H	H	L	H	H	H	H	H	H	H	L	L254
	White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	White L255

5.0 I/O CONNECTION PIN ASSIGNMENT

5.1 **Interface Connector** (20-pins, STM MSB240420E or equivalent)

Pin No.	Signal	Description
1	VDD	Power Supply 3.3V(typ)
2	VDD	Power Supply 3.3V(typ)
3	NC	No Connect
4	NC	No Connect
5	Rin0-	Negative LVDS differential data input
6	Rin0+	Positive LVDS differential data input
7	VSS	Ground
8	Rin1-	Negative LVDS differential data input
9	Rin1+	Positive LVDS differential data input
10	VSS	Ground
11	Rin2-	Negative LVDS differential data input
12	Rin2+	Positive LVDS differential data input
13	VSS	Ground
14	ClkIN-	Negative LVDS differential clock input
15	ClkIN+	Positive LVDS differential clock input
16	GND	Ground
17	Rin3-	Negative LVDS differential data input
18	Rin3+	Positive LVDS differential data input
19	VSS	Ground
20	SEL 6/8	Select 6/8 bit high/low LVDS Input

5.2 LED Board Pin Assignment:

LED Power Source Connector (STM MSB24038P5 or equivalent)

Pin No	Symbol	Description
1	VCC	12V
2	GND	Ground
3	Enable	VLED On/Off
4	Dimming	PWM Dimming
5	NC	No Connect

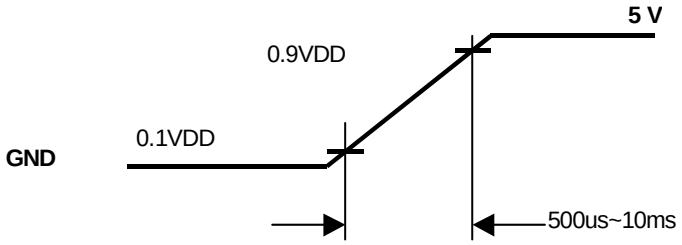
6.0 ELECTRICAL CHARACTERISTICS

6.1 TFT LCD Module:

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Voltage of power supply	V_{DD}	3.0	3.3	3.6	V	
Current of power supply	I_{DD0}	--	TBD	TBD	mA	(1)
Input rush current	I_{RUSH}	--	--	3.0	A	(3)

Note (1) V_{DD} =3.3V, Black pattern (L0), Frame Rate 60Hz

Note (3) Input Rush Current condition



6.2 **Back-Light Unit**

Parameter	Symbol	Min	Typ	Max	Units	Condition
LED Operation Current	I_F	---	60	--	mA	Ta=25℃
Light Bar Input Voltage	V_F	TBD	22.4	23.8	Volt	Ta=25℃
LED Power consumption	P_{LED}	---	5.376	5.712	Watt	Ta=25℃ Note (1)
LED Life-Time	N/A	50,000	--	--	Hour	Ta=25℃ $I_{F=}$60mA Note (2)

Notes (1) The specified values are for a single LED lightbar.

Notes (2) The specified current is input LED chip 100% duty current.

Notes (3) Calculator value for reference $P=I_F \times V_F \times N$ (LED Parallel Qty')

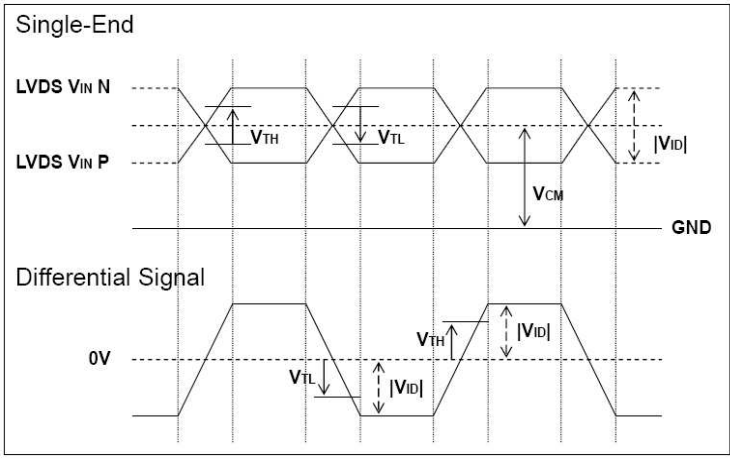
Notes (4) The LED lifetime defines as the estimated time to 50% degradation of original luminance

Notes (5) For better LED light bar driving quality, it is recommended to utilize the adaptive boost converter with current balancing function to drive LED light-bar.

6.3 Switching Characteristics for LVDS Receiver

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Differential Input High Threshold	Vth	—	—	+100	mV	V_{CMLVDS}=1.25V
Differential Input Low Threshold	Vtl	-100	—	—	mV	
Input Current	I_{IN}	-10	—	+10	uA	V_{IN}=2.4V/0V, V_{DD}=3.6V
Differential input Voltage	$\|V_{ID}\|$	0.1	—	0.6	V	
Common Mode Voltage Offset	V_{CM}	1.15	—	1.35	V	

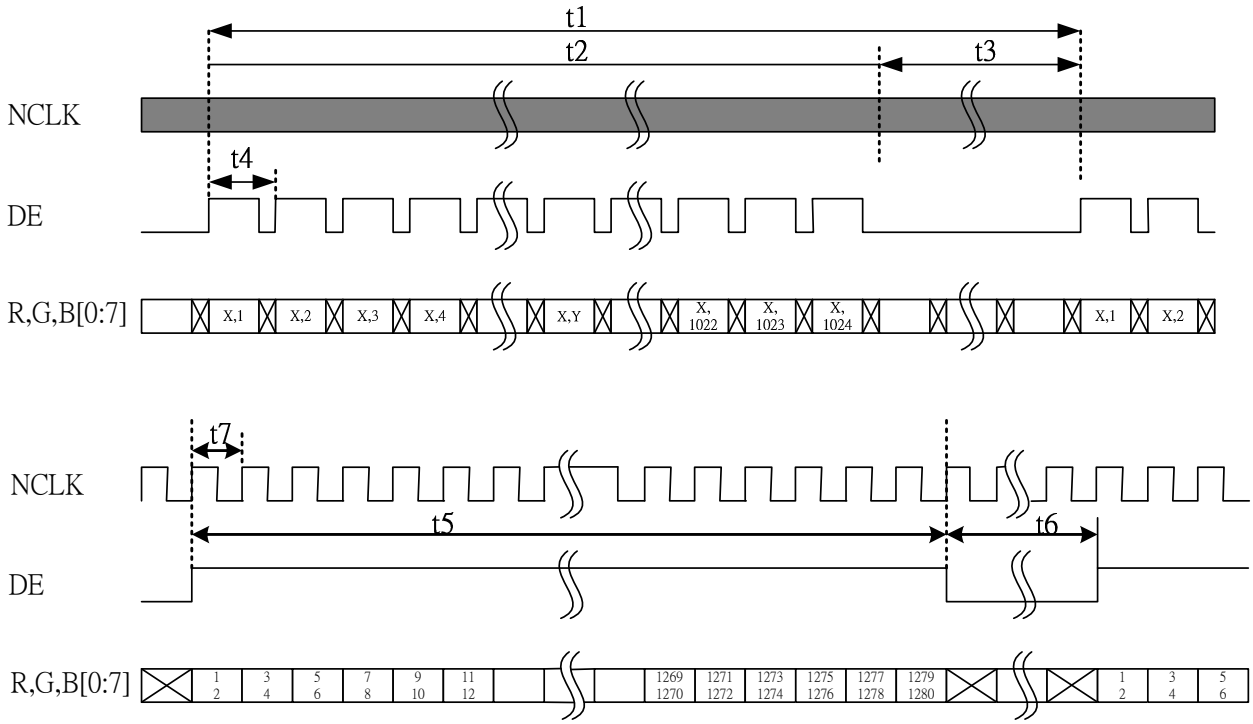
Differential Signal Diagram



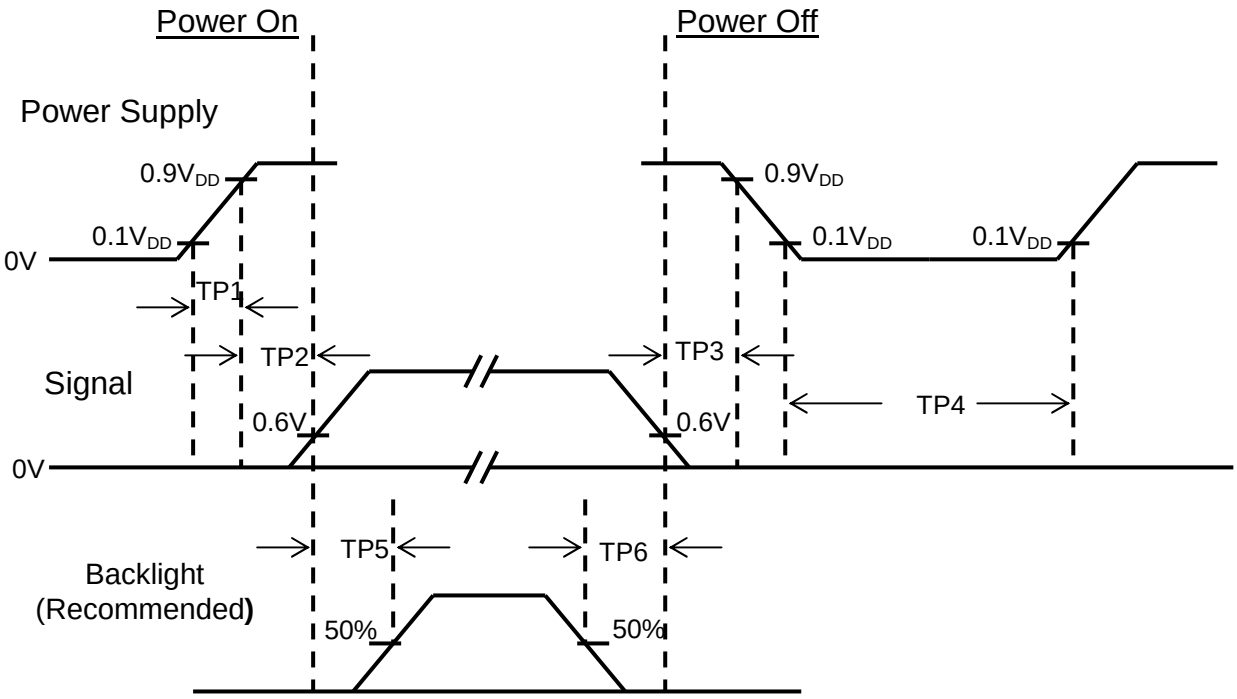
6.4 Interface Timing (DE mode)

Item	Symbol	Min.	Typ.	Max.	Unit
Frame Rate	--	50	60	75	Hz
Frame Period	t1	776	806	990	line
Vertical Display Time	t2	-	768	-	line
Vertical Blanking Time	t3	8	38	222	line
1 Line Scanning Time	t4	TBD	TBD	TBD	clock
Horizontal Display Time	t5	-	1024	-	clock
Horizontal Blanking Time	t6	70	320	696	clock
Clock Rate	t7	50	65	80	MHz

Timing Diagram of Interface Signal (DE mode)



6.5 Power On / Off Sequence：



Item	Min.	Typ.	Max.	Unit	Remark
TP1	0.5	--	10	msec	
TP2	0	--	50	msec	
TP3	0	--	50	msec	
TP4	500	--	--	msec	
TP5	200	--	--	msec	
TP6	200	--	--	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 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.

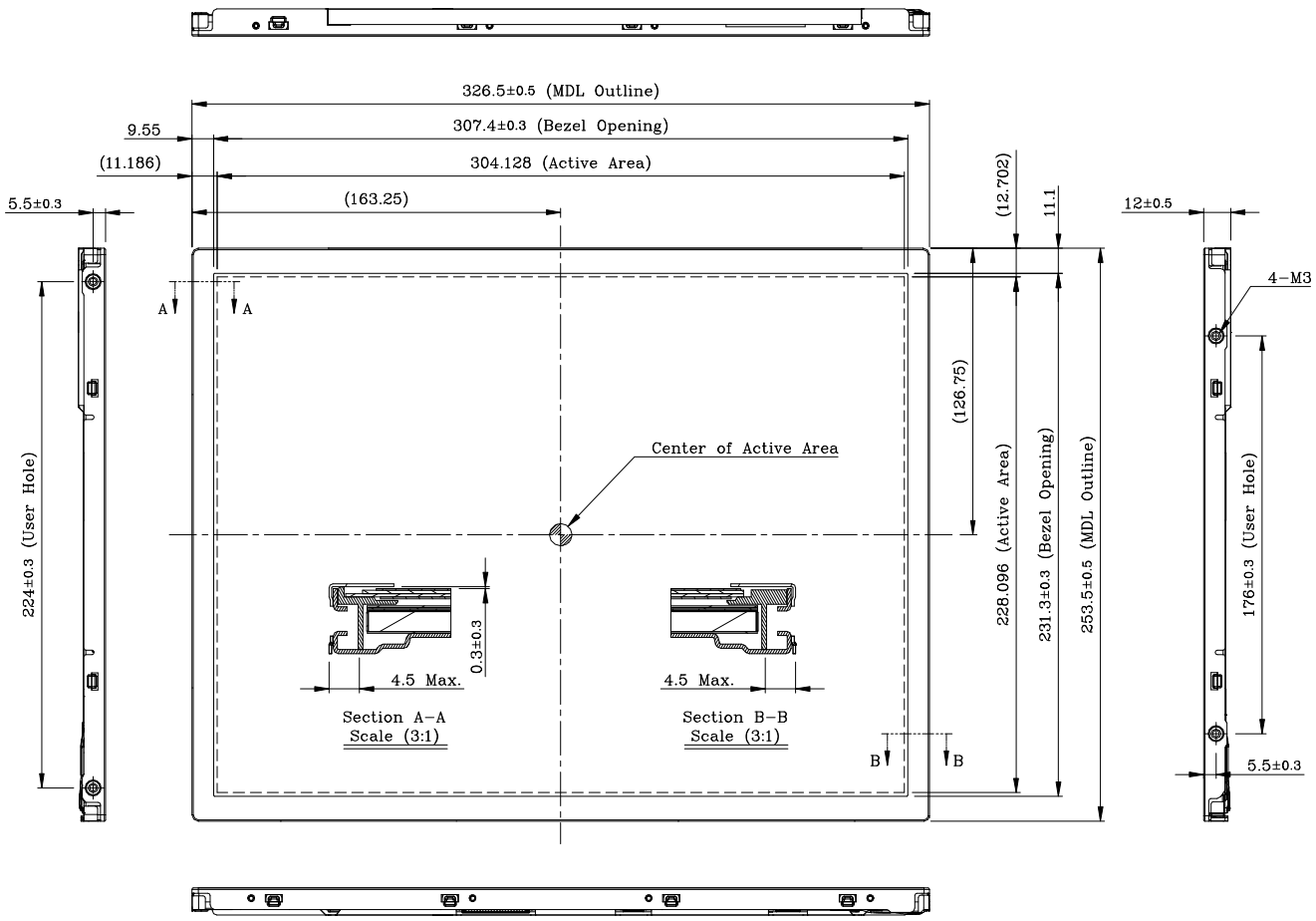
(3) In case of VDD = off level, please keep the level of input signal on the low or keep a high impedance.

(4) TP4 should be measured after the module has been fully discharged between power off and on period.

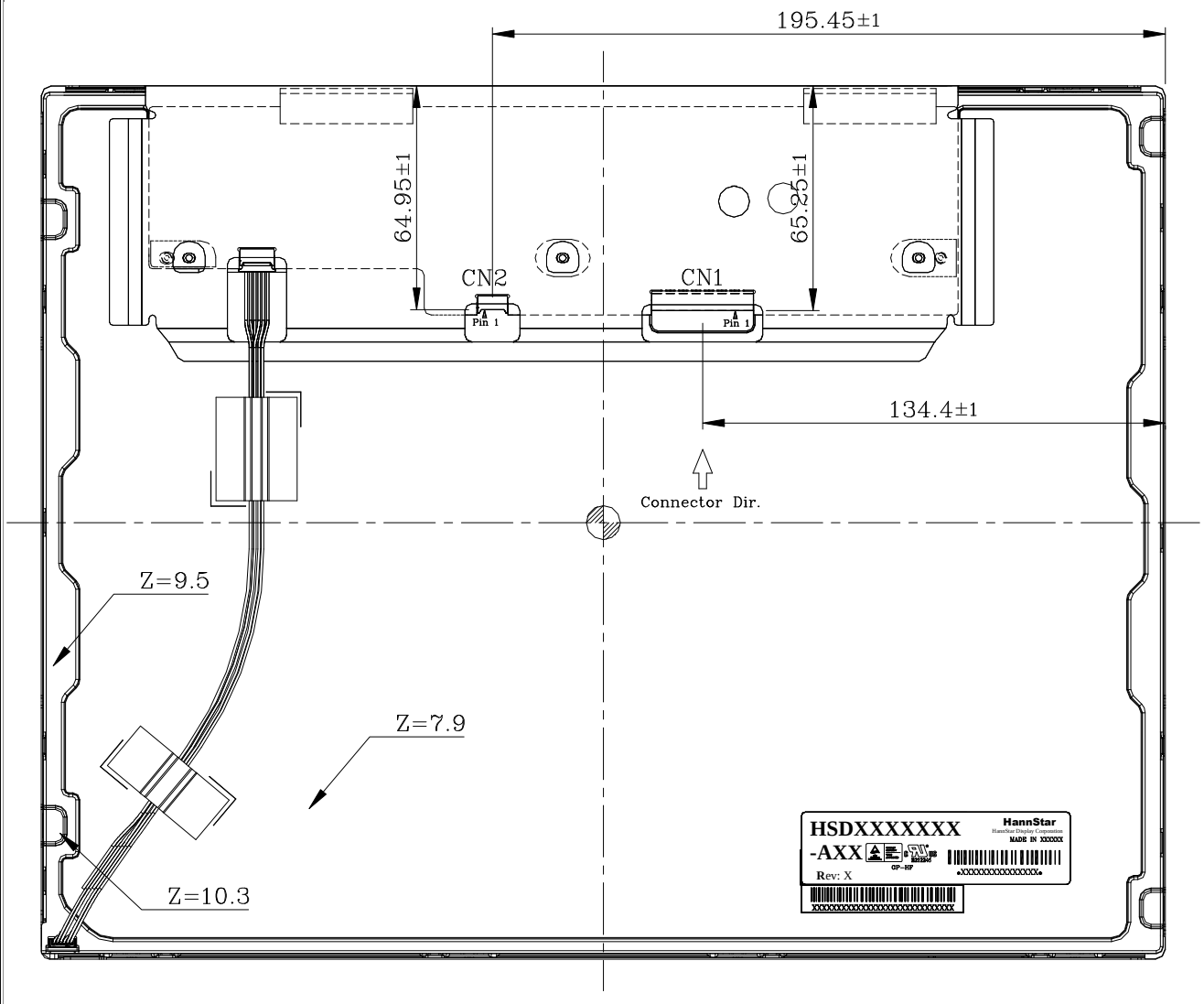
(5) Interface signal shall not be kept at high impedance when the power is on.

7.0 OUTLINE DIMENSION

7.1 Front View:



7.2 Back View:



8.0 LOT MARK

8.1 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: Code 8 is defined by the last number of the year. For example:

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

8.2 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.

9.0 PACKAGE SPECIFICATION

9.1 Packing form

TBD

9.2 Packing assembly drawings

TBD

10.0 GENERAL PRECAUTION

10.1 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.

10.2 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.

10.3 Breakage of LCD Panel

10.3.1 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.

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

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

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

10.4 Electric Shock

10.4.1 Disconnect power supply before handling LCD module.

10.4.2 Do not pull or fold the CCFL cable.

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

10.5 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.

10.6 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.

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

10.7 Mechanism

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

10.8 Static Electricity

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

10.8.2 Because LCD module uses CMOS-IC on circuit board and TFT-LCD panel, it is very weak to electrostatic discharge. Please be careful with electrostatic discharge.

10.8.3 Persons who handle the module should be grounded through adequate methods.

10.9 Strong Light Exposure

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

10.10 Disposal

When disposing LCD module, obey the local environmental regulations.