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TO :

Date : Aug., 08, 2013

HannStar Product Specification **(Formal)**

Model: HSD070IFW1-A*
(Module)

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.

Rev.	Date	Sub-Model	Description of change
1.1	Aug, 08, 2013	A**	Formal Product Specification was first released.

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1.0 GENERAL DESCRIPTION

1.1 Introduction

HannStar Display model HSD070IFW1-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 7.0 (16:9) inch diagonally measured active display area with WSVGA (1024 horizontal by 600 vertical pixel) resolution.

1.2 Features

- 7 inch (16:9 diagonal) configuration
- 16.7M color by 6 bit+HiFRC R.G.B signal input
- RoHS/ Halogen Free Compliance

1.3 Applications

- Automotive

1.4 TFT LCD General information

Item		Specification	Unit
Outline Dimension		164.9 x 100.0 (typ)	mm
Display area		153.6(H) x 86.64(V)	mm
Number of Pixel		1024 RGB (H) x 600(V)	pixels
Pixel pitch		0.150(H) x 0.1444(V)	mm
Pixel arrangement		RGB Vertical stripe	
Display mode		Normally white	
NTSC		50 (typ.)	%
Surface treatment		AG, with EWV Flim	
Weight		146g (Typ.)	g
Back-light		White LED	
Power Consumption	Logic	0.35 (typ) @ Black pattern 、 Frame rate 60Hz	W
	BL System	2.45 (typ) @ Black pattern w/o LED driver	W

1.5 Mechanical Information

Item		Min.	Typ.	Max.	Unit
Module Size	Horizontal (H)	164.6	164.9	165.2	mm
	Vertical (V)	99.7	100.0	100.3	mm
	Depth (D)	5.4	5.7	6.0	mm
	Depth (with component)			7.3	mm
Weight		—	146	156	—

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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	V_{DD}	-0.3	5.0	V	
	V_{GH}	-0.3	40.0	V	
	V_{GL}	-20.0	0.3	V	
	AV_{DD}	6.5	13.5	V	
	V_I	-0.3	$V_{DD} + 0.3$	V	
Logic Signal Input Level	V_{DD}	-0.3	5.0	V	

2.1.2 Backlight unit

Item	Symbol	Typ.	Max.	Unit	Note
LED current	I_L	240	-	mA	(1) (2)(3)
LED voltage	V_L	9.6	10.2	V	(1) (2)(3)
LED reverse voltage	V_R	--	5	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) $T_a = 25 \pm 2^\circ\text{C}$
- (3) Test Condition: LED current 240 mA. The LED lifetime could be decreased if operating I_L is larger than 240 mA.

2.1.3 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
Contrast		CR	Θ=0 Normal viewing angle	640	800	—		(1)(2)(4)
Response time		Tr		—	4	8	msec	(1)(3)
		Tf		—	12	24		
White luminance (Center)		Y _L		480	600	—	cd/m ²	(1)(4) (I _L =240mA)
Color chromaticity (CIE1931)	Red	R _x		-0.05	0.617 0.353 0.365 0.580 0.148 0.098 0.31 0.33	+0.05		
		R _Y						
	Green	G _x						
		G _Y						
	Blue	B _x						
		B _Y						
	White	W _x						
		W _y						
Viewing angle	Hor.	Θ _L	CR>10	70	80	—		(1)(4)
		Θ _R		70	80	—		
	Ver.	Θ _U		60	70	—		
		Θ _D		70	80	—		
Brightness uniformity		B _{UNI}	Θ=0 (9point)	70	75	—		(5)
View Direction		6 O' clock						(6)

3.2 Measuring Condition

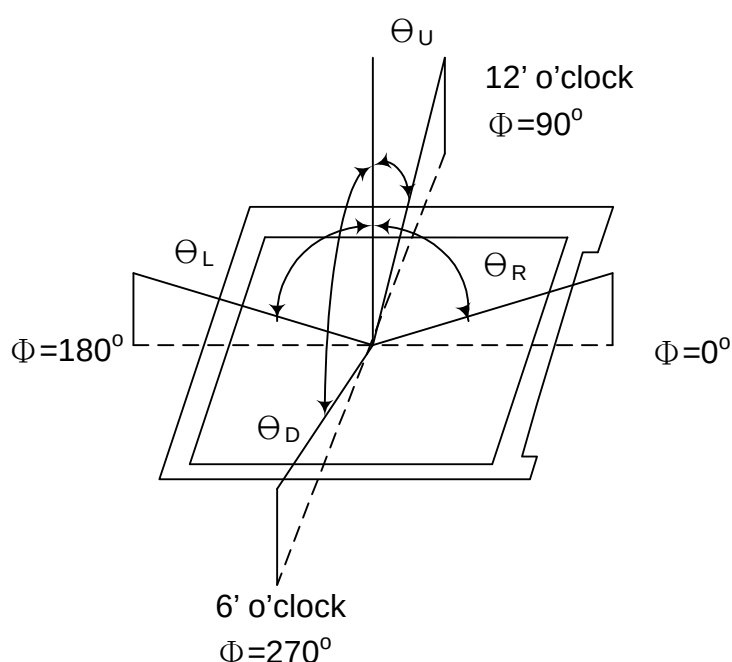
- Measuring surrounding : dark room
- LED current I_L : 240mA
- Ambient temperature : 25±2°C
- 15min. warm-up time.

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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:

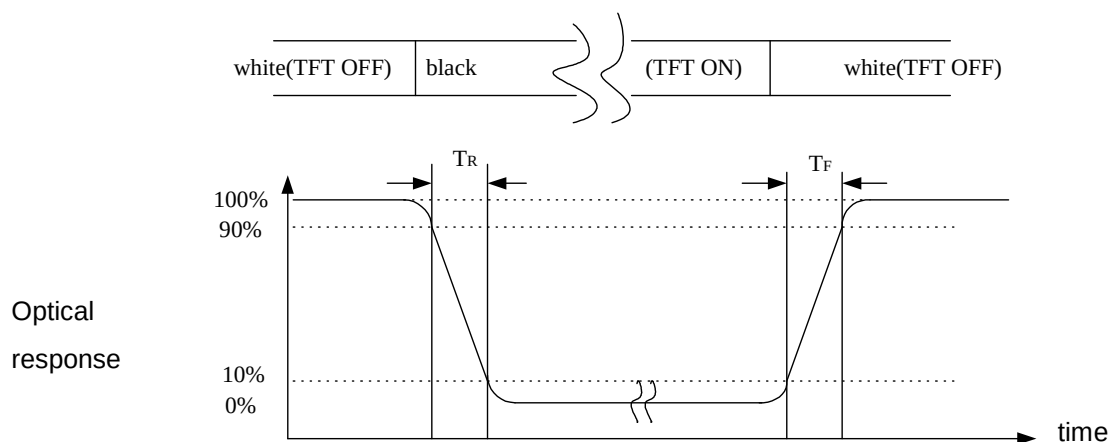


Note (2) Definition of Contrast Ratio (CR) :
measured at the center point of panel

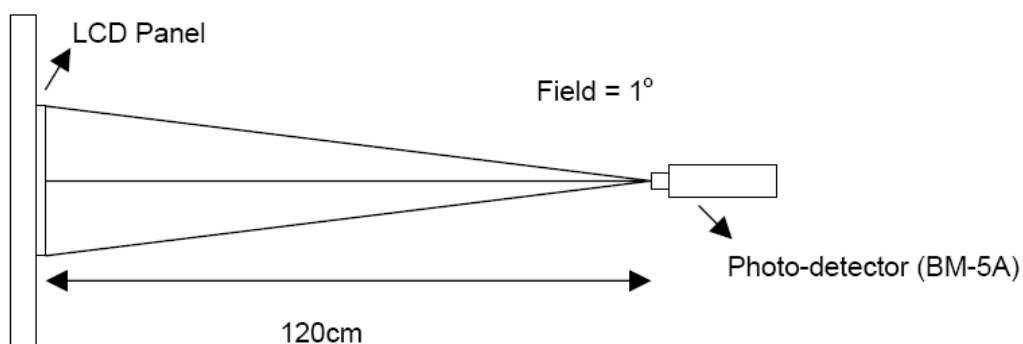
$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

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

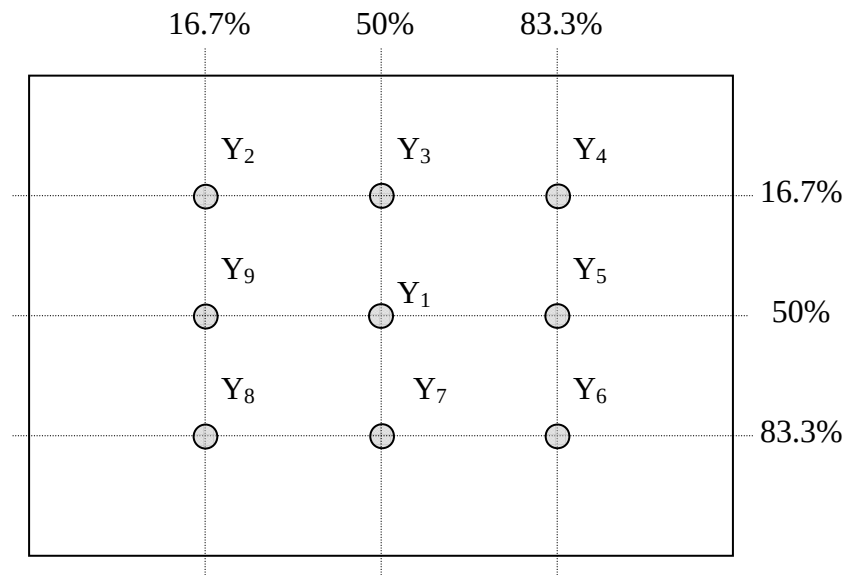


Note (4) Definition of optical measurement setup



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Note (5) Definition of Average Luminance Uniformity of White (Center)
Definition of brightness uniformity



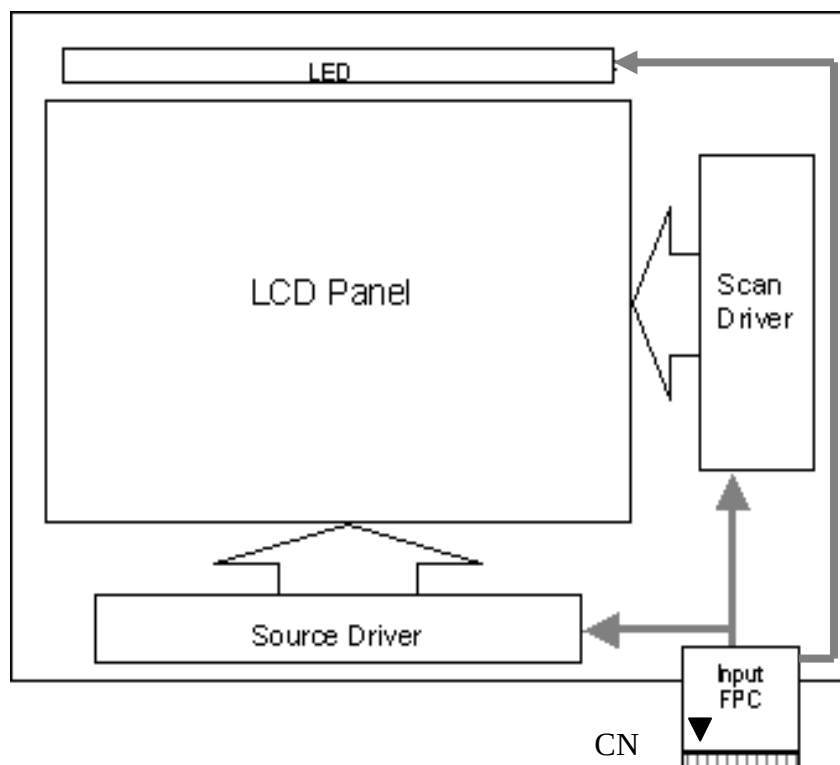
$$\text{Luminance uniformity} = \frac{(\text{Min Luminance of 9 points})}{(\text{Max Luminance of 9 points})} \times 100\%$$

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

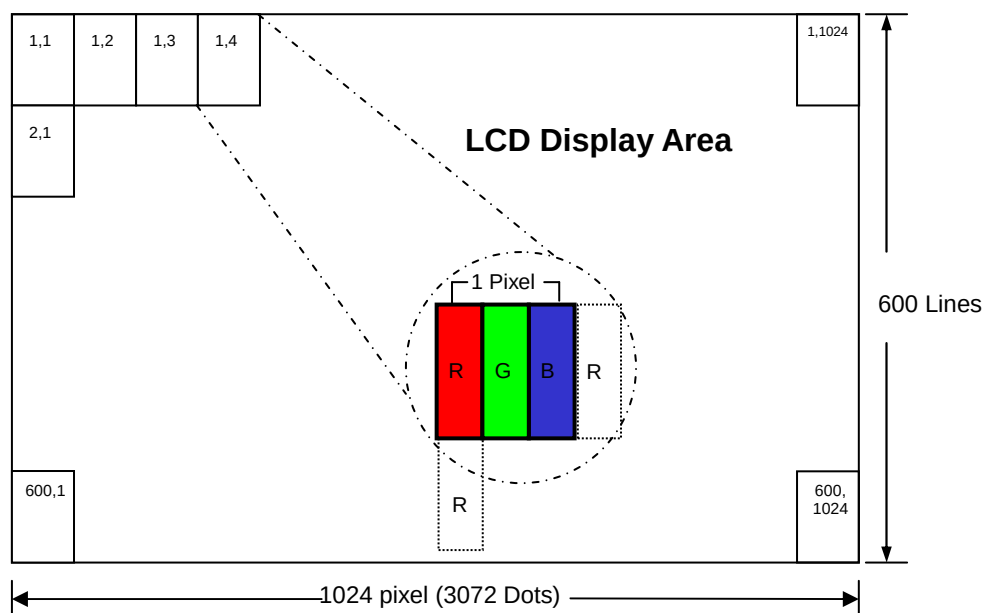
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4.0 BLOCK DIAGRAM

4.1 TFT LCD Module



4.2 Pixel Format



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4.3 Relationship Between Displayed Color and Input

4.3.1 6bit

	Display	MSB LSB R5 R4 R3 R2 R1 R0	M L G5 G4 G3 G2 G1 G0	S S B5 B4 B3 B2 B1 B0	B B 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	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	L L L L L L	-
	Green	L L L L L L	H H H H H H	L L L L L L	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	L L L L L L	-
	Red	H H H H H H	L L L L L L	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	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	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 ↑ ↓ Light	L L L L L H	L L L L L L	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	L L L L L L	L2
		:	:	:	:	L3...L60
	Dark ↑ ↓ Light	H H H H L H	L L L L L L	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	L L L L L L	L62
		H H H H H H	L L L L L L	L L L L L L	L L L L L L	Red L63
	Red	H H H H H H	L L L L L L	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	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 L	L L L L L L	L1
		L L L L L L	L L L L L L	H L L L L L	L L L L L L	L2
		:	:	:	:	L3...L60
	Dark ↑ ↓ Light	L L L L L L	H H H H L H	L L L L L L	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	L L L L L L	L62
		L L L L L L	H H H H H H	L L L L L L	L L L L L L	Green L63
	Green	L L L L L L	H H H H H H	L L L L L L	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	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 L	L L L L L L	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...L60
	Dark ↑ ↓ Light	L L L L L L	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	L L L L L L	H H H H H L	L L L L L L	L62
		L L L L L L	L L L L L L	H H H H H H	L L L L L L	Blue L63
	Blue	L L L L L L	L L L L L L	H H H H H H	L L L L L L	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	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	L L L L L H	L1
		L L L L H L	L L L L H L	L L L L L L	L L L L H L	L2
		:	:	:	:	L3...L60
	Dark ↑ ↓ Light	H H H H L H	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	H H H H H L	L62
		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 L63
	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 L63

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4.3.2 8bit

	Display	MSB R7 R6 R5 R4 R3 R2 R1 R0	LSB G7 G6 G5 G4 G3 G2 G1 G0	MSB B7 B6 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 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 ↑ ↓ Light	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
		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
	Light	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 ↑ ↓ Light	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
		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
	Light	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 ↑ ↓ Light	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
		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
	Light	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 ↑ ↓ Light	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
		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
	Light	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

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5.0 INTERFACE PIN CONNECTION

FPC connector is used for electronics interface. The recommended model is FH12A-40S-0.5SH manufactured by Hirose.

Pin No.	Symbol	I/O	Function	Note
1	VCOM	P	Common Voltage	
2	VDD	P	Power Voltage for digital circuit	
3	VDD	P	Power Voltage for digital circuit	
4	NC	---	No connection	
5	Reset	I	Global reset pin	Note1
6	U/D	I	Vertical inversion	Note2
7	L/R	I	Horizontal inversion	Note2
8	STBYB	I	Standby mode, Normally pulled high STBYB = "1", normal operation STBYB = "0", timing controller, source driver will turn off, all output are High-Z	
9	GND	P	Ground	
10	RXCLKIN-	I	- LVDS differential clock input	
11	RXCLKIN+	I	+ LVDS differential clock input	
12	GND	P	Ground	
13	RXIN0-	I	- LVDS differential data input	
14	RXIN0+	I	+ LVDS differential data input	
15	GND	P	Ground	
16	RXIN1-	I	- LVDS differential data input	
17	RXIN1+	I	+ LVDS differential data input	
18	GND	P	Ground	
19	RXIN2-	I	- LVDS differential data input	
20	RXIN2+	I	+ LVDS differential data input	
21	GND	P	Ground	
22	RXIN3-	I	- LVDS differential data input	
23	RXIN3+	I	+ LVDS differential data input	
24	GND	P	Ground	
25	SELB	I	6bit/8bit mode selection	Note3
26	GND	P	Ground	
27	AVDD	P	Power for Analog Circuit	
28	GND	P	Ground	
29	VGH	P	Gate ON Voltage	
30	NC	---	No connection	
31	NC	---	No connection	
32	VGL	P	Gate off Voltage	
33	GND	P	Ground	
34	NC	---	No connection	

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Pin No.	Symbol	I/O	Function	Note
35	LED-	P	LED Cathode	
36	LED-	P	LED Cathode	
37	NC	---	No connection	
38	NC	---	No connection	
39	LED+	P	LED Anode	
40	LED+	P	LED Anode	

I: input O: Output P: Power

Note1 : Global reset pin: Active low to enter reset mode. Suggest connecting with an RC reset circuit for stability. Normally pull high. (R=10K Ω , C=0.1 μ F)

Note: If RC is not added, users must follow the rule, T2 > 50ms on page 18 item 6.5 power on/off sequence.

Note2 : When L/R="0", set right to left scan direction.

When L/R="1", set left to right scan direction.

When U/D="0", set top to bottom scan direction.

When U/D="1", set bottom to top scan direction.

Note3 : If LVDS input data is 6 bits, SELB must be set to High;

If LVDS input data is 8 bits, SELB must be set to Low.

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6.0 ELECTRICAL CHARACTERISTICS

6.1 TFT LCD Module

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	VDD	3.0	3.3	3.6	V	
	VGH	17.7	18	18.3	V	
	VGL	-10.3	-10	-9.7	V	
	AVDD	9.2	9.5	9.8	V	
VCOM	VCOMin	1.98	2.38	2.78	V	
Input signal voltage	ViH	0.7 VDD	-	VDD	V	Note (1)
	ViL	0	-	0.3 VDD	V	
Current of power supply	IDD	-	33	-	mA	VDD =3.3V
	IADD	-	18	-	mA	AVDD=9.5V
	IGH	-	0.31	-	mA	VGH=18V
	IGL	-	1.0	-	mA	VGL=-10V

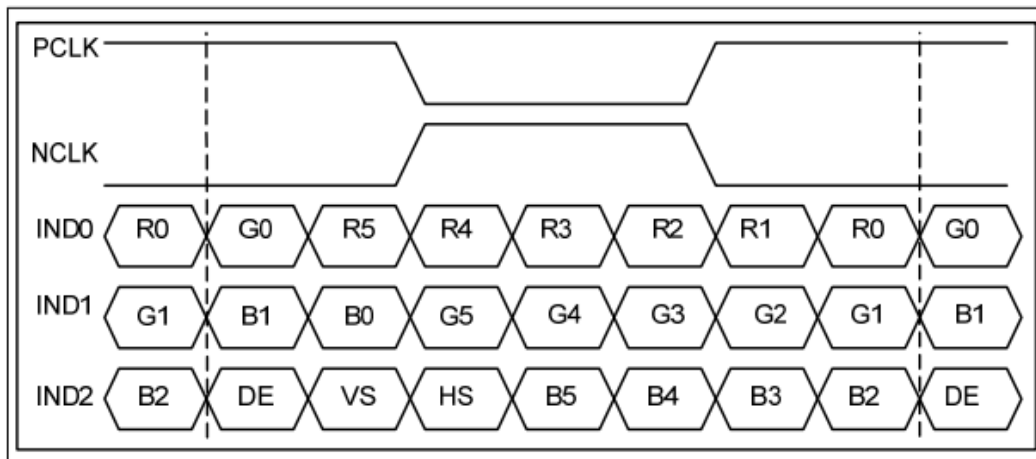
6.2 Switching Characteristics for LVDS Receiver

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}	0.7	1.2	1.6	V	

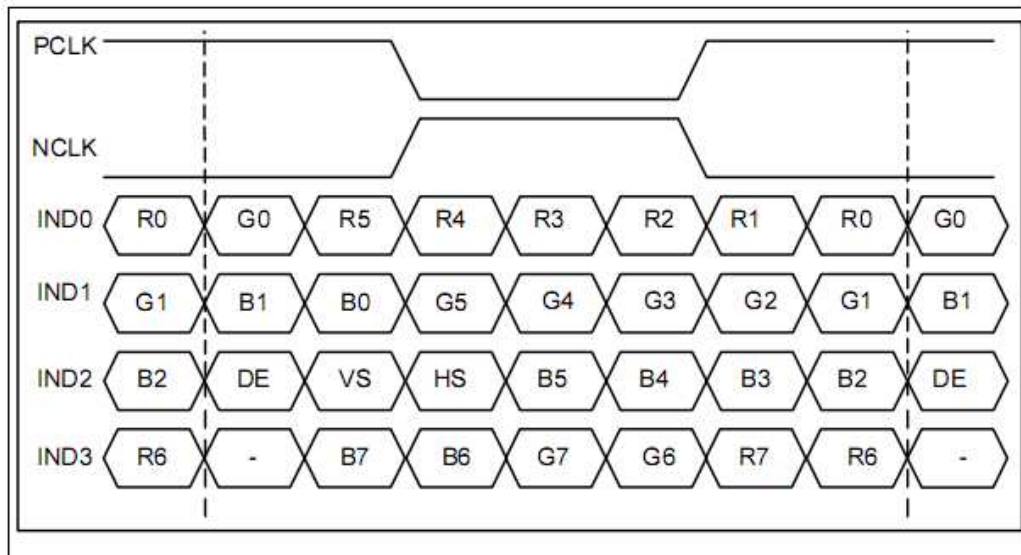
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6.3 Bit LVDS input

6.3.1 6bit LVDS input



6.3.2 8Bit LVDS input

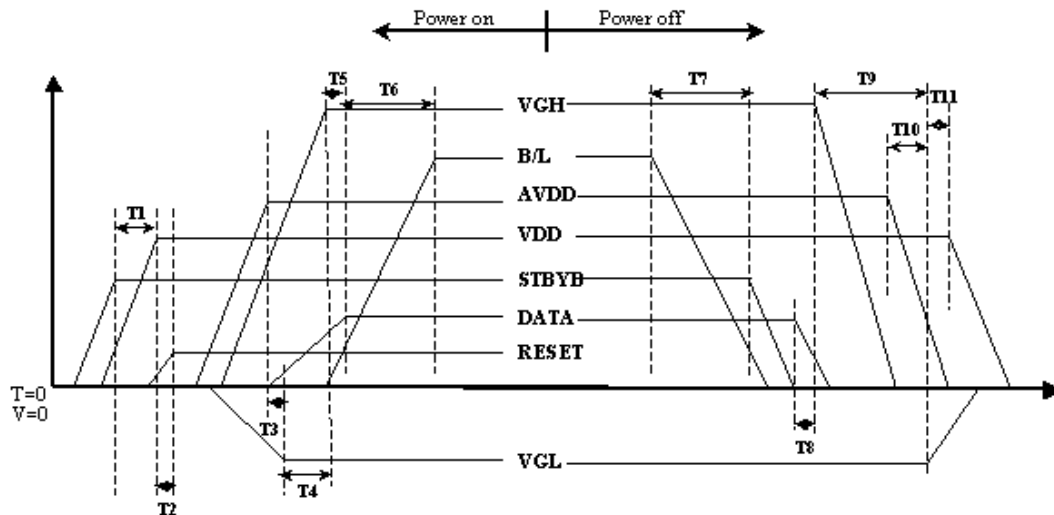


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6.4 Interface Timing (DE mode)

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK frequency @Frame rate=60hz	fclk	40.8	51.2	67.2	Mhz
Horizontal display area	thd	1024			DCLK
HSYNC period time	th	1114	1344	1400	DCLK
HSYNC blanking	thb+thfp	90	320	376	DCLK
Vertical display area	tvd	600			H
VSYNC period time	tv	610	635	800	H
VSYNC blanking	tvb+tvfp	10	35	200	H

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

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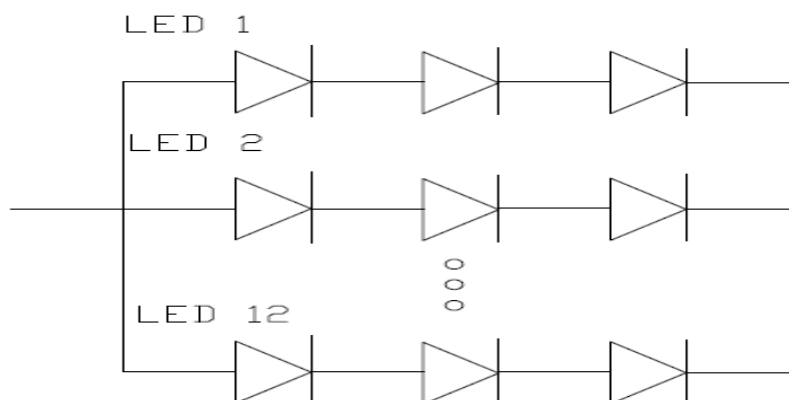
6.6 Backlight Unit

Parameter	Symbol	Min	Typ	Max	Units	Condition
LED Current	I_F	--	240	--	mA	$T_a=25^{\circ}\text{C}$
LED Voltage	V_F	--	9.6	10.2	Volt	$T_a=25^{\circ}\text{C}$
LED Life-Time	N/A	10,000	--	--	Hour	$T_a=25^{\circ}\text{C}$ $I_F=22.5\text{mA}$ Note (2)

Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: $T_a=25\pm3^{\circ}\text{C}$, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note (2) The "LED life time" is defined as the module brightness decrease to 50% original brightness at $T_a=25^{\circ}\text{C}$ and $I_L=180\text{mA}$. The LED lifetime could be decreased if operating I_L is larger than 180mA. The constant current driving method is suggested.

Note (3) LED Light Bar Circuit

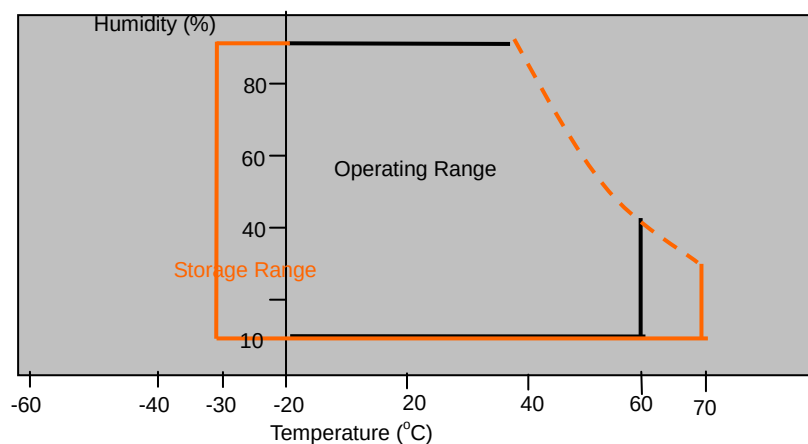


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7.0 Reliability test items

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	Thermal Cycling Test (non operation)	-20°C(30min)→+70°C(30min),100 cycles	
6	Vibration	Sine Wave 1.5G, 5~500Hz, XYZ 30min/each direction	
7	Shock	Half-Sine, 200G, 2ms, ±XYZ, 1time	

Storage / Operating temperature



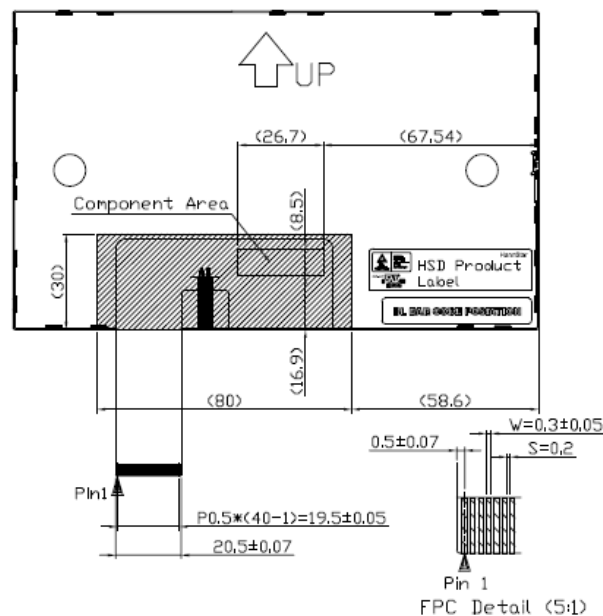
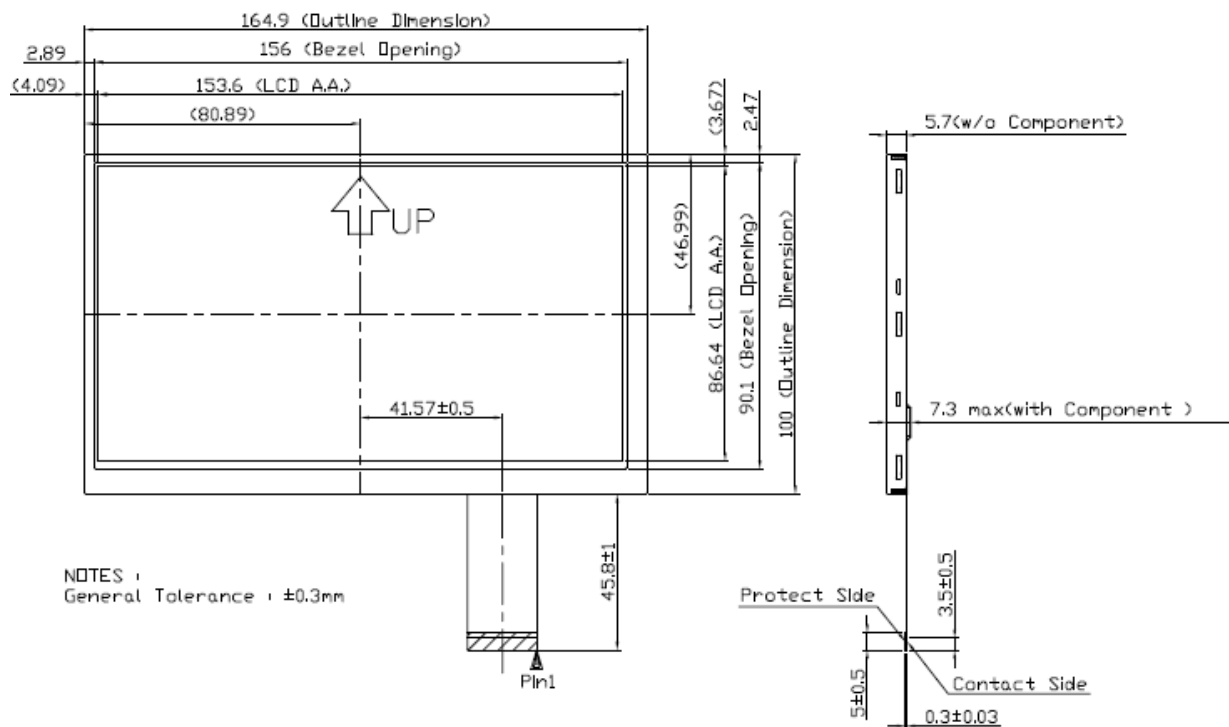
Note .Max wet bulb temp.=39°C

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8.0 OUTLINE DIMENSION

8.1 Front View Outline Dimension

Unit : mm



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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 lot mark is attached to the back side of the LCD module. See Product back view. (Section 8.0 : OUTLINE DIMENSION)
- (2) Detail of the Lot mark: Print 15 code as lot mark (see 9.1 Lot Mark)
- (3) This is subject to change without prior notice.



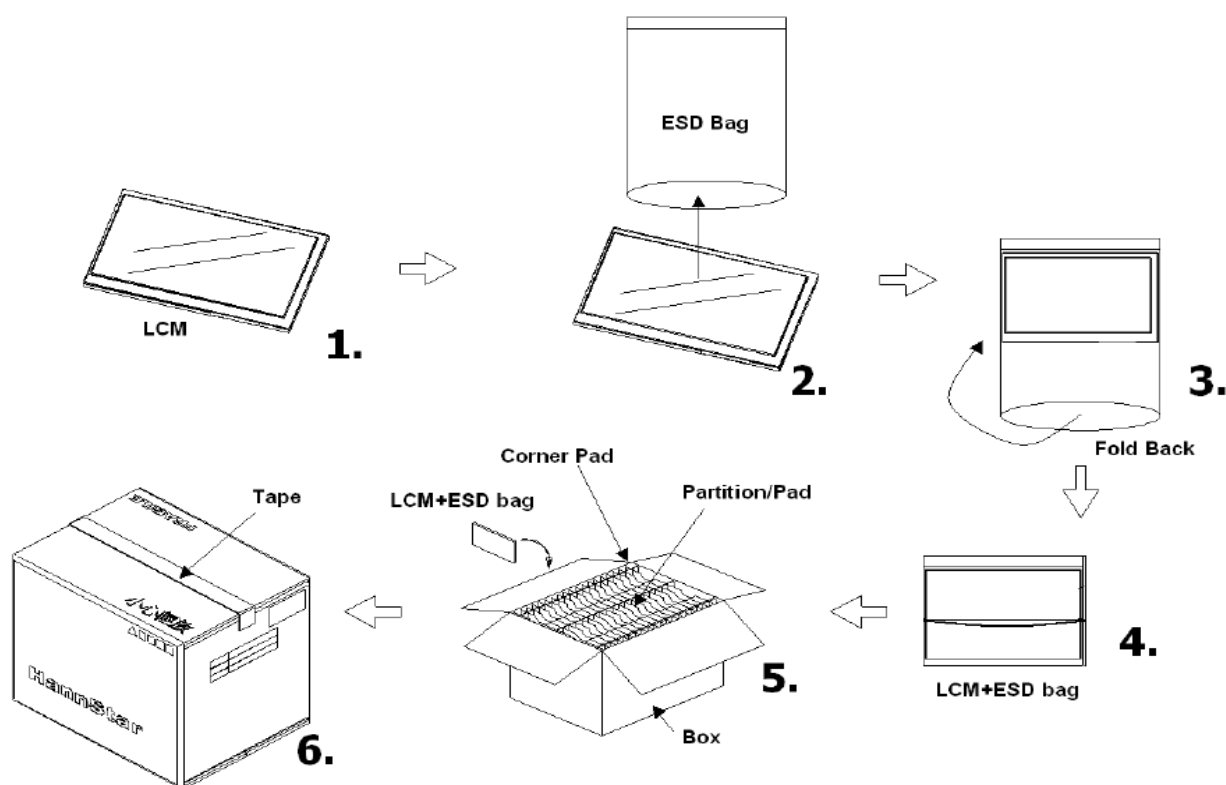
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10.0 PACKAGE SPECIFICATION

10.1 Packing form

LCM Model	LCM Qty. in the Box	Inner Box Size(mm)	Notice
HSD070IFW1-A00	80pcs/Box	451mmx375mmx	--

10.2 Packing assembly drawings



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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 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.

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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.