


Product Specification				
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Thin-Film-Transistor LCD Module  
 Model: TFT-H103A3VNGD1E0

Acceptance

Approved and Checked by

Approved by	Checked by		Made by
	GW	TO	SGD

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### Revise Records

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### Special Notes

Note1.	
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### 1.0 GENERAL DESCRIPTION

#### 1.1 Introduction

Model: TFT-H103A3VNGD1E0 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 10.25 inch diagonally measured active display area with HD (1280 horizontal by 480 vertical pixel) resolution.

#### 1.2 Features

- 10.25 (8:3 diagonal) inch configuration
- LVDS
- ROHS / Halogen Free Compliance

#### 1.3 Applications

- Automobile


#### 1.4 General information

Item	Specification	Unit	
Outline Dimension	265.2 (H) x 109.85 (V) x 8.65 (D) (Typ)	mm	
Display area	243.84(H) x 91.44(V) (10.25" diagonal)	mm	
Number of Pixel	1280(H) x 480(V)	pixels	
Pixel pitch	0.1905(H) x 0.1905(V)	mm	
Pixel arrangement	RGB Vertical Stripe		
Display mode	Normally Black		
NTSC	70(Typ.)	%	
Surface treatment	Antiglare, Hard-Coating (3H)		
Weight	290	g	
Back-light	Single LED (Side-Light type)		
Power Consumption	Logic System (White Pattern)	Logic 2.0W(typ) TBD(max)	W
	B/L System	4.896(Max.)	W

#### 1.5 Mechanical Information

Item	Min.	Typ.	Max.	Unit	
Module Size	Horizontal (H)	264.9	265.2	265.5	mm
	Vertical (V)	109.55	109.85	110.15	mm
	Depth (D)	8.35	8.65	8.95	mm
Weight	--	290	--	g	

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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	3.6	V	
	$V_{GH}$	-0.3	23.0	V	
	$V_{GL}$	-15.0	0.3	V	
	$AV_{DD}$	-0.5	15	V	
	$V_I$	-0.3	$V_{DD} + 0.3$	V	
Logic Signal Input Level	$V_{DD}$	-0.3	3.6	V	

#### 2.2 Environment Absolute Rating

Item	Symbol	Min.	Max.	Unit	Note
Operating Temperature	$T_{opa}$	-30	85	°C	
Storage Temperature	$T_{stg}$	-30	85	°C	

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### 3.0 OPTICAL CHARACTERISTICS


#### 3.1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note	
Contrast		CR		600	900	—		(1)(2)	
Response time	Rising	TR+TF	$\Theta=0$ Normal viewing angle	—	30	40	msec	(1)(3)	
	Falling								
White luminance (Center)		$Y_L$			400	600	—	cd/m <sup>2</sup>	(1)(4) ( $I_L=180mA$ )
Color chromaticity (CIE1931)	White	$W_x$		0.256	0.296	0.336		(1)(4)	
		$W_y$		0.29	0.330	0.37			
	Red	$R_x$		0.613	0.653	0.693			
		$R_y$		0.302	0.342	0.382			
	Green	$G_x$		0.266	0.306	0.346			
		$G_y$		0.582	0.622	0.662			
	Blue	$B_x$		0.104	0.144	0.184			
		$B_y$	0.052	0.092	0.132				
Viewing angle	Hor.	$\Theta_L$	CR>10	80	85	—			
		$\Theta_R$		80	85	—			
	Ver.	$\Theta_U$		80	85	—			
		$\Theta_D$		80	85	—			
Brightness uniformity		$B_{UNI}$	$\Theta=0$	70	80	—	%	(5)	
Optima View Direction		Free						(6)	

#### 3.2 Measuring Condition

- Measuring surrounding : dark room
- LED current  $I_L$  : 180mA
- Ambient temperature : 25±2°C
- 15min. warm-up time.

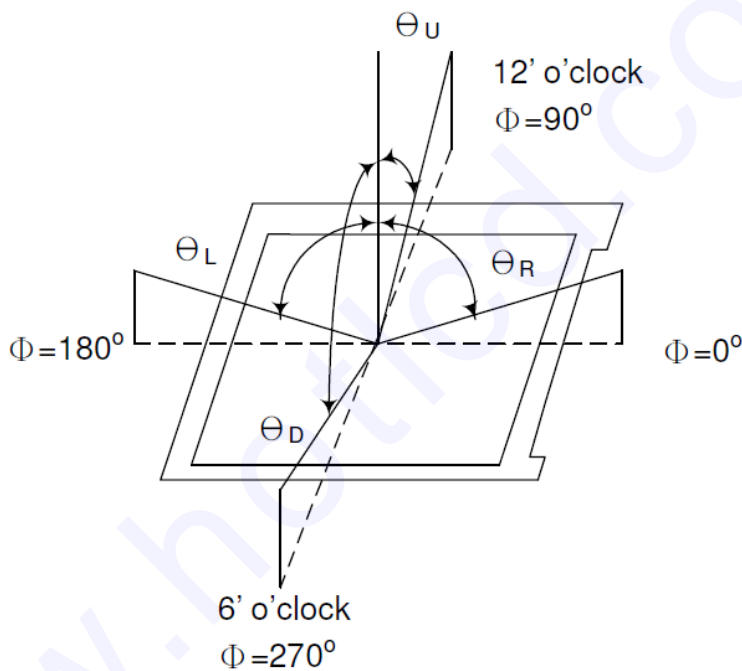
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### 3.3 Measuring Equipment

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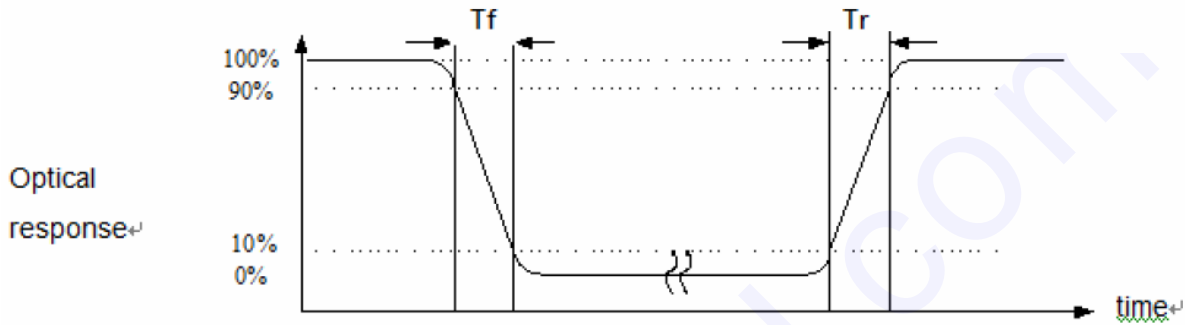
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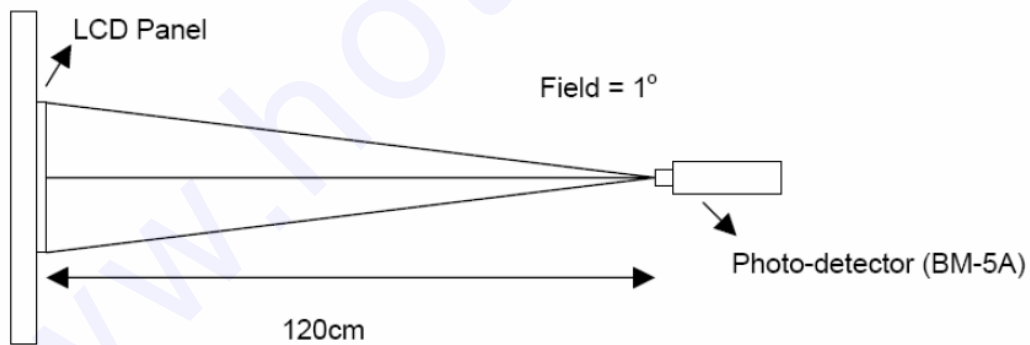
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**Note (3)** Definition of Response Time : Sum of  $T_R$  and  $T_F$



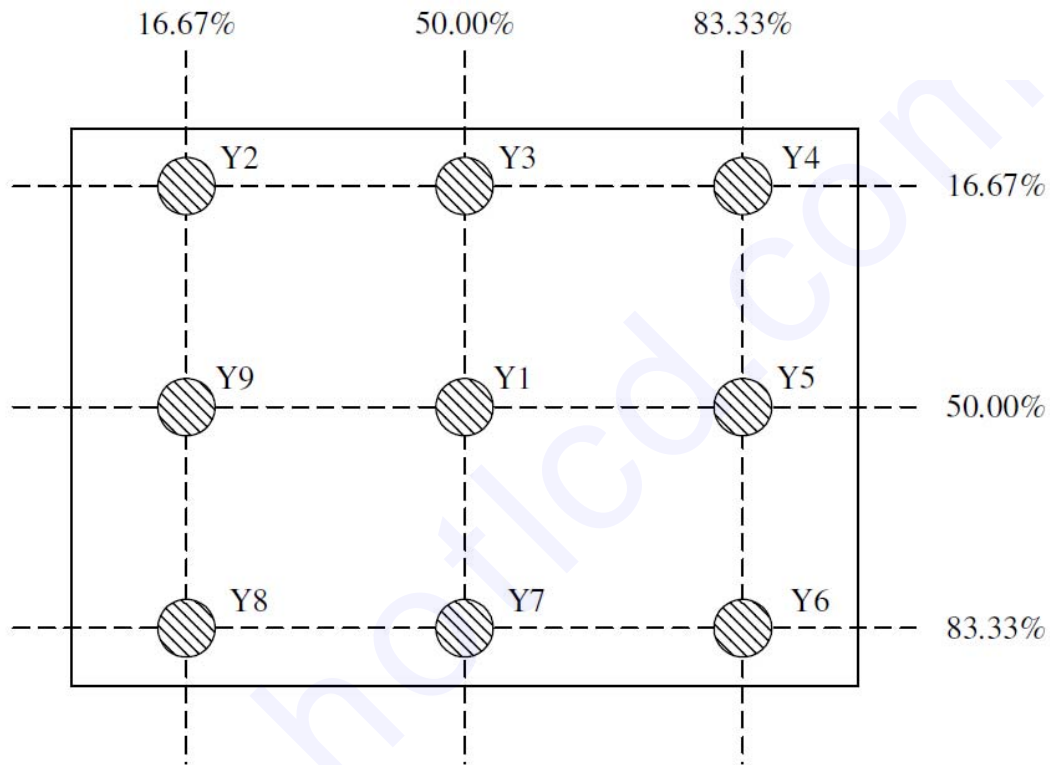
**Note (4)** Definition of optical measurement setup



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**Note (5)** Definition of 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.)



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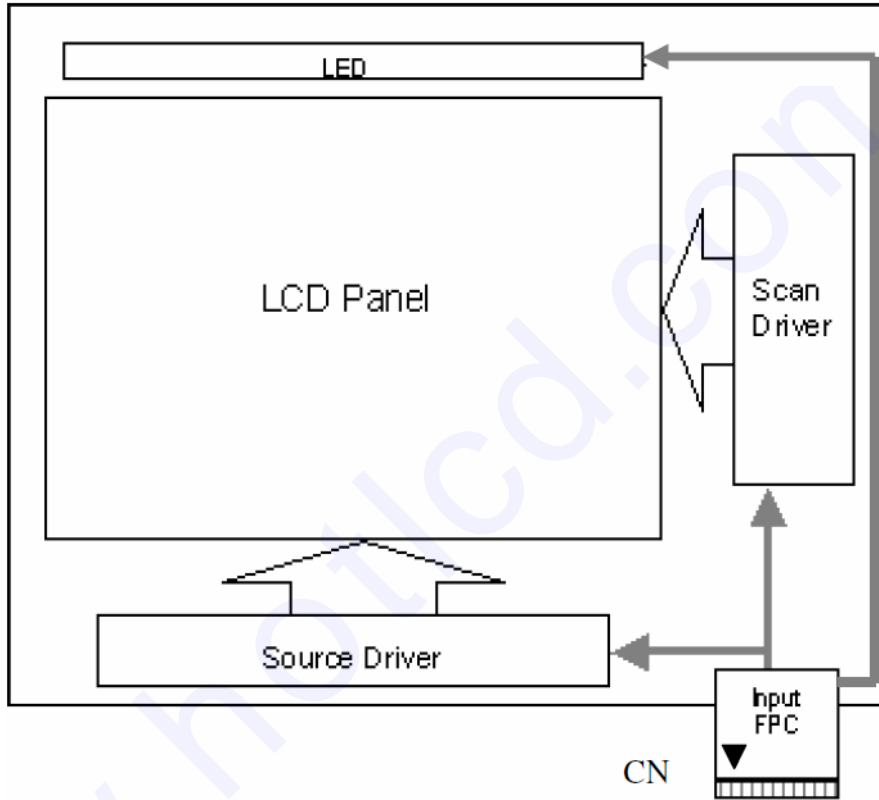
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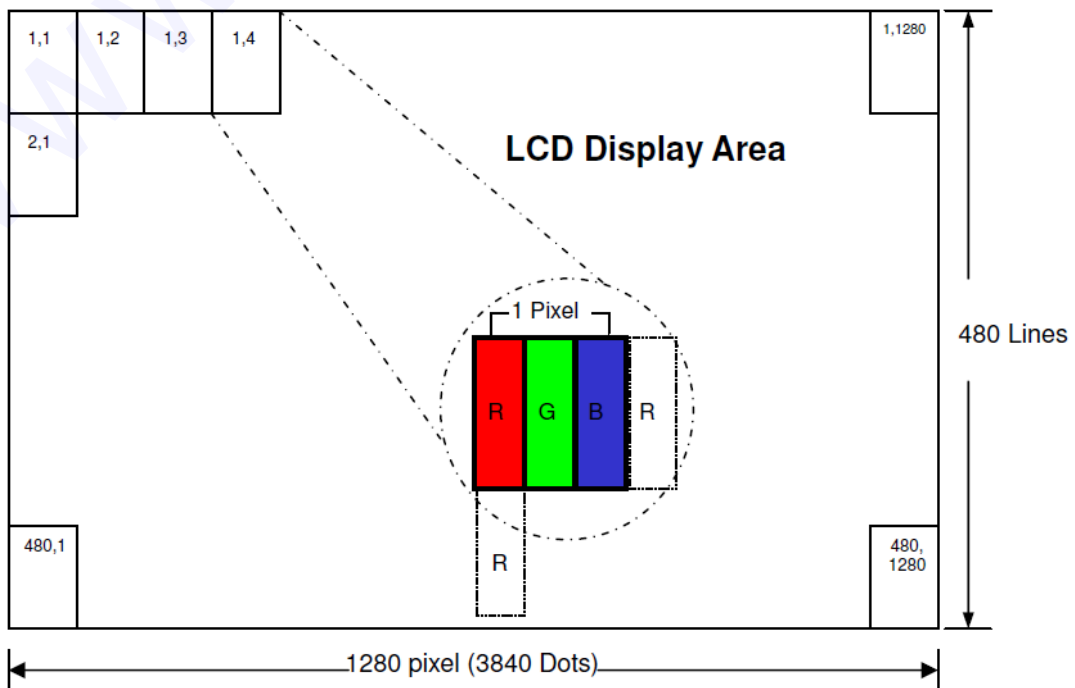
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## 4.0 BLOCK DIAGRAM

### 4.1 TFT LCD Module:



### 4.2 Pixel Format



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### 4.3 Relationship Between Displayed Color and Input

	Display	MSB				LSB				MSB				LSB				Gray scale Level								
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0		B7	B6	B5	B4	B3	B2	B1	B0
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	H	L	L	L	L	L	L	L	L	L	L1
		L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	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	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	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	H	L	L1
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	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	L	L	L	L252
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	L	H	L	L253
L		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	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	H	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	H	L	L1
		L	L	L	L	L	L	H	L	L	L	L	L	L	L	H	L	L	L	L	L	L	H	L	L	L2
		:																								L3...L251
	Light	H	H	H	H	H	H	L	L	H	H	H	H	H	L	L	H	H	H	H	H	L	L	L	L252	
		H	H	H	H	H	H	L	H	H	H	H	H	L	H	H	H	H	H	H	L	H	L	L	L	L253
H		H	H	H	H	H	H	L	H	H	H	H	H	L	H	H	H	H	H	L	L	L	L	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

#### 5.1 FPC Pin Assignment:

FPC connector is used for electronics interface. The recommended model is CN1 (Input signal): FH52-60S-0.5SH (HRS) all compatible


Pin NO.	Symbol	Description	Note
1	AGND	Analog ground	
2	AVDD	Analog power	
3	DVDD	Digital power	
4	GND	Digital ground	
5	NC	NC	
6	DVDD	Digital power	
7	GND	Digital ground	
8	NC	NC	Note 2
9	NC	NC	Note 2
10	NC	NC	Note 2
11	NC	NC	Note 2
12	NC	NC	Note 2
13	NC	NC	Note 2
14	NC	NC	Note 2
15	GND	Digital ground	
16	DVDD_LVDS	Digital power	
17	GND	Digital ground	
18	PIND3	Positive LVDS differential data input	
19	NIND3	Negative LVDS differential data input	
20	GND	Digital ground	
21	PINC	Positive LVDS differential clock input	
22	NINC	Negative LVDS differential clock input	
23	GND	Digital ground	
24	PIND2	Positive LVDS differential data input	
25	NIND2	Negative LVDS differential data input	
26	GND	Digital ground	
27	PIND1	Positive LVDS differential data input	
28	NIND1	Negative LVDS differential data input	
29	GND	Digital ground	
30	PIND0	Positive LVDS differential data input	

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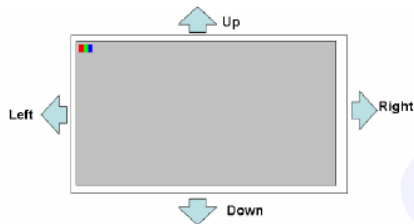
Pin NO.	Symbol	Description	Note
31	NIND0	Negative LVDS differential data input	
32	GND	Digital ground	
33	GND_LVDS	LVDS ground	
34	GRB	Global reset pin. Active low to enter reset state. Suggest to connecting with an RC reset circuit for stability. Normally pull high. (R=10KΩ,C=0.1uF)	
35	STBYB	Standby mode STBYB= 1, normal operation STBYB=0 ,timing control, source driver will turn off, all output are high-Z	
36	NC	Floating or GND or DVDD	Note 1
37	DVDD	Digital power	
38	NC	Floating or GND or DVDD	Note 1
39	AGND	Analog ground	
40	AVDD	Analog power	
41	NC	Not connect	
42	NC	Not connect	
43	GND	Digital ground	
44	DVDD	Digital Power	
45	GND	Digital ground	
46	NC	NC	Note 2
47	NC	NC	Note 2
48	NC	NC	Note 2
49	NC	NC	Note 2
50	NC	NC	Note 2
51	NC	NC	Note 2
52	NC	NC	Note 2
53	GND	Digital ground	
54	DVDD	Digital power	
55	SELB	6bit/8bit mode select, must connect DVDD or GND SELB = "1"(DVDD): LVDS input data is 8bits(Default) SELB = "0"(GND): LVDS input data is 6bits	

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Pin NO.	Symbol	Description	Note
56	VGH	Positive power for TFT	
57	DVDD	Digital power for Gate IC	
58	VGL	Negative power for TFT	
59	GND	Digital ground for Gate IC	
60	BIST	Normal operation/BIST pattern select. must connect DVDD or GND BIST="1"(DVDD): BIST mode BIST="0"(GND): Normal operation.	

**Note 1 : UPDN and SHLR control function , 已內部設定為 Left→Right & Up→Down**



**Note 2 : IC 內建數位電阻可進行 Gamma 調整,不需外部調整。**

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### 6.0 ELECTRICAL CHARACTERISTICS

#### 6.1 TFT LCD Module

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	VDD	3	3.3	3.6	V	
	VGH	19	20	21	V	Note (1)
	VGL	-11	-10	-9	V	Note (2)
	AVDD	12.3	12.4	12.5	V	
Current of power supply	IDD	10	15	20	mA	VDD =3.3V, Note(3)
	IADD	20	45	55	mA	AVDD=12.4V, Note(3)
	IGH	0.2	0.5	1	mA	VGH=20V, Note(3)
	IGL	0.4	0.8	1	mA	VGL=-10V, Note(3)


Note :

- (1) : VGH is TFT Gate operating Voltage.
- (2) : VGL is TFT Gate operating Voltage.
- (3) : @ White Pattern & 60Hz.

#### 6.2 Switching Characteristics for LVDS Receiver

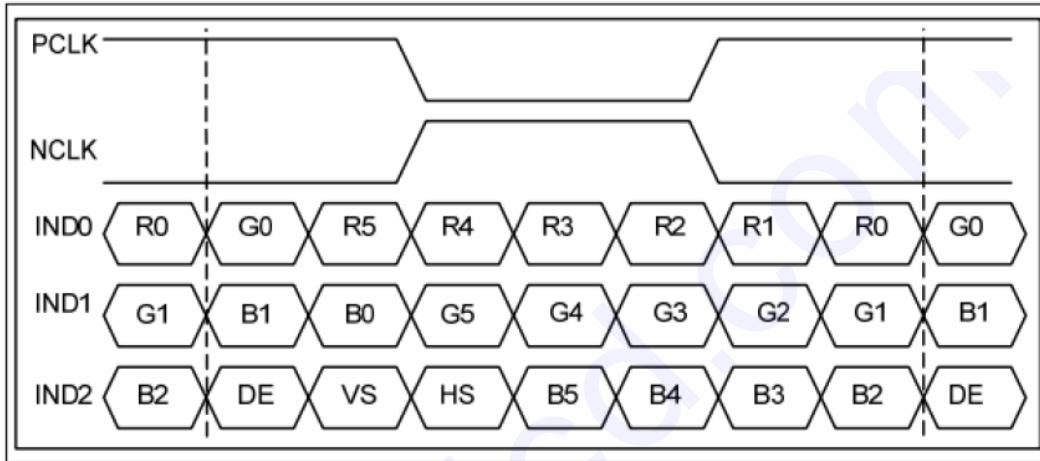
Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Differential Input High Threshold	$V_{TH}$	100	-	300	mV	
Differential Input Low Threshold	$V_{TL}$	-300	-	100	mV	
Differential input common mode voltage	$V_{CM}$	1.0	1.2	$1.7- V_{ID} /2$	V	
Input Current	$I_{IN}$	-10	-	10	$\mu A$	RX+/-, RXC+/-
Differential input Voltage	$ V_{ID} $	200	-	600	mV	

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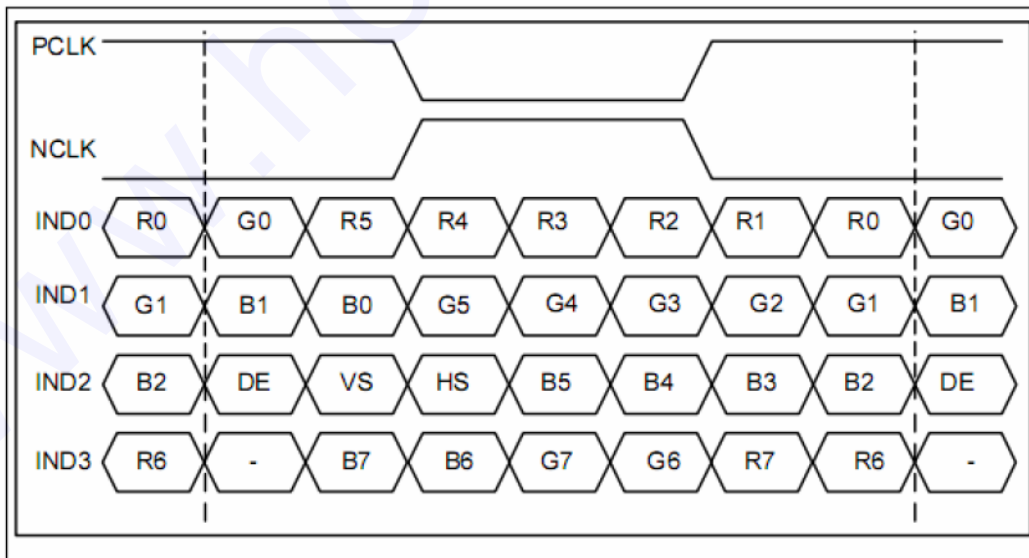
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### 6.3 Bit LVDS input


#### 6.3.1 6bit LVDS input



#### 6.3.2 8Bit LVDS input



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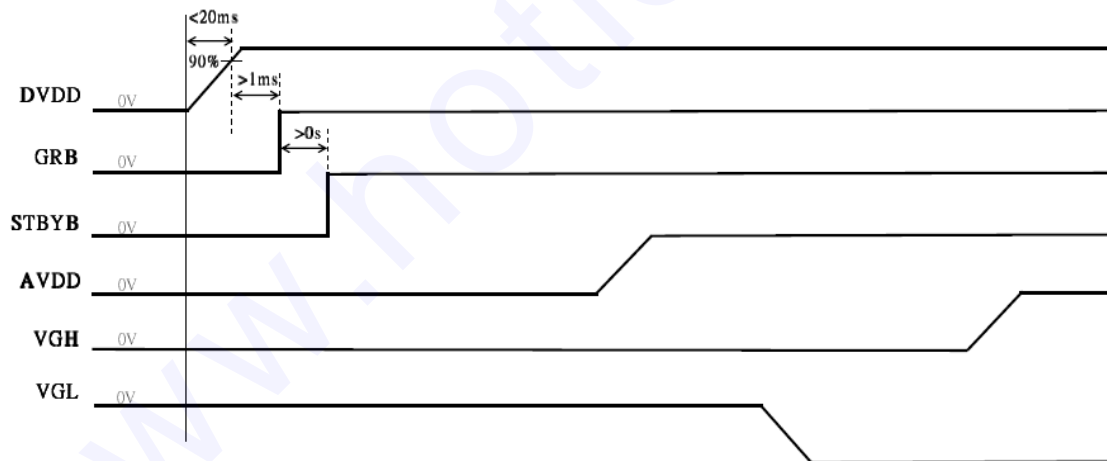
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### 6.4 Interface Timing (DE mode)

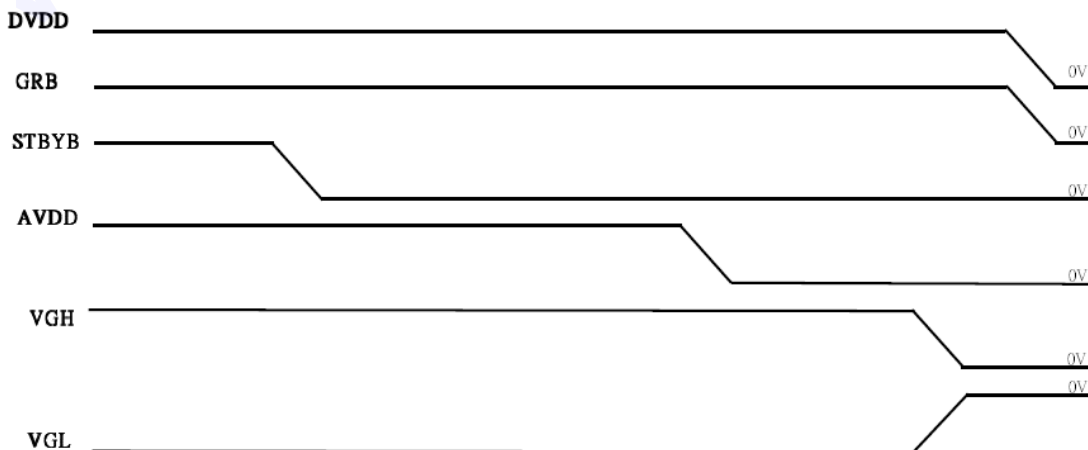
Parameter	Symbol	1280xRGBx480			Unit
		Min	Typ	Max	
DCLK frequency	F <sub>CLK</sub>	37.4	39.4	42.3	MHz
Horizontal display area	T <sub>HD</sub>	1280			CLK
HS period time	T <sub>H</sub>	1340	1344	1360	CLK
HS blanking	T <sub>HFP</sub> +T <sub>HBP</sub>	60	64	80	CLK
Vertical display area	T <sub>VD</sub>	480			H
VS period time	T <sub>V</sub>	486	488	500	H
VS blanking	T <sub>VFP</sub> +T <sub>VBP</sub>	6	8	20	H
Frame rate	FR	55	60	65	Hz

### 6.5 Power On / Off Sequence

#### Power On




#### Power Off





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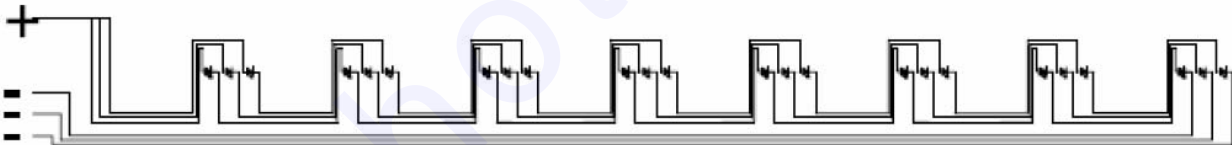
### 6.6 Backlight Unit

Parameter	Symbol	Min	Typ	Max	Units	Condition
LED Current	$I_L$	--	180	--	mA	$T_a=25^{\circ}\text{C}$
LED Voltage	$V_L$	--	25.6	27.2	Volt	$T_a=25^{\circ}\text{C}$
LED Life-Time	N/A	30,000	--	--	Hour	$T_a=25^{\circ}\text{C}$ $I_F=60\text{mA}$ Note (2)

Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition:  $T_a=25\pm 3^{\circ}\text{C}$ , typical  $I_L$  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



**BLU Circuit: 8S-3P BLU  $I_f=180\text{mA}$**

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### 7.0 Reliability test items

No.	Item	Conditions	Remark
1	High Temperature Storage	Ta=+85°C, 240hrs	
2	Low Temperature Storage	Ta=-30°C, 240hrs	
3	High Temperature Operation	Ta=+85°C, 240hrs	
4	Low Temperature Operation	Ta=-30°C, 240hrs	
5	High Temperature and High Humidity (operation)	Ta=+60°C, 90%RH, 240hrs	
6	Thermal Cycling Test (non operation)	-30°C(30min) → +85°C(30min), 100 cycles	
7	Electrostatic Discharge	±200V,200pF(0Ω) 1 time/connector	
8	Vibration	1.Random: 1.04G, 10~500Hz, XYZ, 30min/each direction 2.Sine: Freq. Range: 8~33.3Hz, Stoke: 1.3mmhz Sweep: 2.9G, 33.3~400 X/Z: 2hrs, Y:4hrs	
9	Shock	Half-Sine, 100G, 6ms, ±XYZ, 3time	
10	Vibration (with carton)	Random: 0.015G <sup>2</sup> /Hz, 5~200Hz -6dB/Octave, 200~400Hz XYZ 各方向 2hrs	
11	Drop (with carton)	Drop height condition, basis on the product weight and follow QB100-0027 1 corner, 3 edges, 6 surfaces	

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

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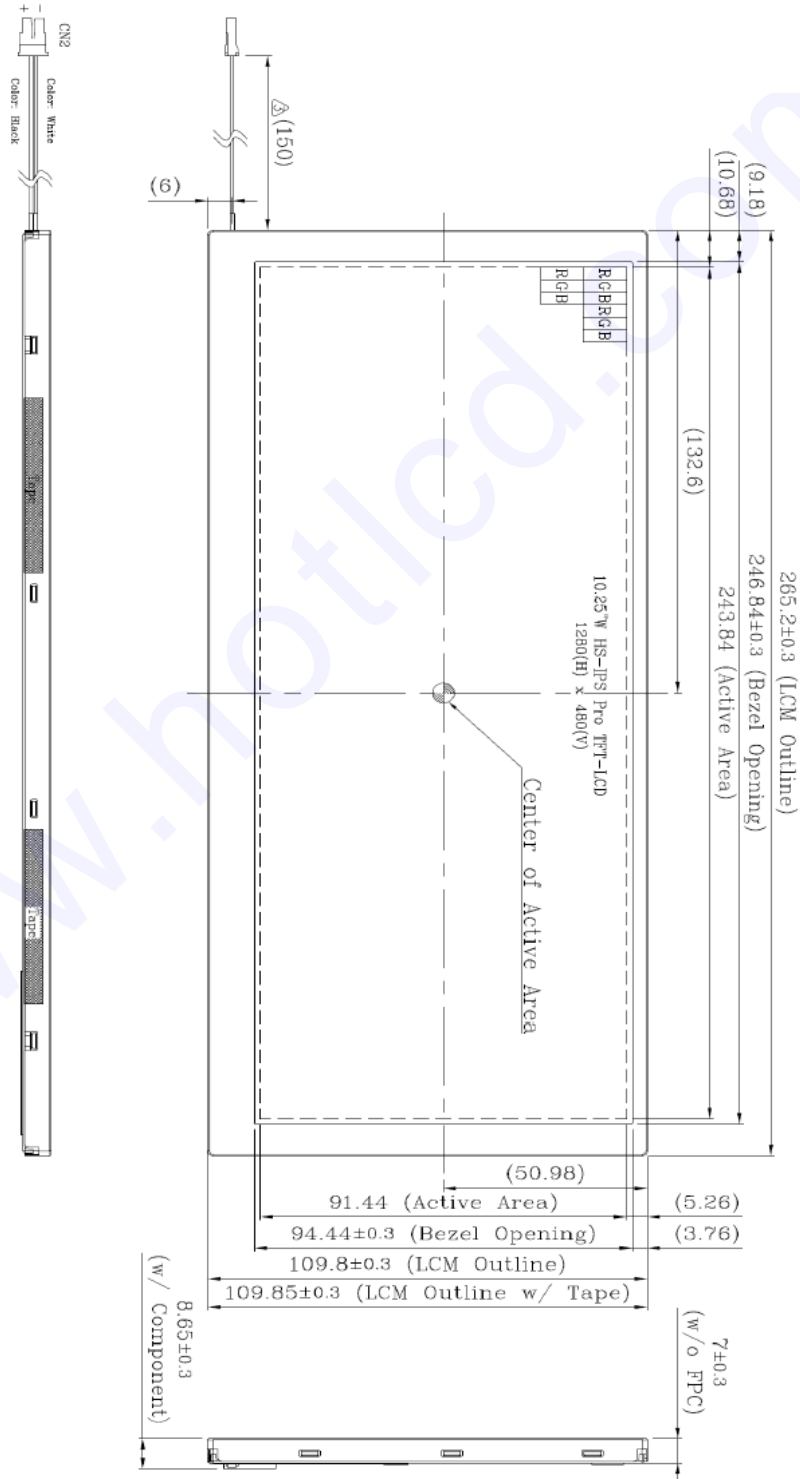
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### 8.0 OUTLINE DIMENSION

#### 8.1 Front View:



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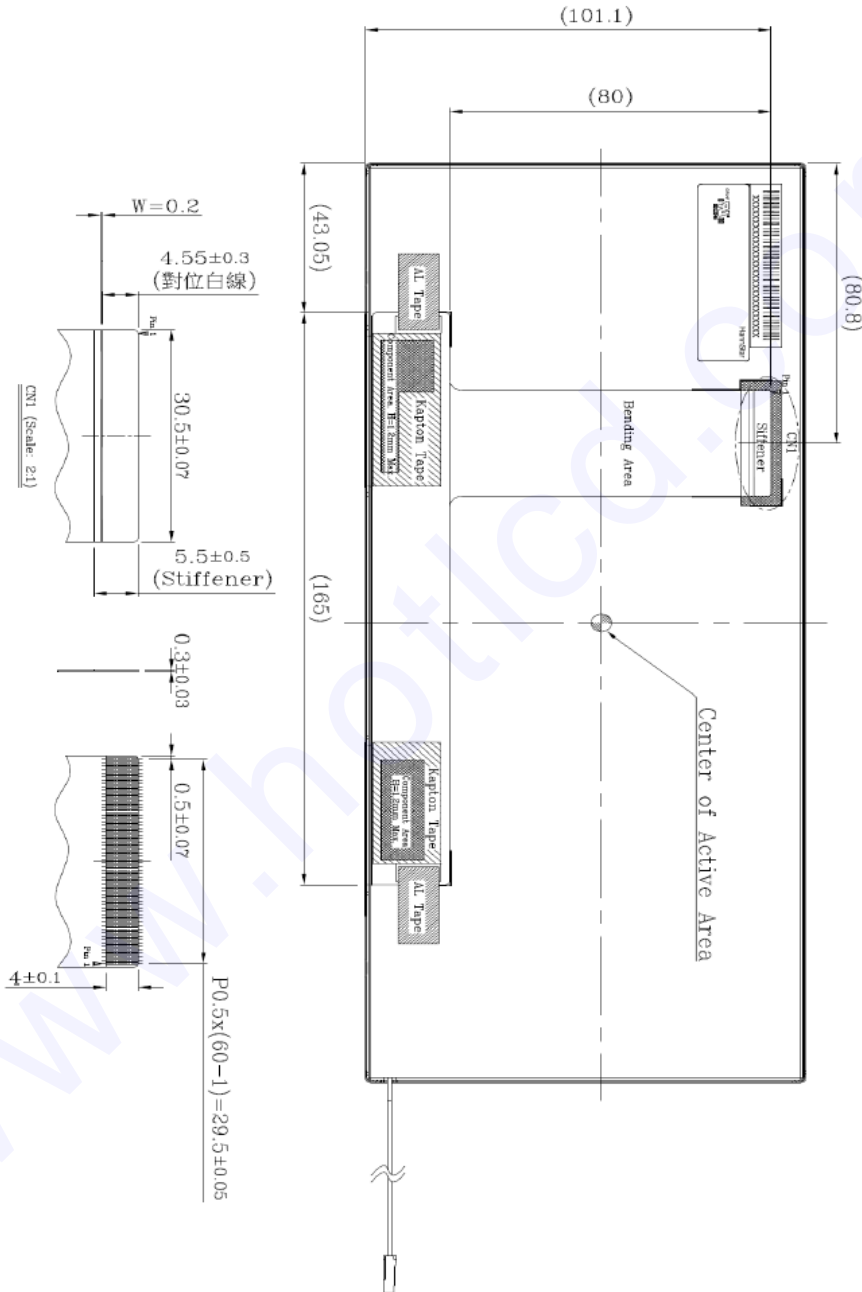
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## 8.1 Rear View:



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### 9. GENERAL PRECAUTION

#### 9.1 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.

#### 9.2 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.

#### 9.3 Breakage of LCD Panel

9.3.1. 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.

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

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

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

#### 9.4 Electric Shock

9.4.1. Disconnect power supply before handling LCD module.

9.4.2. Do not pull or fold the LED cable.

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

#### 9.5 Absolute Maximum Ratings and Power Protection Circuit

9.5.1. 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.

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

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

#### 9.6 Operation


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

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

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

9.6.4 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.

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

### 9.7 Mechanism

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

### 9.8 Static Electricity

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

9.8.2 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.

### 9.9 Strong Light Exposure

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

### 9.10 Disposal

When disposing LCD module, obey the local environmental regulations.