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TO :

Date : Mar., 8, 2011

# HannStar Preliminary Specification

Model: **HSD101PFW4**  
**-A00**

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.



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### Record of Revisions

Rev.	Date	Sub-Model	Description of change
1.0	Jan., 19, 2011	A00	Preliminary specification was first released.
2.0	Feb., 24, 2011	A00	P18 Update clock rate to 61.6MHz.
2.1	Mar., 8, 2011	A00	P4 Update weight. P5 Update typ. and max. values of depth and weight. P23&24 Update outline dimension.



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## 1.0 GENERAL DESCRIPTION

### 1.1 Introduction

HannStar Display model HSD101PFW4-A00 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 10.1 (16:9) inch diagonally measured active display area with WSVGA (1024 horizontal by 600 vertical pixel) resolution.

### 1.2 Features

- 10.1 (16:9 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

### 1.4 General information

Item	Specification	Unit
Outline Dimension	245x 146.5 (typ) w/ Bracket & PCB	mm
Display area	222.72(H) x 125.28(V)	mm
Number of Pixel	1024 RGB (H) x 600(V)	pixels
Pixel pitch	0.2175(H) x 0.2088(V)	mm
Pixel arrangement	RGB Vertical stripe	
Display mode	Normally white	
NTSC	45	%
Surface treatment	Glare, Hard-Coating (3H)	
Weight	146 (Max.)	g
Back-light	White LED	
Power Consumption	0.7 (Max)/Logic	W

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### 1.5 Mechanical Information

Item		Min.	Typ.	Max.	Unit	Remark
Module Size	Horizontal (H)	244.5	245	245.5	mm	W/ bracket & PCB
	Vertical (V)	146	146.5	147	mm	
	Depth (D)	—	3.1	3.4	mm	
Weight		—	136	146	g	

## 2.0 ABSOLUTE MAXIMUM RATINGS

### 2.1 Electrical Absolute Rating

#### 2.1.1 TFT LCD Module

Item	Symbol	Min.	Max.	Unit	Note
LED Power Supply voltage	$V_{LED}$	-0.3	6.0	V	GND=0
Logic Supply voltage	$V_{DD}$	-0.3	6.0	V	

### 2.2 Environment Absolute Rating

Item	Symbol	Min.	Max.	Unit	Note
Operating Temperature	$T_{opa}$	0	50	°C	
Storage Temperature	$T_{stg}$	-20	60	°C	

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### 3.0 OPTICAL CHARACTERISTICS

#### 3.1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast		CR	$\theta=0$ Normal viewing angle	400	500	—		(1)(2)(4)
Response time		Tr		—	4	6	msec	(1)(3)
		Tf		—	12	19		
White luminance (5 point)		$Y_L$			170	200	—	cd/m <sup>2</sup>
Color chromaticity (CIE1931)	Red	$R_x$	$\theta=0$ Normal viewing angle	-0.05	(0.605)	+0.05		
		$R_y$			(0.352)			
	Green	$G_x$			(0.309)			
		$G_y$			(0.537)			
	Blue	$B_x$			(0.149)			
		$B_y$			(0.111)			
	White	$W_x$			0.313			
		$W_y$			0.329			
Viewing angle	Hor.	$\theta_L$	CR>10		40	45	—	(1)(4)
		$\theta_R$			40	45	—	
	Ver.	$\theta_U$			10	15	—	
		$\theta_D$			30	35	—	
Brightness uniformity		$B_{UNI}$	$\theta=0$ (5point)	—	—	1.25		(5)
Brightness Uniformity		$B_{UNI}$	$\theta=0$ (13 points)	—	—	1.5		(6)

#### 3.2 Measuring Condition

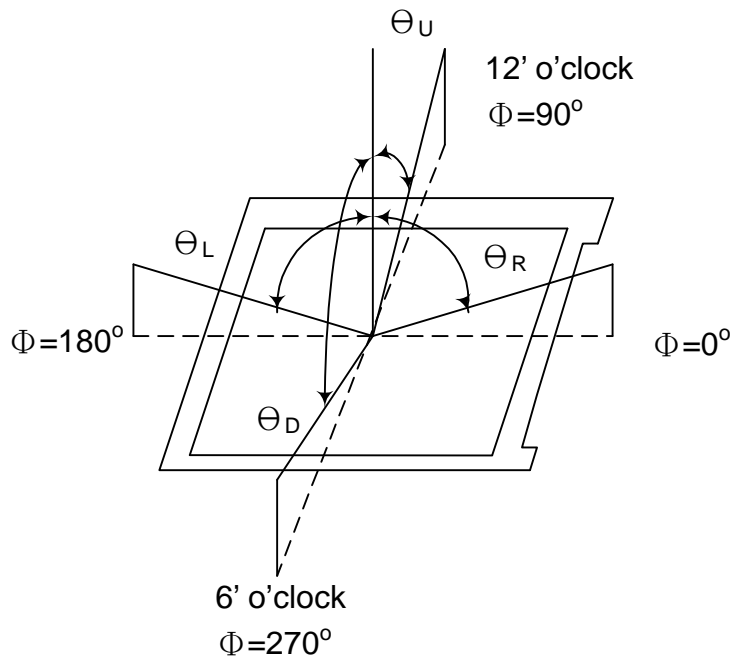
- Measuring surrounding : dark room
- Ambient temperature : 25±3°C
- 15min. warm-up time.

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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:

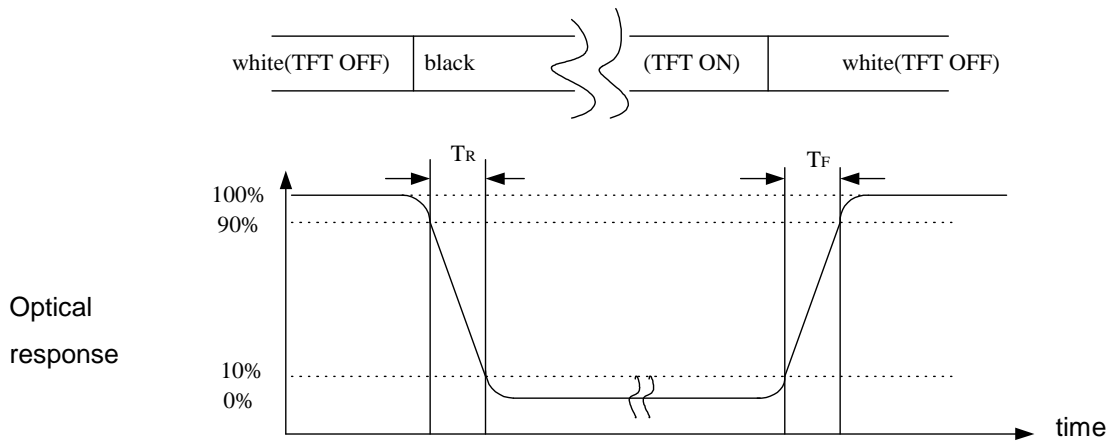


**Note (2)** Definition of Contrast Ratio (CR) :  
measured at the center point of panel

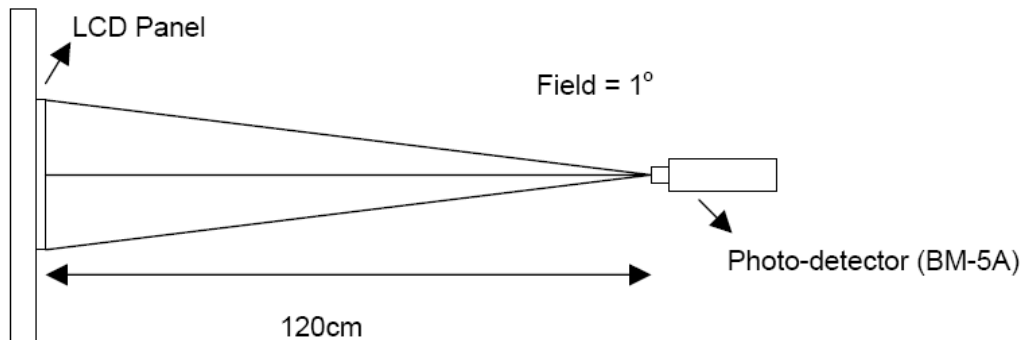
$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

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



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

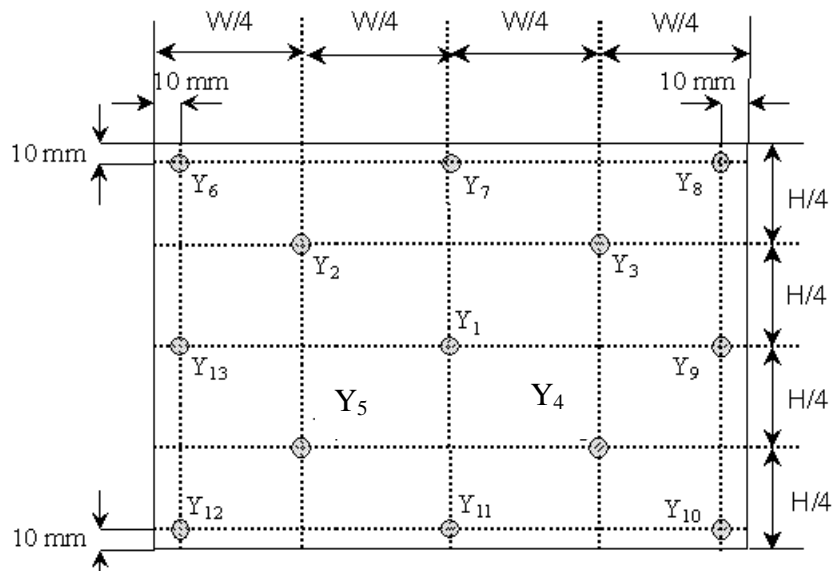




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**Note (5) Definition of Average Luminance Uniformity of White (5 Point)**

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



**Note (6) Definition of brightness uniformity**

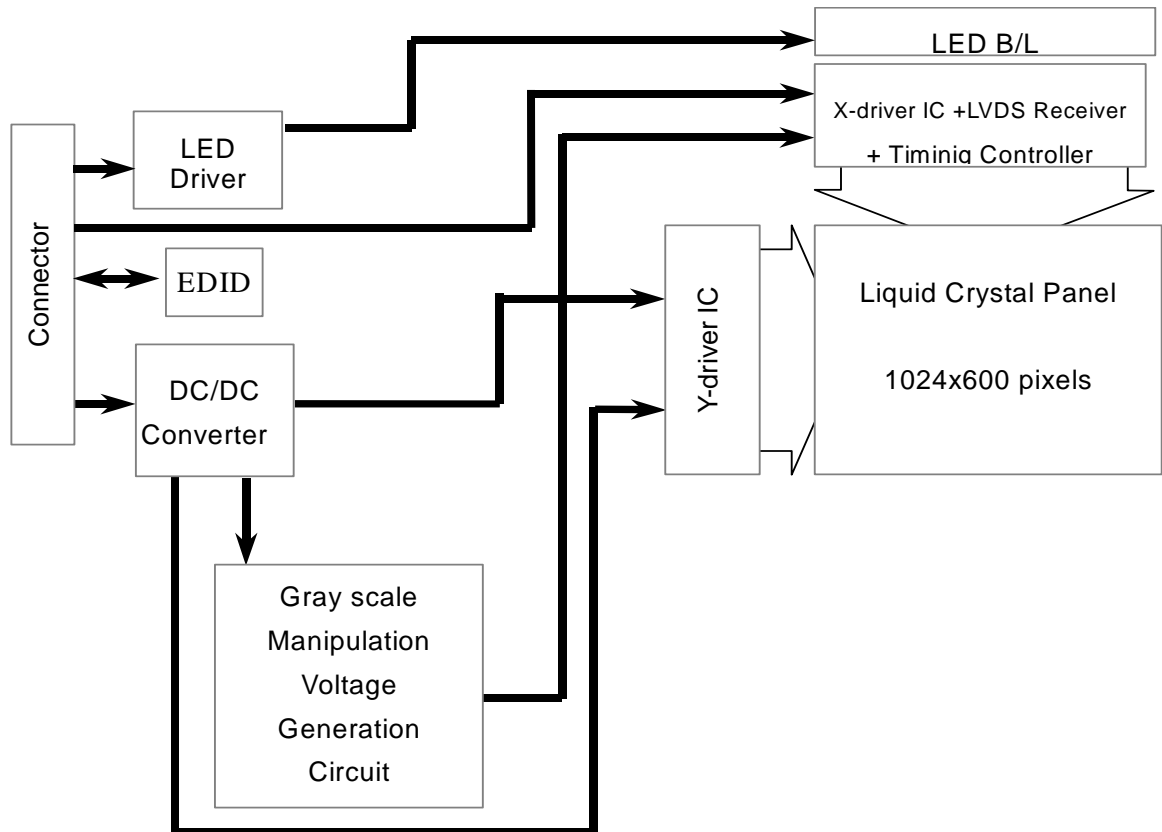
$$\text{Luminance uniformity} = \frac{(\text{Max Luminance of 5 points})}{(\text{Min Luminance of 5 points})}$$

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

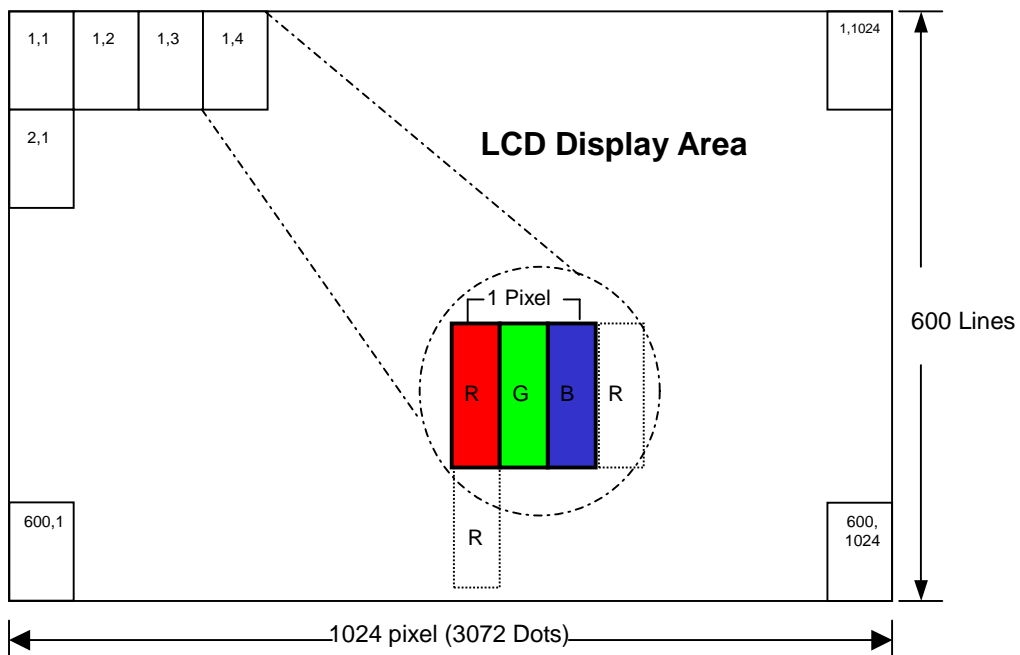
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### 4.0 BLOCK DIAGRAM

#### 4.1 TFT LCD Module:



#### Pixel Format



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### 4.2 Relationship Between Displayed Color and Input

	Display	MSB						LSB						MSB						LSB						Gray scale level
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	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	-						
	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	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	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	White L63							

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## 5.0 INTERFACE PIN CONNECTION

### 5.1 TFT LCD Module : CN1 (Input signal): IPEX 20455-040E-12 (IPEX or equivalent)

Pin	Signal	Description
1	GND	Ground
2	AVDD	PowerSupply,3.3V(typical)
3	AVDD	PowerSupply,3.3V(typical)
4	DVDD	DDC3.3V power
5	NC	NC
6	SCL	DDC Clock
7	SDA	DDC Data
8	Rin0-	- LVDSdifferential data input
9	Rin0+	+ LVDSdifferential data input
10	GND	Ground
11	Rin1-	- LVDSdifferential data input
12	Rin1+	+ LVDSdifferential data input
13	GND	Ground
14	Rin2-	- LVDSdifferential data input
15	Rin2+	+ LVDSdifferential data input
16	GND	Ground
17	ClKIN-	- LVDSdifferential data input
18	ClKIN+	+ LVDSdifferential data input
19	GND	Ground
20	VDDA_EN	VDDA on/off
21	NC	No Connection
22	GND	Ground
23	NC	No Connection
24	NC	No Connection
25	GND	Ground
26	NC	No Connection
27	NC	No Connection
28	GND	Ground
29	NC	No Connection
30	NC	No Connection
31	VLED_GND	LED Ground
32	VLED_GND	LED Ground
33	VLED_GND	LED Ground
34	NC	No Connection
35	PWM	System PWM Signal Input
36	VLED_EN	LED enable pin(+3.3V input)/VLED on/off

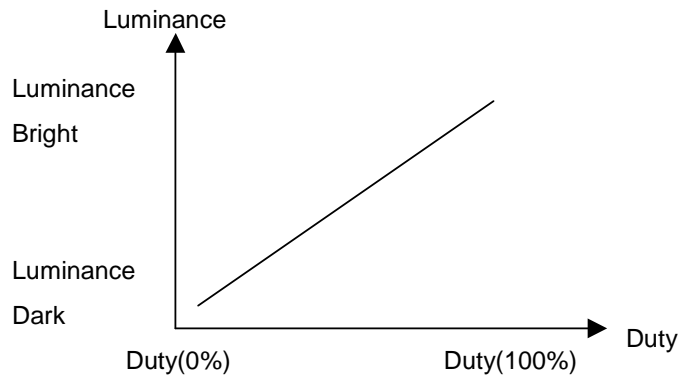
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37	NC	No Connection
38	VLED	LED Power Supply5V
39	VLED	LED Power Supply5V
40	VLED	LED Power Supply5V

**Note :** The brightness of LCD panel could be changed by adjusting PWM

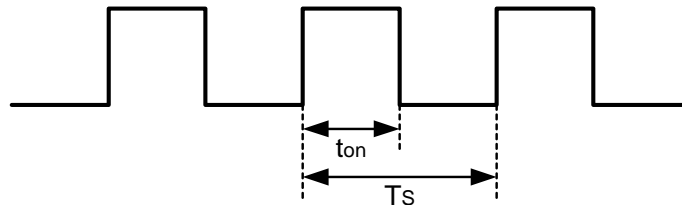
**[Note]**

**(1) ADJ can adjust brightness to control Pin. Pulse duty the bigger the brighter.**



**(2) ADJ Signal=0~3.3V · Operation Conditions :**

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
ADJ Logic-High Level	V <sub>ADJH</sub>		1.8	3.3	3.6	V
ADJ Logic-Low Level	V <sub>ADJL</sub>		0	0	0.4	V
Dimming Frequency	F <sub>ADJ</sub>		18	20	22	kHz
Dimming Duty Cycle	D		20	--	100	%



$$D = t_{on} / T_s \times 100\%$$

$$F_{ADJ} = 1 / T_s$$

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**(3) VLED\_EN & VDDA\_EN & CABC\_EN · Operation Conditions :**

Parameter	Symbol	Min	Typ	Max	Units	Remark
LED enable pin (control LED driver circuit on/off)	LED_EN (H)	3.0	3.3	3.6	Volt	LED on
	LED_EN (L)	--	0	0.2		LED off
VDD on/off signal (control Panel VDD power source on/off)	VDDA_EN (H)	3.0	3.3	3.6	Volt	VDD on
	VDDA_EN (L)	--	0	0.2		VDD off

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## 6.0 ELECTRICAL CHARACTERISTICS

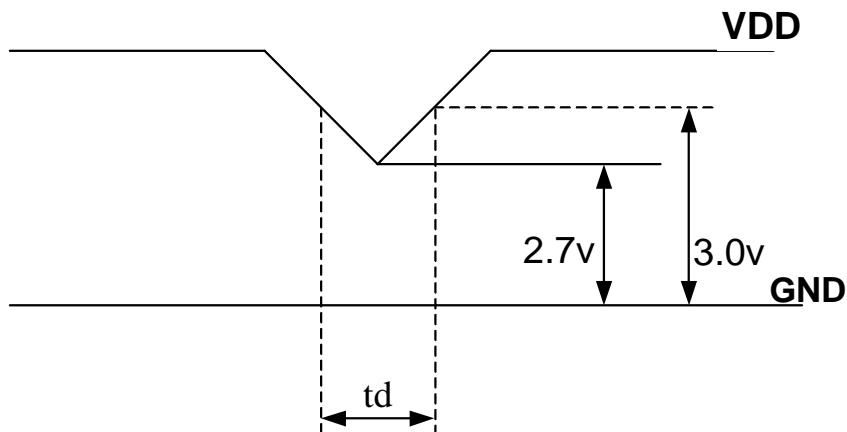
### 6.1 TFT LCD Module

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	$V_{DD}$	3.0	3.3	3.6	V	Note (1)
Current of power supply	$I_{DD}$	-	0.19	-	A	$V_{DD} = 3.3V$ $T_a = 25^\circ C$ $f_v = 60Hz$ Note (2)(3)
Inrush current	$I_{RUSH}$	-	-	1.50	A	Note (4)

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

When  $V_{DD}$  operating within  $2.7V \leq V_{DD} < 3.0V$  ,  $t_d \leq 10ms$  , the display may momentarily become abnormal .

$V_{DD} < 2.7V$ ,  $V_{DD}$  dip condition should also follow the Power On/Off conditions for supply voltage.

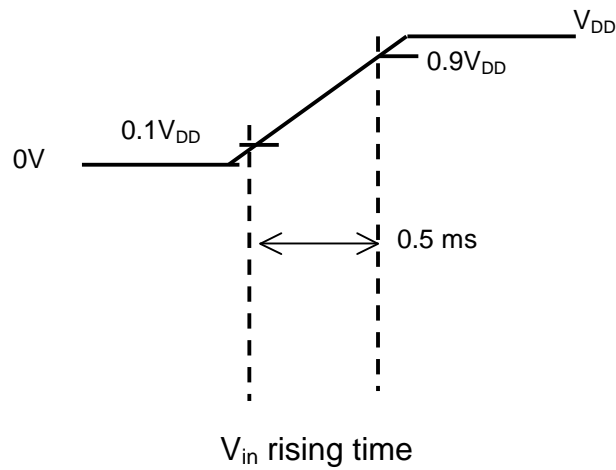
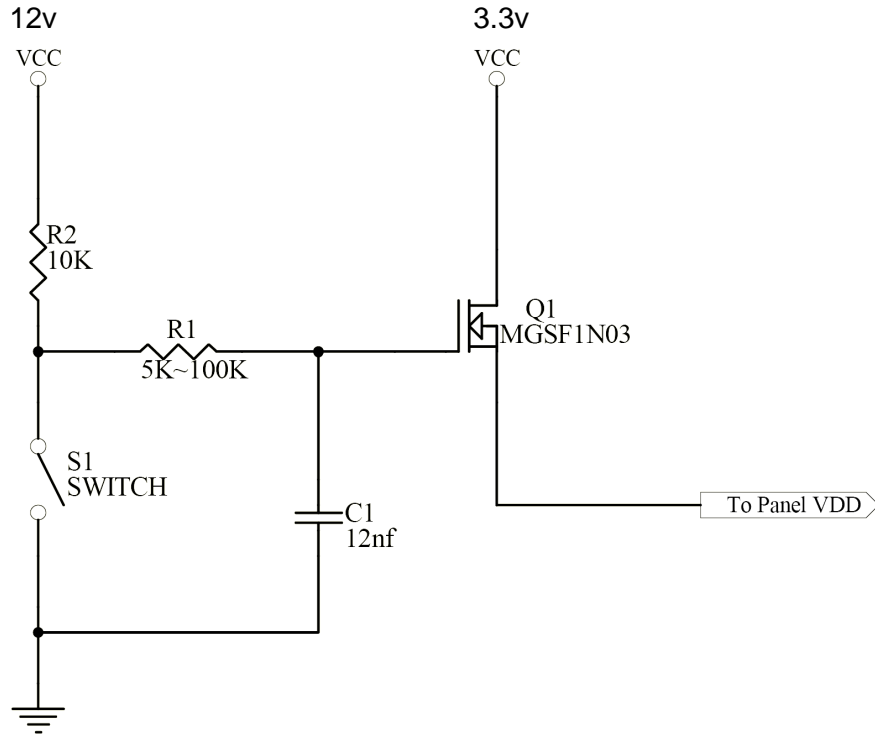


(2) Maximum Measurement Condition: Black Pattern

(3) Typical Measurement Condition: Mosaic Pattern

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(4) Power on Inrush current test circuit



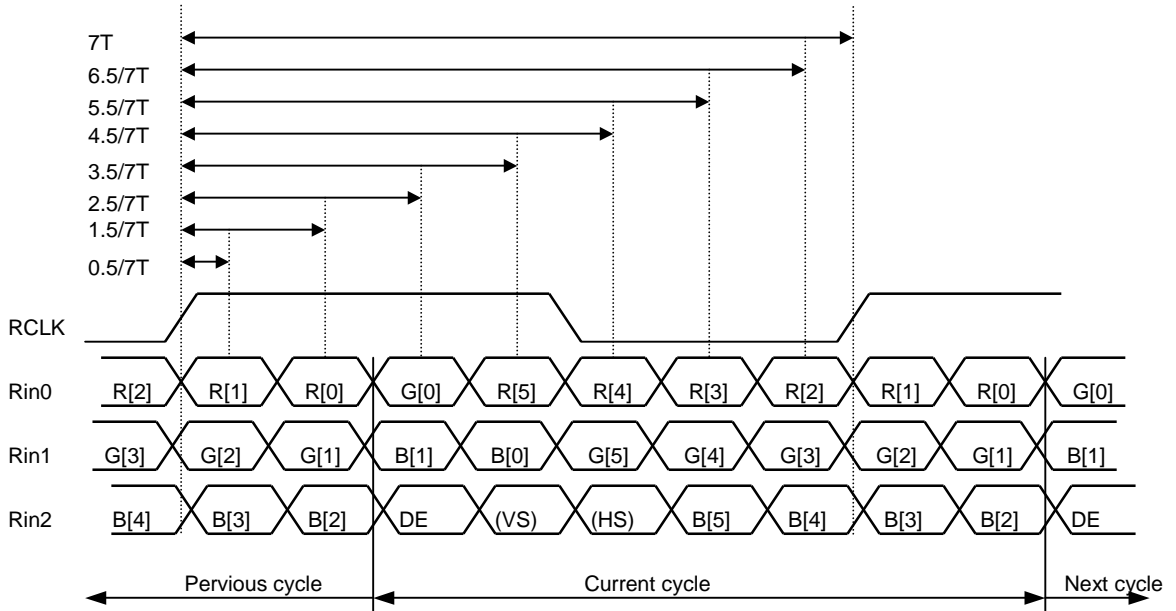


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### 6.2 Switching Characteristics for LVDS Receiver

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Differential Input High Threshold	$V_{th}$	—	—	100	mV	$V_{CM}=1.2V$
Differential Input Low Threshold	$V_{tl}$	-100	—	—	mV	
Input Current	$I_{IN}$	-10	—	+10	$\mu A$	
Differential input Voltage	$ V_{ID} $	0.2	—	0.6	V	
Common Mode Voltage Offset	$V_{CM}$	0.7	1.2	1.6	V	

### 6.3 Bit Mapping & Interface Definition



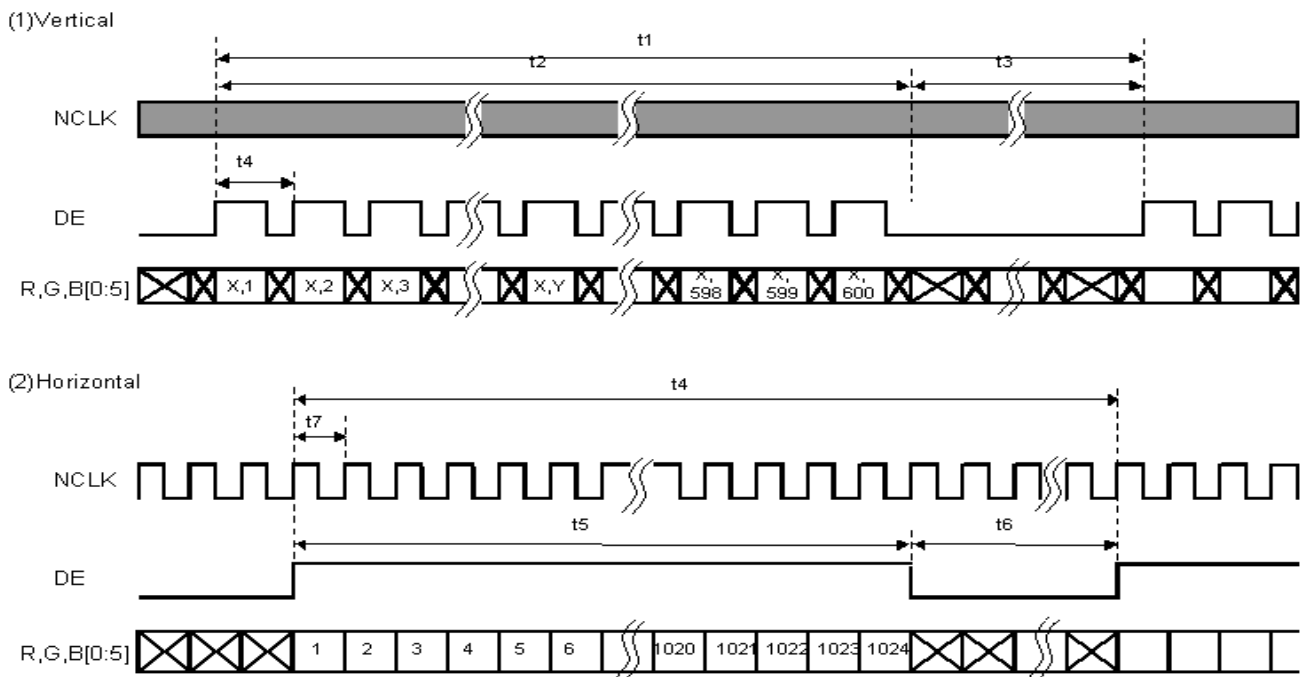
LVDS Receiver Input Timing Definition  
for 6bits LVDS input

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### 6.4 Interface Timing (DE mode)

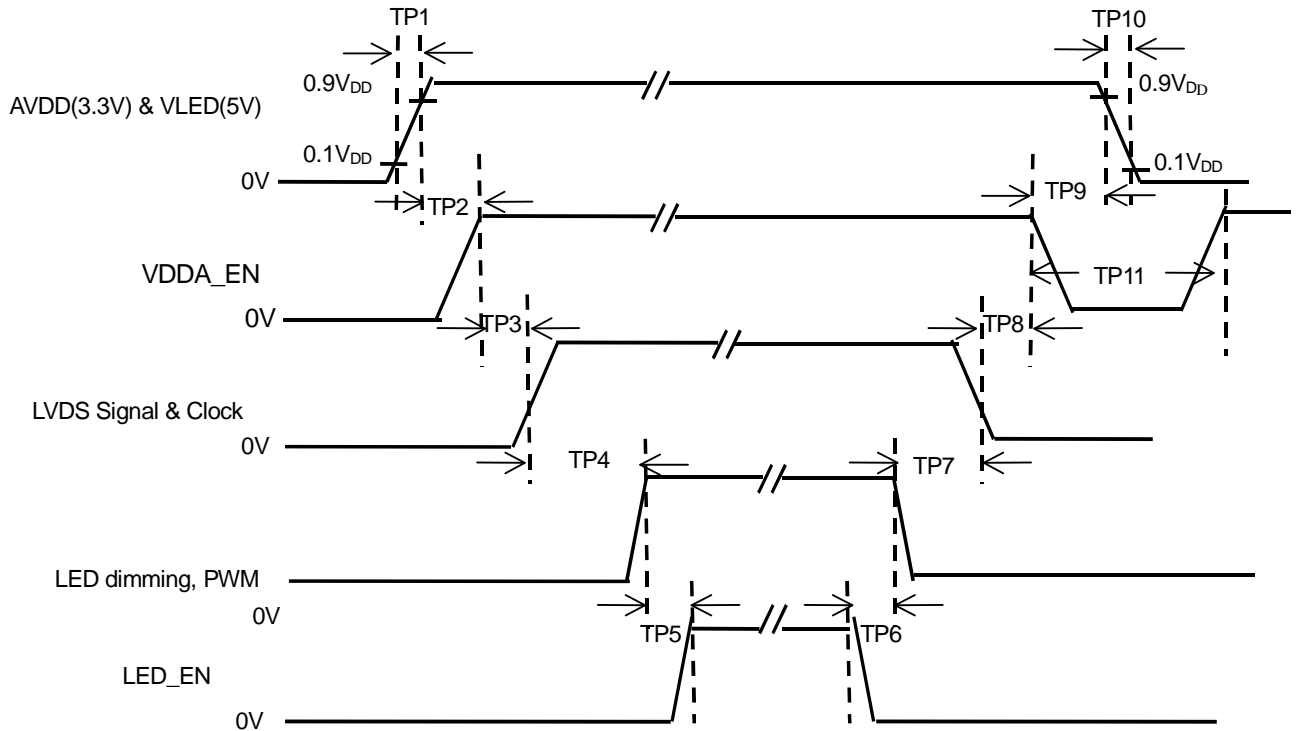
Item	Symbol	Min.	Typ.	Max.	Unit
Frame Rate	--	55	60	65	Hz
Frame Period	t1	612	635	680	line
Vertical Display Time	t2	600	600	600	line
Vertical Blanking Time	t3	12	35	80	line
1 Line Scanning Time	t4	1114	1344	1400	clock
Horizontal Display Time	t5	1024	1024	1024	clock
Horizontal Blanking Time	t6	90	320	376	clock
Clock Rate	t7	40.8	51.2	61.6	MHz

### Timing Diagram of Interface Signal (DE mode)



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### 6.5 Power On / Off Sequence



Item	Min.	Typ.	Max.	Unit	Remark
TP1	0.5	--	10	msec	
TP2	10	--	--	msec	
TP3	30	40	90	msec	
TP4	200	--	--	msec	
TP5	10	--	--	msec	
TP6	0	--	--	msec	
TP7	110	--	--	msec	
TP8	0	16	80	msec	
TP9	0	--	--	msec	Must exceed 0
TP10	--	10	30	msec	
TP11	1000	--	--	msec	

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- 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 voltage within the LCD operation range. When the back-light turns on before the LCD operation or the LCD turns off before the back-light turns off, the display may momentarily become white.
- (3) In case of  $V_{DD}$  = 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.

### 6.6 Backlight Unit

Parameter	Symbol	Min	Typ	Max	Units	Condition
LED Current	$I_F$	--	17.5	18.55	mA	$T_a=25^{\circ}C$
LED Voltage	$V_F$	3.0	3.2	3.4	Volt	$T_a=25^{\circ}C$
LED Power consumption	$P_{LED}$	--	1.34	1.51	Watt	$T_a=25^{\circ}C$ Note (1)
LED Life-Time	N/A	10,000	--	--	Hour	$T_a=25^{\circ}C$ $I_F=20mA$ 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.

### 6.7 LED Driver

#### 6.7.1 Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit	Note
LED Power Supply voltage	$V_{LED}$	-0.3	6	Volt	
LED_EN, PWM pin Voltage	$V_{EN}, V_{PWM}$	--	5.5	Volt	



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### 6.7.2 DC Electrical Characteristics

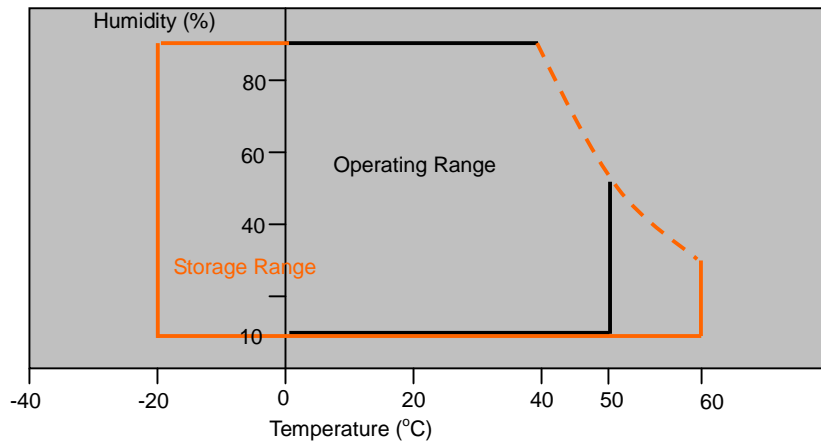
Parameter	Symbol	Min	Typ	Max	Units	Remark
LED Power Supply Voltage	$V_{LED}$	4.5	--	5.5	Volt	
PWM High Threshold	$V_{PWMH}$	3.0	--	--	Volt	
PWM Low Threshold	$V_{PWML}$	--	--	0.2	Volt	

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### 7.0 Reliability test items

No.	Item	Conditions	Remark
1	High Temperature Storage	Ta=+60°C, 240hrs	
2	Low Temperature Storage	Ta=-20°C, 240hrs	
3	High Temperature Operation	Ta=+50°C, 500hrs	
4	Low Temperature Operation	Ta=0°C, 500hrs	
5	Thermal Cycling Test (non operation)	-20°C(30min)→+60°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



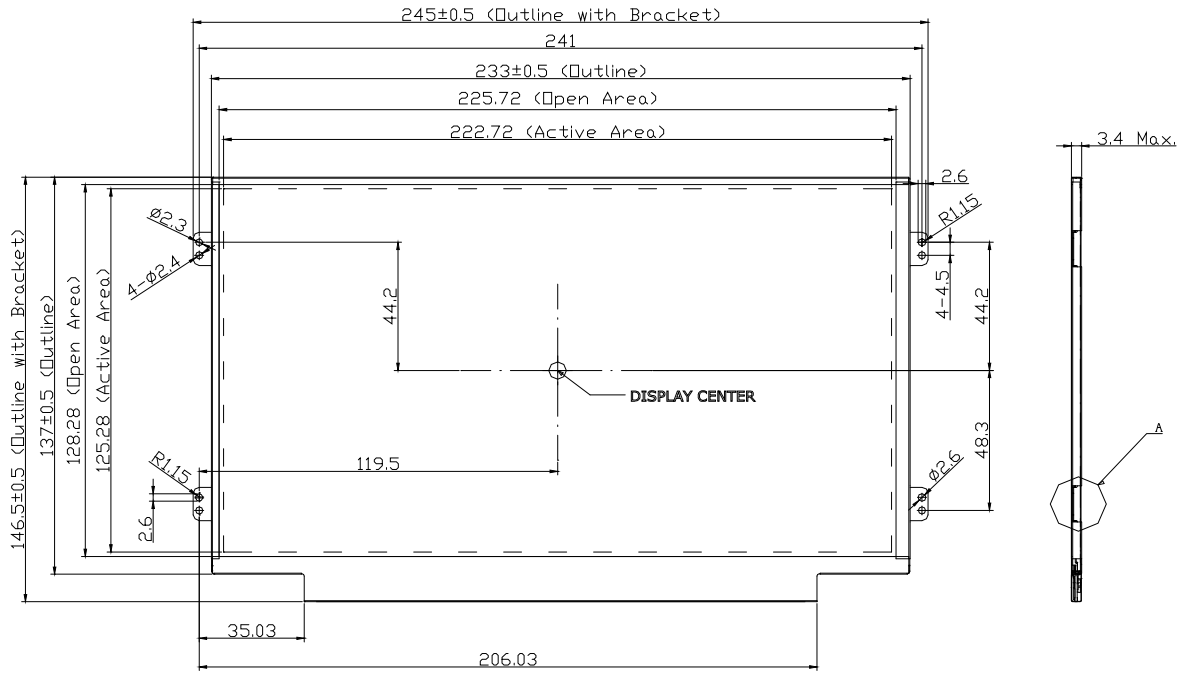
**Note** .Max wet bulb temp.=39°C

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## 8.0 OUTLINE DIMENSION

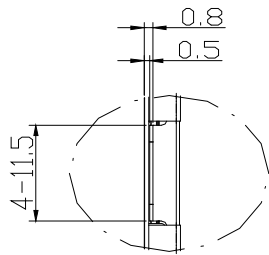
### 8.1 Front View Outline Dimension

Unit : mm

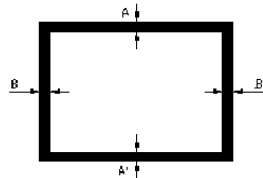


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### 8.2 Back View Outline Dimension



細部 A (2)



BM Assembly Tolerance

$$|A-A'| \leq 1.0 \text{ (mm)}$$

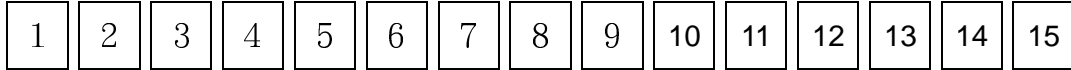
$$|B-B'| \leq 1.0 \text{ (mm)}$$



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**9.0 LOT MARK**

**9.1 Lot Mark**



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**

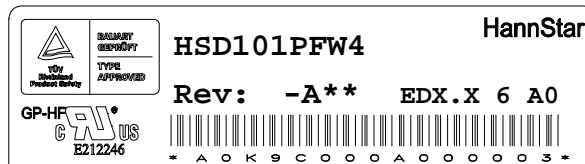
Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Mark	6	7	8	9	0	1	2	3	4	5

**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. See Product back view. ( Section 8.0 : OUTLINE DIMENSION )
- (2) Detail of the Mark : As attached below
- (3) This is subject to change without prior notice.



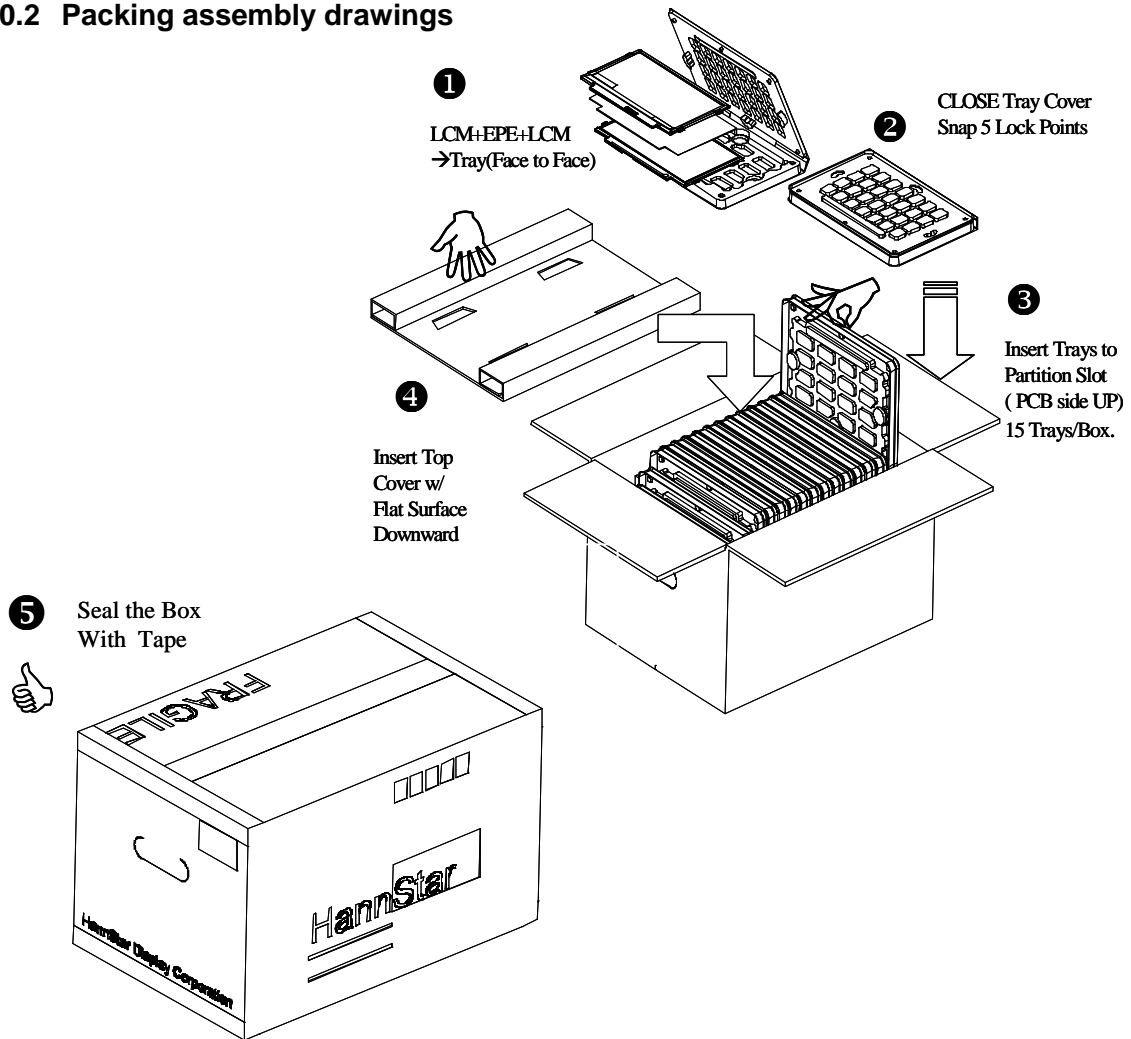
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## 10.0 PACKAGE SPECIFICATION

### 10.1 Packing form

LCM Model	LCM Qty. in the box	Inner Box Size (mm)	Notice
HSD101PFW4-A	30pcs/box	565x316 x240 <sup>H</sup>	

### 10.2 Packing assembly drawings



HSD101PFW4-A	Material	Notice
Box	Corrugated Paper Board	AB Flute
Partition/Pad	Corrugated Paper Board	B Flute
Pad	Corrugated Paper Board	B Flute
Tray	PE	--
EPE	PET	--

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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 cause deformation or color fading.

11.6.5 When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzene 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 be removed very slowly from the surface of LCD module to prevent electrostatic occurrence.

11.8.2 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. 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.