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TO :

Date : Sep., 13, 2011

# HannStar Product Specification (Formal)

Model: **HSD101PWW2**  
**-A\*\***

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.



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### Record of Revisions

Rev.	Date	Sub-Model	Description of change
1.0	Sep, 13, 2011	A00	Formal product specification was first released.



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## 1.0 GENERAL DESCRIPTION

### 1.1 Introduction

HannStar Display model HSD101PWW2-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 10.1(16:10) inch diagonally measured active display area with WXGA (1280 horizontal by 800 vertical pixel) resolution.

### 1.2 Features

- 10.1 (16:10 diagonal) inch configuration
- One channel LVDS interface
- 16.7M (6 bit + Hi FRC)
- RoHS Compliance
- Halogen Free

### 1.3 Applications

- Handbook
- Notebook

### 1.4 General information

Item	Specification	Unit
Outline Dimension	229(Typ) x151 (Typ)	mm
Display area	216.96 (H) x 135.6(V)	mm
Number of Pixel	1280 RGB (H) x 800(V)	pixels
Pixel pitch	0.1695(H) x 0.1695(V)	mm
Pixel arrangement	RGB Vertical stripe	
Display mode	Normally Black	
NTSC	45	%
Surface treatment	Glare, Anti-Reflection $\leq 1.5\%$ , Hard-Coating (3H)	
Weight	155g(Max.)	g
Back-light	White LED	
Power Consumption	Logic and BLU 4.56(max) @White pattern PWM duty ratio=100% Vin=3.3V, VLED=12V	W

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### 1.5 Mechanical Information

Item		Min.	Typ.	Max.	Unit
Module Size	Horizontal (H)	228.7	229	229.3	mm
	Vertical (V)	150.7	151	151.3	mm
	Depth (D) w/o PCB	—	2.5	2.7	mm
	Depth (D) w/ PCB	—	4.53	4.83	mm
Weight		—	145	155	g

Note : I/F conn Position Depth is 4.88mm (Max)

## 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	4.0	V	

#### 2.1.2 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	600	800	—		(1)(2)(4)
Response time	Rising	Tr+Tf		—	25	40	msec	(1)(3)
White luminance (Center Point)		$Y_L$		550	650	—	cd/m <sup>2</sup>	(1)(4)(5) ( $I_L=22mA$ )
Color chromaticity (CIE1931)	Red	$R_x$		0.545	0.575	0.605		
		$R_y$		0.321	0.351	0.381		
	Green	$G_x$		0.299	0.329	0.359		
		$G_y$		0.542	0.572	0.602		
	Blue	$B_x$		0.134	0.164	0.194		
		$B_y$		0.083	0.113	0.143		
	White	$W_x$		0.290	0.320	0.350		
		$W_y$	0.310	0.340	0.370			
Viewing angle	Hor.	$\Theta_L$	CR>10	80	89	—		(1)(4)
		$\Theta_R$		80	89	—		
	Ver.	$\Theta_U$		80	89	—		
		$\Theta_D$		80	89	—		
Brightness uniformity		$B_{UNI}$	$\Theta=0$ (9point)	—	—	1.25		(6)

#### 3.2 Measuring Condition

- Measuring surrounding : dark room
- Ambient temperature :  $25\pm 2^\circ C$
- 15min. warm-up time.

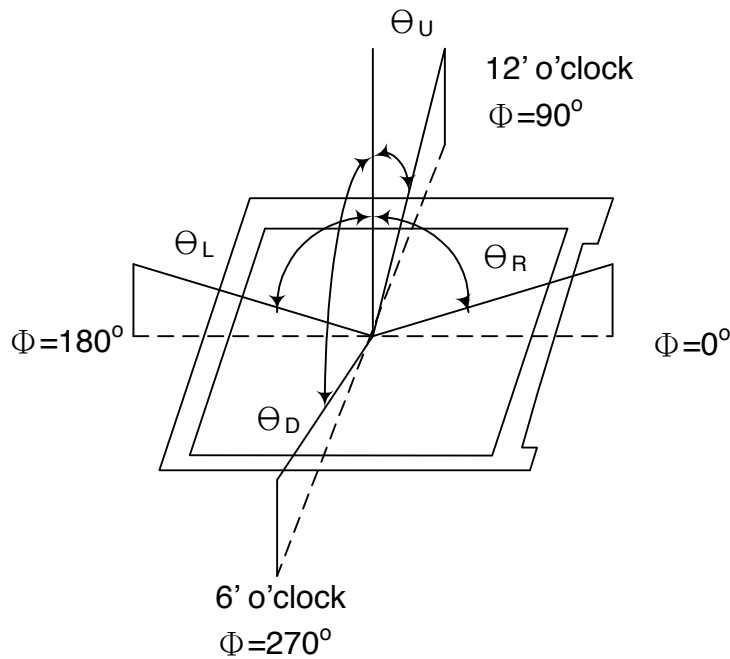
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### 3.3 Measuring Equipment

- 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:

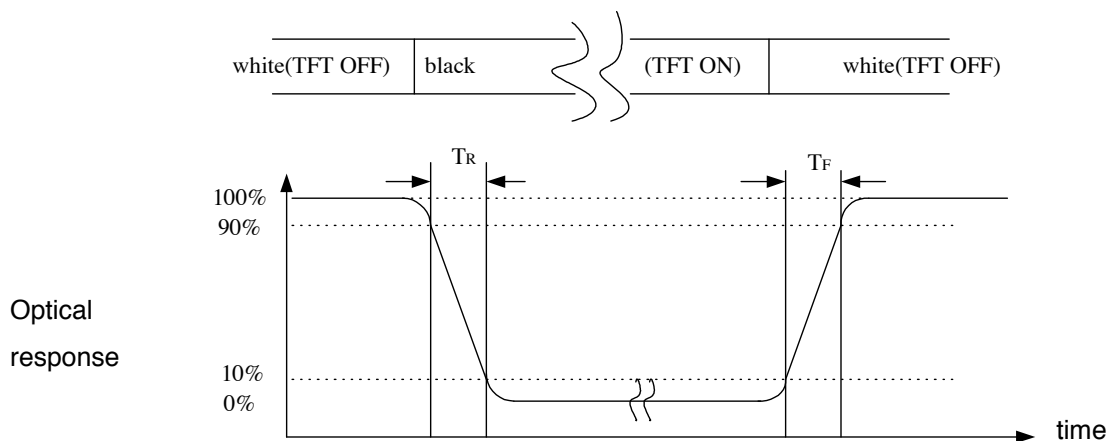


**Note (2)** Definition of Contrast Ratio (CR) :  
measured at the center point of panel

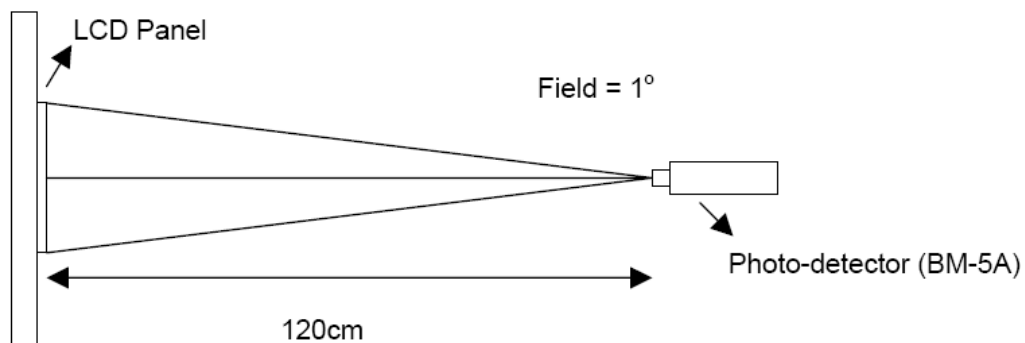
$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

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



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



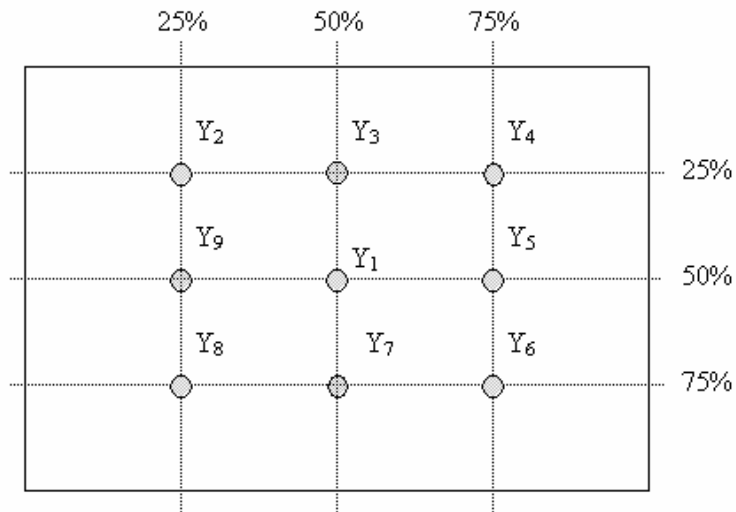


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**Note (5) Definition of Average Luminance Uniformity of White (9 Point) and center point**

$$\text{Average Luminance Uniformity} = \frac{Y_1+Y_2+Y_3+Y_4+Y_5+Y_6+Y_7+Y_8+Y_9}{9}$$

Center Point Luminance = Y1 Luminance



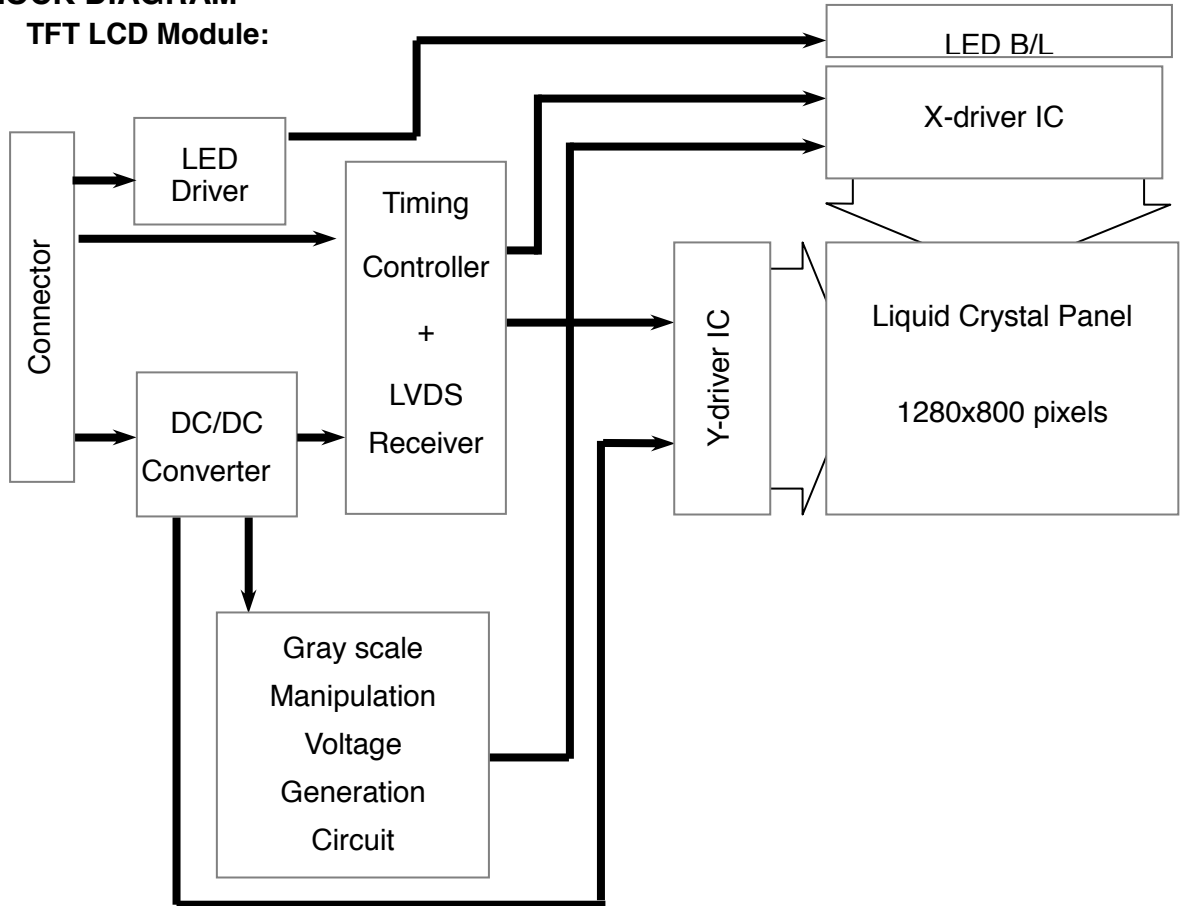
**Note (6) Definition of Brightness Uniformity**

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

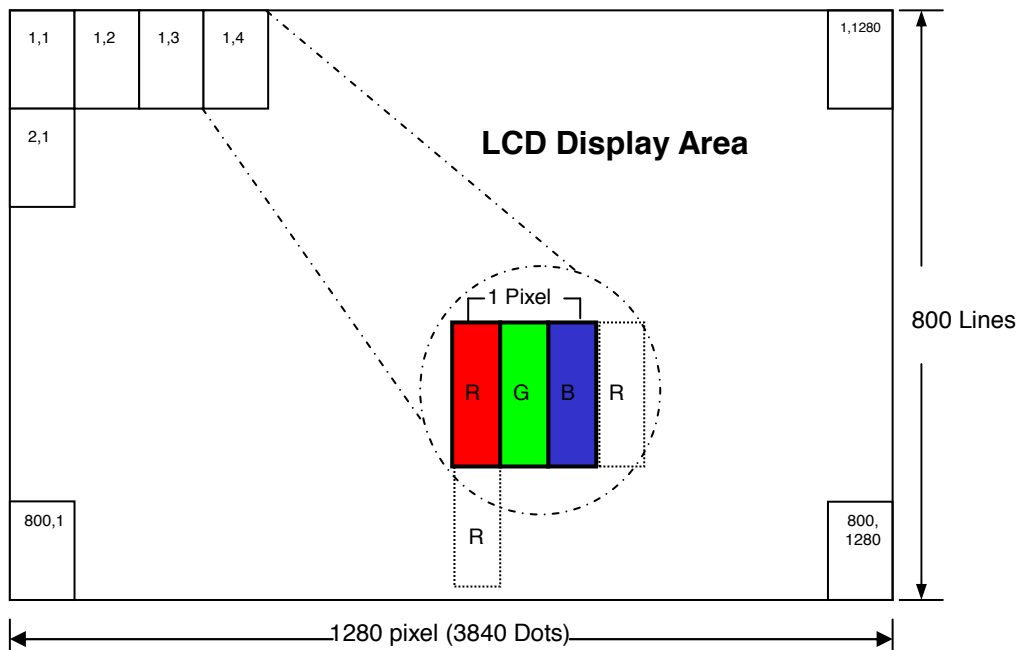
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### 4.0 BLOCK DIAGRAM

#### 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	L255	
		H	H	H	H	H	H	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L255	
		H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L255	
Red	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	L	L	L	L	L	L	H	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	L	L	L	L	L	L	L	L	L	L	L255		
		L	L	L	L	L	L	L	L	H	H	H	H	H	L	H	L	L	L	L	L	L	L	L	L255		
		L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L255		
Green	L	L	L	L	L	L	L	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	H	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	L	L	L	L255	
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	L	H	L	L255	
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L255	
Blue	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	H	L	L	L	L	L	L	H	L	L	L1		
		L	L	L	L	L	H	L	L	L	L	L	L	H	L	L	L	L	L	L	L	H	L	L	L2		
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3...L251		
	↓ Light	H	H	H	H	H	L	L	H	H	H	H	L	L	H	H	H	H	L	L	H	H	H	H	L	L	L252
		H	H	H	H	H	L	H	H	H	H	H	L	H	H	H	H	H	L	H	H	H	H	H	L	H	L253
		H	H	H	H	H	H	L	H	H	H	H	H	L	H	H	H	H	H	L	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	White L255			

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## 5.0 INTERFACE PIN CONNECTION

### 5.1 TFT LCD Module : CN (Input signal): : 196357-30041-3 (P-TWO or equivalent)

Pin No.	Signal	Description
1	VDD	Power Supply, 3.3V (typical)
2	VDD	Power Supply, 3.3V (typical)
3	VDD	Power Supply, 3.3V (typical)
4	DDC_VDD	DDC 3.3V Power
5	SCV	EDID Clock
6	SDA	EDID Data
7	NC	NC
8	GND	Ground
9	RXIN0-	- LVDS differential data input (R0-R5, G0)
10	RXIN0+	+ LVDS differential data input (R0-R5, G0)
11	GND	Ground
12	RXIN1-	- LVDS differential data input (G1-G5, B0-B1)
13	RXIN1+	+ LVDS differential data input (G1-G5, B0-B1)
14	GND	Ground
15	RXIN2-	- LVDS differential data input (B2-B5, HS, VS, DE)
16	RXIN2+	+ LVDS differential data input (B2-B5, HS, VS, DE)
17	GND	Ground
18	RXCLKIN-	- LVDS differential clock input
19	RXCLKIN+	+ LVDS differential clock input
20	GND	Ground
21	RXIN3-	- LVDS differential data input (R6-R7,G6-G7,B6-B7)
22	RXIN3+	+ LVDS differential data input (R6-R7,G6-G7,B6-B7)
23	GND	Ground
24	LED_PWM	PWM for LED dimming control
25	LED_EN	LED_EN Pin(+3.0V Input)
26	CABC_EN	CABC(+3.0V Input)
27	Color Engine_EN	Color Engine(+3.0V Input)
28	VLED	LED Power Supply
29	VLED	LED Power Supply
30	VLED	LED Power Supply

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

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## 6.0 ELECTRICAL CHARACTERISTICS

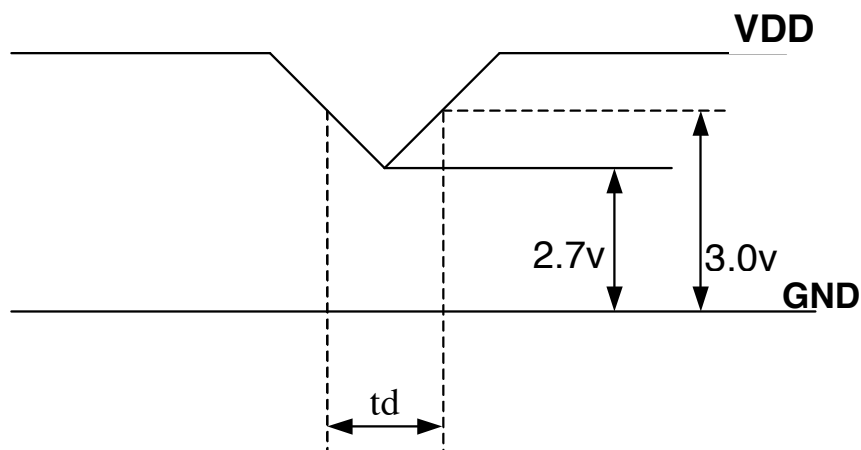
### 6.1 TFT LCD Module

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	$V_{DD}$	3.0	3.3	3.6	V	Note (2)
Current of power supply	$I_{DD}$	-	0.315	-	A	$V_{DD} = 3.3V$ · White pattern (L63)
Inrush current	$I_{RUSH}$	-	-	1.50	A	Note (2)

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

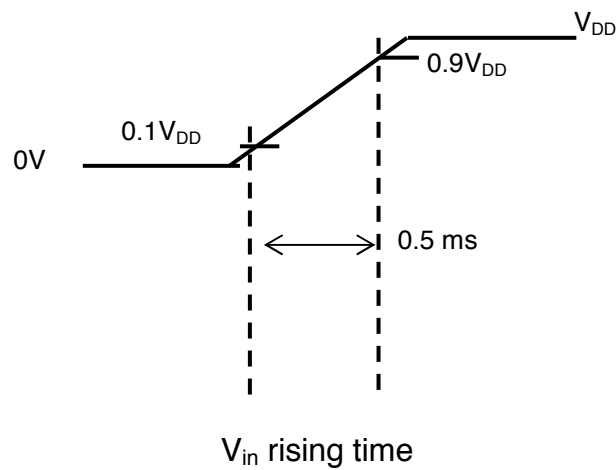
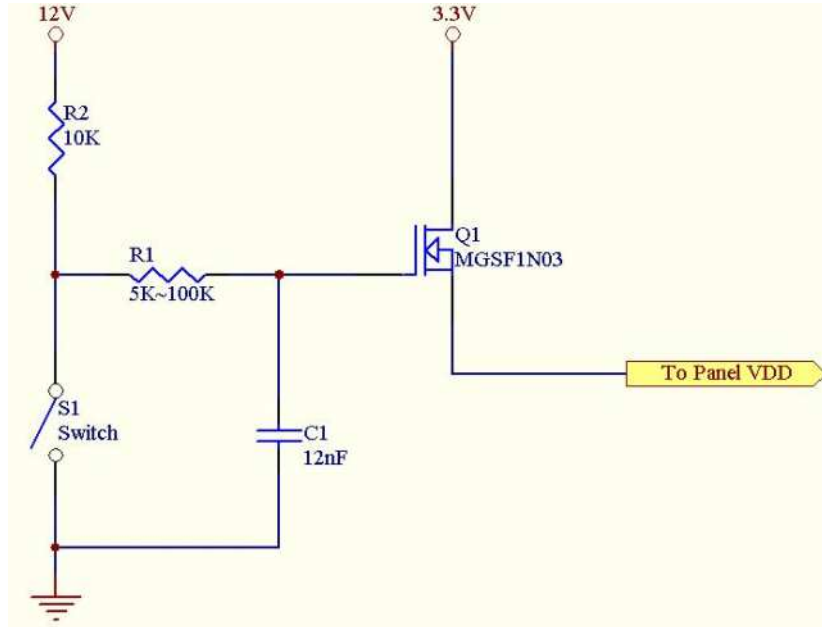
When  $V_{DD}$  operating within  $2.7V \leq V_{DD} < 3.0V$  ,  $t_d \leq 10ms$  , the display may momentarily become abnormal.

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



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

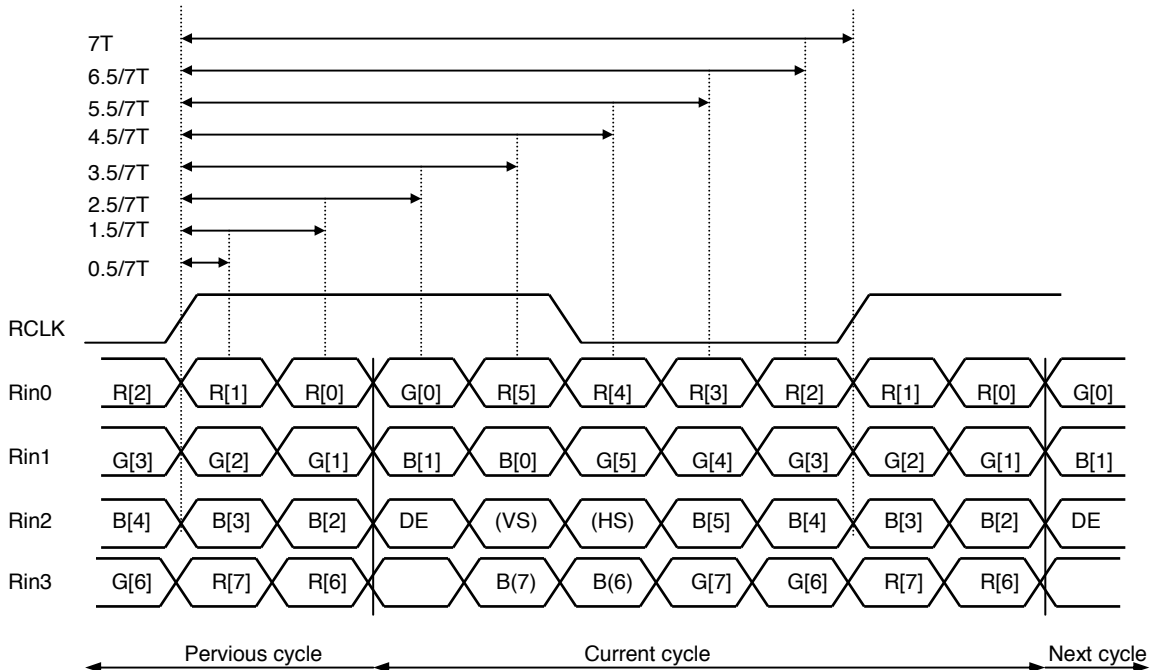


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### 6.2 Switching Characteristics for LVDS Receiver

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Differential Input High Threshold	V <sub>th</sub>	—	—	100	mV	V <sub>CM</sub> =1.2V
Differential Input Low Threshold	V <sub>tl</sub>	-100	—	—	mV	
Input Current	I <sub>IN</sub>	-10	—	+10	uA	
Differential input Voltage	V <sub>ID</sub>	0.1	—	0.6	V	
Common Mode Voltage Offset	V <sub>CM</sub>	( V <sub>ID</sub>  /2)	1.2	2.4-( V <sub>ID</sub>  /2)	V	

### 6.3 Bit Mapping & Interface Definition



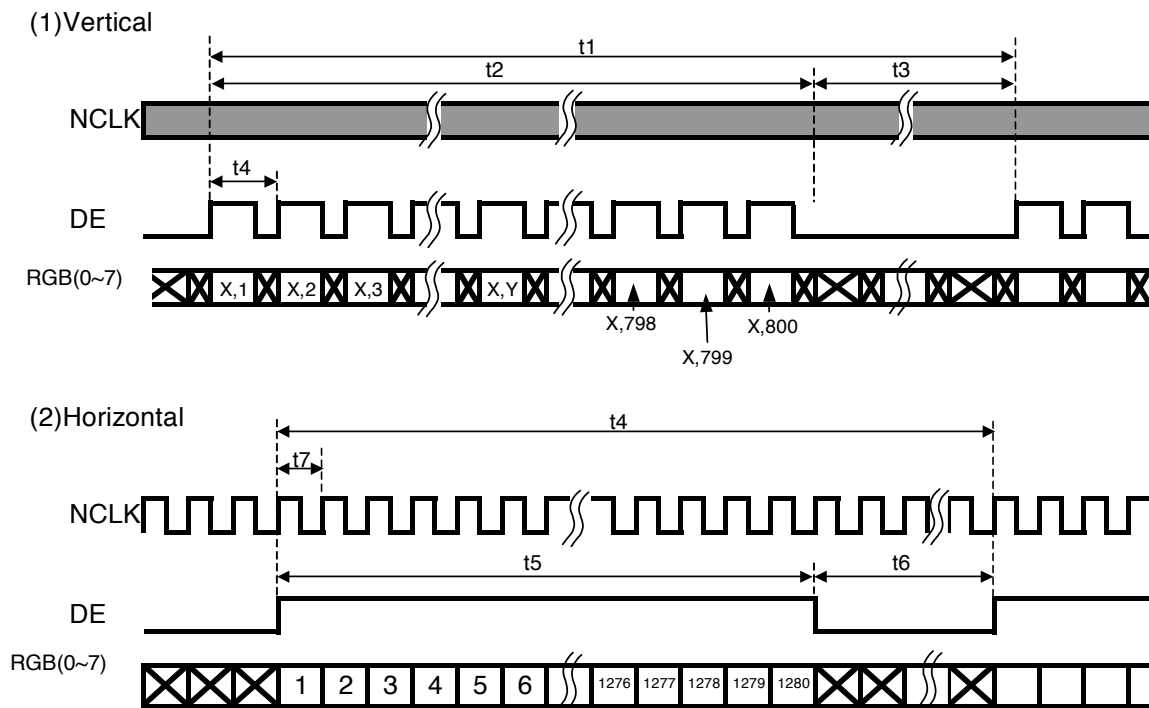
LVDS Receiver Input Timing Definition  
for 8bits LVDS input

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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	803	823	1023	line
Vertical Display Time	t2	800	800	800	line
Vertical Blanking Time	t3	3	23	223	line
1 Line Scanning Time	t4	1334	1440	1961	clock
Horizontal Display Time	t5	1280	1280	1280	clock
Horizontal Blanking Time	t6	54	160	681	clock
Clock Rate	t7	64.3	71.1	82	MHz

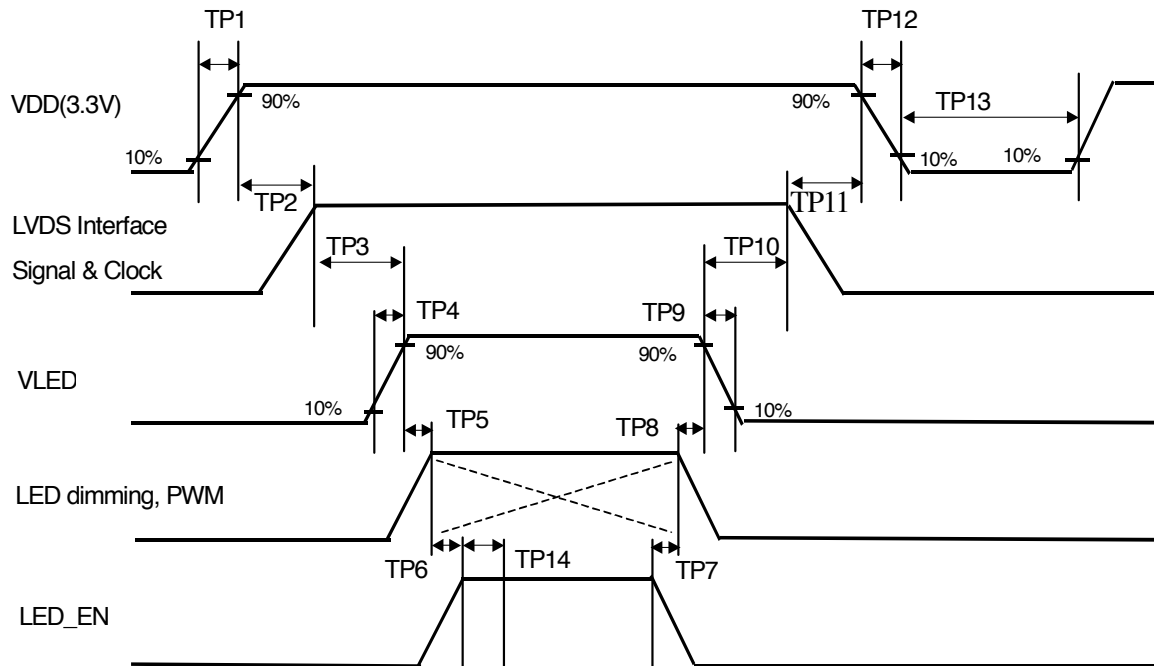
### Timing Diagram of Interface Signal (DE mode)





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### 6.5 Power On / Off Sequence



Item	Min.	Typ.	Max.	Unit	Remark
TP1	0.5	--	10	msec	
TP2	0	--	50	msec	
TP3	200	--	--	msec	
TP4	0.5	--	10	msec	
TP5	10	--	--	msec	
TP6	10	--	--	msec	
TP7	0	--	--	msec	
TP8	10	--	--	msec	
TP9	0	--	10	msec	
TP10	200	--	--	msec	
TP11	0	--	50	msec	
TP12	1	--	10	msec	
TP13	1000	--	--	msec	
TP14	50	--	--	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) TP13 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) The duty of LED dimming signal should be more than 20% in TP6 and TP14
  - (7) PWM can adjust brightness to control Pin. Pulse duty the bigger the brighter

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### 6.6 Backlight Unit

Parameter	Symbol	Min	Typ	Max	Units	Condition
Backlight Power consumption	$P_{LED}$	--	--	3.46	Watt	Ta=25°C VLED=12V PWM duty 100% Note (1)
LED Life-Time	N/A	10,000	--	--	Hour	Ta=25°C I <sub>F</sub> =20mA Note (2)

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

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

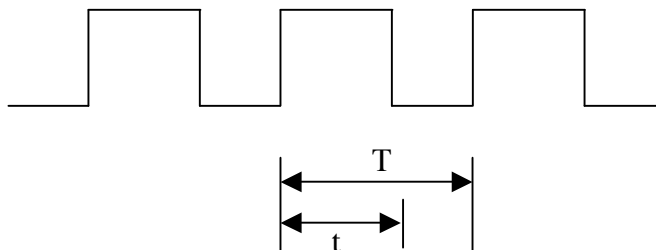
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## 6.7 LED Driver

### 6.7.1 DC Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Units	Remark
LED Power Supply Voltage	$V_{LED}$	5	--	15	Volt	
LED_EN High Threshold	$V_{ENH}$	2.0	--	--	Volt	
LED_EN Low Threshold	$V_{ENL}$	--	--	0.4	Volt	
PWM High Threshold	$V_{PWMH}$	2.0	--	--	Volt	
PWM Low Threshold	$V_{PWML}$	--	--	0.4	Volt	
PWM Frequency	$F_{PWM}$	225	--	275	Hz	
PWM Duty Cycle	$T_D$	10	--	100	%	Note(1)

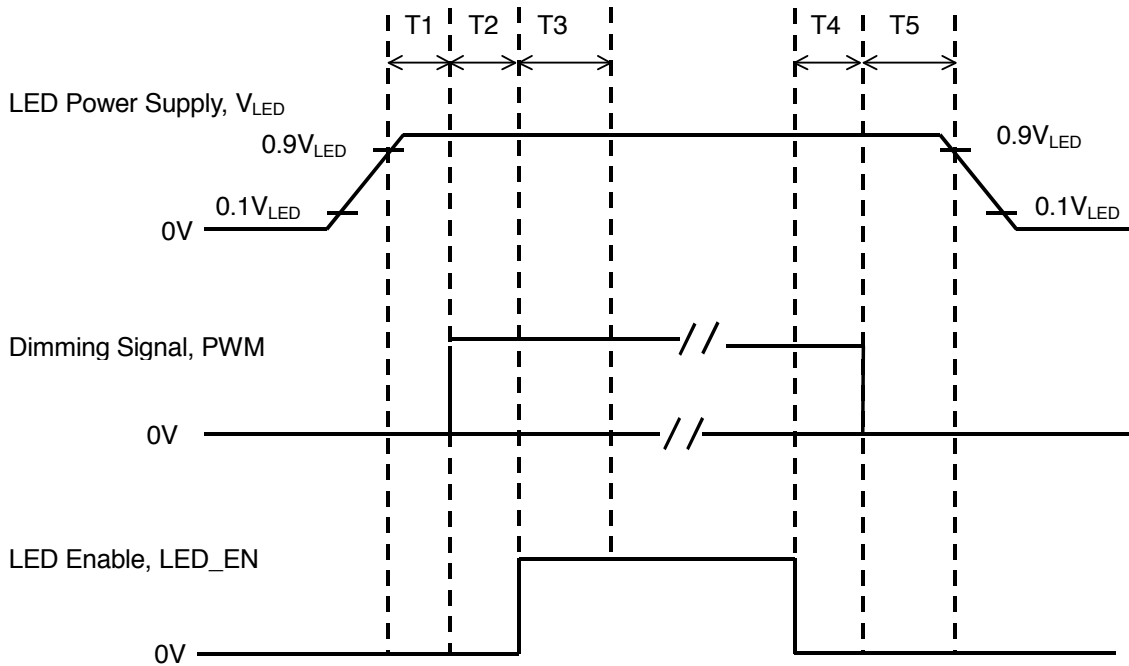
**Note (1):** PWM Duty Cycle



$$\text{Duty Cycle} = (t / T) * 100\%$$

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### 6.7.2 LED Power on/off sequence



Symbol	Value			Unit
	Min	Typ	Max	
T1	10	--	--	ms
T2	10	--	--	
T3	50	--	--	
T4	0	--	--	
T5	10	--	--	

**Note (1):** The duty of LED dimming signal should be more than 20% in T2 and T3

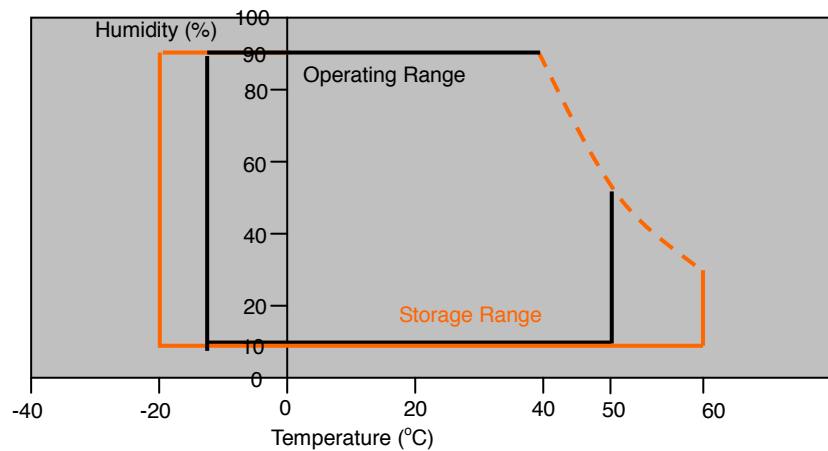
**Note (2):** PWM can adjust brightness to control Pin. Pulse duty the bigger the brighter

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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, 300hrs	
4	Low Temperature Operation	Ta=0°C, 300hrs	
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	
8	Temperature Humidity Bias	a=+40°C, 90% RH, 240hrs	

#### Storage / Operating temperature



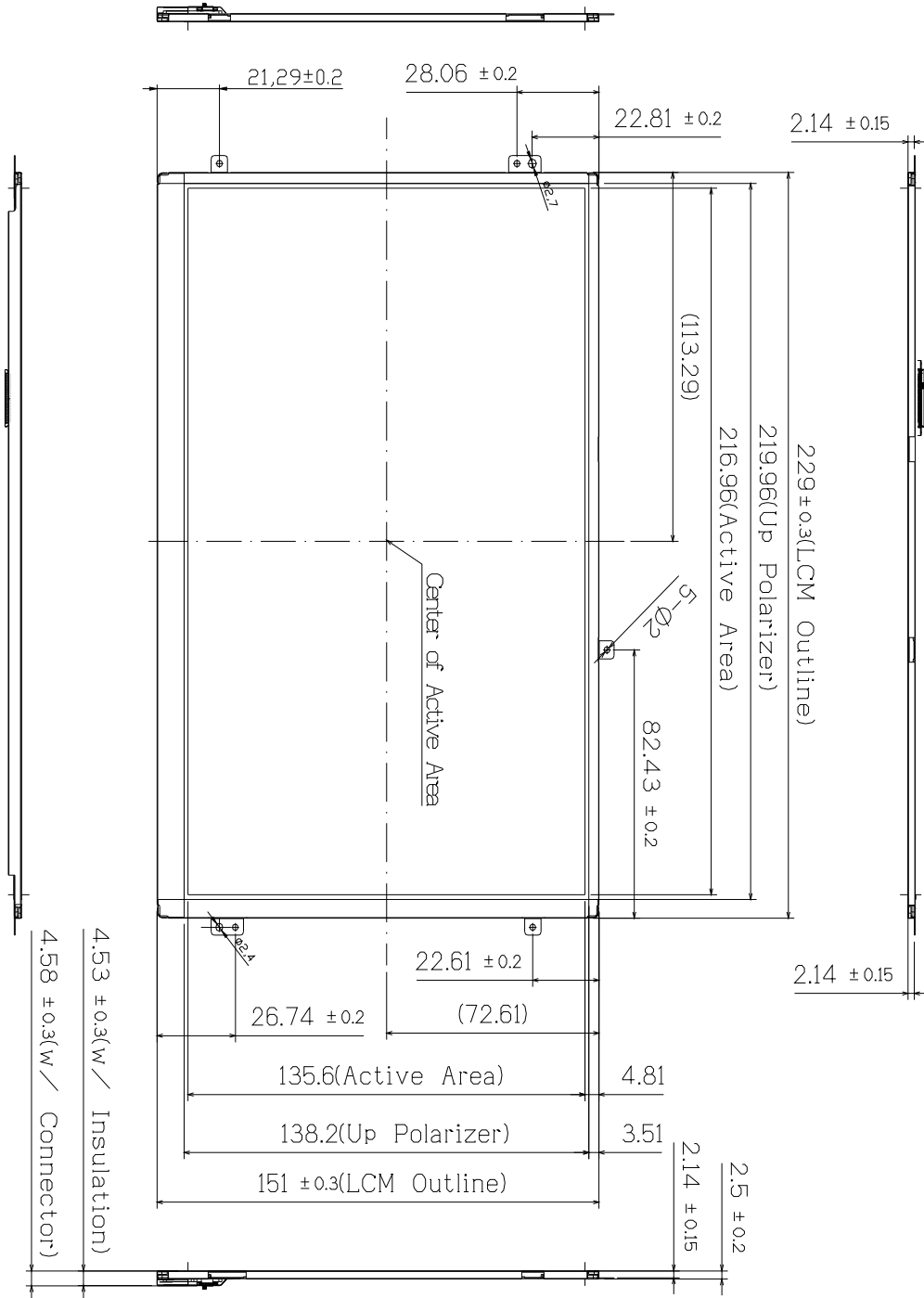
**Note** .Max wet bulb temp.=39°C

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## 8.0 OUTLINE DIMENSION

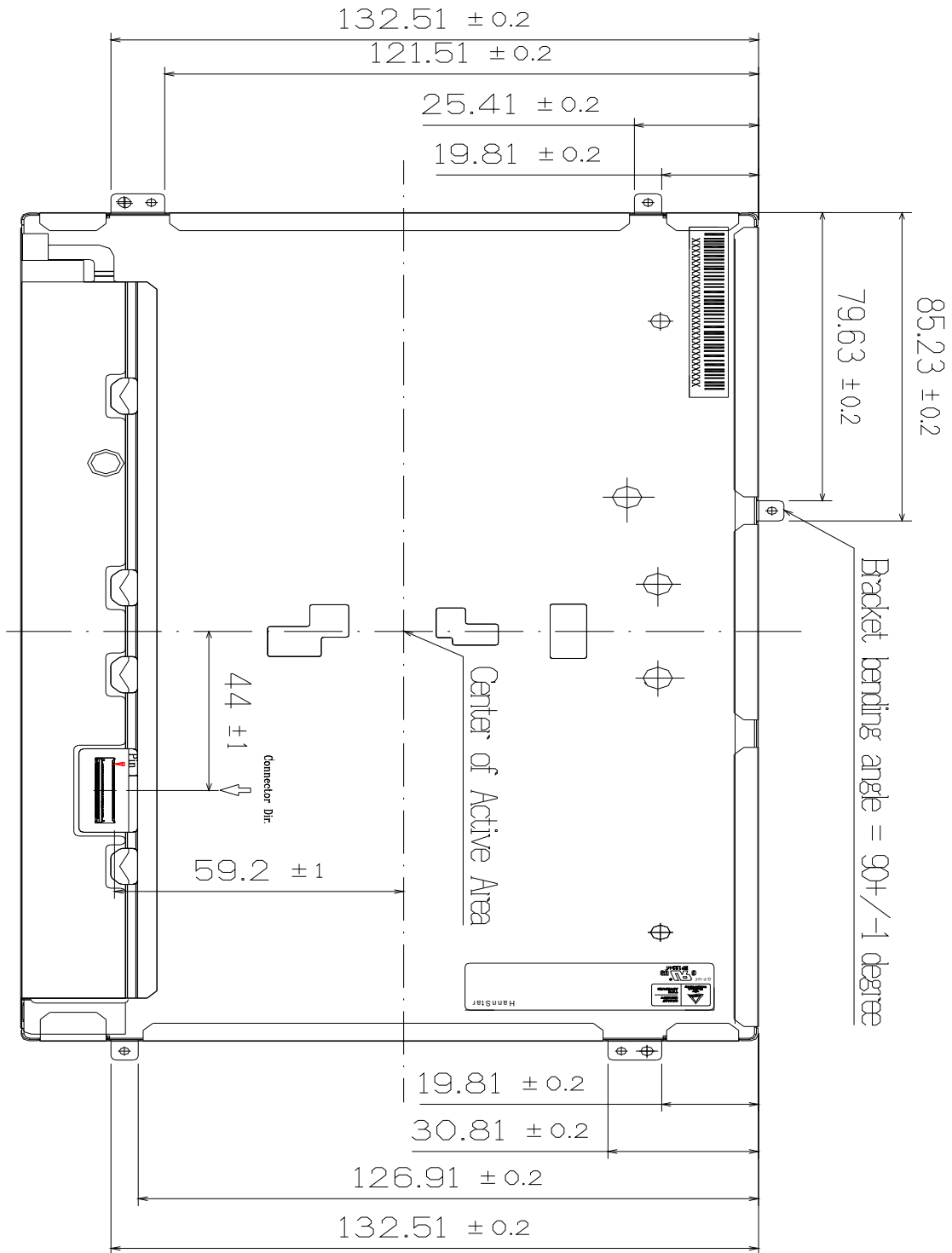
### 8.1 Front View Outline Dimension

Unit : mm



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### 8.2 Back View Outline Dimension





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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

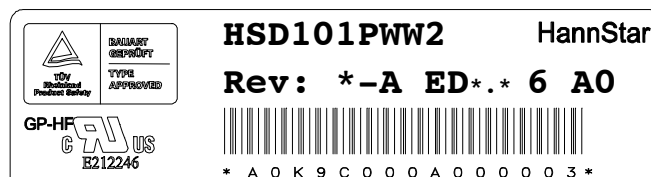
#### Note (2) Production Month

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) The label is attached to the backside of the LCD module.

(2) This is subject to change without prior notice.



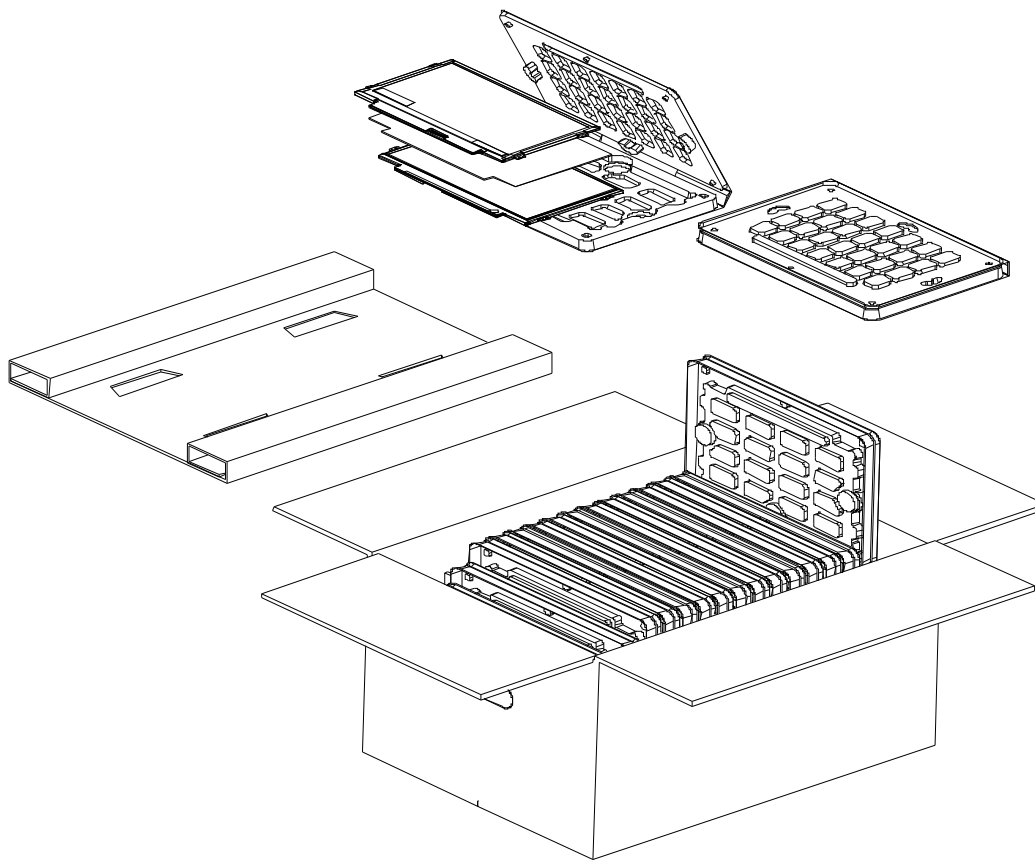
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## 10.0 PACKAGE SPECIFICATION

### 10.1 Packing form

LCM Model	LCM Qty. in the box	Inner Box Size (mm)	Notice
HSD101PWW2-A	30 pcs/box	476*380*304(H)	

### 10.2 Packing assembly drawings



HSD101PWW2-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	--

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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.

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.



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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.