HannStar HannStar Display Corp.

Document Title	HSD150PU13-A Product Information	Page No.	1 / 31
Document No.		Revision	1.0

Date : April 22, 2003

HannStar Product Information

Model: HSD150PU13 -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.

HannStar Display Corp.

Document Title	HSD150PU13-A Product Information	Page No.	4 / 31
Document No.		Revision	1.0

1.0 GENERAL DESCRIPTION

1.1 Introduction

HannStar Display model HSD150PU13-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 15 inch diagonally measured active display area with UXGA resolution (1200 vertical by 1600 horizontal pixel array) and can display up to 262,144 colors.

1.2 Features

■ 15 UXGA for Notebook PC

■ 2ch-LVDS interface system with 6bit color data.

■ Compatible with SPWG style-B standard.

1.3 Applications

■ Notebook PC

■ Moniputers

■ Display terminals for AV applications

■ Monitors for industrial applications

1.4 General information

Item	Specification	Unit
Outline dimension(typ.)	317.3(W) × 242.0(H) × 6.5max (D).	mm
Display area	304.8(W) × 228.6(H)(15.0" diagonal)	mm
Number of pixels	1600(H) × 1200(V)	pixels
Pixel pitch	0.1905(H) × 0.1905(V)	mm
Pixel arrangement	RGB vertical stripe	
Display color	6 bit / 262,144 color	
Weight(typ.)	600	g
Back-light	1-CCFL , Side-light type	
Input signal	2-ch LVDS	
Viewing direction	6 o'clock	
Power supply voltage	3.3	V

HannStar HannStar Display Corp.

Document Title	HSD150PU13-A Product Information	Page No.	5 / 31
Document No.		Revision	1.0

1.5 Mechanical Information

Item		Min.	Typ.	Max.	Unit
Module Size	Horizontal(H)	316.8	317.3	317.8	mm
	Vertical(V)	241.5	242.0	242.5	mm
	Depth(D)	---	6.2	6.5	mm
Weight (Without inverter)		---	600	---	g

2.0 ABSOLUTE MAXIMUM RATING

2.1 Absolute Rating of Environment

Item	Symbol	Min.	Max.	Unit	Note
Storage temperature	T_{STG}	-20	60	^{o}C	
Operating temperature	T_{OPR}	0	50	^{o}C	
Operating humidity	H_{OPR}	10	80	%RH	(1)
Storage humidity	H_{STG}	10	90	%RH	(1)
Vibration(non-operating)	V_{nop}	—	1.5	G	(2)
Shock (non-operating)	S_{nop}	180	—	G	(3)
Low pressure(operating)	P_{LOP}	697	—	hPa	(4)
Low pressure(non-operating)	P_{LNOP}	116	—	hPa	(5)

Note (1) Max wet bulb temp =39°C

(2) 5-500Hz sweep/cycle ,X,Y,Z each directions,0.5hr each.
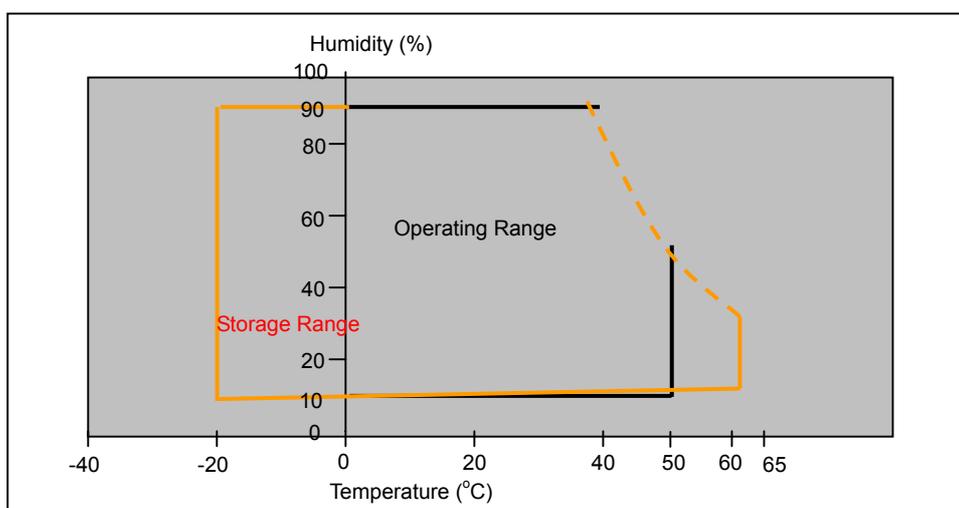
(3) Half sine wave, 2ms, ±X, ±Y, ±Z direction, one time each. For this shock test, it is necessary to fill the silicon rubber between the shock jig as buffer.

(4) 2 hours. (10000 feet)

(5) 24 hours. (50000 feet)

2.2 Electrical Absolute Rating

2.2.1 TFT LCD Module

Item	Symbol	Min.	Max.	Unit	Note
Power supply voltage	V_{DD}	-0.3	4.0	V	(1)
Logic input voltage	V_{IN}	-0.3	V_{DD}+0.3	V	(1)

2.2.2 Back-Light Unit

Item	Symbol	Min.	Max.	Unit	Note
Lamp voltage	V_{FL}	0	2000	$V_{(rms)}$	(1)
Lamp current	I_L	3.0	7.5	$mA_{(rms)}$	(1)
Lamp frequency	f_L	20	100	kHz	(1)

Note (1) Permanent damage may occur to the LCD module if beyond this specification. Functional operation should be restricted to the conditions described under normally operating conditions.

HannStar Display Corp.

Document Title	HSD150PU13-A Product Information	Page No.	7 / 31
Document No.		Revision	1.0

3.0 OPTICAL CHARACTERISTICS

3.1 Optical specification

| Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast		CR		150	250	—		(1)(2)
Response time	Rising	T_R		—	$T_R + T_F$	—	msec	(1)(3)
	Falling	T_F		—	35	—		
White luminance (center of screen)		Y_L		120	150	—	cd/m^2	(1)(4) (I_L=6.0mA)
Color chromaticity (CIE1931)	Red	R_x	Θ=0 Φ=0 Normal Viewing Angle	0.54	0.57	0.60		(1)(4)
		R_y		0.32	0.35	0.38		
	Green	G_x		0.28	0.31	0.34		
		G_y		0.54	0.57	0.60		
	Blue	B_x		0.13	0.16	0.19		
		B_y		0.12	0.15	0.18		
	White	W_x		0.28	0.31	0.34		
		W_y		0.31	0.34	0.37		
Viewing angle	Hor.	Θ_L	CR>=10	—	40	—		
		Θ_R		—	40	—		
	Ver.	Θ_U		—	20	—		
		Θ_D		—	40	—		
Brightness uniformity		B_{UNI}	Θ=0	65	—	—	%	(4)
Crosstalk		CT(n)	Φ=0	--	—	1.3	%	(5)

3.2 Measuring Condition

- Measuring surrounding : dark room
- Lamp current I_{FL} : 6.0 ± 0.1mA(rms), lamp freq. F_L=50 ± 10 kHz
- V_{DD}=3.3V ± 0.3V
- Surrounding temperature : 25±2°C
- 30min. warm-up time.

3.3 Measuring Equipment

- LCD-7000 of Otsuka Electrics Corp., which utilized MCPD-7000 for Chromaticity and BM-5A for other optical characteristics.
- Measuring spot size : 10~12mm

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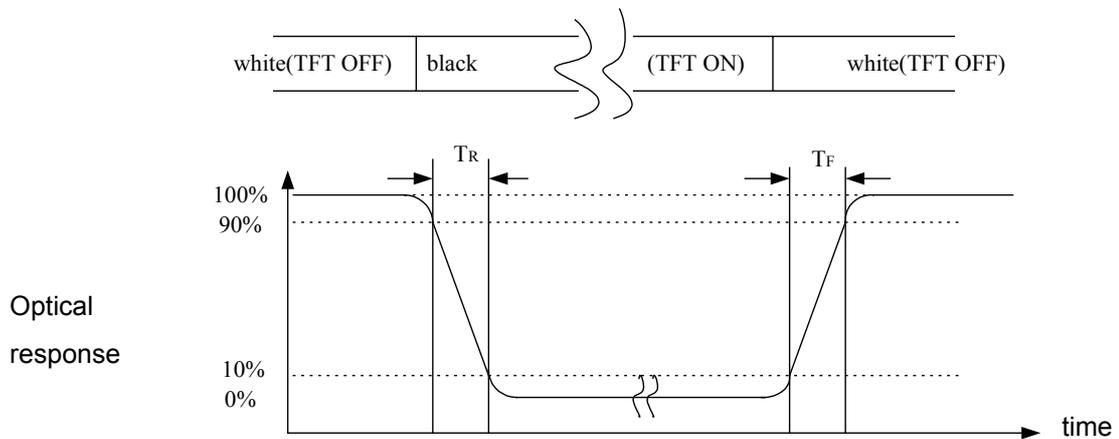| Document Title	HSD150PU13-A Product Information	Page No.	8 / 31
Document No.		Revision	1.0

Note (1) Definition of Viewing Angle :
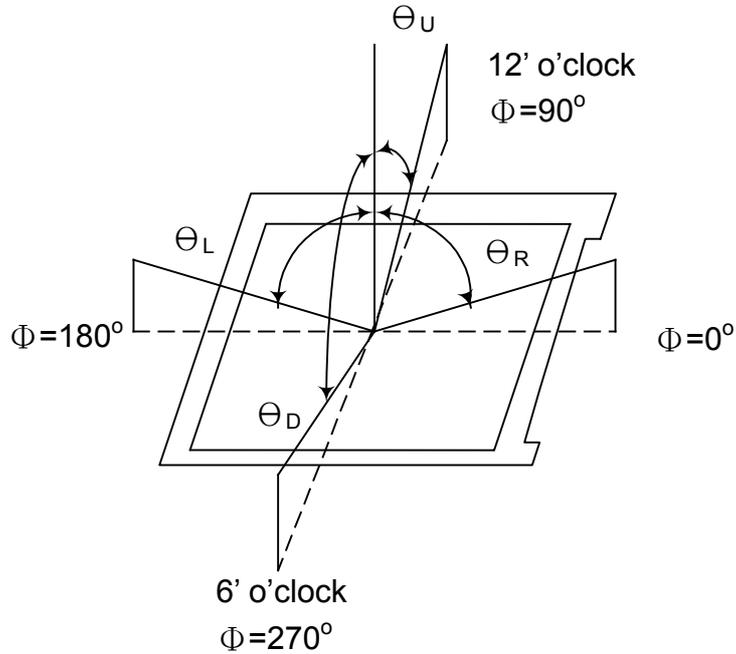
Note (2) Definition of Contrast Ratio(CR) :
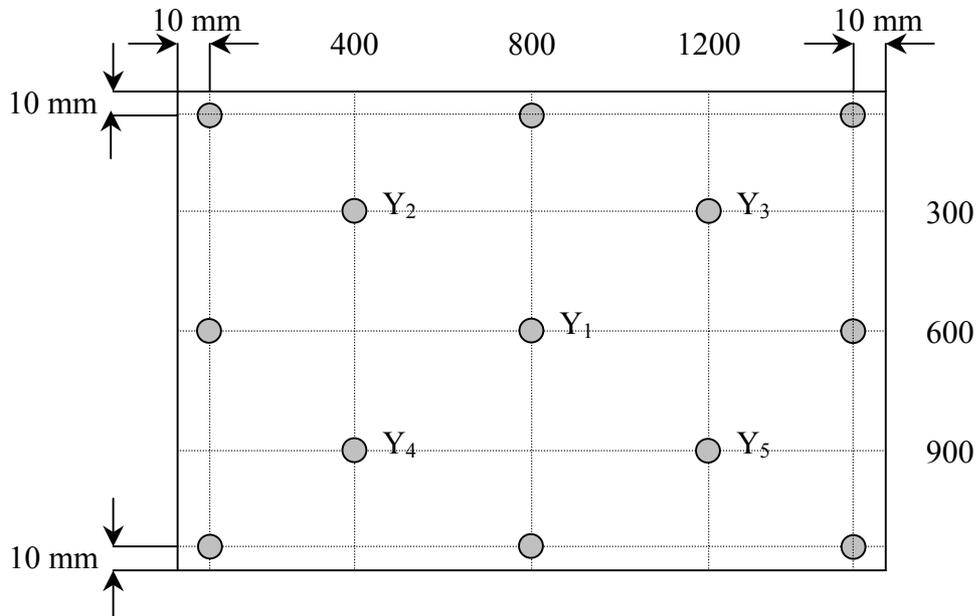measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white (L63)}}{\text{Luminance with all pixels black (L0)}}$$

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

HannStar Display Corp.

Document Title	HSD150PU13-A Product Information	Page No.	9 / 31
Document No.		Revision	1.0

Note (4) Definition of brightness uniformity

Photo-detector (BM-5A)

Field=2 °

50cm

LCD panel

Center of panel

10 mm   400   800   1200   10 mm

10 mm

Y_2 Y_3 300

Y_1 600

Y_4 Y_5 900

10 mm
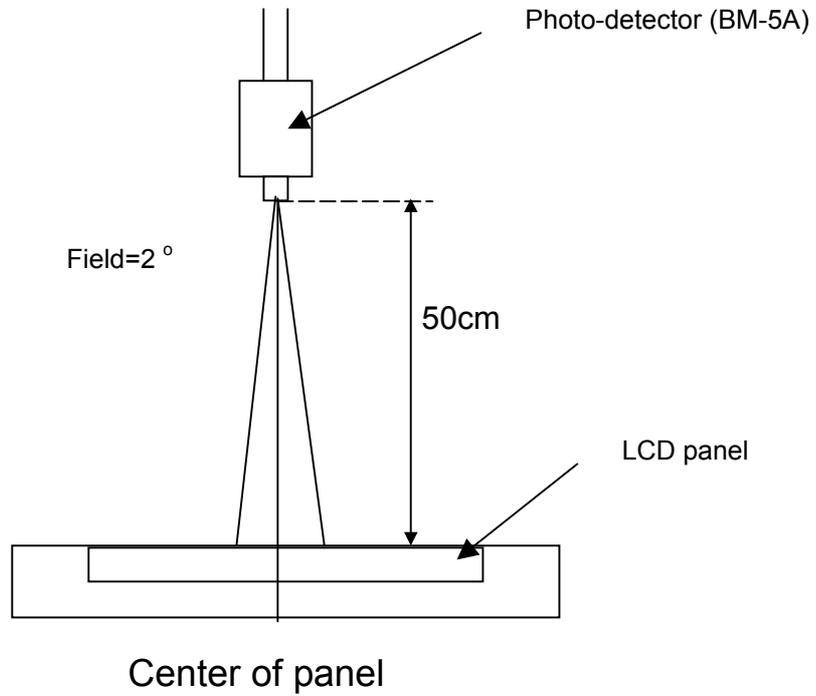
$$\text{Luminance uniformity} = \frac{(\text{Min Luminance of 13 points})}{(\text{Max Luminance of 13 points})} \times 100\%$$

HannStar HannStar Display Corp.

Document Title	HSD150PU13-A Product Information	Page No.	10 / 31
Document No.		Revision	1.0

Note (5) Definition of crosstalk   CT(1) ~ CT(4)

$$CT(n) = \frac{\left| L(n) - LB(n) \right|}{L(n)} \times 100\% , \; n = 1 \sim 4$$
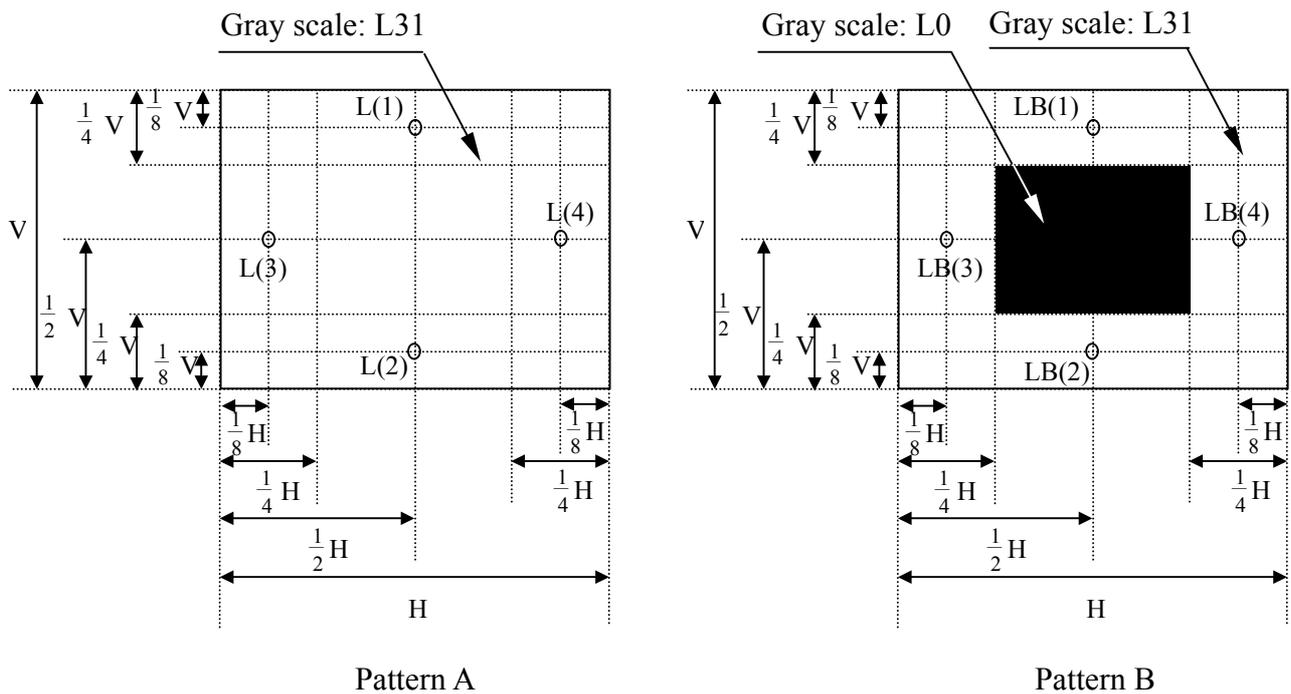
Where L(n) = Luminance of point "n" at pattern A (cd/m^2) , n=1$\sim$4

LB(n) = Luminance of point "n" at pattern B (cd/m^2) , n=1$\sim$4

The location measured will be exactly the same in both patterns.

L0 : Luminance with all pixels black

L63 : Luminance with all pixels white

Gray scale: L31

Gray scale: L0   Gray scale: L31

Pattern A

Pattern B

HannStar HannStar Display Corp.

Document Title	HSD150PU13-A Product Information	Page No.	11 / 31
Document No.		Revision	1.0

4.0 ELECTRICAL CHARACTERISTICS

4.1 TFT LCD Module

Item		Symbol	Min.	Typ.	Max.	Unit	Note
Voltage of power supply		V_{DD}	3.0	3.3	3.6	V	
Input voltage	High	V_{IH}	—	—	100	MV	$V_{CM}=1.2V$
	Low	V_{IL}	-100	—	—	mV	
Current of power supply	Mosaic	I_{DD}	720	800	880	mA	(1)
Vsync frequency		f_V	—	60.00	60.00	Hz	(2)
Hsync frequency		f_H	—	75.00	—	KHz	
Main frequency		f_{DCLK}	75.50	81.00	81.00	MHz	

Note (1) Mosaic : Dot checker image

Grey scale: L0～L63.
L0: Luminance with all pixels black.
L63: Luminance with all pixels white.
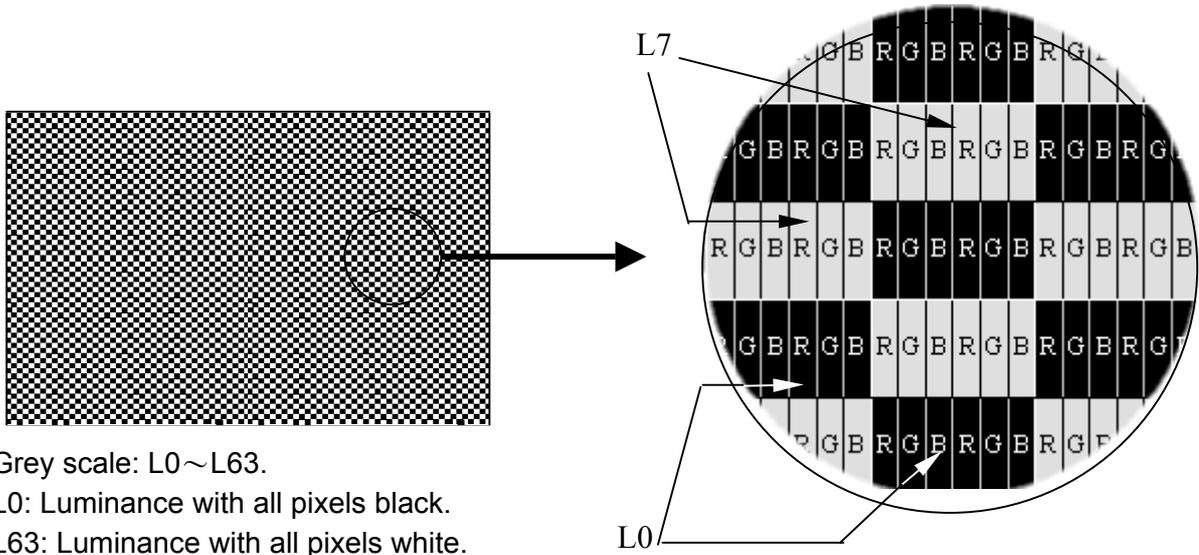
Note (2) When f_v is too low, a flicker may be occurred on the display.

HannStar HannStar Display Corp.

Document Title	HSD150PU13-A Product Information	Page No.	12 / 31
Document No.		Revision	1.0

4.2 Back-Light Unit

The back-light system is an edge-lighting type with 1 CCFL(Cold Cathode Fluorescent Lamp). The characteristics of the lamp1 are shown in following tables.

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Lamp current	IL	3.0	6.0	7.5	MA(rms)	(1)
Lamp voltage	VL	—	790	860	V(rms)	I_L=6.0mA
Frequency	fL	20	50	100	KHz	(2)
Operating life time	Hr	10,000	—	—	Hour	(3)
Startup voltage	Vs	—	—	1350	V(rms)	At 0°C(4)

Note (1) Lamp current is measured with current meter for high frequency as shown below. Specified valued are for a lamp.
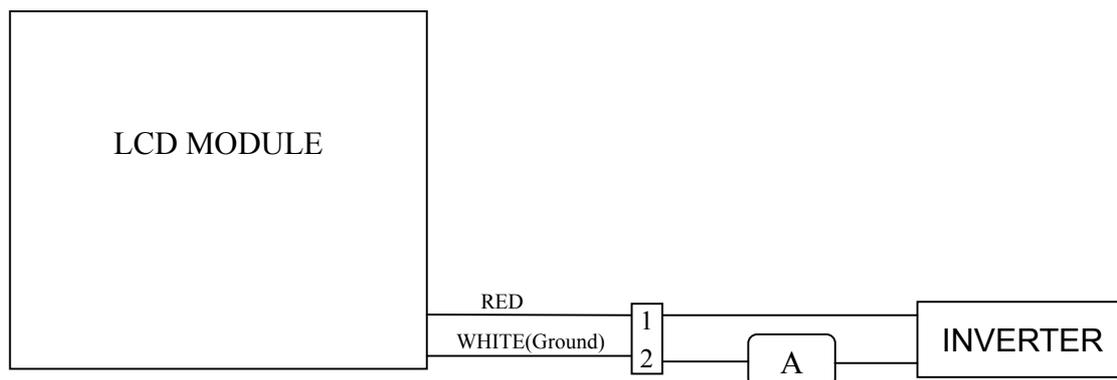
Note (2) Lamp frequency may produce interference with horizontal synchronous frequency and this may cause line flow on the display. Therefore lamp frequency shall be detached from the horizontal synchronous frequency and its harmonics as far as possible in order to avoid interference.

Note (3) Life time (Hr) can be defined as the time in which it continues to operate under the condition: Ta=25±3°C, I_L=6.0mA(rms) and f_L=51kHz until one of the following event occurs :

1. When the brightness becomes 50%

2. When the startup voltage(Vs) at 0°C becomes higher than the maximal Value of Vs specified above.

Note (4) Max. startup voltage shall be defined as max. voltage which CCFL can be startup. When the customer select the inverter, the min. value of startup voltage must be higher than CCFL's max. startup voltage

HannStar Display Corp.

Document Title	HSD150PU13-A Product Information	Page No.	13 / 31
Document No.		Revision	1.0

5.0 BLOCK DIAGRAM
5.1 TFT LCD Module

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Connector ──→ LVDS Receiver + Timing Controller ──→ X-driver IC
                                                 ──→ Y-driver IC ──→ Liquid Crystal Panel
                                                                     1600×1200 pixels

Connector ──→ DC/DC Converter
DC/DC Converter ──→ DDC2B E²PROM
DC/DC Converter ──→ Gray scale Manipulation Voltage Generation
```

5.2 Back Light Unit

1	← HOT
2	← COLD

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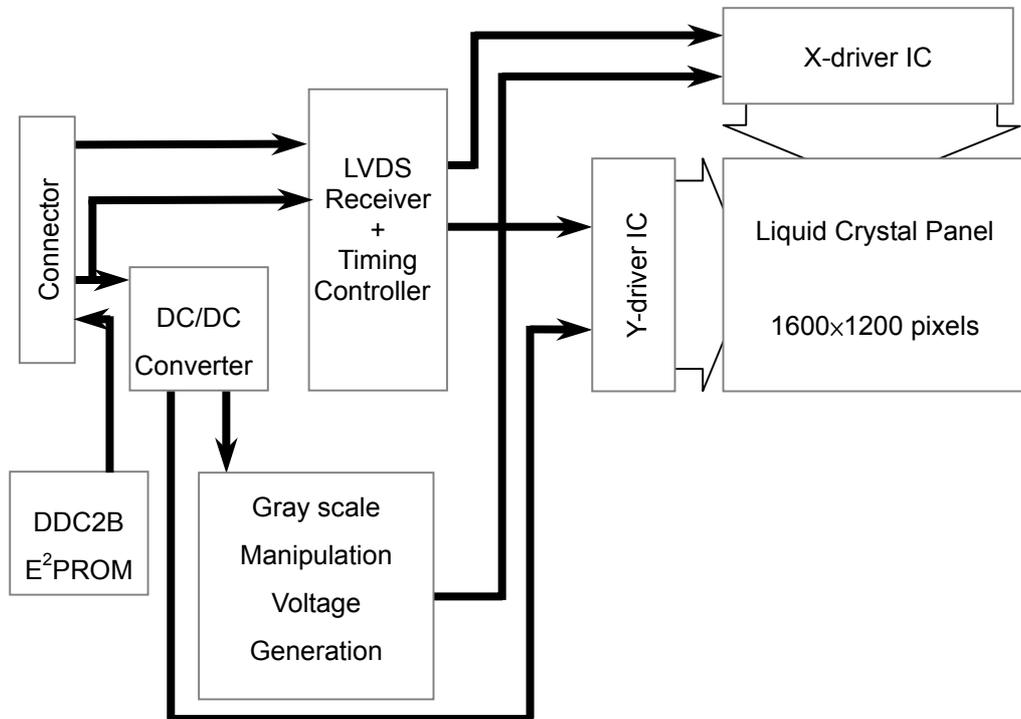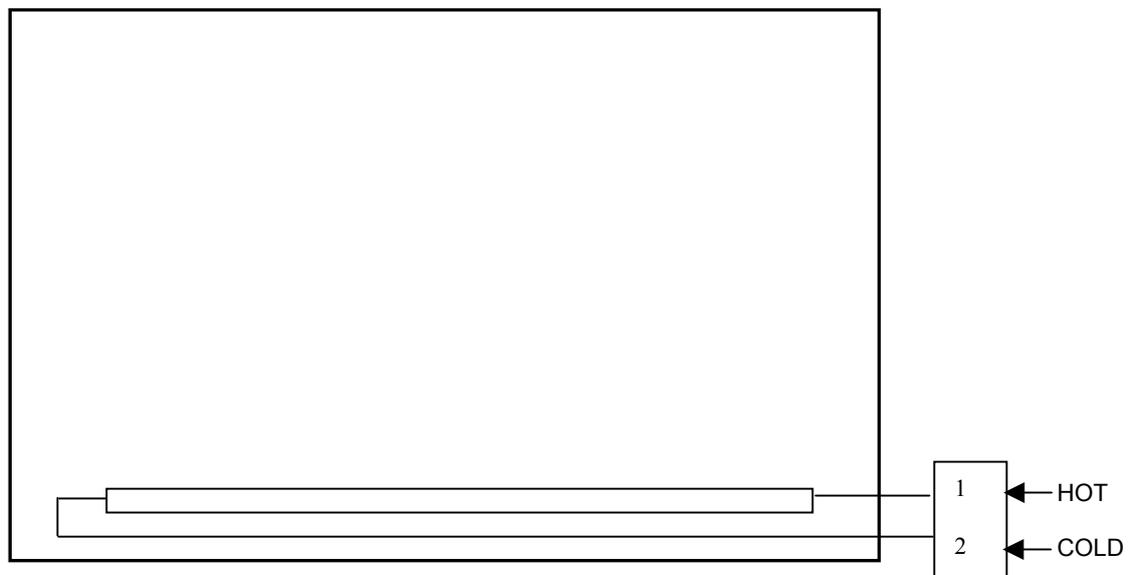
Document Title	HSD150PU13-A Product Information	Page No.	14 / 31
Document No.		Revision	1.0

6.0 INTERFACE PIN CONNECTION

6.1 TFT LCD Module

CN1[1] INPUT SIGNAL (FI-XB30SR-HF11A/JAPAN AVIATION ELECTRONICS INDUSTRY,LTD.)[1]

MATING CONNECTOR: FI-X30M,FI-X30MR

Terminal no.	Symbol	Function
1	GND	Ground
2	VDD	Power Supply : +3.3V
3	VDD	Power Supply : +3.3V
4	VEDID	DDC 3.3V power
5	NC	Reserved for supplier test point
6	ClkEDID	DDC clock
7	DATAEDID	DDC data
8	EIN0-	EVEN Transmission Data of Pixels 0 (Negative : -)
9	EIN0+	EVEN Transmission Data of Pixels 0 (Positive : +)
10	GND	Ground
11	EIN1-	EVEN Transmission Data of Pixels 1 (Negative : -)
12	EIN1+	EVEN Transmission Data of Pixels 1 (Positive : +)
13	GND	Ground
14	EIN2-	EVEN Transmission Data of Pixels 2 (Negative : -)
15	EIN2+	EVEN Transmission Data of Pixels 2 (Positive : +)
16	GND	Ground
17	ECLK-	EVEN Sample Clock (Negative : -)
18	ECLK+	EVEN Sample Clock (Positive : +)
19	GND	Ground
20	OIN0-	ODD Transmission Data of Pixels 0 (Negative : -)
21	OIN0+	ODD Transmission Data of Pixels 0 (Positive : +)
22	GND	Ground
23	OIN1-	ODD Transmission Data of Pixels 1 (Negative : -)
24	OIN1+	ODD Transmission Data of Pixels 1 (Positive : +)
25	GND	Ground
26	OIN2-	ODD Transmission Data of Pixels 2 (Negative : -)
27	OIN2+	ODD Transmission Data of Pixels 2 (Positive : +)
28	GND	Ground
29	OCLK-	ODD Sample Clock (Negative : -)
30	OCLK+	ODD Sample Clock (Positive : +)

Note 1) Please connects NC pin to nothing. Don't connect it to ground nor to other signal input. (NC pin should be open.)

6.2 Back-Light Unit

CN2 CCFL Power Source (BHSR-02VS-1) / JAPAN SOLDERLESS TERMINAL MFG CO., LTD.

Terminal no.	Symbol	Function
1	V_L	CCFL power supply (high voltage)
2	G_L	CCFL power supply (low voltage)

HannStar Display Corp.

Document Title	HSD150PU13-A Product Information	Page No.	15 / 31
Document No.		Revision	1.0

6.3 Relationship Between Displayed Color and Input

	Display	MSB R5	R4	R3	R2	R1	LSB R0	MSB G5	G4	G3	G2	G1	LSB G0	MSB B5	B4	B3	B2	B1	LSB 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	-
	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↑	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
	↓Light	:					:	:					:	:					:	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↑	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
	↓Light	:					:	:					:	:					:	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	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↑	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
	↓Light	:					:	:					:	:					:	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	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↑	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
	↓Light	:					:	:					:	:					:	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	H	White L63

6.4 Pixel Format

	Pixel 0	Pixel 1	Pixel 2	Pixel 3	Pixel 4	Pixel 5	• • •	Pixel 1599

Line 0 → R G B R G B R G B R G B R G B R G B   • • •   R G B
Line 1 → R G B R G B R G B R G B R G B R G B   • • •   R G B
Line 2 → R G B R G B R G B R G B R G B R G B   • • •   R G B
Line 3 → R G B R G B R G B R G B R G B R G B   • • •   R G B
Line 4 → R G B R G B R G B R G B R G B R G B   • • •   R G B
Line 5 → R G B R G B R G B R G B R G B R G B   • • •   R G B

LCD Display Area

1 Pixel = R G B

1200 Lines

Line 1199 → R G B R G B R G B R G B R G B R G B   • • •   R G B

1600 Pixels
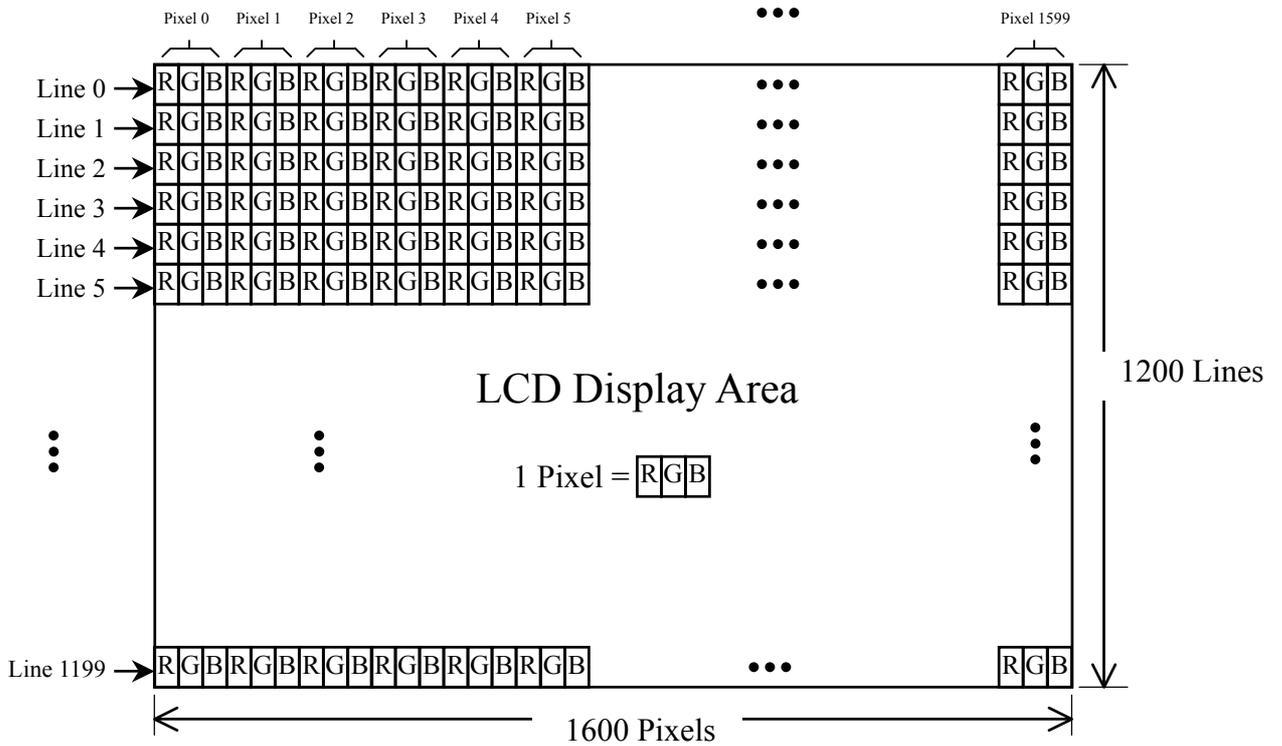
Note: The first pixel is Even pixel.

HannStar HannStar Display Corp.

Document Title	HSD150PU13-A Product Information	Page No.	17 / 31
Document No.		Revision	1.0

6.5 RECOMMENDED TRANSMITTER TO HSD150PU13-A INTERFACE ASSIGNMENT

Case1: EVEN DATA (6bit transmitter)

THC63LVDM63A				Output signal	HSD150PU13-A interface(CN1)	
Input terminal no.		Input signal (Graphics controller output signal)				
Symbol	Terminal	Symbol	Function	Symbol	Terminal	Symbol
T1IN0/TA0	44	RE0	RED Pixels Display Data (LSB)	T1OUT0- T1OUT0+	No. 8 No. 9	EIN0- EIN0+
T1IN1/TA1	45	RE1	RED Pixels Display Data			
T1IN2/TA2	47	RE2	RED Pixels Display Data			
T1IN3/TA3	48	RE3	RED Pixels Display Data			
T1IN4/TA4	1	RE4	RED Pixels Display Data			
T1IN5/TA5	3	RE5	RED Pixels Display Data (MSB)			
T1IN6/TA6	4	GE0	GREEN Pixels Display Data (LSB)			
T1IN7/TB0	6	GE1	GREEN Pixels Display Data	T1OUT1- T1OUT1+	No. 11 No. 12	EIN1- EIN1+
T1IN8/TB1	7	GE2	GREEN Pixels Display Data			
T1IN9/TB2	9	GE3	GREEN Pixels Display Data			
T1IN10/TB3	10	GE4	GREEN Pixels Display Data			
T1IN11/TB4	12	GE5	GREEN Pixels Display Data (MSB)			
T1IN12/TB5	13	BE0	BLUE Pixels Display Data (LSB)			
T1IN13/TB6	15	BE1	BLUE Pixels Display Data			
T1IN14/TC0	16	BE2	BLUE Pixels Display Data	T1OUT2- T1OUT2+	No. 14 No. 15	EIN2- EIN2+
T1IN15/TC1	18	BE3	BLUE Pixels Display Data			
T1IN16/TC2	19	BE4	BLUE Pixels Display Data			
T1IN17/TC3	20	BE5	BLUE Pixels Display Data (MSB)			
T1IN18/TC4	22	HSYNC	H-Sync			
T1IN19/TC5	23	VSYNC	V-Sync			
T1IN20/TC6	25	DE	Data Enable Signal			
T1CLK IN /CLKIN	26	NCLK	Data Sampling Clock	T1CLK OUT- T1CLK OUT+	No. 17 No. 18	ECLK - ECLK +

EIN0

T1 IN6 /TA6	T1 IN5 /TA5	T1 IN4 /TA4	T1 IN3 /TA3	T1 IN2 /TA2	T1 IN1 /TA1	T1 IN0 /TA0
GE0	RE5	RE4	RE3	RE2	RE1	RE0

EIN1

T1 IN13 /TB6	T1 IN12 /TB5	T1 IN11 /TB4	T1 IN10 /TB3	T1 IN9 /TB2	T1 IN8 /TB1	T1 IN7 /TB0
BE1	BE0	GE5	GE4	GE3	GE2	GE1

EIN2

T1 IN20 /TC6	T1 IN19 /TC5	T1 IN18 /TC4	T1 IN17 /TC3	T1 IN16 /TC2	T1 IN15 /TC1	T1 IN14 /TC0
DE	VSYNC	HSYNC	BE5	BE4	BE3	BE2

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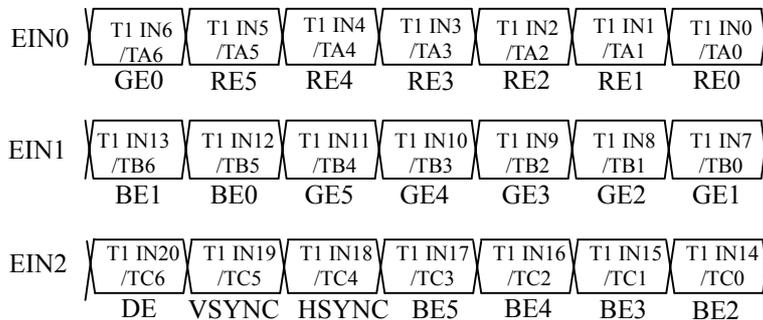
Document Title	HSD150PU13-A Product Information	Page No.	18 / 31
Document No.		Revision	1.0

ODD DATA(6bit transmitter)

Input terminal no.		Input signal (Graphics controller output signal)		Output signal	HSD150PU13-A Interface(CN1)	
		THC63LVDM63A				
Symbol	Terminal	Symbol	Function	Symbol	Terminal	Symbol
T2IN0/TA0	44	RO0	RED Pixels Display Data (LSB)	T2OUT0- T2OUT0+	No. 20 No. 21	OIN0- OIN0+
T2IN1/TA1	45	RO1	RED Pixels Display Data			
T2IN2/TA2	47	RO2	RED Pixels Display Data			
T2IN3/TA3	48	RO3	RED Pixels Display Data			
T2IN4/TA4	1	RO4	RED Pixels Display Data			
T2IN5/TA5	3	RO5	RED Pixels Display Data (MSB)			
T2IN6/TA6	4	GO0	GREEN Pixels Display Data (LSB)			
T2IN7/TB0	6	GO1	GREEN Pixels Display Data	T2OUT1- T2OUT1+	No. 23 No. 24	OIN1- OIN1+
T2IN8/TB1	7	GO2	GREEN Pixels Display Data			
T2IN9/TB2	9	GO3	GREEN Pixels Display Data			
T2IN10/TB3	10	GO4	GREEN Pixels Display Data			
T2IN11/TB4	12	GO5	GREEN Pixels Display Data (MSB)			
T2IN12/TB5	13	BO0	BLUE Pixels Display Data (LSB)			
T2IN13/TB6	15	BO1	BLUE Pixels Display Data			
T2IN14/TC0	16	BO2	BLUE Pixels Display Data	T2OUT2- T2OUT2+	No. 26 No. 27	OIN2- OIN2+
T2IN15/TC1	18	BO3	BLUE Pixels Display Data			
T2IN16/TC2	19	BO4	BLUE Pixels Display Data			
T2IN17/TC3	20	BO5	BLUE Pixels Display Data (MSB)			
T2IN18/TC4	22	NC	Non Connection(open)			
T2IN19/TC5	23	NC	Non Connection(open)			
T2IN20/TC6	25	NC	Non Connection(open)			
T1CLK IN /CLKIN	26	NCLK	Data Sampling Clock	T2CLK OUT- T2CLK OUT+	No. 29 No. 30	OCLK - OCLK+

Note : Please connect NC pin to nothing. Don't connect it to ground nor to other signal input.

OIN0

T2 IN6 /TA6	T2 IN5 /TA5	T2 IN4 /TA4	T2 IN3 /TA3	T2 IN2 /TA2	T2 IN1 /TA1	T2 IN0 /TA0
GO0	RO5	RO4	RO3	RO2	RO1	RO0

OIN1

T2 IN13 /TB6	T2 IN12 /TB5	T2 IN11 /TB4	T2 IN10 /TB3	T2 IN9 /TB2	T2 IN8 /TB1	T2 IN7 /TB0
BO1	BO0	GO5	GO4	GO3	GO2	GO1

OIN2

T2 IN20 /TC6	T2 IN19 /TC5	T2 IN18 /TC4	T2 IN17 /TC3	T2 IN16 /TC2	T2 IN15 /TC1	T2 IN14 /TC0
DE	VSYNC	HSYNC	BO5	BO4	BO3	BO2

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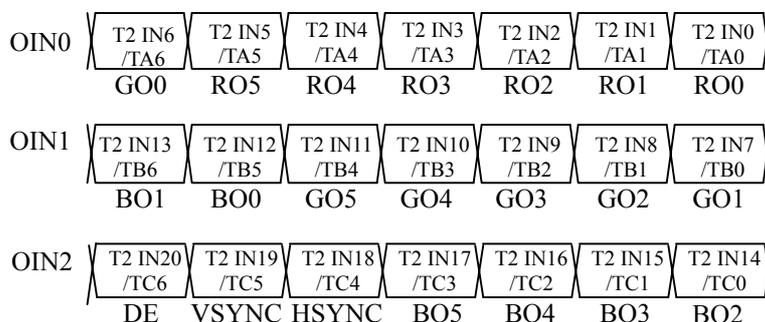
Document Title	HSD150PU13-A Product Information	Page No.	19 / 31
Document No.		Revision	1.0

Case2 : EVEN DATA (8bit transmitter)

Input terminal no.		Input signal (Graphics control output signal)		Output signal	HSD150PU13-A Interface(CN1)	
Symbol	Terminal	Symbol	Function	Symbol	Terminal	Symbol
			THC63LVDM83A			
T1IN0/TA0	51	RE0	RED Pixels Display Data (LSB)	T1OUT0- T1OUT0+	No. 8 No. 9	EIN0- EIN0+
T1IN1/TA1	52	RE1	RED Pixels Display Data			
T1IN2/TA2	54	RE2	RED Pixels Display Data			
T1IN3/TA3	55	RE3	RED Pixels Display Data			
T1IN4/TA4	56	RE4	RED Pixels Display Data			
T1IN5/TA5	3	RE5	RED Pixels Display Data (MSB)			
T1IN6/TA6	4	GE0	GREEN Pixels Display Data (LSB)			
T1IN7/TB0	6	GE1	GREEN Pixels Display Data	T1OUT1- T1OUT1+	NO.11 NO.12	EIN1- EIN1+
T1IN8/TB1	7	GE2	GREEN Pixels Display Data			
T1IN9/TB2	11	GE3	GREEN Pixels Display Data			
T1IN10/TB3	12	GE4	GREEN Pixels Display Data			
T1IN11/TB4	14	GE5	GREEN Pixels Display Data (MSB)			
T1IN12/TB5	15	BE0	BLUE Pixels Display Data (LSB)			
T1IN13/TB6	19	BE1	BLUE Pixels Display Data			
T1IN14/TC0	20	BE2	BLUE Pixels Display Data	T1OUT2- T1OUT2+	NO.14 NO.15	EIN2- EIN2+
T1IN15/TC1	22	BE3	BLUE Pixels Display Data			
T1IN16/TC2	23	BE4	BLUE Pixels Display Data			
T1IN17/TC3	24	BE5	BLUE Pixels Display Data (MSB)			
T1IN18/TC4	27	HSYNC	H-Sync			
T1IN19/TC5	28	VSYNC	V-Sync			
T1IN20/TC6	30	DE	Data Enable Signal			
T1IN21/TD0	50	NC	Non Connection (open)	T1OUT3- T1OUT3+	NC NC	NC NC
T1IN22/TD1	2	NC	Non Connection (open)			
T1IN23/TD2	8	NC	Non Connection (open)			
T1IN24/TD3	10	NC	Non Connection (open)			
T1IN25/TD4	16	NC	Non Connection (open)			
T1IN26/TD5	18	NC	Non Connection (open)			
T1IN27/TD6	25	NC	Non Connection (open)			
T1CLK IN /CLKIN	31	NCLK	DATA SAMPLING CLOCK	T1CLK OUT- T1CLK OUT+	NO. 17 NO. 18	ECLK - ECLK +

Note : Please connect NC pin to nothing. Don't connect it to ground nor to other signal input.

EIN0	TIN6 /TA6	TIN5 /TA5	TIN4 /TA4	TIN3 /TA3	TIN2 /TA2	TIN1 /TA1	TIN0 /TA0
	GE0	RE5	RE4	RE3	RE2	RE1	RE0

EIN1	TIN13 /TB6	TIN12 /TB5	TIN11 /TB4	TIN10 /TB3	TIN9 /TB2	TIN8 /TB1	TIN7 /TB0
	BE1	BE0	GE5	GE4	GB3	GE2	GE1

EIN2	TIN20 /TC6	TIN19 /TC5	TIN18 /TC4	TIN17 /TC3	TIN16 /TC2	TIN15 /TC1	TIN14 /TC0
	DE	VSYNC	HSYNC	BE5	BE4	BE3	BE2

EIN3	TIN27 /TD6	TIN26 /TD5	TIN25 /TD4	TIN24 /TD3	TIN23 /TD2	TIN22 /TD1	TIN21 /TD0
	NC	NC	NC	NC	NC	NC	NC

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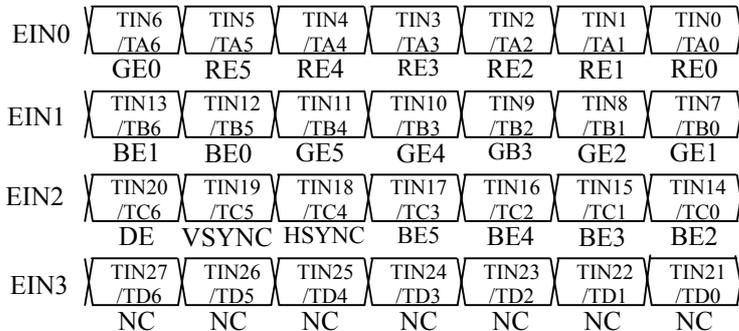
Document Title	HSD150PU13-A Product Information	Page No.	20 / 31
Document No.		Revision	1.0

ODD DATA (8bit transmitter)

Input terminal no.		Input signal (Graphics control output signal)		Output signal	HSD150PU13-A Interface(CN1)	
		THC63LVDM83A				
Symbol	Terminal	Symbol	Function	Symbol	Terminal	Symbol
T2IN0/TA0	51	RO0	RED Pixels Display Data (LSB)	T2OUT0- T2OUT0+	No. 20 No. 21	OIN0- OIN0+
T2IN1/TA1	52	RO1	RED Pixels Display Data			
T2IN2/TA2	54	RO2	RED Pixels Display Data			
T2IN3/TA3	55	RO3	RED Pixels Display Data			
T2IN4/TA4	56	RO4	RED Pixels Display Data			
T2IN5/TA5	3	RO5	RED Pixels Display Data (MSB)			
T2IN6/TA6	4	GO0	GREEN Pixels Display Data (LSB)	T2OUT1- T2OUT1+	NO.23 NO.24	OIN1- OIN1+
T2IN7/TB0	6	GO1	GREEN Pixels Display Data			
T2IN8/TB1	7	GO2	GREEN Pixels Display Data			
T2IN9/TB2	11	GO3	GREEN Pixels Display Data			
T2N10/TB3	12	GO4	GREEN Pixels Display Data			
T2IN11/TB4	14	GO5	GREEN Pixels Display Data (MSB)			
T2IN12/TB5	15	BO0	BLUE Pixels Display Data (LSB)			
T2IN13/TB6	19	BO1	BLUE Pixels Display Data			
T2IN14/TC0	20	BO2	BLUE Pixels Display Data	T2OUT2- T2OUT2+	NO.26 NO.27	OIN2- OIN2+
T2IN15/TC1	22	BO3	BLUE Pixels Display Data			
T2IN16/TC2	23	BO4	BLUE Pixels Display Data			
T2IN17/TC3	24	BO5	BLUE Pixels Display Data (MSB)			
T2IN18/TC4	27	NC	Non Connection (open)			
T2IN19/TC5	28	NC	Non Connection (open)			
T2IN20/TC6	30	NC	Non Connection (open)			
T2IN21/TD0	50	NC	Non Connection (open)	T2OUT3- T2OUT3+	NC NC	— —
T2IN22/TD1	2	NC	Non Connection (open)			
T2IN23/TD2	8	NC	Non Connection (open)			
T2IN24/TD3	10	NC	Non Connection (open)			
T2IN25/TD4	16	NC	Non Connection (open)			
T2IN26/TD5	18	NC	Non Connection (open)			
T2IN27/TD6	25	NC	Non Connection (open)			
T2CLK IN /CLKIN	31	NCLK	DATA SAMPLING CLOCK	T2CLK OUT- T2CLK OUT+	NO. 29 NO. 30	OCLK - OCLK +

Note : Please connect NC pin to nothing. Don't connect it to ground nor to other signal input.

OIN0	T2IN6 /TA6	T2IN5 /TA5	T2IN4 /TA4	T2IN3 /TA3	T2IN2 /TA2	T2IN1 /TA1	T2IN0 /TA0
	GO0	RO5	RO4	RO3	RO2	RO1	RO0

OIN1	T2IN13 /TB6	T2IN12 /TB5	T2IN11 /TB4	T2IN10 /TB3	T2IN9 /TB2	T2IN8 /TB1	T2IN7 /TB0
	BO1	BO0	GO5	GO4	GO3	GO2	GO1

OIN2	T2IN20 /TC6	T2IN19 /TC5	T2IN18 /TC4	T2IN17 /TC3	T2IN16 /TC2	T2IN15 /TC1	T2IN14 /TC0
	NC	NC	NC	BO5	BO4	BO3	BO2

OIN3	T2IN27 /TD6	T2IN26 /TD5	T2IN25 /TD4	T2IN24 /TD3	T2IN23 /TD2	T2IN22 /TD1	T2IN21 /TD0
	NC	NC	NC	NC	NC	NC	NC

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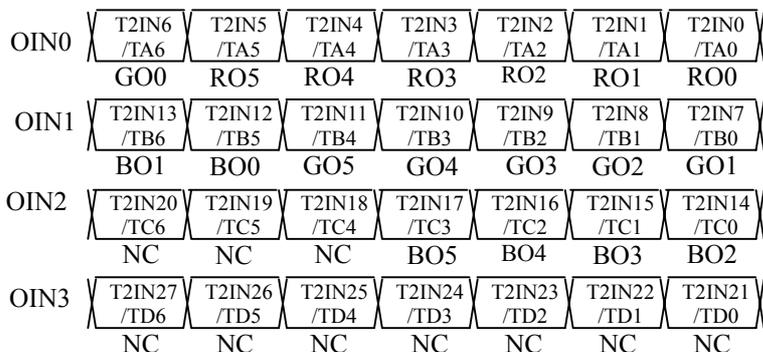
Document Title	HSD150PU13-A Product Information	Page No.	21 / 31
Document No.		Revision	1.0

7.0 INTERFACE TIMING [1)2)3)4)5)6)]

7.1 Timing Parameters (Hsync, Vsync and DE mode)

Item		Symbol	Min.	Typ.	Max.	Unit
Frame Period		t1	$1210 \times t4$	$1250 \times t4$	$1250 \times t4$	—
			—	16.67	16.67	Ms
Vertical Display Term		t2	$1200 \times t4$	$1200 \times t4$	$1200 \times t4$	—
Vertical Blanking Term		t3	$10 \times t4$	$50 \times t4$	$50 \times t4$	—
1 Line Scanning Time		t4	$1040 \times t7$	$1080 \times t7$	$1080 \times t7$	—
			—	13.33	—	Us
Horizontal Display Term		t5	$800 \times t7$	$800 \times t7$	$800 \times t7$	—
Horizontal Blanking Term		t6	$240 \times t7$	$280 \times t7$	$280 \times t7$	—
Clock Period		t7	12.346	12.346	13.244	Ns
V-Sync Pulse Width		tvw	$2 \times t4$	—	—	—
V-Sync Set up Time		tvsu	$8 \times t7$	—	—	—
V-Sync Hold Time		tvhd	$8 \times t7$	—	—	—
Vertical Front Porch		tvfp	$2 \times t4$	—	—	—
Vertical Data Sync Period		tvds	$8 \times t4$	—	—	—
Horizontal Period		th	$1040 \times t7$	$1080 \times t7$	$1080 \times t7$	—
H-Sync Pulse Width		thw	$4 \times t7$	—	—	—
Horizontal Front Porch		thfp	$4 \times t7$	—	—	—
Horizontal Data Sync Period		thds	t6 - thfp	t6 - thfp	t6 - thfp	—
DE Pulse Width		twde	$800 \times t7$	$800 \times t7$	$800 \times t7$	—
Clock	Low time	t8	5	—	—	Ns
	High time	t9	5	—	—	Ns
Data	Setup time	t10	2	—	—	Ns
	Hold time	t11	5	—	—	Ns

t3 = tvfp + tvds   t4 = th   t6 = thfp + thds

Note 1) Refer to "7.2 Timing Chart" and LVDS(THC63LVDF84A) specifications by THine Electronic,Inc..

Note 2) If ENAB is fixed to "H" or "L" level for certain period while NCLK is supplied , the panel displays black with some flicker.

Note 3) If NCLK is fixed to "H" or "L" level for certain period while ENAB is supplied , the panel may be damaged.

Note 4) Please adjust LCD operating signal timing and FL driving frequency , to optimize the display quality. There is a possibility that flicker is observed by the interference of LCD operating signal timing and FL driving condition(especially driving frequency),even if the condition satisfies above timing specifications and recommended operating conditions shown in 3.

Note 5) Do not make t1,t2,t3 and tvds fluctuate. If t1,t2,t3 and tvds are fluctuate, the panel displays black.

Note 6) In case of using the long frame period, the deterioration of display quality, noise etc. may be occurred.

Note 7) NCLK count of each Horizontal Scanning Time should be always the same.
    V-Blanking period should be "n" X "Horizontal scanning Time" (n : integer).
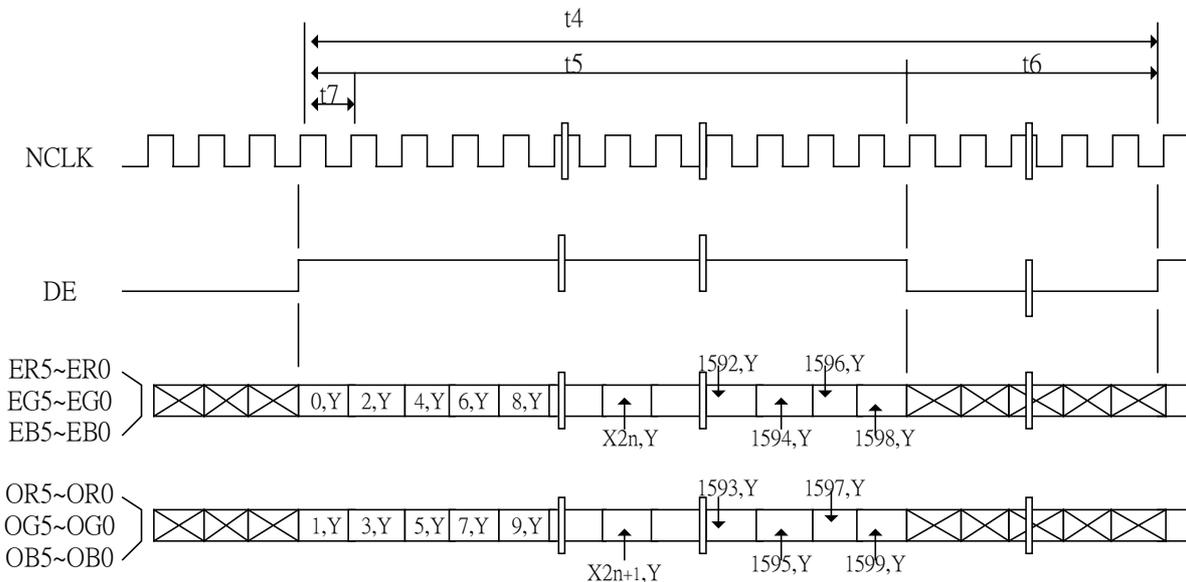   Frame period should be always the same.

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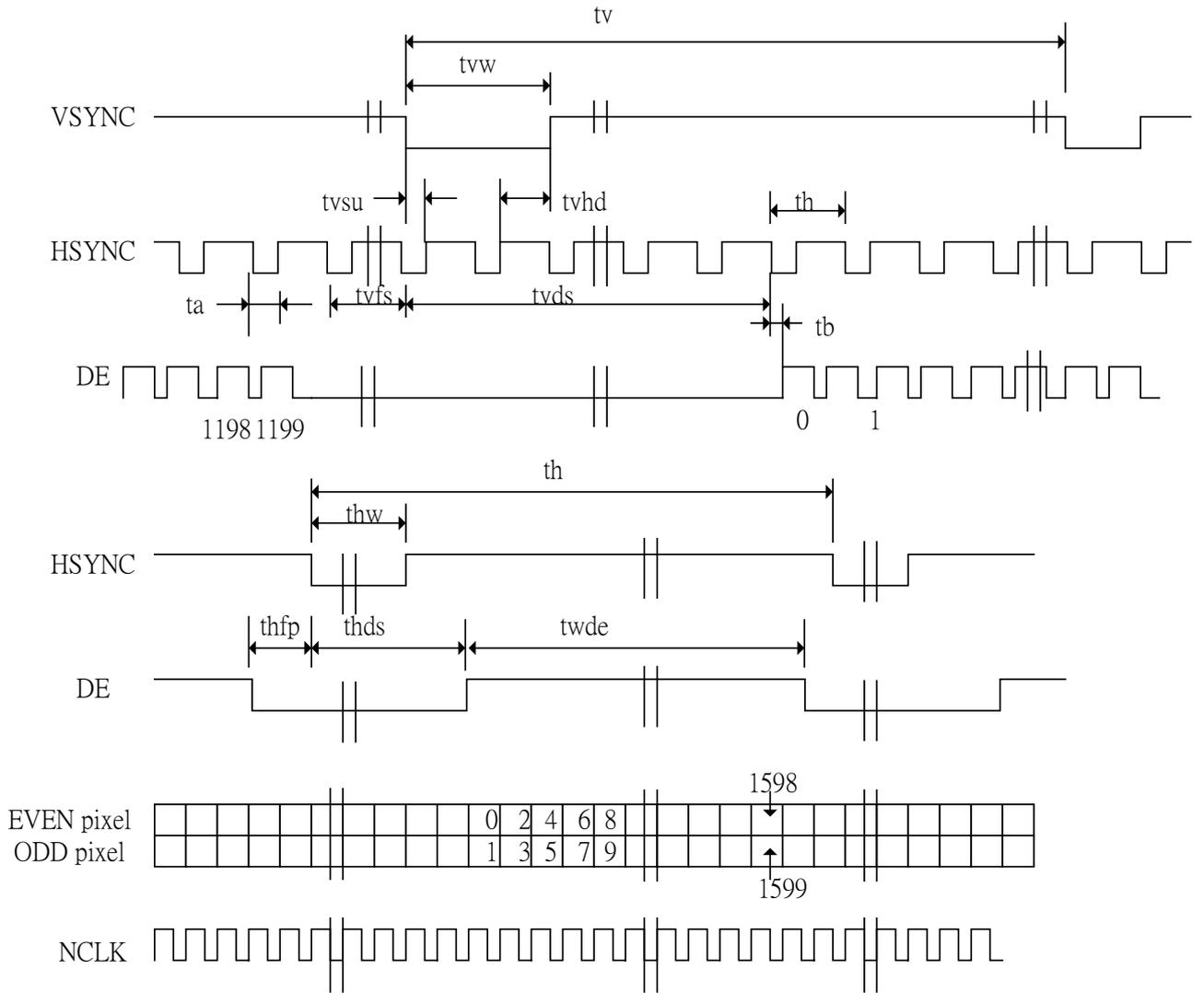| Document Title	HSD150PU13-A Product Information	Page No.	22 / 31
Document No.		Revision	1.0

7.2 Timing Diagram of Interface Signal (Hsync, Vsync and DE mode)
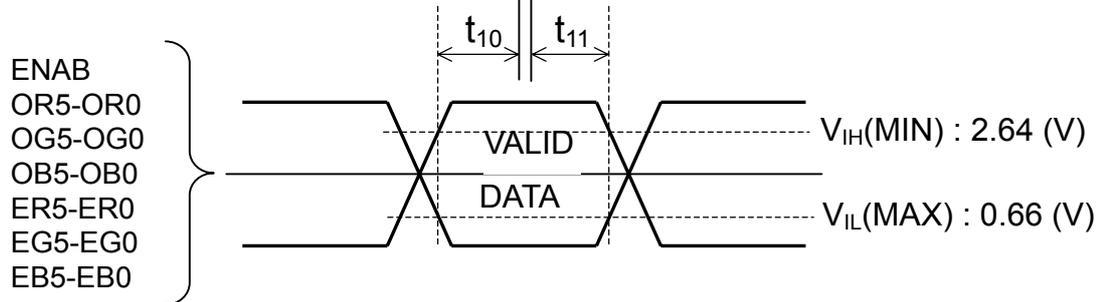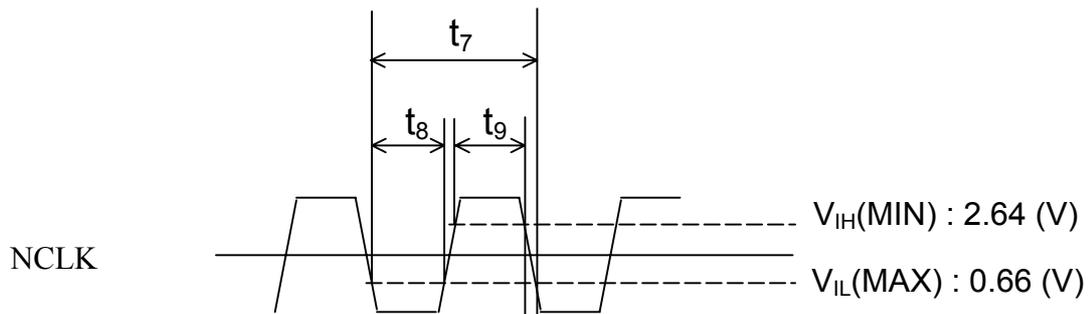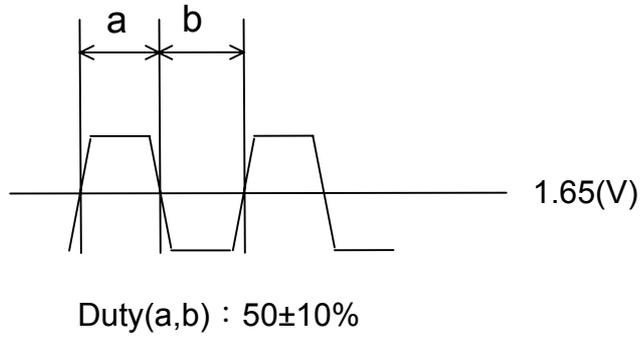
7.2.1 Vertical Timing
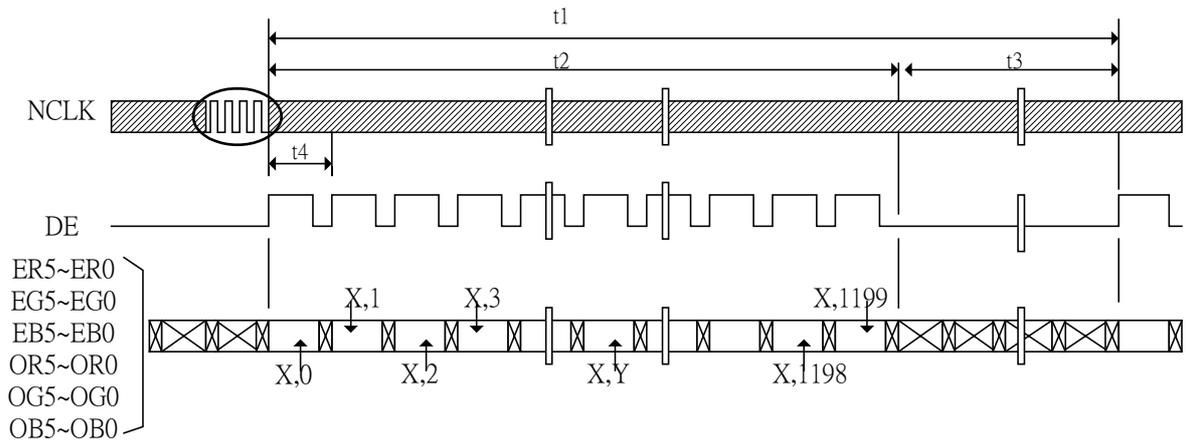
7.2.2 Horizontal Timing

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Document Title	HSD150PU13-A Product Information	Page No.	23 / 31
Document No.		Revision	1.0

7.2.3 SYNC Timing

a b

1.65(V)

Duty(a,b)：50±10%

t_7

t_8 t_9

NCLK

V_{IH}(MIN) : 2.64 (V)

V_{IL}(MAX) : 0.66 (V)

t_{10} t_{11}

ENAB
OR5-OR0
OG5-OG0
OB5-OB0
ER5-ER0
EG5-EG0
EB5-EB0

VALID
DATA

V_{IH}(MIN) : 2.64 (V)

V_{IL}(MAX) : 0.66 (V)

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Document Title	HSD150PU13-A Product Information	Page No.	25 / 31
Document No.		Revision	1.0

7.3 Power ON/OFF Sequence
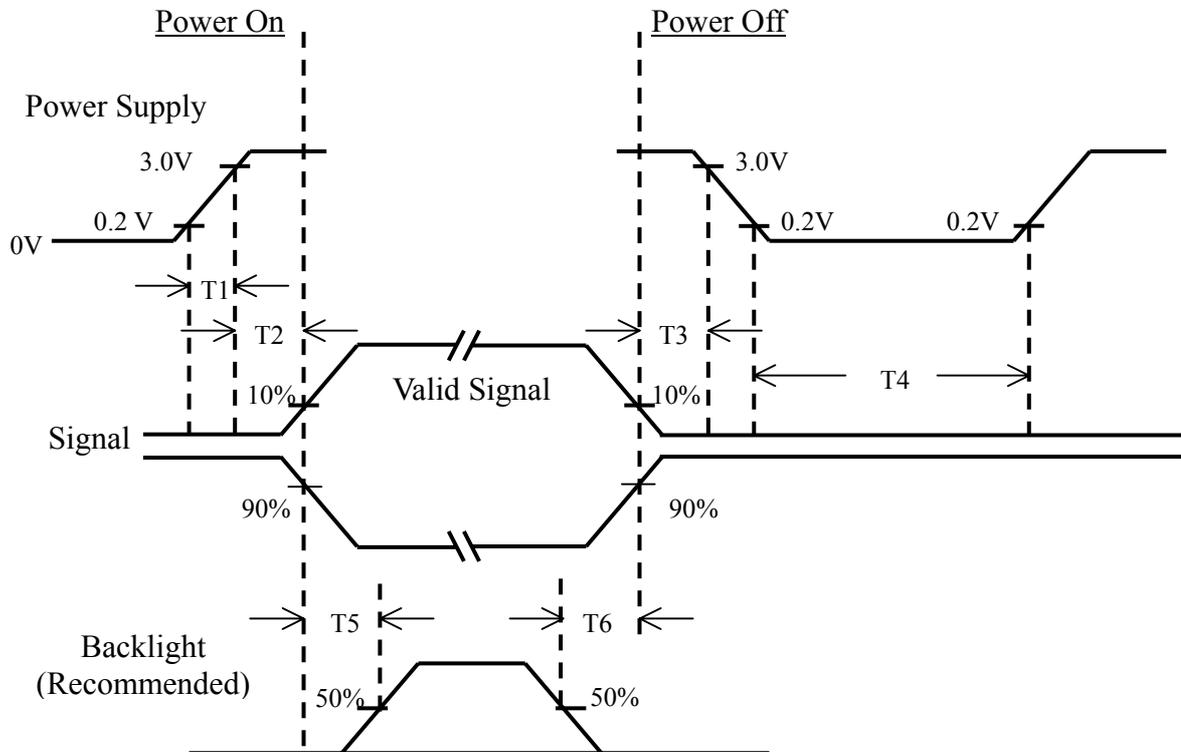
Power ON/OFF Sequence

Item	Min.	Typ.	Max.	Unit	Remark
T1	0	—	10	msec	
T2	0	—	50	msec	
T3	0	—	50	msec	
T4	400	—	—	msec	
T5	200	—	—	msec	
T6	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 V_{DD} = off level, please keep the level of input signal on the low or keep a high impedance.

(4) T4 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.

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Document Title	HSD150PU13-A Product Information	Page No.	26 / 31
Document No.		Revision	1.0

8.0 OUTLINE DIMENSION

Unit : mm

8.1 Front View Outline Dimension

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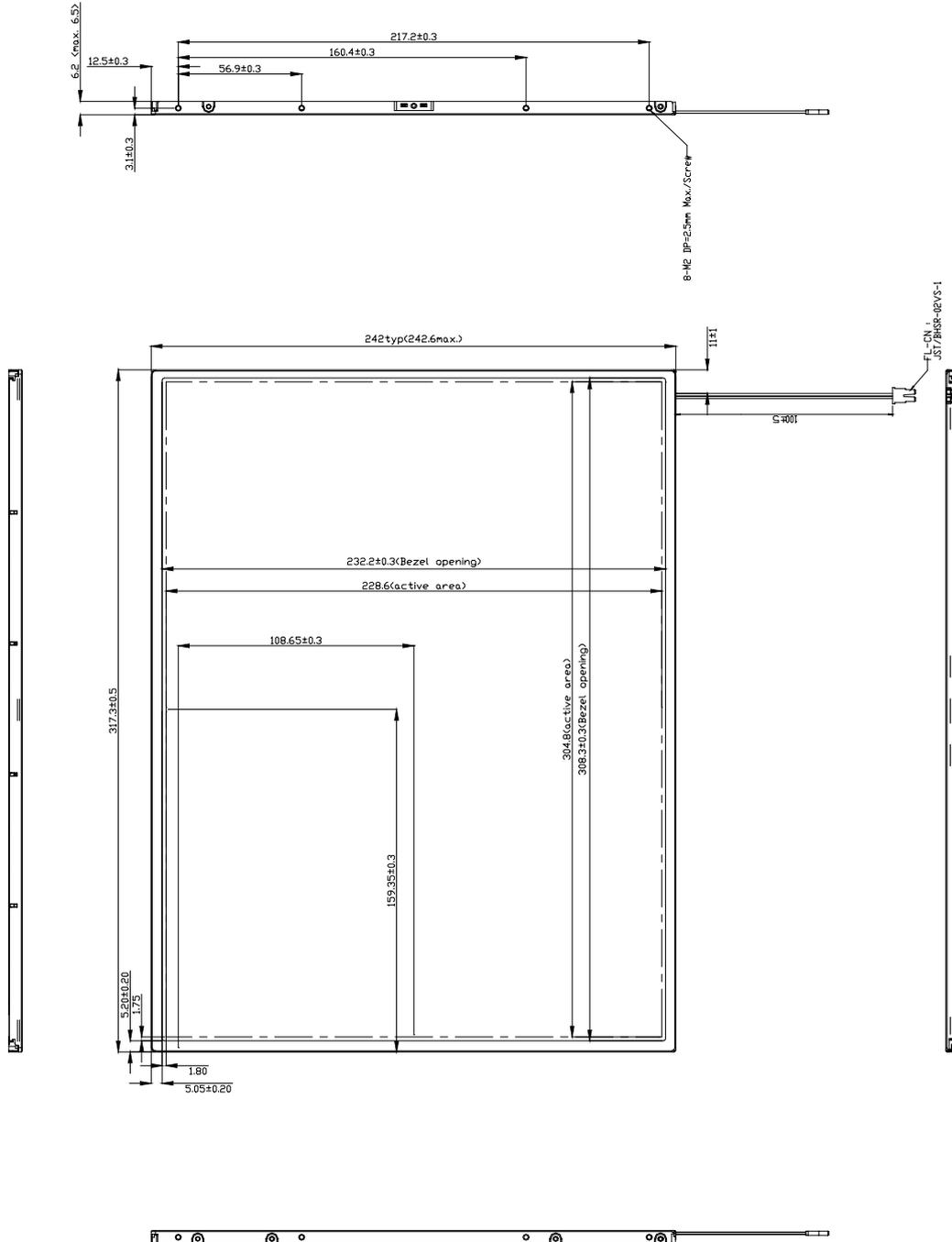
Document Title	HSD150PU13-A Product Information	Page No.	27 / 31
Document No.		Revision	1.0

8.2 Back View Outline Dimension

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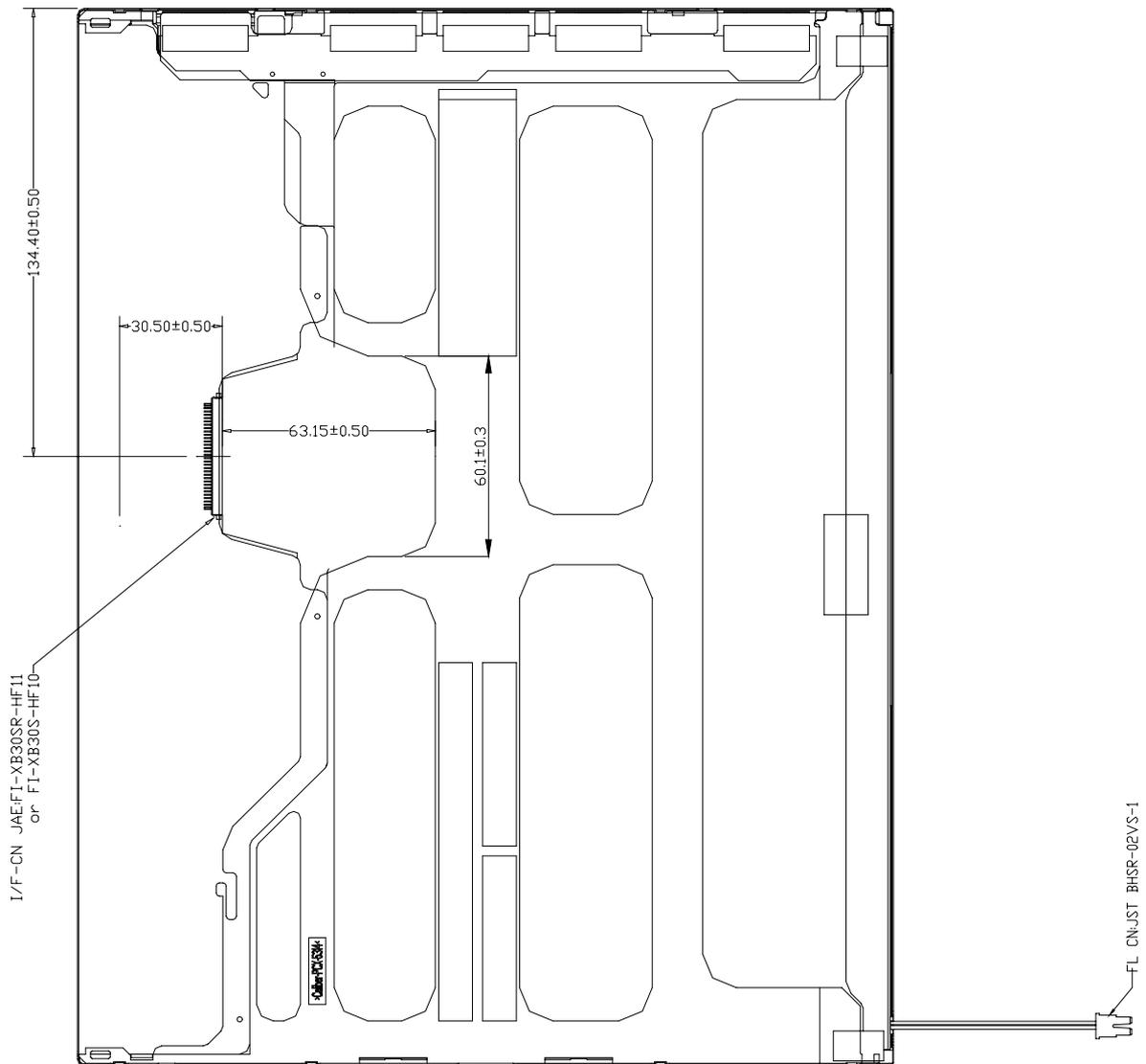
Document Title	HSD150PU13-A Product Information	Page No.	28 / 31
Document No.		Revision	1.0

8.3 Tolerance of distance between active area and bezel opening

$$\mid a-b \mid \ \leqq \ 1.0 \ mm$$

$$\mid c-d \mid \ \leqq \ 1.0 \ mm$$

LCD

a

b

c

d

Bezel opening

Active area

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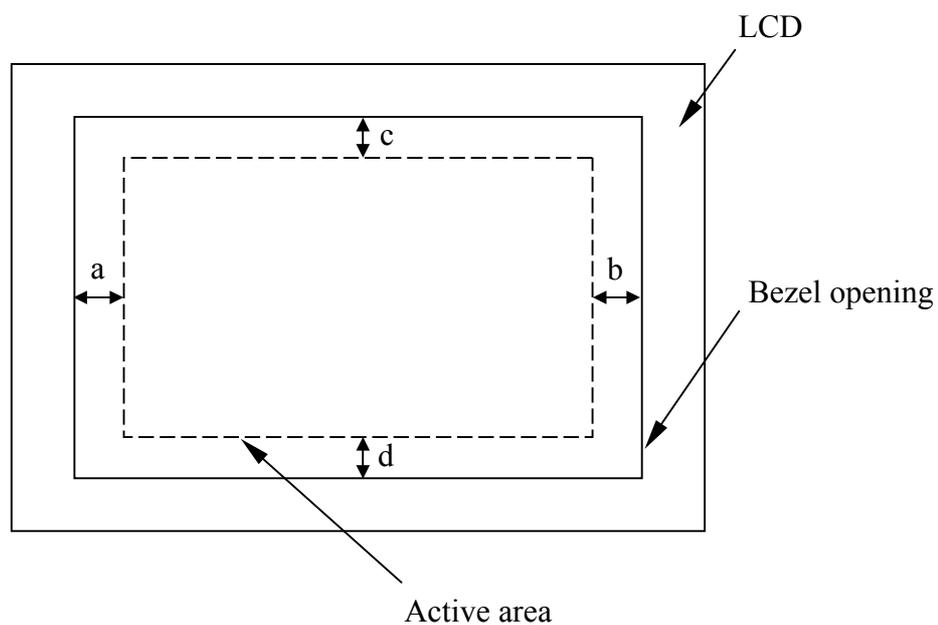
Document Title	HSD150PU13-A Product Information	Page No.	29 / 31
Document No.		Revision	1.0

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	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Mark	9	0	1	2	3	4	5	6	7	8

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.

HSD150PU
13-A
Rev:

HannStar
HannStar Display Corporation
MADE IN TAIWAN

* A 0 K 9 C 0 0 0 A 0 0 0 0 0 3 *

Lot mark

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Document Title	HSD150PU13-A Product Information	Page No.	30 / 31
Document No.		Revision	1.0

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 to employ 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.

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

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

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Document Title	HSD150PU13-A Product Information	Page No.	31 / 31
Document No.		Revision	1.0

10.6.4 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.

10.6.5 When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzine 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 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.

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.