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To　　　:

Date　:　　Sep. 13, 2001

HannStar Product Information

Preliminary

Model　:　HSD170ME11 -A

Note:1.The information contained herein is preliminary and may be changed without prior notices.
　　　2.Please contact HannStar Display Corp. before designing your product based on this module specification.
　　　3.The information contained herein is presented merely to indicate the characteristics and perfor-mance 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	Description of change
1.0	Sep.13, 2001	• Preliminary specification for HSD170ME11-A was first issue.

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1.0 GENERAL DESCRIPTION

1.1 Introduction

HannStar Display model HSD170ME11-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 17 inch diagonally measured active display area with SXGA resolution (1024 vertical by 1280 horizontal pixel array) and can display up to 8bit colors.

1.2 Features

■ High brightness with low power consumption

■ Wide viewing angle

■ Compact and light weight design

■ 4 CCFLs(Cold Cathode Fluorescent Lamp)

■ Input timing：DE only mode

■ 2ch-LVDS interface system with 16.7M colors

1.3 Applications

■ Desktop monitors

■ Moniputers

■ Display terminals for AV applications

■ Monitors for industrial applications

1.4 General information

Item	Specification	Unit
Display area	337.92(W) x 270.336(H)	mm
Number of Pixel	1280(H) x 1024(V)	pixels
Pixel pitch	0.264(H) x 0.264(V)	mm
Pixel arrangement	RGB Vertical stripe	
Display color	True 8 bit (16.7M)	colors
Display mode	Normally white	
Surface treatment	Antiglare, Hard-Coating(3H)	
Weight	2150(max)	g
Back-light	4-CCFLs at Top & Bottom side	
Input signal	2-ch LVDS	
Power consumption	TBD	W
Optimum viewing direction	6 o'clock	

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1.5 Mechanical Information

Item		Min.	Typ.	Max.	Unit
Module Size	Horizontal(H)	---	383.5	---	mm
	Vertical(V)	---	306.0	---	mm
	Depth(D)	---	20.0	21.0	mm
Weight (Without inverter)		---	---	2150	g

2.0 ABSOLUTE MAXIMUM RATING
2.1 Absolute Rating of Environment

Item	Symbol	Min.	Max.	Unit	Note
Storage temperature	T_{STG}	-20	65	^{o}C	
Operating temperature	T_{OPR}	0	50	^{o}C	
Vibration(non-operating)	V_{NOP}	--	1.5	G	(1)
Shock(non-operating)	S_{NOP}	--	50	G	(2)
Storage humidity	H_{STG}	10	90	%RH	(3)
Operating humidity	H_{OP}	10	80	%RH	(3)
Low pressure(operating)	P_{LOP}	697	--	hPa	(4)
Low pressure(non-operating)	P_{LNOP}	116	--	hPa	(5)

Note   (1) 10-300Hz sweep/cycle, sine wave, X,Y,Z each directions, 0.5hr each

(2) 11ms, ±X, ±Y, ±Z direction, one time each, half sine wave. For this shock test, it is necessary to fill the silicon rubber between the shock jig as buffer.

(3) Max wet bulb temp.=$39^{o}C$

(4) 2hrs. (10000 feet)

(5) 24hrs. (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	6.0	V	(1)

2.2.2 Back-Light Unit

Item	Symbol	Min.	Max.	Unit	Note
Lamp voltage	V_L	0	2000	V_{rms}	(1)
Lamp current	I_{FL}	--	7.5	mA	(1)
Lamp frequency	f_L	0	100	kHz	(1)

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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.

3.0 OPTICAL CHARACTERISTICS

3.1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast		CR		--	350	--		(1)(2)
Response time	Rising	T_R		--	T_R+T_F	--	msec	(1)(3)
	Falling	T_F		--	=25ms	--		
White luminance (5 point Average)		Y_L	$\Theta=0^o$ $\Phi=0^o$ Normal viewing angle	200	250 (I_{FL}=6mA)	--	cd/m^2	
Color Chromaticity (CIE1931)	Red	Rx		TBD	TBD	TBD		(1)(4)
		Ry		TBD	TBD	TBD		
	Green	Gx		TBD	TBD	TBD		
		Gy		TBD	TBD	TBD		
	Blue	Bx		TBD	TBD	TBD		
		By		TBD	TBD	TBD		
	White	Wx		TBD	0.310	TBD		
		Wy		TBD	0.330	TBD		
Viewing angle	Hor.	Θ_L	CR>10		(75)	--		
		Θ_R			(75)	--		
	Ver.	Θ_U			(70)	--		
		Θ_D			(70)	--		
Brightness uniformity		B_{UNI}	$\Theta=0^o$	(70)	(80)	--	%	(5)
Cross Talk		CT(n)	$\Phi=0^o$	--	--	1.3	%	(6)

3.2 Measuring Condition

■ Measuring surrounding : dark room

■ Lamp current I_{FL} : 6mA, lamp freq. F_L=50KH$_z$

■ V_{DD}=5.0V
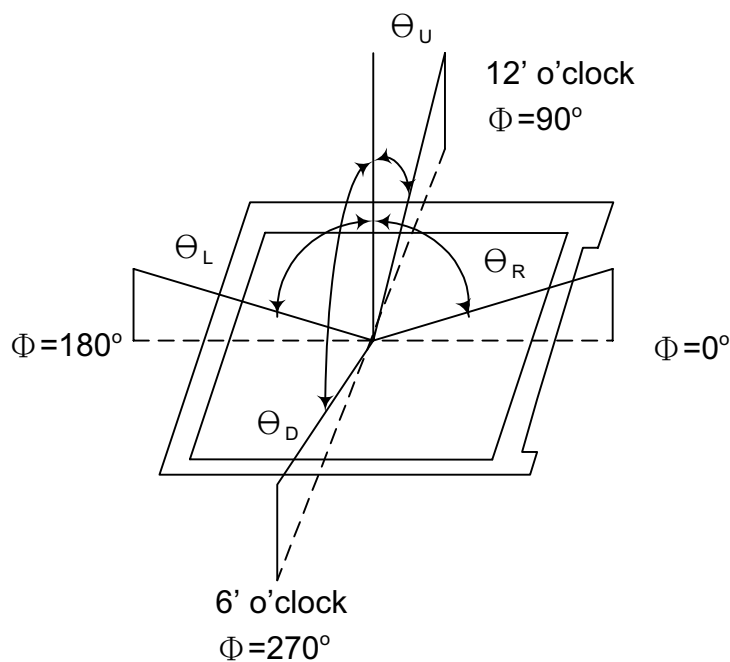
■ Surrounding temperature : 25°C

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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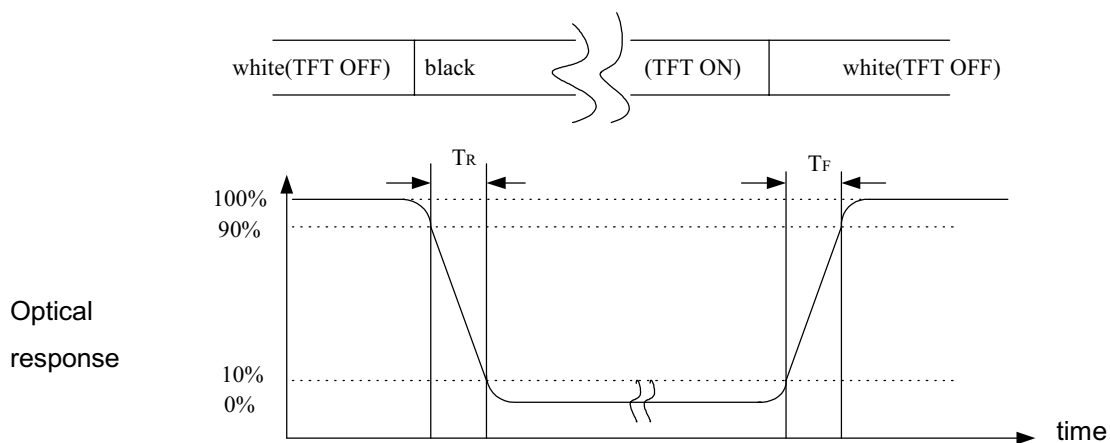| Document Title	HSD170ME11-A product information	Page No.	7 /26
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Note (1) Definition of Viewing Angle:

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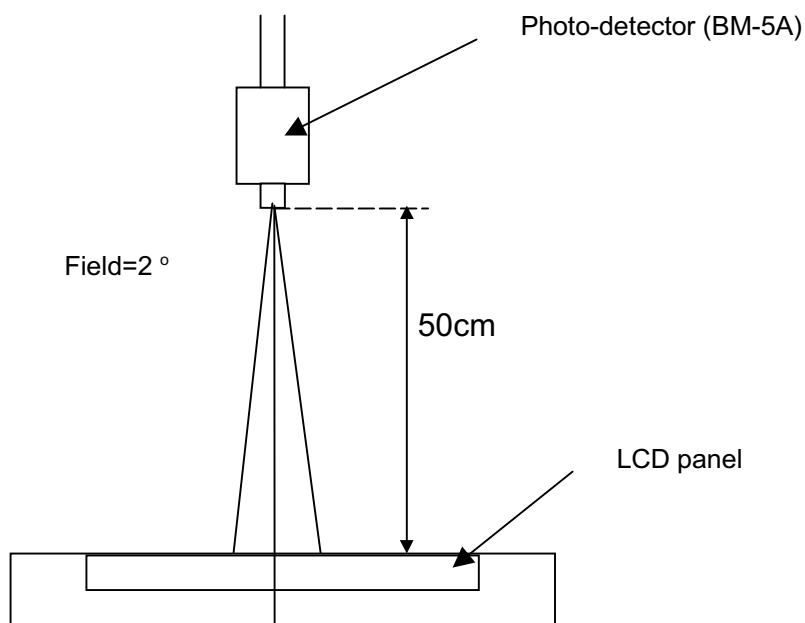measured at the center point of panel

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

Global LCD Panel Exchange Center
www.panelook.com
屏库:全球液晶屏交易中心

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

| white(TFT OFF) | black | (TFT ON) | white(TFT OFF) |

Optical response

100%
90%

T_R

T_F

10%
0%

time

Note (4) Definition of brightness uniformity

Photo-detector (BM-5A)

Field=2 °

50cm

LCD panel

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Note (5) Definition of brightness uniformity

Luminance uniformity = (Min Luminance)/(Max Luminance)x100%

320　　　640　　　960

256

512

768

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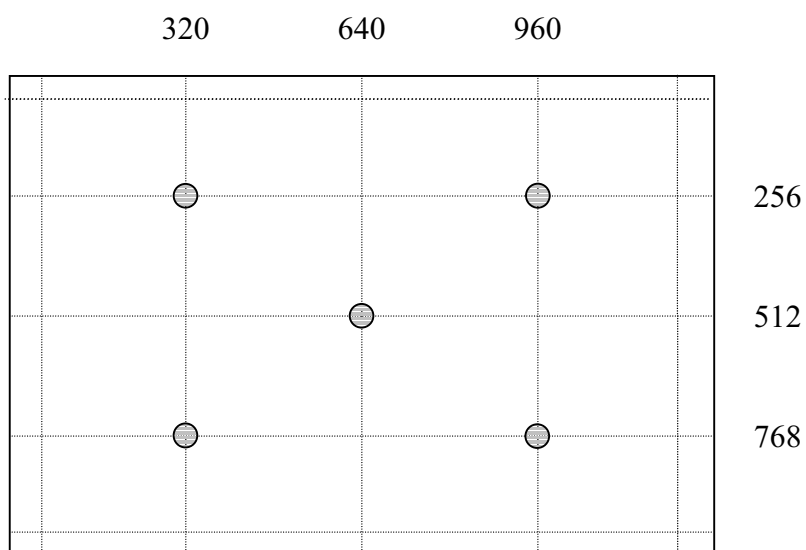
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Note (6) Definition of crosstalk   CT(1) ~ CT(4)

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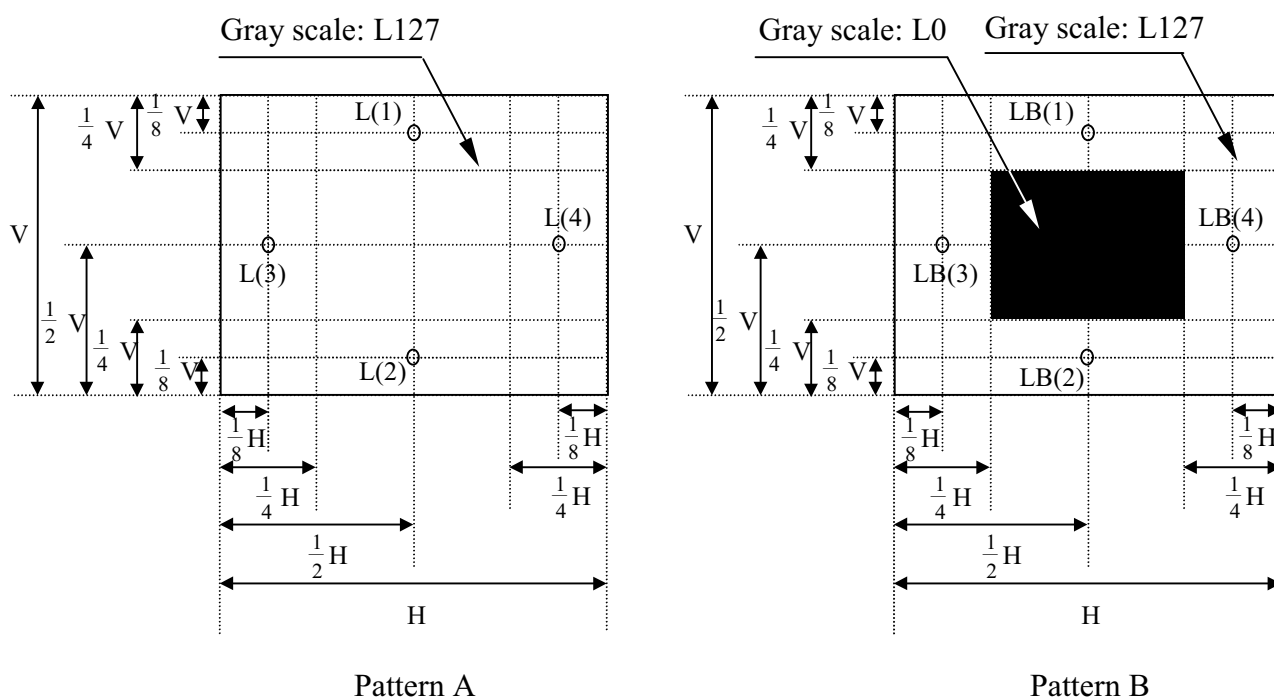
Where L(n) = Luminance of point "n" at pattern A (cd/m^2) , n=1～4

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

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

L0 : Luminance with all pixels black

L255 : Luminance with all pixels white

Gray scale: L127

Gray scale: L0   Gray scale: L127

Pattern A

Pattern B

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4.0 ELECTRICAL CHARACTERISTICS
4.1 TFT LCD Module

Item		Symbol	Min.	Typ.	Max.	Unit	Note
Voltage of power supply		V_{DD}	4.5	5.0	5.5	V	
Current of power supply	Mosaic	I_{DD}	--	TBD	--	mA	(1)
Vsync frequency		f_V	--	--	60	Hz	
Hsync frequency		f_H	--	--	64	KHz	
Main frequency		f_{DCLK}	--	--	27	MHz	(2)

Note (1) Mosaic : Dot checker image
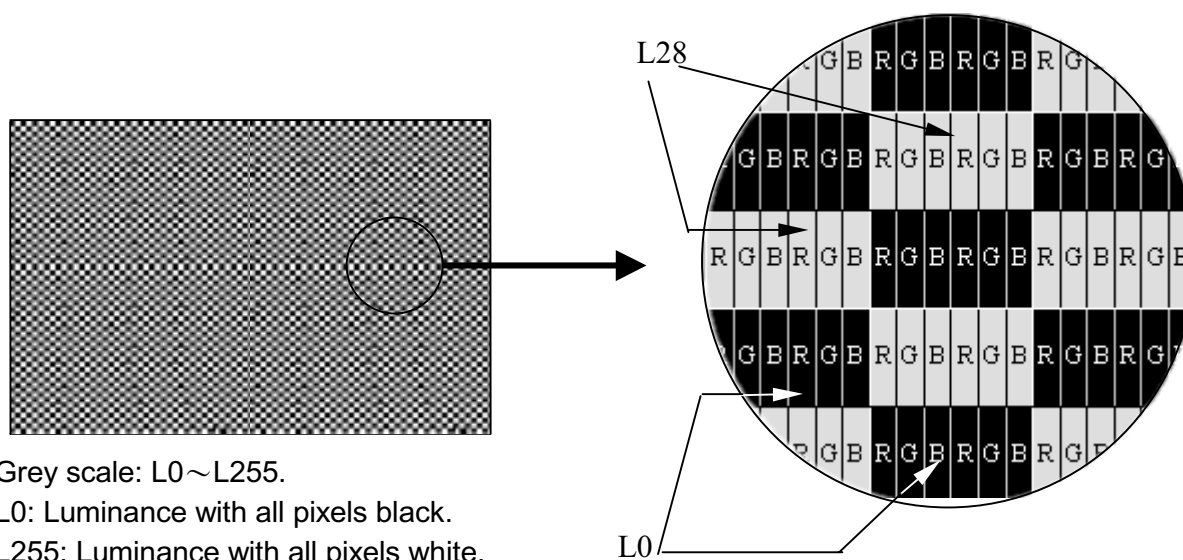
Grey scale: L0～L255.
L0: Luminance with all pixels black.
L255: Luminance with all pixels white.

Note (2) 2 pixel / clk

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4.2 Back-Light Unit

The back-light system is an edge-lighting type with 4 CCFL(Cold Cathode Fluorescent Lamp). The characteristics of four lamps are shown in the following tables.

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Lamp current	IL	3.0	6.0	7.5	mA(rms)	(1)
Lamp voltage	VL	--	TBD	--	V(rms)	I_L=6.0mA
Frequency	fL	30	50	80	KHz	(2)
Operating life time	Hr	50,000	--	--	Hour	(3)
Startup voltage	Vs	--	--	TBD	V(rms)	at 25°C
				TBD		at 0°C

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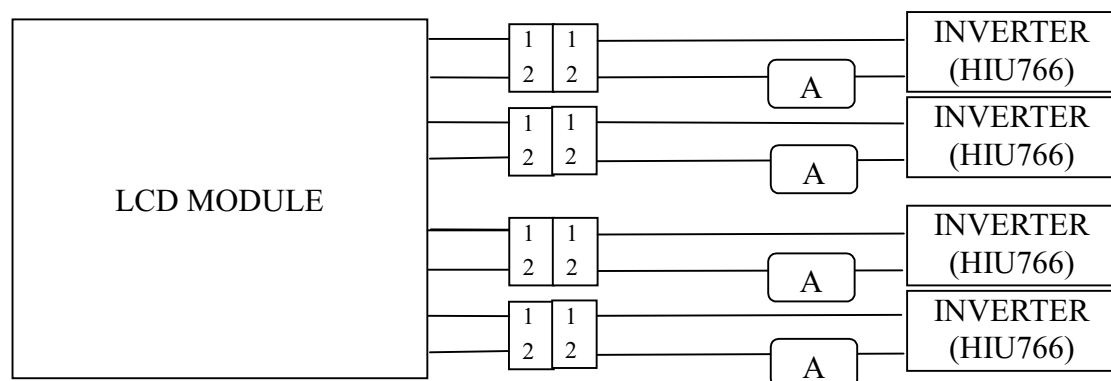
Note (2)   Lamp frequency may produce interference with horizontal synchronous frequency and this may cause line flow on the display. Therefore lamp frequency shall be detached from the horizontal synchronous frequency and its harmonics as far as possible in order to avoid interference.

Note (3)   Life time (Hr) can be defined as the time in which it continues to operate under the condition : Ta=25±3°C, IL=6.0mA(rms) and fL= 50KHz until one of the following event occurs :
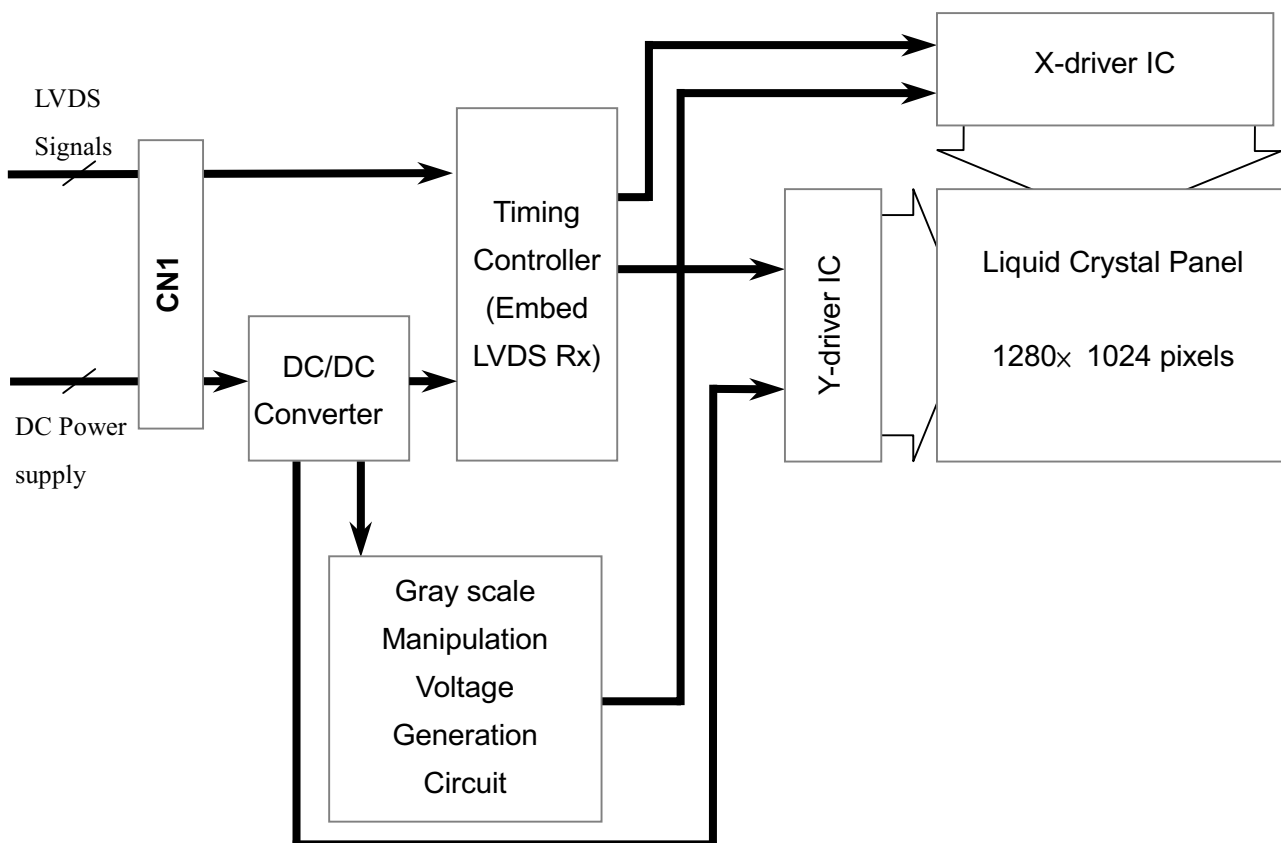-When the brightness becomes 50%
-When the startup voltage (Vs) at 0°C becomes higher than the maximal
 Value of Vs specified above.

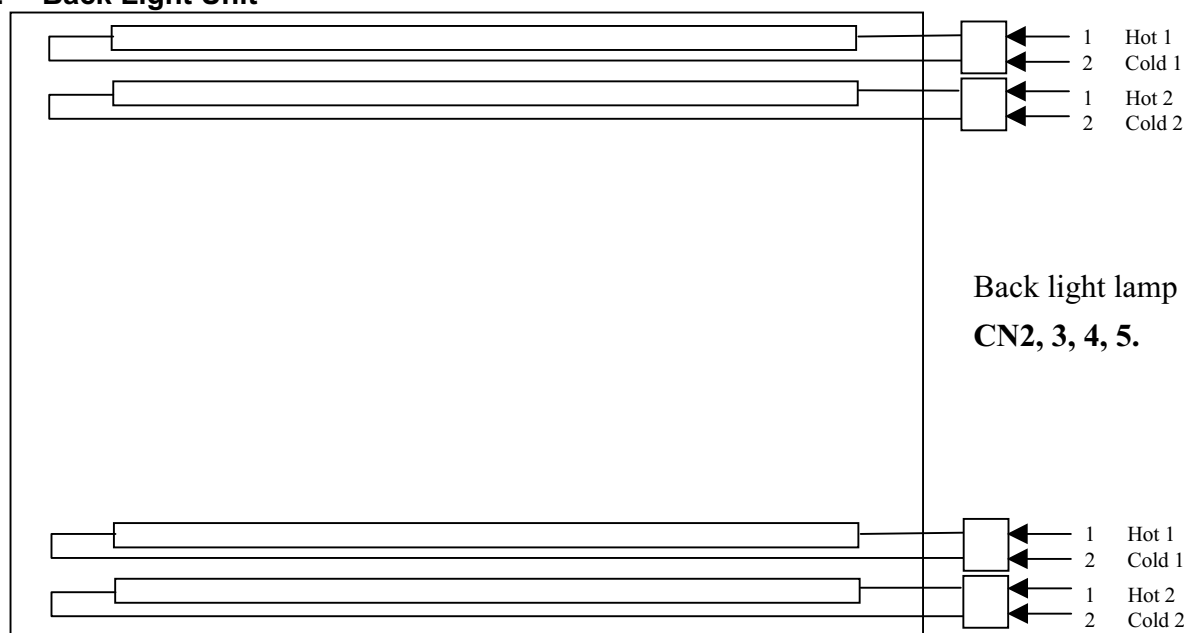HannStar Display Corp.

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5.0 BLOCK DIAGRAM
5.1 TFT LCD Module

5.2 Back Light Unit

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6.0 INTERFACE PIN CONNECTION

6.1 TFT LCD Module

CN1[1)2)] : Data Signal and Power Supply (FI-X30S-HF /JAE)

Pin No.	Symbol	Function
1	RXO0-	Negative Transmission Data of Pixel 0 (ODD data)
2	RXO0+	Positive Transmission Data of Pixel 0 (ODD data)
3	RXO1-	Negative Transmission Data of Pixel 1 (ODD data)
4	RXO1+	Positive Transmission Data of Pixel 1 (ODD data)
5	RXO2-	Negative Transmission Data of Pixel 2 (ODD data)
6	RXO2+	Positive Transmission Data of Pixel 2 (ODD data)
7	GND	Power Ground
8	RXOC-	Negative Sampling Clock (ODD data)
9	RXOC+	Positive Sampling Clock (ODD data)
10	RXO3-	Negative Transmission Data of Pixel 3 (ODD data)
11	RXO3+	Positive Transmission Data of Pixel 3 (ODD data)
12	RXE0-	Negative Transmission Data of Pixel 0 (EVEN data)
13	RXEO+	Positive Transmission Data of Pixel 0 (EVEN data)
14	GND	Power Ground
15	RXE1-	Negative Transmission Data of Pixel 1 (EVEN data)
16	RXE1+	Positive Transmission Data of Pixel 1 (EVEN data)
17	GND	Power Ground
18	RXE2-	Negative Transmission Data of Pixel 2 (EVEN data)
19	RXE2+	Positive Transmission Data of Pixel 2 (EVEN data)
20	RXEC-	Negative Sampling Clock (EVEN data)
21	RXEC+	Positive Sampling Clock (EVEN data)
22	RXE3-	Negative Transmission Data of Pixel 3 (EVEN data)
23	RXE3+	Positive Transmission Data of Pixel 3 (EVEN data)
24	GND	Power Ground
25	LVDSCHNG	Refer to Note: 3)4)
26	NC	No Connection
27	NC	No Connection
28	V_{DD}	Power Supply: +5V
29	V_{DD}	Power Supply: +5V
30	V_{DD}	Power Supply: +5V

Note 1) Please connects NC pin & Test pin to nothing. Don't connect it to ground nor to other signal input.

Note 2) Please connects GND pin to ground. Don't use it as no-connect nor connect with high impedance
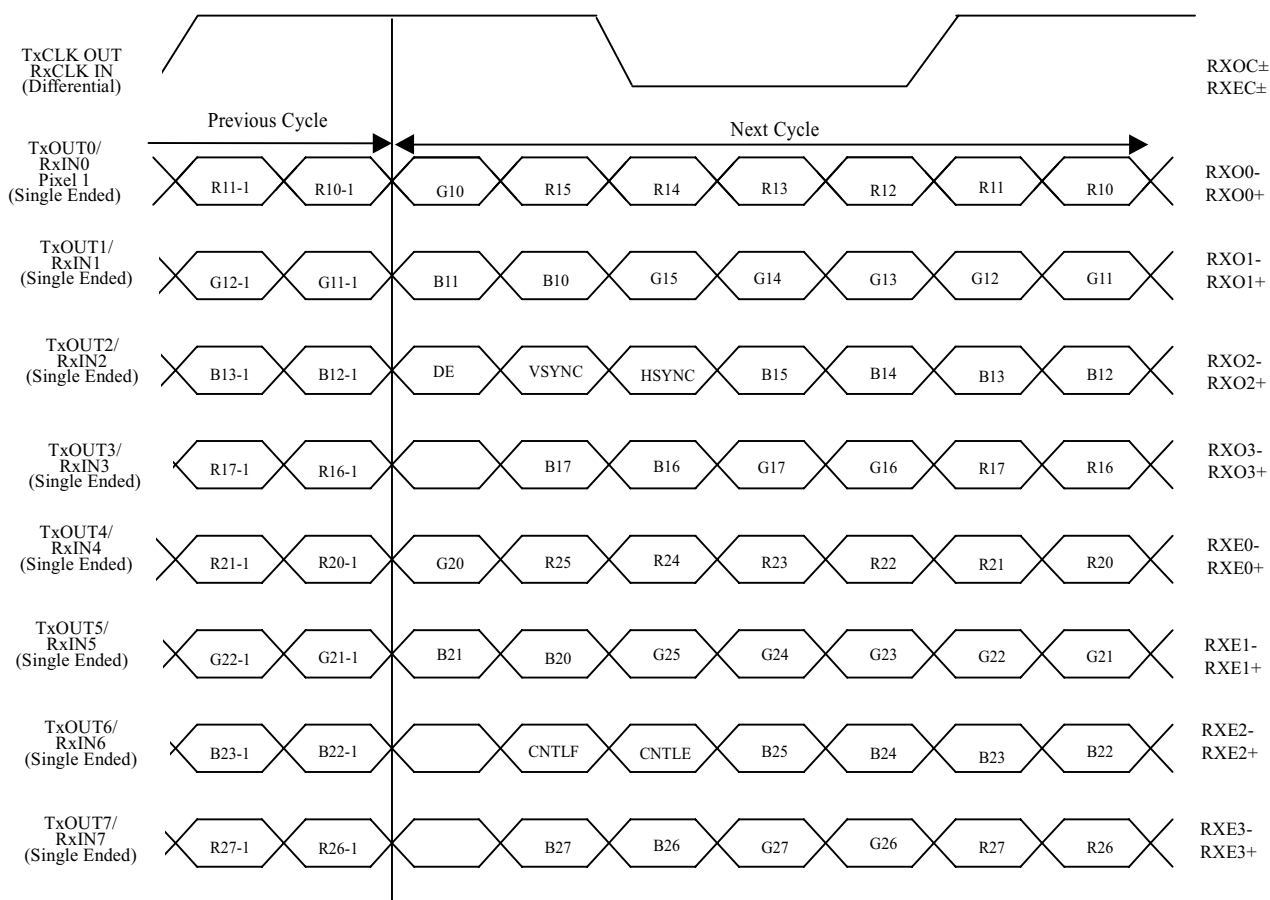
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Note 3) LVDS Transmitter Data Mapping (**NS DS90C387**)

LVDSCHNG=NC

TTL Data Inputs Mapped to LVDS Outputs
Non-DC Balanced Mode (Backward Compatible)

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Note 4) LVDS transmitter Data Mapping (**Thine/THC63LVD823**)

LVDSCHNG=L
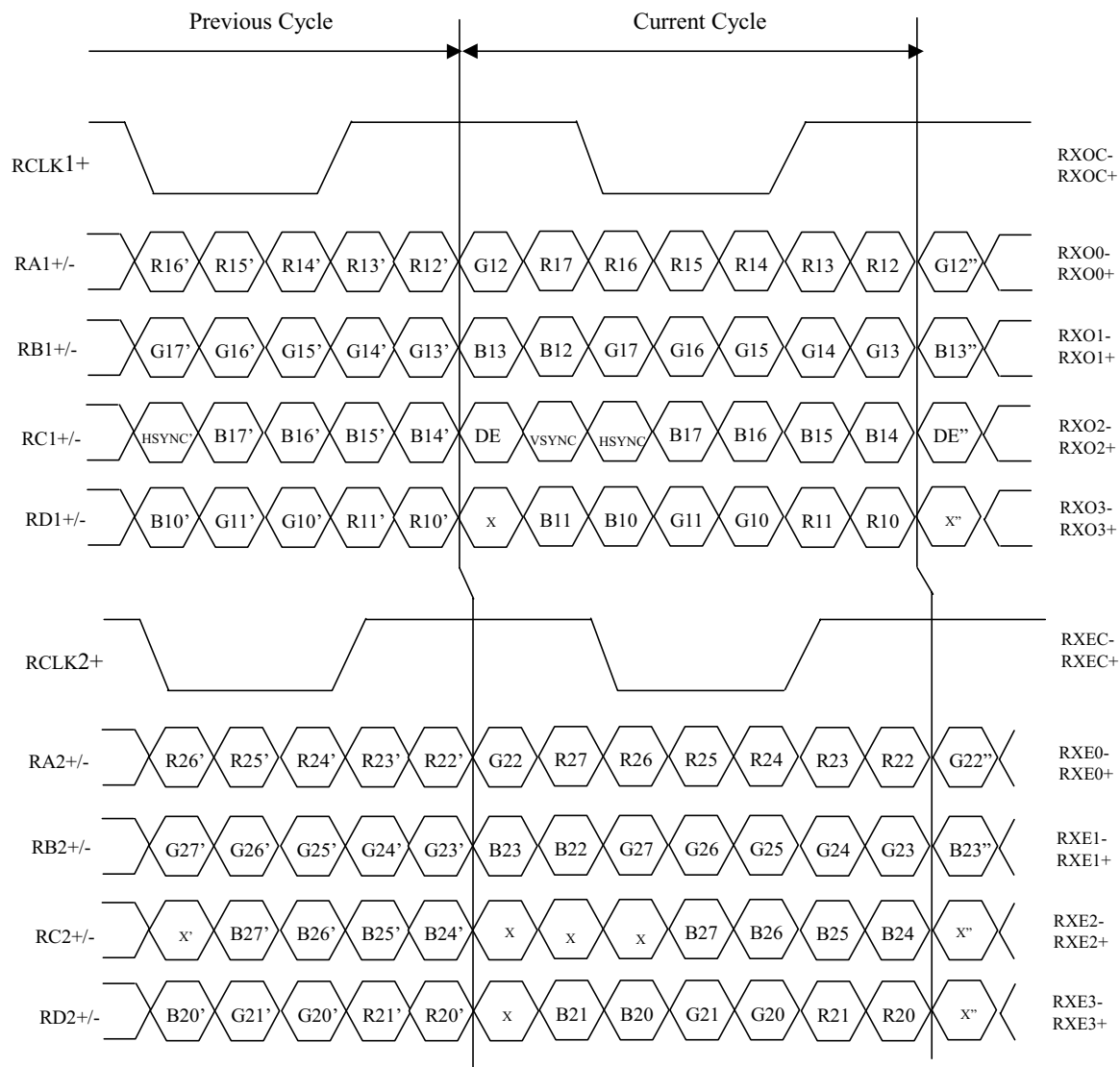
6.2 Back-Light Unit

CN2, 3, 4, 5: CCFL Power Source (BHSR-02VS-1/JST MFG Co., LTD)

Pin No.	Symbol	Color	Function
1	Hot1	Pink	CCFL power supply (High voltage)
2	Cold1	White	Ground

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6.3 Relationship between Displayed Color and Input

|	Display	MSB ←→ LSB R7 R6 R5 R4 R3 R2 R1 R0	MSB ←→ LSB G7 G6 G5 G4 G3 G2 G1 G0	MSB ←→ LSB B7 B6 B5 B4 B3 B2 B1 B0	Gray scale level
Basic color	Black	L L L L L L L L	L L L L L L L L	L L L L L L L L	-
	Blue	L L L L L L L L	L L L L L L L L	H H H H H H H H	-
	Green	L L L L L L L L	H H H H H H H H	L L L L L L L L	-
	Light Blue	L L L L L L L L	H H H H H H H H	H H H H H H H H	-
	Red	H H H H H H H H	L L L L L L L L	L L L L L L L L	-
	Purple	H H H H H H H H	L L L L L L L L	H H H H H H H H	-
	Yellow	H H H H H H H H	H H H H H H H H	L L L L L L L L	-
	White	H H H H H H H H	H H H H H H H H	H H H H H H H H	-
Gray scale of Red	Black	L L L L L L L L	L L L L L L L L	L L L L L L L L	L0
	Dark	L L L L L L L H	L L L L L L L L	L L L L L L L L	L1
		L L L L L L H L	L L L L L L L L	L L L L L L L L	L2
	↑	:	:	:	L3…L251
	↓	H H H H H L H H	L L L L L L L L	L L L L L L L L	L252
	Light	H H H H H H L H	L L L L L L L L	L L L L L L L L	L253
		H H H H H H H L	L L L L L L L L	L L L L L L L L	L254
	Red	H H H H H H H H	L L L L L L L L	L L L L L L L L	Red L255
Gray scale of Green	Black	L L L L L L L L	L L L L L L L L	L L L L L L L L	L0
	Dark	L L L L L L L L	L L L L L L L H	L L L L L L L L	L1
		L L L L L L L L	L L L L L L H L	L L L L L L L L	L2
	↑	:	:	:	L3…L251
	↓	L L L L L L L L	H H H H H L H H	L L L L L L L L	L252
	Light	L L L L L L L L	H H H H H H L H	L L L L L L L L	L253
		L L L L L L L L	H H H H H H H L	L L L L L L L L	L254
	Green	L L L L L L L L	H H H H H H H H	L L L L L L L L	Green L255
Gray scale of Blue	Black	L L L L L L L L	L L L L L L L L	L L L L L L L L	L0
	Dark	L L L L L L L L	L L L L L L L L	L L L L L L L H	L1
		L L L L L L L L	L L L L L L L L	L L L L L L H L	L2
	↑	:	:	:	L3…L251
	↓	L L L L L L L L	L L L L L L L L	H H H H H L H H	L252
	Light	L L L L L L L L	L L L L L L L L	H H H H H H L H	L253
		L L L L L L L L	L L L L L L L L	H H H H H H H L	L254
	Blue	L L L L L L L L	L L L L L L L L	H H H H H H H H	Blue L255
Gray scale of White & Black	Black	L L L L L L L L	L L L L L L L L	L L L L L L L L	L0
	Dark	L L L L L L L H	L L L L L L L H	L L L L L L L H	L1
		L L L L L L H L	L L L L L L H L	L L L L L L H L	L2
	↑	:	:	:	L3…L251
	↓	H H H H H L H H	H H H H H L H H	H H H H H L H H	L252
	Light	H H H H H H L H	H H H H H H L H	H H H H H H L H	L253
		H H H H H H H L	H H H H H H H L	H H H H H H H L	L254
	White	H H H H H H H H	H H H H H H H H	H H H H H H H H	White L255

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6.4 Pixel Format
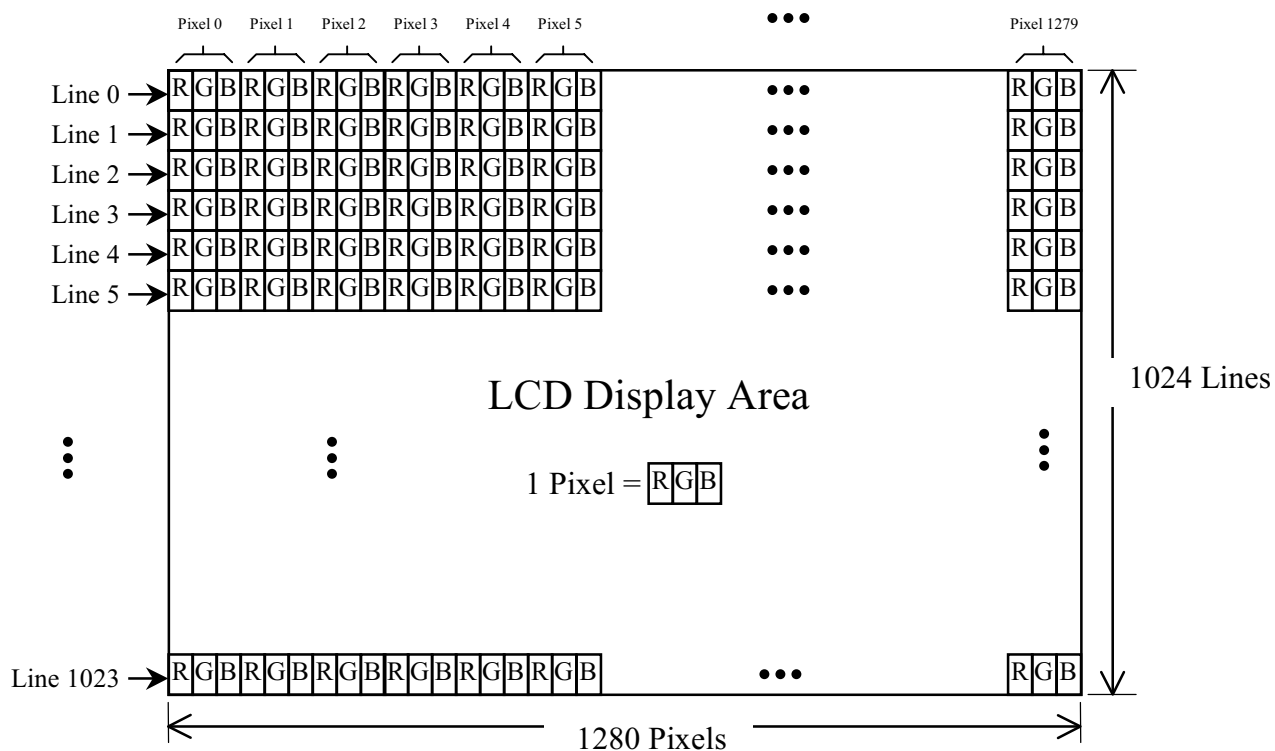
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7.0 INTERFACE TIMING

7.1 Timing Parameters (DE only mode)

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Remarks
Clock	Frequency	$1/T_C$	40	-	54	MHz	(10
	High Time	T_{CH}	4	-	-	nsec	
	Low Time	T_{CL}	4	-	-	nsec	
Data	Setup Time	T_{DS}	4	-	-	nsec	
	Hold Time	T_{DH}	4	-	-	nsec	
Data Enable	Setup Time	T_{ES}	4	-	-	nsec	
Frame Frequency	Cycle	T_V	-	16.7	16.7	msec	
			1032	1066	1066	lines	
Vertical Active Display Term	Display Period	T_{VD}	1024	1024	1024	lines	
	Vertical Blank Period	T_{VB}	8	-	-	lines	
One Line Scanning Time	Cycle	T_H	672	-	844	clocks	
Horizontal Active Display Term	Display Period	T_{HD}	640	640	640	clocks	

Note (1): 2pixels/clk input

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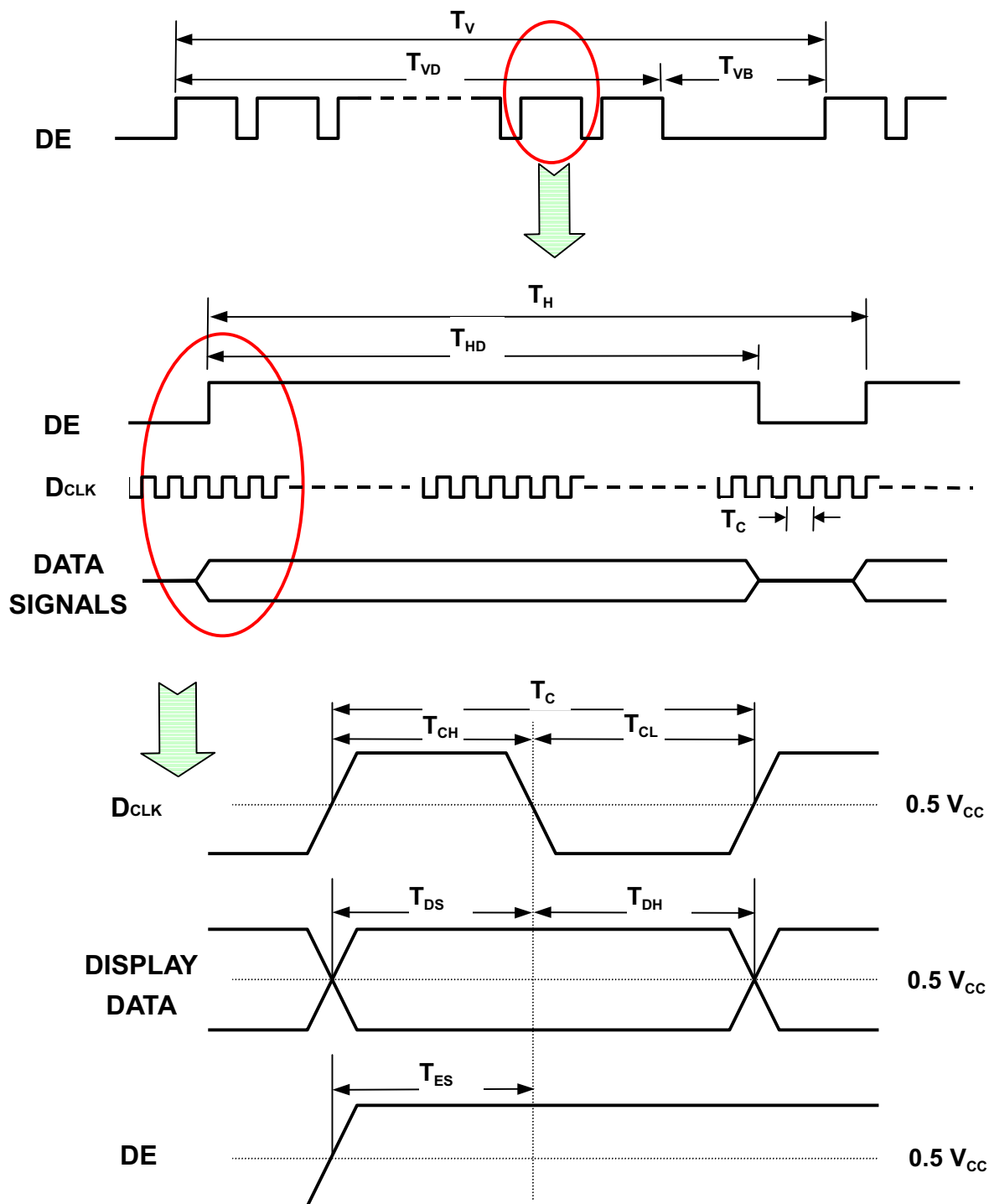### 7.2 Timing Diagram of Interface Signal (DE only mode)

24 Bit two pixel/clock input mode

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7.3 Power ON/OFF Sequence
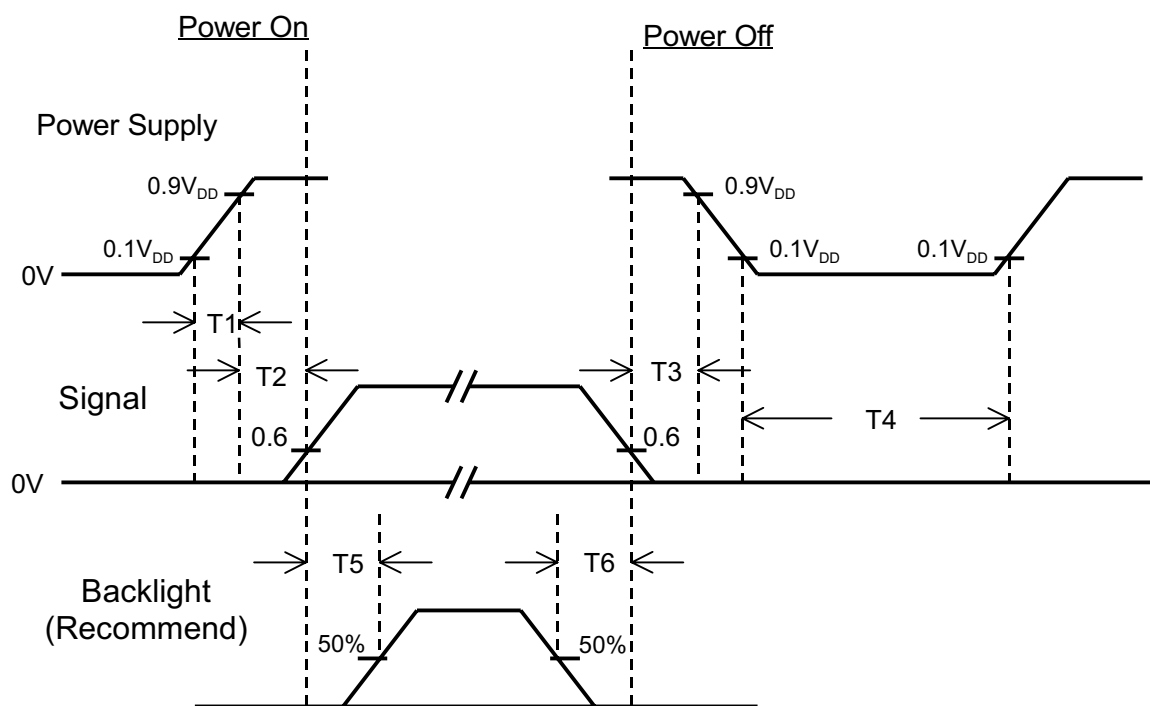
Item	Min.	Typ.	Max.	Unit	Remark
T1	0	—	10	msec	
T2	0	—	50	msec	
T3	0	—	50	msec	
T4	1	—	—	sec	
T5	200	—	—	msec	
T6	200	—	—	msec	

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.

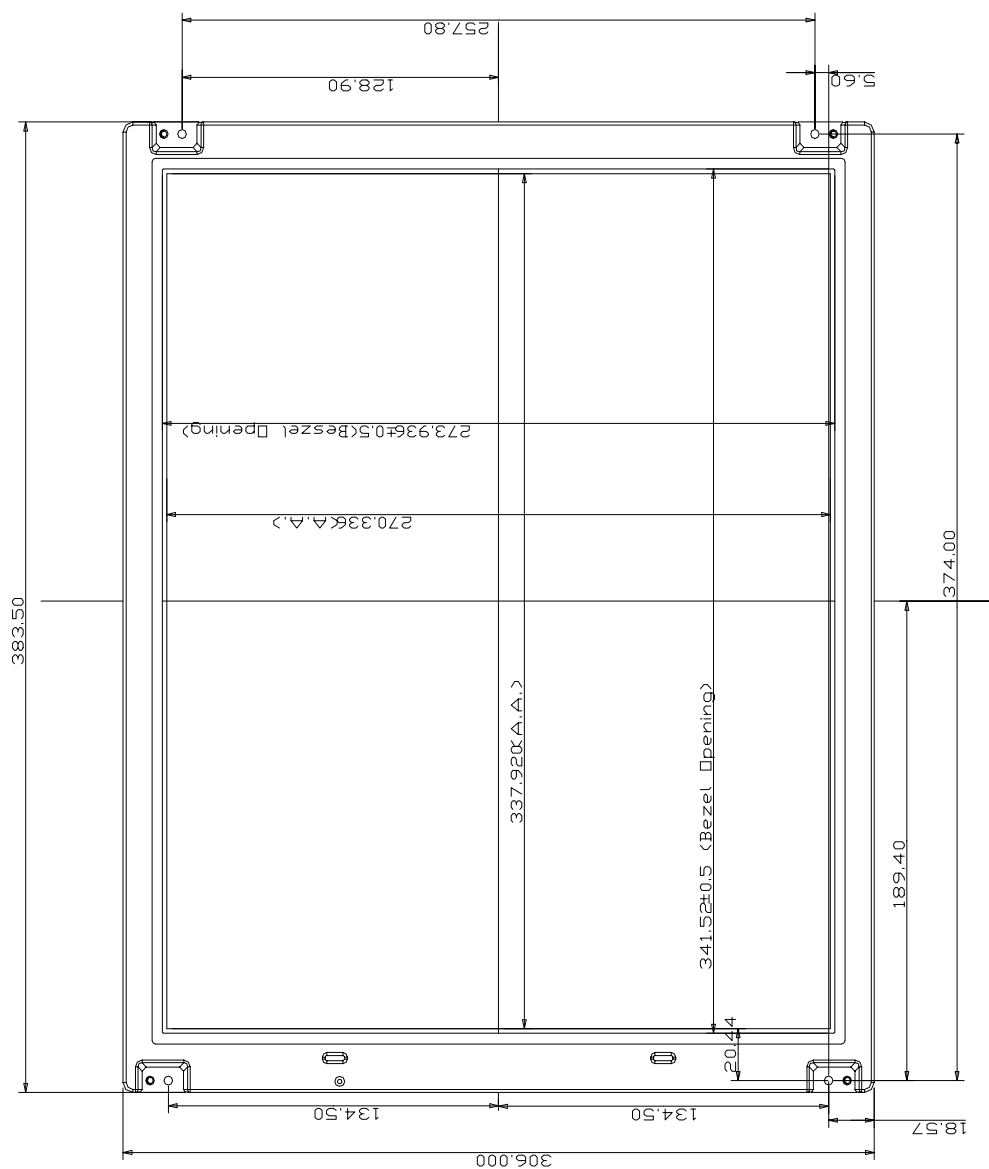(5) Interface signal shall not be kept at high impedance when the power is on.

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8.0 OUTLINE DIMENSION

8.1 Front View   Unit : mm
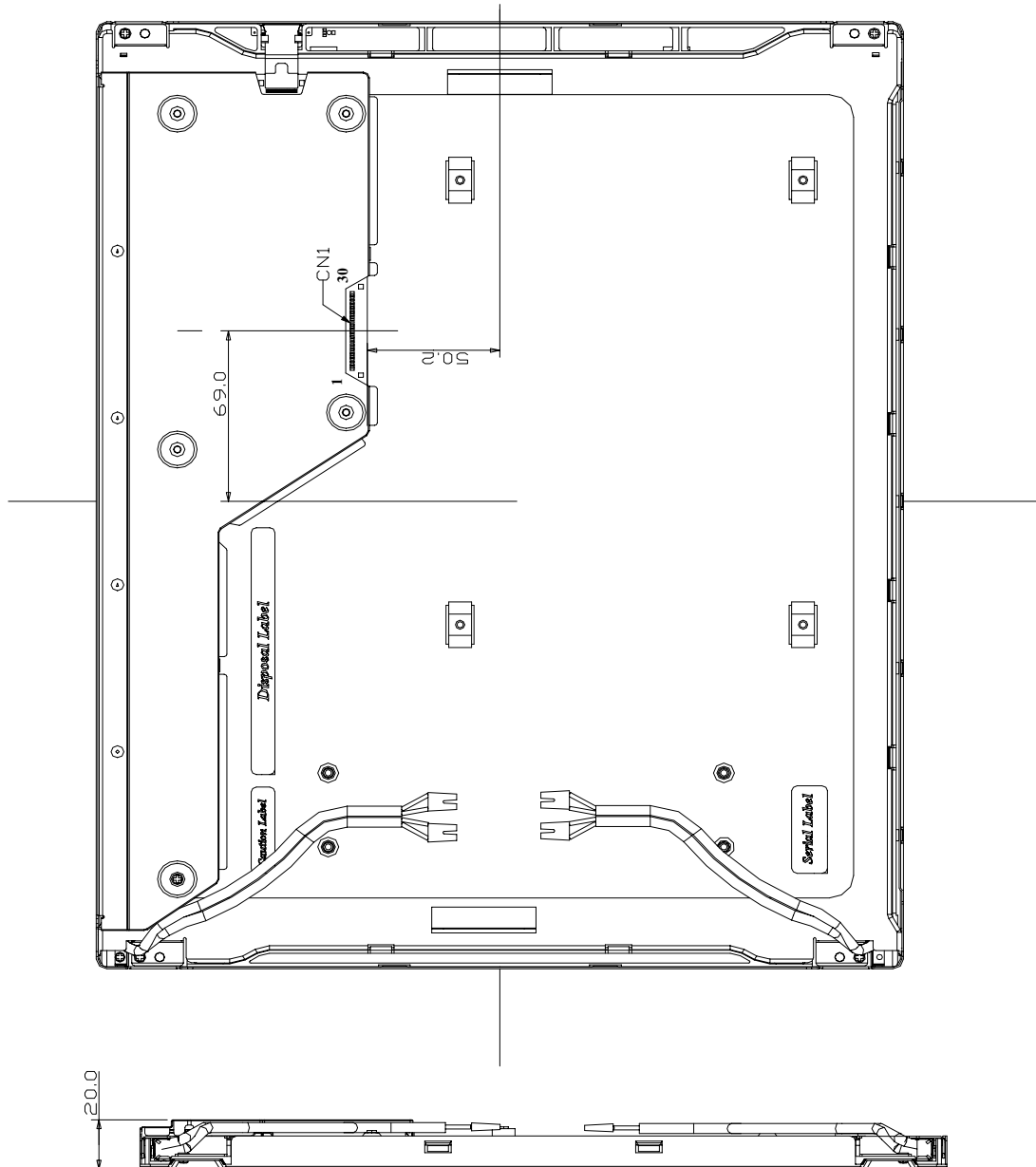

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8.2　Back View

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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	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

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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

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.

10.4 Electric Shock

9.4.1 Disconnect power supply before handling LCD module.

9.4.2 Do not pull or fold the CCFL cable.

9.4.3 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

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.

10.6 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.

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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.

9.6. 5When 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

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.

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.