Date : Mar . 11. 2005

HannStar Product Information

Model : **HSD230WX12-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.

Record of Revisions

Rev.	Date	Description of change

1.0	Aug. 05, 2004	Product Information for HSD230WX12-A00 was first issued .

Contents

1.0 GENERAL DESCRIPTION

1.1 Introduction

HannStar Display model HSD230WX12-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 22.92-inch diagonally measured active display area with Wide XGA resolution (768 vertical by 1280 horizontal pixel array) and can display up to 16.7 million colors.

1.2 Features

- 22.92” WXGA for TV application panel
- High brightness and wide view angle
- Fast response time & High color reproduction
- LVDS interface system.
- Long lamp lifetime.

1.3 Applications

- High Definition TV application
- Public Display
- Measuring Instrument
- New media equipment

1.4 General information

Item	Specification	Unit
Display area	499.20(H) x 299.52(V)	mm
Number of Pixel	1280(H) x 768(V)	pixels
Pixel pitch	0.39(H) x 0.39(V)	mm
Pixel arrangement	RGB Vertical stripe	
Display color	16,7M	colors
Display mode	Normally Black	
Surface treatment	Anti-reflective, Hard-Coating(3H)	
Weight(without inverter)	2500	g
Back-light	12 CCFL	
Input signal	1-ch LVDS	
Power Consumption	TBD	W

1.5 Mechanical Information

Item		Min.	Typ.	Max.	Unit
Module Size	Horizontal(H)	539.5	540.0	540.5	mm
	Vertical(V)	339.5	340.0	340.5	mm
	Depth(D)	29.9	30.6	31.3	mm
Weight (Without inverter)		--	2500	2700	g

Customer screw torque suggestion value :

Side Mount: Not Suggest.

Front Mount: M3: 3 to 6 kgf-cm

M3.5: 4 to 8 kgf-cm

M4: 6 to 10 kgf-cm

2.0 ABSOLUTE MAXIMUM RATING

2.1 Absolute Rating of Environment

Item	Symbol	Min.	Max.	Unit	Note
Storage temperature	T_{STG}	-20	60	°C	(1)
Operating temperature	T_{OPR}	0	50	°C	(1)
Vibration(non-operating)	V_{nop}	—	1.5	G	(2)
Shock(non-operating)	S_{nop}	—	50	G	(3)
Storage humidity	H_{STG}	10	90	%RH	(4)
Operating humidity	H_{OP}	10	80	%RH	(4)
Low pressure(operating)	H_{LOP}	697	—	hPa	(5)
Low pressure(non-operating)	H_{LNOP}	116	—	hPa	(6)

Note (1) Temperature and Humidity should be applied to the glass surface of a TFT module, not to the system installed with a module

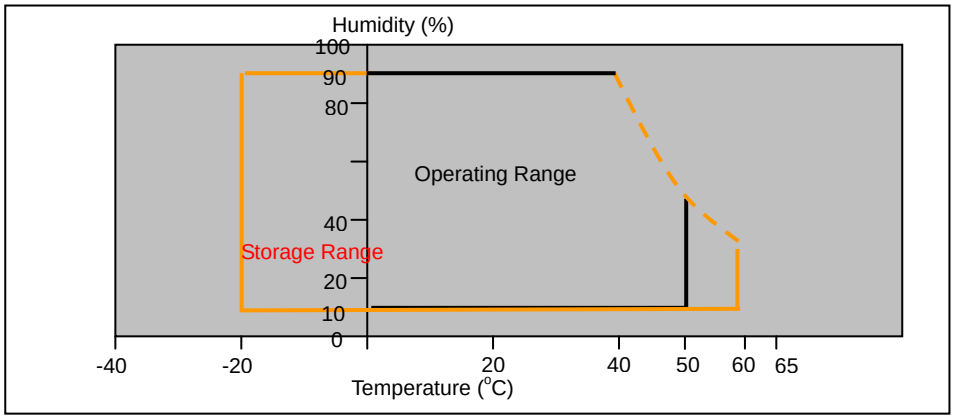
(2)10-500Hz,Random, 30min/cycle, X/Y/Z each one cycle except for resonant frequency.

(3)11ms/±X,±Y,±Z direction, half-sine wave.

(4) Max wet bulb temp =39°C

(5) 2hours. (10000 feet)

(6) 24hours. (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	5.5	V	(1)
Logic input voltage	V_{IN}	-0.3	3.6	V	(1)

2.2.2 Back-Light Unit

Item	Symbol	Min.	Max.	Unit	Note
Lamp voltage	V_L	720	1000	V_{rms}	(1)
Lamp current	I_L	-	8.0	mA	(1)
Lamp frequency	f_L	25	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.

3.0 OPTICAL CHARACTERISTICS

3.1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast		CR	Θ=0 Φ=0 Normal viewing angle	400	500	—	-	(1)(2)
Response time	Rising	T_R + T_F		—	25	35	msec	(1)(3)
	Falling							
luminance of white(center)		Y_L		400	500	—	cd/m^2	(1)(4)(5) (I_L=6.0mA)
Color chromaticity (CIE1931)	Red	R_x		0.610	0.640	0.670	-	(1)(4)
		R_y		0.291	0.321	0.351	-	
	Green	G_x		0.255	0.285	0.315	-	
		G_y		0.573	0.603	0.633	-	
	Blue	B_x		0.112	0.142	0.172	-	
		B_y		0.042	0.072	0.102	-	
	White	W_x		0.253	0.283	0.313	-	
		W_y		0.268	0.298	0.328	-	
Viewing angle	Hor.	θ_R	CR>20	80	85	—	Deg	
		θ_L		80	85	—		
	Ver.	θ_U		80	85	—		
		θ_D		80	85	—		
Brightness uniformity		B_{UNI}		70	80		%	(6)

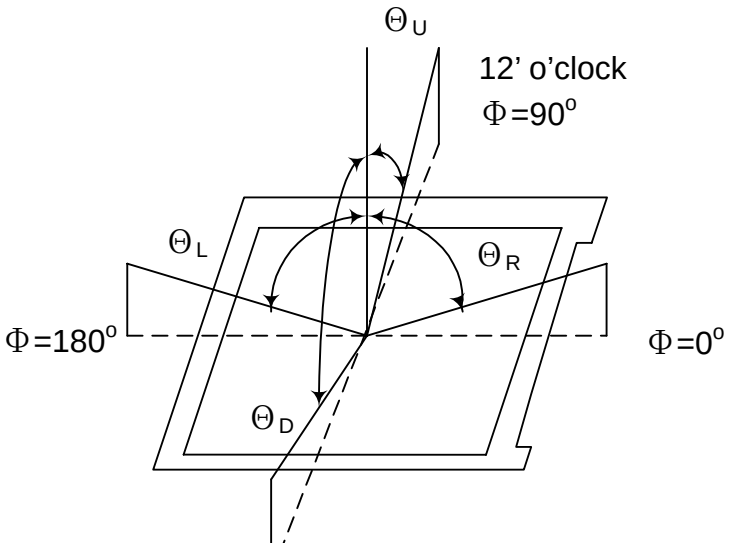
3.2 Measuring Condition

- Measuring surrounding : dark room
- Single Lamp current I_L :6.0mA+-0.5mA, lamp freq. F_L= 50KHz
- V_{DD}=+5.0V, f_V=60Hz, f_{DCLK}=65MHz
- Inverter Model:PLCD09231202(EMax)
- Surrounding temperature : 25°C
- 40min. warm-up time (Vertically Set)

3.3 Measuring Equipment

- MD-3000V of Otsuka Electrics Corp., which utilized MCPD-7000 for Chromaticity and BM-5A for other optical characteristics.
- Measuring spot size : 10~12mm

Note (1) Definition of Viewing Angle:

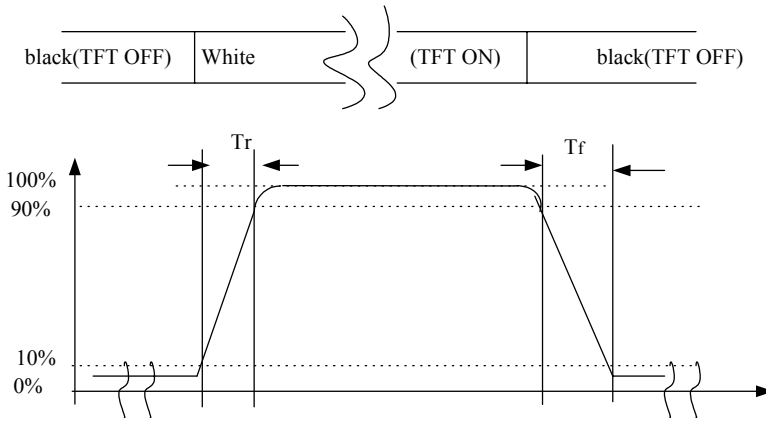


Note (2) Definition of Contrast Ratio(CR) :

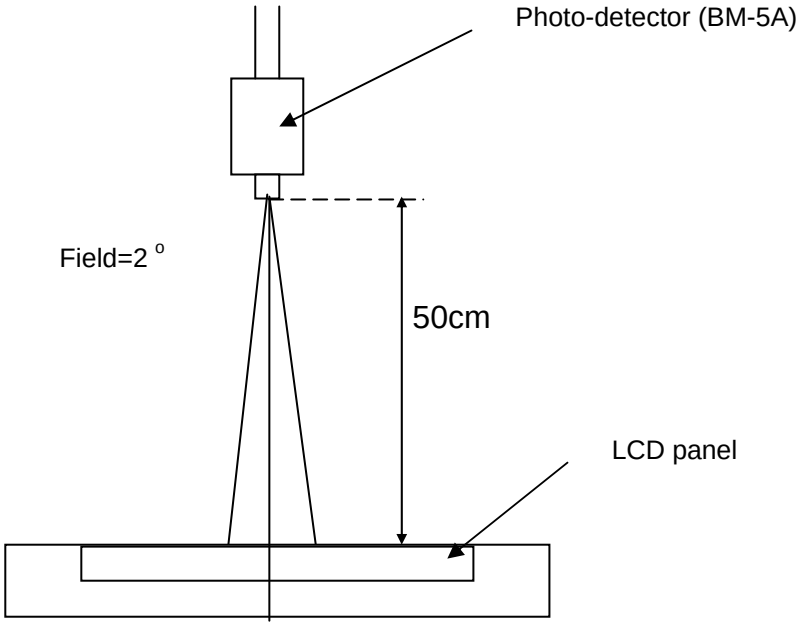
Measured at the center point of panel

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

Note (3) Definition of Response Time: Sum of T_r and T_f



Note (4) Optical Characteristic Measurement Setup

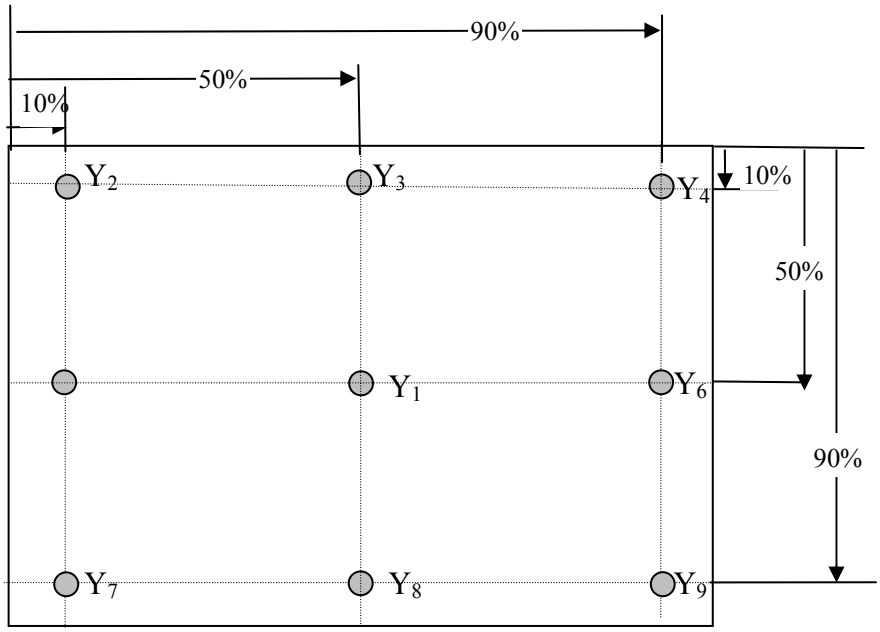


Note (5) Definition of Luminance of White: measured the luminance of white at Y1

Luminance of white =Y_1

Note (6) Definition of Brightness Uniformity (B_{UNI})

$$\text{Uniformity of 9 points} = \frac{\text{Min Luminance of Y1~Y9}}{\text{Max Luminance of Y1~Y9}} \times 100\%$$



4.0 ELECTRICAL CHARACTERISTICS

4.1 TFT LCD Module

Item		Symbol	Min.	Typ.	Max.	Unit	Note
Voltage of power		V_{DD}	4.5	5.0	5.5	V	
Differential input threshold voltage	High	V_{IH}	—	—	100	mV	V_{CM}=1.2 V
	Low	V_{IL}	-100	—	—	mV	
Current of power supply	L255	I_{DD}	—	900	1200	mA	
Vsync frequency		f_V	50	60	70	Hz	(1)
Hsync frequency		f_H	40.3	48.4	56.5	kHz	
Main frequency		f_{DCLK}	54	65.0	76	MHz	
Inrush current		I rh	-	-	3	mA	(2)

Note (1) When f_v is too low, a flicker may be occurred on the display.

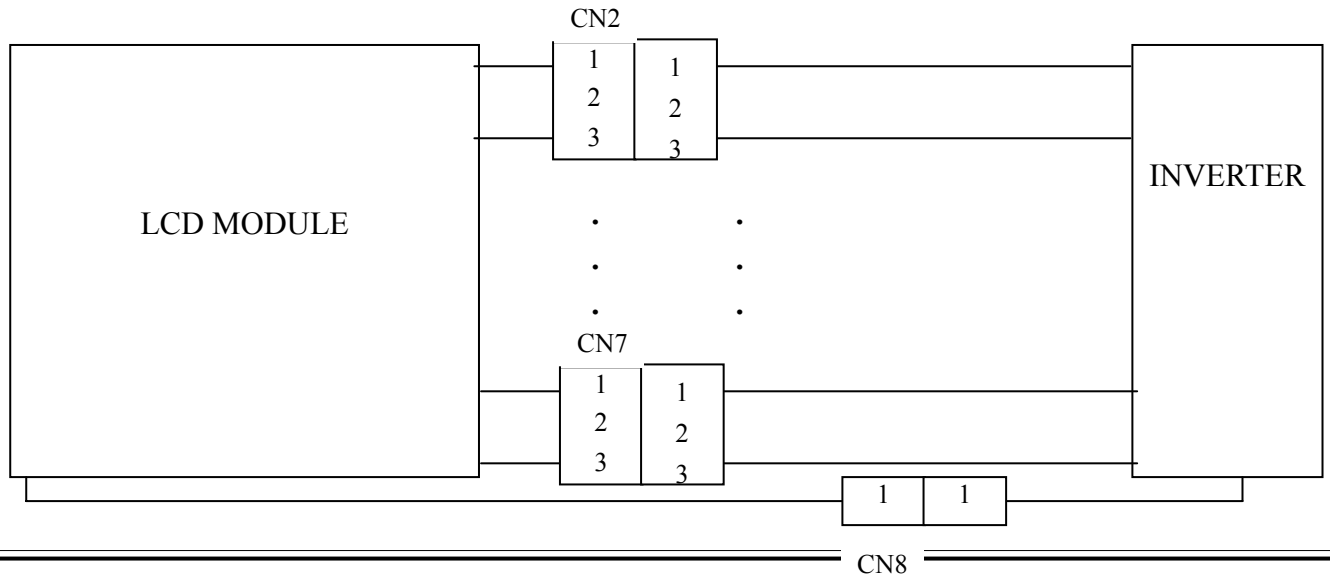
Note (2) The duration of inrush current is about 0.5ms and rising time of power input Is 1 ms (min)

4.2 Back-Light Unit

The back-light system is 12 CCFL(Cold Cathode Fluorescent Lamp).

The characteristics of the lamp are shown in the following tables.

INVERTER: PLCD09231202(EMax)(1)



Item	Symbol	Min.	Typ.	Max.	Unit	Note
Lamp current	IL	4.0	6.0	8.0	mA(rms)	(1)
Lamp voltage	VL	630	700	770	V(rms)	I_L=6.0mA
Frequency	fL	40	50	80	KHz	(2)
Lamp Operating life time	Hr		50000	--	Hour	(3)
Startup voltage	Vs	--		1220	V(rms)	at 25°C
				1530		at 0°C (note 4)

Note (1) Lamp current is measured with current meter for high frequency as shown below. Specified valued are for single lamp.

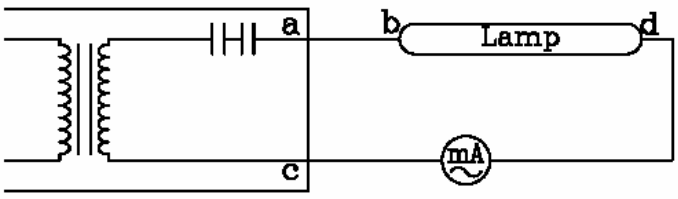
Note (2) Lamp frequency may produce interference with horizontal synchronous Frequency and this may cause line flow on the display. Therefore lamp Frequency shall be detached from the horizontal synchronous frequency and its harmonics as far as possible in order to avoid interference.

Note (3) Lamp operating Life time (Hr) can be defined as the time in which it Continues to operate under the condition: Ta=25~35°C, I_L=6.0mA(typ) until when the brightness becomes 50% less than the initial brightness.

Note (4) At 0℃, the starting voltage of lamp must exceed the Max startup voltage.

Lamp Characteristic Measurement

Lamp Current Measurement Circuit



Inverter

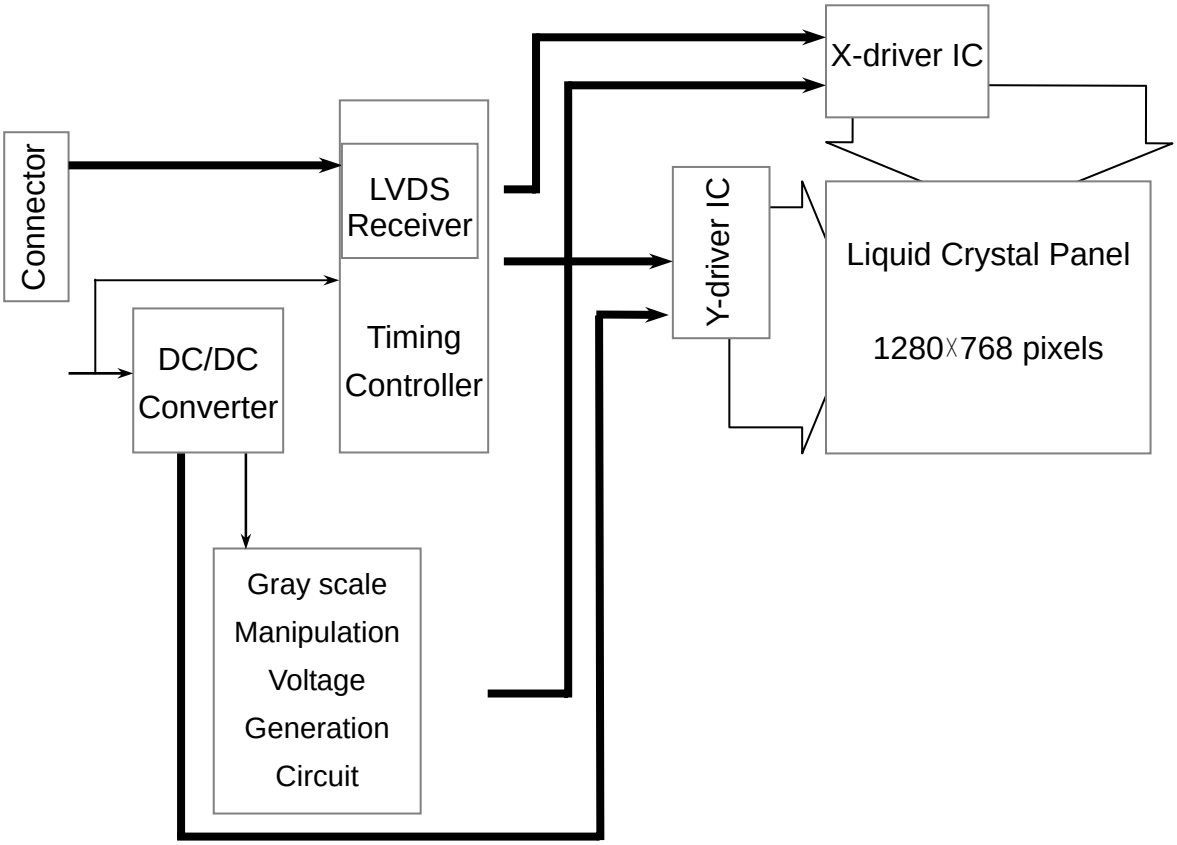
Measurement Items　Measuring Equipment

Lamp Current　Thermocouple Ⓜ meter

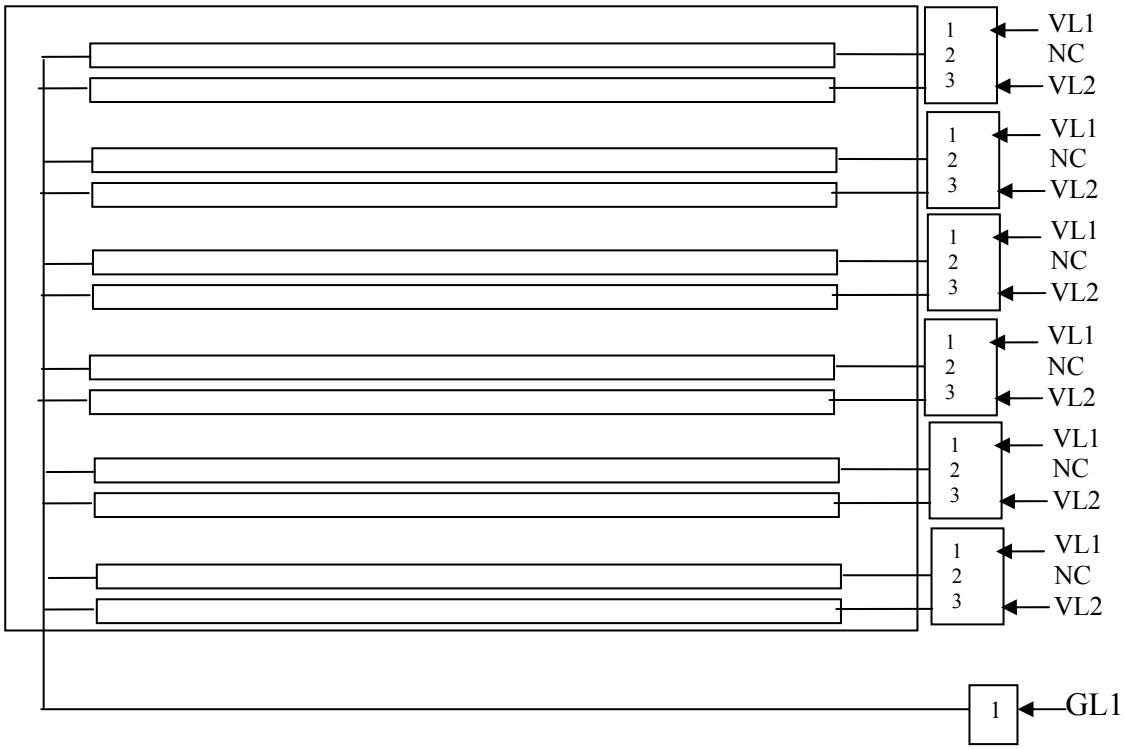
YOKOGAWA TYPE : 2016

5.0 BLOCK DIAGRAM

5.1 TFT LCD Module



5.2 Back Light Unit



6.0 INTERFACE PIN CONNECTION

6.1 TFT LCD Module

Connector : HRS:DF14-20P-1.25H

Matching Socket : HRS:DF14-20P-1.25C

Pin No.	Symbol	Function	Polarity	Remark
1	VDD	Power Supply : +5.0V	—	
2	VDD	Power Supply : +5.0V	—	
3	GND	Ground	—	
4	GND	Ground	—	
5	IN0-	Transmission Data of Pixels 0	Negative	
6	IN0+	Transmission Data of Pixels 0	Positive	
7	GND	Ground		
8	IN1-	Transmission Data of Pixels 1	Negative	
9	IN1+	Transmission Data of Pixels 1	Positive	
10	GND	Ground		
11	IN2-	Transmission Data of Pixels 2	Negative	
12	IN2+	Transmission Data of Pixels 2	Positive	
13	GND	Ground	—	
14	CLK-	Sampling Clock	Negative	
15	CLK+	Sampling Clock	Positive	
16	GND	Ground		
17	IN3-	Transmission Data of Pixels 3	Negative	
18	IN3+	Transmission Data of Pixels 3	Positive	
19	GND	Ground		
20	GND	Ground		

6.2 Back-Light Unit

High Voltage connector:

CN2—CN7: BHR-03VS-1/Japan Solderless Terminal MFG Co., LTD

Terminal no.	Symbol	Function
1	VL1	CCFL power supply (high voltage)
2	GND	NC
3	VL2	CCFL power supply (high voltage)

Low Voltage connector:

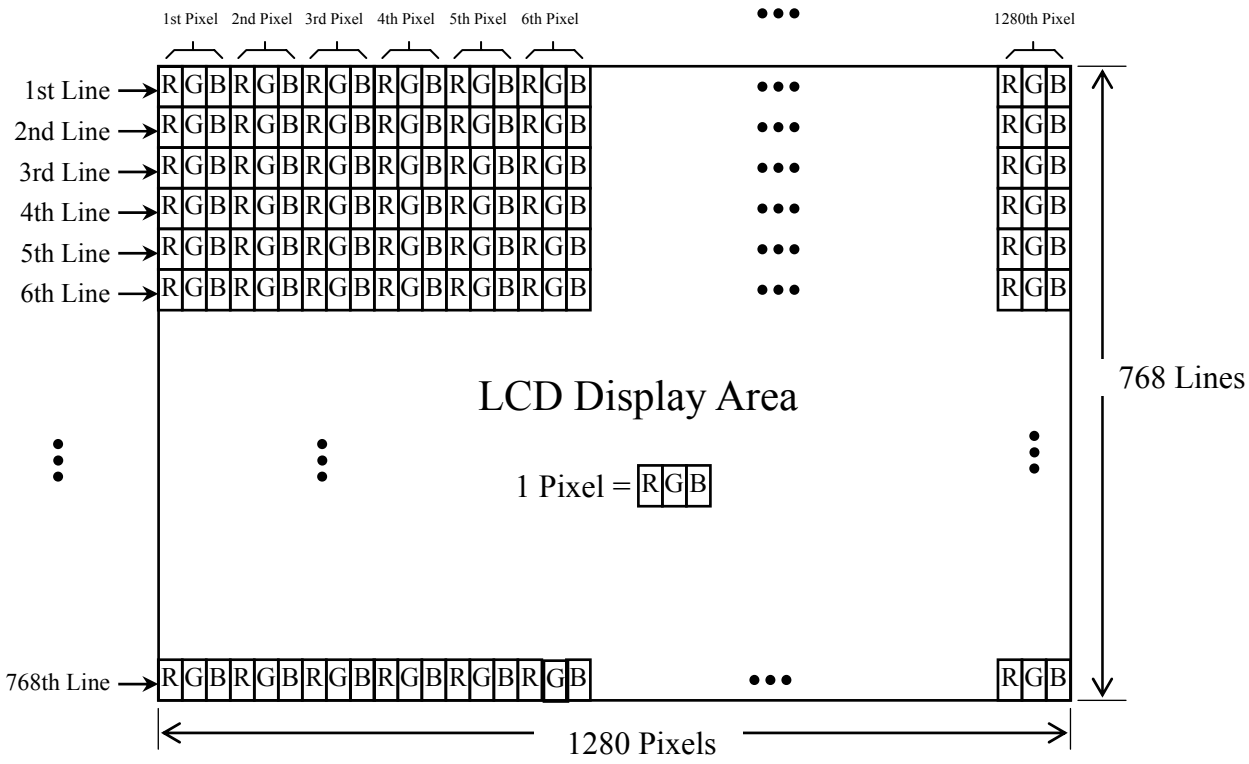
CN8: ZHR-02/Japan Solderless Terminal MFG Co., LTD

Terminal no.	Symbol	Function
1	GL1	CCFL power supply (low voltage)

6.3 Relationship Between Displayed Color and Input

	Display	MSB R7	R6	R5	R4	R3	R2	R1	LSB R0	MSB G7	G6	G5	G4	G3	G2	G1	LSB G0	MSB B7	B6	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	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

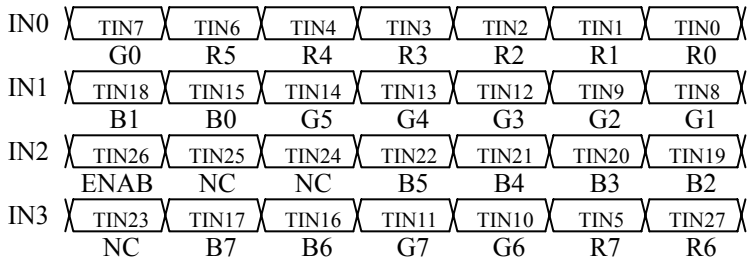
6.4 Pixel Format



6.5 Recommended Transmitter to HSD230WX12-A Interface Assignment

8bit Transmitter

DS90CF386 or equivalent					
Input terminal no.	Input signal		Output signal	To HSD230WX12-A interface(CN1)	
Symbol	Symbol	Function	Symbol	Terminal	Symbol
Txin0	R0	RED Pixels Display Data	TOUT0- TOUT0+	No. 5 No. 6	IN0- IN0+
Txin1	R1	RED Pixels Display Data			
Txin2	R2	RED Pixels Display Data			
Txin3	R3	RED Pixels Display Data			
Txin4	R4	RED Pixels Display Data			
Txin6	R5	RED Pixels Display Data			
Txin7	G0	RED Pixels Display Data			
Txin8	G1	RED Pixels Display Data	TOUT1- TOUT1+	NO.8 NO.9	IN1- IN1+
Txin9	G2	GREEN Pixels Display Data			
Txin12	G3	GREEN Pixels Display Data			
Txin13	G4	GREEN Pixels Display Data			
Txin14	G5	GREEN Pixels Display Data			
Txin15	B0	BLUE Pixels Display Data			
Txin18	B1	BLUE Pixels Display Data			
Txin19	B2	BLUE Pixels Display Data	TOUT2- TOUT2+	NO.11 NO.12	IN2- IN2+
Txin20	B3	BLUE Pixels Display Data			
Txin21	B4	BLUE Pixels Display Data			
Txin22	B5	BLUE Pixels Display Data			
Txin24	NC	Non Connection (open)			
Txin25	NC	Non Connection (open)			
Txin26	ENAB	Compound Synchronization Signal			
Txin27	R6	RED Pixels Display Data	TOUT3- TOUT3+	NO.17 NO.18	IN3- IN3+
Txin5	R7	RED Pixels Display Data			
Txin10	G6	GREEN Pixels Display Data			
Txin11	G7	GREEN Pixels Display Data			
Txin16	B6	BLUE Pixels Display Data			
Txin17	B7	BLUE Pixels Display Data			
Txin23	NC	Non Connection (open)			
CLK IN	NCLK	DATA SAMPLING CLOCK	TCLK OUT- TCLK OUT+	NO. 14 NO. 15	CLK IN- CLK IN+



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

7.1 Timing Parameters (DE mode)

Item	Symbol	Min.	Typ.	Max.	Unit	Remarks
Frame period	t1	772xt3 —	806*t3 16.7	1024xt3 —	— ms	1) 5)
Vertical display term	t2	 —	768×t3 15.9	 —	— ms	1)
One line Scanning time	t3	1300xt5 —	1344*t5 20.7	1688xt5 —	— μs	1) 5)
Horizontal display term	t4	 —	1280×t5 19.7	--	— μs	1)
Clock period	t5	--	15.4	—	ns	5)

Note 1) Refer to TIMING CHART at page20, 21 and LVDS specification (DS90C385) by National Semiconductor Corporation.

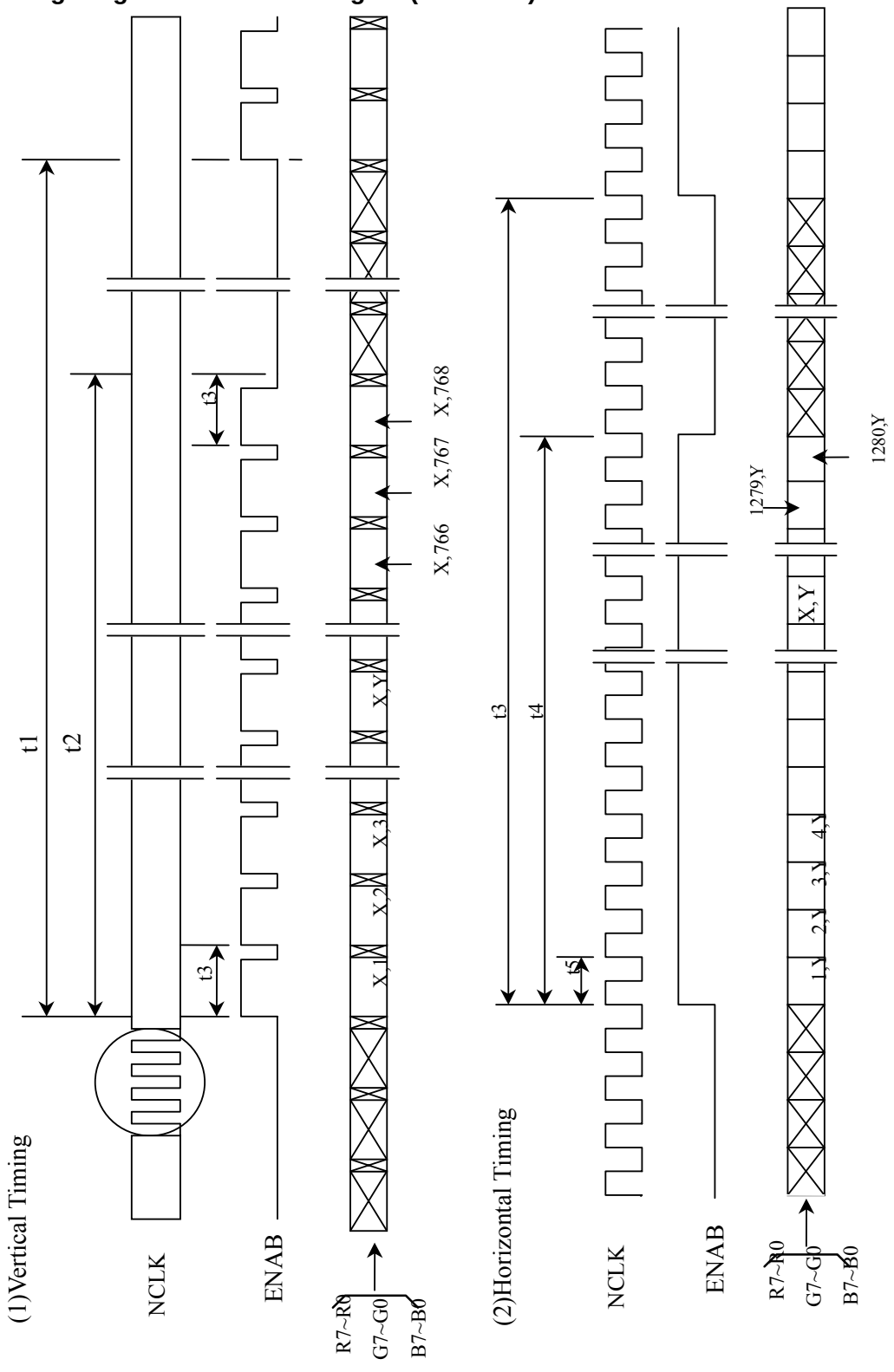
Note 2) When ENAB is fixed to “H” level or “L” level after NCLK is supplied, the panel displays black with some flicker.

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

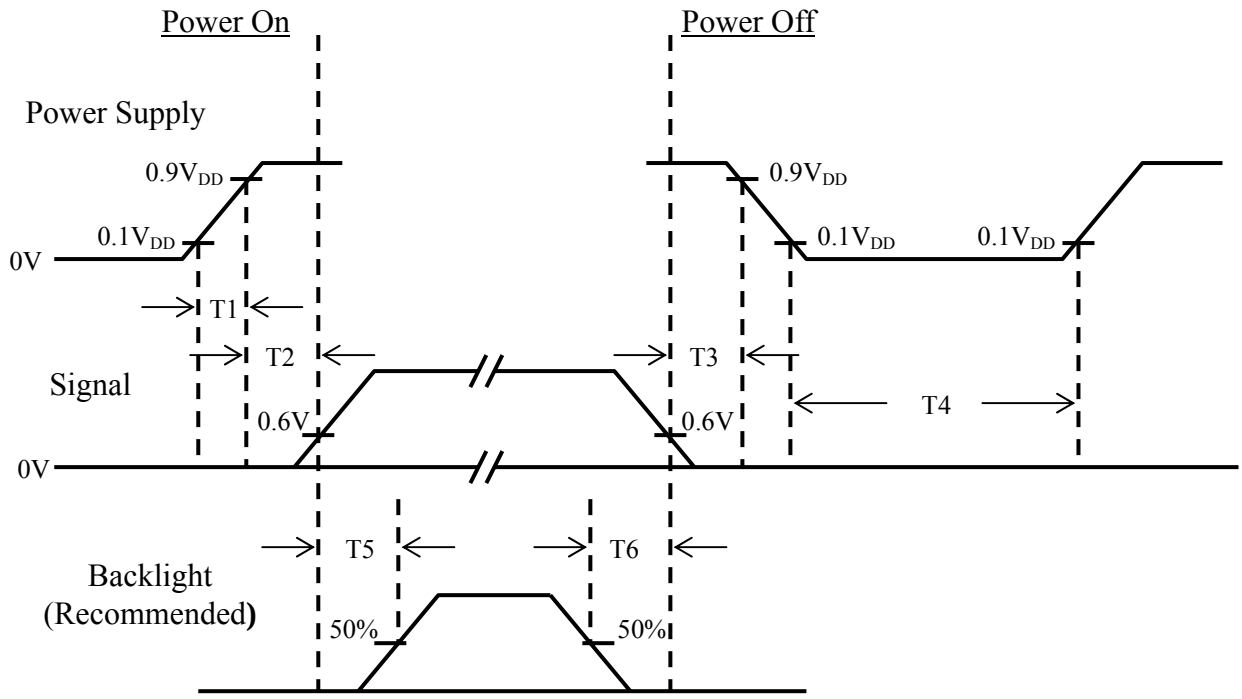
Note 4) Do not make t1 and t3’s fluctuate. If t1 or t3 is fluctuating, the panel displays black.

Note 5) 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).

7.2 Timing Diagram of Interface Signal (DE mode)



7.3 Power ON/OFF Sequence



Item	Min.	Typ.	Max.	Unit	Remark
T1	0.4	—	10	msec	
T2	0	—	50	msec	
T3	0	—	50	msec	
T4	1000	—	—	msec	
T5	200	—	—	msec	
T6	200	—	—	msec	

(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 turns off before the back-light turns off, the display may momentarily become white.

(3) In case of VDD = off level, please keep the level of input signal on the low or keep a high impedance.

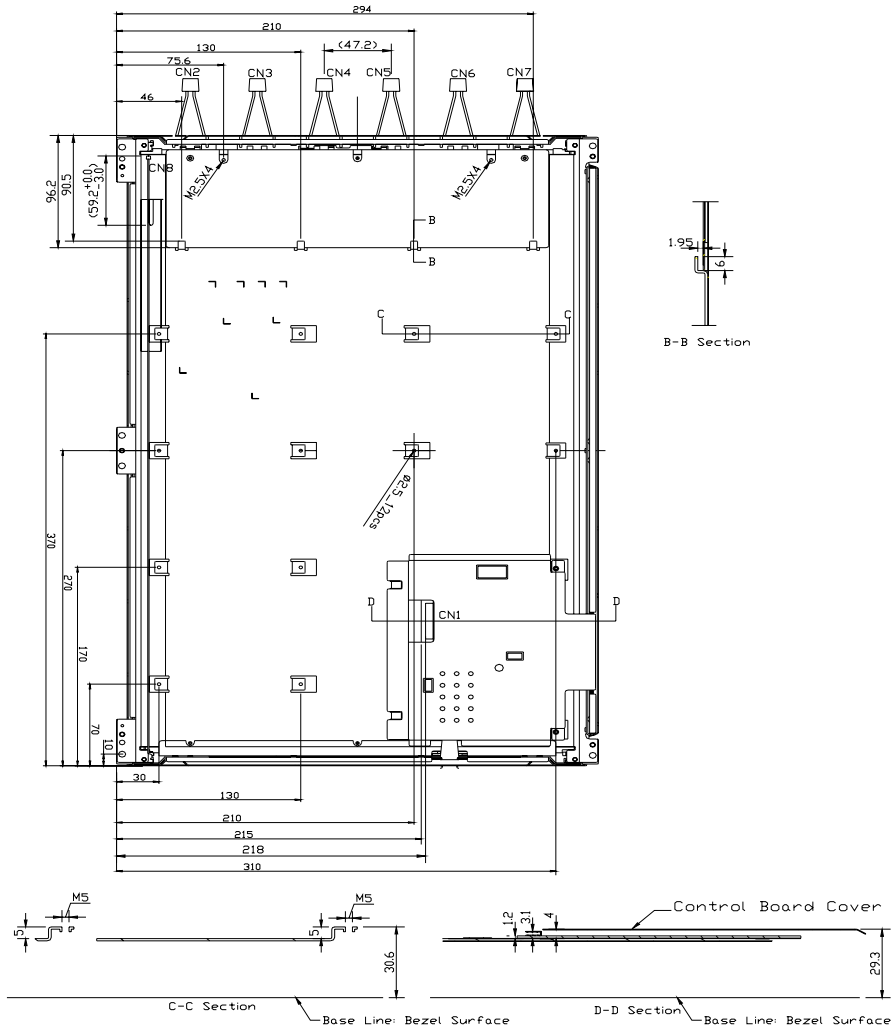
(4) T4 should be measured after the module has been fully discharged between power off and on period.

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

8.0 OUTLINE DIMENSION

(1) Front view outline dimension

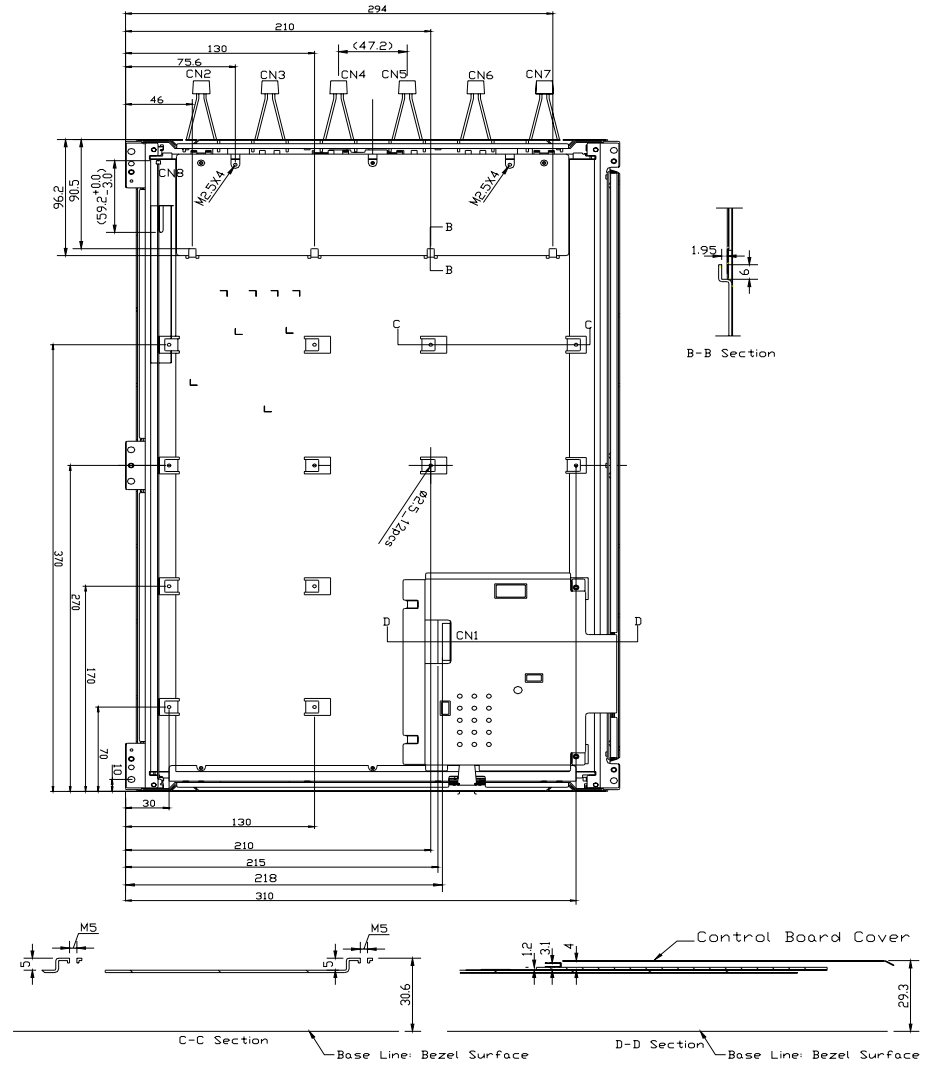
Unit: mm



Note:
CN1: HRS\DF14_20P_1.25H X 1EA
CN2~7: BHR-03VS-1BHR X 6EA
CN8: ZHR-02 X 1EA
Customer End Fixed (Symmetry):
6EA-Ø5, 8EA-M3-BR(Side),
2EA -Ø4 for Alignment

Unspecified Dimension Tolerance Definition:
1. L>=500mm, Tolerance=±1.0mm
2. 500>L>=200, Tolerance=±0.5mm
3. 200>L, Tolerance=±0.3mm
4. Diameter Tolerance=±0.2mm
5. Length of Leadwire Tolerance=±5mm
6. Pitch Tolerance of Connector(CN2~CN7)=±5mm

(2) Back view outline dimension **Unit: mm**



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5. Length of Leadwire Tolerance=±5mm
6. Pitch Tolerance of Connector(CN2~CN7)=±5mm

9
9

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

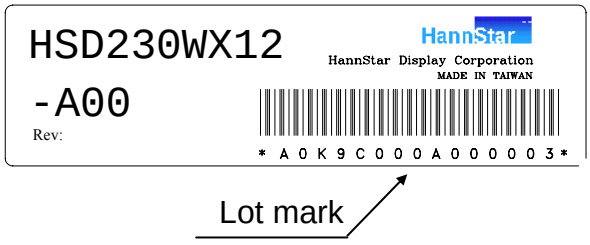
Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Mark	9	0	1	2	3	4	5	6	7	8

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.



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

10.5.0 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.

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

10.5.2 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.

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 mouting holes arranged in four corners tightly.

10.8 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.

10.9 Strong Light Exposure

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

10.8 Disposal

When disposing LCD module, obey the local environmental regulations.