TO

Date：2008/08/21

Customer Acceptance Specification

Model : HSD070IDW1-A10

Accepted by:	
Signature	Date
Proposed by: Technical Service Division	
Signature	Date

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.

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

Record of Revisions

Rev.	Date	Sub-Model	Description of change
1.0	2008/08/21	A10	Preliminary Product Specification was first issued.

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

Contents

1.0 General description p.4

2.0 Absolute maximum ratings p.5

3.0 Optical characteristics p.6

4.0 Block diagram p.10

5.0 Interface pin connection p.11

6.0 Electrical characteristics p.15

7.0 Reliability test items..... p.23

8.0 Outline dimension p.24

9.0 Lot mark p.26

10.0 Package specification p.27

11.0 General precaution p.28

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

1.0 GENERAL DESCRIPTION

1.1 Introduction

HannStar Display model HSD070IDW1-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 7.0 (16:9) inch diagonally measured active display area with WVGA (800 horizontal by 480 vertical pixel) resolution.

1.2 Features

- 7 (16:9 diagonal) inch configuration
- 6 bits + FRC driver with 1channel TTL interface
- LED Backlight
- Up/Down, Left/Right reversion selection
- RoHS Compliance

1.3 Applications

- Mobile NB
- Digital Photo frame
- Multimedia applications and Others AV system

1.4 General information

Item		Specification	Unit
Outline Dimension		165.0 x 104.0 x 5.1 (Typ.)	mm
Display area		153.6(H) x 86.64(V)	mm
Number of Pixel		800 RGB(H) x 480(V)	pixels
Pixel pitch		0.192(H) x 0.1805(V)	mm
Pixel arrangement		RGB Vertical stripe	
Display mode		Normally white	
Surface treatment		Antiglare, Hard-Coating(3H) with EWV film	
Weight		130 (Typ.)	g
Back-light		Single LED (Side-Light type)	
Power Consumption	B/L System	1.68(Max.)	W

1.5 Mechanical Information

Item		Min.	Typ.	Max.	Unit
Module Size	Horizontal(H)	164.7	165.0	165.3	mm
	Vertical(V)	103.7	104.0	104.3	mm
	Depth(D)	—	5.1	5.4	mm
Weight (Without inverter)		—	130	—	g

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

2.0 ABSOLUTE MAXIMUM RATINGS

2.1 Electrical Absolute Rating

2.1.1 TFT LCD Module

Item	Symbol	Min.	Max.	Unit	Note
Power supply voltage	Vcc	-0.3	6.0	V	GND=0
	V_{GH}	0.3	40	V	GND=0
	V_{GL}	-20	0.3	V	GND=0
	AV_{DD}	0.5	15	V	AGND=0
	V_{COM}	0	6	V	
Logic Signal Input Level	V_I	-0.3	Vcc +0.3	V	

2.1.2 Back-Light Unit

Item	Symbol	Typ.	Max.	Unit	Note
LED current	I_L	140	—	mA	(1) (2)(3)
LED voltage	V_L	10.5	12	V	(1) (2)(3)

Note

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

(2) Ta =25±2℃

(3) Test Condition: LED current 140 mA. The LED lifetime could be decreased if operating IL is larger than 140mA

2.2 Environment Absolute Rating

Item	Symbol	Min.	Max.	Unit	Note
Operating Temperature	T_{opa}	-20	70	℃	
Storage Temperature	T_{stg}	-30	80	℃	

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

3.0 OPTICAL CHARACTERISTICS

3.1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast		CR	Θ=0 Normal viewing angle	400	500	—		(1)(2)
Response time	Rising	T_R		—	5	7	msec	(1)(3)
	Falling	T_F		—	20	28		
White luminance (Center)		Y_L		160	200	—	cd/m^2	(1)(4) (I_L=140mA)
Color chromaticity (CIE1931)	White	W_x		0.260	0.310	0.360		(1)(4)
		W_y		0.280	0.330	0.380		
Viewing angle	Hor.	Θ_L	CR>10	60	70	—		
		Θ_R		60	70	—		
	Ver.	Θ_U		40	50	—		
		Θ_D		50	60	—		
Brightness uniformity		B_{UNI}	Θ=0	70	—	—	%	(5)(7)
Optima View Direction		6 O' clock						(6)

3.2 Measuring Condition

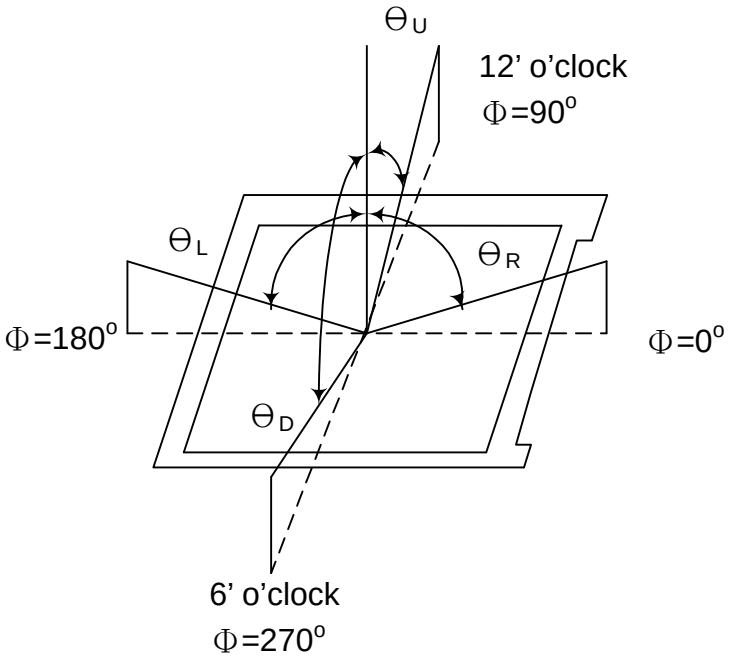
- Measuring surrounding: dark room
- LED current I_L : 140mA
- Ambient temperature: 25±2°C
- 15min. warm-up time.

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

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

Note (1) Definition of Viewing Angle :

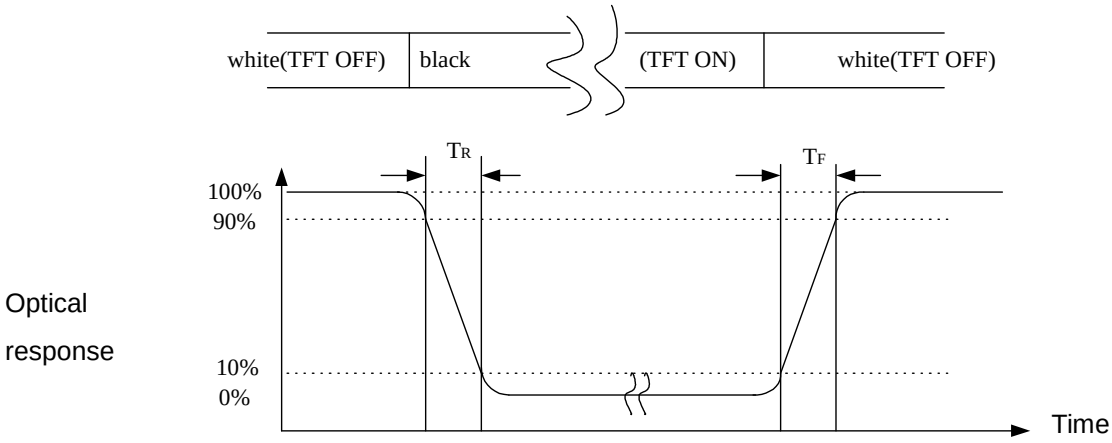


Note (2) Definition of Contrast Ratio (CR):
Measured at the center point of panel

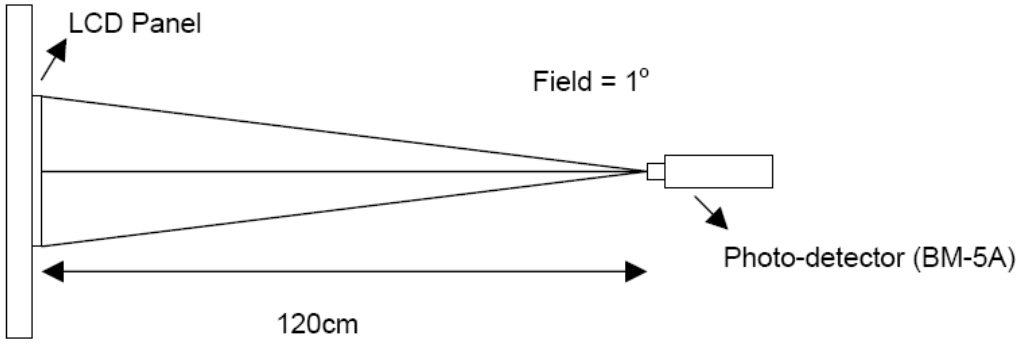
$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

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

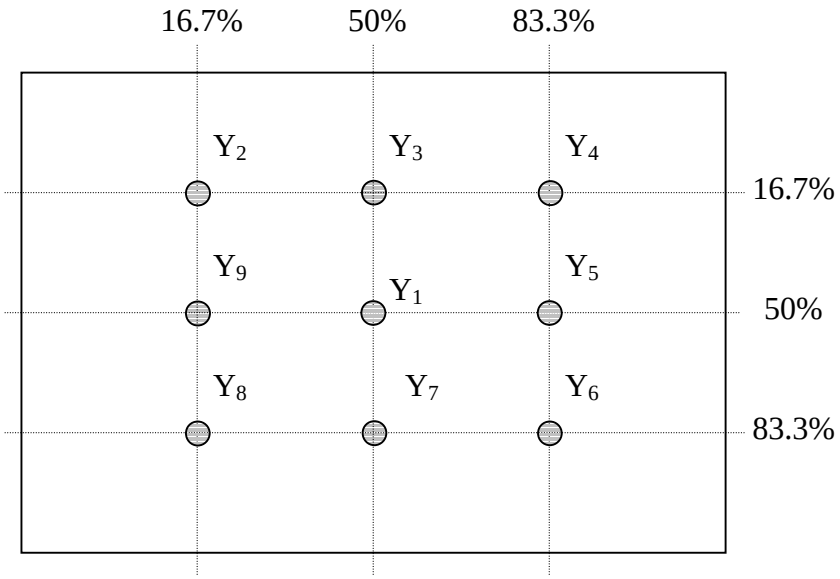


Note (4) Definition of optical measurement setup



The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

Note (5) Definition of brightness uniformity



$$\text{Luminance uniformity} = \frac{\text{(Min Luminance of 9 points)}}{\text{(Max Luminance of 9 points)}} \times 100\%$$

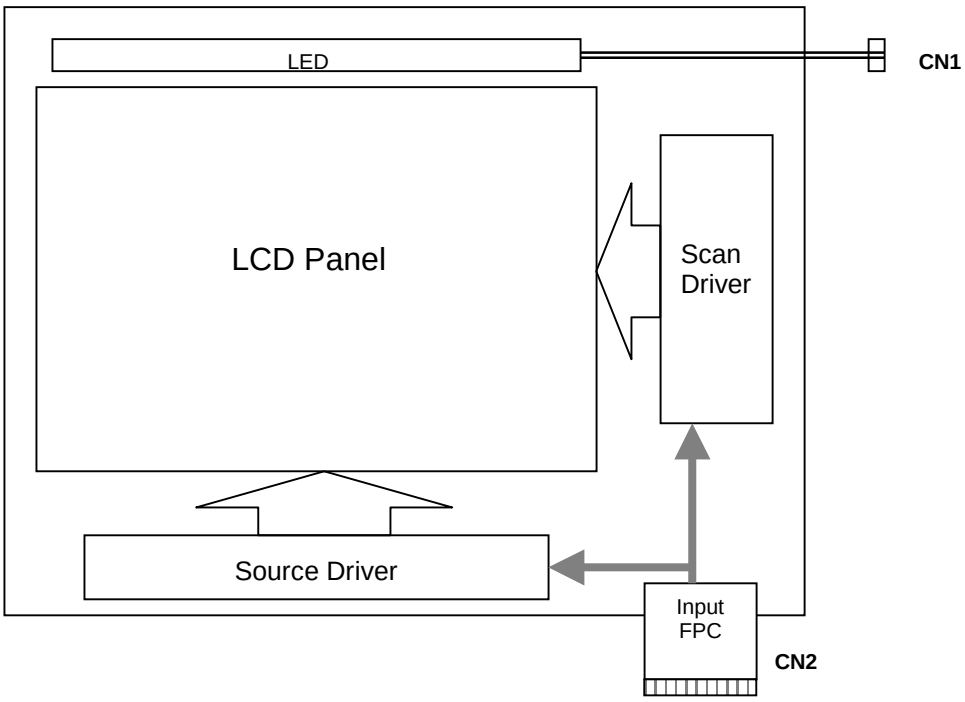
Note (6) Rubbing Direction (The different Rubbing Direction will cause the different optimal view direction.

Note (7) Measured at the brightness of the panel when all terminals of LCD panel are electrically open.

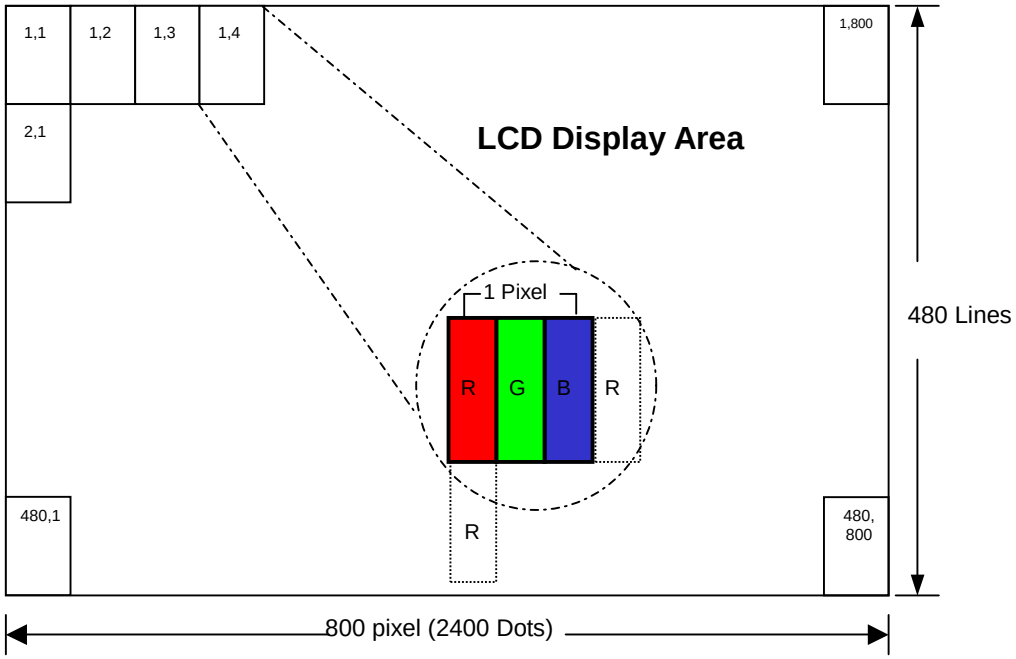
The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

4.0 BLOCK DIAGRAM

4.1 TFT LCD Module



4.2 Pixel Format



The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

5.0 INTERFACE PIN CONNECTION

5.1 TFT LCD Module

CN2 (Input signal): FPC Down Connector, (FH28-60S-0.5SH (HIROSE), 60pin,pitch = 0.5mm)

Terminal no.	Symbol	I/O	Function
1	AGND	P	Analog Ground
2	AVDD	P	Analog Power
3	VCC	P	Digital Power
4	R0	I	Data Input(LSB)
5	R1	I	Data Input
6	R2	I	Data Input
7	R3	I	Data Input
8	R4	I	Data Input
9	R5	I	Data Input
10	R6	I	Data Input
11	R7	I	Data Input(MSB)
12	G0	I	Data Input(LSB)
13	G1	I	Data Input
14	G2	I	Data Input
15	G3	I	Data Input
16	G4	I	Data Input
17	G5	I	Data Input
18	G6	I	Data Input
19	G7	I	Data Input(MSB)
20	B0	I	Data Input(LSB)
21	B1	I	Data Input
22	B2	I	Data Input
23	B3	I	Data Input
24	B4	I	Data Input
25	B5	I	Data Input
26	B6	I	Data Input
27	B7	I	Data Input(MSB)

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

28	DCLK	I	Clock input
29	DE	I	Data Enable signal
30	HSD	I	Horizontal sync input.Negative polarity
31	VSD	I	Vertical sync input.Negative polarity
32	MODE3	I	DE/SYNC mode select .normally pull high H:DE mode.L:HSD/VSD mode
33	RSTB	I	global reset pin.Active low to enter reset state.suggest to connecting with an RC reset circuit for stability .normally pull high.
34	STBYB	I	standby mode,normally pull high STBYB="1",normal operation STBYB="0",timming control ,soruce driver will turn off,all output are high-Z
35	SHLR	I	Source right or left sequence control.SHLR="L",shift left:last data=S1<-S2…S1200=first data SHLR="H",shift right:first data=S1->SS2…S1200=last data

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

Terminal no.	Symbol	I/O	Function
36	VCC	P	Digital Power
37	UPDN	I	gate up or down scan control. UPDN="L" , DOWN shift : G1->G2…->G480 ; UPDN="H", up shift: G1<-G2…<-G480
38	GND	P	Digital Ground
39	AGND	P	Analog Ground
40	AVDD	P	Analog Power
41	VCOMin	I	For external VCOM DC input(Optional)
42	DITH	I	Dithering setting DITH="H" 6bit resolution (last 2 bits of input data turncated) DITH="L" 8bit resolution (default setting)
43	NC	-	Not connect
44	NC	-	Not connect
45	V10	P	Gamma correction voltage reference
46	V9	P	Gamma correction voltage reference
47	V8	P	Gamma correction voltage reference
48	V7	P	Gamma correction voltage reference
49	V6	P	Gamma correction voltage reference
50	V5	P	Gamma correction voltage reference
51	V4	P	Gamma correction voltage reference
52	V3	P	Gamma correction voltage reference
53	V2	P	Gamma correction voltage reference
54	V1	P	Gamma correction voltage reference
55	NC	-	Not connect
56	VGH	P	Positive Power for TFT
57	VCC	P	Digital Power
58	VGL	P	Negative Power for TFT
59	GND	P	Digital Ground
60	NC	-	Not connect

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

5.2 Back-Light Unit

CN1 LED Power Source (**BHSR-02VS-1**)

Mating Connector: (**SBHT-002T-P0.5**)

Terminal no.	Symbol	Function
1	VL	LED power supply (high voltage)
2	GL	LED power supply (low voltage)

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

6.0 ELECTRICAL CHARACTERISTICS

6.1 TFT LCD Module

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	Vcc	2.7	3.0	3.5	V	
	V_{GH}	14.5	15	20	V	
	V_{GL}	-10	-7	-6.5	V	
	AV_{DD}	9.85	10	10.15	V	
VCOM	VCOMin	-	3.9	-	V	
Input signal voltage	V_{iH}	0.7 Vcc	-	Vcc	V	Note (1)
	V_{iL}	0	-	0.3 Vcc	V	
Current of power supply	I_{DD}	-	5.426	-	mA	Vcc =3.0V
	I_{ADD}	-	24.1	-	mA	AV_{DD}=10 V(Black)
	I_{GH}	-	0.128	-	mA	V_{GH}=15V
	I_{GL}	-	0.344	-	mA	V_{GL}= 7V
Input level of V1~V5	Vx	AVDD/2-		AVDD-0.1-	V	
Input level of V6~V10	Vx	0.1-		AVDD/2-	V	

Note (1): HSYNC, VSYNC, DE, Digital Data

Note (2): Be sure to apply the power voltage as the power sequence spec.

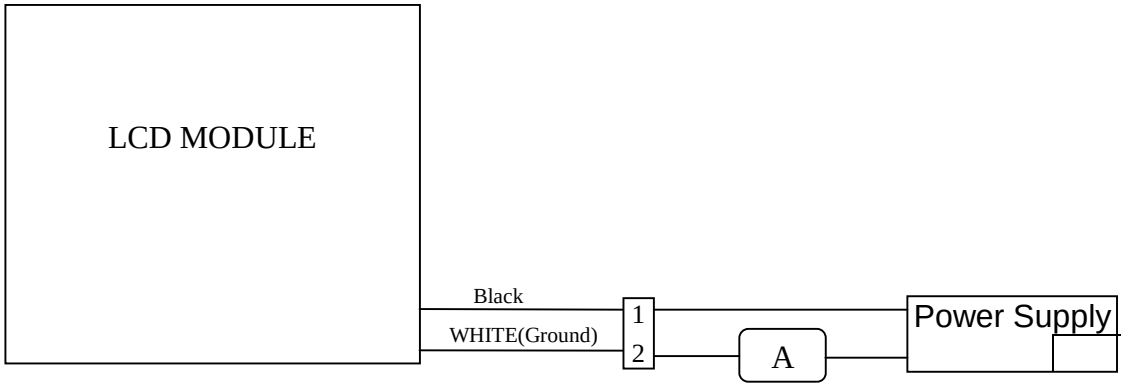
Note (3): DGND=AGND=0V,)

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

6.2 Back-Light Unit

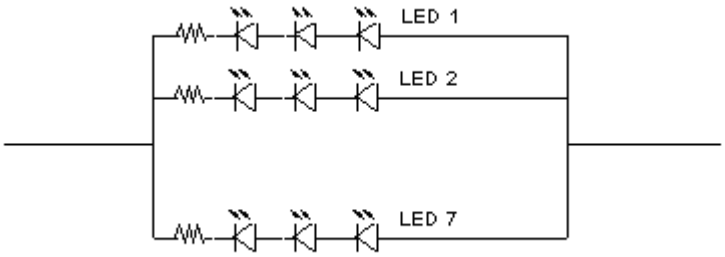
The backlight system is an edge-lighting type with 21 LED.
The characteristics of the LED is shown in the following tables.

Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED current	IL	—	140	—	mA	(2)
LED voltage	VL	—	10.5	—	V	
Operating LED life time	Hr	20,000	—	—	Hour	(1)(2)



Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: Ta=25±3 °C, typical IL value indicated in the above table until the brightness becomes less than 50%.

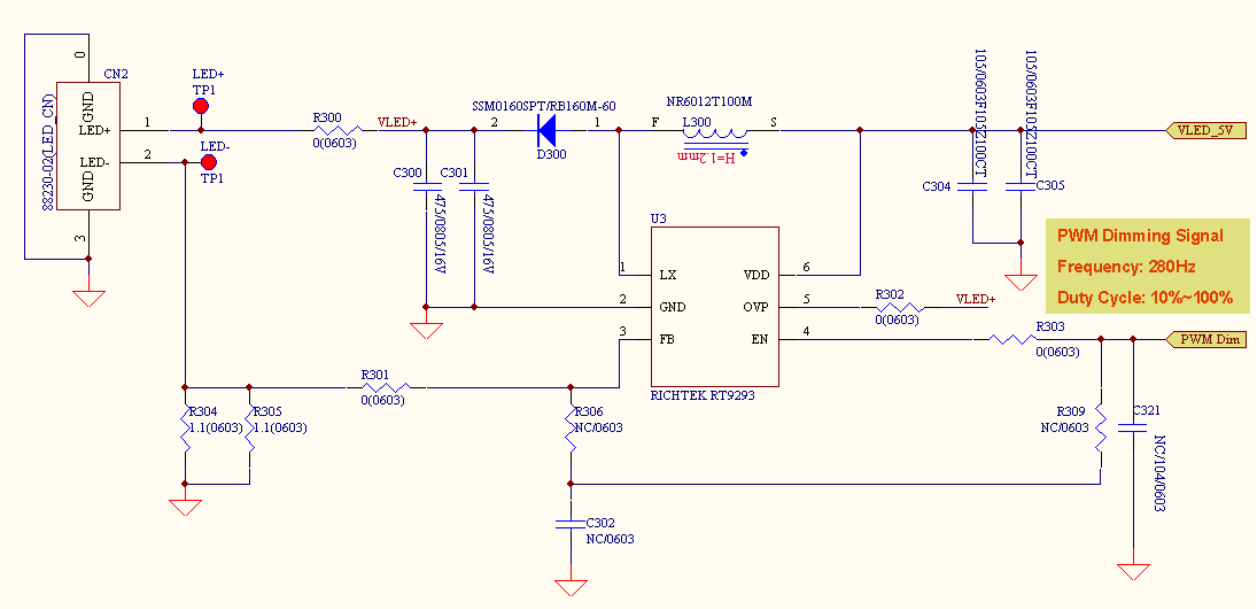
Note (2) The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25℃ and IL=140mA. The LED lifetime could be decreased if operating IL is larger than 140mA. The constant current driving method is suggested.



LED Light Bar Circuit

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

Note (3) Suggested Schematic of LED Back-Light Driver



Suggested Schematic of LED Back-Light Driver

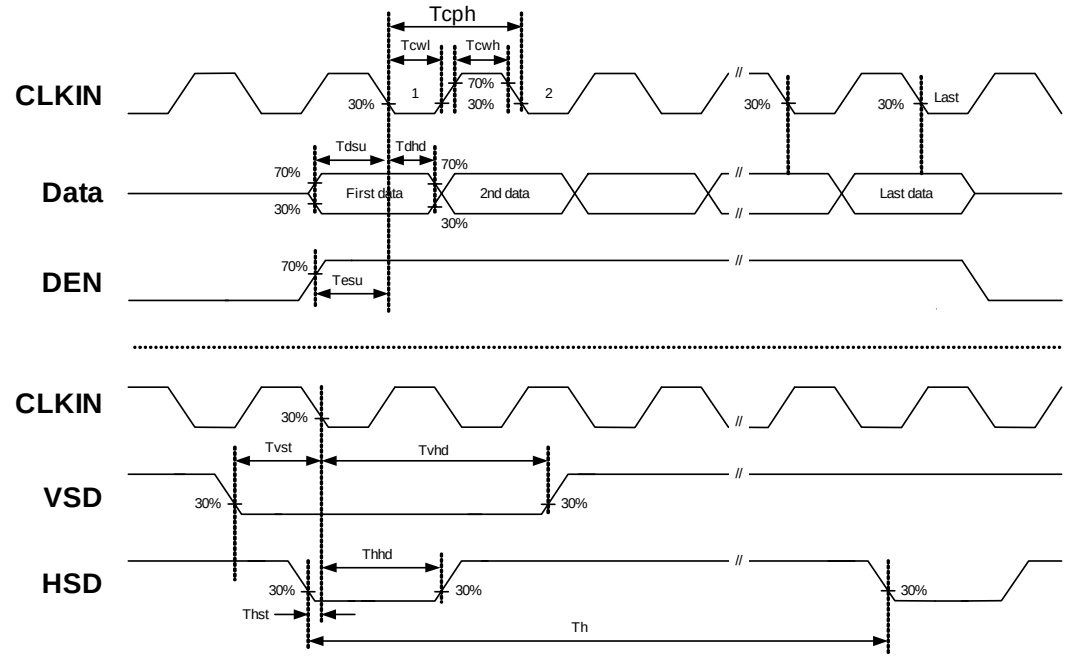
The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

6.3 AC Characteristics

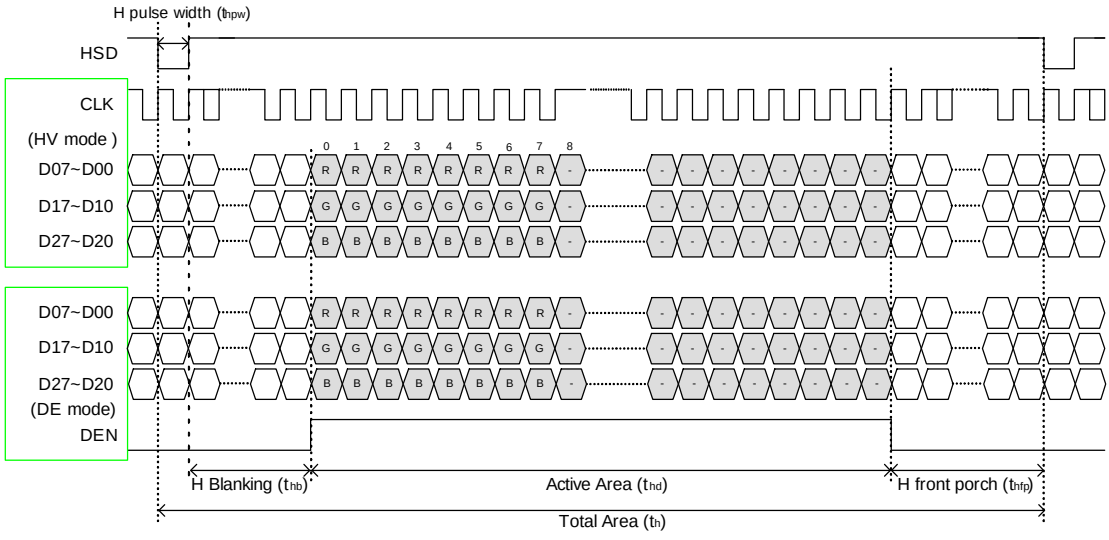
Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK cycle time	Tcph	25			ns	
DCLK frequency	fclk		30	40	MHz	
DCLK pulse duty	Tcwh	40	50	60	%	
VSD setup time	Tvst	8			ns	
VSD hold time	Tvhd	8			ns	
HSD setup time	Thst	8			ns	
HSD hold time	Thhd	8			ns	
Data setup time	Tdsu	8			ns	
Data hold time	Tdhd	8			ns	
DE setup time	Tesu	8			ns	
DE hold time	Tehd	8			ns	
Horizontal display area	thd		800		Tcph	
HSD period time	th		928		Tcph	
HSD pulse width	thpw	1	48		Tcph	
HSD back porch	thb		40		Tcph	
HSD front porch	thfp		40		Tcph	
Vertical display area	tvd		480		th	
VSD period time	tv		525		th	
VSD pulse width	tvpw		3		th	
VSD back porch	tvb		29		th	
VSD front porch	tvfp		13		th	

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

6.4 Timing Diagram of Interface Signal

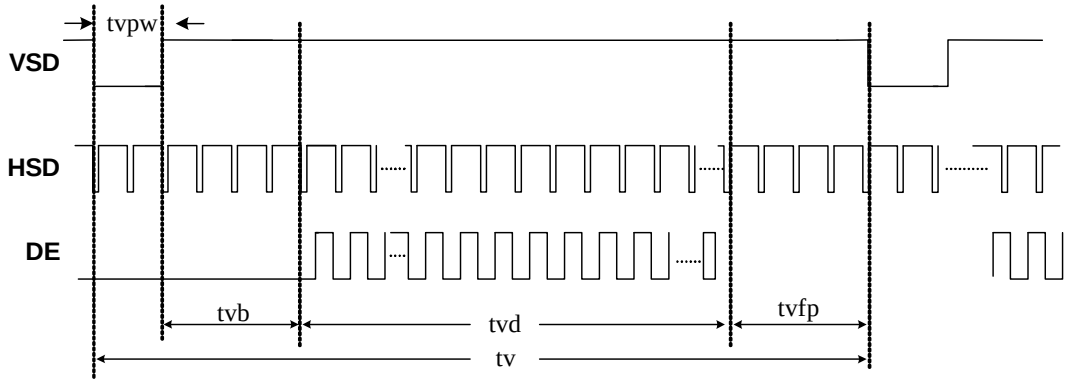


Sampling clock timing



Horizontal display timing range

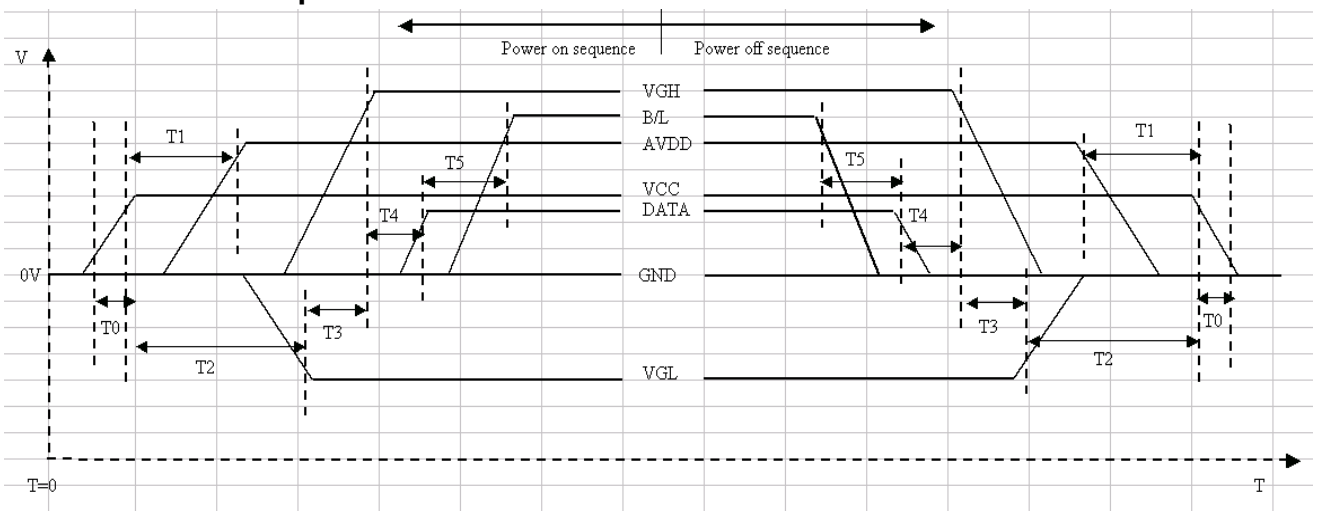
The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.



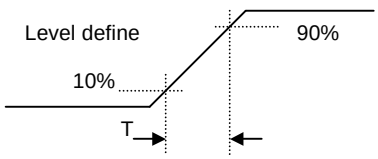
Vertical timing

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

6.5 Power Sequence



Item	Min.	Typ.	Max.	Unit
T0	0.5	--	20	msec
T1	16			msec
T2	20			msec
T3	10			msec
T4	10		50	msec
T5	50			msec



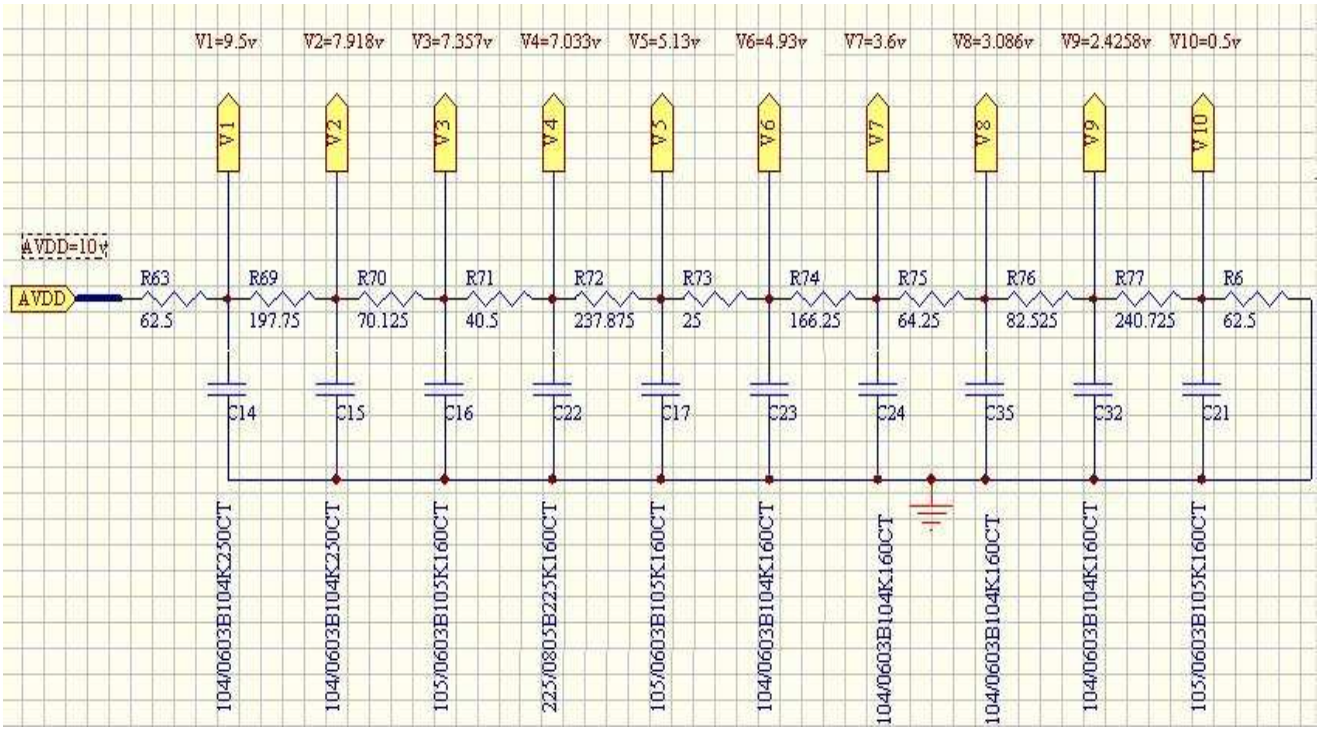
Power On Sequence: VCC-> AVDD -> VGL -> VGH -> Data -> B/L

Power Off Sequence: B/L-> Data -> VGH -> VGL -> AVDD -> VCC

Notes: Data include R0~R7, G0~G7, B0~B7, HSD, VSD, DCLK, SHLR, UPDN, DE MODE, RSTB, STBYB, SHLR, UPDN, DITH

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

6.6 Gamma circuit



The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

7.0 Reliability test items

No.	Item	Conditions	Remark
1	High Temperature Storage	Ta=+80°C, 240hrs	
2	Low Temperature Storage	Ta=-30°C, 240hrs	
3	High Temperature Operation	Ta=+70°C, 240hrs	
4	Low Temperature Operation	Ta=-20°C, 240hrs	
5	High Temperature and High Humidity (operation)	Ta=+60°C, 90%RH, 240hrs	
6	Thermal Cycling Test (non operation)	-30°C(30min) → +80°C(30min), 200cycles	
7	Electrostatic Discharge	±200V,200pF(0Ω) 1 time/each terminal	
8	Vibration	1.Random: 1.04Grms, 5~500Hz, X/Y/Z, 30min/each direction 2. Sine: Freq. Range: 8~33.3Hz Stoke: 1.3mm Sweep: 2.9G, 33.3~400Hz X/Z: 2hr, Y: 4hr, cyc: 15min	
9	Shock	100G, 6ms, ±X, ±Y, ±Z 3 time for each direction	JIS C7021, A-10 (Condition A)
10	Vibration (with carton)	Random: 0.015G^2/Hz, 5~200Hz -6dB/Octave, 200~400Hz XYZ each direction: 2hr	
11	Drop (with carton)	Height: 60cm 1 corner, 3 edges, 6 surfaces	JIS Z0202

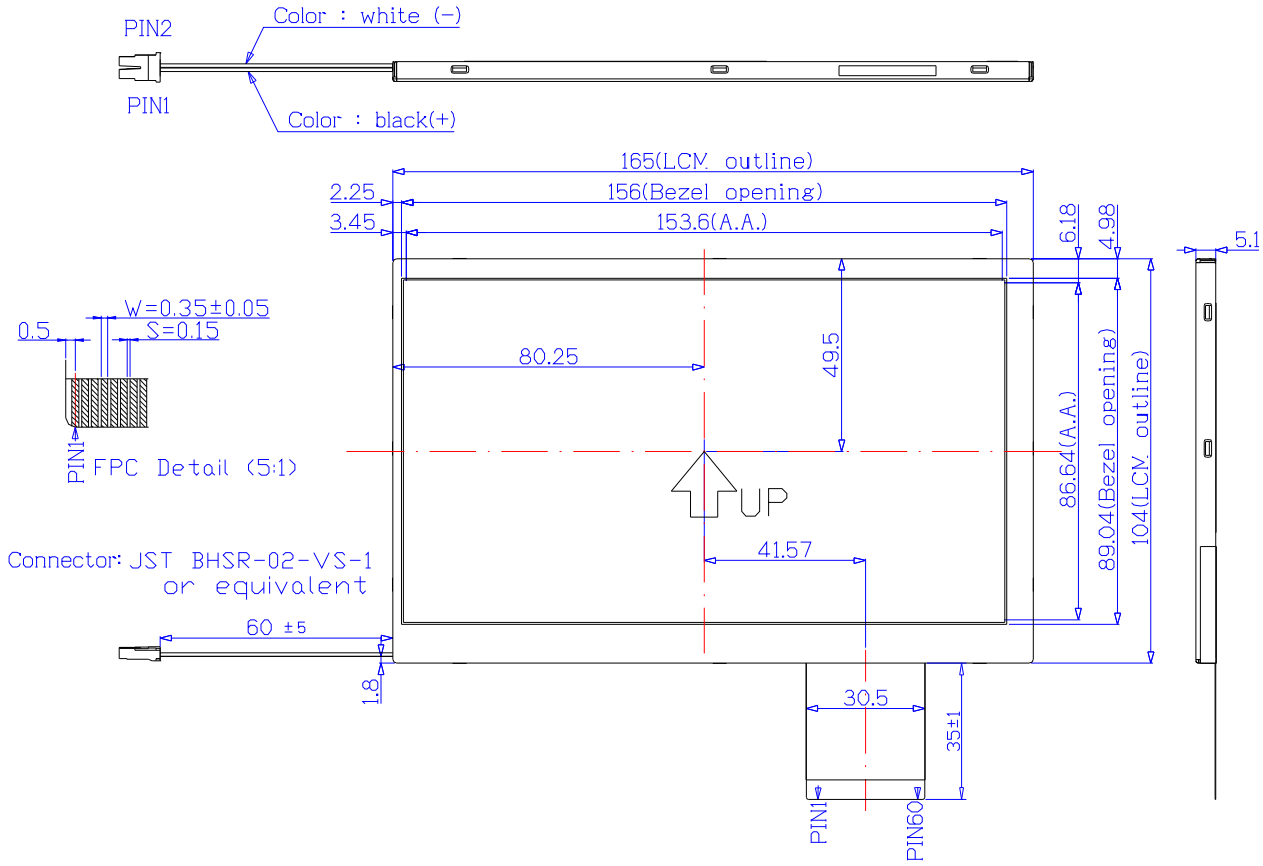
Note: There is no display function NG issue occurred, all the cosmetic specification is judged before the reliability stress.

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

8.0 OUTLINE DIMENSION

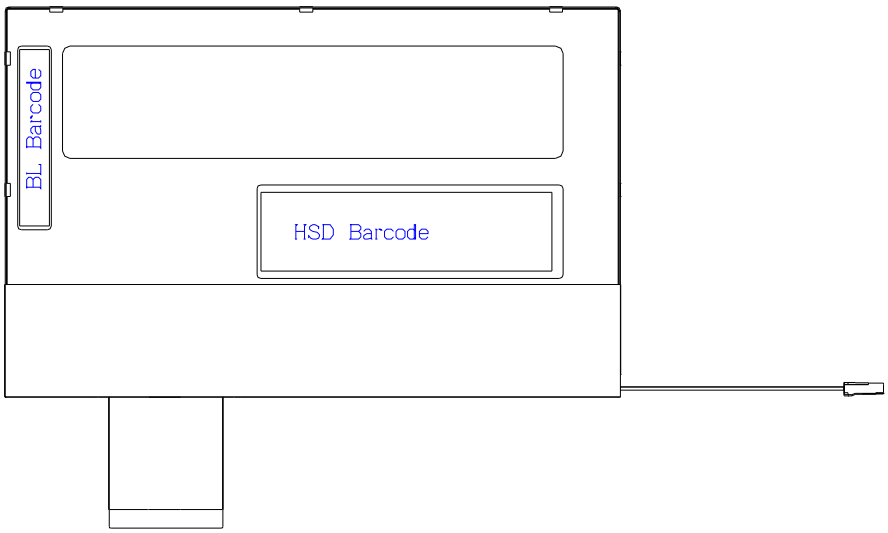
8.1 Outline Dimension

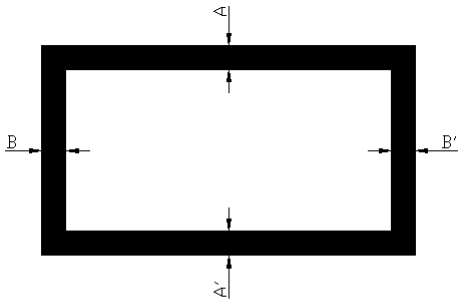
Unit : mm



The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

Note:
1.General tolerence : +/−0.3mm





BM Assembly Tolerance

| A - A' | ≦ 1 (mm)

| B - B' | ≦ 1 (mm)

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

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

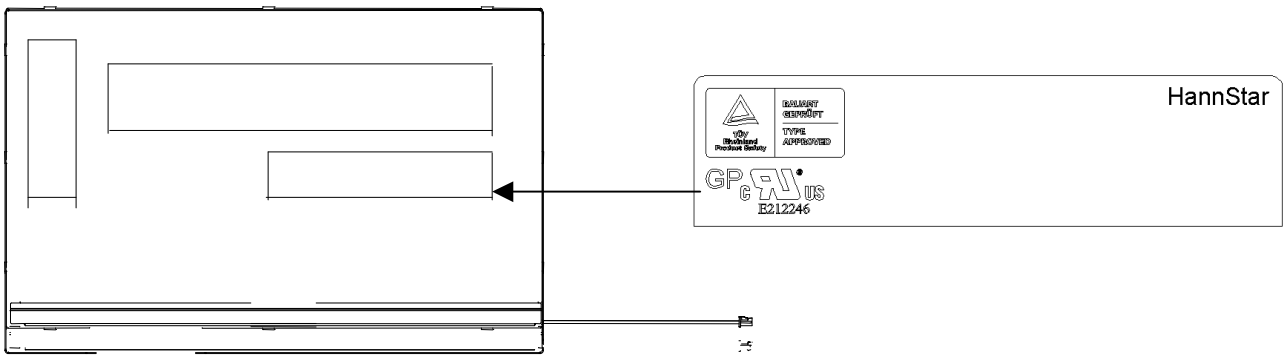
Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Mark	9	0	1	2	3	4	5	6	7	8

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.



The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

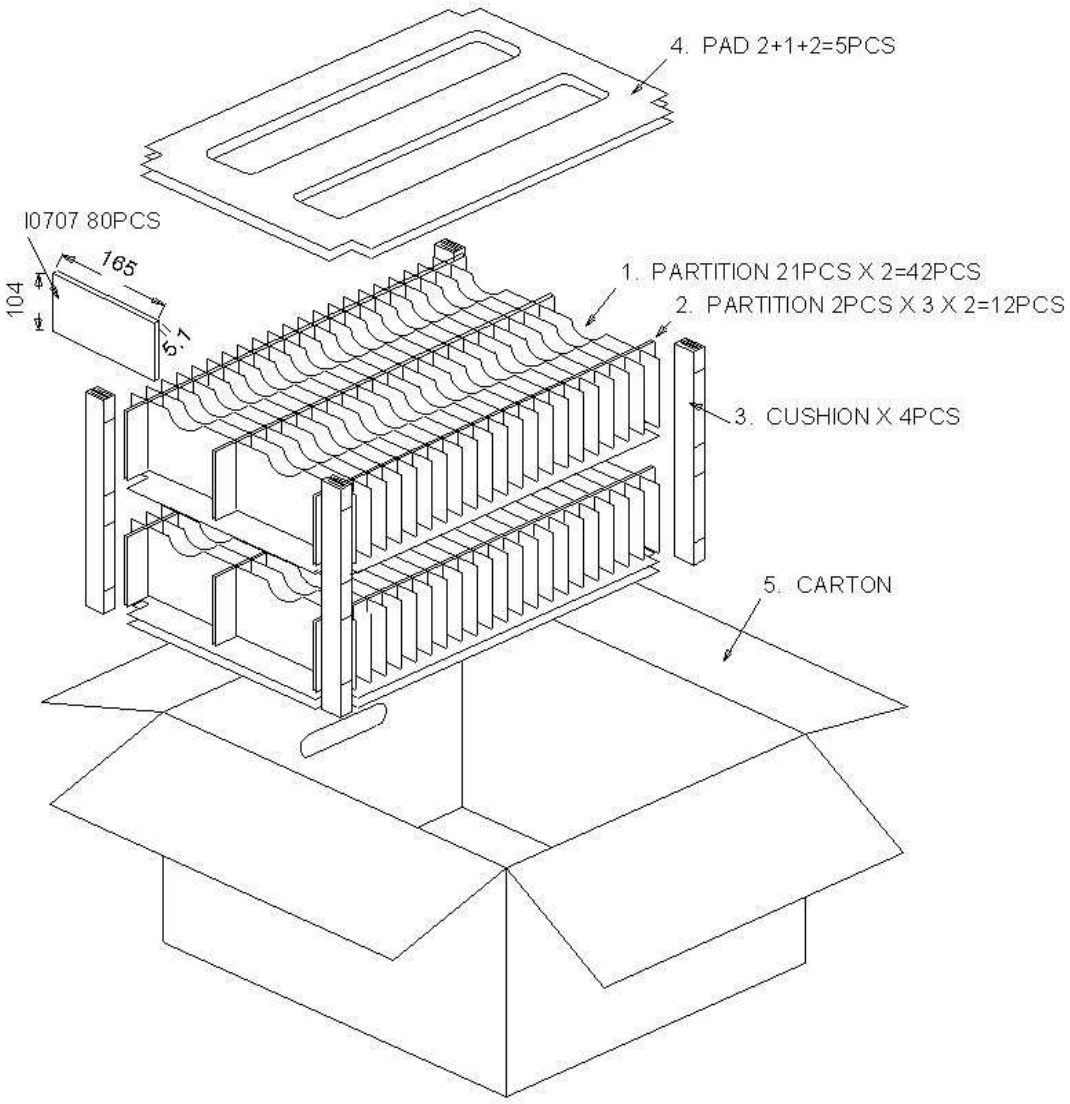
10.0 PACKAGE SPECIFICATION

10.1 Packing form

(1) Package quantity in one carton: 80 pieces.

(2) Carton size: 464±5 mm×360±5 mm×370±5 mm.

10.2 Packing assembly drawings



The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

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.

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.

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.

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 mouting 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.

The information contained in this document is the exclusive property of HannStar Display Corporation. It shall not be disclosed, distributed or reproduced in whole or in part without written permission of HannStar Display Corporation.