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TO :

Date : 2023/12/08

HannStar Product Specification

(Preliminary)

23.8” Reflective TFT-LCD Module

Model: **HSD238MUW3-A00-P**

Note: (1) The information contained herein is tentative 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 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.

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Record of Revisions

Rev.	Date	Sub-Model	Description of change
1.0	2023/11/7 2023/11/13 2023/11/14 2023/11/16 2023/12/07 2023/12/08	-A00-P	Preliminary Product Specification was first released Update “8.0 OUTLINE DIMENSION” drawing Update “9.2 Detail of Lot Mark “ data Update 2.1 Electrical Absolute Rating, 5.1 FPC Pin Assignment, 6.1 TFT LCD Module Information. Mod the file information “Transflective” to “Reflective” Mod “1.1 Introduction” description Del “1.4 General information” NCS item Update “1.4 General information” Frame rate item Up-data “2.1 Electrical Absolute Rating” data Mod “3.1 Optical specification” and “3.2 Optical Specification” data Add “Note (4) Definition of optical measurement setup3.4 Measuring Equipment, Note (5) Definition of optical measurement setup” drawing Up-data “6.3 Interface Timing” data Mod “8.0 OUTLINE DIMENSION” drawing Update “6.4 Power on/off Sequence” data Update “6.2 Frontlight Unit” data

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1.0 GENERAL DESCRIPTION

1.1 Introduction

HannStar Display model HSD238MUW3-A00-P is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. It is a reflective type display. This model is composed of TFT LCD panel, a driving circuit and decorative light. This TFT LCD has a 23.8 inch (16:9) diagonally measured active display area with WUXGA (1920 horizontal by 1080 vertical pixel) resolution.

1.2 Features

- 23.8 inch configuration
- 16.7M color by R.G.B. 8bits
- ROHS / Halogen Free Compliance

1.3 Applications

- TFT LCD Monitor
- Industrial Application
- Amusement

1.4 General information

Item		Specification	Unit
Outline Dimension		543.04(H)x326.46(V)x5.5(D) (w/o PCBa)	mm
Display area		527.04(H)x296.46(V)	mm
Number of Pixel		1920(RGB)x1080	pixels
Pixel pitch		0.2745(H)x0.2745(V)	mm
Pixel arrangement		RGB Vertical Stripe	
Display mode		Normally White	
Interface		LVDS	
Surface treatment(CG)		AG	
Weight		TBD(Typ.)	g
Frame Rate		60Hz (Typ.)	Hz
Power Consumption	Logic System	TBD(Typ.)	W
	D/L System	TBD(Typ.)	W

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2.0 ABSOLUTE MAXIMUM RATINGS

2.1 Electrical Absolute Rating

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	VDD	-0.3	6.5	V	GND=0
Logic Signal Input Level	VI	-0.3	4.3	V	

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) $T_a = 25 \pm 5^\circ\text{C}$

2.2 Environment Absolute Rating

Item	Symbol	Min.	Max.	Unit	Note
Operating Temperature	T_{opa}	-20	60	$^\circ\text{C}$	
Storage Temperature	T_{stg}	-30	70	$^\circ\text{C}$	

Note 1:

If T_a below 50°C , the maximal humidity is 90%RH, if T_a over 50°C , absolute humidity should be less than 70%RH.

Note 2:

The response time will be extremely slow when the operating temperature is around -10°C , and the back ground will become darker at high temperature operating.

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3.0 OPTICAL CHARACTERISTICS

3.1 Optical specification (with D65 light and decorative light off)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
White Reflectance (with Polarizer)	R _w (%)	Θ=0 Normal viewing angle	—	(16.99)	—	%	(4)
Contrast Ratio	CR		—	(17.985)	—	—	(1)(2)
NCS	S(%)		—	(50.4)	—	%	(4)
White chromaticity (CIE1931)	W _x			(0.294)			(4)
	W _y			(0.311)			(4)
Response Time	ms			(15)			
Viewing Angle	Hor.	Θ _L	—	(60)	—	—	(1)(4)
		Θ _R	—	(60)	—		
	Ver.	Θ _U	—	(55)	—		
		Θ _D	—	(55)	—		

3.2 Optical Specification(decorative light on)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio	CR	Θ=0 Normal viewing angle	—	(15)	—	—	(1)(2)
NTSC	S(%)		—	(TBD)	—	%	(4) or (5)
White luminance	Y _L		(15)	(20)			(4) or (5)
White chromaticity (CIE1931)	W _x		(0.254)	(0.294)	(0.334)		(4) or (5)
	W _y		(0.271)	(0.311)	(0.351)		(4) or (5)
Response Time	Tr+Tf	—		(5)		ms	(1)(3)
Viewing Angle	Hor.	Θ _L	—	(60)	—	—	(1)(4) or (1)(5)
		Θ _R	—	(60)	—		
	Ver.	Θ _U	—	(55)	—		
		Θ _D	—	(55)	—		
Brightness Uniformity	B _{UNI}	Θ=0	(30)	—	—		9 AVG

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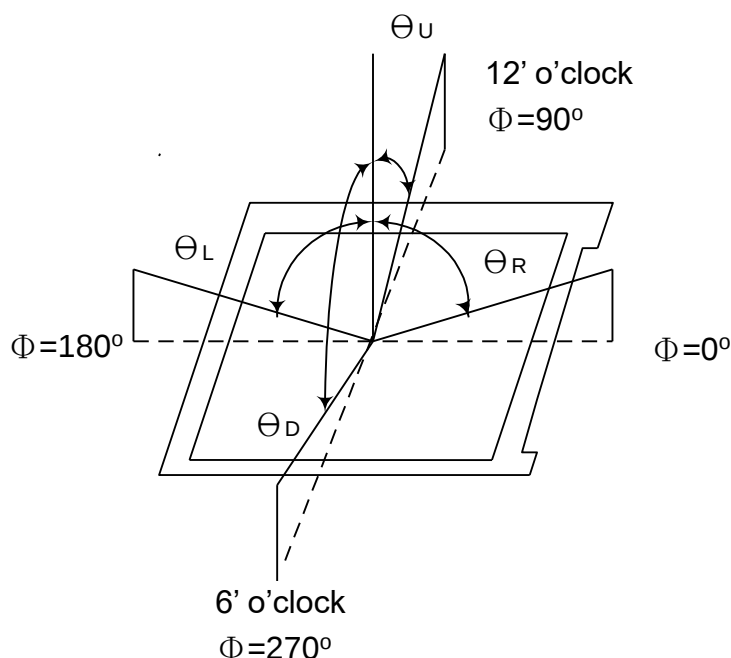
3.3 Measuring Condition

- Measuring surrounding : dark room
- Ambient temperature : $25 \pm 5^{\circ}\text{C}$
- 15min. warm-up time.
- The optical specifications are measured under standard backlight

3.4 Measuring Equipment

- DMS (DMS = Display Measurement System) of AUTRONIC-MELCHERS GmbH, motorized goniometer system for comprehensive display characterization

Note (1) Definition of Viewing Angle:

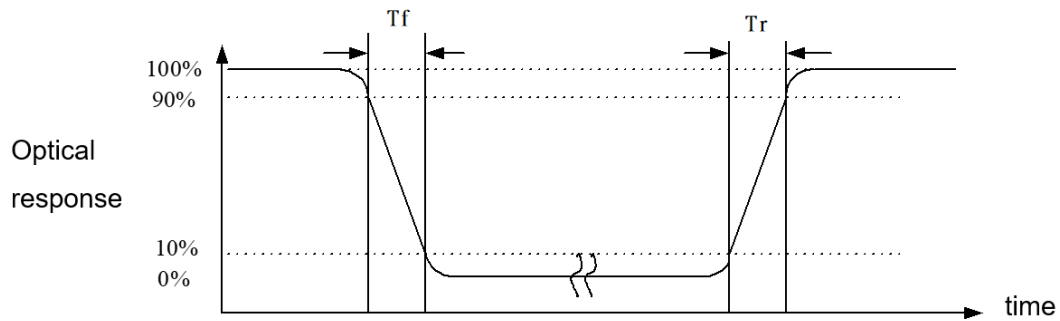


Note (2) Definition of Contrast Ratio (CR) :
measured at the center point of panel

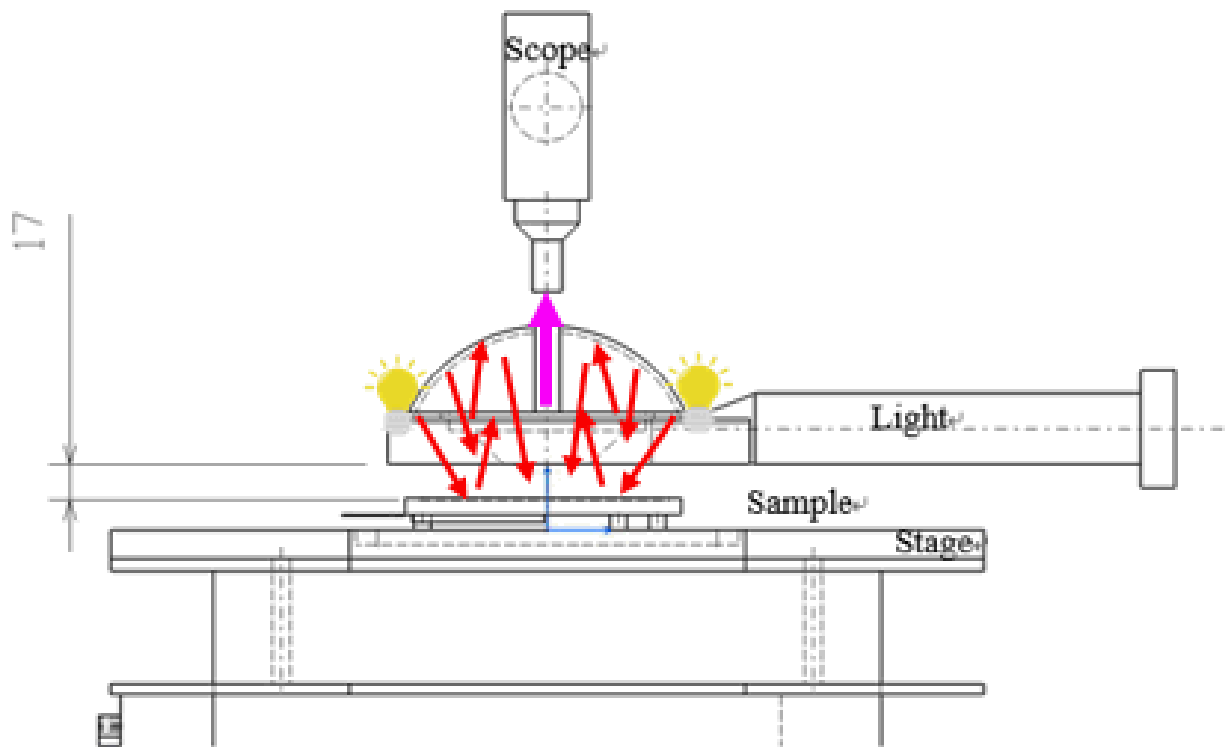
$$\text{CR} = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

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

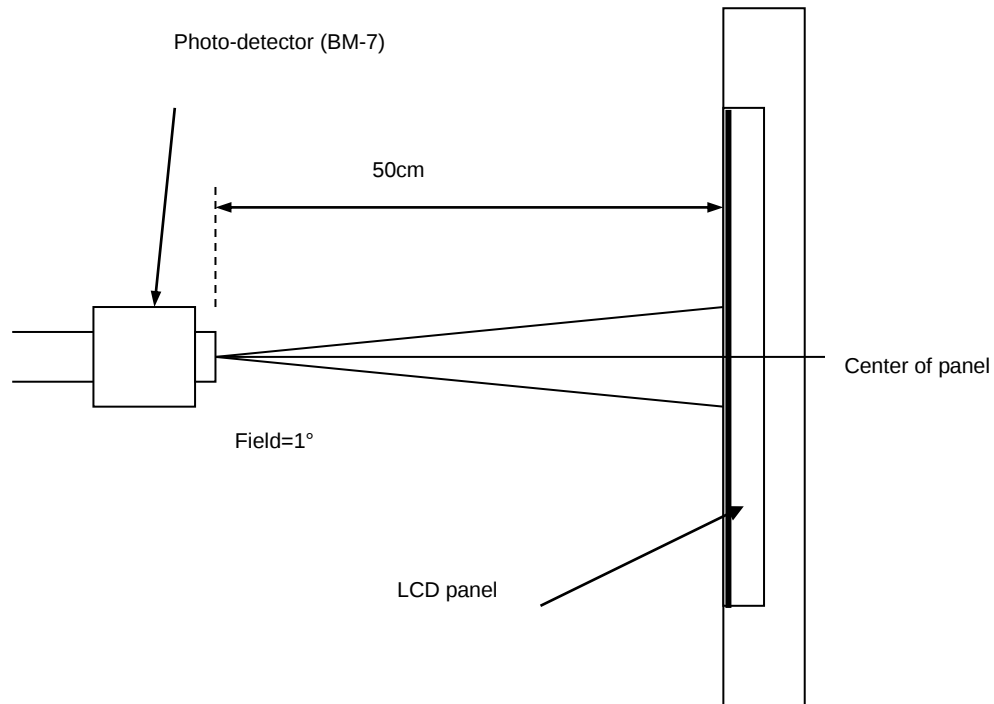


Note (4) Definition of optical measurement setup(Integrating sphere)



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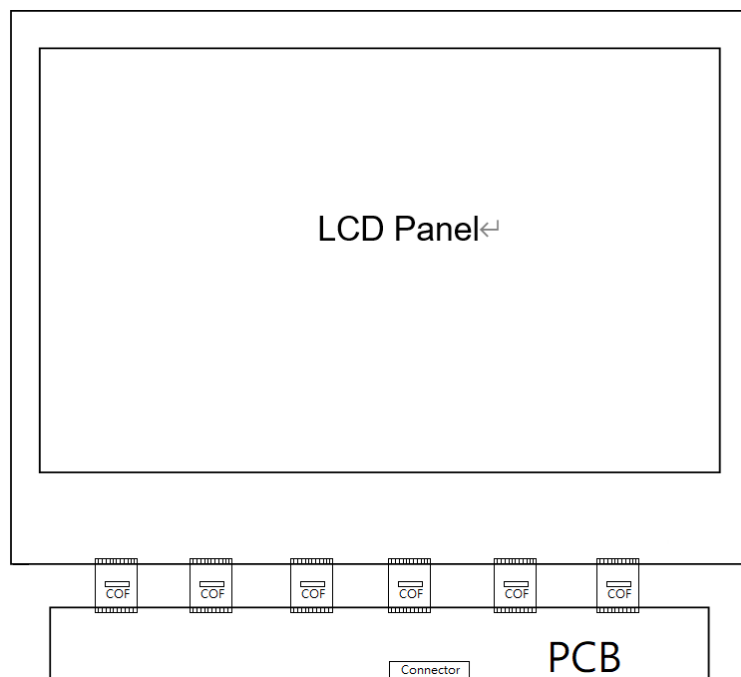
Note (5) Definition of optical measurement setup(Common measurement methods)



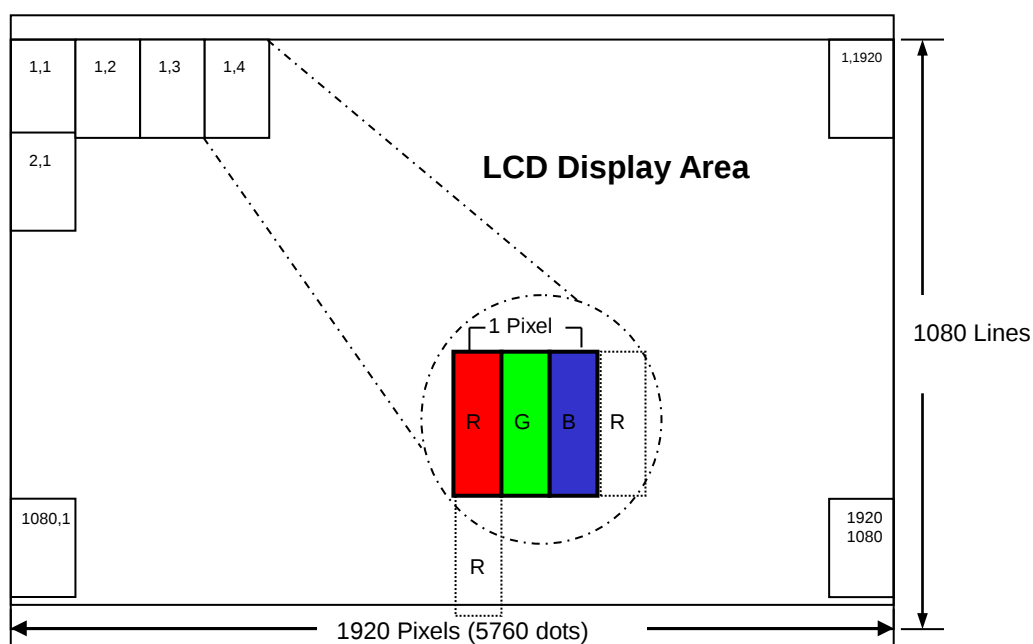
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4.0 BLOCK DIAGRAM

4.1 TFT LCD Module

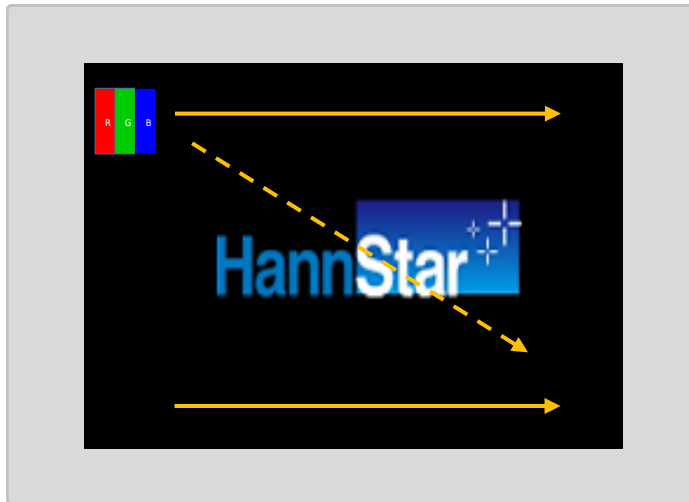


4.2 Pixel Format



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4.3 Display Scanning Direction



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5.0 INTERFACE PIN CONNECTION

5.1 FPC Pin Assignment(LVDS)

The used Connector “LV1023F-03000QH” or equivalent

No.	Symbol	Description
1	RxOIN0-	Negative LVDS differential data input (Odd data)
2	RxOIN0+	Positive LVDS differential data input (Odd data)
3	RxOIN1-	Negative LVDS differential data input (Odd data)
4	RxOIN1+	Positive LVDS differential data input (Odd data)
5	RxOIN2-	Negative LVDS differential data input (Odd data)
6	RxOIN2+	Positive LVDS differential data input (Odd data)
7	GND	Power ground
8	RxOCLKIN-	Negative LVDS differential clock input (Odd clock)
9	RxOCLKIN+	Positive LVDS differential clock input (Odd clock)
10	RxOIN3-	Negative LVDS differential data input (Odd data)
11	RxOIN3+	Positive LVDS differential data input (Odd data)
12	RxEIN0-	Negative LVDS differential data input (Even data)
13	RxEIN0+	Positive LVDS differential data input (Even data)
14	GND	Power ground
15	RxEIN1-	Negative LVDS differential data input (Even data)
16	RxEIN1+	Positive LVDS differential data input (Even data)
17	GND	Power ground
18	RxEIN2-	Negative LVDS differential data input (Even data)
19	RxEIN2+	Positive LVDS differential data input (Even data)
20	RxECLKIN-	Negative LVDS differential clock input (Even clock)
21	RxECLKIN+	Positive LVDS differential clock input (Even clock)
22	RxEIN3-	Negative LVDS differential data input (Even data)
23	RxEIN3+	Positive LVDS differential data input (Even data)
24	NC	Reserved for LCD manufacture's use(WP)
25	NC	Reserved for LCD manufacture's use(SCL)
26	NC	Reserved for LCD manufacture's use(SDA)
27	NC	Reserved for LCD manufacture's use(Bist)
28	VDD	Power Supply +5V
29	VDD	Power Supply +5V
30	VDD	Power Supply +5V

Notes: NC pin must be retained; this pin can't contact GND or other signal

5.2 BLU Pin Assignment

The recommended Connector “FH52-10S-0.5SH” or equivalent

No.	Symbol	Description
1	V _L	Input Power
2	V _L	Input Power
3	V _L	Input Power
4	NC	No Connection
5	CH1	Feedback Channel 1(K1)
6	CH2	Feedback Channel 2(K2)
7	CH3	Feedback Channel 3(K3)
8	CH4	Feedback Channel 4(K4)
9	NC	No Connection
10	NC	No Connection

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5.3 Relationship Between Displayed Color and Input

	Display	MSB LSB								MSB LSB								MSB LSB								Gray scale Level
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0	
Basic color	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	-
	Green	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	-
	Light Blue	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-
	Red	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-
	Purple	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	-
	Yellow	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	-
	White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-
Gray scale of Red	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark ↑ ↓ Light	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	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L252
		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 ↑ ↓ Light	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	H	L	L	L	L	L	L	L	L	L	L	L252
		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 ↑ ↓ Light	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L1
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	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	H	L	L	L252
		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 ↑ ↓ Light	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	H	L	L	L	L	L	L	L	H	L	L	L2
		:								:								:								L3...L251
		H	H	H	H	H	H	L	L	H	H	H	H	H	H	L	L	H	H	H	H	H	H	L	L	L252
		H	H	H	H	H	H	L	H	H	H	H	H	H	L	H	H	H	H	H	H	H	L	H	H	L253
		H	H	H	H	H	H	H	L	H	H	H	H	H	H	L	H	H	H	H	H	H	H	L	H	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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6.0 ELECTRICAL CHARACTERISTICS

6.1 TFT LCD Module

Item		Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage		VDD	4.5	5.0	5.5	V	
Current of VDD		I _{VDD}	-	TBD	-	mA	VDD=5.0V, @60Hz

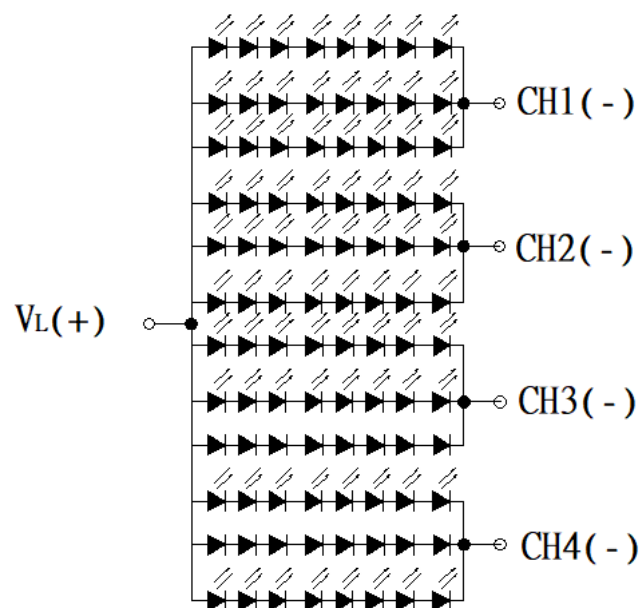
6.2 Frontlight Unit

Parameter	Symbol	Min	Typ	Max	Units	Condition
LED Light Bar Current	I _{VL}	--	60	--	mA	Ta=25°C
LED Light Bar Voltage	V _L	22.4	--	24.8	Volt	Ta=25°C
LED Life-Time	N/A	20,000	--	--	Hour	Ta=25°C Note (1)

Note (1) The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25°C. and ILED=60mA. The LED lifetime could be decreased if operating ILED is larger than 60 mA. The constant current driving method is suggested.

Note (2) LED BACK LIGHT: 96 chip white LEDs (12P8S)

Note (3) $I_{VL} = I_{CH1} + I_{CH2} + I_{CH3} + I_{CH4}$

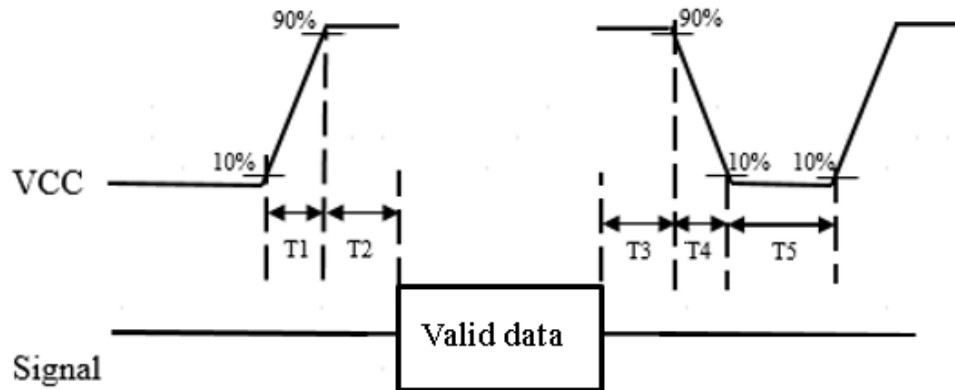


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6.3 Interface Timing

Item	Min.	Typ.	Max.	Unit
Frame Rate	(48)	(60)	(76)	Hz
Vertical Display Time	1080			
Vertical Time	(1100)	(1125)	-	line
Vertical Blanking Time	(20)	(45)	-	line
Horizontal Display Time	960			
Horizontal Time	(1000)	(1100)	-	clock
Horizontal Blanking Time	(40)	(140)	-	clock
Clock Rate	(25)	(74.25)	-	MHz

6.4 Power on/Off Sequence



Power on/off signal sequence

Item	Values			Units
	Min.	Typ.	Max.	
T1	0.5	-	10	ms
T2	0	30	50	ms
T3	0	20	50	ms
T4	0.1	-	100	ms
T5	1000	-	-	ms

Note (1) When no clock is detected, the panel will display black.

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Note(2) In case that Vcc is in off level, please keep the level of input signals on the low or high impedance.

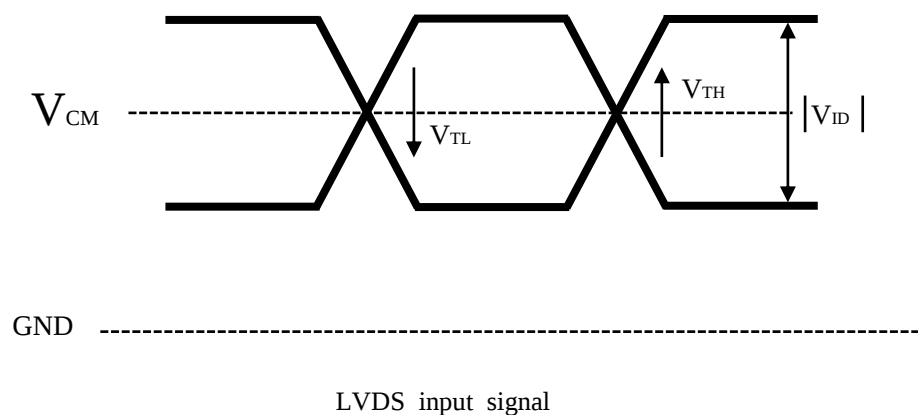
Note(3) To avoid some abnormal display noise, we suggest “Vcc falling time” to follow “T4” definition.

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6.5 Signal Electrical Characteristics

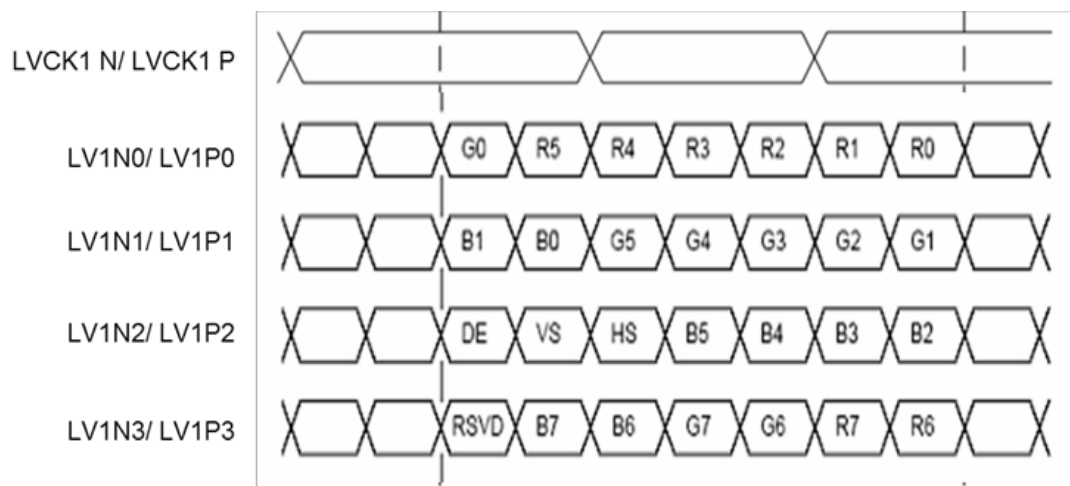
Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
LVDS interface	Differential Input High Threshold Voltage	V _{TH}	+100	-	-	mV	Note (1)
	Differential Input Low Threshold Voltage	V _{TL}	-	-	-100	mV	
	Common Input Voltage	V _{CM}	1.0	1.2	1.4	V	
	Differential input voltage	V _{ID}	100	-	600	mV	
	Terminating Resistor	R _T	90	100	110	ohm	

Note(1) The LVDS input signal has been defined as follows:



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VESA Format:



VESA format

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7.0 RELIABILITY TEST ITEMS

No.	Item	Conditions	Remark
1	High Temperature Storage	Ta=+70℃, 240 hrs	1、2、3
2	Low Temperature Storage	Ta=-30℃, 240 hrs	1、2、3
3	High Temperature Operation	Ta=+60℃, 240 hrs	1、2、3
4	Low Temperature Operation	Ta=-20℃, 240 hrs	1、2、3
5	High Temperature and High Humidity (operation)	Ta=60℃, 90%RH, 240 hrs	1、2、3
6	Thermal Cycling Test (non operation)	-20℃ (30 min)→ +70℃ (30 min), 200 cycle	1、2、3

Note1: There is no display function NG issue occurred, all the cosmetic specification is judged before the reliability stress.

Note2: All of the function & cosmetic Judgment basis base on room temperature.

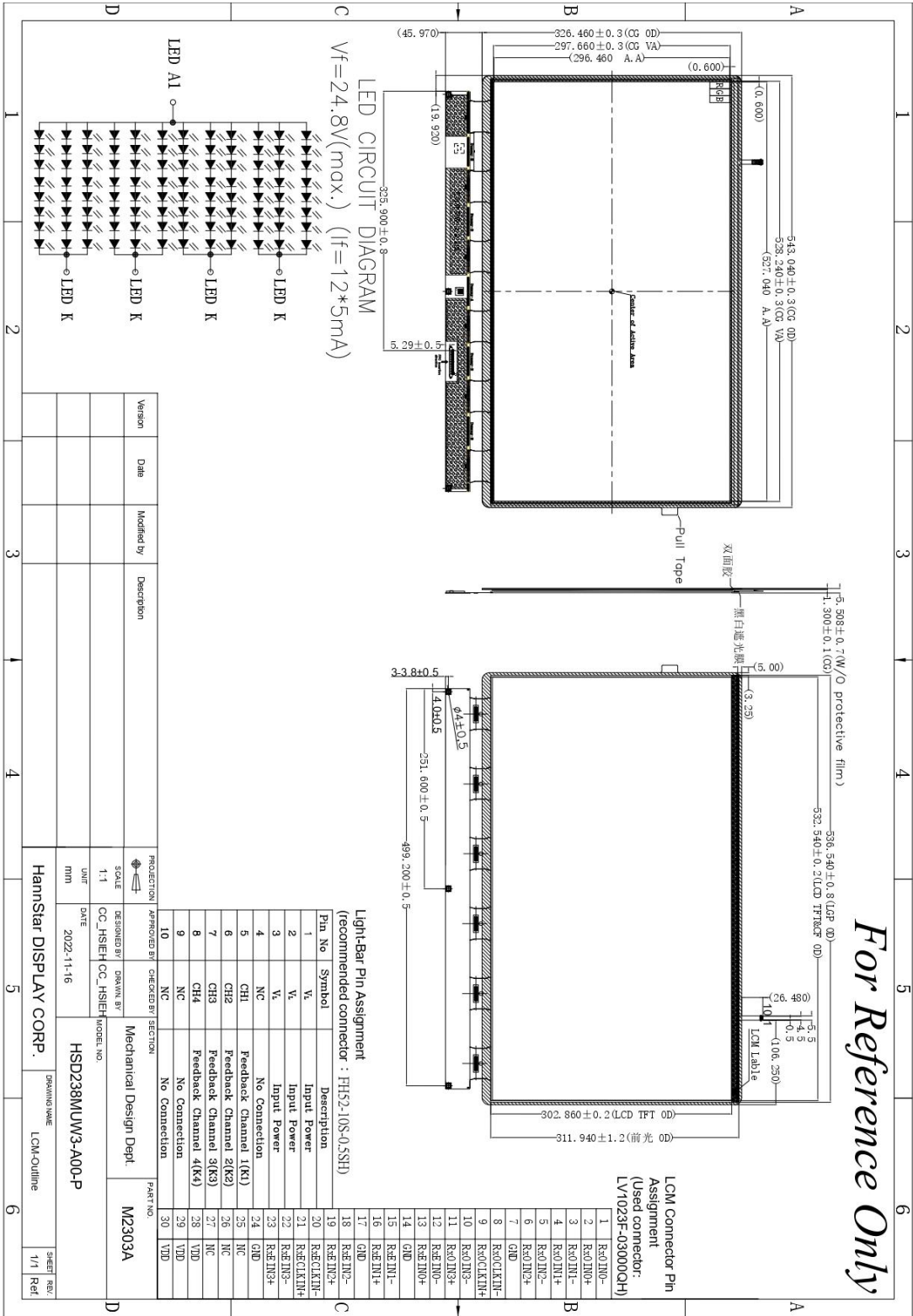
(The tested module must have enough recovery time at least 2 hours at room temperature.)

Note3: The test condition definition panel's surface temperature.

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8.0 OUTLINE DIMENSION

Unit : mm



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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
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Code 1, 2, 3, 5: HannStar internal flow control code.

Code 4: production location.

Code 6: production year.

Code 7: production month.

Code 8, 9, 10, 11, 12, 13: serial number.

Note (1) Production Year: Code 8 is defined by the last number of the year, for example

Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Mark	6	7	8	9	0	1	2	3	4	5	6

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 Detail of Lot Mark

(1) Below label is attached on the LCD FPC. See Section 8.0: Outline Dimension.

(2) The detail of Lot Mark is attached as below.

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



J	8	4	Y	*	*	*	*	*	*	*	*	*
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10.0 PACKAGE SPECIFICATION

10.1 Packing form

Packaging material	Standard	Quantity
BOX		
Blister tray		
Foam1		
Foam2		
Foam3		
Vacuum bag		
Module	HSD238MUW3-A00-P	

10.2 Packing Drawing

TBD

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11.0 GENERAL PRECAUTION

11.1 Use Restriction

This product is not authorized for use in life supporting systems, aircraft navigation control systems, military systems and any other application where performance failure could be life-threatening or otherwise catastrophic.

11.2 Disassembling or Modification

Do not disassemble or modify the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display. HannStar does not warrant the module, if customers disassemble or modify the module.

11.3 Breakage of LCD Panel

- 11.3.1** If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid crystal, and do not contact liquid crystal with skin.
- 11.3.2** If liquid crystal contacts mouth or eyes, rinse out with water immediately.
- 11.3.3** If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.
- 11.3.4** Handle carefully with chips of glass that may cause injury, when the glass is broken.

11.4 Electric Shock

- 11.4.1** Disconnect power supply before handling LCD module.
- 11.4.2** Do not pull or fold the LED cable.
- 11.4.3** Do not touch the parts inside LCD modules and the fluorescent LED's connector or cables in order to prevent electric shock.

11.5 Absolute Maximum Ratings and Power Protection Circuit

- 11.5.1** Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts' parameters, environmental temperature, etc., otherwise LCD module may be damaged.
- 11.5.2** Please do not leave LCD module in the environment of high humidity and high temperature for a long time.
- 11.5.3** It's recommended to employ protection circuit for power supply.

11.6 Operation

- 11.6.1** Do not touch, push or rub the polarizer with anything harder than HB pencil lead.
- 11.6.2** Use fingerstalls of soft gloves in order to keep clean display quality, when persons handle the LCD module for incoming inspection or assembly.
- 11.6.3** When the surface is dusty, please wipe gently with absorbent cotton or other soft material.
- 11.6.4** Wipe off saliva or water drops as soon as possible. If saliva or water drops contact with polarizer for a long time, they may causes deformation or color fading.

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11.6.5 When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzine or other adequate solvent.

11.7 Static Electricity

11.7.1 Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.

11.7.2 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.

11.8 Strong Light Exposure

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

11.9 Disposal

When disposing LCD module, obey the local environmental regulations.