



SPECIFICATION



HSD015GPN3-90000A-MX

1.54" – 200 x 200 – SPI

Version: 1.0
Date: 08.08.2023

Note: This specification is subject to change without prior notice

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TO : DATA MODUL

Date : Aug.08.2023

HannStar Product Information

(Preliminary)

1.54” Mono TFT-LCD Module

Model: **HSD015GPN3-90000A-MX**

- 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.
- (4) The mark “ ** ” of Model means sub-model code.



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Record of Revisions

Rev.	Date	Sub-Model	Description of change
1.0	Aug.,08,2023	90000A-MX	Preliminary Product Information was first released

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1.0 GENERAL DESCRIPTION

1.1 Introduction

HannStar Display model HSD015GPN3-90000A-MX is a mono active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is reflective type TFT LCD panel, a driving circuit and a Front light system. This TFT LCD has a 1.54 inch diagonally measured active display area with 200 x 200 dot (200 horizontal by 200 vertical pixel) resolution.

1.2 Features

- 1.54 inch configuration
- Mono by 2 Gray signal input.
- ROHS / Halogen Free Compliance

1.3 General information

- Industrial Application

1.4 General information

Item	Specification	Unit	
Outline Dimension(LCM)	29.46(H) x34.71(V) x 1.502 (T) (Typ.)	mm	
Display area	27.66(H) x 27.66(V)	mm	
Number of Pixel	200 (H) x 200 (V)	pixels	
Pixel pitch	0.1383(H) X 0.1383(V)	mm	
Display mode	Normally White	--	
Display Interface	SPI	--	
Surface treatment	HCLR	Note	
Weight	TBD	g	
Power Consumption	Logic System (Black Pattern)	45.12 @1Hz	uW
	F/L System	63@330nits	mW

Note: Due to the special surface treatment of the light guide plate, HannStar recommend to attach by air bonding above it instead of direct bonding.

1.5 Mechanical Information

Item	Min.	Typ.	Max.	Unit
Module Size	Horizontal (H)	29.46		mm
	Vertical (V)	34.71		mm
	Depth (D)	1.502		mm
Weight	—	TBD	TBD	g

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2.0 ABSOLUTE MAXIMUM RATINGS

2.1 Electrical Absolute Rating

Item	Symbol	Min.	Max.	Unit	Note
Analog Supply voltage	VCC	2.8	3.3	V	GND=0
Logic Input voltage	Vin	2.8	3.3	V	GND=0

2.2 Environment Absolute Rating

Item	Symbol	Min.	Max.	Unit	Note
Operating Temperature	T _{opa}	-20	70	°C	(3),(4)
Storage Temperature	T _{stg}	-30	80	°C	(3),(4)

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3.0 OPTICAL CHARACTERISTICS

3.1 Optical specification

((Reflective, w/HSD FOG+D65 light))

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
White Reflectance (with Polarizer)	R _w (%)	Θ=0 Normal viewing angle	—	44.57	—	%	(4) Measuring with HSD polarizer, Reference Only Base on V _{op} =4.5V
Contrast Ratio	CR		—	15	—	—	(1)(2) Base on V _{op} =4.5V
Color Chromaticity (CIE1931)	White	W _x	—	(0.300)	—	—	(1)(4) Measuring with HSD polarizer, Reference Only
		W _y	—	(0.330)	—		
Viewing Angle	Hor.	Θ _L	—	60	—	—	(1)(4) Measuring with HSD polarizer, Reference Only
		Θ _R	—	60	—		
	Ver.	Θ _U	—	60	—		
		Θ _D	—	60	—		

3.2 Optical specification (Front Light on)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast	CR>2	Θ=0 Normal viewing angle	—	TBD	—		(1)(2)
White luminance	Y _L		—	(330)	—	cd/m ²	(1)(4)
Color chromaticity (CIE1931)	White		W _x	—	TBD	—	—
		W _y	—	TBD	—		
Viewing angle	Hor.	Θ _L	—	60	—	—	(1)(4)
		Θ _R	—	60	—		
	Ver.	Θ _U	—	30	—		
		Θ _D	—	30	—		

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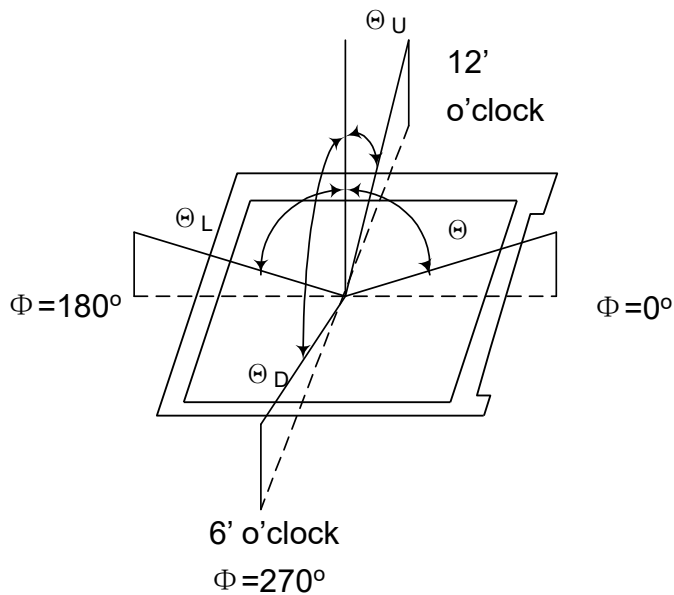
3.3 Measuring Condition

- Measuring surrounding: dark room
- Ambient temperature: $25 \pm 2^\circ\text{C}$
- 15min. warm-up time.

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:

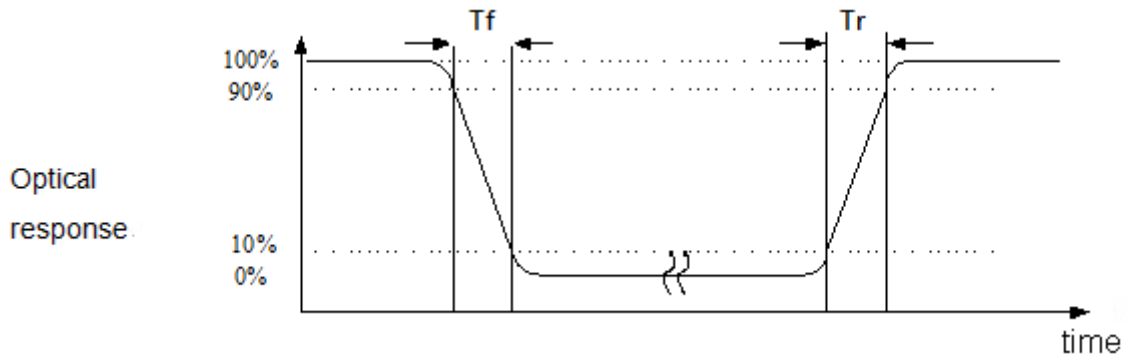


Note (2) Definition of Contrast Ratio (CR) :
measured at the center point of panel

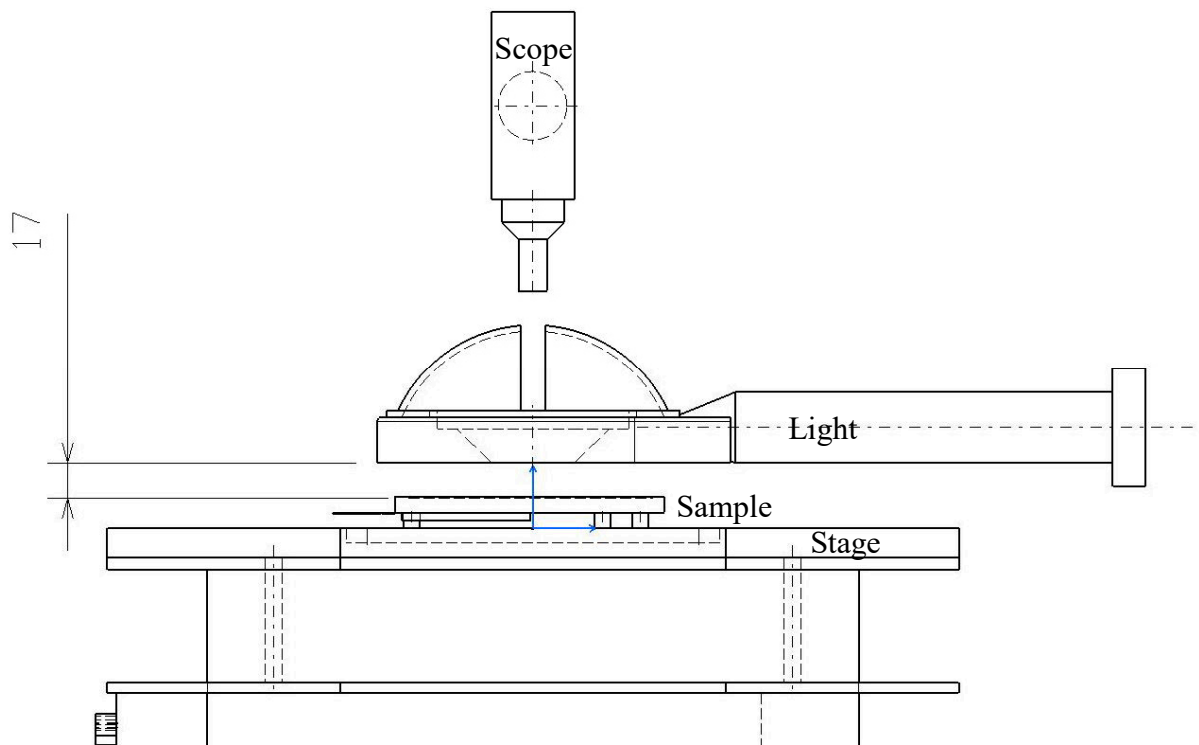
$$\text{CR} = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

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



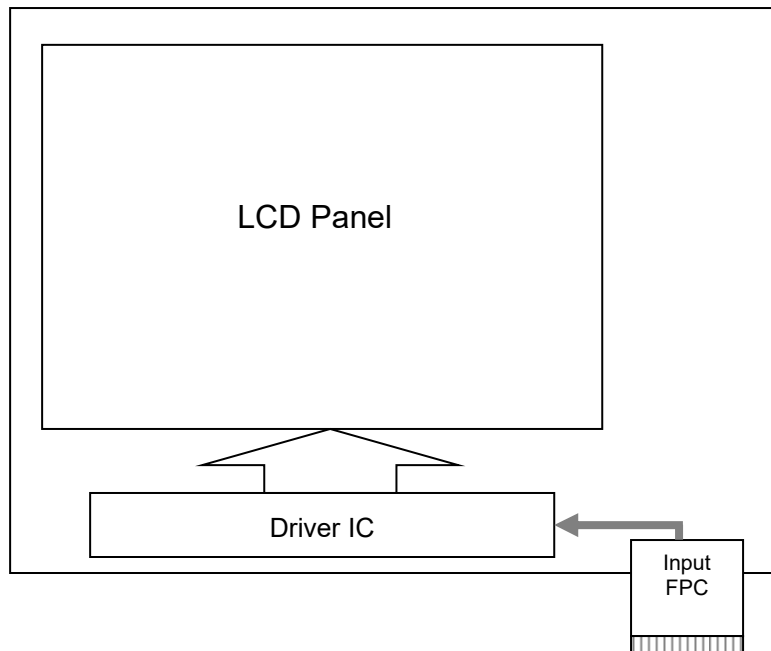
Note (4) Definition of optical measurement setup



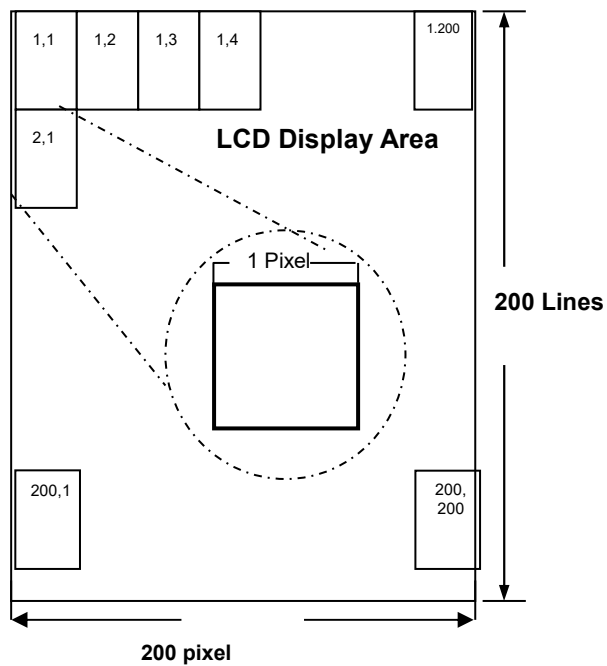
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4.0 BLOCK DIAGRAM

4.1 TFT LCD Module



4.1 Pixel Format



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4.2 Relationship Between Displayed Color and Input

	Display	B/W	Gray scale Level
Basic color	Black	H	-
	White	L	-

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5.0 INTERFACE PIN CONNECTION

5.1 LCM Pin Assignment

PIN	SYMBOL	Description
1	GND	Ground
2	GND	Ground
3	VDDA	3.2V(min.)/3.3V(Typ.)/3.4V(Max.)
4	VDDI	3.2V(min.)/3.3V(Typ.)/3.4V(Max.)
5	NC	Not connect
6	NC	Not connect
7	DB0	Not connect
8	DB1	Not connect
9	DB2	Not connect
10	DB3	Not connect
11	DB4	Not connect
12	DB5	Not connect
13	NC	Not connect
14	NC	Not connect
15	DB6	Not connect
16	DB7	Not connect
17	DB8	Not connect
18	DB9	Not connect
19	DB10	Not connect
20	DB11	Not connect
21	NC	Not connect
22	NC	Not connect
23	DB12	Not connect
24	DB13	Not connect
25	DB14	Not connect
26	DB15	Not connect
27	DB16	Not connect
28	DB17	Not connect

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29	GND	Ground
30	DCLK	Not connect
31	RESET	Reset
32	HSYNC	Not connect
33	VSYNC	Not connect
34	DE	Not connect
35	IM3	Not connect
36	IM2	Not connect
37	IM1	Not connect
38	IM0/ID	Not connect
39	LED_ON	HSD Reserved Function(OTP Power Use)
40	LED_PWM	Not connect
41	RS	SPI Data/command Select(4wire SPI interface)
42	RD	Not connect
43	SCL/WR	SPI Clock Input(4wire SPI interface)
44	SDI/SDA	SPI Data Input(4wire SPI interface)
45	CS	SPI Chip Select(4wire SPI interface)
46	LED-	LED-
47	LED+	LED+
48	GND	Ground
49	GND	Ground
50	GND	Ground

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5.2 Light bar Pin Assignment

Connector : FH52-10S-0.5SH (HRS)

Pin 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	NC	No Connection
7	NC	No Connection
8	NC	No Connection
9	NC	No Connection
10	NC	No Connection

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6.0 ELECTRICAL CHARACTERISTICS

6.1 TFT LCD Module

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Analog Supply voltage	VCC	2.8	3.3	3.3	V	
Analog supply current	I _{VCC}		13.7	17.1	uA	VCC=2.8V
Logic input voltage	V _{IH}	0.8*VDDI	-	VDDI	V	
	V _{IL}	0	-	0.2*VDDI	V	

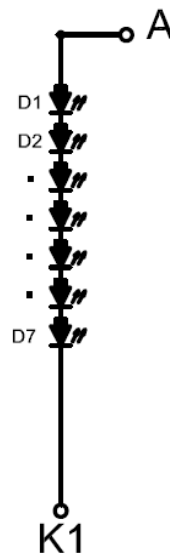
6.2 Front Light Unit

Parameter	Symbol	Min	Typ	Max	Units	Condition
LED Current	I _F	--	3	--	mA	Ta=25°C
LED Voltage	V _F	--	21	--	Volt	Ta=25°C
LED Life-Time	N/A		--	30000	Hour	Ta=25°C Note (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°C. and I_F=6mA. The LED lifetime could be decreased if operating I_F is larger than 6mA. The constant current driving method is suggested.

Note (3) LED Light Bar Circuit



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6.3 Interface Characteristics

6.3.1 8080 Parallel Interface

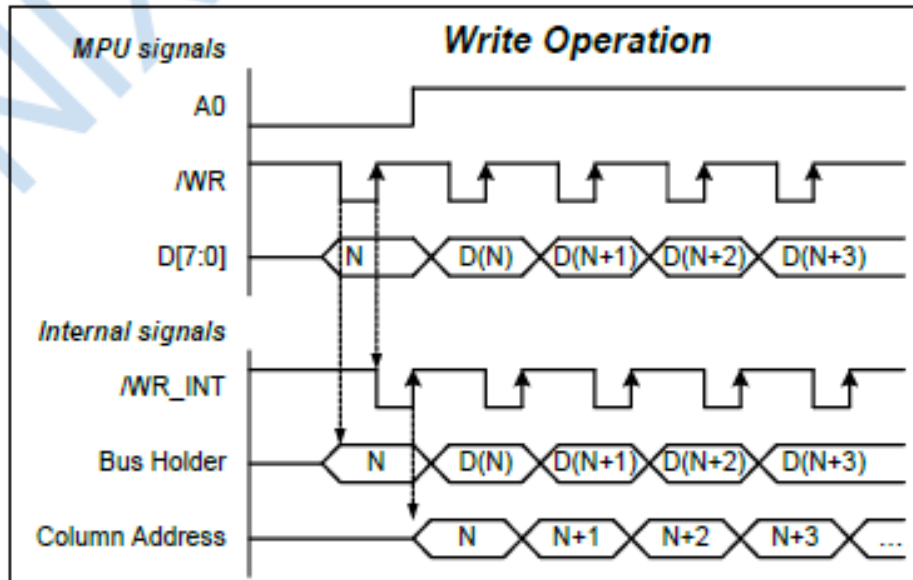
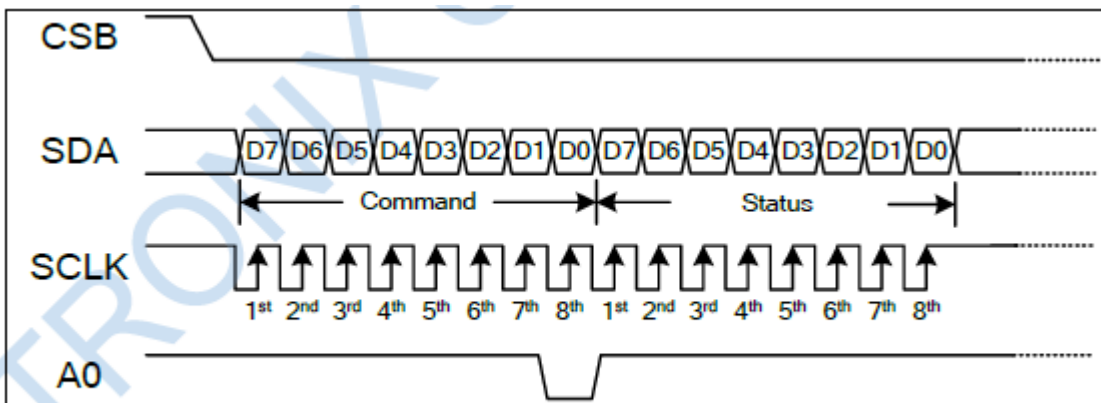


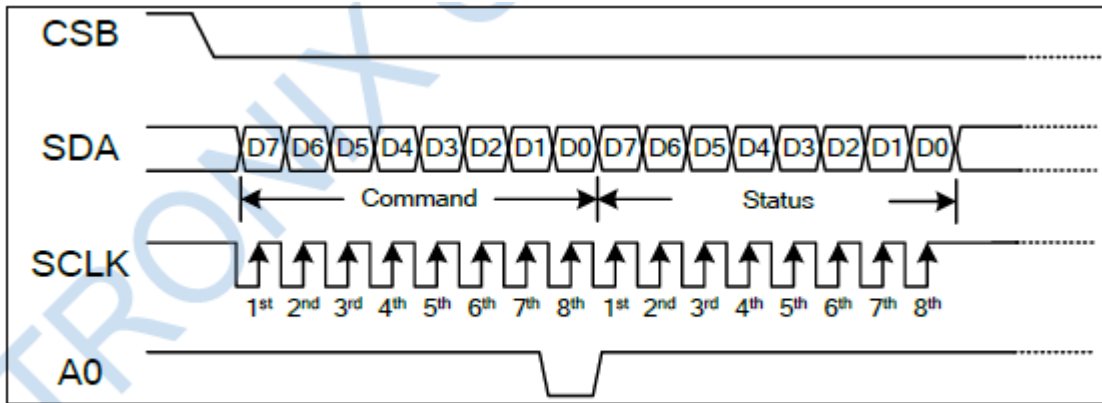
Fig1. Data Transfer: Write

6.3.2 Single 4-Line Serial Interface



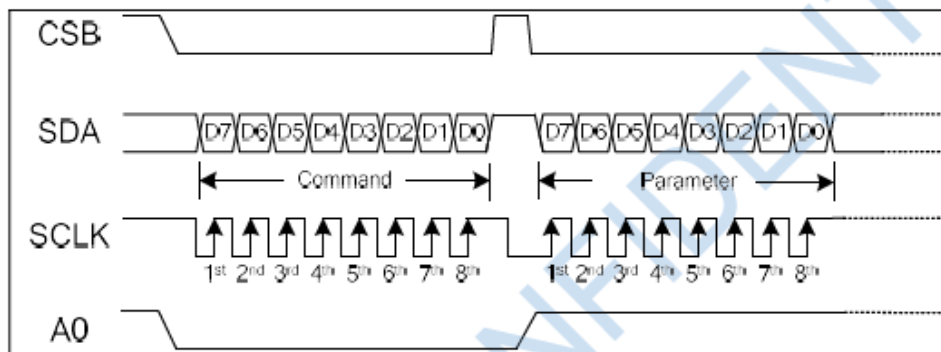
Read Status Operation of 4-Line SPI

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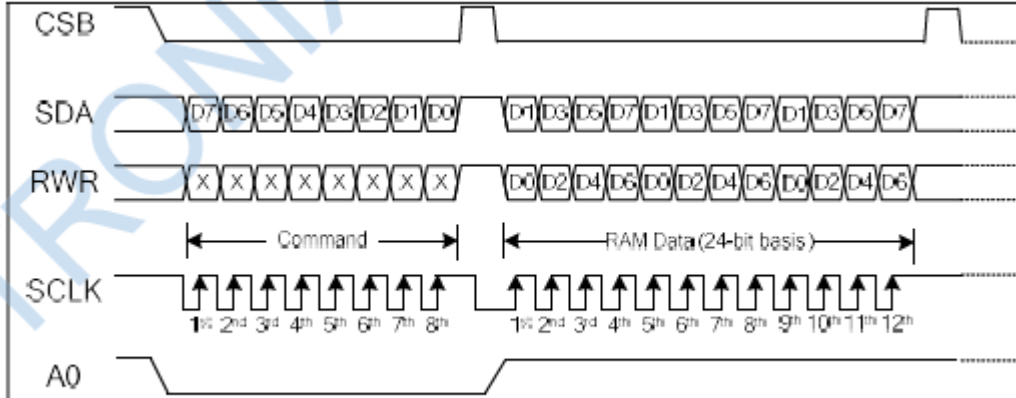
Read Status Operation of 4-Line SPI

6.3.3 Dual 4-Line Serial Interface



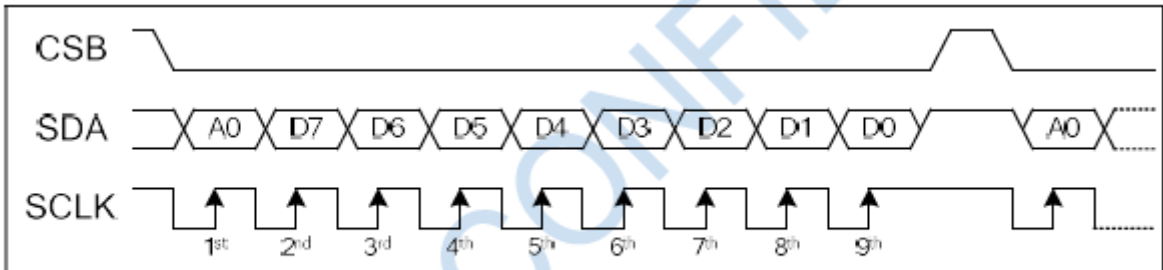
Command Write Operation of Dual 4-Line SPI

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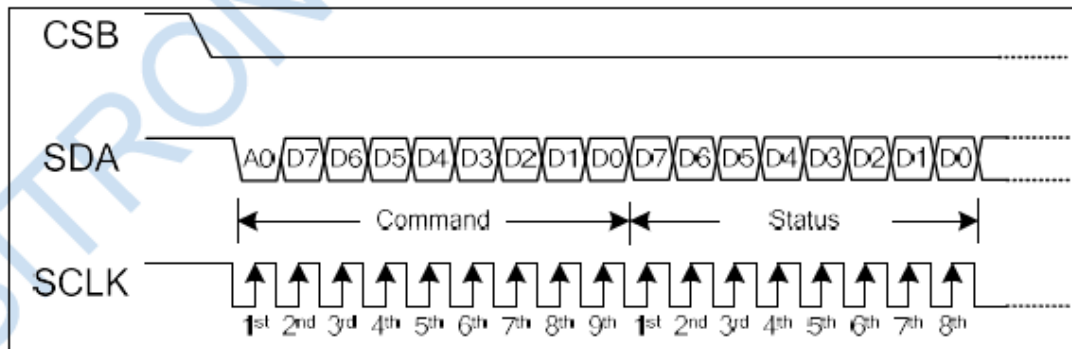


RAM Write Operation of Dual 4-Line SPI

6.3.4 3-Line Serial Interface



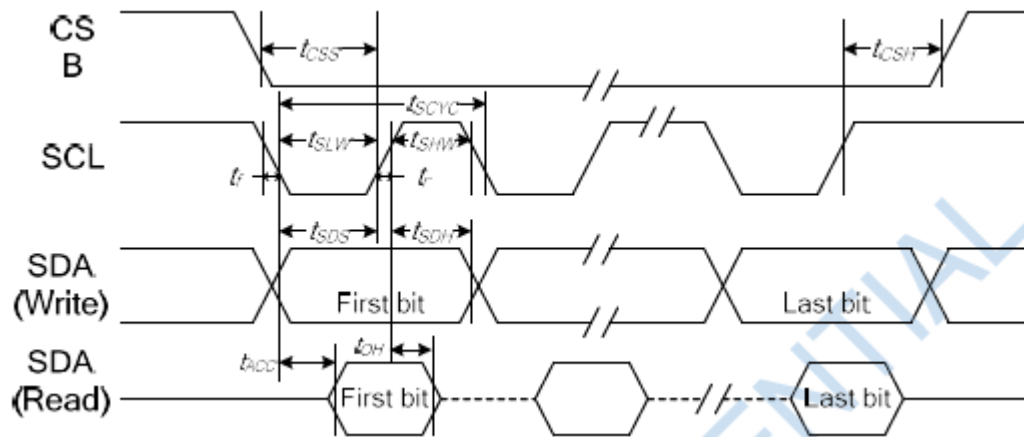
Write Operation of 3-Line SPI



Read Status Operation of 3-Line SPI

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6.3.5 System BusTiming for 3SPI MCU Interface



VDDI = 1.8~3.3V, Ta = 25°C

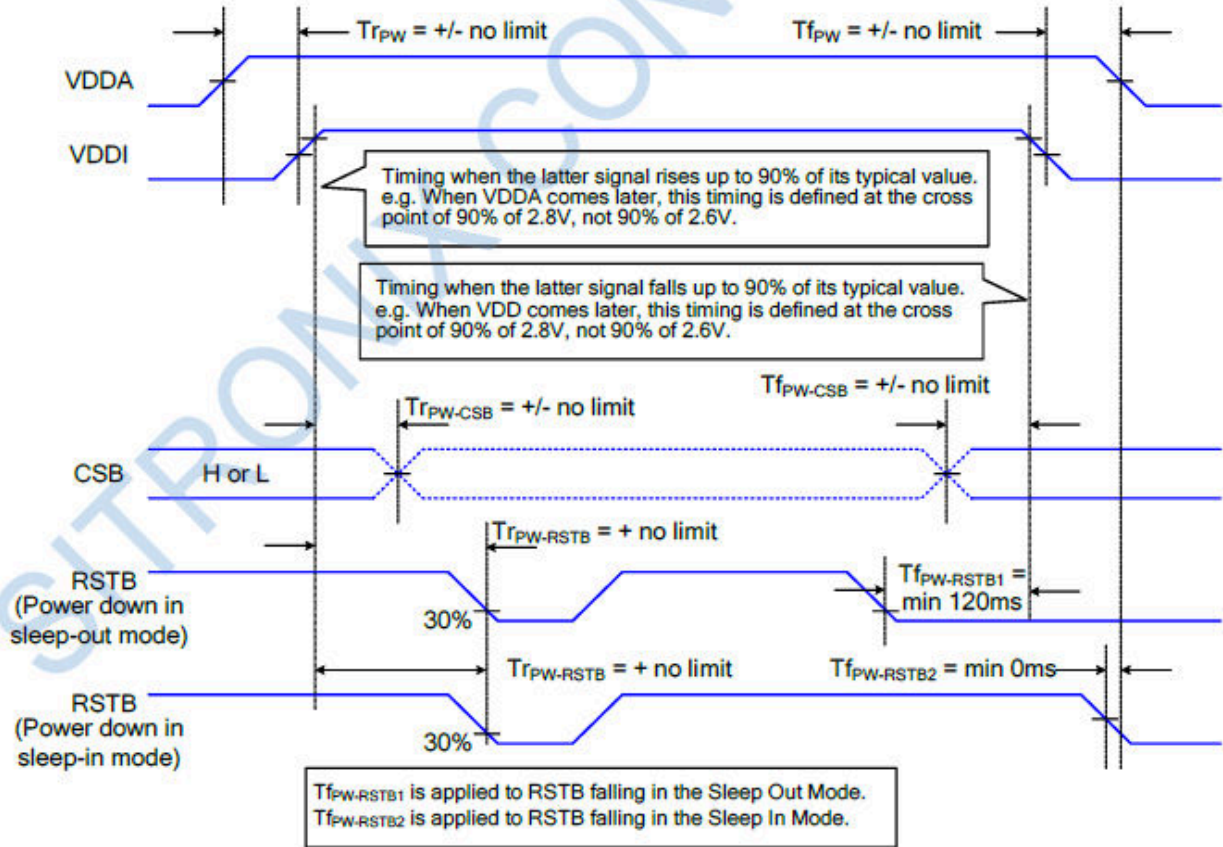
Item	Signal	Symbol	Condition	Min.	Max.	Unit
Serial clock period (Write)	SCL	tSCYC		30	—	ns
Serial clock period (Read)				150		
SCLK "H" pulse width (Write)		tSHW		15	—	
SCLK "H" pulse width (Read)				60		
SCLK "L" pulse width (Write)		tSLW		15	—	
SCLK "L" pulse width (Read)				60		
Data setup time	SDA	tSDS		10	—	
Data hold time	(Write)	tSDH		10	—	
Data setup time	SDA	tACC	For maximum CL=30p	10	50	
Data hold time	(Read)	tOH	For minimum CL=8p	15	50	
CSB-SCLK time	CSB	tCSS		10	—	
CSB-SCLK time		tCSH		10	—	

Note:

1. The input signal rise and fall time (t_r , t_f) are specified at 15 ns or less.
2. All timing is specified using 20% and 80% of VDDI as the standard.

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6.4 Power ON/OFF Sequence



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7.0 RELIABILITY TEST ITEMS

No.	Item	Conditions	Remark
1	High Temperature Storage	Ta=+80±2°C, 240hrs	1,2,3
2	Low Temperature Storage	Ta=-30±2°C, 240hrs	1,2,3
3	High Temperature Operation	Ta=70±2°C, 240hrs	1,2,3
4	Low Temperature Operation	Ta=-20±2°C, 240hrs	1,2,3
5	High Temperature and High Humidity (operation)	Ta=60±2°C, 90%RH, 240Hrs	1,2,3

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

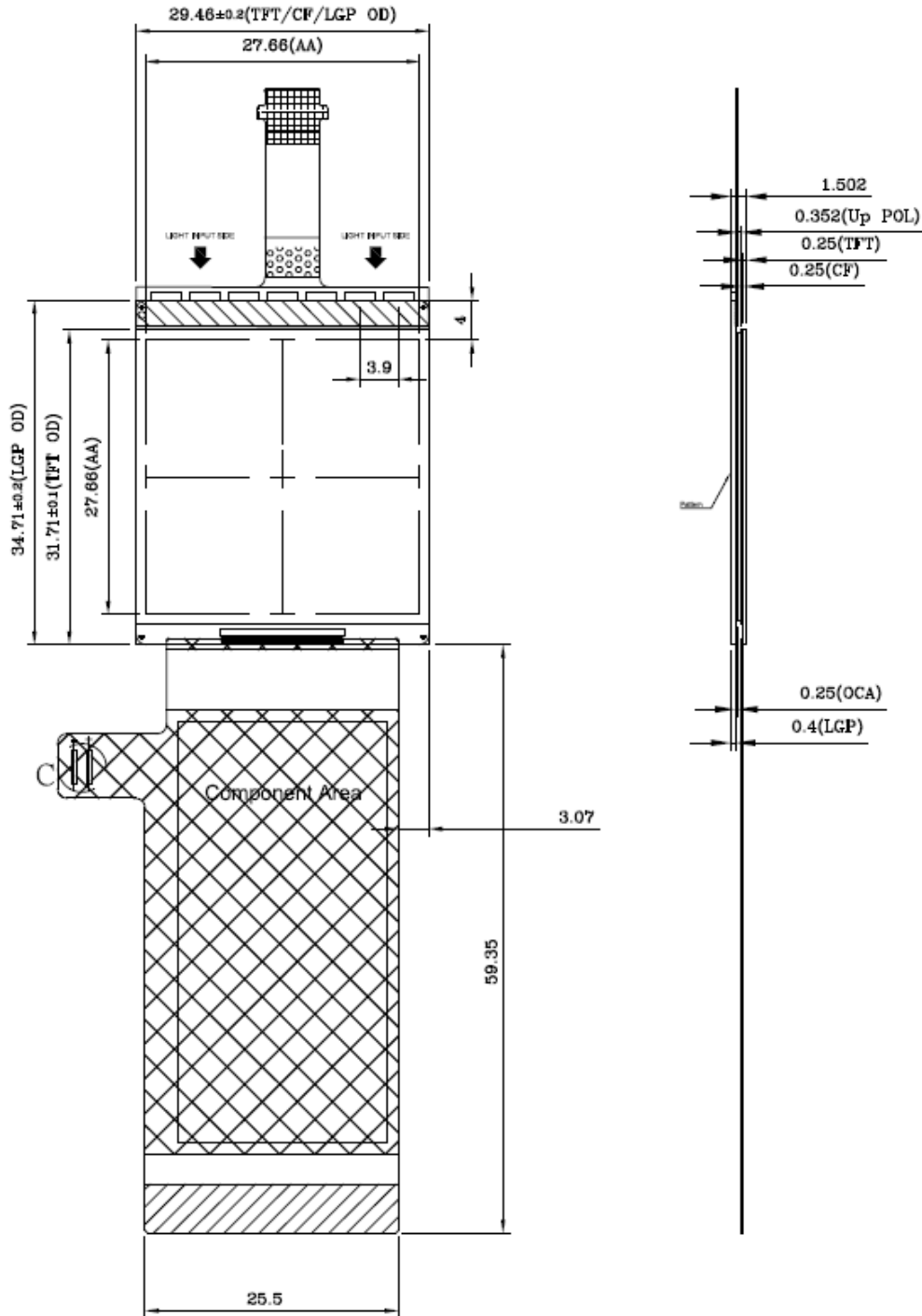
Note2: All of the function & cosmetic Judgment basis base on room temperature.
(The tested module must have enough recovery time at least 2 hours at room temperature.)

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

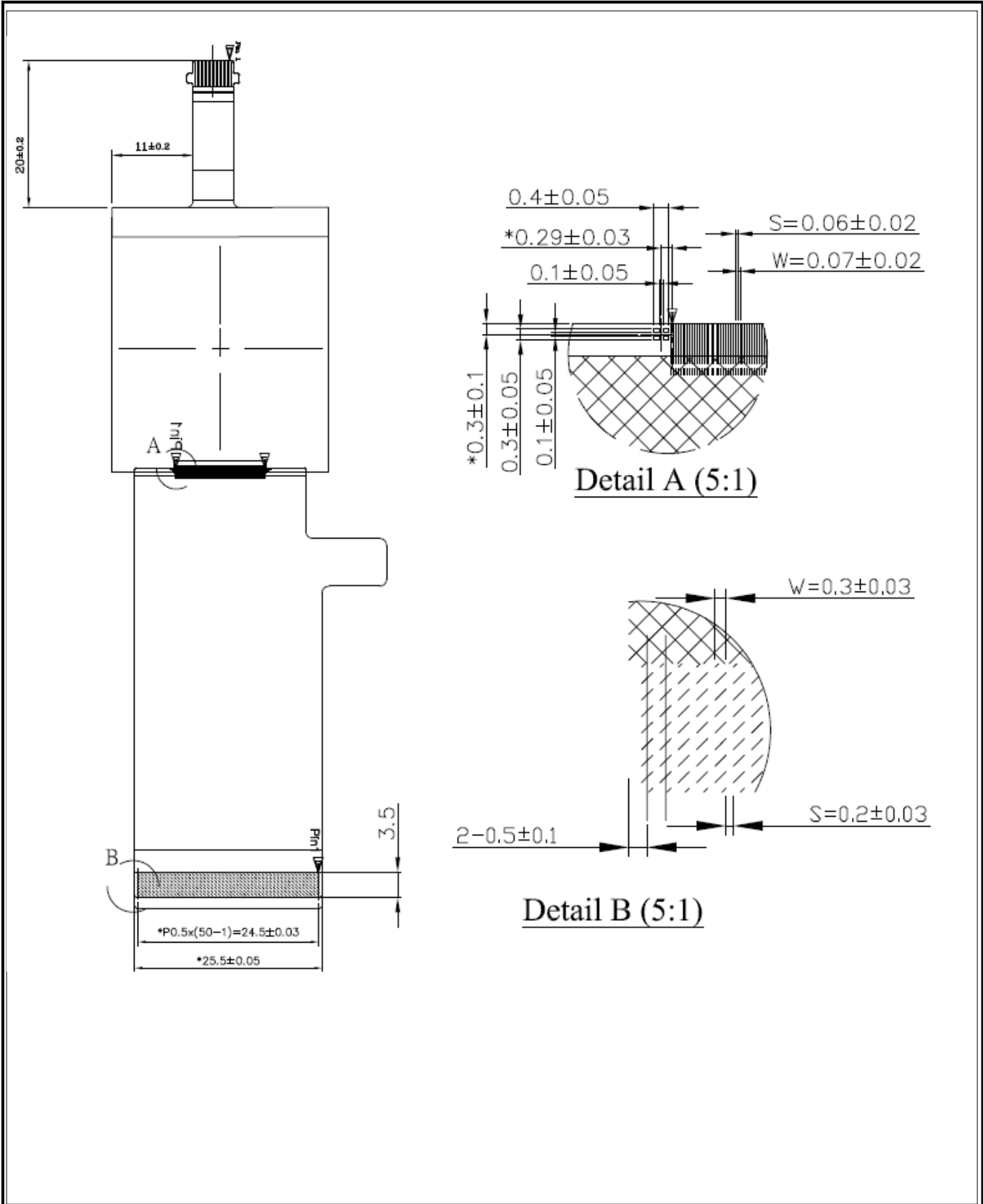
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8.0 OUTLINE DIMENSION

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	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: Code 8 is defined by the last number of the year, for example

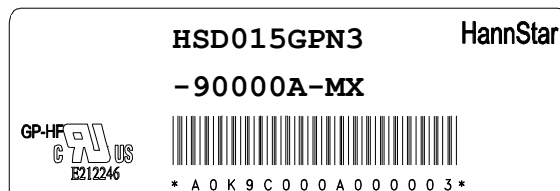
Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Mark	6	7	8	9	0	1	2	3	4	5	6

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 backside of the LCD module. 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.



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10.0 PACKAGE SPECIFICATION

10.1 Packing form

TBD

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

11.3.2. 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.

11.3.3. If liquid crystal contacts mouth or eyes, rinse out with water immediately.

11.3.4. If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.

11.3.5. 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.

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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

- 11.7.1 Please mount LCD module by using mounting holes arranged in four orners 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.



ALL TECHNOLOGIES. ALL COMPETENCIES. ONE SPECIALIST.



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