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To : Willtron 威力創

Date : May. 16. 2018

Formal Specification

Model : HSD190MEN6 – A00

- Note:
1. The information contained herein is preliminary and may be changed without prior noticed.
 2. Please contact HannStar Display(Nanjing) 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 Display(Nanjing) Corp. 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	May. 16,2018	A00	HSD 190MEN6-A00 formal specification was 1 st issued

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1.0 GENERAL DESCRIPTIONS

1.1 Introduction

HannStar Display model **HSD190MEN6-A00** 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, the voltage reference, common voltage, DC-DC converter, column, and row driver circuit. This TFT LCD has a 19-inch diagonally measured active display area with SXGA resolution (1024 vertical by 1280 horizontal pixel array) .

1.2 Features

- 19" SXGA TFT LCD Panel
- LED Backlight System
- Supported SXGA (V:1024 lines, H:1280 pixels) Resolution
- Supported to 75Hz Refresh Rate
- LCD Timing Controller
- RoHS Compliance
- VESA Compatible
- Halogen Free

1.3 Applications

- Desktop Monitors
- Display terminals for AV applications
- Monitors for industrial applications

1.4 General information

Item	Specification		Unit
Outline dimension	396 * 324 * 9.9(Typ)		mm
Display area	376.32 (H) x 301.056 (V) (19.0" diagonal)		mm
Number of Pixel	1280(H) x 1024(V)		Pixels
Pixel pitch	0.294(H) x 0.294(V)		mm
Pixel arrangement	RGB Vertical Stripe		
Display color	16.7M (6-bits+Hi FRC)		
Color temperature	6500K		
Display mode	Normally white		
Surface treatment	Antiglare, Hard-Coating (3H)		
Weight	1600		g
Back-light	White LED		
Input signal	2-ch LVDS		
Power consumption	System	3.6(Typ.), 4.2(Max.) L0 pattern	W
	B/L	11.83 (Max.)	

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1.5 Mechanical Information

Item		Min.	Typ.	Max.	Unit
Module Size	Horizontal(H)	395.5	396.0	396.5	mm
	Vertical(V)	323.5	324.0	324.5	mm
	Depth(D)		9.9		mm
Weight (without inverter)		1400	1600	1800	g
Torque of customer screw hole		--	--	3.0	Kgf*Cm

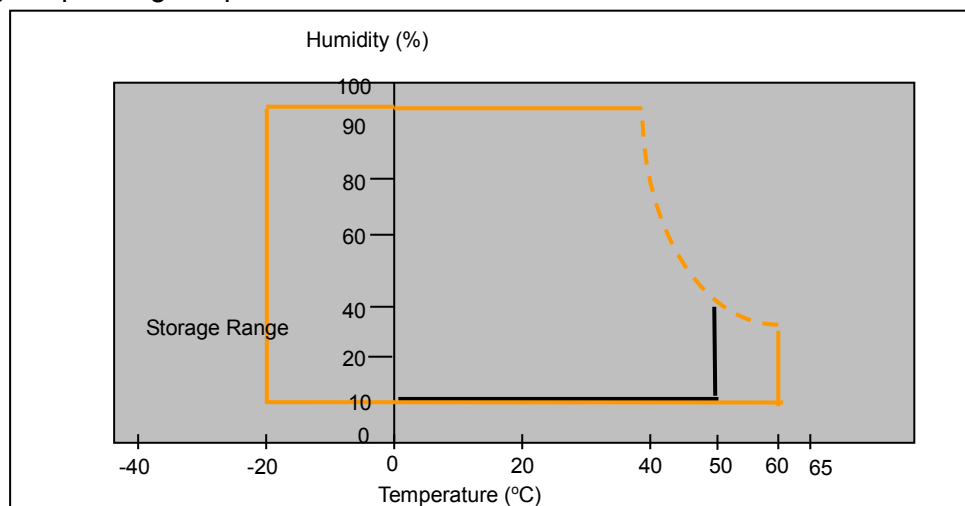
2.0 ABSOLUTE MAXIMUM RATINGS

2.1 Absolute Rating of Environment

Item	Symbol	Min.	Max.	Unit	Note
Storage temperature	T _{STG}	-20	60	°C	
Operating temperature	T _{OPR}	0	50	°C	(1)
Vibration (non-operating)	V _{NOP}	--	1.5	G	(2)
Shock (non-operating)	S _{NOP}	--	70	G	(3)
Storage humidity	H _{STG}	10	90	%RH	(3)
Operating humidity	H _{OP}	10	90	%RH	(4)
Low pressure (operating)	P _{LOP}	697	--	HPa	(5)
Low pressure (non-operating)	P _{LNOP}	116	--	HPa	(6)

Note 1 :

(1)Storage /Operating temperature



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- (2) 5-500-5Hz sine wave, X, Y, Z each directions, 30 min/cycle.
- (3) 11ms, $\pm X$, $\pm Y$, $\pm Z$ direction, one time each. For this shock test, It is necessary to fill the silicon rubber between the shock jig as buffer.
- (4) Max wet bulb temp. =39°C
- (5) 2 hrs. (10000 feet)
- (6) 24hrs. (50000 feet)

Note 2 : There is no display function NG issue occurred, all the cosmetic specification is judged before the reliability stress.

2.2 Electrical Absolute Rating:

2.2.1 TFT LCD Module:

Item	Symbol	Min.	Max.	Unit.	Note
Power supply Voltage	VDD	-0.3	5.5	V(DC)	(1)(2)

2.2.2 Back Light Unit:

Item	Symbol	Typ.	Max.	Unit	Note
LED current	I_F	60	65	mA	(1)(2)(3)
LED Voltage	V_F	3.4	3.6	Volt	(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) To exceed 65mA, life time accelerate drop down.

(3) Within $T_a=25\pm 2^\circ\text{C}$

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3.0 OPTICAL CHARACTERISTICS

3.1 Optical specification

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast	CR		700	1000	--		(1)(2)
Response time	Rising	TR +TF	--	5	10	msec	(1)(3)
	Falling						
White luminance (center of screen)	Y_L	$\Theta=0^\circ$	200	250	--	cd/m ²	(1)(4)
Color chromaticity (CIE1931)	Red	R_x	-0.03	0.643	+0.03		(1)(4)
		R_y		0.337			
	Green	G_x		0.322			
		G_y		0.637			
	Blue	B_x		0.152			
		B_y		0.049			
	White	W_x		0.313			
		W_y		0.329			
Viewing angle	Hor.	Θ_L	CR>10	75	85	--	
		Θ_R		75	85	--	
	Ver.	Θ_H		70	80	--	
		Θ_L		70	80	--	
Viewing angle	Hor.	Θ_L	CR>5	75	85	--	
		Θ_R		75	85	--	
	Ver.	Θ_H		75	85	--	
		Θ_L		75	85	--	
Brightness uniformity	B_{UNI}	$\Theta=0^\circ$ $\phi=0^\circ$	75	--	--	%	(6)

3.2 Measuring Condition

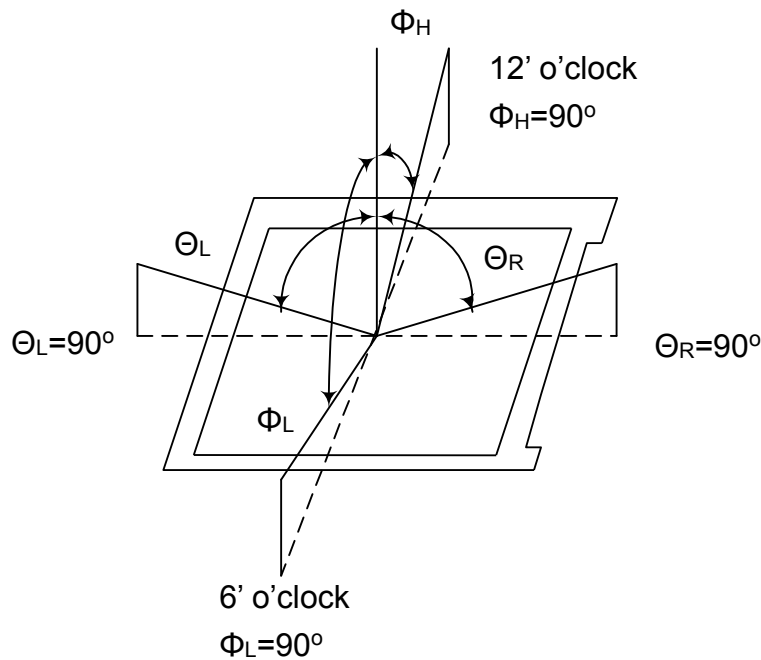
- Measuring surrounding: dark room
- Each LED current is 60 mA
- $V_{DD1}=5.0V$, $f_V=60Hz$, $f_{DCLK}=54MHz$
- Surrounding temperature: $25\pm 2^\circ C$
- 20min. Warm-up time.

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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: 20~21mm

Note (1) Definition of Viewing Angle:

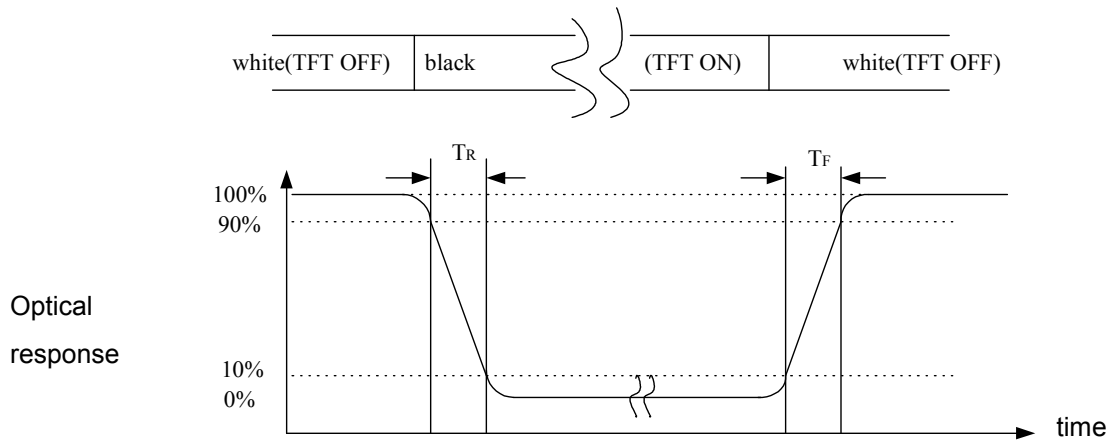


Note (2) Definition of Contrast Ratio(CR) :
measured at the center point of panel

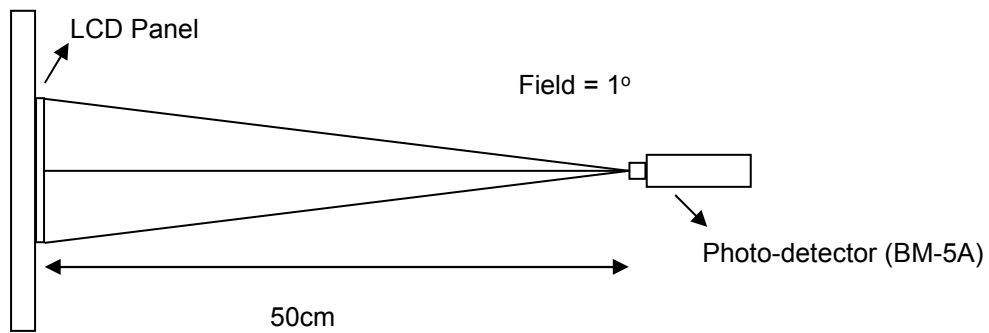
$$CR = \frac{\text{Luminance with all pixels white (L255)}}{\text{Luminance with all pixels black (L0)}}$$

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

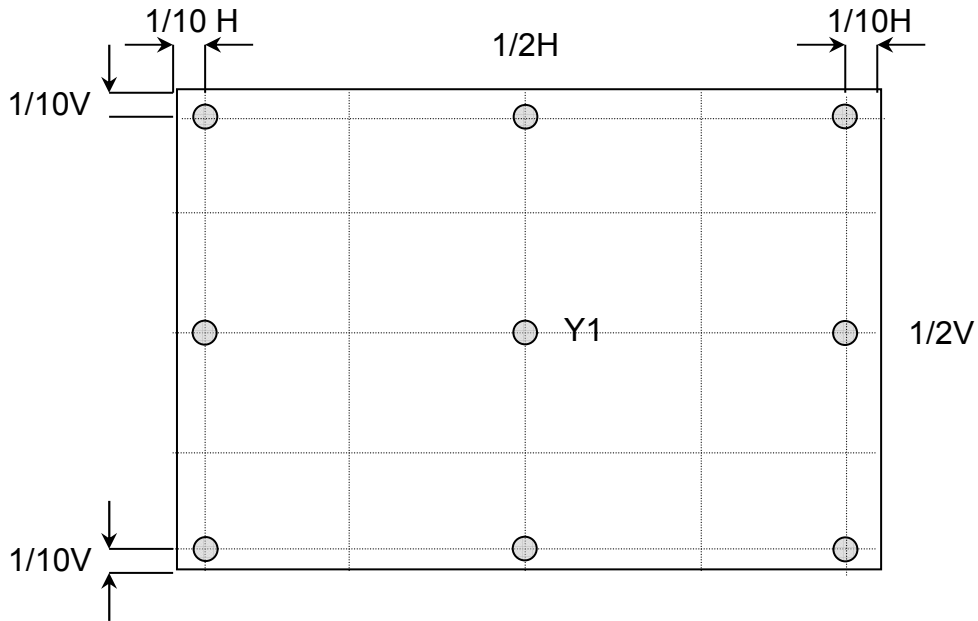


Note (4) Optical characteristic measurement setup



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Note (5) Definition of Center Luminance of White (center)
Center Luminance= Y1



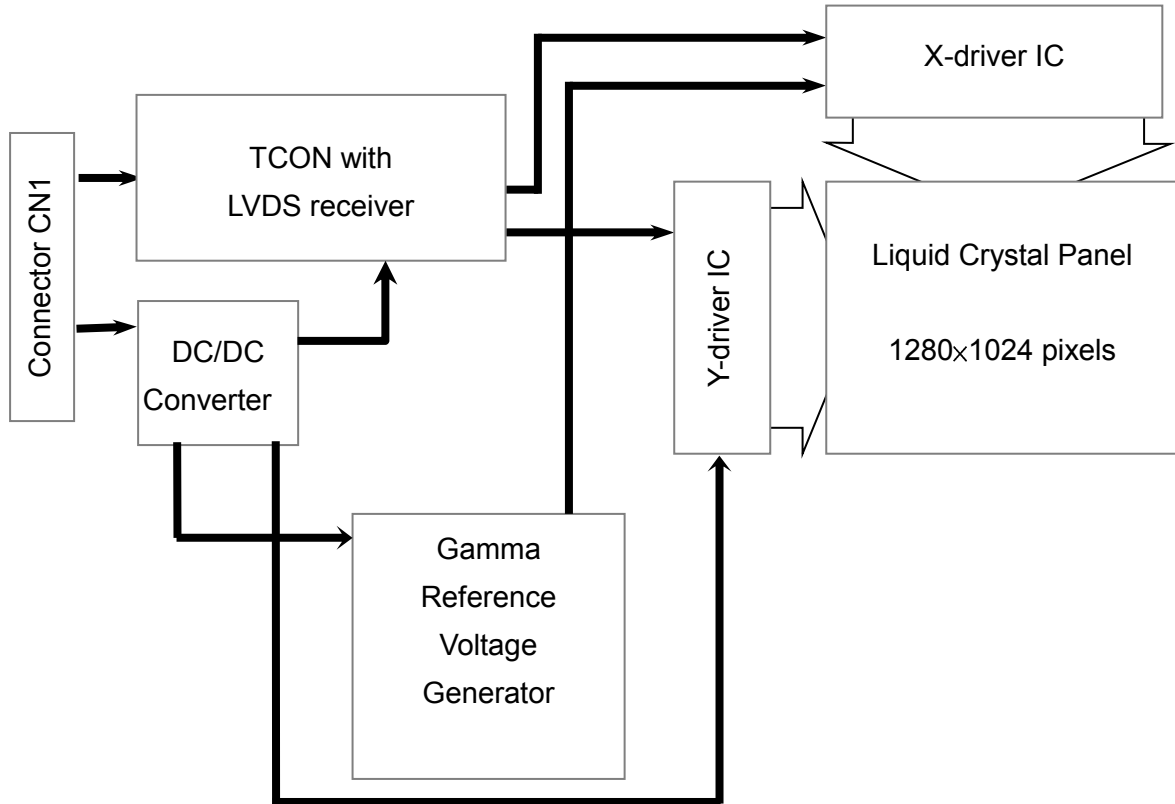
Note (6) Definition of brightness uniformity

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

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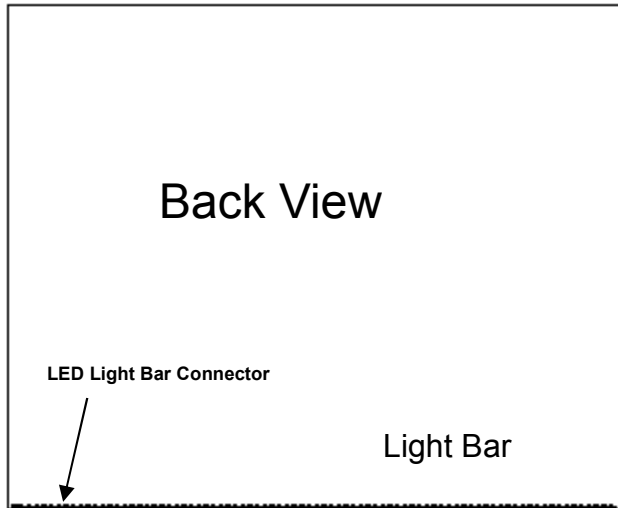
4.0 BLOCK DIAGRAM

4.1 LCD Module Block Diagram:

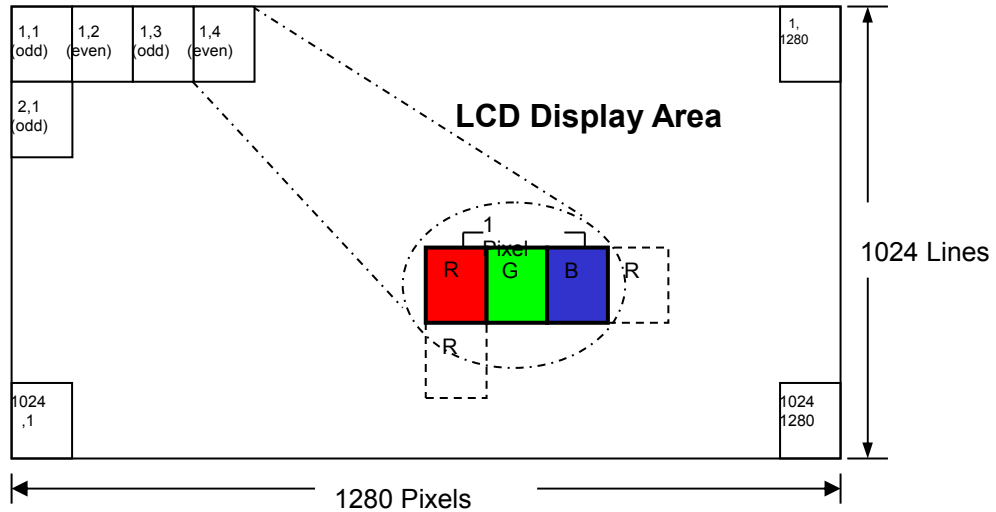


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4.2 Back Light Unit



4.3 Pixel Format



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4.4 Relationship Between Displayed Color and Input

Display	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
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	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	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	L	L	L	L	L	L	L	L	L	L	L252	
	L	L	L	L	L	L	L	L	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	L	L	L	L	L	L	L	L	L	L254		
Green	L	L	L	L	L	L	L	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	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	L	L252	
	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	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	L	L254		
Blue	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	H	L	L	L	L	L	L	H	L	L	L	L	L	L	H	L	L1		
		L	L	L	L	L	L	H	L	L	L	L	L	H	L	L	L	L	L	L	H	L	L2			
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3...L251	
		H	H	H	H	H	L	L	H	H	H	H	L	L	H	H	H	H	L	L	L	L	L252			
	H	H	H	H	H	L	H	H	H	H	H	L	H	H	H	H	H	L	H	L	L	L253				
	H	H	H	H	H	H	L	H	H	H	H	H	L	H	H	H	H	H	L	L	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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5.0 I/O CONNECTION PIN ASSIGNMENT

5.1 Interface Connector (30-pins, P-TWO 187098-30091, JAE FI-XB30SSRL-HF16 or equivalent)

Pin No.	Signal	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	RxOIN 3-	Negative LVDS differential data input (Odd data)
11	RxOIN 3+	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-	Positive LVDS differential data input (Even data)
16	RxEIN1+	Negative 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	GND	Power ground
25	GND	Power ground
26	NC	No connection
27	NC	No connection
28	Power	Power +5V
29	Power	Power +5V
30	Power	Power +5V

5.2 LED Board Pin Assignment:

CN102: LED Power Source Connector (Entery Industrial Co., Ltd 3707K-Q06N-01R or equivalent)

Pin No	Symbol	Description
1	IRLED	Current out
2	IRLED	Current out
3	VLED	Voltage in
4	VLED	Voltage in
5	IRLED3	Current out
6	IRLED4	Current out

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6.0 ELECTRICAL CHARACTERISTICS

6.1 TFT LCD Module:

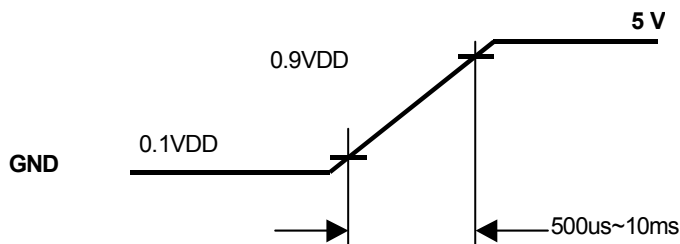
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Voltage of power supply	V_{DD}	4.5	5.0	5.5	V	
Current of power supply	I_{DD0}	--	720	840	mA	(1)
Vsync frequency	f_V	50	60	76	Hz	(2)
Hsync frequency	f_H	53.3	64	80	KHz	
Frequency	f_{DCLK}	50	54	67.5	MHz	
Input rush current	I_{RUSH}	--	--	3.0	A	(3)

Note (1) $V_{DD} = 5.0V$, Black pattern (L0), Frame Rate 60Hz



Note (2) When f_V is too low, a flicker may be occurred on the display.

Note (3) Input Rush Current condition



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6.2 Back-Light Unit

Parameter	Symbol	Min	Typ	Max	Units	Condition
LED Operation Current	I_F	---	60	65	mA	Ta=25°C
Light Bar Input Voltage	V_F	37.7	44.2	45.5	Volt	Ta=25°C
LED Power consumption	P_{LED}	---	10.608	11.83	Watt	Ta=25°C Note (1)
LED Life-Time	N/A	--	30,000	--	Hour	Ta=25°C $I_F=60mA$ Note (2)

Notes (1) The specified values are for a single LED lightbar.

Notes (2) The specified current is input LED chip 100% duty current.

Notes (3) Calculator value for reference $P=I_F \times V_F \times N$ (LED Parallel Qty')

Notes (4) The LED lifetime defines as the estimated time to 50% degradation of original luminance

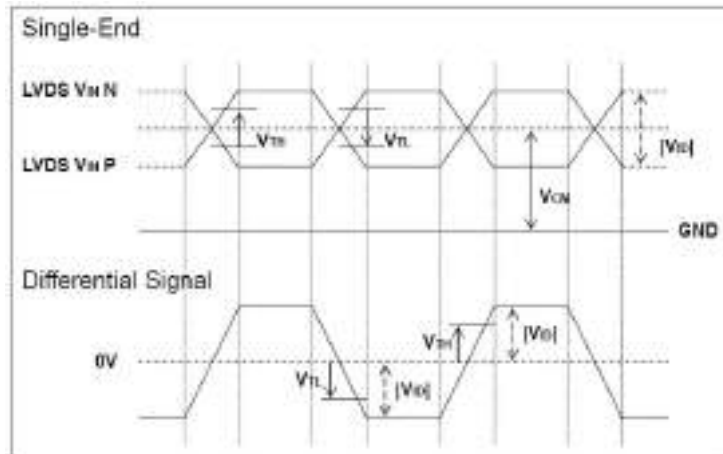
Notes (5) For better LED light bar driving quality, it is recommended to utilize the adaptive boost converter with current balancing function to drive LED light-bar.

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6.3 Switching Characteristics for LVDS Receiver

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Differential Input High Threshold	V _{th}	—	—	+100	mV	V _{CM} LVDS=1.25V
Differential Input Low Threshold	V _{tl}	-100	—	—	mV	
Input Current	I _{IN}	-10	—	+10	uA	V _{IN} =2.4V/0V, V _{DD} =3.6V
Differential input Voltage	V _{ID}	0.1	—	0.6	V	
Common Mode Voltage Offset	V _{CM}	1.15	—	1.35	V	
Clock Frequency	f _c	50	54	67.5	MHz	

Differential Signal Diagram

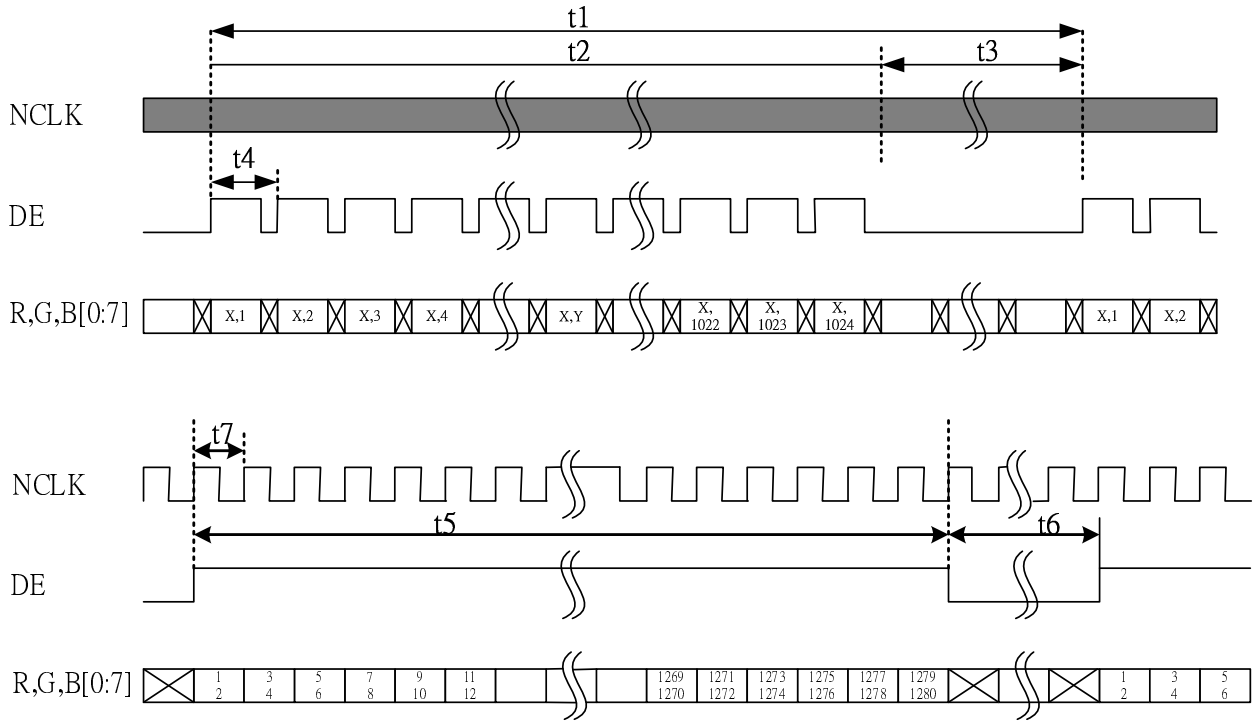


6.4 Interface Timing (DE mode)

Item	Symbol	Min.	Typ.	Max.	Unit
Frame Rate	--	50	60	76	Hz
Frame Period	t ₁	1029	1066	1150	line
Vertical Display Time	t ₂	1024	1024	1024	line
Vertical Blanking Time	t ₃	5	42	126	line
1 Line Scanning Time	t ₄	720	844	875	clock
Horizontal Display Time	t ₅	640	640	640	clock
Horizontal Blanking Time	t ₆	80	204	235	clock
Clock Rate	t ₇	50	54	67.5	MHz

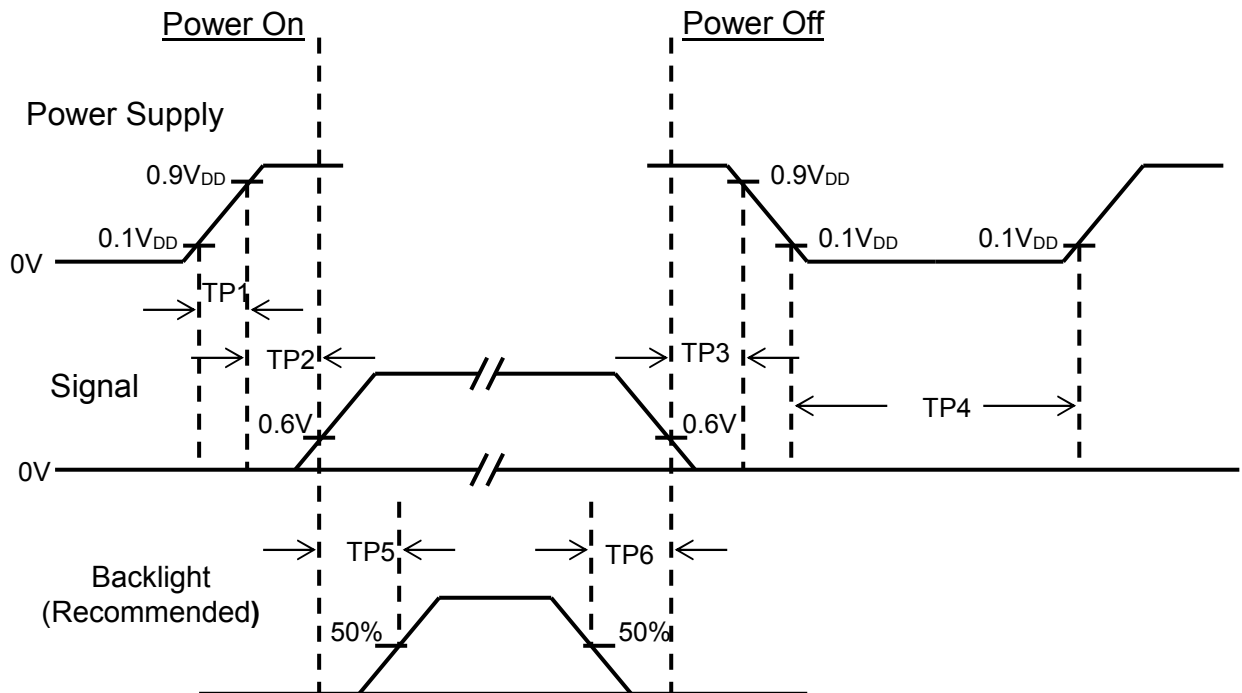
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Timing Diagram of Interface Signal (DE mode)



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6.5 Power On / Off Sequence :



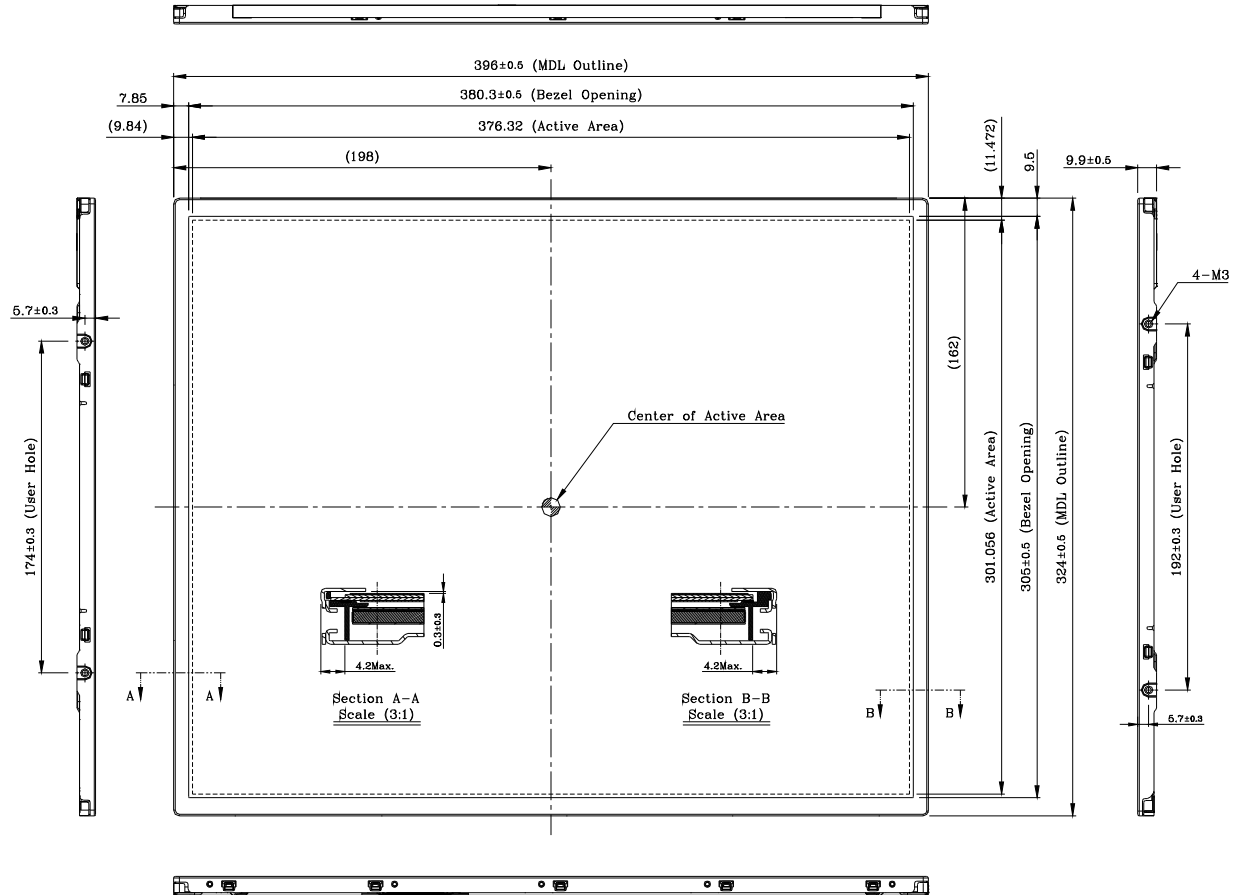
Item	Min.	Typ.	Max.	Unit	Remark
TP1	0.5	--	10	msec	
TP2	0	--	50	msec	
TP3	0	--	50	msec	
TP4	500	--	--	msec	
TP5	200	--	--	msec	
TP6	200	--	--	msec	

- 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 voltage 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 V_{DD} = off level, please keep the level of input signal on the low or keep a high impedance.
 - (4) TP4 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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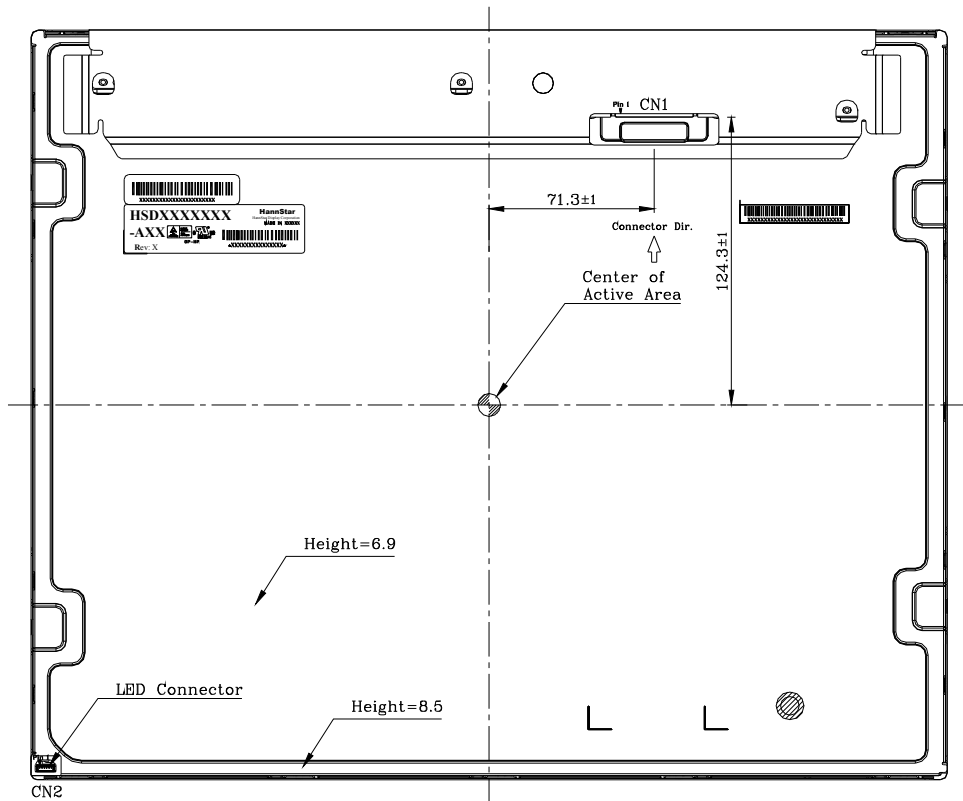
7.0 OUTLINE DIMENSION

7.1 190MEN6-A Front View:



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7.2 190MEN6-A Back View:



1. Backlight: LED Light Source
2. I/F Connector (CN1) Specification:
P-TWO 187098-30091 or Equivalent
3. LED Light Bar Connector (CN2) Specification:
Entry Industrial 3707K-Q06N-01R or Equivalent
4. User Mounting Torque Spec: 3 Kgf-cm Max.
5. Unspecified Tolerance is $\pm 0.5\text{mm}$

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8.0 LOT MARK

8.1 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
Mark	6	7	8	9	0	1	2	3	4	5

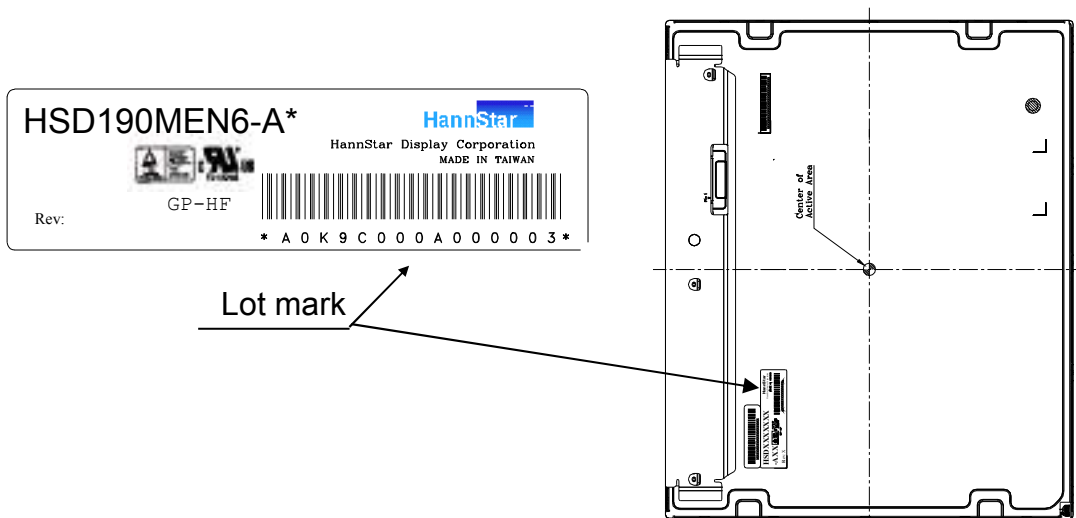
Note (2) Production Month

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

8.2 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.



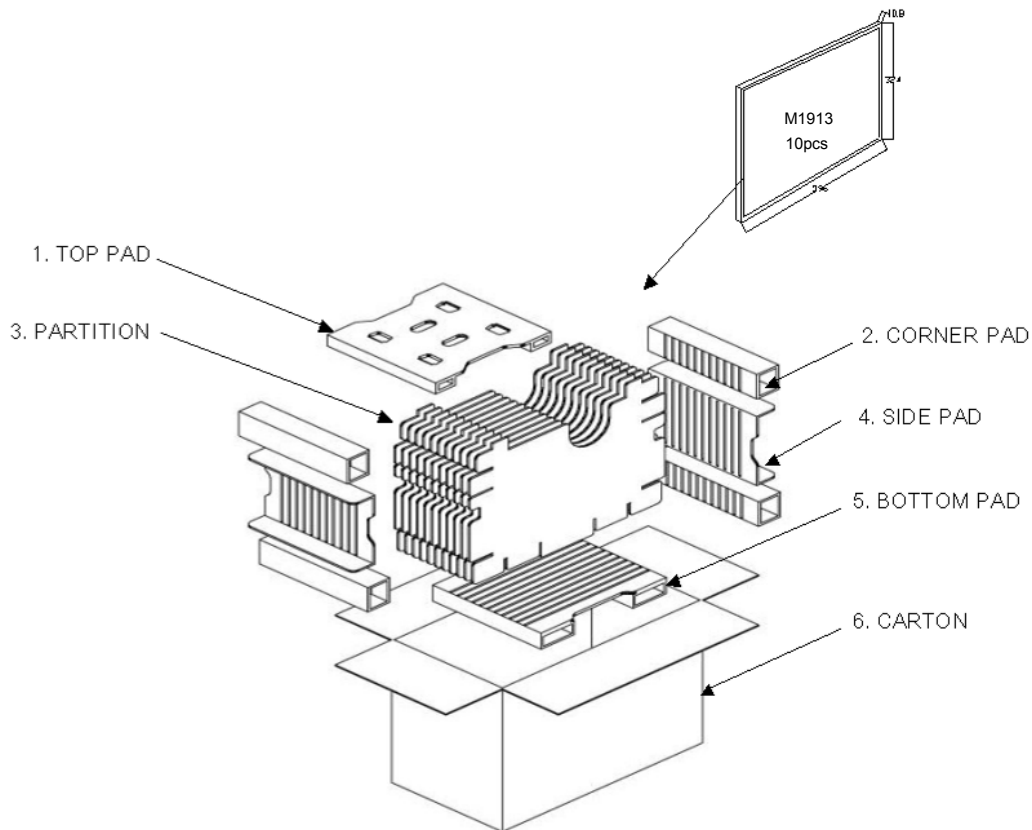
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9.0 PACKAGE SPECIFICATION

9.1 Packing form(I)

- (1) package quantity in one carton: 10 pieces.
- (2) carton size: 544 mm×302 mm×446^H mm.
- (3) for domestic transportation only.

9.2 Packing assembly drawings

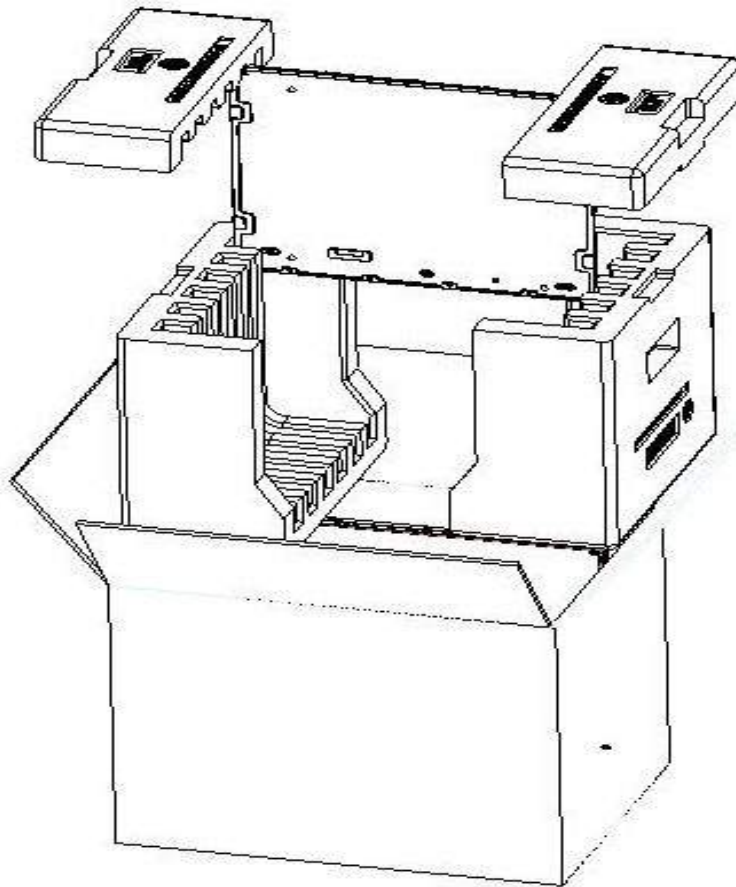


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9.3 Packing form(II)

- (1) package quantity in one carton: 12 pieces.
- (2) carton size: 475 mm×365 mm×400^H mm.
- (3) for domestic transportation only.

9.4 Packing assembly drawings



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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

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

10.5.1 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.

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

10.5.3 It's recommended employing 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.

Use fingerstalls of soft gloves in order to keep clean display quality, when persons handle the LCD module for incoming inspection or assembly.

10.6.2 When the surface is dusty, please wipe gently with absorbent cotton or other soft material.

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10.6.3 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.

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

10.7 Mechanism

Please mount LCD module by using mounting holes arranged in four corners tightly.

10.8 Static Electricity

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

10.8.2 Because LCD module uses CMOS-IC on circuit board and TFT-LCD panel, it is very weak to electrostatic discharge. Please be careful with electrostatic discharge.

10.8.3 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.