TO :

Date :

HannStar Product Specification

(Preliminary)

15.6” Color TFT-LCD Module

Model: HSD156JUW1- A**

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.

Contents

1.0 GENERAL DESCRIPTION

1.1 **Introduction** HannStar Display model HSD156JUW1-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 15.6 inch diagonally measured active display area with FHD (1920 horizontal by 1080 vertical pixel) resolution.

1.2 Features

- 15.6 (16:9 diagonal) inch configuration
- Two channel LVDS interface
- 16.7M color by 8 bit R.G.B signal input
- RoHS Compliance
- Halogen Free

1.3 Applications

- Automotive

1.4 General information

Item		Specification	Unit
Outline Dimension		363.8 x 215.9 x 11.5 (Typ.)	mm
Display area		344.16(H) x 193.59(V)	mm
Number of Pixel		1920 RGB (H) x 1080(V)	pixels
Pixel pitch		0.1792(H) x 0.1792(V)	mm
Pixel arrangement		RGB Vertical stripe	
Display mode		Normally Black	
NTSC		70(typ) 60(min)	%
Surface treatment		AG	
Weight		TBD (Typ.)	g
Back-light		White LED	
Power Consumption	Logic System (White Pattern)	5W	W
	B/L System	23.1W MAX (Include LED driver effiency)	W

1.5 Mechanical Information

Item		Min.	Typ.	Max.	Unit
Module Size	Horizontal (H)	363.3	363.8	364.3	mm
	Vertical (V)	215.4	215.9	216.4	mm
	Depth (D) w/ PCB	11.0	11.5	12.0	mm
Weight		—	TBD	TBD	g

2.0 ABSOLUTE MAXIMUM RATINGS

2.1 Electrical Absolute Rating

2.1.1 TFT LCD Module

Item	Symbol	Min.	Max.	Unit	Note
Logic Supply voltage	V_{DD}	-0.3	6.0	V	
Backlight Supply Voltage	V_{LED}	-0.3	45	V	

2.1.2 Environment Absolute Rating

Item	Symbol	Min.	Max.	Unit	Note
Operating Temperature	T_{opa}	-30	85	℃	
Storage Temperature	T_{stg}	-40	90	℃	

3.0 OPTICAL CHARACTERISTICS

3.1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast		CR	Θ=0 Normal viewing angle	700	1000	—		(1)(2)
Response time	Rising	T_R		—	18	20	msec	(1)(3)
	Falling	T_F		—	17	20		
White luminance (Center)		Y_L		650	850	—	cd/m^2	(1)(4) (I_L=720mA)
Color chromaticity (CIE1931)	White	W_x		0.26	0.31	0.36		(1)(4)
		W_y		0.28	0.33	0.38		
	Red	R_x		TBD	TBD	TBD		
		R_y		TBD	TBD	TBD		
	Green	G_x		TBD	TBD	TBD		
		G_y		TBD	TBD	TBD		
	Blue	B_x		TBD	TBD	TBD		
		B_y		TBD	TBD	TBD		
Viewing angle	Hor.	Θ_L	CR>10	—	85	—		
		Θ_R		—	85	—		
	Ver.	Θ_U		—	85	—		
		Θ_D		—	85	—		
Brightness uniformity		B_{UNI}	Θ=0	—	—	0.751		(5)
Optima View Direction		Free						(6)

3.2 Measuring Condition

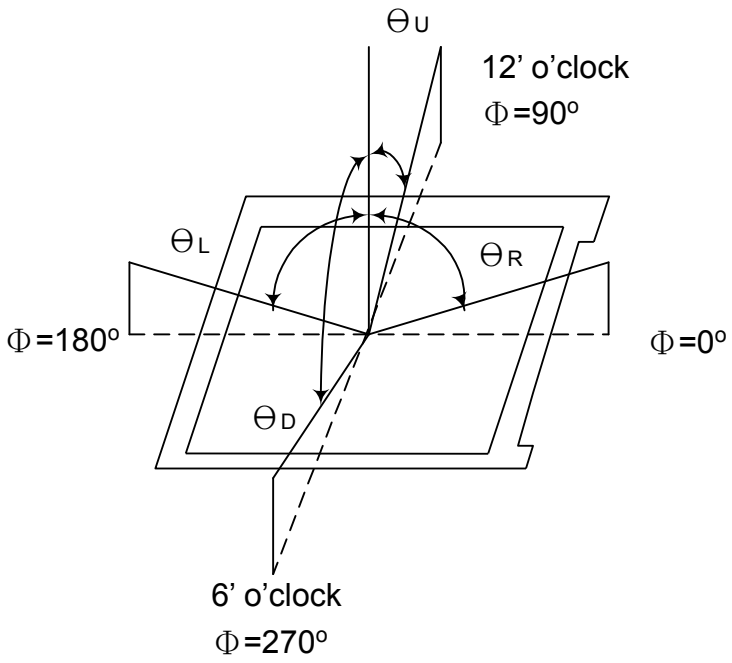
- Measuring surrounding：dark room
- LED current I_L：720mA
- Ambient temperature：25±2ºC
- 15min. warm-up time.

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

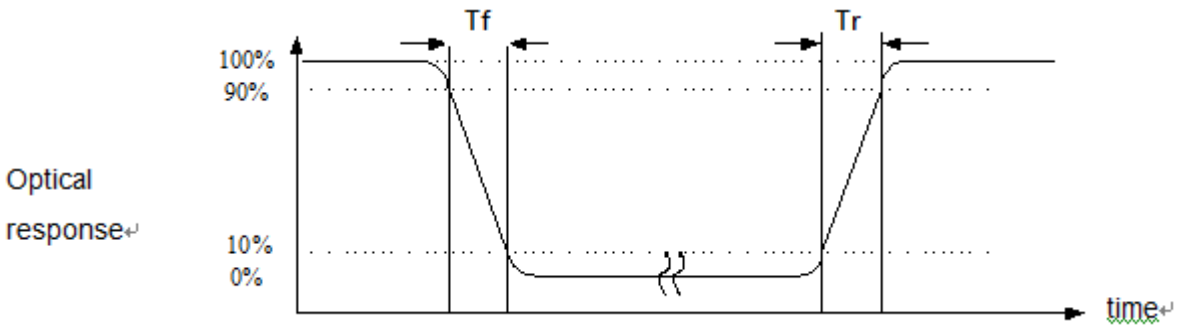
Note (1) Definition of Viewing Angle:



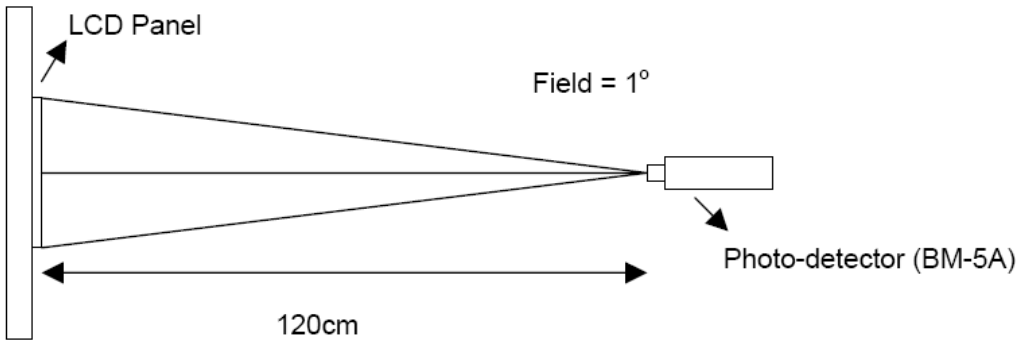
Note (2) Definition of Contrast Ratio (CR) :
measured at the center point of panel

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

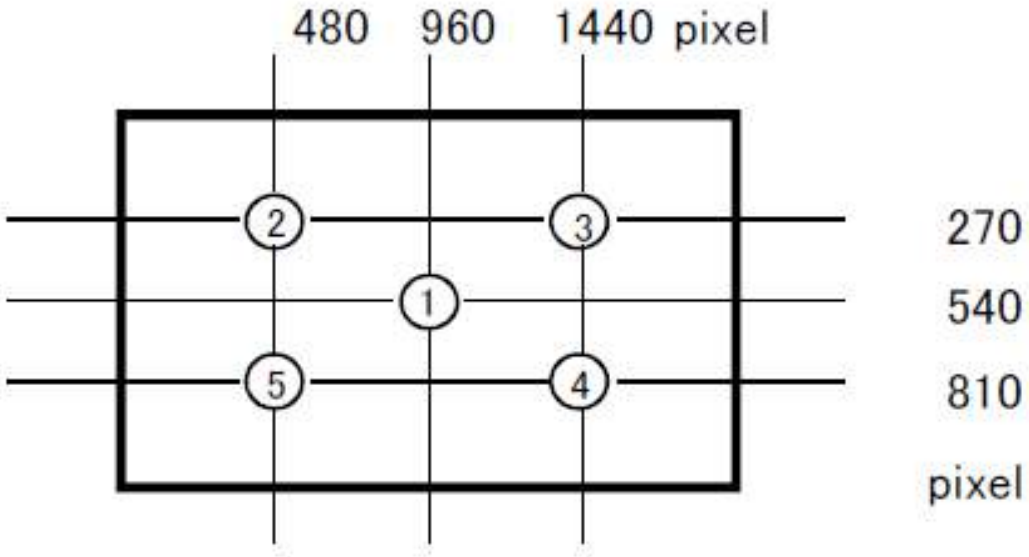
Note (3) Definition of Response Time : Sum of T_R and T_F



Note (4) Definition of optical measurement setup



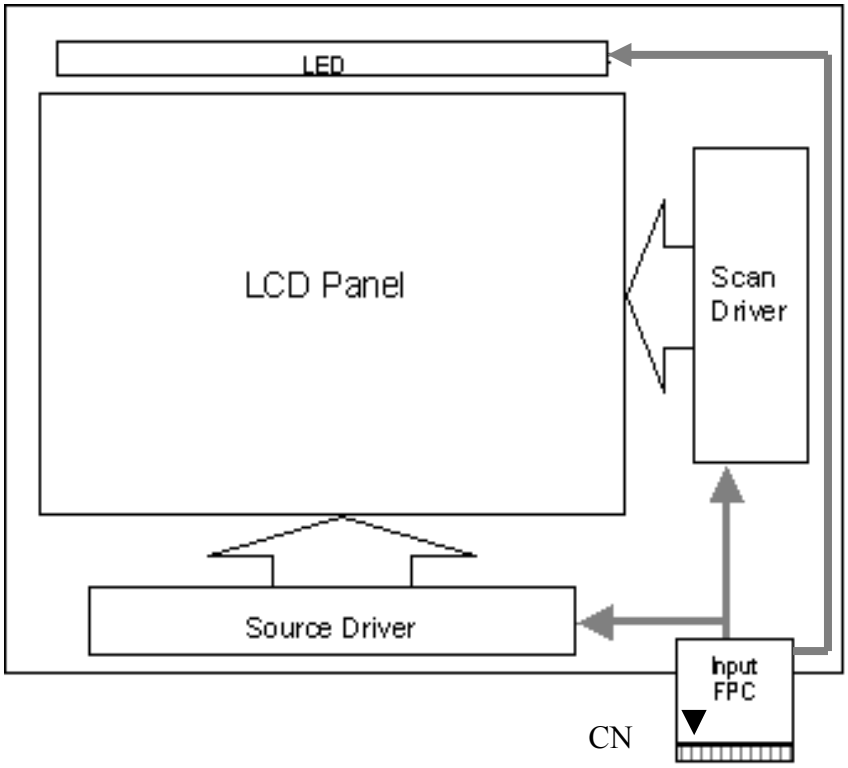
Note (5) Definition of brightness uniformity



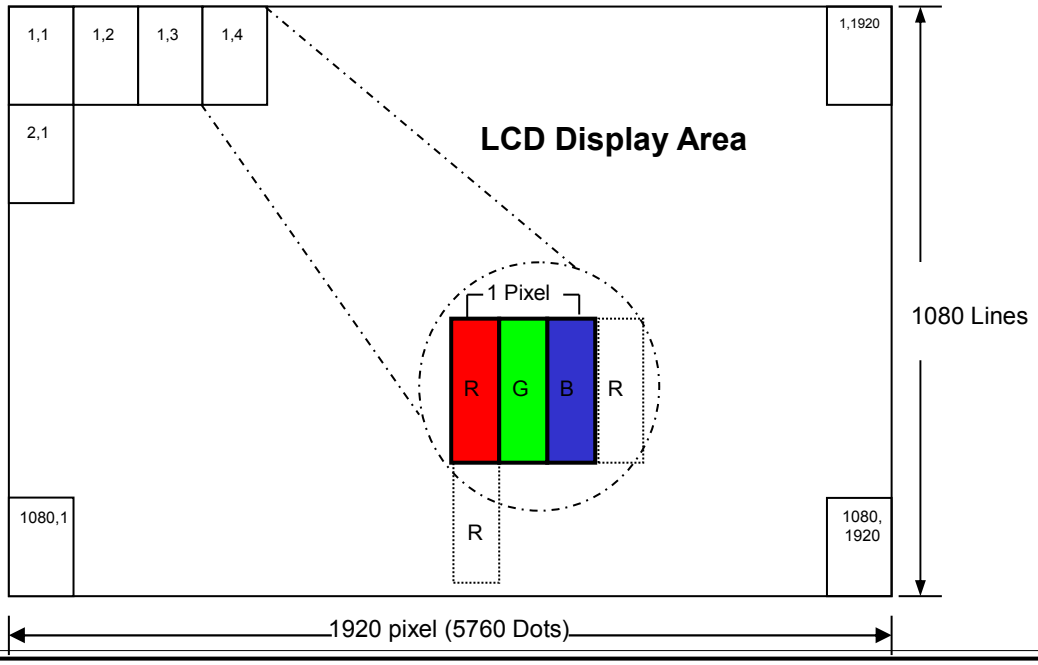
$$\text{Luminance uniformity} = \frac{\text{(Min Luminance of 5 points)}}{\text{(Max Luminance of 5 points)}} \times 100\%$$

4.0 BLOCK DIAGRAM

4.1 TFT LCD Module:



4.2 Pixel Format



4.3 Relationship Between Displayed Color and Input

		MSB							LSB	MSB							LSB	MSB							LSB	Gray scale
	Display	R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0	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	H	L	L	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	H	L	L	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	H	L	L	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	H	L	L	H	H	H	H	H	H	L	L	H	H	H	H	H	H	L	L	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

5.0 INTERFACE PIN CONNECTION

5.1 CN1 : JAE FI-XB30SSRL-HF16 or compatible connector

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	Please Contact to GND(Bist function for HSD test)
26	GND	Power ground
27	GND	Power ground
28	VCC	Power +5V
29	VCC	Power +5V
30	VCC	Power +5V

Note：The brightness of LCD panel could be changed by adjusting PWM

5.2 CN2 : STM MSB24038P8B or compatible connector

Pin No.	Signal	Description
1	VLED	Power Supply +12V
2	VLED	Power Supply +12V
3	VLED	Power Supply +12V
4	GND	Ground
5	GND	Ground
6	GND	Ground
7	BL_EN	BL On Off Control
8	PWM	PWM Signal

6.0 ELECTRICAL CHARACTERISTICS

6.1 TFT LCD Module

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	VCC	4.7	5.0	5.5	V	
Current of power supply	IDD	--	300	--	mA	V_{CC} =5.0V、L255 pattern
VDD Power	PDD		1.5	5	W	V_{CC} =5.0V、L255 pattern
Inrush current	I_{RUSH}	-	-	3.0	A	Note

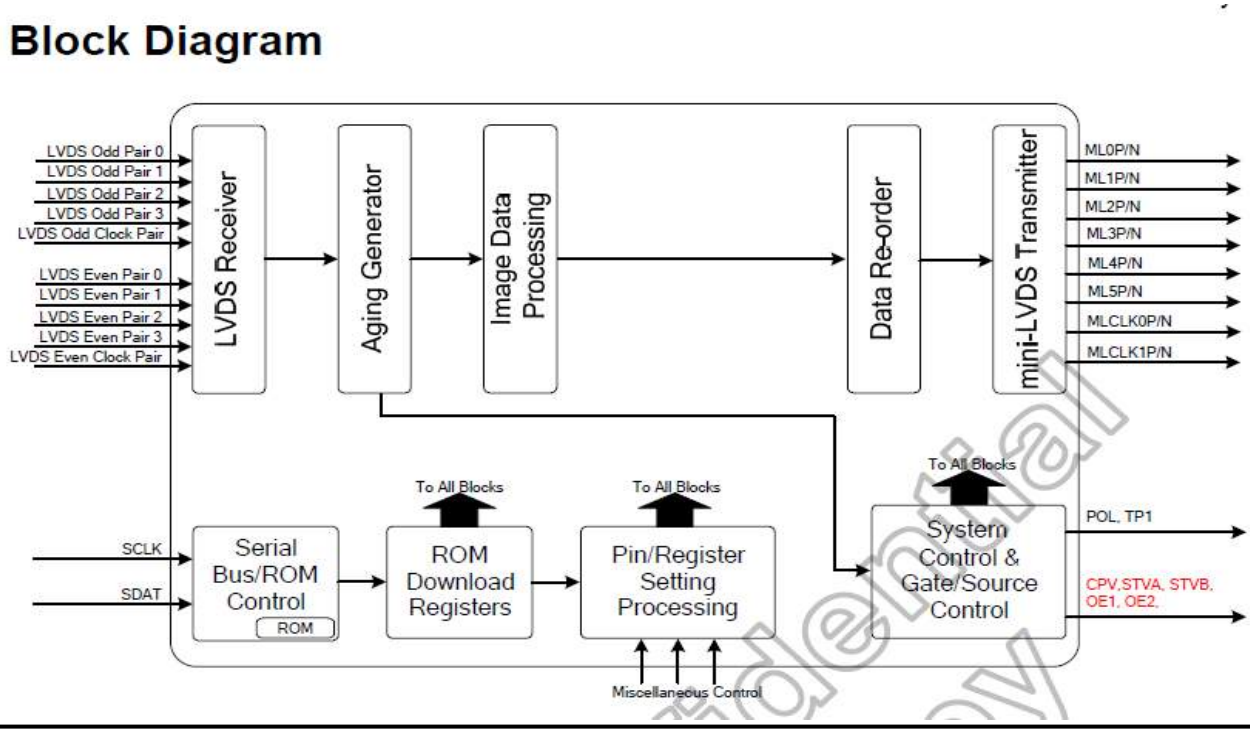
Note : Inrush current test circuit and rising time setting (power on)

6.2 Switching Characteristics for LVDS Receiver

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Differential Input High Threshold	Vth	—	—	100	mV	V_{CM}=1.2V
Differential Input Low Threshold	Vtl	-100	—	—	mV	
Input Current	I_{IN}	-10	—	+10	uA	
Differential input Voltage	$\|V_{ID}\|$	0.2	—	0.6	V	
Common Mode Voltage Offset	V_{CM}	($\|V_{ID}\|$/2)	1.2	2.25-($\|V_{ID}\|$/2)	V	

6.3 Bit LVDS input

6.3.1 LVDS Block Diagram



6.3.2 8Bit LVDS input

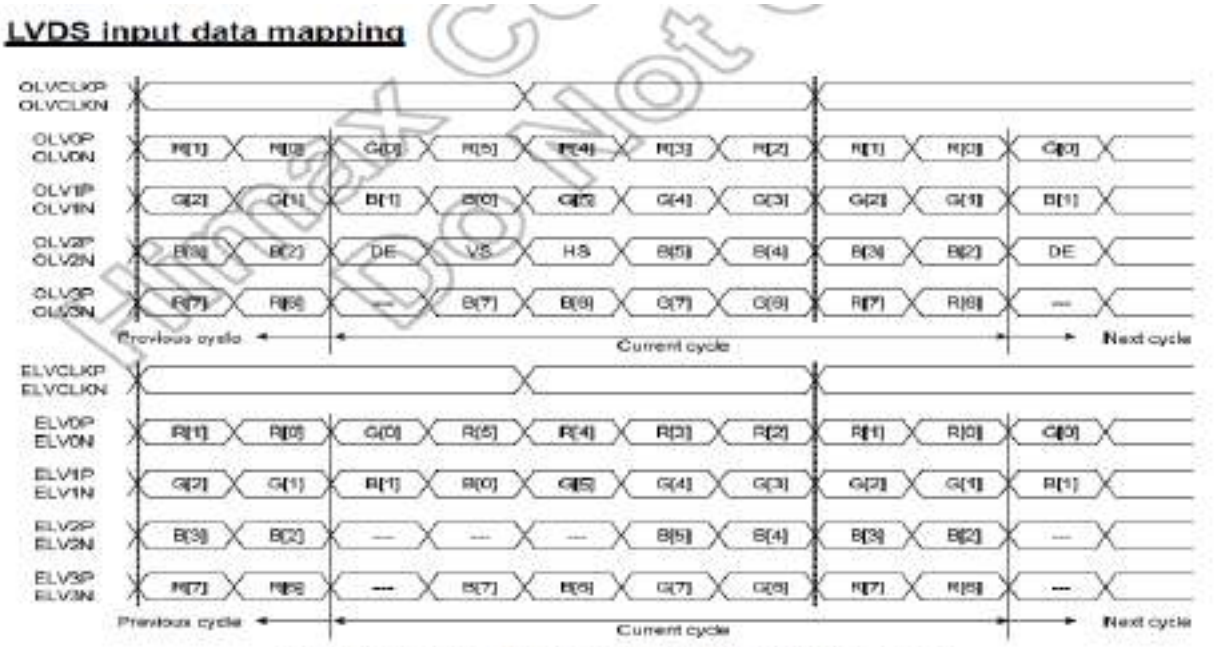


Figure 6.2: LVDS input data mapping (VESA format)

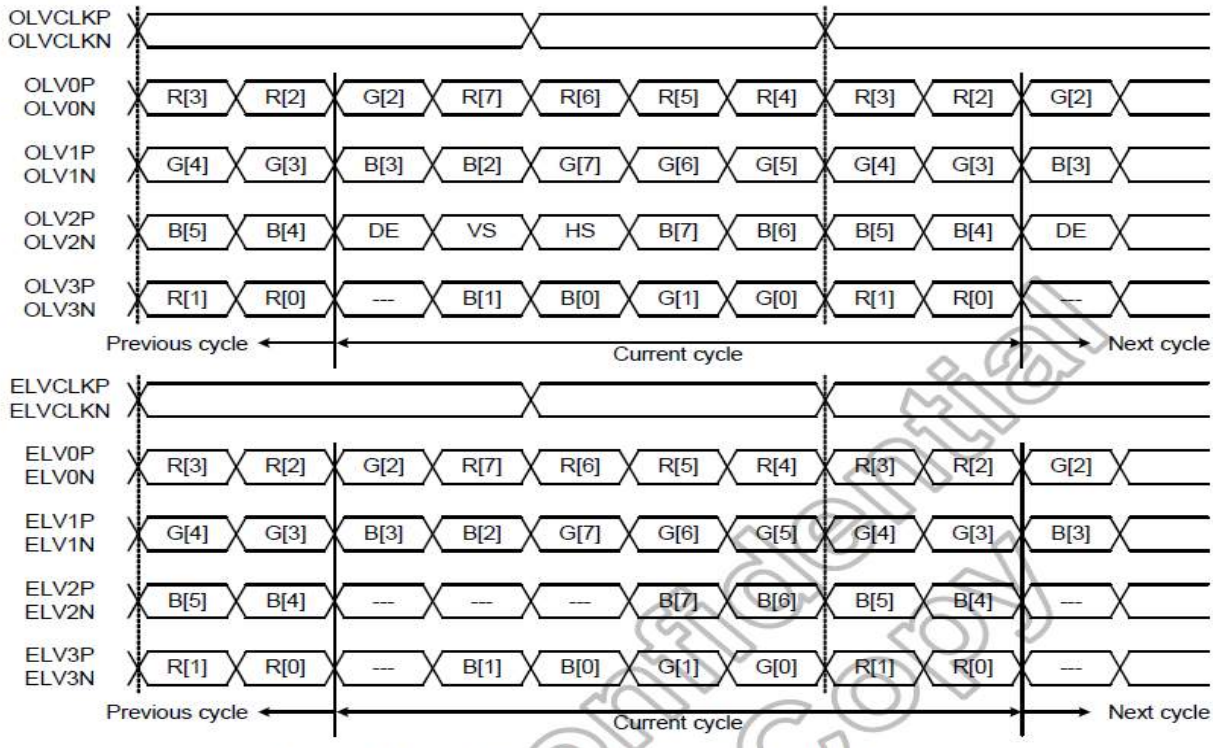
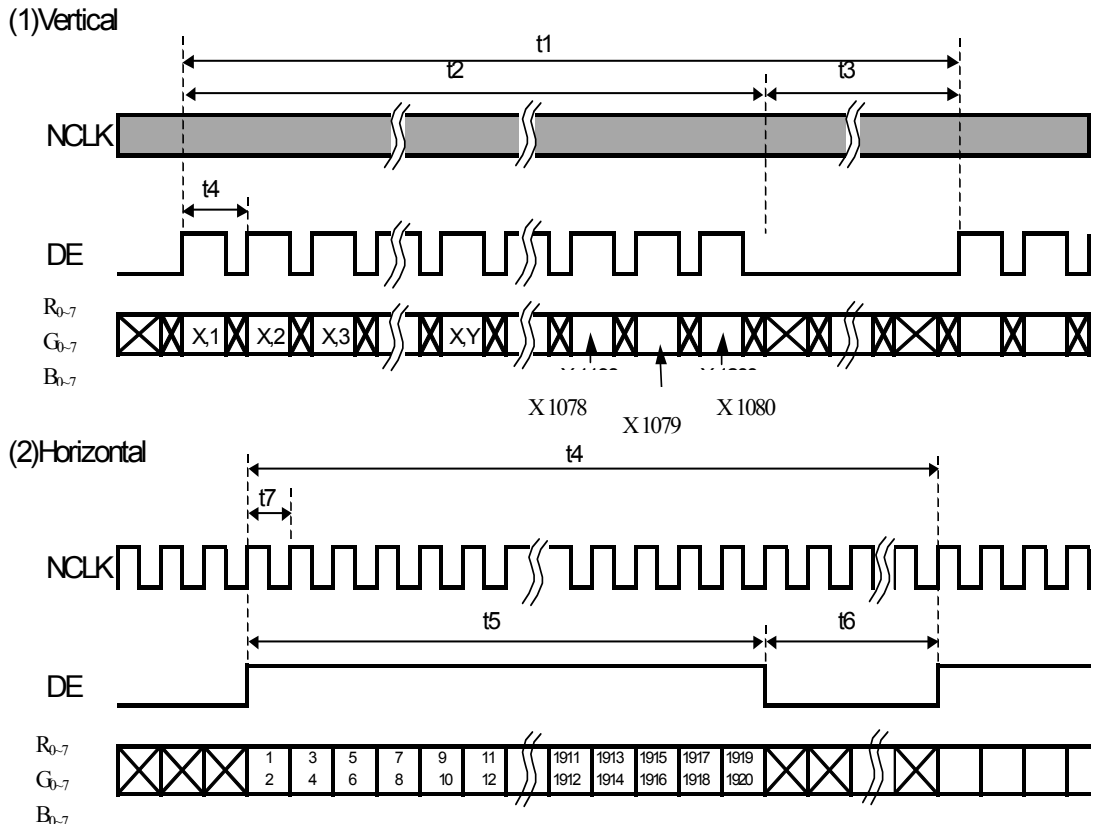


Figure 6.3: LVDS input data mapping (JEIDA format)

6.4 Interface Timing (DE mode)

Item	Symbol	Min.	Typ.	Max.	Unit
Frame Rate	--	58	60	62	Hz
Frame Period	t1	1085	1124	1168	line
Vertical Display Time	t2	1080	1080	1080	line
Vertical Blanking Time	t3	5	44	88	line
1 Line Scanning Time	t4	1050	1080	1110	clock
Horizontal Display Time	t5	960	960	960	clock
Horizontal Blanking Time	t6	90	120	150	clock
Clock Rate	t7	66	72.8	80.5	MHz

Timing Diagram of Interface Signal (DE mode)



6.5 Power On / Off Sequence

Power On/off sequence

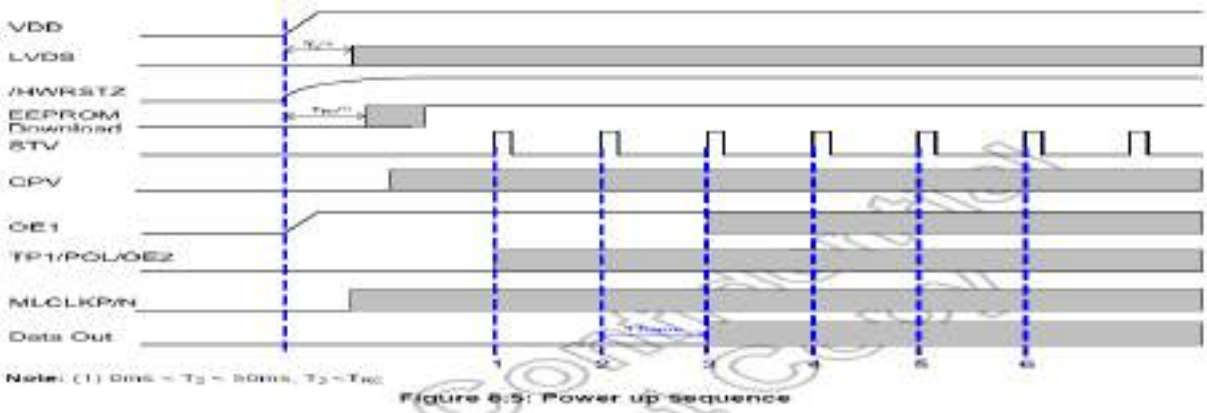
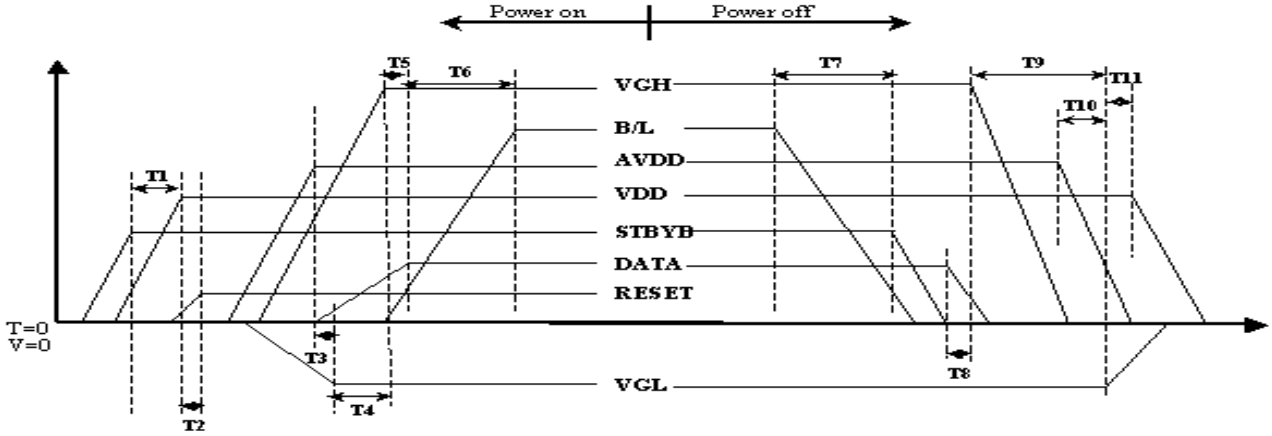


Figure 6.5: Power up sequence



Item	Min.	Typ.	Max.	Unit
TP1	0.5	--	10	msec
TP2	0	--	50	msec
TP3	200	--	--	msec
TP4	0.5	--	10	msec
TP5	10	--	--	msec
TP6	10	--	--	msec
TP7	0	--	10	msec
TP8	200	--	--	msec
TP9	0	--	50	msec
TP10	1	--	10	msec
TP11	1000	--	--	msec

6.6 Backlight Unit

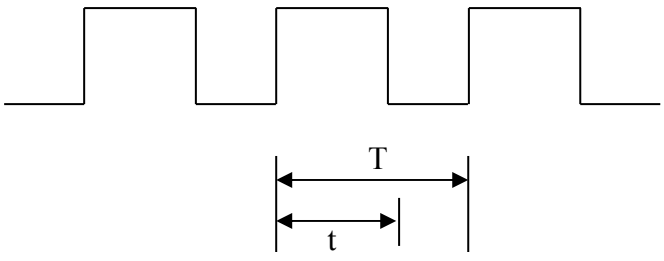
DC Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Units	Remark
LED Power Supply Voltage	V_{LED}	9	12	16	Volt	
Current dissipation	I_{LED}	--	0.72	--	A	
PWM High Threshold	V_{PWMH}	2.0	--	5.5	Volt	
PWM Low Threshold	V_{PWML}	--	--	0.4	Volt	
EN High Threshold	V_{ENH}	2.0	--	5.5	Volt	
EN Low Threshold	V_{ENL}	--	--	0.4	Volt	
PWM Frequency	F_{PWM}	100	--	10K	Hz	Note(1)
PWM Duty Cycle	T_D	3	--	100	%	Note(2)

Note (1)

Dimming Frequency (Hz)	Duty (Min.)	Duty (Max.)
$100 < f_{PWM} \leq 500$	0.2%	100%
$500 < f_{PWM} \leq 1k$	0.4%	100%
$1k < f_{PWM} \leq 2k$	0.8%	100%
$2k < f_{PWM} \leq 5k$	1.5%	100%
$5k < f_{PWM} \leq 10k$	3%	100%

Note (2) PWM Duty Cycle



Duty Cycle = (t / T) *100%

Parameter	Symbol	Min	Typ	Max	Units	Condition
LED Current	I_L	--	720	--	mA	Ta=25℃
LED Voltage	V_L	--	24	25.6	Volt	Ta=25℃
LED Life-Time	N/A	--	50000	--	Hour	Ta=25℃ I_F=120mA 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℃ and IL=720mA. The LED lifetime could be decreased if operating IL is larger than 720mA. The constant current driving method is suggested.

Note (3) LED Light Bar Circuit (8S6P)

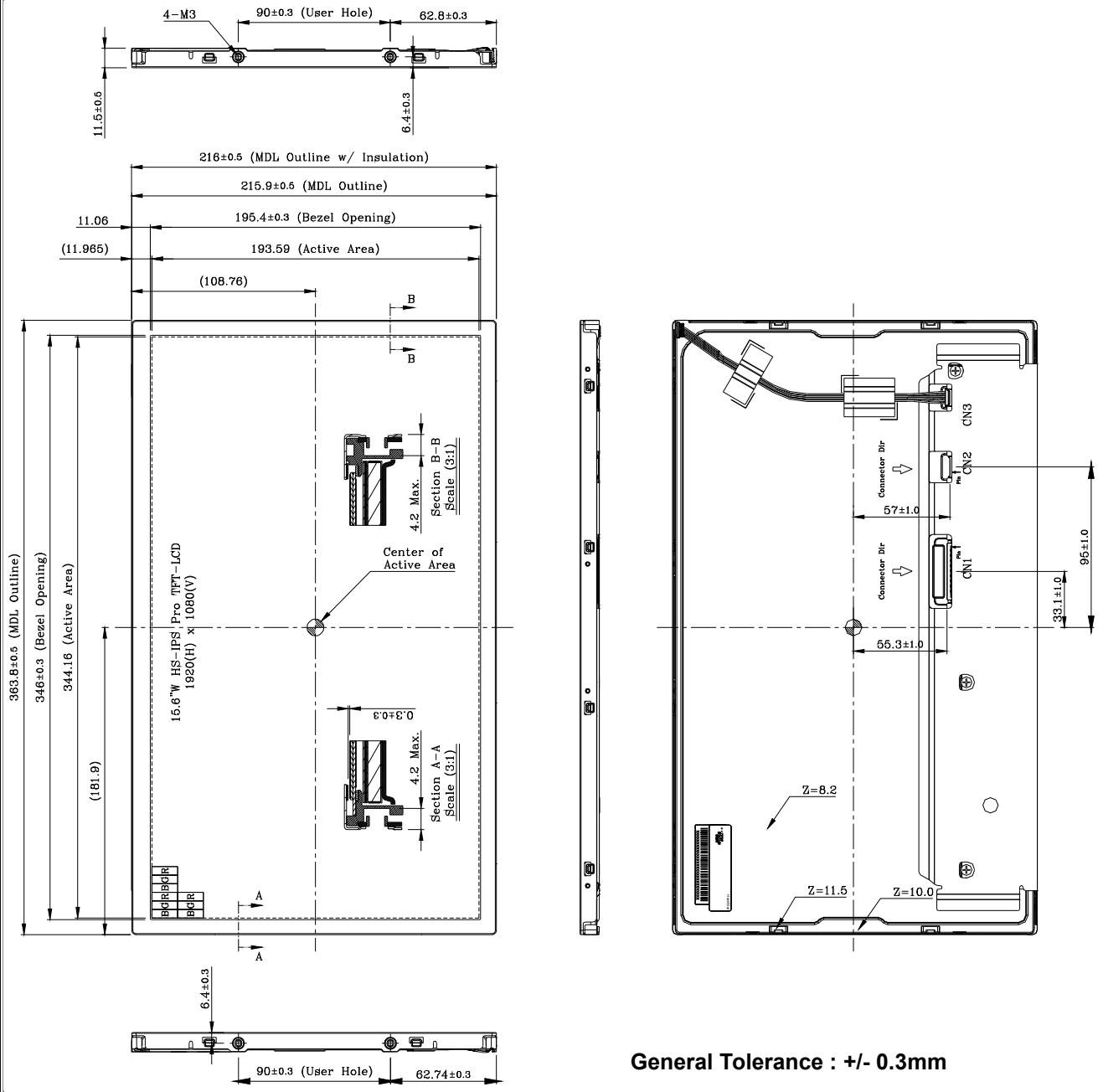
7.0 Reliability test items

No.	Item	Conditions	Remark
1	High Temperature Storage	Ta=+90°C, 540hrs	
2	Low Temperature Storage	Ta=-40°C, 540hrs	
3	High Temperature Operation	Ta=+85°C, 540hrs	
4	Low Temperature Operation	Ta=-30°C, 540hrs	
5	High Temperature and High Humidity (operation)	Ta=+65°C, 90%RH, 540hrs	
6	Thermal Cycling Test (non operation)	-30°C(30min) → +85°C(30min), 300 cycles	
7	Electrostatic Discharge	±200V,200pF(0Ω) 1 time/connector	
8	Vibration	1.Random: 1.04G, 10~500Hz, XYZ, 30min/each direction 2.Sine: Freq. Range: 8~33.3Hz, Stoke: 1.3mmhz Sweep: 2.9G, 33.3~400 X/Z: 2hrs, Y:4hrs	
9	Shock	Half-Sine, 100G, 6ms, ±XYZ, 1time	
10	Vibration (with carton)	Random: 0.015G^2/Hz, 5~200Hz -6dB/Octave, 200~400Hz XYZ 各方向 2hrs	
11	Drop (with carton)	Drop height condition, basis on the product weight and follow QB100-0027 1 corner, 3 edges, 6 surfaces	
12	ESD(Air & Contact)	AA區(打Panel 四周) 1. Air : 4kv/ 8kv / 12/ 15kv 2.Contact : 2kv 4kv / 6kv / 8kv 3.電阻電容 ：150 pf / 330 歐姆 Connecter : 1.Contact : 200v 2.電阻電容 ：200 pf / 0 歐姆 判定標準 ： 符合 Class C (含)以上 Class A：測試時畫面無任何變化；依據各執行電壓Spec作判定 Class B：測試時畫面有閃動或雜訊產生；依據各執行電壓Spec作判定 Class C：測試時畫面當機，但重新Reset後恢復正常；依據各執行電壓Spec作判定 NG：畫面經重新開機仍無法恢復出畫	

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

8.0 OUTLINE DIMENSION

Unit : mm



General Tolerance : +/- 0.3mm

User Mounting Torque Spec: 3kgf-cm Max.

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

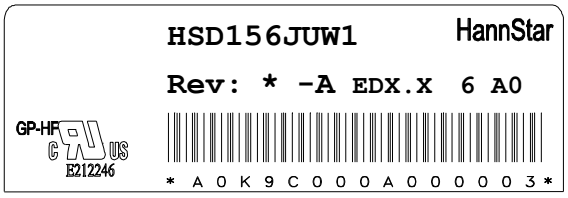
Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Mark	6	7	8	9	0	1	2	3	4	5

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

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.

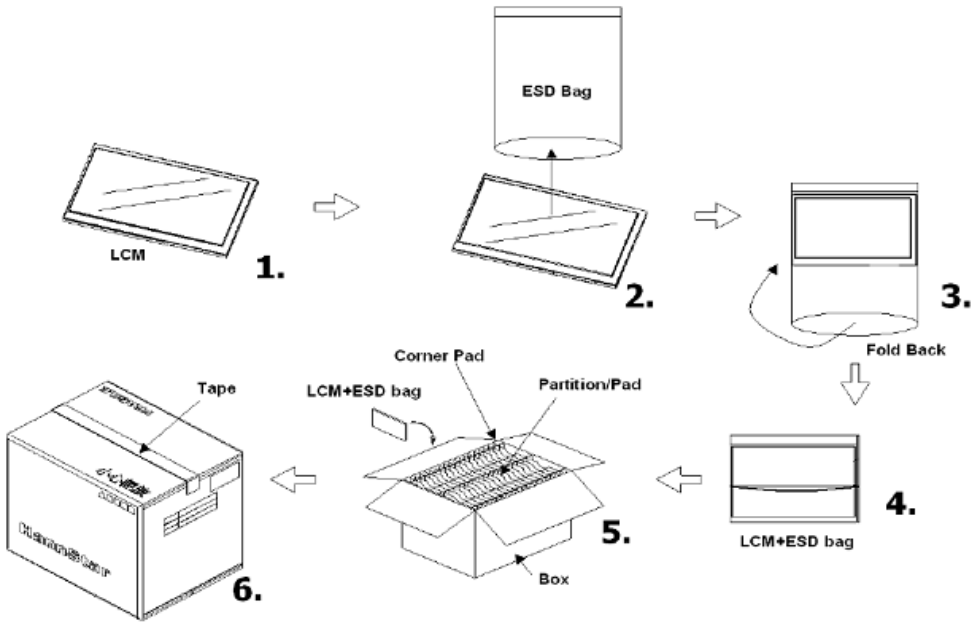


10.0 PACKAGE SPECIFICATION

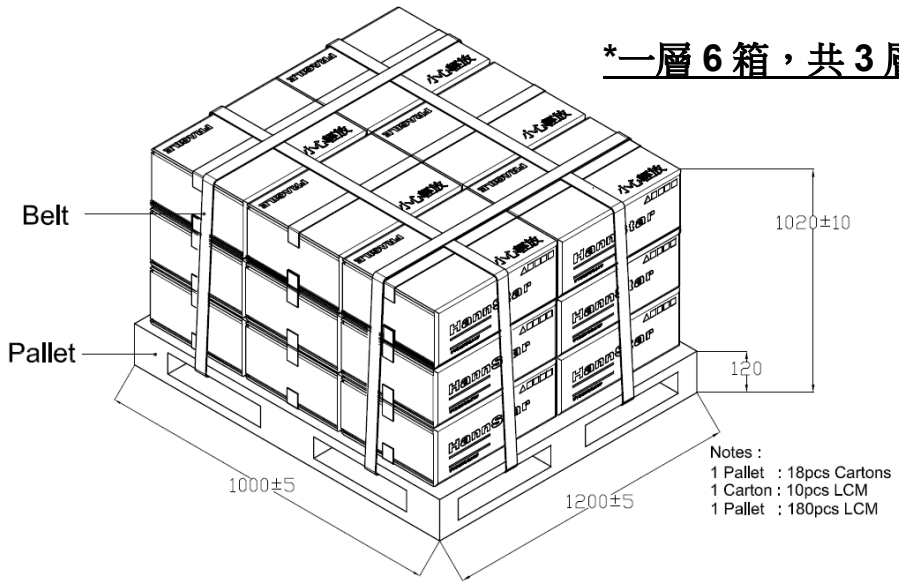
10.1 Packing form

LCM Model	Qty. in the Box	Inner Box Size(mm)	Notice
HSD156JUW1-A	10pcs/Box	465mmx270mmx300	--

10.2 Packing assembly drawings



***一層 6 箱，共 3 層，共 18 箱**



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.

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 mounting 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.