TO :

Date : Nov.10, 2020

HannStar Product Specification

(Formal)

Model: HSD128JUW1-A10

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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.

(3) The mark " ** " of Model means sub-model code.

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Record of Revisions

Rev.	Date	Sub-Model	Description of change
1.0	Nov., 5, 2019	A10	Formal Specification was first released
2.0	Jun.,8, 2020	A10	Modify the 6.6 Backlight unit (P20)
3.0	Sep.,25,2020	A10	Modify the 1.3 Applications (P4)
4.0	Nov.10,2020	A10	Mofify the 5.0 Interface Pin Connection(P14) Modify the 6.5 Power On Sequence(P19)

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1.0 GENERAL DESCRIPTION

1.1 Introduction

HannStar Display model HSD128JUW1-A10 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 12.8” (16:9) inch diagonally measured active display area with 5760 x 1080 dot (1920 horizontal by 1080 vertical pixel) resolution.

1.2 Features

- 12.8 (16:9 diagonal) inch configuration
- 16.7M
- ROHS / Halogen Free Compliance

1.3 Applications

- TFT LCD Monitor
- Industrial Application
- Amusement
- Vehicle

1.4 General information

Item		Specification	Unit
Outline Dimension		294.4(H) x 175.0(V) x 6.5(Typ.)	mm
Display area		283.392(H) x 159.408(V)	mm
Number of Pixel		1920 RGB (H) x 1080(V)	pixels
Pixel pitch		0.1476(H) x 0.1476 (V)	mm
Pixel arrangement		RGB Vertical stripe	
Display mode		Normally Black	
NTSC		75 (typ.)	%
Surface treatment		Glare	
Weight		460 (Typ.)	g
Back-light		Single LED (Side-Light type)	
Power Consumption	Logic System (White Pattern)	1.65 W (Max)	W
	B/L System	15.504 (Max.)	W

1.5 Mechanical Information

Item		Min.	Typ.	Max.	Unit
Module Size	Horizontal (H)	293.9	294.4	294.9	mm
	Vertical (V)	174.5	175.0	175.5	mm
	Depth (D)	6.0	6.5	7.0	mm
Weight		—	460	—	g

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2.0 ABSOLUTE MAXIMUM RATINGS

2.1 Electrical Absolute Rating

2.1.1 TFT LCD Module

Parameters	Symbol	Min.	Max.	Unit	Note
Power Logic	VCC	-0.3	4	V	

2.2 Environment Absolute Rating

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

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3.0 OPTICAL CHARACTERISTICS

3.1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast		CR	Θ=0 Normal viewing angle	1100	1500	—		(1)(2)
Response time	Rising	T_R		—	13	16	msec	(1)(3)
	Falling	T_F		—	12	14		
White luminance (Center)		Y_L		530	700	—	cd/m^2	(1)(4) (I_L=380mA)
Color chromaticity (CIE1931)	White	W_x		0.254	0.294	0.334		(1)(4)
		W_y		0.269	0.309	0.349		
	Red	R_x		0.595	0.635	0.675		
		R_y		0.289	0.329	0.369		
	Green	G_x		0.255	0.295	0.335		
		G_y		0.577	0.617	0.657		
	Blue	B_x		0.113	0.153	0.193		
		B_y		0.010	0.050	0.090		
Viewing angle	Hor.	Θ_L	CR>10	80	85	—		
		Θ_R		80	85	—		
	Ver.	Θ_U		80	85	—		
		Θ_D		80	85	—		
Brightness uniformity		B_{UNI}	Θ=0	70	80	—	%	(5)
Optima View Direction		Free						(6)
Reflection	%	R (%)	—	—	5.0	5.5	%	(7)

3.2 Measuring Condition

- Measuring surrounding：dark room
- LED current I_L：**380mA**
- Ambient temperature：25±2°C
- 15min. warm-up time.

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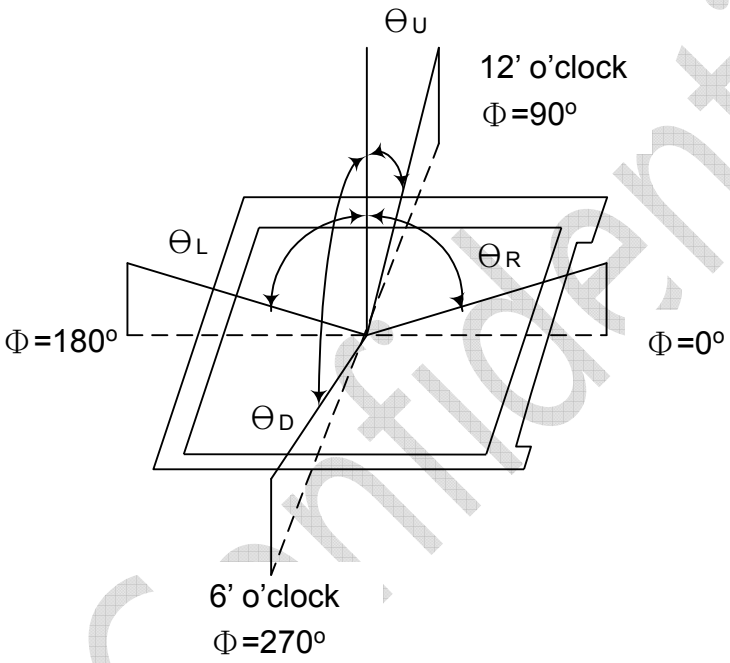
3.3 Measuring Equipment

- FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.
- Measuring spot size：20 ~ 21 mm

Note (1) Definition of Viewing Angle:



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

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

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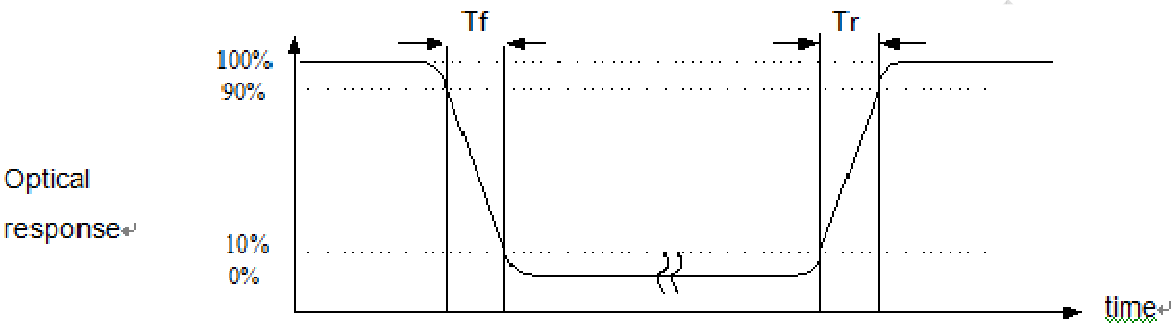
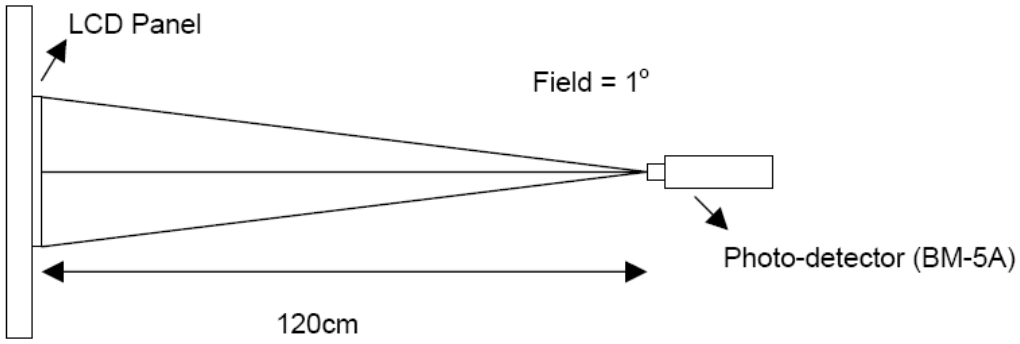
Note (3) Definition of Response Time : Sum of T_R and T_F



Note (4) Definition of optical measurement setup



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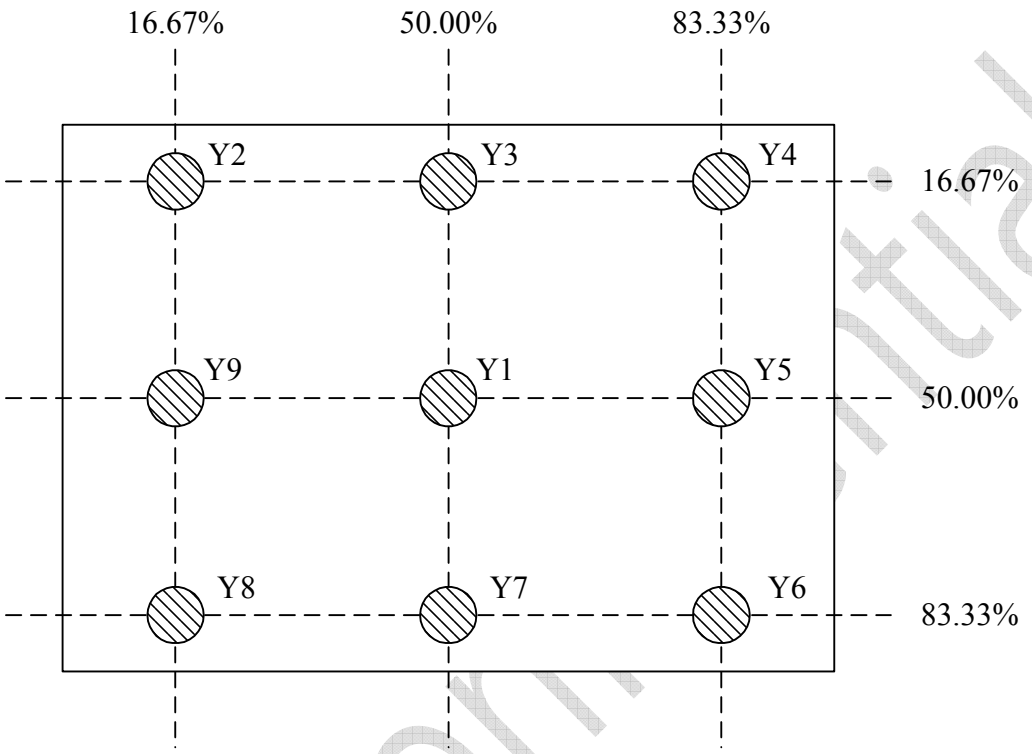
Note (5) Definition of brightness uniformity



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

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

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Note (7) Definition of CM-3700A(Konica Minolta) Measurement specification

■ The Settings of the instrument：

A. reflection rate;

B. Measuring the aperture: MAV(8mm);

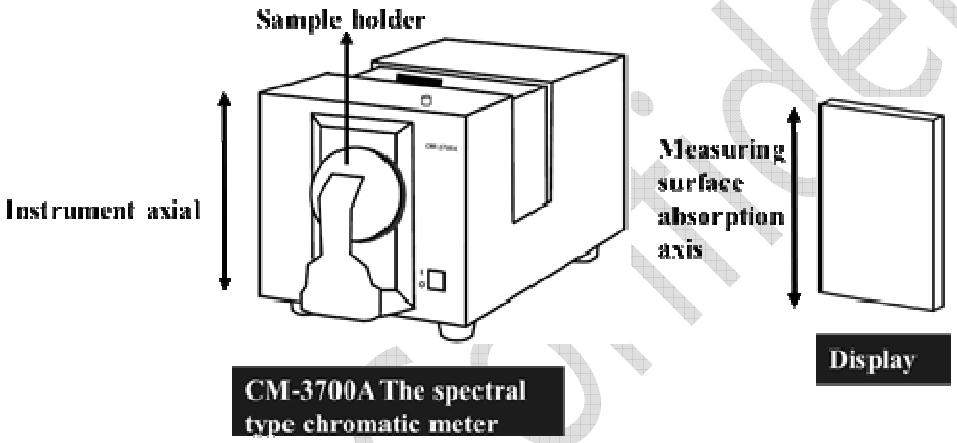
C. Observer perspective: 2˚;

D. Specular light: SCI;

E. The light source: D65.

■ The definition of measurement way

Chromatic meter will display the absorption of shaft and spectral type axial parallel alignment, and placed the sample frame for photometry.



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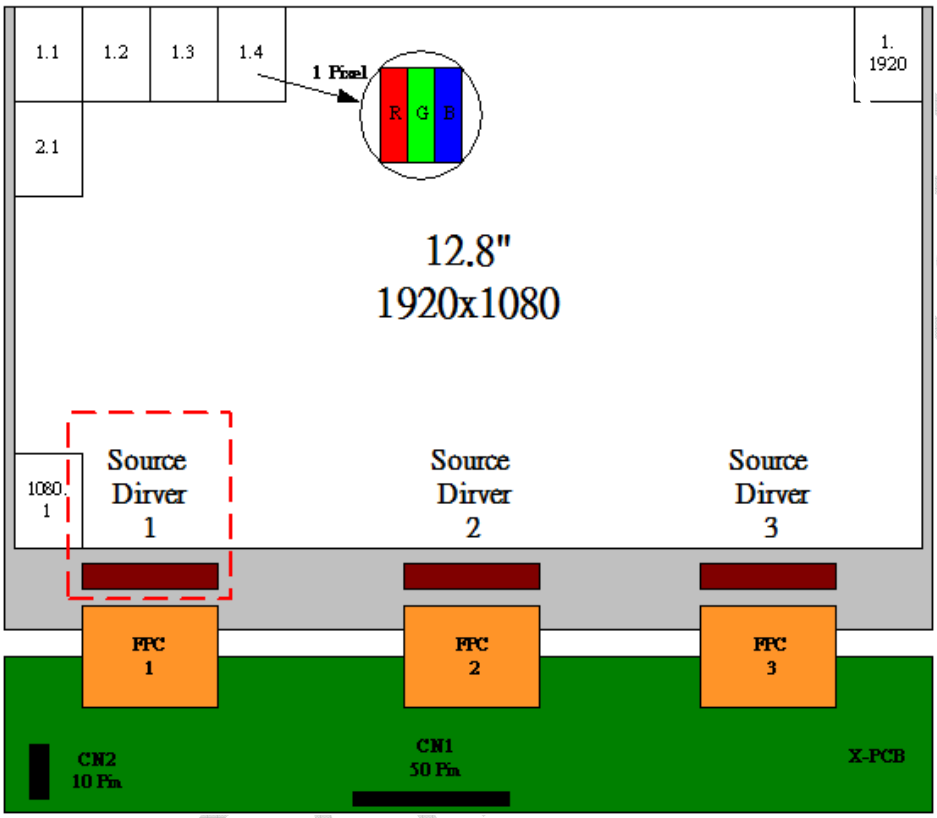
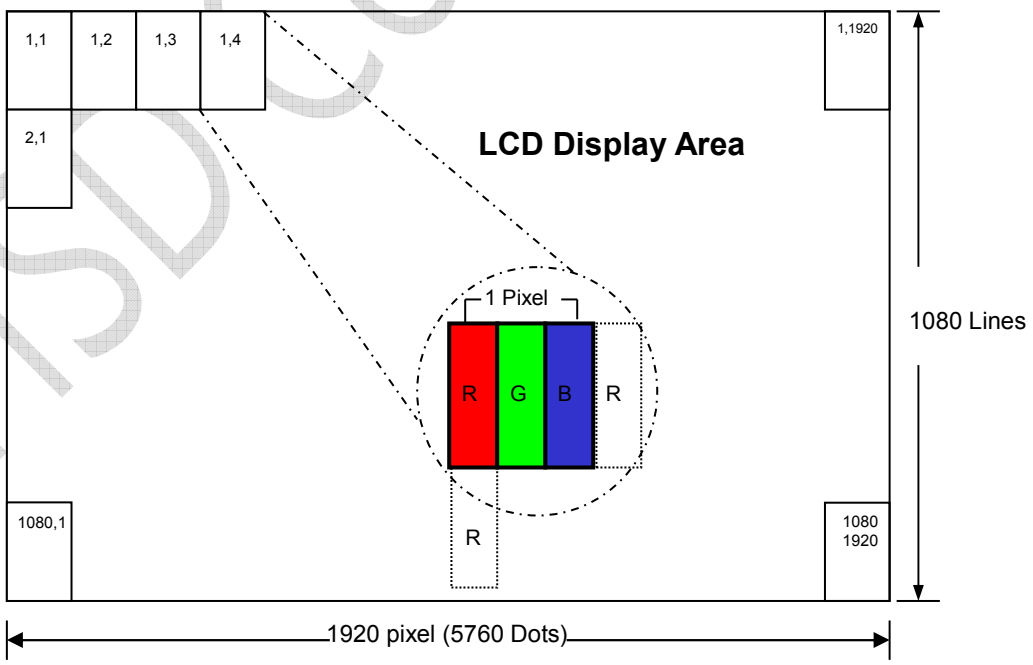
4.0 BLOCK DIAGRAM

4.1 TFT LCD Module:



4.2 Pixel Format



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4.3 Relationship Between Displayed Color and Input

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

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5.0 INTERFACE PIN CONNECTION

CN1 FPC connector is used for electronics interface.

AORORA F31L-1A7H1-21050 or equal(50PIN)

Pin no.	Symbol	Function	Note
1	GND	Power ground	
2	NC/BIST	No connector(BIST Pin)	
3	VCC	Digital Power/Vin = 3.3V	
4	VCC	Digital Power/Vin = 3.3V	
5	GND	Power ground	
6	GND	Power ground	
7	NC	No connector(Serial interface OTP Power)	
8	NC	No connector	
9	GND	Power ground	
10	ORXIN0-	Negative LVDS differential data input (Odd data)	
11	ORXIN0+	Positive LVDS differential data input (Odd data)	
12	ORXIN1-	Negative LVDS differential data input (Odd data)	
13	ORXIN1+	Positive LVDS differential data input (Odd data)	
14	ORXIN2-	Negative LVDS differential data input (Odd data)	
15	ORXIN2+	Positive LVDS differential data input (Odd data)	
16	ORXCLKIN-	Negative LVDS differential clock input (Odd clock)	
17	ORXCLKIN+	Positive LVDS differential clock input (Odd clock)	
18	ORXIN3-	Negative LVDS differential data input (Odd data)	
19	ORXIN3+	Positive LVDS differential data input (Odd data)	
20	ERXIN0-	Negative LVDS differential data input (Even data)	
21	ERXIN0+	Positive LVDS differential data input (Even data)	
22	ERXIN1-	Negative LVDS differential data input (Even data)	
23	ERXIN1+	Positive LVDS differential data input (Even data)	
24	ERXIN2-	Negative LVDS differential data input (Even data)	
25	ERXIN2+	Positive LVDS differential data input (Even data)	
26	ERXCLKIN-	Negative LVDS differential clock input (Even clock)	
27	ERXCLKIN+	Positive LVDS differential clock input (Even clock)	
28	ERXIN3-	Negative LVDS differential data input (Even data)	
29	ERXIN3+	Positive LVDS differential data input (Even data)	
30	GND	Power ground	

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31	FAULT	FAULT signal output(normal=H,abnormal=L)	note1
32	RESET	Global reset pin, active low.	
33	STBYB	Standby mode setting pin, active low.	
34	NC	No connector(Serial interface chip enable.CSB)	
35	NC	No connector(Serial interface clock input.SCL)	
36	NC	No connector(Serial interface data input/output.CDA)	
37	NC	No connector(Serial interface data input/output.CDA)	
38	GND	Power ground	
39	GND	Power ground	
40	NC	No connector	
41	LEDA	LED power (Anode)	
42	LEDA	LED power (Anode)	
43	LEDA	LED power (Anode)	
44	NC	No connector	
45	LEDK	Cathode 1	
46	LEDK	Cathode 2	
47	LEDK	Cathode 3	
48	LEDK	Cathode 4	
49	NTC_A	NTC_Anode	note2
50	NTC_K	NTC_Cathode	
Note1: IC Enter self protection mode. (No HS/VS/DE/CLK)[Lower than 40Hz]			
Note2: Murata NCU15XH103F6SRC			

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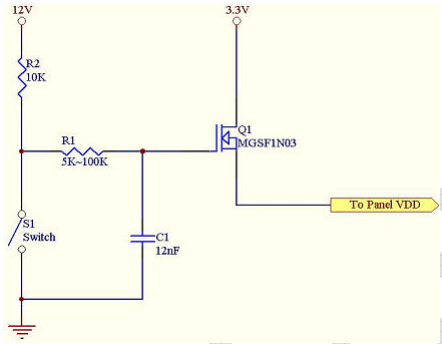
6.0 ELECTRICAL CHARACTERISTICS

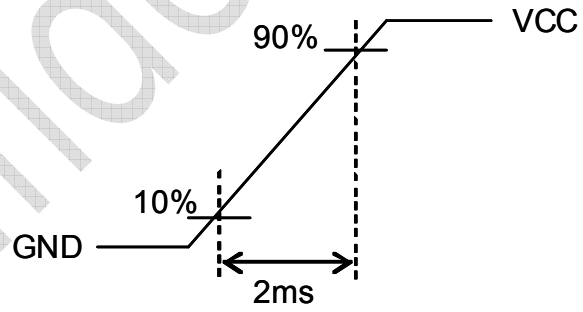
6.1 TFT LCD Module

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	VCC	3	3.3	3.6	V	
Input signal voltage	ViH	VCC*0.7	-	VCC	V	
	ViL	0	-	VCC*0.3	V	
Current of power supply	I_{DD}	--	--	500	mA	VCC =3.3V White pattern
Inrush current	I_{RUSH}	—	—	2.0	A	Note*

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



Test circuit



Rising time

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	$\|V_{ID}\|$	0.1	—	0.6	V	
Common Mode Voltage Offset	V_{CM}	1	1.2	1.7-($\|V_{ID}\|$/2)	V	

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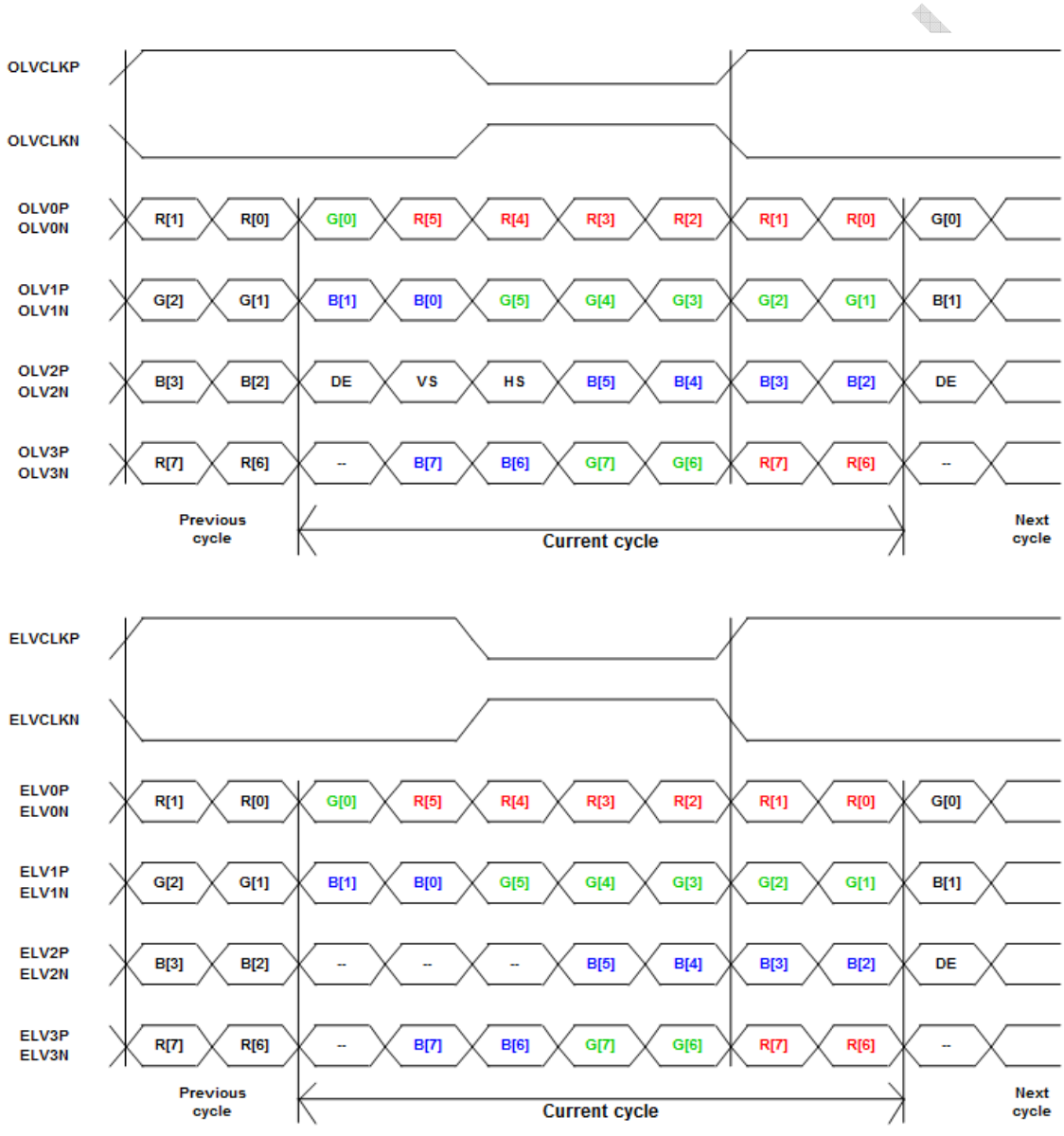
6.3 Bit LVDS input

6.3.1 8Bit LVDS input



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6.4 Interface Timing (DE mode)

Interface Timing (DE mode) Two Port LVDS Timing.(1920xRGBx1080)					
Item	Symbol	**Min.**	**Typ.**	**Max.**	Unit
Frame Rate	FR	**55**	**60**	**65**	Hz
Vertical Display Time	T_{vd}		**1080**		H
Vertical pulse width	T_{vpw}	**1**	**3**	**20**	H
Vertical back porch	T_{vbp}	**2**	**24**	**200**	H
Vertical front porch	T_{vfp}	**5**	**8**	**200**	H
Frame Period	T_v	**1087**	**1112**	**1404**	H
Horizontal Display Time	T_{hd}		**960**		DCLK
Horizontal pulse width	T_{hpw}	**10**	**12**	**200**	DCLK
Horizontal back porch	T_{hbp}	**5**	**16**	**200**	DCLK
Horizontal front porch	T_{hfp}	**24**	**26**	**200**	DCLK
1 Horizontal line	T_v	**989**	**1012**	**1248**	DCLK
Clock Rate	F_{DCLK}	**64.5**	**66.9**	**80**	MHz

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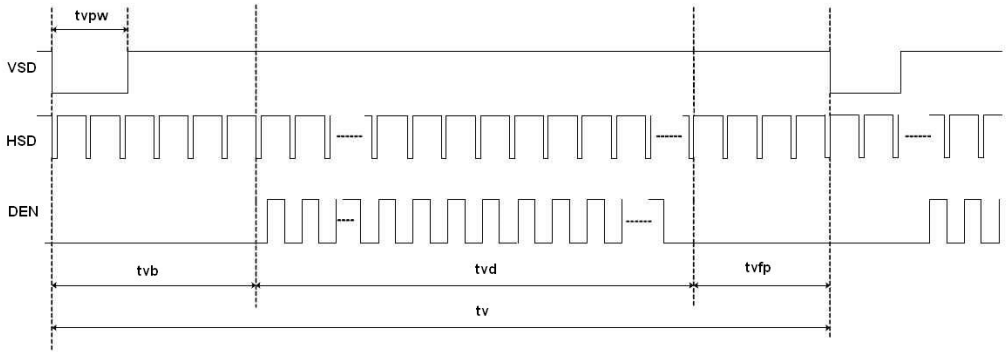
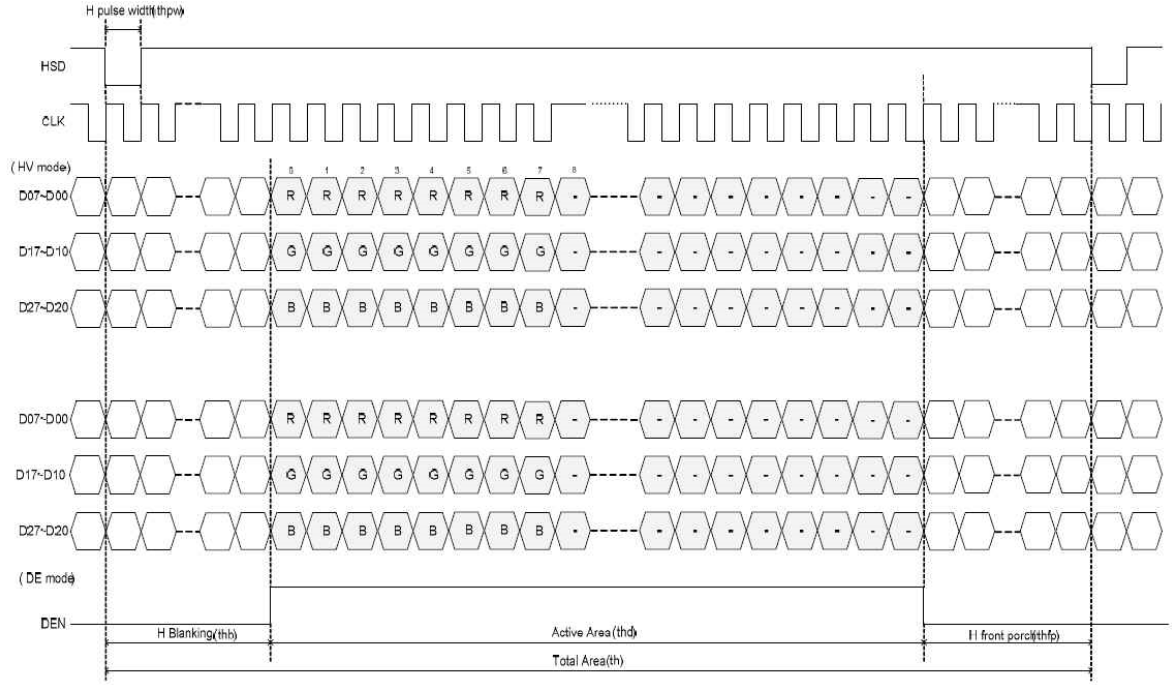
Timing Diagram of Interface Signal (DE mode)

(1) Vertical input timing



(2) Horizontal Vertical input timing



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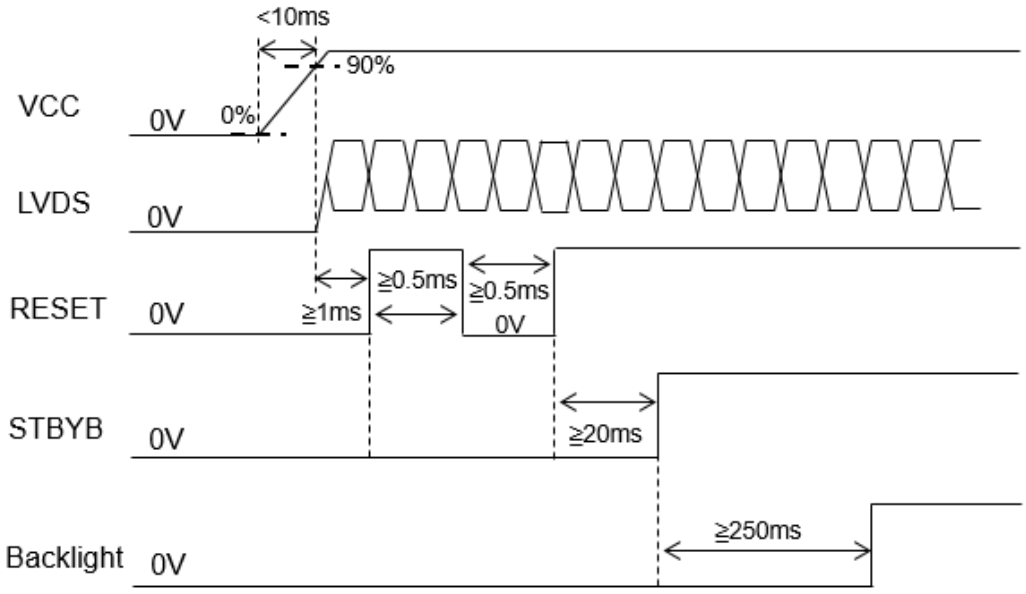
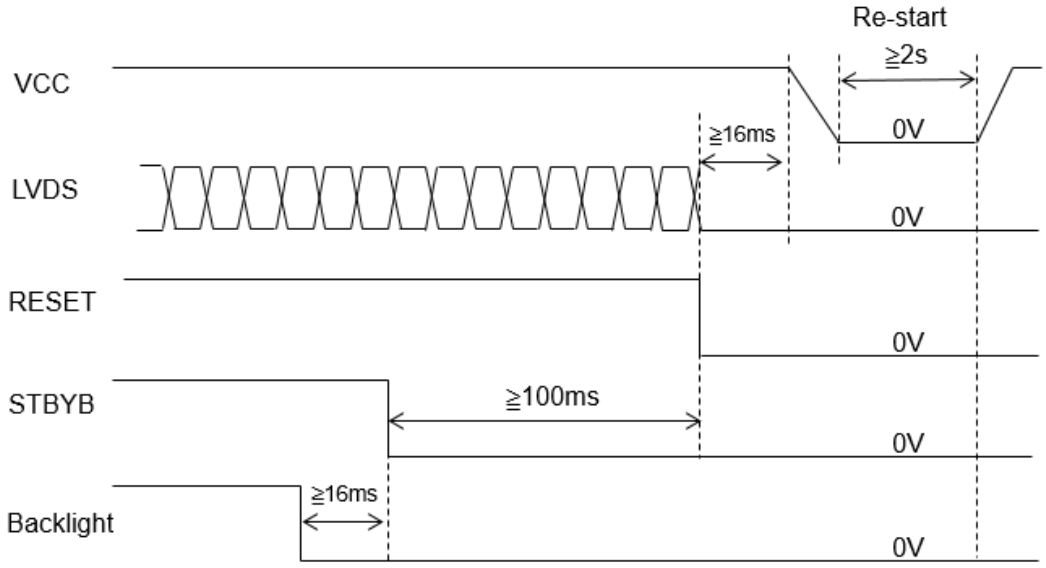
6.5 Power On / Off Sequence

Power on Sequence



Power off Sequence



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6.6 Backlight Unit

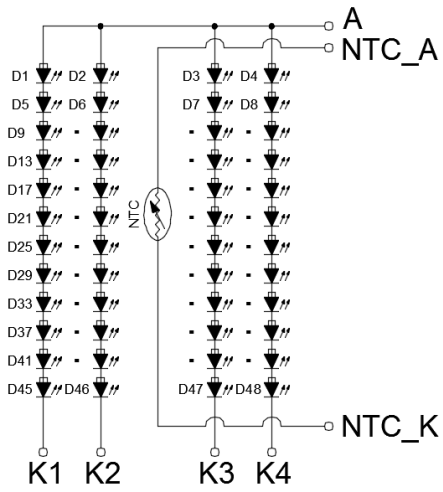
Parameter	Symbol	Min	Typ	Max	Units	Condition
LED Current	IL	--	380	--	mA	Ta=25℃
LED Voltage	V_F	--	38.4	40.8	Volt	Ta=25℃
LED Life-Time	N/A	30,000	--	--	Hour	Ta=25℃ I_F=95mA Note (2)

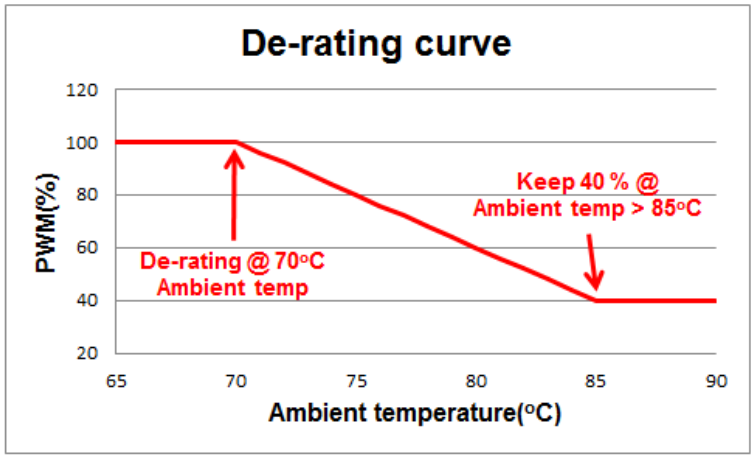
Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: Ta=25±3 °C, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note (2) The "LED life time" is defined as the module brightness decrease to 50% original brightness at Ta=25℃ and IL= 380 mA. The LED lifetime could be decreased if operating IL is larger than 380 mA. The constant current driving method is suggested.

Note (3) LED Light Bar Circuit 12S4P =48pcs LED

Note (4) LED temperature current curve, The temperature at 70 degrees before the output Duty 100%,70 degrees to 85 degrees when the linear drop to Duty 40%.





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7.0 RELIABILITY TEST ITEMS

No.	Item	Conditions	Remark
1	High Temperature Storage	Ta=+90°C, 500hrs	1, 2, 3
2	Low Temperature Storage	Ta=-40°C, 500hrs	1, 2, 3
3	High Temperature Operation	Ta=+85°C, 500hrs	1, 2, 3
4	Low Temperature Operation	Ta=-30°C, 500hrs	1, 2, 3
5	High Temperature and High Humidity (operation)	Ta=+65°C, 90%RH, 240hrs	1, 2, 3
6	Thermal Cycling Test (non operation)	-30°C(30min)→+85°C(30min),100 cycles	1, 2, 3
7	Electrostatic Discharge	R=330Ω,C=150pF Contact = ± 8 kV, class B Air = ± 15 kV, class B 1 time for each point	
8	Vibration	1.Random: 1.04G, 10~500Hz, XYZ, 30min/each direction 2.Sine: Freq.Range, 8~33.3Hz, Stoke: 1.3mm Sweep: 2.9G, 33.3~400Hz 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, 2hrs/each direction	
11	Drop (with carton)	Drop height condition, basis on the product weight and follow QB200-0015, 1 corner, 3 edges, 6 surfaces	

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

Note2: The test result shall be evaluated after the sample has been left at room temperature and humidity for 2 hours without load. No condensation shall be accepted. The sample shall be free from defects:
(Air bubble in the LCD、Seal leak、Non-display、Missing segments、Glass crack).

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

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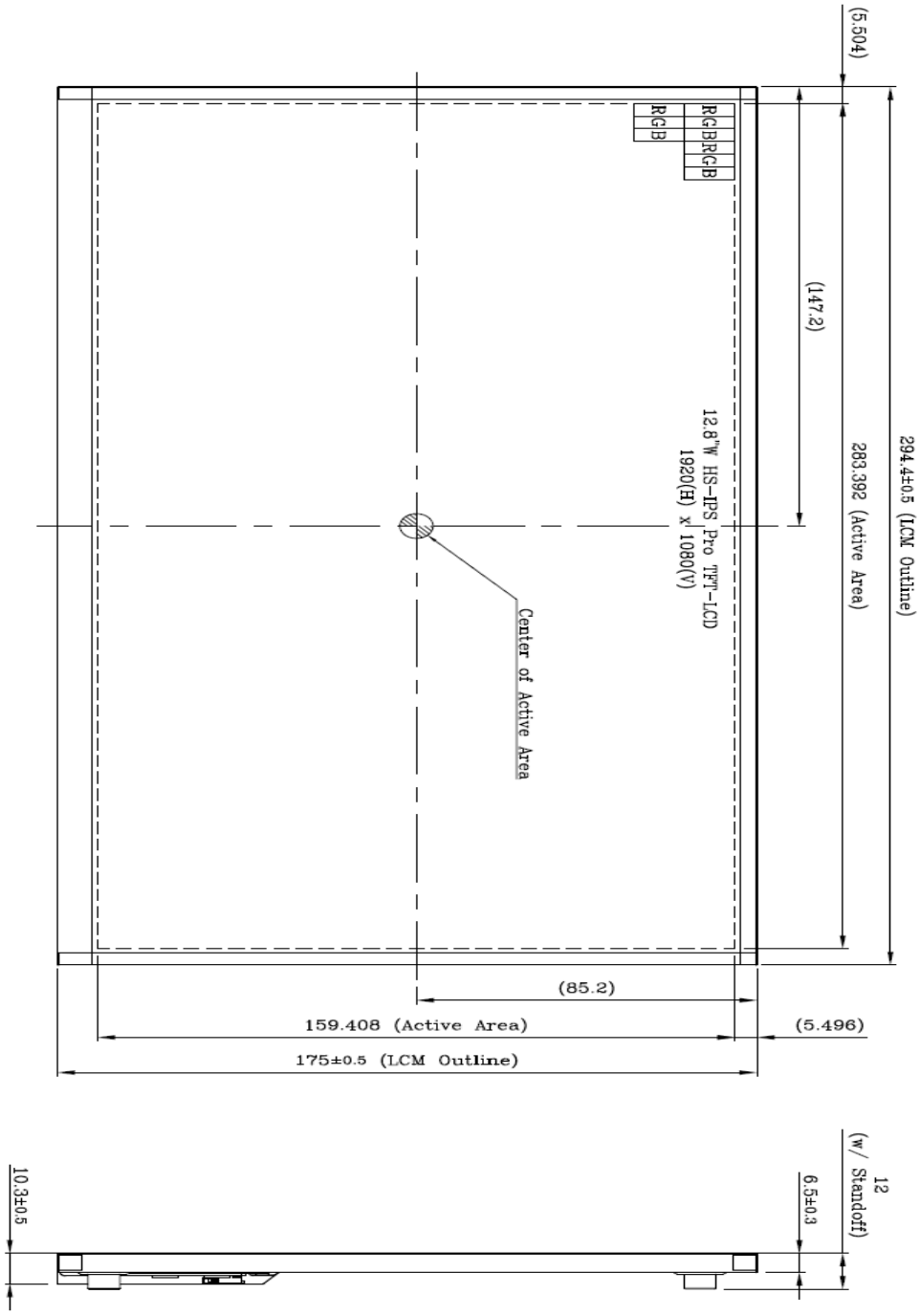
8.0 OUTLINE DIMENSION

Unit : mm



Note: General tolerance: +/- 0.3mm

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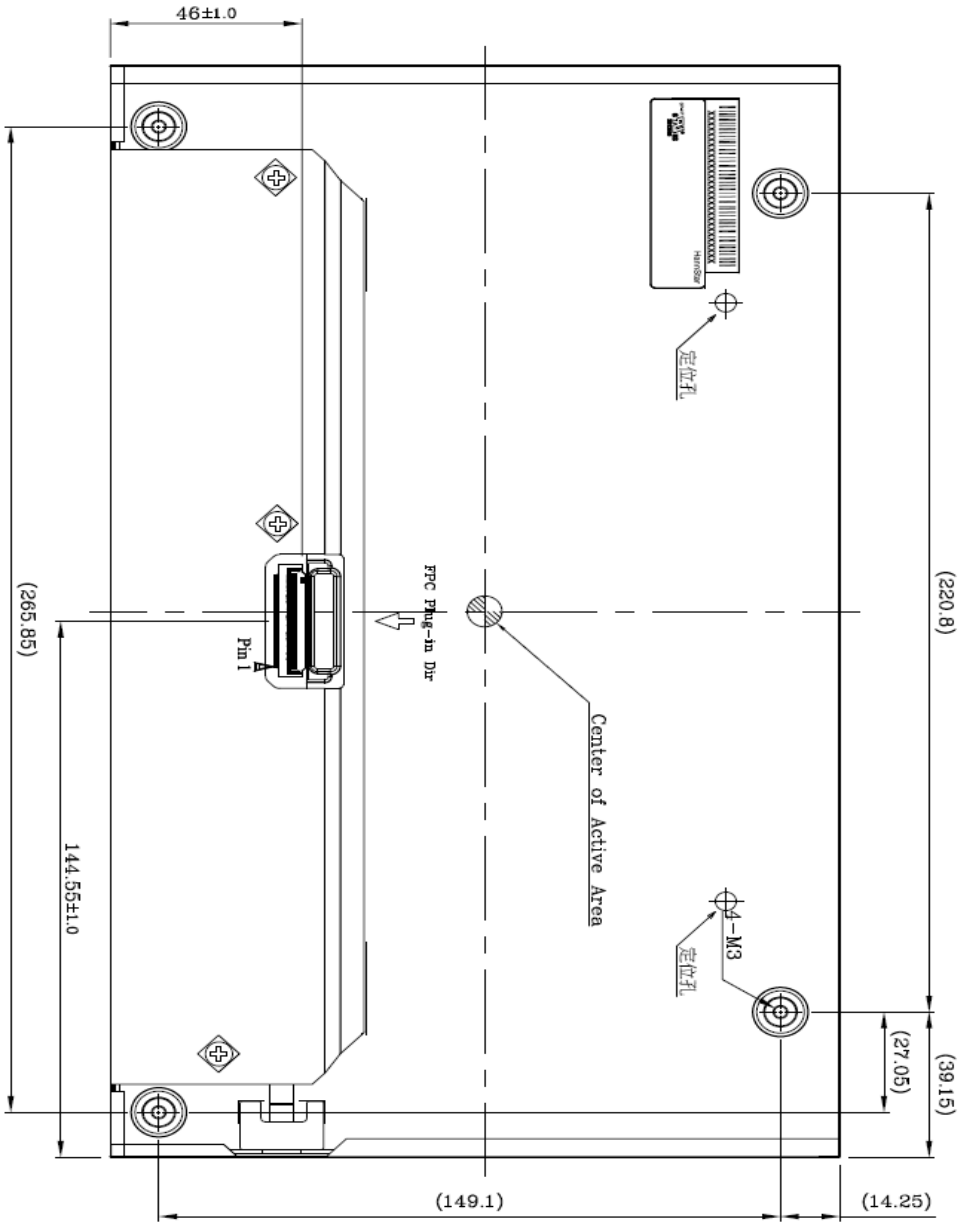

Note: General tolerance: +/- 0.3mm

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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

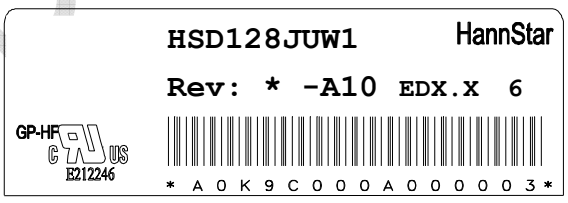
Year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Mark	9	0	1	2	3	4	5	6	7	8

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 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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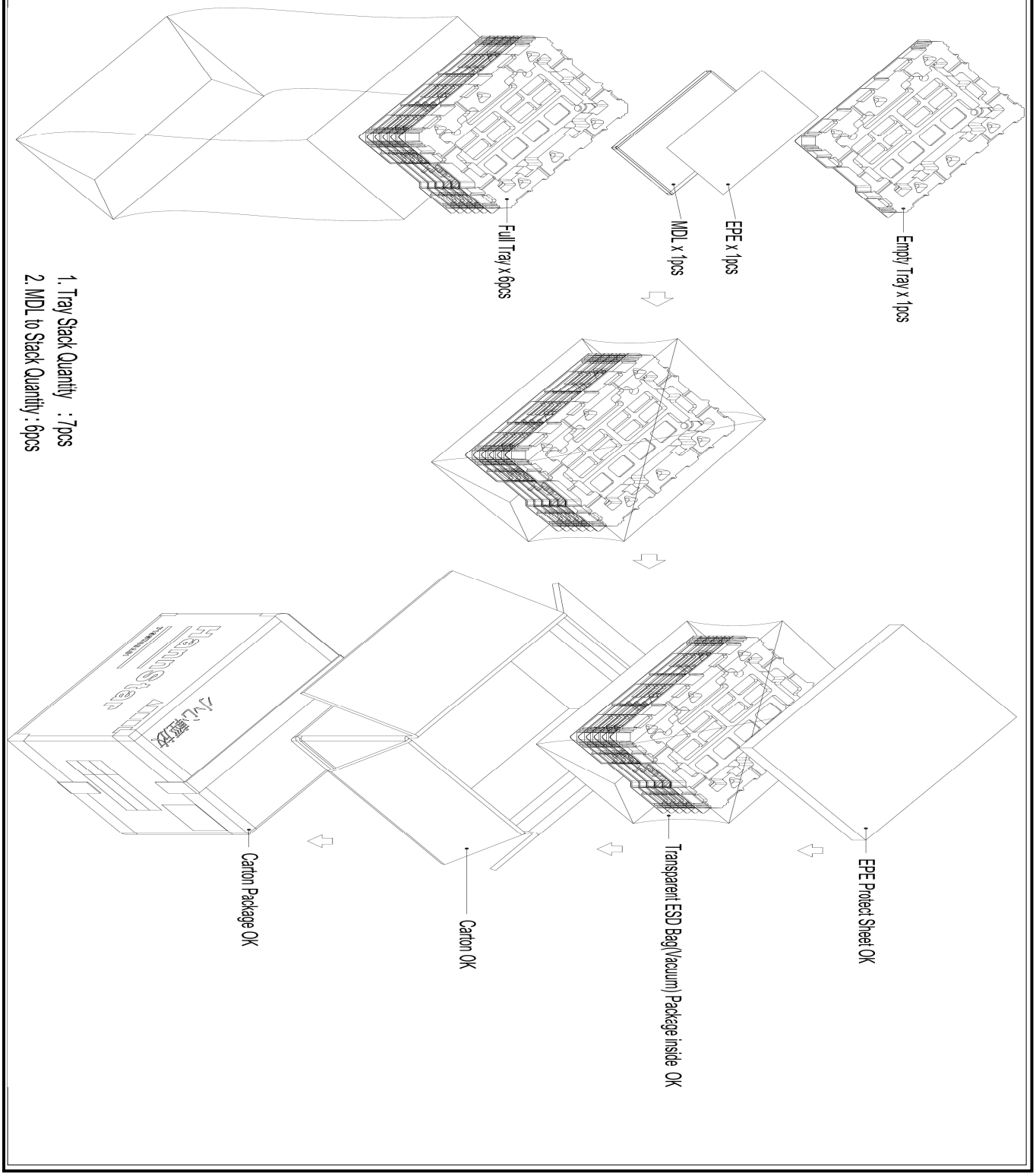
10.0 PACKAGE SPECIFICATION



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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.

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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.

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