

SPECIFICATION

Product Type: 5" TFT LCM

ZX050ML115-12A

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1.0 General Description

1.1 Introduction

HannStar Display model HSD0501DW1-A00-0299 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. This TFT LCD has a 5.0 (15:9) inch diagonally measured active display area with WVGA (800 horizontal by 480 vertical pixel) resolution.

1.2. Features

- 5.0 (15:9 diagonal) inch configuration
- 6 bits + FRC driver with 1 channel TTL interface
- RoHS and Halogen-Free Compliance

1.3 Applications

- Personal Navigation Device
- Multimedia applications and Others AV system

1.4. General information

Item	Specification	Unit
Outline Dimension	120.7 (H) x 75.8 (V) x 3.1 (D)	mm
Display area	108 (H) x 64.8 (V)	mm
Number of Pixel	800 RGB (H) x 480 (V)	pixels
Pixel pitch	0.135 (H) x 0.135 (V)s	mm
Pixel arrangement	RGB Vertical stripe	
Display mode	Normally white	

2.0 Absolute Maximum Ratings

2.1 Electrical Absolute Rating

2.1.1 TFT LCD Module

Item	Symbol	Min.	Max.	Unit	Note
Power supply voltage	V _{DD}	-0.5	5.0	V	GND=0
Logic Signal Input Level	V _I	-0.3	V _{DD} +0.3	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) Ta =25±2℃

2.2 Environment Absolute Rating

Item	Symbol	Min.	Max.	Unit	Note
Operating Temperature	Topa	-10	60	℃	
Storage Temperature	Tstg	-20	70	℃	

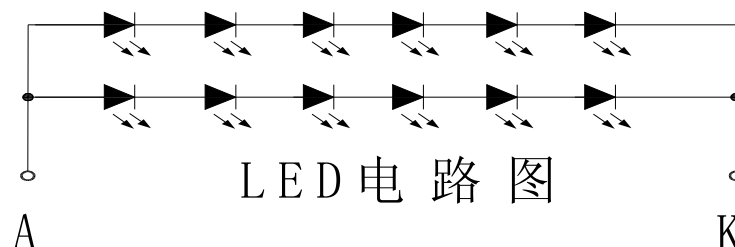
2.3 Back-light Unit:

PARAMETER	Sym.	Min.	Typ.	Max.	Unit	Test Condition	Note
LED Current	IF	-	40	-	mA	-	-
LED Voltage (Total)	VF	18	19.8	21	V	-	-
Life Time		-	25000	-	Hr.	I ≅ 40mA	-
Color	White						

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) Ta=25±2℃

(3) Test condition: LED Current 40mA



3.0 Optical Characteristics

3.1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max	Unit	Note	
LCM luminance (Center)		YL	I=40mA	320	350	—	cd/m ²	9 point AVG	
Threshold voltage		VSAT		—	2.4	—			
		VTH		—	1.4	—			
Transmittance (With PZ)		T		—	6.78	—			
Brightness uniformity		BUNI	Θ=0	75			%	(5) (6)	
Contrast		CR	Normal viewing angle	480	600	—		(2) (3)	
Response time	Rising	TR		—	3	6	msec	(2) (4)	
	Falling	TF		—	7	14			
Color gamut		S			—	50	—	%	C light
Color chromaticity (CIE1931)	White	WX	CR>10	0.30	0.32	0.34		(2) (5)	
		WY		0.32	0.34	0.36			
Viewing angle	Hor.	θ _L		65	75	—			
		θ _R		65	75	—			
	Ver.	θ _U	50	60	—				
		θ _D	60	70	—				
Optima View Direction		6 O'clock						(5)	

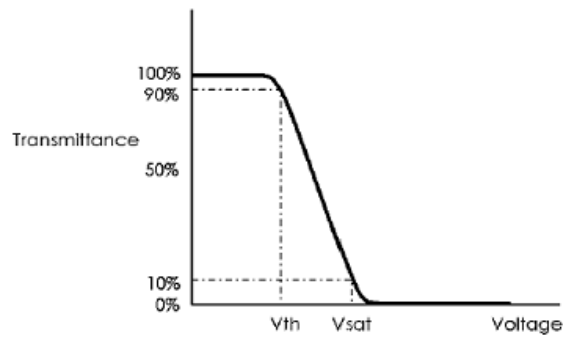
3.2 Measuring Condition

- Measuring surrounding : dark room
- Ambient temperature : 25±2°C
- 30min. warm-up time.

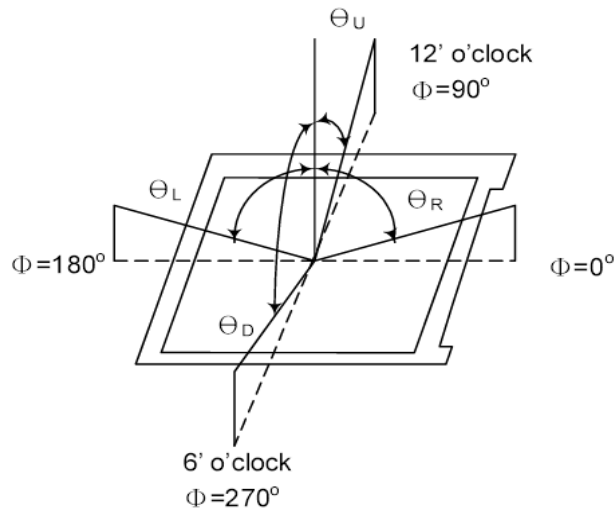
3.3 Measuring Equipment

- TOPCON BM-7
- Measuring spot size : field 2°

Note (1) Definition of V_{sat} and V_{th} (at 20°C)



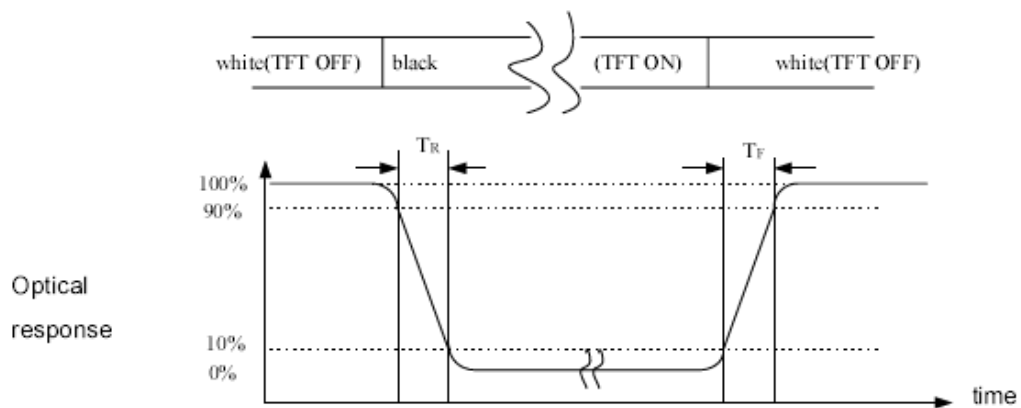
Note (2) Definition of Viewing Angle :



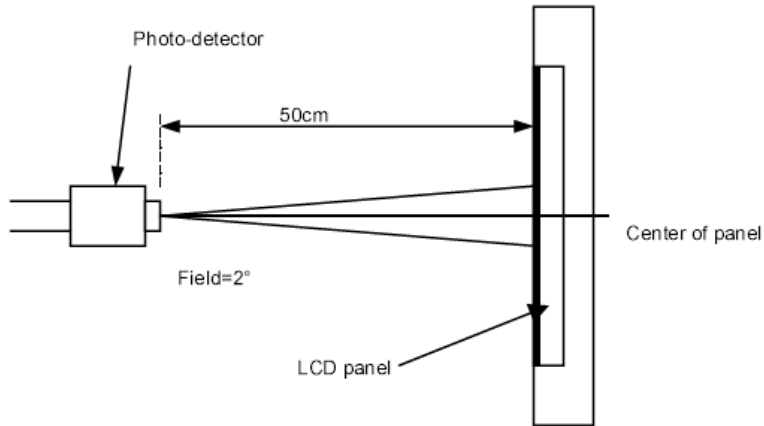
Note (3) Definition of Contrast Ratio (CR) :
measured at the center point of panel

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

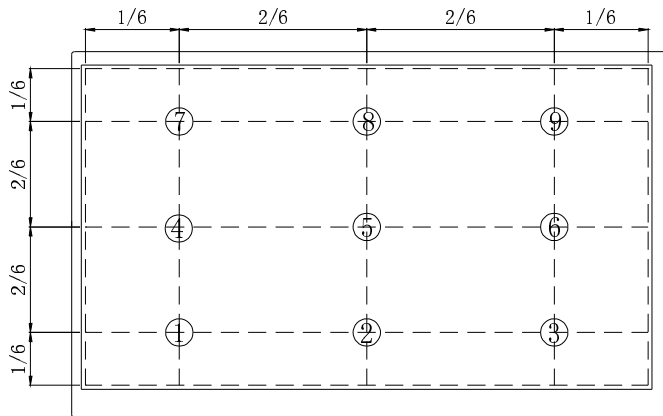
Note (4) Definition of Response Time : Sum of T_R and T_F



Note (5) Definition of optical measurement setup

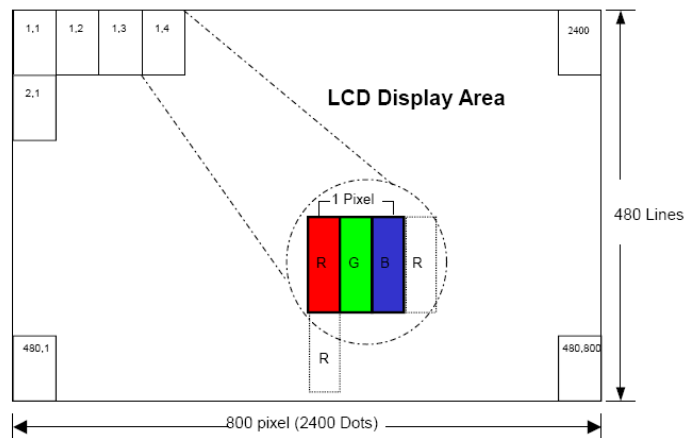


Note (6) Definition of brightness uniformity



4.0 Block Diagram

4.1 Pixel Format



5.0 Interface Pin Connection

FPC connector is used for electronics interface.

Pin No.	Symbol	I/O	Function
1	V _{LED-}	P	Power for LED backlight cathode
2	V _{LED+}	P	Power for LED backlight anode
3	GND	P	Power ground
4	V _{DD}	P	Power voltage
5	R0	I	Red data (LSB)
6	R1	I	Red data
7	R2	I	Red data
8	R3	I	Red data
9	R4	I	Red data
10	R5	I	Red data
11	R6	I	Red data
12	R7	I	Red data (MSB)
13	G0	I	Green data (LSB)
14	G1	I	Green data
15	G2	I	Green data
16	G3	I	Green data
17	G4	I	Green data
18	G5	I	Green data
19	G6	I	Green data
20	G7	I	Green data (MSB)
21	B0	I	Blue data (LSB)
22	B1	I	Blue data
23	B2	I	Blue data
24	B3	I	Blue data
25	B4	I	Blue data
26	B5	I	Blue data
27	B6	I	Blue data
28	B7	I	Blue data (MSB)
29	DGND	I	Digital ground
30	DCLK	I	Pixel clock
31	DISP	I	Display on/ off
32	HSYNC	I	Horizontal sync signal
33	VSYNC	I	Vertical sync signal
34	DE	I	Data enable
35	NC	-	No Connect
36	GND	P	Power ground
37	X _R	I/O	Right electrode - differential analog
38	Y _B	I/O	Bottom electrode - differential analog
39	X _L	I/O	Left electrode - differential analog
40	Y _T	I/O	Top electrode - differential analog

I/O: I: input, O: output, P: power

6. Electrical Characteristics

6.1 TFT LCD Module

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	V_{DD}	3.0	3.3	3.6	V	
Input signal voltage	V_{IH}	$0.7V_{DD}$	-	V_{DD}	V	(1)
	V_{IL}	GND	-	$0.3V_{DD}$	V	(1)
Current of power supply	I_{DD}	-	-	220	mA	$V_{DD}=3.3V$

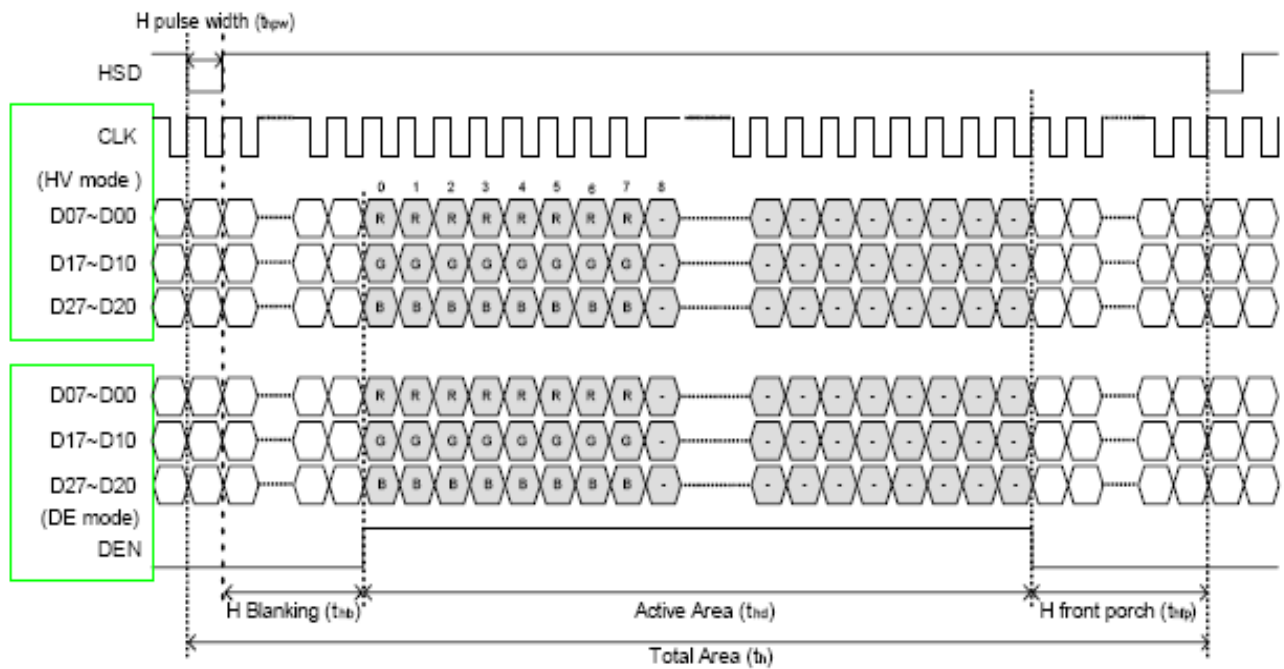
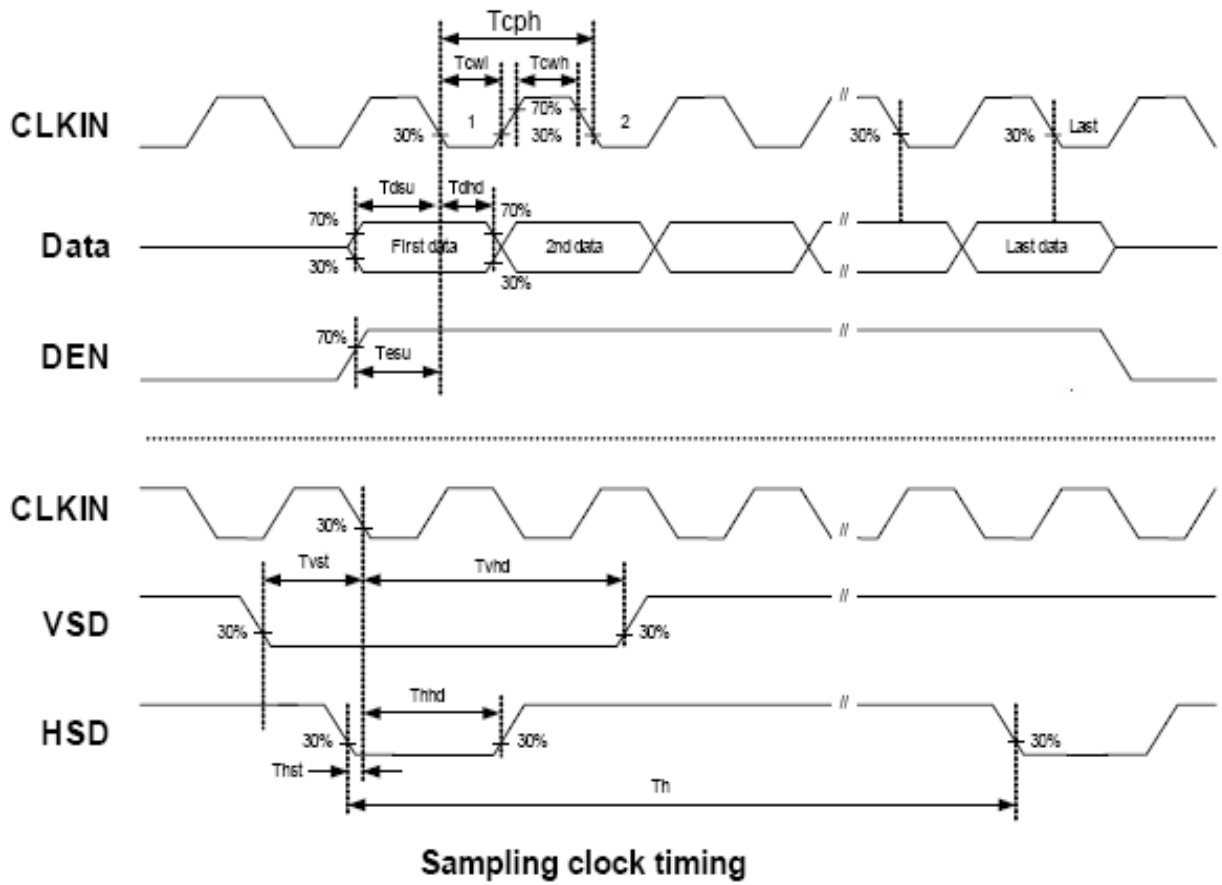
Note (1): HSYNC, VSYNC, DE, R/G/B Data

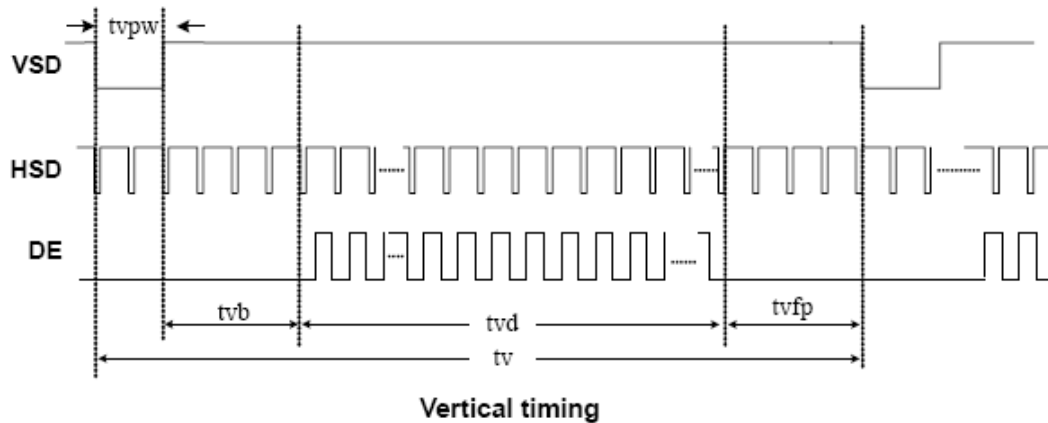
Note (2): GND=0V

6.2 AC Characteristics

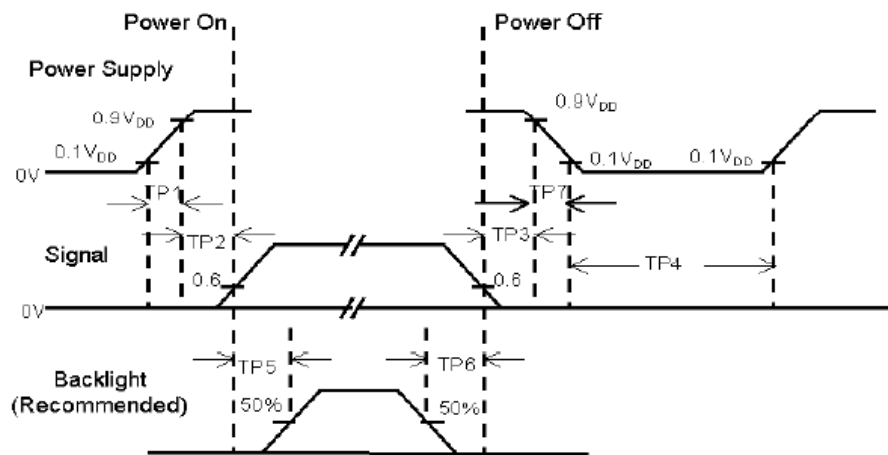
Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK cycle time	Tclk	25			ns	
DCLK frequency	fclk		33	40	MHz	
DCLK pulse duty	Tcwh	40	50	60	%	
VSYNC setup time	Tvst	8			ns	
VSYNC hold time	Tvhd	8			ns	
HSYNC setup time	Thst	8			ns	
HSYNC hold time	Thhd	8			ns	
Data setup time	Tdasu	8			ns	
Data hold time	Tdahd	8			ns	
DE setup time	Tdesu	8			ns	
DE hold time	Tdehd	8			ns	
Horizontal display area	Thd		800		Tcph	
HSYNC period time	Th		928		Tcph	
HSYNC width	Thwh	1	48		Tcph	
HSYNC back porch	Thbp		40		Tcph	
HSYNC front porch	Thfp		40		Tcph	
Vertical display area	Tvd		480		th	
VSYNC period time	Tv		525		th	
VSYNC width	Tvwh		3		th	
VSYNC back porch	Tvbp		29		th	
VSYNC front porch	Tvfp		13		th	

6.3 Timing Diagram of Interface Signal





6.4 Power Sequence



Item	Min.	Typ.	Max.	Unit	Remark
TP1	0.5	--	10	msec	
TP2	0	--	50	msec	
TP3	0	--	50	msec	
TP4	1000	--	--	msec	
TP5	200	--	--	msec	
TP6	200	--	--	msec	
TP7	0.5	--	10	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 $V_{DD} = \text{off level}$, 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.

7.0 Reliability test items

NO	Item	Conditions	Remark
1	High Temperature Storage	Ta=+70°C, 240hrs	
2	Low Temperature Storage	Ta=-20°C, 240hrs	
3	High Temperature Operation	Ta=+60°C, 240hrs	
4	Low Temperature Operation	Ta=-10°C, 240hrs	
5	High Temperature and High Humidity (operation)	Ta=+60°C, 90%RH, 240hrs	
6	Thermal Cycling Test (non operation)	-20°C (0.5hr) → +70°C (0.5hr), 200cycles	
7	Vibration	1. Random:1.04G, 10-500HZ, X, Y, Zdirection 30min/each direction 2. Sweep sine:1.5G, 5~500Hz, X/Y/Z, 30min/each direction	
8	Shock	100G, 6ms, ±X, ±Y, ±Z 3 time for each direction	JIS C7021, A-10 (Condition A)
9	Vibration (with carton)	Random:1.04Grms, 10~500Hz, X/Y/Z 45min/each direction Fixed:5Hz, 1.5Grms, X/Y/Z 45min/each direction	
10	Drop (with carton)	Height: 60cm 1 corner, 3 edges, 6 surfaces	JIS Z0202
11	Electrostatic Discharge	±200V, 200PF, 0Ω 1 time/each terminal	

Note: All tests above are practiced at module type.

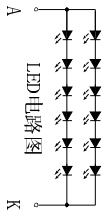
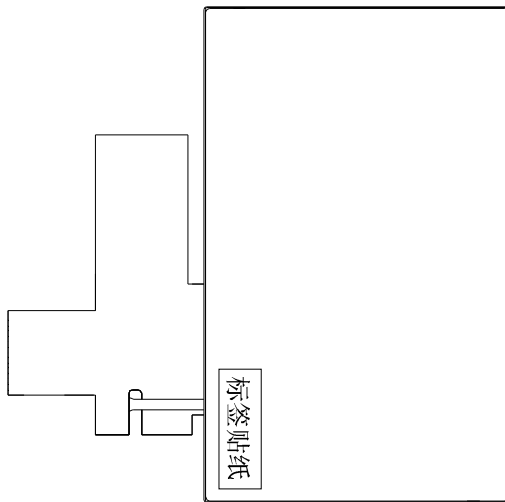
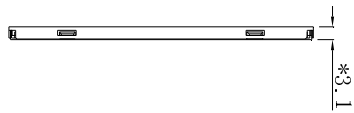
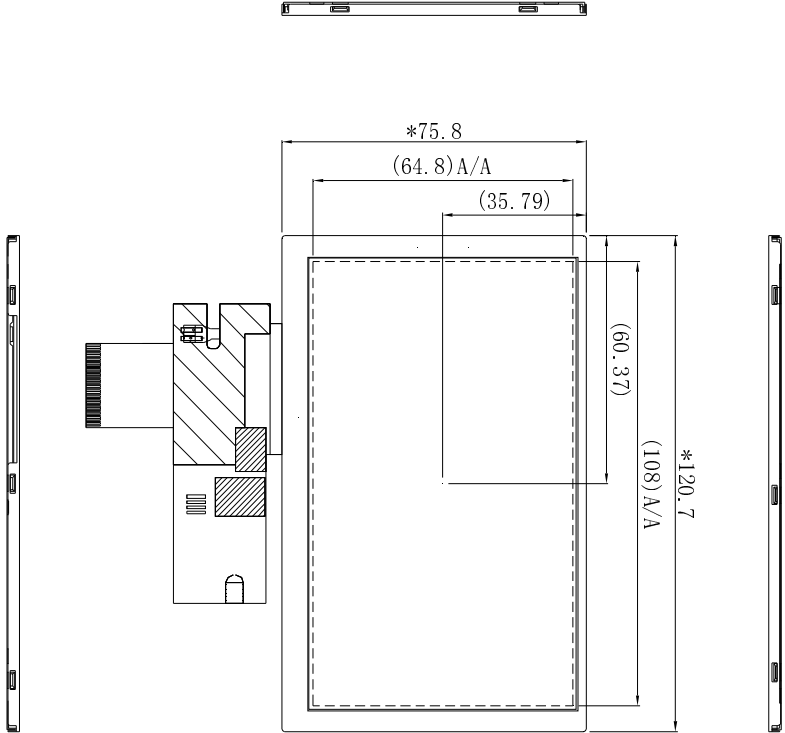
There is no display function NG issue occurred, All the cosmetic specification is judged before the reliability stress.

8.0 Outline dimension

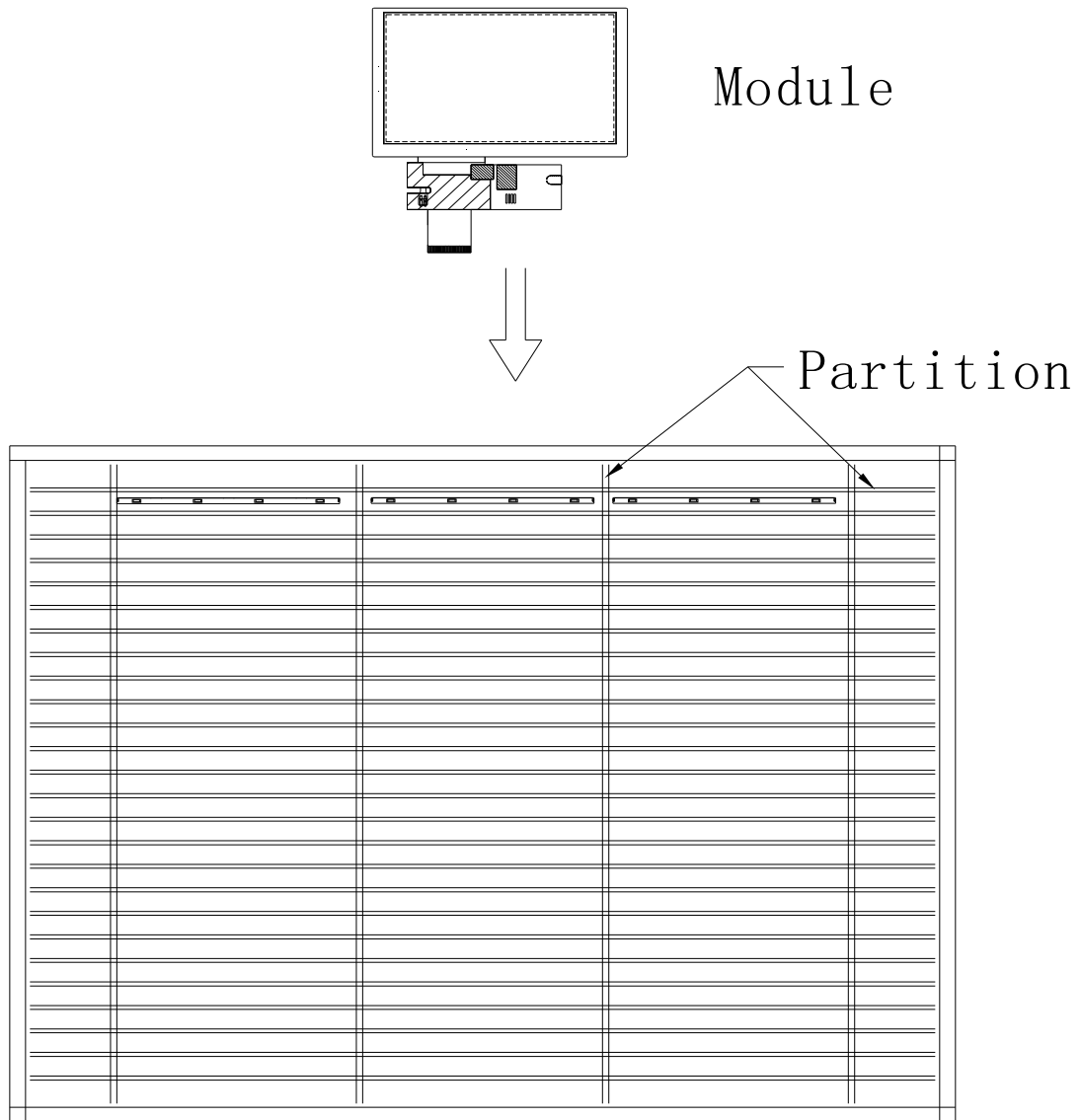


- Notes:
1. Unit:mm
 2. Do not scale drawing.
 3. All radii without dimension R0.2
 4. Luminous intensity (9 AV9): 320cd/m²(Min): 350cd/m²(Typ): 380cd/m²(Max)
 5. Uniformity : 75%(Min)
VF:18V(Min):19.8V(Typ):21V(Max) ; IF:10mA(Fix)
 6. The color coordinates:
 7. Δ Modification rev number
 8. Draft angle 1.0°
 9. General Tolerance: ±0.2
 10. Mark mold cavity indentation in recess approximately where indicated.
 11. * For important dimension: () for reference dimension
 12. Rofis must be complied. (Use Lead-free process)

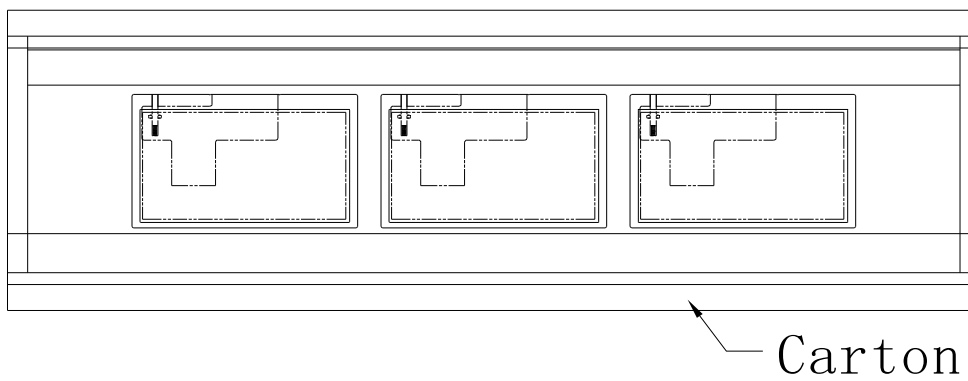
	MIN	TYP	MAX
x	0.30	0.32	0.34
y	0.32	0.34	0.36



9.0 Packing form



Total: 75PCS Module/Carton



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.