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SPECIFICATION FOR LCD MODULE

客户名称(Customer) : _____

产品名称(Product) : 5寸液晶显示屏

产品型号(Description): TB050-H4012H49A-01

Compile by 编制	Quality/Engineer 品质/工程	Checked 审核	Approved 批准

Customer Approve 客户确认	QC 品质	R&D 研发	Approved 批准



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1.0 GENERAL DESCRIPTION

1.1 Introduction

MINGTAI Display model TB050-H4012H49A-01 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

5.0 (15:9) inch diagonally measured active display area with WVGA (800 horizontal by 480 vertical pixel) resolution.

1.2 Features

- n 5.0 (15:9 diagonal) inch configuration.
- n 6 bits + FRC driver with 1 channel TTL interface

1.3 Applications

- n Personal Navigation Device
- n Multimedia applications and Others AV system

1.4 General information

Item	Specification	Unit
Screen Size	5.0 inches	Diagonal
Number of Pixel	800 RGB (H) x 480(V)	Pixels
Display area	107.7(H) x 64.6(V)	mm
Outline Dimension	120.9 x 75.95 x2.8(Typ)	mm
Display mode	Normally white	--
Pixel arrangement	RGB Vertical stripe	--
Pixel pitch	0.135(H) x 0.135(V)	mm
Back-light	LED Side-light type	--
Surface treatment	Antiglare, Hard-Coating (3H)	--

1.5 Mechanical Information

Item		Min.	Typ.	Max.	Unit
Module Size	Horizontal (H)	120.6	120.9	121.2	mm
	Vertical (V)	75.65	75.95	76.25	mm
	Depth (D)	--	2.8	3.00	mm



Weight	--	66	--	g
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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	VDD	-0.5	5.0	V	GND=0
Logic Signal Input Level	Vi	-0.3	VDD +0.3	V	

2.1.2 Back-Light Unit

Item	Symbol	Typ	Max	Unit	Note
LED current	IL	40	--	mA	(1)(2)(3)
LED voltage	VL	19.2	--	V	(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) $T_a = 25 \pm 2^\circ\text{C}$
- (3) Test Condition: LED current 40 mA. The LED lifetime could be decreased if operating IL is larger than 40mA.

2.2 Environment Absolute Rating

Item	Symbol	Min.	Max.	Unit	Note
Storage temperature	T_{STG}	-30	80	$^\circ\text{C}$	
Operating temperature	T_{OPR}	-20	70	$^\circ\text{C}$	



3.0 OPTICAL CHARACTERISTICS

3.1 Optical specification

Item		Symbol	Condition	Min	Type	Max	Unit	Note
White luminance (Center)		YL	È=0 Normal Viewing Angle	450	500	--	cd/m ²	(1)(4)(6) (I L=40mA)
Response time		T _r		-	2	4	msec	(1)(3)
		T _f		--	6	12		
Contrast ratio		CR	CR 10	480	600	--	--	(1)(2)
Color Chromaticity (CIE 1931)	white	W _x		0.260	0.310	0.360		
		W _y		0.280	0.330	0.380		
Viewing Angle	Hor.	È _L	60	70	--		(1)(4)	
		È _R	60	70	--			
	Ver.	È _U	50	60	--			
		È _D	60	70	--			
Brightness uniformity		B _{UNI}	È=0	70	--	--	%	(6)
Optima View Direction		6 o'clock						(5)

3.2 Measuring Condition

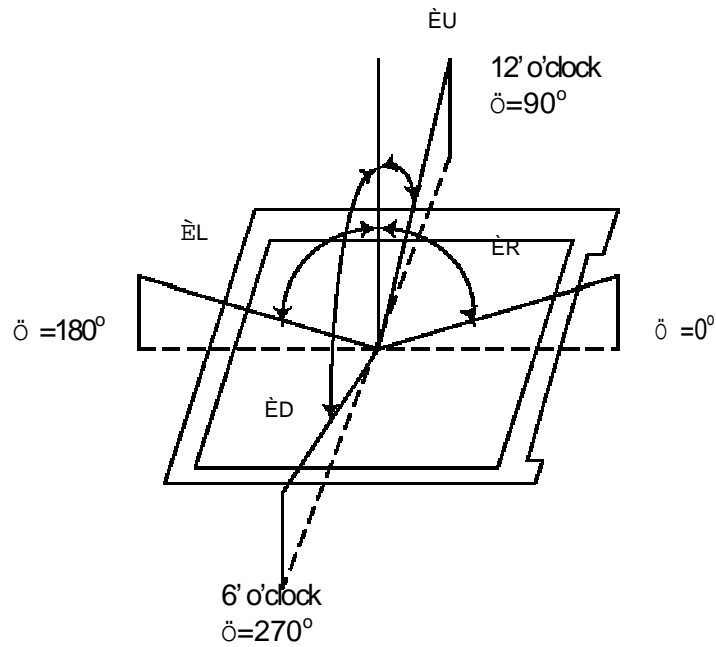
- n Measuring surrounding: dark room
- n LED current I_L: 40mA
- n Ambient temperature: 25±2oC
- n 15min. warm-up time

3.3 Measuring Equipment

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



Note (1) Definition of Viewing Angle

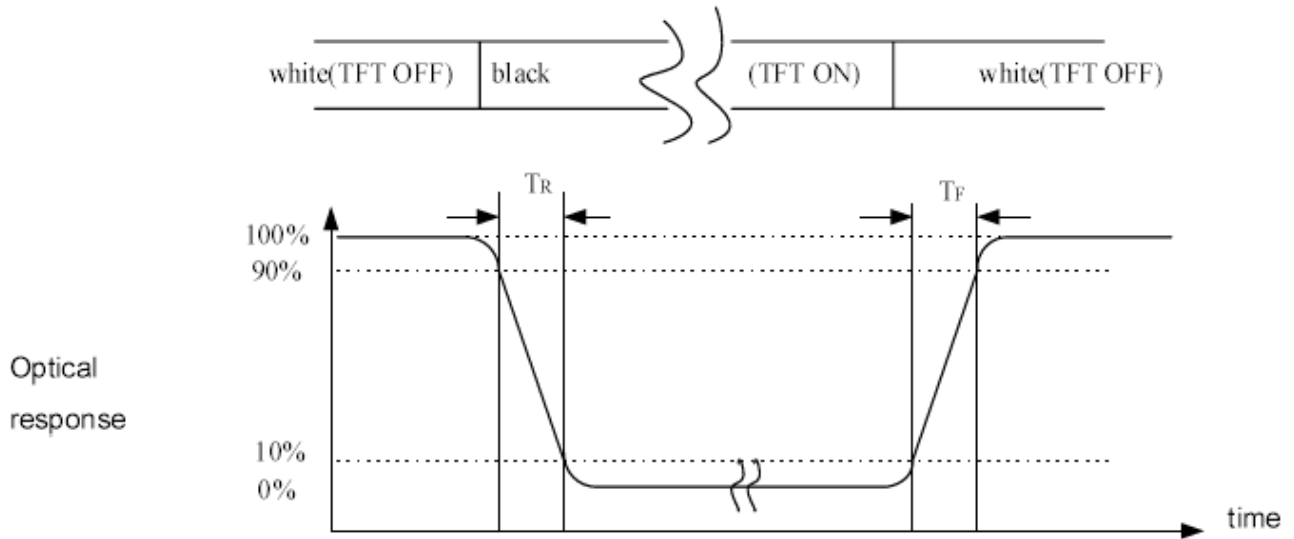


**Note (2) Definition of Contrast Ratio(CR):
Measured at the center point of panel**

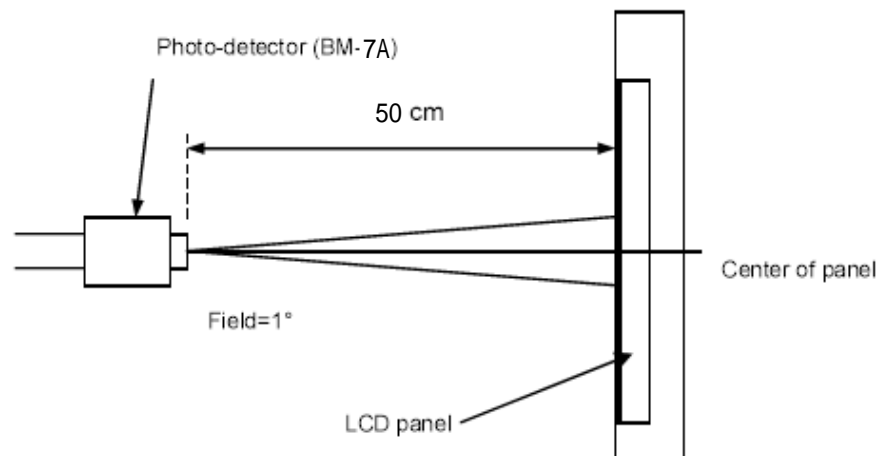
$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$



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

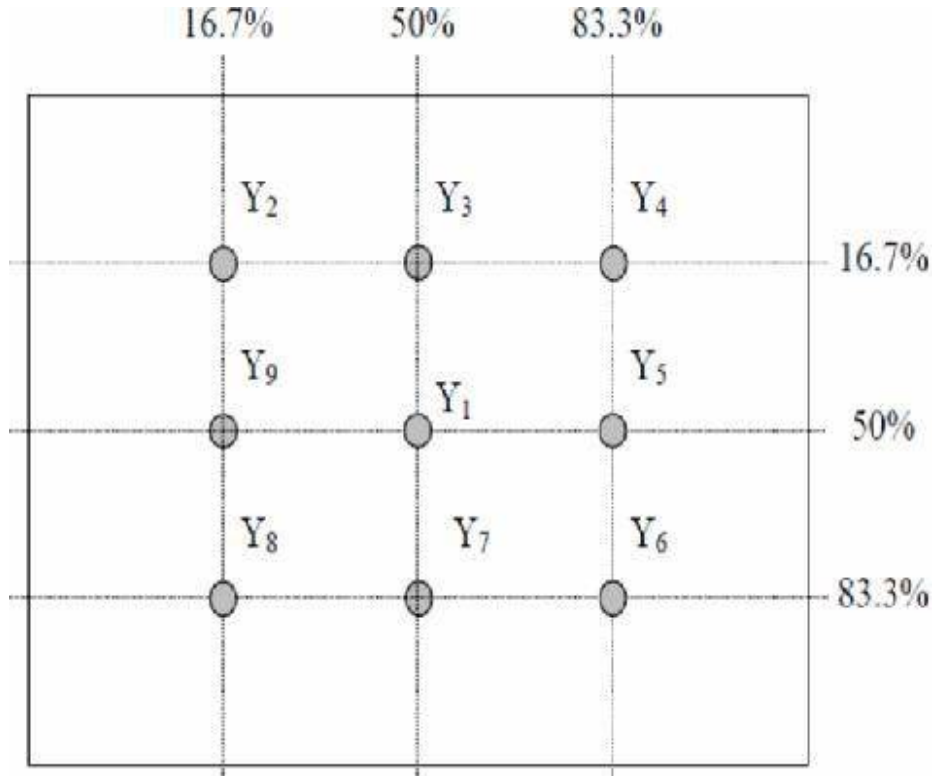


Note (4) Definition of optical measurement setup





Note (5) Definition of brightness uniformity



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

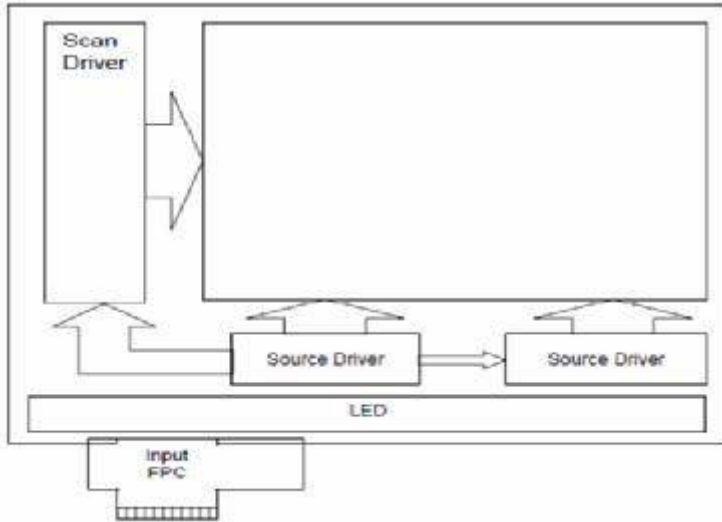
Note (6) Rubbing Direction (The different Rubbing Direction will cause the different optima view direction.)

Note (7) Measured at the brightness of the panel when all terminals of LCD panel are electrically open.

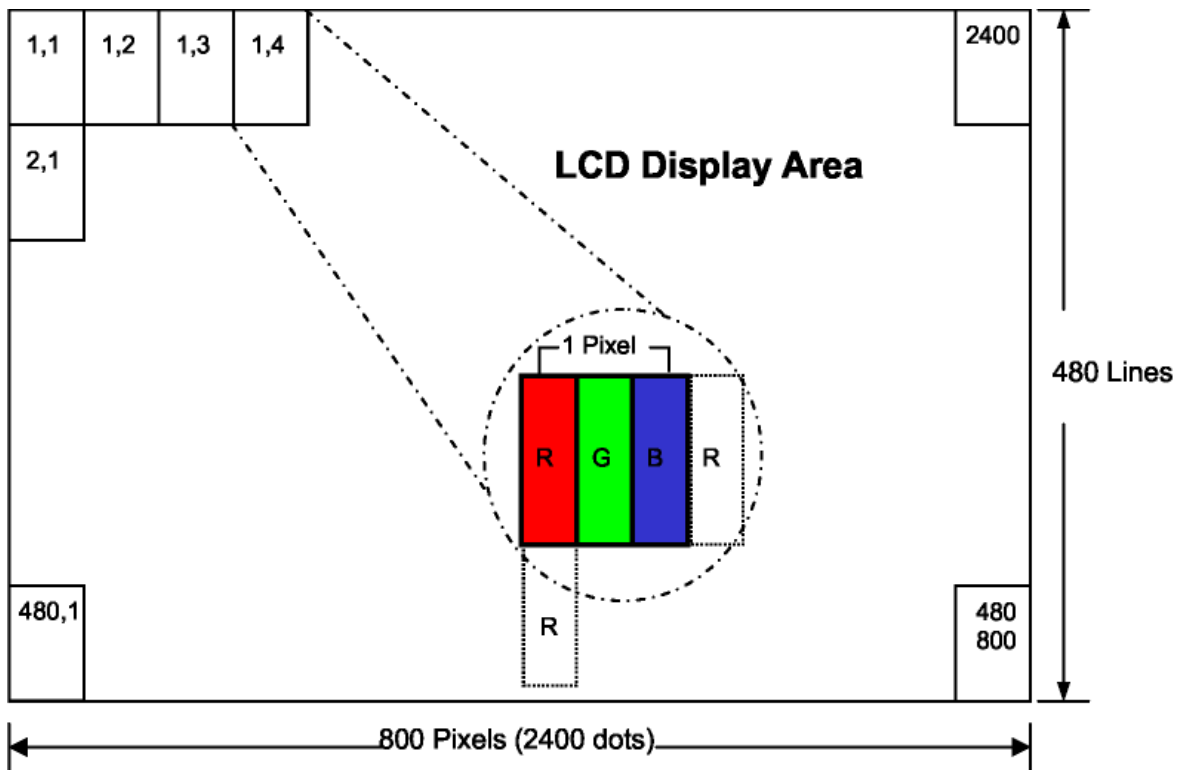


4.0 BLOCK DIAGRAM

4.1 TFT LCD Module



4.2 Pixel Format





5.0 INPUT INTERFACE PIN ASSIGNMENT

FPC connector is used for electronics interface.

The recommended model is FH19SC-40S-0.5SH (51) manufactured by HIROSE

Pin No.	Symbol	I/O	Function
1	VLED-	P	Power for LED backlight cathode
2	VLED+	P	Power for LED backlight anode
3	GND	P	Power ground
4	VDD	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	X_B	I/O	Bottom electrode - differential analog
39	X_L	I/O	Left electrode - differential analog
40	X_T	I/O	Top electrode - differential analog

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



6.0 ELECTRICAL CHARACTERISTICS

6.1 TFT LCD Module

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Supply voltage	VDD	3.0	3.2	3.4	V	
Input signal Voltage	VIH	0.7 VDD	-	VDD	V	Note (1)
	VIL	GND	-	0.3 VDD	V	Note (1)
Current Power Supply	IDD	-	-	220	mA	VDD=3.3V

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

Note (2): GND=0V

6.2 Back-Light Unit

The backlight system is an edge-lighting type with 12 LED.

The characteristics of the LED are shown in the following tables.

Item	Symbol	Min	Typ	Max	Unit	Note
LED current	IL	-	40	-	mA	(2)
LED voltage	VL	-	19.2	-	V	
Operating LED life time	Hr	10000	-	-	Hour	(1)(2)

Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: $T_a=25\pm 3\text{ }^{\circ}\text{C}$, 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 $T_a=25^{\circ}\text{C}$ and $IL=40\text{mA}$. The LED lifetime could be decreased if operating IL is larger than 40mA. The constant current driving method is suggested.

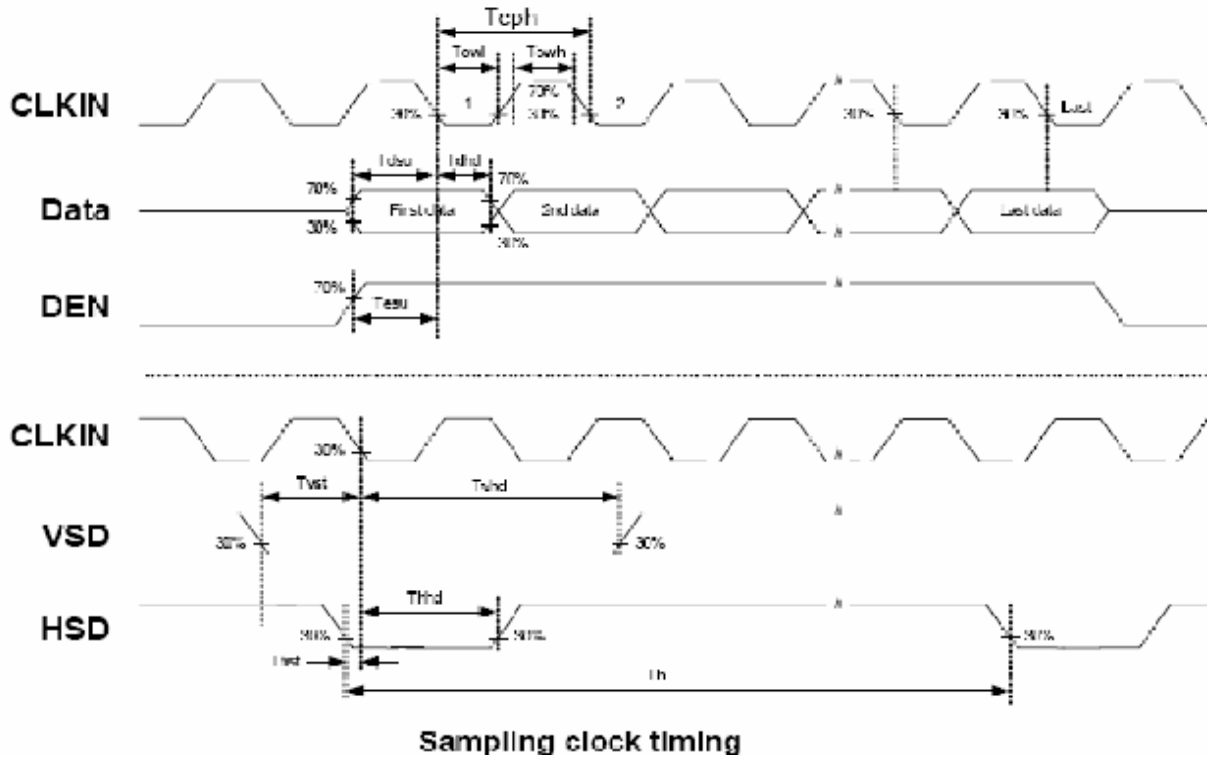


6.3 AC Characteristics

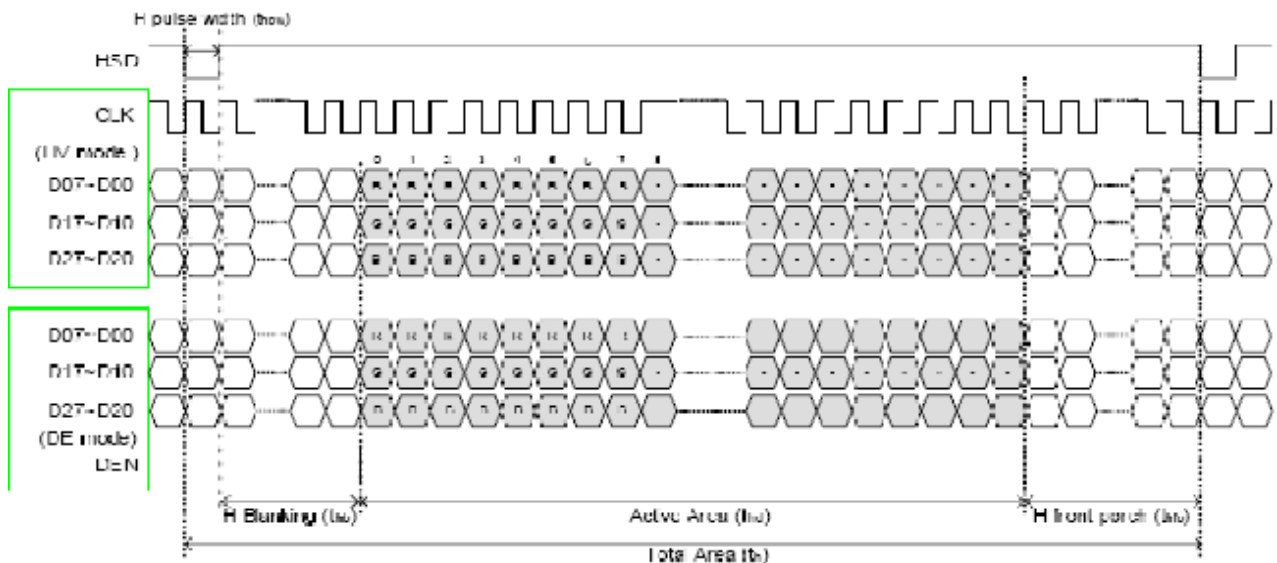
Item	Symbol	Min.	Typ.	Max.	Unit.	Remark
DCLK cycle time	Tclk	25	-	-	ns	
DCLK frequency	Fclk	-	33	40	MHz	
DCLK pulse duty	Tcwh	40	50	60	%	
VSYNC setup time	Tvst	8	-	-	ns	
VSYNC hold time	Tvhd	8	-	-	ns	
HSYNC setup time	Thst	8	-	-	ns	
HSYNC hold time	Thhd	8	-	-	ns	
Data setup time	Tdasu	8	-	-	ns	
Data 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	

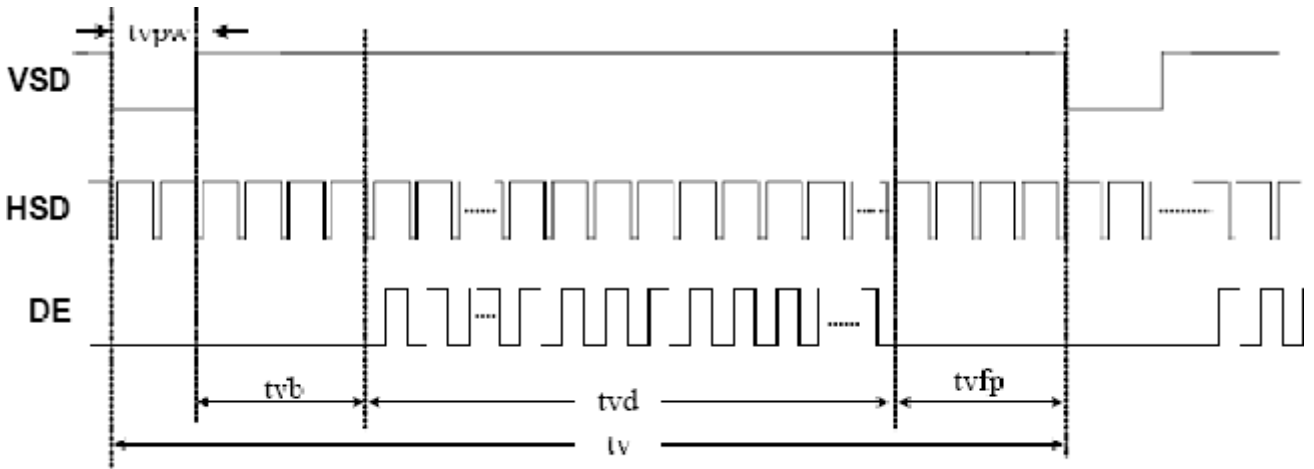


6.4 Timing Diagram of Interface Signal



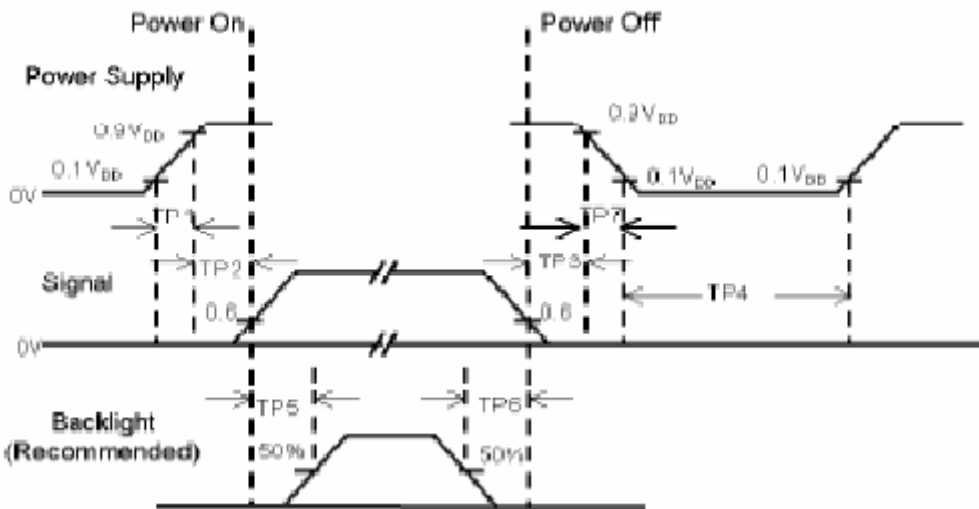
Sampling clock timing





Vertical timing

6.5 Power Sequence



- Note :**
- (1) The supply voltage of the external system for the module input should be the same as the definition of VDD.
 - (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 VDD = 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	Notes
1	High Temperature Storage	Ta= \sim 80°C, 240hrs	
2	Low Temperature Storage	Ta= \sim -30°C, 240hrs	
3	High Temperature Operation	Ta= \sim 70°C, 240hrs	
4	Low Temperature Operation	Ta= \sim -20°C, 240hrs	
5	High Temperature and High Humidity (operation)	Ta= \sim 60°C, 90%RH, 240hrs	
6	Thermal Cycling Test (non operation)	-30°C(30min) \rightarrow \sim 80°C(30min), 200cycles	
7	Electrostatic Discharge	\pm 200V,200pF(0_) 1 time/each terminal	
8	Vibration	1 .Random: 1 .04Grms, 5~500Hz, X/Y/Z, 30min/each direction 2. Sine: Freq. Range: 8~33.3Hz Stoke: 1.3mm Sweep: 2.9G, 33.3~400Hz X/Z: 2hr, Y: 4hr, cyc: 15min	
9	Shock	100G, 6ms, \pm X, \pm Y, \pm Z 3 time for each direction	JIS C7021, A-10 (Condition A)
10	Vibration (with carton)	Random: 0.015G ² /Hz, 5~200Hz -6dB/Octave, 200~400Hz XYZ each direction: 2hr	
11	Drop (with carton)	Height: 60cm 1 corner, 3 edges, 6 surfaces	JIS Z0202

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

8.0 Precautions





8.1 Operation




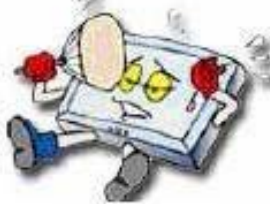


Burn-in sometimes happens when the same character was displayed at along time. Therefore, to prevent Burn-in, it is recommended to set up a Screen-saver function.

8.2 Safety

The liquid crystal in the LCD is poisonous, DO NOT put it in your mouth. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and water.


8.3 Handling

	<p>a. The LCD module shall be installed flat, without twisting or bending. b. COF or FPC has narrow pattern width, so easily become open circuit by external force. DO NOT apply pressure to COF or FPC especially in bending area.</p>
	<p>c. To avoid damage in appearance or malfunction, DO NOT subject the module to mechanical shock or to excessive force on its surface.</p>
	<p>d. The polarizer attached to the display is very easy to damage, handle it with care to avoid scratching.</p>
	<p>e. To avoid contamination on the display surface, DO NOT touch the display surface with bare hands. f. Provide a space so that the LCD module does not come into contact with other components.</p>


	<p>g. To protect the LCD panel from external pressure, put covering glass (acrylic board or similar board) to keep appropriate space between them.</p>
	<p>h. Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.</p>
	<p>i. Property of semiconductor devices may be affected when they are exposed to light possibly resulting in malfunctioning of the ICs. To prevent such malfunctioning of the ICs, your design and mounting layout done are so that the IC is not exposed to light in actual use.</p>
	<p>j. Strong light exposure causes degradation of color filter. It may not recover</p>
	<p>k. DO NOT contact with water to avoid Metal corrosion. l. When it is not in use, the screen must be turned off or the pattern must be frequently changed by a screen saver. If it displays the same pattern for a long period of time, brightness down/image sticking may develop due to the LCD structure.</p>
	<p>m. Never disassemble LCD product under any circumstances. If unqualified operators or users assemble the product after disassembling it, it may not function or its operation may be seriously affected.</p>

8.4 Static Electricity


Since a module is composed of electronic circuits, it is not strong to electrostatic discharge.

	<ul style="list-style-type: none"> a. The LCD module shall be installed flat, without twisting or bending. Ground soldering iron tips, tools and testers when they operate. b. Ground your body when handling the products. c. DO NOT apply voltage to the input terminal without applying power supply. d. DO NOT apply voltage that exceeds the absolute maximum rating. e. Store the products in an anti-electrostatic container. f. Peel off protect tape, attached to polarizer, slowly to minimize ESD damage.
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8.5 Storage

	<p>Store the products in a dark place at +5 ~ +25 degree C, low humidity (50%RH or less). DO NOT store the products in an atmosphere containing organic solvents or corrosive gases.</p>
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8.6 Cleaning

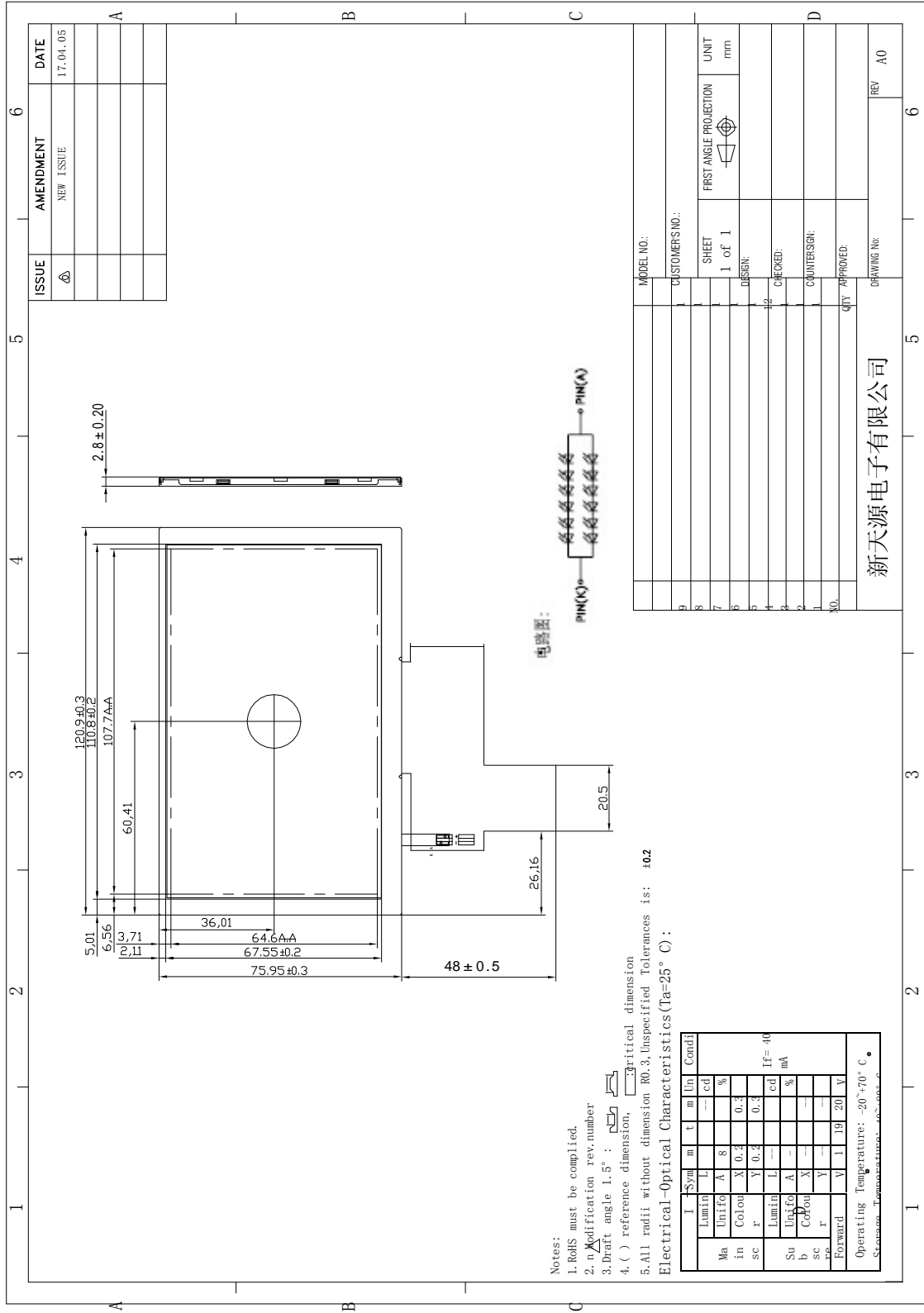
	<ul style="list-style-type: none"> a. DO NOT wipe the polarizer with dry cloth, as it might cause scratch. b. Wipe the polarizer with a soft cloth soaked with petroleum IPA, other chemical might damage.
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8.7 Waste

	<p>When dispose of LCD module, manage it at the production waste according to the relevant laws and regulations.</p>
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9.0 OUTLINE DIMENSION H-B050WV-001

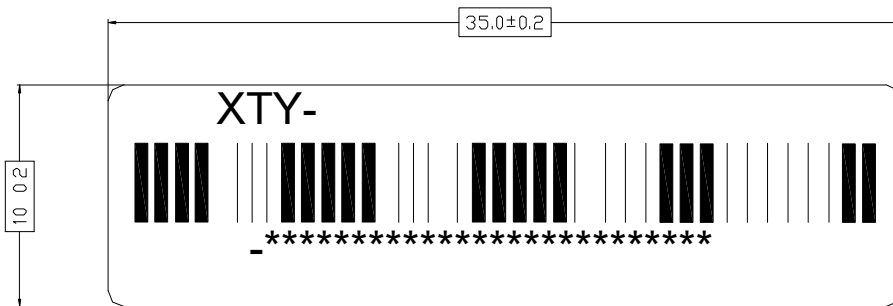




10.0 LOT MARK

10.1 Location of Lot Mark

- (1) Location: The label is attached to the backside of the LCD module.
- (2) Detail of the Mark: as attached below.
- (3) This is subject to change without prior notice.



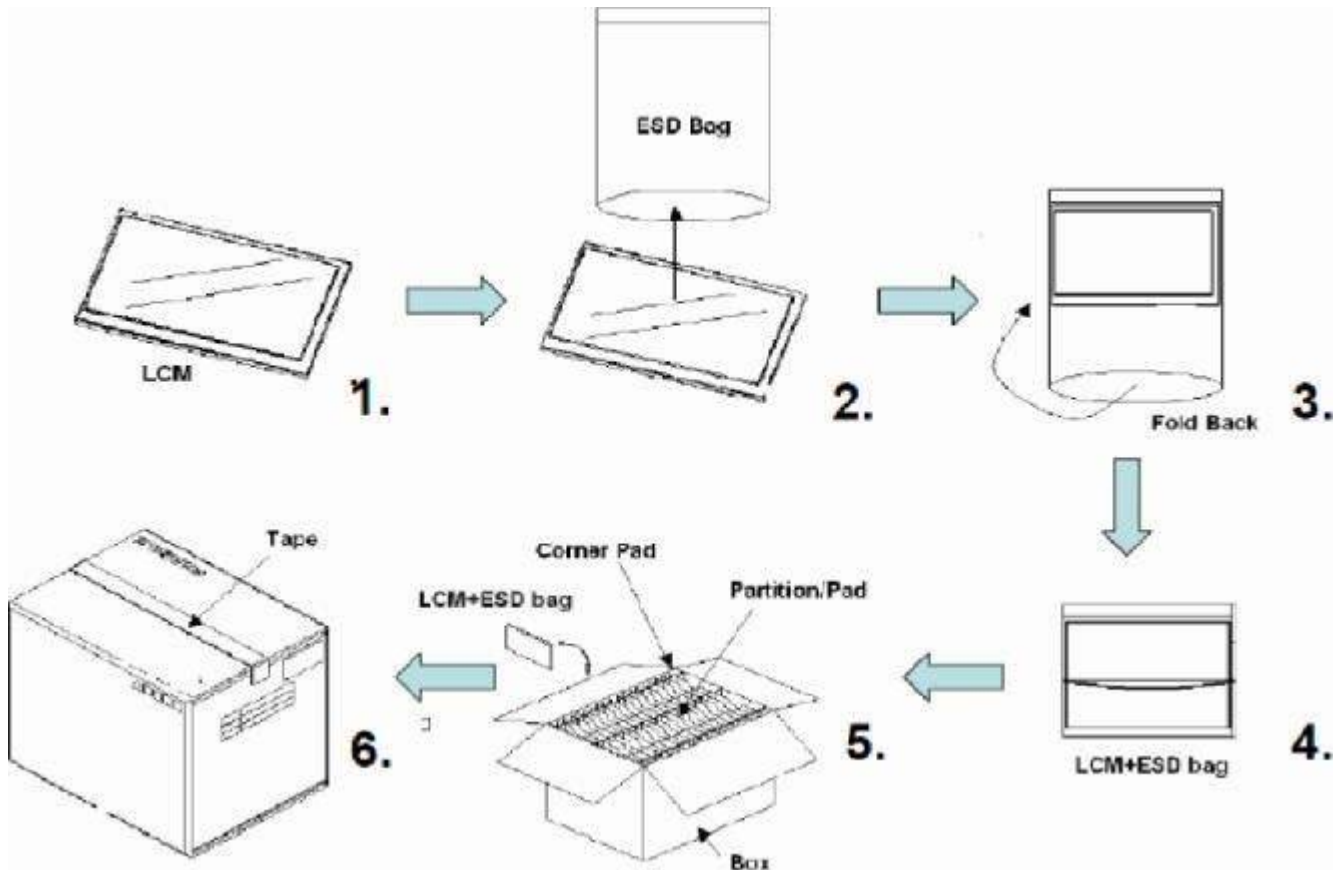


11.0 PACKAGE SPECIFICATION

11.1 Packing form

LCM Model	LCM Qty. in the box	Inner Box Size (mm)	Notice
TB050-H4012H49-00	150 pcs/box	460±5 x 370±5 x 190±5	

11.2 Packing assembly drawings



Items	Material	Notice
Box	Corrugated Paper Board	AB Flute
Partition/Pad	Corrugated Paper Board	A/B Flute
Corner Pad	Corrugated Paper Board	AB Flute
ESD bag	PE	