



晶采光電科技股份有限公司
AMPIRE CO., LTD.

SPECIFICATIONS FOR LCD MODULE

CUSTOMER	
CUSTOMER PART NO.	
AMPIRE PART NO.	AM-800480ACTMQW-00H
APPROVED BY	
DATE	

- Approved For Specifications
- Approved For Specifications & Sample

AMPIRE CO., LTD.

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RECORD OF REVISION

Revision Date	Page	Contents	Editor
2012/2/8	--	New Release	Rober

1. Features

6.5 inch module 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 backlight system. This TFT LCD has a 6.5 inch diagonally measured active display area with 800 horizontal by 480 vertical pixel resolutions.

- (1) Construction: 6.5" a-Si TFT active matrix, White LED Backlight.
- (2) Resolution (pixel): 800(R.G.B) X 480
- (3) Number of the Colors : 16.7M colors (R , G , B 8 bit digital each)
- (4) LCD type : Transmissive , normally White
- (5) Power Supply Voltage: 3.3V for logic voltage.
- (7) Viewing Direction: 6 O'clock (Gray Inversion)

2. PHYSICAL SPECIFICATIONS

Item	Specifications	unit
LCD size	6.5 inch (Diagonal)	
Outline Dimension	155.2(W) × 89.4(H) × 5.5(D) mm	mm
Number of Pixel	800 RGB (H) x 480 (V)	pixels
Pixel pitch	0.05975(W) × 0.1598 (H) mm	mm
Pixel arrangement	RGB Vertical stripe	
Display mode	Normally white	
Surface treatment	Antiglare	
Weight	126.9 (typ.)	g
Power consumption (B/L system)	1.488 (typ)	W

3. ABSOLUTE MAX. RATINGS

Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Power voltage	DV_{DD}	-0.3	5.0	V	
	AV_{DD}	6.5	13.5	V	
	V_{GH}	-0.3	40.0	V	
	V_{GL}	-20.0	0.3	V	
	$V_{GH}-V_{GL}$	-	40.0	V	
Operation Temperature	T_{OP}	-30	85	°C	
Storage Temperature	T_{ST}	-30	85	°C	
LED Reverse Voltage	V_R	-	1.2	V	Each LED Note 2
LED Forward Current	I_F	-	25	mA	Each LED

Note 1: The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

Note 2: V_R Conditions: Zener Diode 20mA

4. ELECTRICAL CHARACTERISTICS

4-1 TFT LCD Module

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	DV_{DD}	3.0	3.3	3.6	V	Note 2
	AV_{DD}	10.2	10.4	10.6	V	
	V_{GH}	15.3	16.0	16.7	V	
	V_{GL}	-7.7	-7.0	-6.3	V	
Input signal voltage	V_{COM}		4.0		V	
Input logic high voltage	V_{IH}	0.7 DV_{DD}	-	DV_{DD}	V	Note 3
Input logic low voltage	V_{IL}	0	-	0.3 DV_{DD}	V	

Note 1: Be sure to apply DV_{DD} and V_{GL} to the LCD first, and then apply V_{GH} .

Note 2: DV_{DD} setting should match the signals output voltage (refer to Note 3) of customer's system board.

Note 3: DCLK,HS,VS,RESET,U/D, L/R,DE,R0~R7,G0~G7,B0~B7,MOD

4-2 Current Consumption

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Current for Driver	I_{GH}	-	0.6	1	mA	
	I_{GL}	-	0.6	1	mA	
	IDV_{DD}	-	4	10	mA	
	$I_{AV_{DD}}$	-	20	50	mA	

4-2 Backlight Driving Conditions

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Voltage for LED backlight	V_L	----	9.3	-----	V	Note 1
Current for LED backlight	I_L	--	160	--	mA	
LED life time	-	20,000	-	-	Hr	Note 2

Note 1: The LED Supply Voltage is defined by the number of LED at $T_a=25\text{ }^\circ\text{C}$ and $I_L=160\text{mA}$.

Note 2: The "LED life time" is defined as the module brightness decrease to 50% original brightness at $T_a=25\text{ }^\circ\text{C}$ and $I_L=160\text{mA}$. The LED lifetime could be decreased if operating I_L is larger than 160mA.

5. Optical Specifications

Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Viewing angle (CR≥ 10)	θ_L	$\Phi=180^\circ$ (9 o'clock)	60	70	-	degree	Note 1
	θ_R	$\Phi=0^\circ$ (3 o'clock)	60	70	-		
	θ_T	$\Phi=90^\circ$ (12 o'clock)	40	50	-		
	θ_B	$\Phi=270^\circ$ (6 o'clock)	60	70	-		
Response time	T_{ON}	Normal $\theta=\Phi=0^\circ$	-	10	20	msec	Note 3
	T_{OFF}		-	15	30	msec	Note 3
Contrast ratio	CR		400	500	-	-	Note 4
Color chromaticity	W_x		0.26	0.31	0.36	-	Note 2 Note 5
	W_y		0.28	0.33	0.38	-	Note 6
Luminance	L		400	500	-	cd/m ²	Note 6
Luminance uniformity	Y_U		70	75	-	%	Note 7

Test Conditions:

1. $DV_{DD} = 3.3V$, $I_L = 160mA$ (Backlight current), the ambient temperature is 25℃.
2. The test systems refer to Note 2.

Note 1: Definition of viewing angle

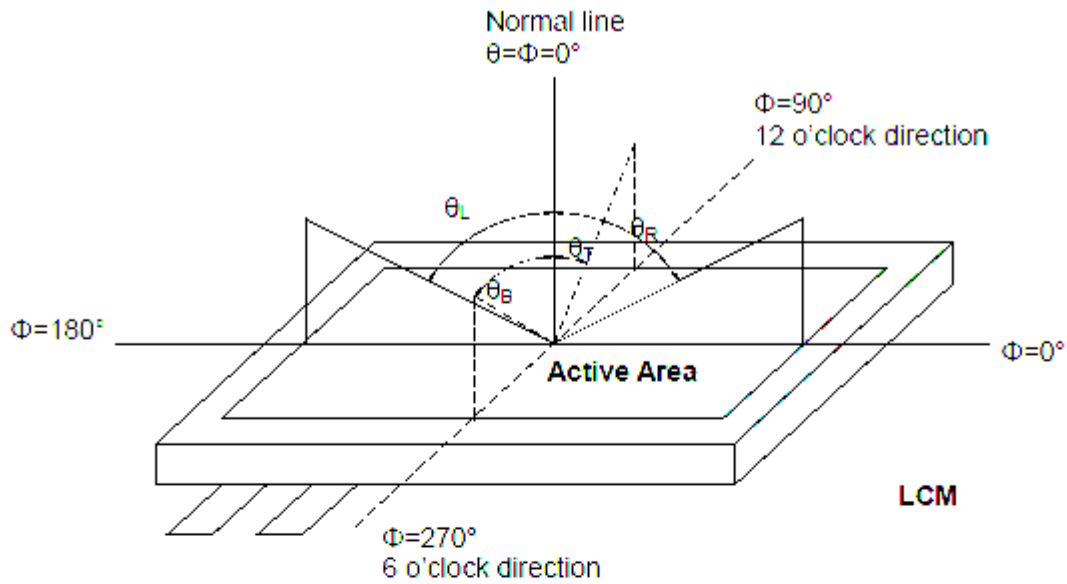


Fig. 4-1 Definition of viewing angle

Note 2: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 30 minutes operation, the optical properties are measured at the center point of the LCD screen. (Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/Field of view: 1° /Height: 500mm.)

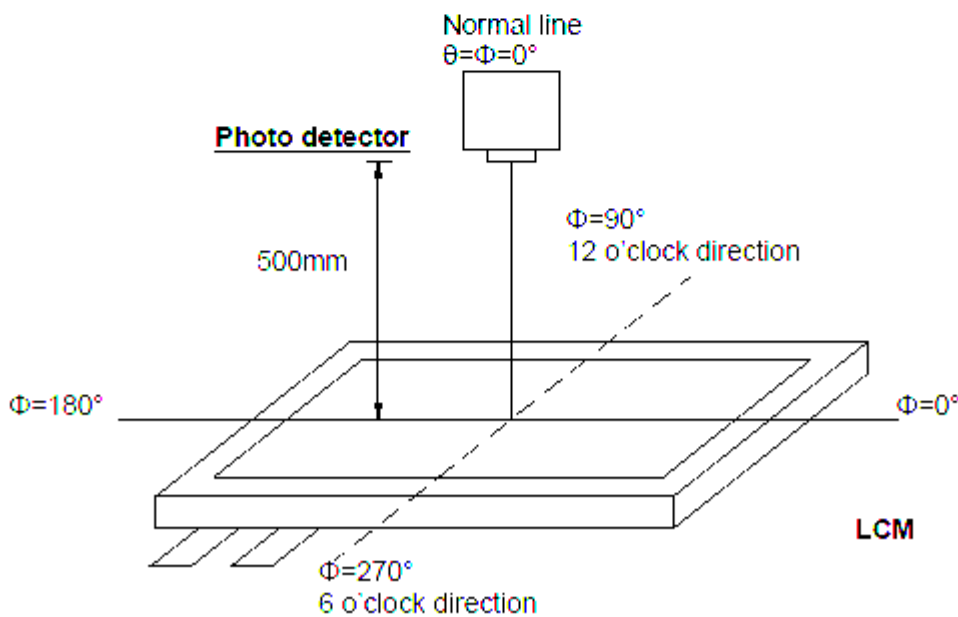


Fig. 4-2 Optical measurement system setup

Note 3: Definition of Response time

The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time (T_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.

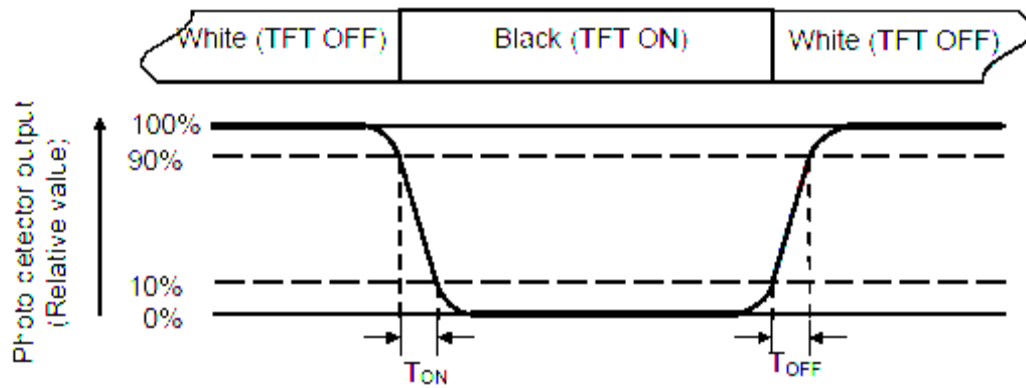


Fig. 4-3 Definition of response time

Note 4: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6: Definition of luminance: Measured at the center area of the panel when LCD panel is driven at "white" state

6. INTERFACE

6-1 TFT LCD Module

FPC Connector is used for the module electronics interface. The recommended model is FH12A-50S-0.5SH manufactured by Hirose

Pin No.	Symbol	I/O	Function	Remark
1	V _{LED+}	P	Power for LED backlight (Anode)	
2	V _{LED+}	P	Power for LED backlight (Anode)	
3	V _{LED-}	P	Power for LED backlight (Cathode)	
4	V _{LED-}	P	Power for LED backlight (Cathode)	
5	GND	P	Power ground	
6	V _{COM}	I	Common voltage	
7	DV _{DD}	P	Power for Digital Circuit	
8	MODE	I	DE/SYNC mode select	Note 1
9	DE	I	Data Input Enable	
10	VS	I	Vertical Sync Input	
11	HS	I	Horizontal Sync Input	
12	B7	I	Blue data(MSB)	
13	B6	I	Blue data	
14	B5	I	Blue data	
15	B4	I	Blue data	
16	B3	I	Blue data	
17	B2	I	Blue data	
18	B1	I	Blue data	Note 2
19	B0	I	Blue data(LSB)	Note 2
20	G7	I	Green data(MSB)	
21	G6	I	Green data	
22	G5	I	Green data	
23	G4	I	Green data	
24	G3	I	Green data	

25	G2	I	Green data	
26	G1	I	Green data	Note 2
27	G0	I	Green data(LSB)	Note 2
28	R7	I	Red data(MSB)	
29	R6	I	Red data	
30	R5	I	Red data	
31	R4	I	Red data	
32	R3	I	Red data	
33	R2	I	Red data	
34	R1	I	Red data	Note 2
35	R0	I	Red data(LSB)	Note 2
36	GND	P	Power Ground	
37	DCLK	I	Sample clock	Note 3
38	GND	P	Power Ground	
39	L/R	I	Left / right selection	Note 4,5
40	U/D	I	Up/down selection	Note 4,5
41	V _{GH}	P	Gate ON Voltage	
42	V _{GL}	P	Gate OFF Voltage	
43	AV _{DD}	P	Power for Analog Circuit	
44	RESET	I	Global reset pin.	Note 6
45	NC	-	No connection	
46	V _{COM}	I	Common Voltage	
47	DITHB	I	Dithering function	Note 7
48	GND	P	Power Ground	
49	NC	-	No connection	
50	NC	-	No connection	

I: input, O: output, P: Power

Note 1: DE/SYNC mode select. Normally pull high.

When select DE mode, MODE="1", VS and HS must pull high.

When select SYNC mode, MODE="0", DE must be grounded.

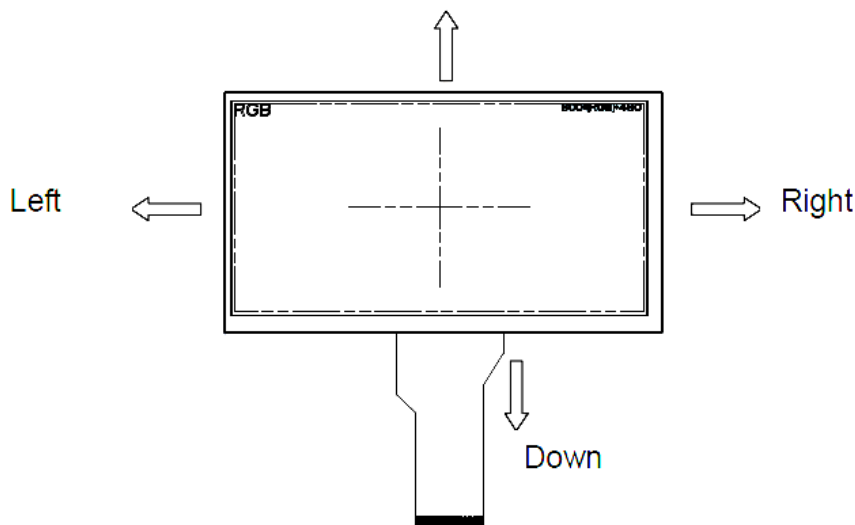
Note 2: When input 18 bits RGB data, the two low bits of R,G and B data must be grounded.

Note 3: Data shall be latched at the falling edge of DCLK.

Note 4: Selection of scanning mode

Setting of scan control input		Scanning direction
U/D	L/R	
GND	DV _{DD}	Up to down, left to right
DV _{DD}	GND	Down to up, right to left
GND	GND	Up to down, right to left
DV _{DD}	DV _{DD}	Down to up, left to right

Note 5: Definition of scanning direction.
Refer to the figure as below:



Note 6: Global reset pin. Active low to enter reset state. Suggest to connect with an RC reset circuit for stability. Normally pull high.

Note 7: Dithering function enable control, normally pull high.
When DITHB="1", Disable internal dithering function,
When DITHB="0", Enable internal dithering function,

7. INPUT SIGNAL :

7-1 AC Electrical Characteristics



Figure 3. 1 Horizontal input timing diagram.

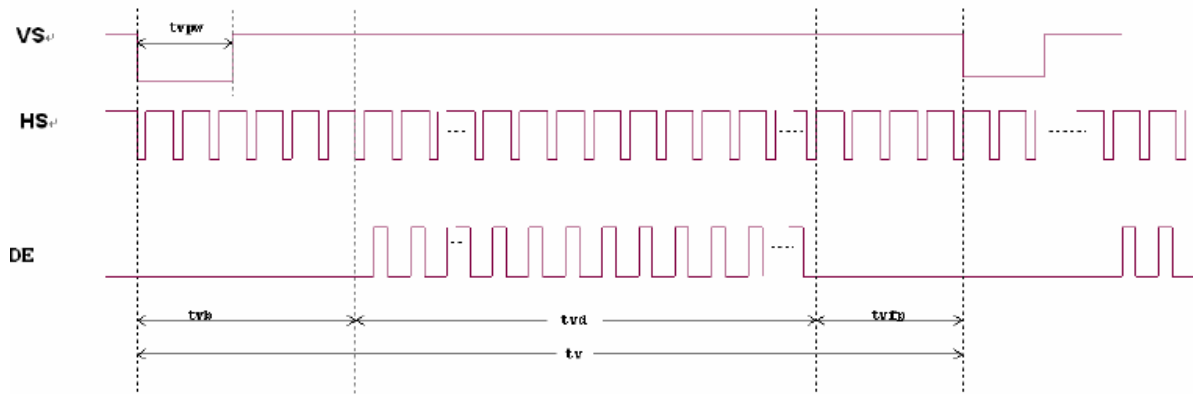


Figure 3. 2 Vertical input timing diagram.

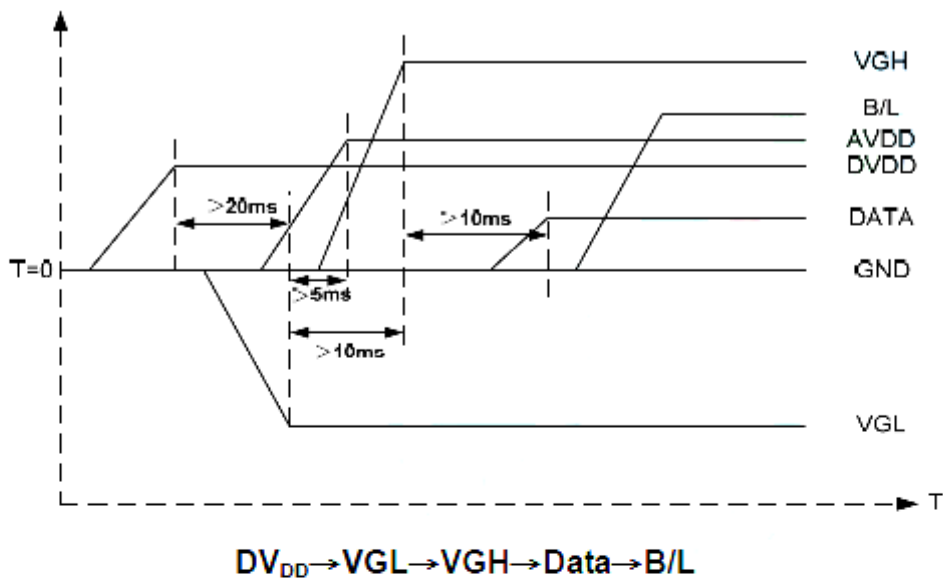
7-2 Timing Diagram of Interface Signal

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Horizontal Display Area	thd	-	800	-	DCLK	
DCLK Frequency	fclk	26.4	33.3	46.8	MHz	
One Horizontal Line	th	862	1056	1200	DCLK	
HS pulse width	thpw	1	-	40	DCLK	
HS Blanking	thb	46	46	46	DCLK	
HS Front Porch	thfp	16	210	354	DCLK	

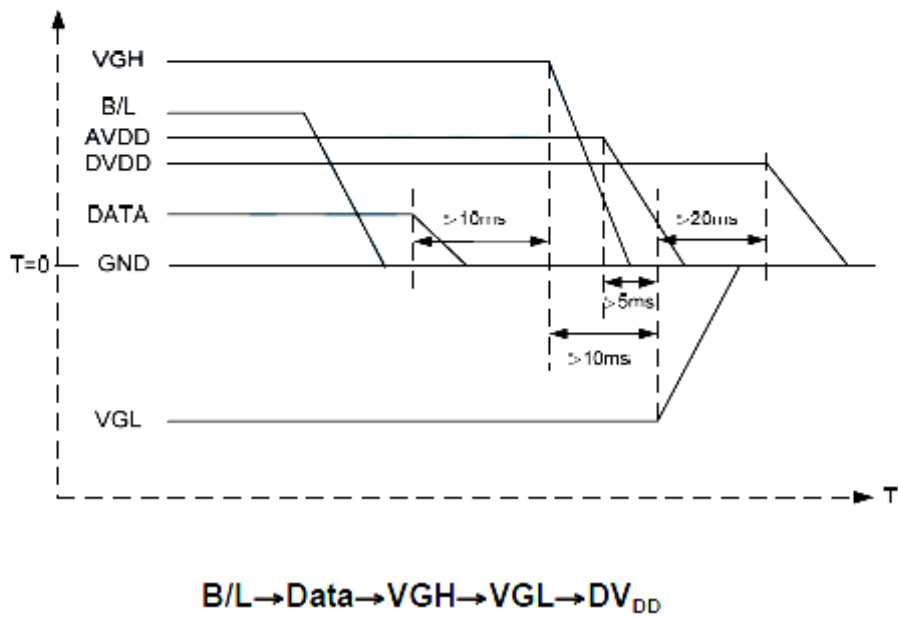
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Vertical Display Area	tvd	-	480	-	TH	
VS period time	tv	510	525	650	TH	
VS pulse width	tvpw	1	-	20	TH	
VS Blanking	tvb	23	23	23	TH	
VS Front Porch	tvfp	7	22	147	TH	

7-3 Power Sequence

1. Power on:



2. Power off:



Note: Data include DCLK.POL.OEV.CKV.STVU.STVD.STHL.STHR.LD.R0~R5.G0~G5.B0~B5

8. RELIABILITY TEST CONDITIONS

8-1 RELIABILITY

Item	Test Conditions	Note
High Temperature Storage	Ta = 85°C 240 hrs	Note 1,Note 4
Low Temperature Storage	Ta = -30°C 240 hrs	Note 1,Note 4
High Temperature Operation	Ts = 85°C 240 hrs	Note 2,Note 4
Low Temperature Operation	Ts = -30°C 240 hrs	Note 1,Note 4
High Temperature and High Humidity (operation)	Ta = +60°C, 90%RH 240 hrs	Note 4
Thermal Cycling Test (non operation)	-30°C (30min) → +85°C (30min), 100cycles	Note 4
Electrostatic Discharge	±2KV, 100pF/1500Ω, Human Body Mode	
Vibration	Frequency range:10~55Hz Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X. Y. Z. (6 hours for total)	
Vibration (with carton)	Random Vibration : 0.015G*G/Hz from 5-200HZ, -6dB/Octave from 200-500HZ 2 hours for each direction of X. Y. Z. (6 hours for total)	
Drop (with carton)	Height: 60cm 1 corner, 3 edges, 6 surfaces	

Note 1: Ta is the ambient temperature of samples.

Note 2: Ts is the temperature of panel' s surface.

Note 3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but doesn' t guarantee all the cosmetic specification.

Note 4: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature

9. General Precautions

9-1 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.

9-2 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. Ampire does not warrant the module, if customers disassemble or modify the module.

9-3 Breakage of LCD Panel

- 9.3.1. 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.
- 9.3.2. If liquid crystal contacts mouth or eyes, rinse out with water immediately.
- 9.3.3. If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.
- 9.3.4. Handle carefully with chips of glass that may cause injury, when the glass is broken.

9-4 Electric Shock

- 9.4.1. Disconnect power supply before handling LCD module.
- 9.4.2. Do not pull or fold the LED cable.
- 9.4.3. Do not touch the parts inside LCD modules and the fluorescent LED's connector or cables in order to prevent electric shock.

9-5 Absolute Maximum Ratings and Power Protection Circuit

- 9.5.1. 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.
- 9.5.2. Please do not leave LCD module in the environment of high humidity and high temperature for a long time.
- 9.5.3. It's recommended to employ protection circuit for power supply.

9-6 Operation

- 9.6.1 Do not touch, push or rub the polarizer with anything harder than HB pencil lead.
- 9.6.2 Use fingerstalls of soft gloves in order to keep clean display quality, when persons handle the LCD module for incoming inspection or assembly.
- 9.6.3 When the surface is dusty, please wipe gently with absorbent cotton or other soft material.
- 9.6.4 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.
- 9.6.5 When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzine or other adequate solvent.

9-7 Mechanism

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

9-8 Static Electricity

- 9.8.1 Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.
- 9.8.2. 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.

9-9 Strong Light Exposure

The module shall not be exposed under strong light such as direct sunlight. Otherwise, display characteristics may be changed.

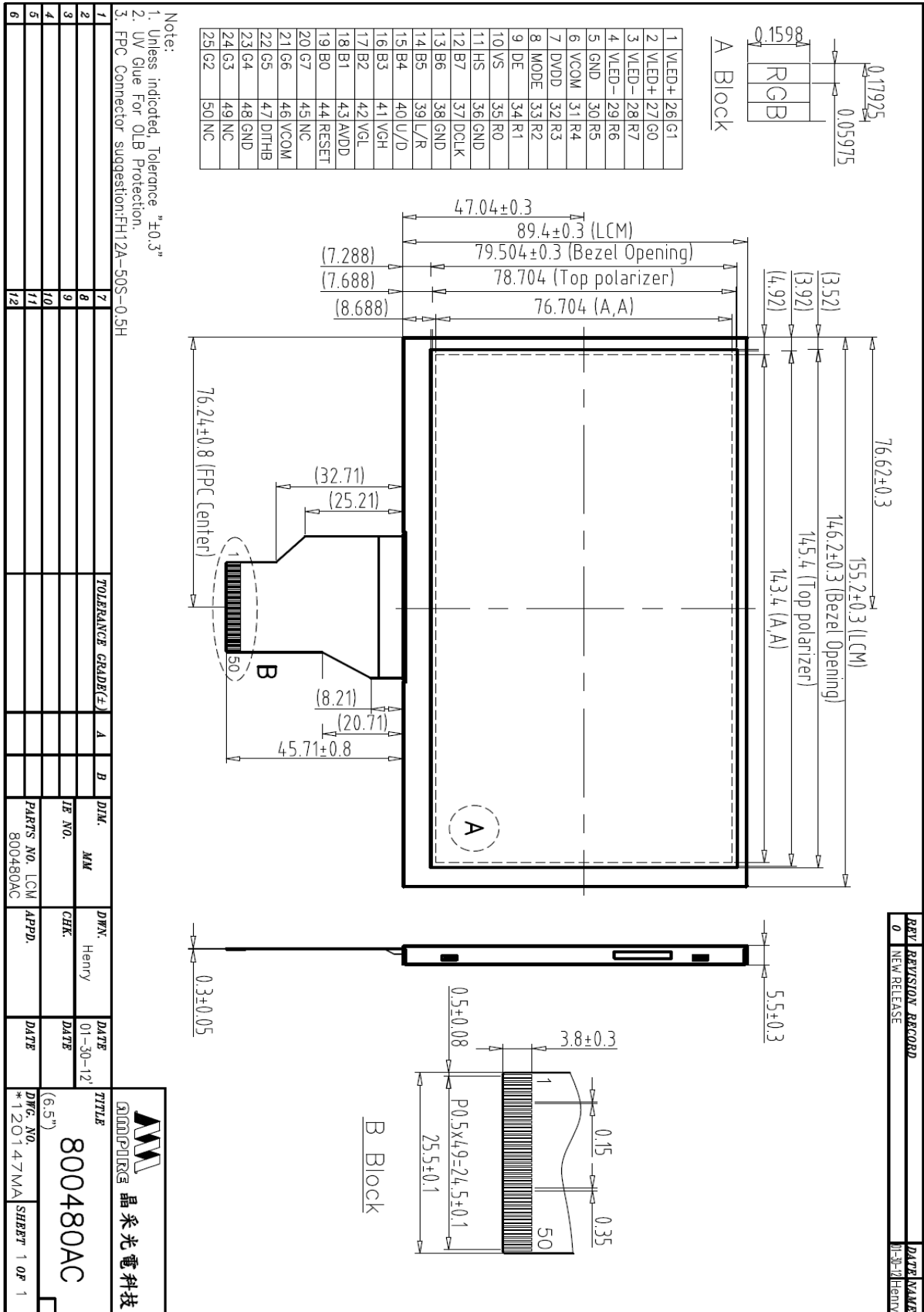
9-10 Disposal

When disposing LCD module, obey the local environmental regulations.

9-11 Others

AMIPRE will provide one year warrantee for all products and three months warrantee for all repairing products.

10. OUTLINE DIMENSION



Note:
 1. Unless indicated, Tolerance "±0.3"
 2. UV Glue For OLB Protection.
 3. FPC Connector suggestion: FH12A-50S-0.5H

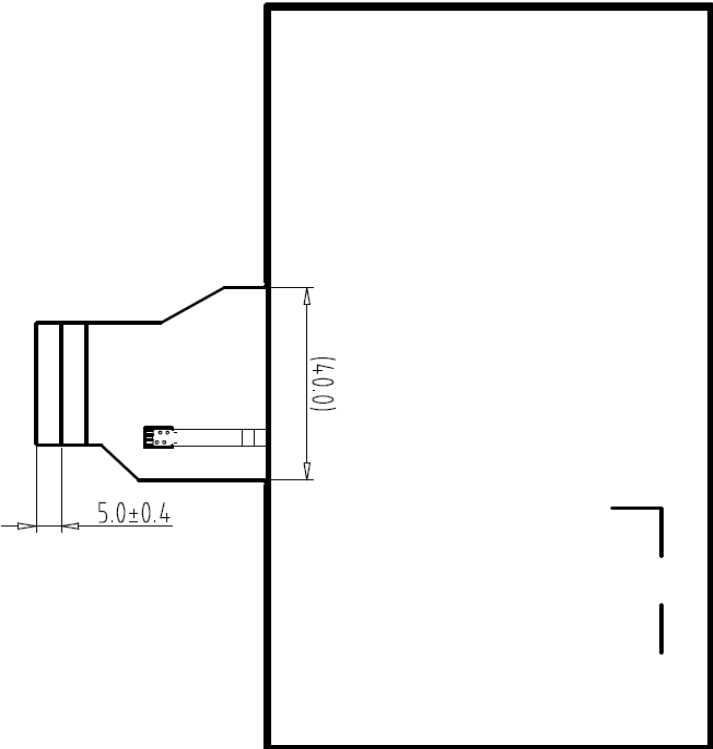
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2	8															
3	9															
4	10															
5	11															
6	12															

REV	REVISION RECORD	DATE NAME
0	NEW RELEASE	11-30-12 Henry

REV	REVISION RECORD	DATE	NAME
0	NEW RELEASE	01-30-12	Henry

1	VLED+	26	G1
2	VLED+	27	G0
3	VLED-	28	R7
4	VLED-	29	R6
5	GND	30	R5
6	VCOM	31	R4
7	DVDD	32	R3
8	MODE	33	R2
9	DE	34	R1
10	VS	35	R0
11	HS	36	GND
12	B7	37	DCLK
13	B6	38	GND
14	B5	39	L/R
15	B4	40	U/D
16	B3	41	VGH
17	B2	42	VGL
18	B1	43	AVDD
19	B0	44	RESET
20	G7	45	INC
21	G6	46	VCOM
22	G5	47	DITHB
23	G4	48	GND
24	G3	49	INC
25	G2	50	INC

- Note:
1. Unless indicated, Tolerance "±0.3"
 2. UV Glue For OLB Protection.
 3. FPC Connector suggestion:FH12A-50S-0.5H



1	7	TOLERANCE GRADE(±)	A	B	DIM.	MM	DRW.	Henry	DATE	01-30-12	TITLE	800480AC	DWG. NO.	*120148MA	SHEET	1 OF 1
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3	9				PARTS NO.	LOCM-1	APPD.		DATE							
4	10															
5	11															
6	12					800480AC										

AMPIRE 晶采光电科技
 800480AC
 SHEET 1 OF 1