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-800480AHTMQW-10H**
APPROVED BY	
DATE	

☑ **Approved For Specifications**
☐**Approved For Specifications & Sample**

AMPIRE CO., LTD.
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APPROVED BY	CHECKED BY	ORGANIZED BY

RECORD OF REVISION

Revision Date	Page	Contents	Editor
2017/11/27		New Release	Lawlite
2017/12/08	16	Update High Temperature Operation	Lawlite
2018/01/23		Rename to AM-800480AHTMQW-10H	Lawlite

1. Features

9 inch Amorphous-TFT-LCD (Thin Film Transistor Liquid Crystal Display) module. This module is composed of a 9" TFT-LCD panel and LED backlight.

(1) Construction: 9" a-Si TFT active matrix, White LED Backlight.

(2) Resolution (pixel): 800(R.G.B) X480

(3) Number of the Colors : 16M colors (R , G , B 8 bit digital each)

(4) LCD type : Transmissive, normally White

(5) Interface: RGB interface 50 pin

(6) Power Supply Voltage: 3.3V for logic voltage.

2. PHYSICAL SPECIFICATIONS

Item	Specifications	unit
LCD size	9 inch (Diagonal)	
Resolution	800 x (RGB) x 480	dot
Dot pitch	0.0825(W) x 0.2327(H)	mm
Active area	198.0(W)x111.696(H)	mm
Module size	211.1(W) x 126.5(H) x 5.9(D)	mm
Driver IC	source IC: NT39419 Gate IC:NT52001	
View direction (Gray inversion)	6 o'clock	
Color arrangement	RGB-stripe	
interface	Digital	
Weight	T.B.D (typ.)	g

3. ABSOLUTE MAX. RATINGS

Item	Symbol	Values		UNIT	Note
		Min.	Max.		
Power voltage	DVDD	-0.3	5.0	V	
	AVDD	-0.5	13.5		
	VGL	-12.0	-2.0		
	VGH	13.0	19.0		
	VGH-VGL	-	31.0		
Input signal voltage	Vi	-0.3	VCC+0.3	V	Note 1
Operation temperature	TOP	-20	80	℃	
Storage temperature	TST	-30	80	℃	

Note 1: The product is subject to be damaged permanently if stresses beyond
those absolute maximum ratings listed above.
Signals include : DCLK, DE, HS, VS, R0~R5, G0~G5, B0~B5.

## 4. ELECTRICAL CHARACTERISTICS

4-1 Typical Operation Conditions

Item	Symbol	Values			Unit	Remark
		MIN	TYP	MAX		
Power Voltage	DVDD	3.0	3.3	3.6	V	Note 2
	AVDD	10.2	10.4	10.6	V	
	VGH	16.3	17.0	17.7	V	
	VGL	-5.7	-5.0	-4.3	V	
Input signal voltage	VCOM	3.2	4.2	5.2	V	Note 4
Logic input high voltage	V_{TH}	$0.7V_{CC}$	-	V_{CC}	V	Note 3
Logic input low voltage	V_{TL}	GND	-	$0.3V_{CC}$	V	Note 3

Note 1: Be sure to apply DVDD and VGL to the LCD first, and then apply VGH.

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

Note 3: DCLK,HS,VS,RSTB,UPDN,STLR,MODE,DITHB.

Note 4: Typical VCOM is only a reference value, it must be optimized according to each LCM. Be sure use VR.
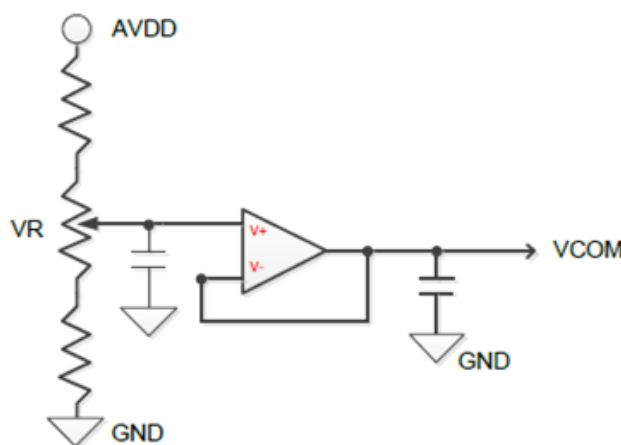
4-2 Current Consumption

Item	Symbol	Values			Unit	Remark
		MIN	TYP	MAX		
Current for Driver	I_{DVDD}	-	5.5	10	mA	
	I_{AVDD}	-	32	50	mA	
	IGH	-	0.3	1	mA	VGH=17.0V
	IGL	-	0.3	1	mA	VGL=-5.0V

4-3 Backlight Driving Conditions

Item	Symbol	Values			Unit	Note
		Min.	Typ.	Max.		
LED voltage	VLED	--	15.5	18	V	Note 1
LED current	IL	--	300	315	mA	Note 1
LED life time	--	--	50k	--	Hr	Note 2

Note 1 : The LED Supply Voltage is defined by the number of LED at Ta=25℃ and IL=300mA.

Note 2 : The "LED life time" is defined as the module brightness decrease to 50% original brightness at Ta=25℃ and IL=300mA. The LED lifetime could be decreased if operating IL is larger than 300mA.

Note 3 : When LCM is operated over 40℃ ambient temperature, the ILED should be follow :
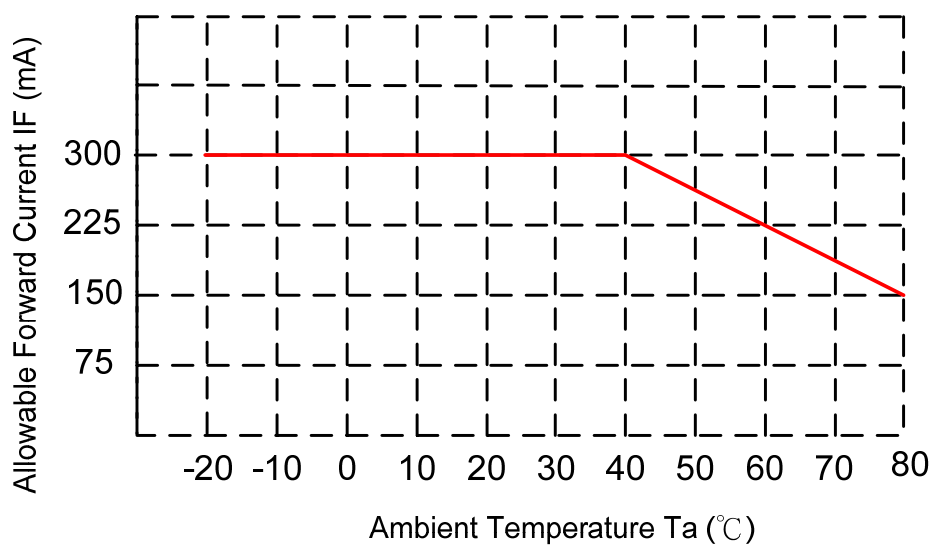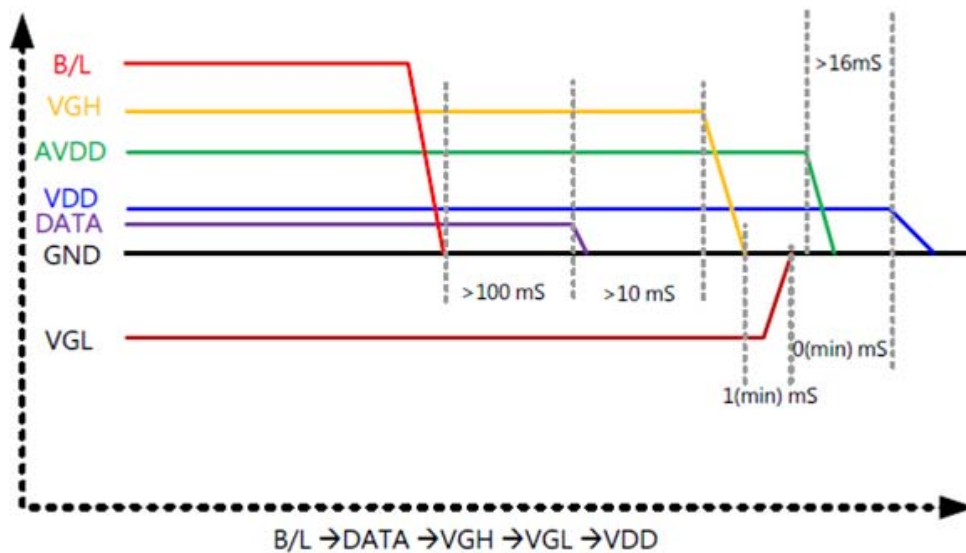
4-4 Power Sequence
4-4-1 Power on sequence
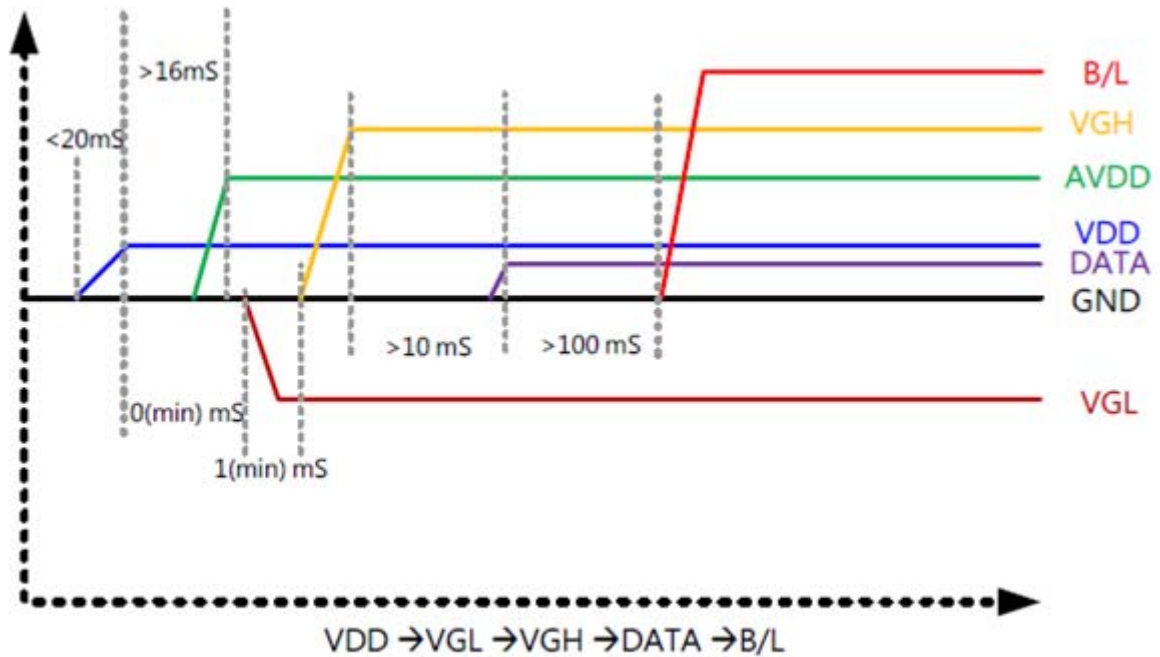
VDD →VGL →VGH →DATA →B/L

Note: Data Signal includes DCLK, DE, HS, VS, R0~R5, G0~G5, B0~B5.

Note : Data Signal includes DCLK, DE, HS, VS, R0~R5, G0~G5, B0~B5.

4-4-2 Power off sequence

B/L →DATA →VGH →VGL →VDD

Note: Data Signal includes DCLK, DE, HS, VS, R0~R5, G0~G5, B0~B5.

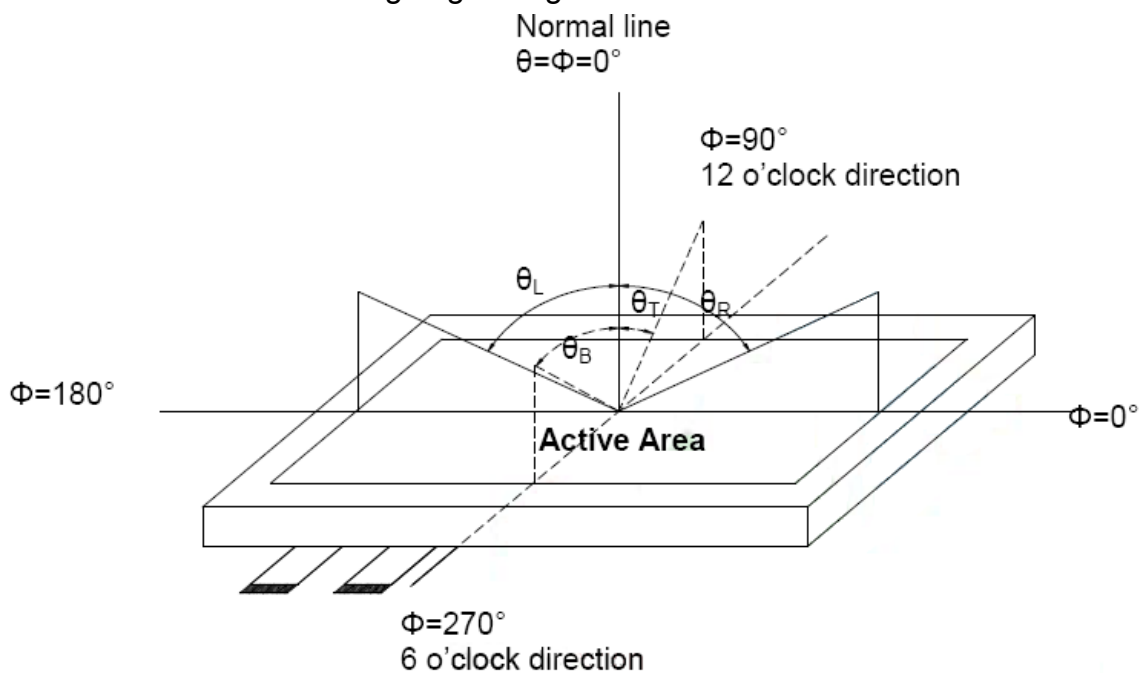Note : Data Signal includes DCLK, DE, HS, VS, R0~R5, G0~G5, B0~B5.

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5. Optical Specifications

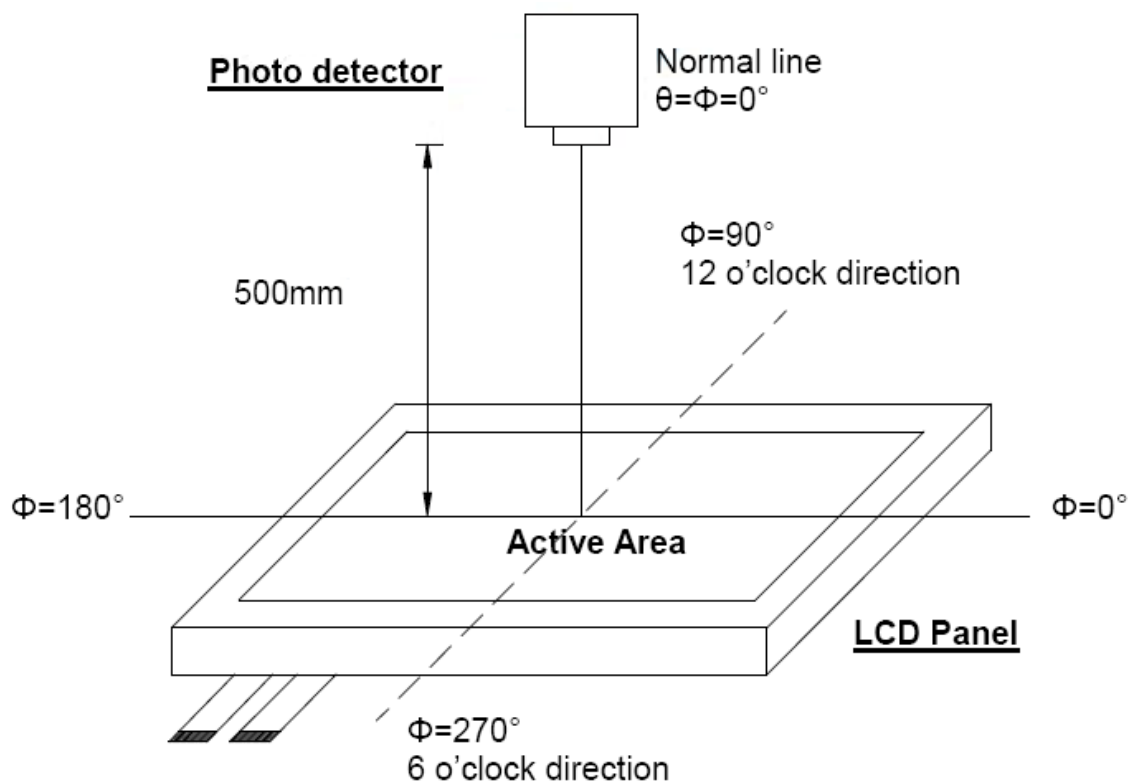| Item	Symbol	Condition	Values			Unit	Note
			Min.	Typ.	Max.		
Viewing angle (CR≧10)	θL	Φ = 180° (9 o'clock)	60	70	--	degree	Note1
	θR	Φ = 0° (3 o'clock)	60	70	--		
	θT	Φ = 90° (12 o'clock)	40	50	--		
	θB	Φ = 270° (6 o'clock)	60	70	--		
Response time	$T_{on} + T_{off}$	Normal θ =Φ=0˚	--	25	35	msec	Note3
Contrast ratio	CR		500	800	--	--	Note4
Color chromaticity	WX		0.247	0.297	0.347	--	Note5 Note6
	WY		0.272	0.322	0.372	--	
Luminance	L		400	500	--	cd/m^2	Note6
Luminance uniformity	YU		70	75	--	%	Note7

Test Conditions :

1. I_L = 300mA (Backlight current), the ambient temperature is 25℃.
2. The test systems refer to Note 2.

Note 1 : Definition of viewing angle range

Normal line
θ=Φ=0°

Φ=90°
12 o'clock direction

θ_L

θ_T θ_R

θ_B

Φ=180°

Active Area

Φ=0°

Φ=270°
6 o'clock direction

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.)

Photo detector

Normal line
θ=Φ=0°

500mm

Φ=90°
12 o'clock direction

Φ=180°

Active Area

Φ=0°

LCD Panel

Φ=270°
6 o'clock direction

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%.
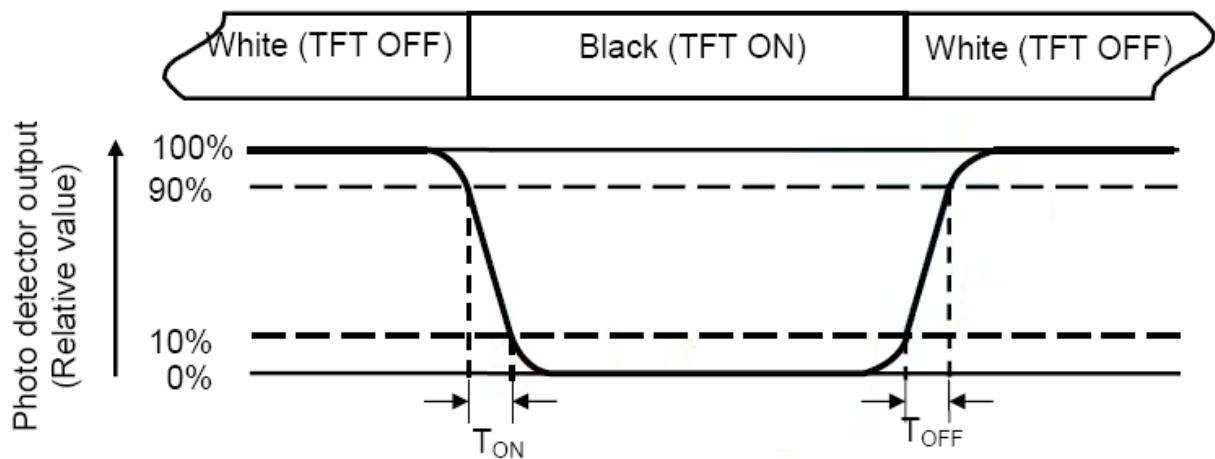
Note 4 : Definition of contrast ratio

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

Note 5 : Definition of color chromaticity (CIE1931)
Color coordinated measured at center point of LCD.
Note 6 : All input terminals LCD panel must be ground when measuring the center area of the panel.

Note 7 : Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer to bellow figure). Every measuring point is placed at the center of each measuring area.

$$\text{Luminance Uniformity (Yu)} = \frac{B_{min}}{B_{max}}$$

L ----- Active area length   W ----- Active area width
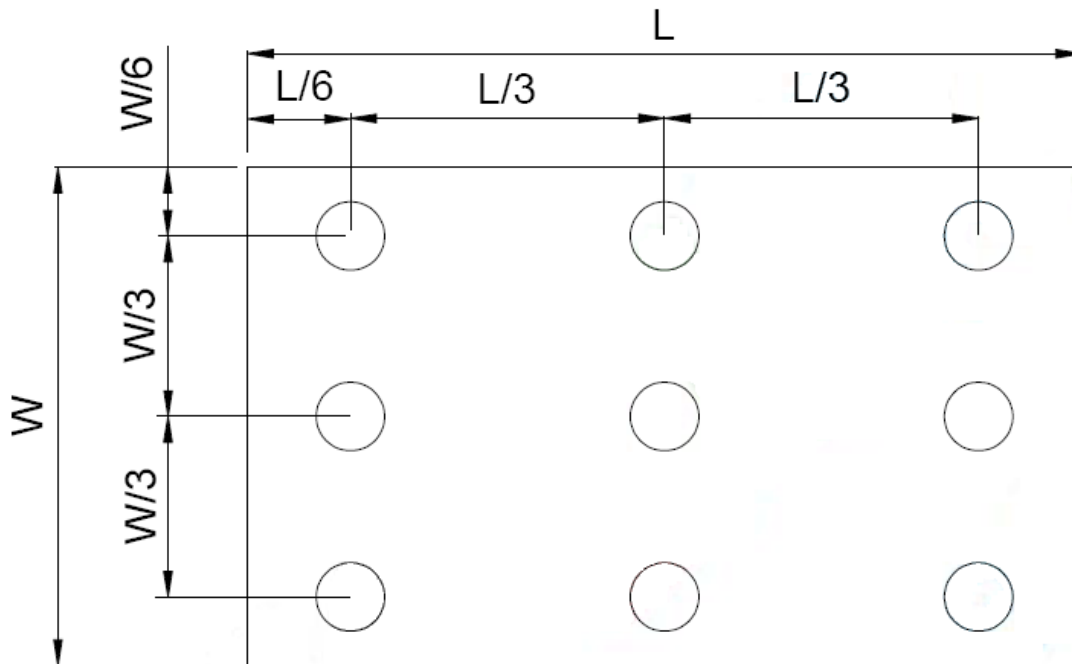
B_{max} : The measured maximum luminance of all measurement position.

B_{min} : The measured minimum luminance of all measurement position.

6. INTERFACE
TFT LCD Panel Driving Section

Pin No.	Symbol	I/O	Description	Note
1	VLED	-	Power for LED back-light	
2	VLED	-	Power for LED back-light	
3	GLED	-	Ground for LED back-light	
4	GLED	-	Ground for LED back-light	
5	GND	P	Power ground	
6	VCOM	I	Common voltage	
7	DVDD	P	Power for Digital circuit	
8	MODE	I	DE/SYNC mode select	(3)
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	
19	B0	I	Blue data(LSB)	
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	
27	G0	I	Green data(LSB)	
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	
35	R0	I	Red data(LSB)	
36	GND	P	Power ground	
37	DCLK	I	Sample clock	
38	GND	I	Power ground	
39	L/R	I	Right/ left selection	(2),(5)
40	U/D	I	Up/down selection	(2),(5)
41	VGH	P	Gate ON voltage	
42	VGL	P	Gate OFF voltage	
43	AVDD	P	Power for Analog circuit	

44	RESET	I	Global reset pin	(1)
45	NC	-	No connection	
46	VCOM	I	Common voltage	
47	DITHB	I	Dithering function	(4)
48	GND	P	Power ground	
49	NC	-	No connection	
50	NC	-	No connection	

I : input, O : output, P : power

Note 1: Global reset pin. Active Low to enter Reset State. Suggest to connecting with an RC reset circuit for stability. Normally pull high.

Note 2: Selection of scanning mode

Setting of control input		Scanning direction
U/D	R/L	
GND	DVDD	Up to down, left to right
DVDD	GND	Down to up, right to left
GND	GND	Up to down, right to left
DVDD	DVDD	Down to up, left to right

Note 3: DE/SYNC mode select, normally pull high.

H: DE mode. When select DE mode , VS and HS must pull high

L: HS/VS mode. When select HS/VS mode , DE must be grounded.

Note4: Dithering function enables control. Normally pull high.

DITHB="1", Disable internal dithering function. For 18bit RGB interface, connect two LSB bits of all the R/G/B data buses to GND.

DITHB="0",Enable internal dithering function, For TTL 24bit parallel RGB image data input.

Note 5: Definition of scanning direction.

Refer to the figure as below:
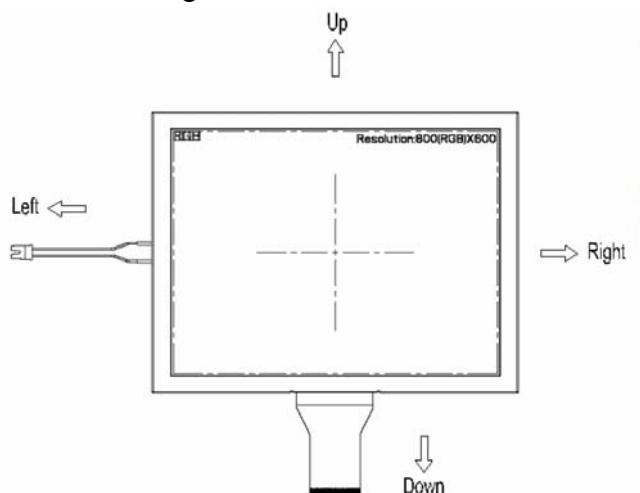
7. INPUT SIGNAL :

7-1 AC Electrical Characteristics

Item	Symbol	Value			Unit	Remark
		Min.	Typ.	Max.		
HS setup time	Thst	8	-	-	ns	
HS hold time	Thhd	8	-	-	ns	
VS setup time	Tvst	8	-	-	ns	
VS hold time	Tvhd	8	-	-	ns	
Data setup time	Tdsu	8	-	-	ns	
Data hole time	Tdhd	8	-	-	ns	
DE setup time	Tesu	8	-	-	ns	
DE hold time	Tehd	8	-	-	ns	
DVDD Power On Slew rate	TPOR	-	-	20	ms	From 0%~90%
RESET pulse width	TRST	1	-	-	ms	
DCLK cycle time	Tcoh	20	-	-	ns	
DCLK pulse duty	Tcwh	40	50	60	%	

7-2 Timing

Item	Symbol	Value			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	Value			Unit	Remark
		Min.	Typ.	Max.		
Vertical Display Area	Thd	-	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 Input Clock and Data Timing Diagram
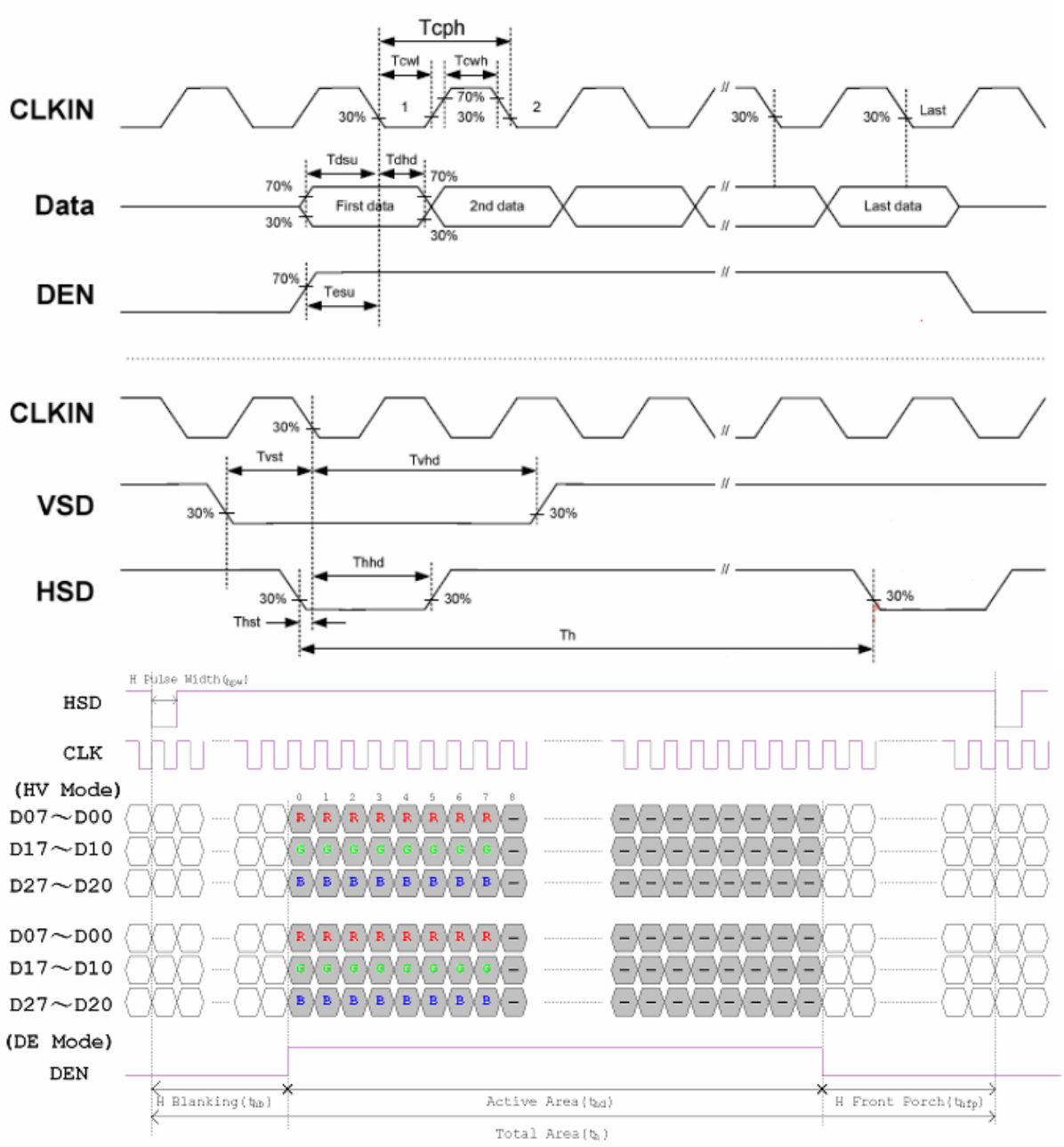
8. RELIABILITY TEST CONDITIONS

Test Item	Test Conditions	Note
High Temperature Operation	80±3°C , t=240 hrs	
Low Temperature Operation	-20±3°C , t=240 hrs	
High Temperature Storage	80±3°C , t=240 hrs	1,2
Low Temperature Storage	-30±3°C , t=240 hrs	1,2
Thermal Shock Test	-20°C ~ 25°C ~ 70°C 30 m in. 5 min. 30 min. (1 cycle) Total 5 cycle	1,2
Humidity Test	40 °C, Humidity 90%, 96 hrs	1,2
Vibration Test (Packing)	Sweep frequency : 10 ~ 55 ~ 10 Hz/1min Amplitude : 0.75mm Test direction : X.Y.Z/3 axis Duration : 30min/each axis	2

Note 1 : Condensation of water is not permitted on the module.

Note 2 : The module should be inspected after 1 hour storage in normal conditions
(15-35°C , 45-65%RH).

Definitions of life end point :

- Current drain should be smaller than the specific value.
- Function of the module should be maintained.
- Appearance and display quality should not have degraded noticeably.
- Contrast ratio should be greater than 50% of the initial value.

Note 3 : The module shouldn't be tested more than one condition, and all the test
conditions are independent.

Note 4 : All the reliability tests should be done without protective film on the module.

9. General Precautions

9-1　Safety

Liquid crystal is poisonous. Do not put it your month. If liquid crystal touches your skin or clothes, wash it off immediately by using soap and water.

9-2　Handling

1. The LCD panel is plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.
2. The polarizer attached to the display is easily damaged. Please handle it carefully to avoid scratch or other damages.
3. To avoid contamination on the display surface, do not touch the module surface with bare hands.
4. Keep a space so that the LCD panels do not touch other components.
5. Put cover board such as acrylic board on the surface of LCD panel to protect panel from damages.
6. Transparent electrodes may be disconnected if you use the LCD panel under environmental conditions where the condensation of dew occurs.
7. Do not leave module in direct sunlight to avoid malfunction of the ICs.

9-3　Static Electricity

1. Be sure to ground module before turning on power or operation module.
2. Do not apply voltage which exceeds the absolute maximum rating value.

9-4　Storage

1. Store the module in a dark room where must keep at +25±10℃ and 65%RH or less.
2. Do not store the module in surroundings containing organic solvent or corrosive gas.
3. Store the module in an anti-electrostatic container or bag.

9-5　Cleaning

1. Do not wipe the polarizer with dry cloth. It might cause scratch.
2. Only use a soft sloth with IPA to wipe the polarizer, other chemicals might permanent damage to the polarizer.

9-5　Others

1. AMIPRE will provide one year warrantee for all products and three months warrantee for all repairing products.
2. Do not keep the LCD at the same display pattern continually. The residual image will happen and it will damage the LCD. Please use screen saver.

10. OUTLINE DIMENSION

A BLOCK

| R | G | B |

1 VLED	26 G1
2 VLED	27 G0
3 GLED	28 R7
4 GLED	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 NC
21 G6	46 VCOM
22 G5	47 DITHB
23 G4	48 GND
24 G3	49 NC
25 G2	50 NC

Note:
1. Unless indicated, Tolerance ±0.3.
2. RTV Glue For OLB Protection.
3. FPC Connector: FH12A-50S-0.5SH or Equivalent.

Viewing Direction

Back View

Contact
Stiffener

PARTS NO. LCM 800480AH
DMN. Henry
DATE 02-04-13'
TITLE 800480AH (9.0")
DWG. NO. *13O219MA
SHEET 1 OF 1