晶釆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-640480VWTZQW-T01H**
APPROVED BY	
DATE	

☐ **Preliminary Specification**
■ **Formal Specification**

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Kokai	Jessica	Simon

This Specification is subject to change without notice.

Revision Date	Page	Contents	Editor
2021/10/08	--	New Release	Simon

1. INTRODUCTION

5.7 inch Amorphous-TFT-LCD (Thin Film Transistor Liquid Crystal Display) module. This TFT LCD has a 5.7 (4:3) inch diagonally measured active display area with 640x480 (640 horizontal by 480 vertical pixels) resolution. This module is composed of a 5.7" TFT-LCD panel and backlight unit.

1-1. Features

(1) Construction: a-Si TFT-LCD with driving system, White LED Backlight.

(2) LCD type : IPS

(3) Number of the Colors : 262K colors (R,G,B 6bit digital each)

(4) Interface: 18 Bit TTL RGB interfaces. 40 pin.

(5) LCD Power Supply Voltage: 3.3V single power input, built-in power supply circuit.

(6) ● capacitive-type touch panel.
   For normal operation, there must be a cover lens of 0.7~4mm thickness to be put on the top of touch panel.
   ● USB interface for touch control.

2. PHYSICAL SPECIFICATIONS

Item	Specifications	unit
Display size (diagonal)	5.7	inch
Resolution	640 (W) x RGB x 480 (H)	dot
Pixel pitch	0.18 (W) x 0.18 (H)	mm
Color configuration	R.G.B Vertical stripe	
Display Mode	Normally Black	

3 Absolute Maximum Ratings

3.1 Electrical Absolute max. ratings

Item	Symbol	Condition	Min.	Max.	Unit	Remark
Power voltage	VCC	GND=0	-0.3	3.96	V	
Logic Input Voltage Range	VIN	GND=0	-0.3	VCC +0.3	V	Note(1)

Note(1) HD, VD, DENA, DCLK, R0~R5, G0~G5, B0~B5.

Note(2) The following are maximum values which, if exceeded, may cause operation or damage to the unit.

3.2 Environmental Absolute Maximum Ratings

Item	Operating		Storage		Remark
	Min.	Max.	Min.	Max.	
Temperature	-20	70	-30	80	Note(2),(3),(4),(5),(6),(7)
Humidity	Note(1)		Note(1)		
Corrosive Gas	Not Acceptable		Not Acceptable		

Note(1) Ambient temperature Temp. <= 60℃ : 90% RH max

Note(2) For storage condition Ta at -30℃ < 240h , at 80℃ < 240h

Note(3) For operating condition Ta at -20℃ < 100h , at 70℃ < 240h

Note(4) Background color changes slightly depending on ambient temperature. This phenomenon is reversible.

Note(5) The response time will be slower at low temperature.

Note(6) Only operation is guaranteed at operating temperature. Contrast, response time, another display quality are evaluated at +25℃

Note(7) When LCM panel is operated over 60℃ (center of the panel surface temperature), the IAK of the LED back-light should be adjusted to 105 mA

Note(8) This is center of the panel surface temperature, not ambient temperature.

Note(9) At 25℃

4 Optical Characteristics

| Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Viewing Angle	Hor.	θU	CR≧10	75	85	--	deg.	(1),(4)
		θD		75	85	--		
	Ver.	θL		75	85	--		
		θR		75	85	--		
Contrast ratio		CR	Θ=Φ=0°	800	1200	--	--	(1),(2)
Response Time		$T_R + T_F$	Θ=Φ=0°	--	30	45	msec	(1),(3)
NTSC		(%)		55	60	--	%	
Color chromaticity	Red	Rx	Θ=Φ=0°	Typ. -0.05	0.630	Typ. +0.05	--	(1),(4),(5)
		Ry			0.312			
	Green	Gx			0.278			
		Gy			0.583			
	Blue	Bx			0.147			
		By			0.115			
	White	Wx			0.312			
		Wy			0.356			
Luminance (IAK=140mA)		L	Θ=Φ=0°	340	425	--	cd/m²	(1),(6)
Luminance Uniformity		ΔL	Θ=Φ=0°	70	-	-	%	(7)

Measuring Condition

Ta=25°C. To be measured on the center area of panel after 10 minutes operation. LED Back-light IAK=140 mA.

- Measuring surrounding：Dark room
- Ambient temperature：25±2℃
- 15min. Warm-up time.
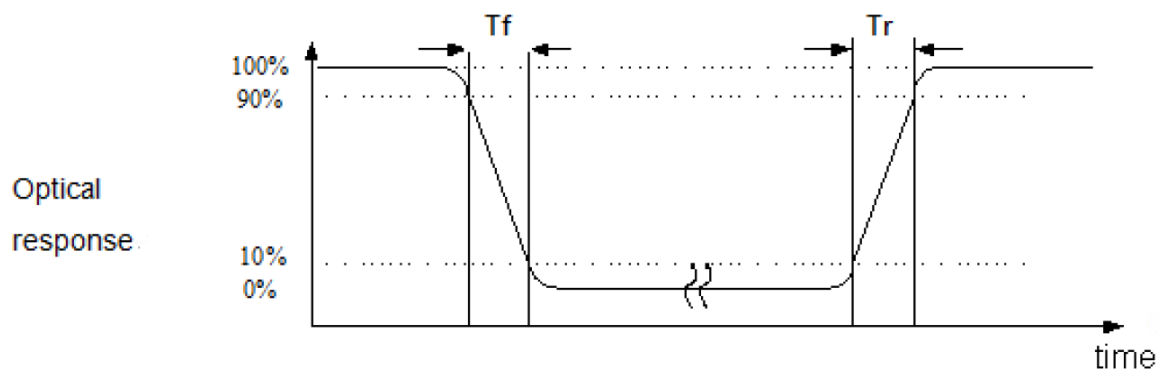
Note(1) Definition of Viewing Angle
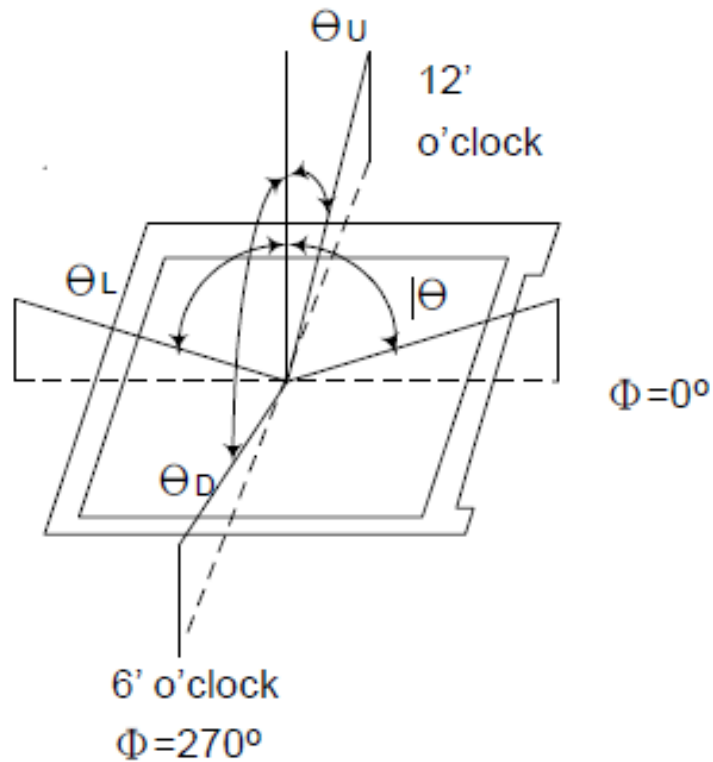
Note(2) Definition of Contrast Ratio (CR) :
    Contrast ratio is calculated with the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector Output when LCD is at "Black" state}}$$

Note(3) Definition of Response Time : Sum of TR and TF

Note(4) Definition of optical measurement setup

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.)
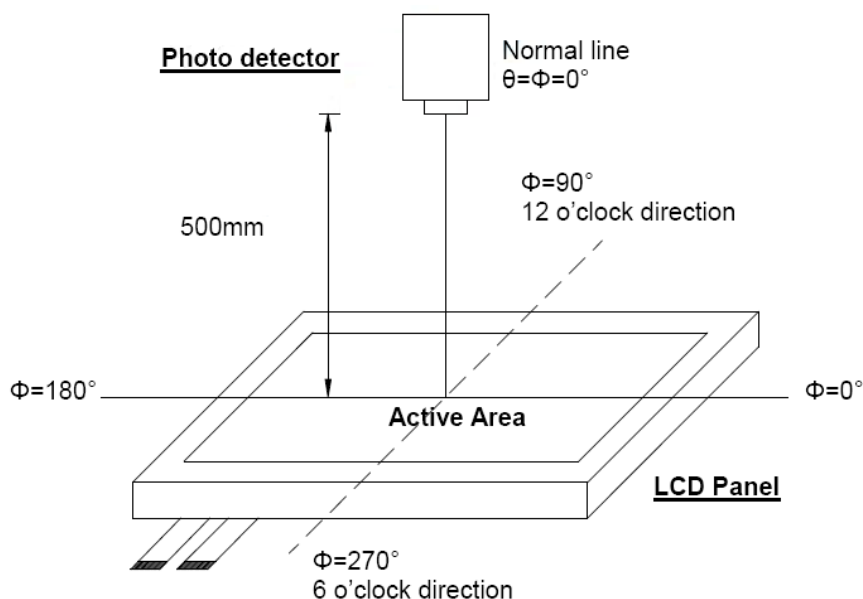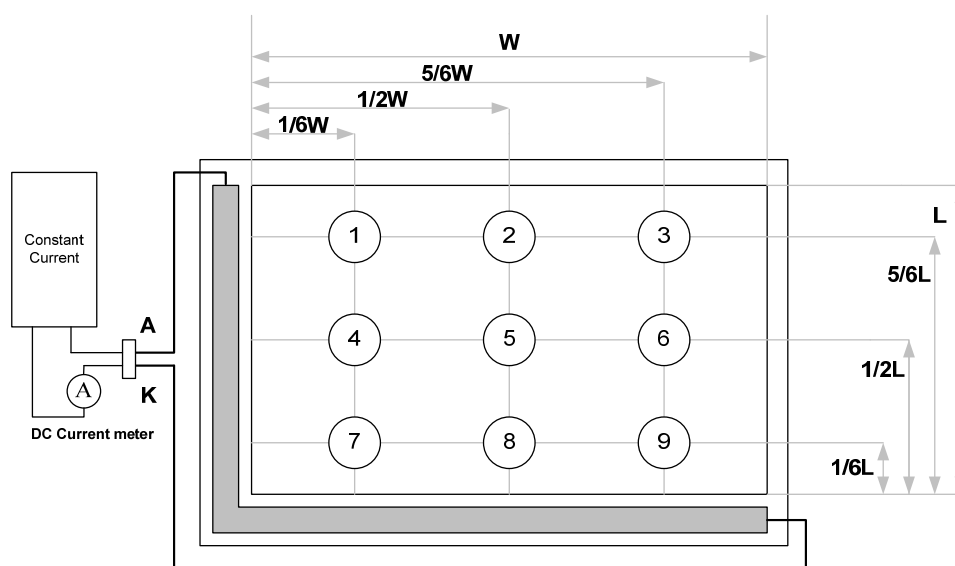

Note(5) Definition of color chromaticity (CIE1931)

Color coordinated measured at center point of LCD.

All input terminals LCD panel must be ground when measuring the center area of the panel.

Note(6) Luminance is measured at point 5 of the display.
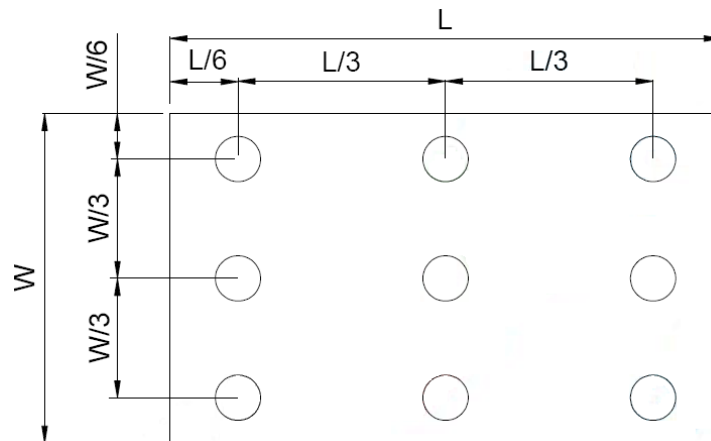
Note(7) Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer to bellow figure).

Every measuring point is placed at the center of each measuring area.

$$\text{Luminance Uniformity (Yu)} = \frac{\text{Bmin}}{\text{Bmax}}$$

L ----- Active area length   W ----- Active area width

Bmax: The measured maximum luminance of all measurement position.

Bmin: The measured minimum luminance of all measurement position.

5 Electrical Characteristics

5.1 DC Characteristics

Item		Symbol	Min.	Typ.	Max.	Unit	Note
Power supply voltage		VCC	3.0	--	3.6	V	
Input voltage for logic	H Level	V_{IH}	0.7* VCC	--	VCC	V	(1)
	L Level	V_{IL}	GND	--	0.3* VCC	V	

Note(1) HD, VD, DENA, DCLK, and R0~R7, G0~G7, B0~B7, DISP.

Note(2) fV =60Hz , Ta=25℃ , Display pattern : All White.

Note(3) *:Will be reference only

5.2 Electrical Characteristic Of LED Backlight

| Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED Forward Voltage	VAK	7.8	8.2	10.5	V	IAK=140mA, Ta=25℃
LED Forward Current	IAK	--	140	--	mA	Ta=25℃
LED life time			50k	-	Hrs.	IAK=140mA, Ta=25℃

Note(1) Ta means ambient temperature of TFT-LCD module.

Note(2) If the module is driven by high current or at high ambient temperature & humidity condition. The operating life will be reduced.
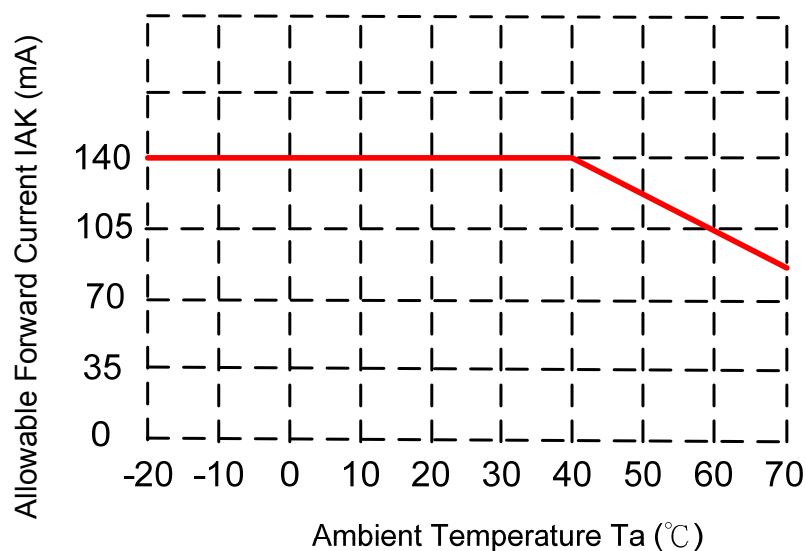
Note(3) The constant current source is needed for LED back-light driving.

Note(4) Operating life means brightness goes down to 50% minimum brightness. LED life time is estimated data. Ta=25℃

Note(5) The structure of LED B/L shows as below.
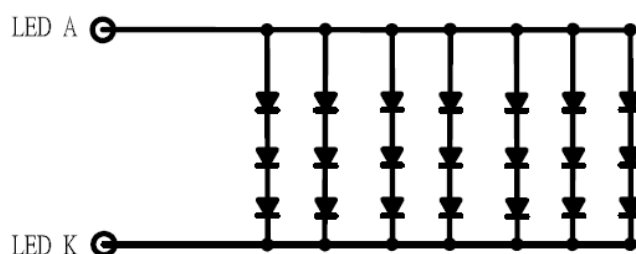
Note(6) When LCM is operated over 60℃ ambient temperature, the IAK of the LED backlight should be adjusted to 105 mA max

6 Interface Pin Assignment

Pin No	Symbol	Function
1	U/D	Up or Down Display Control
2	(NC)	No connection
3	Hsync(NC)	Honizontal SYNC. (Sync mode used)
4	VLED	Power Supply for LED
5	VLED	Power Supply for LED
6	VLED	Power Supply for LED
7	Vcc	Power Supply for LCD
8	Vsync(NC)	Vertical SYNC. (Sync mode used)
9	DE	Data Enable
10	Vss	Power Ground
11	Vss	Power Ground
12	ADJ	Adjust for LED Brightness
13	B5	Blue Data 5 (MSB)
14	B4	Blue Data 4
15	B3	Blue Data 3
16	Vss	Power Ground
17	B2	Blue Data 2
18	B1	Blue Data 1
19	B0	Blue Data 0 (LSB)
20	Vss	Power Ground
21	G5	Green Data 5 (MSB)
22	G4	Green Data 4
23	G3	Green Data 3
24	Vss	Power Ground
25	G2	Green Data 2
26	G1	Green Data 1
27	G0	Green Data 0 (LSB)
28	Vss	Power Ground
29	R5	Red Data 5 (MSB)
30	R4	Red Data 4
31	R3	Red Data 3
32	Vss	Power Ground
33	R2	Red Data 2
34	R1	Red Data 1
35	R0	Red Data 0 (LSB)
36	Vss	Power Ground
37	Vss	Power Ground
38	DCLK	Clock Signals
39	Vss	Power Ground
40	L/R	Left or Right Display Control

NOTE :
1. ADJ adjust brightness to control Pin , Pulse duty the bigger the brighter.
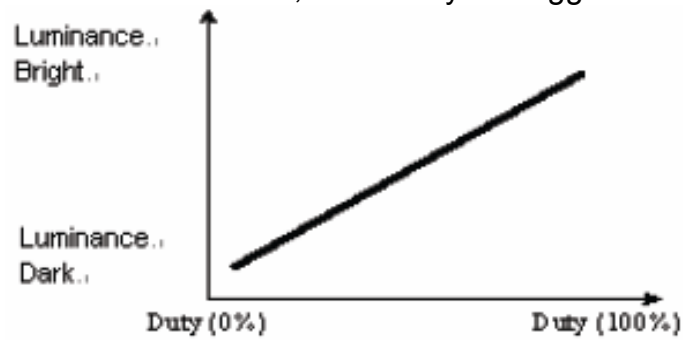
2. ADJ signal = 0 ~ 5.0V , operation frequency : 200Hz~20KHz
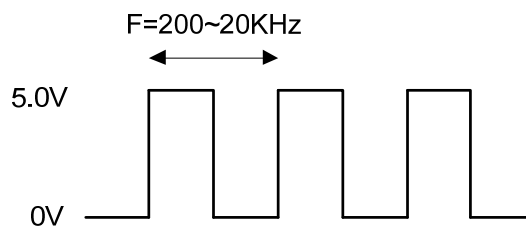
3. VSS Pin must ground contact , can not be floating.

4. U/D and L/R are controlled function

| L/R	U/D	Function
1	0	Normally display
0	0	Left and Right opposite
1	1	Up and Down opposite
0	1	Left and Right opposite , Up and Down opposite

7 Interface Timing

AC electrical characteristics

Parameter Symbol		Min	Typ	Max	Unit
HSD setup time	T_{hst}	8	-	-	ns
HSD hold time	T_{hhd}	8	-	-	ns
VSD setup time	T_{vst}	8	-	-	ns
VSD hold time	T_{vhd}	8	-	-	ns
Data setup time	T_{dsu}	8	-	-	ns
Data hold time	T_{dhd}	8	-	-	ns
DE setup time	T_{esu}	8	-	-	ns
DE hold time	T_{ehd}	8	-	-	ns
VDD Power On Slew rate	T_{POR}	-	-	20	ms
RSTB pulse width	T_{Rst}	10	-	-	us
CLKIN cycle time	T_{cph}	20	-	-	ns
CLKIN pulse duty	T_{cwh}	40	50	60	%
Output stable time	T_{sst}	-	-	6	us

Timing for RGB Interface

VDD=3.3V, VSS=0V, Ta=25℃

Parameter	Symbol	Min	Typ	Max	Unit	Remark
DCLK frequency	fclk	--	24	50	MHz	
Horizontal display area	thd		640		DCLK	
One Horizontal Line	th	--	760	--	DCLK	
HSD pulse width	thpw	1	48	255	DCLK	
HSD Back Porch(blanking)	thb		88		DCLK	
HSD Front Porch	thfp	1	32	255	DCLK	
DE Mode Blanking	th-thd	85	120	512	DCLK	
Vertical display area	tvd		480		TH	
VSD period time	tv	513	525	767	TH	
VSD pulse width	tvpw	3	3	255		
VSD Back Porch(blanking)	tvb		32		TH	
VSD Front Porch	tvfp	1	13	255	TH	
DE Mode Blanking	tv-tvd	4	45	255	TH	
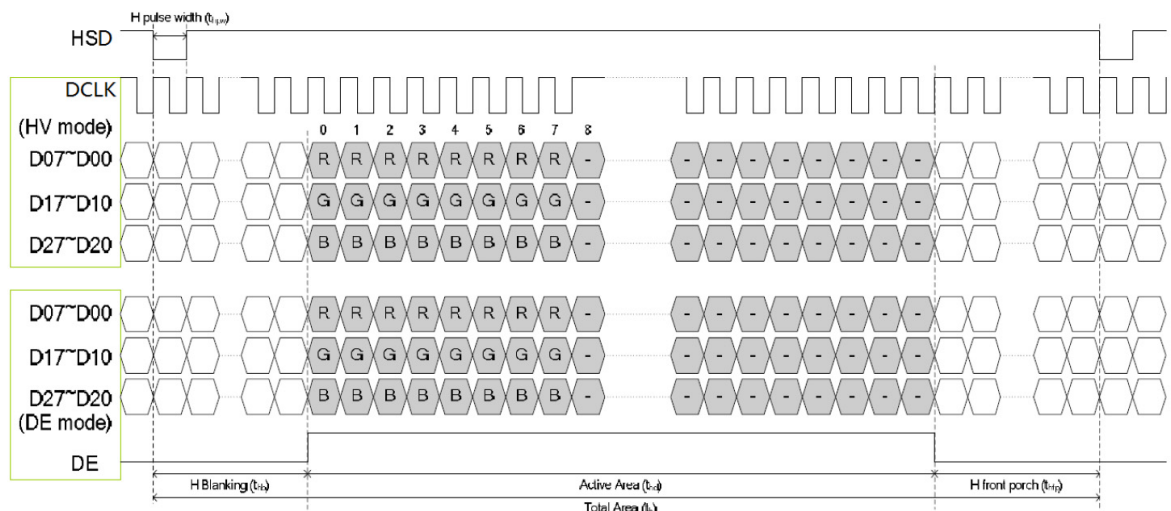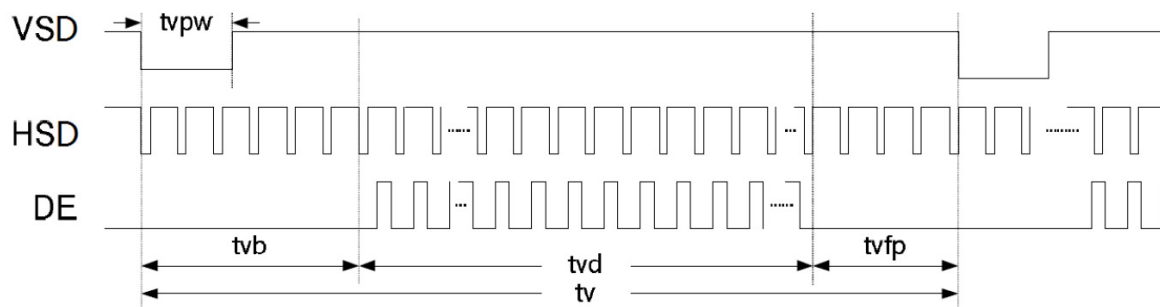
Input Clock and Data timing Diagram

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
CLKIN Frequency	Fclk	-	40	50	MHz	VDD=3.0V~3.6V
CLKIN Cycle Time	Tclk	20	25	-	ns	-
CLKIN Pulse Duty	Tcwh	40	50	60	%	Tclk
Time from HSD to Source Output	Thso		64		CLKIN	-
Time from HSD to LD	Thld		64		CLKIN	-
Time from HSD to STV	Thstv		2		CLKIN	-
Time from HSD to CKV	Thckv		20		CLKIN	-
Time from HSD to OEV	Thoev		4		CLKIN	-
LD Pulse Width	Twld		10		CLKIN	-
CKV Pulse Width	Twckv		66		CLKIN	-
OEV Pulse Width	Twoev		74		CLKIN	-
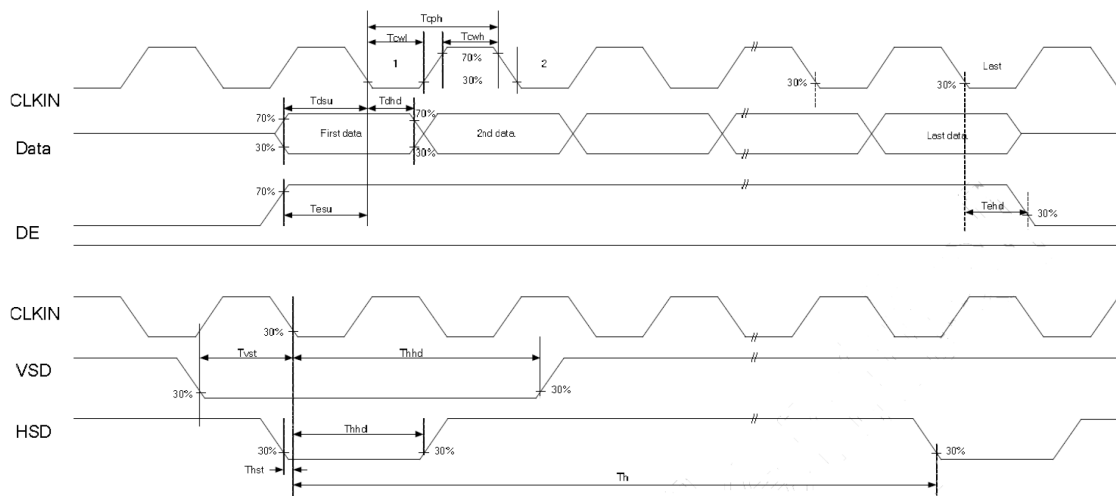
Input Clock and Data Timing Diagram

Power On/Off Sequence
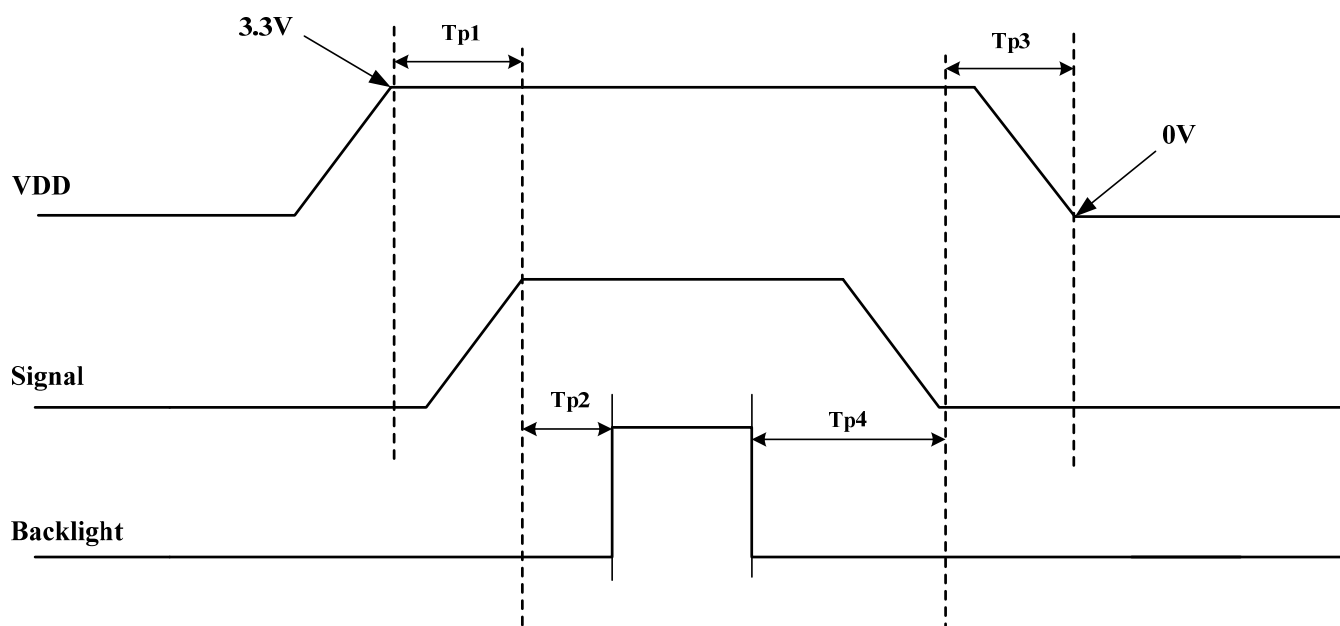
Item	Symbol	Value			Units	Remark
		Min.	Typ.	Max.		
VDD on to signal starting	Tp1	5	-	50	ms	
Signal starting to backlight on	Tp2	150	-	-	ms	
Signal off to VDD off	Tp3	5	-	50	ms	
Backlight off to signal off	Tp4	150	-	-	ms	

8.Displayed Color and Input Data
Data Signal

COLOR		INPUT DATA																							
		R DATA								G DATA								B DATA							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
		MSB							LSB	MSB							LSB	MSB							LSB
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	CYAN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	MAGENTA	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
RED	RED(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	GREEN(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	GREEN(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
BLUE	BLUE(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	BLUE(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

9. Projected capacitive-type touch panel

9.1 Basic Characteristic

ITEM	SPECIFICATION
Type	Projective Capacitive Touch Panel
Activation	5-fingers or Signal-finger
X/Y Position Reporting	Absolute Position
Touch Force	No contact pressure required
Calibration	No need for calibration
Report Rate	Approx. 100 points/sec
Interface	USB
Control IC	EXC80W32
Note	**For normal operation, there must be a cover lens of 0.7~4mm thickness to be put on the top of touch panel.**

Specify the normal operating condition

(GND=0V)

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Power Supply Voltage	VCC	4.75	5.0	5.25	V	
Power Consumption	I$_{VCC}$	-	T.B.D	-	mA	

9.2 Interface

Pin No.	Symbol	Function
1	VCC	USB Power 5V
2	D+	USB Data+
3	D+	USB Data+
4	GND	USB Power Ground
5	D-	USB Data-
6	D-	USB Data-
7	NC	No connection
8	NC	No connection

Grounding

TP needs to work in environment with stable stray capacitance. In order to minimize the variation in stray capacitance, all conductive mechanical parts must not be floating. Intermittent floating any conductive part around the touch sensor may cause significant stray capacitance change and abnormal touch function. It is recommended to keep all conductive parts having same electrical potential as the GND of the touch controller module.
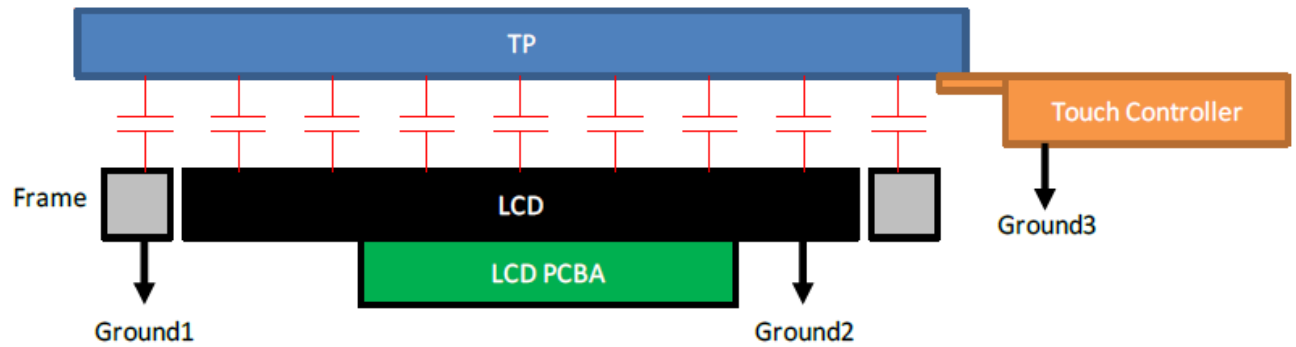
GND1, GND2 and GND3 should be connected together to have the same ground

10. Reliability Test Conditions

Test Item	Test Conditions	Note
High Temperature Operation	70±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)
Storage Humidity Test	60 °C, Humidity 90%, 240 hrs	(1),(2)
Vibration Test (Packing)	Sweep frequency : 10 ~ 50 ~ 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 inspired after 1 hour storage in normal conditions (15~35 ℃, 45~65%RH).

Note(3) The module shouldn't be tested over one condition, and all the tests are independent.

Note(4) All reliability tests should be done without the protective film.

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 initial value.

11. 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. AMPIRE does not warrant the module, if customers disassemble or modify the module.

11.3 Breakage of LCD Panel

(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.

(2) If liquid crystal contacts mouth or eyes, rinse out with water immediately.

(3) If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.

(4) Handle carefully with chips of glass that may cause injury, when the glass is broken.

11.4 Electric Shock

(1) Disconnect power supply before handling LCD module.

(2) Do not pull or fold the LED cable.

(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

(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.

(2) Please do not leave LCD module in the environment of high humidity and high temperature for a long time.

(3) It's recommended to employ protection circuit for power supply.

11.6 Operation

(1) Do not touch, push or rub the polarizer with anything harder than HB pencil lead.

(2) Use fingerstalls of soft gloves in order to keep clean display quality, when persons handle the LCD module for incoming inspection or assembly.

(3) When the surface is dusty, please wipe gently with absorbent cotton or other soft material.

(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 cause deformation or color fading.

(5) When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzene or other adequate solvent.

11.7 Mechanism

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

The square adhesive tape which is between the touch panel and display can't provide well supporting in the long term and high ambient temperature condition. Whether upright or horizontal position the support holder which is in the back side of the display is needed. Do not let the display floating.
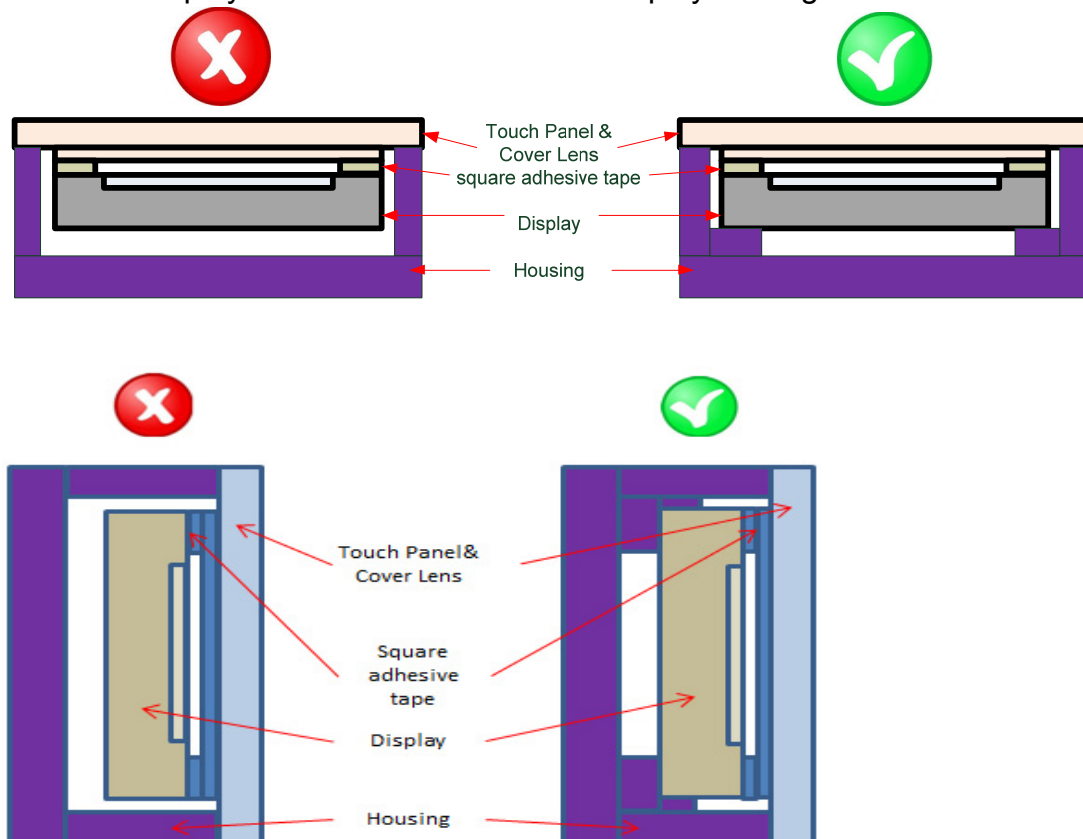
12. OUTLINE DIMENSION

Note:
1. Unless indicated, Tolerance ±0.3"
2. UV Glue For OLB Protection.
3. LCD 640x480 (R.G.B) TFT LCD=>640480V 5.7" TFT LCD

	T/P (USB)
1	VCC
2	D+
3	D+
4	GND
5	D-
6	D-
7	NC
8	NC

1	640480VF-T01	7	
2	640480GW-T06H (80W32/USB)	8	
3		9	
4		10	
5		11	
6		12	

A Block

B Block

P0.5x7
4.5±0.3

0.18
0.06
0.18

RGBRGB
RGBRGB

51.22±0.3
(2.43)
96.0±0.3 (ASF)
(3.03)
(4.43)

62.03±0.3
127.0±0.3
124.06±0.3 (T/P Sensor)
124.0±0.3 (ASF)
118.0±0.2 (V.A) Bezel
115.2 (A.A)

94.75±0.5
(82.0±0.5)
30.0±0.3
4.5

17.6±0.3 (30.0) (21.1)
(8.02)   86.4 (A.A)
(6.62)   89.2±0.2 (V.A) Bezel
(68.7±1.0)   98.43±0.3 (Bezel & T/P)

Remove tape

TOLERANCE GRADE(±)

DIM.	A	B
IE NO.		
MM		

PARTS NO. LCM
640480VW-T01

DWN. SNOW
CHK.
APPD.
DATE

DATE 10-05-21'
DATE
DATE
DATE

ASF
T=0.238

Stiffener
Stiffener
Stiffener
Contact L=3.0
Component area
(30.0x30.0x1.6TMax.)
0.3±0.05
L=4.0

9.638±0.3
7.3±0.3
7.9±0.3
5.8±0.3

TITLE 640480VW-T01
(5.7") IPS USB
DWG. NO.
*211017MA SHEET 1 OF 1

AMPIRE 晶采光電科技

REV REVISION RECORD
0 NEW RELEASE
DATE NAME
10-05-21 SNOW

CN1

No.	Signal	No.	Signal
1	U/D	21	G5
2	DMS(NC)	22	G4
3	HSYNC(NC)	23	G3
4	VLED	24	VSS
5	VLED	25	G2
6	VLED	26	G1
7	VCC	27	G0
8	VSYNC(NC)	28	VSS
9	DE	29	R5
10	VSS	30	R4
11	VSS	31	R3
12	ADJ	32	VSS
13	B5	33	R2
14	B4	34	R1
15	B3	35	R0
16	B2	36	VSS
17	B1	37	VSS
18	B0	38	DCLK
19	B0	39	VSS
20	VSS	40	L/R

T/P (USB)

No.	Signal
1	VCC
2	D+
3	D+
4	GND
5	D-
6	D-
7	NC
8	NC

Note:
1. Unless indicated, Tolerance "±0.3"
2. UV Glue For OLB Protection.
3. LCD 640x480 (R.G.B) TFT LCD=>640480V 5.7" TFT LCD

1	640480VF-T01			7	640480VW-T01
2	640480GW-T06H (80W32/USB)			8	
3				9	
4				10	
5				11	
6				12	

TOLERANCE GRADE(±)				PARTS NO. LCM-1	
DIM.	A	B	IE NO.	640480VW-T01	
MM			DWN. SNOW	CHK.	APPD.
			DATE 10-05-21'	DATE	DATE

Back view

CN1 (Bottom Contact)
089H40-000000-G2-R

98.43±0.3
(68.7±1.0)
17.6±0.3 (30.0) (21.1)
127.0±0.3
(64.11±0.3)
(53.83±0.5)

Component area
(30.0x30.0x1.6TMax.)
Contact L=3.0
0.3±0.05 L=4.0

9.638±0.3
7.3±0.3
7.9±0.3
5.8±0.3

ASF
T=0.238

REV.	REVISION RECORD	DATE	NAME
0	NEW RELEASE	10-05-21	SNOW

△△△ AMPIRE 晶采光電科技

TITLE 640480VW-T01
(5.7") IPS USB

DWG. NO. *211018MA   SHEET 1 OF 1