



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-800480RDMZQW-T81H
Approved by	
Date	

☐ Preliminary Specification

☒ Formal Specification

**AMPIRE CO., LTD.**

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Approved by	Checked by	Organized by
Patrick	Mark	Mantle

\*This specification is subject to change without notice.

## RECORD OF REVISION

Revision Date	Page	Contents	Editor
2022/03/31	--	New Release	Mantle

## 1. Introduction

It's a 7 inches Amorphous-TFT-LCD (Thin Film Transistor Liquid Crystal Display) module. This module is composed of a 7" TFT-LCD panel, LED backlight.

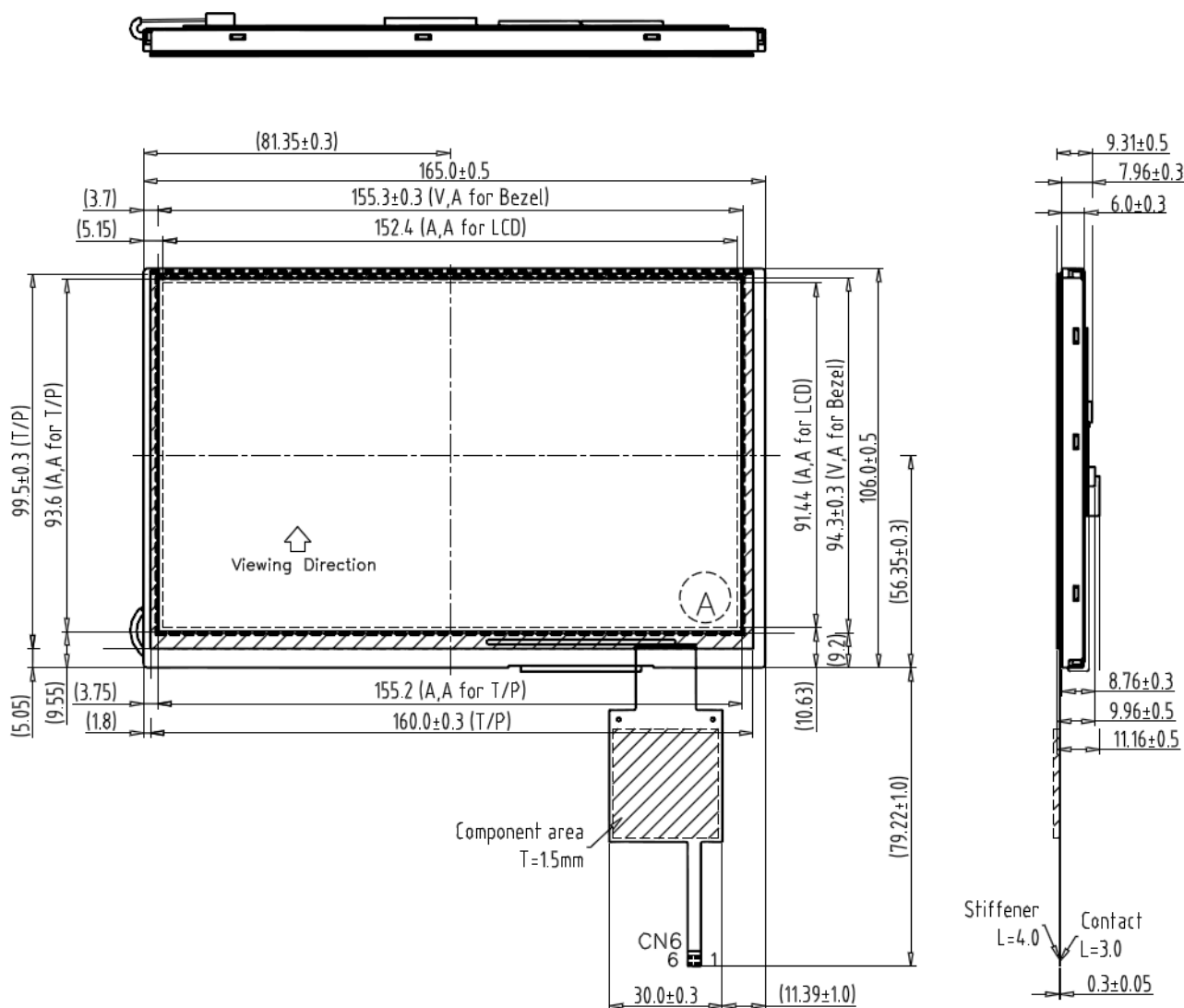
- (1) Construction: 7" a-Si TFT active matrix, White LED Backlight.
- (2) Resolution (pixel): 800(R.G.B) X480
- (3) Number of the Colors: 262,144 colors (R, G, and B 6 bit digital each)
- (4) LCD type: Transmissive, normally black
- (5) Interface: TTL

### 1.1 Features

- (1) Input interface voltage : 3.3V
- (2) Data enable mode
- (3) LED driver : 12V input
- (4) LED Back-light is with CABLE connection
- (5) Projective Capacitive Touch Panel:
  - Touch Controller : EXC80w32
  - Interface : USB

## 2. Physical Specifications

Item	Specifications	unit
LCD size	7 inch (Diagonal)	
Resolution	800 x (RGB) x 480	dot
Pixel pitch	0.1905 x 0.1905	mm
Color arrangement	RGB-stripe	
Brightness	850	cd/m2
Contrast ratio	1000 : 1	
Backlight unit	LED	



### 3. Absolute Max. Ratings

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power Voltage	VCC	-0.5	--	5	V	
Signal Input Voltage	DCLK DE R0~R5 G0~G5 B0~B5	-0.5	--	VCC+0.3	V	
Operation Temperature	TOP	-20	-	70	°C	
Storage Temperature	TST	-30	-	80	°C	

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.

## 4. Electrical Characteristics

### 4.1 DC Characteristics

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
Power supply		VCC	3.2	3.3	3.4	V	
Input Voltage for logic	H Level	VIH	0.7 VCC	--	VCC	V	
	L Level	VIL	0	--	0.3 VCC	V	
(Panel+ LSI) Consumption Power		White Mode	--	510	765	mW	Note1

Note(1) TFT power supply current. VCC=3.0V, fV =60Hz, Ta=25℃, Display pattern: All White

### 4.2 AC Characteristics

#### TTL

Horizontal Input Timing Table

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
DCLK frequency	fclk	20	33.3	42.8	MHz	
Horizontal display area	thd	800			DCLK	
1 Horizontal Line	th	908	928	1178	DCLK	
HSD pulse width	thpw	1	48	87	DCLK	thb+thpw=88 DCLK is fixed.
HSD Back Porch (Blanking)	thb	87	40	1	DCLK	
HSD Front Porch	thfp	20	40	290	DCLK	

Vertical Input Timing Table

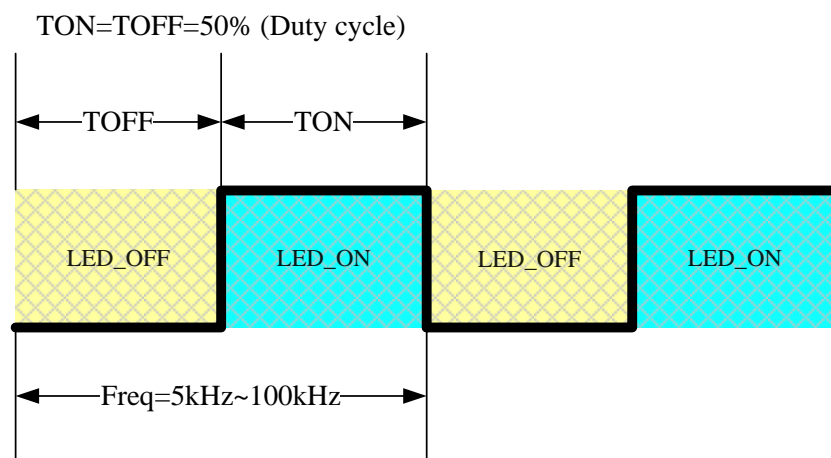
Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Vertical display area	tvd	480			H	
VSD period time	tv	517	525	606	H	
VSD pulse width	tpw	1	1	3	H	Tvpw+tvb=32 H is fixed
VSD Back Porch (Blanking)	tvb	31	31	29	H	
VSD Front Porch	tvfp	5	13	94	H	

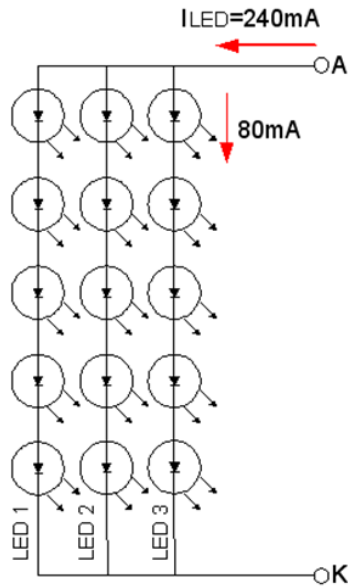
## 5. LED Driving Conditions

Item	Symbol	Min.	Typ.	Max.	Unit	Condition
Power Supply Voltage For LED	VLED	-	12	14	V	
ADJ signal frequency	fPWM	5	--	100	kHz	
ADJ signal logic level High	VIH	-	3.3	5.0	V	
ADJ signal logic level Low	VIL	-	-	0.5	V	
ADJ Duty cycle	-	10	-	100	%	
LED Backlight Voltage	VAK	--	15	--	V	For reference $I_{AK}=240\text{mA}$
LED Backlight Current	I <sub>AK</sub>	-	240	-	mA	<b>Ta=25°C</b>
LED Life Time			50K		Hr	Note(2)

Note(1) The backlight must be driven by constant current source.

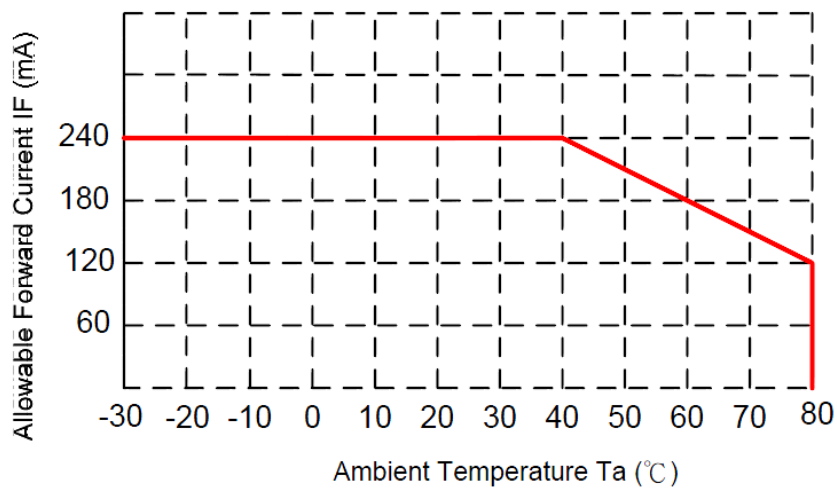
Note(2) Brightness to be decreased to 50% of the initial value.





The constant current source is needed for white LED back-light driving.

When LCM is operated over  $40^{\circ}C$  ambient temperature, the  $I_{AK}$  of the LED back-light has to be reduced.





## 6. Interface

CN2 : 089H40-000000-G2-C or Equivalent.

Pin No	Symbol	Function
1	LGND	LED Driver Ground
2	LGND	LED Driver Ground
3	ADJ	Dimming for LED Driver IC.
4	VLED	Power Supply for LED Driver IC (12V)
5	VLED	Power Supply for LED Driver IC (12V)
6	VLED	Power Supply for LED Driver IC (12V)
7	VCC	Power supply for LCD (3.3V)
8	VCC	Power supply for LCD (3.3V)
9	DE	Data Enable Timing Signal
10	GND	Ground
11	GND	Ground
12	GND	Ground
13	B5	Blue data (MSB)
14	B4	Blue data
15	B3	Blue data
16	GND	Ground
17	B2	Blue data
18	B1	Blue data
19	B0	Blue data (LSB)
20	GND	Ground
21	G5	Green data (MSB)
22	G4	Green data
23	G3	Green data
24	GND	Ground
25	G2	Green data
26	G1	Green data
27	G0	Green data (LSB)
28	GND	Ground
29	R5	Red data (MSB)
30	R4	Red data
31	R3	Red data
32	GND	Ground
33	R2	Red data
34	R1	Red data
35	R0	Red data (LSB)
36	GND	Ground
37	GND	Ground
38	DCLK	Data Clock
39	GND	Ground
40	GND	Ground

## 7. Optical Characteristics

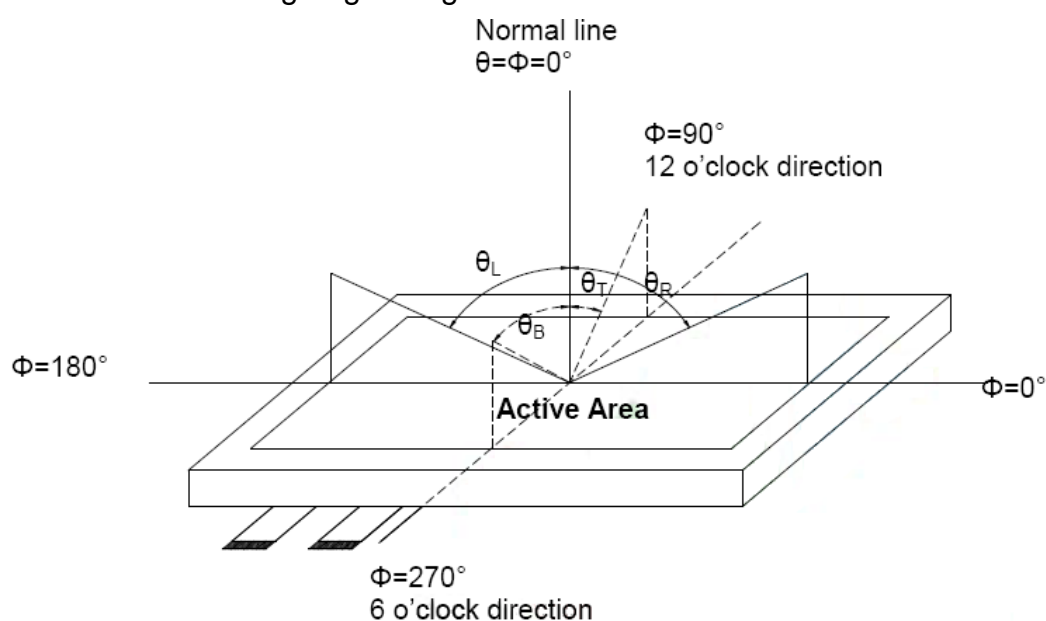
Item	Symbol	Condition	Values			Unit	Note
			Min.	Typ.	Max.		
Viewing angle (CR $\geq$ 10)	$\theta$ L	$\Phi = 180^\circ$ (9 o'clock)	80	85	--	degree	Note1
	$\theta$ R	$\Phi = 0^\circ$ (3 o'clock)	80	85	--		
	$\theta$ T	$\Phi = 90^\circ$ (12 o'clock)	80	85	--		
	$\theta$ B	$\Phi = 270^\circ$ (6 o'clock)	80	85	--		
Response time	TON	25°C	--	20	30	msec	Note3
	TOFF					msec	
Contrast ratio	CR	Normal $\theta = \Phi = 0$	800	1000	--	--	Note4
Color chromaticity	WX		Typ. -0.05	TBD	Typ. +0.05	--	Note5 Note6
	WY			TBD		--	
	RX			TBD			
	RY			TBD			
	GX			TBD			
	GY			TBD			
	BX			TBD			
	BY			TBD			
NTSC	--		65	70		%	Note5
Luminance (central point)	L		680	850	--	cd/m <sup>2</sup>	Note6
Luminance uniformity	YU		70	75	--	%	Note6

Test Conditions:

VCC = 3.3V, IAK = 240mA (Backlight current), the ambient temperature is 25°C.

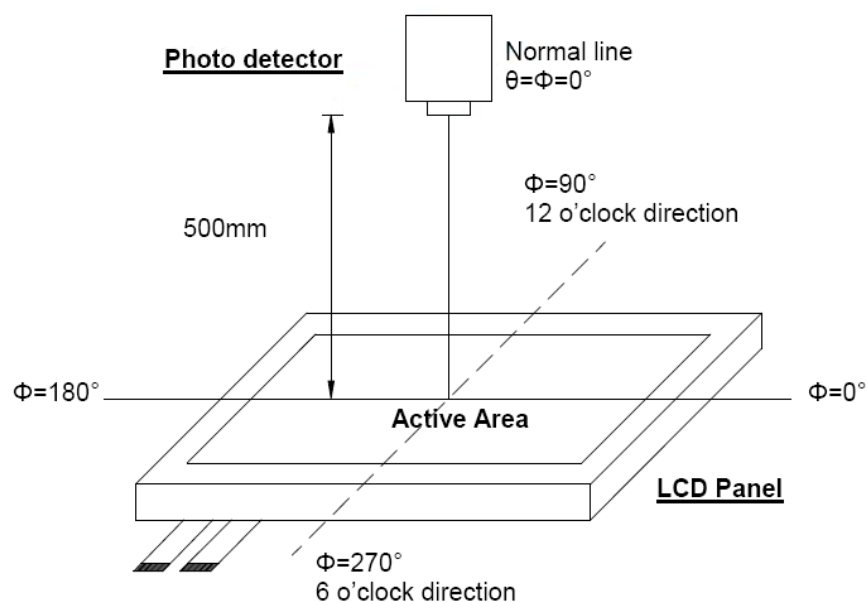
The test systems refer to Note 2.

Note(1) Definition of viewing angle range



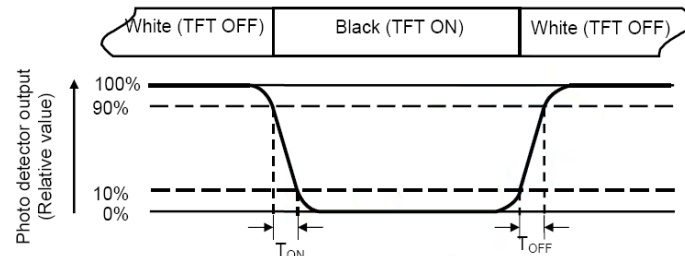
Note(2) Definition of optical measurement system

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:  $1^\circ$  / Height: 500mm.)



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 (TON) is the time between photo detector output intensity changed from 90% to 10%. And fall time (TOFF) is the time between photo detector output intensity changed from 10% to 90%.



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 coordinated measured at center point of LCD.

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

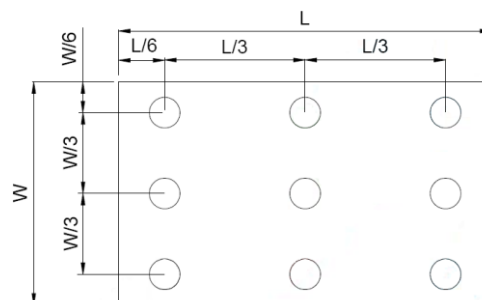
Note(6) Definition of Luminance Uniformity

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

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

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

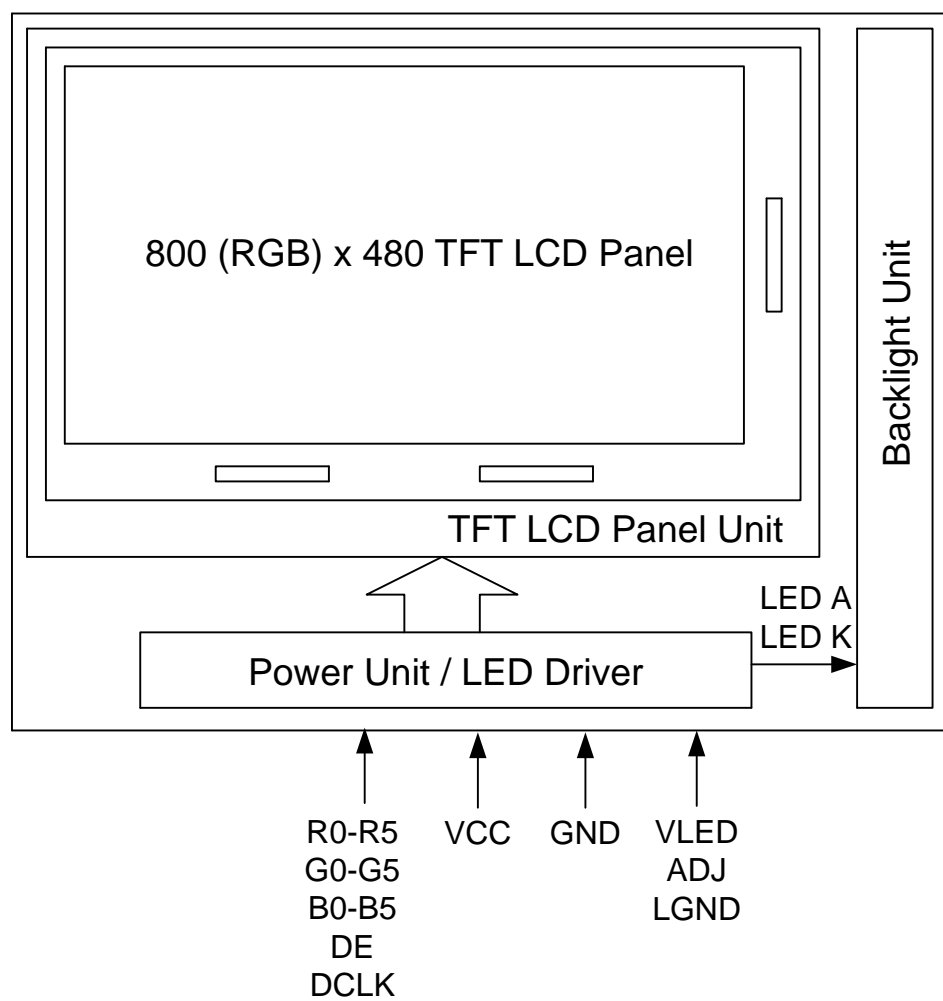
L ----- Active area length      W ----- Active area width



Bmax : The measured maximum luminance of all measurement position.

Bmin : The measured minimum luminance of all measurement position.

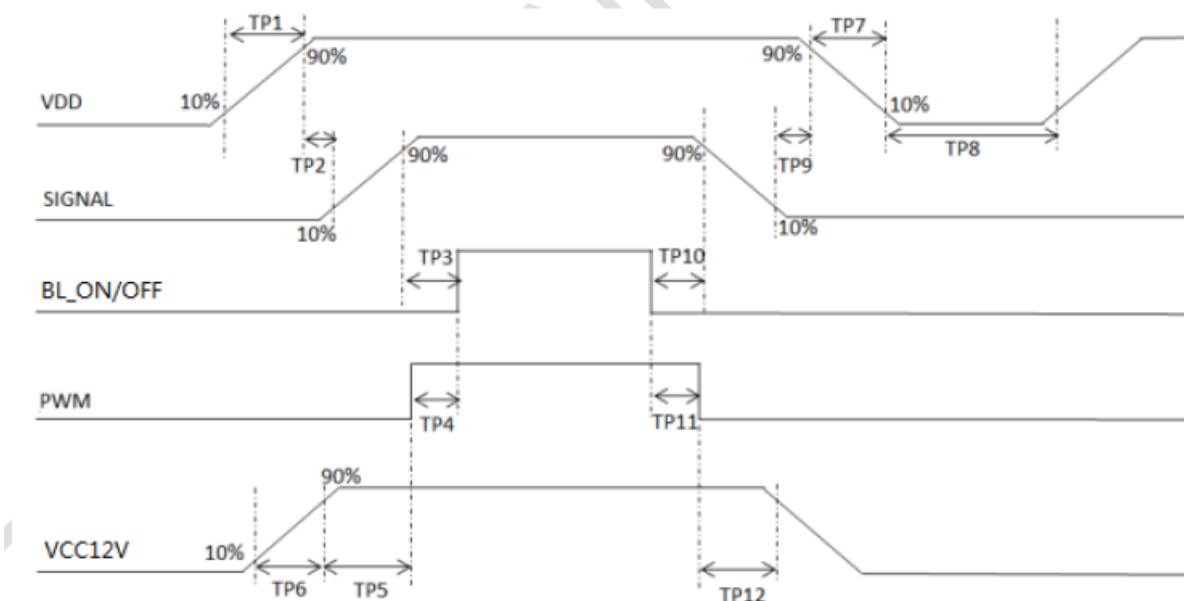
## 8. Block Diagram



## 9. Power ON/OFF sequence

Item	Symbol	MIN	Typ	MAX	Unit	Remark
VDD on to VDD stable	Tp1	0.5	-	10	ms	
VDD stable to signal on	Tp2	0	-	50	ms	
Signal stable to BL_ON/OFF on	Tp3	200	-	-	ms	
PWM on to BL_ON/OFF on	Tp4	0	-	200	ms	
VCC12V to PWM on	Tp5	10	-	-	ms	
VCC12V on to VCC12V stable	Tp6	0.5	-	10	ms	
VDD off time	Tp7	0.5	-	10	ms	
VDD off to next VDD on	Tp8	500	-	-	ms	
Signal off before VDD off	Tp9	0	-	500	ms	
BL_ON/OFF off before signal off	Tp10	200	-	-	ms	
BL_ON/OFF off before PWM off	Tp11	0	-	200	ms	
PWM off before VCC12V off	Tp12	10	-	-	ms	

Table 5.2 Power on/off sequence



## 10. Touch Panel ELECTRICAL SPECIFICATION

### 10.1 Basic Characteristic

ITEM	SPECIFICATION
Type	Projective Capacitive Touch Panel
Activation	2-fingers or Signal-finger
X/Y Position Reporting	Absolute Position
Touch Force	No contact pressure required
Calibration	No need for calibration
Report Rate	Approx 80 points/sec
Control IC	<a href="#">EETI EXC80W32</a>

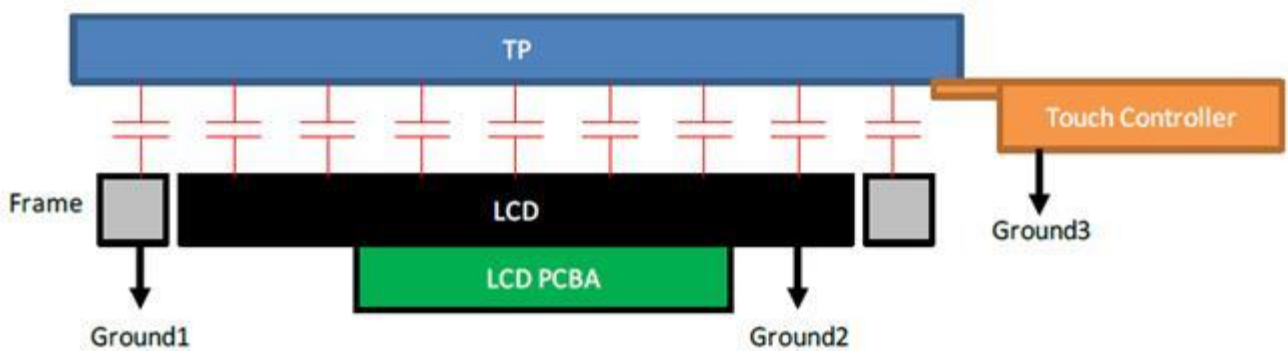
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Power Supply Voltage	VIN	--	5.0	--	V	
Power Consumption	I <sub>VIN</sub>		50		mA	

### 10.2 Interface

Pin	Name	Description
1	DGND	Power GND
2	DA-	USB Data-
3	DA+	USB Data+
4	VIN	Power supply 5.0V
5	NA	No connection
6	NA	No connection

### 10.3 Notice

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



## 11. Reliability Test Conditions

Test Item	Test Conditions	Note
High Temperature Operation	70±3°C ,Dry t=240 hrs	
Low Temperature Operation	-20±3°C, Dry t=240 hrs	
High Temperature Storage	80±3°C , Dry t=240 hrs	1,2
Low Temperature Storage	-30±3°C ,Dry t=240 hrs	1,2
Humidity Test	60 °C, Humidity 90%, 240 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 inspired after 1 hour storage in normal conditions (15~35°C , 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.

## **12. Use Precautions**

### **12.1 Handling precautions**

- (1) The polarizing plate may break easily so be careful when handling it. Do not touch, press or rub it with a hard-material tool like tweezers.
- (2) Do not touch the polarizing plate surface with bare hands so as not to make it dirty. If the surface or other related part of the polarizing plate is dirty, soak a soft cotton cloth or chamois leather in benzine and wipe off with it. Do not use chemical liquids such as acetone, toluene and isopropyl alcohol. Failure to do so may bring chemical reaction phenomena and deteriorations.
- (3) Remove any spit or water immediately. If it is left for hours, the suffered part may deform or decolorize.
- (4) If the LCD element breaks and any LC stuff leaks, do not suck or lick it. Also if LC stuff is stuck on your skin or clothing, wash thoroughly with soap and water immediately.

### **12.2 Installing precautions**

- (1) The PCB has many ICs that may be damaged easily by static electricity. To prevent breaking by static electricity from the human body and clothing, earth the human body properly using the high resistance and discharge static electricity during the operation. In this case, however, the resistance value should be approx.  $1\text{M}\Omega$  and the resistance should be placed near the human body rather than the ground surface. When the indoor space is dry, static electricity may occur easily so be careful. We recommend the indoor space should be kept with humidity of 60% or more. When a soldering iron or other similar tool is used for assembly, be sure to earth it.
- (2) When installing the module and ICs, do not bend or twist them. Failure to do so may crack LC element and cause circuit failure.
- (3) To protect LC element, especially polarizing plate, use a transparent protective plate (e.g., acrylic plate, glass etc) for the product case.
- (4) Do not use an adhesive like a both-side adhesive tape to make LCD surface (polarizing plate) and product case stick together. Failure to do so may cause the polarizing plate to peel off

### **12.3 Storage precautions**

- (1) Avoid a high temperature and humidity area. Keep the temperature between  $0^{\circ}\text{C}$  and  $35^{\circ}\text{C}$  and also the humidity under 60%.
- (2) Choose the dark spaces where the product is not exposed to direct sunlight or fluorescent light.
- (3) Store the products as they are put in the boxes provided from us or in the same conditions as we recommend.

## 12.4 Operating precautions

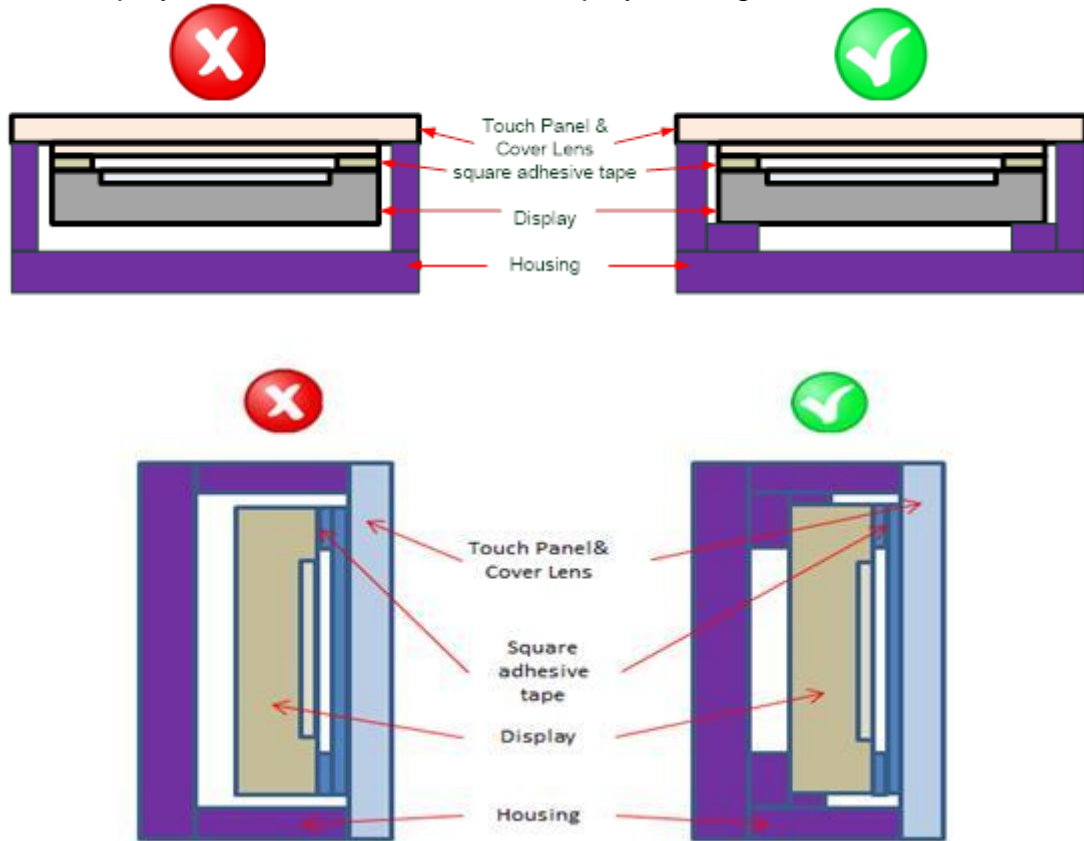
- (1) Do not boost the applied drive voltage abnormally. Failure to do so may break ICs. When applying power voltage, check the electrical features beforehand and be careful. Always turn off the power to the LC module controller before removing or inserting the LC module input connector. If the input connector is removed or inserted while the power is turned on, the LC module internal circuit may break.
- (2) The display response may be late if the operating temperature is under the normal standard, and the display may be out of order if it is above the normal standard. But this is not a failure; this will be restored if it is within the normal standard.
- (3) The LCD contrast varies depending on the visual angle, ambient temperature, power voltage etc. Obtain the optimum contrast by adjusting the LC drive voltage.
- (4) When carrying out the test, do not take the module out of the low-temperature space suddenly. Failure to do so will cause the module condensing, leading to malfunctions.
- (5) Make certain that each signal noise level is within the standard (L level: 0.2VCC or less and H level: 0.8VCC or more) even if the module has functioned properly. If it is beyond the standard, the module may often malfunction. In addition, always connect the module when making noise level measurements.
- (6) The CMOS ICs are incorporated in the module and the pull-up and pull-down function is not adopted for the input so avoid putting the input signal open while the power is ON.
- (7) The characteristic of the semiconductor element changes when it is exposed to light emissions, therefore ICs on the LCD may malfunction if they receive light emissions. To prevent these malfunctions, design and assemble ICs so that they are shielded from light emissions.
- (8) Crosstalk occurs because of characteristics of the LCD. In general, crosstalk occurs when the regularized display is maintained. Also, crosstalk is affected by the LC drive voltage. Design the contents of the display, considering crosstalk.

## 12.5 Other

- (1) Do not disassemble or take the LC module into pieces. The LC modules once disassembled or taken into pieces are not the guarantee articles.
- (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.
- (3) AMIPRE will provide one year warranty for all products and three months warranty for all repairing products.

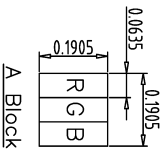
## 12.6 Mechanism

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.





REV	REVISION RECORD	DATE NAME
0	NEW RELEASE	05-18-21 EMILY



A Block

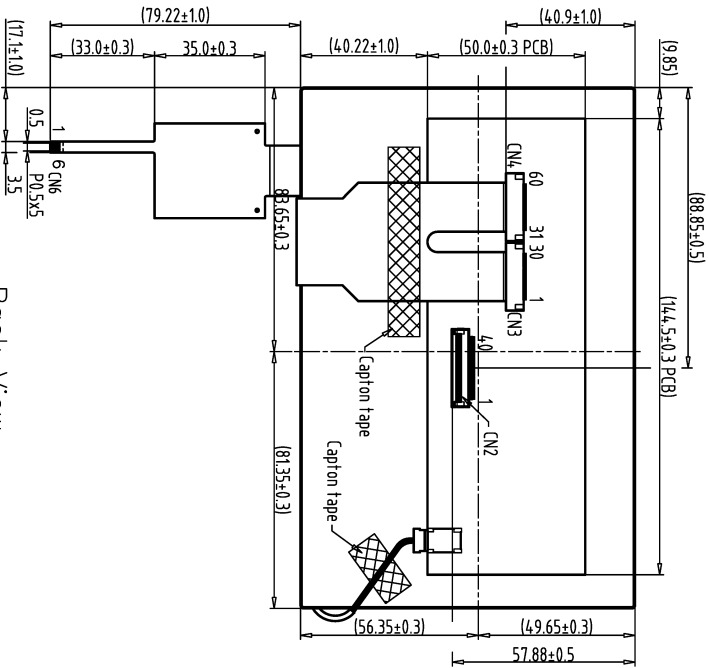
CN2					
1	LGND	21	G5		
2	LGND	22	G4		
3	ADJ	23	G3		
4	VLED	24	GND		
5	VLED	25	G2		
6	VLED	26	G1		
7	VCC	27	G0		
8	VCC	28	GND		
9	DE	29	R5		
10	GND	30	R4		
11	GND	31	R3		
12	GND	32	GND		
13	B5	33	R2		
14	B4	34	R1		
15	B3	35	R0		
16	GND	36	GND		
17	B2	37	GND		
18	B1	38	DCLK		
19	B0	39	GND		
20	GND	40	GND		

CN6		
1	DGND	
2	DA-	
3	DA+	
4	VIN	
5	NA	
6	NA	

Note:

1. Unless indicated, Tolerance " $\pm 0.3$ "
2. UV Glue For OLB Protection.
3. CN2:089H40-000000-G2-C or Equivalent
4. CN3&CN4:CSF-2782-301R P0.5 30Pin or Equivalent
5. LCD 800X3(R.G.B)x480=> 7.0" Digital TFT LCD

Back View



1	800480RC-01 LCM	7		TOLERANCE GRADE(±)	A	B	DIM.	MM	DWN.	EMILY	DATE	TITLE
2	1024600K8-I CTP	8									05-18-21	800480RD-T81
3	800480RR-TAD (USB interface)	9					IE NO.		CHK.		DATE	(7.0")
4	(for 80W32 IC)	10									DATE	DWG. NO.
5	CTP:P0.5 6PIN/089H06-000000-G2-R	11					PARTS NO LCM-1		APPD.		DATE	*2105109MA
6		12					800480RD-T81					SHEET 1 OF 1


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#### **14. Package**

**T.B.D.**