

# SPECIFICATIONS FOR LCD MODULE

<b>CUSTOMER</b>	
<b>CUSTOMER PART NO.</b>	
<b>AMPIRE PART NO.</b>	<b>AM-1280800P4TZQW-THDH</b>
<b>APPROVED BY</b>	
<b>DATE</b>	

☐ Preliminary Specification

☒ Formal Specification

<b>APPROVED BY</b>	<b>CHECKED BY</b>	<b>ORGANIZED BY</b>
<i>Kokai</i>	<i>Jessica</i>	<i>Simon</i>

This specification is subject to change without notice

## RECORD OF REVISION

Revision Date	Page	Contents	Editor
2020/12/23	-	New Release	Simon

## 1. Features

The TFT LCD module Kit include

1. 7" TFT Liquid Crystal Display module with Capacitive touch panel.
  - LCD Resolution : 1280 x RGB x 800
  - Number of Color : 16M colors ( R,G,B 8 Bit digital each)
  - Built-in LED Back-light driver.
  - Brightness :850 cd/m<sup>2</sup>
2. Projective Capacitive Touch
  - Interface : USB
  - Touch Controller: **EXC80W32**
3. HDMI to LCD interface board
  - Single Power input: 12V / 2A power input. (Connector: PJ2).
  - HDMI Digital input : (Connector: HDMI1)
    - ◆ HDMI 1.4a Compliant
    - ◆ Single-link (Type A HDMI) on-chip TMDS receiver up to 225MHz. Support long cable.
    - ◆ Do not support HDCP.
  - Support input video format :

Resolution	V Sync	Resolution	V Sync
640x480	60	1280x800	60
640x480	72	1280x800	75
640x480	75	1280x960	60
800x600	56	1280x1024	60
800x600	60	1280x1024	75
800x600	72	1360x768	60
800x600	75	1366x768	60
848x480	60	1400x1050	60
1024x768	60	1400x1050	75
1024x768	70	1440x900	60
1024x768	75	1440x900	75
1152x864	75	1600x900	60
1280x720	60	1680x1050	60
1280x768	60	1680x1050	75
1280x768	75	1920x1080	60

## 2. TFT LCD Module PHYSICAL SPECIFICATIONS

Item	Specifications	unit
LCD size	7 inch (Diagonal)	
Resolution	1280 x (RGB) x 800	dot
Dot pitch	0.117(H) x 0.117(V)	mm
Active area	149.76(W) x 93.6(H)	mm
Color arrangement	RGB-stripe	

## 3. ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	VALUES		UNIT	REMARK
		MIN	MAX		
Power Voltage	V <sub>IN</sub>	-0.3	13	V	GND=0V, TA=25°C
Operation Temperature	T <sub>op</sub>	-20	70	°C	
Storage Temperature	T <sub>st</sub>	-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 SPECIFICATIONS

### 4.1 Typical Operation Conditions (HDMI Interface Board)

Item	Symbol	Min	Typ	Max	Unit	Note
HDMI Interface Board Power Supply voltage	$V_{IN}$	11.5	12.0	12.5	V	
Power Consumption	$I_{VIN}$	-	T.B.D	-	A	

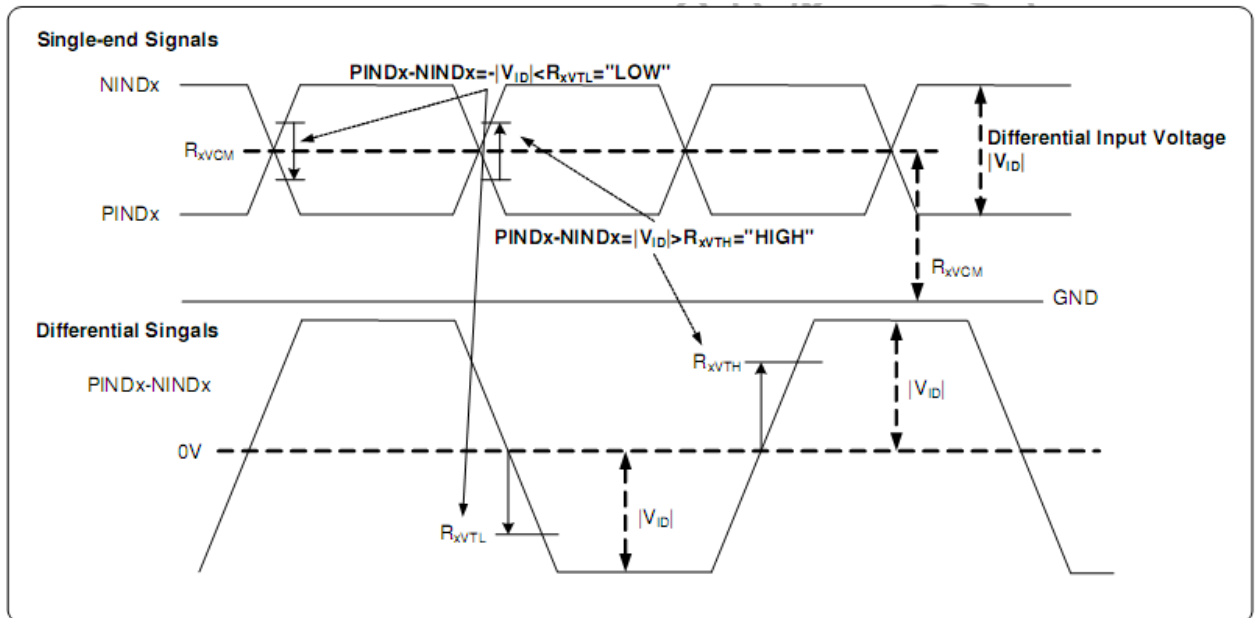
### 4.2 Typical Operation Conditions (TFT LCD Module)

**For Design reference only. These supply voltage and signals do not need to input by end user.**

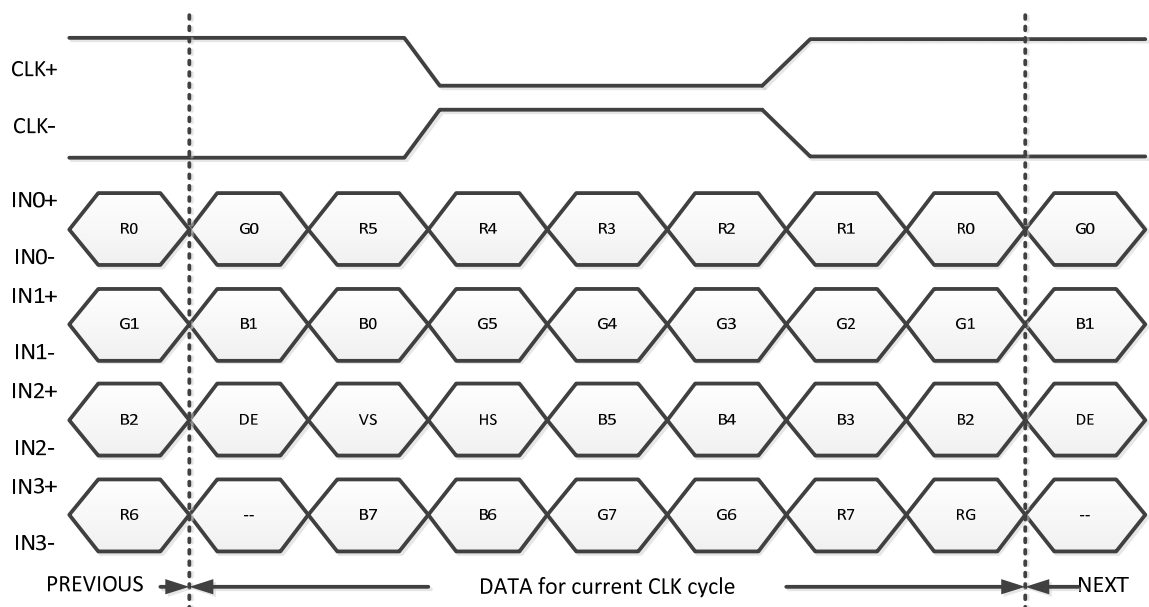
#### DC Electrical Characteristics

VDD=3.3V, AVDD=11V, AGND=GND=0V, Ta=25°C

Parameter	Symbol	Min	Typ	Max	Unit	Remark
Differential input high Threshold voltage	$R_{XVTH}$	—	—	+0.1	V	
Differential input Low Threshold voltage	$R_{XVTL}$	-0.1	—	—	V	
Input voltage range	$R_{XVIN}$	0	—	VDD-1.0	V	
Differential input common Mode voltage	$R_{XVCM}$	$ V_{ID} /2$	—	$2.4- V_{ID} /2$	V	
Differential input voltage	$ V_{ID} $	0.2	—	0.6	V	
LVDS Digital Operating Current	$R_{VXliz}$	-10	—	+10	uA	
LVDS Digital Operating Current	$I_{ddlvs}$	—	(40)	(50)	mA	Fclk=65MHz,VDD=3.3V
LVDS Digital Stand-by Current	$I_{stlvs}$	—	(10)	(50)	uA	Clock & all functions are stopped



#### 4.2.1 24-BIT LVDS Input Data Format



Note: R/G/B data 7: MSB, R/G/B data 0: LSB

Signal Name	Description	Remark
R7 R6 R5 R4 R3 R2 R1 R0	Red Data 7 (MSB) Red Data 6 Red Data 5 Red Data 4 Red Data 3 Red Data 2 Red Data 1 Red Data 0 (LSB)	Red-pixel Data Each red pixel's brightness data consists of these 8 bits pixel data.
G7 G6 G5 G4 G3 G2 G1 G0	Green Date 7 (MSB) Green Date 6 Green Date 5 Green Date 4 Green Date 3 Green Date 2 Green Date 1 Green Date 0 (LSB)	Green-pixel Data Each green pixel's brightness data consists of these 8 bits pixel data.
B7 B6 B5 B4 B3 B2 B1 B0	Blue Data 7 (MSB) Blue Data 6 Blue Data 5 Blue Data 4 Blue Data 3 Blue Data 2 Blue Data 1 Blue Data 0 (LSB)	Blue-pixel Data Each blue pixel's brightness data consists of these 8 bits pixel data.
CLK+ CLK-	LVDS Clock Input	
DE	Display Enable	
VS	Vertical Sync Signal	
HS	Horizontal Sync Signal	

## 4.2.2 Timing Table

LCD Interface Timing (DE mode)  
1280x800 (RES[3:0] = 0010)

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
CLK frequency	$t_{CLK}$	62.6	68.2	78.1	Mhz	
Horizontal blanking time	$t_{HBT}$	20	69	164	$t_{CLK}$	$t_{HBP} + t_{HFP}$
Horizontal back porch	$t_{HBP}$	5	5	164- $t_{HFP}$	$t_{CLK}$	
Horizontal display area	$t_{HD}$	1280	1280	1280	$t_{CLK}$	
Horizontal front porch	$t_{HFP}$	15	64	159	$t_{CLK}$	
Horizontal period	$t_H$	1300	1349	1444	$t_{CLK}$	
Horizontal pulse width	$t_{HPW}$	1	1	256	$t_{CLK}$	
Vertical blanking time	$t_{VBT}$	5	42	101	$t_H$	$t_{VBP} + t_{VFP}$
Vertical back porch	$t_{VBP}$	2	2	101- $t_{VFP}$	$t_H$	
Vertical display area	$t_{VD}$	800	800	800	$t_H$	
Vertical front porch	$t_{VFP}$	3	40	99	$t_H$	
Vertical period	$t_V$	803	842	901	$t_H$	
Vertical pulse width	$t_{VPW}$	1	1	128	$t_H$	

### 4-3 LED Driving Conditions

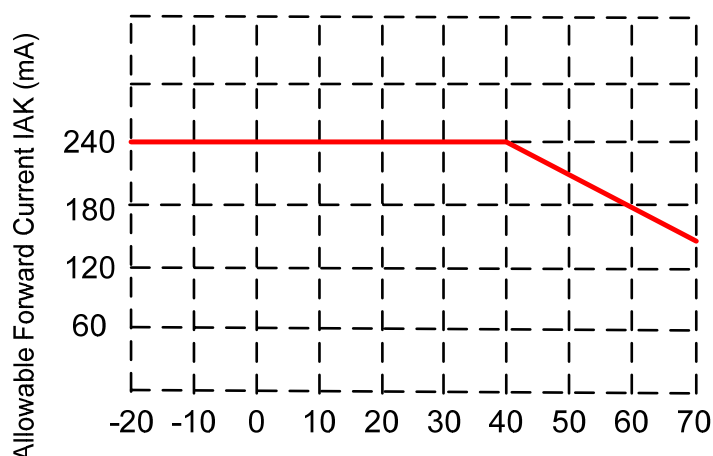
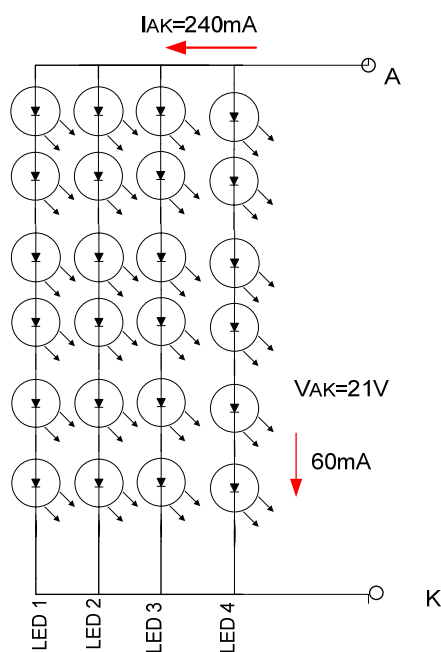
For Design reference only. These supply voltage and signals do not need to input by end user.

Item	Symbol	Values			Unit	Note
		Min.	Typ.	Max.		
LED Driver Power Voltage	$V_{LED}$	9	12	14	V	
LED Driver Current Consumption	$I_{LED}$	--	520	--	mA	$V_{LED}=12V$ $ADJ=5V$ (duty 100%)
ADJ Input Voltage	$V_{ADJ}$	1.2	3.3	3.6	V	duty=100% Note(3)
LED voltage	$V_{AK}$	--	21	--	V	Note(1)
LED forward Current	$I_{AK}$	--	240	--	mA	$T_a=25^{\circ}C$
LED life time	--	--	50,000	--	Hr	Note(2)

Note (1) The constant current source is needed for white LED back-light driving.

Note (2) Brightness to be decreased to 50% of the initial value.  $T_a=25^{\circ}C$

Note (3)  $V_{LEDADJ}$  is PWM signal input. It is for brightness control.





## 4-4 Projective Capacitive Touch Panel :

### 4.4.1 Basic Characteristic

ITEM	SPECIFICATION
Type	Projective Capacitive Touch Panel
Activation	Max 10-fingers or Single-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	EXC80W32
Interface	USB
Resolution	16384x16384

### 4.4.2 Electrical Absolute Max Rating

Item	Symbol	Values		UNIT	Note
		Min.	Max.		
Power Supply voltage	VDD	-0.3	5.5	V	GND =0V

### 4.4.3 ELECTRICAL CHARACTERISTICS

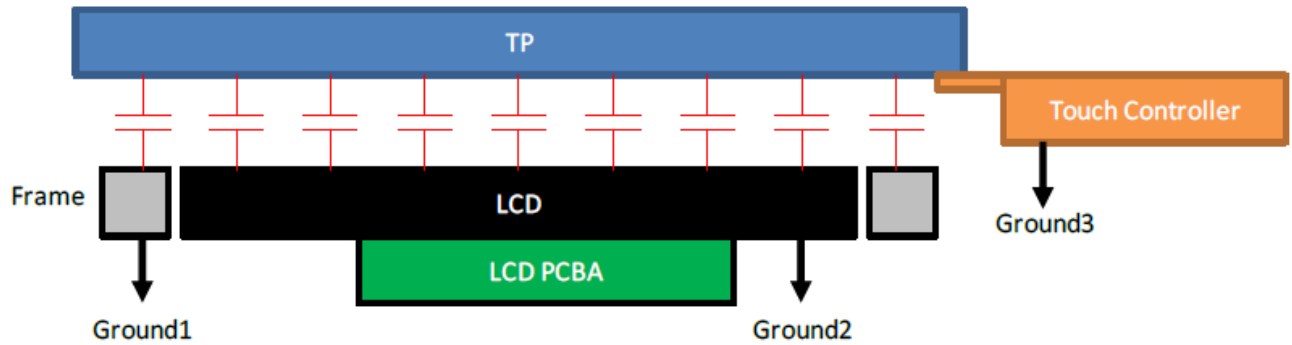
Specify the normal operating condition  
(GND=0V)

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

### 4.4.4 Interface

Pin	Name	Description
1	GND	Power GND
2	D-	USB Data-
3	D+	USB Data+
4	VDD	Power supply 5.0V
5	NC	No connection
6	NC	No connection

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.



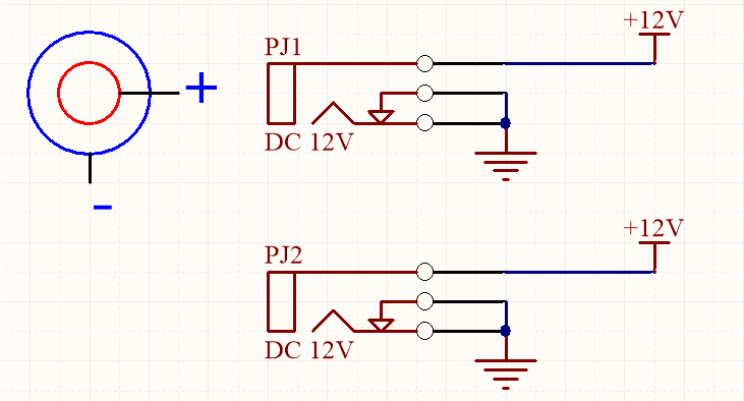
GND1, GND2 and GND3 should be connected together to have the same ground

## 5. INTERFACE

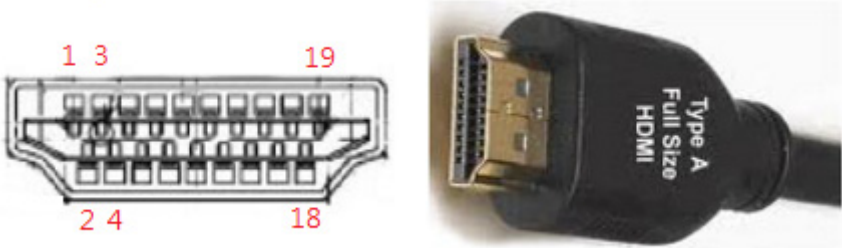
### 5.1 INTERFACE (HDMI Interface Board)

- **PJ2 Power Supply Power Jack:**

Inner terminal is positive. Outer terminal is GND



- **HDMI1: HDMI Type A Connector**

HDMI			
			
PIN	SIGNAL	PIN	SIGNAL
1	TMDS Data2+	11	TMDS Clock Shield (Ground)
2	TMDS Data2 Shield (Ground)	12	TMDS Clock-
3	TMDS Data2-	13	CEC (not used)
4	TMDS Data1+	14	Reserved (No Connection)
5	TMDS Data1 Shield (Ground)	15	SCL
6	TMDS Data1-	16	SDA
7	TMDS Data0+	17	DDC/CED (Ground)
8	TMDS Data0 Shield (Ground)	18	+5V input
9	TMDS Data0-	19	Hot Plug Detect
10	TMDS Clock+		

## 6. Optical Specifications

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles	$\theta T$	$CR \geq 10$	80	88	-	Degree	Note 2
	$\theta B$		80	88	-		
	$\theta L$		80	88	-		
	$\theta R$		80	88	-		
Contrast Ratio	CR	$\theta = 0^\circ$	600	800	-		Left/right $0^\circ$ Top/bottom $5^\circ$
Response Time	$T_{ON}$	$25^\circ C$	-	35	40	ms	Note1 Note4
	$T_{OFF}$						
Chromaticity	White	x	0.256	0.306	0.356		Note5 Note1
		y	0.279	0.329	0.379		
	Red	x	0.520	0.570	0.620		
		y	0.280	0.330	0.380		
	Green	x	0.300	0.350	0.400		
		y	0.542	0.592	0.642		
	Blue	x	0.105	0.155	0.205		
		y	0.051	0.101	0.151		
Uniformity	U		70	75	-	%	Note1、Note6
NTSC			45	50	-	%	
Luminance	L		680	850	-	cd/m <sup>2</sup>	Note7

Test Conditions:

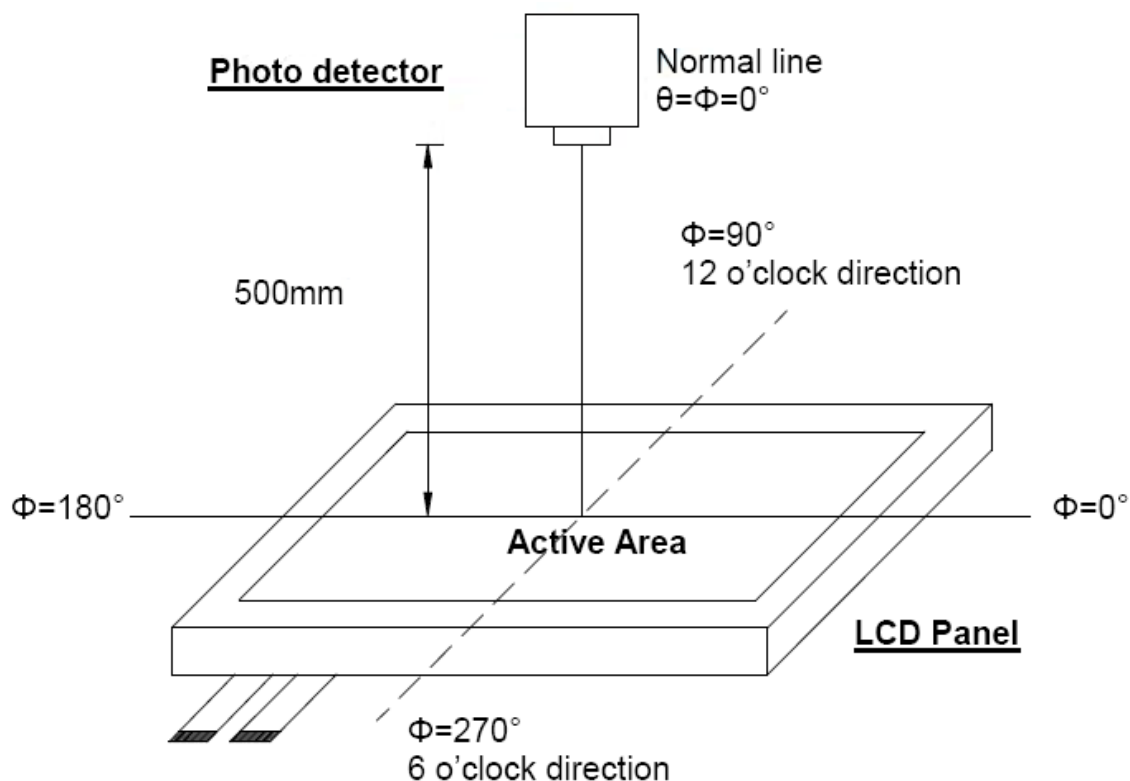
1.  $I_F = 60mA$ (one channel), the ambient temperature is  $25^\circ C$ .
2. The test systems refer to Note 1 and Note2.

Definition of optical measurement system.

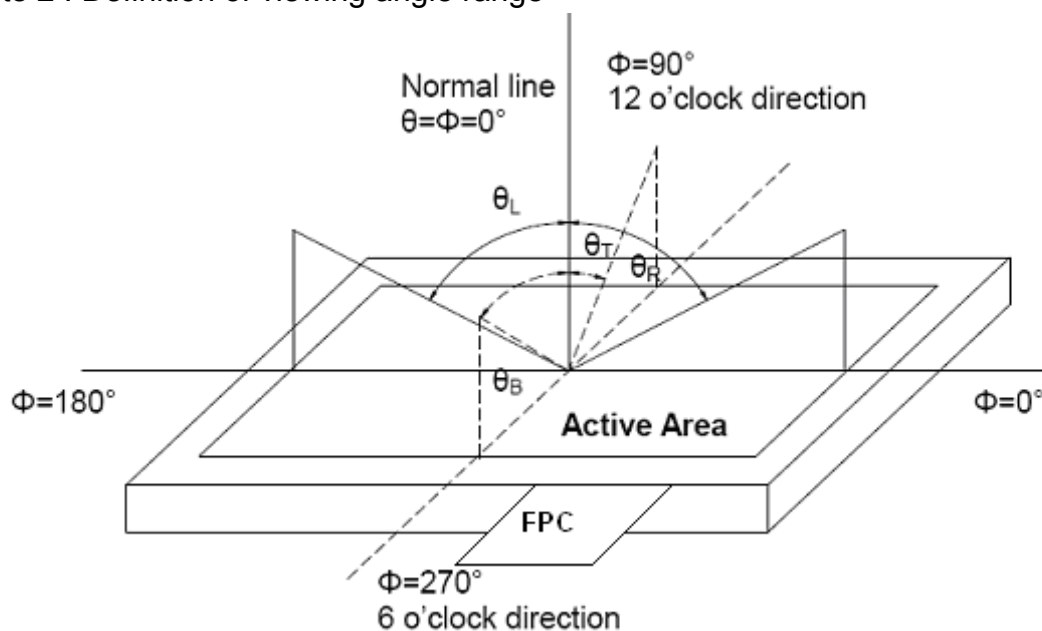
The optical characteristics should be measured in dark room. After 10 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.

Note 1 : 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.)

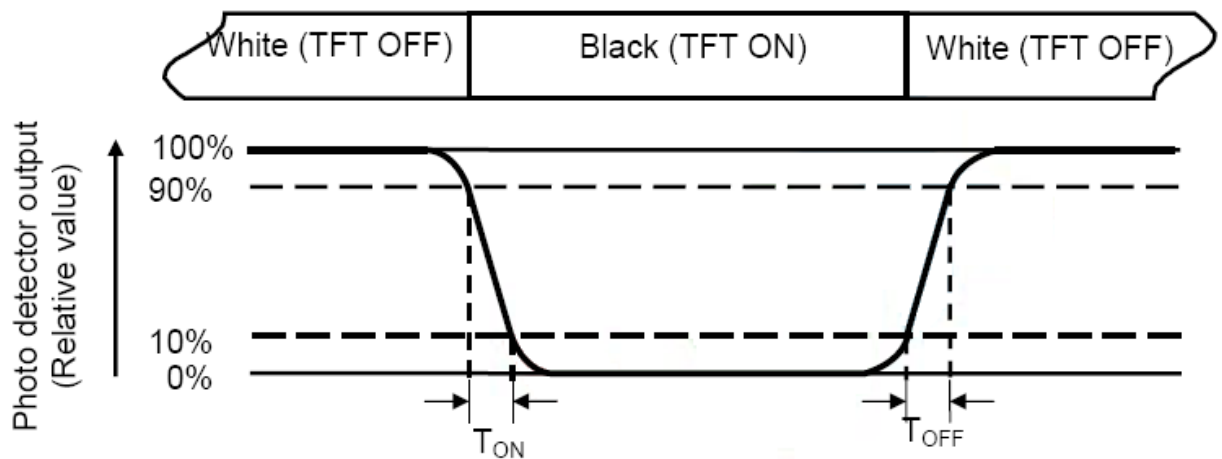


Note 2 : Definition of viewing angle range



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

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

Note 5 : Definition of color chromaticity (CIE1931)

Color coordinated measured at center point of LCD.

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.

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

## 8. ELIABILITY 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
Thermal Shock Test	-20°C ~ 25°C ~ 70°C 30 m in. 5 min. 30 min. ( 1 cycle ) Total 100 cycle(Dry)	1,2
Storage 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.

## **9. GENERAL PRECAUTION**

### **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**

- (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.

### **9.4 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.

### **9.5 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.



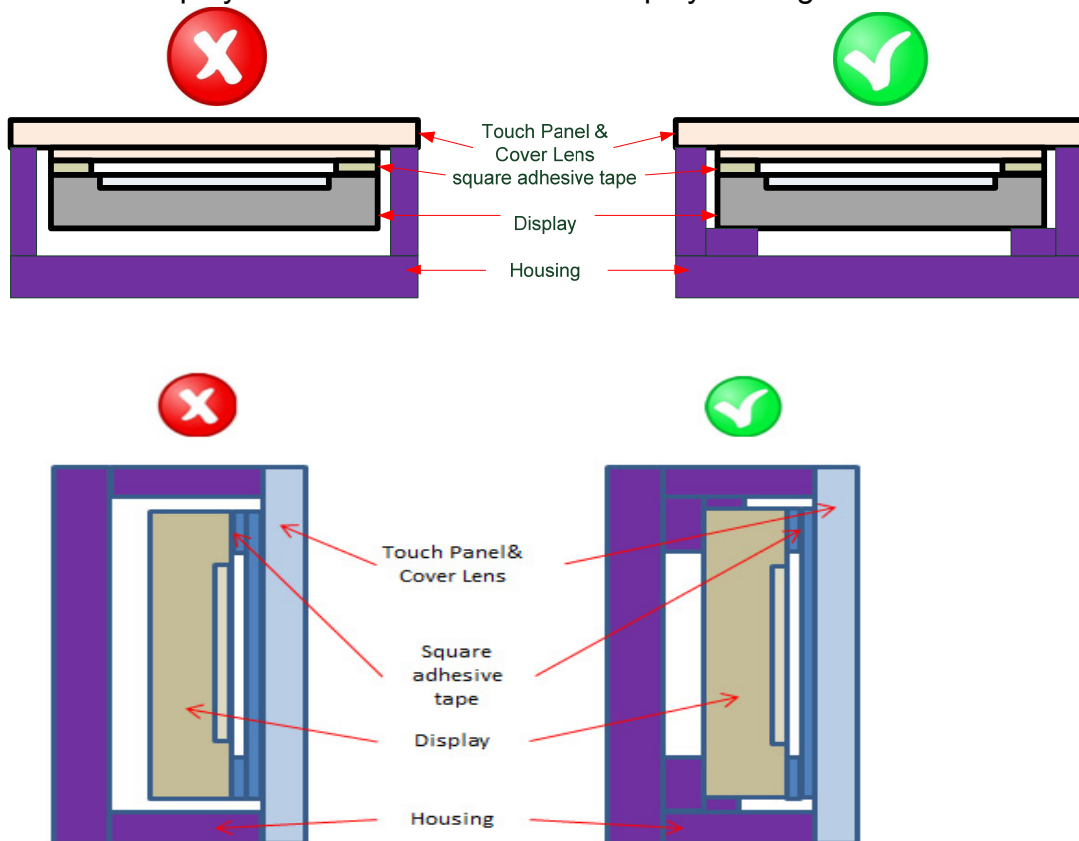
## 9.6 Operation

- (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.

## 9.7 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.



### **9.8 Static Electricity**

- (1) Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.
- (2) Because LCD modules 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**

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.

## Date : 2020/12/23



1	GND
2	D-
3	D+
4	VDD
5	NC
6	NC

1. Unless indicated, Tolerance “ $\pm 0.3$ ”

1. Unless indicated, Tolerance "±0.3"
2. UV Glue For OLB Protection.
3. HDMI A TYPE:P0.5 19Pin/HDFFP1-1N51 or Equivalent
4. CN1:P0.5 40Pin/089H40-000000-G2-R or Equivalent.
5. DC Jack:DC-0005-20-20Z2S-γ or Equivalent.
6. T/P Controller board: ENTERY 3808K-F06N-03L or Equivalent
7. LCD 1280X3(R.G.B)X800=> 7.0" Digital TFT LCD

**AMPIRE** 晶采光電科技

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