



晶采光電科技股份有限公司
AMPIRE CO., LTD.

/SIMPLEPLUS
Touch Displays

SPECIFICATIONS FOR LCD MODULE

CUSTOMER	
CUSTOMER PART NO.	
AMPIRE PART NO.	AMA-070A04-DU2511-G010
APPROVED BY	
DATE	

☐ Approved For Specifications

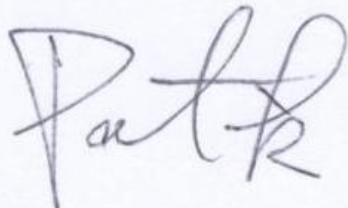
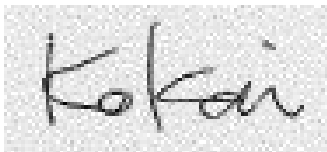
☐ Approved For Specifications & Sample

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RECORD OF REVISION

Revision Date	Page	Contents	Editor
2018/2/8	--	New Release	Emil

1.0 General Descriptions

7 inch Amorphous-TFT-LCD (Thin Film Transistor Liquid Crystal Display) module.

This module is composed of a 7" TFT-LCD panel and backlight unit.

1.1 Features

- 7 inch (16:9 diagonal) configuration
- 262K colors (R , G , B, 6bit digital each)
- RoHS

1.2 Product Summary

Item	Specification	Remark
LCD Size	7.0 inch (Diagonal)	
Resolution	800 x 3 (RGB) x 480	
Display Mode	Normally Black.	
Pixel pitch	0.1905 (W) x 0.1905(H) mm	
Active area	152.4(W) x 91.44(H) mm	
interface	LVDS	
Color arrangement	RGB-stripe	
Luminance	425 cd/m ²	cd/m ²
Viewing Direction	All direction	

2.0 Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit	Remakes
Supply Voltage	V_{DD}	-0.3	3.6	V	-
Input Voltage of Logic	V_I	-0.3	$V_{DD}+0.3$	V	Note 1
Operating Temperature	T_{OP}	-30	85	°C	Note 2
Storage Temperature	T_{ST}	-30	85	°C	Note 2

Note 1: The rating is defined for the signal voltages of the interface such as CLK and pixel data pairs.

Note2: The maximum rating is defined as above based on the chamber temperature, which might be different from ambient temperature after assembling the panel into the application. Moreover, some temperature-related phenomenon as below needed to be noticed:

- Background color, contrast and response time would be different in temperatures other than 25°C.
- Operating under high temperature will shorten LED lifetime.

3.0 ELECTRICAL CHARACTERISTICS

3.1 LCD CHARACTERISTICS

Item	Symbol	Min.	Typ.	Max.	Unit	Note
LCD Supply Voltage	VDD	3.0	3.3	3.6	V	-
Logic Input Voltage	VIH	0.7VDD	-	VDD		
	VIL	GND	-	0.3VDD	V	
LCD Supply Current	ICC	-	T.B.D	-	mA	(1)
Power Supply Voltage For LED Driver	VLED	11.7	12	12.3	V	(1)
Power Supply Current For LED Driver	ILED	--	T.B.D	--	mA	VLED =12V
Differential Input High Threshold	VTH	-	-	+100	mV	VOC=+1.2V
Differential Input Low Threshold	VTL	-100	-	-	mV	

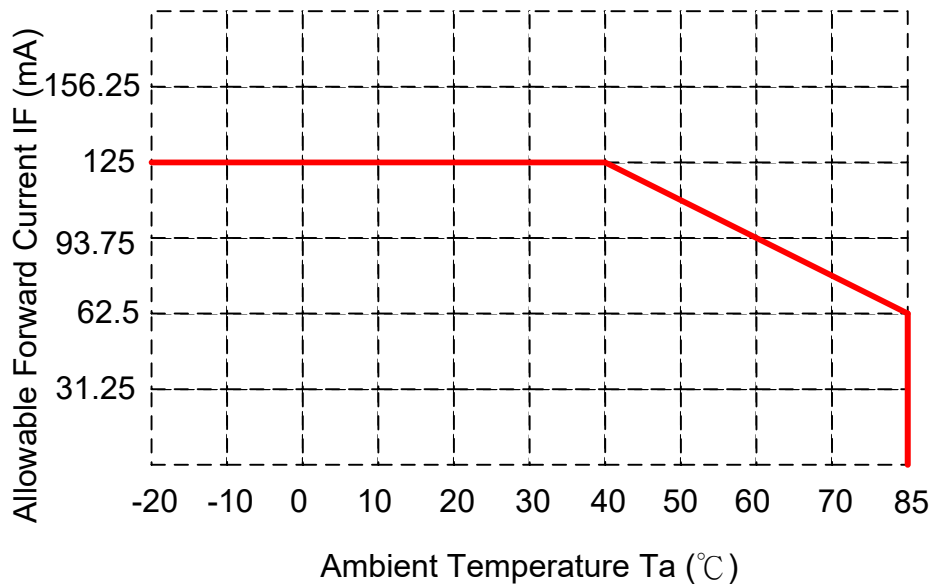
Note1: Ta=25°C , Display pattern : All White

3.2 BACKLIGHT CHARACTERISTICS

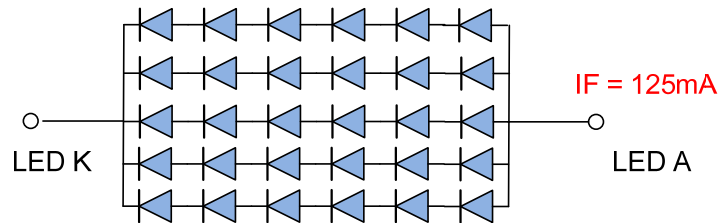
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Input Voltage	VLED	11.7	12.0	12.3	V	
Input Current	ILED	--	T.B.D	--	mA	0% PWM duty
DIM Frequency	Fpwm	100		20K	Hz	
DIM Signal Logic High	VIH	1.2	--	3.3	V	
DIM signal logic Low	VIL	0	--	0.4	V	
LED Forward Current	IF	--	125	--	mA	Ta=25°C
LED Forward Voltage	VF	--	18	--	V	IF=125mA, Ta=25°C
LED life time			50,000	-	Hr	IF=125mA, Ta=25°C

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

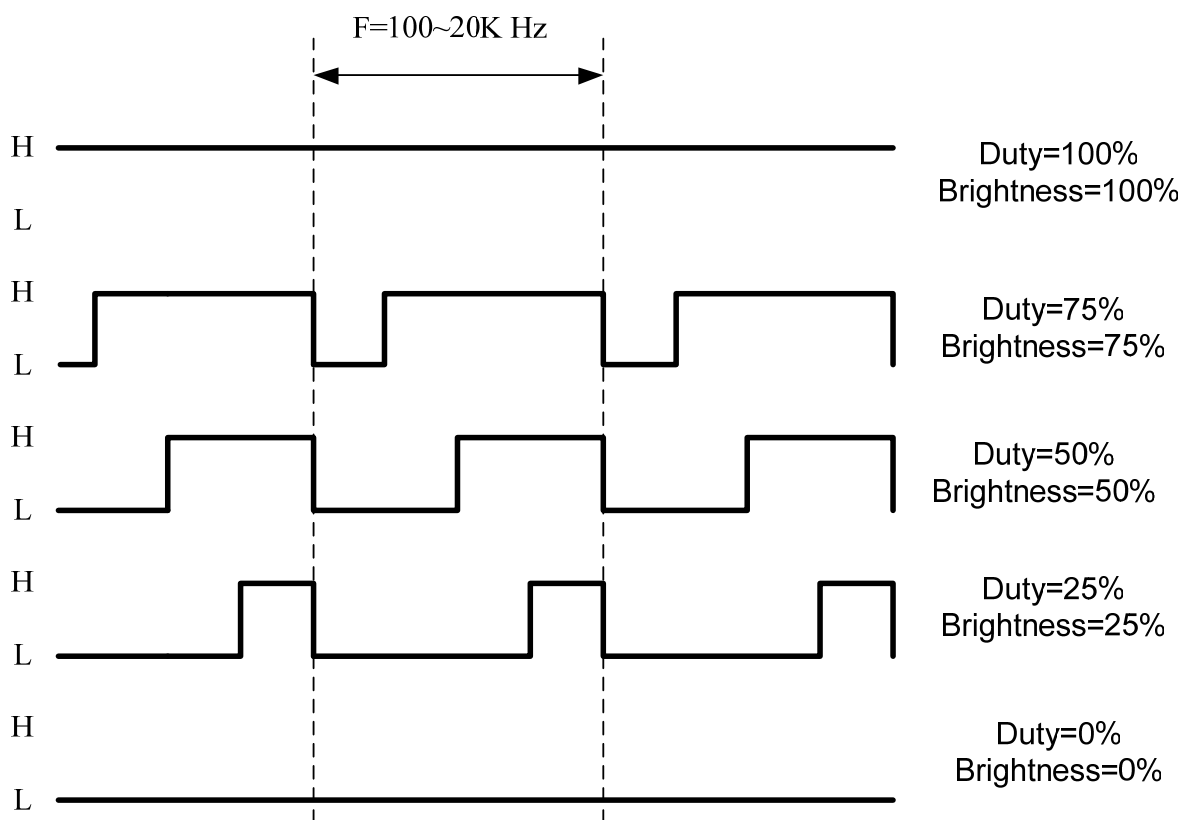
When LCM is operated over 85°C ambient temperature, the I_{LED} of the LED back-light should be adjusted to 62.5mA max



■ 6 LED Serial x 5 LED Parallel



■ DIM Duty



4.0 TIMING

4.1 time table

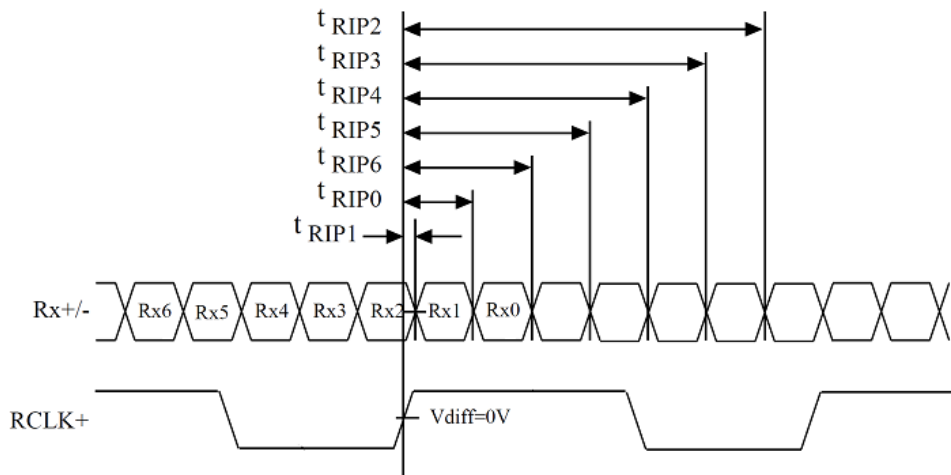
HV mode for 800x480

Parameter	Symbol	Min.	Typ.	Max.	Unit
CLK frequency	F_{CLK}	25.2	25.4	35.7	MHz
Horizontal display area	T_{HD}		800		CLK
HS period time	T_H	860	864	974	CLK
HS pulse width	T_{HPW}	1	2	40	CLK
HS back porch	T_{HBP}		32		CLK
HS front porch	T_{HFP}	28	32	142	CLK
Vertical display area	T_{VD}		480		H
VS period time	T_V	488	490	611	H
VS pulse width	T_{VPW}	1	2	20	H
VS back porch	T_{VBP}		5		H
VS front porch	T_{VFP}	3	5	126	H

DE mode for 800x480

Parameter	Symbol	Min.	Typ.	Max.	Unit
CLK frequency	F_{CLK}	25.2	25.4	35.7	MHz
Horizontal display area	T_{HD}		800		CLK
HS period time	T_H	860	864	974	CLK
HS blanking	$T_{HFP} + T_{HBP}$	60	64	174	CLK
Vertical display area	T_{VD}		480		H
VS period time	T_V	488	490	611	H
VS blanking	$T_{VBP} + T_{VFP}$	8	10	131	H

4.2 LVDS receiver timing



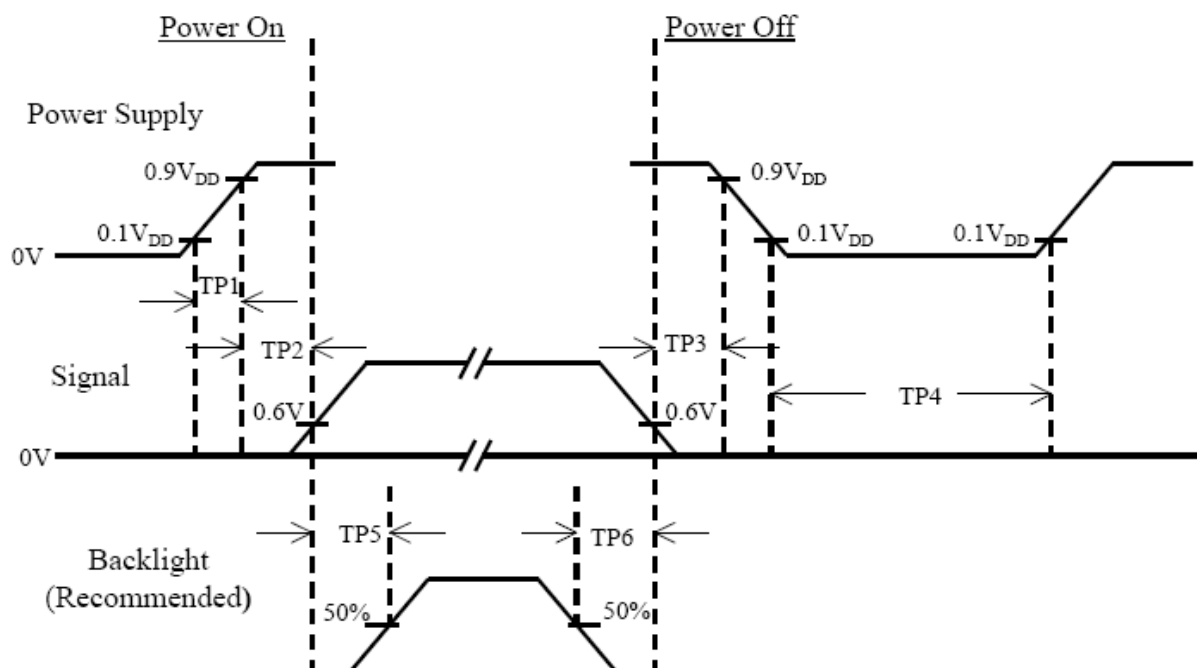
Switching Characteristics

$V_{CC} = 3.0 - 3.6V$, $T_a = -10 - +70\text{ }^{\circ}C$

RECEIVER

t_{RCP}	CLK OUT Period	11.76	T	50.0	ns
t_{RCH}	CLK OUT High Time		$4T/7$		ns
t_{RCL}	CLK OUT Low Time		$3T/7$		ns
t_{RCD}	RCLK+/- to CLK OUT Delay		$5T/7$		ns
t_{RS}	TTL Data Setup to CLK OUT	$3T/7-2.5$			ns
t_{RH}	TTL Data Hold from CLK OUT	$4T/7-3.5$			ns
t_{TLH}	TTL Low to High Transition Time		3.0	5.0	ns
t_{THL}	TTL High to Low Transition Time		3.0	5.0	ns
t_{RIP1}	Input Data Position 0 ($T=11.76ns$)	-0.4	0.0	0.4	ns
t_{RIP0}	Input Data Position 1 ($T=11.76ns$)	$T/7-0.4$	$T/7$	$T/7+0.4$	ns
t_{RIP6}	Input Data Position 2 ($T=11.76ns$)	$2T/7-0.4$	$2T/7$	$2T/7+0.4$	ns
t_{RIP5}	Input Data Position 3 ($T=11.76ns$)	$3T/7-0.4$	$3T/7$	$3T/7+0.4$	ns
t_{RIP4}	Input Data Position 4 ($T=11.76ns$)	$4T/7-0.4$	$4T/7$	$4T/7+0.4$	ns
t_{RIP3}	Input Data Position 5 ($T=11.76ns$)	$5T/7-0.4$	$5T/7$	$5T/7+0.4$	ns
t_{RIP2}	Input Data Position 6 ($T=11.76ns$)	$6T/7-0.4$	$6T/7$	$6T/7+0.4$	ns
t_{RPLL}	Phase Lock Loop Set			10.0	ms

4.3 Power On / Off Sequence

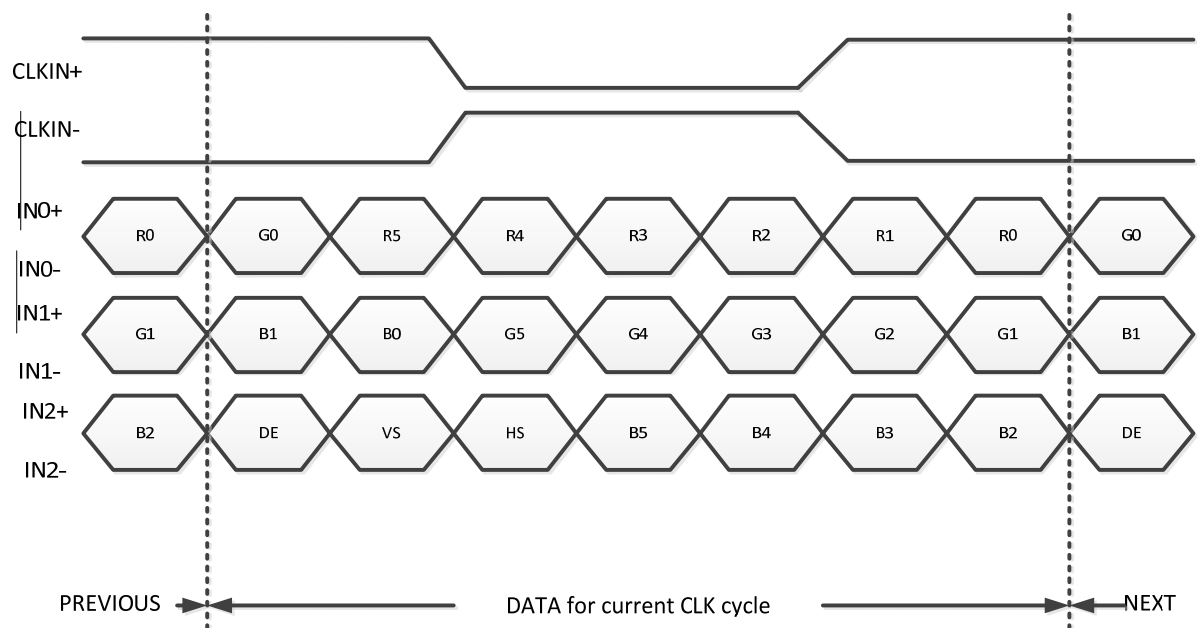


Item	Min.	Typ.	Max.	Unit	Remark
TP1	0.5	--	10	msec	
TP2	0	--	50	msec	
TP3	0	--	50	msec	
TP4	500	--	--	msec	
TP5	200	--	--	msec	
TP6	200	--	--	msec	

Note :

- (1) The supply voltage of the external system for the module input should be the same as the definition of VDD.
- (2) Apply the lamp voltage within the LCD operation range. When the back-light turns on before the LCD operation or the LCD turns off before the back-light turns off, the display may momentarily become white.
- (3) In case of VDD = off level, please keep the level of input signal on the low or keep a high impedance.
- (4) TP4 should be measured after the module has been fully discharged between power off and on period.
- (5) Interface signal shall not be kept at high impedance when the power is on.

5.0 LVDS DATA FORMAT



Note : R/G/B data 6 : MSB, R/G/B data 0 : LSB

Signal Name	Description	Remark
R5 R4 R3 R2 R1 R0	Red Data 5 (MSB) 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 6 bits pixel data.
G5 G4 G3 G2 G1 G0	Green Date 5 (MSB) 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 6 bits pixel data.
B5 B4 B3 B2 B1 B0	Blue Data 5(MSB) 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 6 bits pixel data.
CLKIN+ CLKIN-	LVDS Clock Input	
DE	Display Enable	
VS	Vertical Sync Signal	
HS	Horizontal Sync Signal	

6.0 INTERFACE

Pin No.	Symbol	I/O	Description	Note
1	VDD	P	Power Voltage for Logic: 3.3V	
2	VDD	P	Power Voltage for Logic: 3.3V	
3	GND	P	Ground	
4	GND	P	Ground	
5	IN0-	I	- LVDS differential data input	
6	IN0+	I	+ LVDS differential data input	
7	GND	P	Ground	
8	IN1-	I	- LVDS differential data input	
9	IN1+	I	+ LVDS differential data input	
10	GND	P	Ground	
11	IN2-	I	- LVDS differential data input	
12	IN2+	I	+ LVDS differential data input	
13	GND	P	Ground	
14	CLK-	I	- LVDS differential data input	
15	CLK+	I	+ LVDS differential data input	
16	GND	P	Ground	
17	VLED	I	POWER SUPPLY for Backlight	
18	VLED	I	POWER SUPPLY for Backlight	
19	GND	P	Ground	
20	ADJ	P	PWM duty 0% to 100%	

7.0 Optical Specifications

7.1 TFT Optical Characteristics

Item		Symbol	Conditio	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≥ 10		80	-	Degree	Note 2
		θB			80	-		
		θL			80	-		
		θR			80	-		
Contrast Ratio		CR	θ=0°	800	1000	-		Left/right 0° Top/bottom 5°
Response Time		T _{ON} +T _{OFF}	25℃	-	25	35	ms	Note1 Note4
Chromaticity	White	x		-0.05	0.328	+0.05		Note5 Note1
		y			0.347			
	Red	x			0.615			
		y			0.321			
	Green	x			0.310			
		y			0.563			
	Blue	x			0.136			
		y			0.098			
Uniformity		U		70	--	-	%	Note1、Note6
Luminance		L		340	425	-	cd/m ²	Note7

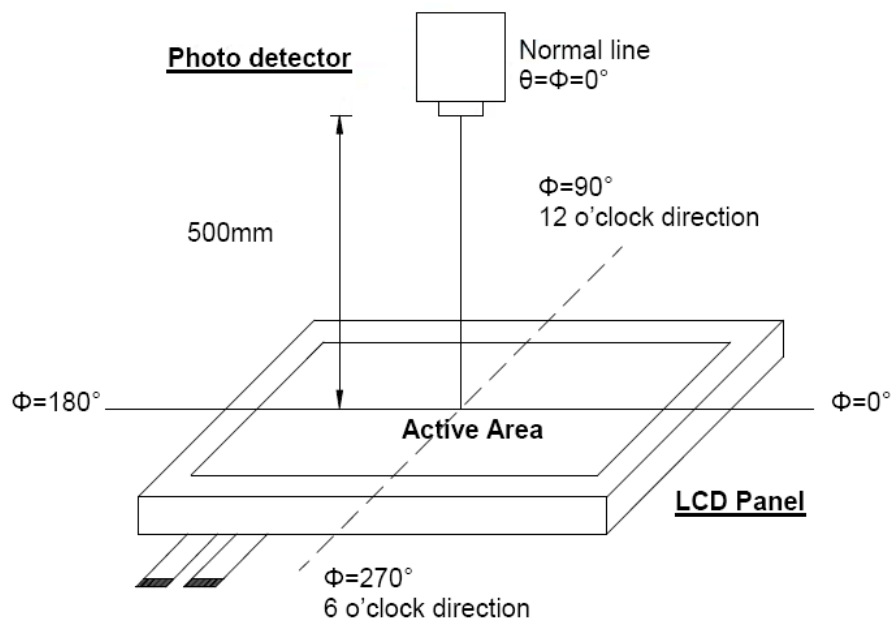
Test Conditions:

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

Note 1: Definition of optical measurement system.

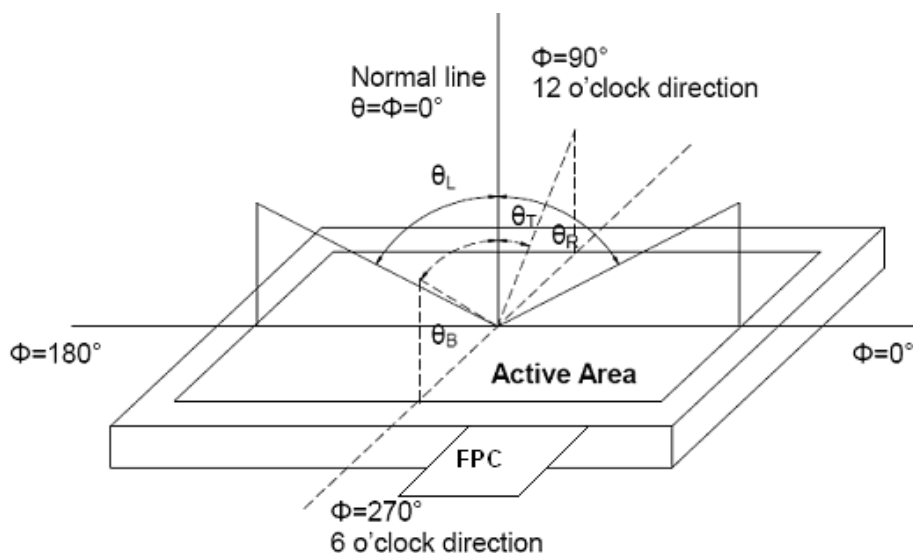
The optical characteristics should be measured in dark room. After 10 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.

Note 1 : Definition of optical measurement system.



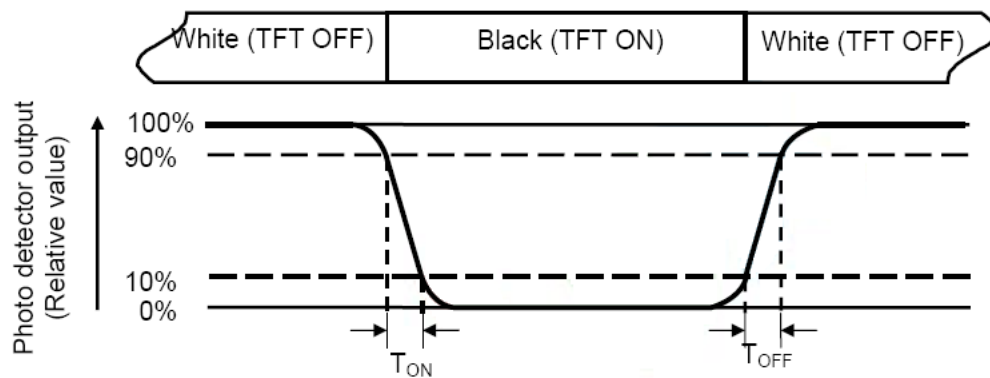
The optical characteristics should be measured in dark room. After 30 minutes operation, the optical properties are measured at the center point of the LCD screen. (Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/Field of view : 1° / Height : 500mm.)

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.

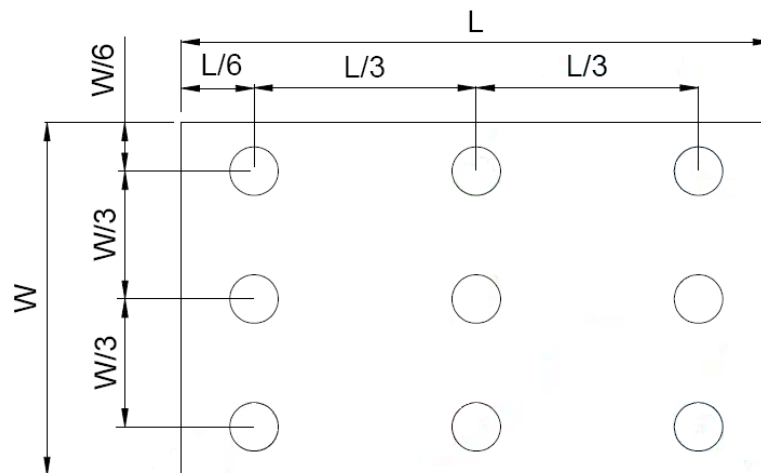
Note 6 : All input terminals LCD panel must be ground when measuring the center area of the panel.

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.

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

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.

8. Projected capacitive-type TOUCH PANEL ELECTRICAL SPECIFICATION

Basic Characteristic

ITEM	SPECIFICATION
Type	Projective Capacitive Touch Panel
Activation	Multi-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	ILI2511
Conductive susceptibility IEC/EN61000-4-6	10Vrms
Radiated Susceptibility IEC/EN61000-4-3	30V/m
Cover Glass	1.1mm chemically strength glass with black border
Bonding method	CG to sensor: optical bonding
	TP module to LCM: tape bonding

Specify the normal operating condition

(GND=0V)

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

Interface

Pin No.	Symbol	Function
1	GND	POWER GND
2	DA-	USB Data-
3	DA+	USB Data+
4	VIN	USB power input 5V
5	NC	No connection
6	NC	No connection

9. Reliability Test Items

Test Item	Test Conditions	Note
High Temperature Operation	85±3°C , t=240 hrs	
Low Temperature Operation	-30±3°C , t=240 hrs	
High Temperature Storage	85±3°C , t=240 hrs	1,2
Low Temperature Storage	-30±3°C , t=240 hrs	1,2
Storage at High Temperature and Humidity	40°C, 85% RH , 240 hrs	1,2
Thermal Shock Test	-30°C (30min) ~ 85°C (30min) 50 cycles	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).

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.

10. GENERAL PRECAUTION

10-1 Safety

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

10-2 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.

10-3 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.

10-4 Storage

1. Store the module in a dark room where must keep at $+25\pm 10^{\circ}\text{C}$ 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.

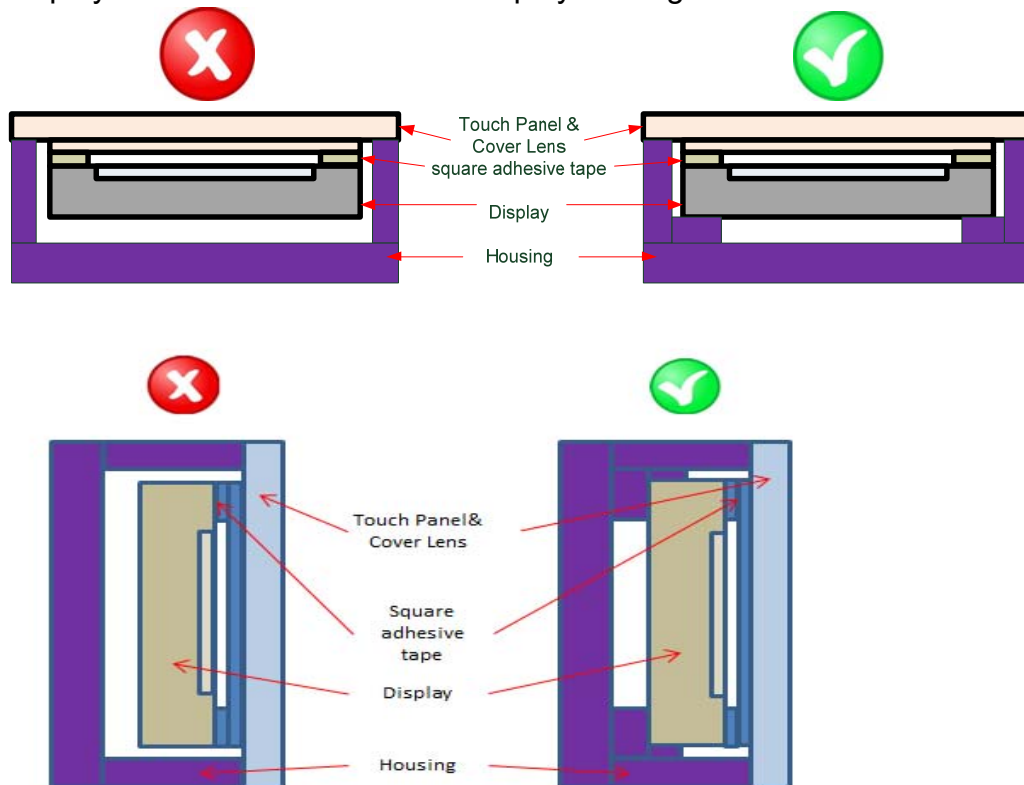
10-5 Cleaning

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

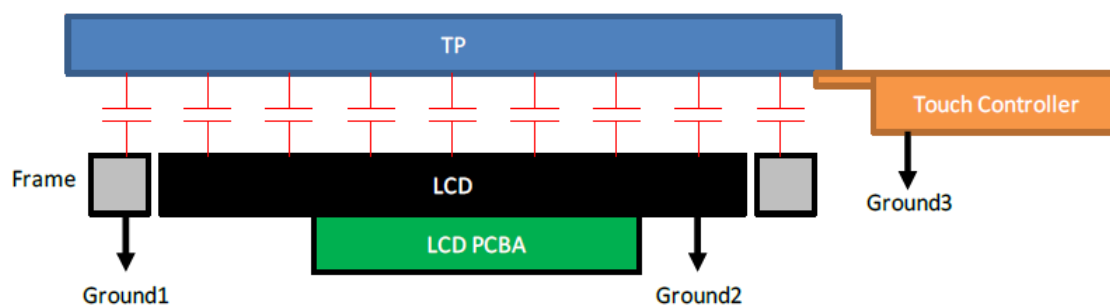
10-6 Mechanism (if the LCM using air bonding)

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

(2) 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.



(3) 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

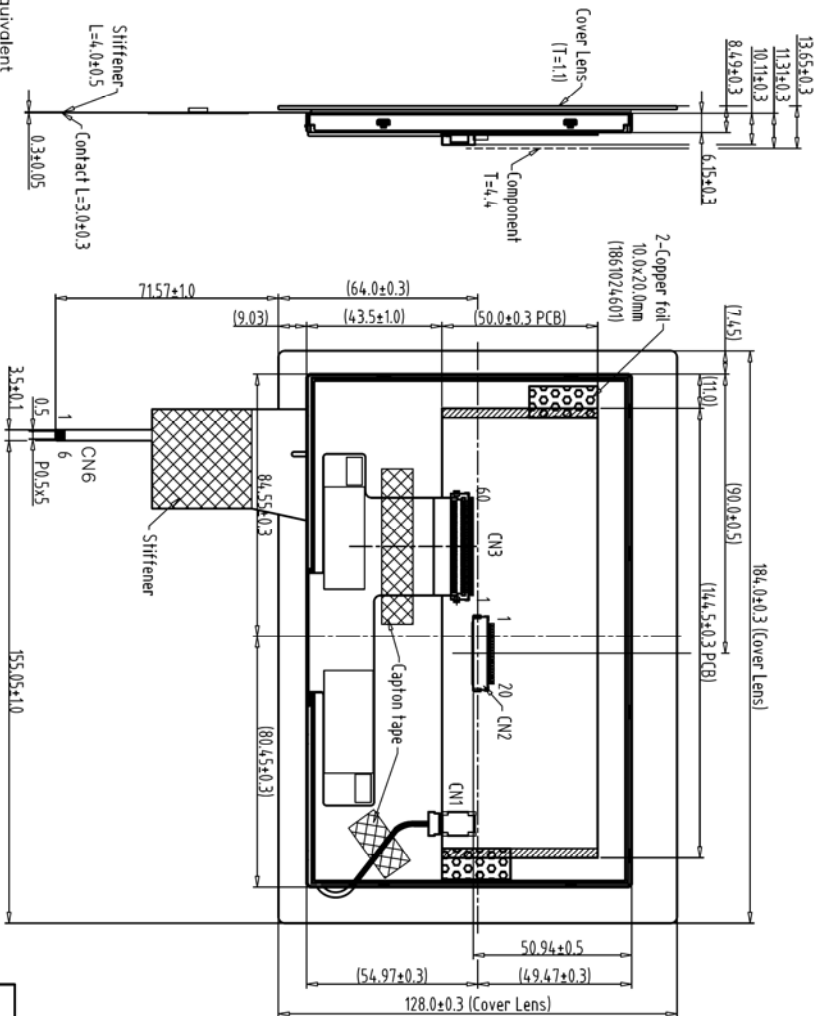
10-7 Others

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

Date : 2018/2/8



REV	REVISION RECORD	DATE	NAME
0	NEW RELEASE	12-07-18	SNOW



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

1	VDD	11	IN2-
2	VDD	12	IN2+
3	GND	13	GND
4	GND	14	CLK-
5	IN0-	15	CLK+
6	IN0+	16	GND
7	GND	17	VLED
8	IN1-	18	VLED
9	IN1+	19	GND
10	GND	20	ADJ

Note:

1. Unless indicated, Tolerance " ± 0.3 "
2. UV Glue For OLB Protection.
3. CN1:ST : BHSR-02VS-1
4. CN2:P1:0 20Pm/CP100-S20G-H16 or Equivalent
5. CN3:P0.5 60Pm IRISO IMSA-120015-60Y903 or Equivalent
6. LCD 800x3(R,G,B)x480=> 7.0" IPS TFT LCD

The diagram shows a cross-sectional view of a camera module assembly. A lens is mounted on a substrate. A dimension line indicates a distance of 0.3 ± 0.5 from the lens to the OLB (Optical Lens Board). The lens has a tolerance of ± 0.5 .

[illegible]