



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-19201080ITZQW-TA5H
Approved by	
Date	

- Preliminary Specification
 Formal Specification

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This Specification is subject to change without notice.

RECORD OF REVISION

Revision Date	Page	Contents	Editor
2022/06/07 2023/03/06	-- 6,14,21 22	New Release Update Timing & LED connector & interface & drawing	Jessica Lawlite

1.0 General Descriptions

1.1 Introduction

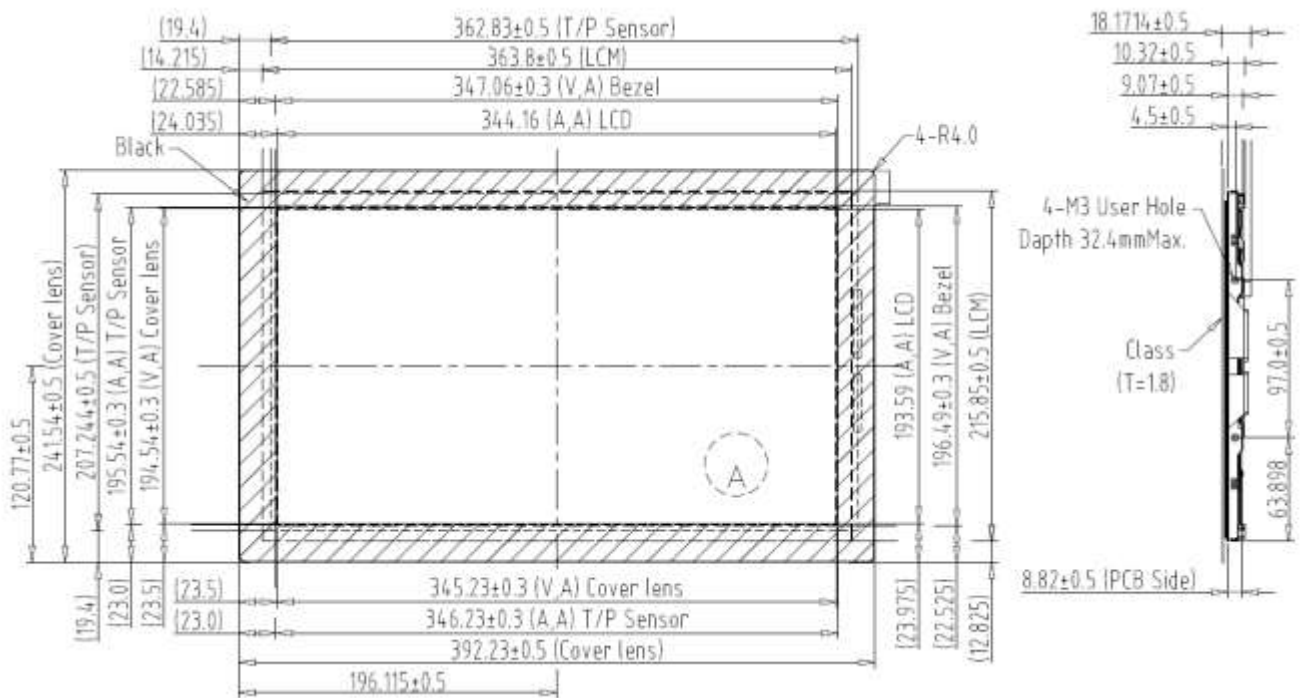
The LCM is a color active matrix TFT LCD module using amorphous silicon TFT's (Thin Film Transistors) as active switching devices. This module has a 15.6 inch diagonally measured active area with FHD resolutions (1920 horizontal by 1080 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical Stripe and this module can display 16.7M colors (6bit+FRC). The TFT-LCD panel used for this module is a low reflection and higher color type.

1.2 Features

- (1) 3.3 V Logic Power
- (2) LVDS (2ch) Interface for 1920 RGB x 1080 resolution
- (3) 16.7M Colors(6bit+FRC)
- (4) Touch panel
 - ✧ IC: ILI2510
 - ✧ Interface: Mini-USB
- (5) Cover glass
 - ✧ Thickness: 1.8mm

1.3 Product Summary

Items	Specifications	Unit
Screen Diagonal	15.6	Inch
Pixel Format	1920 (H) x RGB x 1080 (V)	-
Pixel Pitch	0.17925 (H) X 0.17925 (V)	mm
Pixel Arrangement	R.G.B. Vertical Stripe	-
Display Mode	Normally Black	-
White Luminance	850 (Typ.)	cd /m2
Contrast Ratio	1000 : 1 (Typ.)	-
Input Voltage	3.3	V
Support Color	16M(6Bit+FRC)	-



2.0 Absolute Maximum Ratings

Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Logic Supply Voltage	VDD	-0.3	4.0	V	
Operation Temperature	TOP	-20	70	°C	
Storage Temperature	TST	-30	80	°C	

Note(1) $T_a = 25 \pm 2^\circ\text{C}$

3.0 Electrical Specifications

3.1 LCD Electronics Specifications

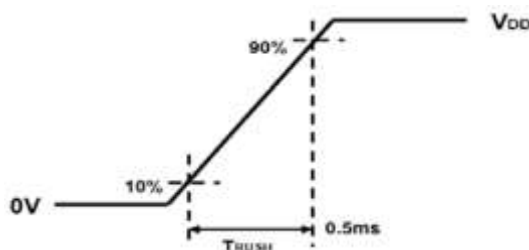
Parameter		Symbol	Value			Unit	Note
			Min	Typ.	Max.		
Power Supply Voltage		VDD	3.0	3.3	3.6	V	(1),(2)
Ripple Voltage		VRP	-	-	200	mV	(1),(3)
Rush Current		IRUSH	-	-	1.5	A	(1),(4)
VDD Current	White Pattern	IDD	-	-	0.454	A	(1),(3)
VDD Power Consumption	White Pattern	PDD	-	-	1.5	W	

Note(1) All of the specifications are guaranteed under normal conditions. Normal conditions are defined as follow: Temperature: 25°C , Humidity: $55 \pm 10\% \text{RH}$.

Note(2) All of the absolute maximum ratings specified in the table, if exceeded, may cause faulty operation or unrecoverable damage. It is recommended to follow the typical value.

Note(3) The specified VDD current and power consumption are measured under the VDD = 3.3 V, FV = 60 Hz condition and White Pattern.

Note(4) The figure below is the measuring condition of VDD. Rush current can be measured when TRUSH is 0.5 msec.



4.0 Interface Timings

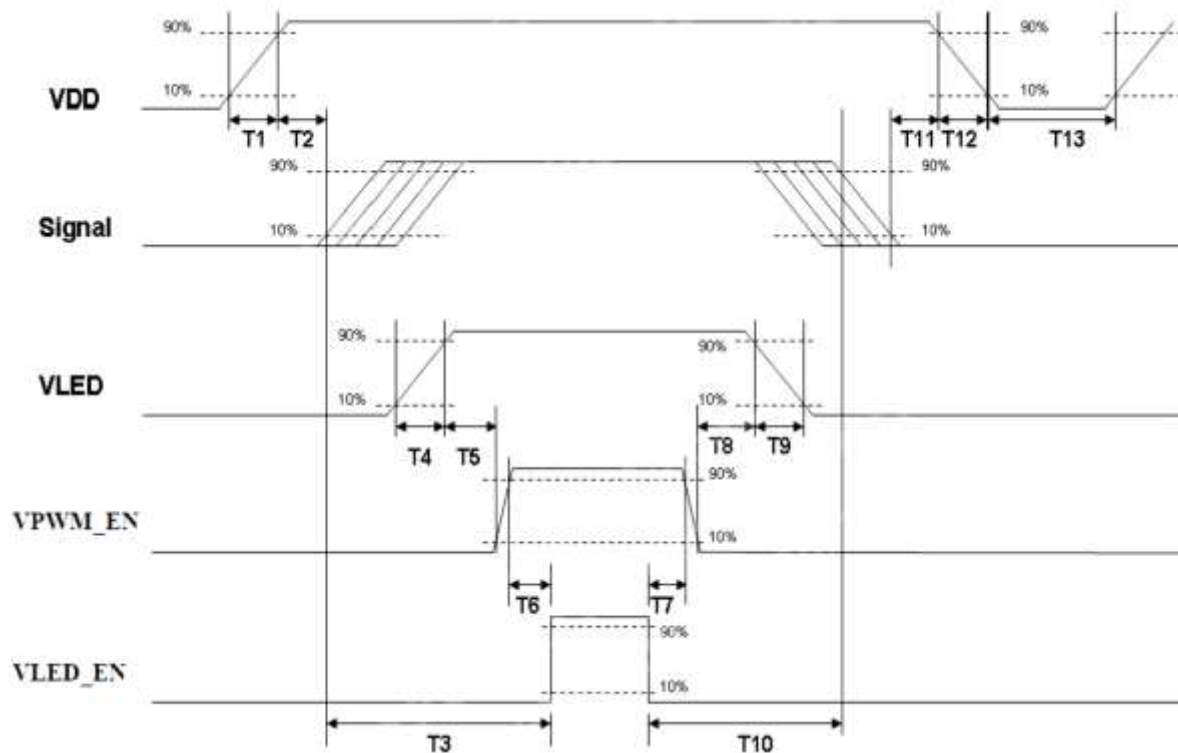
4.1 Display Timing Specifications

Parameter	Symbol	Min.	Typ.	Max.	Unit
LVDS Clock Frequency	Fclk	(69.5)	(70.5)	(73)	MHz
V Total Time	VT	(1104)	(1116)	(1080+A)	Clocks
VActive Time	VA	1080			-
H Total Time	HT	(1050)	(1052)	(960+B)	Lines
H Active Time	HA	960			-
Frame Rate	FV	-	(60)	-	Hz

Note(1) SCC can only be driven to 2%

Note(2) The maximum clock frequency= $[(960+B) \cdot (1080+A) \cdot 60] < 73\text{MHz}$

4.2 Power ON/OFF Sequence



Power Sequencing Requirements

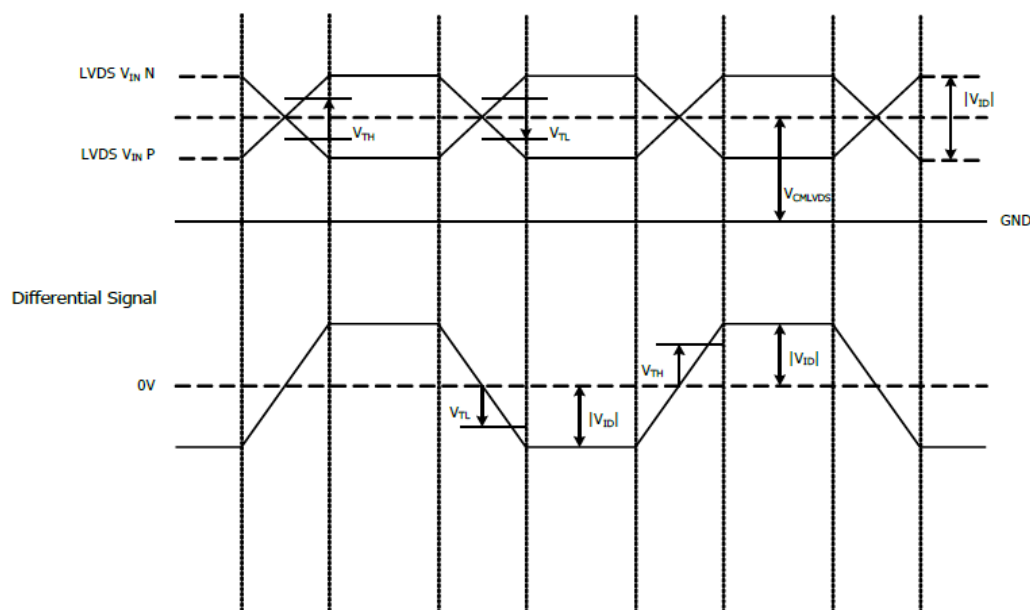
Parameter	Min.	Typ.	Max.	Unit
T1	0.5	-	10	ms
T2	30	40	50	ms
T3	200	-	-	ms
T4	0.5	-	10	ms
T5	10	-	-	ms
T6	10	-	-	ms
T7	0	-	-	ms
T8	10	-	-	ms
T9	-	-	10	ms
T10	110	-	-	ms
T11	0	16	50	ms
T12	-	-	10	ms
T13	1000	-	-	ms

4.3 LVDS Input Signal Specifications

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Differential Input High Threshold	V _{th}	-	-	+100	mV	V _{CM} =1.2V
Differential Input Low Threshold	V _{tl}	-100	-	-	mV	V _{CM} =1.2V
Magnitude Differential Input Voltage	V _{ID}	100	-	600	mV	-
Common Mode Voltage	V _{CM}	0.7		1.6	V	-

Note(1) Input signals shall be low or Hi- resistance state when VDD is off.

Note(2) All electrical characteristics for LVDS signal are defined and shall be measured at the interface connector of LCD.

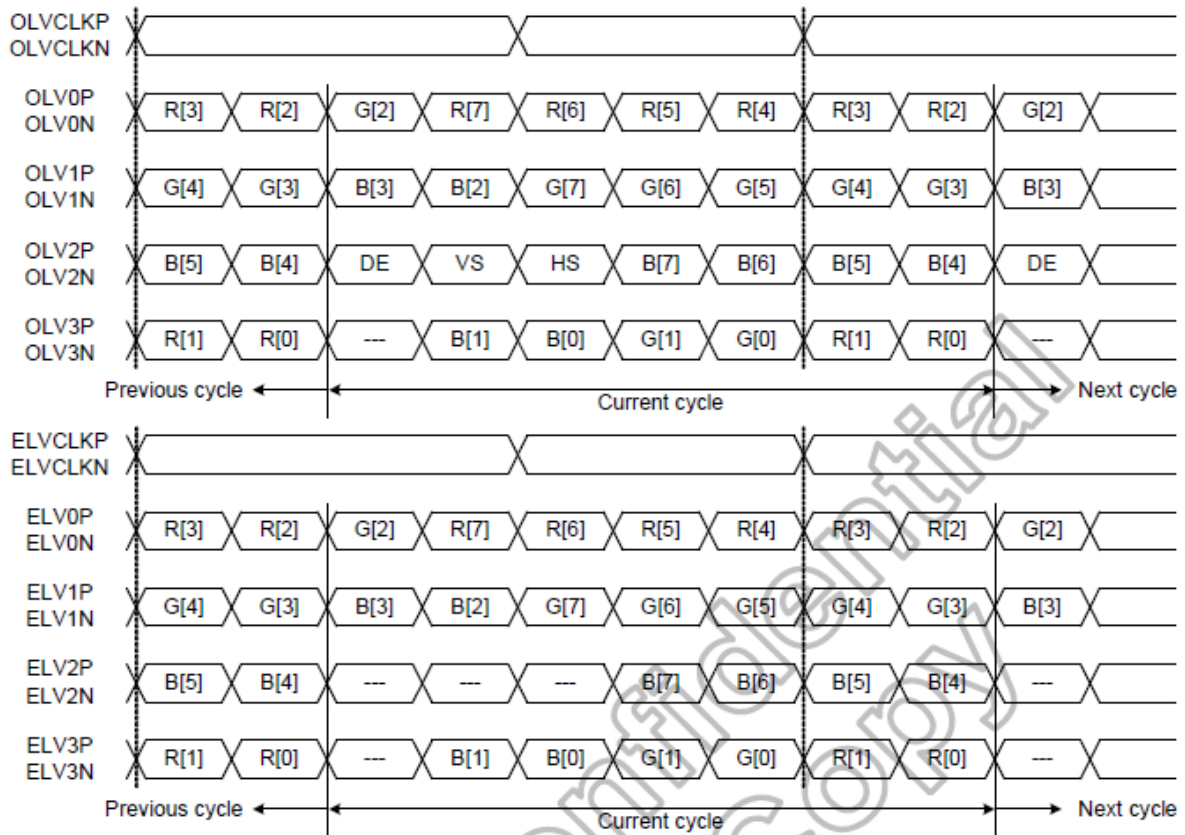


LVDS AC Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
Clock Period	TLVCP	-	(T)	-	ns
Clock High Time	TLVCH	-	(4T/7)	-	ns
Clock Low Time	TLVCL	-	(3T/7)	-	ns

Note(1) T=1/Fclk

Data Mapping

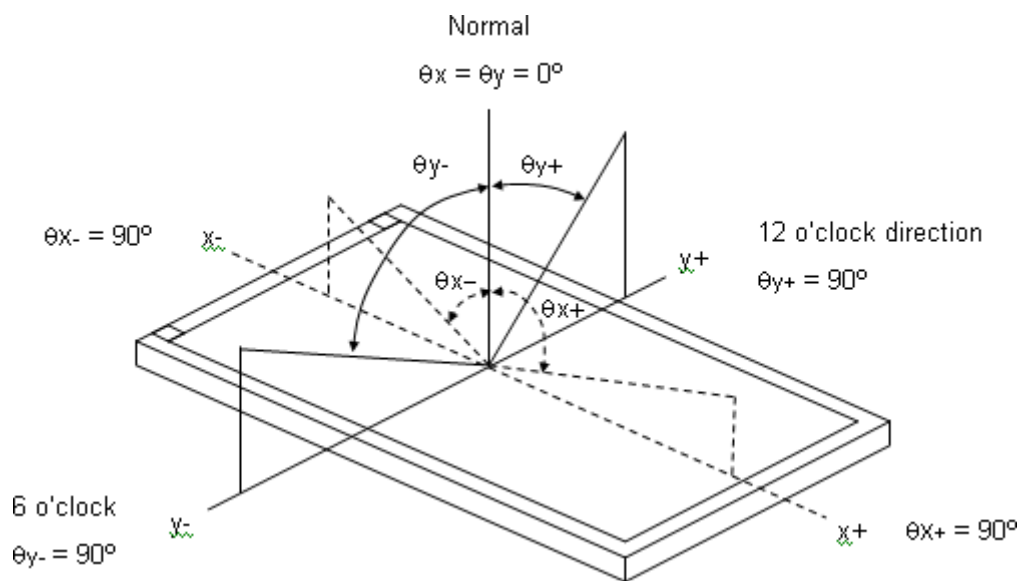


5.0 Optical Specifications

The optical characteristics are measured under stable conditions as following notes

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Color Chromaticity (CIE 1931)	Red	Rx	$\theta_x=0^\circ, \theta_y=0^\circ$ CS-2000	Typ - 0.05	T.B.D	Typ + 0.05	-	(1), (5)
		Ry			T.B.D			
	Green	Gx			T.B.D			
		Gy			T.B.D			
	Blue	Bx			T.B.D			
		By			T.B.D			
	White	Wx			0.313			
		Wy			0.329			
Center Luminance of White		LC		680	850	-	cd/m ²	(4), (5)
Contrast Ratio		CR		700	1000	-	-	(2), (5)
Response Time		TR+TF	$\theta_x=0^\circ, \theta_y=0^\circ$	-	25	35	ms	(3)
NTSC			$\theta_x=0^\circ, \theta_y=0^\circ$	-	72	-	%	(5), (6)
Luminance Uniformity			9 Points	75	80		%	(5), (6)
Viewing Angle	Horizontal	θ_{x+}	$CR \geq 10$	80	85	---	Deg.	(1), (5)
		θ_{x-}		80	85			
	Vertical	θ_{y+}		80	85			
		θ_{y-}		80	85	---		

Note(1) Definition of Viewing Angle (θ_x, θ_y):



Note(2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

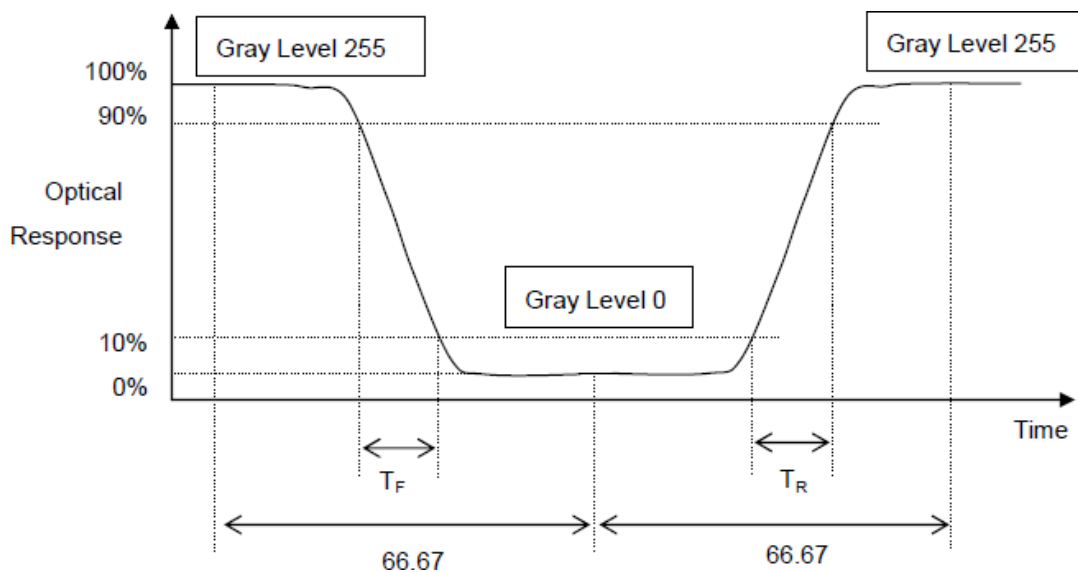
$$\text{Contrast Ratio (CR)} = L_{255} / L_0$$

L255: Luminance of gray level 255 L 0: Luminance of gray level 0

$$\text{CR} = \text{CR} (5)$$

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (6).

Note(3) Definition of Response Time (T_R, T_F):



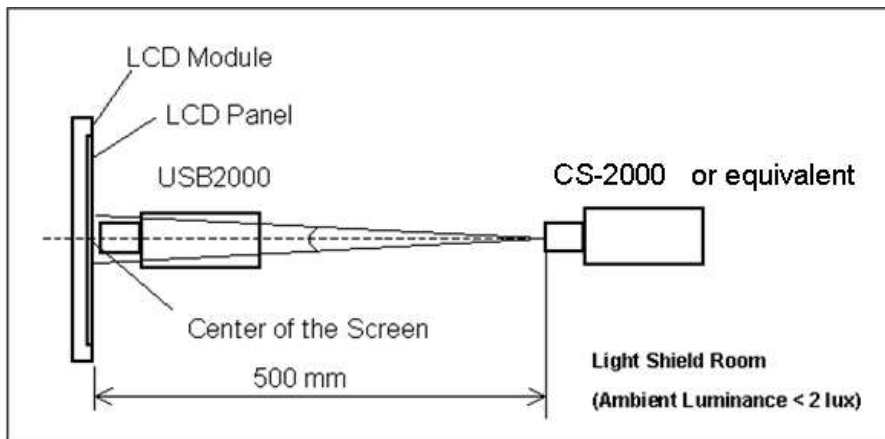
Note(4) Definition of Luminance of White (LC):

Measure the luminance of gray level 255 at center point $L_C = L$ (5)

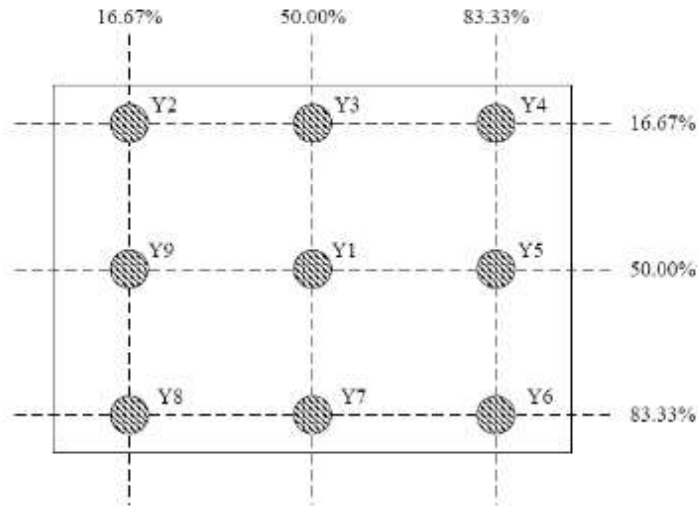
$L(x)$ is corresponding to the luminance of the point X at Figure in Note (6).

Note(5) Measurement Setup:

The LCD module should be stabilized at given temperature for 30 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 30 minutes in a windless room.



Note (6) Definition of White Variation



(Min Luminance of 9 points)

$$\text{Luminance uniformity} = \frac{\text{Min Luminance of 9 points}}{\text{Max Luminance of 9 points}} \times 100\%$$

(Max Luminance of 9 points)

6.0 Interface Connections

LVDS connector

Item	Description
Manufacturer / Type	STM MSBKT2407P30HB
Mating Receptacle / Type (Reference)	JAE FI-X30HL(Locked Type)

Pin	Name	Description
1	RxO0-	Negative LVDS differential data input (Odd data)
2	RxO0+	Positive LVDS differential data input (Odd data)
3	RxO1-	Negative LVDS differential data input (Odd data)
4	RxO1+	Positive LVDS differential data input (Odd data)
5	RxO2-	Negative LVDS differential data input (Odd data)
6	RxO2+	Positive LVDS differential data input (Odd data)
7	GND	Ground
8	RxOCLK-	Negative LVDS differential clock input (Odd clock)
9	RxOCLK+	Positive LVDS differential clock input (Odd clock)
10	RxO3-	Negative LVDS differential data input (Odd data)
11	RxO3+	Positive LVDS differential data input (Odd data)
12	RxE0-	Negative LVDS differential data input (Even data)
13	RxE0+	Positive LVDS differential data input (Even data)
14	GND	Ground
15	RxE1-	Negative LVDS differential data input (Even data)
16	RxE1+	Positive LVDS differential data input (Even data)
17	GND	Ground
18	RxE2-	Negative LVDS differential data input (Even data)
19	RxE2+	Positive LVDS differential data input (Even data)
20	RxECLK-	Negative LVDS differential clock input (Even clock)
21	RxECLK+	Positive LVDS differential clock input (Even clock)
22	RxE3-	Negative LVDS differential data input (Even data)
23	RxE3+	Positive LVDS differential data input (Even data)
24	GND	Ground
25	Bist	LCD Panel Self-Test Enable(3.3V Typ.) For Ampire use, When it is not used, Connecting to GND or Floating is recommended
26	SDA	I2C-Compatible Serial-Data Input. Floating is recommended in the Costumer
27	SCL	I2C-Compatible Serial-Data Input. Floating is recommended in the Costumer
28	VDD	Power Supply Input Voltage(3.3V)
29	VDD	Power Supply Input Voltage(3.3V)
30	VDD	Power Supply Input Voltage(3.3V)

LED connector

Item	Description
Manufacturer / Type	STM/MSB24038P8A(P1.25x8pin)

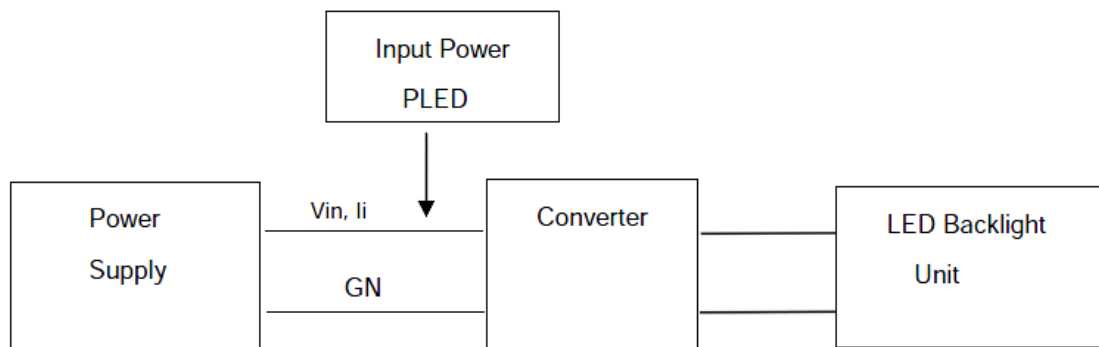
Pin	Name	Description
1	VLED	LED power supply(12V Typ)
2	VLED	LED power supply(12V Typ)
3	VLED	LED power supply(12V Typ)
4	GND	Ground
5	GND	Ground
6	GND	Ground
7	VLED_EN	Backlight On/Off (3.3V Typ)
8	VPWM_EN	System PWM signal input for dimming (3.3V Typ)

7.0 LED Driving Conditions

Parameter	Symbol	Value			Unit	Note	
		Min.	Typ.	Max.			
Converter Power Supply Voltage	LED_Vin	10.8	12.0	13.2	V		
Converter Power Supply Current	li			2	A	@LED_Vin=12V Duty=100%	
Power Consumption	PLED			26.3	W	@ LED_Vin = 12V Duty=100%	
EN Control Level	Backlight on	LED_EN	1.5	-	5.5	V	
	Backlight off		0		0.5		
PWM Control Level	PWM High Level	LED_PWM	1.2	-	5.5	V	
	PWM Low Level		0	-	0.5		
PWM Control Duty Ratio	PWM	10	--	100	%		
PWM Control Frequency	fPWM	100	-	1000	Hz		
LED Life Time	LL	50,000			Hrs	(2)	

Note(1) LED light bar input voltage and current are measured by utilizing a true RMS multimeter as shown below:

Note(2) The lifetime of LED is estimated data and defined as the time when it continues to operate under the conditions at $T_a = 25 \pm 2^\circ\text{C}$ and Duty 100% until the brightness becomes $\leq 50\%$ of its original value. Operating LED under high temperature environment will reduce life time and lead to color shift.



8.0 Touch panel electrical specification

8.1 Electrical characteristics

Item	Specification
Type	Projective Capacitive Touch Panel
Activation	Two-fingers or Single-finger
X/Y Position Reporting	Absolute Position
Touch Force	No contact pressure required
Calibration	No need for calibration
Report Rate	Approx. 200 points/sec
Control IC	ILI2510

Item	Symbol	Min.	Typ.	Max.	Unit
Touch panel power supply	VDD	4.75	5	5.25	V
Touch panel power supply current at Normal operation mode	IVDD	--	45 (Reference)	--	mA
Touch panel power supply current at USB suspend mode	IVDD	--	TBD	--	uA

8.2 Interface

Pin No.	Symbol	Function
1	PVDD	USB Power 5V
2	D-	USB Data-
3	D+	USB Data+
4	PGND	GND
5	PGND	GND

9.0 Reliability Test

The reliability test items and its conditions are shown below.

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 at High Temperature and Humidity	40°C, 90% RH , 240 hrs	1,2

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.

10.0 General Precaution

10.1 Use Restriction

- (1) 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.

10.2 Disassembling or Modification

- (1) 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.

10.3 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.

10.4 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.

10.5 Absolute Maximum Ratings and Power Protection Circuit

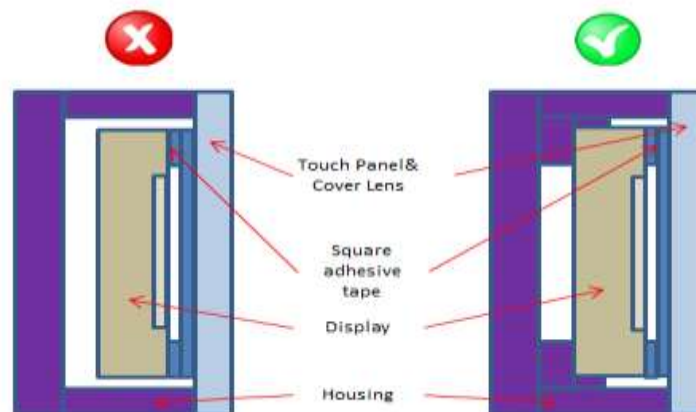
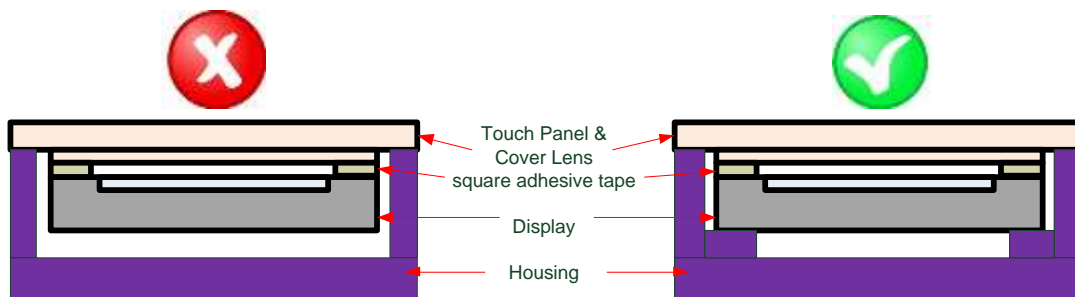
- (1) Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts' parameters, environmental temperature, etc., otherwise LCD module may be damaged.
- (2) Please do not leave LCD module in the environment of high humidity and high temperature for a long time.
- (3) It's recommended to employ protection circuit for power supply.

10.6 Operation

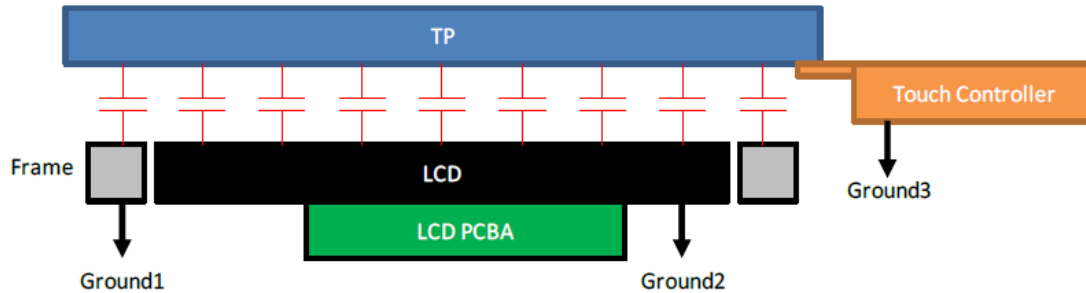
- (1) Do not touch, push or rub the polarizer with anything harder than HB pencil lead.
- (2) Use fingerstalls of soft gloves in order to keep clean display quality, when persons handle the LCD module for incoming inspection or assembly.
- (3) When the surface is dusty, please wipe gently with absorbent 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.

10.7 Mechanism

- (1) Please mount LCD module by using mounting holes arranged in four corners tightly.
- (2) Please hold the LCD module properly when you use or store it.
- (3) 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.



- (4) 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

10.8 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.

10.9 Strong Light Exposure

- (1) The module shall not be exposed under strong light such as direct sunlight. Otherwise, display characteristics may be changed.

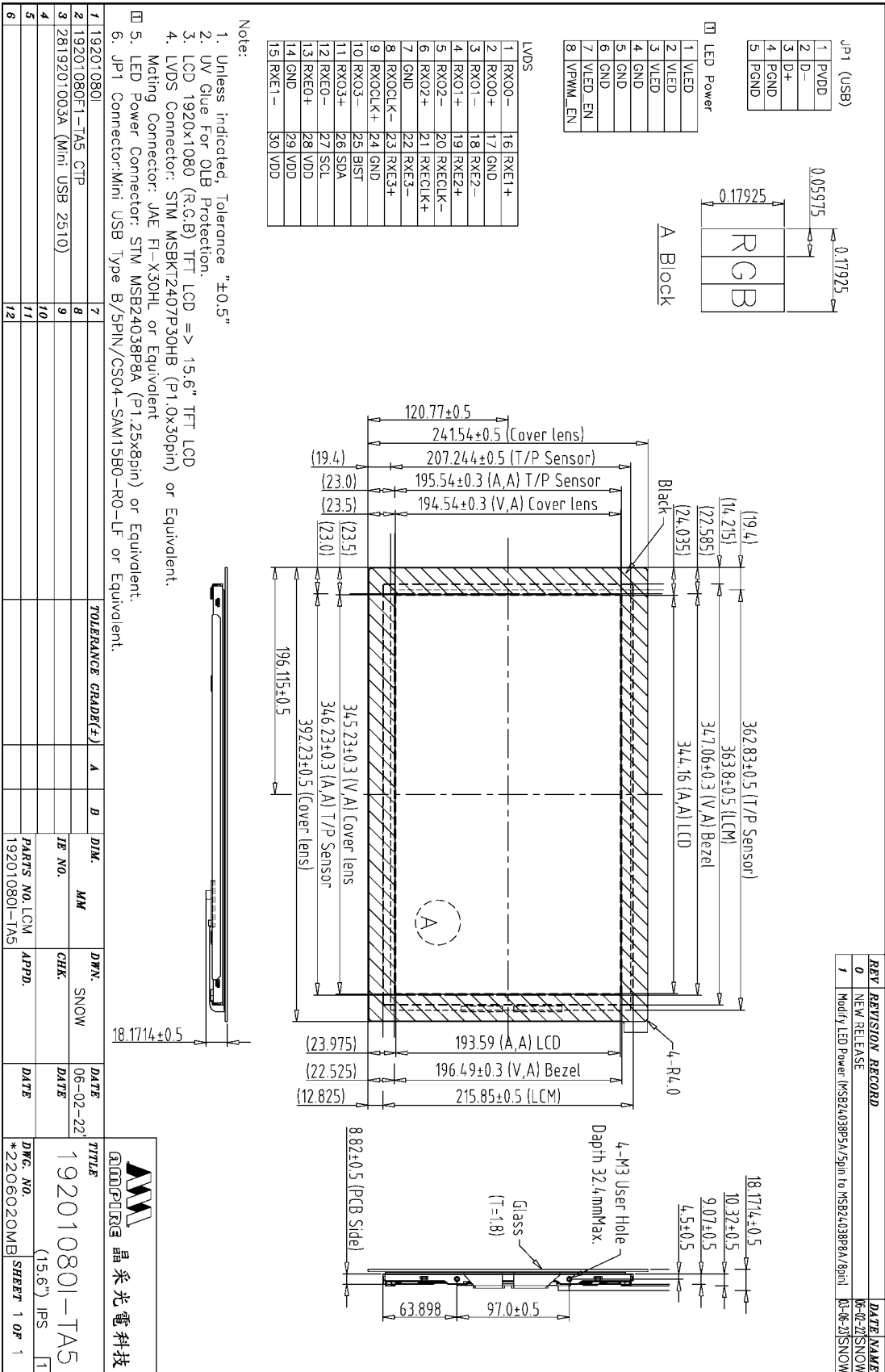
10.10 Disposal

- (1) When disposing LCD module, obey the local environmental regulations.

10.11 Others

- (1) 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.

11.0 Outline Dimension



12.0 Package

TBD