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-19201080D1TZQW-01H
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
2019/10/15	--	New Release	Simon
2020/03/25	23	Modify Cable	Mantle

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 an 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 16M colors(6bit+FRC). The TFT-LCD panel used for this module is a low reflection and higher color type.

1.2 Features

- 3.3 V Logic Power
- LVDS (2ch) Interface for 1920 RGB x 1080 resolution
- 16M Colors(6bit+FRC)
- On board LED Driving circuit
- Green Product (RoHS)

1.3 Product Summary

Items	Specifications	Unit
Screen Diagonal	15.6	Inch
Active Area	344.16 (H) ×193.59 (V)	mm
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	1000 (Typ)	cd /m2
Contrast Ratio	800 : 1 (Typ)	-
Input Voltage	3.3	V
Outline Dimensions	363.8x215.9x9.3	mm
Support Color	16M(6Bit+FRC)	-

2.0 Absolute Maximum Ratings

ITEM	SYMBOL	VALUES		UNIT	REMARK
		MIN	MAX		
Logic Signal Input Level	Vin	-0.3	4.0	V	
Power Supply Voltage	Vcc	-0.3	3.6	V	
Operation Temperature	T_{op}	-30	75	℃	Note(1)
Storage Temperature	T_{st}	-30	80	℃	

Note (1) Permanent damage may occur to the LCD module if you operate beyond this specification. Please reduce the back-light current to a half by PWM at 70~75℃. To prevent the back-light material waving.

Note (2) Ta =25±2℃

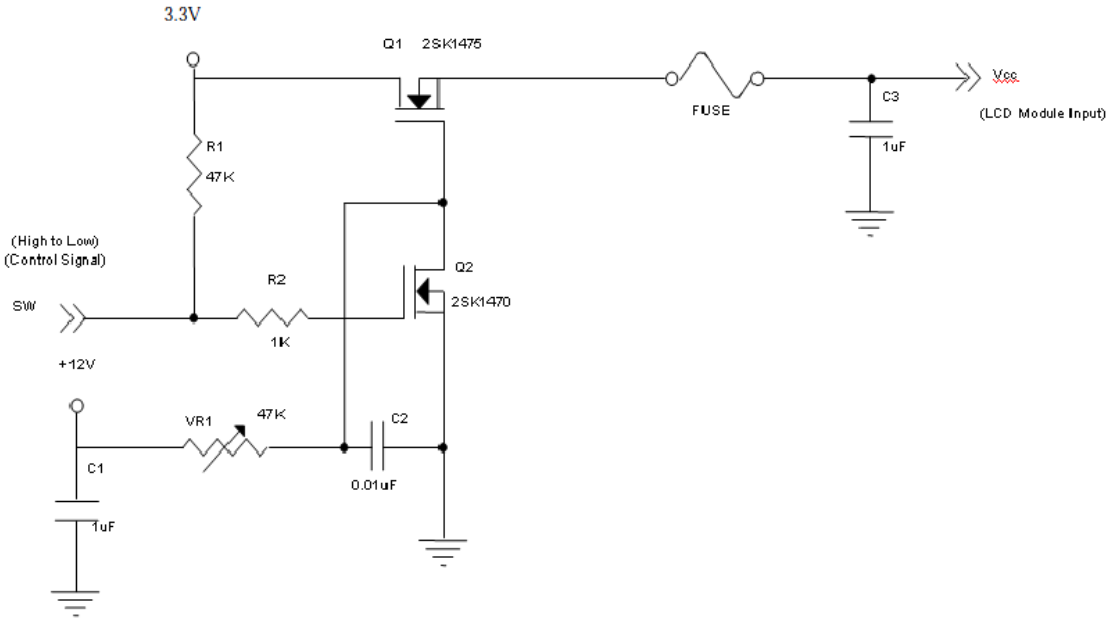
3.0 ELECTRICAL SPECIFICATIONS

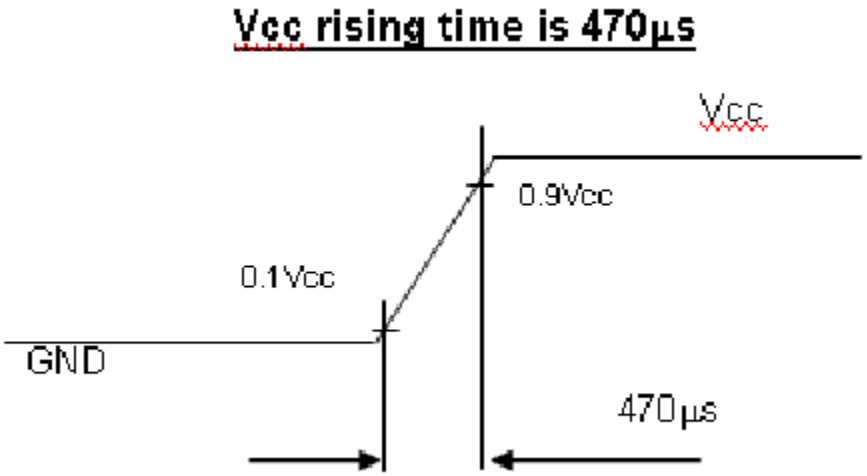
3.1 LCD ELECTRONICS SPECIFICATION

Parameter		Symbol	Value			Unit	Note
			Min	Typ.	Max.		
Power Supply Voltage		Vcc	3.15	3.3	3.6	V	-
Ripple Voltage		VRP	-	-	150	mV	-
Rush Current		IRUSH	-	-	3	A	(2)
Power Supply Current	White	-	-	1.22	1.5	A	(3)a
	Black	-	-	0.51	0.7	A	(3)b
	Vertical Stripe	-	-	0.82	1	A	(3)c
Power Consumption		PLCD	-	4	5	Watt	(4)
LVDS differential input voltage		Vid	200		600	mV	(5)
LVDS common input voltage		Vic	1.0	1.2	1.4	V	(6)
LVDS terminating resistor		Rt		100		ohm	

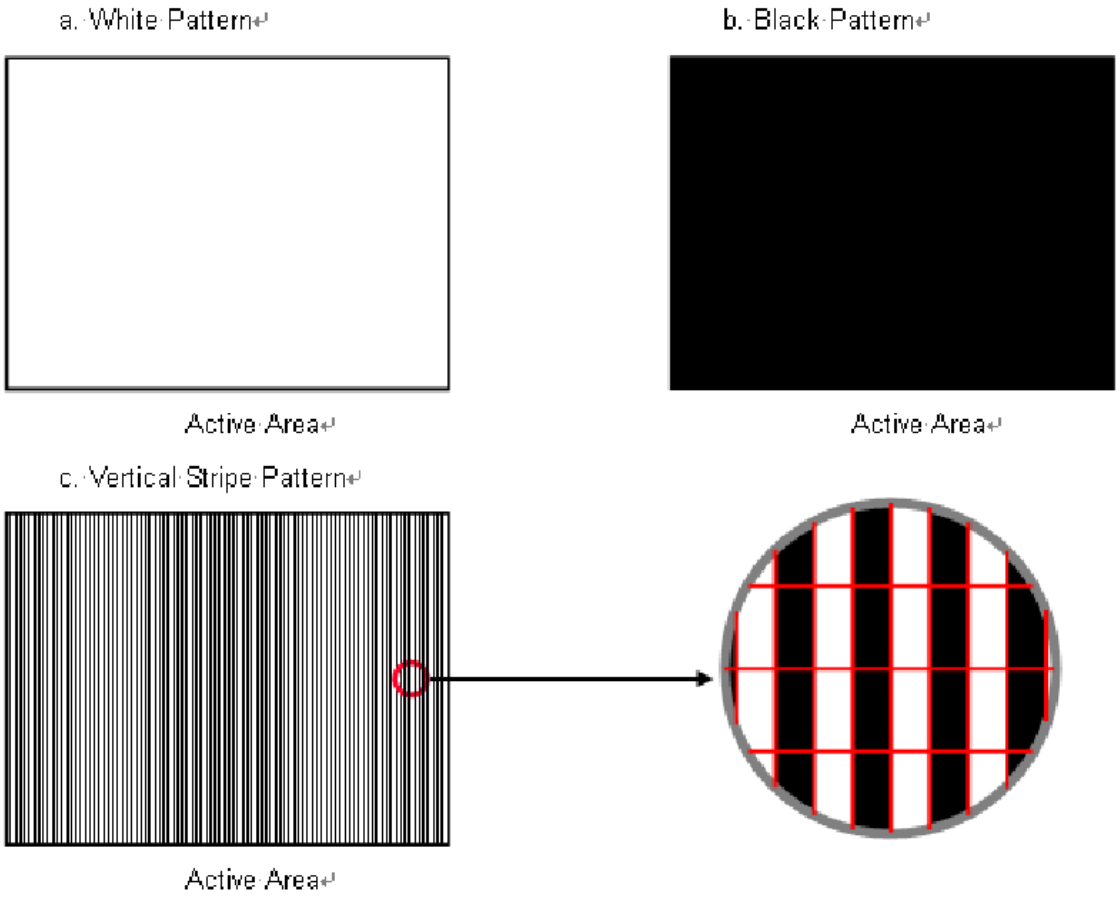
Note(1) The ambient temperature is Ta =25±2℃

Note(2) Measurement Conditions:



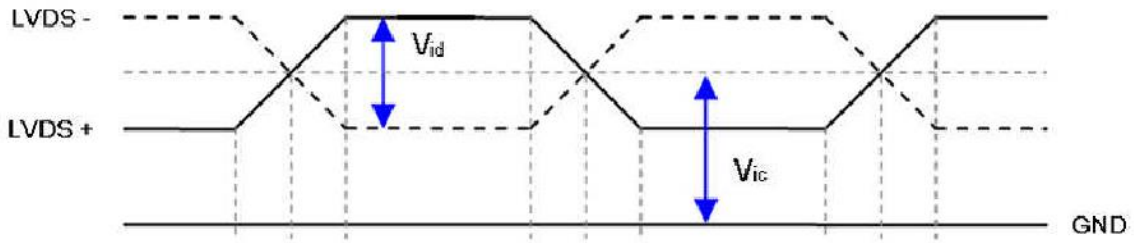


Note(3) The specified power supply current is under the conditions at Vcc=3 3V, Ta=25±2℃, Fr=60Hz, whereas a power dissipation check pattern below is displayed.



Note(4) The power consumption is specified at the pattern with the maximum current.

Note(5) VID waveform condition



4. Interface Timings

4.1 DISPLAY TIMING SPECIFICATIONS

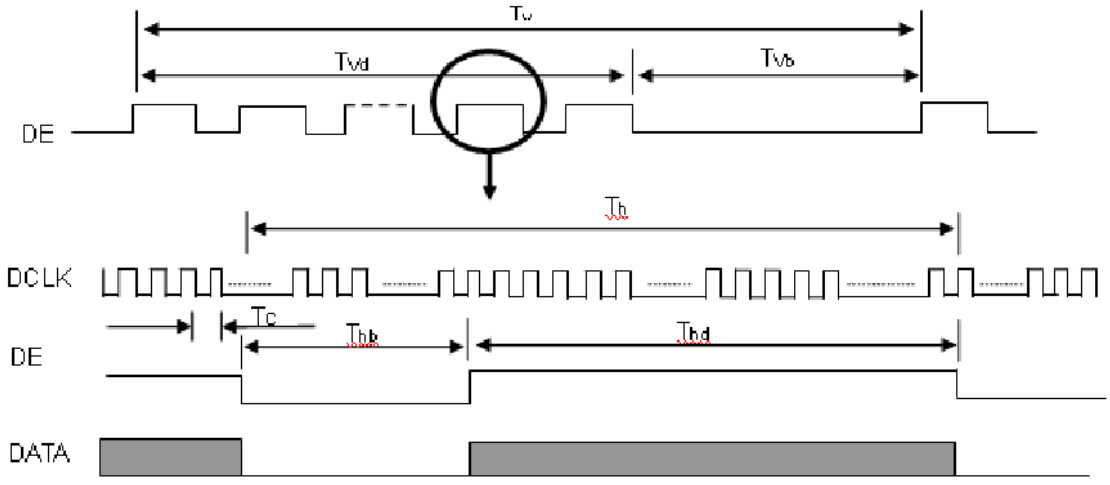
The input signal thiming specifications are shown as the following table and timing diagram.

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
LVDS Clock	Frequency	Fc	60	70.93	75	MHz	-
	Period	Tc		14.1		ns	
	Input cycle to cycle jitter	T_{rcl}	-0.02*Tc		0.02*Tc	ns	(3)
	Input clock to data skew	TLVCCS	-0.02*Tc		0.02*Tc	ns	(4)
	Spread spectrum modulation range	Fclkin_mod	FC*98%		FC*102%	MHz	(5)
	Spread spectrum modulation frequency	F_{SSM}			200	KHz	
Vertical Display Term	Frame Rate	Fr	50	60	60	Hz	Tv=Tvd+Tvb
	Total	Tv	1090	1110	1130	Th	-
	Active Display	Tvd	1080	1080	1080	Th	-
	Blank	Tvb	Tv-Tvd	30	Tv-Tvd	Th	-
Horizontal Display Term	Total	Th	1050	1065	1075	Tc	Th=Thd+Thb
	Active Display	Thd	960	960	960	Tc	-
	Blank	Thb	Th-Thd	105	Th-Thd	Tc	-

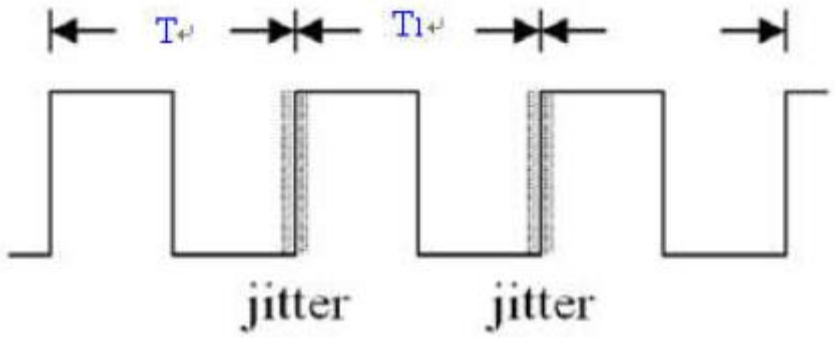
Note(1) Because this module is operated by DE only mode, Hsync and Vsync input signals are ignored.

Note(2) Thed Tv(Tvd+Tvb) must be integer, otherwise this module would operate abnormally.

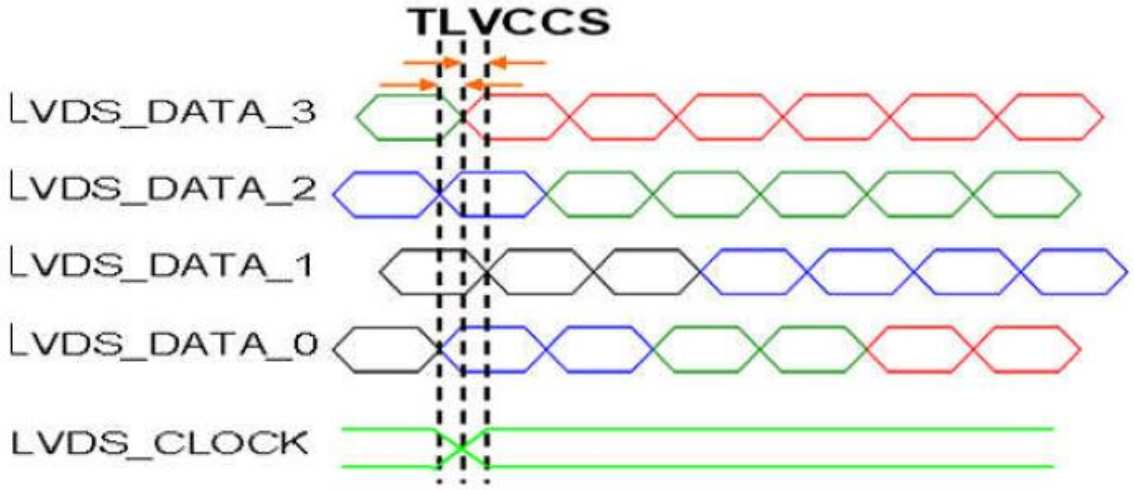
INPUT SIGNAL TIMING DIAGRAM



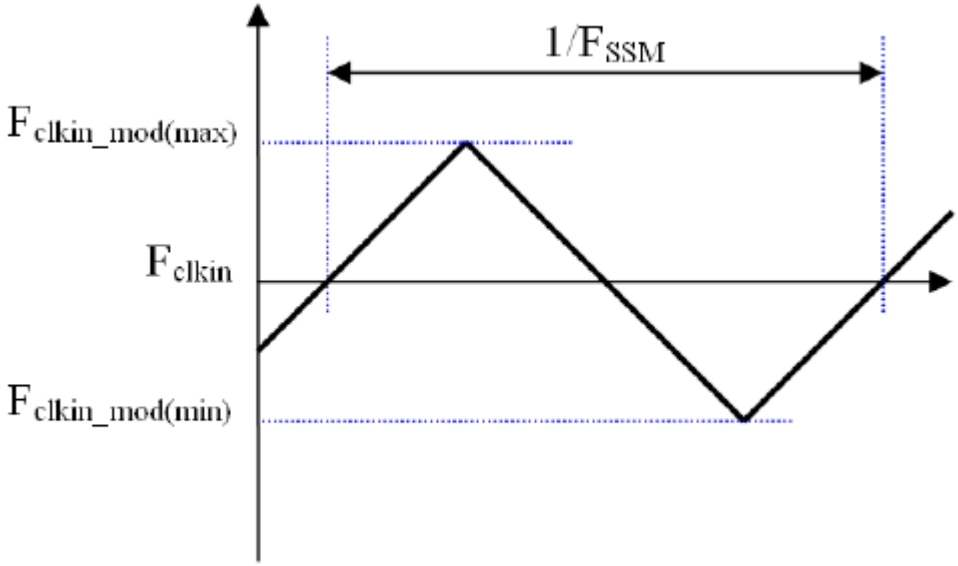
Note(3) The input clock cycle-to-cycle jitter is defined as below figures. Trcl= $|T_1 - T|$



Note(4)Input Clock to data skew is defined as below figures.

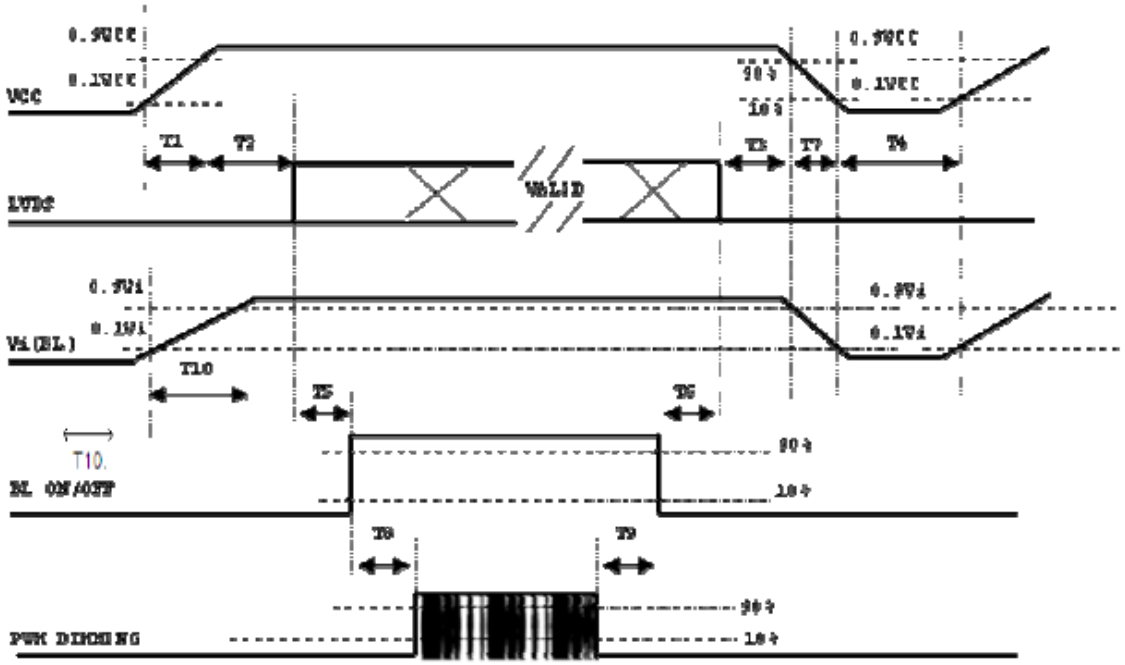


Note(5) The SSCG(Sprand spectrum clock generator) is defined as below figures.



4.2 POWER ON/OFF SEQUENCE

The power swquence specifications are shown as the following table and diagram.



Timing Specifications:

Parameter	Value			Units
	Min	Typ	Max	
T1	0.5	-	10	ms
T2	0	-	50	ms
T3	0	-	50	ms
T4	500	-	-	ms
T5	450	-	-	ms
T6	200	-	-	ms
T7	10	-	100	ms
T8	10	-	-	ms
T9	10	-	-	ms
T10	20	-	50	ms

Note (1) The supply voltage of the external system for the module input should be the same as the definiteion of Vcc.

Note (2) When the backlight turns on before the LCD operation of the LCD turns off , the display may momentarily become abnormal screen.

Note (3) In case of Vcc = off leve, please keep the level of input signals on the low or keep a high impedance.

Note (4) T4 should be measured after the module has been fully discharged between power off and on period.

Note (5) Interface signal shall not be kept at high impedance when the power is on.

Note (6) There might be slight elecronic noise when LCD is turned off(even backlight unit is also off).To avoid this symptom, we suggest “Vcc falling timing” o follow”T7 spec”.

4.3 LVDS INPUT SIGNAL SPECIFICATIONS

4.3.1 LVDS DATA MAPPING TABLE

LVDS Channel O0	LVDS output	D7	D6	D4	D3	D2	D1	D0
	Data order	OG0	OR5	OR4	OR3	OR2	OR1	OR0
LVDS Channel O1	LVDS output	D18	D15	D14	D13	D12	D9	D8
	Data order	OB1	OB0	OG5	OG4	OG3	OG2	OG1
LVDS Channel O2	LVDS output	D26	D25	D24	D22	D21	D20	D19
	Data order	DE	NA	NA	OB5	OB4	OB3	OB2
LVDS Channel O3	LVDS output	D23	D17	D16	D11	D10	D5	D27
	Data order	NA	OB7	OB6	OG7	OG6	OR7	OR6
LVDS Channel E0	LVDS output	D7	D6	D4	D3	D2	D1	D0
	Data order	EG0	ER5	ER4	ER3	ER2	ER1	ER0
LVDS Channel E1	LVDS output	D18	D15	D14	D13	D12	D9	D8
	Data order	EB1	EB0	EG5	EG4	EG3	EG2	EG1
LVDS Channel E2	LVDS output	D26	D25	D24	D22	D21	D20	D19
	Data order	DE	NA	NA	EB5	EB4	EB3	EB2
LVDS Channel E3	LVDS output	D23	D17	D16	D11	D10	D5	D27
	Data order	NA	EB7	EB6	EG7	EG6	ER7	ER6

4.3.2 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color(red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary the color. The table below provides the assignment of color versus data input.

Color		Data Signal																						
		Red							Green								Blue							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	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	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	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	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
Gray Scale Of Red	Red(0) / Dark	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(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
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	Red(253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(254)	1	1	1	1	1	1	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
Gray Scale Of Green	Green(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	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
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	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	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
Gray Scale Of Blue	Blue(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	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
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	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	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

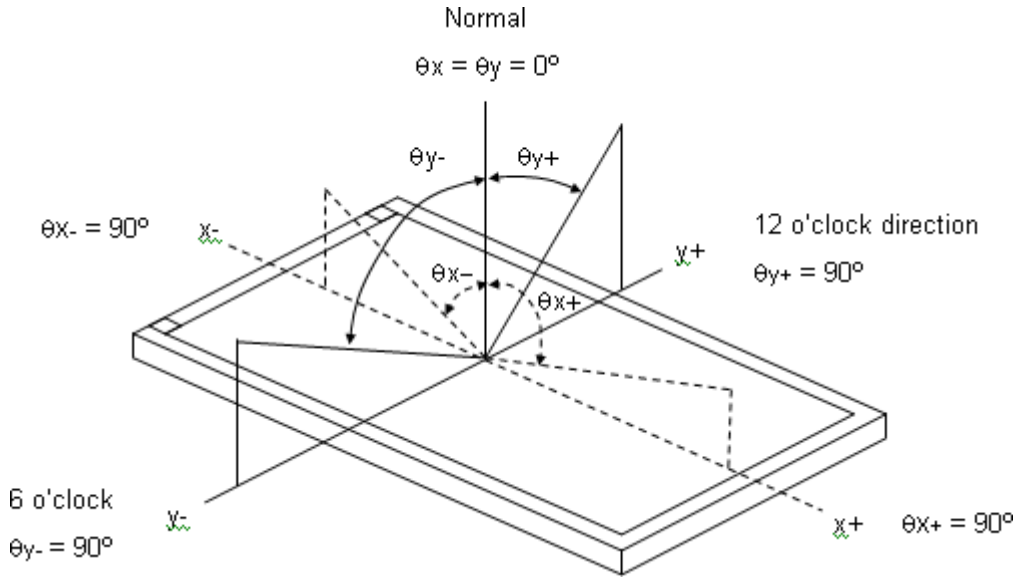
Note (1) 0: Low Level Voltage, 1: High Level Voltage

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	θ_x=0°, θ_Y =0° CS-2000 R=G=B=255 Gray scale	Typ – 0.05	0.652	Typ + 0.05	-	(1), (5)
		Ry			0.338			
	Green	Gx			0.333			
		Gy			0.613			
	Blue	Bx			0.150			
		By			0.050			
	White	Wx			0.313			
		Wy			0.329			
Center Luminance of White		L_C		800	1000	-	cd/m^2	(4), (5)
Contrast Ratio		CR		600	800	-	-	(2), (5)
Response Time		T_R	θ_x=0°, θ_Y =0°	-	13	18	ms	(3)
		T_F		-	12	17		
White Variation		W	θ_x=0°, θ_Y =0°	70	-	-	%	(5), (6)
Viewing Angle	Horizontal	θ_x+	CR ≧ 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 (θx, θy):



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

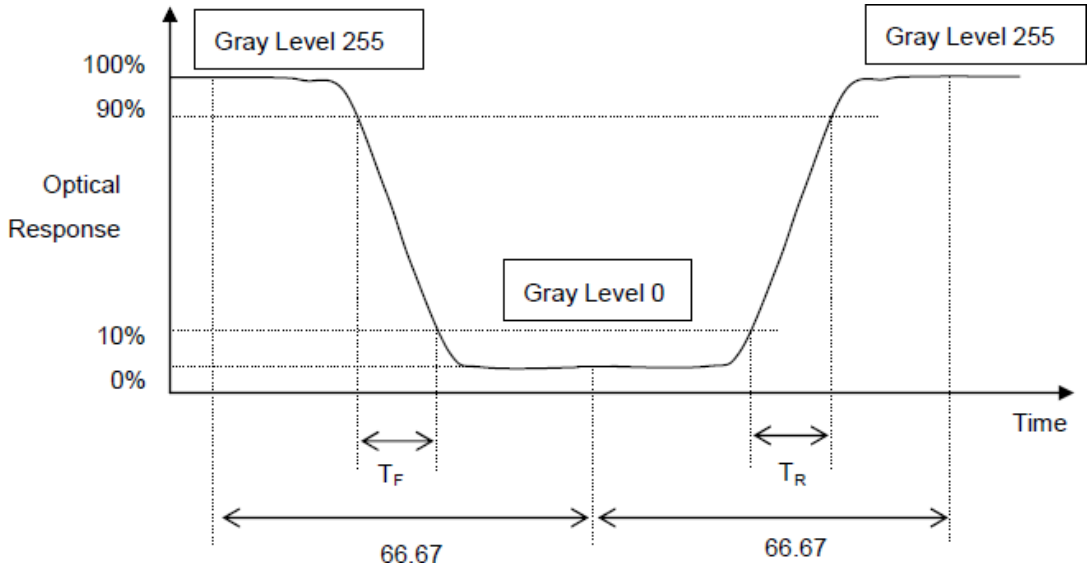
The contrast ratio can be calculated by the following expression. Contrast Ratio (CR) = L255 / L0

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

CR = 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):



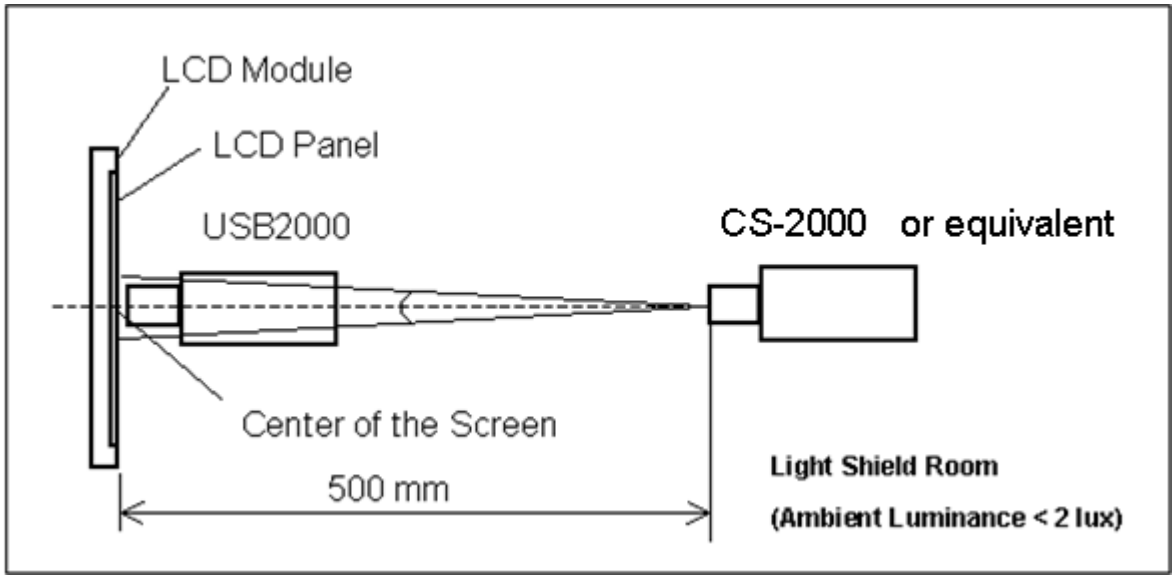
Note (4) Definition of Luminance of White (L_C):

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

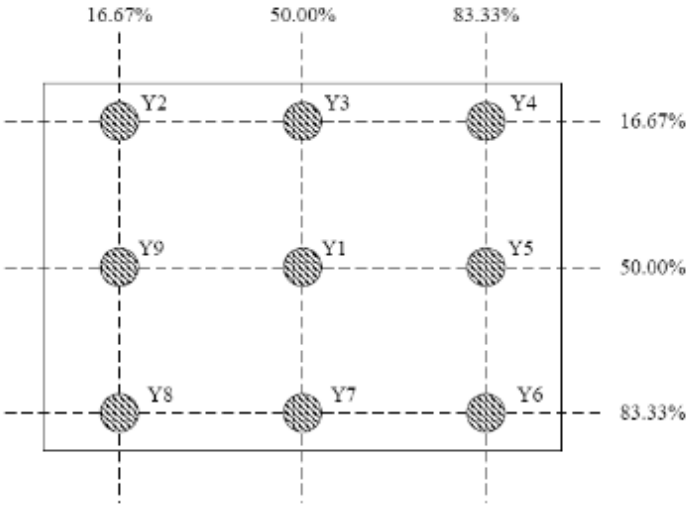
L (x) is corresponding to the luminance of the point X at Figure in Note (6).

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



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

6. Interface Connections

Connector: I-PEX 20455-040E-76 or Equivalent.
Mating Connector: I-PEX 20453-040T-03 or Equivalent.

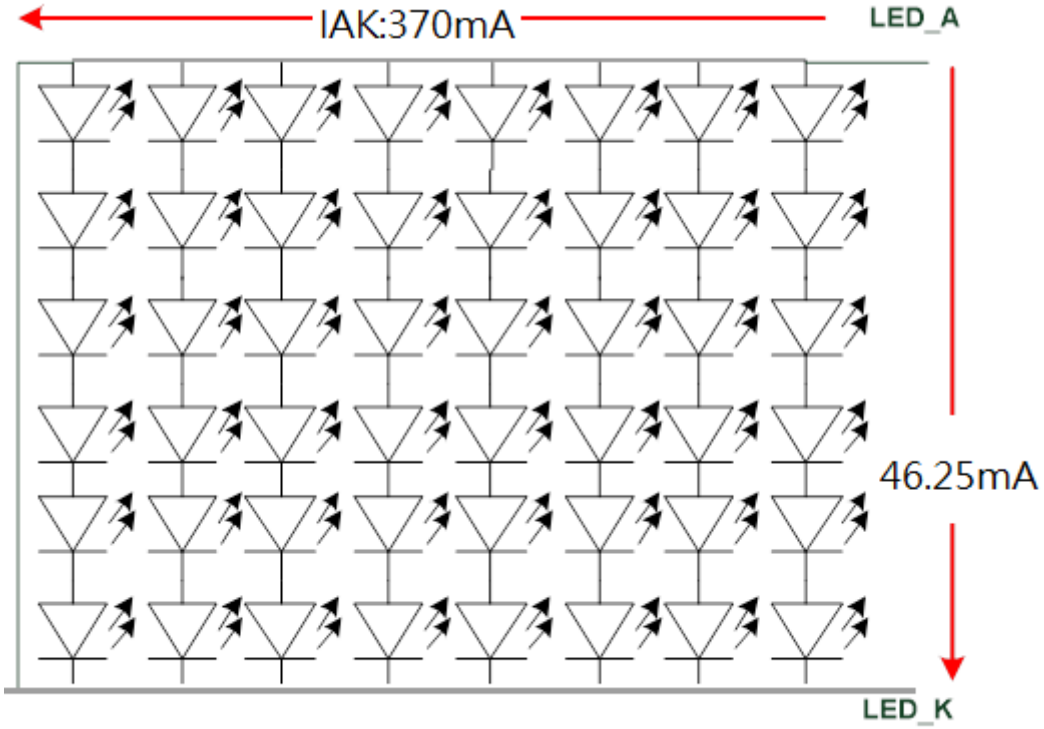
Pin #	Signal Name	Description
1	LED _VCC	+12V Vi power supply
2	LED _VCC	+12V Vi power supply
3	LED _VCC	+12V Vi power supply
4	LED _VCC	+12V Vi power supply
5	GND	Ground
6	GND	Ground
7	GND	Ground
8	GND	Ground
9	LED_EN	LED Enable Pin：High→Enable
10	LED_PWM	PWM Signal for LED Dimming Control
11	LCD _VCC	LCD logic and driver power 3.3V
12	LCD _VCC	LCD logic and driver power 3.3V
13	LCD _VCC	LCD logic and driver power 3.3V
14	NC	Not connection, this pin should be open
15	NC	Not connection, this pin should be open
16	NC	Not connection, this pin should be open
17	LCD GND	LCD logic and driver ground
18	RXO0-	Negative LVDS differential data input. Channel O0 (odd)
19	RXO0+	Positive LVDS differential data input. Channel O0 (odd)
20	RXO1-	Negative LVDS differential data input. Channel O1 (odd)
21	RXO1+	Positive LVDS differential data input. Channel O1 (odd)
22	RXO2-	Negative LVDS differential data input. Channel O2 (odd)
23	RXO2+	Positive LVDS differential data input. Channel O2 (odd)
24	LCD GND	LCD logic and driver ground
25	RXOC-	Negative LVDS differential clock input. (odd)
26	RXOC+	Positive LVDS differential clock input. (odd)
27	LCD GND	LCD logic and driver ground
28	RXO3-	Negative LVDS differential data input. Channel O3(odd)
29	RXO3+	Positive LVDS differential data input. Channel O3 (odd)
30	RXE0-	Negative LVDS differential data input. Channel E0 (even)
31	RXE0+	Positive LVDS differential data input. Channel E0 (even)

32	RXE1-	Negative LVDS differential data input. Channel E1 (even)
33	RXE1+	Positive LVDS differential data input. Channel E1 (even)
34	LCD GND	LCD logic and driver ground
35	RXE2-	Negative LVDS differential data input. Channel E2 (even)
36	RXE2+	Positive LVDS differential data input. Channel E2 (even)
37	RXEC-	Negative LVDS differential clock input. (even)
38	RXEC+	Positive LVDS differential clock input. (even)
39	RXE3-	Negative LVDS differential data input. Channel E3 (even)
40	RXE3+	Positive LVDS differential data input. Channel E3 (even)

7. LED Driving Conditions

Item	Symbol	Values			Unit	Note
		Min.	Typ.	Max.		
LED Driver voltage	VLED	-	12	-	V	
Power Supply Current For LED Driver	ILED	-	1600	-	mA	VLED=12V VADJ=5V (duty 100%)
ADJ Input Voltage	V_{ADJ}	-	5	VLED	V	duty=100%
ADJ Dimming Freq.	F_{ADJ}	0.1		30	kHz	
LED voltage	V_{AK}	--	35.2		V	I_{AK} =370mA Ta=25℃
LED current	I_{AK}	--	370	--	mA	Ta=25℃
		--	277.5	--	mA	Ta=60℃
LED Life Time	-	--	50K	--	Hour	Note (2)

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

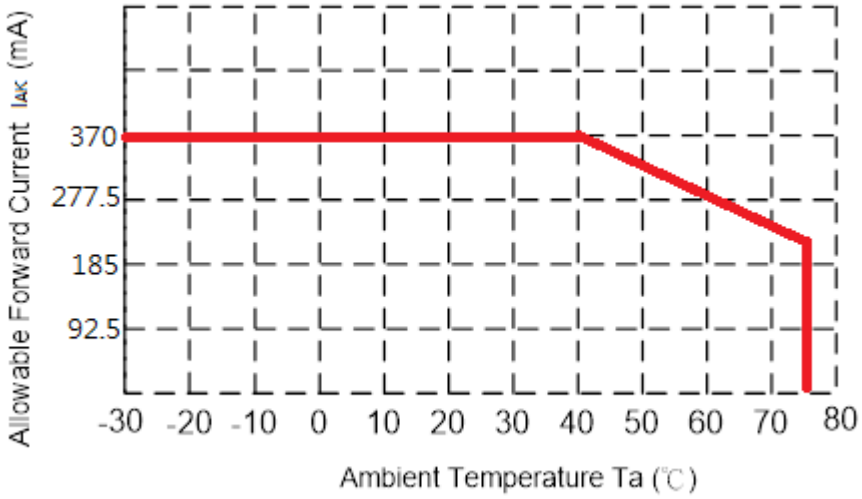


Note (2) : Condition: Ta=25℃, continuous lighting

Life time is estimated data. Definitions of failure:

1. LCM brightness becomes half of the minimum value.
2. LED doesn't light normally.

When LCM is operated over 40℃ ambient temperature, the I_{LED} should follow :



8. Reliability Test

The reliability test items and its conditions are shown below.

Test Item	Test Conditions	Note
High Temperature Operation	75±3°C , t=240 hrs	
Low Temperature Operation	-30±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	50°C, 80% RH , 240 hrs	1,2
Thermal Shock Test	-20°C (30min) ~ 60°C (30min) , 100 cycles	1,2
Vibration Test (Packing)	Sweep frequency : 10~55~10 Hz/1min Amplitude : 0.75mm Test direction : X.Y.Z/3 axes Duration : 30 min/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.

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.

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.

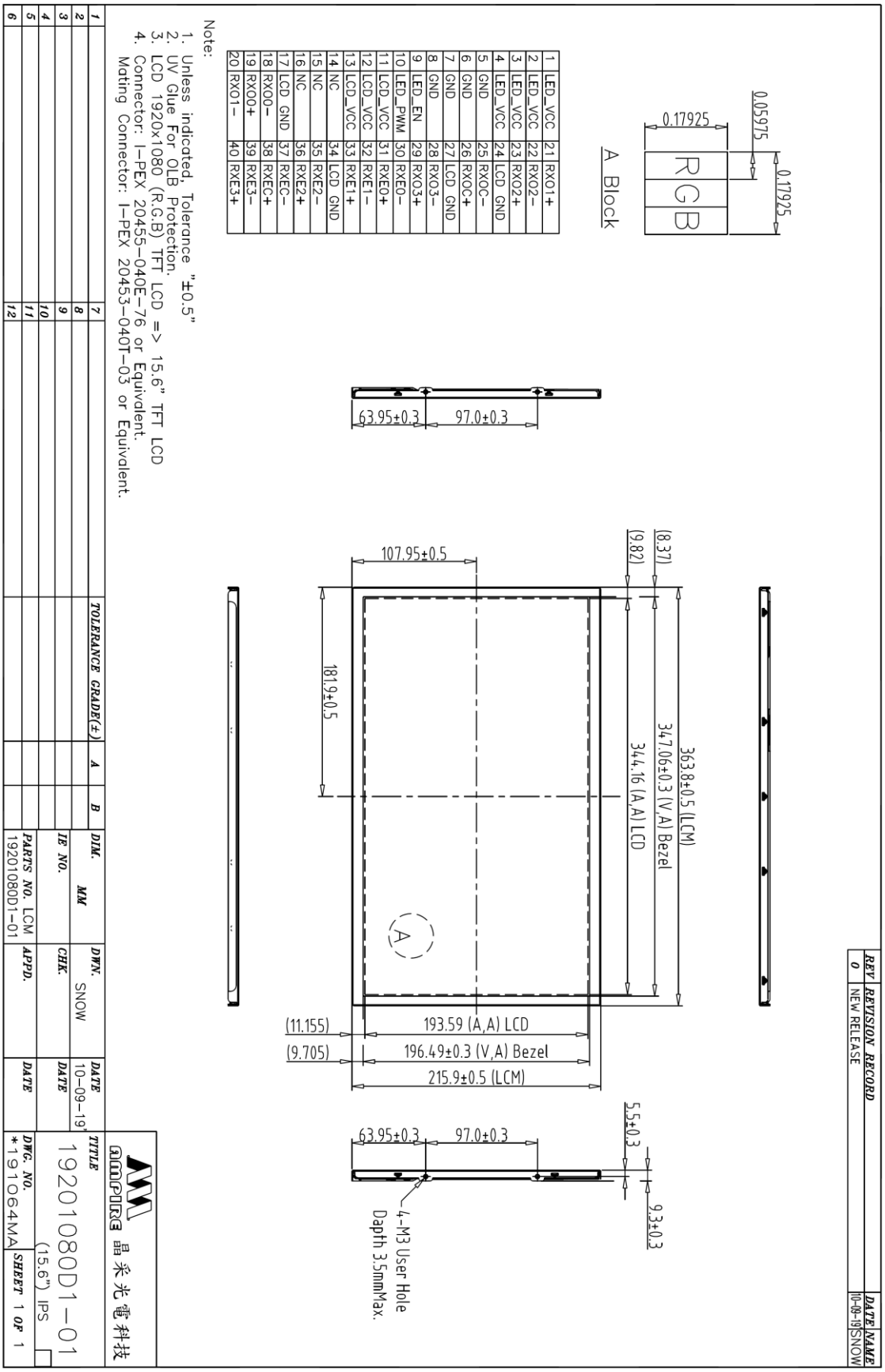
9.10 Disposal

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.

10.0 Outline Dimension



Note:
1. Unless indicated, Tolerance "±0.5"
2. UV Glue For OLB Protection.
3. LCD 1920x1080 (R.G.B) TFT LCD => 15.6" TFT LCD
4. Connector: I-PEX 20455-040E-76 or Equivalent.
   Mating Connector: I-PEX 20453-040T-03 or Equivalent.

REV	REVISION RECORD	DATE	NAME
0	NEW RELEASE	10-09-19	SNOW

	TOLERANCE GRADE(±)	A	B

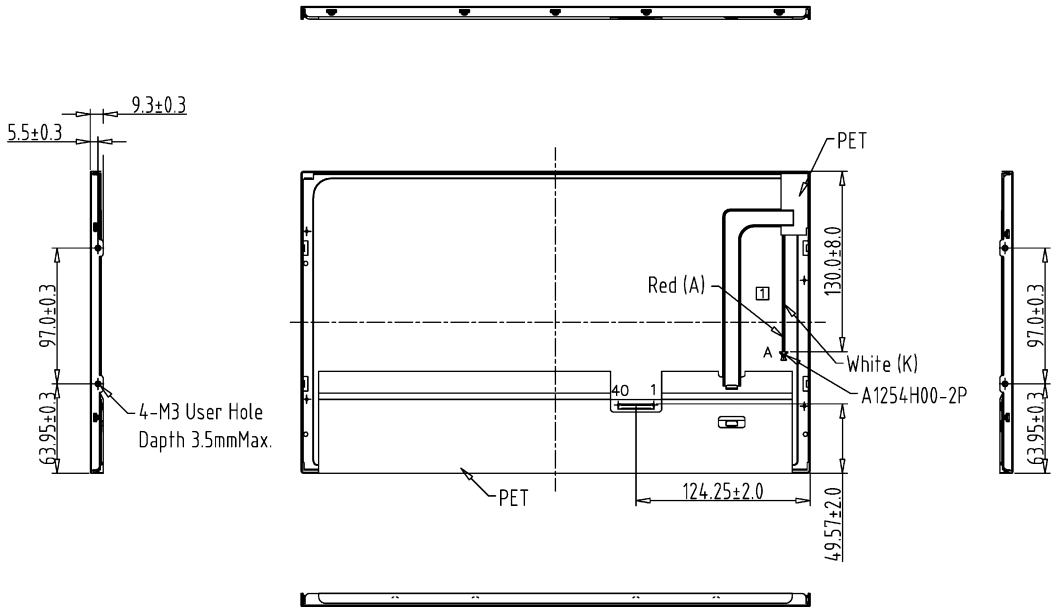
DIM.	DWN.	DATE
MM	SNOW	10-09-19
IE NO.	CHK.	DATE
PARTS NO. LCM 1920108OD1-01	APPD.	DATE

AMPIRE 晶采光電科技

TITLE	
1920108OD1-01 (15.6") IPS	
DWG. NO. *1910164MA	SHEET 1 OF 1

REV	REVISION RECORD	DATE	NAME
0	NEW RELEASE	10-09-19	SNOW
1	Modify Cable	03-20-20	SNOW

1	LED_VCC	21	RXO1+
2	LED_VCC	22	RXO2−
3	LED_VCC	23	RXO2+
4	LED_VCC	24	LCD GND
5	GND	25	RXOC−
6	GND	26	RXOC+
7	GND	27	LCD GND
8	GND	28	RXO3−
9	LED_EN	29	RXO3+
10	LED_PWM	30	RXE0−
11	LCD_VCC	31	RXE0+
12	LCD_VCC	32	RXE1−
13	LCD_VCC	33	RXE1+
14	NC	34	LCD GND
15	NC	35	RXE2−
16	NC	36	RXE2+
17	LCD GND	37	RXEC−
18	RXO0−	38	RXEC+
19	RXO0+	39	RXE3−
20	RXO1−	40	RXE3+



Back view

Note:

1. Unless indicated, Tolerance "±0.5"
2. UV Glue For OLB Protection.
3. LCD 1920x1080 (R.G.B) TFT LCD => 15.6" TFT LCD
4. Connector: I-PEX 20455-040E-76 or Equivalent.
   Mating Connector: I-PEX 20453-040T-03 or Equivalent.

				TOLERANCE GRADE(±)	A	B	DIM. MM	DWN. SNOW	DATE 10-09-19	TITLE 19201080D1-01 (15.6") IPS 1
1		7								
2		8					IE NO.	CHK.	DATE	
3		9								
4		10								
5		11					PARTS NO. LCM-1 19201080D1-01	APPD.	DATE	DWG. NO. *191065MB SHEET 1 OF 1
6		12								

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