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-19201080WTZMW-00H
APPROVED BY	
DATE	

☐ **Preliminary Specification**
■ **Formal Specification**

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APPROVED BY	CHECKED BY	ORGANIZED BY
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This Specification is subject to change without notice.

RECORD OF REVISION

Revision Date	Page	Contents	Editor
2024/2/2	--	New Release	Kokai
2024/5/2	6	Update I_{LED}	Kokai
	11	Update NTSC	
		Add Power consumption	

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 16.7M colors(8bit). The TFT-LCD panel used for this module is a low reflection and higher color type.

1.2 Features

- +3.3V LCD Panel Power
- +12V LED back-light Power
- LVDS (2ch) Interface for 1920 RGB x 1080 resolution
- 16.7M Colors(6bit+FRC)
- Mini LED Back-light and Local Diming Control circuit.
  - High contrast ration > 10000:1
  - High Color gamut by Blue LED + Quantum dot film technology.
- 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	(10000 : 1)	-
Input Voltage	3.3	V
Support Color	16.7M(8Bit)	-
Polarizer Surface	Anti-Glare	-

2.0 Absolute Maximum Ratings

2.1 Electrical Absolute max. ratings

Item	Symbol	Condition	Min.	Max.	Unit	Remark
Power voltage	V_{DD}	GND=0	-0.3	3.6	V	
LED Power voltage	V_{LED}	GND=0	-0.3	13.0	V	
Input voltage	V_{in}		-0.3	V_{DD}+0.3	V	Note 1

Note1: LED_EN, LED_PWM

2.2 Environmental Absolute max. ratings

Item	OPERATING		STORAGE		Remark
	MIN	MAX	MIN	MAX	
Temperature	-20	70	-30	80	Note2,3,4,5,6
Humidity	Note1		Note1		
Corrosive Gas	Not Acceptable		Not Acceptable		

Note1 : Ambient temperature Ta <= 40℃ : 85% RH max

Ta > 40℃: Absolute humidity must be lower than the humidity of 85%RH at 40℃

Note2 : For storage condition Ta at -20℃ < 48h , at 70℃ < 100h

For operating condition Ta at -20℃ < 100h

Note3 : Background color changes slightly depending on ambient temperature. This phenomenon is reversible.

Note4 : The response time will be slower at low temperature.

Note5 : Only operation is guaranteed at operating temperature. Contrast, response time, another display quality are evaluated at +25℃

Note6 : This is center of the panel surface temperature, not ambient temperature.

3.0 ELECTRICAL SPECIFICATIONS

3.1 LCD ELECTRONICS SPECIFICATION

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Power supply	V_{DD}	3.0	-	3.3	V	
LED Driver Power Supply	V_{LED}	11.5	12	12.5	V	
Permissible ripple voltage	VRPC	-	-	100	mVp-p	Note 1
Power Supply current	I_{DD}		(680)	(1100)	mA	Note 2

Note1:

- This product works even if the ripple voltage levels are over the permissible values, but there might be noise on the display image.
- The permissible ripple voltage includes spike noise.
- The load variation influence does not include.

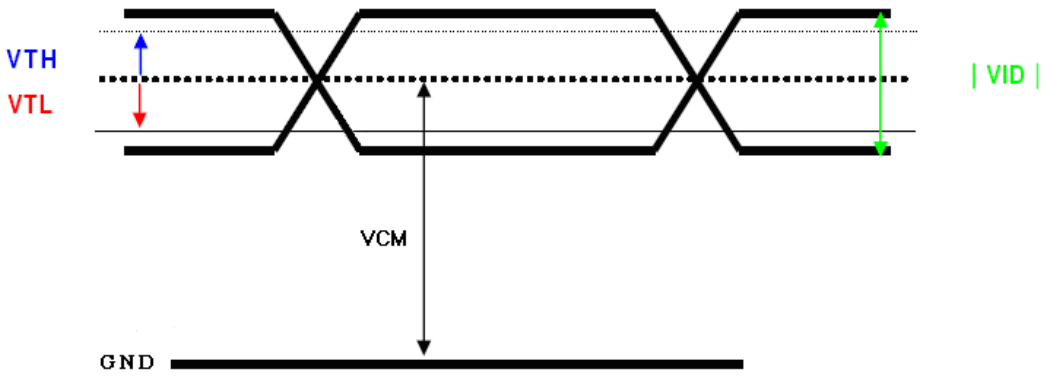
Note2: TFT power supply current. (Will be updated by real sample)

IDD (typ) : V_{DD}=3.0V, f_V =60Hz, Ta=25℃, Checkered flag pattern.

IDD (max) : V_{DD}=3.0V, f_V =60Hz, Ta=25℃, Pattern for maximum current.

3.2 Switching Characteristics of LVDS Receiver

Item	Symbol	Min.	Typ.	Max.	Unit	Condition
Differential Input High Threshold	VTH	--	--	100	mV	VCM=1.2V
Differential Input Low Threshold	VTL	-100	--	--	mV	
Input current	IIN	-10	--	+10	uA	
Differential input Voltage	|VID|	0.2	--	0.6	V	
Common Mode Voltage Offset	VCM	$\frac{\lvert VID \rvert}{2}$	1.25	2.4-$\frac{\lvert VID \rvert}{2}$	V	



3.3 Electrical characteristic of Min LED Back-light

Power supply and driving control of the Mini LED Back-light							
Item		**Symbol**	**Min.**	**Typ.**	**Max.**	**Unit**	**Note**
Input Voltage		V_{LED}	11.5	12	12.5	V	
Input Current		I_{LED}	--	(3.2)	(3.8)	A	Note 1
Power consumption		P_{LED}		38.4	47.5	W	
LED_PWM	Frequency	Fpwm	(100)		(200)	Hz	For design reference only, will be updated by real sample.
	Signal Logic High	VIH	(1.2)	--	(3.3)	V	
	signal logic Low	VIL	0	--	(0.4)	V	
	Duty		(5)		100	%	
LED_EN	Signal Logic High	VIH	(1.2)	--	(3.3)	V	
	signal logic Low	VIL	0	--	(0.4)	V	

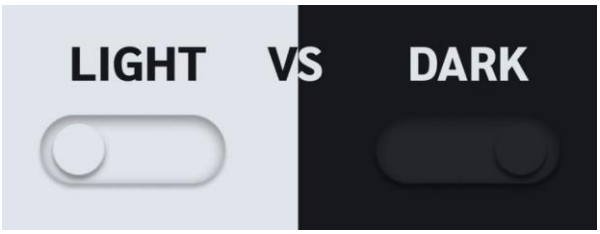
Structure of Mini LED Back-light For reference only, the driving circuit is included.						
Item	**Symbol**	**Min.**	**Typ.**	**Max.**	**Unit**	**Note**
LED Zone	3 parallel strings and 3 series of a LED zone.					
Partition	576				LED Zone	
Total LED	5184				pcs	
LED Zone Forward Current	IF	--	--	15	mA	5mA/LED
LED Forward Voltage	VF	2.6*3	--	2.9*3	V	
LED life time			50,000	-	Hr	Note 1,2,3,4

Note 1: The LED driver current is dynamic and relative to the display pattern. The value defined as following condition. VLED=12V. Full all white pattern. All the LED chips are turn on by 5mA.

Note 2: If the module is driven by high current or at high ambient temperature & humidity condition. The operating life will be reduced.

Note 3: LED life time means brightness goes down to 50% minimum brightness. LED life time is estimated data. Ta=25℃

Note 4: Dark UI can enhance the life time and reduce power consumption.



4. Interface Timings

4.1 DISPLAY TIMING SPECIFICATIONS

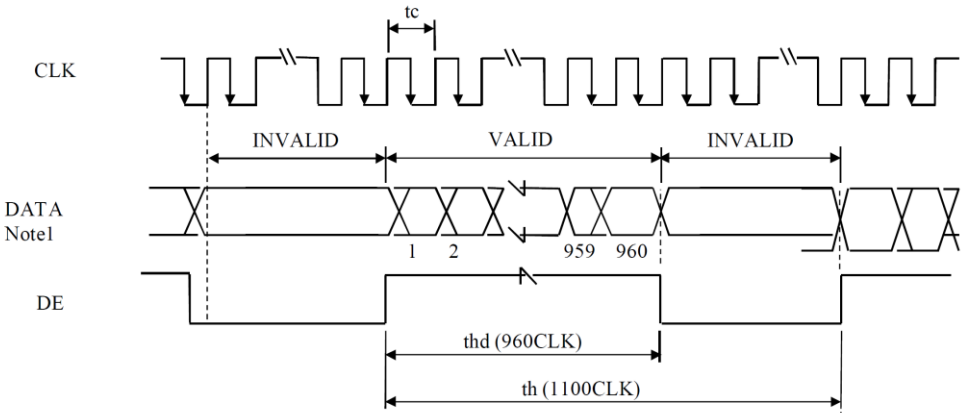
The input signal timing specifications are shown as the following table and timing diagram.

(Note1, Note2, Note3)

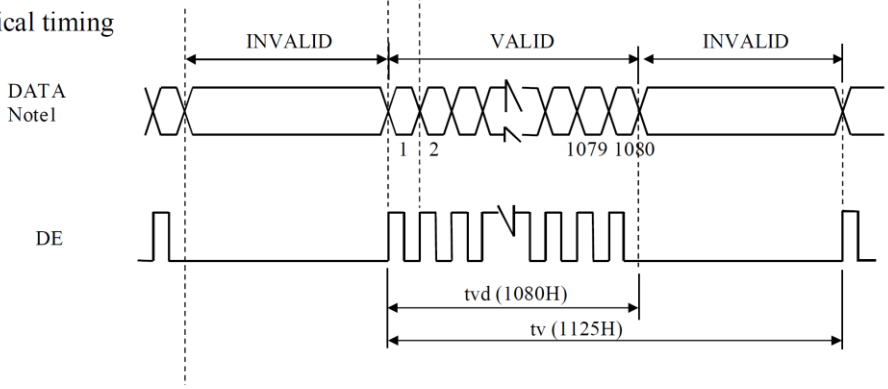
Parameter			Symbol	min.	typ.	max.	Unit	Remarks
CLK	Frequency		1/tc	65.0	74.175	81.5	MHz	13.48ns (typ.)
	Duty ratio		-	-			-	-
	Rise time, Fall time		-				ns	
DATA	CLK-DATA	Setup time	-	-			ns	-
		Hold time	-				ns	
	Rise time, Fall time		-				ns	
DE	Horizontal	Cycle	th	13.19	14.83	16.53	μs	67.43kHz (typ.)
				1,075	1,100	-	CLK	
		Display period	thd	960			CLK	-
	Vertical (One frame)	Cycle	tv	15.39	16.68	18.18	ms	59.94Hz (typ.)
				1,100	1,125	-	H	
		Display period	tvd	1,080			H	-
	CLK-DE	Setup time	-	-			ns	-
		Hold time	-				ns	
	Rise time, Fall time		-				ns	

Note1: Definition of parameters is as follows.
tc= 1CLK, th= 1H
Note2: See the data sheet of LVDS transmitter.
Note3: Vertical cycle (tv) should be specified in integral multiple of Horizontal cycle (th).

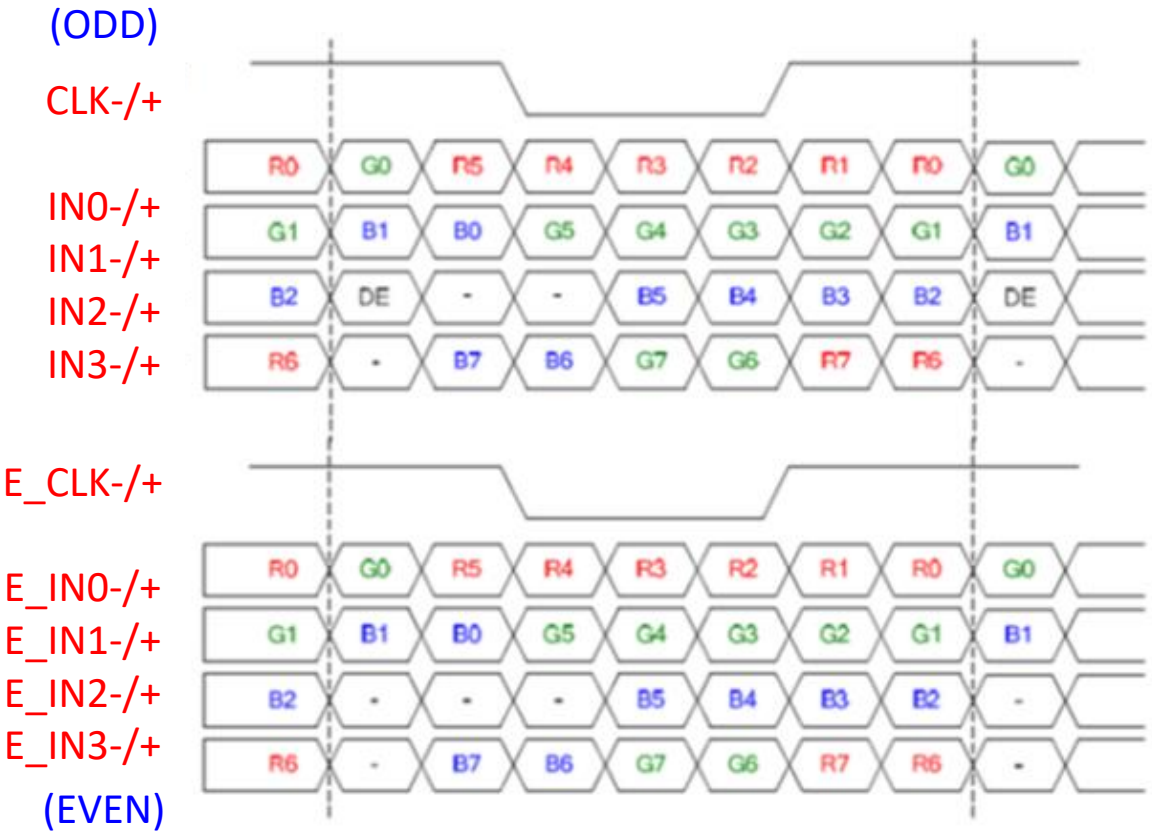
Horizontal timing



Vertical timing



4.2 LVDS data mapping



LVDS data mapping (VESA standard)

4.3 POWER ON/OFF SEQUENCE

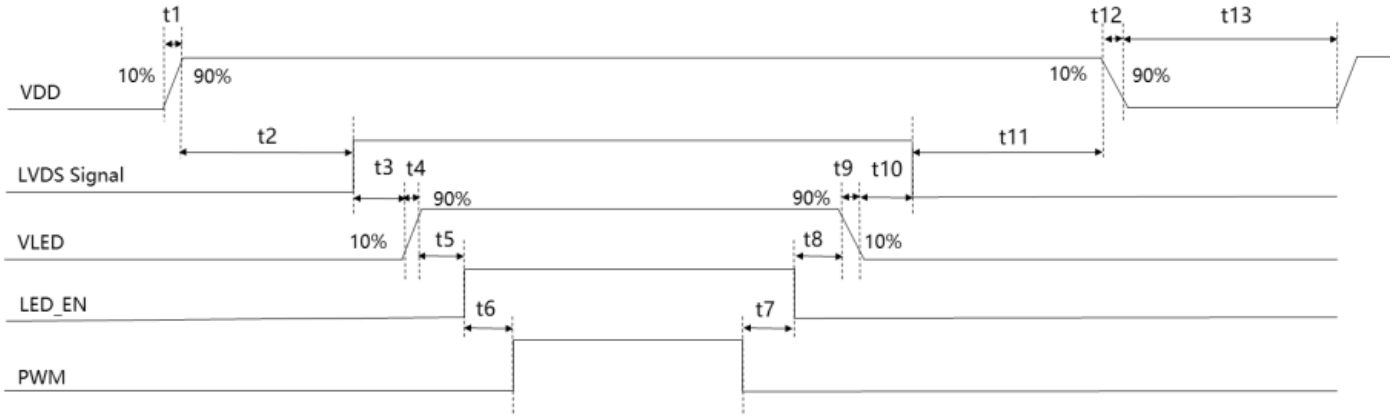


Table 4.3 Power on sequence

Symbol	Min	Typ	Max	Unit	Remark
t1	1	-	3	ms	
t2	-	-	1	ms	
t3	200	-	-	ms	
t4	1	-	-	ms	Note 1
t5	2	-	-	ms	
t6	2	-	-	ms	
t7	2	-	-	ms	
t8	2	-	-	ms	
t9	1	-	-	ms	
t10	200	-	-	ms	
t11	200	-	-	ms	
t12	1	-	3	ms	
t13	1000	-	-	ms	

Note1: Display at least two black frames before signal off. It is advised that backlight turned on later than display stabled.

Note2: The low level of these signals and analog powers are GND level.

Note3: All of the power and signals should be kept at GND level before power on. If there are residual voltages on them, the LCD might not work properly.

Note4: The power on/off sequence is the first version. It will be updated when the design is fixed.

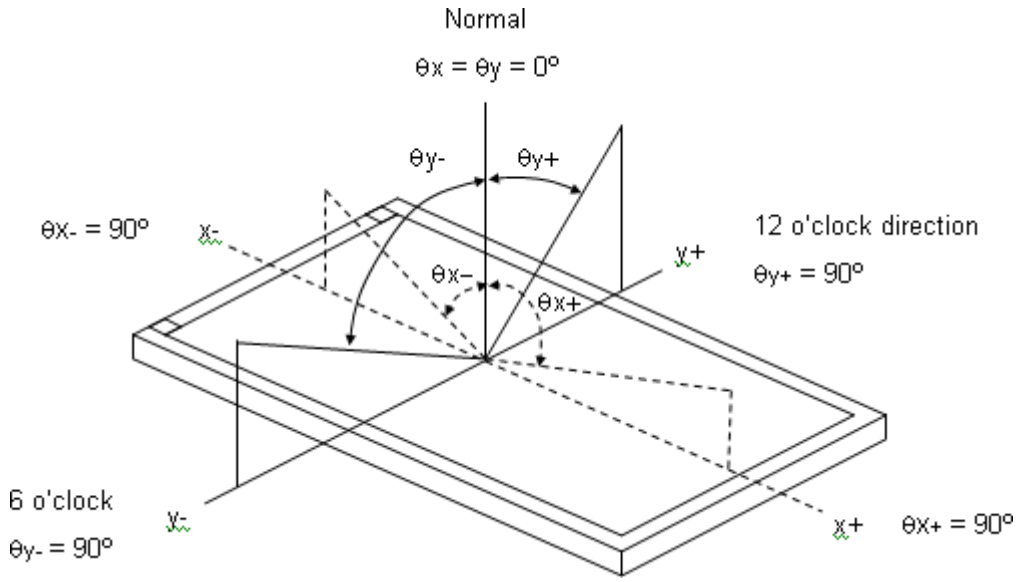
Note5: Keep LED_EN at low level until the display has stabilized.

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	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		L_C		800	1000	-	cd/m^2	(4), (5)
Contrast Ratio		CR		10000	-	-	-	(2), (5)
Response Time		T_R	θ_x=0°, θ_Y =0°	-	25	40	ms	(3)
		T_F		-				
Uniformity		U	θ_x=0°, θ_Y =0°	70	75	-	%	(5), (6)
NTSC		-		105	115		%	
Viewing Angle	Horizontal	θ_x+	CR ≧ 10	80	88	---	Deg.	(1), (5)
		θ_x-		80	88			
	Vertical	θ_Y+		80	88			
		θ_Y-		80	88	---		

Note (1) Definition of Viewing Angle (θx, θy):



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

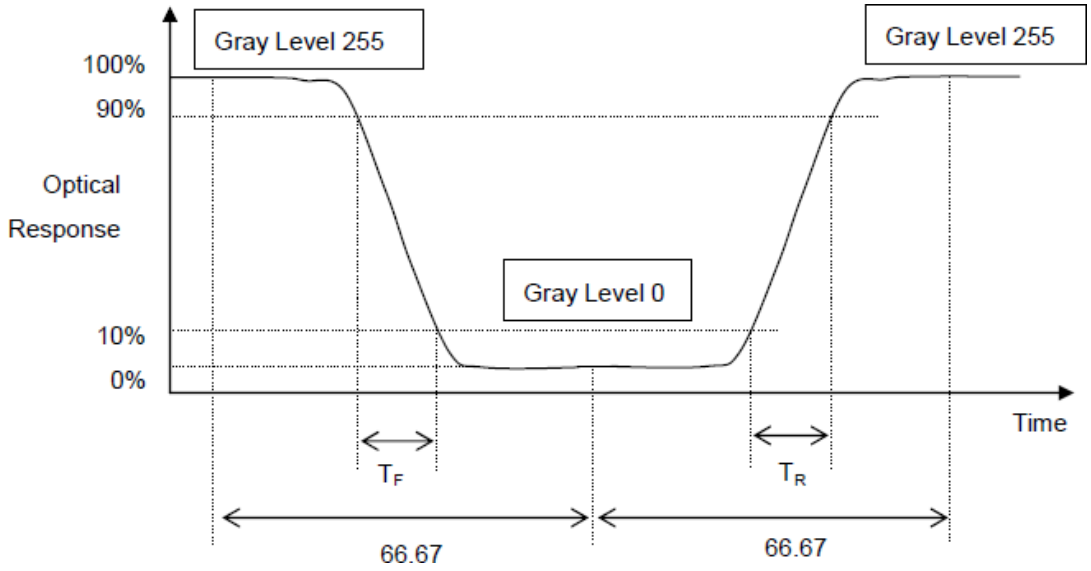
The contrast ratio can be calculated by the following expression. Contrast Ratio (CR) = L255 / L0

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):



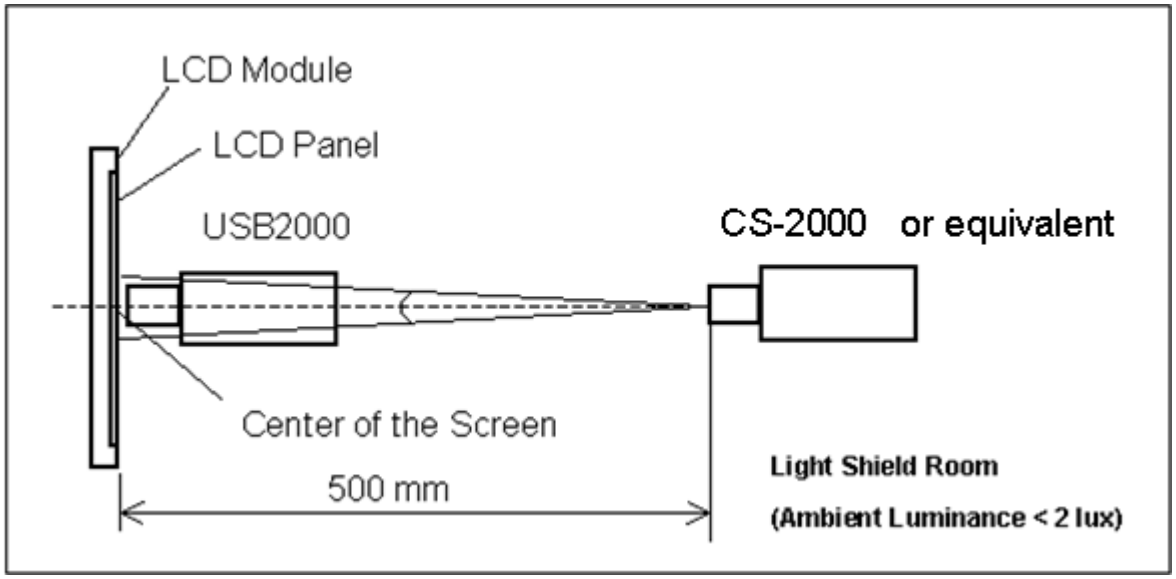
Note (4) Definition of Luminance of White (L_C):

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

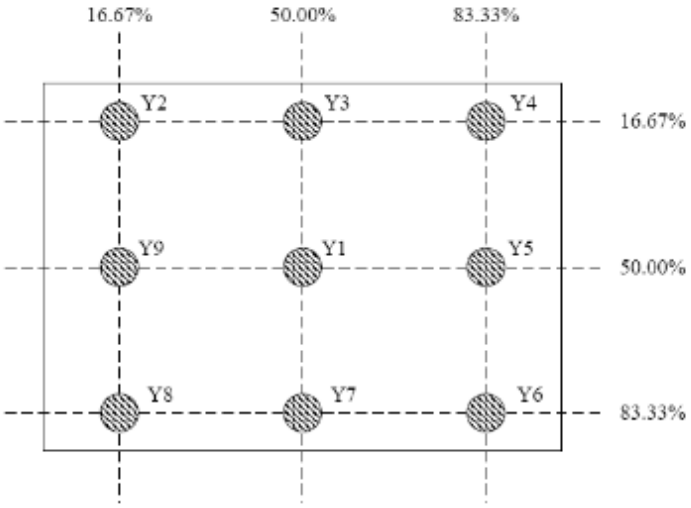
L (x) is corresponding to the luminance of the point X at Figure in Note (6).

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

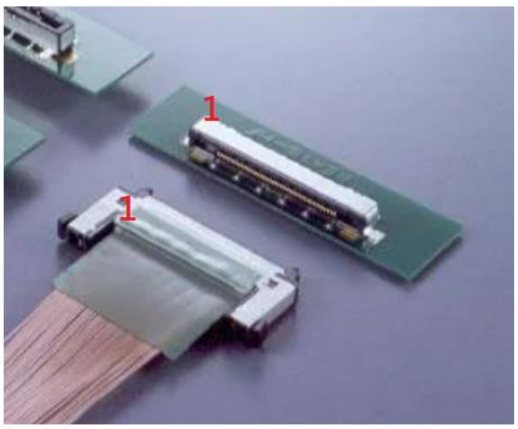


$$\text{Luminance uniformity} = \frac{\text{(Min Luminance of 9 points)}}{\text{(Max Luminance of 9 points)}} \times 100\%$$

6. Interface Connections

Connecter : JAE FI-RE51S-HF or Equivalent Mating connecter : FI-RE51HL		
Pin	Name	Description
1~7	VLED	Power Supply input for LED back-light driving circuit.（+12V）
8	LED_EN	Backlight on/off control signal(1:on, 0:off)
9	GND	Ground
10	GND	Ground
12	IN0-	ODD pixel -LVDS differential data input (R0~R5,G0)
13	IN0+	ODD pixel +LVDS differential data input (R0~R5 G0)
14	IN1-	ODD pixel -LVDS differential data input (G1~G5,B0,B1)
15	IN1+	ODD pixel +LVDS differential data input (G1~G5,B0,B1)
16	IN2-	ODD pixel -LVDS differential data input (B2~B5,-,-,DE)
17	IN2+	ODD pixel +LVDS differential data input (B2~B5,-,-,DE)
18	GND	Ground
19	CLK-	ODD pixel -LVDS differential Clock input
20	CLK+	ODD pixel +LVDS differential Clock input
21	GND	Ground
22	IN3-	ODD pixel -LVDS differential data input (R6~R7,G6~G7,B6~B7)
23	IN3+	ODD pixel +LVDS differential data input (R6~R7,G6~G7,B6~B7)
24	VDD	Power Supply input for TFT Panel driving circuit.（+3.3V）
25	VDD	Power Supply input for TFT Panel driving circuit.（+3.3V）
26	GND	Ground
27	GND	Ground
28	E_IN0-	EVEN pixel -LVDS differential data input (R0~R5,G0)
29	E_IN0+	EVEN pixel +LVDS differential data input (R0~R5 G0)
30	E_IN1-	EVEN pixel -LVDS differential data input (G1~G5,B0,B1)
31	E_IN1+	EVEN pixel +LVDS differential data input (G1~G5,B0,B1)
32	E_IN2-	EVEN pixel -LVDS differential data input (B2~B5,-,-,DE)
33	E_IN2+	EVEN pixel +LVDS differential data input (B2~B5,-,-,DE)
34	GND	Ground
35	E_CLK-	EVEN pixel -LVDS differential Clock input
36	E_CLK+	EVEN pixel +LVDS differential Clock input
37	GND	Ground
38	E_IN3-	EVEN pixel -LVDS differential data input (R6~R7,G6~G7,B6~B7)
39	E_IN3+	EVEN pixel +LVDS differential data input (R6~R7,G6~G7,B6~B7)
40~46	GND	Ground
47~51	VLED	Power Supply input for LED back-light driving circuit.（+12V）

Note 1st pin location:



7. 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	50°C, 80% RH , 240 hrs	1,2
Thermal Shock Test	-20°C (30min) ~ 70°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 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℃ , 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.

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 the initial value.

8 . GENERAL PRECAUTION

8.1 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.

8.2 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.

8.3 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.

8.4 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.

8.5 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.

8.6 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.

8.7 Mechanism

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

8.**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.

8.9 Strong Light Exposure

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

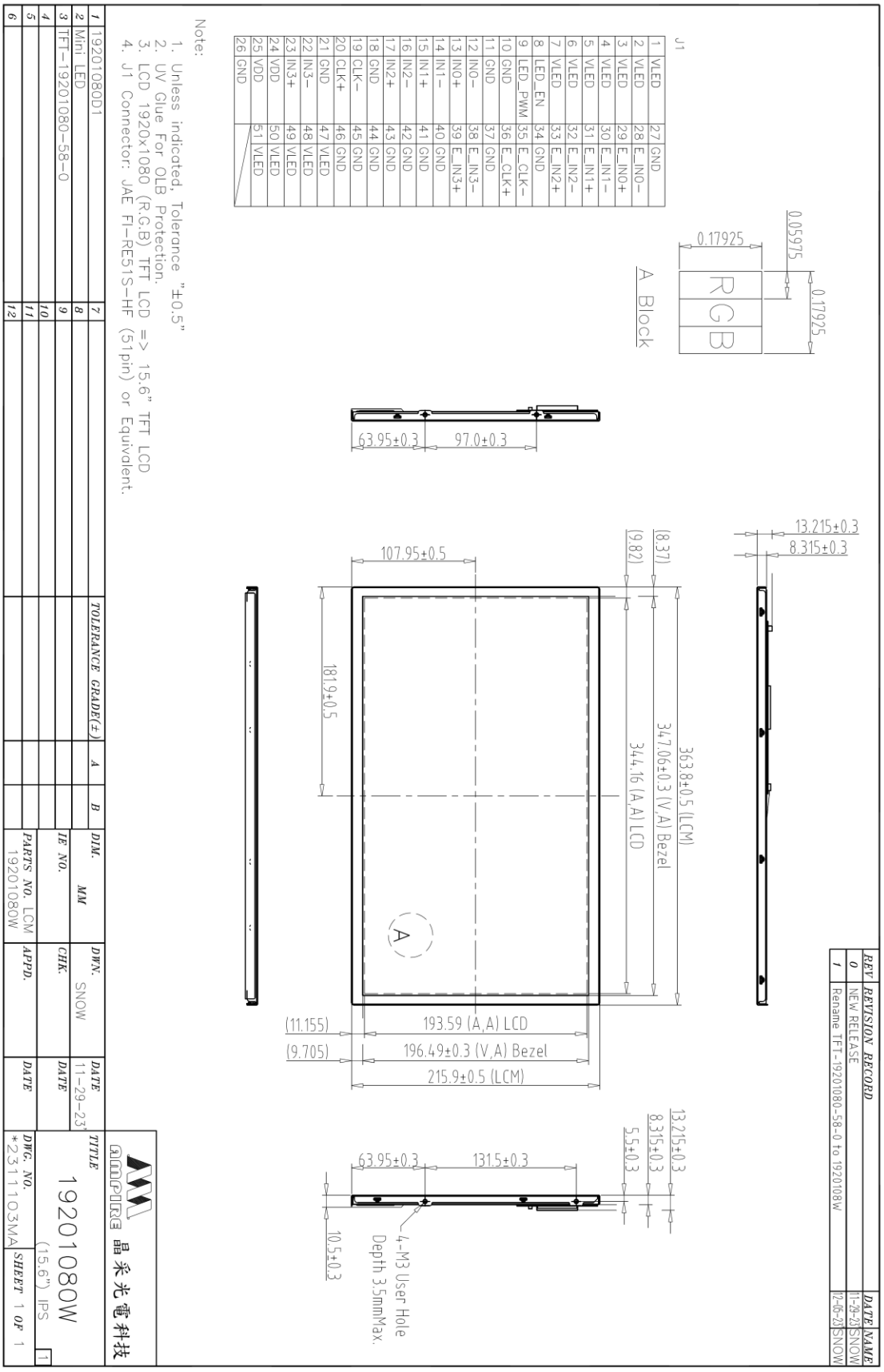
8.**10 Disposal**

When disposing LCD module, obey the local environmental regulations.

8.**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.

9 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. J1 Connector: JAE FI-RE51S-HF (51pin) or Equivalent.

REV.	REVISION RECORD	DATE	NAME
0	NEW RELEASE	11-29-23	SNOW
1	Rename TFT-19201080-58-0 to 19201080W	12-05-23	SNOW

1	19201080D1	7		TOLERANCE GRADE(±)	A	B	DIM. MM	DWN. SNOW	DATE 11-29-23
2	Mini LED	8					IE NO.	CHK.	DATE
3	TFT-19201080-58-0	9					PARTS NO. LCM 19201080W	APPD.	DATE
4		10							
5		11							
6		12							

晶采光電科技 AMPIRE

TITLE: 19201080W (15.6") IPS

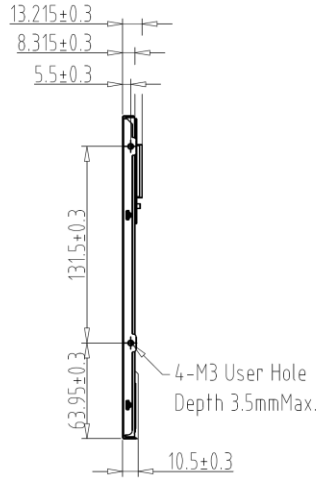
DWG. NO. *23111O3MA

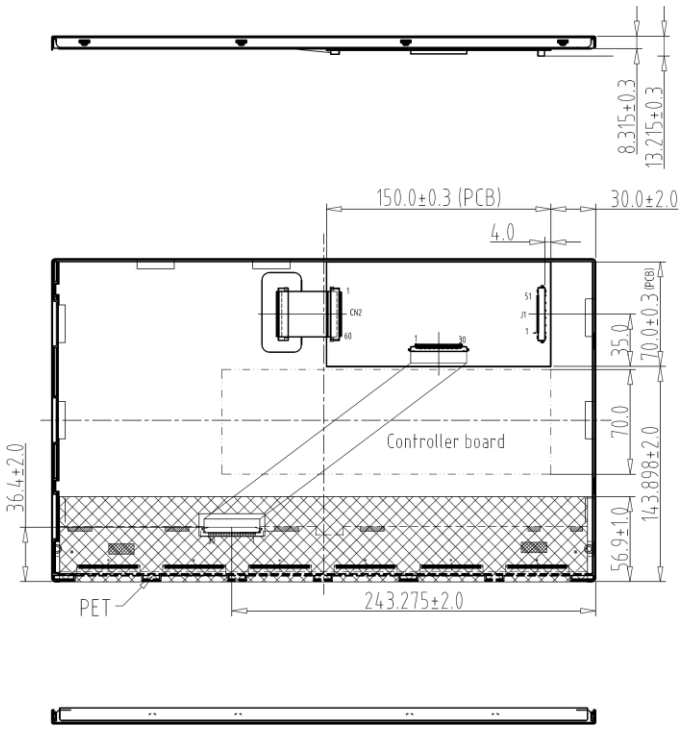
SHEET 1 OF 1

REV	REVISION RECORD	DATE	NAME
0	NEW RELEASE	11-29-23	SNOW
1	Rename TFT-19201080-58-0 to 1920108W	12-05-23	SNOW

J1

1	VLED	27	GND
2	VLED	28	E_IN0−
3	VLED	29	E_IN0+
4	VLED	30	E_IN1−
5	VLED	31	E_IN1+
6	VLED	32	E_IN2−
7	VLED	33	E_IN2+
8	LED_EN	34	GND
9	LED_PWM	35	E_CLK−
10	GND	36	E_CLK+
11	GND	37	GND
12	IN0−	38	E_IN3−
13	IN0+	39	E_IN3+
14	IN1−	40	GND
15	IN1+	41	GND
16	IN2−	42	GND
17	IN2+	43	GND
18	GND	44	GND
19	CLK−	45	GND
20	CLK+	46	GND
21	GND	47	VLED
22	IN3−	48	VLED
23	IN3+	49	VLED
24	VDD	50	VLED
25	VDD	51	VLED
26	GND		





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. J1 Connector: JAE FI-RE51S-HF (51pin) or Equivalent.

1	19201080D1	7		TOLERANCE GRADE(±)	A	B	DIM. MM	DWN. SNOW	DATE 11-29-23
2	Mini LED	8							
3	TFT-19201080-58-0	9					IE NO.	CHK.	DATE
4		10							
5		11					PARTS NO. LCM-1 19201080W	APPD.	DATE
6		12							

晶采光電科技

TITLE: 19201080W (15.6") IPS 1

DWG. NO. *2311104MA

SHEET 1 OF 1

10 Package

T.B.D