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-1920720ETZQW-00H
APPROVED BY	
DATE	

☐ Preliminary Specification
■ Formal Specification

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APPROVED BY	CHECKED BY	ORGANIZED BY
Kokai	Mark	Lawlite

This Specification is subject to change without notice.

RECORD OF REVISION

Revision Date	Page	Contents	Editor
2021/08/09	--	New Release	Lawlite
2021/10/15	10	Modify Connector Type	Tank
2023/02/08	6	Add Current Temperature Comparison Table	Mantle
	11	Add Note for NTC	
2025/02/13	6	Update LED Lifetime Typ. value	

1. INTRODUCTION

12.3” color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, driver ICs ,control circuit and LED backlight. By applying 1920X720 images are displayed on the 12.3 ” diagonal screen. Display 16.7M colors by R.G.B signal input.

2. PHYSICAL SPECIFICATIONS

Item	Specifications	Remark
LCD size	12.3 inch(Diagonal)	
Active area	292.032 (W) x 109.512 (H) mm	
Number of Pixels	1920(H) × 3 (RGB) × 720(V)	
Color arrangement	R.G.B-stripe	
Display mode	Normally Black	
Number of Colors	16.7M	
Brightness (cd/m^2)	800nit(min) / 1000nit(typ)	
Response Time (ms)	30ms(Max.)	
Contrast Ratio	1000:1(Typ.)	
Viewing Angle (CR≧10)	170degree (Horizontal.)	
	170degree (Vertical)	
Driver element	Active matrix TFT in IPS technology	
Interface	LVDS	
Module Size (mm)	(299.032)(Typ.) x (123.012)(Typ.) x (8.023) (Max.)	
Module Weight (g)	(380) (Max)	
Surface Treatment	HC/3H	

3. ABSOLUTE MAX. RATINGS

The following are maximum values which, if exceeded, may cause faulty operation or damage to the unit.

Item	Symbol	Min.	Max.	Unit	Note
Supply voltage range	VCC	-0.3	4.0	V	
Logic Input Signal Voltage	VI	-0.3	2.4	V	
Operating Temperature	Top	-30	+85	℃	
Storage Temperature	Tstg	-40	+90	℃	

Note : All voltage values are with respect to the GND terminals unless otherwise noted.

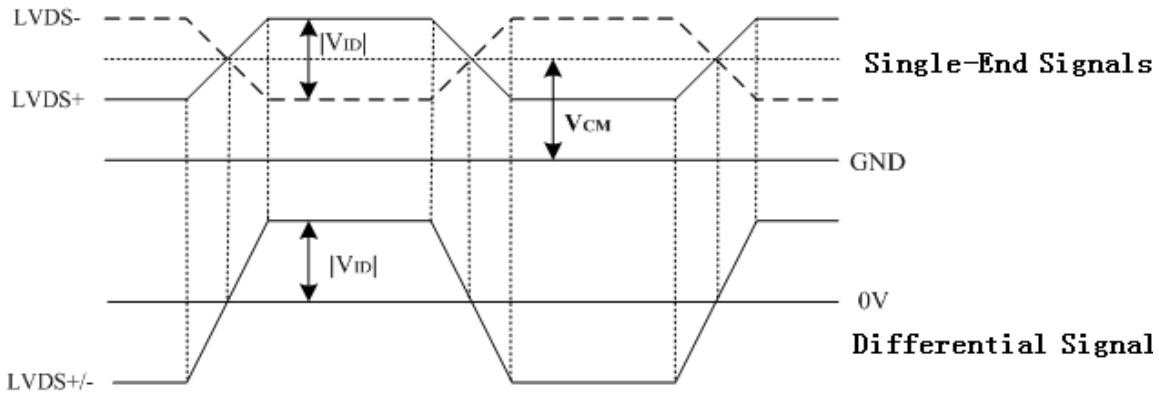
4. ELECTRICAL CHARACTERISTICS

4.1. Power Specification

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	VCC	3.0	3.3	3.6	V	
Input Signal Voltage	VIH	3.0		3.6	V	
	VIL	0		0.4	V	
VCC Current	ICC	--	--	460	mA	VCC =3.3V Note (1)
LVDS DRIVER DC SPECIFICATIONS						
Differential Output Voltage	|VID|	100	--	600	mV	RL=100ohm (2)
Common Mode Voltage	VCM	1	1.2	(1.7-|VID|/2)	mV	
LVDS RECEIVER DC SPECIFICATIONS						
Differential Input High Threshold	VTH	--	--	+100	mV	(2)
Differential Input Low Threshold	VTL	-100	--	--	mV	

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

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

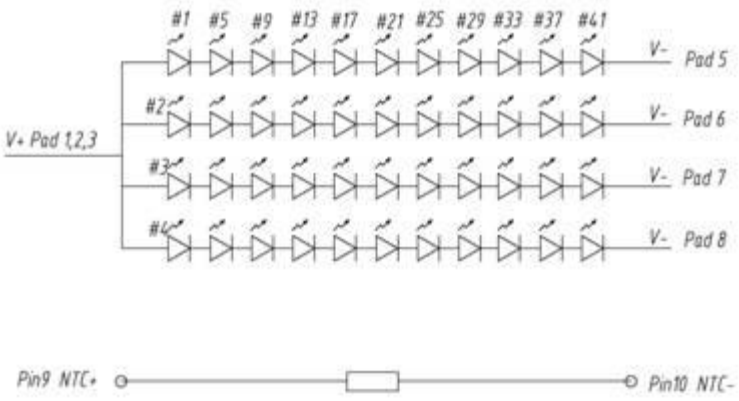


LED BACKLIGHT DRIVER UNIT

Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED Forward Current	IF	--	360	--	mA	Ta=25℃
LED Forward Voltage	VF	--	--	36.3	V	IF=360mA Ta=25℃
LED Lifetime	--	30000	50000	--	Hr	IF=360mA Ta=25℃

Note 1: Ta means ambient temperature of TFT-LCD module.

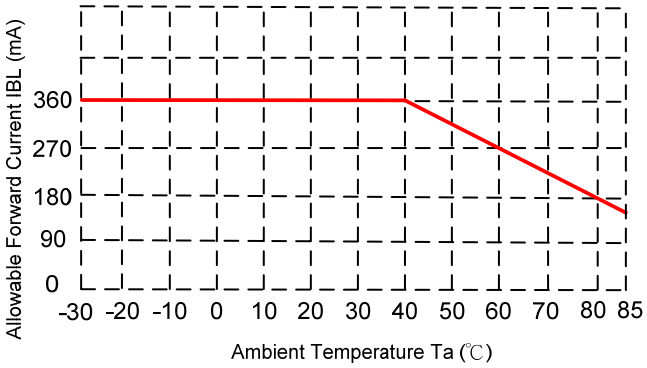
Note 2: the structure of LED B/L shows as below.



Note 3: Using the constant current control to avoid the leakage light and brightness quality issue.

Note 4: Definition of Led lifetime：Luminance < Initial luminance 50%.

Note 5:When LCM is operated over 60℃ ambient temperature, the IF of the LED back-light should be adjusted to 270mA max



5. Optical Specifications

Item	Symbol	Condition	Values			Unit	Remark
			Min	Typ	Max		
Viewing angle (CR≥ 10)	θ_L	θ=180°(9 o'clock)	80	85	-	degree	Note 1
	θ_R	θ=0°(3 o'clock)	80	85	-		
	θ_T	θ=90°(12 o'clock)	80	85	-		
	θ_B	θ=270°(6 o'clock)	80	85	-		
Response time	$T_{r+}T_f$	Normal θ=Φ=0° Point-5	-	--	30	Msec	Note 1 Note 2 Note 3
Contrast ratio	CR		800	1000	-	-	Note 4
Color chromaticity	W_X		T.B.D -0.05	0.300	T.B.D +0.05	-	Note 2 Note 5 Note 6
	W_Y			0.320			
	R_X			0.621			
	R_Y			0.313			
	G_X			0.304			
	G_Y			0.650			
	B_X			0.157			
	B_Y			0.054			
Luminance	W_Y		850	1000		cd/m^2	Note 6
Luminance uniformity	Y_U		--	80	-	%	Note 7
NTSC	-	Point-5	70	75	-	%	

Test Conditions:

1. VCC=3.3V, IL=360 mA (Backlight current), the ambient temperature is 25℃.
2. The test systems refer to Note 2.

Note 1: Definition of viewing angle range

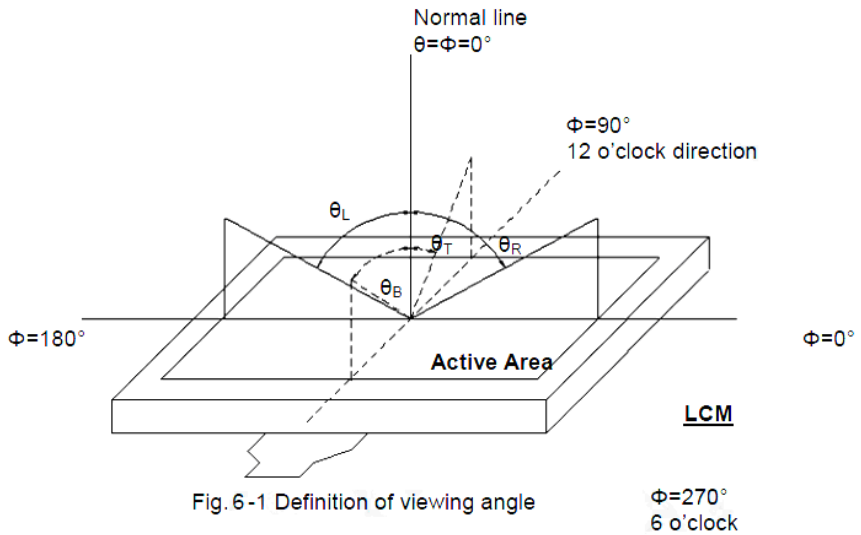


Fig. 6-1 Definition of viewing angle

Note 2: 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. (Viewing angle is measured by ELDIM-EZ contrast/Height :1.2mm, Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/ Field of view: 1° /Height: 500mm.)

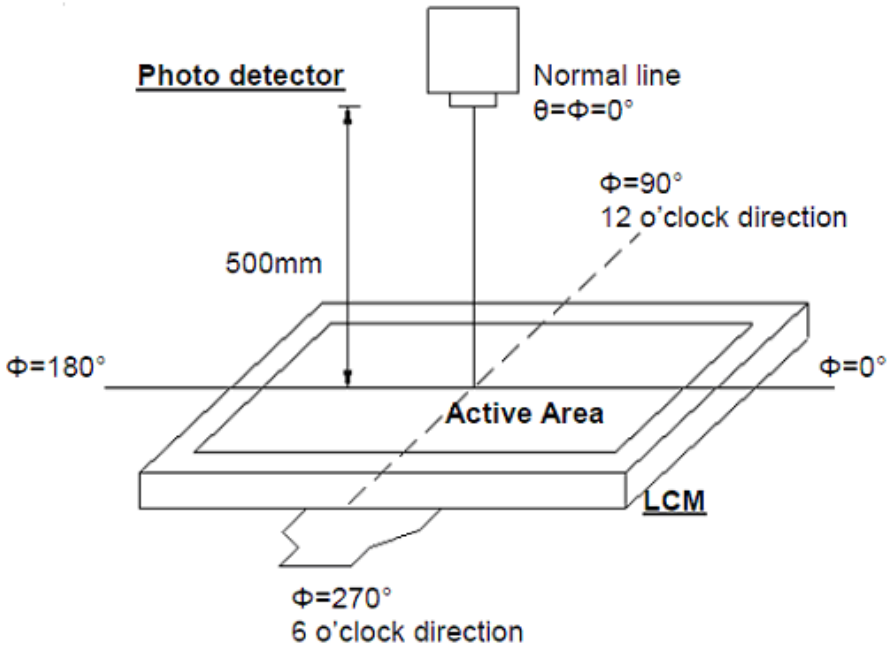


Fig. 6-2 Optical measurement system setup

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 (TON) is the time between photo detector output intensity changed from 90% to 10%. And fall time (TOFF) is the time between photo detector output intensity changed from 10% to 90%.

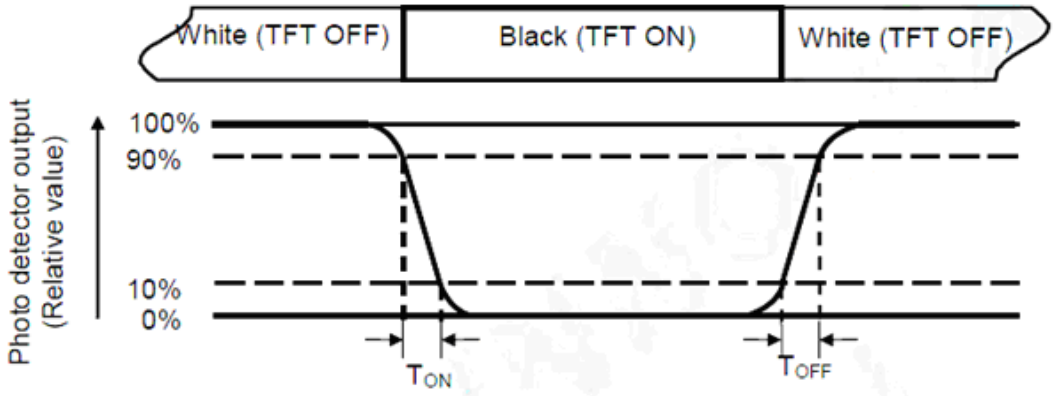


Fig. 6-3 Definition of response time

Note 4: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness @ "White" state}}{\text{Brightness @ "Black" state}}$$

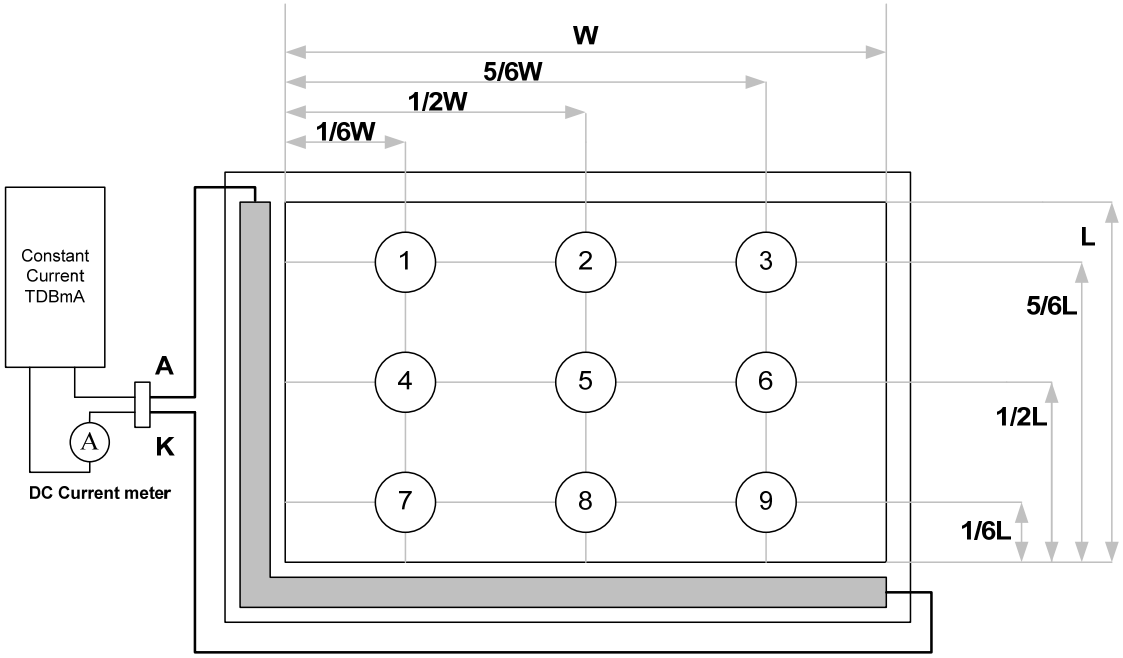
Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6: All input terminals LCD panel must be ground while measuring the center area of the panel. The LED driving condition is IL=360 mA.

Note 7: Definition of Luminance Uniformity

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



B_{max}: The measured maximum luminance of all measurement position.

B_{min}: The measured minimum luminance of all measurement position.

6. INTERFACE

6.1. CN1: F31L-1A7H1-21050 (0.5Pitch, 50Pin) or Equivalent

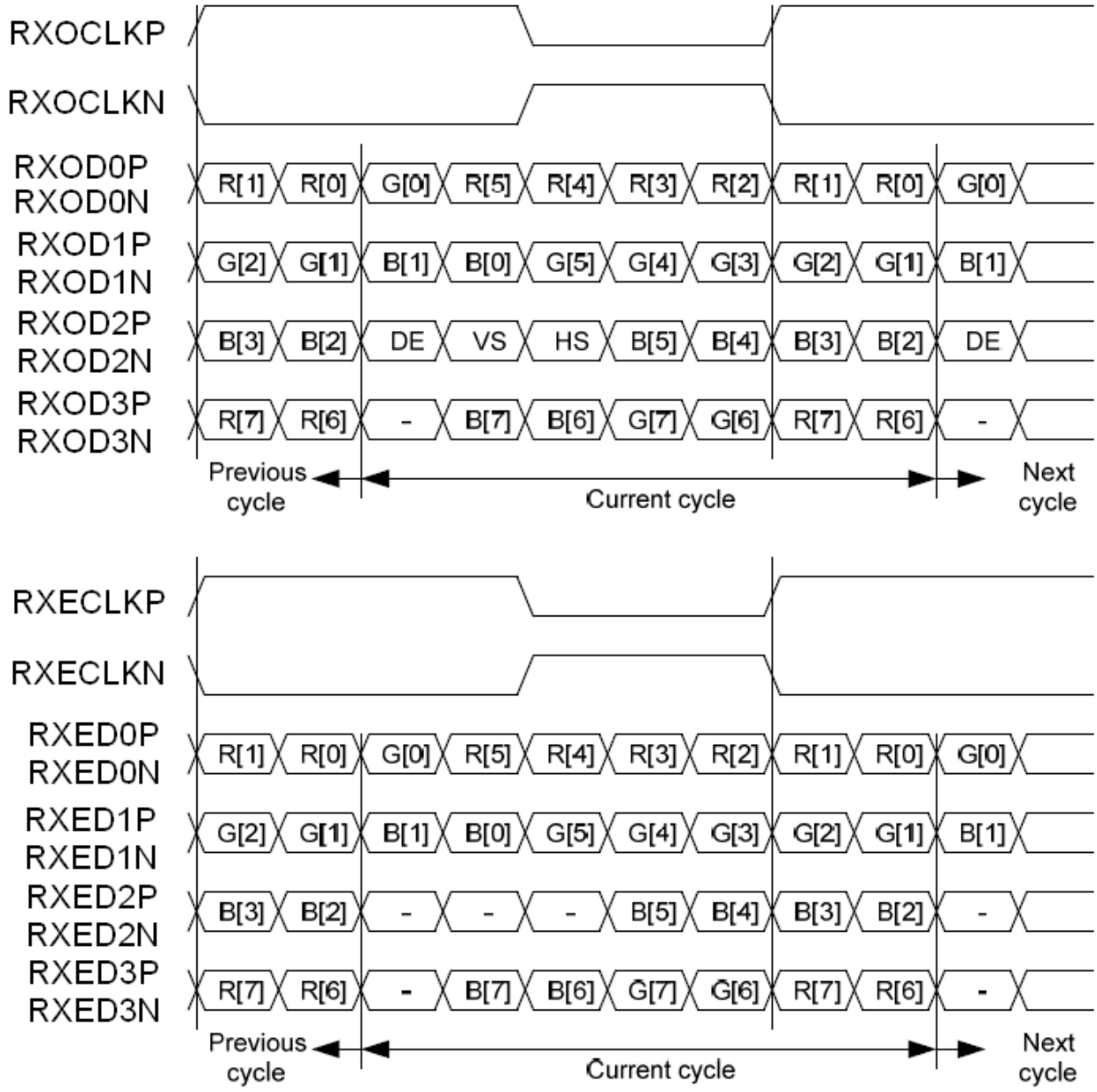
Pin No.	Symbol	I/O	Description	Note
1	GND	P	Power ground	
2	BIST	-	LCD Panel Self Test Enable, When it is not used, connecting to GND is recommended, don't floating	
3	VCC	P	Digital Power/Vin =3.3V	
4	VCC	P	Digital Power/Vin =3.3V	
5	GND	P	Power ground	
6	GND	P	Power ground	
7	OTP	-	Serial interface OTP power	(8.6)V
8	NC	-	No connection	
9	GND	P	Power ground	
10	ORXIN0-	I	Odd pixel negative LVDS differential data inputs	
11	ORXIN0+	I	Odd pixel positive LVDS differential data inputs	
12	ORXIN1-	I	Odd pixel negative LVDS differential data inputs	
13	ORXIN1+	I	Odd pixel positive LVDS differential data inputs	
14	ORXIN2-	I	Odd pixel negative LVDS differential data inputs	
15	ORXIN2+	I	Odd pixel positive LVDS differential data inputs	
16	ORXCLKIN-	I	Odd pixel negative LVDS differential clock inputs	
17	ORXCLKIN+	I	Odd pixel positive LVDS differential clock inputs	
18	ORXIN3-	I	Odd pixel negative LVDS differential data inputs	
19	ORXIN3+	I	Odd pixel positive LVDS differential data inputs	
20	ERXIN0-	I	Even pixel negative LVDS differential data inputs	
21	ERXIN0+	I	Even pixel positive LVDS differential data inputs	
22	ERXIN1-	I	Even pixel negative LVDS differential data inputs	
23	ERXIN1+	I	Even pixel positive LVDS differential data inputs	
24	ERXIN2-	I	Even pixel negative LVDS differential data inputs	
25	ERXIN2+	I	Even pixel positive LVDS differential data inputs	
26	ERXCLKIN-	I	Even pixel negative LVDS differential clock inputs	
27	ERXCLKIN+	I	Even pixel positive LVDS differential clock inputs	
28	ERXIN3-	I	Even pixel negative LVDS differential data inputs	
29	ERXIN3+	I	Even pixel positive LVDS differential data inputs	
30	GND	P	Power ground	
31	FAULT	-	FAULT signal output(normal=H, abnormal=L)	
32	RESET	-	Global reset pin, active High.	
33	STBYB	-	Standby mode, active High.	
34	CSB	-	No connection	Note 1
35	SCL	-	No connection	Note 1
36	SDAI	-	No connection	Note 1
37	SDAO	-	No connection	Note 1
38	GND	P	Power ground	
39	GND	P	Power ground	
40	NC		No connection	
41	LEDA		LED power(Anode)	
42	LEDA		LED power(Anode)	
43	LEDA		LED power(Anode)	
44	NC		No connection	
45	LEDK		Cathode1	
46	LEDK		Cathode2	
47	LEDK		Cathode3	
48	LEDK		Cathode4	
49	NTC_A		NTC_ Anode	
50	NTC_K		NTC_ Cathode	

Note 1 : These pin are Internal test , don't connect GND and VCC.

Note 2 : The relationship of temperature and resistance for NTC.

Temperature/℃	Resistance/Kohm	Temperature/℃	Resistance/Kohm
-40	195.652	60	3.014
-35	148.171	65	2.586
-30	113.347	70	2.228
-25	87.559	75	1.925
-20	68.237	80	1.669
-15	53.650	85	1.452
-10	42.506	90	1.268
-5	33.892	95	1.110
0	27.219	100	0.974
5	22.021	105	0.858
10	17.926	110	0.758
15	14.674	115	0.672
20	12.081	120	0.596
25	10.000	125	0.531
30	8.315	130	0.474
35	6.948	135	0.424
40	5.834	140	0.381
45	4.917	145	0.342
50	4.161	150	0.309
55	3.535		

7. LVDS Input Data Format



2-port LVDS signals, VESA format (8-bit)

8. AC Timing characteristic

8.1. AC Timing characteristic of LVDS

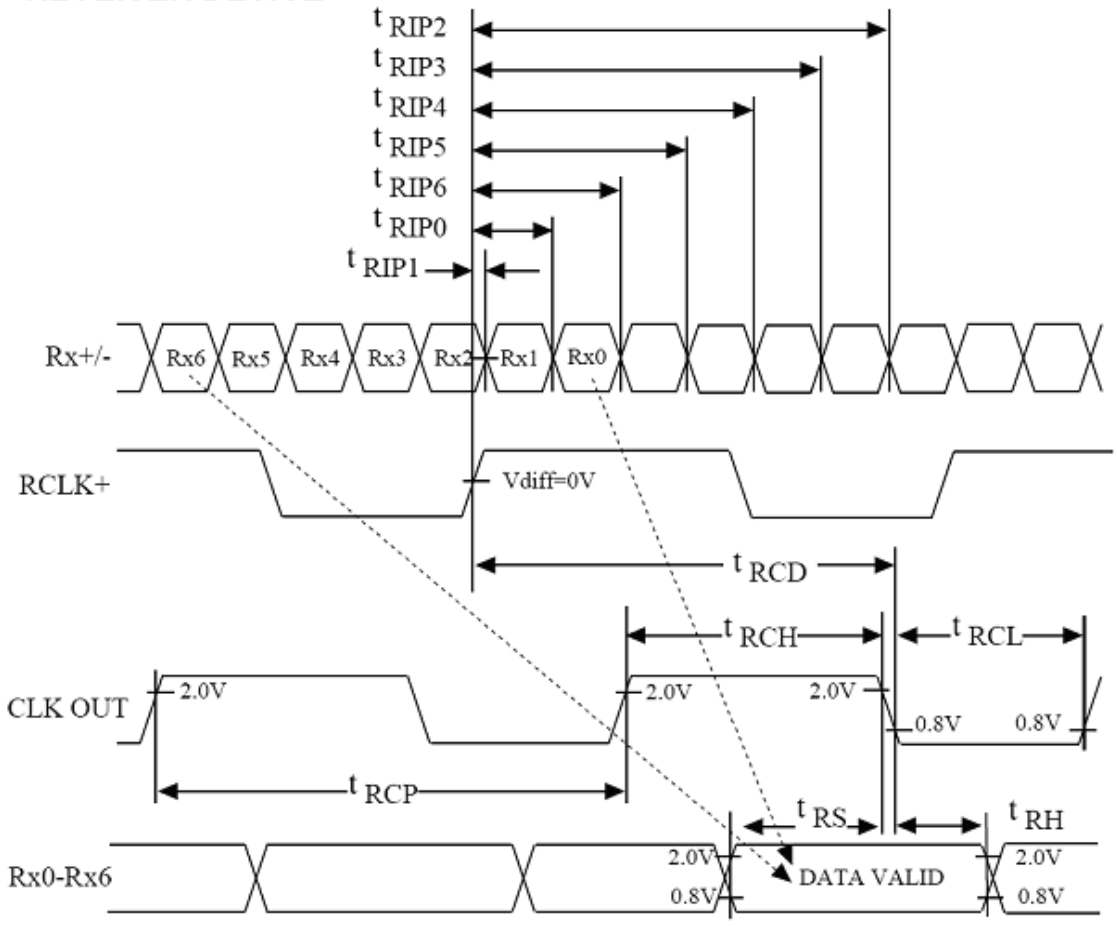
Switching Characteristics

Vcc = 3.0 - 3.6V, Ta = -10 - +70 ˚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

RECEIVER DEVICE

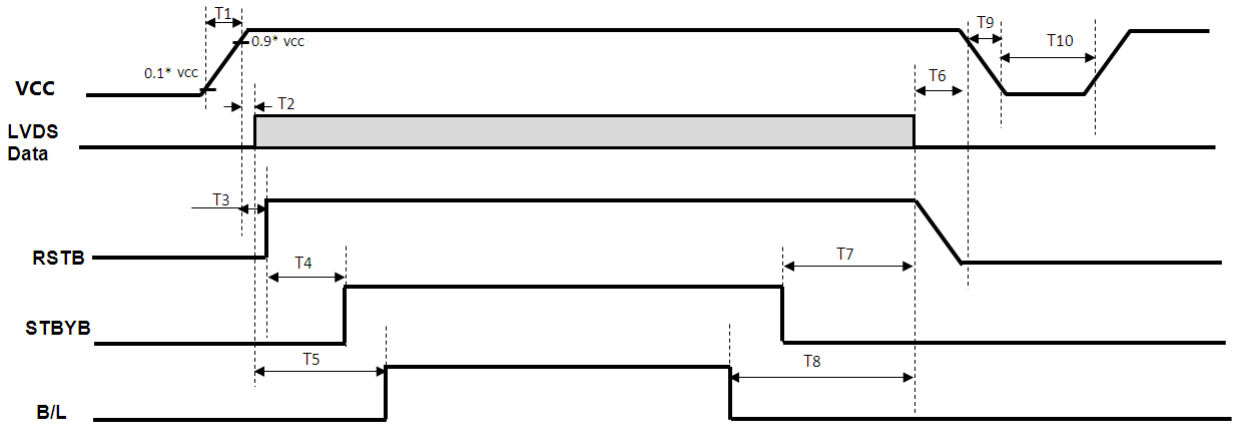


Note:
1) Vdiff = (RA+) - (RA-), ... (RCLK+) - (RCLK-)

8.2. Interface Timings

Parameter	Symbol	Min.	Typ.	Max.	Unit
LVDS Clock Frequency	Fclk		88.6		MHz
H Total Time	HT	1975	2020	2880	Clocks
H Active Time	HA		1920		Clocks
V Total Time	VT	728	731	1080	Lines
V Active Time	VA		720		Lines
Frame Rate	FV	55	60	65	Hz

8.3. Power ON/OFF Timing



Parameter	Symbol	Min.	Typ.	Max.	Unit
VCC Rising Time	T1	ms	(0.5)	--	(10)
VCC to LVDS	T2	ms	(0)	--	(50)
VCC to RSTB	T3	us	(10)	--	--
RSTB to STBYB pull H	T4	ms	(36)	--	--
LVDS to BL power On	T5	ms	(200)	--	--
BL power off to LVDS disable	T8	ms	(200)	--	--
STBYB pull L to RSTB	T7	ms	(133)	--	--
LVDS Disable to VCC Power off	T6	ms	(0)	--	(50)
VCC Fall Time	T9	ms	(0.5)	--	(30)
VCC Power off	T10	ms	(500)	--	--

9. RELIABILITY TEST CONDITIONS

Test Item	Test Conditions	Note
High Temperature Operation	85±3°C , t=1000 hrs	
Low Temperature Operation	-30±3°C , t=1000 hrs	
High Temperature Storage	90±3°C , t=1000 hrs	1,2
Low Temperature Storage	-40±3°C , t=1000 hrs	1,2
Humidity Test	60 °C, Humidity 90%, 500 hrs	1,2
Vibration Test	half-sine Frequency: 8Hz ~ 33Hz Stroke: 1.3mm Sweep: 2.9G 33.3Hz ~ 400Hz X,Z Cycle : 15 minutes 2 hrs for each direction of X,Z ; 4 hours for Y direction	2
Shock Non-operating Test	100G,6ms,sin wave,±XYZ×3times,Total 18times	

Note (1) A sample can only have one test. Outward appearance, image quality and optical data can only be checked at normal conditions according to the IVO document before reliable test. Only check the function of the module after reliability test.

Note (2) The setting of electrical parameters should follow the typical value before reliability test.

Note (3) During the test, it is unaccepted to have condensate water remains. Besides, protect the module from static electricity.

Note (4) The sample must be released for 24 hours under normal conditions before judging. Furthermore, all the judgment must be made under normal conditions. Normal conditions are defined as follow: Temperature: 25℃, Humidity: 55± 10%RH. Ta= Ambient Temperature, Tgs= Glass Surface Temperature.

Note (5) The module should be fixed firmly in order to avoid twisting and bending.

Note (6) It could be regarded as pass, when the module recovers from function fault caused by ESD after resetting.

Note (7) LED forward current should follow the current of LED vary with environmental temperature.

10. USE PRECAUTIONS

10.1. Handling precautions

1) The polarizing plate may break easily so be careful when handling it. Do not touch, press or rub it with a hard-material tool like tweezers.
2) Do not touch the polarizing plate surface with bare hands so as not to make it dirty. If the surface or other related part of the polarizing plate is dirty, soak a soft cotton cloth or chamois leather in benzine and wipe off with it. Do not use chemical liquids such as acetone, toluene and isopropyl alcohol. Failure to do so may bring chemical reaction phenomena and deteriorations.
3) Remove any spit or water immediately. If it is left for hours, the suffered part may deform or decolorize.
4) If the LCD element breaks and any LC stuff leaks, do not suck or lick it. Also if LC stuff is stuck on your skin or clothing, wash thoroughly with soap and water immediately.

10.2. Installing precautions

1) The PCB has many ICs that may be damaged easily by static electricity. To prevent breaking by static electricity from the human body and clothing, earth the human body properly using the high resistance and discharge static electricity during the operation. In this case, however, the resistance value should be approx. 1MΩ and the resistance should be placed near the human body rather than the ground surface. When the indoor space is dry, static electricity may occur easily so be careful. We recommend the indoor space should be kept with humidity of 60% or more. When a soldering iron or other similar tool is used for assembly, be sure to earth it.
2) When installing the module and ICs, do not bend or twist them. Failure to do so may crack LC element and cause circuit failure.
3) To protect LC element, especially polarizing plate, use a transparent protective plate (e.g., acrylic plate, glass etc) for the product case.
4) Do not use an adhesive like a both-side adhesive tape to make LCD surface (polarizing plate) and product case stick together. Failure to do so may cause the polarizing plate to peel off.

10.3. Storage precautions

1) Avoid a high temperature and humidity area. Keep the temperature between 0°C and 35°C and also the humidity under 60%.

2) Choose the dark spaces where the product is not exposed to direct sunlight or fluorescent light.
3) Store the products as they are put in the boxes provided from us or in the same conditions as we recommend.

10.4. Operating precautions

1) Do not boost the applied drive voltage abnormally. Failure to do so may break ICs. When applying power voltage, check the electrical features beforehand and be careful. Always turn off the power to the LC module controller before removing or inserting the LC module input connector. If the input connector is removed or inserted while the power is turned on, the LC module internal circuit may break.
2) The display response may be late if the operating temperature is under the normal standard, and the display may be out of order if it is above the normal standard. But this is not a failure; this will be restored if it is within the normal standard.
3) The LCD contrast varies depending on the visual angle, ambient temperature, power voltage etc. Obtain the optimum contrast by adjusting the LC dive voltage.
4) When carrying out the test, do not take the module out of the low-temperature space suddenly. Failure to do so will cause the module condensing, leading to malfunctions.
5) Make certain that each signal noise level is within the standard (L level: 0.2Vcc or less and H level: 0.8Vcc or more) even if the module has functioned properly. If it is beyond the standard, the module may often malfunction. In addition, always connect the module when making noise level measurements.
6) The CMOS ICs are incorporated in the module and the pull-up and pull-down function is not adopted for the input so avoid putting the input signal open while the power is ON.
7) The characteristic of the semiconductor element changes when it is exposed to light emissions, therefore ICs on the LCD may malfunction if they receive light emissions. To prevent these malfunctions, design and assemble ICs so that they are shielded from light emissions.

8) Crosstalk occurs because of characteristics of the LCD. In general, crosstalk occurs when the regularized display is maintained. Also, crosstalk is affected by the LC drive voltage. Design the contents of the display, considering crosstalk.

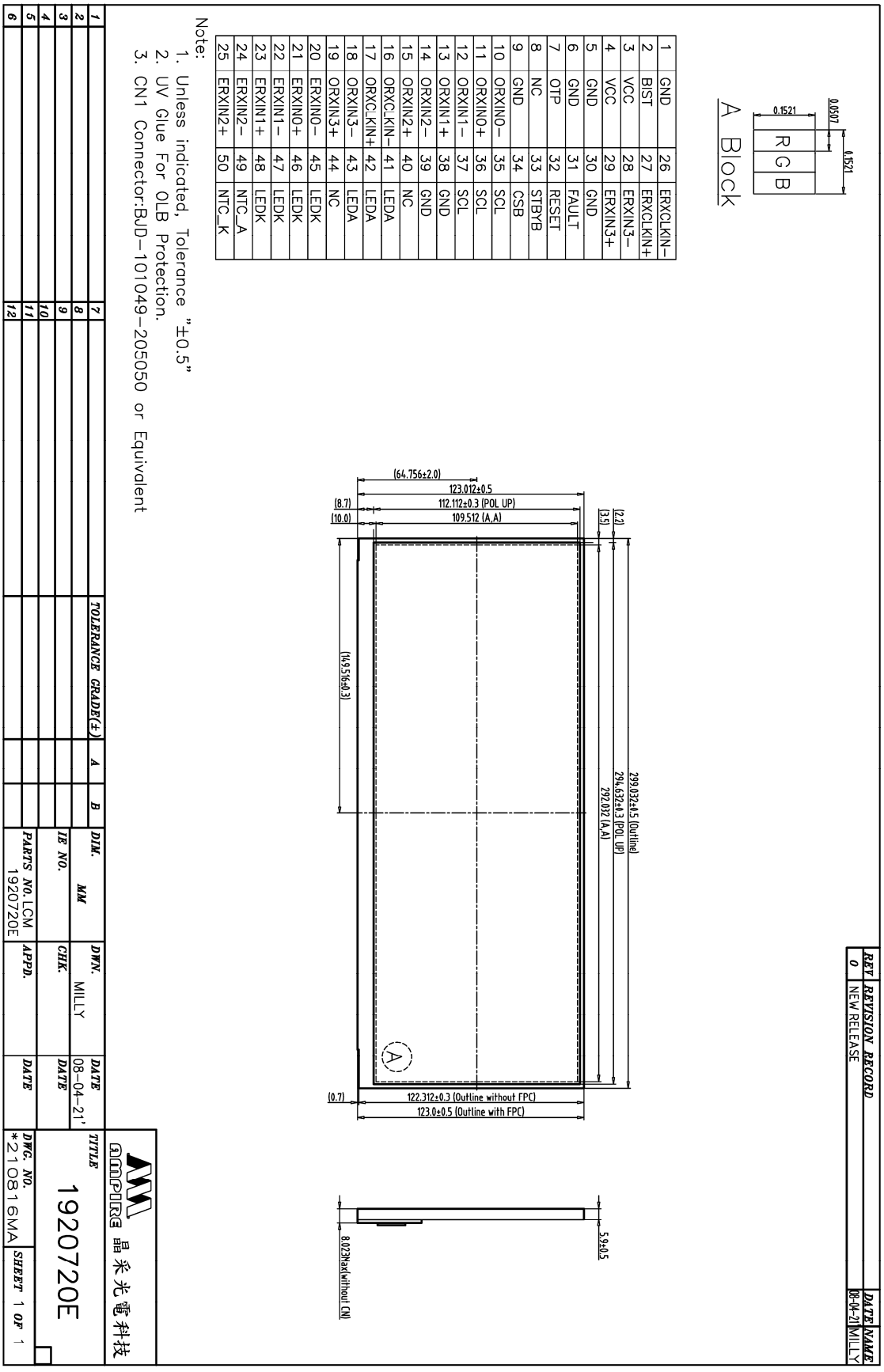
10.5. Other

1) Do not disassemble or take the LC module into pieces. The LC modules once

disassembled or taken into pieces are not the guarantee articles.

2) The residual image may exist if the same display pattern is shown for hours. This residual image, however, disappears when another display pattern is shown or the drive is interrupted and left for a while. But this is not a problem on reliability.
3) AMIPRE will provide one year warrantee for all products and three months warrantee for all repairing products.

11. OUTLINE DIMENSION



1	GND	26	ERXCLKIN−
2	BIST	27	ERXCLKIN+
3	VCC	28	ERXIN3−
4	VCC	29	ERXIN3+
5	GND	30	GND
6	GND	31	FAULT
7	OTP	32	RESET
8	NC	33	STBYB
9	GND	34	CSB
10	ORXIN0−	35	SCL
11	ORXIN0+	36	SCL
12	ORXIN1−	37	SCL
13	ORXIN1+	38	GND
14	ORXIN2−	39	GND
15	ORXIN2+	40	NC
16	ORXCLKIN−	41	LEDA
17	ORXCLKIN+	42	LEDA
18	ORXIN3−	43	LEDA
19	ORXIN3+	44	NC
20	ERXIN0−	45	LEDK
21	ERXIN0+	46	LEDK
22	ERXIN1−	47	LEDK
23	ERXIN1+	48	LEDK
24	ERXIN2−	49	NTC_A
25	ERXIN2+	50	NTC_K

Note:
1. Unless indicated, Tolerance "±0.5"
2. UV Glue For OLB Protection.
3. CN1 Connector:BJD-101049-205050 or Equivalent

REV	REVISION RECORD	DATE	NAME
0	NEW RELEASE	08-04-21	MILLY

1											
2											
3											
4											
5											
6											
	7	8	9	10	11	12					

TOLERANCE GRADE(±)	A	B	DIM. MM	DWN. MILLY	DATE 08-04-21'
			IE NO.	CHK.	DATE
			PARTS NO. LCM 1920720E	APPD.	DATE

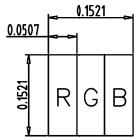
AMPIRE 晶采光電科技

TITLE 1920720E

DWG. NO. *21O816MA

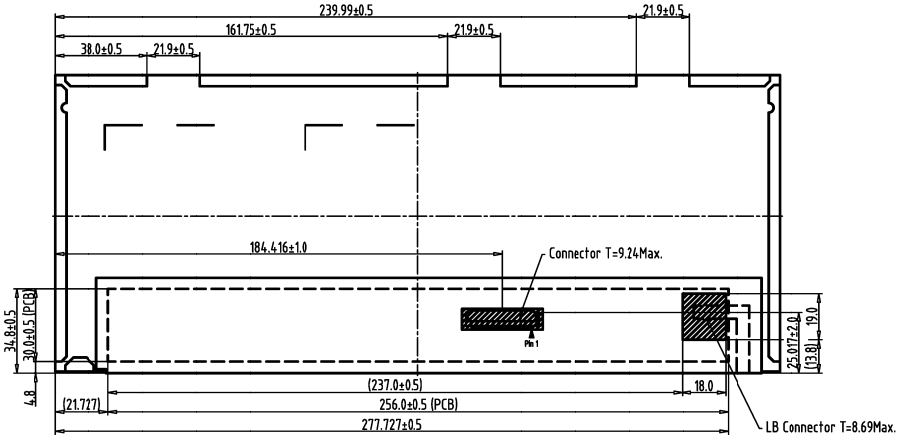
SHEET 1 OF 1

REV	REVISION RECORD	DATE	NAME
0	NEW RELEASE	08-04-21	MILLY



A Block

1	GND	26	ERXCLKIN−
2	BIST	27	ERXCLKIN+
3	VCC	28	ERXIN3−
4	VCC	29	ERXIN3+
5	GND	30	GND
6	GND	31	FAULT
7	OTP	32	RESET
8	NC	33	STBYB
9	GND	34	CSB
10	ORXIN0−	35	SCL
11	ORXIN0+	36	SCL
12	ORXIN1−	37	SCL
13	ORXIN1+	38	GND
14	ORXIN2−	39	GND
15	ORXIN2+	40	NC
16	ORXCLKIN−	41	LEDA
17	ORXCLKIN+	42	LEDA
18	ORXIN3−	43	LEDA
19	ORXIN3+	44	NC
20	ERXIN0−	45	LEDK
21	ERXIN0+	46	LEDK
22	ERXIN1−	47	LEDK
23	ERXIN1+	48	LEDK
24	ERXIN2−	49	NTC_A
25	ERXIN2+	50	NTC_K



Back View

Note:
1. Unless indicated, Tolerance "±0.5"
2. UV Glue For OLB Protection.
3. CN1 Connector:BJD−101049−205050 or Equivalent

AMPIRE 晶采光電科技

1		7		TOLERANCE GRADE(±)	A	B	DIM. MM	DWN. MILLY	DATE 08−04−21'	TITLE 1920720E
2		8								
3		9					IE NO.	CHK.	DATE	
4		10								
5		11					PARTS NO.LCM−1 1920720E	APPD.	DATE	DWG. NO. *210817MA
6		12								SHEET 1 OF 1

AMPIRE CO., LTD.

Date: 2023/02/08