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-1024768MTMQW-01H
APPROVED BY	
DATE	

☑ Approved For Specifications

☐ Approved For Specifications & Sample

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RECORD OF REVISION

Revision Date	Page	Contents	Editor
2013/5/15	--	New Release	Kokai

1. Features

AM-1024768MTMQW-T01H is 10.4" color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, driver ICs, control circuit and backlight. The 10.4" screen produces a high resolution image that is composed of 1024×768 pixel elements in a stripe arrangement. Display 262K colors by 6 Bit R.G.B signal input.

(1) Construction: 10.4” a-Si TFT active matrix, White LED Backlight.
(2) Resolution (pixel): 1024(R.G.B) X 768
(3) Number of the Colors : 262,144 (R , G , B 6 bit digital each)
(4) LCD type : Normally white
(5) Viewing Direction: 150 degree (Horizontal.) 140 degree (Vertical)
(6) Interface : LVDS interface
(7) Include LED driver Board

2. PHYSICAL SPECIFICATIONS

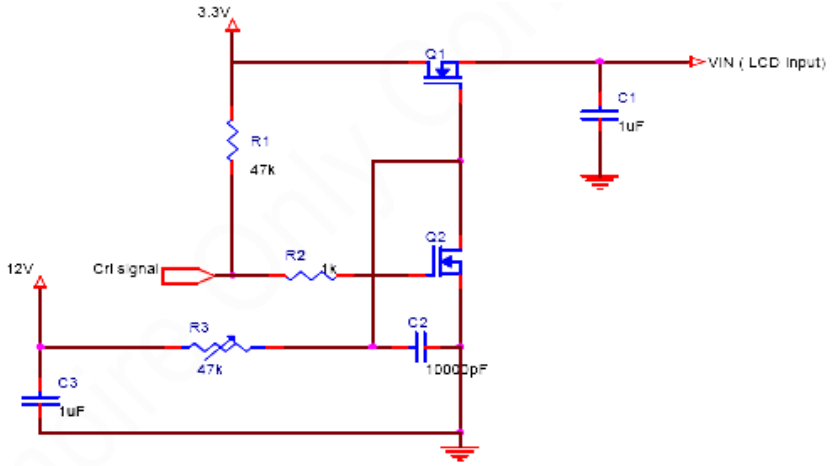
Item	Specifications	unit
LCD size	10.4 inch (Diagonal)	
Outline Dimension (Include connecter)	236(W)×174.3(H)×7.4(D) (with PWB and component)	mm
Number of Pixel	1024(H) × 3 (RGB) × 768(V)	pixels
Pixel pitch	0.20625 x0. 20625	mm
Pixel arrangement	RGB vertical stripe	
Display mode	Normally white	
Surface treatment	AG	
Weight	385 (TYP)	g
Back-light	LED	
Power consumption	4.3 (Typ)	W

3. ABSOLUTE MAX. RATINGS

ITEM	SYMBOL	MIN.	MAX.	UNIT	NOTE
Power Supply Voltage	Vcc	-0.3	4.0	V	
LED Supply Voltage	VLED		10.65	V	
ICC Rush Current	IRUSH	-	1	A	【Note 2】
Operation Temperature	T_{op}	-20	70	℃	【Note 1】
Storage Temperature	T_{stg}	-30	80	℃	【Note 1】
Forward Current (per LED)	If		30	mA	
Reverse Voltage (per LED)	VR		5	V	
Pulse forward current (per LED)	Ifp		100	mA	【Note 3】

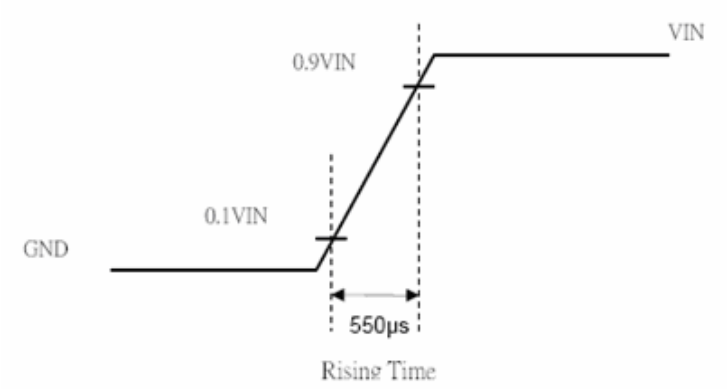
【Note1】If users use the product out off the environment operation range
（temperature and humidity, it will concern for visual quality.）

【Note2】The input pulse-current measurement system as below：



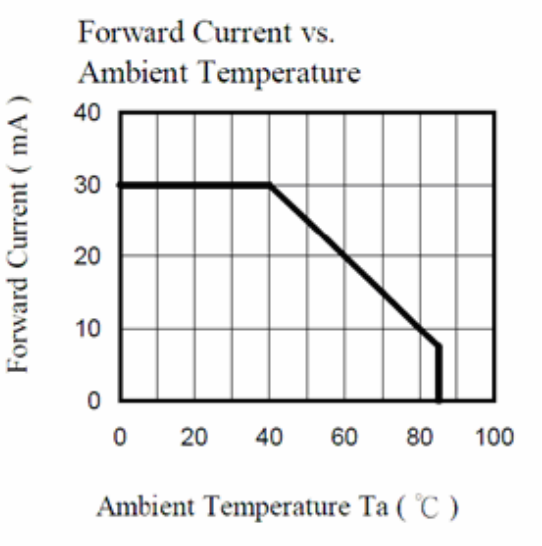
Control signal: High (+3.3V) _Low (GND)

Supply Voltage of rising time should be from R3 and C2 tune to 550 us.



【Note3】Ifp Conditions ： Pulse Width 10mse≦c，Duty≦1/10。

【Note4】Each one of LED operation must be follow diagram of Ambient Temperature and Allowable Forward Current.


Forward Current vs.
Ambient Temperature
Forward Current (mA)
40
30
20
10
0
0
20
40
60
80
100
Ambient Temperature Ta (℃)

4. ELECTRICAL CHARACTERISTICS

4-1 TFT LCD Power Voltage

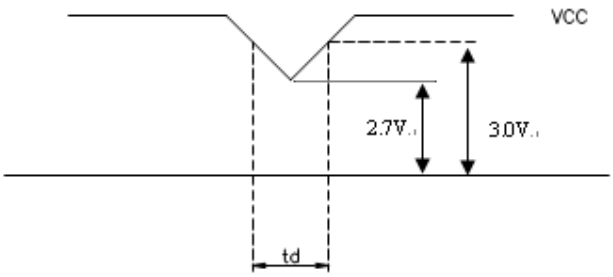
ITEM		SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
Power Supply Voltage For LCD		V_{CC}	3.0	3.3	3.6	V	【Note 1】
Logic Input Voltage (LVDS:IN+,IN-)	Common Mode Voltage	VCM	1.08	1.2	1.32	V	【Note 2】
	Differential Input Voltage	VID	250	350	450	mV	【Note 2】
	Threshold Voltage(high)	VTH	-	-	100	mV	【Note 2】
	Threshold Voltage(low)	VTL	-100	-	-	mV	【Note 2】

Remarks：

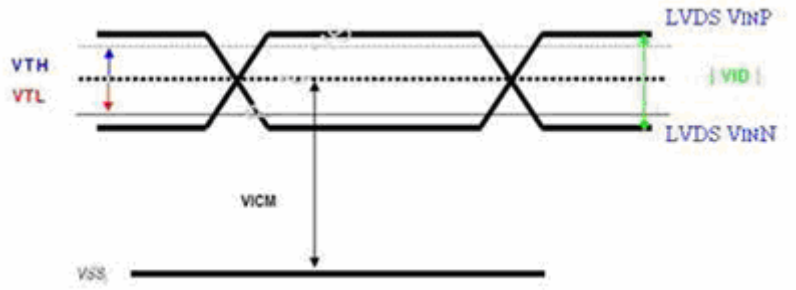
【Note1】 VCC –dip condition:

1) When 2.7 V ≦VCC＜3.0V，td≦10ms.

2) VCC＞3.0V，VCC-dip condition should be same as VCC-turn-on condition.



【Note 2】LVDS signal



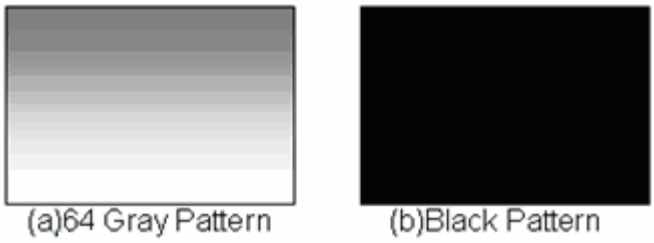
4-2 TFT- LCD Current Consumption

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
LCD Power Current	I_{CC}	--	450	500	mA	【Note1】

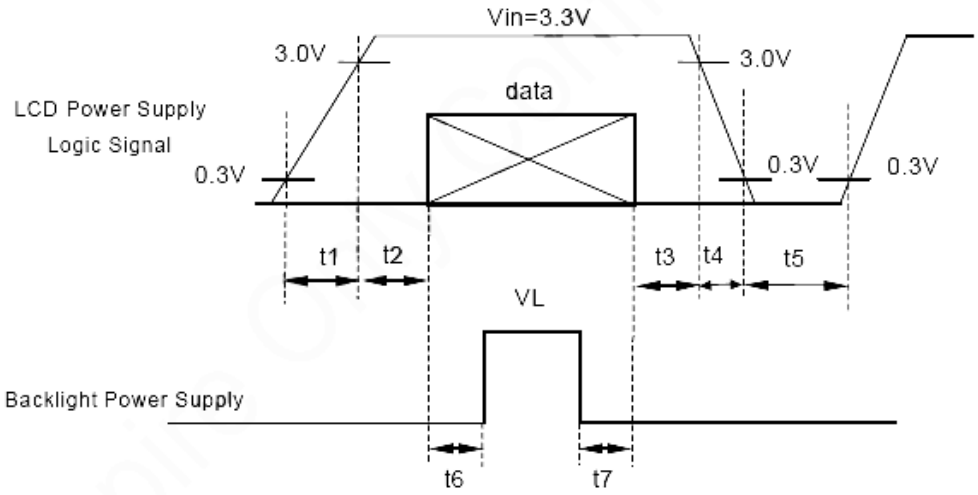
【Note1】（Frame rate = 60 Hz）

Typical: Under 64 gray pattern @ Vcc = 3.3 V

Maximum: Under black pattern @ Vcc = 3.0 V



4-3 Power and Signal sequence



Data: RGB DATA, DCLK, DENA

0.5<t1≦10ms 200ms≦t5

0＜t2≦50ms 200ms≦t6

0＜t3≦50ms 200ms≦t7

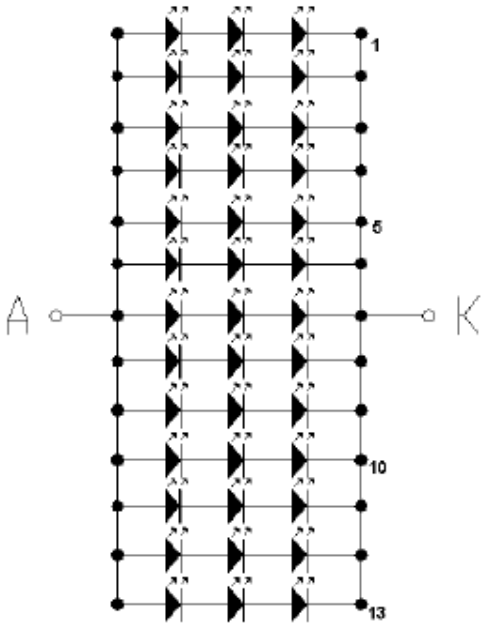
0＜t4≦10ms

4-4 Backlight

ITEM	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT	REMARKS
LED current	IL	Ta=25℃ (20mA/serise)	--	260	--	mA	Note 1,2
LED voltage	VL	Ta=25℃ (20mA/serise)	8.44	9.6	10.8	V	Note 1,2
Power consumption	WL	Ta=25℃ (20mA/serise)	--	2.496	--	W	Note 1,2
LED Lifetime	-	Ta=25℃ IF=20mA	20000	-	-	Hr	Note 3,4,5

Remarks：

*1)LED Circuit Diagram：



*2) A：Anode(＋)，K：Cathode(－)

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

*4) DEFINITION OF LED LIFETIME：LUMINANCE < INITIAL LUMINANCE 50%

5. Optical Specifications

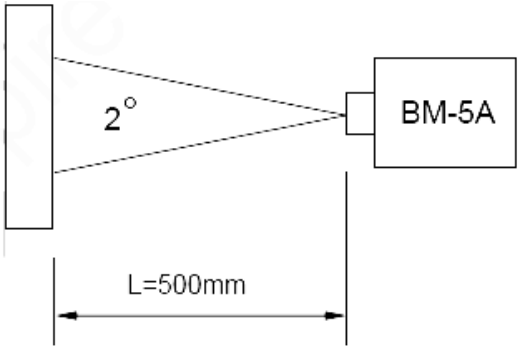
5-1 Optical specification

Ta = 25℃, V_{CC} =3.3V

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Constrast Ratio		CR	Point-5			--	--	*1)*2)*3)
Luminance*)		Lw	Point-5	400	500	--	cd/m^2	*1)*3)
Luminance Uniformity		ΔL		70	80		%	*1)*3)
Response Time (White - Black)		Tr+ Tf	Point-5		25	30	ms	*1)*3)*5)
Viewing Angle	Left	Deg.	Point-5 CR≧10	65	75			*1)*2)*4)
	Right	Deg.		65	75			*1)*2)*4)
	Upper	Deg.		50	60			*1)*2)*4)
	Lower	Deg.		70	80			*1)*2)*4)
NTSC				42	47	--	%	
Color Coordinate	White	Wx Wy	θ=ϕ= 0° Point-5	0.273 0.289	0.313 0.329	0.353 0.369	--	*1)*3)
	Red	Rx Ry		0.528 0.287	0.568 0.327	0.608 0.367		
	Green	Gx Gy		0.308 0.533	0.348 0.573	0.388 0.613		
	Blue	Bx By		0.120 0.064	0.160 0.104	0.200 0.144		

NOTE:

*1) Measure condition：25℃±2℃，60±10%RH，under10 Lux in the dark room.BM-5A (TOPCON)，viewing angle2°，IL=260mA ，after 10 minutes operation.



*2) Definition of contrast ratio：

Contrast Ratio (CR) = (White) Luminance of ON ÷ (Black) Luminance of OFF

*3) Definition of luminance：Measure white luminance on the point 5 as figure8-1

Definition of Luminance Uniformity: Measure white luminance on the point1~9 as figure 5-1

△L = [L (MIN)/L (MAX)] ×100

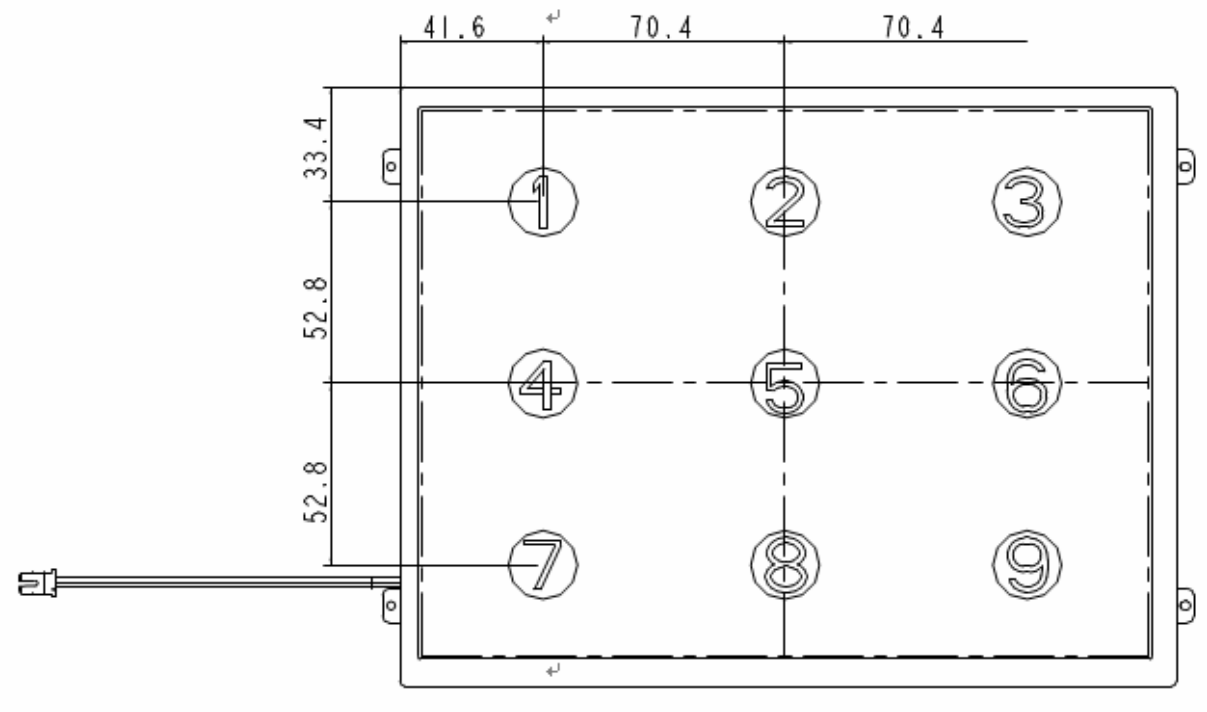


Fig.5-1 Measuring point

*4) Definition of Viewing Angle(θ, Ψ),refer to Fig.5-2 as below :

These items are measured by EZ-CONTRAST (ELDIM) in the dark room. (No ambient light).

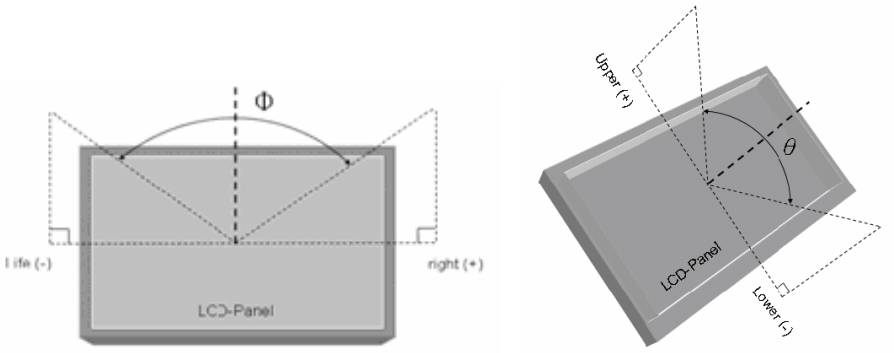


Fig.5-2 Definition of Viewing Angle

*5) Definition of Response Time.(White-Black)

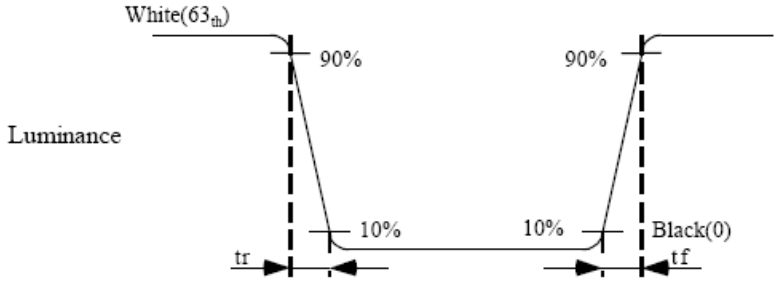


Fig.5-3 Definition of Response Time (White-Black)

6. INTERFACE CONNECTION

LCD connector (30pin)：STARCONN，P/N：MSBK2407P30D or other of the same class

Pin No.	SYMBOL	FUNCTION
1	GND	Ground
2	V_{CC}	+3.3V Power
3	V_{CC}	+3.3V Power
4	NC	NC
5	NC	NC
6	NC	NC
7	GND	GND
8	RXIN0-	LVDS Signal(-)—channel 0
9	RXIN0+	LVDS Signal(+)—channel 0
10	GND	Ground
11	RXIN1-	LVDS Signal(-)—channel 1
12	RXIN1+	LVDS Signal(+)—channel 1
13	GND	Ground
14	RXIN2-	LVDS Signal(-)—channel 2
15	RXIN2+	LVDS Signal(+)—channel 2
16	GND	Ground
17	RXCLKIN-	LVDS Clock Signal(-)
18	RXCLKIN+	LVDS Clock Signal(+)
19	GND	Ground
20	NC	NC
21	NC	NC
22	GND	Ground
23	GND	Ground
24	NC	NC
25	NC	NC
26	NC	NC
27	NC	NC
28	NC	NC
29	NC	NC
30	NC	NC

【Note】

1) GND Pin must be connected to ground. Don't be floating.
2) NC Pin must be floating.

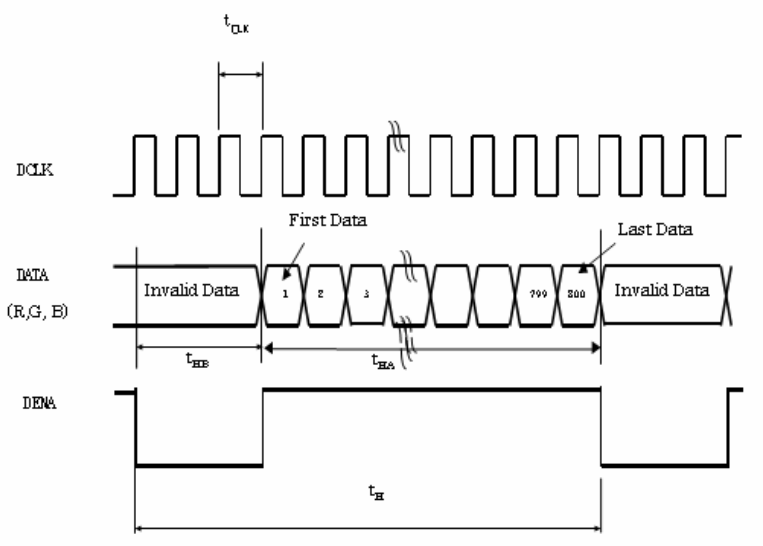
7. INPUT SIGNAL (DE ONLY MODE)

7-1 Timing Specification

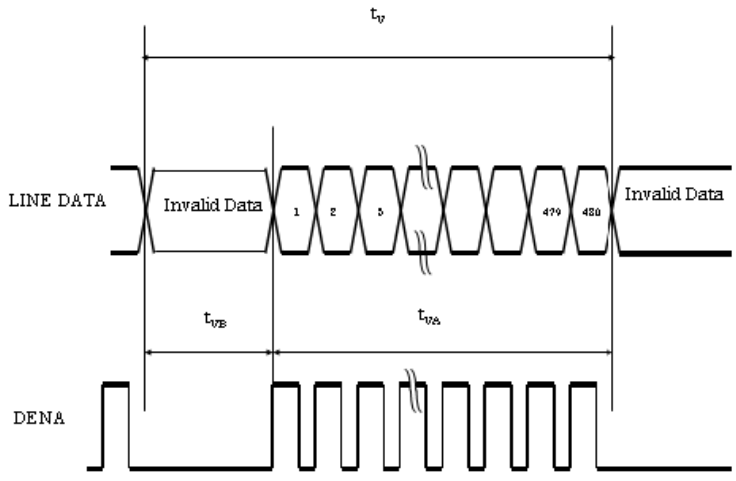
ITEM				SYMBOL	MIN.	TYP.	MAX.	UNIT
LVDS input signal sequence	CLK Frequency			fCLKin	51	65	71	MHz
LCD input timing	DENA	Horizontal	Horizontal Period	t_H	1160	1344	1350	tCLK
			Horizontal Valid	t_{HA}		1024		tCLK
			Horizontal Blank	t_{HB}	136	320	326	tCLK
		Vertical	Frame	fV	55	60	65	Hz
			Vertical Period	t_V	790	806	810	t_H
			Vertical Valid	t_{VA}		768		t_H
			Vertical Blank	t_{VB}	22	38	42	t_H

7-2 Timing sequence (Timing chart)

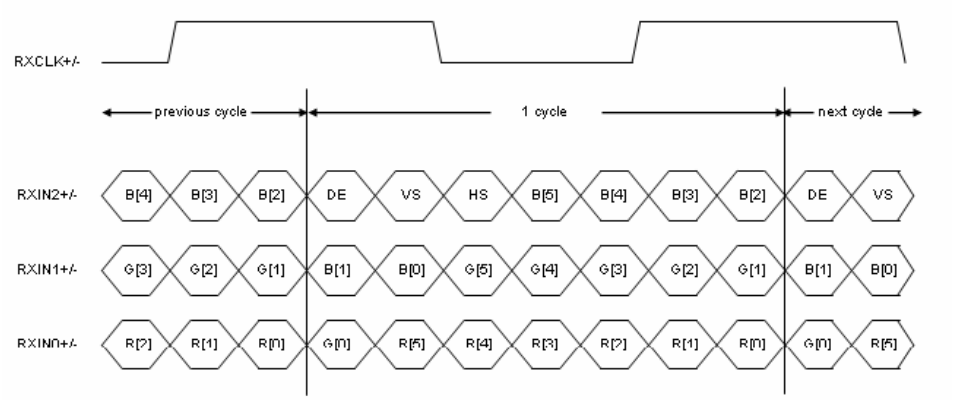
7-2-1 Horizontal Timing Sequence



7-2-2 Vertical Timing Sequence



7-2-3 LVDS Input Data mapping



7-3 Color Data Assignment

COLOR	INPUT DATA	R DATA						G DATA						B DATA					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
		MSB					LSB	MSB					LSB	MSB					LSB
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	BLUE(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	CYAN	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	MAGENTA	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	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
RED	RED(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	1	0	0	0	0	0	0	0	0	0	0	0	0
	RED(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	GREEN(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	1	0	0	0	0	0	0
	GREEN(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	GREEN(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	GREEN(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
BLUE	BLUE(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	1
	BLUE(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	BLUE(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	BLUE(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

【Note1】Definition of Gray Scale

color(n)：(n)Means the level of gray scale, the larger (n) means the brighter level.

【Note2】Data: 1-High, 0-Low

8. RELIABILITY TEST

8-1 Temperature and humidity

ITEM	CONDITIONS	NOTE
HIGH TEMPERATURE OPERATION	60℃ , 240Hrs	(1)(2)
HIGH TEMPERATURE AND HIGH HUMIDITY OPERATION	40℃ , 90%RH , 240Hrs	
HIGH TEMPERATURE STORAGE	70℃ , 240Hrs	
LOW TEMPERATURE OPERATION	-5℃ , 240Hrs	
LOW TEMPERATURE STORAGE	-20℃ , 240Hrs	
THERMAL SHOCK (Non-operation)	-20℃(0.5Hr) ~70℃(0.5Hr) 100Cycle ; 1hour/cycle	

NOTE :

(1) Temperature and relative humidity range is shown in the figure below

(a) 90% RH Max.(Ta≦40℃)

(b) Wet-bulb temperature should be 39℃ Max (Ta＞40℃)

(c) No condensation

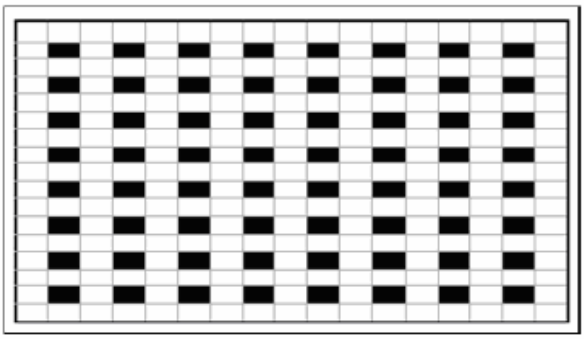
(2) No display malfunctions

[Note]：

Condition of Image Sticking test：25 ℃± 2 ℃

Operation with test pattern sustained for 4 hrs, then change to gray pattern immediately.

After 5 min(s), the mura must be disappeared completely.



(a) Test Pattern (chess board Pattern)

(b) Gray Pattern

8-2 Shock and Vibration

TEST ITEMS	CONDITIONS
Shock (Non-operation)	● Shock level:980m/s^2(equel to 100G) ● Waveform:half sinusoidal wave,6ms. ● Number of shocks:one shock input in each direction of three mutually perpendicular axes for a total of three shock inputs.
Vibration (Non-operation)	● Frequency range:8~33.3Hz ● Stroke:1.3mm ● Vibration:sinusodial wave,perpendicularaxis(both x, z axis:2Hrs, y axis 4Hrs). ● Sweep:2.9G,33.3Hz-400Hz ● Cycle:15min

8-3 Electrostatic Discharge

ITEM	CONDITION	NOTE
ESD	150pF，330Ω，±8kV&±15kV air & contact test	*1)
	200pF，0Ω，±200V contact test	*2)

Note: Measure

1: LCD glass and metal bezel

2: IF connector pins

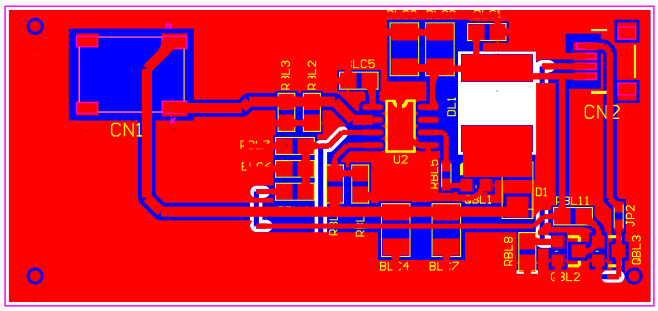
8-4 Judgment Standard

The Judgment of the above test should be made as follow:

Pass: Normal display image with no obvious non-uniformity and no line defect.
Partial transformation of the module parts should be ignored.

Fail: No display image, obvious non-uniform, or line defect.

9. LED Driver Board



- **Interface:**

CN2: JST SM04B-SRSS-TB (LF) (SN)

Pin No.	Symbol	I/O	Description	Note
1	VLED	P	Voltage for LED circuit (3.3V~5.0V)	
2	LED_EN	I	LED BLU ON/OFF	
3	GND	I	Power ground	
4	ADJ	P	Adjust the LED brightness by PWM	

- **Electrical characteristics:**

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
LED Driver Power Voltage	V_{LED}	4.5	5	5.5	V	
LED Current	I_{LED}	--	254	--	mA	ADJ=Hi
LED Driver Power Current	I_{LED}(VLED=5V)	-	620	--	mA	Ta=25℃
ADJ frequency	f_{PWM}	100	--	200	Hz	
ADJ logic level High	VIH	2.2	--	VLED (5.0V)	V	
ADJ logic level High	VIL	0	--	0.5	V	

11. USE PRECAUTIONS

11-1 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.

11-2 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.

11-3 Storage precautions

1) Avoid a high temperature and humidity area. Keep the temperature between 0℃ and 35℃ 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.

11-4 Operating precautions

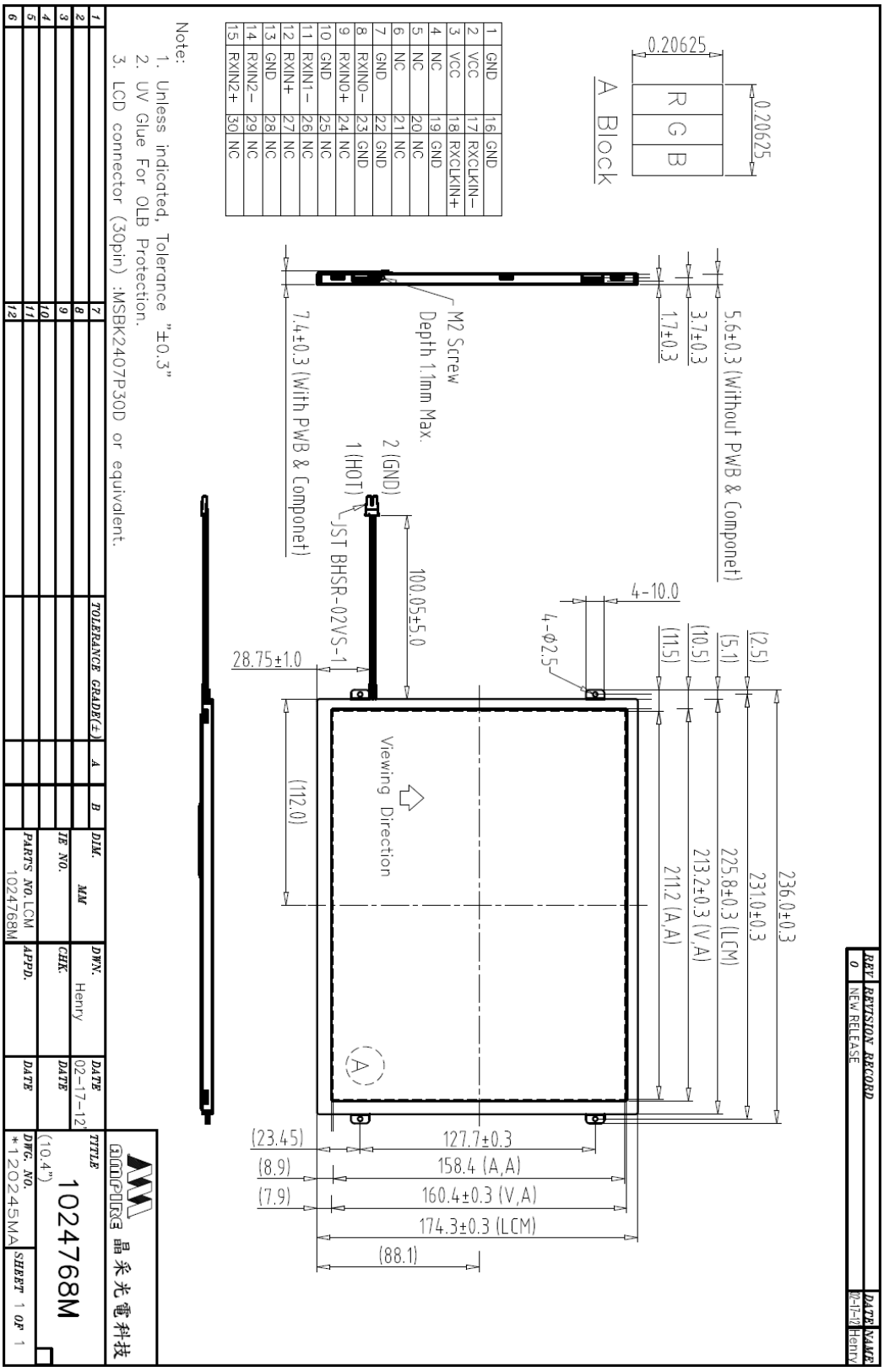
1) Do not boost the applied drive voltage abnormally. Failure to do so may break ICs. When applying power voltage, check the electrical features beforehand and be careful. Always turn off the power to the LC module controller before removing or inserting the LC module input connector. If the input connector 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: 0.2Vdd or less and H level: 0.8Vdd 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.

11-5 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.

12. MECHANICAL DIMENSION

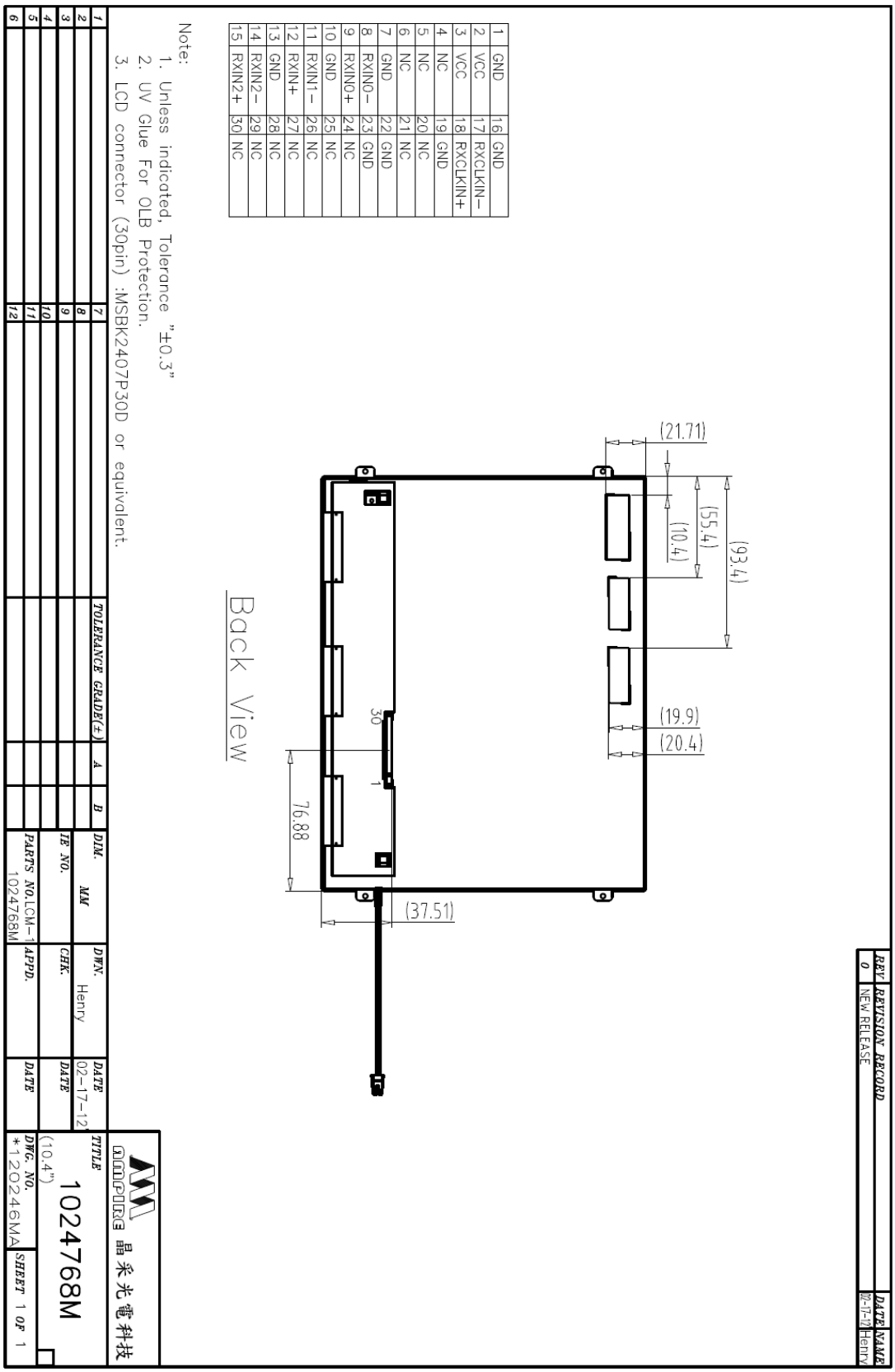
12-1 Front Side



1	GND	16 GND
2	VCC	17 RXCLKIN−
3	VCC	18 RXCLKIN+
4	NC	19 GND
5	NC	20 NC
6	NC	21 NC
7	GND	22 GND
8	RXIN0−	23 GND
9	RXIN0+	24 NC
10	GND	25 NC
11	RXIN1−	26 NC
12	RXIN+	27 NC
13	GND	28 NC
14	RXIN2−	29 NC
15	RXIN2+	30 NC

[Note] : Tolerance is ±0.3mm unless noted

12-2 Rear Side



1	GND	16	GND
2	VCC	17	RXCLKIN−
3	VCC	18	RXCLKIN+
4	NC	19	GND
5	NC	20	NC
6	NC	21	NC
7	GND	22	GND
8	RXIN0−	23	GND
9	RXIN0+	24	NC
10	GND	25	NC
11	RXIN1−	26	NC
12	RXIN1+	27	NC
13	GND	28	NC
14	RXIN2−	29	NC
15	RXIN2+	30	NC

[Note]：Tolerance is ±0.3mm unless noted