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-1024600Y2TZQW-A2H**
APPROVED BY	
DATE	

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

AMPIRE CO., LTD.
4F., No.116, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City221, Taiwan (R.O.C.)
新北市汐止區新台五路一段 **116** 號 **4** 樓**(**東方科學園區 **A** 棟**)**

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
2021/12/20	--	New Release	Lawlite

1. Features

   This module is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This TFT LCD has a 9.0 (16:9) inch diagonally measured active display area with WSVGA (1024 horizontal by 600 vertical pixel) resolution.

(1) Construction: 9" a-Si TFT active matrix, PCB and White LED Backlight.

(2) Resolution (pixel): 1024(R.G.B) X 600

(3) Number of the Colors and LVDS Interface :

    a. SELB=L : 16.7M colors (R , G , B, 8bit digital each). 24 Bit LVDS interface

    b. SELB=H : 262K colors (R , G , B, 6bit digital each). 18 Bit LVDS interface

(4) LCD type: IPS, Transmissive , normally Black.

(5) Power Supply Voltage: 3.3V single power input for TFT LCD. Built-in +12V input LED Driver

(6) New Driver IC : HX8282-A + HX8696-A00

2. PHYSICAL SPECIFICATIONS

Item	Specifications	unit
LCD size	9 inch (Diagonal)	
Resolution	1024 (RGB) x 600	dot
Dot pitch	0.192(W) x 0.19025(H)	mm
Active area	196.6(W) x 114.1(H)	mm
Module size	211.1(W) x 126.5(H) x10.05(D)	mm
Display Mode	Normally Black	
Color arrangement	RGB Vertical stripe	
interface	LVDS	
Brightness	1200	cd/m^2

3. ABSOLUTE MAX. RATINGS

1.1 Electrical Absolute max. ratings

Item	Symbol	Condition	Min.	Max.	Unit	Remark
Power voltage	V_{DD}	GND=0	-0.3	4.5	V	
LED Power voltage	V_{LED}	GND=0	-0.3	12.0	V	
Input voltage	V_{in}		-0.3	V_{DD}+0.3	V	Note 1

Note1: SELB , U/D, L/R

3.2 Environmental Absolute max. ratings

Item	OPERATING		STORAGE		Remark
	MIN	MAX	MIN	MAX	
Temperature	-30	85	-30	85	Note2,3,4,5,6,7
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 -30℃ < 48h , at 85℃ < 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 : When LCM panel is operated over 60℃ (center of the panel surface temperature), the I_{LED} of the LED back-light should be adjusted to 180mA

Note7 : This is center of the panel surface temperature, not ambient temperature.

4. ELECTRICAL CHARACTERISTICS

4-1   Typical Operation Conditions

Typical operating conditions (GND=0V)

| Item		Symbol	Min.	Typ.	Max.	Unit	Remark
Power supply		V_{DD}	3.0	3.3	3.6	V	
Input Voltage for logic	H Level	V_{IH}	0.7 V_{DD}	--	V_{DD}	V	Note 1
	L Level	V_{IL}	0	--	0.3 V_{DD}	V	
Power Supply current		I_{DD}		320		mA	Note 2

Note1: SELB , U/D, L/R

Note2: TFT power supply current.

V_{DD}=3.3V, f_v =60Hz, Ta=25℃, Display pattern: All white

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	$\dfrac{\|VID\|}{2}$	1.25	$2.4-\dfrac{\|VID\|}{2}$	V	
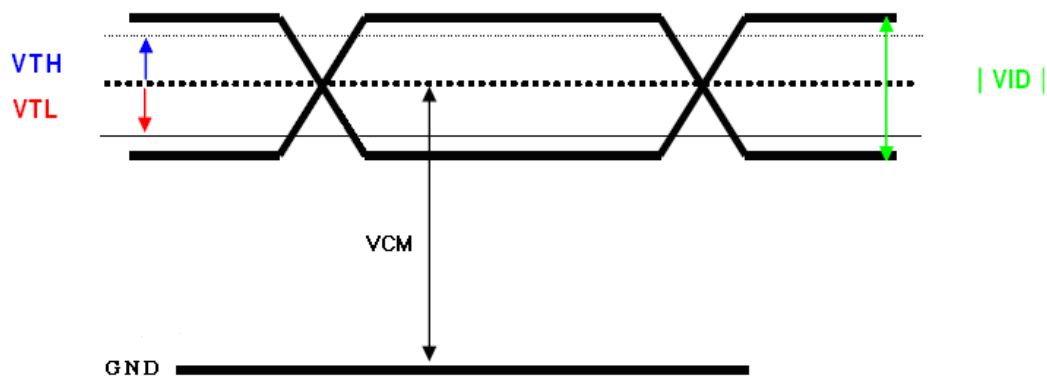
4-2 LED Driving Conditions(Preliminary, not decided yet)

Item	Symbol	Values			Unit	Note
		Min.	Typ.	Max.		
LED Driver Power Voltage	V_{LED}	9	12	14	V	
LED Driver Current Consumption	I_{LED}	--	830	--	mA	VLED=12V ADJ=5V (duty 100%)
ADJ Input Voltage	V_{ADJ}	1.2	--	V_{LED}	V	duty=100% Note(3)
ADJ Frequency	F_{ADJ}	100	200	500	Hz	
ADJ Duty cycle		5		100	%	
LED forward Current	I_{AK}	--	240	--	mA	Ta=25℃
LED life time	--	--	50,000	--	Hr	Note(2)

Note (1) The constant current source is needed for white LED back-light driving.
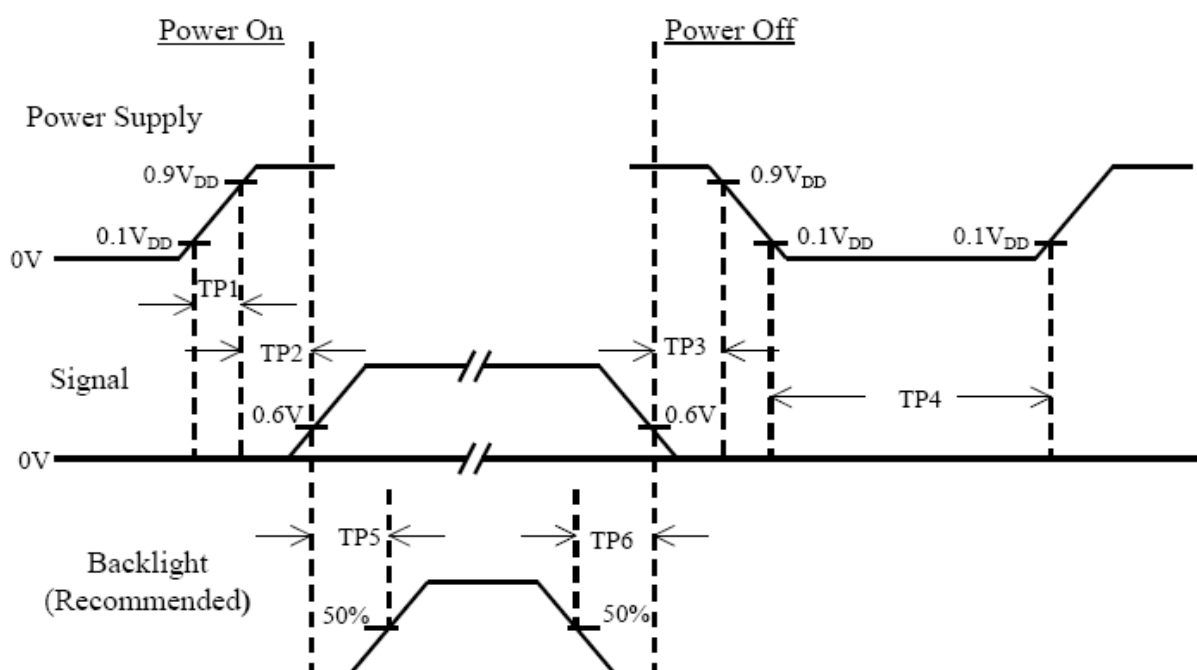
Note (2) Brightness to be decreased to 50% of the initial value. Ta=25℃

Note (3) VLEDADJ is PWM signal input. It is for brightness control.

Please use ADJ to reduce the I_{LED}, when operated over 40℃ ambient temperature.
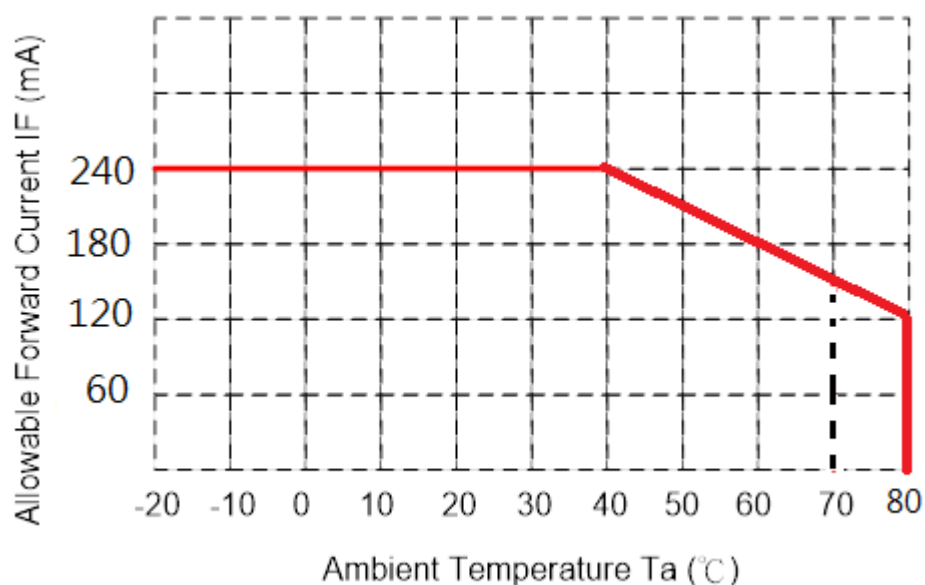
4-3 **Power Sequence**

Item	Min.	Typ.	Max.	Unit	Remark
TP1	0.5	--	10	msec	
TP2	0	--	50	msec	
TP3	0	--	50	msec	
TP4	500	--	--	msec	
TP5	200	--	--	msec	
TP6	200	--	--	msec	

Note：

(1) The supply voltage of the external system for the module input should be the same as the definition of VDD.

(2) Apply the lamp voltage within the LCD operation range. When the back-light turns on before the LCD operation or the LCD turns off before the back-light turns off, the display may momentarily become white.

(3) In case of VDD = off level, please keep the level of input signal on the low or keep a high impedance.

(4) TP4 should be measured after the module has been fully discharged between power off and on period.

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

5. Optical Specifications

| Item	Symbol	Condition	Values			Unit	Note
			Min.	Typ.	Max.		
Viewing angle (CR≧10)	θ L	Φ = 180° (9 o'clock)	75	85	--	degree	Note1
	θ R	Φ = 0° (3 o'clock)	75	85	--		
	θ T	Φ = 90° (12 o'clock)	75	85	--		
	θ B	Φ = 270° (6 o'clock)	75	85	--		
Response time	TON	Normal θ =Φ=0°	--	18	--	msec	Note3
	TOFF		--	17	--	msec	
Contrast ratio	CR		640	800	--	--	Note4
Color chromaticity	WX		0.260	0.310	0.360	--	Note5 Note6
	WY		0.280	0.330	0.380	--	
Luminance	L		960	1200	--	cd/m^2	Note6

Test Conditions:

1. VCC = 3.3V, I$_L$ = 240mA (Backlight current), the ambient temperature is 25℃.
2. The test systems refer to Note 2.

Note 1 : Definition of viewing angle range
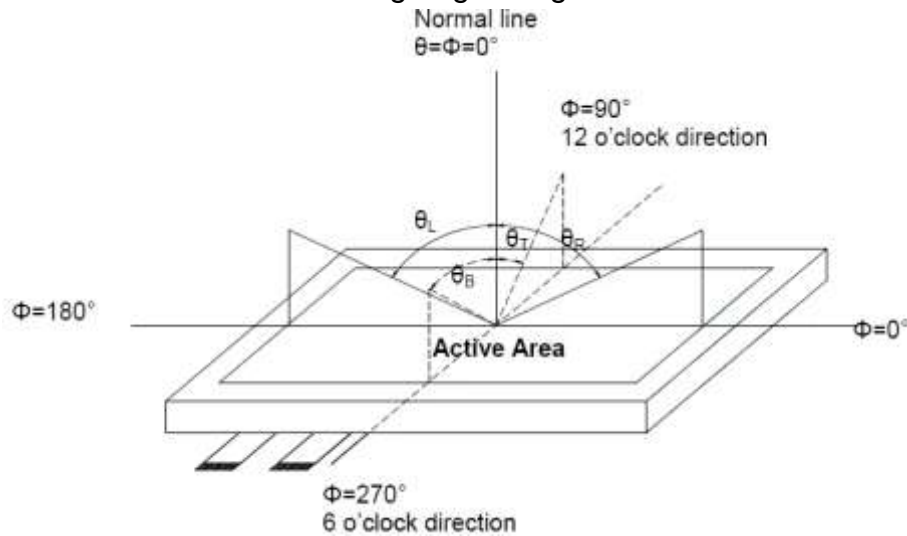
Note 2 : Definition of optical measurement system.

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. (Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/Field of view : 1° / Height : 500mm.)
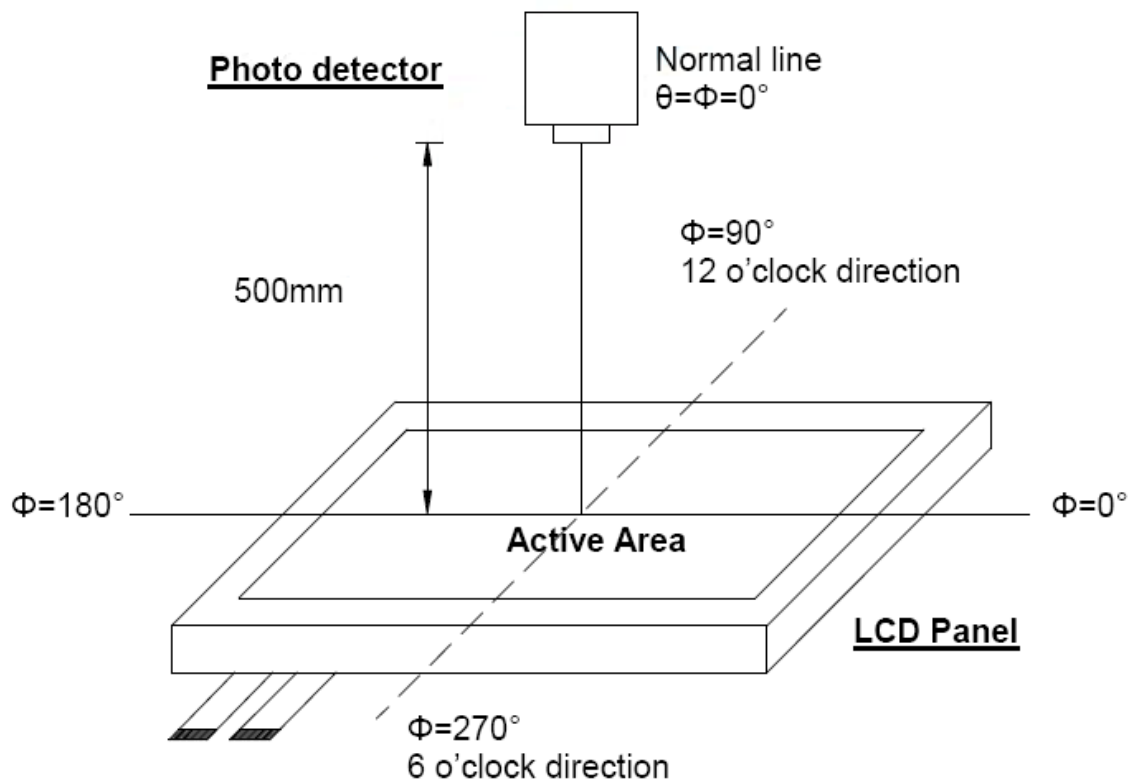
Note 3 : Definition of Response time

The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time (T_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.
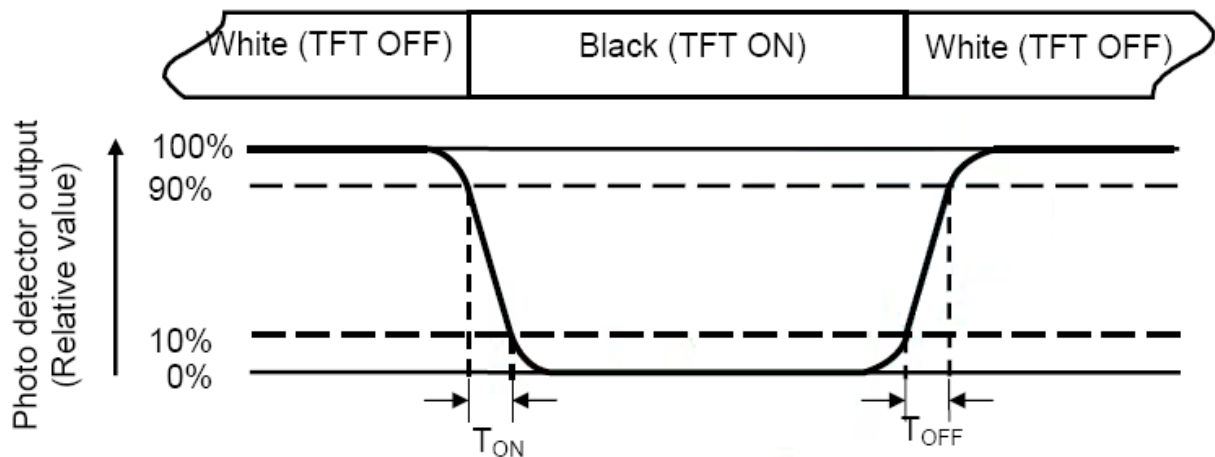
Note 4 : Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 5 : Definition of color chromaticity (CIE1931)

Color coordinated measured at center point of LCD.

Note 6 : All input terminals LCD panel must be ground when measuring the center area of the panel.

6. INTERFACE

Electrical Interface Connection

CN1(Input signal): CSTAR DS100-430-H23 (equivalent JAE FI-XB30SSRL-HF16)

Pin No.	Symbol	Description	Note
1	GND	Ground	
2	VDD	3.3V Power	
3	VDD	3.3V Power	
4	NC	No connection	
5	ADJ	LED PWM	Note*
6	NC	No connection	
7	NC	No connection	
8	RXIN0-	LVDS Signal - channel0-	
9	RXIN0+	LVDS Signal+ channel0+	
10	GND	Ground	
11	RXIN1-	Data Input channel1-	
12	RXIN1+	Data Input channel1+	
13	GND	Ground	
14	RXIN2-	Data Input channel2-	
15	RXIN2+	Data Input channel2+	
16	GND	Ground	
17	RXCLKIN-	Data Input CLK-	
18	RXCLKIN+	Data Input CLK+	
19	GND	Ground	
20	RXIN3-	Data Input channel3-	
21	RXIN3+	Data Input channel3+	
22	GND	Ground	
23	GND	Ground	

| 24	VLED	VLED Power +12V	
25	VLED	VLED Power +12V	
26	VLED	VLED Power +12V	
27	SELB	LVDS Interface Select PIN SELB = "0", 24BIT LVDS SELB = "1", 18BIT LVDS	Note3
28	U/D	Vertical inversion	Note2
29	L/R	Horizontal inversion	Note2
30	LED_ON	LED Enable Pin：High→Enable	

[Note]
(1) ADJ can adjust brightness to control Pin. Pulse duty the bigger the brighter.
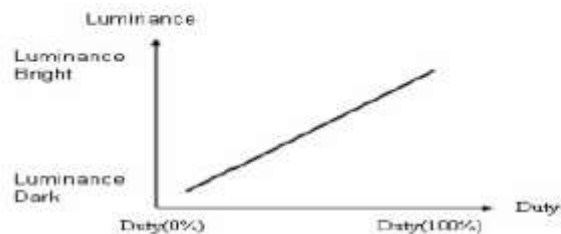
(2) ADJ Signal=0~3.3V，Operation Frequency：

Dimming Range		
PWM Frequency (F)	Duty Cycle (Min.)	Duty Cycle (Max.)
100Hz < F < 500Hz	5%	100%
500Hz < F < 20KHz	10%	100%

Duty Cycle = t / T *100%
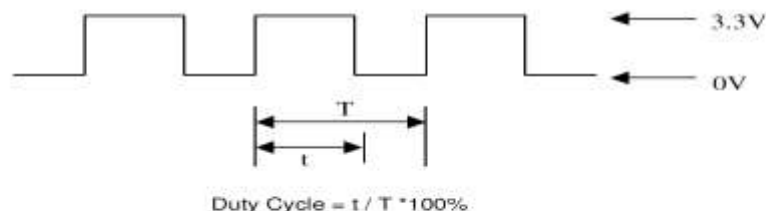
Note2：When L/R="0", set right to left scan direction.
　　　　When L/R="1", set left to right scan direction.
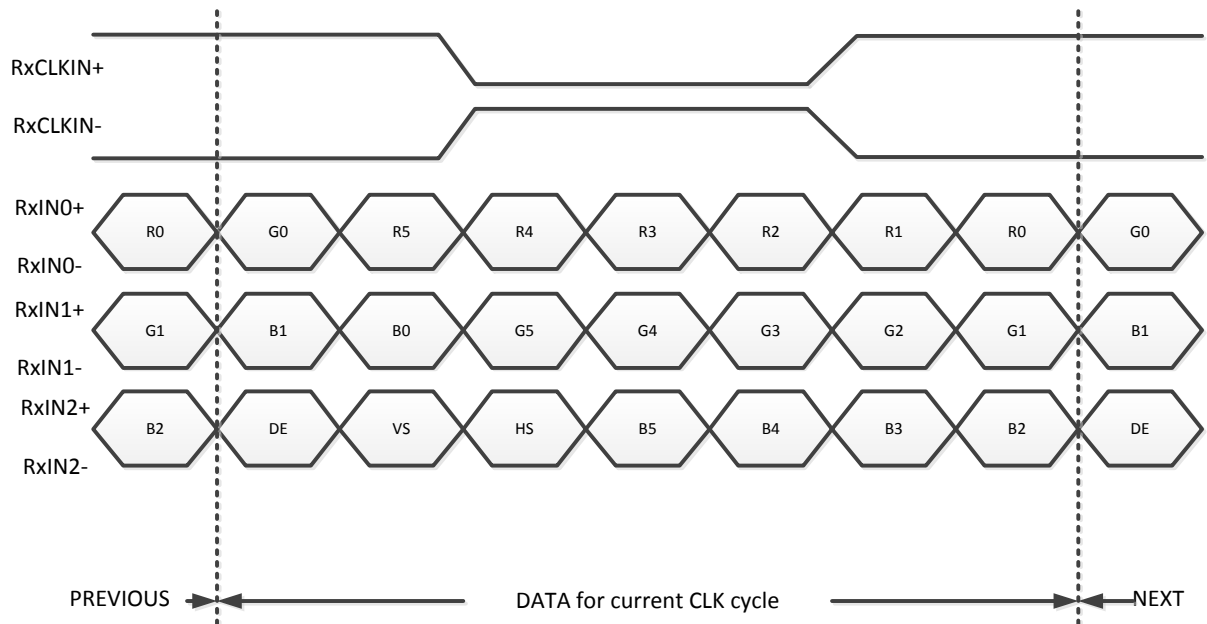　　　　When U/D="0", set top to bottom scan direction.
　　　　When U/D="1", set bottom to top scan direction.

Note3：If LVDS input data is 6 bits, SELB must be set to High;
　　　　If LVDS input data is 8 bits, SELB must be set to Low.
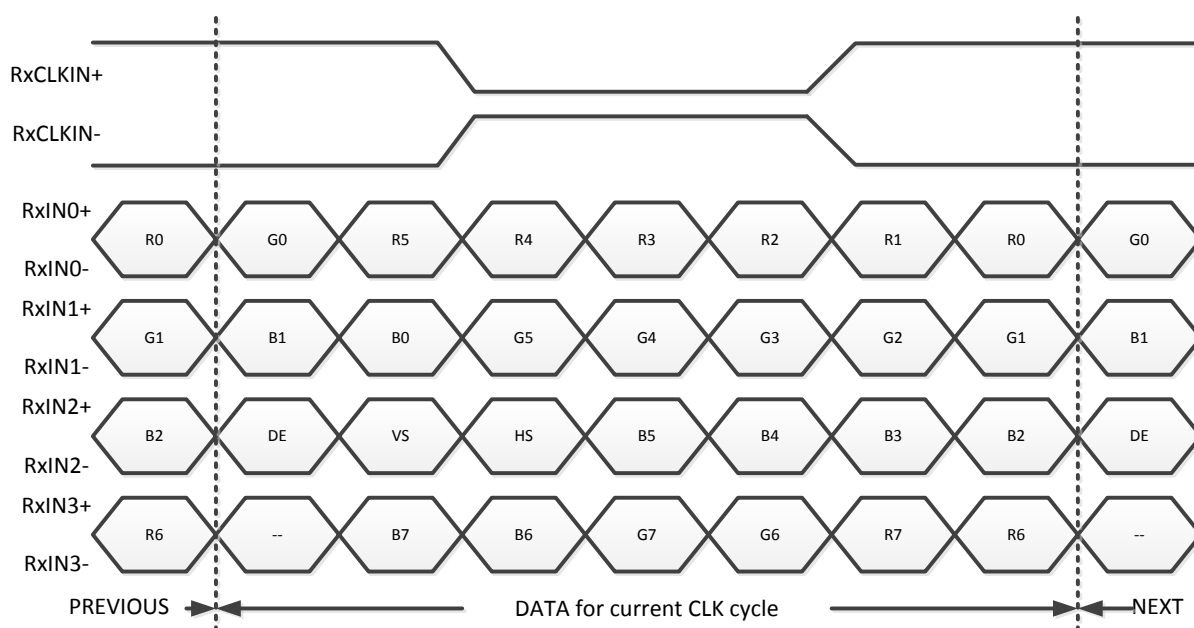
7. TIMING CHARACTERISTICS

● **18-BIT LVDS Input Data Format (SELB=H)**

Note : R/G/B data 6 : MSB, R/G/B data 0 : LSB

Signal Name	Description	Remark
R5 R4 R3 R2 R1 R0	Red Data 5 (MSB) Red Data 4 Red Data 3 Red Data 2 Red Data 1 Red Data 0 (LSB)	Red-pixel Data Each red pixel's brightness data consists of these 6 bits pixel data.
G5 G4 G3 G2 G1 G0	Green Date 5 (MSB) Green Date 4 Green Date 3 Green Date 2 Green Date 1 Green Date 0 (LSB)	Green-pixel Data Each green pixel's brightness data consists of these 6 bits pixel data.
B5 B4 B3 B2 B1 B0	Blue Data 5(MSB) Blue Data 4 Blue Data 3 Blue Data 2 Blue Data 1 Blue Data 0 (LSB)	Blue-pixel Data Each blue pixel's brightness data consists of these 6 bits pixel data.
RxCLKIN+ RxCLKIN-	LVDS Clock Input	
DE	Display Enable	
VS	Vertical Sync Signal	
HS	Horizontal Sync Signal	

● 24-BIT LVDS Input Data Format (SELB=L)


Note : R/G/B data 7 : MSB, R/G/B data 0 : LSB

Signal Name	Description	Remark
R7 R6 R5 R4 R3 R2 R1 R0	Red Data 7 (MSB) Red Data 6 Red Data 5 Red Data 4 Red Data 3 Red Data 2 Red Data 1 Red Data 0 (LSB)	Red-pixel Data Each red pixel's brightness data consists of these 8 bits pixel data.
G7 G6 G5 G4 G3 G2 G1 G0	Green Date 7 (MSB) Green Date 6 Green Date 5 Green Date 4 Green Date 3 Green Date 2 Green Date 1 Green Date 0 (LSB)	Green-pixel Data Each green pixel's brightness data consists of these 8 bits pixel data.
B7 B6 B5 B4 B3 B2 B1 B0	Blue Data 7 (MSB) Blue Data 6 Blue Data 5 Blue Data 4 Blue Data 3 Blue Data 2 Blue Data 1 Blue Data 0 (LSB)	Blue-pixel Data Each blue pixel's brightness data consists of these 8 bits pixel data.
RxCLKIN+ RxCLKIN-	LVDS Clock Input	
DE	Display Enable	
VS	Vertical Sync Signal	
HS	Horizontal Sync Signal	

7-2 RGB Timing(DE MODE)

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK frequency @Frame rate=60hz	fclk	40.8	51.2	67.2	Mhz
Horizontal display area	thd		1024		DCLK
HSYNC period time	th	1114	1344	1400	DCLK
HSYNC blanking	thb+thfp	90	320	376	DCLK
Vertical display area	tvd		600		H
VSYNC period time	tv	610	635	800	H
VSYNC blanking	tvb+tvfp	10	35	200	H

Timing Diagram of Interface Signal (DE mode)

(1) Vertical input timing
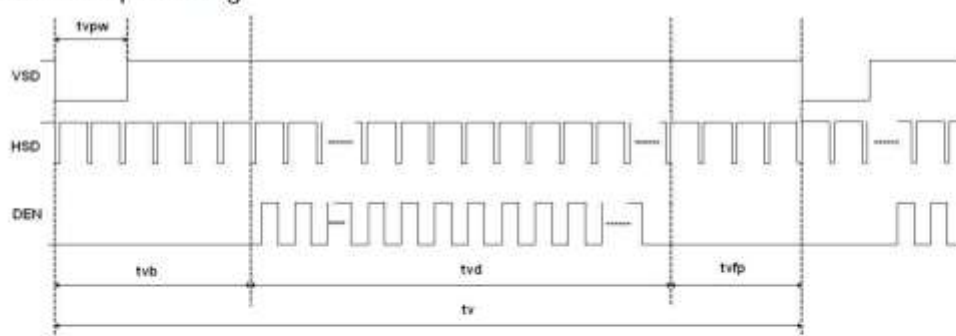
(2) Horizontal Vertical input timing
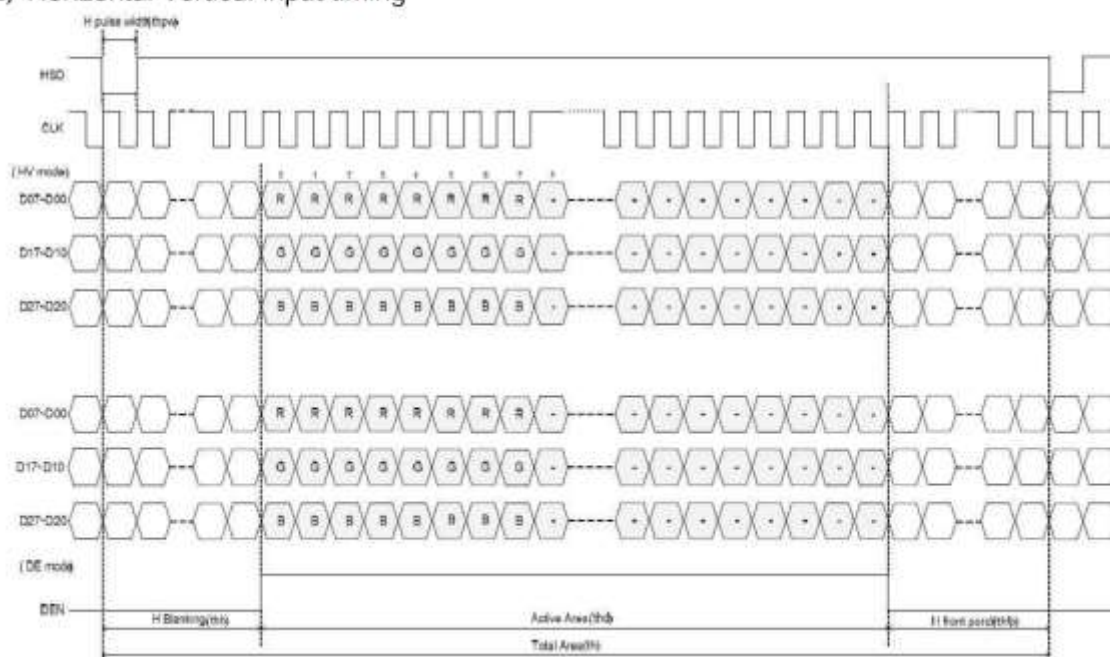
8. RELIABILITY TEST CONDITIONS

Test Item	Test Conditions	Note
High Temperature Operation	85±3°C ,Dry t=240 hrs	
Low Temperature Operation	-30±3°C, Dry t=240 hrs	
High Temperature Storage	85±3°C , Dry t=240 hrs	1,2
Low Temperature Storage	-30±3°C ,Dry t=240 hrs	1,2
Thermal Shock Test	-30°C ~ 25°C ~ 85°C 30 m in. 5 min. 30 min. (1 cycle) Total 100 cycle(Dry)	1,2
Storage Humidity Test	60 °C, Humidity 90%, 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).

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.

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. USE PRECAUTIONS

9-1 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.

(1) 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.

9-2 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

9-3 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.
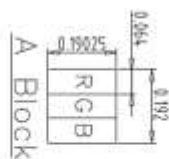
(3) Store the products as they are put in the boxes provided from us or in the same conditions as we recommend.
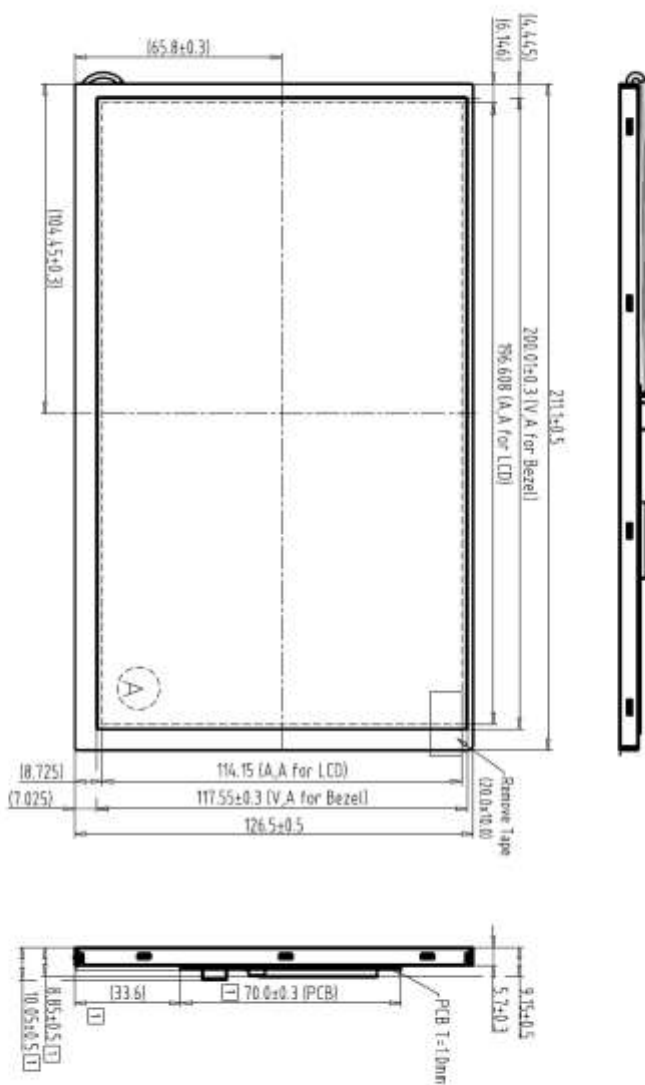
9-4 Operating precautions

(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.

9-5 Other

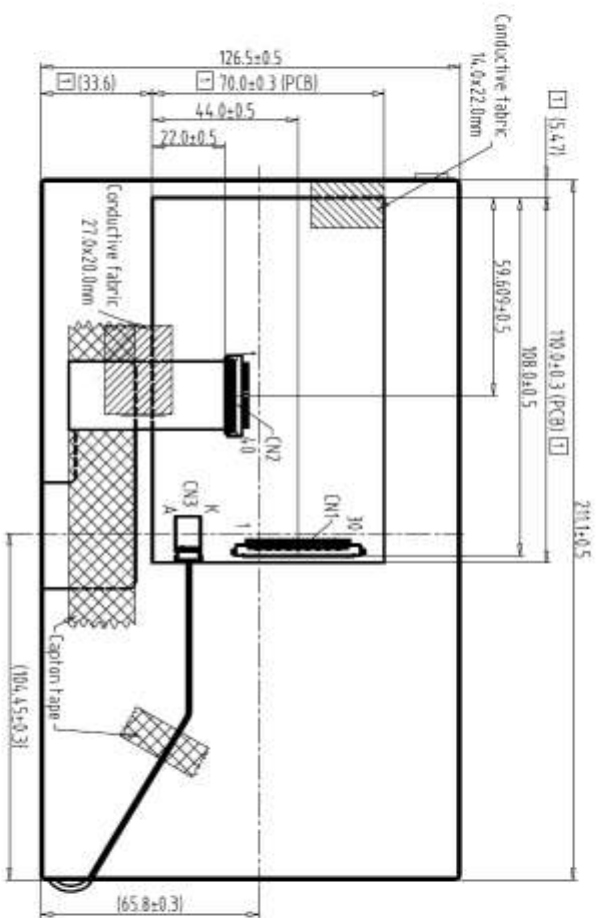(1) Do not disassemble or take the LC module into pieces. The LC modules once disassembled or taken into pieces are not the guarantee articles.

(2) 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.

(3) AMIPRE will provide one year warrantee for all products and three months warrantee for all repairing products..

10. OUTLINE DIMENSION

CN1

1	GND	16	GND
2	VDD	17	RXCLKIN-
3	VDD	18	RXCLKIN+
4	NC	19	GND
5	ADJ	20	RXIN3-
6	NC	21	RXIN3+
7	GND	22	GND
8	RXIN0-	23	GND
9	RXIN0+	24	VLED
10	GND	25	VLED
11	RXIN1-	26	VLED
12	RXIN1+	27	SELB
13	GND	28	U/D
14	RXIN2-	29	L/R
15	RXIN2+	30	LED_ON

Note:
1. Unless indicated, Tolerance "±0.3"
2. UV Glue For OLB Protection.
3. CN1:P1.0 30PIN/DS100-430-H23 or Equivalent
4. CN2:P0.5 40PIN H2.0/089H40-000000-G2-R or Equivalent
5. LCD 1024x3(R.G.B)x600=> 9.0" Digital TFT LCD

1	1024x600 IPS			
2	B/L LED (1000nits)			
3	LED driver on board			
4	TFT-1024600-57-0			

TITLE: 1024600Y2-A0

DWG. NO.: *151212MA (9.0"+1000nits B/L)

SHEET 1 OF 1

PARTS' NO. LCM 1024600Y2-A0

DWN. EMILY   DATE 12-02-15'

Back View

CN1

1	GND	16	GND
2	GND	17	RXCLKIN-
3	RXCLKIN-	18	RXCLKIN+
4	NC	19	GND
5	ADJ	20	RXIN3-
6	NC	21	RXIN3+
7	GND	22	GND
8	RXIN0-	23	GND
9	RXIN0+	24	VLED
10	GND	25	VLED
11	RXIN1-	26	VLED
12	RXIN1+	27	SELB
13	GND	28	U/D
14	RXIN2-	29	L/R
15	RXIN2+	30	LED_ON

Note:
1. Unless indicated, Tolerance "±0.3"
2. UV Glue For OLB Protection.
3. CN1:P1.0 30PIN/DS100-430-H23 or Equivalent
4. CN2:P0.5 40PIN H2.0/089H40-000000-G2-R or Equivalent
5. LCD 1024X3(R.G.B)x600=> 9.0" Digital TFT LCD

1	1024x600 IPS	7	
2	B/L LED (1000nits)	8	
3	LED driver on board	9	
4	TFT-1024600-57-0	10	
5		11	
6		12	

	TOLERANCE GRADE(±)	A	B	DIM.	MM

	PART'S NO. LCM-1 1024600Y2-A0	IE NO.	DWN. EMILY	CHK.	APPD.

	DATE 12-02-15'	DATE	DATE

AMPIRE 晶采光電科技

TITLE: 1024600Y2-A0
(9.0"+1000nits B/L)
DWG. NO. +15121 3MA
SHEET: 1 OF 1