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-800600K7MZQW-B0H
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**)**
TEL:886-2-26967269 , FAX:886-2-26967196 or 26967270

Approved by	Checked by	Organized by
Patrick	Simon	Tank

This Specification is subject to change without notice

RECORD OF REVISION

Revision Date	Page	Contents	Editor
2024/05/22	-	New Release	Tank

1. INSTRUCTION

Ampire 10.4” Display Module is a color active matrix TFT-LCD that uses amorphous silicon TFT as a switching device. This model is composed of a TFT-LCD panel, a driving circuit. This TFT-LCD has a high resolution (800(R.G.B) x 600) and can display up to 262,144 colors.

1.1 Features

(1) Construction : a-Si TFT-LCD with driving system, White LED Backlight.

(2) LCD type : Transmissive , Normally Black

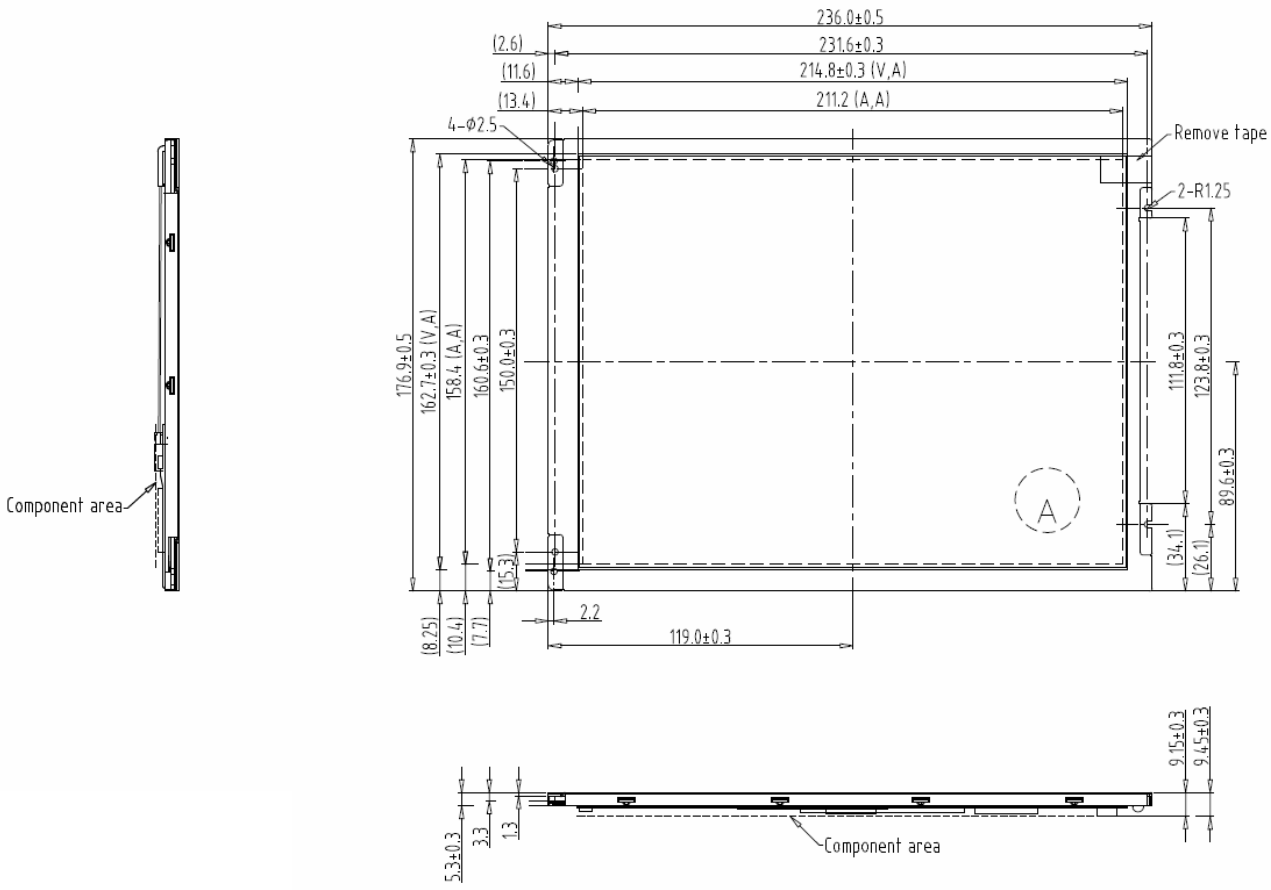
(3) Number of the Colors : 262K colors (R,G,B 6 bit digital each)

(4) TTL Interface. (DE mode only)

(5) LCD Power Supply Voltage: 3.3V single power input, built-in power supply circuit.

2. PHYSICAL SPECIFICATIONS

Item	Specifications	Unit
Display Resolution(dot)	800RGB (W) x 600(H)	dots
Active Area	211.2 (W) x 158.4(H)	mm
Pixel Pitch	0.264 (W) x 0.264 (H)	mm
Color Configuration	R.G.B -stripe	
Backlight Unit	LED	
Display Color	262,144	colors



3. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min.	Max.	Unit	Note
Supply Voltage Range	VDD	-0.3	3.96	V	GND=0V
Voltage range at any terminal	VIN	-0.3	VDD+0.3	V	Note 2
Supply Voltage Range	VLED	-0.3	14	V	
Operating Temperature	Top	-20	70	℃	
Storage Temperature	Tstg	-30	80	℃	

Note 1 : The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

Note 2 : VIN represents DE, VSYNC, HSYNC, DCLK, R0~R5, G0~G5, B0~B5.

4. OPTICAL CHARACTERISTICS

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Response Time		$T_r + T_f$	Θ=Φ=0°	-	35	45	ms	(1)(4)
Contrast Ratio		CR		1000	1200	-	-	(1)(3)
Viewing Angle		ΘT	CR≧10	78	88	-	degree	(1)(2)
		ΘB		78	88	-		
		ΘL		78	88	-		
		ΘR		78	88	-		
Luminance		L	Θ=Φ=0°	**400**	**500**	-	cd/m^2	(1)(7)
Luminance Uniformity		ΔL		75	80	-	%	(1)(6)
Color Chromaticity	Red	Rx		Typ. -0.05	0.599	Typ. +0.05	-	(1)(5)
		Ry			0.323		-	
	Green	Gx			0.335		-	
		Gy			0.593		-	
	Blue	Bx			0.152		-	
		By			0.115		-	
	White	Wx			0.305		-	
		Wy			0.335		-	

Note(1) Definition of optical measurement system

The optical characteristics should be measured in dark room. The optical characteristics are measured at the center point of the LCD screen.

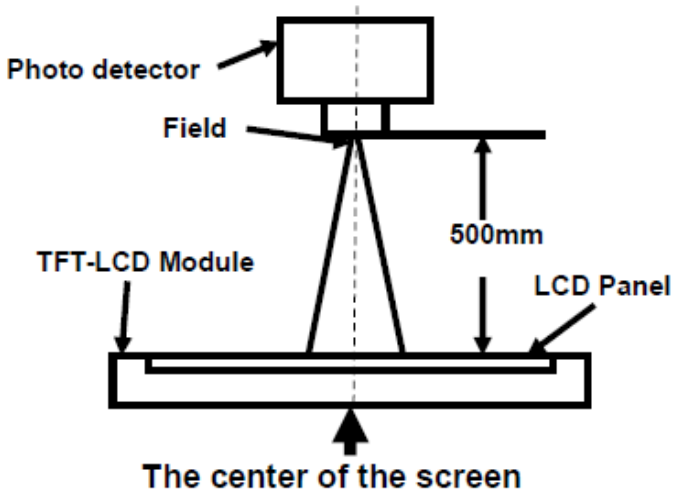


Fig1.Measurement Set Up

Note(2) Definition of viewing angle range and measurement system. Viewing angle is measured at the center point of the LCD.

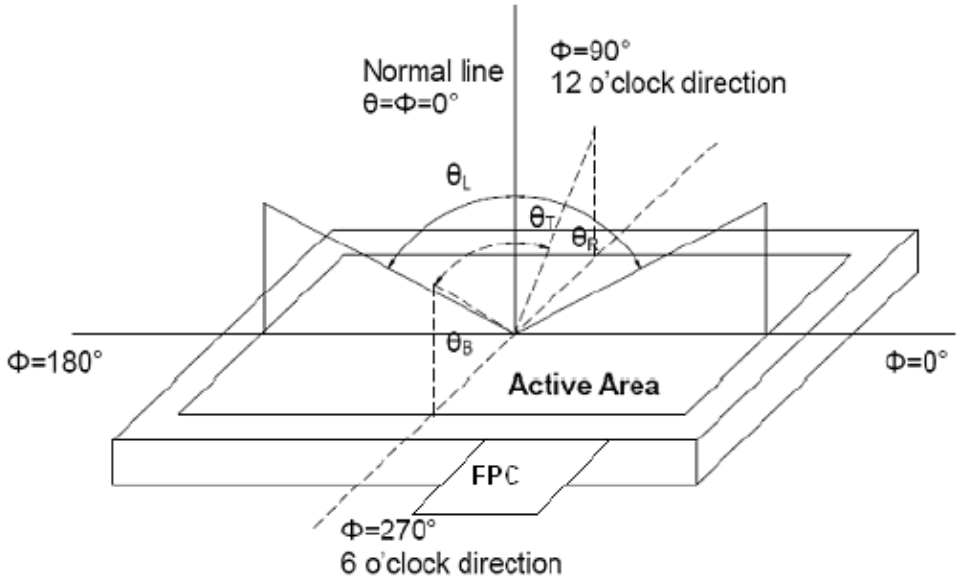


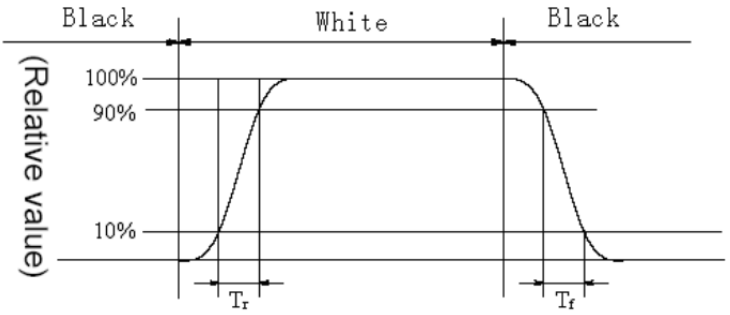
Fig2.Measurement viewing angle

Note(3) Definition of contrast ratio

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

Note(4) Definition of Response time

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time (Tr) is the time between photo detector output intensity changed from 10% to 90%. And fall time (Tf) is the time between photo detector output intensity changed from 90% to 10%.



Note(5) Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note(6) Definition of Luminance Uniformity

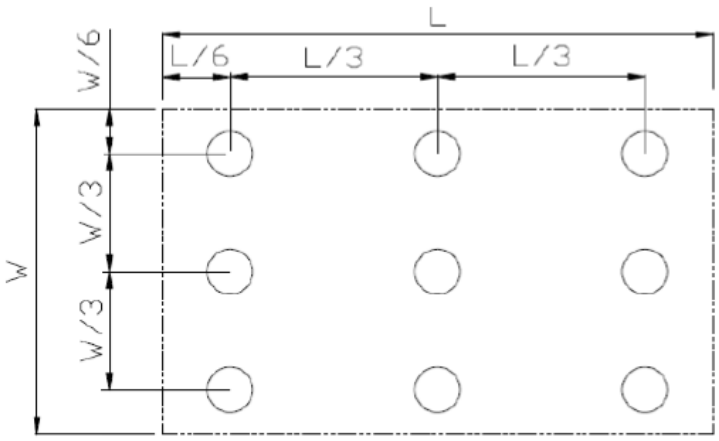
Active area is divided into 9 measuring areas (Refer Fig.5). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity (U) = Lmin/Lmax

Lmax: The measured Maximum luminance of all measurement position.

Lmin: The measured Minimum luminance of all measurement position.

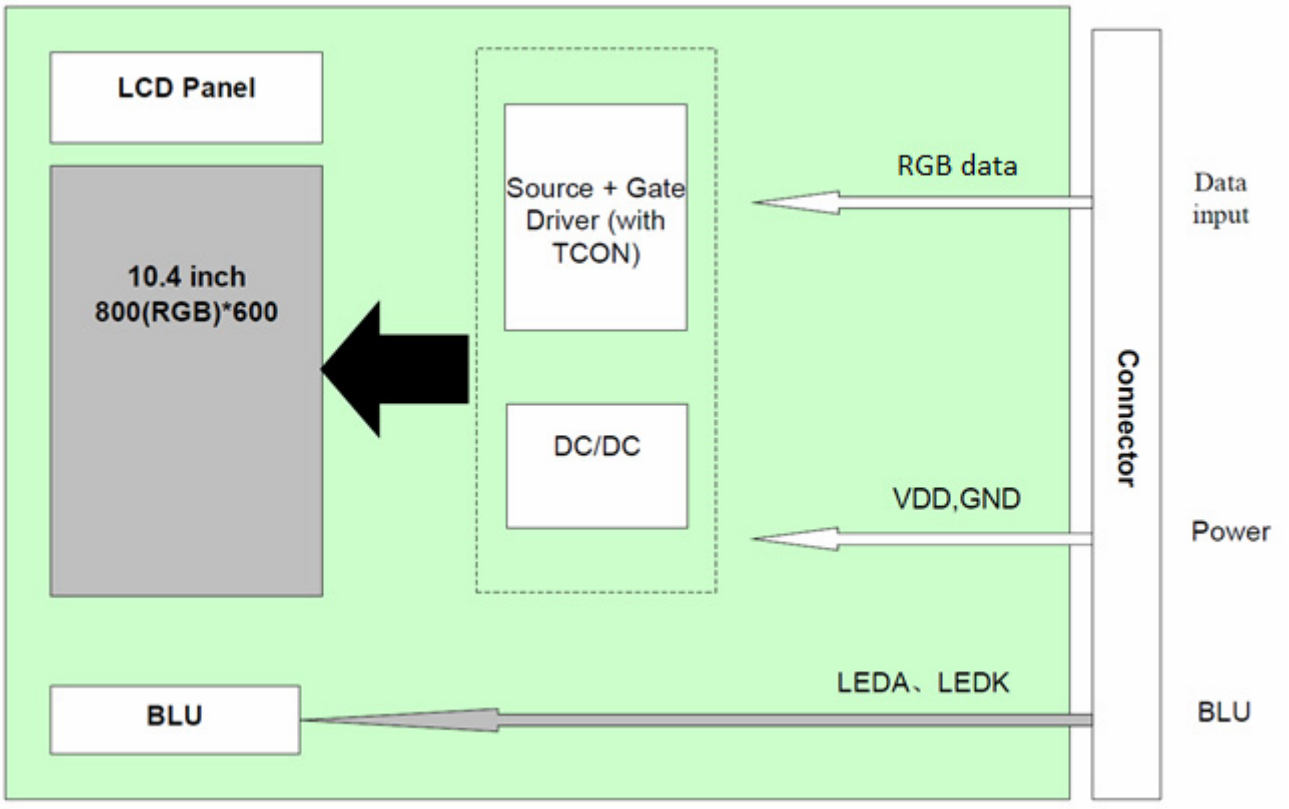
L-------Active area length; W-----Active area width



Note(7) Definition of Luminance:

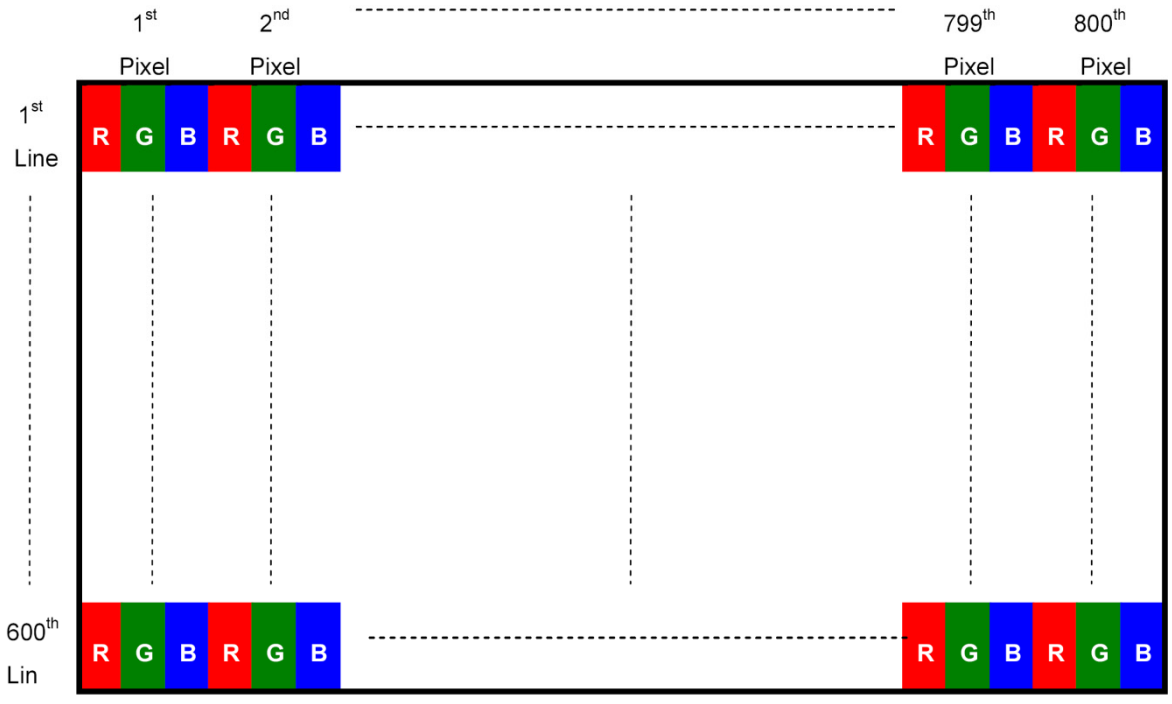
Measure the luminance of white state at center point.

5. Block Diagram



5.1 LCD Pixel Format

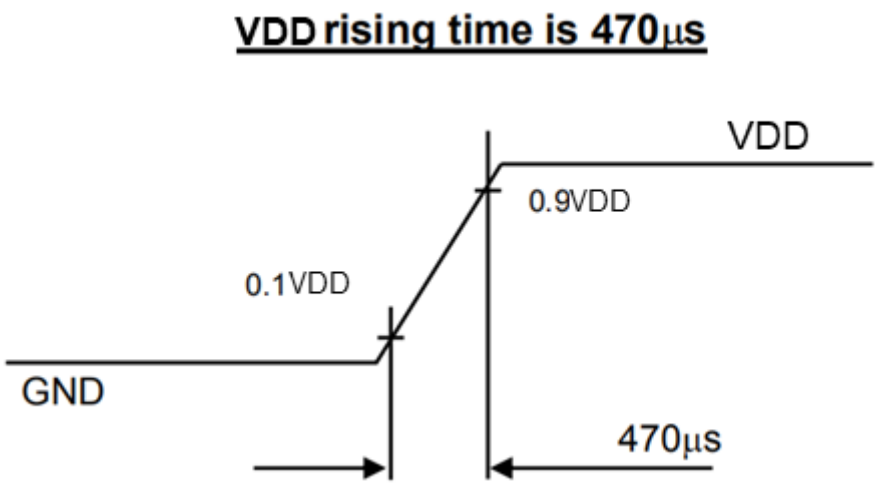
Following figure shows the relationship between input signal and LCD pixel format.



6. ELECTRICAL CHARACTERISTICS

Item		Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage		VDD	3.0	3.3	3.6	V	Include ripple
High-level Input Voltage		VIH	$0.8V_{DD}$	-	V_{DD}	V	GND=0V
Low-level Input Voltage		VIL	GND	-	$0.2V_{DD}$	V	GND=0V
Power Consumption	60Hz	P	--	T.B.D	--	mW	White pattern
VDD rush current		Irush	-	-	1.5	A	

Note: Inrush current test condition



7. Backlight Driving Circuit

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Input Voltage	V_{LED}	10.8	12.0	12.6	V	
Input Current	I_{LED}	--	T.B.D.	--	mA	100% duty
Forward Current	I_F	-	T.B.D.	-	mA	Note 1
Forward Voltage	V_F	-	T.B.D.	-	V	Note 1
Backlight Power Consumption	W_{BL}	-	T.B.D.	-	mW	Note 1
LED life time		-	50000	-	Hrs	

Note(1) LED connection of backlight shown as below:

T.B.D.

Note(2) One LED: IF = T.B.D mA. Total LED back-light driving current

Note(3) If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced.

Note(4) Operating life means brightness goes down to 50% of initial brightness. Typical operating life time is estimated data.

Note(5) The backlight must be driven by constant current source.

Note(6) Brightness to be decreased to 50% of the initial value.

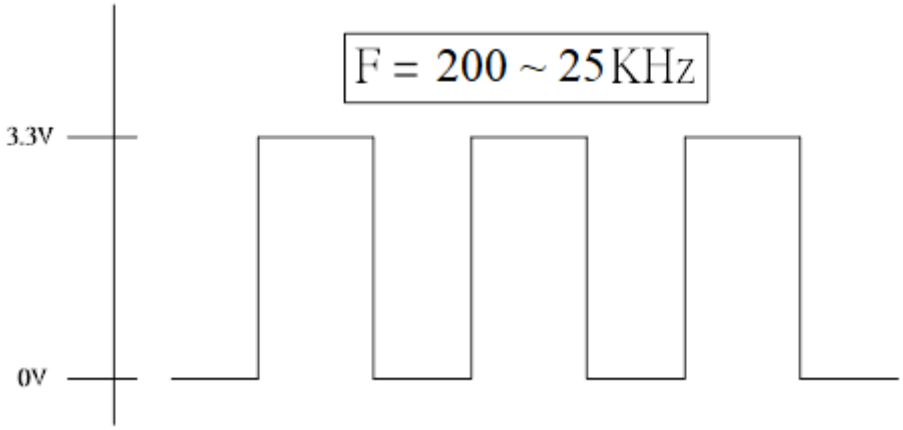
Note(7) When LCM is operated over 40℃ ambient temperature, the **IF** should be follow :

T.B.D.

8. INTERFACE

Pin no	Symbol	Function
1	VLED	LED Driving Voltage (12V)
2	VLED	LED Driving Voltage (12V)
3	VADJ	Adjust the LED brightness by PWM (3.3V)
4	GLED	Ground for LED Circuit
5	GLED	Ground for LED Circuit
6	VDD	Power Supply for Digital Circuit (3.3V)
7	VDD	Power Supply for Digital Circuit (3.3V)
8	MODE	**Please No Connect** **DE Mode (Default setting)**
9	DE	Data enable
10	VSYNC	VSYNC Signal Input **(DE mode only, please no connect)**
11	HSYNC	HSYNC Signal Input **(DE mode only, please no connect)**
12	GND	Power Ground
13	B5	Blue Data Input (MSB)
14	B4	Blue Data Input
15	B3	Blue Data Input
16	GND	Power Ground
17	B2	Blue Data Input
18	B1	Blue Data Input
19	B0	Blue Data Input (LSB)
20	GND	Power Ground
21	G5	Green Data Input (MSB)
22	G4	Green Data Input
23	G3	Green Data Input
24	GND	Power Ground
25	G2	Green Data Input
26	G1	Green Data Input
27	G0	Green Data Input (LSB)
28	GND	Power Ground
29	R5	Red Data Input (MSB)
30	R4	Red Data Input
31	R3	Red Data Input
32	GND	Power Ground
33	R2	Red Data Input
34	R1	Red Data Input
35	R0	Red Data Input (LSB)
36	GND	Power Ground
37	DCLK	Sampling Clock
38	GND	Power Ground
39	NC	No Connection
40	NC	No Connection

Note : VADJ maximum/minimum voltage and frequency maximum/minimum value as below.



9. Timing Characteristic of the LVDS

9.1 AC characteristics

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
HS setup time	T_{hst}	8	-	-	ns
HS hold time	T_{hhd}	8	-	-	ns
VS setup time	T_{vst}	8	-	-	ns
VS hold time	T_{vhd}	8	-	-	ns
Data setup time	T_{dsu}	8	-	-	ns
Data hold time	T_{dhd}	8	-	-	ns
DE setup time	T_{esu}	8	-	-	ns
DE hold time	T_{ehd}	8	-	-	ns
VDD Power On Slew rate	T_{POR}	-	-	20	ms
RSTB pulse width	T_{Rst}	10	-	-	μs
CLKIN cycle time	T_{cph}	20	-	-	ns
CLKIN pulse duty	T_{cwh}	40	50	60	%
Output stable time	T_{sst}	-	-	6	μs

Table 9.1.1 AC characteristics

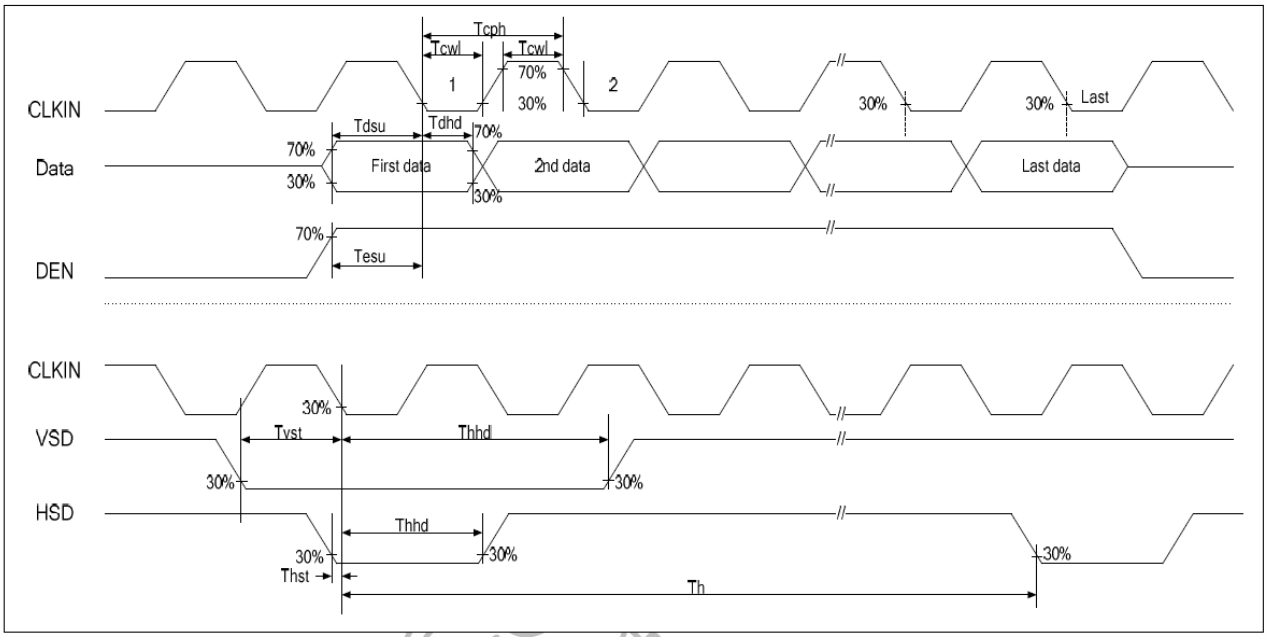


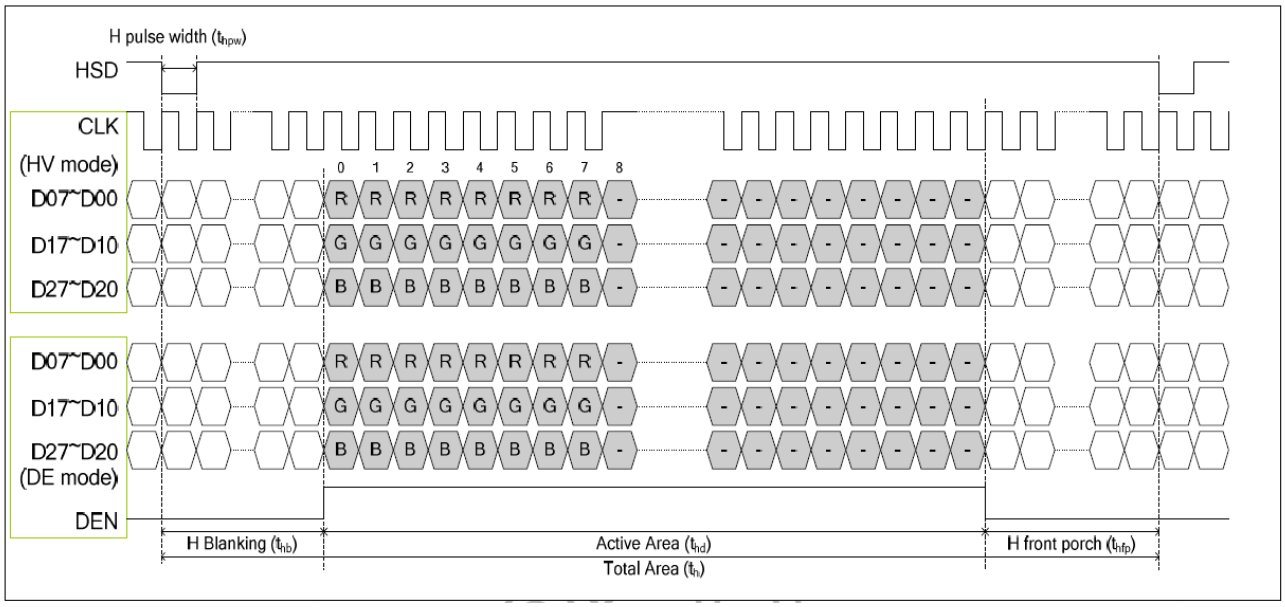
Figure 9.1.1 AC characteristics

9.2 Data Input Timing Parameter Setting

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK frequency		Fclk	33.1	39.6	62.4	MHz	Tclk=1/Fclk
Horizontal section	Horizontal total	TH	890	1000	1300	Tclk	
	Horizontal blanking	THC	90	200	500	Tclk	
	Valid Data Width	THD		800		Tclk	
Vertical section	Vertical total	TV	620	660	800	TH	
	Vertical blanking	TVC	20	60	200	TH	
	Valid Data Width	TVD		600		TH	
Frame Rate		F		60		HZ	

Table 9.2.1 Data Input Timing Parameter Setting

- **Horizontal timing**



- **Vertical Timing**

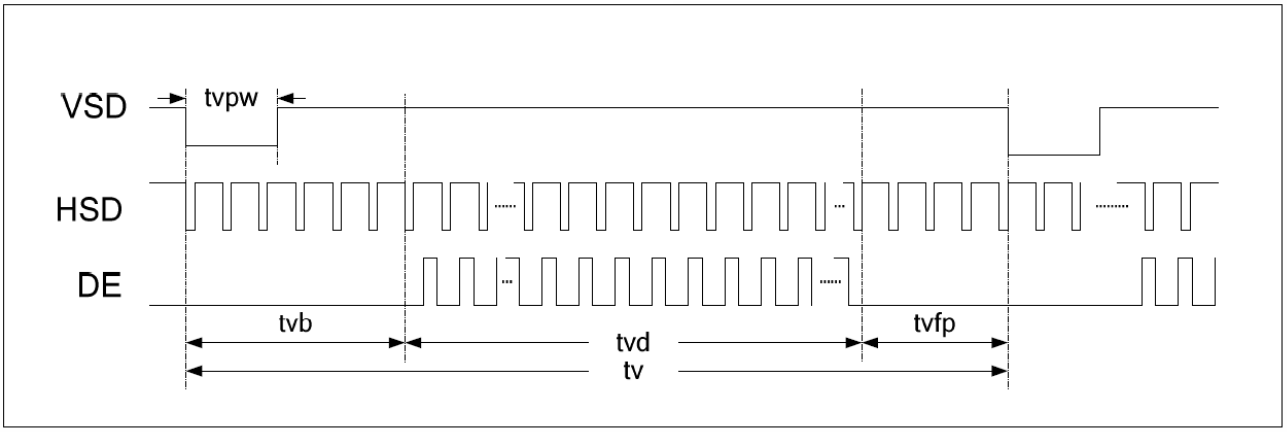


Figure 9.2.1 Data Input Timing

10. Power ON/OFF Sequence

Item	Symbol	Min	Typ	Max	Unit	Remark
VDD 10% to VDD 90%	Tp0	1	-	5	ms	
VDD to signal starting	Tp1	20	-	50	ms	
Signal starting to backlight on	Tp2	200	-	-	ms	
Signal off to VDD	Tp3	50	-	100	ms	
Backlight off to signal off	Tp4	200	-	-	ms	
To next VDD	Tp5	2	-	-	S	

Table 10.1 Power on/off sequence

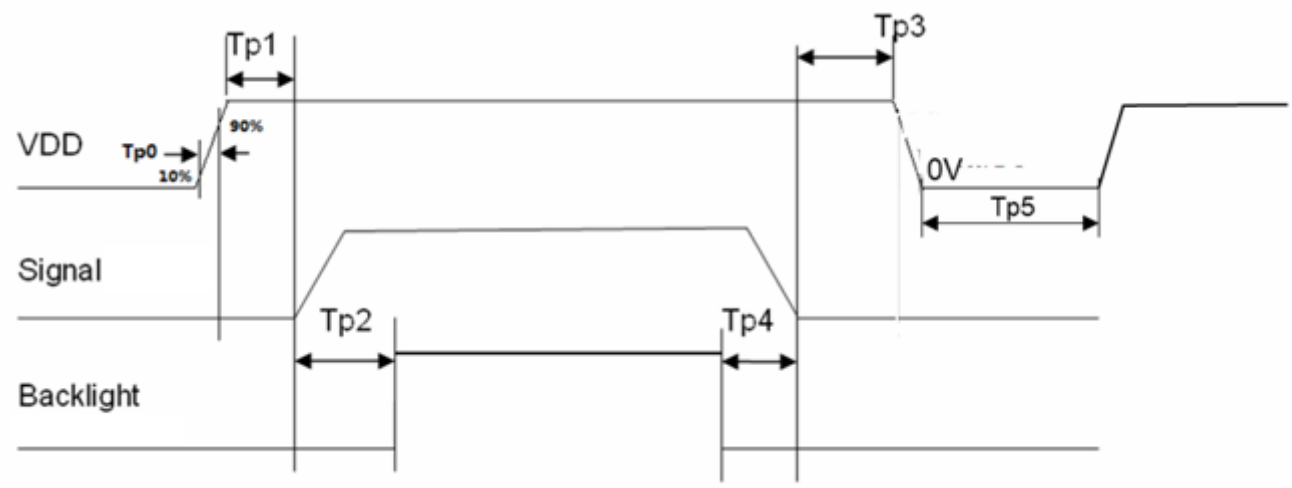


Figure 10.1 Power on/off sequence

Note(1) The low level of these signals and analog powers are GND level.

Note(2) 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.

Note(3) The power on/off sequence is the first version. It will be updated when the design is fixed.

Note(4) LEDA/K is the voltage applied to backlight. Keep it turned off until the display has stabilized.

11. Reliability Test

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
Thermal Shock Test	-20°C ~ 25°C ~ 70°C 30 min. ~ 5 min. ~ 30 min. (1 cycle) Total 5 cycle	
Humidity Test	60 °C, Humidity 90%, 240 hrs	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 inspired after 1 hour storage in normal conditions (15~35℃, 45~65%RH).

Note(3) The module shouldn't be tested over one condition, and all the tests are independent.

Note(4) All reliability tests should be done without the protective film.

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 initial value.

12. USE PRECAUTIONS

12.1 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.

12.2 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.

12.3 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.

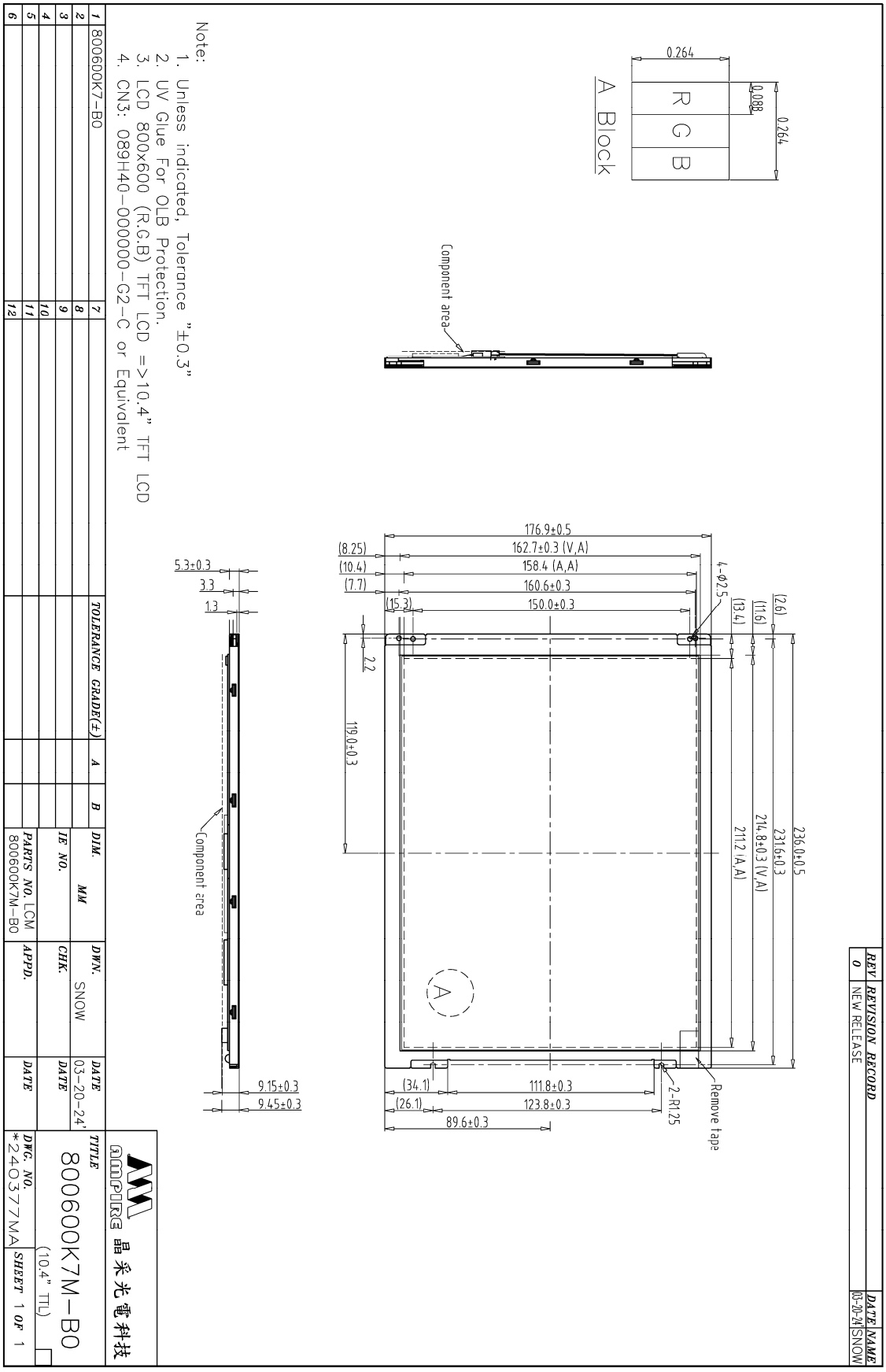
12.4 Operating precautions

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.

12.5 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 warranty for all products and three months warrantee for all repairing products.

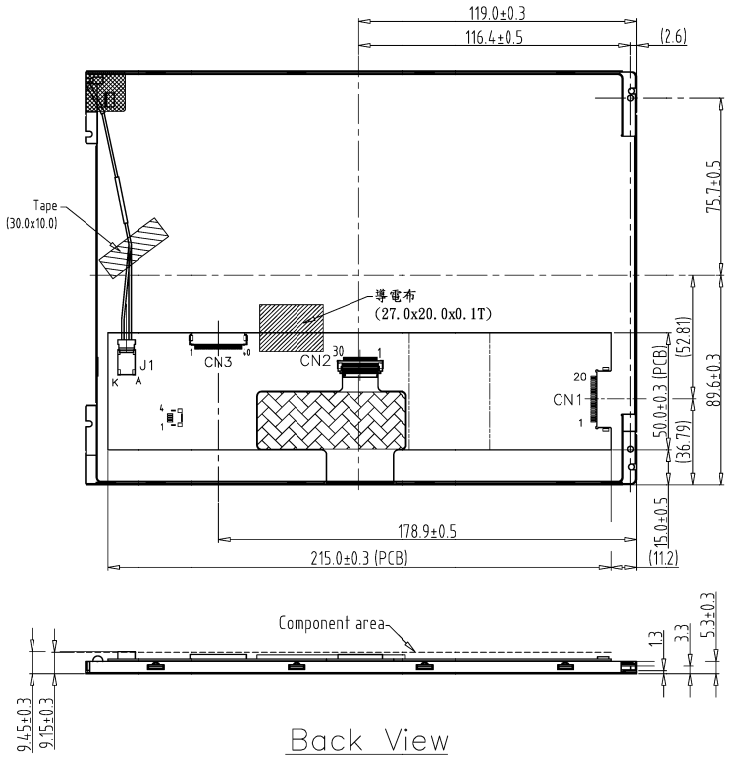
13. OUTLINE DIMENSION



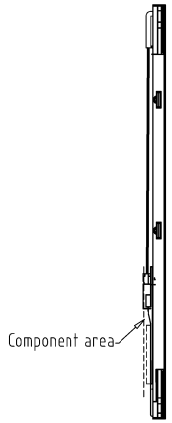
REV	REVISION RECORD	DATE	NAME
0	NEW RELEASE	03-20-24'	SNOW

CN3

1	VLED	21	G5
2	VLED	22	G4
3	ADJ	23	G3
4	GLED	24	GND
5	GLED	25	G2
6	VCC	26	G1
7	VCC	27	G0
8	MODE	28	GND
9	DE	29	R5
10	VS	30	R4
11	HS	31	R3
12	GND	32	GND
13	B5	33	R2
14	B4	34	R1
15	B3	35	R0
16	GND	36	GND
17	B2	37	DCLK
18	B1	38	GND
19	B0	39	NC
20	GND	40	NC



Back View



Note:

1. Unless indicated, Tolerance "±0.3"
2. UV Glue For OLB Protection.
3. LCD 800x600 (R.G.B) TFT LCD =>10.4" TFT LCD
4. CN3: 089H40-000000-G2-C or Equivalent

				TOLERANCE GRADE(±)	A	B	DIM. MM	DWN. SNOW	DATE 03-20-24'	TITLE 800600K7M-B0 (10.4" TTL)
1	800600K7-B0	7								
2		8								
3		9					IE NO.	CHK.	DATE	
4		10								
5		11					PARTS NO. LCM-1 800600K7M-B0	APPD.	DATE	DWG. NO. *240378MA
6		12								SHEET 1 OF 1

AMPIRE 晶采光電科技

14. Package

T.B.D.