



晶采光電科技股份有限公司  
AMPIRE CO., LTD.

## SPECIFICATIONS FOR LCD MODULE

<b>CUSTOMER</b>	
<b>CUSTOMER PART NO.</b>	
<b>AMPIRE PART NO.</b>	<b>AM-1024768RTNQW-T00H-A</b>
<b>APPROVED BY</b>	
<b>DATE</b>	

Preliminary Specification

Formal Specification

**AMPIRE CO., LTD.**

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This Specification is subject to change without notice.

## RECORD OF REVISION

Revision Date	Page	Contents	Editor
2020/05/15	--	New Release	Mark
2020/08/07	7	Update Optical Characteristics	Tank
	12	Add REV Pin detail	

## 1.0 General Descriptions

### 1.1 Introduction

The LCM is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. It is composed of a TFT LCD panel, a backlight system, column driver , row driver circuit and a resistive touch panel . This TFT LCD has a 12.1-inch diagonally measured active display area with resolution (1024 horizontal by 768 vertical pixels array).

### 1.2 Features

- 12.1" TFT LCD Panel
- LED Backlight System
- Supported 1024x768 pixels resolution
- Compatible with RoHS Standard
- Viewing Direction: 6 o'clock ( Gray Inversion )
- 4 Wire resistive touch panel.

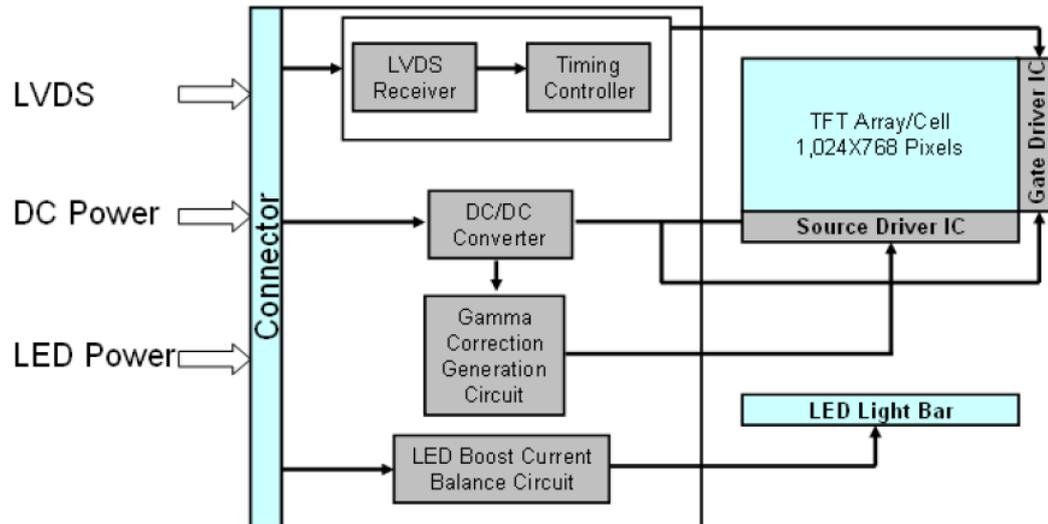
### 1.3 Product Summary

Items	Specifications	Unit
Screen Diagonal	12.1	Inch
Active Area	245.76(H) x 184.32(V)	mm
Pixel Format	1024(RGB) x768	-
Pixel Pitch	0.24(H) x 0.24(V)	mm
Pixel Arrangement	R.G.B. Vertical Stripe	-
Display Mode	Normally White	-
White Luminance	280(Typ.)	cd /m2
Contrast Ratio	800 : 1 (Typ.)	-
Response Time	16(TYP)	msec
Outline Dimensions	279.0(H) x 209.0(V) x11.16(D) Typ.	mm
Electrical Interface (Logic)	LVDS	-
Support Color	16.7M	-

## 1.4 Functional Block Diagram

Shows the functional block diagram of the LCD module.

**Figure 1 Block Diagram**



## 2.0 Absolute Maximum Ratings

Table 1 Absolute Ratings of Environment

Item	Symbol	Min	Max	Unit	Conditions
Supply Voltage	VDD	-0.5	5	V	-
Operating Temperature	TOP	-20	70	°C	Note
Operating Humidity	HOP	10	85	%RH	Note
Storage Temperature	TST	-30	80	°C	Note
Storage Humidity	HST	10	95	%RH	Note

Note (1): Humidity: 85%RH Max. ( $T \leq 40^{\circ}\text{C}$ ) Note static electricity.

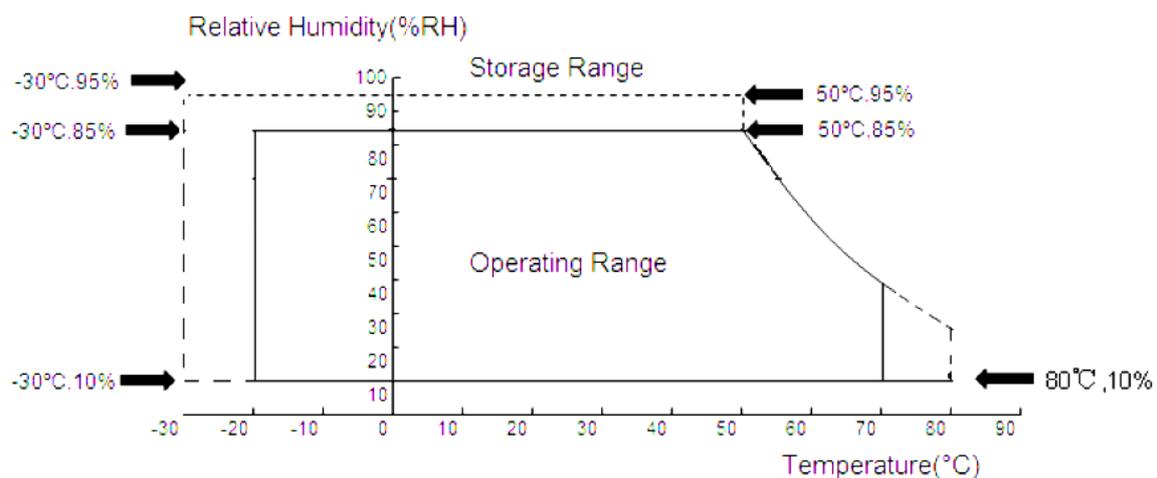
Maximum wet bulb temperature at  $39^{\circ}\text{C}$  or less. ( $T > 40^{\circ}\text{C}$ ) No condensation.

Note (2): There is a possibility of causing deterioration in the irregularity and others of the screen and the display fineness though the liquid crystal module doesn't arrive at destruction when using it at  $80 \sim 85^{\circ}\text{C}$  or  $-20^{\circ}\text{C}$ .

Note (3): There is a possibility of causing the fineness deterioration by the prolonged use in the (high temperature) humidity environment (60% or more).

Note (4): In the operating temperature item, the low temperature side is the ambient temperature regulations. The high temperature side is the panel surface temperature regulations.

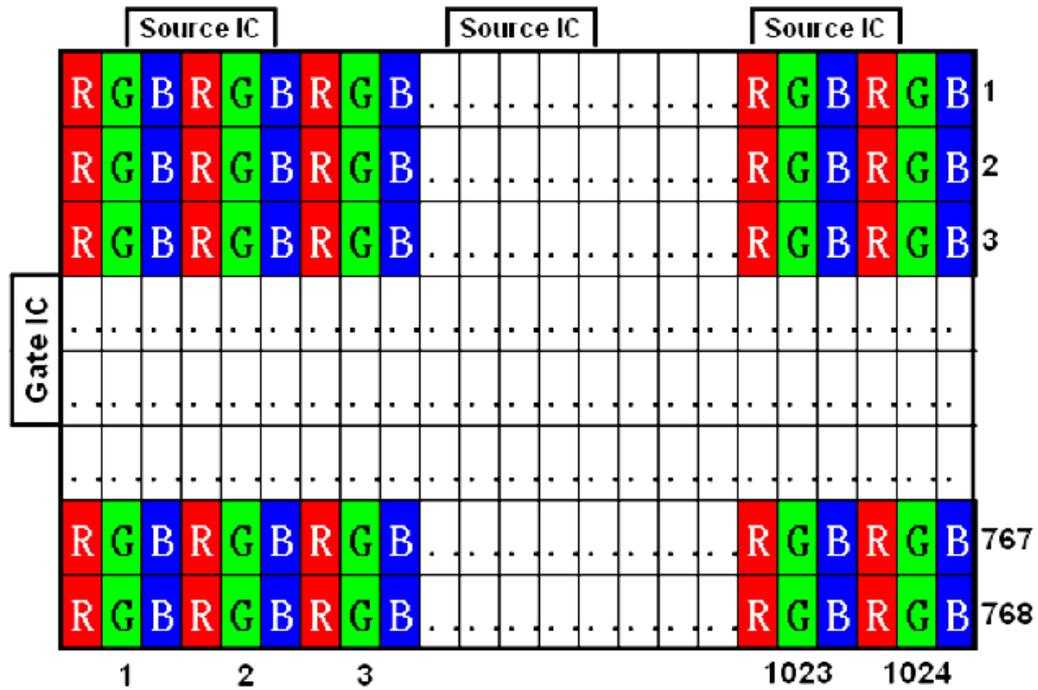
Note (5): Storage Range&Operating Range Picture:



### 3.0 Pixel Format Image

Figure 2 shows the relationship of the input signals and LCD pixel format image.

**Figure 2 Pixel Format**



## 4.0 Optical Characteristics

The optical characteristics are measured under stable conditions as following notes

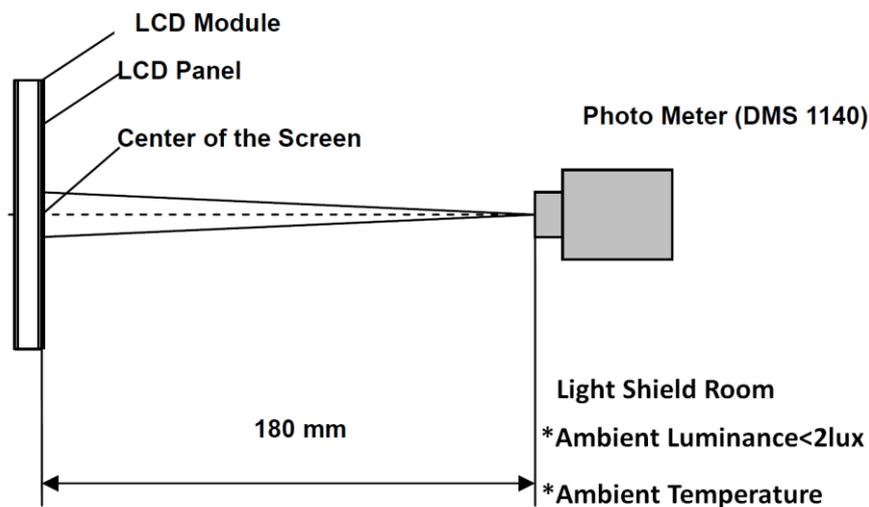
**Table 2 Optical Characteristics**

Item	Conditions		Min.	Typ.	Max.	Unit	Note
Viewing Angle (CR>10)	Horizontal	$\theta_L$	70	80	-	degree	(1),(2),(3)
		$\theta_R$	70	80	-		
	Vertical	$\theta_T$	70	80	-		
		$\theta_B$	70	80	-		
Contrast Ratio	Center		720	800	-	-	(1),(2),(4)
Response Time	Rising + Falling		-	16	19	ms	(1),(2),(5)
Color Chromaticity	Red	x	Typ. -0.05	0.644	Typ. +0.05	-	(1),(2)
	Red	y		0.344		-	
	Green	x		0.310		-	
	Green	y		0.634		-	
	Blue	x		0.152		-	
	Blue	y		0.081		-	
	White	x		0.305		-	
	White	y		0.325		-	
White Luminance	Center		250	280	-	cd/m <sup>2</sup>	(1),(2),(6)
Luminance Uniformity	9Points		75	80	-	%	(1),(2),(6)

Note (1) Measurement Setup:

The LCD module should be stabilized at given temperature (25 °C) for 15 minutes to Avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 15 minutes in a windless room.

**Figure 3 Measurement Setup**



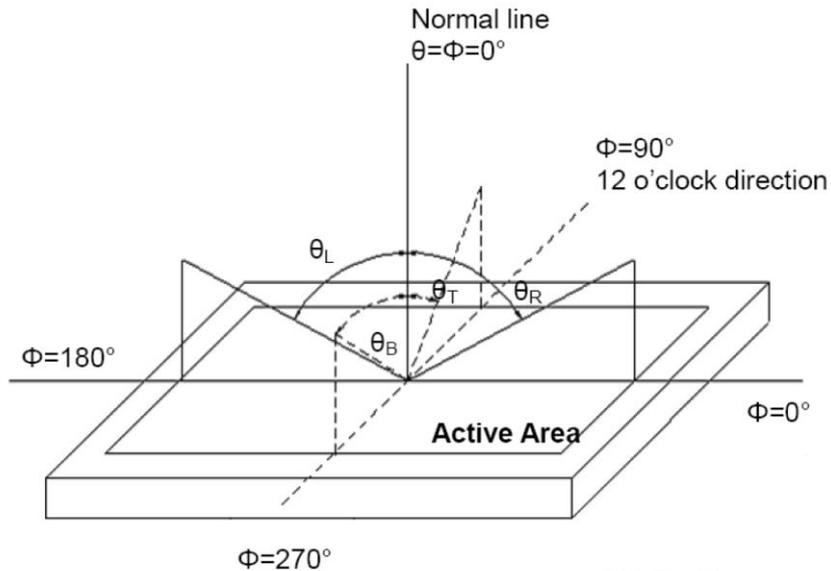
Note (2) The LED input parameter setting as:

VLED: 12V;

PWM\_LED: Duty 100 %

Note (3) Definition of Viewing Angle

**Figure 4 Definition of Viewing Angle**



Note (4) Definition Of Contrast Ratio (CR)

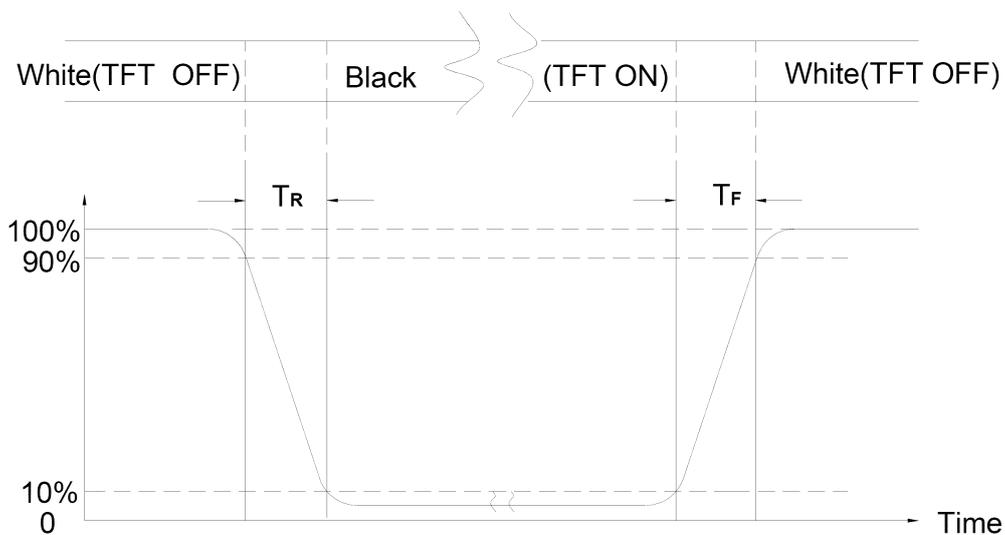
The contrast ratio can be calculated by the following expression

$$\text{Contrast Ratio (CR)} = L_{255} / L_0$$

L255: Luminance of gray level 255, L0: Luminance of gray level 0

Note (5) Definition Of Response Time (TR, TF)

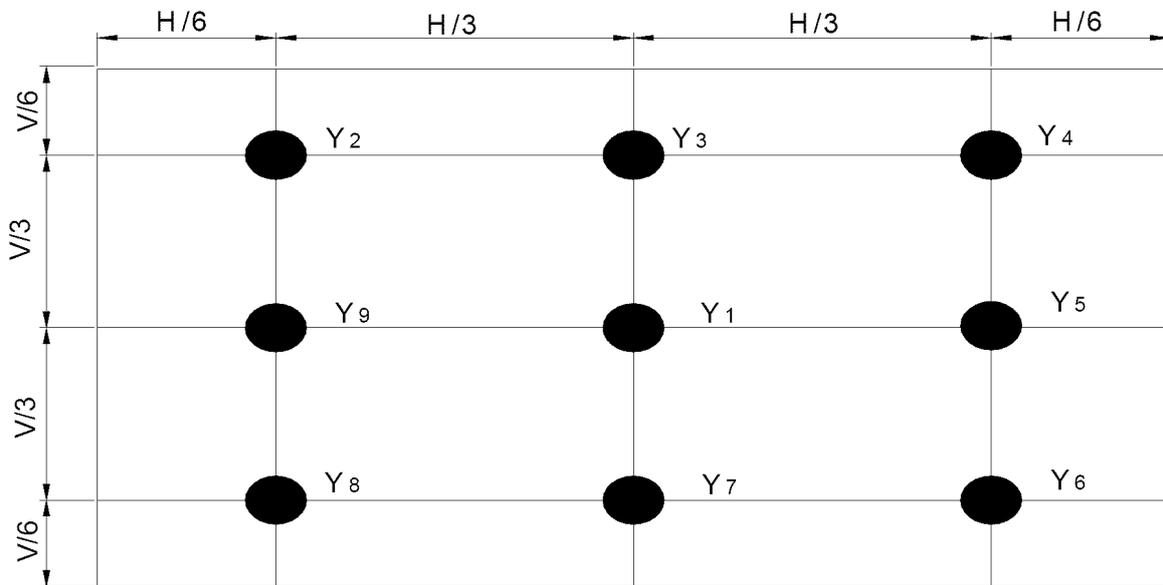
**Figure 5 Definition of Response Time**



Note (6) Definition Of Brightness Luminance

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

**Figure 6 Measurement Locations**



## 5.0 Backlight Characteristics

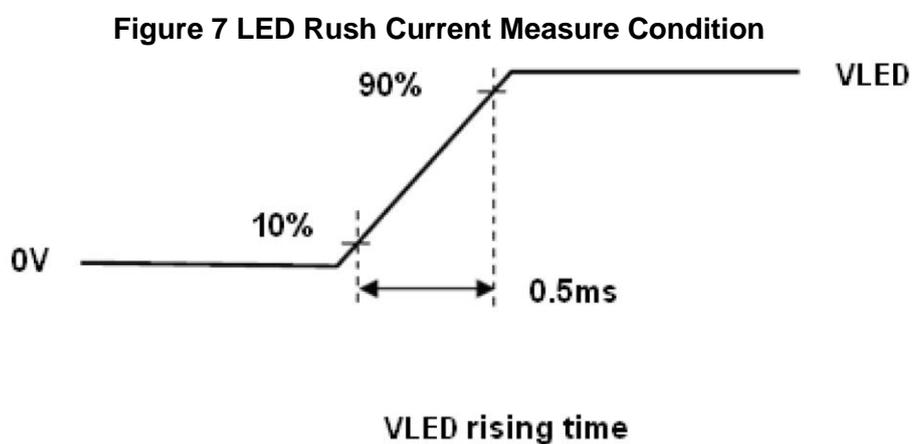
### 5.1 Parameter Guideline Of LED Backlight

**Table 3 Parameter Guideline for LED Backlight**

Symbol	Parameter	Min.	Typ.	Max.	Units	Condition
VLED	LED Input	10.8	12	12.6	[V]	Ta=25°C
ILED	LED Current	-	240	-	mA	Ta=25°C
VF	LED Forward Voltage	2.8	3.3	3.6	V	Ta=25°C
IF	LED Forward Current	-	60	-	mA	Ta=25°C
PL	BL Power Consumption	-	-	6.1	W	Ta=25°C
V <sub>PWM</sub>	PWM Signal Voltage	2.5	3.3	5.5	V	
V <sub>EN</sub>	LED Enable Voltage	2	3.3	5.5	V	
F <sub>PWM</sub>	Input PWM Frequency	200	-	20000	HZ	
LT	LED Life Time	30,000	-	-	Hours	Ta=25°C Note A

Note A: The LED life time define as the estimated time to 50% degradation of initial luminous.

Note B: A higher LED power supply voltage will result in better power efficiency.  
Keep the VLED between 12V and 12.6V is strongly recommended.



## 6.0 Electrical Characteristics

### 6.1 TFT LCD Module Interface Connector

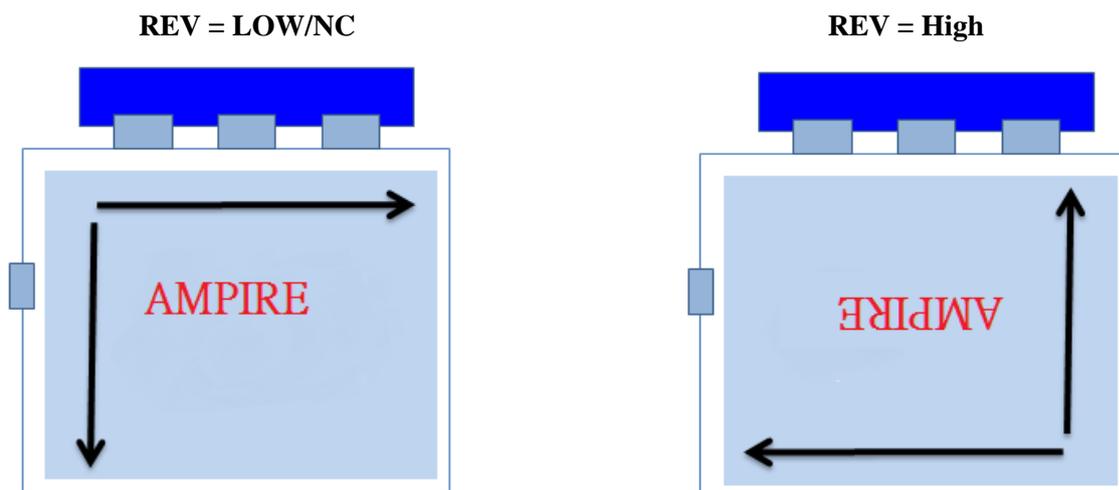
**Table 4 Connector Name / Designation**

Item	Description
Type / Part Number	MSB240420HE
Mating connector	P240420H

**Table 5 Signal Pin Assignment**

Pin #	Signal Name	Description	Remarks
1	VDD	Power Supply, 3.3V (typical)	-
2	VDD	Power Supply, 3.3V (typical)	-
3	VSS	GND	-
4	REV	Reverse Scan selection	1*
5	Rin1-	-LVDS differential data input	
6	Rin1+	+LVDS differential data input	
7	VSS	GND	
8	Rin2-	-LVDS differential data input	
9	Rin2+	+LVDS differential data input	
10	VSS	GND	
11	Rin3-	-LVDS differential data input	
12	Rin3+	+LVDS differential data input	
13	VSS	GND	
14	ClkIN-	-LVDS differential data input	
15	ClkIN+	+LVDS differential data input	
16	GND	GND	
17	Rin4-	-LVDS differential data input	
18	Rin4+	+LVDS differential data input	
19	SEL68	6/8 bits LVDS data input selection(H:8bit L/NC:6bit)	
20	Bist	Internal use	

Note1: About REV Please refer ;



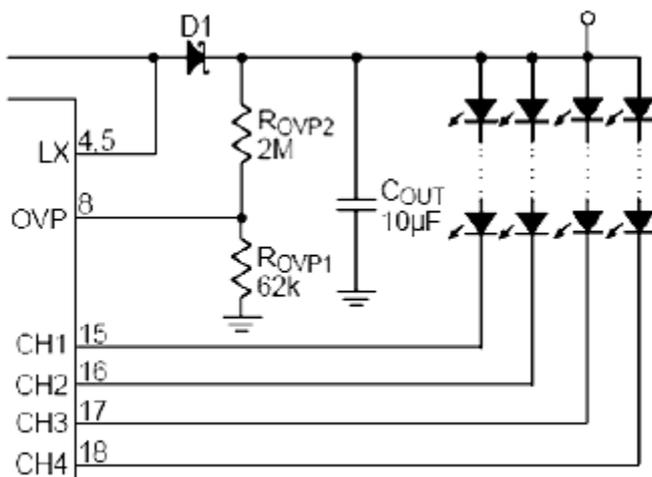
Note2: All input signals shall be low or Hi-resistance state when VDD is off.

## 6.2 TFT Backlight Interface Connector

Table 6 Connector Name / Designation

Item	Description
Type / Part Number	MSB24038P5A
Mating connector	P24038P5

Pin #	Function
1	VCC(12V input)
2	GND
3	On/Off(5V-ON,0V-OFF)
4	Dimming(PWM)
5	NC



## 7.0 Interface Timings

### 7.1 Timing Characteristics

Table 6 Interface Timings

Parameter	Symbol	Unit	Min.	Typ.	Max.
LVDS Clock Frequency	Fclk	MHz	50	65	80
H Total Time	HT	Clocks	1100	1344	2047
H Active Time	HA	Clocks	1024	1024	1024
H Blanking Time	HBL	Clocks	76	320	1023
V Total Time	VT	Lines	776	806	1023
V Active Time	VA	Lines	768	768	768
V Blanking Time	VBL	Lines	8	38	255
Frame Rate	Vsync	Hz	-	60	-

Synchronization Method: DE only

Note: H Blank area and V Blank area can not be changed at every frame

### 7.2 Timing Diagram of Interface Signal

Figure 8 Timing Characteristics

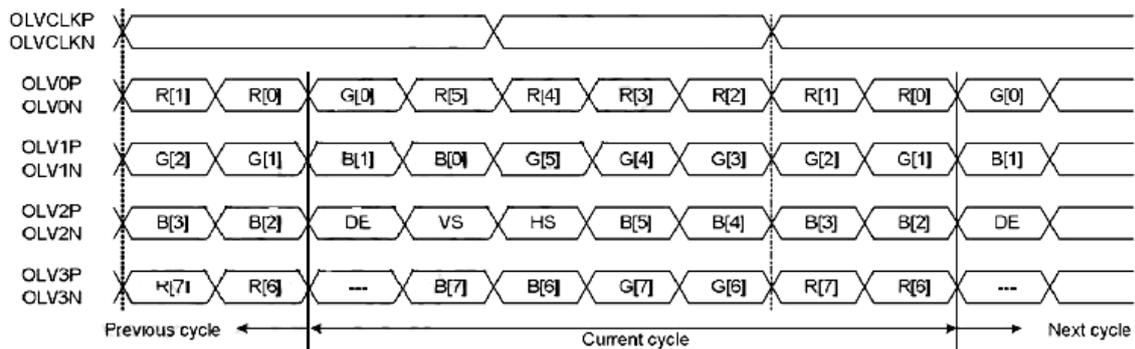
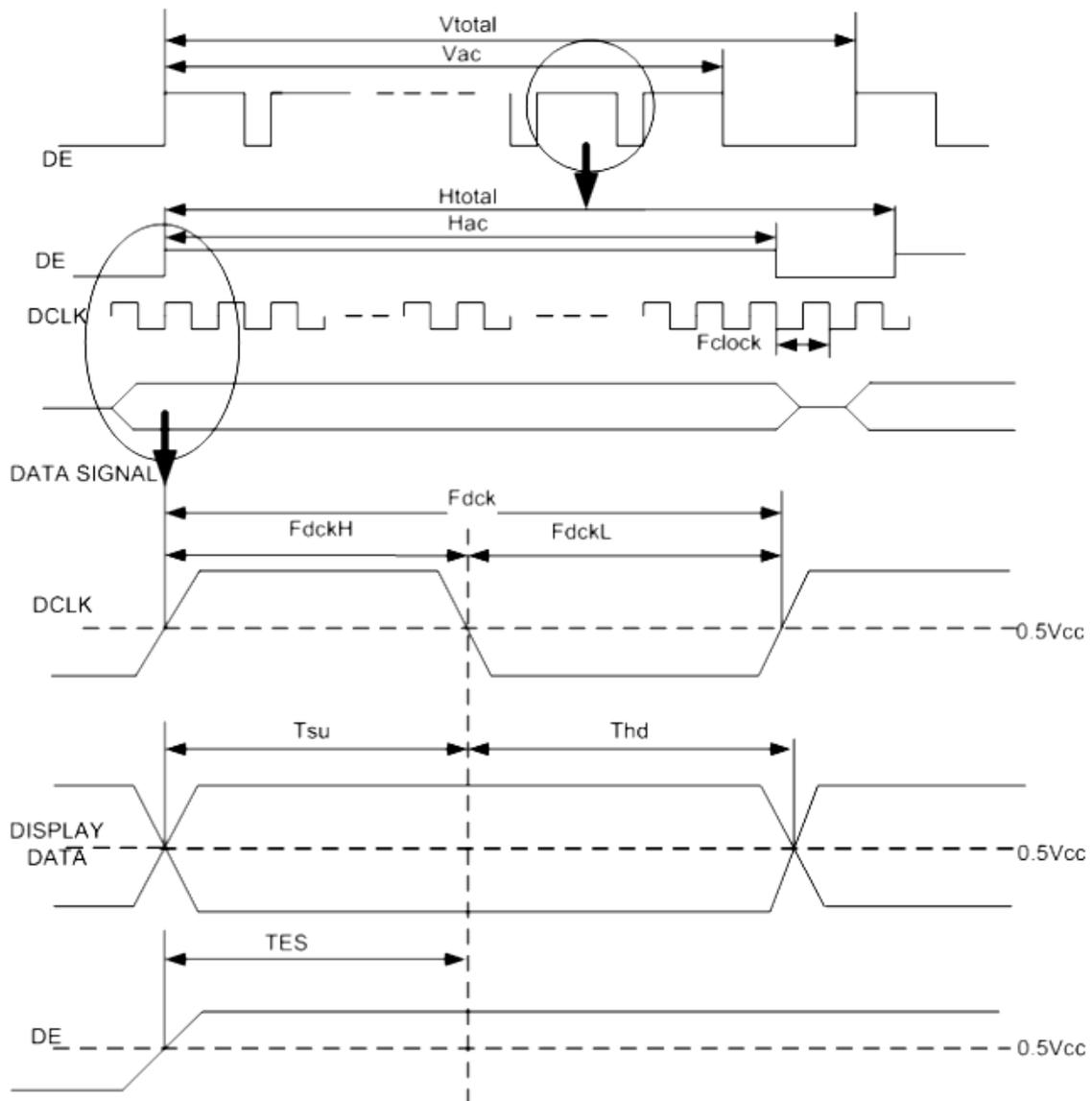


Figure 9 Timing Characteristics



## 8.0 Power Consumption

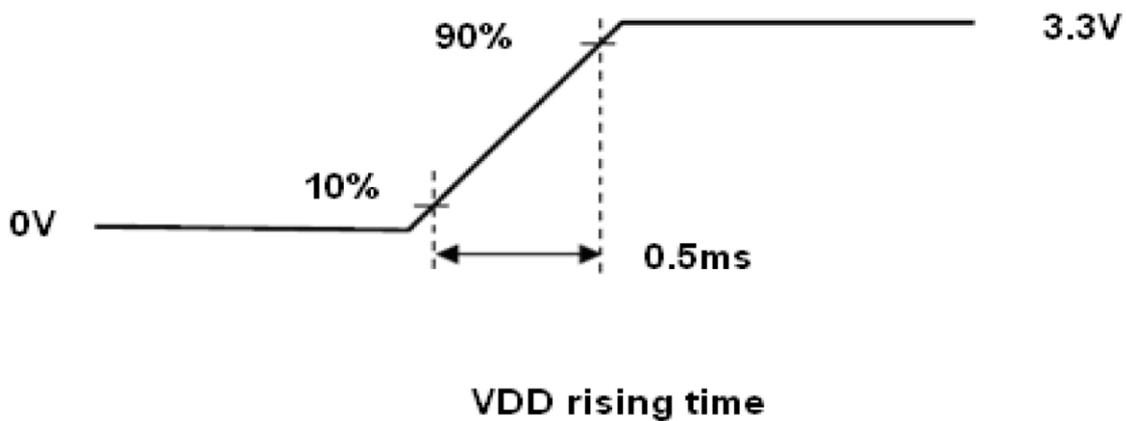
Input power specifications are as follows.

**Table 8 Power Consumption**

Item	Symbol	Min.	Typ.	Max.	Units	Note
LCD Drive Voltage (Logic)	VDD	3.0	3.3	3.6	V	(2), (4)
VDD Current	IDD	-	-	250	mA	(3),(4),(6)
VDD Power Consumption	PDD	-	-	0.825	W	
Rush Current	Irush	-	-	3	A	(1),(4),(5)
Allowable Logic/LCD Drive Ripple Voltage	VDDrp	-	-	200	mV	(4)

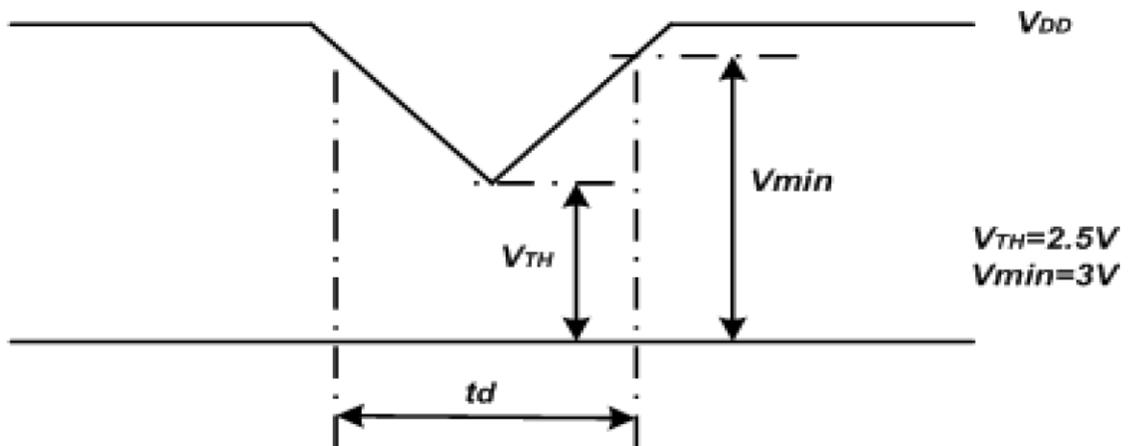
Note 1. Measure Condition

**Figure 9 VDD rising time**



Note 2. VDD Power Dip Condition

Figure 10 VDD Power Dip

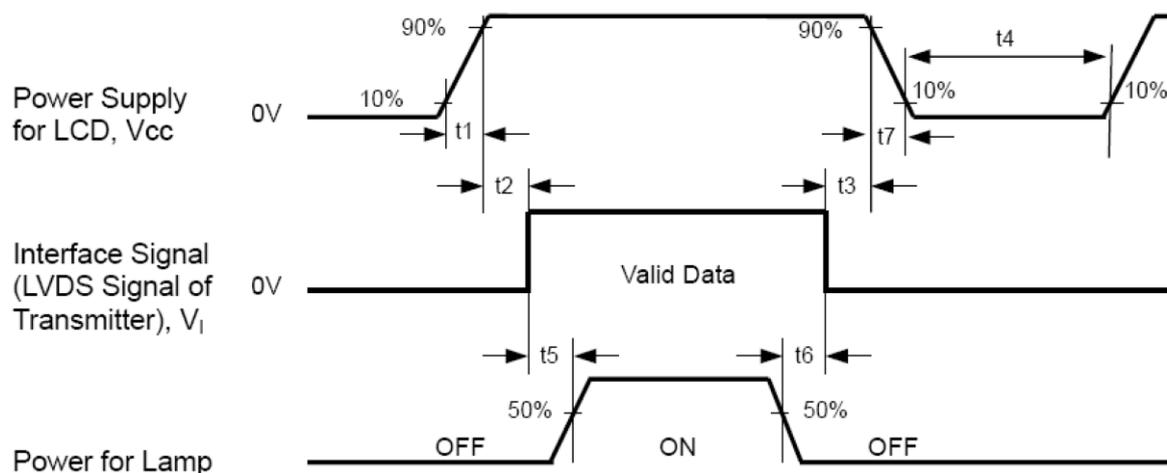


If  $V_{TH} < V_{DD} \leq V_{min}$ , then  $t_d \leq 10ms$  ; When the voltage return to normal our panel must revive automatically.

## 9.0 Power ON/OFF Sequence

VDD power on/off sequence is as follows. Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state or low level when VDD is off.

**Figure 11 Power Sequence**



**Table 9 Power Sequencing Requirements**

Parameter	Value			Units
	Min.	Typ.	Max.	
T1	0.5	-	10	[ms]
T2	30	40	50	[ms]
T3	200	-	-	[ms]
T4	10	-	-	[ms]
T5	10	-	-	[ms]
T6	0	-	-	[ms]
T7	10	-	-	[ms]
T8	100	-	-	[ms]
T9	0	16	50	[ms]
T10	-	-	10	[ms]
T11	1000	-	-	[ms]

## 10. TOUCH PANEL ELECTRICAL SPECIFICATION

Parameter	Condition	Standard Value
Terminal Resistance	X Axis	300~ 800 $\Omega$
	Y Axis	100 ~ 600 $\Omega$
Insulating Resistance	DC 25 V	More than 20M $\Omega$
Linearity	--	$\leq 1.5 \%$
Notes life by Pen	Note a	100,000 times(min)
Input life by finger	Note b	1,000,000 times (min)

### Note A .

Notes area for pen notes life test is 10 x 9 mm.

Size of word is 7.5 x 6.75

Shape of pen end : R0.8mm

Load : 250 g

### Note B

By Silicon rubber tapping at same point

Shape of rubber end : R8mm

Load : 250gf

Frequency : 5 Hz

### Interface

No.	Symbol	Function
1	X1	Touch Panel Top Signal in Y Axis
2	Y1	Touch Panel Right Signal in X Axis
3	X2	Touch Panel Bottom Signal in Y Axis
4	Y2	Touch Panel Left Signal in X Axis

## 11 Reliability Test Items

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	60°C, 90% 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°C , 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.

- 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.

## **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.  $1M\Omega$  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**

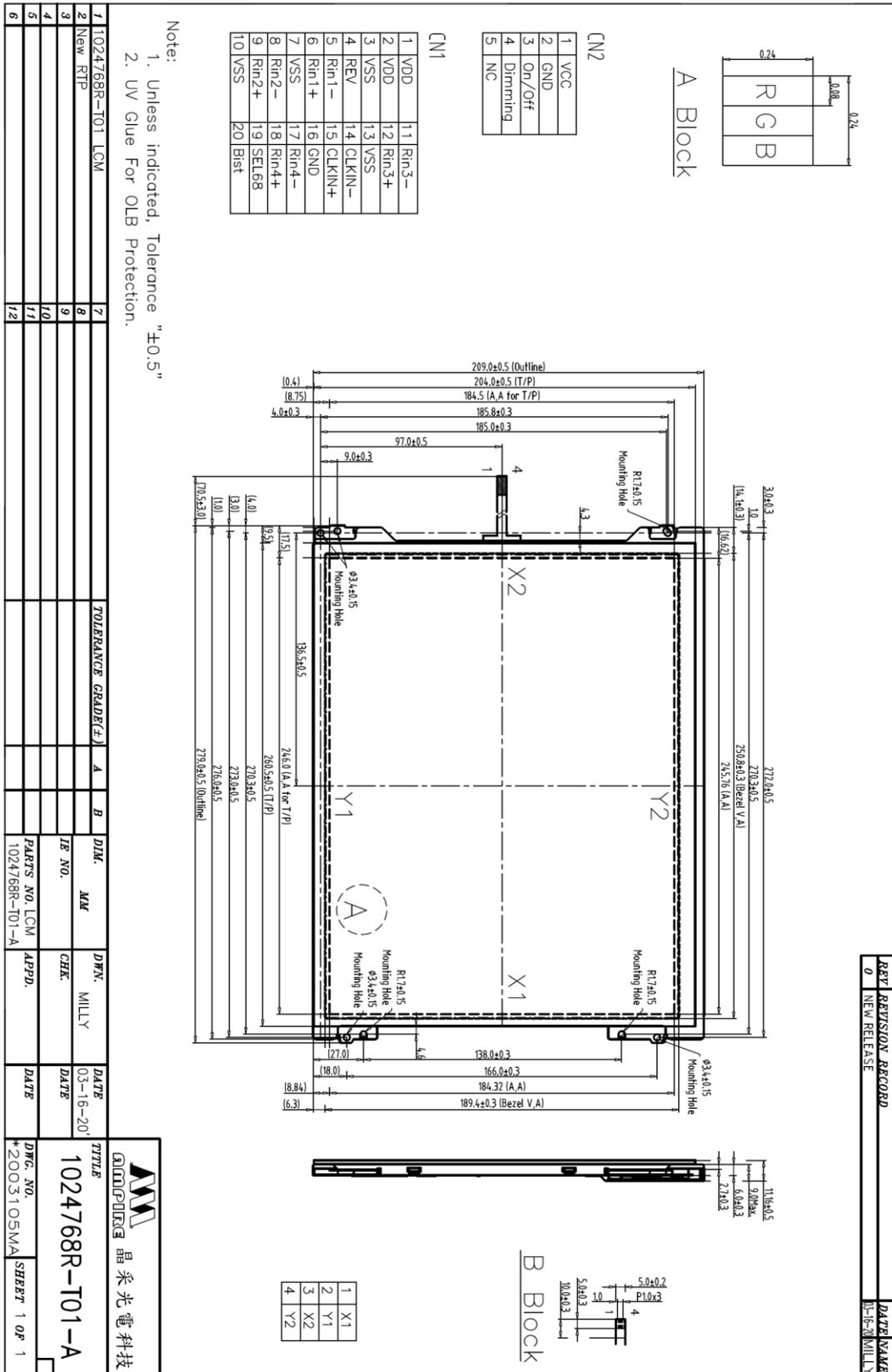
- 1) Do not boost the applied drive voltage abnormally. Failure to do so may break ICs. When applying power voltage, check the electrical features beforehand and be careful. Always turn off the power to the LC module controller before removing or inserting the LC module input connector. If the input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

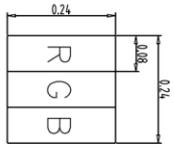
### **12.5 Other**

- 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 warrantee for all products and three months warrantee for all repairing products.

# 13. MECHANIC DRAWING



REV	REVISION RECORD	DATE	NAME
0	NEW RELEASE	15-10-20	MILLY



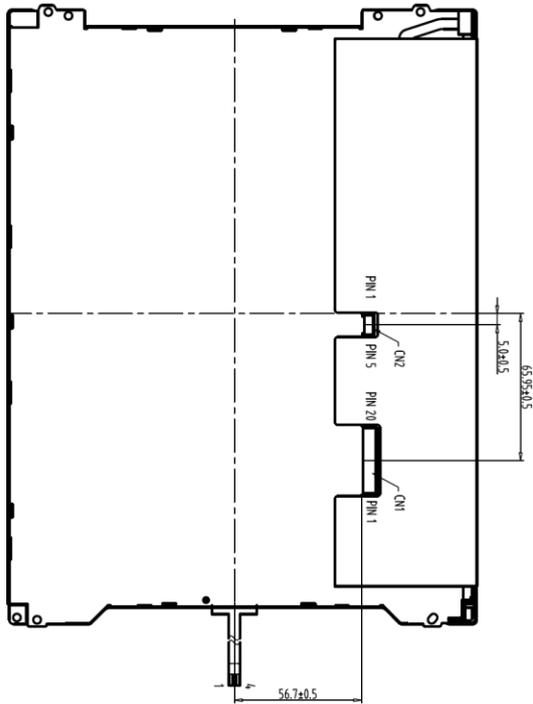
A Block

CN2

1	VCC
2	GND
3	On/Off
4	Dimming
5	NC

CN1

1	VDD	11	Rin3-
2	VDD	12	Rin3+
3	VSS	13	VSS
4	REV	14	CLKIN-
5	REV	15	CLKIN+
6	Rin1+	16	GND
7	VSS	17	Rin4-
8	Rin2-	18	Rin4+
9	Rin2+	19	SEL68
10	VSS	20	Bist



Back View

Note:  
 1. Unless indicated, Tolerance "±0.5"  
 2. UV Glue For OLB Protection.

1	1024768R-T01 LCM	7	TOLERANCE GRADE(F)	A	B	DM.	MM	DM.	MILLY	DATE	TITLE	DWG. NO.	SHEET
2	New RTP	8								03-16-20	1024768R-T01-A	*2003106MA	1 OP 1
3		9								DATE			
4		10								DATE			
5		11								DATE			
6		12								DATE			