

# Specifications for LCD module

<b>Customer</b>	
<b>Customer part no.</b>	
<b>Ampire part no.</b>	<b>AM-1280720MTZQW-00H</b>
<b>Approved by</b>	
<b>Date</b>	

☐ Preliminary Specification

☒ Formal Specification

Approved by	Checked by	Organized by
Patrick	Lawlite	Kokai

This Specification is subject to change without notice.

## RECORD OF REVISION

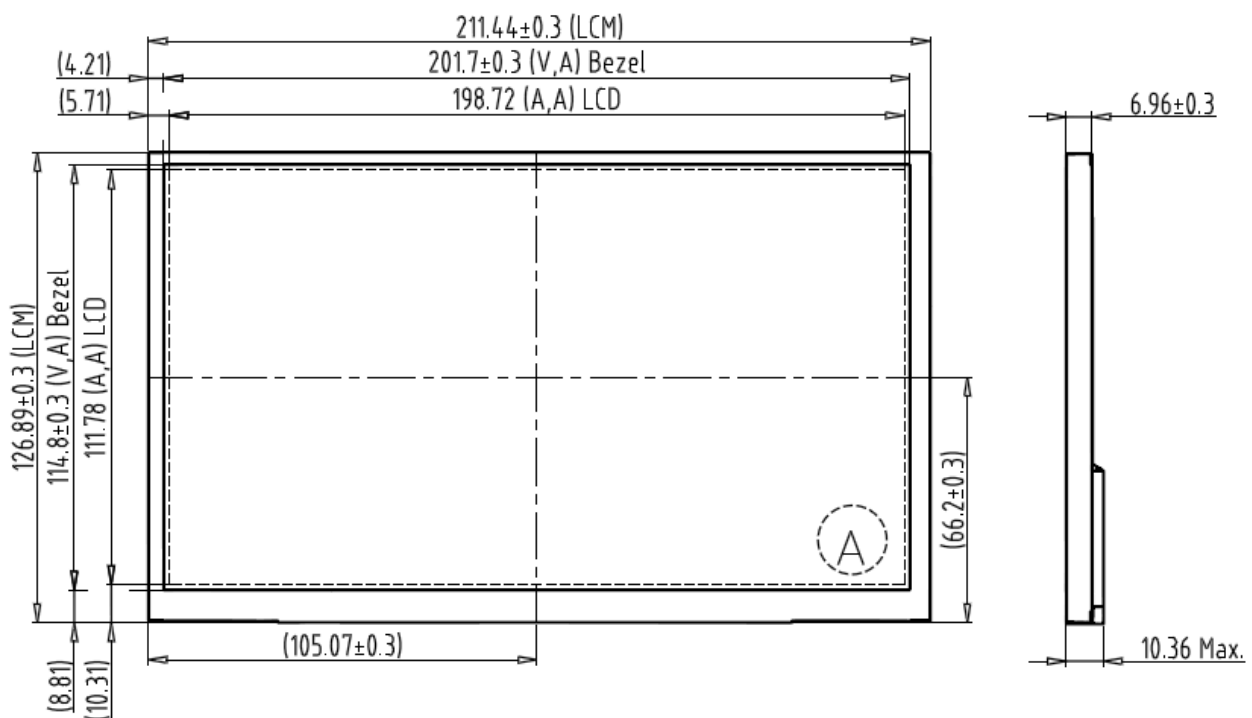
Revision Date	Page	Contents	Editor
2020/7/1	-	New Release	Kokai
2021/12/28	15	Correct IAK=234mA	Kokai

## 1. Features

9" TFT Liquid Crystal Display module 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 timing controller, voltage reference, common voltage, column driver and row driver circuit. This TFT LCD has a 9 inch diagonally measured active display area with 1280 horizontal by 720 vertical pixel array resolutions.

## 2. Physical Specifications

Item	Specifications	Remark
LCD size	9 inch(Diagonal)	
Driver element	a-Si TFT active matrix	
Display resolution	1280 (W) × 3(RGB) × 720(H) dots	
Display mode	Normally Black, Transmissive (IPS)	
Pixel size	0.15525 (W) x0.15525 (H) mm	
Color arrangement	R.G.B-stripe	
Interface	LVDS	
Color Depth	16.7M	



### 3. Absolute Maximum Ratings

Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Power Voltage	VDD	-0.3	4.0	V	GND=0V, TA=25°C
Operation Temperature	TOP	-30	85	°C	
Storage Temperature	TST	-40	90	°C	

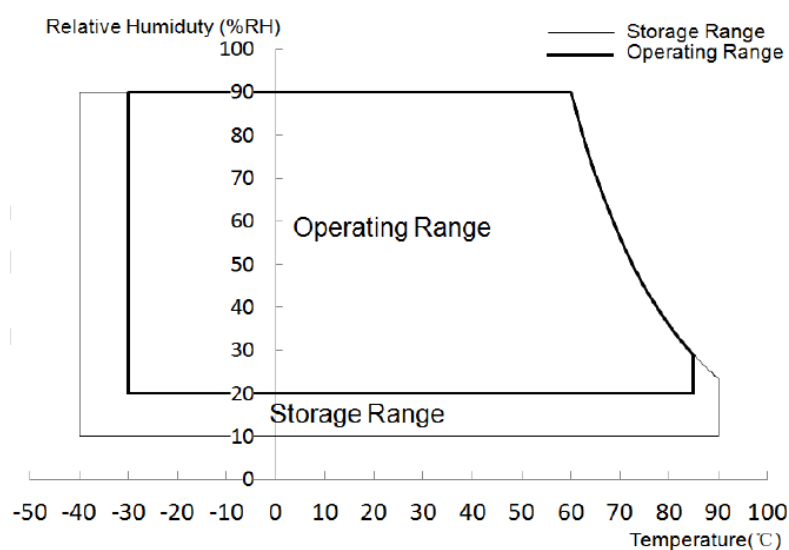
Note(1) The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

Note (2) All the contents of electro-optical specifications and display fineness are guaranteed under Normal Conditions. All the display fineness should be inspected under normal conditions. Normal conditions are defined as follow: Temperature: 25°C, Humidity: 55± 10%RH.

Note (3) Unpredictable results may occur when it was used in extreme conditions. Ta= Ambient Temperature, Tgs= Glass Surface Temperature. All the display fineness should be inspected under normal conditions.

Note (4) Temperature and relative humidity range are shown in the figure below. Wet bulb temperature should be lower than (57.8)°C, and no condensation of water. Besides, protect the module from static electricity.

#### ● Absolute Ratings of Environment of the LCD Module



## 4. Electrical Specifications

### 4.1 Typical Operation Conditions

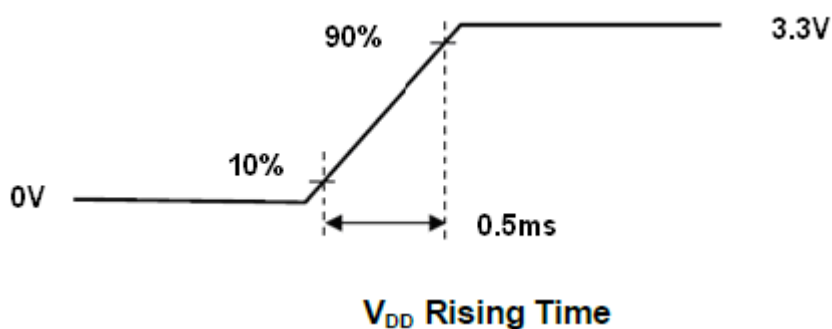
Item	Symbol	Values			Unit	Remark
		MIN	TYP	MAX		
Power Voltage	VDD	3.0	3.3	3.3	V	Note 1,2
Power Consumption	$I_{VDD}$	--	--	0.23	mA	Note 1,4 VDD=3.3V
Rush Current	$I_{Rush}$			1.0	A	Note 1,5

Note (1) All of the specifications are guaranteed under normal conditions. Normal conditions are defined as follow: Temperature: 25°C, Humidity: 55± 10%RH.

Note (2) All of the absolute maximum ratings specified in the table, if exceeded, may cause faulty operation or unrecoverable damage. It is recommended to follow the typical value.

Note (4) The specified VDD current and power consumption are measured under the VDD = (3.3) V, FV= (60) Hz condition and White pattern.

Note (5) The figures below is the measuring condition of VDD. Rush current can be measured when TRUSH is 0.5 ms.



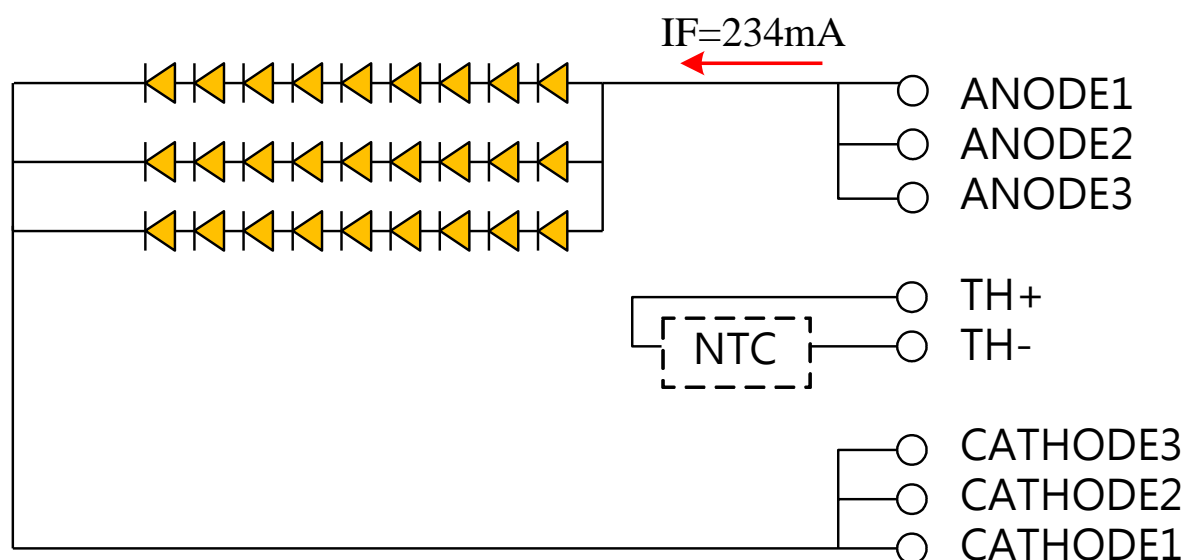
## 4.2 LED Driving Conditions

Item	Symbol	Min.	Typ.	Max.	Unit	Condition
LED Backlight Voltage	VAK	25.2	27.0	29.7	V	IAK=234mA
LED Backlight Current	IAK	--	234	--	mA	Ta=25°C
LED Life Time		--	50	--	kHr	Note(1)

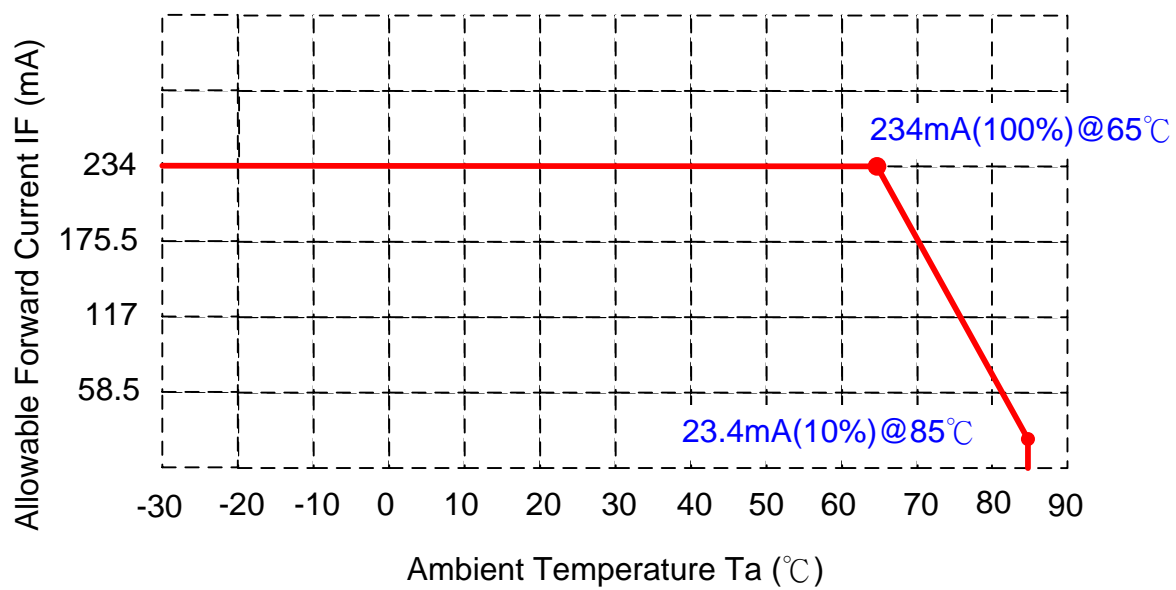
Brightness to be decreased to 50% of the initial value. Ta=25°C

The structure of LED B/L shows as below :

- 9 Serial x 3 parallel LED.
- The default is without NTC resistor.



Note(1) When LCM is operated over 40°C ambient temperature, the IAK should be follow :



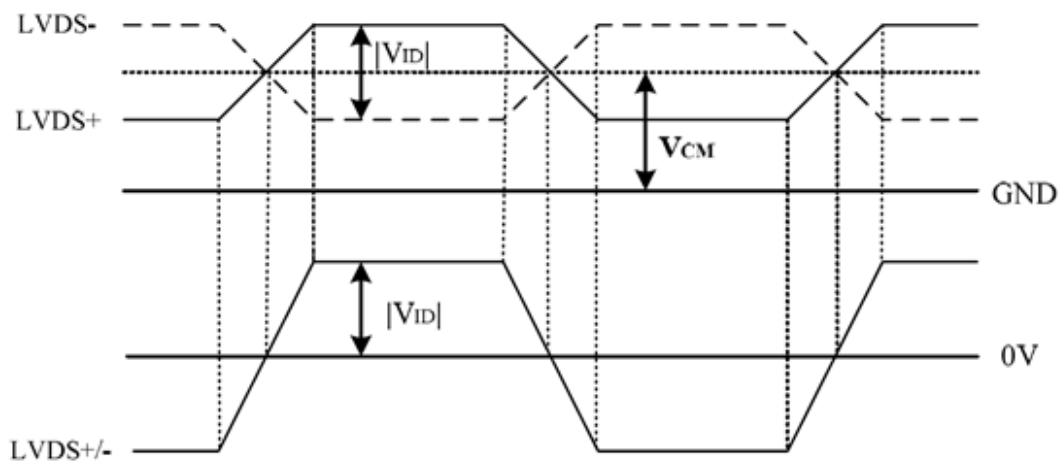
## 5. LVDS Signal Timing Characteristics

### 5.1 AC Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Differential Input High	$V_{th}$	-	-	+100	mV	$V_{CM}=+1.2V$
Differential Input Low	$V_{tl}$	-100	-	-	mV	$V_{CM}=+1.2V$
Magnitude Differential Input	$ V_{ID} $	200	-	400	mV	-
Common Mode Voltage	$V_{CM}$	$0.3 + (V_{ID}/2)$	-	$V_{DD} - 1.2 - (V_{ID}/2)$	V	-
Common Mode Voltage	$\Delta V_{CM}$	-	-	50	mV	$V_{CM}=+1.2V$

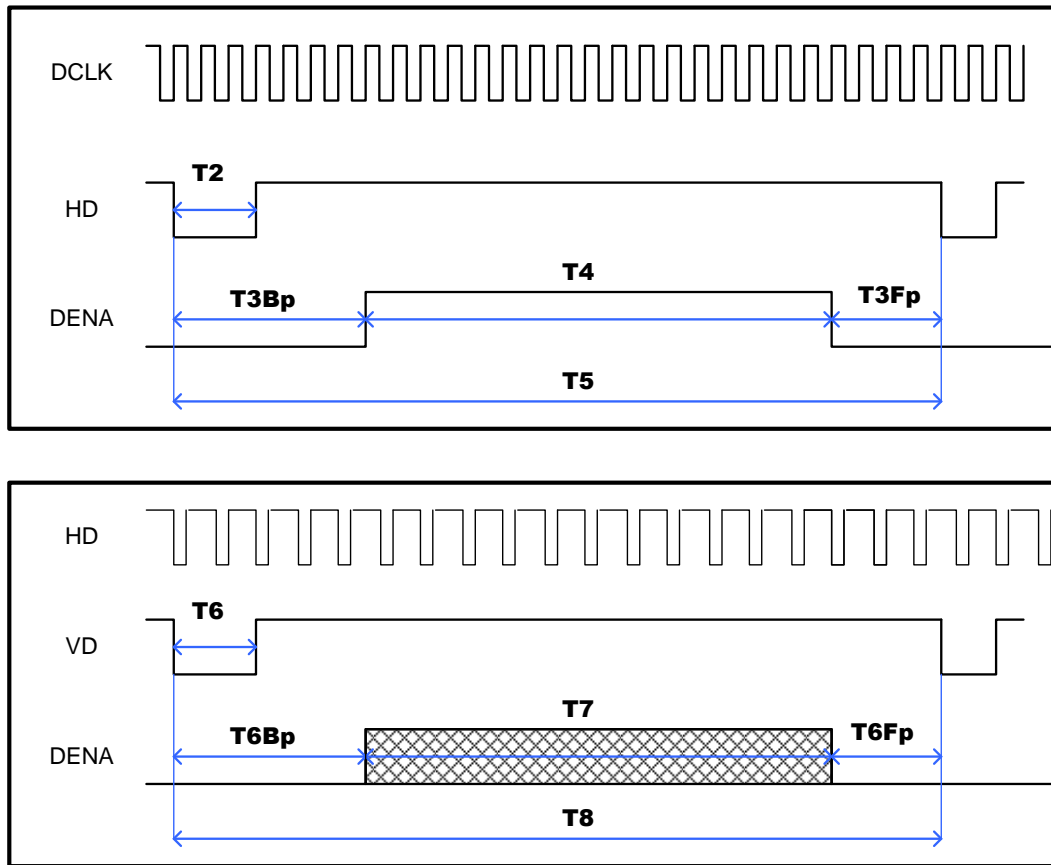
Note (1) Input signals shall be low or Hi-Z state when VDD is off.

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



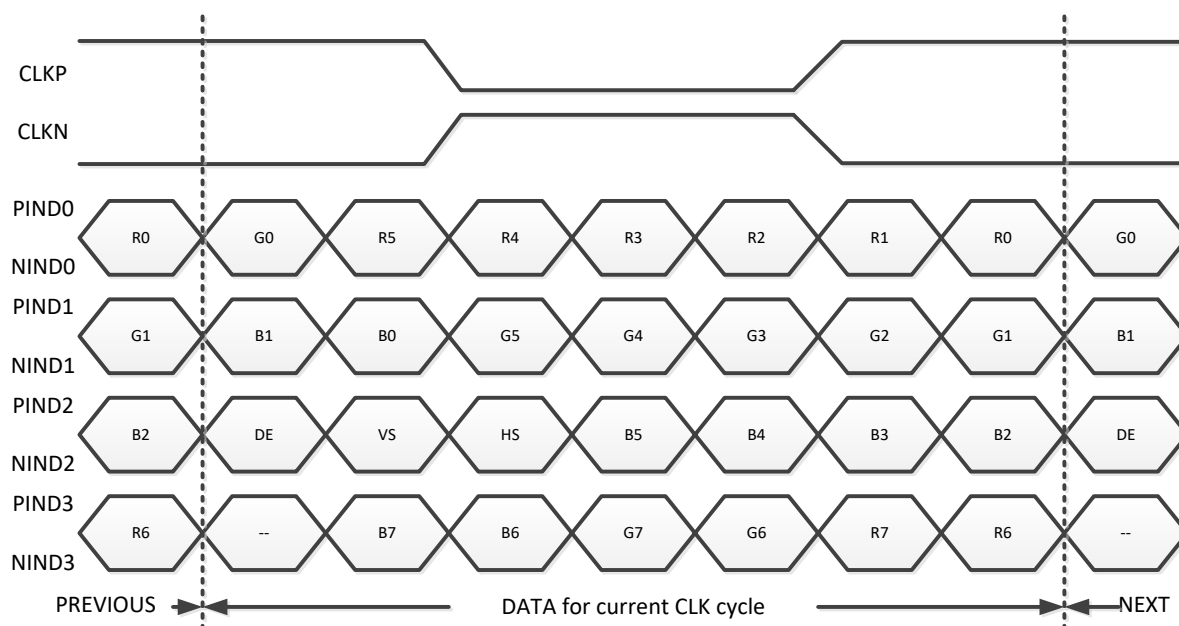


## 5.2 TTL Timing Table



ITEM	SYMBOL	MIN	TYP	MAX	UNIT
Clock Frequency	1/T1	57.1	58.1	85	MHz
Horizontal Blanking	T3Fp+T3Bp	29	42	364	Clocks
Horizontal Display Period	T4	1280			Clocks
Horizontal total Period	T5	1309	1322	1644	Clocks
Vertical Blanking	T6Fp+T6Bp	7	13	216	Lines
Vertical Display Period	T7	720			Lines
Vertical total Period	T8	727	733	936	Lines

### 5.3 LVDS Input Data Format

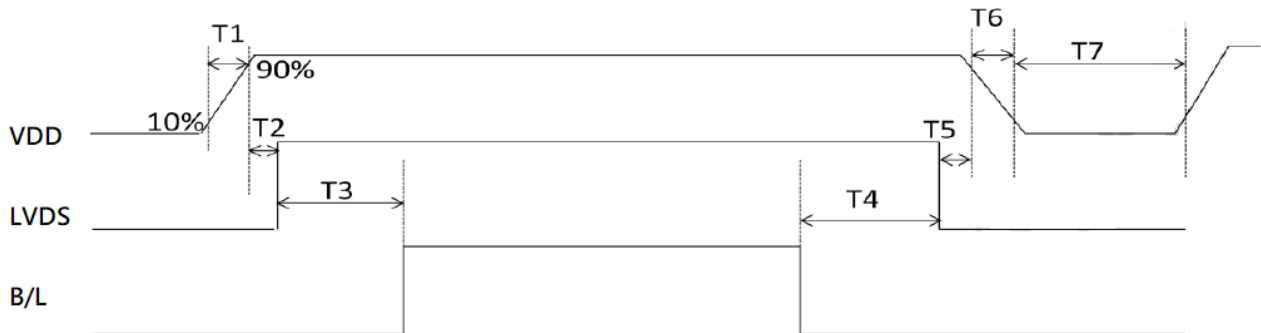


Note : R/G/B data 7 : MSB, R/G/B data 0 : LSB

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.
CLKP CLKN	LVDS Clock Input	
DE	Display Enable	
VS	Vertical Sync Signal	
HS	Horizontal Sync Signal	

## 5.4 Power On/OFF Timing

- Interface signals are also shown in the chart. Signals from any system shall be Hi-resistance state or low level when VDD voltage is off.
- When system first start up, should keep the VDD high time longer than 200ms, otherwise may cause image sticking when VDD drop off.



Item	Symbol	MIN	Typ	MAX	Unit	Remark
VDD Rise Time	T1	(0.5)	-	(10)	ms	
VDD Good to Signal Valid	T2	(0)	-	(50)	ms	
Signal Valid to Backlight On	T3	(200)	-	-	ms	
Backlight Power Off to Signal Disable	T4	(200)	-	-	ms	
Signal Disable to Power Down	T5	(0)	-	(50)	ms	
VCC Fall Time	T6	(0.5)	-	(30)	ms	
VCC Power Off	T7	(500)	-	-	ms	

## 6 Interface

**CN1: Mating Connector : AORORA F31L-1A7H1-21040 or Equivalent**

Pin #	Signal Name	Description	Remarks
1	GND	Ground	-
2	GND	Ground	
3	PIND3	+LVDS differential data input	
4	NIND3	-LVDS differential data input	
5	GND	Ground	
6	CLKP	+LVDS differential clock input	
7	CLKN	-LVDS differential clock input	
8	GND	Ground	
9	PIND2	+LVDS differential data input	
10	NIND2	-LVDS differential data input	
11	GND	Ground	
12	PIND1	+LVDS differential data input	
13	NIND1	-LVDS differential data input	
14	GND	Ground	
15	PIND0	+LVDS differential data input	-
16	NIND0	-LVDS differential data input	
17	GND	Ground	
18	NC/CS	Reserve test pin. Keep it floating	
19	NC/SCL	Reserve test pin. Keep it floating	
20	NC/SDO	Reserve test pin. Keep it floating	
21	NC/SDI	Reserve test pin. Keep it floating	
22	GND	Ground	
23	NC	Dummy Pin. Keep it floating	
24	VDD	Power Supply, 3.3V (typical)	
25	VDD	Power Supply, 3.3V (typical)	
26	VDD	Power Supply, 3.3V (typical)	

27	VDD	Power Supply, 3.3V (typical)	
28	NC/VPP	Reserve test pin. Keep it floating	
29	GND	Ground	
30	GND	Ground	
31	TH-	Backlight thermistor-	
32	TH+	Backlight thermistor+	
33	CATHODE1	LED Light, cathode -	
34	CATHODE1	LED Light, cathode -	
35	CATHODE1	LED Light, cathode -	
36	NC	Dummy Pin. Keep it floating.	
37	NC	Dummy Pin. Keep it floating.	
38	ANODE1	LED Light, anode +	
39	ANODE2	LED Light, anode +	
40	ANODE3	LED Light, anode +	

## 7 Optical Specifications

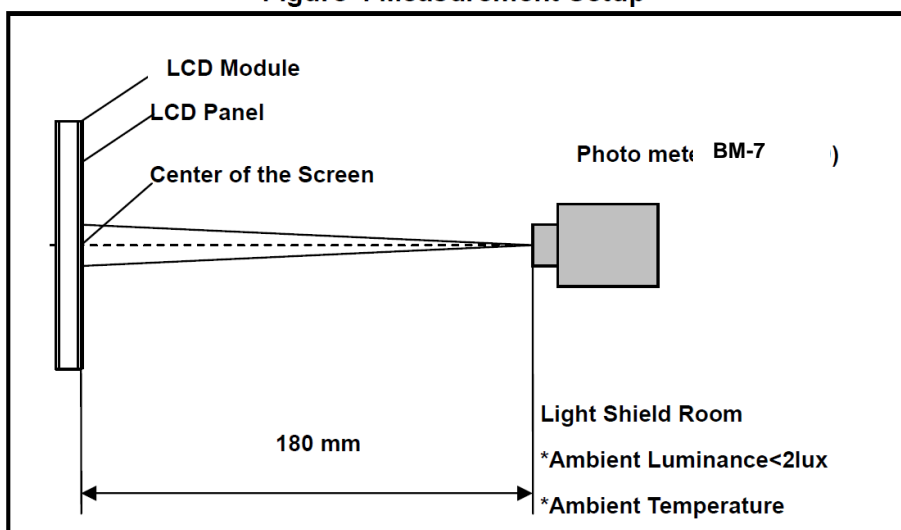
Item	Conditions		Min.	Typ.	Max.	Unit	Note
Viewing Angle ( CR>10 )	Horizontal	$\theta_{x+}$	T.B.D	(80)	-	degree	(1),(2),(3)
		$\theta_{x-}$	T.B.D	(80)	-		
	Vertical	$\theta_{y+}$	T.B.D	(80)	-		
		$\theta_{y-}$	T.B.D	(80)	-		
Contrast Ratio	Center		800	1000	-	-	(1),(2),(4)
Response Time	Rising		-	-	-	ms	(1),(2),(5)
	Falling		-	-	-	ms	
	Rising + Falling		-	30	40	ms	
Color Chromaticity (CIE1931)	NTSC		TBD	70	-	%	(1),(2)
	Red	x	Typ. -0.05	0.638	Typ. +0.05	-	(1),(2)
	Red	y		0.344		-	
	Green	x		0.317		-	
	Green	y		0.625		-	
	Blue	x		0.149		-	
	Blue	y		0.078		-	
	White	x		0.310		-	
	White	y		0.330		-	
White Luminance	Center		800	1000	-	cd/m <sup>2</sup>	(1),(2),(6)
Luminance Uniformity	9Points		70	85	-	%	(1),(2),(6)

## Note(1)

### Measurement Setup:

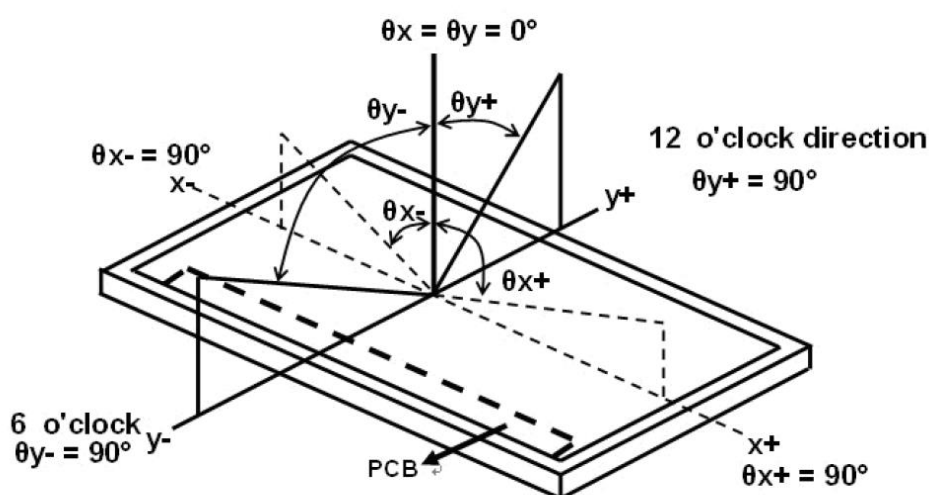
The LCD module should be stabilized at given temperature(25°C) for 15 minutes to Avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 15 minutes in a windless room.

**Figure 4 Measurement Setup**



Note(2) The LED driving current  $I_{AK}=234\text{mA}$

Note(3) Definition of viewing angle:



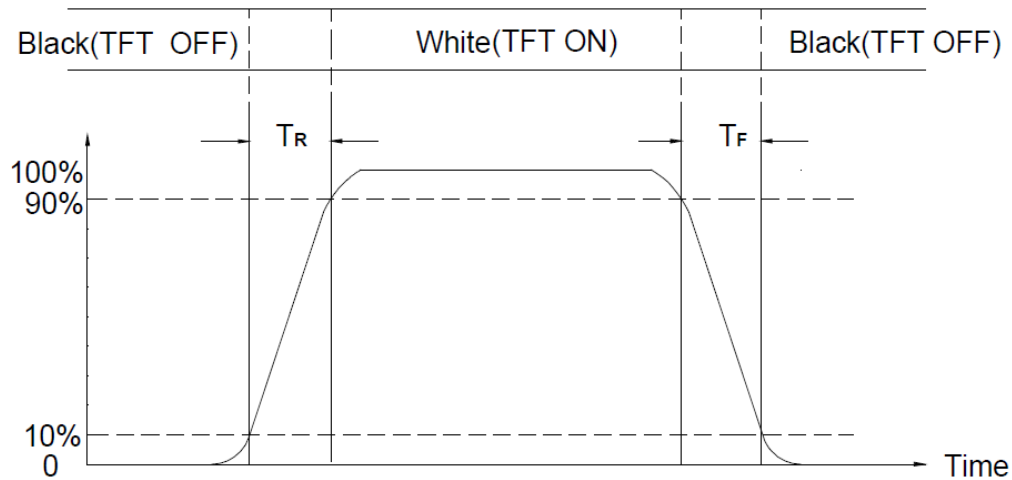
Note(4) Definition of Contrast Ratio (CR)

The contrast ratio can be calculated by the following expression

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

L63: Luminance of gray level 255, L0: Luminance of gray level 0

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



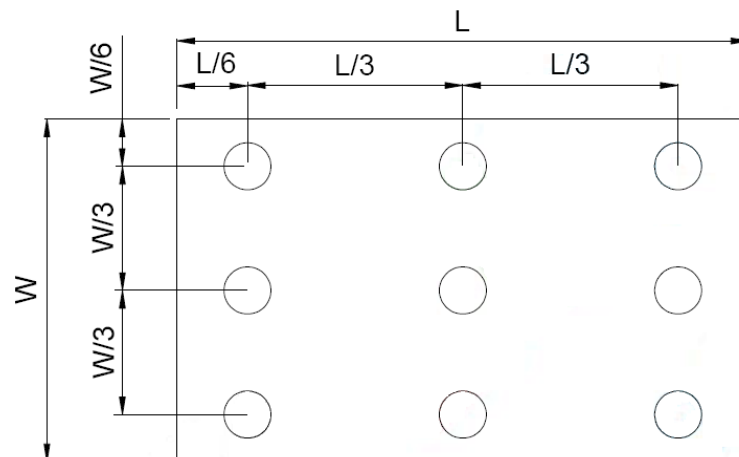
Note(6) Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer to bellow figure).

Every measuring point is placed at the center of each measuring area.

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

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



Bmax : The measured maximum luminance of all measurement position.

Bmin : The measured minimum luminance of all measurement position.



## 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	90±3°C , Dry t=240 hrs	1,2
Low Temperature Storage	-40±3°C ,Dry t=240 hrs	1,2
Storage Humidity Test	60 °C, Humidity 90%, 240 hrs	1,2
Vibration Test (Packing)	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

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 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 the initial value.

## 9 General Precaution

### 9.1 Safety

- (1) Liquid crystal is poisonous. Do not put it your mouth. If liquid crystal touches your skin or clothes, wash it off immediately by using soap and water.

### 9.2 Handling

- (1) The LCD panel is plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.
- (2) The polarizer attached to the display is easily damaged. Please handle it carefully to avoid scratch or other damages.
- (3) To avoid contamination on the display surface, do not touch the module surface with bare hands.
- (4) Keep a space so that the LCD panels do not touch other components.
- (5) Put cover board such as acrylic board on the surface of LCD panel to protect panel from damages.
- (6) Transparent electrodes may be disconnected if you use the LCD panel under environmental conditions where the condensation of dew occurs.
- (7) Do not leave module in direct sunlight to avoid malfunction of the ICs.

### 9.3 Static Electricity

- (1) Be sure to ground module before turning on power or operation module.
- (2) Do not apply voltage which exceeds the absolute maximum rating value.

### 9.4 Storage

- (1) Store the module in a dark room where must keep at  $+25\pm 10^{\circ}\text{C}$  and 65%RH or less.
- (2) Do not store the module in surroundings containing organic solvent or corrosive gas.
- (3) Store the module in an anti-electrostatic container or bag.

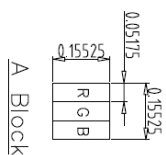
### 9.5 Cleaning

- (1) Do not wipe the polarizer with dry cloth. It might cause scratch.
- (2) Only use a soft cloth with IPA to wipe the polarizer, other chemicals might permanent damage to the polarizer.

### 9.6 Others

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

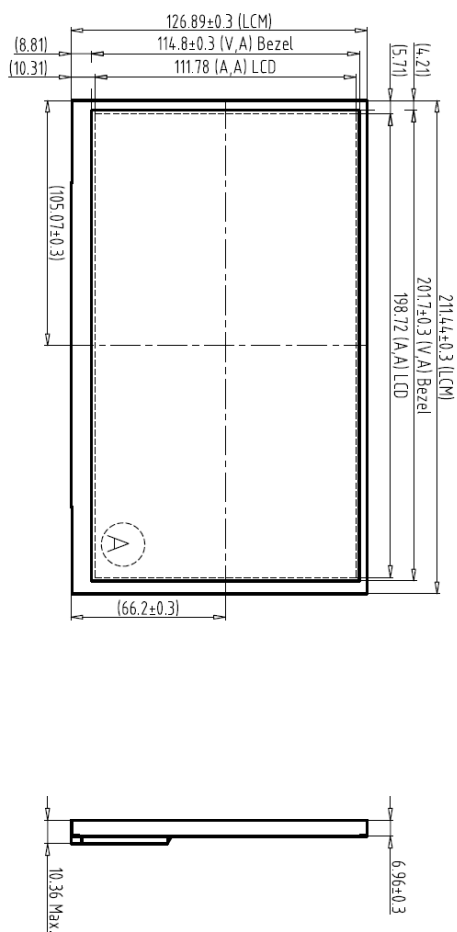
## 10 Outline Dimension



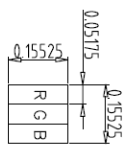
1	GND	21	NC/SD1
2	GND	22	GND
3	PINB3	23	NC
4	PINB3	24	VDD
5	GND	25	VDD
6	CLKP	26	VDD
7	CLKN	27	VDD
8	GND	28	NC/VPP
9	PINB2	29	GND
10	PINB2	30	GND
11	GND	31	TH-
12	PINB1	32	TH+
13	PINB1	33	CATHODE1
14	GND	34	CATHODE1
15	PINB0	35	CATHODE1
16	PINB0	36	NC
17	GND	37	NC
18	NC/CS	38	ANODE1
19	NC/SCL	39	ANODE2
20	NC/SDO	40	ANODE3

Note:

1. Unless indicated, Tolerance " $\pm 0.5$ "
2. UV Glue For OLB Protection.

[illegible]

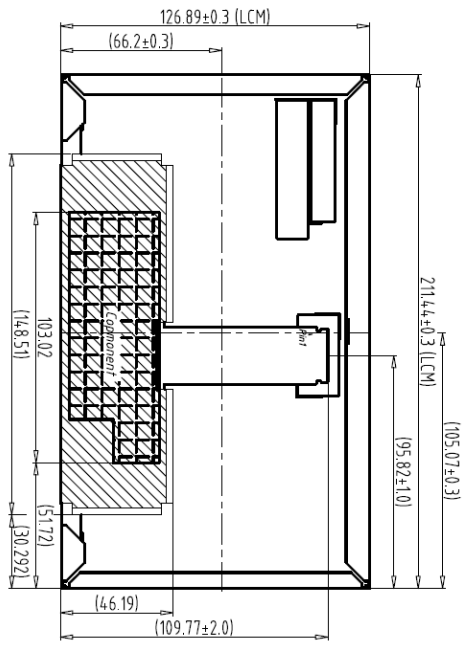
REV	REVISION RECORD	DATE NAME
0	NEW RELEASE	05-18-20 EMILY



A Block

1	GND	21	NC/SDI
2	GND	22	GND
3	PIND3	23	NC
4	NIND3	24	VDD
5	GND	25	VDD
6	CLKP	26	VDD
7	CLKN	27	VDD
8	GND	28	NC/VP
9	PIND2	29	GND
10	NIND2	30	GND
11	GND	31	TH-
12	PIND1	32	TH+
13	NIND1	33	CATHODE1
14	GND	34	CATHODE2
15	PIND0	35	CATHODE3
16	NIND0	36	NC
17	GND	37	NC
18	NC/CS	38	ANODE1
19	NC/SCL	39	ANODE2
20	NC/SDO	40	ANODE3

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



Back View

1	CNT: JUSTCONN (101049-204050)	7		TOLERANCE GRADE(E)	A	B	DIM.	MM	DWN.	EMILY	DATE	05-18-20
2		8					TE NO.		CHK.		DATE	
3		9					PARTS NO.	1280720M	APPD.		DATE	
4		10										
5		11										
6		12										

品光電科技

1280720M

(9.0")

DWG. NO. \*200567MA

SHEET 1 OF 1