

Specifications for LCD module

Customer	
Customer part no.	
Ampire part no.	AM-800480NBTZQW-T01H
Approved by	
Date	

☐ Preliminary Specification

☒ Formal Specification

Approved by	Checked by	Organized by
Patrick	Jessica	Mantle

*This specification is subject to change without notice.

RECORD OF REVISION

Revision Date	Page	Contents	Editor
2020/12/15	-	New Release	Mantle

1. Features

5 inch Amorphous-TFT-LCD (Thin Film Transistor Liquid Crystal Display) module.
This module is composed of a 5" TFT-LCD panel and backlight unit.

- (1) Construction: 5" a-Si TFT active matrix and White LED Backlight.
- (2) Resolution (pixel): 800(R.G.B) X 480
- (3) Number of the Colors : 16.7M colors (R , G , B, 8bit digital each)
- (4) LCD type : **IPS : Transmissive , Normally Black**
- (5) Viewing Direction: All Direction.
- (6) LCD Interface : 24 Bit TTL RGB interface
- (7) Power Supply Voltage: 3.3V single power input. Built-in power supply circuit.
- (8) Touch Panel
 - I. Interface: I2C
 - II. Controller: ILI2511
- (9) Cover lens : 129.48 x 86.28 x 1.1mmT :

2. Physical Specifications

NO	Item	Specification	Remark
1	LCD Size	5.0 inch (Diagonal)	
2	Driver element	a-Si TFT active matrix	
3	Resolution	800 x 3 (RGB) x 480	
4	Display Mode	Normally Black. Transmissive	
5	Dot pitch	0.135(W) x 0.135(H) mm	
8	Color arrangement	RGB-stripe	
9	Luminance	425 (typ.)	cd/m ²

3. Absolute Maximum Ratings

The following values are maximum operation conditions. If exceeded, it may cause faulty operation or damage

3.1 Electrical Absolute max. ratings

Item	Symbol	Condition	Min.	Max.	Unit	Remark
Power voltage	VDD	GND=0	-0.3	4.0	V	
Input voltage	VIN		-0.3	VDD+0.3	V	Note(1)

Note(1) Hsync, Vsync, DE, PCLK, DISP, R0~R7, G0~G7, B0~B7, LEFT/RIGHT, UP/DOWN.

3.2 Environmental Absolute max. Ratings

Item	Operating		Storage		Remark
	Min.	Max.	Min.	Max.	
Temperature	-20	70	-30	80	Note(2),(3),(4),(5),(6),(7)
Humidity	Note(1)		Note(1)		
Corrosive Gas	Not Acceptable		Not Acceptable		

Note(1) Ambient temperature $T_a \leq 40^{\circ}\text{C}$: 85% RH max

$T_a > 40^{\circ}\text{C}$: Absolute humidity must be lower than the humidity of 85%RH at 40°C

Note(2) For storage condition T_a at $-30^{\circ}\text{C} < 48\text{h}$, at $80^{\circ}\text{C} < 100\text{h}$

For operating condition T_a at $-20^{\circ}\text{C} < 100\text{h}$

Note(3) Background color changes slightly depending on ambient temperature. This phenomenon is reversible.

Note(4) The response time will be slower at low temperature.

Note(5) Only operation is guaranteed at operating temperature. Contrast, response time, another display quality are evaluated at $+25^{\circ}\text{C}$

Note(6) When LCM panel is operated over 60°C (center of the panel surface temperature), the IAK of the LED back-light should be adjusted to 105mA

Note(7) This is center of the panel surface temperature, not ambient temperature.

4. Electrical Characteristics

4.1 DC Characteristics

Typical operating conditions (GND=0V)

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
Power supply		VDD	3.0	3.3	3.6	V	
Input Voltage for logic	H Level	VIH	0.7*VDD	--	VDD	V	Note(1)
	L Level	VIL	0	--	0.3*VDD	V	
Power Supply current		IDD		TBD	--	mA	Note(2)

Note(1) Hsync, Vsync, DE, PCLK, DISP, R0~R7, G0~G7, B0~B7, LEFT/RIGHT, UP/DOWN.

Note(2) TFT power supply current.

Note(3) VDD=3.3V, fV =60Hz, Ta=25°C, Display pattern: All White

4.2 Electrical characteristic of LED Back-light

Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED Forward Voltage	VAK	8.4	9.0	10.2	V	IAK=140mA, Ta=25°C
LED Forward Current	IAK	--	140	--	mA	Ta=25°C
LED life time			30k	-	Hrs.	IAK=140mA, Ta=25°C

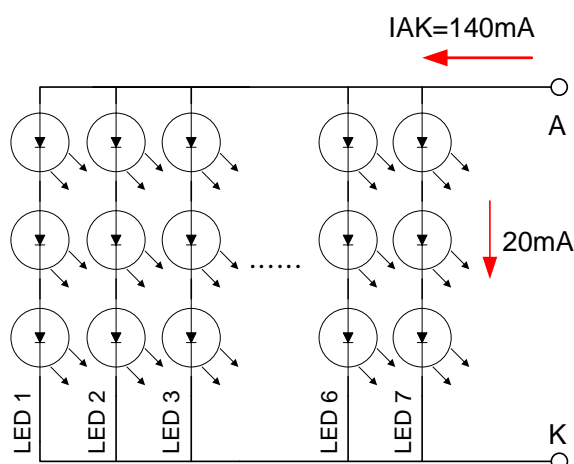
Note(1) Ta means ambient temperature of TFT-LCD module.

Note(2) If the module is driven by high current or at high ambient temperature & humidity condition. The operating life will be reduced.

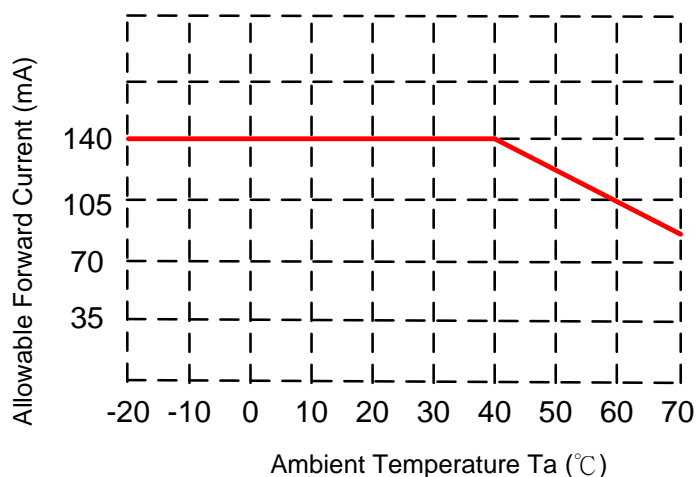
Note(3) The constant current source is needed for LED back-light driving.

Note(4) Operating life means brightness goes down to 50% minimum brightness. LED life time is estimated data. Ta=25°C

Note(5) The structure of LED B/L shows as below.



Note(6) When LCM is operated over 60°C ambient temperature, the IAK of the LED backlight should be adjusted to 105mA max



5. Optical Characteristics of LCD

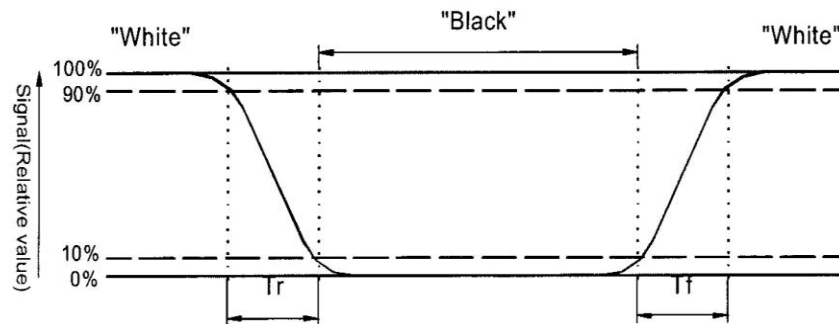
Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response Time		Tr + Tf	$\Theta=0^\circ$		30	40	ms ms	Note 1,2,3,5
Contrast ratio		CR	At optimized viewing angle	800	1000	-		Note 1,2,4,5
Viewing Angle	Top Bottom Left Right		$CR \geq 10$	75 75 75 75	85 85 85 85	- - - -	deg.	Note1,2, 5,6
Brightness		YL	IAK=140mA 25°C	340	425	-	cd/ m ²	Note 7
Red chromaticity	XR	$\Theta=0^\circ$ $\Theta=0^\circ$	Typ. -0.05	Typ. +0.05	TBD	Typ. +0.05		Note 7 For reference only. These data should be update according the prototype.
	YR				TBD			
Green chromaticity	XG				TBD			
	YG				TBD			
Blue chromaticity	XB				TBD			
	YB				TBD			
White chromaticity	XW				0.32			
	YW				0.37			

It's for reference only. These data should be update according the prototype.

- Note(1) Ambient temperature=25°C, and lamp current IAK=105mA. To be measured in the dark room.
- Note(2) To be measured on the center area of panel with a viewing cone of 1° by Topcon luminance meter BM-7, after 10 minutes operation.

Note(3) Definition of response time:

The output signals of photo detector are measured when the input signals are changed from "black" to "white" (falling time) and from "white" to "black" (rising time), respectively. The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figure as below.



Note(4) Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

$$\text{Contrast ratio(CR)} = \frac{\text{Brightness of All White}}{\text{Brightness of All Black}}$$

Note(5) White $V_i = V_{i50} + 1.5V$ Black $V_i = V_{i50} + 2.0V$

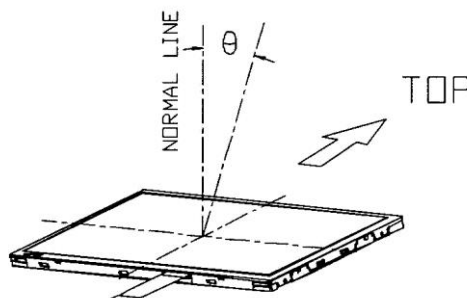
"±" means that the analog input signal swings in phase with V_{COM} signal.

" " means that the analog input signal swings out of phase with V_{COM} signal.

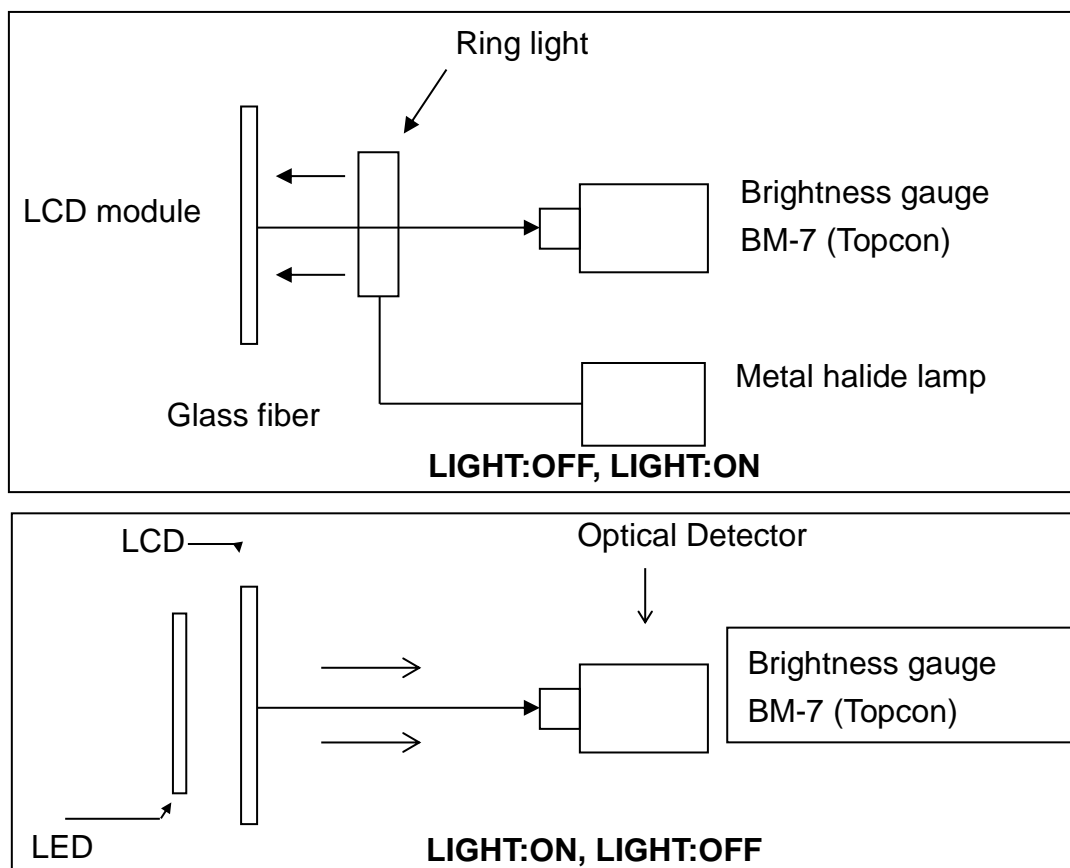
V_{i50} : The analog input voltage when transmission is 50%. The 100%

Transmission is defined as the transmission of LCD panel when all the Input terminals of module are electrically opened.

Note(6) Definition of viewing angle. Refer to figure as below.



Note(7) Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.



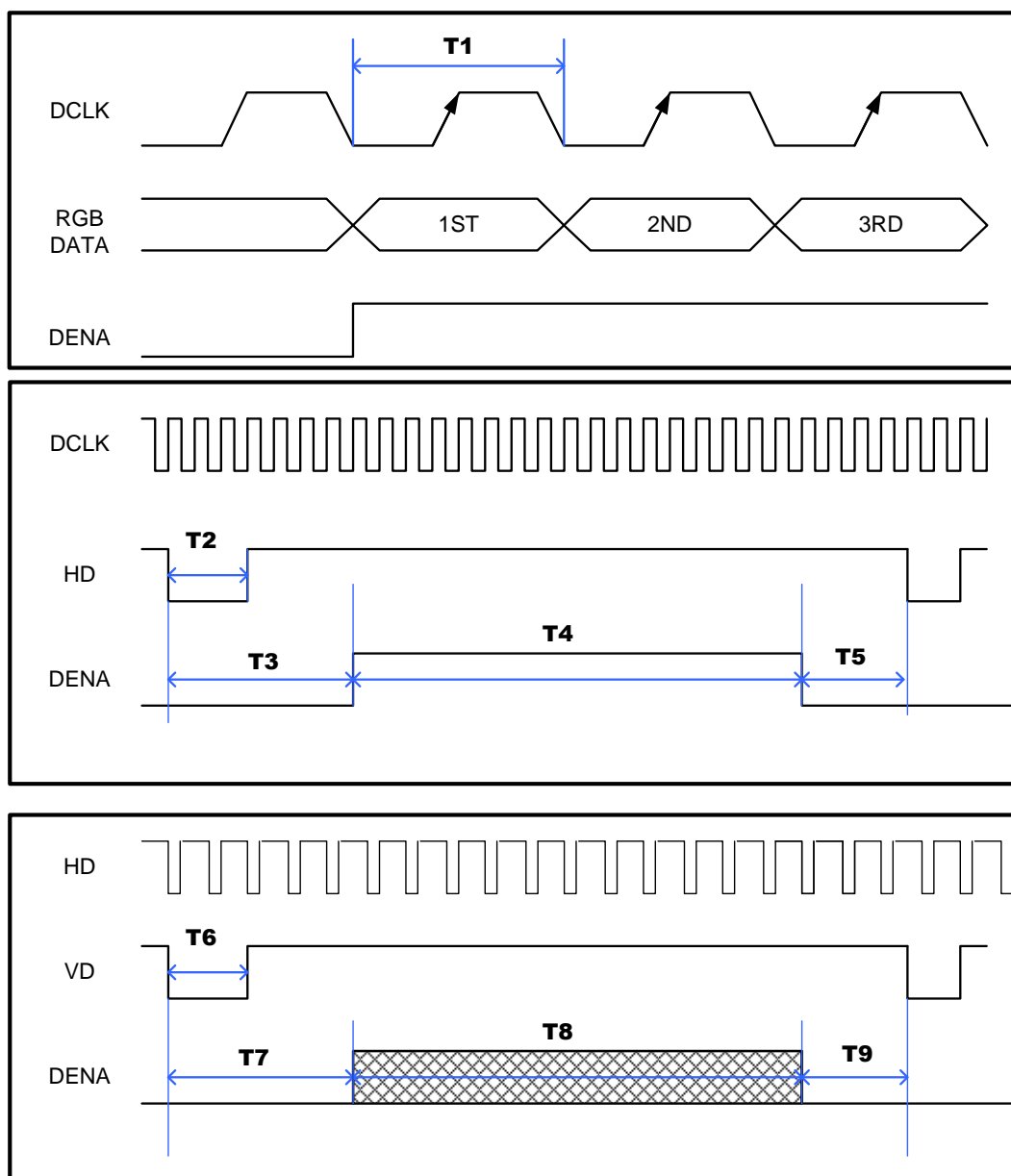
6. Interface

Pin no	Symbol	I/O	Description	Remark
1	LEDK	P	LED Back-light Cathode	
2	LEDA	P	LED Back-light Anode	
3	GND	P	Power GND	
4	VDD	P	Power supply for the logic (3.3V)	
5	R0	I	Red Data (LSB)	
6	R1	I	Red Data	
7	R2	I	Red Data	
8	R3	I	Red Data	
9	R4	I	Red Data	
10	R5	I	Red Data	
11	R6	I	Red Data	
12	R7	I	Green Data (MSB)	
13	G0	I	Green Data (LSB)	
14	G1	I	Green Data	
15	G2	I	Green Data	
16	G3	I	Green Data	
17	G4	I	Green Data	
18	G5	I	Green Data	
19	G6	I	Green Data	
20	G7	I	Green Data (MSB)	
21	B0	I	Blue Data (LSB)	
22	B1	I	Blue Data	
23	B2	I	Blue Data	
24	B3	I	Blue Data	
25	B4	I	Blue Data	
26	B5	I	Blue Data	
27	B6	I	Blue Data	
28	B7	I	Blue Data (MSB)	
29	GND	P	Power GND	
30	PCLK	I	Clock signal. Latching data at the rising edge.	
31	DISP	I	L: Standby mode. H: Normal display mode	
32	HSYNC	I	Horizontal sync input in digital RGB mode	
33	VSYNC	I	Vertical sync input in digital RGB mode.	

34	DE	I	Input data enable control	
35	NC	-	No connection	
36	GND	P	Power GND	
37	LEFT/RIGHT	I	L: From right to left H: From left to right	
38	UP/DOWN	I	L: From down to left H: From up to down	
39	NC		No connection	
40	NC		No connection	

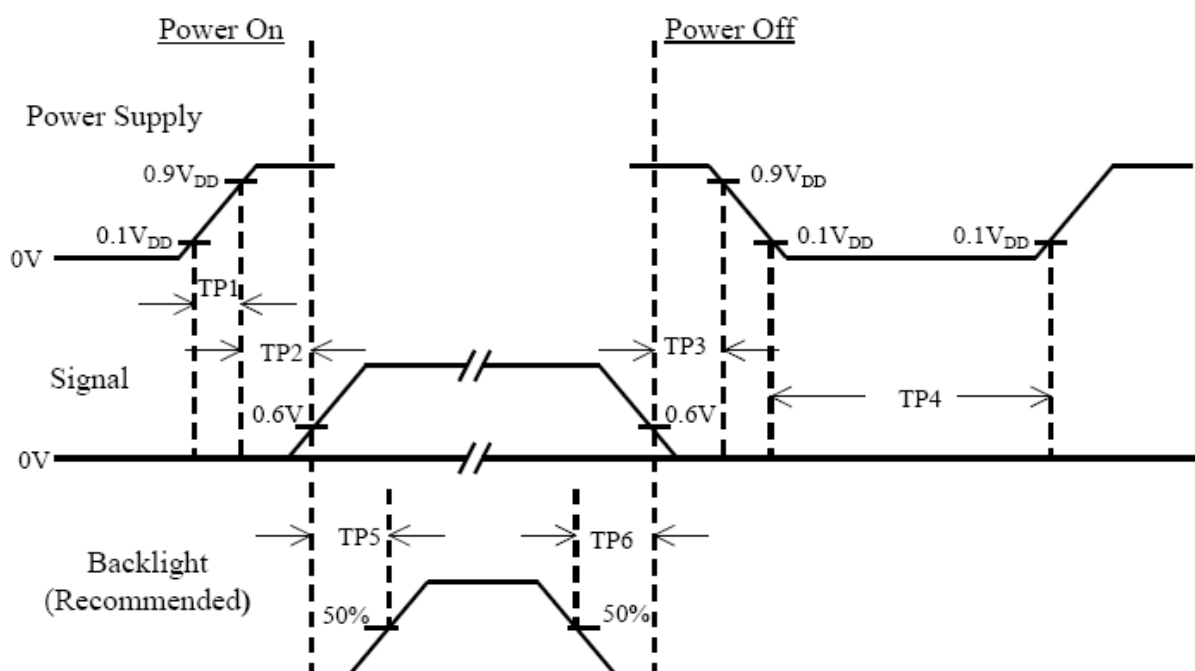
7. LCD Interface Timing

7.1 TTL RGB



Item	Symbol	Min.	Typ.	Max.	Unit
Clock Frequency	$1/T1$	23	25	27	MHz
HSYNC Pulse Wide	$T2$	2	8	8	clocks
HSYNC Back Porch	$T3$	4	8	48	Clocks
HSYNC Front Porch	$T5$	4	8	48	Clocks
Horizontal Display Period	$T4$	800			Clocks
Horizontal total Period	$T3+T4+T5$	808	816	896	Clocks
VSYNC Pulse Wide	$T6$	2	4	8	Lines
VSYNC Back Porch	$T7$	4	8	12	Lines
VSYNC Front Porch	$T9$	4	8	12	Lines
Vertical Display Period	$T8$	480			Lines
Vertical total Period	$T7+T8+T9$	488	496	504	Lines

7.2 Power On/Off Sequence



Item	Min.	Typ.	Max.	Unit	Remark
TP1	0.5	--	10	msec	
TP2	0	--	50	msec	
TP3	0	--	50	msec	
TP4	500	--	--	msec	
TP5	250	--	--	msec	
TP6	100	--	--	msec	

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

Note(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.

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

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

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

8 Projected capacitive-type Touch panel specification

8.1 Basic Characteristics

Item	Specification
Interface Type	Projective Capacitive Multi-Touch Panel
X/Y Position Reporting	Absolute Position
Touch Force	No contact pressure required
Calibration	No need for calibration
Report Rate	Approx. 80 points/sec
Interface	I2C
Control IC	ILI2511

8.2 Optical Characteristic

Item	Specification
Transmittance	80% (min)

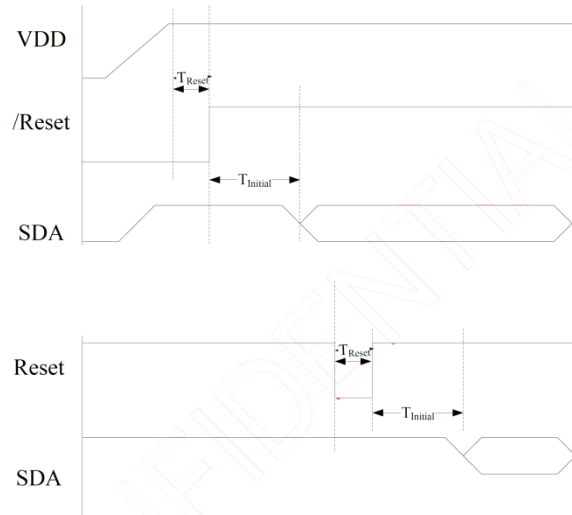
8.3 Electrical Characteristics

Item	Specification
I2C Interface	Power & signal Input 3.3V

8.4 Pin Define

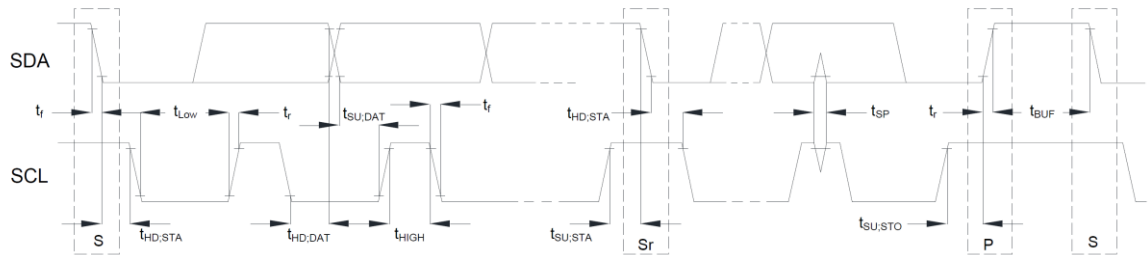
Pin No	Symbol	Function
1	GND	Digital ground
2	SDA	I2C Data
3	SCL	I2C Clock
4	VDD	USB Power 3.3V
5	INT	Interrupt pin, active low.
6	RST	Reset pin, active low.

8.5 Power- on Timing Chart



Symbol	Parameter	MIN.	MAX.	Unit
$T_{Initial}$	After powering-on or resetting the device, the device needs $T_{Initial}$ time to configure the system.	-	100	ms
T_{Reset}	$/Reset$ pin low hold time	50	-	μs

8.6 I2C AC Waveform



8.7 I2C Characteristics

Symbol	Parameter	100KHz			400KHz		
		Min	Max	Unit	Min	Max	Unit
f_{SCL}	SCL clock frequency	0	100	kHz	0	400	KHz
$t_{HD,STA}$	Hold time (repeated) START condition. After this period, the first clock pulse is generated	4.0	-	μs	0.6	-	μs
t_{LOW}	LOW period of the SCL clock	4.7	-	μs	1.3	-	μs
t_{HIGH}	HIGH period of the SCL clock	4.0	-	μs	0.6	-	μs
$t_{SU,STA}$	Set-up time for a repeated START condition	4.7	-	μs	0.6	-	μs
$t_{HD,DAT}$	Data hold time	0	3.45	μs	0	0.9	μs
$t_{SU,DAT}$	Data set-up time	250	-	ns	100	-	ns
t_r	Rise time of both SDA and SCL signals	-	1000	ns	-	300	ns
t_f	Fall time of both SDA and SCL signals	-	300	ns	-	300	ns
$t_{SU,STO}$	Set-up time for STOP condition	4.0	-	μs	0.6	-	μs
t_{BUF}	Bus free time between a STOP and START condition	4.7	-	μs	1.3	-	μs

8.8 Device Address

MSB							LSB
1	0	0	0	0	0	1	0/1
Device Address							R/W

7-bit Device Address: 0x41

8-bit Device Read Address: 0x83

8-bit Device Write Address: 0x82

8.9 Data Transfer

Data is transferred over the I2C bus with 8-bit address and 8-bit data.

1	7	1	1	8	1	1
S	Slave Address	Wr	A	Data Byte	A	P

S Start Condition




Sr Repeated Start Condition

Rd Read (bit value of 1)

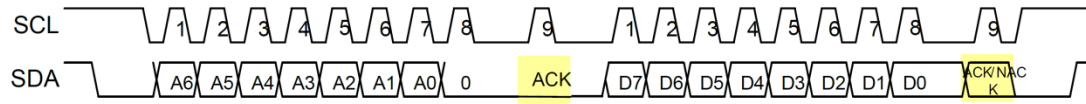
Wr Write (bit value of 0)

A/NA Acknowledge (this bit position may be '0' for an ACK or '1' for a NACK)

P Stop Condition

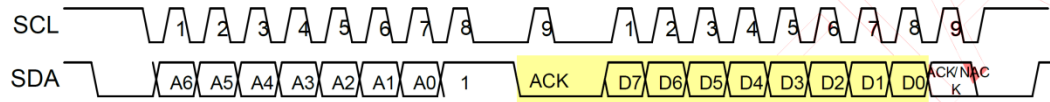
	Master-to-Slave
	Slave-to-Master
	Continue

I2C Write timing



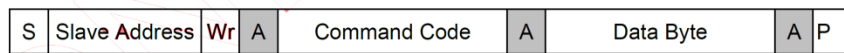
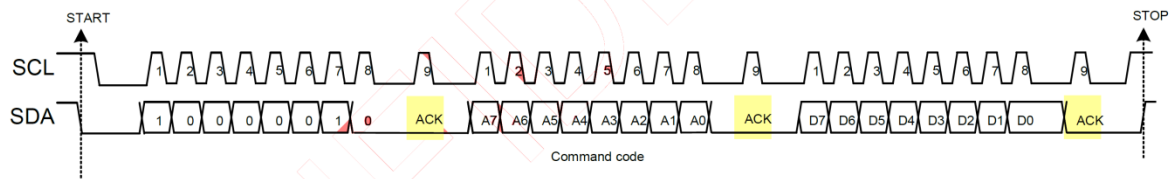
 => slave to master

I2C Read timing



 => slave to master

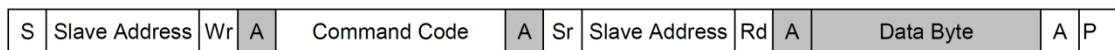
Byte Write



Byte Write

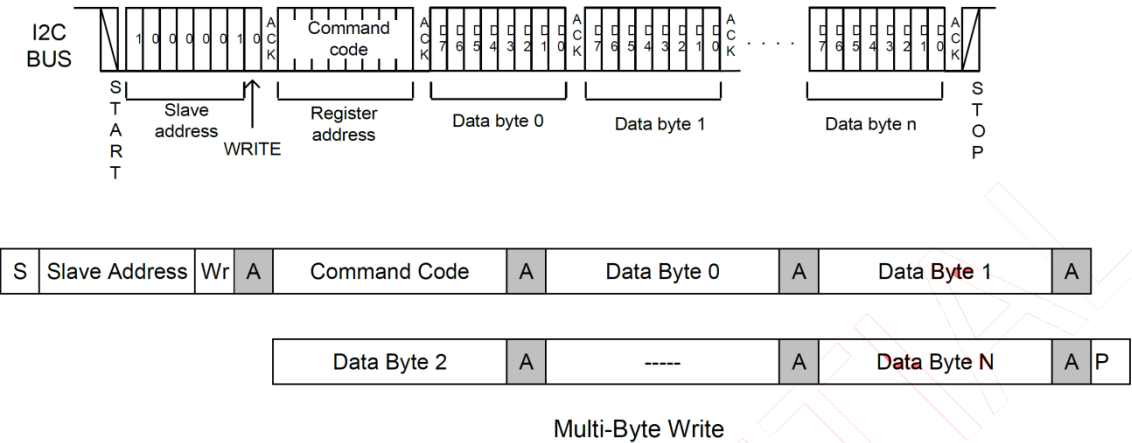
Byte Read

C

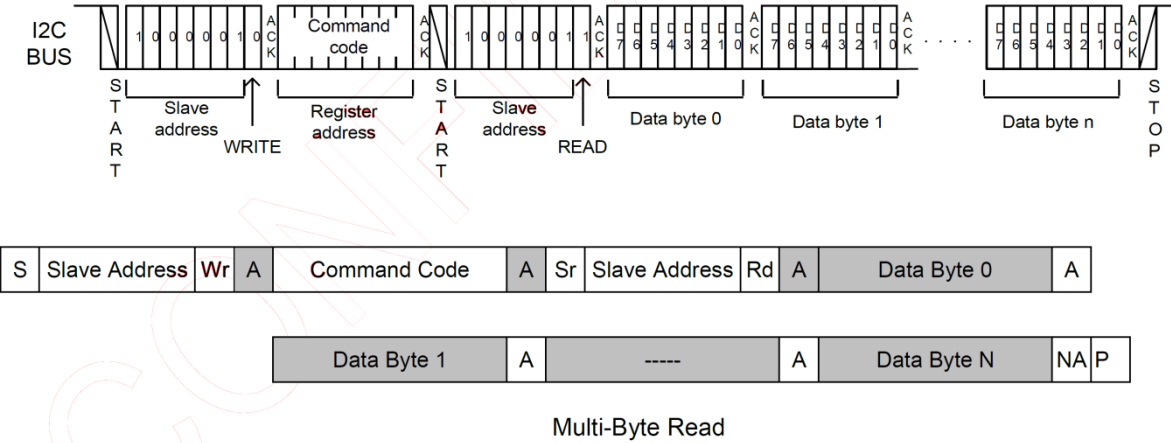


Byte Read

Multi-Byte Write



Multi-Byte Read



8.10 Format Protocol

Protocol V3.X Command List

CMD Code	Name	Set /Get	Note	b7	b6	b5	b4	b3	b2	b1	b0	
0x10	Touch Information	Get		0: No touch 1: Last Report at ID 0 to ID 5 (include release status) 2: Last Report at ID 6 to ID 9 (include release status)								
			ID0	1: Touch Down, 0: Touch Off	0	X_High direction coordinate						
				X_Low direction coordinate								
				0	0	Y_High direction coordinate						
				Y_Low direction coordinate								
				Touch Pressure								
				ID1	1: Touch Down, 0: Touch Off	0	X_High direction coordinate					
			X_Low direction coordinate									
			0		0	Y_High direction coordinate						
			Y_Low direction coordinate									
			Touch Pressure									
			ID2		1: Touch Down, 0: Touch Off	0	X_High direction coordinate					
				X_Low direction coordinate								
				0	0	Y_High direction coordinate						
				Y_Low direction coordinate								
				Touch Pressure								
				ID3	1: Touch Down, 0: Touch Off	0	X_High direction coordinate					
					X_Low direction coordinate							
					0	0	Y_High direction coordinate					
					Y_Low direction coordinate							
					Touch Pressure							
			ID4		1: Touch Down, 0: Touch Off	0	X_High direction coordinate					
				X_Low direction coordinate								
				0	0	Y_High direction coordinate						
				Y_Low direction coordinate								
				Touch Pressure								

			ID5	1: Touch Down, 0: Touch Off	0	X_High direction coordinate
				X_Low direction coordinate		
				0	0	Y_High direction coordinate
				Y_Low direction coordinate		
				Touch Pressure		
0x14	Touch Information 2	Get	ID6	1: Touch Down, 0: Touch Off	0	X_High direction coordinate
				X_Low direction coordinate		
				0	0	Y_High direction coordinate
				Y_Low direction coordinate		
				Touch Pressure		
			ID7	1: Touch Down, 0: Touch Off	0	X_High direction coordinate
				X_Low direction coordinate		
				0	0	Y_High direction coordinate
				Y_Low direction coordinate		
				Touch Pressure		
			ID8	1: Touch Down, 0: Touch Off	0	X_High direction coordinate
				X_Low direction coordinate		
				0	0	Y_High direction coordinate
				Y_Low direction coordinate		
				Touch Pressure		
			ID9	1: Touch Down, 0: Touch Off	0	X_High direction coordinate
				X_Low direction coordinate		
				0	0	Y_High direction coordinate
				Y_Low direction coordinate		
				Touch Pressure		
0x20				The maximum X coordinate (bit 7:0)		
				The maximum X coordinate (bit 15:8)		
				The maximum Y coordinate (bit 7:0)		
				The maximum Y coordinate (bit 15:8)		
				The channel numbers of X direction		
				The channel numbers of Y direction		
				The maximum report points		

				The channel numbers of TouchKey / Scrolling Bar
				For Touch Key Application (Maximum supports 31 Touch Key) Byte 8 : The Touch Key number (<32) Byte 9: 0xFF
0x30	Enter Sleep Mode	Set		--
0x40	Firmware Version	Get		Chip ID Code
				Major firmware version
				Minor firmware version
				Release firmware version
				For Customer Firmware Version
				For Customer Firmware Version
				For Customer Firmware Version
				For Customer Firmware Version
0x42		Get		Major protocol version : 0x03
				Minor protocol version : XX
				Release protocol version : XX

Protocol V3.X Data Format

CMD Code	Name	Set / Get	Note	b7	b6	b5	b4	b3	b2	b1	b0
0x10	Touch Information	Get	Packet Number	0: No touch 1: Last Report at ID 0 to ID 5 (include release status) 2: Last Report at ID 6 to ID 9 (include release status)							
			ID0	1: Touch Down, 0: Touch Off	0	X_High direction coordinate					
		X_Low direction coordinate									
		0		0	Y_High direction coordinate						
		Y_Low direction coordinate									
		Touch Pressure									

			ID1	1: Touch Down, 0: Touch Off	0	X_High direction coordinate
				X_Low direction coordinate		
				0	0	Y_High direction coordinate
				Y_Low direction coordinate		
				Touch Pressure		
			ID2	1: Touch Down, 0: Touch Off	0	X_High direction coordinate
				X_Low direction coordinate		
				0	0	Y_High direction coordinate
				Y_Low direction coordinate		
				Touch Pressure		
			ID3	1: Touch Down, 0: Touch Off	0	X_High direction coordinate
				X_Low direction coordinate		
				0	0	Y_High direction coordinate
				Y_Low direction coordinate		
				Touch Pressure		
			ID4	1: Touch Down, 0: Touch Off	0	X_High direction coordinate

				X_Low direction coordinate		
				0	0	Y_High direction coordinate
				Y_Low direction coordinate		
				Touch Pressure		
			ID5	1: Touch Down, 0: Touch Off	0	X_High direction coordinate
				X_Low direction coordinate		
				0	0	Y_High direction coordinate
				Y_Low direction coordinate		
				Touch Pressure		

9. 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 inspired 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 initial value.

10. General Precautions

10.1 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.

10.2 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.

10.3 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.

10.4 Storage

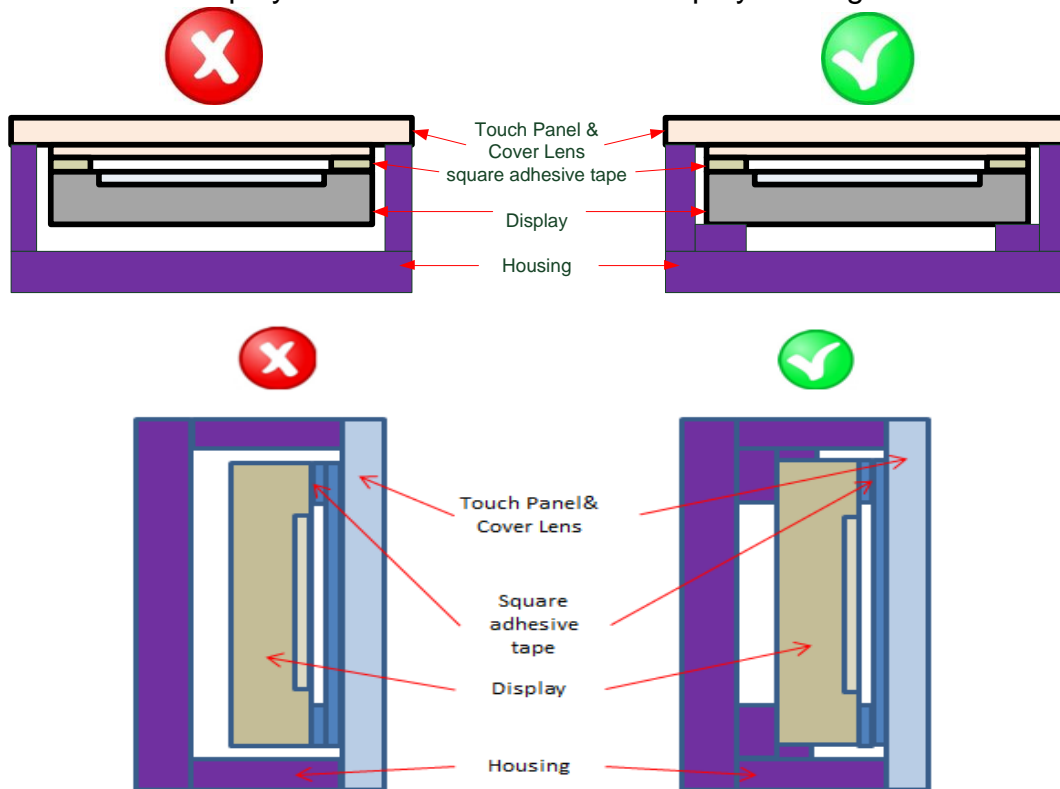
- (1) Store the module in a dark room where must keep at $+25\pm 10^{\circ}\text{C}$ and 65%RH or less.
- (2) Do not store the module in surroundings containing organic solvent or corrosive gas.
- (3) Store the module in an anti-electrostatic container or bag.

10.5 Cleaning

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

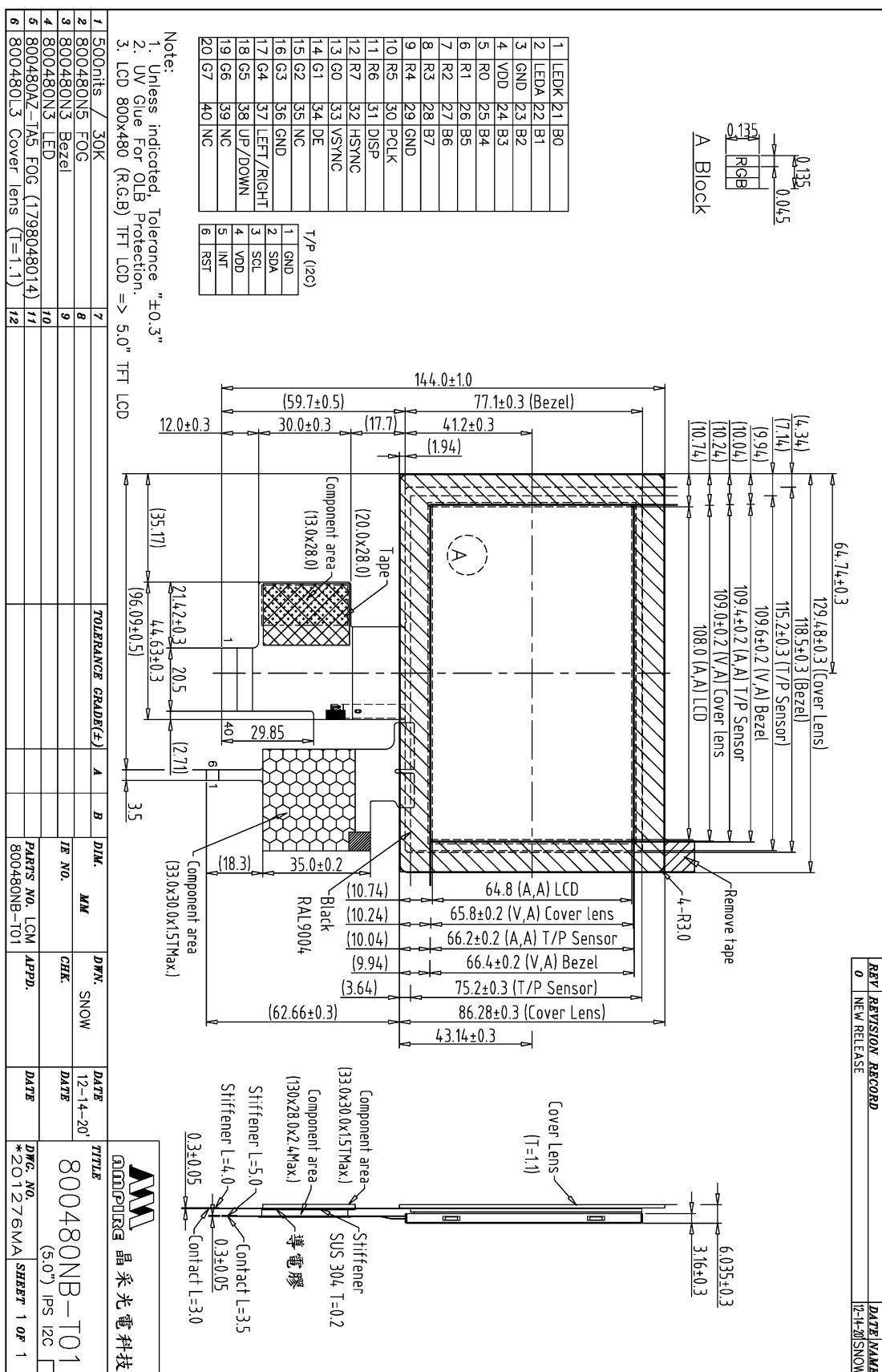
10.6 Mechanism

- (1) Please mount LCD module by using mounting holes arranged in four corners tightly.
- (2) The square adhesive tape which is between the touch panel and display can't provide well supporting in the long term and high ambient temperature condition. Whether upright or horizontal position the support holder which is in the back side of the display is needed. Do not let the display floating.

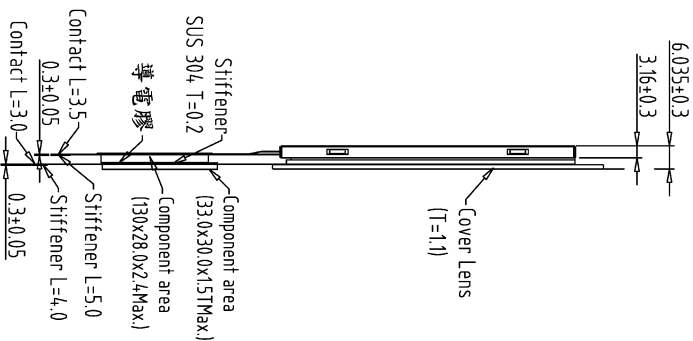
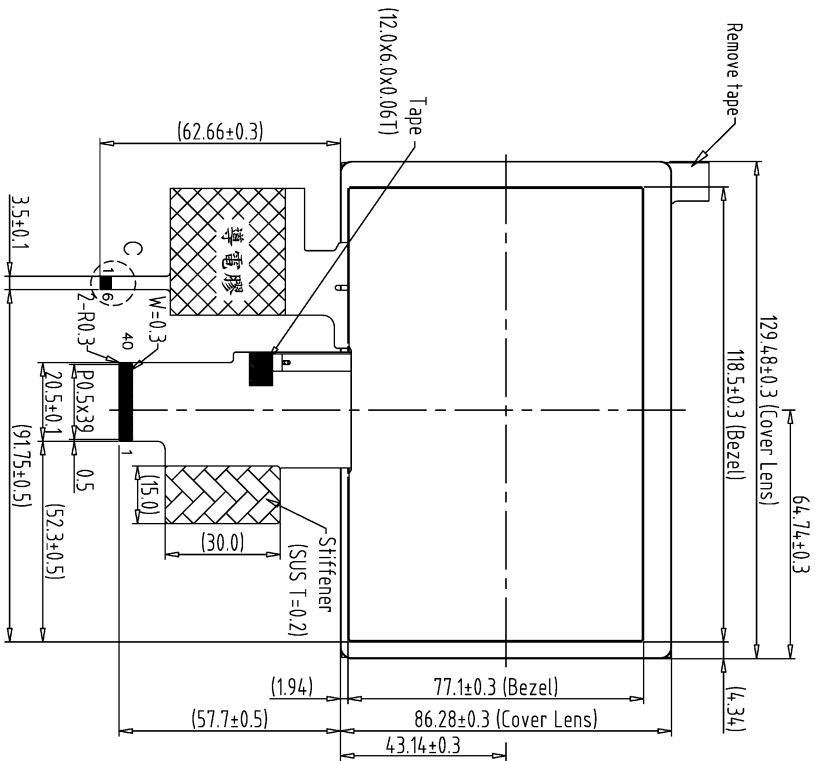
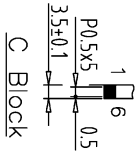


10.7 Others

- (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.



REV	REVISION RECORD	DATE	NAME
0	NEW RELEASE	12-14-20	SNOW



1	LEDK	21	B0
2	LEDA	22	B1
3	GND	23	B2
4	VDD	24	B3
5	R0	25	B4
6	R1	26	B5
7	R2	27	B6
8	R3	28	B7
9	R4	29	GND
10	R5	30	CLK
11	R6	31	DISP
12	R7	32	HSYNC
13	G0	33	VSNC
14	G1	34	DE
15	G2	35	NC
16	G3	36	GND
17	G4	37	LEFT/RIGHT
18	G5	38	UP/DOWN
19	G6	39	NC
20	G7	40	NC

1	GND	(2C)
2	SDA	
3	SCL	
4	VDD	
5	INT	
6	RST	

- Note:
1. Unless indicated, Tolerance "±0.3"
 2. UV Glue For OLB Protection.
 3. LCD 800x480 (R.G.B) TFT LCD => 5.0" TFT LCD

Back view

1	500nits / 30K	7	7	TOLERANCE	GRADE(±)	A	B	DIM.	MM	DWN.	SNOW	DATE	DATE	TITLE	DWG. NO.	SHEET
2	800480N5 FOG	8	8					IE NO.		CHK.		12-14-20		800480NB-T01	(5.0") IPS 12C	1
3	800480N3 Bezel	9	9					PARTS NO.	LOM-1	APPD.						
4	800480N3 LED	10	10													
5	800480AZ-1A5 FOG (1798048014)	11	11													
6	800480L3 Cover lens (T=1.1)	12	12						800480NB-T01							

