



晶采光電科技股份有限公司
AMPIRE CO., LTD.

/SIMPLEPLUS
Touch Displays

Specifications for LCD module

Customer	
Customer part no.	
Ampire part no.	AMA-121A05-DU8046-G018
Approved by	
Date	

☐ Preliminary Specification

☒ Formal Specification

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Approved by	Checked by	Organized by
Kokai	Simon	Tank

*This specification is subject to change without notice.

RECORD OF REVISION

Revision Date	Page	Contents	Editor
2023/10/23	-	New Release	Tank

1. Features

12.1 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 driving circuit and a back light system. This TFT LCD has a 12.1 inch diagonally measured active display area with HD (1024 horizontal by 768 vertical pixels) resolution.

(1) Projective Capacitive Touch

- a. Interface : USB
- b. Touch Controller: EXC80W46
- c. Cover Lens :
 - i. Tempered Soda Lime Glass: T=1.8mm.
 - ii. Black border (Pantone :Black)

(2) Tape bonding between LCD and touch panel.

(3) ROHS.

2. Physical Specifications

Item	Specifications	Remark
LCD Size	12.1 inch(Diagonal)	
Driver Element	a-Si TFT active matrix	
Display Resolution	1024(W) x 3(RGB) x 768(H) dots	
Display Mode	Normally Black	
Dot Pitch	0.240(W) x 0.240(H) mm	
Active Area	245.76(W) x 184.32(H) mm	
Color Arrangement	RGB Vertical Stripe	

3. Absolute Maximum Ratings

Item	Symbol	Values		Unit	Remark
		Min	Max		
LCD Power Voltage	VDD	-0.3	5.0	V	
LED Driver Power Voltage	VLED	-0.3	14	V	
Operation Temperature	TOP	-30	70	°C	
Storage Temperature	TST	-30	80	°C	

Note(1) The absolute maximum rating values of this product are not allowed to be exceeded at any times.

Note(2) 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.

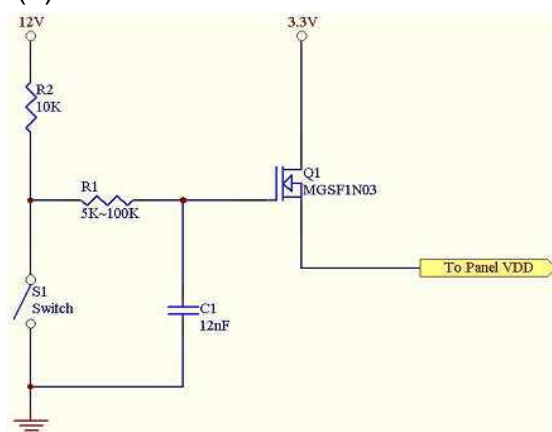
4. Electrical Specifications

4.1 TFT LCD module

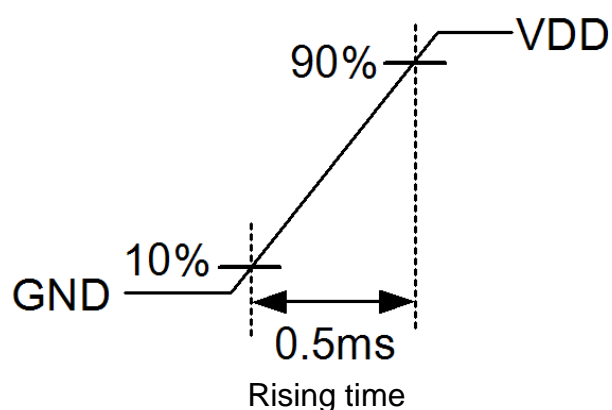
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	VDD	3.0	3.3	3.6	V	Ta=25°C
Logic Input Voltage	VIH	0.8*VDD	--	VDD	V	BIST, SEL68, reLR, reUD
	VIL	0	--	0.2*VDD	V	
Current of Power Supply	IDD	—	0.242	0.364	A	VDD =3.3V White pattern (L255)
VDD Power	PDD	—	0.8	1.2	W	VDD =3.3V White pattern (L255)
Inrush Current	IRUSH	—	—	2.0	A	Note(1),(2)

Note(1) : The min. output current of the VDD (3.3V) supply should be more than 2.0A.

Note(2) : Inrush current test circuit and rising time setting



Test circuit



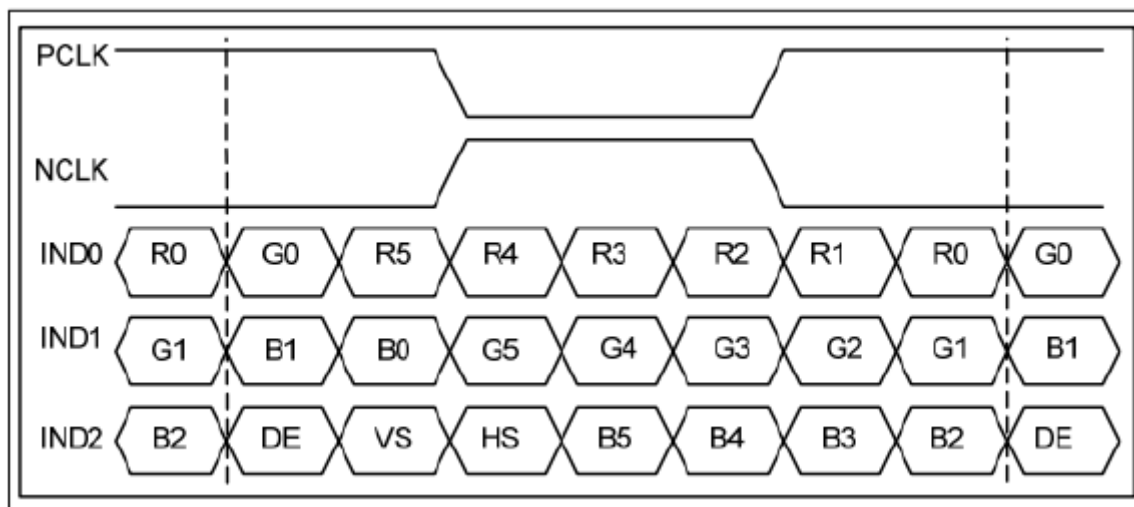
4.2 Switching Characteristics for LVDS Receiver

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Differential Input High Threshold	VTH	100	-	300	mV	
Differential Input Low Threshold	VTL	-300	-	-100	mV	
Differential Input Common Mode Voltage	VCM	1.0	1.2	$1.7 - \frac{ VID }{2}$	V	
Input Current	IIN	-10		10	uA	RX+/-, RXC+/-
Differential Input Voltage	VID	200		600	mV	

4.3 Bit LVDS input

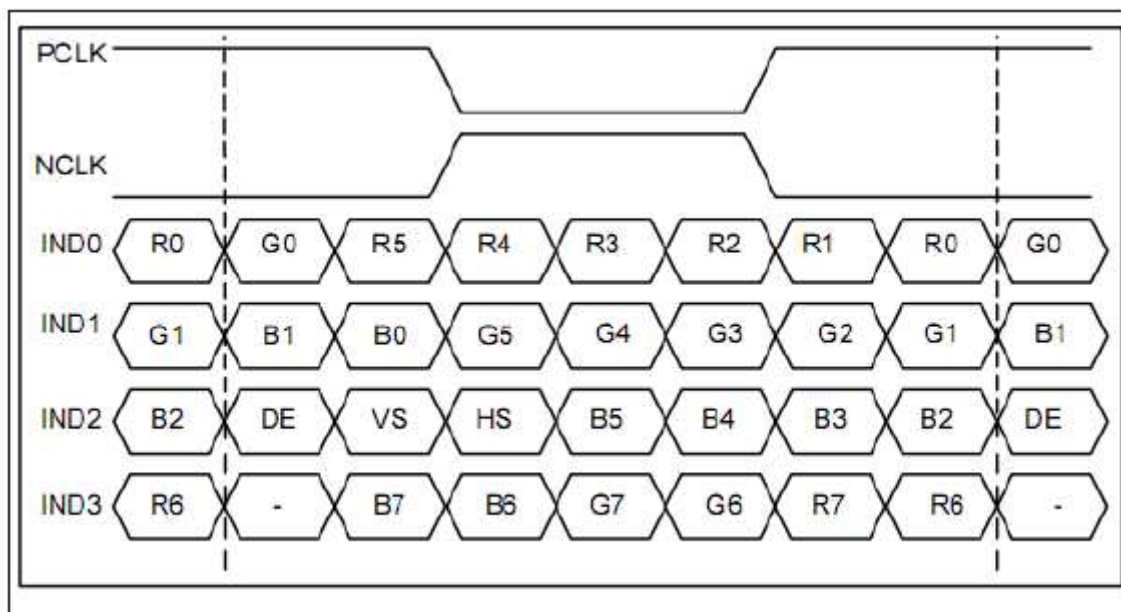
4.3.1 6bit LVDS input

Pin4 SEL68=0 : LVDS input data is 6bits (VESA)



4.3.2 8Bit LVDS input

Pin4 SEL68=1 : LVDS input data is 8bits (VESA)

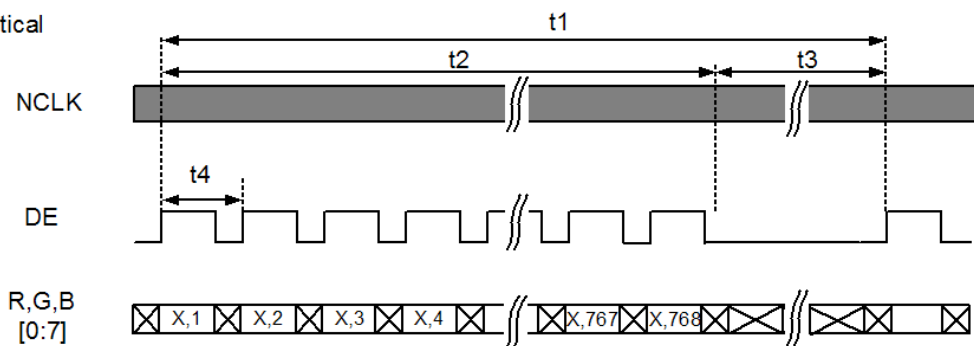


4.4 Interface Timing (DE mode)

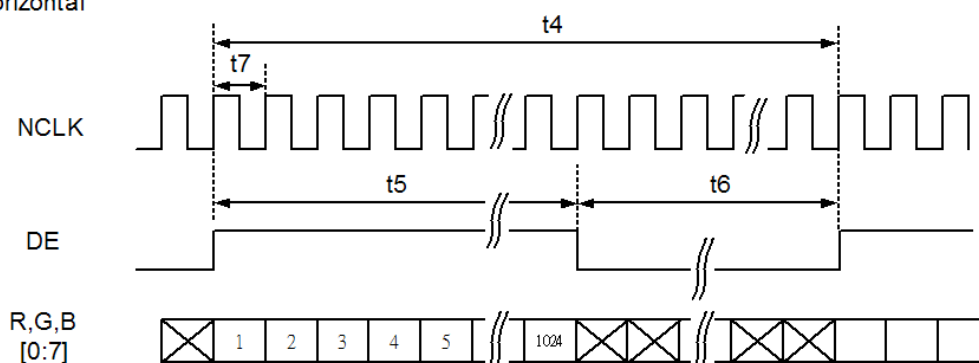
Item	Symbol	Min.	Typ.	Max.	Unit
Frame Rate	--	55	60	65	Hz
Vertical Total Time	TV	783	798	813	line
Vertical Display Time	TVD	768			line
Vertical Blanking Time	TVB	15	30	45	line
Horizontal Total Time	TH	1104	1124	1144	clock
Horizontal Display Time	THD	1024			clock
Horizontal Blanking Time	THB	80	10	120	clock
Clock Rate	1/ TClock	51.2	53.8	56.2	MHz

Timing Diagram of Interface Signal (DE mode)

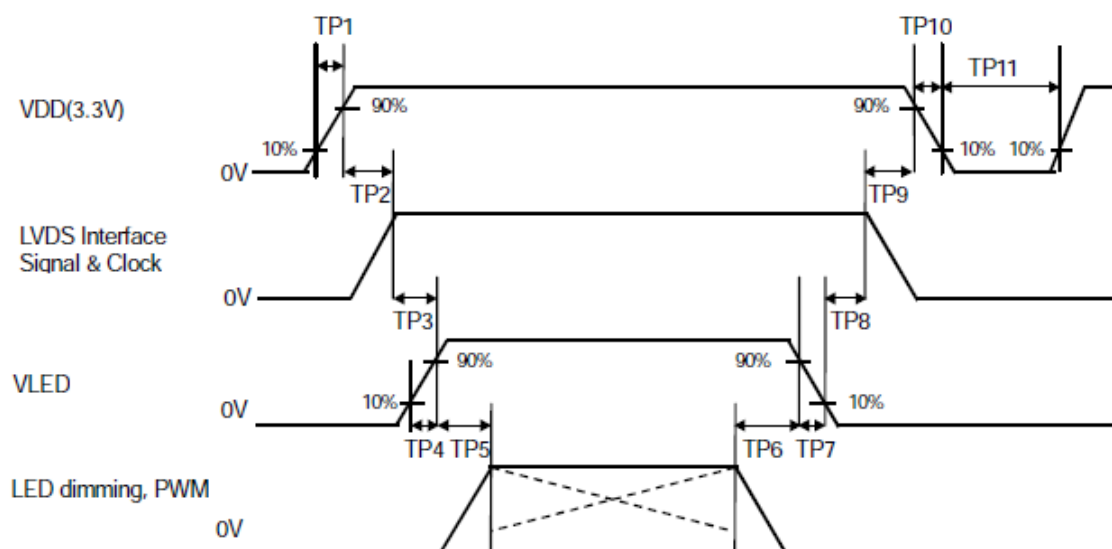
1. Vertical



2. Horizontal



4.5 Power On / Off Sequence



Item	Min.	Typ.	Max.	Unit
TP1	0.5	--	10	msec
TP2	0	--	50	msec
TP3	200	--	--	msec
TP4	0.5	--	10	msec
TP5	10	--	--	msec
TP6	10	--	--	msec
TP7	0	--	10	msec
TP8	200	--	--	msec
TP9	0	--	50	msec
TP10	1	--	10	msec
TP11	1000	--	--	msec

4.6 Backlight Unit

4.6.1 White LED Backlight

(For Design Reference only , The Backlight driving by built-in LED Driver)

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	CONDITION
LED Backlight Voltage	V_F	--	22.4	--	V	For reference
LED Backlight Current	I_F	-	412	--	mA	Ta=25°C
LED Life Time		80	100	-	Khr	

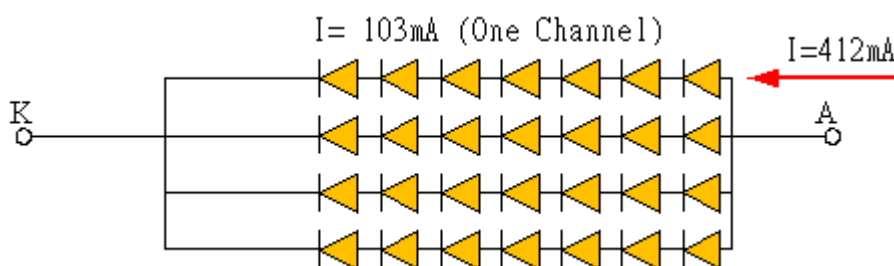
Note 1: Ta means ambient temperature of TFT-LCD module.

Note 2: V_F , I_F are defined for LED B/L.

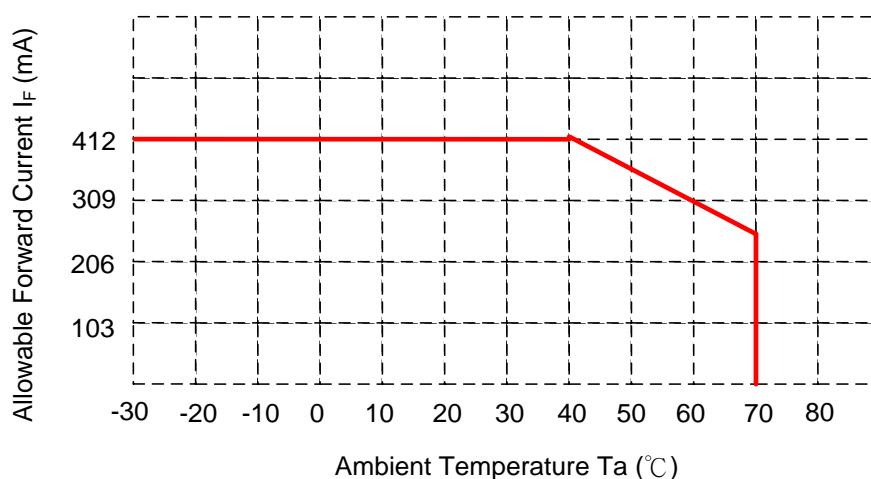
Note 3: If the module is driven by high current or at high ambient temperature & humidity condition. The operating life will be reduced.

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.

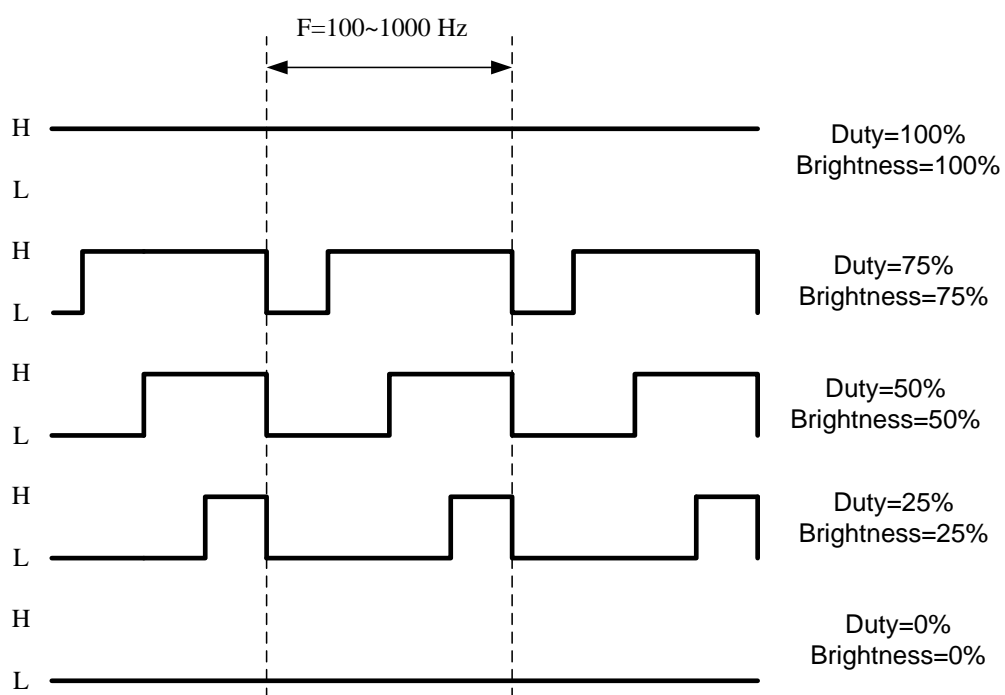


When LCM is operated over 40°C ambient temperature, the I_F should be follow :



4.6.2 LED Driver

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Input Voltage	VL	10.8	12.0	13.2	V	
Input Current	I _{LED}	--	(961)	--	mA	100% PWM duty
BLEN Logic High	V _{IH}	2.5	--	VL	V	
BLEN Logic Low	V _{IL}	0	--	0.4	V	
V _{PDIM} Logic High	V _{IH}	2.5	--	5.5	V	
V _{PDIM} Logic Low	V _{IL}	0	--	0.4	V	
V _{PDIM} PWM Frequency	F _{PDIM}	100	500	1000	Hz	
V _{PDIM} PWM Duty Range	DR	5	--	100	%	



5. Interface

5.1 Interface Connector (Input signal):

STARCONN 076B20-0048RA-G4 or JAE FI-SEB20P-HFE (or equivalent)

Pin NO.	Symbol	Description	Note
1	RX3+	Differential Data Input, CH3 (Positive)	
2	RX3-	Differential Data Input, CH3 (Negative)	
3	BIST	Normal operation/BIST pattern select BIST="0": Normal operation BIST="1" : BIST mode	Note(1)
4	SEL68	6bit/8bit mode select SELB = "1" : LVDS input data is 8bits SELB = "0" : LVDS input data is 6bits	Note(1)
5	GND	Ground	
6	RXC+	Differential Clock Input (Positive)	
7	RXC-	Differential Clock Input (Negative)	
8	GND	Ground	
9	RX2+	Differential Data Input , CH2 (Positive)	
10	RX2-	Differential Data Input , CH2 (Negative)	
11	GND	Ground	
12	RX1+	Differential Data Input , CH1 (Positive)	
13	RX1-	Differential Data Input, CH1 (Negative)	
14	GND	Ground	
15	RX0+	Differential Data Input, CH0 (Positive)	
16	RX0-	Differential Data Input, CH0 (Negative)	
17	reLR	Left or right display control SHLR="1" : Right → Left SHLR="0" : Left → Right	Note(2)
18	reUD	Up / down display control UPDN="1" : Down → Up UPDN="0" : Up → Down	Note(2)
19	VDD	Power supply, 3.3V	
20	VDD	Power supply, 3.3V	

Note(1) The high level voltage "1" is 3.3V, and the low level voltage "0" is GND.

Note(2) UPDN and SHLR control function

reLR	reUD	Data shifting
1	0	Right→Left, Up→Down
0	0	Left→Right, Up→Down
1	1	Right→Left, Down→Up
0	1	Left→Right, Down→Up

5.2 Backlight Pin Assignment

Connector: FI-S8P-HEF JAE (or equivalent)

Mating Connector: FI-S8S (JAE)

Pin NO.	Symbol	Description	Note
1	VL	LED Driver input voltage	12V
2	VL	LED Driver input voltage	12V
3	VL	LED Driver input voltage	12V
4	GNDL	LED Driver ground	Ground
5	GNDL	LED Driver ground	Ground
6	GNDL	LED Driver ground	Ground
7	BLDN	LED Driver Enable pin. High : LED Back-light ON Low : LED Back-light Low	12V
8	V _{PDIM}	PWM input for Back-light brightness adjust	

5.3 Touch Panel Controller Board Pin Assignment

Connector: SM12B-SHLS-TF(LF)(SN) JST (or equivalent)

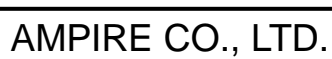
Mating Connector: SHLP-12V-S-B (JST)

Pin NO.	Symbol	Description	UART	USB
1	VDD5	No connection	Do not Support	5V
2	CKW	No connection		NC
3	SC	No connection		NC
4	GND	Ground		GND
5	DIN	No connection		NC
6	DOUT	No connection		NC
7	TEST1	No connection		NC
8	TEST2	No connection		NC
9	RESET	Reset Signal, Active Low		RESET
10	D-	USB D-		D-
11	D+	USB D+		D+
12	VUSB	USB Power Supply		5V

6. Optical Specifications

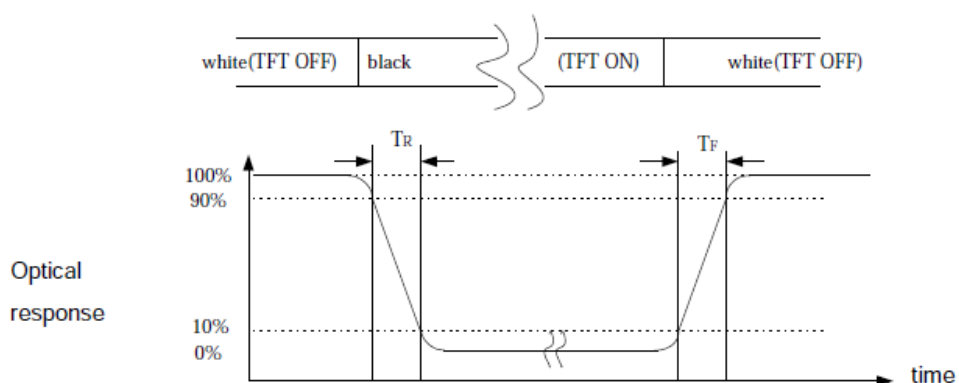
Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast		CR	Θ=0 Normal viewing angle	600	900	—		(1)(2)
Response time	Rising	TR+TF		—	30	40	msec	(1)(3)
	Falling							
White luminance (Center)		YL		480	600	—	cd/m ²	(1)(4)
Color chromaticity (CIE1931)	White	Wx		Typ. -0.05	0.296	Typ. +0.05		(1)(4)
		Wy			0.333			
	Red	Rx			0.666			
		Ry			0.327			
	Green	Gx			0.278			
		Gy			0.594			
	Blue	Bx			0.134			
		By			0.121			
Viewing angle	Hor.	ΘL	CR>10	80	85	—		
		ΘR		80	85	—		
	Ver.	ΘU		80	85	—		
		ΘD		80	85	—		
Brightness uniformity		BUNI	Θ=0	70	80	—	%	(5)
Optima View Direction		Free						(6)

Date: 2023/10/23



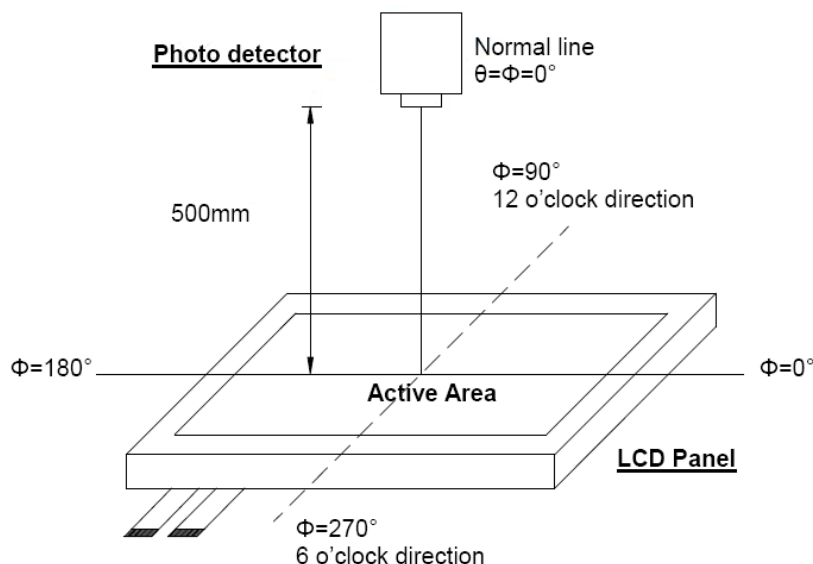
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Note(3) Definition of Response Time : Sum of TR and TF



Note(4) Definition of optical measurement setup

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.)

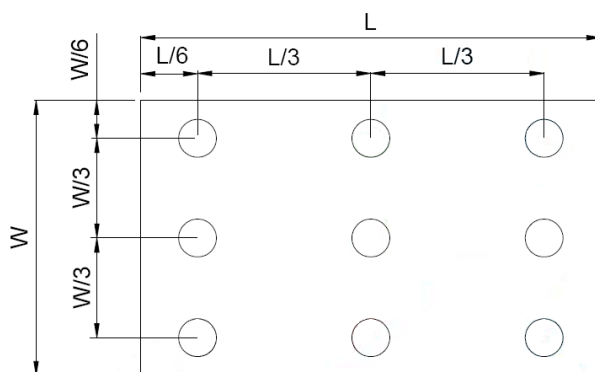


Note(5) Definition of brightness uniformity

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



B_{\max} : The measured maximum luminance of all measurement position.

B_{\min} : The measured minimum luminance of all measurement position.

Note(6) Rubbing Direction (The different Rubbing Direction will cause the different optima view direction.

7. Touch Panel Unit

7.1 Basic Characteristic

ITEM	SPECIFICATION
Type	Projective Capacitive Touch Panel
Activation	10-fingers or Signal-finger
X/Y Position Reporting	Absolute Position
Touch Force	No contact pressure required
Calibration	No need for calibration
Report Rate	Approx. 100 points/sec
Resolution	16384 x 16384
Interface	USB
Control IC	EXC80W46

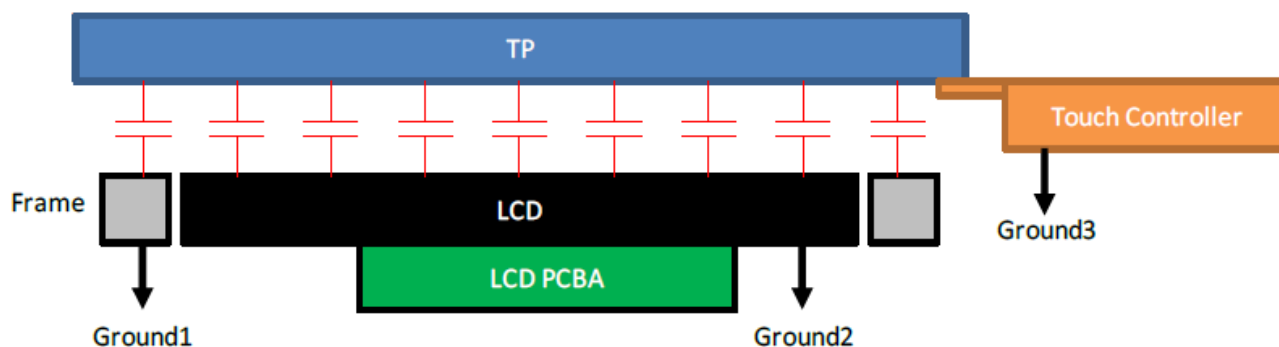
Specify the normal operating condition
(GND=0V)

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Power Supply Voltage	VBUS	4.75	5.0	5.25	V	
Low Level Input Voltage	VIL	0	--	0.8	V	1
High Level Input Voltage	VIH	0.8*3.3	--	3.3	V	1
Power Consumption	I _{VDD}		T.B.D		mA	

Note 1: RESET

7.2 Grounding

TP needs to work in environment with stable stray capacitance. In order to minimize the variation in stray capacitance, all conductive mechanical parts must not be floating. Intermittent floating any conductive part around the touch sensor may cause significant stray capacitance change and abnormal touch function. It is recommended to keep all conductive parts having same electrical potential as the GND of the touch controller module.



GND1, GND2 and GND3 should be connected together to have the same ground

8. Reliability Test Conditions

Test Item	Test Conditions	Note
High Temperature Operation	70±3°C ,Dry t=240 hrs	
Low Temperature Operation	-30±3°C, Dry t=240 hrs	
High Temperature Storage	80±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 ~ 70°C 30 min. 5 min. 30 min. (1 cycle) Total 100 cycle(Dry)	1,2
Storage 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 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 Use Restriction

- (1) This product is not authorized for use in life supporting systems, aircraft navigation control systems, military systems and any other application where performance failure could be life-threatening or otherwise catastrophic.

9.2 Disassembling or Modification

- (1) Do not disassemble or modify the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display. AMPIRE does not warrant the module, if customers disassemble or modify the module.

9.3 Breakage of LCD Panel

- (1) If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid crystal, and do not contact liquid crystal with skin.
- (2) If liquid crystal contacts mouth or eyes, rinse out with water immediately.
- (3) If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.
- (4) Handle carefully with chips of glass that may cause injury, when the glass is broken.

9.4 Electric Shock

- (1) Disconnect power supply before handling LCD module.
- (2) Do not pull or fold the LED cable.
- (3) Do not touch the parts inside LCD modules and the fluorescent LED's connector or cables in order to prevent electric shock.

9.5 Absolute Maximum Ratings and Power Protection Circuit

- (1) Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts' parameters, environmental temperature, etc., otherwise LCD module may be damaged.
- (2) Please do not leave LCD module in the environment of high humidity and high temperature for a long time.
- (3) It's recommended to employ protection circuit for power supply.

9.6 Operation

- (1) Do not touch, push or rub the polarizer with anything harder than HB pencil lead.
- (2) Use fingerstalls of soft gloves in order to keep clean display quality, when persons handle the LCD module for incoming inspection or assembly.
- (3) When the surface is dusty, please wipe gently with absorbent cotton or other soft material.
- (4) Wipe off saliva or water drops as soon as possible. If saliva or water drops contact with polarizer for a long time, they may cause deformation or color fading.
- (5) When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzene or other adequate solvent.

9.7 Static Electricity

- (1) Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.
- (2) Because LCD modules use CMOS-IC on circuit board and TFT-LCD panel, it is very weak to electrostatic discharge. Please be careful with electrostatic discharge. Persons who handle the module should be grounded through adequate methods.

9.8 Strong Light Exposure

- (1) The module shall not be exposed under strong light such as direct sunlight. Otherwise, display characteristics may be changed.

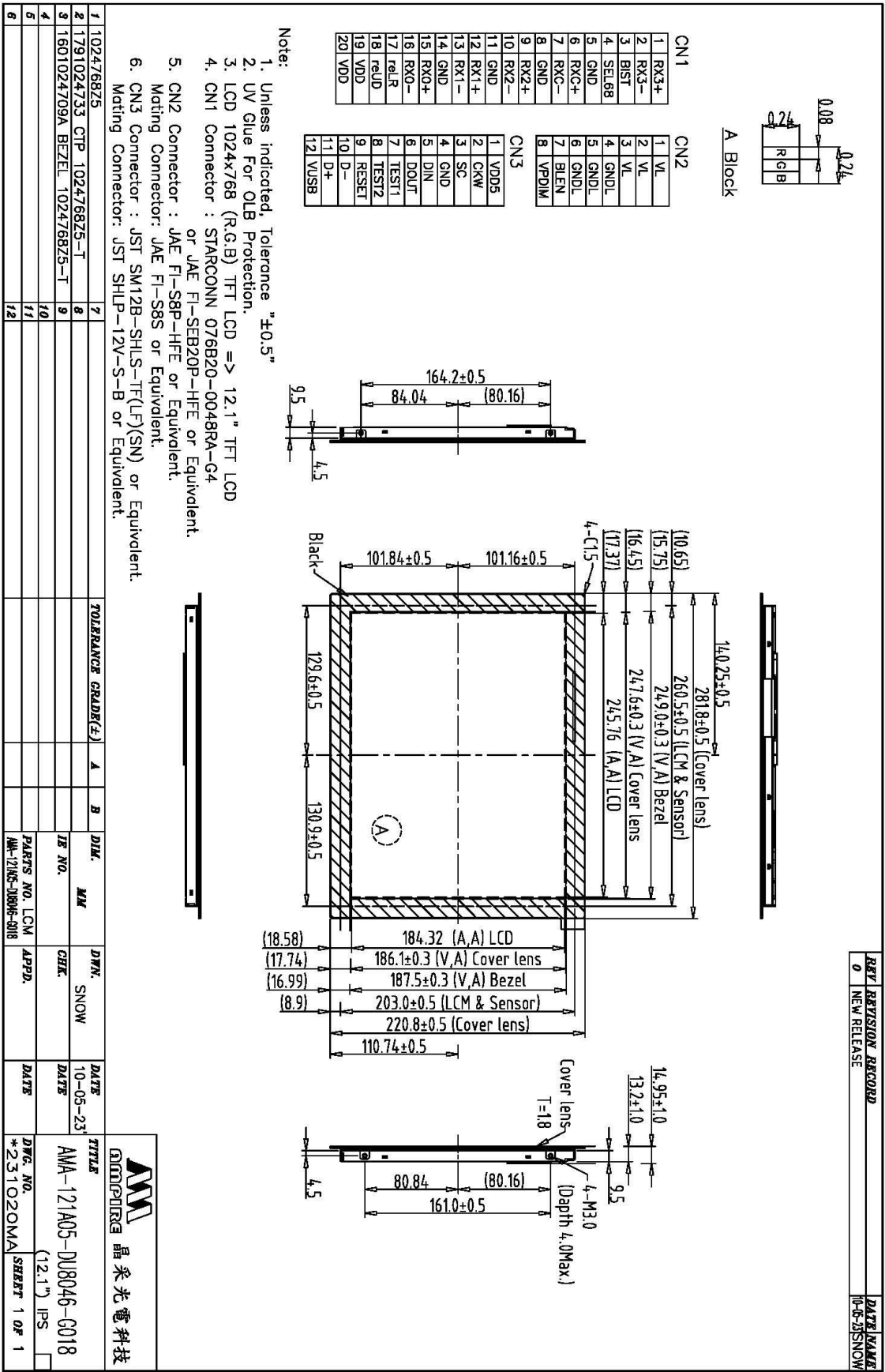
9.9 Disposal

- (1) When disposing LCD module, obey the local environmental regulations.

9.10 Others

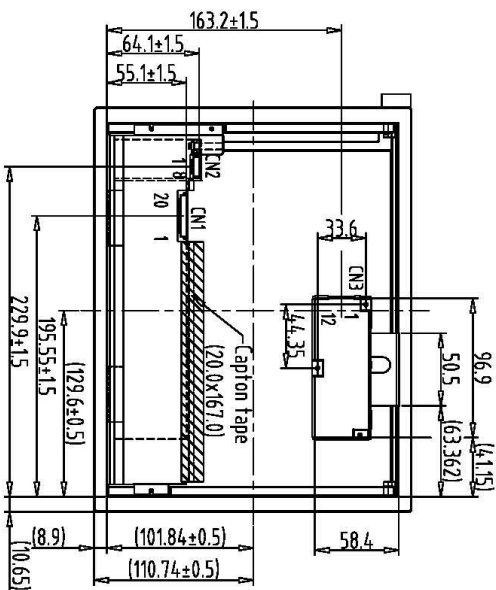
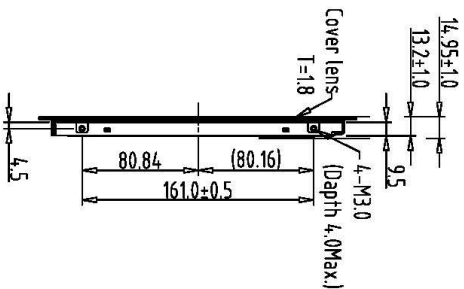
- (1) AMIPRE will provide one year warrantee for all products and three months warrantee for all repairing products.
- (2) Do not keep the LCD at the same display pattern continually. The residual image will happen and it will damage the LCD. Please use screen saver.

10. Outline Dimension



REV	REVISION RECORD	DATE	NAME
0	NEW RELEASE	10-05-23	SNOW

CN1	1 RX3+	CN2	1 VL
2 RX3-	2 VL	2 VL	3 VL
3 BIST	3 VL	4 GNDL	5 GNDL
4 SEL6B	5 GND	6 GNDL	7 BLEN
5 GND	6 RXC+	8 VPDI	
6 RXC-	7 RXC-		
7 RXC+	8 GND		
8 GND	9 RX2+		
9 RX2-	10 RX2-		
10 RX2+	11 GND		
11 GND	12 RX1+		
12 RX1+	13 RX1-		
13 RX1-	14 GND		
14 GND	15 RX0+		
15 RX0+	16 RX0-		
16 RX0-	17 reLR		
17 reLR	18 reUD		
18 reUD	19 VDD		
19 VDD	20 VDD		



Back View

- Note:
1. Unless indicated, Tolerance "±0.5"
 2. UV Glue For OLB Protection.
 3. LCD 1024x768 (R.G.B) TFT LCD => 12.1" TFT LCD
 4. CN1 Connector : STARCONN 076B20-0048RA-G4
or JAE FI-SEB20P-HFE or Equivalent.
 5. CN2 Connector : JAE FI-S8P-HFE or Equivalent.
 6. Mating Connector: JST SM12B-SHS-TF(LF)(SN) or Equivalent.

Mating Connector: JST SHLP-12V-S-B or Equivalent.

1	102476825	2		TOLERANCE GRADE(%)	A	B	DIM.	MM	DWG.	SNOW	DATE	TITLE
2	1791024733 CTP 102476825-T	8					JE NO.				10-05-23	AMA-121A05-DU8046-G018
3	1601024709A BEZEL 102476825-T	9					PARTS NO. LCM-1	APPD.			DATE	(12.1") IPS
4		10					MM-121A05-DU8046-G018				DATE	DWG. NO.
5		11									DATE	SHEET 1 OF 1
6		12									DATE	



Date: 2023/10/23



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REV	REVISION RECORD	DATE NAME
0	NEW RELEASE	10-16-73SNOW

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